

Designers and Manufacturers of

ELECTRIC HEATING ELEMENTS AND SYSTEMS

▶ Hi-Tech Elements offers turnkey design, engineering and manufacturing services to suit your specific heating application.



ISO 9001:2015 CERTIFIED



**EASTERN
CONTROLS**

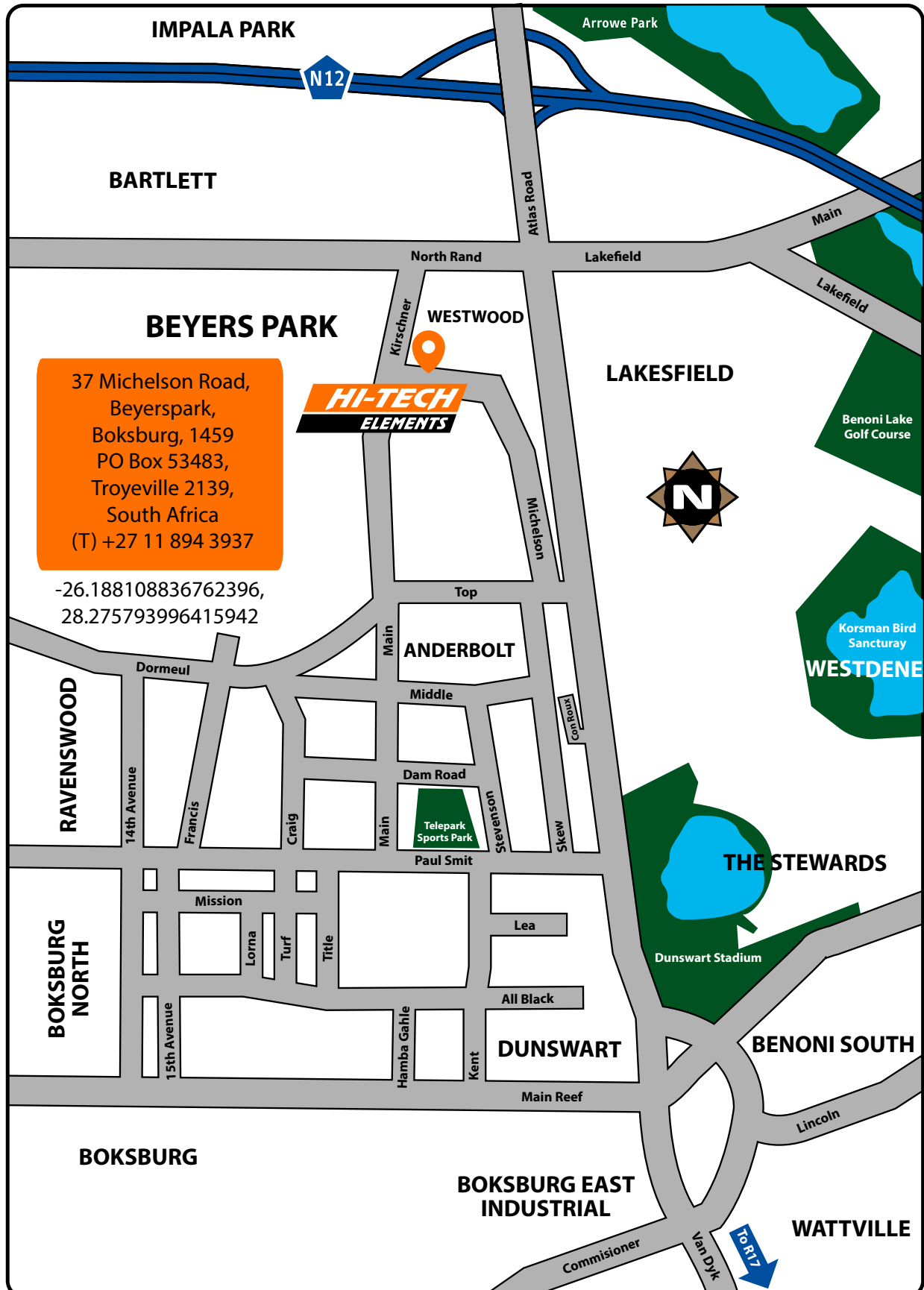


Map

HI-TECH
ELEMENTS



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EASTERN
CONTROLS



HOTTUBE





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COMPANY NAME	Hi-Tech Elements (Pty) Ltd
REGISTRATION NO	1998/016756/07
DIRECTOR	Shaun Bester
ESTABLISHED	1992
OUR SERVICE	<p>The design, manufacture and installation of all heating systems including:</p> <ul style="list-style-type: none">• High wattage heating system requirements• Unique size requirements• Hazardous environments• Turnkey projects• Temperature control systems• Consulting service• Spares and repairs
PRODUCT LISTING	<p>The Hot Rod® Hottube Flange heaters In-line duct heating Drum heaters Infrared elements Infrared reflector panels (short and medium wave) Thermocouples, RTD sensors and thermostats (Eastern Controls) Temperature controllers and complete control panels Mica and ceramic band/flat elements Nozzle heaters Cartridge elements Furnace spiral/strip elements Batch/conveyor ovens (temperature and annealing) Exe rated - optional</p>
INDUSTRIES SERVED	<p>Chemical Galvanizing Mining Plating Rubber Plastic Motor Food All manufacturing Industrial and related industries</p>
HI-TECH ELEMENTS' MISSION STATEMENT	<p>Hi-Tech Elements is committed to becoming the preferred supplier of heating systems and allied services and products to the African continent.</p>

Contact Details

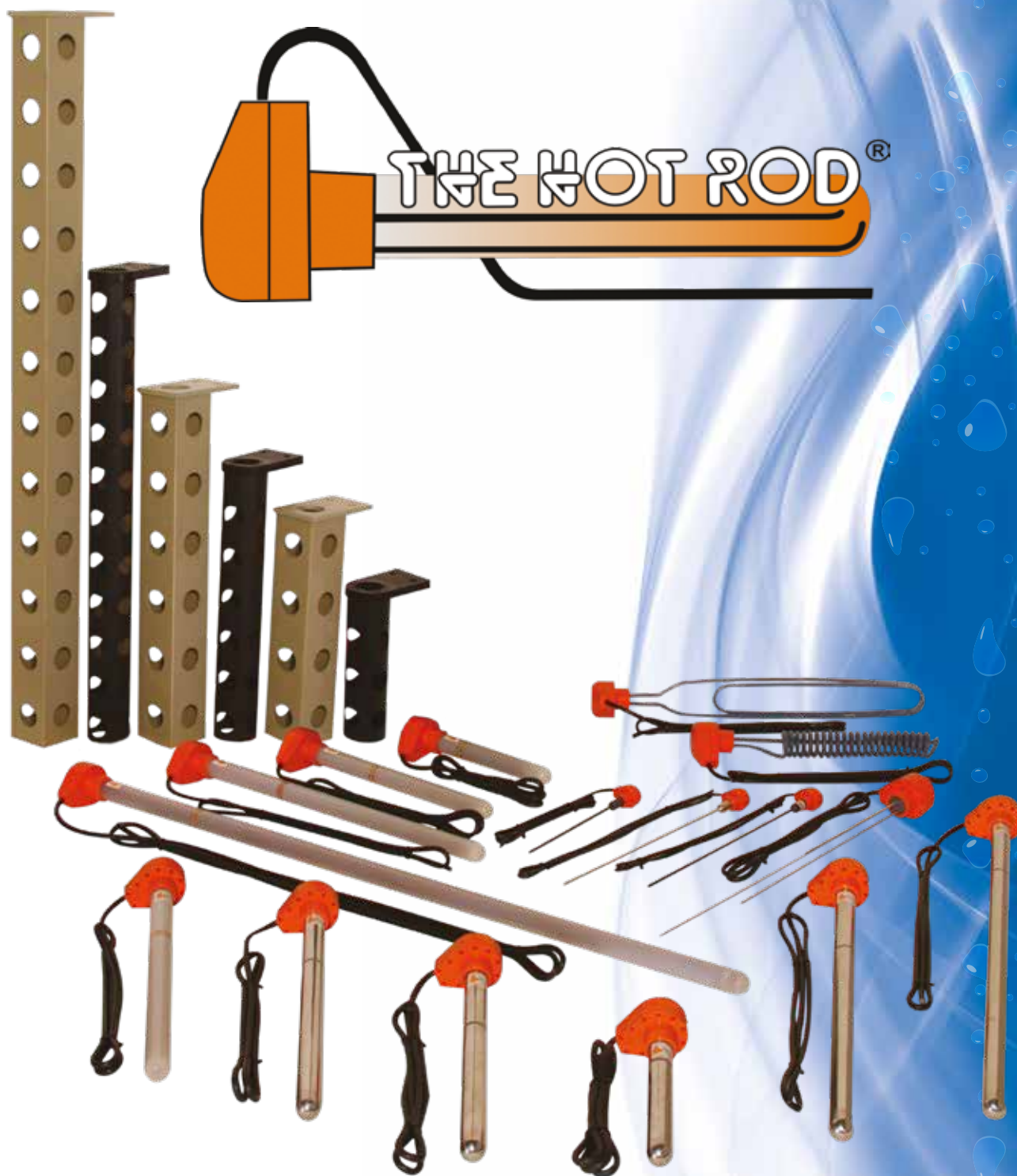
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DEFINITION OF TERMS STOCK	A product that forms part of our standard range, is immediately available for delivery, collection or shipment.
STANDARD	A design is on file but needs to be manufactured once an order has been placed.
CUSTOM DESIGNED	The product is being specially designed and manufactured to client specifications.

