



SERIES 2000 TEMPERATURE REGULATOR

SIZES 1/2" – 2"
CONTROLS -25 to 400°F

SERIES 2000 TEMPERATURE REGULATOR

APPLICATION DATA

DIRECT ACTING

- Bottle Washing Machinery
- Steam Tables
- Plating Tanks
- Heating Ducts
- Fuel Oil Heaters
- Cooking Vats
- Water Heaters
- Heat Exchangers
- Parts Washer

THREE-WAY MIXING

- Fire Tube Boiler
- Internal Combustion Engine

REVERSE ACTING

- Induction Furnaces
- Industrial Compressors
- Cold Storage Boxes
- Cooling Ducts
- Engine Jacket Cooling
- Liquid Chillers

GAS SERVICE

- Oil Treaters
- Line Heaters
- Separators
- Glycol Dehydrators
- Storage Tanks

VALVE RATINGS

Valve Ends ASME/ANSI	Pressure PSIG (bar)	Temperature °F (°C)
Class 250 NPT	250 (17.2)	400 (204)

Canadian Registration # OC 0591.9C

- Self-actuated
- Two and Three Way Valve Bodies
- Single or Double Seat
- Overtemperature Protection
- Spring Loaded Teflon Chevron Type Packing Assembly
- Double Guided Stainless Steel Monolithic Disc Assembly
- Stainless Steel Seat Rings and Disc
- Adjusting Key Attached
- Galvanized Iron Union Ends
- Full Ported and Full Flow Bronze Body
- Copper Bulb with 8' Armored Capillary

MODELS

- Type 2010 — Single Seat, Direct Acting
- Type 2020 — Single Seat, Reverse Acting
- Type 2030 — Double Seat, Direct Acting
- Type 2040 — Double Seat, Reverse Acting
- Type 2050 — Three-way Mixing and Diverting
- Type 2060 — Gas Service-15 psig maximum. If pressure exceeds 15 psi, a pressure reducing regulator should be used ahead of the temperature regulator.

OPTIONS

- Dial Temperature Gage (Indicating)
- Stainless Steel Bulb
- Stainless Steel Armored Capillary
- Capillary lengths greater than 8'
- Extra Large Bulb
- Union Bushings & Wells

SERIES 2000 TEMPERATURE REGULATOR

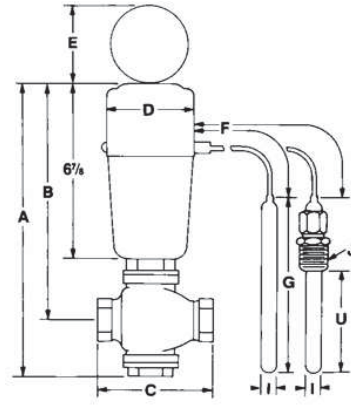
SPECIFICATION

The valve shall be self-operated, requiring no external energy source. It shall have single or double stainless steel seats with double guided monolithic disc assembly for proper alignment. The valve shall be direct acting (heating) or reverse acting (cooling) and have two way or three way operation. The packing assembly shall be spring loaded, self adjusting with chevron type teflon packing. The thermal system line and bulb assembly shall be partially filled with a liquid/gas combination and in a range selected for fast response. The valve rating shall be 250 PSIG at 400°F. Body materials shall be bronze.

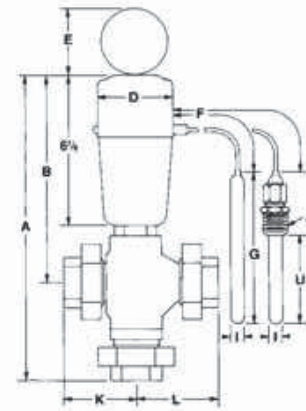
MODEL 2060 FOR GAS SERVICE ONLY: The valve shall be self-operated, requiring no external energy source and designed to control process temperature by regulating gas flow. It shall be normally open and close with increased temperature. "Bubble tight" dead end shutoff shall be provided by Buna-N vulcanized to disc backing. The packing assembly shall be spring loaded, self adjusting with chevron type teflon packing. The thermal system line and bulb assembly shall be partially filled with a liquid/gas combination and in a range selected for fast response. The valve rating shall be 15 PSIG. Body materials shall be nodular iron.

