



# Duct heaters for air heating

for ATEX/IECEX hazardous areas  
or in non-atex version

HEATING GASES

MAINTAINING A CONTINUOUS  
TEMPERATURE

CETAL duct heaters are designed and manufactured according to customer specification.

Reliability and robustness are key drivers for our engineers.

## Advantages

- Large range of materials and options according to customer process and conditions of use
- Benefit from CETAL's 50 years of experience as designer and manufacturer!
- Equipment available for use in hazardous areas or safe environment
- The end-to-end control of the design and production chain allows us to deliver a product which suits your process perfectly



Rev 1.3

www.cetal.com



ATEX



Duct heaters for rectangular or round ducts are made up of stainless steel heating elements or sometimes finned heating elements mounted on a galvanized or stainless steel plate. The electrical wiring is done in a protected steel or stainless steel connecting box.

### Applications

These cost-effective and highly robust duct heaters are used in air conditioning systems for the heating of industrial premises. Recommended minimum air speed is 2m/s.

### Industrial sectors

- Petrochemicals
- Chemical industry
- Food industry
- Plastics
- Aeronautics
- Etc.

### Duct heater design

After customer specification analysis, our engineers will drive you to the best solution for your process.

### Removable heating elements

The heating elements can be removed and replaced if required.

This enables you to optimize the lifetime of the duct heater and to save costs.

### ATEX/IECEX

**CETAL** duct heaters are available in ATEX/IECEX version for class temperature T1 (450°C) to T6 (85°C).

### Temperature control

Temperature sensors (thermostat, limiter, thermocouple or PT100) in the medium (process control) or on the heating element (safety control), on the flange or in the connecting box.

## CETAL heating elements



1. Connection terminals
2. Tube
3. Insulation : magnesia oxyde (Mg O), to secure optimized heat transfer and electrical insulation.
4. Resistance wire: Made of Nickel Chrome 80/20, it is the active part of the heating element (Joule effect)
5. Cold length
6. Sealing material: Keeps out external moisture. Different types (silicon, resins, cement) are used depending on the industrial application, the external medium and temperature.
7. Output insulation: Made of steatite ou corundum, it provides dielectric insulation (creepage distance, distance in the air).

**CETAL** manufactures its own heating elements which are the key components (active parts) of all electric heating systems. The design is defined according to customer specifications.

The watt density, tube diameter and the tube sheath are chosen to optimize the reliability and robustness (corrosion, temperature) of **CETAL** equipments.

### Manufacturing

The electric heating resistance (sheathed heating resistance) consists of a Nickel Chrome 80/20 resistance wire placed in the middle of a protective tube (sheath). It is filled with high-quality magnesia oxyde enabling the optimized heat transfer and electrical insulation. Each side of the heating element has a cold length which is used for wiring; its length depends on the application...



### Rectangular duct heaters

Electrical duct heaters with square or rectangular section are used in air ducts, in closed loop (recycled air) or open loop.

For temperatures above 110°C, the connection box is placed at a stand-off distance. The stand-off area can be insulated

- Tubular heating elements with or without fins, AISI 321 tube (stainless steel) or other material. The heating elements are equipped with steel or stainless steel connectors which are clamped or welded.
- The watt density ( $W/cm^2$ ) is adapted according to the conditions of use (flowrate, temperature)..
- Safety and medium control thermostat.
- Steel or stainless steel frame.
- Stand-off connecting box for temperatures above 110°C.
- Voltage 230-400 V.
- Other voltage on request.
- **Standard range available: B range**

