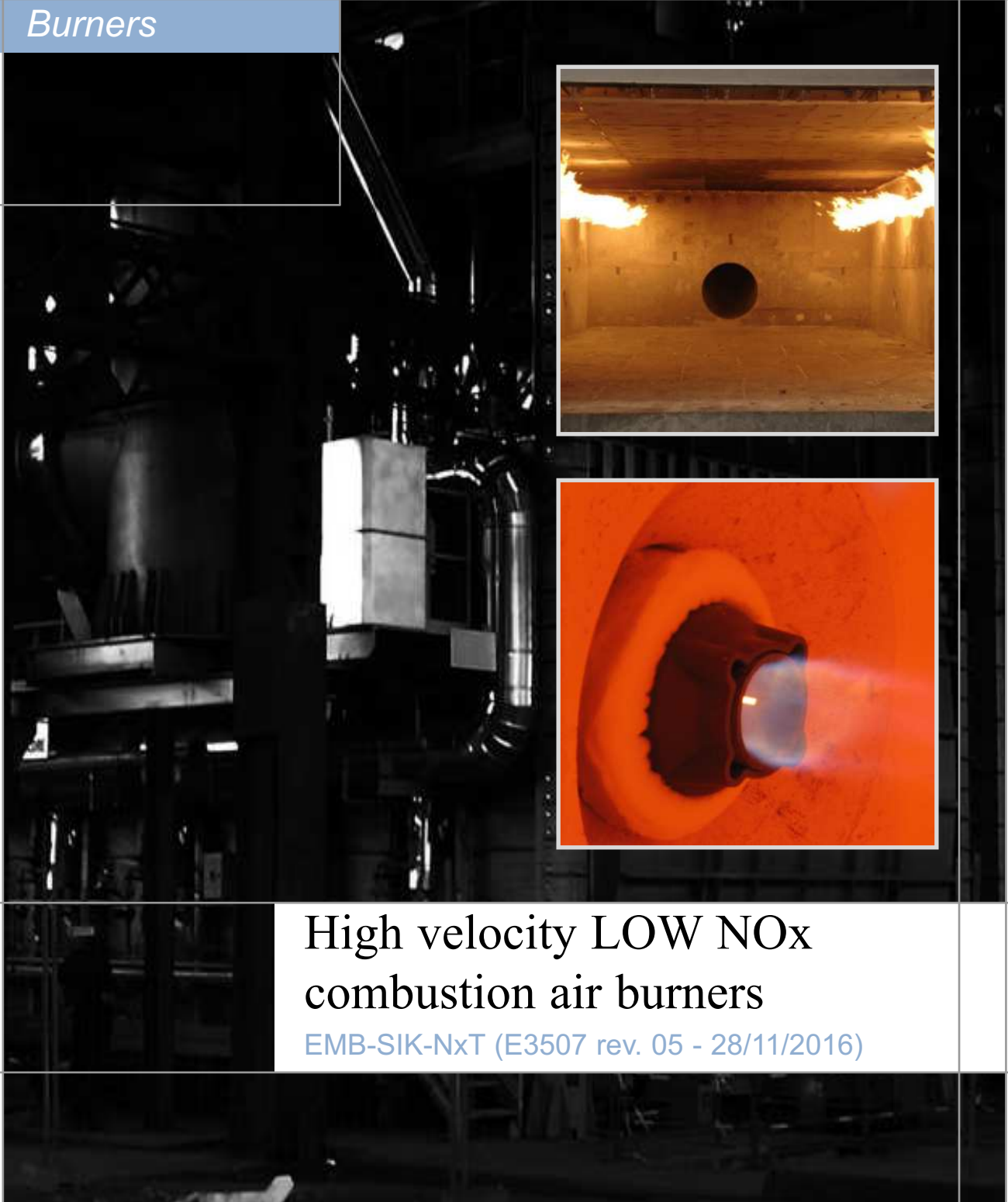


Burners



High velocity LOW NO_x
combustion air burners

EMB-SIK-NxT (E3507 rev. 05 - 28/11/2016)

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-NxT 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.



- For ESA-PYRONICS, the NxT symbol has the following two meanings which are connected to each other: **NEXT GENERATION**, or new generation burners that maintain functionality, reliability and performance. **NOx TECHNOLOGY** energy saving and low polluting emissions.

CERTIFICATIONS:



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

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The EMB-SIK-NxT burners are “nozzle mix” type burners; the combustion agent and fuel are mixed at the combustion head avoiding dangerous flame backfire. The air flow together with the shape of the silicon carbide head produce a tight flame that allows high heat penetration inside the combustion chamber.

APPLICATIONS

- Fibre coated furnaces
- Ceramic furnaces
- Treatment furnaces
- Tunnel furnaces
- Chariot furnaces



F3010I03

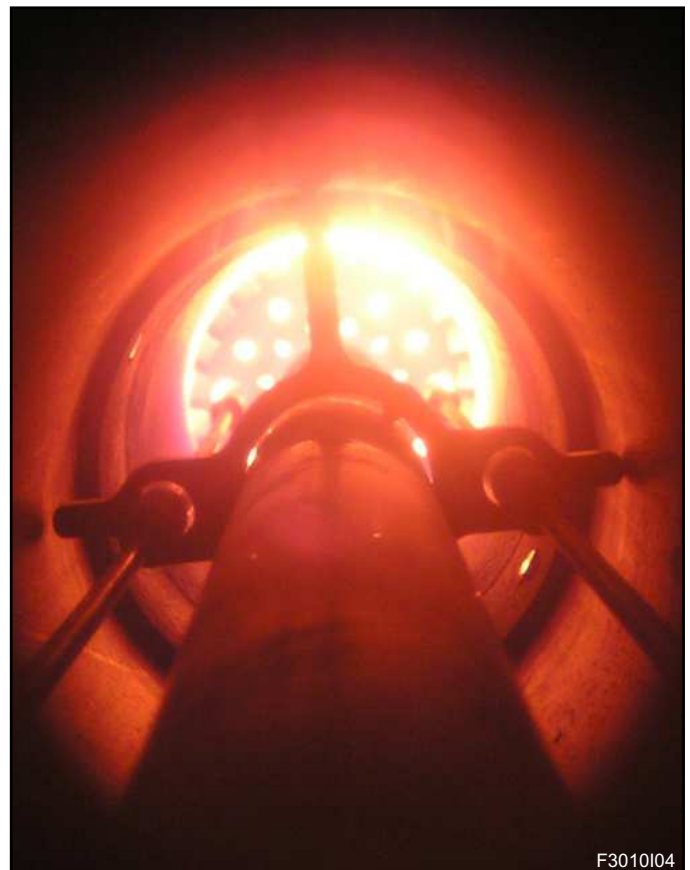
CHARACTERISTICS

GENERAL:

- Functioning with preheated air: from 200°C to 500°C
- Capacity:: from 100 to 700 kW
- Air and gas pressure to the burner: 50 mbar
- Operation with various types of gas: CH₄/GPL
Propane/etc...
- Technology: NxT
- Flow rate ratio: 1:5
- Easily replaceable electrodes.
- Burners with micrometric gas regulator, ignition and detection electrodes, peepsights, calibrated inserts and pressure outlets for measuring the combustion air and fuel gas ratios.

