

## Direct-Operated Regulators

# Temperature Regulators



TEMPERATURE  
Regulators



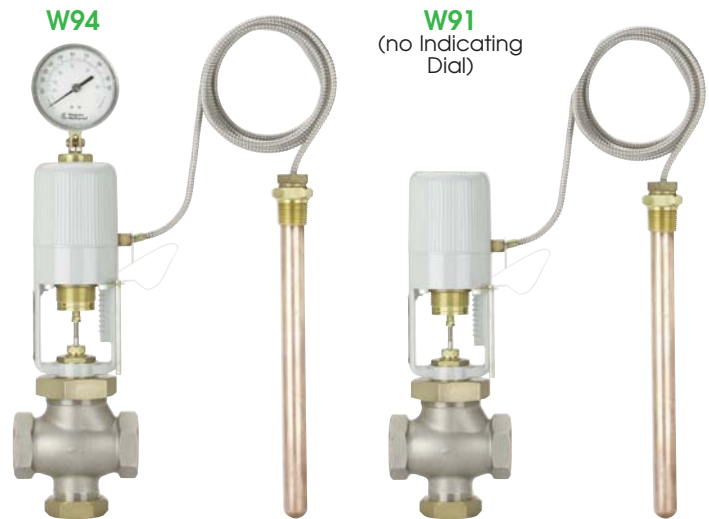
# Direct-Operated Regulators

## Temperature Regulators

# W91/W94 Series

For **Heating** & **Cooling**

Model	<b>W91 (No Indicating Dial)</b> <b>W94 (Temperature Indicating Dial)</b>
Service	<b>Water, Steam, Other Liquids</b>
Sizes	<b>1/2" – 4"</b>
Connections	<b>Threaded, Union Ends, 125# FLG</b> <b>250# FLG (optional)</b>
Body Material	<b>1/2" – 1 1/2"</b> Bronze/Stainless Steel <b>2"</b> Cast Iron (Direct-acting) <b>2"</b> Bronze (Reverse-acting) <b>2 1/2" – 4"</b> Cast Iron
Seat Material	<b>Stainless Steel</b>
Max Inlet Pressure	<b>250 PSIG</b>



### Typical Applications

The **W91** & **W94** Self-Operating Temperature Regulators are the preferred choice of original equipment manufacturers, mechanical contractors and specifying engineers. They require no external power source and are ideal for regulating the temperature of tanks, process streams and various types of industrial equipment. The Actuator is noted for its rugged die-cast aluminum housing, fully-enclosed bellows assembly and internal over-temperature range protection.

#### Model **W91**

**Non-Indicating** (without indicating dial) features a lower profile and should be specified where space constraints may be an issue.

#### Model **W94**

**Temperature Indicating** (with indicating dial) will allow the operator to verify the process temperature and to aid in temperature adjustment.

### Features

- Self-Operating (no external power source required)
- Temperature Indicating & Non-Indicating models available
- Heavy Duty Die-Cast Aluminum Housing
- 1/2" thru 4" Valve Sizes
- Fully Enclosed Bellows
- Temperature Over-range protection spring to protect thermal system

### Specifications

<b>Dial Thermometer:</b>	3 1/2" dial, stainless steel case, swivel and angle adjustment (Model W94 only)
<b>Housing:</b>	Die-cast aluminum, epoxy powder coated grey finish
<b>Bellows:</b>	High-pressure brass, corrosion resistant, tin plated finish
<b>Temperature Over-range Protection:</b>	Protects Thermal System from damage up to 100°F over high limit of range

### Temperature Regulator Valve Action

Application	Stem Action	Normal (Fail) Position
Heating	In-To-Close	Normally Open
Cooling	In-To-Open	Normally Closed

