The Specialists in Custom Heating

Vulcanic TEE

THERMAL ELECTRIC ELEMENTS

Vulcanic Thermal Electric Elements

Product Catalogue

Including the VTEE range of IECEx and ATEX certified hazardous area heaters

Contents

Section 1

Company Profile & Quality Accreditation

Company Profile

Thermal Electric Elements Pty Ltd was founded in 1972 in Sydney, NSW. The company began as a father and son operation manufacturing heating elements for commercial and industrial use and has grown to be a leader in the design and manufacture of electric elements in Australia.

Motivated by a long-term view towards expansion and the sharing of common values, the family company of Thermal Electric Elements joined the Vulcanic Group in 2017.

The new company, branded Vulcanic TEE, takes great pride in its customer service, quality standards and commitment to continued growth of both the company and its people.

Vulcanic TEE has a reputation built on specials and one off orders, as well as custom design work. Through its commitment to research and development, and a willingness to embrace new technology, the company has introduced increased flexibility in the design of elements and has improved element reliability. These advances are particularly relevant to the design and manufacture of elements to suit specific and unique customer applications. Vulcanic TEE is now the preferred supplier to a wide variety of industries. Custom designs for specific applications and quick turnaround times are what keep the company ahead of its competitors.

With significant investment in specialist equipment for tubular element manufacturing, electrical and sheetmetal fabrication, Vulcanic TEE's capabilities are second to none. All design is done in-house at our manufacturing facility in Coffs Harbour, ensuring a close relationship between design and production to provide the highest quality products with industry leading lead-times.

Vulcanic TEE prides itself on providing a quality product and the attainment of certification from SIMTARS in 2011 has helped to further this. The company is currently certified to design and manufacture explosionproof units to IECEx standards, which includes a Quality Assurance system that exceeds ISO 9001 standards.

Proudly manufacturing in Australia and with sales offices strategically located around the country, Vulcanic TEE are well placed to support clients across Australia and beyond. Working across a wide range of industries including HVAC&R, Construction, Railways, Oil and Gas, Mining, and Food and Beverage amongst others, Vulcanic TEE provides local experience and support to specialist applications across a broad cross-section of customers.

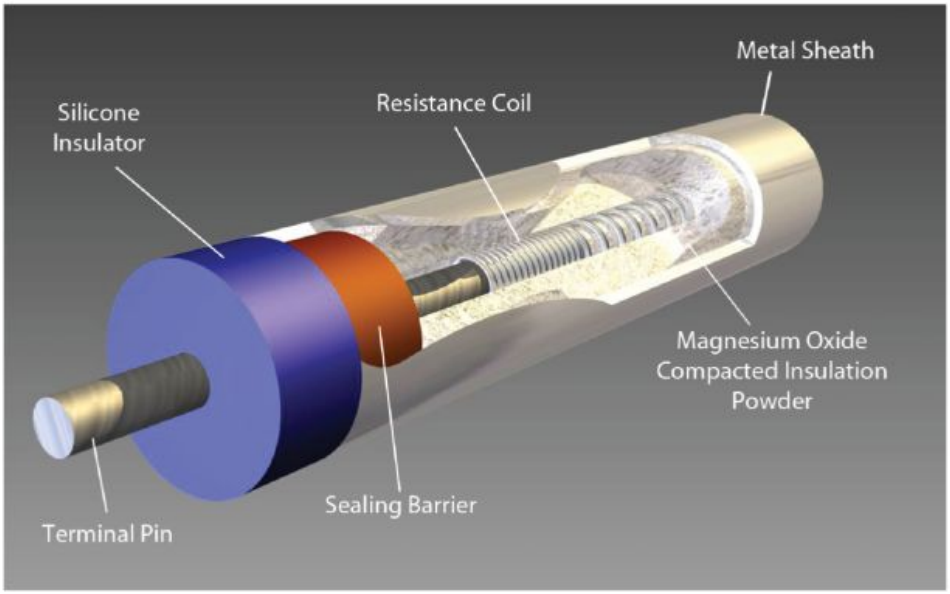
Section 2

Element Construction & General Information

Element Construction & General Information

Vulcanic Thermal Electric Elements are the most versatile of all electric heating elements and are widely used as the main source of electric heat for the domestic, commercial, industrial and scientific areas. With a vast range of sheath materials, shapes, voltages and wattages; they can be used in many applications.
Tubular elements can be immersed in liquids, cast into metals, clamped, placed in vessels and ducts to heat gases or simply used as radiant heaters for a variety of processes. They are easy to install, require low maintenance and have excellent internal electrical insulation and heat conduction.

Vulcanic Thermal Electric Elements are manufactured with a resistance coil of nickel-chrome wire centrally located within a metal sheath tube. Terminal pins are fusion welded to each end of the resistance coil. These terminal pins are the cold zone of the heating element. The resistance coil assembly is stretched within the tube and filled with a magnesium oxide powder which electrically insulates the assembly from the outer sheath of the element. The magnesium oxide powder has excellent heat transfer properties and when combined with an evenly stretched resistance coil, a uniform heat is achieved along the length of the heating element. Once filled, the heating element is then roll compacted which compresses the magnesium oxide powder to a rock hard construction. This protects the resistance assembly from atmospheric corrosion and mechanical damage. The heating element is then trimmed at each end to expose the terminal pin.
Silicone insulators are used to insulate the terminal pin from the outer sheath of the element and a terminal connection is fitted. Various terminals, flanges, mounting bushes or plates, heat dissipation fins, terminal boxes and more can be fitted to suit all installations.



Section 3

Terminations

Leads and Termination Types

Leads

1 Vulcanised Rubber Moulded Ends
A fully moisture resistant, high electrical insulated connection with extra mechanical strength around the cable to the element cold pin junction. Widely used within the refrigeration industry and applications where a wet environment exists.

2 Heatshrink with Silicone or Rubber Leads
An economical alternative to the ***vulcanised rubber moulded ends*** type. Moisture resistant and also used within the refrigeration industry where less mechanical stress is present at the cable to element cold pin junction.

3 High Temperature Leads with Silicone Coated Fibreglass or Teflon Sleeve
Used for ovens, heated platens, heater bands and nozzle elements.

Terminations

4 Stirrup
Used for higher temperature applications where the electrical connection can only be accessed from the front of the element.

5 M5 Stud Spotweld
Used for higher temperatures where a firm connection with multiple cables or busbar is required. Supplied with locking nuts and washers.

6 Flag
Used for higher temperature applications where an electrical connection can only be accessed 90° to the element.

7 Quick Connect
Recommended to be used on heating elements not exceeding 1750 watts or 7.5 Amps current rating.

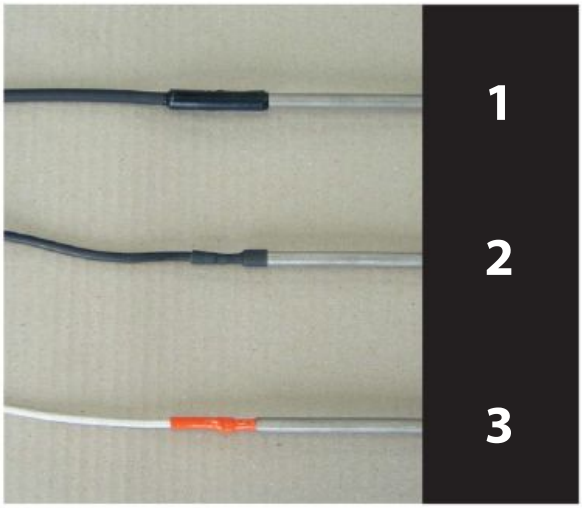
8 M5 Brass Stud Crimp On
Used for lower temperature applications where a firm connection with multiple cables or busbar is required. Supplied with locking nuts and washers.

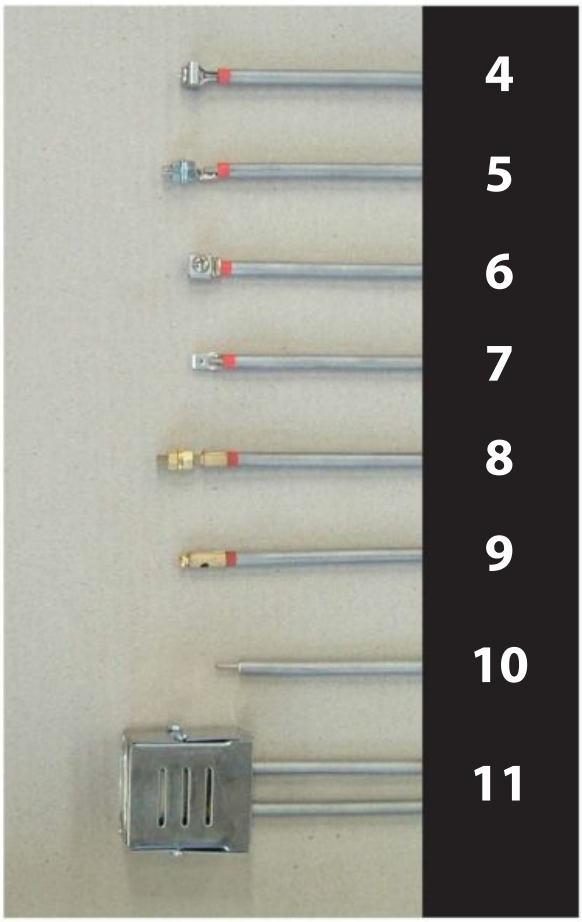
9 Brass Post
Used for lower temperature applications where an electrical connection can only be accessed from the front of the element.

10 Trimmed Element Ends with Exposed Terminal Pin
Lengths of 12mm to 50mm. Used where the end user has their own special electrical connections available.

11 Plugall Socket
Used where electrical 2 pin ceramic or silicone Europlug is available. Widely used within the plastics industry, for heater bands, platen heaters, or any application where elements are being changed frequently for portable use.

Leads and Terminations





Element Bushes & Locking Nuts

Thermal's range of element bushes with matching locking nuts are available in SS, brass, aluminium and mild steel. Standard gaskets/washers available include brass, teflon, fibre, rubber, Clingerite, tooth lock and Kevlar with graphite high temperature/high pressure gaskets.Other options can be supplied upon request.

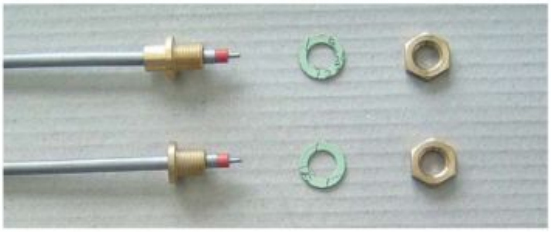
2" BSP Bush - Parallel Thread
Thread Diameter - 60mm
1 1/2" BSP Bush - Taper Thread
Thread Diameter - 48mm
1 1/4" BSP Bush - Parallel Thread
Thread Diameter - 41mm
1" BSP Bush - Parallel Thread
Thread Diameter - 33mm

Crimp on Type

Suitable for dry applications, eg. air conditioning and ovens

3/8" BSP
Thread Diameter - 16.5mm

1/4" BSP
Thread Diameter - 13mm



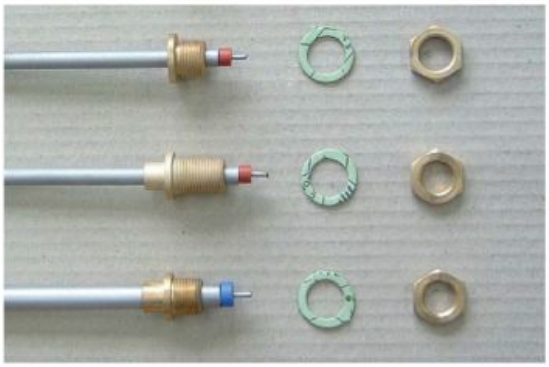
Welded or Silver Brazed

Suitable for moist applications, eg. refrigeration or tanks

1/4" BSP
Thread Diameter - 13mm

3/8" BSP
Thread Diameter - 16.5mm

1/2" UNF
Thread Diameter - 13mm



Section 4

Certified Hazardous Area Heaters

4.1

What is the IECEx Scheme?

Hazardous areas can be found in a range of industries where explosive atmospheres are present. An explosive atmosphere might be caused by the presence of flammable gases, liquids, vapours or dusts. Examples of these areas can be found in places such as petrol stations; sewage treatment; oil/gas refineries and processing facilities; mining; laboratories and more.

Minimising the risk of ignition within a hazardous area is paramount to ensuring the safety of both equipment and workers operating within that area. In order to assist in standardising the level of safety in these areas, a variety of certifications can be achieved based on the product, use or location.

For electrical equipment used in various countries, the International Electrotechnical Commission (IEC) provides a set of standards relating to various aspects of ignition protection. The IECEx Scheme is used in a number of countries throughout the world, including Australia.

According to the IEC, "the objective of the IECEx system is to facilitate international trade in equipment and services for use in explosive atmospheres, while maintaining the required level of safety."[1]
In this scheme, the Ex 'd' and Ex 'e' classifications are found to be the most commonly used for electric heaters in hazardous areas.

4.2

What is the ATEX Directive?

The ATEX directive is a European certification designed to ensure that products sold in the European market are of high quality and safety standards (similar to the Ex Scheme).
ATEX certification is widely approved and used in both the European and South East Asian markets.

1. IECEx website - About IECEx, International Electrotechnical Commission (IEC), for more information visit ***http://www.iecex.com/about.htm***

VTEE Explosionproof Heaters

Our range of heaters is growing continually and can be manufactured to suit yout requirements. All our heaters, are manufactured with the highest quality matérials, form the magnesium oxide insulation, to the element sheaths and electrical controls.

This range of certified flanged immersion heaters are currently available at ratings up to 690V 430kW and withdrawable immersion heaters are available with process temperatures up to 450°C. Drawing on Thermal's extensive electric heating element experience, the elements used in these bundles can be a variety of sheaths to suit your specific applications, including Stainless Steel, Titanium, Incoloy and more. Element lengths can be anywhere from 300mm to 6m depending on your requirements, with varying element quantities within the bundle, giving you the moste efficient design.

Flange type is determined by your specifications in order to match your current system or provide the best fit for the heater design.

The VTEE'S range of heaters are rated to IP66 and available in T3-T6 temperature classifications for -20˚C to +60˚C ambient operating temperatures.

VTEE'S heaters are constructed in accordance with IEC standards 60079-0; 60079-1; 80079-34 and ATEX standards EN 60079-0 and 60079-1.

Applications and Options

VTEE's heaters are designed for hazardous areas where an explosive atmosphere is present. Hazardous areas can be found in a wide variety of places including oil platforms, mines, petroleum processing, sewage treatment and laboratories to name a few.

Some applications our heaters are often used in:

- Fuel Gas
- Natural Gas
- Industrial Gases
- Crude Oils / Hydrocarbon Liquids
- Fuel Oils
- Heat Transfer Oils
- Molecular Sieve Regeneration
- Knockout Drums and more...

Range of Options

Thermal can supply you with a part of the heater or the complete unit depending on your requirements.
From the heater bundle (with a variety of options including compression fittings and stand-off flanges) to the vessel, control panel, complete oven and more!

Technical Information

All units are provided with full documentation and technical data sheets to assist you with installation and servicing. VTEE are also always available for technical advice and after-sales service to ensure you continue to reap the benefits of our high quality, efficient heaters.

VTEE End Sealing

The importance of end sealing

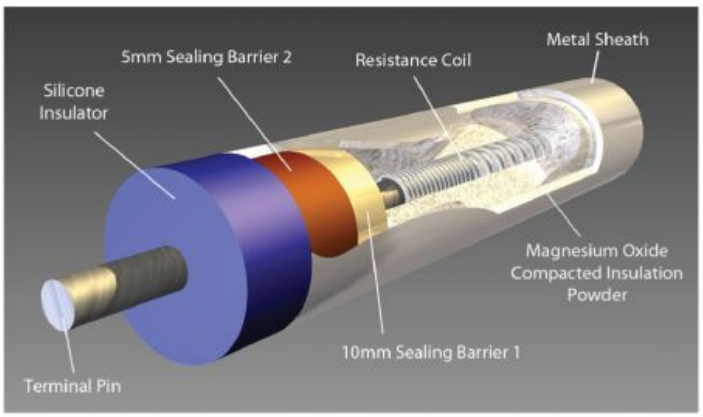
The main cause of earth leakage trip issues is moisture ingress through the element ends. This leads to low insulation readings and subsequent element failure over time.
To eliminate this problem, Vulcanic Thermal Electric uses a twin sealing process on all of its VTEE's heaters, which guarantees high insulation resistance readings for years to come.

Thermal's end sealing procedure

- Heating elements are placed into a vertical dehydration oven for a minimum of 48 hours and allowed to completely dry out.
- Insulation tests are performed and must be greater than 500MΩ before the sealing process is carried out.
- Sealing process 1 (10mm) is carried out while the heating element is in the hot state (110°C minimum surface temperature).
- Heating elements are placed for the second time into the oven for a minimum of 36 hours.
- Insulation test performed - greater than 500MΩ minimum reading allowable.
- Sealing process 2 (5mm) is carried out while the element is inthe hot state.
- Once sealed, insulation and Hi pot tests are performed.

VTEE's in house test results (shown below) verify the twin sealing process and guarantee's the reliability and longevity of the unit.

- Squeeze test and then immersed in 20-24°C water for 45 minutes.
  Result: 200MΩ Insulation test
- Environmental chamber test at 90°C. 95% relative humidity for 4 weeks.
  Result: 200MΩ
- Immersed in 20-24°C water for 28 days.
  Result: 200MΩ
- High temperature oven at 125°C for 6 weeks, removed and placed in sub-zero temperatures for 72 hours.
  Result: 200MΩ



Element assembly into Flange or Enclosure

Double Ferrule / Double Bite Compression Fitting
- For easy individual heater element replacement

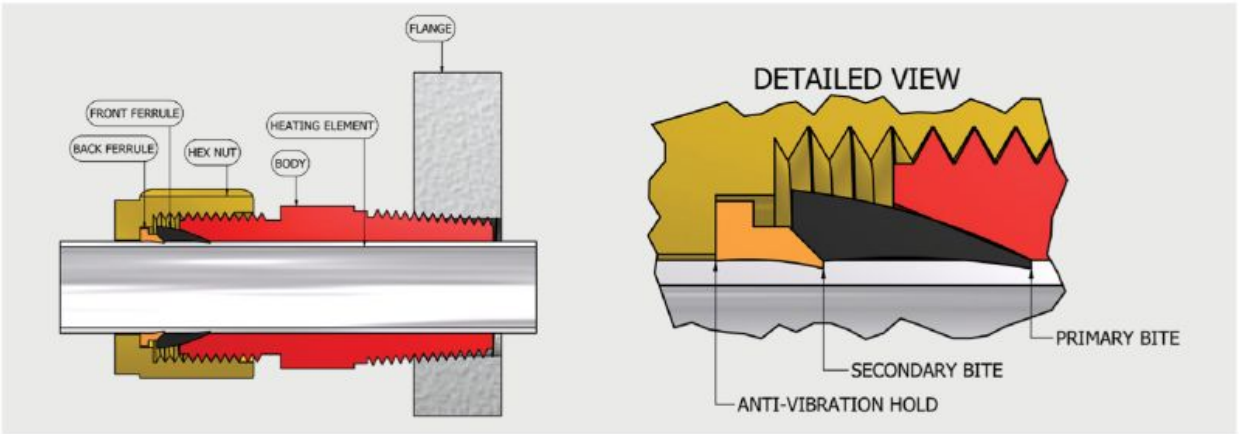
Double Ferrule Compression fittings are torque free, self-aligned mechanical grip fittings that are an industry standard for the chemical, bio-technology, semi-conductor, oil and gas industries to name a few.

The complete assembly is made up of four parts (body, front ferrule, back ferrule and nut) that offer excellent leak-proof performance in vacuum as well as in low and high pressure applications.

The back ferrule provides an anti-vibration hold on the heating element and leak-proof sealing is guaranteed at high operating temperatures.

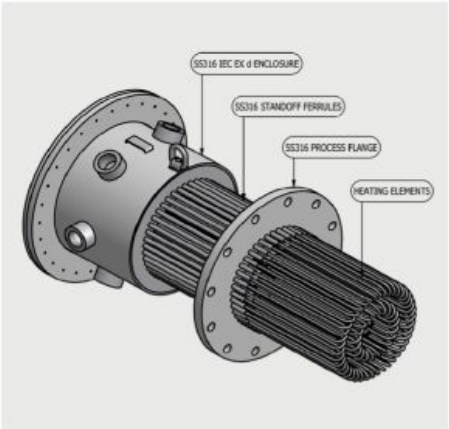
The two ferrule design offered provides a leak-proof seal at three separate points and can adjust to temperature cycling while eliminating damage to the element sheath normally caused by inferior fittings.

- The heater element is inserted into the process flange or Ex 'd' enclosure via means of the four piece Stainless Steel compression fitting.
- The body of the compression fitting has an NPT thread that is designed for high pressure applications.
- The general arrangement and layout of the fitting entry points have been designed so as the integrity of the flange is maintained to the existing design codes.
- Easy removal and replacement of individual heating elements can be achieved without the need to replace the complete flanged heater bundle.

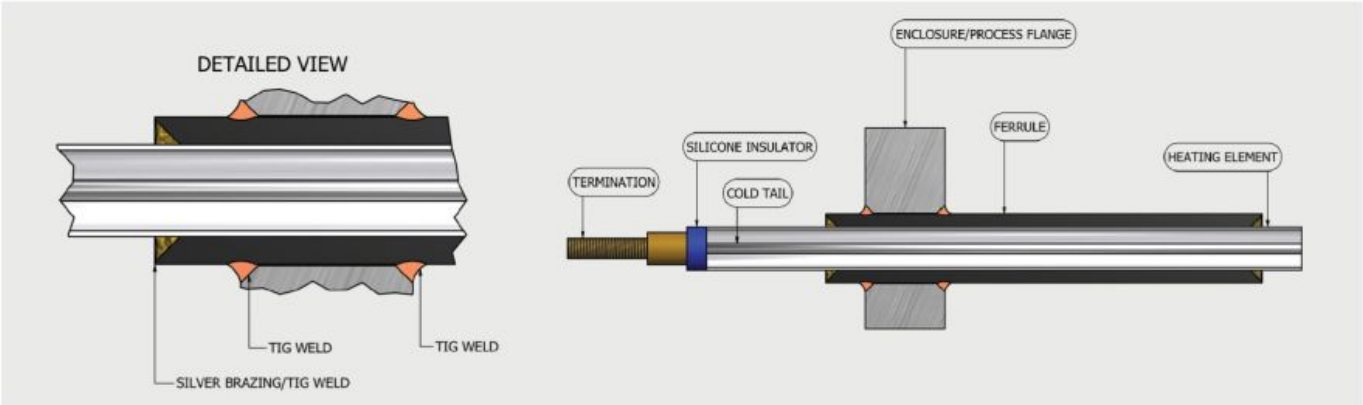


Standoff Flange Heater Ferrule Arrangement
- For use on Compact High Powered Ex heaters

Tungsten Inert Gas (TIG) welding is highly resistant to corrosion and cracking over long time periods and is ideal for use when working with many of the exotic materials that are required for the Petrochemical, Chemical, Oil and Gas industries.
It is the preferred choice when VTEE Ex heaters are required to be installed into a process area that allows for the maximum kilowatt rating achievable with the minimal amount of space used.



- Thorough cleanliness and preparation are imperative in achieving the best results with numerous inspections and quality checking performed before a single weld is committed to.
- 316SS standoff ferrules are TIG welded into the process flange or base of the VTEE Ex enclosure that guarantee a high quality, strong and clean weld to prevent the occurrence of oxidisation.
- All element ends are heat treated and normalised numerous times prior to being TIG welded or silver brazed into position. This process relieves stress on all element to ferrule contact points ensuring stress fractures not occur during assembly and most importantly at the customers process facility.
- Various exotic flange and ferrule materials are available to suit customers requirements.
- The general arrangement and layout of the ferrule/element entry points have been designed so as to maintain the integrity of the flange and to comply with existing design codes and pressures.



Withdrawable Types Heaters

VTEE's withdrawable tubular heaters are suitable for applications where replacements, maintenance or repairs are to be carried out without disturbing the contents of the tank.

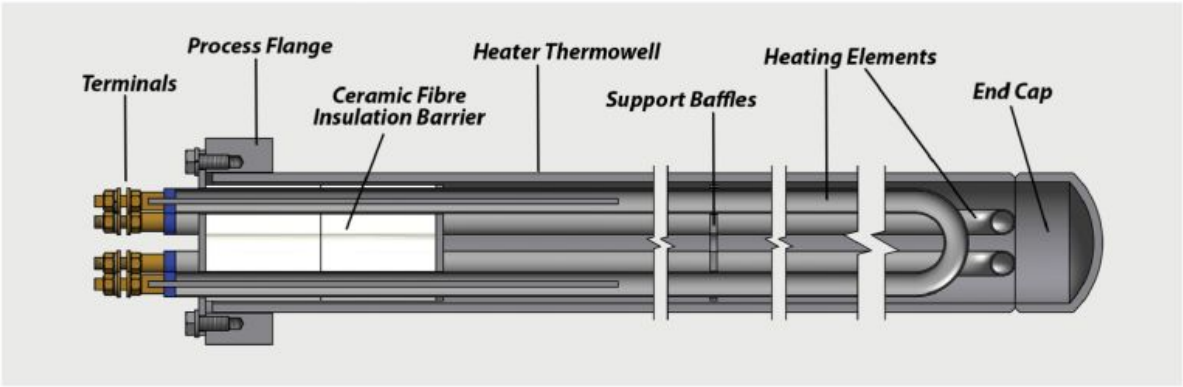
The stainless steel removable core easily slides out of the flange mounted thermowell, minimising disruption to your process or tank contents.

VTEE's Ex withdrawable heaters feature multiple 50NB stainless steel thermowells up to 6 metres in length welded to the process flange.

The SS removable core heating bundles are enclosed within and the complete unit is designed to offer maximum serviceability with minimum disruption to your process or the need to drain storage tanks.

Withdrawable heaters are very resistant to physical, mechanical or vibration damage and are suitable for solutions where drainage of the tank is impractical.

Materials such as bitumen, wax, fats and oils require low element surface temperatures to prevent product degradation, which makes withdrawable heaters ideal to protect your product and process quality.



Hazardous Area Ovens

Thermal's popular industrial ovens, used in a wide range of industries for decades, are also available certified for hazardous areas.

VTEE's hazardous area ovens are available in temperatures up to 450° and can be custom designed to suit your specific needs, tailoring the size, temperature and fittings to maximise heat efficiency for your particular process.

We also offer a range of standard sizes to suit 4, 8 and 16 drums (standard 205L/44 gallon size).

All of our ovens can be made weatherproof and lockable, giving you more than just a highly efficient heating unit.

Dulux Paint Facilities

- Suitable for Waxes, Oils, Chemicals, Greases, Plastics, Paints and much more
- Standard designs or fully customised
- Capacities from 1 to 64 x 205L drums
- Stainless Steel heating elements
- IECEx certified heaters, control panel and fans
- Portable free standing design
- Single or multiple chamber options
- Suitable for indoor and outdoor use
- Fully insulated
- Temperatures up to 450°C
- Quick temperature recovery
- Evenly distributed heat
- Chequer plate flooring
- Fan speed control
- Heavy duty locking hardware
- Also available for safe areas

Section 5

Flange, Circulation & Process Heaters

Flange, Circulation & Process Heaters

Flange, circulation and process heaters are suitable for larger volumes of liquid and where greater temperatures are required. Tubular elements are welded or brazed into a standard pipe flange.

Thermal manufacture a large range of flange, circulation and process heating units, suitable for an infinite range of applications, including:

- Caustic Cyanide used in gold processing
- Hot water storage
- Asphalt
- Wax
- Caustic solutions
- Detergent
- Sterilising equipment
- Heating oils - ranging from fuel, heat transfer, lubricating and vegetable types
- Gases - all types
- Clean In Place (CIP) systems

A range of flange diameters (50mm NB to 600 NB) and materials are available with heater unit length from 300mm to 6000mm long.

Installation - Flanged

The heater assembly is bolted onto a mating flange which is welded to the tank wall or pipe.
VTEE can suggest a suitable option or can match a heater design to suit an existing tank inlet.

Features

Larger output.
Economical installation.

Options

- Can be manufactured in Stainless Steel, Incoloy or Titanium
- Various wattages and voltages
- Various element diameters
- All types and several flange sizes available

Hazardous Area Heaters

VTEE certified process, inline and immersion heaters are often used in various applications, including Butane/Propane vapourisers; Glycol (TEG & MEG) reboilers; Crude oil; Fuel oils; Sea water; Tank heating; Industrial Gases and more.
All VTEE units are custom designed to produce the most efficient solution for your needs.

The current range of ThermalEx heaters are certified to Ex 'd', Zone 1, Group I, IIb and IIb + H2 with temperature classifications from T3-T6 and rated to IP66.
This range is constantly expanding, so if you are looking for something outside this range, please contact us to discuss the options available.

All VTEE units are designed and manufactured in Australia at VTEE's Coffs Harbour plant in Northern NSW, cutting lead times and shipping costs as well as providing easy access to technical advice and after-sales service.

See Section 4 for more information on certified heaters.

OAU-C-202

Section 6

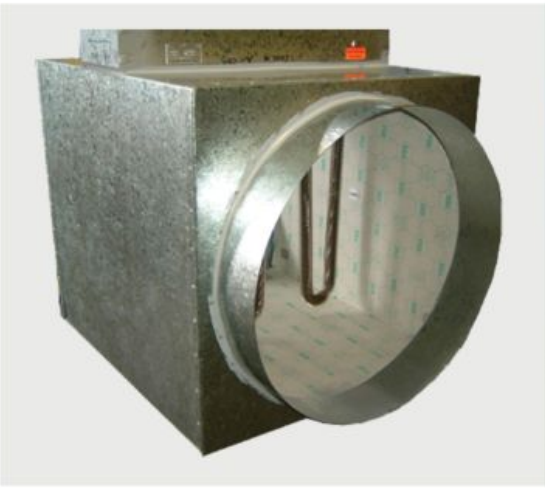
HVAC - Air Conditioning Industry

Electric Duct Heaters (Finned Heater Banks)

VTEE can offer you a complete solution to your duct heating needs.
Complete air heater banks are designed and built to meet the requirements of individual air conditioning installations. Once we have been provided with full details of the job, the most economic arrangement of elements will be selected to comply with the requirements.
Terminal boxes are custom made to suit your duct size.
Thermal can also supply duct heater units completely wired with a duct section and insulation making them ready to install directly into the duct work.
Normally each part of the duct heater would have to be organised through different suppliers. A company for the elements, a company for the duct section and someone to wire it. By ordering the completely pre-assembled unit from Thermal you'll save time and money knowing the unit is connected and working, all you have to do is insert it into your existing duct work!
Thermal will tailor-make each unit to suit your specifications and all work meets Australian Industry Test Standards - AS/NZS 3102:2002.

Options for complete units include:

- Internal insulation
- Terminal box and safety's
- Spiggots, TDF flanges or slides
- Stage switching and contactors
- Complete wiring of the control circuit
- Room sensor and controls



6.2

Information for ordering Electric Duct Heaters

Complete air heater banks incorporating the choice of elements are designed and built to meet the requirements of individual air conditioning installations.
Once we have been provided with full details for the job, the most economic arrangement of elements, banks, etc, will be selected to comply with requirements.
Terminal boxes are custom made to suit your duct size.
Heaters are wired in number of steps required to a terminal block inside, therefore enabling your electrician to connect up power supply easily.

Job data required for finned or unfinned heater banks

1. Nominate the element to be fitted or standard specified, ie. AS1668 Part 1 or AS3102
2. Size of duct and entry side for bank.
3. Total kilowatts required.
4. Number of control steps needed and whether wiring is single or 3 phase.
5. Details of controls required to be fitted to banks.

6.3

Heater Banks for Package Units

Package unit heaters are comprised of elements mounted in a steel frame with removable terminal cover for easy connection of power supply by electrician.
Job data required is similar to that needed for electric duct heaters plus size or brand model of air conditioning unit requiring heater.


Air Heater Bank for Package Unit

6.4

Terminal Boxes

Standard Boxes

- 22g galvanised or zincanneal material
- Removable cover
- 75mm deep

Under normal circumstances we select appropriate boxes, elements, etc, to give the most economic combination to give you the best airspace coverage inside the duct.

Weather resistant boxes are also available at slightly extra cost for use in external applications.

Finned Air Heater Elements - AMS Type

Sheath Watts Density

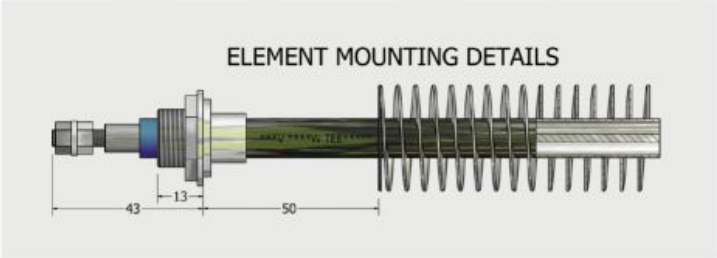
124kW/m^2 (80W/in^2) Fin and sheath total 11kW/m^2 (7W/in^2)

Operating Temperatures

Maximum permissible temperature of element when operating is 400°C.
Minimum air velocity of 3 metres/sec through face area of duct is recommended if operated in accordance with AS/NZS 1668 Part 1.

Construction

Continuous spiral Stainless Steel fin fitted to 8mm diameter
Stainless Steel sheathed tubular element.
Diameter of fin 27mm.
Finning pitch 6.4mm.

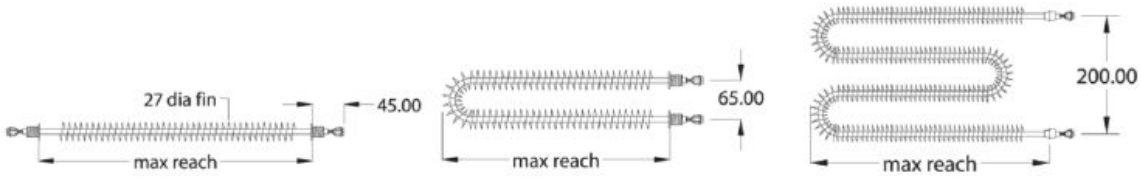


Finish

Stainless Steel

Mounting

Bushes M16 thread at 13mm long.
Clearance hole of 18mm required.
Nuts and washers included.