THE HOT ROD®



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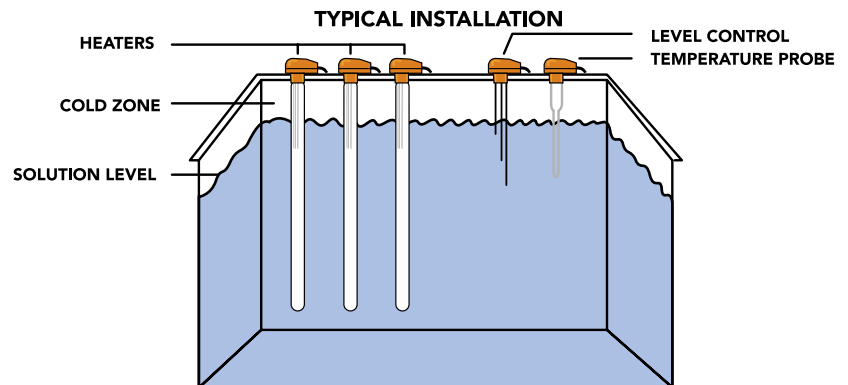
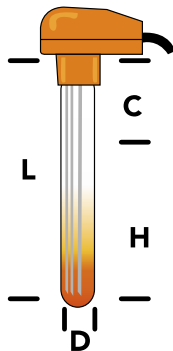
The Hot Rod Technical Data

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HEATERS



	7Kw	*3Kw	5Kw	4Kw	3Kw	*1,5Kw	3Kw	*1,5Kw	2Kw	1,5Kw	1Kw
Lmm	1 500	1 500	1 000	1 000	1 000	1 000	750	750	600	500	300
Cmm	350	350	250	250	250	250	250	250	200	200	100
Hmm	1 150	1 150	750	750	750	750	500	500	400	300	200
Dmm	40	40	40	40	40	40	40	40	40	40	40

The above list is the standard range of Hotrod~heaters. The elements are ceramic filled incoloy tubes contained within an outer sheath of either stainless steel, titanium or vitrosol glass. Specials can be made to any length in increments of 25 mm with hot and cold zones to suit any application by using a ceramic type element. Where possible it is advisable to install heaters in multiples of 3 in order to keep the phases balanced. It is desirable to locate the temperature probe at a reasonable distance from the heaters in order to obtain accurate control. Solution level must never be allowed to fall below the cold zone of the heater. In the case of stainless steel units the heat will be transferred up the sheath resulting in the melting of the PVC cap and the sheath falling out. In the case of the Vitrosol heater subsequent thermal shock could cause the sheath to crack. It is important therefore to maintain the correct solution level at all times. This can be controlled automatically by the use of a level control unit used in conjunction with a solenoid operated valve to maintain the solution level, or as a safety device to isolate the heaters in the event of a rapid loss of solution.

Vitrosol

Vitrosol heaters are made from translucent fused silica which has an extremely low co-efficient of expansion and is inert to most acids. This makes it the ideal choice for the heating of acid solutions. Note: Vitrosol is a form of glass and must not be used in hydrofluoric acid or strong alkaline solutions. It also needs protection from mechanical damage. This can best be effected by means of a polypropylene guard, or PVC in the case of chrome or nitric solutions.

Titanium

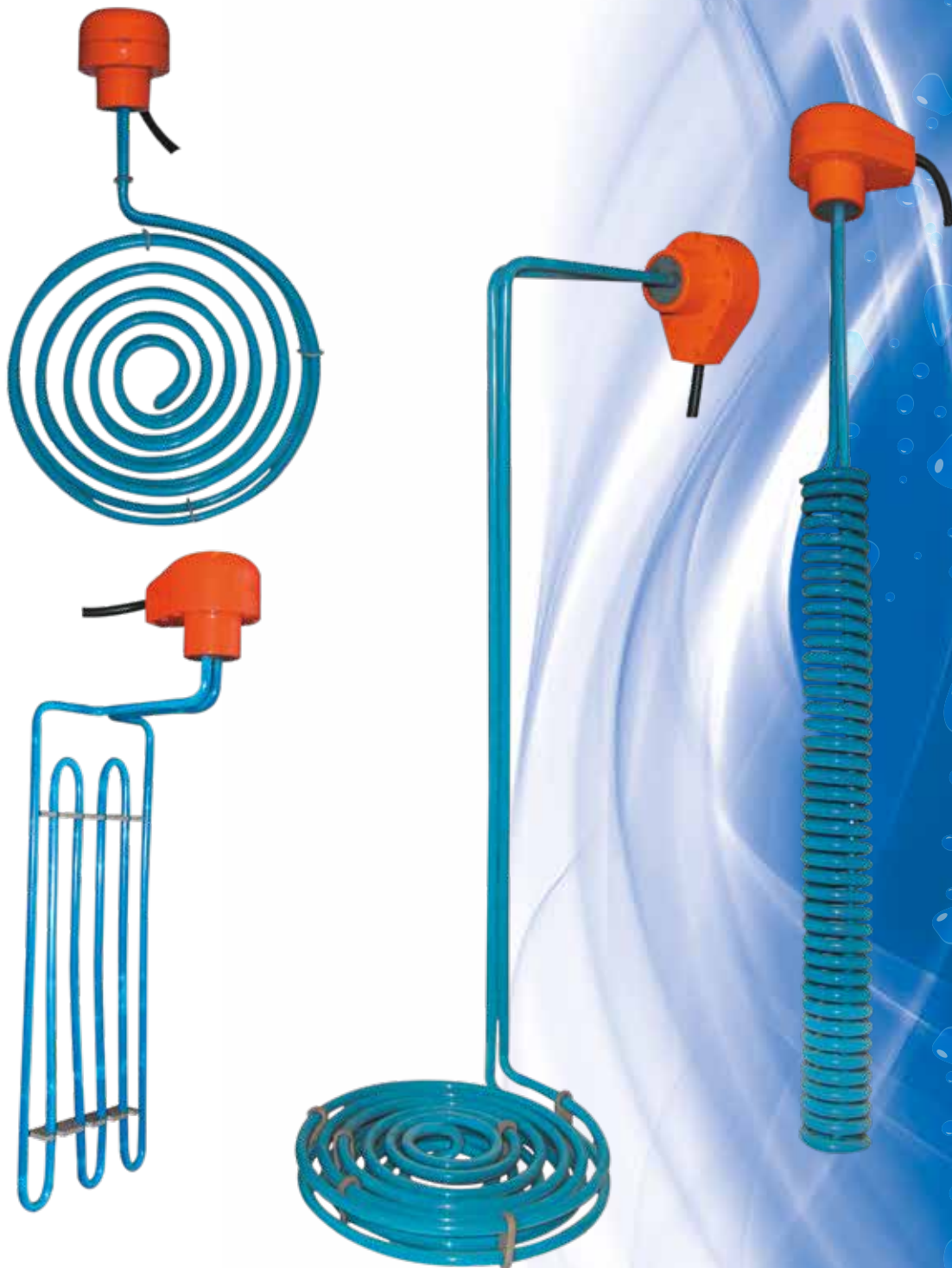
Titanium heaters can be used in a wide range of acid and alkaline solutions, but chemical attack does occur in some instances at varying rates, depending on temperature and concentration of the solutions. In electroplating processes such as nickel plating it is advisable to connect the Titanium sheath anodically to prevent corrosion.

Stainless Steel 316

Stainless steel heaters are ideal for use in phosphating solutions and in solutions with an alkaline or neutral PHvalue. Certain acidic chemical processes recommend the use of stainless steel tanks but this does not necessarily mean the use of stainless steel heaters. In these instances it is advisable to use Vitrosol heaters due to the chemical attack on stainless steel at the elevated surface temperatures of the heater tube. In brass plating processes, liquid ammonia must be used, not ammonium chloride, as the chloride will attack the stainless steel sheath.

*** In phosphating solutions it is advisable to use a multiple of low kilowatt heaters rather than one high kilowatt heater. This will lower the watts density and avoid a rapid build-up of phosphate sludge on the heater tube which forms an insulating.**

THE TEFLON® HOT ROD



*Teflon is a Du Pont registered name



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The Teflon Hot Rod Heater Technical Data

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Standard Range Teflon Hot Rod Heaters

REFERENCE	WATTAGE	VOLTAGE	LENGTH/SIZE
TEF1000	1 000 Watt	240 Volt	3 300/10 mm
TEF1500	1 500 Watt	240 Volt	4 500/10 mm
TEF2000	2 000 Watt	240 Volt	5 350/10 mm
TEF3000	3 000 Watt	250 Volt	5 350/10 mm
TEF3001	3 000 Watt	250 Volt	5 100/13.5 mm
TEF4001	4 000 Watt	250 Volt	5 100/13.5 mm

HOTROD® Teflon® heaters are custom manufactured in various bending configurations and kilowatt ratings to suit your specific requirements. The PTFE has a good mechanical strength and does not embrittle.

HOTROD® Teflon® (PTFE) heaters are manufactured From mineral tubular sheathed elements coated with PTFE. The PTFE is acid and temperature resistant up to 280° C and is the only heater that can be applied to solutions containing hydrofluoric acid or fluoride forms in chemical heating applications.

HOTROD® Teflon® heaters are also suitable for other acid solutions and because of the low watts density loading, can increase the expected element life.

Note: The element must not operate in sludge deposits that accumulate at the bottom of chemical tanks.

THE MINIHOT ROD®



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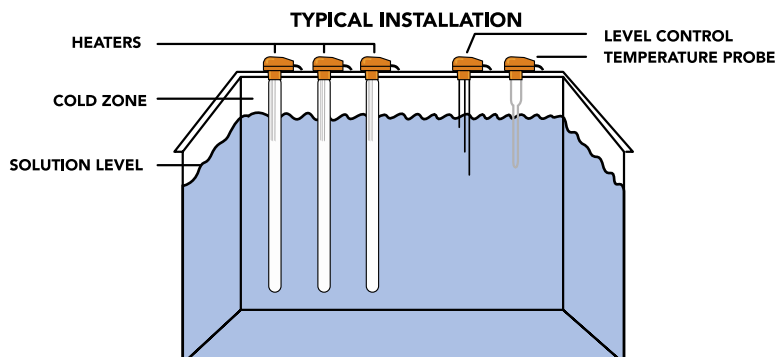
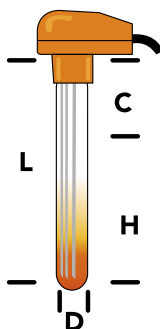
The Mini Hot Rod Technical Data

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HEATERS



	1 250 Watts	800 Watts	700 Watts	600 Watts	450 Watts	350 Watts
Lmm	400	400	350	300	250	200
Cmm	120	120	100	100	90	75
Hmm	280	280	250	200	160	125
Dmm	20	20	20	20	20	20

The above list is the standard range of Mini HOTROD® heaters. The elements are segmented ceramics contained within an outer sheath of either Stainless Steel, Titanium or Vitrosol glass. Specials can be made to any length in increments of 16 mm with hot and cold zones to suit any application. It is desirable to locate the temperature probe at a reasonable distance from the heaters in order to obtain accurate control. The temperature can be controlled by using a HOTROD® temperature controller. The controller is a non indicating potentiometric instrument offering on-off control with a switching hysteresis of 2° C utilising a Pt100 probe. Solution level must never be allowed to fall below the cold zone of the heater. In the case of Stainless Steel and Titanium units the heat will be transferred up the sheath resulting in the melting of the PVC cap and the sheath falling out. In the case of the Vitrosol heaters thermal shock could cause the sheath to crack. It is important therefore to maintain the correct solution level at all times. The level can be controlled automatically by the use of a HOTROD® level control unit used in conjunction with a solenoid operated valve to maintain the solution level, or as a safety device to isolate the heaters in the event of an abnormal loss of solution.

