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Knowledge
Based

Since 1975

PACKMAN
Industrial Group

General Catalogue

Heating, Cooling, Combustion
& Water Treatment Solution

PACKMAN industrial group

PACKMAN GROUP
History

Heating Product Group

The Packman Company was founded in February 1975, and was soon afterwards registered in companies Registration Office. In early years the Packman construction and service branch focused on building installations. Different mega power plants were built by cooperating with Brown Boveri and Asseck companies in 1976.

The company started its official activities in construction of High-Pressure Vessels such as Hot-Water Boilers, Steam Boilers , Storage Tanks, Softeners and Heat Exchangers from 1984.

Packman Company is one of the first companies which supplied the high quality and standard hot water boilers to the customers.

Packman has exported its products to countries such as Uzbekistan, United Arab Emirates and other countries in the Middle East. It is one of the largest producers of hot-water and steam boilers in the Middle East.

Now we are proud to announce that the Packman industrial group has five major sub-brands that have product titles in all field of HVAC equipment and engineering services, and we do not know this success except with the help and support of our customers.

1. Construction Services Industry Association
2. Industry Association
3. Construction Companies' Syndicate
4. Technical Department Association
5. Mechanical Engineering Association
6. Engineering Standard Association

Departements:

Sales Deps:

∩ Power Plant & Petrochemical
∩ Industrial
∩ Hospitality Service
∩ Commercial & Residential
∩ Sport Complex & Pool

Technical Deps:

≡ Manufacturing R&D
≡ Innovation Center
≡ EPC Execute Unit
≡ Product Develop Unit
≡ Sales Engineering Dep.

Others:

≈ After Sales Service
≈ Project Control
≈ Financial Office
≈ Commercial Office
≈ Marketing Department

PACKMAN GROUP
Brands

PACKMAN
Industrial Group

Designer & manufacturer of Condensing, Hot Water, Steam, Hot Oil & Waste Heat Boilers, Heat Exchangers, Autoclave Pressure & Storage Vessels & etc

GREENMAN
Green mindset, green future

Engineering & Designing Commercial Greenhouse Plant, CO2 Dosing System, Flue gas Condenser & Special HVAC Systems, Sustainable Agriculture & etc

ROMAN
Water solution

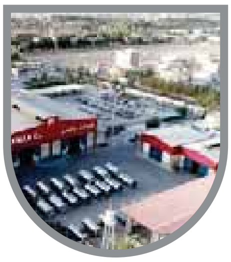
Designer & manufacturer Reverse Osmosis Plant & Package, Water Treatment, Softener & Filters and Chemical Dosing Systems & etc

RAADMAN
a look to the future

Designer & manufacturer of Industrial Mono & Dual Block Gas, LPG, Light & Heavy Oil Burners, Premixed & Postmixed Burners, Watertube burners, Process burners, Special application burners & Combustion Solutions & etc

CHILLMAN
Coolest hvac around

Designer & manufacturer of Air & Water Cooled Chillers, Air Handling Units, Fancoil, HVAC Equipment, Cold Storage Room & etc


1. Isfahan Factory


2. Vilashahr Factory


3. Parand Factory


4. Parand (2) Factory


5. Bonyad Factory

SOME OF Certificates are




















SOME OF
Certificates are

•Pool boiler room designe

•Steam boiler room

•Boiler Selection

- Hot Water Boiler Installation Commissioning
- Steam Boiler Installation And Commissioning
- Steam Mobile Boiler Installation And Commissioning
- Boiler Efficiency Calculation
- Hot Oil Boiler Maximum Temperature Calculation
- Boiler General Arrangement And Civil Guide In Boiler Room

Product
CATEGORY

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PACKMAN (Heating Product Group)

CHILLMAN (Cooling Product Group)

RAADMAN (Burners & Combustion Products Group)

ROMAN (Water Treatment Products)

GREENHOUSE (Greenhouse Products Group)

Heating Product Group of **PACKMAN**

Heating Product Group
PACKMAN

Condensing Boiler

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Hot Water Boiler

Steam Boiler

Thermal Oil Boiler

Waste Heat Boiler

Heat Exchanger

Heating Product Group
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Condensing Boiler
Heating Product Group
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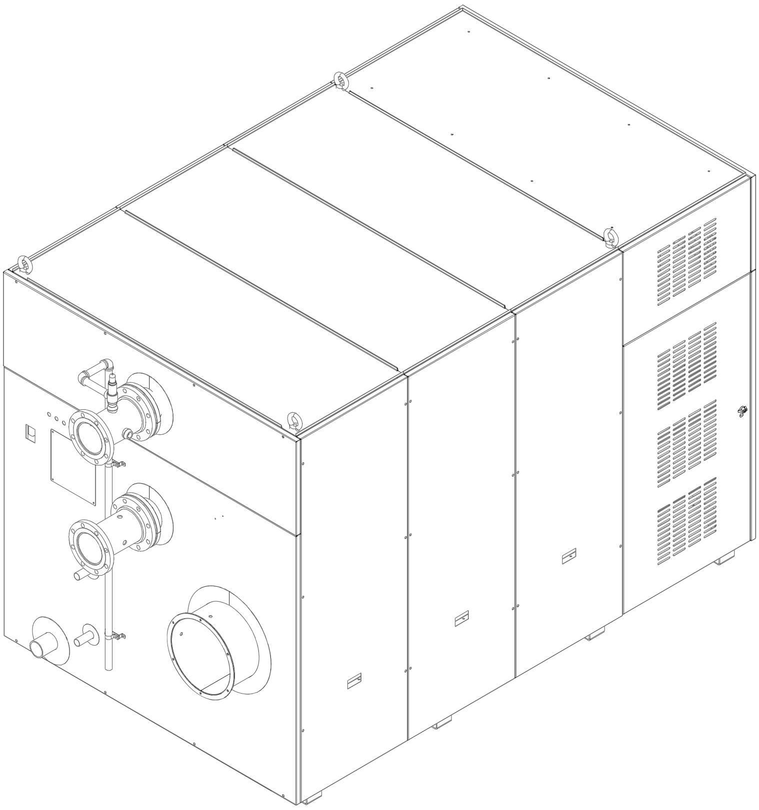
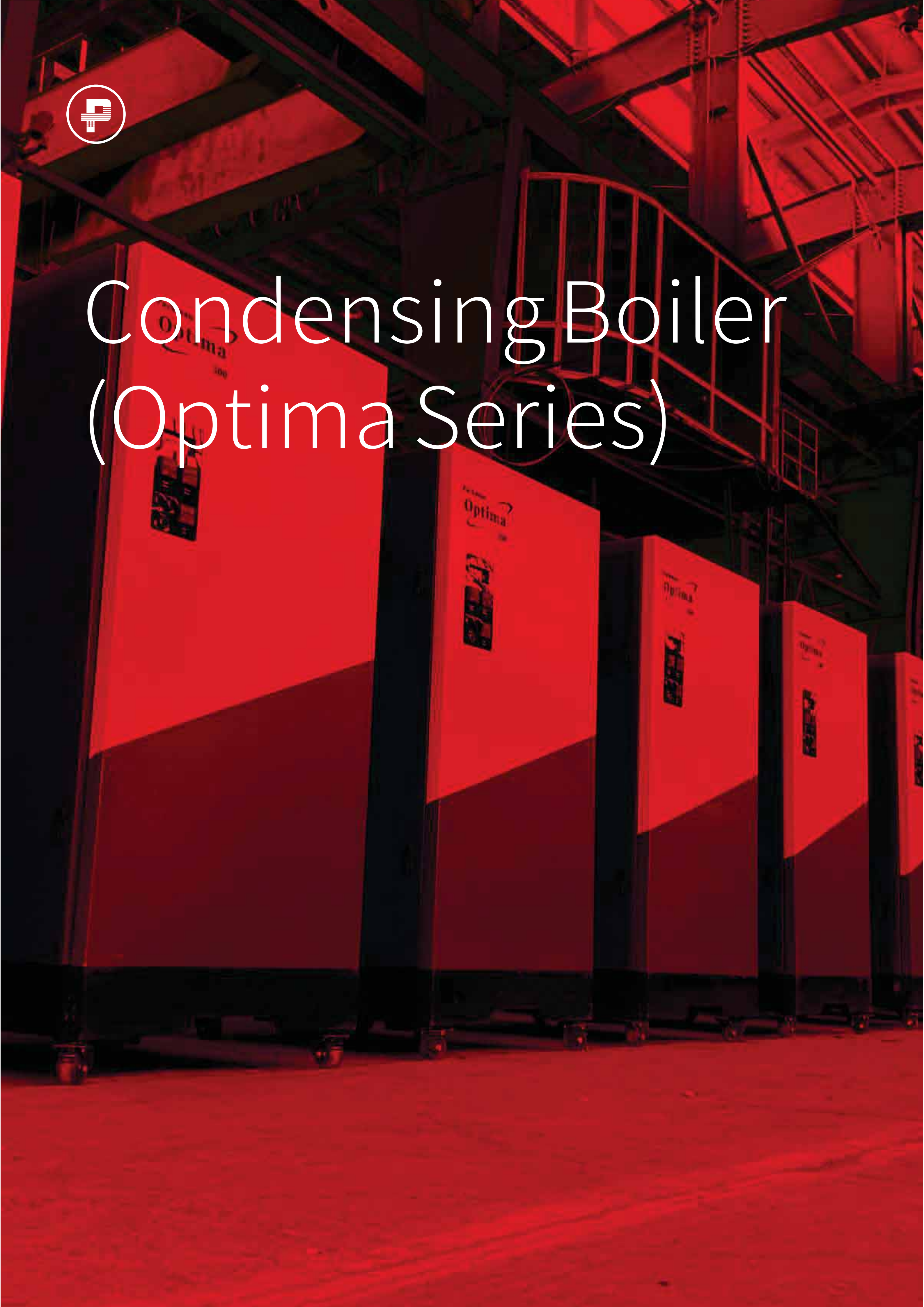
Condensing Boiler **page**



Condensing Boiler (Optima Series)



Product Description

Condensing Boiler technology is the most efficient, environmentally friendly form of fuel heating available today. Condensing technology recovers the condensation heat retained latently in flue gases; part of the energy that normally disappears up the chimney in other heating systems. Additionally, a modern condensing heating system increases the value of the building as well as quality of life by reducing emissions. Condensing technology offers an intelligent, easy-to-install solution to decrease fuel costs.

With condensing technology, the water vapor contained in the flue gases condenses on the cooler heat exchanger surfaces of the boiler, transferring heat into the boiler water. Large heat-transfer surfaces, a counter-flow heat exchanger design, and cold return water temperatures together optimize condensation opportunities. The heat released from condensation is transmitted directly into the boiler water, minimizing thermal flue gas losses. The seasonal efficiency of the OPTIMA series condensing boilers can reach up to 107%, reducing heating costs by up to 20% in comparison with conventional heating.

Optima Series

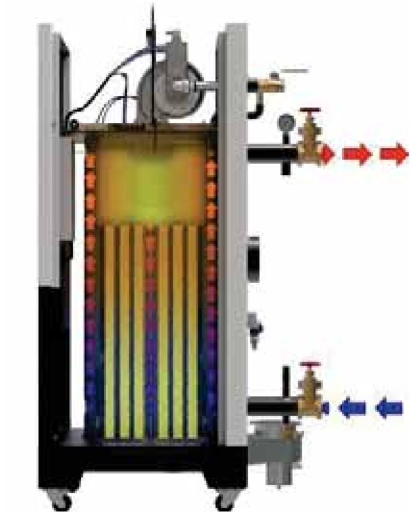
Packman was founded in 1975 and started its official activities in construction of high-pressure vessels such as hot water boilers, steam boilers, storage tanks, softeners and heat exchangers from 1984. In the last ten years, Packman has been the first company to design and manufacture gas-fired condensing boilers in all capacities in Iran.

The OPTIMA series design is based on Packman's over 45 years of experience in the hot water boilers market. Available in eight sizes from 100 kw to 600 kw. For more applications, greater than 600 kw, can easily chain multiple units together.

The OPTIMA series is a completely integrated solution with firetube heat exchanger, premix burner and boiler management controls. The advanced heat exchange design in the OPTIMA series allows the boiler to achieve efficiencies up to 107%, and the modulating premix burner delivers high turndown and NOx levels to less than 20 ppm. This boiler is ideal for central heating applications and indirect hot water supply for working pressures up to 10 bar.

Optima Structure

The internal structure of Optima boilers is as follows



Application

- Multi-family/Apartments, Education, Hotels, Medical Centers/Nursing Homes, Office Buildings and etc.
- Buildings with a hot-water heating system – low temperature: 55°C (131°F) or below.
- Existing buildings with a hot-water heating system where the heat can be transferred before returning to the boiler (e.g. heating a fresh air compensator or a domestic water).
- Reheat the mitigation water system using heat pumps for heating and air-conditioning.

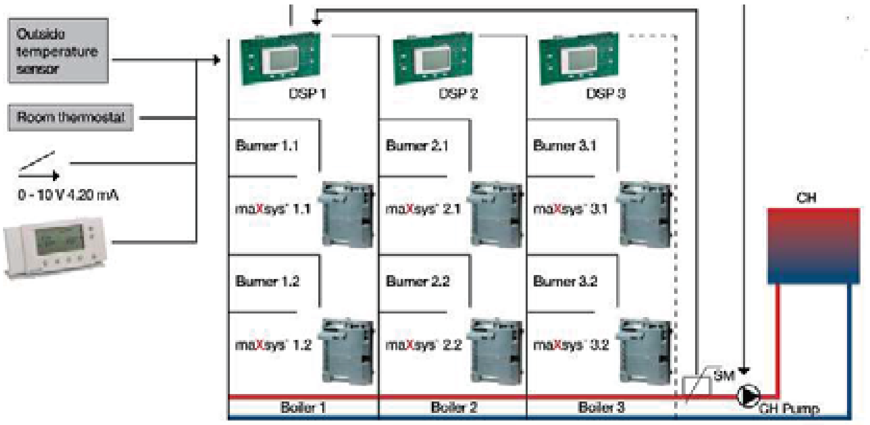
Operating Features & Benefits

- The heating circuit flow and low temperature return flow can be connected without any additional equipment, e.g. flow monitors.
- The ideal solution for projects where energy performance is sought.
- Space Savings; the appliance is more compact and making it fit easily in a mechanical room.
- The 316L stainless steel heat exchanger is designed for greater strength and longer life.
- Dual temperature returns connections for +6% efficiency gain.

- The ability to install an outdoor sensor
- Metal fiber premix modulating burner for ultra-low NOx emissions.
- Modulating starting from 30% of the power.
- Low hydraulic resistance (ideal for primary variable flow applications)
- No minimum temperature requirement.
- Easy-access, hinged burner boiler lid to aid burner servicing.
- Low noise with less than 70 dB at 3 feet.
- Direct/conventional vent with CPVC, Polypropylene.
- Removable frames allow for easy access and simplifies maintenance.
- Cascade Installation; easy-chain multiple units for applications over 600kW. (Up to 6 units can be connected to one sequencer panel.)

Intelligent Integrated Controls

OPTIMA Series boilers are equipped with Honeywell MAXSYS controller, it is a proven boiler/burner management control that provides an intuitive operator interface featuring integrated burner sequencing, trending, flame safety, modulation, alarms, lockout, and much more, ensuring your boiler system operates at peak efficiency, while providing necessary safety and reliability.

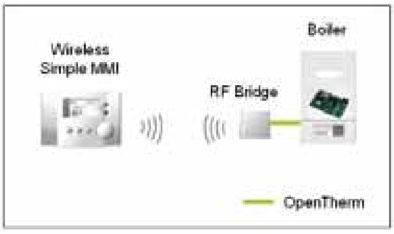


The Honeywell MAXSYS controller with integrated lead/lag optimizes the boiler room's operational efficiency while delivering precise temperature control to meet heating demands. The Honeywell MAXSYS controller can communicate with your building's Energy Management System (EMS), which helps maximize overall system efficiency.

- Multiple loop PID set point control (central heat, domestic hot water and lead/lag),
- Configurable lead/lag control to match system requirements,
- Outdoor temperature reset,
- Remote enable and set point.

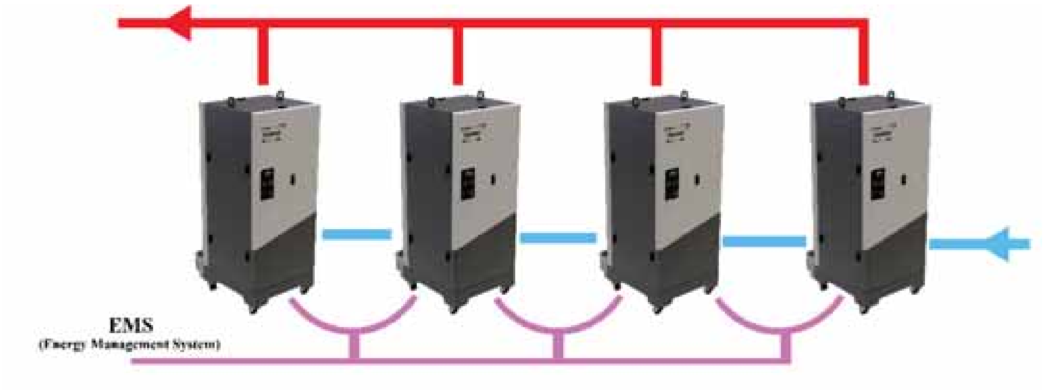
Remote Access To Boiler

- Actual time/day display
- Actual room temperature/room temperature set point
- Set point adjustments
- Seven days' time program with 2-6 points with independent room temperature settings for each day
- System output indications.



Optimal Hydronic Boiler Room Management

The OPTIMA condensing boiler operates most efficiently at reduced firing rates. The Honeywell MAXSYS controller is uniquely capable of taking advantage of the OPTIMA's combustion and thermal performance characteristics to sequence and modulate OPTIMA boilers to maximize system efficiency.



The Honeywell MAXSYS controller uses the common base load firing rate method to sequence and modulate a multiple-boiler system. This approach optimizes the boilers' operating efficiency while minimizing energy-wasting short cycling. The elimination of short cycling minimizes purge and standby losses, while extending the life and reliability of your boiler system.
Up to 6 units can be connected to one sequencer panel. One unit will be set to operate as the master with up to 5 dependent units. Additionally, it can operate a hydronic heating loop with Domestic Hot Water Priority on an indirect storage tank or heat exchanger.

The Latest Boiler Design Technology

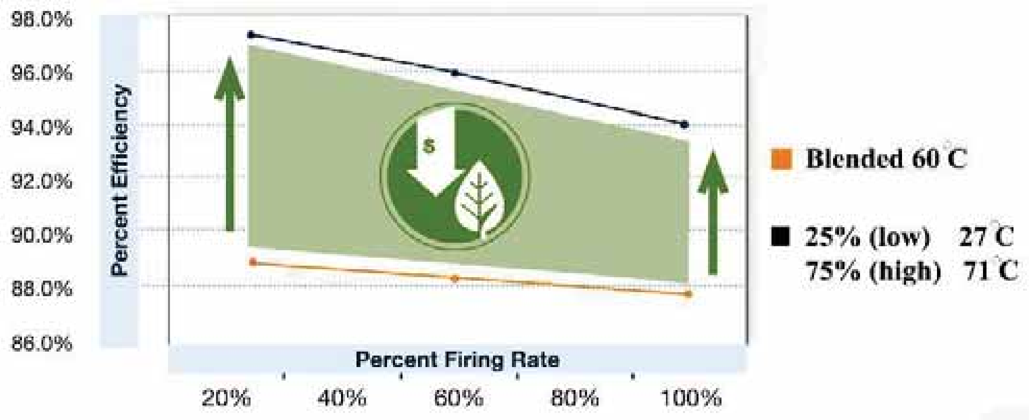
The OPTIMA, featuring stainless steel heat exchanger, is the best condensing boiler on the market. Designed to provide maximum condensing efficiency, the most reliable operation and complete system design flexibility. The dual return advantage provides a 6%+ efficiency gain. Finally, our proven firetube arrangement ensures reliability and longevity. In the other hand, the OPTIMA was designed with the boiler operator in mind; from the hinged burner to removable frames, no other boiler is as easy to maintenance.

Modulating Premix Burner

The modulating premix burner and linkage less control automatically adjust the air/gas mixture for maximum efficiency and optimum turndown. A symmetrical, 360° even-temperature heat output is achieved from the burner, providing clean combustion with ultra-low NOx emissions of less than 20 ppm as standard.

Dual Return Advantage

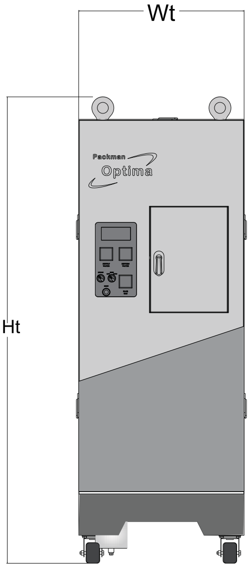
The OPTIMA’s dual return advantage offers more opportunity to improve system efficiency. Most hydronic systems blend returns from different loops, compromising the performance of your condensing boiler system. Our advanced heat exchanger technology allows you to connect a cold (less than 540C) return to the lower inlet connection and connect a high-temperature (greater than 600C) return to the upper inlet connection, realizing a +6% gain in efficiency by achieving true condensing performance even in applications with high-pressure heating loops.

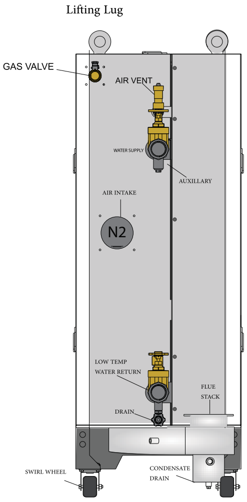


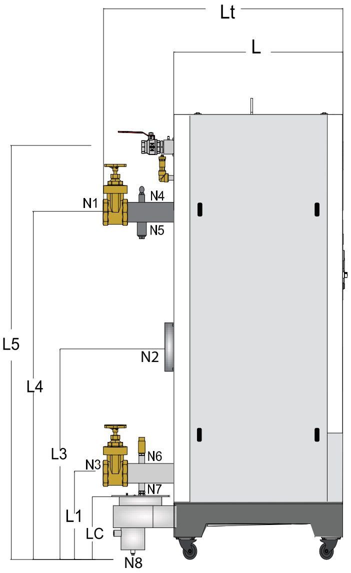
Space-saving Design

All OPTIMA products are delivered as a single, fully assembled unit. Its small footprint, doorway size, and quiet operation make it ideal for both new construction and retrofit applications.

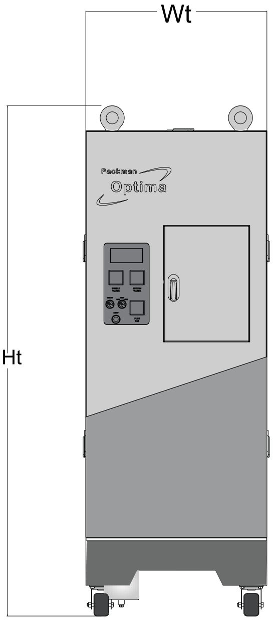
The end result is OPTIMA boilers that easily-installed, highly efficient, conserves space and lowers energy use to create significant short- and long-term savings.

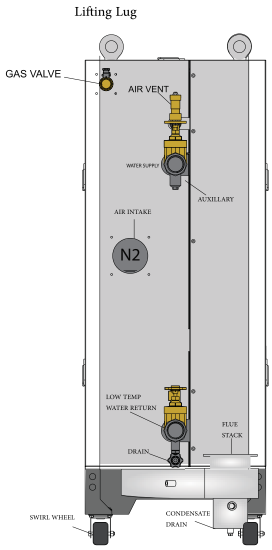


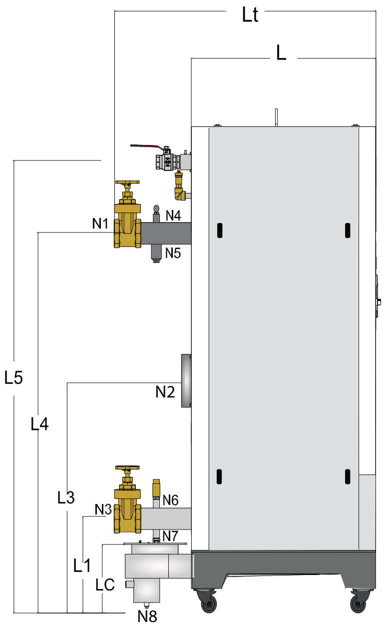




Model	Unit	Optima 100	Optima 150	Optima 200	Optima 250	Optima 300	Optima 400	Optima 500	Optima 600
Technical Data									
Max Heat Output	kW	100	150	200	250	300	400	500	600
Min Heat Output	kW	25	37.5	50	62.5	75	100	125	150
Efficiency at (30-40°C)	%	98							
Efficiency at (70-80°C)	%	91							
Min & Max Working Pressure	bar	2-16							
Water Temperature Range	°C	30-80							
Recommended Water Flowrate	m³/hr	9	13.5	18	22.5	27	36	45	54
Water Content	Liter	89	122	154	165	197	253	274	318
Max Condensate	l/hr	12	18	24	30	36	48	60	72
Min Gas Pressure	mbar (psi)	18 (1/4)							
Max Gas Pressure	mbar (psi)	60 (2)		100 (2)					
Min Gas Consumption	m³/hr	2.3	3.45	4.6	5.75	6.9	9.2	11.5	13.8
Max Gas Consumption	m³/hr	9.2	13.8	18.4	23	27.6	36.8	46	55.2
Electric Supply	V/Hz/ph	220/50/1							
Electrical Power Consumption	W	250	300	450	500	550	850	900	950
Condensate PH	-	4-4.5							
Stack Material	-	Stainless Steel 304 L or plymer according to ISIRI 19279							

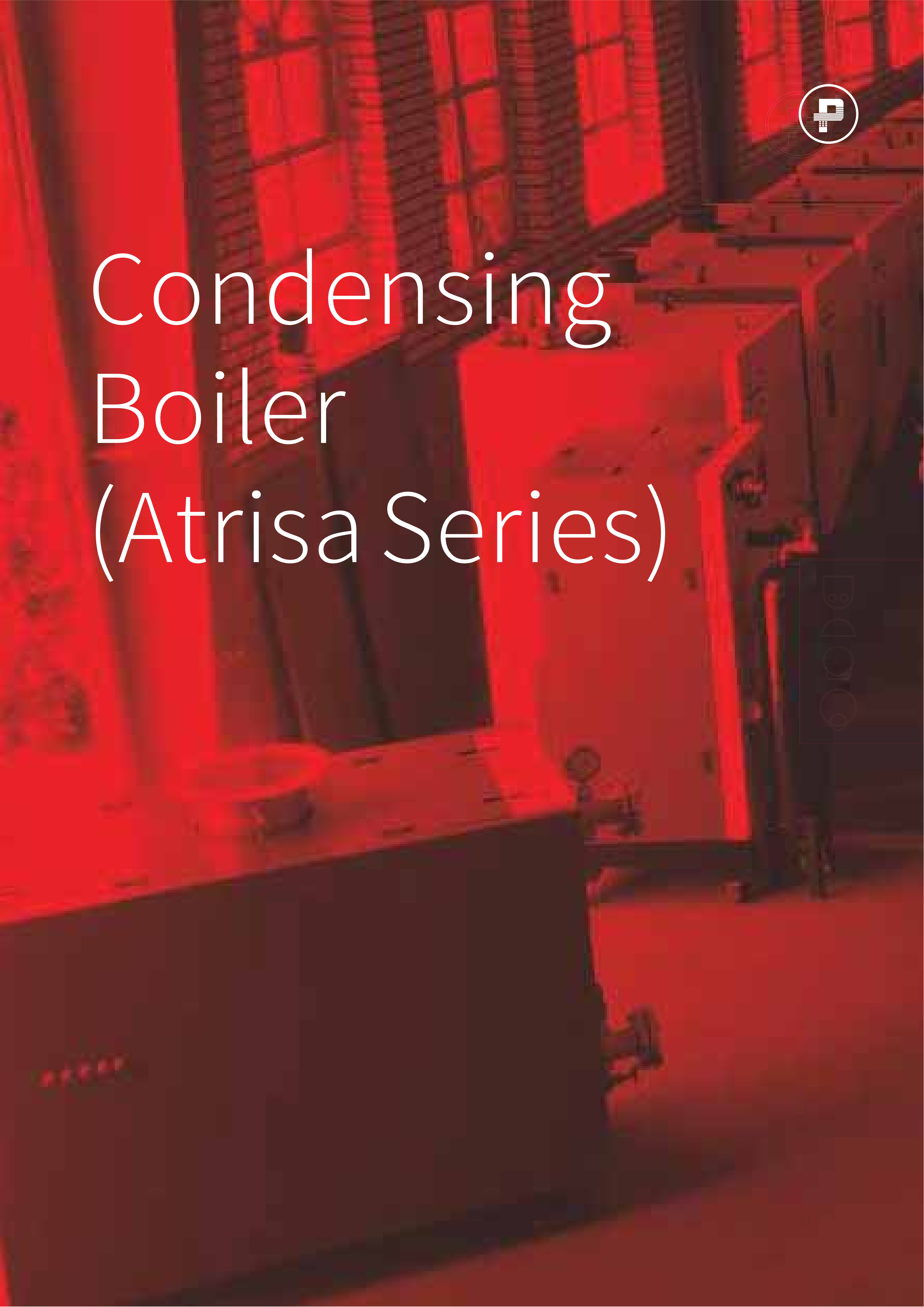






Model	Unit	Optima 100	Optima 150	Optima 200	Optima 250	Optima 300	Optima 400	Optima 500	Optima 600
Connection Size									
Water Inlet	in	2	2	2 1/2	2 1/2	2 1/2	3	3	3
Water Outlet	in	2	2	2 1/2	2 1/2	2 1/2	3	3	3
Stack & Air Intake	in	5	5	6	6	6	8	8	8
Condensate Discharge	in	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Drain	in	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Relief Valve	in	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Gas Connection	in	1	1	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2
Dimension									
Length (Lt)	mm	900	970	970	1100	1140	1260	1290	1330
Length (L)	mm	650	715	765	790	830	910	940	980
Width (Wt)	mm	600	665	715	740	780	860	890	930
Height (Ht)	mm	1680	1740	1890	1930	2000	2090	2090	2200
Weight									
Shipping Weight	kg	288	350	422	452	514	620	676	764
Service Weight	kg	377	472	576	617	711	873	950	1082

Condensing Boiler (Atrisa Series)



Product Description

The Condensing Technology of boilers and water heaters features an advanced high efficiency and convenient that produces installation, operating, and lifetime cost advantages to systems operating from 450 to 2000 kw. For applications greater than 600 kW,you can easily chain multiple units together. Premix burners with a fiber mesh make the PACKMAN Condensing Boilers ideal for“green” operation. The Premix burner technology help to achieve emission levels less than 20 ppm Nox.

At a Glance

Key Features

- Available in five sizes from 450 to 2000 kw
- Efficiencies of up to 98%
- Advanced modulation technology
- Natural Gas or Dual Fuel
- Turndown ratio up to 5:1
- Whisper-quiet operation, even at full fire
- Small footprint
- chain multiple units for applications over 600 kw
- Direct/conventional vent with CPVC or Polypropylene(PP)

Atrisa Series

The Atrisa Series of boilers and water heaters continues the PACKMAN tradition of meeting the market demand for hot water solutions that reduce installation and life cycle costs while providing the best uptime reliability. Incorporating the latest in highefficiency, the Atrisa Series brings best-in class operation to a wide range of facilitiesincluding:

- Multi-family/Apartments
- Education
- Hotels
- Medical Centers/Nursing Homes
- Office Buildings

High performance in a compact, flexible design makes the Atrisa Series the perfect hot water solution for systems requiring 450 to 2000 kw and above.

In addition to lowering energy usage, the Atrisa Series maximizes each square foot for a greater return on new facility investment. A variety of quick-to-install, cost-efficient accessories eliminate the need for special rigging or system changes to existing mechanical rooms, making the Atrisa Series equally well suited for retrofits. The end result is an easily-installed, highly efficient solution that conserves space and owers energy use to create significant shortand long-term savings for all kind of buildings.
The modular design in the Atrisa Series creates installation, operational, and reliability benefits unmatched by competitive boilers or water heaters in the same class. Designing a hydronic system with an Atrisa Series unit delivers advantages such as:

Lower Costs: Installation, operating, and lifetime costs are all reduced due to the modular design that maximizes efficiency and operation.

Higher Uptime Reliability: The modular design also creates a level of redundancy and reliability from a single Atrisa Series boiler or water heater that is typically only found in multi-unit systems.

Installation Flexibility: A wide variety of venting options allows the Atrisa Series to be easily integrated into any system, whether it is a retrofit or new construction.

Space Savings: Its compact footprint allows the Atrisa Series to be installed in small mechanical rooms.

Easy Access: Simple side access makes it more efficient for technicians to conduct scheduled service and maintenance on the units, which in turn saves time and reduces labor costs.

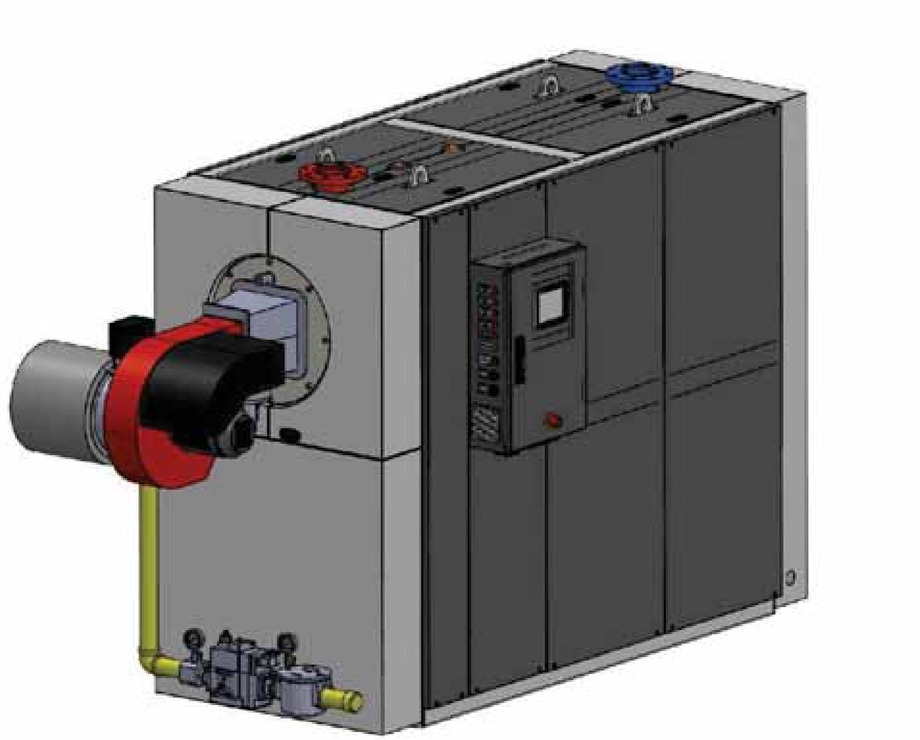
Maintaining the PACKMAN heritage, the Atrisa Series delivers high operating efficiency of up to 98%. By achieving the highest possible seasonal efficiencies, the Atrisa Series creates short-term and lifecycle energy savings.
Best-in-class performance is achieved by using superior design approach that incorporates.

High-Quality Materials: At the heart of the boiler is a unique heat exchanger designed with oval-section stainless steel tubes. The heat exchanger is constructed out of 316L stainless steel tubes for high reliability and long life.

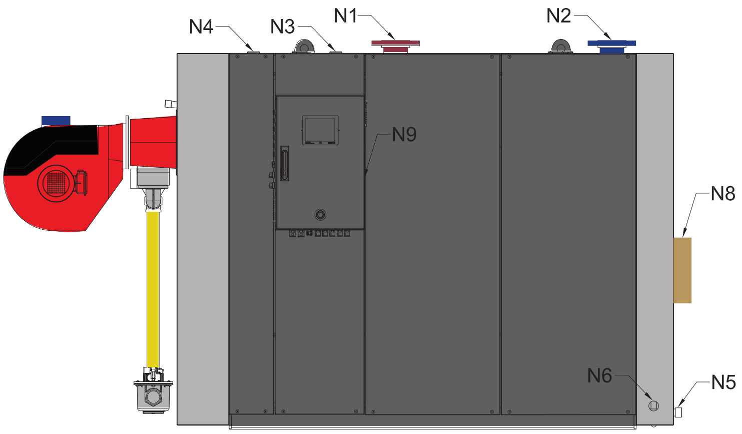
Advanced Modulation and Condensing Technologies: The Atrisa Series continues the decades-long trademark of PACKMAN solutions featuring fully modulating and condensing technologies. High modulation means the Atrisa Series matches loads exactly to need, minimizing cycling, eliminating over-firing, and achieving tight temperature control.

Premix Burner: The Atrisa Series features a total premix combustion unit, with variable-speed fan. The burner occupies very little space vertically, allowing the entire length of the heat exchanger to be exploited and bringing obvious benefits regarding condensation and stratification in the boiler.

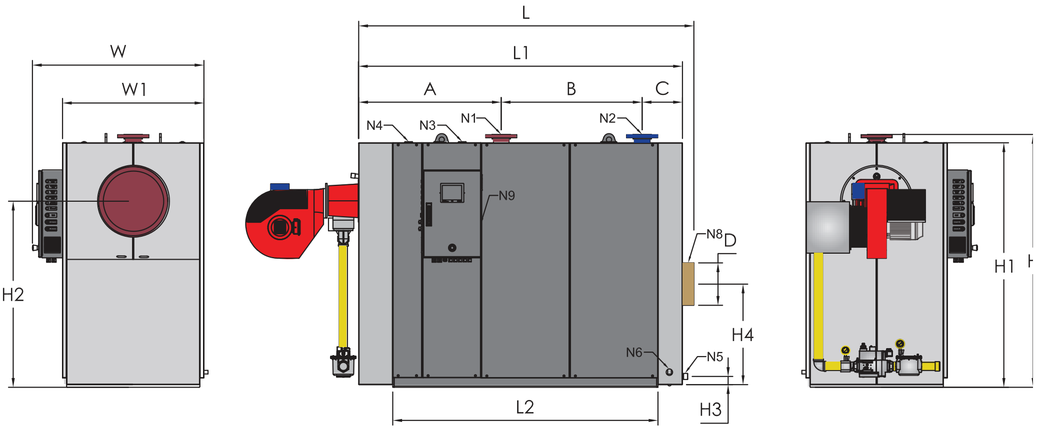
High Level Design: PACKMAN condensing boilers are designed using high level technics such as computational fluid dynamics (CFD) for high thermal efficiency and finite elements (FE) analysis for ensuring long life.



Model	Unit	Atrisa-450	Atrisa-650	Atrisa-800	Atrisa-1000	Atrisa-1250	Atrisa-1500	Atrisa-1750	Atrisa-2000
Technical Data									
Max Heat Output	kW	450	650	800	1,000	1,250	1,500	1,750	2,000
Min Heat Output	kW	90	130	160	200	250	300	350	400
Max Heat Output (Oil)	kW	337	487	600	750	937	1,125	1,312	1,500
Efficiency at (30-50°C)	%	98							
Efficiency at (60-80°C)	%	91							
Max Working Pressure Range	bar	16							
Max. Allowable Temperature	°C	85							
Recommended Water Flowrate in T (10 °C)	m^3/hr	38.7	56	68.8	86	107.5	129	150	172
Recommended Water Flowrate in ΔT (20 °C)	m^3/hr	140	160	210	250	270	280	290	310
Min Water Flowrate	m^3/hr	16.2	23.4	28.8	36	45	54	63	72
Pressure Drop ΔT (10 °C)	mbar	390	440	600	710	780	790	840	890
Pressure Drop ΔT (20 °C)	mbar	140	160	210	250	270	280	290	310
Fireside Pressure Drop	mbar	5.4	5.8	5.8	6.3	6.7	7.3	8.1	8.5
Stack Material	-	Stainless Steel 304 L or plymer according to ISIRI 19279							
Max. Condensate	L/h	49	71	88	110	137	165	192	220
Condensate PH	-	4-4.5							
Water Content	Lit	1,155	1,245	1,805	2,130	2,080	2,340	2,925	2,925

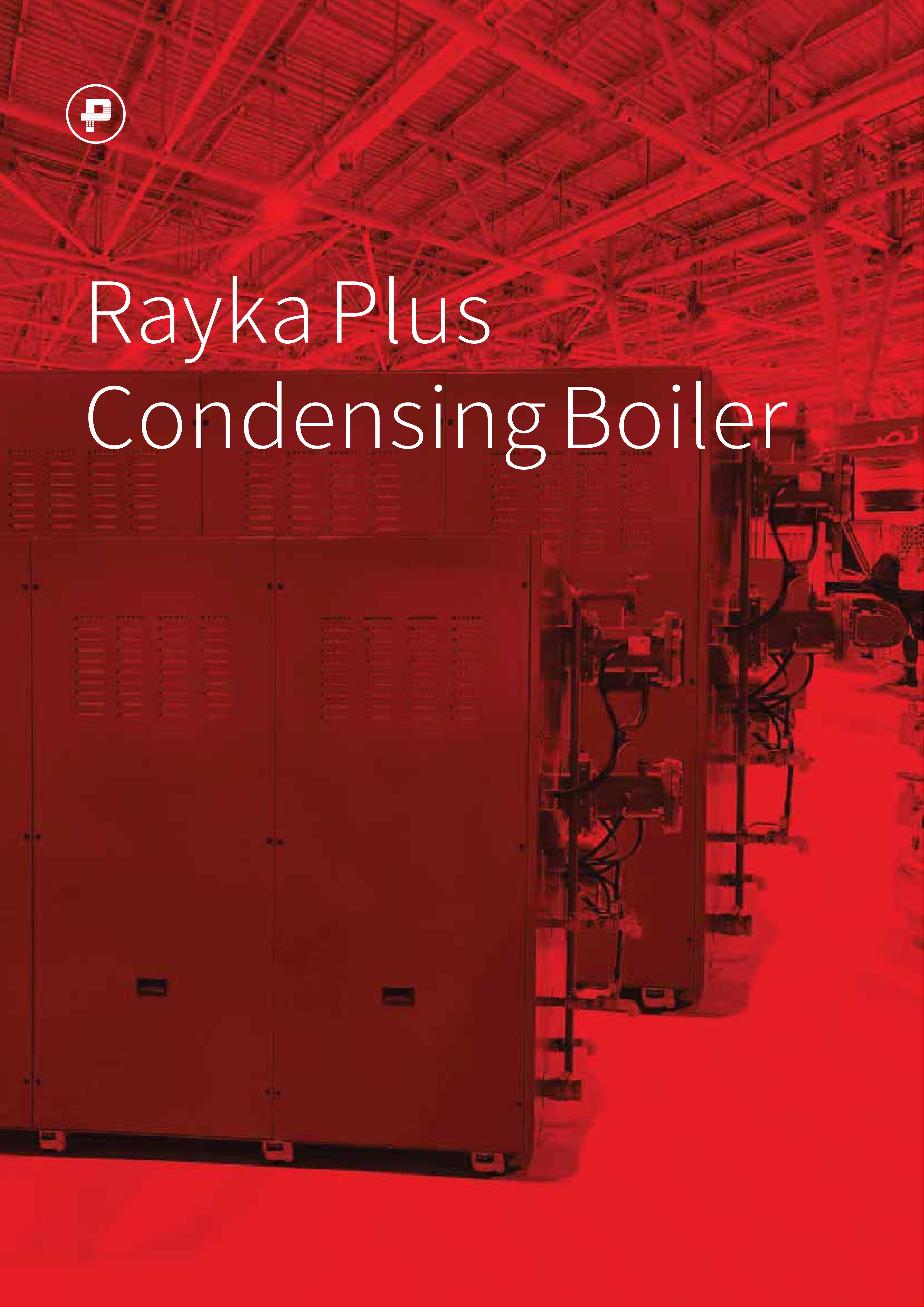


Model	Unit	Atrisa-450	Atrisa-650	Atrisa-800	Atrisa-1000	Atrisa-1250	Atrisa-1500	Atrisa-1750	Atrisa-2000
Combustion & Fuel									
RADMAN Burner @Sea Level	Model	Raadman							
Type of Fuels	type	Gas or Dual							
Max Gas Consumption @Sea Level with Calorific Value 10,000 W/m^3	m^3/hr	45	65	80	100	125	150	175	200
Firing Rate For Fuel Oil @Sea Level with Calorific Value 12,000 W/kg	litr/hr	28.1	40.6	50.0	62.5	78.1	93.8	109.3	125.0
Gas inlet pressure	mbar (psi)	60 (2)							
Burner Emissions									
Nox Level with Raadman Burner	mg/ kwh	120	120	120	120	120	120	120	120
Co Level with Raadman Burner	mg/ kwh	30	30	30	30	30	30	30	30
Sound Noise Level	dB	75	75	75	75	75	75	75	75
Connection Size									
Water Outlet (N1)	in	2 1/2	3	4	4	4	5	5	5
Water Inlet (N2)	in	2 1/2	3	4	4	4	5	5	5
Safety Valve (N3)	in	1	1	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2
Auxiliary (N4)	in	1	1	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2
Boiler Drain (N5)	in	1	1	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
Condensate Drain (N6)	in	3/4	3/4	3/4	3/4	1	1	1	1
Auxiliary (N7)	in	1	1	1	1	1	1	1	1
Stack (N8)	mm	250	300	300	350	350	400	400	400
Electric Cabinet (N9)	_	_	_	_	_	_	_	_	_
Water Temperature Sensor (N10)	in	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Flue Temperature Sensor (N11)	in	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2



Model	Unit	Atrisa-450	Atrisa-650	Atrisa-800	Atrisa-1000	Atrisa-1250	Atrisa-1500	Atrisa-1750	Atrisa-2000
Dimension									
A	mm	732	732	1,011	1,161	1,161	1,200	1,350	1,350
B	mm	837	1,003	1,073	1,323	1,323	1,328	1,628	1,628
c	mm	291	285	296	296	296	322	322	322
D	mm	250	300	300	350	350	400	400	400
E	mm	116	116	112	112	112	121	121	121
H1	mm	1,490	1,490	1,800	1,800	1,860	1,990	2,060	2,060
H2	mm	1,140	1,140	1,370	1,370	1,400	1,500	1,570	1,570
H3	mm	80	80	80	80	80	85	85	85
H4	mm	585	585	760	760	760	760	820	820
W1	mm	880	880	1,040	1,040	1,100	1,160	1,160	1,160
L1	mm	1,860	2,020	2,380	2,780	2,780	2,850	3,300	3,300
L2	mm	1440	1600	1930	2330	2330	2430	2880	2880
H	mm	1,550	1,550	1,860	1,860	1,920	2,050	2,120	2,120
W	mm	1,100	1,100	1,260	1,260	1,320	1,380	1,380	1,380
L	mm	1,945	2,105	2,455	2,835	2,835	2,935	3,385	3,385
Boiler Room Clearances									
Min Front Clearance (FC)	mm	500 + Length of Burnur	500 + Length of Burnur	500 + Length of Burnur	500 + Length of Burnur	500 + Length of Burnur	500 + Length of Burnur	500 + Length of Burnur	500 + Length of Burnur
Min Rear Clearance (RC)	mm	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Min Side Clearance(SC)	mm	500	500	500	500	500	500	500	500
Min Boiler Room Length	mm	3,945	4,105	4,455	4,835	4,835	4,395	5,385	5,385
Weight									
Shipping Weight	Kg	1,420	1,590	2,390	2,750	2,970	3,450	3,680	4,100
Service Weight	kg	2,575	2,835	4,195	4,880	5,050	5,790	6,605	7,025

Rayka Plus
Condensing Boiler



Product Description

Packman's RAYKA PLUS & RAYKA condensing boilers can work with natural gas or oil. These boilers have high efficiency since they use the latent heat of water vapor which exists in flue gasses to preheat the cold water entering the boiler As a result. Water vapor and other products of combustion are condensed which in turn leads to energy and cost saving.
The Boiler's operation is governed by the desired temperature of hot water outlet. Using a analog, high precision temperature controller, the owner will identify the required hot water temperature. A temperature sensor located in the boiler's outlet manifold continuously measures the outlet water's temperature.
A combustion controller is incorporated to operate the gas valve and air damper separately. This actuator controls the air/gas mixture entering the burner. For As long as the set temperature is above that of the outlet water, the boiler operates at maximum output capacity. Analogue signals are sent to the temperature controller from the temperature sensor. The controller then sends the corresponding signals to the actuator. Therefore, the appropriate volume of air/gas mixture flows into the burner. As the outlet temperature approaches the set temperature, the air/gas mixture flow is gradually reduced by the servomotor (connected to the gas butterfly valve and the air damper). This results in gradual decrease in the unit's capacity. This modulating system allows for optimum continuous operation of the boiler and offers almost infinite capacity within the boiler operating range.
All of our products employ the patented radial pulsed technology. Due to the turbulent mode of heat transfer, turbulent water flow and direct heating of the heat exchanger, the overall heat transfer (thermal) efficiency of the products is in the range of 94.0% - 98.9%, depending on the return water's temperature. Packman's Rayka Condensing Boilers are suitable for both open & closed cycle heating.
In construction of these boilers, all tests are conducted in accordance with the American National Standard Institute (ANSI). In addition, all Pressure Parts are in accordance with the American Society of Mechanical Engineers (ASME) standard. All materials used in the heat exchanger are also selected according to the requirements of the American Society of Testing Material (ASTM)

Condensing Boiler Material

Packman Boilers are constructed of 300 series stainless steel (316L). 300 series stainless steels have more solidity than 400 series, because they contain nickel and chromium.

Capacity Range

The capacity range of Packman 's Rayka Plus condensing boilers differs from 500,000 to 3,000,000 kcal/hr and Rayka 800,000 to 10,000,000 kcal/hr with working pressure up to 25 bar g. The stainless-steel heat exchanger used in the boilers is constructed as a vertical coil, the size of which depends on capacity. These condensing boilers can directly produce sanitary hot water due to their material & structure.

Applications

These boilers are used in schools, commercial and residential buildings, potable water direct heating, water desalination systems, swimming pools and various other heating systems.

Smart Connection (IOT)

Remotely control able to facilitate heat & set point programing. Communicating any type of protocol supported. Fault and status report available.Air and gas damper's automatic control.Load controllingCapacity ranges from 16% to 100% of full load.Adjustable hot water flow rate.Boiler Operation based on return water temperature direct heating.

Packman's RAYKA PLUS & RAYKA Condensing Boiler's Advantages

- Up to 10,000,000 kcal/hr Capacity
- Up to 25 bar working Pressure
- Can works in direct water heating, (no need for auxiliary heat exchanger)
- Easy maintenance and commissioning
- Up to 98% HHV efficiency
- Special radial pulse burner with lowest amount of contamination
- Modular Premix burner with a capacity range of 16% to 100%
- No need for long chimneys (UPVC and other corrosion and temperature resistant materials for chimney are acceptable).
- RAYKA Series Compatibility with dual fuel burners.

- PLC Control panel compatible with IOT system
- Suitable for potable water direct heating, Water Desalination Systems, swimming pool direct heating and etc.

BMS Connection

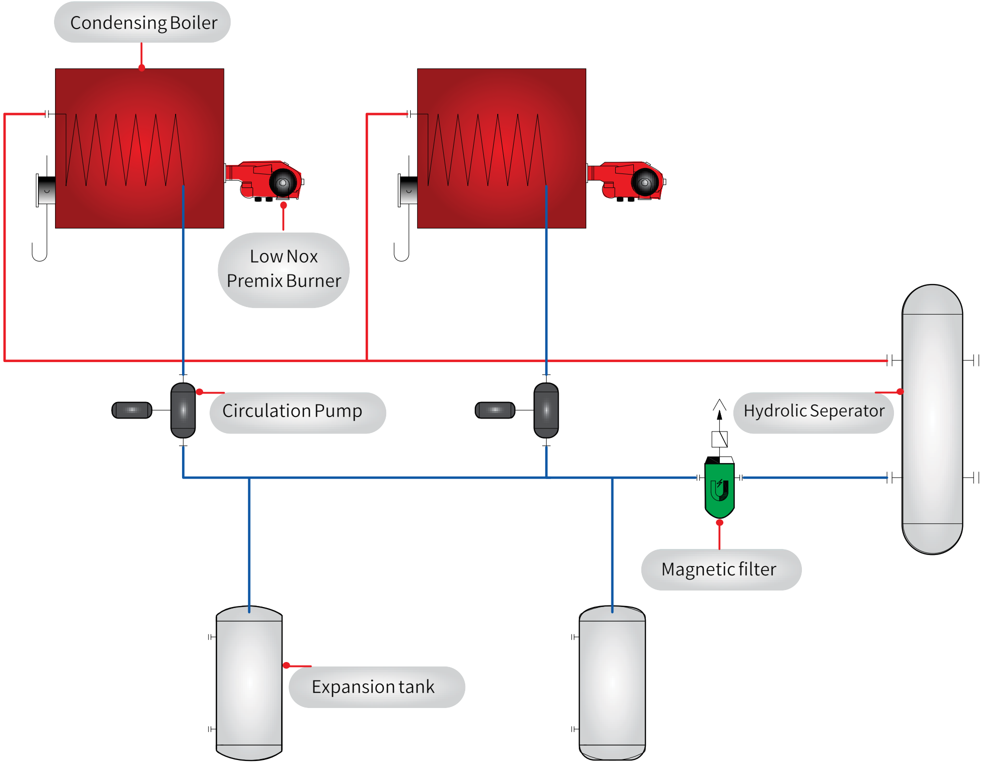
- Remotely control able to facilitate heat & Set point programing
- Supported Communicating any type of protocol
- Fault and status report available
- Air and gas damper's automatic control.

Load Controling

- Capacity range from 16% to 100% of full load.
- Adjustable hot water flow rate.
- Boiler Operation based on return water temperature direct heating.

Direct Heating

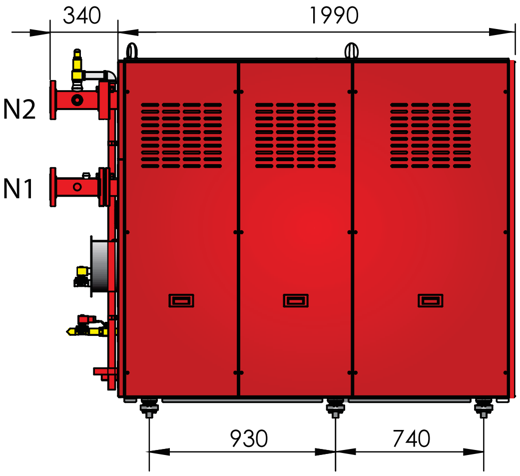
- Direct water heating is possible for pools, domestic hot water supply & etc.
- 5 degrees centigrade water inlet is acceptable.

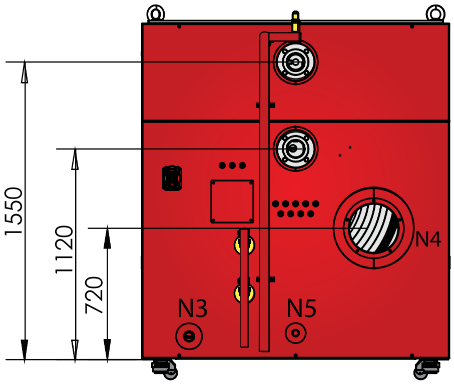


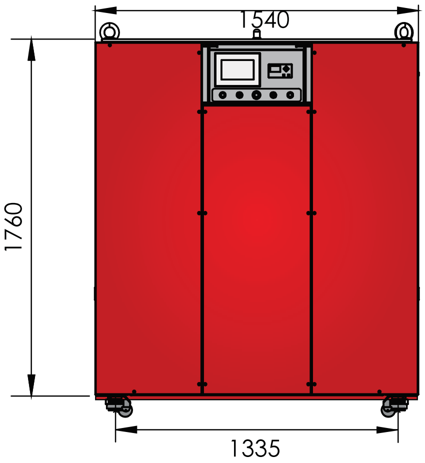
RAYKA PLUS Condensing Boiler 500.000 kcal/h

Model	Unit	500.000
Specification		
Heat Output (min-max)	kcal/h	125,000-500,000
Efficiency @ (30-50°C)	%	98
Efficiency @ (60-80°C)	%	91
NOX Class	-	Super Low NOx
Max Noise	dBA	80
Net Weight	kg	1000
Water Side		
Min Flow Rate	m^3/h	45
Max Working Pressure	bar	16
Water Side Pressure Drop at △T = 10 °C	bar	0.9
Max Supply Temperature	°C	85
Max Condensate Flow Rate	L/h	73
Water Content	L	160
Combustion		
Gas Consumption Rate with Calorific Value 9200 (kcal/m3)	m^3/h	56
Max Flue Temperature at Condensing Mode (30-50°C)	°C	53
Flue Gas Flow Rate	kg/h	935
Carbon Monoxide	ppm	< 10
Connections		
Supply Water Connection (N1)	in	3
Return Water Connection (N2)	in	3
Gas Connection (N3)	in	1 1/2
Flue Gas Outlet (N4)	mm	250
Condensate Drain (N5)	mm	32
Electrical		
Electric Power Suppl Voltage	V	240
Electric Power Supply Frequency	Hz	50
Pump Suggestion		
Head	m	9
Flow Rate	m^3/h	50

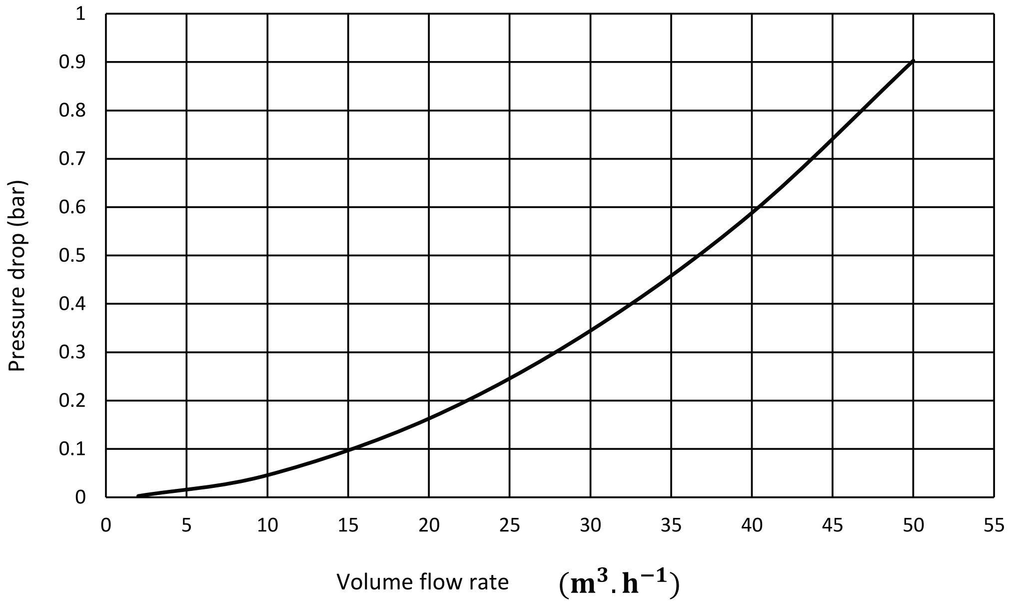
Dimensional Specifications:







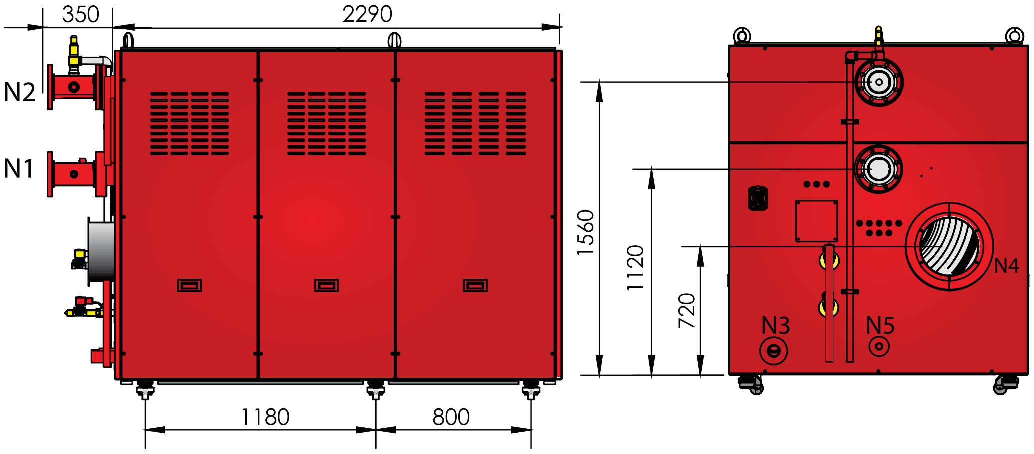
WATER-SIDE PRESSURE DROP CURVE

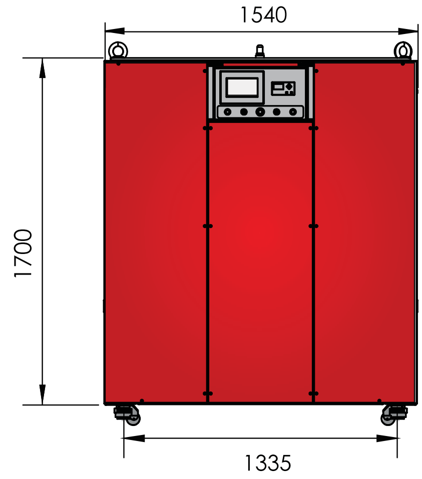


RAYKA PLUS Condensing Boiler 800.000 kcal/h

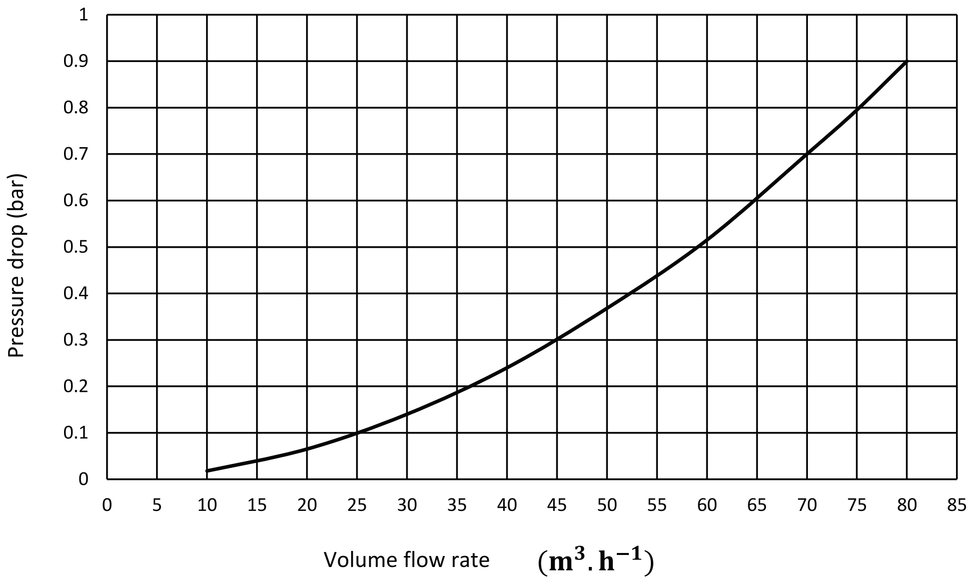
Model	Unit	800.000
Specification		
Heat Output (min-max)	kcal/h	200,000-800,000
Efficiency @ (30-50°C)	%	98
Efficiency @ (60-80°C)	%	91
NOX Class	-	Super Low NOx
Max Noise	dBA	80
Net Weight	kg	1620
Water Side		
Min Flow Rate	m^3/h	75
Max Working Pressure	bar	16
Water Side Pressure Drop at △T = 10 °C	bar	0.9
Max Supply Temperature	°C	85
Max Condensate Flow Rate	L/h	118
Water Content	L	240
Combustion		
Gas Consumption Rate with Calorific Value 9200 (kcal/m3)	m^3/h	90
Max Flue Temperature at Condensing Mode (30-50°C)	°C	54
Flue Gas Flow Rate	kg/h	1500
Carbon Monoxide	ppm	< 10
Connections		
Supply Water Connection (N1)	in	4
Return Water Connection (N2)	in	4
Gas Connection (N3)	in	2
Flue Gas Outlet (N4)	mm	300
Condensate Drain (N5)	mm	32
Electrical		
Electric Power Suppl Voltage	V	380
Electric Power Supply Frequency	Hz	50
Pump Suggestion		
Head	m	9
Flow Rate	m^3/h	80

Dimensional Specifications:





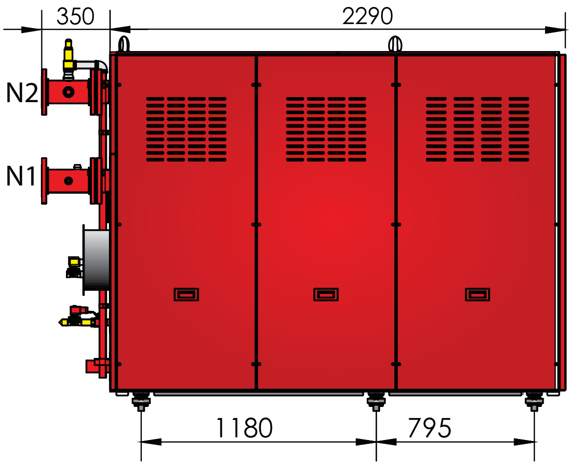
WATER-SIDE PRESSURE DROP CURVE

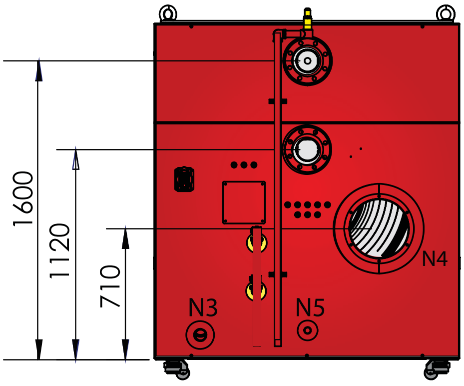


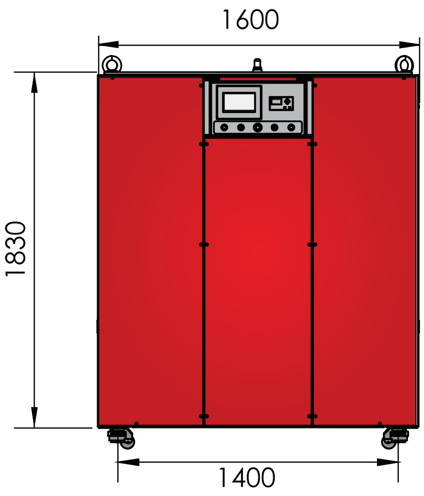
RAYKA PLUS Condensing Boiler 1.000.000 kcal/h

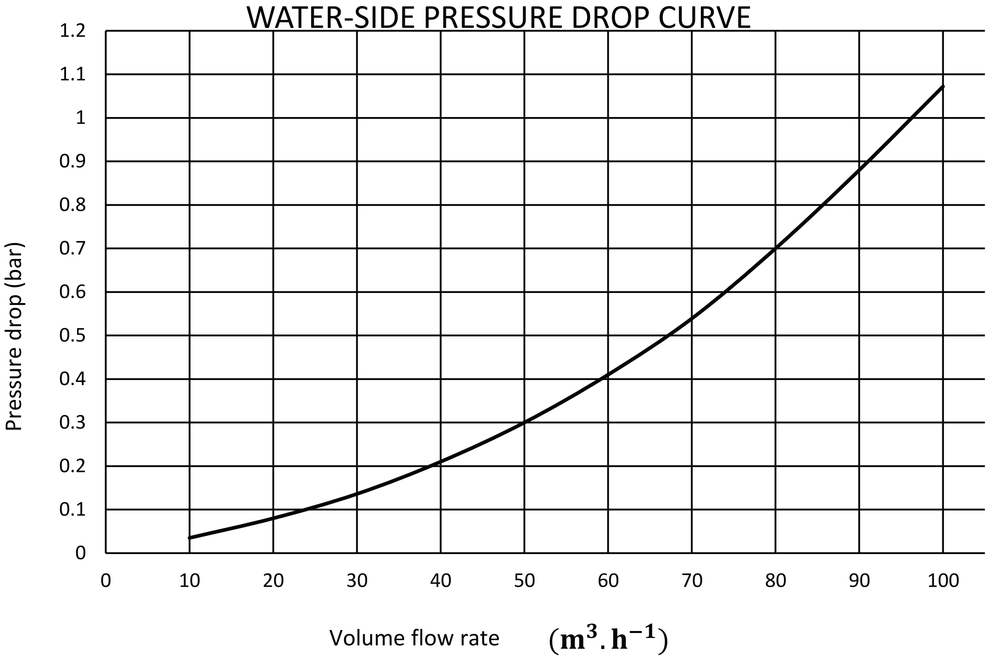
Model	Unit	1.000.000
Specification		
Heat Output (min-max)	kcal/h	250,000-1,000,000
Efficiency @ (30-50°C)	%	98
Efficiency @ (60-80°C)	%	91
NOX Class	-	Super Low NOx
Max Noise	dBA	85
Net Weight	kg	1800
Water Side		
Min Flow Rate	m^3/h	85
Max Working Pressure	bar	16
Water Side Pressure Drop at △T = 10 °C	bar	1.1
Max Supply Temperature	°C	85
Max Condensate Flow Rate	L/h	148
Water Content	L	310
Combustion		
Gas Consumption Rate with Calorific Value 9200 (kcal/m3)	m^3/h	115
Max Flue Temperature at Condensing Mode (30-50°C)	°C	54
Flue Gas Flow Rate	kg/h	1880
Carbon Monoxide	ppm	< 10
Connections		
Supply Water Connection (N1)	in	5
Return Water Connection (N2)	in	5
Gas Connection (N3)	in	2
Flue Gas Outlet (N4)	mm	300
Condensate Drain (N5)	mm	32
Electrical		
Electric Power Suppl Voltage	V	380
Electric Power Supply Frequency	Hz	50
Pump Suggestion		
Head	m	11
Flow Rate	m^3/h	100

Dimensional Specifications:





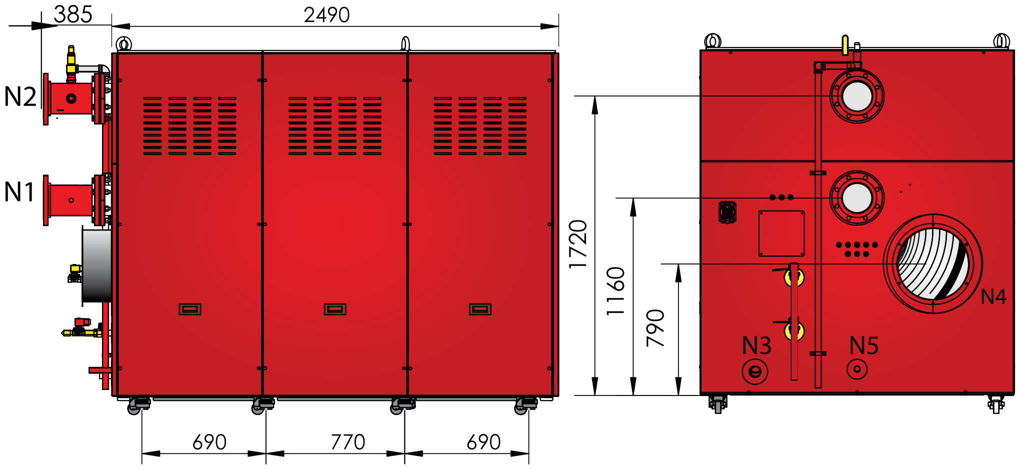


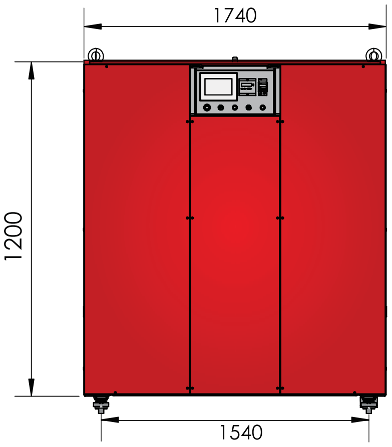


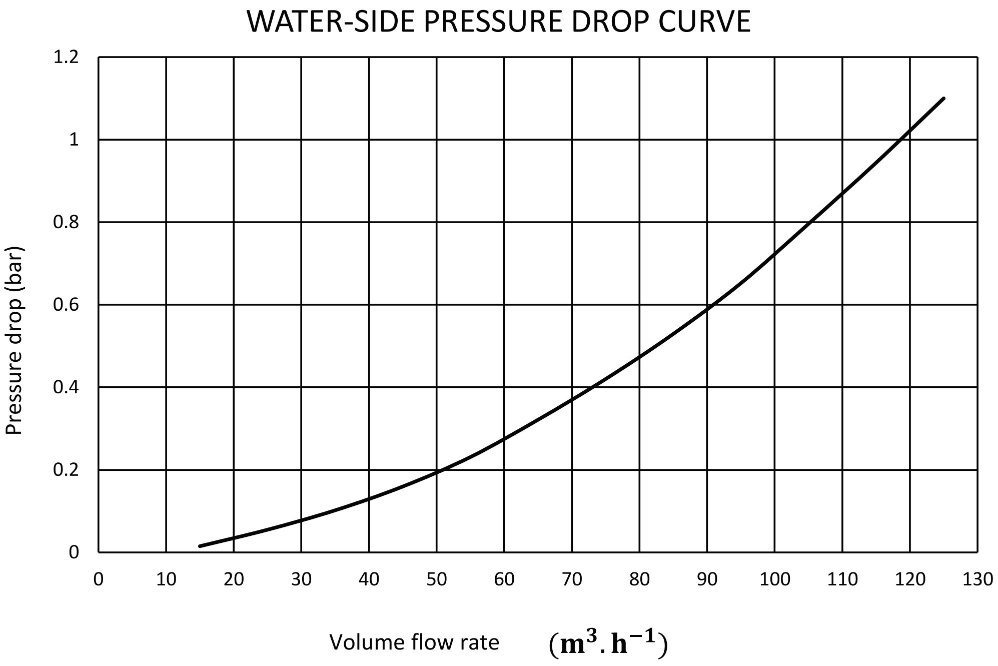
RAYKA PLUS Condensing Boiler 1.250.000 kcal/h

Model	Unit	1.250.000
Specification		
Heat Output (min-max)	kcal/h	200,000-1,250,000
Efficiency @ (30-50°C)	%	98
Efficiency @ (60-80°C)	%	91
NOX Class	-	Super Low NOx
Max Noise	dBA	85
Net Weight	kg	2250
Water Side		
Min Flow Rate	m³/h	105
Max Working Pressure	bar	16
Water Side Pressure Drop at ∆T = 10 °C	bar	1.1
Max Supply Temperature	°C	85
Max Condensate Flow Rate	L/h	185
Water Content	L	510
Combustion		
Gas Consumption Rate with Calorific Value 9200 (kcal/m3)	m³/h	140
Max Flue Temperature at Condensing Mode (30-50°C)	°C	53
Flue Gas Flow Rate	kg/h	2345
Carbon Monoxide	ppm	< 10
Connections		
Supply Water Connection (N1)	in	6
Return Water Connection (N2)	in	6
Gas Connection (N3)	in	2
Flue Gas Outlet (N4)	mm	400
Condensate Drain (N5)	mm	32
Electrical		
Electric Power Suppl Voltage	V	380
Electric Power Supply Frequency	Hz	50
Pump Suggestion		
Head	m	11
Flow Rate	m³/h	125

Dimensional Specifications:



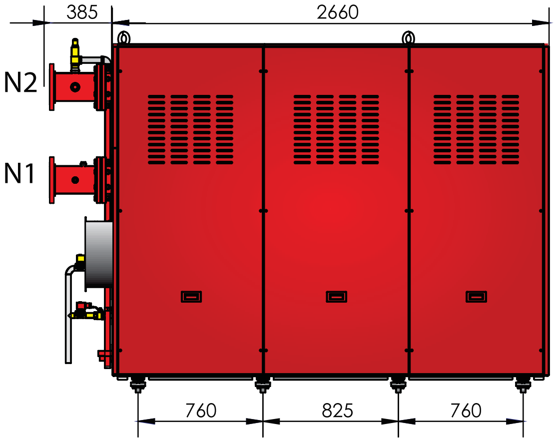


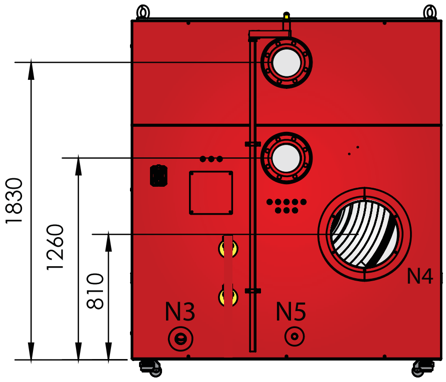


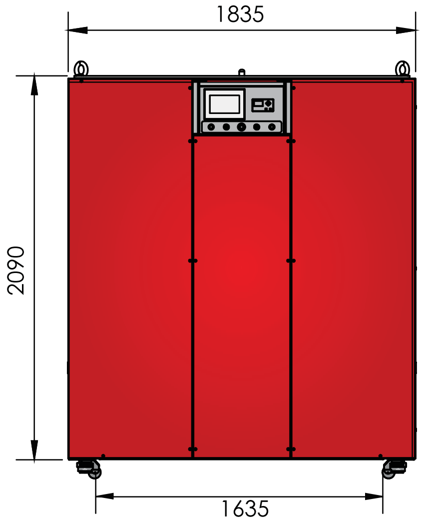
RAYKA PLUS Condensing Boiler 1.500.000 kcal/h

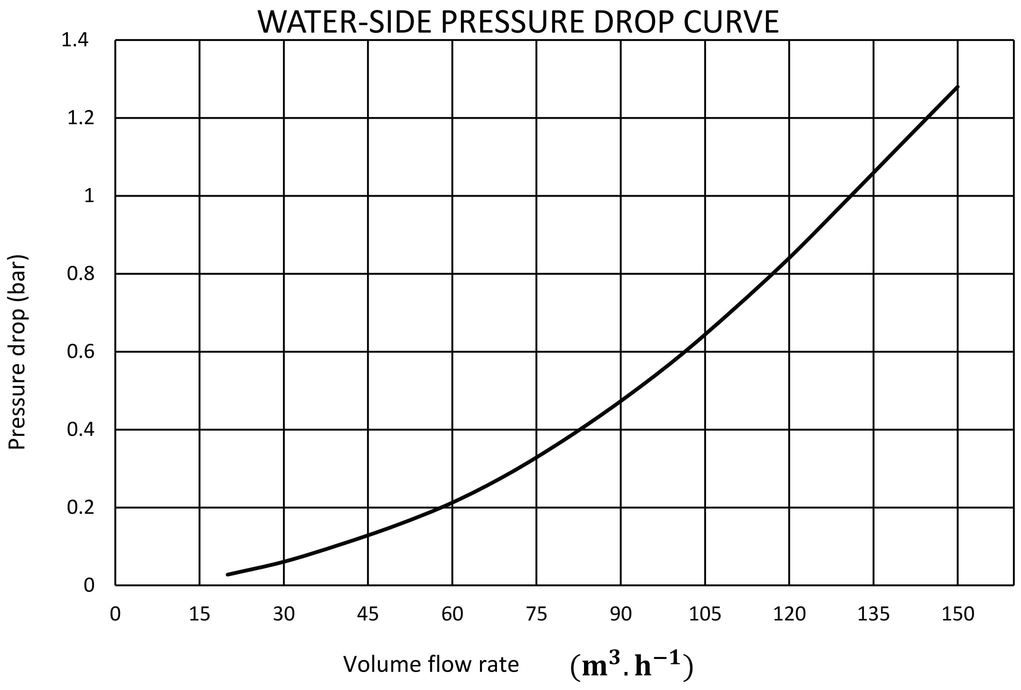
Model	Unit	1.500.000
Specification		
Heat Output (min-max)	kcal/h	250,000-1,500,000
Efficiency @ (30-50°C)	%	98
Efficiency @ (60-80°C)	%	91
NOX Class	-	Super Low NOx
Max Noise	dBA	85
Net Weight	kg	2700
Water Side		
Min Flow Rate	m^3/h	130
Max Working Pressure	bar	16
Water Side Pressure Drop at $\triangle T = 10$ °C	bar	1.3
Max Supply Temperature	°C	85
Max Condensate Flow Rate	L/h	222
Water Content	L	680
Combustion		
Gas Consumption Rate with Calorific Value 9200 (kcal/m3)	m^3/h	170
Max Flue Temperature at Condensing Mode (30-50°C)	°C	55
Flue Gas Flow Rate	kg/h	2814
Carbon Monoxide	ppm	< 10
Connections		
Supply Water Connection (N1)	in	6
Return Water Connection (N2)	in	6
Gas Connection (N3)	in	2
Flue Gas Outlet (N4)	mm	400
Condensate Drain (N5)	mm	32
Electrical		
Electric Power Suppl Voltage	V	380
Electric Power Supply Frequency	Hz	50
Pump Suggestion		
Head	m	13
Flow Rate	m^3/h	150

Dimensional Specifications:





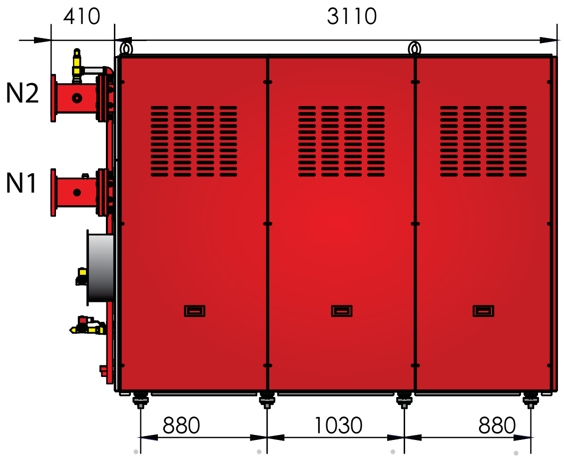


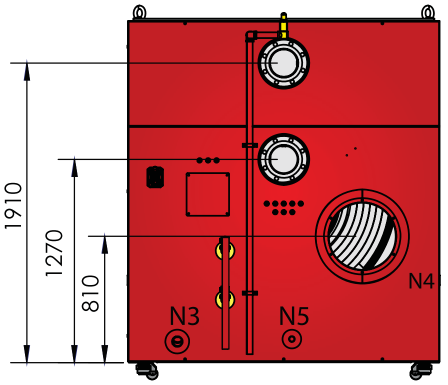


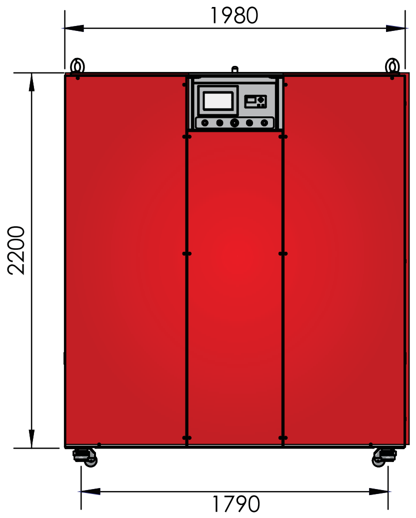
RAYKA PLUS Condensing Boiler 2.000.000 kcal/h

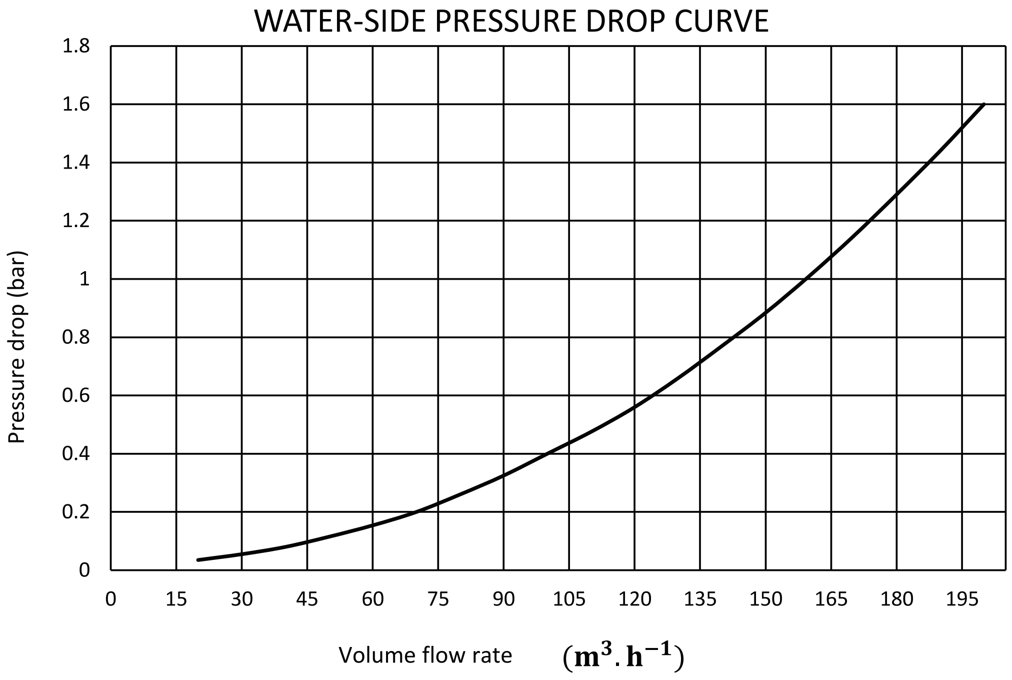
Model	Unit	2.000.000
Specification		
Heat Output (min-max)	kcal/h	350,000-2,000,000
Efficiency @ (30-50°C)	%	98
Efficiency @ (60-80°C)	%	91
NOX Class	-	Super Low NOx
Max Noise	dBA	85
Net Weight	kg	3600
Water Side		
Min Flow Rate	m^3/h	150
Max Working Pressure	bar	16
Water Side Pressure Drop at ⊿T = 10 °C	bar	1.6
Max Supply Temperature	°C	85
Max Condensate Flow Rate	L/h	296
Water Content	L	950
Combustion		
Gas Consumption Rate with Calorific Value 9200 (kcal/m3)	m^3/h	240
Max Flue Temperature at Condensing Mode (30-50°C)	°C	53
Flue Gas Flow Rate	kg/h	3750
Carbon Monoxide	ppm	< 10
Connections		
Supply Water Connection (N1)	in	6
Return Water Connection (N2)	in	6
Gas Connection (N3)	in	2
Flue Gas Outlet (N4)	mm	500
Condensate Drain (N5)	mm	32
Electrical		
Electric Power Suppl Voltage	V	380
Electric Power Supply Frequency	Hz	50
Pump Suggestion		
Head	m	17
Flow Rate	m^3/h	200

Dimensional Specifications:





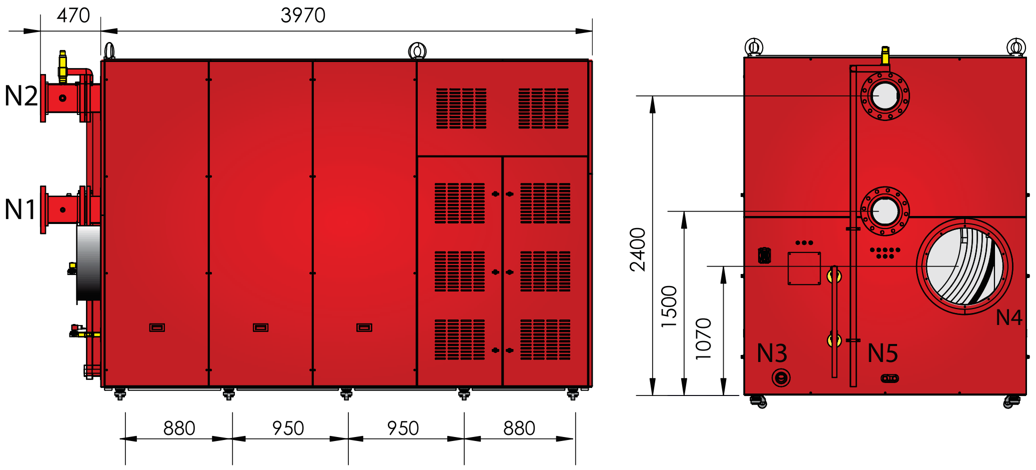


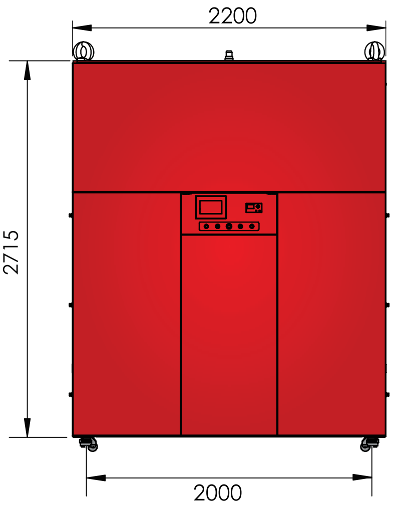


RAYKA PLUS Condensing Boiler 3.000.000 kcal/h

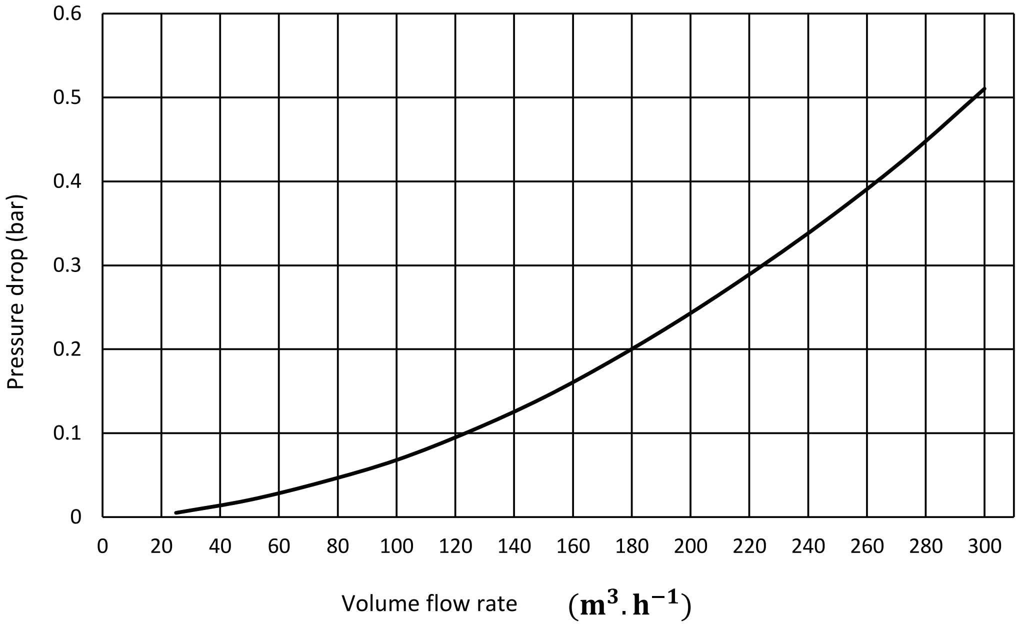
Model	Unit	3.000.000
Specification		
Heat Output (min-max)	kcal/h	500,000-3,000,000
Efficiency @ (30-50°C)	%	98
Efficiency @ (60-80°C)	%	91
NOX Class	-	Super Low NOx
Max Noise	dBA	85
Net Weight	kg	5600
Water Side		
Min Flow Rate	m^3/h	300
Max Working Pressure	bar	16
Water Side Pressure Drop at △T = 10 °C	bar	0.5
Max Supply Temperature	°C	85
Max Condensate Flow Rate	L/h	444
Water Content	L	1300
Combustion		
Gas Consumption Rate with Calorific Value 9200 (kcal/m3)	m^3/h	360
Max Flue Temperature at Condensing Mode (30-50°C)	°C	53
Flue Gas Flow Rate	kg/h	5640
Carbon Monoxide	ppm	< 10
Connections		
Supply Water Connection (N1)	in	8
Return Water Connection (N2)	in	8
Gas Connection (N3)	in	3
Flue Gas Outlet (N4)	mm	600
Condensate Drain (N5)	mm	32
Electrical		
Electric Power Suppl Voltage	V	380
Electric Power Supply Frequency	Hz	50
Pump Suggestion		
Head	m	6
Flow Rate	m^3/h	300

Dimensional Specifications:





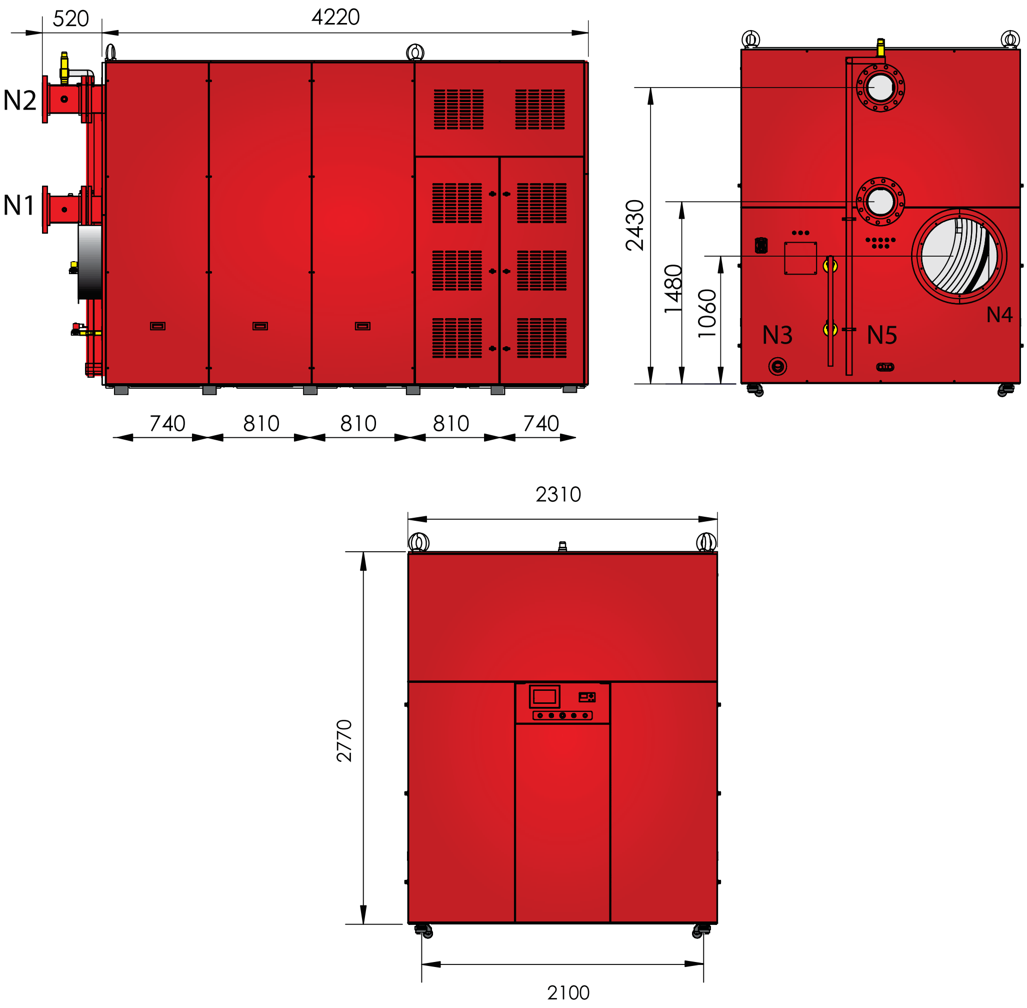
WATER-SIDE PRESSURE DROP CURVE



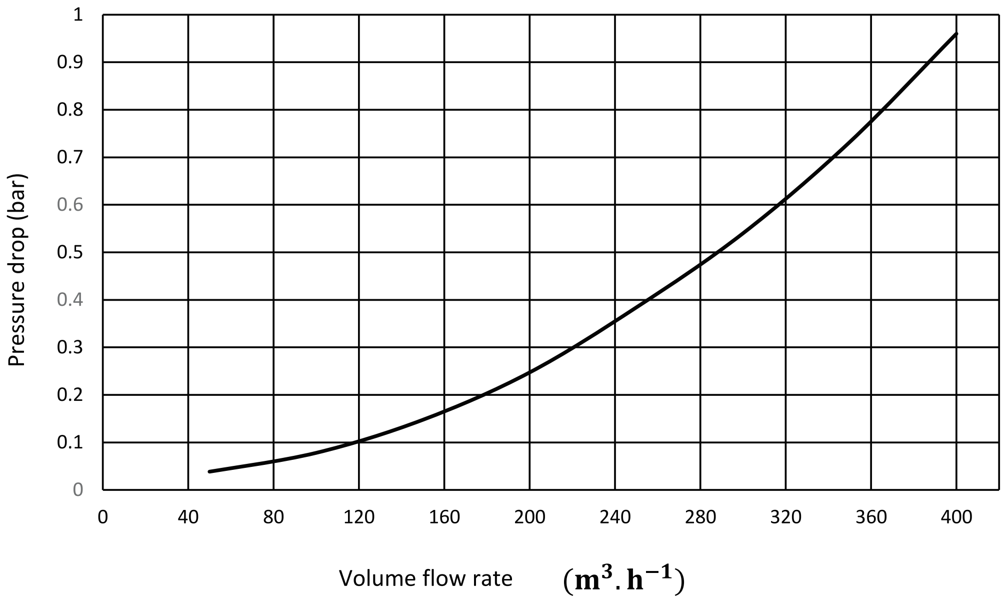
RAYKA PLUS Condensing Boiler 4.000.000 kcal/h

Model	Unit	4.000.000
Specification		
Heat Output (min-max)	kcal/h	650,000-4,000,000
Efficiency @ (30-50°C)	%	98
Efficiency @ (60-80°C)	%	91
NOX Class	-	Super Low NOx
Max Noise	dBA	89
Net Weight	kg	6000
Water Side		
Min Flow Rate	m^3/h	400
Max Working Pressure	bar	16
Water Side Pressure Drop at $\Delta T = 10$ °C	bar	0.9
Max Supply Temperature	°C	85
Max Condensate Flow Rate	L/h	592
Water Content	L	1800
Combustion		
Gas Consumption Rate with Calorific Value 9200 (kcal/m3)	m^3/h	450
Max Flue Temperature at Condensing Mode (30-50°C)	°C	53
Flue Gas Flow Rate	kg/h	7500
Carbon Monoxide	ppm	< 10
Connections		
Supply Water Connection (N1)	in	10
Return Water Connection (N2)	in	10
Gas Connection (N3)	in	3
Flue Gas Outlet (N4)	mm	650
Condensate Drain (N5)	mm	32
Electrical		
Electric Power Suppl Voltage	V	380
Electric Power Supply Frequency	Hz	50
Pump Suggestion		
Head	m	10
Flow Rate	m^3/h	400

