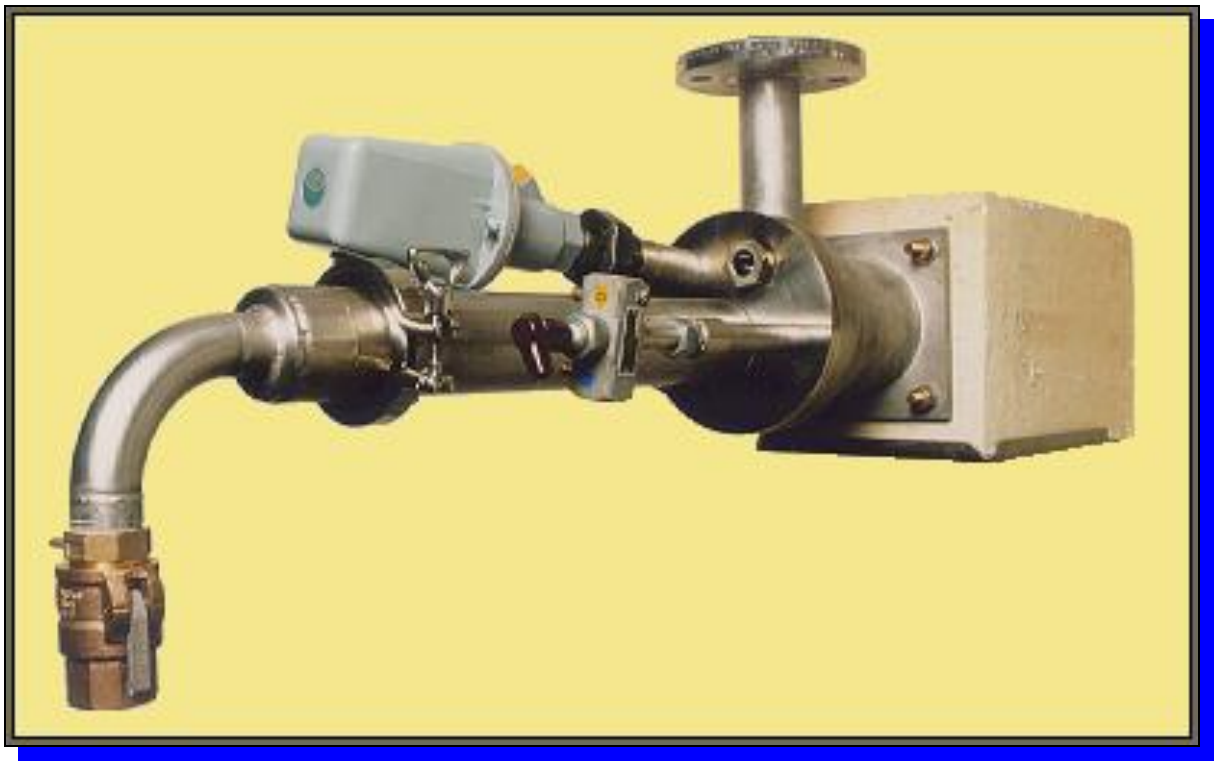
ALBATCH BURNER
Gas fuel version



INSTALLATION, ASSEMBLY,

AND MAINTENANCE PROCEDURES

January 2017

AIR LIQUIDE

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1. INTRODUCTION

The ALBATCH burner is a non-water-cooled oxy-fuel burner especially designed for batch melting furnaces.

This burner is particularly dedicated to applications where automatic ignition system and/or flame supervision are essential.
An ignition pilot burner and a flame supervision cell can be integrated into the burner body. An observation window located on the burner body is used for visually checking whether or not there is a flame.