Material Composition:

- Mixer body: cast iron G25
- Collector: cast iron G25
- Flame holder tube: silicon carbide
- Combustion head: AISI310S
- Fixing flange: iron



F3010I04

CAPACITY PARAMETERS AND FLAME LENGTH

EMB-SIK-NxT burner flame ignition and detection take place using two separate electrodes; both are included in the supply. The adoption of flame control systems is

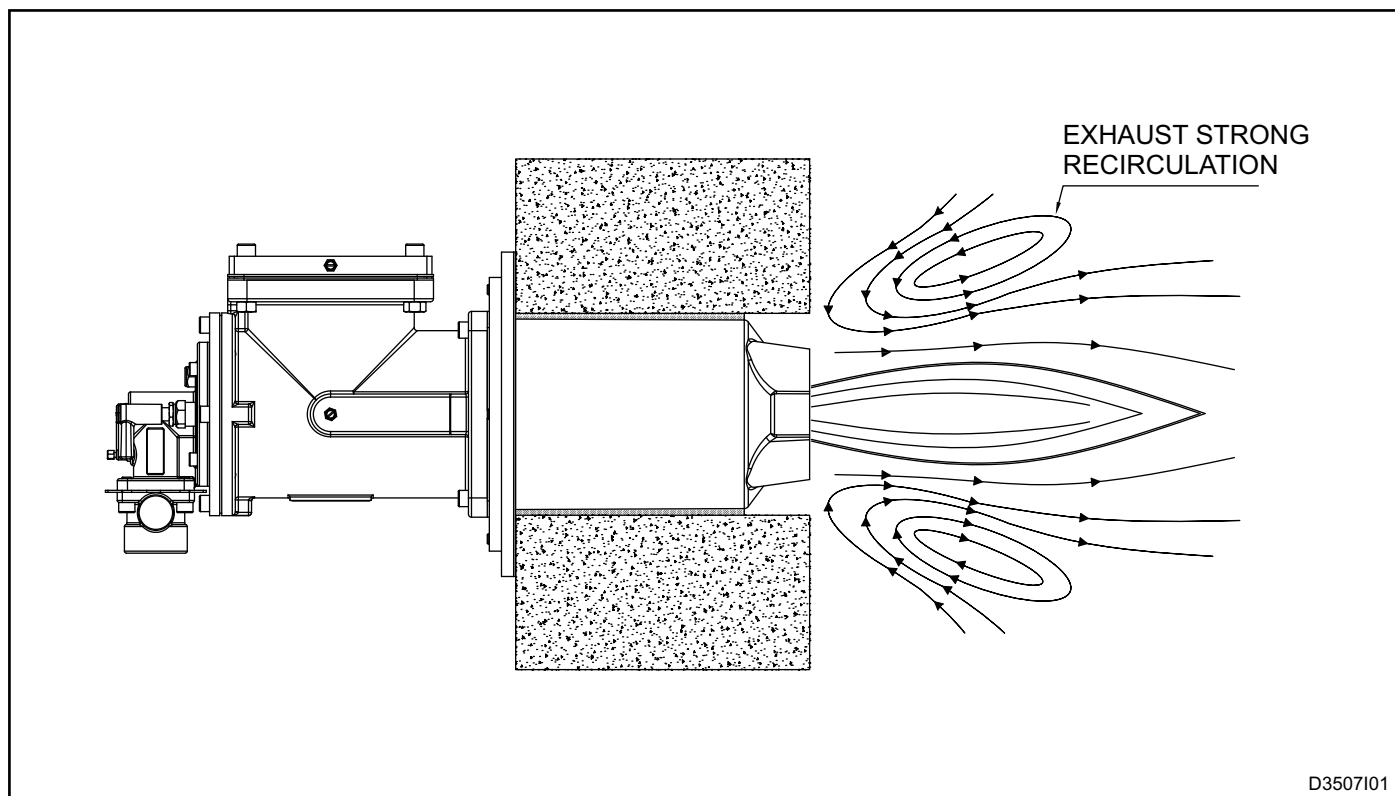
highly recommended in all plants operating at temperatures below 750°C (UNI EN746/2 Norm).

| Model | Potential kW | Flame length mm | Ignition / Detection |
|---------------|--------------|-----------------|----------------------|
| EMB-3-SIK-NxT | 100 | 900 | ESA WAND |
| EMB-4-SIK-NxT | 180 | 1250 | 3EN |
| EMB-5-SIK-NxT | 250 | 1600 | 3EN |
| EMB-6-SIK-NxT | 450 | 1800 | 3EN |
| EMB-7-SIK-NxT | 700 | 2300 | 3EN |

DESCRIPTION

The EMB-SIK-NxT burners are LOW NOx and apply the most recent technical expertise to ensure low NOx and CO emissions, yet remaining functional even at low chamber temperatures during ignition when the plant is cold.

The burners are solid and robust with small weight and dimensions (main insulation is in ceramic fibre), with separate air and gas inlets and mixing at the nozzle (no flame flashbacks).



D3507I01

Multistage combustion technology, together with strong recirculation of flu gases, guarantees low NOx and Co

emission even with preheating air temperatures as low as 600°C.

BLOCK HOLDER BURNER VERSION (EMB-SIK-NxT-BH)

The EMB-SIK-NxT-BH are gas burners used for direct heating. These burners allow excess air, stoichiometric and excess gas regulation. Depending on the size and use, this type of burner can be used for natural gas and LPG combustion (in the standard version) and other types of gaseous combustible agents with heating different properties (special versions on request). The burner is provided with concrete block holder for special high temperature application such as:

- Annealing lines.
- NOx galvanizing lines.
- Ceramic furnaces or fibre cover treatment furnaces.
- Tunnel or car bottom furnaces.
- Dryers.
- Stretching furnaces.
- Treatment furnaces.



CHARACTERISTICS

GENERAL:

- | | |
|-----------------------------------|--------------|
| ■ Temperature limit: | 1.400°C |
| ■ Air and gas pressure to burner: | 50mbar |
| ■ Flow ratio: | 5 : 1 |
| ■ Flame speed: | up to 120m/s |
| ■ Excess air: | up to 400% |
| ■ Excess gas: | up to 20% |
| ■ Preheated air up to: | 600°C |

MATERIAL COMPOSITION:

- | | |
|---------------------|---------------|
| ■ Mixer body: | Cast iron G25 |
| ■ Gas collector: | Cast iron G25 |
| ■ Flameproof tube: | SiC |
| ■ Combustion head: | AISI310 |
| ■ Fixing flange: | Fe |
| ■ Refractory block: | T.max 1750°C |



BURNER PERFORMANCE

The capacity, lengths and flame speed refer to burner fueled by natural gas (8600 Kcal / Nm³), located in the combustion chamber at zero pressure above sea level, working with 10% excess air.

- MIN/MAX (ON/OFF) functioning
- Chamber temperature 1200°C
- Preheated air temperature 500°C