Dimensional Specifications:



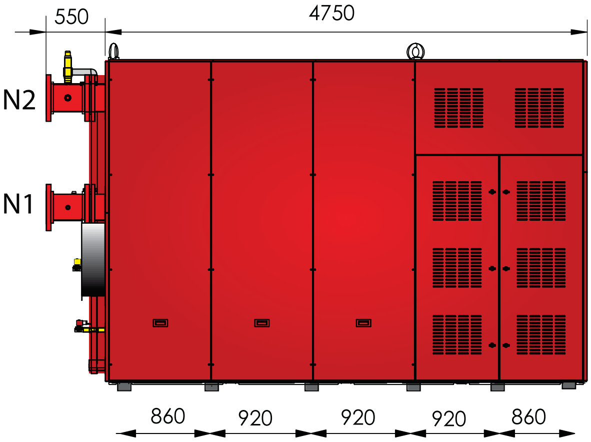
WATER-SIDE PRESSURE DROP CURVE

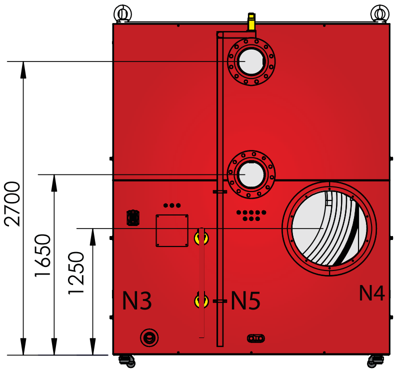


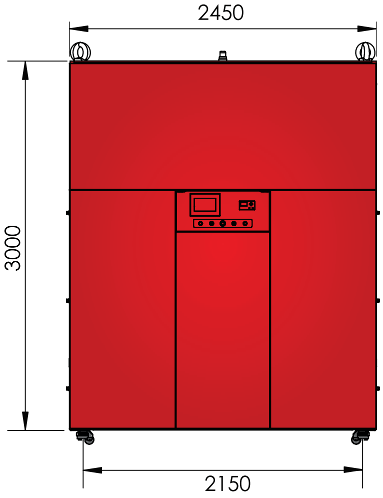
RAYKA PLUS Condensing Boiler 5.000.000 kcal/h

Model	Unit	5.000.000
Specification		
Heat Output (min-max)	kcal/h	800,000-5,000,000
Efficiency @ (30-50°C)	%	98
Efficiency @ (60-80°C)	%	91
NOX Class	-	Super low NOx
Max Noise	dBA	89
Net Weight	kg	7500
Water Side		
Min Flow Rate	m³/h	500
Max Working Pressure	bar	16
Water Side Pressure Drop at ΔT = 10 °C	bar	1.2
Max Supply Temperature	°C	85
Max Condensate Flow Rate	L/h	740
Water Content	L	2000
Combustion		
Gas Consumption Rate with Calorific Value 9200 (kcal/m3)	m³/h	560
Max Flue Temperature at Condensing Mode (30-50°C)	°C	53
Flue Gas Flow Rate	kg/h	9380
Carbon Monoxide	ppm	< 10
Connections		
Supply Water Connection (N1)	in	12
Return Water Connection (N2)	in	12
Gas Connection (N3)	in	3
Flue Gas Outlet (N4)	mm	700
Condensate Drain (N5)	mm	32
Electrical		
Electric Power Suppl Voltage	V	380
Electric Power Supply Frequency	Hz	50
Pump Suggestion		
Head	m	13
Flow Rate	m³/h	500

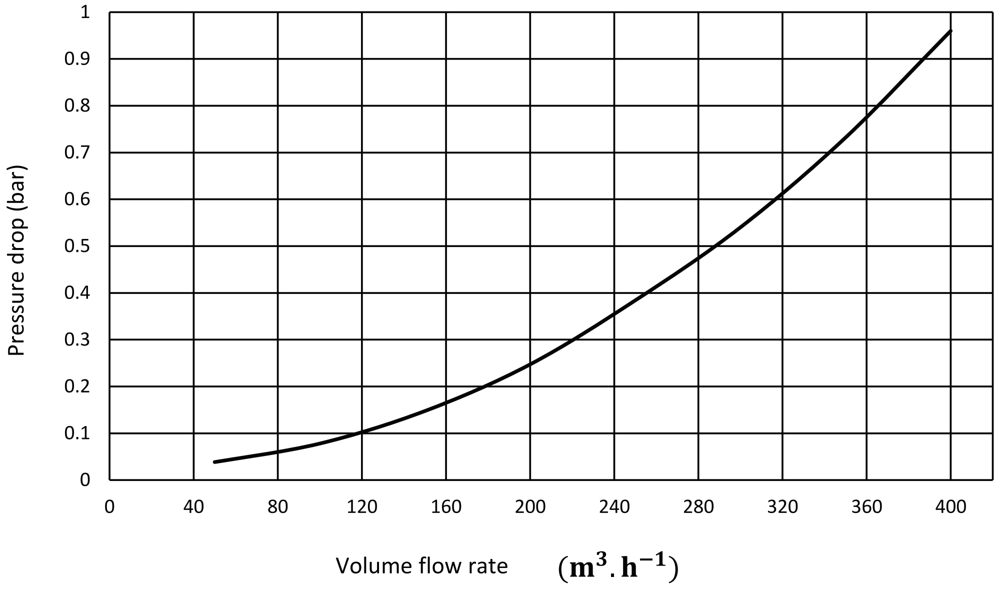
Dimensional Specifications:

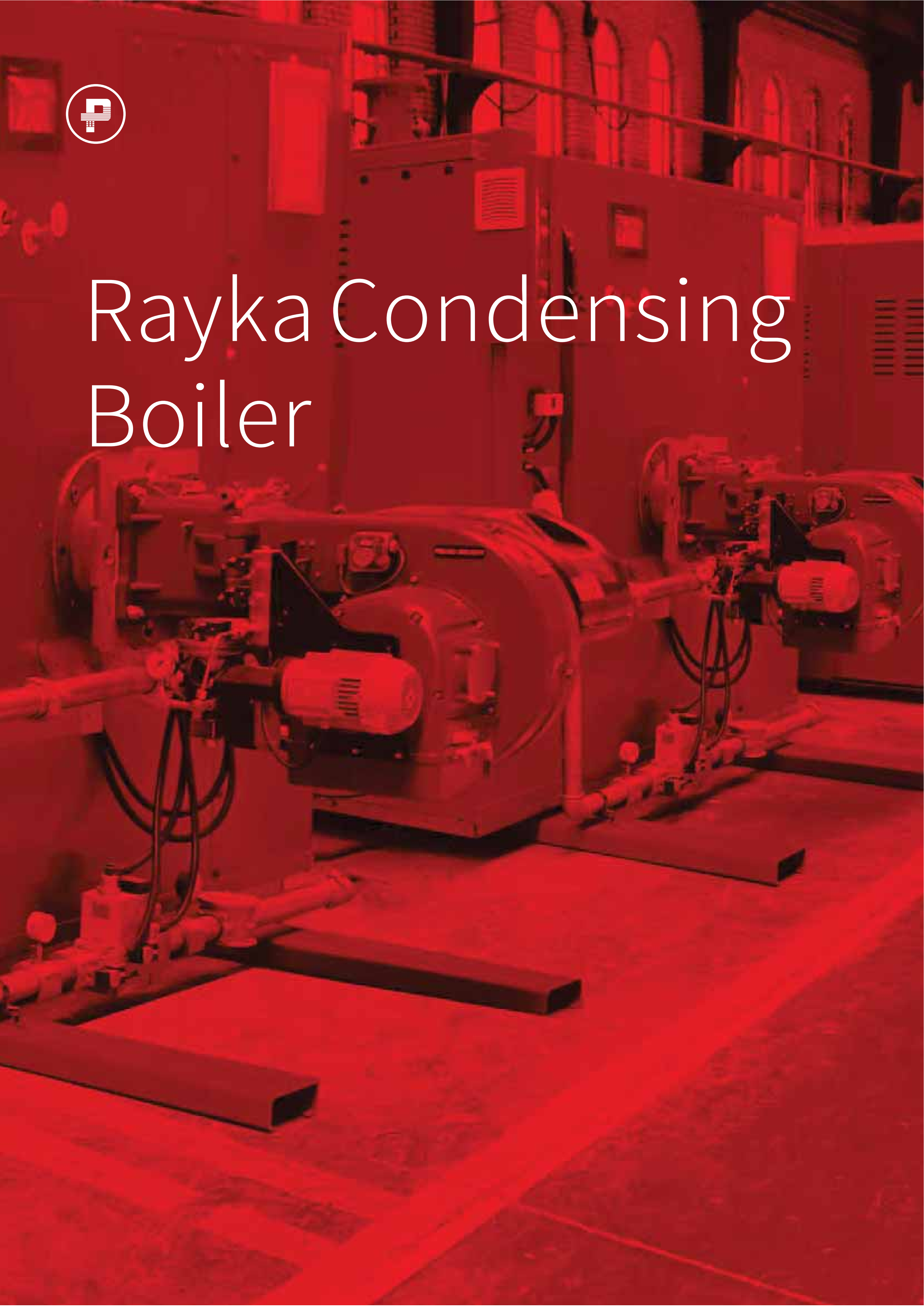






WATER-SIDE PRESSURE DROP CURVE



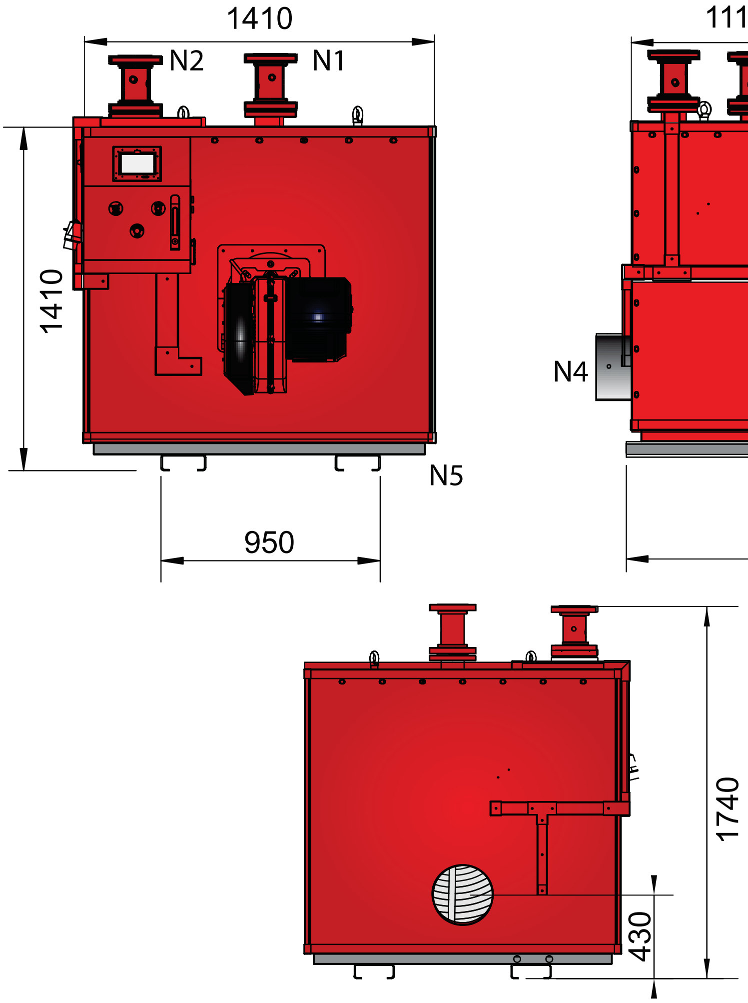


Rayka Condensing Boiler

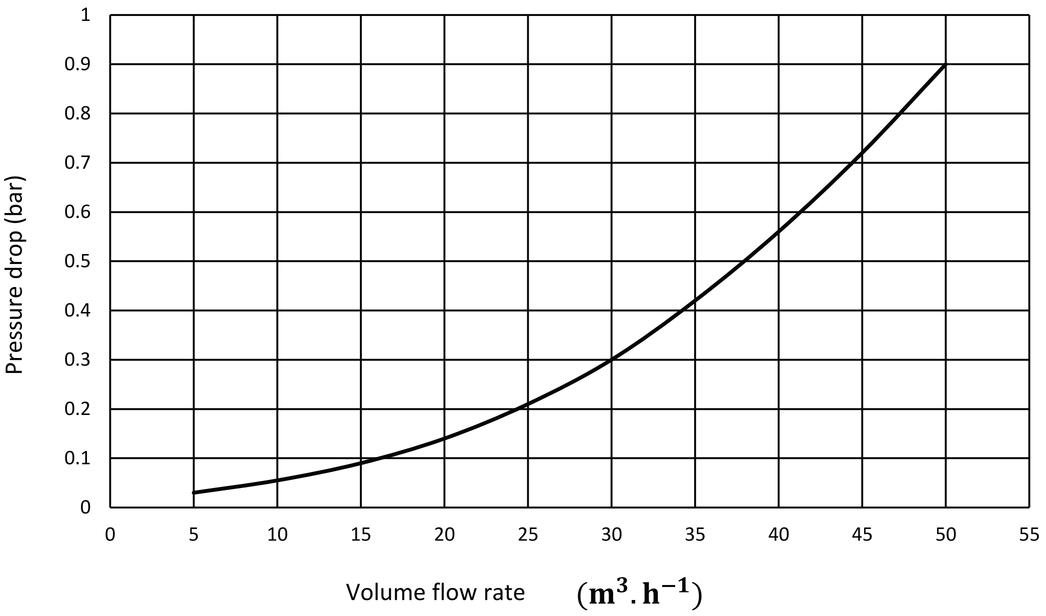
RAYKA Condensing Boiler 500.000 kcal/h

Model	Unit	500.000
Specification		
Heat Output (min-max)	kcal/h	125,000-500,000
Efficiency @ (30-50°C)	%	98
Efficiency @ (60-80°C)	%	91
NOX Class	-	2
Max Noise	dBA	80
Net Weight	kg	950
Water Side		
Min Flow Rate	m^3/h	45
Max Working Pressure	bar	16
Water Side Pressure Drop at $\triangle T = 10$ °C	bar	0.9
Max Supply Temperature	°C	85
Max Condensate Flow Rate	L/h	73
Water Content	L	190
Combustion		
Gas Consumption Rate with Calorific Value 9200 (kcal/m3)	m^3/h	56
Max Flue Temperature at Condensing Mode (30-50°C)	°C	55
Flue Gas Flow Rate	kg/h	935
Carbon Monoxide	ppm	< 100
Connections		
Supply Water Connection (N1)	in	3
Return Water Connection (N2)	in	3
Gas Connection (N3)	in	1 1/2
Flue Gas Outlet (N4)	mm	250
Condensate Drain (N5)	mm	32
Electrical		
Electric Power Suppl Voltage	V	380
Electric Power Supply Frequency	Hz	50
Pump Suggestion		
Head	m	9
Flow Rate	m^3/h	50

Dimensional Specifications:



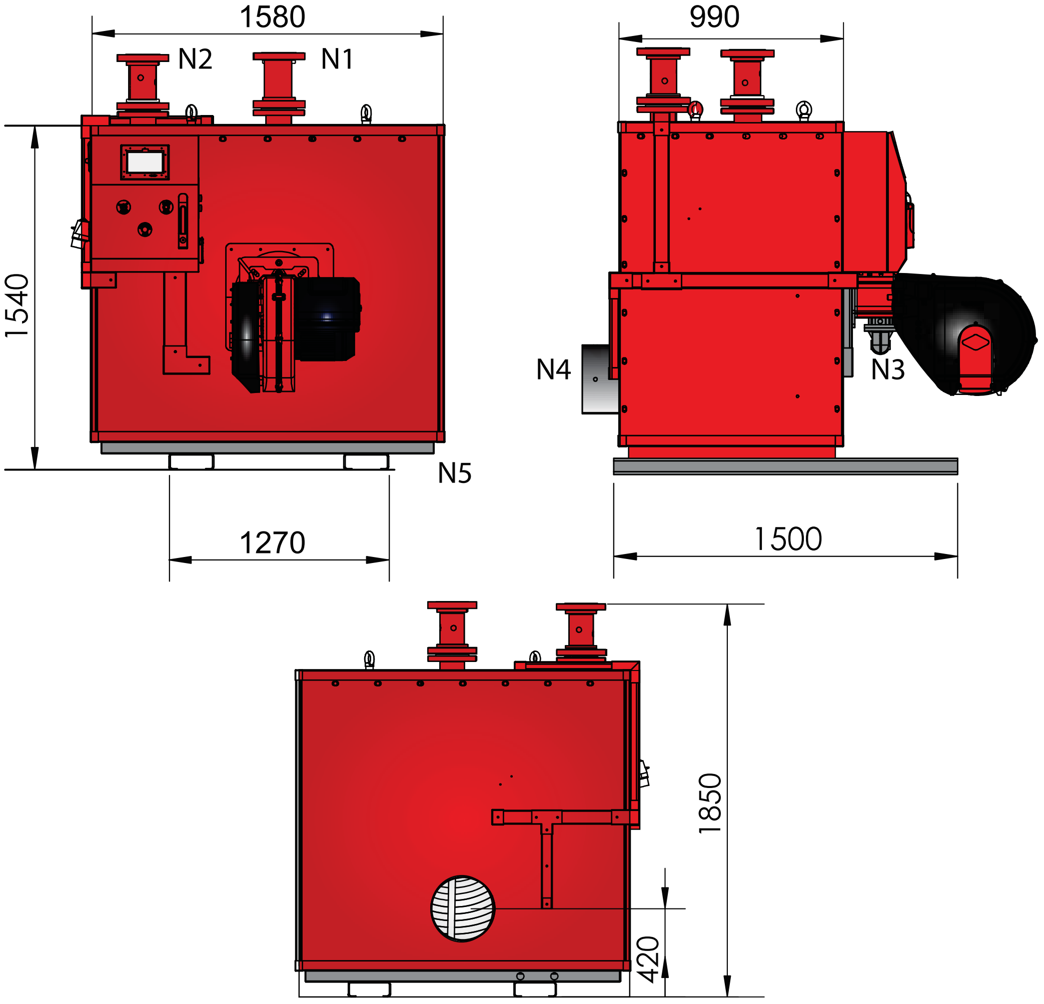
WATER-SIDE PRESSURE DROP CURVE



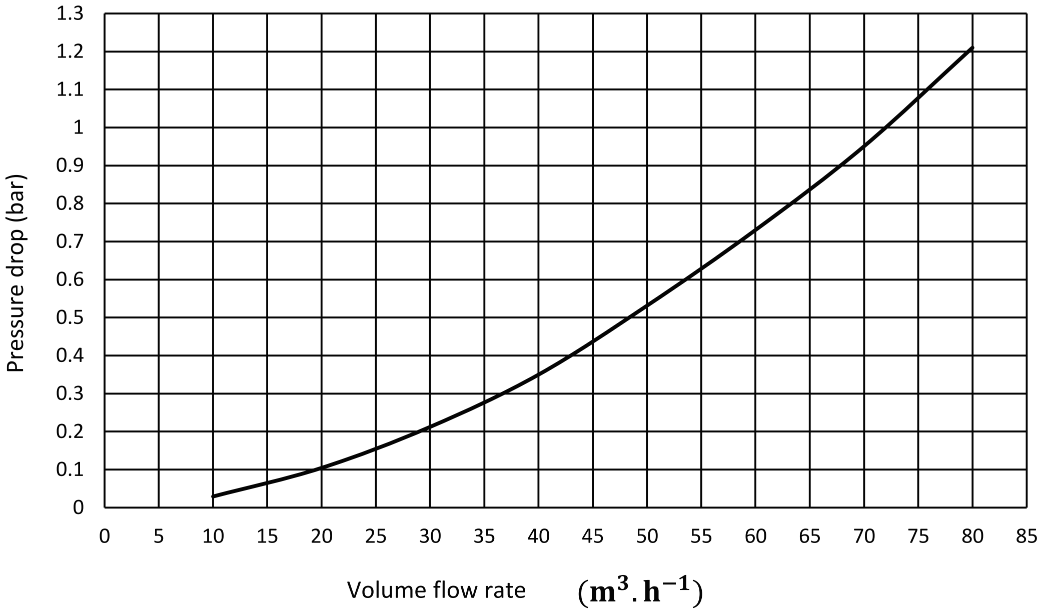
RAYKA Condensing Boiler 800.000 kcal/h

Model	Unit	800.000
Specification		
Heat Output (min-max)	kcal/h	200,000-800,000
Efficiency @ (30-50°C)	%	98
Efficiency @ (60-80°C)	%	91
NOX Class	-	2
Max Noise	dBA	80
Net Weight	kg	1300
Water Side		
Min Flow Rate	m^3/h	75
Max Working Pressure	bar	16
Water Side Pressure Drop at △T = 10 °C	bar	1.2
Max Supply Temperature	°C	85
Max Condensate Flow Rate	L/h	118
Water Content	L	275
Combustion		
Gas Consumption Rate with Calorific Value 9200 (kcal/m3)	m^3/h	90
Max Flue Temperature at Condensing Mode (30-50°C)	°C	54
Flue Gas Flow Rate	kg/h	1500
Carbon Monoxide	ppm	< 100
Connections		
Supply Water Connection (N1)	in	4
Return Water Connection (N2)	in	4
Gas Connection (N3)	in	1 1/2
Flue Gas Outlet (N4)	mm	300
Condensate Drain (N5)	mm	32
Electrical		
Electric Power Suppl Voltage	V	380
Electric Power Supply Frequency	Hz	50
Pump Suggestion		
Head	m	12
Flow Rate	m^3/h	80

Dimensional Specifications:



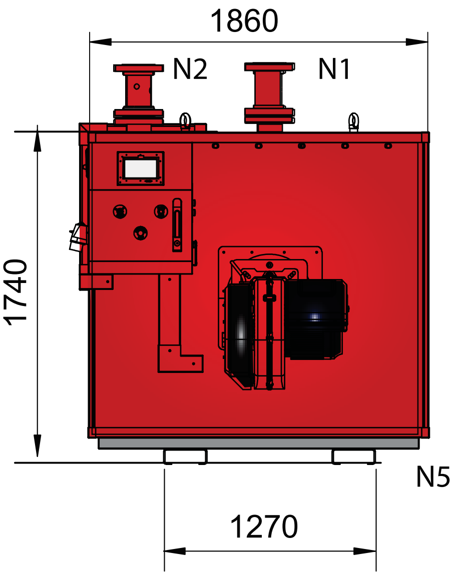
WATER-SIDE PRESSURE DROP CURVE

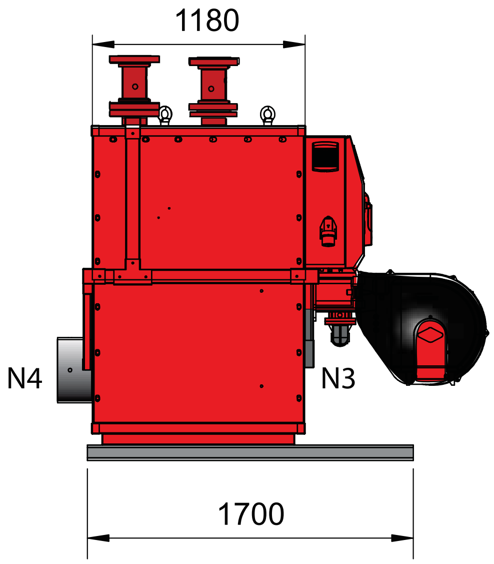


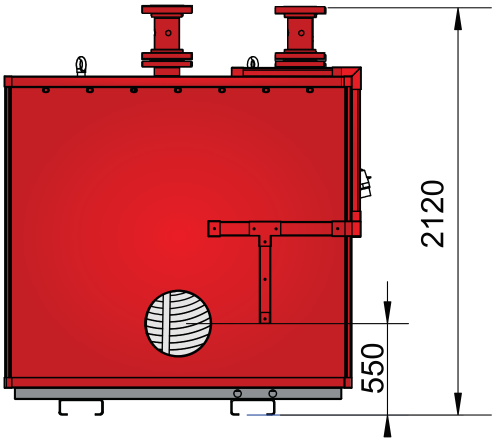
RAYKA Condensing Boiler 1.000.000 kcal/h

Model	Unit	1.000.000
Specification		
Heat Output (min-max)	kcal/h	250,000-1,000,000
Efficiency @ (30-50°C)	%	98
Efficiency @ (60-80°C)	%	91
NOX Class	-	2
Max Noise	dBA	85
Net Weight	kg	1500
Water Side		
Min Flow Rate	m^3/h	95
Max Working Pressure	bar	16
Water Side Pressure Drop at △T = 10 °C	bar	1.4
Max Supply Temperature	°C	85
Max Condensate Flow Rate	L/h	148
Water Content	L	375
Combustion		
Gas Consumption Rate with Calorific Value 9200 (kcal/m3)	m^3/h	115
Max Flue Temperature at Condensing Mode (30-50°C)	°C	54
Flue Gas Flow Rate	kg/h	1880
Carbon Monoxide	ppm	< 100
Connections		
Supply Water Connection (N1)	in	5
Return Water Connection (N2)	in	5
Gas Connection (N3)	in	2
Flue Gas Outlet (N4)	mm	300
Condensate Drain (N5)	mm	32
Electrical		
Electric Power Suppl Voltage	V	380
Electric Power Supply Frequency	Hz	50
Pump Suggestion		
Head	m	14
Flow Rate	m^3/h	100

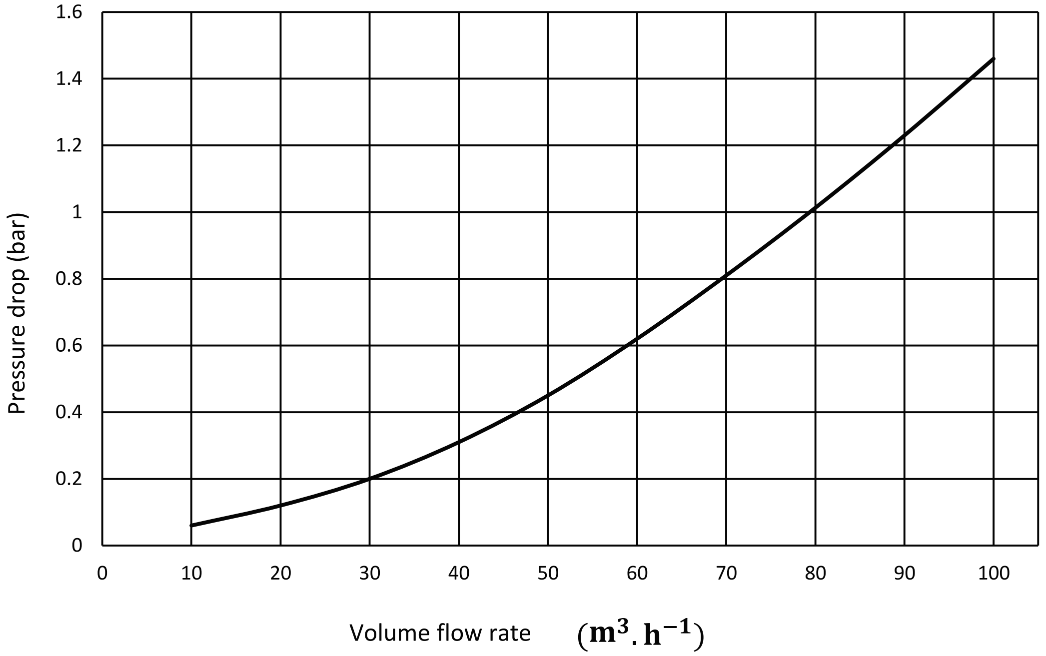
Dimensional Specifications:







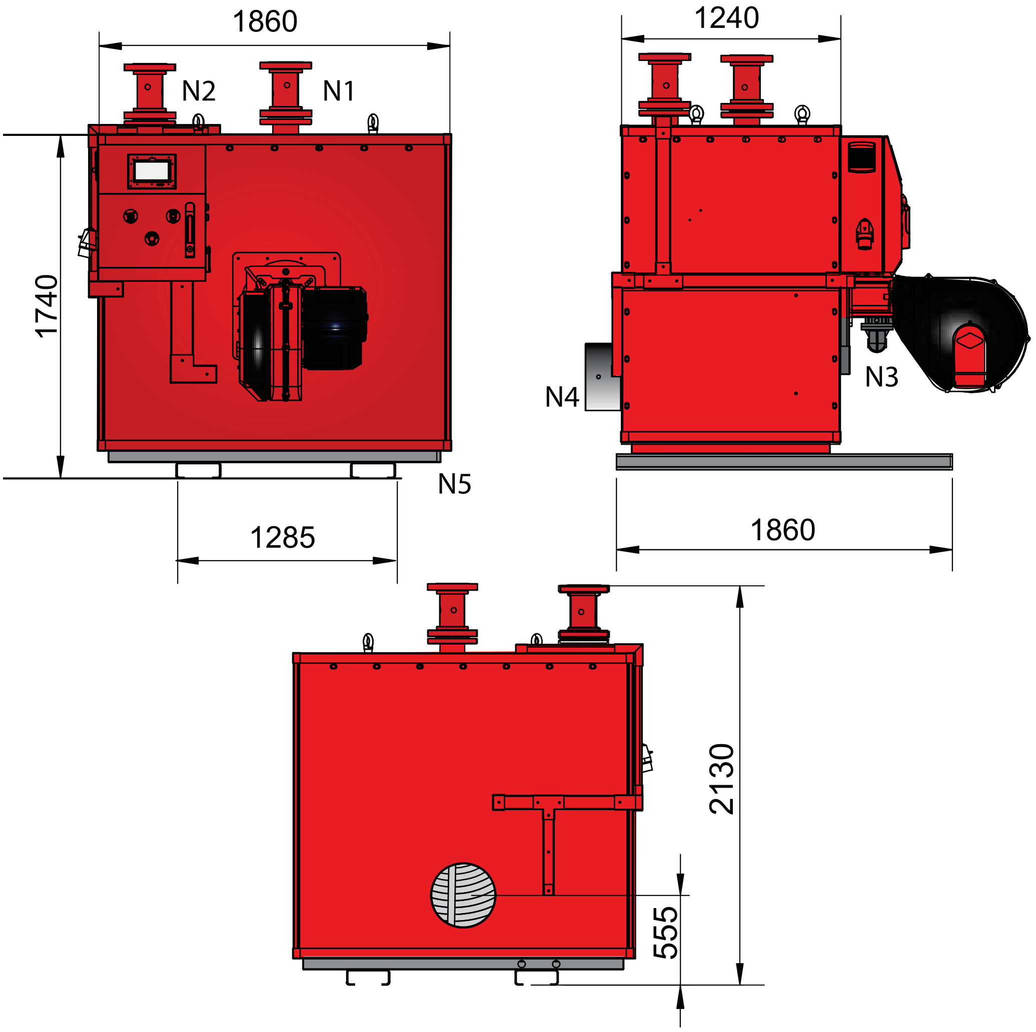
WATER-SIDE PRESSURE DROP CURVE

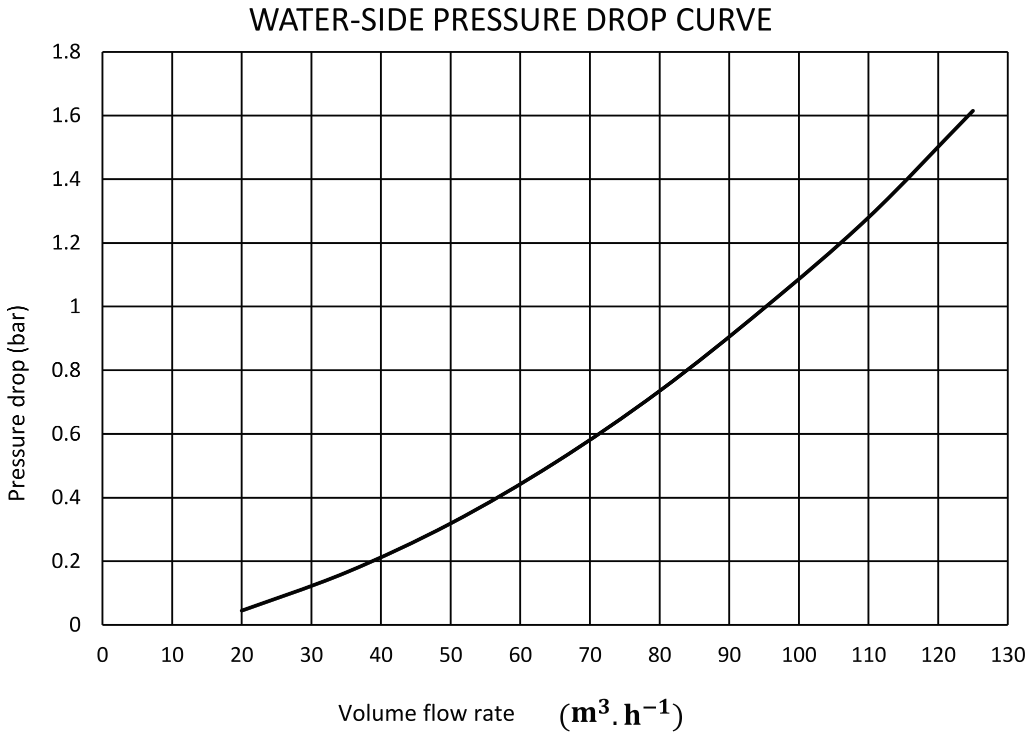


RAYKA Condensing Boiler 1.250.000 kcal/h

Model	Unit	1.250.000
Specification		
Heat Output (min-max)	kcal/h	200,000-1,250,000
Efficiency @ (30-50°C)	%	98
Efficiency @ (60-80°C)	%	91
NOX Class	-	2
Max Noise	dBA	85
Net Weight	kg	1700
Water Side		
Min Flow Rate	m^3/h	115
Max Working Pressure	bar	16
Water Side Pressure Drop at △T = 10 °C	bar	1.6
Max Supply Temperature	°C	55
Max Condensate Flow Rate	L/h	185
Water Content	L	450
Combustion		
Gas Consumption Rate with Calorific Value 9200 (kcal/m3)	m^3/h	140
Max Flue Temperature at Condensing Mode (30-50°C)	°C	56
Flue Gas Flow Rate	kg/h	2345
Carbon Monoxide	ppm	< 100
Connections		
Supply Water Connection (N1)	in	6
Return Water Connection (N2)	in	6
Gas Connection (N3)	in	2
Flue Gas Outlet (N4)	mm	400
Condensate Drain (N5)	mm	32
Electrical		
Electric Power Suppl Voltage	V	380
Electric Power Supply Frequency	Hz	50
Pump Suggestion		
Head	m	16
Flow Rate	m^3/h	125

Dimensional Specifications:

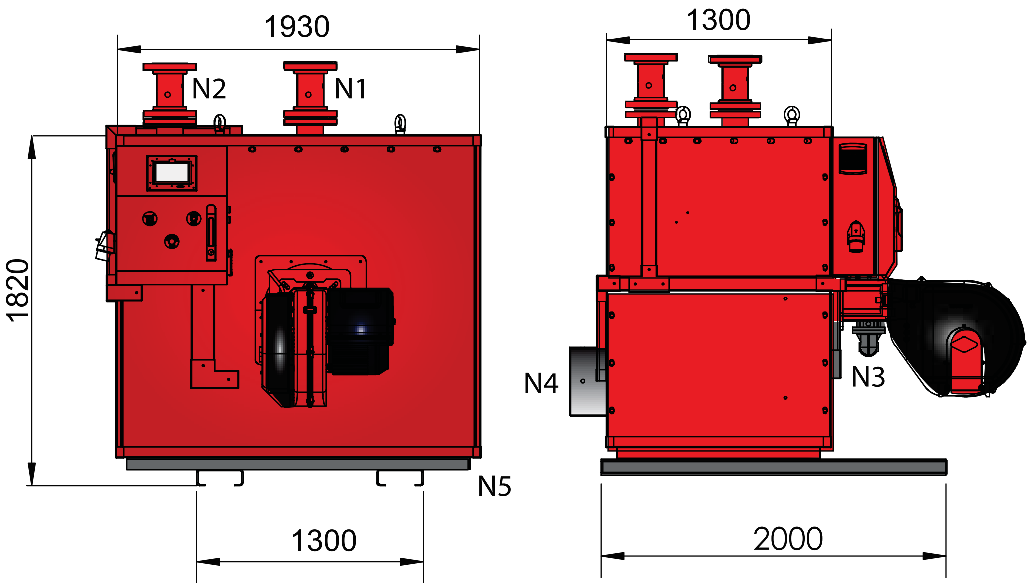


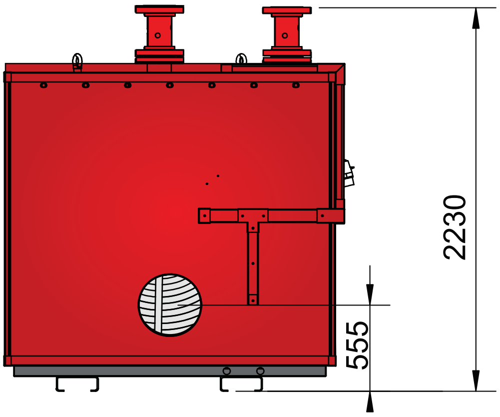


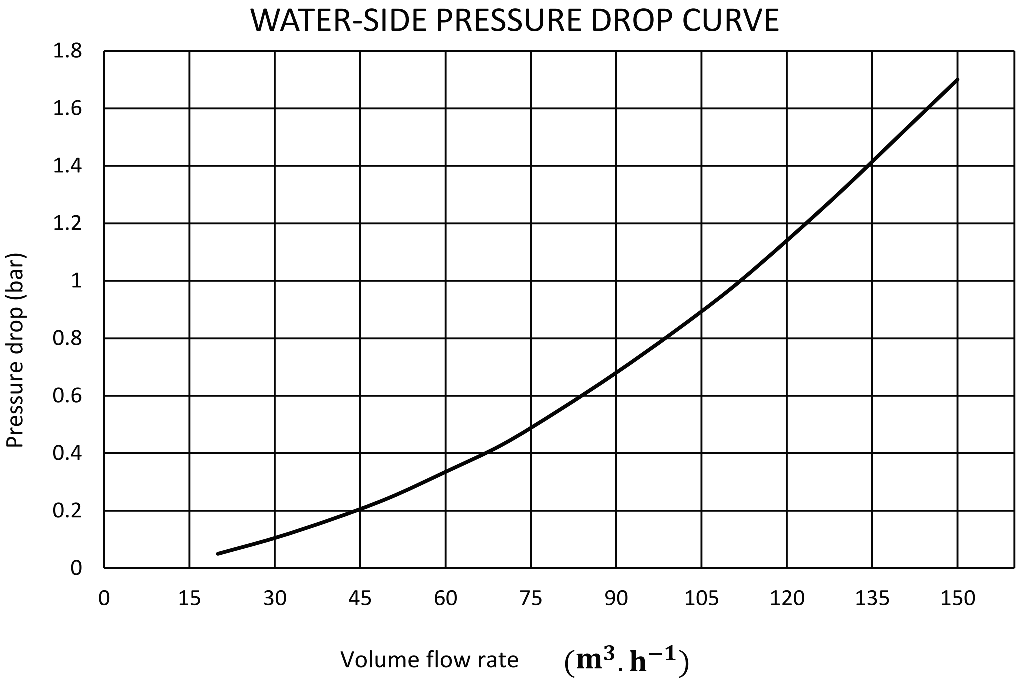
RAYKA Condensing Boiler 1.500.000 kcal/h

Model	Unit	1.500.000
Specification		
Heat Output (min-max)	kcal/h	250,000-1,500,000
Efficiency @ (30-50°C)	%	98
Efficiency @ (60-80°C)	%	91
NOX Class	-	2
Max Noise	dBA	85
Net Weight	kg	1900
Water Side		
Min Flow Rate	m^3/h	130
Max Working Pressure	bar	16
Water Side Pressure Drop at $\triangle T = 10$ °C	bar	1.7
Max Supply Temperature	°C	85
Max Condensate Flow Rate	L/h	222
Water Content	L	540
Combustion		
Gas Consumption Rate with Calorific Value 9200 (kcal/m3)	m^3/h	170
Max Flue Temperature at Condensing Mode (30-50°C)	°C	55
Flue Gas Flow Rate	kg/h	2814
Carbon Monoxide	ppm	< 100
Connections		
Supply Water Connection (N1)	in	6
Return Water Connection (N2)	in	6
Gas Connection (N3)	in	2
Flue Gas Outlet (N4)	mm	400
Condensate Drain (N5)	mm	32
Electrical		
Electric Power Suppl Voltage	V	380
Electric Power Supply Frequency	Hz	50
Pump Suggestion		
Head	m	17
Flow Rate	m^3/h	150

Dimensional Specifications:



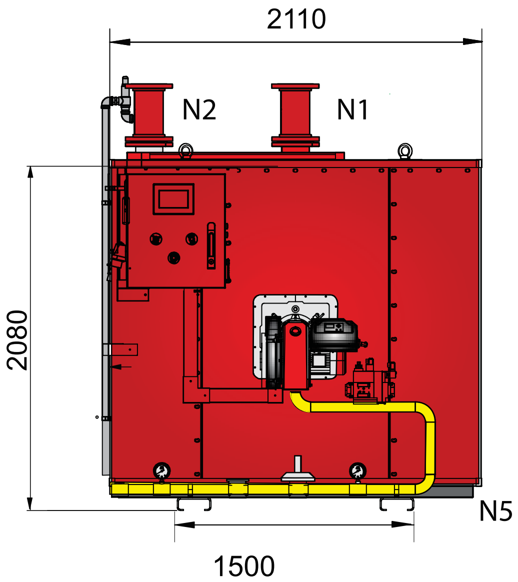


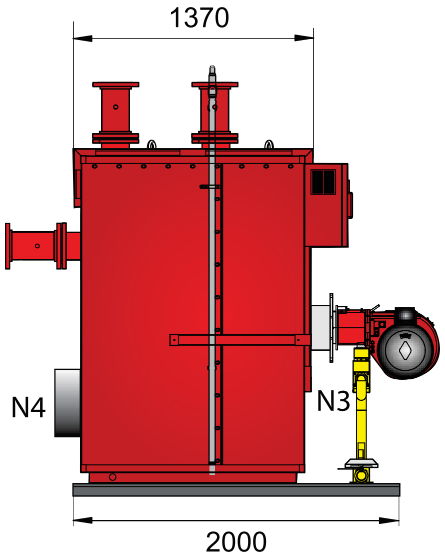


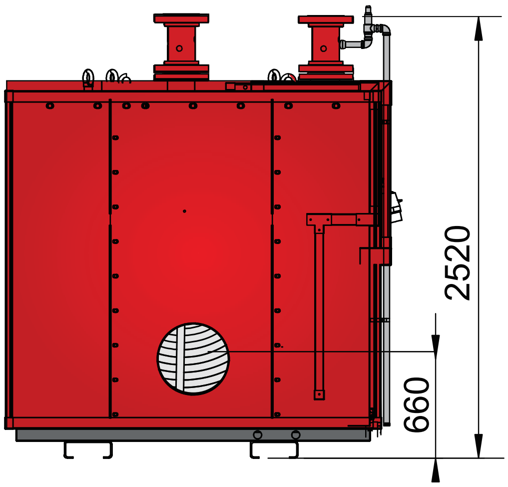
RAYKA Condensing Boiler 2.000.000 kcal/h

Model	Unit	2.000.000
Specification		
Heat Output (min-max)	kcal/h	350,000-2,000,000
Efficiency @ (30-50°C)	%	98
Efficiency @ (60-80°C)	%	91
NOX Class	-	2
Max Noise	dBA	85
Net Weight	kg	2200
Water Side		
Min Flow Rate	m^3/h	190
Max Working Pressure	bar	16
Water Side Pressure Drop at △T = 10 °C	bar	1.8
Max Supply Temperature	°C	85
Max Condensate Flow Rate	L/h	296
Water Content	L	790
Combustion		
Gas Consumption Rate with Calorific Value 9200 (kcal/m3)	m^3/h	240
Max Flue Temperature at Condensing Mode (30-50°C)	°C	54
Flue Gas Flow Rate	kg/h	2345
Carbon Monoxide	ppm	< 100
Connections		
Supply Water Connection (N1)	in	6
Return Water Connection (N2)	in	6
Gas Connection (N3)	in	2
Flue Gas Outlet (N4)	mm	500
Condensate Drain (N5)	mm	32
Electrical		
Electric Power Suppl Voltage	V	380
Electric Power Supply Frequency	Hz	50
Pump Suggestion		
Head	m	19
Flow Rate	m^3/h	200

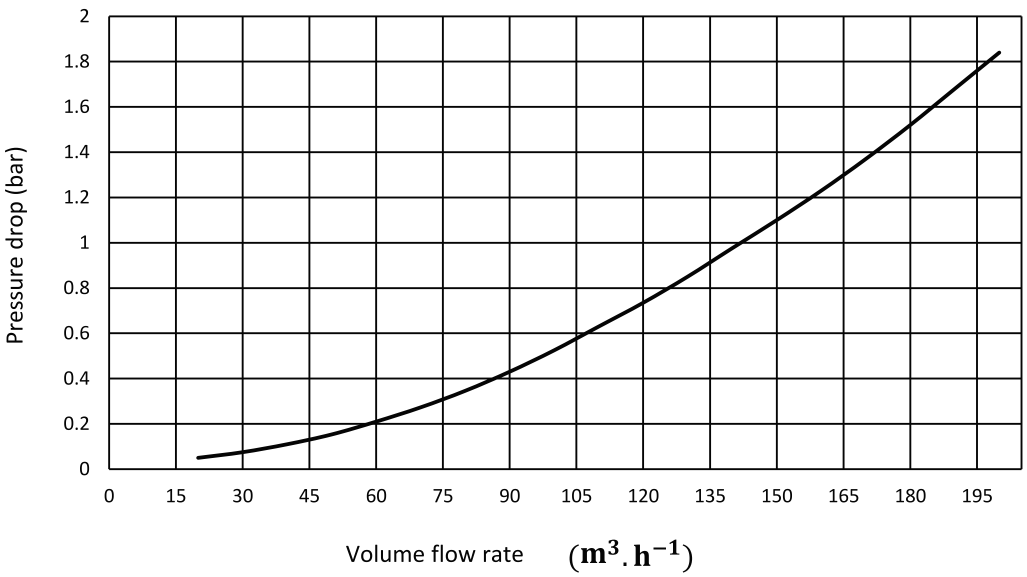
Dimensional Specifications:







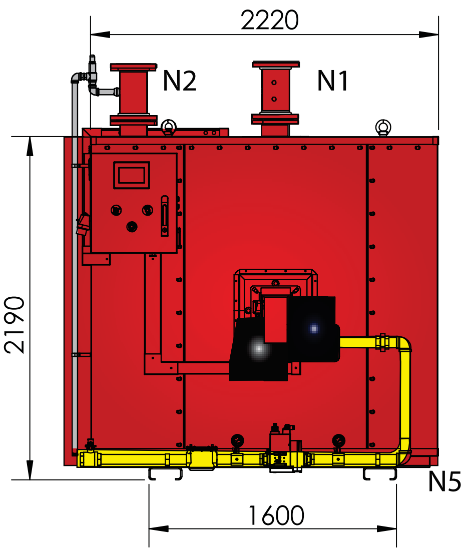
WATER-SIDE PRESSURE DROP CURVE

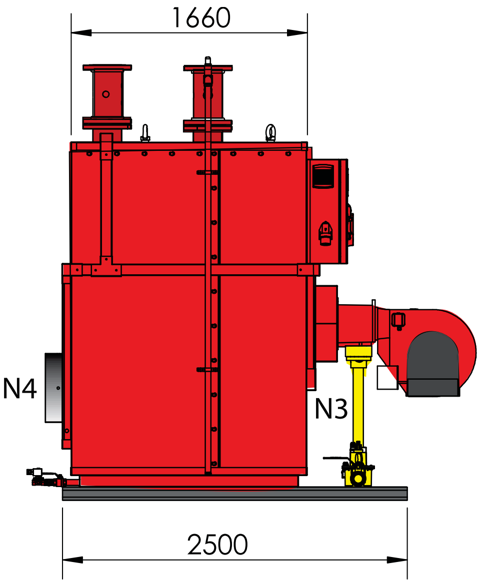


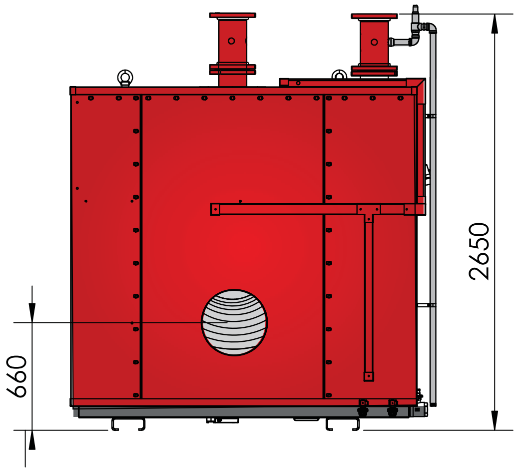
RAYKA Condensing Boiler 3.000.000 kcal/h

Model	Unit	3.000.000
Specification		
Heat Output (min-max)	kcal/h	500,000-3,000,000
Efficiency @ (30-50°C)	%	98
Efficiency @ (60-80°C)	%	91
NOX Class	-	2
Max Noise	dBA	89
Net Weight	kg	3000
Water Side		
Min Flow Rate	m^3/h	280
Max Working Pressure	bar	16
Water Side Pressure Drop at △T = 10 °C	bar	2.2
Max Supply Temperature	°C	85
Max Condensate Flow Rate	L/h	444
Water Content	L	1200
Combustion		
Gas Consumption Rate with Calorific Value 9200 (kcal/m3)	m^3/h	360
Max Flue Temperature at Condensing Mode (30-50°C)	°C	54
Flue Gas Flow Rate	kg/h	5640
Carbon Monoxide	ppm	< 100
Connections		
Supply Water Connection (N1)	in	8
Return Water Connection (N2)	in	8
Gas Connection (N3)	in	3
Flue Gas Outlet (N4)	mm	600
Condensate Drain (N5)	mm	32
Electrical		
Electric Power Suppl Voltage	V	380
Electric Power Supply Frequency	Hz	50
Pump Suggestion		
Head	m	22
Flow Rate	m^3/h	300

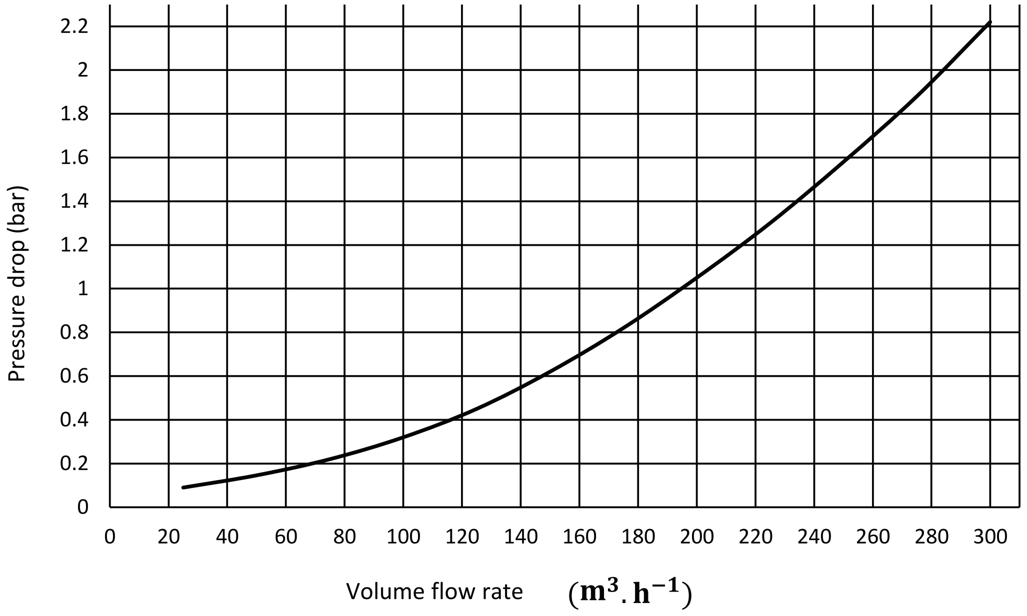
Dimensional Specifications:







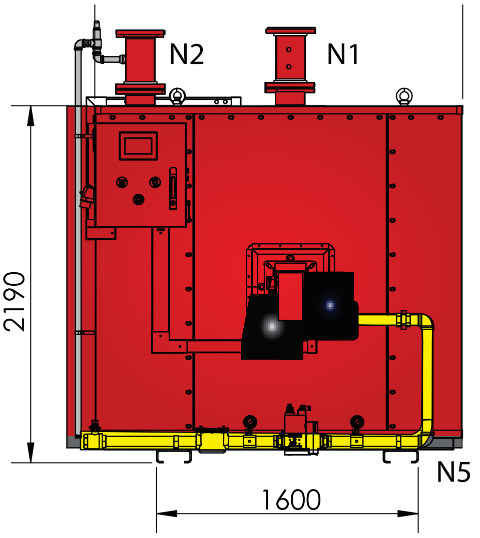
WATER-SIDE PRESSURE DROP CURVE

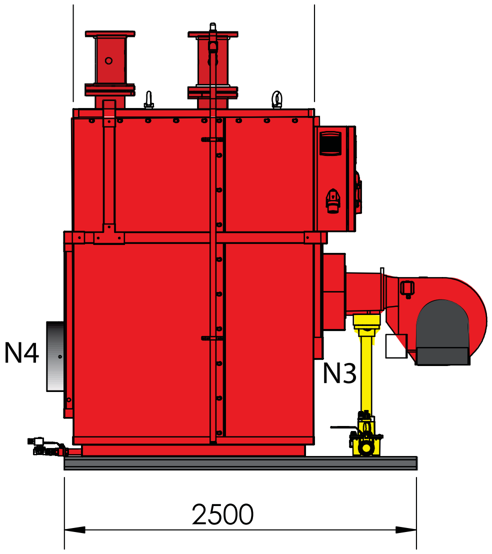


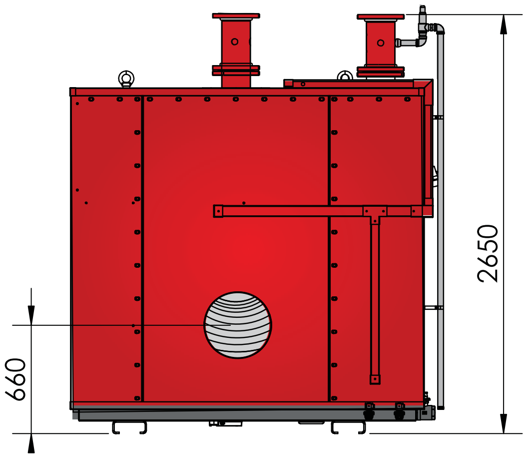
RAYKA Condensing Boiler 4.000.000 kcal/h

Model	Unit	4.000.000
Specification		
Heat Output (min-max)	kcal/h	650,000-4,000,000
Efficiency @ (30-50°C)	%	98
Efficiency @ (60-80°C)	%	91
NOX Class	-	2
Max Noise	dBA	89
Net Weight	kg	5700
Water Side		
Min Flow Rate	m^3/h	400
Max Working Pressure	bar	16
Water Side Pressure Drop at △T = 10 °C	bar	0.9
Max Supply Temperature	°C	85
Max Condensate Flow Rate	L/h	592
Water Content	L	1800
Combustion		
Gas Consumption Rate with Calorific Value 9200 (kcal/m3)	m^3/h	450
Max Flue Temperature at Condensing Mode (30-50°C)	°C	53
Flue Gas Flow Rate	kg/h	7500
Carbon Monoxide	ppm	< 100
Connections		
Supply Water Connection (N1)	in	10
Return Water Connection (N2)	in	10
Gas Connection (N3)	in	3
Flue Gas Outlet (N4)	mm	650
Condensate Drain (N5)	mm	32
Electrical		
Electric Power Suppl Voltage	V	380
Electric Power Supply Frequency	Hz	50
Pump Suggestion		
Head	m	10
Flow Rate	m^3/h	400

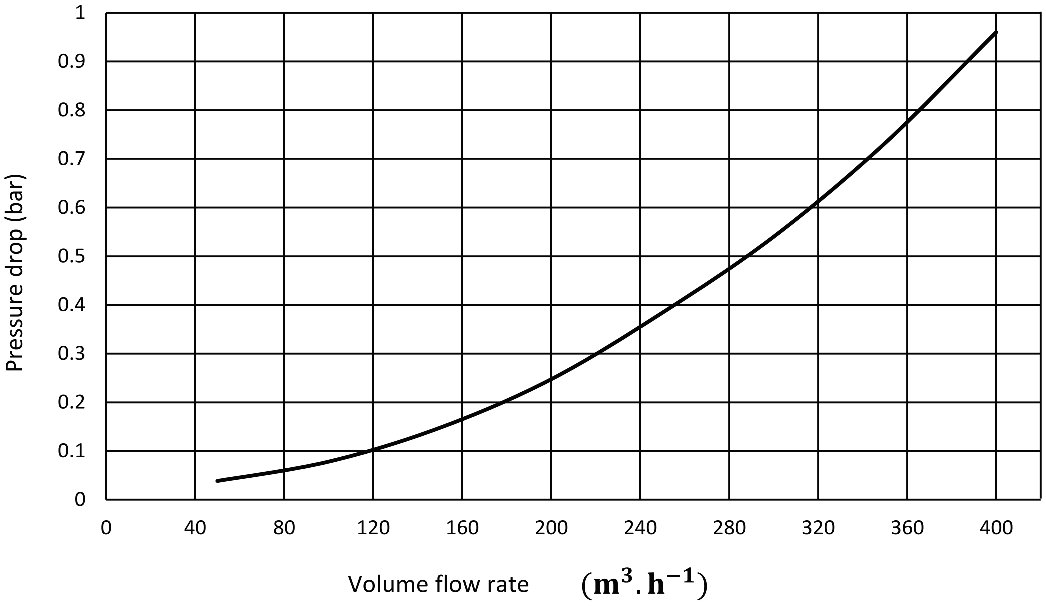
Dimensional Specifications:







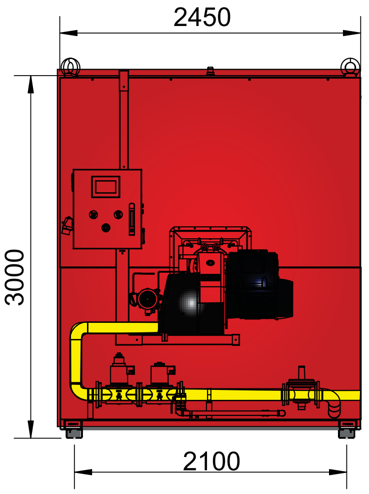
WATER-SIDE PRESSURE DROP CURVE

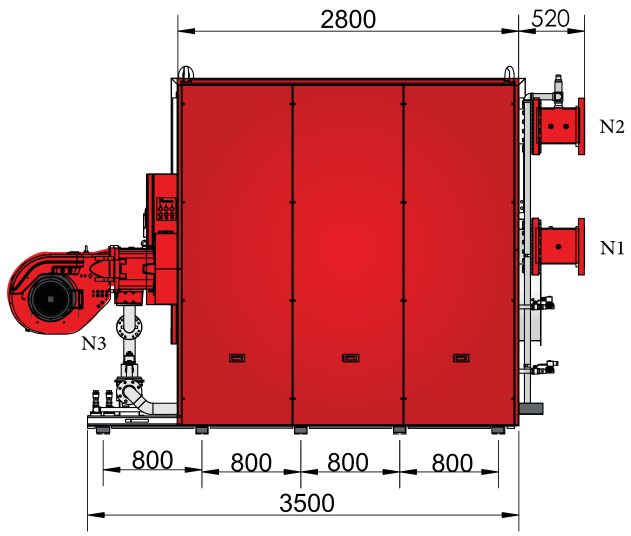


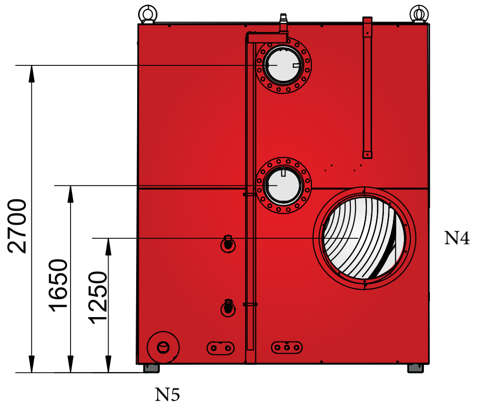
RAYKA Condensing Boiler 5.000.000 kcal/h

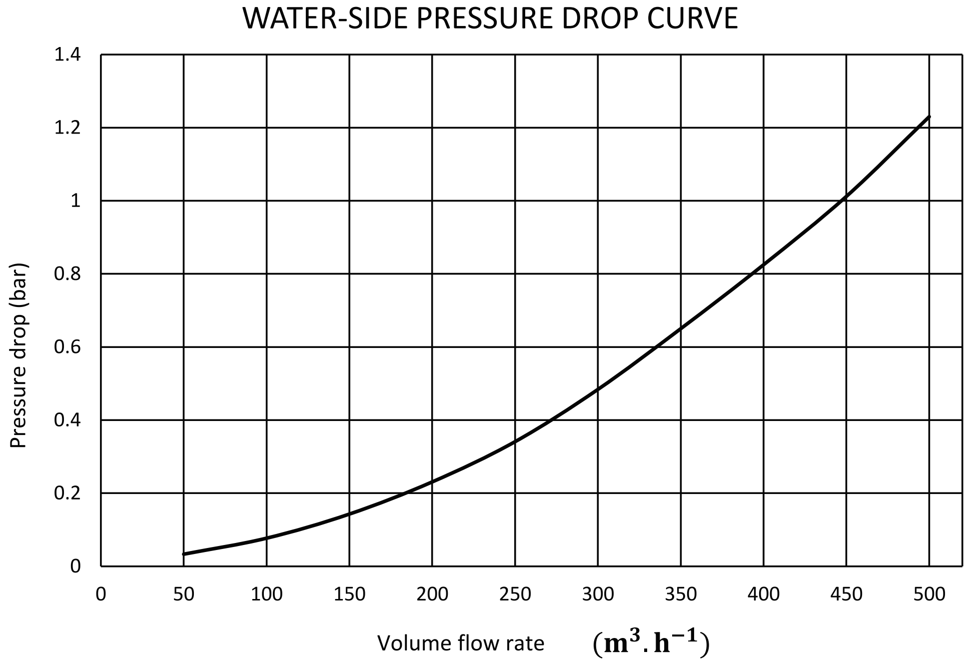
Model	Unit	5.000.000
Specification		
Heat Output (min-max)	kcal/h	800,000-5,000,000
Efficiency @ (30-50°C)	%	98
Efficiency @ (60-80°C)	%	91
NOX Class	-	2
Max Noise	dBA	89
Net Weight	kg	6200
Water Side		
Min Flow Rate	m^3/h	500
Max Working Pressure	bar	16
Water Side Pressure Drop at $\triangle T = 10$ °C	bar	1.2
Max Supply Temperature	°C	85
Max Condensate Flow Rate	L/h	740
Water Content	L	2000
Combustion		
Gas Consumption Rate with Calorific Value 9200 (kcal/m3)	m^3/h	560
Max Flue Temperature at Condensing Mode (30-50°C)	°C	53
Flue Gas Flow Rate	kg/h	9380
Carbon Monoxide	ppm	< 100
Connections		
Supply Water Connection (N1)	in	12
Return Water Connection (N2)	in	12
Gas Connection (N3)	in	3
Flue Gas Outlet (N4)	mm	700
Condensate Drain (N5)	mm	32
Electrical		
Electric Power Suppl Voltage	V	380
Electric Power Supply Frequency	Hz	50
Pump Suggestion		
Head	m	13
Flow Rate	m^3/h	500

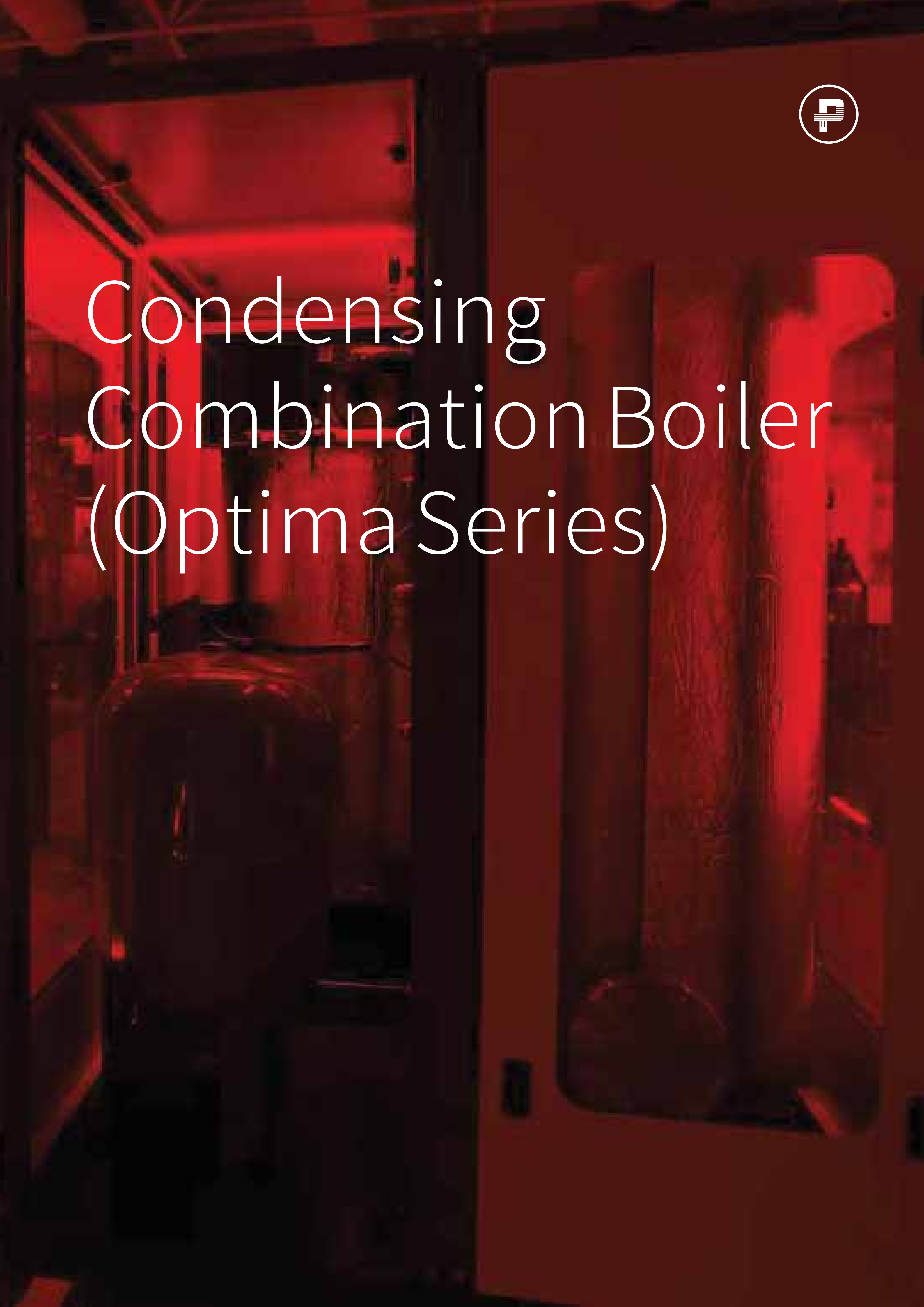
Dimensional Specifications:








WATER-SIDE PRESSURE DROP CURVE



Condensing Combination Boiler (Optima Series)

Product Description

The modulating premix burner and the proven stainless steel boiler body ensure a standard efficiency of up to 98 % (Hs)/109 % (Hi). This reduces heating costs and protects the environment. All ground condensing boilers from Packman, COMBI-OP is equipped with a stainless steel Boiler, Burner, Pumps, Expansion Tank & Piping, and Instruments, presenting all the benefits offered by its heat transfer principle.

With its modulation from 1:5, the Premix burner saves energy and reduces emissions, with its extremely clean combustion.

The COMBI-CO is equipped with an intelligent Control combustion controller that guarantees permanently optimized combustion.

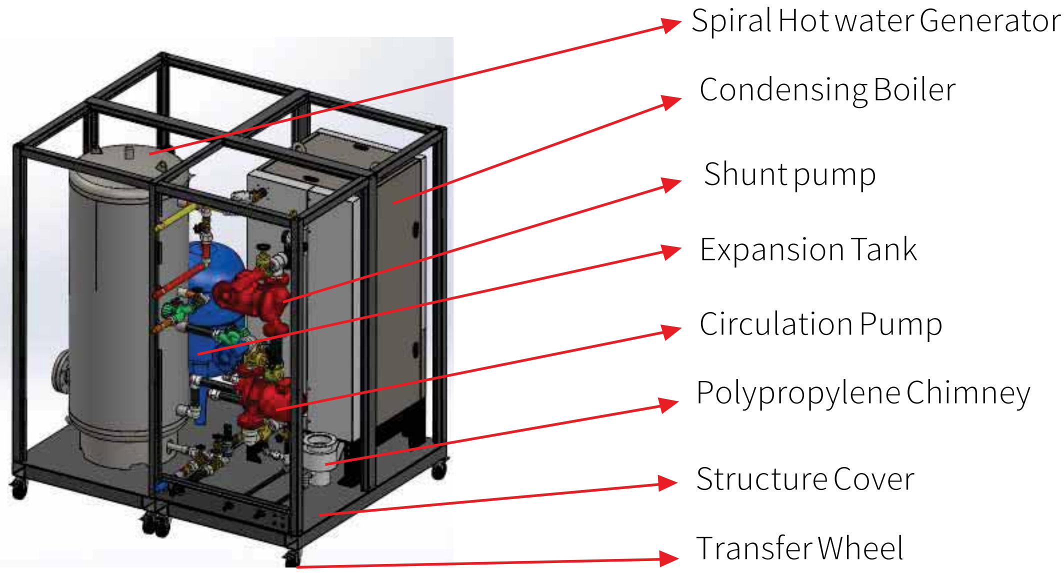
Condensing Boiler

- Fire tube stainless steel boiler.

through the flue gas and the condensate flowing in the same direction.

- Excellent corrosion resistance through high-grade stainless steel & Modulating Premix burner .
- Clean combustion.
- Long service life through the stainless steel mesh.
- Optimized match between the boiler and the burner & Pro Control combu tion controller .
- Consistently high efficiency, even in case of fluctuating gas composition and air pressure.
- Consistently low emissions.
- Low combustion noise through low fan speed & even more compact dimensions and low weights.
- up to 300 kW Package.
- Particularly easy to install, maintain and service, due to modular design & a large wiring chamber.
- Particularly quiet, even suitable for living spaces.
- Space-saving, because no service clearances at the package sides are required.

Specifications



Condensing Boiler: The condensing technology of boilers and water heaters features an advanced high efficiency and convenient that produces installation, operating, and lifetime cost

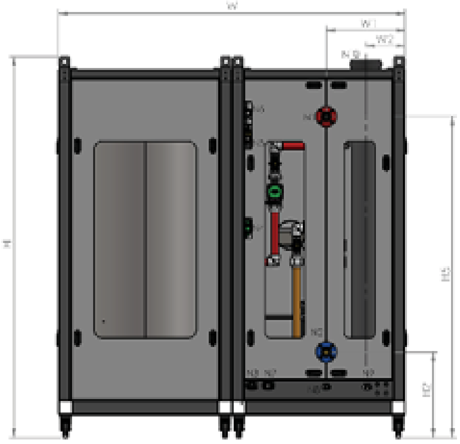
Spiral Domestic Hot Water Tank: Domestic hot water tank is used for supplying clean hot water, for building and industries.

Expansion Tank: Expansion tank are required in a closed loop heating water HVAC systems to conserve the expanding fluid and limit the pressure whitin a heating system.

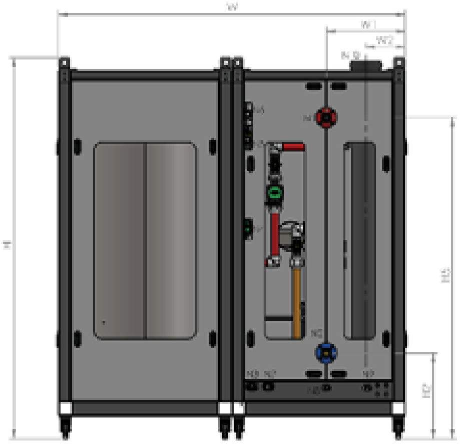
Shunt Pump: Shunt Pump to provide minimum flow of boiler we must use shunt line and pump on outside the boiler to connect outlet to inlet for circulating the water cross boiler.

Structure & Covering: Steel Structure and glass opening cover allows easy access to the operator for operation with the device.

Polypropylene Chimney: Due to the low temperature of the chimney in the condensing boiler, we can use polymeric materials such as polypropylene for the chimney of these boilers, which is both cheaper and easier to run in the system.



Model		Unit	100	150	200	250	300
Technical Data							
Max Heat Output		kW	100	150	200	250	300
Min Heat Output		kW	25	37.5	50	62.5	75
Efficiency	30/40	%	98				
	70/80	%	91				
Min & Max Working Pressure		bar	2-16				
Water Temperature Range		°C	30-80				
Recommended Water Flowrate		m³/hr	9	13.5	18	22.5	27
Water Head Loss in Primary Circuit		m	1	1.3	1.6	2.3	3.1
Boiler Water Content		Liter	89	122	154	165	197
Max Condensate		l/hr	12	18	24	30	36
Min Gas Pressure		mbar (psi)	18 (1/4)				
Max Gas Pressure		mbar (psi)	60 (2)			100 (2)	
Min Gas Consumption		m³/hr	2.3	3.45	4.6	5.75	6.9
Max Gas Consumption		m³/hr	9.2	13.8	18.4	23	27.6
Spiral Domestic Hot Water Tank Capacity		Liter	400	500	500	600	700
Spiral Domestic Hot Water Tank Continouse Flowrate		m³/hr	1.2	1.5	1.5	1.8	2
Expansion Tank Capacity		Liter	80		100		
Electric Supply		V/Hz/ph	220/50/1				
Electrical Power Consumption		W	900	1100	1150	1750	1750
Condensate PH		-	4-4.5				
Stack Material		-	Stainless Steel 304 L or plymer according to ISIRI 19279				



Model	Unit	100	150	200	250	300
Connection Size						
Heating Supply	in	1 1/2	1 1/2	1 1/2	2	2
Heating Return	in	1 1/2	1 1/2	1 1/2	2	2
Cold Water Inlet (DHWT)	in	1	1	1	1 1/4	1 1/4
Hot Water Return (DHWT)	in	1	1	1	1	1
Hot Water Supply (DHWT)	in	1	1	1	1 1/4	1 1/4
Stack & Air Intake	in	5	5	6	6	6
Condensate Discharge	in	1/2	1/2	1/2	1/2	1/2
Drain	in	1/2	1/2	1/2	1/2	1/2
Relief Valve	in	1/2	1/2	1/2	1/2	1/2
Gas Connection	in	1	1	1	1 1/4	1 1/4
Dimension						
Length (L)	mm	1395	1460	1510	1540	1580
Width (Wt)	mm	1780	1910	2010	2060	2140
Height (Ht)	mm	2035	2150	2220	2240	2310
W1	mm	400	435	460	470	490
W2	mm	215	235	235	235	245
H1	mm	300	300	300	300	300
H2	mm	500	500	500	500	500
H3	mm	1215	1215	1215	1225	1225
H4	mm	1515	1735	1735	1745	1900
H5	mm	1710	1790	1870	1900	1975
H6	mm	1750	1890	1890	1995	2090
Shipping Weight	kg	970	1080	1190	1310	1560

Magnetic Filter

Product Description

The impurity water circulation in heating and air conditioning systems may cause corrosion and damage to equipment and system components such as control valves, pumps, as well as clogging of heat exchangers, pipes and radiators, etc. These blockages can damage the system or cause a significant decrease in its efficiency.

Filters remove these impurities and harmful particles from the system. Impurities usually have ferrous materials that can be removed from the system using a suitable magnetic field. This operation is done using suitable magnets in magnetic filters. Sometimes, filters need to stop the system to drain the impurities, which is a disadvantage for this type of filter. None of the filters presented in this catalog need to stop the system to drain the impurities. This is an important advantage for magnetic filters.

Technical specifications	
Inlet and outlet size	2 inches to 10 inches
Material	
Body	ASTM A106 steel
Body color	Static leather color
Magnet	Neodymium magnet
Magnet sheath	Stainless steel
Filter	Stainless steel
Operation	
Usable fluid	Water
Maximum working pressure	10 bar(150psi)
Connections	
Flange	ANSI 150 CLASS
Relief Valve	Water plug valve
Air vent valve	Automatic air vent valve

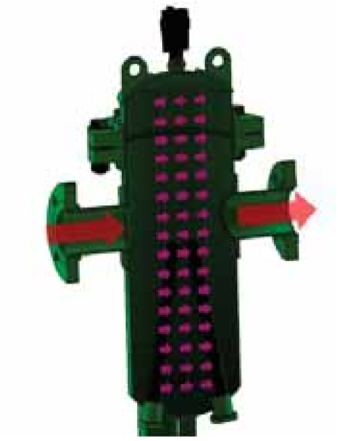
Filter Function

The piece placed in the tank will create a lower pressure drop in the system in this type of filter; Because the tank is designed in such a way that the speed of the fluid inside the chamber is low and the fluid passes through the filter at a low speed, which causes the pressure to not drop much. Also, the impact of the particles with the filter element inside the chamber causes the kinetic energy of the particles to be lost and their sedimentation in the chamber, which can be attributed to the low speed of the fluid in this chamber. That is, in addition to the filtration of particles by passing through the filter element (what happens in normal filters), settled particles and smaller particles will not have a chance to pass due to the low speed of the fluid in the chamber. These particles are removed during the operation of the system by settling the particles on the bottom of the chamber and opening the relief valve under the chamber.

The presence of ferromagnetic particles in the system is another important point. Usually, magnetite particles in engine room systems can be deposited in converters, pipes or pumps and disrupt system performance.

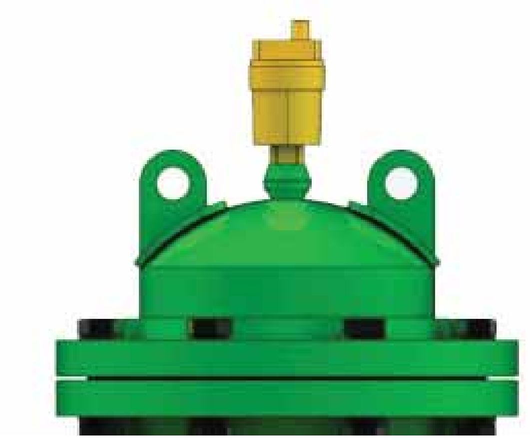
Magnetic particles with very small sizes (so that they pass through normal filters) are caused by iron corrosion. In addition to using the filter element in the low-speed fluid chamber, some strong neodymium magnets are used to attract the magnetic particles in the fluid in the existing magnetic filters.

This magnet is not in direct contact with the fluid and is removed from the chamber when the system is drained without the need to shut down the system. The particle discharge operation is done by the relief valve and then the magnet is placed in the chamber.



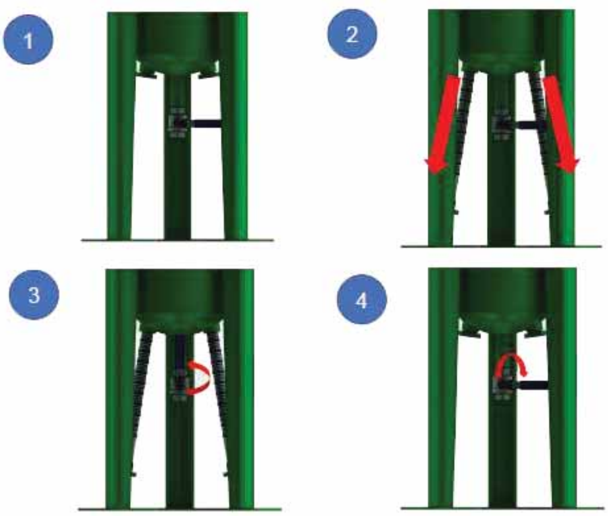
Air vent valve

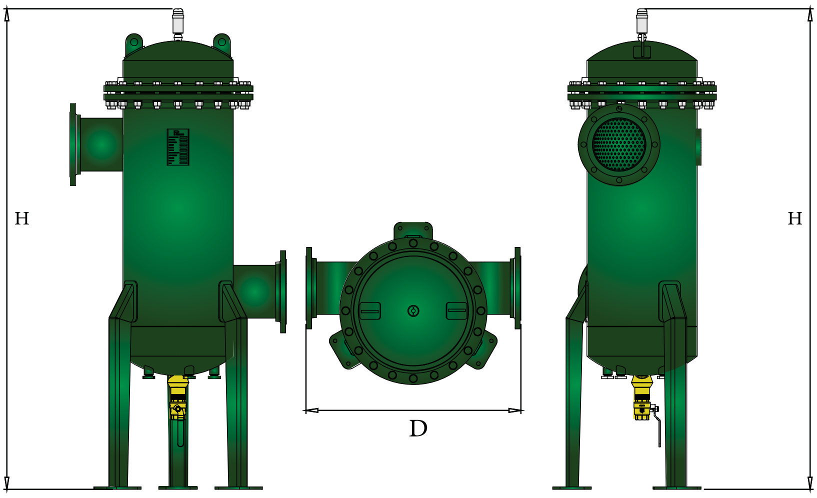
An automatic air valve is placed in the upper part of the filter, which can fully and automatically drain the air from the system when the system is started. Also, if there are bubbles in the system that can cause problems in the operation of the boiler by entering the boiler, this automatic valve can remove the bubbles from the system and prevent damage to the system in the short term as well as long-term corrosion caused by the bubbles.



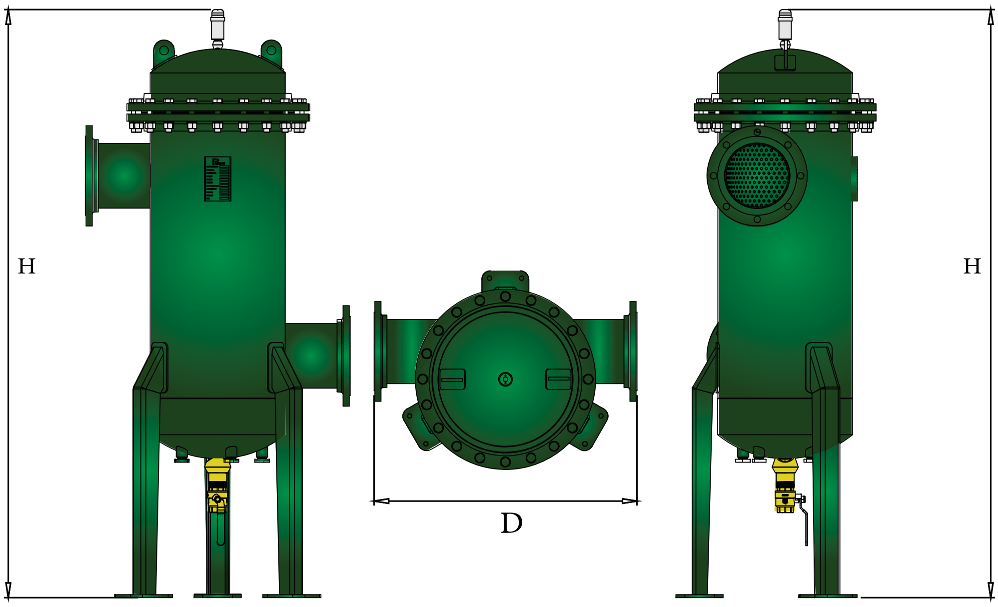
Discharge Conditions

There is no need to stop the system to empty this filter. Remove the magnets from their housings as shown in the figure. By removing the magnetic field, the magnetite particles attached to the sheath wall settle. Then the relief valve of the system is opened to remove the settled particles (both magnetic and non-magnetic particles). Then the relief valve is closed and the magnets are also closed inside the sheath.

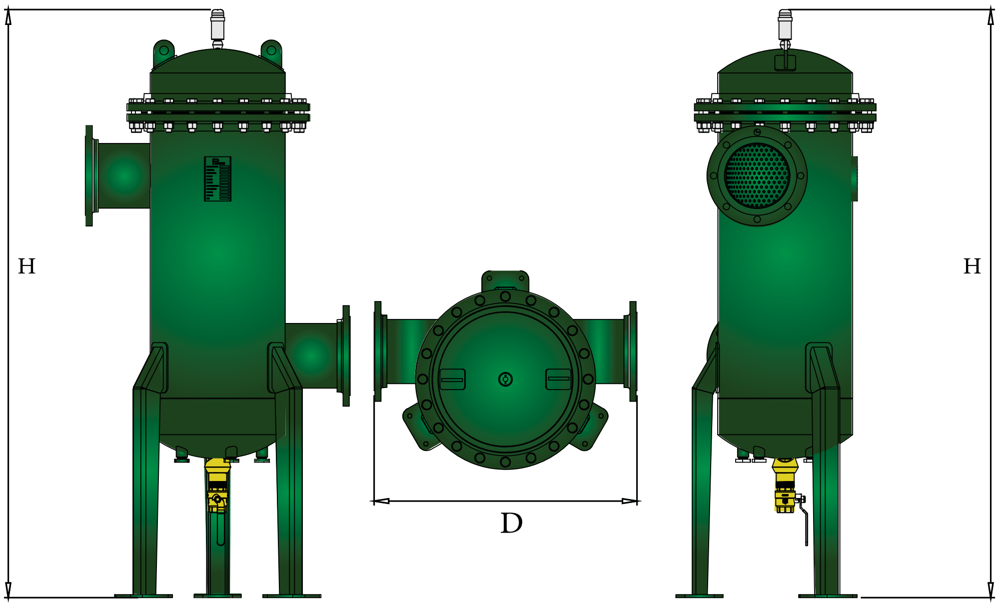




Model	Unit	PMF-2	PMF-3	PMF-4	PMF-5	PMF-6	PMF-8	PMF-10	PMF-12	PMF-14
Technical Specifications										
Nozzle size	in	2	3	4	5	6	8	10	12	14
Body Size	in	8	10	12	16	18	18	20	24	28
The number of rows of magnets	-	2	2	4	4	4	6	6	6	6
Number of sets of 4 in each row	-	8	9	9	11	13	10	10	13	13
Total number of magnets	-	64	72	144	176	208	240	240	312	312
The distance between the nozzles	mm	200	230	260	330	380	430	500	600	700



Technical Specifications	
2 inch Magnetic Filter	
Inlet and outlet flange	2 inches - class 150
Maximum operating flow rate	100 gallons per minute
Weight	42 Kg
The number of magnets used	1 piece
3 inch Magnetic Filter	
Inlet and outlet flange	3 inches - class 150
Maximum operating flow rate	220 gallons per minute
Weight	70 Kg
The number of magnets used	2 piece
4 inch Magnetic Filter	
Inlet and outlet flange	4 inches - class 150
Maximum operating flow rate	400 gallons per minute
Weight	77 Kg
The number of magnets used	2 piece

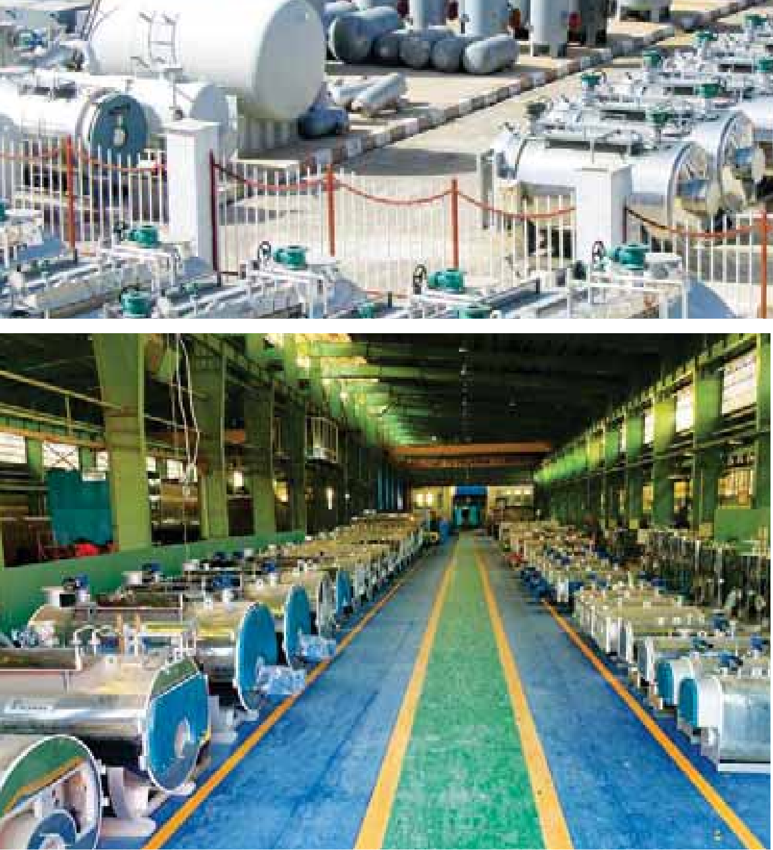


Technical Specifications	
5 inch Magnetic Filter	
Inlet and outlet flange	5 inches - class 150
Maximum operating flow rate	615 gallons per minute
Weight	159 Kg
The number of magnets used	4 piece
6 inch Magnetic Filter	
Inlet and outlet flange	6 inches - class 150
Maximum operating flow rate	880 gallons per minute
Weight	165 Kg
The number of magnets used	4 piece
8 inch Magnetic Filter	
Inlet and outlet flange	8 inches - class 150
Maximum operating flow rate	1570 gallons per minute
Weight	435 Kg
The number of magnets used	4 piece










Hot water Boiler
Heating Product Group
PACKMAN

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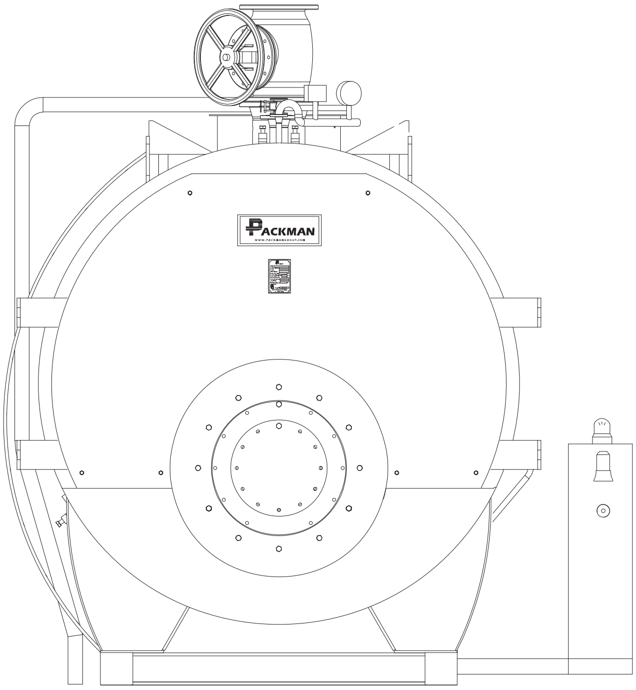
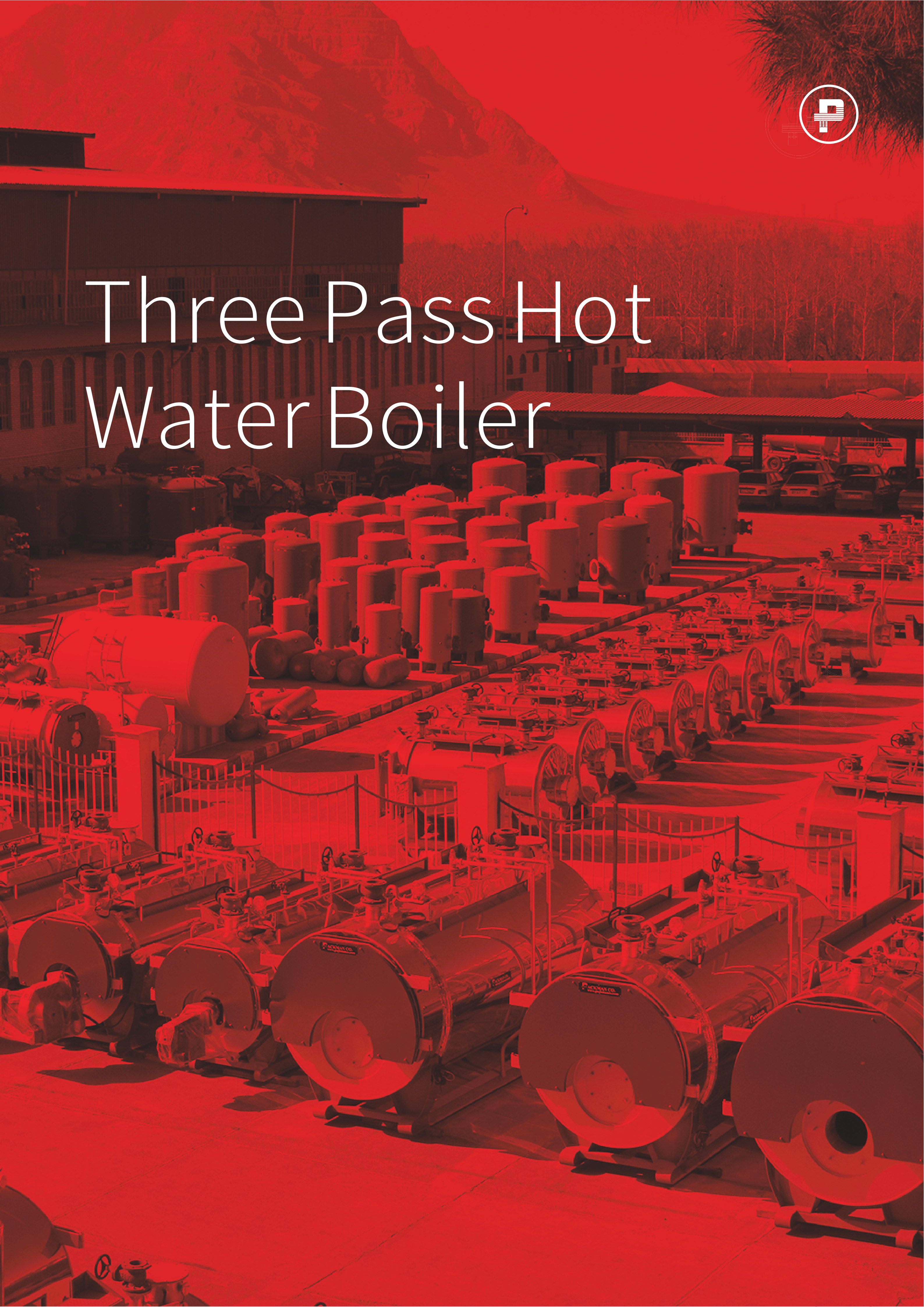


Three Pass Hot Water Boiler



Product Description

Packman’s Three Pass Boilers are fabricated in workshops equipped with most modern machines. Materials and workmanship are under a permanent quality control to construct reliable elements and groups.

Reliable to make sure that you can receive a highly efficient performance from your PACKMAN boiler, even after a number of years. Bellow are the advantages of packman’s three pass boilers:

- The boilers are adjusted to the plant by heating circuit environment and construction conditions.
- Adaptability of the thermal layout to fuel, medium and operation
- Adjustability of the boiler to the plant with regard to heating,environmental and constructional conditions.
- Selection of dimensions and materials according to thermal stress and charge.
- Designed with the greatest possible elasticity to tolerate thermal stresses.
- Possible higher heating efficiency by cooling the flue gas touched surfaces with water and reducing the radiation heat losses.
- Highly economical operation made possible by optimum controllability.

Three-pass Boiler

The three pass boiler is robust and economical. The furnace is formed with fire tubes.

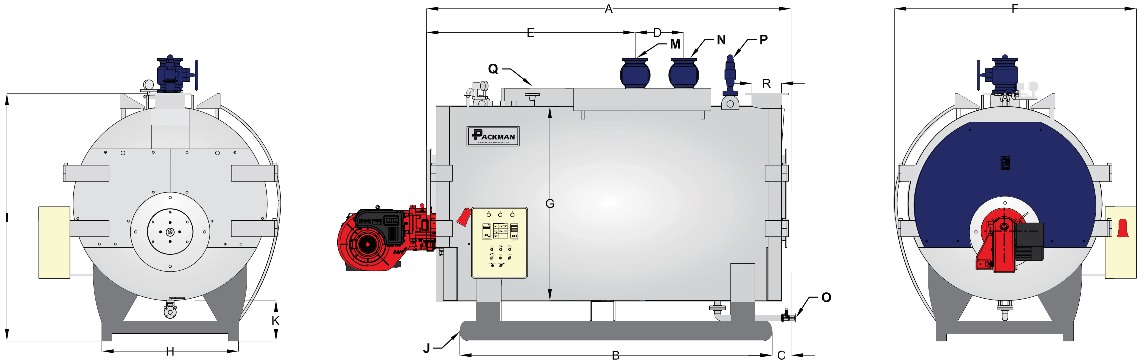
flue gases pass through the furnace & are directed to the top smoke tubes where they are cooled down. Most of the large water capacity boilers are made of this type, it’s been proven that three pass boilers are the most economical. Because of its structure three pass boiler is compatible with both liquid and gaseous fuels, or even coal and wood combustion.

- Fire tubes: In a three pass boiler the combustion chamber is formed with fire tubes. The chosen diameter guarantees the desired flame. Based on the diameter and working pressure, it is decided to employ either plane fire tubes or spiral ones.
- Boiler supports & skids: For boilers stand on supports. Most of the units are delivered with skids; So there is no need for special foundations or installation processes. Also all necessary accessories for operation, such as oil or gas firing

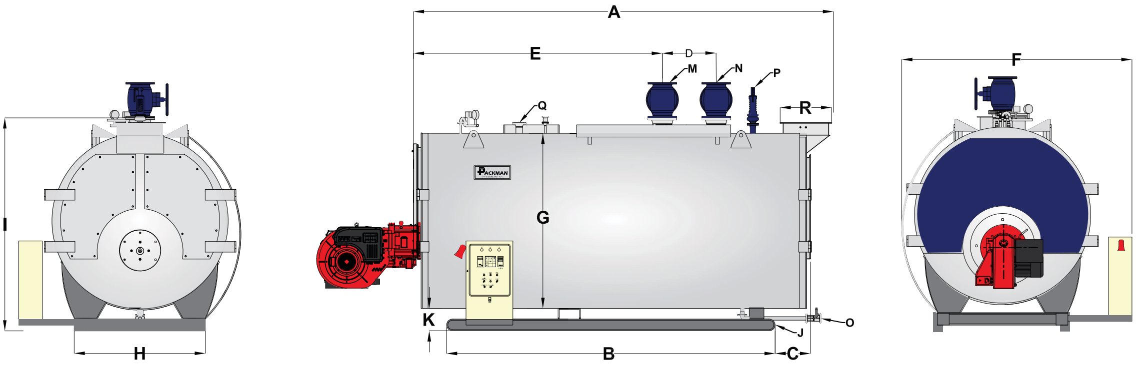
equipment, combustion air fan, oil pre heater, control panel or switchboard and feeding device, can be mounted on a skid.