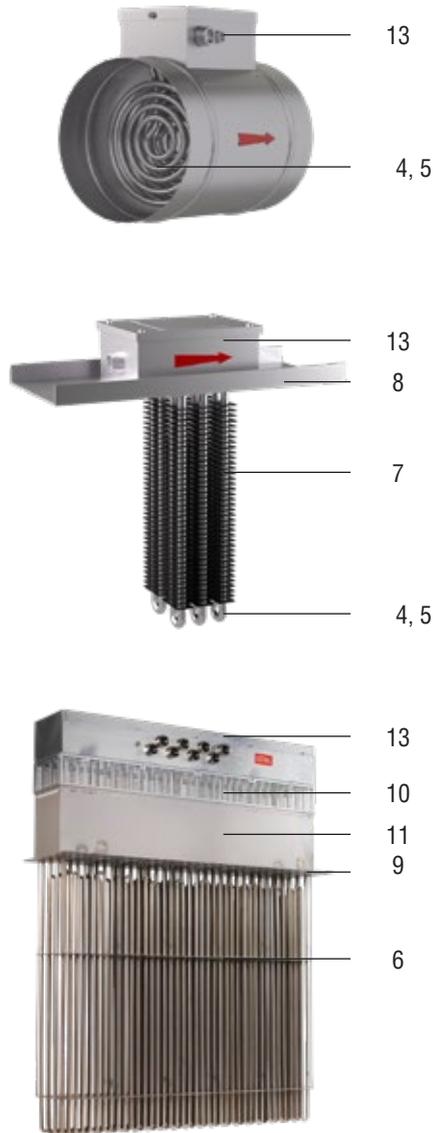
### Duct heaters for rectangular ducts

- Heating elements with electro zinc coated or stainless steel fins mounted on galvanized steel or stainless steel plate for drawer mounting.
- Connecting box made of protected steel or stainless steel, IP55
- Safety and medium control thermostat.
- Voltage 230-400 V.
- Coupling MONO or TRI, cable gland.
- Other voltage on request.
- **Standard range available: BTR range**



### Duct heaters for round ducts

- Duct Ø 125 to 630 mm in galvanized or stainless steel.
- Heating elements with stainless steel AISI 321 (1.4541) or others bended in spiral shape or multiple bended heating element mounted in row.
- Safety and medium control thermostat.
- Connecting part in protected steel or stainless steel.
- Voltage 230-400 V.
- Coupling MONO or TRI, cable gland.
- Other voltage on request.
- **Standard range available: BTO range**



## Design of your duct heater

### Input data

- A. Application
- B. Type of gas
- C. Pressure
- D. Inflow and outflow temperature
- E. Flow rate (mass or volume)
- F. Environment of use
- G. Voltage (V)
- H. ATEX/IECEX or not, temperature class
- I. Mounting in duct or on flange
- J. Dimensions of the duct
- K. Chassis
- L. Directives, standards, construction codes

### CETAL thermal design and offer

Design procedure to optimize your product

1. Power
2. Choice of technology and product type
3. Watt density ( $W/cm^2$ )
4. Number of heating elements
5. Material / Tube diameter
6. Type and number of baffles
7. With or without fins for heat dissipation
8. Type of flange
9. Type of assembly (welding or brazing)
10. Stand-off length (SOL)
11. Thermal insulation
12. Temperature control and safety, type of sensor
13. Connecting box / Cable gland
14. Quotation: price and delivery time

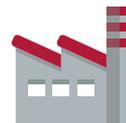
## Benefit from the CETAL advantages!



Design and manufacturing experts since 50 years!



Calculation and design tools specifically developed for industrial heating applications



End-to-end control of design and production chain for products which suit your process perfectly



Benefit from the CETAL know-how to optimize your process and reduce costs!

## Technical Data

### Available tube materials

- Stainless steel
  - AISI 321 (1.4541)
  - AISI 316L (1.4404)
  - AISI 309 (1.4828)
- Others
  - Incoloy 800 (1.4876)
  - Incoloy 825 (2.4858)
  - Inconel 600 (2.4816)
  - Titanium
- Specific coating
  - Teflon™ (PTFE)
  - Halar

### Tube diameter

- 6.5 / 8.5 / 10 / 13.5 / 16 mm

### Flange / Steel plate

- Shape acc. to specifications
- Tube material choice according to applications and standards (steel, stainless steel or others)

