PACKMAN
Industrial Group

Last update: 27/11/2022

Mechanical Modular and Mechanical Staging Gas or Dual-Fuel Burner

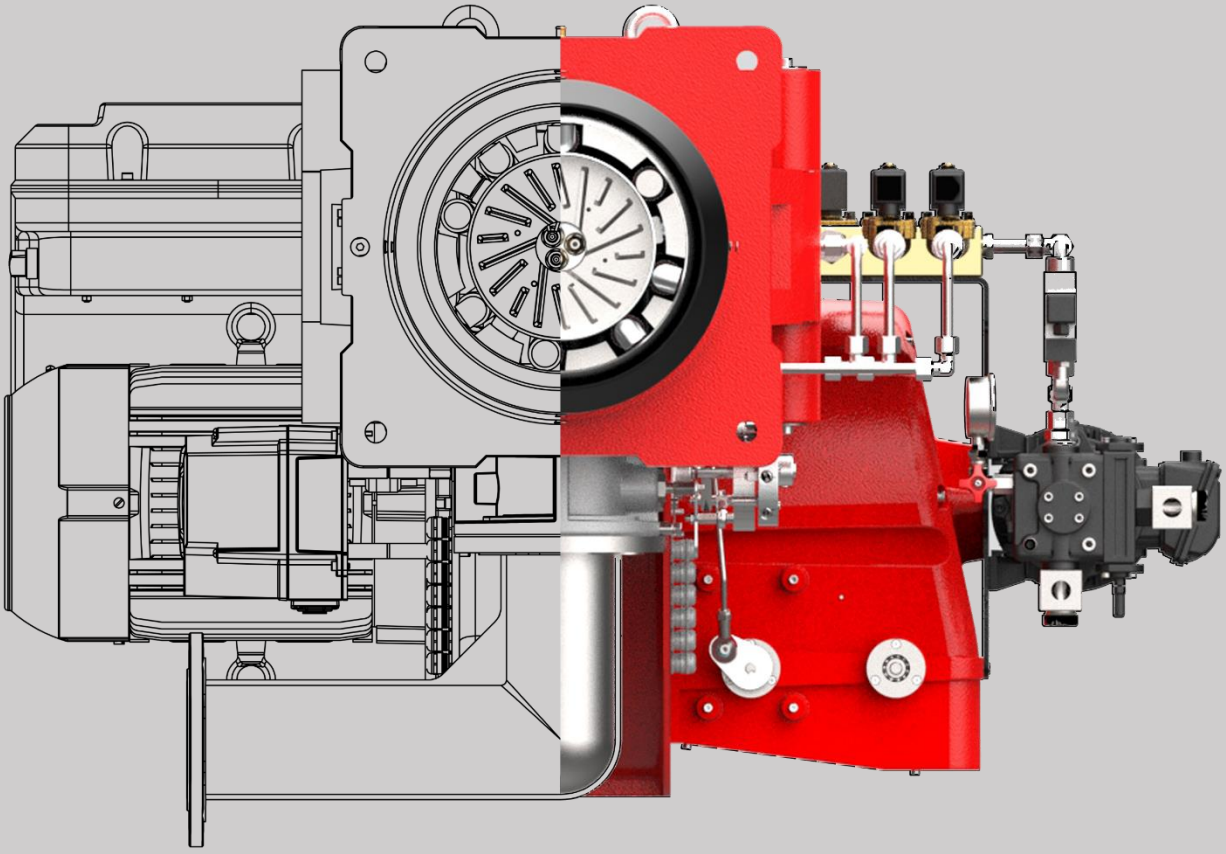
From 300 kW up to 6200 kW

www.packmangroup.com
www.raadmanburner.com

- raadman -
A look to the future

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 its activity in January 2011 in the area of burners with the 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 the 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 60000 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.

R LG B- MC - 255 /LN

Blank: NOx class: II acc to EN-676

LN: Low NOx with Class III acc to EN-676

Reference of approximate Capacity x 10 kW

Operation:

Blank:	Two Stage or One Stage
M:	Natural Gas, LPG: Electronic Modular Light Oil, Heavy Oil: Two/Three Stage Progressive
MC:	Natural Gas, LPG: Mechanical Modular Light Oil, Heavy Oil: Two/Three Stage Progressive
MS:	Natural Gas, LPG: Mechanical staging Light Oil, Heavy Oil: Two/Three Stage Progressive
M/M:	Natural Gas, LPG: Electronic Modular Light Oil, Heavy Oil: Electronic Modular

B: Burner

Type of Fuel:

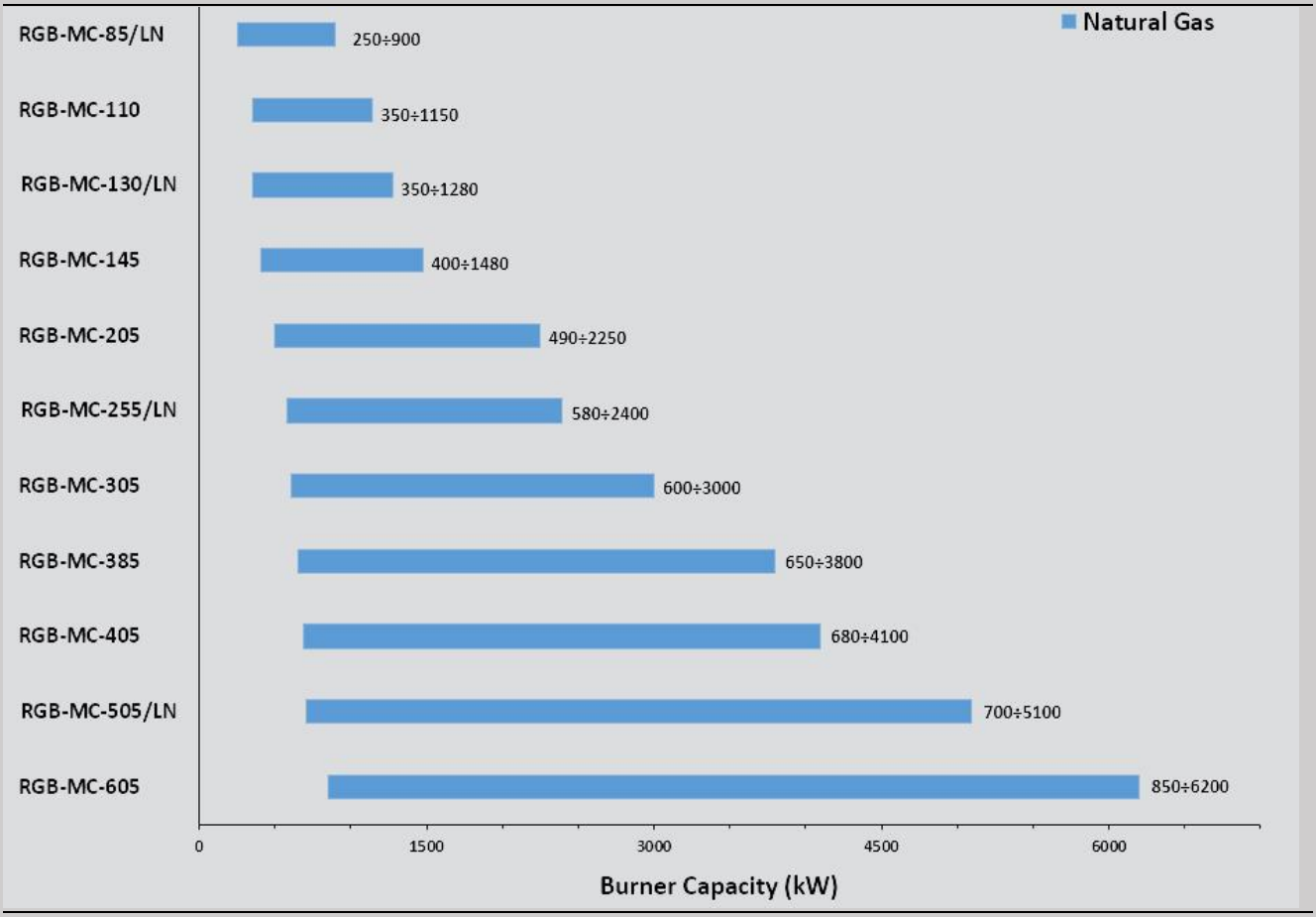
G:	G= Natural Gas
GP:	G= Natural Gas, P= Propane
LG:	L= Light oil, G= Natural Gas
LGP:	L= Light oil, G= Natural Gas, P= Propane
LHG:	L= Light oil, H= Heavy oil, G= Natural Gas
LHGP:	L= Light oil, H= Heavy oil, G= Natural Gas, P= Propane

Product Family Name: RAADMAN

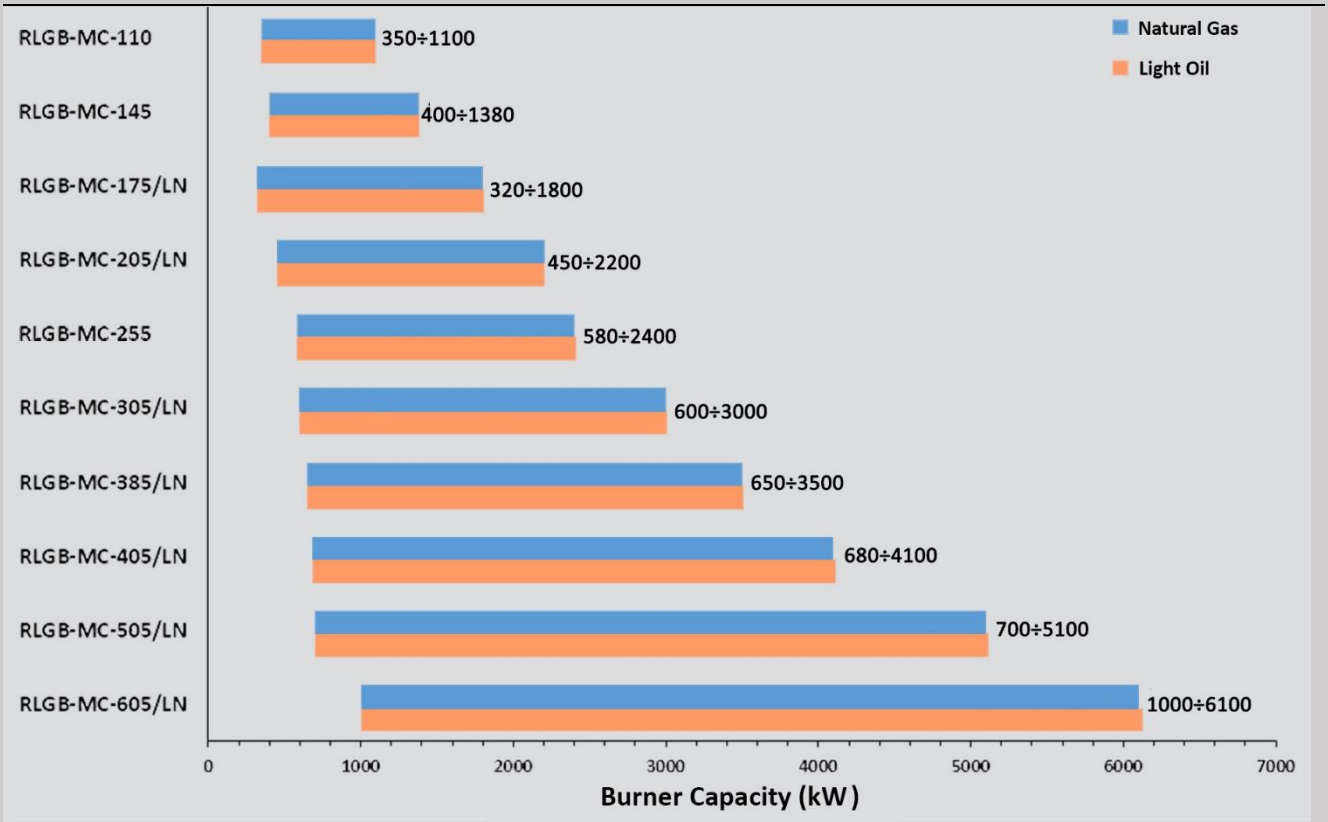
Note: Due to the same firing rate, working diagram and gas train, the MC series and MS series are brought into the same section, where the MC series represent MC series and MS series both.

Firing rate

RGB-MC Series



RLGB-MC Series

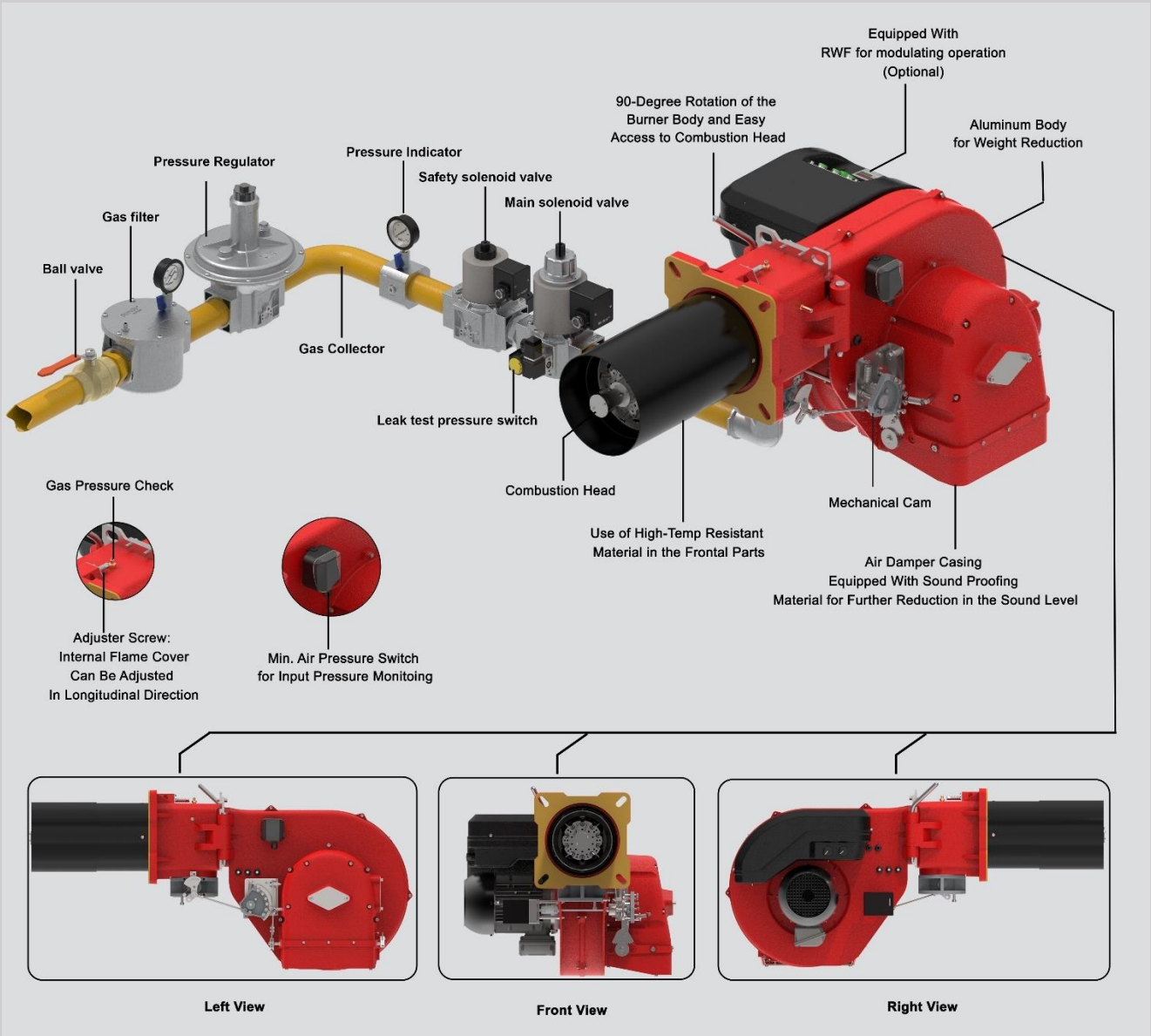


Mechanical modular raadman burners

RGB-MC series of burners cover a firing range from 1000 to 6000 kW, and they are manufactured with high-quality electro/mechanical accessories with easy installation and commissioning. They are mechanically resistant and are economically designed for city or industrial applications such as three pass hot water boilers, steam boilers, hot air generators, etc.

