



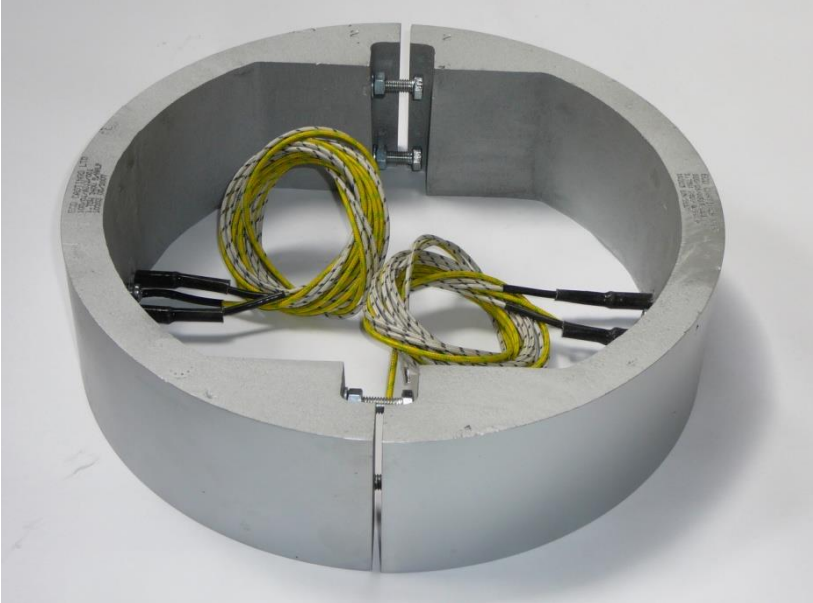
AMN Export Ltd.
45 Wordsworth Way
ROCHDALE
OL11 5JE
UNITED KINGDOM

Tel. direct: +44 1706-759506
Fax direct: +44 1706-632377
Mobile : +44 7554 662560
Web: www.amnexport.co.uk
Email: sales@amnexport.co.uk

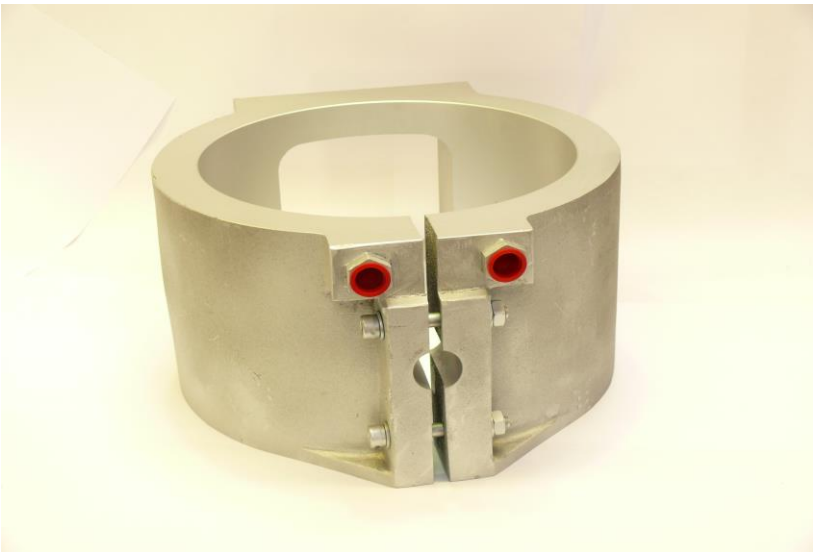
Cast heaters - general introduction



Finned heater assembly
(top half of cowl removed)



Internal band heater



Band cooler

Where uniform heat distribution and efficiency is important, Cast Heaters provide better results. The high thermal conductivity of aluminium (and aluminium bronze) allows for an extremely uniform temperature to be applied to the component surfaces, alleviating hot or cold spots which may affect the equipment's performance.

Heat is provided by a tubular sheathed wire element which has long been recognised for its reliability, strength and adaptability. It is due to the versatility of this element that cast heaters can be manufactured to suit limitless application and specifications.

All Cast Heaters are manufactured totally in-house, from tubular heating element design and construction, element forming, foundry casting through to machining and electrical connection. With control over the entire process, we guarantee our heater manufacture and performance to be of the highest standard.

With our long experience in Cast Heater design and manufacture, together with our ongoing policy of research and development our qualified design engineers would welcome the opportunity to discuss and advise on your cast heater requirements and applications.

The sections below show some of the more common uses of Cast Heaters. We know that it is impossible to cover every usage of Cast Heater in this brochure. Consequently, if you find your requirement is not covered please inform us, however unusual the specification may be.

Cast Heater Applications covered in this brochure:

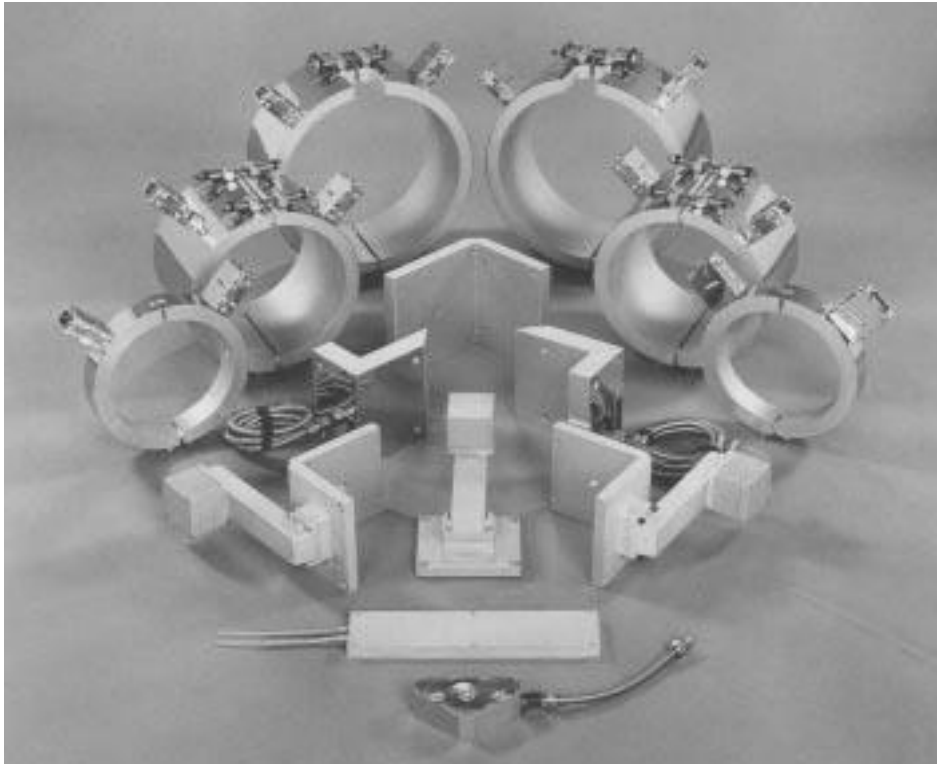
Pages 4-10 General Aluminium
 Aluminium Bronze Heaters
 Cast Iron Heaters
 (Specifications and Terminations).

