

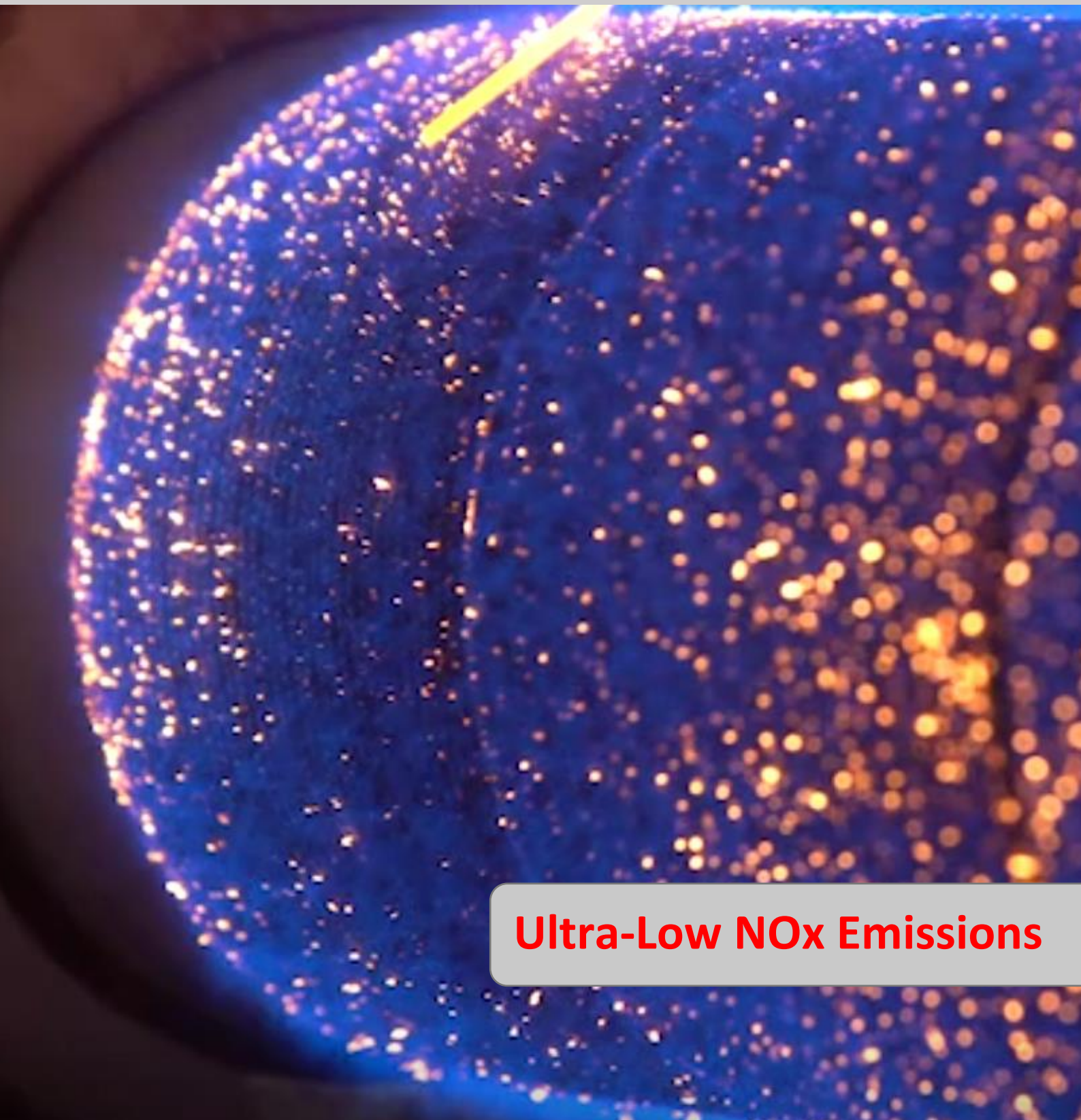


- raadman -

## Pre-Mixed and Post-Mixed gas burners (PB- Series)

From 100 kW up to 4000 kW

[www.packmangroup.com](http://www.packmangroup.com)  
[www.raadman-burner.com](http://www.raadman-burner.com)



**Ultra-Low NOx Emissions**



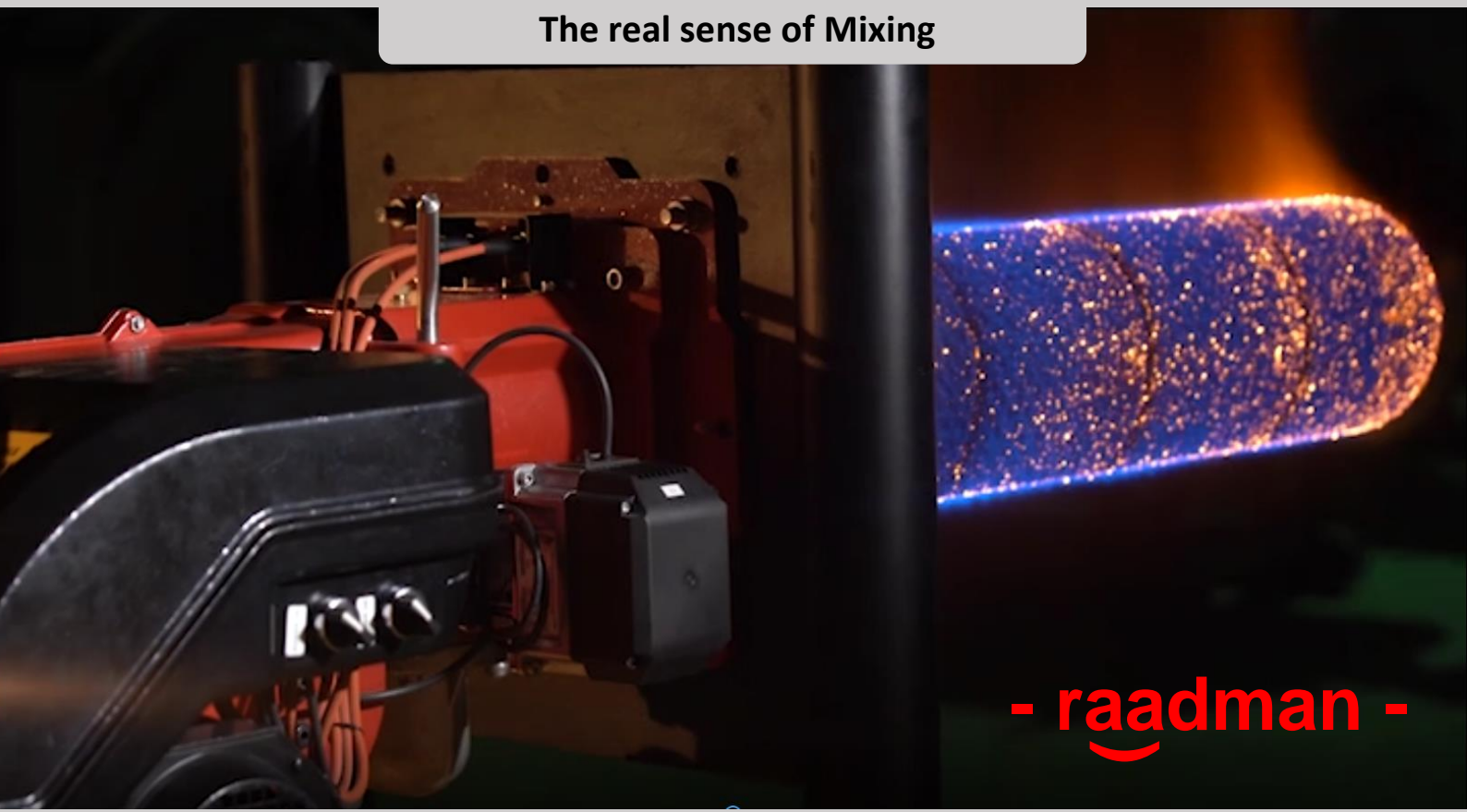
More than  
**48 Years of Reliability**

# History

The PACKMAN Company was established in February of 1975. This company started its official activity in the field of construction of High-Pressure Vessels such as Hot-Water Boilers, Steam Boilers, Pool Coil Tanks, Softeners and Heat Exchangers from 1984. As the first supplier of Hot water boilers with high quality and standard mark, PACKMAN has started exporting its products to countries such as Uzbekistan, United Arab Emirates and other countries in the region. Currently, PACKMAN honor-fully is one of the largest producers of hot-water and steam boilers in the Middle East. After 40 years of experience in the field of heating industry, especially boilers and burners, this group started his activity on January 2011 in the area of burners with brand of RAADMAN. The main objective of this group was improvement and development of industrial burners in order to produce high quality and highly efficient industrial burners with optimum operation in the Middle East. Based on technical knowledge and engineering design of industrial burners, PACKMAN Corporation started the production of low, medium and big sized industrial burners. By the efforts of engineers of R&D department, the burner's combustion improved significantly and as a consequence, the production of burners developed rapidly. Gas, Light oil (LFO), Heavy oil (HFO) and dual/triple fuel burners with different firing ranges were produced and tested successfully.

Nowadays, the burners of this company cover a firing range of 100 to 40000 kW. Single stage, double stage, modular and Low NOx burners (generally lower than 80 mg/kWh and individually lower than 40 mg/kWh) are available for various domestic and industrial applications. High quality, optimum operation and customer satisfaction has always been considered in the production of RAADMAN burners. Diversity and high quality of RAADMAN burners, besides their easy installation and maintenance make them a perfect selection for many customers.