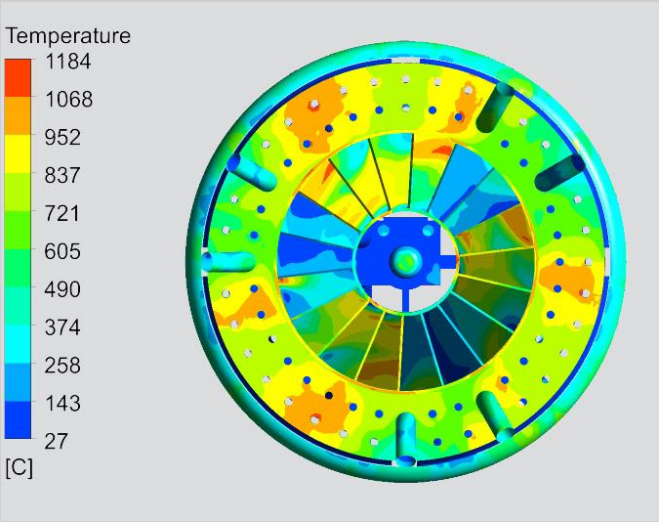
Their operation is “two-stage” at the oil side and “modulating” at the gas side with the installation of a PID logic regulator and respective probes. The customers should kindly note that the PID regulator is not included in the burners routine process and should be ordered separately.

RGB-MC series burners guarantee high-efficiency levels in all the various applications, thus reducing fuel consumption and running costs. Optimization of sound emissions is guaranteed by the special design of the air suction circuit and the use of soundproofing material. The exclusive design ensures reduced dimensions, simple use, and maintenance. A wide range of accessories guarantees elevated working flexibility

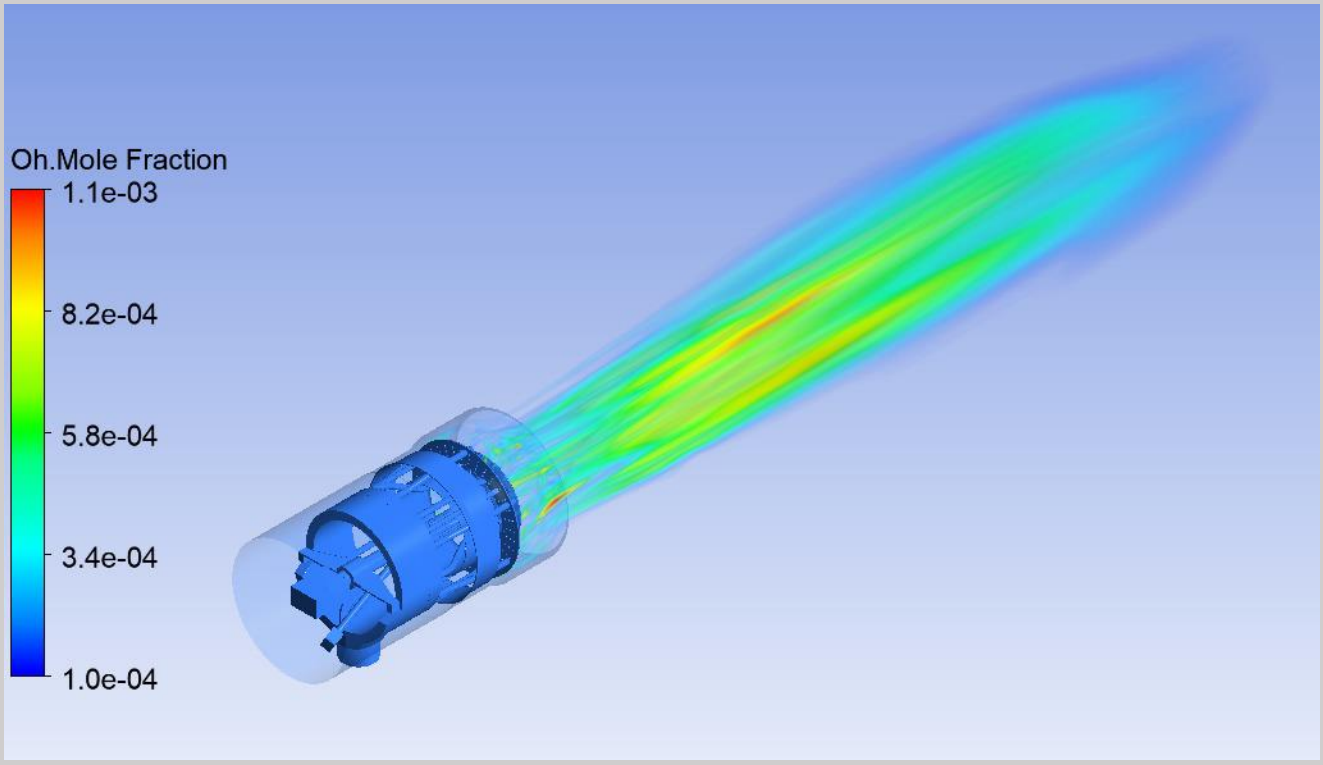


CFD experts in R&D department

The industry relies on heat from the burners in all combustion systems. Optimizing burner performance is critical to comply 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 have 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 modeling methodology that helps in this regard. Commercial CFD codes utilize a standard approach to simulate chemical kinetics, which approximates 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.



Specification

Fuels

- Natural gas
- Light oil (viscosity < 6 sCt)
- Other types of fuels (such as heavy oil, LPG, etc.) requires written confirmation from burner department of packman corporation (raadman brand).

Applications

raadman gas and dual fuel burners are suitable for the following utilization.

- Installation on heat exchanger
- Hot water boiler
- Steam boiler and high-pressure hot water boiler
- Hot air generator
- Compatible with all types of combustion chambers according to EN303 standard.

Control

The following methods of regulation are available for RGB-MC and RLGB-MC Series burners:
Oil: Two-stage operation
Gas: Two-stage progressive or modulating operation, with a specific kit (PID regulator and related temperature or pressure sensors.

Technical & Functional Features

- Lightweight and optimized geometry.
- High-quality heat-resistant steel material for all parts of burner head as well as flame covering accessories.
- Air damper for air flow setting and butterfly valve for regulating gas output controlled by a servomotor with variable cam
- Mono-bloc design and fully enclosed aluminum air housing.
- Simple Installation, adjustment, and maintenance.
- Easy access to internal components.
- Engineered to maximize efficiency and fuel cost savings.
- Suitable for firetube, firebox, and water tube boilers
- Equipped with high-quality and reliable electronic devices.
- Up to 10-20 % flame shape control
- High-quality staging controllers from well-known producers.

Standard compliance

- Designed in accordance with ISIRI-7595 and ISIRI-7594 Iran national standards (equal to the BS-EN676, BS-EN267 European standards)

Permissible ambient conditions:

- Ambient temperature
- -10 to +40 °C (14 to 104F)
- -15 to +40 °C (5 to 104F)

Air humidity: max. 80 % relative humidity, no condensation.
The combustion air must be free of aggressive substances (halogens, chlorides, etc.) and impurities (dust, debris, vapors, etc.)

Emission:

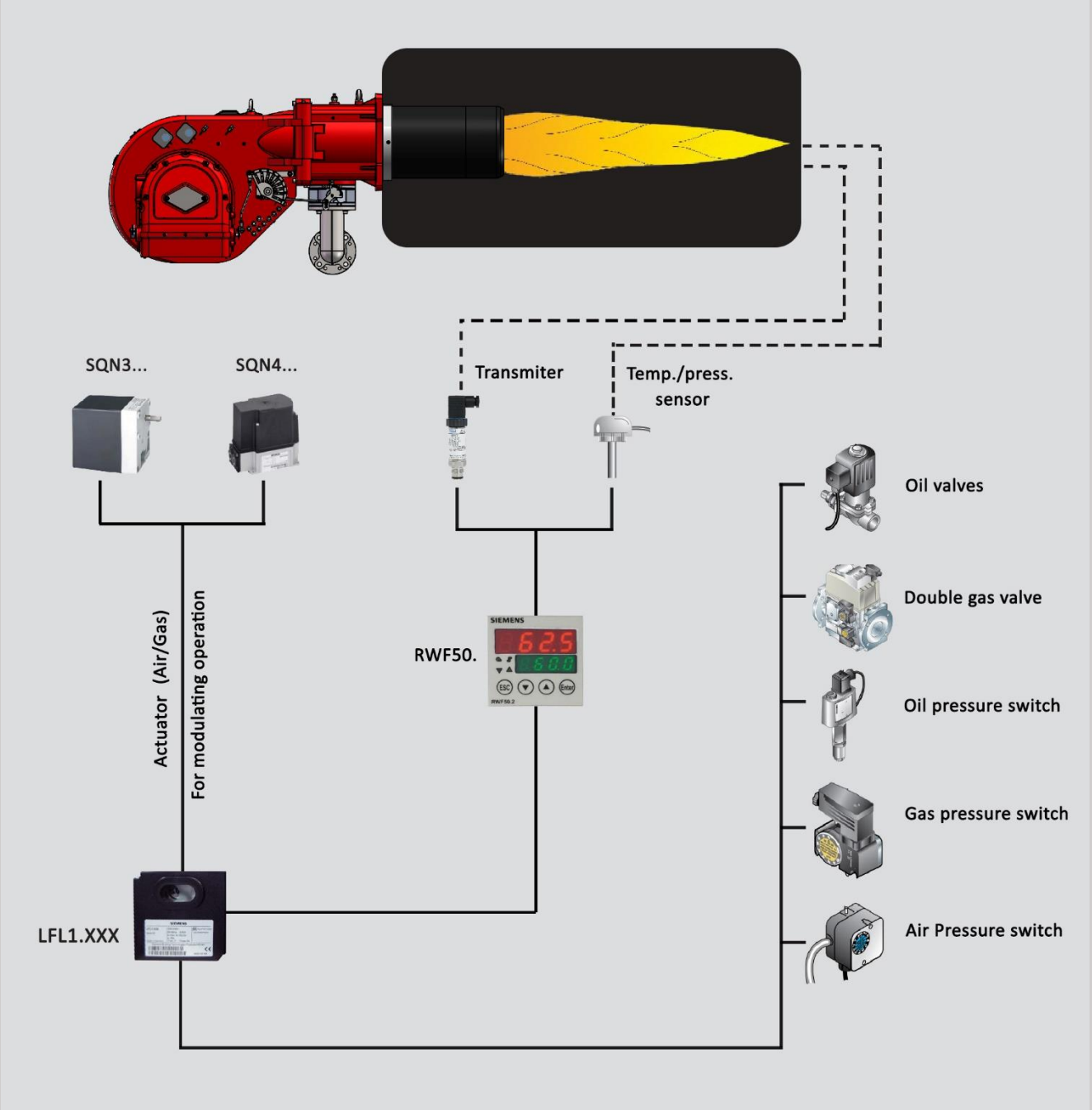
The emissions have been measured in various models at the maximum output, according to DIN-EN 676 and DIN-EN 297 standards.
The values of CO and NOx during burner operation are lower than 30 and 120 mg/kWh at 20 % excess of air for normal versions and, lower than 20 and 80 mg/kWh for Low NOx versions (LN series). consequently, the burner's NOx class of II and III is reported and being approved for normal version and LN Versions respectively.

Special notes:

LN versions have a higher rate of mixing during their operation. This results in a further decrease in the flame length and an increase in the flame diameter.