Pages 11-13 Heater Coolers.

Pages 14-16 Finned Heaters, Cowls and Blowers.

Page 17 Cooling Efficiency: Air cooled vs. Liquid cooled

Page 18 Energy Efficiency: Ceramic knuckle vs. Aluminium



Barrel Heaters, Platen Heaters, Die Heaters. 'U' form and 'L' form Heaters.

Cast Heater Advantages

- 1. High thermal conductivity** Providing extremely uniform temperatures over the whole of the heated surfaces.
- 2. Accurate temperature control** The high thermal conductivity eliminates any hot or cold spots that may occur with other forms of heating. This uniform heat distribution makes for accurate temperature control.
- 3. Exceptionally long life** Utilising a recognisable reliable tubular sheathed wire element and ribbed construction cast heaters provide a good resistance to misuse.
- 4. Efficiency** The high thermal conductivity rapidly conducts this heat away from the tubular element to the component surface.
- 5. Contamination resistant** With the heating element cast into the aluminium and together with sealed terminal boxes the cast heater becomes a contaminant-resistant heating unit.

With all the above advantages, Cast Heaters provide a long life, high performance, cost reducing heating unit.

Specification

Sheath Size	Sheath Material	Max. Voltage	Max. Amperage
6.3mm Dia.	Mild Steel or Incoloy	250V	10 Amps
8.0mm Dia.	Mild Steel or Incoloy	480V	20 Amps
9.5mm Dia.	Mild Steel or Incoloy	480V	25 Amps
11.2mm Dia.	Mild Steel or Incoloy	600V	30 Amps

Resistance Tolerance $\pm 7\frac{1}{2}\%$ Wattage Tolerance $\pm 7\frac{1}{2}\%$

Aluminium and Aluminium Bronze

Specifications

Plates

Round, square or odd shape.
 Minimum thickness (mould cast) $\frac{5}{8}$ " (16mm).
 Minimum thickness (die cast) $\frac{3}{8}$ " (9.5mm).
 Round Plate minimum diameter $1\frac{1}{2}$ " O.D. (38mm).
 Round Plate maximum diameter 64" O.D. (1600mm).
 Oblong, square or odd shape maximum size 56" x 56" (1400mm x 1400mm).

Bands

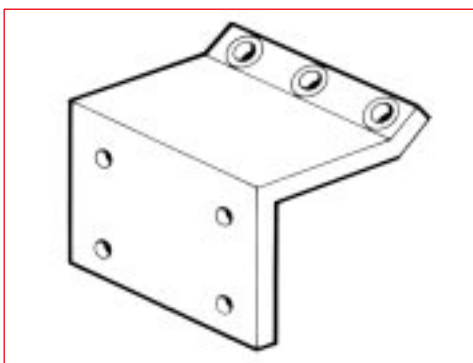
No minimum diameter (minimum O.D. 3" (75mm).
 Maximum diameter 30" (762mm).
 Maximum working temperature aluminium 400°C.
 Standard watts density 25w sq. inch (4w sq. cm.). (Higher watts density on approval).
 Maximum working temperature – Aluminium Bronze 750°C.
 Standard watts density 35w sq. inch (5.5w sq. cm.). (Higher watts density on approval).
 Machined dimension tolerance ± 0.003 ".

Note: Heaters highly rated or used near maximum temperature must be firmly clamped. Barrel Heaters must be fitted with all over stainless steel clamp bands or bolts, and clamped with spring washers to alleviate any thermal expansion or movement away from heating surface.