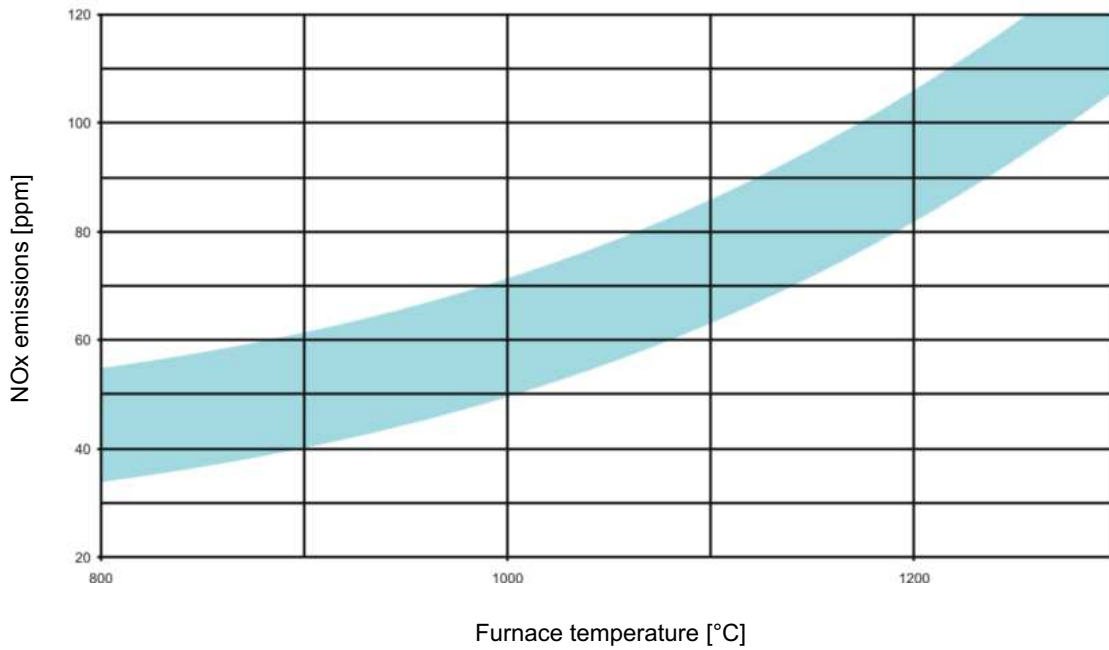
MAXIMUM CAPACITY

| Parameter | | | Burner model | | | | |
|--------------|--------------------------------------|----------------------|--------------|-------|-------|-------|-------|
| | | | EMB-3 | EMB-4 | EMB-5 | EMB-6 | EMB-7 |
| Max Capacity | Burner capacity (2% O ₂) | [kW] | 100 | 180 | 250 | 450 | 700 |
| | Combustion air flow | [Nm ³ /h] | 110 | 198 | 275 | 495 | 770 |
| | Gas flow | [Nm ³ /h] | 10 | 18 | 25 | 45 | 70 |
| | Burner air inlet pressure | [mbar] | 50 | | | | |
| | Burner gas inlet pressure | [mbar] | 70 | | | | |

MINIMUM CAPACITY

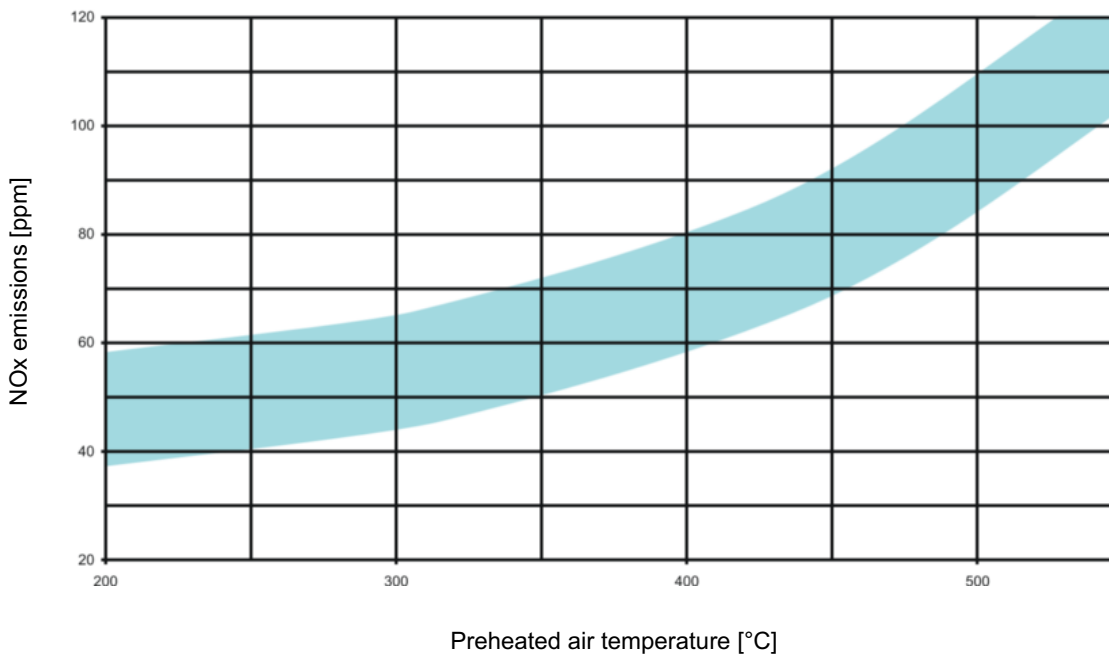
| Parameter | | | Burner model | | | | |
|---------------|--------------------------------------|----------------------|--------------|-------|-------|-------|-------|
| | | | EMB-3 | EMB-4 | EMB-5 | EMB-6 | EMB-7 |
| Min. Capacity | Burner capacity (2% O ₂) | [kW] | 20 | 36 | 50 | 90 | 140 |
| | Combustion air flow | [Nm ³ /h] | 22 | 40 | 55 | 99 | 154 |
| | Gas flow | [Nm ³ /h] | 2 | 36 | 5 | 9 | 14 |
| | Burner air inlet pressure | [mbar] | 2 | | | | |

EMISSIONS



Preheated air 500 °C
O₂ = 3% 100% Potential

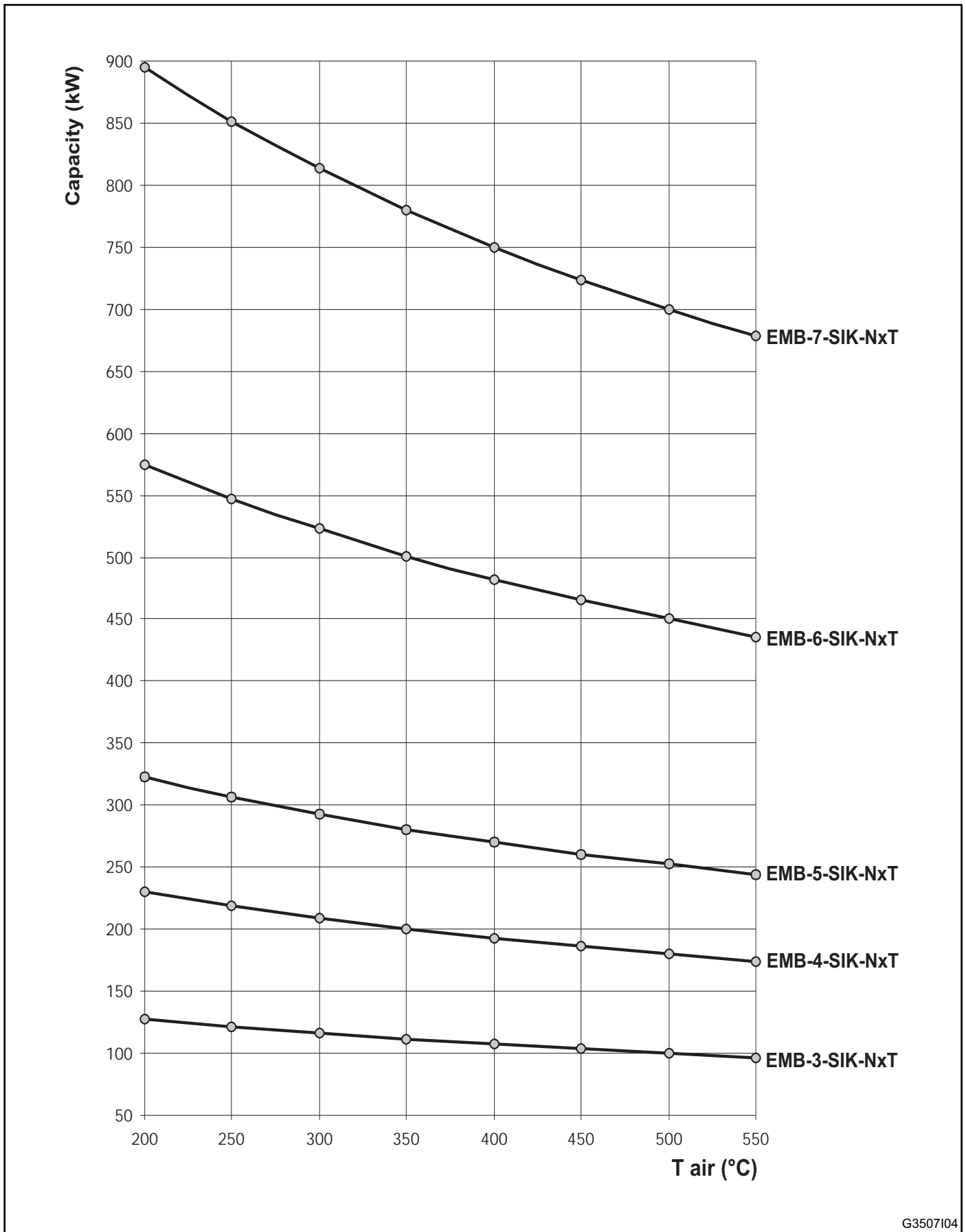
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Chamber T: 1200 °C
O₂ = 3% 100% Potential