Burner management system overview

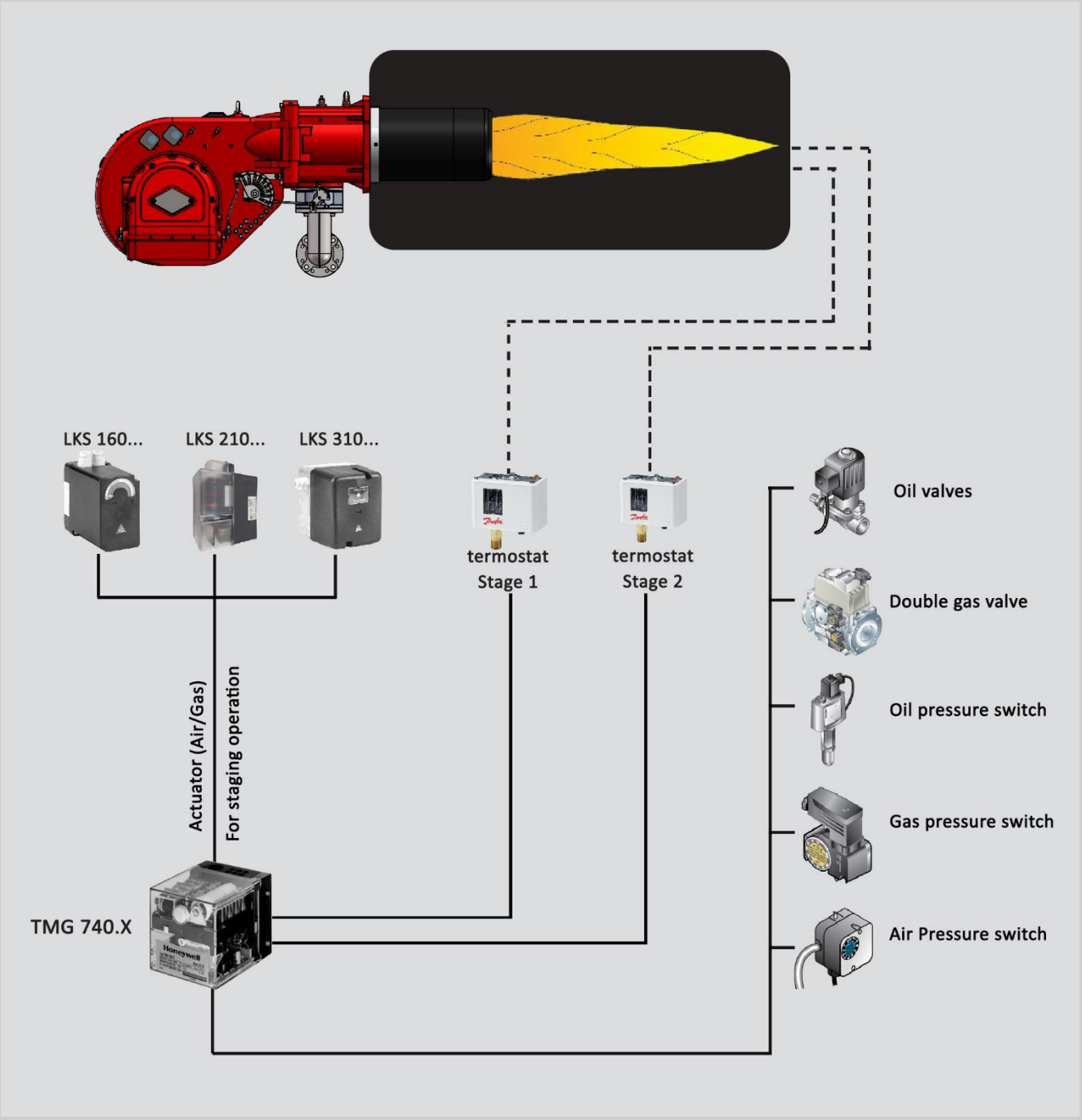
Mechanical Modualar management system



To obtain modulating operation, the RGB-MC series of burners requires a regulator with three-point outlet controls. The following lists the accessories are required for the mechanical modulating operation.

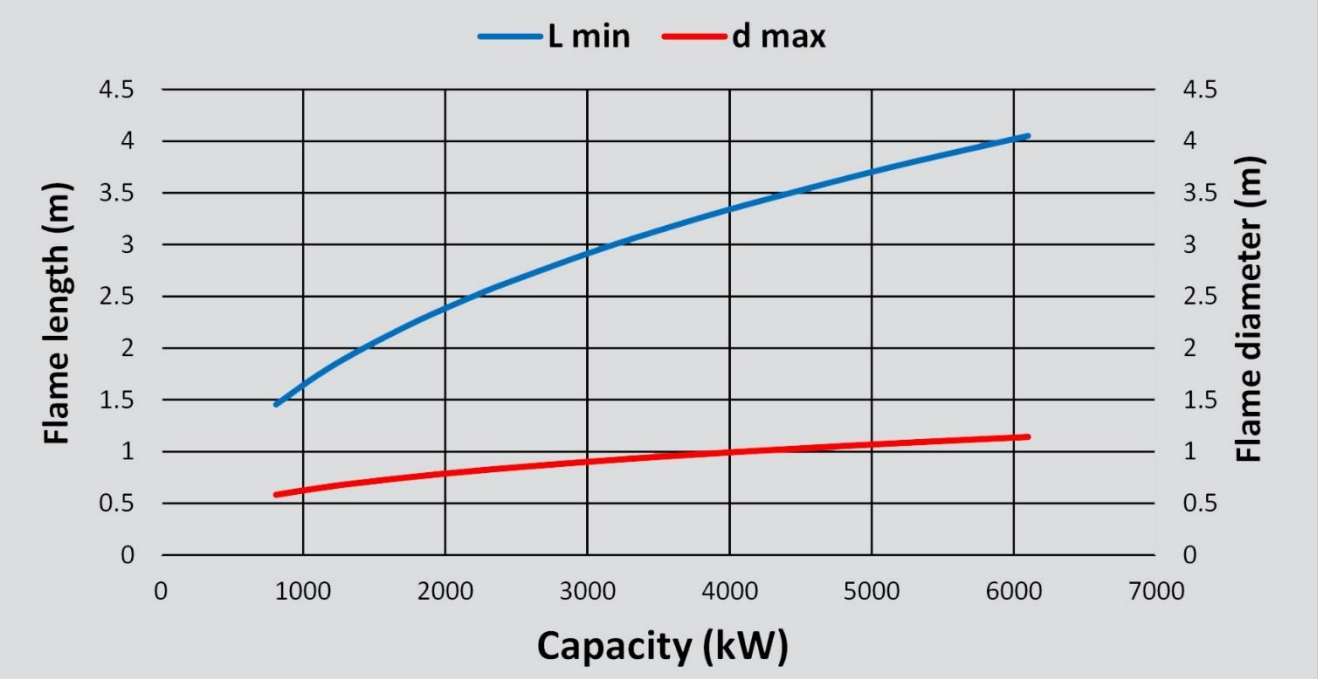
- RWF50
- Temperature sensor
- Actuator modulating operation

Mechanical staging management system

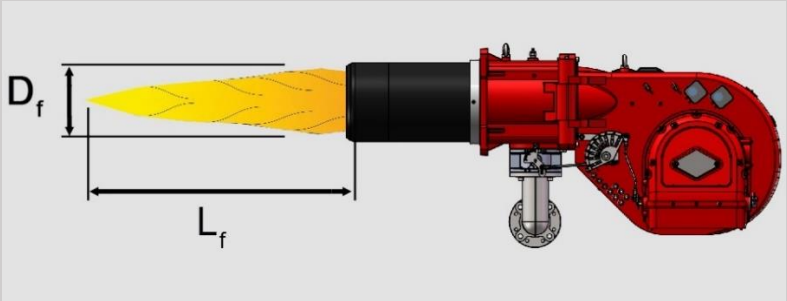


To obtain staging operation, the RGB-MS series of burners requires two termostat and actuator with 2-stage.

Flame dimension

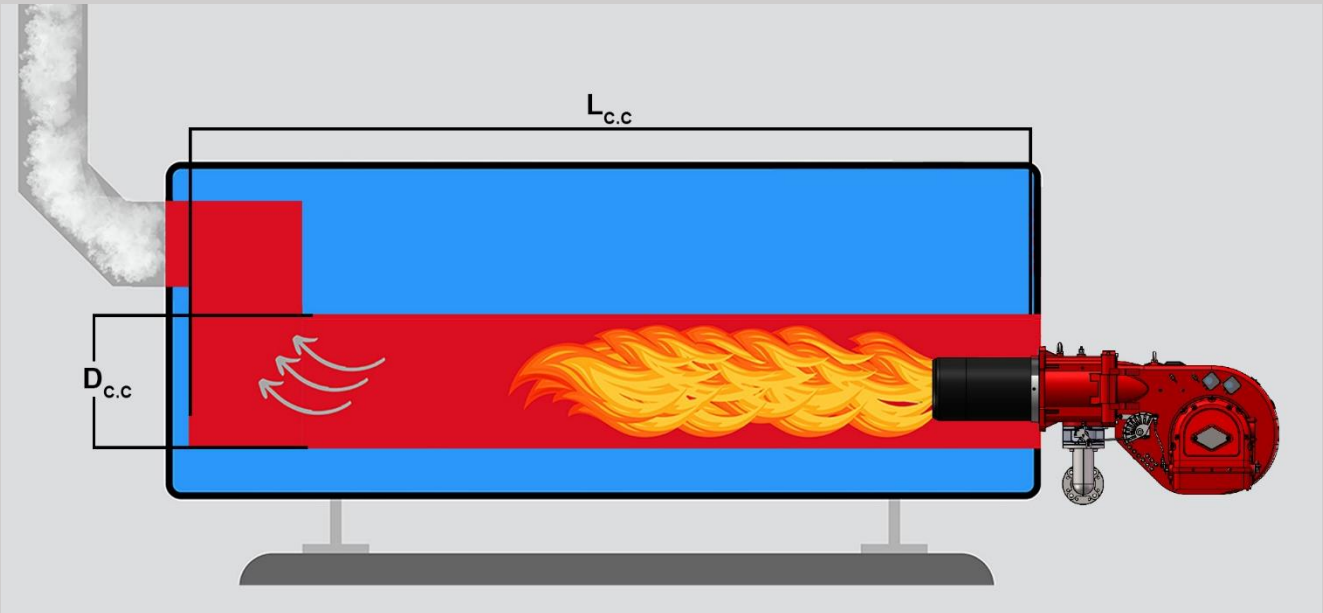


The flame dimensions which play an effective role in the burner efficiency and influence their compatibility to the boiler combustion chamber geometry, are presented in the above diagram.

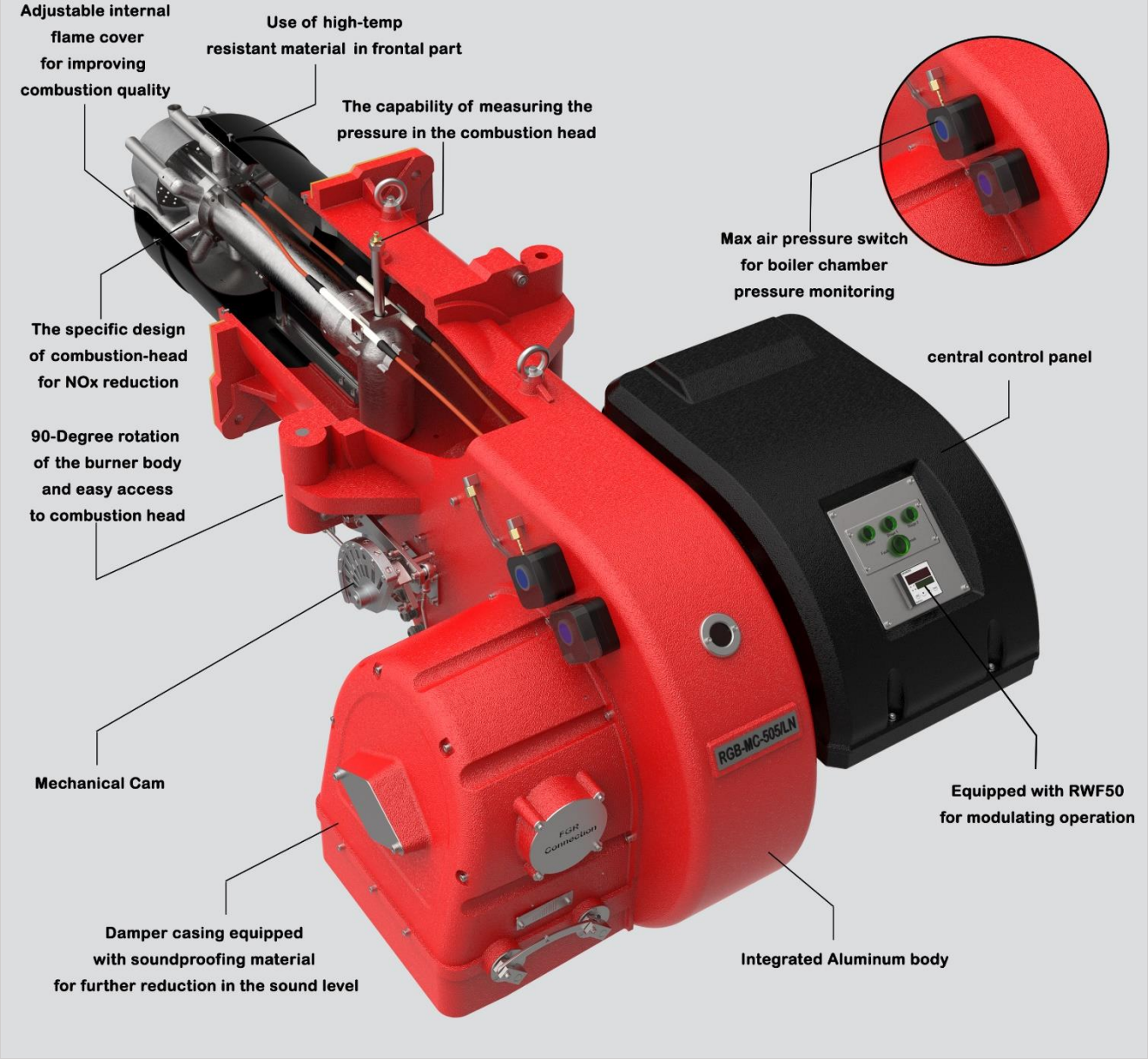


SUGGESTED COMBUSTION CHAMBER DIMENSIONS:

The raadman burners can be appropriately selected for all boilers which are designed according to the BS-2790, BS-855, EN-303, BS-EN 12953-3. It is recommended that a flame fill 90% of combustion chambers at its maximum output.



