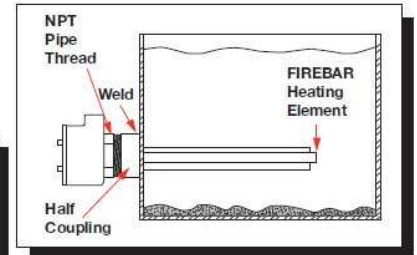
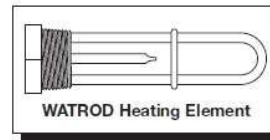


Screw plug immersion heaters are ideal for direct immersion heating of liquids, including all types of oils and heat transfer solutions. Available in a variety of sizes, screw plug immersion heaters feature both round and flat tubular elements. Heating elements are hairpin bent and either welded or brazed into the screw plug—depending on element sheath and plug material compatibility. General purpose (NEMA 1) terminal enclosures are standard; with optional moisture resistant (NEMA 4), explosion resistant (NEMA 7) and explosion/moisture resistant (NEMA 7/4) enclosures available to meet specific application needs. Optional thermostats provide convenient process temperature regulation.

Performance Capabilities

- Watt densities to 120 W/in² (18.6 W/cm²), Wattages to 38 kW
- UL® and CSA component recognition to 480VAC and 600VAC respectively
- Incoloy® sheath temperatures to 1600°F (870°C)
- Passivated 316 stainless steel sheath temperatures to 1200°F (650°C)
- 304 stainless steel sheath temperatures to 1200°F
- Steel sheath temperatures to 750°F (400°C)
- Copper sheath temperatures to 350°F (175°C)



Features and Benefits

A variety of element sheath and screw plug materials

- Meets your application needs

Integral thermowells

- Provides convenient temperature sensor insertion and replacement without draining the fluid being heated

Terminal enclosures

- Provides ability to be rotated to simplify connection with existing conduits

Welding or brazing WATROD and FIREBAR elements to the screw plug

- Provides a pressure tight seal

WATROD hairpins are repressed (recompacted)

- Maintains MgO density, dielectric strength, heat transfer and life

2 ½ in. (64 mm) NPT screw plug assemblies features element support(s)

- Ensures proper spacing for maximizing heater performance and life

Screw plug and element sizes:

1" NPT	0.260 and 0.315 inch Round
1¼" NPT	0.260 and 0.315 inch Round 1 inch Flat
2" NPT	0.430 and 0.475 inch Round
2½" NPT	0.430 and 0.475 inch Round 1 inch Flat

Phase Capability:

1" NPT	1-Phase
1¼, 2, 2½" NPT	1 or 3-Phase

UL® and CSA component recognition under File E52951 and 31388 respectively

Typical Applications

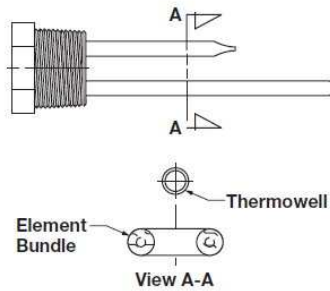
- **Water:**
 - Deionized
 - Demineralized
 - Clean, Potable, and Process
- **Industrial water rinse tanks**
- *Hydraulic oil, crude, asphalt*
- *Lubricating oils at API specified watt densities*
- *Air and gas flow*
- *Caustic solutions*
- *Chemical baths*
- *Anti-freeze (glycol) solutions*
- *Paraffin*

Screw Plug Orientation

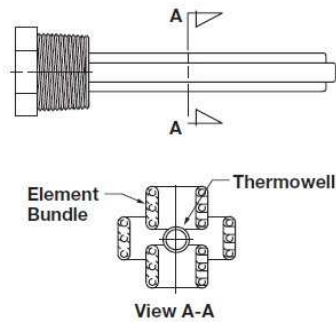
Correct element/thermowell orientation assures proper process temperature sensing. Correct horizontal mounting of WATROD and FIREBAR screw plugs is shown below. Correct orientation assures optimum performance and maximum heater life. Additional mounting information is provided in the Installation and Maintenance Instructions.

