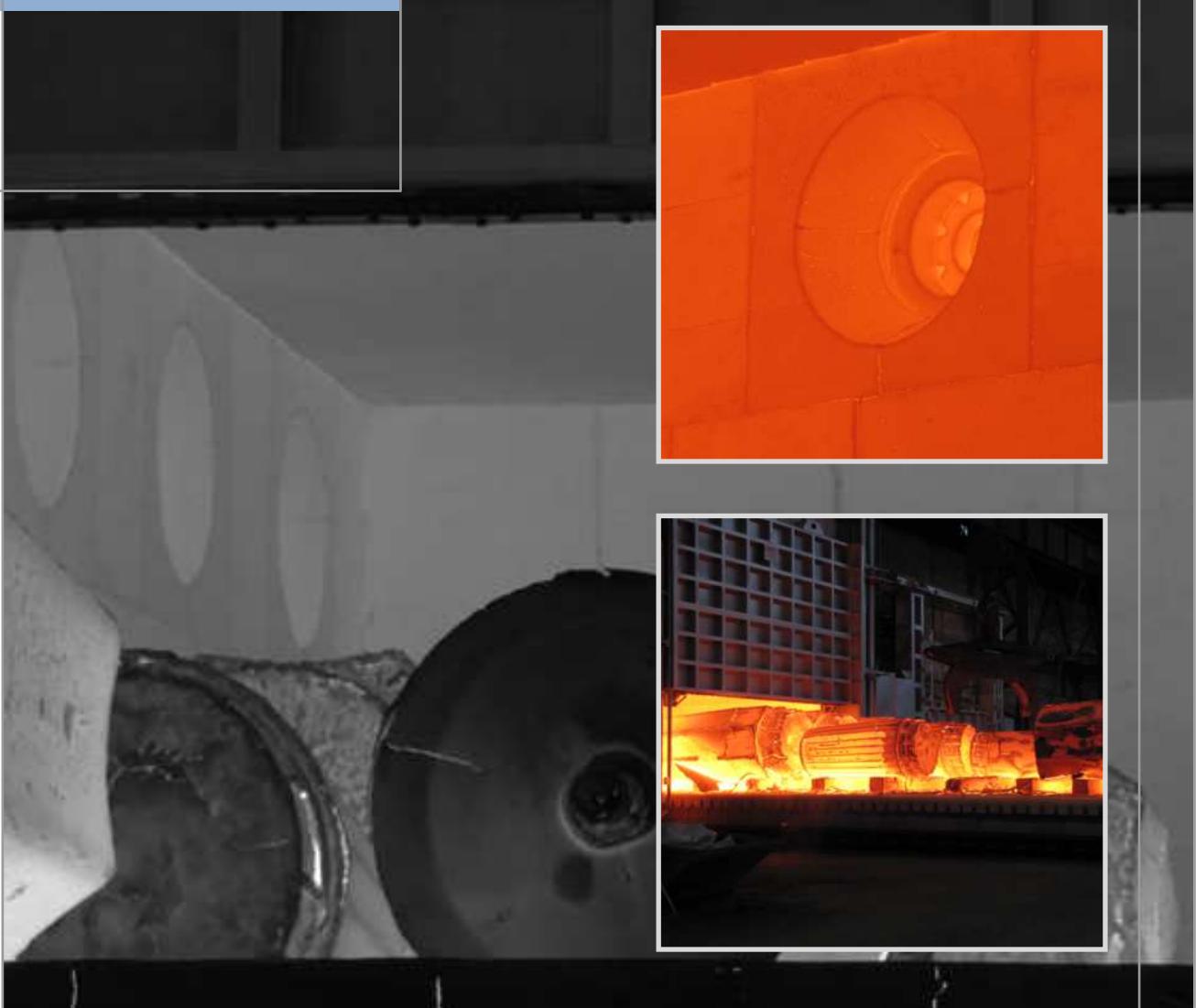


## Burners



## Regenerative burners

REGE-NxT (E3905 rev. 02 - 15/01/2018)

## 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](http://www.esapyronics.com) website.
- The REGE-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).

## CONTACTS / SERVICE:



Esa S.p.A. Via Enrico Fermi 40 24035 Curno (BG) - Italy Tel +39.035.6227411 Fax +39.035.6227499 <a href="mailto:esa@esacombustion.it">esa@esacombustion.it</a>	ESA Belgium Zoning Industriel, 4ème rue B-6040 Jumet - Belgium Tel +32.71.256970 Fax +32.71.256979 <a href="mailto:marketing@pyronics.be">marketing@pyronics.be</a>
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[www.esapyronics.com](http://www.esapyronics.com)

The REGE-NxT burners are regenerative gas burners for direct heating. These burners use combustion fumes to preheat the combustion agent. The system is based on pairs of burners that exchange heat via a heat exchanger that accumulates and yields heat during alternate suction and ejection cycles of the exhaust gases. According to the size and conditions of use, this type of burner guarantees a substantial decrease in consumption compared with traditional burners that are fed by air at room temperature.

## APPLICATIONS

- Smelting furnaces
- Forging furnaces
- Heat treatment furnaces.
- Reheating furnaces
- Glass treatment furnaces



## CHARACTERISTICS

### GENERAL:

- Capacity: from 300 to 4000 kW
- Functioning with various types of gas: CH4/LPG/Propane/etc.
- Maximum furnace temperature: 1400 °C  
1500 °C (on request)
- Burner inlet air pressure: 80 mbar
- Burner inlet gas pressure: 80 mbar
- Combustion fume suction pressure - 80 mbar  
@ 250 °C
- Inlet air temperature: room temperature
- Preheated air temperature: up to 1200 °C
- Flow ratio: 3:1
- Flame speed: up to 100 m/s
- Low NOx and CO

### MATERIAL COMPOSITION:

- Regenerator and burner carpentry: Fe420 / AISI304
- Regenerative bed: alumina
- Air diffuser: refractory material Tmax 1750 °C
- Refractory insulation: refractory isolat Tmax 1500 °C



## CAPACITY PARAMETERS AND FLAME LENGTH

The ignition of the REGE-NxT burners takes place via PBC-FR/X series pilot burners. Detection instead is made via a UV-2 sensor (both the pilot burner as well as the UV sensor are not included).