RGB-MC series raadman burner:



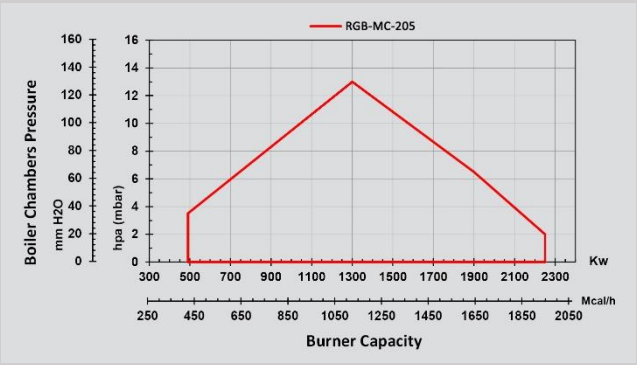
Burner selection: capacity and working diagram

Gas Burner

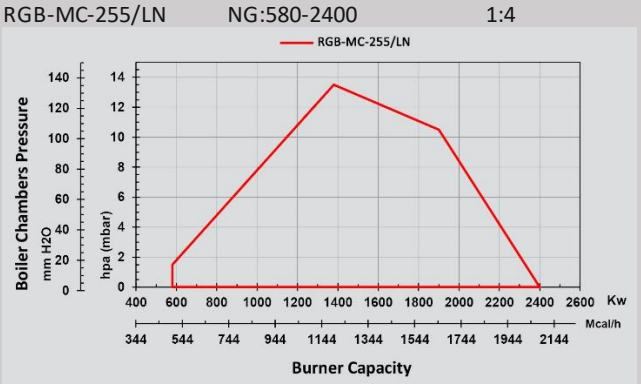
Burner	Capacity (kW)	Turn Down
RGB-MC-85/LN	NG:250-900	1:3
RGB-MC-130/LN	NG:350-1280	1:3

Burner	Capacity (kW)	Turn Down
RGB-MC-110	NG:350-1150	1:3
RGB-MC-145	NG:400-1480	1:4

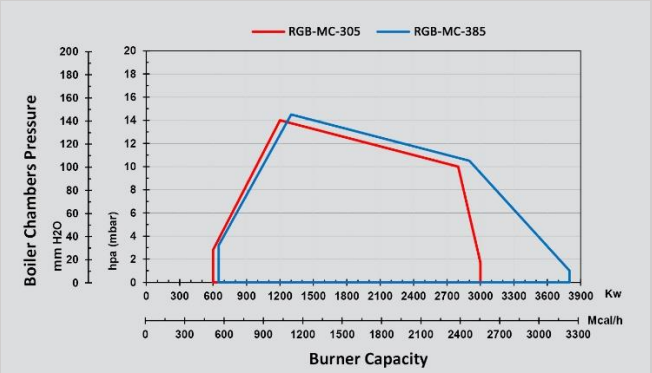
Burner	Capacity (kW)	Turn Down
RGB-MC-205	NG: 490-2250	1:4



Burner	Capacity (kW)	Turn Down
RGB-MC-255/LN	NG:580-2400	1:4



Burner	Capacity (kW)	Turn Down
RGB-MC-305	NG: 600-3000	1:5
RGB-MC-385	NG: 650-3800	1:5



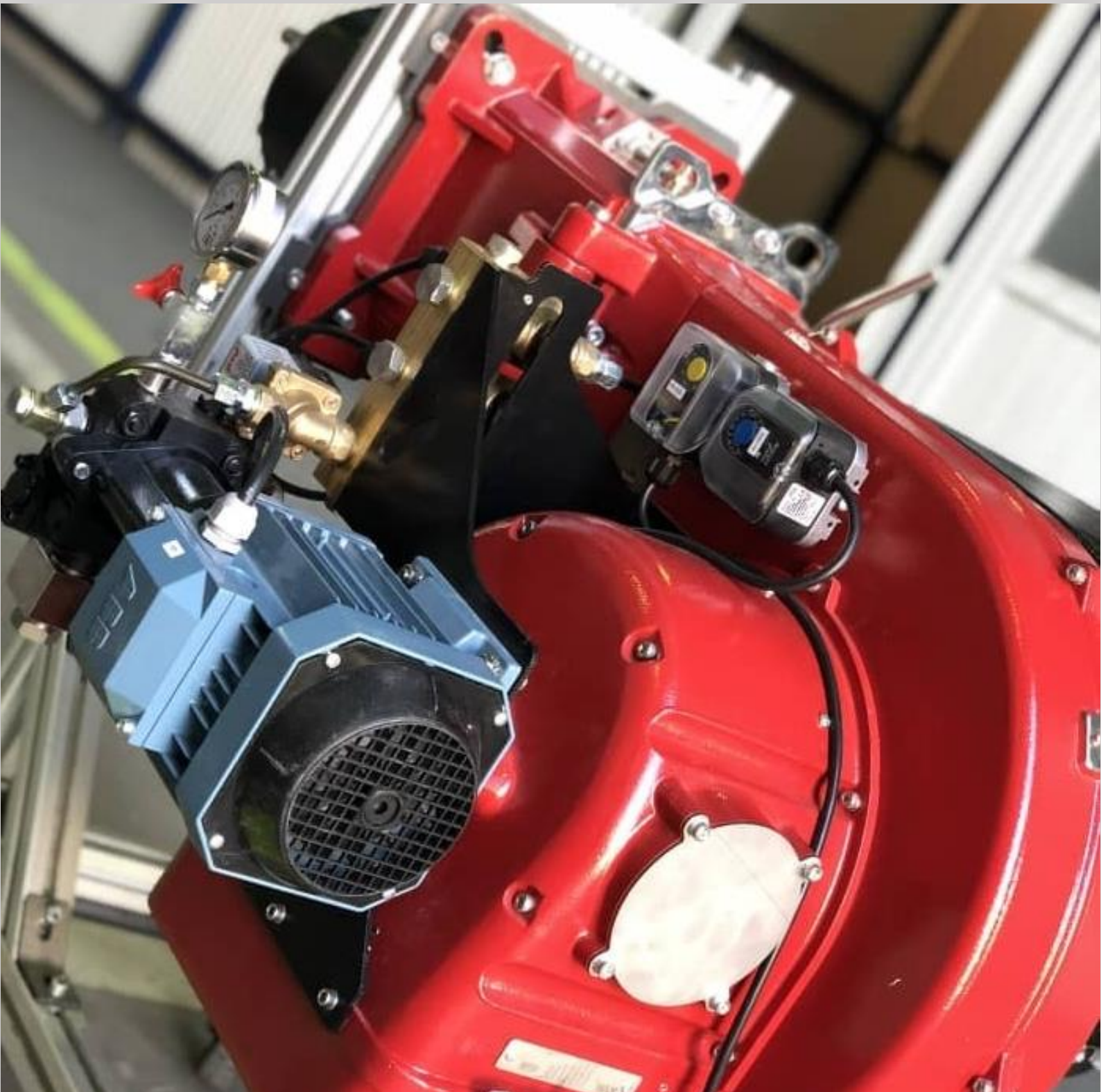
Burner	Capacity (kW)	Turn Down
RGB-MC-405/LN	NG: 680-4100	1:6
RGB-MC-505/LN	NG: 700-5100	1:7

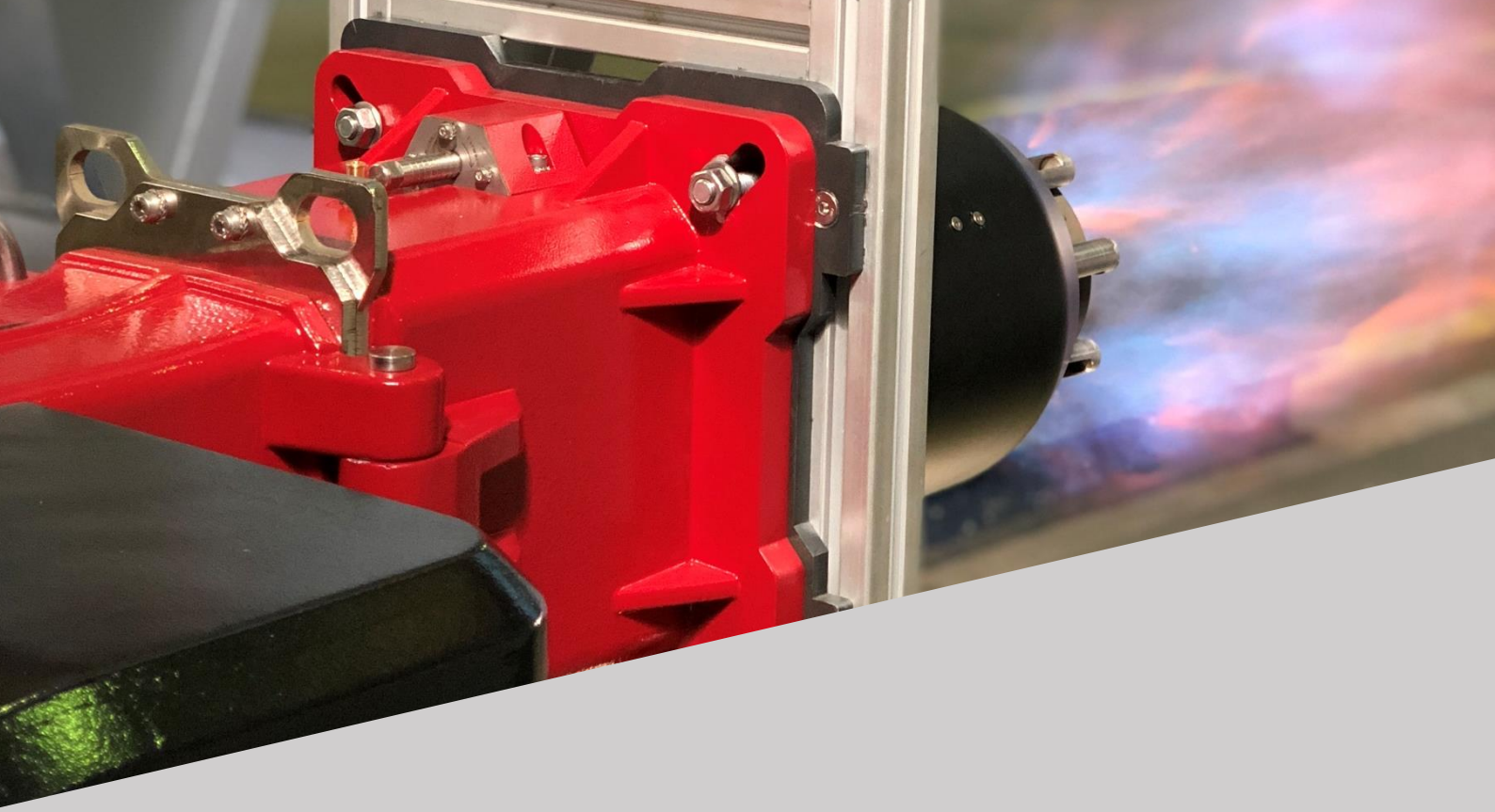
Burner	Capacity (kW)	Turn Down
RGB-MC-605	NG: 850-6200	1:7

About working diagram

Working diagram for gas burner certified in accordance with EN 676.

The firing rate diagram has been obtained considering ambient temperature of 20°C and atmospheric pressure of 1013 mbar (Sea level condition). For installation at higher altitudes, a reduction in capacity of 1% per 100 m above sea level should be taken into account.





Technical data: RGB-MC series (Gas burner)

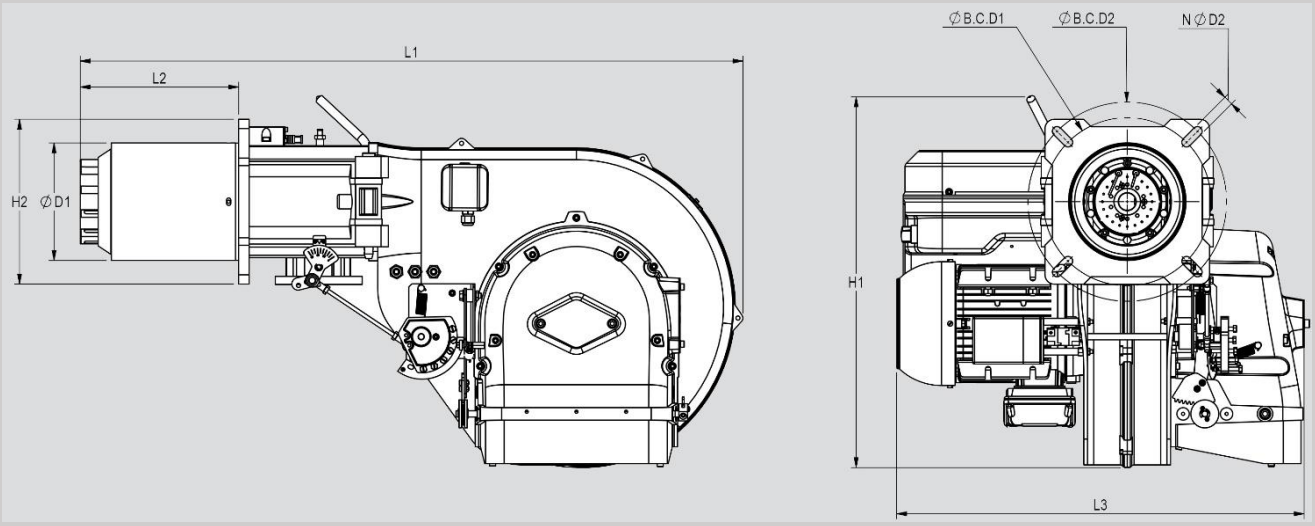
RGB-MC Series burner include Ventilation system with AC motor, Ignition transformer, and electrodes, electrical panel with power contactors, fuses, relays, central controller, air pressure switches, soundproofing material, Lamp signals for operational supervision, etc.