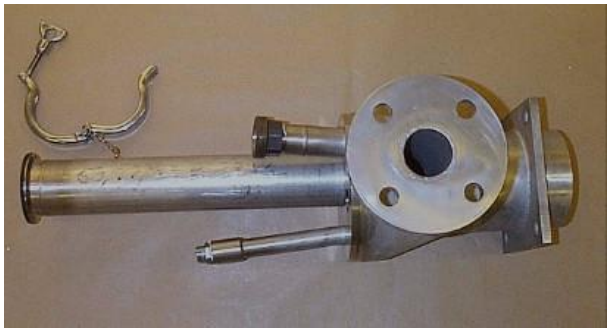
The configuration of this burner is of pipe-in-pipe type; the fuel pipe is located inside the oxygen pipe. The fuel gas stream surrounded by an oxygen stream is partially combusted in the burner block cavity then the flame develops in the furnace.

2. DESCRIPTION

The ALBATCH burner is composed of:

-a square section refractory burner block with an inner shape inserted in the furnace wall

-a metallic burner body attached to the burner block which ensures the oxygen distribution



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-a fuel lance

Both the metallic and the refractory parts of the burner are cooled by the oxygen flow. Experimental and modeling studies have been carried out to design the inner shape of the burner in order to ensure efficient cooling and to prevent any deposit forming inside the block.
The alloy steels employed for the metallic parts (stainless steel 316L type for the burner body and the lances, stainless steel 310 or Inconel 600 type for the gas fuel injectors and KANTHAL APM type for the external nozzle of the fuel oil lance) offer good resistance to corrosion for the burner's "cold part" and good resistance to temperature and oxidation for the "hot part".
The AZS rebounded material (Al_2O_3 + ZrO_2 + SiO_2) used for the refractory burner block is resistant to thermal shocks and the many atmospheres encountered in the various processes.
Other refractory compositions are available upon request, to suit the customer process.

The ALBATCH burner concept has been developed to minimize the oxygen pressure requirement which makes it compatible with the On-site oxygen supply (VSA).

The ALBATCH burner is a bi-fuel burner which can be operated either with gaseous fuel or with oil fuel.
When both liquid and gaseous fuels are available, it is possible to switch from one to the other simply by replacing the gas fuel injector with a fuel oil injector, without modifying the burner body or the burner block. This operation can be performed in 2 minutes per burner.

The ALBATCH burner produces a low momentum flame which minimizes dust emission and prevents any refractory wear.
The pipe-in-pipe system delivers an axi-symmetric luminous flame. The flame shape is of cylindrical type.

The ALBATCH burner can operate from 30 % to 150 % of its nominal firing rate.

The ALBATCH burner is referenced for natural gas, propane and fuel oil.

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III ASSEMBLING

For a simplified and easy assembling of the burner, it is preferable for the entire furnace enclosure to be cold in order to avoid excessive thermal shocks on the refractory block and to prematurely deteriorate the equipment. If, for operational purposes, the burner must be mounted on a hot enclosure, a specific procedure must be prepared in collaboration with the various partners.

But before any manipulation, we advise you

* To check the general condition of the various parts composing the burner

A refractory block
4 threaded rods M10, length 85mm
8 M10 nuts, 4 flat washers, 4 "fan" washers
A ceramic gasket
An oxygen body
A fuel lance
A porthole
A 3 pieces fitting
A Viton gasket ∅ 63 or ∅ 76.1 according to version

Note: the flame controller and the igniter are not supplied unless otherwise agreed.

* To make the assembly in a relatively clean place.

As the burner is degreased, it must be ensured that all the parts are clean. If there is any doubt, do not hesitate to remove all traces of grease, oil or any other element with oxygen-compatible cleaning products

In case of doubt, contact an AIR LIQUIDE representative

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III.1 MOUNTING THE BURNER BODY ON THE REFRACTORY BLOCK

⇒ Put the refractory block vertically, the 4 nuts visible
⇒ Hand tighten the threaded rod M10 on each nut
⇒ Place the fibrous gasket on the burner body on the fixing plate
⇒ Insert the burner body on the refractory block

THE FLANGE MUST BE ALIGNED WITH THE "HIGH" MARK LOCATED ON THE REFRACTORY BLOCK

⇒ Install washers, then washers "fan"
⇒ Screw the nuts with a 17 mm wrench

After this first operation, the assembly "burner body / refractory block" is easily transportable.

