

# BURNERS OF THE NEW GENERATION E&M



## COMPACT BURNERS JBM



- ALL TYPE OF LIQUID AND GASEOUS FUELS
- LOW POLLUTANT EMISSIONS
- LOW NOISE LEVEL
- ELECTRONIC REGULATION

## E&M COMBUSTION IS INNOVATION

Since the foundation of the company, innovation has turned into one of the basic and fundamental goals of E & M Combustion. Our company tries to provide increasingly innovative equipment for the market based on three fundamental goals:

- Developing burners with more and more efficiency.
- Reducing emission of pollutants without losing energetic efficiency.
- Designing equipment in a way that they achieve qualities which are highly valued nowadays such as: decreasing the level of dB, easy access to burner elements, resistance, using new material, etc.

For achieving this goal, we think that there is no better way than the collaboration of our R+D+i department with technological centers of combustion in different countries. Thus, we work with the most efficient researchers, which allows us to exchange information and work on several investigations in such a way that the final result is achieving different options of improvement which is in other words, an extremely satisfactory and innovative product for the client.

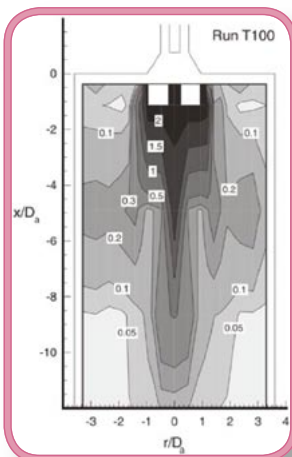
Our working implements are multiple. On the one hand, we use the most modern software for the simulation of fluids. On the other hand, our devices are fully tested in a complete group of installations such as: a semi -industrial combustor, laminated flow combustor, aerodynamic test bench , etc. Finally, our burners are tested in boilers and furnace plants in order to provide the market with a totally reliable and especially innovative product.



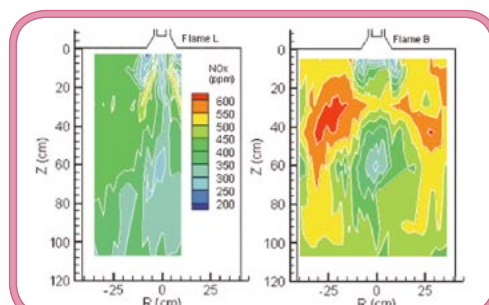
Gas flame.



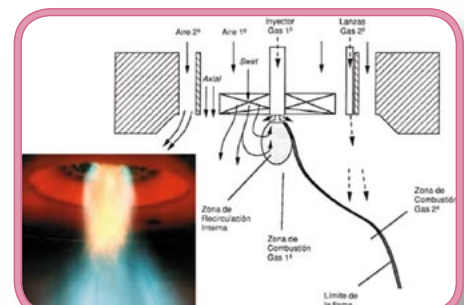
Industrial combustor.



Software simulation.



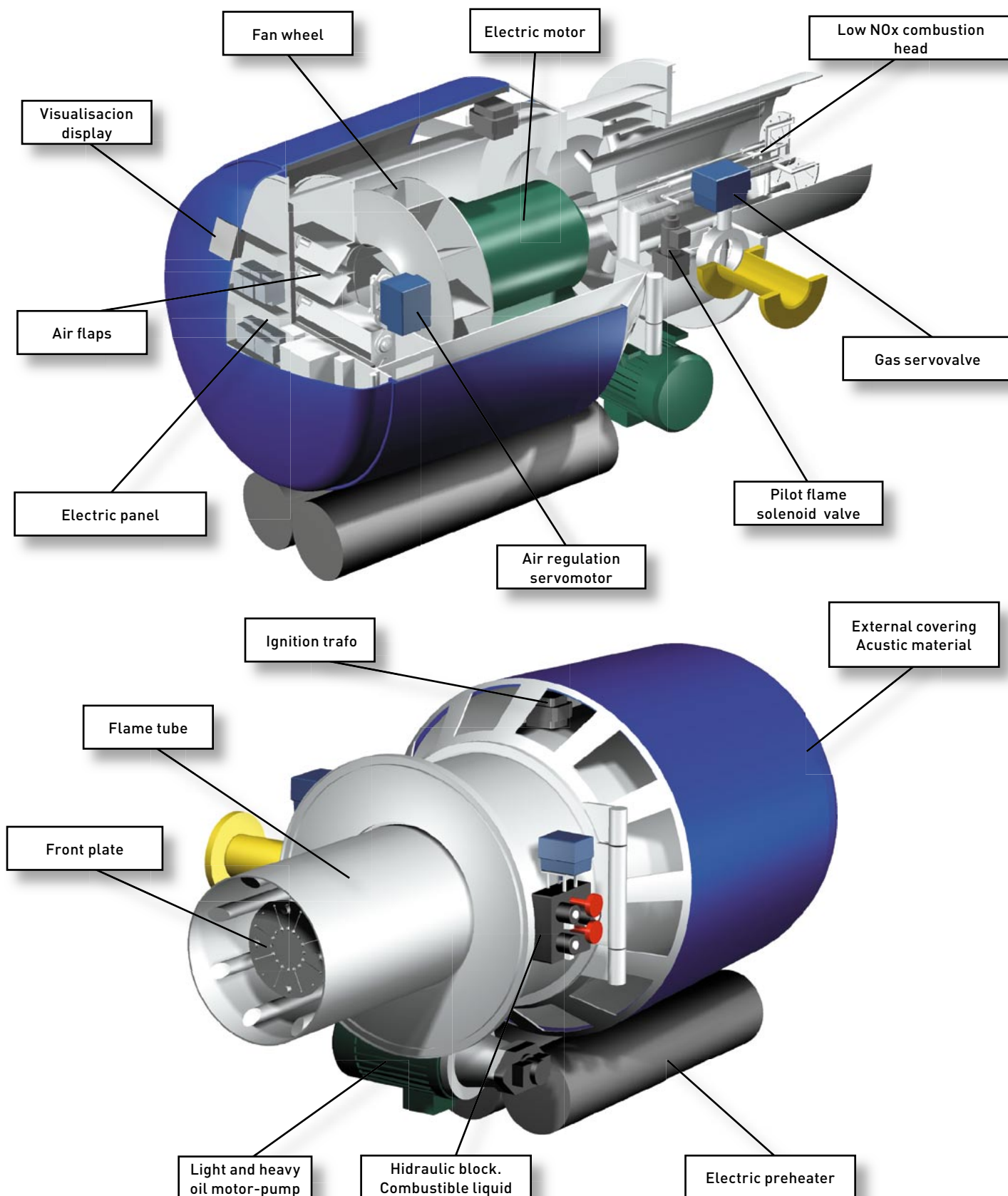
Flame simulation.