- N.G operation: II or III Stages or Mechanical Modular

	Power system	Power management system	
Burner	**Motor(kW/PH/V/HZ/rpm)**	**Controller**	**Actuator (N.M)**
RGB-MC-85/LN	1.5 /3 /380-400 /50 /2840	Siemens/Honeywell	3/10
RGB-MC-110	1.5 /3 /380-400 /50 /2840	Siemens/Honeywell	3/10
RGB-MC-130/LN	2.2 /3 /380-400 /50 /2840	Siemens/Honeywell	3/10
RGB-MC-145	2.2 /3 /380-400 /50 /2840	Siemens/Honeywell	3/10
RGB-MC-205	4 /3 /380-400 /50 /2840	Siemens/Honeywell	3/10
RGB-MC-255/LN	5.5 /3 /380-400 /50 /2840	Siemens/Honeywell	3/10
RGB-MC-305	7.5 /3 /380-400 /50 /2900	Siemens/Honeywell	3/10
RGB-MC-385	7.5 /3 /380-400 /50 /2900	Siemens/Honeywell	10/15
RGB-MC-405/LN	9.2 /3 /380-400 /50 /2900	Siemens/Honeywell	10/15
RGB-MC-505/LN	11 /3 /380-400 /50 /2900	Siemens/Honeywell	10/15
RGB-MC-605	15 /3 /380-400 /50 /2900	Siemens/Honeywell	10/15

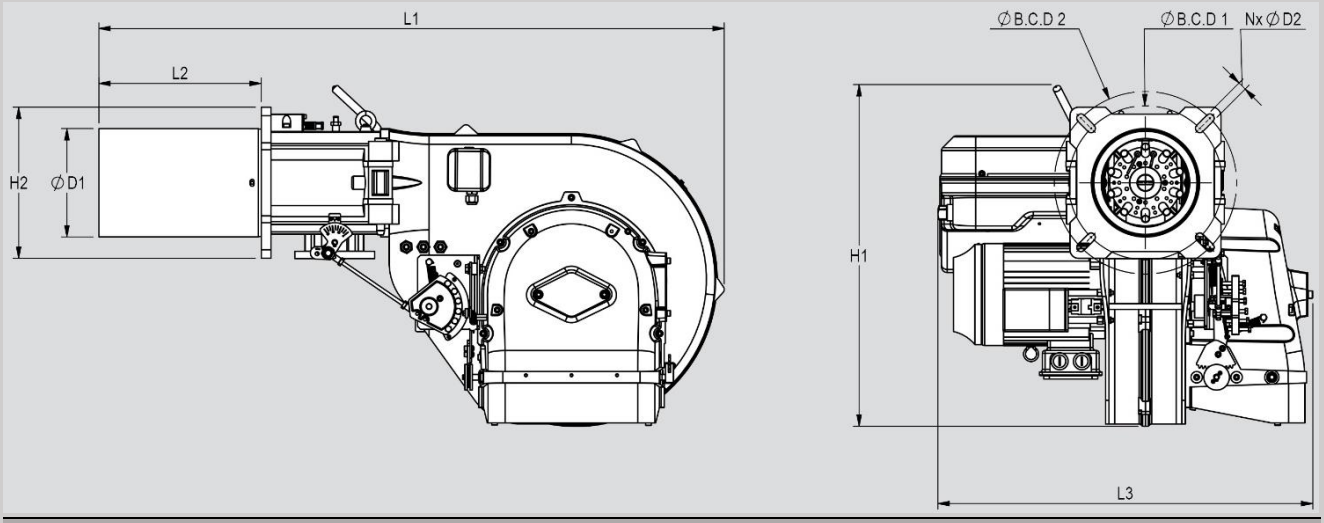
General Dimension of RGB-MC series

RGB-MC-85/LN, RGB-MC-130/LN



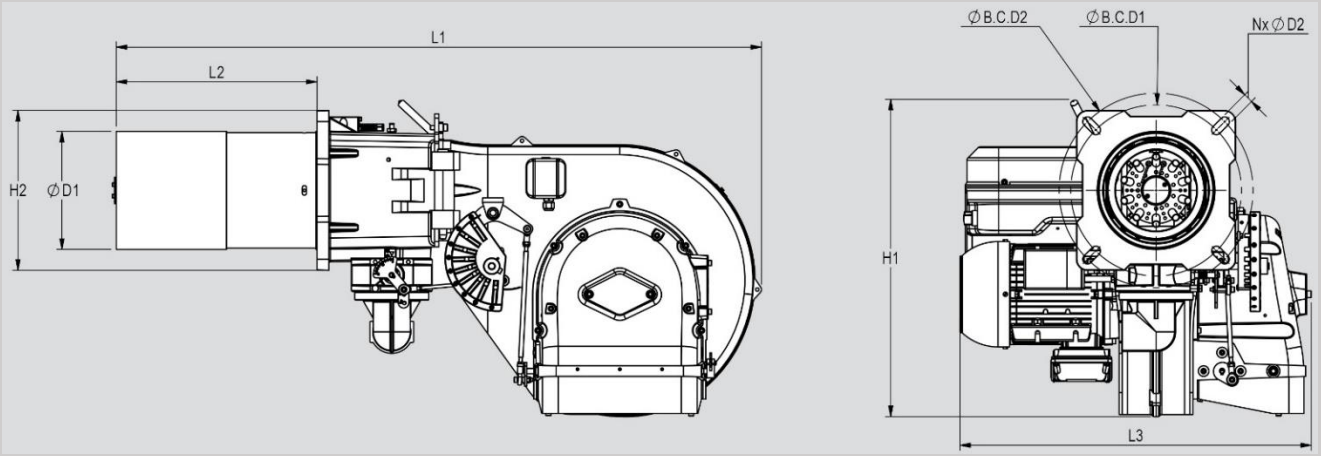
Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C.D.1	B.C.D.2
RGB-MC-85/LN	1068	255	641	598	265	193	15	4	270	320
RGB-MC-130/LN	1072	260	586	598	265	193	15	4	270	320

RGB-MC-110, RGB-MC-145



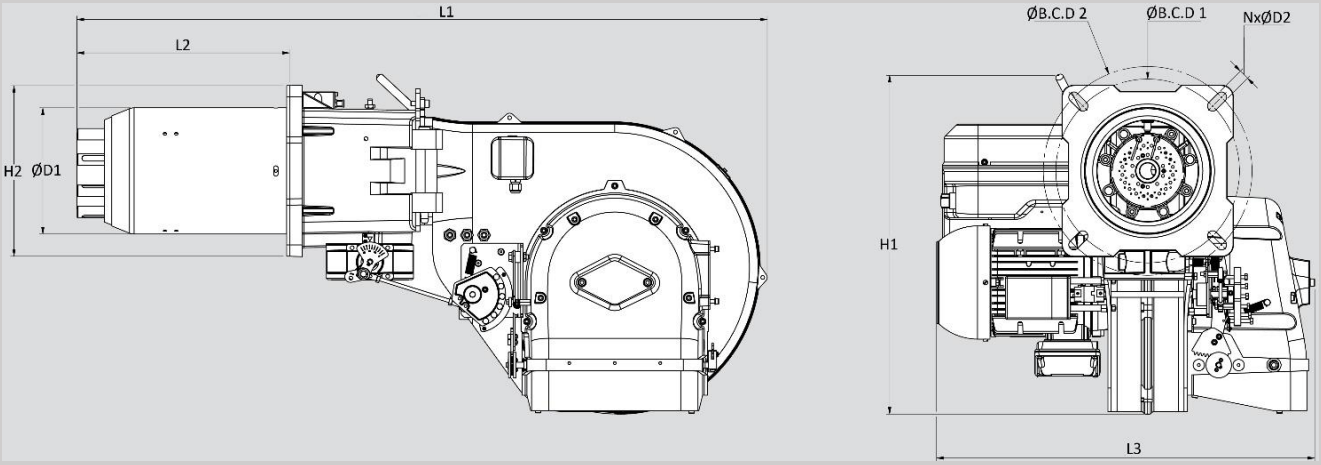
Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C.D.1	B.C.D.2
RGB-MC-110	1066	254	643	598	265	184	15	4	270	320
RGB-MC-145	1097	285	643	598	265	194	15	4	270	320

RGB-MC-205



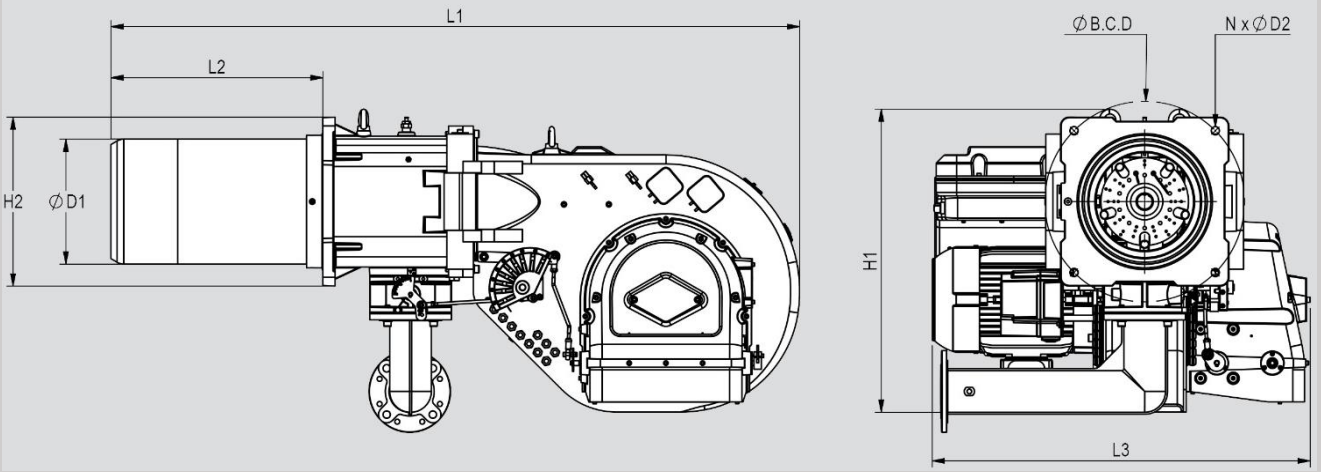
Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C.D1	B.C.D1
RGB-MC-205	1229	388	666	600	302	223	18	4	323	367

RGB-MC-255/LN



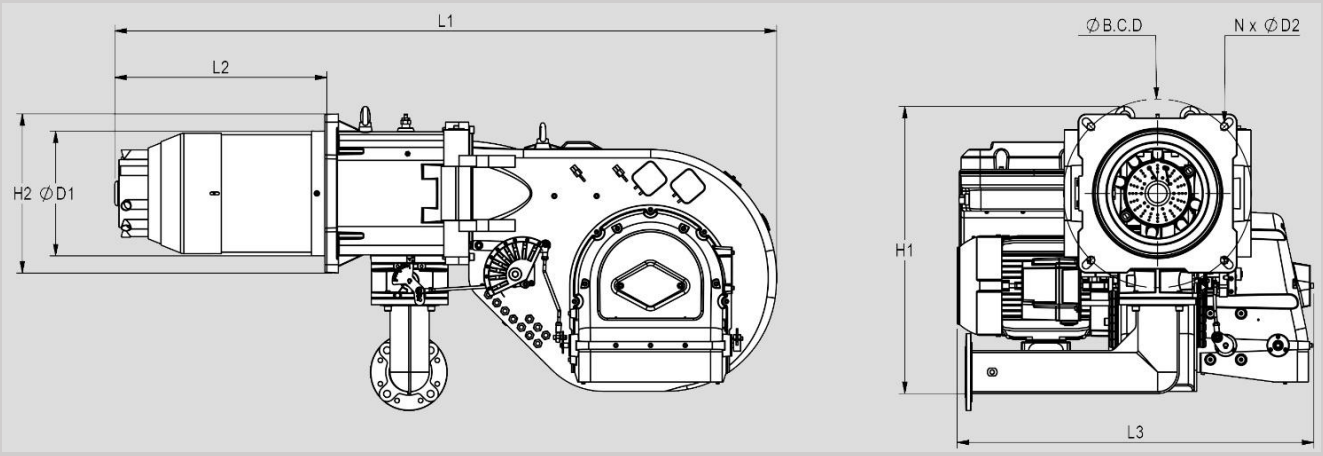
Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C.D.1	B.C.D.2
RGB-MC-255/LN	1214	374	762	598	300	226	18	4	323	368

RGB-MC-305, RGB-MC-385



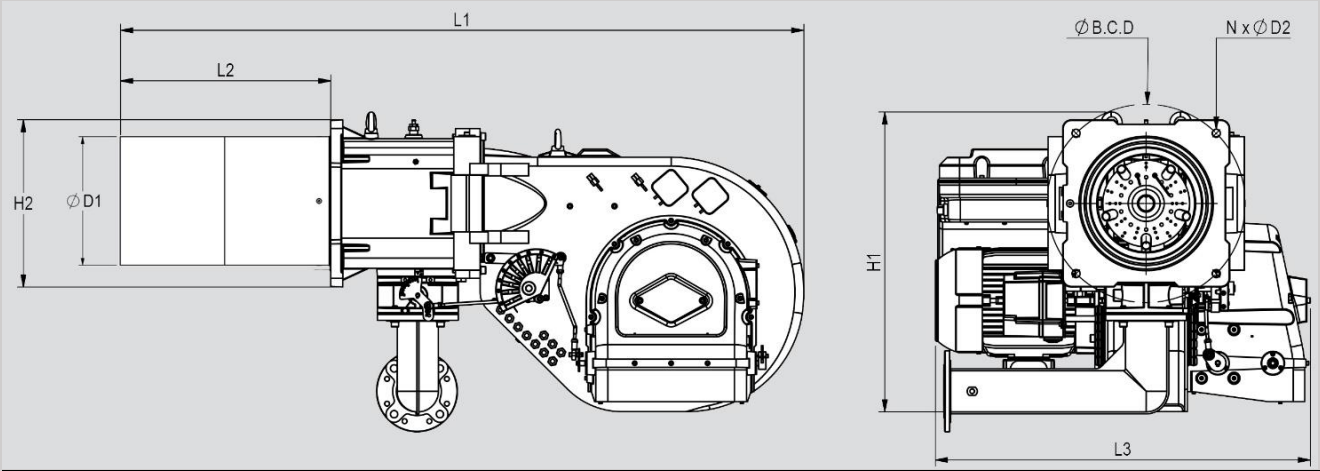
Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C. D
RGB-MC-305	1689	519.5	927	741	413	328	20	4	490
RGB-MC-385	1689	519.5	927	741	413	328	20	4	490

RGB-MC-405/LN, RGB-MC-505/LN



Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C. D
RGB-MC-405/LN	1721	552	930	798	413	328	20	4	490
RGB-MC-505/LN	1721	552	930	798	413	328	20	4	490

