

# Thermowells



- Threaded Thermowell
- Socket Weld Thermowell
- Flanged Thermowell
- Fabricated Thermowell
- Bar Stock Thermowell
- Van Stone Thermowell
- Helical Strake Thermowell



**TEMPSENS**

[www.tempsens.com](http://www.tempsens.com)



## ABOUT THE COMPANY

TEMPSENS Instruments (I) Pvt. Ltd is a part of Pyrotech group which was established by four technocrats in 1976 at Udaipur, with its first product as Thermocouples and RTDs. Today Tempsens is a leading thermal and cable solution provider. The headquarters are based in India, and manufacturing units in Germany and Indonesia.

Tempsens is an ISO 9001:2015, ISO 14001:2015, OHSAS 18001 certified company with NABL Accredited Laboratories.

The company is involved into manufacturing of Thermocouples, RTDs, Thermowells, Cables, Non contact Pyrometers, Heaters/Furnaces and Calibration Equipments etc. with covered area of 2,70,000 Sq. Ft.

We are leading manufacturers of high quality & precision Thermowells Temperature Sensors and accessories. Having experience of more than 40 years, in manufacturing high specification thermo wells, we have developed such an expertise in production engineering that we are capable to meet standard as well as custom built configuration for all industrial sectors and processes.

Tempsens is proud of its innovative solution, quick delivery, high technical standards and outstanding quality which have been appreciated and valued by its customers worldwide.

Tempsens exports to more than 70 countries.



***“Tempsens mission is to lead the Thermal and Cable industry with Passion, Innovation, Excellence & Reliability”***





## FACILITIES

### WELDING AND BRAZING

- Laser Welding Machines
- Programmable Micro Plasma Welding Machines
- TIG Welding Machines with Pulse Modulation And Rotary Positioner
- Induction Brazing Machines
- Resistance Welding Machines
- Brazing Sets (Oxy-Acetative)
- Deep Penetration Welding Machines

### MACHINING

- CNC Turning Centers
- Turn Mill Centers
- VMC Machines
- Deep Hole Drilling Machines upto 1500mm Drilling Capacity
- Milling Centers
- Manual Lathe Machines
- Cutting Machines

### TESTING

- Digital Radiography Setup for Junction Integrity
- PMI Setup for Chemical Analysis of Alloys
- Pressure Test Setup
- Helium & Nitrogen Leak Detector
- Profile Projector
- Dye Penetration Test Setup for Weld Joints
- Microscopic Junction Check
- Ultrasonic Thickness Test
- Mechanical checks - lengths, gauges, concentricity checks
- Passivation Test
- WPS, PQR
- Material certificates as per BN10204 - 3.1/3.2
- Complete wake frequency Analysis as per ASME PTC 19.3 TW - 2016



# THERMOWELLS



Thermowells provide protection for temperature probes against unfavorable operating conditions such as corrosive media, physical impact (e.g. clinker in furnaces) and high pressure gas or liquid. Their use also permits quick and easy probe interchanging without the need to “open-up” the process. It is closed-end reentrant tube designed for insertion of a temperature-sensing element, and provided with means for a pressure-tight attachment to a vessel.

## TYPES OF THERMOWELLS

### Threaded Thermowell

A threaded Thermowell has threads at its one end and is screwed into the process. Thread can be of tapered or parallel type. Parallel or tapered thread is made for convenient installation into a weld in fitting directly into the process. Such a connection is suitable for smaller diameter well, which are not likely to be changed.



### Socket Weld Thermowell

A socket weld Thermowell is welded into a weldolet and a weld in Thermowell is welded directly into the process. Welded connection can be used when the process is not corrosive and routine removal is not required. High integrity is achieved and this technique is suitable for high temperature and pressure.

### Flanged Thermowell

A flanged Thermowell has a flange collar which is attached to a mating flange. Flanged connection is preferable if there is a need for more frequent well replacement such as high corrosion rates.



# THERMOWELLS

Thermowells are also classified according to their production method

## Fabricated Thermowell

Fabricated thermowells are manufactured from tubes which are sealed by a solid welded tip at the process. It means that the stem of thermowell is manufactured from tube and tip is made separately than both these parts are welded by utilizing suitable welding process. The flange is also joined to this assembly by welding process. Fabricated thermowells are generally recommended for low to medium process loads.