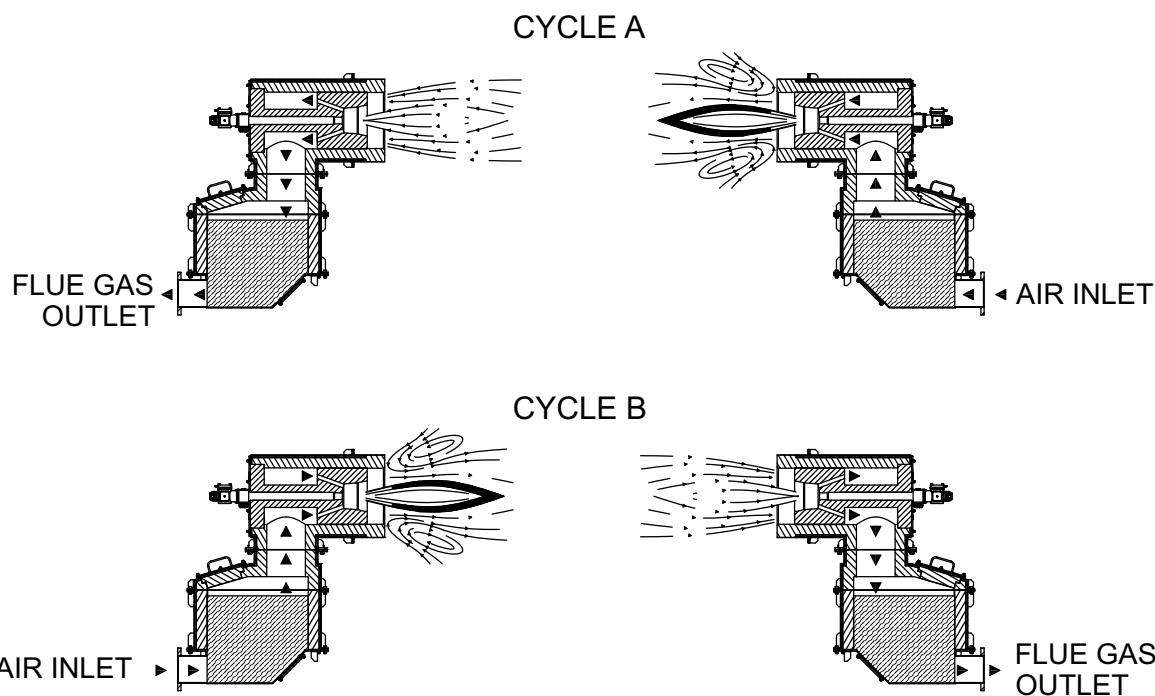
The adoption of flame control systems is highly recommended in all plants that operate at temperatures below 750°C (UNI EN746-2 Norm).

Model	Capacity kW	Flame length mm	Flame speed (m/s)	Ignition	Detection
REGE-4-NxT	300	1200	100	P42PBC-FR/X	UV-2
REGE-5-NxT	400	1600	100	P42PBC-FR/X	UV-2
REGE-6-NxT	600	1900	100	P64PBC-FR/X	UV-2
REGE-7-NxT	900	2200	100	P64PBC-FR/X	UV-2
REGE-8-NxT	1200	2600	100	P64PBC-FR/X	UV-2
REGE-9-NxT	1800	3400	100	P64PBC-FR/X	UV-2
REGE-10-NxT	2400	3800	100	P64PBC-FR/X	UV-2
REGE-11-NxT	3200	4200	100	P64PBC-FR/X	UV-2
REGE-12-NxT	4000	5000	100	P64PBC-FR/X	UV-2

## DESCRIPTION

In regenerative burners the heat exchange between combustion fumes and combustion air takes place via an alternate functioning of two burners in a fixed series of cycles: the combustion fumes produced by the first burner

are sucked in by the second burner and preheat a mediator that is normally made from a tank filled with ceramic material of various shapes and sizes.



D3905I01

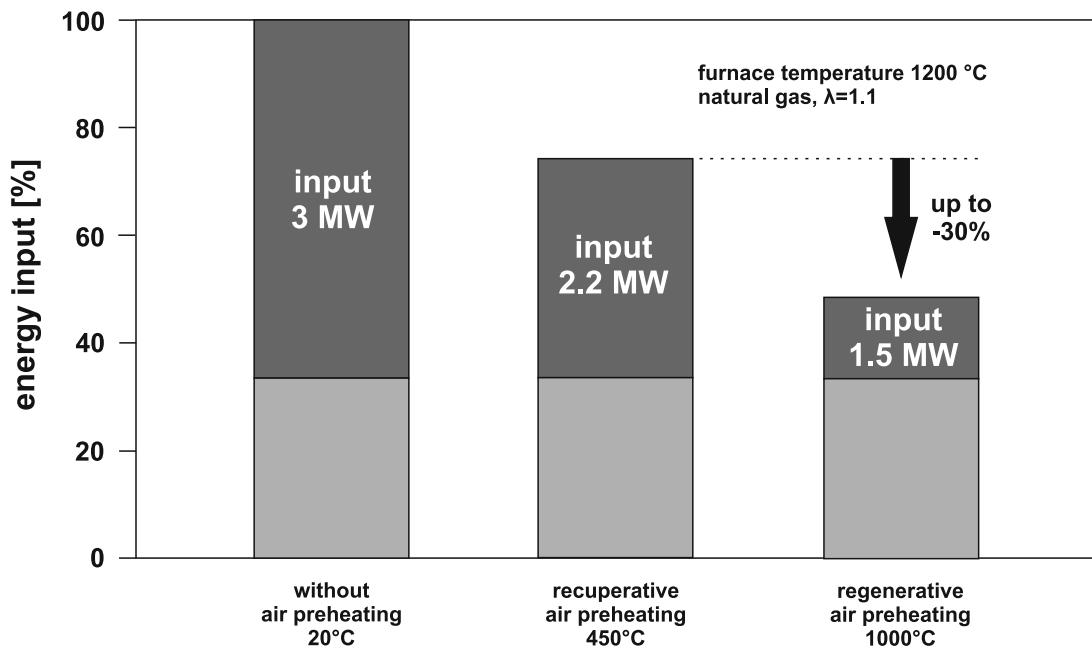
In the following cycle, the function is inverted so that the combustion air that is sent to the burner is preheated by the heat accumulated by the ceramic bed of the burner

that worked as a chimney in the previous cycle, obtaining a preheat temperature that is above the normal heat recovery systems which are based on exchangers.

## DESCRIPTION

As you can see in the table below, the regenerative systems guarantee up to 50% more fuel saving compared with traditional systems fed by ambient air and up to

30% more compared with heat recovery traditional systems.



G3905I02

Though the structure is more complex than other types of burners and requires more components, valves, additional piping and an advanced technological control system

as well as higher maintenance costs compared with a traditional system, it is particularly affordable in high temperature and heat capacity applications.

## BURNER PERFORMANCE

The flame capacity, lengths and speed refer to a burner supplied by natural gas (8600 Kcal/Nm<sup>3</sup>) placed in

a combustion chamber at zero pressure at sea level, operating with 10% excess air.

- MIN/MAX functioning (ON/OFF)
- Chamber temperature 1200°C
- Percentage of fumes intercepted by the regenerator: 80%