Vitrosol

Vitrosol heaters are made from translucent fused silica which has an extremely low co-efficient of expansion and is inert to most acids. This makes it the ideal choice for the heating of acid solutions.

Note: Vitrosol is a form of glass and must not be used in hydrofluoric acid or strong alkaline solutions. It also needs protection from mechanical damage. This can best be effected by means of a polypropylene guard, or PVC in the case of chrome or nitric solutions.

Titanium

Titanium heaters can be used in a wide range of acid and alkaline solutions, but chemical attack does occur in some instances at varying rates, depending on temperature and concentration of the solutions. In electroplating processes such as nickel plating it is advisable to connect the Titanium sheath anodically to corrosion.

Stainless Steel 316

Stainless steel heaters are ideal for use in phosphating solutions and in solutions with an alkaline or neutral PH value. Certain acidic chemical processes recommend the use of stainless steel tanks but this does not necessarily mean the use of stainless steel heaters. In these instances it is advisable to use Vitrosol heaters due to the chemical attack on stainless steel at the elevated surface temperatures of the heater tube. In brass plating processes, liquid ammonia must be used, not ammonium chloride, as the chloride will attack the stainless steel sheath.

APPLICATIONS

Metal treatment processes, small electroplating installations, jewellery production, gunsmith processes, PC board production, water distillation units, large fish tanks, pilot plants and laboratories.

The Hot Rod Liquid Level & Temperature Control

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Liquid Level Probes

- Standard size: Stainless Steel 316, 3 leg or 5 leg in 300 mm; 500 mm; 700 mm lengths. (Hi Level; Low level; Common)
- Sizes cut to suit customer requirements
- All above liquid level probes also available in Halar (Teflon®) coat with either LEAD TIPS or TITANIUM TIPS, depending on the chemical type

Pt100 Temperature Probes

- 0 - 100° C (available in standard sizes in both Stainless Steel 316 and Halar (Teflon®) coated
- 200 mm; 300 mm; 400 mm; 500 mm; 600 mm; 750 mm; 1 000 mm; 1 500 mm sizes
- All above sizes standard with 2 metre cable. Extra cable lengths available on request

Liquid Level & Temperature Controller

LIQUID LEVEL CONTROLLER

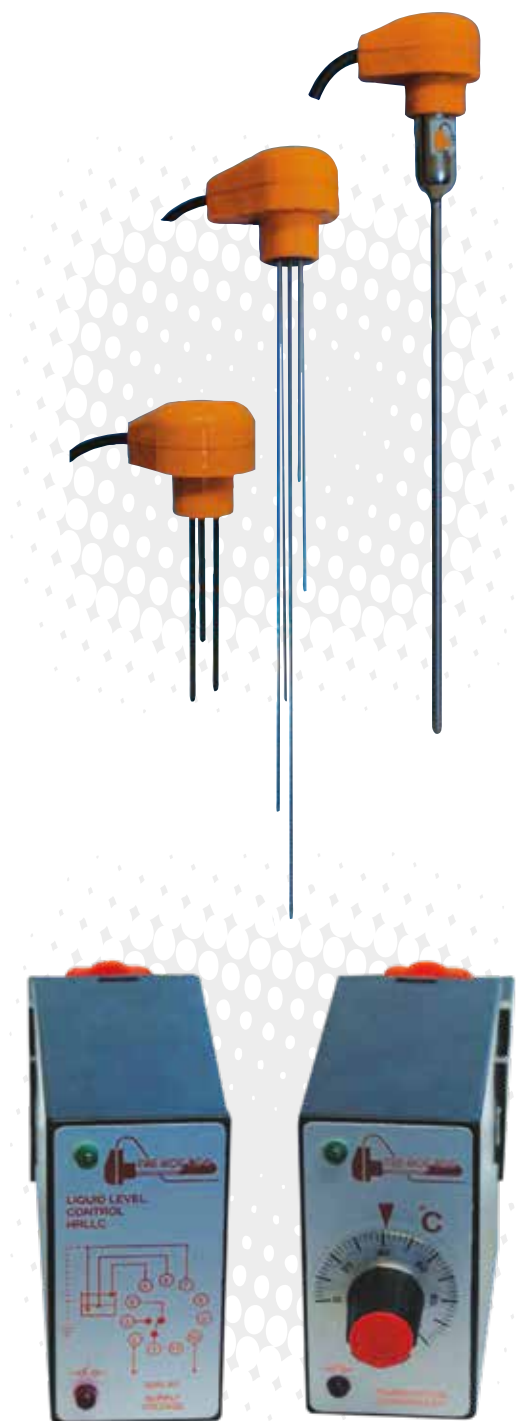
- 11 Pin base
- Relay output function
- Available ex stock to suit liquid level probe

PT100 TEMPERATURE CONTROLLER - ANALOGUE

- 11 Pin base
- 0 - 100° C (available ex stock)
- Relay output function

PT100 TEMPERATURE CONTROLLER - DIGITAL

- 11 Pin base
- Variable programmable inputs
- Pt 100; Type J, K, R, S, T
- Standard alarm and relay output functions



Hottube Tubular Sheathed Elements & Assemblies

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ELEMENTS



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HOTTUBE

Incoloy/Stainless Steel Sheathed Elements

These versatile elements can be bent into spirals, loopcoils, hairpins or multi-leg configurations to meet specific application requirements.

SPECIFICATIONS

- Ø6,5 mm, Ø8,0 mm or Ø11,2 mm
- Up to 5,3 m hot lengths
- Cold lengths up to 500 mm
- Various grades incoloy, stainless steel

FEATURES

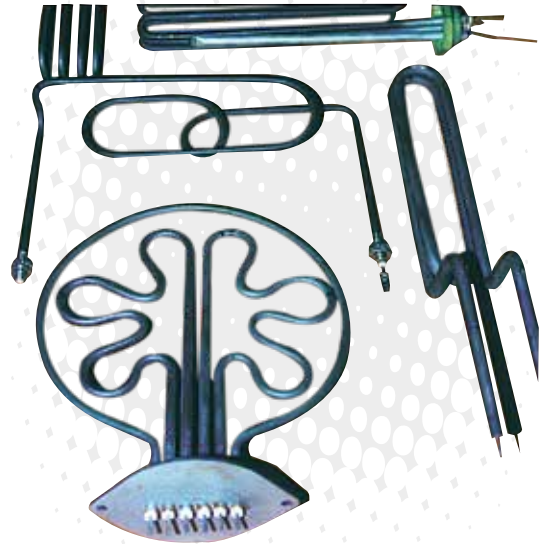
- Magnesium powder insulation filled sheath
- Silicone sealed ends
- Various termination and mounting options
- Excellent insulation properties

APPLICATIONS

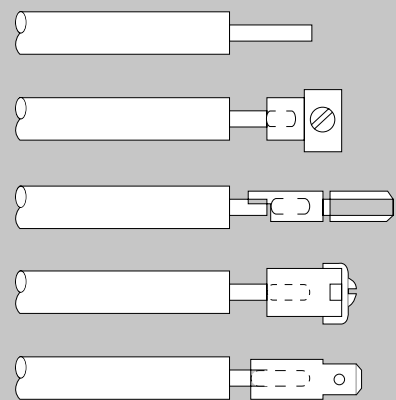
- Surface heating
- Direct immersion in water, oils, solvents and other chemicals as well as for the heating of gasses and air
- Adaptable to most applications
- Soft water and low temperature applications such as chemical heating and defrosting

CAPABILITIES

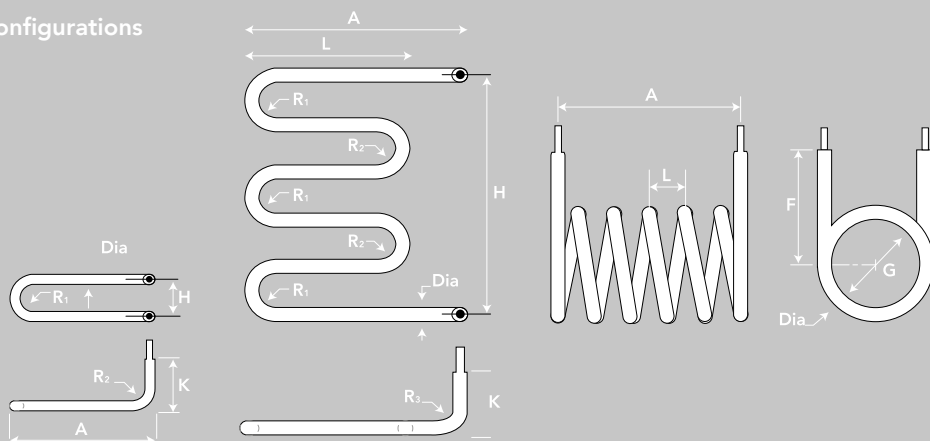
- Watts density rating up to 9.9 Watts/cm²
- Application up to 600° C (air)



Typical Terminations



Bending Configurations



Standard Tubular Elements & Applications

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ELEMENTS



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The following elements are all 8 mm in diameter, straight, fully annealed and sealed. They can be supplied as a straight unit for field bending or factory bent to specification.

