

# THERMO CATALYTIC SYSTEMS LTD

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Bruest ATEX Certified Flameless Gas Catalytic Heaters – Industrial Oven Systems

01/01/09

## SPECIFICATION STANDARD “CATBOX” CATALYTIC BOX OVEN



Registered in England No. 3349485

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## SPECIFICATION

### STANDARD “CATBOX” CATALYTIC BOX OVEN

*(FOR PRICES PLEASE SEE SEPARATE PRICE LIST)*

## PRINCIPLE

The CATBOX thermo-catalytic box oven from T.C.S. is designed to provide a clean and warm curing environment to accelerate the curing of coatings, thereby alleviating the bottle neck at the drying stage and freeing up valuable floor space and racks/trolleys. **(For example, curing times of 20 minutes and less can be achieved with acid-catalysed lacquers.)**

It is *especially* suitable for the **curing of heat-sensitive lacquers applied onto wood** and wood-based products. The Bruest thermocatalytic heaters provide an economical source of heat, which is completely safe even in the presence of flammable solvent liquids and vapours.

The controlled temperature with gentle air movement ensures thorough curing in a fraction of the time required in ambient conditions, (often minutes rather than hours), **without “solvent -pop”** or over-cure. The products are then ready for the next stage of production. The Bruest heaters will also consume solvent vapours thereby reducing V.O.C. emissions. The oven is *also suitable for use with water-based coatings.*

### TYPICAL DRYING TIMES IN A CATBOX

Type of Coating	Acid Catalyzed- High Solids	Acid Catalyzed- Modified	Pre- Catalyzed Lacquers	Waterborne Lacquers & Pigmented coatings	Water-based Stains
Non-volatile content	50-55%	40-45%	25-30%	30-40%	Not applicable
Wet Film weight-per coat	80 g per square meter	80 g per square meter	80 g per square meter	80 g per square meter	30 g per square meter
Flow-out time	5 minutes	3 minutes	3 minutes	2 minutes	Not applicable
Drying time in a CATBOX	Sanding-15 minutes	Sanding-10 minutes	Sanding-10 minutes	Sanding-10 minutes	5 minutes
	Topcoat-20 minutes	Topcoat-15 minutes	Topcoat-10 minutes	Topcoat-10 minutes	
Typical Air drying time	1 hour to 1 1/2 hours	1 hour to 1 1/2 hours	1 hour to 1 1/2 hours	1 hour to 1 1/2 hours	1 hour

Note : The above are guidelines only. Your drying times will vary according to a variety of factors including particular paint formulation, coating thickness & porosity of substrate.

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## **CONSTRUCTION**

### **OPTION 1 : SINGLE SKINNED STAINLESS STEEL OVEN (WILL FLAT-PACK FOR DELIVERY)**

The oven will be **constructed from panels formed from highly polished bright annealed 304 grade stainless steel**. Each panel will have a flat surface area of approx. 1,000mm x 2,000mm. The oven will be supported by a goal-post type box section steel frame at either end.

The internal dimensions are approx. 3,000 mm long, approx. 2,000 mm wide and approx. 2,000 mm high. The **external** dimensions are approx. 3,100 mm long, approx. 2,000 mm wide and approx. 2,400 mm high (height to top of fan assembly).

There will be a pair of doors at one-end for loading and unloading, measuring approx. 2,000 mm and tall and 2,000 mm wide (1000 mm each leaf). The doors will be single skinned and made from panels formed from highly polished bright annealed 304 grade stainless steel, **suitable stiffened**.

### **OPTION 2 : DOUBLE SKINNED & INSULATED, LINED INTERNALLY WITH STAINLESS STEEL (TO BE DELIVERED ALREADY ASSEMBLED)**

The oven will be constructed from 70 mm box section mild steel frame fitted out with 40 mm thick insulated panels formed from plastisol coated mild steel sheet. The oven is then lined internally with mirror finish 430 grade , 0.7 mm thick stainless steel sheet.

The internal dimensions are approx. 3,000 mm long, approx. 2,000 mm wide and approx. 2,000 mm high. The **external** dimensions are approx. 3,150 mm long, approx. 2,150 mm wide and approx. 2,400 mm high (height to top of fan assembly)

There will be a pair of doors at one-end for loading and unloading, measuring approx. 2,000 mm and tall and 2,000 mm wide (1000 mm each leaf) constructed in the same way as the rest of the enclosure.

The plastisol coated panels are available in a limited number of standard RAL colours, the box section will be painted to match.