Clamping

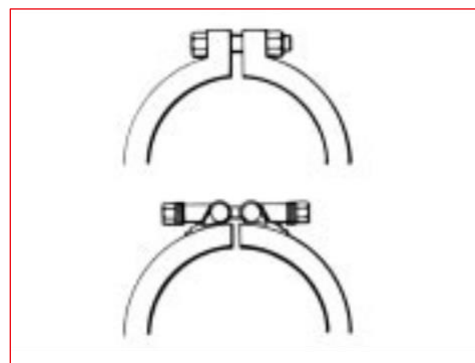
Plates

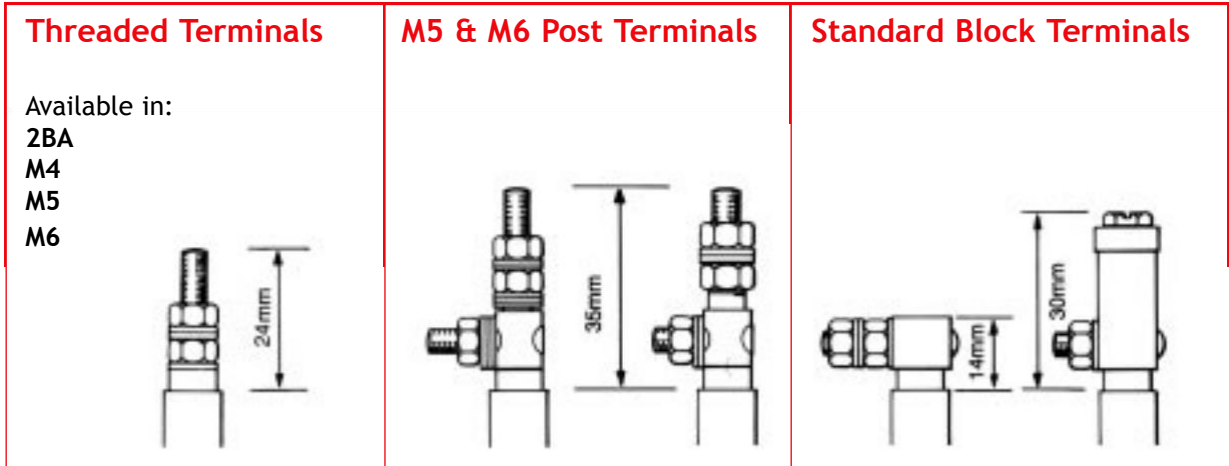
Bolted into heating surface, box shapes bolted to surface or 45° lugs can be cast.



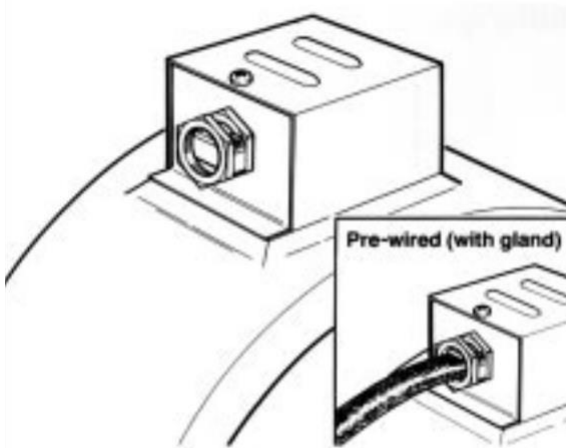
Band Heaters

Lug clamping or band and scroll clamping. For larger heaters all over stainless steel bands and spring washers are used.

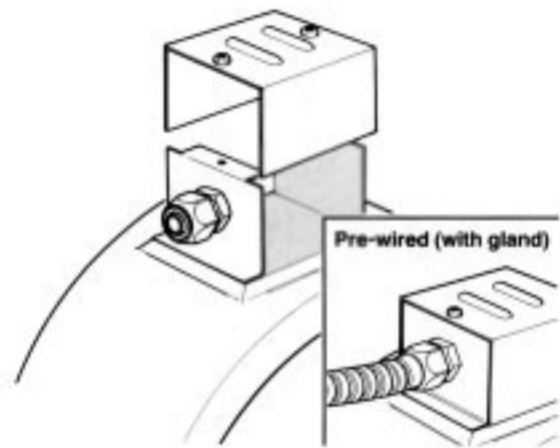




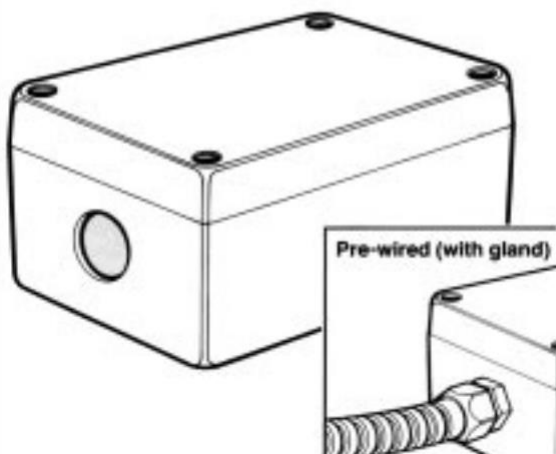
Standard Boxes 2 Piece (End Exit)



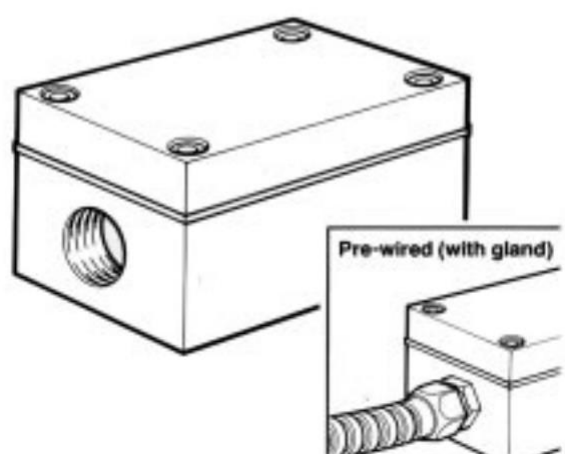
3 Piece (Top, Side or End Exit)



