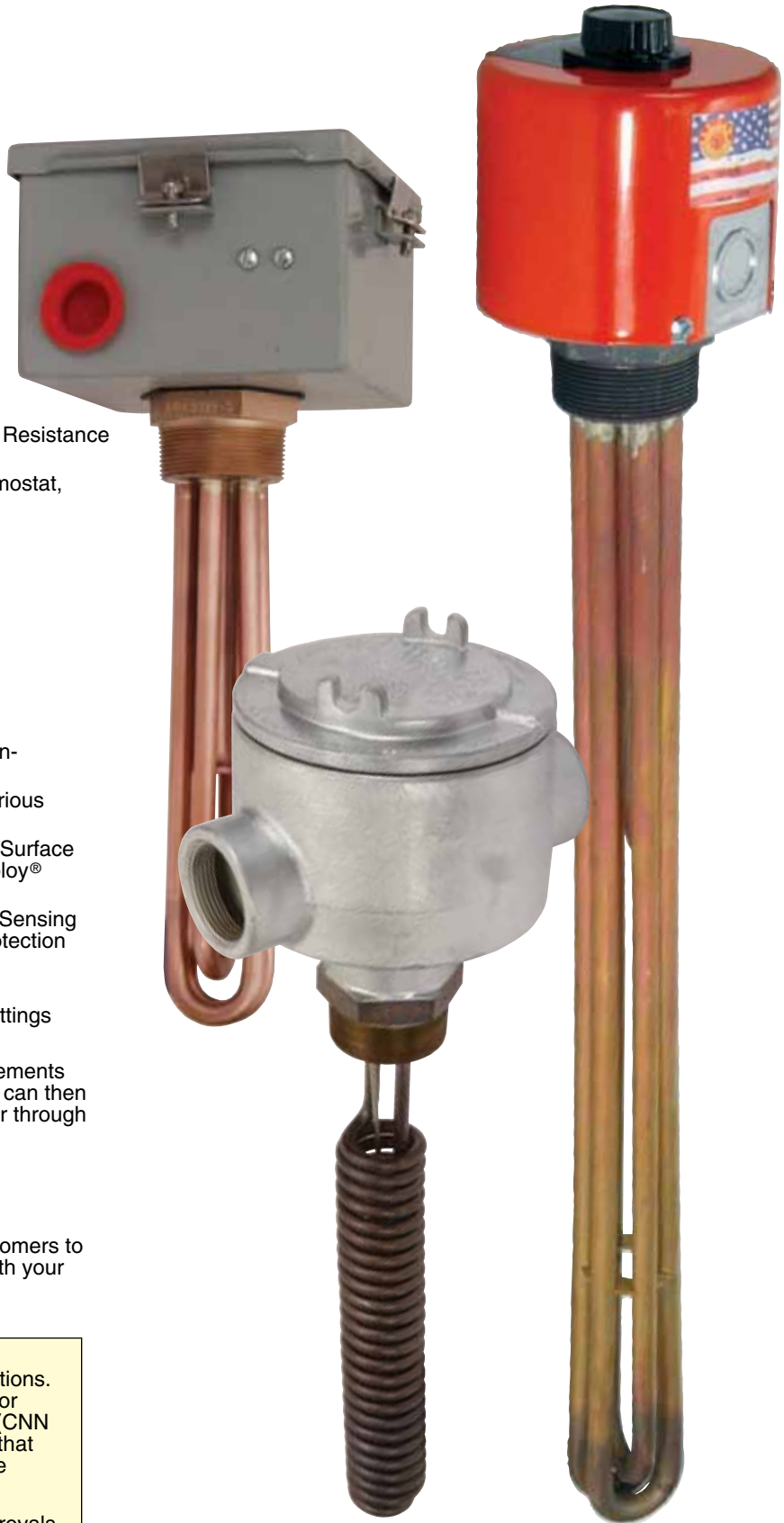
Screw Plug Immersion Heaters

TSP Series



- Stainless Steel, Brass or Steel Screw Plugs
- Four Standard Screw Plug Sizes—25.4 mm (1"), 31.8 mm (1¼"), 50.8 mm (2"), 63.5 mm (2½")
- Recompacted Element Bends Restore Insulation Resistance after Forming
- Thermowell for Optional Bulb and Capillary Thermostat, RTD or Thermocouple Probe
- Corrosion-Resistant Electrical Wiring Hardware
- Four Standard Sheath Materials—Copper, Steel, 316 Stainless Steel and Incoloy® 800
- NEMA 1 Round Terminal Housing
- Silicone Resin Element Seal Standard