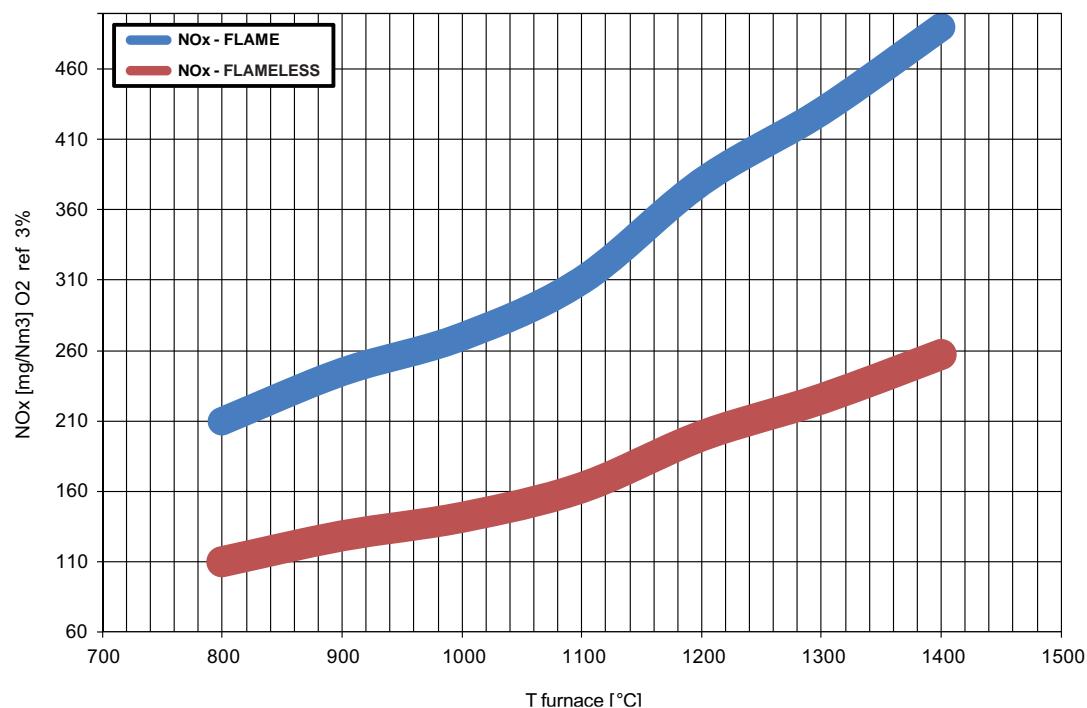
### MAXIMUM CAPACITY

Max. capacity	Parameter	Burner model					
		REGE- 4	REGE- 5	REGE- 6	REGE-7	REGE-8	
Max. capacity	Burner capacity (2% O <sub>2</sub> )	[kW]	300	400	600	900	1200
	Combustion air flow	[Nm <sup>3</sup> /h]	330	440	660	990	1320
	Gas flow	[Nm <sup>3</sup> /h]	30	40	60	90	120
	Combustion fume flow @ 250°C	[Nm <sup>3</sup> /h]	288	384	576	864	1152
	Air flow of cooling gas lance	[Nm <sup>3</sup> /h]	6	7,5	11	17	22
	Burner inlet air pressure	[mbar]			80		
	Burner inlet gas pressure	[mbar]			80		

Max. capacity	Parameter	Burner model				
		REGE-9	REGE-10	REGE-11	REGE-12	
Max. capacity	Burner capacity (2% O <sub>2</sub> )	[kW]	1800	2400	3200	4000
	Combustion air flow	[Nm <sup>3</sup> /h]	2160	2640	3520	4400
	Gas flow	[Nm <sup>3</sup> /h]	180	240	320	400
	Combustion fume flow @ 250°C	[Nm <sup>3</sup> /h]	1872	2880	3072	3840
	Air flow of cooling gas lance	[Nm <sup>3</sup> /h]	32	44	58	72
	Burner inlet air pressure	[mbar]		80		
	Burner inlet gas pressure	[mbar]		80		

Furnace T [°C]	Capacity [kW]										Combustion air T [°C]
	REGE-4	REGE-5	REGE-6	REGE-7	REGE-8	REGE-9	REGE-10	REGE-11	REGE-12		
800	362	483	725	1087	1449	2174	2898	3864	4830		620
900	343	458	686	1029	1373	2059	2745	3660	4575		720
1000	327	436	654	980	1307	1961	2614	3485	4357		820
1100	313	417	625	938	1250	1875	2500	3334	4167		920
1200	300	400	600	900	1200	1800	2400	3200	4000		1020
1300	289	385	578	867	1155	1733	2311	3081	3852		1120
1400	279	372	558	837	1116	1673	2231	2975	3719		1220

## NOx EMISSIONS TABLE



G3905I01

Burner at 100% capacity with 10% excess air

The emission is subject to change depending on several factors such as:

- Operating temperature of the furnace.
- Heating / cooling management cycles of the ceramic bed
- Excess air.
- Fuel chemical composition.

The guaranteed value will be determined case by case, according to the conditions indicated by the customer.

## WARNINGS

- REGE-NxT series burners are meant to be used for fixed installations. If you require mobile installations (bell furnaces, etc ...) it is necessary to first evaluate the possibility of installation, given the size and mass of the burner.
- The burner must always be switched on at minimum power, then modulating towards the maximum, facilitating ignition and reducing outlet overpressure.
- For all low temperature applications (up to 750°C), the burner ignition and the fuel gas solenoid valve commands must be performed 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 combustion air and fuel gas pressure values are correct (**Pag.05**).
- 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 PYRONICS will not be held responsible for any damage to persons or things.

- If there should be problems with other devices during the burner start-up phase, use a connector with anti disturbance filter to connect the high tension cable to 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 installation of the REGE-NxT burners consists of two distinct phases. One concerns the actual burner on the furnace wall and the other concerns the regenerator. In any case, given the particularity of the regenerative burners, it is compulsory to install stainless steel compensators between the burner and the air, gas and fume feeding lines.

### BURNER INSTALLATION

The REGE-NxT burners are generally mounted on the furnace wall. Roof mounting is completely unadvisable. The light obtained for burner housing must have enough free space around it that is then to be filled with ceramic fibre. In any case, ask ESA PYRONICS for the correct burner assembly drawing as well as the correct internal profile of the furnace wall. The central lance cooling air and gas inlets can freely be turned to 90° and have a flange (UNI or ESA-PYRONICS, threaded or welded). For installation, carefully follow these instructions:

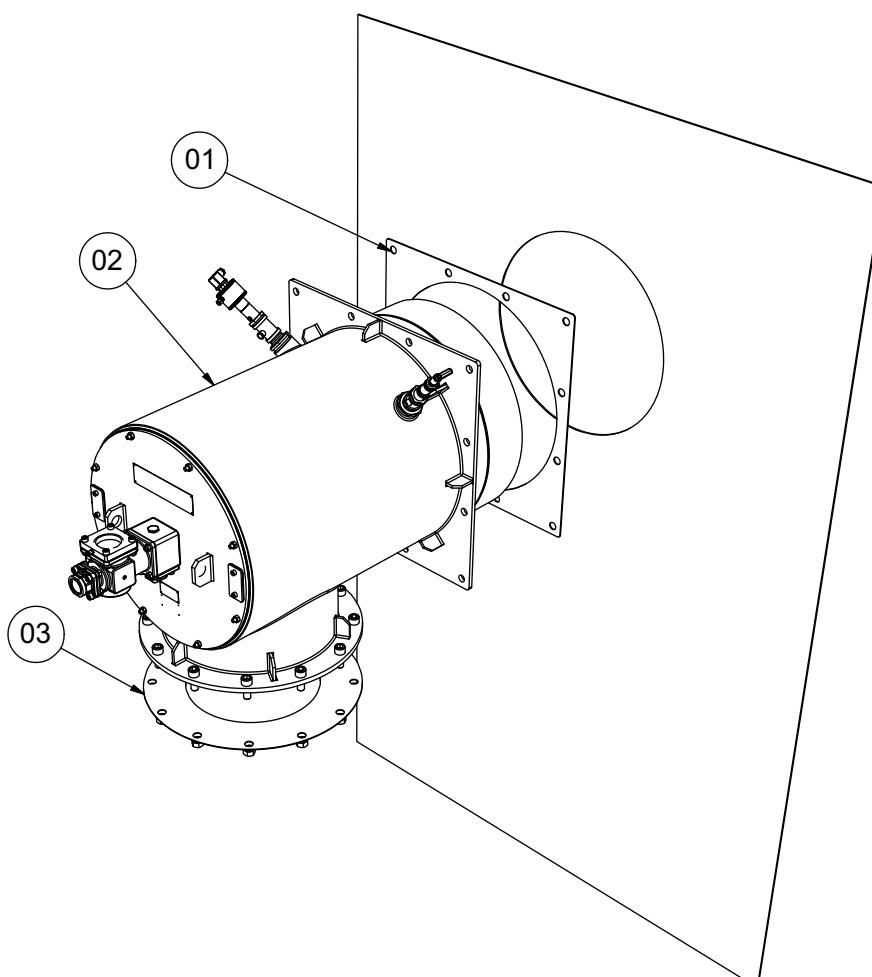
1 - insert the burner body gasket on the furnace wall (**pos.01**)