	W/CM ²	WATTAGE	VOLTAGE	LENGTH
Defrosting, thick oils and greases	1,2	200	230	770
	1,2	300	230	1 080
	1,2	400	230	1 390
	1,2	500	230	1 700
	1,2	600	230	2 010
	1,2	750	230	2 470
	1,2	1 000	230	3 245
Thick oils, heat transfer oils and waxes	2,4	500	230	980
	2,4	750	230	1 395
	2,4	1 000	230	1 780
	2,4	1 500	230	2 680
	2,4	2 000	230	3 500
Light oils, caustic solutions and air heating	3,2*	1 000	230	1 315
	3,2*	1 500	230	2 000
	3,2*	2 000	230	2 605
	3,2*	2 500	230	2 975
	3,2*	3 000	230	3 615
Light oils, air and surface heating	3,9*	1 000	230	1 140
	3,9*	1 500	230	1 635
	3,9*	2 000	230	2 130
	3,9*	2 500	230	2 625
	3,9*	3 000	230	3 120
Vegetable oils, molten metal, air and surface heating	4,7*	1 000	230	975
	4,7*	1 500	230	1 395
	4,7*	2 000	230	1 800
	4,7*	2 500	230	2 215
	4,7*	3 000	230	2 505
Radiant, air and surface heating	5,5*	1 000	230	802
	5,5*	1 500	230	1 172
	5,5*	2 000	230	1 542
	5,5*	2 500	230	1 854
	5,5*	3 000	230	2 282
	5,5*	4 000	230	3 010

* STRAIGHT ELEMENT - STOCK ITEMS

Standard Tubular Elements & Applications

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Radiant, degreasing and manifold heating	6,2*	1 000	230	770
	6,2*	1 500	230	1 080
	6,2*	2 000	230	1 390
	6,2*	2 500	230	1 700
	6,2*	3 000	230	2 010
	6,2*	4 000	230	2 745
Water immersion	9,9*	1 000	230	500
	9,9*	1 500	230	660
	9,9*	2 000	230	825
	9,9*	2 500	230	1 260
	9,9*	3 000	230	1 670

* STRAIGHT ELEMENT - STOCK ITEMS

Standard Assemblies & Applications

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ELEMENTS



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Standard tubular element bundles welded into 1.25" and 2" BSP screw-in bosses can be applied to various heating applications where direct immersion heating is required such as liquids, oils and degreasing solutions.

LIGHT OIL IMMERSION HEATERS - 3.2W/CM (STAINLESS)			
WATTAGE	VOLTAGE	IML	BOSS
1 000	230	350	1.25" BSP
1 500	230	525	1.25" BSP
2 000	230	660	1.25" BSP
2 500	230	775	1.25" BSP
3 000	230	950	1.25" BSP
3 000	230/400	660	1.25" BSP
4 500	230/400	1 000	1.25" BSP
6 000	230/400	1 320	1.25" BSP
6 000	230/400	1 050	2.00" BSP
7 500	230/400	1 200	2.00" BSP
9 000	230/400	1 450	2.00" BSP
VEGETABLE OIL IMMERSION HEATERS - 5.5W/CM (STAINLESS)			
WATTAGE	VOLTAGE	IML	BOSS
1 000	230	250	1.25" BSP
1 500	230	325	1.25" BSP
2 000	230	400	1.25" BSP
2 500	230	500	1.25" BSP
3 000	230	600	1.25" BSP
3 000	230/400	425	1.25" BSP
4 500	230/400	600	1.25" BSP
6 000	230/400	1 150	1.25" BSP
6 000	230/400	650	2.00" BSP
7 500	230/400	750	2.00" BSP
9 000	230/400	900	2.00" BSP

(Other thread sizes optional).

Standard Assemblies & Applications

HI-TECH
ELEMENTS



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Standard tubular element bundles welded into 1.25" and 2" BSP screw-in bosses can be applied to various heating applications where direct immersion heating is required such as liquids, oils and degreasing solutions.

WATER IMMERSION HEATERS - 9.9W/CM (STAINLESS)			
WATTAGE	VOLTAGE	IML	BOSS
1 000	230	150	1.25" BSP
1 500	230	180	1.25" BSP
2 000	230	225	1.25" BSP
2 500	230	285	1.25" BSP
3 000	230	325	1.25" BSP
3 000	230/400	425	1.25" BSP
4 500	230/400	330	1.25" BSP
6 000	230/400	425	1.25" BSP
6 000	230/400	425	2.00" BSP
7 500	230/400	550	2.00" BSP
9 000	230/400	850	2.00" BSP
STANDARD WATER IMMERSION HEATERS - HARD WATER (STAINLESS)			
REF	WATTAGE	VOLTAGE	IML
HI 3032	6 000	230/400	420
HI 3028	9 000	230/400	635
HI 3075	12 000	230/400	635
HI 3027	12 000	230/400	835

(Other thread sizes optional).

Special Flanged Tubular Assemblies

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Flanged Immersion & Duct Heaters

This range of heating systems is manufactured in various wattage and voltage ratings for specific application requirements with mounting and sheath material options.

These assemblies are engineered and configured using standard or specifically manufactured tubular elements for the heating of liquids, air or gases. The units can also be manufactured with certified explosion or fire resistant terminal enclosures for protection in hazardous environments.

SPECIFICATIONS

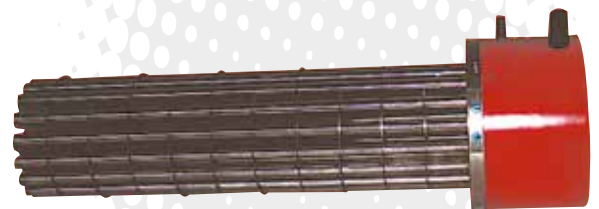
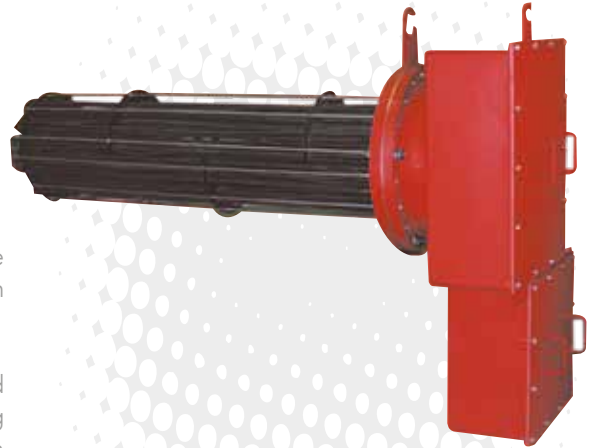
- Custom manufactured wattage and voltages
- Custom manufactured lengths
- Excellent dielectric strength
- High mass construction retains heat longer
- Exe rating optional

FEATURES

- Temperature applications up to 600° C
- Watts density ratings designed to suit application
- In excess of 6 Mega Watt

APPLICATIONS

- Water/oil immersion heating
- In-line air heating
- Special chemical immersion heating





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SPACE RADIANT HEATER

- Free-standing or Wall mounted
- Light and easy to install
- Cost effective
- Heat selected areas
- Upgrade working environment
- Increase productivity during winter
- Standard range ex stock or designed and manufactured to customer requirements



WALL MOUNTING



**WINTER WARMTH
IMPROVES
PRODUCTIVITY**





TECHNICAL INFORMATION

SPACE RADIANT HEATERS

INDUSTRIAL APPLICATIONS

- Conveyor ovens
- Paint drying
- Curing ovens
- Heat setting
- Armature baking

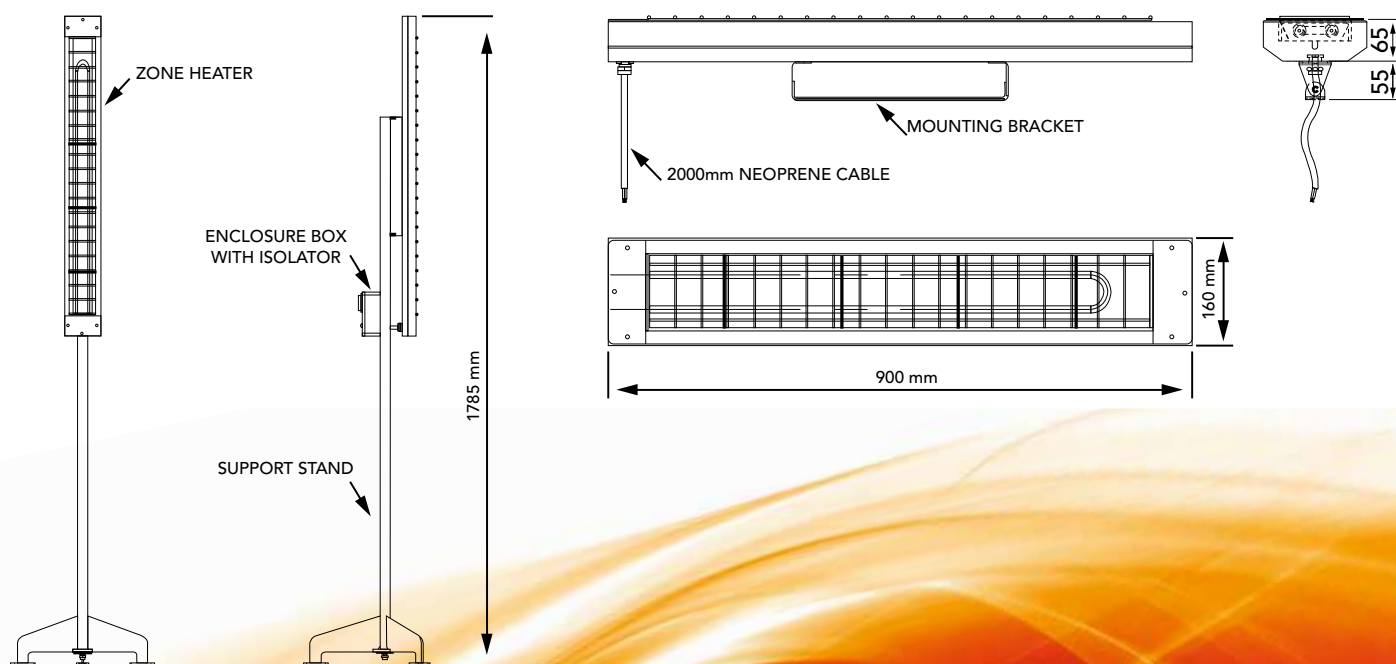
COMFORT APPLICATIONS

- Open factory areas
- Warehouses
- Entrance halls
- Work benches
- Canteens

TECHNICAL DATA

- Tubular sheathed element
- Highly polished 430BA STST reflector
- Free-standing or Wall mounted
- Two brackets included for mounting onto framework of oven, ceiling etc.
- Angle setting facilities
- Lightweight protective guards
- Mediumwave
- Other sizes manufactured to customer specification

