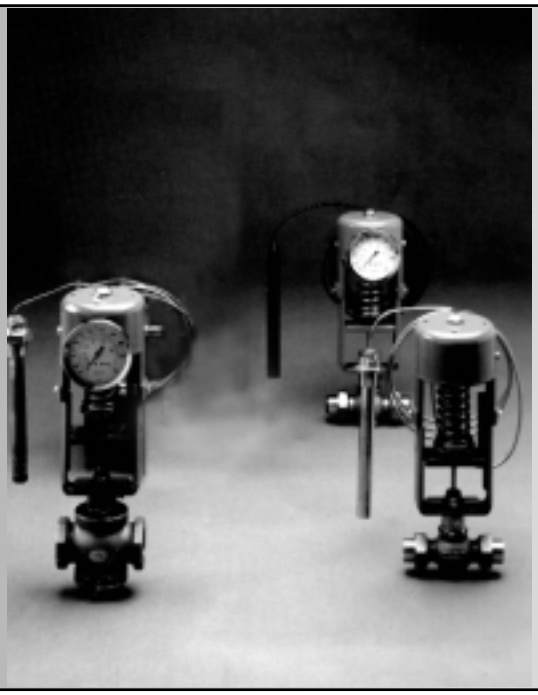
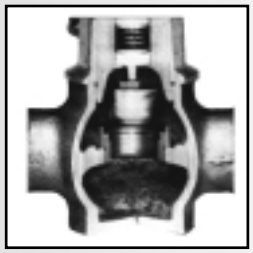
# #11 Self-Operating Temperature Regulators



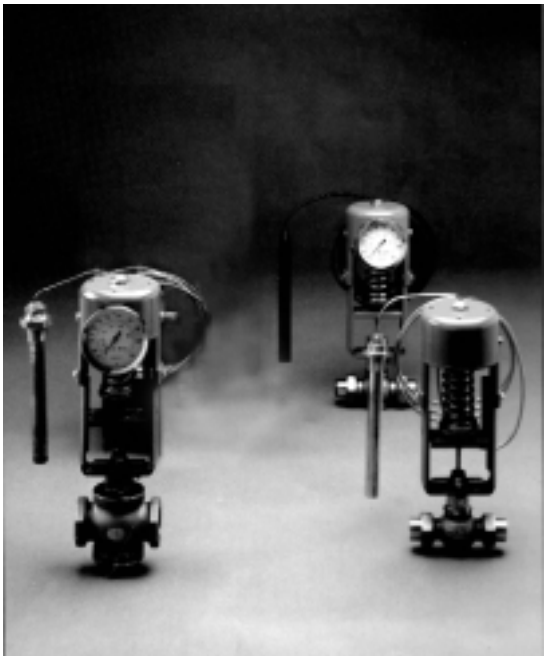


## Remote Bulb for Heating, Cooling, Mixing and By-Pass Applications

POWERS™

Water Tempering Innovation Since 1891

# Powers #11 Regulators

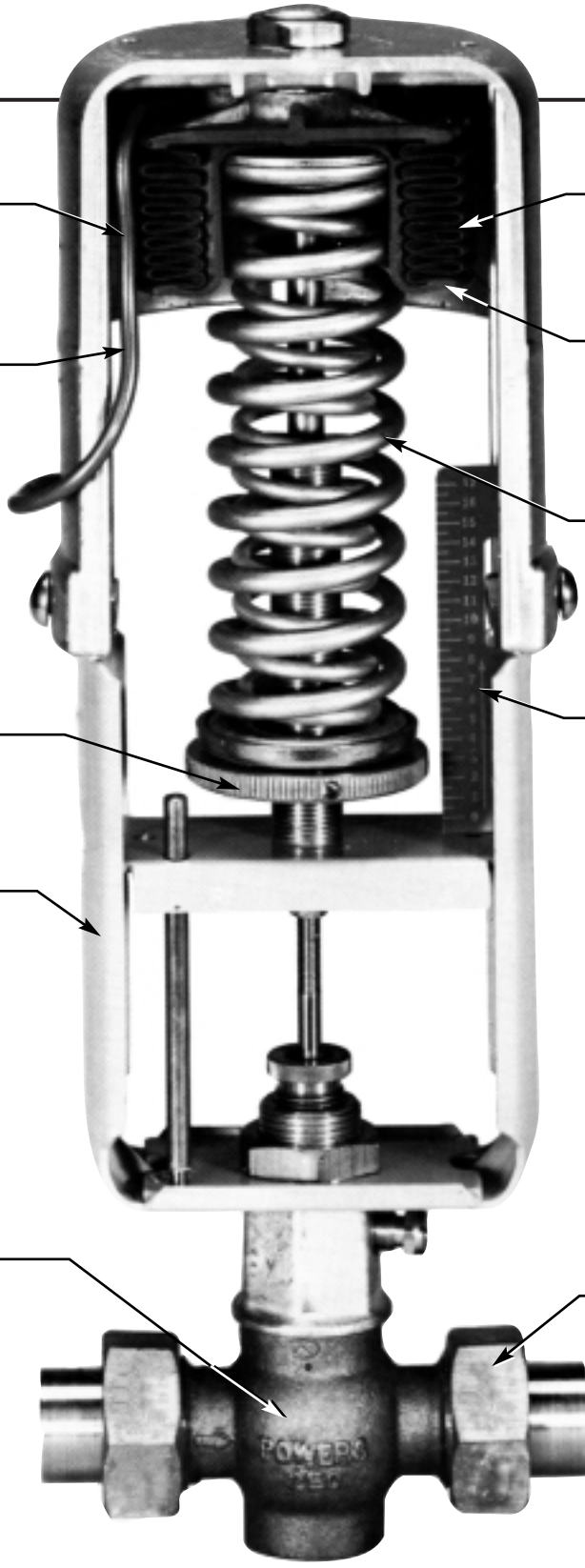


With Powers #11 Self-Operating Temperature Regulators, you no longer need external power to control your process. Just one temperature set-point adjustment to make and the rugged, self-operating #11 Regulator controls the flow of heating or cooling medium and maintains a ***uniform*** temperature.

So whether you're using processing equipment, heat exchangers, or machinery, Powers #11 Self-Operating Temperature Regulators are the easy solution to your control problems.

# Table of Contents

# Powers #11 Features




Thick (.049″) wall capillary eliminates need for additional armor.

Protected capillary entry into regulator shields against damage and strain.

Temperature adjustment screw utilizes ball bearing spring platform, for easy adjustment.

Open yoke design minimizes heat transfer from valve to bellows, allowing more accurate control.

Wide range of heating, cooling, and mixing valve bodies are available.

Large (7.8 sq. in.) bellows provides extra valve positioning power, increasing accuracy.

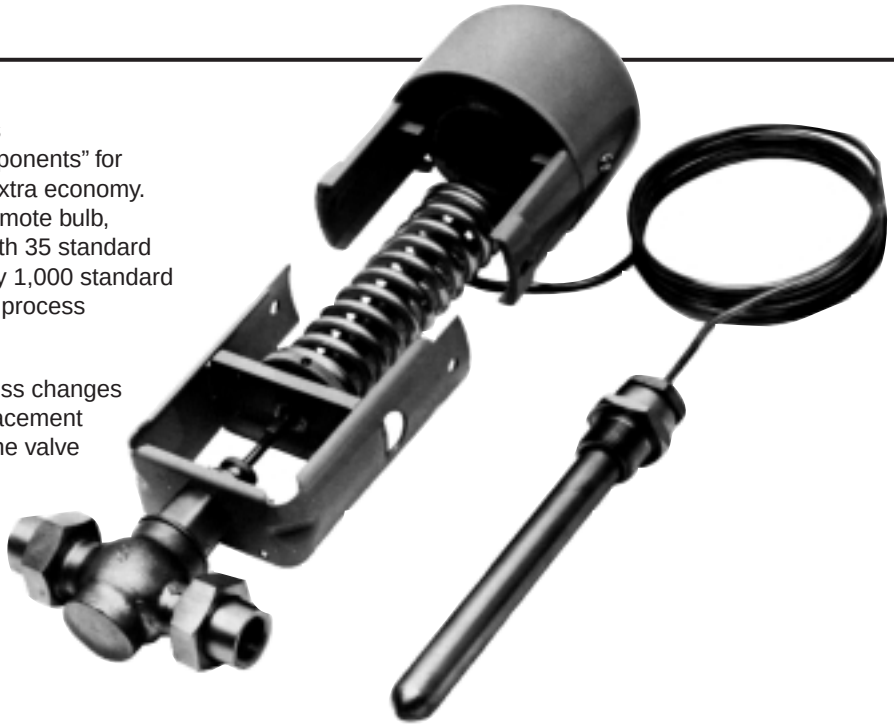
Deep corrugations in bellows provides long life..

High rate spring allows 60°F adjustment span.

Temperature setting scale provides easy, convenient reference when changing setpoints.

Union ends assist installation and maintenance

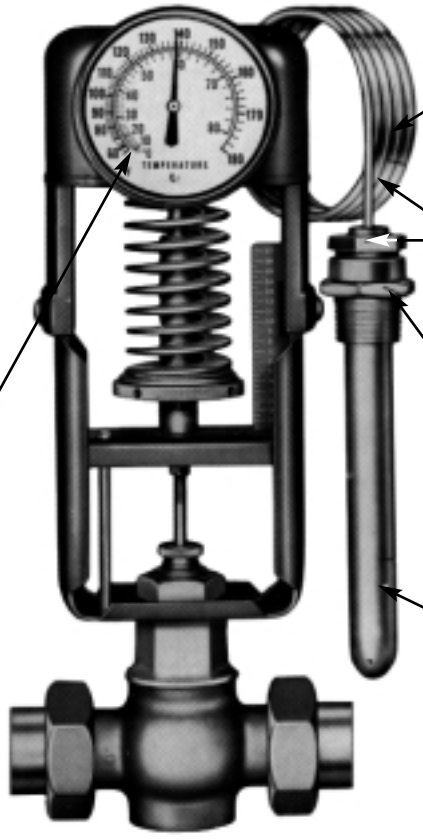
# Component System
# Thermal System Options



Powers No. 11 Regulator capability includes ***interchangeable*** sensing and control "components" for minimum downtime, greater flexibility, and extra economy. Any of 29 thermal systems (composed of remote bulb, capillary, and bellows) can be teamed up with 35 standard valve assemblies. This means approximately 1,000 standard models are available to meet virtually every process requirements.

If a thermal system is damaged—or if process changes require a different temperature range—replacement can be made in minutes without removing the valve assembly from the supply line. Similarly, a single thermal system can accommodate a variety of valve types and sizes.

The Thermal System is the key component of a #11 Regulator. It senses the process temperature and provides power to stroke the valve. The #11 Thermal System offers tremendous flexibility through its wide range of options. Standard features and options are listed below. (See "How to Order" section, pp. 22–23, for specifying #11 Thermal System Options.)



**Capillary Length**
- Standard 8′
- Optional 15′ or 30′

**Bulb and Capillary Material**
- Standard: Copper
- Optional: Stainless steel or Teflon

**Bulb Fitting**
- Standard Style D (Fixed Union)
- Optional Style A (Adjustable Union), Style J (Plain Bulb), or Style V (Vertical Bulb)

**Bulb Size**

Usually dictated by range and valve selection. See "How to Order" section (pp. 22–23) for applicable bulb size.