2 - Lift the burner (**pos.02**) and fix it to the stud bolts of the outerflange making sure that the gasket (**pos.01**) has not moved and is not deformed. Do not, for any reason, remove the fibreceramic cushion that is around the burner refractory block.

3 - fasten the fixing bolts .

4 - connect the cooling air and gas lines to the burner via the flange.

5 - fix the air inlet gasket (**pos.03**) with scotch tape to the lower burner flange in the correct position of the flange holes. This must be done before installing the regenerator.



D3905I03

## INSTALLATION

### REGENERATOR INSTALLATION

The REGE-NxT has two shelves which are placed for supporting the total weight of the whole assembly (refractory body + ceramic bed).

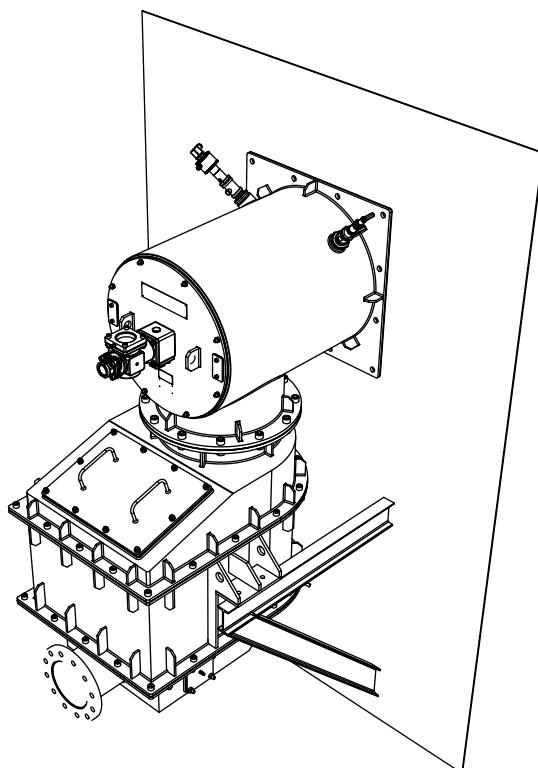
It can be mounted in two different ways (see Figure D3905I03):

- Mounting with lower shelf: the two regenerator shelves are layed on a special support structure created by the furnace that supports all the weight. The shelves have

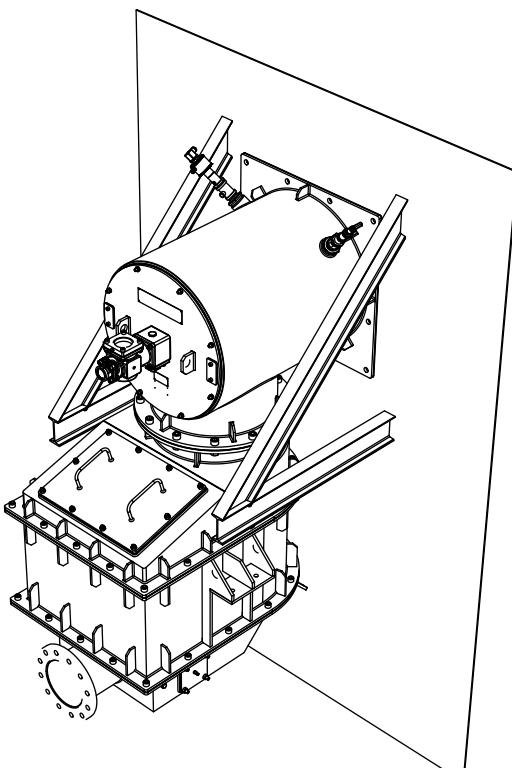
threaded holes where to insert the bolts that are used as vertical micrometric adjustment, to align the position of the regenerator compared with the burner air inlet flange.

- Mounting with upper shelf: The two regenerator shelves are hung, by rods on a special support structure created by the furnace that supports all the weight. The rods are used as vertical micrometric adjustment, to align the position of the regenerator compared with the burner air inlet flange.