III.2 INSTALLATION

A. REFRACTORY BLOCK AND BURNER BODY

Since the ALBATCH burner is intended for installation on different types of furnace, this chapter can provide only general information. (See Appendix 1: ALBATCH burner dimensions)

⇒ Place the body / block assembly in the housing on the furnace
⇒ Maintain a continuity on the inner wall of the furnace
⇒ Fill the spaces with fibrous refractory
⇒ Ensure a good seal between the refractory block and the rest of the furnace
⇒ Connect the oxygen line

The entire weight of the oxygen pipe must not be supported solely by the body of the burner.
The oxygen flange must be in upright position upwards

B. FLAME CONTROLLER

⇒ Place the male part of the three-piece fitting on the socket ∅1”
⇒ Adapt the female part to the selected controller type

We recommend:

1. Single UV cells with porthole as

- UVS10 by KROMSCHRODER

For any other choice of flame control system, the equipment must respect our configuration, our dimensions and have the same operating characteristics.

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2. Self-controlled UV cells as

- 45UVS from FIREYE

For any other choice of flame control system, the equipment must respect our configuration, our dimensions and have the same operating characteristics.

In addition, it is preferable to take cells with a solid sighting angle between 5 ° and 10 °.

The burner configuration provides no additional sweeping air.

C. IGNITION SYSTEM

⇒ Put the gland fitting on the female socket ∅ ½ "
⇒ Install the pilot burner, we recommend:

- KROMSCHRODER ZMI ∅ 16mm

⇒ Connect the fuel and air supplies

For any other choice of ignition system, the equipment must respect our configuration, our dimensions and have the same operating characteristics.

D. PORTHOLE

⇒ Put the porthole on the female socket ∅ ¾ "
⇒ Screw the porthole with a 27 mm wrench

Handle with Caution: fragile part

E. FUEL LANCE

⇒ Screw the male part of a quick coupling ∅ 1 " (power 500/1000 kW) or ∅ 2 " (power 1500/2000 kW)
⇒ Thread the gasket onto the fuel lance
⇒ Insert the lance into the burner body
⇒ Fit the gasket between the ferrules
⇒ Tighten securely with the collar
⇒ Connect the fuel supply to the quick coupling

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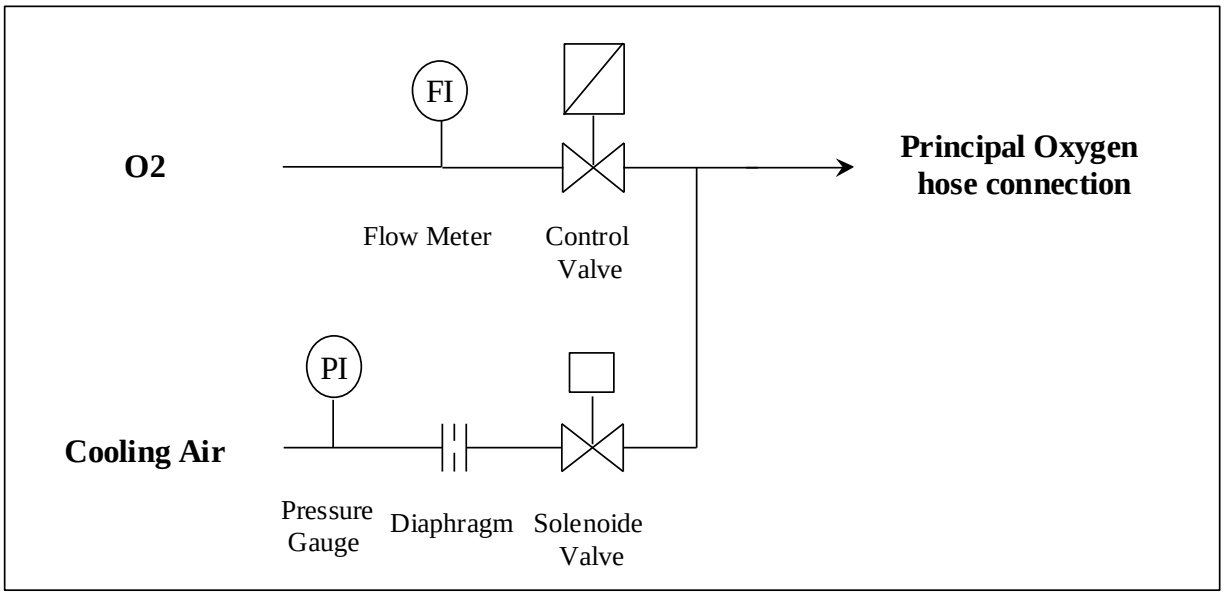
IV. COOLING OF THE BURNER

