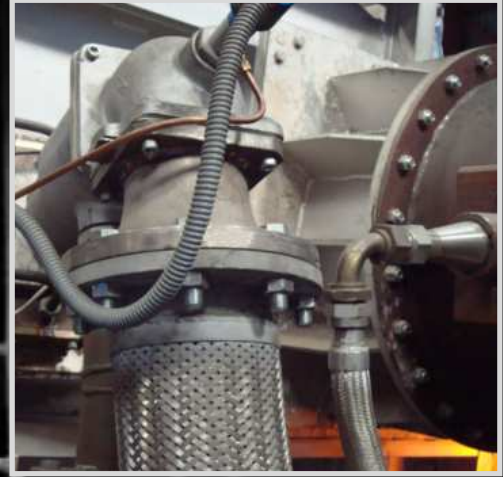
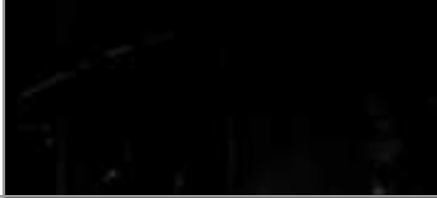


*Burners*



## High velocity premix burners

E-THERM (E3160 rev. 01 - 24/09/2012)

## GENERAL WARNINGS:



■ All installation, maintenance, ignition and setting must be performed by qualified staff, respecting the norms present at the time and place of the installation.

■ To avoid damage to people and things, it is essential to observe all the points indicated in this handbook. The reported indications do not exonerate the Client/User from observing general or specific laws concerning accidents and environmental safeguarding.

■ The operator must wear proper DPI clothing (shoes, helmets...) and respect the general safety, prevention and precaution norms.

■ To avoid the risks of burns or high voltage electrocution, the operator must avoid all contact with the burner and its control devices during the ignition phase and while it is running at high temperatures.

■ All ordinary and extraordinary maintenance must be performed when the system is stopped.

■ To assure correct and safe use of the combustion plant, it is of extreme importance that the contents of this document be brought to the attention of and be meticulously observed by all personnel in charge of controlling and working the devices.

■ The functioning of a combustion plant can be dangerous and cause injuries to persons or damage to equipment. Every burner must be provided with certified combustion safety and supervision devices.

■ The burner must be installed correctly to prevent any type of accidental/undesired heat transmission from the flame to the operator or the equipment.

■ The performances indicated in this technical document regarding the range of products are a result of experimental tests carried out at ESA-PYRONICS. The tests have been performed using ignition systems, flame detectors and supervisors developed by ESA-PYRONICS. The respect of the above mentioned functioning conditions cannot be guaranteed if equipment, which is not present in the ESA-PYRONICS catalogue, is used.

## DISPOSAL:



To dispose of the product, abide by the local legislations regarding it.

## GENERAL NOTES:



■ In accordance to the internal policy of constant quality improvement, ESA-PYRONICS reserves the right to modify the technical characteristics of the present document at any time and without warning.

■ It is possible to download technical sheets which have been updated to the latest revision from the **www.esapyronics.com** website.

■ The E-THERM products have been designed, manufactured and tested according to the most correct construction practices and following the applicable requirements described in **UNI EN 746-2-2010** 'Industrial heating process equipment - Part 2: Safety requirements for combustion and for the handling and processing of fuels'. We emphasize that the burners described in this data sheet **are provided as independent units and are excluded from the scope of the Machine Directive 2006/42/EC** not having any mobile items that are not exclusively manual.

■ Certified in conformity with the **UNI EN ISO 9001** Norm by DNV GL.

## CERTIFICATIONS:



The products conform to the requests for the Euroasia market (Russia, Belarus and Kazakhstan).

## CONTACTS / SERVICE:



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[www.esapyronics.com](http://www.esapyronics.com)

E-THERM are premix gas burners for direct heating. The shape of the flame tube in silicon carbide produces a tight flame that allows for high heat penetration and better temperature uniformity inside the combustion chamber, due to the high velocity of combustion products. The complete mixing of the combustion products and fuel near the combustion head and the special mixture analysis plug, make the burner appropriate for processes in which the presence of excess unburned products and excess air must be reduced to the minimum. According to the size and conditions of use, this type of burner can be used for combustion with natural gas or LPG, in the standard version, and other types of gaseous fuel with different heating power, in special versions on request.

## APPLICATIONS

- Vertical furnaces for copper melting
- Copper waiting furnaces
- Atmosphere generators
- Billet heating furnaces

## CHARACTERISTICS

### GENERAL:

- Capacity: from 300 to 1.000kW
- Maximum application temperature: 1.700°C
- Air and gas pressure to burner: 60mbar
- Flow ratio: 5 : 1
- Flame velocity: from 100 m/s to 150 m/s
- Low CO and NOx content
- Excess air: upto 400%
- Functioning with various fuel gases: CH4/LPG/Propane/etc.
- Functioning with preheated air: 450°C

### MATERIAL COMPOSITION:

- Mixer body: Cast iron G25
- Proportioning element: AISI304
- Fixing flange with water cooling: AISI304
- Fixing flange without water cooling:
- Refractory block: Tmax 1750°C
- Elbows: Cast iron G25



## IGNITION AND DETECTION

The ignition of the E-THERM burners takes place via a high voltage discharge created through a 14MM electrode; detection is carried out via a UV-2 high sensibility probe (neither are included with the supply).