### How to write proper model number:

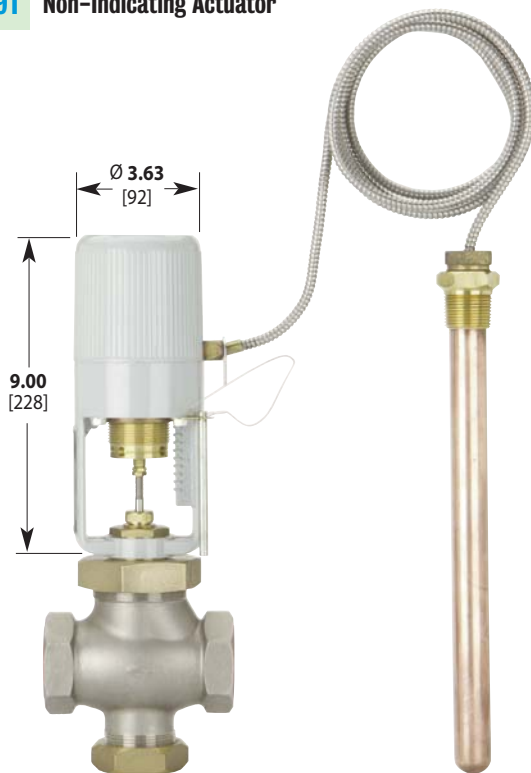
Explanation of Model Number:	<b>W91</b>	<b>06</b>	<b>08</b>	<b>S15</b>	<b>H13N</b>
	Model	Temp. Range	Cap. Length	Bulb Type	Valve Body
<b>Model Number:</b>	<b>W91-06-08-S15-H13N</b>				

### Model Code Configuration

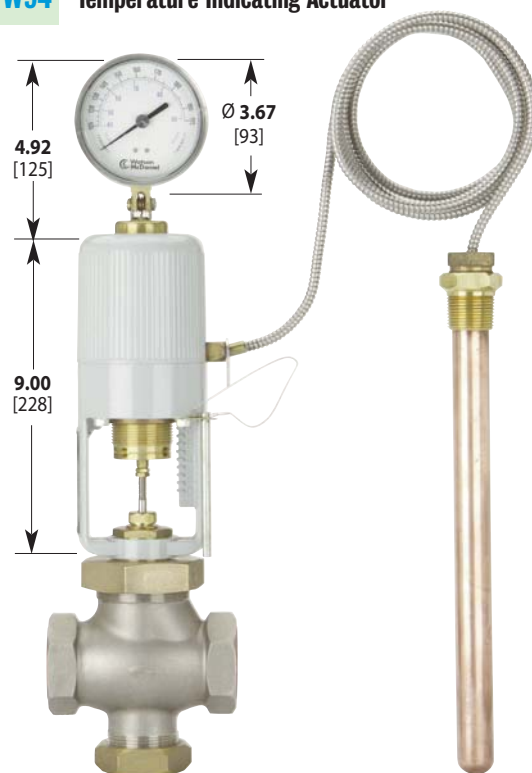
Models	Temperature Range	Capillary Length	Sensing Bulb	Valve Body Selection
<b>W91</b> Non-Indicating	<b>01 – 14</b> Refer to Temperature Range Chart	<b>08</b> 8 Feet (standard)	<b>S15</b> Brass bulb (standard)	Refer to Valve Body Section
<b>W94</b> Indicating Dial		<b>12</b> 12 Feet		
		<b>16</b> 16 Feet	<b>S16</b> Stainless bulb	(Omit this selection if purchasing Actuator only)
		<b>20</b> 20 Feet		
		<b>24</b> 24 Feet		

Note: Thermowells are ordered separately. See Thermowell & Bulb Connections page.

**W91** Non-Indicating Actuator



**W94** Temperature Indicating Actuator



Dimensions: inches [mm]  
Actuator Weight: 6 lbs.

TEMPERATURE  
Regulators

**Description of Working Span**

The recommended working span typically falls within the upper third of the nominal range. Single-Seat In-To-Close, all Double-Seat, and all 3-Way valves have a recommended working span in this part of the nominal range. Using the valve in the recommended working span improves temperature response time of the system.