MATERIALS OF CONSTRUCTION

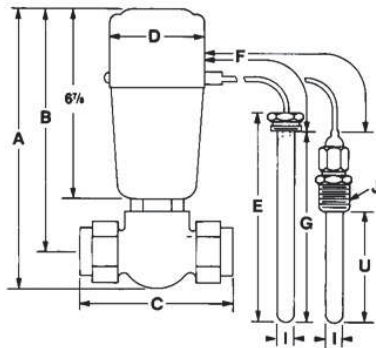
ITEM	TYPE 2010-2050	TYPE 2060
Body	Bronze ASTM B62 C83600	Ductile Iron ASTM A536 65-45-12
Trim	Stainless Steel	Buna-N
Packing	Teflon	Buna-N
Unions	Iron	Iron
Yoke	Steel	Steel
Cap	Aluminum	Aluminum
Bellows	Bronze	Bronze
Spring	Steel	Steel
Capillary	Copper	Copper
Bulb	Copper	Copper
Armor	Bronze	—
Stem	304 Stainless Steel	304 Stainless Steel
Disc	304 Stainless Steel	Buna-N
Seat	303 Stainless Steel	—



**TYPE 2010-2040 DIRECT
& REVERSE ACTING**



TYPE 2050 THREE WAY



TYPE 2060 GAS SERVICE

TYPE 2060 GAS SERVICE DIMENSIONS inches (mm) AND WEIGHTS pounds (kg)

Size	Dimensions					Shipping Weight (Approx.)
	A	B	C	D	F†	
1/2"	9 3/4	8 1/2	5 5/8	3 1/2	10 Ft.	8 (3.6)
3/4"	(248)	(216)	(143)	(89)	(3 m.)	
1"						

†See following pages for standard lengths, ranges, bulb sizes and maximum line lengths.

TYPE 2010-2040 DIRECT & REVERSE ACTING DIMENSIONS inches (mm) AND WEIGHTS pounds (kg)

Size	Type No.	Dimensions						Shipping Weight (Approx.)
		A	B	C	D	E	F†	
1/2" (A, B, C, D, E) 1/2, 3/4	2010	9 3/4 (248)	8 1/2 (216)	5 1/2 (140)	3 1/2 (89)	2 13/16 (71)	8 Ft.	10 (4.5)
	2020							
1/2" 3/4"	2030	12 7/16 (316)	9 3/4 (248)	7 9/16 (182)	3 1/2 (89)	2 13/16 (71)	8 Ft.	13 (5.9)
	2040							
1"	2010	12 7/16 (316)	9 3/4 (248)	7 9/16 (182)	3 1/2 (89)	2 13/16 (71)	8 Ft.	13 (5.9)
	2020							
1 1/4" 1 1/2" 2"	2030	12 7/8 (327)	9 31/32 (253)	8 15/16 (227)	3 1/2 (89)	2 13/16 (71)	8 Ft.	20 (9.1)
	2040							25 (11)
								30 (14)

TYPE 2050 THREE WAY DIMENSIONS inches (mm) AND WEIGHTS pounds (kg)

Size	Dimensions						Shipping Weight (Approx.)
	A	B	D	F†	K	L	
1/2" 3/4"	13 7/8 (352)	9 3/4 (248)	3 1/2 (89)	8 Ft.	3 5/16 (84)	3 5/8 (92)	2 13/16 (71)
1"							
1 1/4" 1 1/2"	14 21/32 (372)	9 31/32 (253)	3 1/2 (89)	8 Ft.	4 1/8 (105)	4 11/16 (119)	12 (5.5)
							13 (5.9)
2"	14 7/8 (378)	9 31/32 (253)	3 1/2 (89)	8 Ft.	4 3/16 (106)	4 7/8 (124)	27 (12)
							33 (15)

