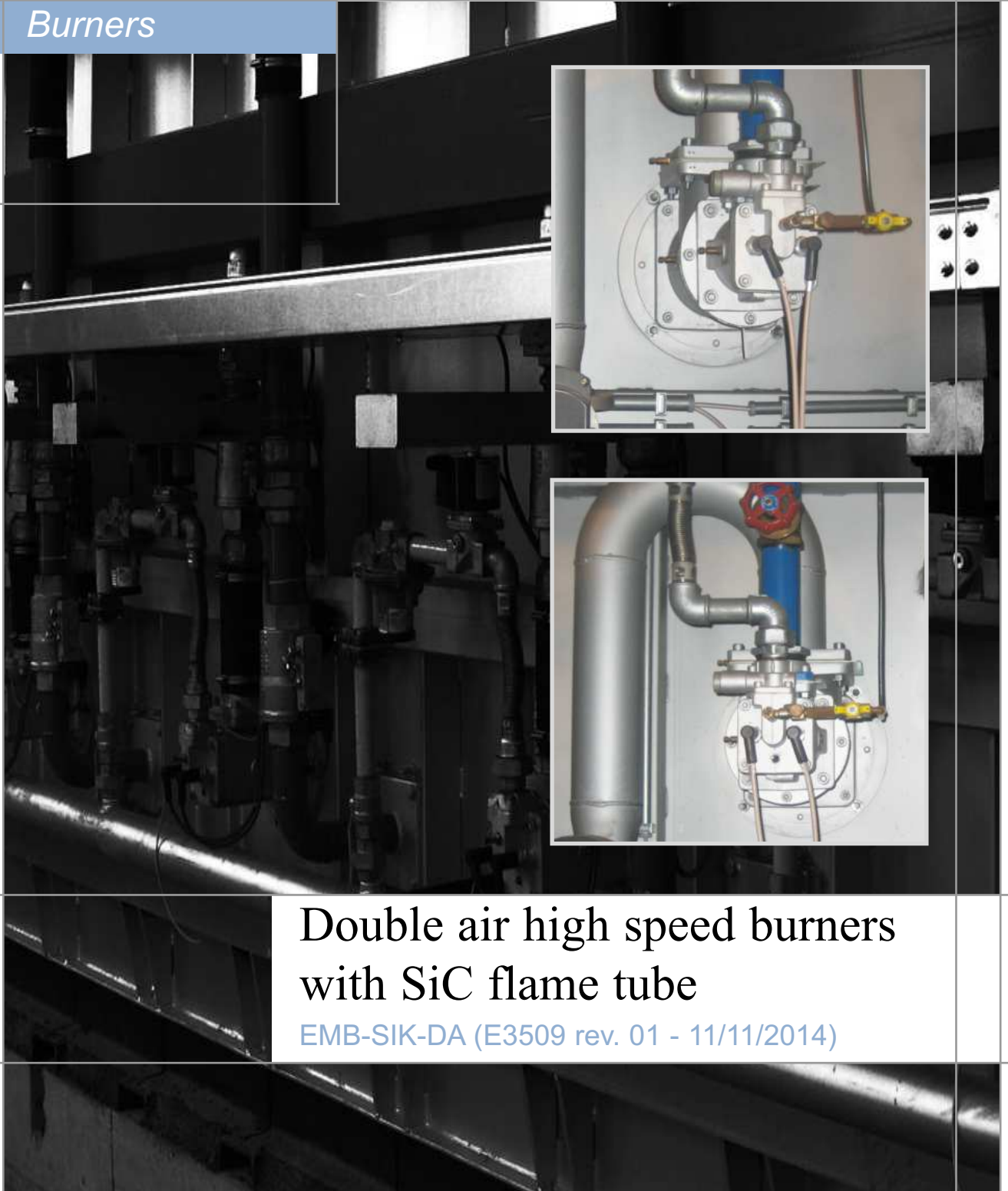


Burners



Double air high speed burners
with SiC flame tube

EMB-SIK-DA (E3509 rev. 01 - 11/11/2014)

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 EMB-SIK-DA 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:



Headquarters:

Esa S.p.A.
Via Enrico Fermi 40
24035 Curno (BG) - Italy
Tel +39.035.6227411
Fax +39.035.6227499
esa@esacombustion.it

International Sales:

Pyronics International s.a.
Zoning Industriel, 4ème rue
B-6040 Jumet - Belgium
Tel +32.71.256970
Fax +32.71.256979
marketing@pyronics.be

www.esapyronics.com

EMB-SIK-DA are gas burners used in direct heating. The shape of the silicon carbide flame tube produces a tight flame which allows high heat penetration and better temperature uniformity inside the combustion chamber due to the high speed of the combustion products. Being able to manage a secondary air inlet, these burners can be used in low temperature applications where good temperature uniformity is required. **Furthermore, these burners are particularly recommended for industrial furnaces that must accomplish heat treatment at different temperatures.**

APPLICATIONS

- Fibre covered furnaces.
- Tunnel or chariot furnaces.
- Treatment furnaces.
- Stretching furnaces.
- Hot air generators.
- Industrial drying.

CHARACTERISTICS

GENERAL:

- Capacity: from 80 to 300 kW
- Application maximum temperature: 1.300°C
- Gas and air pressure to the burner: 45mbar
- Flow ratio: 8 : 1
- Flame speed: da 60 m/s a 120 m/s
- Excess air: up to 400% without secondary air
up to 2000% with secondary air

MATERIAL COMPOSITION:

- Burner body: cast iron G25
- Gas collector: cast iron G25
- Flame tube: SiC
- Combustion head: AISI310
- Fixing flange: Fe360



IGNITION AND DETECTION

Flame ignition and detection of the EMB-SIK-DA burners takes place through separate electrodes; both are supplied. The adoption of certified flame control systems is

highly recommended in all operations with temperatures below 750°C (UNI EN746/2) Norm.

Model	Ignition with electrode	
	Igniter	Detector
EMB-2-SIK-DA	WAND	WAND
EMB-3-SIK-DA	3EN / IS-4	3EN / IS-4
EMB-4-SIK-DA	3EN / IS-4	3EN / IS-4

CAPACITY PARAMETERS AND FLAME LENGTH

Flame length and speed is approximately referred to natural gas burners, placed in open air, operating in stoichiometric ratio at nominal power.

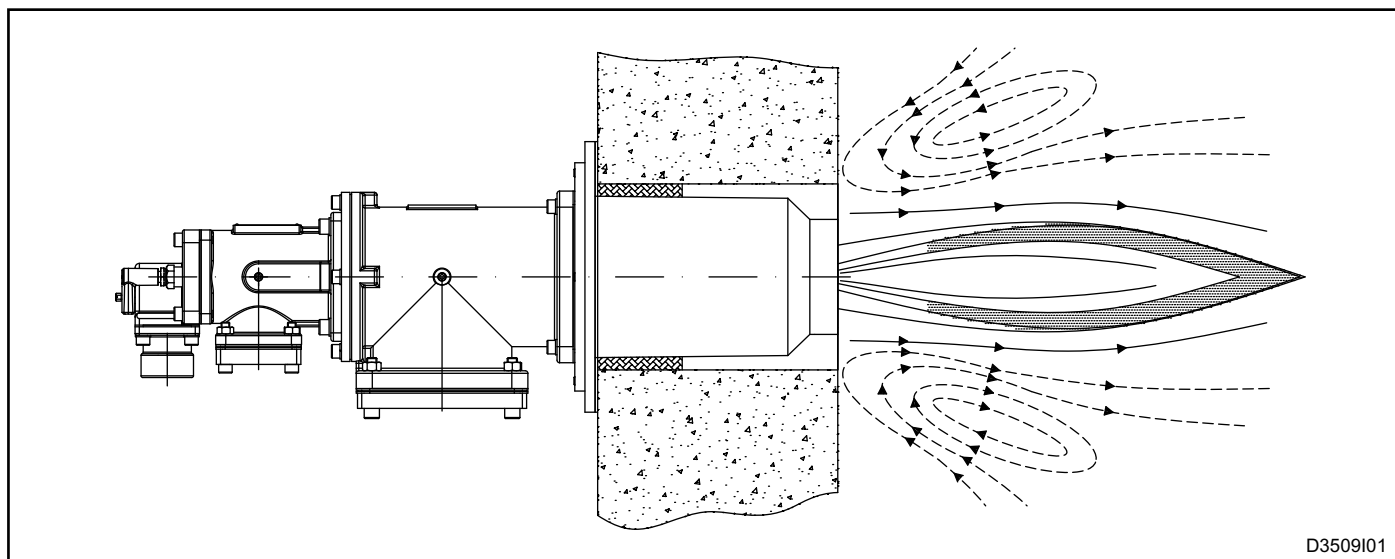
In special applications a mono electrode is used for flame ignition and a UV probe for flame detection.