**UPPER MOUNTING BRACKET  
ASSEMBLY**



**LOWER MOUNTING BRACKET  
ASSEMBLY**

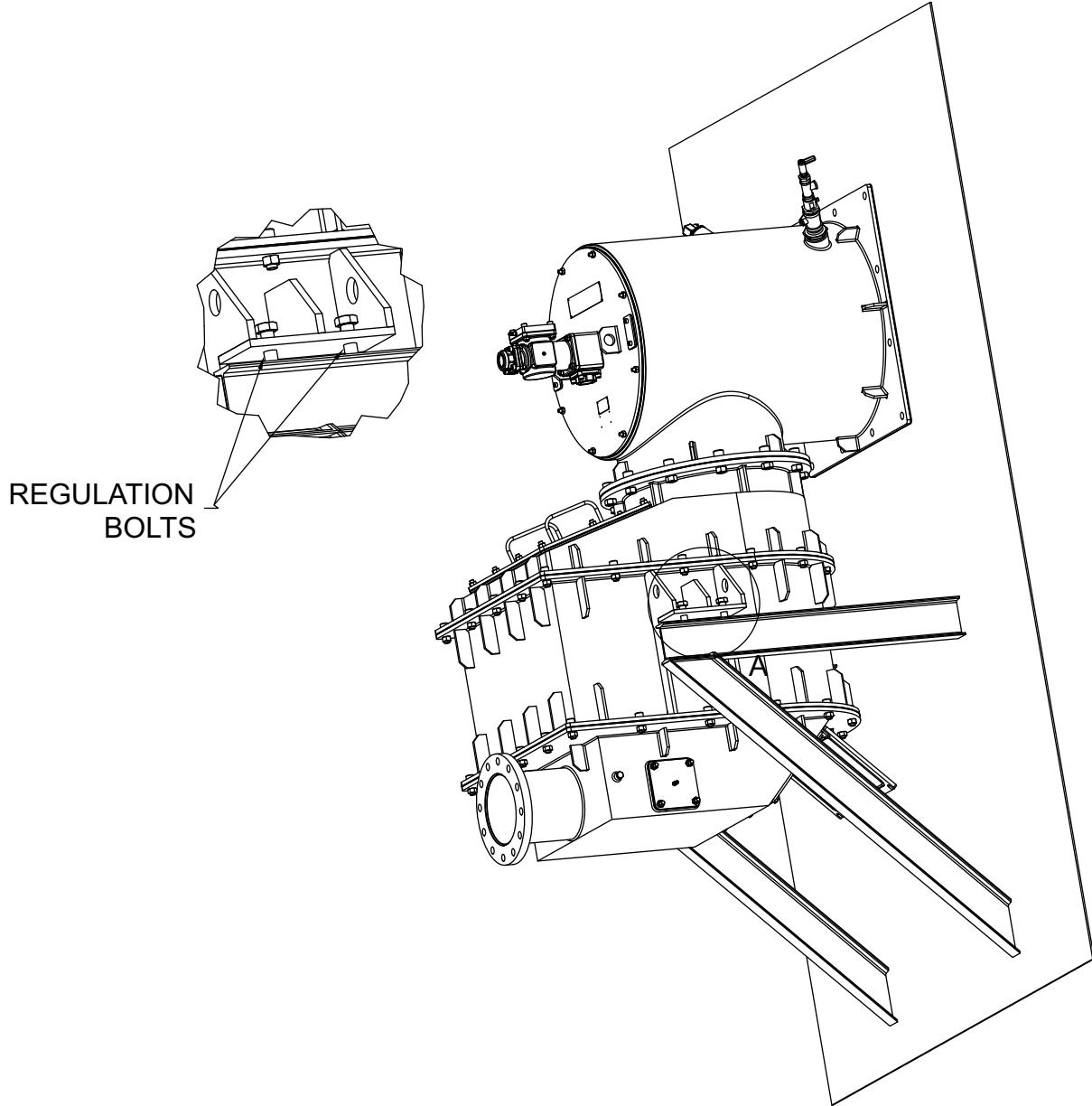


D3905I03

## INSTALLATION

Once the regenerator and burner have been connected with bolts and nuts (making sure not to damage or deform the gasket between the two), adjust the nuts (or rods) of the shelves so as to lighten the weight of the regenerator for the burner (the weight of the regenerator must only weigh

on the furnace support structure and not on the burner). In any case the lower part of the regenerator is not big enough to bear the load of the actual regenerator thus each support structure weighing this part down will damage it.

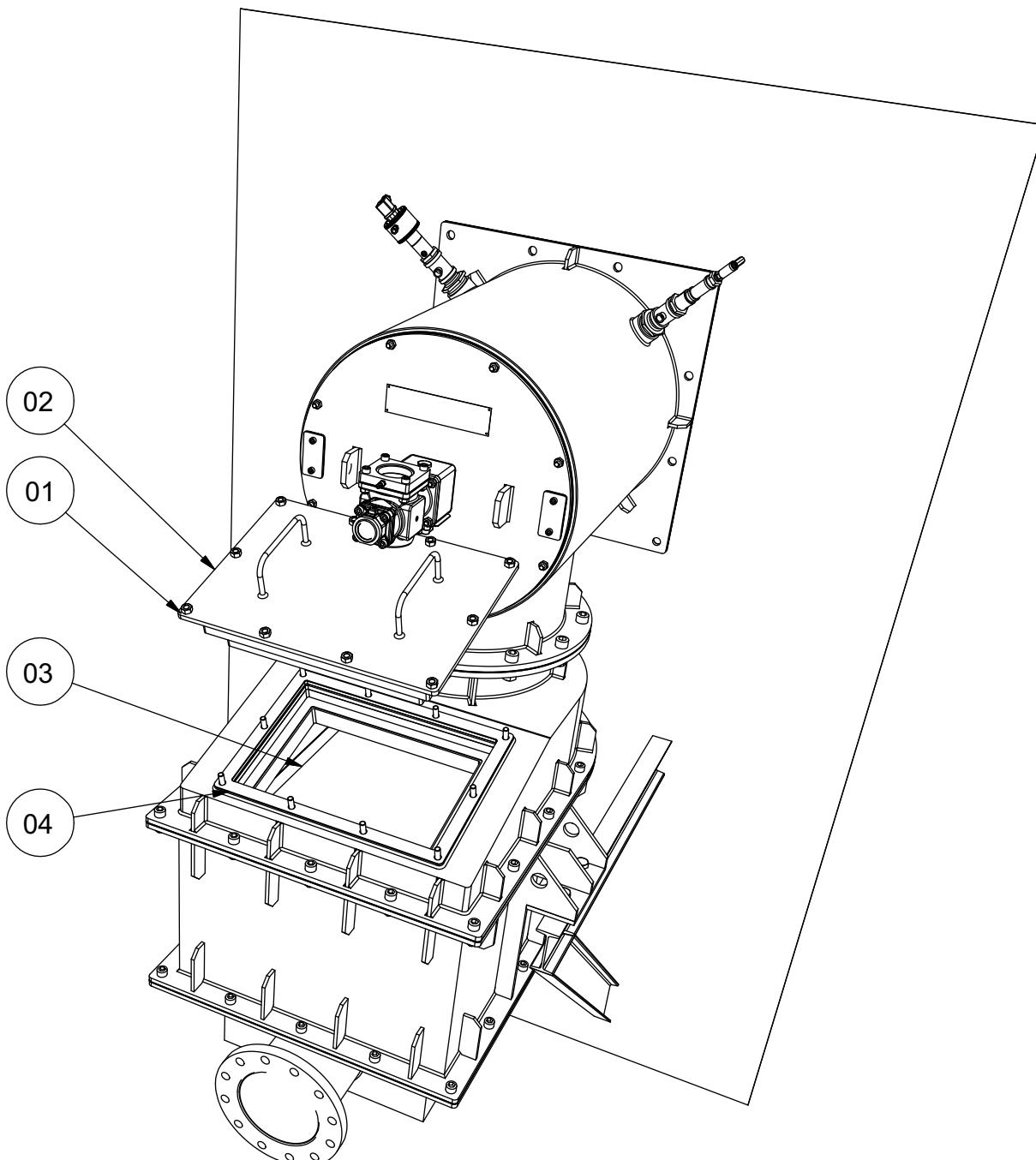


## INSTALLATION

- Unscrew the nuts (**pos. 01**) from the upper load door.
- Remove the door (**pos.02**), being careful not to damage the gasket (**pos.04**).
- Fill the regenerator body with ceramic balls (**pos.03**) according to the size and quantity indicated by ESA PYRONICS.

Avoid dropping the balls from too high up. Once the balls are loaded make sure that they are evenly spread on the surface, avoiding localized accumulation.

- Close the upper door again (**pos.02**), replacing the gasket if damaged.