### Mounting

- Vertical or horizontal position

### Electrical data

- Voltage :  $V_{AC}$  ou  $V_{CC}$
- Cabling according to main voltage VAC/VCC 1PH + N or 3PH
- Power: from a few Watt to several Megawatts

### Connecting box (non-ATEX)

- IP 54 / IP 66 / IP 67
- Material: painted steel, stainless steel, aluminum
- Polyamide or nickel-plated brass cable gland

### ATEX/IECEX connecting box

- Explosion-proof connecting box, aluminium, stainless steel or painted steel, Ex d IIC
- Stainless steel increased security enclosure, Ex e IIC
- Nickel-plated brass cable gland (stainless steel as option)

### Standard documentation

- Certificate of conformity to the order
- Heater wiring diagram
- Instruction manual

### On-request documentation

- Supplied according to directives, standard and construction code
- Material certificate 3.1 acc to NF EN 10204

### Certifications (if requested)

- According to standards to comply with
- ATEX/IECEX certificate for component or system
- EAC CU TR, c CSA us



### Options

- **Temperature control**



Temperature sensors (thermostat, limiter, thermocouple or PT100) in the medium (process control) or on the heating element (safety control), on the flange or in the connecting box.

- **Separate connecting box for temperature control** out of the power connecting box
- **Stainless steel material for ATEX/IECEX cable gland**
- **Space heaters against moisture** inside the connecting box
- **Coating** for the connecting box; customized specifications and colors.
- **Tropicalization** : Adapted materials and components, heat-shrink insulated terminals



**New!**

### Standard power control panels

CETAL offer a large range of cost-effective power control panels



## Standard Duct Heater

CETAL has developed an **optimized standard range** for duct heater in order to offer the **best cost** and **delivery time**.

The range is based on 2 main sub-systems:

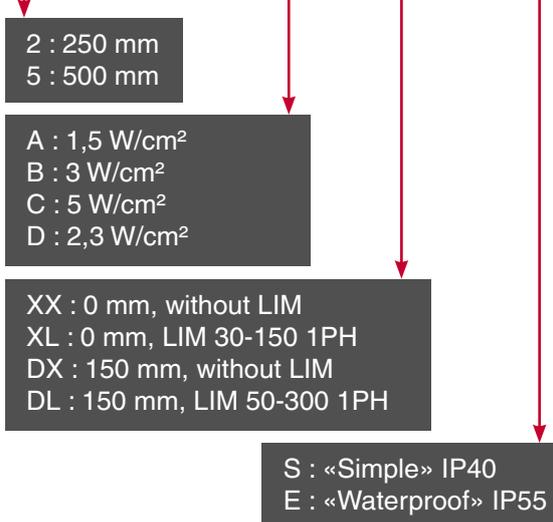
- Frame: 6 different frames, 3 duct sizes (200x200, 300x300 et 400x400) and 2 depths
- Heating rank: 3 to 15 ranks made of standardized heating elements
- Thermostat 30°C -150°C or 50 – 300°C as a basis

Several **options** are possible:

- IP40 or IP55
- No stand off length (Sol = 0mm) or 150mm
- Temperature control: Automatic thermostat alone or automatic thermostat & manual thermostat (LIM)

The **duct heater name** is working as follow:

**BAT - width/100 height/100 depth/100 - P(W)/100 - Charge - Sol & LIM & IP**



Ex: BAT-222-060B-XLS

Duct heater 200x200 mm , 250 mm depth; 6kW , Watt density 3W/cm<sup>2</sup>, SOL = 0mm , with Thermostat 30-110°C 1PH (as basis) + manual thermostat 30-150°C 1PH , IP40