Optional Features

- NEMA 4 Moisture-Proof and/or NEMA 7 Explosion-Resistant Terminal Housings
- Integral Single or Double Pole Thermostats in Various Temperature Ranges to Suit the Application
- Passivation, Electropolishing or Bright Annealing Surface Treatments Available for Stainless Steel and Incoloy® Elements
- Type J and K Thermocouples or RTD Probes for Sensing Process Temperatures, or Over-Temperature Protection when Attached to the Sheath
- Special Sheath Materials
- Special Straight Bulkhead or European Thread Fittings

Screw plug immersion heaters consist of tubular elements welded or brazed into a threaded screw plug which can then be inserted into a threaded opening in a tank wall or through a mating full or half coupling.

Need Customer Assistance?

We take pride in our record of working with our customers to develop the right heater for the job. Call OMEGA with your requirements.

OMEGA screw plug immersion heaters are UL recognized and CSA certified in many design variations. The UL file numbers are E90771 (CCN UBJY2/8) for heaters not containing a thermostat and E234452 (CNN KSXF2) for heaters used in water based solutions that include a thermostat. OMEGA's equivalent CSA file number is 043099.

If you require UL, CSA, or other NRTL agency approvals, please specify when ordering.

Screw Plug Immersion Heaters

Checklist—Selecting the Proper Screw Plug Heater

☑ Determine a Safe and Efficient Element Watt Density

Element Watt Density is the wattage dissipated per square inch of the element sheath surface and is calculated with the following formula.

$$\text{Watt Density} = \frac{\text{element wattage}}{\pi \times \text{element diameter} \times \text{element heated length}}$$

For a particular application, element watt density will govern element sheath temperature. Factors to consider when choosing a suitable watt density are:

1. Many materials are heat sensitive and can decompose or be damaged if the element is running too hot.
2. Air and other gases that are poor conductors of heat require watt densities matched to the velocity of the gas flow to prevent element overheating.
3. When heating hard water and cleaning solutions mineral deposits can build up on the element sheath, acting as a heat insulator and raising the internal element temperature. If these deposits cannot be periodically removed, use a lower watt density element to increase heater life expectancy.

☑ Select the Element Sheath Material

Sheath Material Selection

CORROSION. In addition to selecting a sheath material that is compatible with the heated medium, other factors that affect corrosion need to be considered.

1. The temperature of the corrodent. As temperature increases the degree of corrosion increases. Also remember that usually the element temperature is higher than the material it is heating.
2. The degree of aeration to which a corrodent is exposed. Stagnant conditions can deprive the stainless steels of oxygen, which is required to maintain their corrosion resistant surface.
3. Velocity of the corrodent. Increased velocity can increase the corrosion rate.

Typical Applications

Copper Sheath—Process water, water with very weak chemical solutions, demineralized, deionized or pure water, hot water storage for washrooms, showers, cleaning and rinsing parts, for freeze protection of cooling towers and sprinkler systems and other aqueous solutions not corrosive to copper sheath. Sheath temperatures to 177°C (350°F).

Incoloy® Sheath—Weak chemical solutions, oils, tar, caustic soda, detergent, alkaline solutions, molten salts, demineralized, deionized or pure water (sheath passivation is recommended), and other aqueous solutions not corrosive to Incoloy® sheath. Air, gas mixtures and superheated steam. Sheath temperatures to 871°C (1600°F).

Steel Sheath—Fluid heat transfer media, tar, high to low viscosity petroleum oils, asphalt, wax, paraffin, degreasing solvents, alcohol, molten salt, and other solutions not corrosive to steel sheath. Sheath temperatures to 399°C (750°F).