Model	Capacity [kW]	Flame tube Type (*)	Flame length [mm]	Flame tube outlet diameter [mm]	Speed of flu gas outlet @1500°C [m/s]						
					at 0m	at 0,5m	at 1m	a 1,5m	a 2m	a 2,5m	a 3m
EMB-2-SIK-DA	80	H2	400 ÷ 600	40 (H2)	120	55	28	18	14	11	10
EMB-3-SIK-DA	150	H3	600 ÷ 900	57 (H3)	120	66	35	24	18	15	12
EMB-4-SIK-DA	300	H4	900 ÷ 1200	70 (H4)	150	105	55	38	29	23	20

DESCRIPTION

According to the size and conditions of use, this type of burner can be used for combustion with natural gas or LPG, in standard versions, and with other types of gase-

ous fuels with different heating capacities, in special versions on request.



D3509I01

BURNER PERFORMANCE

The flame capacity, length and speed refer to natural gas burners (8600 Kcal/Nm³), placed in a combustion chamber at zero pressure at sea level and operating with 10% excess air.

- MIN/MAX (ON/OFF) functioning
- Chamber temperature 1000°C
- Ambient air temperature
- NO_x < 180 mg/Nm³ [O₂ = 3% ref.]

MAXIMUM CAPACITY

Free flame application			Burner model		
			EMB-2-SIK	EMB-3-SIK	EMB-4-SIK
Max Capacity	Burner capacity (2% O ₂)	[kW]	80	150	300
	Combustion air flow	[Nm ³ /h]	88	165	330
	Secondary air flow *	[Nm ³ /h]	200	400	600
	Gas flow	[Nm ³ /h]	8	15	30
	Burner air pressure inlet	[mbar]	45		
	Δp gas measuring flange	[mbar]	10		

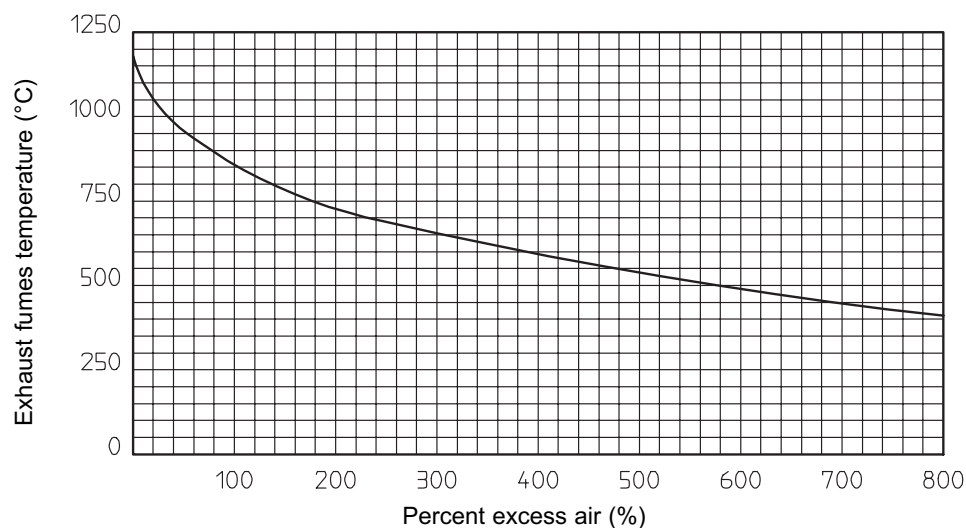
MINIMUM CAPACITY

Free flame application			Burner model		
			EMB-2-SIK	EMB-3-SIK	EMB-4-SIK
MIN Capacity	Burner capacity (2% O ₂)	[kW]	10	19	38
	Combustion air flow	[Nm ³ /h]	11	21	42
	Secondary air flow **	[Nm ³ /h]	-	-	-
	Gas flow	[Nm ³ /h]	1	1,9	3,8
	Burner air pressure inlet	[mbar]	0,7		
	Δp gas measuring flange	[mbar]	0,2		

* higher flow on request

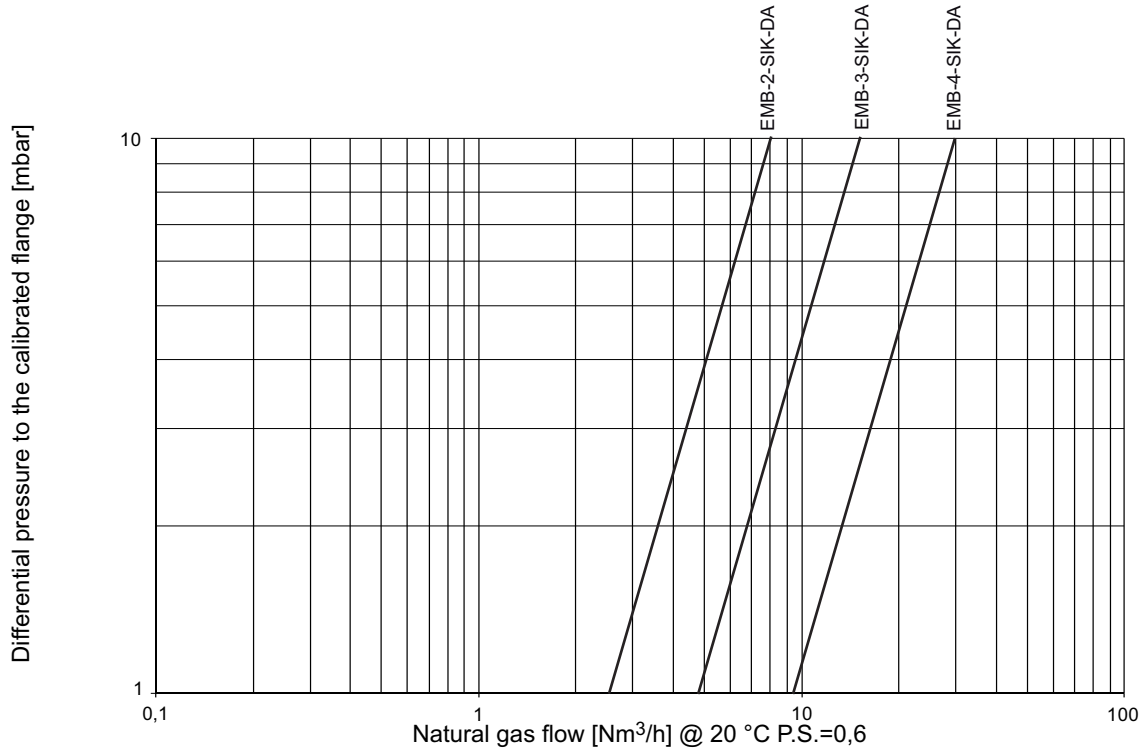
** The secondary air can be excluded by closing the dedicated regulation valve.