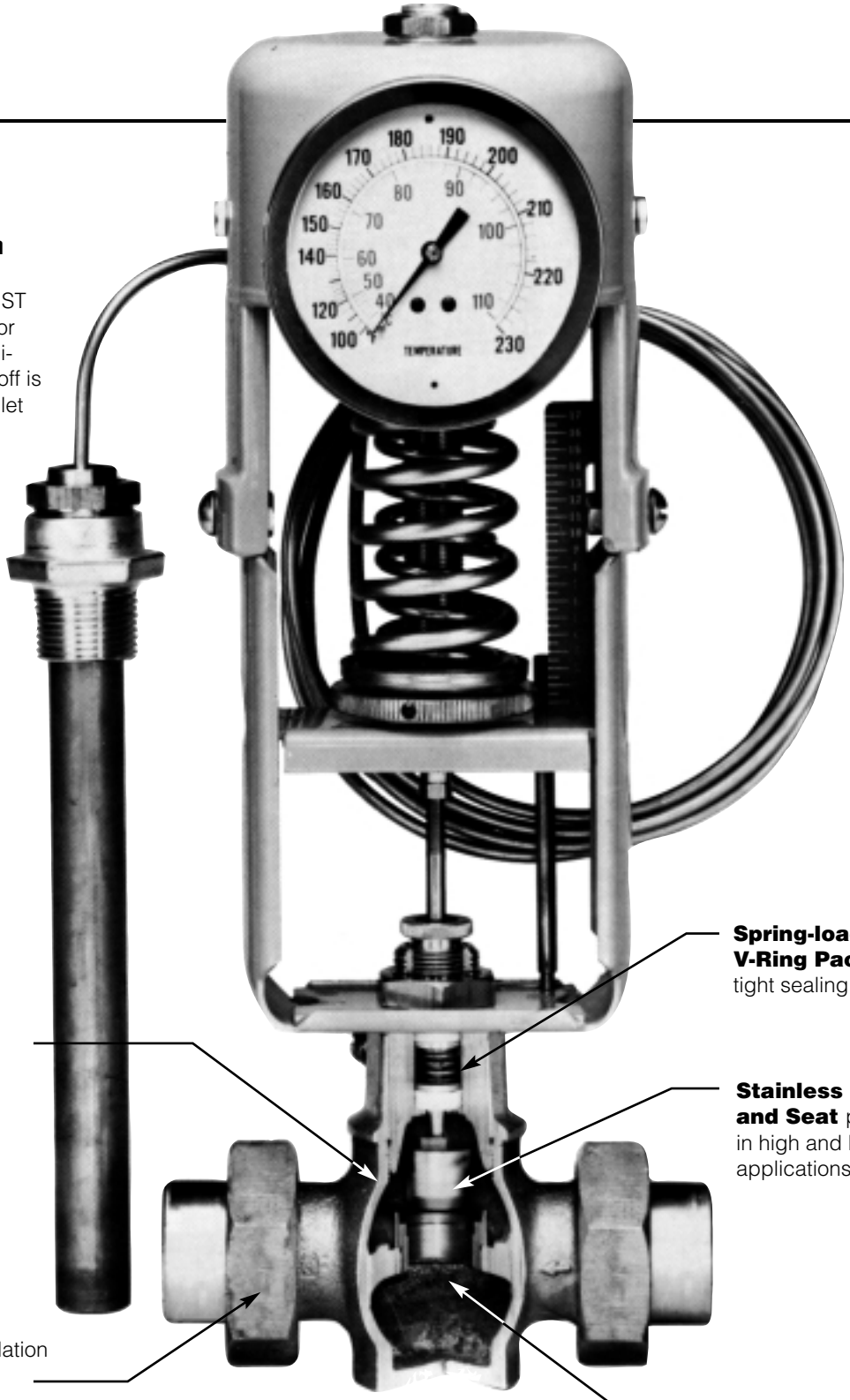
**Optional Dial Indicator**
- Stainless steel case
- Rotates in any direction
- Fast response
- Dual °F / °C scale
- Wide availability of temperature ranges. (See "How to Order" section, pages 22–23, for range availability.)

# Powers #11 Type ST Regulator

**Heating or Cooling**
**Size ½″ to 1″**
**with Stainless Steel Trim**

**Application:** #11 Type ST Regulator is well-suited for heating and cooling applications where good shutoff is required or where high inlet pressures cause a large pressure differential across the valve. The Type ST is normally the single seat valve used for cooling applications, and steam applications above 50 PSI.

(Maximum leakage @ closure is 0.1% of maximum flow)



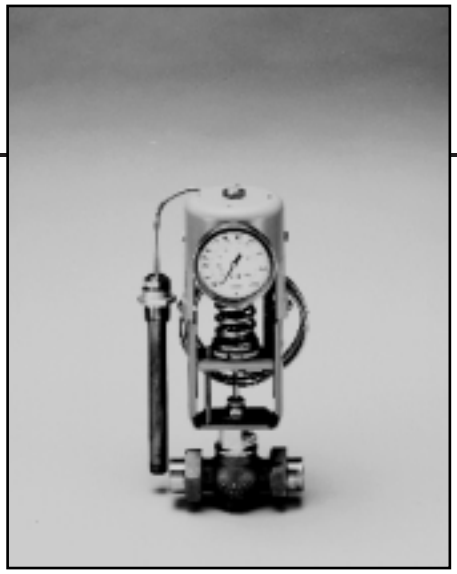

**Spring-loaded V-Ring Packing** provides tight sealing and long life.

**Self-Aligning Plug** assists with tight shutoff.

**Stainless Steel Plug and Seat** provide long life in high and low pressure applications.

**Union ends** ease installation and maintenance

**Reduced Ports** are available for low flow applications.



## Selection

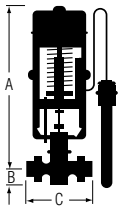
Refer to Load Calculations (page 16) to determine the valve capacity required for your process.

Next, refer to the Valve Sizing Charts (pages 16–21) to select valve size matching your capacity requirements.

## How to Order

Refer to the product number guide (on pages 22–23) to match your valve and thermal system selections and determine product number.

## Type ST Dimensions




| Valve Style | Material and Connections | Valve Size | A in. (mm) | B in. (mm) Heating | B in. (mm) Cooling | C in. (mm) | Shipping Weight lbs. (kg) |
|---|---|---|---|---|---|---|---|
| **Single Seat** Stainless Steel Trim | Bronze body, double female unions | ½″ | 14⅛ (359) | 1¼ (32) | 1¾ (44) | 5⅝ (143) | 21 (9.5) |
| | | ¾″ | 14¼ (362) | 1⅜ (35) | 2 (51) | 6 (152) | 20 (10) |
| | | 1″ | 14⅜ (365) | 1½ (38) | 2¼ (57) | 6¾ (171) | 22 (11) |

## Specifications

**Body:** Bronze ANSI Class 250

**Connections:** Union ends

**Trim:** Stainless steel

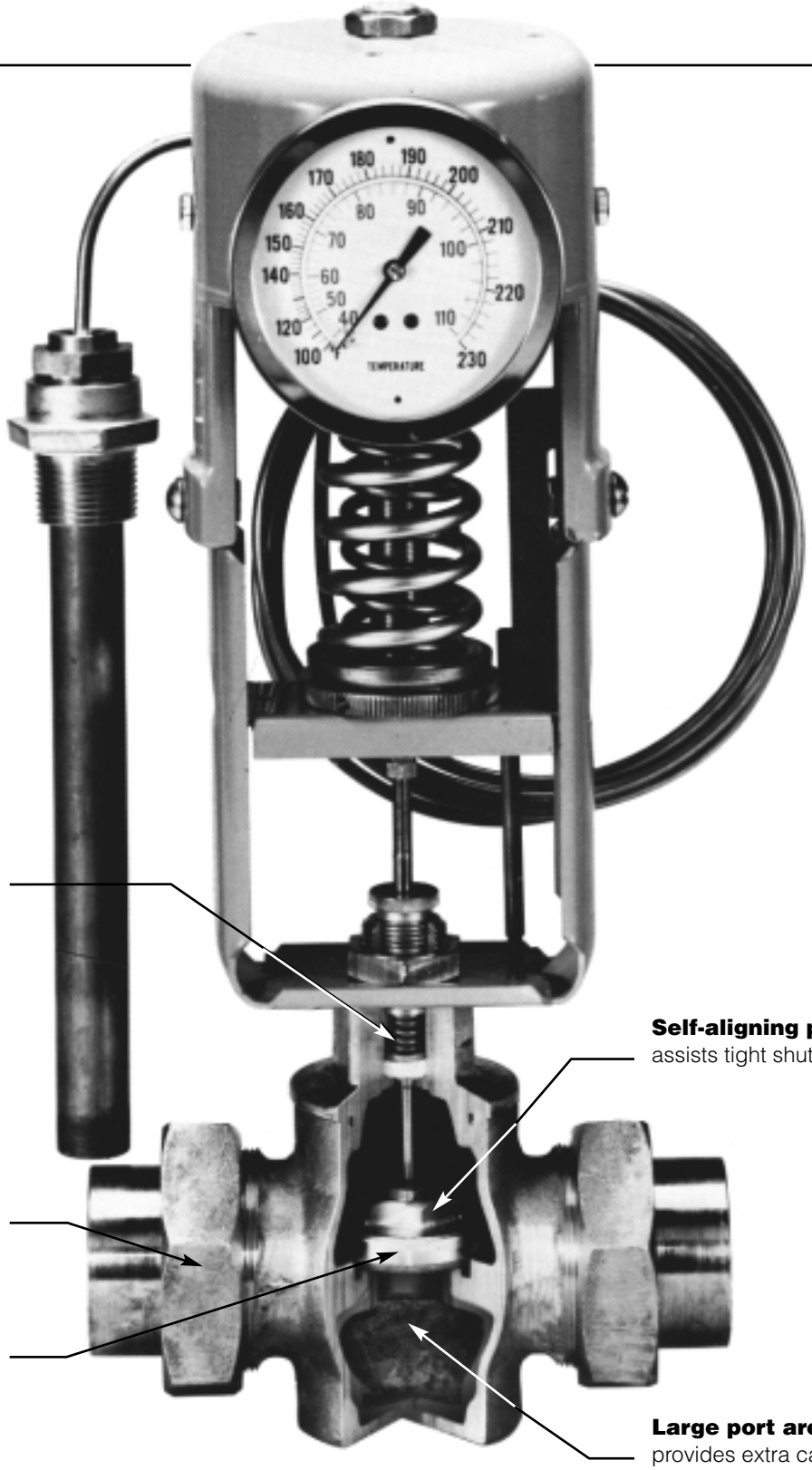
| **Sizes** | ½A | ½B | ½C | ½D | ½ | ¾ | 1 |
|---|---|---|---|---|---|---|---|
| **$C_V$** | .25 | .50 | 1.0 | 2.0 | 2.6 | 4.6 | 10.5 |
| **Max. Pressure Differential** (psi/kPa) | | 200 (1379) | 200 (1379) | 200 (1379) | 200 (1379) | 140 (965) | 70 (483) |

# Powers #11 Type CD Regulator

**Heating**
**Size ½″ to 1½″**
**Bronze trim with**
**Composition Shut Off Disc**

**Application:** The #11 Type CD Regulator is well-suited for heating applications where the steam inlet pressure is under 50 psi and good shut-off is required. The Type CD is only available for steam service.

(Maximum leakage @ closure is .01% of maximum flow)




**Spring-loaded V-Ring Teflon Packing** provides good sealing, long life, and requires no lubricant.

**Self-aligning plug** assists tight shut-off.

**Union ends** ease installation and maintenance.

**Composition disc** assists shut-off

**Large port area** provides extra capacity.

## Selection

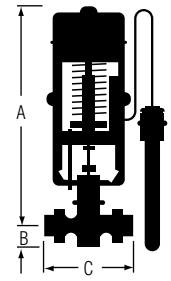
Refer to Load Calculations (page 16) to determine valve capacity required for your process.

Refer to Valve Sizing Charts (pages 16–21) to select valve size matching your capacity requirements.

## How to Order

Next refer to the product number guide (pages 22–23) to match your valve and thermal system selections and determine product number.