**The real sense of Mixing**



**- raadman -**



# A new class of emissions:

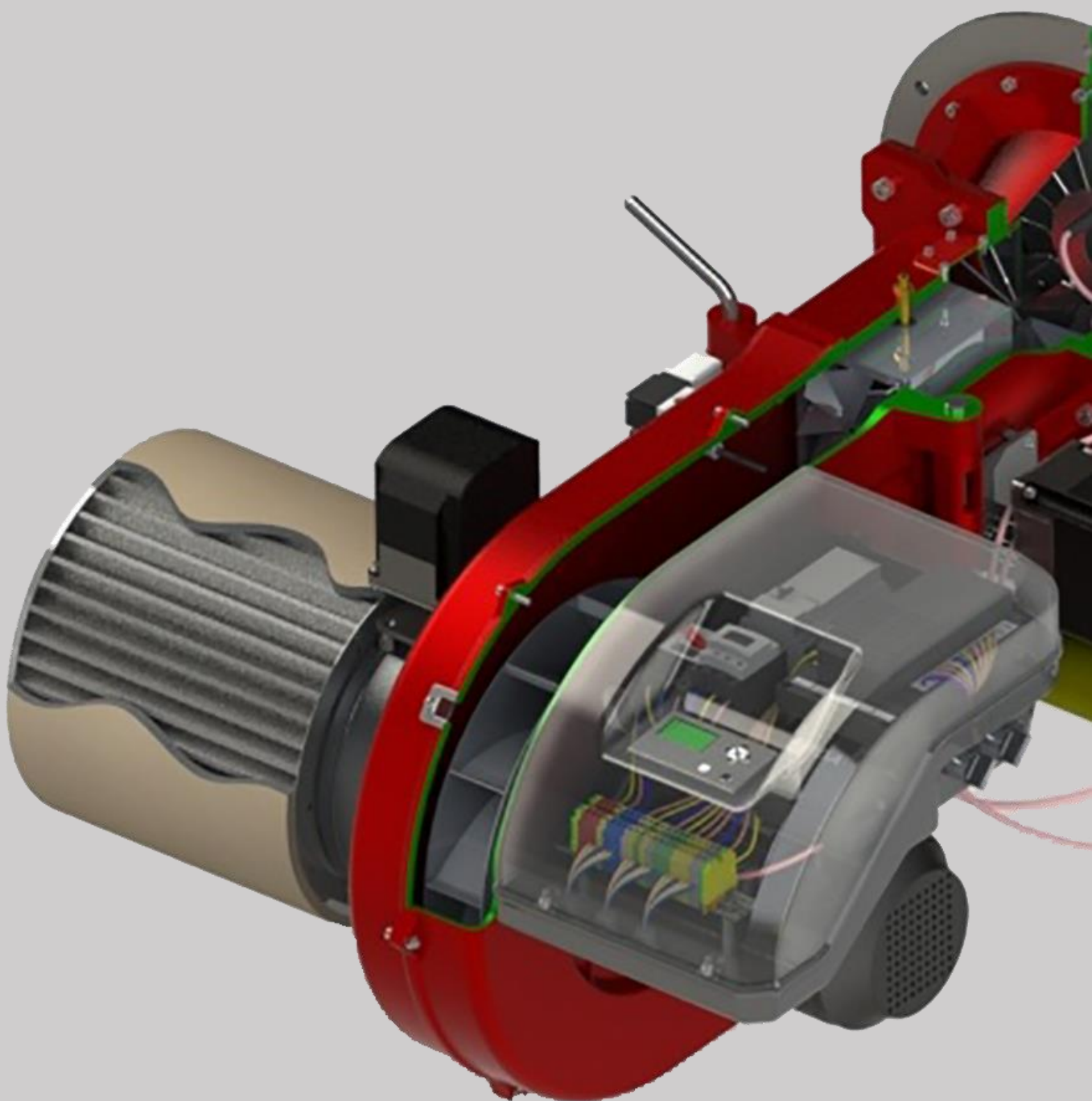
## **PB-Series Burners**

### **Ultra-Low NOx**

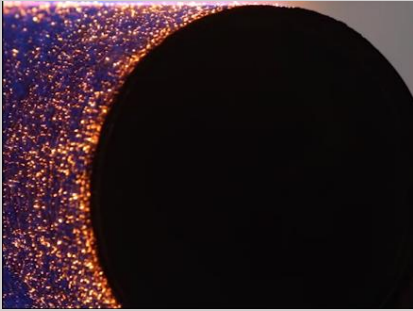
Today, high fuel consumption and environmental pollution are serious problems, especially in industrial societies. The combustion industry plays a significant role in stated pollutants.

For more than one decade, PACKMAN Low NOx burners have been used on a wide variety of heat generators and industrial plant. Currently, PACKMAN delightfully introduces new generation of Ultra Low NOx pre-mixed as well as post-mixed burners known as PB-Series.

The Raadman PB burner series are applied wherever the very lowest of emission levels are being demanded. A further advantage of this type of combustion system is that it can be utilized on appliances with particularly small combustion chambers.



# Raadman premix technology for extremely low NOx emission



Fiber metal heating head is made of a steel chamber with a coating of metal fibers. Metal fibers are manufactured fibers composed of pure metals and metallic alloys which can be processed into textile products, porous media, plastic-coated metals, etc.

This permeable thermal coating releases most of the heat transfer through the radiation mechanism, part of which radiates from the hot surface of the thermal head and the other part from the radiation of hot combustion gases. These heating heads are produced in different ways, two of the most common production methods are weaving fibers and vacuum forming.



Raadman burners have always been particularly efficient and environmentally friendly. Premix burner technology is used to achieve NOx emissions below 15 ppm and even lower. Premixing followed by surface-stabilized combustion has been state of the art for many years in small condensing boilers. It is environmentally friendly, reliable and efficient. Extending these benefits to typical heat generators with larger outputs was the developmental goal for the PB burner series. Special gas / air mix Stabilized surface combustion relies on a homogeneous gas / air mixture. For that reason, a completely new mixing assembly was developed for the PB burner series. A key feature in post mixed burner is the separated feed of gas and air, the two media are not mixed together upstream of the burner head. A uniform mixture is created by the gas flow through the distributor and the combustion air that has been set in rotation by the swirl plate.



An important feature of these thermal heads is their rapid cooling process, which will occur only a few seconds after the burner is getting turned off, during the post-purge period.

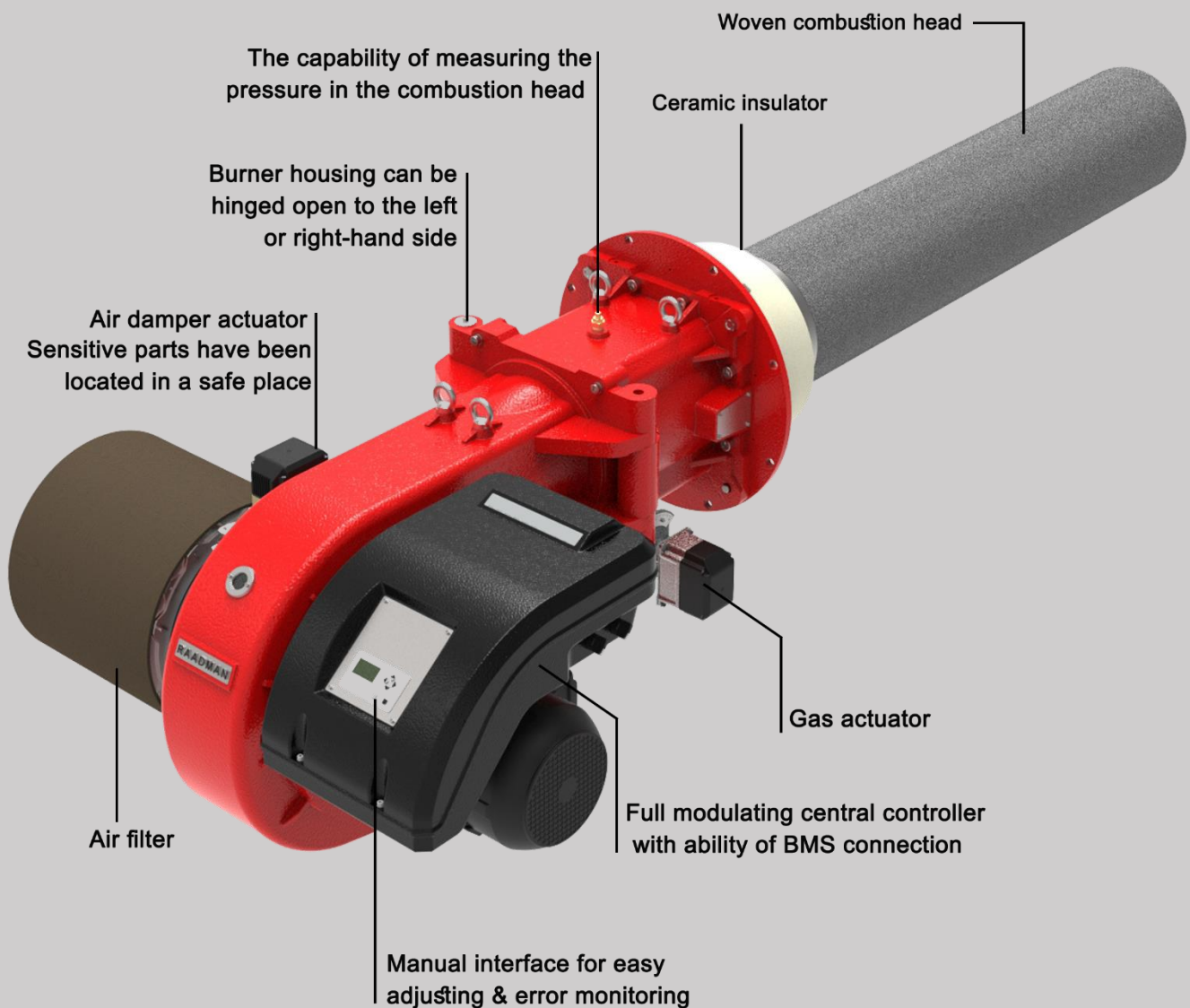
The orifices of these type of burner heads are approximately 150 microns, therefore the combustion air must be cleaned from the dust and particles. For this reason, a 50 microns filter is suggested to be applied at the entrance of burner air damper. If the orifices become clogged, the temperature rises dramatically and causes the head failure.

In addition, excess air plays a critical role into their life span. Even though they could last for 7-10 years in sufficient excess air condition, they would last only 20000 hours in low excess of air.

# Raadman Post-Mixed Burners

In nozzle mixed burners, fuel and air enter the combustion head from independent paths and are mixed by diffuser and flow swirling blades. The idea of designing premix burners has been formed to increase the Homogeneity of mixture, and consequently increases the combustion quality of the burner and reduce NOx and CO emissions.