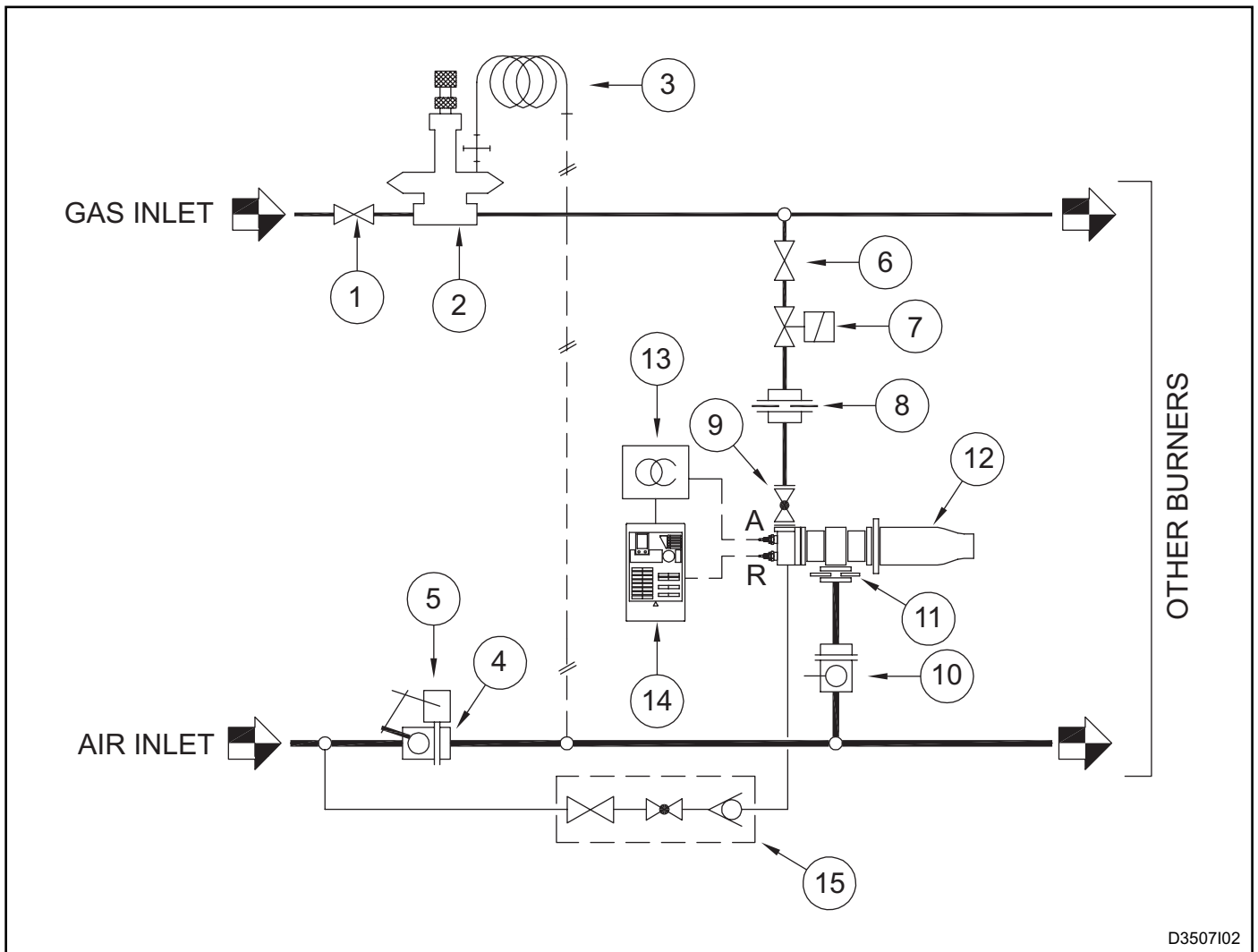
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BURNER CAPACITY ACCORDING TO PREHEATED AIR TEMPERATURE