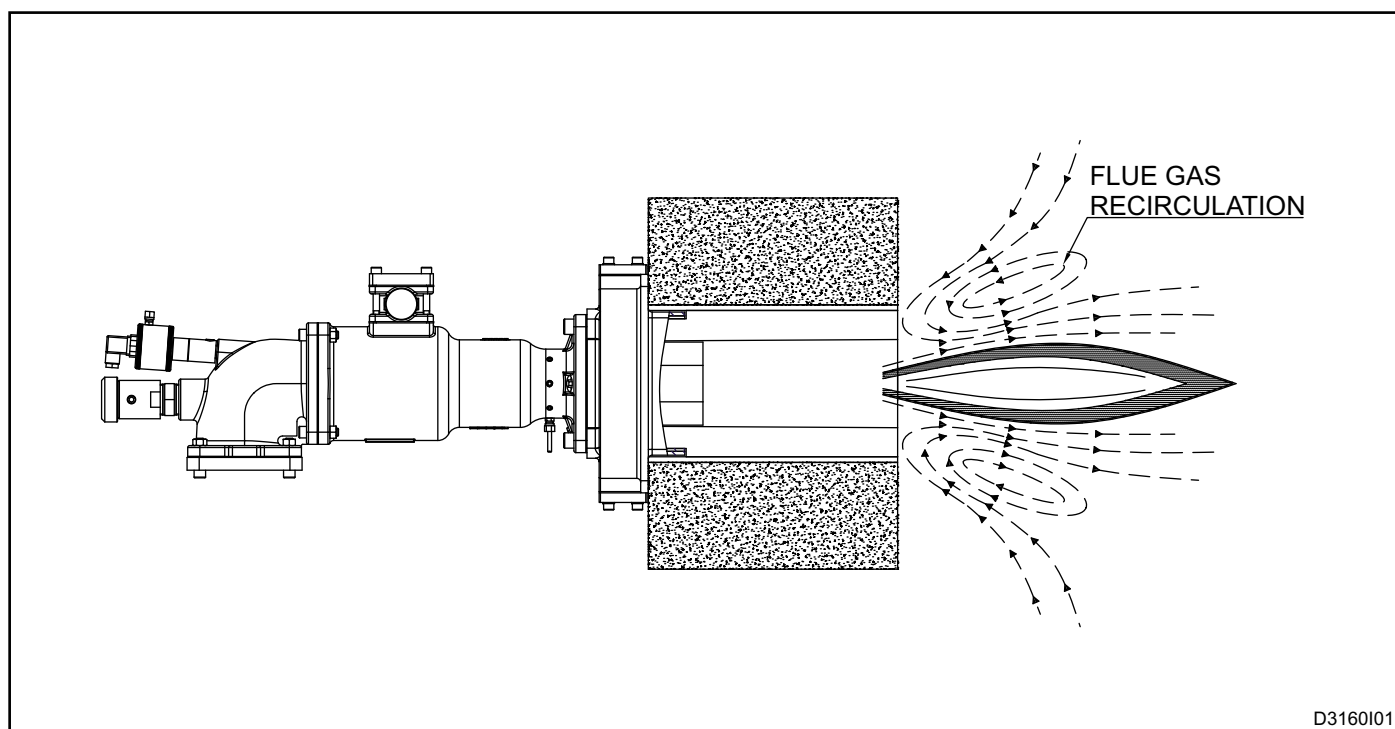
The use of certified flame control devices is highly recommended in all plants operating at temperatures below 750°C (UNI EN746-2 Norm). A pilot burner for ignition may be supplied on request.

Burner model	Capacity [kW]	Diametro uscita fumi [mm]	Flame length [mm]	Flame velocity [m/s]	Igniter / detector
300T	300	90	300	100-150	14MM/UV-2
450T	450	90	500	100-150	14MM/UV-2
750T	750	134	800	100-150	14MM/UV-2
1000T	1.000	134	1100	100-150	14MM/UV-2

## DESCRIPTION

The E-THERM burners guarantee excellent mixing of gas and air thanks to the mixing chamber placed upstream the refractory nozzle in silicon carbide, a mixture analysis plug allows some mixture to be taken out that can be analyzed using special instruments. The combustion ratio is thus monitored in all those processes that require particular atmospheres.

The E-THERM burners have the advantage of being supplied separately by air and gas. This prevents flame back-fire and makes the use of these burners possible on combustion chambers with temperatures exceeding 1.300°, the water cooling flange is especially recommended with these temperatures.



D3160101

**BURNER PERFORMANCE**

D3400DFI01

The flame capacities, lengths and velocities refer to a burner supplied with natural gas (8600 Kcal/Nm<sup>3</sup>) pla-

ced in a combustion chamber at zero pressure at sea level, functional with 10% of excess air.