Low NO<sub>x</sub> flame.



## DESCRIPTION OF THE BURNER COMPONENTS



## E&M TECHNOLOGY

E&M Combustión, by means of its R+D+i department and by the collaboration of technological centers specialized in combustion technology of different countries, has developed a new range of burners of the new generation whose principal qualities are: high energetic efficiency, low emission of pollutants and a reduced level of dB.

The design, development and manufacture are based on the European regulations EN 676-EN 267, and have been produced according to very strict parameters of quality.

## INNOVATION IN DESIGN

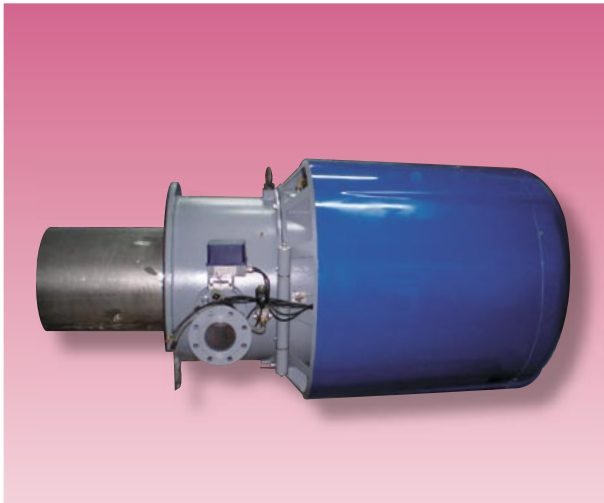
The innovative design that our products present, plays a fundamental role in its own way, other than the appearance of the product, it also allows us to achieve qualities which have remarkably improved till now which have been obtained by conventional designs of burners.

## VENTILATION SYSTEM

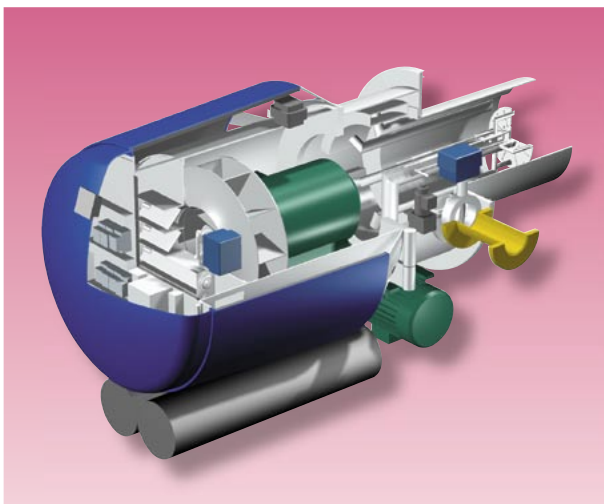
### REDUCED NOISE EMISSION

On the outside, the burner has a sound proof covering which allows us to decrease the dB in an important manner. The air enters from the front part of the burner. This part of the burner is the closest to the boiler, in some cases for steam applications, it is placed under the doors of the boiler, which is where the boiler radiates the heat, because of that, the air is obtained from a much warmer section than if the inlet of the air had been placed in the back part of the burner. By doing this, we get a highly increased efficiency of combustion.

On the other hand, a low speed of air inlet has been calculated for the burners, which in addition to the acoustic cover and the fact that the motor of the fan is placed inside the device, make these burners one of quietest ones in the market.



*Innovative design of burner.*



*Noise reduction system.*

## COMPACT BURNER

### EASY ACCESS

The burner has a mono block design that incorporates the fan and the control panel, and in case of combustible liquids, the pump and preheaters.

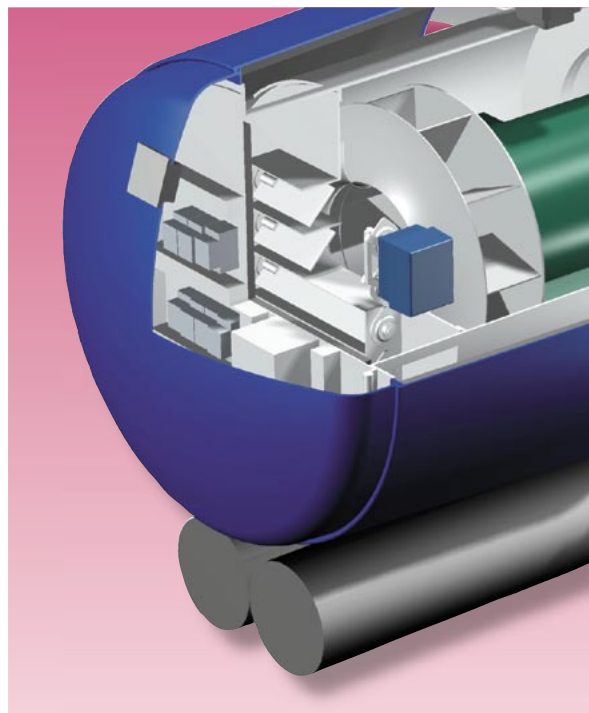
These burners present the following advantages in operation:

- The control panel is incorporated in the back part of the burner which is easy to reach.
- Double hinge which allows direct access to the combustion head and on the other side, to the motor.
- Easy disassembly of the main gas pipe of the burner, by extracting the front plate and the ignition electrodes and the burner lance in case of combustible liquid burners.
- Easy access to the fan wheel by disassembling 8 screws placed on the air flaps plate.
- Easy disassembly of the flame tube without needing to disassemble the burner.

## CONTROL PANEL

### ELECTRICAL REGULATION

The burner incorporates the control panel, which includes a switchboard that controls the independent actuators in order to control the air flaps, butterfly valves for gas flow and the combustible liquid's regulation valve. The operation of the burner is totally controlled by this switchboard.