Pre-Cast Aluminium Box



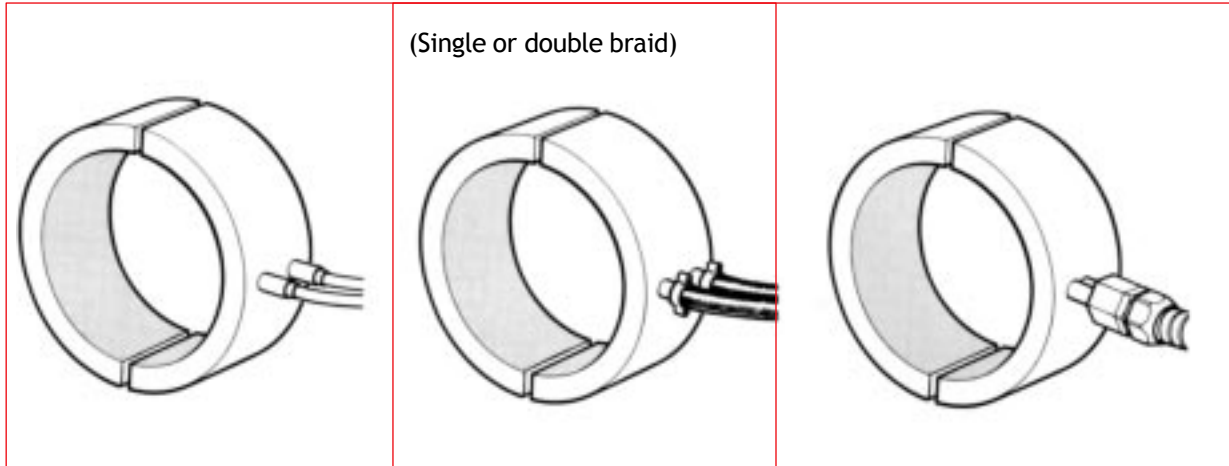
Special Cast-to-Size Boxes



High Temperature Leads

Braided Covered Leads

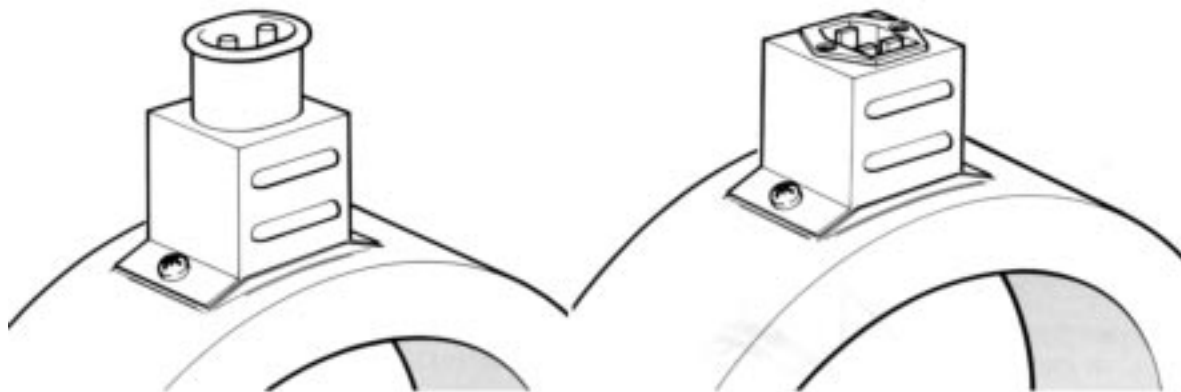
Flexible Conduit Covered Leads



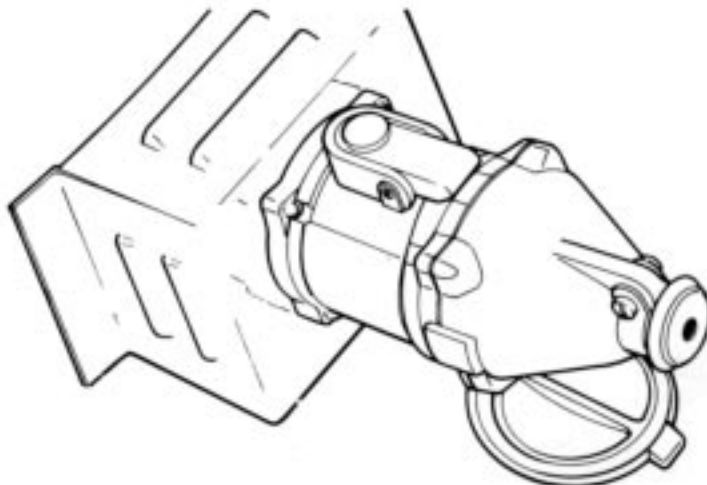
Cast Aluminium Standard Plug and Socket Terminations

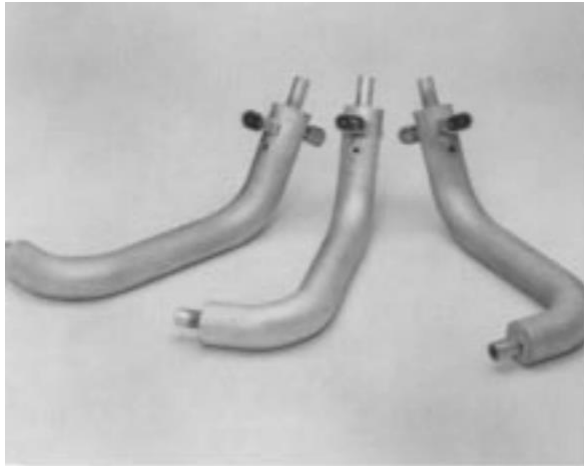
2-Pin Scraper Earth Socket
(Rating up to 15 amps single phase)

Euro 3-Pin Socket
(Rating up to 15 amps single phase)

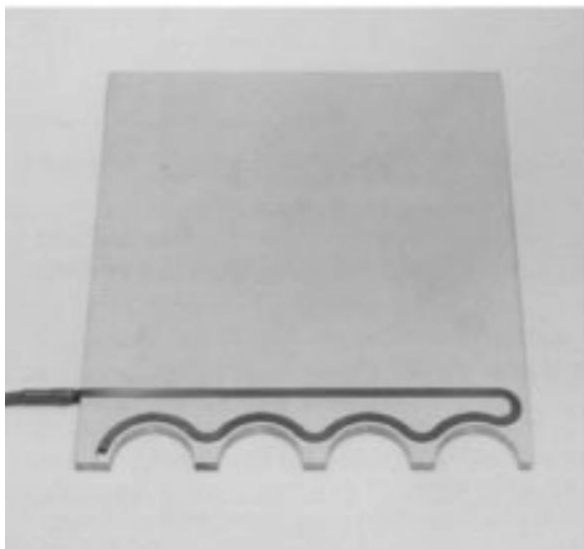


Marechal Decontactor Plug and Socket
Rating up to 35 amps single phase





Tubular Heaters can also be formed and cast around machine component parts, such as transfer pipes and other special parts.