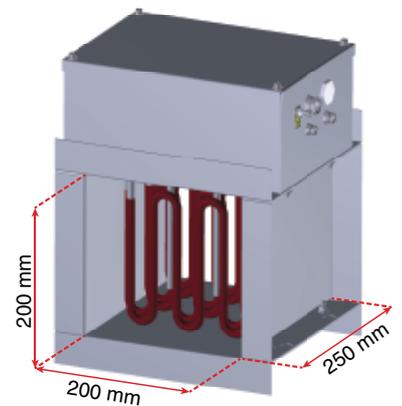
### Basic features

- Steel plate for frame and electrical box in St Steel 304L
- Mecanical assembly mounting
- Electrical box (IP40 or IP55)
- Supply 400V 3Ph, Start coupling
- Heating element Ø10mm in St steel 316L
- Polyamide cable glands (size according to power)
- Only for air heating with pressure close to (+/- 5000Pa)
- Watt density and power to be chosen according to customer needs.
- Min flowrate for entrance air speed of 2m/s
- Max flowrate for outlet air speed of 10m/s

### Cross section: 200 x 200

Min flow rate 300 m<sup>3</sup>/h  
Max flow rate 1500 m<sup>3</sup>/h

Frame depth		250			500	
Heating element rank qty		3	6	9	12	15
1,5 W/cm <sup>2</sup>	Power [W]	1500	3000	4500	6000	7500
	Item	BAT222-015A	BAT222-030A	BAT225-045A	BAT225-060A	BAT225-075A
2,3 W/cm <sup>2</sup>	Power [W]	2250	4500	6750	9000	11250
	Item	BAT222-022D	BAT222-045D	BAT225-067D	BAT225-090D	BAT225-112D
3 W/cm <sup>2</sup>	Power [W]	3000	6000	9000	12000	15000
	Item	BAT222-030B	BAT222-060B	BAT225-090B	BAT225-120B	BAT225-150B
5 W/cm <sup>2</sup>	Power [W]	4500	9000	13500	18000	22500
	Item	BAT222-045C	BAT222-090C	BAT225-135C	BAT225-180C	BAT225-225C



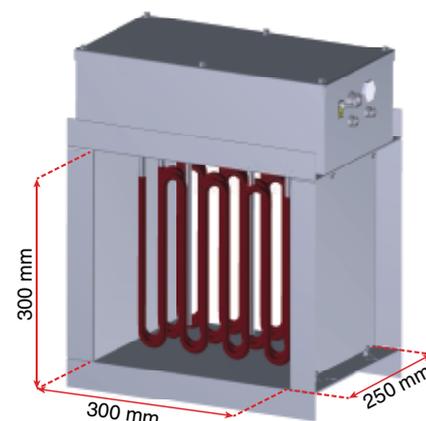
Ref 3D: **BAT222-060B-XL**

**Cross section: 300 x 300**

 Débit minimal conseillé 650 m<sup>3</sup>/h

 Débit maximal conseillé 3250 m<sup>3</sup>/h

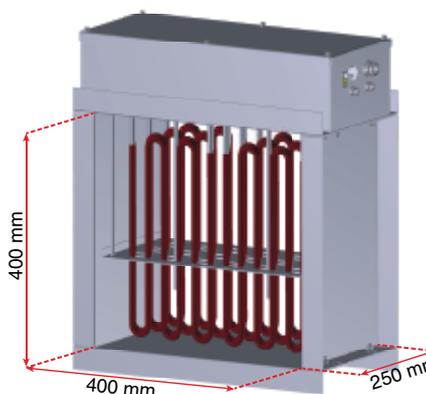
Frame depth		250			500	
Heating element rank qty		3	6	9	12	15
1,5 W/cm <sup>2</sup>	Power [W]	3000	6000	9000	12000	15000
	Item	BAT332-030A	BAT332-060A	BAT335-090A	BAT335-120A	BAT335-150A
2,3 W/cm <sup>2</sup>	Power [W]	4500	9000	13500	18000	22500
	Item	BAT332-045D	BAT332-090D	BAT335-135D	BAT335-180D	BAT335-225D
3 W/cm <sup>2</sup>	Power [W]	6000	12000	18000	24000	30000
	Item	BAT332-060B	BAT332-120B	BAT335-180B	BAT335-240B	BAT335-300B
5 W/cm <sup>2</sup>	Power [W]	9000	18000	27000	36000	45000
	Item	BAT332-090C	BAT332-180C	BAT335-270C	BAT335-360C	BAT335-450C