STRAIGHT LENGTH			'U' FORM			'W' FORM			WEIGHTS
Part #	Watts	Max Reach	Part #	Watts	Max Reach	Part #	Watts	Max Reach	kg
AMS075S	750	334	AMS075U	750	164	AMS125W	1250	133	0.25
AMS100S	1000	415	AMS100U	1000	204	AMS150W	1500	155	0.3
AMS125S	1250	486	AMS125U	1250	240	AMS175W	1750	175	0.36
AMS150S	1500	574	AMS150U	1500	284	AMS200W	2000	188	0.4
AMS175S	1750	655	AMS175U	1750	324	AMS250W	2500	233	0.47
AMS200S	2000	722	AMS200U	2000	358	AMS300W	3000	275	0.5
AMS250S	2500	886	AMS250U	2500	440	AMS350W	3500	315	0.6
AMS300S	3000	1055	AMS300U	3000	524	AMS400W	4000	355	0.75
AMS350S	3500	1213	AMS350U	3500	603	AMS450W	4500	388	0.9
AMS400S	4000	1373	AMS400U	4000	683	AMS500W	5000	433	1.0
AMS450S	4500	1522	AMS450U	4500	758				1.1
AMS500S	5000	1686	AMS500U	5000	840				1.2

All dimensions are given in millimetres and elements are rated at 240V.
Special sizes, voltages and wattages manufactured to suit your requirements.

Finned Air Heater Elements - APS Type

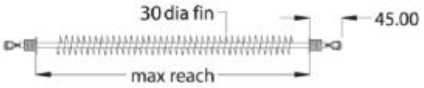
Sheath Watts Density
43.5kW/m² (28W/in²) Fin and sheath total 2.8kW/m² (1.8W/in²)

Operating Temperatures
Element surface temperature will not exceed 400°C in still air at 20°C if operated in accordance with AS/NZS 1668 Part 1.

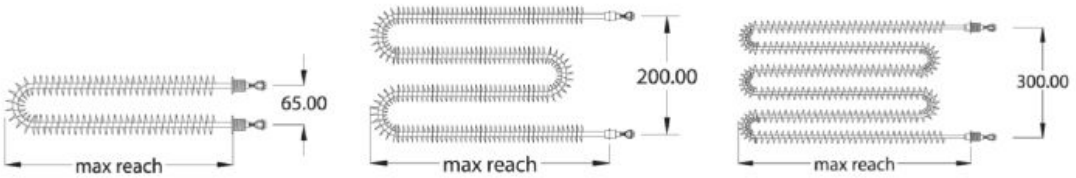
Construction
Continuous spiral Stainless Steel fin fitted to 10.7mm diameter Stainless Steel sheathed tubular element.
Diameter of fin 30mm.
Finning pitch 5.1mm.

Finish
Stainless Steel

Mounting
Bushes M16 thread at 13mm long.
Clearance hole of 18mm required.
Nuts and washers included.



STRAIGHT LENGTH		
Part #	Watts	Max Reach
APS075S	750	597
APS100S	1000	764
APS125S	1250	931
APS150S	1500	1098
APS175S	1750	1265
APS200S	2000	1433
APS250S	2500	1767
APS300S	3000	2102
APS350S	3500	2436
APS400S	4000	2770
APS450S	4500	3105
APS500S	5000	3437



'U' FORM			'W' FORM			TRIPLE 'U' FORM			WEIGHTS
Part #	Watts	Max Reach	Part #	Watts	Max Reach	Part #	Watts	Max Reach	kg
APS075U	750	298	APS075W	750	164	APS175T	1750	237	0.7
APS100U	1000	381	APS100W	1000	205	APS200T	2000	266	0.86
APS125U	1250	465	APS125W	1250	243	APS250T	2500	324	1
APS150U	1500	548	APS150W	1500	286	APS300T	3000	383	1.2
APS175U	1750	632	APS175W	1750	331	APS350T	3500	441	1.4
APS200U	2000	716	APS200W	2000	373	APS400T	4000	499	1.6
APS250U	2500	883	APS250W	2500	456	APS450T	4500	558	1.8
APS300U	3000	1050	APS300W	3000	537	APS500T	5000	616	2.25
APS350U	3500	1217	APS350W	3500	623				2.6
APS400U	4000	1384	APS400W	4000	707				3
APS450U	4500	1552	APS450W	4500	788				3.3
APS500U	5000	1718	APS500W	5000	874				3.6

All dimensions are given in millimetres and elements are rated at 240V.
Special sizes, voltages and wattages manufactured to suit your requirements.

Finned Air Heater Elements - ASS Type

Sheath Watts Density

60kW/m² (39W/in²) Fin and sheath total 4.3kW/m² (2.8W/in²)

Operating Temperatures

Maximum permissible temperature of element when operating is 400°C.
Minimum air velocity of 1.0 metre/sec through face area of duct is recommended if operated in accordance with AS/NZS 1668 Part 1.

Construction

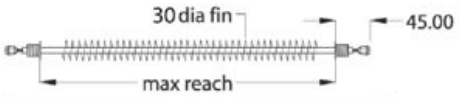
Continuous spiral Stainless Steel fin fitted to 10.7mm diameter Stainless Steel sheathed tubular element. Diameter of fin 30mm. Finning pitch 5.1mm.

Finish

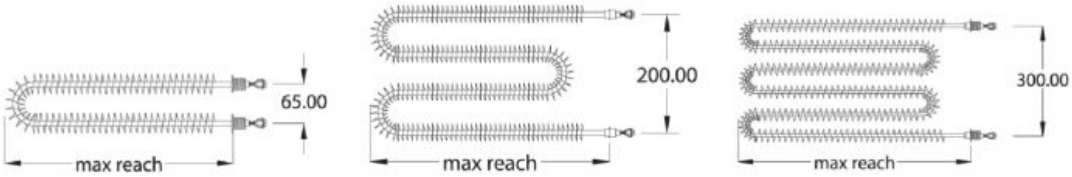
Stainless Steel

Mounting

Bushes M16 thread at 13mm long.
Clearance hole of 18mm required.
Nuts and washers included.



STRAIGHT LENGTH		
Part #	Watts	Max Reach
ASS075S	750	455
ASS100S	1000	564
ASS125S	1250	695
ASS150S	1500	815
ASS175S	1750	920
ASS200S	2000	1055
ASS250S	2500	1277
ASS300S	3000	1495
ASS350S	3500	1718
ASS400S	4000	1948
ASS450S	4500	2220
ASS500S	5000	2473
ASS600S	6000	2908



'U' FORM			'W' FORM			TRIPLE 'U' FORM			WEIGHTS
Part #	Watts	Max Reach	Part #	Watts	Max Reach	Part #	Watts	Max Reach	kg
ASS075U	750	226	ASS100W	1000	154	ASS250T	2500	239	0.55
ASS100U	1000	281	ASS125W	1250	184	ASS300T	3000	276	0.6
ASS125U	1250	346	ASS150W	1500	218	ASS350T	3500	315	0.75
ASS150U	1500	406	ASS175W	1750	240	ASS400T	4000	357	0.8
ASS175U	1750	459	ASS200W	2000	278	ASS450T	4500	403	0.95
ASS200U	2000	526	ASS250W	2500	334	ASS500T	5000	447	1
ASS250U	2500	638	ASS300W	3000	384	ASS600T	6000	593	1.4
ASS300U	3000	747	ASS350W	3500	439				1.6
ASS350U	3500	858	ASS400W	4000	500				1.8
ASS400U	4000	973	ASS450W	4500	569				2
ASS450U	4500	1109	ASS500W	5000	632				2.2
ASS500U	5000	1235	ASS600W	6000	738				2.5
ASS600U	6000	1453							2.9

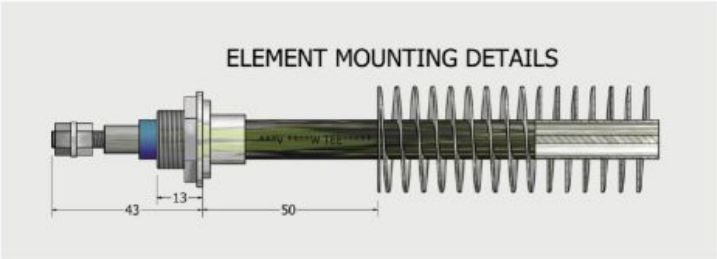
All dimensions are given in millimetres and elements are rated at 240V.
Special sizes, voltages and wattages manufactured to suit your requirements.

Finned Air Heater Elements - AVS Type

Sheath Watts Density
31kW/m^2 (20W/in^2) Fin and sheath total 4.8kW/m^2 (3.1 W/in^2)

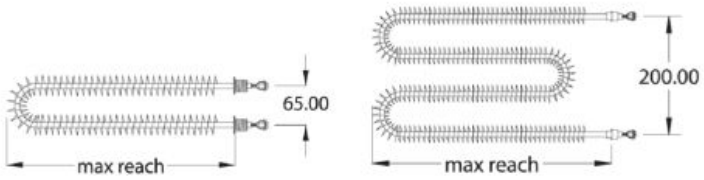
Operating Temperatures
Element surface temperature will not exceed 400°C in still air at 20°C
if operated in accordance with AS/NZS 1668 Part 1.

Construction
Continuous spiral Stainless Steel fin fitted to 8mm diameter
Stainless Steel sheathed tubular element.
Diameter of fin 27mm.
Finning pitch 6.4mm.



Finish
Stainless Steel

Mounting
Bushes M16 thread at 13mm long.
Clearance hole of 18mm required.
Nuts and washers included.



'U' FORM			*'W' FORM*			*WEIGHTS*
Part #	Watts	Max Reach	Part #	Watts	Max Reach	kg
AVS050U	500	380	**AVS050W**	500	205	0.5
AVS075U	750	535	**AVS075W**	750	280	0.66
AVS100U	1000	710	**AVS100W**	1000	370	0.87
AVS150U	1500	1010	**AVS150W**	1500	520	1.22
AVS180U	1800	1200	**AVS180W**	1800	615	1.43
AVS200U	2000	1325	**AVS200W**	2000	680	1.58
AVS240U	2400	1580	**AVS240W**	2400	805	1.77

All dimensions are given in millimetres and elements are rated at 240V.
Special sizes, voltages and wattages manufactured to suit your requirements.

Finned Air Heater Elements - ATS Type

Sheath Watts Density

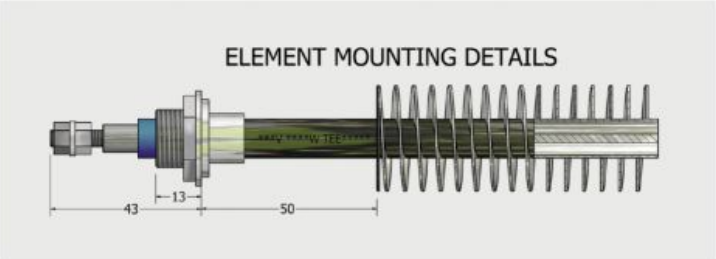
101kW/m^2 (65W/in^2) Fin and sheath total 18.2kW/m^2 (11.8W/in^2)

Operating Temperatures

Maximum permissible temperature of elem ent when operating is 400°C.
Minimum air velocity of 3 metres/sec through face area of duct is recommended if operated in accordance with AS/NZS 1668 Part 1.

Construction

Continuous spiral Stainless Steel fin fitted to 8mm diameter Stainless Steel sheathed tubular element.
Diameter of fin 27mm.
Finning pitch 5.1mm.

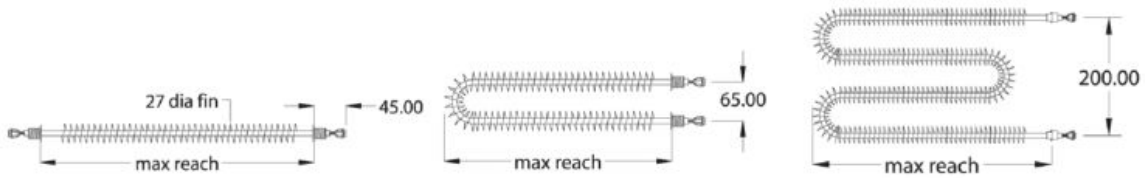


Finish

Stainless Steel

Mounting

Bushes M16 thread at 13mm long.
Clearance hole of 18mm required.
Nuts and washers included.



STRAIGHT LENGTH			*'U' FORM*			*'W' FORM*			*WEIGHTS*
Part #	Watts	Max Reach	Part #	Watts	Max Reach	Part #	Watts	Max Reach	kg
ATS090S	900	457	**ATS090U**	900	220	**ATS180W**	1800	205	0.31
ATS120S	1200	560	**ATS120U**	1200	275	**ATS200W**	2000	220	0.35
ATS150S	1500	673	**ATS150U**	1500	330	**ATS240W**	2400	260	0.43
ATS180S	1800	775	**ATS180U**	1800	380	**ATS300W**	3000	315	0.48
ATS200S	2000	851	**ATS200U**	2000	420	**ATS360W**	3600	370	0.51
ATS240S	2400	1003	**ATS240U**	2400	495	**ATS480W**	4800	475	0.6
ATS300S	3000	1219	**ATS300U**	3000	605				0.72
ATS360S	3600	1435	**ATS360U**	3600	710				0.83
ATS480S	4800	1867	**ATS480U**	4800	925				1.11

All dimensions are given in millimetres and elements are rated at 240V.
Special sizes, voltages and wattages manufactured to suit your requirements.

6.10

Finned Air Heaters - For Corrosive Atmospheres

Construction

Thermal Incoloy sheathed tubular elements are fitted with continuous brass (ACFB) or stainless steel fins (ACFS), ensuring excellent heat transfer to air in duct heating.
Finned air heaters are manufactured to order and come in a variety of shapes and sizes. ACF type elements are used where a non-corrosive heater is required, for instance, marine applications.

Installation

For best results, finned type heaters should be evenly spaced at 50mm centres with alternate rows staggered to expose heaters to the in-flowing air. For duct mounting,
3/8" BSP bushes are provided complete with washers and locknuts.

6.11

Unfinned Air Heater Elements - ACU Type

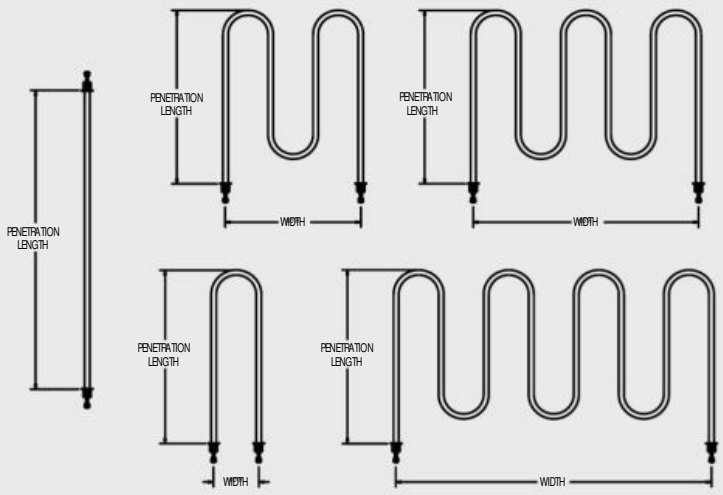
Construction

Thermal Incoloy sheathed tubular elements are designed to heat air flows in circular and rectangular ducts or circulated air in industrial ovens. They can be used as radiant heaters and resistive load banks.

Installation

3/8" BSP bushes are designed to provide fitting and rigid support of the elements.
For bush mounting 18mm holes are required. Unfinned air heaters are made to the customers specifications in straight, U form, W form or Triple U form.

Standard unfinned heaters come with 3/8" BSP brass bushes and stirrup terminals
if they do not suit your application we can modify our product to suit your requirements



Controls & Accessories

In accordance with AS/NZS 1668 Part 1, temperature controllers and air pressure switches are required to eliminate overheating and possible premature failure of duct heaters.

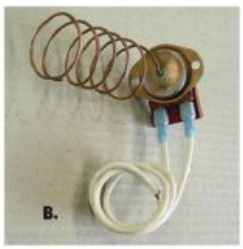
Over Temperature Safety Devices

An over temperature controller is a thermally operated switch, designed to provide protection when its capillary tube is heated above a preset cut out temperature.
This could be caused by an accidental cutting of the air flow.
Over temperature controllers come in both manual and automatic reset.
The units are fail safe - if the capillary is ruptured, the contacts open automatically.

A. Adjustable manual reset

over-temp
Rating - 20A
Cut out temp range - 60°C
to 150°C

Adjustable Manual Reset 60 deg-150deg C



Manual Reset Overload

B. Manual reset over-temp

Rating - 16A
Cut out temp range - 120°C

C. Air Pressure Switch

Current Rating - 15A - resistive at 125VAC
Operating Pressure - .05" + .02" - .02" to 12.0" WC
Temp range - -40°C to +82°C

Air Pressure Switch

D. PENN Type Over Temp

Single Pole Double Throw (for alarm circuit)
Opens on rise, Manual reset
Temp range - -4°C to +101°C

PENN Type Over Temp

Other controls are available on request

EDH Handing Side

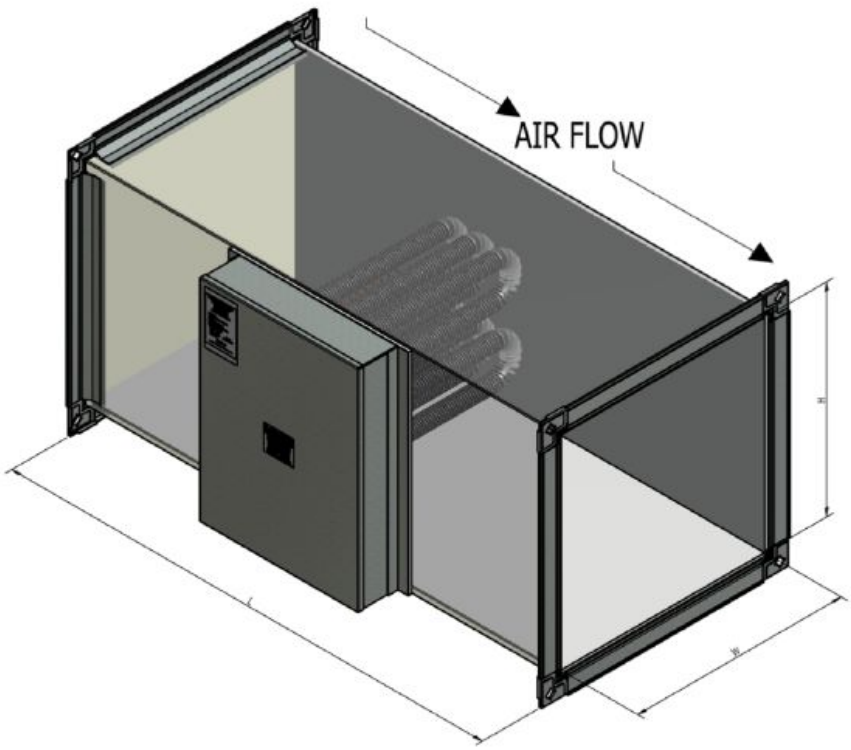
To improve the efficiency of VTEE Duct Heaters, Thermal designs all units with a specified handing side based on the customers requirements and site limitations.

By selecting a handing side relevant to the particular duct installation, on-site servicing is made much easier by facing the unit in a more easily accessible direction.

Determining the best handing side for an electric duct heater also optimises the performance of the unit by allowing for much more thorough over temperature monitoring based on the position of the unit within the duct.

The handing side is based on the ductwork that the unit is being installed into when looking down the duct with the airflow coming towards you. The handing is then specified as either Left hand side or Right hand side.

As an example, the picture below displays Left hand side handing



When ordering, please specify the handing side required for each unit you require.

If you are unsure of the handing side needed, our design and sales team can assist in determining the best solution for your situation.

Evapodry Condensate Removal Tray

Suffering from unwanted condensate from your air conditioning unit?

Evapodry can solve this problem by evaporating the condensate from the collection tray under the split system's compressor.

A new and improved control unit ensures a more reliable evaporation process. The probe senses condensate that has accumulated in the tray and energises the heating element.
When the probe senses that the liquid has evaporated, the heating element is de-energised.

The electric heating element together with its condensate sensing probe, fits inside the collection tray as an integrated unit. All electrical terminations are inside an IP55 rated enclosure.

The condensate collection tray is stainless steel measuring 400 x 400 x 55mm deep, with the integrated heating element and control box fitted to the front.

Specifications

- Heating Element 240V 1000W or 2400W
- Enclosure is IP55 rated with weatherproof flexible conduit entry, and termination is by the 1 metre flexible 3 core lead with a 3 pin 10 amp plug.
- Evaporation rate is one litre per hour (for 1kW unit) or 2.5 litres per hour (for 2.4kW unit) and this may vary dependent upon atmospheric conditions
- Condensate tray is stainless steel 400 x 400 x 55mm deep. Other sizes to order
- Element safety cover fabricated from perforated stainless steel

The Evapodry tray conforms to health and safety standards in accordance with Plumbing Industry Commission - Section 7 part E.

Probe senses condensate level and energises or de-energises the heating element.

Section 7

Immersion Heaters

Electric Immersion Heaters

Electric Immersion heaters are extremely useful in many applications. High heating efficiency and accurate control are maintained due to the heat being generated within the solution.
Immersion heaters are easily installed and are often used to heat liquids, viscous materials and solids with low melting points. Some common substances include solvents, oil, water, plating baths, salts, wax, paraffin, asphalt and molasses.

Design of the shape, sheath and mounting are specifically tailored to the application.
The heat absorption rate of substances will often determine the heat intensity (watt density) of the element. Usually low or mild heat is used for oils and soft metals and more intense heat is required for water and salts.

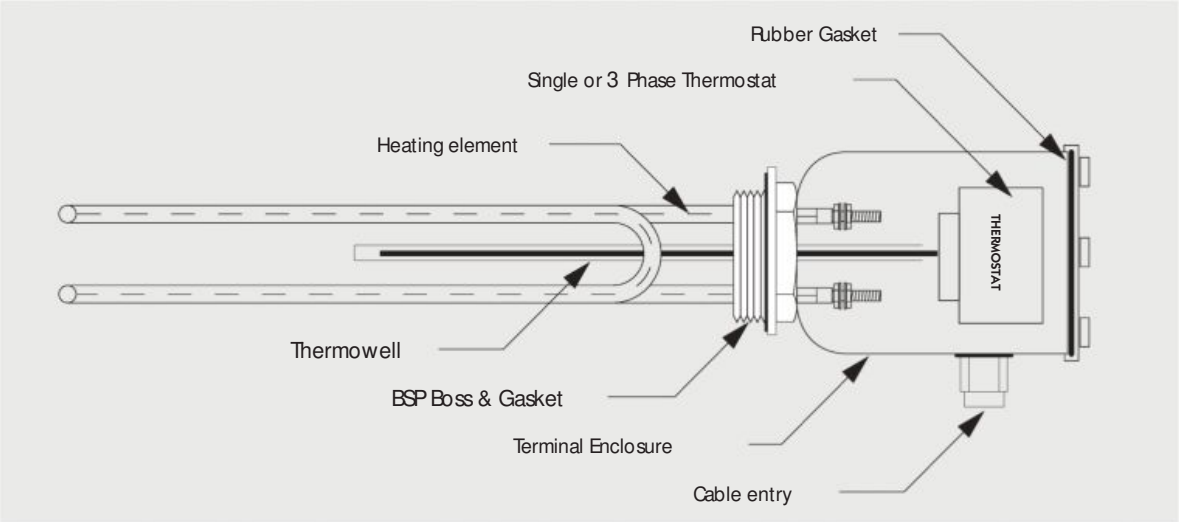
For accurate temperature control a thermowell is fitted which then allows for single or 3 phase thermostat inclusion.

Most of our product range is manufactured in stainless steel or Incoloy element sheaths.
Thermal can, however, design specific heaters with different sheaths (such as Titanium), shapes, sizes, wattages and voltages as required for your application. The heater mounting can also be designed to suit the application and vessel accessibility.

Types of Immersion Heaters:

The most common method of applying heat to tank or vessel contents without limiting work area are:

Screw In - For small to medium size containers
Over The Side - A heavy duty element for portable situations
Withdrawable - Tubular or Ceramic Bobbin



Screw In Type Heaters

Screw in heaters are suitable for small and medium sized containers. The tubular elements are brazed or welded into a BSP bush and a terminal housing is provided for electrical connections.

Installation

Screw In heaters are screwed into a female BSP fitting in the tank or into a pipe coupling or half coupling.

Applications

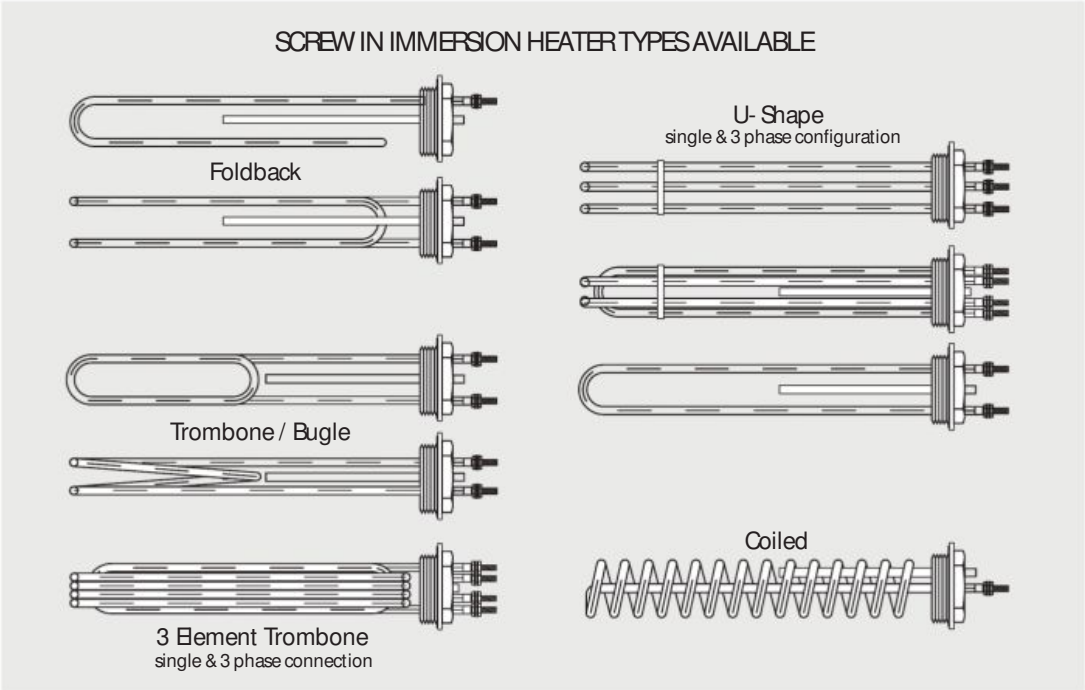
Hot water storage, fluid heating - eg. tar, asphalt, wax, oil, caustic soda, detergent, sterilising equipment, gases.

Features

A compact heater for areas where over the side heaters cannot be used - eg. closed in tanks.

Options

- Can be manufactured in Stainless Steel, Incoloy, Titanium
- Various wattages and voltages
- Various element diameters
- Several BSP bush sizes available - ranging from 3/8" BSP to 4" BSP
- Assorted shapes - Trombone, U-shaped, triple loop, fold back, coiled
- Several termination variations
- 3 phase - Star or Delta options



2" BSP Clean Water Immersion Heaters

Part #	Watts	No. Elements and Shape	Length
TWI5050	500	1 x U-shape	250
TWI50100	1000	1 x U-shape	250
TWI50150	1500	1 x U-shape	250
TWI50200	2000	1 x Foldback	250
TWI50240	2400	1 x Foldback	250
TWI50360	3600	1 x Foldback	300
TWI50400	4000	3 x U-shape	250
TWI50500	5000	3 x U-shape	250
TWI50600	6000	3 x U-shape	300
TWI50720	7200	3 x U-shape	350
TWI50960	9600	3 x U-shape	425
TWI501080	10800	3 x U-shape	500
TWI501200	12000	3 x U-shape	550
TWI501500	15000	3 x U-shape	650
TWI502000	20000	3 x U-shape	850

1.25" BSP Clean Water Immersion Heaters

Part #	Watts	No. Elements and Shape	Length
TWI3250	500	1 x U-shape	250
TWI32100	1000	1 x U-shape	250
TWI32150	1500	1 x U-shape	250
TWI32200	2000	1 x Foldback	250
TWI32240	2400	1 x Foldback	250
TWI32360	3600	1 x Foldback	300
TWI32400	4000	3 x U-shape	250
TWI32500	5000	3 x U-shape	250
TWI32600	6000	3 x U-shape	300
TWI32720	7200	3 x U-shape	350
TWI32960	9600	3 x U-shape	425
TWI321080	10800	3 x U-shape	500
TWI321200	12000	3 x U-shape	550
TWI321500	15000	3 x U-shape	650
TWI322000	20000	3 x U-shape	850

All dimensions given are in millimetres and elements are rated at 240V each.
Units with 3 elements can be used for 240/415V 3 phase star connection.
Non standard units can be manufactured to your specific application on request.

2" BSP Light Oils & Alkaline Immersion Heaters

Part #	Watts	No. Elements and Shape	Length
TOI5050	500	1 x U-shape	375
TOI50100	1000	2 x U-shape	375
TOI50150	1500	3 x U-shape	375
TOI50200	2000	3 x U-shape	450
TOI50240	2400	3 x U-shape	500
TOI50360	3600	3 x U-shape	700
TOI50400	4000	3 x U-shape	900
TOI50500	5000	3 x Trombone	750
TOI50600	6000	3 x Trombone	900
TOI50720	7200	3 x Trombone	1050
TOI50960	9600	3 x Trombone	1300
TOI501080	10800	3 x Trombone	1425

1.25" BSP Light Oils & Alkaline Immersion Heaters

Part #	Watts	No. Elements and Shape	Length
TOI3250	500	1 x U-shape	375
TOI32100	1000	2 x U-shape	375
TOI32150	1500	3 x U-shape	375
TOI32200	2000	3 x U-shape	450
TOI32240	2400	3 x U-shape	500
TOI32360	3600	3 x U-shape	700
TOI32400	4000	3 x U-shape	900
TOI32500	5000	3 x U-shape	1090
TOI32600	6000	3 x U-shape	1350

All dimensions given are in millimetres and elements are rated at 240V each.
Units with 3 elements can be used for 240/415V 3 phase star connection.
Non standard units can be manufactured to your specific application on request.

Over The Side Heaters

Over the side immersion heaters are compact and portable enough to move from tank to tank and guarantee minimal interference with the production process. They can easily be re-positioned along the tank wall to improve heat distribution and are ideal where removal of the heater is required for periodic cleaning and inspection of the tank.

Over the side heaters are available for heating water, light weight oils, salt baths, alkaline cleaning solutions, cyanide plating solutions, citric juices, acid baths and other corrosive liquids.

Standard units up to 4000W come complete with terminal enclosure and thermostat control.
If our stock range of heaters are not suited to your application, then custom manufactured units can be produced to suit your requirements.

Installation
Simply place over side wall of tank.

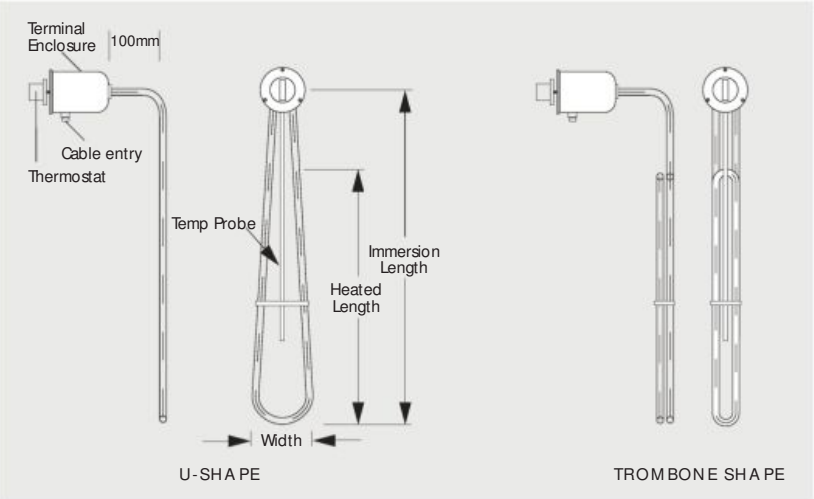
Features
- Portable
- Economical
- Ease of maintenance

Applications
Heating all solutions where drainage of the tank is impractical.

Options
- Can be manufactured in stainless steel, Incoloy and Titanium
- Various wattages and voltages
- Various element diameters
- Terminal enclosure fully moisture resistant
- Rubber seals
- 3 phase - Star or Delta wiring options
- Digital temperature controls
- Programmable timers
- Various watt densities

Information required when requesting a quote or order:

1. Physical size of tank (Length and Depth)
2. Solution to be heated
3. Available power supply
4. Minimum liquid level
5. Time to heat to temperature



Part #	Watts	Sheath	Shape	Width	Immersion Length Total	Heated
OTS100	1000	INC 800	U-Shape	100	500	300
OTS200	2000				650	450
OTS300	3000				850	650
OTS400	4000				1050	850
OTS500	5000				1300	1100
OTS600	6000				1500	1300
OTSI100	1000	INC 825	U-Shape	100	500	300
OTSI200	2000				650	450
OTSI300	3000				850	650
OTSI400	4000				1050	850
OTSI500	5000				1300	1100
OTSI600	6000				1500	1300
OTSS100	1000	7.9 Ø 321SS Low Watt Density Oil Immersion	Trombone	100	575	375
OTSS200	2000				825	625
OTSS300	3000				1200	1000
OTSS400	4000				1500	1300
OTSS500	5000				1825	1625
OTSS600	6000				2000	1800

All dimensions are in millimetres

Part #	Watts	Sheath	Shape	Width	Immersion Length Total	Immersion Length Heated
OTST100	1000	Titanium	U-Shape	150	500	300
OTST200	2000				650	450
OTST300	3000				850	650
OTST400	4000				1050	850
OTST500	5000				1300	1100
OTST600	6000				1500	1300
OTSL100	1000	Lead	U-Shape	150	560	360
OTSL200	2000				700	500
OTSL300	3000				880	680
OTSL400	4000				1050	850
OTSL500	5000				1310	1110
OTSL600	6000				1500	1300
OTSI100H	1000	INC 800 High Watt Density Water Immersion	U-Shape	50	300	150
OTSI200H	2000				500	350
OTSI300H	3000				575	425
OTSI400H	4000				750	600
OTSI500H	5000				975	725
OTSI600H	6000				1050	900

* All dimensions are in millimetres

Special Over The Side Heaters

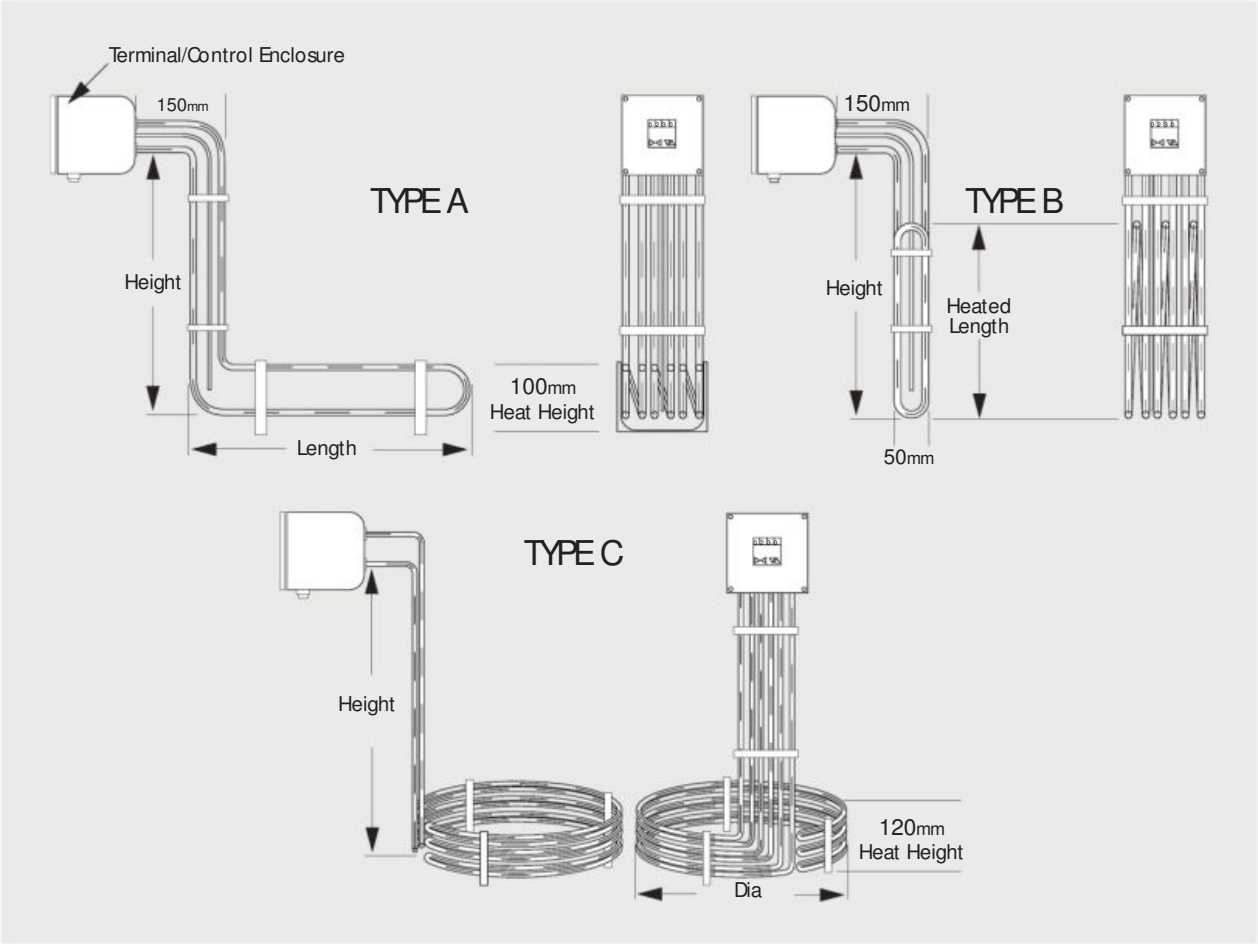
Suitable for square, rectangular or circular tanks.
Single or 3 phase units with element multiples of 3 and stage wired.