FIREBAR Heating Elements

1 1/4 in. (32 mm) NPT-One Element

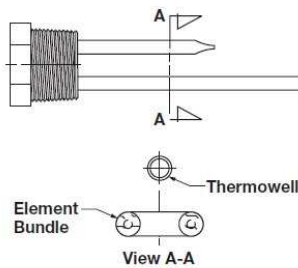


2 1/2 in. (64 mm) NPT-Three Elements

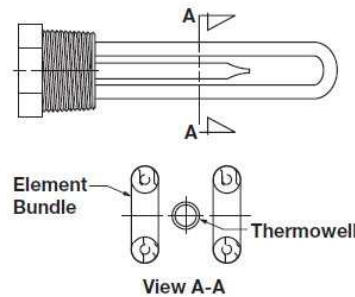


WATROD Heating Element

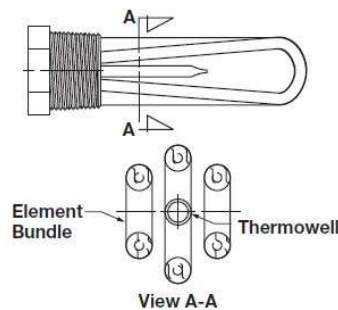
1 in. (25 mm) NPT-One Element



1 1/4 (32 mm) and 2 in. (51 mm) NPT-Two Elements



2 (51 mm) and 2 1/2 in. (64 mm) NPT-Three Elements



Terminal Enclosures

General purpose (NEMA 1) terminal enclosures, without thermostats, are available on all screw plug immersion heaters. To meet specific application requirements, Watlow offers the following optional terminal enclosures:

- *General purpose (NEMA 1) with single or double pole thermostat*
- *Moisture-resistant (NEMA 4) or corrosion resistant (NEMA 4X) —available with optional single or double pole thermostat*
- *Explosion-resistant (NEMA 7) class 1, groups B, C and D explosion resistant—available with optional single or double-pole thermostat.*
- *Explosion and moisture-resistant (NEMA 7/4) combination—available with optional single- or double-pole thermostat*

Note: Unless otherwise stated on the accompanying illustrations, both WATROD and FIREBAR screw plugs are centered on the terminal enclosure. To order, add the suffix letter(s) to the screw plug heater's base code number. Also, specify class and group, if applicable.

CSA Certified Enclosures

CSA certified moisture and/or explosion-resistant terminal enclosures protect wiring in hazardous gas environments. These terminal enclosures, covered under CSA File number 61707, are available on all WATROD and FIREBAR screw plug immersion heaters. For additional information, contact Thermal Solutions of Texas.

To order, specify **CSA certified enclosure**, **process temperature** (°F), and **maximum working pressure** of application (psig), **media** being heated and heater **mounting orientation** (horizontal or vertical) and **screw plug size**.

ASME Pressure Vessel Code Welding

Screw plug assemblies can be provided with an ASME Section VIII, Div. I pressure vessel stamp upon request.

Pilot Light

The optional pilot light gives the operator visual indication of heater on or off power status. The PL10 pilot light is configured to a maximum 250VAC and supplied with 6 in. (152 mm) leads. The PL11 pilot light is rated for 480VAC and supplied with 4 in. (102 mm) leads. Pilot lights may be attached to either single or double pole thermostats with general purpose (NEMA 1) enclosure only.

Thermostats

To provide process temperature control, Watlow offers optional single-pole, single-throw (SPST) and double pole, single throw (DPST) thermostats. Unless otherwise specified, thermostats are mounted inside the terminal enclosure. Please verify that the thermostat's sensing bulb O.D. is compatible with the screw plug's thermowell I.D.

CAUTION: Explosion-resistant terminal enclosures are intended to provide explosion containment in the electrical termination/wiring enclosure only. No portion of the assembly outside of this enclosure is covered under this NEMA rating. NEMA rating effectiveness may be compromised by abuse or misapplication.