## Type CD Dimensions




| Valve Style | Material and Connections | Valve Size | A in. (mm) | B in. (mm) Heating | B in. (mm) Cooling | C in. (mm) | Shipping Weight lbs. (kg) |
|---|---|---|---|---|---|---|---|
| **Single Seat** Composition Disc | Bronze body, double female unions | ½″ | 14⅛ (360) | 1⅛ (29) | N/A | 5⅝ (143) | 19 (8.6) |
| | | ¾″ | 14¼ (363) | 1⅜ (35) | N/A | 6 (152) | 20 (9.1) |
| | | 1″ | 14⅜ (366) | 1½ (38) | N/A | 6¾ (171) | 22 (10) |
| | | 1¼″ | 14⅝ (372) | 1¾ (44) | N/A | 7 (178) | 24 (10.9) |
| | | 1½″ | 15 (382) | 2 1/16 (52) | N/A | 8 (203) | 26 (11.3) |

## Specifications

**Body:** Bronze ANSI Class 250

**Connections:** Union ends

**Trim:** Bronze

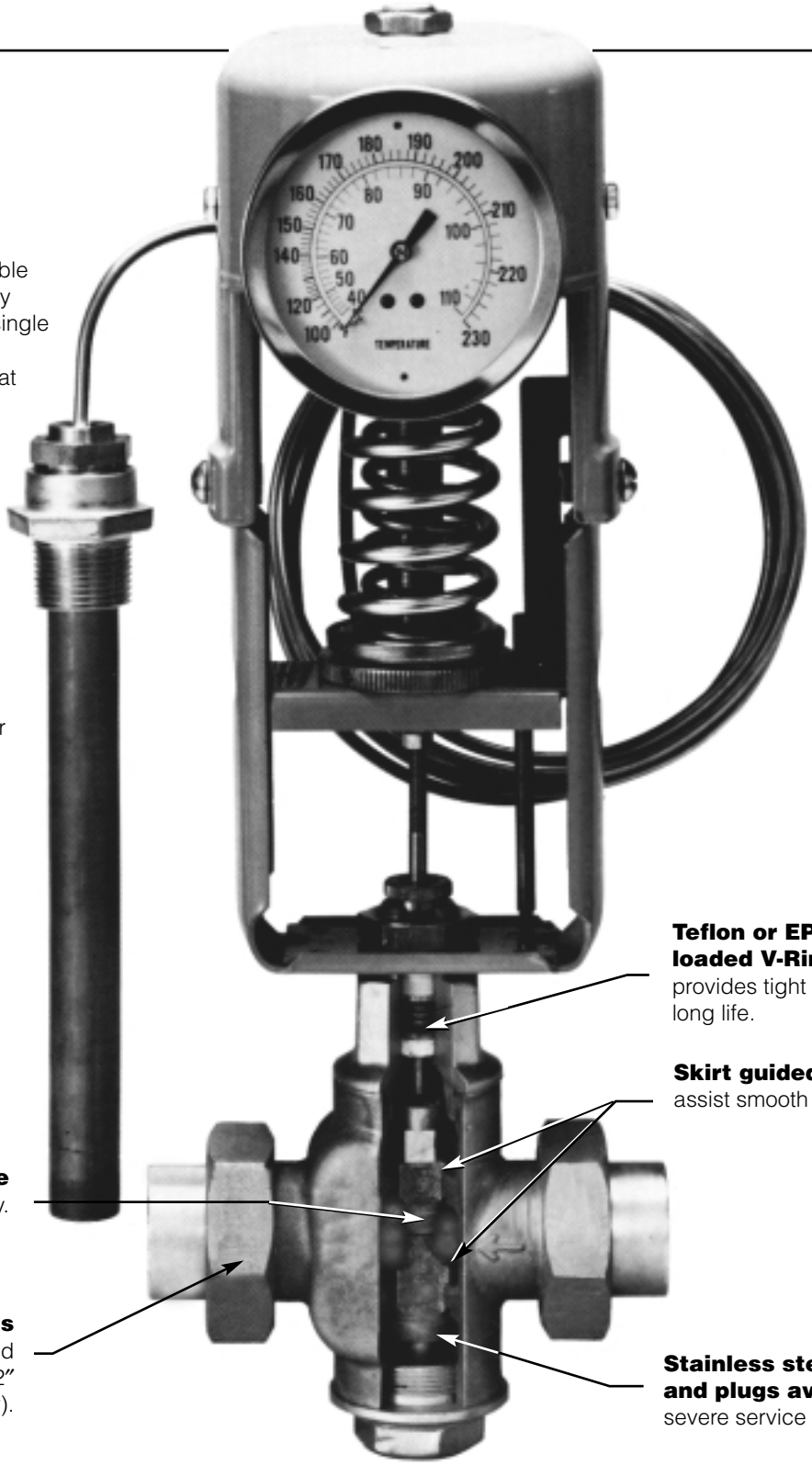
| **Sizes** | ½″ | ¾″ | 1″ | 1¼″ | 1½″ |
|---|---|---|---|---|---|
| **$C_V$** | 3.1 | 5.5 | 12.0 | 15.8 | 22.0 |
| **Max. Pressure Differential** (PSI/kPa)—**Steam** | 50 (345) | 50 (345) | 50 (345) | 45 (310) | 30 (207) |
| **Max. Pressure Differential** (PSI/kPa)—**Water** | 30 (207) | 30 (207) | 30 (207) | 30 (207) | 30 (207) |

# Powers #11 Type DB and DS Double Seat Regulators (1″ to 2″)

**Heating or Cooling**
**Sizes 1″ to 2″**
**Double Seat**
**Bronze or Stainless Trim**

**Application:** The #11 Double Seat Regulators are normally used in applications where single seat regulators do not have enough capacity. Double Seat Regulators do not have tight shut-off (when new, leakage = 0.5% of max. flow), and should not be used where leakage can cause over-heating in low capacity heating systems (e.g. Heat Exchangers). Double Seat Regulators will work well in heating systems that have storage capacity (e.g., tank type water heaters, or constant flow heat exchanger systems with storage tanks) and are excellent for cooling applications which usually utilize some additional method of bypassing water around the #11 Regulator.

Bronze trim is suitable for water and steam inlet pressures below 50 psi. Stainless steel trim should be used when inlet pressure is above 50 psi.



## Selection

Refer to Load Calculations (page 16) to determine valve capacity required for your process.

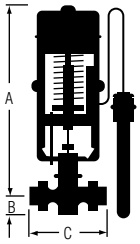
Refer to Valve Sizing Charts (pages 16–21) to select valve size matching your capacity requirements.

| Type | Description |
|---|---|
| DB | Double Seat Bronze Trim, Size 1″ to 2″ |
| DS | Double Seat Stainless Trim, Size 1″ to 2″ |

## How to Order

Refer to the product number guide (pages 22–23) to match your valve and thermal system selections and determine product number.

## Double Seat Regulator Dimensions




| Valve Style | Material and Connections | Valve Size | A in. (mm) | B in. (mm) Heating | B in. (mm) Cooling | C in. (mm) | Shipping Weight lbs. (kg) |
|---|---|---|---|---|---|---|---|
| Double Seat | Bronze body, double female unions, Types DB, DS | 1″ | 15 (381) | 2⅛ (54) | 2¾ (70) | 6¾ (171) | 24 (11) |
| | | 1¼″ | 15¼ (387) | 2½ (64) | 3 (76) | 7 (178) | 26 (12) |
| | | 1½″ | 15⅜ (390) | 2⅝ (67) | 3¼ (83) | 8 (203) | 28 (13) |
| | | 2″ | 16½ (419) | 3⅝ (92) | 4⅜ (111) | 9⅝ (244) | 39 (18) |

## Specifications

**Body:** 1″ to 2″ Bronze ANSI Class 250, 2½″ to 4″ Iron ANSI Class 125

**Connections:** 1″ to 2″ Union Ends, 2½″ to 4″ Flanged

**Trim:** Bronze or Stainless Steel

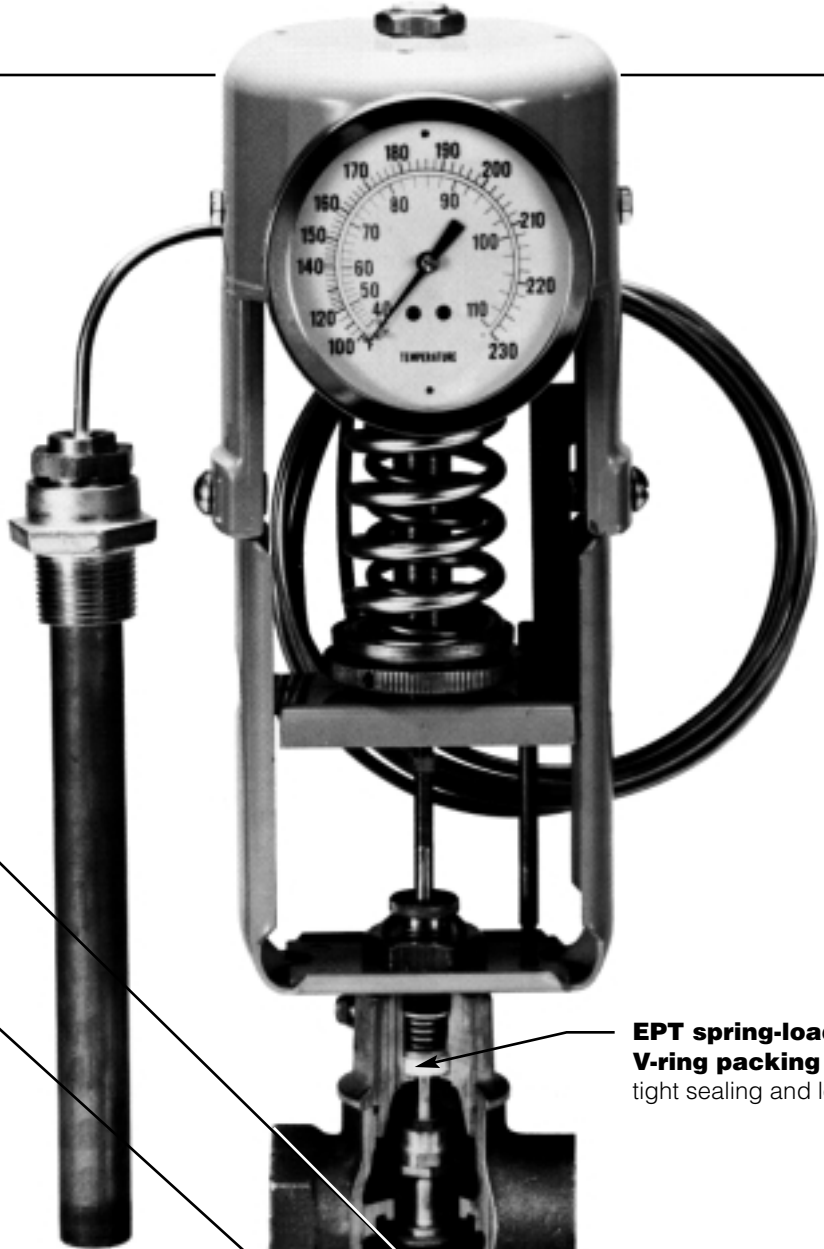
| Sizes | 1″ | 1¼″ | 1½″ | 2″ |
|---|---|---|---|---|
| $C_V$ | 13.5 | 22.0 | 28.0 | 53.0 |
| **Max. ΔP Bronze** (PSI/kPa) | 50 (345) | 50 (345) | 50 (345) | 50 (345) |
| **Max. ΔP Stainless Steel** (PSI/kPa) | 150 (1034) | 150 (1034) | 150 (1034) | 125 (862) |

# Powers #11 Type WM Regulator (½″ to 2″)

**Size ½″ to 2″**
**Water Mix Three-Way**
**Bronze or Iron Body,**
**Bronze Trim**

**Application:** The #11 Type WM/IM Regulator is typically used for domestic or process water tempering. It is also used for bypass control (in lieu of a diverting valve), but must be piped as a mixing valve (two inlets, one outlet).