Surface Treatments for Stainless Steel and Incoloy® Elements and Other Wetted Parts to Improve Corrosion Resistance

Screw Plug Immersion Heater surfaces in contact with the material being heated can be passivated or electro-polished to improve their resistance to corrosion.

Passivation removes surface contamination, usually iron, so that the optimum corrosion resistance of the stainless steel is maintained. Surface contamination would come from the small amount of steel that may be worn off a tool during the manufacturing process. Passivating is accomplished by dipping the heater in a warm solution of nitric acid.

Electro-Polishing is an electrochemical process that removes surface imperfections and contaminants, enhancing the corrosion resisting ability of the stainless steels. The resultant surface is clean, smooth and bright. Many medical and food applications require this finish.

☑ Select the Terminal Housing Type

Standard catalog screw plug immersion heaters are supplied with the Type 1N general purpose (NEMA 1) terminal housing with a single Dual ½ to ¾ conduit knockout as shown on the previous page. Additional housings with and without a thermostat include:

Moisture Resistant (NEMA 4)

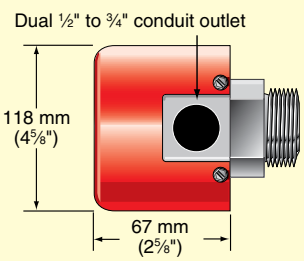
Explosion Resistant (NEMA 7)

Moisture/Explosion Resistant (NEMA 4/7)

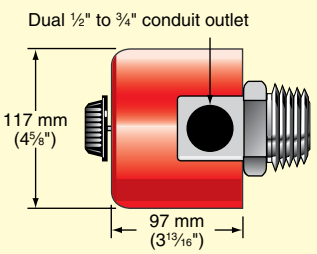
If the housings on this and the following page do not meet the size, construction or other criteria of your application, consult OMEGA with your requirements.

Standard NEMA 1 Housings

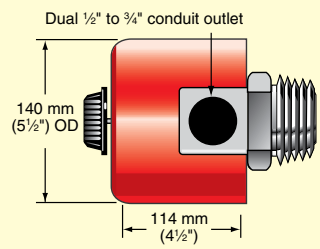
TYPE 1N
(no thermostat)
for 1", 1¼", 2" and 2½"
screw plug heaters



TYPE 1T
(with a single pole thermostat)
for 1", 1¼", 2" and 2½"
screw plug heaters



TYPE 6T
(with a double pole thermostat)
for 1", 1¼", 2" and 2½"
screw plug heaters

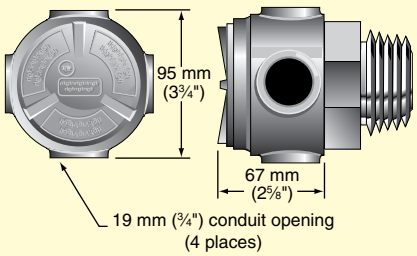


Screw Plug Immersion Heaters

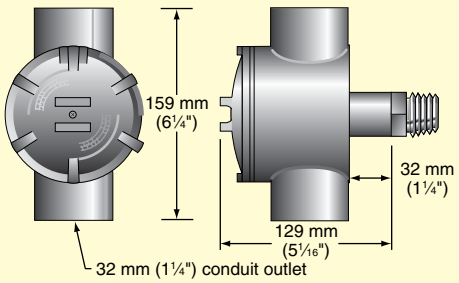
Standard NEMA 4 and/or 7 Housings

NEMA 4 rating requires the use of the cover gasket.

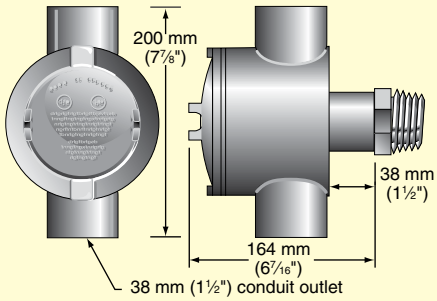
TYPE 2N
(no thermostat)
for 1", 1¼", 2" and 2½"
screw plug heaters