**Temperature Range Chart**

W91 & W94 Actuators				
Range Code	Nominal Range		Recommended Working Span *	
01	20 to 70 °F	-10 to 20 °C	40 to 65 °F	5 to 20 °C
02	40 to 90 °F	5 to 30 °C	65 to 85 °F	20 to 30 °C
03	30 to 115 °F	0 to 45 °C	85 to 110 °F	30 to 45 °C
04	50 to 140 °F	10 to 60 °C	110 to 135 °F	45 to 60 °C
05	75 to 165 °F	25 to 70 °C	135 to 160 °F	60 to 70 °C
06	105 to 195 °F	40 to 90 °C	160 to 190 °F	70 to 90 °C
07	125 to 215 °F	55 to 100 °C	190 to 210 °F	90 to 100 °C
09	155 to 250 °F	70 to 120 °C	210 to 245 °F	100 to 120 °C
10	200 to 280 °F	95 to 135 °C	245 to 275 °F	120 to 135 °C
11	225 to 315 °F	110 to 155 °C	275 to 310 °F	135 to 155 °C
12	255 to 370 °F	125 to 185 °C	305 to 365 °F	155 to 185 °C
13	295 to 420 °F	145 to 215 °C	365 to 415 °F	185 to 215 °C
14	310 to 440 °F	155 to 225 °C	415 to 435 °F	215 to 225 °C

\*Note: The recommended working span typically falls within the upper third of the nominal range.

## SENSING BULB & CAPILLARY Selection

### Sensing Bulb Selection & Installation:

The sensing bulb and capillary are available in Copper (best heat transfer properties) or Stainless Steel (for corrosive applications). Copper has better heat transfer properties than stainless steel and should always be chosen for better temperature control unless used in corrosive service. The length of the sensing bulb is dependent upon the capillary length required (see chart). Longer capillary lengths require a longer length sensing bulb to operate the regulator. For installation, the Union Hub is threaded into a tank or piping system. The bulb slides through the Union Hub and is held in place by the Union Nut which spins freely around the armored capillary and threads into the Union Hub. The angled surface of the sensing bulb forms a metal-to-metal seal on the inner edge of the Union Hub to prevent leakage of the process fluid.

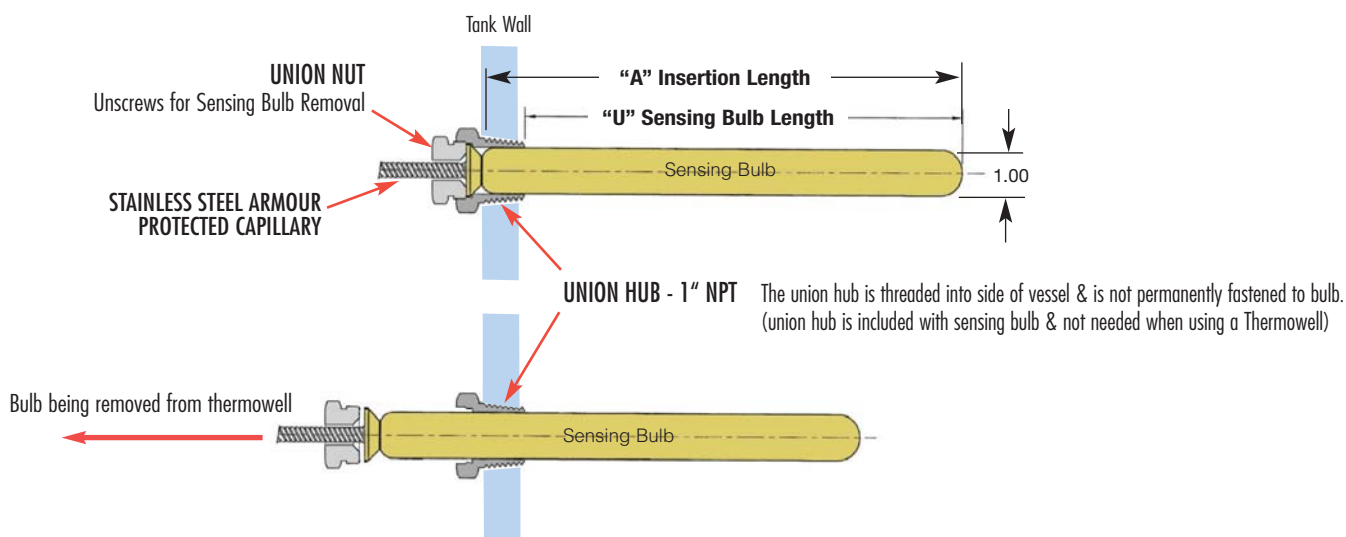
### Thermowell Option (ordered separately)