Thermocouples

Type J or K thermocouples offer extremely accurate sensing of process and/or sheath temperatures. A thermocouple may be inserted into the thermowell or attached to the heater's sheath. Thermocouples are supplied with 120 in. (3048 mm) leads (longer lead lengths available). Unless otherwise specified, thermocouples are supplied with temperature ranges detailed on the Thermocouple Types chart. Using a thermocouple requires an appropriate temperature and power controller, these must be purchased separately. Thermal Solutions offers a wide variety of temperature and power controllers to meet virtually all applications. Temperature controllers can be configured to accept process variable inputs, too. Contact Thermal Solutions of Texas for details. To order, specify Type J or K thermocouple and lead length. Indicate if the thermocouple is for process temperature sensing or heater sheath high-limit protection. Please specify if the screw plug will be mounted vertical or horizontal in the tank. If vertical, indicate if the housing is on top or bottom. If the screw plug heater is mounted in an in-line circulation heating application, indicate flow direction relative to the heater's enclosure.

Thermocouple Types

ASTM Type	Conductor Characteristics		Temperature Range	
	Positive	Negative	°F	°C
J	Iron (Magnetic)	Constantan (Non-Magnetic)	0 to 100	(-20 to 540)
K	Chromel (Non-Magnetic)	Alumel (Magnetic)	0 to 2000	(-20 to 1100)

Type J and Type K thermocouples are rated 32 to 1382°F and 32 to 2282°F (0-750°C and 0-1250°C), respectively. Exceeding temperature ranges shown on this chart is not recommended.

Wattages and Voltages

Thermal Solutions routinely supplies screw plug immersion heaters with 120 to 480VAC as well as wattages from 250 watts to 38kW.

Sheath Materials

The following sheath materials are available on WATROD and FIREBAR heating elements:

Standard Sheath Materials

Watrod	Incoloy	316 S/S
	Copper	Steel
Firebar	Incoloy	

Exotic Sheath Materials

Contact Thermal Solutions for details and availability.

External Finishing

Passivation

During the manufacturing process, particles of iron or tool steel may become embedded in the stainless steel or alloy sheath. If not removed, these particles may corrode, produce rust spots and/or contaminate the process. For critical applications, passivation will remove free iron from the sheath. To order, specify **passivation**.

Other Finishes

Bright annealing is available to meet cosmetic demands.

Screw Plug Materials

The following screw plug materials are available: To order, specify screw plug size and material.

Standard Screw Plug Materials

Watrod	316 S/S
	Steel
	Brass
Firebar	Incoloy

Made-to-Order Plug Materials

For both WATROD and FIREBAR, contact Thermal Solutions of Texas for details and availability.

Screw Plug Sizes

Including European

- NPT– 3/4, 1, 1 1/4, 2, 2 1/2 in.

To order, specify size, style (NPT) and material.

Screw Plug to Flange Adapters

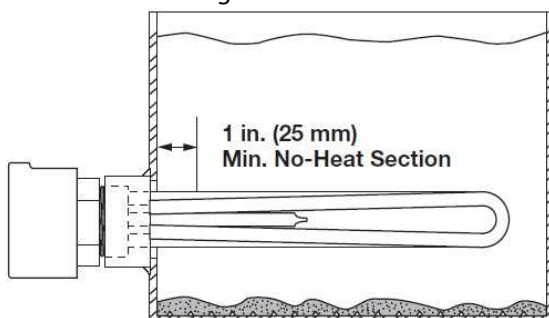
Screw plug to flange adaptors permit replacing flange heaters with screw plug heaters. To order, specify the appropriate code number.