Note : 1 . An oven with doors at both ends creating a "through-feed " system is available, see " Extras"

Note: 2 The modular design means that the standard oven can be increased in length in, for example 0.5-m intervals. Alternatively, **ovens to the same general design can be purpose built to any size.**

## **BRUEST FLAMELESS GAS INFRARED HEATERS**

The oven system will be equipped with 2 **British Gas recommended**, Bruest flameless gas thermo-catalytic infrared emitters, *ATEX Certified as Category 2 equipment for use in Zone 1* (and Zone 2) potentially explosive atmospheres.

The heaters will be manufactured in stainless steel for corrosion resistance in keeping with the current standards(IGE/UP/12) from the Institute of Gas Engineers & Managers, section 12.4.1.

**The heaters will be fully contained within the oven** to maximise heat retention and to allow “ mirror-tech” heater orientation if required

Each heater will be complete with a protective face grill, made in *stainless steel*, to I.P. 20 (“**finger-proof**”) to prevent personel from touching the hot surface of the face of the heater.

The catalyst pads within the heaters are **guaranteed for 5 years**.

The heaters will contain pre-heating elements of: 240 v (other voltages are available). The heaters will be jettied for Natural (mains) Gas or Propane (bottled/tank) gas as required. ***Please specify fuel***

Each heater will measure approx.12”x72” (305mm x 1,829mm approx.) rated at be **36,000 Btus. (10.5Kw)**.

*Note : Where less or more heat is required, ovens with fewer/smaller or more/bigger heaters are available .*

## **GAS TRAIN**

**Each heater** will be fitted with the following :

gas pressure tap point  
stainless steel flexible hose  
½” manual isolator

The oven system will be complete with a gas train including all gas pressure governors, solenoid valves, stainless steel flexi-hoses and isolators as required to connect into **a suitable gas supply within 3 meters of the oven.**

The system will require:

69 cubic feet per hour of NATURAL gas at a pressure of 3 ½” W.C.at the heaters OR  
1.96 cubic meters per hour of NATURAL gas at a pressure of 9 mbar at the heaters

OR

29 cubic feet per hour of PROPANE gas at a pressure of 11” W.C.at the heaters OR  
0.82 cubic meters per hour of PROPANE gas at a pressure of 28 mbar at the heaters

## **ELECTRICAL**

The electrical connections to the pre-heating elements on the heaters will be made in heat-resistant cable and terminated in Zone 1 explosionproof cable glands.

*The electrical supply will be provided by others and be terminated in a fused isolator within 3 meters of the control panel.*



## CONTROL CABINET

There will be a central control panel located on or adjacent to the oven. The panel will be a powder-coated metal cabinet complete with indicator lights and engraved legends. It will monitor and regulate the various electrical inputs and outputs from the equipment ensuring adequate pre-heating and safe entry of gas to the heaters.

### Closed Loop Air Temperature Control

The system will employ an air temperature sensor, which will provide the input to a dual-display temperature controller in the control cabinet, which will display the air temperature within the room/oven and provide the output to the gas flow control manifold. This system will automatically adjust the gas flow to the heaters (working together) and use of their elements to **provide an actual air temperature in the room/oven within +/- 5°C of the control set point** (desired temperature), e.g. 35 degrees C.

### Air Movement

The panel will also control the air movement system. There will be a re-circulation and extraction system complete with a filtered air intake. During one complete curing cycle, the system will complete a “Drying phase” and a “Purge Phase”.

#### *Drying phase*

During the drying phase, the re-circulation system will capture hot air (generated by convection currents over the surface of the catalytic panels and re-radiation from the substrate). The air will then be re-introduced at low level and re-circulated around the oven and over the catalytic heaters where solvent vapours will be oxidised. During the drying phase, the system, which is controlled via belimos (motorised air valves), will still bleed approx. 30% to extract.

#### *Purge phase (Approx. 2 minutes)*

At the end of the “Drying Phase” the “Purge Phase” will commence, i.e. the recirculation belimo will close, the extract will open fully allowing the extract system will purge 100% of the air out of the oven via ducting. **Any further extraction to the exterior of the building is excluded and would be extra.**

At the end of this “Purge Phase” the control system will extend an **audible/visual alarm** to notify the operator that the cure cycle is complete.