- Boiler’s insulation: The cylindrical part of the boiler contains water,steam and the heating surfaces. From outside, the boiler is covered with a higly effective insulation as well as a cladding of stainless steel sheets (at both sides). All connections and nozzles including, mountings, fittings, control instrument nozzles, service platforms, flue gas reversing chambers and flue gas duct are mounted or contained in the boiler’s cylindrical part. man-holes and hand-holes that are provided on the boiler’s body as well, allow inspection at the water side and heating surfaces.
- Smoke tubes: The second and third boiler’s passes are formed by thick-walled smoke tubes which are welded into the end plates. The tubes are easily accessible and can be cleaned without difficulty. The arrangement of the smoke tubes is according to the required specifications of ascending flue passes in order to prevent the formation of residual-or lingering gases.
- Rear reversing chamber: Packman’s three pass fire tube boilers have an interior flue gas reversing chamber, situated in the water space. Here the direction of the flue gases, coming out of the fire tube is changed and they are distributed to the smoke tubes of the second pass. The all over cooling of the reversing chamber in the boiler’s water contributes to an optimum heat utilization. The exterior of this reversing chamber is formed of tightly welded tube walls; Which is water cooled (Wet Back) and absolutely gas tight. Access openings allow a flue gas side inspection of the interior and exterior reversing chambers.
- Front reversing chamber: Inside of a tightly welded and insulated chamber made of steel sheets the flue gases pass from the second to the third pass. The reversing chamber is equipped with large doors, allowing free access to the smoke tubes for the purpose of easy maintenance and cleaning. High quality sealing materials guarantee that the doors seal the gas tightly.

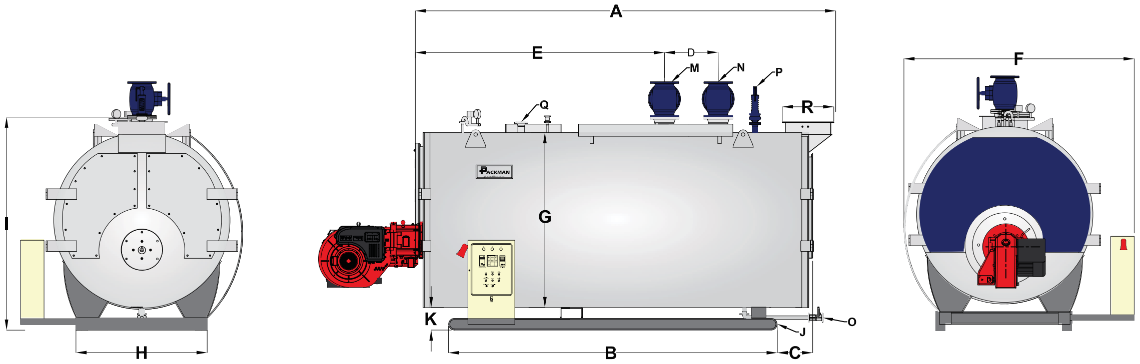
Specific explanations on three-pass boiler with wood or coal fuels and their special constructions can be sent upon request. In addition our engineers and other representatives are always at your service for further information and assistance.



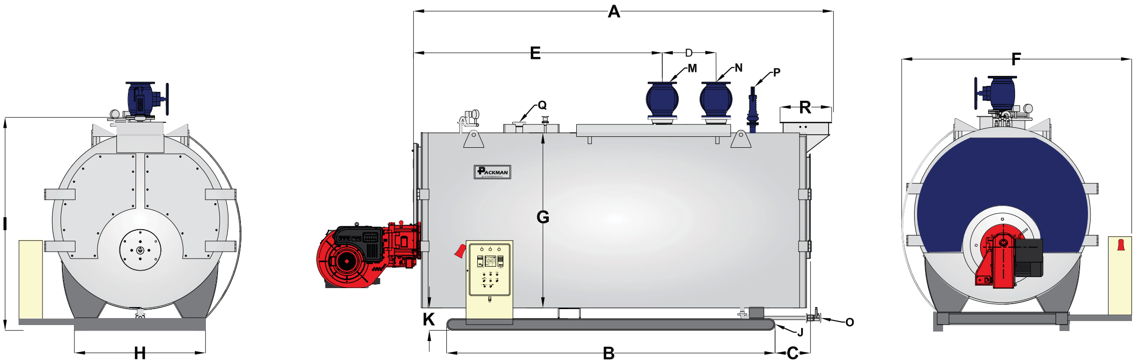
Model	Unit	PHWBN-350	PHWBN-500	PHWBN-700	PHWBN-800
Technical Data					
Thermal Capacity	kW	350	500	700	800
Thermal Capacity	kcal/hr	300,000	430,000	620,000	690,000
Working Pressure	bar	up to 30 bar			
Heating Surface	m^2	16	17	26	27
Pressure Drop in Combustion Chamber	mbar	2.2	3.5	2.5	3.8
Design Standard	_	BS/EN 12953			
Max Gas Consumption @Sea Level	m^3/hr	35	50	70	80
Max Fuel Oil Consumption @Sea Level	liter/hr	32	45	63	72
Max Heavy Fuel Oil Consumption @Sea Level	liter/hr	29	42	58	67
Connectoins Size					
Water Outlet (N)	in	3	4	4	4
Water Inlet (M)	in	3	4	4	4
Safety Valve @ 10 bar Working Pressure (P)	in	1	1	1	1
Expansion Valve (Q)	in	1	1 1/4	1 1/4	1 1/4
Venting Valve	in	1	1	1	1
Drain Valve (O)	in	1 1/4	1 1/4	1 1/2	1 1/2
Stack I.D. (R)	mm	203	254	305	305
Boiler Dimensions					
Length (A)	mm	2,750	3,200	3,400	3,500
Skid (B)	mm	2,300	2,700	2,700	2,700
Boiler Front to Water Outlet Flange (D)	mm	300	400	400	400
Boiler Front to Water Return Flange (E)	mm	1,700	2,000	2,200	2,320
Width (F)	mm	1,800	1,800	1,900	1,900
Boiler Outer Diameter (G)	mm	1,360	1,360	1,450	1,450
External Skid Width (H)	mm	900	900	1,050	1,050
Water Outlet Flange to Ground (I)	mm	1,850	1,850	1,920	1,920
Min Front Clearance	mm	2,400	2,800	3,000	3,150
Min Rear Clearance	mm	1,000	1,000	1,000	1,000
Min Side Clearance	mm	700	700	900	900
Min Boiler Room Length	mm	6,500	7,000	7,300	7,500
Weight					
Shipping Weight @ 10 bar Working Pressure	kg	2,450	2,700	3,350	3,450
Service Weight @ 10 bar Working Pressure	kg	3,850	4,190	5,090	5,270



Model	Unit	PHWBN-1000	PHWBN-1250	PHWBN-1500	PHWBN-1750	PHWBN-2000
Technical Data						
Thermal Capacity	kW	1,000	1,250	1,500	1,750	2,000
Thermal Capacity	kcal/hr	860,000	1,070,000	1,290,000	1,500,000	1,720,000
Working Pressure	bar	up to 30 bar				
Heating Surface	m^2	30	34	44	48	75
Pressure Drop in Combustion Chamber	mbar	3.9	5.9	4.1	6.1	4.2
Design Standard	_	BS/EN 12953				
Max Gas Consumption @Sea Level	m^3/hr	100	125	150	175	200
Max Fuel Oil Consumption @Sea Level	liter/hr	92	115	138	161	184
Max Heavy Fuel Oil Consumption @Sea Level	liter/hr	88	110	132	154	176
Connectoins Size						
Water Outlet (N)	in	4	5	5	6	6
Water Inlet (M)	in	4	5	5	6	6
Safety Valve @ 10 bar Working Pressure (P)	in	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2
Expansion Valve (Q)	in	1 1/2	1 1/2	1 1/2	2	2
Venting Valve	in	1	1	1	1	1
Drain Valve (O)	in	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
Stack I.D. (R)	mm	360	360	410	400	400
Boiler Dimensions						
Length (A)	mm	3,520	3,880	3,920	4,270	4,730
Skid (B)	mm	2,600	2,700	2,700	3,000	3,700
Boiler Front to Water Outlet Flange (D)	mm	450	450	450	450	550
Boiler Front to Water Return Flange (E)	mm	2,140	2,350	2,320	2,690	3,080
Width (F)	mm	2,100	2,100	2,250	2,250	2,410
Boiler Outer Diameter (G)	mm	1,540	1,540	1,700	1,700	1,860
External Skid Width (H)	mm	1,000	1,000	1,120	1,120	1,240
Water Outlet Flange to Ground (I)	mm	2,010	2,010	2,190	2,190	2,350
Min Front Clearance	mm	3,300	3,700	3,600	4,000	3,900
Min Rear Clearance	mm	1,000	1,000	1,000	1,000	1,000
Min Side Clearance	mm	600	600	600	600	600
Min Boiler Room Length	mm	7,850	8,600	8,550	9,300	9,650
Weight						
Shipping Weight @ 10 bar Working Pressure	kg	3,900	4,300	5,000	5,500	7,200
Service Weight @ 10 bar Working Pressure	kg	6,060	6,790	7,560	8,990	11,900

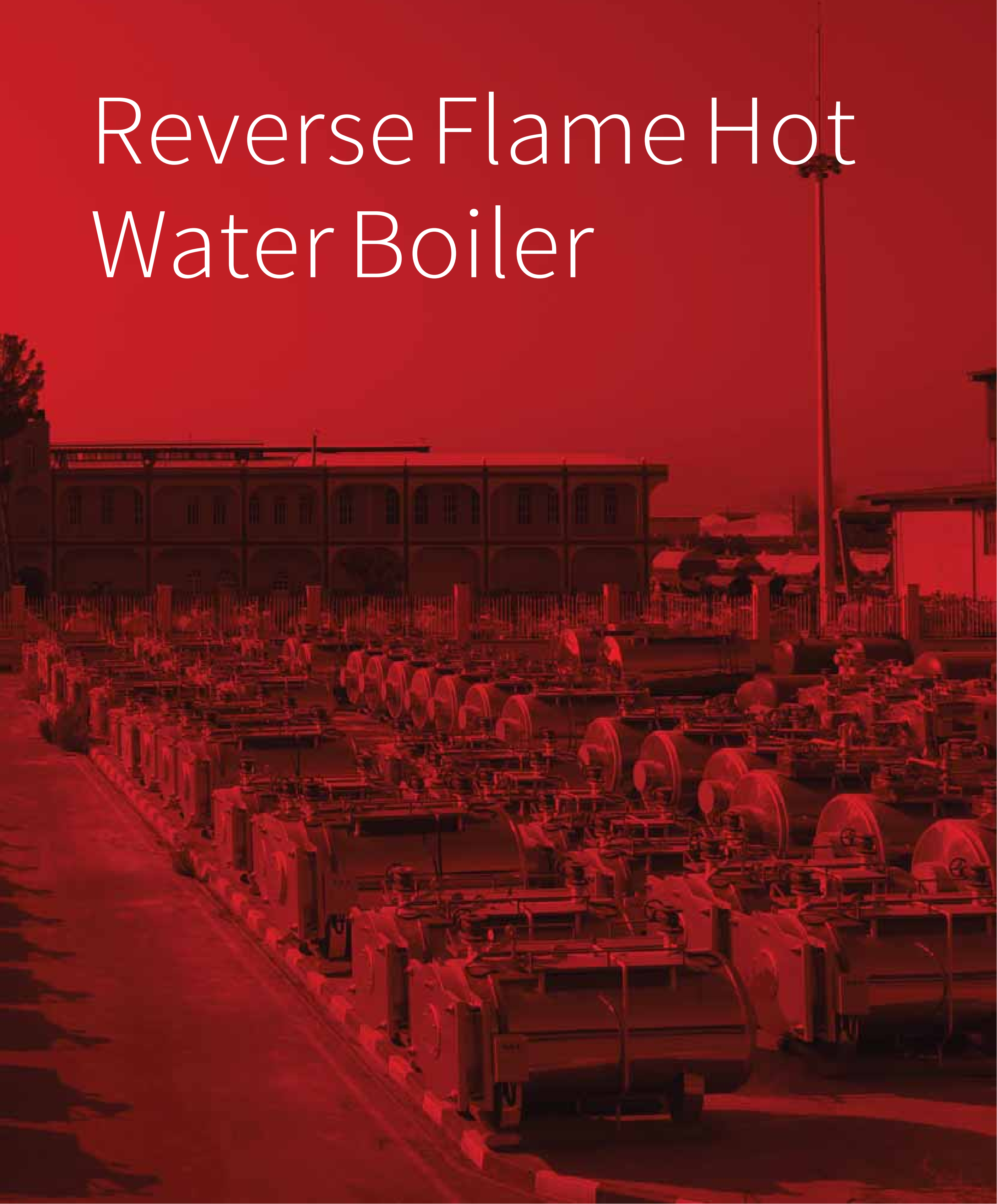


Model	Unit	PHWBN-2500	PHWBN-3000	PHWBN-3500	PHWBN-4000	PHWBN-5000
Technical Data						
Thermal Capacity	kW	2,500	3,000	3,500	4,000	5,000
Thermal Capacity	kcal/hr	2,150,000	2,580,000	3,010,000	3,440,000	4,300,000
Working Pressure	bar	up to 30 bar				
Heating Surface	m^2	82	100	110	130	150
Pressure Drop in Combustion Chamber	mbar	6.7	5.1	6.3	5.9	6.5
Design Standard	_	BS/EN 12953				
Max Gas Consumption @Sea Level	m^3/hr	250	300	350	400	500
Max Fuel Oil Consumption @Sea Level	liter/hr	230	276	322	368	460
Max Heavy Fuel Oil Consumption @Sea Level	liter/hr	220	264	308	352	440
Connectoins Size						
Water Outlet (N)	in	6	8	8	8	10
Water Inlet (M)	in	6	8	8	8	10
Safety Valve @ 10 bar Working Pressure (P)	in	1 1/2	2	2 1/2	3	3
Expansion Valve (Q)	in	2	2	2	2	2
Venting Valve	in	1	1	1	1	1
Drain Valve (O)	in	1 1/2	1 1/2	1 1/2	2	2
Stack I.D. (R)	mm	400	510	510	510	610
Boiler Dimensions						
Length (A)	mm	5,140	5,170	5,490	5,490	5,720
Skid (B)	mm	4,000	4,000	4,000	4,000	4,000
Boiler Front to Water Outlet Flange (D)	mm	550	540	570	540	700
Boiler Front to Water Return Flange (E)	mm	3,520	3,470	3,640	3,640	3,840
Width (F)	mm	2,410	2,630	2,730	2,850	3,000
Boiler Outer Diameter (G)	mm	1,860	2,080	2,080	2,190	2,340
External Skid Width (H)	mm	1,240	1,400	1,400	1,500	1,600
Water Outlet Flange to Ground (I)	mm	2,350	2,570	2,570	2,700	2,860
Min Front Clearance	mm	4,300	4,300	4,500	4,500	4,560
Min Rear Clearance	mm	1,000	1,100	1,100	1,200	1,300
Min Side Clearance	mm	600	900	900	1,200	1,200
Min Boiler Room Length	mm	10,450	10,600	11,100	11,200	11,600
Weight						
Shipping Weight @ 10 bar Working Pressure	kg	7,500	8,600	9,600	12,500	13,000
Service Weight @ 10 bar Working Pressure	kg	12,730	14,890	16,470	20,190	21,950



Model	Unit	PHWBN-6000	PHWBN-7000	PHWBN-8000	PHWBN-9000	PHWBN-10000
Technical Data						
Thermal Capacity	kW	6,000	7,000	8,000	9,000	10,000
Thermal Capacity	kcal/hr	5,160,000	6,020,000	6,880,000	7,740,000	8,600,000
Working Pressure	bar	up to 30 bar				
Heating Surface	m^2	183	220	260	290	330
Pressure Drop in Combustion Chamber	mbar	6.8	7.5	7.8	8.1	8.5
Design Standard	_	BS/EN 12953				
Max Gas Consumption @Sea Level	m^3/hr	600	700	800	900	1,000
Max Fuel Oil Consumption @Sea Level	liter/hr	552	644	745	828	932
Max Heavy Fuel Oil Consumption @Sea Level	liter/hr	528	616	703	792	880
Connectoins Size						
Water Outlet (N)	in	10	10	10	10	12
Water Inlet (M)	in	10	10	10	10	12
Safety Valve @ 10 bar Working Pressure (P)	in	3	3	3	3	3
Expansion Valve (Q)	in	2	3	3	3	3
Venting Valve	in	1	1	1	1	1
Drain Valve (O)	in	2	2	2	2	2
Stack I.D. (R)	mm	610	610	610	760	760
Boiler Dimensions						
Length (A)	mm	6,070	6,260	6,670	6,760	7,000
Skid (B)	mm	4,800	5,000	5,000	5,000	5,500
Boiler Front to Water Outlet Flange (D)	mm	700	650	1,000	910	800
Boiler Front to Water Return Flange (E)	mm	4,230	4,550	4,000	3,990	4,620
Width (F)	mm	3,200	3,330	3,700	3,680	3,900
Boiler Outer Diameter (G)	mm	2,550	2,680	2,740	3,030	3,250
External Skid Width (H)	mm	1,770	1,850	2,000	2,150	2,300
Water Outlet Flange to Ground (I)	mm	3,080	3,210	3,400	3,580	3,780
Min Front Clearance	mm	4,900	5,100	5,200	5,300	5,800
Min Rear Clearance	mm	1,400	1,500	1,500	1,600	1,800
Min Side Clearance	mm	1,200	1,200	1,200	1,500	1,500
Min Boiler Room Length	mm	12,400	12,900	13,100	13,700	14,600
Weight						
Shipping Weight @ 10 bar Working Pressure	kg	16,500	18,400	22,000	23,700	29,500
Service Weight @ 10 bar Working Pressure	kg	28,390	32,190	38,365	42,640	50,500

Reverse Flame Hot Water Boiler



Product Description

Reverse Flame Hot Water Boiler are designed to confirm to highest global installations standards with a permissible overall operating pressure up to 16 bar.The main design principle of Reverse flame boilers has been to provide economical products & maximum protection of the environment. Favorable base measurements has ensured that it fits into small boiler rooms where space is tight.

The combustion chamber offers optimum conditions for complete combustion which, in conjunction with balanced thermal stress of all heating surfaces, guarantees a high degree of fuel and heat utilization. Due to the concentric arrangement of all heating surfaces around the flame and streamlined shape of the turbulence pipes the intrinsic energy requirement is reduced to a minimum.

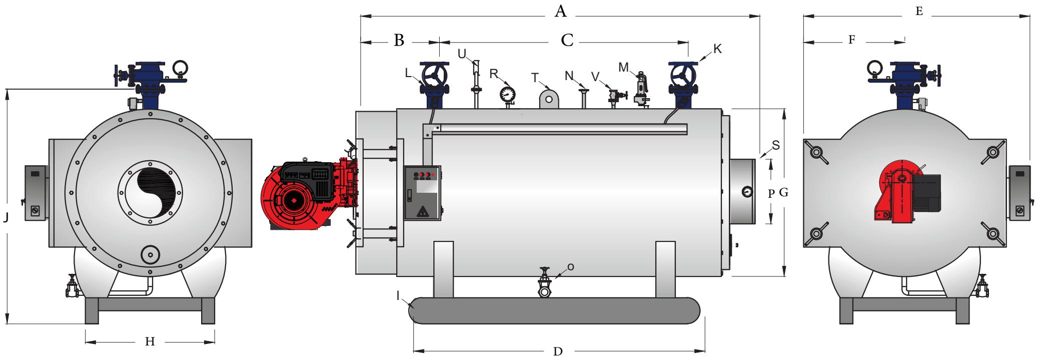
The boiler's tubes & sheets are specifically designed to eliminate heat stress, which in combination with the advantage of easy maintenance ensures a long service life. In the boiler's fire tubes (1st pass) the returning flue gases envelop the burner's flame thus ensuring complete soot-free combustion with a high CO2 content. This is one of the most important prerequisites for environmentally friendly boiler operation.

The boiler's body is covered with 100 mm heat insulation mats with a cladding of stainless steel sheets Packman's Reverse flame Hot water Boiler is produced in modern, sophisticated and well-equipped workshops.

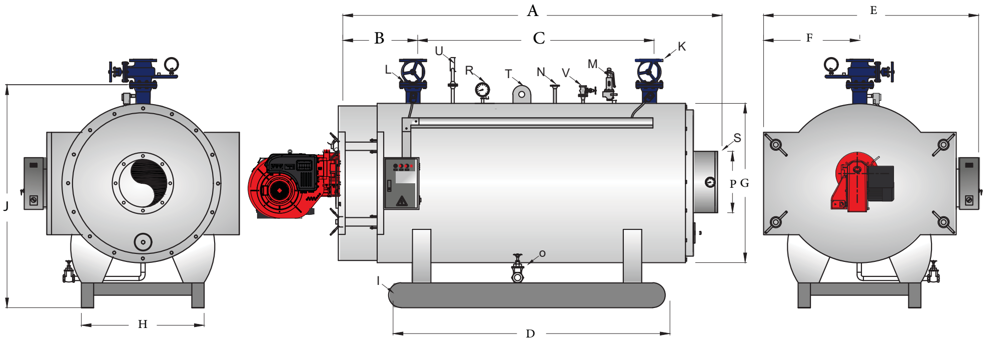
Thorough testing ensures a top level quality. The furnace is formed with fire tubes. The flue gases are directed to the top smoke tubes where they are cooled down. Most of the medium water capacity boilers are made of this type. It is compatible with liquid and gaseous fuels and light combustion oil.

Boiler Supports, Skids

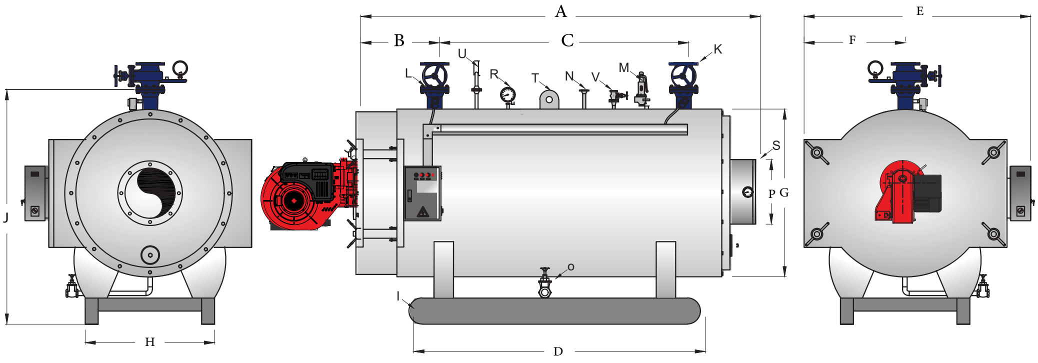
The boilers stand on supports. Most of the units are delivered with skids; So there is no need for special foundations or installation processes. Also all the accessories necessary for operation, such as oil or gas firing equipment, combustion air fan, oil pre heater, control panel or switchboard and feeding device, can be mounted on the skid.



Model	Unit	PHWB-10	PHWB-15	PHWB-20	PHWB-25	PHWB-30
Technical Data						
Thermal Capacity	kw	116	174	232	290	348
Thermal Capacity	kcal/hr	100,000	150,000	200,000	250,000	300,000
Working Pressure	bar	up to 30 bar				
Pressure Drop in Combustion Chamber	mbar	0.6	0.68	0.73	0.76	0.85
Design Standard	_	BS/EN 12953				
Max Gas Consumption @Sea Level	m^3/hr	12	18	23	29	35
Max Fuel Oil Consumption @Sea Level	liter/hr	10	16	22	27	32
Max Heavy Fuel Oil Consumption @Sea Level	liter/hr	10	15	20	26	31
Connectoins Size						
Water Outlet (L)	in	1	1 1/2	1 1/2	1 1/2	2
Water Inlet (K)	in	1	1 1/2	1 1/2	1 1/2	2
Safety Valve @ 10 bar Working Pressure (M)	in	3/4	3/4	1	1	1
Venting Valve (N)	in	1	1	1	1	1
Drain Valve (O)	in	1	1	1	1	1
Stack I.D. (P)	in	10	10	10	10	10
Boiler Dimensions						
Length (A)	mm	1,660	1,950	2,130	2,150	2,300
Width (E)	mm	1,180	1,260	1,320	1,370	1,390
Boiler Outside Diameter (G)	mm	880	960	1,020	1,070	1,090
Height (J)	mm	1,330	1,430	1,490	1,540	1,560
Min Front Clearance	mm	1,280	1,520	1,680	1,690	1,860
Min Rear Clearance	mm	1,020	1,020	1,020	1,020	1,020
Min Side Clearance	mm	1,000	1,000	1,000	1,000	1,000
Min Boiler Room Length	mm	3,960	4,490	4,830	4,860	5,180
Weight						
Shipping Weight @ 10 bar Working Pressure	kg	870	1,040	1,240	1,350	1,490

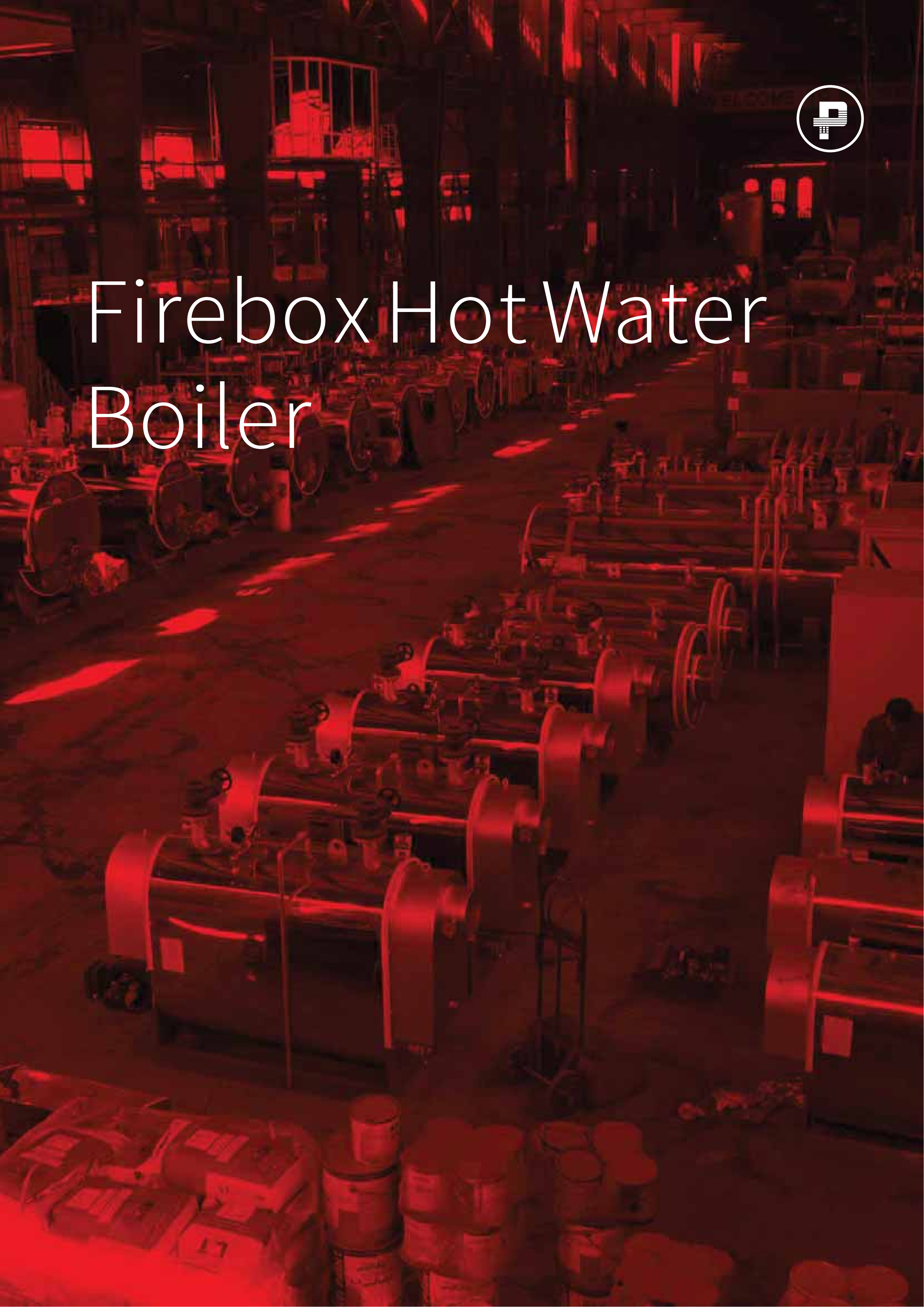


Model	Unit	PHWB-35	PHWB-40	PHWB-50	PHWB-60	PHWB-70
Technical Data						
Thermal Capacity	kw	407	465	581	697	814
Thermal Capacity	kcal/hr	350,000	400,000	500,000	600,000	700,000
Working Pressure	bar	up to 30 bar				
Pressure Drop in Combustion Chamber	mbar	1.1	1.2	1.21	1.30	1.41
Design Standard	_	BS/EN 12953				
Max Gas Consumption @Sea Level	m^3/hr	41	47	58	70	82
Max Fuel Oil Consumption @Sea Level	liter/hr	38	43	54	65	75
Max Heavy Fuel Oil Consumption @Sea Level	liter/hr	36	41	51	62	72
Connectoins Size						
Water Outlet (L)	in	2	2 1/2	2 1/2	3	3
Water Inlet (K)	in	2	2 1/2	2 1/2	3	3
Safety Valve @ 10 bar Working Pressure (M)	in	1	1	1	1 1/4	1 1/4
Venting Valve (N)	in	1	1	1	1	1
Drain Valve (O)	in	1	1	1	1	1
Stack I.D. (P)	in	12	12	12	12	12
Boiler Dimensions						
Length (A)	mm	2,380	2,400	2,350	2,350	2,410
Width (E)	mm	1,410	1,440	1,440	1,500	1,600
Boiler Outside Diameter (G)	mm	1,110	1,140	1,170	1,230	1,300
Height (J)	mm	1,580	1,610	1,640	1,700	1,770
Min Front Clearance	mm	1,900	1,900	1,900	1,900	2,010
Min Rear Clearance	mm	1,120	1,120	1,120	1,120	1,120
Min Side Clearance	mm	1,000	1,000	1,000	1,000	1,000
Min Boiler Room Length	mm	5,400	5,420	5,370	5,370	5,540
Weight						
Shipping Weight @ 10 bar Working Pressure	kg	1,580	1,600	1,700	1,840	2,180



Model	Unit	PHWB-80	PHWB-90	PHWB-100	PHWB-125	PHWB-150	PHWB-175	PHWB-200
Technical Data								
Thermal Capacity	kw	930	1,046	1,163	1,453	1,744	2,035	2,325
Thermal Capacity	kcal/hr	800,000	900,000	1,000,000	1,250,000	1,500,000	1,750,000	2,000,000
Working Pressure	bar	up to 30 bar						
Pressure Drop in Combustion Chamber	mbar	1.50	1.70	1.85	1.95	2.05	2.15	2.45
Design Standard	_	BS/EN 12953						
Max Gas Consumption @ Sea Level	m^3/hr	93	105	117	145	175	204	233
Max Fuel Oil Consumption @Sea Level	liter/hr	86	97	107	134	161	188	214
Max Heavy Fuel Oil Consumption @Sea Level	liter/hr	82	92	102	128	153	179	205
Connectoins Size								
Water Outlet (L)	in	3	3	4	4	5	5	5
Water Inlet (K)	in	3	3	4	4	5	5	5
Safety Valve @ 10 bar Working Pressure (M)	in	1 1/4	1 1/4	1 1/2	1 1/2	2	2	2 1/2
Venting Valve (N)	in	1	1	1	1	1	1	1
Drain Valve (O)	in	1	1	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2
Stack I.D. (P)	in	14	14	16	16	16	16	18
Boiler Dimensions								
Length (A)	mm	2,540	2,710	2,900	3,190	3,410	3,720	3,720
Width (E)	mm	1,650	1,650	1,730	1,760	1,880	1,940	1,990
Boiler Outside Diameter (G)	mm	1,350	1,350	1,410	1,440	1,560	1,630	1,650
Height (J)	mm	1,820	1,840	1,920	1,950	2,070	2,170	2,190
Min Front Clearance	mm	2,010	2,180	2,300	2,580	2,700	3,100	3,100
Min Rear Clearance	mm	1,180	1,180	1,280	1,280	1,280	1,280	1,400
Min Side Clearance	mm	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Min Boiler Room Length	mm	5,730	6,070	6,480	7,050	7,390	8,100	8,220
Weight								
Shipping Weight @ 10 bar Working Pressure	kg	2,280	2,480	3,000	3,420	4,020	4,680	4,750

Firebox Hot Water Boiler



Product Description

The Packaged Fire Tube Boiler has proven to be highly efficient and cost effective in generating energy for processes and heating applications. Efficient Firebox threepass designs are available from 100KW to 1200KW range. Our firebox boilers are equipped with a forced flat flame retention burner which results in high efficiency over i.e 85. This boiler-burner combination gives reliable operation with minimum maintenance.

Standard Features

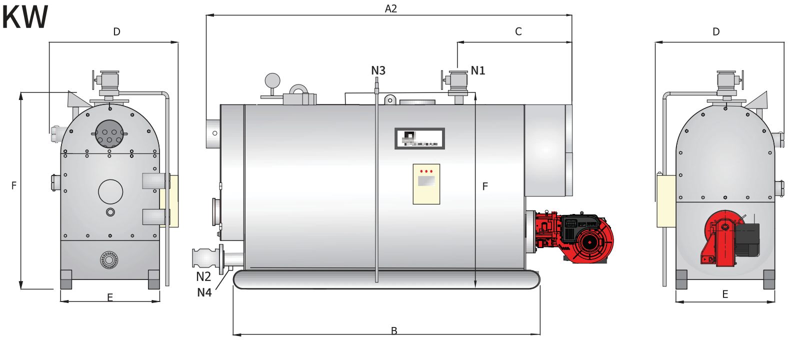
All Firebox units contain operating control, systems relief valves, burner and fuel train. The installation is simple and only service connections need to be placed. Compatible with natural gas, oil or dual burners. High density 2” mineral wool insulation assures lower radiant heat loss.

Efficiency

Conventional atmospheric burners operate with high excess air up tp 300% causing the flame temperature to be decreased. It is obvious that excess air has substantial effect on flame temperature and consequently on the rate of heat transfer and efficiency. Forced draft burners which are used in our boilers operate at lower excess air, about 10-30 percent.

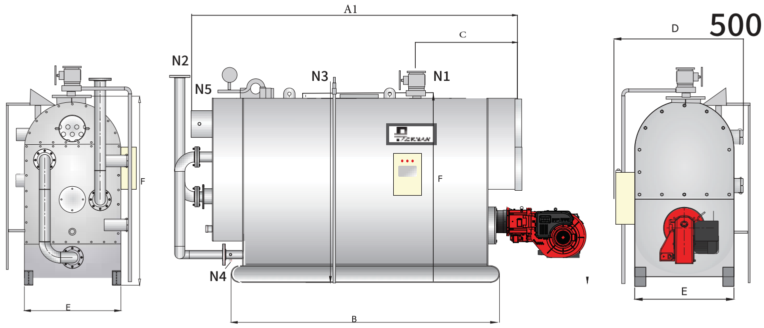
This results in an acceptable efficiency about 84-85% with less operation cost. The initial cost of a boiler is the smallest portion of your boiler investment. Fuel costs and maintenance costs represent the largest portion of your boiler equipment investment. Some basic design differences can reveal huge variations in expected efficiency & performance levels. Evaluating these design differences can provide insight into what efficiency value and resulting operating costs you can expect.

100-400 KW

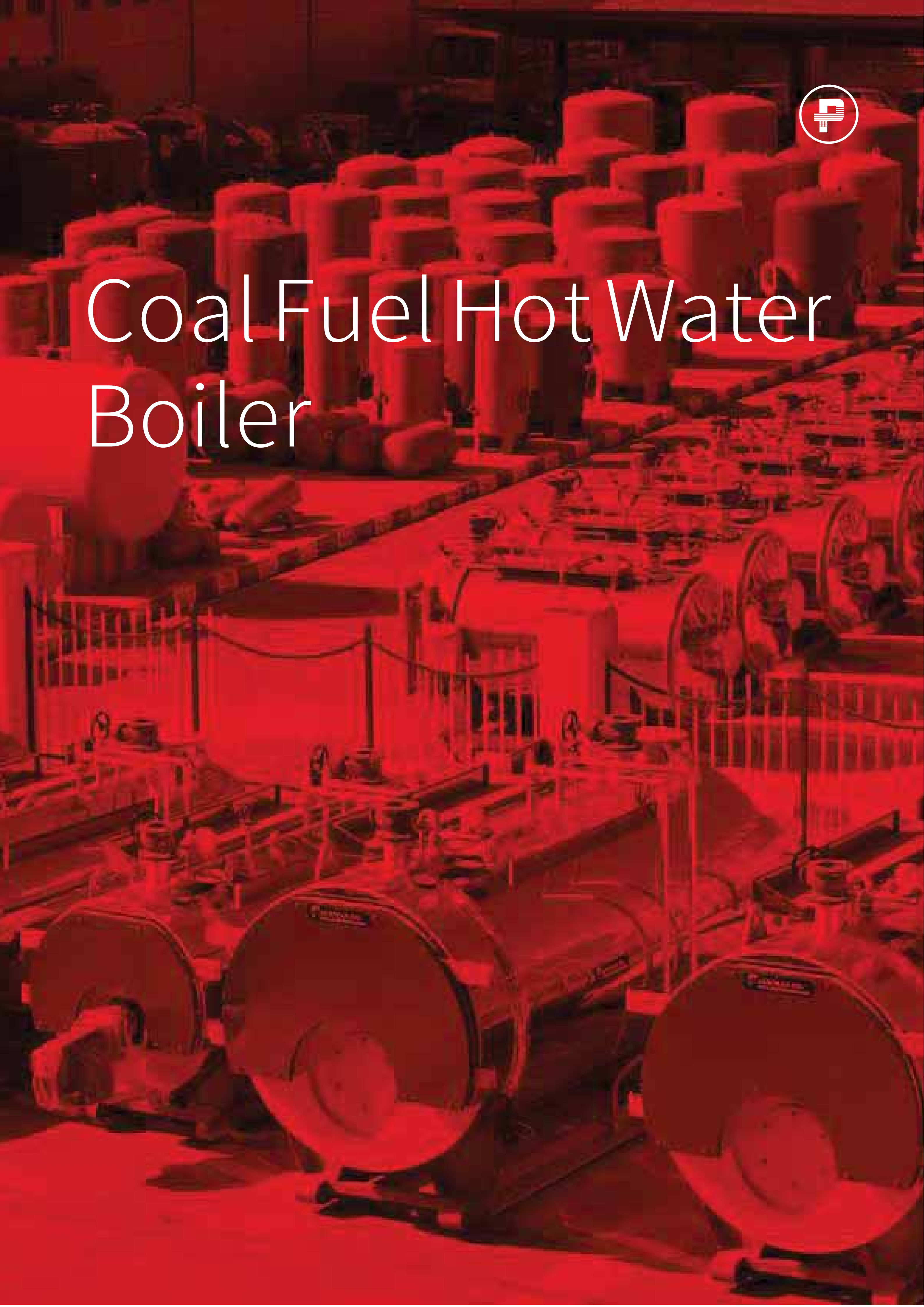


Model	Unit	PHW-FB-100	PHW-FB-150	PHW-FB-200	PHW-FB-250	PHWB-FB-325	PHWB-FB-400
Technical Data							
Thermal Capacity	kw	100	150	200	250	325	400
Thermal Capacity	kcal/hr	86,000	129,000	172,000	215,000	280,000	344,000
Working Pressure	bar	Up to 16 bar					
Heating Surface	m^2	3	5	6	8	10	13
Pressure Drop in Combustion Chamber	mbar	2.20	2.20	2.50	2.50	2.20	2.50
Design Standard	-	BS/EN 12953					
Max Gas Consumption @Sea Level	m^3/hr	10	15	20	25	32.5	40
Max Fuel Oil Consumption @Sea Level	liter/hr	8.3	12.5	16.7	20.8	27	33.3
Max Heavy Fuel Oil Consumption @Sea Level	liter/hr	7.1	10.7	14.3	17.8	23.2	28.6
Connectoins Size							
Water Outlet (N_1)	in	2	2	2	3	3	3
Water Inlet (N_2)	in	2	2	2	3	3	3
Safety Valve (N_3)	in	1	1	1	1	1	1
Drain Valve (N_4)	in	1	1	1	1	1	1
Stack I.D. (N_5)	in	6	6	6	8	8	8
Boiler Dimensions							
Length (A2)	mm	1,490	1,640	1,840	1,910	2,110	2,310
Width (D)	mm	960	960	960	1,100	1,100	1,100
Height (F)	mm	1,320	1,320	1,320	1,590	1,590	1,590
External Skid Width (E)	mm	620	620	620	760	760	760
Min Front Clearance	mm	1,200	1,320	1,520	1,570	1,690	1,970
Min Rear Clearance	mm	700	700	700	800	800	800
Min Side Clearance	mm	500	500	500	500	500	500
Min Boiler Room Length	mm	3,390	3,660	4,060	4,280	4,600	5,080
Weight							
Shipping Weight @ 10 bar Working Pressure	kg	900	930	1,000	1,400	1,500	1,650

500-1200 KW



Model	Unit	PHW-FB-500	PHW-FB-600	PHW-FB-700	PHW-FB-800	PHW-FB-900	PHWB-FB-1000	PHWB-FB-1200
Technical Data								
Thermal Capacity	kw	500	600	700	800	900	1,000	1,200
Thermal Capacity	kcal/hr	430,000	516,000	602,000	688,000	774,000	860,000	1,032,000
Working Pressure	bar	Up to 16 bar						
Heating Surface	m^2	16	19	22	25	27	31	38
Pressure Drop in Combustion Chamber	mbar	3.50	3.00	2.50	3.80	3.8	3.92	5.88
Design Standard	-	BS/EN 12953						
Max Gas Consumption @Sea Level	m^3/hr	50	60	70	80	90	100	120
Max Fuel Oil Consumption @Sea Level	liter/hr	41.7	50	58.3	66.7	75	83.3	100
Max Heavy Fuel Oil Consumption @Sea Level	liter/hr	35.7	42.8	50	57.1	64.3	71.4	85.7
Connectoins Size								
Water Outlet (N_1)	in	4	4	4	4	4	4	4
Water Inlet (N_2)	in	4	4	4	4	4	4	4
Safety Valve (N_3)	in	11/2	11/2	11/2	11/2	11/2	11/2	2
Drain Valve (N_4)	in	1	1	1	1	11/2	11/2	11/2
Stack I.D. (N_5)	in	10	10	10	10	10	10	10
Boiler Dimensions								
Length (A1)	mm	2,450	2,590	2,750	2,900	3,070	3,240	3,450
Width (D)	mm	1,260	1,260	1,260	1,260	1,260	1,340	1,340
Height (F)	mm	1,920	1,920	1,920	1,920	1,920	2,050	2,050
External Skid Width (E)	mm	920	920	920	920	920	1000	1000
Min Front Clearance	mm	2,130	2,300	2,450	2,600	2,800	3,000	3,200
Min Rear Clearance	mm	1,000	1,000	1,000	1,000	1,000	1,200	1,200
Min Side Clearance	mm	700	700	700	700	700	1,000	1,000
Min Boiler Room Length	mm	5,580	5,890	6,200	6,500	6,870	7,440	7,850
Weight								
Shipping Weight @ 10 bar Working Pressure	kg	2,500	2,700	3,000	3,100	3,150	3,900	4,000



Coal Fuel Hot Water Boiler

Product Description

A coal-fired boiler is a heating boiler and efficient heating system widely used in industrial applications. It harnesses the energy stored in coal to produce steam or hot water for heating, power generation, and other industrial processes. With its long-standing history and technological advancements, the coal-fired boiler continues to provide a dependable and cost-effective solution for heat generation in diverse industries.

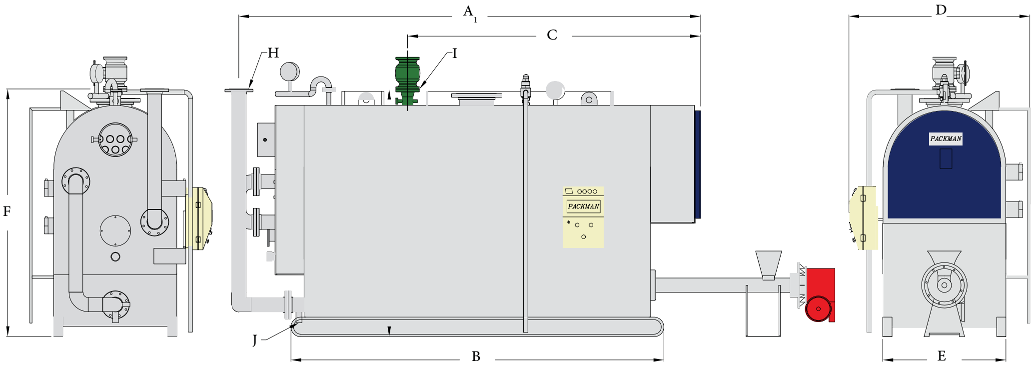
A coal-fired boiler is a type of combustion system that utilizes pulverized coal as the primary fuel source. The boiler comprises a furnace or combustion chamber where coal is burned, generating intense heat. This heat is then transferred to water-filled tubes within the boiler, resulting in the production of steam or hot water. The steam or hot water is subsequently used for various industrial applications.

Applications of Coal-Fired Boilers

Power Generation: Coal-fired boilers have been traditionally used in power plants to generate electricity. The heat produced by burning coal in the boiler is used to convert water into steam, which drives steam turbines to generate power. These boilers are designed to operate continuously, ensuring a reliable and stable power supply to the grid.

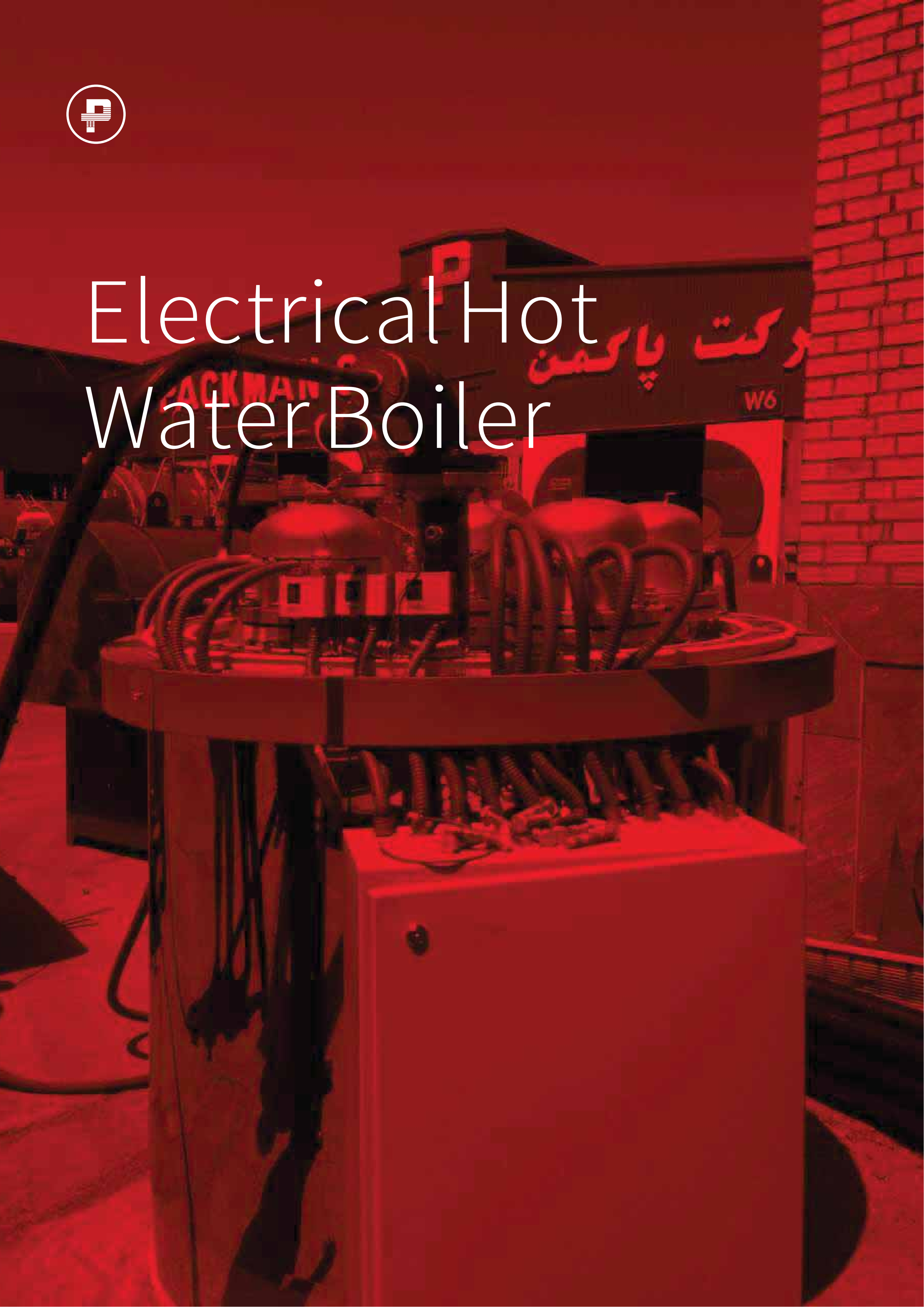
Industrial Processes

Coal-fired boilers are widely employed in industries that require a significant amount of heat for their processes. They are commonly used in sectors such as oil refining, chemical manufacturing, paper and pulp production, textile manufacturing, and food processing. These boilers provide the necessary thermal energy for heating, drying, and other industrial operations.



Model		Unit	PHWB-CA-250	PHWB-CA-325	PHWB-CA-400	PHWB-CA-500	PHWB-CA-600	PHWB-CA-700	PHWB-CA-800	PHWB-CA-1000	PHWB-CA-1200
Boiler Capacity		kw	250	325	400	500	600	700	800	1000	1200
Lengths											
Overall	A1	mm	1960	2160	2360	2500	2650	2810	2970	3300	3520
Skid	B	mm	1570	1570	1950	2050	2190	2350	2500	2800	3000
Boiler Head to Water Outlet	C	mm	1120	1320	1470	1620	1730	1800	1900	2180	2360
Widths											
Overall	D	mm	1300	1300	1300	1600	1600	1600	1600	1680	1680
External Skid Width	E	mm	900	900	900	1100	1100	1100	1100	1180	1180
Heights											
Water Outlet FLG. to Ground	F	mm	1590	1590	1590	1980	1980	1980	1980	2100	2100
Skid l-Beam Size (IPN)	G	mm	120	120	120	140	140	140	140	160	160
Connections											
Water Return	I	in	3 ”	3 ”	3 ”	3 ”	4 ”	4 ”	4 ”	4 ”	4 ”
Water Outlet	H	in	3 ”	3 ”	3 ”	3 ”	4”	4”	4”	4”	4”
Drain	J	in	1 ”	1 ”	1 ”	1 ”	1 ”	1 ”	1 ”	1 1/2 ”	1 1/2 ”
Stack I.D.	K	in	8 ”	8 ”	8 ”	8 ”	10”	10”	10”	10”	10”
Minimum Boiler Room Clearances											
Front Clearance	-	mm	1570	1690	1970	2130	2300	2450	2600	3000	3200
Rear Clearance	-	mm	800	800	800	1000	1000	1000	1000	1200	1200
Side Clearance	-	mm	500	500	500	700	700	700	700	1000	1000

Electrical Hot Water Boiler



Product Description

This technical document provides a comprehensive overview of our electric hot water boiler catalog, designed to meet the heating needs of residential, commercial, and industrial applications. It aims to assist customers in understanding the product’s features, specifications, installation guidelines, operating instructions, maintenance requirements, and safety precautions.

An electric boiler is a heating device that uses electricity to generate heat and provide hot water or steam for various applications. It consists of several components that work together to convert electrical energy into thermal energy.

Electric boilers are commonly used in residential, commercial, and industrial settings where a clean and efficient heating solution is required. They offer advantages such as precise temperature control, compact size, low maintenance requirements, and the absence of combustion byproducts.

Product Overview:

Our electric hot water boilers are high-quality and energy-efficient heating solutions that provide a reliable and constant supply of hot water. They are designed to meet various capacity requirements, ranging from small residential units to large-scale commercial or industrial systems.

Features and Specifications:

This section highlights the key features and specifications of our electric hot water boilers, including:

- Energy efficiency ratings
- Heating capacity
- Temperature control options
- Compact design for easy installation
- Corrosion-resistant materials
- Safety features such as overheat protection and pressure relief valves
- Digital control panel for precise temperature adjustments
- Multiple heating elements for rapid water heating

- Insulation for heat retention and reduced energy consumption

Every boiler including following parts:

1. Heating Element: The heating element is the core component of an electric boiler. It is usually made of resistance wire, such as nichrome or stainless steel, which has a high electrical resistance. When an electric current passes through the heating element, it generates heat due to the resistance.

2. Control System: The control system regulates the operation of the electric boiler, ensuring efficient and safe performance. It includes various sensors, thermostats, and control switches that monitor and adjust the temperature, pressure, and flow rate of the water or steam.

3. Water Tank or Heat Exchanger: In electric boilers used for heating water, a water tank or heat exchanger is present to hold and heat the water. The heating element is immersed in the water or wrapped around the heat exchanger, transferring heat to the water.

4. Circulation Pump: A circulation pump is used to circulate the heated water or steam throughout the system. It ensures even distribution of heat and maintains a constant flow rate.

5. Safety Devices: Electric boilers incorporate several safety devices to prevent overheating, pressure buildup, or other potential hazards. These may include pressure relief valves, temperature limits, and automatic shutdown mechanisms.

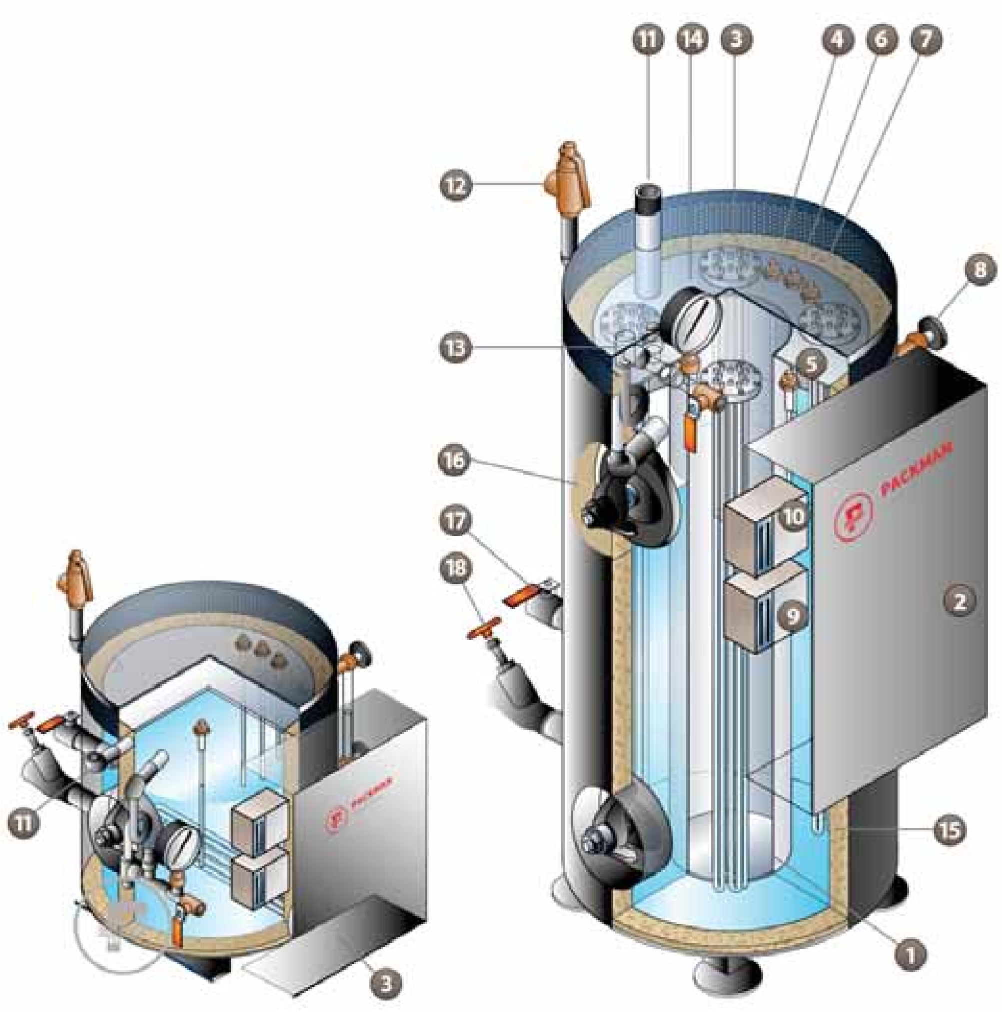
6. Control Panel: The control panel provides a user interface for operating and monitoring the electric boiler. It allows users to adjust temperature settings, view system status, and diagnose any faults or issues.

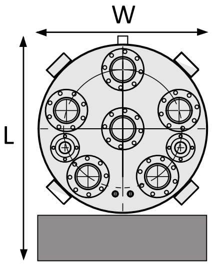
7. Energy Efficiency Features: Modern electric boilers often include energy-saving features like programmable timers, temperature controls, and insulation to minimize heat loss and optimize energy

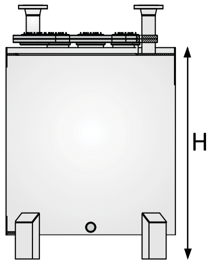
consumption.

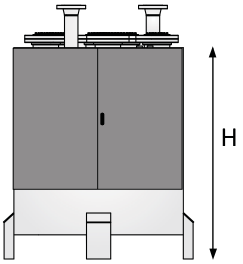
Equipment:

Electric panel
Inlet and outlet valve
Pressure indicator
Termometer
Aquastat
Output power can be control
Output tempreture can be control (Water pressure indicate)
PLC control panel assamble by packman(Siemens and telemecanique)

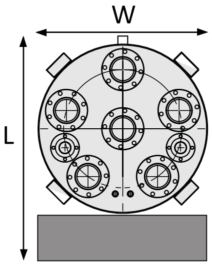


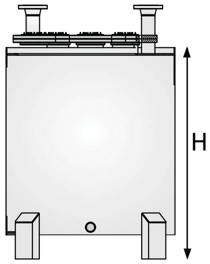


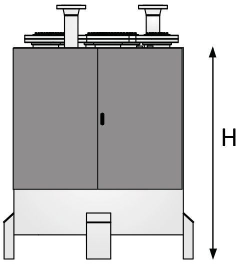




Model/ PHWB-E	Unit	80	100	150	200	250	300	400
Technical Data								
Thermal Capacity	kw	80	100	150	200	250	300	400
Thermal Capacity	kcal	70,000	86,000	129,000	172,000	215,000	258,000	344,000
Boiler Type	-	Electric Heater						
Thermal Efficiency	%	100	100	100	100	100	100	100
Maximum Working Pressure	bar	16	16	16	16	16	16	16
Number of Element	N	4	5	8	10	13	15	20
Max Working Water Temperature	°C	85.0	85.0	85.0	85.0	85.0	85.0	85.0
Recommended Water Flow Rate	gpm	28	34	52	69	86	103	138
Boiler Water Content	Liter	147	212	212	288	477	477	589
Water Pressure Drop in Boiler	bar	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Design Standard	-	ASME						
Material								
Element Material	-	Stainless Steel						
Shell Material	-	SA 516 Gr70						
Shell Insulation	-	Rock Wool						
Base Plate	-	SA 36						
Cover	-	SS 403ba						
Connectoins Size								
Water Outlet	in	1 1/2	2	2	3	3	3	3
Water inlet	in	1 1/2	2	2	3	3	3	3
Safety Valve	in	3/4	1	1	1	1	1	1
Drain Valve	in	1	1	1	1	1	1	1
Boiler Dimensions								
Width	mm	500	600	600	700	900	900	1,000
Lenght (with control panel)	mm	900	1,000	1,000	1,200	1,600	1,600	1,800
Height	mm	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Boiler Weight								
Shipping Weight @ 6 bar	kg	263	386	386	556	623	623	840
Service Weight @ 6 bar	kg	410	598	598	844	1,100	1,100	1,429
Electrical Data								
Electric Power Consumption	kW	80	100	150	200	250	300	400
No of Phase	-	3	3	3	3	3	3	3
Frequency	Hz	50	50	50	50	50	50	50
Voltage	v	400	400	400	400	400	400	400
Current	A	128	160	241	321	401	481	642
Control Panel IP Level	-	IP45	IP45	IP45	IP45	IP45	IP45	IP45







Model/ PHWB-E	Unit	500	600	700	800	1000	1200
Technical Data							
Thermal Capacity	kw	500	600	700	800	1,000	1,200
Thermal Capacity	kcal	430,000	516,000	602,000	688,000	860,000	1,032,000
Boiler Type	-	Electric Heater					
Thermal Efficiency	%	100	100	100	100	100	100
Maximum Working Pressure	bar	16	16	16	16	16	16
Number of Element	N	25	30	35	40	50	60
Max Working Water Temperature	°C	85.0	85.0	85.0	85.0	85.0	85.0
Recommended Water Flow Rate	gpm	172	206	241	275	344	413
Boiler Water Content	Liter	712	904	1,061	1,385	2,010	2,010
Water Pressure Drop in Boiler	bar	0.10	0.10	0.10	0.10	0.10	0.10
Design Standard	-	ASME					
Material							
Element Material	-	Stainless Steel					
Shell Material	-	SA 516 Gr70					
Shell Insulation	-	Rock Wool					
Base Plate	-	SA 36					
Cover	-	SS 403ba					
Connectoins Size							
Water Outlet	in	4	4	4	4	4	4
Water inlet	in	4	4	4	4	4	4
Safety Valve	in	11/2	11/2	11/2	11/2	11/2	2
Drain Valve	in	1	1	1	1	11/2	11/2
Boiler Dimensions							
Width	mm	1,100	1,200	1,300	1,400	1,600	1,600
Lenght (with control panel)	mm	1,900	1,950	2,000	2,200	2,400	2,400
Height	mm	1,500	1,600	1,600	1,800	2,000	2,000
Boiler Weight							
Shipping Weight @ 6 bar	kg	910	1,043	1,150	1,250	1,400	1,400
Service Weight @ 6 bar	kg	1,622	1,947	2,211	2,635	3,410	3,410
Electrical Data							
Electric Power Consumption	kW	500	600	700	800	1,000	1,200
No of Phase	-	3	3	3	3	3	3
Frequency	Hz	50	50	50	50	50	50
Voltage	v	400	400	400	400	400	400
Current	A	802	962	1,123	1,283	1,604	1,925
Control Panel IP Level	-	IP45	IP45	IP45	IP45	IP45	IP45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Steam Boiler
Heating Product Group
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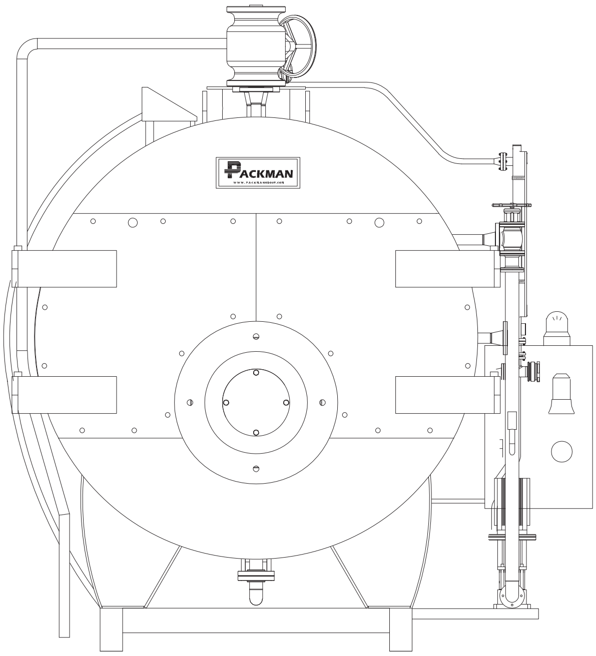
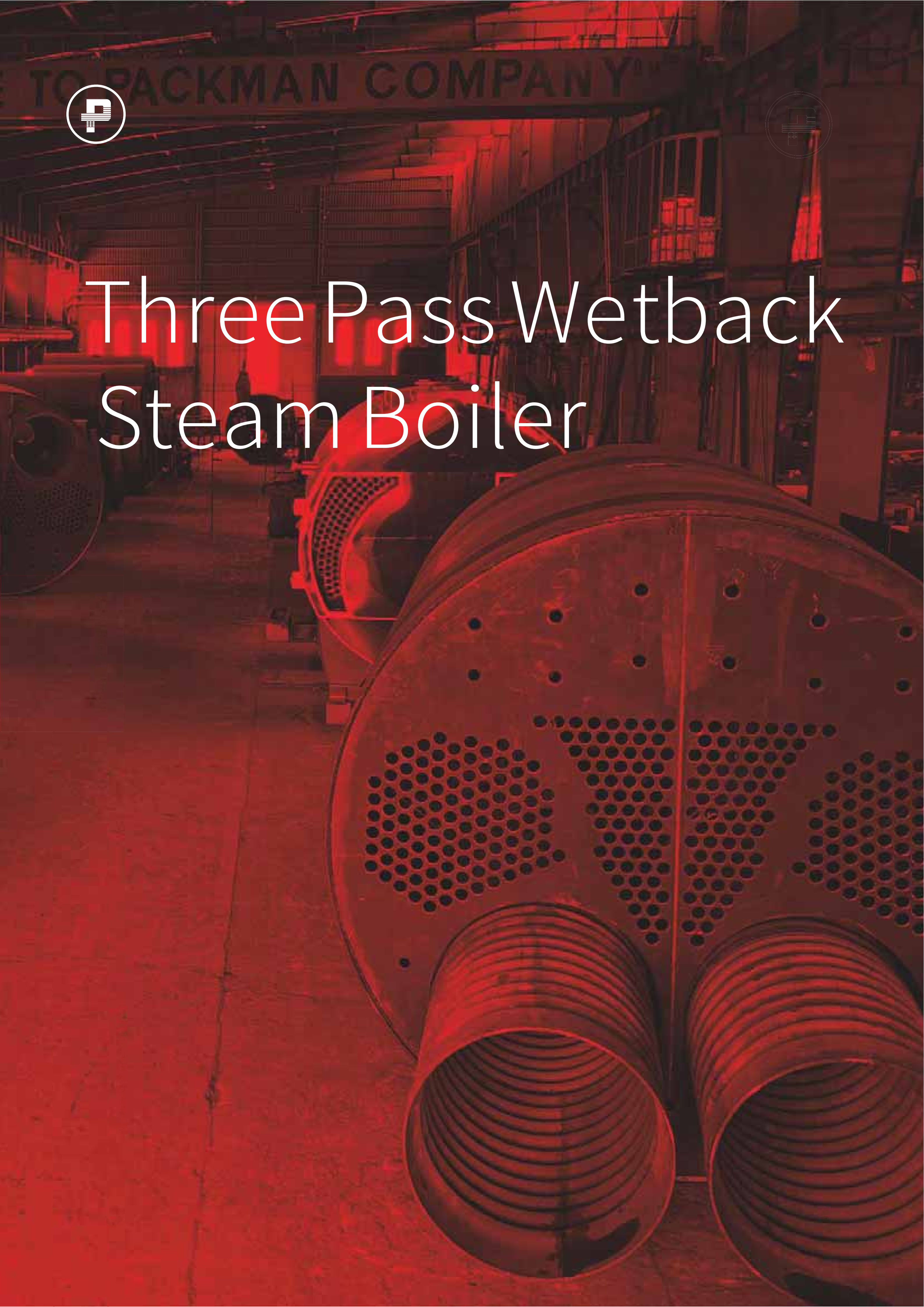
Steam Boiler **page**



Three Pass Wetback Steam Boiler



Product Description

Packman Three Pass Boilers are fabricated in workshops equipped with the most modern machines. Materials and workmanship are under a permnent quality control to construct the reliable elements and groups. Reliable to make sure that you can rely on your PACKMAN boiler, even after a number of years, And these are the Bellow are the advantages of packman three pass boilers:

- The boilers are adjusted to the plant by heating circuit environment and construction conditions
- Adaptation of the thermal layout to fuel, medium and operation
- Adjusting of the boiler to the plant with regard to heating circuit environmental and constructional conditions
- Dimensioning and material selection are according to thermal stress and charge.
- Type of the design construction is based on the greatest possible elasticity to tolerate thermal stresses.
- Higher heating is possible by cooling the flue gas touched surfaces wit water and reducing the radiation heat losses.
- With recent techniques it is possible to reduce losses and energy consumption, besides the more economical operation is achieved by optimum controllability.

Three-Pass Boiler

The three-pass boiler is robust and economical. The furnace is formed by the fire tube. The flue gases are directed through topped smoke tubes where they are cooled down. As it has proved to be especially economical to lead the flue gases through three passes most of the large water space boilers built today belong to this type-hence the name “three-pass boilers”.

Because of its constructional design the three-pass boiler is especially suitable for the combustion of liquid or gaseous fuels. It can, however, as well be used for solid fuels. Coal or wood performances.

- Fire tube: In the three-pass boiler the fire tube forms the combustion chamber.The chosen diameter makes sure that an unobjectionable flame can develop and a complete burnout is guaranteed. The decision whether plane or spiral fire tubes are to be used depends on the diameter and the working pressure.The arrangement in the inferior part of the water space has an especially favorable effect on the heat exchange and the water circulation, and allows a clear arrangement of the remaining flue gas pases.

Boiler Supports, Skids

The boiler body is based on supports,Most of the unit are delivered on skids by that special foundations for the installation are not required. In this case all accessories which are necessary for operation, such as oil or gas firing equipment, combustion air fan, oil pre heater, control panel or switchboard and feeding device, can be mounted on the skid, too.

Boiler Body, Insulation

The cylindrical boiler body forms the water and the steam apace and contains the heating surfaces. Outside it is provided with a highly effective insulation as well as with a cladding of stainless steel sheets (at both sides). All connection pieces with mountings, fittings, control instru ments as well as service platform, flue gas reversing chambers and flue gas duct arc mounted at boiler body. Man-and hand-holes allow inspection at the water side and supervision of the heating surfaces.

Smoke Tubes

The second and third boiler pass are formed by thick-walled smoke tubes which are welded into the end plates.The tubes are easily accessible and can be cleaned without problems.The arrangement of the smoke tubes considers the recommendation of ascending flue passes in order to prevent the formation of residual-or lingering gases.

Rear ReversingChamber

PACKMAN three pass boilers with a fire tube have an interior flue gas reversing chamber, situated in the water space. Here the direction of the flue gases, coming out of the fire tube is changed and they are distributed to the smoke tubes of the second pass. The all over cooling of the reversing chamber contributes to an optimum heat utilization. At PACKMAN double outside the boiler body. The exterior reversing chamber is formed of tightly welded tube walls; it is water cooled (Wet Back) and absolutely gas tight. At this type, too, an economical heat utilization has been drawn into consideration.Access openings allow a flue gas side inspection of the interior and exterior reversing chamber.

Front Reversing Chamber

Inside of a tightly welded and insulated chaber made of steel sheets the flue gases are led from the second to the third boiler pass. The reversing chamber is equipped with large doors, allowing free access to the smoke tubes and easy maintenance and cleaning. High quality tightening material guarantees that the doors are shut gas tight. Special literature on three-pass boiler with wood or coal firing as well as on special constructions can be sent upon request. In addition our engineers as well as our representatives abroad are always at your disposal for further in formation and assistance.

Product Capacity Calculation & Selection

The Steam boiler selected based on maximum require capacity and type of process, The better way to select the capacity and pressure of the boiler is the following steps:

1- Calculate the maximum heat load based on your process.

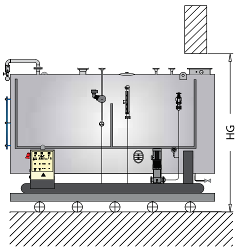
2- Adding 20% to maximum load for coefficient of confidence.

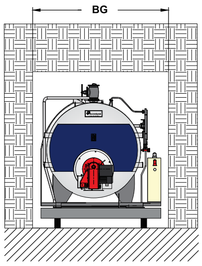
3- Consider the 85% average efficiency for three pass steam boiler.

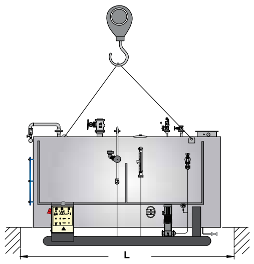
4- Calculate pressure based on your project and distance between boiler and consumer.

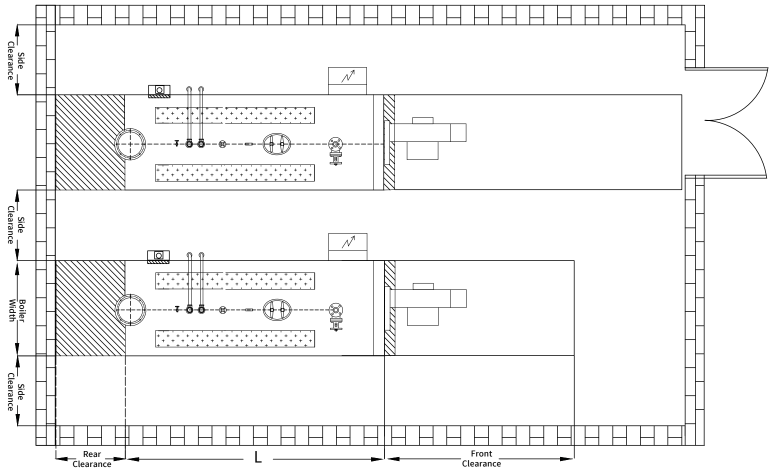
5- Determine the number of boiler you have: it is better you choose number of boiler for 100% of full load

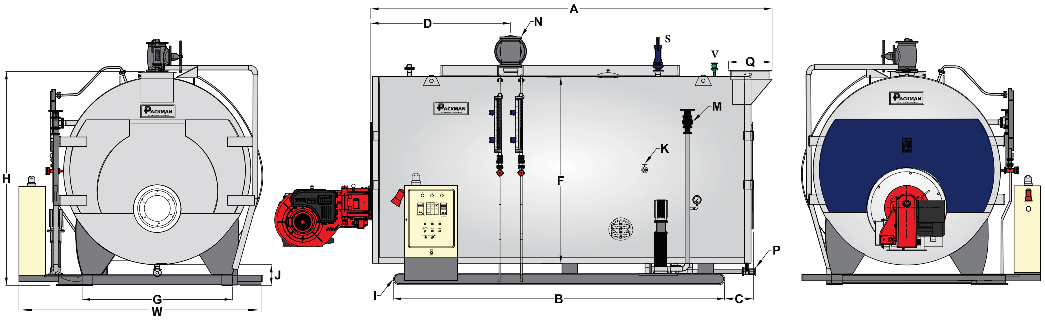
Finally you can select the model from the following table.



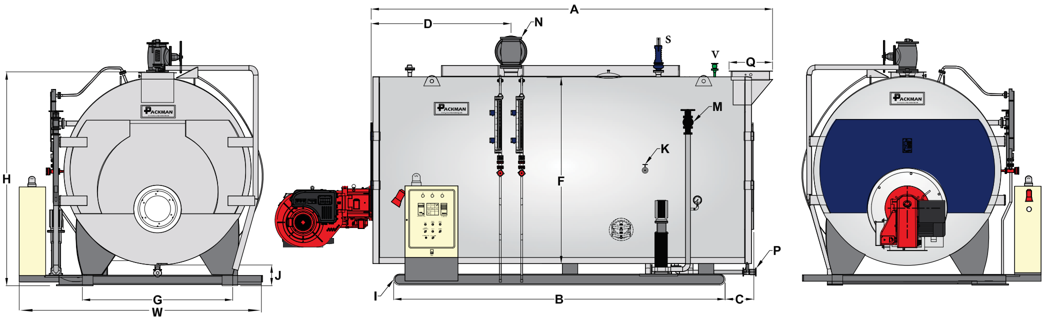




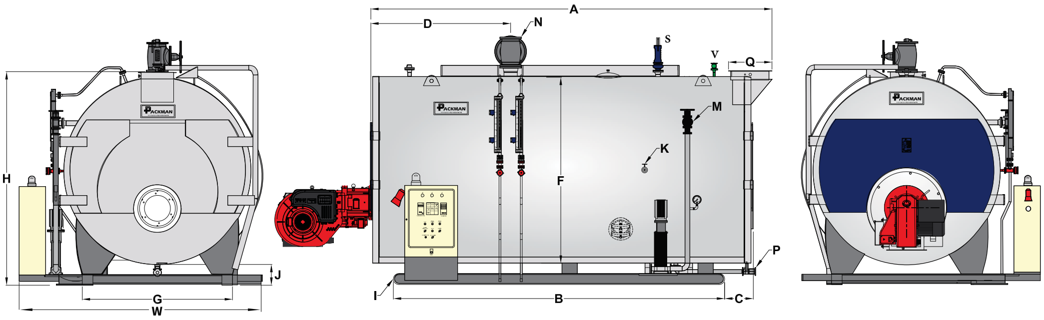




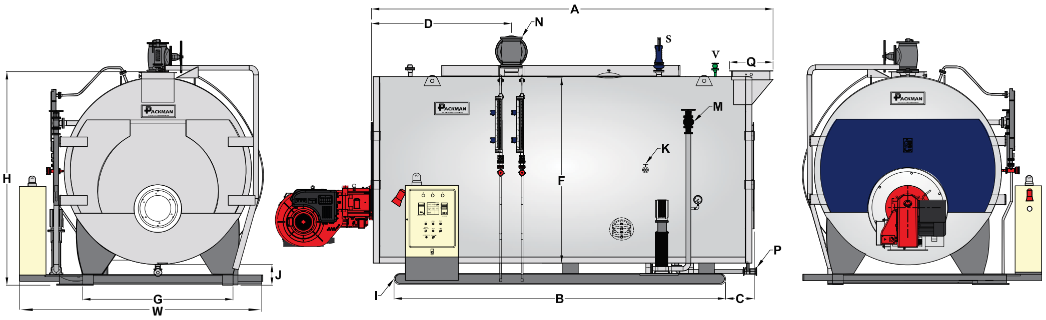
Model	Unit	PSBHN-350	PSBHN-500	PSBHN-700	PSBHN-800
Technical Data					
Thermal Capacity	kw	350	500	700	800
Steam Output	kg/hr	500	750	1000	1200
Heating Surface	m^2	16	17.5	25.7	26.8
Working Pressure	bar	Up to 30 bar			
Pressure Drop in Combustion Chamber	mbar	2.2	3.5	2.5	3.8
Design Standard	-	BS/EN 12953			
Max Gas Consumption @Sea Level	m^3/hr	35	50	70	80
Max Fuel Oil Consumption @Sea Level	liter/hr	29	42	58.5	67
Max Heavy Fuel Oil Consumption @Sea Level	liter/hr	25	36	50	57
Connection Size @ 10 Bar Working Pressure					
Steam Outlet (N)	in	2	2	3	3
Safety Valve (S)	in	1	1	1 1/2	1 1/2
Sampling (K)	in	1/2	1/2	1/2	1/2
Feeding Valve (M)	in	1	1	1 1/4	1 1/4
Venting Valve (V)	in	1	1	1	1
Drainage Valve (P)	in	1 1/4	1 1/4	1 1/2	1 1/2
Stack I.D. (Q)	in	8	10	12	12
Boiler Dimension					
Lengths (A)	mm	2750	3200	3400	3500
Boiler Diameter (F)	mm	1440	1440	1560	1560
Width (W)	mm	1900	1900	2100	2100
Height (H)	mm	1850	1850	1950	1950
Min Front Clearance	mm	2400	2800	3000	3100
Min Rear Clearance	mm	1000	1000	1000	1000
Min Side Clearance	mm	700	700	900	900
Min Boiler Room Length	mm	6500	7000	7300	7500
Weight					
Shipping Weight @ 10 bar Working Pressure	kg	2650	3000	3580	3700



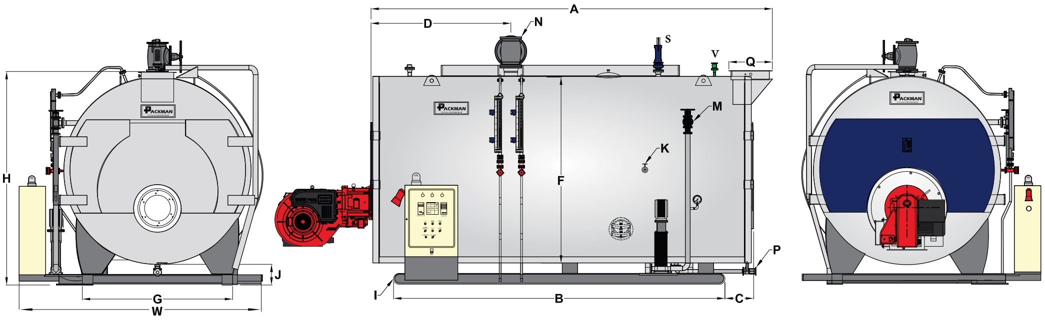
Model	Unit	PSBHN-1000	PSBHN-1250	PSBHN-1500	PSBHN-1750
Technical Data					
Thermal Capacity	kW	1,000	1,250	1,500	1,750
Steam Output	kg/hr	1,500	2,000	2,500	2,800
Heating Surface	m^2	30.2	34.2	44	48.3
Working Pressure	bar	up to 30 bar			
Pressure Drop in Combustion Chamber	mbar	3.92	5.88	4.12	6.05
Design Standard	-	BS/EN 12953			
Max Gas Consumption @Sea Level	m^3/hr	100	125	150	175
Max Fuel Oil Consumption @Sea Level	liter/hr	83	104	125	146
Max Heavy Fuel Oil Consumption @Sea Level	liter/hr	71	89	107	125
Connection Size @ 10 Bar Working Pressure					
Steam Outlet (N)	in	3	3	3	3
Safety Valve (S)	in	1	1	1 1/2	1 1/2
Sampling (K)	in	1/2	1/2	1/2	1/2
Feeding Valve (M)	in	1	1	1 1/2	1 1/2
Venting Valve (V)	in	3/4	3/4	3/4	3/4
Drainage Valve (P)	in	1 1/4	1 1/2	1 1/2	1 1/2
Stack I.D. (Q)	in	14	14	16	16
Boiler Dimension					
Lengths (A)	mm	3580	3880	4000	4300
Boiler Diameter (F)	mm	1580	1580	1800	1800
Width (W)	mm	2020	2020	2320	2320
Height (H)	mm	2000	2000	2250	2250
Min Front Clearance	mm	3500	3700	3700	4000
Min Rear Clearance	mm	1000	1000	1000	1000
Min Side Clearance	mm	700	700	900	900
Min Boiler Room Length	mm	8500	8700	9000	9500
Weight					
Shipping Weight @ 10 bar Working Pressure	kg	4250	4700	5600	6300



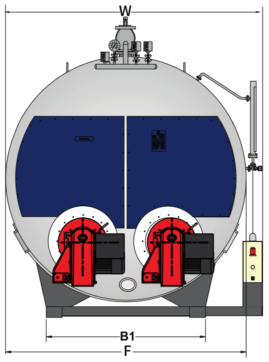
Model	Unit	PSBHN-2000	PSBHN-2500	PSBHN-3000	PSBHN-3500
Technical Data					
Thermal Capacity	kw	2,000	2,500	3,000	3,500
Steam Output	kg/hr	3,000	4,000	4,500	5,000
Heating Surface	m^2	75	82	100	110
Working Pressure	bar	up to 30 bar			
Pressure Drop in Combustion Chamber	mbar	4.17	6.7	5.13	6.3
Design Standard	-	BS/EN 12953			
Max Gas Consumption @Sea Level	m^3/hr	200	250	300	350
Max Fuel Oil Consumption @Sea Level	liter/hr	167	208	250	292
Max Heavy Fuel Oil Consumption @Sea Level	liter/hr	143	179	214	250
Connection Size @ 10 Bar Working Pressure					
Steam Outlet (N)	in	4	5	6	6
Safety Valve (S)	in	1 1/2	1 1/2	2	2
Sampling (K)	in	1/2	1/2	1/2	1/2
Feeding Valve (M)	in	2	2	2	2
Venting Valve (V)	in	1	1	1	1
Drainage Valve (P)	in	1 1/2	1 1/2	1 1/2	2
Stack I.D. (Q)	in	16	16	20	20
Boiler Dimension					
Lengths (A)	mm	4790	5230	5250	5480
Boiler Diameter (F)	mm	2025	2025	2225	2225
Width (W)	mm	2600	2600	2810	2810
Height (H)	mm	2480	2480	2690	2690
Min Front Clearance	mm	4000	4300	4300	4500
Min Rear Clearance	mm	1000	1000	1100	1100
Min Side Clearance	mm	1000	1000	1000	1200
Min Boiler Room Length	mm	9700	10000	10500	10800
Weight					
Shipping Weight @ 10 bar Working Pressure	kg	8730	9480	10920	11070

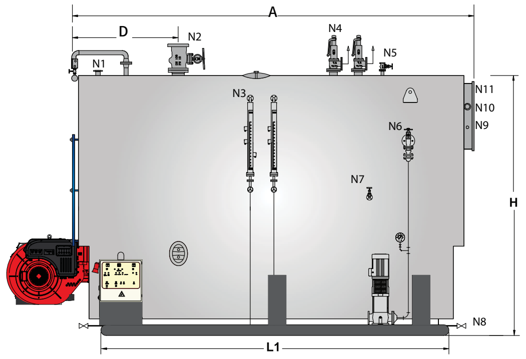


Model	Unit	PS-BHN-4000	PS-BHN-5000	PS-BHN-6000	PS-BHN-7000
Technical Data					
Thermal Capacity	kw	4,000	5,000	6,000	7,000
Steam Output	kg/hr	6,000	8,000	10,000	11,600
Heating Surface	m^2	130	150	183	220
Working Pressure	bar	up to 30 bar			
Pressure Drop in Combustion Chamber	mbar	5.89	6.5	6.8	7.5
Design Standard	-	BS/EN 12953			
Max Gas Consumption @Sea Level	m^3/hr	400	500	600	700
Max Fuel Oil Consumption @Sea Level	liter/hr	333	417	500	583
Max Heavy Fuel Oil Consumption @ Sea Level	liter/hr	286	357	429	500
Connection Size @ 10 Bar Working Pressure					
Steam Outlet (N)	in	6	6	6	8
Safety Valve (S)	in	2	2	2 1/2	2 1/2
Sampling (K)	in	1/2	1/2	1/2	1/2
Feeding Valve (M)	in	2	2 1/2	2 1/2	2 1/2
Venting Valve (V)	in	1	1	1	1
Drainage Valve (P)	in	2	2	2	2
Stack I.D. (Q)	in	20	24	24	24
Boiler Dimension					
Lengths (A)	mm	5480	5640	5970	6180
Boiler Diameter (F)	mm	2400	2570	2730	2880
Width (W)	mm	3100	3250	3500	3700
Height (H)	mm	2870	3030	3210	3350
Min Front Clearance	mm	4500	4500	4900	5100
Min Rear Clearance	mm	1200	1300	1400	1500
Min Side Clearance	mm	1200	1200	1300	1300
Min Boiler Room Length	mm	11100	11350	12190	12500
Weight					
Shipping Weight @ 10 bar Working Pressure	kg	13760	15250	18090	21310



Model	Unit	PSBHN-8000	PSBHN-9000	PSBHN-10000
Technical Data				
Thermal Capacity	kw	8,000	9,000	10,000
Steam Output	kg/hr	12,500	14,000	15,500
Heating Surface	m^2	260	290	330
Working Pressure	bar	up to 30 bar		
Pressure Drop in Combustion Chamber	mbar	7.8	8.1	8.5
Design Standard	-	BS/EN 12953		
Max Gas Consumption @Sea Level	m^3/hr	800	900	1,000
Max Fuel Oil Consumption @Sea Level	liter/hr	667	750	833
Max Heavy Fuel Oil Consumption @Sea Level	liter/hr	571	643	714
Connection Size @ 10 Bar Working Pressure				
Steam Outlet (N)	in	8	8	10
Safety Valve (S)	in	2 1/2	3	3
Sampling (K)	in	1/2	1/2	1/2
Feeding Valve (M)	in	3	3	4
Venting Valve (V)	in	1	1	1
Drainage Valve (P)	in	2	2	2
Stack I.D. (Q)	in	24	30	30
Boiler Dimension				
Lengths (A)	mm	6380	6680	7100
Boiler Diameter (F)	mm	3050	3330	3530
Width (W)	mm	3900	4000	4500
Height (H)	mm	3530	3740	3950
Min Front Clearance	mm	5300	5500	5800
Min Rear Clearance	mm	1500	2000	1800
Min Side Clearance	mm	1400	1500	1700
Min Boiler Room Length	mm	13000	14000	14500
Weight				
Shipping Weight @ 10 bar Working Pressure	kg	23910	28500	33200





Model	Unit	PSBHN-12000	PSBHN-14000	PSBHN-15000	PSBHN-16000	PSBHN-18000	PSBHN-20000
Technical Data							
Thermal Capacity	kw	12,000	14,000	15,000	16,000	18,000	20,000
Steam Output	kg/hr	18,000	21,000	22,500	24,000	27,000	30,000
Heating Surface	m^2	400	467	500	533	600	667
Working Pressure	bar	up to 30 bar					
Pressure Drop in Combustion Chamber	mbar	9.5	10.5	11.5	12.5	13.5	14.5
Design Standard	-	BS/EN 12953					
Max Gas Consumption @Sea Level	m^3/hr	1,200	1,400	1,500	1,600	1,800	2,000
Max Fuel Oil Consumption @Sea Level	liter/hr	1,117	1,303	1,397	1,490	1,676	1,862
Max Heavy Fuel Oil Consumption @Sea Level	liter/hr	1,054	1,229	1,317	1,405	1,580	1,756
Connection Size @ 10 Bar Working Pressure							
Steam Outlet (N2)	in	10	10	12	12	12	12
Safety Valve (N4)	in	4	4	4	4	5	5
Sampling (N7)	in	3/4	3/4	3/4	3/4	3/4	3/4
Feeding Valve (N6)	in	4	4	4	4	5	5
Venting Valve (N5)	in	1	1	1	1	1	1
Drainage Valve (N8)	in	2	2	2 1/2	2 1/2	2 1/2	2 1/2
Stack I.D. (N11)	in	30	32	34	38	38	40
Boiler Dimension							
Lengths (A)	mm	7400	7400	7700	8200	8200	8500
Boiler Diameter (F)	mm	3700	3800	3950	4050	4250	4500
Width (W)	mm	4200	4200	4300	4350	4500	4850
Height (H)	mm	4150	4250	4400	4500	4700	4800
Min Front Clearance	mm	6100	6100	6400	6800	6800	7100
Min Rear Clearance	mm	2000	2000	2000	2000	2500	2500
Min Side Clearance	mm	1700	1700	1700	2000	2000	2000
Min Boiler Room Length	mm	15500	15500	16100	17000	17500	18100
Weight							
Shipping Weight @ 10 bar Working Pressure	kg	36,000	39,000	44,000	47,000	54,000	60,000

Vertical Steam Boiler

Product Description

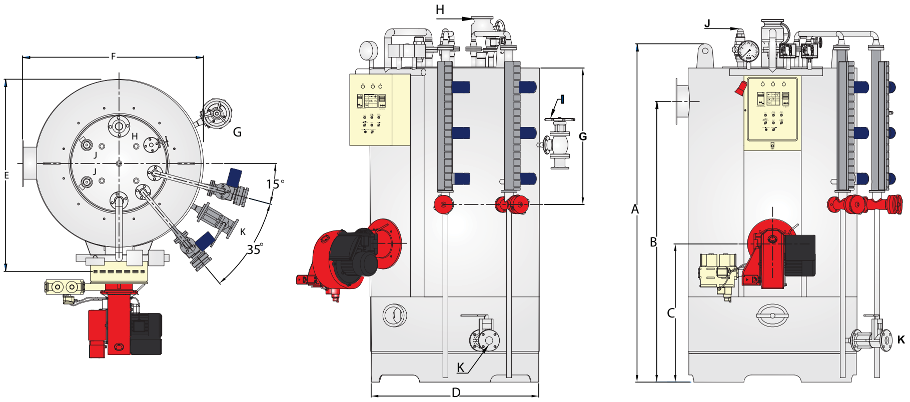
Packman vertical steam boiler PSB series are designed with simple mechanical structure via modern machinery and equipment to confirm to the latest regulations of EN and DIN standards. The PSB series are user friendly, and use the latest technology to meet every customers needs.
The vertical steam boiler is robust and economical. The furnace is formed by the fire tube. The flue gases are directed through topped smoke tubes .
Constructional design boiler is especially suitable for the combustion of liquid or gaseous fuels. It can, however, as well be used for solid fuels. Coal or wood performances.

Fire Tube

The chosen diameter makes sure that an unobjectionable flame can develop and a complete burnout is guaranteed. The decision whether plane or spiral fire tubes are to be used depends on the diameter and the working pressure. The arrangement in the inferior part of the water space has an especially favorable effect on the heat exchange and the water circulation, and allows a clear arrangement of the remaining flue gas passes. Boiler supports, skids: The boiler body is based on supports. Most of the unit are delivered on skids; by that special foundations for the installation are not required. In this case all accessories which are necessary for operation, such as oil or gas firing equipment, combustion air fan, oil preheater, control panel or switchboard and feeding device, can be mounted on the skid, toosed to

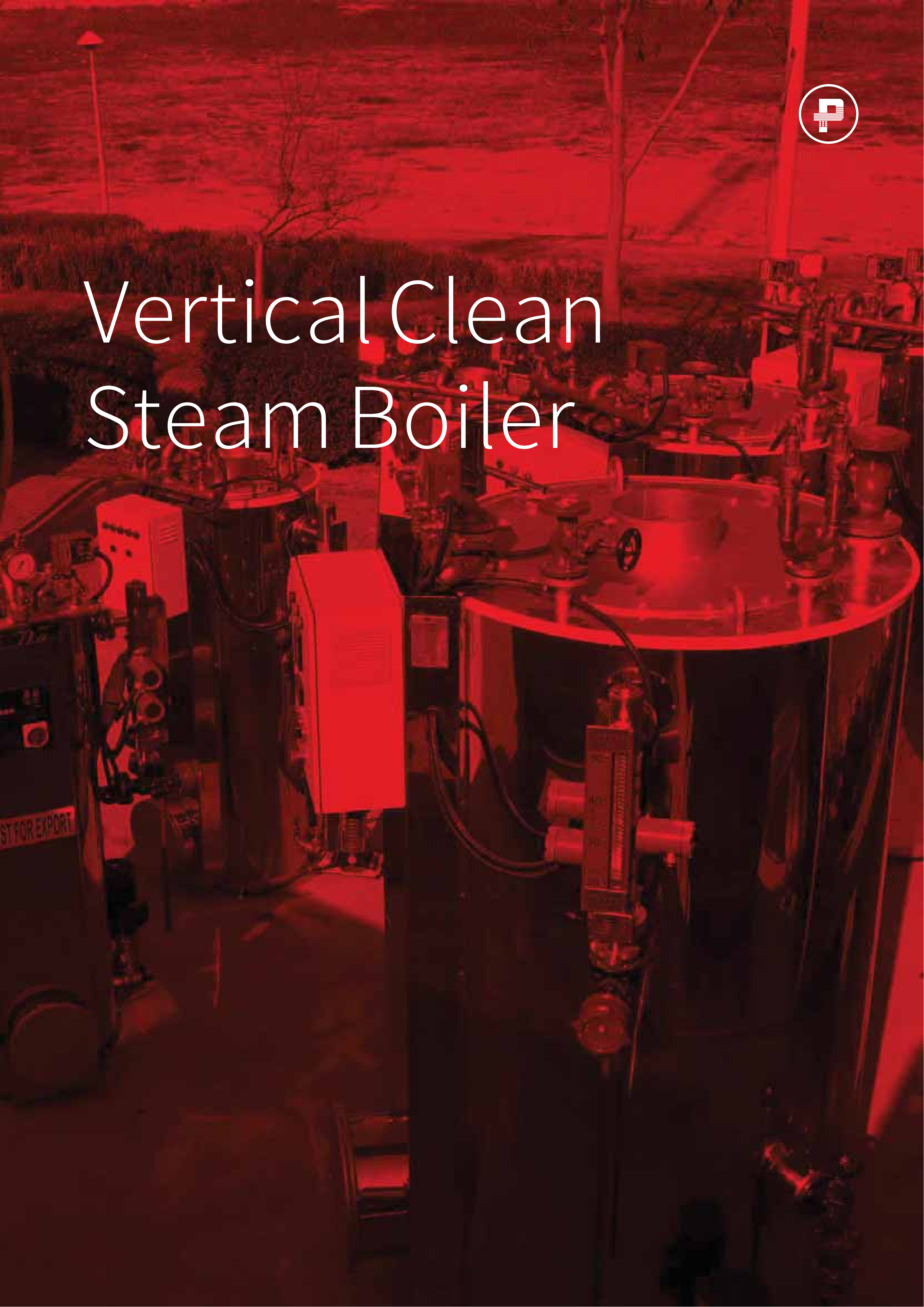
Product Capacity Calculation & Selection

The Steam boiler selected based on maximum require capacity and type of process The better way to select the capacity and pressure of the boiler is following below steps:
1- Calculate the maximum heat load based on your process.
2- Adding 20% to maximum load for coefficient of confidence.
3- Consider the 80% average efficiency for vertical steam boiler.
4- Calculate pressure based on your project and distance between boiler and consumer.
5- Determined the number of boiler you have: it is better you choose number of boiler for 100% of full load
Finally you can select the model from the table in bellow.