## Bar stock Thermowell

Such thermowell bodies are machined and drilled from solid bar stock. This results in a non-welded water tight unit. In this Immersion tip is also made by same material along with stem. In such type of thermowell, no welding process is required for stem and tip production. Flange can be weld according to requirement. Bar-Stock thermowell is also known as "Solid drilled thermowell".



## MATERIALS

Sheath material ranges from mild and stainless steel to refractory oxides (Ceramics) and a variety of exotic material including rare metals.

### Metallic Protection Tubes

Sr. No.	Material	Max. Operating Temp(°C)	Feature
1.	321 S.S.	980°C	Common against heat and corrosion.
2.	321 S.S.	980°C	Higher corrosion resistance.
3.	316 S.S.	980°C	Excellent resistance to corrosives, heat, acids and alkalis.
4.	310 S.S.	1,000°C	Good high temperature strength with resistance to oxidation.
5.	446 S.S.	1,050°C	Excellent resistance to oxidizing and reducing flames containing sulphur.
6.	Inconel 800	1000°C	Excellent to high temperature oxidizing atmosphere and thermal shock.
7.	Inconel 600	1,050°C	Excellent resistance at high temperature, Avoid sulphurous atmospheres
8	Hastelloy C-276	1000°C	Excellent resistance to high temperature oxidizing and reducing atmospheres and also Cl <sub>2</sub> gases.

### Ceramic Protection Tubes

Sr. No.	Material	Max. Operating Temp(°C)	Feature
1.	Recrystallised Alumina 99.7% purity (C-799)	1750°C	Good resistance to chemical attack, mechanically strong but avoid severe thermal shock
2.	Ceramic 60% Alumina (C-610)	1500°C	Sintered alumina, used in heating furnaces, regenerators etc.
3.	Nitride Bonded Silicon Carbide	1500°C	Good resistance, mechanically strong, unsuitable for oxidizing atmosphere but resist fluxes.
4.	Silicon Nitride	1350°C	Excellent thermal shock resistance, most suitable for molten aluminium
5.	Recrystallised Silicon Carbide	1500°C	Excellent thermal shock resistance
6.	Tungsten Carbide	350°C	Good mechanical strength and high abrasion resistance

# SPECIAL THERMOWELL

## Van-Stone Themowell

In van stone thermowell, stem, tip and sub part of flange all these three prepared by using single bar or rod material. There is no need of welding for these three parts of thermowell. The flange sub-part serves as a gasket in such type of thermowell. On this sub-part flange is used according to requirement.



## Sanitary Type Thermowell

Specially designed thermowell for food, dairy, and pharmaceutical industries. These thermowell come with advantage that the process connection need not be opened for replacement, removal or repair of the instrument.



## Other Special Thermowells / Protection Tubes

- Metal Thermowells with Tungsten Carbide/Ceramic/PTFE/PVDF/PFA coatings
- Silicon Carbide(Recrystallised & Nitride Bonded)
- Platinum Thimble
- Tantalum, Titanium, Nickle Cladding,
- Tantalum Tungsten (Ta10W) Alloy
- Graphite
- Silicon Nitride
- Hard cram plating
- Sterlite Coating
- Boro Nitrate Coating
- Other materials in various sizes available on request

## Helical Strake Thermowell



Helical Strake Thermowell are specially constructed thermowells which have special design features that allows the thermowell to be sustained well inside a fluid flow. Special feature of this thermowell is the helical ridges which are constructed using standard calculations, these helical ridges reduces the vortex formation inside the fluid flow due to the thermowell which reduces the vibrations upto 90% compared to a normal thermowell. The construction of this thermowell is based on the parameters provided in the standard ASME STS- 1.