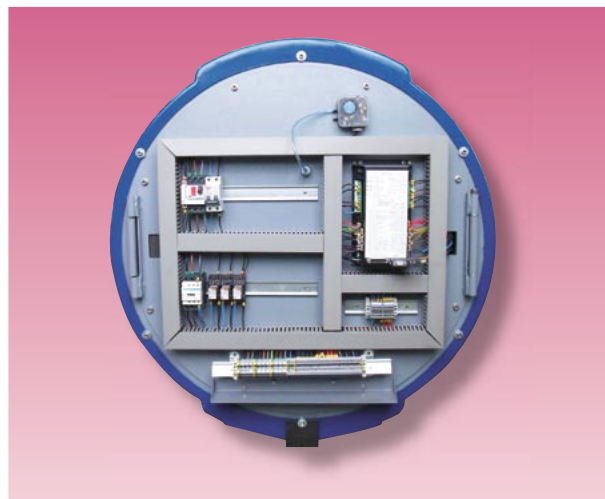


*Easy access to the different components.*



*Abatible burner in several positions.*

*Easy disassembly of the head components.*



*Control panel incorporated.*





*Visualisation display incorporated.*

## COMBUSTION HEAD

### VISUALISATION DISPLAY

The burner incorporates a display screen which shows the general condition of the burner in the protecting covering of the control panel. The information we get:

- Burner load value
- Pressure or temperature of the boiler operation
- Intensity of the flame detection.
- Measurement of  $O_2$  & CO in cases of using both elements continuously.
- Fault memories, etc.

The location of the display in the back part of the device, keeps us alert of the condition of the burner, fault memories at one glimpse.

This incredibly reduces the time wasted in repairing faults.



*Internal gas ring.*

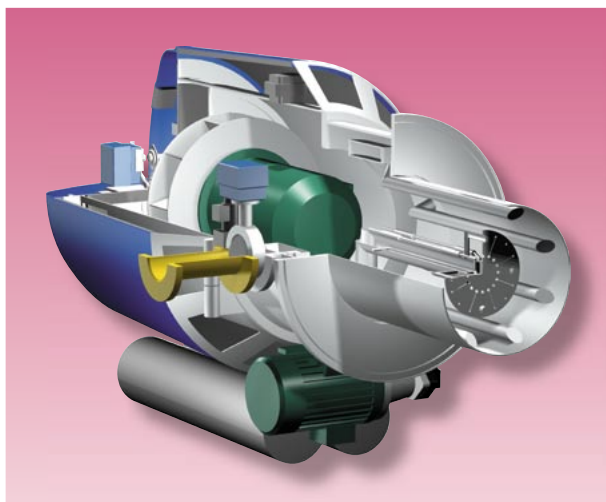
## BURNER HEAD

### REGARDING THE ENVIROMENT

The Low NOX combustion heads are designed to reduce pollutant emissions as much as possible, which is in favour of the environment and it achieves a high level of thermal efficiency.

(From 91 to 94 % of the N.C.V.).

Measurements of NOx emission which are obtained by natural gas range between 80 and 100 mg/kW depending on the type of boiler.



*Burner section.*

## GAS COMBUSTION HEAD

### IGNITION SYSTEM CIS

The gas combustion head is constituted by an internal gas ring which leads different lances to the outer part and in the inside, a central pipe of gas where the internal lances and the ignition system are situated. Distribution of gas is 20% in the internal lances and 80% in the external ones, which produces the combustion in two different steps, and causes a remarkable reduction of NOx and a well -balanced flame.

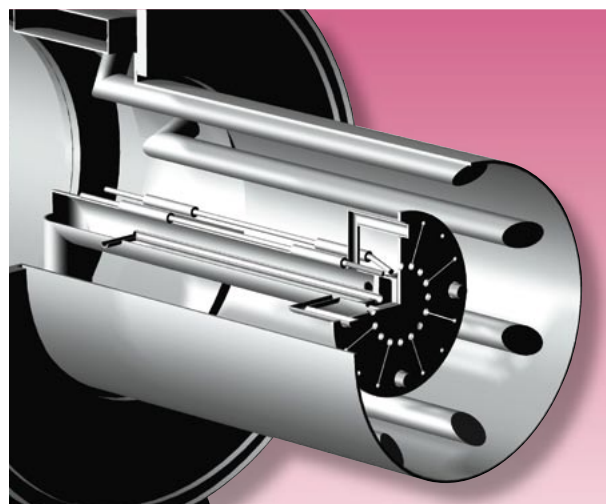
This combustion head gives access to the external lances of gas by means of the opening of the burner.

These lances are movable, allowing us to orientate them in different positions, so that we can achieve different flame dimensions. In addition to this factor, the possibility of using swirlers, also gives the burner a variety of dimensions of flames and allows it to adapt to any type of combustion chamber.

The start up or ignition in burners is performed by an innovative system called C.I.S (crown ignition system). The pilot flame is produced right behind the front plate creating a crown shape and in a way uniformed around it. This system presents the following advantages in regards of conventionals:

- Reduction in different pressure variations.
- Reduction in fluctuations of flames.
- Softness and stability in the start up.

All components of the head are made of best quality refractory steel which hereby guarantees its lifetime.