- MIN/MAX (ON/OFF) functioning
- Chamber temperature 1100°C
- Atmospheric air temperature

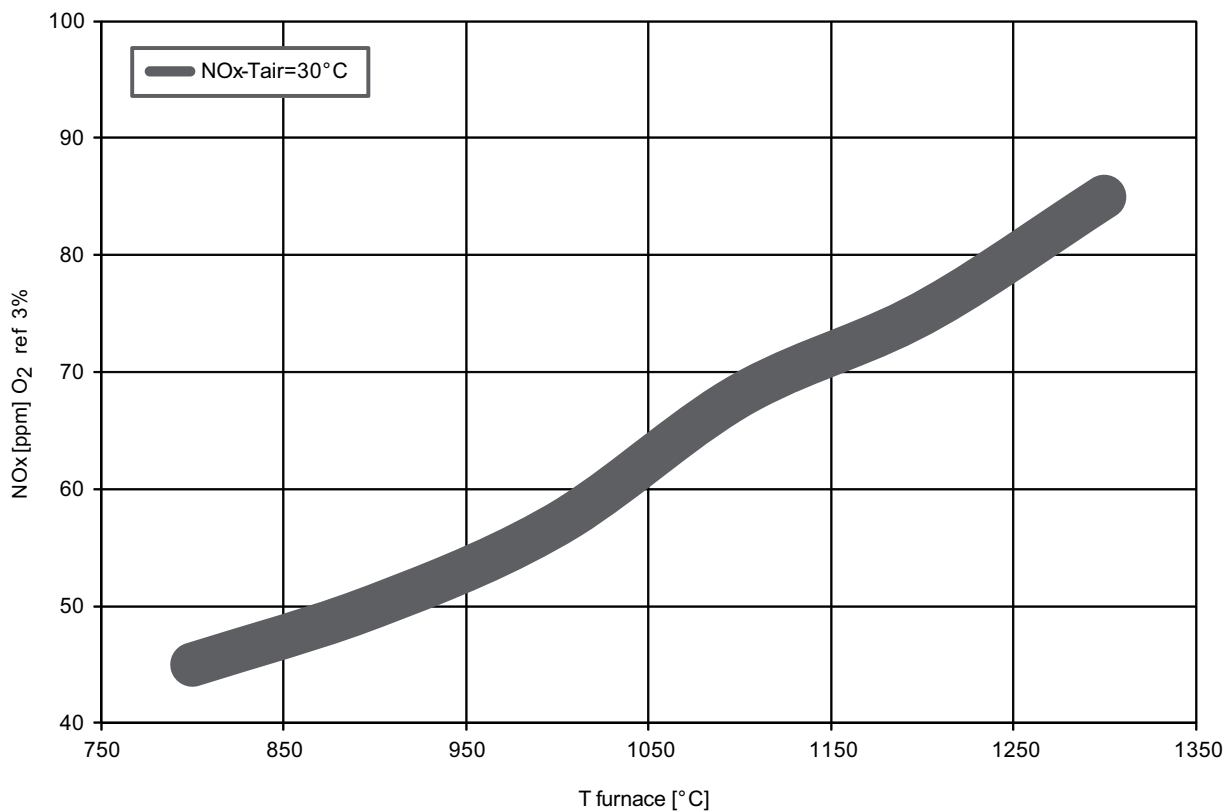
**MAXIMUM CAPACITY**

Free flame application			Burner model			
			300T	450T	750T	1000T
<b>Max. capacity</b>	Burner capacity (2% O <sub>2</sub> )	[kW]	300	450	750	1000
	Combustion air flow	[Nm <sup>3</sup> /h]	315	473	788	1050
	Gas flow	[Nm <sup>3</sup> /h]	30	45	75	100
	Burner inlet air pressure	[mbar]	60			
	Mixture pressure	[mbar]	50	50	50	50

**MINIMUM CAPACITY**

Free flame application			Burner model			
			300T	450T	750T	1000T
<b>Min. capacity</b>	Burner capacity (2% O <sub>2</sub> )	[kW]	60	90	150	200
	Combustion air flow	[Nm <sup>3</sup> /h]	63	95	158	210
	Gas flow	[Nm <sup>3</sup> /h]	6	9	15	20
	Burner inlet air pressure	[mbar]	2			
	Mixture pressure	[mbar]	1.7	1.7	1.7	1.7