A thermowell isolates the sensing bulb from the process fluid. It can be used to remove the sensing bulb while the system is filled with fluid or to protect the sensing bulb from corrosive liquids or excessive system pressures (see following page).

### Sensing Bulb & Capillary

ORDER CODE	Sensing Bulb Material	Capillary Tubing Material	Capillary Length in Ft.		
			8, 12, 16	20	24
S15	Copper (Brass Union Hub)	Copper with Stainless Steel Spiral Armour	A	13"	16"
			U	12.25"	15.25"
S16	Stainless Steel (Stainless Steel Union Hub)	Stainless Steel with Stainless Steel Spiral Armour	A	13"	16"
			U	12.25"	15.25"

Other Options available. Consult Factory.



## SENSING BULB inside OPTIONAL THERMOWELL

**Thermowell Option (ordered separately)**

Thermowells isolate and protect the sensing bulb from the process fluid, and are available in either Brass (best heat transfer) or Stainless Steel (for corrosive applications). Thermowells allow for sensing bulb removal and replacement without having to drain liquid from the system. To maintain the best temperature control, always use a Copper Sensing bulb as opposed to a Stainless Steel sensing bulb. For corrosive applications, Stainless Steel thermowells (with a copper sensing bulb) can be used. Thermowells are also recommended for applications with excessive system pressures or extremely turbulent flow to protect the sensing bulb from damage.