***All the above parameters, (curing temperature, curing time, purge time) can be easily adjusted by the operator.***

## TOTAL GAS CONSUMPTION

*Note : The gas consumption below is calculated on a **worst case basis**, i.e. on running the system on full output all the time. In fact, because the system will modulate between high and low output in order to maintain the desired temperature, in most cases the system will only be run on full output approx. one third of the time.*

2 heaters at 36,000 Btu/hour = 72,000 Btu/hour

### Natural (Mains) Gas

The price of natural gas is usually given in pence per Therm or pence per Kilowatt. **You need to find this out from your gas company.**

2 off 12"x 72" heaters at 36,000 Btu = 72,000 Btu per hour

1 Therm = 100,000 Btu per hour, **therefor consumption is 0.72Therms per hour**

*Alternatively, In Kilowatts:*

1 kW = 3,412 Btu/hour. Therefor

$$\frac{72,000 \text{ Btu per hour}}{3,412 \text{ Btu/hour per kW}} = 21.1 \text{ kW. Therefor, consumption is 21.1 kW}$$

For example : **21.1 kW @ 4 pence per kW hour = £ 0.84 per hour**

**RUNNING COSTS ARE BASED ON A NATURAL GAS TARIFF OF 4 PENCE PER kW HOUR WHICH IS A LIGHT INDUSTRIAL TARIFF FROM E-ON (POWERGEN) CURRENT AT SEPTEMBER 2008. IT IS FOR ILLUSTRATION ONLY AS GAS PRICES VARY OVER TIME, ACCORDING TO THE VOLUME USED AND ACCORDING TO LOCAL MARKET CONDITIONS. DISCOUNTS ARE AVAILABLE FOR CUSTOMERS WITH LARGER USAGE.**

### Propane (Bottled or Tank) Gas

If natural mains gas is unavailable the system can be run on Propane gas, e.g. from 47 Kg bottles.

1 Kg of Propane contains 47,500 Btu, therefor consumption is:

$$\frac{72,000 \text{ Btu per hour}}{47,500 \text{ Btu per Kg}} = 1.52 \text{ Kg of Propane per hour}$$

*If the system were run flat out (see note, above) one pair of 47 Kg bottles would last just over 62 hours.*

Example 1, based on *list* price of bottled propane (£1.08 per Kg)

**1.52Kg per hour @ £1.08 per Kg = £ 1.64 per hour**

***Trade customers may be able to negotiate significant (25%) reductions from propane suppliers' list prices, therefor :***

Example 2, based on *discounted* price of bottled propane (£0.81 per Kg)

**1.52Kg per hour @ £0.81 per Kg = £ 1.23 per hour**

**Bulk propane from a tank is available at even lower cost.** (You may need to get a quotation from your supplier taking the following hourly consumption figures as your starting point)

1 litre of liquid Propane contains = 24,356 Btu, therefor consumption is:

$$\frac{72,000 \text{ Btu per hour}}{24,356 \text{ Btu per litre}} = 2.96 \text{ Litres of liquid Propane per hour}$$

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## **PRICES :**

Please contact us for current prices. **All prices are subject to V.A.T.**

## **Optional Extras**

- 1.Second set of double doors.
- 2.Extend oven length by increments of 500 mm.
- 3,Georgian Wired glass windows.
- 4.Delivery, assembly, installation to local services and functional commissioning.
5. Travelling to and from site is not included in item 4 and is charged at £ 75 per 3-man crew per hour **plus** £ 0.60 per mile mileage charge. \*

## **TERMS & CONDITIONS**

*While this specification is at time of writing, T.C.S. reserve the right to alter this standard specification at any time prior to order. Actual specifications will need to be confirmed at time of order. Please contact us for current pricing or a quotation to suit your needs.*

For information only, our standard terms are as follows:

The Bruest catalyst pads are guaranteed for 5 years. The standard manufacturers' warranties and guarantees will apply to all other components.

Assumed: free use of site services, customer's forklift truck.

Payment terms : 35 % with order, 25 % on advice of readiness for delivery, 30 % on delivery, 10% due 30 days after delivery

Delivery : **1-5 weeks** from receipt of written purchase order and mobilisation deposit subject to confirmation.

VAT: Where appropriate, VAT will be added to all the above invoices at the rate ruling applied at date of invoice.

## **EXCLUSIONS:**

Clearance of any existing equipment  
Supply of mains electric, gas, air or water  
Any necessary building works or roof work in the area  
Off loading of goods  
Supply or provision of any equipment, support structure, services etc other than those specified within our quotation  
Supply of specialist access equipment required

## **TERMS:**

*Unless otherwise agreed in writing, the proposal notes and terms and conditions located at the rear of this document shall apply to any order placed by the customer. In the event of any inconsistency between these terms and those passing between the parties these terms shall prevail. No variation of the term and conditions shall be allowed unless expressly accepted in writing.*

Yours sincerely, for Thermo Catalytic Systems Ltd.

David Miller (E. & O.E.)