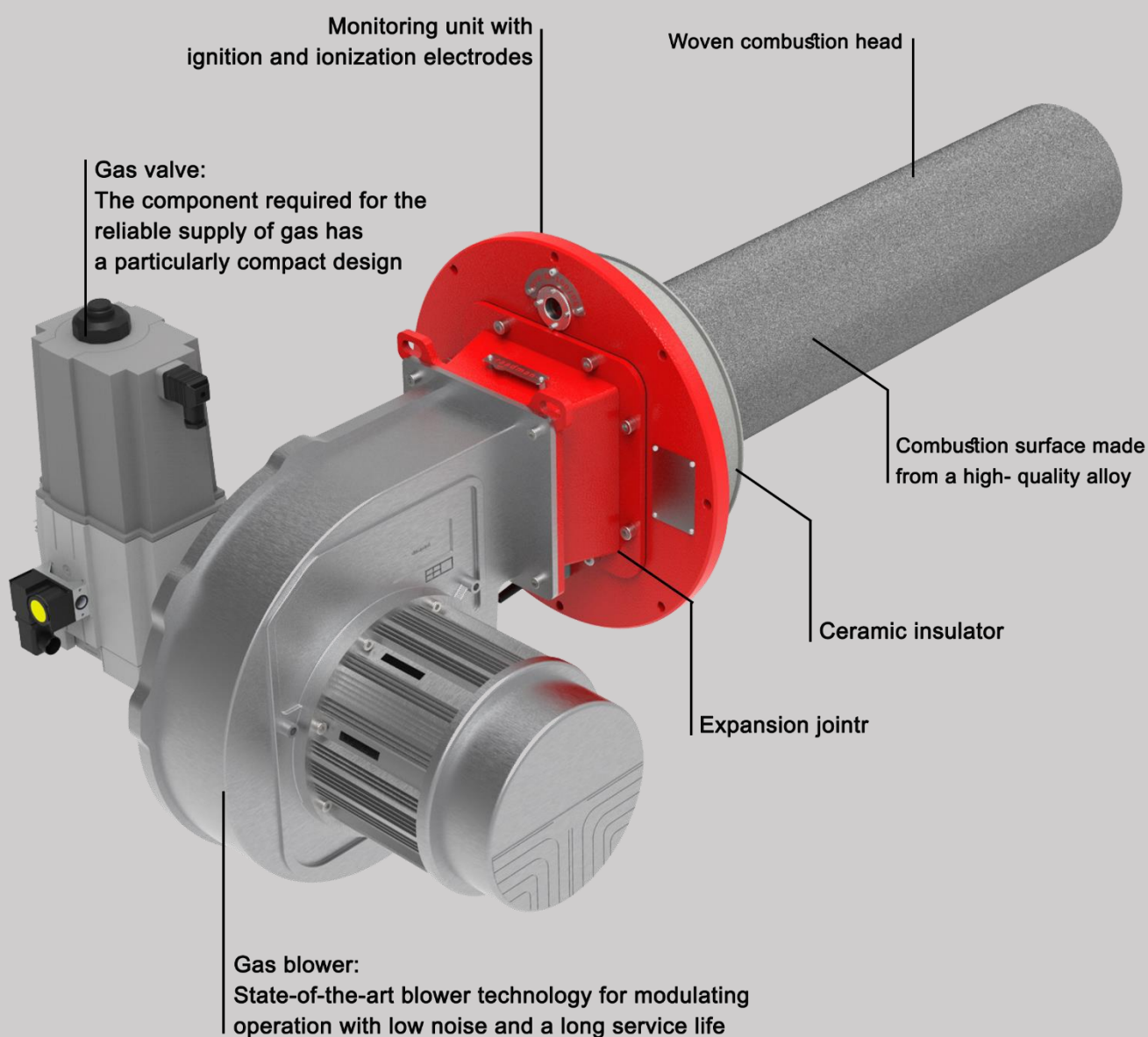
The mixing head has been innovatively designed for complete mixing of fuel and air using staging mechanism and a set of flow rotating blades. The fuel and air are injected from independent paths and are mixed through two rows of rotating blades, due to the creation of vortices and turbulence in the flow.



# Raadman Pre-mixed Burner

Raadman pre-mixed burners equipped with a centrifugal fan and a brushless electromotor that guarantee high performance, low sound emission and optimized speed variation. The motor speed variation controls the regulation of gas delivery. Pre-mixed burner gas train consist of a pneumatic proportioning multiblock gas valve that regulates gas input by fan pressure feedback.

Thanks to standard mixing venturis, Gas and combustion air are completely mixed before the fan wheel. Using the PWM pulse and, as a consequence, controlling the rotation of blower, the mixture is transferred to combustion area. Finally, A well spark, results a pre-mixed flame with minimum pollutions.





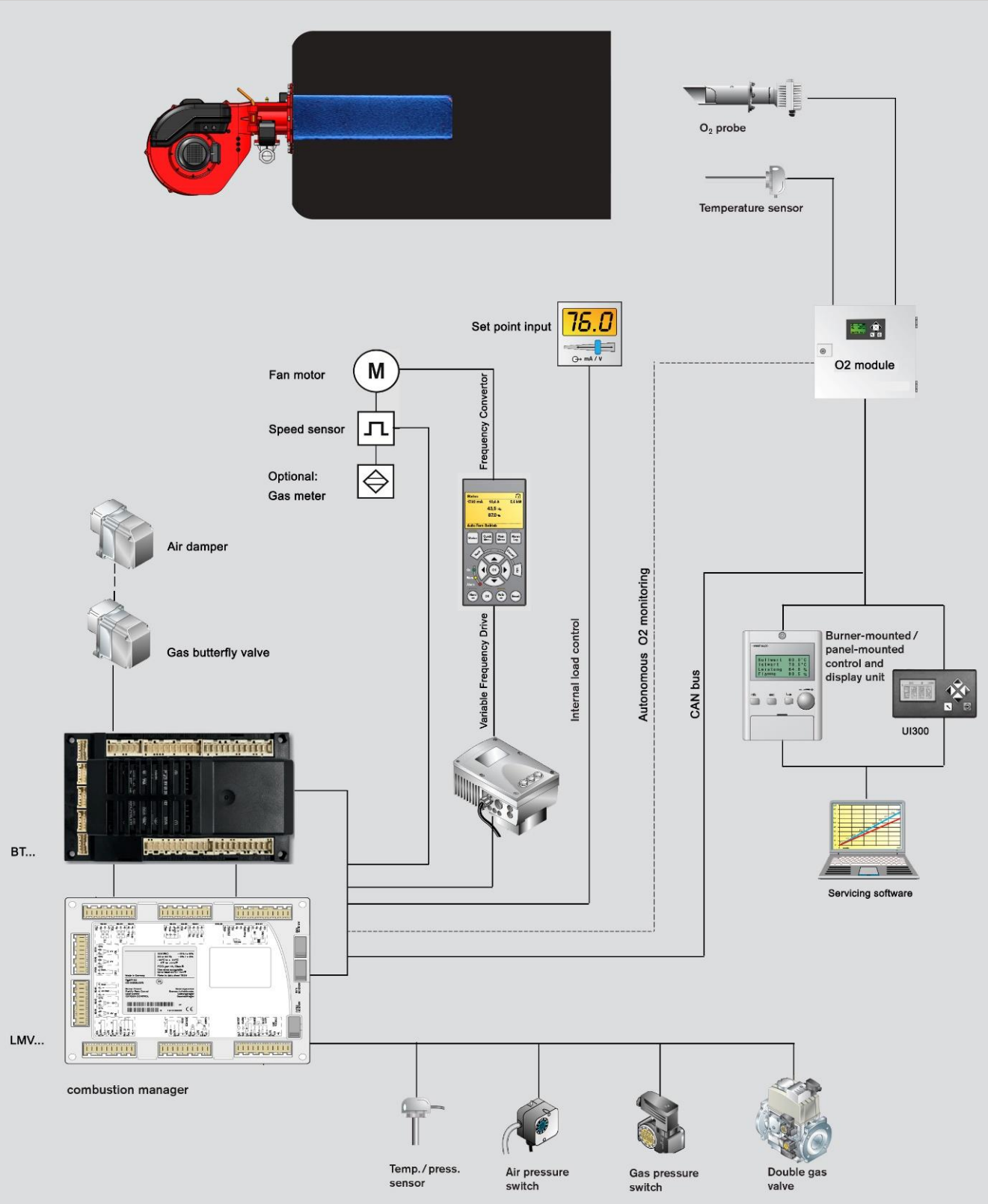
# Electronic modular operation

Full electronic modulating burners are designed to safely operate throughout its firing range from high fire to low fire. The most common turndown ratings in PB-Series burner are 1:5 up to 1:6. High turndown is used to reduce the burner cycling and maintain a consistent temperature or pressure in the boiler. This is crucial if the boiler is used in an industrial process that requires a consistent temperature or pressure. PB-Series burners are equipped with an electronic microprocessor management panel, which in post-mixed burners controls the air damper and fuel servomotors and in pre-mixed burners, using PWM signals, controls fan rotational speed. Using electronic modulation, hysteresis is prevented by the precise control of the separated independent servomotors and the software linked by can - bus. The Siemens LMV26/37 and Siemens LME71, as the most popular brands used in Raadman Post-Mixed and Premix burners respectively. This burner Control System combines the benefits of an electronic fuel/air ratio controller with an electronic burner control unit.