**NO<sub>x</sub> EMISSION TABLE**



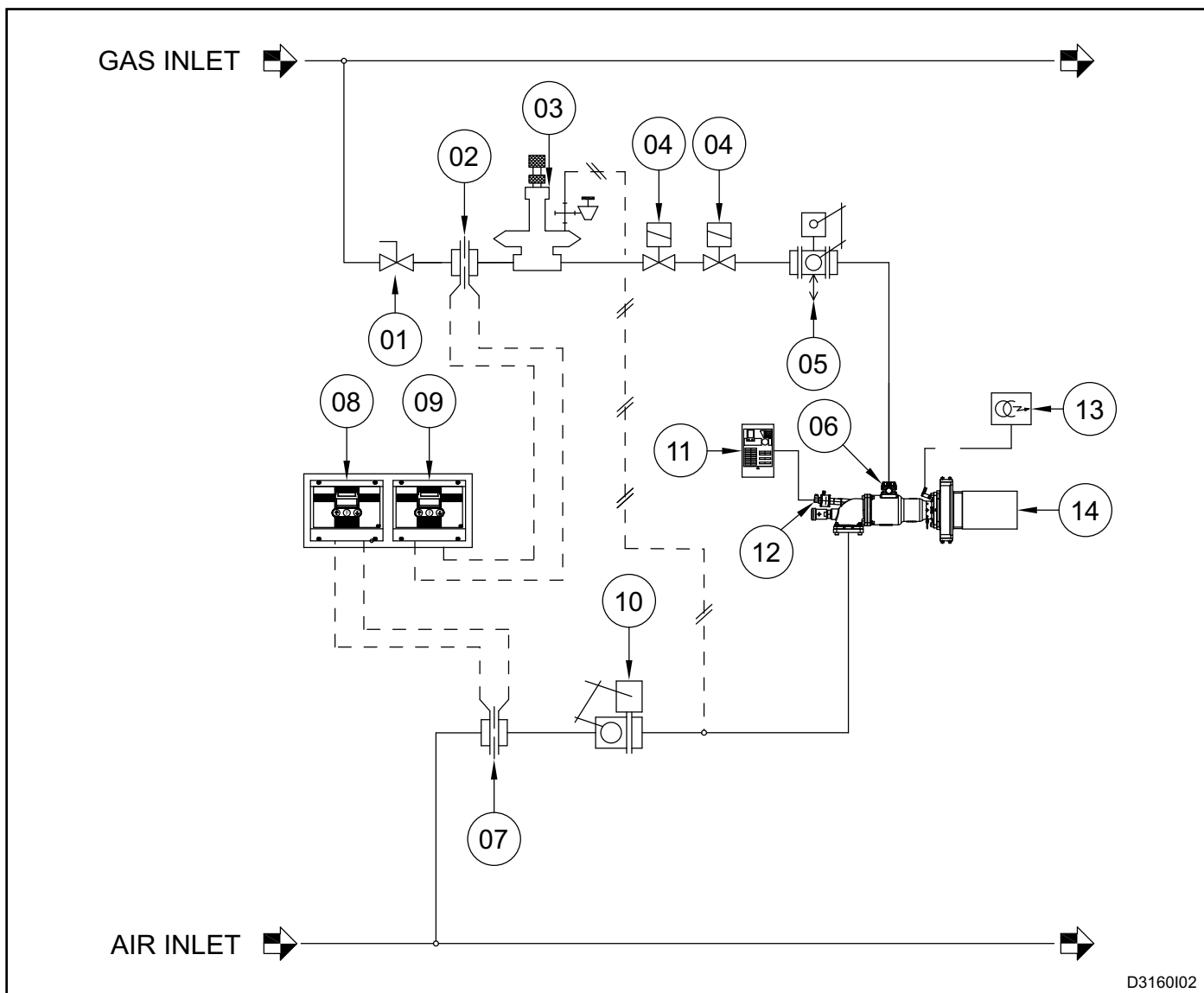
G3160I01

Burner at 100% capacity with 10% of excess air

The emission value is subject to variations and depends on various factors such as:

- Furnace working temperature
- Heated air temperature
- Excess air
- Fuel chemical composition. The value guaranteed will therefore be established case-by-case according to the conditions indicated by the client.

**FLOW SCHEME**



D3160I02

Pos.	Description	E-THERM	
		Included	Not Included
1	Gas interception valve		X
2	Calibrated gas flange		X
3	Balanced modulator		X
4	Safety solenoid valve		X
5	Gas flow regulation valve		X
6	Gas flow limiting device	X	
7	Calibrated air flange		X
8	Air pressure transmitter		X
9	Gas pressure transmitter		X
10	Air flow regulation valve		X
11	Flame control		X
12	Flame detection sensibility probe		X
13	Ignition transformers		X
14	Burner	X	

## WARNINGS

- The E-THERM series burners are meant to be used for fixed installations. If mobile installations are required, it is necessary to first consider the possibility of possible problems due to the movement of the actual furnace.
- Burner ignition must always take place from minimum power and then moving gradually towards maximum power.
- The passing from minimum to maximum power and vice-versa, must always be done gradually and not instantaneously.
- For all low temperature applications (up to 750°C), burner ignition and the fuel gas solenoid valve command must be carried out by a certified burner control device.
- To avoid possible damage to the burners, make sure that the blower does not send air fouled by combustion products, oils, solvents or other substances. To avoid these phenomena from occurring, possibly install the blower or the suction duct outside the establishment and far from the exhaust ducts.
- Check the correct connection of the supply lines after installation. Before switching the burner on check the correct combustion air and fuel gas pressure values.
- If there is trouble with other devices during the burner start up phase, use the connector with anti disturbance filter for the high-tension (HT) cable connection of the ignition electrode.
- Avoid burner ignition close to each other so as not to heat the ignition command system devices (solenoid valves and transformers).
- Consider prewash time lapse + first safety time lapse + min. of 5 sec. = time lapse between one ignition and another. (however, do not attempt more than 2 ignitions during a 30sec. time lapse).
- Make sure the power supply is TURNED OFF when intervening on the burner and its devices. In case of burner malfunctioning, follow the indications in the 'Maintenance' chapter of the present manual or contact ESA-PYRONICS assistance.
- Any modification or repair done by third parties can compromise the application safety and automatically cause the general warrantee conditions to expire.



## INSTALLATION

The E-THERM series burners have a special fixing furnace wall flange. The light obtained by the burner positioning must provide free space around the burner that must then be filled with fibre-ceramic mattress. For installation follow the instructions below:

- 1 - Place the E-THERM burners far from heat sources and products such as: liquids, solvents or corrosive gases.
- 2 - Make sure the housing sizes and supply lines correspond to the specifications in "Overall dimensions".
- 3 - Assemble the burner to the furnace wall (**pos. 01**), placing a fibre-ceramic gasket (**pos. 02**) between the attachment flange and the furnace wall. While inserting the burner check that the insulation previously covering it is not altered or damaged in any way. Once the spacer has been fixed to the furnace, from the inside of the combustion chamber, seal any possible cracks left between the wall and the actual spacer with fibre-ceramic mattress.