Screw Plug to Flange Adapters

Screw Plug to Flange Adapter	Material	Estimated Shipping Weight		Availability	Code Number
		lbs	(kg)		
1 1/4 to 3 in.-150#	Steel	13	(5.9)	Stock	125X3SA
2 1/2 to 3 in.-150#	Steel	11	(5.0)	Stock	250X3SA
2 1/2 to 4 in.-150#	Steel	16	(7.3)	Stock	250X4SA
2 1/2 to 5 in.-150#	Steel	25	(11.3)	Stock	250X5SA
2 1/2 to 6 in.-150#	Steel	33	(15.0)	Stock	250X6SA

Application Hints

- Select the recommended sheath material and watt density for the substance being heated. If unable to determine the correct heater material and type, contact Thermal Solutions.
- Extend the element's no-heat section completely into the fluid being heated to help prevent premature heater failure. See illustration below for proper no-heat section placement.
- Locate screw plug heater low in the tank, but above the sludge level.



- Choose a FIREBAR element when the application requires a smaller system package or lower watt density.
- Ensure wiring integrity by making sure terminal enclosure temperature does not exceed 400°F (205°C).
- Keep electrical connections clean, dry and tight.
- Size power feeder wires in accordance with National Electrical Code guidelines and other applicable codes.
- Size power feeder wires in accordance with national electrical code guidelines and other applicable codes.
- Minimize problems associated with low liquid level conditions by using a low liquid level sensor or sheath temperature high-limit control.
- Periodically remove the screw plug assembly for inspection and clean the heating element(s). This preventive maintenance will reduce premature failure and optimize heater performance.
- Refer to the Installation and Maintenance Instructions for correct orientation of FIREBAR elements. Correct element orientation to flow minimizes pressure drop, increases buoyancy force and heater performance.

Extended Capabilities for WATROD and FIREBAR Screw Plug Immersion Heaters

Options

Pilot Light

The optional pilot light gives the operator visual indication of heater on or off power status.

The PL10 pilot light is configured to a maximum 250VAC and supplied with 6 in. (152 mm) leads.

The PL11 pilot light is rated for 480VAC and supplied with 4 in. (102 mm) leads.

Pilot lights may be attached to either single or double pole thermostats with general purpose (NEMA 1) enclosure only. For moisture or explosion resistant terminal enclosures (NEMA 4 or NEMA 7), consult factory.

To order, refer to the Build-a-Code chart.

Wattages and Voltages

Watlow routinely supplies screw plug immersion heaters with 120 to 480VAC as well as wattages from 250 watts to 38kW. If required, Thermal Solutions may configure heaters with voltages and wattages outside these parameters. For more information on special voltage and wattage configurations, contact Thermal Solutions of Texas.

Extended Sheath Materials

The following sheath materials are available on WATROD and FIREBAR heating elements:

Extended Sheath Materials

WATROD	304 and 321 S/S Alloy 400 and 600 Titanium Hastelloy C276
FIREBAR	304 S/S Incoloy®

Screw Plug Materials

The following screw plug materials are available: To order, specify screw plug size and material.

Extended Screw Plug Materials

WATROD	304, 304H, 316H, 321 S/S Titanium Alloy 400 and 600 Hastelloy C276 Incoloy
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Screw Plug Sizes

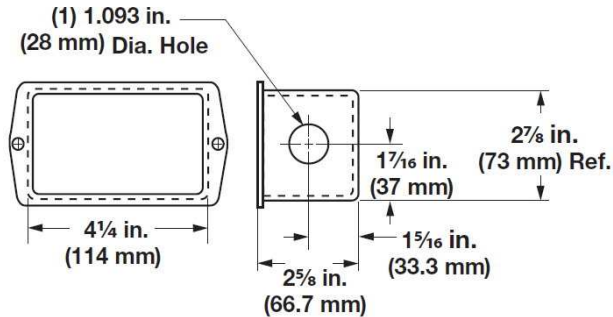
Including European

- *Gas (Gas Pipe Standard) – G11/4, G11/2, G2 in. (brass only)*
- *BSP (British Standard Pipe) – 11/2, 2 in. (stainless steel only)*