(Maximum leakage @ closure is .01% of maximum flow)

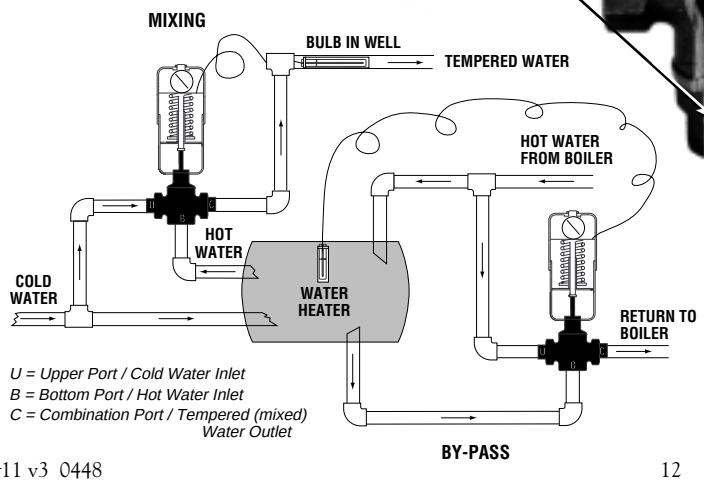


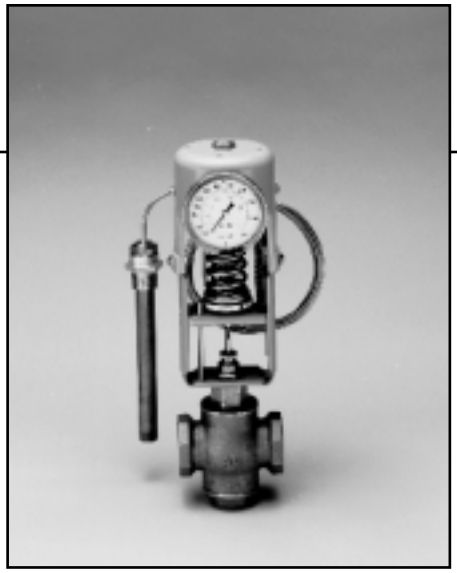

**EPT Discs** (½″ to 2″) assist shut-off.

**Lower guide** stabilizes plug, assisting shut-off and modulation.

**EPT spring-loaded V-ring packing** provides tight sealing and long life.

**Self-aligning plug** assists tight shut-off.





## Selection

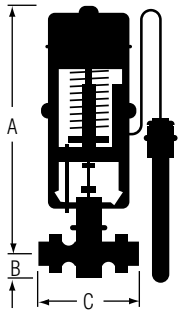
Refer to Load Calculations (page 16) to determine valve capacity required for your process.

Refer to Valve Sizing Charts (pages 16–21) to select valve size matching your capacity requirements.

## How to Order

Next refer to the product number guide (pages 22–23) to match your valve and thermal system selections and determine product number.

## Type WM Dimensions




| Valve Style | Material and Connections | Valve Size | A in. (mm) | B in. (mm) | C in. (mm) | Shipping Weight lbs. (kg) |
|---|---|---|---|---|---|---|
| Water Mix | Bronze body, screwed ends, Type WM | ½″ | 14⅛ (359) | 1¾ (44) | 2⅞ (73) | 21 (9.5) |
| | | ¾″ | 14¼ (362) | 2¼ (57) | 3⅜ (86) | 22 (10) |
| | | 1″ | 14⅜ (365) | 2½ (64) | 3⅞ (98) | 23 (10.4) |
| | | 1¼″ | 14⅝ (371) | 2¾ (70) | 4½ (114) | 25 (11.3) |
| | | 1½″ | 14⅞ (378) | 3 (76) | 5⅛ (130) | 28 (12.7) |
| | | 2 | 15¼ (387) | 3⅜ (86) | 6⅛ (156) | 33 (15) |

## Specifications

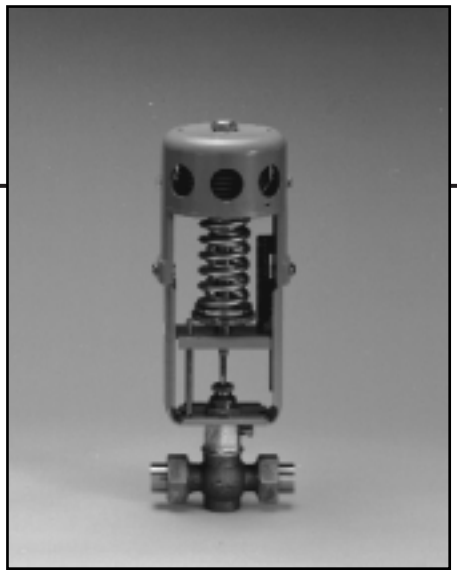
**Body:** ½″ to 2″ Bronze ANSI Class 125

**Connections:** ½″ to 2″ Screwed Ends

**Trim:** Bronze (½″ to 2″ with EPT discs)

| Sizes | ½″ | ¾″ | 1″ | 1¼″ | 1½″ | 2″ |
|---|---|---|---|---|---|---|
| $C_V$ Mixing | 4.2 | 7.2 | 12.4 | 20.1 | 25.5 | 39.3 |
| $C_V$ Bottom Port (bypass) | 2.2 | 6.0 | 8.9 | 15.8 | 17.9 | 30 |
| $C_V$ Top Port (bypass) | 3.5 | 6.0 | 11.2 | 16.7 | 23.7 | 38 |
| **Max.** $\Delta P$ (PSI/kPa) | 25 (150) | 25 (150) | 25 (150) | 25 (150) | 25 (150) | 25 (150) |

# Special #11 Regulators



*#11 Ambient Sensing Regulator*

Powers Process Controls can build Special #11 Regulators for a wide range of applications. Always consult your factory representative for availability of any Special #11 Regulators.

For example, Powers Process Controls has developed:

- Ambient Sensing Regulator for Controlling Space Temperature or Steam Tracing Pipelines
- Nickel-Coated Regulator for Sea Water Service
- Plugged Port Three-Way Regulator for Boiler Blow Down Tempering
- Special bulbs and capillaries for OEM applications

## Optional Accessories

### Steam Strainer

Prolongs life and prevents temperature variations due to lodged dirt or sediment between plugs and seats. Self-cleaning unit installs in steam supply line to valve.

| Size | ½″ | ¾″ | 1″ | 1¼″ | 1½″ | 2″ |
|---|---|---|---|---|---|---|
| Order No. | 043-718 | 043-724 | 043-730 | 043-736 | 043-740 | 043-744 |

### Stem Lubricator

Silicone grease lubricant minimizes friction between valve stem and packing. Suitable for valves handling steam, hot and cold water, air, natural gas, oils,and most other liquids compatible with bronze or cast iron valve bodies. Temperature limits of fluid in valve: –40°F to +400°F. (Not used with Teflon V-Ring Pkg.)

**Order No. 590-184A**

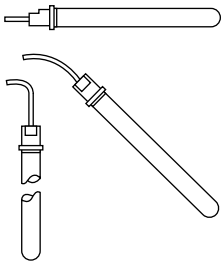
# Installation Information

No. 11 is the simplest of all temperature regulators to install because it mounts directly in the supply line—no external power requirement and no mounting brackets. **Recommended valve installation** is in vertical position (Figure 1) or in any position within 90° in either direction as shown. **Remote sensing bulb** is mounted either horizontally or vertically (end down) with bushing furnished. A special bulb must be ordered for vertical (end up) mounting (Figure 2).

*Figure 1: Regulator*

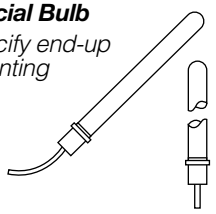
*Figure 2: Bulb*

***Standard Bulb***



***Special Bulb***

*Specify end-up mounting*



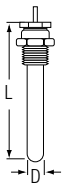
# Sensing Bulbs and Protective Wells

Bulb size is usually dictated by range and valve type selected. Refer to "How to Order" information on pages 22–23 for proper bulb size.

## Style D—Fixed Union Bulbs (Standard)

For rigid, pressure-tight attachment to vessel or pipeline—either directly or into socket well (see Style S wells). Union connection simplifies installation.

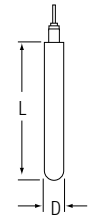
| Nominal Dimensions (O.D. x Length) | Tank Fitting Size | Bulb & Capillary Material | Actual Dimensions (in/mm) | | Pressure Rating (2) (PSI/kPa) | |
|---|---|---|---|---|---|---|
| | | | D | L | Shock | Non-Shock |
| 1″ x 9″ | 1″ NPT | Copper | 15/16″ (24) | 8″ (203) | 175 (4445) | 250 (6350) |
| | 1″ NPT | 347 Stainless | 15/16″ (24) | 8 1/16″ (205) | 500 (12700) | 725 (18415) |
| 1″ x 20″ | 1″ NPT | Copper | 15/16″ (24) | 19 7/8″ (505) | 175 (4445) | 250 (6350) |
| | 1″ NPT | 347 Stainless | 15/16″ (24) | 19 13/16″ (503) | 500 (12700) | 725 (18415) |
| 1 1/4″ x 24″ | 1 1/4″ NPT | Copper | 1 3/16″ (30) | 22 11/16″ (576) | 150 (3810) | 200 (5080) |
| 1 3/8″ x 30″ | 1 1/4″ NPT | Copper | 1 3/8″ (35) | 28 5/8″ (727) | 150 (3810) | 200 (5080) |




## Style J—Plain Bulb (Special)

No union—for liquid or air immersion in *open* tanks or ducts. Maximum 15 foot coated capillary length.

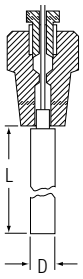
| Nominal Dimensions (O.D. x Length) | Bulb & Capillary Material | Standard Capillary Lengths (Feet) | Actual Dimensions (in/mm) | |
|---|---|---|---|---|
| | | | D | L |
| 1″ x 9″ | 347 Stainless | 8, 15 | 15/16″ (24) | 8 3/4″ (222) |
| | Teflon-coated (1) | 15 | 15/16″ (24) | 8 3/4″ (222) |
| 1″ x 20″ | 347 Stainless | 8, 15 | 15/16″ (24) | 20 1/2″ (520) |
| | Teflon-coated (1) | 15 | 15/16″ (24) | 20 1/2″ (520) |




## Style A—Adjustable Union Bulb (Special)

For pressure-tight insertion into tanks or ducts. Adjustable union permits capillary to be moved any desired distance through fitting and into liquid for more effective sensing bulb position.

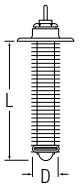
| Nominal Dimensions (O.D. x Length) | Tank Fitting Size | Bulb & Capillary Material | Actual Dimensions (in/mm) | | Pressure Rating (2) (PSI/kPa) | |
|---|---|---|---|---|---|---|
| | | | D | L | Shock | Non-Shock |
| 1″ x 9″ | 1″ NPT | 347 Stainless | 15/16″ (24) | 8 3/4″ (222) | 500 (12700) | 725 (18415) |
| 1″ x 20″ | 1″ NPT | 347 Stainless | 15/16″ (24) | 20 1/2″ (520) | 500 (12700) | 725 (18415) |




## Style G—Finned Bulb (Special) *Kit may be added to style "D" bulb as noted.*

For air-sensing applications not corrosive to copper. Has duct-mounting flange for easy installation. Flange requires 3 1/4″ dia. bolt circle; four 9/32″ dia. bolt holes at 90° spacing.

| Nominal Dimensions (O.D. x Length) | Bulb & Capillary Material | Actual Dimensions (in/mm) | | Accessory Kit Numbers |
|---|---|---|---|---|
| | | D | L | |
| 1″ x 9″ Bulb | Copper | 2″ (51) | 8 13/16″ (224) | 701-549 |
| 1″ x 20″ Bulb | Copper | 2″ (51) | 20 15/16″ (532) | 701-550 |




## Style S Wells

For sealing Style D bulb in tanks or pipeline installation. Provides higher pressure rating and corrosion protection for bulb.

| Nominal Dimensions | Tank FItting Size | Material | Actual Dimensions | | Wall Thickness | Pressure Rating* | | Part No. |
|---|---|---|---|---|---|---|---|---|
| | | | D | L | | D | L | |
| 1″ x 9″ | 1″ NPT | 316L Stainless | 1 1/64″ (27) | 8 1/16″ (221) | .032″ | 450 (3103) | 675 (4654) | 808-478 |
| | 1″ NPT | Chrome-Plated Copper | 1″ (25) | 9 1/16″ (230) | .025″ | 175 (1207) | 250 (1724) | 709-193 |
| 1″ x 20″ | 1″ NPT | Chrome-Plated Copper | 1″ (25) | 21″ (533) | .025″ | 175 (1207) | 250 (1724) | 709-075 |
| | 1″ NPT | 316L Stainless | 1 1/64″ (27) | 20 3/8″ (518) | .032″ | 450 (3103) | 675 (4654) | 808-475 |
| 1 1/4″ x 24″ | 1 1/4″ NPT | 347 Stainless | 1 17/64″ (29) | 23 5/16″ (592) | .032″ | 360 (2483) | 540 (3725) | 808-461 |
| | 1 1/4″ NPT | Chrome-Plated Copper | 1 1/4″ (30) | 24″ (610) | .025″ | 150 (1035) | 200 (1380) | 709-128 |


* Pressure ratings are valid up to the following temperature limits: 270°F for all copper bulbs and wells; 600°F for all others.