4 - Connect the combustion air and fuel gas inlet pipes, inserting, if possible, expansion joints in AISI.

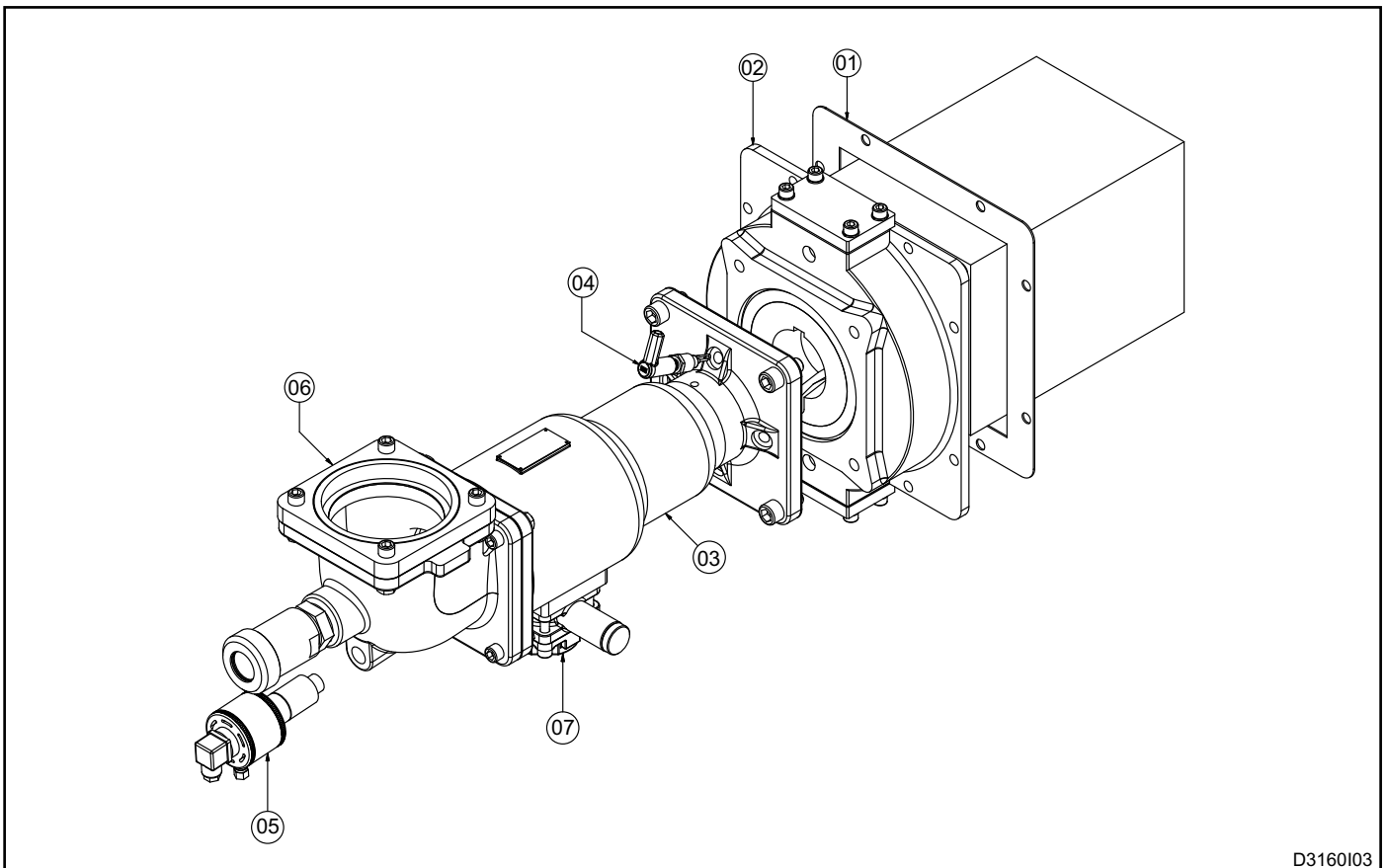
5 - Wire the ignition and detection electrode or UV high sensibility probe, being careful to pass the conductors far from heat sources.

6 - Ensure that the burner body and all metallic elements are connected to the plant's grounding system with appropriate conductors.

7 - The connection cable from the ignition transformer to the electrode must be specific for high tension and not shielded. It must not be longer than roughly a meter; otherwise the ignition transformer must be placed near the burner. The HT cable must be placed far from the power lines and not in metallic ducts. Ideally it should be left in open air.

8 - For further details, consult the technical data sheet concerning the ignition transformers.

9 - Wire the ignition electrode and detection probe being careful to pass the conductors far from heat sources.



D3160103

## IGNITION AND SETTING

The operations indicated in the following chapter must be carried out by expert technicians. The failure to comply to these instructions could generate dangerous conditions.

**1** - Check that the pressure values of combustion air on the blower outlet and the fuel gas supply are within the allowed range.

**2** - Regulate the combustion plant's working and safety device intervention pressures, whether there is one device per burner or a general device for the whole combustion plant, such as; gas pressure reducer, relief valve, pressure switches, etc. simulate the intervention of all the safety devices, including the safety overheating intervention, checking that the fuel shut off devices work correctly.