When the burner is turn off, a cooling fluid (nitrogen or oil free dry air) must be supplied immediately in the principal oxygen hose to protect the burner and the fuel injectors (see figure below).



IMPORTANT

ACCORDING TO EN 746.2 STANDARDS, THE BURNER START-UP PROCEDURE MUST INCORPORATE A FLUSHING / PURGING PHASE OF THE COMBUSTION CHAMBER.

V. MAINTENANCE

Before working on the ALBATCH burner, make sure that no flame is present through a visual inspection via the porthole.

V.1 CONTROL OF THE FUEL INJECTORS

⇒ Stop the burner via the control cabinet
⇒ Check the cooling procedure
⇒ Check through the porthole for non-presence of flame
⇒ Disconnect the gas hose from the quick coupling
⇒ Remove the collar
⇒ Remove the fuel lance
⇒ Check the condition of the fuel injectors
⇒ Check the refractory block and the oxygen body
⇒ Depending on the observations, clean the fuel injectors or replace the fuel lance if necessary
⇒ Reinsert the fuel lance

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⇒ Tighten the collar
⇒ Connect the fuel supply

The burner can be restarted.

During the first few months of operation of the burner, the frequency of control of the fuel injectors should be done every time the furnace is turned off or once a week. Then the frequency of maintenance remains at the initiative of the operator following a better knowledge of the tool. We recommend a monthly frequency.

Verification of the fuel lance, flame controller and igniter is mandatory after each accidental shutdown of one of the fluids or electricity.

WHEN COOLING NITROGEN OR AIR IS NOT AVAILABLE, THE FUEL LANCE MUST BE DISMOUNTED FROM THE BURNER.

IF THE FUEL LANCE IS LEFT IN THE BURNER WITHOUT COOLING, SYSTEMATICALLY INSPECT IT AS DAMAGE MAY HAVE OCCURRED TO THE METALLIC PARTS (see maintenance chapter).

V.2 **LONG TERM STOP**

⇒ Dismount the fuel lance by following the previous procedure
⇒ Take the ferrules gasket
⇒ Fit the cap
⇒ Install the ferrules
⇒ Tighten the collar
⇒ Check burner cooling

VI. **SAFETY WITH OXY-COMBUSTION**

Every operator who manipulates the oxy-fuel ALBATCH burner should be trained on oxygen safety procedures. In particular, operators must be aware of the following minimum safety instructions for oxygen use:

- **Never use oil or grease for oxygen piping, nor assembling burner parts.**
- **Do not use organic materials for tightness components.**
- **Always clean all parts before installing them.**

Failure to respect these instructions may cause ignition in the oxygen circuit, and further propagation along the oxygen piping.

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In a general way:

Every time a burner is dismounted, a cleaning of all metallic parts (without VITON gasket) that are in contact with pure oxygen by a specific cleaner product for oil and grease is mandatory.

The VITON gasket and the gaskets of the quick connecting components must be inspected every 3 months.

Every year, all these sealing components must be replaced by new ones.

In addition, if nitrogen is used for cooling the burner, special instructions must be issued for all operations in the combustion chamber or on the burner. The operator may be in a low oxygen atmosphere.

In case of doubt on the compatibility of a material, a material or a safety instruction, contact an AIR LIQUIDE representative.