EXCESS AIR AND TEMPERATURE CHART



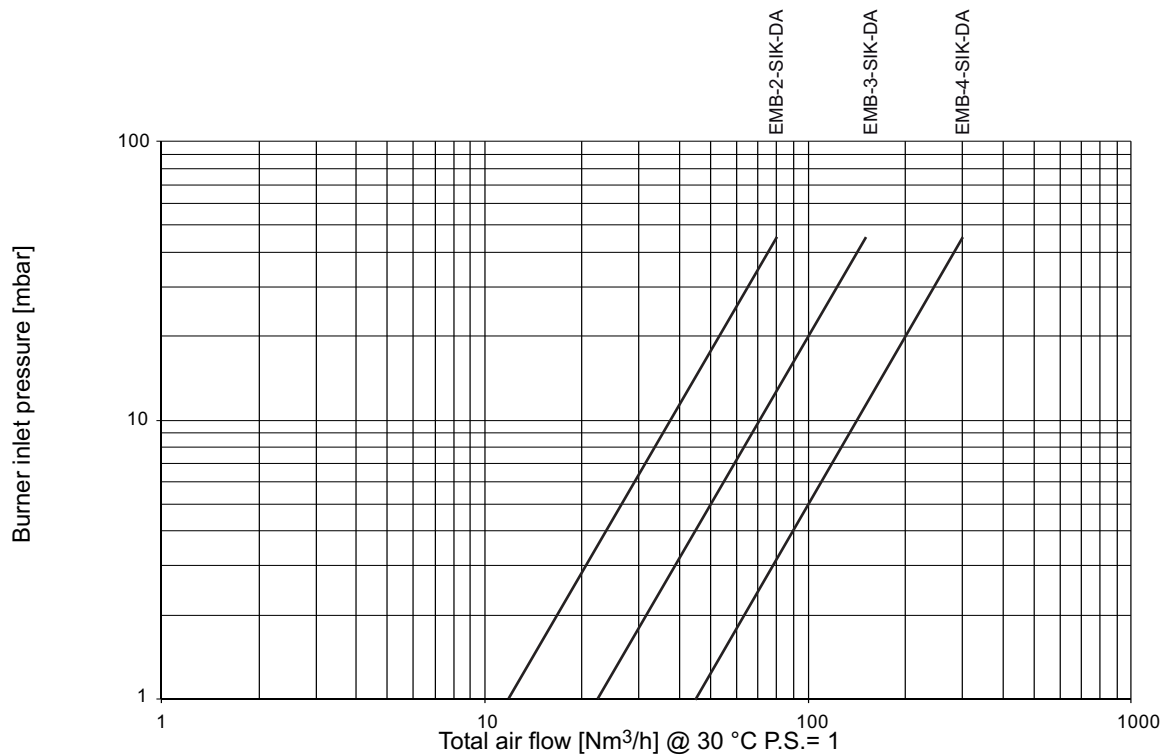
G3509101

METHANE GAS FLOW DIAGRAM



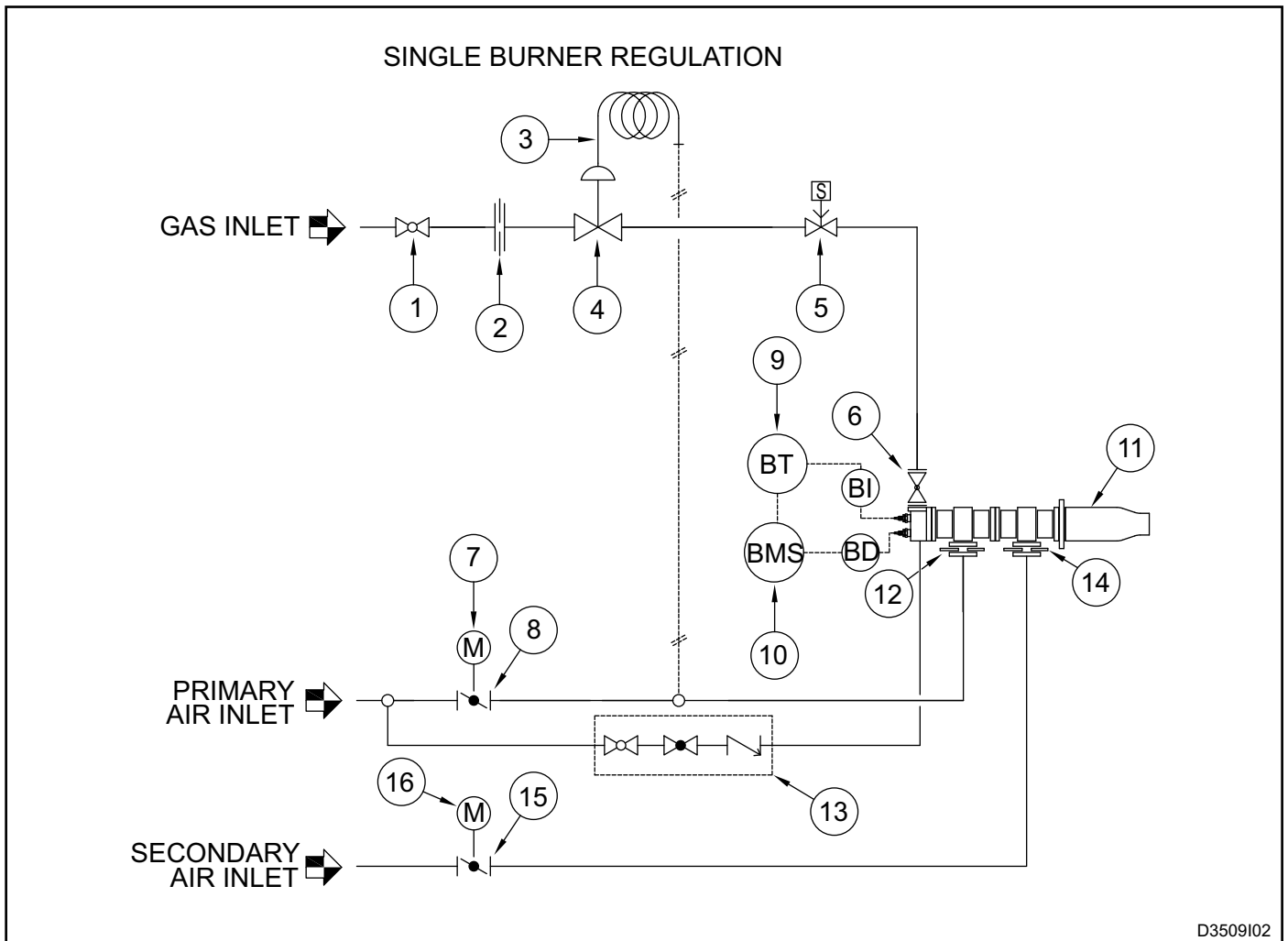
G3509102

AIR FLOW DIAGRAM



G3509103

FLOW SCHEME - SINGLE BURNER REGULATION



D3509I02

Pos.	Description	Included	Not included
1	Main gas interception ball valve		X
2	Gas ΔP measurement calibrated flange	X	
3	Impulse line		X
4	Zerogovernor		X
5	Safety gas solenoid valve		X
6	Gas passage limiting device	X	
7	Servo motor		X
8	Air regulation motorized valve		X
9	Ignition transformer		X
10	Flame control device		X
11	High speed burner	X	
12	Combustion air inlet orifice	X	
13	Premixed air regulatin group (only in LPG version)	X	
14	Secondary air inlet orifice	X	
15	Secondary air regulation motorized valve		X
16	Servo motor		X

WARNINGS

- The EMB-SIK-DA burner ignition must always be done at minimum power and then modulating towards maximum. In this way, ignition is made easier and outlet pressure is reduced. It is therefore opportune to use slow opening solenoid valves for fuel.
- The passing from minimum to maximum power and vice versa, must be gradual and not instantaneous.
- Vertical mounting of burners with the flame facing upwards is highly discouraged. Burners mounted in this position could suffer from ignition failure or bad flame detection due to the presence of external objects that could deposit on the electrode combustion head.
- For all applications at low temperature (up to 750°C), burner ignition as well as the fuel gas solenoid valve command must be controlled via a certified burner control device.
- To avoid possible damage to burners, make sure that the blower does not send them air that may be fouled by combustion products, oils, solvents or other. To avoid these phenomena from taking place, possibly install the blower or the suction duct outside the establishment and far from the exhaust pipes.
- Check the correct connection of the feeding lines after installation. Before switching the burner on, check that the combustive air and fuel gas pressure values are correct (**Pag.06**).
- The burner can only function within the indicated power range. Functioning at lower or higher powers could compromise the burner performance as well as its life span. In which case, the general warranty conditions will automatically expire and ESA will not be held responsible for any damage to persons or objects
- 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). 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 warranty conditions to expire.

INSTALLATION

The EMB-SIK-DA burners have appropriate furnace wall fixing flange. The light obtained for the burner housing must leave open space around the burner. This space has then to be filled with ceramic-fibre.

For the installation carefully follow the instructions below:

1 - Place the EMB-SIK-DA burners far from heat sources and products such as: liquids, solvents or corrosive gases.