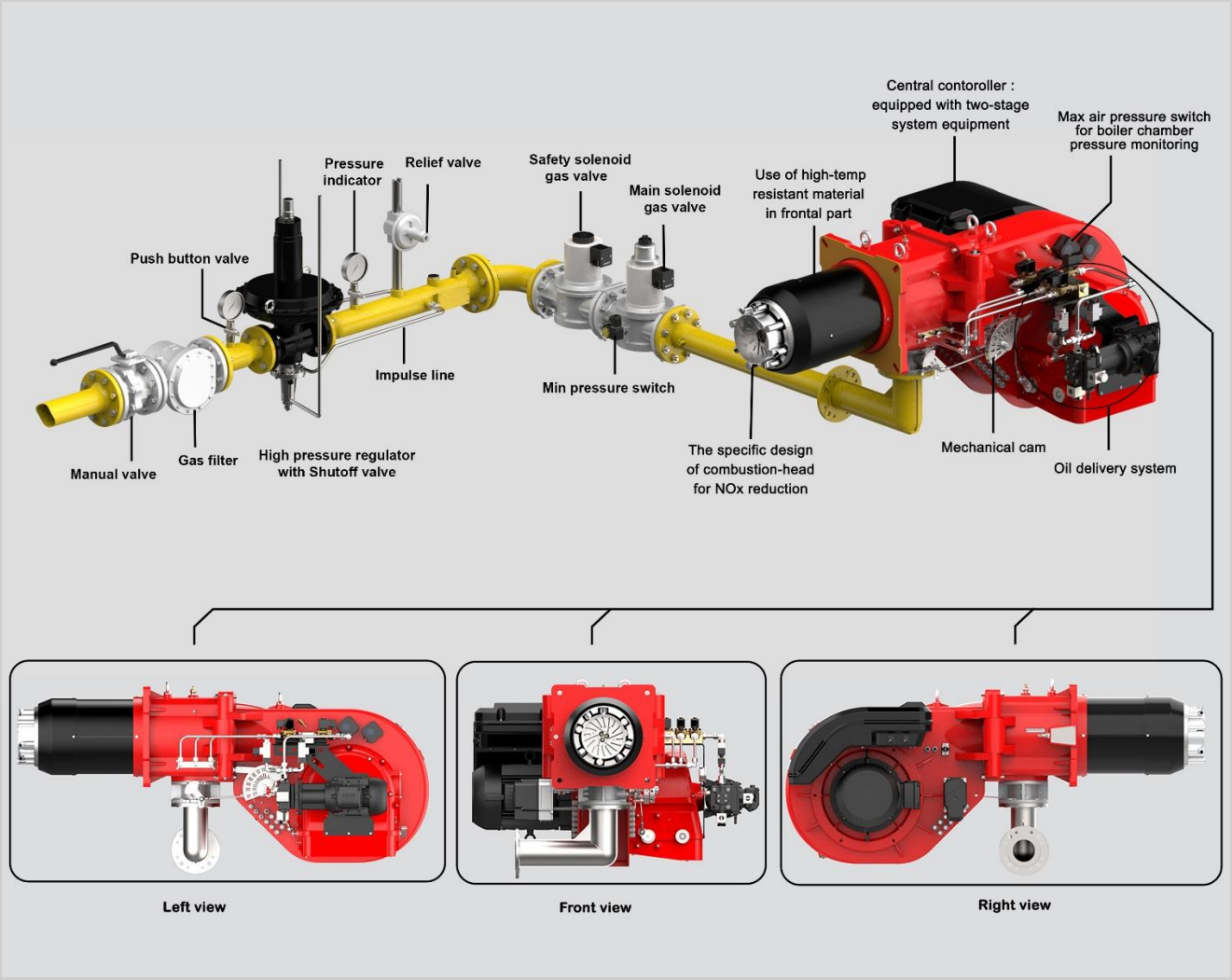
RGB-MC-605



Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C. D
RGB-MC-605	1665	502	1035	741	410	334	20	4	490

We are delighted to gratefully guarantee the best performance of our productions in order to meet our customer demands.

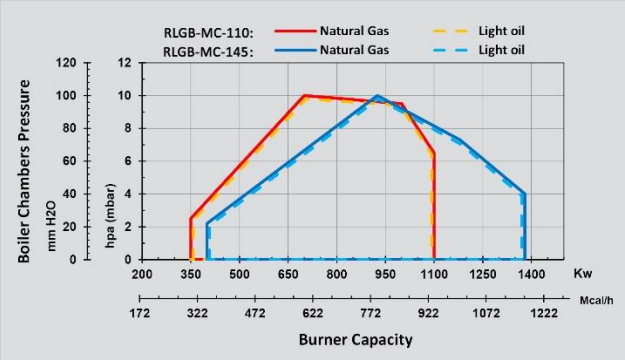
RLGB-MC series raadman burner:



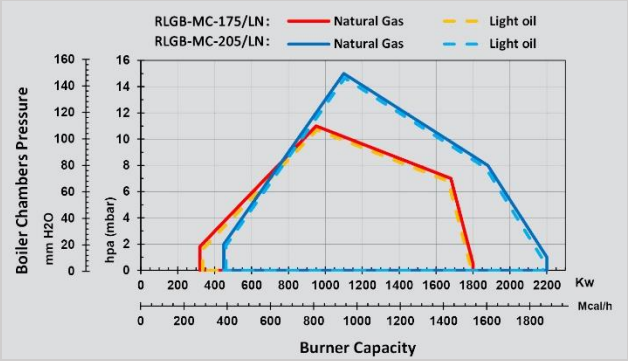
Burner selection: capacity and working diagram

Dual-fuel Burner

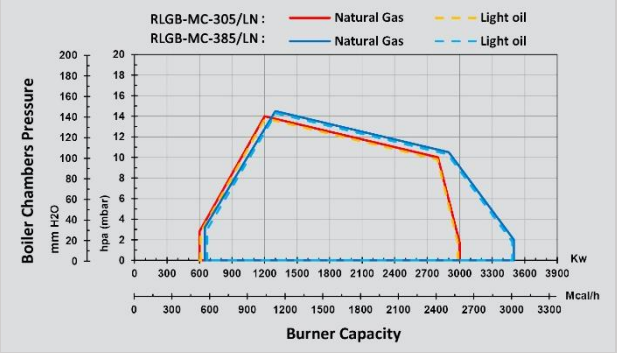
Burner	Capacity (KW)	Turn down
RLGB-MC-110	NG: 350-1100	1:3
	LFO: 350-1100	1:3
RLGB-MC-145	NG: 400-1380	1:4
	LFO:400-1380	1:4



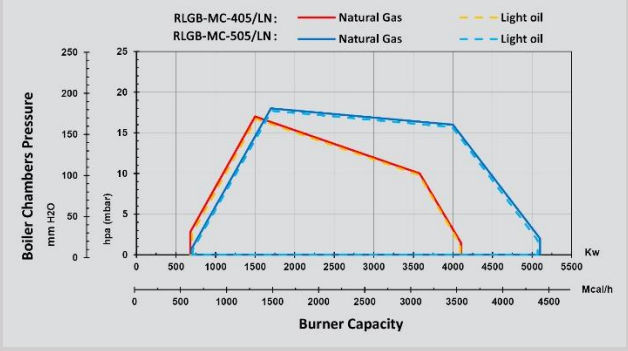
Burner	Capacity (kW)	Turn down
RLGB-MC-175/LN	NG:320-1800	1:5
	LFO: 320-1800	1:5
RLGB-MC-205/LN	NG:450-2200	1:5
	LFO:450-2200	1:5



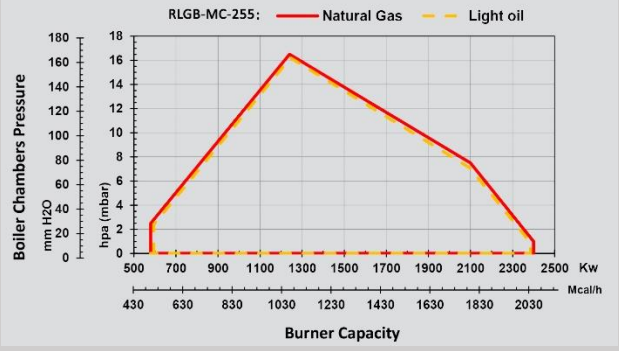
Burner	Capacity (kW)	Turn down
RLGB-MC-305/LN	NG:600-3000	1:5
	LFO: 600-3000	1:5
RLGB-MC-385/LN	NG:650-3500	1:5
	LFO:650-3500	1:5



Burner	Capacity (KW)	Turn down
RLGB-MC-405/LN	NG: 680-4100	1:6
	LFO: 680-4100	1:6
RLGB-MC-505/LN	NG: 700-5100	1:7
	LFO:700-5100	1:7



Burner	Capacity (KW)	Turn down
RLGB-MC-255	NG:580-2400	1:4
	LFO:580-2400	1:4



Burner	Capacity (KW)	Turn down
RLGB-MC-605/LN	NG: 1000-6100	1:6
	LFO: 1000-6100	1:6

Working diagrams for light fuel oil burner are certified in accordance with EN 267.

The firing rate diagram has been obtained considering the ambient temperature of 20°C and atmospheric pressure of 1013 mbar (Sea level condition).

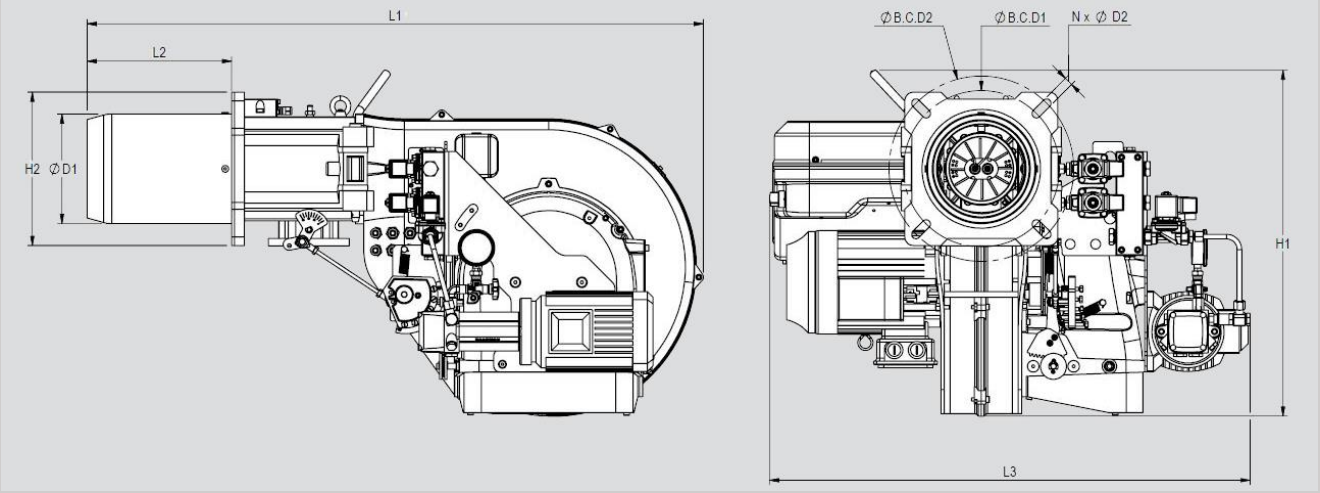
Technical data: RLGB-MC series (Dual-fuel burner)

- N.G operation: Staging or Mechanical Modular
- LFO operation: II or III Stages

	Power system	Power management system	
Burner	**Motor(kW/PH/V/HZ/rpm)**	**Controller**	**Actuator (N.M)**
RLGB-MC-110	1.5 /3 /380-400 /50 /2840	Siemens/Honeywell	3/10
RLGB-MC-145	2.2 /3 /380-400 /50 /2840	Siemens/Honeywell	3/10
RLGB-MC-175/LN	4 /3 /380-400 /50 /2840	Siemens/Honeywell	3/10
RLGB-MC-205/LN	5.5 /3 /380-400 /50 /2840	Siemens/Honeywell	3/10
RLGB-MC-255	5.5 /3 /380-400 /50 /2840	Siemens/Honeywell	3/10
RLGB-MC-305/LN	7.5 /3 /380-400 /50 /2940	Siemens/Honeywell	3/10
RLGB-MC-385/LN	7.5 /3 /380-400 /50 /2940	Siemens/Honeywell	10/15
RLGB-MC-405/LN	11 /3 /380-400 /50 /2940	Siemens/Honeywell	10/15
RLGB-MC-505/LN	11 /3 /380-400 /50 /2940	Siemens/Honeywell	10/15
RLGB-MC-605/LN	15 /3 /380-400 /50 /2920	Siemens/Honeywell	10/15

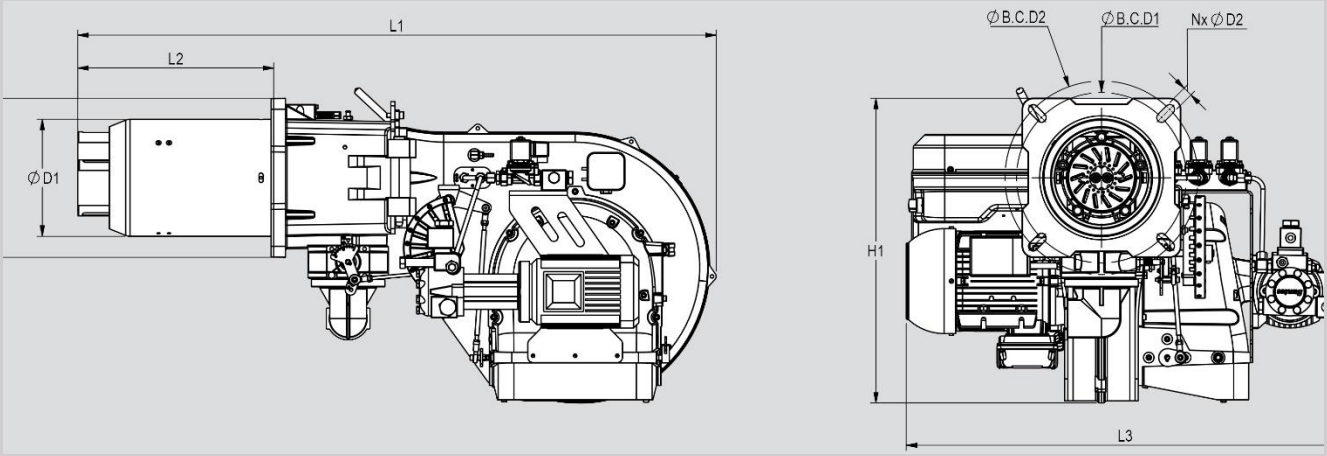
General dimension of RLGB-MC series

RLGB-MC-110, RLGB-MC-145



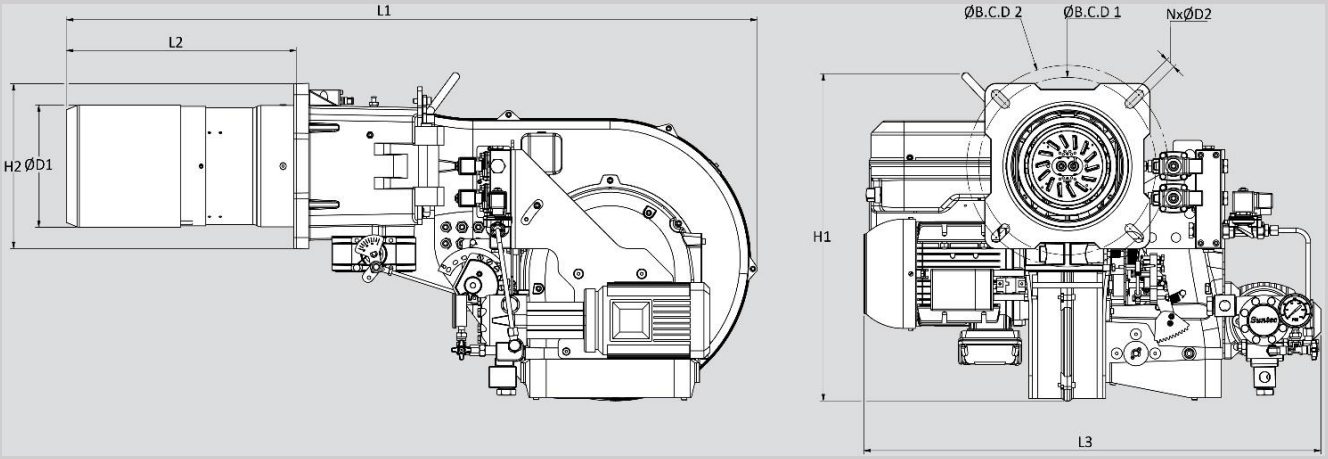
Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C. D1	B.C. D2
RLGB-MC-110	1068	250	830	598	265	184	15	4	270	320
RLGB-MC-145	1068	255	830	598	265	194	15	4	270	320