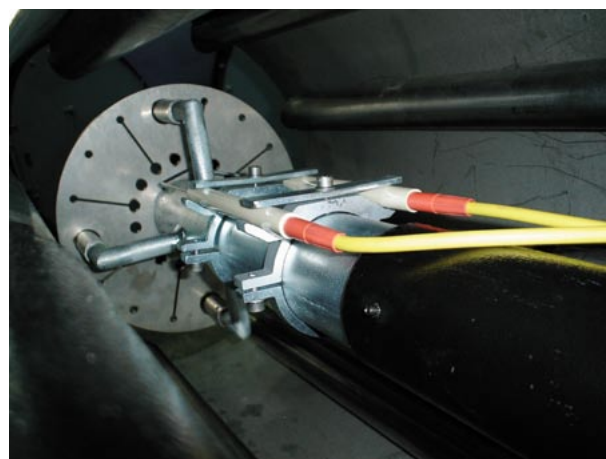
*Low NOx gas combustion head.*

## PUMP AND HYDRAULIC BLOCK

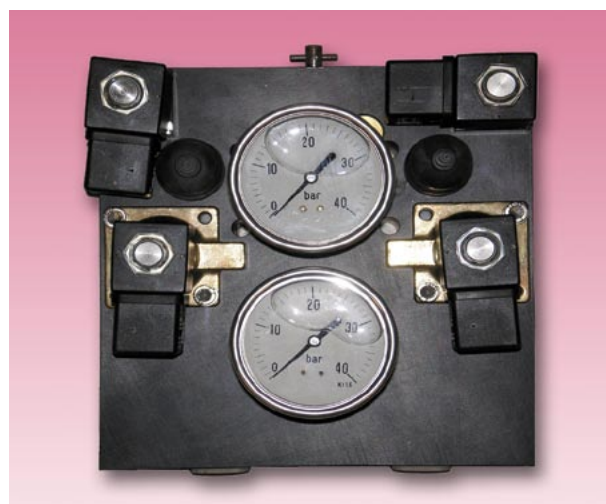
### SIMPLICITY

In combustible liquids, the pump of the burner is incorporated in the front part. This provides easy and simple access to assembly and disassembly of the pump. The motor pump is connected to the hydraulic group. This, designed by E&M Combustion engineers, allows the whole combustible regulation system to be used in an aluminium block. The advantages of traditional regulation systems are as follows:

- Reducing space in regulation and control system.
- Eliminating possible leakage produced when the combustible liquid runs through the pipe connectors.
- Immediate visualisation of regulation parameters (pressure of inlet and outlet, position of the regulation actuator of the combustible liquid's flow,...).
- Ability of changing magnetic valves easily (they are threaded to the block)
- Connected to the pump by two flexible pipes.