**3** - Place the air motorized regulation valve in the maximum opening position and adjust the burner inlet air pressures via the valve shutter, referring to the "Burner performance" chapter for the maximum capacity.

**4** - Place the air motorized regulation valve in the minimum opening position and adjust its opening to obtain (on burner and ejector inlet) the minimum power pressures.

**5** - Switch the burner control device on and attempt ignition several times until the actual burner ignites. While attempting ignition, act on the gas regulation valve and starting from the totally closed position, open it gradually until the burner ignites.

**6** - Place the air motorized regulation valve in the maximum opening position, via the gas regulation valve, adjust the maximum fuel flow, checking the differential pressure created on the calibrated gas flange.

**7** - Check again that at minimum and maximum power, the burner inlet air pressure corresponds to the values indicated in the "Capacity parameters" chapter. It is possible that with the burner on, these values may differ in comparison to when the burner is off.

**8** - If necessary, with all burners running at the same power, analyze the combustion products in the chamber (where possible).

**9** - Attempt several burner ignitions at minimum power, moving to maximum power, to check the ignition reliability and flame stability during regulation.

## EXTRAORDINARY MAINTENANCE

For correct disassembly and better maintenance of the E-THERM burners, scrupulously follow the instructions below with the plant off.

### IGNITION AND FLAME DETECTION ELECTRODE REPLACEMENT

**1** - Check that the burner flame control device is disconnected.

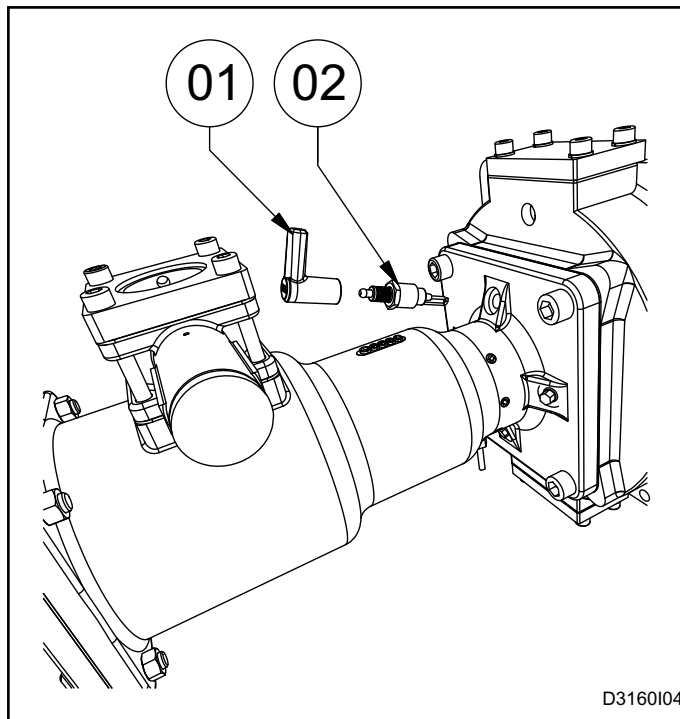
**2** - Disconnect the electrodes (**pos. 01**).

**3** - Unscrew the electrode (**pos. 02**) at the base of the air body, removing the seat.

**4** - Replace the faulty electrode (**pos. 02**) paying attention to place the new electrode in the correct position again.

**5** - Restore electrical connection (**pos. 01**).

**6** - Check the correct flame ignition/detection of the electrode.



D3160I04

## BURNER IN LOCKOUT

In burner lockout conditions, refer to the burner control indications and to the relative manual to identify the cause. Below the main cases have been indicated:

■ **Illegal flame detection:** lockout due to the detection of an illegal flame signal during the phases that precede ignition or after shut down. The causes can be found in the detection system (broken probe or humidity), or the drawing of gas by the safety solenoid valve that allows the burner to remain running.

■ **Ignition failed:** lockout due to missing flame formation

during start-up. The causes can be found in the ignition system (no spark, broken electrode or electrode not in the correct position), in bad combustion product and fuel flow regulation or in the detection system (broken probes or interrupted cables). Specifically, in the first two cases, the flame does not ignite, whilst in the last case, the flame forms but the burner control device is unable to detect it.

■ **Flame signal loss:** lockout due to flame signal loss during normal burner functioning. The causes can be found in the regulation of combustion air and fuel flow (rapid flow variations, regulation out of allowed range) or in the detection system (broken, dirty or badly positioned probes).

## GENERAL MAINTENANCE PLAN

Operation	Type	Advised time	Notes
Electrode high tension connector	O	annual	Check integrity of outer plastic and oxidation of internal electrode terminal.
Ignition/detection electrode	O	annual	Replace if the kantal terminal is worn or if ceramic is damaged
Carbide nozzle	O	annual	During furnace stop, check that there are no material deposits on its surface
Refractory block	O	annual	During furnace stop check that there are no cracks or in the material. If necessary replace.
Replacement of gas gaskets	S	annual	See note (*) and (**)
Burner setting	O	annual	Repeat all the steps in the "IGNITION AND SETTING" chapter
Photocell glass replacement	O	Every six months	Reduce to every four months in dusty atmospheres
Photocell replacement	O	10.000h functioning	However every 2 years