PRODUCT (ex stock)	LENGTH	WIDTH	WATTAGE	VOLTAGE
SPACE HEATER	900 mm	160 mm	3,0 KW	240 V
SPACE HEATER	900 mm	160 mm	1,5 KW	240 V





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Mica Band Heaters

SPECIFICATIONS

- Custom designed and manufactured to meet specifications

FEATURES

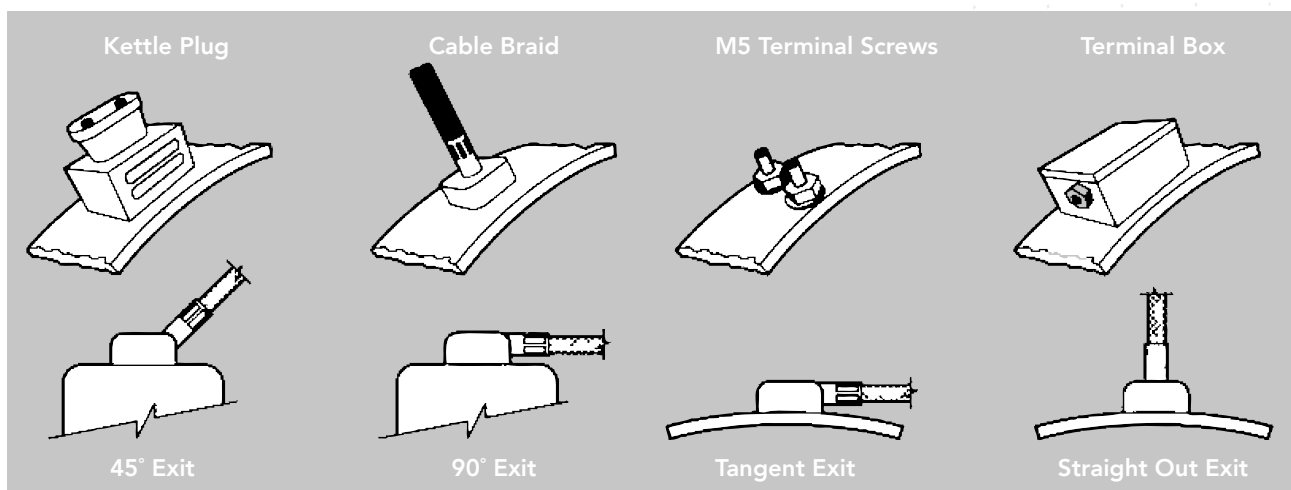
- Flexible, one-piece unit allows for quick and easy installation and can be fully opened to the diameter of the barrel
- Installed individually without having to remove other band heaters already in place
- Excellent dielectric strength achieved by using high-grade mica insulation, which transfers heat away from the windings to the sheath of the band heater
- High temperature nichrome resistance ribbon precisely wound for even heating
- Mild steel, electrogalvanized steel inner sheath
- Brightly annealed stainless steel outer sheath
- Various clamping configurations available including welded barrel clamps, bent up angled clamps or quick-release clamps
- Terminal arrangements available to suite your specific machine such as the standard kettle plug, connection box, stud terminals or flexible leads

APPLICATIONS

- Plastic injection moulding
- Plastic blow mouldings
- Plastic recycling
- Plastic extrusion

CAPABILITIES

- Sheath temperatures to 280° C
- Watts density ratings to 3,0W/cm²





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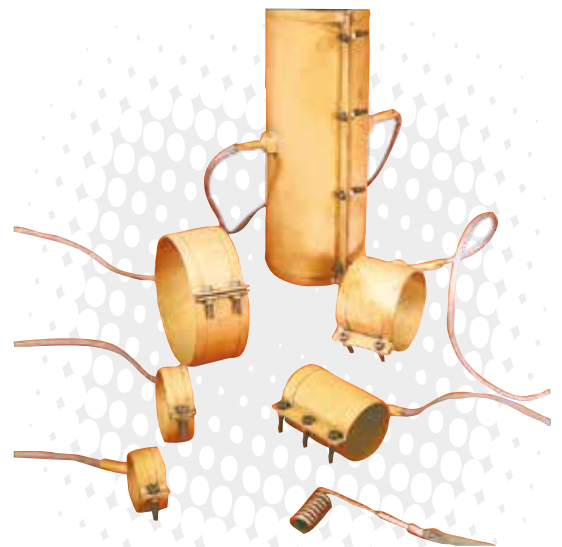
Sealed Nozzle Heaters

SPECIFICATIONS

- Custom designed and manufactured to meet specifications

FEATURES

- Brass encapsulated for maximum thermal conductivity
- Stainless steel option for nylon and higher temperature purposes
- Manufactured with standard bent-up angle clamps
- Terminated through a totally sealed terminal cap with flexible braided cable
- Standard range available or custom designed to specification
- Built-in thermocouple option



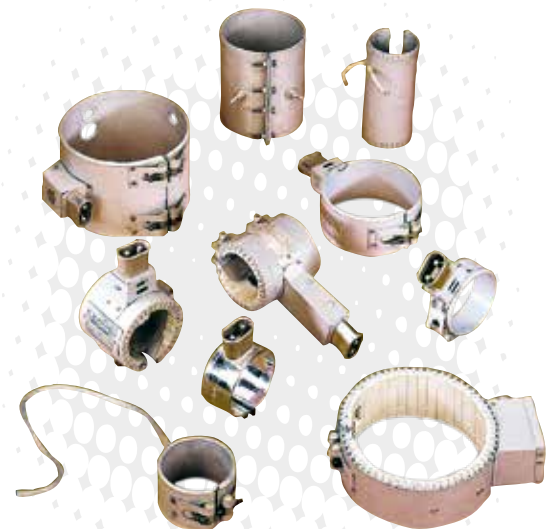
Ceramic Band Heaters

SPECIFICATIONS

- Custom designed and manufactured to meet specifications

FEATURES

- Higher performance capability than the mica band heater
- Ceramic insulating bricks used to support the element wire therefore allowing for higher thermal conductivity
- A layer of low thermal conductivity insulation between the ceramic core and element sheath directing heat to the centre of the unit
- Higher watt density results in faster heat-up times and throughput which increases overall productivity

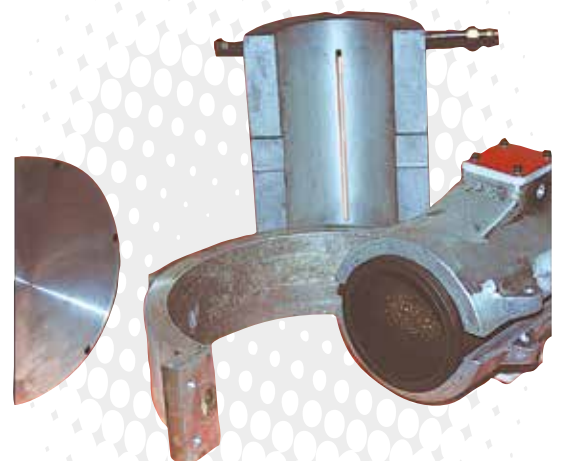


CAPABILITIES

- Operating temperatures up to 750° C
- Watts density ratings to 6,0 W/cm²

Cast Aluminium Heaters

Manufactured primarily for the plastics industry these elements can be cast to suit any barrel or die that needs to be heated. These units can also be supplied with cooling tubes cast in for heating and cooling applications. With a low thermal mass of aluminium these heaters have a quick heat up time and due to the larger surface area, a lower loading on the element is exerted, resulting in a longer life expectancy.



Flat Clad Heaters

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ELEMENTS



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Flat Metal Clad Elements

SPECIFICATIONS

- Custom designed and manufactured to meet specifications

FEATURES

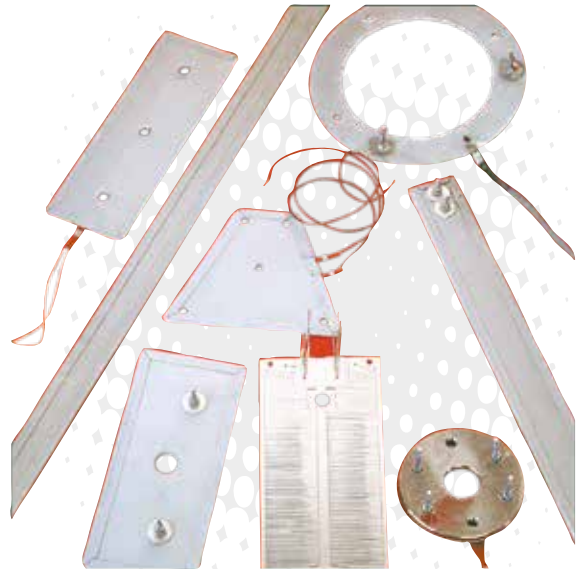
- Excellent dielectric strength achieved using high-grade mica insulation transferring heat from the windings to the sheath of the clad element
- High temperature nichrome resistance ribbon precisely wound for even heating
- Low mass construction which heats up faster
- Brightly annealed stainless steel outer sheath (also in brass)
- Terminal arrangements to suit requirements including standard kettle plug, connection box, stud terminals or flexible leads
- Economical and reliable
- Manufactured in any shape

APPLICATIONS

- Dies and moulds
- Hot plates
- Packaging and food warming equipment
- Vulcanising presses

CAPABILITIES

- Sheath temperatures up to 280° C
- Watts density ratings to 3 W/cm²



Anti-condensation Strip Heaters

SPECIFICATIONS

- 205 x 40 x 8 mm - 40 Watt 230 Volt
- 205 x 40 x 8 mm - 80 Watt 230 Volt

Other sizes and voltages manufactured on request

FEATURES

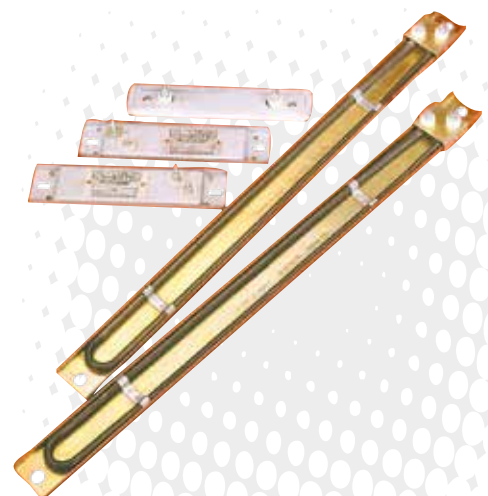
- Prevents freezing or condensation in control panels that are electrical or electronic
- Stainless steel sheathed
- Mica insulated
- Self limiting

APPLICATIONS

- Control panel anti-condensation
- Restricted environmental heating

CAPABILITIES

- Uncontrolled operations
- Predetermined temperature ranges



Temperature Controllers

HI-TECH
ELEMENTS



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Temperature & Process Controllers

Hi-Tech Elements offers a broad and diverse range of temperature measuring instrumentation ranging from the basic 11 pin plug in base controller to the sophisticated process controller that delivers predictable and repeatable temperature control confidence.