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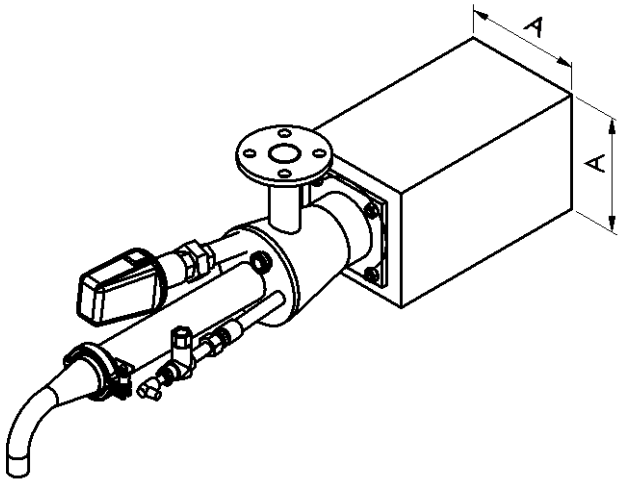
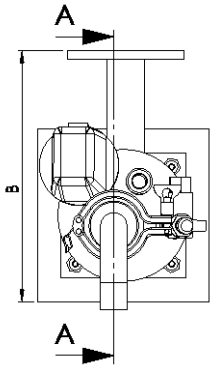
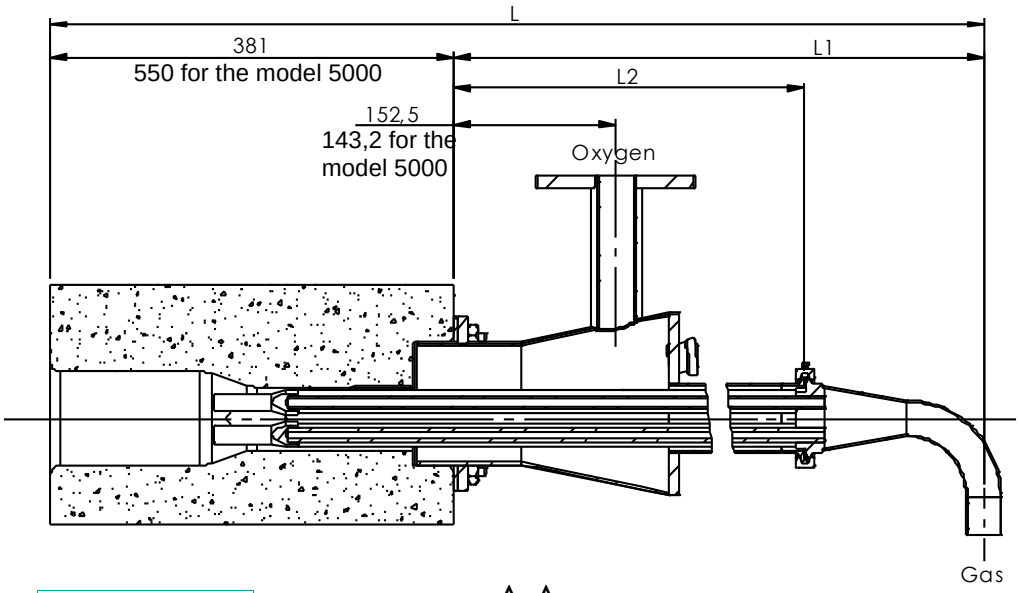
APPENDIX

Appendix A : ALBATCH burner dimensions

ALBATCH BURNER Gas Version							
Model	L	L1	L2	A	B	O_2 (Oxygen)	Natural Gas or Propane
200 L 3 tubes	1107	726	563	220	320	FLANGE DN40 PN10	1" (Taper pipe)
200 L 1 tube	1046	665	563	220	320	FLANGE DN40 PN10	1/2" (Taper pipe)
500/1000 L 3 tubes	1112.8	731.8	563	220	320	FLANGE DN40 PN10	1" (Taper pipe)
1500/2000 L 3 tubes	1156.1	775.1	565	250	335	FLANGE DN80 PN10	1"1/2 (Taper pipe)
500/1000 L 1 tube	1070.8	689.8	563	220	320	FLANGE DN40 PN10	1" (Taper pipe)
1500/2000 L 1 tube	1081.5	701.5	565	250	335	FLANGE DN80 PN10	1"1/2 (Taper pipe)
5000 L 3 tubes	1433.2	883.2	565.2	400	410	FLANGE DN125 PN16	2" (Taper pipe)
5000 L 1 tube	1292.2	742.2	565.2	400	410	FLANGE DN125 PN16	2" (Taper pipe)