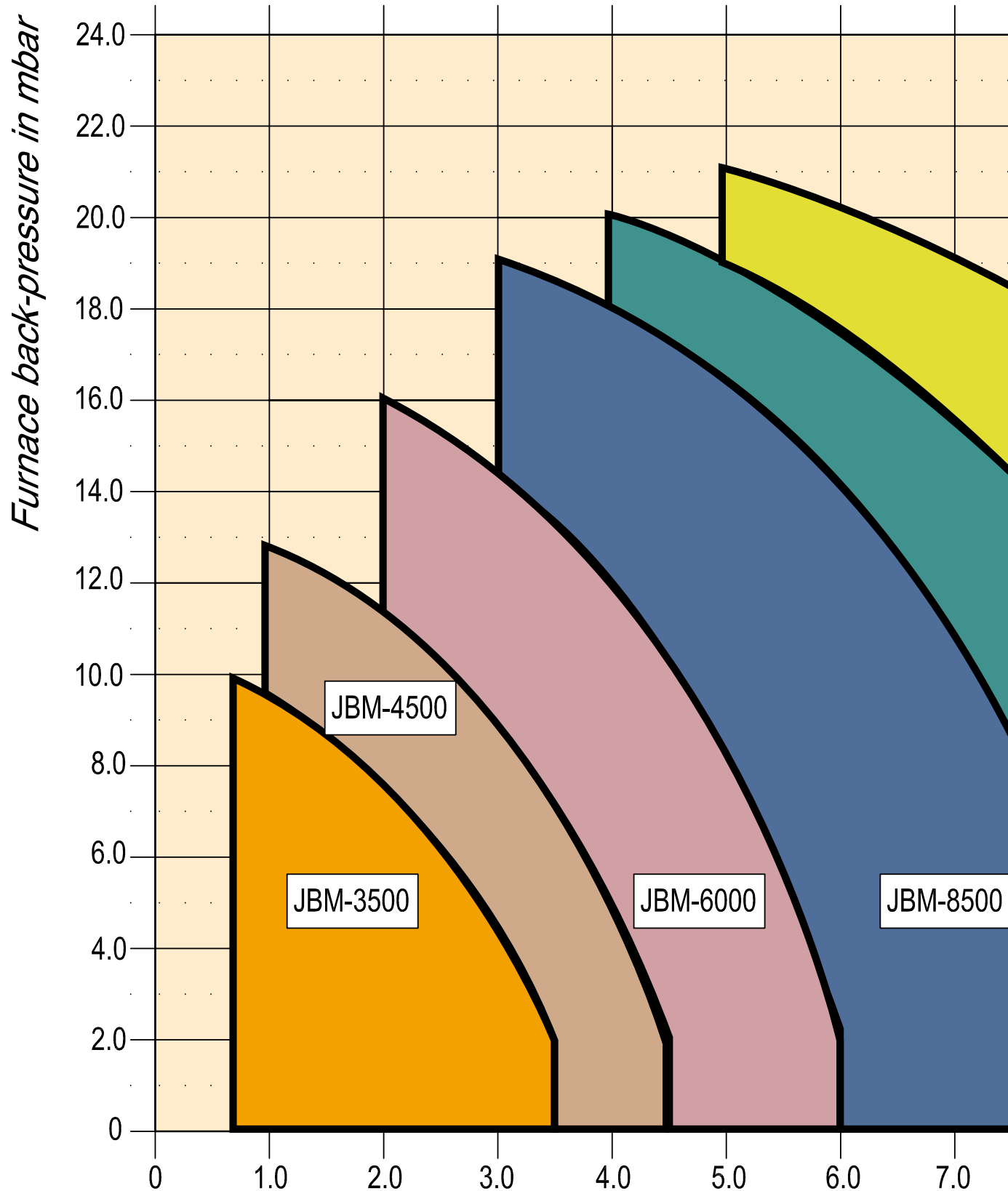


*C.I.S. ignition system.*



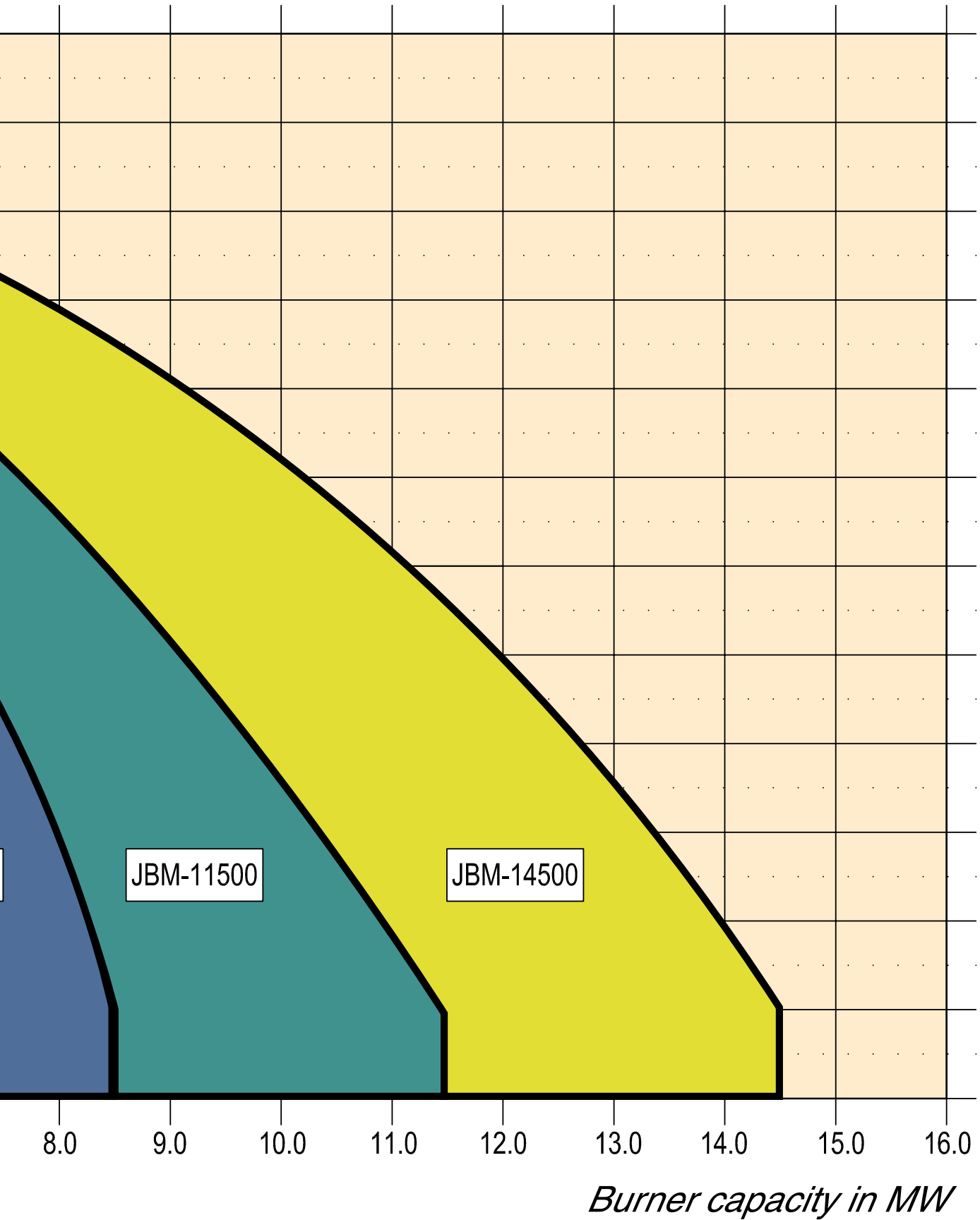
*Hydraulic block.*

## BURNER POWER CURVES





# COMBUSTION SOLUTIONS



## ELECTRICAL REGULATION

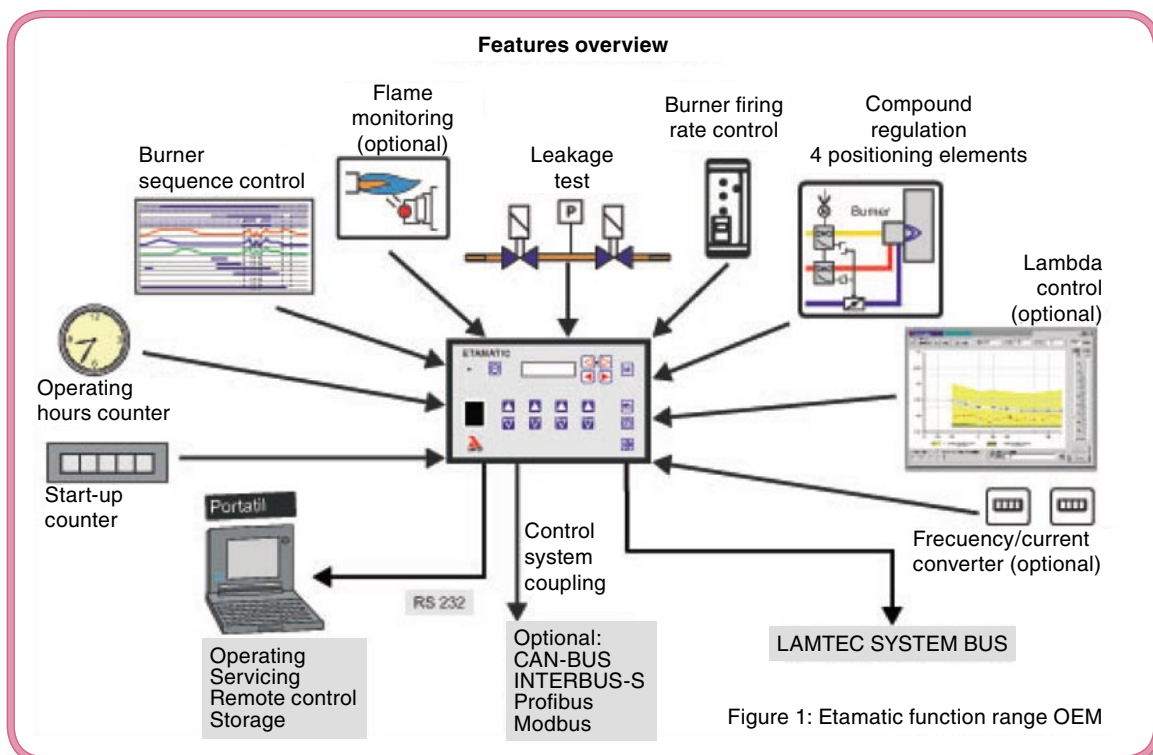
### ADVANTAGES IN ACCESSABILITY

Burners manufactured by E&M combustion incorporate electronic regulation switchboards in order to have precise control on the fuel- air ratio. This electronic regulation system presents advantages in traditional regulation systems based on mechanical systems, such as:

- All control and regulation functions of the burner are integrated in one single device, including sequences of ignition, security controls, P.I.D. regulation, leakage test and flame detection system.
- It remarkably increases the precision of the regulation ,avoiding mechanical hysteresis produced in rods and cams of the traditional regulation .This is operated by the transmission of electrical pulses to individual actuators.
- They can control up to four channels.
- It incorporates a visualisation display of information that can quickly show the state of the burner as well as fault memories and hours of operating.
- Presents an external connection to P.C. or to P.L.C. bus system.
- Reduces time of commissioning due to pre-regulations in the factory.