SPECIFICATIONS

- Various sizes 48 mm up to 96 mm
- Various brand names with full service support and spares available

FEATURES

- Accuracy up to 0.1% of setpoint
- Blind, deviation or digital indication
- Process and ramping control
- Industry standard inputs
- Versatile output choices [4 - 20 Ma or 0 - 10 V]
- Auto tuning
- Easy set-up

APPLICATIONS

- Suited to all heating systems
- Electric, gas, alternative fuels, etc
- Molten metals

BRAND NAMES AVAILABLE

- TOHO
- RKC
- CAHO
- Other available on request
- Complete control system available on request
- Solid state / Thyristor
- Control switching





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EASTERN
CONTROLS

Thermocouple Principal

The modern thermocouple is derived from Seebeck's discovery that, if a circuit is formed using two dissimilar metal conductors with one junction at a higher temperature than the other, then a current will flow in the circuit. The resultant emf is proportional to the temperature difference between the junctions. For many industrial heating processes, particularly those carried out at a high temperature, a thermocouple is the most accurate, convenient and simple method of temperature measurement.

Standard Products

- From simple control to the more complex control system
- Solid State relays
- Thyristor Control (SCR)
- Electro mechanical contactor or relays
- Programmable Logic Controller

HARDWARE FOR ALL THERMOCOUPLES

- Male and Female connectors
- Compensating cable
- All fittings
(1/4 inch: 3/8 inch: 1/2 inch: 3/4 inch)

PLC HARDWARE AND LONG DISTANCE SIGNALLING

- 0 - 10 Volts
- 4 - 20 Ma
- Thermocouple Transmitters

GENERAL PURPOSE TYPE J, K UP TO 400° C

- Plastics Industry (Bayonet Type)
- Refrigeration (Pt100)
- Most simple application where control is required

Pt100 FOR ACCURACY FROM - 80° C to 200° C as a standard (4.8Ø and 6.0Ø)

• Air Probe

• Water

• Oil

• Flammable liquids

• Halar coating for chemicals

Up to 200° C for accuracy on specialised applications and where flexibility and durability is required.

FURNACE THERMOCOUPLE TYPE K, R, S (WIRE & BEAD)

• Type K

0-1200° C

Ni Cr

• Type R, S

0-1600° C

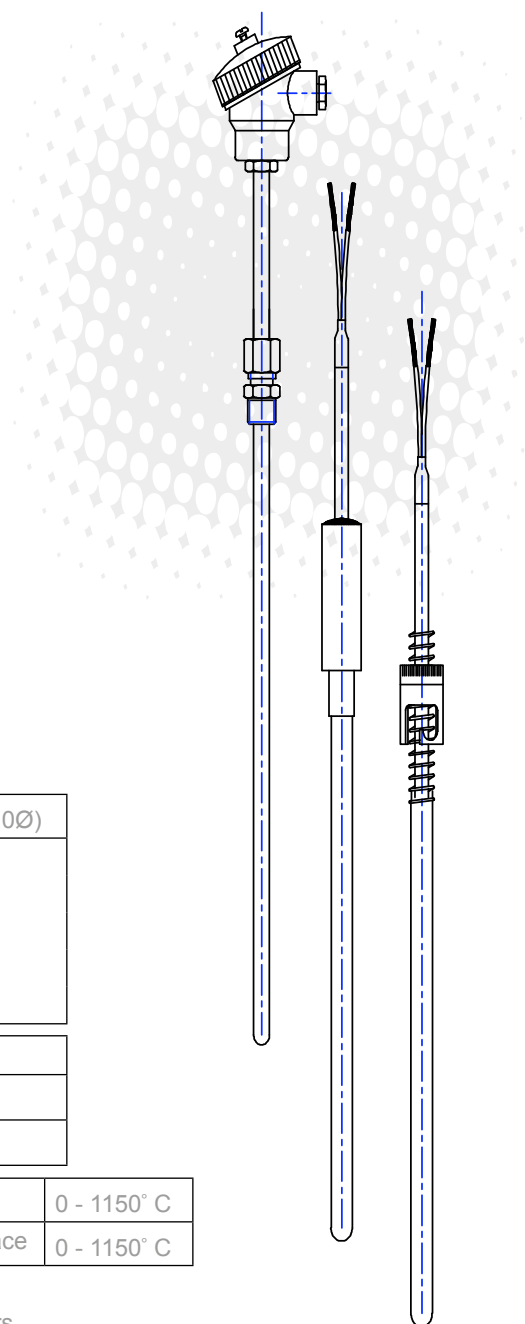
Platinum / Rhodium

Sheath Type:	• Pythagoras	0 - 1400° C	• 446 SS	Gas Furnace	0 - 1150° C
	• Alsint	0 - 1800° C	• Inconel	Electric Furnace	0 - 1150° C

MINERAL INSULATED TYPE J, K

Manufactured only on request. Standard sizes: 3.0, 4.8 and 6.0 mm Diameters.

Sheath types: 310 StSt. Benefits are flexibility, variety of size and longer life before oxidation occurs.



International Thermocouple Standards

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CONTROLS

Thermocouple








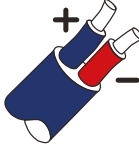
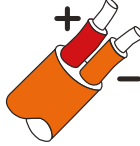

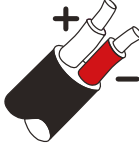
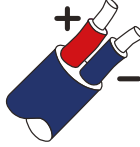







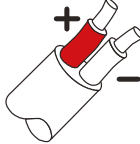

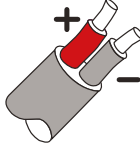
Codes / Conductor combination characteristics

National & International standards

Extension & compensating cable colours

Code Conductor Combinations



Extension & compensating cable colours Code Conductor Combinations				Approximate working temperature range of measuring junction °C	 British to BS 1843	 South African & American to ANSI / MC96.1	 German to DIN 43714	DCMV / 100°C
	+ Leg	- Leg						
K	Nickel-Chromium Also known as: *Chromel, *Thermokanthal KP,Ni-Cr, *T1, *Tophel	Nickel-Aluminium (magnetic) Also known as: Ni-Al *Alumel, *Thermokanthal KN, *T2, *Nial	0 to +1100°C				4.10	
T	Copper	Copper-Nickel Also known as: Cuperon, *Advance, Constantan	-185 to +300°C				4.2	
J	Iron (magnetic) Also known as: Fe	Copper-Nickel Also known as: Cupron, *Advance, Constantan	-20 to +700°C				5.30	
E	Nickel-Chromium Also known as: * Chromel, *Tophel, Chromium, Nickel	Copper-Nickel Also known as: Nickel, Copper, * Advance, Constantan, *Cupron	0 to +800°C				0.65	
N	Nickel-Chromium Silicon Also known as: Nicr sil	Nickel-Silicon- Magnesium Also known as: Nicr sil	-0 to +1100°C	This combination shows good promise as an alternative to type "K". Appears to be more stable and longer lived.			2.8	
R	Platinum - 13% Rhodium	Platinum -	+20 to +1600°C				1.10	
S	Platinum - 10% Rhodium	Platinum -	0 to +1550°C				1.00	
B	Platinum - 30% Rhodium	Platinum - 6% Rhodium	-100 to +1600°C				0.70	
RTD	Pt 100	3 Wire		100 Ohms	38,5 Ohms		100°C	



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Parallel Circuit Heating Cable

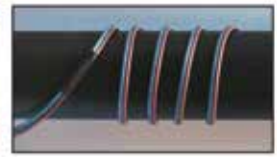
Parallel circuit heating tracer is supplied with a constant wattage output of 30 and 40 Watt per meter at any required length not exceeding 60 meters. The tracer incorporates twin silicone insulated conductors with a spiral wound Nichrome element connected to the conductor at 1 000 mm intervals. The outer jacket is either extruded silicone or Teflon FEP fluoropolymer resin. Specifically designed for process temperature compensation applications such as freeze protection, heating of pipe-lines, valves, pumps, etc. The tracer must always be temperature regulated either through a mechanical switching device (thermostat) or an electric switching device (controller). Maximum application temperature output varies between 120 - 150° C depending on tracer selection.

Self-Regulating Heating Cable

Similar in design to parallel heat tracer but supplied in a variety of wattages ranging from 25 Watt per meter to 65 Watt per meter at any required length not exceeding 60 meters. This tracer is designed to self-regulate and no additional temperature control is required. Maximum application temperature output is around 100° C but depends on the tracer selection.