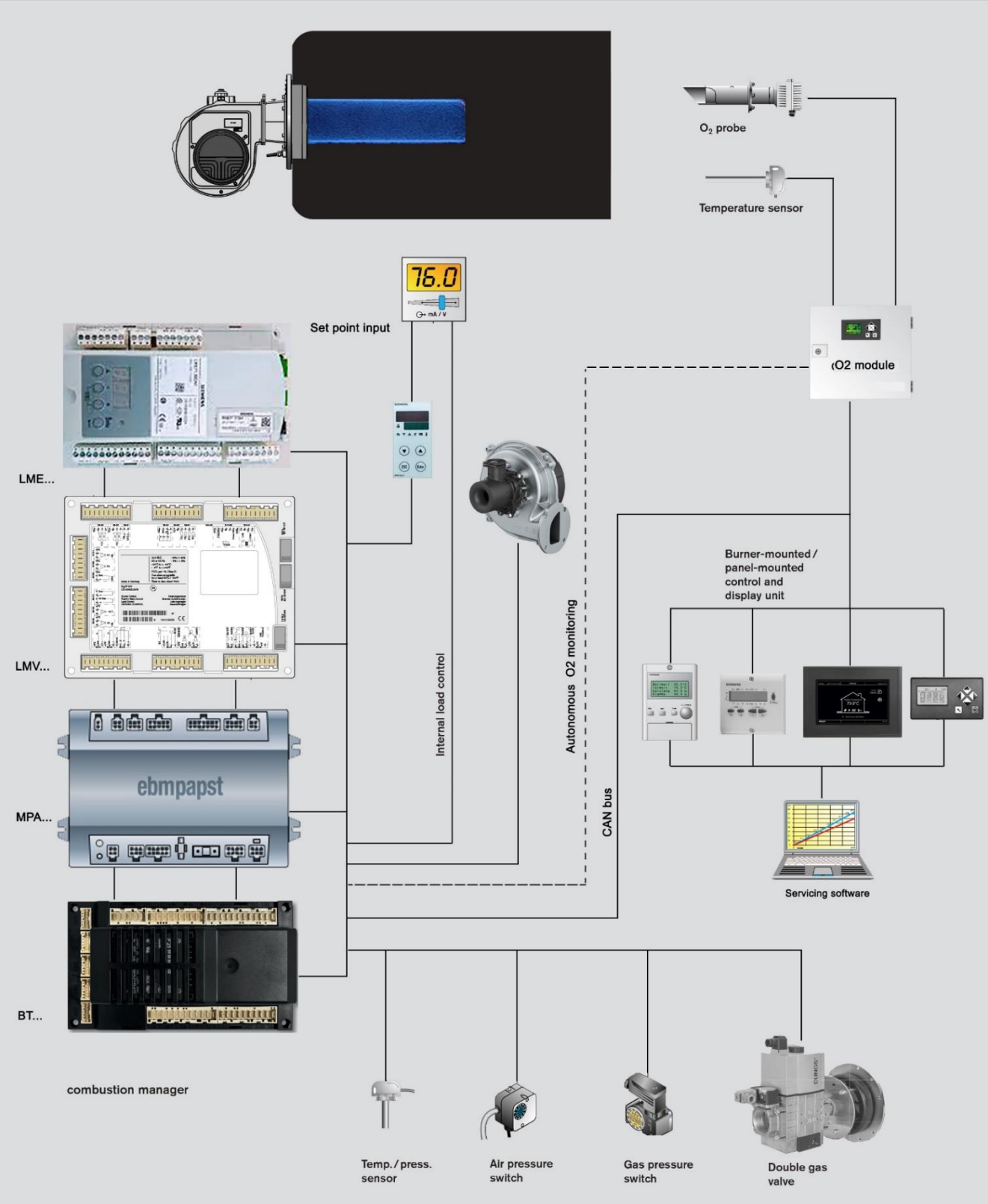




# Raadman Post-Mixed Control Management System

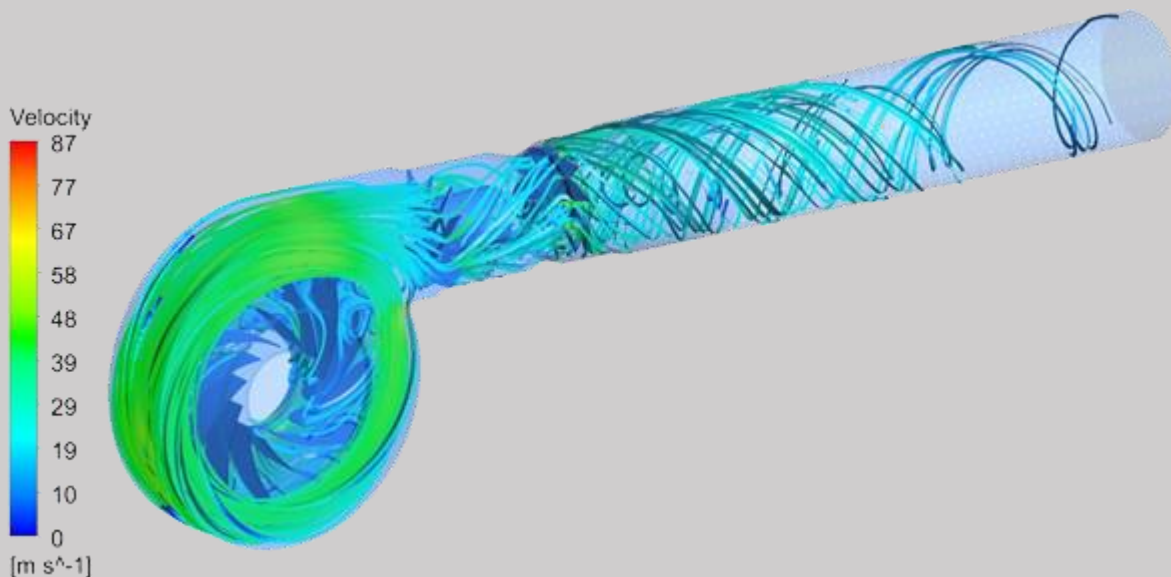
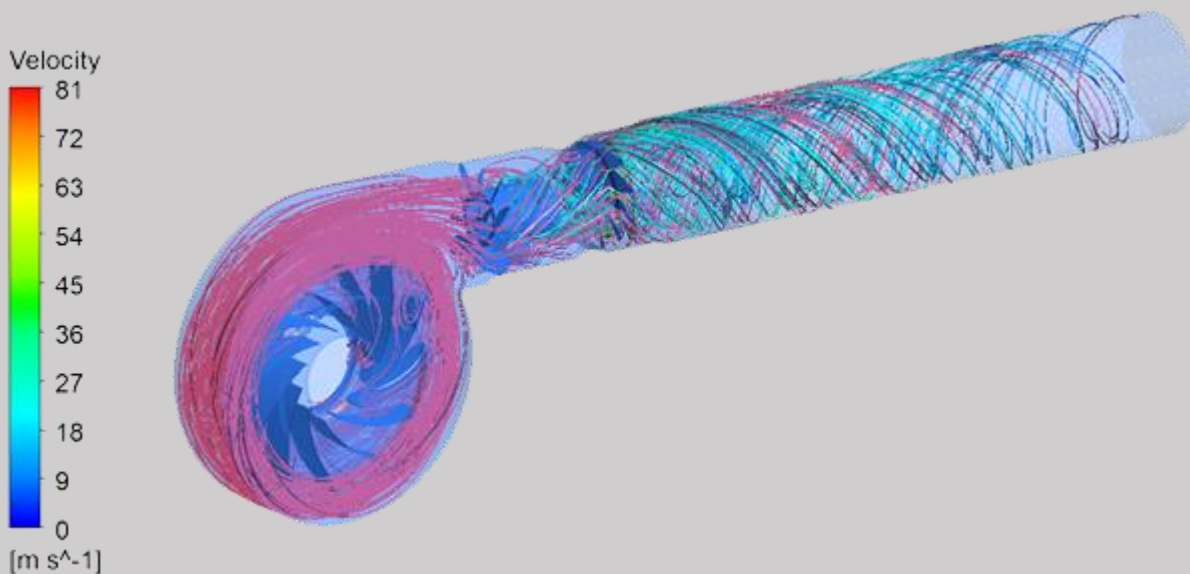


# Raadman Pre-mixed Control Management System



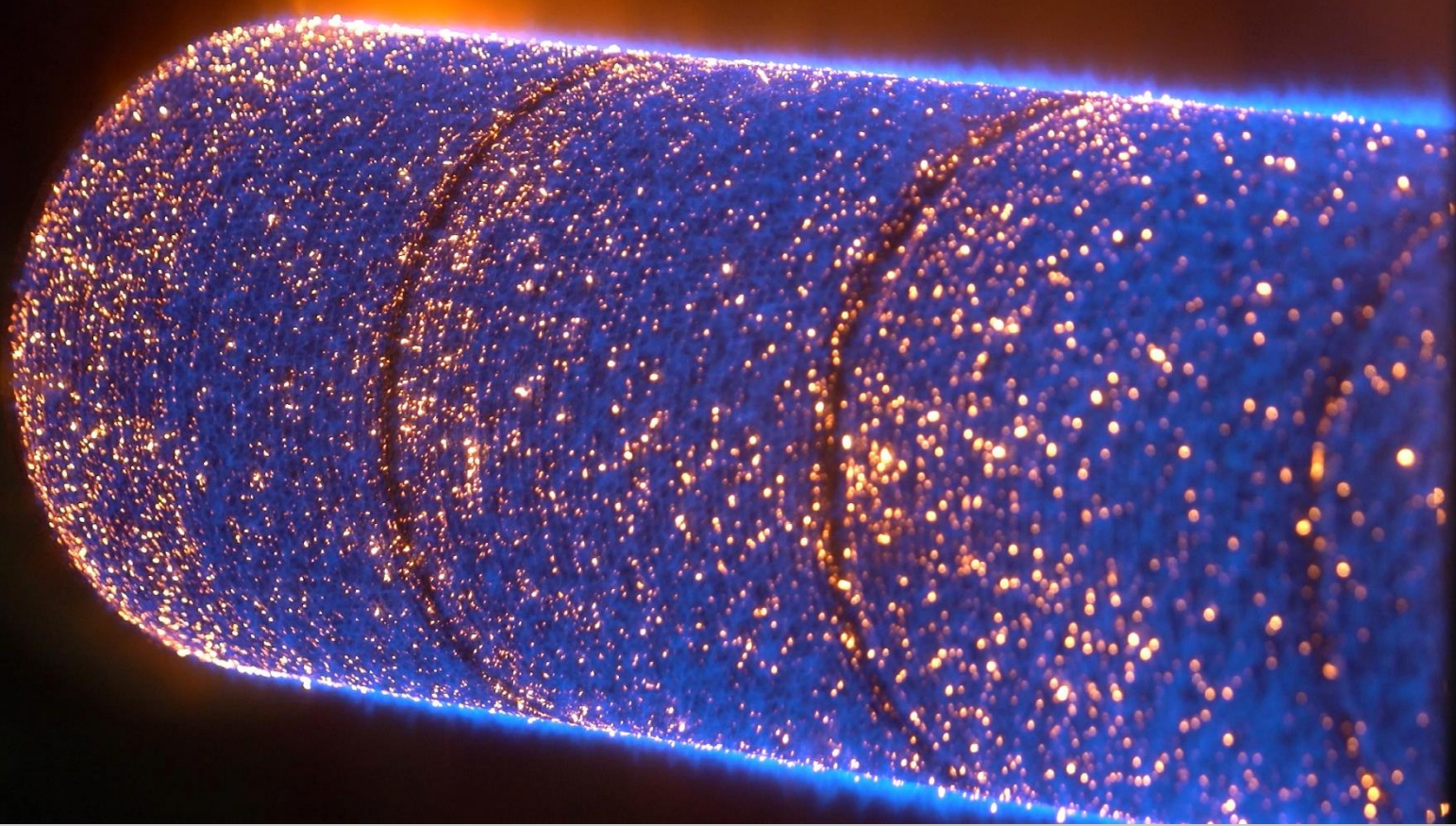
# CFD experts in R&D department

Industry relies on heat from the burners in all combustion systems. Optimizing burner performance is critical to complying with stringent emissions requirements and to improve industrial productivity. Engineers involved in designing and building advanced combustion equipment for the hydrocarbon process industries routinely use Advanced CFD to advance new burner technology. The science and technology of CFD has matured to the point where performance predictions are made with a degree of confidence from models covering a wide range of complex furnace, burner, and reactor geometries. While tremendous advances have been made in understanding the fundamentals of combustion, the remaining challenges are complex. To make improvements, it is critical to understand the dynamics of the fuel fluid flow and the flame and its characteristics. Computational Fluid Dynamics offers a numerical modelling methodology that helps in this regard. Commercial CFD codes utilize a standard approach to simulate chemical kinetics, which approximate the consumption and production of chemical species. This causes the engineer to use simplifying assumptions about the chemistry considered in the simulation. CFD can help engineers to optimize flow through orifices, blades and swirlers to achieve a homogenous mixture of air and gas.