2 - Make sure that the housing dimensions and the distance between the centers of the feeding pipes correspond to what is specified in the "Overall dimensions" chapter.

3 - Assemble the burner onto the furnace wall (pos. 01) interposing a ceramic fibre gasket between the attachment flange and the furnace wall (pos.08). During the burner insertion phase check that the insulation previously wrapped around the outside is not altered nor damaged. Once the spacer has been fixed onto the furnace, from the inside of the combustion chamber, seal any possible cracks that may be left between the wall and the spacer with ceramic fibre.

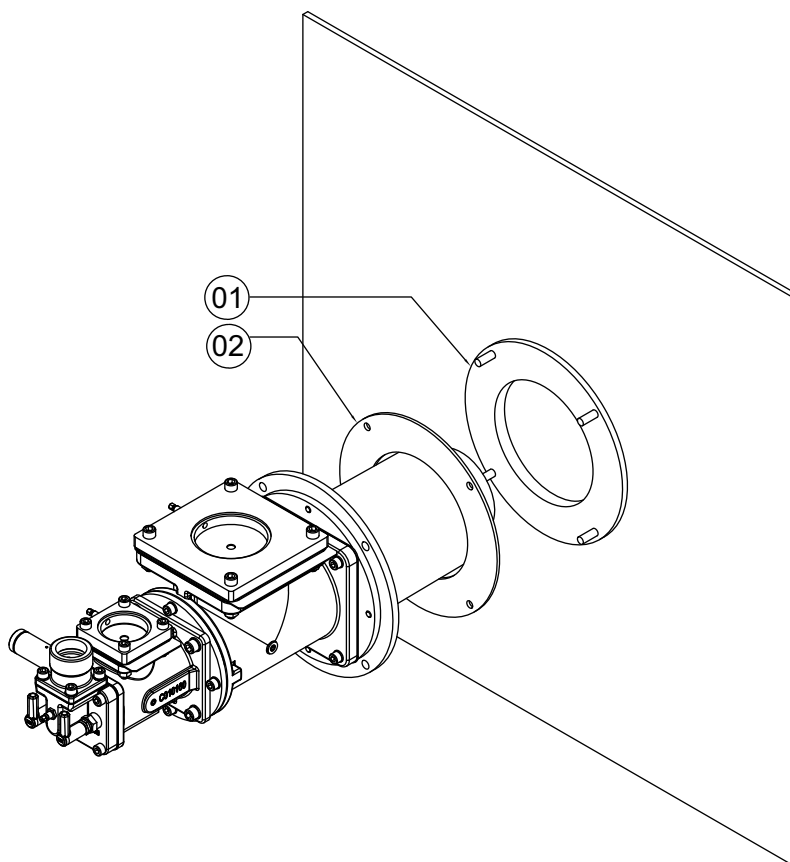
4 - Connect the combustion air and fuel gas inlet piping, interposing, if possible, dilation joints of correct sizes.

5 - Connect electricity to the ignition electrode and to the uv-scan detector making sure not to pass the conductors near heat sources..

6 - Check that the burner body and all its metallic elements are earthed with appropriate conductors.

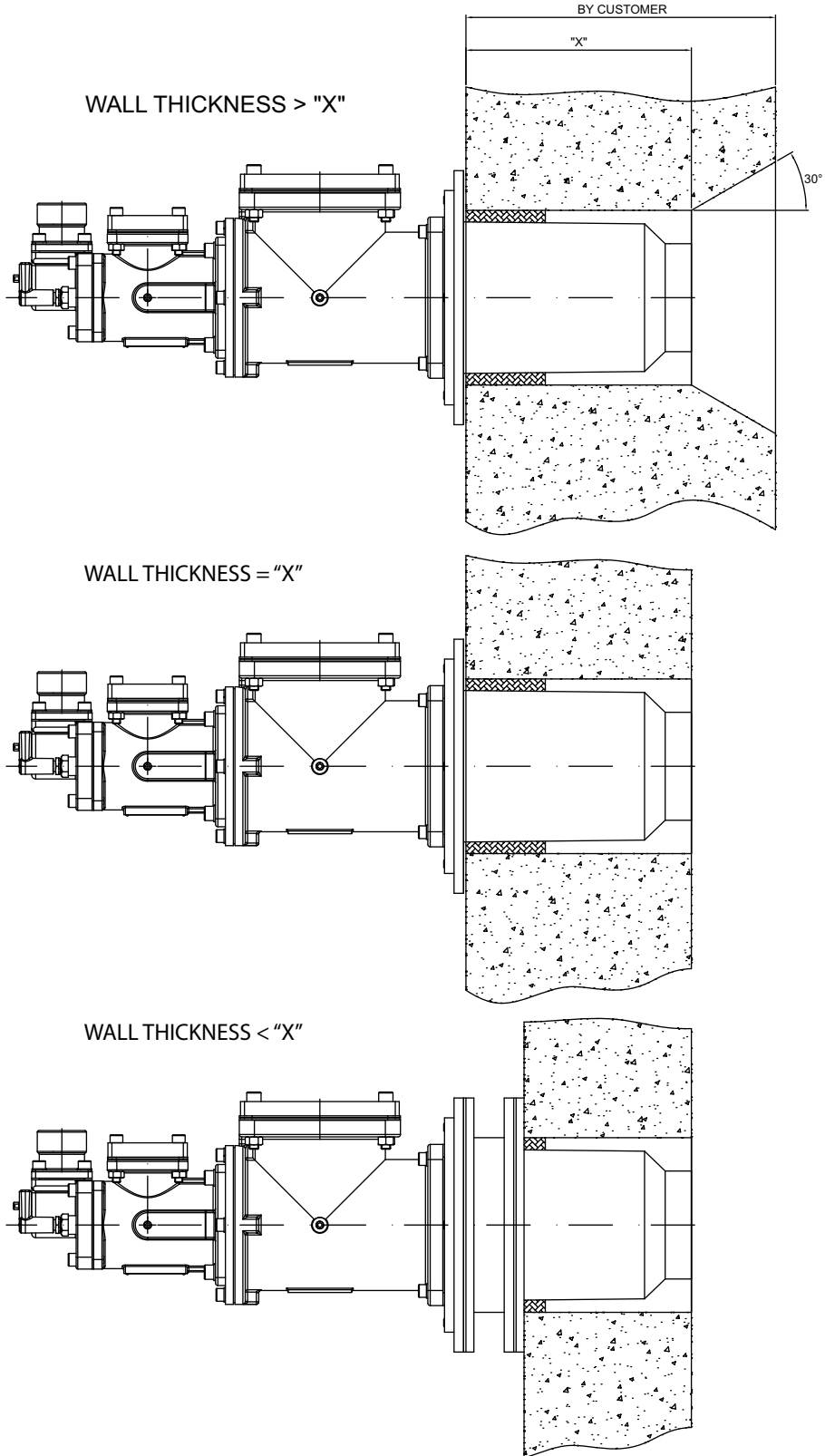
7 - The connecting cable from the ignition transformer to the electrode must be specific for high tension and not screened. It must not be more than 1 metre long; otherwise the ignition transformer must be positioned near the burner. The high tension cable must be placed far from the power cables and not in metallic ducts. Ideally it should be left in open air.

8 - For further information please consult the technical data sheet concerning the ignition transformers.



D3509I03

FURNACE WALL MOUNTING CHART



D3506104

START-UP - SETTING

The procedures indicated in the following chapter must be carried out by expert technicians. The non-observance of the instructions given can provoke dangerous conditions.

- 1** - Check that the combustion air pressure exiting the blower and the combustive fuel feeding pressure are both within the allowed range.
- 2** - Adjust the working pressure and the safety device pressure of the combustion plant, whether there is one per burner or one for the whole plant i.e. gas pressure reduction gear, block valve, relief valve, pressure switches etc. Simulate the intervention of all the safety devices including the intervention of the safety over temperature, checking that the fuel safety block devices act properly.
- 3** - Referring to the maximum capacity values in the "Burner Performance " chapter, position the air regulation motorized valve.
- 4** - Activate the burner control device and attempt the ignition until the burner switches on. While attempting to ignite the burner, act on the gas adjustment valve and, starting from the totally closed position, open it gradually until the burner ignites.