TYPE 2T
(with a single pole thermostat)
for 1" and 1¼" screw plug heaters

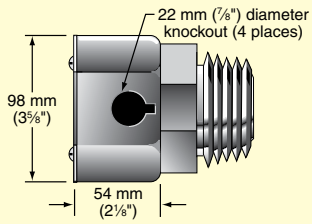


TYPE 3T
(with a double pole thermostat)
for 2" and 2½" screw plug heaters



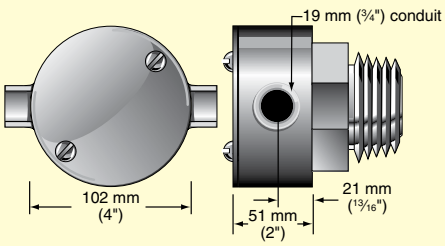
Alternate NEMA 1 Housing

Type 3N
(no thermostat)
for 1", 1¼", 2" and 2½"
screw plug heaters



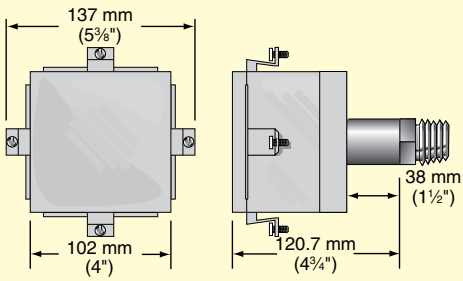
Alternate NEMA 4 Housing

TYPE 4N
(no thermostat)
for 1", 1¼", 2" and 2½"
screw plug heaters



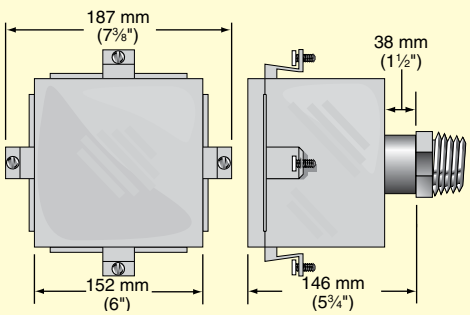
Alternate NEMA 4 Housing

TYPE 4T
(with a single pole thermostat)
for 1" and 1¼" screw plug heaters



Alternate NEMA 4 Housing

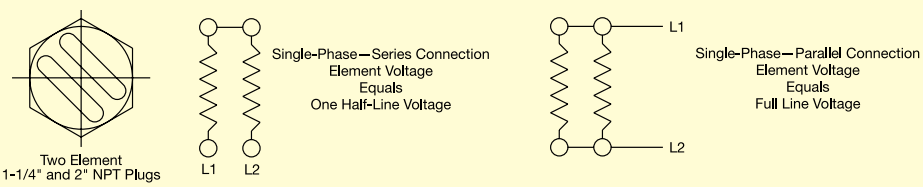
TYPE 5T
(with a single or double pole thermostat)
for 2" and 2½" screw plug heaters



CAUTION

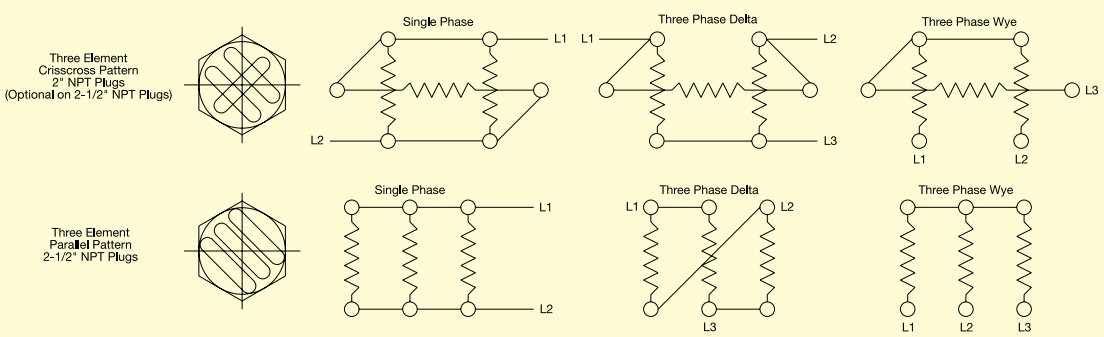
Explosion resistant terminal housings are intended to provide containment of an explosion in the enclosure only. No portion of the heater assembly outside the enclosure is covered under this NEMA rating. Abnormal use of a heater which results in excessive temperature can create hazardous conditions such as a fire. Never perform any type of service nor remove the housing cover prior to disconnecting all electrical power to the heater.