Model	Unit	PSBV-100	PSBV-150	PSBV-200	PSBV-300	PSBV-400	PSBV-500
Technical Data							
Thermal Capacity	kw	80	100	150	200	250	350
Steam Output	kg/hr	100	150	200	300	400	500
Heating Surface	m^2	4.8	6.3	7.8	11.1	14.1	17.1
Working Pressure	bar	Up to 16 bar					
Pressure Drop in Combustion Chamber	mbar	1.6	1.8	2	2.2	3.3	3.5
Design Standard	-	BS/EN 12953					
Max Gas Consumption @Sea Level	m^3/hr	8	10	15	20	25	35
Max Fuel Oil Consumption @Sea Level	liter/ hr	7.4	9.2	13.8	18.4	23	32.2
Max Heavy Fuel Oil Consumption @Sea Level	liter/ hr	7	8.8	13.2	17.6	22	30.8
Connection Size @ 10 bar Working Pressure							
Steam Outlet (H)	in	1	1	1 1/2	1 1/2	2	2
Safety Valve (J)	in	2* 3/4	2* 3/4	2* 3/4	2* 3/4	2*1	2*1
Feeding Valve (I)	in	1	1	1	1	1	1
Venting Valve (V)	in	3/4	3/4	3/4	3/4	3/4	1
Drain Valve (K)	in	1	1	1	1	1	1
Stack I.D. (Q)	in	6	6	6	8	8	8
Boiler Dimension							
Length (F)	mm	950	1040	1100	1210	1320	1420
Width (E)	mm	890	970	1030	1150	1260	1360
Height (A)	mm	2030	2030	2030	2370	2370	2370
Min Front Clearance	mm	500	500	500	500	500	500
Min Rear Clearance	mm	500	500	500	500	500	500
Min Side Clearance	mm	500	500	500	500	500	500
Min Boiler Room Length	mm	1950	2040	2100	2210	2320	2420
Weight							
Shipping Weight @ 10 bar Working Pressure	kg	800	950	1100	1300	1700	1900

Vertical Clean Steam Boiler



Product Description

Vertical clean steam boilers are used to produce pure and clean steam, free of any harmful substances and impurities. Applications for pure and clean steam are found in the food, cosmetic, biochemical, and pharmaceutical industries, as well as for sterilization and any direct steam heating processes where the demands on steam quality are very high.

Our clean steam boilers has been designed to provide sterilizer grade clean steam from suitably treated water using oil or gas burners as the heating medium and can be supplied with or without an integral feed water pre-heating.

Vertical Our clean steam boiler covers steam outputs from 100 kW up to 700 kW and other capacity units can be designed to order. The boiler is manufactured from AISI 304L stainless steel and all internal surfaces are passivated to provide a corrosion resistance surface and developed with high efficiencies, in rigid and reliable designs, ensuring low operation and maintenance cost.

Skilled engineers provide technical support, already from the first contact within the sales department, ensuring the best individual guidance in choosing the correct product for the actual application. From initial assessment of customers clean steam needs, through design, manufacturing, documentation and validation, delivery and deployment, to maintenance and life cycle support, we ensure all elements fit perfectly to achieve the highest system performance.

Benefits

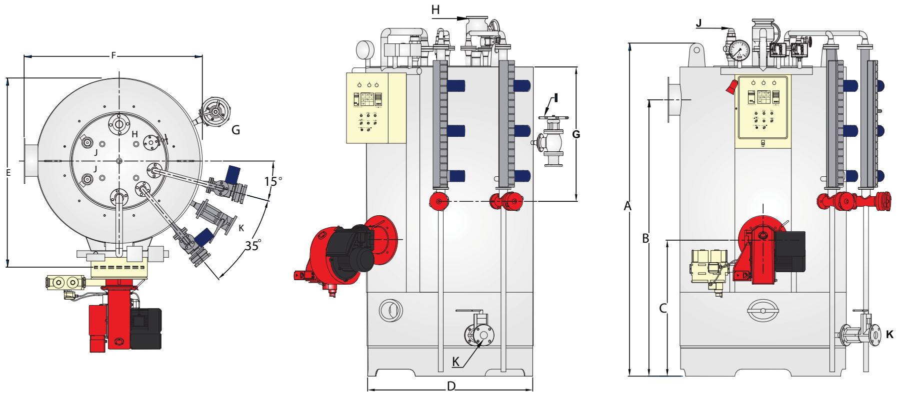
1. Short delivery times for standard Pure Steam Generators
2. High energy efficiency by ideal design and energy retrieval measures
3. Vertical design with minimal area demand
4. All clean steam and feed water wetted parts in AISI 304L stainless steel
5. Using PLC controlled to regulate generator clean steam outlet pressure, generator water level

Quality Control

1.Strength calculation report with applied materials information.

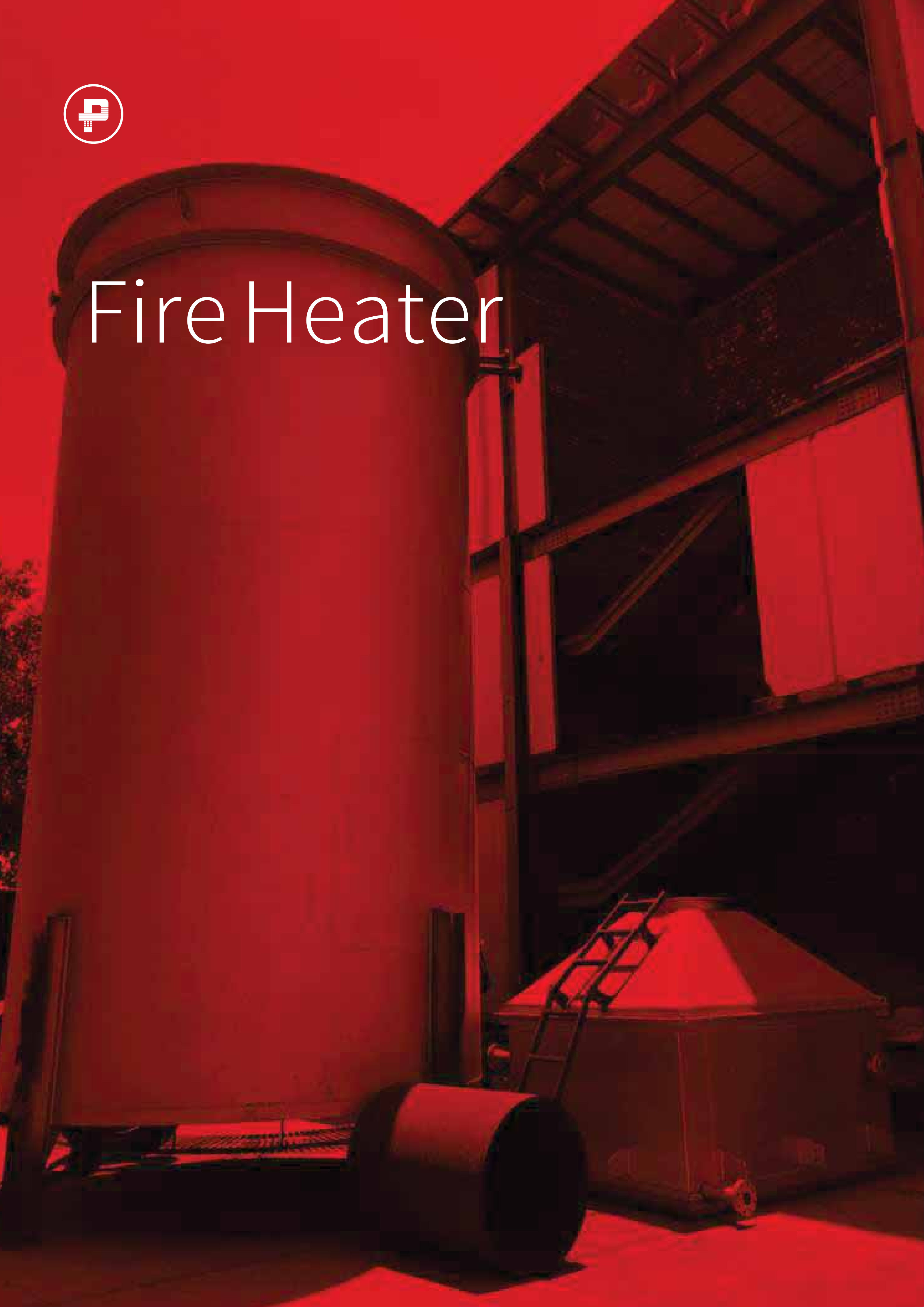
2. 100% NDT (non-destructive inspection) report of steel plate tube and welding rod including RT and UT examination reports.

3. Hydraulic test report: ensure the standard working pressure and safety.



Model	Unit	PSBV-100	PSBV-150	PSBV-200	PSBV-300	PSBV-400	PSBV-500
Technical Data							
Thermal Capacity	kw	80	100	150	200	250	350
Steam Output	kg/hr	100	150	200	300	400	500
Heating Surface	m^2	4.8	6.3	7.8	11.1	14.1	17.1
Working Pressure	bar	Up to 16 bar					
Pressure Drop in Combustion Chamber	mbar	1.6	1.8	2	2.2	3.3	3.5
Design Standard	-	BS/EN 12953					
Max Gas Consumption @Sea Level	m^3/hr	8	10	15	20	25	35
Max Fuel Oil Consumption @Sea Level	liter/hr	7.4	9.2	13.8	18.4	23	32.2
Max Heavy Fuel Oil Consumption @Sea Level	liter/hr	7	8.8	13.2	17.6	22	30.8
Connection Size @ 10 bar Working Pressure							
Steam Outlet (H)	in	1	1	1 1/2	1 1/2	2	2
Safety Valve (J)	in	2* 3/4	2* 3/4	2* 3/4	2* 3/4	2*1	2*1
Feeding Valve (I)	in	1	1	1	1	1	1
Venting Valve (V)	in	3/4	3/4	3/4	3/4	3/4	1
Drain Valve (K)	in	1	1	1	1	1	1
Stack I.D. (Q)	in	6	6	6	8	8	8
Boiler Dimension							
Length (F)	mm	950	1040	1100	1210	1320	1420
Width (E)	mm	890	970	1030	1150	1260	1360
Height (A)	mm	2030	2030	2030	2370	2370	2370
Min Front Clearance	mm	500	500	500	500	500	500
Min Rear Clearance	mm	500	500	500	500	500	500
Min Side Clearance	mm	500	500	500	500	500	500
Min Boiler Room Length	mm	1950	2040	2100	2210	2320	2420
Weight							
Shipping Weight @ 10 bar Working Pressure	kg	800	950	1100	1300	1700	1900

Fire Heater



Product Description

Industrial fire heaters play a vital role in various industrial settings, providing efficient and reliable heating solutions. These advanced heating systems are designed to generate and distribute high-temperature heat in a controlled manner, ensuring optimal conditions for industrial processes. With their robust construction, advanced features, and stringent safety measures, industrial fire heaters have become an indispensable component in numerous industries.

What is an Industrial Fire Heater?

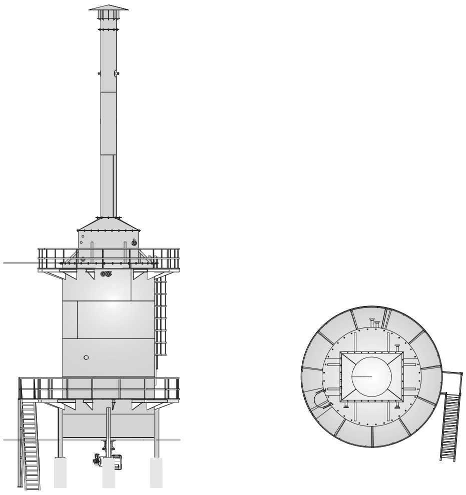
An industrial fire heater is a specialized heating device specifically designed for industrial applications, where precise and controlled heat generation is essential. These heaters utilize a combustion process, often fueled by natural gas, propane, or fuel oil, to produce the necessary heat energy. The combustion process occurs within a well-insulated firebox, ensuring maximum heat transfer efficiency.

Applications of Industrial Fire Heaters

Oil and Gas Industry: Industrial fire heaters find extensive use in the oil and gas sector, primarily for processes such as crude oil heating, wellhead heating, and natural gas processing. These heaters facilitate the maintenance of optimal temperatures during oil refining, ensuring efficient separation and purification of various hydrocarbon compounds.

Chemical Industry: In chemical plants, industrial fire heaters are employed for diverse applications, including heat transfer fluid heating, reactor vessel heating, and distillation processes. They enable precise temperature control and uniform heat distribution, ensuring the integrity and efficiency of chemical reactions.

Food Processing: Industrial fire heaters play a crucial role in the food processing industry, providing the necessary heat for cooking, drying, baking, and sterilization processes. These heaters ensure compliance with stringent food safety regulations while enhancing production efficiency and reducing processing time.



Power Generation: Industrial fire heaters are utilized in power plants to generate steam, which is often required for electricity production. These heaters play a vital role in maintaining optimal steam temperatures and pressures, ensuring the smooth operation of turbines and other power generation equipment.

Manufacturing: Numerous manufacturing processes rely on industrial fire heaters for efficient heat transfer. Applications include heat treatment of metals, curing of coatings, plastic molding, and various other thermal processes that require precise and controlled heating.

Advantages of Industrial Fire Heaters

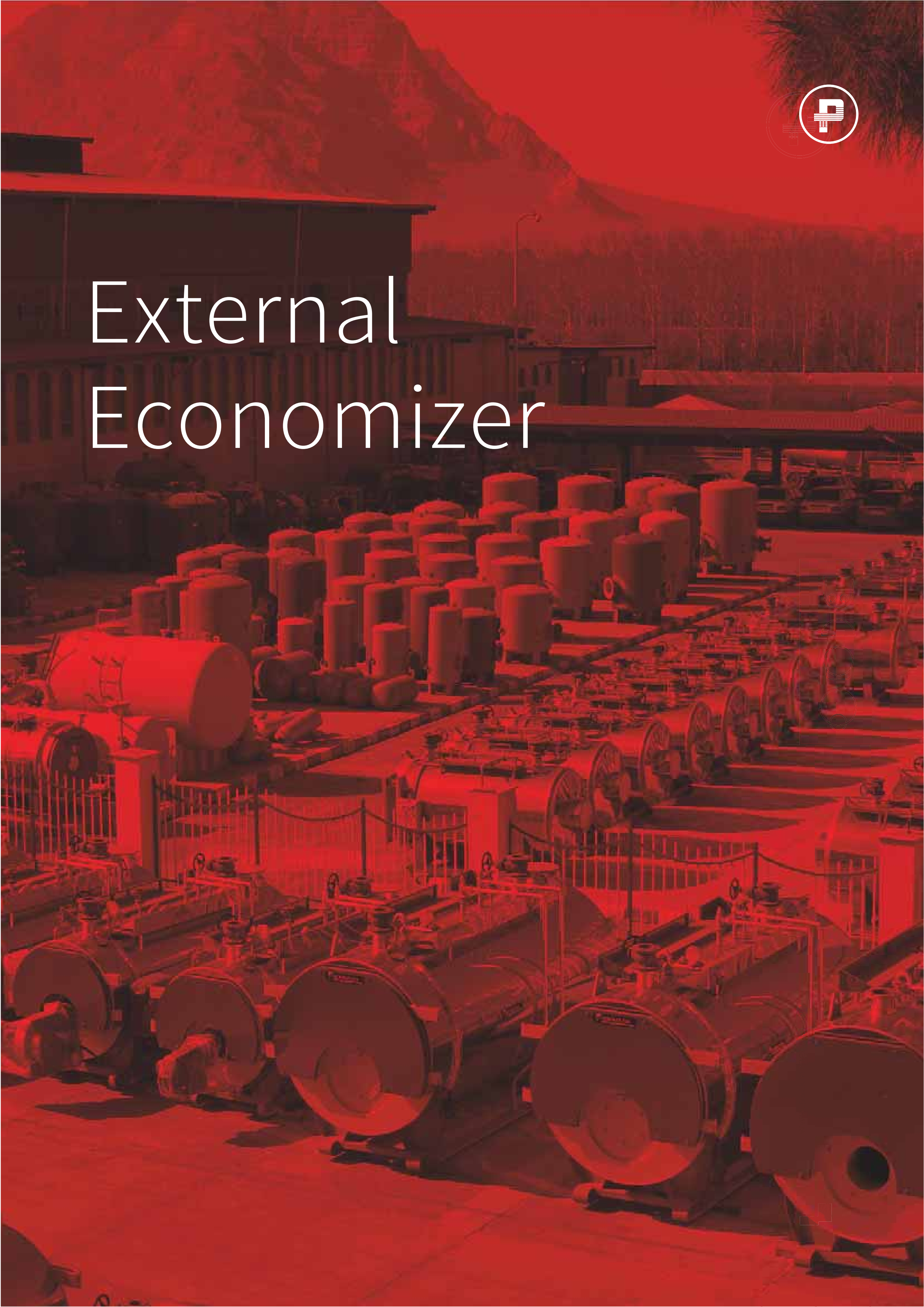
Efficiency: Industrial fire heaters are designed to provide high thermal efficiency, minimizing heat loss and optimizing energy consumption. This results in reduced fuel consumption and operating costs, making them cost-effective solutions for industrial heating needs.

Safety: These heaters incorporate advanced safety features such as flame detection systems, temperature controls, and pressure sensors to ensure safe operation. Additionally, their sturdy construction and adherence to safety standards minimize the risk of accidents and ensure the protection of personnel and assets.

Versatility: Industrial fire heaters offer flexibility in terms of fuel type, combustion control, and heat output capacity. This versatility allows them to accommodate a wide range of industrial applications and adapt to varying process requirements.

Reliability: Built with durable materials and utilizing proven technology, industrial fire heaters are known for their reliability and long operational life. Regular maintenance and servicing further enhance their performance and longevity.

External Economizer



Product Description

Packman External Economizers specifically designed to recover the lost heat exiting from exhaust stacks and preheat water. Our broad line of economizers covers the spectrum of boiler sizes, ranging from very small hot water boilers with burner inputs of 1,000 kg/hr to large boilers delivering steam at 100,000 kg/hr in two types of water & fire tube. In addition, Cain produces boiler feedwater systems, condensate tank and pump systems, exclusive soot blower assemblies, and unique modulating internal exhaust gas bypass systems.

System Description

Exhaust heat from combustion typically leaving the stack and into the atmosphere is instead transferred from the exhaust stream by means of an economizer. This lost this lost exhaust heat is now captured and saved to various heat sinks such as boiler feedwater, cold makeup water, process water, swimming pool water, glycol, and thermal fluids. Combustion source fuel types including natural gas, light & heavy oil and No.2-6 fuel oil are all heat sources which can be retrofitted with Packman heat exchangers.
Packman External Economizer for cylindrical or rectangular stack connections, large or small boilers, a particular pinch point requirement, stack or liquid temperature control, special heat sink requirements, special heat transfer metallurgy requirements, specific maintenance concerns, optional equipment requirements, installation space and weight concerns, and package system requirements.

Exhaust Application

- Steam Boilers (Water & Fire Tubes)
- Hot Water Boilers
- Hot Oil Heaters
- Dryer Furnace
- Specific Combustion Sources

Cylindrical Economizer (PECO)

PECO is a custom-designed heat exchanger which can be construct fire &

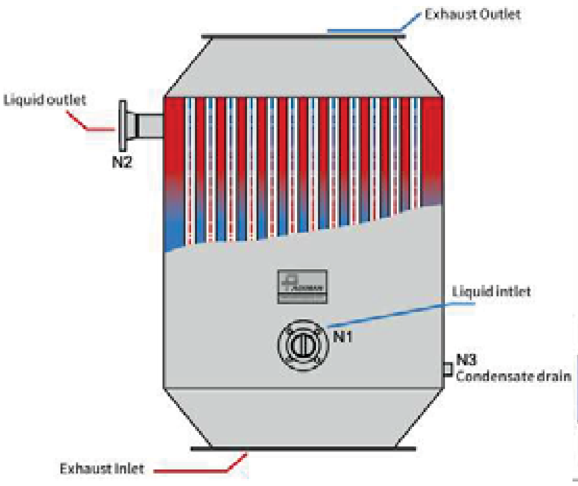
water tube and applied in confined areas and is offered in stainless steel, carbon steel, or Aluminum finned tubing. Design flexibility allows specific engineering requirements to be met such as fin spacing for fouling conditions and low gas pressure drops.

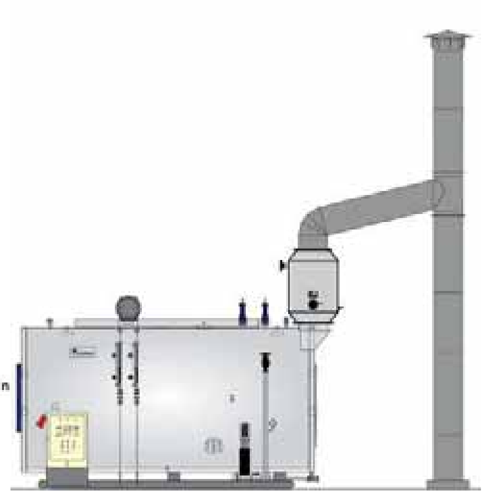
Features

- Internal thermal expansion design
- Cylindrical heat transfer coil(s) design
- Mounting flanges for bolting to mating flanges
- Quick release tension latches
- Internal bypass
- Condensate drain catch ring assembly
- Safety & Control Instruments
- Hinged stainless steel access door panels

Optional Equipment

- Exclusive manual or timed automatic water cleaning
- Circulating pump kit to maintain desired liquid flow rate
- Vertical pressurized storage tank, to create a “bulge” or temporary heat sink in the event of no-water-flow conditions
- Liquid temperature control assembly including temperature-regulated modulating exhaust gas bypass and remote indicators





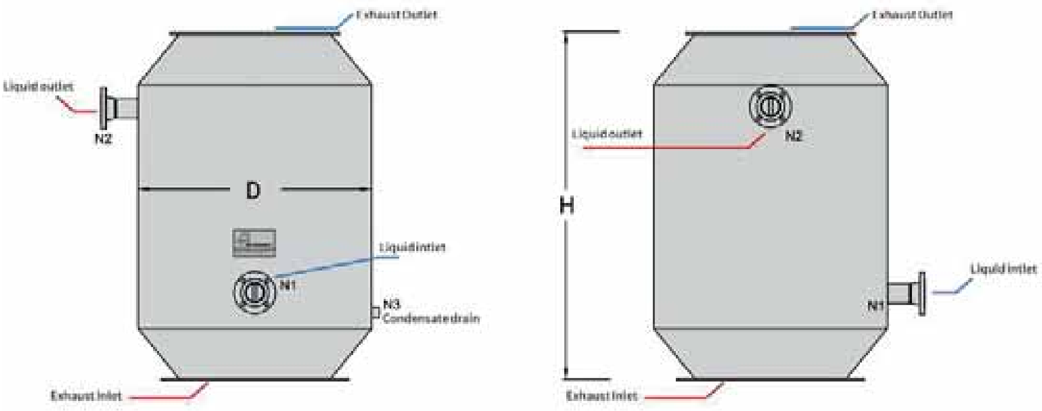
General Design Specification

- Furnish and install economizers on each of the combustion sources (boilers, hot water heaters, hot oil heater, etc.) as designed and manufactured by Packman.
- The Economizer shall be a light weight design for easy installation, cylindrical with counterflow heat transfer design manufactured and tested in accordance with the requirements of Section VIII, Division 1 of the ASME Boiler .
and Pressure Vessel Code, and is stamped to a minimum design pressure of boiler. Each Economizer shall be designed to include as standard, a carbon steel, internal, Flue Gas Bypass Diverter to provide for full emergency by-pass, requiring no additional ductwork for controlling: 1. Stack corrosion, 2. Turn down performance, 3. Back pressure.
- Each Economizer have continuous hinged, gas-tight, carbon steel inspection panels, which provide for complete access to the entire heating surface for inspection and/or cleaning. The inspection panels shall be secured by adjustable, quick release tension latches and no tools shall be required for the opening of the inspection panels.
- Heat Recovery unit shall be either a single, multiple, or parallel coil design and must be completely drainable when mounted vertically.
- Header manifolds, where used, shall be SA105, connections shall bethreaded or flanged as specified.
- Exterior surfaces other than stainless steel shall be primed and painted with a high temperature metallic paint rated for 500°C.

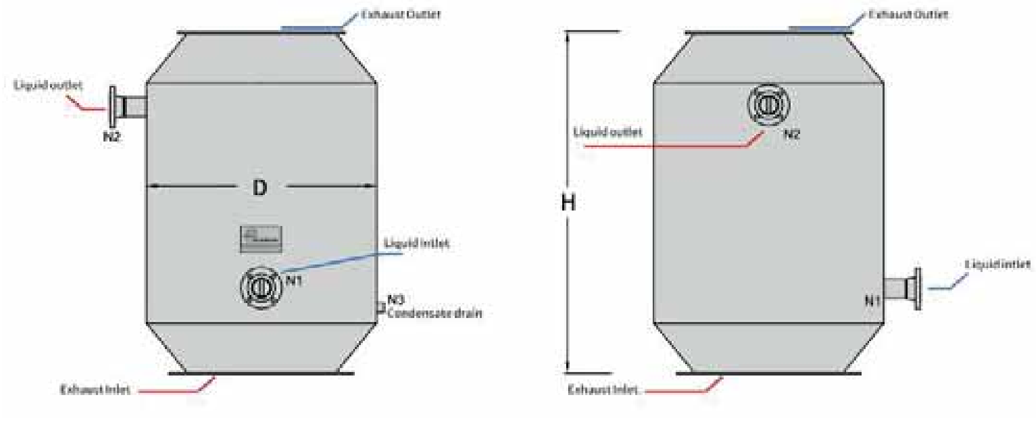
A Packman external boiler economizer can often be installed in-line with your existing stack, resulting in a relatively quick and cost-efficient installation process with minimal retrofitting, labor, materials, and down time. Generally, because of their lighter weight and smaller size, the PECO requires little, if any, additional support (usually suspended from the ceiling). In applications where additional support is required.

The Firetube Series boiler economizer is comprised of 14 standard models. An “off the shelf” unit, it is designed primarily for boilers with round stacks and a combustion capacity of 1 to 35 t/h with entering gas temperatures between 150° and 350°C. The standard stack connections can be easily modified to fit specific boiler stacks with 10” to 34” diameters, alleviating the cost of stack adapters. The units come standard for operation with No. 2 fuel oil and/or natural gas and depending on the efficiency of the combustion.

Model	Unit	PECO
Technical Data		
Exhaust Outlet Temperature	°C	150
Water Inlet Temperature	°C	105
Water Flowrate	Kg/hr	Based on Boiler Flowrate
Exhaust Inlet Temperature	°C	250
Water Outlet Temperature	°C	140
Water Outlet Temperature	°C	140



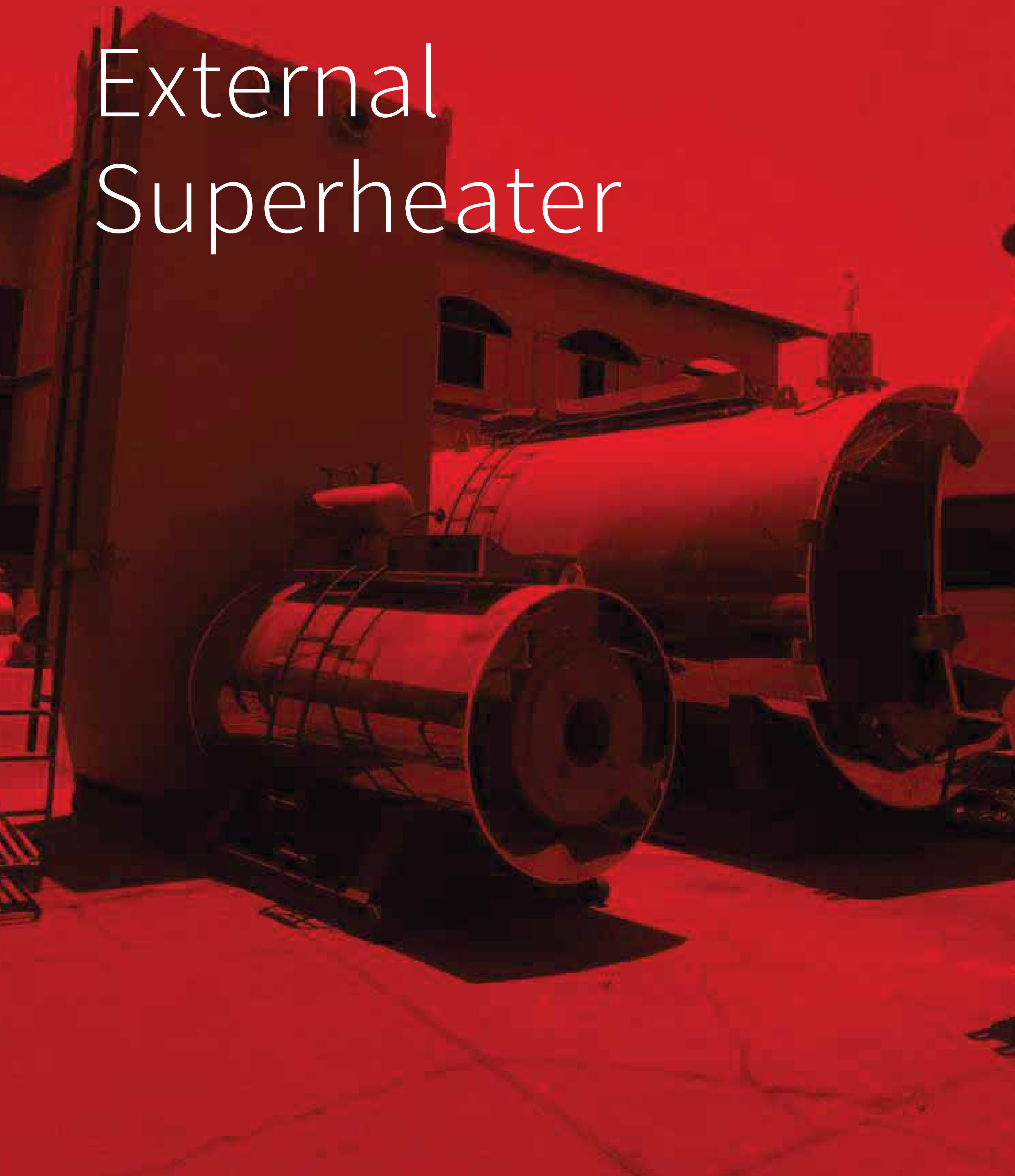
Model	Unit	PECO-1	PECO-1.5	PECO-2	PECO-2.5	PECO-3	PECO-4	PECO-4.5
Technical Data								
Boiler Capacity	Kg/hr	1,000	1,500	2,000	2,500	3,000	4,000	4,500
Heating Surface	ft2	110	170	220	260	350	460	590
Diameter	mm	550	550	550	700	700	700	700
Height	mm	750	920	920	920	1100	1100	1250
Stack ID	in	14	14	14	16	16	16	16
Water Connection	in	1	1	1-1/4	1-1/4	1-1/2	1-1/2	1-1/2
Drain Connection	in	1/2	1/2	1/2	1/2	1/2	1/2	3/4
Total Weight	kg	210	323	418	494	665	874	1121



Model	Unit	PECO-5	PECO-6	PECO-8	PECO-9	PECO-11	PECO-12	PECO-14	PECO-15
Technical Data									
Boiler Capacity	Kg/hr	5,000	6,000	7,500	9,000	11,000	12,000	13,500	15,000
Heating Surface	ft2	650	740	890	1,059	1,186	1,313	1,450	1,620
Diameter	mm	950	950	1100	1100	1100	1100	1100	1250
Height	mm	1250	1250	1250	1250	1450	1450	1450	1500
Stack ID	in	20	20	20	24	24	24	24	30
Water Connection	in	1-1/2	1-1/2	1-1/2	1-1/2	1-1/2	2	2	2
Drain Connection	in	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4
Total Weight	kg	1235	1406	1691	2012	2253	2495	2755	3078

Model	Unit	PECO-18	PECO-20	PECO-22	PECO-25	PECO-28	PECO-30	PECO-32	PECO-35
Technical Data									
Boiler Capacity	Kg / hr	18,000	20,000	22,000	25,000	28,000	30,000	32,000	35,000
Heating Surface	ft^2	1,980	2,200	2,490	2,750	3,120	3,370	3,580	3,860
Diameter	mm	1250	1500	1500	1500	1500	1750	1750	1750
Height	mm	1500	1800	1800	1900	1900	2000	2200	2200
Stack ID	in	30	36	36	36	36	36	40	40
Water Connection	in	2	2	2	2	3	3	3	3
Drain Connection	in	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4
Total Weight	kg	3762	4180	4731	5225	5928	6403	6802	7334

External Superheater

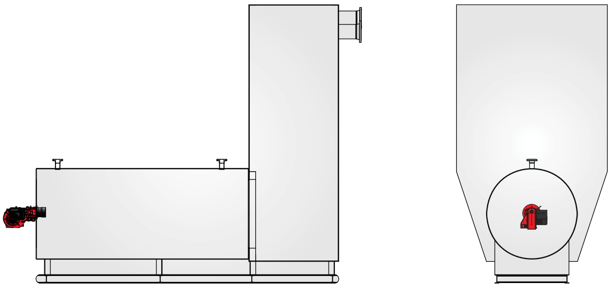


Product Description

External Super heater or Radiative superheaters are used as the first heat transfer surfaces after the furnace. Often a platen arrangement is preferred to create a fouling-resistant construction.

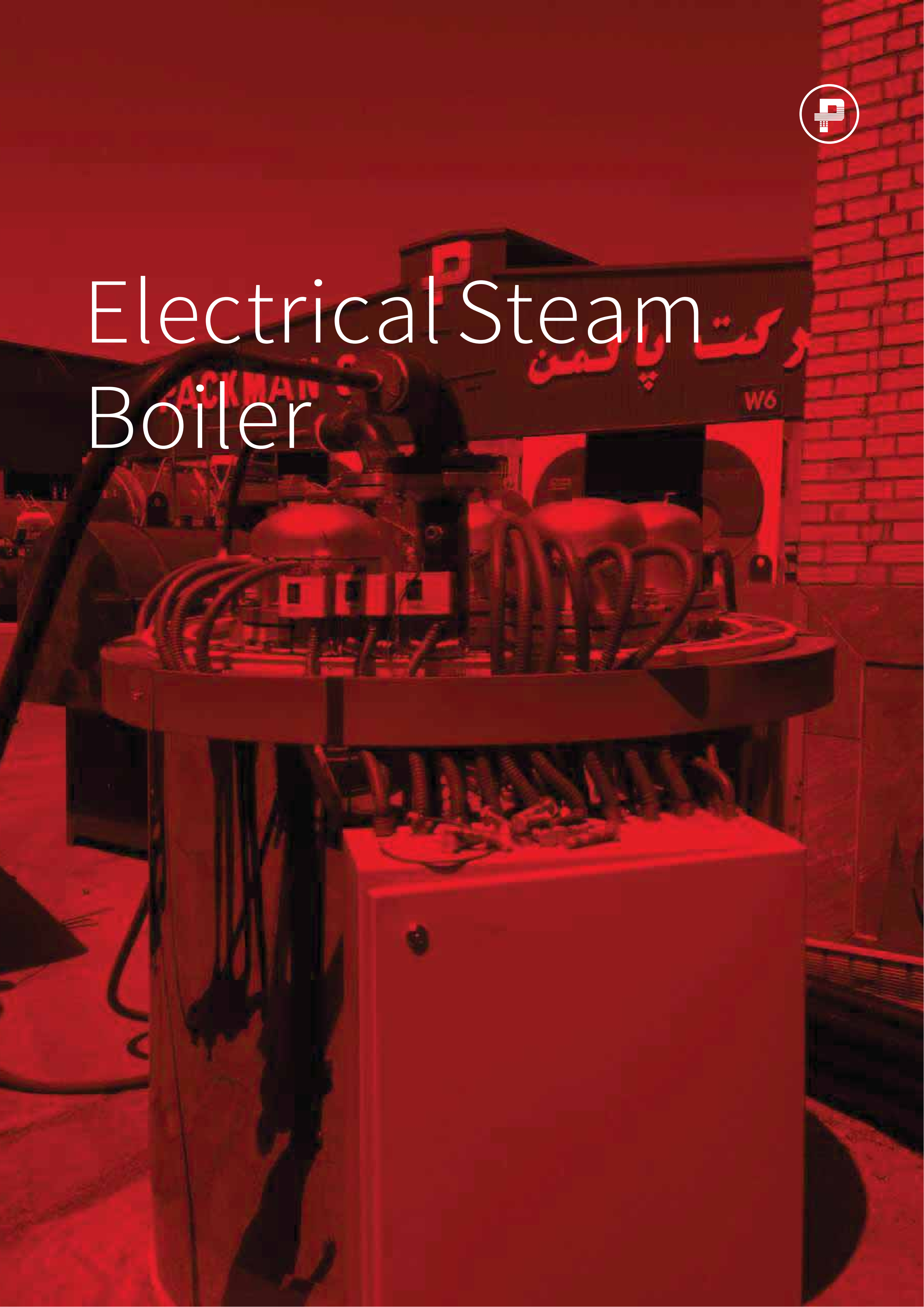
Superheaters are the hottest heat transfer surfaces in the boiler, so they are often built with temperature-resistant alloys. As these superheaters operate at flue gas temperature ranges of 800–1400°C, they often need to be built with corrosion resistance in mind. High-grade materials are expensive and require special welding techniques and often heat treatment. Superheater type, design, material, and construction methods always involve compromise to achieve the desired technical level at low cost.

The wall superheater is a special class of superheater. Sometimes part of the superheating surface needs to be located at the furnace proper. The wall superheater surface is used in these applications. A wall superheater is basically a flat panel of joined tubes that hangs either as close to the furnace membrane wall as possible or forms part of the furnace. Sometimes the back-pass side walls form a superheating surface. Typically wall superheaters are the first superheater after the steam drum or the coolest superheater.Design of super heater is according to BS1113 Standard and SA210-C for



Material Properties							
SA210C / ASTM A210 Grade C Chemical Composition							
Carbon Max	0.35%	Phosphorus Max	0.035%	Silicon Min	0.10%	Chromium	N/A
Manganese*	0.29-1.06%	Sulfur Max	0.035%	Nickle	N/A	Molybdenum	N/A
SA210C / ASTM A210 Grade C Mechanical Properties							
Tensile Strength	ksi: 70	MPa: 485	Maximum Hardness		Rockwell B	89 HRB Max.	
Yield	ksi: 40	MPa: 275			Brinell	179 HB Max.	

Electrical Steam Boiler



Product Description

This technical document provides a comprehensive overview of our electric steam boiler catalog, designed to meet the heating needs of residential, commercial, and industrial applications. It aims to assist customers in understanding the product's features, specifications, installation guidelines, operating instructions, maintenance requirements, and safety precautions.

An electric boiler is a heating device that uses electricity to generate heat and provide steam for various applications. It consists of several components that work together to convert electrical energy into thermal energy.

Electric boilers are commonly used in Industrial, commercial, and petrochemical projects where a clean and efficient energy solution is required. They offer advantages such as precise pressure control, compact size, and the absence of combustion byproducts.

Product Overview:

Our electric steam boilers are high-quality and energy-efficient heating solutions that provide a reliable and constant supply of steam. They are designed to meet various capacity requirements, ranging from small units to large-scale industrial systems.

Features and Specifications:

This section highlights the key features and specifications of our electric steam boilers, including:

- Energy efficiency ratings
- Heating capacity
- Pressure control options
- Compact design for easy installation
- Corrosion-resistant materials
- Safety features such as overheat protection, pressure switches and pressure relief valves
- Digital control panel for precise temperature adjustments
- Multiple heating elements for rapid water heating
- Insulation for heat retention and reduced energy consumption

Every boiler including following parts:

1. Heating Element: The heating element is the core component of an electric boiler. It is usually made of resistance wire, such as nichrome or stainless steel, which has a high electrical resistance. When an electric current passes through the heating element, it generates heat due to the resistance.

2. Control System: The control system regulates the operation of the electric boiler, ensuring efficient and safe performance. It includes various sensors, thermostats, and control switches that monitor and adjust the temperature, pressure, and flow rate of the water or steam.

3. Water Tank or Heat Exchanger: In electric boilers used for heating water, a water tank or heat exchanger is present to hold and heat the water. The heating element is immersed in the water or wrapped around the heat exchanger, transferring heat to the water.

4. Feedwater Pump: A centrifugal multistage pump is used to feed the water throughout the boiler. It ensures even distribution of heat and maintains a constant flow rate.

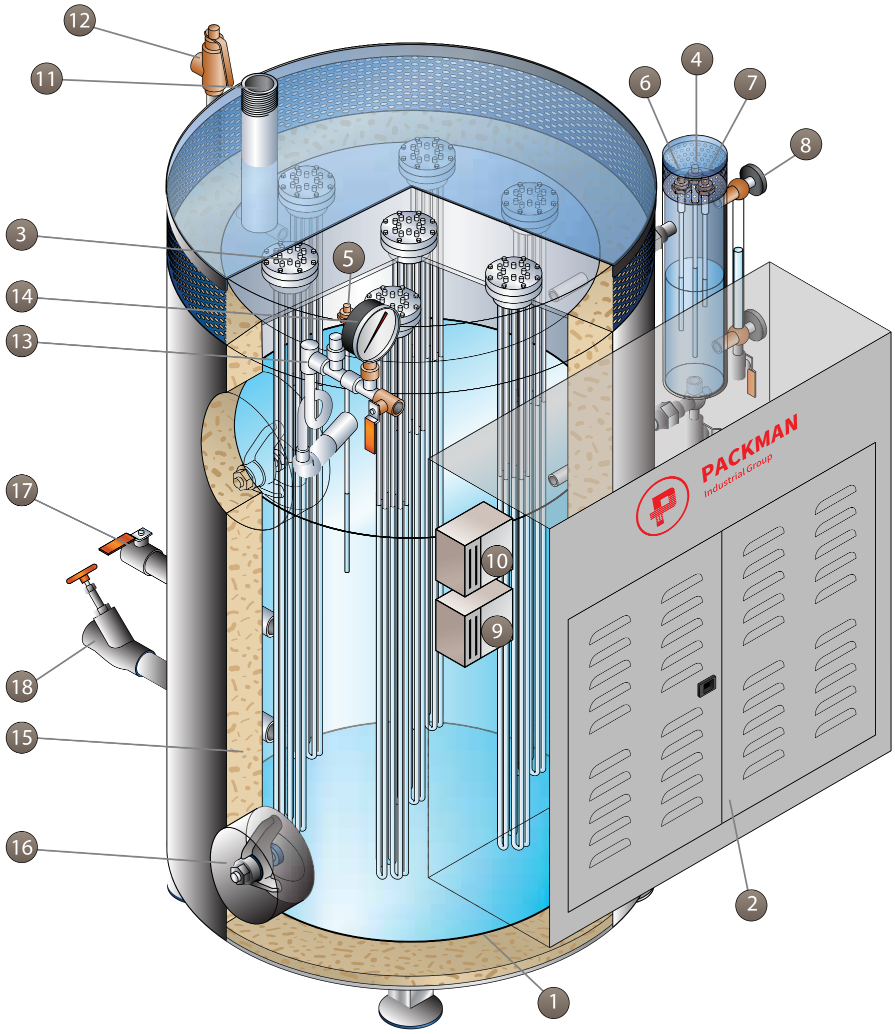
5. Safety Devices: Electric boilers incorporate several safety devices to prevent overheating, pressure buildup, or other potential hazards. These may include pressure relief valves, temperature limits, and automatic shutdown mechanisms.

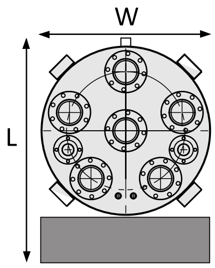
6. Control Panel: The control panel provides a user interface for operating and monitoring the electric boiler. It allows users to adjust pressure settings, view system status, and diagnose any faults or issues.

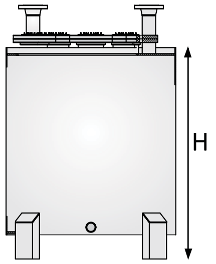
7. Energy Efficiency Features: Modern electric boilers often include energy-saving features like programmable timers, temperature controls, and insulation to minimize heat loss and optimize energy consumption.

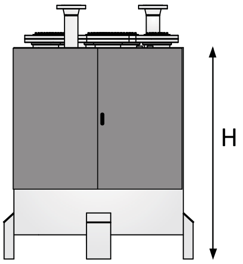
Component Locations:

1. Boiler Body	10. High Limit Pressure Control
2. Electric Control Panel	11. Steam Outlet
3. Electric Heating Elements	12. Safety Valve
4. Low Water Cut Off Switch	13. Instruments Collector
5. Water Level Control	14. Steam Pressure Gauge
6. Low Low Water Cut Off Switch	15. Boiler Body Insulation
7. High Water Level Cut Off Switch	16. Handhole
8. Sight Glass	17. Feedwater Valve
9. Operating Pressure Control	18. Blowdown Valve

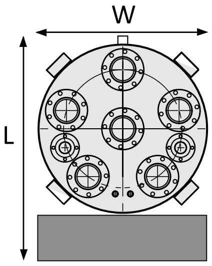


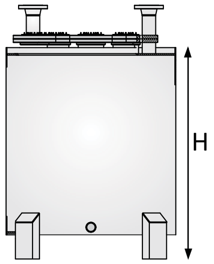


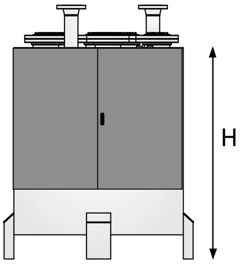




Model/ PSB-E	Unit	100	150	250	300	400	450	500
Technical Data								
Thermal Capacity	kw	70	100	170	200	270	300	350
Steam Capacity	kghr	100	150	250	300	400	450	500
Boiler Type	-	Electric Heater						
Thermal Efficiency	%	100	100	100	100	100	100	100
Maximum Working Pressure	bar	16	16	16	16	16	16	16
Number of Element	N	4	5	9	10	14	15	18
Boiler Water Content	Liter	147	212	212	288	477	477	589
Water Pressure Drop in Boiler (bar)	gpm	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Design Standard	Liter	ASME						
Material								
Element Material	-	Stainless Steel						
Shell Material	-	SA 516 Gr70						
Boiler Insulation	-	Rock Wool						
Base Plate	-	SA 36						
Cover	-	SS 403ba						
Connectoins Size								
Steam Output	in	1	1	1 1/2	1 1/2	2	2	2
Water inlet	in	1	1	1	1	1	1	1
Safety Valve	in	3/4	3/4	3/4	3/4	1	1	1
Drain Valve	in	1	1	1	1	1	1	1
Boiler Dimensions								
Width	mm	500	600	600	700	900	900	1,000
Lenght (with control panel)	mm	900	1,000	1,000	1,200	1,600	1,600	1,800
Height	mm	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Boiler Weight								
Shipping Weight @ 6 bar	kg	263	386	386	556	623	623	840
Service Weight @ 6 bar	kg	410	598	598	844	1,100	1,100	1,429
Electrical Data								
Electric Power Consumption	kw	70	100	170	200	270	300	350
No of Phase	-	3	3	3	3	3	3	3
Frequency	Hz	50	50	50	50	50	50	50
Voltage	v	400	400	400	400	400	400	400
Current	A	112	160	273	321	433	481	561
Control Panel IP Level	-	IP45	IP45	IP45	IP45	IP45	IP45	IP45







Model/ PSB-E	Unit	600	750	1000	1200	1500	2000
Technical Data							
Thermal Capacity	kw	400	500	700	800	1,000	1,300
Steam Capacity	kghr	600	750	1,000	1,200	1,500	2,000
Boiler Type	-	Electric Heater					
Thermal Efficiency	%	100	100	100	100	100	100
Maximum Working Pressure	bar	16	16	16	16	16	16
Number of Element	N	20	25	35	40	50	65
Boiler Water Content	Liter	712	904	1,061	1,385	2,010	2,010
Water Pressure Drop in Boiler (bar)	gpm	0.10	0.10	0.10	0.10	0.10	0.10
Design Standard	Liter	ASME					
Material							
Element Material	-	Stainless Steel					
Shell Material	-	SA 516 Gr70					
Boiler Insulation	-	Rock Wool					
Base Plate	-	SA 36					
Cover	-	SS 403ba					
Connectoins Size							
Steam Output	in	2	2	3	3	3	3
Water inlet	in	1	1	1	1	1	1
Safety Valve	in	1	1	11/2	11/2	11/2	2
Drain Valve	in	1	1	1	1	11/2	11/2
Boiler Dimensions							
Width	mm	1,100	1,200	1,300	1,400	1,600	1,600
Lenght (with control panel)	mm	1,900	1,950	2,000	2,200	2,400	2,400
Height	mm	1,500	1,600	1,600	1,800	2,000	2,000
Boiler Weight							
Shipping Weight @ 6 bar	kg	910	1,043	1,150	1,250	1,400	1,400
Service Weight @ 6 bar	kg	1,622	1,947	2,211	2,635	3,410	3,410
Electrical Data							
Electric Power Consumption	kw	400	500	700	800	1,000	1,300
No of Phase	-	3	3	3	3	3	3
Frequency	Hz	50	50	50	50	50	50
Voltage	v	400	400	400	400	400	400
Current	A	642	802	1,123	1,283	1,604	2,085
Control Panel IP Level	-	IP45	IP45	IP45	IP45	IP45	IP45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Thermal oil boiler
Heating Product Group
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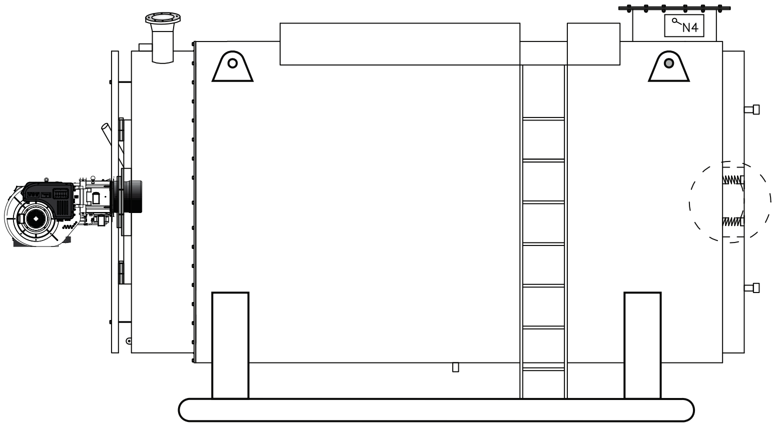
Thermal Oil Boiler **page**



Thermal Oil Boiler

Product Description

Thermal Oil Heaters are widely used to supply heat up to 350C at very low pressure, typically just the pressure required to pump the oil through the system. Whereas other heating fluids would require a pressure of 85 bar to achieve this temperature.

In(typical) industrial processes a high temperature fluid is often required, and achieving this steam can be controversial and expensive.

Steam is typically used as a heat medium in heating systems. But at high temperatures, steam requires a corresponding high operating pressure. Steam is typically used as a heat medium in heating systems. But at high temperatures, stea m requires a corresponding high operating pressure. In (typical) industrial processes a high temperature fluid is often required, and achieving this steam can be controversial and expensive.

Thermal oil heaters are widely used to supply heat up to 300°C at very low pressure, typically just the pressure required to pump the oil through the system. Where as other heating fluids would require a pressure of 85 bar to achieve this temperature.

Advantages

Oil Heating Systems, in comparison to other heating systems like the producing steam offer many advantages, which can be listed as follows:

- Low pressure
- High temperature (Consequently smaller heating surface is required)
- No risk of corrosion (Oil is an effective preservative, thus the system's life would be considerably longer) than other heating systems
- No risk of freezing when the plant is shut down
- No scale deposits
- No softener required for pretreatment of the boiler feed
- No chemical dosing system required
- No heat loss due to hot condensate and flash steam
- No steam trap required
- No Blow down system needed
- No risk of compressed gas explosion
- No deaereator or condensation tank required

- No vaccum Breaker needed
- No supervision required
- Less necessary maintenance
- Higher performance & efficiency
- More safety
- More reliability
- Accurate temperature control is possible
- Quiet operation (no steam stroke & flash steam noise)
- Easy to operate
- Robust construction

- Glue industry
- Food processing industry
- Metal industry
- Tyre industry
- Design & Construction
- Paint & varnish industry
- Packing & packaging industry
- Glass industry
- Industrial laundries

Industrial Applications

Thermal oil heaters are used in the following industries:

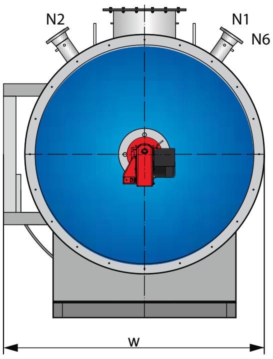
- Cement industry
- Chemical / petrochemical industry
- Polymer industry
- Textile industry
- Leather industry
- Oil industry
- Bitumen & Tar processing industry
- Paper mills industry
- Wood industry
- Soap & Detergent industry
- Pharmaceutical industry

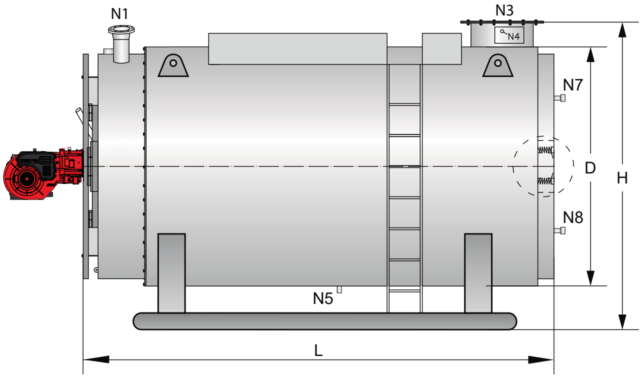
The design & construction of Thermal Oil Heaters require special skills. Due to the fact that we have a permanent top level quality control, we can offer Thermal Oil Heaters featuring the best heating surface, efficiency, safety, reliability & durability. The design is based on a forced circulation. The heater consists of two sets of tubes which are coiled to form 2 coaxial cylinder. The flue gas is conducted in a three pass counter flow system as described below:

1st Pass - The rediant heat of the burner's flame is transferred to the thermal oil in the main combustion chamber.

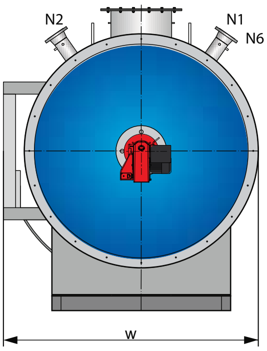
2nd Pass - Combustion gases then pass through the space between the

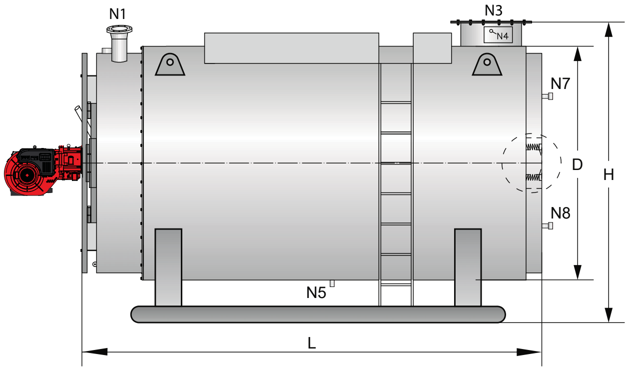
inner and outer coiled tube, where the heat is transferred by convection.
3rdPass - The last convection pass is between the outer coil and the heater's shell, where combustion gases are here after cooled.
This design ensures that maximum heat transfer is achieved before the combustion gases exit the heater, it is warranting high thermal efficiency. Maximum heat transfer is also affected by thermal fluid's velocity and heating surface area. In order to achieve maximum heat transfer and low pressure drop and also to protect oil from degradation, the optimum fluid velocity and heat flux rate must be achieved and maintained which is possible through our optimum design of coil's cross sectional area. The design philosophy ensures that the film temperature in tubes is not exceeded beyond its permissible limits for parts of the tubes exposed to flame impingement. We carry out thorough analysis to determine whether this temperature requirement is met. The maximum film temperature is then used to calculate the service life of thermal oil. It should be noted that for the case of thermal oil, low film temperature, ensures longer life. We provide modest volume of the thermal oil while considering the heater's capacity. Our design also provides the necessary means for safe thermal expansion due to high temperature of the oil. Furthermore, coil's life is extended by optimizing length to diameter ratio and heat flux rate.
Packman supplies a comprehensive set of safety control systems for thermal oil heaters. The logic of control elements comply with the stringent regulations enforced by DIN 4754. There are many safety interlocks, incorporated in the system. All of our heaters provide continuous flow monitoring by means of differential pressure controllers. The flow monitoring is an essential future in oil heating systems, as it measures and monitors the minimum flow rate. If the flow rate drops below a certain minimum value, the firing will be shut down.
Also the thermostats measuring the temperature of flue gases, supply and return oil are connected to the firing system and shall prevent an inadmissible temperature rise in the system. A level switch is also included in the expansion tank which is connected to the feed pump and the burner.
Packman will integrate your desired control requirements from basic relay logic to advanced PLC in order to interface with your plant.



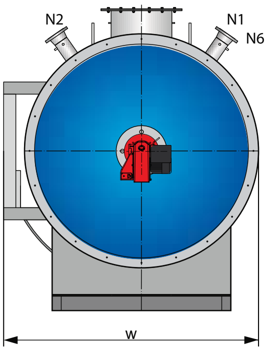


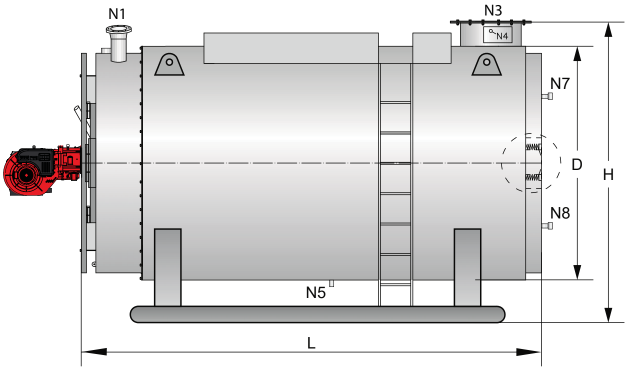
Item No.	Description	Specification
Designe Data		
1	Heater Configuration	Horizontal
2	Heating Capacity Range	From 250.000 to 4.000.000 Kcal/hr
3	Max. Operating temp. of Thermal Oil	300 °C
4	Design Temp. of Thermal Oil	350 °C
5	Diffrential Temp. Of Thermal Oil	25 °C or 40 °C
6	Permissible Operating Pressure	8.5 bar g
7	Design pressure	10 bar g
8	Pneumatic Or Hydrostatic Test Pressure	15 bar g
9	Thermal Efficiency	83-85%
10	No. Of Circulation Of Flue gasses	3 pass
11	Coil Material	St 35.8 according to DIN 17175
12	Shell Material	17 Mn 4 according to DIN 17155 (1.0481)
13	Return Chamber Material	17 Mn 4 according to DIN 17155 (1.0481)
14	Heater Standard	According to DIN 4754
15	Shell Insulation	Rock wool, Thk, 150 mm, Density 120 kg/m3
16	Shell Cover	Stainless steel SS 304, Thk. 1.5 mm
17	Test Typ	100% Radiography, Pneumatic, Penetration



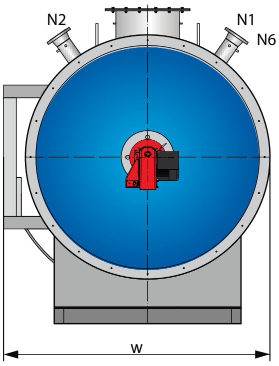


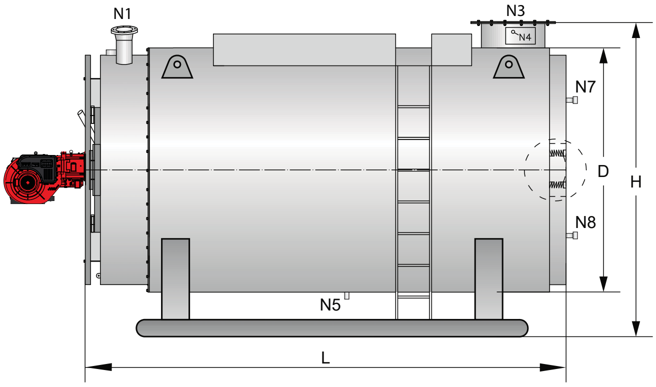
Model	Unit	PTOH-250	PTOH-500	PTOH-600	PTOH-750	PTOH-800	PTOH-1000
Lengths							
Thermal Capacity	kw	300	600	700	900	950	1,150
Thermal Capacity	kcal/hr	250,000	500,000	600,000	750,000	800,000	1,000,000
Boiler Type	-	Three Pass					
Working Pressure	bar	Up to 16					
Pressure Drop in Combustion Chamber	mbar	2.2	2.5	3.1	3.9	4.2	5.9
Design Standard	-	DIN 4754					
Max Gas Consumption @Sea Level	m^3/hr	30	60	70	90	95	115
Max Fuel Oil Consumption @Sea Level	litr/hr	25	50	58	75	79	96
Max Heavy Fuel Oil Consumption @Sea Level	litr/hr	21	43	50	64	68	82
Connectoins							
Oil Outlet (N2)	in	2	2	2	3	3	4
Oil Inlet (N1)	in	2	2	2	3	3	4
Condensate Discharge (N5)	in	1	1	1	1	1	1
Thermo Meter (N4)	in	1/2	1/2	1/2	1/2	1/2	1/2
Instrument Manifold (N6)	in	1/2	1/2	1/2	1/2	1/2	1/2
Venting Valve (N7)	in	1	1	1	1	1	1
Drainage Valve (N8)	in	1	1	1	1 1/2	1 1/2	1 1/2
Stack I.D. (N3)	mm	250	250	300	350	400	400
Boiler Dimensions							
Lengths (L)	mm	1,980	2,400	2,700	3,130	3,200	3,400
Width (W)	mm	1,460	1,600	1,600	1,600	1,750	1,980
Height (H)	mm	1,920	2,100	2,100	2,100	2,200	2,500
Min Front Clearance	mm	1,386	1,680	1,890	2,191	2,240	2,380
Min Rear Clearance	mm	1,000	1,000	1,000	1,000	1,000	1,000
Min Side Clearance	mm	1,000	1,000	1,000	1,000	1,000	1,000



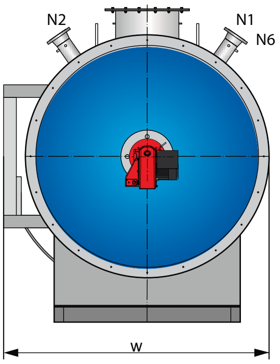


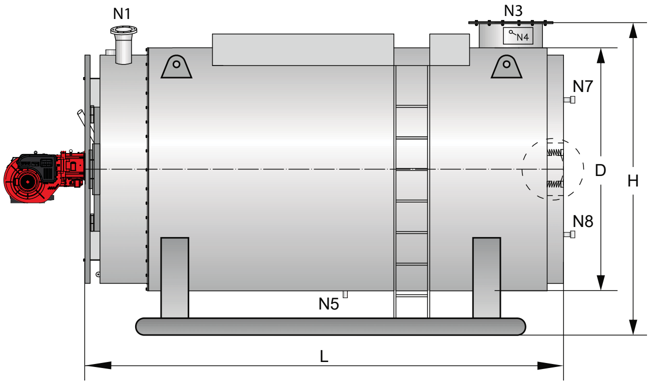
Model	Unit	PTOH-1250	PTOH-1500	PTOH-1750	PTOH-2000	PTOH-2250	PTOH-2500
Lengths							
Thermal Capacity	kw	1,500	1,750	2,000	2,500	2,750	3,000
Thermal Capacity	kcal/hr	1,250,000	1,500,000	1,750,000	2,000,000	2,250,000	2,500,000
Boiler Type	-	Three Pass					
Working Pressure	bar	Up to 16					
Pressure Drop in Combustion Chamber	mbar	4.1	4.8	4.2	6.7	5.1	5.1
Design Standard	-	DIN 4754					
Max Gas Consumption @Sea Level	m^3/hr	150	175	200	250	275	300
Max Fuel Oil Consumption @Sea Level	litr/hr	125	146	167	208	229	250
Max Heavy Fuel Oil Consumption @Sea Level	litr/hr	107	125	143	179	196	214
Connectoins							
Oil Outlet (N2)	in	4	4	5	6	6	6
Oil Inlet (N1)	in	4	4	5	6	6	6
Condensate Discharge (N5)	in	1	1	1	1	1	1
Thermo Meter (N4)	in	1/2	1/2	1/2	1/2	1/2	1/2
Instrument Manifold (N6)	in	1/2	1/2	1/2	1/2	1/2	1/2
Venting Valve (N7)	in	1	1	1	1	1	1
Drainage Valve (N8)	in	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
Stack I.D. (N3)	mm	450	450	500	600	600	600
Boiler Dimensions							
Lengths (L)	mm	3,580	3,620	3,620	3,750	4,000	4,400
Width (W)	mm	2,020	2,020	2,300	2,300	2,300	2,400
Height (H)	mm	2,600	2,600	2,750	2,870	2,870	3,040
Min Front Clearance	mm	2,506	2,534	2,534	2,625	2,800	3,080
Min Rear Clearance	mm	1,000	1,000	1,000	1,000	1,000	1,000
Min Side Clearance	mm	1,000	1,000	1,000	1,000	1,000	1,000





Model	Unit	PTOH-2750	PTOH-3000	PTOH-3250	PTOH-3500
Lengths					
Thermal Capacity	kw	3,200	3,500	3,750	4,000
Thermal Capacity	kcal/ hr	2,750,000	3,000,000	3,250,000	3,500,000
Boiler Type	-	Three Pass			
Working Pressure	bar	Up to 16			
Pressure Drop in Combustion Chamber	mbar	5.5	6.3	6.0	5.9
Design Standard	-	DIN 4754			
Max Gas Consumption@Sea Level	m^3/hr	320	350	375	400
Max Fuel Oil Consumption @SeLevel	litr/hr	267	292	313	333
Max Heavy Fuel Oil Consumption @Sea Level	litr/hr	229	250	268	286
Connectoins					
Oil Outlet (N2)	in	8	8	8	8
Oil Inlet (N1)	in	8	8	8	8
Condensate Discharge (N5)	in	1	1	1	1
Thermo Meter (N4)	in	1/2	1/2	1/2	1/2
Instrument Manifold (N6)	in	1/2	1/2	1/2	1/2
Venting Valve (N7)	in	1	1	1	1
Drainage Valve (N8)	in	1 1/2	1 1/2	1 1/2	1 1/2
Stack I.D. (N3)	mm	750	750	750	750
Boiler Dimensions					
Lengths (L)	mm	5,140	5,140	5,500	5,730
Width (W)	mm	2,500	2,500	2,500	2,500
Height (H)	mm	3,100	3,100	3,100	3,100
Min Front Clearance	mm	3,598	3,598	3,850	4,011
Min Rear Clearance	mm	1,500	1,500	1,500	1,500
Min Side Clearance	mm	1,500	1,500	1,500	1,500





Model	Unit	PTOH-3750	PTOH-4000	PTOH-5000	PTOH-6000
Lengths					
Thermal Capacity	kw	4,500	5,000	6,000	7,000
Thermal Capacity	kcal/hr	3,750,000	4,000,000	5,000,000	6,000,000
Boiler Type	-	Three Pass			
Working Pressure	bar	Up to 16			
Pressure Drop in Combustion Chamber	mbar	6.5	6.7	7.2	7.0
Design Standard	-	DIN 4754			
Max Gas Consumption @Sea Level	m^3/hr	450	500	600	700
Max Fuel Oil Consumption @Sea Level	litr/hr	375	417	500	583
Max Heavy Fuel Oil Consumption @Sea Level	litr/hr	321	357	429	500
Connectoins					
Oil Outlet (N2)	in	8	10	10	10
Oil Inlet (N1)	in	8	10	10	10
Condensate Discharge (N5)	in	1	1	1	1
Thermo Meter (N4)	in	1/2	1/2	1/2	1/2
Instrument Manifold (N6)	in	1/2	1/2	1/2	1/2
Venting Valve (N7)	in	1	1	1	1
Drainage Valve (N8)	in	1 1/2	1 1/2	1 1/2	1 1/2
Stack I.D. (N3)	mm	800	900	900	900
Boiler Dimensions					
Lengths (L)	mm	6,500	6,800	7,000	7,500
Width (W)	mm	2,800	3,000	3,200	3,300
Height (H)	mm	3,200	3,300	3,300	3,500
Min Front Clearance	mm	4,550	4,760	4,900	5,250
Min Rear Clearance	mm	1,500	1,500	1,500	1,500
Min Side Clearance	mm	1,500	1,500	1,500	1,500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Waste Heat Boiler
Heating Product Group
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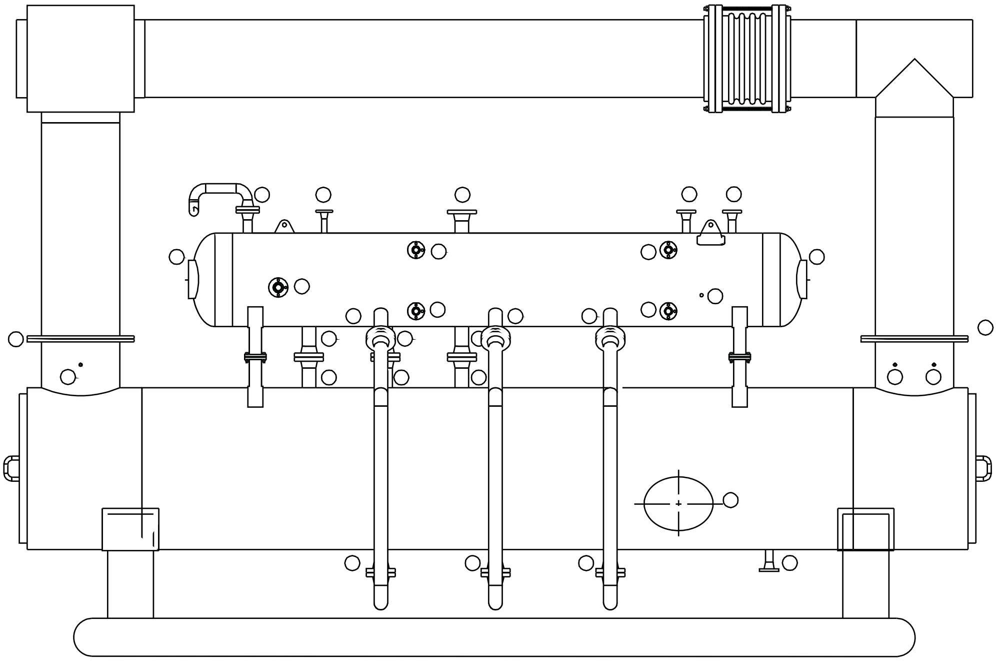
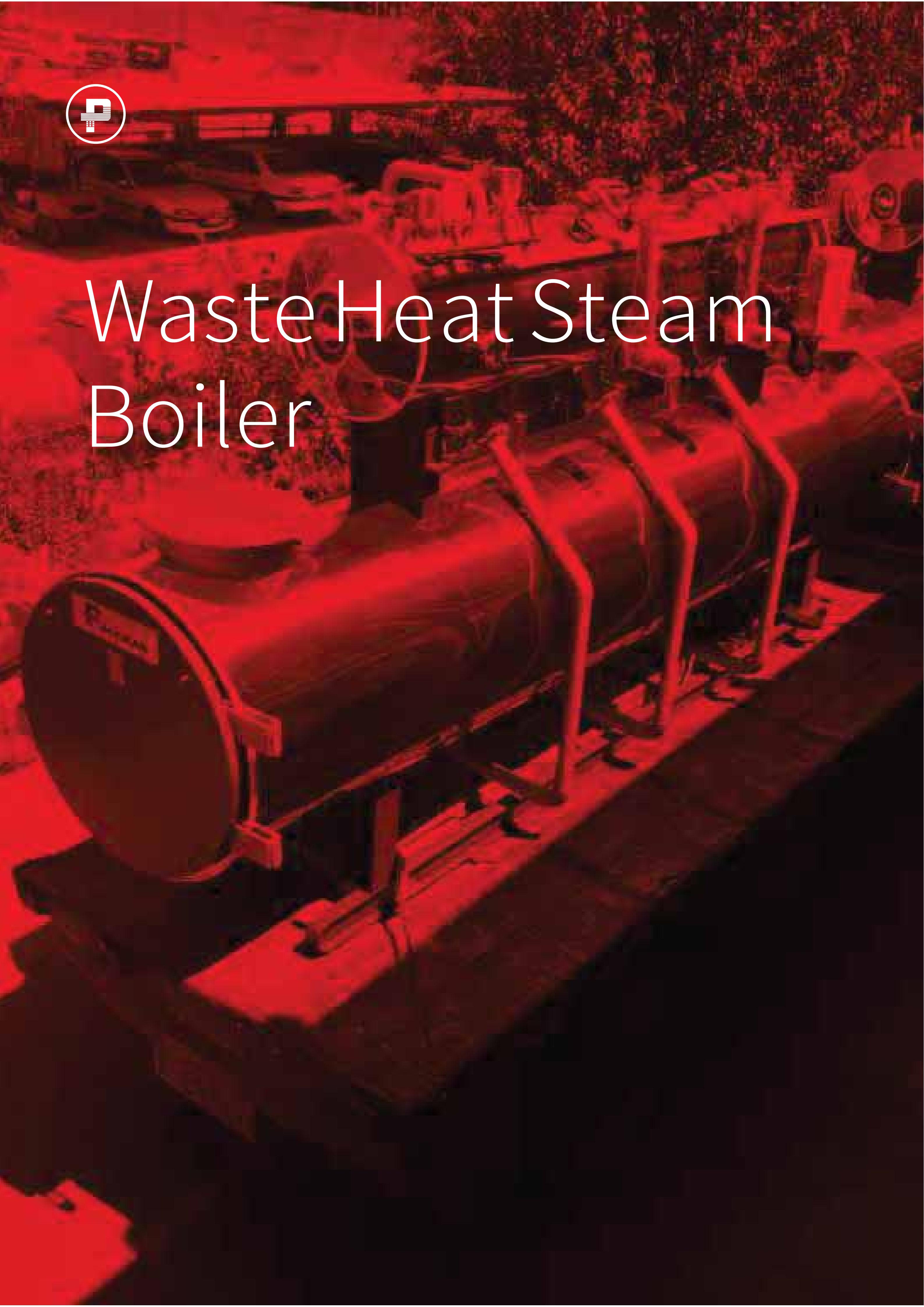


Waste Heat Steam Boiler



Product Description

Waste Heat Steam Boilers (WHSB) use the wasted energy from any process plant like exhaust gases from engine-operated CHP units, gas turbines, industrial processes with waste heat exhaust gas to generate steam. As steam generator systems, they are energy efficient in operation and can be put to many applications. The range for saturated or superheated steam extends from 1 to 25 bar gauge, while the capacity is between 100 and 25,000 kg of generated steam per hour. Control with the automatic Controlling System.

Packman Waste Heat Boiler Advantages

- Efficient steam generation in combined heat and power plants
- Cost-saving and reliable operation of the systems
- Maximum functionality, safety and service
- Performance areas: 1 to 25 barg, 100 to 25,000 kg/h
- Certifications: BS/EN-12953 European
- Can be used in all plants with exhaust gases from hydrogen, natural gas, biogas, sewage gas and special gases, plus diesel and other liquid fuels
- Single, double version for operation with one or two engines with completely separate exhaust gas sections
- The Controlling System is individually adapted to each project and is delivered in the required specifications.

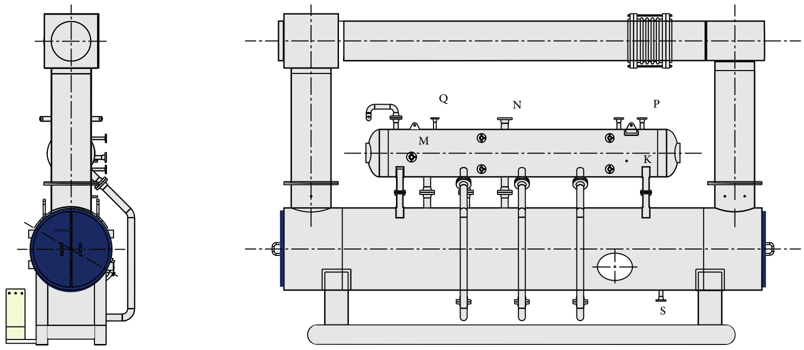
steam generator systems are ready for connection and complement one another within precisely matched components. The main boiler body with prescribed safety technology forms the foundation. Economizers, bypass solutions and a pump unit are added, as is modern and convenient control and regulation technology. This wide-ranging scope of delivery guarantees custom-made applications and offers safe, fault-free and low-maintenance plant operation.

Applications

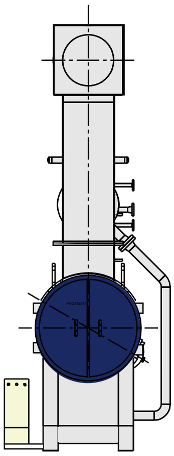
steam boilers are used in the following industries:

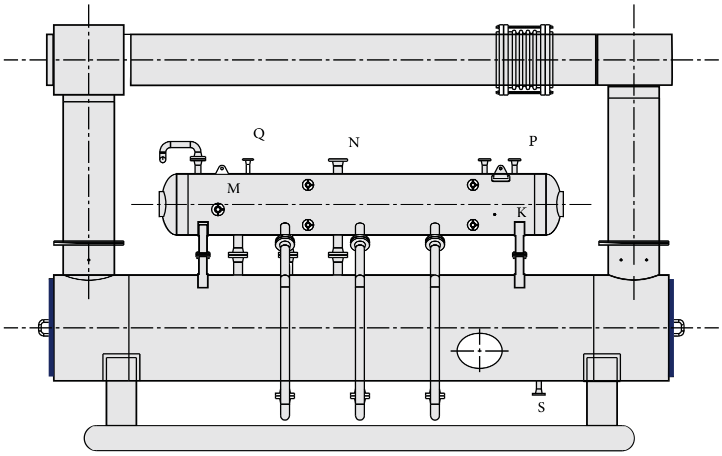
Food processing, textile industry, pharmaceuticals, paper production, chemical industry

The economizer preheats the feed water and cools the exhaust gas below the saturated steam temperature. This enables better use of the energy in the exhaust gas, which considerably improves the energy balance and significantly increases the amount of steam. The remaining residual energy in the exhaust gas can additionally be used in an exhaust gas heat exchanger. The superheater raises the temperature above the saturated steam temperature for steam transport or in applications where superheated steam is required, such as in steam turbines.



Model	Unit	PSB-WH-500	PSB-WH-700	PSB-WH-1000	PSB-WH-1250	PSB-WH-1500
Technical Data						
Thermal Capacity	kW	500	700	1000	1250	1500
Steam Output	Kg/h	750	1000	1500	2000	2500
Working Pressure	bar	Up to 20				Up to 20
Pressure Drop in Combustion Chamber	mbar	3.5				3.2
Inlet Exhaust Temperature	°C	400-500	400-500	400-500	400-500	400-500
Outlet Exhaust Temperature	°C	220				220
Economizer Outlet Exhaust Temperature	°C	120	120	120	120	120
Water Inlet Temperature	°C	105	105	105	105	105
Connection Size						
Steam Outlet @10barg (N)	in	2	3	3	3	3
Safety Valve @10barg (P)	in	1	1	1	1	1 1/2
Sampling (K)	in	1/2	1/2	1/2	1/2	1/2
Feeding Valve (M)	in	1	1	1	1	1 1/2
Vent Valve (Q)	in	3/4	3/4	1	1	1
Drainage Valve (S)	in	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2
Boiler Dimension						
Boiler Dimension	mm	Call Packman Technical Office				

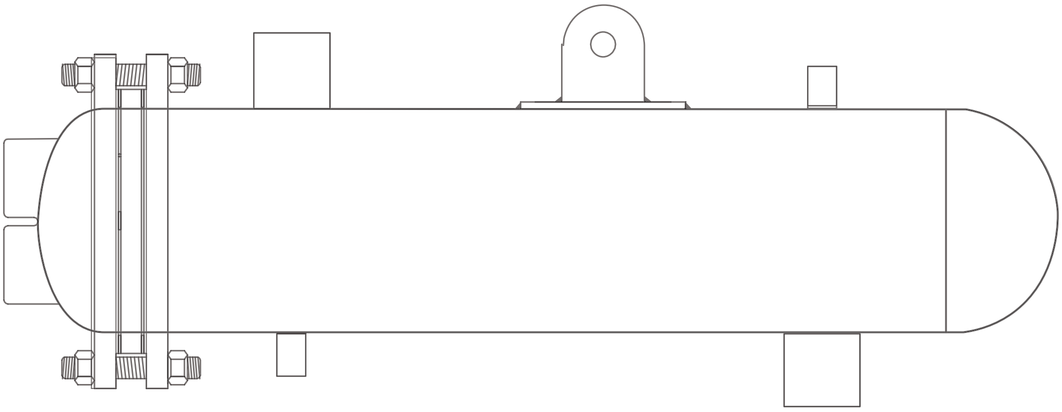




Model	Unit	PSB-WH-1750	PSB-WH-2000	PSB-WH-2500	PSB-WH-3000	PSB-WH-3500
Thermal Capacity	kW	1750	2000	2500	3000	3500
Steam Output	Kg/h	3000	3500	4000	4500	5000
Working Pressure	bar	Up to 20	Up to 20	Up to 20	Up to 20	Up to 20
Pressure Drop in Combustion Chamber	mbar	3.5	3.5	3	3.5	4
Inlet Exhaust Temperature	°C	400-500	400-500	400-500	400-500	400-500
Outlet Exhaust Temperature	°C	220	220	220	220	220
Economizer Outlet Exhaust Temperature	°C	120	120	120	120	120
Water Inlet Temperature	°C	105	105	105	105	105
Connection Size						
Steam Outlet @10barg (N)	in	3	4	5	6	6
Safety Valve @10barg (P)	in	1 1/2	1 1/2	1 1/2	2	2
Sampling (K)	in	1/2	1/2	1/2	1/2	1/2
Feeding Valve (M)	in	1 1/2	2	2	2	2
Vent Valve (Q)	in	1	1	1	1	1
Drainage Valve (S)	in	1 1/2	1 1/2	1 1/2	1 1/2	2
Boiler Dimension						
Boiler Dimension	mm	Call Packman Technical Office				

Heat Exchanger
Heating Product Group
PACKMAN

Heat Exchanger **page**



Heat Exchanger

Product Description

A Shell and Tube Heat Exchanger is the most common type of heat exchangers used in oil refineries and other large chemical processes, and is also suitable for higher-pressure applications. As its name implies, this type of heat exchanger consists of a shell (a large pressure vessel) with a bundle of tubes inside it. One fluid runs through the tubes, and another fluid flows over the tubes (through the shell) the heat is then transferred between the two fluids. The set of tubes which is called a tube bundle, may be composed of several types of tubes: plain,longitudinally finned, etc.
the fluids can be either liquids or gases. In order to heat exchangers which don't experience any phase change between inlet & outlet fluids (liquid or gas) on each side can be called one-phase or single-phase heat exchangers. Twophase heat exchangers can be used to heat a liquid to boil it into a gas (vapor),sometimes called boilers, or cool a vapor to a liquid (called condensers), with the.

PACKMAN'S Heat Exchanger Properties

Shell and tube Heat Exchangers of PACKMAN Company are U-TYPE and Duplex with Copper Coil.ASME VIII DIV.1 & THEMA CLASS C standards are observed in Heat exchanger's production exchanger's are analyzed, dsigned and tested via relevant engineering software.
PACKMAN'S heat exchanger's are designed in different diameters from 6 inches to 30 inches, to meet the customer's needs.
The shell made of as advised in the relevant standard. The shell can also be made of stainless steel in case of customer's request. The tubes are the best-quality seamless copper pipes which make the highest heat transfer & efficiencies possible.
The diameter of the tube used in the exchanger is 3/4 inches the thicknesses selected in according with working pressure considering the triangular tube layout.
In this type of exchangers, pipes are connected to the tube-sheet with waltz welding and the tube are easily re place able.
Packman's exchanger's caps with diameters of up to 14-inch are made of cast iron. Water inlet & outlet Nozzles are in parallel. Higher diameter exchanger's caps are made of steel and water inlet & outlet nozzles are perpendicular with respect to each other.

Design Of Heat Exchanger

In order to optimize the heat exchanger's design, it is necessary to specify characteristics such as the fluid's flow rate, the inlet and outlet temperature of the fluid's. The heat transfer capacity can replace one of the afore mentioned data in input's list. In order to use a fluid other than water in the heat exchanger's the design of the exchanger changes accordingly.

Thermal design of a shell and tube heat exchanger typically includes the determination of heat transfer area, number of tubes, tube's length and diameter, tube's layout, number of tube passes, type of heat exchanger (fixed tube sheet, removable tube bundle etc.), tube's pitch, number of baffles, their type and size, shell and tube side pressure drop, etc.

Shell is the container for one of the fluids and the tube bundle is placed inside the shell. Shell's diameter should be selected to give a close fit to the tube bundle. The clearance between the tube bundle and inner shell's wall depends on the type of exchanger. Shells are usually fabricated from standard steel sheets with a satisfactory corrosion allowance. The shell's thickness of 3/8 inches for the internal diameters of 12 to 24 inches is reasonable for operating pressures of up to 300 psi.

The most efficient condition for heat transfer is to have the maximum possible number of tubes in the shell to increase turbulence. The tube's thicknesses should be enough to withstand the internal pressure considering the adequate corrosion allowance. The tube thickness is expressed in terms of BWG (Birmingham Wire Gauge) and true outside diameter (OD). The tube's length of 6, 8, 12, 16, 20 and 24 ft are preferably used. Using longer tubes reduce shell diameter at the expense of higher shell's pressure drop. Stainless steel, admiralty brass, copper, bronze and alloys of copper-nickel are the commonly used tube materials.

The number of passes is chosen to get the required tube side fluid velocity to obtain greater heat transfer co-efficients and also reduce scale formation. The tube passes may vary from 1 to 16. The tube passes of 1, 2 and 4 are common in Packman's designs. The partition built into the exchanger's head known as partition plate (also called pass partition) is used to direct the tube's flow.

Product Capacity Calculation & Selection

Shell and tube heat exchanger's are designed by trial and error. The design is mainly based on the Kern method. Once the correct type of exchanger has been chosen, the engineering staff of the supplier will need to make sure that the model supplied is correctly sized for the job. The basic heat design equation, which has been widely used for many years, is:

$Q=U\ A\ \Delta Tm$

Where:

Q is the rate of heat transfer between the two fluids in the heat exchanger

U is the overall heat transfer coefficient. This depends on the conductive properties of the fluids and the material used in heat exchanger

A is the heat transfer surface area

Δtm is the logarithmic temperature difference, calculated from the inlet and outlet temperatures of both fluids. The value of U is harder to calculate:

$$U=\frac{1}{\frac{1}{h_1}+R_{fl}+R_W\ \frac{1}{h_2}+R_{f2}}$$

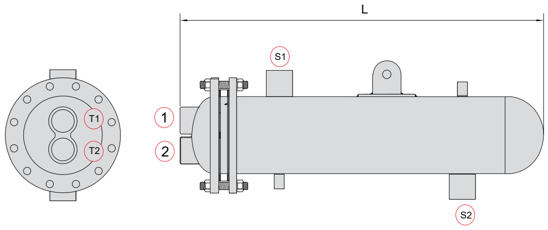
h1 and h2 are the partial heat transfer coefficients, W/m2.K (tube and shell side respectively)

Rw is the thermal resistance of the wall, m2.K/W

Rf1 and Rf2 are the fouling factors, m2.K/W (tube and shell side respectively)

While the values for Rf are usually specified by the client, the values of h and Rw may be influenced directly by the choice of tube size and thickness, and the materials used for construction. The values of the partial heat transfer coefficients h depend greatly on the nature of the fluids but also, crucially, on the geometry of the heat transfer surfaces with which they are in contact. Importantly, the final values are heavily influenced by what happens at the level of boundary layers: the fluid actually in contact with the heat transfer surface. The driving force for heat transfer is the difference in temperature between the two elements. In the case of a tubular heat exchanger, the temperature of the two fluids changes as they pass through the heat exchanger.

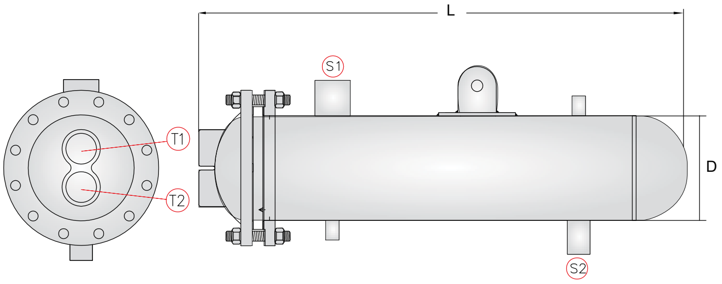
Heat Exchanger (Water to Water)



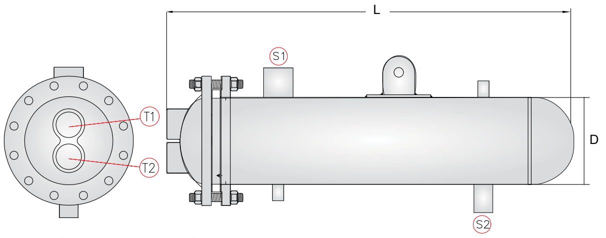
Model	Tube Sheet Size	Heating Surface (sq ft)	Water Inlet (S1)	Water Outlet (S2)	Hot Water Inlet (T1)	Hot Water outlet (T2)	Total Length (mm)
Technical Data							
PHXW-65	6”	5'	2"	2"	2"	2"	600
PHXW-67		7.5'	2"	2"	2"	2"	850
PHXW-610		10'	2"	2"	2"	2"	1050
PHXW-612		12.5'	2"	2"	2"	2"	1300
PHXW-615		15'	2"	2"	2"	2"	1500
PHXW-617		17.5'	2"	2"	2"	2"	1700
PHXW-620		20'	2"	2"	2"	2"	1950
PHXW-622		22.5'	2"	2"	2"	2"	2200
PHXW-820	8”	20'	2"	2"	2"	2"	1100
PHXS-825		25’	2"	2"	2"	2"	1300
PHXW-830		30'	2"	2"	2"	2"	1550
PHXW-835		35'	2"	2"	2"	2"	1650
PHXW-840		40'	2"	2"	2"	2"	1850
PHXW-1035	10”	35'	2,1/2"	2,1/2"	3"	3"	1150
PHXW-1040		40'	2,1/2"	2,1/2"	3"	3"	1300
PHXW-1045		45'	2,1/2"	2,1/2"	3"	3"	1500
PHXW-1050		50'	2,1/2"	2,1/2"	3"	3"	1600
PHXW-1055		55'	2,1/2"	2,1/2"	3"	3"	1700
PHXW-1060		60’	2,1/2”	2,1/2”	3"	3"	1850
PHXW-1075		75’	2,1/2”	2,1/2”	3"	3"	2250
PHXW-10116		116’	2,1/2”	2,1/2”	3"	3"	3300
PHXW-1260	12”	60'	3"	3"	3"	3"	1400
PHXW-1270		70'	3"	3"	3"	3"	1600
PHXW-1280		80'	3"	3"	3"	3"	1800
PHXW-1290		90'	3"	3"	3"	3"	1900
PHXW-12100		100'	3"	3"	3"	3"	2100
PHXW-1480	14”	80'	3"	3"	3"	3"	1550
PHXW-1490		90'	3"	3"	3"	3"	1600
PHXW-14100		100'	3"	3"	3"	3"	1750
PHXW-14110		110'	3"	3"	3"	3"	1900
PHXW-14120		120'	3"	3"	3"	3"	2000

Model	Tube Sheet Size	Heating Surface (sq ft)	Water Inlet (S1)	Water Outlet (S2)	Hot Water Inlet (T1)	Hot Water outlet (T2)	Total Length (mm)
Technical Data							
PHXW-16100	16”	100'	4"	4"	4"	4"	1450
PHXW-16110		110'	4"	4"	4"	4"	1560
PHXW-16120		120'	4"	4"	4"	4"	1700
PHXW-16130		130'	4"	4"	4"	4"	1760
PHXW-16140		140'	4"	4"	4"	4"	1860
PHXW-16150		150'	4"	4"	4"	4"	1960
PHXW-16160		160'	4"	4"	4"	4"	2060
PHXW-18140	18”	140'	4"	4"	4"	4"	2140
PHXW-18150		150'	4"	4"	4"	4"	2200
PHXW-18160		160'	4"	4"	4"	4"	2240
PHXW-18170		170'	4"	4"	4"	4"	2340
PHXW-18180		180'	4"	4"	4"	4"	2440
PHXW-18190		190'	4"	4"	4"	4"	2500
PHXW-18200		200'	4"	4"	4"	4"	2540
PHXW-18210		210'	4"	4"	4"	4"	2640
PHXW-20200	20”	200'	6"	6"	8"	8"	2330
PHXW-20210		210'	6"	6"	8"	8"	2370
PHXW-20220		220'	6"	6"	8"	8"	2470
PHXW-20230		230'	6"	6"	8"	8"	2500
PHXW-20240		240'	6"	6"	8"	8"	2570
PHXW-20250		250'	6"	6"	8"	8"	2670
PHXW-20260		260'	6"	6"	8"	8"	2720
PHXW-20270		270'	6"	6"	8"	8"	2770
PHXW-20280		280'	6"	6"	8"	8"	2870
PHXW-24290	24”	290'	8"	8"	10"	10"	2330
PHXW-24300		300'	8"	8"	10"	10"	2330
PHXW-24320		320'	8"	8"	10"	10"	2430
PHXW-24340		340’	8"	8"	10"	10"	2530
PHXW-24360		360'	8"	8"	10"	10"	2580
PHXW-24380		380'	8"	8"	10"	10"	2630
PHXW-24400		400'	8"	8"	10"	10"	2730
PHXW-24420		420'	8"	8"	10"	10"	2830
PHXW-24440		440'	8"	8"	10"	10"	2880
PHXW-24450		450’	8"	8"	10"	10"	3000

Heat Exchanger (Steam to Water)



Model	Tube Sheet Size	Heating Surface (sq ft)	Steam Inlet (S1)	Conden-sate Outlet (S2)	Hot Water Inlet (T1)	Hot Water Outlet (T2)	Total Length (mm)
Technical Data							
PHXS-65	6”	5'	2"	1"	2"	2"	600
PHXS-67		7.5'	2"	1"	2"	2"	850
PHXS-610		10'	2"	1"	2"	2"	1050
PHXS-612		12.5'	2"	1"	2"	2"	1300
PHXS-615		15'	2"	1"	2"	2"	1500
PHXS-617		17.5'	2"	1"	2"	2"	1700
PHXS-620		20'	2"	1"	2"	2"	1950
PHXS-622		22.5'	2"	1"	2"	2"	2200
PHXS-820	8”	20'	2"	1"	2"	2"	1100
PHXS-825		25'	2"	1"	2"	2"	1300
PHXS-830		30'	2"	1"	2"	2"	1550
PHXS-835		35'	2"	1"	2"	2"	1650
PHXS-840		40'	2"	1"	2"	2"	1850
PHXS-1035	10”	35'	2,1/2"	1,1/4"	3"	3"	1150
PHXS-1040		40'	2,1/2"	1,1/4"	3"	3"	1300
PHXS-1045		45'	2,1/2"	1,1/4"	3"	3"	1500
PHXS-1050		50'	2,1/2"	1,1/4"	3"	3"	1600
PHXS-1055		55'	2,1/2"	1,1/4"	3"	3"	1700
PHXS-1075		75’	2,1/2"	1,1/4"	3"	3"	2250
PHXS-1260	12”	60'	3"	1,1/2"	3"	3"	1400
PHXS-1270		70'	3"	1,1/2"	3"	3"	1600
PHXS-1280		80'	3"	1,1/2"	3"	3"	1800
PHXS-1290		90'	3"	1,1/2"	3"	3"	1900
PHXS-12100		100'	3"	1,1/2"	3"	3"	2100
PHXS-1480	14”	80'	3"	1,1/2"	3"	3"	1550
PHXS-1490		90'	3"	1,1/2"	3"	3"	1600
PHXS-14100		100'	3"	1,1/2"	3"	3"	1700
PHXS-14110		110'	3"	1,1/2"	3"	3"	1900
PHXS-14120		120'	3"	1,1/2"	3"	3"	2000
PHXS-14170		170'	3"	1,1/2"	3"	3"	2500



Model	Tube Sheet Size	Heating Surface (sq ft)	Steam Inlet (S1)	Condensate Outlet (S2)	Hot Water Inlet (T1)	Hot Water Outlet (T2)	Total Length (mm)
Technical Data							
PHXS-16100	16”	100'	4"	2"	4"	4"	1450
PHXS-16110		110'	4"	2"	4"	4"	1560
PHXS-16120		120'	4"	2"	4"	4"	1700
PHXS-16130		130'	4"	2"	4"	4"	1760
PHXS-16140		140'	4"	2"	4"	4"	1860
PHXS-16150		150'	4"	2"	4"	4"	1960
PHXS-16160		160'	4"	2"	4"	4"	2060
PHXS-18140	18”	140'	4"	2"	4"	4"	2140
PHXS-18150		150'	4"	2"	4"	4"	2140
PHXS-18160		160'	4"	2"	4"	4"	2240
PHXS-18170		170'	4"	2"	4"	4"	2340
PHXS-18180		180'	4"	2"	4"	4"	2440
PHXS-18190		190'	4"	2"	4"	4"	2500
PHXS-18200		200'	4"	2"	4"	4"	2540
PHXS-18210		210'	4"	2"	4"	4"	2640
PHXS-20200	20”	200'	6"	3"	8"	8"	2330
PHXS-20210		210'	6"	3"	8"	8"	2370
PHXS-20220		220'	6"	3"	8"	8"	2470
PHXS-20230		230'	6"	3"	8"	8"	2500
PHXS-20240		240'	6"	3"	8"	8"	2570
PHXS-20250		250'	6"	3"	8"	8"	2670
PHXS-20260		260'	6"	3"	8"	8"	2720
PHXS-20270		270'	6"	3"	8"	8"	2770
PHXS-20280		280'	6"	3"	8"	8"	2870
PHXS-24290	24”	290'	8"	4"	10"	10"	2330
PHXS-24300		300'	8"	4"	10"	10"	2330
PHXS-24320		320'	8"	4"	10"	10"	2430
PHXS-24340		340'	8"	4"	10"	10"	2530
PHXS-24360		360'	8"	4"	10"	10"	2580
PHXS-24380		380'	8"	4"	10"	10"	2630
PHXS-24400		400'	8"	4"	10"	10"	2730
PHXS-24420		420'	8"	4"	10"	10"	2830
PHXS-24440		440'	8"	4"	10"	10"	2880

- Please fill in and attach only one of the following formats to determine the capacity of the diameter and heat surface of heat exchanger.Obviously, calculating will be perfect if we have completed information.