For large quantity work a permanent die can be made giving a high quality finish on the cast surface, leaving only essential surfaces to be machined.

Ordering Instructions

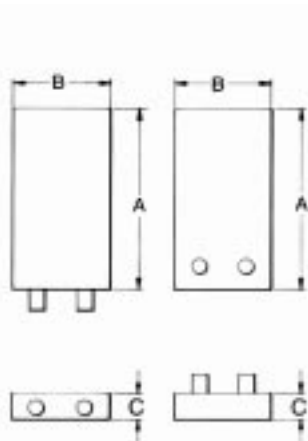
When ordering please state:

Plate Heaters

- A = Length
- B = Width
- C = Thickness
- D = Wattage and Voltage

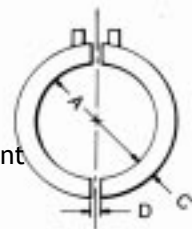
Element exiting location and length.

Termination type –
Machined surfaces required.



Band Heaters

- A = Inside diameter
- B = Width
- C = Thickness
- D = Gaps
- E = Terminal centres
- Wattage and Voltage Element
- Exiting Location – if different from drawing.
- Termination type.



Options

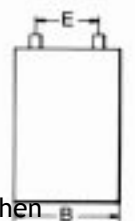
Please state if terminal box is required (and position if different from drawing).

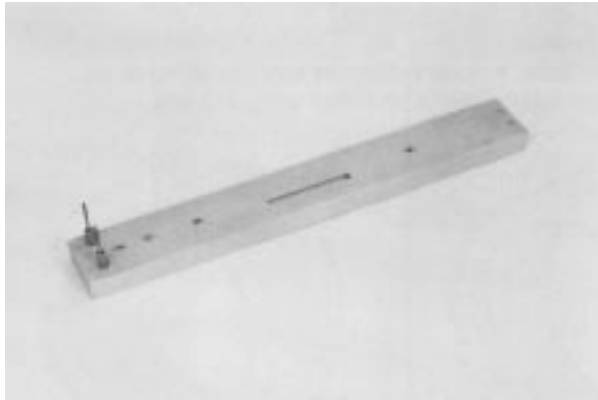
Any thermocouple holes or cut outs.

Special features.

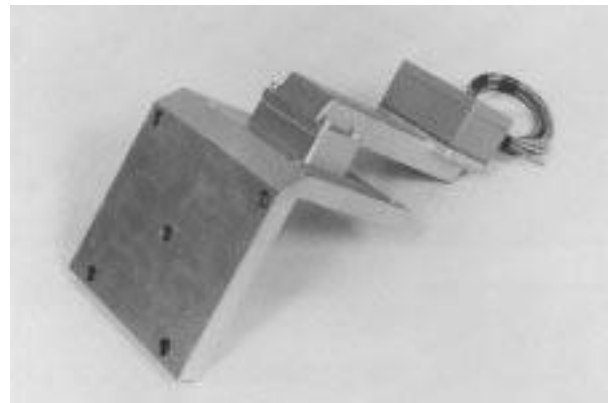
A machine drawing or sketch is preferred when ordering.

Specials – Please supply machine drawing or sketch.





Die Cast Aluminium Strip Heater
Complete with Cast-In Threaded Bushes and Thermocouple Seat.



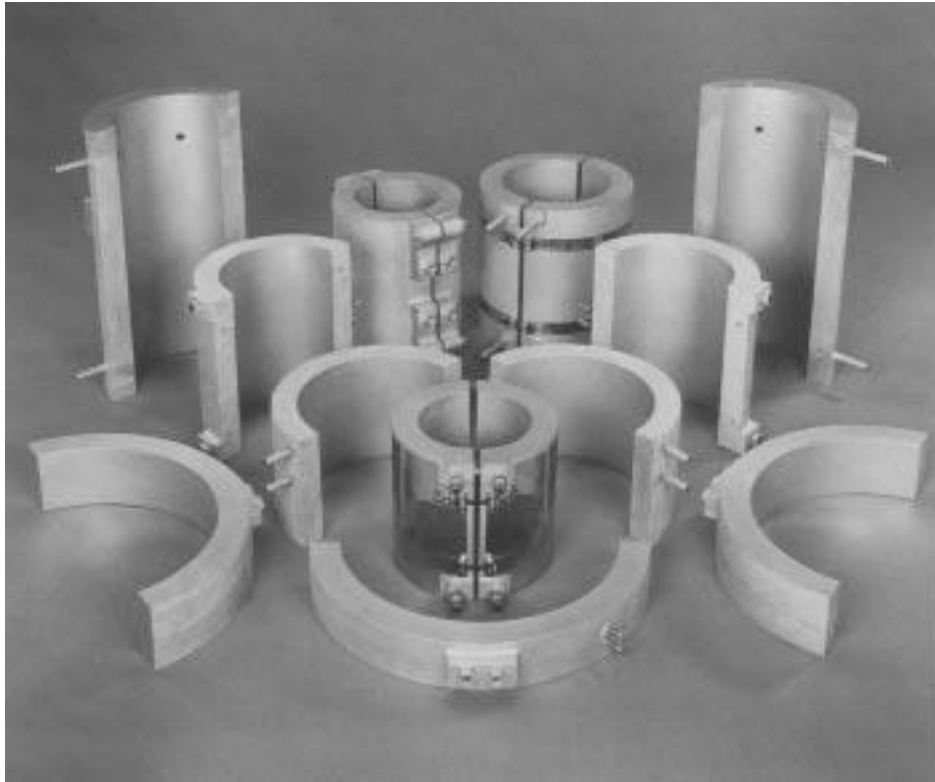
Die Cast Aluminium Bronze 'L' Shape Heater
Complete with Terminal Extension Housing and Splash Proof Box to comply with IP54 Standard.



Die Cast Aluminium Surface Heater
With recess for insulating material.



Insulated Die Cast Aluminium 'L' Shape Heater
Cut away to show insulation and Stainless Steel Cover.