### ADVANTAGES FOR SAVING ENERGY

One of the great advantages of electronic switchboards is the possibility of using frequency converters and oxygen probes as elements that save energy. These connections are optional, but reduce energy expenses, as for the ones related to the consumption of the motor as well as ones for combustion efficiency.



## ENERGETIC EFFICIENCY

### A GREAT DEAL FOR SAVING

One of the greatest advantages that E&M burners of the new generation presents is its high energetic efficiency thanks to these three fundamental factors:

- 1) The combustion heads have been designed for achieving excellent combustion with minimum excess of oxygen obtained, and as a result, a remarkable efficiency in combustion.
- 2) The fans are designed to achieve an excellent efficiency .They also allow us to use a frequency converter for the regulation of the air flow.
- 3) It is possible to use optimizing O<sub>2</sub> & CO systems for improving combustion efficiency.

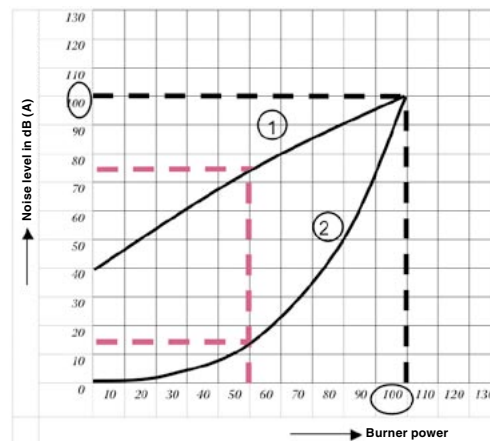
### Advantages of using a frequency converter

#### Saving energy consumed by motor

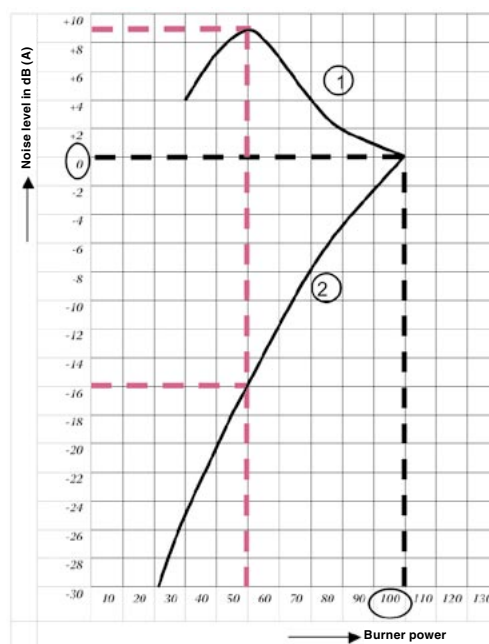
It is possible to estimate that the figure 1 on the right shows a notable energy saving by using a frequency converter. In curve 1 the % of the consumption of the motor using a regulation for traditional air flaps is described. In curve 2 we have the % of electrical consumption used in a speed converter. Both curves depend on the load of the burner. As we can see, starting from 70-80% of the load of the burner, saving becomes very important. This varies between 30-50% depending on the burner's power in every moment.

#### Reduction of the level of noise of the motor

One of the other important advantages of using a frequency converter is reducing the level of dB that is produced by the motor. In the graph of fig.2, we can observe the two curves that indicate the level of noise of the device with and without a speed converter. As we can see at some points the difference is really important. In addition to this improvement, the design of the burner itself makes E&M burners one of the quietest in the market.

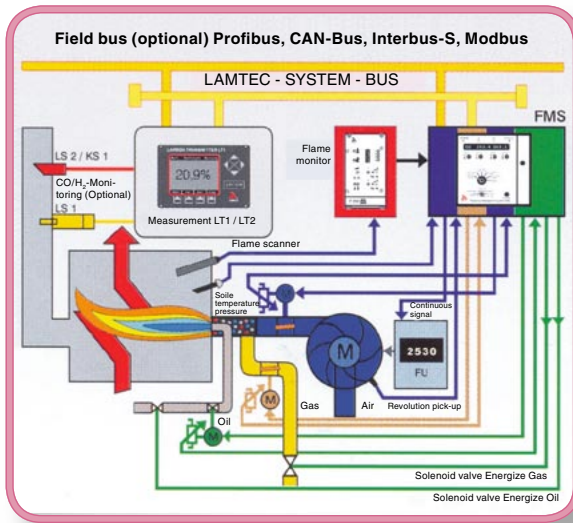


- 1 = Control by air flaps (old burners)  
2 = Control by frequency converter



- 1 = Control by air flaps (old burners)  
2 = Control by frequency converter





## THE LAMTEC-O<sub>2</sub>-CONTROL

### SENSOR-LED ONLINE OPTIMISATION

Today, mainly O<sub>2</sub> regulations based on zirconium dioxide oxygen probes, known as Lambda probes, are used for monitoring and optimisation of furnace plants. They offer the following advantages.

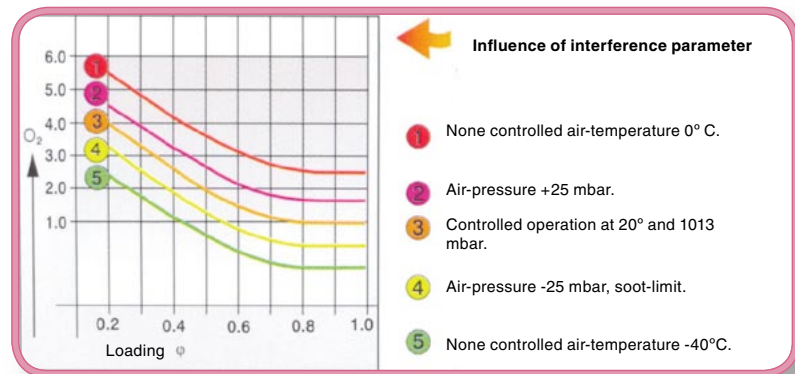
- Direct measurement in most exhaust gas without gas preparation.
- Rapid reaction and adjustment time  $t_{90} < 15$  s.
- Permanent measuring value coverage.
- No gas sample extraction.
- Low maintenance.