Information required when requesting a quote or order:

1. Physical size of tank (Length and Depth)
2. Temperature to reach
3. Solution to be heated
4. Available power supply
5. Minimum liquid level
6. Time to heat to temperature

Options

- Programmable timers
- Controllers
- Stage heating
- Fully water resistant control enclosure



Withdrawable Type - Tubular

Stainless Steel sheathed alternative to the standard ceramic bobbin type. The withdrawable tubular has been designed and manufactured to outlast its ceramic counterpart, which is fragile and will deteriorate much sooner through physical damage. Tubular withdrawables are suitable for applications where replacement or repairs are to be carried out without disturbing the contents of the tank.

Installation

This is achieved by inserting the withdrawable tubular element into a nominal diameter pipe - commonly known as the thermowell - ranging from 50mm diameter for standard units, up to 100mm diameter for specials. The thermowell may be a permanent fixture of the tank or it can be supplied as a separate removable tube with 2" BSP boss which can then be fitted to a mating tank socket.

Features

Robust, suitable for harsh conditions and extremely resistant to mechanical or physical abuse, or where vibration may occur.

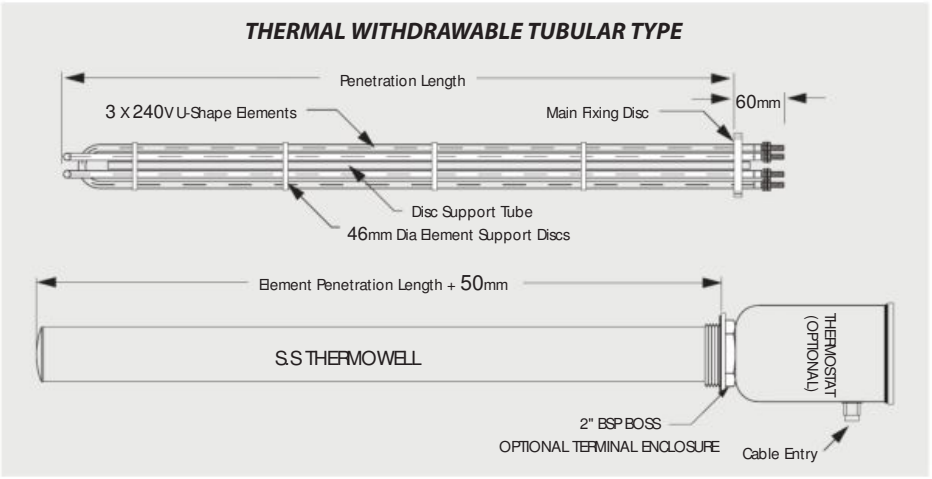
Applications

Suitable for all solutions where drainage of the tank is impractical and where direct heating is not achievable or recommended. Materials such as bitumen, wax, fats and oils require low element surface temperatures to prevent product degradation.

Options

- Can be manufactured in Stainless Steel, Incoloy or Titanium
- Various wattages and voltages
- Various element diameters
- Can be manufactured to Zone 1 Class 1 standards
- Several terminal variations

THERMAL WITHDRAWABLE TUBULAR TYPE



Part #	Watts	Volts	Length	Watt Density kW/m²	Watt Density W/in²
TWT-65A	750	240	650	8	5
TWT-65B	1500	240	650	16	10
TWT-65C	3000	240/415	650	31	20
TWT-80A	900	240	800	8	5
TWT-80B	1800	240	800	16	10
TWT-80C	3600	240/415	800	31	20
TWT-85A	1000	240	850	8	5
TWT-85B	2000	240	850	16	10
TWT-85C	4000	240/415	850	31	20
TWT-105A	1200	240	1050	8	5
TWT-105B	2400	240	1050	16	10
TWT-105C	4800	240/415	1050	31	20
TWT-125A	1200	240	1250	8	5
TWT-125B	3000	240	1250	16	10
TWT-125C	6000	240/415	1250	31	20
TWT-150A	1800	240	1500	8	5
TWT-150B	3600	240/415	1500	16	10
TWT-150C	6000	240/415	1500	31	20
TWT-165A	2000	240	1650	8	5
TWT-165B	4000	240/415	1650	16	10
TWT-165C	8000	240/415	1650	31	20
TWT-205A	2500	240	2050	8	5
TWT-205B	5000	240/415	2050	16	10
TWT-205C	10000	240/415	2050	31	20
TWT-250A	3000	240/415	2500	8	5
TWT-250B	6000	240/415	2500	16	10
TWT-250C	12000	240/415	2500	31	20
TWT-305A	3750	240/415	3050	8	5
TWT-305B	7500	240/415	3050	16	10
TWT-305C	15000	240/415	3050	31	20
TWT-330A	4000	240/415	3300	8	5
TWT-330B	8000	240/415	3300	16	10
TWT-330C	16000	240/415	3300	31	20
TWT-410A	5000	240/415	4100	8	5
TWT-410B	10000	240/415	4100	16	10
TWT-410C	20000	240/415	4100	31	20

Recommended Thermowell Power Densities:

8kW/m² (5W/in²) for bitumen, tar, fuel oil.

16kW/m² (10W/in²) for heat transfer oil, hydraulic and turbine oils, vegetable oil storage, waxes and tallow storage.

32kW/m² (20W/in²) for soluble oils, emulsions, water, engine oil and general lubricants.

All dimensions are in millimetres.

Withdrawable Type - Ceramic Bobbin

An alternative to the Stainless Steel tubular type which is also suitable for applications where replacement or repairs are to be carried out without disturbing the contents of the tank.

Installation

Achieved by inserting the ceramic bobbin into a 50mm nominal diameter tube commonly known as the thermowell. The thermowell may be a permanent fixture of the tank or it can be supplied as a separate removable tube with 2" BSP boss which can then be fitted to the mating tank socket.

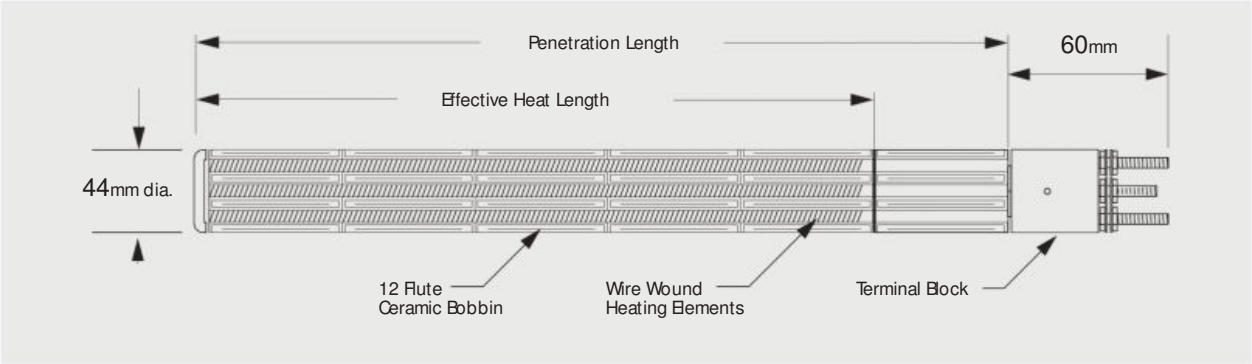
Applications

Suitable for all solutions where drainage of the tank is impractical and where direct heating is not achievable or recommended. Materials such as bitumen, wax, fats and oils require low element surface temperatures to prevent product degradation.

Please note Ceramic Bobbins are **MADE TO ORDER ONLY**

Information required when requesting a quote or order:

1. Voltage
2. Number of phases
3. Wattage
4. Penetration length
5. Cold length



Thermal Heat Coils

The Heat Coil series of heaters are designed for use in the chemical, electroplating and metal finishing industries. Boasting a robust design, heat coils are manufactured from 316SS, Incoloy and Titanium sheaths ensuring a long lasting, reliable and hassle-free package.

Teflon Heat Coils are used in solutions where previously only Vitrosol or Quartz heaters were available. Now a solid package is here! No fragile sheaths, no cracking or breakages. A reliable and rigid metal sheathed element within a non-contaminating, chemical resistant Teflon sleeve. A 0.75mm wall thickness of Teflon gives a safe barrier between the solution and the heating element.

Teflon Heat Coils are compatible with most plating tank solutions and are inert to acids, pickling and anodising solutions up to 90°C.

Optional extras

- Chemical resistive terminal/control enclosures
- Analog or digital temperature controls

Titanium sheathed element pictured

Teflon Series - HCT

Part #	Watts	Penetration	Heated Length	Diameter
HCT05	500	300	200	60
HCT10	1000	500	300	60
HCT20	2000	600	400	60
HCT30	3000	750	500	60

Titanium Series - HCTI

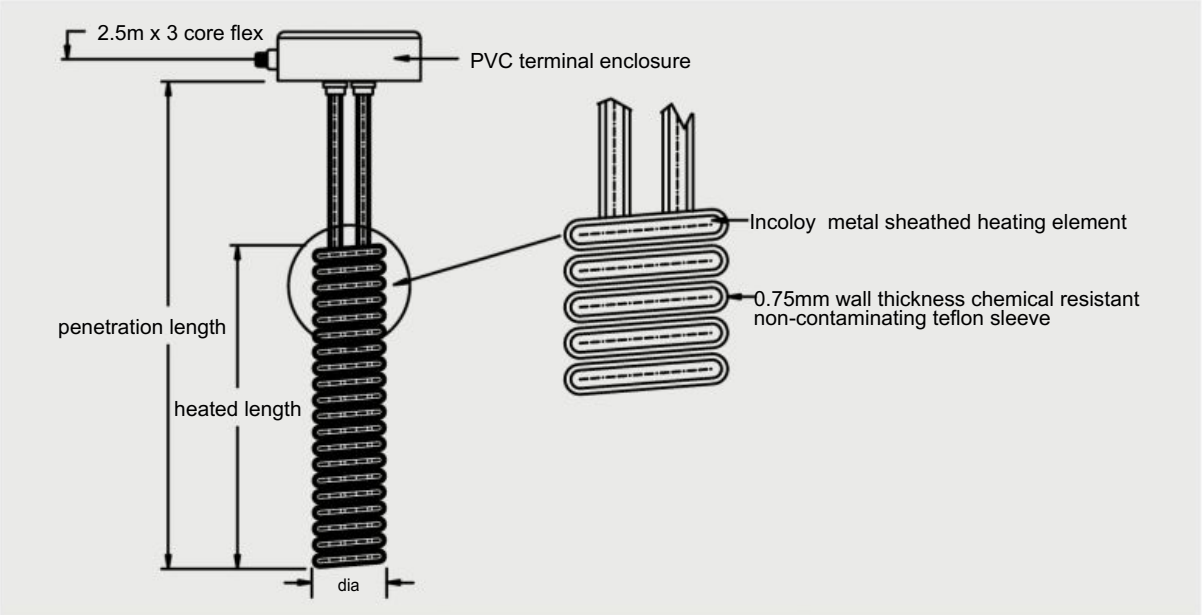
Part #	Watts	Penetration	Heated Length	Diameter
HCTI05	500	300	200	60
HCTI10	1000	500	300	60
HCTI20	2000	600	400	60
HCTI30	3000	750	500	60
HCTI40	4000	850	600	60
HCTI50	5000	950	700	90
HCTI60	6000	1050	800	90

Stainless Steel Series - HCS

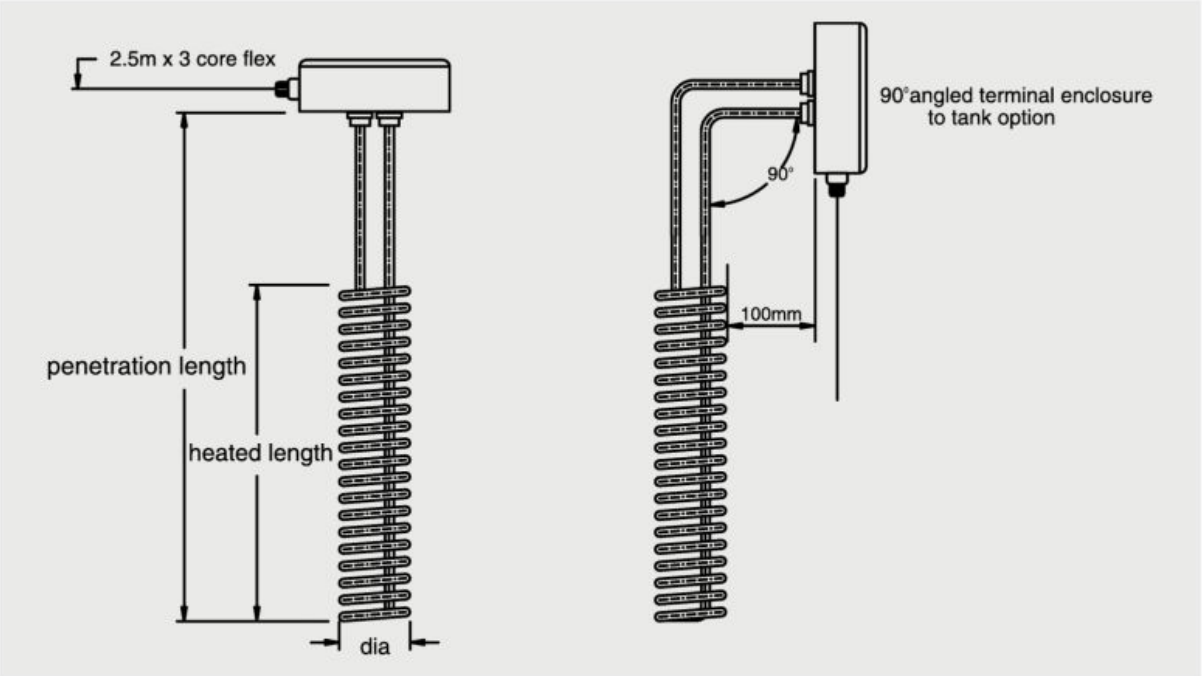
Part #	Watts	Penetration	Heated Length	Diameter
HCS05	500	300	200	60
HCS10	1000	500	300	60
HCS20	2000	600	400	60
HCS30	3000	750	500	60
HCS40	4000	850	600	60
HCS50	5000	950	700	90
HCS60	6000	1050	800	90

Other sizes available upon request

Teflon series heat coil



Titanium & Stainless Steel series heat coils



Immersion Heater Watt Density Guide

Sheath Power kW/m²	12.4	18.6	31	124
Density W/in²	8	12	20	80
Application				
Clean Water				✔
Gases	Consult Design Dept			
Mild Acid Solutions	✔	✔		
Mild Alkaline Solutions, Detergent			✔	
Caustic Soda			✔	
Soluble Oils, Emulsions			✔	
Engine Oil, General Lubricants		✔	✔	
Hydraulic and Turbine Oils		✔		
Waxes		✔		
Heat Transfer Oils		✔		
Vegetable Oil Storage		✔		
Tallow Storage		✔		
Bitumen	✔			
Fuel Oil	✔			

Hot Stick Heaters

The Hot Stick range of heaters is made for use in the electroplating, metal finishing and chemical industries.

It is an over the side type heater and is available in three different sheaths :
Quartz, Stainless Steel and Titanium.

The main criteria for selecting the appropriate Hot Stick is to know what solution it will be heating. Please contact us to determine the correct sheath material required for your application.

The wattage required to heat the load to the desired temperature in an acceptable amount of time must also be determined as well as the depth of the tank being used and the level of the liquid being heated.

The heated section must be covered by liquid at all times ***(refer to page 10.18)***.

The following table shows the Hot Sticks dimensions and accompanying elements.

HS Sheaths Only					***HS Series***	
Vitrosol (Quartz) Part #	Stainless Steel Part #	Titanium Part #	Total Length in mm	Heated Length in mm	Elements to Suit	Sheath Watt Density kW/m^2
HSVS0300	HSSS0300	HSTS0300	300	200	HSE10-300 - 1000W	40
HSVS0500	HSSS0500	HSTS0500	500	300	HSE15-500 - 1500W	40
HSVS0600	HSSS0600	HSTS0600	600	400	HSE20-600 - 2000W	40
HSVS0750	HSSS0750	HSTS0750	750	500	HSE15-750 - 1500W	23
					HSE30-750 - 3000W	48
HSVS1000	HSSS1000	HSTS1000	1000	750	HSE15-1000 - 1500W	16
					HSE30-1000 - 3000W	31
					HSE40-1000 - 4000W	42
					HSE50-1000 - 5000W	53

HOT STICK SHEATH

HOT STICK REPLACEABLE ELEMENT

A typical installation will require the following selections to be made:
For example, when ordering a 3kW Vitrosol Hot Stick for a 1000mm deep tank the following parts need to be ordered:

- Vitrosol sheath (1000mm) - HSVS1000
- Element (3kW) - HSE30-1000
- Lead assembly (2m long) - HRC2

Other components to consider:

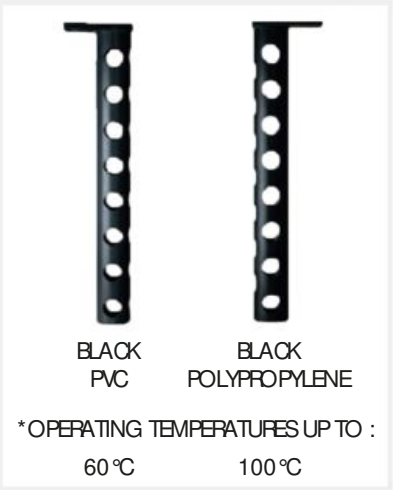
- Heater guard (PVC or Polypropylene - see below)
- Mounting bracket (over page)
- Liquid level and temperature control (if required, see page 10.18)

Lead Assembly

Lead assembly for Hot Stick heaters - Part no. HRC2 - 2.8mm^2. 3 core flexible (2 metres long), acid and oil resistant and heat stabilised cable (temperature range -30°C to 85°C).

Heater Guards

Vitrosol (Quartz) HSVS and coiled Teflon HSTEFE sheaths require a fully enclosed protective guard.
Use PVC for solutions below 70°C and Polypropylene for solutions up to 100°C.
(Except for chrome and nitric solutions)



STANDARD GUARDS

PVC	Polypropylène	Length
HSGPV0300	HSGPP0300	300
HSGPV0500	HSGPP0500	500
HSGPV0600	HSGPP0600	600
HSGPV0750	HSGPP0750	750
HSGPV1000	HSGPP1000	1000

Mounting Brackets

Mounting brackets are supplied complete with stainless steel mounting bolts. Stainless (HSSS) and Titanium (HSTS) sheaths require either a PVC or Polypropylene mounting bracket.
The mounting brackets are also suitable for mounting level and temperature sensors.
PVC - For Nitric and Chrome solutions.
Polypropylene - For most other solutions.

Part #	Size (mm)
PVC HSBPVC - STD	170 x 100 x 20
Polypropylene HSBPOLY - STD	180 x 100 x 10

Mini Hot Sticks

For other applications where smaller immersion heaters are required there is a Mini Hot Stick range available. These applications may include: PC board production, large fish tanks, laboratories, pilot plants and the jewellery industries.
Mini Hot Sticks are supplied complete with their in-built heating element and PVC mounting bracket.

Vitrosol Part #	Stainless Steel Part #	Titanium Part #	Watts	Total Length	Heated Length
MHSV0450	MHSS0450	MHST0450	450	250	160
MHSV0600	MHSS0600	MHST0600	600	300	200
MHSV0700	MHSS0700	MHST0700	700	350	250

Mini Heater Guards

When using Vitrosol and coiled Teflon sheathed heaters it is recommended that a guard be used to protect the sheath from mechanical damage.

PVC	Polypropylene	Length
MHSGPV0250	MHSGPP0250	250
MHSGPV0300	MHSGPP0300	300
MHSGPV0350	MHSGPP0350	350

Teflon over the side Immersion Heaters

It is recommended that a fully enclosed guard be used to protect Teflon heaters, where mechanical damage may occur.
If this is not an issue, heaters can be installed with supplied PVC mounting bracket and stainless steel bolts.
*Average sheath watts density for Coils & Banjos is 16kW/m^2

COILED TYPE

Part #	Watts	Total Length	Heated Length
HSTE15C 50/30	1500	500	300
HSTE20C 70/40	2000	700	400
HSTE30C 90/60	3000	900	600
HSTE30C 100/70	3000	1000	700
HSTE40C 75/45	4000	750	450
HSTE40C 100/70	4000	1000	700

BANJO TYPE

Part #	Watts	Total Length	Heated Length
HSTE15B 60/30	1500	600	300
HSTE20B 75/35	2000	750	350
HSTE30B 75/35	3000	750	350
HSTE40B 80/40	4000	800	400

Controls

The MC2 is a liquid expansion type thermostat housed in an acid resistant Poly-carbonate enclosure.
The MC2 is fitted with a 1 metre capillary tube and sensing bulb designed to switch 16 Amps 240V resistive load and comes complete with two indicator lamps, one to indicate supply and the other to indicate whether the load is on.

Special note: If the MC2's are being used to sense solution temperatures other than water, it is recommended you use an appropriate thermostat pocket, or sheath the sensing bulb and capillary with a sleeving compatible to the solution being heated.

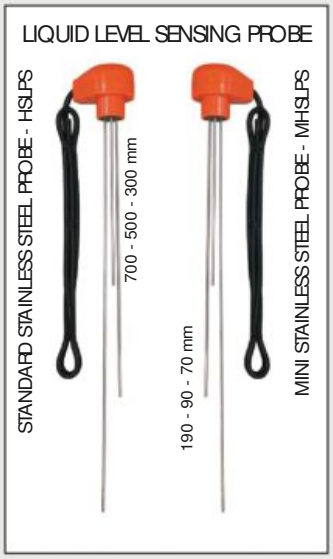
Part #	Temp Range
MC2 - 0 - 40	0 - 40°C
MC2 - 30 - 110	30 - 110°C
MC2 - 50 - 300	50 - 300°C

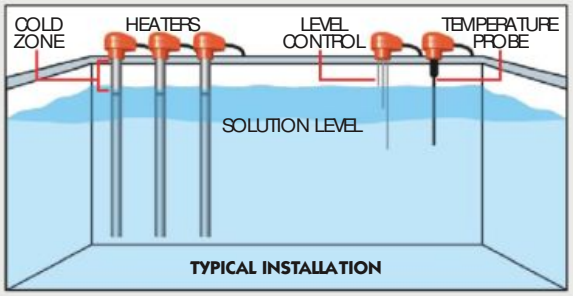
125 x 125 x 100mm DEEP

Liquid Level Controller

To maintain correct solution level
Part # HSLC1

Used in conjunction with:





Temperature Controller

Non-indicating 0-100°C
Part # HRTC100

Used in conjunction with:

Level Sensing Probes

Part #	Mini Part #
HSLPS	MHSLPS

PT100 Temperature Probes

SS Part #	Halar Coated	Length
HSTPS0200	HSTPH0200	200
HSTPS0300	HSTPH0300	300
HSTPS0400	HSTPH0400	400
HSTPS0500	HSTPH0500	500

Section 8

ThermaLoad - Intelligent Load Banks

8.1

What are Load Banks?

The necessity and dependence on power at mining sites; oil and gas refining; in hospitals; transport and many other essential services has meant a rapid growth of back up generators and UPS systems for back up power. The increase of computers and telecommunications equipment demands faultless performance in the event of power down conditions. This can only be fully achieved by resistive load testing the stand by systems on installation and at regular intervals.

The life and efficiency of diesel generators can be greatly reduced when running underloaded, causing damage to the engine, to a point where engines could stall or completely fail to start when they are needed most.

8.2

Benefits of Load Banks

Only resistive load banks can guarantee the ultimate operating conditions and efficiencies of stand by generators. Auxiliary equipment such as resistive load banks ensure regular and reliable load testing can be performed without interruption to mains power supply and leaving you confident that your emergency power system will function during any mains power interruption.

Regular load testing also ensures back-up generators are used, which maintains the life of its parts which can deteriorate or fail if never used. Build-up of dust, water and other elements in outdoor situations can affect the efficiency of your back-up power system.

Specifications & Features

Available in manually switched to fully automatic-controlled units. Ranging in sizes from 0.2kW to 2MW with safety interlocks such as high temperature overloads, low air flow switches, phase sequence control and fan motor overloads. A load cooling timer which allows the cooling fan to continue operation for an additional 5 minutes after load shut down is optional.

Features

- Low temp SS finned air resistors
- Powder coated rigid housing
- High air flow axial fan(s) with safeties
- Auto and manual load switching/shedding
- Load switching from 0.5kW increments
- LCD multifunction metering
- Data extraction and fault log capability
- Auxiliary power outlet for cooling fan operation
- Emergency stop
- Power on - Resistors on - Fan on - Fault indication
- Manual reset over temperature safety thermostat
- IP55 rated
- Lockable castors
- Power-loc connectors and 6m cables
- Real time graphic display
- Provision for forklift tynes
- Overhead lifting access

Spare parts such as individual heater elements, castor wheels, grills, connections and more are also available

Touch Screen Controller

Vulcanic Thermal Electric can supply resistive load banks with a touch screen controller for fully automatic operation.

Design Features

Control Management Setup

- Manual override = Yes/No
- Load dump = Yes/No

Monitor Button

This will present the user with real time data of the system in operation, either in auto or manual.
Values presented graphically can be scrolled

- Generator load kW
- Load Bank engaged kW
- Volts, Amps, Hz, Cos
- Load Bank temperature
- Fan status
- Cool down time elapsed
- Cool down time remaining

Auto/Manual Button

When Auto is selected the unit will automatically select the required resistor steps based on the setup criteria. In the event mains power is selected, the system will dump the load and initiate the system cool down function.
When MANUAL is selected, the unit will present the user with a window to enter a kW value as a number. The system will engage the required steps to reach the desired value. There is also an UP/DOWN button to allow the user to increase or decrease the kW value incrementally.

Load Dump Button

At any time while the system is operating in Auto or Manual mode, the user can press the Load Dump Button on the screen to cancel all load steps immediately.

Remote Connection

The ability to connect remotely through the Schneider app.

Data Logging

Optional data logging of testing reports into Excel format.

Portable Load Banks

Portable load banks offer a simple and compact solution for load testing.

While all ThermaLoad load banks feature castors, our portable range provide a more compact and portable unit for ease of manoeuverability.

ThermaLoad portable load banks make it easy to access out of the way testing locations or roof top generators only accessible by elevators.

Features

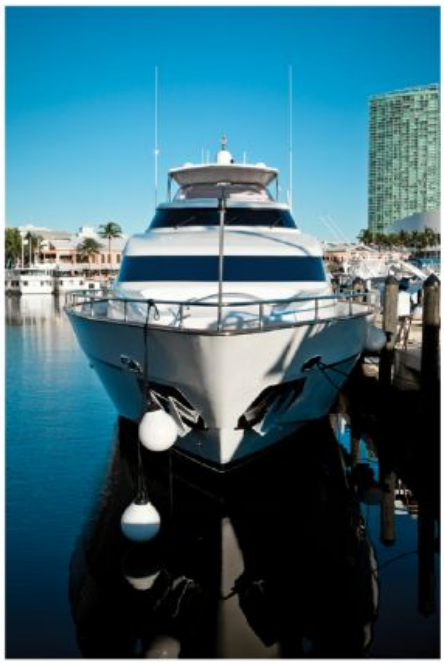
- Single and Three phase power
- Centrifugal fan
- Manual or Auto operation
- Available with main leads or surface socket
- Light weight but still rigid
- Compact size
- Lockable castors for transport
- Weatherproof for site operation
- Optional metering
- Powder coated housing
- Simple operation
- Emergency Stop
- Spare parts available

Water-Cooled Load Banks

Thermal can design and manufacture water cooled load banks for a wide range of applications, including yachts, ships, high-rise buildings or applications where a fan-cooled unit would be too large, bulky or noisy.

Water cooled load banks can use all types of water (including recycled water from chiller systems or sea water pumped directly into a ship) offering a flexible, quiet and efficient design for load testing.

Design Features



- Vertical or horizontal mount
- High grade 316L stainless steel resistive elements
- Full 316 stainless steel construction
- Power ratings from 10kW up to 1MW
- Incorporates the digital touch screen control seen on our standard range of ThermaLoad load banks
- Supplied complete with circulation pump and control cabinet ready for installation
- Quiet operation
- Ideal for use in super yachts, naval ships, ferries, cargo vessels, indoor installations, offshore platforms, HVAC, city buildings and more
- Spare parts available

Braking Resistors

Braking Resistors are used in motion systems to convert excess electrical energy when decelerating into thermal energy through electric heater elements inside the unit.
This is known as dynamic braking.
Vulcanic Thermal Electric design and manufacture custom braking resistors to suit the load and spatial requirements of your application. Our braking resistor units can be air cooled or water cooled, based on your needs.

Thermal can supply a complete braking resistor unit or individual replacement parts, from controls and accessories, to the finned heater elements used inside the unit.

Braking resistors can be used in a range of applications, including conveyors, engines, cranes, trains and more...

Optional Features

- Painted, Galvanised or Stainless Steel finish
- Aluminium grilles
- Air Pressure switch
- IP Rated
- Lockable castors
- Isolation switch
- Axial fan
- Turret punched grill/assembly
- High temperature overload

Section 9

Drum Heating

Base Drum Heaters

Base Drum Heaters are ideal for use in applications where the drum requires heating and is then moved onto the next production stage. Low watt density heating elements are clamped between two heavy metal plates and are temperature controlled. A leg height of 100mm, robust steel construction with high temperature painted finish, 2.5m x 3 core flexible lead and 10 Amp plug are standard for the single phase units. This type of heater is best suited for closed drum situations.

Complete stainless steel units are also available and are highly recommended for use in corrosive areas. Thermal manufacture totally sealed units designed for hazardous applications, eg. Class 1 Zone 1, Explosion proof and Dust Ignition Proof classifications.

Maximum temperatures achieved are approximately 65°C - 80°C for the single phase units and 250°C - 300°C for the three phase units.

A multitude of voltages, wattages, diameters, temperature controls and programmable timers are available upon request.

Part #	To suit drum size	Volts	Watts	Phases
TBDS20	20L	240	1500	Single
TBDT20	20L	240	1500	Single
TBDS205	205L	240	2400	Single
TBDT205	205L	240	2400	Single
TBDS205/3	205L	415	7200	Three
TBDT205/3	205L	415	7200	Three

'S' for Simmerstat control - energy regulator
'T' for Thermostat control

Pictured - TBDS20

Stainless Steel Clamp On Heaters

Stainless Steel Clamp on heaters are ideal for applications where short heat up times and high temperatures need to be achieved. A low watt density multiform heating element is designed to wrap around the outside of the drum, held on by a stainless steel band with quick release toggle fasteners. Clamp on heaters are light weight, portable and can be moved from drum to drum with ease. If more heat is required, extra clamp on heaters can easily be fitted. Three phase heaters are also manufactured by Thermal - with greater power output - and are available upon request.

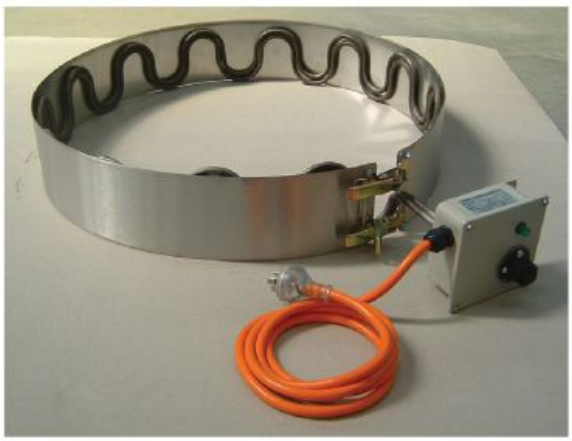
The clamp on heater is ideal for applications where the material or solution to heat cannot come into direct contact with the heating element. This makes them best suited for closed drum situations, eg. solvents.

Standard clamp on heater units are manufactured with Incoloy sheathed heating elements, 110mm wide and are Simmerstat controlled. 2.5m x 3 core flexible lead and 10 Amp plug are standard for single phase units.

A multitude of voltages, wattages, diameters, temperature controls and programmable timers are available upon request. Please contact us with your special requirements.