Optional Moisture Resistant Housings

Single-Pole Thermostat

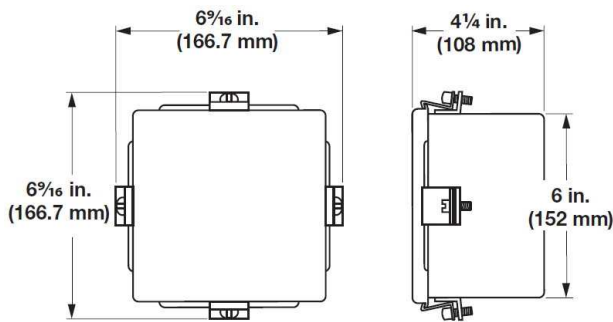
1 and 1¼ inch NPT-1 WATROD Element



Note: The thermostat is not centered on the WATROD screw plug immersion heater.

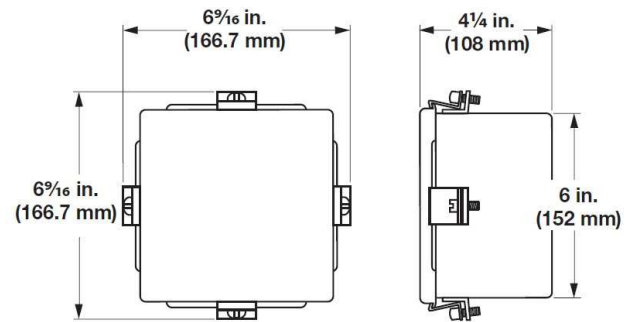
Single-Pole Thermostat

All 2 and 2½ inch NPT



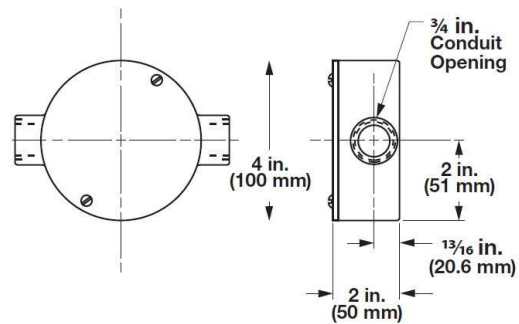
Double-Pole Thermostat

1¼ inch NPT-2 WATROD Elements, 1¼ inch NPT-1 FIREBAR Element, All 2 and 2½ inch NPT screw plugs



Note: The thermostat is not centered on the screw plug immersion heater.

Without Thermostat



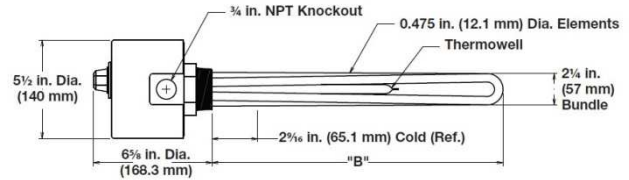
To order: Reference "W" in the Build-a-Code chart

Application: Lightweight Oils and Heat Transfer Oils

- 2 inch NPT screw plug
- WATROD elements
- With thermostat (DPST)

Note: Higher amperage products require a pilot duty thermostat with separate power controller. Please see following pages for available heaters without thermostats.