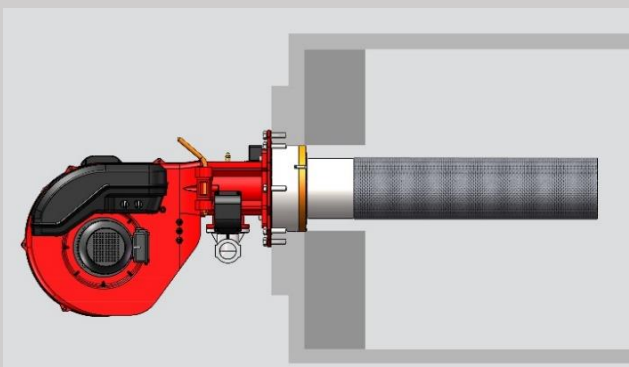
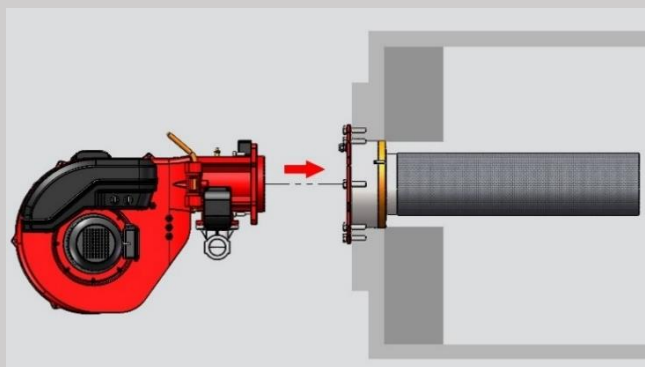
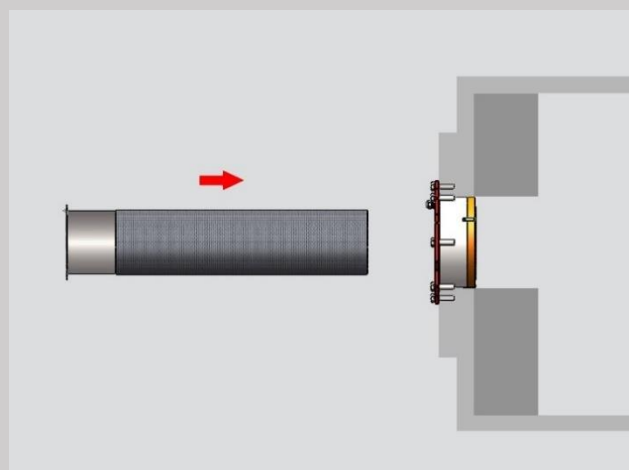
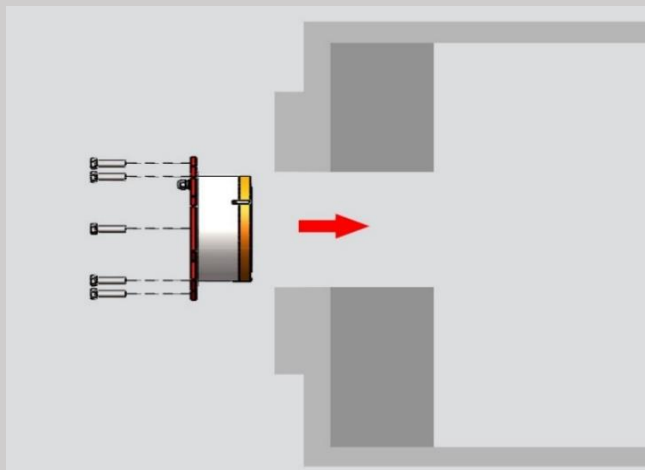




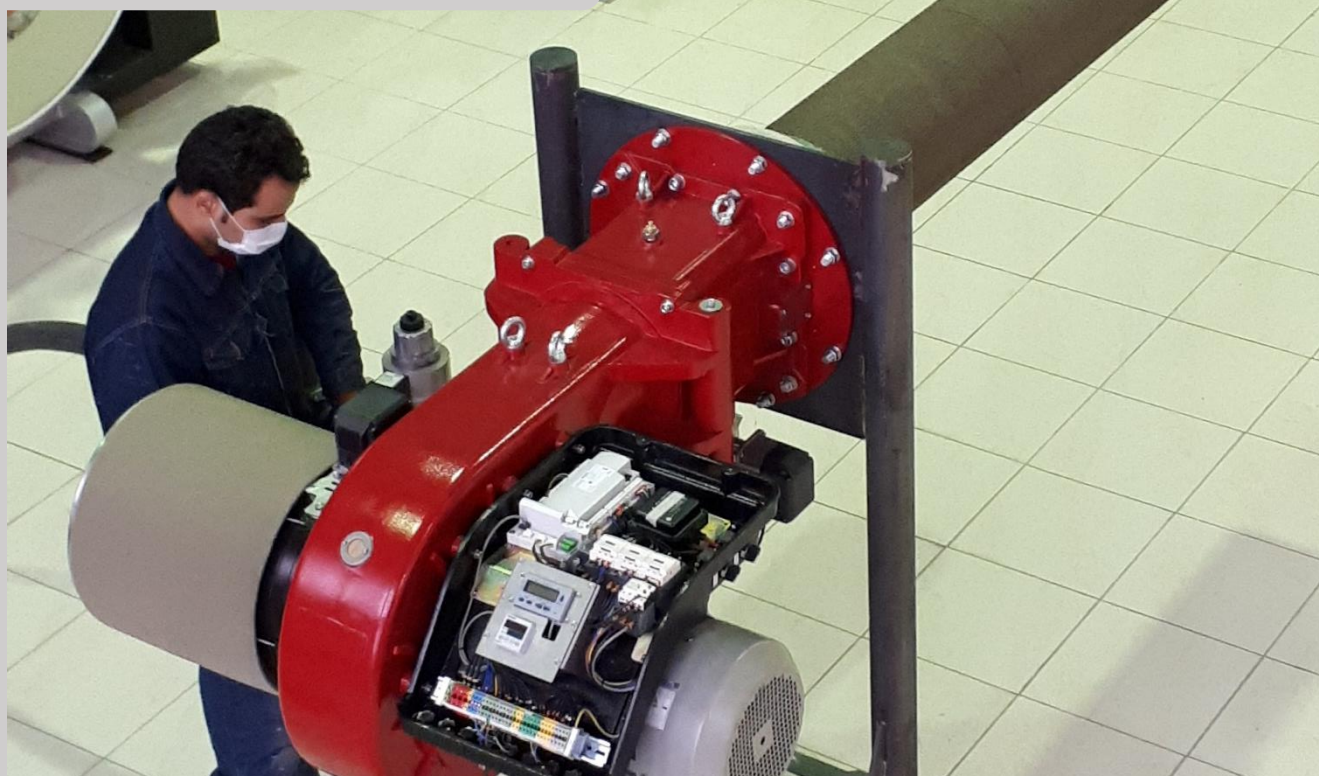
Thanks to **Ultra Low NOx** combustion technology, we are delighted to gratefully guarantee the best performance of our productions in order to meet our customer demands.



## Installation and removal of post-Mixed burners:

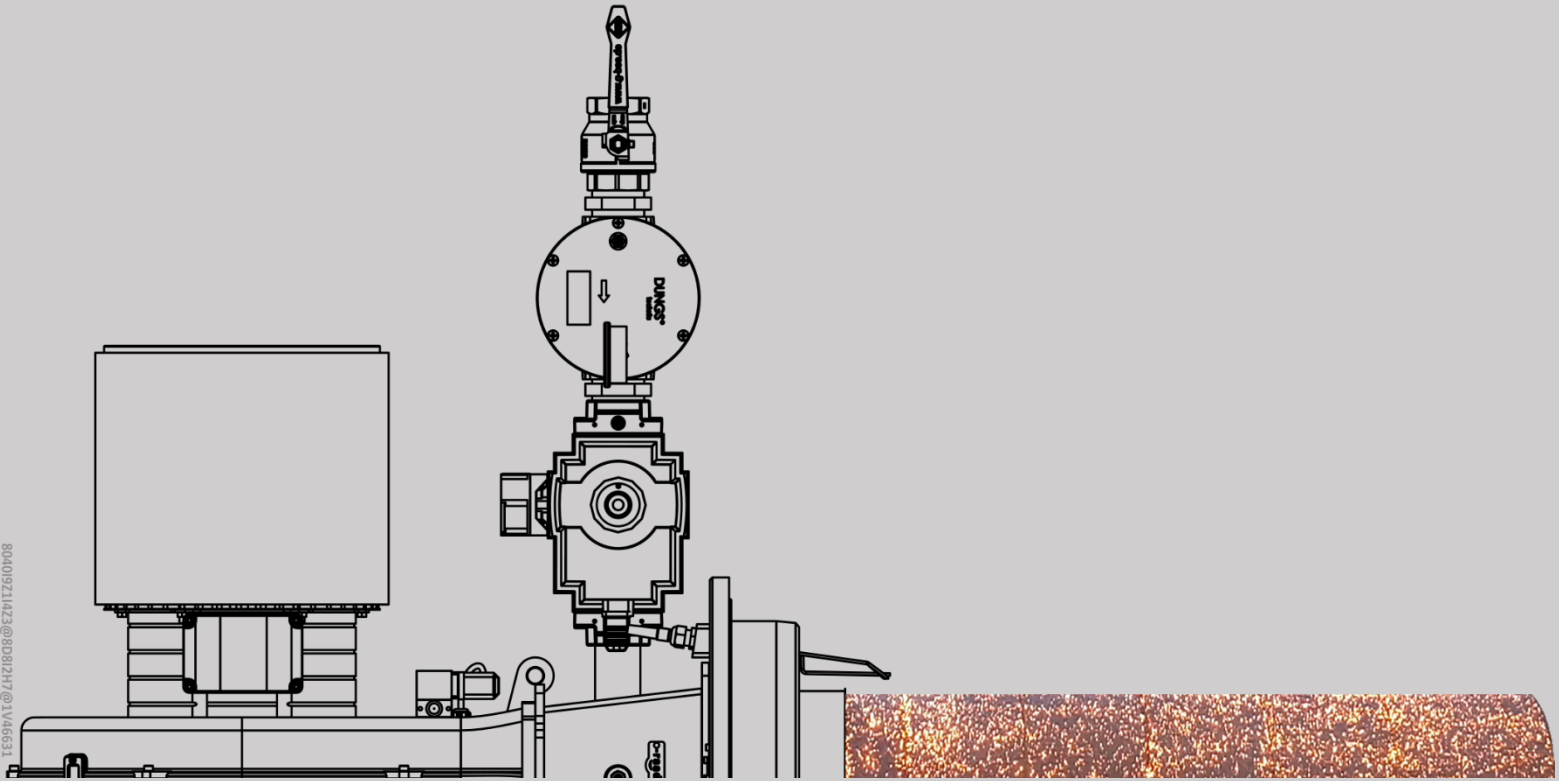
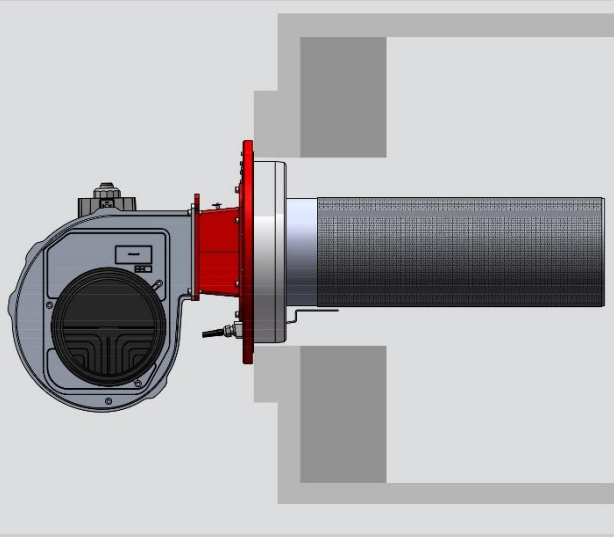
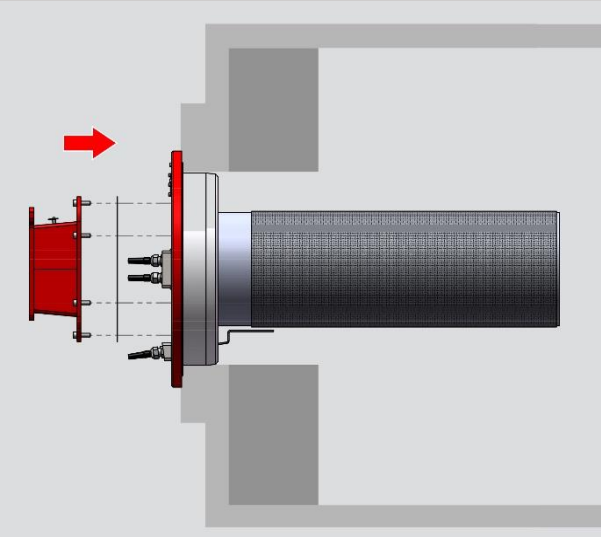
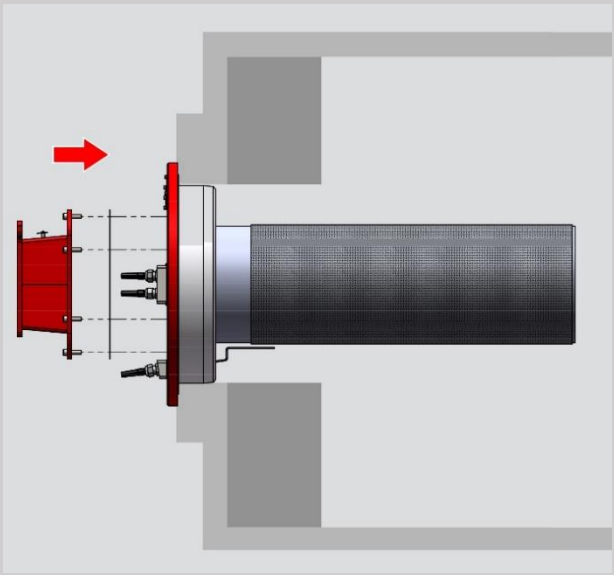
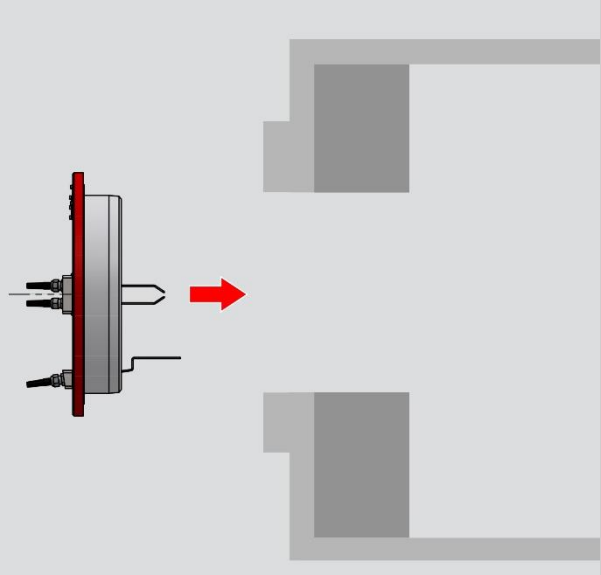