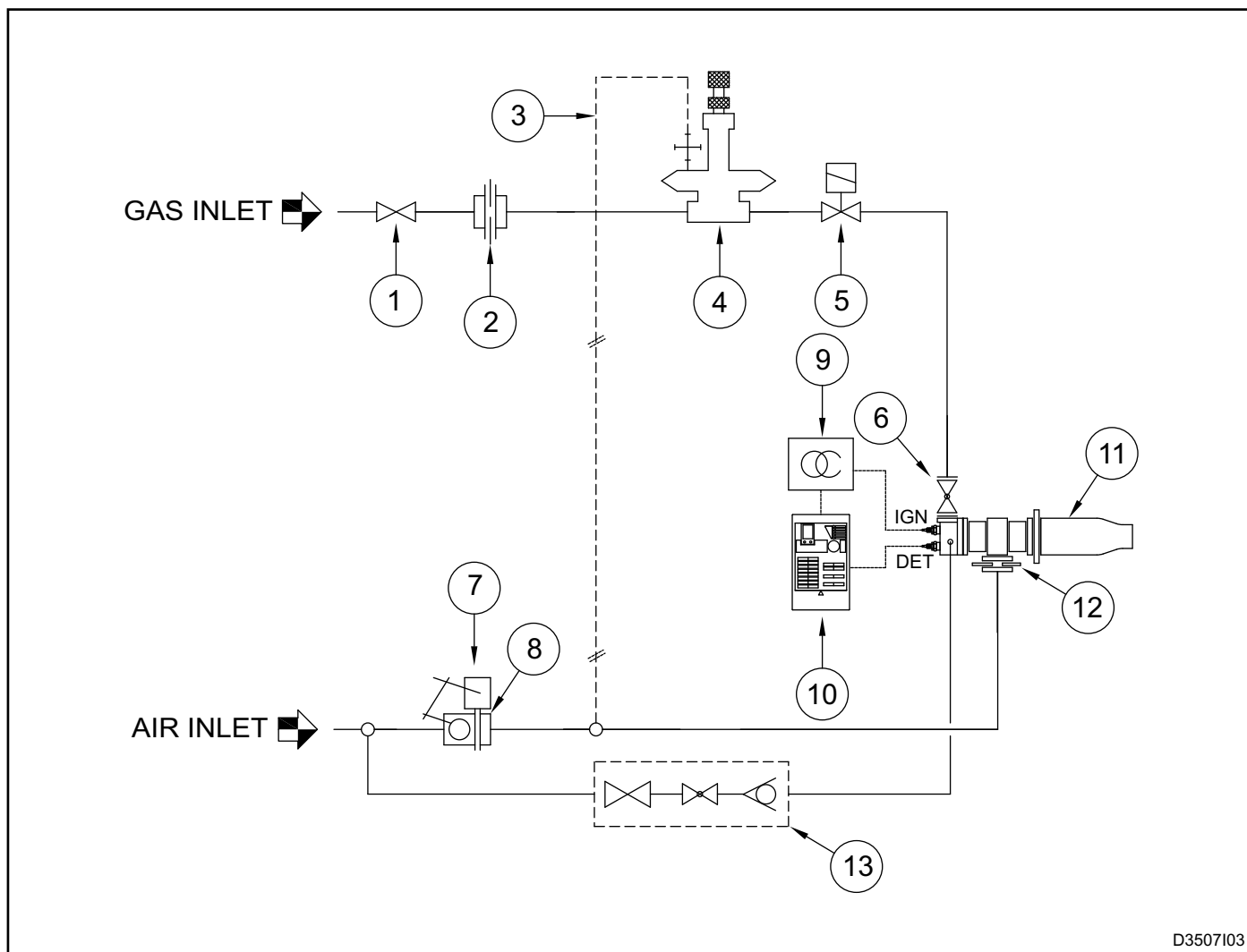
G3507104

FLOW SCHEME - SINGLE ZONE REGULATION



| Pos. | Description | Included | Not included |
|------|--|----------|--------------|
| 1 | Main gas shut off ball valve | | X |
| 2 | Balanced modulator | | X |
| 3 | Impulse line | | X |
| 4 | Air regulation servo assisted butterfly valve | | X |
| 5 | Electric servo motor | | X |
| 6 | Gas shut-off ball valve to the single burners | | X |
| 7 | Main burner safety gas solenoid valve | | X |
| 8 | DP gas measuring calibrated flange | X | |
| 9 | Gas flow limiting device | X | |
| 10 | Manual air regulation butterfly valve | | X |
| 11 | DP air inlet pressure measurement calibrated orifice | X | |
| 12 | Free flame burner | X | |
| 13 | Ignition transformer | | X |
| 14 | Flame control | | X |
| 15 | Premix air regulation group (only LPG model) | X | |

FLOW SCHEME - SINGLE BURNER REGULATION



D3507103

| Pos. | Description | Included | Not included |
|------|--|----------|--------------|
| 1 | Main gas shut off ball valve | | X |
| 2 | ΔP gas measurement calibrated flange | X | |
| 3 | Impulse line | | X |
| 4 | Zerogovernor | | X |
| 5 | Safety gas solenoid valve | | X |
| 6 | Gas flow limiting device | X | |
| 7 | Servomotor | | X |
| 8 | Air regulation motorized valve | | X |
| 9 | Ignition transformer | | X |
| 10 | Flame control | | X |
| 11 | High velocity burner | X | |
| 12 | Air inlet orifice | X | |
| 13 | Premix air regulation group (only LPG version) | X | |

WARNINGS

- EMB-SIK-NxT burner ignition must always be carried out at minimum power, then modulating towards maximum, facilitating start-ups and reducing the excess outlet pressure. Therefore slow opening solenoid valves should be used on the fuel line.
- The transition from minimum to maximum power, and vice versa, should be gradual and not instantaneous.
- Vertical mounting of burners with flame looking upwards is highly inadvisable. The burners mounted in this position could lack flame or suffer from bad flame detection due to the presence of external objects that could deposit on the combustion head and on the electrodes.
- For all applications at low temperature (up to 750°C) burner ignition and the fuel gas solenoid valve control must be carried out via a certified burner control device.
- To avoid possible damage to the burners, make sure that the blower does not send stale air from combustion products, oils, solvents or other. To prevent these phenomena from taking place, preferably install the blower or suction duct outside of the establishment and far from exhaust pipes.
- Check the correct connection of the feeding lines after installation. Before switching the burner on, check that the combustion 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 things.
- 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-NxT burners are equipped with a special 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-NxT 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 on the furnace wall (**pos. 01**), interposing a ceramic fibre gasket between the attachment flange and the furnace wall (**pos. 02**). Once the burner has been fixed to the furnace, from inside the combustion chamber, use ceramic fibre mat to seal any cracks left between the wall and silicon carbide flame holder tube according to the indications in the "Overall dimensions" chapter.

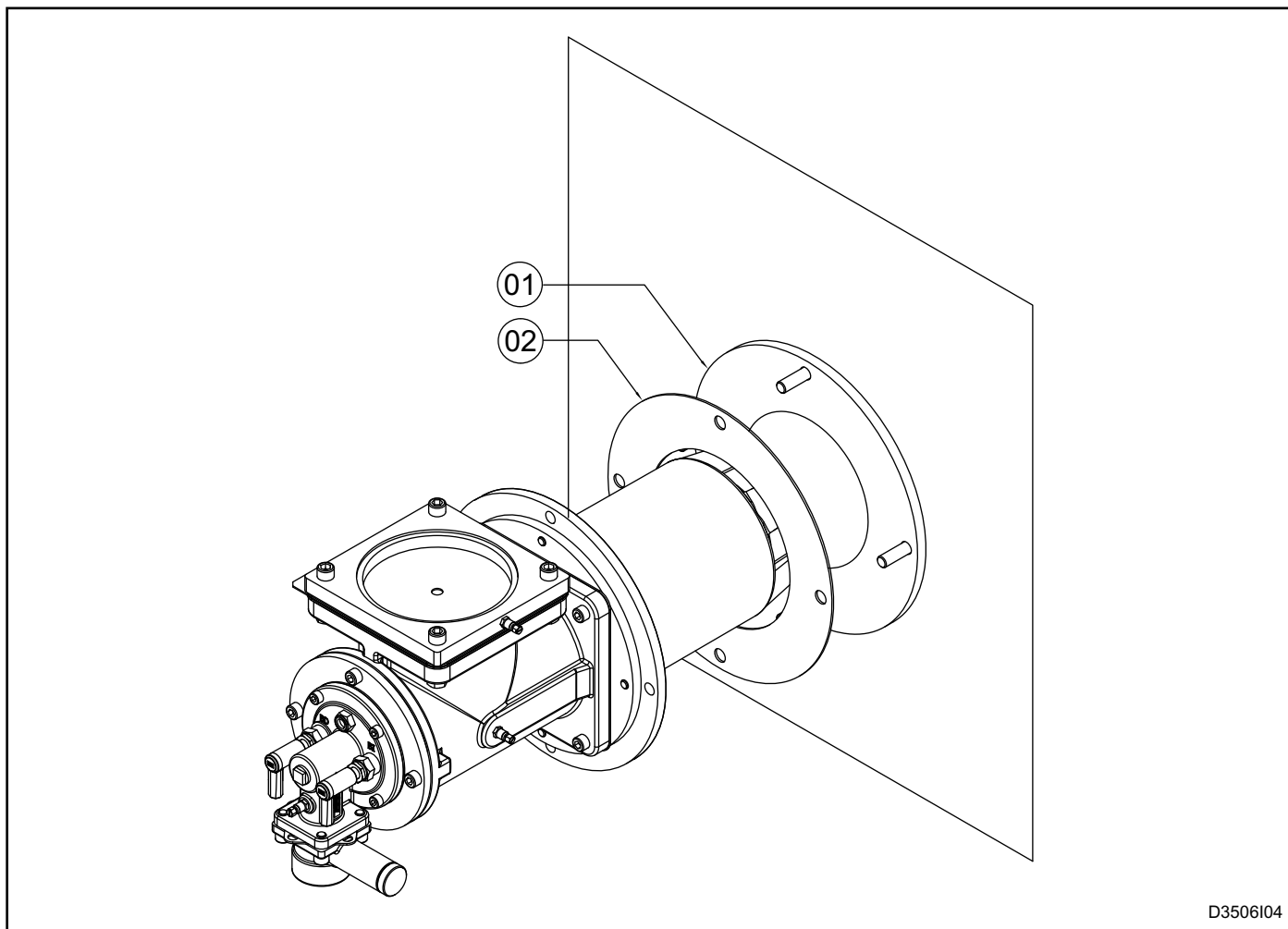
4 - Connect the combustion air and fuel gas inlet piping, interposing, if possible, dilation joints of correct sizes.