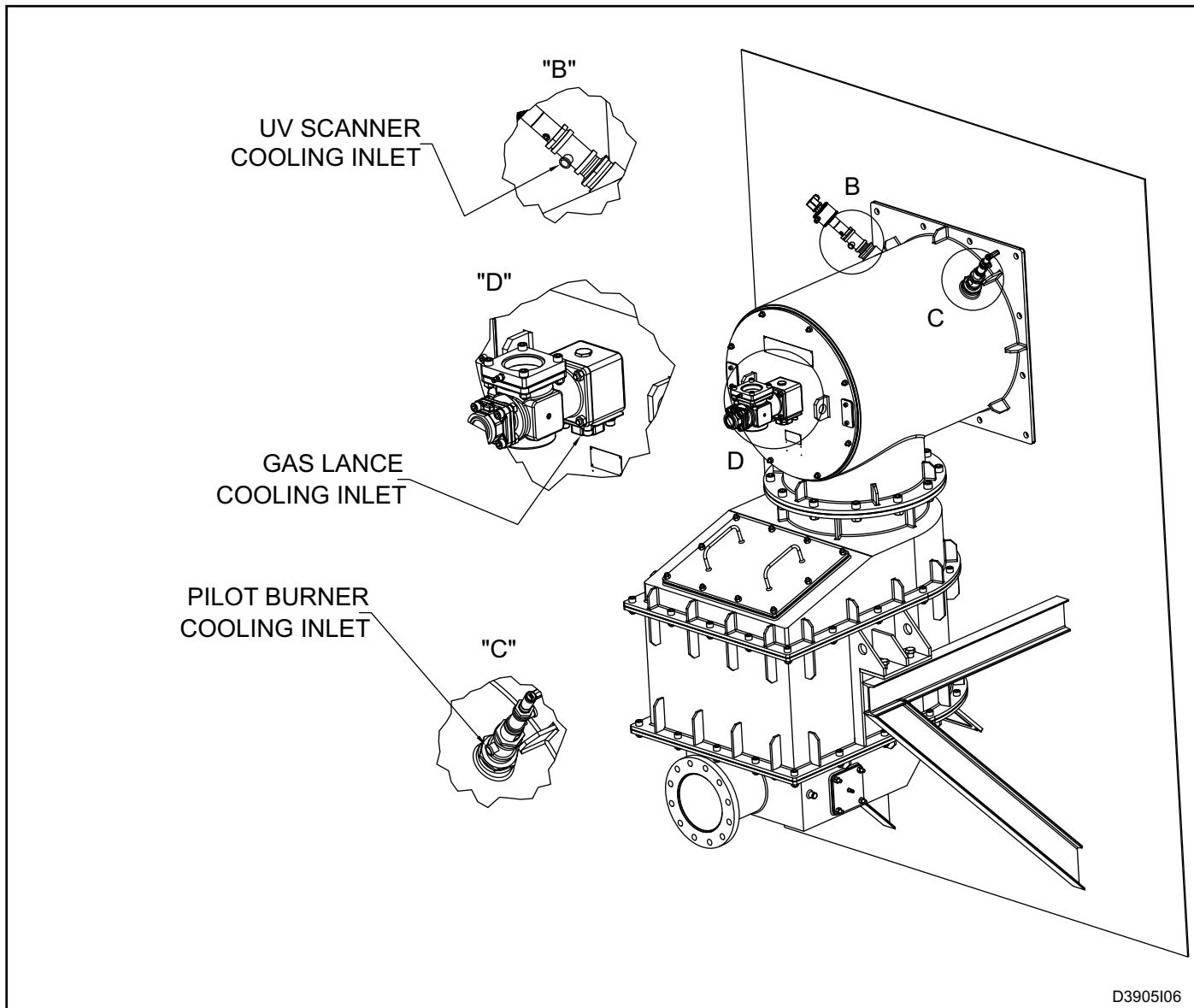
D3905I05

## INSTALLATION

### COOLING LINE INSTALLATION

The REGE-NxT burners are supplied with various cooling

air inlets. Each of these must be sized and connected to guarantee the correct air ratio and avoid damage to the internal organs that are cooled.



D3905I06

#### Main lance cooling inlet

To keep the gas lance from overheating during the combustion fume suction phase, connect the "D" inlet to the air collector to guarantee an air flow of about 18Nm<sup>3</sup>/h for every burner capacity MW. Refer to the capacity chart for correct flow values.

#### Uv sensor ai cooling inlet

To guarantee the correct functioning of the sensor, guarantee a cooling air flow of about 2Nm<sup>3</sup>/h. If the HT cable

is used, provide a double inlet for the sensor for a total flow of about 4Nm<sup>3</sup>/h

#### Pilot burner air cooling inlet

The burner is subject to strong heating due to its position inside the air diffuser. Respect the position inside the guide tube according to ESA-PYRONICS indications. Furthermore, guarantee a cooling air flow no lower than 12 Nm<sup>3</sup>/h.

## IGNITION - SETTING

The operations indicated in the following chapter must be carried out by expert technicians or qualified operators. the non-observance of these instructions could generate dangerous conditions.

**1** - Check that the combustion air pressure exiting the blower and the fuel gas supply are within the allowed range.

**2** - Regulate the working pressure as well as the intervention pressure of the safety devices on the combustion-plant whether each burner has a device of its own or whether the devices are general for the plant. These devices include: gas pressure reducer, block valve, relief valve, pressure switches etc. Simulate safety overheating intervention checking that the fuel shut off devices act correctly.

**3** - Place the air regulation valve in the maximum opening position and regulate the burner air inlet flow, referring to the values indicated in the "Burner Performance" chapter for the maximum burner capacity (page 5)

**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.

**5** - Fully open the air regulation valve and adjust the maximum fuel capacity via the gas adjustment valve, checking the differential pressure created on the calibrated gas flange.

**6** - If necessary, with all burners turned onto the same power, analyse the combustion products in the chamber (where possible) or exiting each burner (on the flu sleeve)

**7** - Repeatedly attempt ignition at minimum burner power, with maximum amplitude, to check the ignition reliability and flame stability during the adjustment.

(\*) For ignition and setting operations of the pilot burner refer to data sheet E3280.

## GENERAL MAINTENANCE PLAN

Operation	Type	Advised time	Notes
<b>High voltage electrode connection</b>	O	annual	check integrity of outer plastic and oxidation of internal electrode terminal.
<b>Pilot burner ignition electrode</b>	O	annual	replace in case the kanthal terminal is worn.
<b>Integrity of the air diffuser</b>	S	every six months	every time the furnace is stopped for maintenance, from the inside, check that there are no cracks in the refractory material. Possible cracks must be filled with appropriate refractory material or liquid fibre.
<b>UV scanner glass cleaning</b>	O	every six months	Reduce to quarterly check in dusty environments.
<b>UV scanner replacement</b>	O	10.000 h. of functioning	In any case, every two years.
<b>Gasket replacement on gas side (**)</b>	O	every two years	see note
<b>Burner setting</b>	O	annual	Repeat the steps in the 'IGNITION AND SETTING' chapter.
<b>Regenerator</b>	O	every six months	reduce in case of process in dusty atmospherei (see pag.15)