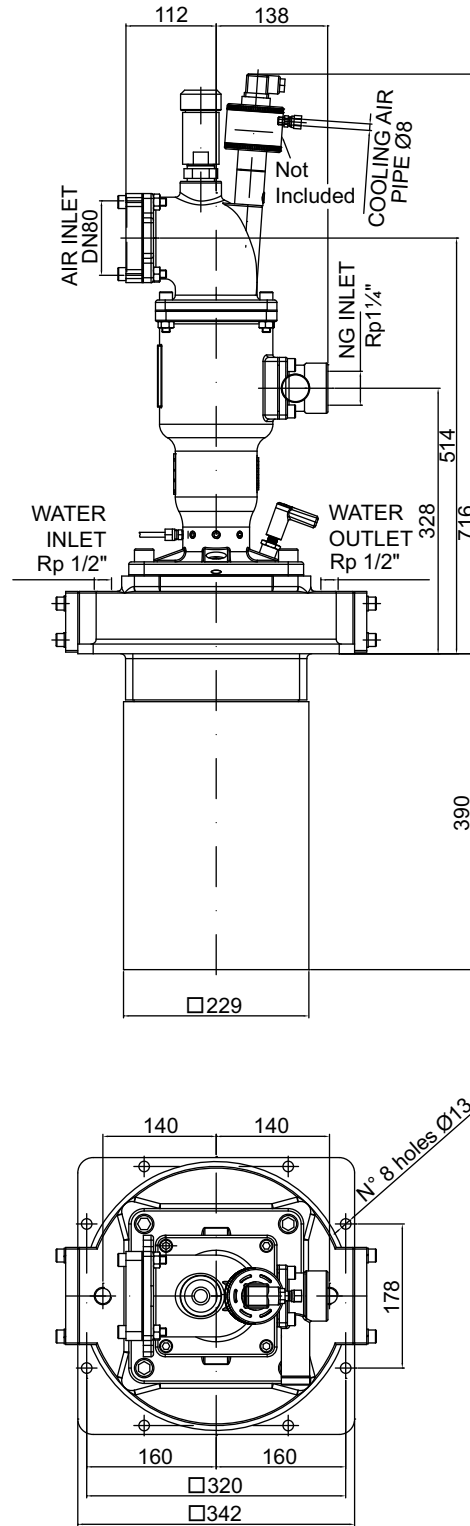
### NOTES:

Key: O = ordinary / E = extraordinary

(\*) it is suggested that the gaskets on the gas side are replaced every time the gas feeding line is disassembled.

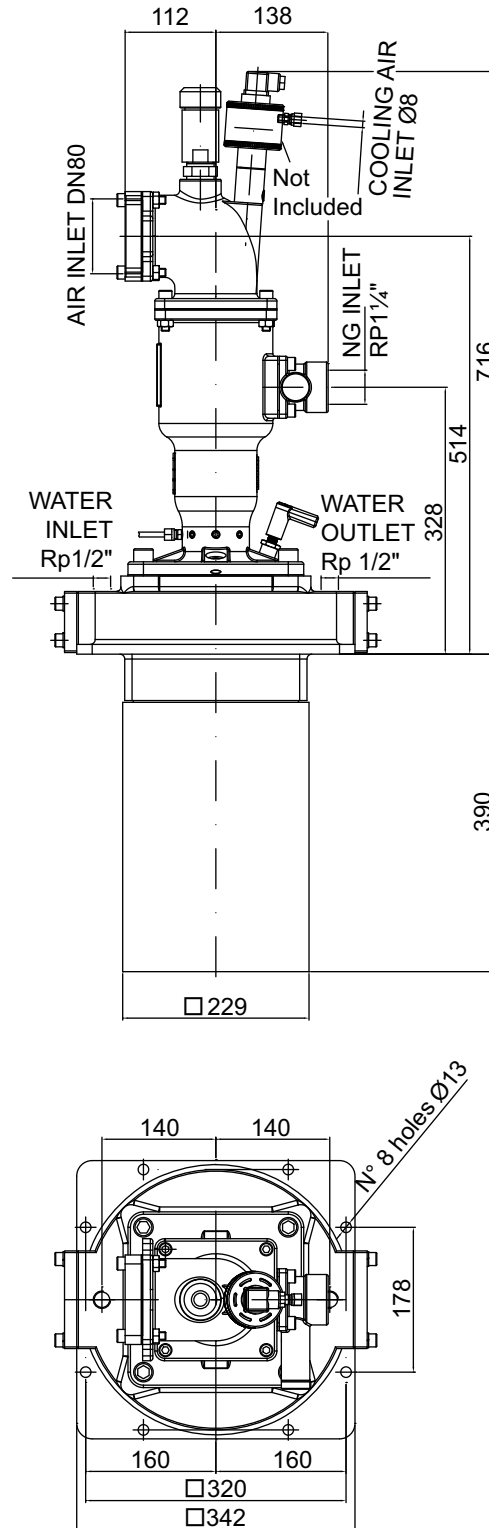
(\*\*) use high temperature gaskets.

