Industrial Cast-in Circulation Heaters
for ATEX/IECEx hazardous areas or in non-ATEX version

The CETAL-developed Cast-In Circulation Heater Technology offers a safe and precise integrated solution for your process heating requirements.

Applications
- Natural gas, butane, propane, N2, Co2, H2
- Oxygen: Special designs
- Hydrocarbons, solvents and paints
- Sensitive fluids and gas applications
- UHP applications
  - Semi conductors applications on request
- Agri-food: pasteurisation / sterilisation

Advantages
- Indirect heating
- Less expensive than a conventional heater
- Compact design, smaller footprint
- Precise, even heating
- Easy cleaning
- Operates at very high pressure
- Standard wide range sized according to flow rate and power output
Cast-in Circulation Heaters

Operating principle
This system is the ideal solution for heating gaseous, liquid or two-phase fluid at a specific flow rate. Cast-in heaters consists of a cylindrical cast aluminium block which is heated. The fluid to be heated circulates through an helical coil which is embedded in the cast aluminium block. The heat is precisely and efficiently transferred to the gas or liquid. To minimise heat losses, the aluminium block is thermally insulated and protected by a casing. As the system is highly flexible, the heater can be connected in series or in parallel, according to power requirements.

Technical advantages of indirect heating
• No direct contact between the fluid to be heated and the heating elements
• Optimized heat exchange
• Homogeneous heating, no hot spots during system start-up and temperature rise phase
• Easy cleaning

Regulation and control
A temperature probe is fitted as standard to monitor and control the skin temperature of the heating elements. Other temperature probes are available as optional extras (for the aluminium block or at the heater inlet and outlet). A control cabinet is used to control the heater.

ATEX and non-ATEX versions available
The entire system is available in an explosion-proof version for the ATEX T1 (450°C) to T6 (85°C) environment or for other "safe" environment applications.

A compact alternative
Cast-in circulation heaters are excellent alternatives to conventional heaters consisting of an immersion heater mounted in a body. They save space, have lower costs and are very competitive for high pressure applications. System maintenance is also considerably reduced.

CETAL flexibility
CETAL heaters are available for specific flow rates and process power requirements. The range starts at 1.5 kW to 32 kW as standard and is available with either a 230 V single-phase, 400 V three-phase to 690 V three-phase power supply.

Maximum thermal exchange and precise heat control with increased safety
Ready-to-use electrical control cabinets (option)

Electric heating controls for industrial processes must be designed for the characteristics of the fluid to be heated and also take into account the process specifications.

CETAL offers an economical range of power supply and control cabinets. They are specially designed to control cast-in circulation heaters. The design of the pre-configured cabinets allows for simplified quick installation and safe commissioning. They are supplied in the form of IP54 sealed metal boxes with a small, space-saving footprint. Depending on the process, two methods of regulation are available: the standard version with a contactor controlled by a PID controller or, optionally, with a static contactor (thyristor). The front panel controls are easy to use:
- General switch-disconnector at the top of the cabinet
- On / Off switch
- Fault acknowledgement button
- Emergency stop button

Technical data
- Dimensions according to the model:
  from 600 x 500 x 250 mm to 1200 x 100 x 300 mm
- Power: 3 kW to 150 kW, 400 V three-phase + earth
- Three-phase 12 A to 200 A disconnector
- Right side handle
- Safety fuse holders + fuses
- Transformer
- ON indicator, general fault indicator, illuminated green knob
- Safety line contactor
- PID controller
- SSR output + 1 high alarm
- Three outputs on potential-free contact
- Wall bracket
- Options:
  - Wave train control contactor
  - If required, 230 V fan with filter and thermostat
  - Floor mounting base
  - Top
### Technical data