First Format:

Heat Exchanger Water/Oil to Water/Oil ☐ Heat Exchanger Steam to Water/Oil ☐

Heating Surface (ft^2):

Shell Diameter (in):

Determine the Working Pressure (bar):

Second Format:

Heat Exchanger Water/Oil to Water/Oil ☐ Heat Exchanger Steam to Water/Oil ☐

Determine the Working Pressure (bar):

Hot Fluid Inlet and Outlet Temperature (°C):

Cold Fluid Inlet and Outlet Temperature (°C):

Hot Fluid Flow Rate (lit/hr):

Cold Fluid Flow Rate (lit/hr):

Third Format:

Heat Exchanger Water/Oil to Water/Oil ☐ Heat Exchanger Steam To Water/Oil ☐

Determine the Working Pressure (bar):

Hot Fluid Inlet and Outlet Temperature (°C):

Cold Fluid Inlet and Outlet Temperature (°C):

Thermal Capacity Exchanged Between Two Fluids (btu/hr):

Forth Format:

Pool Application:

Volume of Pool (m^3):

Volume of Jacuzzi (m^3):





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Heating Product Group
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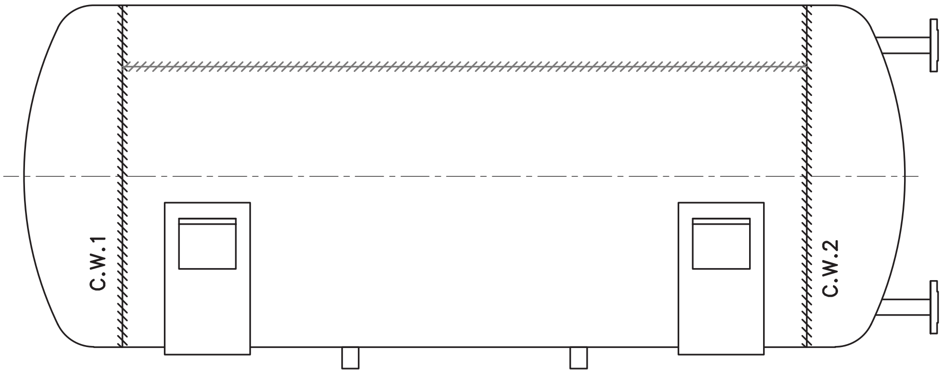
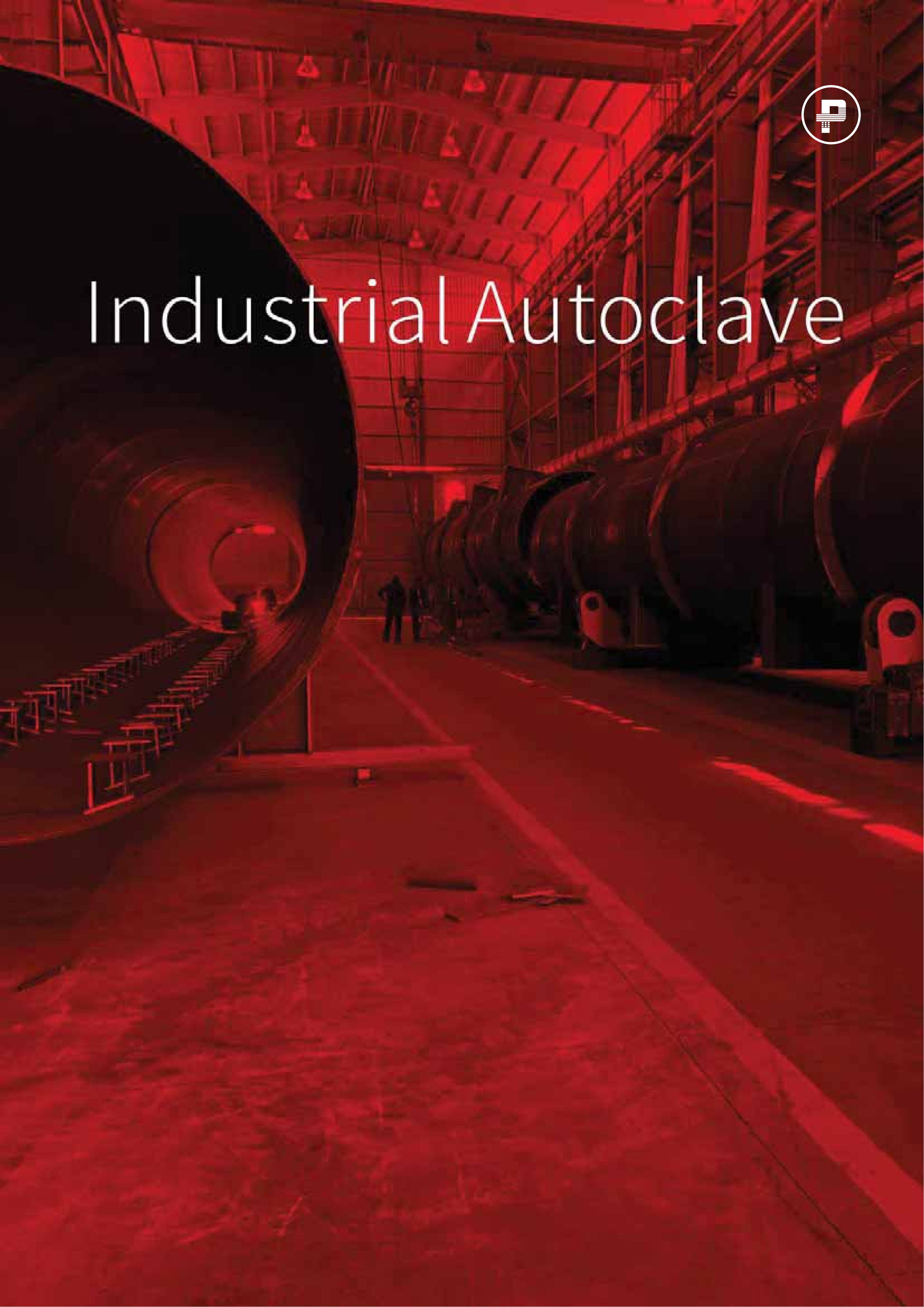
Pressurized Tanks **page**



Industrial Autoclave



Product Description

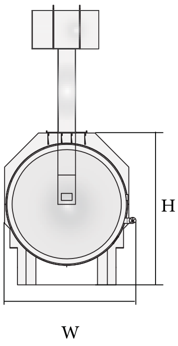
THE PACKMAN COMPANY has the most advanced production line of autoclave, adopts fully automated welding and advanced flow detection instruments, to ensure the safety and reliable operation of autoclave. Our company also design and manufacture various forms of autoclave according to customer's requirements.Industrial autoclaves belong large pressure vessel equipment, used in aerated concrete block, concrete pipe pile, sand lime brick, coal dust brick, high curing gypsum and other building materials, as well as rubber products, wood drying, preservative treatment and other production projects that require exposure to elevated pressure and temperature.

Feature

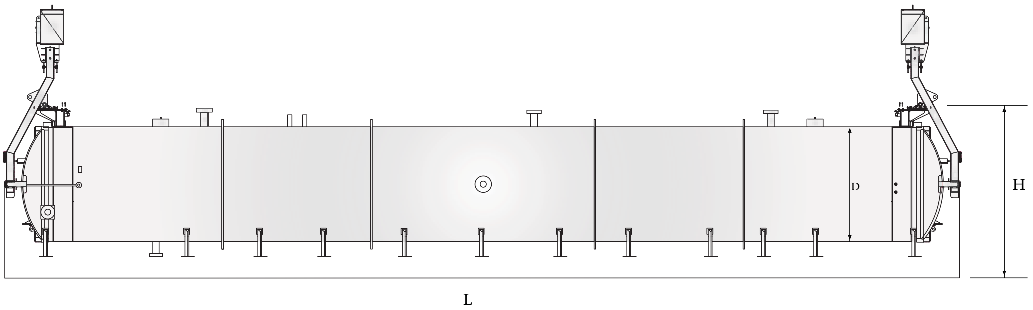
1. Autoclave door with quick open structure equipped with perfect safe interlock protection device, utmost ground to avoid the potential wrong operation, to ensure the safe operation of the auto clave and the safety of operators.
2. Imported rubber sealing ring has the advantages of simple installation, good sealing performance and long service life.
3. Good compatibility with the auxiliary equipment, short installation period, and low investment costs.
4. Depending on the customer's requirement, size of autoclave, available space, various methods are being used to handle the doors.
5. The PLC software is provided with a numerical cycle selector on the touch screen to configure cycles and cycle parameters.
6. For applications requiring vacuum bags, we offer multiple vacuum controls, valves, filtration and sensor manifolds for user- selectable production set-ups.

Quality Control

1. Strength calculation report with applied materials information.
2. 100% NDT (non-destructive inspection) report of steel plate tube and welding rod including RT and UT examination reports.
3. Hydraulic test report: ensure the standard working pressure and safety.

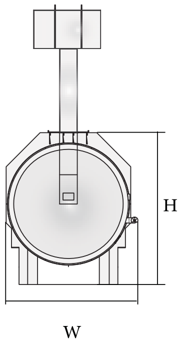


FRONT VIEW

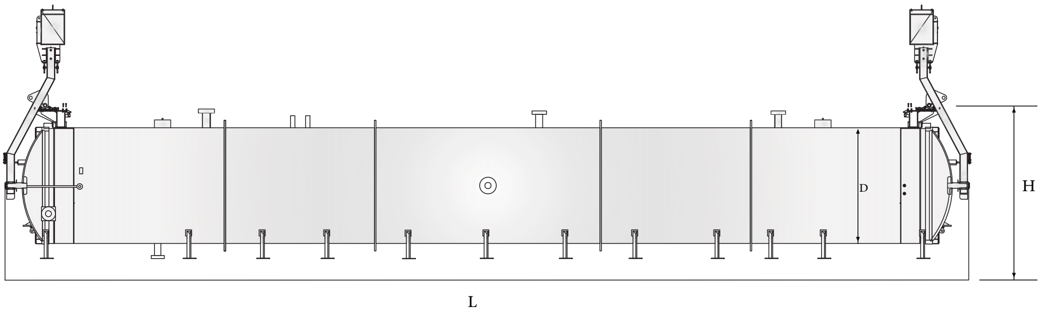


GENERAL VIEW

Model	Unit	PA 1.65x1.0	PA 1.65x1.3	PA 2.0x1.0	PA 2.0x1.1	PA 2.0x1.3	PA 2.0x1.5	PA 2.2x1.3
Technical Data								
Working Temperature	°C	184	195	184	188	195	201	195
Working Pressure	Mpa	1.0	1.3	1.0	1.1	1.3	1.5	1.3
Design Pressure	Mpa	1.1	1.4	1.1	1.2	1.4	1.6	1.4
Design Temperature	°C	187	198	187	192	198	204	198
Internal Diameter (D)	m	1.65	1.65	2.0	2.0	2.0	2.0	2.2
Width (W)	m	2.619	2.619	2.695	2.695	2.695	2.695	3.288
Height (H)	m	2.595	2.595	3.225	3.225	3.225	3.225	3.43
Effective Length (L)	m	Customized						
Working Medium	-	Saturation Steam						
Door Information								
Mode of Opening	-	Manual Opening, Electric Opening, Pneumatic Opening, Hydraulic Opening						
Form of Opening	-	Side Open, Upper Open						

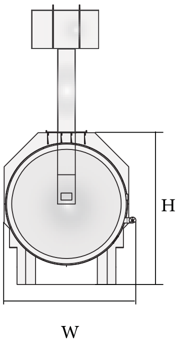


FRONT VIEW

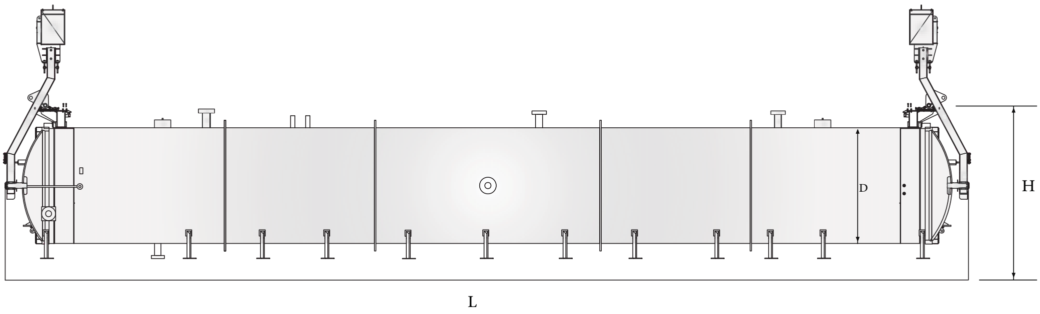


GENERAL VIEW

Model	Unit	PA 2.2x1.5	PA 2.4x1.3	PA 2.4x1.5	PA 2.5x1.3	PA 2.5x1.5	PA 2.68x1.3	PA 2.68x1.5
Technical Data								
Working Temperature	°C	201	195	201	195	201	195	201
Working Pressure	Mpa	1.5	1.3	1.5	1.3	1.5	1.3	1.5
Design Pressure	Mpa	1.6	1.4	1.6	1.4	1.6	1.4	1.6
Design Temperature	°C	204	198	204	198	204	198	204
Internal Diameter (D)	m	2.2	2.4	2.4	2.5	2.5	2.68	2.68
Width (W)	m	3.288	3.154	3.154	3.254	3.254	3.28	3.28
Height (H)	m	3.43	3.917	3.917	4.017	4.017	4.143	4.143
Effective Length (L)	m	Customized						
Working Medium	-	Saturation Steam						
Door Information								
Mode of Opening	-	Manual Opening, Electric Opening, Pneumatic Opening, Hydraulic Opening						
Form of Opening	-	Side Open, Upper Open						



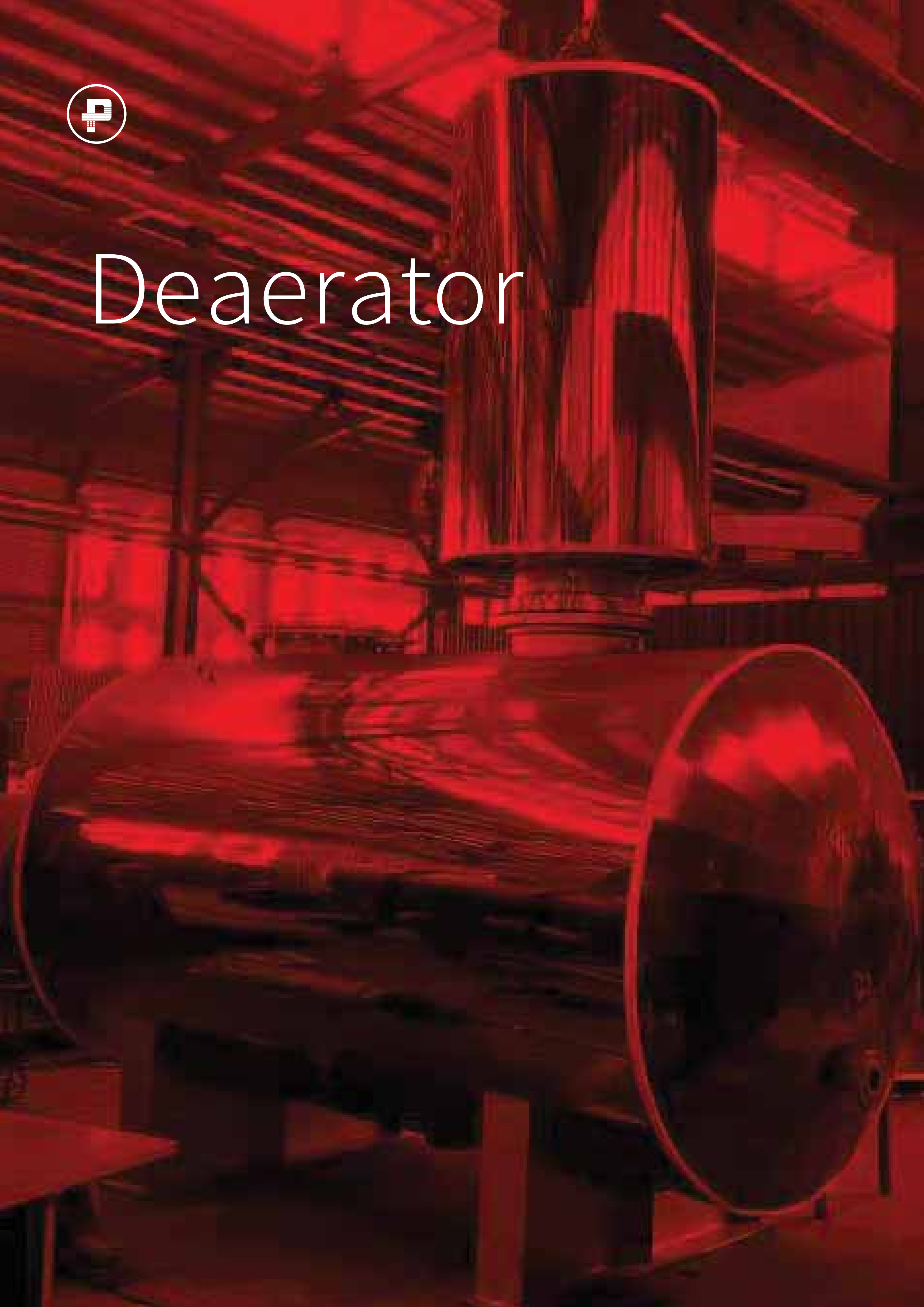
FRONT VIEW



GENERAL VIEW

Model	Unit	PA 2.85x1.3	PA 2.85x1.5	PA 3.0x1.3	PA 3.0x1.5	PA 3.2x1.3	PA 3.2x1.5
Technical Data							
Working Temperature	°C	195	201	195	201	195	201
Working Pressure	Mpa	1.3	1.5	1.3	1.5	1.3	1.5
Design Pressure	Mpa	1.4	1.6	1.4	1.6	1.4	1.6
Design Temperature	°C	198	204	198	204	198	204
Internal Diameter (D)	m	2.85	2.85	3.0	3.0	3.2	3.2
Width (W)	m	3.58	3.58	4537	4.537	4.74	4.74
Height (H)	m	4.493	4.493	4.66	4.66	5.131	5.131
Effective Length (L)	m	Customized					
Working Medium	-	Saturation Steam					
Door Information							
Mode of Opening	-	Manual Opening, Electric Opening, Pneumatic Opening, Hydraulic Opening					
Form of Opening	-	Side Open, Upper Open					

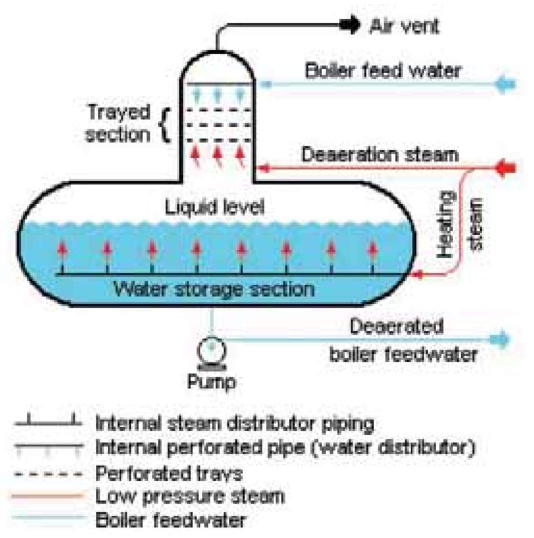
Deaerator



Product Description

A Deaerator is a device that is used for the removal of oxygen and other dissolved gases from the feed-water to steam generators. The deaerator is part of the feed-water heating system. It is usually situated between the last low pressure heater and feed-water booster pumps. In particular, dissolved oxygen in the steam generator can cause serious corrosion damage by attaching to the walls of metal piping and other metallic equipment and forming oxides. Furthermore, dissolved carbon dioxide combines with water to form carbonic acid that causes further corrosion.

In the deaerator, the condensate is heated to saturated conditions usually by the steam extracted from the steam turbine. The extraction steam are mixed in the deaerator by a system of spray nozzles and cascading trays between which the steam percolates. Any dissolved gases in the condensate are released in this process and removed from the deaerator by venting to the atmosphere or to the main condenser. Directly below the deaerator is the feed-water storage tank, in which a large quantity of feed-water is stored at near saturation conditions. In the turbine trip event, this feed-water can be supplied to steam generators to maintain the required water inventory during transient. The deaerator and the storage tank is usually located at a high elevation to ensure an adequate net positive suction head (NPSH) at the inlet to the feedwater pumps. NPSH is used to measure how close a fluid is to saturated conditions. Lowering the pressure at the suction side can induce cavitation. This arrangement minimizes the risk of cavitation in the pump.



PACKMAN Deaerator Properties

DEAERATORS are devices that reduce the amount of oxygen in the water for the steam boiler feeder. They are used for pre-heating the water entering the steam boiler.PACKMAN's DEAERATORS have two main components, one is storage tank with a pre-heating input and another is a tower with a lattice tray to accelerate the separation of gases in the inlet water.

The Storage Tank Specification

- Reservoir storage tank is horizontal cylindrical.
- The tank heads is designed and manufactured in accordance with the ASME standard.
- Hydrostatic test is performed on the tank up to 6 bar pressure.
- The head type of the reservoir is the Torispherical type.
- The tank has man hole and hand-hole which is suitable for pressure vessels.
- The tank has a steam inlet for preheating.
- The base of the tank is in the form of a saddle.
- The sheet is made of steel grade SA36.
- The level of the reservoir is controlled by the LI and control lever with magnetic sensors.
- The tank has the nozzles needed to operate the DEAERATOR.
- Welding of the reservoir is carried out with submerged arc welding.
- The tank has suitable hooks for transportation.

The Tower Specification

- Towers are designed and built according to ASME SEC. VIII, DIV.1.
- Towers are analyzed for seismic loading based on EARTHQUAKE DESIGN CODE.
- Hydrostatic test is carried out on the tower to 6 bar.
- The pressure design is 3.5 bar and the pressure is 0.5 bar.
- Tower made of stainless steel plate with a grade of 304L.
- The tower has stainless steel lattice trays to remove additional gases.
- The tower should have a separate hook for transportation.

Specifications Of The Equipments Installed On The Device A Preheaing line

- Magnetic level control with four sensors for disconnecting and connecting water and steam inlet solo valves
- Water inlet solo valve-220V
- Steam inlet solo valve-220V
- Water thermometer with a temperature rating of 0-120 ° C
- Water manometer with a diameter of 150mm and a rating of 0-4bar
- Relief valve with 15PSI setting point and 5-35bar working pressure Suitable drain valve for the tank.
- Steam pressure line for reducing the inlet vapor pressure (including flange needle,filter,and a flanged vapor pressurizer device with a converter, flanes and related fittings)
- Overflow trap for the tipping of the reservoir to the condensate (Overflow Trap)
- Vacuum Breaker
- Completely electrical wired pane

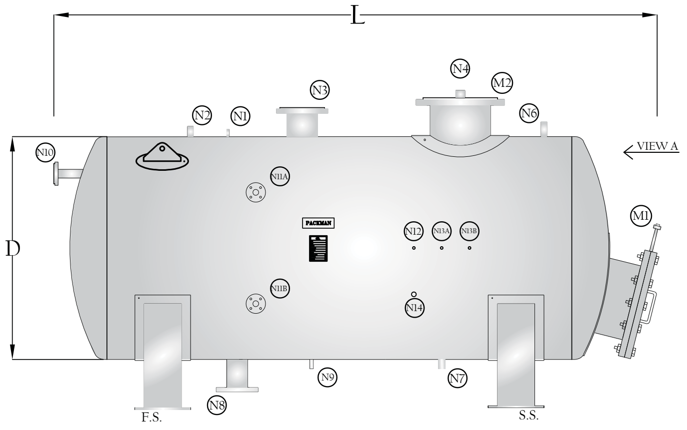
Product Selection

Deaerators are particularly desirable when steam pressures exceed 50 psi. For lower steam pressures, deaerator or a Thermal feed heating assembly may be suitable. Large spread out steam systems with surging returns may require additional storage or a split tank system. High make-up requirements especially dictate the use of a deaerator. Pressurized deaerators must be selected when blend temperatures exceed 180° F.

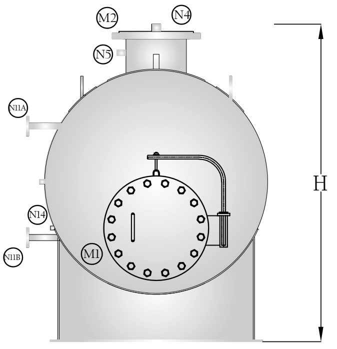
Horsepower refers to total system boiler capacity served by the deaerator. This capacity determines the size of the heating assembly, the openings, the overflow, the transfer pumps as well as the standard tank. The DEAERATOR capacity is based on the volume of water to be heated, the water temperature rise and the steam pressure available. High temperature returns over 227° do not need to be heated and should be admitted under the water line.

In order to determine the capacity of the deaerator, boiler capacity should be determined. The deaerator is sized for the boiler capacity in pph. The manufacturer designed the DEAERATOR suitable for the boiler capacity. If someone needs to select the deaerator capacity by self, the following formulation could be needed.

Spray Type Deaerator



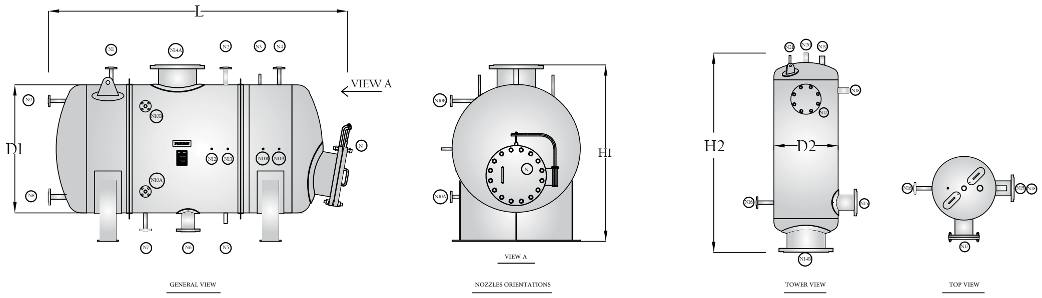
GENERAL VIEW



VIEW A

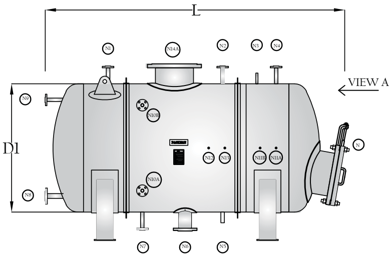
Model	Unit	PDR-S-5	PDR-S-10	PDR-S-18	PDR-S-30	PDR-S-50	PDR-S-70
Technical Data							
Design Standard	-	ASME SEC.VIII. DIV.1					
Flow Rate	lb/ hr	5,000	10,000	18,000	30,000	50,000	70,000
Working Pressure	bar	0.5	0.5	0.5	0.5	0.5	0.5
Connectoins Size							
Vacuum Breaker (N_1)	in	1/2	1/2	1/2	1/2	1/2	1/2
Safety Valve (N_2)	in	3/4	1	1	1 1/4	2	2
Steam Inlet (N_3)	in	3	4	6	6	6	10
Vent (Water Side) (N_4)	in	1	1/2	1 1/4	1 1/4	4	4
Water Inlet (N_5)	in	1	1	1 1/2	1 1/2	1 1/2	2
Vent (Steam Side)(N_4)	in	1	1	1 1/4	1 1/4	4	4
Condensate Return (N_6)	in	1	1	1	1 1/2	1 1/2	2
Drain (N_7)	in	1	1	2	2	2	2
Water Outlet (N_8)	in	3	4	4	5	5	6
Scrubber Drain (N_9)	in	3/4	3/4	3/4	1	1	1
Over Flow (N_{10})	in	1	1	1 1/2	1 1/2	2	2
Level Controller (N_{11})A	in	1	1	1	1	1	1
Level Controller (N_{11})B	in	1	1	1	1	1	1
Thermometer (N_{12})	in	1/2	1/2	1/2	1/2	1/2	1/2
Temperature Sensor (N_{13})	in	1/2	1/2	1/2	1/2	1/2	1/2
Circulation Pump (N_{14})	in	1	1	1	1	1	2
Hand Hold (M_2)	in	10	12	12	12	12	12
Man Hole (M_1)	in	16	16	16	16	16	16
Dimensions							
Vessel Diameter (D)	mm	1100	1200	1200	1200	1600	1750
Vessel Length (L)	mm	2300	2400	3400	4000	4200	4600
Vessel Height (H)	mm	1580	1700	1700	1700	2100	2300

Tray Type Deaerator

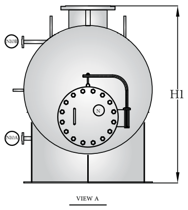


Model	Unit	PDR-T-10	PDR-T-18	PDR-T-25	PDR-T-30	PDR-T-50	PDR-T-70	PDR-T-110	PDR-T-150
Technical Data									
Design Standard	-	ASME SEC.VIII. DIV.1							
Flow Rate	lb/hr	10,000	18,000	25,000	30,000	50,000	70,000	110,000	150,000
Working Pressure	bar	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Number Of Tower	-	1	1	1	1	1	1	1	2
Connectoins Size									
Tank Connections									
Man Hole (N)	in	16	16	16	16	16	16	16	16
Equalizer (N_1)	in	1	1	1	1	1	1	1	1
Minimum Flow (N_2)	in	1	1	1	1	1	1	1 1/2	2
Pressure Indicator (N_3)	in	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Spare (N_4)	in	1	1	1	1	1	1 1/2	1 1/2	1 1/2
Drain (N_5)	in	1	1	2	2	2	2	2	2
Outlet (N_6)	in	4	4	5	5	6	6	6	6
Chemical Dosing Inlet (N_7)	in	1	1	1	1	1	1	1	1
Heating Steam Inlet (N_8)	in	1 1/2	1 1/2	2	2	4	4	5	5
Steam Trap (N_9)	in	1	1	1	1	1 1/2	1 1/2	1 1/2	1 1/2
Level Gauge (N_{10}) A/B	in	1	1	1	1	1	1	1	1
Temperature Switch (N_{11}) A/B	in	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Temperature Indicator (N_{12})	in	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Tower Connections									
Tower (N_{14})	in	10	14	14	14	16	16	20	16
Heating Steam Inlet (N_{15})	in	3	5	5	5	6	6	6	6
Equalizer (N_{16})	in	1	1	1	1	1	1	1	1
Tray Access Door (N_{17})	in	6	6	6	6	6	6	8	6
Inlet Denim Water (N_{18})	in	1 1/4	1 1/2	1 1/2	1 1/2	2	2	2	2 1/2
Safety Valve (N_{19})	in	1	1	2	2	2	2	2	2 1/2
Vent (N_{20})	in	1	1	1 1/2	1 1/2	2	2	2	2

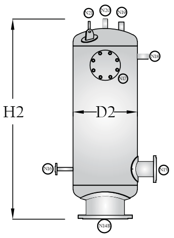
Tray Type Deaerator



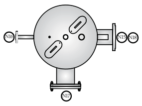
GENERAL VIEW



NOZZLES ORIENTATIONS



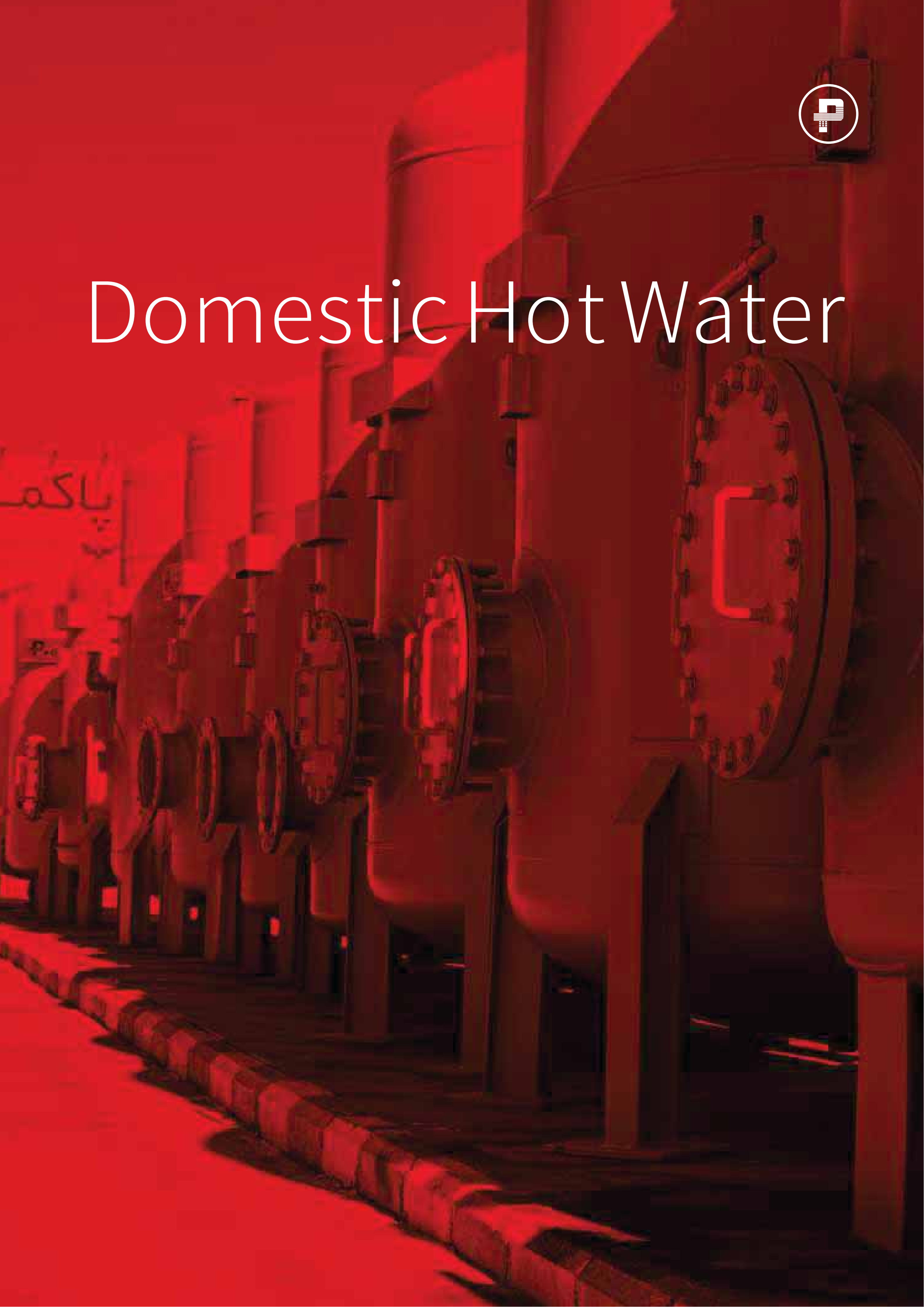
TOWER VIEW



TOP VIEW

Model	Unit	PDR-T-10	PDR-T-18	PDR-T-25	PDR-T-30	PDR-T-50	PDR-T-70	PDR-T-110	PDR-T-150
Dimensions									
Tank Dimension									
Vessel Diameter (D_1)	mm	1100	1200	1200	1200	1600	1600	1900	2250
Vessel Length(L_1)	mm	2200	2800	3150	3400	4700	4830	5100	5700
Vessel Height (H_1)	mm	1600	1650	1650	1650	2100	2100	2410	2750
Tower Dimension									
Tower Diameter (D_2)	mm	410	600	700	700	800	800	900	800
Tower Height (H_2)	mm	1350	1850	2150	2150	2100	2500	2810	2550

Domestic Hot Water



Product Description

Water heaters equipped with tank are suitable solutions for hospitals, sports arenas, hotels, apartment blocks and similar large buildings. The product's scope of application covers storage and heating with a demand for high performance, comfort and hygiene resource-efficient operation. The systems can be combined with a second or multiple DHW storage tanks to meet on-site requirements.

A storage water heater operates by releasing hot water from the top of the tank when the hot water tap is turned on. To replace that hot water, cold water enters the bottom of the tank, ensuring that the tank is always full.

PACKMAN'S Domestic hot water Tank's Properties

PACKMAN'S Domestic hot water Tanks are made of SA 36 (St 37.2 in accordance with DIN standard) or in case of customer's request they can be made of 17MN4 (which is Suitable for boiler construction) with a certain thickness.

PACKMAN'S domestic hot water tank is used for supplying clean hot water, for buildings and industries. These tanks are capable of operation in both steam and hot water systems. The shells are make of either steel with three-layers of epoxy coating, hot-galvanized steel (suitable for the manufacturing of pressure vessels with no direct heat exposure) or 17MN4.

The tanks are made of vertical cylinders with two heads, in various diameters and thicknesses. Epoxy coating/galvanizing methods are used to provide potable & clean water. NormallPACKMAN suggests shells with epoxy coating instead of galvanized shells because of the lead issues present in galvanized tanks.

The tank contains a copper coil with a thickness of 1 mm for transferring heat from hot fluid to the cold one. The tank also has a hand hole for capacities lower than 2000 liters (ManHoles are used for greater capacities) which provide accessibility to it's inside. It should be noted that access to the inside of the tank is also possible through the the coil flange.

Manufacturing Standards

ASME Standard is observed in construction of Domestic hot water tanks.

PACKMAN'S Domestic hot water tank's head is Tori spherical. This type of head provides longe life and a high pressure resistance for the system compared to the other shapes with the same thickness. The production price per kilo of these heads can reach to twice the price ratio of the usual heads on the market.

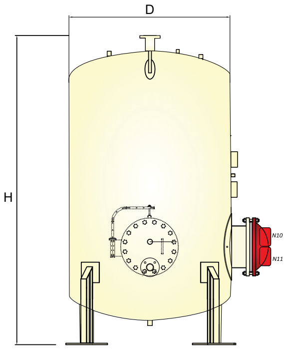
Welding Procedure

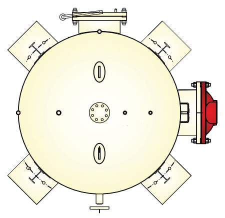
Welding is done with Swedish ISBU submerged arc welding equipment. After constructing the tank and welding the lugs, the body of the tank is connected to the heads using a submerged welding method. Interior and exterior coating and painting conditions PACKMAN'S DHW is coated with three layers of epoxy colors with a total thickness of 305 microns and is heat-resistant and suitable for use in sanitary applications. The outer surface of the tank is

also covered with an epoxy layer and an industrial paint layer with a total thickness of 150 microns. Galvanized shells will only be sprayed with industrial colors.

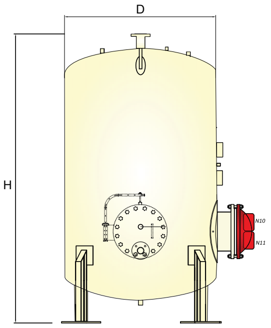
Distinction's of PACKMAN'S Products

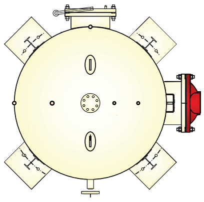
- Long life span of the device As a result of the quality of welding, color and epoxy coatings.
- Manufactured with the latest technology in the world in welding and cutting.
- High strength against pressure due to the design thickness and quality of the material .
- High quality of connections and tank legs
- High quality of Epoxy and industrial colors





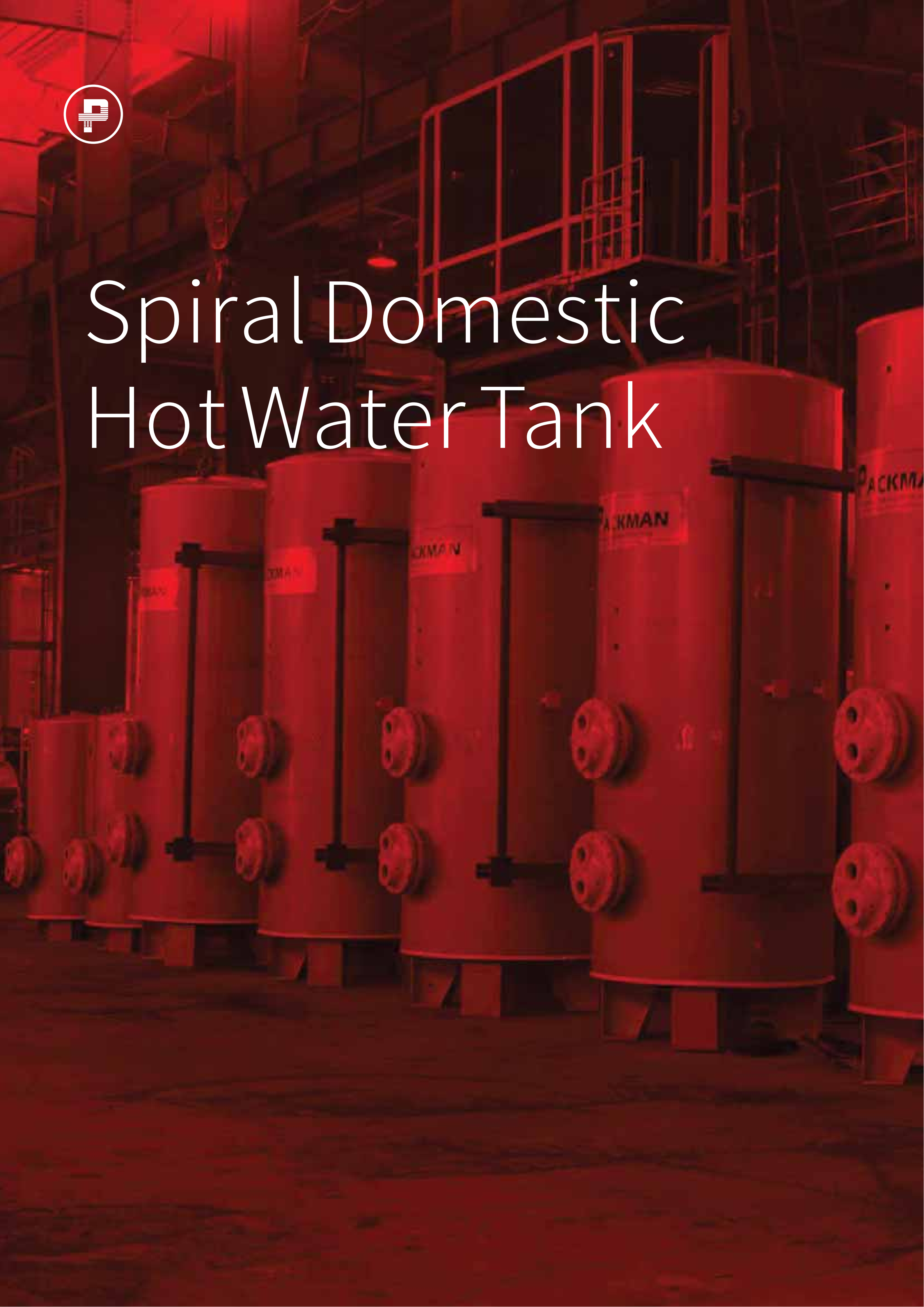
Model	Unit	PDHT-300	PDHT-400	PDHT-500	PDHT-800	PDHT-1000	PDHT-1500	PDHT-2000	PDHT-2500	PDHT-3000
Technical Data										
Design Standard	-	ASME SEC.VIII. DIV.1								
Vessel Type	-	Vertical								
Heating Surface	ft^2	11	15	19	30	37	56	74	93	112
Thermal Capacity One Coil	kw	17	23	29	47	58	87	116	145	174
Thermal Capacity One Coil	kcal/hr	15,000	20,000	25,000	40,000	50,000	75,000	100,000	125,000	150,000
Volume Capacity	litr	300	400	500	800	1,000	1,500	2,000	2,500	3,000
Connections Size										
Coil Entrance	in	10	10	10	14	14	14	14	14	14
Circulation	in	3/4	3/4	3/4	3/4	1	1	1	1	1 1/4
Cold Water Inlet	in	1	1	1	1	1 1/4	1 1/4	1 1/2	1 1/2	2
Hot Water Outlet	in	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	2	2	2 1/2
Hand Hole (mm*mm) / Man Hole	in	210*160	210*160	210*160	210*160	210*160	210*160	210*160	210*160	210*160
Drain	in	1	1	1	1	1	1	1	1	1
Temperature Switch	in	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Monometer	in	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Termometer	in	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Safety Valve	in	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4
Boiler Hot Water Outlet	in	3	3	3	3	3	3	3	3	3
Boiler Hot Water Inlet	in	3	3	3	3	3	3	3	3	3
Material										
Shell	-	Carbon Steel								
Head	-	Carbon Steel								
Vessel Dimensions										
Vessel Diameter	mm	600	600	700	800	900	1100	1200	1320	1320
Vessel Height	mm	1500	1600	1790	2200	2200	2200	2200	2300	2750





Model	Unit	PDHT-3500	PDHT-4000	PDHT-5000	PDHT-6000	PDHT-7000	PDHT-8000	PDHT-9000	PDHT-10000	PDHT-15000
Technical Data										
Design Standard	-	ASME SEC.VIII. DIV.1								
Vessel Type	-	Vertical						Horizaontal		Vertical
Heating Surface	ft^2	130	149	186	223	261	298	335	372	559
Thermal Capacity One Coil	kw	203	233	291	349	407	465	523	581	872
Thermal Capacity One Coil	kcal/hr	175,000	200,000	250,000	300,000	350,000	400,000	450,000	500,000	750,000
Volume Capacity	Litr	3,500	4,000	5,000	6,000	7,000	8,000	9,000	10,000	15,000
ConnectIons Size										
Coil Entrance	in	14	16	16	16	16	16	16	16	16
Circulation	in	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	2	2	2	2
Cold Water Inlet	in	2	2	2 1/2	3	3	3	3	3	3
Hot Water Outlet	in	2 1/2	2 1/2	3	4	4	4	4	4	4
Hand Hole(m*mm) / Man Hole	in	210*160	16	16	16	16	16	16	16	16
Drain	in	1	1	1 1/2	2	2	2	2	2	2
Temperature Switch	in	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Monometer	in	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Termometer	in	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Safety Valve	in	3/4	3/4	3/4	1	1	1 1/2	1 1/2	1 1/2	1 1/2
Boiler Hot Water Outlet	in	3	4	4	4	4	4	4	4	4
Boiler Hot Water Inlet	in	3	4	4	4	4	4	4	4	4
Material										
Shell	-	Carbon Steel								
Head	-	Carbon Steel								
Vessel Dimensions										
Vessel Diameter	mm	1320	1592	1592	1750	1750	1910	1910	1910	1910
Vessel Height	mm	3000	2700	3200	3250	3350	3400	2450	2450	2450

Spiral Domestic Hot Water Tank



Product Description

PACKMAN'S Spiral Domestic hot water Tanks are made of Stainless Steel (St 37.2 in accordance with DIN standard) or in case of customer's request they can be made of 17MN4 (which is Suitable for boiler construction) with a certain thickness.

PACKMAN'S Spiral domestic hot water tank is used for supplying clean hot water, for buildings and industries. These tanks are capable of operation in two circuit system. The shells are made of either steel with three-layers of epoxy coating, hot-galvanized steel if its made by carbon steel grade (suitable for the manufacturing of pressure vessels with no direct heat exposure) or 17MN4.

The tanks are made of vertical cylinders with two heads, in various diameters and thicknesses. Epoxy coating/galvanizing methods are used to provide potable & clean water. Normally PACKMAN suggests shells with stainless steel and no need to special coating .

The tank contains a stainless steel coil with a thickness of 1 mm for transferring heat from hot fluid to the cold one. The tank also has a hand hole for capacities lower than 2000 liters (Man-Holes are used for greater capacities) which provide accessibility to it's inside. It should be noted that access to the inside of the tank is also possible through the the coil flange.

Manufacturing Standards

ASME Standard is observed in construction of Spiral Domestic hot water tanks.

PACKMAN'S Domestic hot water tank's head is Tori spherical. This type of head provides long life and a high pressure resistance for the system compared to the other shapes with the same thickness. The production price per kilo of these heads can reach to twice the price ratio of the usual heads on the market.

Welding Procedure

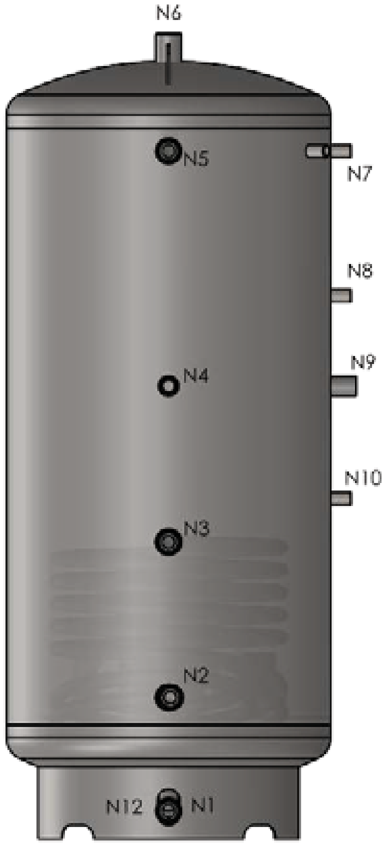
Welding is done with Swedish ISBU submerged arc welding equipment. After constructing the tank and welding the lugs, the body of the tank is connected to the heads using a submerged welding method.

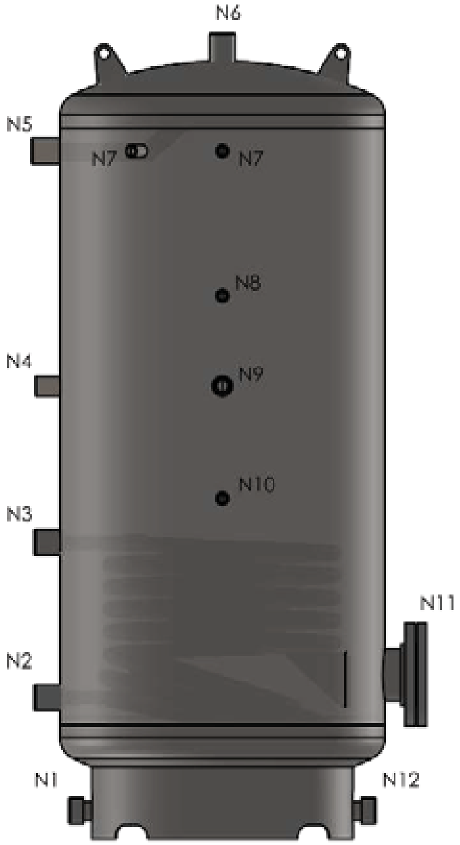
Interior and Exterior Coating And Painting Conditions

For carbon steel shell, PACKMAN'S Spiral DHW is coated with three layers of epoxy colors with a total thickness of 305 microns and is heat-resistant and suitable for use in sanitary applications. The outer surface of the tank is also covered with an epoxy layer and an
industrial paint layer with a total thickness of 150 microns. Galvanized shells will only be sprayed with industrial colors

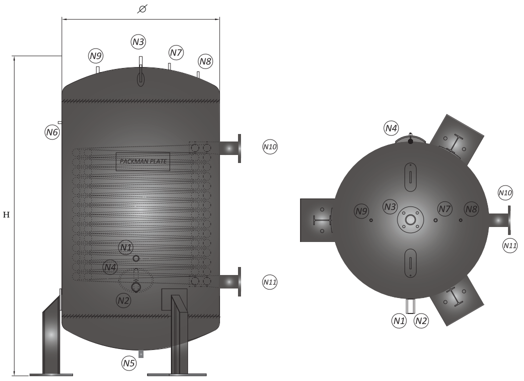
Distinctions of PACKMAN'S Products

Long life span of the device As a result of the quality of welding, material and etc.Manufactured with the latest technology in the world in welding and cutting. High strength against pressure due to the design thickness and quality of the material .





Model	Unit	DHWTS-400	DHWTS-500	DHWTS-600	DHWTS-700	DHWTS-800	DHWTS-1000
Technical Data							
Design Standard	Code	ASME SEC.VIII.DIV.1					
Vessel Type	Type	Vertical					
Volume Capacity	Liter	400	500	600	700	800	1,000
Heating Surface	m^2	1.5	1.7	1.9	2.45	2.6	3
Thermal Capacity One Coil	kW	70	87	105	116	140	163
Thermal Capacity One Coil	kcal/hr	60,000	75,000	90,000	100,000	120,000	140,000
Water Design Temperature	° C	60	60	60	60	60	60
Connectoins Size							
Cold Water Inlet (N1)	in	1	1	1 1/4	1 1/4	1 1/2	1 1/2
Heat Exchanger Return (N2)	in	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
Heat Exchanger Supply (N3)	in	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
Circulation Return (N4)	in	1	1	1	1	1	1
Hot Water (N5)	in	1	1	1 1/4	1 1/4	1 1/2	1 1/2
Air Vent/Pressure Relief (N6)	in	1	1	1 1/4	1 1/4	1 1/2	1 1/2
Thermometer/ Temp Sensor (N7)	in	1/2	1/2	1/2	1/2	1/2	1/2
Pressure Gauge (N8)	in	1/2	1/2	1/2	1/2	1/2	1/2
Auxiliary (N9)	in	1	1	1	1	1	1
Thermometer (N10)	in	1/2	1/2	1/2	1/2	1/2	1/2
Handhole (N11)	in	4	4	4	4	4	4
Drain (N12)	in	1	1	1 1/4	1 1/4	1 1/2	1 1/2
Material							
Shell	Type	Stainless Steel					
Head	Type	Stainless Steel					
Coil	Type	Stainless Steel					
Vessel Dimensions							
Vessel Diameter (⌀)	mm	635	635	720	720	860	860
Vessel Height (H)	mm	1,530	1,750	1,780	1,940	1,780	1,940



Model	Unit	DHWTS-1500	DHWTS-2000	DHWTS-2500	DHWTS-3000
Technical Data					
Design Standard	Code	ASME SEC.VIII.DIV.1			
Vessel Type	Type	Vertical	Vertical	Vertical	Vertical
Volume Capacity	Liter	1,500	2,000	2,500	3,000
Heating Surface	m^2	5	6	8.5	9
Thermal Capacity One Coil	kW	233	326	436	488
Thermal Capacity One Coil	kcal/hr	100,000	120,000	150,000	200,000
Water Design Temperature	° C	60	60	60	60
Connectoins Size					
Cold Water Inlet (N1)	in	1 1/4	1 1/2	1 1/2	2
Heat Exchanger Return (N2)	in	1 1/2	2	2	2 1/2
Heat Exchanger Supply (N3)	in	1 1/2	2	2	2 1/2
Circulation Return (N4)	in	1	1	1	1 1/4
Hot Water (N5)	in	1 1/2	2	2	2 1/2
Air Vent/Pressure Relief (N6)	in	3/4	3/4	3/4	3/4
Thermometer/ Temp Sensor (N7)	in	1/2	1/2	1/2	1/2
Pressure Gauge (N8)	in	1/2	1/2	1/2	1/2
Auxiliary (N9)	in	1	1	1	1
Thermometer (N10)	in	1/2	1/2	1/2	1/2
Handhole (N11)	in	4	4	4	4
Drain (N12)	in	1	1	1	1
Material					
Shell	Type	Carbon Steel			
Head	Type	Carbon Steel			
Coil	Type	Stainless Steel			
Vessel Dimensions					
Vessel Diameter (⌀)	mm	1,100	1,200	1,320	1,320
Vessel Height (H)	mm	2,200	2,200	2,300	2,750

Close Expansion Tank

Product Description

Expansion Tanks are required in a closed loop heating or chilled water HVAC systems to conserve the expanding fluid and limit the pressure within a heating or cooling system. A properly sized tank will accommodate the expansion of the system's fluid during the heating or cooling cycle without the system having to experience critical pressure limits. The expansion tank uses compressed air to maintain system's pressure by accepting and expelling amount of extra water due to the changing volume of as the heat water & cool water. Some tank designs incorporate a diaphragm or bladder to isolate the expanded water from the pressure controlling air cushion. As water is expanded, it is contained in the bladder to prevent corrosion. The pressure controlling air cushion is pre-charged at the factory and can be adjusted in the field to meet critical system requirements. This design allows the designer & engineers to reduce tank sizes down to 80%.

Expansion tanks are designed to absorb expansion forces and control of the pressure in heating/cooling systems. This tank is the oldest style design and works well when the air is controlled and kept in the tank, not in the system. The expansion tank has been used for many years and works very well in specific systems. A plain steel expansion tank also requires an air control system. The air volume or air cushion above the water level in the tank must be controlled. The common face between this air cushion and the water in the tank allows the air to be absorbed by the water. If the air is not removed properly from the water and placed back into the air cushion, the expansion tank will become waterlogged.

PACKMAN Closed Expansion Tank Properties

PACKMAN's Closed Expansion Tanks are made of SA 36 (St 37.2 in accordance with DIN standard) or in case of customer's request they can be made of 17MN4 (which is Suitable for boiler construction) with a certain thickness and without any change in price.

Manufacturing Standards

ASME Sec VIII, Div. 1 is observed in the construction of closed expansion tanks.

Torispherical / Elliptical Head

PACKMAN's Closed Expansion Tanks head is Torispherical. This type of head has a longer life and a higher pressure strength compared to other shapes with the same thickness. The production price/per kilo of these heads can reach to twice the price ratio of the usual heads on the market.

Welding Procedure

Welding is done with the Swedish ISBU submerged arc welding equipment. After constructing the tank and welding the lugs, the body of the tank is connected to the heads using a submerged arc welding method. The heads are welded internally and externally, which increases their life and strength. In the root pass, the TIG, argon or other welding methods with the 6010 cellulose electrode is used. The EW7018 electrode is used in fill pass. Finally the submerged method with EW7018 electrodes is used in the cover pass.

Product Capacity Calculation & Selection

Required volume in a closed expansion tank

$Vet = k\,Vw\,[(v1 / v0) - 1] / [(pa / p0) - (pa / p1)]$

Vet = required expansion tank's volume

pa = atmospheric pressure - 14.7 (psia)

p0 = system's initial pressure - cold pressure (psia)

p1 = system's operating pressure - hot pressure (psia)

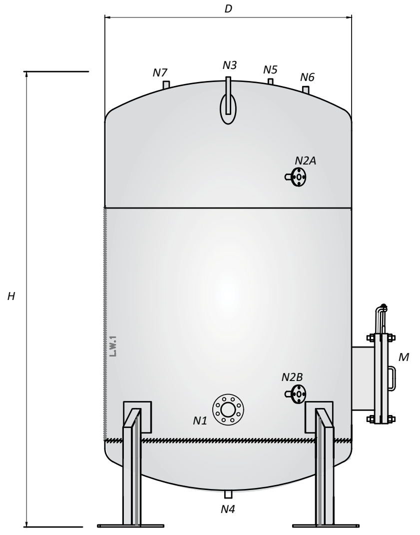
k = safety factor (approximately 2 is common)

Vw = water volume in the system (gallon, liter)

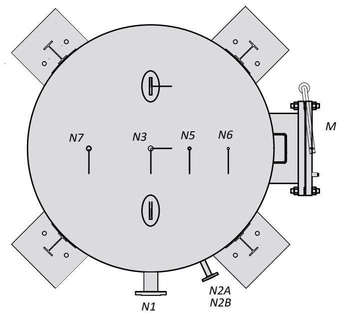
v0 = specific volume of water at initial (cold) temperature (ft3/lb, m3/kg)

v1 = specific volume of water at operating (hot) temperature (ft3/lb, m3/kg)

Vertical Type

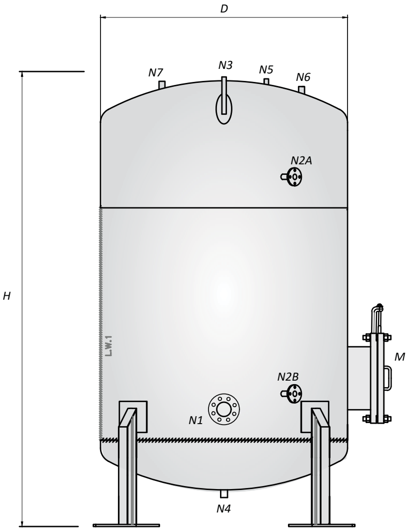


GENERAL VIEW

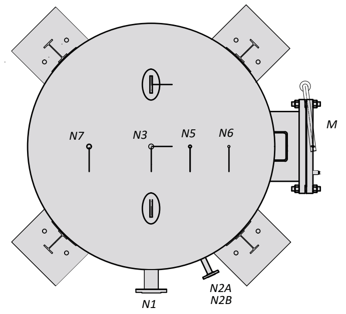


TOP VIEW

Model	Unit	PCET-300	PCET-500	PCET-800	PCET-1000	PCET-1500	PCET-2000	PCET-2500
Technical Data								
Design Standard	-	ASME SEC. VIII. DIV.1						
Vessel Type	-	Vertical						
Volume Capacity	lit	300	500	800	1000	1500	2000	2500
Vessel Water Pressure Drop	bar	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Connectoins Size								
Safety Valve (N7)	in	3/4	3/4	3/4	3/4	3/4	3/4	3/4
Pressure Indicator (N5)	in	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Drain (N4)	in	3/4	3/4	1	1	1	1	1
Level Gauge (N2A) , (N2B)	in	1	1	1	1	1	1	1
Spare (N6)	in	1/2	1/2	1/2	1/2	1/2	1/2	1
Nitrogen Inlet (N3)	in	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Water Inlet & Outlet (N1)	in	1	1	1 1/2	1 1/2	1 1/2	1 1/2	2
Material								
Shell	-	Carbon Steel						
Toris Head	-	Carbon Steel						
Vessel Dimensions								
Vessel Diameter (D)	mm	610	800	800	900	1100	1200	1320
Vessel Height (H)	mm	1500	2200	2200	2200	2200	2300	2300



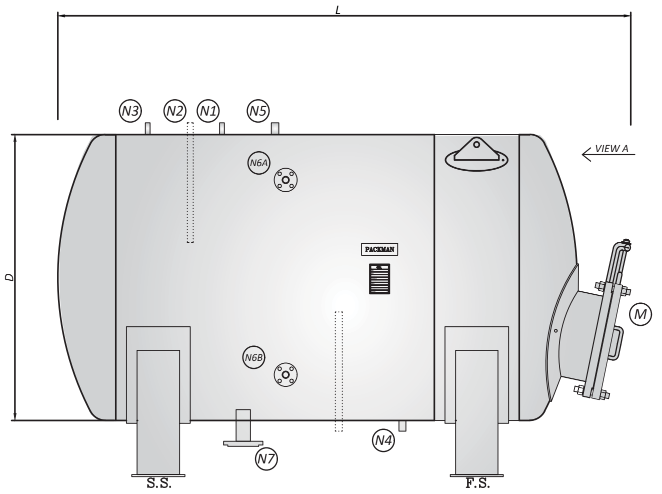
GENERAL VIEW

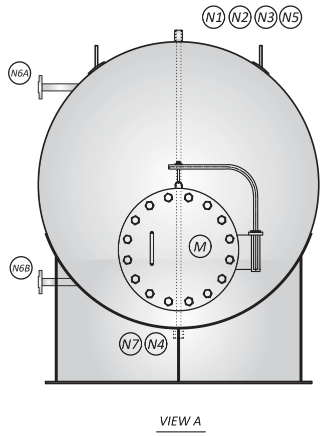


TOP VIEW

Model	Unit	PCET-3000	PCET-3500	PCET-4000	PCET-5000	PCET-6000	PCET-7000	PCET-10000
Technical Data								
Design Standard	-	ASME SEC. VIII. DIV.1						
Vessel Type	-	Vertical						
Volume Capacity	litr	3000	3500	4000	5000	6000	7000	10000
Vessel Water Pressure Drop	bar	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Connectoins Size								
Safety Valve (N7)	in	3/4	3/4	1	1	1	1	1
Pressure Indicator (N5)	in	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Drain (N4)	in	1	1	1	1 1/2	2	2	2
Level Gauge (N2A) , (N2B)	in	1	1	1	1	1	1	1
Spare (N6)	in	1	1	1	1	1	1	1
Nitrogen Inlet (N3)	in	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Water Inlet & Outlet (N1)	in	2 1/2	2 1/2	2 1/2	3	3	3	4
Man Hole (M)	in	14	14	16	16	16	16	16
Material								
Shell	-	Carbon Steel						
Toris Head	-	Carbon Steel						
Vessel Dimensions								
Vessel Diameter (D)	mm	1320	1320	1600	1600	1750	1750	1910
Vessel Height (H)	mm	2700	3000	2500	3000	3200	3450	4400

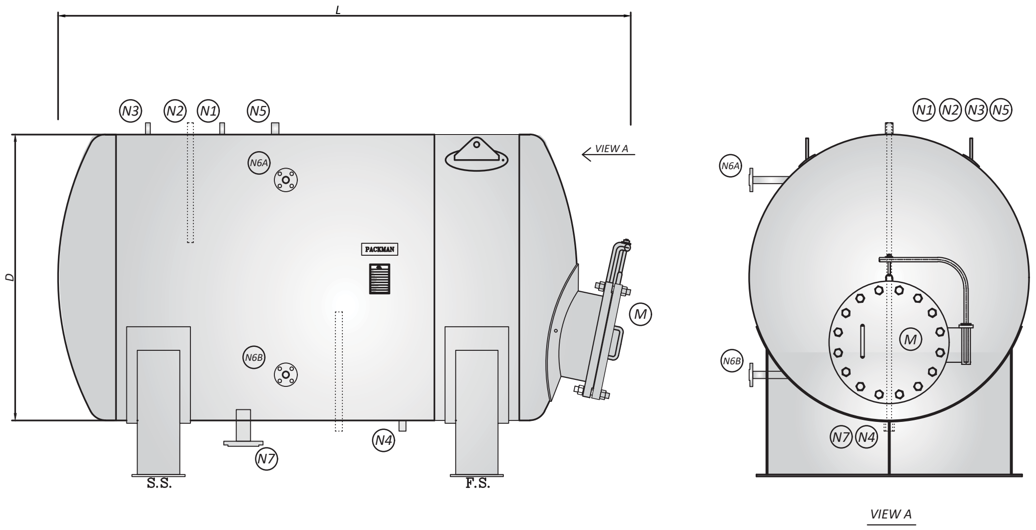
Horizontal Type





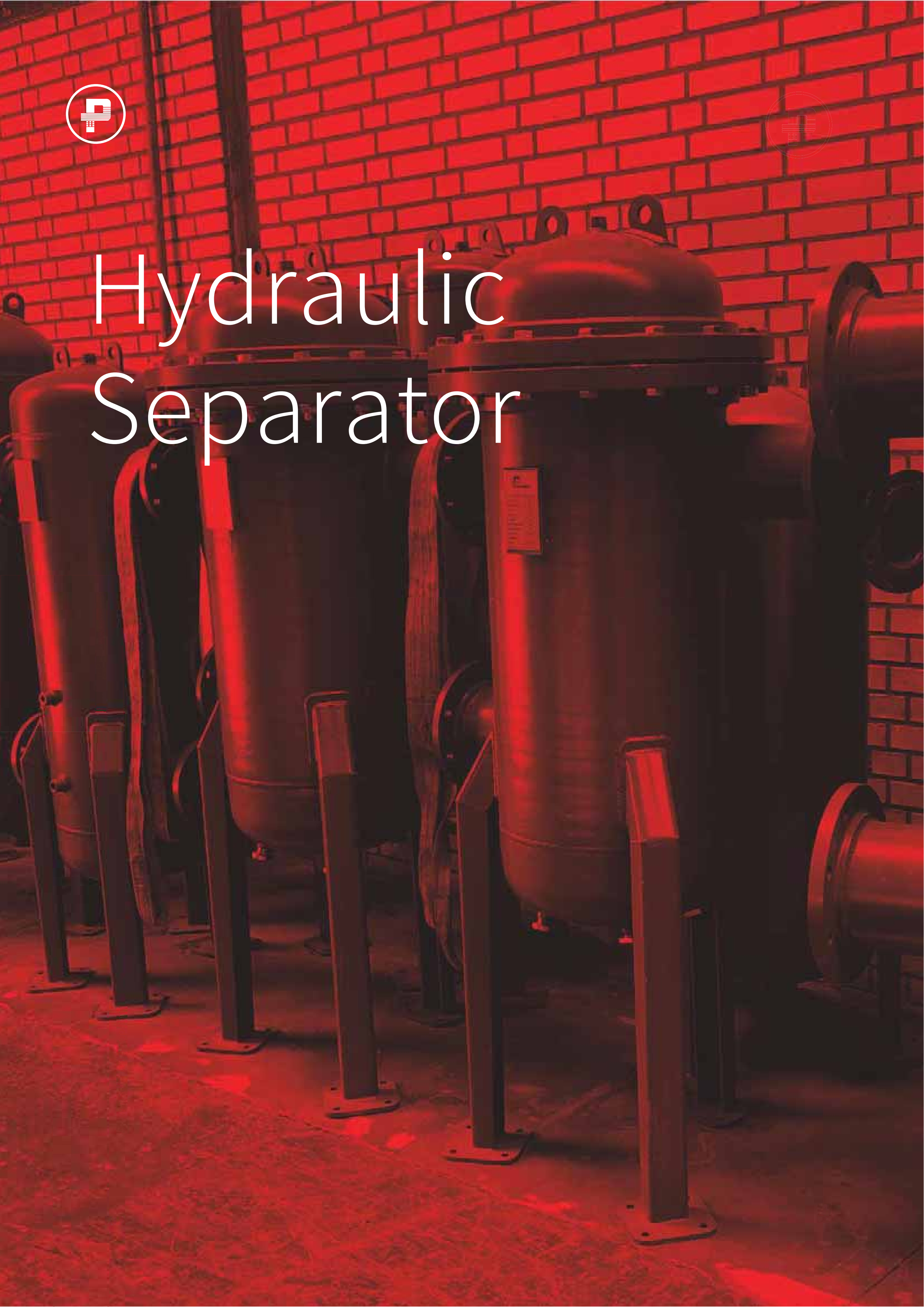
Model	Unit	PCET-300	PCET-400	PCET-800	PCET-1000	PCET-1500	PCET-2000
Technical Data							
Design Standard	-	ASME SEC. VIII. DIV.1					
Vessel Type	-	Horizontal					
Volume Capacity	litr	300	400	800	1000	1500	2000
Vessel Water Pressure Drop	bar	0.1	0.1	0.1	0.1	0.1	0.1
Connectoins Size							
Safety Valve (N2)	in	3/4	3/4	3/4	3/4	3/4	3/4
Pressure Indicator (N3)	in	1/2	1/2	1/2	1/2	1/2	1/2
Drain (N4)	in	1	1	1	1	1	1
Level Gauge (N6A) , (N6B)	in	1	1	1	1	1	1
Spare (N5)	in	1/2	1/2	1/2	1/2	1	1
Nitrogen Inlet (N1)	in	1/2	1/2	1/2	1/2	1/2	1/2
Water Inlet & Outlet (N7)	in	1	1	1 1/2	1 1/2	1 1/2	2
Material							
Shell	-	Carbon Steel					
Toris Head	-	Carbon Steel					
Vessel Dimensions							
Vessel Diameter (D)	mm	600	600	800	900	1100	1200
Vessel Length (L)	mm	1450	1650	2000	2000	2000	2200

Horizontal Type



Model	Unit	PCET-2500	PCET-3000	PCET-4000	PCET-8000	PCET-9000	PCET-10000
Technical Data							
Design Standard	-	ASME SEC. VIII. DIV.1					
Vessel Type	-	Horizontal					
Volume Capacity	litr	2500	3000	4000	8000	9000	10000
Vessel Water Pressure Drop	bar	0.1	0.1	0.1	0.1	0.1	0.1
Connectoins Size							
Safety Valve (N2)	in	3/4	3/4	1	1	1	1
Pressure Indicator (N3)	in	1/2	1/2	1/2	1/2	1/2	1/2
Drain (N4)	in	1	1	2	2	2	2
Level Gauge (N6A) , (N6B)	in	1	1	1	1	1	1
Spare (N5)	in	1	1	1	1	1	1
Nitrogen Inlet (N1)	in	1/2	1/2	1/2	1/2	1/2	1/2
Water Inlet & Outlet (N7)	in	2 1/2	2 1/2	3	3	3	3
Man Hole (M)	in	16	16	16	16	16	16
Material							
Shell	-	Carbon Steel					
Toris Head	-	Carbon Steel					
Vessel Dimensions							
Vessel Diameter(D)	mm	1320	1320	1600	1910	1910	1910
Vessel Length (L)	mm	2300	2700	2600	3300	3650	4100

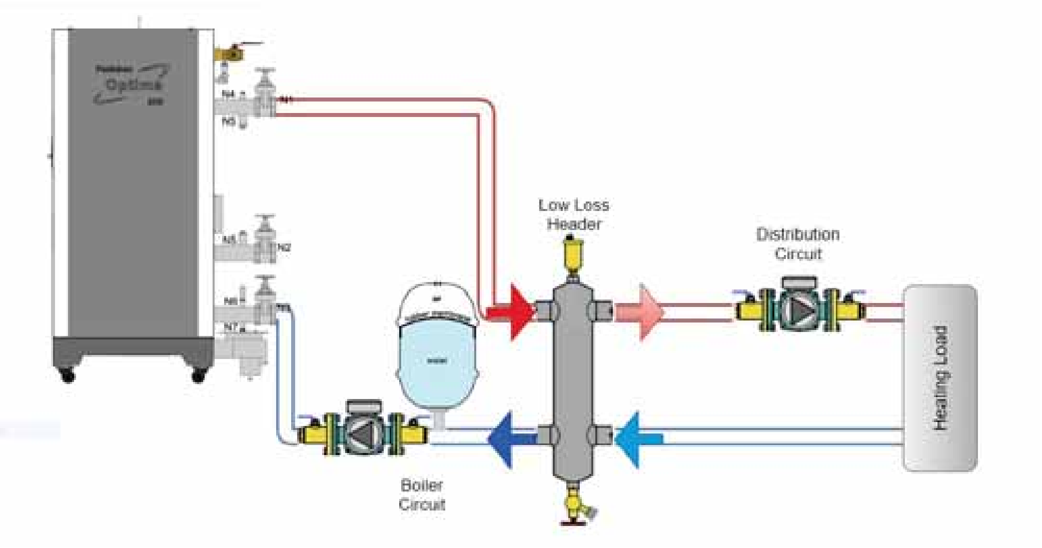
Hydraulic Separator



Product Description

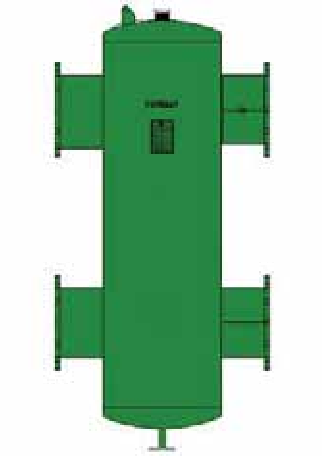
Using a Hydraulic Separator makes the water circulation path in the boiler (primary circuit) and circulation path on the consumer side (secondary circuit) separated hydraulically. Finally, this condition causes stability in the system and also creates a hydraulic structure that can play an influential role to release the air trapped in the design and to remove any debris collected at the bottom of the vessel.

In fact, for the proper operation of the boiler, to ventilate and prevent thermal load fluctuations of the system is recommended to use the method of the primary and secondary circuits with Hydraulic Separators in the design of systems.



In order to prevent noise and corrosion in the body and nozzles, the fluid velocity must be controlled.

Also, the low velocity of the fluid in the Hydraulic Separator, it makes possible that the accumulation of sediments in the lower part, which is why the Hydraulic Separator should be vertical and have a drain valve.

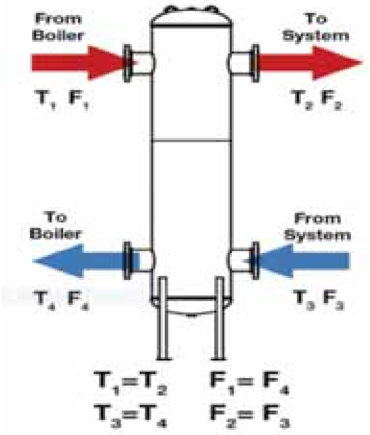


Specifications of Valves And Fittings	
Equip	Specification
Pressure Gauge	Filling with Glycerin Diameter=10 cm, Nominal Pressure Range: 0-10 bar & 0-20 bar
Temperature Transmitter	Operating Temperature: 0-100 °C 4-20 mA Sensor PT100

Based on the functional conditions of the consumer side and the boiler side, it may be mentioned in three modes as below:

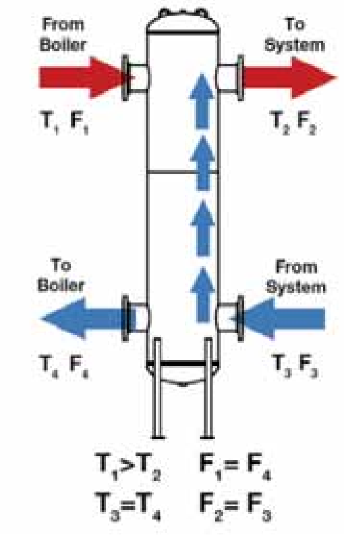
1-Equal Flow

Flow Rate of Boiler and system (consumer Side) is equal.



2- Greater Secondary Flow

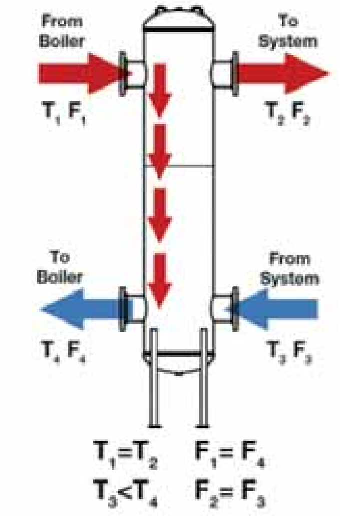
In this case, the flow rate on the consumer side is greater than the flow rate on the boiler side. In fact, in this case, the temperature of the return water from the system is lower and this temperature is mixed in the Hydraulic Separator body and as a result, the temperature of the water entering the system decreases.



3- Greater Primary Flow

In this case, the flow rate on the consumer side is lower than the flow rate on the boiler side.

Actually, System demand is less than boiler output, and in the Hydraulic Separator body, Water flow with higher temperature is mixed, and as a result, the temperature of the water returning to the boiler increases.



Formulas to determine temperature

T_2 =((F_3-F_1) T_3+ F_1 T_1)/F_3

T_4 =((F_1-F_2) T_1+ F_3 T_3)/F_1

Calculation

As shown in the figure, two primary and secondary circuits are connected to the Hydraulic Separator For the sizing of the Hydraulic Separator, the temperature difference of any side that leads to a larger sizing is used as the calculation criterion. Usually, the temperature difference of the consumer side (secondary circuit) causes a larger size.

Circulating water flow is calculated

$$Q=\dot{m}\overset{\circ}{c}\Delta T \quad Q\text{: Thermal capacity}$$

$$\dot{m}(kg/hr)=Q\left(\frac{kcal}{hr}\right) / C\left(\frac{kcal}{kg^{\circ}}\right)\Delta T(\overset{\circ}{c})$$

Therefore, the flow of water circulating in the circuit is calculated by the following method:

$$\dot{m}\left(\frac{m^3}{hr}\right)=Q\left(\frac{kcal}{hr}\right)/C\left(\frac{kcal}{kg^{\circ}C}\right)\Delta T(\overset{\circ}{C})*1000$$

Benefits and Functions of using Hydraulic Separator

- Creating hydraulic balance in primary and secondary circuits
- Separates and vents air from the system.
- Separation and collection of impurities in the primary and secondary circuits

Benefits and Functions of using Hydraulic Separator		
Head	Shell	Item
Up to 16” Body size	SA 53	ASTM A234 GR.WBP
More than 16” Body size	SA 36	SA36

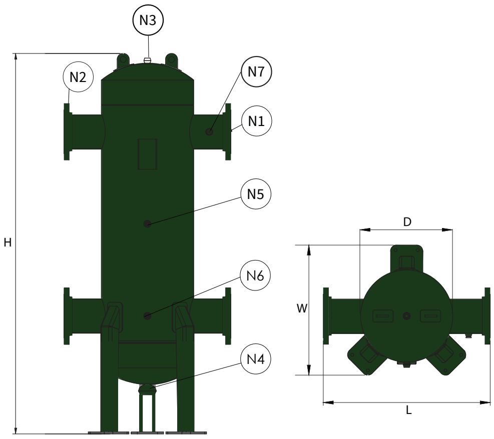
Welding conditions

Welding equipment is used from Sweden’s ISAB brand. Welding Hydraulic Separator components with the use of penetration welding methods including root pass welding steps, protective gas method Argon, filler pass, and face pass are performed using an electric arc method using an electrode EW7018.

Design standard

The ASME Sec Vlll, Div.1 standard is used in the construction of the hydraulic separator Vessel Heads type, are tori spherical, this type of head compared to other shapes of the same thickness has a longer life and higher-pressure resistance.

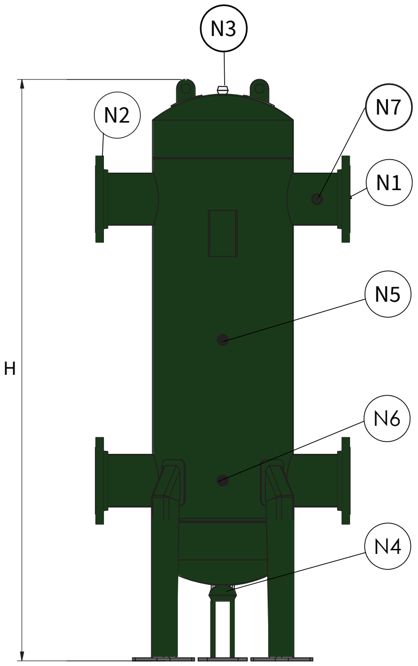
The production price of each kilo of this lens can reach twice the price of normal lenses in the market.

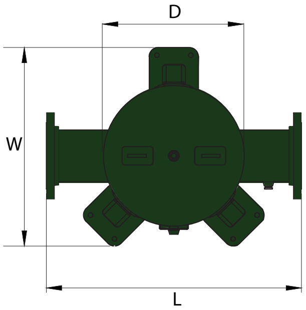


- Hydraulic Separator Is Designed based on Higher Flow Rate. The Consumer Flow Rate Is Always Greater than or Equal to the Producer Flow Rate.
- It Should be noted that the Specified Flow Rates are based on a Temperature Difference of 10 Degrees Celsius for the Heating Load and a Temperature Difference of 5 Degrees Celsius for the Cooling load.

Model	Unit	PLL 2-8	PLL 3-10	PLL 4-12	PLL 5-16	PLL 6-18
Technical Data						
Design Standard	_	ASME SEC. VIII DIV.1				
Design Temperature	°C	5-100				
Flow Rate	gpm	1-32	32-90	90-175	175-350	350-550
Heating Load	kcal/hr	1-86,000	86,000- 200,000	200,000- 400,000	400,000- 800,000	800,000- 1,250,000
Cooling Load *	Btu/hr	1-160,000	160,000- 450,000	450,000- 875,000	875,000- 1,750,000	1,750,000- 2,750,000
Connection Size						
Body Size (D)	in	8	10	12	16	18
Secondary Inlet & Outlet (N1)	in	2	3	4	5	6
Primary Inlet & Outlet (N2)	in	2	3	4	5	6
Vent (N3)	in	1/2	1/2	1/2	1/2	1/2
Drain (N4)	in	1 1/2	1 1/2	2	2	2
Manometer (N5)	in	1/2	1/2	1/2	1/2	1/2
Thermometer (N6)	in	1/2	1/2	1/2	1/2	1/2
Thermo Switch (N7)	in	1/2	1/2	1/2	1/2	1/2
Dimension						
Diameter (D)	mm	220	275	325	410	460
Length (L)	mm	420	525	620	740	830
Width (W)	mm	420	465	520	615	645
Total Height (H)	mm	1,060	1,210	1,420	1,700	1,890

- The Term "Cooling Load" Refers to Using Hydraulic Separator for Cooling System (Chiller & Fancoil)

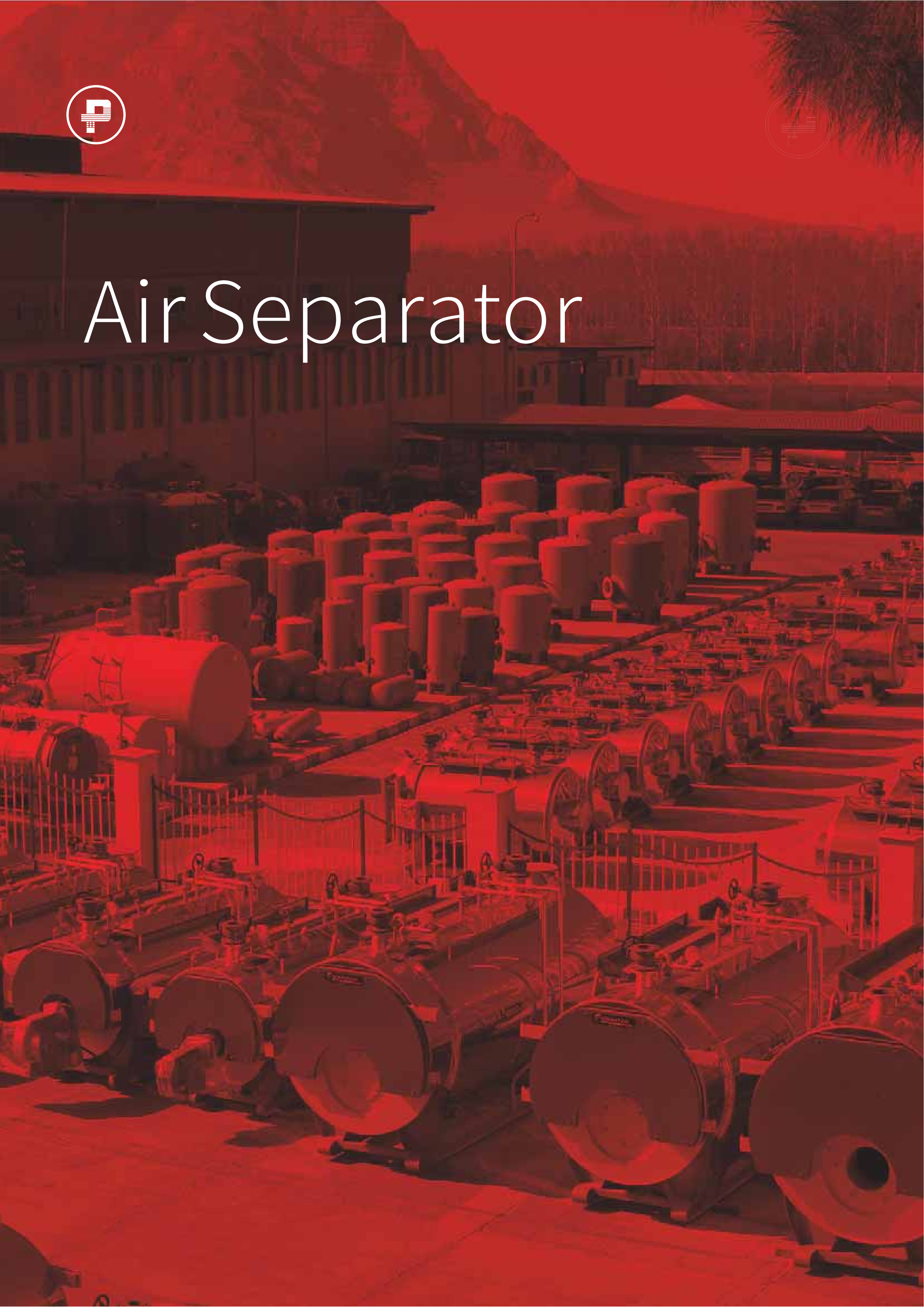




Model	Unit	PLL 8-18	PLL 10-20	PLL 12-24	PLL 14-28
Technical Data					
Design Standard	_	ASME SEC. VIII DIV.1			
Design Temperature	°C	5-100			
Flow Rate	gpm	550-1,100	1,100-1,980	1,980-3,300	3,300-4,400
Heating Load	kcal/hr	1,250,000-2,500,000	2,500,000-4,500,000	4,500,000-7,500,000	7,500,000-10,000,000
Cooling Load *	Btu/hr	2,750,000-5,500,000	5,500,000-9,900,000	9,900,000-16,500,000	16,500,000-22,000,000
Connection Size					
Body Size (D)	in	18	22	24	28
Secondary Inlet & Outlet (N1)	in	8	10	12	14
Primary Inlet & Outlet (N2)	in	8	10	12	14
Vent (N3)	in	1/2	1/2	1	1
Drain (N4)	in	2	2	2	2
Manometer (N5)	in	1/2	1/2	1/2	1/2
Thermometer (N6)	in	1/2	1/2	1/2	1/2
Thermo Switch (N7)	in	1/2	1/2	1/2	1/2
Dimension					
Diameter (D)	mm	460	510	610	715
Length (L)	mm	905	950	1,140	1,280
Width (W)	mm	675	740	815	1,050
Total Height (H)	mm	2,000	2,230	2,580	2,980

- The Term “Cooling Load” Refers to Using Hydraulic Separator for Cooling System (Chiller & Fancoil)

Air Separator



Product Description

Air separators eliminate the air from closed loop heating and cooling systems quickly and efficiently. Water enters and exits through unique tangential nozzle connections, which promote a low velocity vortex effect in the center of the unit. Natural centrifugal forces allow the heavier air-free water to move towards the outer edges, while entrained air is captured by the stainless steel collection tube and released to the top of the separator. This air can then be redirected to the compression tank, or released out of the system through an automatic air vent. The bubble free water then exits near the bottom of the unit and the system is thus protected against noise, blockage and damage commonly caused by entrained air.

PACKMAN’S Air Separator Tank Properties

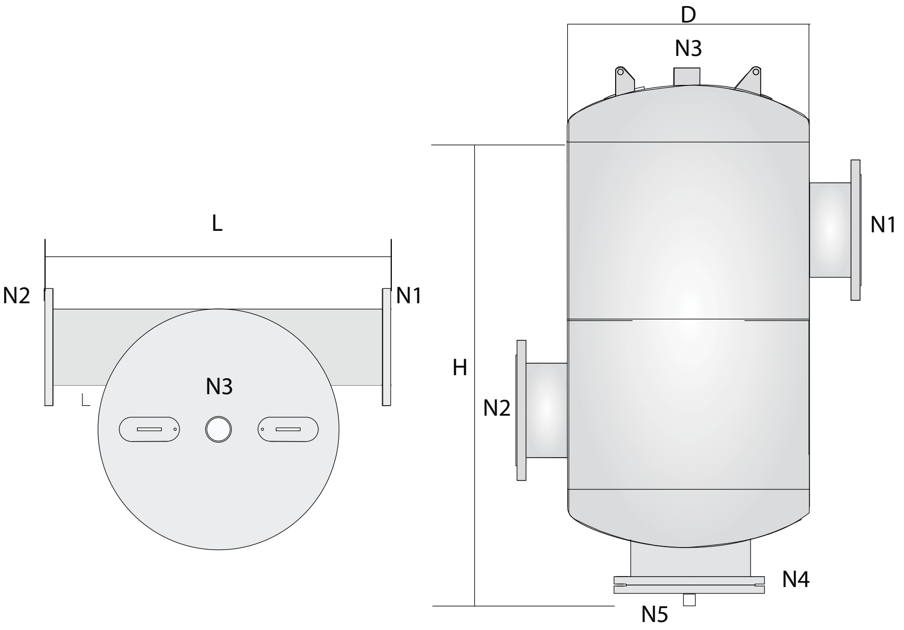
PACKMAN’s Atmospheric Air Separator Tanks are made of SA 36 (St 37.2 in accordance with DIN standard) or in case of customer’s emphasis they can be made of 17MN4 (which is Suitable for boiler construction) with suitable thickness and without any change in the price.

Manufacturing Standards

ASME Sec VIII, Div. 1 is observed in the construction of Air Separator tanks. PACKMAN’s Air Separator tank’s heads are Torispherical. This type of head has a longer life and a higher pressure strength compared to other shapes with the same thickness. The production price per kilo of these heads can reach up to twice the price ratio of the usual heads on the market.

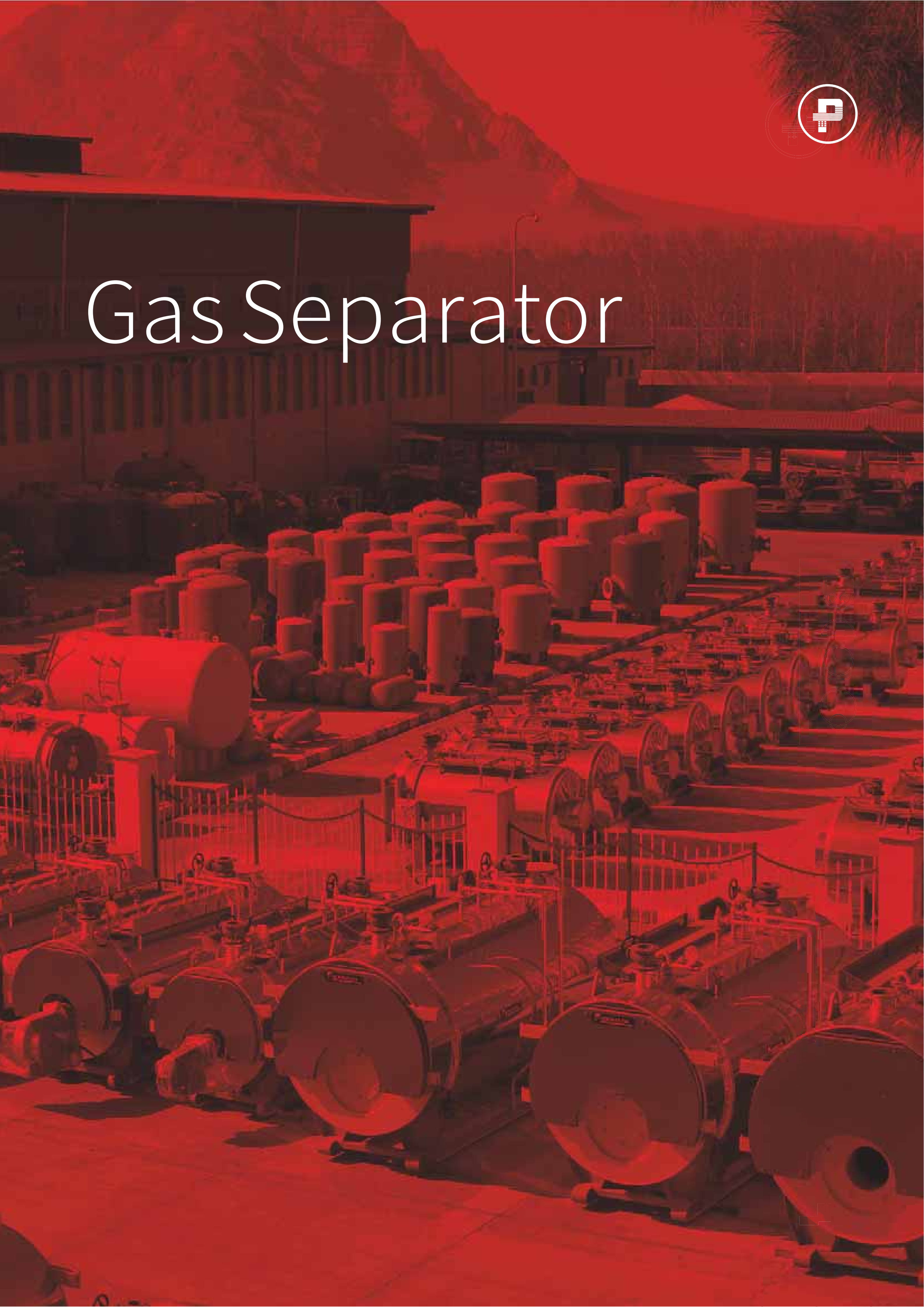
Welding Procedure

Welding is done with the Swedish ISBU submerged arc welding equipment. After constructing the tank and welding the lugs, the body of the tank is connected to the heads using a submerged arc welding method. The heads are welded internally and externally, which increases their life and strength. In the root pass, the TIG, argon or other welding methods with the 6010 cellulose electrode is used. The EW7018 electrode is used in fill pass. Finally the submerged method with EW7018 electrodes is used in the welding cover pass.



Model	Unit	PAS-300	PAS-500	PAS-700	PAS-1300	PAS-2000	PAS-4400
Technical Data							
Design Standard	-	ASME SEC. VIII. DIV.1					
Vessel Type	-	VERTICAL					
Flow Rate	gpm	300	500	700	1300	2000	4400
Volume Capacity	litr	60	120	180	600	880	2300
Vessel Water Pressure Drop	bar	0.1	0.1	0.1	0.1	0.1	0.1
Connectoins Size							
Inlet (N1)	in	4	5	6	8	10	16
Outlet (N2)	in	4	5	6	8	10	16
Vent (N3)	in	1	1	2	2	2 1/2	3
Hand Hole (N4)	in	8	8	12	12	12	16
Drain (N5)	in	1/2	1/2	1/2	1/2	1/2	2
Material							
Shell	-	Carbon Steel					
Head	-	Carbon Steel					
Vessel Dimensions							
Vessel Diameter (D)	mm	320	400	460	800	800	1200
Vessel Height (H)	mm	1000	1000	1300	1700	2000	2600
Inlet to Outlet Length (L)	mm	600	700	650	1100	1150	1600

Gas Separator



Product Description

Gas Separators eliminate the air gas from closed loop heating and cooling systems quickly and efficiently. Oil enters and exits through unique tangential nozzle connections which promote a low velocity vortex effect in the center of the unit. Natural centrifugal forces allow the heavier gas-free oil to move towards the outer edges, while entrained air is captured by the stainless steel collection tube and released to the top of the separator. This air can then be redirected to the compression tank, or released out of the system through an automatic vent. The bubble free oil then exits near the bottom of the unit and the system is thus protected against the noise, blockage and damage commonly caused by entrained gas.

PACKMAN's Gas Separator Tank Properties

PACKMAN's Atmospheric Gas Separator Tanks are made of SA 36 (St 37.2 in accordance with DIN standard) or in case of a customer's emphasis they can be made of 17MN4 (which is Suitable for boiler construction) with suitable thickness and without any change in the price.