RLGB-MC-175/LN, RLGB-MC-205/LN



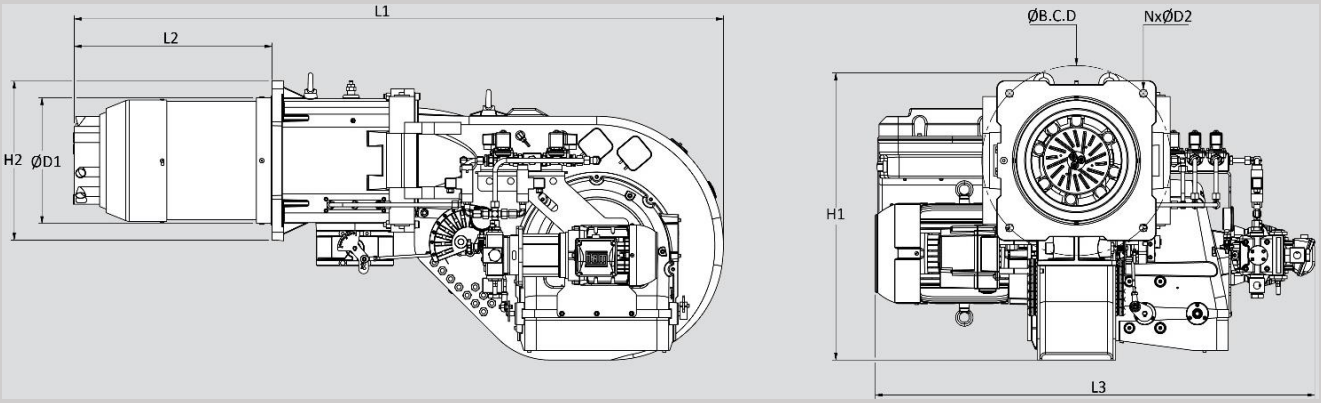
Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C. D1	B.C. D2
RLGB-MC-175/LN	1213	373	875	598	300	226	18	4	323	367
RLGB-MC-205/LN	1213	373	875	598	300	226	18	4	323	367

RLGB-MC-255



Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C. D1	B.C. D2
RLGB-MC-255	1260	419	833	598	300	223	18	4	323	367

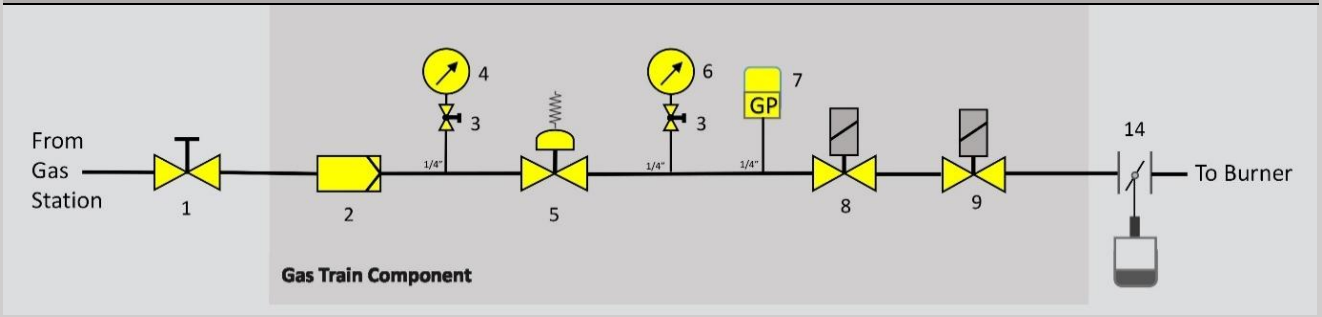
RLGB-MC-305/LN, RLGB-MC-385/LN, RLGB-MC-405/LN, RLGB-MC-505/LN, RLGB-MC-605/LN



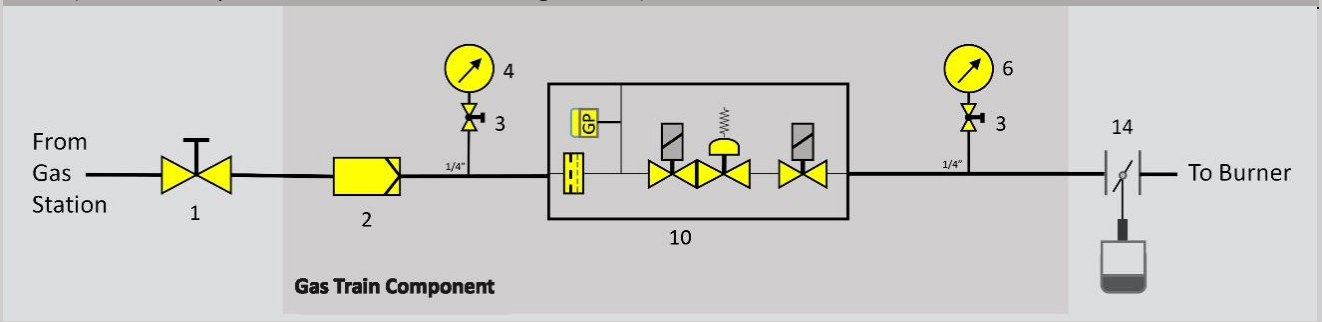
Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C. D
RLGB-MC-305/LN	1683	510	1137	741	410	328	20	4	490
RLGB-MC-385/LN	1683	510	1137	741	410	328	20	4	490
RLGB-MC-405/LN	1683	510	1249	741	410	328	20	4	490
RLGB-MC-505/LN	1683	510	1249	741	410	328	20	4	490
RLGB-MC-605/LN	1680	512	1245	741	410	340	20	4	490

Gas train diagram:

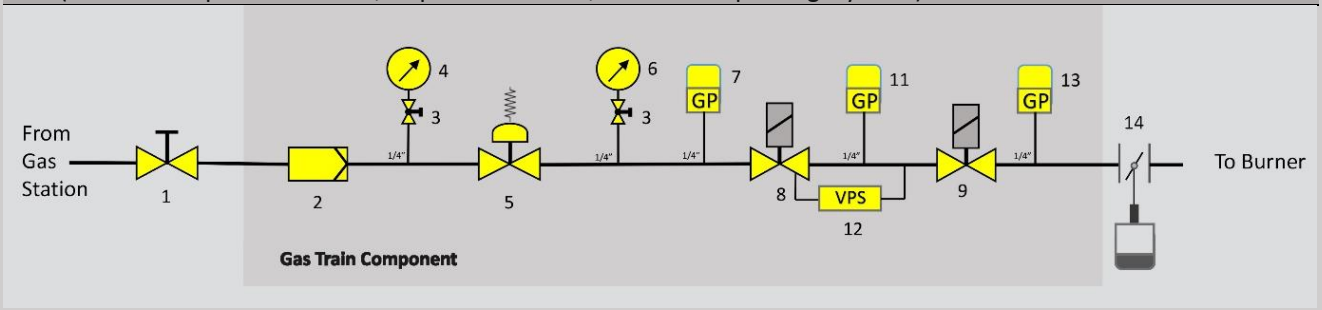
GT1(Pressure input<500 mbar, separated items)



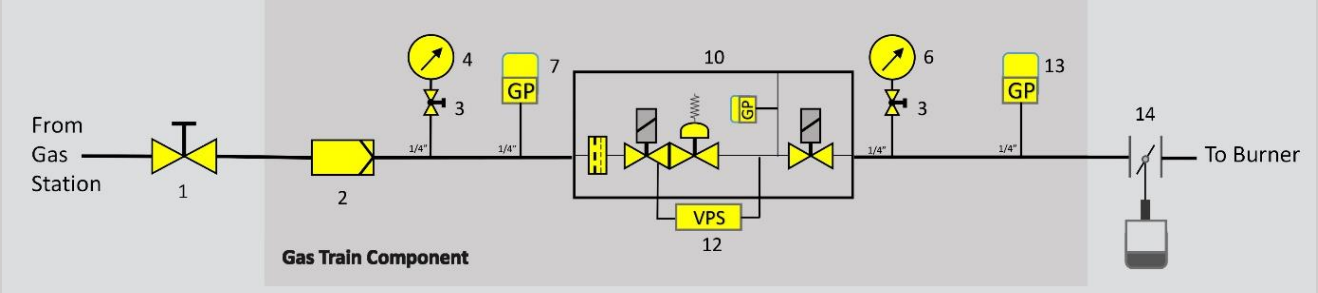
GT2 (Pressure input<500 mbar, multi bloc gas train)



GT3 (Pressure input<500 mbar, separated items,with valve proving system)



GT4 (Pressure input<500 mbar, multi bloc gas train, with valve proving system)



1: Ball valve
2: Gas filter
3: Ball valve
4: Pressure Gauge
5: Pressure regulator (Low pressure)
6: Pressure Gauge
7: Min gas pressure switch
8: Safety gas valve
9: Main gas valve
10: Multi-Block Solenoid Valve
11: Leak Test gas pressure switch
12: Valve proving system
13: Max gas pressure switch
14: Butterfly valve

Gas Valve Train Sizing

RGB-MC-Series...				
Burner	**Gas model**	**Gas train size**	**ΔP B.V (mbar)**	**ΔP C.H** (mbar)**
RGB-MC-85/LN	GT1/GT2	Rp 1 ½	2	11.7
RGB-MC-110	GT1/GT2	Rp 1 ½	2	9
RGB-MC-130/LN*	GT3/GT4	Rp 1 ½	2	22.5
RGB-MC-145*	GT3/GT4	Rp 2	2	8.6
RGB-MC-205	GT3/GT4	Rp 2	3	14.5
RGB-MC-255/LN	GT3/GT4	Rp 2	3	24.9
RGB-MC-305	GT3/GT4	DN 65	4	20.6
RGB-MC-385	GT3/GT4	DN 65	4	31.7
RGB-MC-405/LN	GT3/GT4	DN 65	4	47
RGB-MC-505/LN	GT3/GT4	DN 65	4	56
RGB-MC-605	GT3/GT4	DN 65	4	62.8

RLGB-MC-Series				
Burner	**Gas model**	**Gas train size**	**ΔP B.V (mbar)**	**ΔP C.H** (mbar)**
RLGB-MC-110	GT1/GT2	Rp 2	2	10
RLGB-MC-145*	GT3/GT4	Rp 2	2	13
RLGB-MC-175/LN*	GT3/GT4	Rp 2	3	17
RLGB-MC-205/LN	GT3/GT4	Rp 2	3	21.5
RLGB-MC-255	GT3/GT4	Rp 2	4	27.8
RLGB-MC-305/LN	GT3/GT4	DN 65	4	23
RLGB-MC-385/LN	GT3/GT4	DN 65	4	27.3
RLGB-MC-405/LN	GT3/GT4	DN 65	4	44
RLGB-MC-505/LN	GT3/GT4	DN 65	4	47
RLGB-MC-605/LN	GT3/GT4	DN 65	4	68

*Max gas pressure switch is optional

**Combustion Head

Note:

According to the BS-EN 676, valve proving system shall be used in burners with capacity above 1.2 MW. Consequently, MADAS-MTC10 or DungsVDK200 valve proving system are highly recommended.

Layout of the valve train

On boilers with hinged doors, the valve train must be mounted on the opposite side to the boiler door hinges.

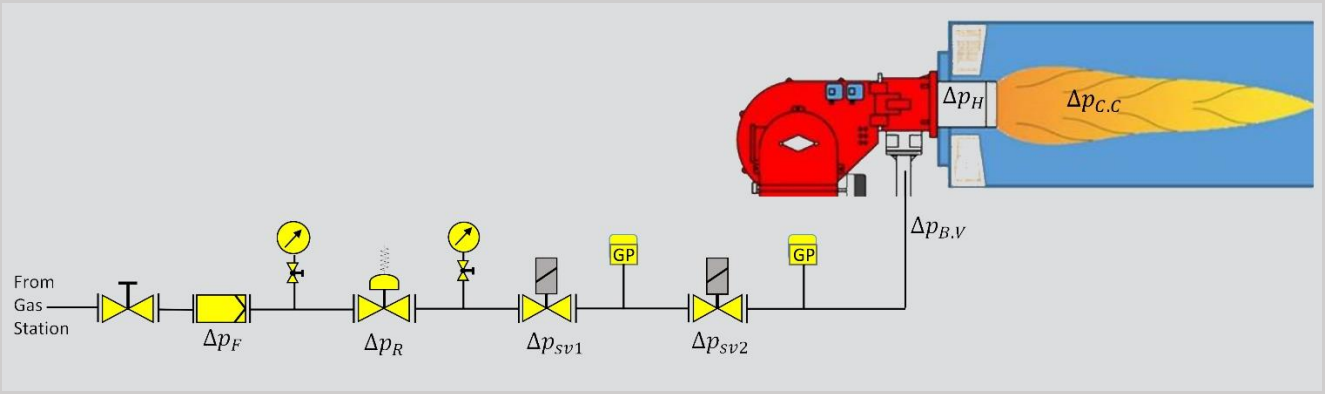
Break points in the valve train

Break points in the valve train should be provided to enable the door of the heat generator to be swung open. The mail gas line is best separated at the compensator.