- General purpose enclosure



	Volts	kW	Ph	B Dimension		Ship Wt		Type 4 (30-110°F)	Type 5A (60-250°F)	Type 7A (100-550°F)
				in	mm	lbs	kg	Code No.	Code No.	Code No.
23 W/in² Steel Plug 2-Steel Elements (3.6 W/cm²)	120/240	1.0	1	9½	(241)	5	(3)	BGS79J6S4	BGS79J6S5A	BGS79J6S7A
	240/480	1.0	1	9½	(241)	5	(3)	BGS79J7S4	BGS79J7S5A	BGS79J7S7A
	120/240	1.5	1	13½	(343)	6	(3)	BGS713J6S4	BGS713J6S5A	BGS713J6S7A
	240/480	1.5	1	13½	(343)	6	(3)	BGS713J7S4	BGS713J7S5A	BGS713J7S7A
	120/240	2.0	1	17½	(445)	7	(4)	BGS717J6S4	BGS717J6S5A	BGS717J6S7A
	240/480	2.0	1	17½	(445)	7	(4)	BGS717J7S4	BGS717J7S5A	BGS717J7S7A
	120/240	2.5	1	20½	(521)	8	(4)	BGS720J6S4	BGS720J6S5A	BGS720J6S7A
	240/480	2.5	1	20½	(521)	8	(4)	BGS720J7S4	BGS720J7S5A	BGS720J7S7A
	120/240	3.0	1	25	(635)	8	(4)	BGS725A6S4	BGS725A6S5A	BGS725A6S7A
	240/480	3.0	1	25	(635)	8	(4)	BGS725A7S4	BGS725A7S5A	BGS725A7S7A
	120/240	4.0	1	32½	(826)	9	(4)	BGS732J6S4	BGS732J6S5A	BGS732J6S7A
	120/240	5.0	1	40	(1016)	10	(5)	BGS740A6S4	BGS740A6S5A	BGS740A6S7A
23 W/in² Steel Plug 3-Steel Elements (3.6 W/cm²)	120	1.5	1	9½	(241)	6	(3)	BHS79J1S4	BHS79J1S5A	BHS79J1S7A
	240	1.5	3	9½	(241)	6	(3)	BHS79J3S4	BHS79J3S5A	BHS79J3S7A
	480	1.5	3	9½	(241)	6	(3)	BHS79J13S4	BHS79J13S5A	BHS79J13S7A
	240	3.0	3	17½	(445)	8	(4)	BHS717J3S4	BHS717J3S5A	BHS717J3S7A
	480	3.0	3	17½	(445)	8	(4)	BHS717J5S4	BHS717J5S5A	BHS717J5S7A
	240	4.5	3	25	(635)	10	(5)	BHS725A3S4	BHS725A3S5A	BHS725A3S7A
	480	4.5	3	25	(635)	10	(5)	BHS725A5S4	BHS725A5S5A	BHS725A5S7A
	240	6.0	3	32½	(826)	13	(6)	BHS732J3S4	BHS732J3S5A	BHS732J3S7A
	480	6.0	3	32½	(826)	13	(6)	BHS732J5S4	BHS732J5S5A	BHS732J5S7A
	240	7.5	3	40	(1016)	14	(7)	BHS740A3S4	BHS740A3S5A	BHS740A3S7A
	480	7.5	3	40	(1016)	14	(7)	BHS740A5S4	BHS740A5S5A	BHS740A5S7A
	240	9.0	3	47½	(1207)	14	(7)	BHS747J3S4	BHS747J3S5A	BHS747J3S7A

RAPID SHIP
Same Day Shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

WATROD and FIREBAR Screw Plug Immersion Heaters

Build-a-Code

Ordering Information

To order, complete the code number to the right with the information below:

	BHS7173	W	5A	
Stock Screw Plug Code Number ①				
Optional Terminal Enclosures ②				
<ul style="list-style-type: none"> S = General purpose enclosure W = Moisture-resistant enclosure E = Explosion-resistant enclosure C = Moisture/explosion-resistant enclosure 				
Optional Process Sensor ④				
<ul style="list-style-type: none"> 1 = 30 to 110°F (-1 to 43°C), SPST 2 = 30 to 250°F (-1 to 121°C), SPST 3 = 175 to 550°F (79 to 288°C), SPST 4 = 40 to 110°F (-1 to 43°C), DPST 5A = 60 to 250°F (16 to 121°C), DPST (FIREBAR) 7A = 100 to 550°F (38 to 288°C), DPST (FIREBAR) PJ = Type J process thermocouple in thermowell PK = Type K process thermocouple in thermowell 				
Sheath Limit Sensor ③				
<ul style="list-style-type: none"> HJ = Type J high-limit thermocouple, horizontal mount TJ = Type J high-limit thermocouple, vertical/housing at top BJ = Type J high-limit thermocouple, vertical/housing at bottom HK = Type K high-limit thermocouple, horizontal mount TK = Type K high-limit thermocouple, vertical/housing at top BK = Type K high-limit thermocouple, vertical/housing at bottom 				