Liquid cooling has been used in plastic extrusion for many years, and is generally recognised as one of the most efficient forms available.

Aluminium/Aluminium Bronze Heater Coolers are now considered standard in the plastic process industry, replacing expensive machine grooved barrels. The heater coolers are cast in halves, strapped or bolted together and machined in pairs to fit exactly on extruder barrels. They are available with single or double cooling tubes which can be cut to length, preformed, to accommodate extruder obstacles, or factory fitted with various types of pipe fittings.

Cast in water connectors are now quite standard as they are easy to connect and prevent unnecessary damage whilst in transit, from misuse or in storage.

Specifications

Standard cooling tubes available: 3/16" 10mm, 12mm, 1/2".

For other diameters please consult factory (14mm, 16mm, 19mm and 3/4" are available)

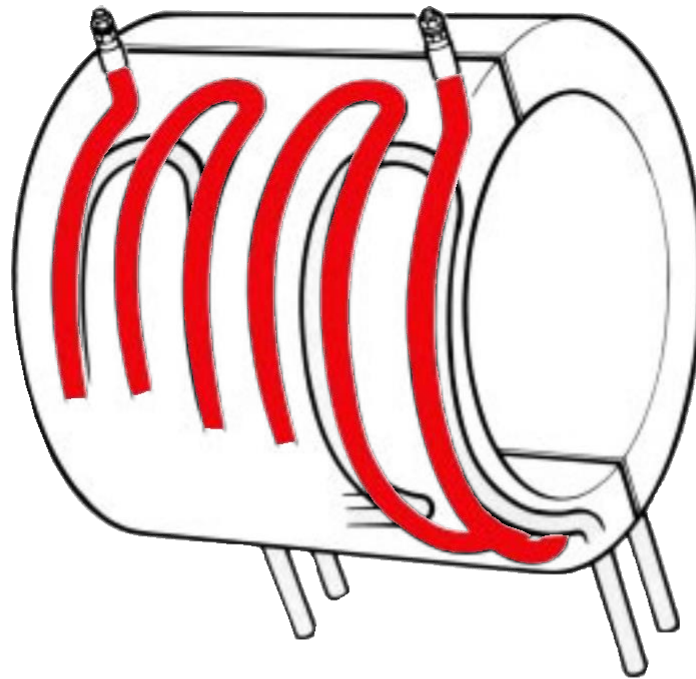
Sizes - No minimum diameter.

Maximum diameter 38" (1000mm).

Minimum width 1 1/2" (38mm).

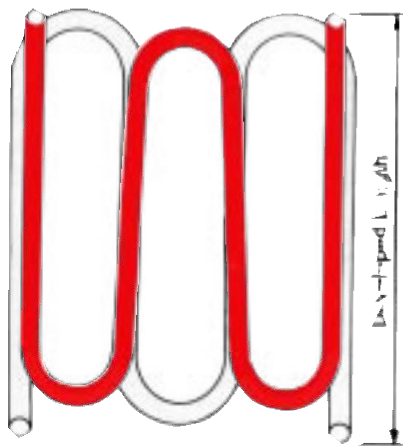
Maximum width 24" single cooling tube. 30" double cooling tube.

Minimum thickness 1 1/4" (32mm)

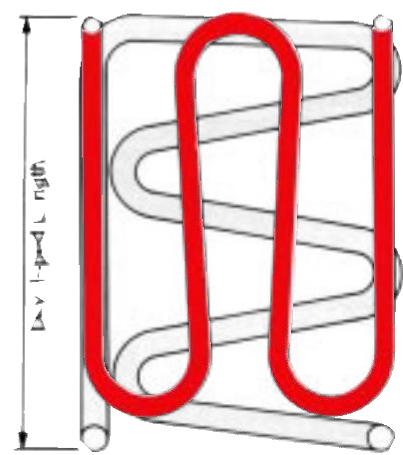


Standard Heater and Water Cooling Tube Configuration

Standard Design Cooling Tube



Self Draining Cooling Tube



The design and layout of the cooling tube is very important as continuous heating and cooling cycles create internal thermal stresses which may cause premature failure to an incorrectly designed cooling tube.

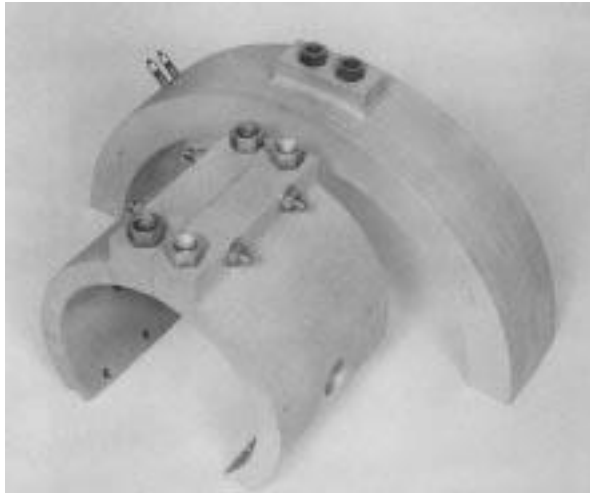
Other causes of failure are using untreated hard water for cooling without the use of softening or cleaning agents. This accelerates the build up of scale on the inside walls of the tube making cooling less efficient and may cause total blocking.

To prevent precipitation (sometimes called furring) of cooling tubes it is recommended that all heater coolers be cooled from a closed loop reservoir of treated water.

Where cooling cycles are very short a combination of an Air Cooled Finned Heater and Liquid Cooled Heater Cooler can be made.