Notes: (1) Teflon-coated bulb and capillary is resistant to deterioration in most metal-finishing baths and other chemical solutions at temperatures to 400°F max. (Refer to Powers Form AE-14 for information on corrosive resistance of specific solutions.)
(2) Pressure ratings are valid up to following temperature limits: 270°F for all copper bulbs and wells; 600°F for all others.

# #11 Regulator Sizing

## Valve Sizing

The following sizing tables apply for *steam* or *water* input. For other media, capacities may be calculated using $C_v$ factors—or consult factory. To prevent cycling, valve size should not exceed supply line size; preferably, it should be one or two sizes smaller.

## Maximum Operating Pressure Differential

A pressure drop (differential) for fluid flow must exist across the valve. Pressure differential is the ***difference in pressure between inlet and outlet under flow conditions.*** The greater the differential, the greater the flow at any plug position.

**For steam,** maximum flow occurs at a drop equal to approximately 50% of absolute supply pressure (gauge pressure + 15 psi). To size properly, it is necessary to know available differential at maximum flow. For best control, as much differential as possible should be taken across the valve. **For water,** use a pressure drop of at least 25% of inlet pressure.

**Caution:** Do not exceed maximum differentials for valve size shown in tables on pages 19–22. Too large a differential may cause valve "chatter" or prevent shutoff. The maximum differential is the pressure the valve will have against it at shutoff.

## Load Calculations

For obtaining Required Amount of Heating or Cooling Medium

**1. For heating or cooling water**

$$GPM = \frac{BTU/hr.}{(°F \text{ water temp. rise or drop}) \times 500}$$

**2. For heating water with steam**

$$\text{Lbs. steam / hr.} = \frac{GPM}{2} \times (°F \text{ water temp rise})$$

**3. For heating or cooling water with water**

$$GPM_1 = GPM_2 \times \frac{°F \text{ water}_2 \text{ temp rise or drop}}{°F \text{ water}_1 \text{ temp rise or drop}}$$

**4. For heating air with steam**

$$\text{Lbs. steam / hrs.} = 1.08 \times (°F \text{ air temp rise}) \times \frac{CFM}{1000}$$

**5. For heating or cooling air with water**

$$GPM = 2.16 \times \frac{CFM \times (°F \text{ air temp. rise})}{1000 \times (°F \text{ water temp drop or rise})}$$

**6. For heating oil with steam**

$$\text{Lbs. steam/hr.} = \frac{GPM}{4} \times (°F \text{ oil temp. rise})$$

### Pounds of Steam per Hour to Raise Water Temperature* ΔT

| U.S. GPH | Temperature Change — ΔT°F | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 10 | 20 | 30 | 40 | 50 | 60 | 80 | 100 | 120 | 140 | 160 | 180 |
| 25 | 2.1 | 4.2 | 6.2 | 8.3 | 10 | 12 | 17 | 21 | 25 | 29 | 33 | 37 |
| 50 | 4.2 | 8.3 | 13 | 17 | 21 | 25 | 33 | 42 | 50 | 58 | 68 | 75 |
| 75 | 6.2 | 13 | 19 | 25 | 31 | 38 | 50 | 63 | 75 | 88 | 100 | 112 |
| 100 | 8.3 | 17 | 25 | 33 | 42 | 50 | 67 | 83 | 100 | 117 | 133 | 150 |
| 150 | 13 | 25 | 38 | 50 | 63 | 75 | 100 | 125 | 150 | 175 | 200 | 225 |
| 200 | 17 | 33 | 50 | 67 | 84 | 100 | 134 | 167 | 200 | 235 | 267 | 300 |
| 300 | 25 | 50 | 75 | 100 | 125 | 150 | 200 | 250 | 300 | 350 | 400 | 450 |
| 400 | 33 | 67 | 100 | 133 | 167 | 200 | 267 | 334 | 400 | 467 | 534 | 600 |
| 500 | 42 | 83 | 125 | 167 | 208 | 250 | 334 | 420 | 500 | 584 | 677 | 750 |
| 750 | 62 | 125 | 187 | 250 | 312 | 375 | 500 | 625 | 750 | 875 | 1,000 | 1,125 |
| 1,000 | 83 | 167 | 250 | 334 | 417 | 500 | 667 | 833 | 1,000 | 1,165 | 1,330 | 1,500 |
| 1,500 | 125 | 250 | 375 | 500 | 625 | 750 | 1,000 | 1,250 | 1,500 | 1,750 | 2,000 | 2,250 |
| 2,000 | 167 | 334 | 501 | 668 | 835 | 1,000 | 1,340 | 1,670 | 2,000 | 2,340 | 2,670 | 3,000 |
| 3,000 | 250 | 500 | 750 | 1,000 | 1,250 | 1,500 | 2,000 | 2,500 | 3,000 | 3,500 | 4,000 | 4,500 |
| 4,000 | 334 | 668 | 1,000 | 1,335 | 1,670 | 2,000 | 2,670 | 3,340 | 4,000 | 4,670 | 5,340 | 6,000 |

* For fuel oil, divide lbs. steam/hr. by 2.

# #11 Regulator Sizing *(cont'd)*

See page 19 for metric equivalents.

## Heating and Cooling Regulators Water Capacities (Gallons per minute)

| | Valve Size (in.) | Available Sizing Pressure Differential — Δ (PSI) | | | | | | | | | | | | | | | | Max. Pressure Diff. Liquid |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Single Seat** Stainless Steel Trim Regulators (Type ST) | | $C_V1$ | 2 | 4 | 6 | 8 | 10 | 15 | 20 | 25 | 30 | 40 | 50 | 60 | 80 | 100 | 125 | |
| | ½A | 0.25 | 0.35 | 0.50 | 0.61 | 0.71 | 0.79 | 0.97 | 1.1 | 1.3 | 1.4 | 1.6 | 1.8 | 1.9 | 2.2 | 2.5 | 2.8 | 200 |
| | ½B | 0.50 | 0.71 | 1.0 | 1.2 | 1.4 | 1.6 | 1.9 | 2.2 | 2.5 | 2.7 | 3.2 | 3.5 | 3.9 | 4.5 | 5 | 5.6 | 200 |
| | ½C | 1.0 | 1.4 | 2.0 | 2.5 | 2.8 | 3.2 | 3.9 | 4.5 | 5 | 5.5 | 6.3 | 7.1 | 7.7 | 8.9 | 10 | 11 | 200 |
| | ½D | 2.0 | 2.8 | 4.0 | 4.9 | 5.6 | 6.3 | 7.8 | 9 | 10 | 11 | 13 | 14 | 16 | 18 | 20 | 22 | 200 |
| | ½ | 2.6 | 3.7 | 5.2 | 6.4 | 7.4 | 8.2 | 10 | 12 | 13 | 14 | 17 | 18 | 20 | 23 | 26 | 29 | 200 |
| | ¾ | 4.6 | 6.5 | 9.2 | 11 | 13 | 15 | 18 | 21 | 23 | 25 | 29 | 33 | 36 | 41 | 46 | 52 | 140 |
| | 1 | 10.5 | 15 | 21 | 26 | 30 | 32 | 41 | 47 | 53 | 58 | 66 | 74 | 81 | — | — | — | 70 |

| | Valve Size (in.) | Available Sizing Pressure Differential — Δ (PSI) | | | | | | | | | | Liquid |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Single Seat** Composition Disc Regulators (Type CD) Heating only | | $C_V1$ | 2 | 4 | 6 | 8 | 10 | 15 | 20 | 25 | 30 | |
| | ½ | 3.1 | 4.3 | 6.2 | 7.6 | 8.8 | 9.8 | 12 | 14 | 16 | 17 | 30 |
| | ¾ | 5.5 | 7.8 | 11 | 14 | 16 | 17 | 21 | 25 | 28 | 30 | 30 |
| | 1 | 12 | 17 | 24 | 29 | 34 | 38 | 47 | 54 | 60 | 66 | 30 |
| | 1¼ | 15.8 | 22 | 32 | 38 | 45 | 50 | 61 | 71 | 79 | 86 | 30 |
| | 1½ | 22 | 31 | 44 | 54 | 62 | 70 | 85 | 98 | 110 | 120 | 30 |

| | Valve Size (in.) | Available Sizing Pressure Differential — Δ (PSI) | | | | | | | | | | | | | | | | Liquid | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Double Seat** Regulators Bronze and Stainless Steel Trim (Types DS & DB) | | $C_V1$ | 2 | 4 | 6 | 8 | 10 | 15 | 20 | 25 | 30 | 40 | 50 | 60 | 80 | 100 | 125 | BRZ | SS |
| | 1 | 13.5 | 19 | 27 | 33 | 38 | 43 | 52 | 60 | 68 | 74 | 85 | 96 | 104 | 120 | 135 | 156 | 50 | 150 |
| | 1¼ | 22 | 31 | 44 | 54 | 62 | 70 | 85 | 98 | 110 | 120 | 139 | 155 | 170 | 196 | 220 | 246 | 50 | 150 |
| | 1½ | 28 | 40 | 57 | 69 | 79 | 89 | 108 | 125 | 140 | 153 | 177 | 198 | 216 | 250 | 280 | 313 | 50 | 150 |
| | 2 | 53 | 75 | 106 | 130 | 150 | 167 | 205 | 236 | 265 | 290 | 335 | 374 | 410 | 473 | 530 | 562 | 50 | 125 |

## Heating Regulators Steam Capacities (Pounds per hour)

| | Max. Pressure Differential | Valve Size (in.) | Inlet Pressure — PSIG | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2 | | 5 | | | | 10 | | | | | 15 | | | | 25 | | | | |
| | | | Available Sizing Pressure Differential — PSIG | | | | | | | | | | | | | | | | | | | |
| **Single Seat** Stainless Steel Trim Regulators (Type ST) | Steam | | 1 | 2 | 1 | 2 | 3 | 5 | 2 | 4 | 6 | 8 | 10 | 2 | 5 | 10 | Max. 15 | 2 | 5 | 10 | 15 | Max. 20 |
| | 200 | ½A | 3 | 4.2 | 3.3 | 4.5 | 5.5 | 6.9 | 5.1 | 7.1 | 8.5 | 9.6 | 10.4 | 5.6 | 8.7 | 12 | 13.5 | 6.5 | 10 | 14 | 16 | 18 |
| | 200 | ½B | 6 | 8.3 | 6.5 | 9.1 | 11 | 13.8 | 10 | 14 | 17 | 19 | 21 | 11 | 17 | 23 | 27 | 13 | 20 | 28 | 33 | 36 |
| | 200 | ½C | 12 | 17 | 13 | 18 | 22 | 27 | 20 | 28 | 34 | 38 | 42 | 22 | 35 | 47 | 54 | 26 | 40 | 55 | 65 | 72 |
| | 200 | ½D | 24 | 33 | 26 | 36 | 44 | 55 | 41 | 57 | 68 | 76 | 83 | 45 | 69 | 93 | 108 | 52 | 81 | 111 | 130 | 144 |
| | 200 | ½ | 31 | 43 | 34 | 47 | 57 | 72 | 53 | 74 | 88 | 99 | 108 | 58 | 90 | 121 | 140 | 68 | 105 | 144 | 170 | 188 |
| | 140 | ¾ | 55 | 76 | 60 | 83 | 101 | 127 | 94 | 130 | 156 | 176 | 192 | 103 | 159 | 215 | 249 | 120 | 186 | 254 | 300 | 332 |
| | 70 | 1 | 125 | 175 | 137 | 191 | 230 | 289 | 215 | 297 | 356 | 401 | 438 | 236 | 364 | 490 | 568 | 274 | 425 | 581 | 685 | 759 |

| | Max. Pressure Differential | Valve Size (in.) | Inlet Pressure — PSIG | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 50 | | | | 75 | | | | 100 | | | | 125 | 150 | 175 | 200 |
| | | | Available Sizing Pressure Differential — PSIG | | | | | | | | | | | | | | | |
| | Steam | | 10 | 15 | 20 | Max. 32.5 | 10 | 25 | 35 | Max. 45 | 10 | 25 | 35 | Max. 57.5 | Max. 70 | Max. 82.5 | Max. 95 | Max. 107.5 |
| | 200 | ½A | 18 | 22 | 25 | 29 | 22 | 33 | 37 | 41 | 25 | 37 | 43 | 52 | 64 | 75 | 86 | 98 |
| | 200 | ½B | 36 | 43 | 49 | 59 | 43 | 65 | 75 | 82 | 49 | 75 | 87 | 104 | 127 | 150 | 173 | 196 |
| | 200 | ½C | 73 | 87 | 98 | 118 | 86 | 130 | 149 | 163 | 98 | 150 | 173 | 209 | 254 | 300 | 345 | 391 |
| | 200 | ½D | 145 | 174 | 196 | 235 | 173 | 261 | 298 | 326 | 197 | 300 | 346 | 418 | 508 | 600 | 690 | 782 |
| | 200 | ½ | 189 | 226 | 225 | 306 | 225 | 339 | 388 | 424 | 256 | 390 | 450 | 543 | 661 | 780 | 898 | 1016 |
| | 140 | ¾ | 334 | 400 | 452 | 542 | 398 | 600 | 687 | 751 | 452 | 690 | 797 | 960 | 1170 | — | — | — |
| | 70 | 1 | 762 | 913 | 1031 | 1236 | — | — | — | — | — | — | — | — | — | — | — | — |

# #11 Regulator Sizing *(cont'd)*

See page 20 for metric equivalents.