**SERIES 2000 TEMP.
REGULATOR**

SERIES 2000 TEMPERATURE REGULATOR SELECTION

DIRECT & REVERSE ACTING & THREE WAY FLOW AND PRESSURE RATINGS psig (bar)

Size	Single Seat				Double Seat				Three Way					
	Type Number		Flow Coefficient C _v	Max. Upstream Pressure	Type Number		Flow Coefficient C _v	Max. Upstream Pressure	Type Number	Flow Coefficient C _v	Max. Difference Between Inlet Pressures*			
	Direct	Reverse			Direct	Reverse								
1/2"C	2010	2020	.40	250 (17.2)	NOT AVAILABLE IN DOUBLE SEAT				NOT AVAILABLE IN THREE WAY					
1/2"D			1.00											
1/2"E			1.80											
1/2"A			3.29											
1/2"B			4.29	200 (13.8)	2030 2040				250 (17.2) 2050					
1/2"T			5.22	140 (9.7)								7.93	5.22	140 (9.7)
3/4"T			6.85	90 (6.2)										
1"T			9.15	65 (4.5)								12.9	9.15	65 (4.5)
1 1/4"T			14.3	40 (2.8)										
1 1/2"T			15.1	30 (2.1)								24.8	15.1	30 (2.1)
2"T	17.2	20 (1.4)	33.0	17.2										

SIZING INFO
PAGE 91

RANGES, BULB SIZES & MAXIMUM LINE LENGTHS

How to Select Range & Bulb Size

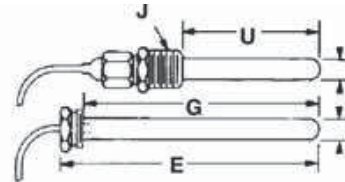
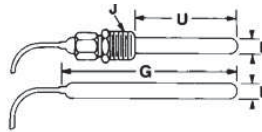
- Select a temperature range with the control point in the upper half of the temperature range.
- Determine line length required (8' is standard).
- Use line length and temperature range to find correct bulb size in chart at right.

EXAMPLE:
Control point: 130°F.
Temperature range: 65/140°F.
Line length: 15'

SOLUTION:
Bulb size: extra large – G = 15 5/8"

Short Ranges (Gold Spring)		Long Ranges (Silver Spring)		Bulb Size	†Max. Line Length	Maximum Over-Temperature	
°F	°C	°F	°C			°F	°C
45 to 115	7.2 to 46	45 to 145	7.2 to 63	X Large	40 Ft.	450	232
65 to 140	18 to 60	65 to 170	18 to 77	X Large	40 Ft.	450	232
120 to 200	49 to 93	120 to 230	49 to 110	Small	40 Ft.	300	149
240 to 310	116 to 154	240 to 340	116 to 171	Small	40 Ft.	350	177
280 to 375	138 to 190	280 to 415	138 to 212	Small	40 Ft.	450	232

†Standard line lengths are 25' and 40'.



BULB DIMENSIONS* inches (mm)

Bulb Sizes	G			U	I			J (NPT)
	Copper	Stain. Stl.	Coated		Plain	Union	Well	
Small	13 3/8 (340)	13 1/4 (337)	11 5/8 (289)	10 1/2 (267)	5/8 (16)	5/8 (16)	3/4 (19)	3/4 or 1
Large	15 5/8 (397)	15 1/8 (384)	13 1/4 (337)	12 1/2 (317)	1 (25)	1 (25)	1 1/8 (29)	1
Extra Large	19 (483)	18 5/8 (473)	19 (483)	16 (406)	1 (25)	1 (25)	1 1/8 (29)	1

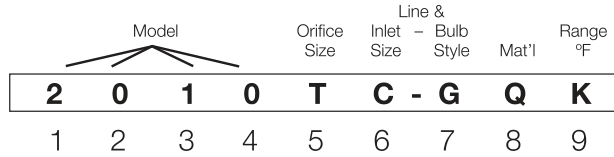
GAS SERVICE BULB & WELL DIMENSIONS inches (mm)

E	G	I		U	J (NPT)
		Bulb	Well		
8 1/4 (210)	7 3/8 (187)	25/32 (20)	15/16 (24)	7 11/16 (195)	1