Manufacturing Standards

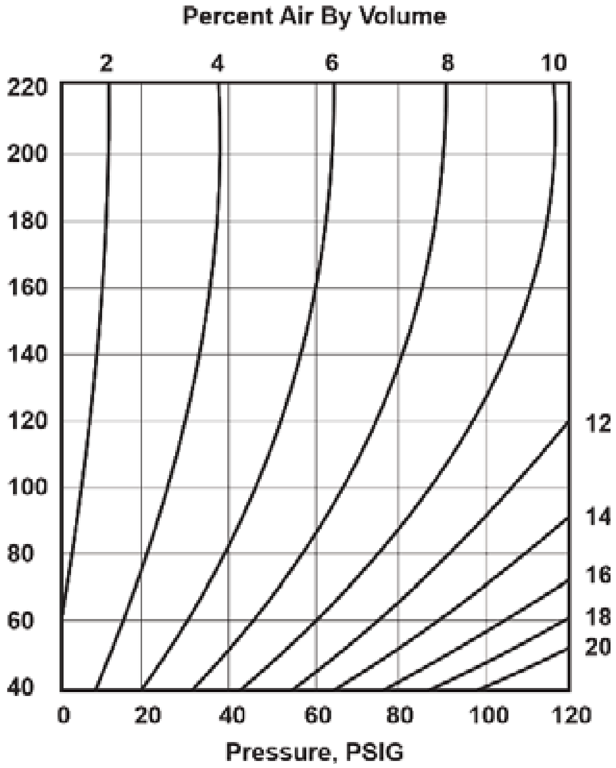
ASME Sec VIII, Div. 1 is observed in construction of Gas Separator tanks.

Torispherical / Elliptical Head

PACKMAN's Gas Separator tank's heads are Torispherical. This type of head has a longer life and a higher pressure strength compared to other shapes with the same thickness. The production price per kilo of these heads can rech up to twice the price ratio of the usual heads on the market.

Welding Procedure

Welding is done with the Swedish ISBU submerged arc welding equipment. After constructing the tank and welding the lugs, the body of the tank is connected to the heads using a submerged arc welding method. The heads are welded internally and externally, which increases their life ana strength. In the root pass, the TIG, argon or other welding methods with the 6010 cellulose electrode is used. The EW7018 electrode is used in fill pass. Finally the submerged method with EW7018 electrodes is used in the welding cover pass.



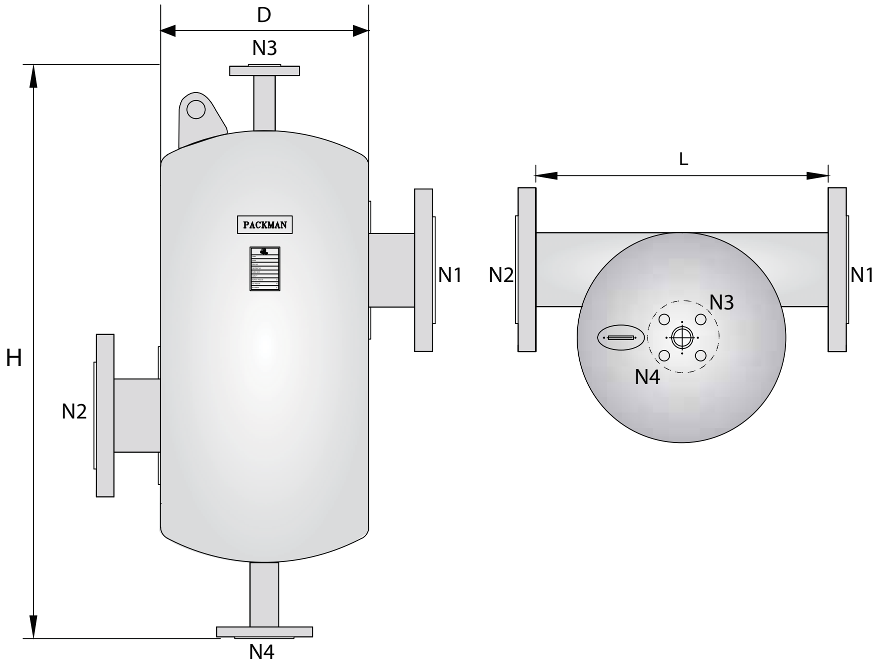
Product Capacity Calculation & Selection

Note that at a fixed pressure, increasing the temperature reduces the amount of air that can be dissolved.

The conclusion is that as oil is heated from the fill temperature to the operating temperature, a great deal of air is released. Therefore, the simple act of bringing the oil to operating temperature could lead to corrosion and air pockets, both of which should be avoided. Depending upon the type of expansion tank used in the system, the air separator is part of an air control system, or an air separation system. Both systems will be discussed later.

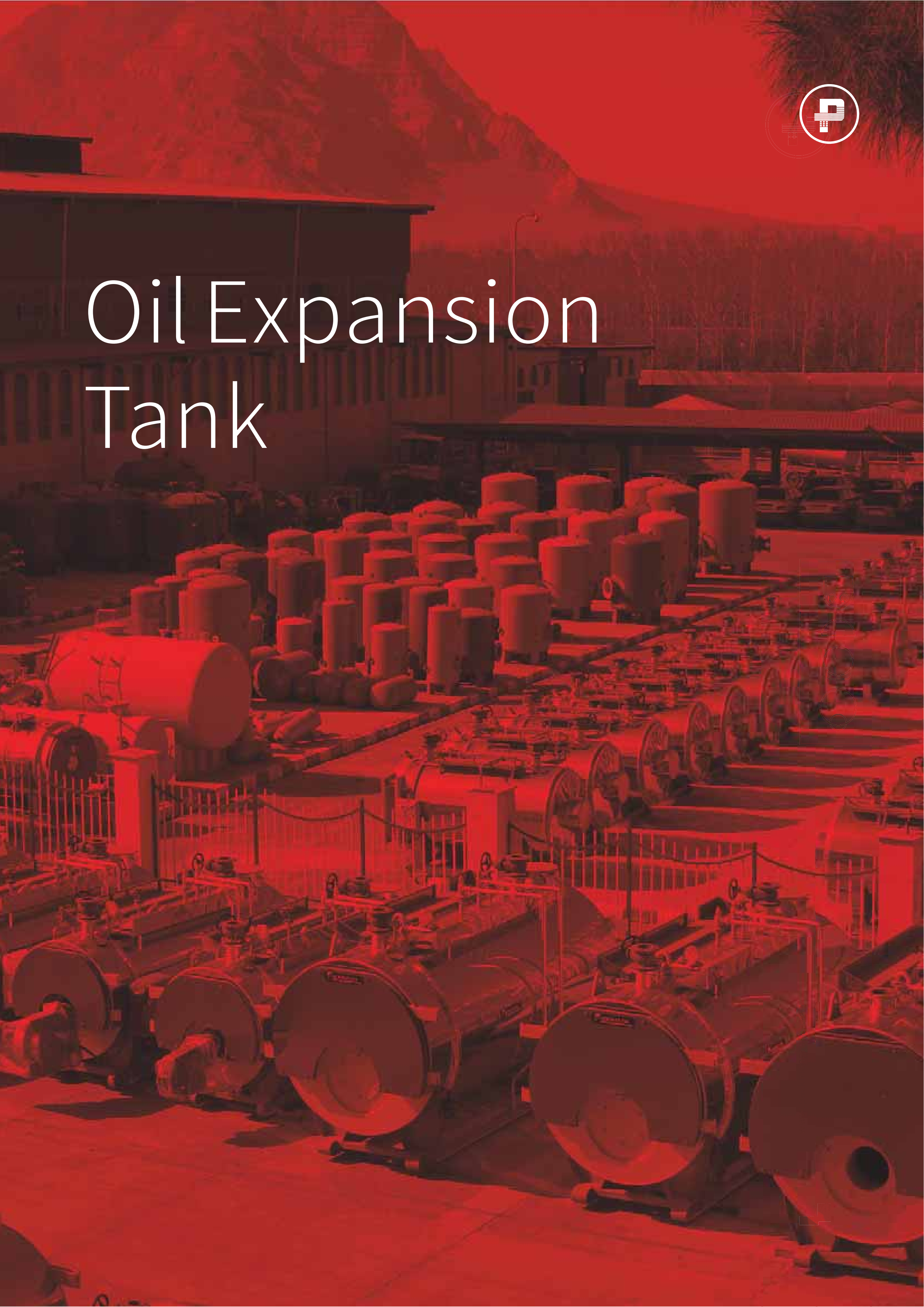
The actual capacity of the factory is required to calculate the size of the air separator. It is very simple to calculate the capacity and, by knowing the flow rate of oil through the device and the maximum permissible pressure drop, the model can be selected from the chart or table which is established by the manufacturer.

It should be mentioned that the maximum operating temperature is 375°F and its maximum working pressure is 125Psi.



Model	Unit	PGS-300	PGS-500	PGS-700	PGS-1300	PGS-2000	PGS-4400
Technical Data							
Design Standard	-	ASME SEC. VIII. DIV.1					
Vessel Type	-	Vertical					
Flow Rate	gpm	300	500	700	1300	2000	4400
Volume Capacity	litr	60	90	140	210	760	2300
Vessel Fluid Pressure Drop	bar	0.1	0.1	0.1	0.1	0.1	0.1
Connectoins Size							
Inlet (N1)	in	4	5	6	8	10	16
Outlet (N2)	in	4	5	6	8	10	16
Vent (N3)	in	1	1	1	2	2 1/2	3
Drain (N4)	in	1 1/4	1 1/2	1 1/2	1 1/4	2	2
Material							
Shell	-	Carbon Steel					
Head	-	Carbon Steel					
Vessel Dimensions							
Vessel Diameter (D)	mm	320	360	410	460	800	1200
Vessel Height (H)	mm	1000	1050	1400	1550	2000	2600
Inlet to Outlet Length (L)	mm	600	550	600	750	1150	1600

Oil Expansion Tank



Product Description

Since The Fluid with in a closed-loop system is heated during liquid phase, it will expand Your system must be designed to accommodate the liquid expansion in order to avoid the overflow of hot oil or over pressurization of your system's equipment and their consequent damage.Since the fluid's volume is changing but the fluid mass is not, calculating the expansion tank's capacity requires a simple conservation of mass equation. The mass of fluid in the system depends upon the volume of liquid (when the system is firstfilled) and the ambient temperature. The expanded volume can thus be achieved considering the highest temperature and constant mass of the oil.

PACKMAN Oil Expansion Tank Properties

PACKMAN's Atmospheric Oil Expansion Tanks are made of SA 36 (St 37.2 in accordance with DIN standard) or in the case of a customer's emphasis they can be made of 17MN4 (which is Suitable for boiler construction) with a certain thickness and without any change in price.

Manufacturing Standards

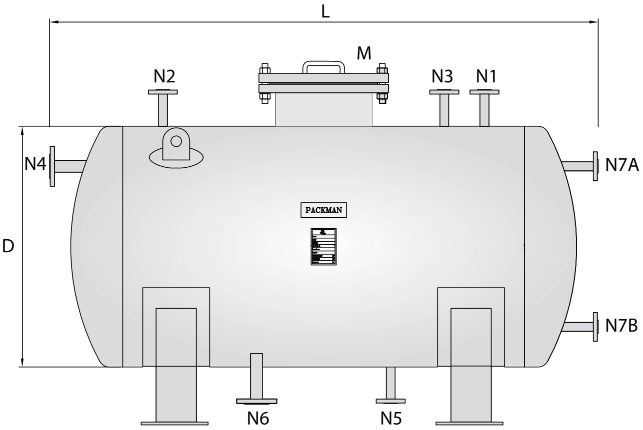
ASME Sec VIII, Div. 1 is observed in construction of Oil Expansion tanks.

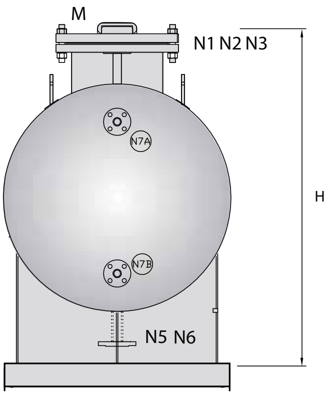
Torispherical / Elliptical Head

PACKMAN's Oil Expansion tank's heads areTorispherical. This type of head has a longer life and a higher pressure strength compared to other shapes with the same thickness. The production price per kilo of these heads can reach up twice the price ratio of the usual heads on the market.

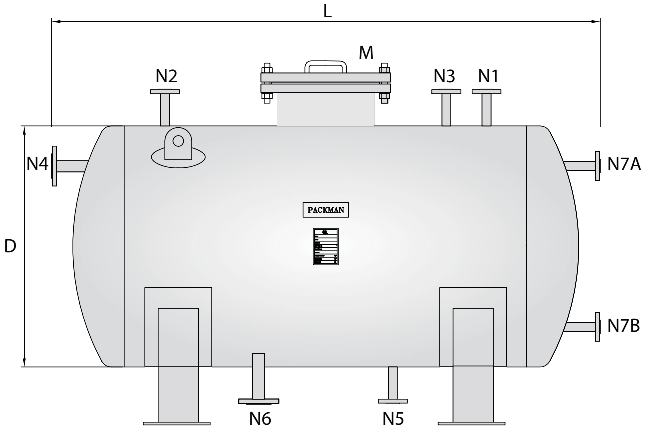
Welding Procedure

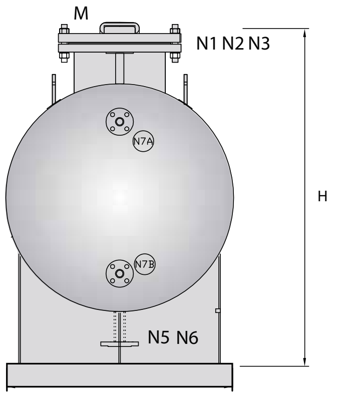
Welding is done with the Swedish ISBU submerged arc welding equipment. After constructing the tank and welding the lugs, the body of the tank is connected to the heads using a submerged welding method. The heads are welded internally and externally, which increases their life and strength. In the root pass, the TIG, argon or other welding methods with the 6010 cellulose electrode is used. The EW7018 electrode is used in fill pass. Finally the submerged method with EW7018 electrodes is used in the cover pass.





Model	Unit	POET-300	POET-800	POET-1000	POET-1500	POET-2000	POET-2500	POET-3000
Technical Data								
Design Standard	-	ASME SEC. VIII. DIV.1						
Vessel Type	-	Horizantal						
Volume Capacity	litr	300	800	1,000	1,500	2,000	2,500	3,000
Connectoins Size								
Hand Hold or ManHole(M)	in	8	8	14	14	14	16	16
Vent (N1)	in	1	1	1	1	1	1 1/2	1 1/2
Oil Inlet (N2)	in	1	1	1	1 1/2	1 1/2	2	2
Vapor Inlet (N3)	in	1	1	1	1	1	1 1/2	1 1/2
Over Flow (N4)	in	1	1	1 1/2	1 1/2	1 1/2	2	2
Oil Outlet (N5)	in	1	1	1 1/2	1 1/2	1 1/2	2	2
Drain (N6)	in	1	1	1	1	1	1 1/2	1 1/2
Level Gauge (N7A), (N7B)	in	1	1	1	1	1	1	1
Material								
Shell	-	Carbon Steel						
Toris Head	-	Carbon Steel						
Vessel Dimensions								
Vessel Diameter (D)	mm	610	800	900	1100	1200	1320	1320
Vessel Lengeth (L)	mm	1700	2200	2200	2200	2200	2200	2600
Vessel Height (H)	mm	1000	1200	1400	1600	1800	1900	1800





Model	Unit	POET-4000	POET-5000	POET-6000	POET-7000	POET-8000	POET-9000	POET-10000
Technical Data								
Design Standard	-	ASME SEC. VIII. DIV.1						
Vessel Type	-	Horizantal						
Volume Capacity	litr	4,000	5,000	6,000	7,000	8,000	9,000	10,000
Connectoins Size								
Hand Hold or ManHole(M)	in	16	16	16	16	16	16	16
Vent (N1)	in	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
Oil Inlet (N2)	in	3	3	3	3	3	3	3
Vapor Inlet (N3)	in	2	2	2	2	2	2	2
Over Flow (N4)	in	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2
Oil Outlet (N5)	in	3	3	3	3	3	3	3
Drain (N6)	in	2	2	2	2	2	2	2
Level Gauge (N7A), (N7B)	in	1	1	1	1	1	1	1
Material								
Shell	-	Carbon Steel						
Toris Head	-	Carbon Steel						
Vessel Dimensions								
Vessel Diameter (D)	mm	1592	1592	1750	1750	1910	1910	1910
Vessel Lengeth(L)	mm	2650	3200	3300	3500	3400	3800	4300
Vessel Height(H)	mm	2100	2100	2250	2250	2400	2400	2400

Pressurized Air Tank

Product Description

Compressed air tank is required in a process or HVAC systems to produce air and control the pressure within a specific process. A properly sized tank will accommodate the necessary pressurized air for the system during the process to control pressure limits.

Compressed air tanks are designed to release air forces and control of the pressure in heating/cooling and etc. systems. These tanks have been used for many purposes in specific systems. The air pressure in the tank must be controlled.

PACKMAN Compressed Air Tank Properties

PACKMAN's Compressed air tanks are made of SA 36 (St 37.2 in accordance with DIN standard) or in case of customer's request they can be made of 17MN4 (which is Suitable for boiler construction) with a certain thickness and without any change in price.

Manufacturing Standards

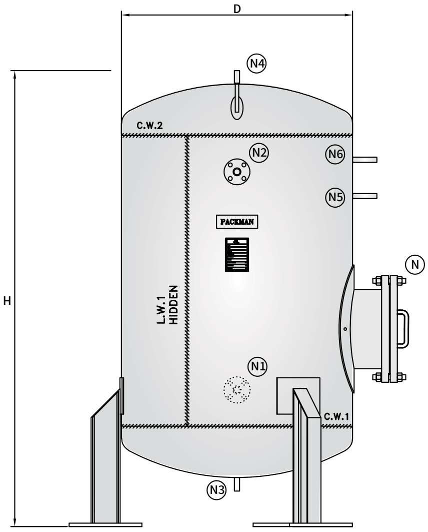
ASME Sec VIII, Div. 1 is observed in the construction of closed expansion tanks.

Tori spherical / Elliptical Head

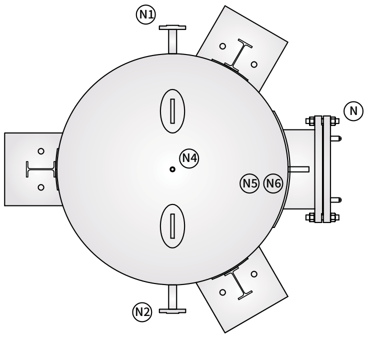
PACKMAN's Compressed air tank's head is Tori spherical or elliptical. This type of head has a longer life and a higher-pressure strength compared to other shapes with the same thickness. The production price/per kilo of these heads can reach to twice the price ratio of the usual heads on the market.

Welding Procedure

Welding is done with the Swedish ISUB submerged arc welding equipment. After constructing the tank and welding the lugs, the body of the tank is connected to the heads using a submerged arc welding method. The heads are welded internally and externally, which increases their life and strength. In the root pass, the TIG, argon or other welding methods with the 6010 cellulose electrode is used. The EW7018 electrode is used in fill pass. Finally, the submerged method with EW7018 electrodes is used in the cover pass.

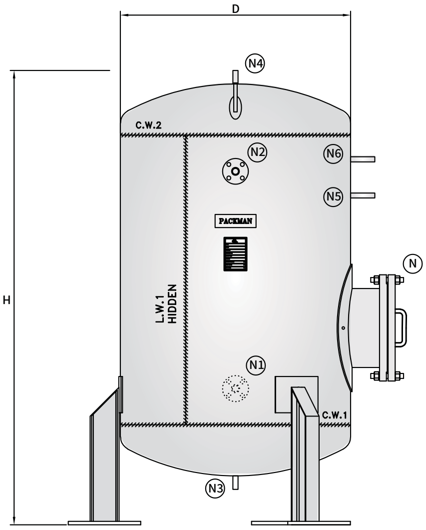


GENERAL VIEW

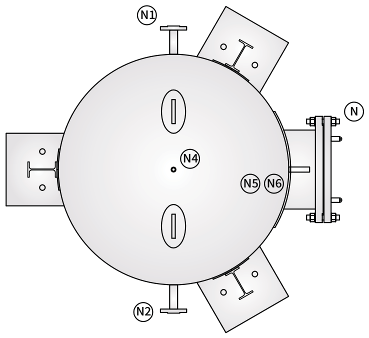


TOP VIEW

Model	Unit	PCAT-300	PCAT-800	PCAT-1000	PCAT-1500	PCAT-2000
Technical Data						
Design Standard		ASME SEC. VIII. DIV.1				
Vessel Type		Vertical				
Volume Capacity	litr	300	800	1000	1500	2000
Working Pressure	bar	8	8	8	8	8
Design Pressure	bar	9	9	9	9	9
Hydrotest Pressure	bar	13	13	13	13	13
Vessel Air Pressure Drop	bar	0.1	0.1	0.1	0.1	0.1
Connectoins Size						
Inlet (N1)	in	1	1	1	1 1/2	1 1/2
Outlet (N2)	in	1	1	1	1 1/2	1 1/2
Drain (N3)	in	1/2	1/2	1/2	1/2	1/2
Safety Valve (N4)	in	1/2	1/2	1/2	1	1
Pressure Indicator (N5)	in	1/2	1/2	1/2	1/2	1/2
Hand Hold or Man Hole (N)	in	8	12	12	14	14
Pressure Switch (N6)	in	1/2	1/2	1/2	1/2	1/2
Material						
Shell		Carbon Steel				
Head		Carbon Steel				
Vessel Dimensions						
Vessel Diameter	mm	600	800	900	1100	1200
Distance Of Head From Level	mm	1600	2200	2100	2200	2300



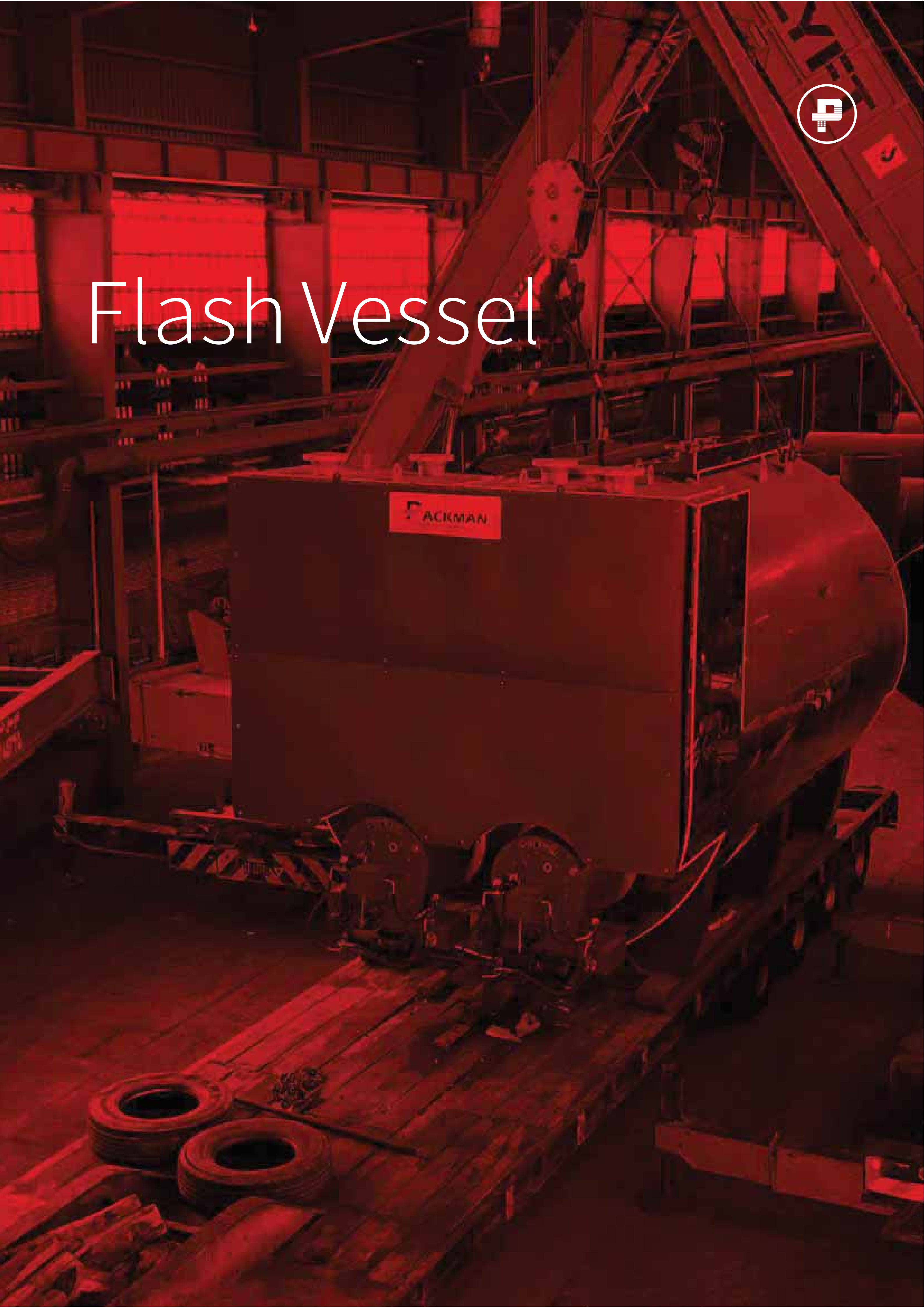
GENERAL VIEW



TOP VIEW

Model	Unit	PCAT-3000	PCAT-4000	PCAT-5000	PCAT-6000	PCAT-10000
Technical Data						
Design Standard		ASME SEC. VIII. DIV.1				
Vessel Type		Vertical				
Volume Capacity	litr	3000	4000	5000	6000	10000
Working Pressure	bar	8	8	8	8	8
Design Pressure	bar	9	9	9	9	9
Hydrotest Pressure	bar	13	13	13	13	13
Vessel Air Pressure Drop	bar	0.1	0.1	0.1	0.1	0.1
Connectoins Size						
Inlet (N1)	in	1 1/2	2	2	3	5
Outlet (N2)	in	1 1/2	2	2	3	5
Drain (N3)	in	1/2	1	1	1	1
Safety Valve (N4)	in	1 1/4	1 1/2	1 1/2	2	2 1/2
Pressure Indicator (N5)	in	1/2	1/2	1/2	1/2	1/2
Hand Hold or Man Hole (N)	in	14	16	16	16	20
Pressure Switch (N6)	in	1/2	1/2	1/2	1/2	1/2
Material						
Shell		Carbon Steel				
Head		Carbon Steel				
Vessel Dimensions						
Vessel Diameter	mm	1320	1592	1592	1750	1910
Distance Of Head From Level	mm	2700	2500	3000	3100	4200

Flash Vessel



Product Description

The Packman Flash Vessle is designed and constructed to ASME VIII DIV 1. The design is free- draining which is essential in boiler blowdown & condensate return applications.

Applications

These vessels are particularly suited to condensate returning from system or boiler blowdown heat recovery systems where efficient separation of the flash steamfrom the blowdown is essential to prevent contamination of the boiler feed Vessle and / or heat transfer surfaces.

Principal Features

Designed and constructed in compliance with pressure vessels standards.
Low separation velocity to produce drier steam.
Free-draining.

Sizes and Pipe Connections

Connections available as standard: Screwed connections to BS 21 taper. Flanged connections to EN 1092 PN16.
Note: Vessels are available to BS 1560 Class 150 or 300, or screwed NPT

How to Size

Use the chart below to select the appropriate flash Vessle. It is necessary to know the pressure on the steam traps or boiler pressure in
the case of blowdown heat recovery, the flash steam pressure (desired or existing), and the condensate or blowdown flowrate.

Example 1: (solid lines)

A boiler plant operating at 12 bar g has a TDS control blowdown flowrate of 2 500 kg /h (3 boilers at 833 kg / h each).
The flash steam from the blowdown is to be added to the low pressure steam system operating at 1 bar g.
1. From boiler pressure move horizontally to flash steam pressure - A
2. Drop vertically to blowdown flowrate in kg / h - B

3. Follow curve to right-hand scale and across to same flash pressure - C

4. Move upwards to flash vessel size. Select flash vessel - in this case an PFV8 is required.

Example 2: (dotted lines)

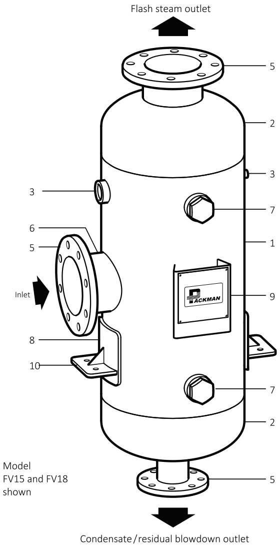
A plant operating on steam at 11 bar g condenses 4 000 kg / h of steam. Flash is to be recovered at 0.5 barg.

1. From pressure on steam traps move horizontally to flash steam pressure - A1

2. Drop vertically to condensate flowrate in kg / h - B1

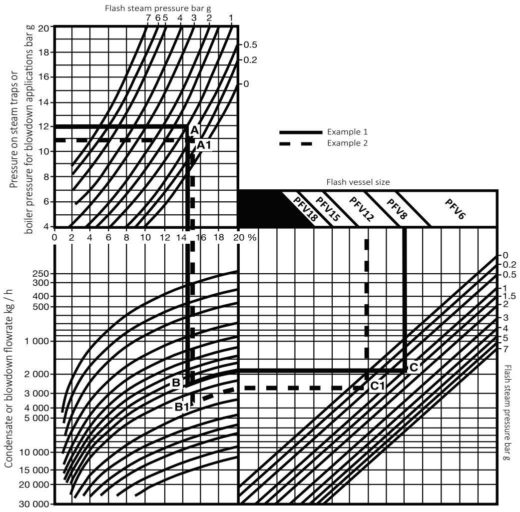
3. Follow curve to right hand scale and across to same flash pressure - C1

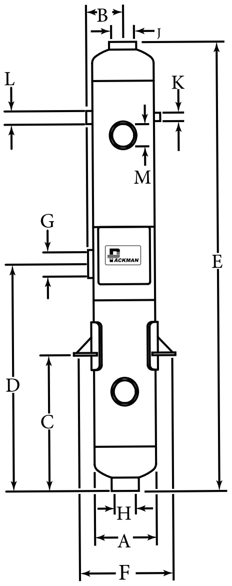
4. Move upwards to flash vessel size. Select flash vessel - in this case an PFV12 is required.



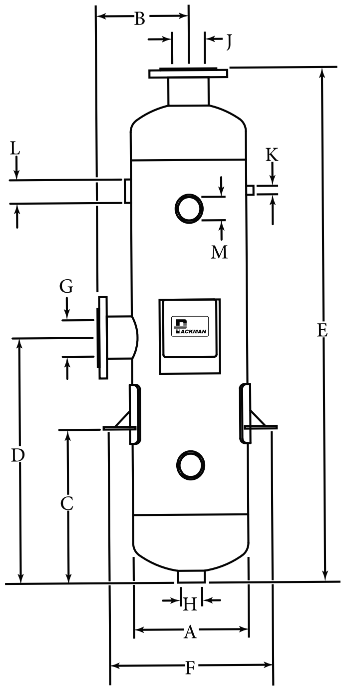
Design Data

No.	Part	Material
1	Shell Cylinder	ASTM A106B
2	End Cap	ASTM A234 WPB
3	Nozzle - Half Coupling	ASTM A105N
4	Nozzle - Full Coupling	ASTM A105N
5	Nozzle - Flange	ASTM A516-70
6	Nozzle - Pipe	ASTM A106B
7	Blanking Plug	ASTM A105N
8	Wrapper plate	ASTM A516-60
9	Name-plate Bracket	BS EN 10028-2 P265GH
10	Support Foot / Gusset	BS EN 10025 S275

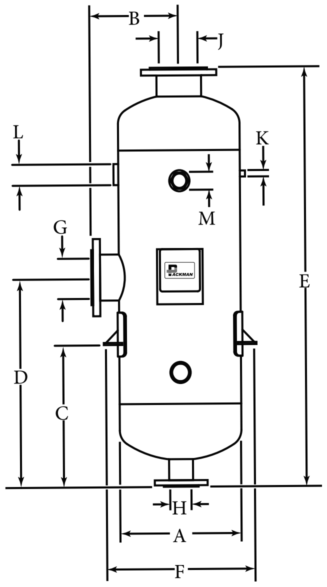




PFV6



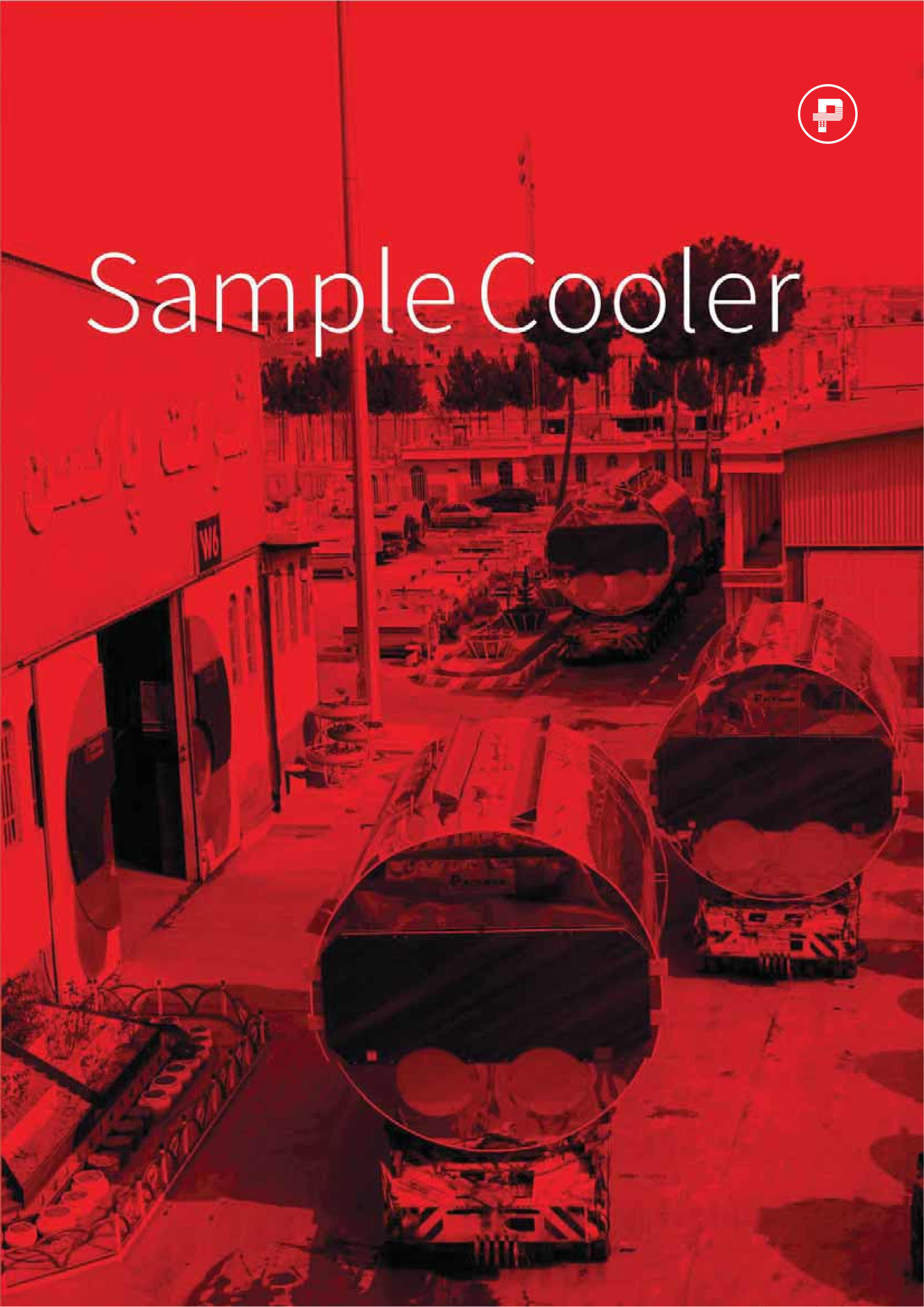
PFV8 and PFV12



PFV15 and PFV18

MODEL	PFV6	PFV8	PFV12	PFV15	PFV18
Design Data					
A	168	219	324	406	457
B	104	210	262	303	329
C	370	413	418	390	514
D	620	663	668	640	764
E	1 225	1 391	1 400	1 275	1 521
F	230	281	411	492	544
G	2"	DN80	DN100	DN150	DN150
H	2"	2"	2"	DN80	DN80
J	2"	DN80	DN100	DN150	DN150
K	3/4”	3/4”	3/4”	3/4”	3/4”
L	3/4”	1"	1 1/2”	1 1/2”	2"
M	2"	2"	2"	2"	2"

Sample Cooler



Product Description

The Sample Cooler is a compact unit, specially designed as per ASME SECVIII, Div-1 & ASME PTC-19.11 recommendations. To handle high pressure & high temperature applications. These coolers as designed for counter flow cooling to achieve very close temperature approach of the sample to coolant. These cooler as made of double helix coil which meets ASME D1192 requirements, fitted with a baffle for maximum efficiency. The shell is mounted through flanged connections and it can be removed without disturbing sample lines.

Sample coolers are used to take samples of water or steam from boilers at high temperature and pressure. The counter-current flow the through the shell and coil condenses the steam and cools hot fluids efficiently to enable safe sampling. When hot pressurized liquids are being cooled the sample cooler prevents 'flashing-off' which can be dangerous and will result in an inaccurate sample. By utilizing corrosion resistant materials for the cooler, contamination is minimized, and service life maximized.

Boiler Water Applications

It is necessary to take regular samples of boiler water to test that a boiler is operating at the required TDS (total dissolved solids) level.

This should be done even if an automatic TDS control system is fitted since any automatic system should be checked at intervals.

When a sample of water is taken from a boiler its pressure reduces and flash steam is formed. If this flash steam were to escape to atmosphere without being condensed the resulting sample would show higher TDS levels than actually existed in the boiler water. To obtain accurate and safe samples it is therefore essential that sufficient cooling is carried out to fully condense any flash steam. The sample cooler reduces boiler water temperature to around 25 °C ready for immediate analysis.

PACKMAN Sample Cooler Tank Properties

PACKMAN's Sample Cooler Tanks are made of S.S316L or in the case of a customer's emphasis they can be made of 17MN4 (which is Suitable for boiler construction) with a certain thickness and without changing the price.

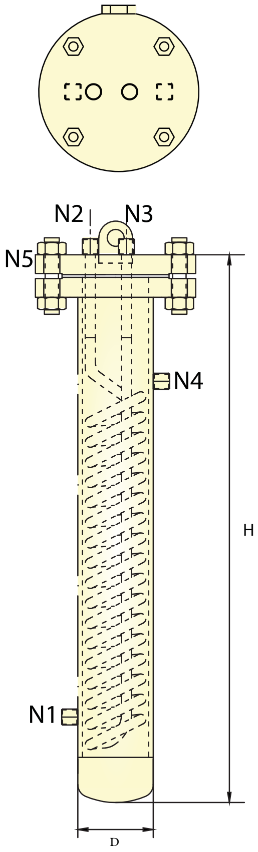
Manufacturing Standards

ASME Sec VIII, Div. 1 is used in the construction of sample cooler tanks.

Welding Procedure

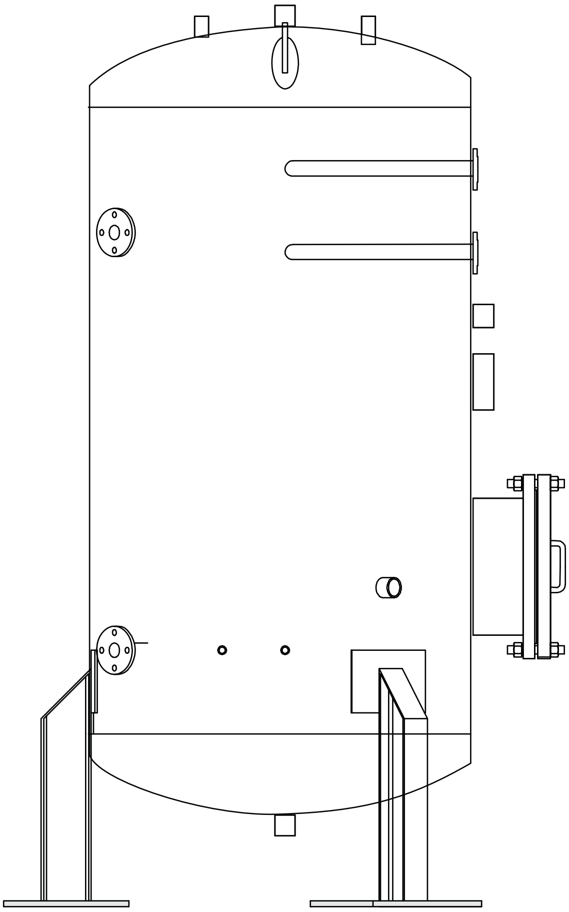
Welding is done by using the Swedish ISBU submerged arc welding equipment. After constructing the tank and welding the lugs, the body of the tank is connected to the heads by welding with a submerged welding method. In addition, the head is welded internally and externally, which increases the lifetime and the strength of the heads. In the welding root pass, the TIG, argon or welding methods with the 6010 cellulose electrode is used. The EW7018 electrode is used in welding fill pass. The submerged method using EW7018 electrodes in the welding cover pass.

Model	Unit	Sample Cooler (Low Pressure)	Sample Cooler (High Pressure)
Technical Data			
Design Standard	_	ASME Section VIII	ASME Section VIII
Operating Pressure (Shell/ Tube)	barg	2/11	2/15
Operating Temperature (Shell/ Tube)	°C	25/185	25/200
Connection Size			
Cold Water Outlet (N1)	in	3/4	3/4
Steam Inlet (N2)	in	1/2	1/2
Condensate Outlet (N3)	in	1/2	1/2
Cold Water Inlet (N4)	in	3/4	3/4
Body Flange (N5)	in	3	4
Material			
Body	-	Carbon Steel or Stainless Steel	
Coil	-	copper	Stainless Steel
Vessel Dimentions			
Vessel Diameter (D)	mm	90	90
Total Height (H)	mm	650	650



Atmospheric Tanks
Heating Product Group
PACKMAN

Atmospheric Tanks **page**



Condensate Tank

Product Description

Condensate Tanks recover condensate returns and add fresh water to meet boiler or deaerator water requirements. It means that One purpose of the condensate tank is to deliver the condensate back to the boiler where there is insufficient differential pressure to flow the condensate to the boiler plant. Also at the main condensate collection point in the boiler operation, where there is a need to collect the condensate and pumping it to the pressurized deaerator system.The preferred method of receiving and delivering condensate to the boiler plant operation is by using a properly sized and designed condensate tank with an electric-motor-driven pump.An efficient steam system will collect condensate in the plant and either return it to a deaerator, send it to a boiler feed tank, or use it in another process. A high percentage of these systems are modulating process steam systems, where steam pressure to the heat transfer varies with the processes. These modulating systems require condensate to flow by gravity from the heat transfer equipment to a vented condensate tank system.The condensate tank system is always vented to the atmosphere to keep pressure out of the condensate return lines.

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PACKMAN Condensate Tank Properties

PACKMAN's Atmospheric Condensate Tanks are made of SA 36 (St 37.2 in accordance with DIN standard) or in the case of a customer's emphasis they can be made of 17MN4 (which is Suitable for boiler construction) with a certain thickness and without changing the price.

Manufacturing Standards

ASME Sec VIII, Div. 1 is used in the construction of atmospheric condensate tanks.

Torispherical / Elliptical Head

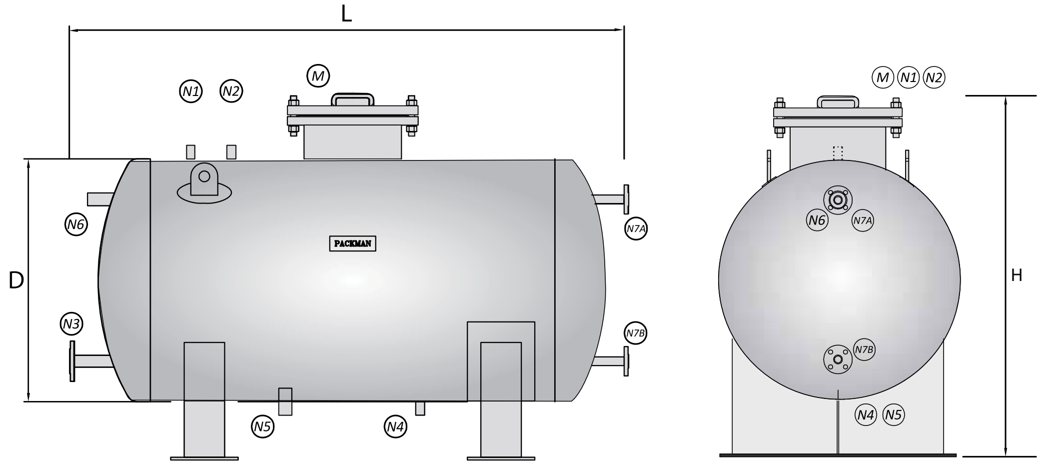
PACKMAN's Condensate tank head is Torispherical. This type of head has a longer life and a higher pressure strength at the same thickness against other shapes. The production price/per kilo of these heads is even up to two times the size of the usual heads on the market.

Welding Procedure

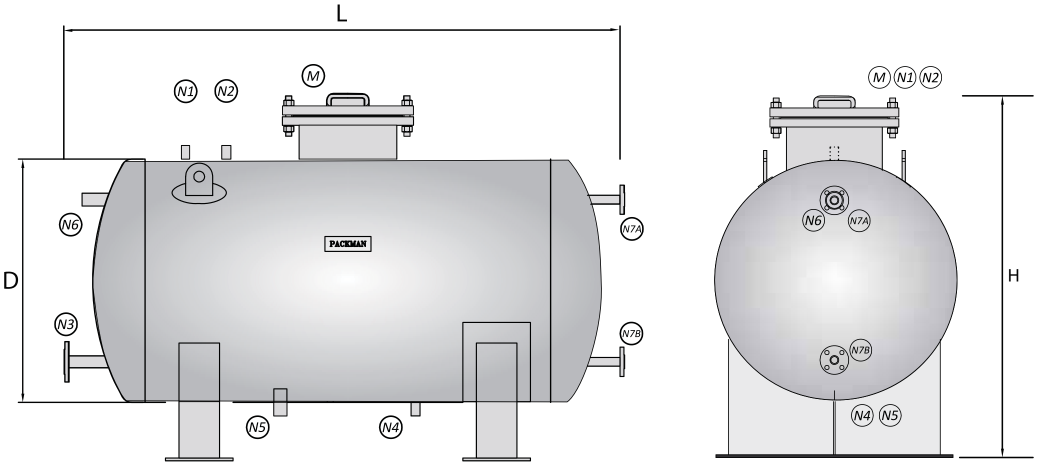
Welding is done by using the Swedish ISBU submerged arc welding equipment. After constructing the condensate tank and welding the lugs, the body of the tank will be connected to the heads by welding with a submerged welding method. In addition, the head is welded internally and externally, which increases the life time and the strength of the heads. In the welding root pass, the TIG, argon or welding methods with the 6010 cellulose electrode is used. The EW7018 electrode is used in welding fill pass. The submerged method using EW7018 electrodes in the welding cover pass.

Product Capacity Calculation & Selection

Selection of a Condensate Storage Tank is based on boiler size, pump required flow, and water storage requirements. Contact your local PACKMAN authorized representative for detailed component sizing information.For the normal installation, it has been found customary to select a receiver of sufficient size to hold a volume equivalent to the condensate evaporated by the boiler in a one-third to one-half hour period at the normal firing rate of the boiler. First of all, we determine the volume of the condensate source based on the amount of steam output from the boiler in kilograms per hour and the percentage of total return condensation and the time required to store the return condensate in the tank and the amount of boiler blown-off.

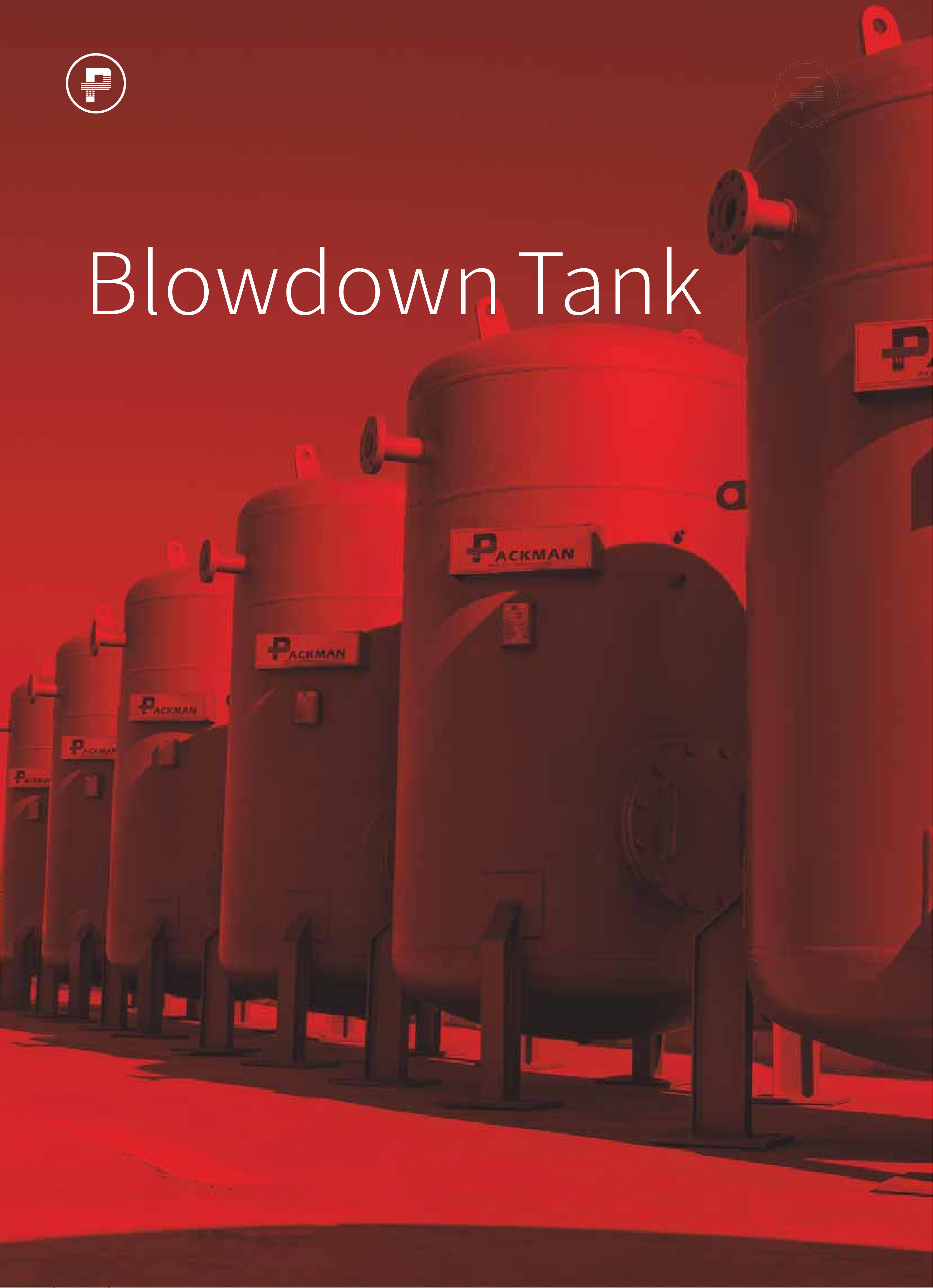


Model	Unit	PCT-300	PCT-400	PCT-800	PCT-1000	PCT-1500	PCT-2000	PCT-2500	PCT-3000	PCT-4000
Technical Data										
Design Standard	-	ASME SEC.VIII. DIV.1								
Vessel Type	-	Horizontal								
Volume Capacity	lit	300	400	800	1000	1500	2000	2500	3000	4000
Connectoins Size										
Vent (N1)	in	3/4	3/4	3/4	3/4	1	1 1/2	1 1/2	1 1/2	1 1/2
Drain (N5)	in	1	1	1	1	1	1 1/2	1 1/2	1 1/2	2
Level Gauge (N7A), (N7B)	in	1	1	1	1	1	1	1	1	1
Water Outlet (N4)	in	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2	3
Hand Hold/ Man Hole (M)	in	8	8	8	14	14	16	16	16	16
Water Inlet (N2)	in	1	1	1	1	1 1/2	2	2	2	3
Condensate Inlet (N3)	in	1 1/2	1 1/2	1 1/2	1 1/2	2	2 1/2	2 1/2	2 1/2	3
Overflow (N6)	in	1 1/2	1 1/2	1 1/2	1 1/2	2	2 1/2	2 1/2	2 1/2	2 1/2
Material										
Shell	-	Carbon Steel								
Toris Head	-	Carbon Steel								
Vessel Dimensions										
Vessel Diameter (D)	mm	610	610	800	900	1100	1200	1320	1320	1600
Vessel Length (L)	mm	1500	1500	2200	2200	2200	2200	2200	2600	2650
Vessel Height (H)	mm	960	960	1200	1400	1600	1800	1900	1800	2100



Model	Unit	PCT-5000	PCT-6000	PCT-7000	PCT-8000	PCT-9000	PCT-10000	PCT-20000	PCT-25000
Technical Data									
Design Standard	-	ASME SEC.VIII. DIV.1							
Vessel Type	-	Horizontal							
Volume Capacity	litr	5000	6000	7000	8000	9000	10000	20000	25000
Connectoins Size									
Vent (N1)	in	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
Drain (N5)	in	2	2	2	2	2	2	2	2 1/2
Level Gauge (N7A), (N7B)	in	1	1	1	1	1	1	1	1
Water Outlet (N4)	in	3	3	3	3	3	3	3	4
Hand Hold/ Man Hole (M)	in	16	16	16	16	16	16	16	16
Water Inlet (N2)	in	3	3	3	3	3	3	3	4
Condensate Inlet (N3)	in	3	3	3	3	3	3	3	4
Overflow (N6)	in	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2
Material									
Shell	-	Carbon Steel							
Toris Head	-	Carbon Steel							
Vessel Dimensions									
Vessel Diameter (D)	mm	1600	1750	1750	1910	1910	1910	2250	2500
Vessel Length (L)	mm	3200	3300	3550	3400	3800	4300	6000	5850
Vessel Height (H)	mm	2100	2250	2250	2400	2400	2400	2400	3050

Blowdown Tank



Product Description

Blowdown Tanks for boilers are used as an alternative system for cooling the bottom boiler blowdown. These large tanks retain the blowdown water volume from one blow after the flash steam has been vented to the atmosphere and allow the water to cool down by natural convection. The cooled water will be below 140° Fahrenheit when it is displaced by the next blowdown and forced out of the overflow drainpipe.
Boiling water causes scaling and deposits to form resulting in a less efficient boiler and a less efficient boiler means increased costs. Because of this, boilers need to be intermittently, and sometimes continuously, flushed of a certain percentage of their water. Therefore, boiler rooms need blowdown tanks to meet legal regulations and to safely dispose of hot, dirty boiler blowdown.

PACKMAN Blowdown Tank Properties

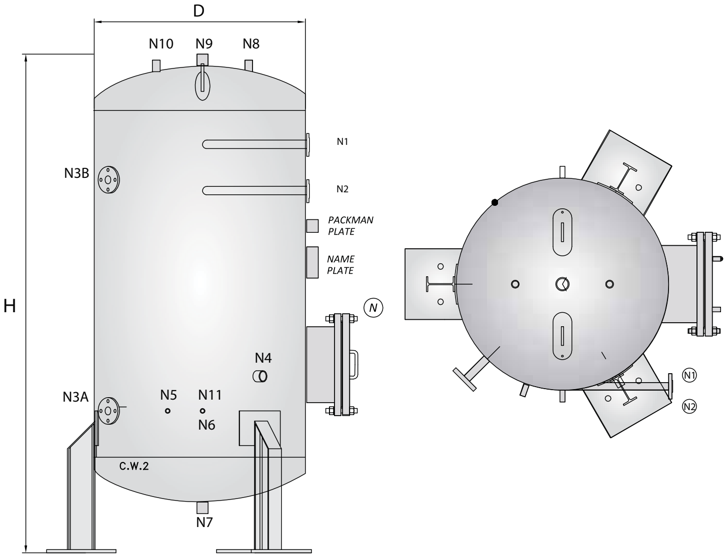
PACKMAN's Atmospheric Blowdown Tanks are made of SA 36 (St 37.2 in accordance with DIN standard) or in the case of a customer's emphasis they can be made of 17MN4 (which is Suitable for boiler construction) with a certain thickness and without changing the price.

Manufacturing Standards

ASME Sec VIII, Div. 1 is used in the construction of blowdown tanks.
PACKMAN's blowdown tank head is Torispherical. This type of head has a longer life and a higher pressure strength at the same thickness against other shapes. The production price/per kilo of these heads is even up to two times the size of the usual heads on the market.

Welding Procedure

Welding is done by using the Swedish ISBU submerged arc welding equipment. After constructing the tank and welding the lugs, the body of the tank is connected to the heads by welding with a submerged welding method. In addition, the head is welded internally and externally, which increases the time life and the strength of the heads. In the welding root pass, the TIG, argon or welding methods with the 6010 cellulose electrode is used. The EW7018 electrode is used in welding fill pass. The submerged method using EW7018 electrodes in the welding cover pass.



Model	Unit	PBT-300	PBT-600	PBT-800	PBT-1000	PBT-1500	PBT-2000	PBT-2500	PBT-3000	PBT-4000
Technical Data										
Design Standard	-	ASME SEC. VIII. DIV.1								
Vessel Type	-	VERTICAL								
Volume Capacity	lit	300	600	800	1000	1500	2000	2500	3000	4000
Connectoins Size										
Man Hole(N)	in	8	8	8	12	14	16	16	16	16
Blow Water Inlet 1 (N1)	in	1	1	1	1	1	2	2	2	2
Blow Water Inlet 2 (N2)	in	1	1	1	1	1	2	2	2	2
Level Gauge (N3A) , (N3B)	in	1	1	1	1	1	1	1	1	1
Water Outlet (N4)	in	1	1	1	1	1 1/2	1 1/2	1 1/2	1 1/2	2
Temperature Switch High (N5)	in	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Temperature Switch Low (N6)	in	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Drain (N7)	in	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2
Service Water Inlet (N8)	in	1/2	1/2	1/2	1	1 1/2	2	2	1 1/2	2
Spare (N10)	in	1	1	1	1	1	1	1	1	1
Temperature Indicator (N11)	in	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Vent (N9)	in	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2
Material										
Shell	-	Carbon Steel								
Toris Head	-	Carbon Steel								
Vessel Dimensions										
Vessel Diameter(D)	mm	610	800	800	900	1100	1200	1320	1200	1592
Vessel Height (H)	mm	1550	2200	2200	2200	2200	2200	2300	3300	2500

Open Expansion Tank

Product Description

An expansion tank or expansion vessel is a small tank used to protect closed (not open to atmospheric pressure) water heating systems and domestic hot water systems from excessive pressure. The tank is partially filled with air, the expansion tank cushions the system from water hammer shocks and absorbs excess water pressure caused by thermal expansion. In other words open Expansion tanks are used as safety accessories in the heating systems where, due to legal reason it is forbidden to install closed expansion tanks. An expansion tank is composed of a cover unit where all the including over flow, supply & circulating water Nozzles are installed. Open expansion Tanks must be installed 2 to 3 meters above the consumer in the highest level. The tanks must have a volume equal to or greater than the expansion volume of the system's total water content, the value of which should be declared.

PACKMAN Open expansion Tank Properties

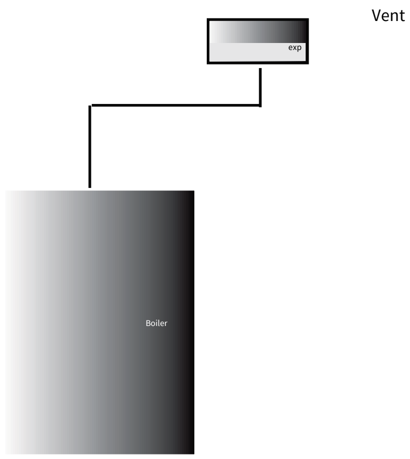
PACKMAN's Open Expansion Tanks are made of SA 36 (St 37.2 in accordance with DIN standard).

Manufacturing Standards

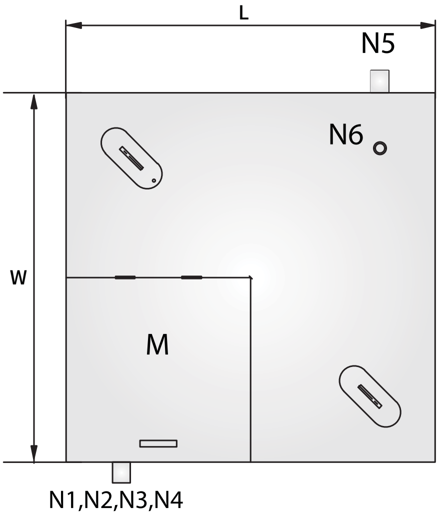
ASME Sec VIII, Div. 1 is observed in the construction of open expansion tanks.

Product Capacity Calculation & Selection

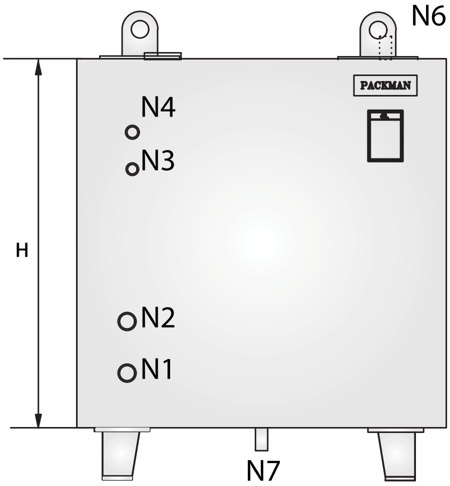
In order to select the capacity of open expansion tank, the expansion volume of the system should be calculated. The volume of the open expansion tank should be about twice the volume change of the system. There are some references for estimation of the system's water content.



Open Exp Tank-Cubic



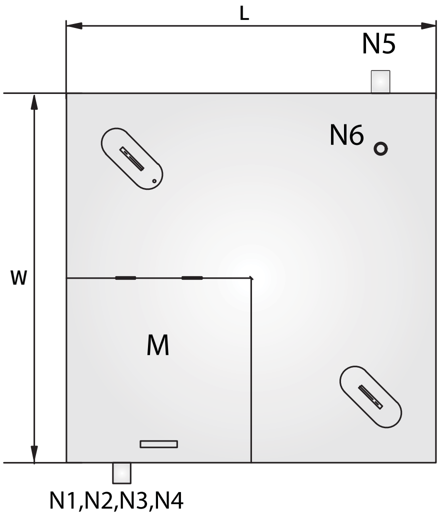
TOP VIEW



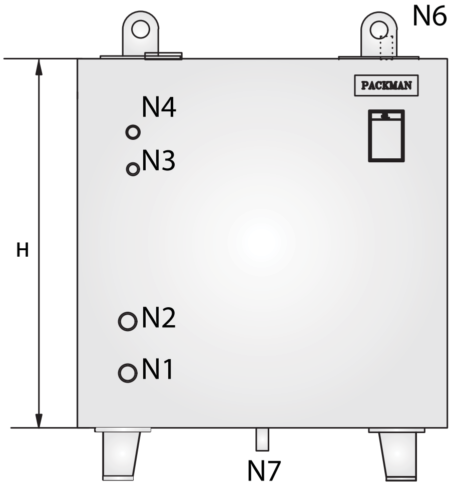
VIEW A

Model	Unit	POET-100	POET-200	POET-300	POET-500	POET-700	POET-800	POET-1000
Technical Data								
Design Standard	-	ASME SEC.VIIII.DIV.1						
Vessel Type	-	Vertical-Cubic						
Volume Capacity	liter	100	200	300	500	700	800	1000
Connectoins Size								
Circulation Water (N1)	in	3/4	3/4	1	1 1/4	1 1/4	1 1/4	1 1/2
Expansion (N2)	in	3/4	3/4	1	1 1/4	1 1/4	1 1/4	1 1/2
Permanent Filler (N3)	in	3/4	3/4	3/4	1	1	1	1
Quick Filler (N4)	in	1	1	1	1 1/4	1 1/4	1 1/4	1 1/4
OverFlow (N5)	in	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2
Vent (N6)	in	3/4	3/4	3/4	1	1	1	1 1/4
Drain (N7)	in	3/4	3/4	3/4	1	1	1	1
Man Hole (M)	in	150* 150	550* 250	550* 275	720* 360	400* 900	450* 900	500* 500
Material								
Shell	-	Carbon Steel						
Vessel Dimensions								
Vessel Height	mm	600	800	1000	1000	1000	1000	1000
Vessel Length	mm	400	500	550	720	900	900	1000
Vessel Width	mm	400	500	550	720	800	900	1000

Open Exp Tank-Cubic



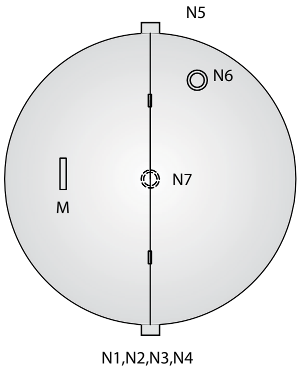
TOP VIEW



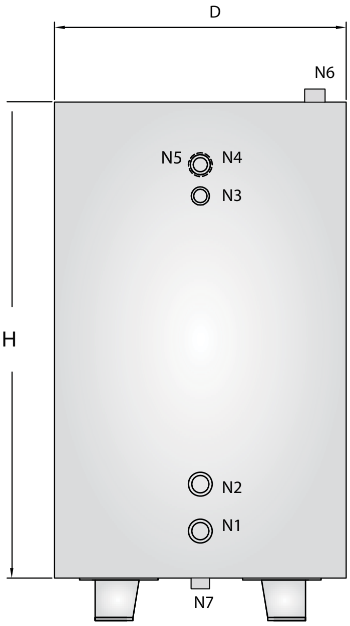
VIEW A

Model	Unit	POET-1200	POET-1500	POET-2000	POET-2500	POET-3000	POET-4000	POET-5000
Technical Data								
Design Standard	-	ASME SEC.VIIII.DIV.1						
Vessel Type	-	Vertical-Cubic						
Volume Capacity	liter	1200	1500	2000	2500	3000	4000	5000
Connectoins Size								
Circulation Water (N1)	in	1 1/2	1 1/2	2	2	2	2	2 1/2
Expansion (N2)	in	1 1/2	1 1/2	2	2	2	2	2 1/2
Permanent Filler (N3)	in	1	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2
Quick Filler (N4)	in	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	2
OverFlow (N5)	in	1 1/2	1 1/2	2	2	2	2	2 1/2
Vent (N6)	in	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	2
Drain (N7)	in	1	1	1	1	1 1/4	1 1/4	1 1/2
Man Hole (M)	in	500*500						
Material								
Shell	-	Carbon Steel						
Vessel Dimensions								
Vessel Height	mm	1000	1000	1000	1000	1000	1000	1250
Vessel Length	mm	1200	1500	2000	2000	2000	2000	2000
Vessel Width	mm	1000	1000	1000	1250	1500	2000	2000

Open Exp Tank-Cylindrical



TOP VIEW



GENERAL VIEW

Model	Unit	POET-300	POET-500	POET-1000	POET-2000
Technical Data					
Design Standard	-	ASME SEC. VIII. DIV.1			
Vessel Type	-	Vertical-Cylindrical			
Volume Capacity	liter	300	500	1000	2000
Connectoins Size					
Circulation Water (N1)	in	1	1 1/4	1 1/2	2
Expansion (N2)	in	1	1 1/4	1 1/2	2
Permanent Filler (N3)	in	3/4	1	1	1
Quick Filler (N4)	in	1	1 1/4	1 1/4	1 1/4
OverFlow (N5)	in	1 1/4	1 1/2	1 1/2	2
Vent (N6)	in	3/4	1	1 1/4	1 1/2
Drain (N7)	in	3/4	1	1	1
Man Hole (M)	in	Half Circle			
Material					
Shell	-	Carbon Steel			
Head	-	Carbon Steel			
Vessel Dimensions					
Vessel Diameter	mm	640	820	930	1300
Vessel Heigth	mm	1000	1000	1520	1520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Reservoir Tanks
Heating Product Group
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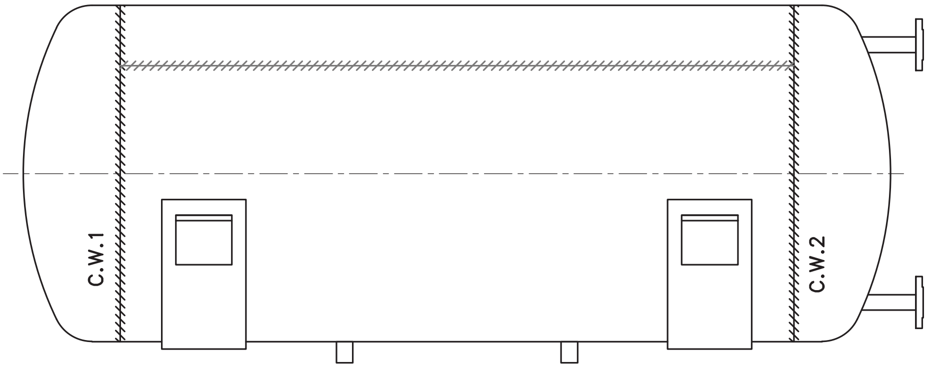
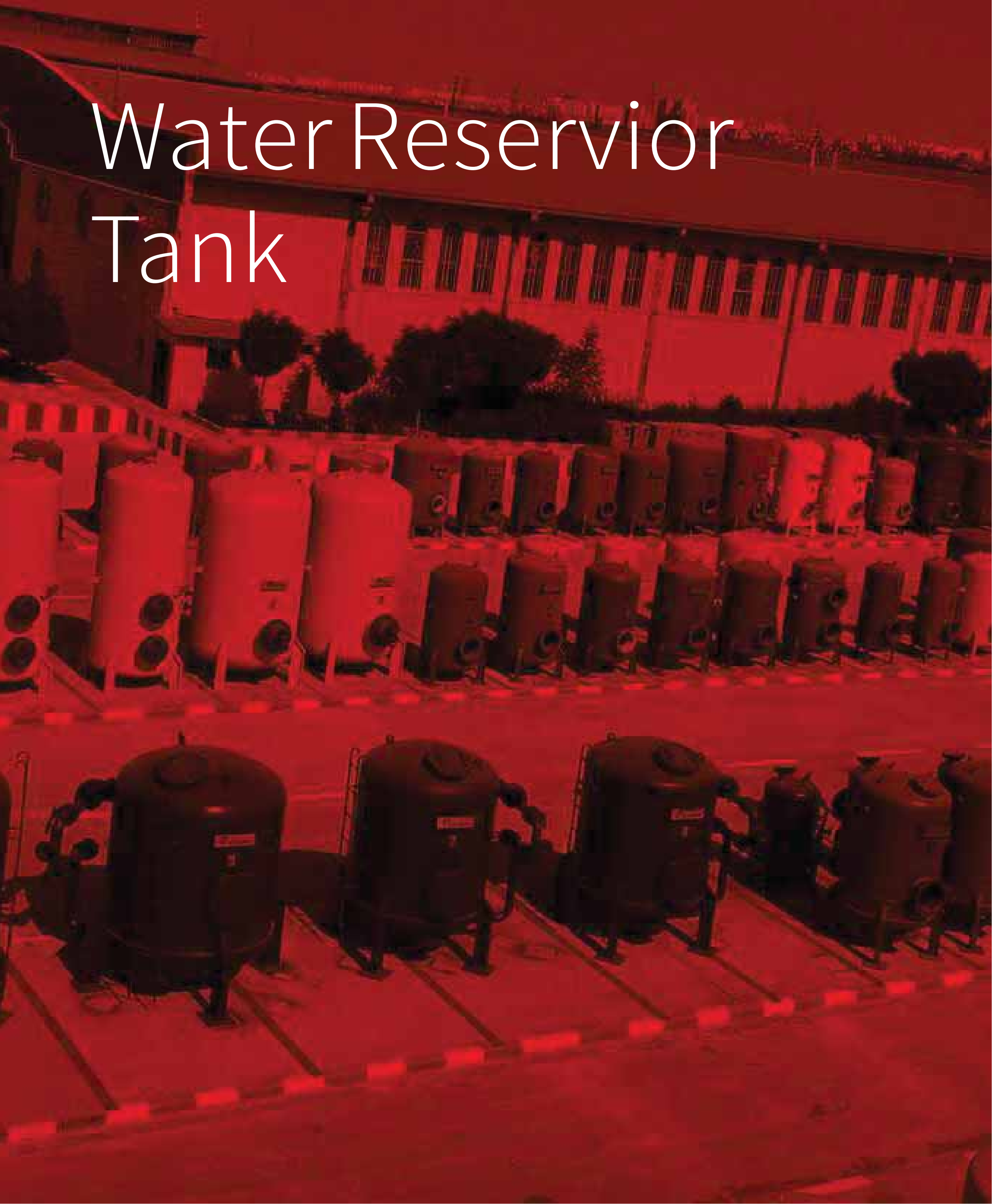
Reservoir Tanks **page**



Water Reservior Tank



Product Description

Water Reservior tank is a container for storing water. Water tanks are used to provide storage of water for use in many applications, drinking water, irrigation agriculture, fire suppression, agricultural farming, both for plants and livestock, chemical manufacturing, food preparation as well as many other uses.Water tank parameters include the general design of the tank, and choice of construction materials, linings. Various materials are used for making water tank: plastics (polyethylene, polypropylene), fiberglass, concrete and steel (welded or bolted, carbon, or stainless). Earthen pots also function as water storages.

PACKMAN Water Storage Tank Properties

PACKMAN Water Storage tanks are made of steel plate of ST37 grade (recommended for the manufacture of pressure vessels-no direct fire contact). In the case of customer request, the tank can be made of 17MN4 (suitable for boiler construction) without any changing in product price.

Manufacturing Standards

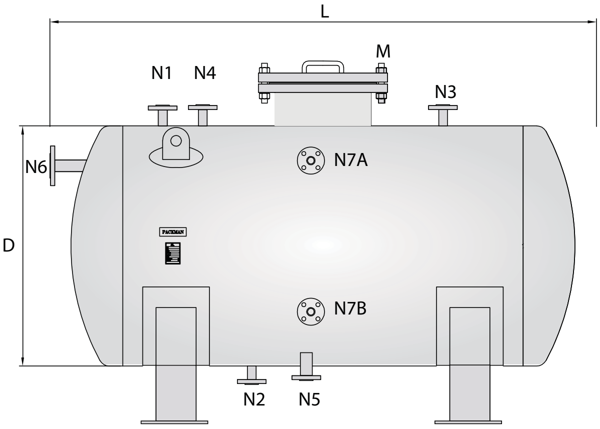
ASME Sec VIII, Div. 1 is used in the construction of water storage tanks. Torispherical/Elliptical Head PACKMAN's water storage tank head is Elliptical which is more reliable than torispherical heads. This type of head has a longer life and a higher pressure strength at the same thickness against other shapes. The production price/per kilo of these heads is even up to two times the size of the usual heads on the market.

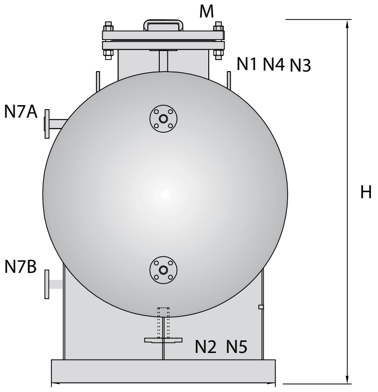
Welding Procedure

Welding is done by using the Swedish ISBU submerged arc welding equipment. After constructing the tank and welding the lugs, the body of the tank is connected to the heads by welding with a submerged welding method. In addition, the head is welded internally and externally, which increases the time life and the strength of the heads.

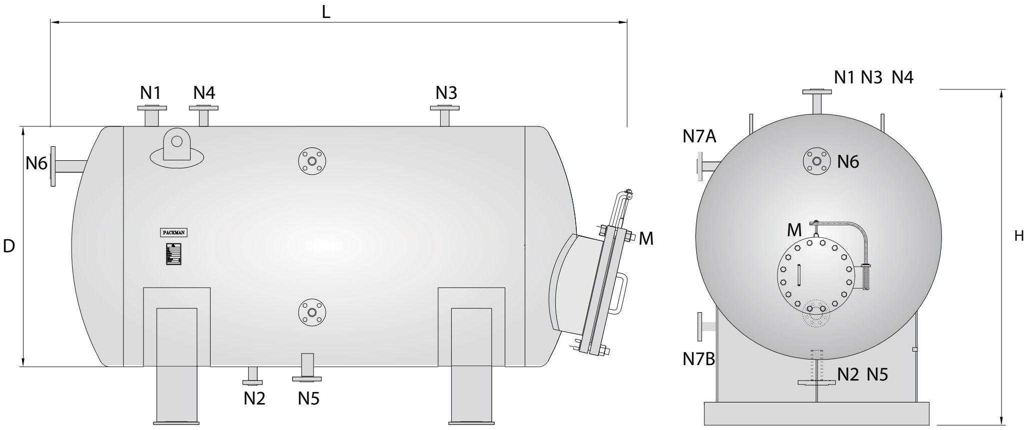
Product Capacity Calculation & Selection

The process of selecting a water or wastewater storage tank starts with a series of questions and considerations. This is one of the main problems which is witnessed in liquid storage containment applications. In order to ensure that the capacity of water storage tank is approved by the responsible authorized department, it is necessary to prepare and install the equipment according to the instructions Standards. Then one can select the product model by determining the volume of storage tanks.



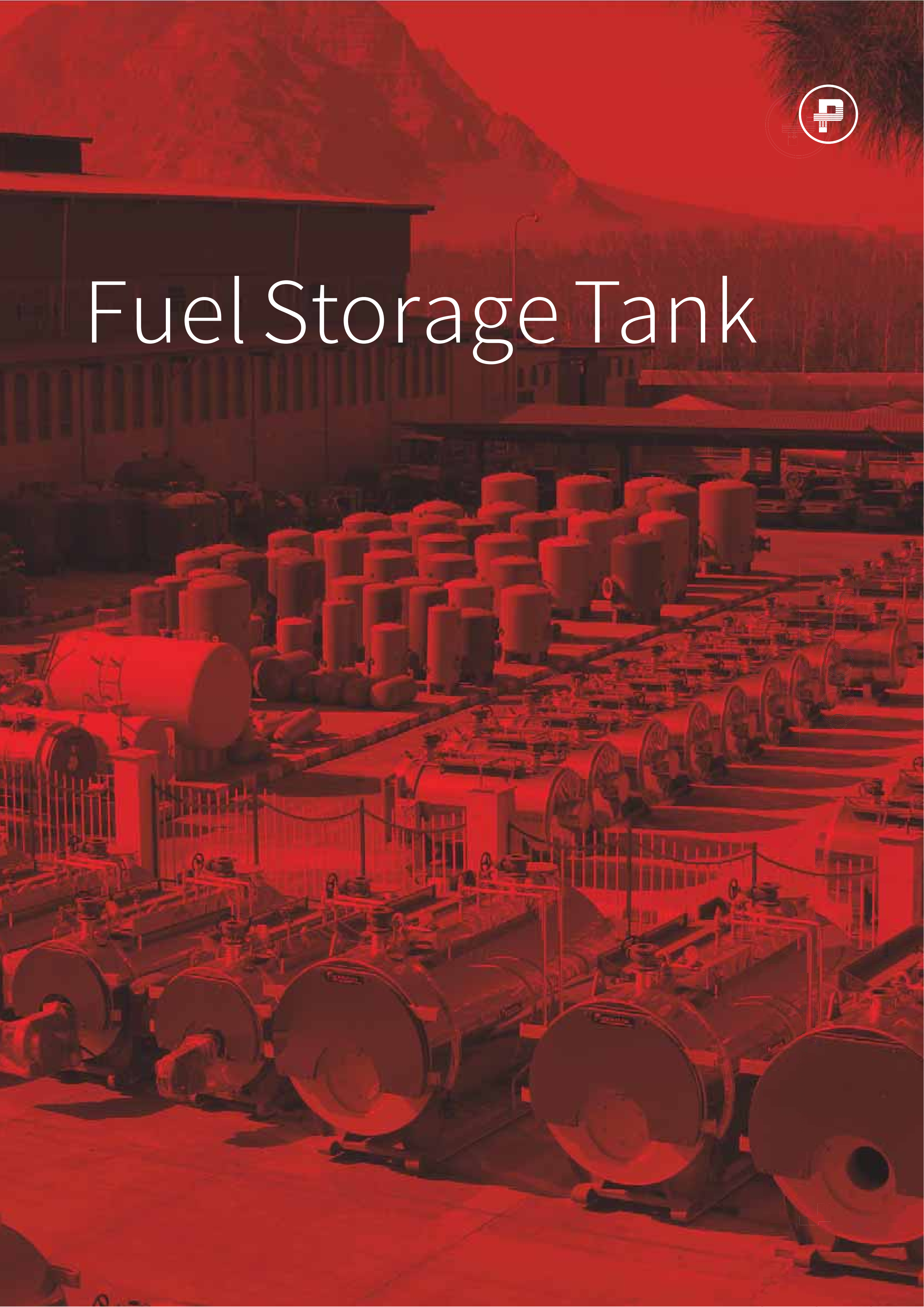


Model	Unit	PWRT-800	PWRT-1000	PWRT-1500	PWRT-2000	PWRT-2500	PWRT-3000	PWRT-4000
Technical Data								
Design Standard	-	ASME SEC. VIII. DIV.1						
Vessel Type	-	Vertical			Horizantal			
Volume Capacity	liter	800	1,000	1,500	2,000	2,500	3,000	4,000
Connectoins Size								
Man Hole (M)	in	12	14	14	14	16	16	16
Water Inlet (N1)	in	1	1 1/2	1 1/2	2	2 1/2	2 1/2	3
Water Outlet (N2)	in	1	1 1/2	1 1/2	2	2 1/2	2 1/2	3
Vent (N3)	in	3/4	3/4	3/4	1	1 1/2	1 1/2	1 1/2
Spare (N4)	in	1	1	1	1	1	1	1
Drain (N5)	in	1	1	1	1	1 1/2	2	2
Over Flow (N6)	in	2	2	2	2	2	2	2 1/2
Level Gauge (N7A), (N7B)	in	1	1	1	1	1	1	1
Material								
Shell	-	Carbon Steel						
Head	-	Carbon Steel						
Vessel Dimensions								
Vessel Diameter	mm	800	900	1,100	1,200	1,320	1,320	1,592
Vessel Length	mm	_	_	_	2,200	2,200	2,600	2,650
Vessel Height	mm	2,200	2,200	2,200	1800	1900	1800	2100



Model	Unit	PWRT-5000	PWRT-6000	PWRT-7000	PWRT-8000	PWRT-9000	PWRT-10000	PWRT-14000	PWRT-20000
Technical Data									
Design Standard	-	ASME SEC. VIII. DIV.1							
Vessel Type	-	Horizantal							
Volume Capacity	liter	5,000	6,000	7,000	8,000	9,000	10,000	14,000	20,000
Connectoins Size									
Man Hole (M)	in	16	16	16	16	16	16	16	16
Water Inlet (N1)	in	3	3	3	3	3	3	4	4
Water Outlet (N2)	in	3	3	3	3	3	3	4	4
Vent (N3)	in	2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2
Spare (N4)	in	1	1	1	1	1	1	1	1
Drain (N5)	in	2	2	2	2	2	2	2	2
Over Flow (N6)	in	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	3	3
Level Gauge (N7A), (N7B)	in	1	1	1	1	1	1	1	1
Material									
Shell	-	Carbon Steel							
Head	-	Carbon Steel							
Vessel Dimensions									
Vessel Diameter (D)	mm	1,592	1,750	1,750	1,910	1,910	1,910	2,250	2,250
Vessel Length (L)	mm	3,200	3,300	3,500	3,400	3,800	4,300	4,500	6,000
Vessel Height (H)	mm	2100	2250	2250	2400	2,400	2400	2750	2750

Fuel Storage Tank



Product Description

Fuel Reservior tank is a container for storing fuel. Fuel tanks are used to provide storage of fuel for use in many applications, drinking fuel, irrigation agriculture, fire suppression, agricultural farming, both for plants and livestock, chemical manufacturing, food preparation as well as many other uses. Fuel tank parameters include the general design of the tank, and choice of construction materials, linings. Various materials are used for making fuel tank: plastics (polyethylene, polypropylene), fiberglass, concrete and steel (welded or bolted, carbon, or stainless). Earthen pots also function as fuel storages.

PACKMAN fuel storage tank Properties

PACKMAN Fuel Storage tanks are made of steel plate of ST37 grade (recommended for the manufacture of pressure vessels-no direct fire contact). In the case of customer request, the tank can be made of 17MN4 (suitable for boiler construction) without any changing in product price.

Manufacturing Standards

ASME Sec VIII, Div. 1 is used in the construction of fuel storage tanks.

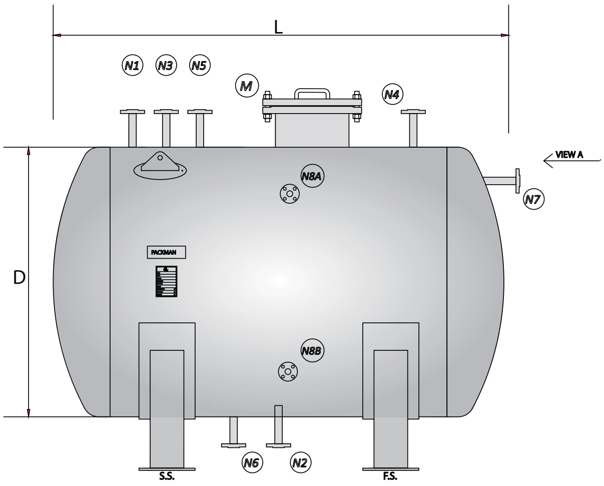
Torispherical/Elliptical Head PACKMAN's fuel storage tank head is Elliptical which is more reliable than torispherical heads. This type of head has a longer life and a higher pressure strength at the same thickness against other shapes. The production price/per kilo of these heads is even up to two times the size of the usual heads on the market.

Welding Procedure

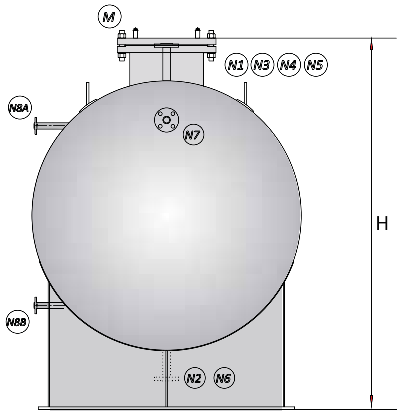
Welding is done by using the Swedish ISBU submerged arc welding equipment. After constructing the tank and welding the lugs, the body of the tank is connected to the heads by welding with a submerged welding method. In addition, the head is welded internally and externally, which increases the time life and the strength of the heads.

Product Capacity Calculation & Selection

The process of selecting a fuel or wastefuel storage tank starts with a series of questions and considerations. This is one of the main problems which is witnessed in liquid storage containment applications. In order to ensure that the capacity of fuel storage tank is approved by the responsible authorized department, it is necessary to prepare and install the equipment according to the instructions Standards. Then one can select the product model by determining the volume of storage tanks.

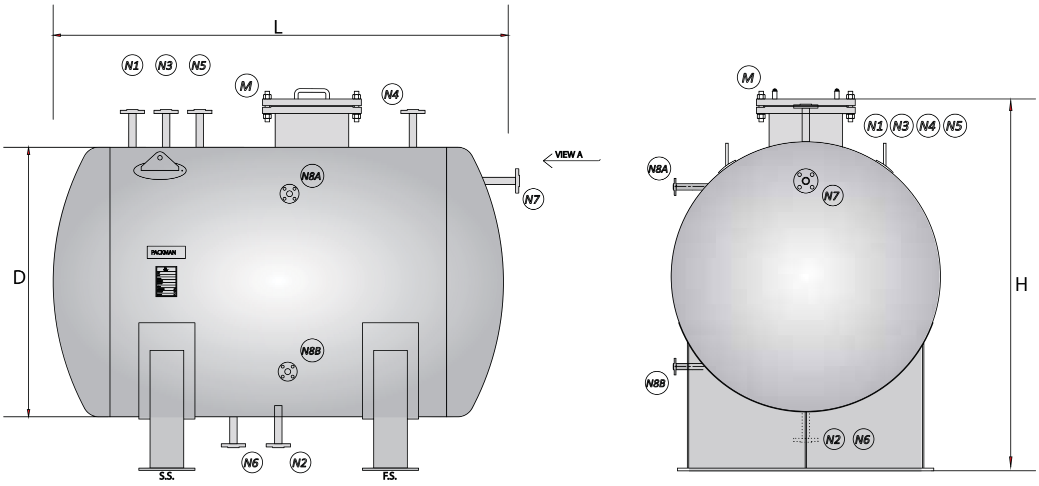


GENERAL VIEW



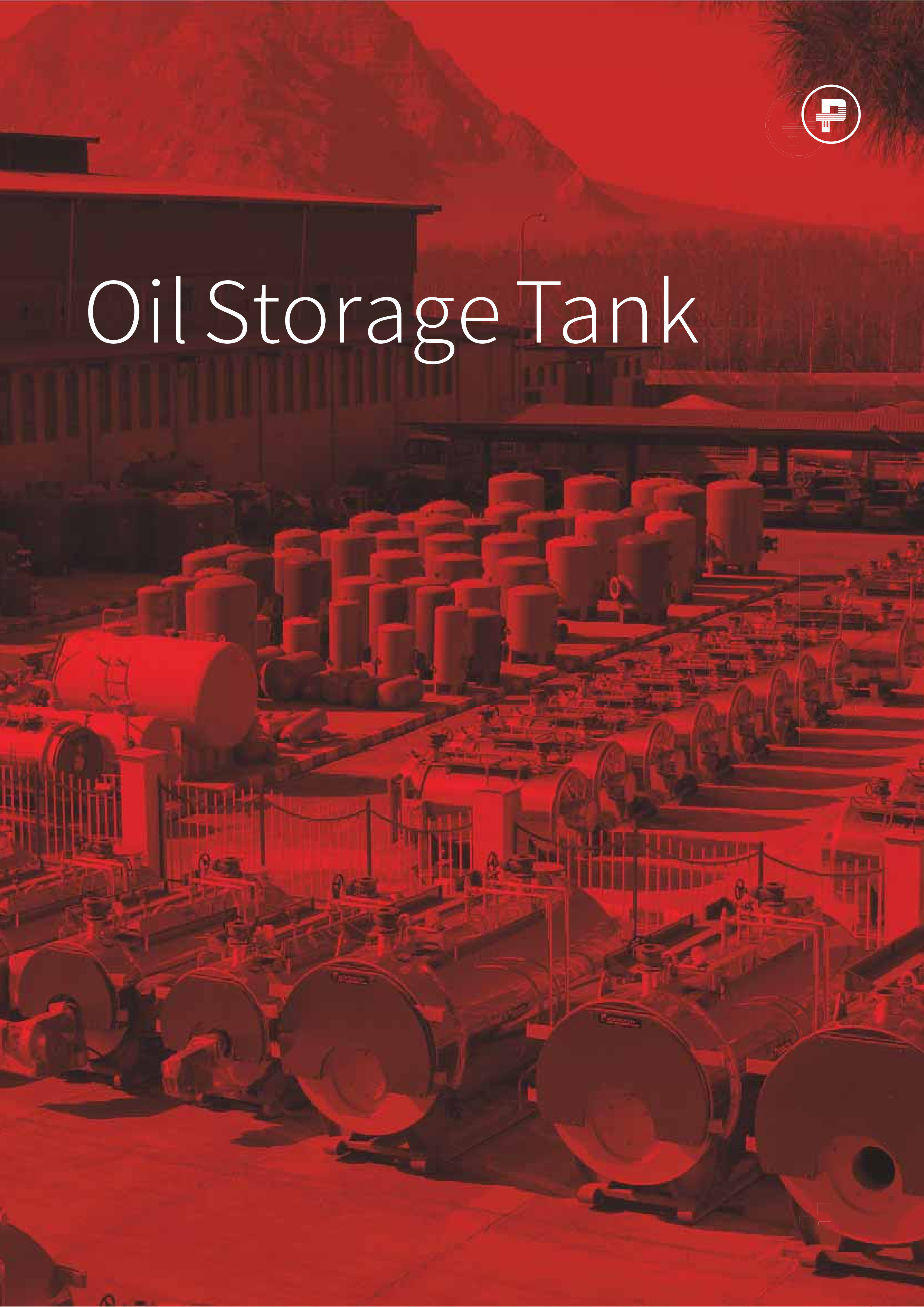
VIEW A

Model	Unit	PFST-300	PFST-800	PFST-1000	PFST-1500	PFST-2000	PFST-2500	PFST-3000	PFST-4000
Technical Data									
Design Standard	-	ASME SEC. VIII. DIV.1							
Vessel Type	-	Vertical				Horizantal			
Volume Capacity	lit	300	800	1000	1500	2000	2500	3000	4000
Connectoins Size									
Man Hole (M)	in	10	12	14	14	14	16	16	16
Inlet (N1)	in	1	1	1	1	1	1	1	1
Outlet (N2)	in	1	1	1	1	1	1	1	1
Vent (N4)	in	3/4	3/4	3/4	3/4	1	1	1	1 1/2
Return (N3)	in	1	1	1	1	1	1	1	1
Spare (N5)	in	_	_	_	1	1	1	1	1
Over Flow (N7)	in	_	_	_	_	1	1	1	1 1/2
Drain (N6)	in	3/4	1	1	1	1	1	1	1 1/2
Level Gauge (in)									
Shell	-	Carbon Steel							
Toris Head	-	Carbon Steel							
Vessel Dimensions									
Vessel Diameter (D)	mm	600	800	900	1100	1200	1320	1320	1592
Height or Length (Head to Head (H)	mm	_	_	_	_	2200	2200	2600	2650
Distance Of Head From Level (D)	mm	1500	2200	2200	2200	1800	1900	1900	2100



Model	Unit	PFST-5000	PFST-6000	PFST-7000	PFST-8000	PFST-9000	PFST-10000	PFST-20000
Technical Data								
Design Standard	-	ASME SEC.VIII. DIV.1						
Vessel Type	-	Horizontal						
Volume Capacity	lit	5000	6000	7000	8000	9000	10000	20000
Connectoins Size								
Man Hole (M)	in	16	16	16	16	16	16	16
Inlet (N1)	in	1	1	1	1	1	1	1
Outlet (N2)	in	1	1	1	1	1	1	1
Vent (N4)	in	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2
Return (N3)	in	1	1	1	1	1	1	1
Spare (N5)	in	1	1	1	1	1	1	1
Over Flow (N7)	in	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
Drain (N6)	in	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
Material								
Shell	-	Carbon Steel						
Toris Head	-	Carbon Steel						
Vessel Dimensions								
Vessel Diameter (D)	mm	1592	1750	1750	1910	1910	1910	2250
Height or Length (Head to Head (H)	mm	3200	3300	3500	3400	3800	4300	6000
Distance Of Head From Level (D)	mm	2100	2250	2250	2400	2400	2400	2750

Oil Storage Tank



Product Description

An Oil Storage Tank, having a capacity sufficient to contain all the oil in the system,must be installed in every oil heater system. In case of any emergency or required repair, the entire contents of the system can be emptied into this storage tank. Oil storage tanks are designed in horizontal cylindrical forms for the purposed collection the storage of the oil contained in the heater and the circuit. They are built with mild steel with external bitumen lining and complete with bottom valve, manholes and nozzles for connection to the plant.

PACKMAN Oil Storage Tank Properties

PACKMAN Oil Storage Tanks are made of St37 steel plates (recommended for construction of pressure vessels with no direct fire contact). In case of customer's request, the tank can be made of 17MN4 (suitable for boiler construction) without any change in product's price.

Manufacturing Standards

ASME Sec VIII, Div. 1 is observed in construction of oil storage tanks.

Torispherical / Elliptical Head

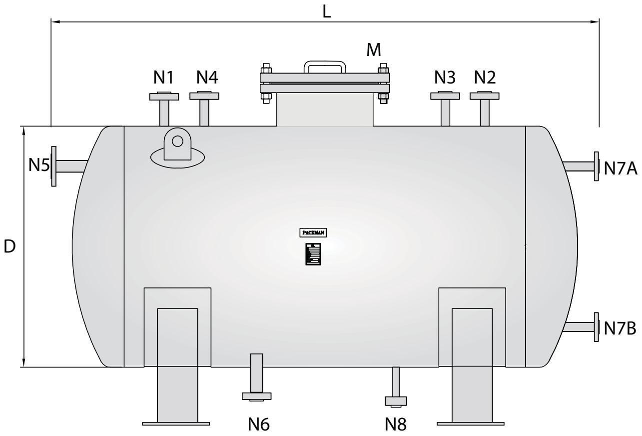
PACKMAN's oil storage tank's heads are Elliptical which are more reliable than torispherical heads. This type of head has a longer life and a higher pressure strength compared to other shapes with the same thickness. The production price per kilo of these heads can reach up to twice the price of the usual heads on the market.

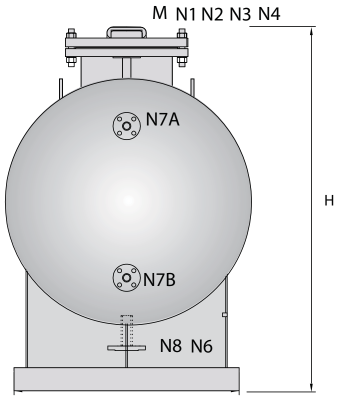
Welding Procedure

Welding is done with the Swedish ISBU submerged arc welding equipment. After constructing the tank and welding the lugs, the body of the tank is connected to the heads with a submerged welding method. The head is welded internally and externally, in order to increase the head's life and strength.