Standard Units

Part #	Drum Size	Volts	Watts
DBH290110	20 litre	240	1200
DBH580110	205 litre	240	2400



Drum Immersion Heaters

Drum immersion heaters are more efficient and economical than external heating and are used where the solution, liquid or material can be heated with the element being in direct contact. Two installation designs are available. The first is able to be inserted through the pouring hole at the top and the other fits straight into an open drum.
Thermal drum immersion heaters are light weight and very portable. They can be used in a variety of tank and bath applications. All Thermal drum immersion heaters are thermostatically controlled and are manufactured in a wide range of materials such as Incoloy, 316SS and Titanium. 2.5m x 3 core flexible lead and 10 Amp plug are standard with the single phase units.

Thermal also manufacture three phase units with greater power output, which greatly reduces initial heat up time and maximises heat recovery. A multitude of voltages, wattages, temperature controllers, programmable timers, sheath watt densities and element protective coatings suitable for specific solutions are available upon request. Please consult our design team with your special requirements.

Standard Heaters

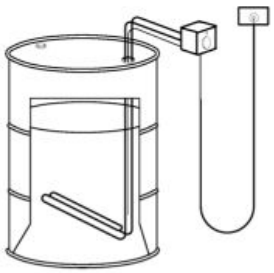
Application: Clean Water Only - 124kW/m^2 (80 watts/in^2)

OPEN DRUM				
Part #	Drum Size	Volts	Watts	Phase
DW-1	20 litre	240	2400	Single
DW-2	205 litre	240	2400	Single
DW-13	20 litre	415	4800	3 Ph
DW-23	205 litre	415	7200	3 Ph

DW

CLOSED DRUM				
Part #	Drum Size	Volts	Watts	Phase
CDW-1	20 litre	240	2400	Single
CDW-2	205 litre	240	2400	Single
CDW-13	20 litre	415	4800	3 Ph
CDW-23	205 litre	415	7200	3 Ph

CDW



Low Watt Density Drum Heaters

18.6kW/m² (12W/in²) - Low Operating Surface Temperature

Low watt density heaters are suitable for mild alkali solutions, detergent, caustic soda, soluble oils, emulsions, engine oils, general lubricants, mild acid solutions, hydraulic and turbine oils, waxes, heat transfer oils, vegetable oils and tallow.

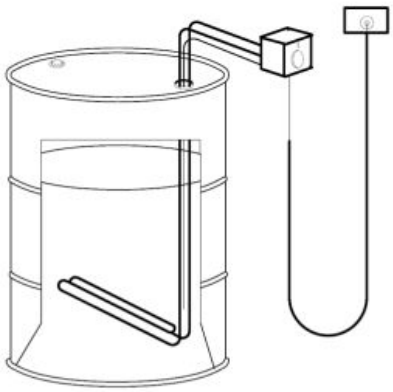
Thermal Low Watt Density drum heaters come in single or 3 phase units. 2.5m x 3 core flexible lead and 10 Amp plug are standard with single phase units.

A multitude of voltages, wattages, temperature controllers, programmable timers, lower watt densities and element protective coatings suitable for specific solutions are available upon request.

OPEN DRUM				
Part #	Drum Size	Volts	Watts	Phase
LDW-1	20 litre	240	2400	Single
LDW-2	205 litre	240	2400	Single
LDW-13	20 litre	415	7200	3 Ph
LDW-23	205 litre	415	10800	3 Ph

CLOSED DRUM				
Part #	Drum Size	Volts	Watts	Phase
CLDW-1	20 litre	240	500	Single
CLDW-2	205 litre	240	2400	Single

LDW = Low Watt Density Heater - Open Drums
CLDW = Low Watt Density Heater - Closed Drums

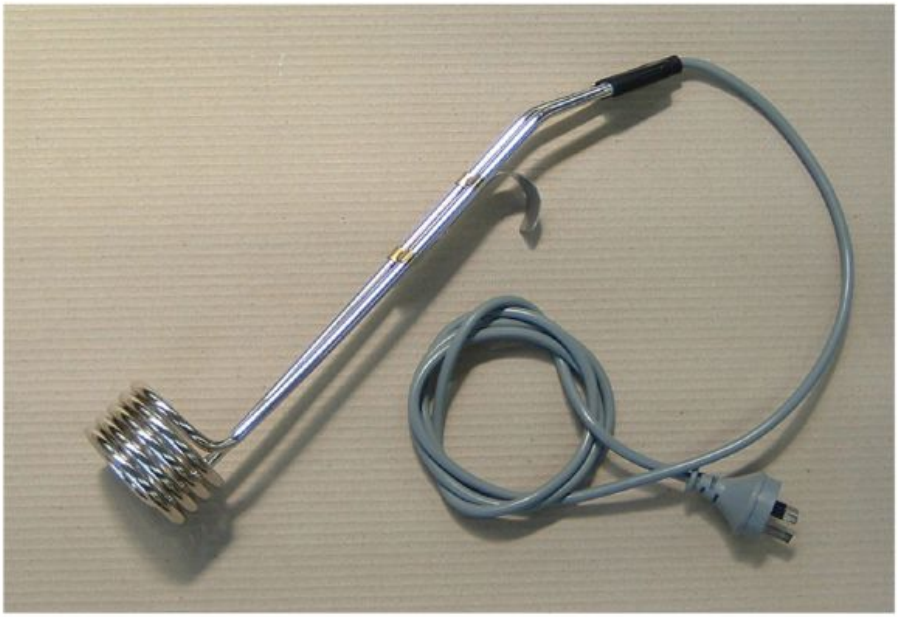


Emergency Drum Heater

A very portable, general purpose, high watt density heater. Suitable for emergency heating and **must only be used in clean water** situations.

The standard emergency drum heater is manufactured with an Incoloy sheath and has a stainless steel adjustable supporting hook. The heater is fitted with a 2.5 metre 3 core flex and 10 Amp plug.

We strongly advise when using this heater that it is used with an earth leakage safety system.



Part Number: TDH-1

Heated Drum Trolley/Storage Rack

Suitable for applications where the 205 litre (44 gallon) drum is required to be mobile with its contents heated. With its heavy duty construction the heated drum trolley is designed for loading, moving and unloading of full drums with ease.

As the drum is strapped down in the horizontal position, the contents can be easily transferred into smaller containers while the underside of the drum is still being heated by fully guarded low watt density multiform heating elements.

The heated drum trolley is for materials such as bitumen, tallow, waxes, fat, grease, resin, syrups and honey, etc. where heat is required to create flow.

Temperature control is achieved with the use of an energy regulator (simmerstat).
The standard Thermal heated drum trolley is rated at 240V 2400W and is connected via a standard 10 Amp extension lead. A range of temperature controllers, programmable timers and power ratings are available. For more information please consult our Design team.

Part Number: TDT2400

Drum Heating Ovens

A heating oven/room can be designed and manufactured to meet your exact size and specifications. Several drums can be heated at the same time and kept thermostatically controlled between 30°C - 110°C, 24 hours a day.
Many materials require extended heating times for complete and proper meltdown; such as honey, malt extract, waxes and various pharmaceutical products. This can only be achieved efficiently in heated drum ovens or rooms.

A robust construction and high quality finish give Thermal the leading edge in industrial ovens. Thermal drum ovens are highly efficient and fully insulated. They have an electronic temperature control, a programmable timer and feature a fan forced recirculated heated air system in standard units. Mobile units and special options are also available.

- Suitable for Waxes, Oils, Chemicals, Greases, Plastics and much more
- Standard designs or fully customised - we can build ovens to suit your needs
- Capacities from 1 to 64 x 205L drums
- Stainless Steel heating elements
- Portable free standing design
- Single or multiple chamber options
- Digital temperature control options
- Suitable for indoor and outdoor use
- Robust construction
- Fully insulated
- Temperatures up to 600°C
- Quick temperature recovery
- Evenly distributed heat
- Chequer plate flooring
- Fan speed control
- Programmable timer control
- Heavy duty locking hardware
- Thermal also offers standard drum ovens for hire

Standard Ovens/Rooms						
Part #	No of Drums	Width	Depth	Height	Volts	Watts
DO1	1	700	925	1300	240	2.4kW
DO2	2	1550	925	1300	240	3.6kW
DO4	4	1550	1550	1300	415	7.2kW
DO8H	8	3250	1550	1300	415	10kW
DO8V	8	1550	1550	2250	415	10kW
DO16H	16	6650	1550	1300	415	15kW
DO16V	16	3250	1550	2250	415	15kW

All dimensions in millimetres - Internal dimensions shown only
V = Vertically stacked
H = Horizontally positioned

Drum Heater Jackets - 205L

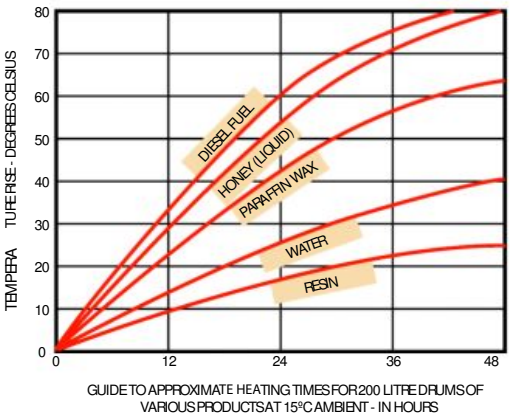
VTEE's Drum Heater Jackets are specially designed products using the latest advance in electric heating element development.

Simply, inexpensively and with safety, you can heat 205 litre drums of your sensitive and valuable product without the expense of building a hot room - our thermally insulated flexible heater jacket simply zips up to form a miniature hot room around your drum.

Operation of a drum heater jacket uses only 500 watts of electrical power. That's about 50c to heat a 200 litre drum of typical product over twelve hours (based on average commercial electricity rates). Compared to alternatives that can cost nearly 3 times more, our drum heater will save you money and energy.

The unique carbon-film electric heating elements featured on Beyond 2000 have been selected to ensure the integrity of your product is preserved throughout the heating process. Heat is spread evenly over a wide surface area - about one square metre - eliminating 'hot spots' and ensuring even distribution.

Because the heating elements don't contain metal wires or resistors they won't deteriorate with repeated use. Being made from carbon/glass fibre they can actually be cut, torn or punctured without appreciable loss of performance. In this unique product where they are protected from damage, with



GUIDE TO APPROXIMATE HEATING TIMES FOR 200 LITRE DRUMS OF VARIOUS PRODUCTS AT 15°C AMBIENT - IN HOURS

For heating foods, plastics, chemicals, oils, greases, adhesives, paints.

Features:

- High Efficiency
- Safe
- Inexpensive to operate
- Easy to use a
- Highest grade materials
- Indefinite element life
- Durable and easy to clean
- Proudly Made in Australia

- Applied to heat 0.3kW/m^2 - only 1/20th usual intensity
- Power consumption 0.5kW - only 1/5th usual power

Our drum heater jackets are available for either vertical or horizontal drum orientation and can be used with thermostats and/or programmable timers. Optional models are available with Integral Residual Current Interrupter (RCI) switches.

Part Number: IDHJ-205 (standard unit)
Electrical Specifications: (Nominal)
Voltage: 240 VAC
Current: 2.1 Amps
Power: 500 Watts

Drum Heater Jackets - IBC

The IBC Heater Jacket is designed to provide a convenient insulation/heating system for raising the temperature of liquid products transported in the IBC (Intermediate Bulk Container).

The Heater Jacket consists of five flexible panels, inside each is a polyester thermal insulation blanket, insulated electric carbon-graphite heating elements, control thermostats and thermal over-temperature cut-off fuses mounted on an aluminium earth sheet, wiring and a flexible power cord with a 3-pin earthed plug. Heater jackets are available for all standard size IBC units.
Custom sized jackets can also be supplied.

Each panel is fitted with heavy duty zip fasteners that make it easy to install on the IBC. The installation forms a stand alone miniature 'hot room' suitable for heating in low ambient temperatures. An efficient insulation material is used inside the panel, minimising energy loss from the heated IBC and most liquid products are able to be raised in temperature within acceptable times.

Part Number: IDHJ-IBC (standard unit)
Electrical Specifications: (Nominal)
Voltage: 240 VAC
Current: 5 Amps
Power: 1200 Watts

Section 10

Refrigeration Industry

Defrost Heaters

Defrost heaters are used for the prevention of ice build up on freezer and evaporator coils.

Construction

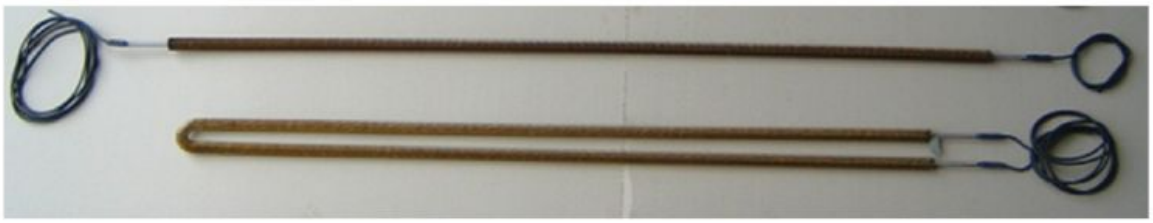
Stainless steel sheathed element with brass or stainless steel fins for quick heat dissipation. Our Defrost heaters are made fully water resistant by vulcanising double insulated cable to the end of the element.

Stainless steel sheathed elements are capable of reaching temperatures of 1150°C, however these temperatures are not required for refrigeration applications, thus giving a long lasting product.

Each element must pass a 1500V DC insulation test and achieve a megger reading not less than 100MΩ before leaving our plant.

A wide variety of terminations, lead lengths and lead types are available. Leads are capable of operating in temperatures of -40°C to +150°C. Custom designed heating elements can be produced for obsolete freezer cabinets, coil and drain pans.

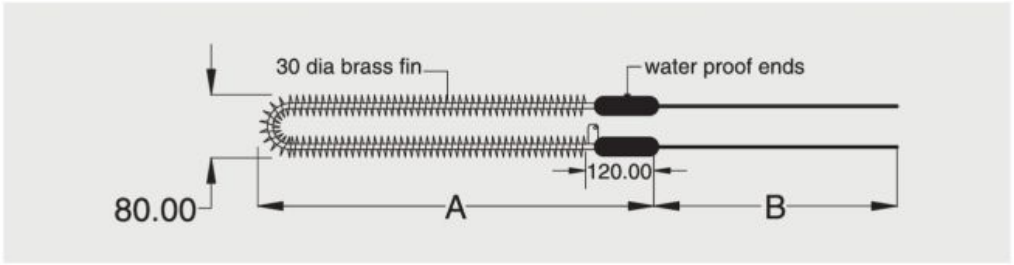
VTEE manufacture the largest range of defrost and drain pan heaters for all the leading commercial refrigeration cabinets including brands such as Muller, Kirby, Repco, Buffalo Trident, Kysor, Hussmann, Coldwright, Heatcraft and more.



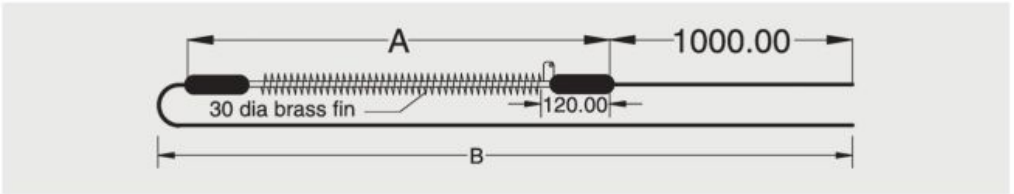
For Island Freezer Cases

Part #	Dim A	Dim B	Watts
1D	1000	1500	1500
2D	1350	1500	1500
3D	1550	1500	1500
4D	1650	1500	1500
5D	1950	2000	2000
6D	1780	1500	2000
7D	2285	1500	2000
8D	2600	2000	2000
9D	3200	2000	2500
10D	2100	1500	2000
11D	2800	1500	2000
12D	3380	1500	2000
13D	3750	2000	3000

Part #	Dim A	Dim B	Watts
80D	2100	2500	1800
81D	2800	2500	2000
82D	3380	2500	2500
83D	2100	6000	1800
84D	2800	6000	2000
85D	3380	6000	2500
86D	1150	1500	400
88D	1780	1500	500
89D	1490	1500	1500
166861S	3200	1000	3400
166862S	2600	1000	2750
166863S	2200	1000	2200
166864S	1600	1000	1650



Part #	Dim A	Dim B	Watts
4980000	1020	2400	1000
4980001	1350	2750	1200
4980021	1960	3150	1600
4980022	2600	3800	2000
4980023	3200	4200	2400



All dimensions are given in millimetres and elements are rated at 240V.
Special sizes, voltages and wattages manufactured to suit your requirements.

Drain & Condensate Pan Heaters

Drain and condensate pan heaters are used for the prevention of ice build up in drain ways and condensate pans of commercial refrigeration units.

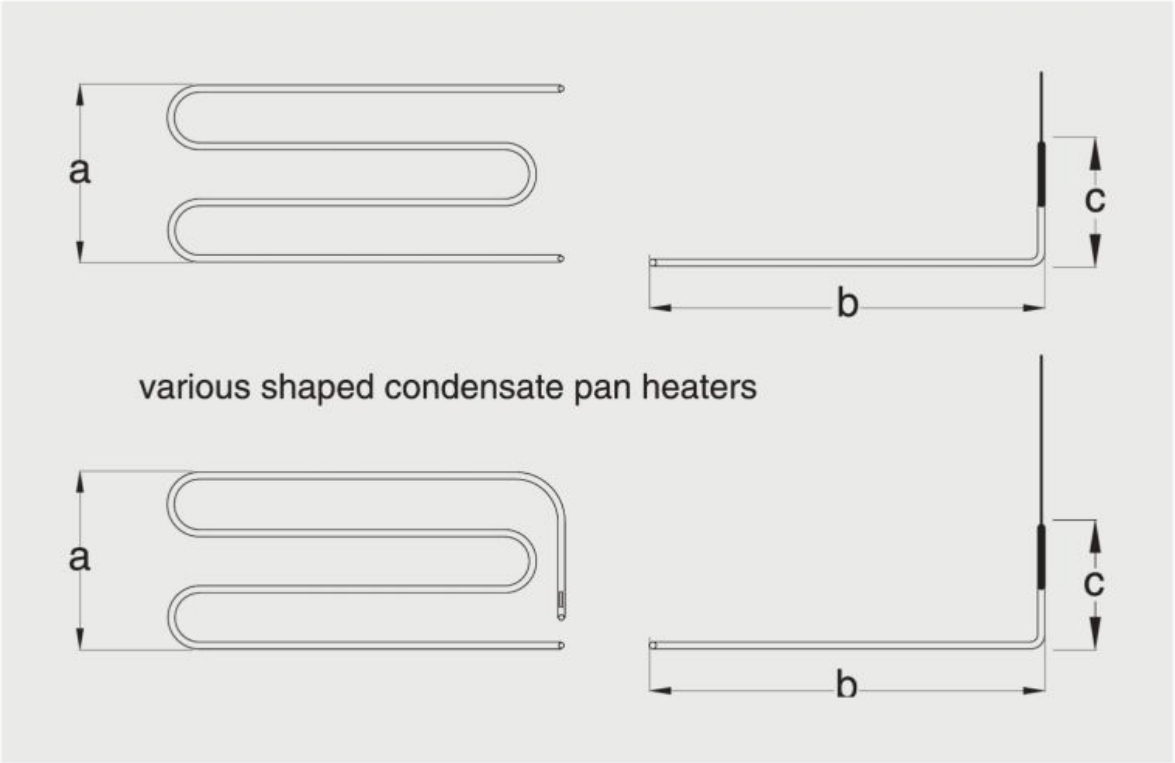
Construction

Stainless steel sheathed, low watt density heaters guarantee a longer life span as they are more robust and resistant to corrosion.

A wide variety of terminations and lead lengths are available. Leads are capable of operating in temperatures of -40°C to +150°C.

As with defrost heaters, custom designed elements can be produced for obsolete freezer cabinets, coil and drain pans.

VTEE manufactures the largest range of defrost and drain heaters for all the leading commercial refrigeration cabinets including brands such as Muller, Kirby, Repco, Buffalo Trident, Kysor, Hussmann, Coldwright, Heatcraft and more.

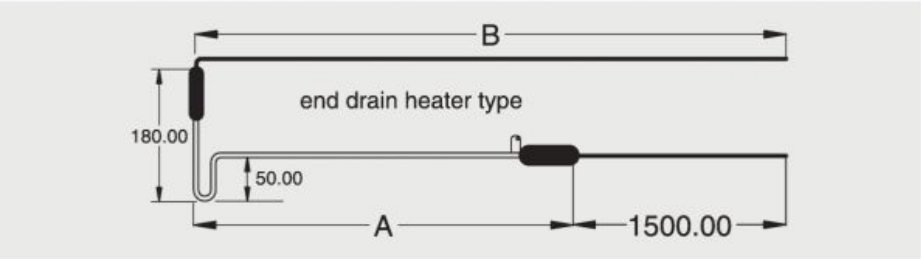


various shaped condensate pan heaters

End Drain

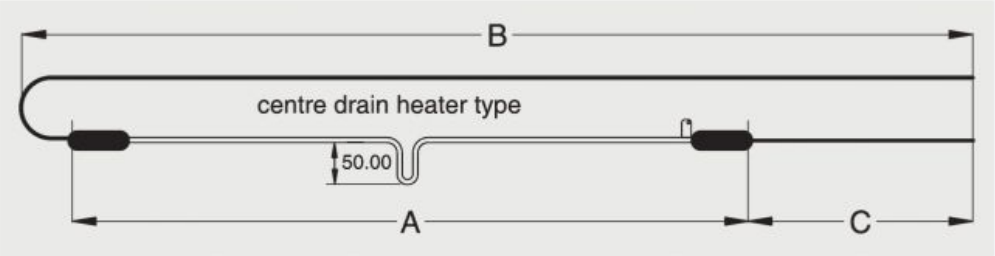
Part #	Dim A	Dim B	Watts
51W	1000	2500	150
52W	1270	2770	200
53W	1675	3125	200
54W	1980	3480	500
55W	1830	3330	200
56W	2290	3790	200

Part #	Dim A	Dim B	Watts
57W	2500	4000	200
58W	3200	4700	500
59W	2300	3800	200
60W	2850	4350	200
61W	3450	4950	200
62W	3760	5260	300



Centre Drain

Part #	Dim A	Dim B	Dim C	Watts
64W	2340	4500	1500	500
65W	3550	5000	1500	500
67W	1829	4600	4600	200

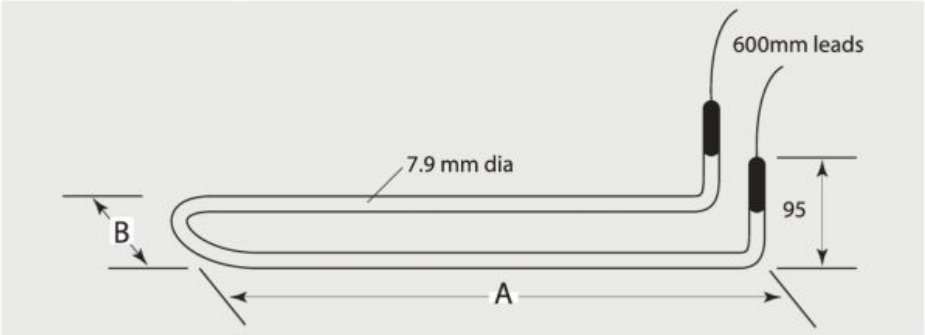


All dimensions are given in millimetres and elements are rated at 240V.
Special sizes, voltages and wattages manufactured to suit your requirements.

Defrost Heaters for Buffalo Trident Coils

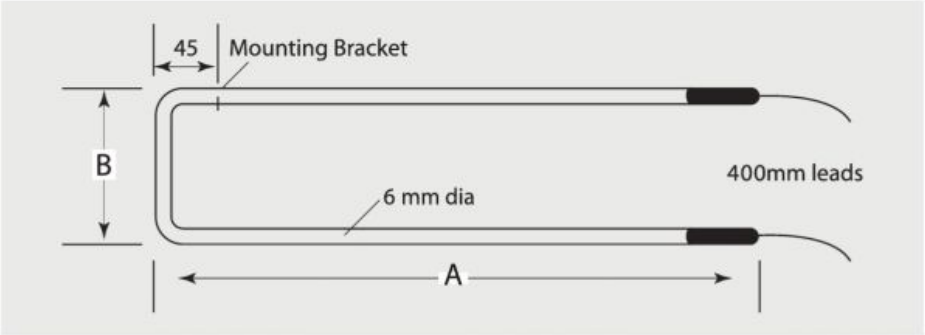
Part #	Dim A	Dim B	Watts
BA01	570	85	1000
BB02	1030	85	1000
BC03	1485	85	1500
BD04	1945	85	1700
BE05	2400	85	2000
BF06	2860	85	2300
BG07	3060	85	2500
BH08	572	160	300

Part #	Dim A	Dim B	Watts
BJ09	1030	160	400
BK10	1485	160	400
BL11	2860	85	800
BM12	3160	85	900
BN13	2550	85	700
BP14	2100	85	600
BQ15	1640	85	500
BR16	1335	85	400



Part #	Dim A	Dim B	Watts
BK18	585	101	475
BL19	890	101	900
BM20	1270	101	1350
BN21	1650	101	1800
BP22	1345	101	1700
BQ23	1955	101	2300
BR24	2565	101	3000
BS25	3175	101	2400

Part #	Dim A	Dim B	Watts
BT26	890	132	550
BU27	1270	132	800
BV28	1650	132	1100
BW29	1345	132	900
BX30	1955	132	1200
BY31	2565	132	1800
BZ32	3175	132	1900



All dimensions are given in millimetres and elements are rated at 240V.
Special sizes, voltages and wattages manufactured to suit your requirements.

Flexible Silicone Drain Heaters

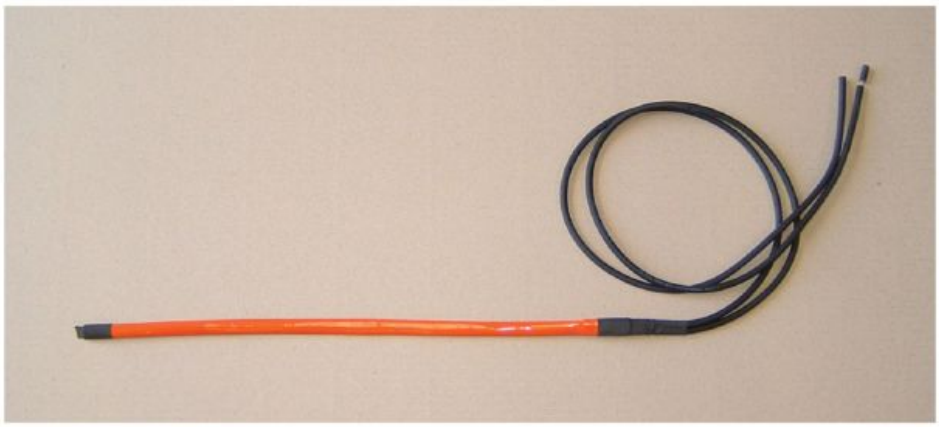
Used extensively within the commercial refrigeration industry to prevent ice build up within condensate trays and drains.

A flexible heater that is resistant to water, oils, chemicals and many harsh environments ensures a safe, reliable and economical solution.

Designed for freeze protection and process temperature maintenance along pipelines, flanges, valves and pumps; or used wherever our reliable tubular calrod type heating elements cannot be used due to uneven surfaces or obstacles prohibiting easy installation. Other applications include anti-condensation heaters for large electric motors, control enclosures, switchboards and sump heaters for diesel engines.

Construction of Silicone Flexible Heater consists of a Nickel Chromium (NiChrome) resistance wire heli-coiled around an electrical grade high temperature fibreglass cord, insulated by a silicone rubber sheath. A second fibreglass sheath is added for further electrical and mechanical protection of the resistance wire.
The double insulated heating cable is enclosed within the third and final high temperature silicone fibreglass sheath, terminated with silicone cold tails and further sealed with a silicone rubber sealant.

Maximum operating temperatures of 220°C. Lengths ranging from 500mm to 15 metres and various watts per metre and voltages are available on request.



75 Watts/Metre		
Part #	Length	Wattage
SF75-1	1.0	75
SF75-2	2.0	150
SF75-3	3.0	225
SF75-4	4.0	300
SF75-5	5.0	375
SF75-6	6.0	450
SF75-7	7.0	525
SF75-8	8.0	600
SF75-9	9.0	675
SF75-10	10.0	750
SF75-11	11.0	825
SF75-12	12.0	900
SF75-13	13.0	975
SF75-14	14.0	1050
SF75-15	15.0	1125

100 Watts/Metre		
Part #	Length	Wattage
SF100-05	0.5	50
SF100-1	1.0	100
SF100-2	2.0	200
SF100-3	3.0	300
SF100-4	4.0	400
SF100-5	5.0	500
SF100-6	6.0	600
SF100-7	7.0	700
SF100-8	8.0	800
SF100-9	9.0	900
SF100-10	10.0	1000
SF100-11	11.0	1100
SF100-12	12.0	1200
SF100-13	13.0	1300
SF100-14	14.0	1400
SF100-15	15.0	1500

150 Watts/Metre		
Part #	Length	Wattage
SF150-05	0.5	75
SF150-1	1.0	150
SF150-2	2.0	300
SF150-3	3.0	450
SF150-4	4.0	600
SF150-5	5.0	750
SF150-6	6.0	900
SF150-7	7.0	1050
SF150-8	8.0	1200
SF150-9	9.0	1350
SF150-10	10.0	1500
SF150-11	11.0	1650
SF150-12	12.0	1800
SF150-13	13.0	1950
SF150-14	14.0	2100
SF150-15	15.0	2250

All length dimensions in metres

Section 11

Drysafe Industrial Drying Cabinet

Drysafe Industrial Drying Cabinet

Experiencing problems in drying your protective clothing?

Using a C-Tick approved Drysafe is the answer.
Safely able to dry any type of heavy duty clothing such as firemans coats, fork lift drivers duffel coats to skiers parkas.

Some industries in which the Drysafe will be of great benefit include:

- Fire & Rescue
- Police & Ambulance
- Transport
- Logging
- Construction
- Council and Utilities
- Oil and Gas
- Railways
- Mining
- Warehousing
- Defence Forces
- Airports
- Shipping

Specifications

Part Number SI0387
240V 2400W electrically heated safe drying cabinet, supplied with a 1m long 3 pin plug.

The cabinet is 2000mm high x 1000mm wide x 600mm deep fitted with two front opening doors. The clothes are hung onto a fixed rail suspended above an electric heating element.
With the doors closed, air is drawn through the base of the drier, over the heater element and through the roof mounted exhaust fan. A 180min timer controls the unit, together with temperature and over temperature controllers.
A green indicator light shows when the cabinet is heating.

Also available with a Boot Rack

Approvals

Tested and approved by NATA laboratory to AS/NZS 1044:1995 (CISPR 14) including amendment No.1 December 1997. Limits and methods of measurement of radio disturbance characterisitics of electrical motor operated and thermal appliances. Copy of the report is available for inspection.
Electrical Safety Requirements Testing on AS/NZS 3350.1-1994 including amendment 6. Safety of household and similar electrical appliances. And to AS/NZS 3350.2.43-1996, including amendment 2 Part 2.43 Particular requirements Cloth dryers and towel rails.

Section 12

U-Bend-It Tubular Heating Elements

U-Bend-It Tubular Heating Elements

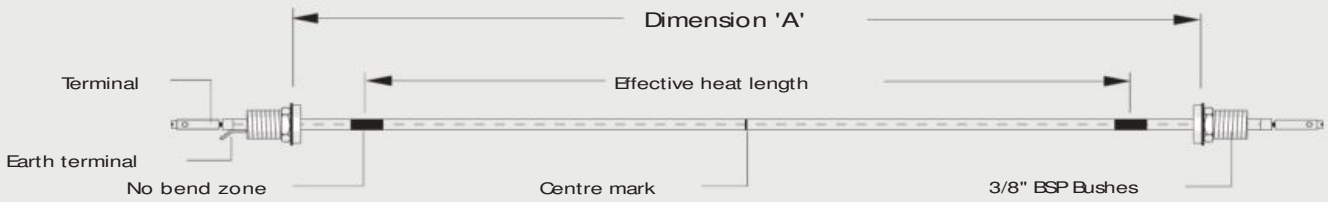
VTEE manufactures annealed straight length heating elements in two element sheaths: Incoloy sheath for water, plate and air heating; and Stainless Steel for oil heating. U-Bend-It (UBI) elements are designed to be bent by you on site and therefore eliminate the need for one off specials where possible, thus reducing down time and saving you money.

UBI elements can be bent to any shape of your imagination as long as they are bent between the two cold-hot zone junctions and a minimum bending radius of two times the element sheath diameter is achieved. A minimum of 10mm distance is required from the cold-hot junction to the centre of the bending mandril to reduce the risk of breaking.

U-Bend-It elements come as a straight element with terminals only or fitted with 3/8" BSP brass bushes, which are very popular in the commercial cooking industry and are used for hot food bars and bain maries.

Special voltages, wattages, lengths, diameters and sheath materials are manufactured to the customer's request.

U-BEND-IT HEATING ELEMENT WITHOUT BUSHES & TERMINALS



U-Bend-It Elements with Bushes & Terminals

Part #	Volts	Watts	Effective Heat Length	Dim. 'A'
UBI-WB50	240	500	160	210
UBI-WB75	240	750	245	295
UBI-WB100	240	1000	325	375
UBI-WB125	240	1250	405	455
UBI-WB150	240	1500	490	540
UBI-WB175	240	1750	570	620
UBI-WB200	240	2000	650	700
UBI-WB240	240	2400	780	830
UBI-WB300	240	3000	975	1025
UBI-WB360	240	3600	1170	1220
UBI-WB420	240	4200	1365	1415
UBI-WB480	240	4800	1560	1610
UBI-WB540	240	5400	1755	1805
UBI-WB600	240	6000	1950	2000
UBI-WB660	240	6600	2145	2195
UBI-WB720	240	7200	2340	2390
UBI-WB800	415	8000	2600	2650
UBI-WB900	415	9000	2925	2975
UBI-WB1000	415	10000	3250	3300
UBI-WB1200	415	12000	3900	3950

High Watt Density - Water Heating Only
Incoloy Sheath
Watt Density = 120kW/m^2 (80W/in^2)
For use in water heating applications including urns, bain maries, sterilisers, wash boilers, steamers and more.

Low Watt Density - Oil Heating
Stainless Steel Sheath
Watt Density = 31kW/m^2 (20W/in^2)
For liquid heating including alkali solutions, detergents, caustic/cyanide solutions and oil.