Wiring Diagrams — Screw Plug Heaters with Two Elements



Note: *Dual-Voltage heaters are factory wired for the higher voltage (series connection) unless otherwise specified. Easily rewired for lower voltage operation (parallel connection).*

Wiring Diagrams — Screw Plug Heaters with Three Elements



Note: *Standard screw plug immersion heaters with three elements, factory wired for three-phase delta, can be rewired for single-phase operation with no wattage change. Wattage can be reduced to one-third of the designed wattage by switching from three-phase delta to wye connection.*

CAUTION

Heaters wired for three-phase wye should not be changed to single-phase or three-phase delta connection, since this will increase wattage and watt density on the elements by three times the original designed wattage, causing premature heater failure.

Screw Plug Immersion Heaters

TSP Series

- Brass Screw Plug
- Copper Sheath Heating Elements
- NEMA 1 Terminal Housing

60 watts/in² (9.3 watts/cm²)—Typical Applications: Clean Water

To Order *Visit omega.com/tsp01840_series for Pricing and Details*

Model Number			Nominal Pipe Size	Immersed Length		KW	Approximate Net Weight	
120V-1Ph	120/240V	240V-1Ph		mm	inch		kg	lbs
TSP01840	—	TSP01841		114	4½	0.5	1	2
TSP01842	—	TSP01843		165	6½	0.75	1	2
TSP01844	—	TSP01845		168	6⅝	1	1	2
TSP01846	—	TSP01847		203	8	1.25	1	2
TSP01848	—	TSP01849	1 NPT	235	9¼	1.5	1	3
TSP01850	—	TSP01851	1 element	318	12½	2	1	3
TSP01852	—	TSP01853		375	14¾	2.5	1	3
TSP01854	—	TSP01855		426	16¾	3	1	3
—	—	TSP01856		533	21	4	1	3
TSP01857	—	TSP01858	1¼ NPT	111	4⅜	0.5	1	3
TSP01859	—	TSP01860	1 element	162	6⅜	0.75	1	3
—	TSP01861	—		111	4⅜	1	1	3
—	TSP01862	—		162	6⅜	1.5	1	3
—	TSP01863	—		216	8½	2	1	3
—	TSP01864	—	1¼ NPT	273	10¾	2.5	2	4
—	TSP01865	—	2 elements	381	15	3	2	4
—	—	TSP01866		483	19	4	2	4
—	—	TSP01867		597	23½	5	2	4
—	—	TSP01868		699	27½	6	2	5

Model Number					Nominal Pipe Size	Immersed Length		KW	Approximate Net Weight	
120V-1Ph	120/240V	240V-3Ph	240/480V	480V-3Ph		mm	inch		kg	lbs
—	TSP01869	—	TSP01870	—		206	8⅛	2	2	4
—	TSP01871	—	TSP01872	—		283	11⅛	3	2	4
—	TSP01873	—	TSP01874	—		384	15⅛	4	2	5
—	TSP01875	—	TSP01876	—	2 NPT	460	18⅛	5	2	5
—	—	—	TSP01877	—	2 elements	537	21⅛	6	3	6
—	—	—	TSP01878	—		676	26⅝	8	3	6
—	—	—	TSP01879	—		816	32⅛	10	3	6
TSP01880	—	TSP01881	—	TSP01882*		206	8⅛	3	2	4
TSP01883	—	TSP01884	—	TSP01885*		283	11⅛	4.5	2	5
—	—	TSP01886	—	TSP01887		384	15⅛	6	2	5
—	—	TSP01888	—	TSP01889	2 NPT	460	18⅛	7.5	3	6
—	—	TSP01890	—	TSP01891	3 elements	537	21⅛	9	3	6
—	—	TSP01892	—	TSP01893		676	26⅝	12	3	7
—	—	TSP01894	—	TSP01895		816	32⅛	15	4	8
TSP01896	—	TSP01897	—	TSP01898*		194	7⅝	3	2	4
—	—	TSP01899	—	TSP01900*		225	8⅞	3.75	2	5
TSP01901	—	TSP01902	—	TSP01903*		270	10⅝	4.5	2	5
—	—	TSP01904	—	TSP01905	2½ NPT	371	14⅝	6	3	6
—	—	TSP01906	—	TSP01907	3 elements	448	17⅝	7.5	3	6
—	—	TSP01908	—	TSP01909		524	20⅝	9	3	7
—	—	TSP01910	—	TSP01911		664	26⅛	12	4	8
—	—	TSP01912	—	TSP01913		803	31⅝	15	4	9
—	—	TSP01914	—	TSP01915		943	37⅛	18	5	10