**NOTES:**

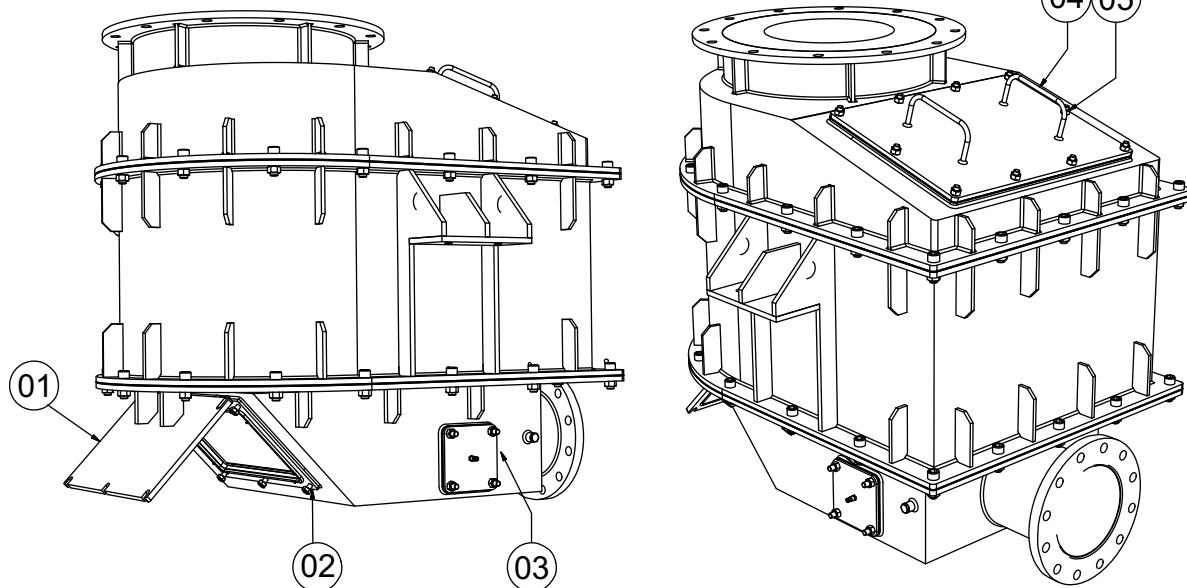
Key: O = ordinary / E = extraordinary

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

## ORDINARY MAINTENANCE OF CERAMIC BED

To ensure an excellent efficiency value for the regenerative system, the ceramic bed of all the regenerators must be maintained at least every six months (more fre-

quently however if the application involves flu gases that are highly polluted by dust or debris in general).



D3905I07

### Maintenance consists in the following:

- Cleaning of the ceramic balls from dust or substances which may reduce their heat conduction.
- Replace damaged or worn ceramic balls
- Visual check of the inside of the regenerator.

### To empty out the ceramic balls from the regenerator, scrupulously follow the instructions below:

- Equip yourself with a large enough container that can hold the ceramic balls. The container should be at least twice as wide as the unloading flap (**pos.01**).
- Place the container under the unloading flap.
- Unscrew the bolts of the lower flap (**pos.02**) keeping the flap closed.
- Slowly open the flap: the ceramic balls will begin to roll out into the container below. The flap has limit stoppers which prevent the balls from pouring out into the front of the regenerator.
- Unscrew the nuts (**pos.05**) from the upper loading flap (**pos.04**).
- Remove the upper loading flap: from the eyeglass, make sure that there are no ceramic balls left inside and that none fell out from the front on the regenerator. If so, remove them from inside.

- Once the regenerator has been emptied visually check the inside of the regenerator to verify the conditions of the internal refractory material. Also check the integrity and cleanliness of the metallic grid on which the ceramic bed is placed.

- To clean the bottom of the regenerator, open the flange (**pos.03**) (the one on the right as well as the one on the left) and with a special instrument, suck up all dust or debris deposits on the bottom.

### To load the regenerator with the regenerated ceramic balls scrupulously follow the instructions below:

- Close the bottom flap (**pos.01**) and the side flanges again (**pos.03**) (replacing where necessary, gaskets and packing sealants).
- From the top, load the ceramic balls. Avoid dropping them from too high up preventing them from breaking during this phase. Once the balls have been loaded, make sure that they are evenly spread on the surface avoiding localized accumulations (if necessary smooth them out)
- Close the upper flap again and if necessary replace the gasket.

## ORDINARY MAINTENANCE

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

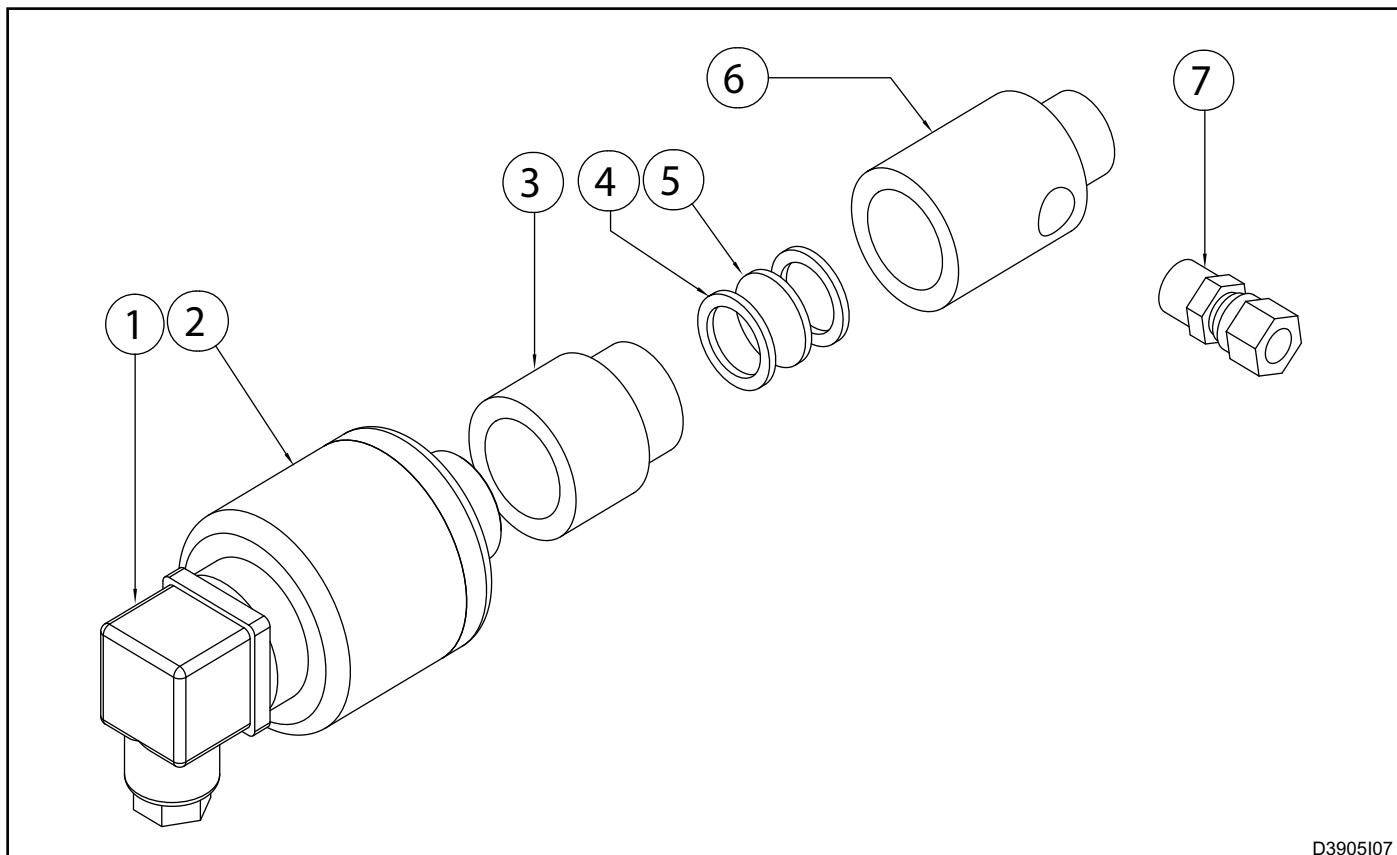
### CLEANING OF UV-SCANNER WATCH GLASS

- 1 - Check that the burner control device is disconnected.
- 2 - Disconnect power supply to the uv-scanner (**pos. 01**) and the cooling line (where present **pos. 07**).
- 3 - Unscrew the aluminium pipe fitting (**pos. 06**) at the base of the gas collector, removing the uv-scanner with its spacer.