Part #	Volts	Watts	Effective Heat Length	Dim. 'A'
UBI-OB50	240	500	650	750
UBI-OB75	240	750	975	1075
UBI-OB100	240	1000	1300	1400
UBI-OB125	240	1250	1625	1725
UBI-OB150	240	1500	1950	2050
UBI-OB175	240	1750	2275	2375
UBI-OB200	240	2000	2600	2700
UBI-OB225	240	2250	2925	3025
UBI-OB250	240	2500	3250	3350
UBI-OB275	240	2750	3575	3675
UBI-OB300	240	3000	3900	4000

All dimensions in millimetres

Part #	Volts	Watts	Effective Heat Length	Dim. 'A'
UBI-CL50	240	500	450	565
UBI-CL75	240	750	670	785
UBI-CL100	240	1000	900	1015
UBI-CL125	240	1250	1120	1235
UBI-CL150	240	1500	1345	1460
UBI-CL175	240	1750	1570	1685
UBI-CL200	240	2000	1790	1905
UBI-CL225	240	2250	2015	2130
UBI-CL250	240	2500	2240	2355
UBI-CL275	240	2750	2465	2580
UBI-CL300	240	3000	2690	2805
UBI-CL360	240	3600	3230	3345
UBI-CL420	240	4200	3765	3880
UBI-CL480	240	4800	4300	4415

U-Bend-It Elements with Bushes & Terminals
Stainless Steel Sheath
Watt Density = 46.5kW/m^2 (30W/in^2)
A longer lasting alternative suitable for bain maries, hot food display bars, ovens and fan forced air heating systems.

U-Bend-It Elements with Bushes & Terminals
Incoloy Sheath
Watt Density = 55kW/m^2 (35W/in^2)
Suitable for ovens and fan forced air heating systems. Can also be suited to water situations where boil dry may occur, eg. bain maries and hot food display cabinets.

Part #	Volts	Watts	Effective Heat Length	Dim. 'A'
UBI-CC50	240	500	370	485
UBI-CC75	240	750	555	670
UBI-CC100	240	1000	740	855
UBI-CC125	240	1250	925	1040
UBI-CC150	240	1500	1110	1225
UBI-CC175	240	1750	1300	1415
UBI-CC200	240	2000	1485	1600
UBI-CC225	240	2250	1670	1785
UBI-CC250	240	2500	1860	1975
UBI-CC275	240	2750	2040	2155
UBI-CC300	240	3000	2225	2340
UBI-CC360	240	3600	2675	2790
UBI-CC420	240	4200	3120	3235
UBI-CC480	240	4800	3565	3680

All dimensions in millimetres

U-Bend-It Elements without Bushes & Terminals

Part #	Volts	Watts	Effective Heat Length	Dim. 'A'
UBI-W50	240	500	160	250
UBI-W75	240	750	245	335
UBI-W100	240	1000	325	415
UBI-W125	240	1250	405	395
UBI-W150	240	1500	490	580
UBI-W175	240	1750	570	660
UBI-W200	240	2000	650	740
UBI-W240	240	2400	780	870
UBI-W300	240	3000	975	1065
UBI-W360	240	3600	1170	1260
UBI-W420	240	4200	1365	1455
UBI-W480	240	4800	1560	1650
UBI-W540	240	5400	1755	1845
UBI-W600	240	6000	1950	2040
UBI-W660	240	6600	2145	2235
UBI-W720	240	7200	2340	2430
UBI-W800	415	8000	2600	2690
UBI-W900	415	9000	2925	3015
UBI-W1000	415	10000	3250	3340
UBI-W1200	415	12000	3900	3990

High Watt Density - Water Heating Only
Incoloy Sheath
Watt Density = 120kW/m^2 (80W/in^2)
For use in water heating applications including urns, bain maries, sterilisers, wash boilers, steamers and more.

Low Watt Density - Oil Heating
Stainless Steel Sheath
Watt Density = 31kW/m^2 (20W/in^2)
For liquid heating including alkali solutions, detergents, caustic/cyanide solutions and oil.

Part #	Volts	Watts	Effective Heat Length	Dim. 'A'
UBI-O50	240	500	650	790
UBI-O75	240	750	975	1115
UBI-O100	240	1000	1300	1440
UBI-O125	240	1250	1625	1765
UBI-O150	240	1500	1950	2090
UBI-O175	240	1750	2275	2415
UBI-O200	240	2000	2600	2740
UBI-O225	240	2250	2925	3065
UBI-O250	240	2500	3250	3390
UBI-O275	240	2750	3575	3715
UBI-O300	240	3000	3900	4040

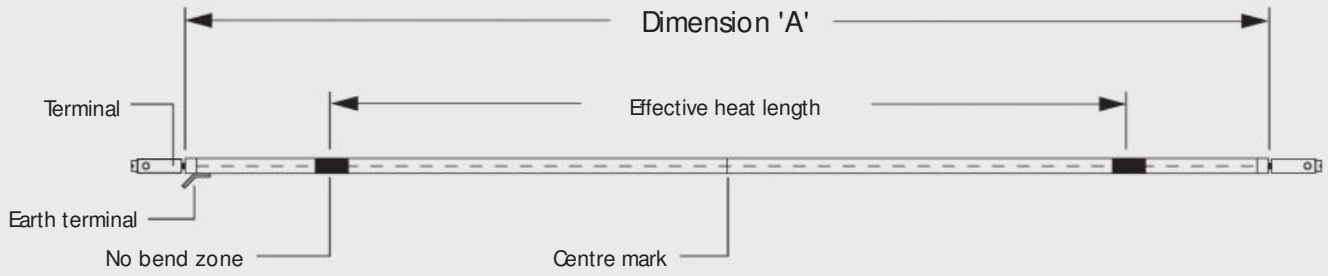
All dimensions in millimetres

Part #	Volts	Watts	Effective Heat Length	Dim. 'A'
UBI-A50	240	500	450	605
UBI-A75	240	750	670	825
UBI-A100	240	1000	900	1055
UBI-A125	240	1250	1120	1275
UBI-A150	240	1500	1345	1500
UBI-A175	240	1750	1570	1725
UBI-A200	240	2000	1790	1945
UBI-A225	240	2250	2015	2170
UBI-A250	240	2500	2240	2395
UBI-A275	240	2750	2465	2620
UBI-A300	240	3000	2690	2845
UBI-A360	240	3600	3230	3385
UBI-A420	240	4200	3765	3920
UBI-A480	240	4800	4300	4455

All dimensions in millimetres

U-Bend-It Elements
Incoloy Sheath
Watt Density = 46.5kW/m^2 (30W/in^2)

U-BEND-IT HEATING ELEMENT WITHOUT BUSHES



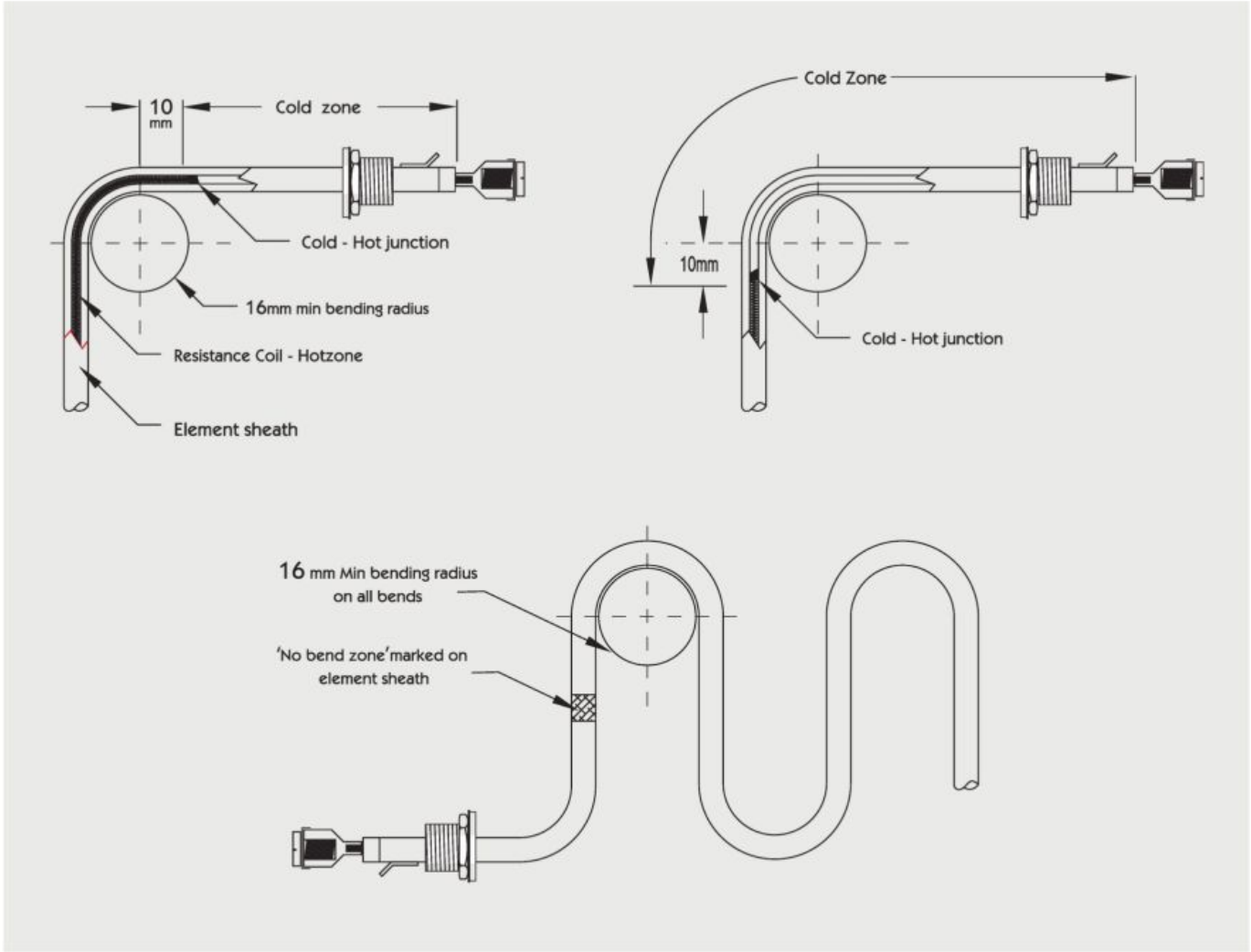
Bending Instructions

All VTEE's U-Bend-It elements are supplied with the 'centre' and 'no bend' zone marked on the element sheath.

When the element shape is determined, ensure all dimensions and bends start from the centre mark - this will ensure that the element bushes, terminal ends and the cold-hot zone finish evenly in length.

Ensure that the minimum bending radius of 16mm is adhered to (32mm bending mandril), this will eliminate element breakage.

U-Bend-It elements can be clamped and bent using a vice, pipe or mandril, a bending lever or simply by hand - as long as there are no sharp edges that may cause damage to the elements.



Section 13

Plastics Industry

Nozzle Heaters for Injection Moulding

VTEE's nozzle heaters have been designed to last and reduce down time with high watt density capabilities to allow maximum temperature ratings and faster heat penetration into the nozzle.

Our nozzle heaters are 6.35mm diameter stainless steel tubular roll formed, making them robust and eliminating the problems that normally occur with conventional mica nozzles.

Operating temperatures of up to 600°C are achieved with outstanding reliability and a long lasting life. With the multi-form construction, this heater can be opened and fitted easily without causing the damage that may normally occur with mica elements.

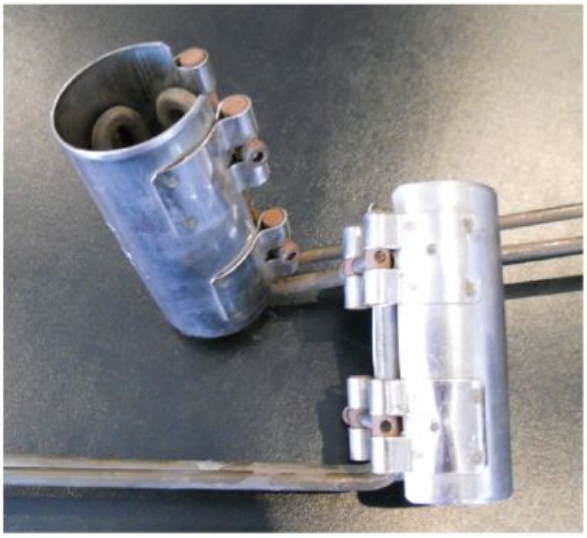
A Low Profile nozzle heater is also available with all of the above capabilities as well as elements of 4mm diameter stainless steel tubular roll formed. They are used in applications where there is limited space around the nozzle. The LP type is available with the same dimensions and wattages as the TS and SN type nozzle heaters.

All our range of nozzle heaters come with 1 metre double glass insulated leads and 300mm tinned copper braid as standard. Many other options are available.

The two basic designs available are:

TS TYPE

SN TYPE



Nozzle Heaters - TS

Part #	Diameter	Width	Watts
TS2512	25	12	125
TS2522	25	22	150
TS2530	25	30	200
TS2538	25	38	250
TS2546	25	46	275
TS3512	35	12	200
TS3522	35	22	250
TS3530	35	30	300
TS3538	35	38	350
TS3546	35	46	400
TS4512	45	12	225
TS4522	45	22	250
TS4530	45	30	300
TS4538	45	38	350
TS4546	45	46	400
TS5512	55	12	250
TS5522	55	22	300
TS5530	55	30	350
TS5538	55	38	400
TS5546	55	46	450
TS7012	70	12	300
TS7022	70	22	350
TS7030	70	30	400
TS7038	70	38	450
TS7046	70	46	500

Part #	Diameter	Width	Watts
TS3212	32	12	200
TS3222	32	22	250
TS3230	32	30	300
TS3238	32	38	350
TS3246	32	46	400
TS3812	38	12	200
TS3822	38	22	250
TS3830	38	30	300
TS3838	38	38	350
TS3846	38	46	400
TS5012	50	12	200
TS5022	50	22	300
TS5030	50	30	350
TS5038	50	38	400
TS5046	50	46	450
TS6212	62	12	250
TS6222	62	22	300
TS6230	62	30	350
TS6238	62	38	400
TS6246	62	46	450
TS7512	75	12	300
TS7522	75	22	350
TS7530	75	30	400
TS7538	75	38	450
TS7546	75	46	500

All dimensions are given in millimetres and elements are rated at 240V.
Special sizes, voltages and wattages manufactured to suit your requirements.

Nozzle Heaters - SN

Part #	Diameter	Width	Watts
SN2550	25	50	200
SN2560	25	60	250
SN2580	25	80	300
SN25100	25	100	450
SN25150	25	150	600
SN25200	25	200	800
SN25250	25	250	1200
SN25300	25	300	1500
SN3550	35	50	300
SN3560	35	60	350
SN3580	35	80	400
SN35100	35	100	550
SN35150	35	150	700
SN35200	35	200	900
SN35250	35	250	1300
SN35300	35	300	1650
SN4550	45	50	350
SN4560	45	60	400
SN4580	45	80	450
SN45100	45	100	650
SN45150	45	150	800
SN45200	45	200	1000
SN45250	45	250	1400
SN45300	45	300	1800
SN5550	55	50	400
SN5560	55	60	450
SN5580	55	80	500
SN55100	55	100	700
SN55150	55	150	900
SN55200	55	200	1200
SN55250	55	250	1600
SN55300	55	300	2000
SN7050	70	50	450
SN7060	70	60	500
SN7080	70	80	550
SN70100	70	100	750
SN70150	70	150	1100
SN70200	70	200	1300
SN70250	70	250	1800
SN70300	70	300	2200

Part #	Diameter	Width	Watts
SN3250	32	50	300
SN3260	32	60	350
SN3280	32	80	400
SN32100	32	100	500
SN32150	32	150	650
SN32200	32	200	850
SN32250	32	250	1250
SN32300	32	300	1600
SN3850	38	50	300
SN3860	38	60	350
SN3880	38	80	400
SN38100	38	100	550
SN38150	38	150	700
SN38200	38	200	900
SN38250	38	250	1300
SN38300	38	300	1650
SN5050	50	50	350
SN5060	50	60	400
SN5080	50	80	450
SN50100	50	100	650
SN50150	50	150	800
SN50200	50	200	1000
SN50250	50	250	1500
SN50300	50	300	1800
SN6250	62	50	400
SN6260	62	60	450
SN6280	62	80	500
SN62100	62	100	700
SN62150	62	150	1000
SN62200	62	200	1250
SN62250	62	250	1650
SN62300	62	300	2000
SN7550	75	50	500
SN7560	75	60	600
SN7580	75	80	650
SN75100	75	100	850
SN75150	75	150	1200
SN75200	75	200	1500
SN75250	75	250	2000
SN75300	75	300	2400

All dimensions are given in millimetres and elements are rated at 240V.
Special sizes, voltages and wattages manufactured to suit your requirements.

Thermalfold Cartridge Heaters

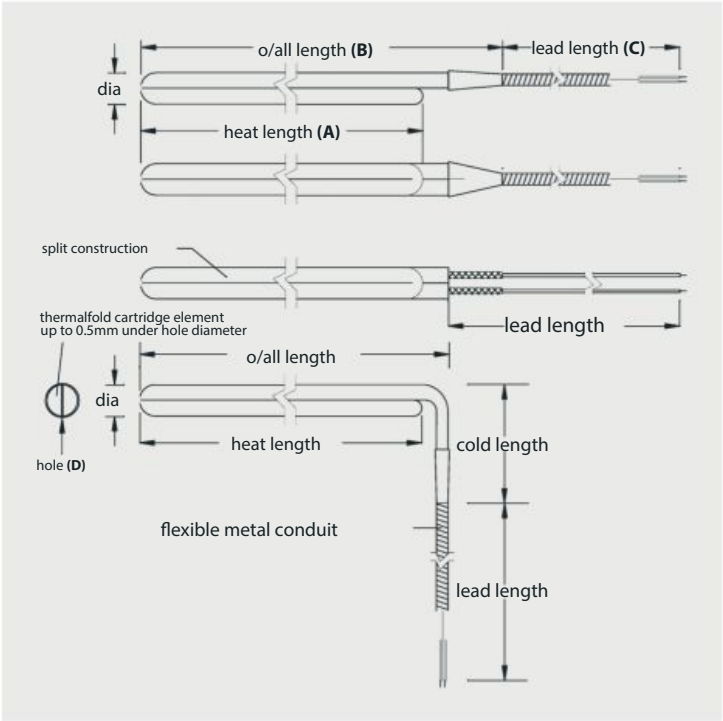
Thermalfold high watt density cartridge heaters are of a unique design and are the latest in electric heating technology.

Thermalfold Cartridge elements are manufactured 0.1mm to 0.5mm under-size to slide easily into the hole size specified. When energised, they heat up and spring open due to their folded construction. While in the heated condition, they are a snug fit and impossible to remove.
On cooling, they contract back to their original diameter and become easy to remove again. Conventional cartridge heaters would normally fail under these conditions.

The maximum element temperature is 800°C. Work temperatures of up to 600°C are therefore achievable, depending on the application.

Thermalfold cartridge heaters range in size from 6mm to 25mm diameter, with various lengths available on request.

Thermalfold cartridge heaters are specially manufactured to suit your requirements.
When ordering, please specify the following dimensions (as per diagram below):
A - Heating length.
B - Overall length of Thermalfold.
C - Length of terminating leads with or without metal flexible conduit.
D - Hole size in which Thermalfold is to fit.
E - Voltage and wattage.



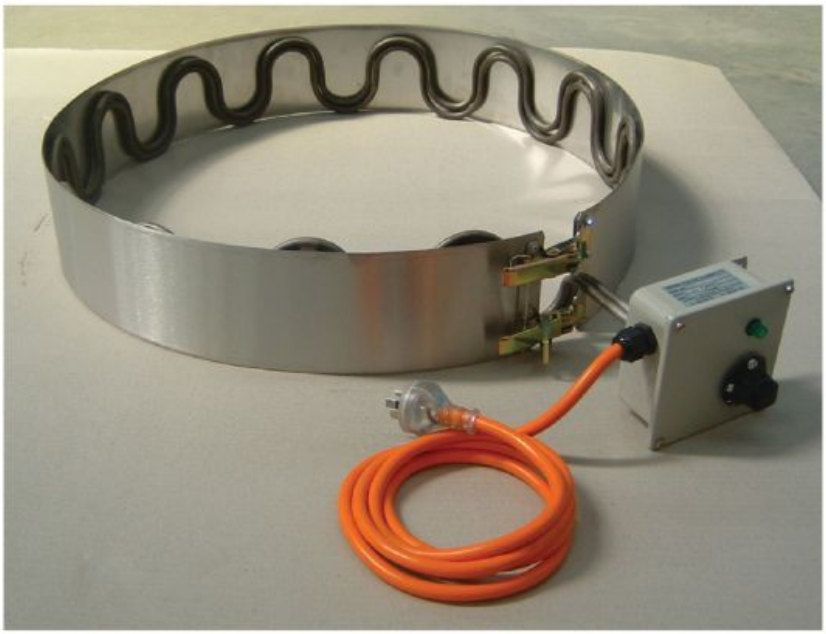
Band Heaters

VTEE's Band Heaters have been designed to last and reduce down time. Band Heaters have high watt density capabilities which allow maximum temperature ratings and faster heat penetration into the barrel.

Our Band Heaters are manufactured in 6.35mm and 7.9mm diameter stainless steel tubular roll formed construction, making them robust and eliminating the problems that normally occur with conventional mica band heaters.

Operating temperatures of up to 600°C are achieved with outstanding reliability and a long lasting life. With the multi-form design, these heaters can be opened and fitted easily without causing damage to them that may normally occur with mica elements. A uniform and greater heating area around the barrel is made possible due to this construction, whereas a mica band heater for applications with thermocouple holes and cut outs may, in many cases, heat only half of the area that the element has been designed for.

VTEE's Band Heaters come standard with 2 metre flexible lead and plug.
If desired, a plugall assembly or terminal enclosure can also be fitted.
The two designs available are BH type and DBH type.



Band Heaters - BH

Part #	Diameter	Width	Watts
BH9045	90	45	500
BH9050	90	50	550
BH9055	90	55	600
BH9060	90	60	650
BH9065	90	65	700
BH9070	90	70	750
BH10045	100	45	500
BH10050	100	50	550
BH10055	100	55	600
BH10060	100	60	650
BH10065	100	65	700
BH10070	100	70	750
BH12545	125	45	600
BH12550	125	50	650
BH12555	125	55	700
BH12560	125	60	750
BH12565	125	65	800
BH12570	125	70	850
BH15045	150	45	700
BH15050	150	50	750
BH15055	150	55	800
BH15060	150	60	850
BH15065	150	65	900
BH15070	150	70	950
BH17545	175	45	1200
BH17550	175	50	1250
BH17555	175	55	1300
BH17560	175	60	1350
BH17565	175	65	1400
BH17570	175	70	1450

Part #	Diameter	Width	Watts
BH20045	200	45	1600
BH20050	200	50	1650
BH20055	200	55	1700
BH20060	200	60	1750
BH20065	200	65	1800
BH20070	200	70	2000
BH22545	225	45	1650
BH22550	225	50	1700
BH22555	225	55	1750
BH22560	225	60	1800
BH22565	225	65	2000
BH22570	225	70	2200
BH25045	250	45	1700
BH25050	250	50	1800
BH25055	250	55	2000
BH25060	250	60	2100
BH25065	250	65	2250
BH25070	250	70	2500
BH30045	300	45	1850
BH30050	300	50	2000
BH30055	300	55	2100
BH30060	300	60	2250
BH30065	300	65	2500
BH30070	300	70	2750
BH32545	325	45	2000
BH32550	325	50	2100
BH32555	325	55	2250
BH32560	325	60	2500
BH32565	325	65	2750
BH32570	325	70	3000

All dimensions are given in millimetres and elements are rated at 240V.
Special sizes, voltages and wattages manufactured to suit your requirements.

Band Heaters - DBH

Part #	Diameter	Width	Watts
DBH9060	90	60	700
DBH9075	90	75	800
DBH90100	90	100	1000
DBH90125	90	125	1250
DBH90150	90	150	1500
DBH90175	90	175	1750
DBH90200	90	200	2000
DBH90225	90	225	2250
DBH90250	90	250	2500
DBH90300	90	300	3000
DBH10060	100	60	700
DBH10075	100	75	800
DBH100100	100	100	1000
DBH100125	100	125	1250
DBH100150	100	150	1500
DBH100175	100	175	1750
DBH100200	100	200	2000
DBH100225	100	225	2250
DBH100250	100	250	2500
DBH100300	100	300	3000
DBH12560	125	60	1000
DBH12575	125	75	1250
DBH125100	125	100	1500
DBH125125	125	125	1750
DBH125150	125	150	2000
DBH125175	125	175	2250
DBH125200	125	200	2500
DBH125225	125	225	2750
DBH125250	125	250	3000
DBH125300	125	300	3250

Part #	Diameter	Width	Watts
DBH15060	150	60	1000
DBH15075	150	75	1250
DBH150100	150	100	1500
DBH150125	150	125	1750
DBH150150	150	150	2000
DBH150175	150	175	2250
DBH150200	150	200	2500
DBH150225	150	225	2750
DBH150250	150	250	3000
DBH150300	150	300	3500
DBH17560	175	60	1500
DBH17575	175	75	1750
DBH175100	175	100	2000
DBH175125	175	125	2250
DBH175150	175	150	2500
DBH175175	175	175	2750
DBH175200	175	200	3000
DBH175225	175	225	3250
DBH175250	175	250	3500
DBH175300	175	300	3750
DBH20060	200	60	1500
DBH20075	200	75	1750
DBH200100	200	100	2000
DBH200125	200	125	2250
DBH200150	200	150	2500
DBH200175	200	175	2750
DBH200200	200	200	3000
DBH200225	200	225	3250
DBH200250	200	250	3500
DBH200300	200	300	3750

All dimensions are given in millimetres and elements are rated at 240V.
Special sizes, voltages and wattages manufactured to suit your requirements.

Band Heaters - DBH

Part #	Diameter	Width	Watts
DBH22560	225	60	1750
DBH22575	225	75	2000
DBH225100	225	100	2500
DBH225125	225	125	2750
DBH225150	225	150	3000
DBH225175	225	175	3250
DBH225200	225	200	3500
DBH225225	225	225	3750
DBH225250	225	250	4000
DBH225300	225	300	4500
DBH25060	250	60	1750
DBH25075	250	75	2000
DBH250100	250	100	2500
DBH250125	250	125	2750
DBH250150	250	150	3000
DBH250175	250	175	3250
DBH250200	250	200	3500
DBH250225	250	225	3750
DBH250250	250	250	4000
DBH250300	250	300	4500
DBH27560	275	60	1750
DBH27575	275	75	2000
DBH275100	275	100	2500
DBH275125	275	125	2750
DBH275150	275	150	3000
DBH275175	275	175	3250
DBH275200	275	200	3500
DBH275225	275	225	3750
DBH275250	275	250	4000
DBH275300	275	300	4500

Part #	Diameter	Width	Watts
DBH30060	300	60	2500
DBH30075	300	75	2750
DBH300100	300	100	3000
DBH300125	300	125	3250
DBH300150	300	150	3500
DBH300175	300	175	3750
DBH300200	300	200	4000
DBH300225	300	225	4250
DBH300250	300	250	4500
DBH300300	300	300	5000
DBH32560	325	60	2500
DBH32575	325	75	2750
DBH325100	325	100	3000
DBH325125	325	125	3250
DBH325150	325	150	3500
DBH325175	325	175	3750
DBH325200	325	200	4000
DBH325225	325	225	4250
DBH325250	325	250	4500
DBH325300	325	300	5000
DBH35060	350	60	2500
DBH35075	350	75	2750
DBH350100	350	100	3000
DBH350125	350	125	3250
DBH350150	350	150	3500
DBH350175	350	175	3750
DBH350200	350	200	4000
DBH350225	350	225	4250
DBH350250	350	250	4500
DBH350300	350	300	5000

All dimensions are given in millimetres and elements are rated at 240V.
Special sizes, voltages and wattages manufactured to suit your requirements.

Section 14

Commercial Cooking Industry

Commercial Cooking Elements

VTEE manufactures a wide range of heating elements for the commercial food industry which are used in a vast range of appliances and machines, including:

- Bain maries - wet or dry
- Rotisseries
- Pizza and bakery ovens
- Grillers
- Dishwashers
- Pressure cookers
- Spray fry cooking ovens
- Popcorn machines
- Steamers
- Hot food displays
- Salamanders
- Deep fryers
- Conveyors
- Commercial toasters
- Coffee machines
- Glass washers
- Hot dog and donut machines
- Electric BBQ's
- Plate ovens and warmers
- Urns
- Pie and food warmers
- Cappuccino machines
- And many others

All heating elements are manufactured in various grades of Incoloy sheath, dependent on the application. A high polished surface finish is also available for certain types of elements, giving a new, clean and shiny appearance - rather than having a dull oxide surface - making them easier to clean if required.

Many shapes, voltages and wattages can be manufactured to suit your application and 'one off' specials for obsolete models can also be produced.

VTEE's unique in-house design and manufacturing processes ensure that all heating elements comply and are operated under earth leakage/residual current protected circuit conditions.

Information required when requesting a quote or order:

1. Shape (refer to pages 11.3 - 11.4 for standard shapes)
2. Approximate dimensions
3. Voltage
4. Wattage
5. Special fittings required
6. Application

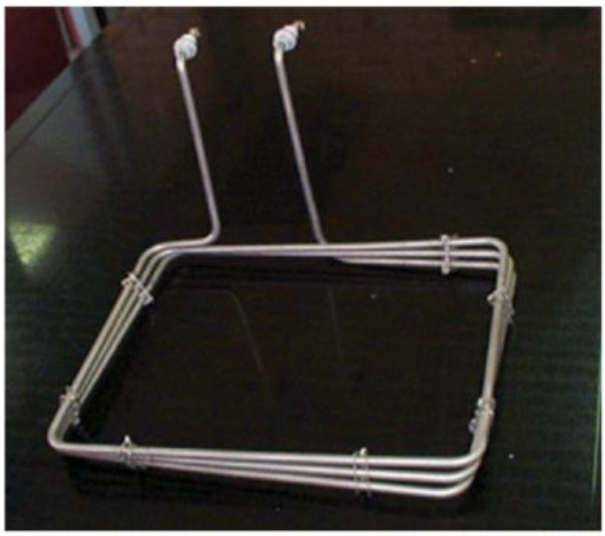
Options

- Brass or Stainless Steel bosses/fittings (see page 3.3)
- Various element terminals (see page 3.1 and 3.2)
- High temperature silicone or fibreglass insulated leads
- High temperature epoxy seal

Replacement elements for Commercial Coffee machines

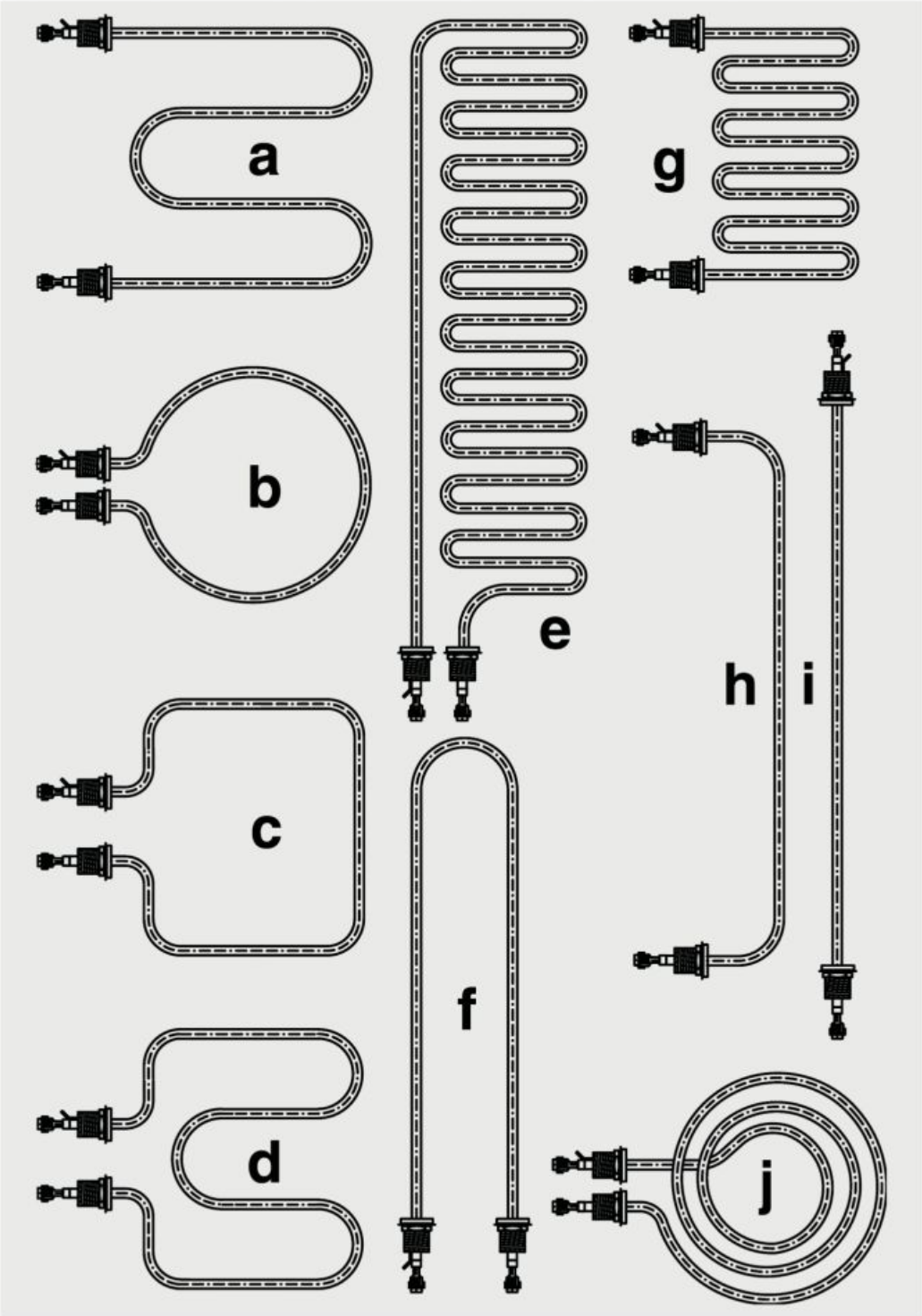
VTEE's manufacture heating elements for all brands of coffee/cappuccino machines, eg. Rancilio, Cecilware, Gaggia, Brugnetti, Faema, Bezzera, Aurora, Brubar,
La Cimbali, Cafe Bar Haros, La Scotty's and La Pavoni.