## Heating Regulators Steam Capacities (Pounds per hour)

**Single Seat** Composition Disc Regulators (Type CD)

| Max. Pressure Differential | Valve Size (in.) | Inlet Pressure — PSIG: 2 | | 5 | | | | 10 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Available Sizing Pressure Differential — PSIG: 1 | 2 | 1 | 2 | 3 | 5 | 2 | 4 | 6 | 8 | 10 |
| Steam | | | | | | | | | | | | |
| 50 | ½ | 37 | 52 | 40 | 56 | 68 | 85 | 63 | 88 | 105 | 118 | 129 |
| 50 | ¾ | 66 | 91 | 72 | 100 | 121 | 151 | 112 | 156 | 186 | 210 | 229 |
| 50 | 1 | 143 | 200 | 157 | 218 | 263 | 330 | 245 | 340 | 407 | 459 | 500 |
| 45 | 1¼ | 189 | 263 | 206 | 287 | 347 | 435 | 323 | 447 | 535 | 604 | 659 |
| 30 | 1½ | 263 | 366 | 286 | 400 | 483 | 606 | 450 | 623 | 745 | 841 | 917 |

| Max. Pressure Differential | Valve Size (in.) | Inlet Pressure — PSIG: 15 | | | | 25 | | | | | 50 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Available Sizing Pressure Differential — PSIG: 2 | 5 | 10 | Max. 15 | 2 | 5 | 10 | 15 | Max. 20 | 10 | 15 | 20 | Max. 32.5 |
| Steam | | | | | | | | | | | | | | |
| 50 | ½ | 70 | 107 | 145 | 167 | 81 | 125 | 171 | 202 | 224 | 225 | 270 | 304 | 365 |
| 50 | ¾ | 124 | 190 | 257 | 297 | 144 | 223 | 304 | 359 | 397 | 399 | 478 | 540 | 648 |
| 50 | 1 | 270 | 416 | 560 | 649 | 313 | 486 | 664 | 783 | 867 | 871 | 1044 | 1179 | 1413 |
| 45 | 1¼ | 355 | 547 | 737 | 854 | 413 | 640 | 874 | 1031 | 1142 | — | — | — | — |
| 30 | 1½ | 495 | 762 | 1027 | 1189 | 575 | 891 | 1217 | 1436 | 1590 | — | — | — | — |

**Double Seat** Regulators Bronze and Stainless Steel Trim* (Types DS & DB)

***Note:** Always use S.S. trim over 50 psig.

| Max. Pressure Differential | | Valve Size (in.) | Inlet Pressure — PSIG: 2 | | 5 | | | | 10 | | | | | 15 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Available Sizing Pressure Differential — PSIG: 1 | 2 | 1 | 2 | 3 | 5 | 2 | 4 | 6 | 8 | 10 | 2 | 5 | 10 | Max. 15 |
| Steam | | | | | | | | | | | | | | | | | |
| Bronze | SS | | | | | | | | | | | | | | | | |
| 50 | 150 | 1 | 161 | 225 | 176 | 245 | 296 | 372 | 276 | 382 | 457 | 516 | 563 | 304 | 467 | 630 | 728 |
| 50 | 150 | 1¼ | 263 | 366 | 286 | 400 | 483 | 606 | 450 | 623 | 745 | 841 | 917 | 495 | 762 | 1027 | 1189 |
| 50 | 150 | 1½ | 335 | 466 | 364 | 508 | 614 | 771 | 572 | 792 | 949 | 1070 | 1167 | 630 | 970 | 1307 | 1513 |
| 50 | 125 | 2 | 633 | 882 | 690 | 963 | 1163 | 1460 | 1084 | 1500 | 1795 | 2025 | 2209 | 1192 | 1836 | 2474 | 2865 |

| Max. Pressure Differential | | Valve Size (in.) | Inlet Pressure — PSIG: 25 | | | | | 50 | | | | 75 | | | | 100 | | | | 125 | 150 | 175 | 200 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Available Sizing Pressure Differential — PSIG: 2 | 5 | 10 | 15 | Max. 20 | 10 | 15 | 20 | Max. 32.5 | 10 | 25 | 35 | Max. 45 | 10 | 25 | 35 | Max. 57.5 | 70 | 82.5 | 95 | 107.5 |
| Steam | | | | | | | | | | | | | | | | | | | | | | | |
| Bronze | SS | | | | | | | | | | | | | | | | | | | | | | |
| 50 | 150 | 1 | 353 | 547 | 747 | 881 | 975 | 980 | 1174 | 1326 | 1590 | 1167 | 1761 | 2015 | 2204 | 1328 | 2026 | 2338 | 2818 | 3432 | 4029 | 4644 | 5258 |
| 50 | 150 | 1¼ | 575 | 891 | 1217 | 1436 | 1590 | 1596 | 1914 | 2161 | 2591 | 1901 | 2870 | 3284 | 3592 | 2164 | 3302 | 3811 | 4593 | 5594 | 6567 | 7568 | 8569 |
| 50 | 150 | 1½ | 731 | 1134 | 1549 | 1827 | 2023 | 2032 | 2436 | 2750 | 3297 | 2420 | 3653 | 4180 | 4571 | 2754 | 4203 | 4850 | 5845 | 7119 | 8357 | 9631 | 10903 |
| 50 | 125 | 2 | 1385 | 2147 | 2932 | 3459 | 3829 | 3846 | 4610 | 5206 | 6241 | 4581 | 6915 | 7912 | 8652 | 5213 | 7956 | 9181 | 11064 | 13475 | 15819 | 18231 | 20642 |

# #11 Regulator Sizing: Metric Equivalents

See page 17 for English units.

## Heating and Cooling Regulators Water Capacities (Liters per second)

| **Single Seat** Stainless Steel Trim Regulators (Type ST) | **Valve Size (in.)** | **Available Sizing Pressure Differential — Δ (kPa)** | | | | | | | | | | | | | | | | **Max. Pressure Diff. Liquid** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **7** | **15** | **30** | **45** | **60** | **75** | **100** | **125** | **150** | **200** | **250** | **350** | **450** | **550** | **650** | **750** | |
| | ½″A | 0.02 | 0.02 | 0.03 | 0.04 | 0.05 | 0.05 | 0.06 | 0.07 | 0.07 | 0.08 | 0.09 | 0.11 | 0.13 | 0.14 | 0.15 | 0.16 | 1379 |
| | ½″B | 0.03 | 0.05 | 0.07 | 0.08 | 0.09 | 0.1 | 0.12 | 0.13 | 0.15 | 0.17 | 0.19 | 0.22 | 0.25 | 0.28 | 0.31 | 0.33 | 1379 |
| | ½″C | 0.06 | 0.09 | 0.13 | 0.16 | 0.19 | 0.21 | 0.24 | 0.27 | 0.29 | 0.34 | 0.38 | 0.45 | 0.51 | 0.56 | 0.61 | 0.66 | 1379 |
| | ½″D | 0.13 | 0.19 | 0.26 | 0.32 | 0.37 | 0.42 | 0.48 | 0.54 | 0.59 | 0.68 | 0.76 | 0.9 | 1.02 | 1.13 | 1.22 | 1.32 | 1379 |
| | ½″ | 0.17 | 0.24 | 0.34 | 0.42 | 0.48 | 0.54 | 0.62 | 0.7 | 0.76 | 0.88 | 0.99 | 1.17 | 1.32 | 1.46 | 1.59 | 1.71 | 1379 |
| | ¾″ | 0.29 | 0.43 | 0.61 | 0.74 | 0.86 | 0.96 | 1.11 | 1.24 | 1.35 | 1.56 | 1.75 | 2.07 | 2.34 | 2.59 | 2.82 | 3.03 | 965 |
| | 1″ | 0.7 | 1.02 | 1.45 | 1.77 | 2.05 | 2.29 | 2.64 | 2.95 | 3.24 | 3.74 | 4.18 | 4.94 | 5.61 | — | — | — | 483 |

| **Single Seat** Composition Disc Regulators (Type CD) Heating only | **Valve Size (in.)** | **Available Sizing Pressure Differential — Δ (kPa)** | | | | | | | | | | **Liquid** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **7** | **15** | **30** | **45** | **60** | **75** | **100** | **125** | **150** | **200** | |
| | ½″ | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.6 | 0.7 | 0.8 | 0.9 | 1.1 | 207 |
| | ¾″ | 0.3 | 0.5 | 0.7 | 0.9 | 1.0 | 1.1 | 1.3 | 1.5 | 1.6 | 1.9 | 207 |
| | 1″ | 0.8 | 1.1 | 1.6 | 1.9 | 2.2 | 2.5 | 2.9 | 3.2 | 3.5 | 4.1 | 207 |
| | 1¼″ | 1.0 | 1.5 | 2.1 | 2.6 | 3.0 | 3.3 | 3.8 | 4.3 | 4.7 | 5.4 | 207 |
| | 1½″ | 1.4 | 2.0 | 2.9 | 3.5 | 4.1 | 4.6 | 5.3 | 5.9 | 6.5 | 7.5 | 207 |

| **Double Seat** Regulators Bronze and Stainless Steel Trim (Types DS & DB) | **Valve Size (in.)** | **Available Sizing Pressure Differential — Δ (kPa )** | | | | | | | | | | | | | | | | **Liquid** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **7** | **15** | **30** | **45** | **60** | **75** | **100** | **125** | **150** | **200** | **250** | **350** | **450** | **550** | **650** | **750** | **BRZ** | **SS** |
| | 1″ | 0.9 | 1.3 | 1.8 | 2.2 | 2.5 | 2.8 | 3.2 | 3.6 | 4.0 | 4.6 | 5.1 | 6.1 | 6.9 | 7.6 | 8.3 | 8.9 | 345 | 1034 |
| | 1¼″ | 1.4 | 2.0 | 2.9 | 3.5 | 4.1 | 4.6 | 5.3 | 5.9 | 6.5 | 7.5 | 8.4 | 9.9 | 11 | 12 | 13 | 14 | 345 | 1034 |
| | 1½″ | 1.8 | 2.6 | 3.7 | 4.5 | 5.2 | 5.8 | 6.7 | 7.5 | 8.2 | 9.5 | 11 | 13 | 14 | 16 | 17 | 18 | 345 | 1034 |
| | 2″ | 3.4 | 4.9 | 7.0 | 8.5 | 9.9 | 11 | 13 | 14 | 16 | 18 | 20 | 24 | 27 | 30 | 32 | 35 | 345 | 862 |