Cast in Water Connectors

Types of water fittings



Special Small Twin Screw Heater Coolers with Cast / W Connectors



Types of Water Fitting available



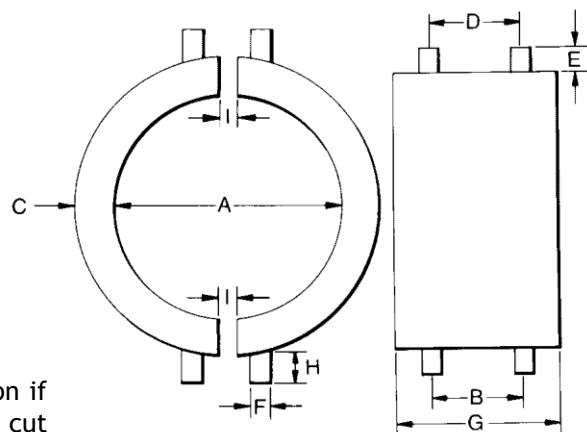
Ordering Instructions

When ordering please state:

- A = inside Diameter
- B = Width of unit
- C = Casting thickness
- D = Distance between terminals
- E = Max/Mm. height of terminal (terminal required)
- F = Dia. of cooling tube
- G = Distance between cooling tubes
- H = Cooling tube length
- I = Gaps required
- J = Wattage and voltage (total or per half)

Options

Please state if terminal box is required (and position if different from drawing) any, thermocouple holes or cut outs. Special features such as cast in connectors etc.



Note: A drawing or sketch is preferred when ordering.



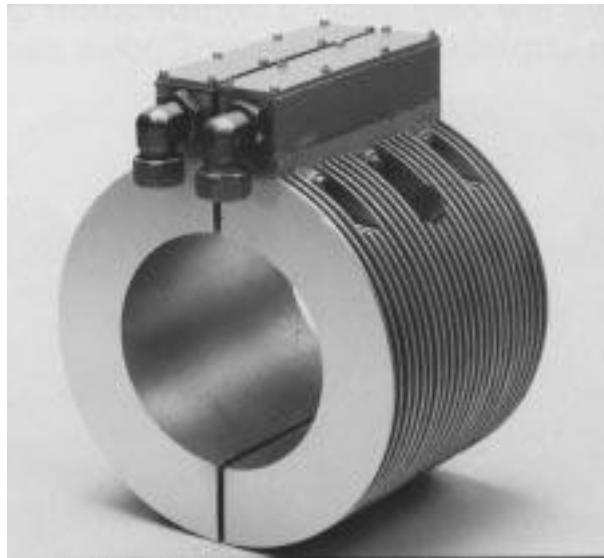
Forced air cooling of extruder barrels using finned heaters has proved itself in the field for many years. Advances in casting methods producing more fin area and with increased output and efficiency of modern blowers enables air cooling to compete with water cooling on many applications. Its advantages are many; clean, efficient, relatively inexpensive and easy to maintain.

The finned heaters are cast in halves, bolted together (on larger heaters using spring washers) and machined in pairs to fit exactly on extruder barrels.

They can be supplied with close fitting air cowls to increase efficiency, insulated to reduce heat losses and reduce ambient outer casing temperatures and fitted with inlet and outlet air deflecting boxes with fan mounting attachment plate finished in aluminium coated steel, nickel coated steel or high temperature paint finish.

With high output blowers (single or double outlet) bolted to inlet box, we are able to supply the complete heating and air cooling unit.

We also specialise (where permissible) in complete machine conversions from water cooling to air cooling systems. Please consult our Design Department for a full survey and advice. (also see pages 16 & 17)



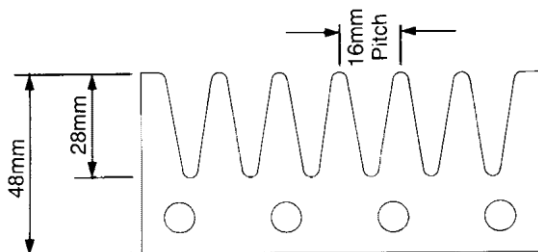
Special Low Profile Finned Heater

Fitted with full length splash proof boxes and hose outlet. Electrical exits. All to 1 P 54 standard.

Specifications

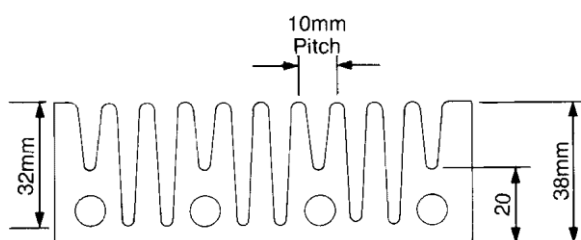
Sizes – No minimum diameter but minimum O.D. 6” (150mm). Maximum diameter 26” (660mm). Minimum width 1½” (38mm) Maximum width 30” (762mm). Thickness (see standard and low profile section.)

Standard Fin Cross-Section



The standard fin profile has been in use for many years. In laboratory tests of casting mass against fin depth, it has been proved that a fin height of 28mm (1 1/8”) has proved to provide optimum efficiency for this design.

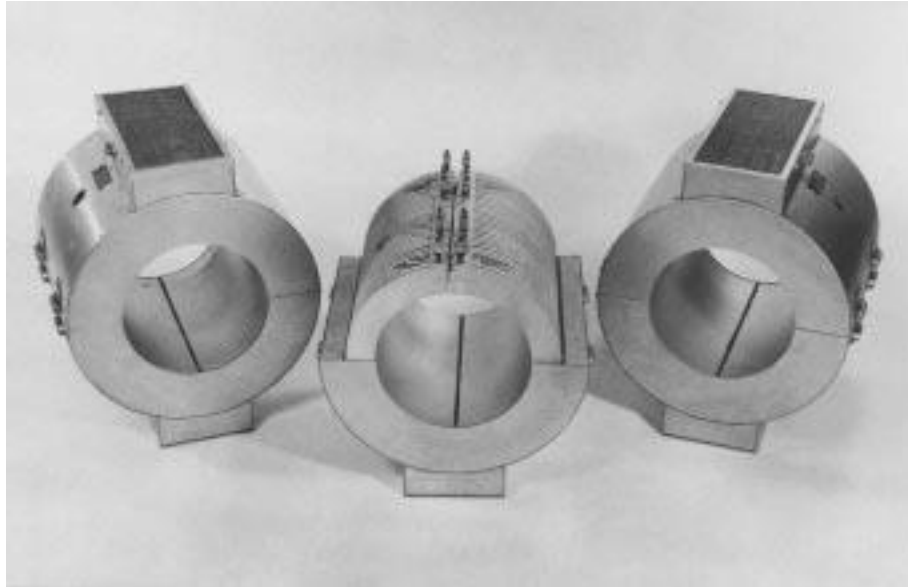
Low Profile Fin Cross-Section



Where permissible, low profile heaters offer even more efficiency than the above design. Increased fin depth and pitch reduced casting mass making heating more efficient. Also the reciprocal is the same, as less mass and more fin area provide a faster cooling cycle.