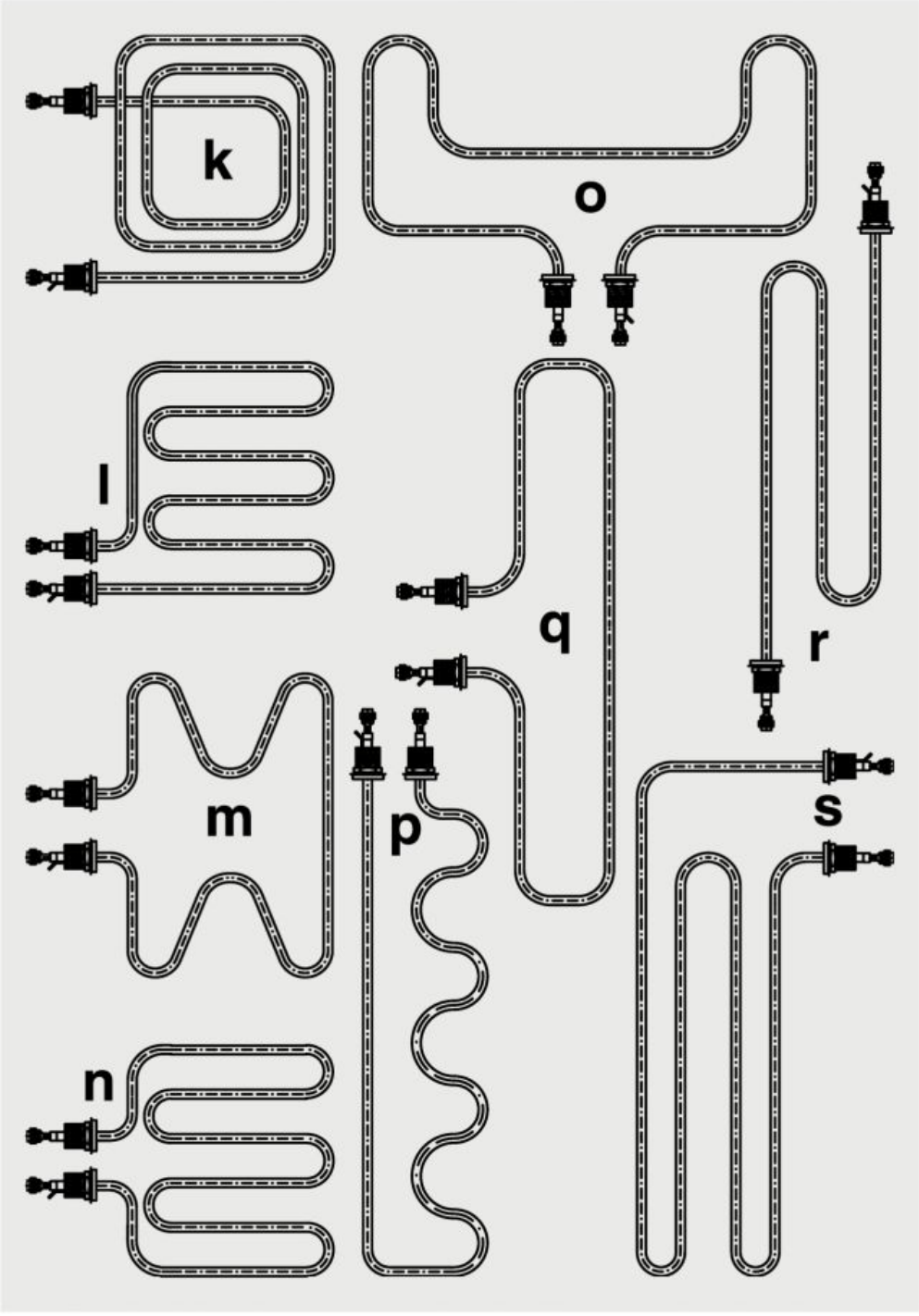
There are many unusual shapes and sizes of element fittings/bosses that are used which are not stock items. The original boss would need to be supplied (which would be reworked) and new elements can be fitted, saving time and money on units imported from Europe.



Common Element Shapes

Most common shapes used within the Commercial Food Industry.

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Section 15

Leisure Industry

Heating Elements for swimming pools, spa, sauna and steam rooms

VTEE manufactures a large range of heating elements that are used for swimming pools, spa, sauna and steam room electric heaters of all makes and models.

Electric elements manufactured by VTEE are unique in design and are manufactured using special processes and materials. Electrical testing and quality inspection are performed several times during production and elements not achieving Thermal's high quality standards are discarded. All materials used to manufacture our heating elements are of the highest grade and quality available today, which eliminates performance problems. This ensures that our elements operate and comply with all electrical standards world wide concerning earth leakage and residual current leakage.
An element sheath that is very highly resistant to corrosion is used, enabling the elements to last much longer than standard type elements when introduced to extreme conditions such as high chlorine and PH levels.

Many shapes, sizes, voltages and element configurations are available.

Section 16

Infrared & Fan Heaters

Axial Hot Boxes

The Axial Hot Box is particularly suitable for use in incubator rooms, drying applications, shops, canteens, change rooms, green houses, nurseries, computer rooms and general purpose heating applications.
(Pictured with optional wall/ceiling mount bracket)

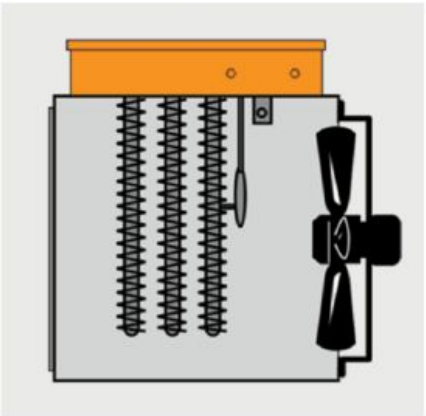
Features

HBA Series are of robust construction, simple to operate and have the following features:

- Single diffuser allowing air flow to be directed as required
- Manual reset cutout protects the heater should the air flow be interrupted
- Low watt density stainless steel finned air heating elements to ensure long life
- 4.5 - 18kW units are supplied with a three phase contactor
- Totally enclosed motor with self-oiling noiseless bearings
- Ambient operating environment -40°C to +60°C
- Normal control thermostat 0-40°C
- Delivers approximately 460 litres of air per second
- Cable entry gland for direct wiring on all models
  Free standing heater suitable for wall and ceiling mounting
- Approx. weights: 2kW - 12kW units - 12kg; 15kW & 18kW units - 15kg
- Compact sizes
  2kW - 12kW: 440mm high x 480mm long x 350mm wide
  15kW & 18kW: 490mm high x 630mm long x 350mm wide
- Powder coated finish
- 2m Lead and plug (10A on 2kW, 15A on 3kW)

Part #	Loading kW	Amps/ Phase	Unit Voltage	Air Temp Rise °C	Safety High Limit Setting @ 15 °C Amb.
HB20240	2.0	10A/1P	240	2.5*	60°C
HB30240	3.0	15A/1P	240	4.0*	60°C
HB45415	4.5	7A/3P	240/415	5.5*	60°C
HB60415	6.0	9A/3P	240/415	7.5*	75°C
HB75415	7.5	10A/3P	240/415	9.7*	95°C
HB90415	9.0	12.5A/3P	240/415	10.5*	105°C
HB12415	12.0	16.7A/3P	240/415	14.5*	120°C
HB15415	15.0	21A/3P	240/415	17.5*	120°C
HB18415	18.0	25A/3P	240/415	23.0*	120°C

* Dependent on application



Centrifugal Hot Boxes

The Centrifugal Hot Box incorporates a single speed fan which provides a continuous flow of air at relatively low noise levels, enabling these heaters to be used for comfort heating and ventilation in a variety of commercial/industrial situations as well as process heating applications.

Features

HBC Series incorporates the following features:

- These units are supplied with castors for ease of movement and can be coupled to ducting systems.
- A 165W 240V electric motor delivers 450 litres per second
- Two stage heat output - 10.5 and 21kW.
- The units can be run with fan only for air movement and ventilation
- Over temperature safety cut out and manual reset button - temp. of intake air should not exceed 75°C
- Fan Run on timer
- Contactors and selector switch, internal wiring, all provided complete with a 2.5m long flexible lead terminated with a 3 phase 5 pin 32 amp plug
- Low watt density stainless steel finned air heating elements for long life
- Three phase, four wire Star connection
- Powder coated finished unit, which measures 660mm long x 480mm wide x 700mm high.
- Weighs approx 50kg.
- Different wattages available on request

Part #	Loading kW	Amps/ Phase	Unit Voltage	Air Temp Rise °C		Safety High Limit Setting
				10.5kW 30°C*	21kW 52°C*	
HBC21415	21.0	29.2	240/415			110°C

* Dependent on application

Explanation of Infrared Heating

Infrared heating is a misconceived technology that many feel is difficult and complicated to apply. While the theory can be complicated, it is far easier to apply when guidance and understanding is given on various heating methods best suited to your application.

The main modes of transferring heat are:

Convection Heating
Where heat energy is transferred from a higher temperature region in a gas or liquid to a lower temperature region as a result of movement of masses within the gas or liquid,
eg. tank or vessel heating.

Conduction Heating
Where two masses of different temperatures are brought into contact with each other and heat is transferred from the hotter to the cooler body, eg. platen heating and extrusion barrels.

Radiation Heating
Where Infrared Radiant energy is transported through space by electromagnetic waves without the need of a conductive medium, allowing heat to be delivered in concentrated areas at very fast rates. Electromagnetic radiation is broken down into four categories:

Ultraviolet | Infrared (Short, Medium and Long wavelength) | Microwave | Induction

Radiant infrared heating is used in many industries, such as:

Textiles
To set nylon and perlon threads
Drying washed and dyed fabrics

Food
Baking
Keeping food warm
Packaging of food products

Plastics & Rubber
Thermoforming
Vacuum forming
Laminating
Pre-heating rubber prior to extrusion

Miscellaneous Processes
Drying and curing of paint and powder coatings
Ink drying
Preheating moulds
Evaporation of water
Maintaining precise environmental temperatures
Drying of skins and colour spraying of leather

Pulp & Paper
Adhesive activation
Drying of pulp paper

Indoor Warmzone

With the flick of a switch the HLX modular heating system provides instant warmth with the flexibility of a modern lighting system. Neatly designed to blend in with all decors. Simple to install in virtually any configuration and with far less pre-heating and wasted heat than other forms of space heating, with generously competitive running costs.

User Applications

- With the HLX modular heating system any work area can be heated instantly, when you really need it, with the flick of a switch
- Ideal application areas for the Warmzone system:
  - Churches
  - Despatch Areas
  - Garages
  - Milking Sheds
  - Offices
  - Halls
  - Factories
  - Squash Courts
  - Textile Mills
  - Workshops
  - Packing Rooms
  - Shops
  - Joiners
  - Restaurants
  - Outdoor undercover entertaining areas
  - Process Lines
  - Frost Protection
  - Studios
  - Warehouses

Wall Mounting

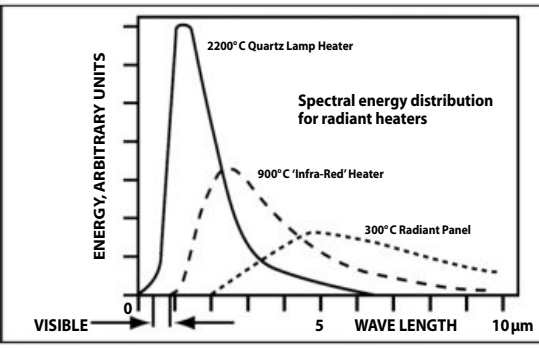
Fix bracket at recommended height for each model. Fasteners and plugs MUST be suitable for the type of wall surface and weight of the heater. Leave a minimum air gap of 45cm (18 in) between the top of the heater and the ceiling or roof.

Recommended Mounting Heights

- 1 x HLX 15 - min 2.2 metres max 3.0 metres
- 2 x HLX 15 - min 2.2 metres max 3.5 metres

	1 x HLX15	2 x HLX15	3 x HLX15
Rating	1.5kW	3kW	4.5kW
Length	400mm	400mm	400mm
Height	140mm	300mm	450mm
Depth	85mm	85mm	85mm
Weight	1.75kg	3.5kg	5.5kg

COMPARISON OF TYPICAL RADIANT HEATING SYSTEMS



All dimensions and weight nominal. Electricity supply 240V single phase + earth or 415V 3 phase + neutral. All heaters must be adequately earthed. For multiple installations the use of a qualified electrician is recommended.
All models are supplied with a mounting bracket to enable heat to be directed where required.
Average lamp life 7,000 hours.
All HLX models are pre-wired ready to install with 240V 1500W ruby red quartz lamps as standard.

Outdoor Warmzone

The Outdoor Warmzone incorporates the very latest developments in infrared heating technology. Safe, silent and beautifully functional, the Outdoor Warmzone is designed to enable you to make the most of your outdoor area - the perfect versatile heat source.

Benefits of using the Warmzone heaters

- The perfect solution for commercial and industrial zone heating, inside or out
- Can be mounted overhead to save floor space - suitable for both wall or umbrella mounting
- Competitive prices
- Technical Support
- Design and planning advice
- Full range of infrared heaters for both fixed and mobile systems

Technical Specifications

- Infrared technology: Instant heat using quartz halogen emitters with a tungsten filament
- Body formed from aluminium and heat resistant thermoplastic
- Designed and manufactured to comply with IP55
- Power supply 220/240V 50/60Hz
- 1500W output - lamp life: 5,000 hours
- Anti-shock emitter mounting system
- Unique and patented design - size: 480mm long x 120mm high x 120mm deep
- Weight of individual heater only 1.7kg
- The thermal effect is significantly improved over existing products due to the revolutionary design combining a very effective reflector with a glass free front face.

Installation

Should be carried out by a qualified electrician and in accordance with SAA current edition regulations and any local Electrical Supply Industry Regulations.
All units must be adequately earthed and be fitted to a suitably rated isolator. MCB's with an instantaneous tripping co-efficient in the range of 7 to 10 times rated current and to the ratings specified on drawings should be used. Cable rating should be to the relevant table set out in the SAA Regulations. Voltage drop from distribution point must be accounted for. Heaters must not be installed in hazardous or explosive conditions.

Ceramic Radiation Heating Elements

Rectangular

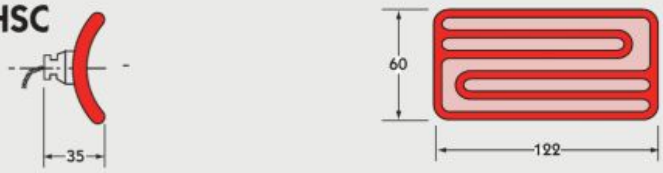
Voltage 230V

FSC (curved version)

FSF (flat version)

Ratings (watts)	150	250	300	350	400	500	650	750	1000
Mean surface temperature C	235	340	370	400	420	450	520	555	600
Peak wavelength µm	5.7	4.7	4.5	4.3	4.1	4	3.6	3.5	3.3

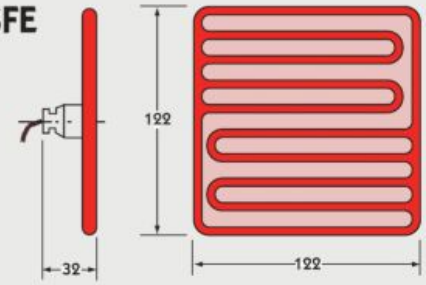
HSC



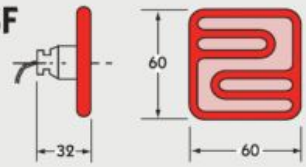
HSF

Ratings (watts)	125	150	200	250	325	375	400	500
Mean surface temperature C	340	370	420	450	520	540	570	600
Peak wavelength µm	4.7	4.5	4.1	4	3.6	3.5	3.4	3.3

SFE



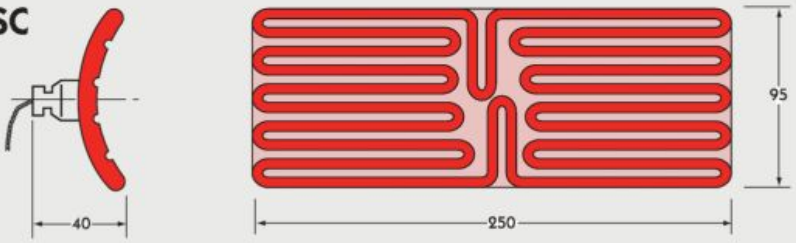
QSF



Ratings (watts)	50	150	250
Mean surface temperature C	175	450	590
Peak wavelength µm	6.4	4	3.3

Ratings (watts)	150	200	250	300	350	400	500	650	750	1000
Mean surface temperature C	235	300	340	370	400	420	450	520	555	600
Peak wavelength µm	5.7	5	4.7	4.5	4.3	4.1	4	3.6	3.5	3.3

LSC

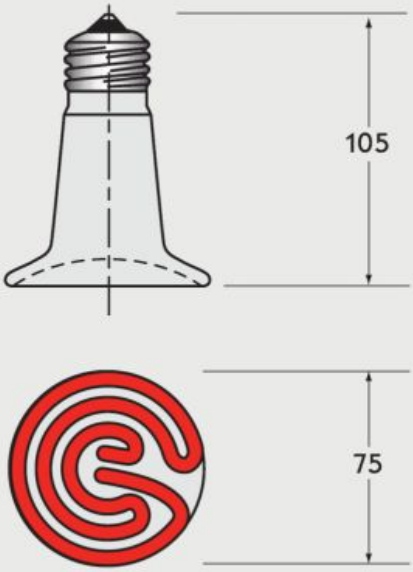


Ratings (watts)	1500
Mean surface temperature C	600
Peak wavelength µm	3.3

*All dimensions in millimetres

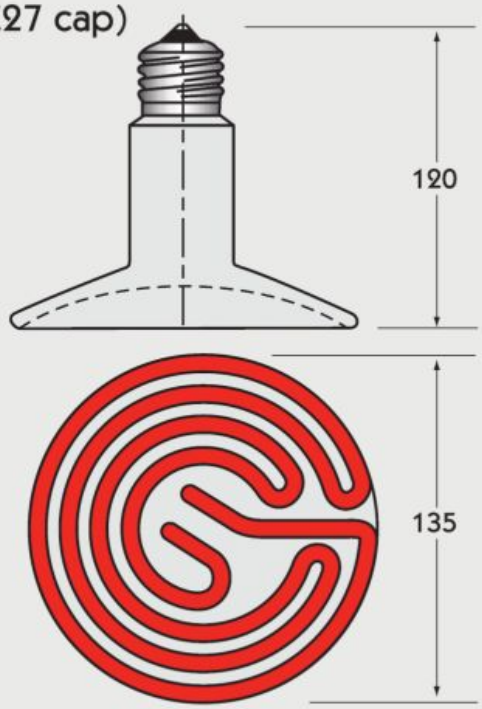
Circular

SFL 2 (E27 cap)



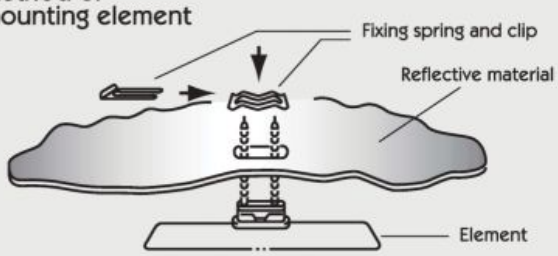
Ratings (watts)	60	75	100
Mean surface temperature C	200	235	275
Peak wavelength µm	6.1	5.7	5.3

SFL 1 (E27 cap)

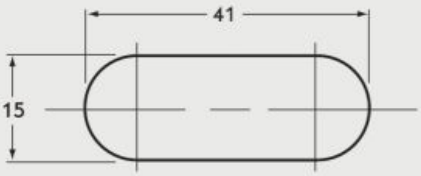


Ratings (watts)	150	250	500
Mean surface temperature C	230	300	480
Peak wavelength µm	5.7	5	3.9

Method of mounting element



*All dimensions in millimetres



Cut out for mounting lug

Ceramic Heater Selection Chart

Application	150	250	300	400	500	650	750	1000
Water Evaporation					■	■	■	■
Powder Coating			■	■	■			
Vacuum Forming			■	■	■	■	■	■
Screen Printing			■	■	■			
Drying Textiles	■					■	■	■
Pre-Heating Moulds			■	■	■			
Drying or Curing Plastics			■	■				
Drying Adhesives						■	■	■
Drying of Skins & Colour Spraying Leather	■	■	■					
Drying of Pulp Paper	■	■	■					
Food Warming & Cabinets	■	■	■	■	■	■		
Heat/Dry Glued Joints				■	■			
Stress Curing of Synthetic Fibres			■	■	■			
Drying Grains	■	■						
Drying Ore Samples			■	■				
Maintain Precise Environmental Temperature			■	■	■			
Low Temperature Drying of Atomised Chemicals & Vitamins			■	■	■			

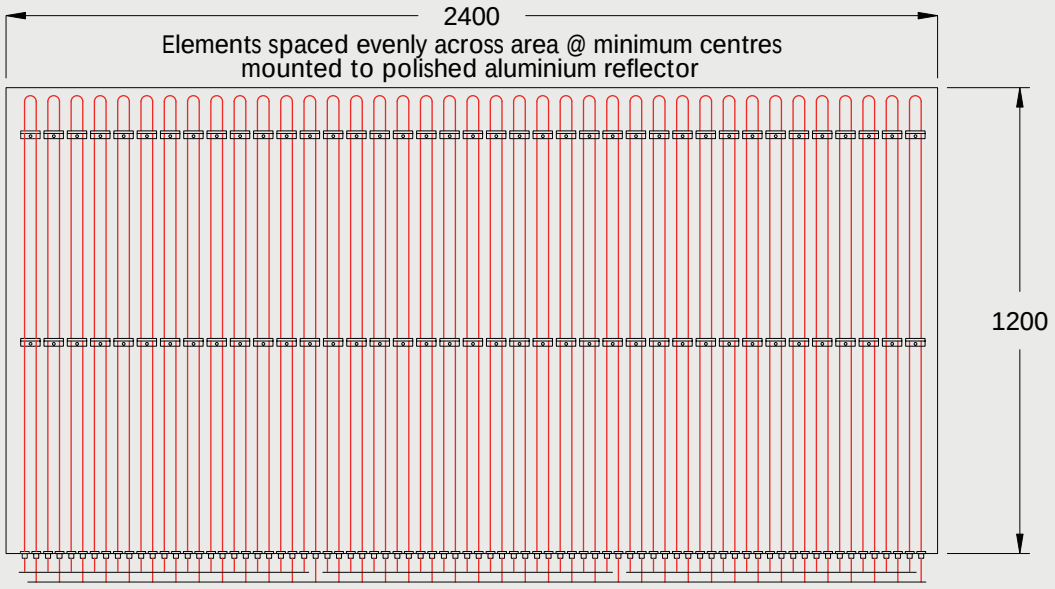
Metal Sheath Infrared Heating

In the past, metal sheath infrared heaters were considered inefficient.
Through an extensive research and development program, Thermal can now offer a black radiation metal sheathed infrared heating element, or system, to suit your every need.
This is an efficient and robust method of heating and can handle a vast range of conditions, such as constant splashing and vibration. Special polished units are available, their exceptional cleanliness qualities making them ideal for use in the food processing and dairy products industries. Polished Aluminium or Stainless Steel reflectors are used to reflect 80% of the infrared radiation and help to direct heat in a controlled direction.

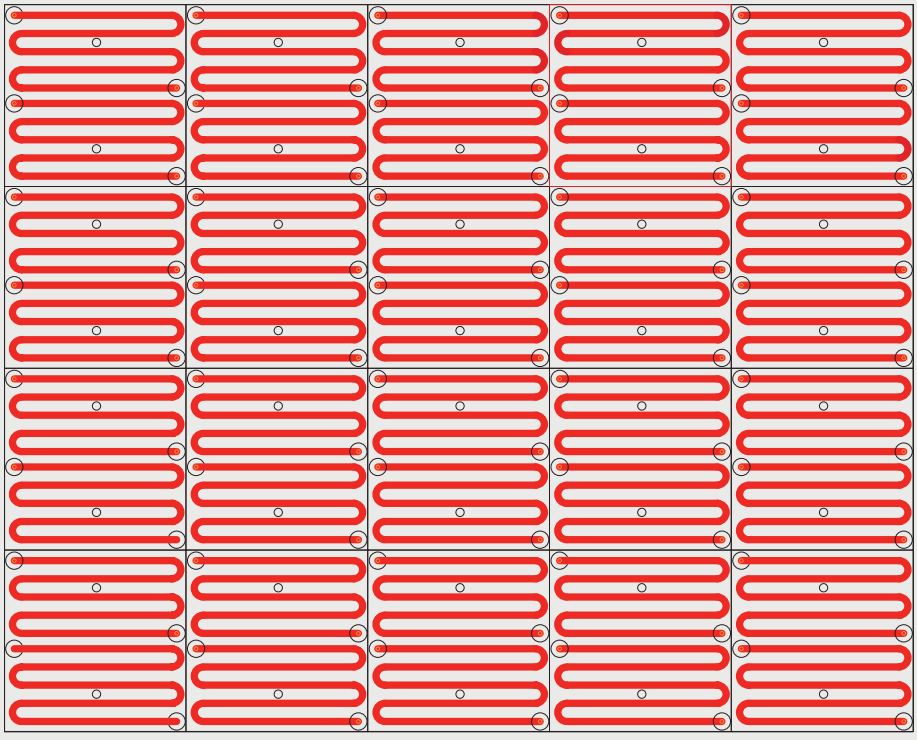
Thermal Black Radiation metal sheathed infrared heaters can be used for:

- Curing
- Drying
- Softening of resins, vinyls and plastics
- Baking, drying and curing of paint, lacquers, adhesives and inks
- Vacuum forming
- Drying paint on textiles
- Mass heating
- Comfort heating

Various metal sheathed Infrared layouts - For maximum efficiency



Element layout for thermoforming machine



Layout of SS infrared heating elements over an area of 1000mm x 800mm
20 heater assemblies were used with 40 separate heating zones

Comparison of Typical Performance

Type of Heater	Wavelength of peak Emission	Temp. of Emitter	Typical Radiant Efficiency	Approx Heat Up Time	Approx Cool Down Time	Resistance to Vibration, Physical & Thermal Shock
Short Wave Quartz tubes Tungsten filament in sealed quar z tube, evacuated or partially filled with halogen/inert gas. Variants have back of tube gold plated: twin tubes; water cooled tubes	0.9 to 1.6µm (1.3µm Typical)	2200°C Typical	80%	2 secs	2 secs	Filament and tube fragile
Tungsten Filament Bulbs Inert gas filled glass bulbs. Variants have back surface metal coated.	0.9 to 1.6µm (1.3µm Typical)	2200°C Typical	75 - 80%	2 secs	2 secs	Filament and bulb fragile
Medium Wave Quartz Tubes Nichrome resistance spiral in unsealed quartz tube. Variants have back of tube gold plated; twin tubes	2.0µm to 3.6µm	1000°C to 750°C	To 70%	30 - 90 secs	10 - 20 secs	Quartz Tube fragile
Ceramic Elements Nichrome resistance spiral embedded in fired and glazed hollow ceramic body.	2.9µm to 4.3µm	750°C to 400°C	To 90%	4 - 9 mins	10 - 15 mins	Fragile, tolerates water splash
Metal Sheathed Elements Nichrome spiral in roll compacted magnesium oxide powder, sheathed in nickel alloy tube.	2.9µm to 5.0µm	780°C to 350°C	60%	3 - 8 mins	8 - 12 mins	Very robust. Tolerates water splash

Section 17

Thermocouples

Thermocouples

Various styles of thermocouples for the smelting, heat treatment and furnace manufacturing industries are available through VTEE. Styles include straight or angled, with single, duplex or triplex elements and numerous cold leg materials and terminal heads. Protective sheath materials include Sialon, Silicon Carbide, Laminated Ceramic, Plumbago, Chrome Iron, Cast Iron, Inconel 600 and 601, 253MA, 316-310 SS, Pythagoras GR61, Alsint AL23, Mulite, Sillimantin.

A full range of lance dip probes are available, incorporating the MARSHALL Type K and N replaceable 8 inch long life chrome iron tips.

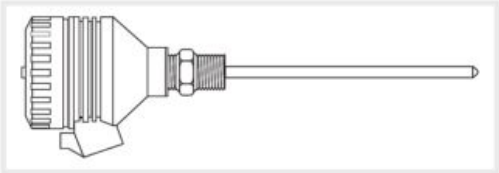
Applications

Specifically designed for non-ferrous metals, aluminium, copper, brass, bronze or salt baths at temperatures to 1300°C.

Various styles of thermocouples and sensors are manufactured for the petrochemical industries. The sensors shown are a small example of what is available. Assemblies available with single and duplex elements in numerous OD sizes, insulated or bonded thermocouple junctions, element sheath materials, spring loaded for terminal blocks and barrel unions.
Also available are thermowells - fabricated or machined bar stock; screwed or flanged; in various metals; specialty coatings; weld on pads; ceramic sheaths; barrel unions; nipples; a large range of mounting hardware; terminal head materials - alloy, cast iron, SS, plastic, bakelite and SAA approved explosion proof Ex 'd'.

Thermocouple Styles

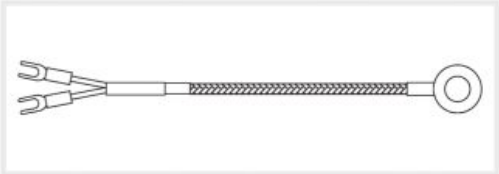
1. Ex 'd' certified terminal head



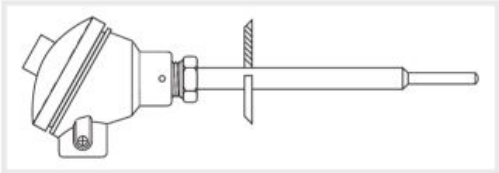
2. Basic Mims thermocouple c/w pot seal

3. Adjustable YM3 bayonet cap thermocouple c/w adaptor

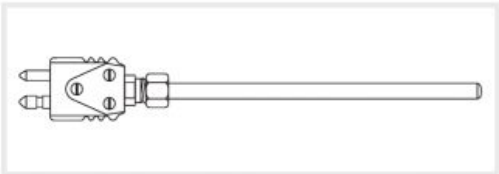
4. Washer style sensor to bolt onto surface



6. Triclover process connection Hygienic welds, reduced tip

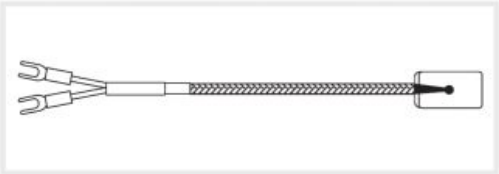


7. Large plug and tube adaptor fitted to thermocouple

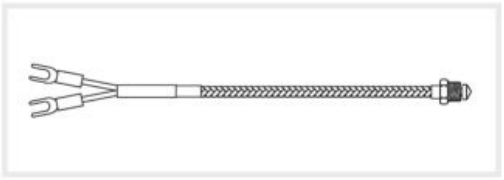


8. Large plug fitted to bayonet thermocouple

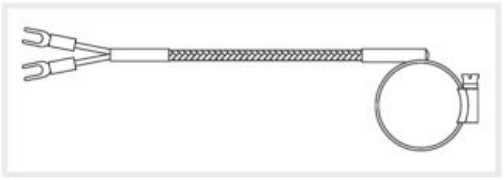
9. Leaf style sensor to fit under heating element



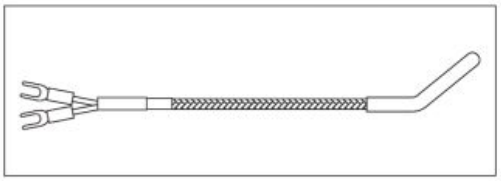
5. Bolt in sensor YM4 stainless steel braided tails



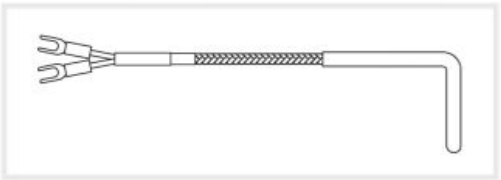
10. Hose clamp sensor



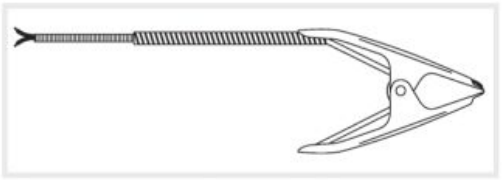
11. Basic wire thermocouple with 45 degree bend



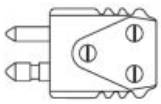
13. Basic wire thermocouple with 90 degree bend



12. Handi clamp product sensing thermocouple

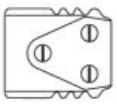


Large plug with round pins



Part # 1060

Large socket



Part # 1010

Section 18

Thermalfold Bolt Heaters

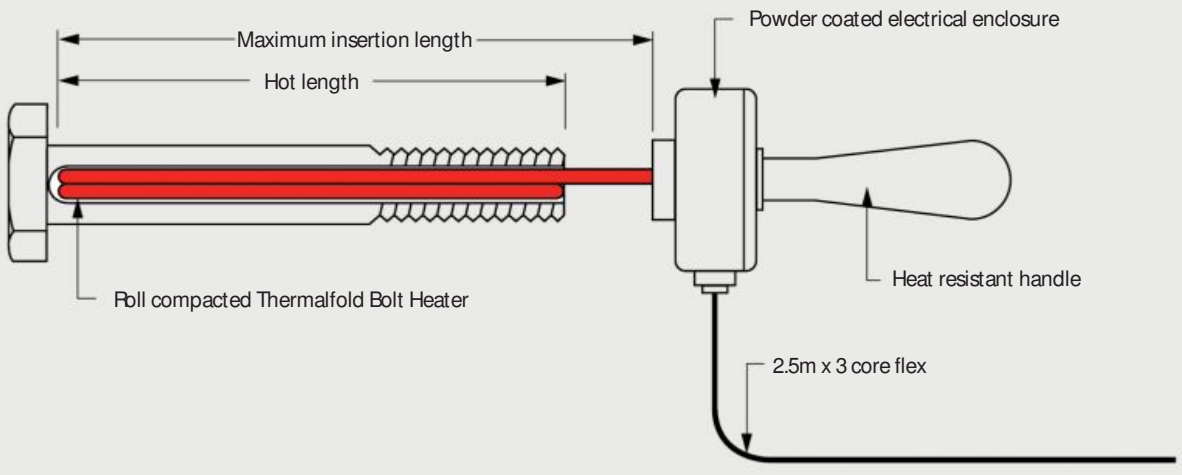
Thermalfold Bolt Heaters

Thermalfold Bolt Heaters are used as an aid to tighten large bolts in heavy machinery and equipment. When inserted into a drilled hole in the bolt, the Thermalfold Bolt Heater rapidly heats the bolt, causing expansion and increasing the bolts length. This allows the nut to be further tightened. When the heater is switched off and removed, the bolt begins to cool and contracts to its original length, ensuring an extra tightened assembly.

Thermalfold Bolt Heaters are of a unique design and can be used in holes which have been drilled up to 0.5mm larger than the bolt heater diameter. When energised, the elements heat up and spring open due to their folded construction. This ensures a quick heat transfer to the bolt. While in the heated condition they are a snug fit and impossible to remove. On cooling, Thermalfold Bolt Heaters contract back to their original diameter and become very easy to remove. Conventional bolt heaters will fail under these conditions. A roll compacted high grade stainless steel construction enables a maximum heater temperature of 600°C giving a faster heat up time, with minimum heat transfer or loss to the area surrounding the bolt.

Bolt heaters are used in industries such as building and construction, boiler manufacturing, power plants, mining, shipyards, large machine and die manufacturers. Typical applications include large compressors, turbines, pressure vessels, steam generators, engine heads, large cylinders and die blocks.