<table>
<thead>
<tr>
<th>Type</th>
<th>Power (KW)</th>
<th>Max. flow rate Nm³/h at 8 bar</th>
<th>Max. flow rate Nm³/h at 80 bar</th>
<th>Max. liquid flow rate m³/h</th>
<th>Distance between inlet &amp; outlet* (mm)</th>
<th>Ext. Ø of helical coil (mm)</th>
<th>Tube thickness (mm)</th>
<th>Width* (mm)</th>
<th>Length* (mm)</th>
<th>Height* (mm)</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cast-in circulation heater</td>
<td>01-xx kW</td>
<td>1.5/3</td>
<td>10</td>
<td>100</td>
<td>0.2</td>
<td>90</td>
<td>6.35</td>
<td>1.24</td>
<td>310</td>
<td>825</td>
<td>400</td>
</tr>
<tr>
<td>Cast-in circulation heater</td>
<td>02-xx kW</td>
<td>1.5/3</td>
<td>25</td>
<td>250</td>
<td>0.5</td>
<td>8</td>
<td>1</td>
<td>310</td>
<td>825</td>
<td>400</td>
<td>30</td>
</tr>
<tr>
<td>Cast-in circulation heater</td>
<td>03-xx kW</td>
<td>1.5/3/6</td>
<td>40</td>
<td>400</td>
<td>1</td>
<td>10</td>
<td>1</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cast-in circulation heater</td>
<td>04-xx kW</td>
<td>1.5/3/6</td>
<td>55</td>
<td>560</td>
<td>1.5</td>
<td>140</td>
<td>13.7</td>
<td>2.24</td>
<td>310</td>
<td>840</td>
<td>400</td>
</tr>
<tr>
<td>Cast-in circulation heater</td>
<td>05-xx kW</td>
<td>3/6/9/12</td>
<td>120</td>
<td>1300</td>
<td>3</td>
<td>17.2</td>
<td>1.6</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cast-in circulation heater</td>
<td>06-xx kW</td>
<td>3/6/9/12/24</td>
<td>180</td>
<td>1900</td>
<td>4</td>
<td>21.3</td>
<td>2.11</td>
<td>90</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cast-in circulation heater</td>
<td>07-xx kW</td>
<td>6/9/12/24</td>
<td>320</td>
<td>3300</td>
<td>7</td>
<td>250</td>
<td>26.7</td>
<td>2.11</td>
<td>430</td>
<td>880</td>
<td>530</td>
</tr>
<tr>
<td>Cast-in circulation heater</td>
<td>08-xx kW</td>
<td>6/9/12/24</td>
<td>540</td>
<td>5500</td>
<td>11</td>
<td>33.4</td>
<td>2.77</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cast-in circulation heater</td>
<td>09-xx kW</td>
<td>6/9/12/24/32</td>
<td>850</td>
<td>8600</td>
<td>19</td>
<td>340</td>
<td>42.2</td>
<td>2.77</td>
<td>540</td>
<td>910</td>
<td>670</td>
</tr>
<tr>
<td>Cast-in circulation heater</td>
<td>10-xx kW</td>
<td>9/12/24/32</td>
<td>1150</td>
<td>12000</td>
<td>26</td>
<td>390</td>
<td>48.3</td>
<td>2.77</td>
<td>590</td>
<td>910</td>
<td>670</td>
</tr>
</tbody>
</table>

* subject to change
Technical data

Attachment and connection
• Standard smooth welding end
• Options:
  - 1/2" to 2" ASME/ANSI B16.5 stainless steel RF flange, 150 lbs to 600 lbs
  - PN 40 or PN 100, DN15 to DN50, RF flange. Other seal bearing on request for ASME or DIN flange
  - Stainless steel female 1/8" to 1 ½" diameter standard NPT or gas or 3000 lbs union fitting
  - Back flange, nuts and bolts and PTFE or spiral wound graphite seal

Operating conditions
• Operating temperature: from -196 °C to +350 °C (-273 °C on request)
• Operating flow rate: from 10 Nm³/h to 12000 Nm³/h max. depending on operating pressure and gas
• Up to 100 bar operating pressure as standard
• Very high pressure up to 420 bar on request

Electrical
• Power: 1.5 kW to 32 kW per unit
• 230 V AC single-phase or three-phase
• 400 V AC three-phase and up to 690 V three-phase optional
• Other voltages available on request

Coil
• Fluid circulation and heating in a 316L stainless steel coil
• Pickled, passivated seamless tube for better mechanical strength
• 6.35 mm to 48.3 mm diameter
• Options:
  - Incoloy or inconel coil
  - Coil electro polishing
  - Oxygen degreasing

Temperature control
• Three-wire PT100 probe for monitoring the heating element temperature
• Options:
  - Safety thermocouple or safety limiter thermostat or thermal fuse
  - Temperature regulation of the aluminium cast-in unit by PT100 probe, thermocouple or thermostat
  - Process regulation with temperature monitoring by PT100 probe at the outlet or thermocouple (in a separate housing)
  - Temperature measurement at the heater inlet by PT100 probe, thermocouple or thermostat (in a separate housing)
  - 4-20 mA transmitter with or without HART protocol for PT100 probes or thermocouples (ATEX version if an Ex e housing is used)

Non-ATEX connection box
• Stainless steel IP66/67 connection box
• Two nickel-plated brass cable glands for power and control

ATEX connection box
• Aluminium explosion-proof box with protective paint, Ex d IIC or stainless steel Ex e II C increased safety box
• Two nickel-plated brass cable glands for power and control
• Options:
  - Anti-condensation heating tape
  - Cable gland for additional temperature probe

Insulation and mounting
• Foamglas® / rock wool / ceramic insulation depending on operating temperatures and the fluid being heated
• Protective aluminium jacket
• Horizontal foot mounting
• Options: vertical foot mounting or wall bracket

Self-draining
• Available option: Vertical mounting configuration
• Gas bleed and complete drain down
• Documentation
• Supplied according to standards and codes

Certifications (if required)
• Conforms to Pressure Equipment Directive 2014/68/EU
• ATEX (option)
  - Ex d IIC T1 to T6
  - Ex IIC 2GD Ex tD A21 IP67
  - Ambient temperature: -50°C ≤ Ta ≤ +60°C
  - According to EC type LCIE 04 ATEX 6094X examination certification

www.cetal.com - Tel.: +33 3 88 06 19 49 - E-mail: contact@cetal.fr
Design and manufacturing of electrical heating equipment for your industrial process
for use in ATEX/IECEx hazardous areas or in non-ATEX version

All CETAL products can be adapted to your specifications.

Contact us!