Therefore where possible, it is recommended that low profile heaters be used.

Where cooling cycles are very short a combination of an Air cooled Finned Heater and a Liquid cooled Heater cooler can be made.



Typical example of Finned Heaters with Insulated Cooling Cowls, complete with Input and Output Air Boxes.

Ordering Instructions

When ordering please state:

A = inside Diameter

B = Width

C = Thickness

D = Gaps

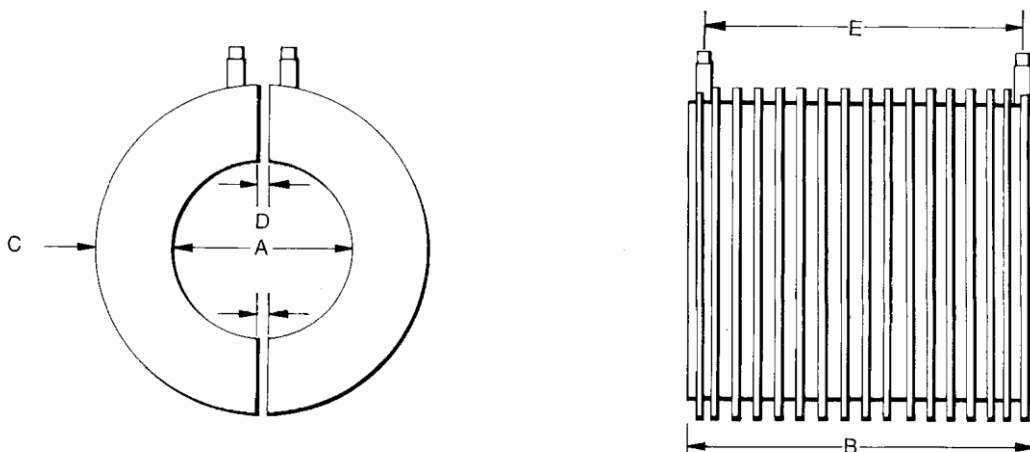
E = Terminal centres

Wattage and Voltage Element exiting location - if different from drawing. Termination type.

Options

Please state if terminal box is required (and position if different from drawing) any, thermocouple holes or cut outs. Special features etc.

Note: A machine drawing or sketch is preferred when ordering.



- Air cooling eliminates the need for chillers, pumps, filters, valves and pipework, as the supply of cool air is limitless and free.
- Air cooled systems are easier to maintain and cleaner to run.
- Air-cooled units are 30 to 50% lighter than equivalent liquid cooled systems so have less of a thermal mass, thus decreasing heat-up and cool-down cycle times.
- Modern high efficiency blower units mean that the cooling is often greater than that with liquid cooling.
- Air cooled systems require less energy to run effectively.
- The exhausted hot air can be re-circulated into colder areas of the factory or offices, or sent to a heat exchanger to pre-warm the hot water systems.

Given these parameters, it is not surprising that most of the modern extruders are fitted with air-cooled aluminium finned heaters as standard. The improved cycle times and reduced energy consumption are reason enough for the change, not to mention your product quality improvements. Finally the life expectancy of an air-cooled system is two or three times higher than that of liquid-cooled, and downtime is also reduced.

Aluminium finned heaters are generally supplied with a custom made cowl, which is insulated. This gives an efficient and safe unit, as the surface temperatures are vastly reduced (can be as low as 80°C with the correct insulation). The cowl is designed to ensure maximum air flow between the fins and is distributed evenly by plate diverters inside the air entry box.

The correct blower is also crucial and AMN will advise on the output required and supply this too.

AMN supply many of the world's leading extruder manufacturers, so let us design an air-cooled unit for your extruder, and measure the results for yourselves.

Energy efficiency : Ceramic knuckle vs. Cast aluminium

- Aluminium is a conductor of heat and therefore more efficient in being heated and cooled than ceramic, which is an insulator.
- Aluminium heaters have a machined contact surface, which is then all in very close contact with the extruder barrel surface, unlike ceramic knuckle segments which each make a single contact.
- Aluminium heaters function complete on direct conduction, whereas ceramic knuckle heaters depend upon convection heating the air which in turn heats the ceramic blocks.
- Aluminium heaters can be effectively cooled by incorporating finned air-cooling or cooling pipes. Ceramic knuckle heaters have a metal outer casing which means that any cooling is being done by indirect convection.

Given these parameters, it is not surprising that most of the modern extruders are fitted with air-cooled aluminium finned heaters. The improved cycle times and reduced energy consumption are reason enough for the change, not to mention your product quality improvements. Finally the life expectancy of an aluminium heater is four to five times higher than that of ceramic, thus downtime is also reduced.

AMN supply many of the world's leading extruder manufacturers, and direct comparison results from them suggest energy savings of between 20 and 36%. Heat-up times improve by between 12 and 28%, and steady state conditions are achieved 15 to 35% quicker.

Aluminium finned heaters are generally supplied with a custom made cowl, which is insulated. This gives an efficient and safe unit, as the surface temperatures are vastly reduced (can be as low as 80°C with the correct insulation). The cowl is designed to ensure maximum air flow between the fins and is distributed evenly by plate diverters inside the air entry box.

Let us design a finned heater unit for your extruder, and measure the results for yourselves.



L- shape heaters



Heated press



Flanged immersion heater