Typical VTEE Bolt Heater Design



Product Range

Diameter	Hot Length	Insertion Length	Watts	Part #	Type	W/in²
8mm Ø	250	325	500	BOH825	Split - 5mm	41
	500	575	1000	BOH850	Split - 5mm	41
	750	825	1500	BOH875	Split - 5mm	41
	1000	1075	2000	BOH8100	Split - 5mm	41
	1250	1325	2500	BOH8125	Split - 5mm	41
	1500	1575	3000	BOH8150	Split - 5mm	41
	1750	1825	3500	BOH8175	Split - 5mm	41
	2000	2075	4000	BOH8200	Split - 5mm	41
11mm Ø	250	325	500	BOH1125	Split - 5mm	41
	500	575	1300	BOH1150	Split - 6.35mm	42
	750	825	2000	BOH1175	Split - 6.35mm	42
	1000	1075	2500	BOH11100	Split - 6.35mm	42
	1250	1325	3250	BOH11125	Split - 6.35mm	42
	1500	1575	4000	BOH11150	Split - 6.35mm	42
	1750	1825	4750	BOH11175	Split - 6.35mm	42
	2000	2075	5000	BOH11200	Split - 6.35mm	42
13mm Ø	250	325	750	BOH1325	Foldback - 6.35mm	26
	500	575	1500	BOH1350	Foldback - 6.35mm	26
	750	825	2000	BOH1375	Foldback - 6.35mm	26
	1000	1075	3000	BOH13100	Foldback - 6.35mm	26
	1250	1325	3750	BOH13125	Split - 6.35mm	62
	1500	1575	4500	BOH13150	Split - 6.35mm	62
	1750	1825	5250	BOH13175	Split - 6.35mm	62
	2000	2075	6000	BOH13200	Split - 6.35mm	62
17mm Ø	250	350	850	BOH1725	Foldback - 7.9mm	22
	500	600	1700	BOH1750	Foldback - 7.9mm	22
	750	850	2500	BOH1775	Foldback - 7.9mm	22
	1000	1100	3500	BOH17100	Split - 7.9mm	46
	1250	1350	4250	BOH17125	Split - 7.9mm	46
	1500	1600	5000	BOH17150	Split - 7.9mm	46
	1750	1850	6000	BOH17175	Split - 7.9mm	46
	2000	2100	7000	BOH17200	Split - 7.9mm	46

Please note: Special wattages, voltages, diameters and lengths are available and manufactured to suit your requirements - Call Thermal with your specific details and we will design it for you.

Diameter	Hot Length	Insertion Length	Watts	Part #	Type	W/in^2
20mm Ø	250	350	1250	**BOH2025**	Foldback - 7.9mm	32
	500	600	2500	**BOH2050**	Foldback - 7.9mm	32
	750	850	3750	**BOH2075**	Foldback - 7.9mm	32
	1000	1100	5000	**BOH20100**	Foldback - 7.9mm	32
	1250	1350	6250	**BOH20125**	Foldback - 7.9mm	32
	1500	1700	7500	**BOH20150**	Foldback - 7.9mm	32
	1750	1950	8750	**BOH20175**	Foldback - 7.9mm	32
	2000	2200	10000	**BOH20200**	Foldback - 7.9mm	32
25mm Ø	500	600	2500	**BOH2550**	Foldback - 10.7mm	24
	750	850	3750	**BOH2575**	Foldback - 10.7mm	24
	1000	1100	5000	**BOH25100**	Foldback - 10.7mm	24
	1250	1450	6250	**BOH25125**	Foldback - 10.7mm	24
	1500	1700	7500	**BOH25150**	Foldback - 10.7mm	24
	1750	1950	8750	**BOH25175**	Foldback - 10.7mm	24
	2000	2200	10000	**BOH25200**	Foldback - 10.7mm	24
32mm Ø	500	650	2500	**BOH3250**	Foldback - 10.7mm	24
	750	900	3750	**BOH3275**	Foldback - 10.7mm	24
	1000	1050	5000	**BOH32100**	Foldback - 10.7mm	24
	1250	1450	6250	**BOH32125**	Foldback - 10.7mm	24
	1500	1700	7500	**BOH32150**	Foldback - 10.7mm	24
	1750	1950	8750	**BOH32175**	Foldback - 10.7mm	24
	2000	2200	10000	**BOH32200**	Foldback - 10.7mm	24

Please note: Special wattages, voltages, diameters and lengths are available and manufactured to suit your requirements - Call Thermal with your specific details and we will design it for you.

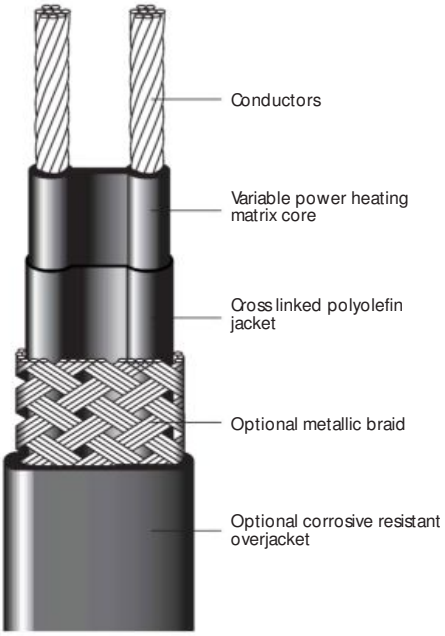
Section 19

Electric Heat Tracing

Electric Heat Tracing

HTSX - Self Regulating Heating Cable

Applications - HTSX cables are used primarily for process maintenance and frost protection of piping which could be subject to steam cleaning up to 12 BARG saturated steam. HTSX was the first matrix heater for process maintenance of temperatures up to 121°C. The low inrush feature of HTSX cable eliminates excessive 'start up' current. Options include braid and overjacket.



BSX - Self Regulating Heating Cable

Applications - BSX cables are used primarily for process maintenance and frost protection of piping in hazardous, non-hazardous or corrosive areas. Options include braid and overjacket.

RSX - Self Regulating Heating Cable

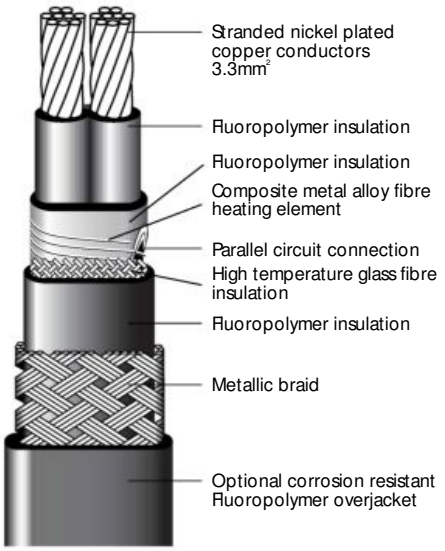
Applications - RSX cables are used primarily for process maintenance and frost protection of piping in hazardous, non-hazardous or corrosive areas. Able to run at higher amperage than the BSX cable. Options include braid and overjacket.

FLX - Self Regulating Heating Cable

Applications - FLX cables are designed to provide freeze and temperature maintenance to metallic and non-metallic piping, tanks and equipment. Options include braid and overjacket.

HPT - Power Limiting Heating Cable

Applications - HPT parallel resistance cables are designed for heating applications ranging from water freeze protection to process maintenance temperatures as high as 149°C. HPT is ideal for applications where steam purging or upset conditions preclude the use of lower temperature rated heat tracing cables. HPT is rated for a maximum continuous exposure temperature of 260°C (cable de-energised). Options include braid and overjacket.



EconoTrace - Constant Wattage Heating Cable (Type FP)

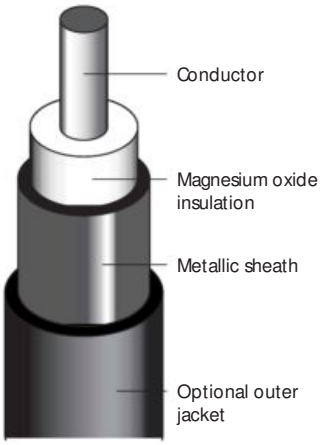
Applications - EconoTrace Type FP parallel resistance, constant wattage heating cables are for water freeze protection and process temperature maintenance up to 65°C. Options include braid and overjacket.

Part #	Heater Type	Watt Density (w/m)	Standard Voltage VAC	Electrical Insulation	Max Maint. Temp °C	Max Cont. Exposure Temp °C
HTSX 3	Self Regulating	10	120/240	Teflon FEP	121	191
HTSX 6	Self Regulating	20	120/240	Teflon FEP	121	191
HTSX 9	Self Regulating	30	120/240	Teflon FEP	121	191
HTSX 12	Self Regulating	39	120/240	Teflon FEP	121	191
BSX 3-2	Self Regulating	10	240	Cross-Linked Polyolefin	65	85
BSX 5-2	Self Regulating	16	240	Cross-Linked Polyolefin	65	85
BSX 8-2	Self Regulating	26	240	Cross-Linked Polyolefin	65	85
BSX 10-2	Self Regulating	33	240	Cross-Linked Polyolefin	65	85
RSX 10	Self Regulating	33	120/240	Cross-Linked Polyolefin	65	85
RSX 15	Self Regulating	48	120/240	Cross-Linked Polyolefin	65	85
FLX 5-2	Self Regulating	16	240	Cross-Linked Polyolefin	65	85
FLX 10-2	Self Regulating	33	240	Cross-Linked Polyolefin	65	85
FLX 15-2	Self Regulating	49	240	Cross-Linked Polyolefin	65	85
HPT 5	Power Limiting	16	120/240	Teflon PFA	149	260
HPT 10	Power Limiting	33	120/240	Teflon PFA	149	260
HPT 15	Power Limiting	49	120/240	Teflon PFA	149	260
HPT 20	Power Limiting	66	120/240	Teflon PFA	149	260
FP 2.5	Constant Watt Parallel	8	120/240	Teflon FEP	65	204
FP 5	Constant Watt Parallel	16	120/240	Teflon FEP	65	204
FP 10	Constant Watt Parallel	33	120/240	Teflon FEP	65	204
FP10-4	Constant Watt Parallel	33	480	Teflon FEP	65	204
FP10-5	Constant Watt Parallel	33	480	Teflon FEP	65	204
MIQ	Constant Series Resistance		300/600	Magnesium Oxide (with alloy 825 sheath)	427	593

MIQ - Mineral Insulated Heating Cables

Applications **-** MIQ high temperature mineral insulated heating cables are used extensively for high temperature maintenance, high temperature exposure and/or high watt density applications which exceed the limitations of thermoplastic insulated cables.

Features **-** The MIQ range are manufactured using Alloy 825. Alloy 825 is a high nickel chromium alloy which is ideally suited for high temperature service and offers exceptional resistance to stress conditions in chloride, acid, salt and alkaline environments.



600V Rated Cable						300V Rated Cable			Resistance/ Conductor	
1	Diameter		2	Diameter		1	Diameter			
Conductor	in	mm	Conductor	in	mm	Conductor	in	mm	Ohms/ft	Ohms/m
			MIQ-R29S2	0.215	5.5	MIQ-28S2	0.13	3.3	5.5	18.04
			MIQ-R27S2	0.215	5.5				4.5	14.76
			MIQ-R25S2	0.215	5.5	MIQ-25S2	0.135	3.4	3	9.84
MIQ-R24S	0.146	3.7	MIQ-R24S2	0.245	6.2	MIQ-24S2	0.146	3.7	2	6.56
MIQ-R23S	0.17	4.3							1.6	5.248
						MIQ-23S2	0.173	4.4	1.375	4.51
MIQ-R22S	0.16	4.1	MIQ-R22S2	0.245	6.2	MIQ-22S2	0.18	4.6	1	3.28
MIQ-R21S	0.16	4.1							0.7	2.296
MIQ-R19S	0.18	4.6	MIQ-R19S2	0.265	6.7	MIQ-19S2	0.196	5	0.5	1.64
MIQ-R18S	0.2	5.1							0.38	1.246
			MIQ-R18S2	0.265	6.7	MIQ-18S2	0.16	4.1	0.35	1.148
MIQ-R17S	0.18	4.6							0.3	0.984
			MIQ-R17S2	0.265	6.7	MIQ-17S2	0.196	5	0.25	0.82
MIQ-R16S	0.18	4.6							0.2	0.656
MIQ-R15S	0.18	4.5	MIQ-R16S2	0.29	7.4	MIQ-16S2	0.215	5.5	0.15	0.492
MIQ-R14S	0.196	5	MIQ-R15S2	0.245	6.2	MIQ-15S2	0.146	3.7	0.1	0.328
MIQ-R13S	0.215	5.5							0.08	0.262
			MIQ-R14S2	0.29	6.2	MIQ-14S2	0.16	4.1	0.075	0.246
MIQ-R12S	0.196	5							0.07	0.23
MIQ-R9S	0.215	5.5							0.06	0.197
			MIQ-R13S2	0.265	6.2	MIQ-13S2	0.18	4.5	0.05	0.164
MIQ-R11S	0.245	6.2							0.04	0.131
			MIQ-R11S2	0.29	7.4	MIQ-11S2	0.196	5	0.035	0.115
MIQ-R10S	0.245	6.2							0.03	0.098
			MIQ-R10S2	0.315	8	MIQ-10S2	0.215	5.5	0.025	0.082
MIQ-R8S	0.196	5	MIQ-R9S2	0.315	8				0.02	0.066
			MIQ-R8S2	0.346	8.8				0.015	0.049
MIQ-R20NC	0.198	4.8	MIQ-R20NC2	0.299	7.6				0.1	0.0328
MIQ-R18NC	0.199	5.1	MIQ-R18NC2	0.309	7.9				0.0065	0.0214
MIQ-R16NC	0.212	5.4	MIQ-R16NC2	0.34	8.7				0.0041	0.0134
MIQ-R14NC	0.24	6.1	MIQ-R14NC2	0.387	9.9				0.0026	0.001
MIQ-R12NC	0.253	6.4	MIQ-R12NC2	0.434	11.1				0.0016	0.0053
MIQ-R10NC	0.286	7.3							0.001	0.0033
MIQ-R8NC	0.319	8.1							0.00064	0.0021

Cold Terminations for Heating Cables

Applications:

Silicone Cold End Terminations allow for simple on-site termination in both hazardous and non hazardous areas. Cold terminations are available for all parallel heating cables type : BSX, HTSX, HPT and FP.

ET-7C endcap

ET-8C endcap

ET-6C endcap

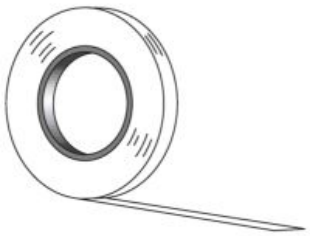
TBX-3L/4L powerboot

RTV silicone sealant

Cable Type Rubber	Endcap Type Silicone	Power Term. Type Silicone Rubber	Max Temp Rating
BSX-BC	ET-8C	TBX-3L	200°C
BSX-OJ	ET-8C	TBX-3L	200°C
BSX-FOJ	ET-8C	TBX-3L	200°C
HTSX-BN	ET-8C	TBX-3L	200°C
HTSX-FOJ	ET-6C	TBX-3L	200°C
HPT-BN	ET-7C (exp temp <200°C)	TBX-4L	200°C
HPT-FOJ	ET-8C (exp temp <200°C)	TBX-4L	200°C
FP-BN	ET-7C	TBX-4L	200°C
FP-FOJ	ET-8C	TBX-4L	200°C

*RTV silicone sealant rated at 265°C

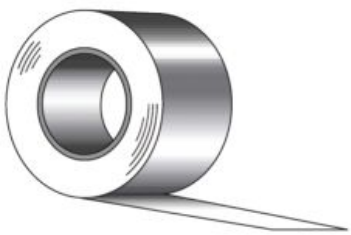
Approvals: When used in conjunction with heated cables type HTSX, BSX or HPT, the end terminations are approved by SAA for use in hazardous areas Zone 1 and 2.



FT Tape

Adhesive tapes for attachment of heated cables to piping.

Type	Size (L&W) (M x mm)	Max Exposure Temp
FT-1H	33 x 12	260°C



Aluminium Tape

Aluminium adhesive tape for parallel coverage of heating cable attachment of thermostat capillaries to piping and for attachment of heating cable to vessel walls.

Type	Size (L&W) (M x mm)	Max Exposure Temp
AL-20L	45 x 50	65°C
AL-30L	45 x 75	65°C
AL-20H	45 x 50	150°C
AL-30H	45 x 75	150°C

Section 20

Technical Information

Calculation for Superheated Steam

Example:
340kg per hour of steam with 90% quality, having an inlet gauge pressure of 700kPa is to be superheated to a temperature of 230°C. How many kilowatts of power is required?

From the reference guide (see next page):

1. Plot a point equalling 700kPa on the centre reference line of the pressure and saturated temp scale (**P**).

2. From that point, mark a line through 90% on the quality scale (**Q**) to the watt hour/weight scale (**W**). The answer is 82.5 Watts/kilogram.

3. Note that the saturated temperature of steam at 700kPa is 170°C. A temperature of 230°C is required, therefore a 60°C temperature rise is needed.

4. From the point of 700kPa plotted on the centre reference line of **P**, mark a line through 60°C on the **S** scale to the **W** scale. The answer is approximately 200 Watts/kilogram.

5. Subtract 82.5 from 200 = 117.5

6. Power required	= Weight x Watt hour/kilogram
	= 340kg x 117.5
	= 39,950 Watts
Always add 20% for loss	+ 7,990 Watts
Total power	= 47,940 Watts
Answer	= 48kW

Definitions

Saturated Temperature is the temperature at which water boils at a given pressure. At zero gauge pressure the temperature is 100°C (212°F), as steam pressure increases the saturated temperature increases - refer to the **P** reference scale.

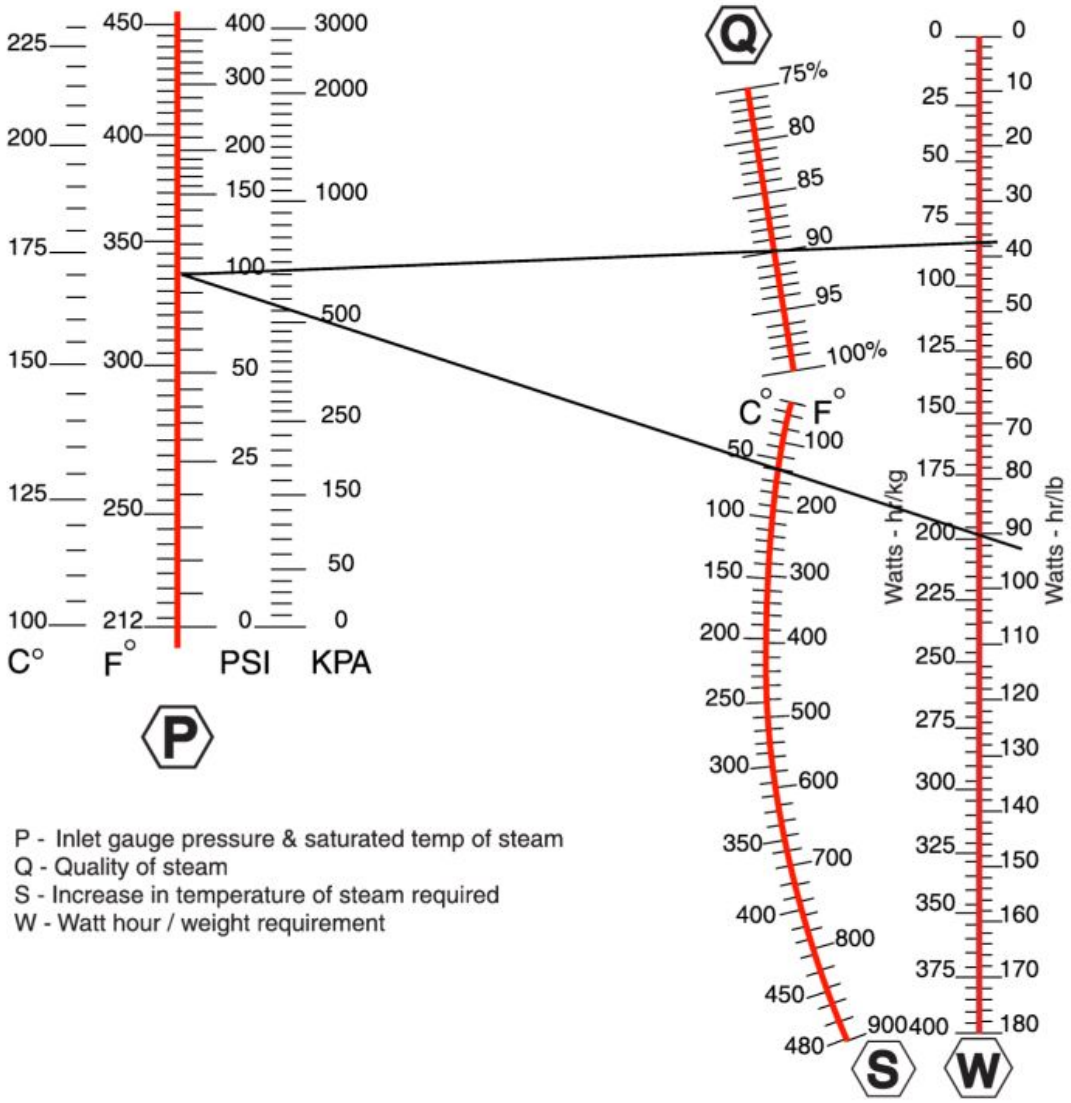
Quality of Steam is the amount of moisture present in the steam, which is measured as the percentage of the total weight. Quality of steam 100% minus the percentage of moisture content, therefore dry steam has 100% quality.

Degrees of Superheat is the increase of steam temperature above the inlet saturated temperature.

Watt hour per Weight is the power required to superheat the steam above the saturated temperature. This is known as Watts per hour per kilogram (pound) required.

Weight of Steam per hour is the flow rate of steam which will be passing through the electric heating unit per hour. This information is vital for the most efficient design of the heater.

Quick Reference Guide for Electrically Heated Steam



P - Inlet gauge pressure & saturated temp of steam
Q - Quality of steam
S - Increase in temperature of steam required
W - Watt hour / weight requirement

Watt Density to Element Sheath Temperature

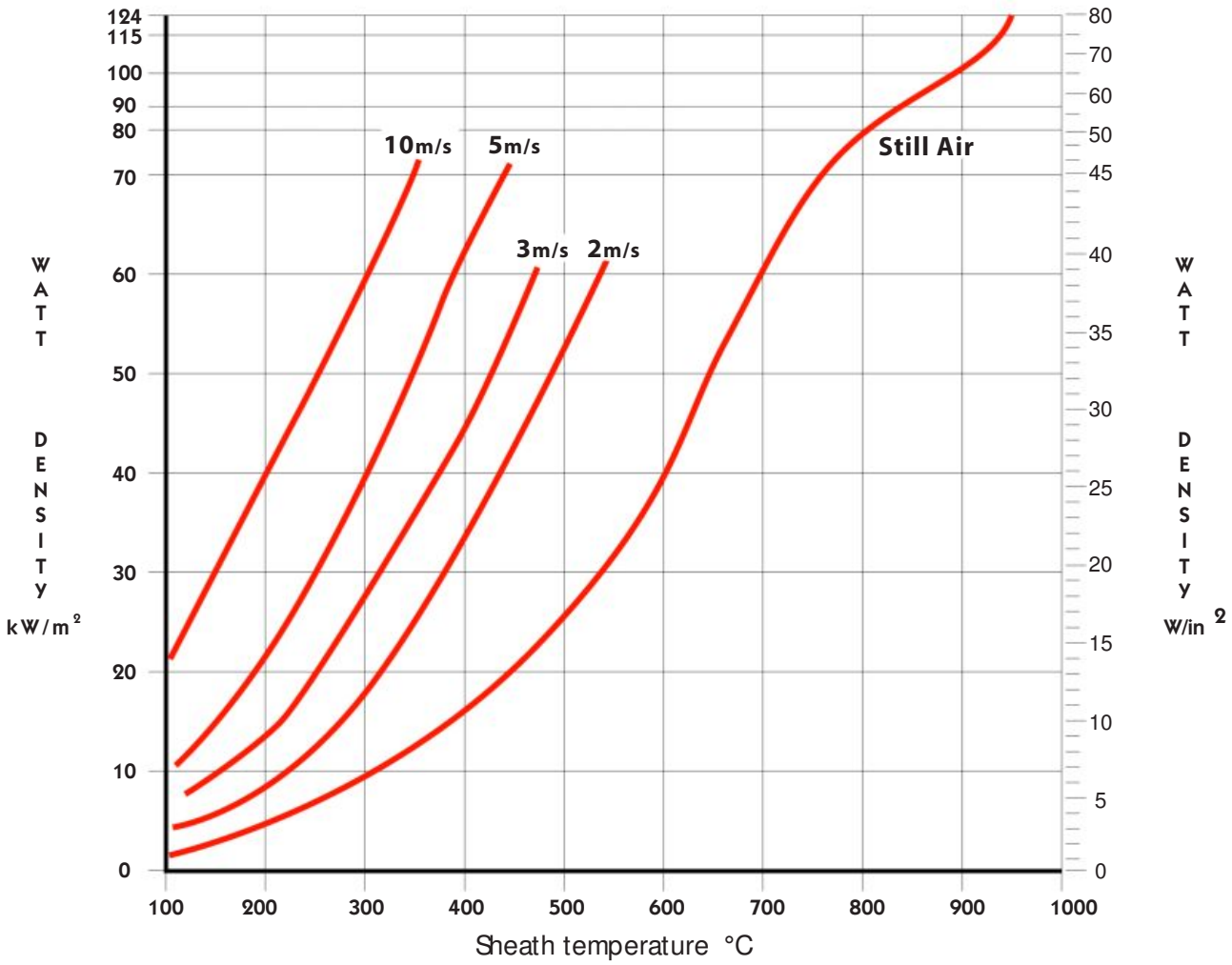
These temperatures are calculated based on a 20˚C ambient (70˚F) in still air

Watt Density			Sheath Temp	
kW/m^2	W/cm^2	W/in^2	°C	°F
1.55	0.16	1	90	195
3.1	0.3	2	135	275
4.0	0.38	2.5	155	310
4.6	0.46	3	175	350
6.2	0.62	4	215	420
7.75	0.78	5	260	500
9.3	0.93	6	290	555
12.4	1.24	8	360	680
15.5	1.55	10	400	750
18.6	1.86	12	450	840
23.25	2.32	15	485	905
31.0	3.10	20	530	985
38.75	3.88	25	580	1075
46.5	4.65	30	650	1200
54.25	5.42	35	685	1265
62.0	6.20	40	710	1310
70.0	7.0	45	750	1380
77.5	7.75	50	800	1470
93.0	9.3	60	860	1580
108.0	10.8	70	930	1705
124.0	12.4	80	950	1740

Surface temperature will vary depending on the application

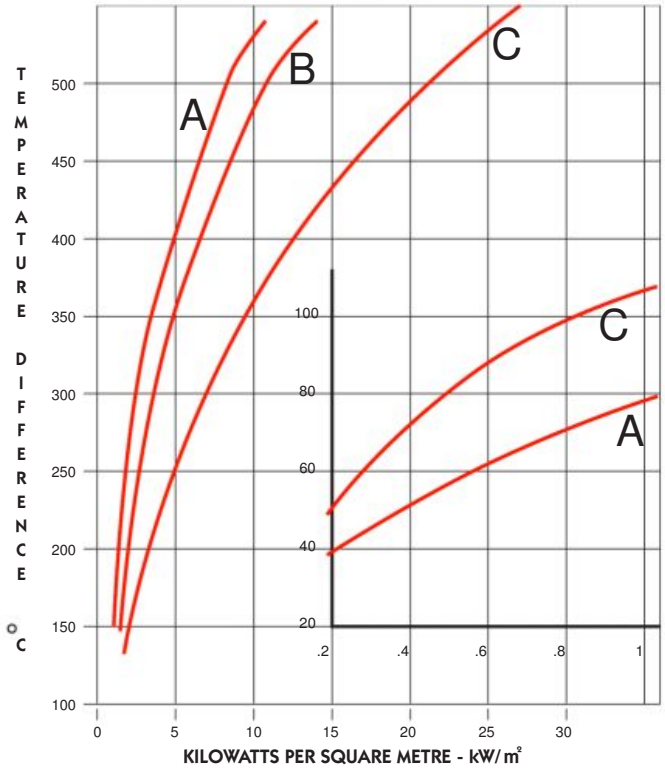
Sheath Temperature

Thermal tubular heating elements sheath temperature in still & moving air



Heat Loss

Losses - Uninsulated metal surfaces

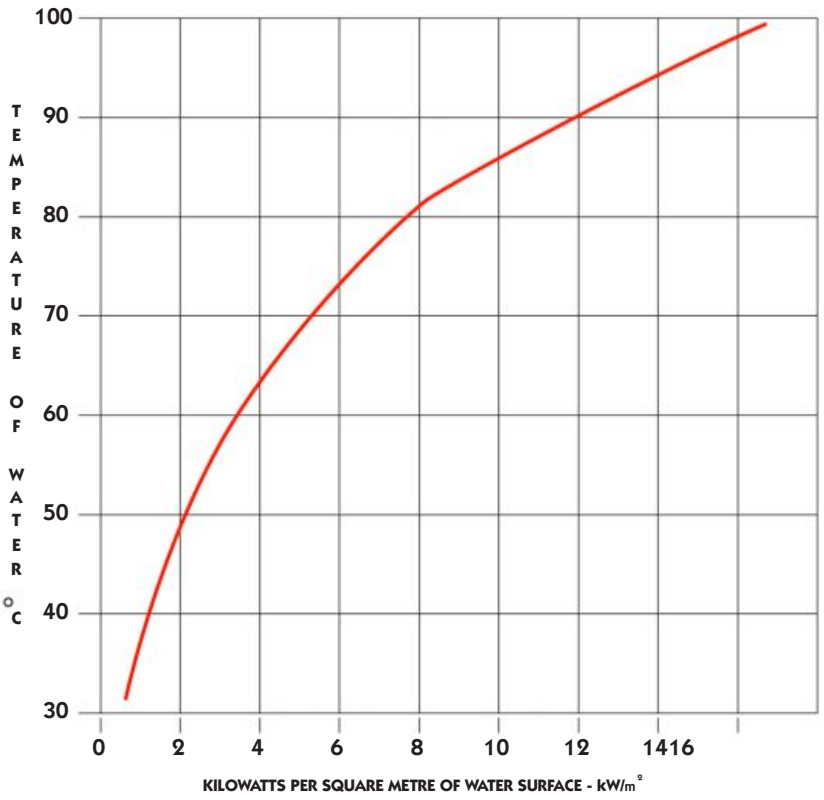


A. Oxidised aluminium vertical surfaces

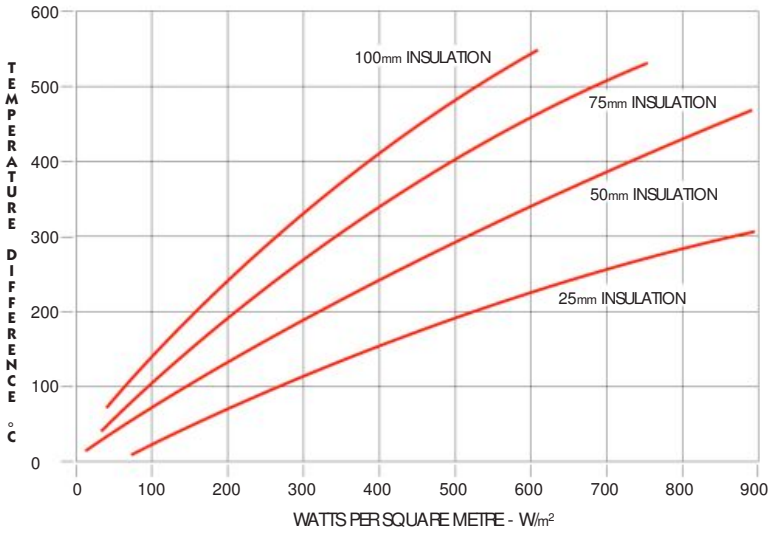
B. Oxidised steel bottom & horizontal surfaces

C. Oxidised steel vertical surface losses from tanks, pipes etc

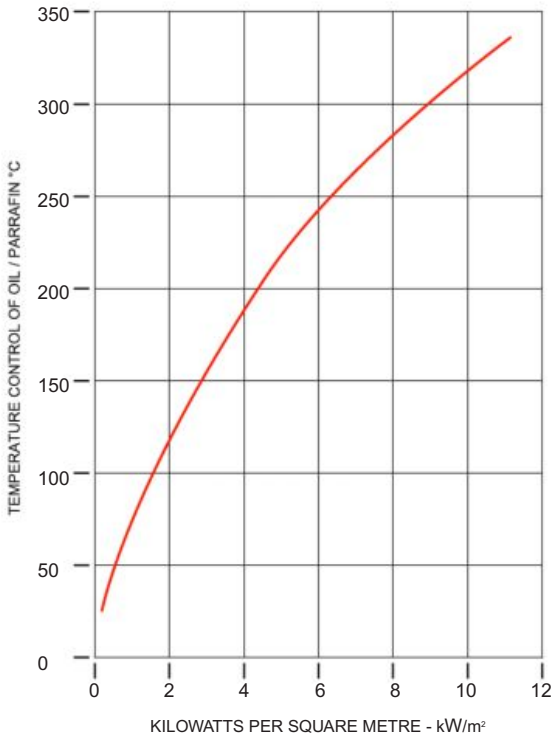
Losses - Open water tanks



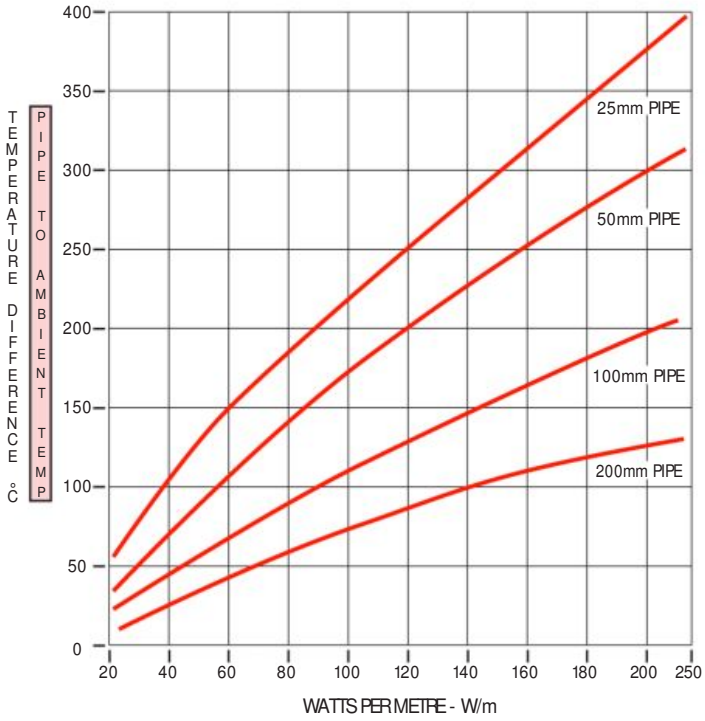
Losses - Insulated wall for ovens, tanks, pipes, etc