**OVERALL DIMENSIONS - E-THERM 300T**



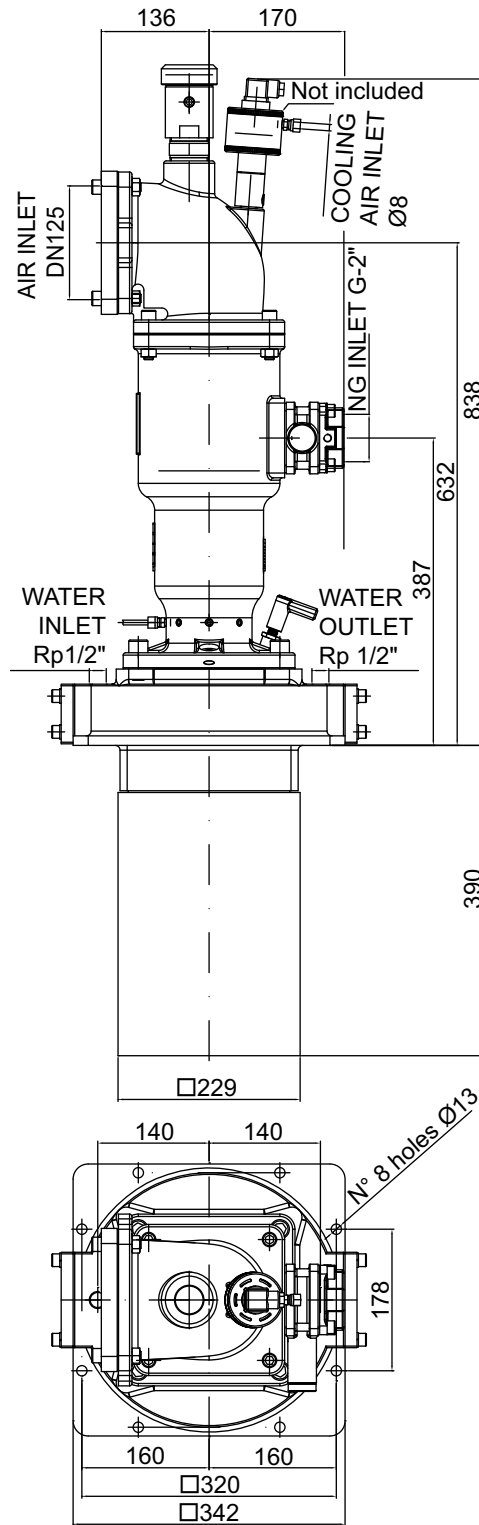
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**OVERALL DIMENSIONS - E-THERM 450T**



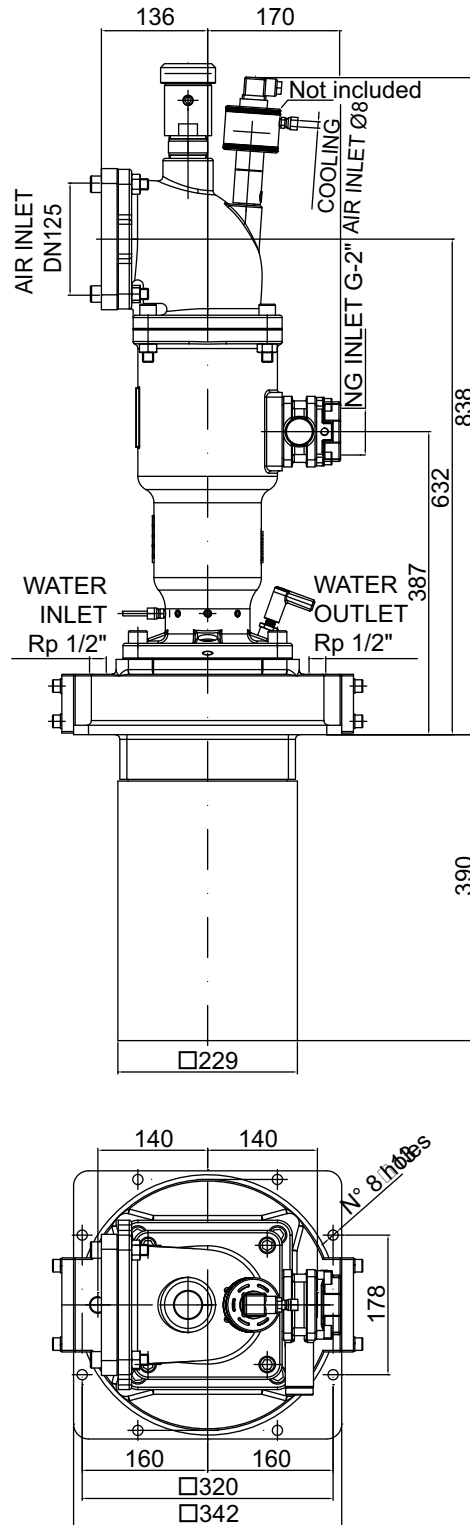
D3160I06

**OVERALL DIMENSIONS - E-THERM 750T**



D3160I07

**OVERALL DIMENSIONS - E-THERM 1000T**



D3160I08

**ORDERING CODE**

E-THERM -  -  -  -  -   
01
02
03
04
05

Model		01
E-THERM 300T	300T	
E-THERM 450T	450T	
E-THERM 750T	750T	
E-THERM 1000T	1000T	

04	Ignition	
	Ign. Electrode + det. Electrode Pilot burner <sup>(2)</sup>	E* P

Gas adjuster		02
With gas adjuster	GA*	
Without gas adjuster	F	

05	Flange type	
	ESA drawing Client drawing	E* C

Fuel		03
Natural gas	CH4*	
LPG	GPL	
Poor gas <sup>(1)</sup>	GP	

The codes indicated with (\*) identify the standard product.

Notes:

1. Particular performance according to gas characteristics
2. Available on request (see "Ignition and Detection" paragraph).