Solid Machined



Wire Welded

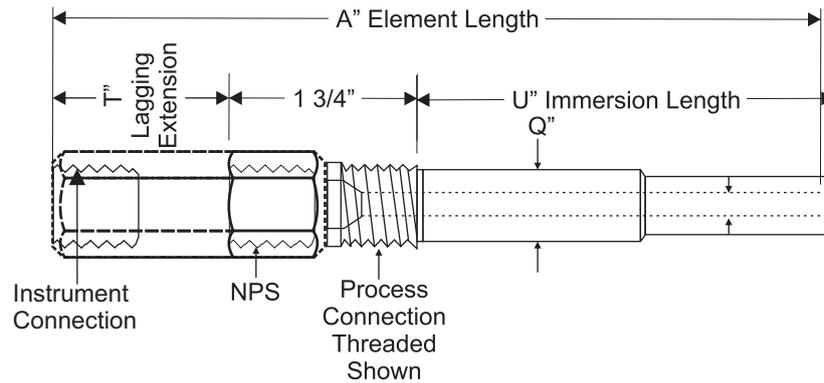
## Solid Sintered Tungsten Carbide



They find application in coal based power plants and Air pre heaters etc. Solid sintered tungsten carbide has got high resistivity to abrasion due to coal particles



# BASICS OF THERMOWELL



- 1. Q Dimension** The thickest part of the shank of the well on the hot side of the process connection or flange. It is dependent on the bore size and the process connection size.
- 2. Bore Size** The inside diameter of thermowell. In other words, the diameter of the internal cylindrical cavity of a thermowell or protection tube. Standard bore sizes are 6.5 mm, 8.5 mm.
- 3. Immersion ("U") Length** The length of a thermowell or protection tube below the mounting threads, flange, bushing, etc. extending into the process area. The "U" length is measured from the bottom of the process connection to the tip of the thermowell.
- 4. Lagging Extension ("T") Length** The length of a thermowell, in addition to the standard head lengths, required to make the head of the thermowell accessible and this enable the probe to extend through insulation or walls.
- 5. Internal Mounting Thread** The thread within the thermowell for attaching a temperature device of the union and nipple extension for a thermowell assembly.

## SELECTION OF THERMOWELL

### 1. Materials the Longevity Factor

The selection of material is the most important factor for thermowell life. The material selected is based on the temperature of the application and the process medium.

### 2. Connection-The Installation Factor

All threaded well are made by easily welded or brazed materials. Welding and brazing is important for the installation requiring seal. The pipe thread provides mechanical strength, and the weld or braze provides the seal.

Flanged wells (other than van stone type) consist of a bar stocks well which is solidly welded to a top quality flange. Standard construction uses a primary "J" groove weld and a bevel groove clean fillet. This double welded construction eliminates the possibility of crevice corrosion since no open joint are exposed from either inside or outside the installation. Socket weld well are simple to install, simply weld them into place.

### 3. Insertion Length-The Accuracy Factor

The distance from the tip of the well to the underside of the thread or other connection is defined as the insertion length (designated as "U"). For best accuracy this length should be greater enough to permit the entire temperature sensitive part of element to project into the medium being measured. A properly installed element: in liquid, the element should be immersed up to its sensitive length plus one inch, and in air or gas, the element should be immersed up to its sensitive length plus three inches

# TECHNICAL STANDARDS

## 4. Bore Size-The Interchangeability Factor

Almost all installation uses several type of temperature measuring sensor. The selection of a standard bore diameter can produce extreme flexibility within the plant. The same well can accommodate thermocouple, resistance thermometer, and bimetal thermometer

## 5. Tapered or Straight Well-the Velocity Rating Factor

Tapered shank provides greater stiffness with same sensitivity. The higher strength to weight ratio give these wells higher natural frequency than the equivalent length straight shank well thus permitting operation at higher fluid velocity. If vibratory stress is a potential problem, tapered wells should be used.

The American Society of Mechanical Engineers (ASME) Performance Test Codes (PTC) is used to determine the performance of specific, mechanical equipment, which are designed to meet specified criteria for performance and operability. The results from applying Codes indicate how well the equipment performs its intended function.

The ASME PTC 19.3 is a thermowell stress calculation, which serves as a mathematical proof that the material chosen and the mechanical design will not fail given the effects of the operating conditions. The calculation provides guidance for establishing a comparison between the shedding frequency and the natural frequency of the thermowell.

## ASME PTC 19.3 - TW 2016

Tempens uses for Thermowell Wake Frequency Calculations as per ASME Standard. PTC 19.3 - TW 2016.