## Heating Regulators Steam Capacities (Kilograms per hour)

| **Single Seat** Stainless Steel Trim Regulators (Type ST) | **Max. Pressure Differential** | **Valve Size (in.)** | **Inlet Pressure — kPa** | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **15** | | **30** | | | | **70** | | | | | **100** | | | | **175** | | | | |
| | | | **Available Sizing Pressure Differential — PSIG** | | | | | | | | | | | | | | | | | | | |
| | **Steam** | | **5** | **15** | **5** | **10** | **15** | **30** | **5** | **10** | **15** | **35** | **70** | **10** | **25** | **50** | **Max. 100** | **10** | **25** | **50** | **100** | **Max. 140** |
| | 1379 | ½″A | 1.2 | 2 | 1.2 | 1.7 | 2.1 | 2.9 | 1.4 | 2 | 2.4 | 3.6 | 4.8 | 2.2 | 3.4 | 4.6 | 6 | 2.5 | 4 | 5.5 | 7.3 | 8.3 |
| | 1379 | ½″B | 2.3 | 3.9 | 2.5 | 3.5 | 4.2 | 5.8 | 2.8 | 4 | 4.8 | 7.2 | 9.5 | 4.3 | 6.7 | 9.2 | 12 | 5.1 | 7.9 | 11 | 15 | 17 |
| | 1379 | ½″C | 4.7 | 7.9 | 5 | 6.9 | 8.4 | 12 | 5.7 | 8 | 9.7 | 14 | 19 | 8.7 | 13.4 | 18.3 | 24 | 10 | 16 | 22 | 29 | 33 |
| | 1379 | ½″D | 9.3 | 16 | 9.9 | 14 | 17 | 23 | 11 | 16 | 19 | 29 | 38 | 17 | 27 | 37 | 48 | 20 | 32 | 44 | 59 | 66 |
| | 1379 | ½″ | 12 | 21 | 13 | 18 | 22 | 30 | 15 | 21 | 25 | 37 | 50 | 23 | 35 | 48 | 62 | 26 | 41 | 57 | 76 | 86 |
| | 965 | ¾″ | 21 | 36 | 23 | 32 | 39 | 53 | 26 | 37 | 45 | 66 | 88 | 40 | 62 | 84 | 111 | 47 | 73 | 101 | 135 | 153 |
| | 483 | 1″ | 49 | 83 | 52 | 73 | 88 | 121 | 60 | 84 | 102 | 151 | 200 | 91 | 141 | 193 | 252 | 107 | 167 | 230 | 309 | 349 |

| | **Max. Pressure Differential** | **Valve Size (in.)** | **Inlet Pressure — kPa** | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **350** | | | | **500** | | | | **700** | | | | **850** | **1000** | **1200** | **1400** |
| | | | **Available Sizing Pressure Differential — PSIG** | | | | | | | | | | | | | | | |
| | **Steam** | | **10** | **50** | **150** | **Max. 250** | **70** | **175** | **250** | **Max. 301** | **70** | **175** | **250** | **Max. 401** | **Max. 476** | **Max. 551** | **Max. 651** | **Max. 751** |
| | 1379 | ½″A | 3.3 | 7.1 | 12 | 14 | 10 | 15 | 17 | 18 | 11 | 17 | 20 | 24 | 28 | 33 | 39 | 45 |
| | 1379 | ½″B | 6.5 | 14 | 23 | 28 | 19 | 29 | 34 | 36 | 23 | 35 | 40 | 48 | 57 | 66 | 78 | 90 |
| | 1379 | ½″C | 13 | 29 | 46 | 56 | 39 | 59 | 67 | 72 | 45 | 69 | 80 | 96 | 114 | 132 | 156 | 180 |
| | 1379 | ½″D | 26 | 57 | 93 | 112 | 78 | 117 | 135 | 144 | 90 | 138 | 161 | 192 | 228 | 264 | 311 | 359 |
| | 1379 | ½″ | 34 | 74 | 121 | 145 | 101 | 152 | 175 | 187 | 118 | 180 | 209 | 249 | 296 | 343 | 405 | 467 |
| | 965 | ¾″ | 60 | 131 | 213 | 257 | 179 | 269 | 310 | 331 | 208 | 318 | 369 | 441 | 524 | — | — | — |
| | 483 | 1″ | 137 | 299 | 487 | 586 | — | — | — | — | — | — | — | — | — | — | — | — |

# #11 Regulator Sizing: Metric Equivalents *(cont'd)*

See page 18 for English units.

## Heating Regulators Steam Capacities (Kilograms per hour)

**Single Seat** Composition Disc Regulators (Type CD)

| Max. Pressure Differential Steam | Valve Size (in.) | Inlet Pressure — kPa | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 15 | | 30 | | | | 70 | | | | |
| | | Available Sizing Pressure Differential — PSIG | | | | | | | | | | |
| | | 5 | 15 | 5 | 10 | 15 | 30 | 5 | 10 | 15 | 35 | 70 |
| 345 | ½″ | 14 | 24 | 15 | 22 | 26 | 36 | 18 | 25 | 30 | 44 | 59 |
| 345 | ¾″ | 26 | 43 | 27 | 38 | 46 | 63 | 31 | 44 | 53 | 79 | 105 |
| 345 | 1″ | 56 | 95 | 60 | 83 | 101 | 139 | 68 | 96 | 116 | 172 | 229 |
| 310 | 1¼″ | 75 | 126 | 79 | 111 | 135 | 185 | 91 | 127 | 155 | 229 | 305 |
| 207 | 1½″ | 103 | 174 | 109 | 153 | 185 | 254 | 125 | 175 | 213 | 315 | 420 |

| Max. Pressure Differential Steam | Valve Size (in.) | Inlet Pressure — kPa | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 100 | | | | 175 | | | | | 350 | | | |
| | | Available Sizing Pressure Differential — PSIG | | | | | | | | | | | | |
| | | 10 | 25 | 50 | Max. 100 | 10 | 25 | 50 | 100 | Max. 140 | 10 | 50 | 150 | Max. 250 |
| 345 | ½″ | 27 | 42 | 57 | 75 | 32 | 49 | 68 | 91 | 103 | 40 | 88 | 144 | 173 |
| 345 | ¾″ | 48 | 74 | 101 | 132 | 56 | 87 | 120 | 162 | 183 | 72 | 157 | 255 | 307 |
| 345 | 1″ | 104 | 161 | 220 | 288 | 122 | 190 | 263 | 353 | 398 | 157 | 342 | 557 | 607 |
| 310 | 1¼″ | 138 | 215 | 293 | 385 | 163 | 254 | 350 | 470 | 531 | — | — | — | — |
| 207 | 1½″ | 190 | 295 | 404 | 529 | 224 | 349 | 482 | 647 | 730 | — | — | — | — |

**Double Seat** Regulators Bronze and Stainless Steel Trim* (Types DS & DB)

***Note:** Always use S.S. trim over 50 psig.

| Max. Pressure Differential Steam | | Valve Size (in.) | Inlet Pressure — kPa | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 15 | | 39 | | | | 70 | | | | | 100 | | | |
| | | | Available Sizing Pressure Differential — kPa | | | | | | | | | | | | | | |
| Bronze | SS | | 5 | 15 | 5 | 10 | 15 | 30 | 5 | 10 | 15 | 35 | 70 | 10 | 25 | 50 | Max. 100 |
| 345 | 1034 | 1″ | 63 | 107 | 67 | 94 | 114 | 156 | 77 | 108 | 131 | 194 | 258 | 117 | 181 | 248 | 324 |
| 345 | 1034 | 1¼″ | 103 | 174 | 109 | 153 | 185 | 254 | 125 | 175 | 213 | 315 | 420 | 190 | 295 | 404 | 529 |
| 345 | 1034 | 1½″ | 131 | 221 | 139 | 194 | 236 | 323 | 159 | 223 | 271 | 401 | 534 | 242 | 376 | 514 | 673 |
| 345 | 1034 | 2″ | 247 | 418 | 263 | 368 | 446 | 612 | 301 | 422 | 513 | 760 | 1012 | 459 | 711 | 972 | 1274 |

| Max. Pressure Differential Steam | | Valve Size (in.) | Inlet Pressure — kPa | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 175 | | | | | 350 | | | | 500 | | | | 700 | | | | 850 | 1000 | 1200 | 1400 |
| | | | Available Sizing Pressure Differential — kPa | | | | | | | | | | | | | | | | | | | | |
| Bronze | SS | | 10 | 25 | 50 | 100 | Max. 140 | 10 | 50 | 150 | Max. 250 | 70 | 175 | 250 | Max. 301 | 70 | 175 | 250 | Max. 401 | 476 | 551 | 651 | 751 |
| 345 | 1034 | 1″ | 137 | 214 | 296 | 397 | 448 | 176 | 385 | 627 | 753 | 525 | 791 | 910 | 971 | 611 | 932 | 1084 | 1294 | 1537 | 1779 | 2102 | 2425 |
| 345 | 1034 | 1¼″ | 224 | 349 | 482 | 647 | 730 | 287 | 627 | 1021 | 1228 | 856 | 1289 | 1483 | 1583 | 995 | 1519 | 1767 | 2109 | 2504 | 2899 | 3425 | 3952 |
| 345 | 1034 | 1½″ | 285 | 444 | 613 | 823 | 930 | 365 | 799 | 1300 | 1562 | 1089 | 1640 | 1887 | 2015 | 1267 | 1933 | 2249 | 2685 | 3187 | 3689 | 4359 | 5029 |
| 345 | 1034 | 2″ | 539 | 841 | 1161 | 1558 | 1760 | 692 | 1512 | 2460 | 2957 | 2061 | 3105 | 3573 | 3814 | 2398 | 3659 | 4257 | 5082 | 6033 | 6984 | 8252 | 9520 |

# Sizing Mixing Regulators

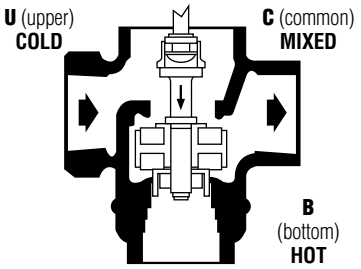
Water Capacities (Gallons per Minute/Liters per Second)

### 3-Way Mixing Valves (Type WM)

The following water capacities of Powers #11 Regulator 3-way valves are based on piping as shown. The cold water supply line must be connected to the upper inlet "U". Hot water supply must be connected to bottom inlet "B". Side port "C" is the outlet for the mixed water.

**Note:** 3-way regulators perform poorly with less than 8 lb. pressure differential.

Tempered water systems should employ downstream high temperature limit controls (Powers AquaSentry) to protect users from scalding in the event of regulator failure.




### Maximum MIXED FLOW for Tempering Applications

**Gallons per Minute**

| Valve Size (in.) | Available Sizing Pressure Differential* — Δ (PSI) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $C_V$1 | 2 | 4 | 6 | 8 | 10 | 15 | 20 | 25 | 30 | 40 | 50 |
| ½ | 4.2 | 5.9 | 8.4 | 10 | 12 | 13 | 16 | 19 | 21 | 23 | 27 | 30 |
| ¾ | 7.2 | 10 | 14 | 18 | 20 | 23 | 28 | 33 | 36 | 39 | 46 | 51 |
| 1 | 12.4 | 18 | 25 | 30 | 35 | 39 | 48 | 55 | 62 | 68 | 78 | 88 |
| 1¼ | 20.1 | 28 | 40 | 49 | 57 | 64 | 78 | 90 | 100 | 110 | 127 | 142 |
| 1½ | 25.5 | 36 | 51 | 62 | 72 | 81 | 99 | 114 | 127 | 140 | 161 | 180 |
| 2 | 39.3 | 55 | 79 | 96 | 111 | 124 | 152 | 176 | 197 | 215 | 248 | 278 |

For sizes 2½, 3, and 4, use "Bottom Port" table.