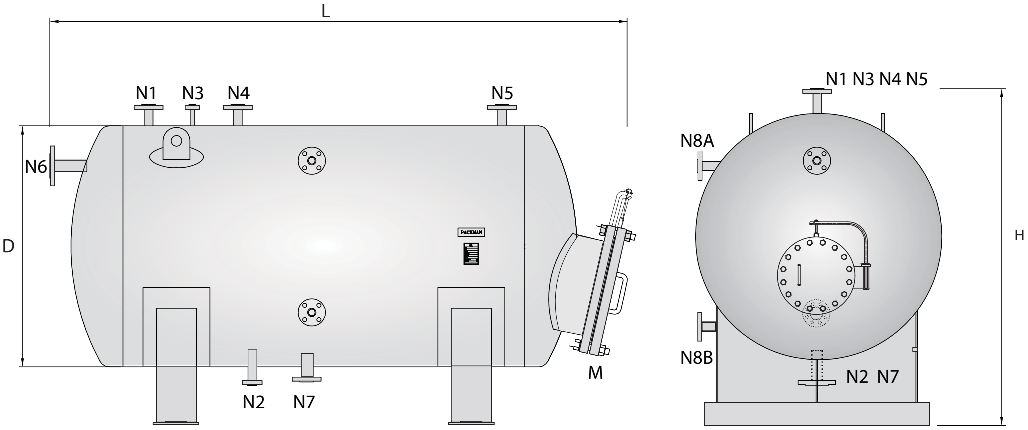
Product Capacity Calculation & Selection:

The volume of the thermal oil storage tank should be selected considering the fact that contents of the system can be emptied into this storage tank.





Model	Unit	POST-8	POST-10	POST-15	POST-20	POST-25
Technical Data						
Design Standard	-	ASME SEC. VIII. DIV.1				
Vessel Type	-	Horizantal				
Volume Capacity	liter	800	1,000	1,500	2,000	2,500
Connectoins Size						
Man Hole (M)	in	14	14	14	14	16
Inlet (N1)	in	1	1	1 1/2	1 1/2	2
Vent (N2)	in	1	1	1	1	1
Expansion Tank Connection (N3)	in	1	1	1	1	1
Return (N4)	in	1	1	1	1	1 1/2
Overflow (N5)	in	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
Outlet (N6)	in	1 1/2	1 1/2	1 1/2	1 1/2	2
Level Gauge (N7A) , (N7B)	in	1	1	1	1	1
Drain (N8)	in	1	1	1	1	1
Material						
Shell	-	Carbon Steel				
Toris Head	-	Carbon Steel				
Vessel Dimensions						
Vessel Diameter (D)	mm	800	900	1,100	1,200	1,320
Vessel Length (L)	mm	2,200	2,200	2,200	2,200	2,200
Vessel Height (H)	mm	1,200	1,400	1,600	1,800	1,900



Model	Unit	POST-30	POST-40	POST-50	POST-60	POST-70	POST-80	POST-90	POST-100	POST-120
Technical Data										
Design Standard	-	ASME SEC. VIII. DIV.1								
Vessel Type	-	Horizantal								
Volume Capacity	liter	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000	12,000
Connectoins Size										
Man Hole (M)	in	16	16	16	16	16	16	16	16	16
Inlet (N1)	in	2	2 1/2	2 1/2	3	3	3	3	3	3
Vent (N5)	in	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
Expansion Tank Connection (N3)	in	1	1	1	1	1	1	1	1	1
Return (N4)	in	1 1/2	2	2	2	2	2	2	2	2
Overflow (N6)	in	2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2
Outlet (N2)	in	2	2 1/2	2 1/2	3	3	3	3	3	3
Level Gauge (N8A) , (N8B)	in	1	1	1	1	1	1	1	1	1
Drain (N7)	in	1 1/2	2	2	2	2	2	2	2	2
Material										
Shell	-	Carbon Steel								
Toris Head	-	Carbon Steel								
Vessel Dimensions										
Vessel Diameter (D)	mm	1,320	1,590	1,590	1,750	1,750	1,910	1,910	1,910	1,910
Vessel Length (L)	mm	2,600	2,650	3,200	3,300	3,600	3,400	3,800	4,300	5,100
Vessel Height (H)	mm	1,800	2,100	2,100	2,250	2,250	2,400	2,400	2,400	2,400

Coolest
HVAC Around

Cooling Product Group of CHILLMAN

ABOUT
CHILLMAN

Chillman Company is one of the subsidiaries of Pakman Industrial Group. Pakman Company, with more than fifty years of experience in the field of marketing, has started to produce the Chilman brand in the production of new technologies in the cooling industry. Chilman Company, by employing skilled and experienced personnel in the field of the country›s cooling industry, has undertaken special engineering innovations in the production of products such as:

- Compression chillers
- Cold water compression chillers
- Cool air compression chillers
- Fan coil
- Air conditioner
- Ice Bank

And other products required in the cooling industry.

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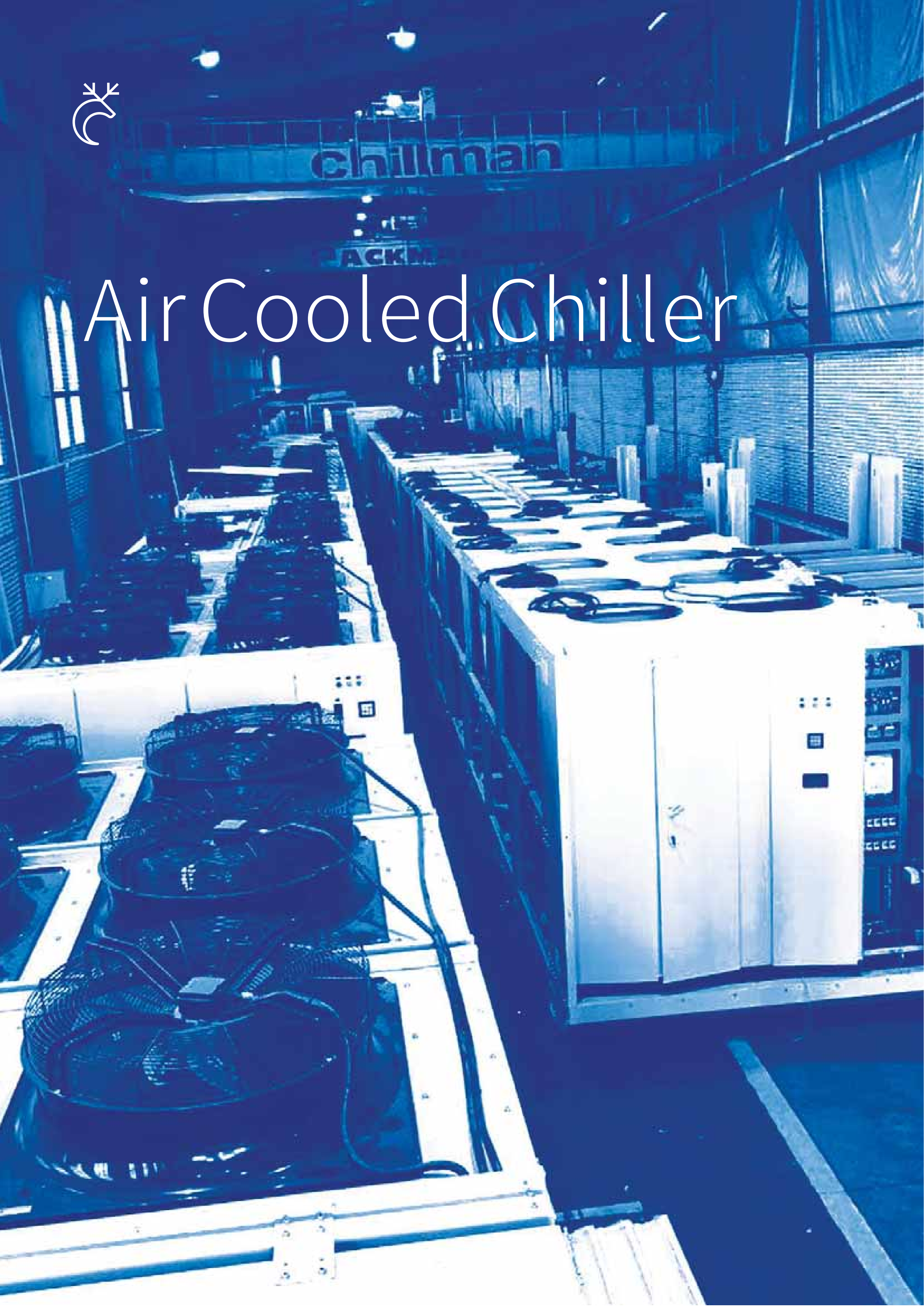
Cooling Product Group
CHILLMAN

Cooling Products **Page**

Air Cooled Chiller



Air-Cooled chiller
Specification & Features

Scroll Compressor

Scroll compressors are now the most used compression technology replacing reciprocating compressors due to its undeniable superiority. Several, fully qualified, multiple compressor assemblies (tandem and trio) allow the use of scroll compressor into our large capacity chillers.

Screw Compressor

All screw compressors are of high efficiency and reliability in all operating conditions and are equipped with separated radial and axial bearings, liquid injection and economizer connection, PTC motor temperature thermistors and discharge temperature thermistors, a motor protector, and oil level switch and oil pressure differential switch connector and other accessories. The compressors have the best reliability, longest bearing life during heavy duty running and strict operating conditions.

Condenser

Condenser coils will be designed to withstand maximum operating pressures and a maximum temperature of 300°F for standard duty copper tube coils with standard headers.

Coils will be of plate fin type construction providing uniform support for all coil tubes. Coils are to be manufactured by copper tube with self-spacing collars, which completely cover the entire tube surface. Fins are to be formed with full collar on all of tube diameters and tube patterns. Fin thickness will be 0.006" +/- 5% for aluminum. Fin spacing available will be at most 14 fins per inch.

Tubing and return bends will be fabricated from UNS 12200 seamless copper conforming to ASTM B75 for standard pressure and temperature applications. Core tubes will be mechanically expanded to form an interference fit within the fin collars. Expansion will not decrease the tube wall thick.

Shell & Tube Evaporator

The evaporators are carefully engineered to provide excellent heat transfer rates, effective refrigerant boiling and assured oil carry-through. Shell circuits are engineered to provide high performance with a low-pressure drop to conserve the required pumping power. Evaporators made by Packman Group are designed for optimum heat transfer rates and features rolled-in tubes and removable heads. Shell side baffling is selected for high operating efficiency and reasonable fluid pressure drops. Compliance with ASME codes and quality controlled manufacturing make the cooler suitable for a wide variety of virtually trouble-free fluid cooling applications.

Electronic Explansion Valve

Electronic expansion valves used in our chillers can manage refrigerant flow through cycle with high accurate precision. Modulation of refrigerant flow guarantees a wide operating range for chillers, due to the combination of the fixed opening and the moving element with a travel of 15 mm driven by stepper motor. These valves have been carefully designed down to the smallest detail, to guarantee high reliability, and ensures correct operation. Electronic expansion valves are made from modular components that are assembled during installation; this solution simplifies maintenance and inspection of the individual components.

Condenser Fan

Direct-drive AC axial fans with high-performance axial impeller, mounted on an external rotor motor. Square full nozzle, pre-galvanized, black plastic-coated RAL 9005, flowoptimized nozzle shape on inlet side, guard grille made of phosphate steel and black plastic-coated.

Sickle-shaped blades; high-strength aluminum alloy or round steel plate; encapsulated in fiber glass-reinforced plastic PP; winglets at the blade tips. Motorized impeller balanced in two planes (static and dynamic) as per DIN ISO 1940. Each V-Type Condenser block has two (2) axial fans which are selected as per condenser required air flow and total pressure drop across condenser coils and other related parts.

Power and Control System

Control System for our chillers has been considered from international companies with wide range of experiences in cooling equipment control system. The selected configuration includes 1 compressor for each circuit, and up to 2 circuits.

The distinctive feature of control software is dynamic control of the compressor operating limits. In fact, the suction and discharge pressure are read at all times, thus determining the compressor operating point. The compressors are the most important and costly part of the unit, and for this reason it is important to guarantee its protection and reliability.

Electrical main parts of chillers have been selected from international companies such as Siemens, Schneider and other European companies. Power and control system cabinet will have IP54 protection degree.

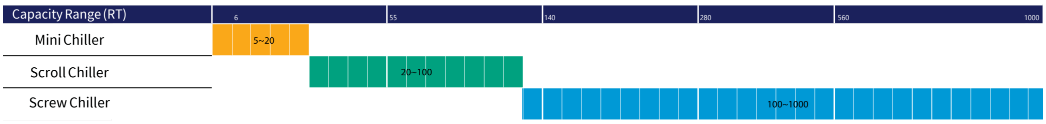
Chiller Structure

All steel structures are designed as per Computer-Aided software. Structure and frames will be constructed form painted carbon steel bars. All structural parts will be painted in electrostatic painting line with at least 100-micron electrostatic paint for tropical marine climate.

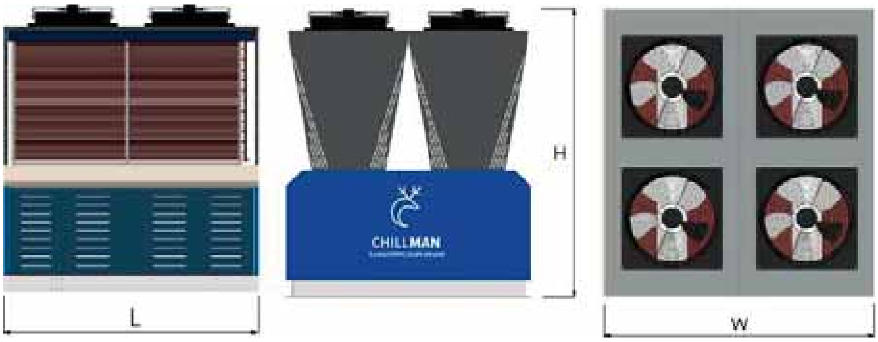
Insulation of evaporator and liquid lines are EPDM type with 25 mm thickness. All copper piping will be connected with special brazed welding. All bolts and nuts are galvanized steel. Required lifting luges are designed as per structural analysis to better and safer shipment.

Chiller dimensional design will be done with consideration of operational and maintenance requirements, space for condensers and fans to deliver sufficient air and each component requirements as per manufacturer standards.

Chillman Air-Cooled Chiller Capacity Range



Air Cooled Chiller (Scroll Compressor)



Model	Unit	Scroll Compressor				
Technical Data						
Cooling Capacity	TR (kw)	20(70)	(105)30	(140)40	(210)60	(280)80
Refrigerant	R407C					
Input Power	ekw	31	42	56	86	118
Electric Power Supply	v/ph/hz	50/3/380	50/3/380	50/3/380	50/3/380	50/3/380
Compressors	Scroll Type					
Compressor Qty	qty	4				
Evaporator	Shell & Tube Heat Exchanger					
Water Flowrate	hr/m³	11	16	22	32	43
Evaporator Qty	qty	1				
Circuit per Evaporaator		2				
Condenser	Finned Tube Heat Exchanger					
Condenser Qty	qty	4	4	6	8	8
Condenser Row/FPI		12.3	12.4	12.4	12.4	12.4
Condenser Fan	Axial Fan					
Condenser Fan Qty	qty	4	4	6	8	8
Expansion Valve	Electronic Expansion Valve					
Expansion Valve Qty	qty	2				
Package Dimensions	Dimension & Weight					
Lenght	mm	3000	3000	4300	5400	5400
Width		2400	2400	2400	2400	2400
Height		2600	2600	2600	2600	2600
Transport Weight	kg	900	1260	1850	2440	3570

COOLING CAPACITY CONDITIONS :

- ELEVATION 1500 m ABOVE SEE LEVEL
- OUTDOOR CONDITIONS : 40 °C
- CONDENSER/EVAPORTATOR TEMPERATURE : 50°C /5°C
- SUBCOOL / SUPERHEAT : 5°C / 10°C
- CHILLED WATER OUT / IN : 7°C/ 12°C

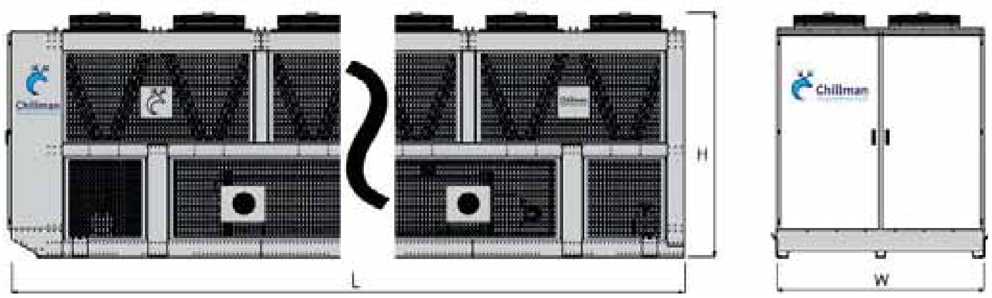
R407C
Refrigerant

Scroll

Axial Fan

Cooling Product Group

Air Cooled Chiller (Screw Compressor)



Model	Unit	Screw Compressor									
Technical Data											
Cooling Capacity	TR (kw)	100 (350)	120 (420)	140 (490)	160 (560)	180 (630)	200 (700)	250 (875)	300 (1050)	400 (1400)	500 (1750)
Refrigerant	R 134a										
Input Power	ekw	125	147	170	195	222	238	303	377	456	568
Electric Power Supply	v/ph/hz	380/3/50									
Compressors	Semi Hermetic Compact Screw										
Compressor Qty	qty	2	2	2	2	2	2	4	4	4	4
Evaporator	Shell & Tube Heat Exchanger										
Water Flowrate	m³/hr	55	65	76	87	98	107	135	160	216	270
Evaporator Qty	qty	1					2				
Circuit per Evaporaator		2						4			
Condenser	Finned Tube Heat Exchanger										
Condenser Qty	qty	10	10	12	14	16	20	22	26	32	40
Condenser Row/FPI		4/12									
Condenser Fan	Axial Fan										
Condenser Fan Qty	qty	10	10	12	14	16	20	22	26	32	40
Expansion Valve	Electronic Expansion Valve										
Expansion Valve Qty	qty	2					4				
Package Dimensions	Dimension & Weight										
Lenght	mm	7700	7700	9100	10500	12000	14800	16200	19000	23400	28000
Width		2500	2500	2500	2500	2500	2500	2500	2500	2500	2500
Height		2900	2900	2900	2900	2900	2900	2900	2900	2900	2900
Transport Weight	kg	4900	5250	6800	7250	9000	10850	11200	15000	21000	23500

COOLING CAPACITY CONDITIONS :

- ELEVATION 1500 m ABOVE SEE LEVEL
- OUTDOOR CONDITIONS : 40 °C
- CONDENSER/EVAPORTATOR TEMPERATURE : 50°C /5°C
- SUBCOOL / SUPERHEAT : 5°C / 10°C
- CHILLED WATER OUT / IN : 7°C/ 12°C

R134a Refrigerant

Screw

Axial Fan

Two Circuits

Ceiling Fancoil

Ceiling Fancoil Specification

- From 300 to 1400 cfm capacity
- Galvanized Sheet Metal Body and Elastomeric Insulation
- Stainless Steel Centrifugal Fan
- Removable & Washable Cotton Filter
- 5 Rotor Speed Electromotor
- Low Noise Emission
- Changeable Coil Entrance
- Changeable Coil Entrance

Basic Design

Heating Basic Design:

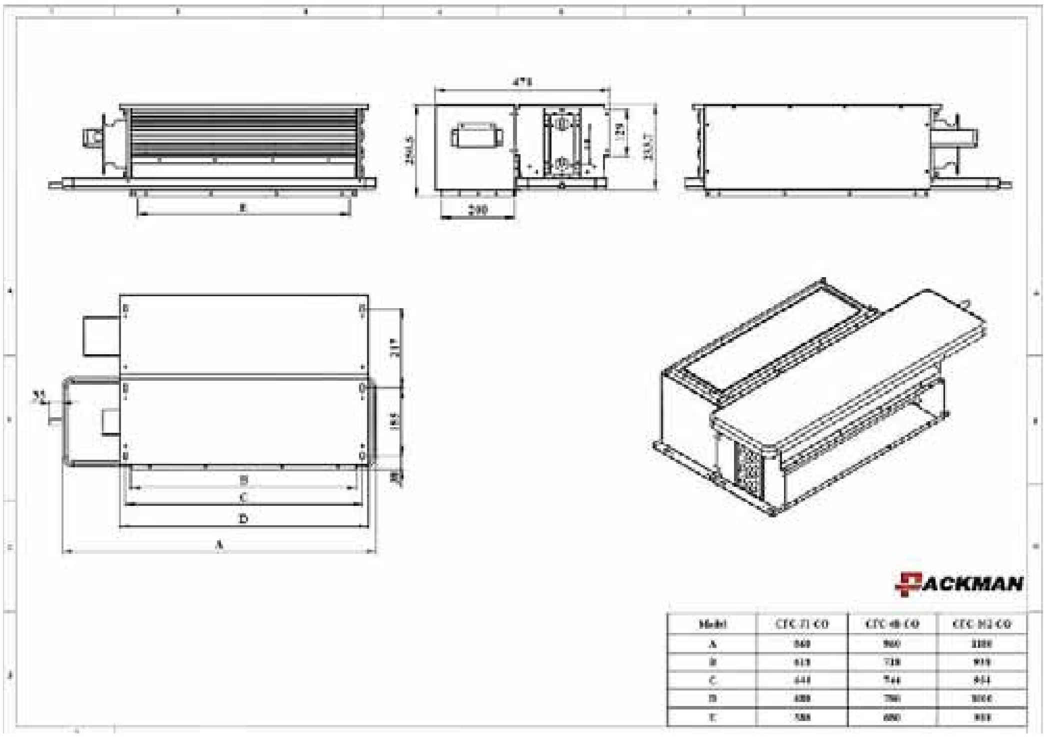
ENT.Air DB = 20 °C   ENT.Fluid T = 50 °C

Cooling Basic Design:

ENT.Air DB = 27 °C   ENT.Air DB = 20 °C

ENT.Air WB = 19 °C   ENT.Fluid T = 7 °C

Dimension Detail



Model			CFC - 200	CFC - 300	CFC - 400	CFC - 600	CFC - 800
Technical Data							
Air Flow	High	cfm	200	300	400	600	800
		m3/h	340	510	680	1020	1360
	Medium	cfm	159	224	303	450	612
		m3/h	270	380	515	765	1040
	Low	cfm	112	153	200	312	418
		m3/h	190	260	340	530	710
Cooling Capacity kw	High	TH	1.92	2.94	3.98	6.06	8
		SH	1.54	2.3	3.07	4.6	6.1
	Medium	TH	1.72	2.55	3.47	5.24	6.99
		SH	1.32	1.89	2.55	3.81	5.1
	Low	TH	1.43	2.06	2.73	4.23	5.62
		SH	1.03	1.44	1.9	2.94	3.91
Heating Capacity kw	High		2.7	3.92	5.14	7.58	10.06
	Medium		2.27	3.16	4.21	6.18	8.31
	Low		1.72	2.33	3.04	4.65	6.19
Power Input	W		25	30	40	60	80
Max Current	A		0.35	0.45	0.65	1	1.4
Noise Level	dB		40	41	43	48	49

Model		CFC - 200	CFC - 300	CFC - 400	CFC - 600	CFC - 800
Technical Data						
Water Flow	lit/h	310	460	620	930	1290
	gpm	1.4	2	2.8	4.1	5.7
Water Pressure Drop	kpa	4	8	15	37	35
Fan	type/ qty	1	2	2	2	2
Motor	type/qty	1	1	1	1	1
	insulation	Class B				
	power supply	AC-220 V				
	volt/ph/freq	220 V/1 Ph/50 Hz				
Coil	type	fin heat exchanger				
	row/fin per Inch	12	12	12	12	12
	face area (m2)	0.11	0.13	0.15	0.19	0.25
	max working pressure(mpa)	1.6	1.6	1.6	1.6	1.6
Dimension	length (mm)	833	888	985	1209	1520
	width (mm)	478	478	478	478	478
	height (mm)	263.5	263.5	263.5	263.5	263.5
Operating Weight	kg	19.5	21.5	23.3	27.8	33
Input Connection Water Tubes	inch/ material	ZG3/4'' / Brass				
Output Connection Water Tubes	inch/ material	ZG3/4''/Brass				
Casing	material/ thickness	Steel /1.5 mm				
	treatment/finish	Galvnized				

Duct Fancoil

Ducted Fan Coil

CHILLMAN Ducted Fan Coil (CHDF) is a device consisting of a coil and a fan assembly. A ducted fan coil is often connected to channel network and a thermostat to regulate the temperature of one or more spaces. It functions as part of an air conditioning system that is connected to the cooling, central heating system in residential, commercial and industrial buildings using air conditioning. The water of the installation system is used to cool and heat the coil if a chiller or boiler is used. The thermostat controls the fan speed and/or water output to the heat exchanger using a control valve, which can be different depending on the design of the building.

Ducted fan coil components

Body:

The use of galvanized sheet with appropriate thickness in the design of the fan coil body has led to high resistance in the movement and vibration of the fan and at the same time light connection to the ceiling. The body is machined and suitable space and compartment are built in it for placing the coil, electric box and fans.

Heat Exchanger:

These fan coils heat exchanger is designed and made of high quality copper with a test pressure of 21 bar and a working pressure of up to 16 bar. Aluminum fins are made on the copper tubes of these fan coils, which are mechanically compressed by expansion on the copper tubes diameter. The pipes size is 3.8 inches.
An aluminum fin with a specific height and thickness is placed on the pipes in order to transfer the most heat. The maximum allowed water inlet temperature is 95 degrees Celsius. The inlet and outlet water connections are 4.3 and 1 inch. The water coils have air escape and drain valves and are standard, which can be easily accessed and moved from below.

Fan & Electromotor:

This device fan is centrifugal forward. It can create a suitable torque to overcome the track pressure drop. It is connected to a single-phase electric motor with a permanent starting capacitor that works with 220 V AC 50 Hz city electricity, which can be started in 3 speeds.

Air Cleaner (Filter):

This device can be equipped with a cleanable 3G filter with a gravity efficiency of 85%. It is made of an 8 mm thick polyester material that is mounted on a metal frame and is fire resistant. This filter can be easily removed without any tools from the back or from below according to the configuration. This equipment is used to increase the air quality level inside the air conditioner.

Ducted Fan Coil Datasheet

Heating

ENT.Air DB = 20 °C

ENT.Fluid T = 50 °C

Cooling

ENT.Air DB = 27 °C

ENT.Air WB = 19 °C

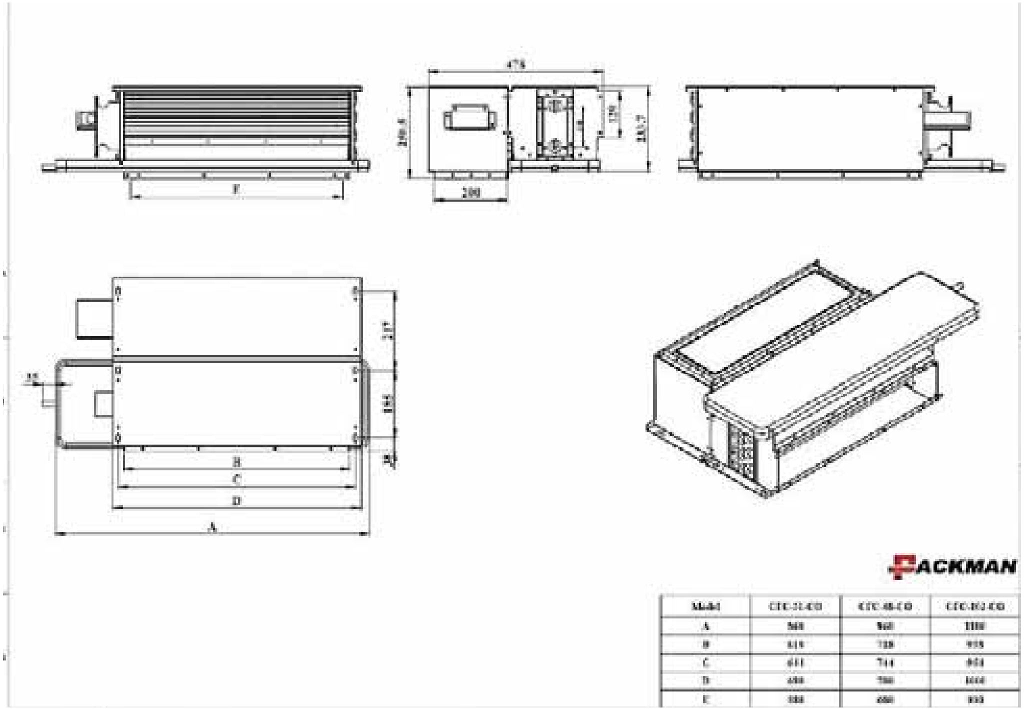
ENT.Air DB = 20 °C

ENT.Fluid T = 7 °C

Ducted fan coil datasheet

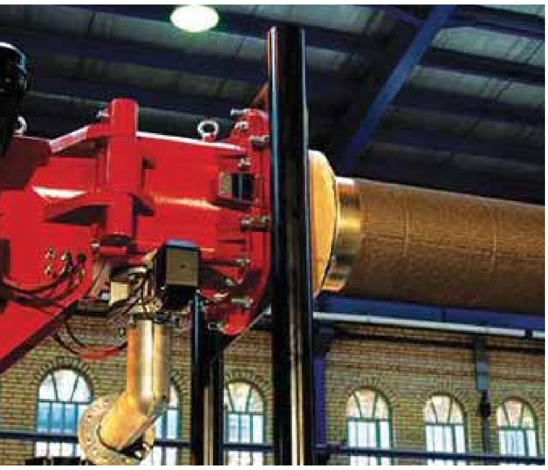
Model			CHDF - 10	CHDF - 12	CHDF - 20	CHDF - 24
Technical Data						
Air Flow	High	cfm	1000	1200	2000	2400
		m3/h	1700	2040	3400	4080
	Medium	cfm	800	1000	1800	2000
		m3/h	1360	1700	3060	3400
	Low	cfm	600	800	1600	1800
		m3/h	1020	1360	2720	3060
Total Cooling Capacity kW	High		5.7	6.9	14.5	15
	Medium		5.2	6.8	13.8	14.5
	Low		4.6	6	13	13.8
Sensible Cooling Capacity	High		4.8	6.24	11.5	12.3
	Medium		4.2	5.4	10.6	11.5
	Low		3.54	4.48	9.8	10.6
Heating Capacity	High		10	17.7	32.3	34.4
	Medium		8.7	15.4	29.9	32.3
	Low		7.3	12.7	27.4	29.9
Power Input	W		160	160	312	350
Max Current	A		0.7	0.7	1.415	1.6
Noise Level	dB		59	47	63	65
Water Flow	Liter/h		1060	1135	2271	2271
	gpm		4.7	5	10	10
Water Resistance	kpa		11.9	5.4	12.5	12.5
Fan						
Fan Type	-		Centrifugal Forward Curve			
Motor	Type		Speed 6 Asynchronousinsulation			
	Insulation		class B			
	Power Supply		1PH/220 - 230V/50Hz			
Coil	Type		Fin & Tube			
	Row/Fin per Inch		3/10			
	Max Working Press.		1.6 MPa/ 16 bars			

Dimensions:



Model	unit	CHDF - 10	CHDF - 12	CHDF - 20	CHDF - 24
Max Length	mm	980	1180	1390	1390
L	mm	630	890	1313	1330
W	mm	680	680	680	680
H	mm	385	385	385	385
Weight	kg	38	56	70	70

a look to
the future



Burners & Combustion Products Group
RAADMAN

ABOUT
Raadman

We stand with honesty and the code of ethics of Packman Group. Also, according to international standards for the planet earth, with the lowest level of pollution emissions, we will produce products of suitable quality with the latest global technologies in the combustion industry. We also have the honor of taking steps to achieve the highest customer satisfaction. The result of this continuous effort is the successful presence of Packman company in the field of technical and engineering services and domestic and foreign markets of Iran.

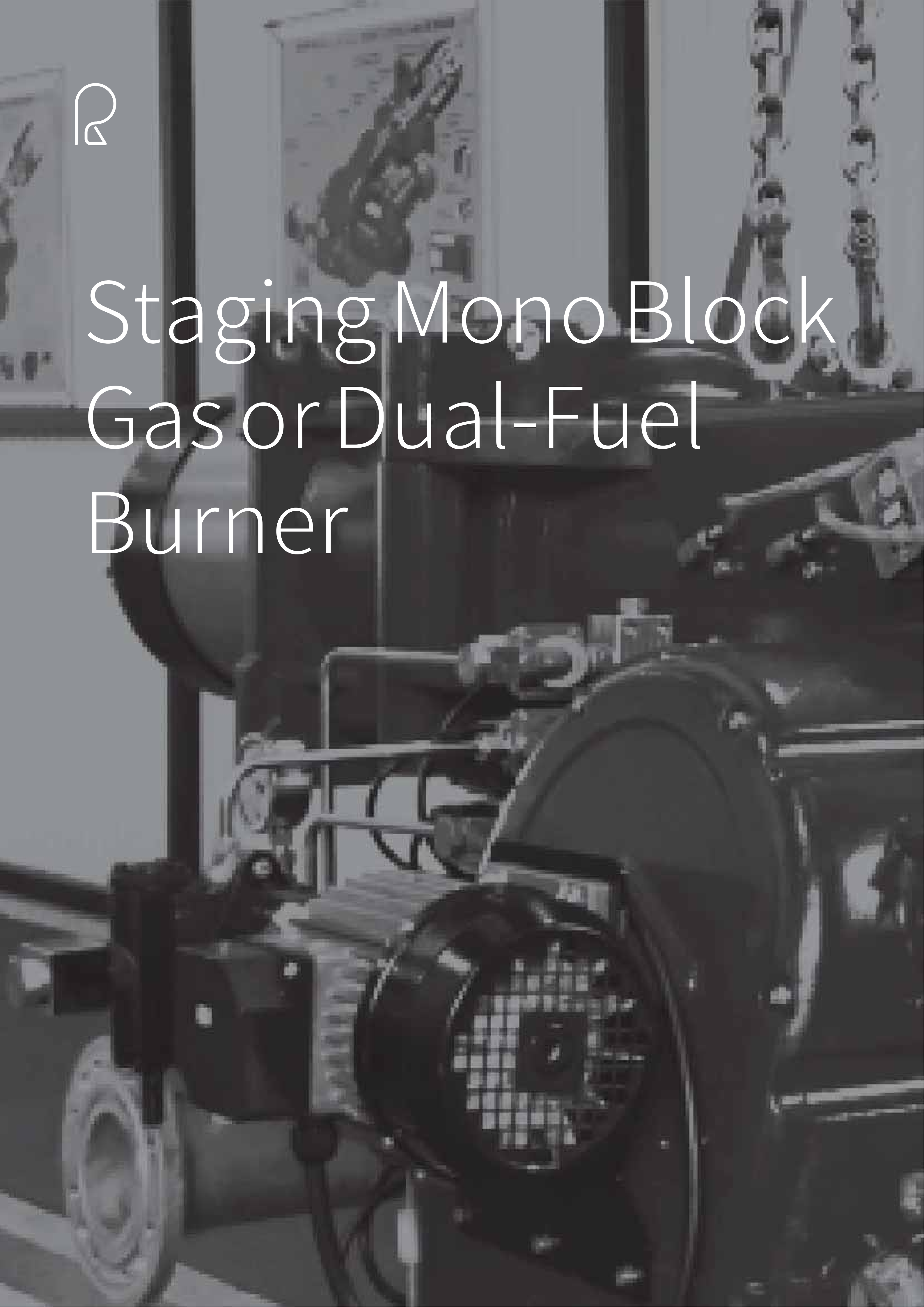
Readman's high-quality products represent renowned solutions with high efficiency and exceptional performance. From a future perspective, the Raadman engineers' researches and developments are about reducing general concerns about energy sources and the environment. All Raadman heating systems are designed and developed to have the future in mind. Our burners work with gas, oil, and other liquids like kerosene, and as a clean fuel, our Hydrogen-ready Burners are focused on reducing the environmental impacts. When reliable heating, hot water, or energy solutions are in demand for residential or businesses, Raadman can give added optional controls to save energy, money, and time.

Today's requirements to have full controls with fewer on-site operators have led to the development of more remote operation capabilities, enabling many manufacturing companies to move more of their operations into automation. Our modular burners are designed to increase the firing range controls, so there is no need to set the burners manually. It helps reduce on-site presence, dangers, and operational costs.

List of Water Treatment Products
RaadMAN

Scan to view the site

Staging Mono Block Gas or Dual-Fuel Burner



R LG B- * - 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
M/M:	Natural Gas, LPG: Electronic Modular Light Oil, Heavy Oil: Electronic Modular

B: Burner

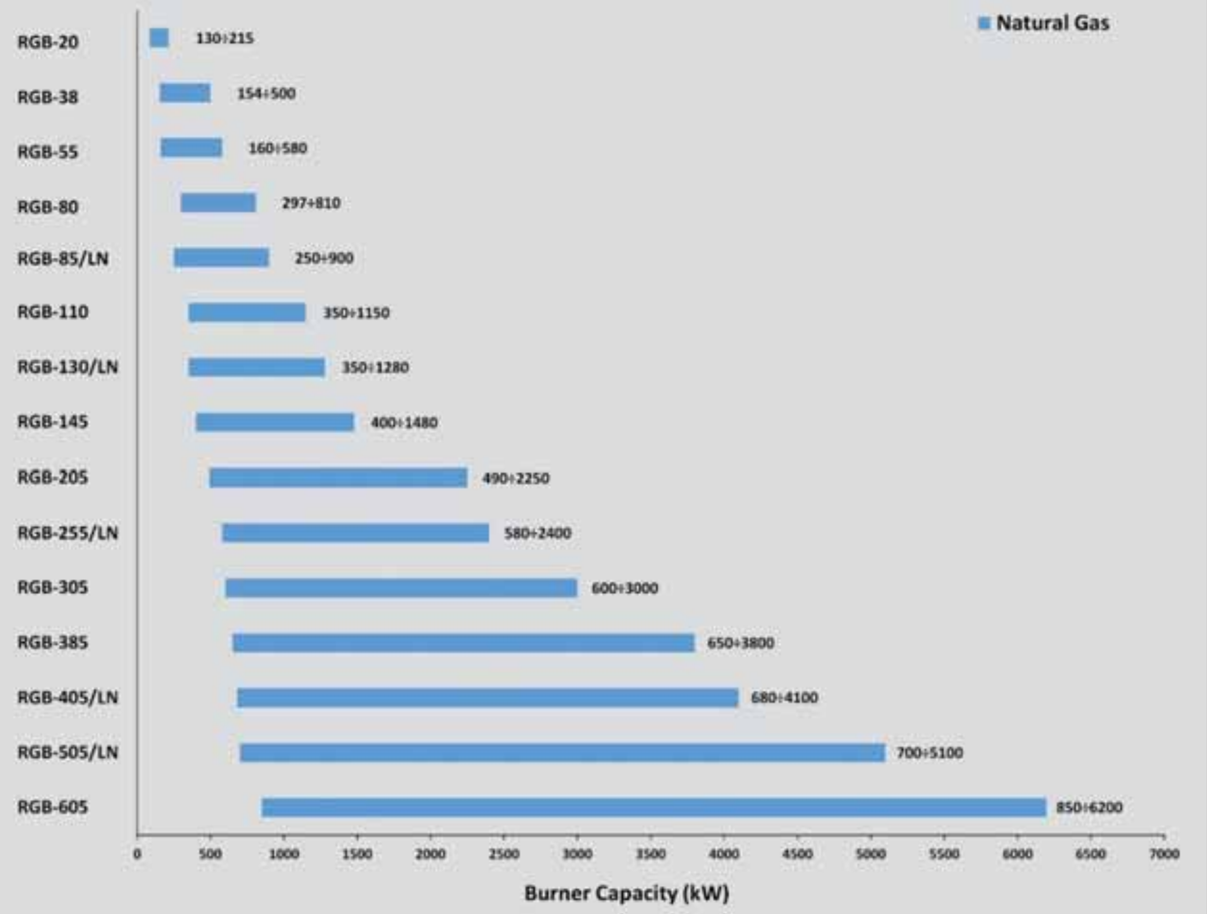
Type of Fuel

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

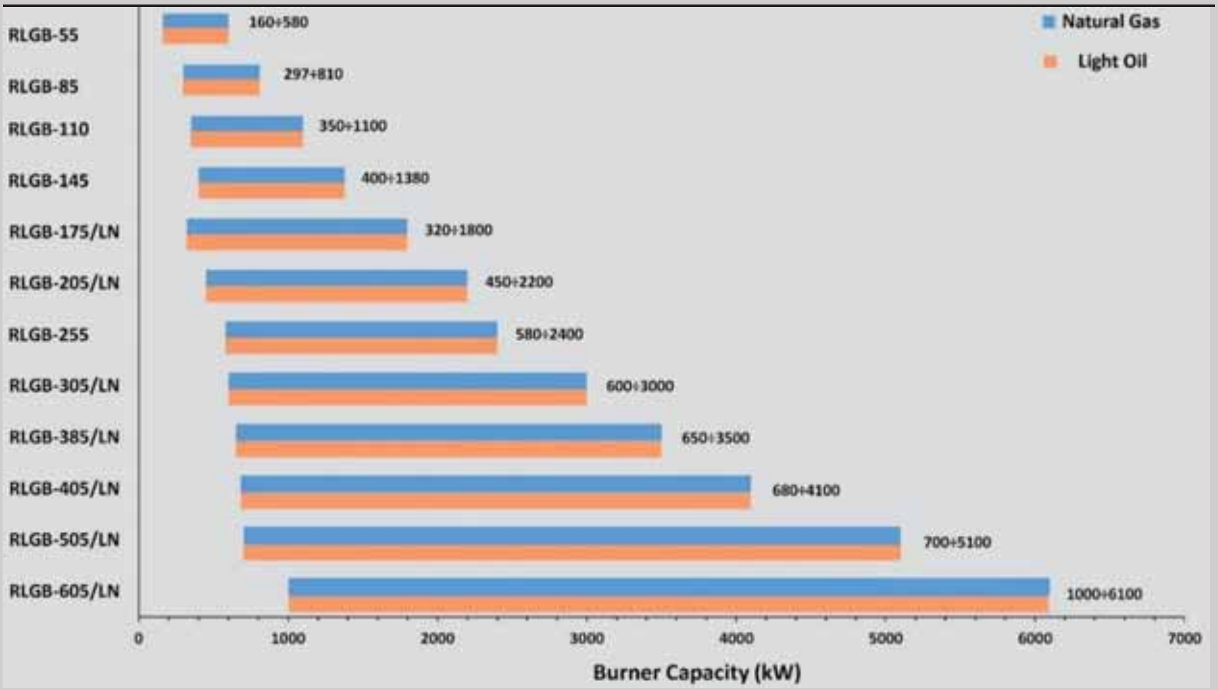
Product Family Name: RAADMAN

Firing ranges

Gas burners (RGB Series):



Dual Fuel burners (RLGB Series):

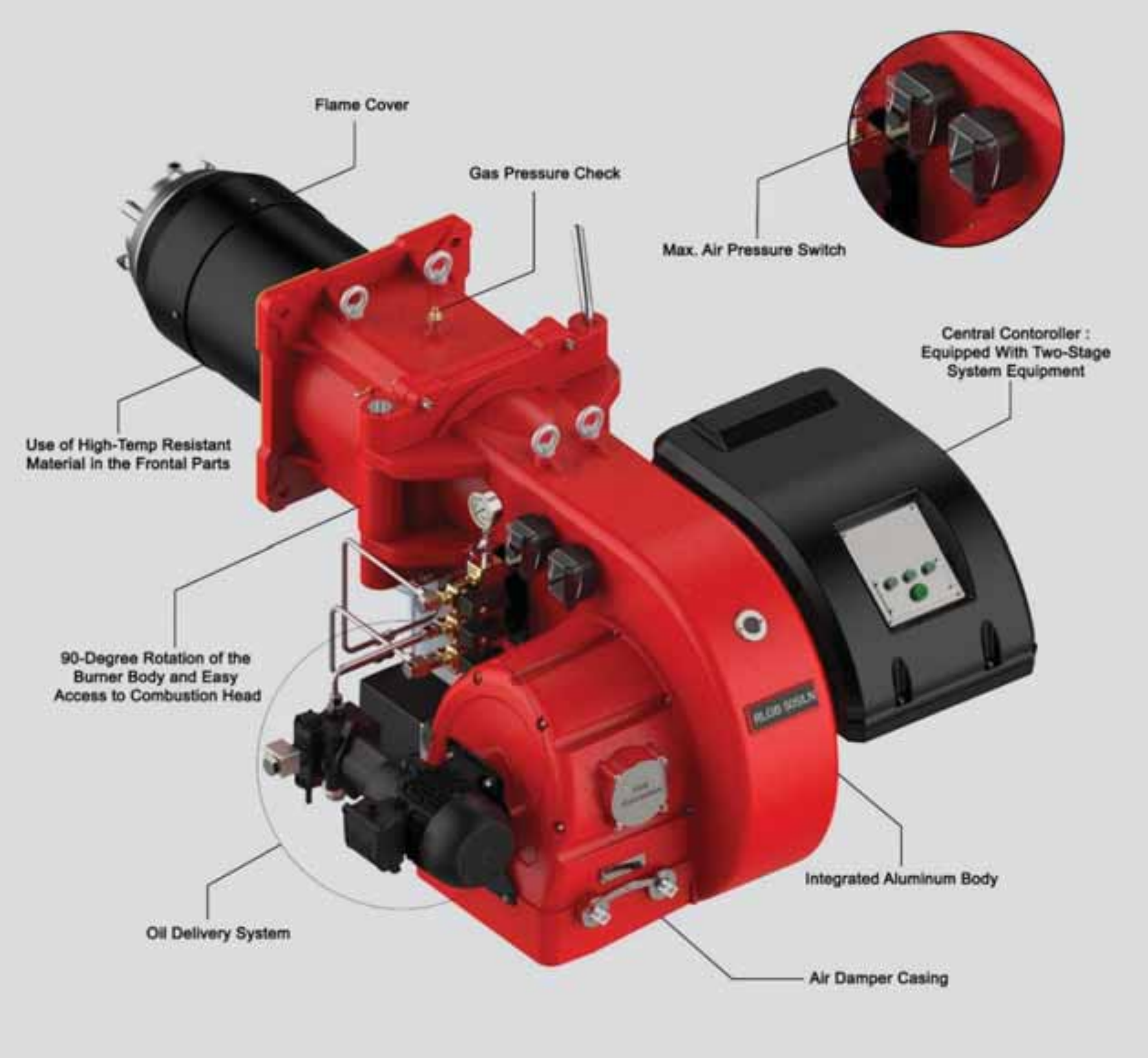


Staging mono block raadman burner

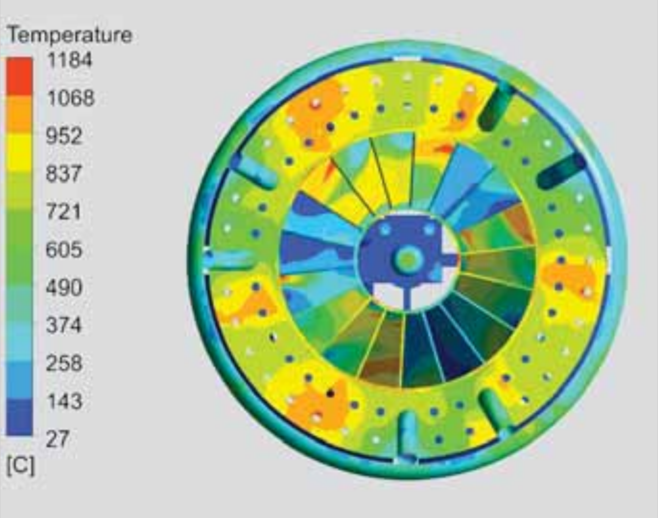
raadman Staging burners cover a firing range from 160 kW to 6200 kW in II or III stage Natural gas and light fuel oil. These burners, with high-quality electro/mechanical accessories with easy installation, commissioning and menaissance, are economically designed for city or industrial applications such as three pass hot water boilers, steam boilers, hot air generator etc.

Two or three stage burners, following the temperature/steam load requested by the system, allow operating at full (or medium) and reduced output, with consequent reduction in turning the burner on and off, that gives better performances to the boiler. Since the burner's air damper is independently controlled by an electric servomotor, during stand-by, the air entrances are getting completely closed and prevents heat loss due to the flue natural draught.

One of the most highlighted privileges of Raadman-Staging, is the lack of mechanical link between gas butterfly valve and air damper. In other word, air damper is controlled with an independent two or three stepping actuators. At the same time, gas (or light oil) is controlled with two or three parallel solenoid valves, resulting an ability of precise control and adjustment on each of burner stages. This helps a superior and complete combustion.

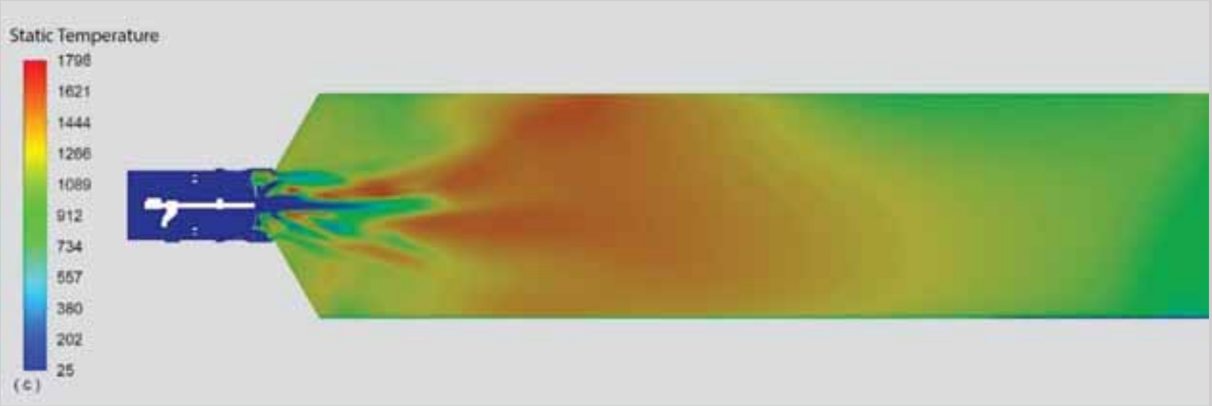


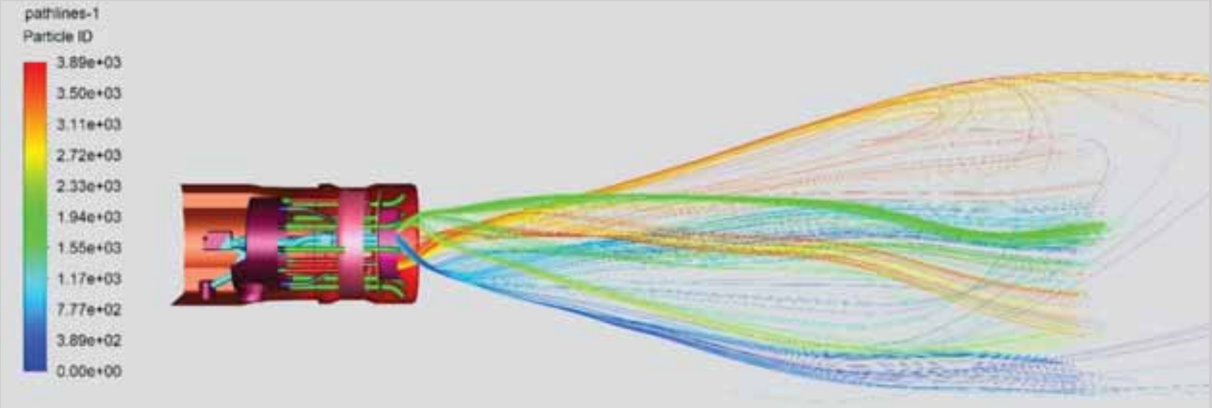
CFD experts in R&D department



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 modeling 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.





Specification

Fuels

- Natural gas
- Light oil (viscosity < 6 cSt)
- 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 utilizations.

- 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.

Technical & Functional Features

Light weight and optimized geometry.

High quality heat resistant steel material for the all parts of burner head as well as flame covering accessories.

Mono-bloc design and fully enclosed aluminum air housing.

Simple Installation, adjustment and maintenance.

Easy access to internal components.

Engineered for 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 standard (equal to the BS-EN676, BS-EN267 European standards)

Control

The following methods of regulation are available for Raadman-Staging (Mono-Bloc) burners:

Gas/oil: Two or Three stages operation

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:

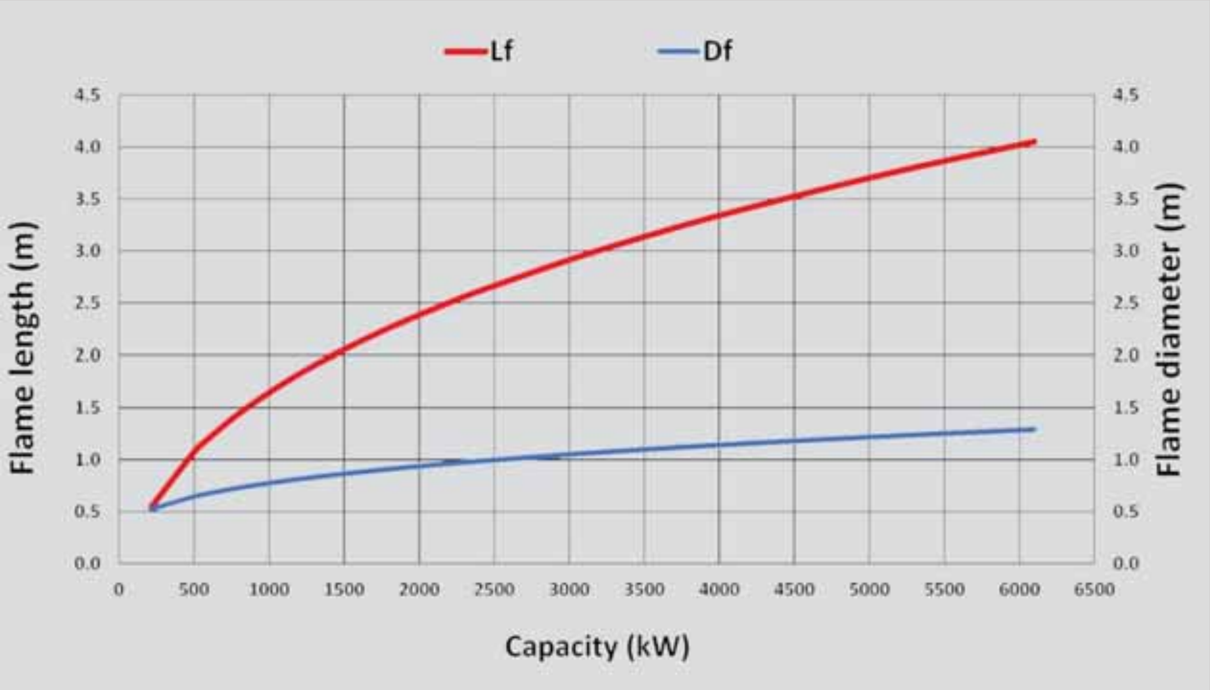
The emissions have been measured in various models at the maximum output, according to DIN-EN 676 and DIN-EN 297 standard.

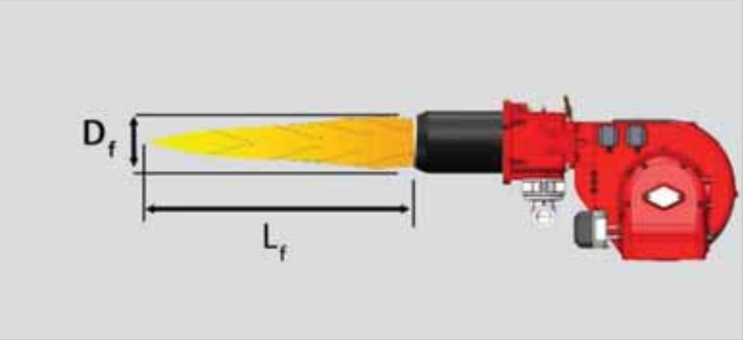
The values of CO and NOx during burner operation are lower than 30 and 120 mg/kWh at 20 % excess of air for normal versions and, lower than 20 and 80 mg/kWh for Low NOx versions (LN series). consequently, the burner's NOx class of II and III is reported and being approved for normal version and LN Versions respectively.

Special notes:

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

Flame dimension

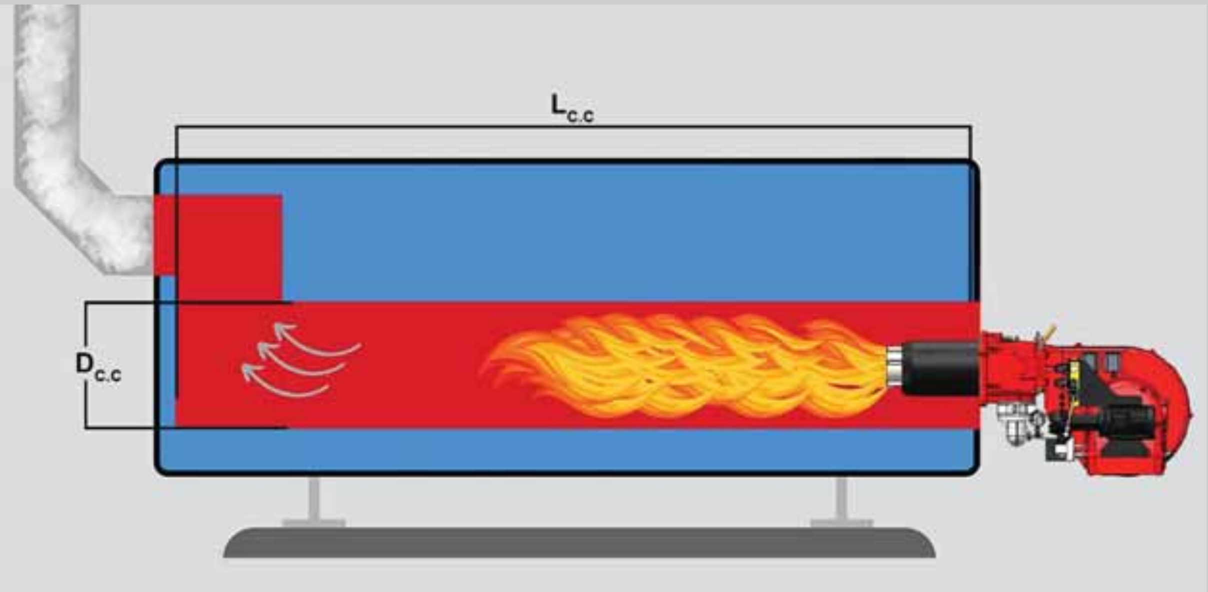




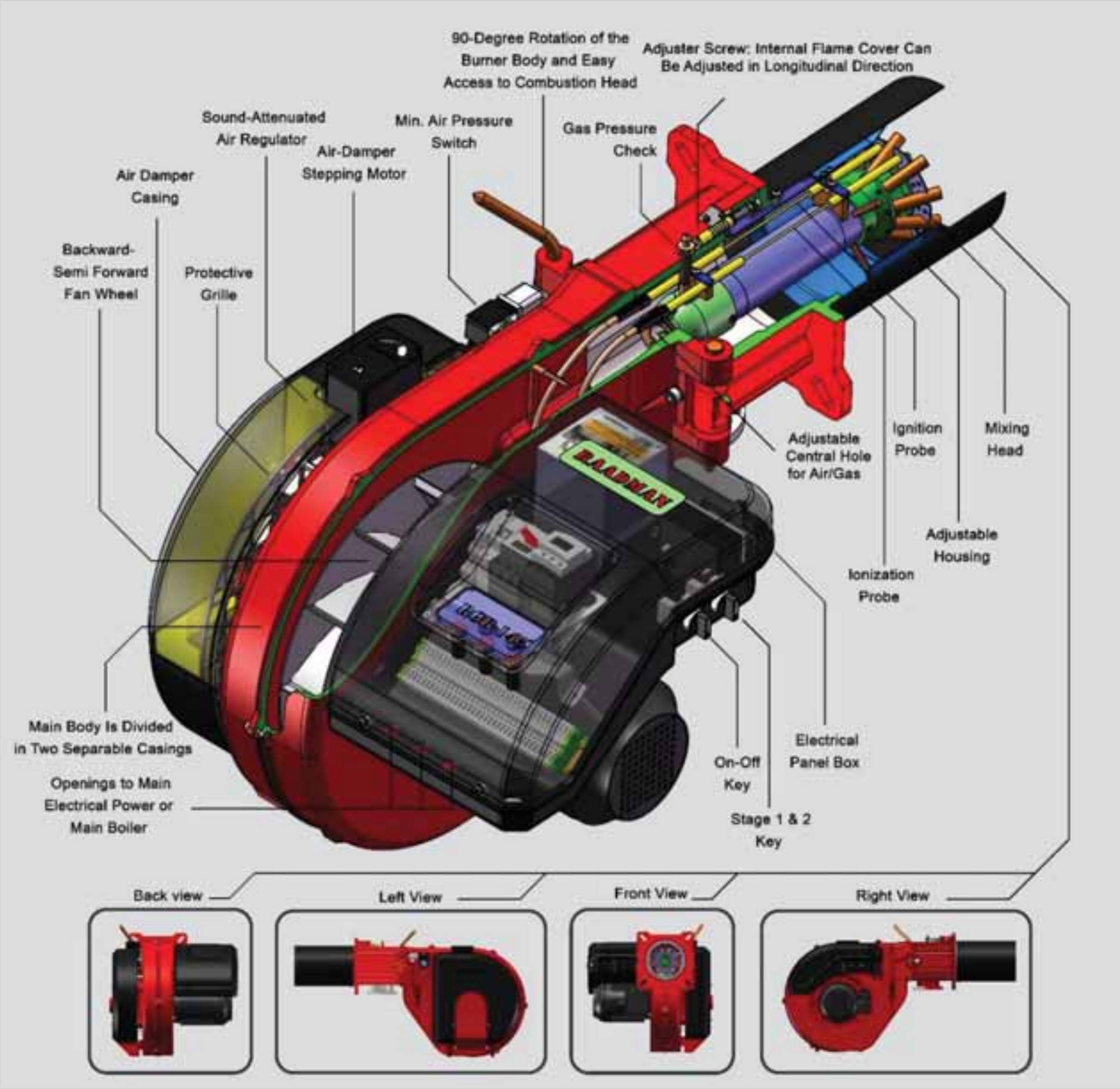
The flame dimensions which play an effective role in the burner efficiency and influence their compatibility to the boiler combustion chamber geometry, are presented in the above diagram.

Suggested combustion chamber dimension:

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.



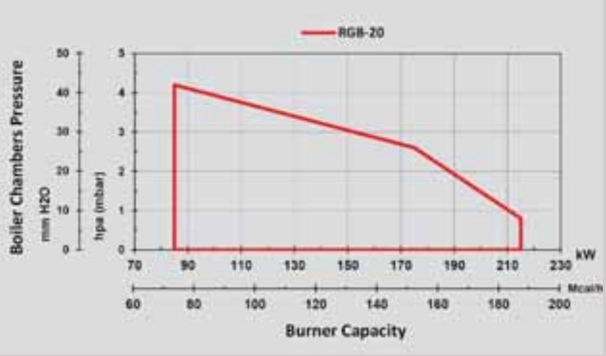
raadman RGB series burner



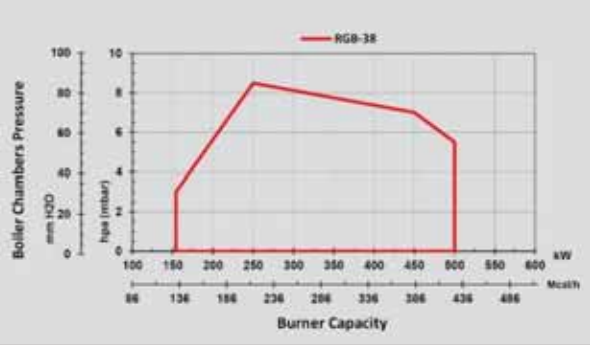
Burner selection: capacity and working diagram

Staging Gas Burner

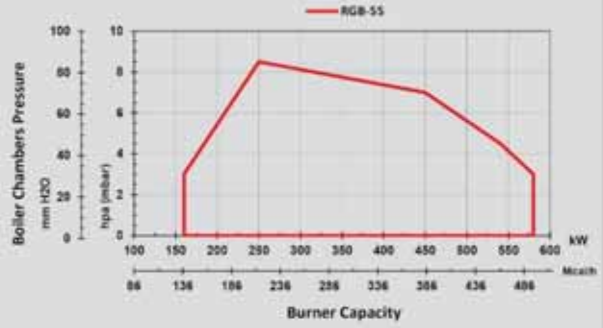
Burner	Capacity (kW)	Turn Down
RGB-20	NG:85-215	1:2



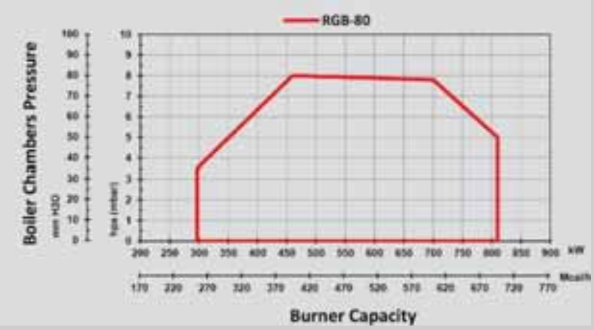
Burner	Capacity (kW)	Turn Down
RGB-38	NG:154-500	1:3



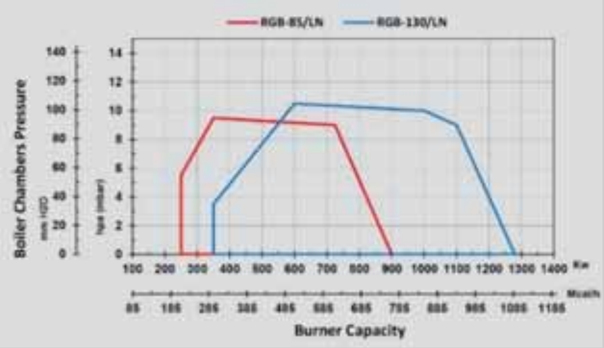
Burner	Capacity (kW)	Turn Down
RGB-55	NG: 160-580	1:3



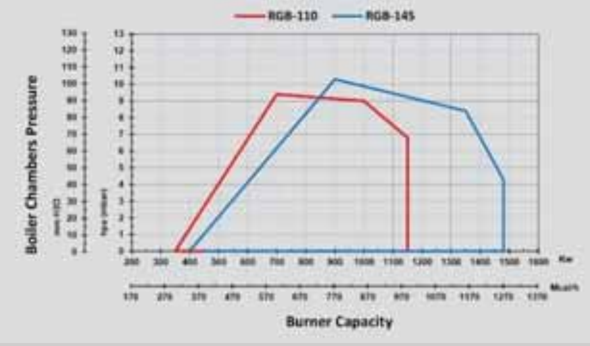
Burner	Capacity (kW)	Turn Down
RGB-80	NG:297-810	1:3



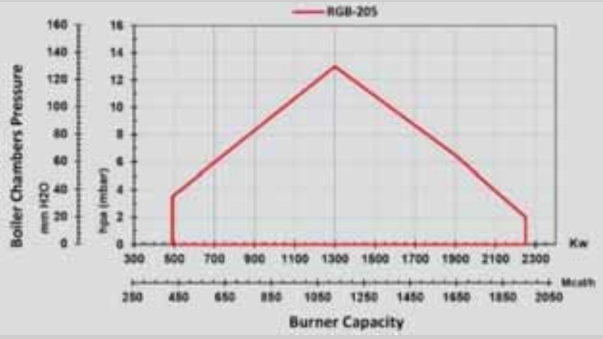
Burner	Capacity (kW)	Turn Down
RGB-85/LN	NG:250-900	1:3
RGB-130/LN	NG:350-1280	1:3



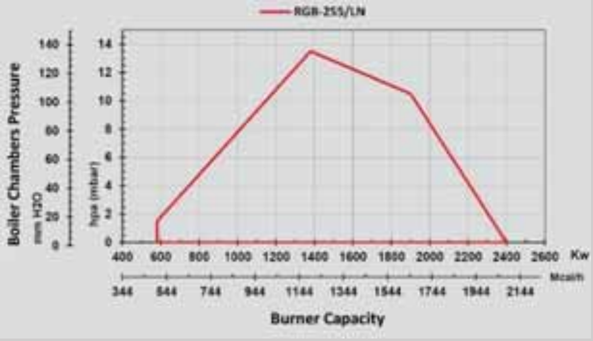
Burner	Capacity (kW)	Turn Down
RGB-110	NG:350-1150	1:3
RGB-145	NG:400-1480	1:4



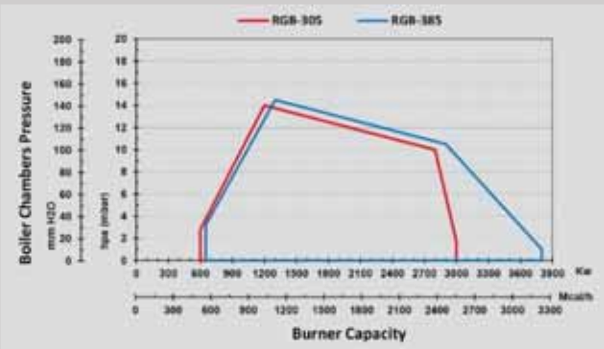
Burner	Capacity (kW)	Turn Down
RGB-205	NG: 490-2250	1:4



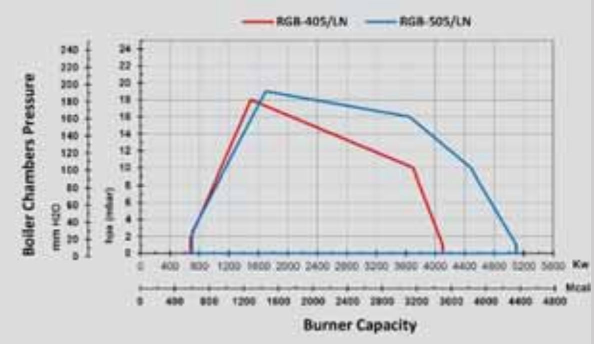
Burner	Capacity (kW)	Turn Down
RGB-255/LN	NG:580-2400	1:4



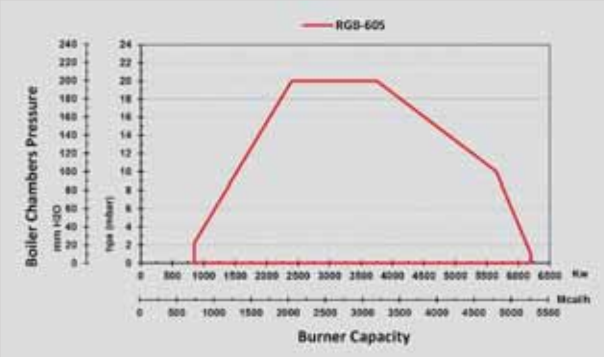
Burner	Capacity (kW)	Turn Down
RGB-305	NG: 600-3000	1:5
RGB-385	NG: 650-3800	1:5



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



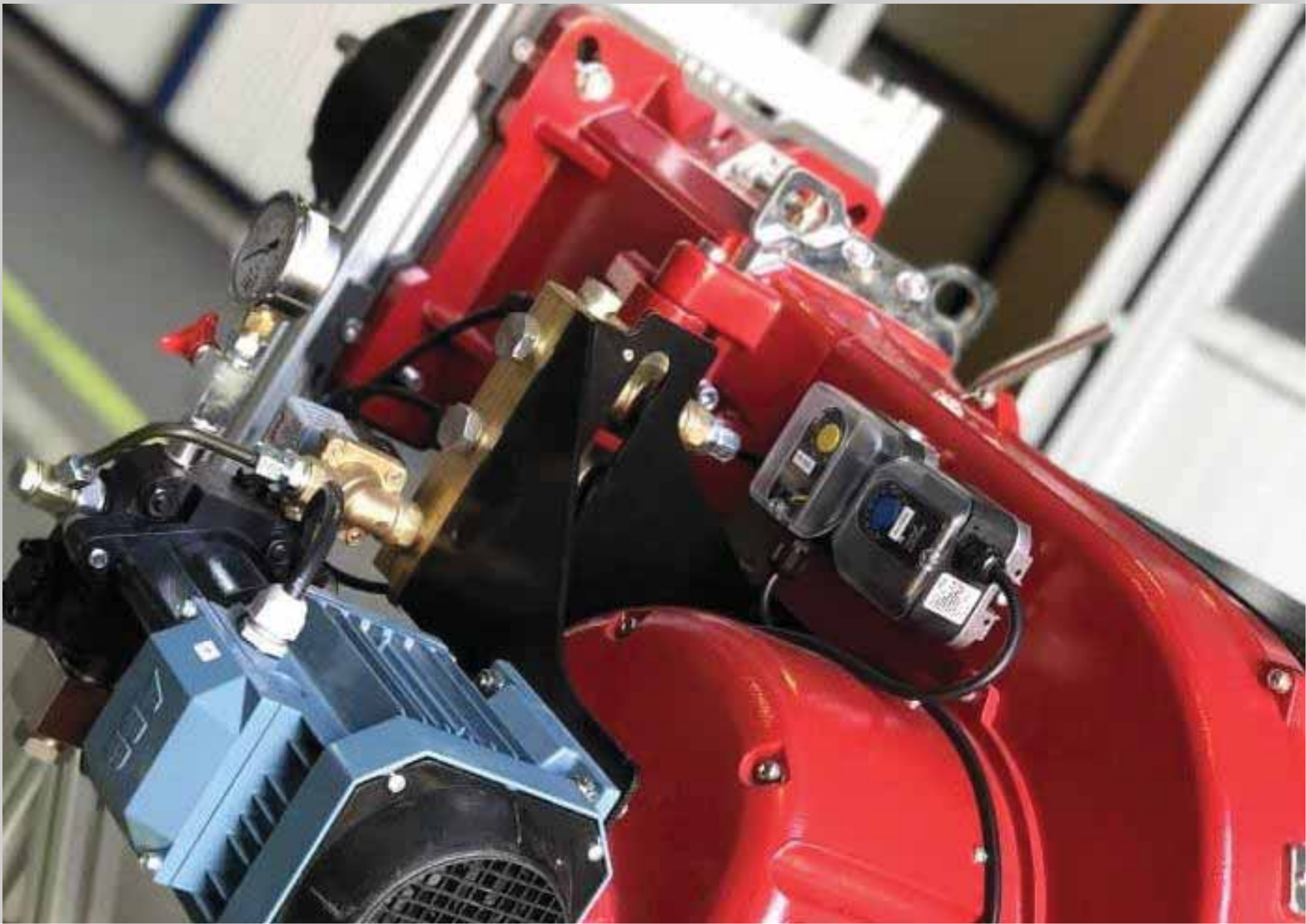
Burner	Capacity (kW)	Turn Down
RGB-605	NG: 850-6200	1:7

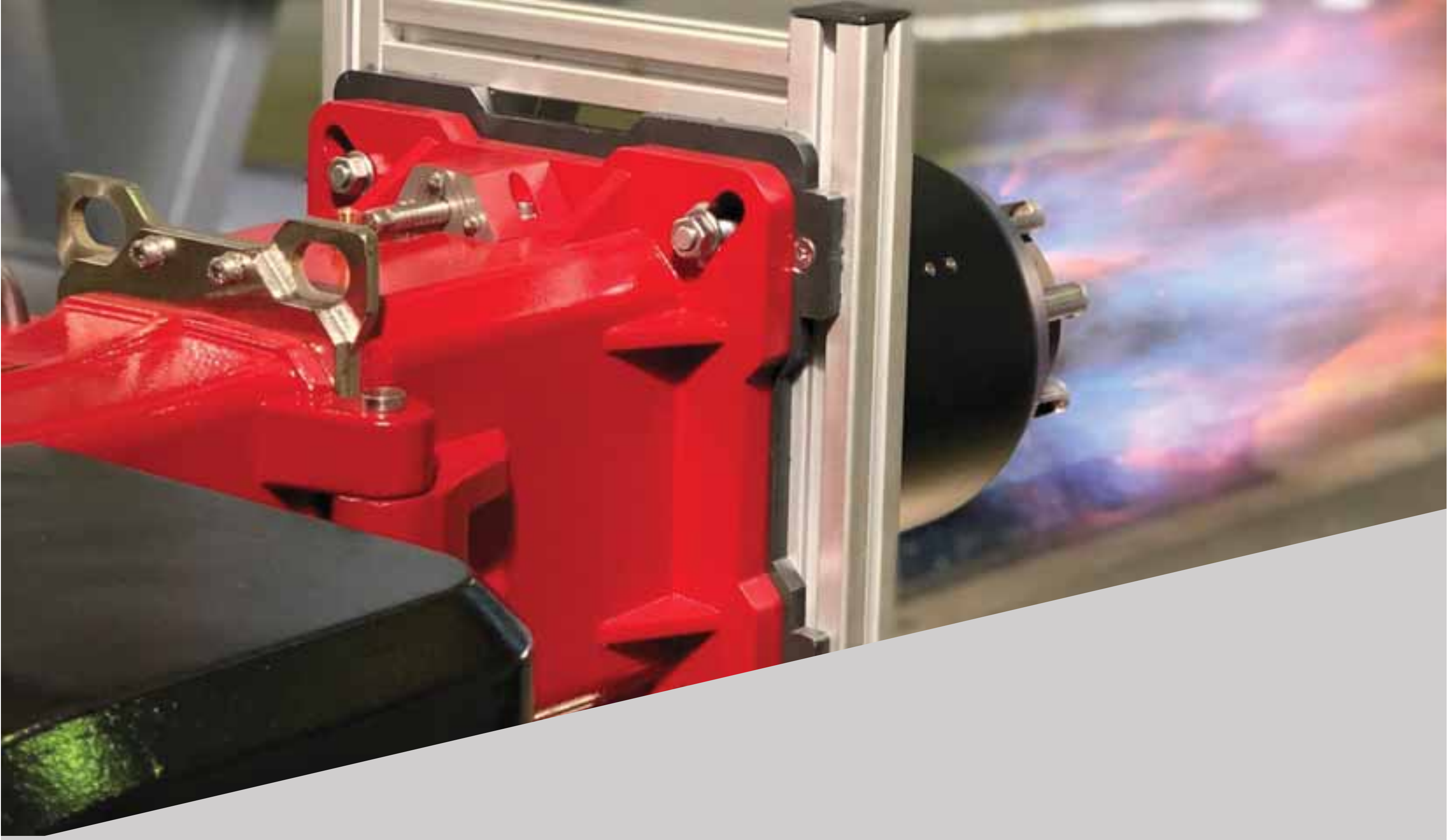


About working diagram

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.





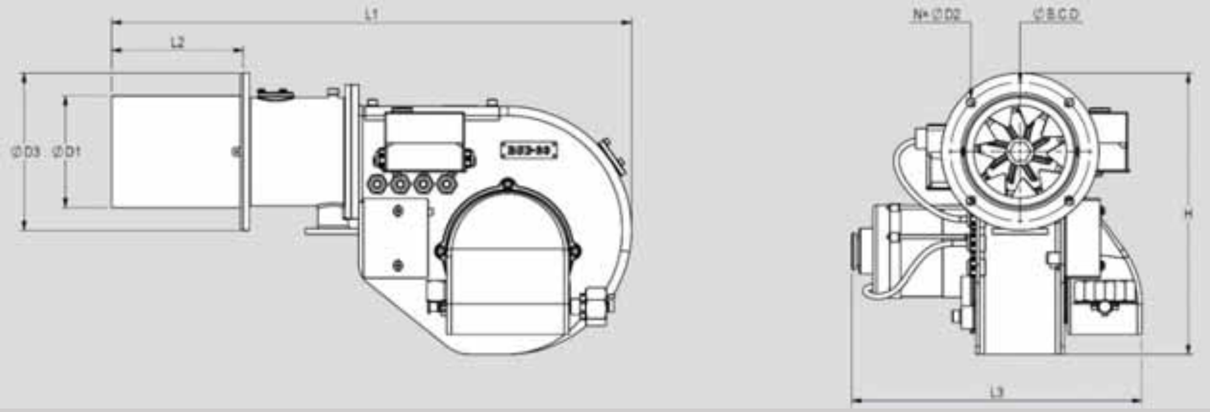
Technical data: RGB series

RGB burners 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.

Burner	Motor(kW/PH/V/HZ/rpm)	Controller	Actuator
RGB-20	0.3 /1 /220 /50 /2700	Shokouh	--
RGB-38	0.45 /3 /380-400 /50 /2700	Shokouh	--
RGB-55	0.75 /3 /380-400 /50 /2840	Shokouh	2.5
RGB-80	1.1 /3 /380-400 /50 /2850	Shokouh	2.5
RGB-85/LN	1.5 /3 /380-400 /50 /2840	Shokouh	2.5
RGB-110	1.5 /3 /380-400 /50 /2840	Siemens	3
RGB-130/LN	2.2 /3 /380-400 /50 /2840	Siemens	3
RGB-145	2.2 /3 /380-400 /50 /2840	Siemens	3
RGB-205	4 /3 /380-400 /50 /2840	Siemens	3
RGB-255/LN	5.5 /3 /380-400 /50 /2840	Siemens	3
RGB-305	7.5 /3 /380-400 /50 /2900	Siemens	3
RGB-385	7.5 /3 /380-400 /50 /2900	Siemens	3
RGB-405/LN	9.2 /3 /380-400 /50 /2900	Siemens	3
RGB-505/LN	11 /3 /380-400 /50 /2900	Siemens	3

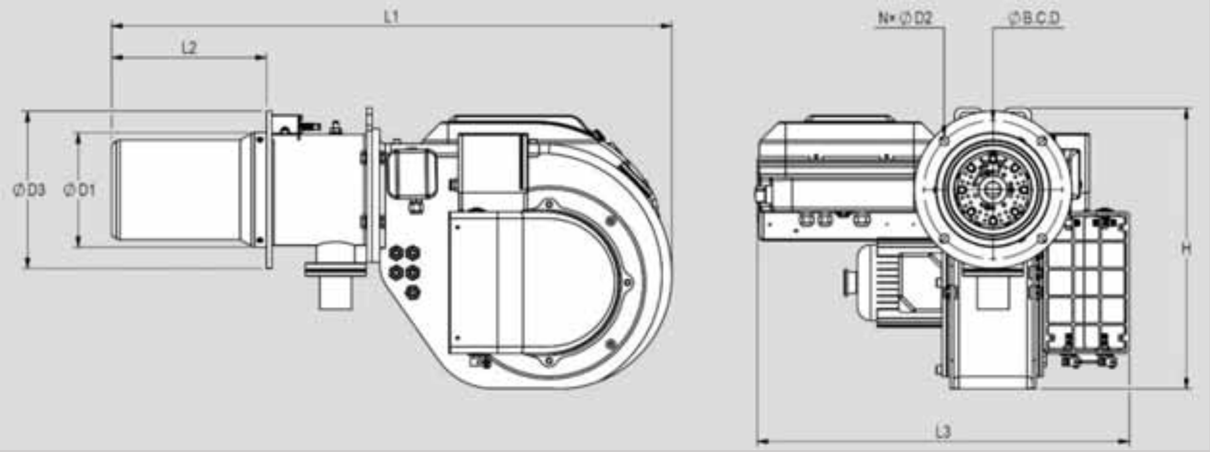
General dimension: RGB series

RGB-20



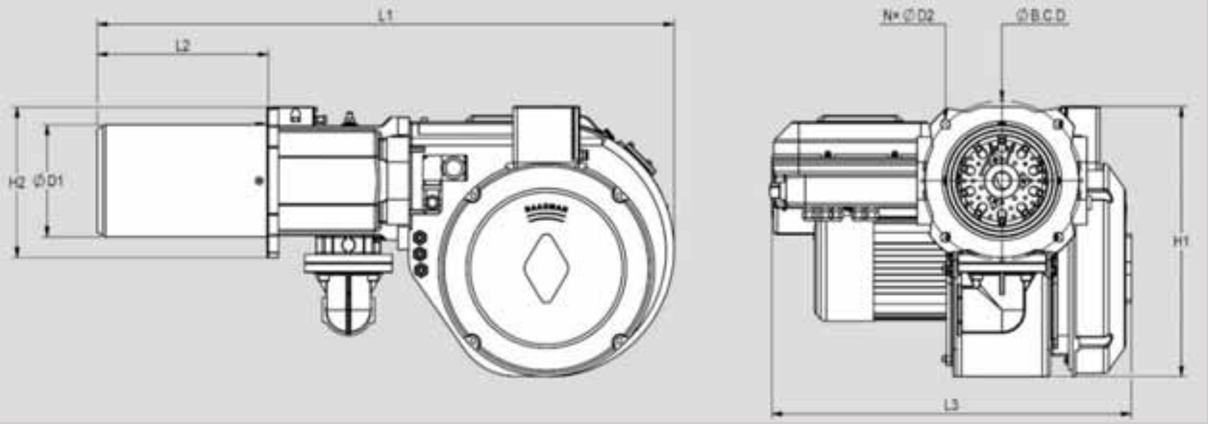
Burner Type	L_1	L_2	L_3	H	D_1	D_2	D_3	N	B.C. D
RGB-20	561	142	313	304	125	9	170	4	150

RGB-38, RGB-55



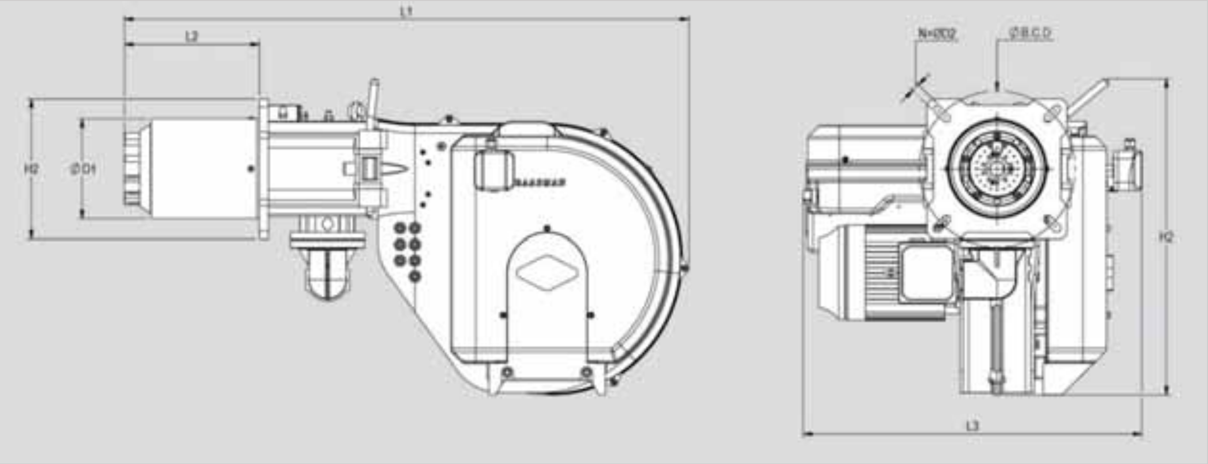
Burner Type	L_1	L_2	L_3	H	D_1	D_2	D_3	N	B.C. D
RGB-38	851	235	538	427	178	13.5	240	4	210
RGB-55	851	235	565	427	178	13.5	240	4	210

RGB-80



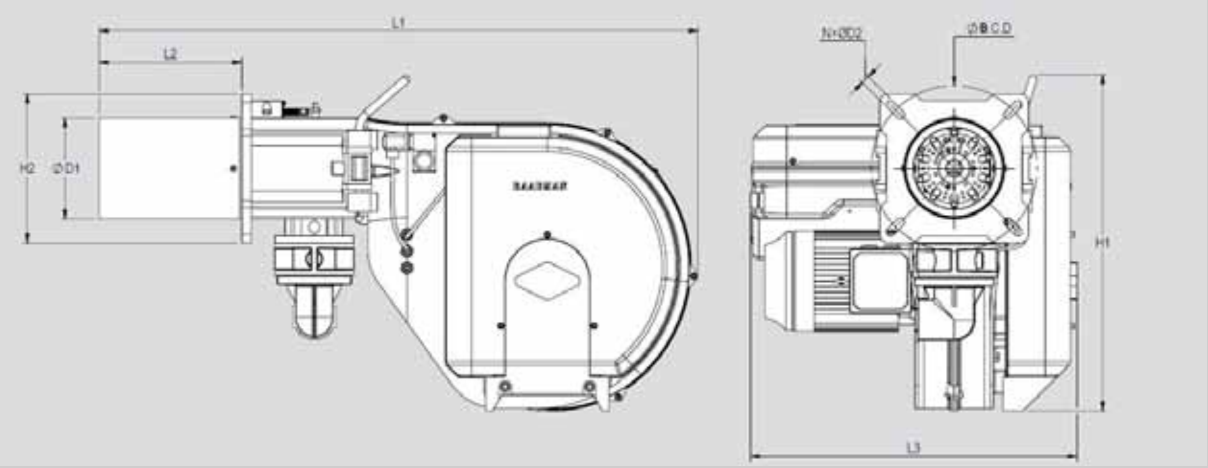
Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C. D
RGB-80	921	273.5	574	432	241	183	15	4	255

RGB-85/LN, RGB-130/LN



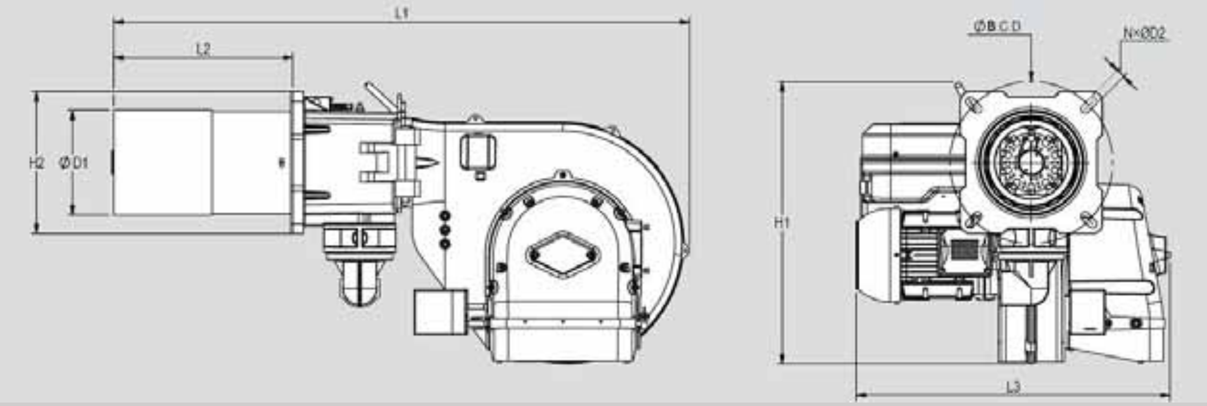
Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C. D
RGB-85/LN	1068	255	582	600	265	190	15	4	295
RGB-130/LN	1068	255	582	600	265	190	15	4	295

RGB-110, RGB-145



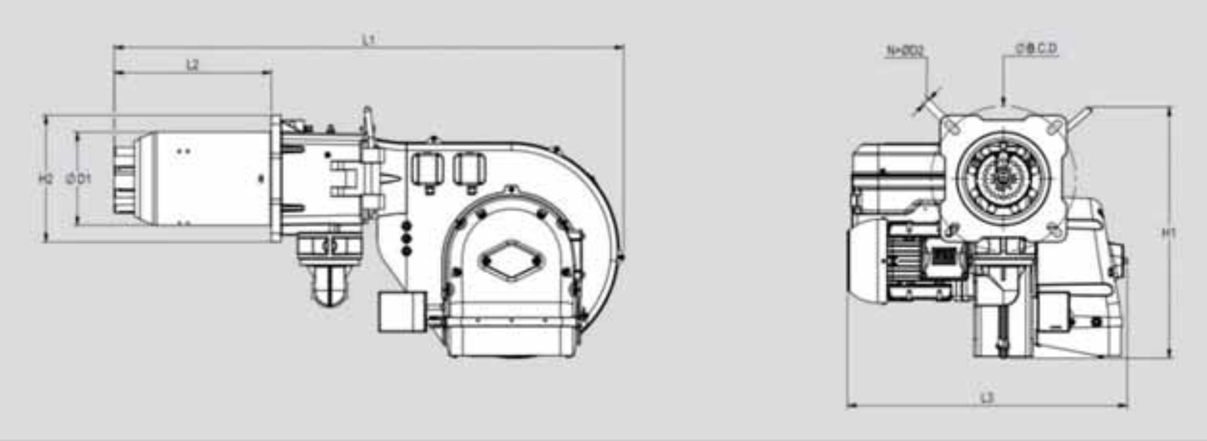
Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C. D
RGB-110	1066	254	582	600	265	180	15	4	295
RGB-145	1097	285	582	600	265	189	15	4	295

RGB-205



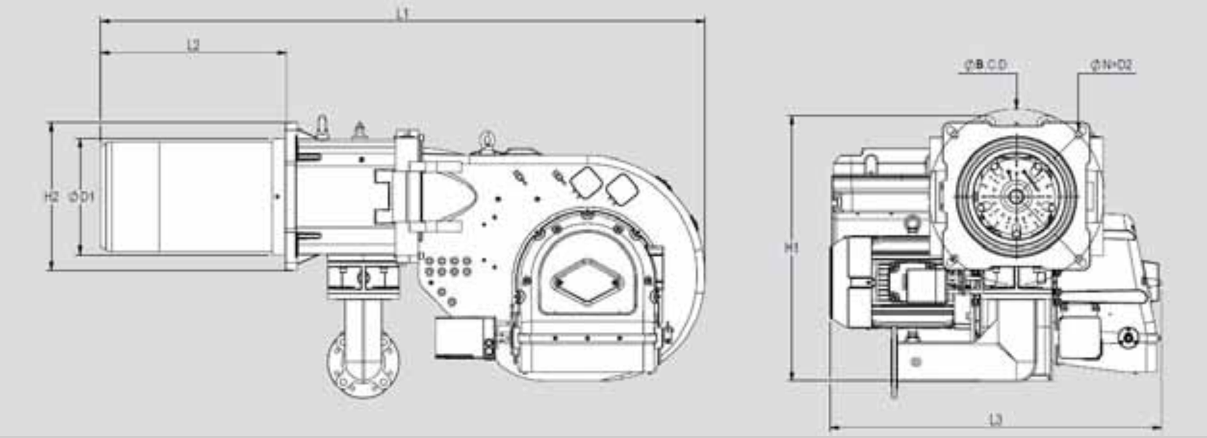
Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C.D
RGB-205	1220	380	666	600	302	223	18	4	345

RGB-255/LN



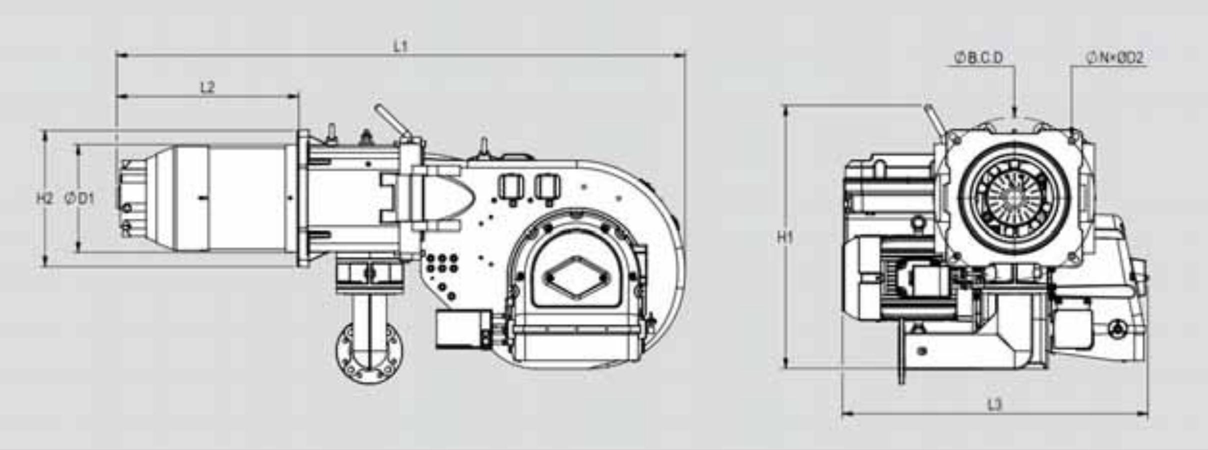
Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C. D
RGB-255/LN	1213	374	666	600	302	222	18	4	345

RGB-305, RGB-385



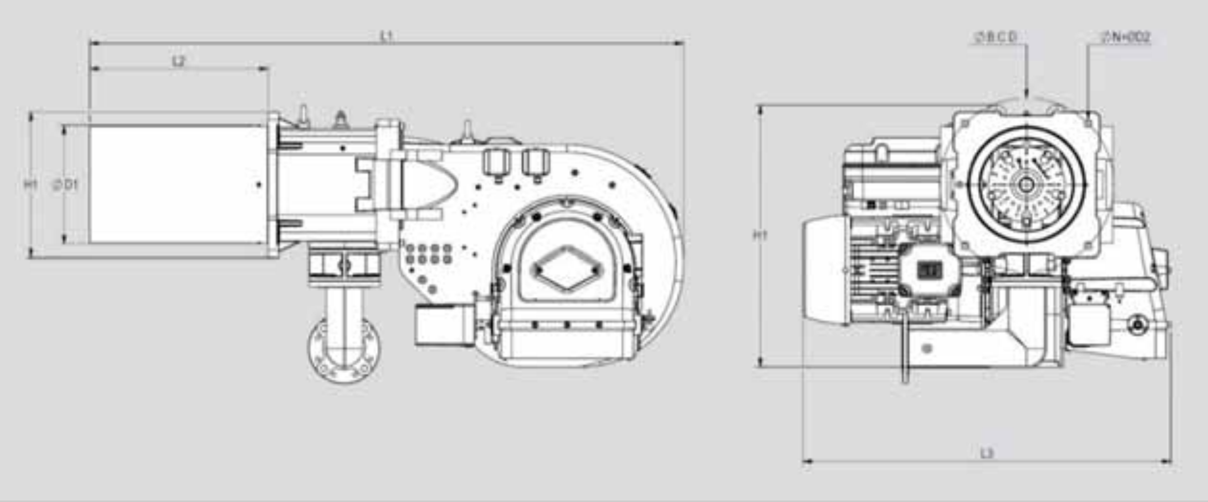
Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C. D
RGB-305	1689	519.5	927	741	413	325	20	4	490
RGB-385	1689	519.5	927	741	413	325	20	4	490

RGB-405/LN, RGB-505/LN



Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C. D
RGB-405/LN	1720	552	925	797	413	324	20	4	490
RGB-505/LN	1720	552	925	797	413	324	20	4	490

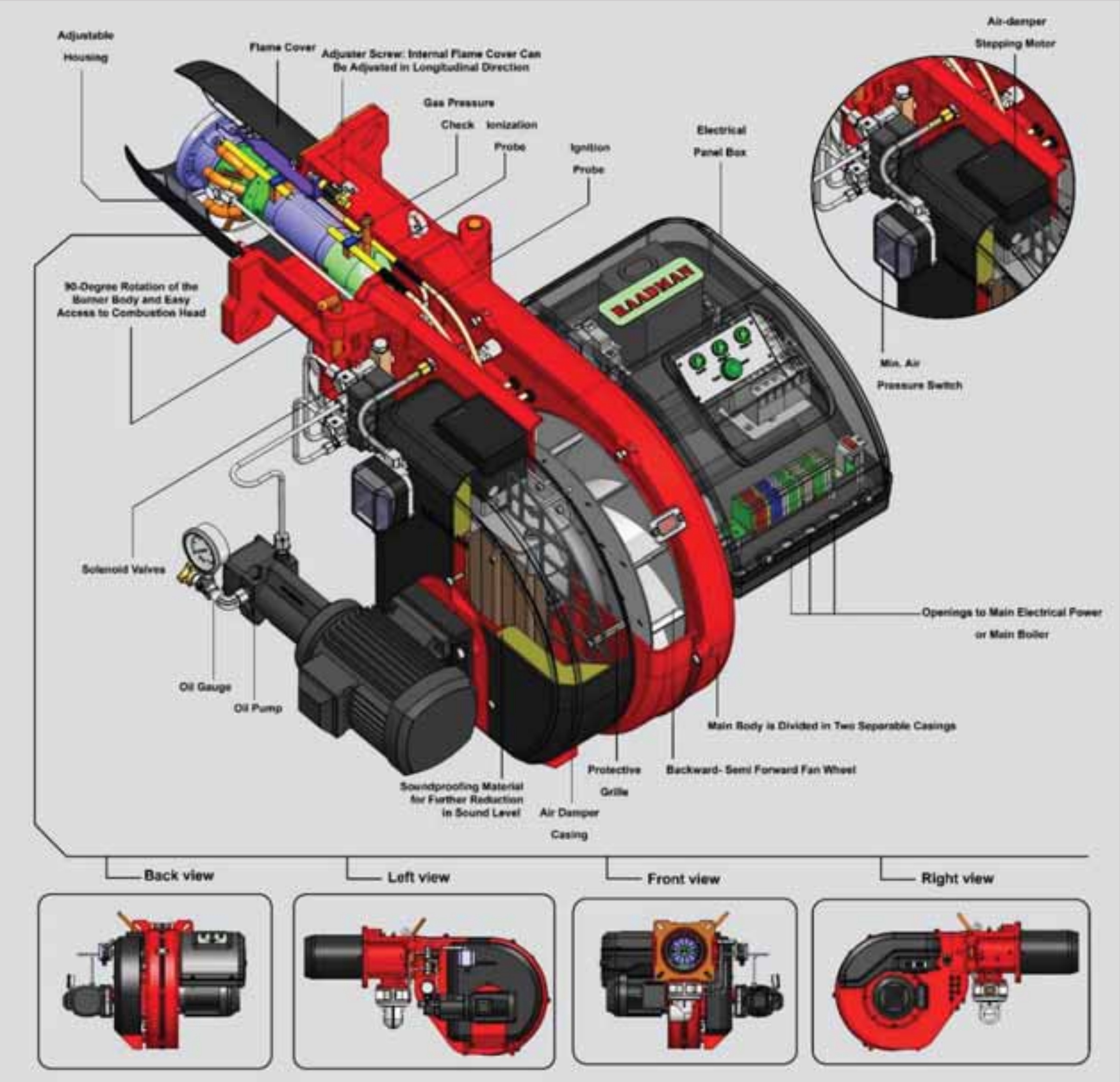
RGB-605



Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C. D
RGB-605	1671	502	1036	741	413	336	20	4	490

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

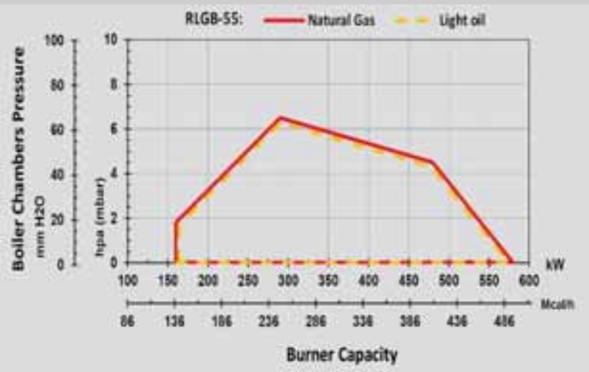
RLGB series raadman burner



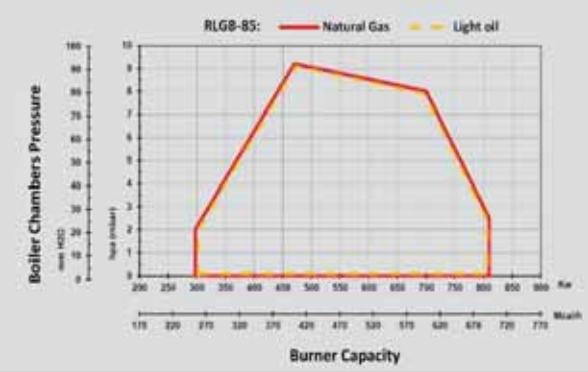
Burner selection: capacity and working diagram

Staging Dual-fuel Burner

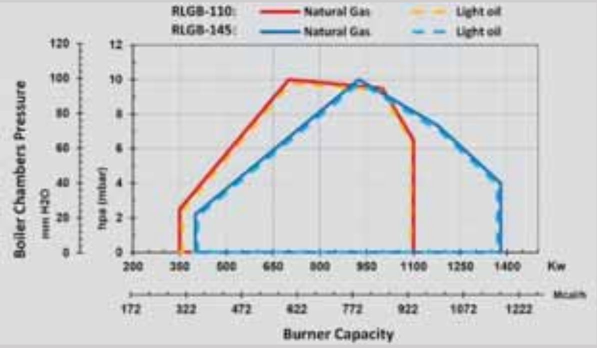
Burner	Capacity (kW)	Turn Down
RLGB-55	NG:160-580	1:3
	LFO: 160-580	1:3



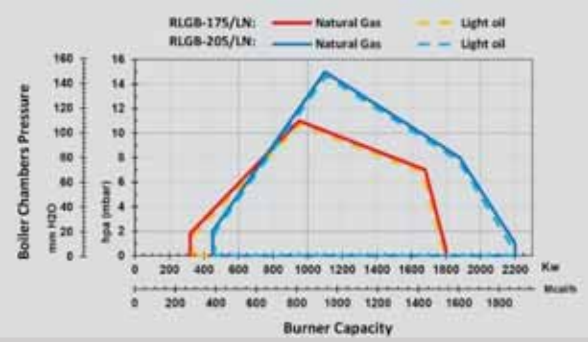
Burner	Capacity (kW)	Turn Down
RLGB-85/LN	NG:297-810	1:3
	LFO: 297-810	1:3



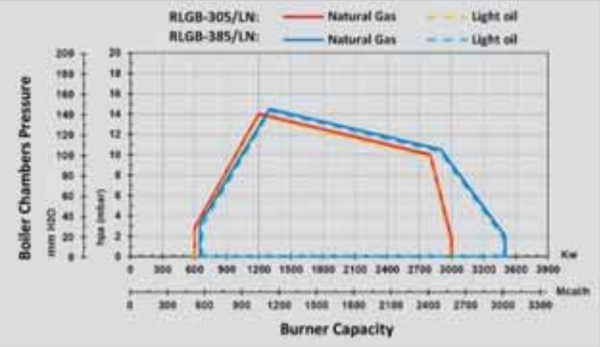
Burner	Capacity (KW)	Turn Down
RLGB-110	NG: 350-1100	1:3
	LFO: 350-1100	1:3
RLGB-145	NG: 400-1380	1:4
	LFO:400-1380	1:4



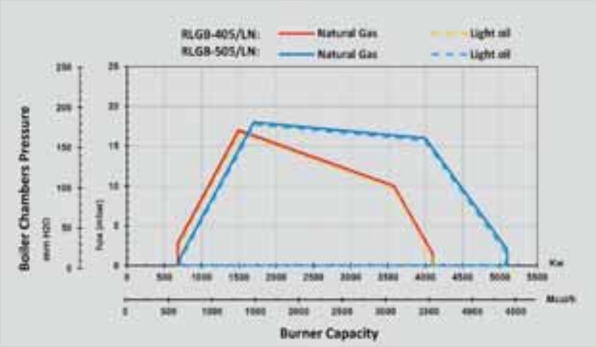
Burner	Capacity (kW)	Turn Down
RLGB-175/LN	NG:320-1800	1:5
	LFO:320-1800	1:5
RLGB-205/LN	NG:450-2200	1:5
	LFO:450-2200	1:5



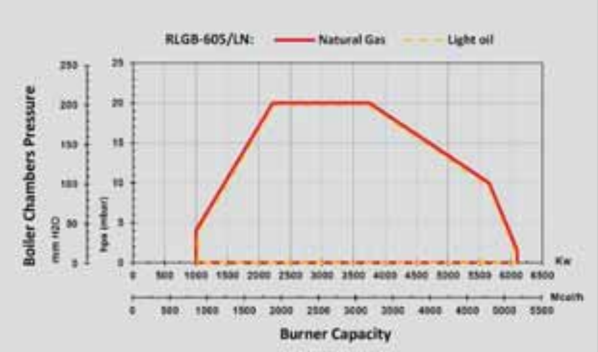
Burner	Capacity (kW)	Turn Down
RLGB-305/LN	NG: 600-3000	1:5
	LFO: 600-3000	1:5
RLGB-385/LN	NG: 350-3500	1:5
	LFO:650-3500	1:5

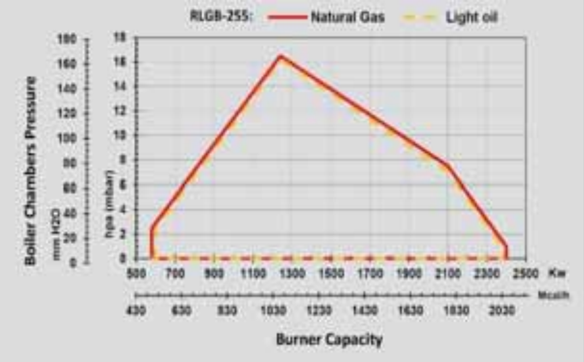


Burner	Capacity (kW)	Turn Down
RLGB-405/LN	NG: 680-4100	1:6
	LFO: 680-4100	1:6
RLGB-505/LN	NG: 700-5100	1:7
	LFO: 700-5100	1:7



Burner	Capacity (kW)	Turn Down	Burner	Capacity (kW)	Turn Down
RLGB-605/LN	NG: 1000-6100	1:6	RLGB-255/LN	NG: 580-2400	1:4
	LFO: 1000-6100	1:6		LFO: 580-2400	1:4





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).