**PACKMAN Low NOx Post-Mixed burner**  
Capacity: 500 - 3000 Kw

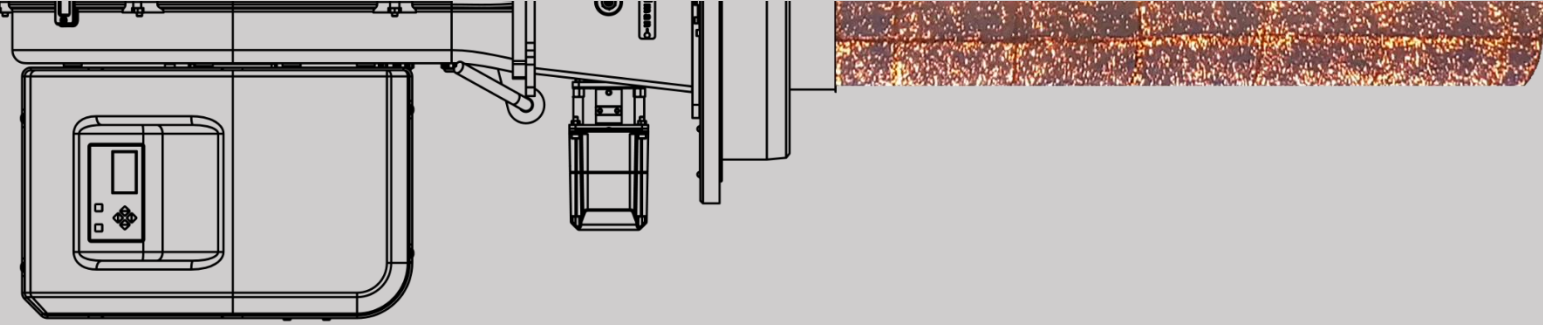




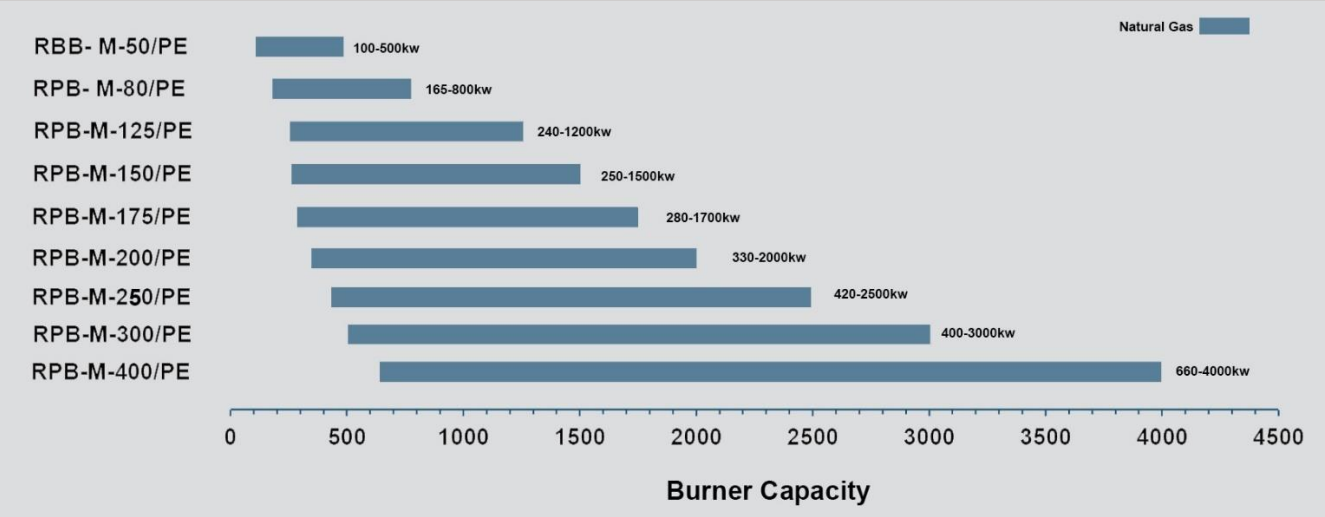
Installation and removal of pre-mixed burners:



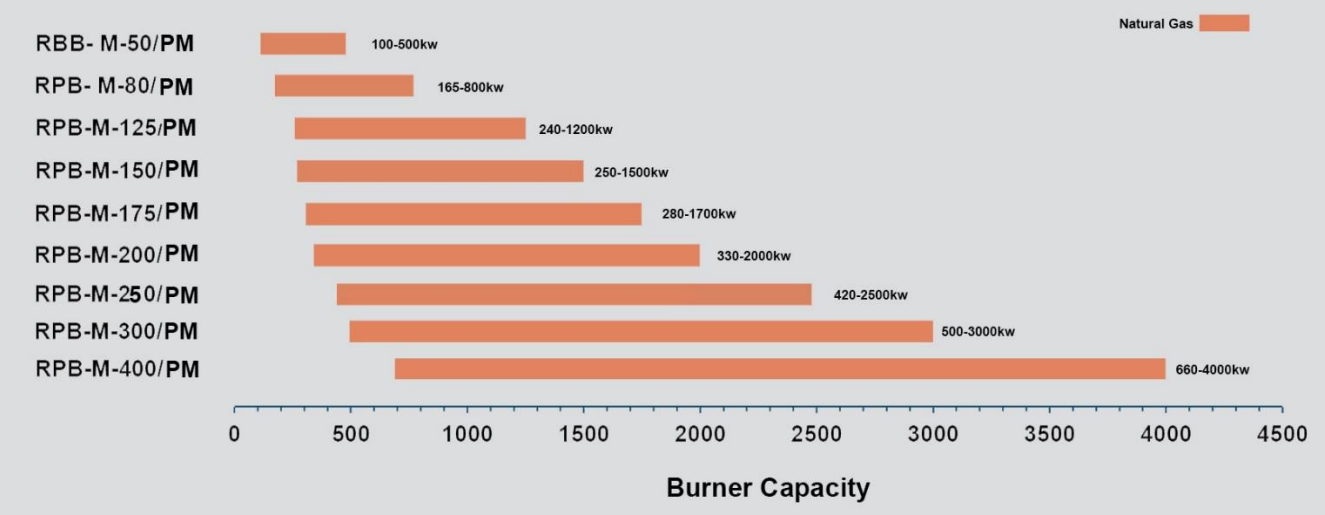




Firing rate of pre-mixed burner:



Firing rate of post-mixed burner:

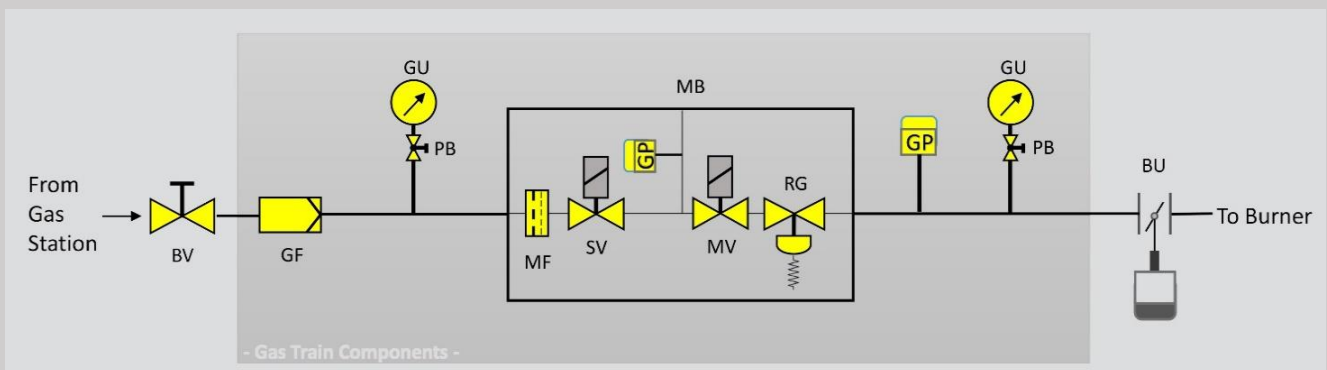
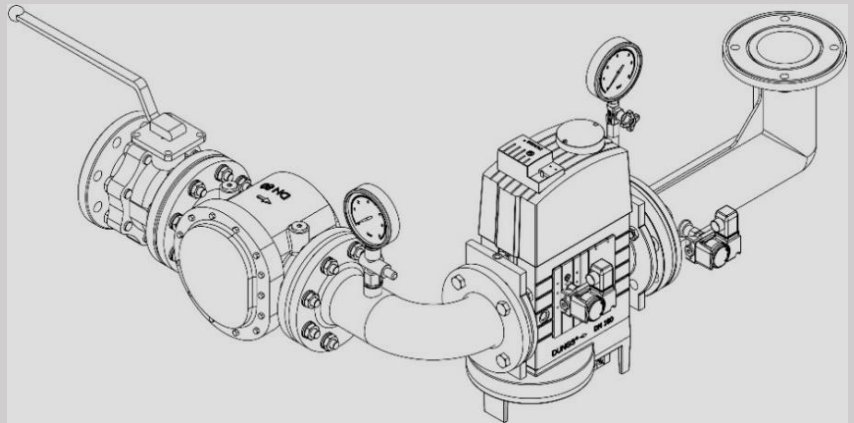


# Post-mix gas burner:

## Low-pressure gas supply

Input pressure is  $< 360$  bar

The total pressure loss in gas valves, Butterfly gate valve and combustion chamber resistance does not exceed 200 mbar.

