5th Edition

# GAS PRESSURE REGULATOR CATALOG






MAXITROL®

## ⚠ 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.**

# 220 SERIES

## Pilot Loaded Design

The 220 series uses a servo-operated design rather than a spring-loaded design and can deliver higher outlet pressures than conventional spring-loaded models.

The main diaphragm of the model 220 is loaded with gas pressure instead of spring pressure. A small pilot regulator, located in the upper housing, accurately controls this gas pressure. When the regulated outlet pressure of the servo regulator is changed by spring adjustment, the outlet pressure of the 220 main regulator will be changed proportionately. Applications include industrial furnaces and ovens.

220D

## Specifications

**Pipe Sizes** ..... 1″ to 3″ threaded connections with NPT or ISO7-1 threads. 4″ 125 lb. flange (220J only).

**Housing Material** ..... 220D, 220E, 220G, 220J: aluminum.

**Mounting** ..... Mount in an upright 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).

**Gas Types** ..... Suitable for natural, manufactured, mixed gases, liquefied petroleum gases, and LP gas-air mixtures.

**Maximum Inlet Pressure** ..... 10 psi (68.9 kPa)

**Flow Rates** ..... up to 50,000 CFH (1416 $m^3/h$)

**Emergency Exposure Limits** ..... 25 psi (170 kPa)

**Ambient Temperature Ranges** ..... -40 to 200°F (-40 to 93°C)

**Sensing Taps** ..... Three positions can be tapped and plugged for measuring pressure. The fourth position is used to supply inlet pressure to the pilot regulator.

**Remote Sensing** ..... 220D, 220E, 220G 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.

**NOTE**: 220D, 220E, 220G, 220J are not CSA certified.

**NOTE**: ″L″ models available for outlet pressures under 1 psi (6.9 kPa).

## Pressure Drop: inches w.c. (kPa) @ 0.64 sp gr gas

| Flow Rate CFH ($m^3/h$) | | 220D | | | 220E | | 220G | | 220J |
|---|---|---|---|---|---|---|---|---|---|
| | | 1″ | 1 1/4″ | 1 1/2″ | 1 1/2″ | 2″ | 2 1/2″ | 3″ | 4″ |
| 1000 | (28.3) | 1.90 (0.47) | 1.70 (0.42) | 1.70 (0.42) | --- | --- | --- | --- | --- |
| 2000 | (56.6) | 4.93 (1.23) | 3.10 (0.77) | 2.90 (0.72) | 1.90 (0.47) | 1.90 (0.47) | --- | --- | --- |
| 3000 | (85.0) | 11.10 (2.76) | 7.42 (1.85) | 5.40 (1.34) | 2.90 (0.72) | 2.40 (0.60) | --- | --- | --- |
| 4000 | (113) | 19.70 (4.91) | 13.20 (3.29) | 11.10 (2.76) | 4.93 (1.23) | 4.00 (1.00) | 2.00 (0.50) | 1.90 (0.47) | 1.70 (0.42) |
| 5000 | (142) | 30.80 (7.67) | 20.70 (5.16) | 17.40 (4.33) | 7.70 (1.92) | 6.25 (1.56) | 2.20 (0.55) | 2.10 (0.52) | 1.70 (0.42) |
| 6000 | (170) | 44.20 (11.01) | 29.70 (7.40) | 25.00 (6.23) | 11.10 (2.76) | 9.00 (2.24) | 2.60 (0.65) | 2.30 (0.57) | 1.70 (0.42) |
| 7000 | (198) | --- | 40.60 (10.11) | 34.00 (8.47) | 15.10 (3.76) | 12.25 (3.05) | 3.00 (0.75) | 2.60 (0.65) | 1.70 (0.42) |
| 8000 | (226) | --- | --- | 44.50 (11.08) | 19.70 (4.91) | 16.00 (3.98) | 4.00 (1.00) | 3.00 (0.75) | 1.80 (0.45) |
| 9000 | (255) | --- | --- | --- | 24.90 (6.20) | 20.25 (5.04) | 5.00 (1.25) | 3.80 (0.95) | 1.90 (0.47) |
| 10000 | (283) | --- | --- | --- | 30.80 (7.67) | 25.00 (6.23) | 6.22 (1.55) | 4.60 (1.15) | 2.10 (0.52) |
| 12000 | (340) | --- | --- | --- | 44.20 (11.01) | 36.00 (8.97) | 9.00 (2.24) | 6.80 (1.69) | 2.40 (0.60) |
| 14000 | (369) | --- | --- | --- | --- | --- | 12.20 (3.04) | 9.30 (2.32) | v |
| 16000 | (453) | --- | --- | --- | --- | --- | 16.00 (4.00) | 12.10 (3.01) | 3.40 (0.85) |
| 18000 | (510) | --- | --- | --- | --- | --- | 20.20 (5.03) | 15.30 (3.81) | 4.40 (1.10) |
| 20000 | (566) | --- | --- | --- | --- | --- | 25.00 (6.23) | 18.90 (4.71) | 5.40 (1.35) |
| 25000 | (708) | --- | --- | --- | --- | --- | 40.60 (10.11) | 30.70 (7.65) | 8.90 (2.22) |
| 30000 | (849) | --- | --- | --- | --- | --- | --- | 42.50 (10.59) | 12.40 (3.09) |
| 35000 | (991) | --- | --- | --- | --- | --- | --- | --- | 17.05 (4.25) |
| 40000 | (1133) | --- | --- | --- | --- | --- | --- | --- | 21.70 (5.41) |
| 45000 | (1274) | --- | --- | --- | --- | --- | --- | --- | 27.40 (6.83) |
| 50000 | (1416) | --- | --- | --- | --- | --- | --- | --- | 33.80 (8.42) |
| 55000 | (1557) | --- | --- | --- | --- | --- | --- | --- | 41.00 (10.21) |