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.

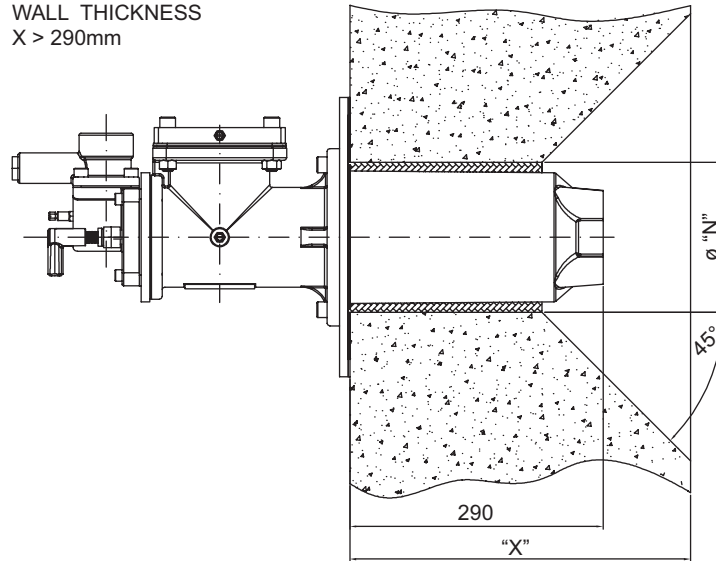
8 - For further information please consult the technical data sheet concerning the ignition transformers.



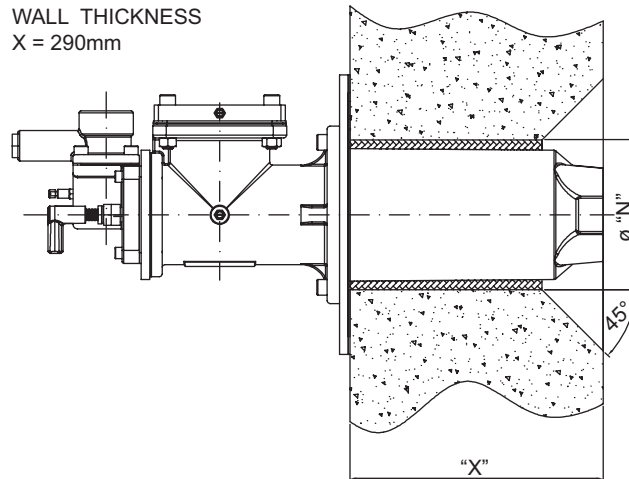
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FURNACE WALL MOUNTING CHART

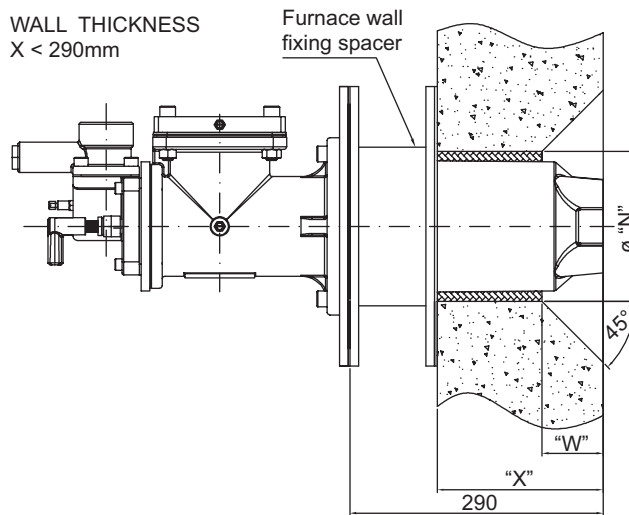
WALL THICKNESS
X > 290mm



WALL THICKNESS
X = 290mm



WALL THICKNESS
X < 290mm



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 indicated in the "Burner performance" chapter, place the motorized position the air regulation motorized valve.

4 - Referring to the minimum capacity values indicated in the "Burner performance" chapter, place the motorized position the air regulation motorized valve.

5 - 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 the burner running, place the air regulation valve as described in point 3, via the gas regulation valve the maximum gas flow rate check 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 be different depending on whether the burner is on or off..

8 - If necessary, with all burners turned onto 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 adjustment.

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 main 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 steady)

3 - Regulate the air flow using the pin valve and consulting the appropriate setting chart (page 10). The aim is to obtain quite a tense bluish flame

4 - Check however that at minimum capacity, the burner does not create black smoke on the combustion head and on the electrodes. Should this occur, increase the premix air setting.

EMB-3-SIK-NxT: Gas pressure body = 2 mbar

EMB-4-SIK-NxT: Gas pressure body = 2 mbar

EMB-5-SIK-NxT: $\Delta p=6.2$ mbar

EMB-6-SIK-NxT: $\Delta p=6.5$ mbar

EMB-7-SIK-NxT: $\Delta p=2.5$ mbar

GENERAL MAINTENANCE PLAN

| Operation | Type | Advised time | Notes |
|---|------|--------------|--|
| High tension electrode connection | O | annual | check integrity of outer plastic and oxidation of internal electrode terminal. |
| Electrode ignition / detection | O | annual | replace if the kantel terminal is worn or if the ceramic is damaged. |
| Combustion head | O | annual | during furnace stop, check that the two elements do not show signs of oxidation caused by high temperature or deposits on the surface. |
| SIC flame tube | O | annual | during furnace stop check that there are no cracks in the ceramic material. If necessary, replace. |
| Gasket replacement of the gas side | E | annual | See note (*) and note (**) |
| Burner settings | O | annual | Repeat all the steps in the "START UP AND SETTINGS" chapter. |
| Premix air setting (where scheduled) | O | annual | Repeat all the steps in the "PREMIX AIR SETTING" chapter. |

NOTES:

Key: O = ordinary / E = extraordinary

(*) it is suggested that the gaskets on the gas side are replaced after every disassembly of the gas feeding line.

(**) use high temperature gaskets.