- 6** - With burner running, place the air regulation motorized valve as described in in point 3 and via the gas regulation valve modify the fuel flow checking the differential pressure that is created on the calibrated gas flange.
- 7** - Double check that, at minimum and maximum power, the burner inlet pressure corresponds to the values in the "PARAMETER CAPACITY" chapter. These values may differ depending on whether the burner is on or off.
- 8** - If necessary, with all burners running at the same power, analyse the combustion products in the chamber (where possible).
- 9** - Repeatedly attempt ignition at minimum burner power, with maximum amplitude, to check the ignition reliability and flame stability during the regulation.

PREMIX AIR FLOW SETTING WHERE SCHEDULED (LPG BURNERS)

The premix line is supplied with the LPG burners. The setting must be carried out with burner off and in minimum flow conditions. The premix line must be fed by an inlet necessarily placed upstream the air flow regulation valve, whether it is in zone or interlocked by the single burner.

- 1** - Place the burner in the minimum combustion air flow conditions..
- 2** - Open the premix air tap upstream the general regulation valve (the flow must be fixed).
- 3** - Regulate the air flow using the micrometric pin valve consulting the appropriate setting table (page 10) The aim is to have a relatively tense bluish flame.

- 4** - Check however, that at minimum capacity, the burner does not create black smoke on the combustion head nor on the electrodes. Should this occur, increase the premix air setting.

EMB-2-SIK-DA: Gas body pressure = 2 mbar
EMB-3-SIK-DA: Gas body pressure = 2 mbar
EMB-4-SIK-DA: Gas body pressure = 2 mbar

GENERAL MAINTENANCE PLAN

Operation	Type	Advised time	Notes
High tension electrode connection	O	annual	Check integrity of external plastic and oxidization of internal connector and electrode terminal.
Electrode ignition / detection	O	annual	Replace if kantal terminal is worn or if ceramics are damaged.
Combustion head	O	annual	During furnace shut down, check that the element does not show any signs of oxidation due to high temperature or material deposits on its surface.
SiC flame tube	O	annual	During furnace shut down check that there are no cracks or ruptures in the ceramic material. If necessary replace it.
Replacement of gas side gaskets	S	annual	See note (*) and note (**)
Burner settings	O	annual	Repeat all the steps in the "START-UP AND SETTING" section.
Premix air settings (where scheduled)	O	annual	Repeat all the steps in the "PREMIX AIR SETTING" section.

NOTES:

Key: O = ordinary / E = extraordinary

(*) replacement of the gaskets on the gas side is suggested after each time the gas feeding line is dismantled.

(**) use high temperature gaskets.

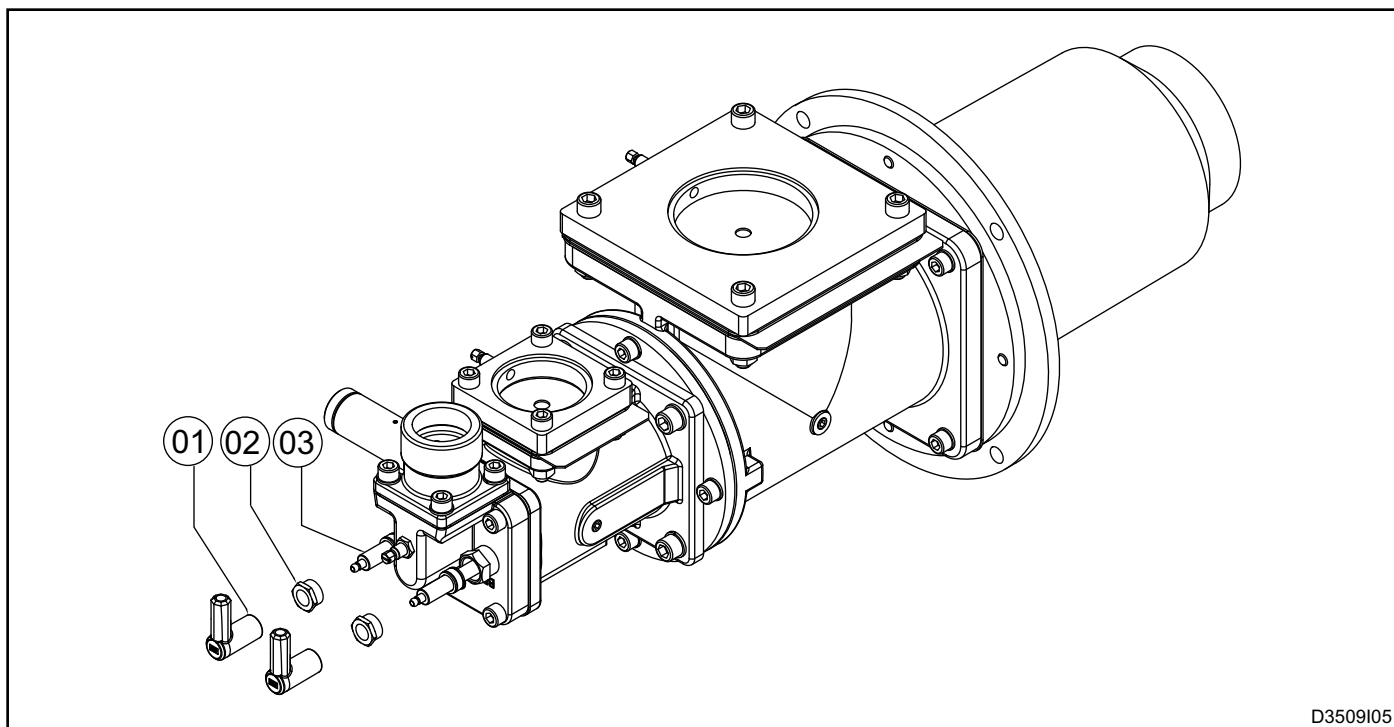
EXTRAORDINARY MAINTENANCE

For correct dismantling and better maintenance of the EMB-SIK-DA burners, meticulously follow the instructions below with the plant turned off.

IGNITION AND FLAME DETECTION ELECTRODE REPLACEMENT

- 1 - Check that the burner control device is off.
- 2 - Disconnect electrical supply to the electrodes (**pos. 01**).

- 3 - Unscrew the connector (**pos. 02**) at the base of the gas collector, removing the electrode (**pos. 03**).
- 4 - Replace the faulty electrode (**pos. 03**) paying attention to the positioning of the new electrode.
- 5 - Reconnect the electrical supply (**pos. 01**).
- 6 - Check the electrode's correct flame ignition/detection.



D3509105

BURNER IN LOCKOUT

In burner lockout conditions refer to the burner control device indications and to the relative manual to identify the cause. The main cases have been indicated here below:

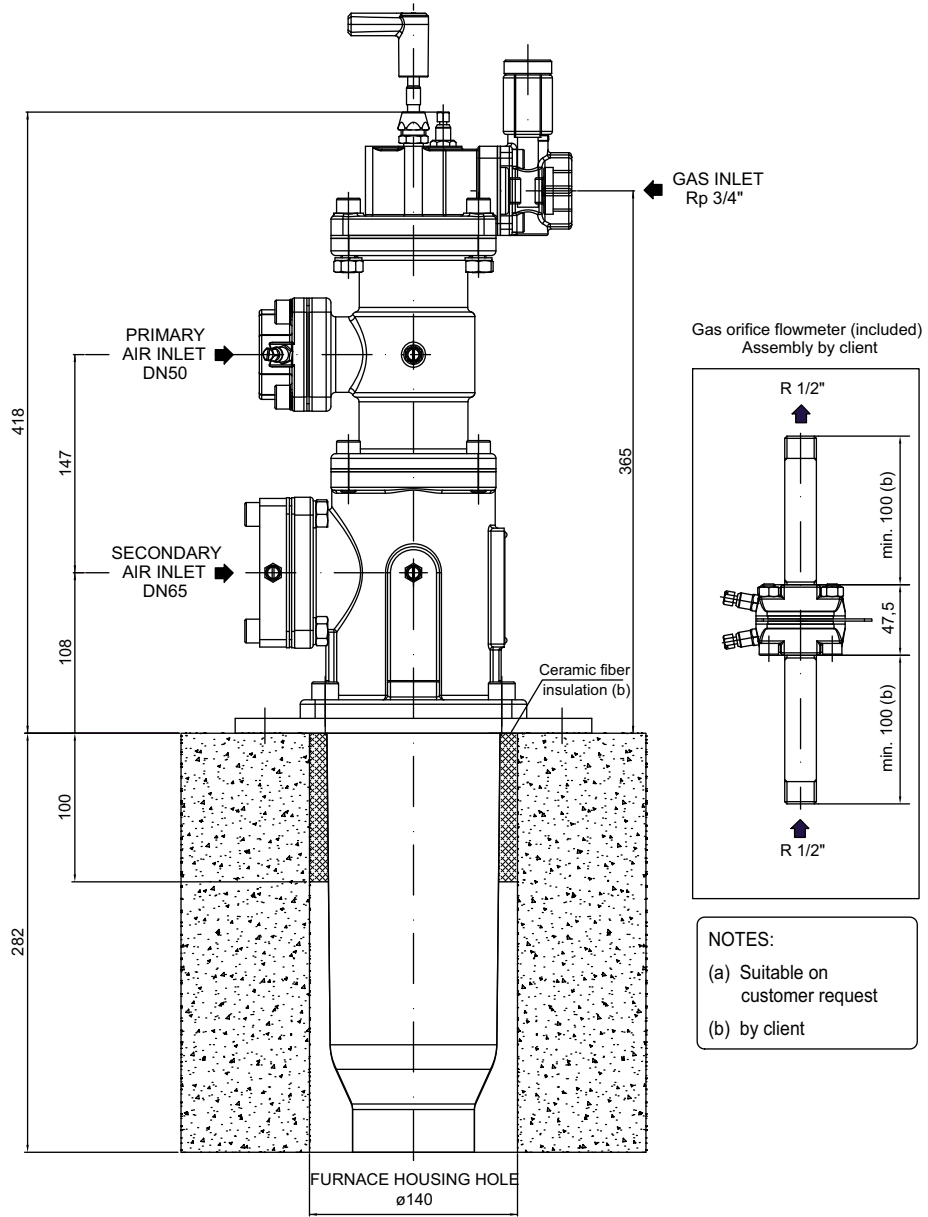
■ **Illegal flame detection**:: shutdown is due to an illegal flame detection during the phases prior to ignition or after the turning off. The causes are within the detection system (broken or faulty sensor or presence of humidity), or in the gas draw from the solenoid safety valve, which allows the burner to remain turned on.

■ **Failed ignition**:: shutdown is caused due to the fact that no flame has been created during the starting pro-

cess. The causes can be found in the start-up system (spark absence, faulty electrodes or incorrect position), in the bad setting of the fuel and combustion flow or in the detection system (faulty sensor or interrupted cables). More precisely, in the first two cases the flame is not ignited, while in the last case the flame is created but the burner control device is unable to detect it.

■ **Flame signal loss**:: shutdown due to the flame signal loss during the normal functioning of the burner. The causes can be found in the combustion air flow regulation (rapid flow variations, adjustment out of allowed range). They can also be found in the detection system (faulty, dirty or badly positioned sensors).

OVERALL DIMENSIONS - EMB-2-SIK-DA-CH4

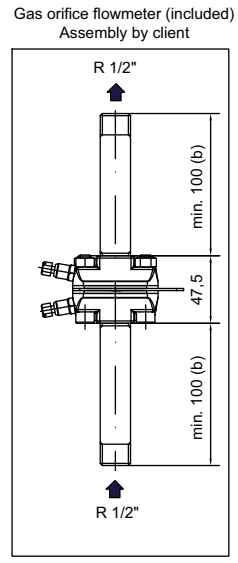
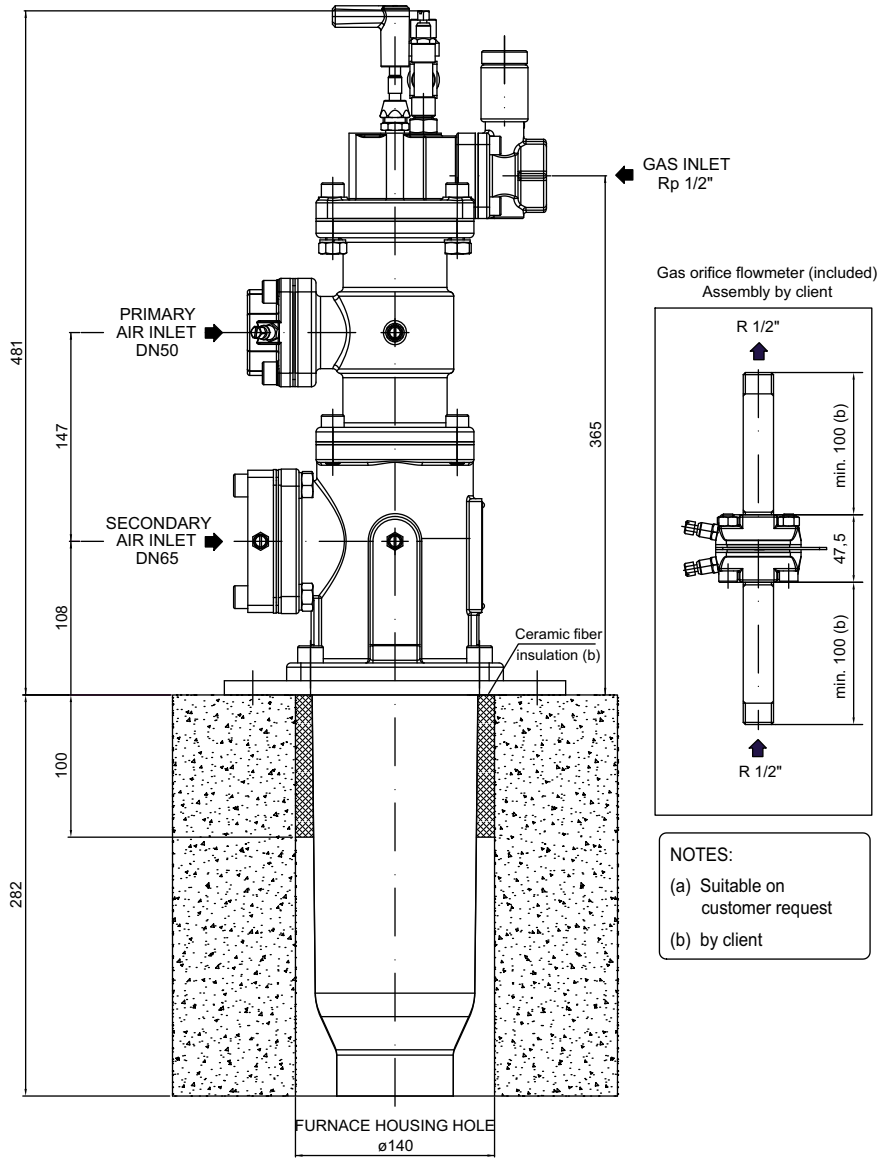


NOTES:

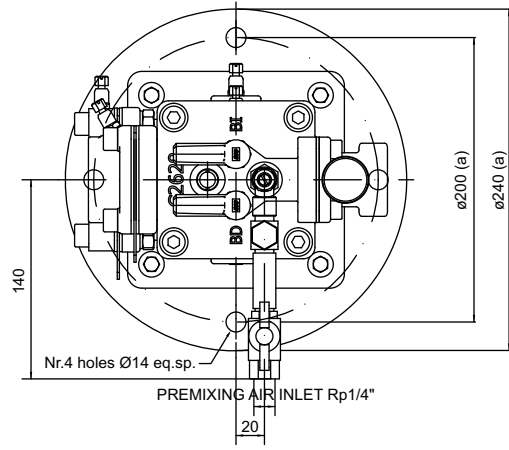
- (a) Suitable on customer request
- (b) by client