With O<sub>2</sub> regulation the fluctuations affecting combustion should be generally compensated for. In addition to this, O<sub>2</sub>

regulation also monitors the fuel-air ratio of the combustion. If this oversteps the permissible values, the alarm is set off.

Fluctuations of the following have a general disruptive effect on combustion.

Air:	Temperature
	Pressure
	Humidity
Fuel:	Heat value
	Temperature
	Viscosity
	Density
	Fluctuation in gas pressure
Pollution:	Burner
	Boiler
Mechanics:	Mechanical hysteresis (rod play)



All these measurements demand more combustion air for safety reasons, than would be necessary for ideal combustion.

These excessive air volumes are heated unnecessarily and transport the heat as a loss via the chimeney.

Excess air volumes cause reduced CO<sub>2</sub> values and increased waste gas temperatures and concur fully with the principle of furnace efficiency or the principle of furnace waste gas loss.

Using Siegert's formula furnace efficiency can be calculated by using the measured residual oxygen content of the exhaust gases and the difference temperature:  $t_{\text{waste gas}} - t_{\text{intake air}}$

# COMBUSTION SOLUTIONS



$$qA = (tA \cdot tL) (A2 / 21 - O2) + B [\%]$$

$$\eta F = 100 - qA$$

qA = waste gas loss

$\eta F$  = furnace efficiency

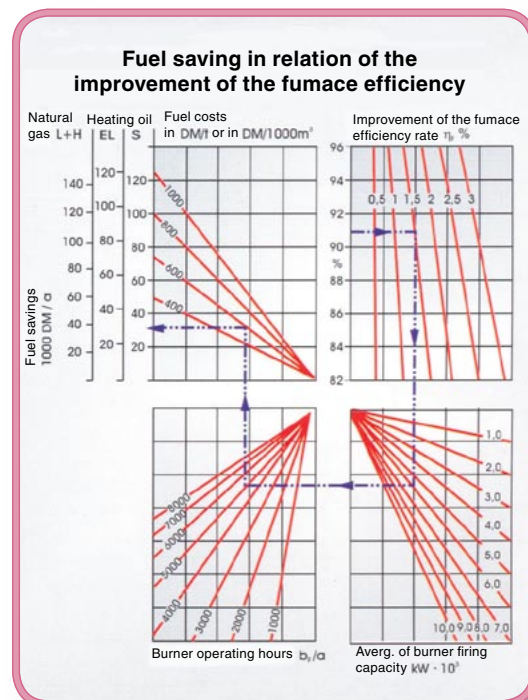
	Heating oil	Natural gas	Town gas	Coal gas	Liquid gas
A2 =	0.68	0.66	0.63	0.63	0.60
B =	0.007	0.009	0.011	0.008	0.011

From this formula it can be seen that:

1% O<sub>2</sub> reduction yields an increase in furnace efficiency.

- with natural gas ca. 0,60 %
- with light oil ca. 0,70 %
- with heavy oil ca. 0,75 %

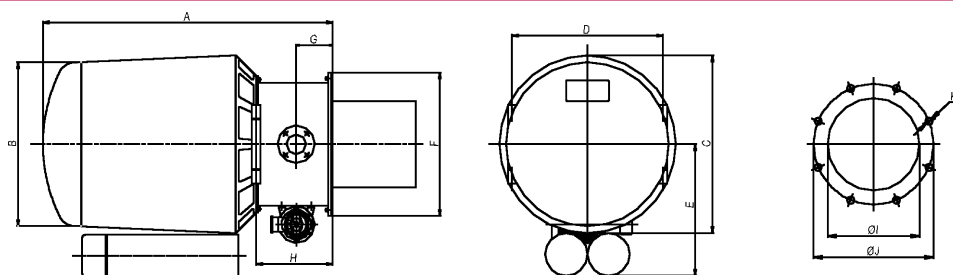
If the influences are added up, this gives the following example for possible improvements in efficiency:



	NATURAL GAS H	HEATING OIL EL	S
1. Heat value deviations.	1.5%	—	0.3%
2. Alteration of burner burden due to oil/gas pressure, derivations, viscosity and temperature changes.	0.5%	0.4%	1.7%
3. Air-temperature.	0.4%	0.4%	0.4%
4. Air-pressure changes.	0.3%	0.3%	0.3%
<b>TOTAL</b>	<b>2.7%</b>	<b>1.1%</b>	<b>2.7%</b>
As extreme values were assumed for these alteration, only half of this sum can be reckoned with on average in the course of a year, ie;	1.35%	0.55%	1.2%
Supposing that by O <sub>2</sub> -regulation as a result of compensating for the fluctuation the burner adjustments can be set on average at approx. 1 vol.% O <sub>2</sub> closer to optimum resulting in an improvement of	0.60%	0.70%	0.75%
<b>Average per year</b>	<b>1.95%</b>	<b>1.25%</b>	<b>1.95%</b>

## DENOMINATION OF THE BURNER

JBM	4.500	G	LT ###
Burner's system: industrial compact burner	Burner's power	Combustible: G-Natural Gas LO-Gasoil FO-fuel-oil GLO-G.N./Gasoil GFO-G.N./Fuel-oil	Length of flame tube



## DIMENSIONS OF BURNER

Model	A	B	C	D	E	F	G	H	I	J	K	Weight (kg)				
												G	LO	FO	GLO	GFO
JBM-3,500	1,280	750	800	670	670	655	175	360	340	570	M12	485	430	475	515	560
JBM-4,500	1,280	750	800	670	670	655	175	360	340	570	M12	495	440	485	530	575
JBM-6,000	1,710	950	1,050	890	770	840	215	450	380	775	M12	720	650	695	750	795
JBM-8,500	1,710	950	1,050	890	770	840	215	450	435	775	M12	750	680	765	785	870
JBM-11,500	1,710	950	1,050	890	770	840	215	450	470	775	M12	780	705	795	815	905
JBM-14,500	1,960	1,125	1,250	1,050	850	900	230	500	525	625	M12	905	825	915	940	1,030