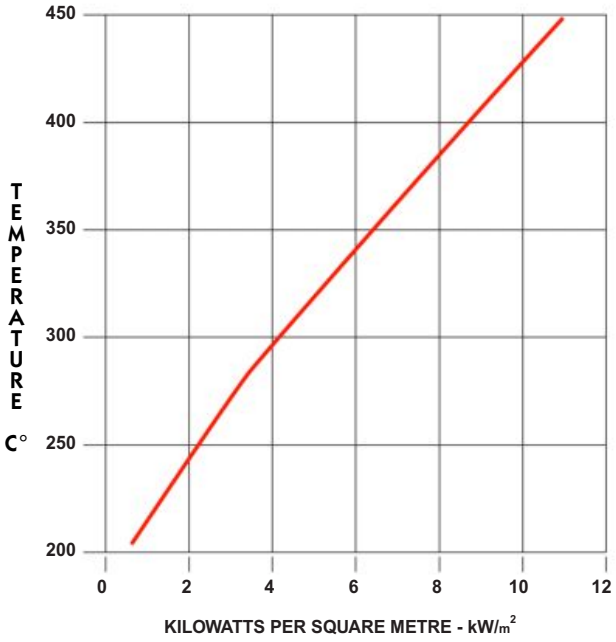
Losses - Surfaces of oil baths



Losses - For pipe lines

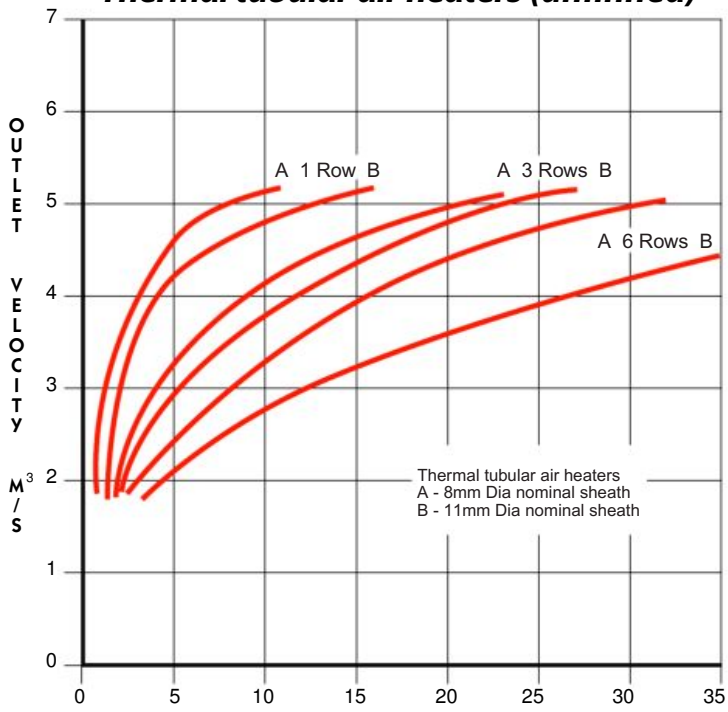


Losses - Molten Metal Surfaces



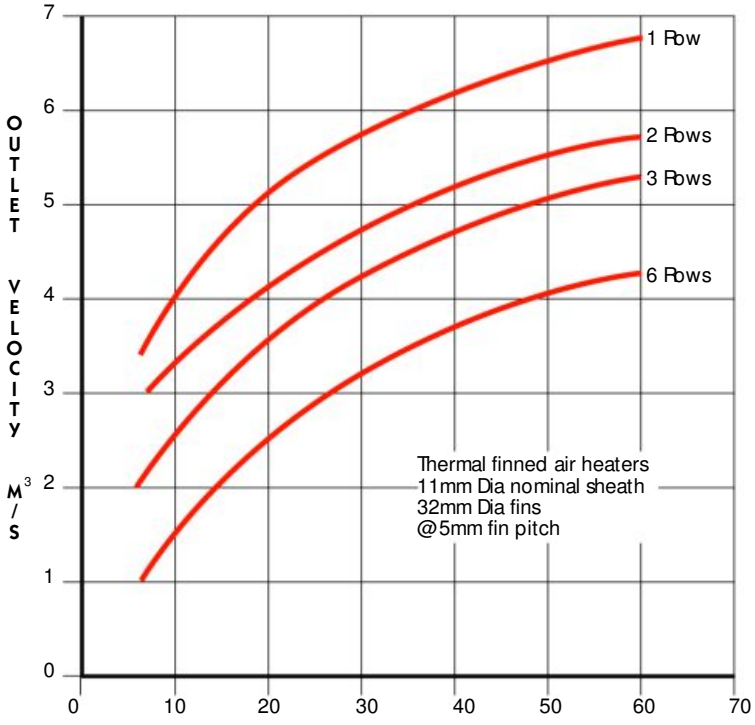
Pressure Drop - forced air

Static pressure drop for Thermal tubular air heaters (unfinned)



Static Pressure drop in Pascals (Pa)

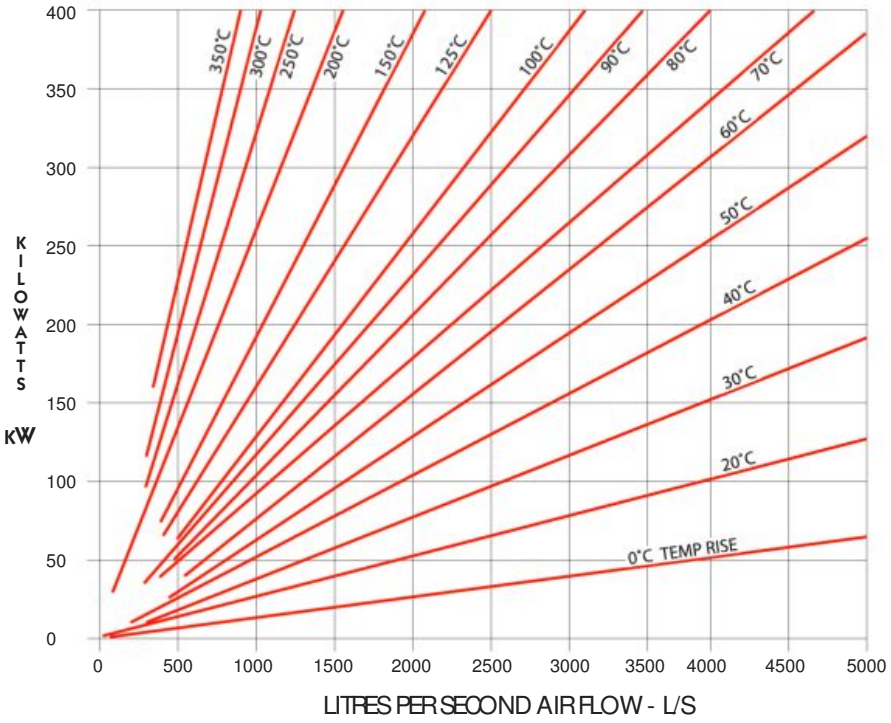
Static pressure drop for Thermal finned tubular air heaters



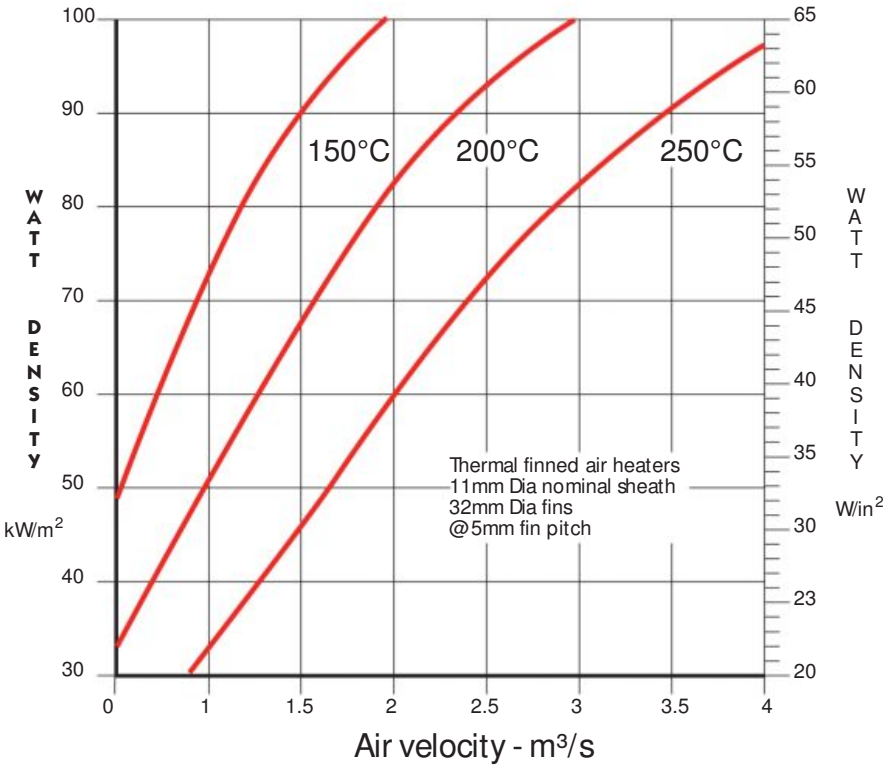
Static pressure drop in Pascals (Pa)

Air Heating

Kilowatts required for air heating



Recirculated air heating with Thermal finned tubular heaters



Formulae and Conversion Tables

To calculate kW required to raise the temperature of a product, the following formula may be used. This formula provides net kW to raise temperature by a desired degree in a desired time. It does not allow for inefficiencies due to heat loss through insulation etc. or changes of state.

$$\frac{V \times p \times Cp \times \Delta T}{t} = \text{kW required}$$

V = Volume required (m^3)
p = Density (kg/m^3)
Cp = Specific heat capacity (kJ/kg.K)
ΔT = Required temperature change (°C)
t = Required heating time in seconds

Note:

1. (V x p) can be substituted by kg in this formula when heating solids such as metals.
2. 1000 litres = $1m^3$

For flow line heating use m^3 per hour flow rate to achieve kW and/or ΔT.

For more accurate check use the following formula:

$$\frac{kW \times 3600}{4.187 \times \Delta T} = m^3/h \text{ (For water only)}$$

Forced air heating formula

Example:

Air is circulated through a heater duct by a 1000CFM blower. The air enters the duct at 35°C and is heated to 120°C

Select one of two formulae:

1. $kW = m^3/s \times \Delta T \times 1.278$

2. Convert 1000 CFM to L/s (refer to table)
= 1000 x 0.472
= 472 litres/sec

$$kW = \frac{L/s \times \Delta T}{783} = \frac{472 \times 85}{783}$$

kW = 51.25
20% safety factor = 10.25
kW = 61.50

The heaters required will total 62kW

Gases and Vapours

Substance	AVERAGE SPECIFIC HEAT CAPACITY (Cp) Metric kJ/kg.K	Imperial Btu/lb.F	DENSITY (p) Metric kg/m³	Imperial lb/ft³
Acetylene	1.465	0.35	1.169	0.073
Air	1.005	0.240	1.281	0.080
Ammonia	2.177	0.520	0.769	0.048
Carbon Dioxide	0.850	0.203	1.970	0.123
Chlorine	0.523	0.125	3.203	0.20
Ethane	1.800	0.43	1.74	0.109
Ethylene	1.675	0.40	1.66	0.073
Flourine	0.749	0.179	2.18	0.136
Hydrochloric Acid	0.816	0.195	1.634	0.102
Hydrogen	14.277	3.41	0.090	0.0056
Methane	2.512	0.60	0.716	0.045
Nitrogen	1.025	0.245	1.249	0.078
Oxygen	0.913	0.218	1.442	0.09
Water Vapour (100°C) Steam	1.926	0.460	0.80	0.050
Sulphur Dioxide	0.649	0.155	2.867	0.179

Plastics

Substance	AVERAGE SPECIFIC HEAT CAPACITY Metric kJ/kg.K	Imperial Btu/lb.F	SPECIFIC GRAVITY $H_2O = 1$ at 4°C	MAX RECOMMENDED SERVICE TEMP Metric °C	Imperial °F
ABS	1.46		1.04	66	150
	0.35				
	1.67	0.4	1.06		
	1.46	0.35	1.17	60	140
Acrylic			1.19	71	160
	1.09		1.3	149	300
	0.26				
Polyester	2.30	0.55	1.45		
	2.30	0.55	0.91	120	250
Polyethylene			0.93		
	1.34		1.04	60	140
	0.32				
Polystyrene	1.46	0.35	1.07	71	160
	1.26	0.3	1.2	65	150
PVC	2.09	0.5	1.55	75	170

Liquids

Substance	AVERAGE SPECIFIC HEAT CAPACITY (Cp)		LATENT HEAT OF FUSION OR EVAPORATION		BOILING POINT		DENSITY (p)	
	Metric kJ/kg.K	Imperial Btu/lb.F	Metric kJ/kg	Imperial Btu/lb	Metric °C	Imperial °F	Metric kg/m³	Imperial lb/ft³
Acetic Acid (100%)	1.968	0.47	404.7	174	118	244	1049	65.5
Acetone	2.152	0.514	98.3	42.3			790	49.3
- Amyl	2.977	0.711	504.8	217			816	50.9
- Ethyl	2.294	0.548	856.07	368	78	172	789	49.3
Bromine	0.448	0.107	200.06	86	58	136	3184	198.7
Glycerine	2.428	0.58	711.03	76.1	200	554	1271.4	79.38
Honey	1.465	0.35	62.34	26.8			1420	88.6
Hydrochloric Acid (10%)	3.098	0.74			85	185	1259	78.6
Kerosene	2.094	0.5	244.3 -255.9	105 -110			819	51.1
Methylated Spirits	2.554	0.610	98.8	42.5			791	49.4
Milk	3.894	0.93					1029	64.2
Oil - Caster	1.817	0.434					959	59.9
- Linseed	1.842	0.44					933	58.2
- Lubricating	1.675	0.40					909	56.7
- Olive or Palm	1.972 2.177-	0.471 0.52-			300 300	572 750	917 799	57.2 49.9
- Paraffin	2.973	0.71	147	63.2				
- Transformer	1.926	0.46					869	54.2
Petroleum	2.140	0.511	309.39 -337.31	133- 145	38- 204	100- 399	877	54.7
Sea Water	3.936- 4.103	0.94- 0.98			101	214	1023	63.9
Sodium Hydroxide (100%)	3.496	0.835			1388	2530	2128	132.8
Sulphuric Acid (100%)	1.440	0.344	511.78	220	310	590	1829	114.2
Tallow	2.094	0.50	188.43	81	32.2	90	939	58.6
Toluene	1.842	0.440	362.9	156	111	232	881	55.0
Turpentine	1.976	0.472	309.4	133	149	300	866	54.1
Vinegar					118	244	1049	65.5
Water	4.187	1.00	2256.5	970	100	212	999	62.4

Metals & Alloys

Substance	AVERAGE SPECIFIC HEAT CAPACITY (Cp)		LATENT HEAT OF FUSION OR EVAPORATION		MELTING POINT		DENSITY (p)	
	Metric kJ/kg.K	Imperial Btu/lb.F	Metric kJ/kg	Imperial Btu/lb	Metric °C	Imperial °F	Metric kg/m³	Imperial lb/ft³
Aluminium Cast	0.942	0.255	321.03-395.47	138.17	660	1220	2697	168.4
Antimony	0.209-0.218	0.050-0.052	58.16-102.36	25-44	630	1166	6613	412.8
Arsenic	0.343	0.082			819	1500	5714	356.7
Brass	0.377-0.419	0.09-0.10	196.34	84.4	1249	2280	8451	527.5
Bronze (Comm)	0.435 0.498-	0.104 0.119-			1177	2150	8661 7102	540.6 443.3
Cast Iron (Grey)	0.544	0.13	96	41.4				
Copper	0.384-0.527	0.092 0.126	181.45	78	1083	1981	8930	557.5
Gold	0.132	0.0316	66.79	28.7	860- 1060	1580- 1940	19279 1023.5	
Gunmetal	0.448	0.107	197.87	84.2			8691	542.5
Iron (99.9%)	0.461-0.544	0.110-0.130	93.05	40	1535	2795	7852	490.1
- Wrought	0.477-0.502	0.114-0.12					7392- 461.4- 7981	492.6
Lead - Melted	0.167	0.04						
- Solid	0.130	0.031	25.59	11	327.5	621	11388	710.8
Magnesium	1.047	0.25	372.2	160	651	1204	1738	108.5
Mercury	0.138	0.033	272.18	75.16	117	243	13855	848
Nickel	0.461	0.11	297	127.7	1450	2642	8810	550
Silver	0.239	0.057	88.39	38	961	1761	10492	655
Solder	0.167	0.04	39.54	17	213	415	9291	580
Steel	0.502	0.12			1399	2550	7849	490
Tin - Solid	0.234	0.056	58.15	25.0	232	450	7288	455
- Melted	0.268	0.064						
Type Metal (85%) Lead (15%) Antimony	1.674	0.040			260	500	10732	670
Zinc	0.398	0.095	118.63	51	419	787	7128	445

Solids

Substance	AVERAGE SPECIFIC HEAT CAPACITY (Cp)		LATENT HEAT OF FUSION OR EVAPORATION		BOILING POINT		DENSITY (p)	
	Metric kJ/kg.K	Imperial Btu/lb.F	Metric kJ/kg	Imperial Btu/lb	Metric °C	Imperial °F	Metric kg/m^3	Imperial lb/ft^3
Asphalt	1.674	0.4	93.05	40	40	104	1099	68.6
Basalt	0.833	0.199			529	984	2397	149.7
Butter, Lard	1.955	0.467			32	90	929	58.0
Celluloid	1.339	0.32			60	140	1349	84.2
Glass - Crown	0.754 0.670-	0.18 0.16-			1126	2058	2397	149.7
Graphite	1.633	0.454			4200	7592	2248	140.3
Gypsum	1.084	0.259			1460	2660	2317	144.7
Ice	2.093	0.5	334.98	144	100	212	899	56.1
Iodine	0.217	0.053	62.2	26.7	1293	2360	4935 1069-	308.0 66.7-
Pitch	2.093	0.5	116.31	50	149	300	1149	71.7
Resin	2.093	0.05			81	178	3197	199.5
Rubber	1.130- 2.010	0.27- 0.48			98- 175	208- 347	829- 908	56.7- 58.0
Salt	0.879	0.21			1465	2669	2098	130.9
Soil	2.093	0.5			1650	3002	1199- 1598	74.8- 99.8
Sugar	1.252	0.30			160	320	1608	100.4
Vegetalo	3.349	0.80			35	95	924	57.7
Vinyl	1.256- 2.093	0.30- 0.50			100- 260	212- 500	1100- 1450	69- 91
Wax - Soft Paraffin	2.889- 2.973	0.69- 0.71	146.56	63	38- 52	100- 125	869- 879	54.2- 54.9
- Hard Paraffin	2.889- 2.973	0.69- 0.71	177.03	76.1	52- 56	125- 133	879- 929	54.9- 58.0
White, Bees	1.465	0.35	174.47	75	62	144	949- 959	59.2- 59.9

Quick Reference Charts

Kilowatts to heat steel in 1 hour

kg's of Steel	Temperature Rise in °C (ΔT)									
	10	25	50	100	150	200	250	300	350	400
10	0.017	0.042	0.085	0.17	0.25	0.34	0.42	0.5	0.6	0.68
25	0.042	0.1	0.21	0.42	0.64	0.85	1	1.27	1.5	1.7
50	0.085	0.21	0.42	0.85	1.3	1.7	2	2.6	3	3.4
100	0.17	0.42	0.85	1.7	2.5	3.4	4.2	5	6	7
150	0.26	0.63	1.27	2.5	3.8	5	6.3	7.5	9	10
200	0.34	0.84	1.7	3.4	5	6.8	8.5	10.2	12	13.6
250	0.42	1	2.1	4.2	6.3	8.5	10.5	12.6	15	16.8
300	0.51	1.26	2.5	5	7.5	10.2	12.6	15.3	18	20.5
350	0.6	1.5	3	6	9	12	15	18	21	24
400	0.68	1.7	3.5	7	10.2	13.6	17	20.4	24	27.2
500	0.84	2.1	4.2	8.4	12.6	16.8	21	25.2	30	33.6
1000	1.7	4.2	8.4	16.8	25.2	34	42	50.5	60	67.5

** Includes +20% tolerance to allow for high heat loss situations or low power voltage.

$$kW = \frac{V \times p \times Cp \times \Delta T}{t} \quad \text{or} \quad \frac{kg \times 0.502 \times \Delta T}{t}$$

Example: To heat 10kg of Steel from 10°C to 20°C in 5 minutes

From table: 0.017kW to heat in 1 hr, therefore to heat in 5 minutes

0.017 x 12 = 204W required

Example: To heat 500kg of Steel from 100°C to 200°C in 4 hours

From table: 8.4kW to heat in 1 hr, therefore to heat in 4 hours

8.4kW ÷ 4 = 2.1kW required

Kilowatts to heat water in 1 hour

Litres of Water	Temperature Rise in °C (ΔT) 10	20	30	40	50	60	70	80	90	100
5	0.07	0.14	0.21	0.28	0.35	0.42	0.49	0.56	0.63	0.7
10	0.14	0.28	0.42	0.56	0.7	0.84	0.98	1.12	1.26	1.4
20	0.28	0.56	0.84	1.12	1.4	1.7	2	2.25	2.5	2.8
50	0.7	1.4	2.1	2.8	3.5	4.2	4.9	5.6	6.3	7
100	1.4	2.8	4.2	5.6	7	8.4	9.8	11.2	12.6	14
200	2.8	5.6	8.4	11.2	14	16.8	19.6	22.4	25.2	28
300	4.2	8.4	12.6	16.8	21	25.2	29.4	33.6	37.8	42
400	5.6	11.2	16.8	22.4	28	33.6	39.2	44.8	50.4	56
500	7	14	21	28	35	42	49	56	63	70
750	10.5	21	31.5	42	52.5	63	73.5	84	94.5	105
1000	14	28	42	56	70	84	98	112	126	140
1500	21	42	63	84	105	126	147	168	189	210
2000	28	56	84	112	140	168	196	224	252	280
2500	35	70	105	140	175	210	245	280	315	350
3000	42	84	126	168	210	252	294	336	378	420
5000	70	140	210	280	350	420	490	560	630	700
10000	140	280	420	560	700	840	980	1120	1260	1400

** Includes +20% tolerance to allow for high heat loss situations or low power voltage.

$$kW = \frac{V \times p \times Cp \times \Delta T}{t}$$

Example: To heat 2000L of Water by 70°C in 4 hours

From table: = 196kW/h, therefore
= 196 ÷ 4

= 49kW required

Example: To heat 10L of Water to 100°C from ambient temperature of 20°C in 10 minutes

From table: = 1.12kW x 6

= 6.72kW required

Kilowatts to heat Oil in 1 hour

Litres of Oil	Temperature Rise in °C (ΔT)								
	10	25	50	75	100	150	200	250	300
5	0.03	0.075	0.15	0.23	0.3	0.45	0.6	0.75	0.9
10	0.06	0.15	0.3	0.46	0.6	0.9	1.2	1.5	1.8
20	0.12	0.3	0.6	0.92	1.2	1.8	2.4	3	3.6
50	0.3	0.75	1.5	2.3	3	4.5	6	7.5	9
100	0.6	1.5	3	4.6	6	9	12	15	18
200	1.2	3	6	9.2	12	18	24	30	36
300	1.8	4.5	9	13.8	18	27	36	45	54
400	2.4	6	12	18.4	24	36	48	60	72
500	3	7.5	15	23	30	45	60	75	90
750	4.5	11.25	21.6	33.8	45	67.5	90	112.5	135
1000	6	15	30	46	60	90	120	150	180
1500	9	22.5	43.2	67.6	90	135	180	225	270
2000	12	30	60	92	120	180	240	300	360
2500	15	37.5	73.2	113.6	150	225	300	375	450
3000	18	45	86.4	138	180	270	360	450	540
5000	30	75	146.4	227	300	450	600	750	900
10000	60	150	293	454	600	900	1200	1500	1800

** Includes +20% tolerance to allow for high heat loss situations or low power voltage.
** For lubricating oils decrease values by 17%

$$kW = \frac{V \times p \times Cp \times \Delta T}{t}$$

Example: To heat 1500L of Oil to a temperature of 100°C in 15 hours

From table: = 90 ÷ 15 hours

= 6kW required

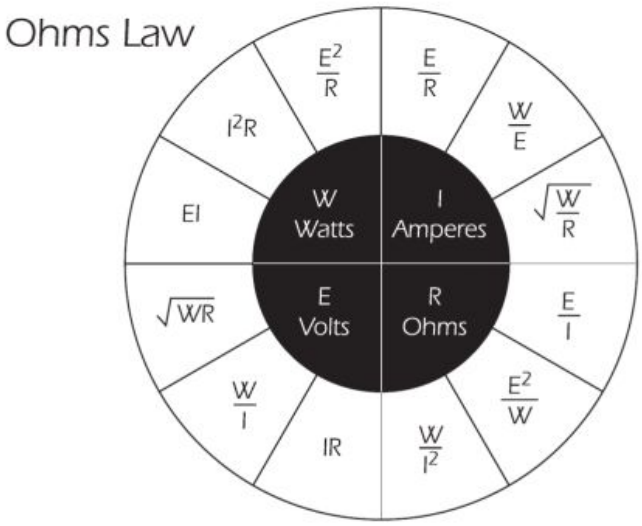
Example: To heat 10L of Oil from 100°C to 200°C in 20 minutes

From table: = 0.6kW x 3

= 1.8kW required

Ohms Law

Watts	VALUES AT 240V Ohms	Amps	VALUES AT 110V Ohms	Amps	VALUES AT 415V Ohms	Amps
100	576	0.4	121	0.9	1722	0.25
200	288	0.83	60.5	1.8	861	0.48
300	192	1.25	40.3	2.7	574	0.72
400	144	1.6	30.25	3.6	430	0.96
500	115	2.08	24.2	4.5	344	1.2
750	76	3.1	16.1	6.8	229	1.8
1000	57	4.16	12.1	9	172	2.4
1250	46	5.2	9.7	11.3	137	3
1500	38	6.25	8	13.6	114	3.6
1750	33	7.3	6.9	15.9	98	4.2
2000	28	8.3	6	18.1	86	4.8
2250	25	9.3	5.3	20.4	76.5	5.4
2500	23	10.4	4.85	22.75	69	6
2750	21	11.4	4.4	25	62	6.6
3000	19	12.5	4	27.2	57	7.2
3250	17.7	13.5	3.72	29.5	53	7.8
3500	16.4	14.6	3.45	31.8	49	8.4
3750	15.3	15.6	3.22	34	45.9	9
4000	14.4	16.6	3	36.3	43	9.6
4500	12.8	18.75	2.7	41	38	10.8
5000	11.5	20.8	2.42	45.5	34.4	12
5500	10.5	23	2.2	50	31	13.2
6000	9.6	25	2	54.5	28.7	14.4



Density

Kilogram per cubic metre (kg/m^3)	Pound per cubic inch (lb/in^3)	Pound per cubic foot (lb/ft^3)
1	0.036×10^{-3}	0.0624
27.68×10^{3}	1	1728
16.02	0.578×10^{-3}	1

Length

Millimetres (mm)	Metres (m)	Inches (in)	Feet (ft)
1	10^{-3}	0.03937	0.00328
1000	1	39.37	3.28
25.4	0.0254	1	0.0833
304.8	0.3048	12	1

Area

Square Millimetres (mm^2)	Square Metres (m^2)	Square Inches (in^2)	Square Feet (ft^2)
1	10^{-6}	1.55×10^{-3}	0.01076×10^{-3}
10^{6}	1	1550	10.764
645.16	0.645×10^{-3}	1	6.949×10^{-3}
92.903×10^{-3}	0.0929	144	1

Mass

Kilogram (kg)	Metric Ton (Tonne = 1000kg)	Pound (lb)	UK Ton (Ton)
1	10^{-3}	2.205	0.984×10^{-3}
1000	1	2205	0.984
0.454	0.454×10^{-3}	1	0.461×10^{-3}
1016	1.016	2240	1

Energy

British Thermal Unit (Btu)	Kilojoule (kj)
1	1.06
0.948	1

Power

British Thermal Unit (Btu)	Kilowatt (kW)
3412	1
1	0.293×10^{-3}

Watt Density

Watt per Square Inch (Watt/in ^{2})	Kilowatts per Square Metre (kW/m ^{2})
1	1.55
0.645	1

Specific Heat Capacity

Btu/lb.°F	J/kg.K	kJ/kg.K
1	4.187×10^{-3}	4.187
238.8	1	10^{-3}
0.2388	10^3	1

Force

Kilogram Force (kgf)	Newton (N)	Pound Force (lbf)
1	9.807	2.205
0.102	1	0.225
0.454	4.448	1

Velocity

Feet per second (ft/s)	Feet per minute (ft/min)	Metres per second (m/s)	Metres per minute (m/min)
1	60	0.305	18.29
0.0167	1	0.005	0.305
3.28	196.85	1	60
0.055	3.28	0.0167	1

Pressure

Inch Water (inH_2O)	Millimetre Mercury (mmHg)	Pound Force Square Inch (lbf/in^2)	Kilopascal (kPa)
1	25.4	39.09×10^{-3}	0.2486
13.161	1	0.4912	3.386
27.70	2.036	1	6.895
4.02	0.2953	0.145	1

Volume

Cubic millimetres (mm^3)	Cubic metres (m^3)	Litre (L)	Cubic inches (in^3)	Cubic feet (ft^3)	Imperial gallon (gal)
1	10^{-9}	10^{-6}	61.023×10^{-6}	0.353×10^{-9}	0.220×10^{-6}
10^9	1	10^3	61.023×10^3	35.315	219.9
10^6	10^{-3}	1	61.023	0.035	0.0220
16.4×10^3	1.64×10^{-6}	1.64×10^{-3}	1	0.578×10^{-3}	3.6×10^{-3}
28.32×10^3	0.0283	28.316	1728	1	6.229
4546×10^3	0.0045	4.546	277.46	0.1605	1

Volume rate of flow

Cubic foot per second (ft^3/s)	Cubic foot per minute (ft^3/min)	Litres per second (L/s)	Gallons per minute (gal/min)	Cubic metres per second (m^3/s)	Cubic metres per minute (m^3/min)
1	60	28.316	373.2	0.028	1.68
0.016	1	0.472	6.229	0.47×10^{-3}	0.0283
0.035	2.119	1	13.2	1×10^{-3}	60×10^3
0.003	0.1605	0.076	1	0.076×10^{-3}	4.56×10^3
35.315	2119	1×10^3	13.19×10^3	1	60
0.588	35.315	16.6	219.9	0.016	1

Temperature conversion table

°C	°F	°C	°F	°C	°F
0	32	700	1292	1400	2552
50	122	750	1382	1450	2642
100	212	800	1472	1500	2732
150	302	850	1562	1550	2822
200	392	900	1652	1600	2912
250	482	950	1742	1650	3002
300	572	1000	1832	1700	3092
350	662	1050	1922	1750	3182
400	752	1100	2012	1800	3272
450	842	1150	2102	1850	3362
500	932	1200	2192	1900	2452
550	1022	1250	2282	1950	3542
600	1112	1300	2372	2000	3632
650	1202	1350	2462	2050	3722

The tables provided are a guide to assist you in calculating your heating requirements.

For advice on your individual needs, contact our Design department for further technical information.

Section 21

Warranty

Warranty Terms

Vulcanic Thermal Electric Elements warrants the products manufactured by it to be free from defects in workmanship and materials. Its obligations pursuant to this Warranty being limited to the repair, replacement or refund of the original net purchase price, at its option and subject to the terms and conditions stated below, of any products or part thereof which its examination shall disclose to be so defective.

Warranty Period

Industrial Elements, equipment or parts thereof:
12 months from date of manufacture, apart from any components for which a special warranty applies as detailed elsewhere in VTEE's offer.
Special Applications:
For special heating elements supplied for difficult applications, VTEE will consult and state the Warranty period for your particular product in their proposal.

Terms

Repair, replacement or refund pursuant to this Warranty shall be effected upon the defective products being returned freight prepaid to the nearest VTEE office. Any repaired or replacement products or part thereof so supplied shall be similarly warranted from the date of such repair or replacement for the unexpired period of Warranty attaching to the original item. Vulcanic Thermal Electric Elements shall not be responsible for any cost of or incidental to removing the defective element.

Conditions

1. This Warranty applies only within the Commonwealth of Australia but can be extended to other international markets with the express agreement of Vulcanic Thermal Electric Elements.

2. Vulcanic Thermal Electric Elements guarantees that the insulation resistance of the electric heater is at an acceptable level and in accordance with Australian Standards when the electric heater is despatched from our production facility. Evidence of this can be found on the electrical test certificate supplied and/or retained with the production records of the company.

As Vulcanic Thermal Electric Elements has no control over the storage, initial or ongoing preservation of the electric heater, it shall be noted that Vulcanic Thermal Electric Elements does not provide any warranty (inferred or otherwise) for minimum insulation resistance of the electric heater.

3. This Warranty shall not apply:

a) If any serial or identification number or installation plate on the product has been altered, rendered illegible or removed.

b) Unless written notice of any defects and any claim in respect thereof has been given within the Warranty period.

c) If the Products have been:

i) Subject to misuse, abuse, negligence or accident;

ii) Operated on an electrical supply the voltage of which varies by more than 10% from the rated voltage applicable to the element;

iii) Connected to improper, inadequate or faulty fluid reticulation services;

iv) Installed, maintained or operated other than in accordance with the instructions and recommendations furnished by Vulcanic Thermal Electric Elements;

v) Damaged by foreign objects;

vi) Repaired or altered other than by Vulcanic Thermal Electric Elements or nominees of Vulcanic Thermal Electric Elements;

vii) Used for any duty or subjected to any operating condition varying from that for which it was specifically supplied by VTEE, nor shall it apply in respect of any damage to the equipment arising from abrasion, erosion, corrosion, deterioration or the like contributed to abnormal temperatures, the influence of foreign matter or energy or the physical or chemical properties of water, steam or chemical compounds unless the equipment was supplied by VTEE for a duty which contemplated the above contributing elements and in respect of which elements there was specific and detailed prior disclosure by the purchaser.

viii) Had rating plates removed

ix) Not fitted by a qualified electrician

4. The purchaser shall be responsible for and shall meet all charges in respect of:

a) Making the products accessible for service;

b) Any labour, transportation, travelling or communication expenses necessarily incurred in the provision of repaired or replacement materials at locations other than Vulcanic Thermal Electric Elements Pty Ltd offices.

5. The Purchaser must produce proof of the date of original use if relevant when making a claim. This Warranty is exclusive of all other warranties, descriptions, representations or conditions (including but not limited to fitness or suitability for purpose, tolerance to any conditions, merchantability or otherwise whether of a like nature or not and whether expressed or implied by law, trade, custom or otherwise) which are expressly excluded. Whether or not any plans or requirements have been submitted to Vulcanic Thermal Electric Elements it shall be the purchaser's exclusive responsibility to ensure that the goods supplied by Vulcanic Thermal Electric will be satisfactory to meet the purchaser's plans or requirements in respect of the goods.

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