Note: *Dual-Voltage heaters are 1-Phase and are wired for the higher voltage unless otherwise specified.*
** 3-phase only. Other 3-phase heaters are convertible to 1-phase.*

Screw Plug Immersion Heaters

TSP Series

- 316 Stainless Steel Screw Plug
- 316 Stainless Steel Sheath Heating Elements
- NEMA 1 Terminal Housing

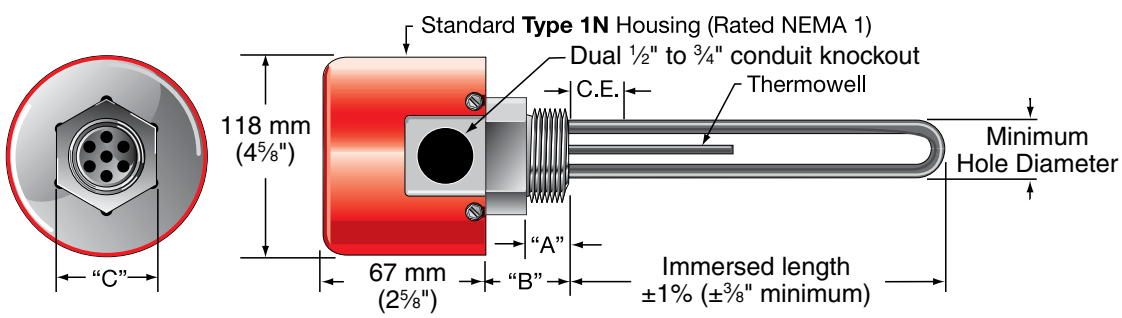
60 watts/in² (9.3 watts/cm²)—Typical Applications: Deionized Water and Demineralized Water

To Order ***Visit omega.com/tsp01840_series for Pricing and Details***

Model Number			Nominal Pipe Size	Immersed Length		KW	Approximate Net Weight	
120V-1Ph	240V-3Ph	480V-3Ph		mm	inch		kg	lbs
TSP01822	TSP01823	TSP01824*	2½" NPT 2 elements	194	7⅝	3	3	7
TSP01825	TSP01826	TSP01827*		270	10⅝	4.5	3	7
—	TSP01828	TSP01829		372	14⅝	6	4	8
—	TSP01830	TSP01831		448	17⅝	7.5	4	8
—	TSP01832	TSP01833		524	20⅝	9	4	9
—	TSP01834	TSP01835		664	26⅛	12	5	10
—	TSP01836	TSP01837		803	31⅝	15	5	11
—	TSP01838	TSP01839		943	37⅛	18	5	12

Note: *Dual-Voltage heaters are 1-Phase and are wired for the higher voltage unless otherwise specified.*
**3-phase only. Other 3-phase heaters are convertible to 1-phase.*

Screw Plug Heater Dimensions



Screw Plug NPT	Minimum Hole Diameter		A		B		C		Thermowell Bulb Size		Standard Cold Ends (CE)		Element Diameter	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
1	29	1⅛	22	⅞	32	1¼	35	1⅜	6.4	¼	25	1	8	0.315
1¼	35	1⅜	24	15⁄16	33	1⅝	44	1¾	6.4	¼	25	1	9	0.315
2	57	2¼	27	1⅛	40	1⅝	64	2½	9.5	⅜	50	2	11	0.430
2½	64	2½	33	1⅝	52	2⅛	76	3	9.5	⅜	50	2	12	0.475