SERIES 2000 TEMPERATURE REGULATOR

SERIES 2000 TEMP. REGULATOR

CODE SELECTION CHART



Model -
 Position 1, 2, 3 & 4
 2010 = Single Seat, Direct Acting
 2020 = Single Seat, Reverse Acting
 2030 = Double Seat, Direct Acting
 2040 = Double Seat, Reverse Acting
 2050 = Three Way

Orifice -
 Position 5
 A
 B
 C
 D
 E
 T = Standard

Inlet Size -
 Position 6
 C = 1/2
 D = 3/4
 E = 1
 F = 1 1/4
 G = 1 1/2
 H = 2

Line & Bulb Style -
 Position 7
 G = Indicating
 N = Non-indicating

Material† -
 Position 8
 Q = Copper Bz Armor 8'
 R = Copper Bz Armor 15'
 N = Copper Bz Armor 25'
 P = Copper Bz Armor 40'
 T = SS Unarmored 8'
 V = SS Unarmored 15'
 W = SS Unarmored 25'
 X = SS Unarmored 40'
 Z = Other

Range °F -
 Position 9
 C = 45/115
 D = 45/145
 E = 65/140
 F = 65/170
 J = 120/200
 K = 120/230
 L = 240/310
 M = 240/340
 N = 280/375
 P = 280/415
 Z = Other

† For SS Armored Thermal Assembly Material, add (-TV) at the end of the code (ex.: 2010TC-NTH-TV)
 † Small bulb standard for J-1 range and higher.
 Extra large bulb standard for D range and lower.
 Large bulb standard for E and F range

THERMOWELL



WELLS

Cat. No.	Bulb Size	Material	Inches (mm)		
			Bulb Dia.	NPT	Well Dia.
99A	S	Brass	5/8 (16)	3/4 (19)	1 1/2 (267)
99B	S	Brass		1 (25)	
99G	S	316 St. St.		3/4 (19)	
99H	S	316 St. St.		1 (25)	
99J	L	Brass	1 (25)	12 1/2 (318)	1 1/2 (29)
99K	X	Brass		16 (406)	
99Q	L	316 St. St.		12 1/2 (318)	
99R	X	316 St. St.		16 (406)	

UNION BUSHINGS



UNION BUSHINGS

Cat. No.	Bulb Size	Material	Inches (mm)	
			Bulb Dia.	NPT
98A	S	Brass	5/8 (16)	3/4
98B	S	Brass		1
98C	S	St. St.		3/4
98D	S	St. St.		1
98E	L & X	Brass	1 (25)	1
98F	L & X	St. St.	1 (25)	1

Thermowells and union bushings are utilized as separate items and should be specified on separate lines.

SIZING SERIES 2000 TEMPERATURE REGULATORS

PERFORMANCE VARIABLE

SIZING SERIES 2000 REGULATORS

EXAMPLE FOR HEATING SERVICE

The maximum anticipated flow requirements for a regulator on heating service is 500 lbs. of steam per hour. The unit steam pressure is 50 psig and the downstream pressure is essentially zero because the steam downstream is discharged into an open drain.

ANSWER: Locate 50 psi on the inlet pressure scale on the left side of the Series 2000 Capacity Chart. Choose the outlet pressure line "up to 20" psig because the downstream pressure is essentially zero. Follow the "up to 20" outlet pressure line until you come to the value closest to 500 lbs. of steam per hour (in this case, 505). Read upward to the valve size and we see that the 1/2" single seated valve is the correct size. To size for three-way valves, use single seated capacities 1/2" through 2" size.

NOTE: FORMULAS FOR EXACT CALCULATIONS.