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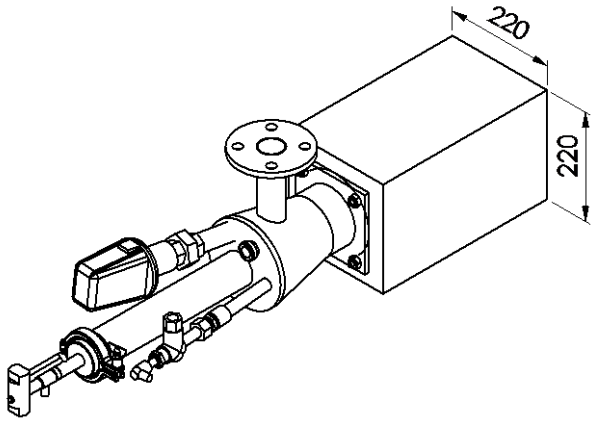
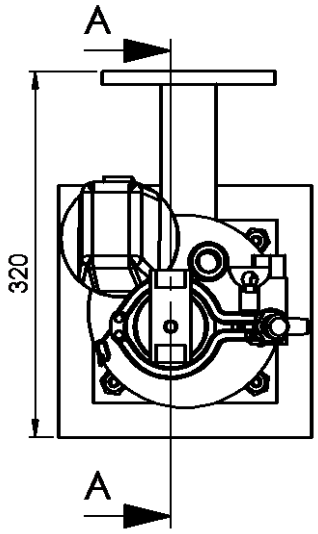
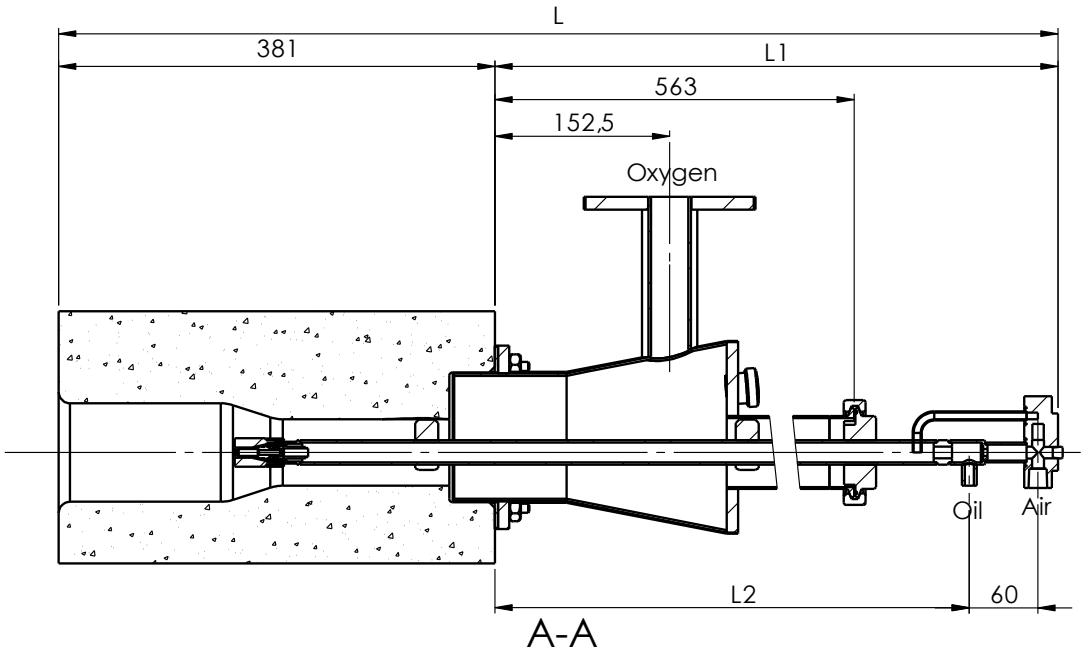
ALBATCH BURNER Oil Version						
Model	L	L1	L2	O_2 (Oxygen)	Oil lance	
					Oil	Air
500	1122	741	663.3	FLANGE DN40 PN10	1/4" (Taper pipe)	3/8" (Taper pipe)
1000	1139	759	680.8	FLANGE DN40 PN10	1/4" (Taper pipe)	3/8" (Taper pipe)