The ASME PTC 19.3 TW (2016) standard applies to thermowells that are:

1. Machined from bar stock material.
2. Having a straight, tapered or step-down shank.
3. Process connection: Threaded, Flanged, Van Stone or welded

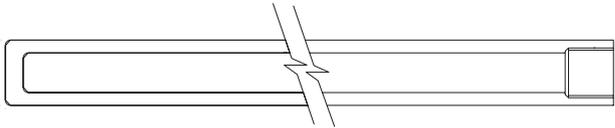
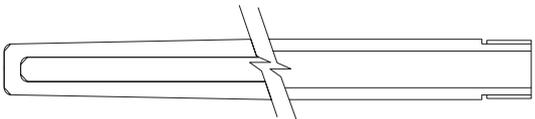
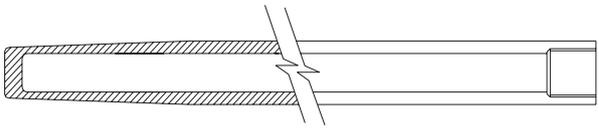
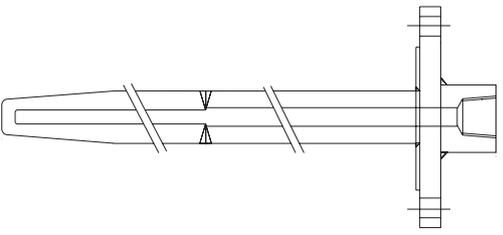
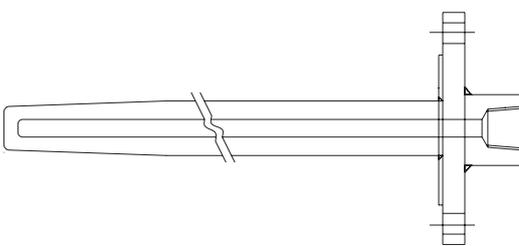
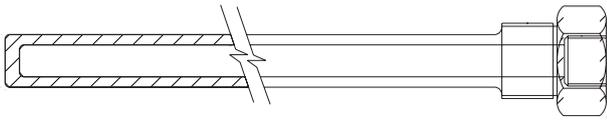
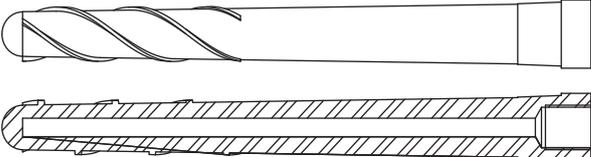
## PRESSURE - TEMPERATURE RATINGS

$$P = k_1 \times S$$

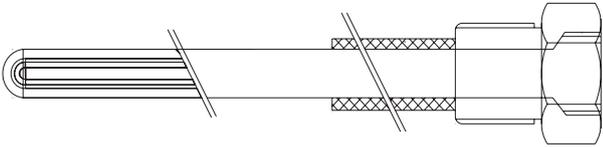
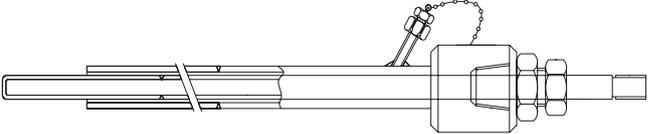
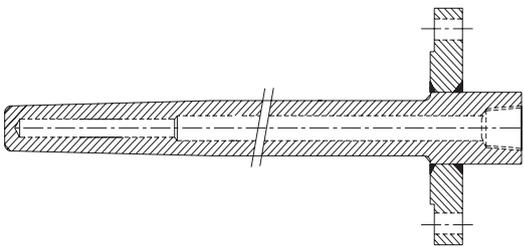
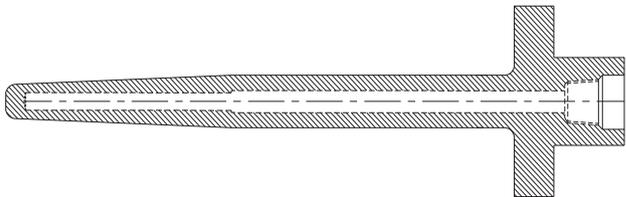
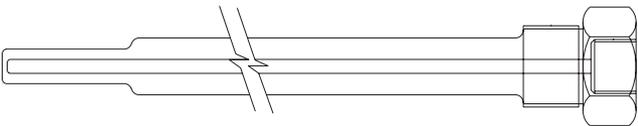
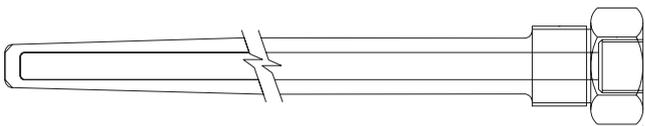
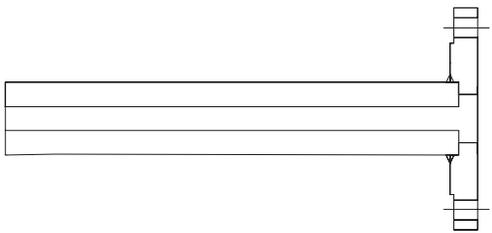
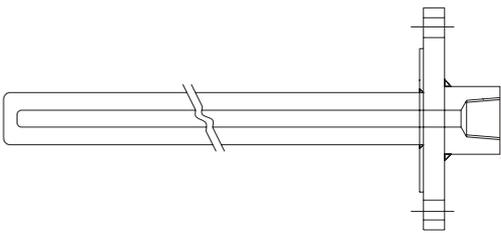
( P =Max Operating Pressure (psi), S = .41 (for .260" bore))  
(per ASM PTC 19.3)