 Ref 3D: **BAT332-120B-XL**
**Cross section: 400 x 400**

 Min flow rate 1150 m<sup>3</sup>/h

 Max flow rate 5750 m<sup>3</sup>/h

Frame depth		250			500	
Heating element rank qty		3	6	9	12	15
1,5 W/cm <sup>2</sup>	Power [W]	6000	12000	18000	24000	30000
	Item	BAT442-060A	BAT442-120A	BAT445-180A	BAT445-240A	BAT445-300A
2,3 W/cm <sup>2</sup>	Power [W]	9000	18000	27000	36000	45000
	Item	BAT442-090D	BAT442-180D	BAT445-270D	BAT445-360D	BAT445-450D
3 W/cm <sup>2</sup>	Power [W]	12000	24000	36000	48000	60000
	Item	BAT442-120B	BAT442-240B	BAT445-360B	BAT445-480B	BAT445-600B
5 W/cm <sup>2</sup>	Power [W]	18000	36000	54000	72000	90000
	Item	BAT442-180C	BAT442-360C	BAT445-540C	BAT445-720C	BAT445-900C


 Ref 3D: **BAT442-240B-XL**
**Design according to the temperature**
**Outlet Air T°C < 110°C**

- Electrical box without stand off length
- Thermostat 30-110°C 1PH , with sleeve in medium

**Outlet Air T°C > 110°C**

- Electrical box with stand off length 150mm
- Thermostat 50-300°C 1PH , with sleeve in medium

**Standard options**

- Manual thermostat in medium with sleeve according to the design:
  - > Version without stand off length, manual thermostat 30-150°C 1Ph with sleeve in medium
  - > Version with stand off length, manual thermostat 30-150°C 1Ph with sleeve in medium

NB: Manual thermostat setting according to customer needs

- IP Choice:
  - > IP40: Clamped steel connectors
  - > IP55: Hard soldered brass connectors, 2 box gaskets
- Possibility for round or rectangular connection on request
  - NB: Possibility for soldered INOX connectors on request

## Realisations



1



2



3

1. Duct heater 6 KW, IP67, for containers heating (working area) on oil & gas platform
2. Duct heater ATEX/IECEX Ex e for duct mounting
3. “Drawer” duct heater, 10 KW, ATEX/IECEX Ex d
4. Air heating 600 °C for mounting on oven with catalytic filter

4



## ATEX/IECEx versions

In addition to heater design, the use of specifically developed connection boxes allows to install the products in hazardous areas.

The increased safety protection mode “e” (EN 60079-7) or the explosion-proof protection mode “d” (EN 60079-1), together with temperature control acc. to EN 60079-0, make it possible to operate the equipments in hazardous area (zone 1 and zone 2) for gases of the A-B-C groups.



ATEX



## ATEX housings, types of protection «d» and «e»



### Type of protection “d” explosion-proof housing

- Must contain the explosion within the enclosure
- Make sure that the ignition cannot reach the hazardous area
- Always keep an external temperature lower than the auto-ignition temperature of any surrounding

The following factors are selected depending on the internal free volume of the enclosure and the gas present in the area

- Type of seal (cylindrical, flat, threaded)
- Seal length
- Gap length

The power and temperature control circuits can be accommodated in separate housings



### Type of protection “e” increased safety

Method: to prevent the occurrence of any accidental ignition source (electric arcs, heating).

This mode of protection is achieved by:

- Selecting high-quality insulating material
- Defining the right creepage distances
- Ensuring the quality of electrical connection
- For all classes of gases and vapours
- Suitable for connection housings

All CETAL products can be adapted to your specifications.

Contact us!

Flange immersion heaters



Screw plug immersion heaters



Removable immersion heaters



Circulation heaters



Cast line heaters



Air duct heaters



Industrial convectors



Formed elements



Cast elements



Ribbed heaters



Anti-condensation heating elements



Bolt heaters



Power control panels – Standard range