- ① Catalog part numbers include standard option enclosures and process sensors. To order optional enclosures or sensors, substitute the appropriate suffix.
- ② Standard catalog listings include either a general purpose enclosure or moisture/explosion-resistant enclosure. Substitute enclosure options are noted.
- ③ Heater orientation is critical to accurate sensing of limit conditions. Use the appropriate code to indicate heater mounting orientation.
- ④ Thermostat part numbers are shown in the Thermostat Chart (ATTACHED).

Thermostats: Bulb and Capillary

Technical Information

Thermostat

Control Mode	Type	Temperature Range		Differential		Ampacity at Line Voltage				Bulb Diameter		Bulb Length		Capillary Length		Terminal Type	Code No.	Estimated Net Weight	
		°F	°C	°F	°C	120	240	277	480	in	(mm)	in	(mm)	in	(mm)			lbs	(kg)
ON-OFF TEMP CONTROL	Single-Pole	30-110	(0-40)	8	(0)	25	25	22	-	0.250	(6)	4.7500	(121)	18	(455)	#12 AWG	1	1	(0.4)
		30-250	(0-120)	15	(8)	25	25	22	-	0.250	(6)	3.2500	(85)	18	(455)	Stranded	2	1	(0.4)
	Double-Pole Single-Throw (SPST)	30-250	(0-120)	15	(8)	25	25	22	-	0.250	(6)	3.2500	(85)	84	(2135)	Leads	2A	1	(0.4)
		175-550	(80-290)	26	(14)	25	25	22	-	0.250	(6)	3.3750	(85)	18	(455)		3*	1	(0.4)
		175-550	(80-290)	26	(14)	25	25	22	-	0.250	(6)	2.7500	(70)	84	(2135)		3A*	1	(0.4)
		60-160	(15-70)	19	(10)	30	30	30	20	0.250	(6)	4.3750	(110)	14	(355)	#8 - 32	12A	1	(0.4)
ON-OFF with	Double-Pole Single-Throw (DPST)	40-110	(4-40)	12	(7)	30	30	30	10	0.250	(6)	6.5625	(167)	36	(915)	Screw	4	2	(0.9)
		60-250	(15-120)	12	(7)	30	30	30	10	0.250	(6)	6.5000	(165)	48	(1220)	Lugs	5A	2	(0.9)
		100-550	(40-290)	22	(12)	30	30	30	10	0.250	(6)	7.0625	(179)	48	(1220)	Lugs	7A	2	(0.9)
MANUAL RESET	(DPST)	60-250	(15-120)	12	(7)	30	30	30	-	0.250	(6)	6.5000	(165)	48	(1220)	#10-32	8	2	(0.9)
		100-550	(40-290)	22	(12)	30	30	30	-	0.188	(8)	12.000	(305)	48	(1220)	Screw Lugs	9	2	(0.9)
MANUAL RESET	(SPST)	350**	(180)	-		30	30	20	-	0.250	(6)	3.5000	(90)	36	(915)	#10-32 Screw Lugs	11	1	(0.4)

* UL recognized only
** Fixed temperature setting

To order, complete the code number to the right with the information below:

Thermostat Code Number _____ **5A**

Enclosure (Remote Mount Only) _____

- S** = General purpose (NEMA 1)
- W** = Moisture resistant (NEMA 4)
- E** = Explosion resistant (NEMA 7)
- EW** = Explosion/moisture resistant (NEMA 7/4)
- D** = Dust resistant (NEMA 12)

Options _____

- CD** = Celsius dial scale
- CB** = Chrome Bezel
- LTB** = Liquid-tight brass fitting (3/8 in - 18 NPT)
- PL11** = Pilot light, 120V only available on NEMA 4/7 and NEMA 7