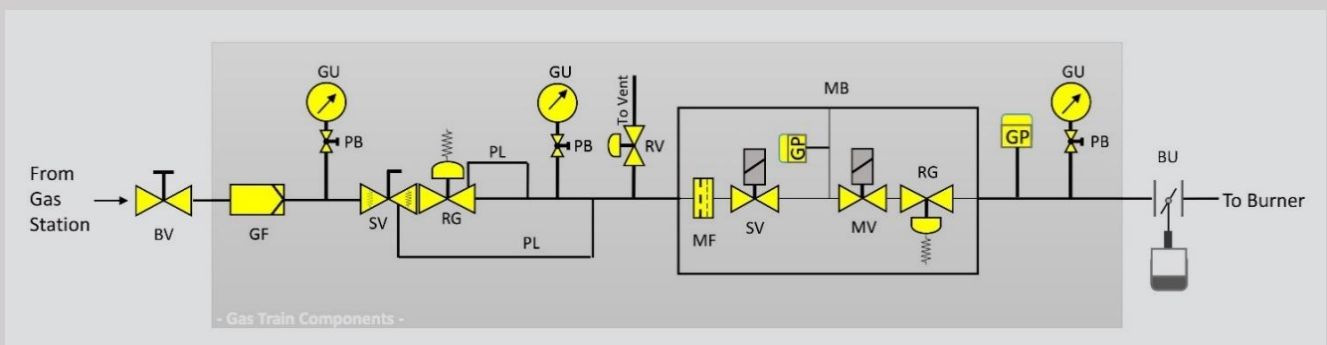
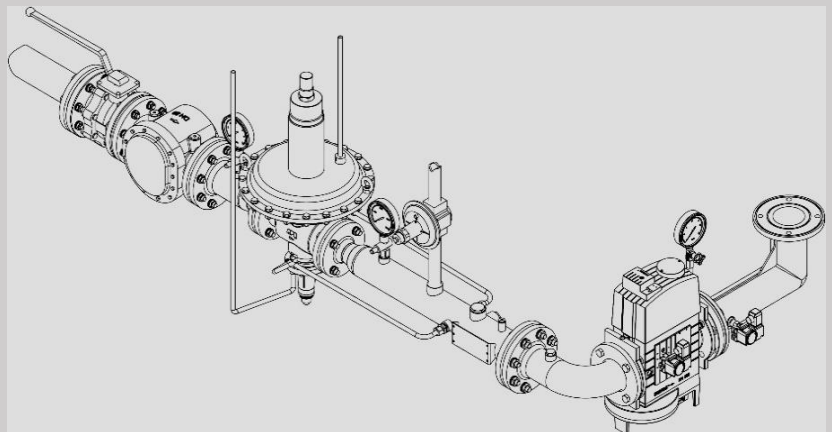


## High-pressure gas supply, Multi bloc version

Used when:

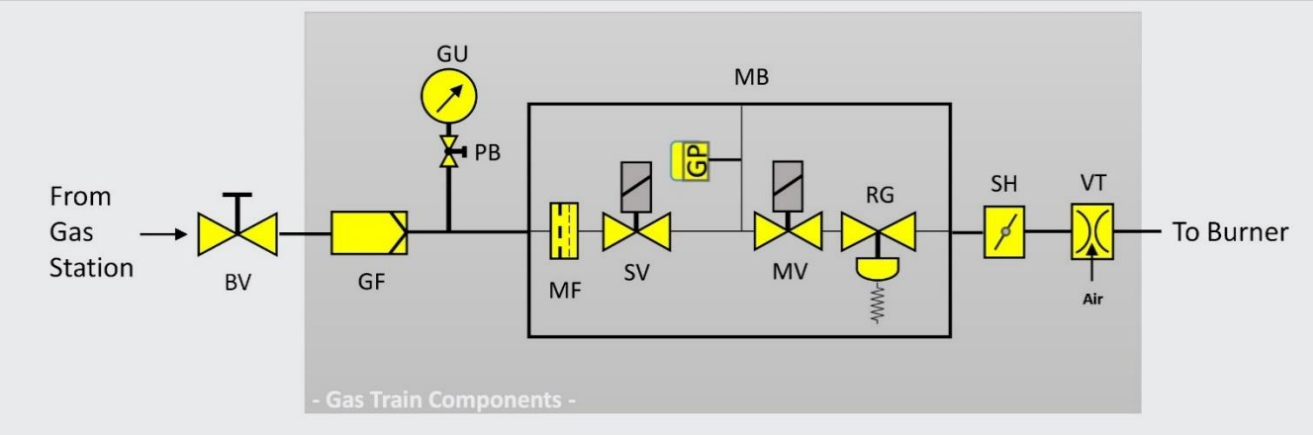
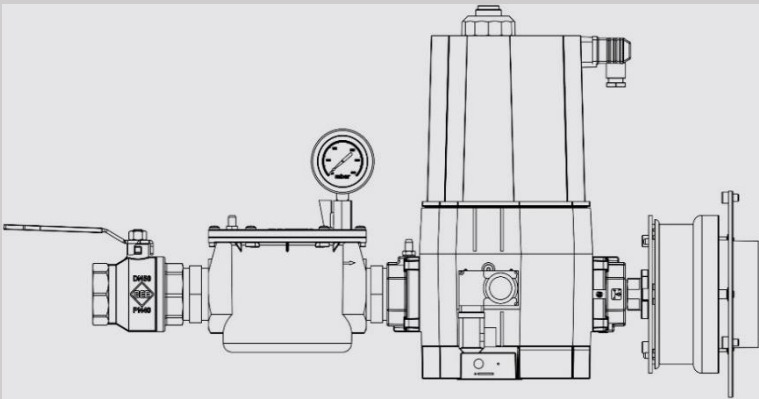
Input pressure is  $> 2$  bar

The total pressure loss in gas valves, Butterfly gate valve and combustion chamber resistance does not exceed 350 mbar.

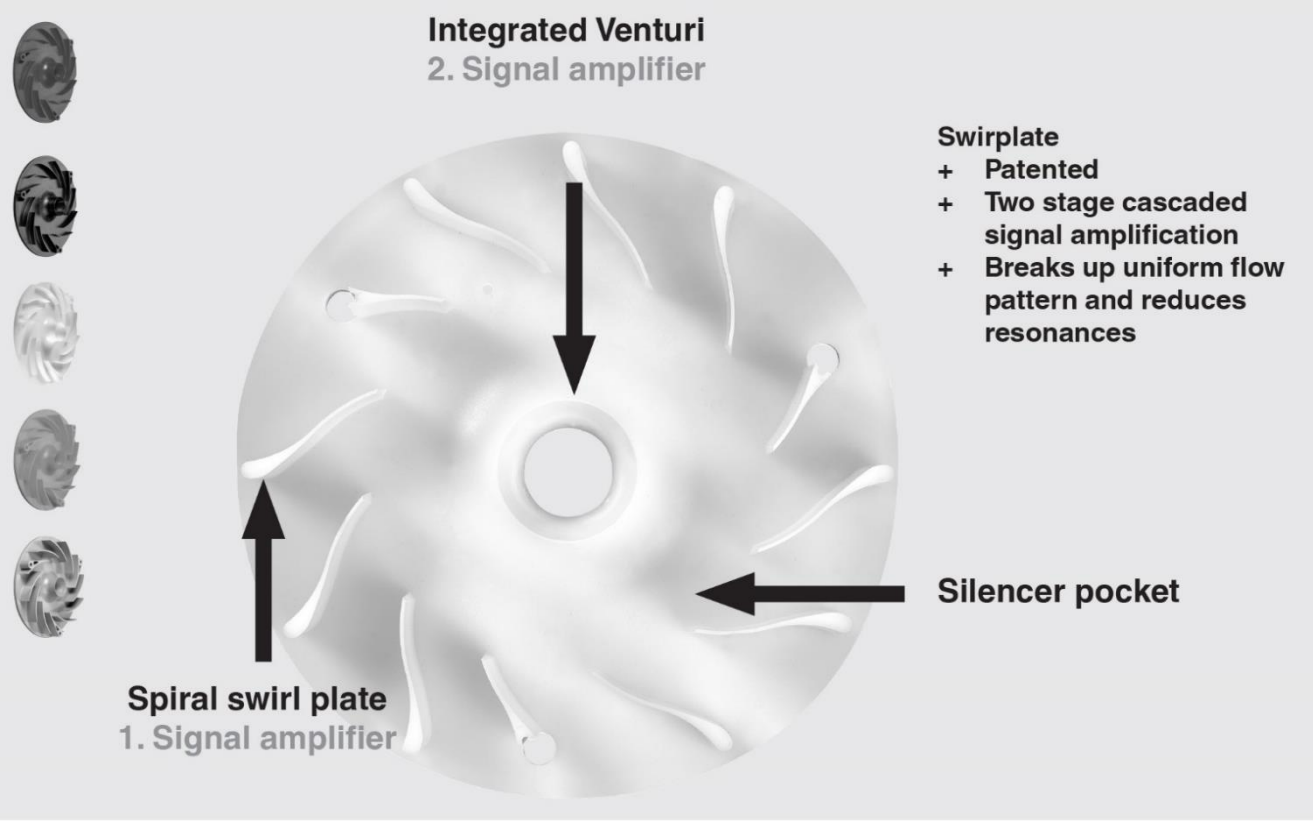


# Pre-mixed gas burner:

In premix burners, a venturi is used before fan to mix fuel and air. The gas line used in these burners is a multiblock gas line. This block consists of two solenoid valves, a regulator and a microfilter.