**NOTE:** Do not exceed 36″ pressure drop when determining acceptable capacities at which these controls may be used. Under some conditions, these limits may be surpassed, but only after consultation with Maxitrol. See pages 58-59 for Regulator Sizing Requirements and Examples.

## Spring Selection

| Model | Available Springs | |
|---|---|---|
| 220D | 1 psi to 3 psi (6.9 kPa to 20.7 kPa) Red | 2 psi to 5 psi (13.8 kPa to 34.5 kPa) Yellow |
| 220E | 1 psi to 3 psi (6.9 kPa to 20.7 kPa) Red | 2 psi to 5 psi (13.8 kPa to 34.5 kPa) Yellow |
| 220G | 1 psi to 3 psi (6.9 kPa to 20.7 kPa) Red | 2 psi to 5 psi (13.8 kPa to 34.5 kPa) Yellow |
| 220J | 1 psi to 3 psi (6.9 kPa to 20.7 kPa) Red | 2 psi to 5 psi (13.8 kPa to 34.5 kPa) Yellow |

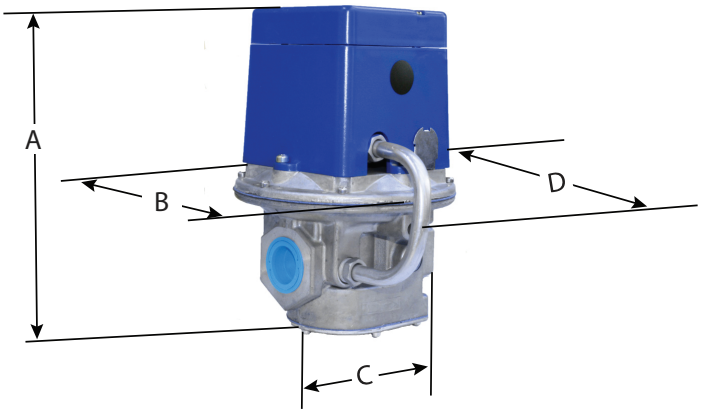
**NOTE:** See pages 56-57 for complete Spring Selection Chart.