4 - Unscrew the aluminium fitting from the insulation teflon connector (**pos. 03**) and remove the quartz watch glass (**pos. 05**).

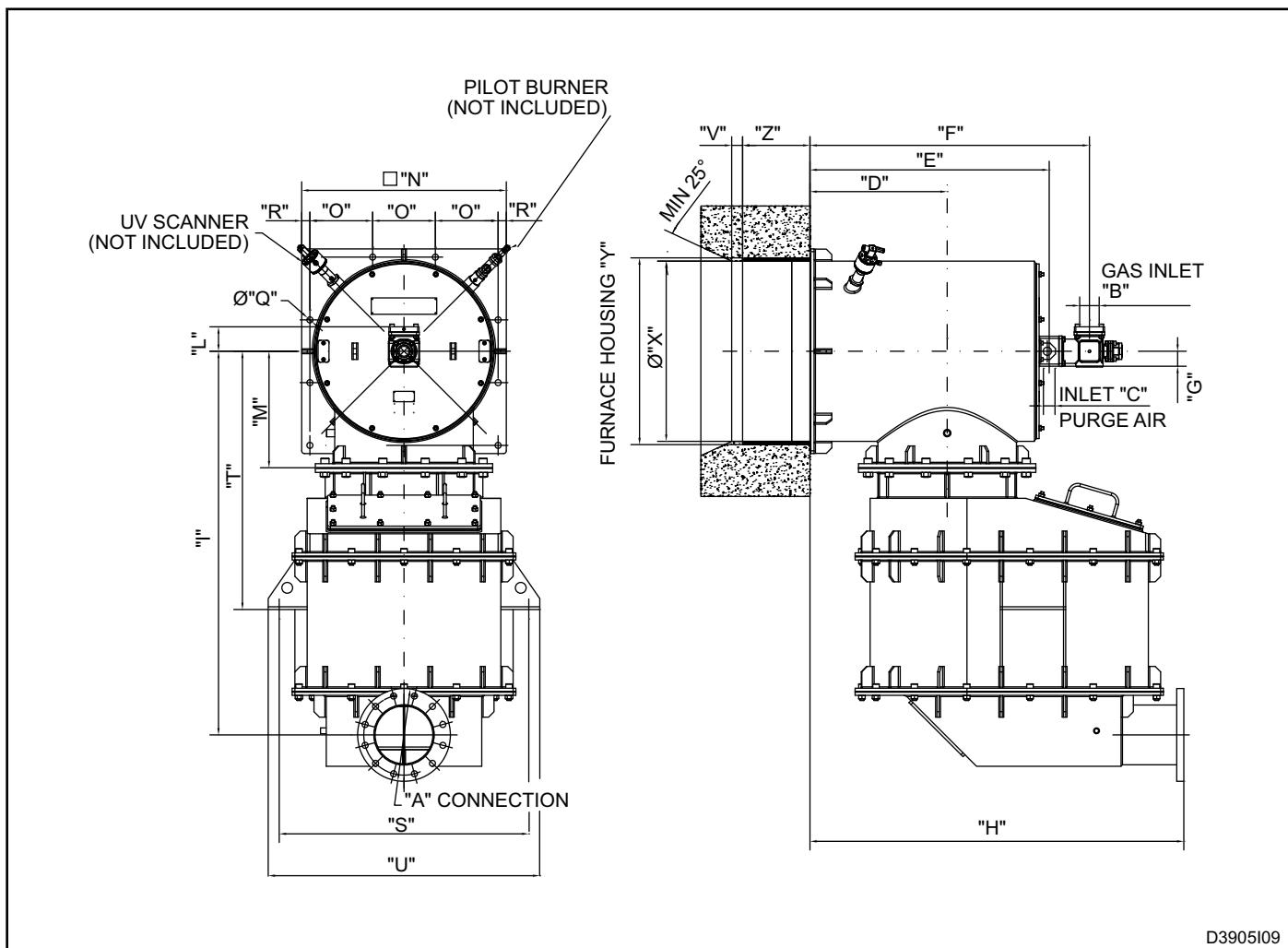
5 - Clean the quartz watch glass with a damp cloth and proceed to reassemble everything making sure that both the glass as well as the gaskets are put back in the correct positions (**pos. 04**) between the aluminium teflon spacer, before tightening.

- 6 - Restore the cooling hoses and power connection.
- 7 - Check the correct flame detection of the uv-scanner.



D3905I07

## OVERALL DIMENSIONS - REGE-NxT



D3905I09

Burner model (*)	A PN16	B	C mm	D mm	E mm	F mm	G mm	H mm	I mm	L mm	M mm	N □ mm	O mm	Q Ø mm	R mm	S mm	T mm	U mm	V mm	X mm	Y mm	Z mm	Mass Kg (**)
REGE-6-NxT	DN150	DN40	Rp1"	463	757	878	111	1083	1281	68	357	600	180	18	30	770	857	870	40	490	530	227	990
REGE-7-NxT	DN150	DN40	Rp1"	492	826	947	109	1209	1366	68	407	650	200	18	25	800	897	900	40	540	580	248	1245
REGE-8-NxT	DN150	DN50	Rp1"	492	824	974	82	1239	1386	90	427	680	210	18	25	850	927	950	40	590	630	250	1450
REGE-9-NxT	DN200	DN65	Rp1.1/4"	543	882	135	91	1411	1386	90	427	750	230	22	30	940	927	950	40	640	680	250	1801
REGE-10-NxT	DN250	DN80	Rp1.1/2"	543	984	1167	111	1592	1481	115	489	900	280	22	30	1040	987	1140	50	762	780	250	2500
REGE-11-NxT	DN300	DN80	Rp2"	690	1132	1310	111	1765	1560	115	527	980	310	20	25	1110	1067	1210	50	812	852	250	3050
REGE-12-NxT	DN350	DN100	Rp2"	673	1152	1335	111	1837	1686	115	607	1050	330	24	30	1190	1147	1290	80	880	930	250	3700

(\*) Other sizes on request

(\*\*) Total mass including burner, regenerator and ceramic bed.

## ORDERING CODE - COMPLETE BURNER

REGE -   - NxT -   -   -   -   -   -   -  

01                    02                    03                    04                    05                    06                    07

Model		01
REGE-4-NxT	4	
REGE-5-NxT	5	
REGE-6-NxT	6	
REGE-7-NxT	7	
REGE-8-NxT	8	
REGE-9-NxT	9	
REGE-10-NxT	10	
REGE-11-NxT	11	
REGE-12-NxT	12	

04	Pilot burner	
Pilot		P
Without pilot		NP

Gas adjuster		02
With gas adjuster		
Flanged	GA*	F

05	Detection	
With UV sensor		UV
Without UV sensor		ND

Fuel		03
Natural gas	CH4	
LPG	GPL	
Poor gas	GP**	

06	Functioning mode	
Flame		F
Flameless		FL(***)

The codes with an asterisk (\*) identify the standard products.

(\*\*) special design on request.

(\*\*\*) Flameless kit on request / GA (Gas Adjuster) inlet not possible.