D3509106

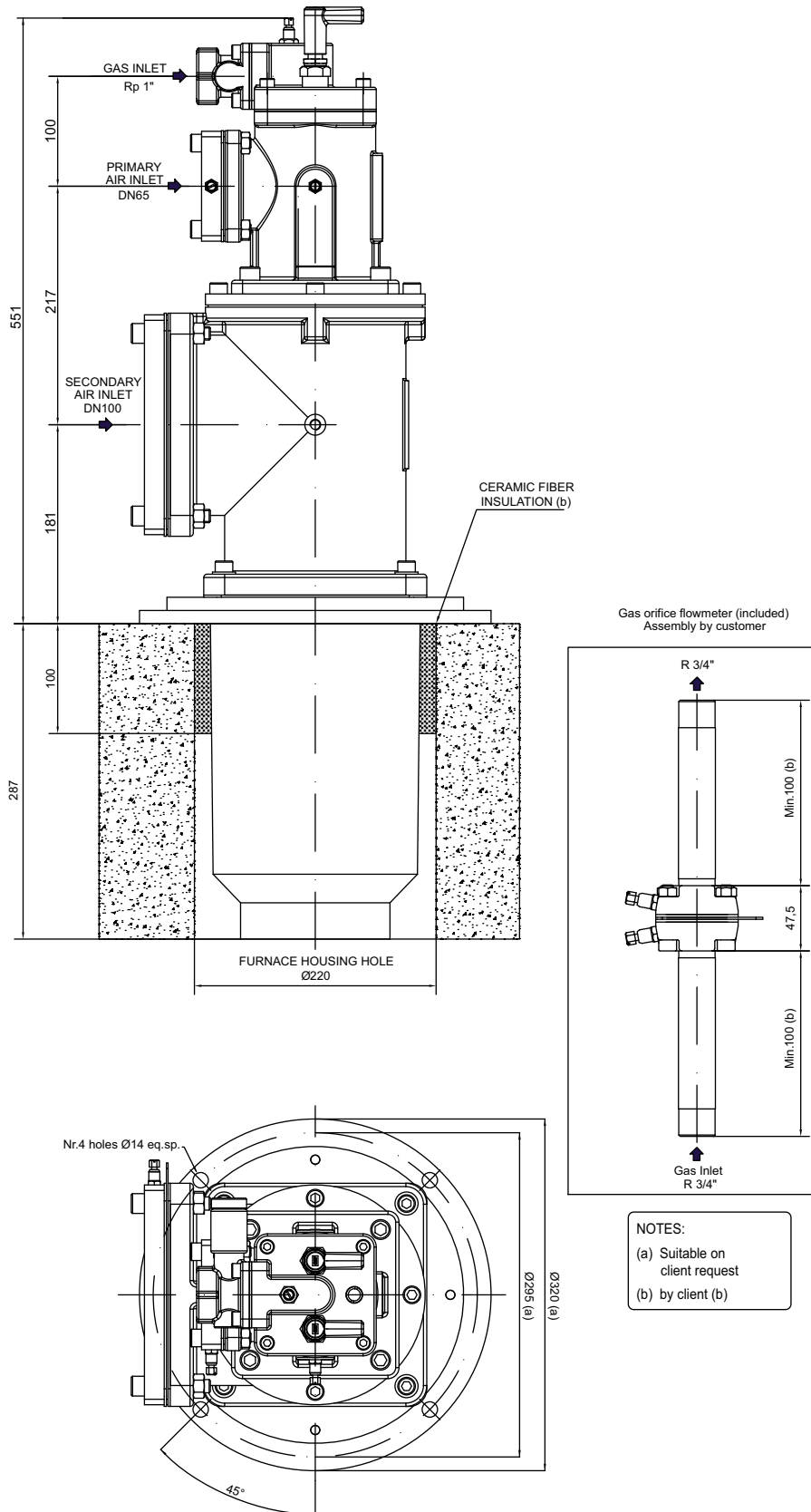
OVERALL DIMENSION - EMB-2-SIK-DA-GPL



NOTES:
(a) Suitable on customer request
(b) by client

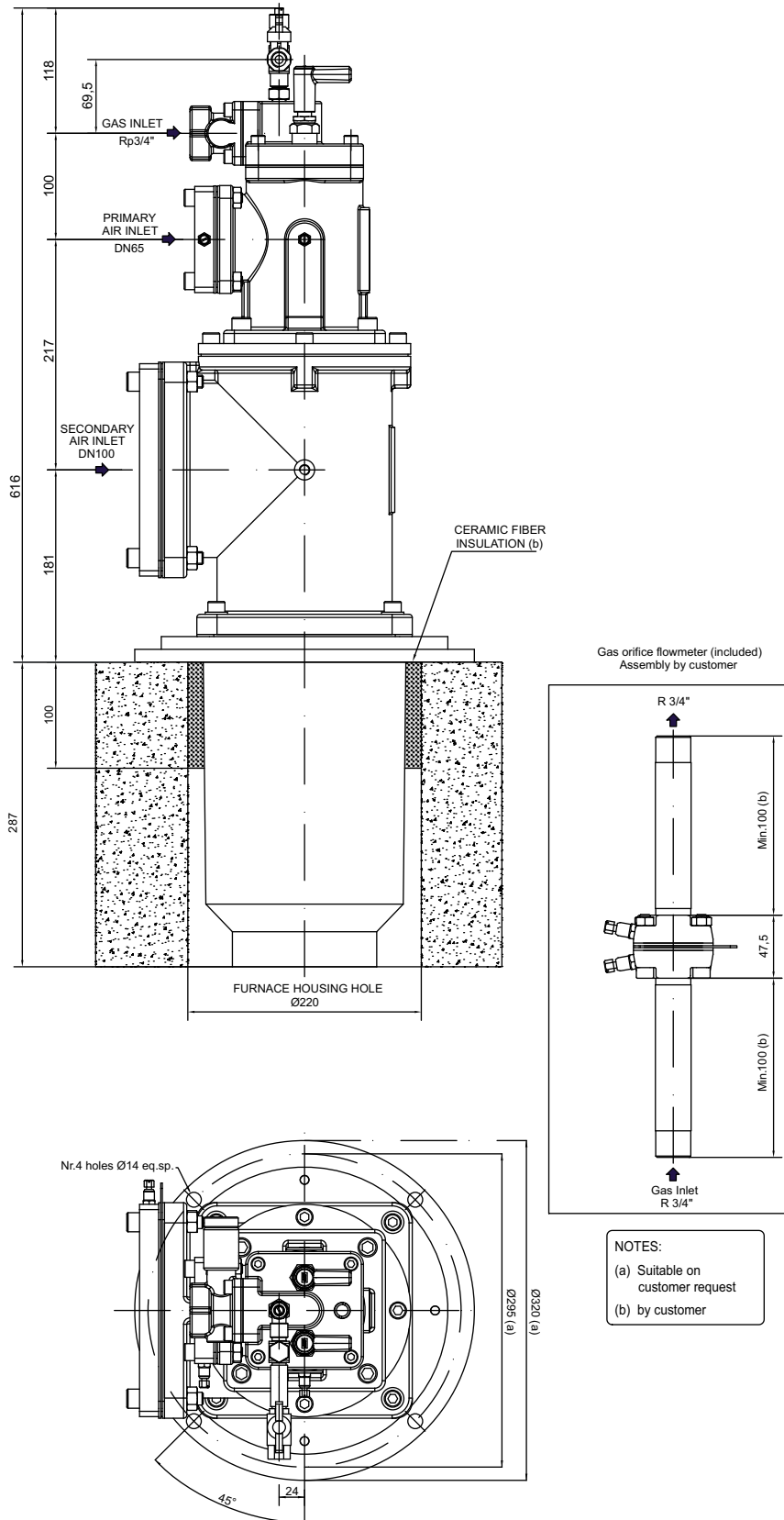


OVERALL DIMENSION - EMB-3-SIK-DA-CH4



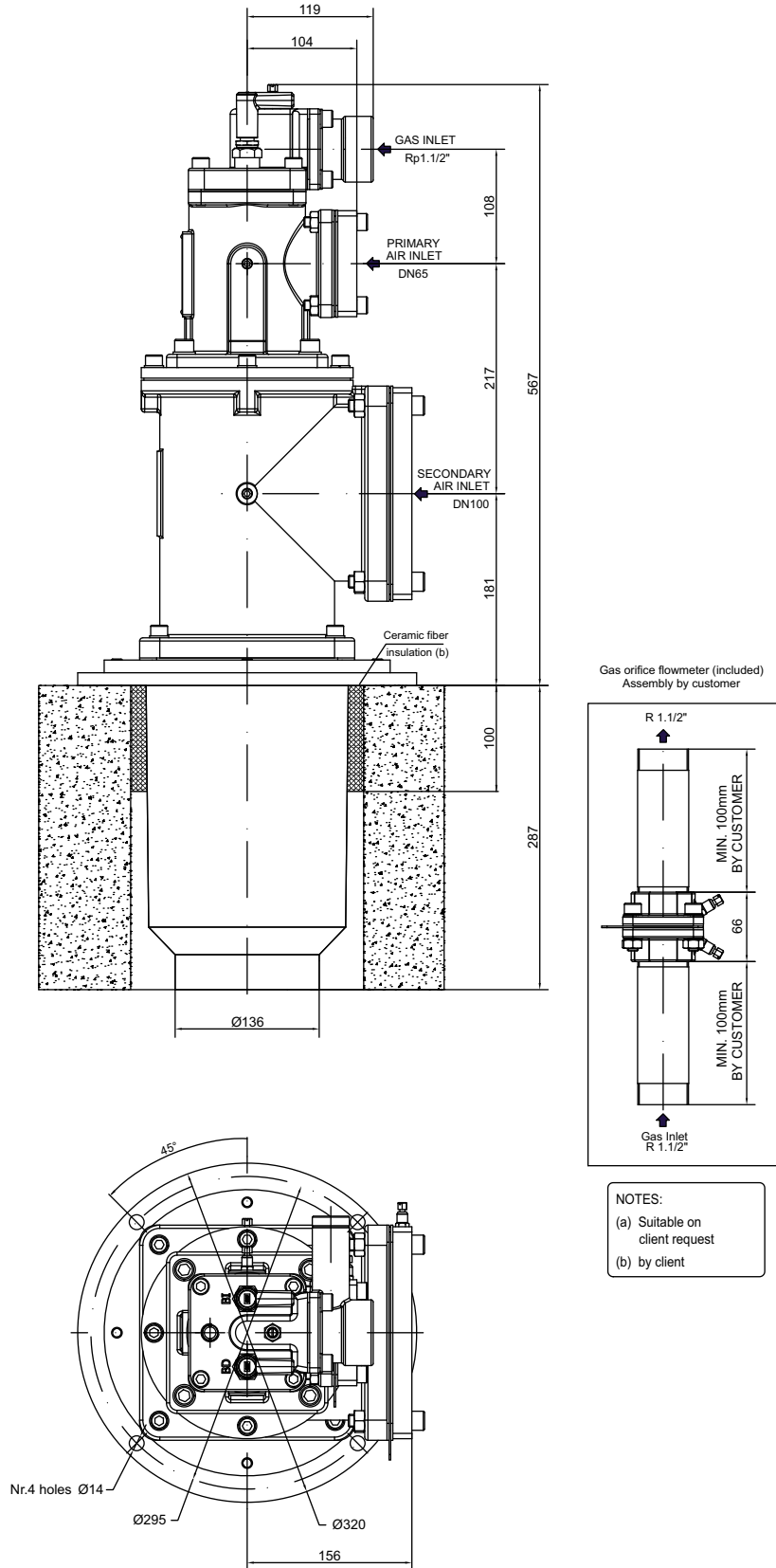
NOTES:
(a) Suitable on client request
(b) by client (b)

OVERALL DIMENSION - EMB-3-SIK-DA-GPL



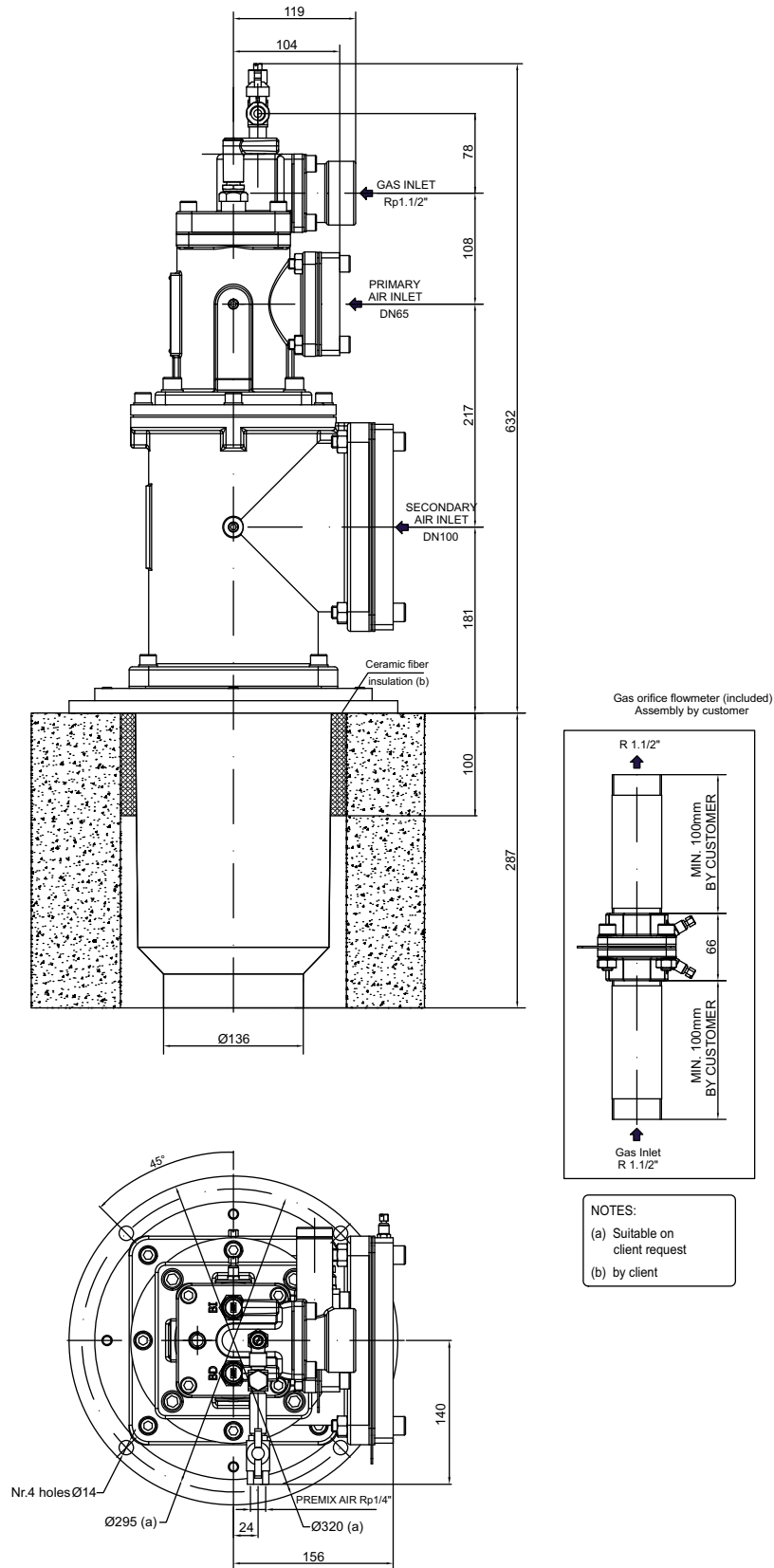
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OVERALL DIMENSION - EMB-4-SIK-DA-CH4



D3509110

OVERALL DIMENSION - EMB-4-SIK-DA-GPL



D3509111

ORDERING CODE - COMPLETE BURNER

EMB - 01 - SIK-DA - 02 - 03 - 04 - 05 - 06

Model		01
EMB-2-SIK-DA	2	
EMB-3-SIK-DA	3	
EMB-4-SIK-DA	4	

04	Ignition	
	Ign. electrode. + Det. electroede Mono electrode	E* M

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

05	SiC Flame tube type (*)	
	Carbide low velocity Carbide medium velocity Carbide high velocity Carbide by Client (4)	L... M... H... C

fuel		03
Methane	CH4*	
LPG	LPG	
Poor gas (1)	GP	

06	Flange type	
	Acc. to ESA drawing Acc. to Client's drawing	E* C

The codes marked with an asterisk (*) identify the standards.S

Notes:

- ¹ Particular performance according to gas characteristics.
- ² Specify construction characteristics and overall dimensions of the carbide SiC flame tube