# 220 SERIES
Pilot Loaded Design

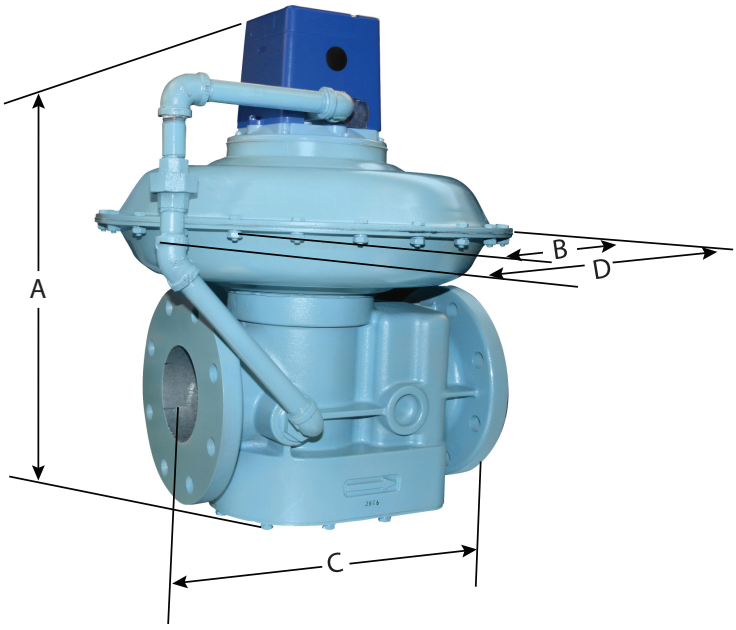
## Dimensions

| Model | Pipe Size | Vent Connection | Swing Radius | Dimensions | | | |
|---|---|---|---|---|---|---|---|
| | | | | A | B | C | D |
| 220D | 1″, 1 1/4″, 1 1/2″ | 12A06 vent limiting device installed. | 8.1″ (206 mm) | 9.5″ (241 mm) | 7″ (178 mm) | 5.5″ (140 mm) | 8.3″ (210 mm) |
| 220E | 1 1/2″, 2″ | 12A06 vent limiting device installed. | 8.6″ (217 mm) | 11.2″ (285 mm) | 9.1″ (232 mm) | 7.6″ (194 mm) | 10″ (256 mm) |
| 220G | 2 1/2″, 3″ | 12A06 vent limiting device installed. | 10.4″ (264 mm) | 14.2″ (362 mm) | 13.5″ (343 mm) | 10.4″ (264 mm) | 15.8″ (400 mm) |
| 220J | 4″ | 12A06 vent limiting device installed. | — | 20.5″ (520 mm) | 18″ (457 mm) | 13.9″ (352 mm) | 20″ (508 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.

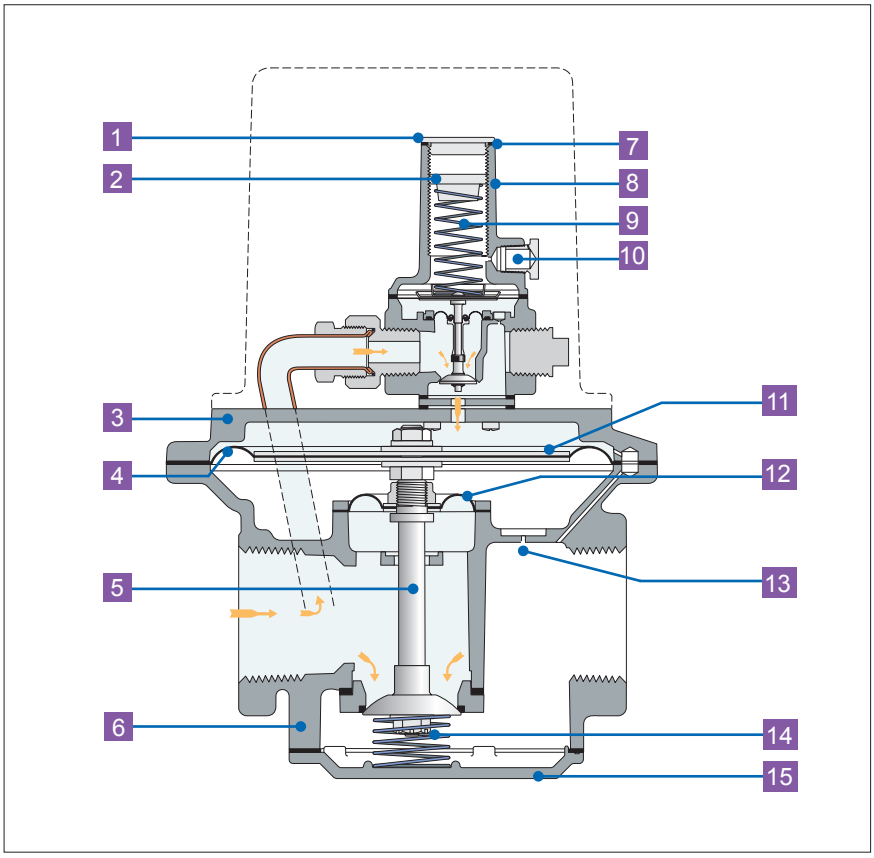



**220D, 2220E, 220G**




**220J**

## Pilot Loaded Design




| | |
|---|---|
| 1 | 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 Hole |
| 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 $m^3/h$ 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**

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

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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: $P2 = P1 \times (Q2/Q1)^2$

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 Bth/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 th 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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