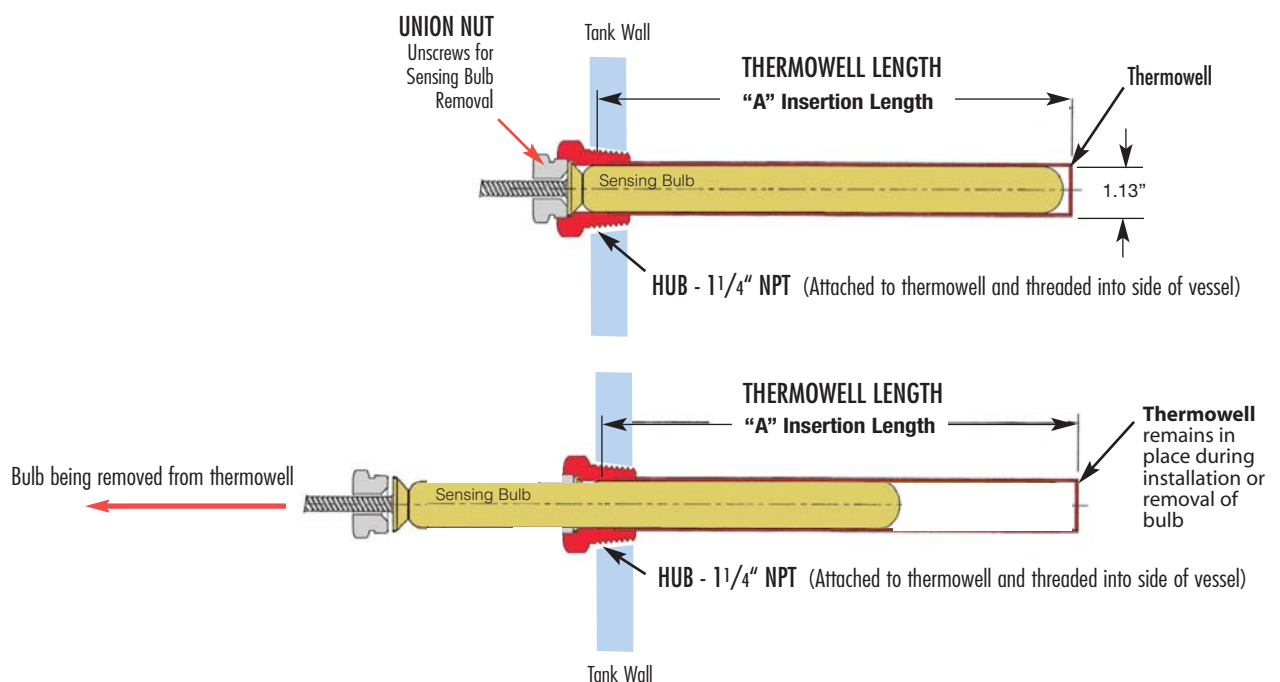
Thermowell Length must be selected based on the length of the sensing bulb. The sensing bulb length is based on the length of the Capillary used in the Thermal System. Longer capillary lengths require a longer sensing bulb to hold the additional actuator fluid inside the sensing bulb. Reference Sensing Bulb Chart for sensing bulb length.

**THERMOWELLS - Model Numbers & Lengths**

Brass Model Code	Stainless Steel Model Code	Nominal Length	"A" INSERTION LENGTH (in.)		Capillary Length (Ft.)
			BULB	THERMOWELL	
<b>536-S2</b>	<b>536-S6</b>	13"	12.25	13.00	8, 12 or 16
<b>536-SE2</b>	<b>536-SE6</b>	16"	15.25	16.00	20
<b>536-WE2</b>	<b>536-WE6</b>	20"	19.25	20.00	24

- Notes:
- 1) Other connections and lengths may be available, consult factory.
  - 2) External pressure rating on Copper is 500 PSI max.
  - 3) External pressure rating on 316 SS is 1000 PSI max.

The Thermowell isolates the sensing bulb from the process liquid and allows for easy and safe removal of the sensing bulb. For applications in which the process media may be corrosive or contained under pressure, the use of a thermowell is required to prevent damage to the sensing bulb. For corrosive applications, use a stainless steel thermowell & copper sensing bulb. To ensure minimum response time, Heat Transfer Paste should be applied to the sensing bulb prior to installation into the thermowell.



# Direct-Operated Regulators Temperature Regulators

# W91/W94 Series

## HEATING

Model Codes in Chart are for complete Temperature Regulators.  
This includes the Valve Body and Thermal Actuator with standard copper bulb and 8 ft. capillary.



### W91

Non-Indicating Type Actuator  
with valve body

**X** = Temperature Range  
**08** = Capillary Length 8ft.  
**S15** = Copper Bulb

Connection			PMO (PSI)
1/2" NPT	Standard Body	W91-X-08S15-H12N	250
	with Integral Union	W91-X-08S15-H12U	250
3/4" NPT	Standard Body	W91-X-08S15-H13N	250
	with Integral Union	W91-X-08S15-H13U	250
1" NPT	Standard Body	W91-X-08S15-H14N	200
	with Integral Union	W91-X-08S15-H14U	200
1 1/4" NPT	Standard Body	W91-X-08S15-H15N	200
	with Integral Union	W91-X-08S15-H15U	200
1 1/2" NPT	Standard Body	W91-X-08S15-H16N	200
	with Integral Union	W91-X-08S15-H16U	200
2" NPT	Standard Body	W91-X-08S15-H17N	150
2"	*Flanged with Standard Actuator	W91-X-08S15-H17F125	150
2 1/2"		W91-X-08S15-H18F125	65
3"		W91-X-08S15-H19F125	50
4"		W91-X-08S15-H20F125	40
2 1/2"	*Flanged with High-Force Actuator	W91H-X-08S15-H18F125	150
3"		W91H-X-08S15-H19F125	150
4"		W91H-X-08S15-H20F125	150