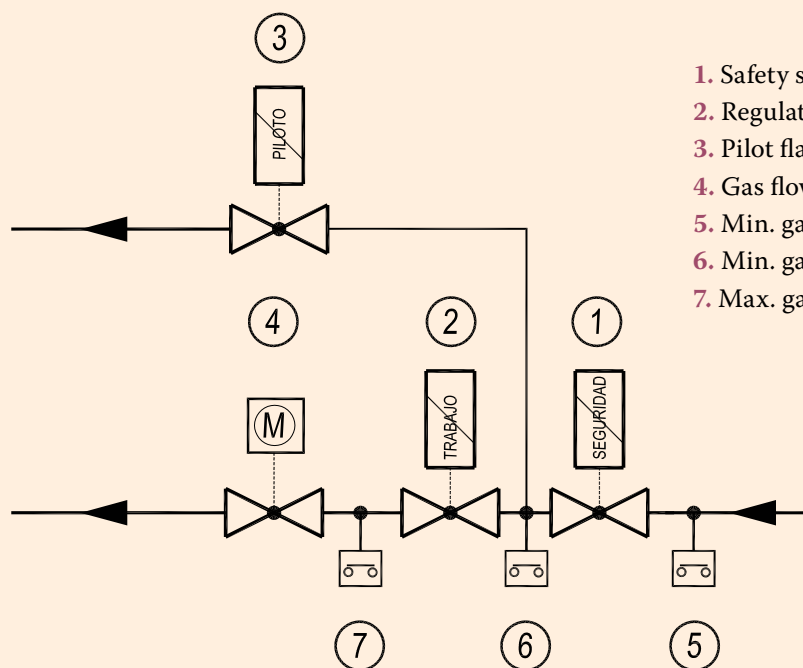
Note: The illustrations and information demonstrated are orientative. E&M Combustion S.L keeps the right to make all necessary modifications for the improvement of our products.

## BURNER COMPONENTS DESCRIPTION

Description	G	LO	FO	GLO	GFO
Body of burner, assembly flange, external covering with acoustic material, motor of burner, fan wheel, air flaps for air regulation, combustion head, ignition trafo., ignition cable, ignition electrodes, flame tube.	•	•	•	•	•
Electronic switchboard Etamatic OEM	•	•	•	•	•
Incorporated electric control panel	•	•	•	•	•
Visualisation display	•	•	•	•	•
Double magnetic valves for gas	•			•	•
Gas magnetic valve for pilot flame ignition	•			•	•
Butterfly valve for gas	•			•	•
Air pressure switch	•	•	•	•	•
Self-checking flame detector	•	•	•	•	•
Gas pressure switch	•			•	•
Actuating motor for air flaps	•	•	•	•	•
Actuating motor for gas butterfly valve	•			•	•
Actuating motor for regulation of combustible flow		•	•	•	•
Motorpump outlet for combustible liquid		•	•	•	•
Hydraulic block		•	•	•	•
Preheater			•		•
Connecting pipes for combustible liquid		•	•	•	•
Oil lance + nozzle		•	•	•	•

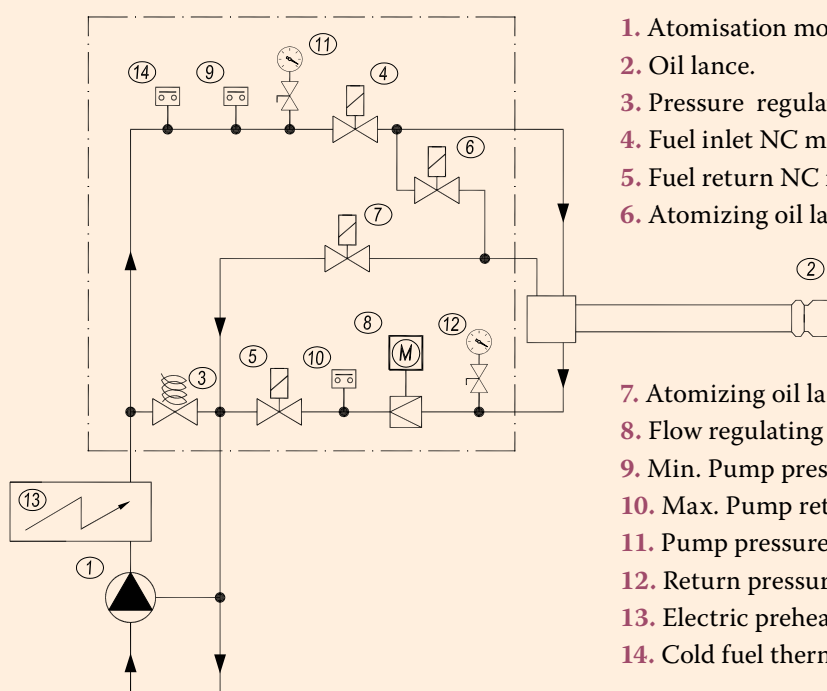


## ESQUEMA LÍNEA DE GAS



- 1. Safety solenoid gas valve.
- 2. Regulation solenoid gas valve.
- 3. Pilot flame solenoid gas valve.
- 4. Gas flow regulation servo valve.
- 5. Min. gas pressure switch.
- 6. Min. gas pressure switch.
- 7. Max. gas pressure switch.

## ESQUEMA BLOQUE HIDRÁULICO



- 1. Atomisation motor pump.
- 2. Oil lance.
- 3. Pressure regulating valve.
- 4. Fuel inlet NC magnetic valve.
- 5. Fuel return NC magnetic valve.
- 6. Atomizing oil lance opening NC magnetic valve.
- 7. Atomizing oil lance closing NO magnetic valve.
- 8. Flow regulating servo valve.
- 9. Min. Pump pressure switch.
- 10. Max. Pump return pressure switch.
- 11. Pump pressure manometer.
- 12. Return pressure manometer.
- 13. Electric preheater (heavy-oil).
- 14. Cold fuel thermostat.



## TECHNICAL SERVICE AND COLLABORATION WITH THE CLIENT

One of the big advantages of our company is the continuous communication and cooperation with our clients. Our success in this business is based in a close collaboration and relationship with our customers by showing them how to handle our equipments and with a technical personal assistance. We are a very flexible company in this material, giving a fast answer and a good service to all problems that can happen in our installations, with an easy accessibility to our engineers.

We really take care very much this aspect of business based in the close communication and friendship with our customer.

[www.emcombustion.es](http://www.emcombustion.es)