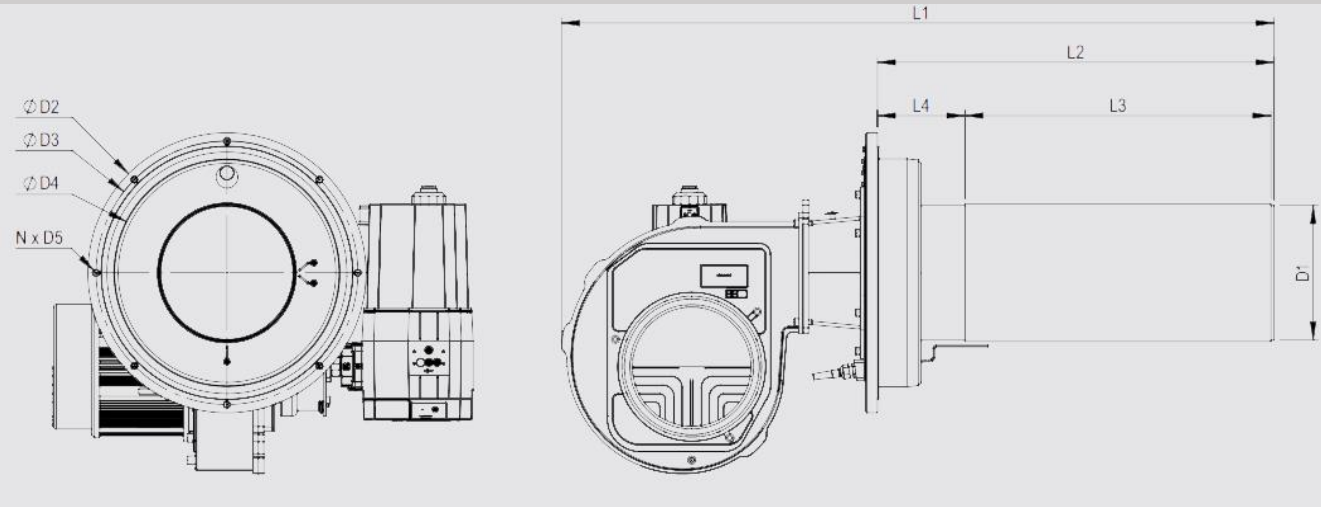


## Swirlplate - The heart of the WhirlWind system



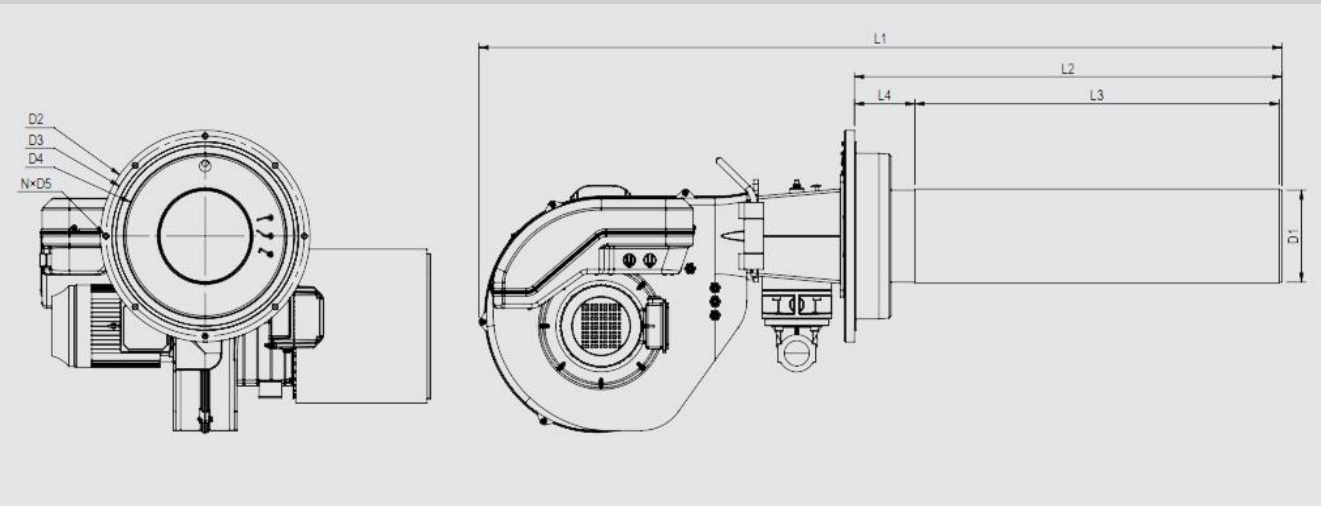


Pre-mixed burner general dimension:



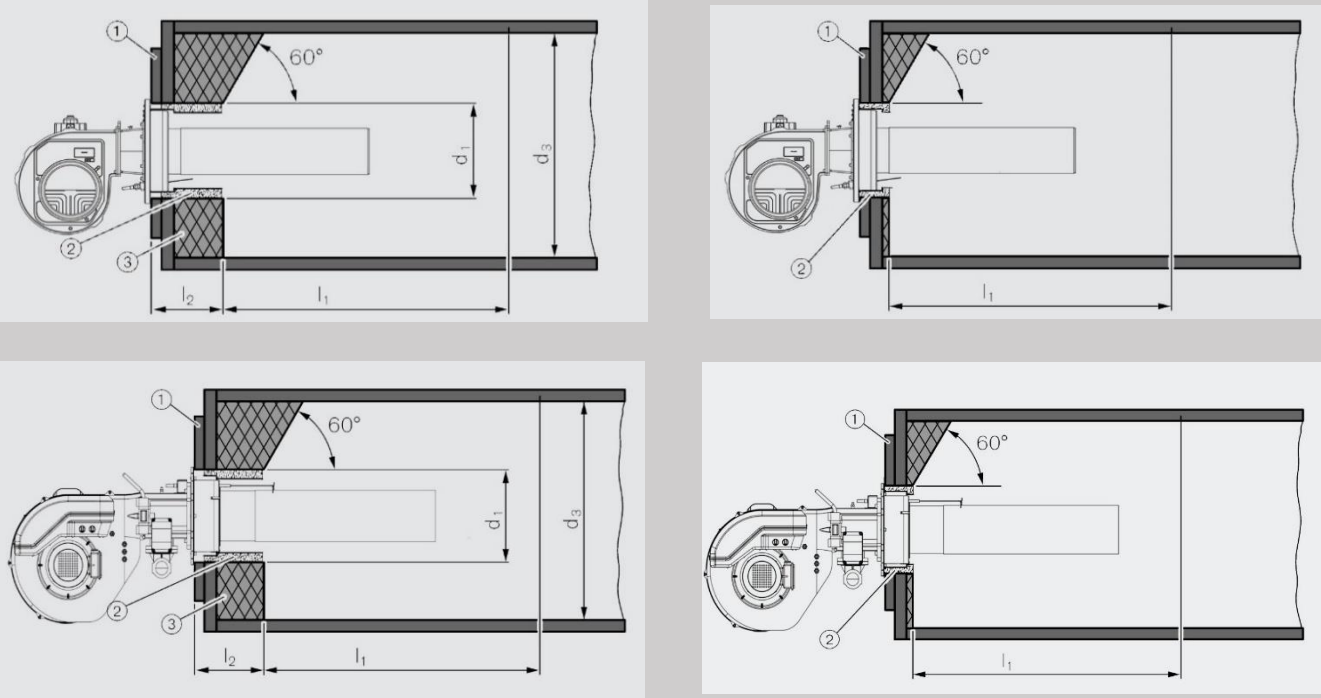
Model	L1	L2	L3	L4	D1	D2	D3	D4	D5	Number Of Holes
RPB-M-50/PE	920	467	306	160	200	460	435	360	11	8
RPB-M-80/PE	1341	697	551	160	200	460	435	360	11	8
RPB-M-120/PE	1414	835	674	160	245	510	480	415	11	8
RPB-M-150/PE	1666	1009	843	160	245	510	480	415	11	8
RPB-M-175/PE	1806	1149	983	160	245	510	480	415	11	8
RPB-M-200/PE	1946	1289	1123	160	245	510	480	415	11	8
RPB-M-250/PE	2051	1361	1145	210	300	580	550	475	11	8
RPB-M-300/PE	2280	1590	1374	210	300	580	550	475	11	8
RPB-M-400/PM	2712	2042	1832	210	300	580	550	475	11	8

Post-mixed burner general dimension:



Model	L1	L2	L3	L4	D1	D2	D3	D4	D5	Number Of Holes
RPB-M-50/PM	1292	467	306	160	200	460	435	360	11	8
RPB-M-80/PM	1522	697	551	160	200	460	435	360	11	8
RPB-M-120/PM	1660	835	674	160	245	510	480	415	11	8
RPB-M-150/PE	1666	1009	843	160	245	510	480	415	11	8
RPB-M-175/PE	1806	1149	983	160	245	510	480	415	11	8
RPB-M-200/PM	2130	1289	1123	160	245	510	480	415	11	8
RPB-M-250/PE	2051	1361	1145	210	300	580	550	475	11	8
RPB-M-300/PM	2790	1590	1374	210	300	580	550	475	11	8
RPB-M-400/PM	3215	2042	1832	210	300	580	550	475	11	8

# Minimum Combustion chamber size:



## Legend

1 Mounting plate

2 Gap

3 Refractory / insulation

Note: The boiler door refractory / insulation may be tapered ( $\geq 60^\circ$ ).

## D1 Minimum boiler opening

RPB-M-50/P-- , RPB-M-80/P-- , .....	370 mm
RPB-M-120/P-- , RPB-M-150/P-- , RPB-M-170/P-- , RPB-M-200/P-- .....	425 mm
RPB-M-250/P-- , RPB-M-300/P , RPB-M-400/P .....	485 mm

## D3 Minimum combustion chamber diameter

RPB-M-50/P-- , RPB-M-80/P-- .....	460 mm
RPB-M-120/P-- , RPB-M-150/P-- , RPB-M-170/P-- , RPB-M-200/P-- .....	515 mm
RPB-M-250/P-- , RPB-M-300/P , RPB-M-400/P .....	575 mm

## I1 Minimum combustion chamber length

RPB-M-50/P-- .....	525 mm
RPB-M-80/P-- .....	770 mm
RPB-M-120/P-- .....	890 mm
RPB-M-150/P-- .....	1060 mm
RPB-M-170/P-- .....	1200 mm
RPB-M-200/P-- .....	1340 mm
RPB-M-250/P-- .....	1360 mm
RPB-M-300/P-- .....	1593 mm
RPB-M-400/P-- .....	2050 mm

## I2 Maximum boiler door depth, including refractory / insulation

RPB-M-50/P-- , RPB-M-80/P-- .....	200 mm
RPB-M-120/P-- , RPB-M-150/P-- , RPB-M-170/P-- , RPB-M-200/P-- .....	200 mm
RPB-M-250/P-- , RPB-M-300/P .....	220 mm



Last but not the least!

**Raadman Pre-mixed and Post-Mixed Burner (PB-Series)** cover a range of 50 up to 4,000 kW generally. They can be used wherever heat is needed – in heating residences or hospitals, schools or offices, especially condensing boilers. They are suitable for all commonly available gas and are notable for their reliability, longevity and great economy. Nearly all burner types over the entire performance range are available in a Low NO<sub>x</sub> version, with particularly low emission levels.



Web: [www.packmangroup.com](http://www.packmangroup.com)  
Web: [www.raadman-burner.com](http://www.raadman-burner.com)



[packmangroup.co](https://www.instagram.com/packmangroup.co)  
[raadman.burner](https://www.instagram.com/raadman.burner)

Head office: 79 No. 10 Street, Bokharest Ave. Tehran, Iran.  
Tel: (+98) 021 42 362, (+98) 021 88739075-9, 88731618  
Fax: (+98) 021 88737131

Burner Factory: No.5, 102 ave. Montazeriye Industrial town,  
Vilashahr, Isfahan, Iran