FG CORD - Glass Fibre Heating Cord

FG CORD is a single core heating tracer with various output capabilities ranging from 25 - 150 Watt per meter and can be supplied to a maximum application length of 50 meters. The heat tracer consists of either a single core or multi stranded Nichrome wire core with termination on either end. The outer insulating jacket is a glass fibre overbraid suitable for high temperature applications and environments. Termination is normally on either end of the trace heater but can also be supplied on one side with an additional glass overbraid if required. Designed for process temperature compensation in applications such as freeze protection, heating of pipelines, valves, pumps, containers, heating mats etc. The tracer must always be temperature controlled and this can be done either with a mechanical switching device - (thermostat) or an electronic switching device (thermocouple and controller). Maximum application temperature limit: 400° C.



High Temperature Furnace Elements

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Open Spiral & Strip Elements

Iron-chromium-aluminium (FeCrAl) and nickel-chromium (NiCr) categorize resistance-heating elements. The difference in crystal structure, mechanical, electrical and thermal properties allow these alloys to be formed into spiral or strip elements and can be applied to a wide range of heating applications at low or high temperatures.

IRON CHROMIUM (FECRAL)

This alloy can be formed into spiral or strip elements to suit the specific application where wire temperatures up to 1 400° C is required.

APPLICATIONS

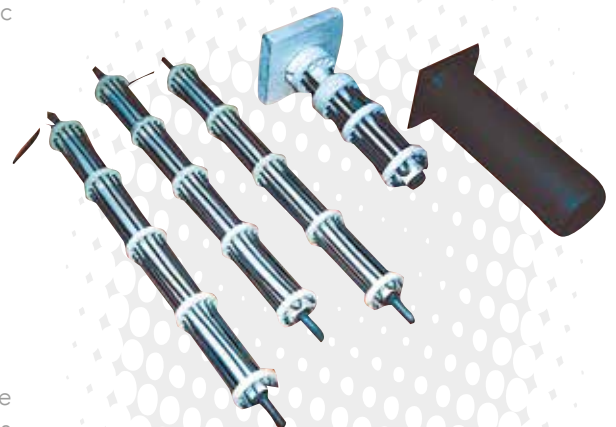
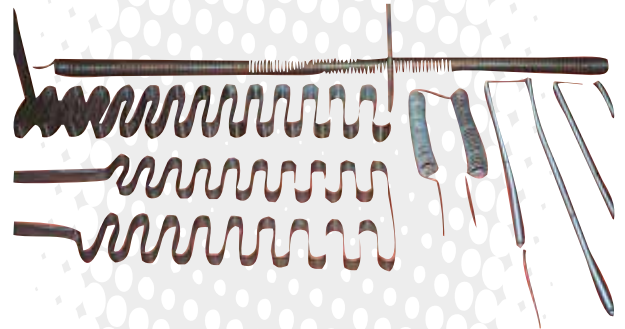
- High temperature furnaces in the heat treating, ceramic, glass or steel industries and many other applications

NICKEL CHROMIUM (NICR)

This alloy can be formed into spiral or strip elements to suit the specific application where wire temperatures up to 1 400° C is required.

APPLICATIONS

- Heavy duty heating applications
- More resistant to hazardous environments
- Nonferrous metal melting



Candle Elements & Assemblies

Electrical candle elements are designed to give a long life while operating at maximum power with rating up to 40Kw/m. This is made possible with the application of specialised element wire in combination with improved element design. They are suitable for applications directly in the atmosphere so that the high potential is fully utilised through a combination of radiation and convection.

IRON CHROMIUM (FECRAL)

This alloy can be formed into spiral or strip elements to suit the specific application where wire temperatures up to 1 400° C is required.

FEATURES

- Manufactured in lengths up to 2 000 mm long
- Manufactured in 0.53 mm or 0.62 mm

CAPABILITIES

- Depending on wire choice, suitable for applications up to 1 200° C
- High power output



High Temperature Furnace Elements

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ELEMENTS



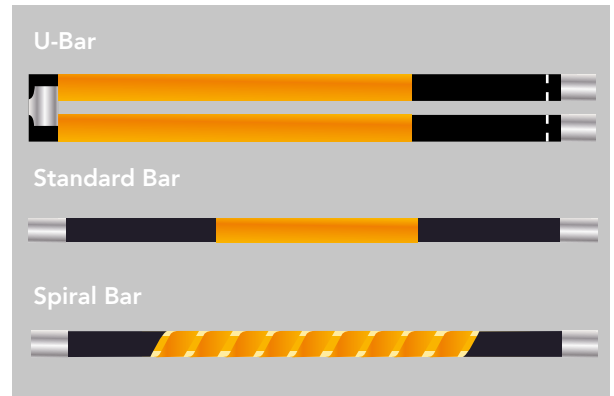
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Silicon Carbide Elements

Manufactured from high quality pure alpha silicon carbide grit and sintered at temperatures over 2 200° C. These elements form recrystallized rods with string uniform bonds known as silicon carbide elements. They can then be applied to various temperature applications ranging from 600 - 1 600° C.

FEATURES AND CAPABILITIES

- Manufactured in various standard lengths and diameters
- Manufactured as single or multi-leg units
- Withstands rapid heating, cooling cycles and high electrical loading
- High power output
- Metal melting and holding furnaces



Element Pockets

Element pockets are manufactured from various diameters stainless steel tubing with a wall thickness of 1,2 mm for maximum heat dissipation into the product to be heated. The pockets can be manufactured to any length in increments of 25 mm with hot and cold zones to suit your specific application. Withdrawable elements can then be removed or replaced without having to decommission the tank/vessel that is being heated.

Ceramic Withdrawable Elements

Manufactured specifically for liquid heating, and houses in steel element sleeves the elements can be applied in the sides of tanks or as elements bundles on flanged assemblies. This design of element facilitates the replacement of elements without the draining of the tank or vessel in which it is applied resulting in reduced maintenance time and increased productivity.

FEATURES

- Sizes are available from Ø16 mm - Ø54 mm
- Custom manufactured wattages, voltages and lengths
- Excellent dielectric strength
- High mass construction retains heat longer





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Multiple Drum Heating Oven

SPECIFICATIONS

- Sizes to suit 2 - 20 drums
- 50 mm insulation
- Various material construction
- Fully automated control
- Mechanical or electric door mechanisms
- Safe for volatile products

APPLICATIONS

- Waxes, oils, frozen food and liquids as well as other drummed products



Flexible Fibreglass Insulated Drum Heater

(sole South African manufacturer)

SPECIFICATIONS

- 575 mm x 220 mm x Wattage to suit application
- 220 Volt single phase
- Temperature limited output

FEATURES

- Quick release clamps
- High temperature pure stranded glass insulation
- Other sizes designed and manufactured on request

APPLICATIONS

- Used on plastic drums for low consistent heat transfer



Direct Immersion Drum Heater

A lightweight unit designed for easy installation through the 50 mm bung hole of a standard 210l drum. The element is durable and resists damage during the installation or removal process. Internally mounted temperature sensors protect against overheating.

SPECIFICATIONS

- 1 000 - 6 000 Watt
- Thermostatically controlled 0 - 120° C or higher
- Single or three phase

FEATURES

- Incoloy sheathed to resist most chemicals
- Direct immersion, quick heat transfer
- Other sizes manufactured to specifications





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Base Drum Heater

Designed for heating vertically standing drums from the base.

SPECIFICATIONS

- 540 mm Ø x 100 mm high
- 3 000 Watt x 230 Volt single phase
- Thermostatically controlled 0 - 200° C or higher

FEATURES

- Solid mild steel construction
- Can accommodate drums up to 500 kg
- Continuous slow heating

APPLICATIONS

- Heating 210l [44 gallon] drums from the base
- Vertical standing drums
- Other sizes manufactured to specifications



Tubular Drum Heaters

This metal clad incoloy drum heater is designed to fit between the ribs of a standard drum for external heating. Quick release clamping buckles allow for fast and efficient drum changing. More suitable for moist and wet conditions.

SPECIFICATIONS

- 575 mm Ø x 220 mm high
- 3 000 Watt x 230 Volt single phase
- Thermostatically controlled 0 - 300° C

FEATURES

- Quick release clamps
- Mildsteel or stainless steel construction
- Other sizes manufactured to specification

APPLICATIONS

- Heating drums externally, wrap around style
- Quick and efficient heat transfer
- Fully insulated outer jackets also available
- Made to customer specifications and adapted to class 1, Division 1, 11 (zone 1, 2 and 3) areas





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Standard Drum Heater

This flexible metal clad unit is designed to fit between the ribs of a standard drum for external heating. Quick release clamping buckles allow for fast and efficient drum changing.

SPECIFICATIONS

- 575 mm Ø x 220 mm in width
- 3 000 Watt x 230 Volt single phase
- Thermostatically controlled 0 - 200° C

FEATURES

- Quick release clamps
- Mild or stainless steel construction
- Die cast terminal enclosure
- Other sizes designed and manufactured on request

APPLICATIONS

- Heating drums externally, wrap-around style
- Quick and efficient heat transfer
- Fully insulated outer jackets also available
- Also manufactured with incoloy for very moist or wet conditions
- Made to customer specifications and adapted to class I Division I, II (zone 1, 2 and 3) areas





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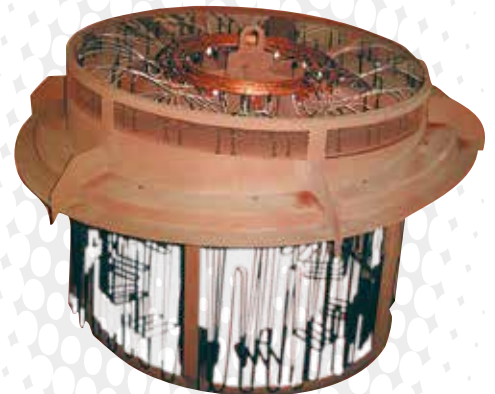
In-line Heating

Elements to design and construct an in-line fuel-oil preheater for use in the textile industry. Hi-Tech Elements designed two 250Kw in-line heaters to exchange 1 200l fuel/min. Both vessels were manufactured to ASME spec and further client specifications. In addition to the client requirements, Hi-Tech Elements' team recommended improvements to the design which included two skid plate lifting lugs, element cluster removal, etc. The unit was supplied with a fully commissioned control panel built to SABS specification.



Molten Metals

Specifically designed for the metal ladle preheating of molten metals, this heater was designed and manufactured by Hi-Tech Elements to operate at constant temperatures of more than 650° C. Hi-Tech Elements designed, manufactured and installed various sizes for one of the largest aluminium processing plants in the world as well as supplying units for use in zinc, lead, aluminium, etc.