### W94

Indicating Type Actuator  
with valve body

**X** = Temperature Range  
**08** = Capillary Length 8ft.  
**S15** = Copper Bulb

	PMO (PSI)	Weight (lbs)
W94-X-08S15-H12N	250	21
W94-X-08S15-H12U	250	21
W94-X-08S15-H13N	250	21
W94-X-08S15-H13U	250	21
W94-X-08S15-H14N	200	21
W94-X-08S15-H14U	200	21
W94-X-08S15-H15N	200	24
W94-X-08S15-H15U	200	24
W94-X-08S15-H16N	200	25
W94-X-08S15-H16U	200	25
W94-X-08S15-H17N	150	57
W94-X-08S15-H17F125	150	57
W94-X-08S15-H18F125	65	65
W94-X-08S15-H19F125	50	80
W94-X-08S15-H20F125	40	105
N/A	-	96
N/A	-	118
N/A	-	60

\* 250# Flange available. Consult Factory. The Special High-Force Actuator will allow the valve to be operated at a higher operating pressure.

## Model Configuration Chart

Note: Thermowells for Models W91/W94 are ordered separately.

Models		Temperature Range = X	Capillary Length	Sensing Bulb	Valve Body Selection
W91	Non-Indicating	<del>XXXX</del>	08 8 Feet (std)	S15 Copper Bulb (std)	Included in Model Code in above chart.
W94	Indicating Dial	(Refer to Temperature Range Chart)	12 12 Feet	(with Brass Union Hub)	
W91H	High-Force		16 16 Feet	S16 Stainless Steel Bulb (with SS Union Hub)	
			20 20 Feet		
			24 24 Feet		

W91 **05** (75 - 165°F)

12

S15

H15N (1 1/4" NPT)

Range Code	Nominal Temperature Range *	
<b>01</b>	20 - 70°F	10 - 20°C
<b>02</b>	40 - 90°F	5 - 30°C
<b>03</b>	30 - 115°F	0 - 45°C
<b>04</b>	50 - 140°F	10 - 60°C
<b>05</b>	75 - 165°F	25 - 70°C
<b>06</b>	105 - 195°F	40 - 90°C
<b>07</b>	125 - 215°F	55 - 100°C
<b>09</b>	155 - 250°F	70 - 120°C
<b>10</b>	200 - 280°F	95 - 135°C
<b>11</b>	225 - 315°F	110 - 155°C
<b>12</b>	255 - 370°F	125 - 185°C
<b>13</b>	295 - 420°F	145 - 215°C
<b>14</b>	310 - 440°F	155 - 225°C

\* The recommended working span falls  
within the upper third of the nominal range.

Example Model Code configured: **W91-05-12-S15-H15N**

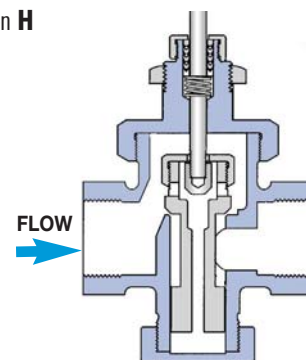
(W91, 75-165 °F Temp. Range, 12 ft. capillary, Std. Copper Sensing Bulb, 1 1/4" NPT Valve Body)

Valve bodies used for HEATING have designation **H**  
(Example: **H15N**)

**Normally Open**

(IN-TO-CLOSE)

Single-seated  
Balanced Valve with  
Class IV shut-off



HEATING