Support of the valve train

The valve train should be properly supported in accordance with the site conditions. See the raadman accessories list for various valve train support components.

Calculation of Minimum Inlet Pressure and Minimum output pressure of regulator

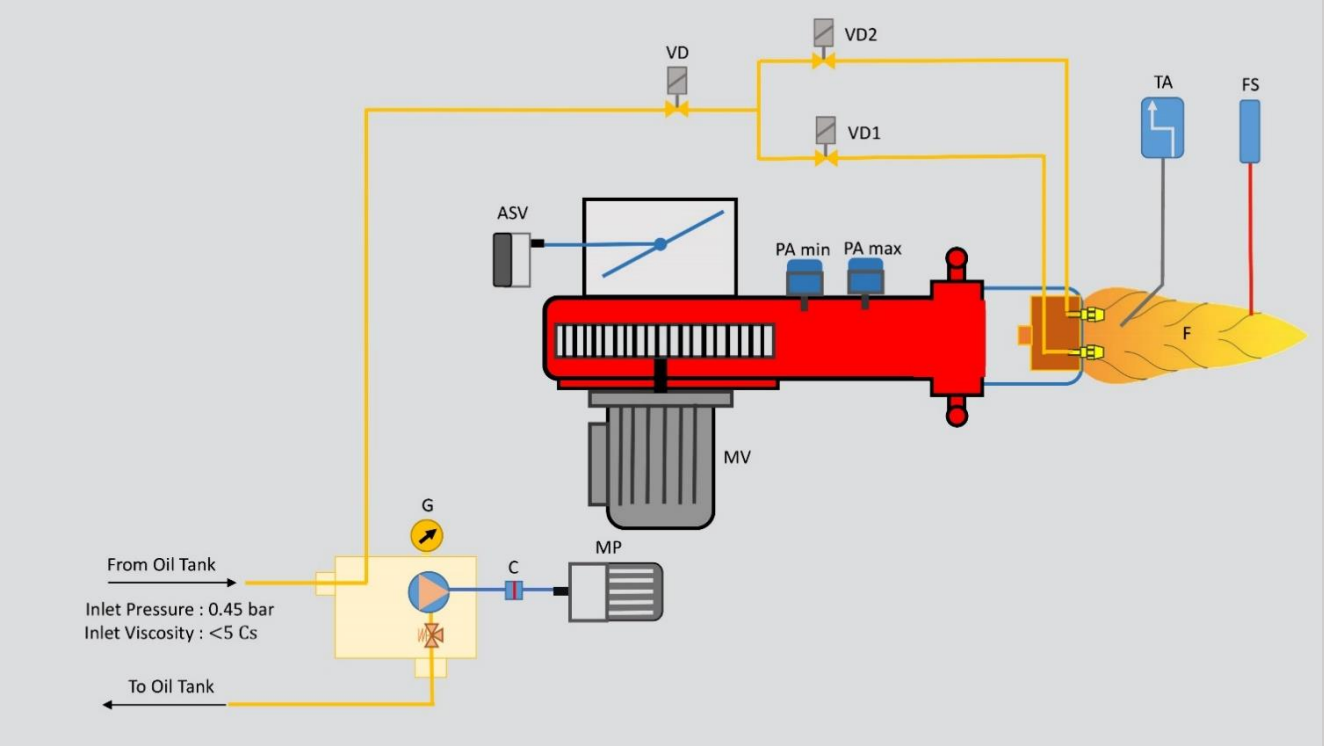


Min Input Pressure= $\Delta P_{Filter(F)}$+ $\Delta P_{Regulator(R)}$+ $\Delta P_{Safety\ solenoid\ valve(sv1)}$+ $\Delta P_{main\ solenoid\ valve(sv2)}$+ $\Delta P_{batterfly\ valve(B.V)}$+ $\Delta P_{Combustion\ Head(H)}$+ $\Delta P_{Combustion\ chamber(C.C)}$

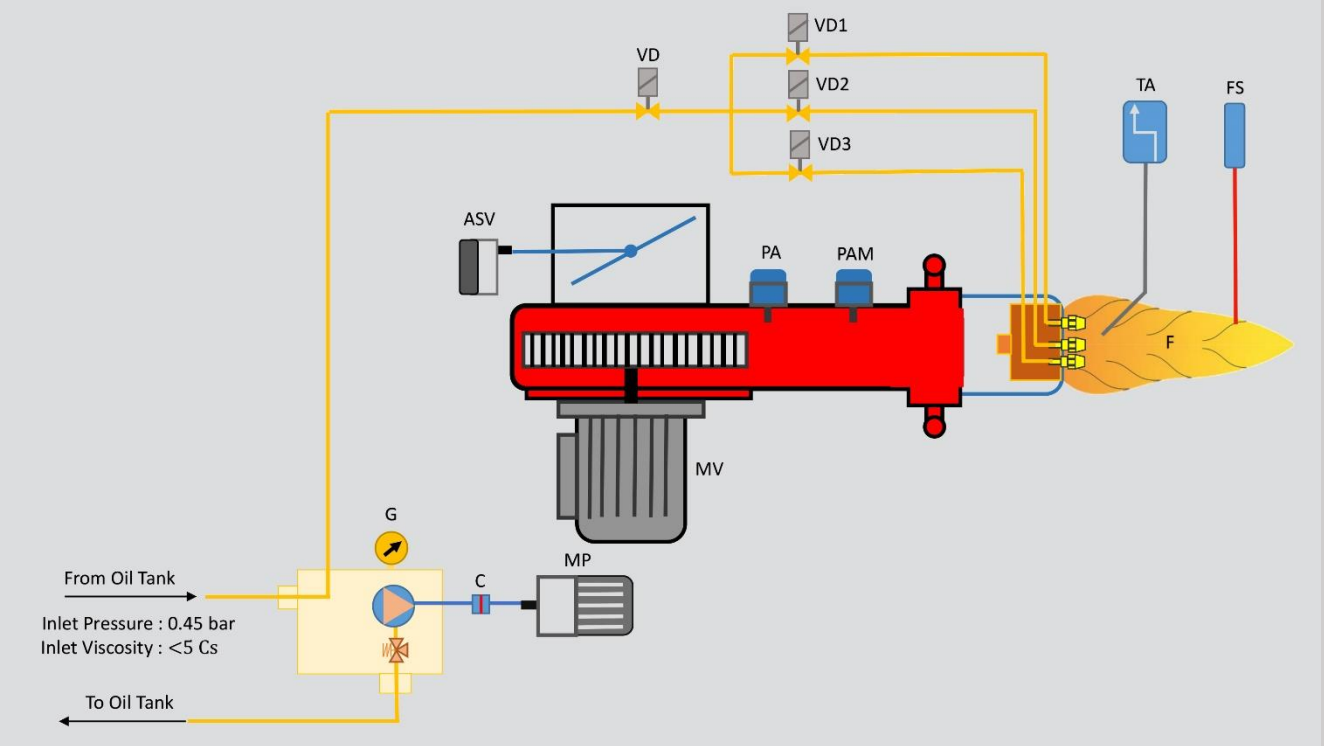
Min output pressure of regulator= $\Delta P_{Safety\ solenoid\ valve(sv1)}$+ $\Delta P_{main\ solenoid\ valve(sv2)}$+ $\Delta P_{batterfly\ valve(B.V)}$+ $\Delta P_{Combustion\ Head(H)}$+ $\Delta P_{Combustion\ chamber(C.C)}$

Oil delivery system

Type OL-III: (Two Stages dual-fuel burner)

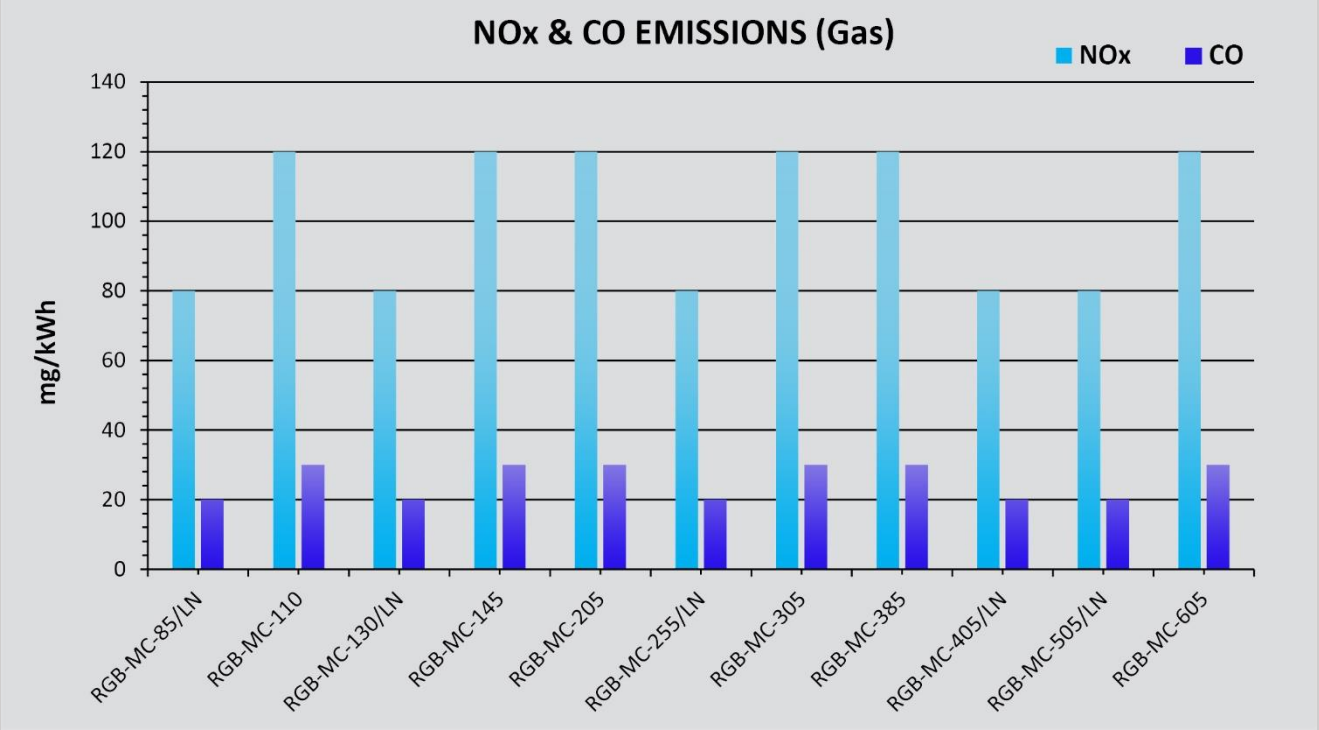


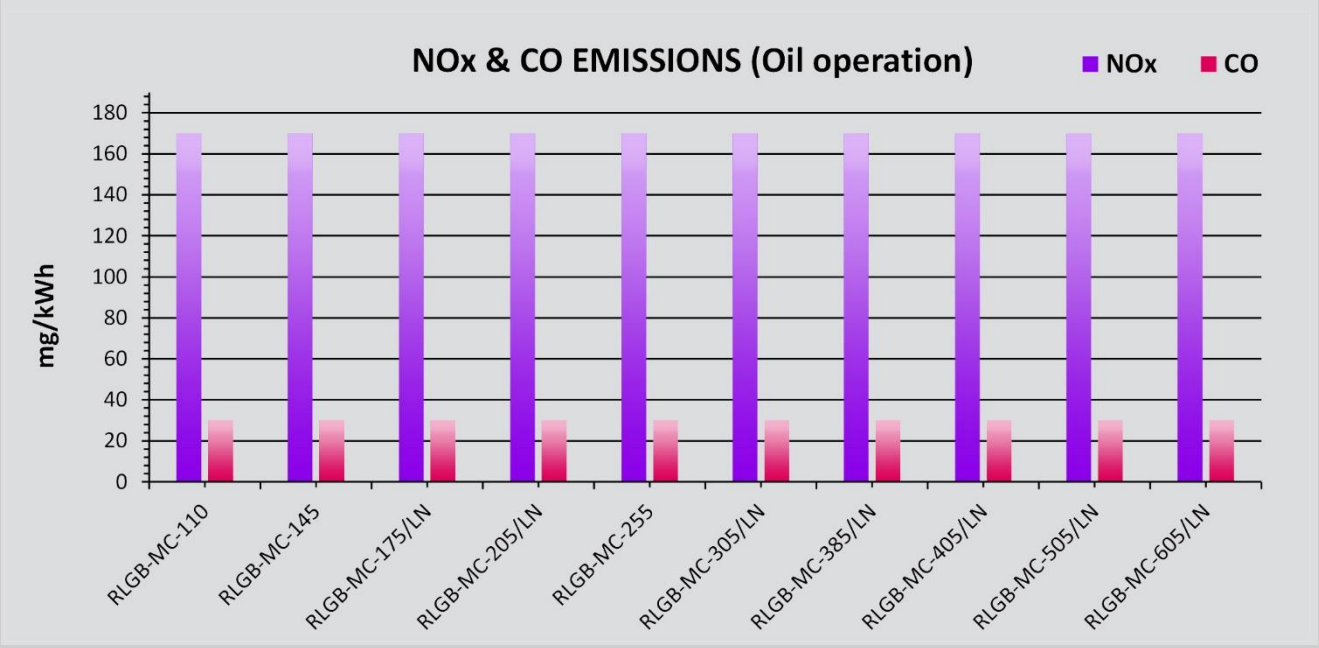
Type OL-III: (Three Stages dual-fuel burner)



MV: Fan motor
MP: Pump motor
FS: Flame sensor
VD: Light oil safety valve
VD1: Light oil delivery valve Stage 1
VD2: Light oil delivery valve Stage 2
VD2: Light oil delivery valve Stage
TA: ignition transformer
C: Coupling
G: Gauge
F: Gas or oil flame
ASV: Air damper servomotor
PA: Air pressure switch

Emission





Mechanical Modular Burners cover a firing range of 1000 up to 6,200 kW generally. They can be used wherever heat is needed in heating residences or hospitals, schools or offices, in industry or trade, on board ships and for mobile plant. They are suitable for all commonly available gas and oil types and are notable for their superior reliability, longevity, great economy and ease of manganese.

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