**Liters per Second**

| Valve Size (in.) | Available Sizing Pressure Differential* — Δ (kPa) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 7 | 15 | 30 | 45 | 60 | 75 | 100 | 125 | 150 | 200 | 250 | 350 |
| ½ | 0.3 | 0.4 | 0.6 | 0.7 | 0.8 | 0.9 | 1 | 1.1 | 1.2 | 1.4 | 1.6 | 1.9 |
| ¾ | 0.5 | 0.7 | 0.9 | 1.2 | 1.3 | 1.5 | 1.7 | 1.9 | 2.1 | 2.4 | 2.7 | 3.2 |
| 1 | 0.8 | 1.1 | 1.6 | 1.9 | 2.2 | 2.5 | 2.9 | 3.2 | 3.5 | 4.1 | 4.6 | 5.4 |
| 1¼ | 1.3 | 1.9 | 2.6 | 3.2 | 3.7 | 4.2 | 4.8 | 5.4 | 5.9 | 6.8 | 7.5 | 9 |
| 1½ | 1.6 | 2.3 | 3.3 | 4 | 4.7 | 5.2 | 6 | 6.7 | 7.4 | 8.5 | 9.5 | 11 |
| 2 | 2.5 | 3.6 | 5.1 | 6.3 | 7.3 | 8.1 | 9.4 | 10 | 11 | 13 | 1.5 | 18 |

For sizes 2½, 3, and 4, use "Bottom Port" table.

### Full Flow through BOTTOM Port (upper port closed) for By-Pass Applications

**Gallons per Minute**

| Valve Size (in.) | Available Sizing Pressure Differential▲ — Δ (PSI) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $C_V$1 | 2 | 4 | 6 | 8 | 10 | 15 | 20 | 25 | 30 | 40 | 50 |
| ½ | 2.2 | 3.1 | 4.4 | 5.4 | 6.2 | 7.0 | 8.5 | 9.8 | 11.0 | 12 | 27 | 16 |
| ¾ | 6.0 | 8.5 | 12 | 15 | 17 | 19 | 23 | 27 | 30 | 33 | 38 | 42 |
| 1 | 8.9 | 13 | 18 | 22 | 25 | 28 | 34 | 40 | 45 | 49 | 56 | 63 |
| 1¼ | 15.8 | 22 | 32 | 39 | 45 | 50 | 61 | 71 | 79 | 87 | 100 | 112 |
| 1½ | 17.9 | 25 | 36 | 44 | 51 | 57 | 69 | 80 | 89 | 98 | 113 | 127 |
| 2 | 30.2 | 43 | 60 | 74 | 85 | 95 | 117 | 135 | 151 | 165 | 191 | 213 |

**Liters per Second**

| Valve Size (in.) | Available Sizing Pressure Differential▲ — Δ (kPa) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 7 | 15 | 30 | 45 | 60 | 75 | 100 | 125 | 150 | 200 | 250 | 350 |
| ½ | 0.1 | 0.2 | 0.3 | 0.4 | 0.4 | 0.5 | 0.5 | 0.6 | 0.6 | 0.7 | 0.8 | 1 |
| ¾ | 0.4 | 0.6 | 0.8 | 1 | 1.1 | 1.2 | 1.4 | 1.6 | 1.8 | 2 | 2.3 | 2.7 |
| 1 | 0.6 | 0.8 | 1.2 | 1.4 | 1.7 | 1.9 | 2.1 | 2.4 | 2.6 | 3 | 3.4 | 4 |
| 1¼ | 1 | 1.5 | 2.1 | 2.6 | 3 | 3.3 | 3.8 | 4.3 | 4.7 | 5.4 | 6.1 | 7.2 |
| 1½ | 1.1 | 1.7 | 2.4 | 2.9 | 3.3 | 3.7 | 4.3 | 4.8 | 5.3 | 6.1 | 6.8 | 8.1 |
| 2 | 1.9 | 2.8 | 3.9 | 4.8 | 5.6 | 6.2 | 7.2 | 8.1 | 8.8 | 10 | 11 | 13 |

### Full Flow through UPPER Port (bottom port closed) for By-Pass Applications

**Gallons per Minute**

| Valve Size (in.) | Available Sizing Pressure Differential▲ — Δ (PSI) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $C_V$1 | 2 | 4 | 6 | 8 | 10 | 15 | 20 | 25 | 30 | 40 | 50 |
| ½ | 3.5 | 5.0 | 7.0 | 8.6 | 9.9 | 11.0 | 13.0 | 16.0 | 18 | 19 | 22 | 25 |
| ¾ | 6.0 | 8.5 | 12 | 15 | 17 | 19 | 23 | 27 | 30 | 33 | 38 | 42 |
| 1 | 11.2 | 16 | 22 | 27 | 32 | 35 | 43 | 50 | 56 | 61 | 71 | 79 |
| 1¼ | 16.7 | 24 | 33 | 41 | 47 | 53 | 64 | 75 | 84 | 92 | 106 | 118 |
| 1½ | 23.7 | 34 | 47 | 58 | 67 | 75 | 92 | 106 | 119 | 130 | 150 | 168 |
| 2 | 38.1 | 54 | 76 | 93 | 108 | 120 | 147 | 170 | 190 | 208 | 241 | 269 |

**Liters per Second**

| Valve Size (in.) | Available Sizing Pressure Differential▲ — Δ (kPa) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 7 | 15 | 30 | 45 | 60 | 75 | 100 | 125 | 150 | 200 | 250 | 350 |
| ½ | 0.2 | 0.3 | 0.5 | 0.6 | 0.7 | 0.7 | 0.8 | 0.9 | 1.0 | 1.2 | 1.3 | 1.6 |
| ¾ | 0.4 | 0.6 | 0.8 | 1.0 | 1.1 | 1.2 | 1.4 | 1.6 | 1.8 | 2.0 | 2.3 | 2.7 |
| 1 | 0.7 | 1.0 | 1.4 | 1.8 | 2.0 | 2.3 | 2.6 | 3.0 | 3.2 | 3.7 | 4.2 | 4.9 |
| 1¼ | 1.1 | 1.6 | 2.2 | 2.7 | 3.2 | 3.5 | 4.1 | 4.6 | 5.0 | 5.8 | 6.5 | 7.6 |
| 1½ | 1.5 | 2.2 | 3.2 | 3.9 | 4.5 | 5.0 | 5.8 | 6.4 | 7.1 | 8.2 | 9.1 | 11 |
| 2 | 2.4 | 3.5 | 5.0 | 6.1 | 7.1 | 7.9 | 9.1 | 10 | 11 | 13 | 14 | 17 |

**Notes:** * Pressure difference between lowest of inlet and outlet pressures. Piping should be arranged so that inlet pressures are equal.
▲ Pressure difference between open port and outlet.

# How to Order…

*Indicate the entire digit code(s) when ordering.*

595 – □ □ □ □ □ □ – □ □ □ □ □ □ □

## Complete #11 Regulators

**Lower Housing**
Determine the order code from the lower housing assembly code chart below. Eliminate the 590 prefix when ordering a complete regulator.

**Thermal System**
Determine the code from the thermal system code chart (page 23). Eliminate the 700 prefix when ordering a complete regulator.

## #11 Lower Housing Assemblies

590 – □ □ □ □ □ □

| Valve Type | | | | Order Code |
|---|---|---|---|---|
| **Seat** | **Packing** | **Body** | **Trim** | |
| Single Comp | EP (heating) | Bronze | Bronze | **CD** |
| Single | TFE (H) EP (C) | Bronze | Stainless | **ST** |
| Double | EP (H & C) | Bronze | Bronze | **DB** |
| Double | TFE (H) EP (C) | Bronze | Stainless | **DS** |
| Mixing | EP (Mixing) | Bronze | Bronze | **WM** |

| | Style | | | | | Order Code |
|---|---|---|---|---|---|---|
| **Size** | **CD** | **ST** | **DB** | **DS** | **WM** | |
| 1/2A | | ■ | | | | **A50** |
| 1/2B | | ■ | | | | **B50** |
| 1/2C | | ■ | | | | **C50** |
| 1/2D | | ■ | | | | **D50** |
| 1/2 | ■ | ■ | | | ■ | **050** |
| 3/4 | ■ | ■ | | | ■ | **075** |
| 1 | ■ | ■ | ■ | ■ | ■ | **100** |
| 1-1/4 | ■ | | ■ | ■ | ■ | **125** |
| 1-1/2 | ■ | | ■ | ■ | ■ | **150** |
| 2 | | | ■ | ■ | ■ | **200** |

| **Valve Action** | **Order Code** |
|---|---|
| Heating | **H** |
| Cooling (not available in Type CD body style) | **C** |
| Mixing (WM only) | **M** |

# #11 Thermal Systems

**700 –** □ □ □ □ □ □ □

**Bulb and Capillary Material** — **Order Code**
Copper (with 8′ capillary) ..... **C**
Stainless Steel (with 8′ capillary) ..... **S**

**Capillary Length**
8′ ..... **08**
15′ (copper) ..... **15**
15′ (stainless steel) ..... **15**
30′ (copper) ..... **30**
30′ (stainless steel) ..... **30**

**Bulb Style**
Fixed Union ..... **D**
No Pipe Fittings ..... **J**
Adj. Union ..... **A**
D Vertical ..... **V**

**Head Assembly**
- **2½″ – 4″ Water Mix Bodies**
  Range codes 22–28 ..... **H**
- **All other bodies**
  Non-Indicating ..... **N**
  Indicating ..... **I**

**Range/Bulb Size Code (two-digit codes below)**
All ranges/bulb sizes listed below are **no charge.** Select range with setpoint in **upper third** for best performance. Consult factory for ranges/bulb sizes not listed.

**Temperature Ranges**

**Single or Double Seat Valves : Sizes 1/2″ through 2″**

| Range/Bulb Size Codes | | Heating D.A. | Cooling R.A. | Water Mix 1/2″ to 2″ |
|---|---|---|---|---|
| 1″ x 20″ Bulb | **01** | 10° to 70°F | 0 to 60°F | 10° to 60°F |
| | **02** | 55° to 115°F | 45° to 105°F | 55° to 115°F |
| | **03** | 85° to 145°F | 70° to 130°F | 80° to 140°F |
| | **04** | | 90° to 150°F | 100° to 160°F |
| 1″ x 9″ Bulb | **05** | 110° to 170°F | 110 to 150°F | 110° to 160°F |
| | **06** | 06 no longer available. Substitute either 05 or 07. | | |
| | **07** | 140° to 200°F | 120° to 180°F | 135° to 195°F |
| | **08** | 170° to 230°F | 150° to 210°F | 160° to 220°F |
| | **09** | 200° to 250°F | 185° to 245°F | 200° to 250°F |
| | **10** | 230° to 290°F | 220° to 280°F | 230° to 280°F |
| | **11** | 270° to 330°F | 255° to 315°F | 260° to 320°F |

**Double Seat : Valve Sizes 2-1/2″ through 4″**

| Range/Bulb Size Codes | | Heating D.A. | Cooling R.A. | Water Mix |
|---|---|---|---|---|
| 1-1/4″ x 24″ Bulb* | **12** | 10° to 70°F | 0 to 60°F | Not applicable |
| | **13** | 55° to 115°F | 45° to 105°F | |
| | **14** | 85° to 145°F | 70° to 130°F | |
| | **44** | | 90° to 150°F | |
| 1″ x 20″ Bulb | **15** | 110° to 170°F | | Not applicable |
| | **16** | 16 no longer available. Substitute either 15 or 17. | | |
| | **17** | 140° to 200°F | 120° to 180°F | |
| | **18** | 170° to 230°F | 150° to 210°F | |
| | **19** | 200° to 250°F | 185° to 245°F | |
| | **20** | 230° to 290°F | 220° to 280°F | |
| | **21** | 270° to 330°F | 225° to 315°F | |

**High Power Head Assembly for 2-1/2″ – 4″ Water Mix**

| | | | |
|---|---|---|---|
| 1-3/8″ x 30″ Bulb | **28** | Below 110°F | 50° to 80°F |
| | **22** | | 70° to 100°F |
| | **23** | | 95° to 125°F |

**High Power Head Assembly for 2-1/2″ – 4″ Water Mix**

| | | | |
|---|---|---|---|
| 1-1/4″ x 24″ Bulb* | **24** | Above 110°F | 120° to 150°F |
| | **25** | | 140° to 170°F |
| | **26** | | 150° to 180°F |
| | **27** | | 180° to 210°F |

* Not available in stainless steel