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Appendix B: Gas specifications for the ALBATCH burner operation

Model	ALBATCH 200	ALBATCH 500	ALBATCH 1000	ALBATCH 1500	ALBATCH 2000	ALBATCH 5000
Fuel oil supply pressure at burner inlet		2 - 5 bar g.				
Maximum viscosity of fuel oil		40 centistokes				
Nominal viscosity of fuel oil		25 centistokes				
Atomizing air supply pressure at burner inlet		2 - 5 bar g.				
Atomizing air flow rate		5 - 15 mass % fuel oil flow rate				
Oxygen supply pressure at burner inlet	25 mbar (Max. oxygen pressure drop through the burner at the maximum recommended firing rate)					
Natural gas supply pressure at burner inlet	150 mbar (Max. Natural gas pressure drop through the burner at the maximum recommended firing rate)					
Cooling air flow rate	Approximately 30 vol. % of nominal oxygen flow rate					

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Appendix C: ALBATCH capacity ranges

Model	Maximum capacity	Nominal capacity	Minimum capacity
ALBATCH 200 Gas version	300 kW	200 kW	70 kW
ALBATCH 500 Gas and liquid versions	750 kW	500 kW	150 kW
ALBATCH 1000 Gas and liquid versions	1500 kW	1000 kW	300 kW
ALBATCH 1500 Gas version	2250 kW	1500 kW	450 kW
ALBATCH 2000 Gas version	3000 kW	2000 kW	600 kW
ALBATCH 5000 Gas version	7500 kW	5000 kW	1500 kW

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Appendix D: General instructions for proper working conditions

-The ALBATCH burner requires control over the fuel and oxygen, so we recommend the installation of a calibrated flow meter on the fuel and oxygen lines for determining accurate volumetric or mass flow rates.

-During combustion, the burner body, the fuel lance and the burner block are cooled by the oxygen flow. However when combustion is not taking place, all parts of the burner are heated and can be destroyed by high furnace temperatures. In this case, a cooling air or nitrogen flow should be established using the oxygen line.
When cooling air or nitrogen flow is not available, the fuel lance must be dismounted from the burner. If the fuel lance is left in the burner without cooling, systematically inspect it as damage to the metallic parts may have occurred.
The cooling air flow must not come from a compressor as oils may be present in the compressed air and contaminate components which need to be clean when oxygen is present.
And it is recommended to supply a cooling air or nitrogen flow rate that is approximately 30 vol. % of nominal oxygen flow rate.

-Quick-coupling systems for the oxygen and fuel will facilitate disassembly and installation.

-Quick-coupling systems also make possible to limit the time for which the burner parts, notably the fuel gas lance, are subjected to furnace temperatures without cooling flow.

-Piping needs to be supported in order to avoid stresses on the burner body which could lead to cracking of the burner block.

-Flexible hoses are advised for the burner supply. Flexible hoses can prevent the burner from damage due to stresses / expansion of the piping.

-The burner block made of AZS rebounded material (Al_2O_3 + ZrO_2 + SiO_2) is generally suitable for most applications. However, it is necessary to ensure that this material is compatible with the customer process.

-Viewing the flame through observation windows, such as peeping holes, makes burner start-up and adjustments easier.

-Oxygen and fuel supply piping must be rated for the pressure and flow rate requirements of the burner operating at maximum capacity. Avoid long distances and turns in the piping as they increase the pressure drop.

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