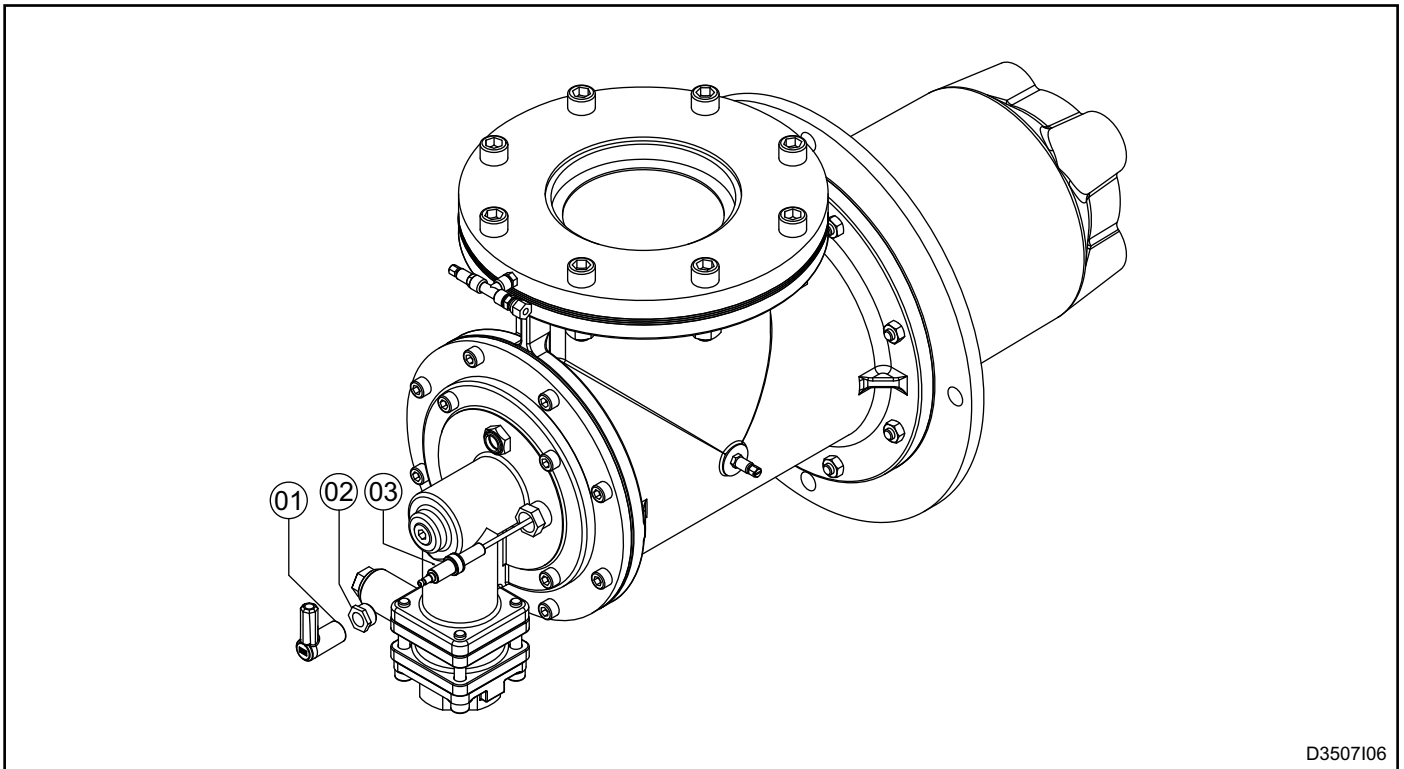
EXTRAORDINARY MAINTENANCE

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

FLAME DETECTION AND IGNITION ELECTRODE REPLACEMENT

- 1 - Check that the burner control device is disconnected
- 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 correct repositioning of the new electrode.
- 5 - Reconnect the electrical supply (**pos. 01**).
- 6 - Check the electrode's correct flame ignition/detection.



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BURNER LOCKOUT

In lockout conditions of the burner refer to the burner control device and to the relative handbook to identify the cause. Below we have indicated the main cases:

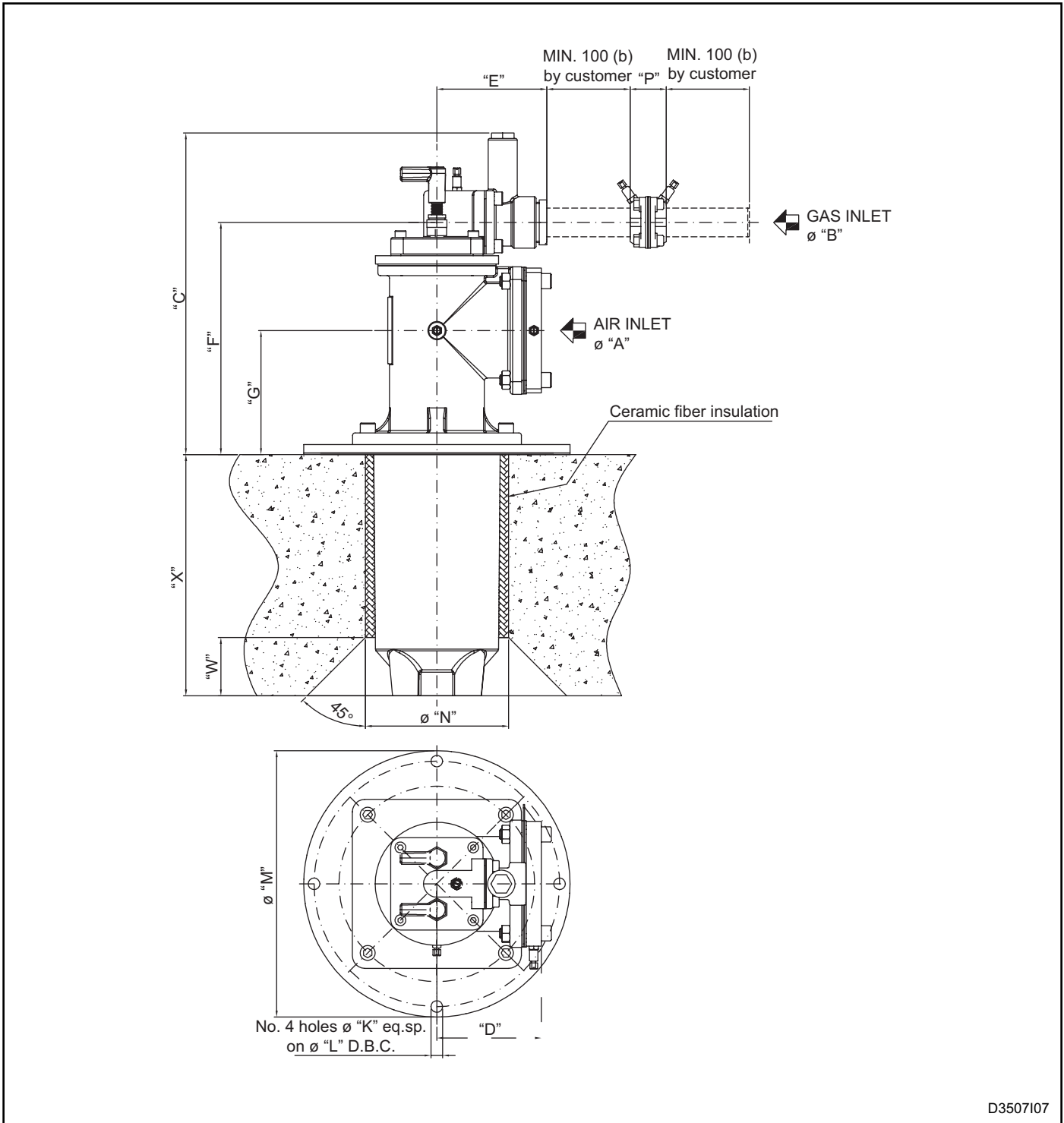
■ **Illegal flame detection:** the shutdown is due to an illegal flame detection during the phases prior to ignition or after the turning off. The causes are within the detection system (broken or faulty sensor or presence of humidity), or in the gas draw from the solenoid safety valve, which allows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