If the outlet pressure is equal to or less than 53% of the absolute inlet pressure:

$$Q \text{ (lbs steam/hr)} = 1.5 \times C_v \times \sqrt{\text{inlet pressure (psia)}}$$

If the outlet pressure is greater than 53% of the absolute inlet pressure:

$$Q \text{ (lbs steam/hr)} = 3 \times C_v \times \sqrt{\text{pressure drop (psi)} \times \text{outlet pressure (psia)}}$$

30°F span from fully open to fully closed
Oversized valve can provide narrower spans—Consult Factory

CAPACITY CHART SEE PAGE 90

STEAM FLOW REQUIREMENTS

Temp. Rise °F	GALLONS OF WATER HEATED PER HOUR										
	25	50	75	100	150	200	300	400	500	750	1000
	LBS. OF STEAM PER HOUR										
10	2	4	6	8	12	17	25	33	42	63	83
20	4	8	12	17	25	33	50	67	83	120	167
30	6	12	19	25	37	50	70	100	120	190	250
40	9	17	25	33	50	66	100	130	170	250	330
50	11	21	31	42	63	84	125	170	210	310	420
60	13	25	37	50	75	100	150	200	250	370	500
80	17	33	50	67	100	130	200	270	330	500	670
100	21	42	63	83	120	170	250	330	420	630	830
120	25	50	75	100	150	200	300	400	500	750	1000
140	29	58	88	117	175	230	350	470	580	880	1170
160	33	66	100	133	200	270	400	530	660	1000	1330

STEAM FLOW REQUIREMENTS

Use the top chart on this page to determine the pounds of steam per hour required to raise the temperature in tank of known capacity to the required temperature. Determine the rise in temperature (control temp. - room temp.) on the left hand column, read the corresponding pounds of steam per hour under the corresponding gallons of water to be heated. Use the lbs. steam/hr. figure in the chart on the opposite page to determine valve size.

Formula for converting the length, width and depth of solutions (all measured in feet) to gallons of solution: Gallons=7.48 x length x width x depth.

EXAMPLE FOR COOLING SERVICE

Find the correct regulator valve size that will feed a compressor intercooler that requires 100 gallons of water per minute under maximum operating conditions. The supply (inlet) pressure (P1) is 60 psi and the downstream pressure (P2) under maximum flow conditions is 20 psi. The 20 psi pressure is required to force the full flow of water through the compressor's cooling system. Inlet pressure must not exceed maximum upstream pressure, per the Series 2000 Temperature Regulator Product Pages.

ANSWER: The pressure drop permitted across the regulator is P1 minus P2 (40 psi). In the Water Capacity Table (right), locate 40 psi in the differential pressure column and read across to the required gallons per minute. Read to the highest value (in this case, 130 GPM). The chart indicates that a 1 1/4" double seated valve is required. To size 3-way valve, use single seated capacities 1/2" through 2" size.

RATED WATER CAPACITY TABLE

PSIG	SINGLE SEATED VALVES						DOUBLE SEATED VALVES					
	1/2	3/4	1	1 1/4	1 1/2	2	1/2	3/4	1	1 1/4	1 1/2	2
Diff. Press.	WATER FLOW—U.S. GALLONS PER MINUTE											
5	12	15	20	32	34	38	18	23	29	46	55	74
10	17	22	29	45	48	54	25	33	41	65	78	104
15	20	27	35	55	59	67	31	40	50	80	96	128
20	23	31	41	64	68	77	35	47	58	92	111	148
25	26	34	46	72	76	86	40	52	65	103	124	165
30	29	38	50	78	83		43	57	71	113	136	181
40	33	43	58	90			50	66	82	130	157	209
50	37	48	65				56	74	91	146	175	233
60	40	53	71				61	81	100	160	192	256
70	44	57					66	87	108	172	207	276
80	47	61					71	93	115	184	222	295
90	50	65					75	99	122	195	235	313
100	52						79	104	129	206	248	330
110	55						83	109	135	216	260	346
120	57						87	114	141	226	272	361
130	60						90	119	147	235	283	376
140	62						94	123	153	244	293	390
150							97	127	158	252	304	404
160							100	132	163	261	314	417
170							103	136	168	269	323	430
180							106	140	173	276	333	443
190							109	143	178	284	342	455
200							112	147	182	291	351	467
210							115	151	187	299	359	478
220							118	154	191	306	368	489
230							120	158	196	312	376	500
240							123	161	200	319	384	511
250							125	164	204	326	392	522