Stress Relief Oven

Hi-Tech Elements has been involved in the supply of spares and control equipment to the plastic manufacturers in South Africa for 20 years and has custom built a stress relieving oven for the specific use in the plastic boards, roof sheeting and the industrial application of continuous corrugated sheeting.

This oven has infrared and convection heating zones and is thyristor controlled with pyrometers for very exact temperature product control.

Pneumatic lifting top section designed for easy operations and maintenance of the unit.

The elements banks are designed for quick removal and refitting during maintenance of the oven.





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Hot Dip Galvanizing Industry

Hi-Tech Elements is the leading manufacturer and supplier of complete plant and spares for the hot dip galvanizing industry. The heating furnace is designed in modular form to suit the kettle and can be fitted or removed for maintenance in approximately one hour, eliminating costly down time and loss of production. The thyristor controlled panels assures cost-saving energy supply at constant levels. Only the highest grade NiCr elements are used and best quality fibre insulation to minimise heat loss. Sizes range from 0,5 m to 10 m long and 12Kw to 1,3Mw.



Flash Drying Oven, Battery Industry

One of the largest independent battery manufacturers on the continent commissioned Hi-Tech Elements to design battery manufacturing equipment. To date all such equipment had been imported and Hi-Tech Elements would be the first local manufacturer to receive a commission of this nature. Not only did our qualified and experienced team develop a product superior to that of the imported unit, but we were able to supply the oven at approximately 55% of imported cost.

The flash drying oven has been designed with three heat sources ie. short wave infrared, convection and gas convection and has extremely efficient heat transfer properties at minimal losses. The all stainless steel belt is also speed variable to suit the pasting machine and take off conveyor.

Complete stainless steel acid wash bays with separate washing and drying facilities has also been successfully completed for the same company.



Infrared Heaters

Hi-Tech Elements is also a leading designer of short, medium and long wave infrared heaters for application to suit the client's requirements. Temperature ranges from 50° C - 700° C. High grade ceramics for vacuum forming, powder and paint coating, metal melting calcifiers, etc. have been very successfully applied.





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Kilowatt-hour requirements to heat steel

Mass	25° C	50° C	100° C	250° C	400° C	500° C	750° C
25	0.1	0.2	0.4	1.0	1.6	2.0	3.0
50	0.2	0.4	0.8	2.0	3.2	4.0	6.0
100	0.35	0.7	1.4	3.5	5.6	7.0	10.5
200	0.7	1.4	2.8	7.0	11.2	14.0	21.0
250	0.9	1.75	3.6	8.75	14.4	18.0	26.25
500	1.75	3.5	7.0	17.5	28.0	35.0	52.5

Kilowatt-hour requirements to still air

Mass	25° C	50° C	100° C	250° C	400° C	500° C	750° C
25	0.18	0.36	0.72	1.8	2.88	3.6	5.4
50	0.34	0.68	1.36	3.4	5.44	6.8	10.2
100	0.7	1.4	2.8	7.0	11.2	14.0	21.0
200	1.4	2.8	5.6	14.0	22.4	28.0	42.0
250	1.7	3.4	6.8	17.0	27.2	34.0	51.0
500	3.4	6.8	13.6	34.0	54.4	68.0	102.0

Kilowatt-hour requirements to heat water

Mass	10° C	20° C	25° C	50° C	60° C	80° C	100° C
50	0.6	1.2	1.5	3.0	3.6	4.8	6.0
100	1.2	2.4	3.0	6.0	7.2	9.6	12.0
200	2.4	4.8	6.0	12.0	14.4	19.2	24.0
500	6.0	12.0	15.0	30.0	36.0	48.0	60.0
1 000	12.0	24.0	30.0	60.0	72.0	96.0	120.0
2 000	24.0	48.0	60.0	120.0	144.0	192.0	240.0

Kilowatt-hour requirements to heat oil

Mass	25° C	50° C	100° C	250° C	400° C	500° C	750° C
50	0.7	1.4	2.8	4.2	5.6	7.0	8.4
100	1.4	2.8	7.0	78.4	14.0	17.5	21.0
200	2.8	7.0	14.0	21.0	28.0	35.0	42.0
500	7.0	14.0	28.0	42.0	56.0	70.0	84.0
1 000	14.0	28.0	56.0	84.0	112.0	114.0	168.0
2 000	28.0	56.0	112.0	168.0	224.0	280.0	336.0

Suggested Watts densities

Material to be heated	Density
Acidic solution	6.2
Alkaline solution	6.2
Caustic solution	3.2
Degreaser	6.2
Ethelene glycol	1.6
Freon	0.5
Gasoline	0.5
Lead	5.4
Oil - vegetable	5.5
Oil - machine	3.2
Oil - bunker fuel	1.6
Paraffin	2.5
Salt - molten	3.9
Sodium cynide	6.2
Sulphur - molten	1.6
Tin - molten	3.1
Trichlorethylene	3.1
Wax	2.5
Water	10.0

To achieve the correct power requirement for the appliaction take the result above and divide by the actual hours required for the specific application.

(i.e water 2 000 kgs 100° C in 6 hours = $240 \div 6 = 40\text{Kw}$)

*No provision for losses.



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Formulae, Ohms Law

Volts

$$\text{Volts} = \sqrt{\text{Watts} \times \text{Ohms}}$$

$$\text{Volts} = \frac{\text{Watts}}{\text{Amperes}}$$

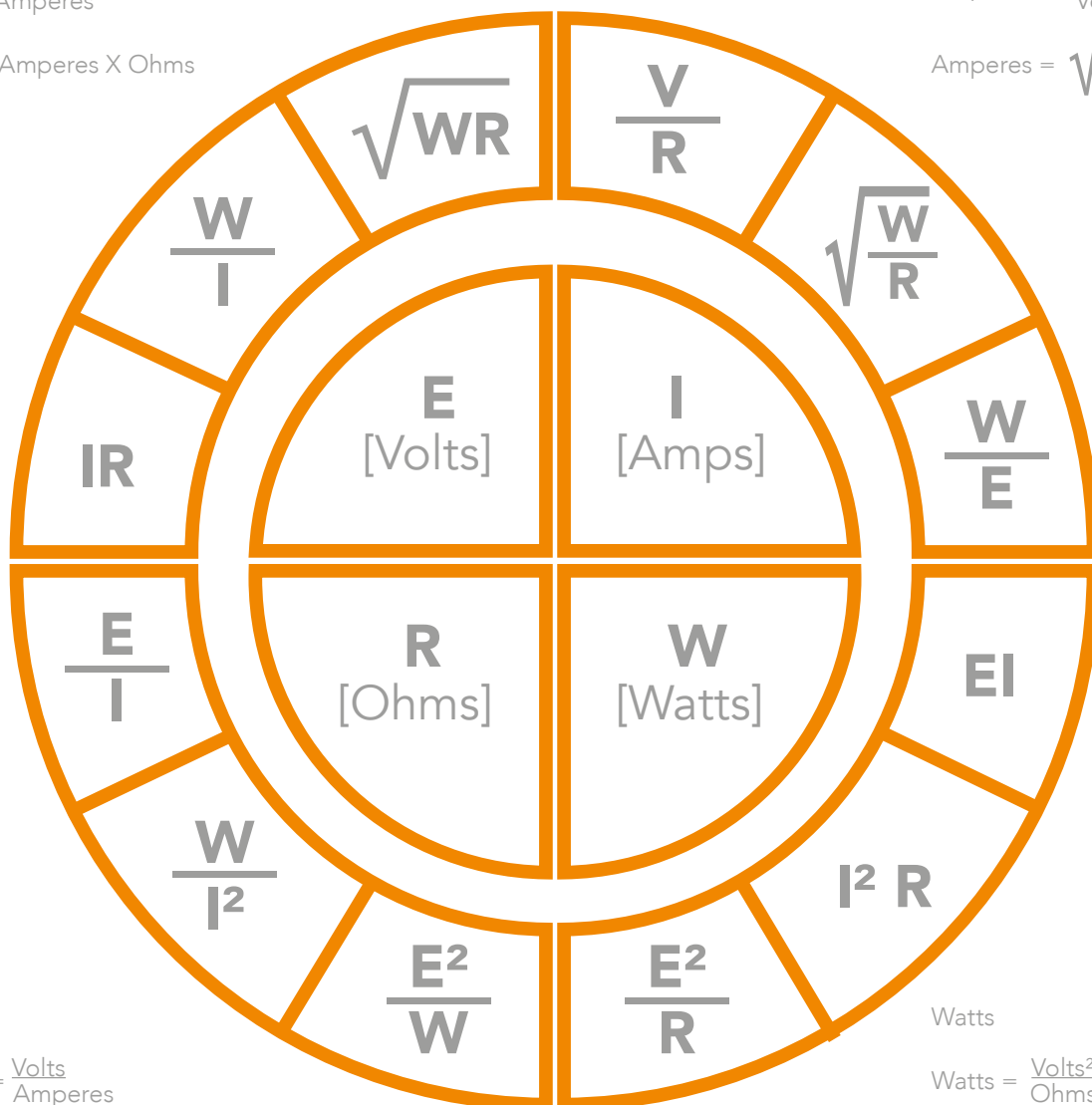
$$\text{Volts} = \text{Amperes} \times \text{Ohms}$$

Amperes

$$\text{Amperes} = \frac{\text{Volts}}{\text{Ohms}}$$

$$\text{Amperes} = \frac{\text{Watts}}{\text{Volts}}$$

$$\text{Amperes} = \sqrt{\frac{\text{Watts}}{\text{Ohms}}}$$



Ohms

$$\text{Ohms} = \frac{\text{Volts}}{\text{Amperes}}$$

$$\text{Ohms} = \frac{\text{Volts}^2}{\text{Watts}}$$

$$\text{Ohms} = \frac{\text{Watts}}{\text{Amperes}^2}$$

Watts

$$\text{Watts} = \frac{\text{Volts}^2}{\text{Ohms}}$$

$$\text{Watts} = \text{Amperes}^2 \times \text{Ohms}$$

$$\text{Watts} = \text{Volts} \times \text{Amperes}$$



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