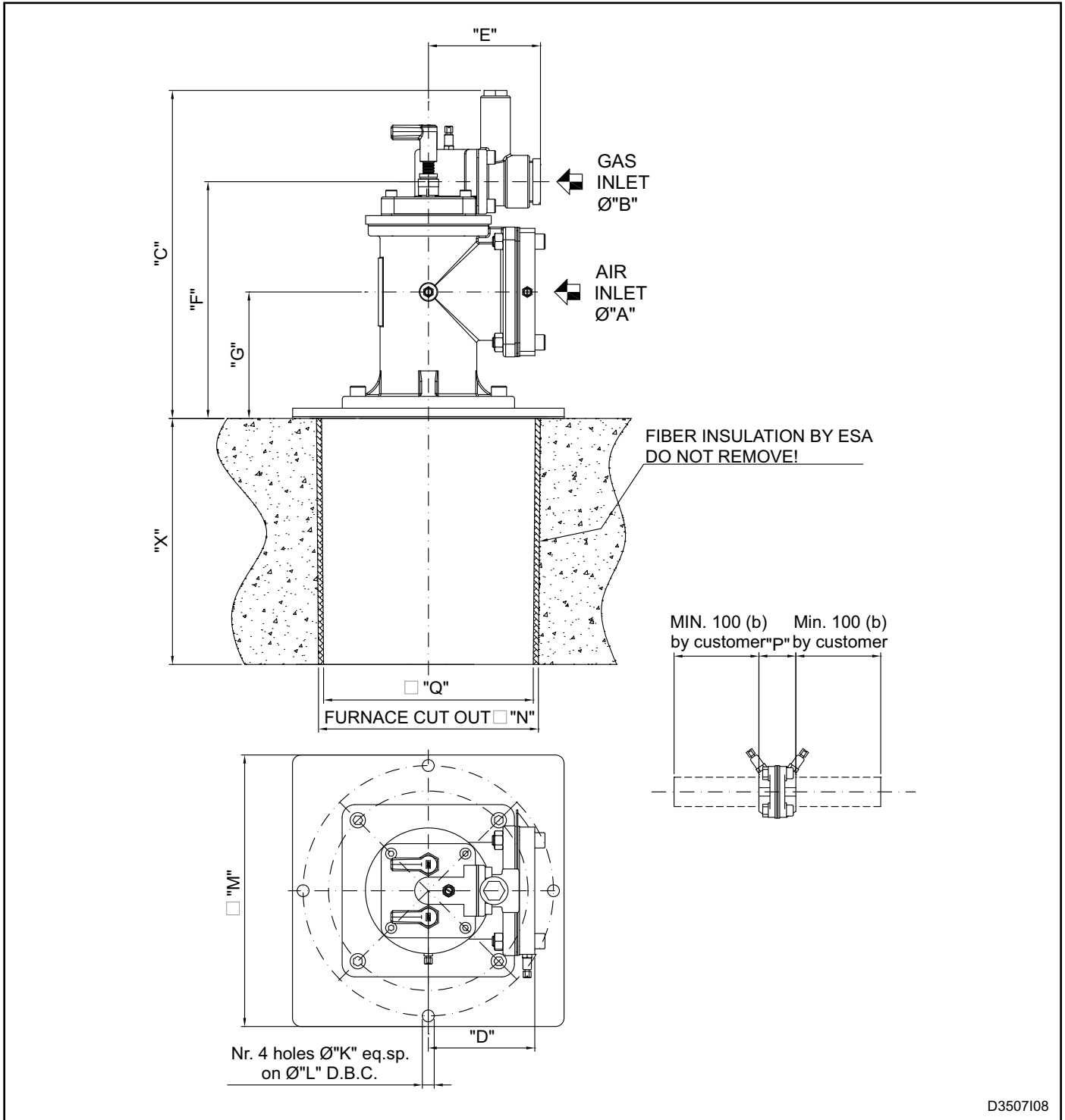
■ **Flame signal loss:** shutdown due to the loss of flame signal during the normal functioning of the burner. The causes can be found in the combustion air flow adjustment (rapid flow variations, adjustment out of allowed range). They can also be found in the detection system (faulty, dirty or badly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

OVERALL DIMENSIONS - EMB-SIK-NxT



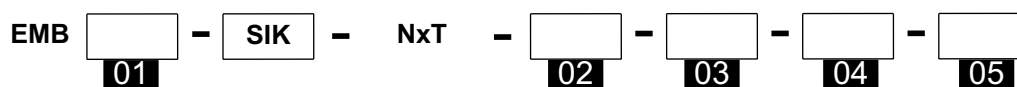
| Model | \varnothing "A" | \varnothing "B" | C [mm] | D [mm] | E [mm] | F [mm] | G [mm] | \varnothing K [mm] | \varnothing L [mm] | \varnothing M [mm] | \varnothing N [mm] | X [mm] | P [mm] | W [mm] | Mass [Kg] |
|---------------|-------------------|-------------------|--------|--------|--------|--------|--------|----------------------|----------------------|----------------------|----------------------|--------|--------|--------|-----------|
| EMB-3-SIK-NxT | Rp. 2.1/2" | Rp. 3/4" | 343 | 118 | 107 | 222 | 110 | 14 | 200 | 240 | 138 | 290 | 46 | 60 | 17.6 |
| EMB-4-SIK-NxT | DN80 | Rp. 1" | 356 | 126 | 107 | 273 | 149 | 14 | 250 | 280 | 172 | 290 | 46 | 75 | 25.9 |
| EMB-5-SIK-NxT | DN100 | Rp. 1" | 387 | 126 | 132 | 279 | 149 | 14 | 295 | 320 | 172 | 290 | 46 | 75 | 27.7 |
| EMB-6-SIK-NxT | DN150 | Rp. 1.1/2" | 468 | 156 | 137 | 355 | 183 | 14 | 295 | 320 | 208 | 290 | 67 | 75 | 40.4 |
| EMB-7-SIK-NxT | DN200 | Rp. 2" | 562 | 221 | 185 | 443 | 218 | 14 | 360 | 400 | 250 | 290 | 67 | 80 | 72.5 |

OVERALL DIMENSIONS - EMB-SIK-NxT-BH



| Model | ø "A" | ø "B" | C [mm] | D [mm] | E [mm] | F [mm] | G [mm] | ø K [mm] | ø L [mm] | □M [mm] | □N [mm] | X [mm] | P [mm] | □Q [mm] | Mass [Kg] |
|---------------|------------|------------|--------|--------|--------|--------|--------|----------|----------|---------|---------|--------|--------|---------|-----------|
| EMB-3-SIK-NxT | Rp. 2.1/2" | Rp. 3/4" | 343 | 118 | 107 | 222 | 110 | 14 | 278 | 330 | 241 | 290 | 46 | 229 | 55 |
| EMB-4-SIK-NxT | DN80 | Rp. 1" | 356 | 126 | 107 | 273 | 149 | 14 | 278 | 330 | 241 | 290 | 46 | 229 | 64 |
| EMB-5-SIK-NxT | DN100 | Rp. 1" | 387 | 126 | 132 | 279 | 149 | 14 | 278 | 330 | 241 | 290 | 46 | 229 | 52 |
| EMB-6-SIK-NxT | DN150 | Rp. 1.1/2" | 468 | 156 | 137 | 355 | 183 | 14 | 349 | 410 | 311 | 290 | 67 | 298 | 92 |
| EMB-7-SIK-NxT | DN200 | Rp. 2" | 562 | 221 | 185 | 443 | 218 | 14 | 464 | 508 | 432 | 290 | 67 | 419 | 140 |

ORDERING CODE - COMPLETE BURNER



| Model | | 01 |
|-----------|---|----|
| EMB-3-SIK | 3 | |
| EMB-4-SIK | 4 | |
| EMB-5-SIK | 5 | |
| EMB-6-SIK | 6 | |
| EMB-7-SIK | 7 | |

| Gas Adjuster | | 02 |
|----------------------|-----|----|
| With Gas Adjuster | GA* | |
| Without Gas Adjuster | F | |

| Fuel | | 03 |
|-------------------------|-----|----|
| Methane | CH4 | |
| LPG | GPL | |
| Poor gas ⁽¹⁾ | GP | |

| Ignition and detection | | 04 |
|------------------------|----|----|
| Double electrode | E* | |

| Flange type | | 05 |
|---------------------------|----|----|
| According to ESA dwg | E* | |
| According to client's dwg | C | |

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

Notes:

¹ Particular performance according to gas characteristics