ALLOWABLE STRESS ( PSI X 1000 )							
	TEMPERATURE (°F)						
Material	70°F	300°F	500°F	700°F	900°F	1100°F	1300°F
C.Stl	14.3	14.3	13.6	11.9	5.0	-	-
304 SS	20.0	15.0	12.9	11.7	10.8	9.8	3.7
310 SS	20.0	16.1	14.3	13.3	12.5	-	-
316 SS	20.0	15.6	13.3	12.1	11.5	11.1	4.1
321 SS	20.0	16.5	14.3	13.0	12.3	6.9	1.7
446 SS	18.6	18.3	18.1	17.9	-	-	-
Inconel	23.3	19.9	18.6	18.2	-	-	-
Hast C-22	28.6	24.6	21.5	19.6	18.6	17.5	-
Hast B-3	31.4	30.3	27.4	25.4	-	-	-
Hast X	23.3	19.2	16.5	15.1	14.5	-	-
F22 SS	21.4	20.9	20.5	20.0	15.8	3.2	-

# LIST OF MODELS

<p><b>Straight Thermowell (Screwed Type)</b></p>	<p><b>Straight Thermowell (Female Thread)</b></p>
	
<p><b>Tapered Thermowell (Male Thread)</b></p>	<p><b>Tapered Thermowell (Female Thread)</b></p>
	
<p><b>Welded Thermowell with Flange</b></p>	<p><b>Taper Thermowell with Flange</b></p>
	
<p><b>Straight Thermowell (Screwed Type)</b></p>	<p><b>Helical Strake Thermowell</b></p>
	

# LIST OF MODELS

<p><b>Thermowell with Ceramic Tube</b></p>	<p><b>Double Protection Tube for Boiler Temp.</b></p>
	
<p><b>Flange with Taper Thermowell (Stepped Drill)</b></p>	<p><b>Vanstone Thermowell (Single Drill/Stepped Drill)</b></p>
	
<p><b>Stepped Thermowell</b></p>	<p><b>Taper Thermowell (Screwed Type)</b></p>
	
<p><b>Heavy Duty Thick Wall Thermowell</b></p>	<p><b>Straight Thermowell with Flange</b></p>
	

# ACCESSORIES

## Compression Fitting / Precision Fitting



- Male Connector
- Pipe Plug
- Reducing Adapter
- Hex Nipple
- Elbow Union
- Back Ferrule
- Three Pipe Union
- Male Pipe weld Connector
- Reducing Bushing

## Bayonet Caps



## Seal Pots



## Flanges



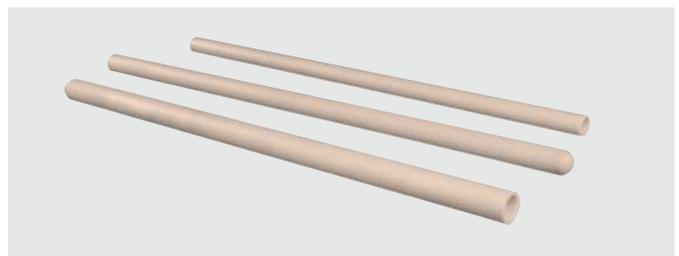
## Connection Head



## Connectors



## Ceramic Tubes



# THERMAL & CABLE SOLUTIONS



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