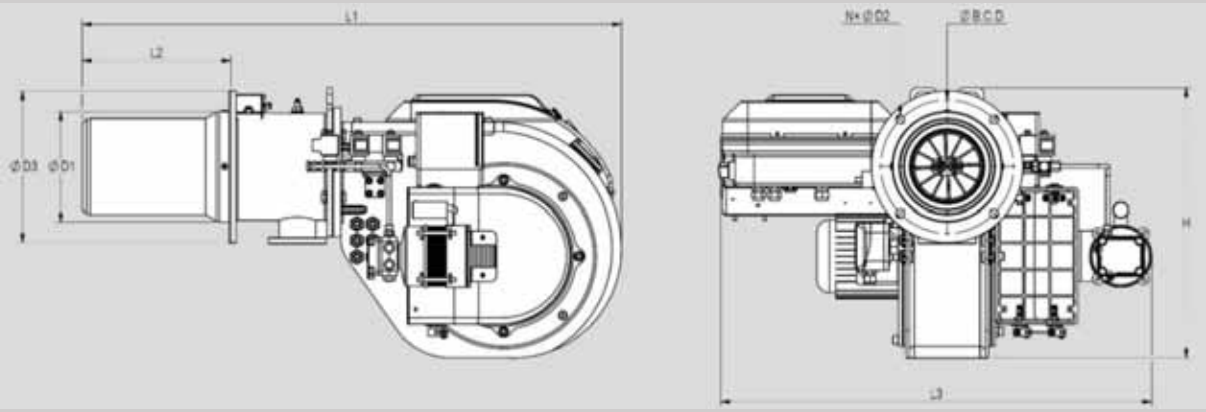
Technical data: RLGB series

RLGB burners include: Ventilation system with AC motor, Ignition transformer and electrodes, electrical panel with power contactors, fuses, relays, central controller, air pressure switches, Oil delivery solenoid valves and pressure gauges plus pump and AC motor with return and feed pipes, sound proofing material, Lamp signals for operational supervision etc.

Burner	Motor(kW/PH/V/HZ/rpm)	Controller	Actuator (N.m)
RLGB-55	0.75/3/380-400/50/2850	Shokouh	2.5
RLGB-85	1.1 /3 /380-400 /50 /2840	Shokouh	2.5
RLGB-110	1.5 /3 /380-400 /50 /2840	Siemens	3
RLGB-145	2.2 /3 /380-400 /50 /2840	Siemens	3
RGB-175/LN	4 /3 /380-400 /50 /2840	Siemens	3
RLGB-205/LN	5.5 /3 /380-400 /50 /2840	Siemene	3
RLGB-255	5.5 /3 /380-400 /50 /2840	Siemens	3
RLGB-305/LN	7.5 /3 /380-400 /50 /2940	Siemens	9
RLGB-385/LN	7.5 /3 /380-400 /50 /2940	Siemens	9
RLGB-405/LN	9.2 /3 /380-400 /50 /2940	Siemens	9
RLGB-505/LN	11 /3 /380-400 /50 /2940	Siemens	9
RLGB-605/LN	15 /3 /380-400 /50 /2920	Siemens	9

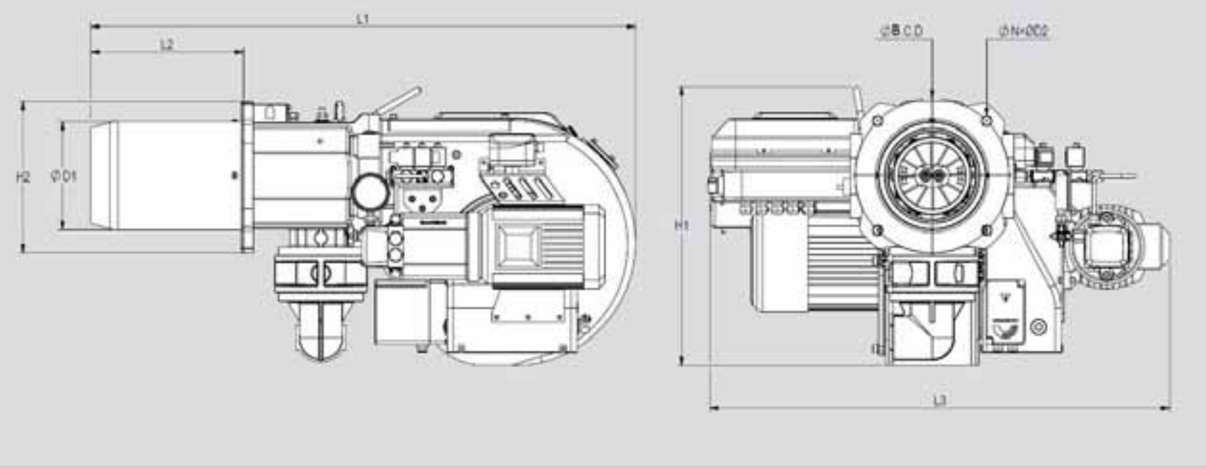
General dimension: RLGB series

RLGB-55



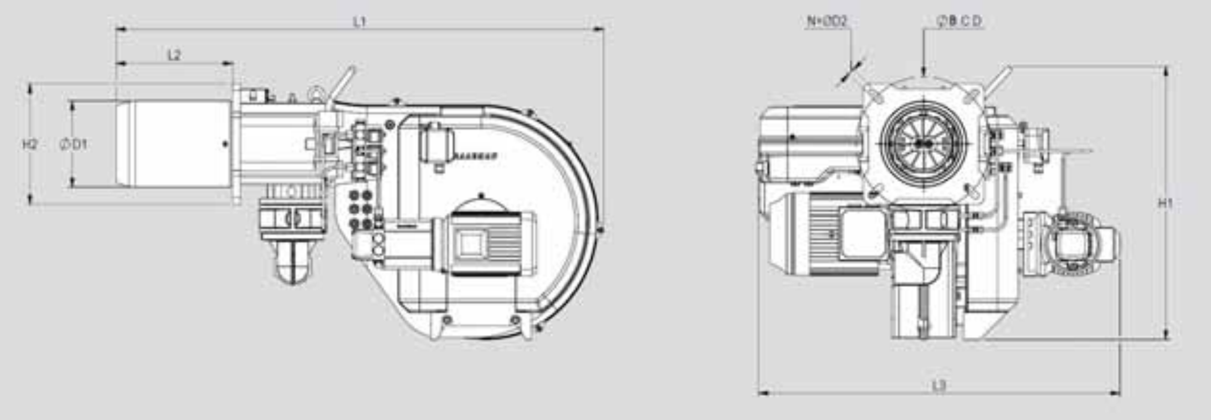
Burner Type	L_1	L_2	L_3	H	D_1	D_2	D_3	N	B.C. D
RLGB-55	853	235	682	427	178	13.5	240	4	210

RLGB-85



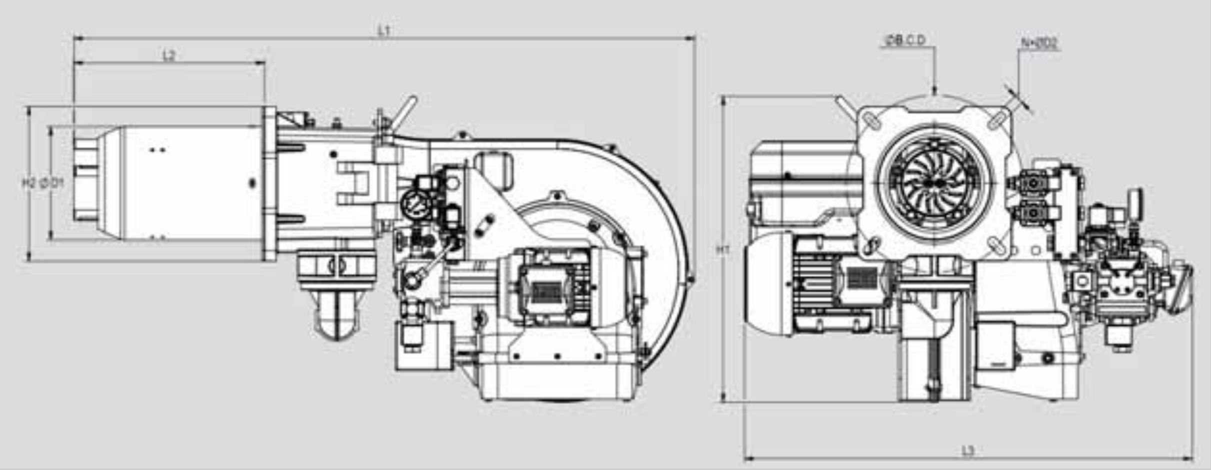
Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C. D
RLGB-85	902	253	760	461	250	182	15	4	255

RLGB-110, RLGB-145



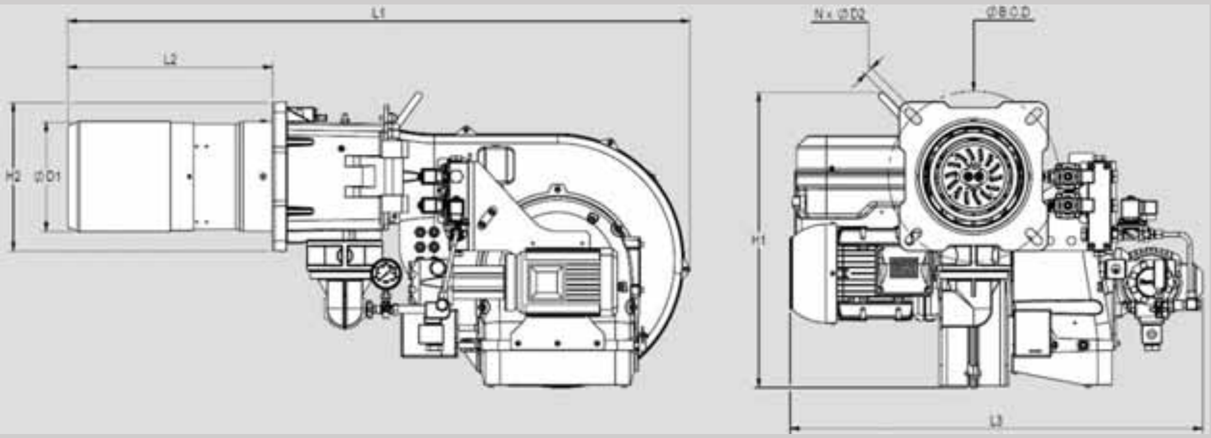
Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C. D
RLGB-110	1068	255	797	600	265	180	15	4	295
RLGB-145	1068	255	797	600	265	180	15	4	295

RLGB-175/LN, RLGB-205/LN



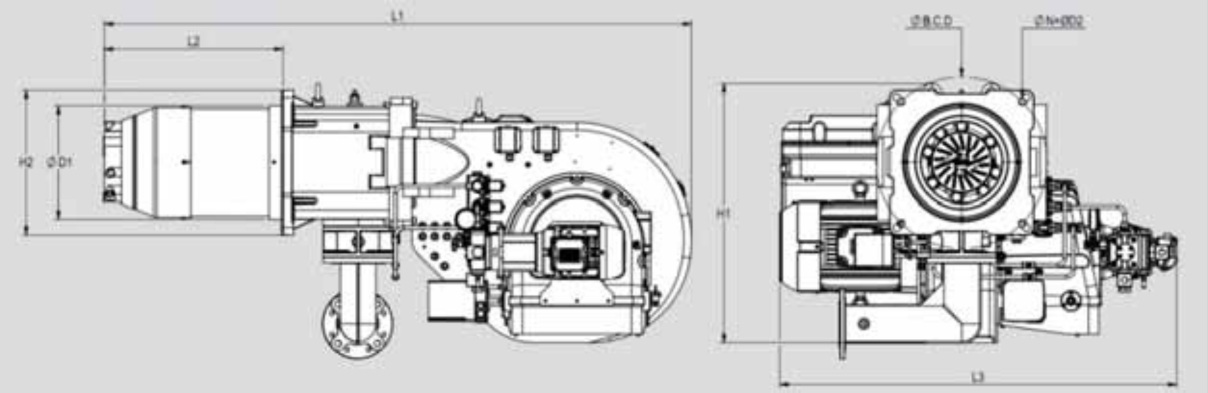
Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C. D
RLGB-175/LN	1213	373	875	600	302	223	15	4	345
RLGB-205/LN	1213	373	875	600	302	223	15	4	345

RLGB-255



Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C.D
RLGB-255	1260	419	833	600	302	224	18	4	345

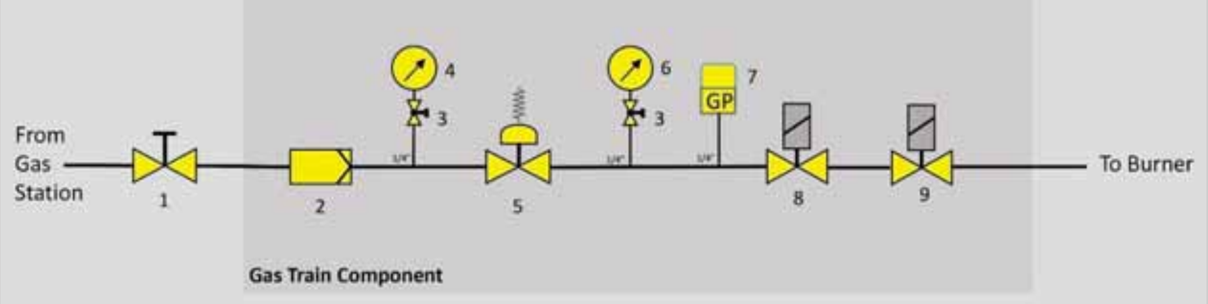
RLGB-305/LN, RLGB-385/LN, RLGB-405/LN, RLGB-505/LN, RLGB-605/LN



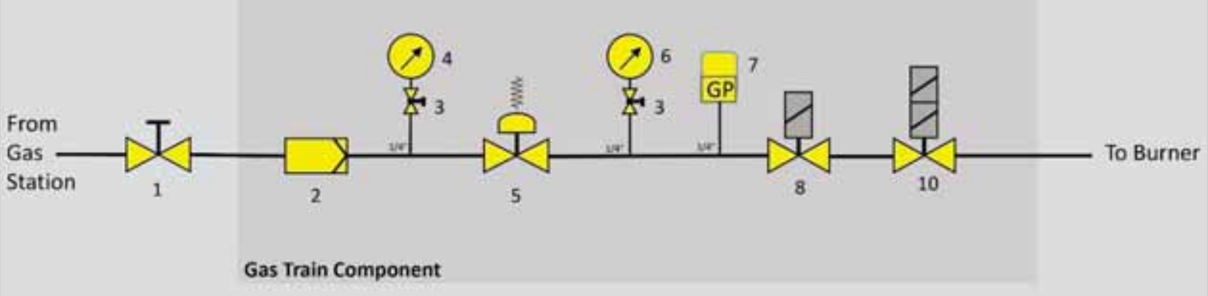
Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C. D
RLGB-305/LN	1681	514	1137	741	413	328	20	4	490
RLGB-385/LN	1681	514	1137	741	413	328	20	4	490
RLGB-405/LN	1682	514	1141	741	413	328	20	4	490
RLGB-505/LN	1682	514	1141	741	413	328	20	4	490
RLGB-605/LN	1680	512	1274	741	413	340	20	4	490

Gas train diagram

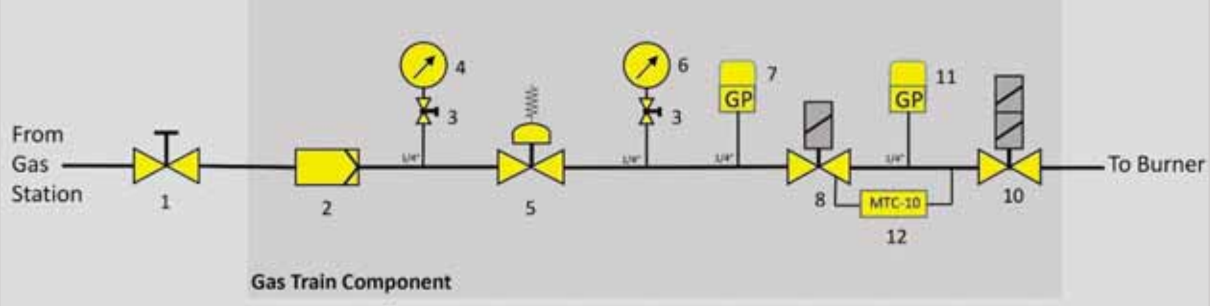
GT1



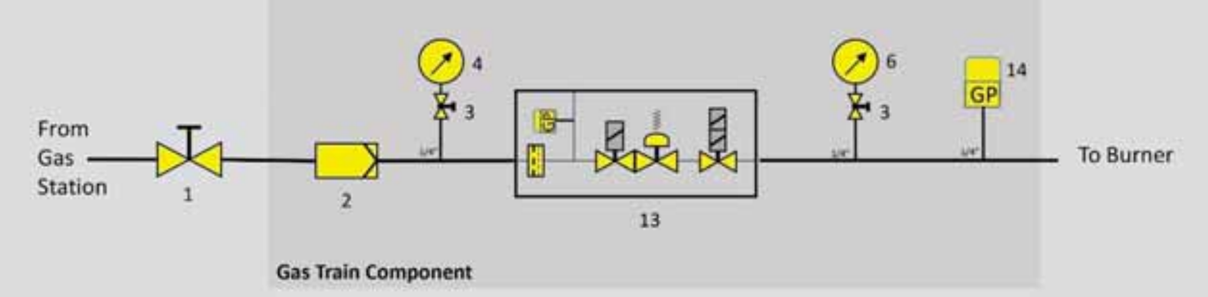
GT2



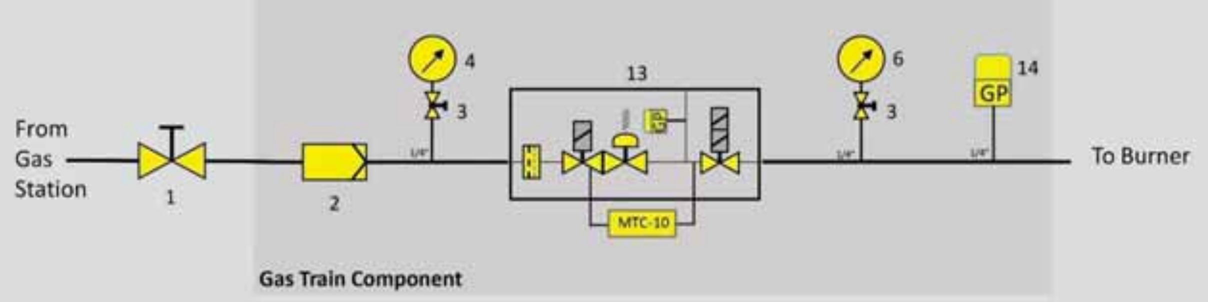
GT3



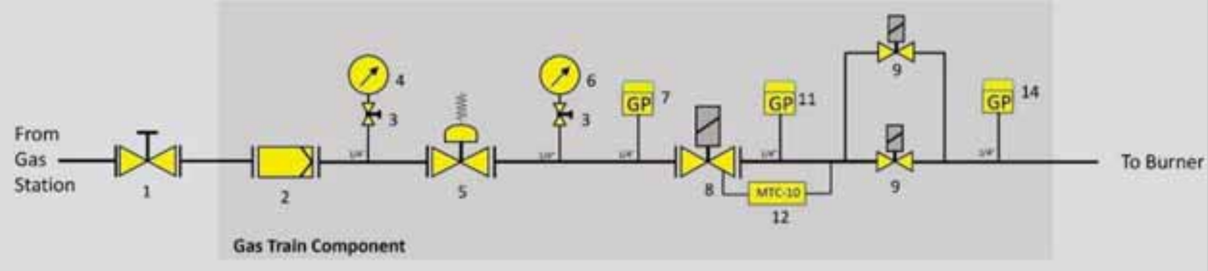
GT4



GT5



GT6



1. Manual Valve
2. Gas Filter
3. Push bottom valve
4. Pressure Gauge
5. Regulator
6. Pressure Gauge
7. Min gas pressure switch
8. Safety Solenoid Valve
9. Stage Solenoid Valve
10. Stage Solenoid Valve (Two Stage)
11. Leak Test Pressure Switch
12. Valve Proving System
13. Multi-Bloc Solenoid Valve
14. Max. gas pressure Switch

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.

Gas train sizing

RGB series					
Burner	**Gas model**	**Gas train size**	**Main Solenoid valve size**	**ΔP B. V***	**ΔP C.H** (mbar)**
RGB-20	GT1	Rp 1	Rp 1	-	0
RGB-38	GT1	Rp 1 ½	Rp 1 ½	-	5.6
RGB-55	GT2	Rp 1 ½	Rp 1 ½	-	7.2
	GT4	Rp 1 ½	Rp 1 ½		
RGB-80	GT2	Rp 1 ½	Rp 1 ½	-	10.3
	GT4	Rp 1 ½	Rp 1 ½		
RGB-85/LN	GT2	Rp 1 ½	Rp 1 ½	-	11.7
	GT4	Rp 1 ½	Rp 1 ½		
RGB-110	GT2	Rp 2	Rp 1 ½	-	9
	GT4	Rp 2	Rp 1 ½		
RGB-130/LN	GT3	Rp 2	Rp 2	-	22.5
	GT5	Rp 2	Rp 2		
RGB-145	GT3	Rp 2	Rp 2	-	8.6
	GT5	Rp 2	Rp 2		
RGB-205	GT3	Rp 2	Rp 2	-	14.5
RGB-255/LN	GT3	DN 65	Rp 2	-	24.9
RGB-305***	GT6	DN 65	Rp 2	-	20.6
RGB-385***	GT6	DN 65	Rp 2	-	31.7
RGB-405/LN***	GT6	DN 65	Rp 2	-	47
RGB-505/LN***	GT6	DN 65	Rp 2	-	56
RGB-605***	GT6	DN 65	Rp 2	-	62.8

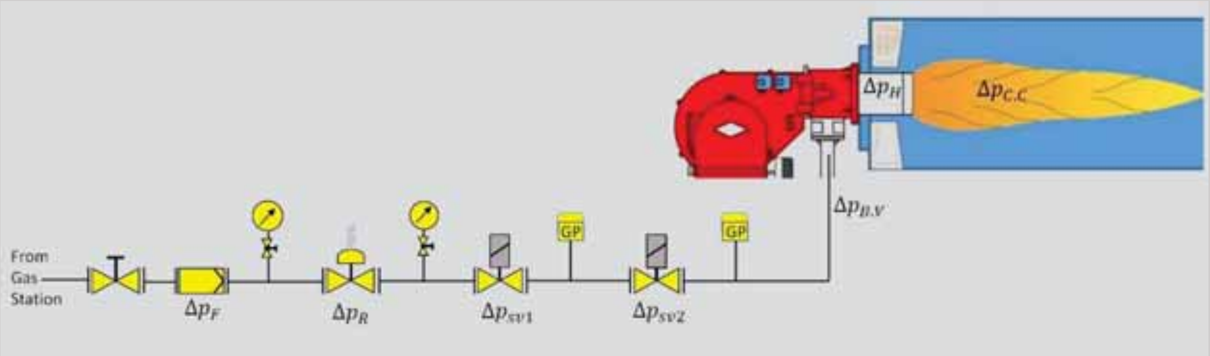
RLGB series					
Burner	**Gas model**	**Gas train size**	**Main Solenoid valve size**	**ΔP B. V***	**ΔP C.H** (mbar)**
RLGB-55	GT2	Rp 1 ½	Rp 1 ½	-	14
	GT4	Rp 1 ½	Rp 1 ½		
RLGB-85	GT2	Rp 1 ½	Rp 1 ½	-	6.2
	GT4	Rp 1 ½	Rp 1 ½		
RLGB-110	GT2	Rp 2	Rp 1 ½	-	10
	GT4	Rp 2	Rp 1 ½		
RLGB-145	GT3	Rp 2	Rp 1 ½	-	13
	GT5	Rp 2	Rp 1 ½		
RLGB-175/LN	GT3	Rp 2	Rp 2	-	17
	GT5	Rp 2	Rp 2		
RLGB-205/LN	GT3	Rp 2	Rp 2	-	21.5
RLGB-255***	GT6	DN 65	Rp 2	-	27.8
RLGB-305/LN***	GT6	DN 65	Rp 2	-	23
RLGB-385/LN***	GT6	DN 65	Rp 2	-	27.3
RLGB-405/LN***	GT6	DN 65	Rp 2	-	44
RLGB-505/LN***	GT6	DN 65	Rp 2	-	47
RLGB-605/LN***	GT6	DN 65	Rp 2	-	68

*Butterfly Valve: In raadman-Staging version, since there is no link between air and gas inlets, no butterfly valve is used. As a result, its relative pressure drop is considered to zero.

**Combustion Head

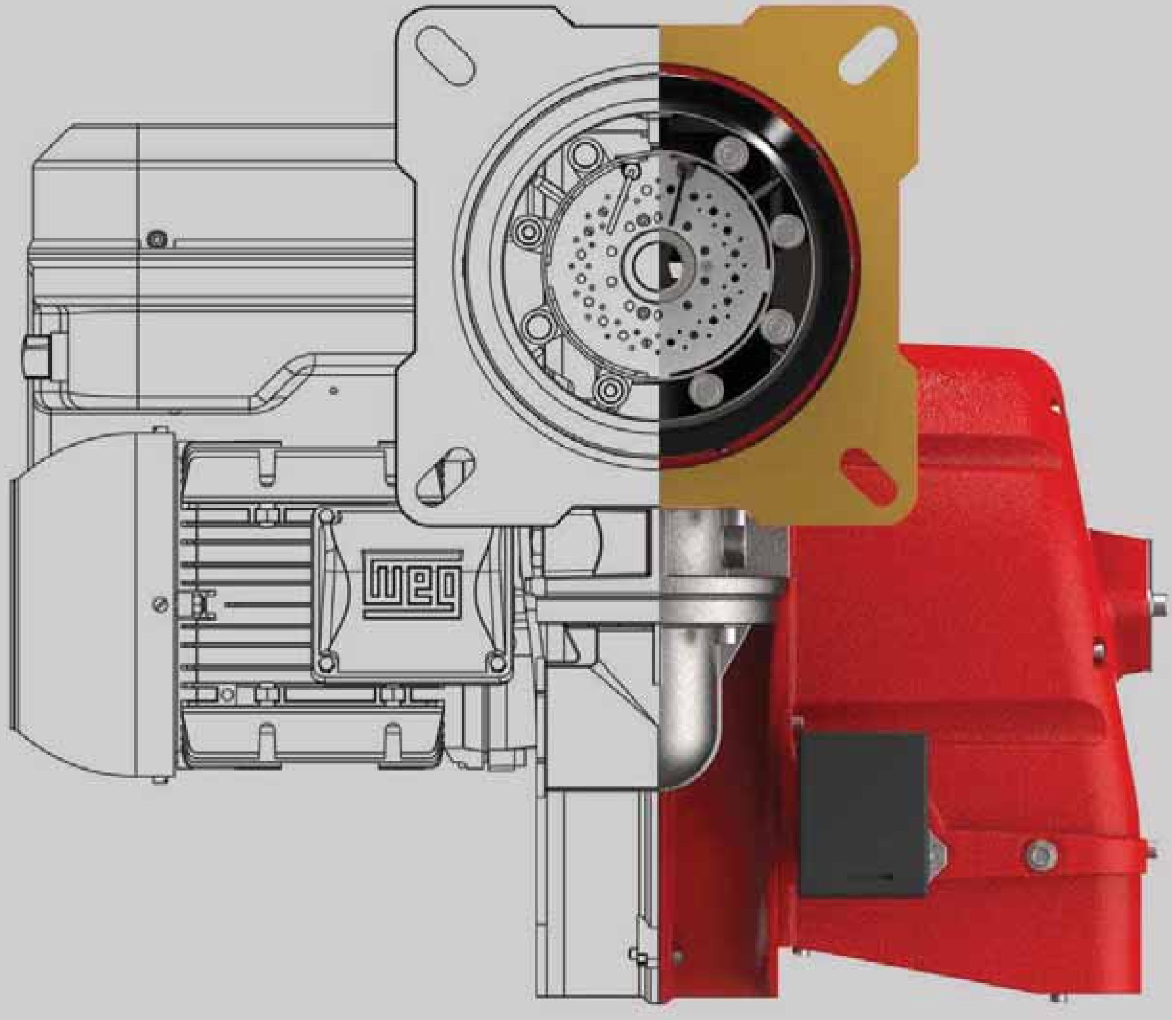
*** Due to the uncommon type of this gas train (GT6), the Mechanical Staging operation type is more favorable for this firing rate of burners.

Calculation of minimum inlet pressure and minimum output pressure of regulator



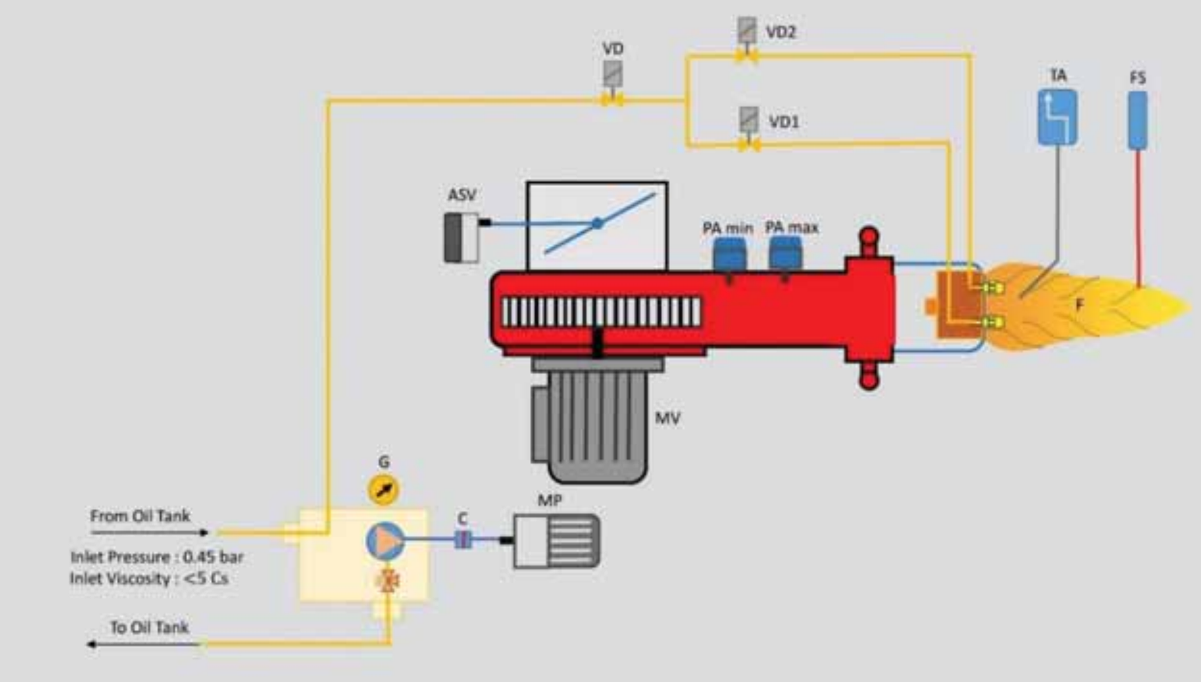
Min input pressure= $\Delta P_{\text{Filter(F)}}+ \Delta P_{\text{Regulator(R)}}+ \Delta P_{\text{Safety solenoid valve(sv1)}}+ \Delta P_{\text{Main solenoid valve(sv2)}}+ \Delta P_{\text{Batterfly valve(B.V)}}- \Delta P_{\text{Combustion Head(C.H)}}+ \Delta P_{\text{Combustion chamber(C.C)}}$

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

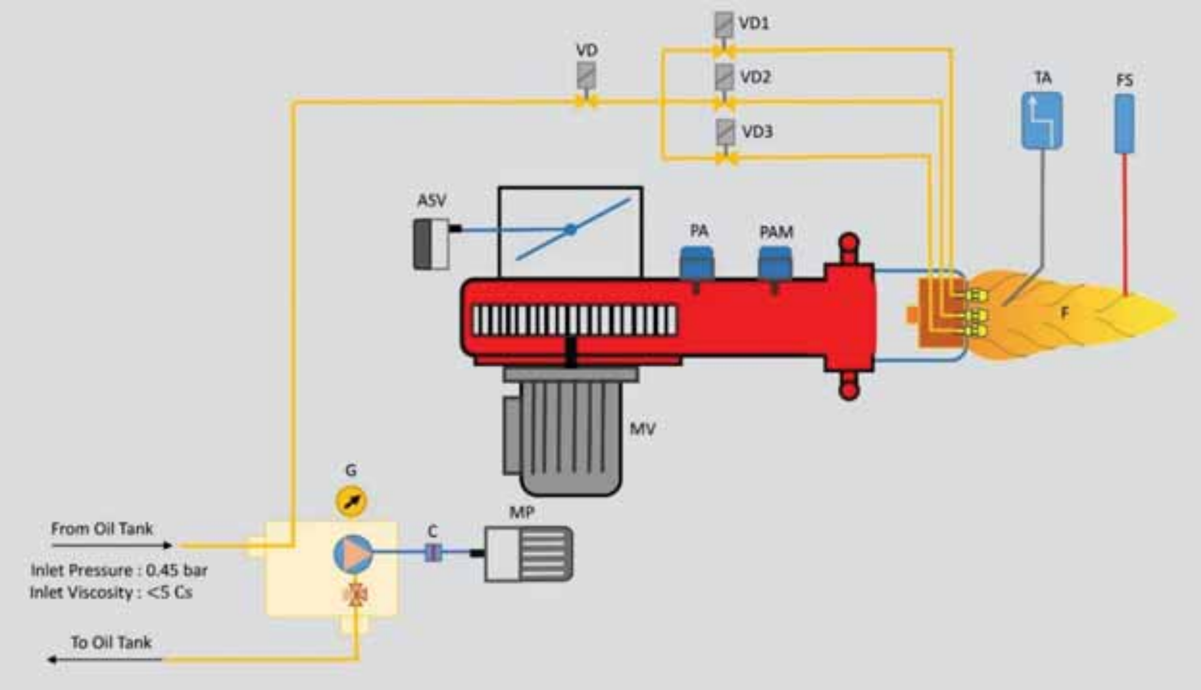


Oil delivery system

Two stages dual-fuel burner



Three stages dual-fuel burner

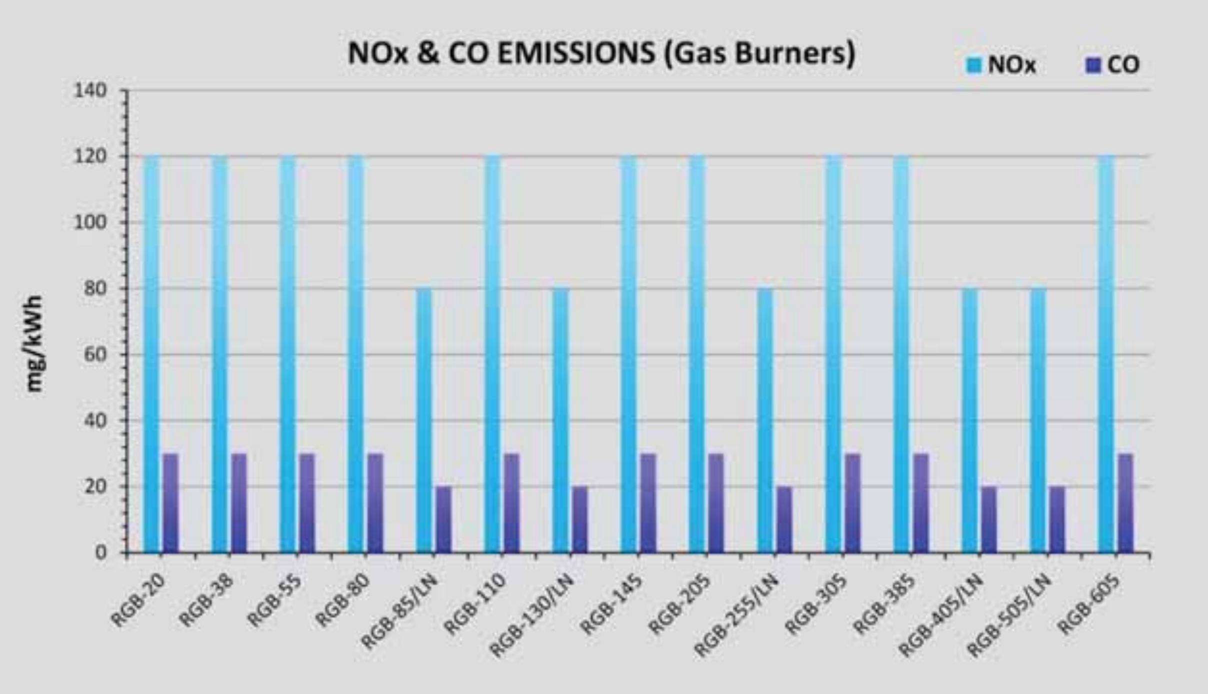


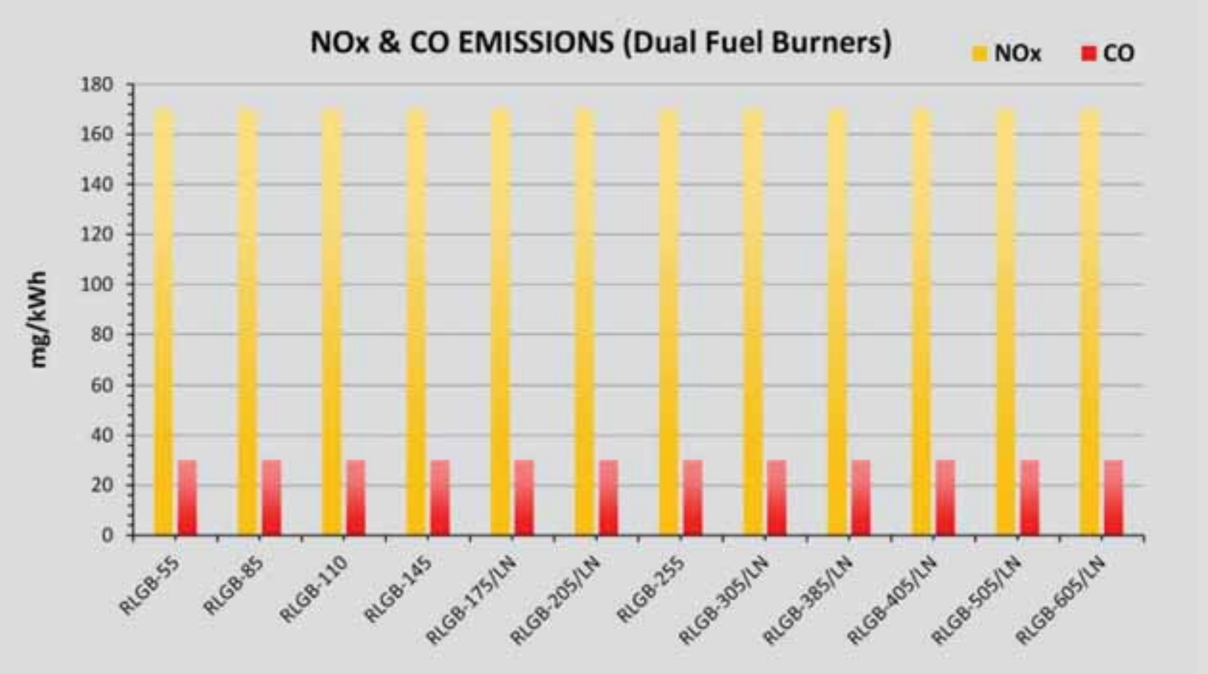
MV: Fan motor
MP: Pump motor
FS: Flame sensor
VD: Light oil safety valve

VD1: Light oil delivery valve Stage 1
VD2: Light oil delivery valve Stage 2
VD2: Light oil delivery valve Stage
TA: ignition transformer

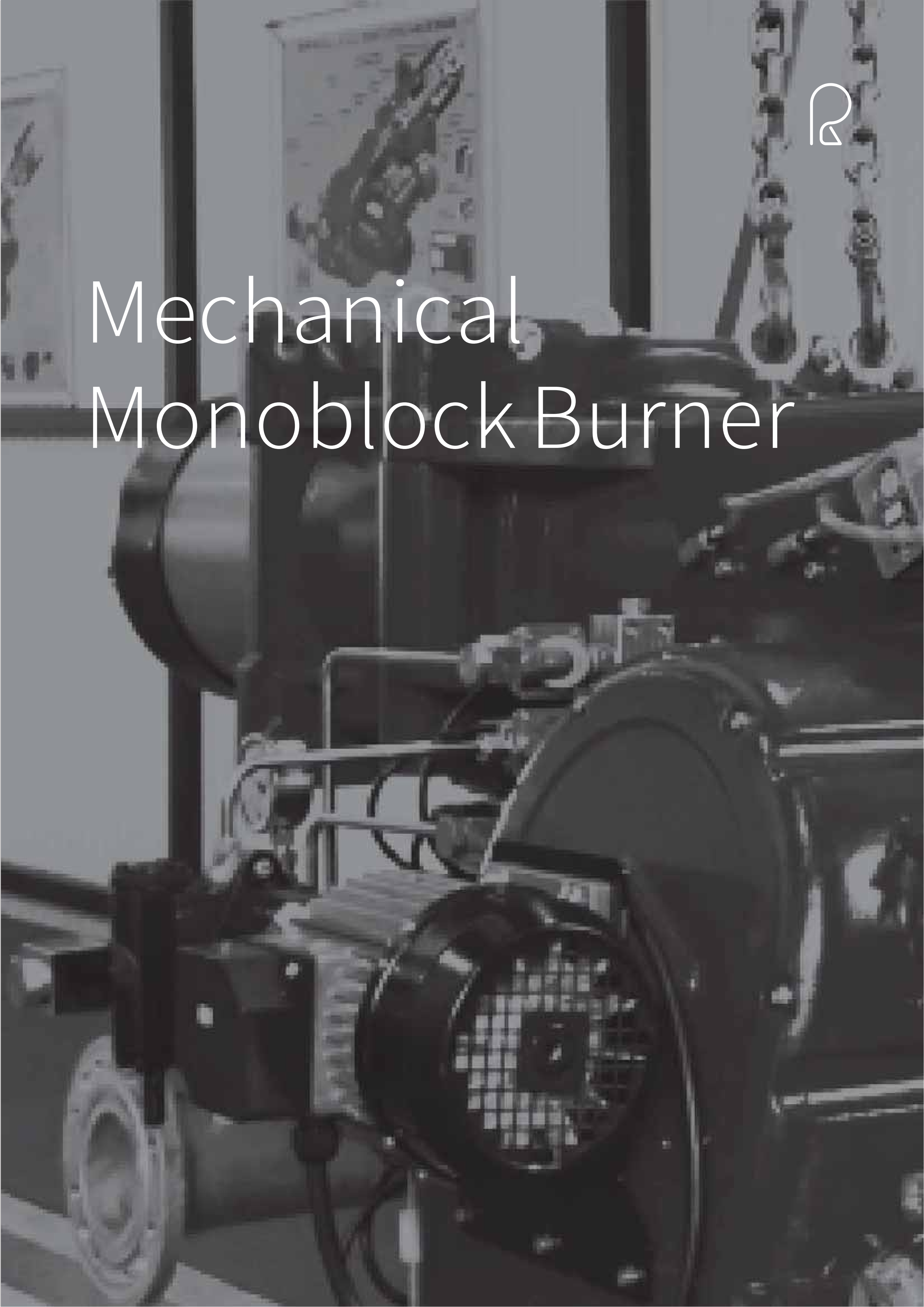
C: Coupling
G: Gauge
F: Gas or oil flame
ASV: Air damper servomotor
PA: Air pressure switch

Emission


NOx & CO EMISSIONS (Gas Burners)
NOx
CO
mg/kWh
140
120
100
80
60
40
20
0
RGB-20
RGB-38
RGB-55
RGB-80
RGB-85/LN
RGB-110
RGB-130/LN
RGB-145
RGB-205
RGB-255/LN
RGB-305
RGB-385
RGB-405/LN
RGB-505/LN
RGB-605


NOx & CO EMISSIONS (Dual Fuel Burners)
NOx
CO
mg/kWh
180
160
140
120
100
80
60
40
20
0
RLGB-55
RLGB-85
RLGB-110
RLGB-145
RLGB-175/LN
RLGB-205/LN
RLGB-255
RLGB-305/LN
RLGB-385/LN
RLGB-405/LN
RLGB-505/LN
RLGB-605/LN

Mechanical Monoblock Burner



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:

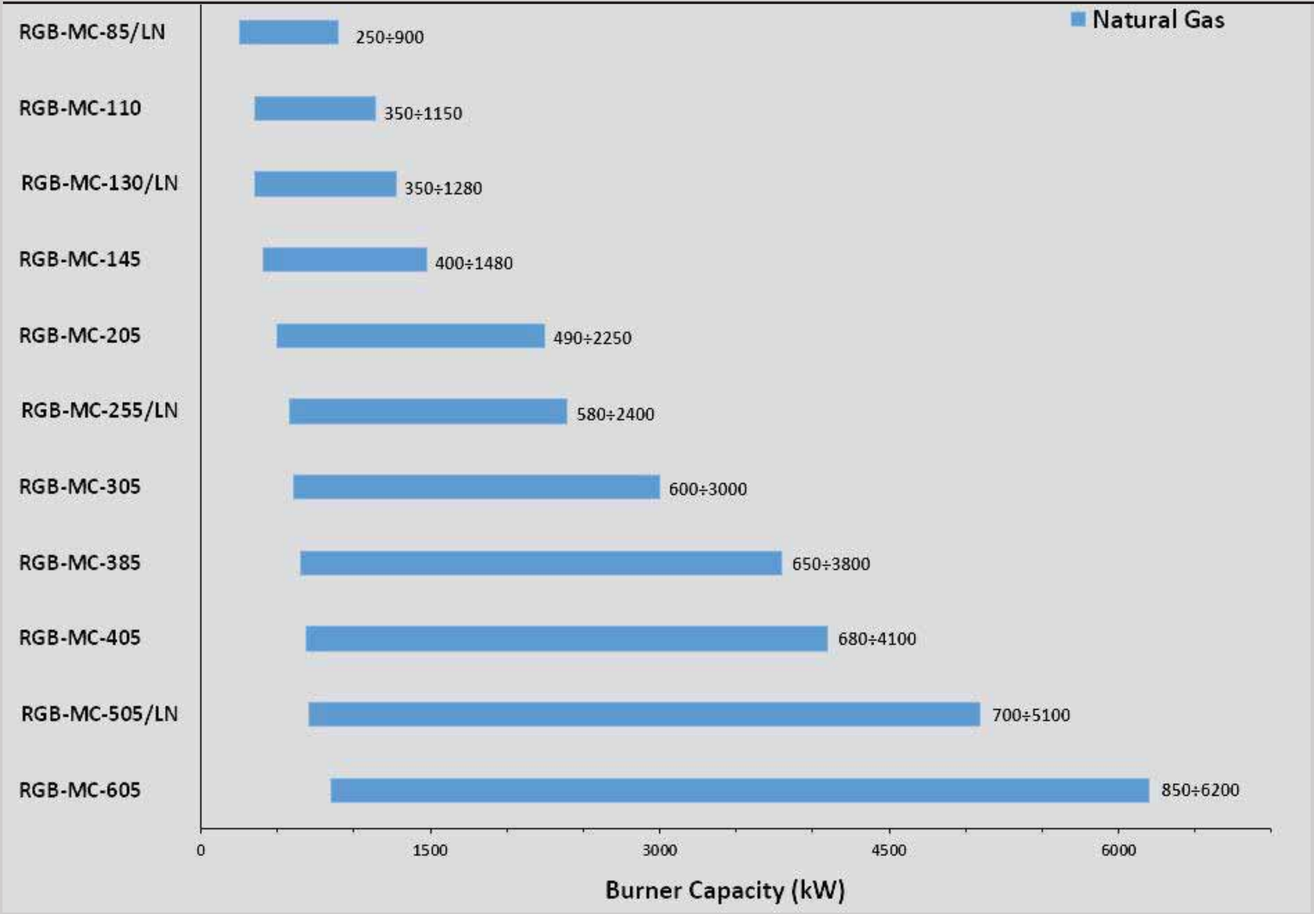
G:	G= Natural Gas
GP:	G= Natural Gas, P= Propane
LG:	L= Light oil, G= Natural Gas
LGP:	L= Light oil, G= Natural Gas, P= Propane
LHG:	L= Light oil, H= Heavy oil, G= Natural Gas
LHGP:	L= Light oil, H= Heavy oil, G= Natural Gas, P= Propane

Product Family Name: RAADMAN

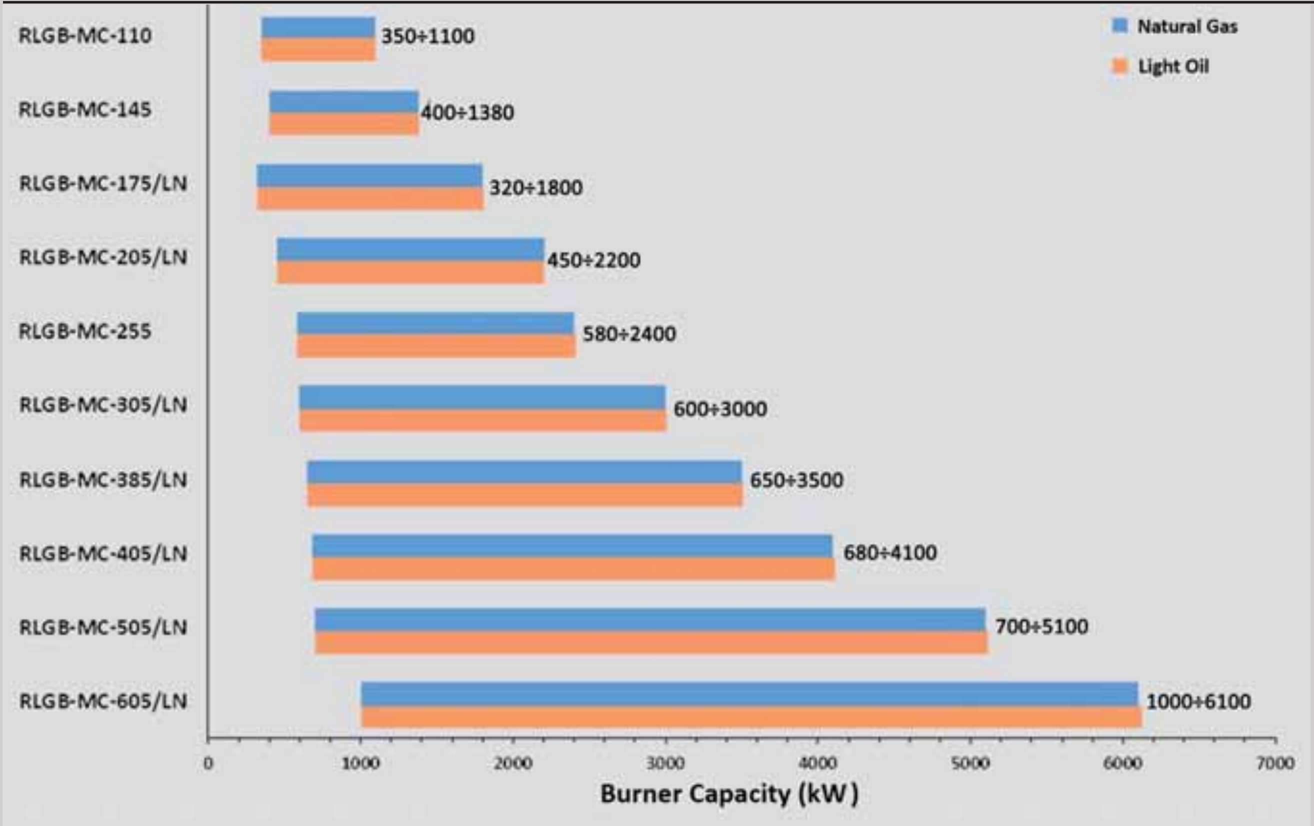
Note: Due to the same firing rate, working diagram and gas train, the MC series and MS series are brought into the same section, where the MC series represent MC series and MS series both.

Firing rate

RGB-MC Series



RLGB-MC Series

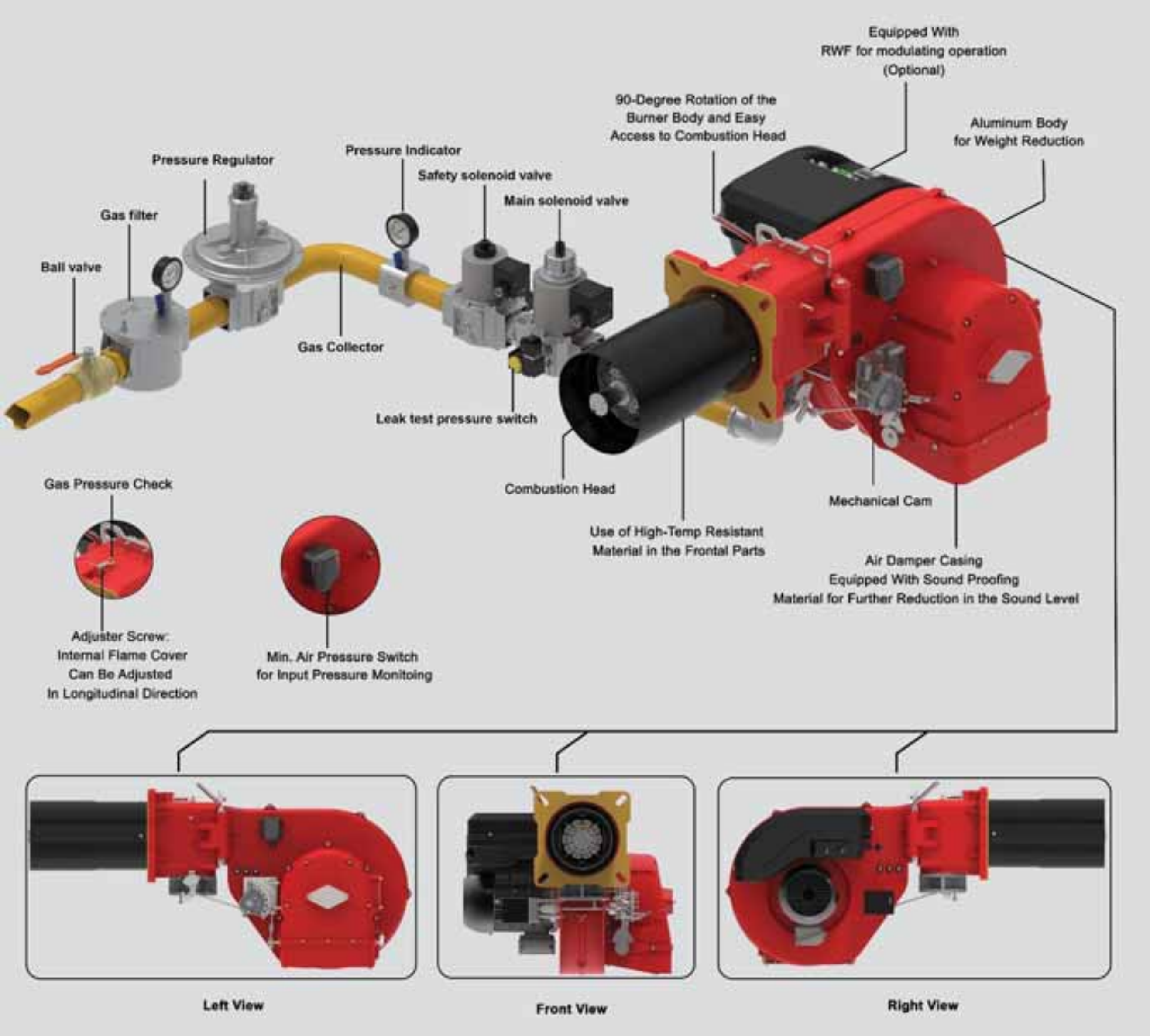


Mechanical modular raadman burners

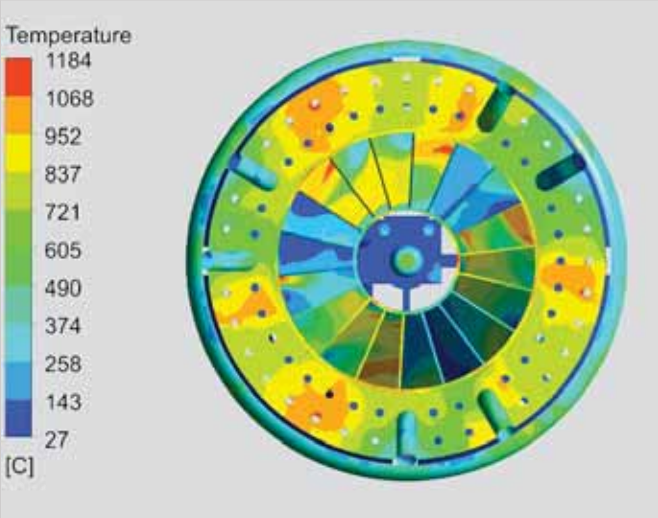
RGB-MC series of burners cover a firing range from 1000 to 6000 kW, and they are manufactured with high-quality electro/mechanical accessories with easy installation and commissioning. They are mechanically resistant and are economically designed for city or industrial applications such as three pass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

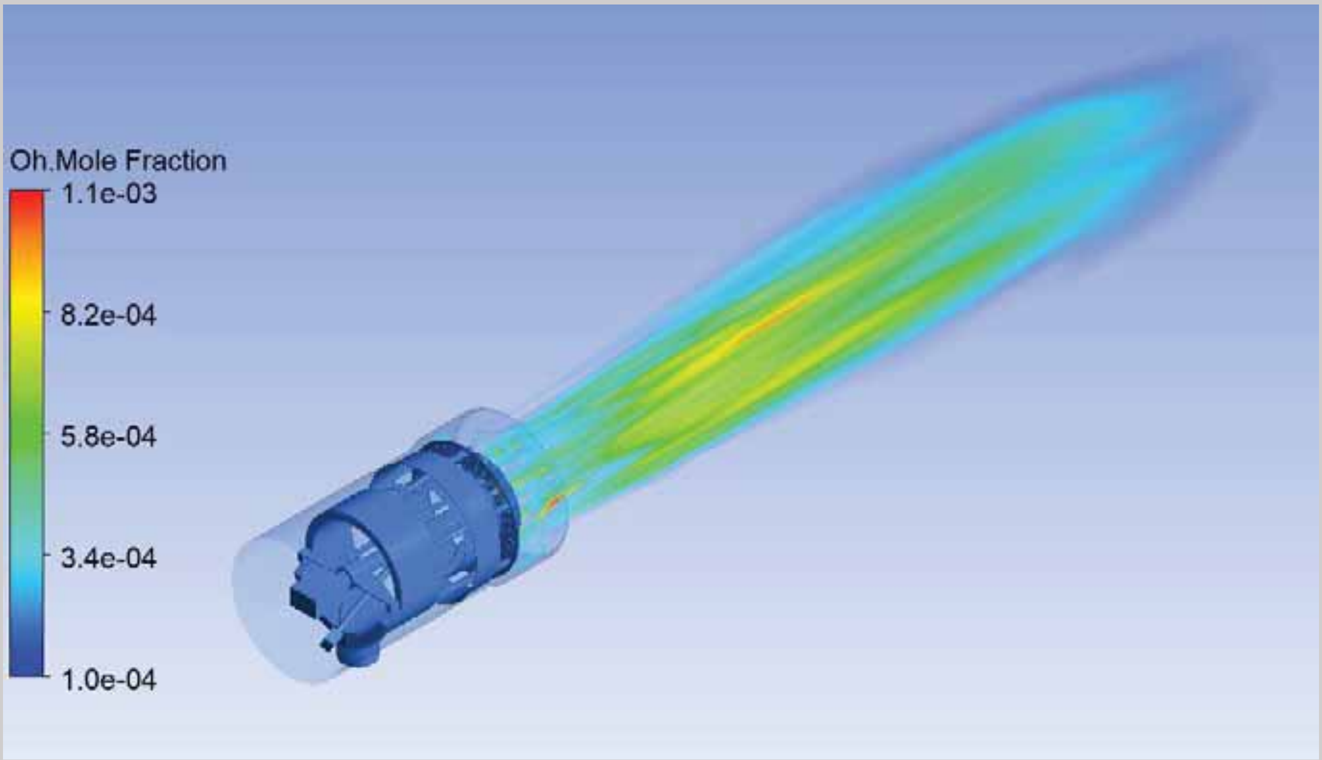


CFD experts in R&D department



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.

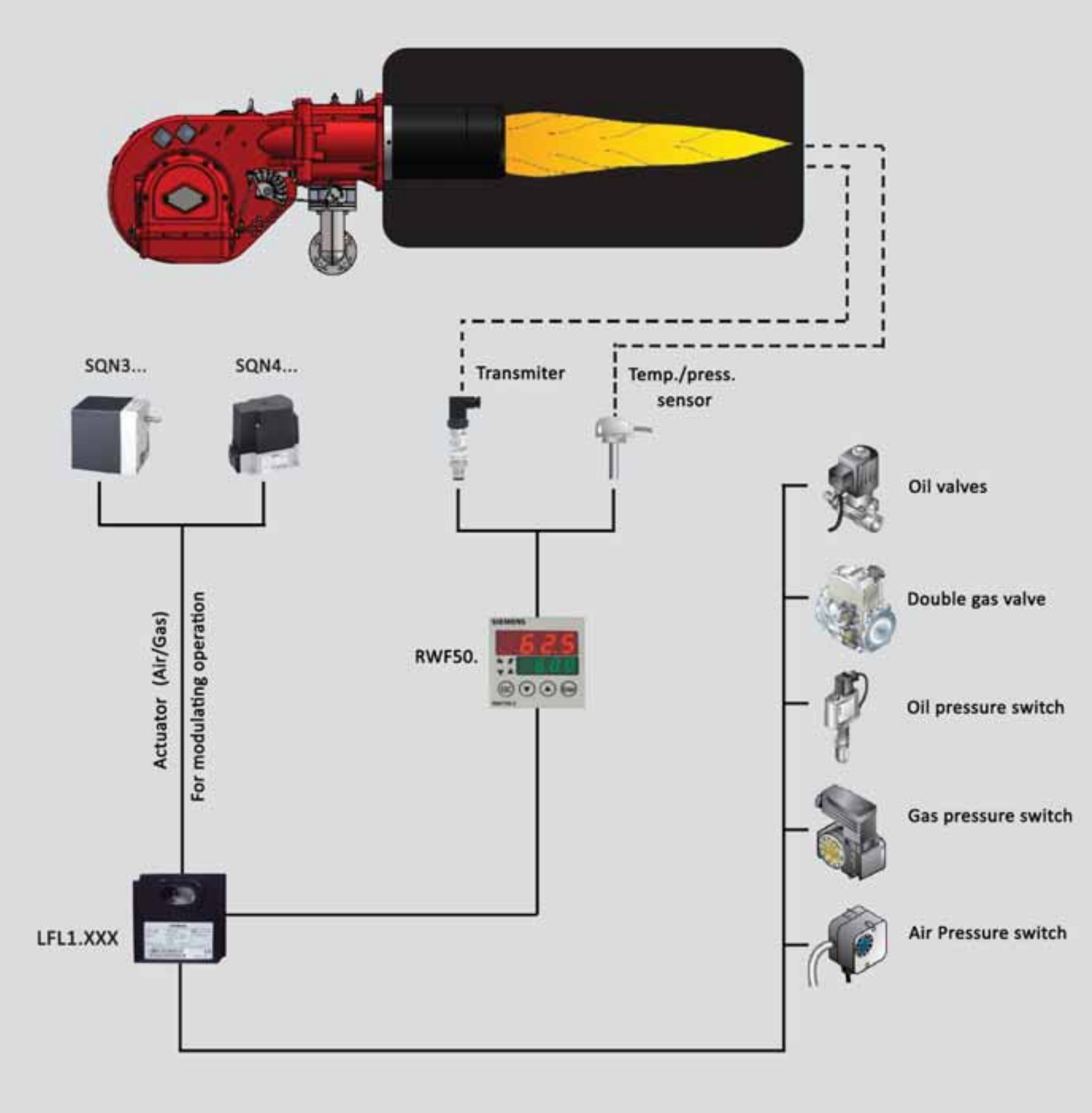
The values of CO and NOx during burner operation are lower than 30 and 120 mg/kWh at 20 % excess of air for normal versions and, lower than 20 and 80 mg/kWh for Low NOx versions (LN series). consequently, the burner's NOx class of II and III is reported and being approved for normal version and LN Versions 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

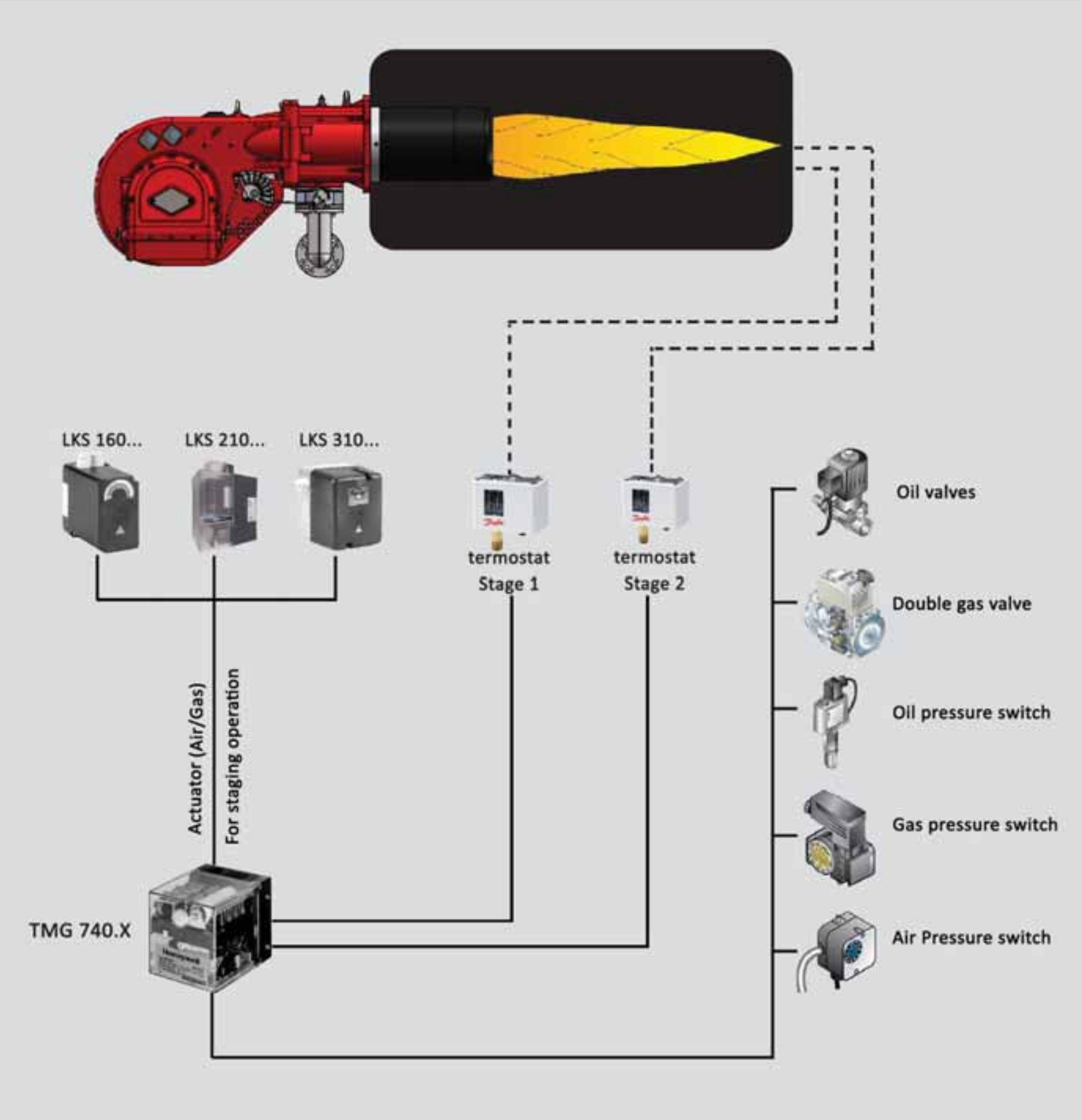
Mechanical Modualar management system



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.

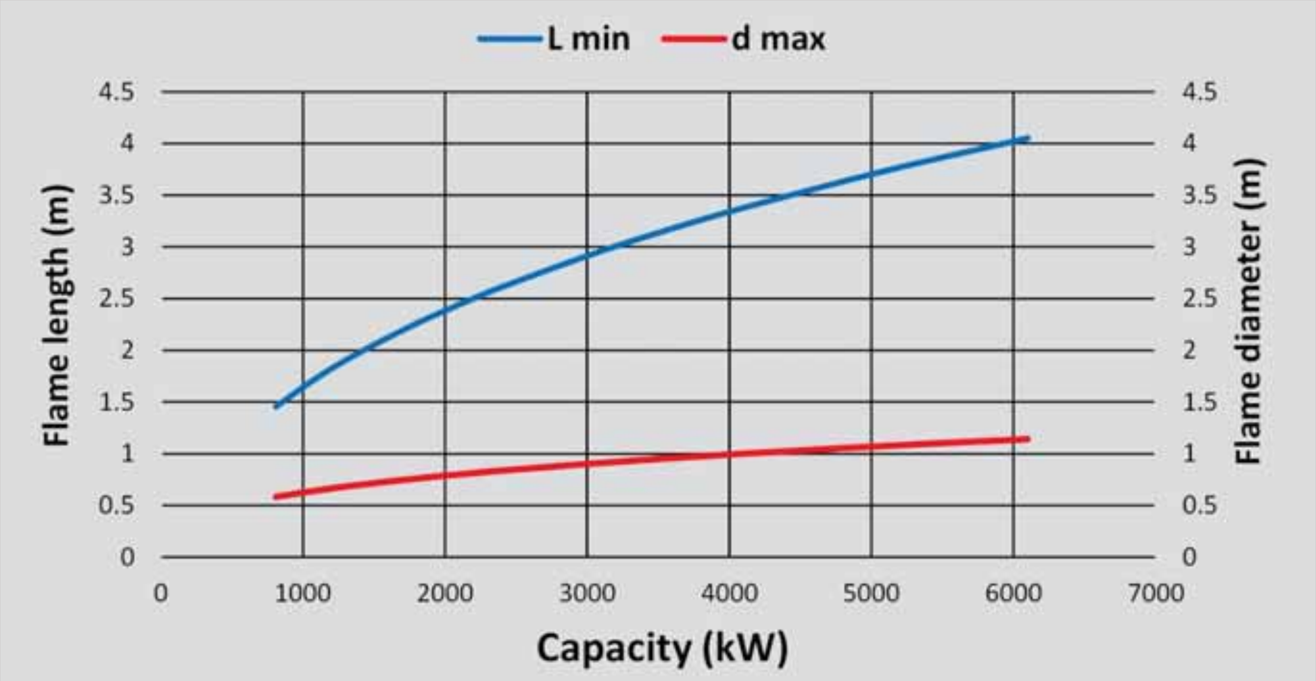
- RWF50
- Temperature sensor
- Actuator modulating operation

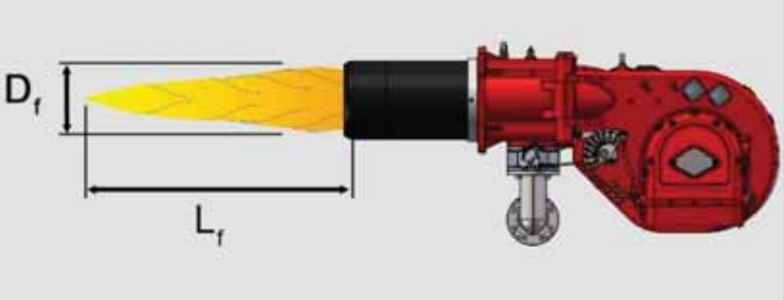
Mechanical staging management system



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

Flame dimension

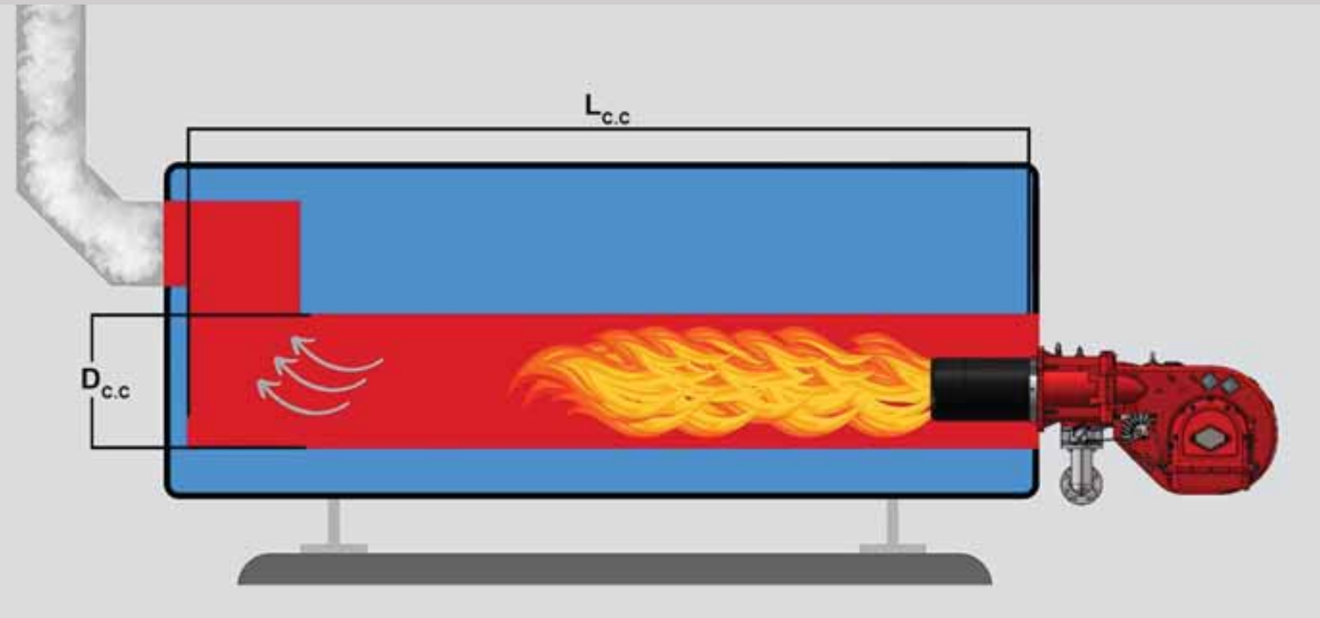




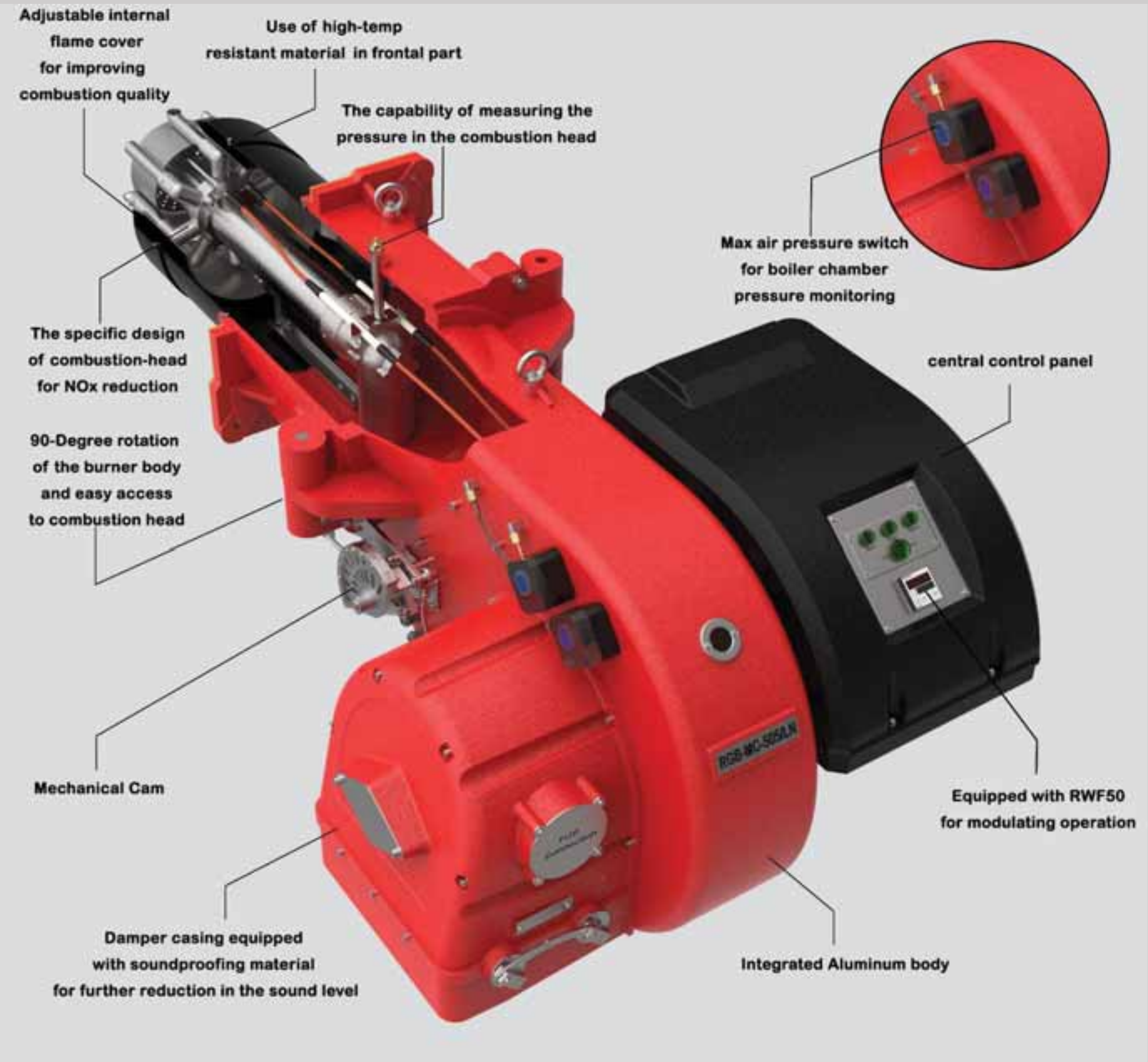
The flame dimensions which play an effective role in the burner efficiency and influence their compatibility to the boiler combustion chamber geometry, are presented in the above diagram.

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.



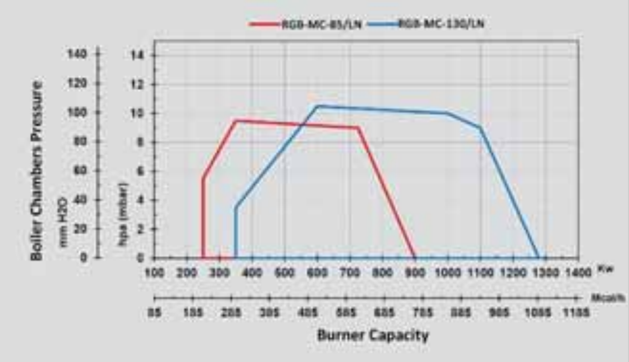
RGB-MC series raadman burner:



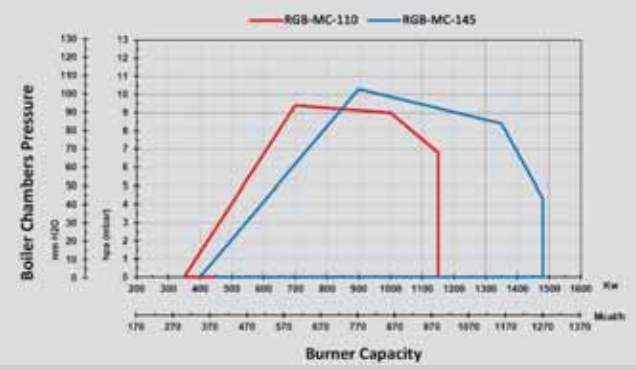
Burner selection: capacity and working diagram

Gas Burner

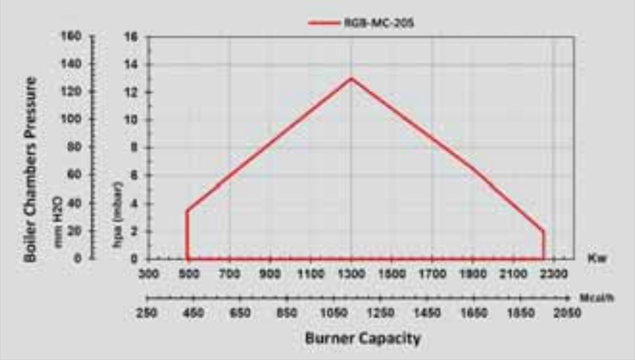
Burner	Capacity (kW)	Turn Down
RGB-MC-85/LN	NG:250-900	1:3
RGB-MC-130/LN	NG:350-1280	1:3



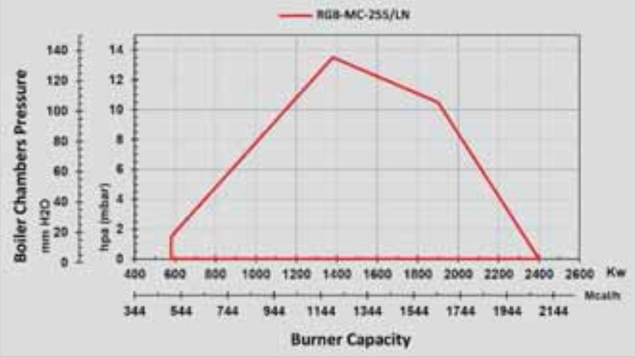
Burner	Capacity (kW)	Turn Down
RGB-MC-110	NG:350-1150	1:3
RGB-MC-145	NG:400-1480	1:4



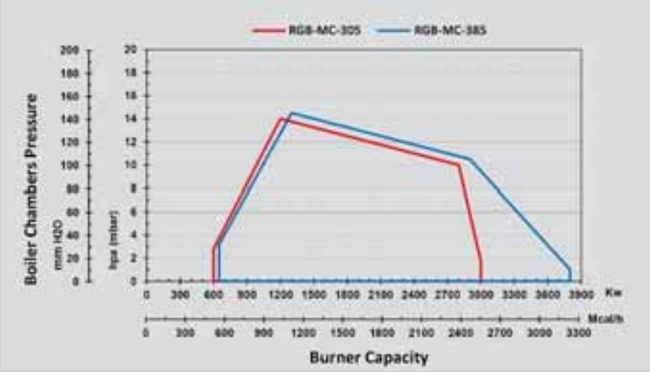
Burner	Capacity (kW)	Turn Down
RGB-MC-205	NG: 490-2250	1:4



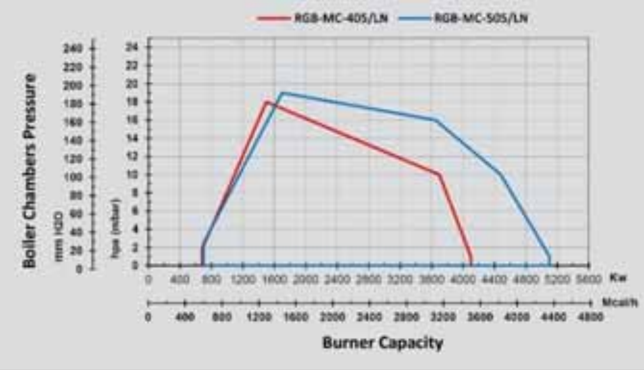
Burner	Capacity (kW)	Turn Down
RGB-MC-255/LN	NG:580-2400	1:4



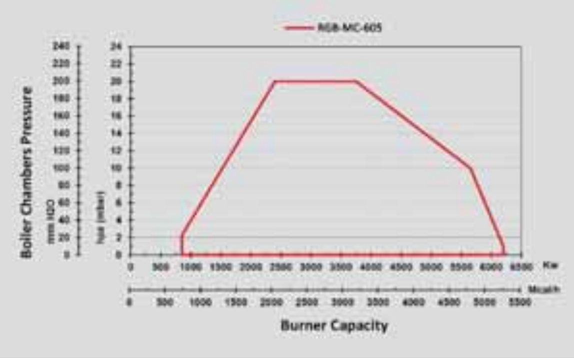
Burner	Capacity (kW)	Turn Down
RGB-MC-305	NG: 600-3000	1:5
RGB-MC-385	NG: 650-3800	1:5



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



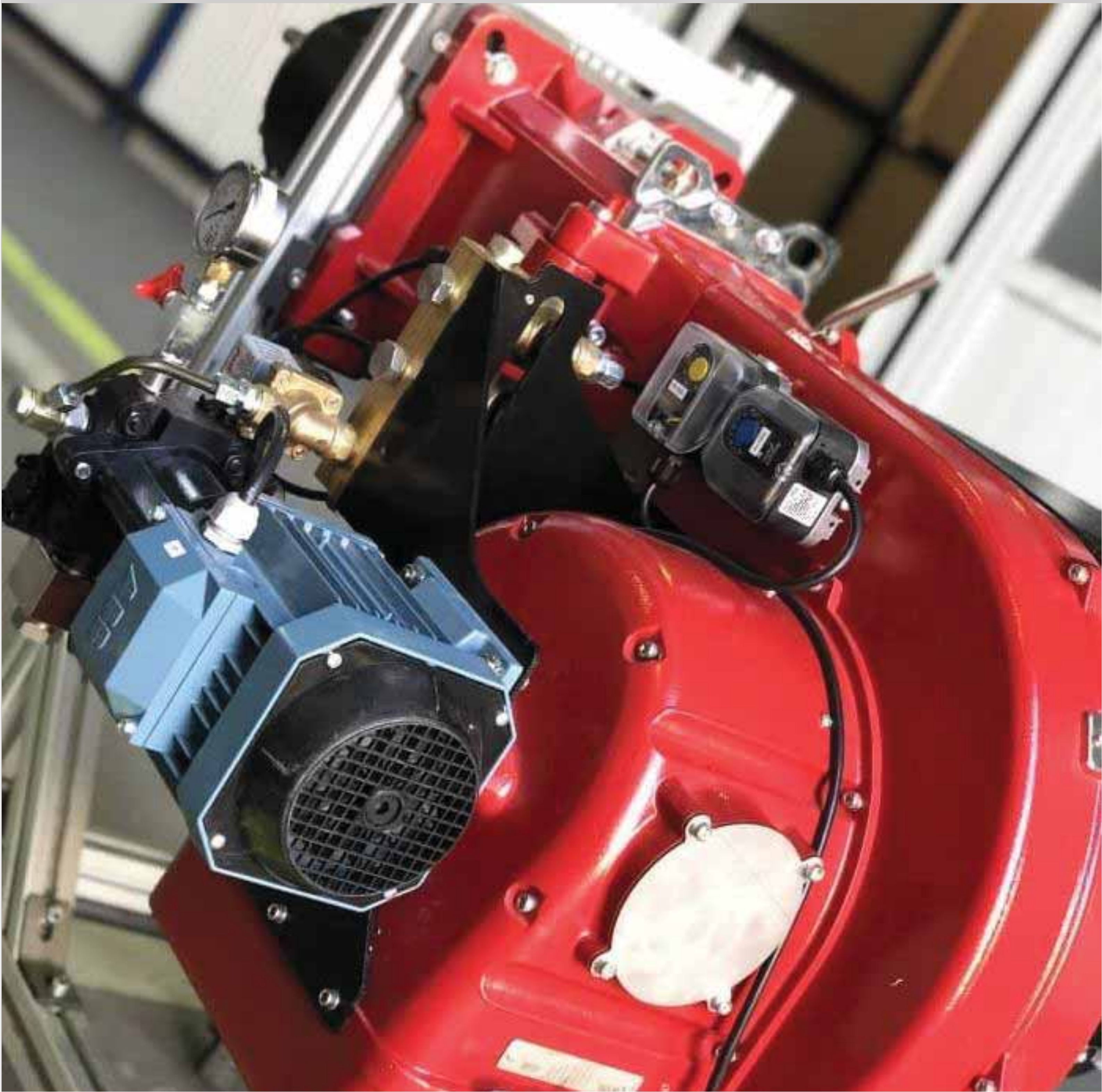
Burner	Capacity (kW)	Turn Down
RGB-MC-605	NG: 850-6200	1:7



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)

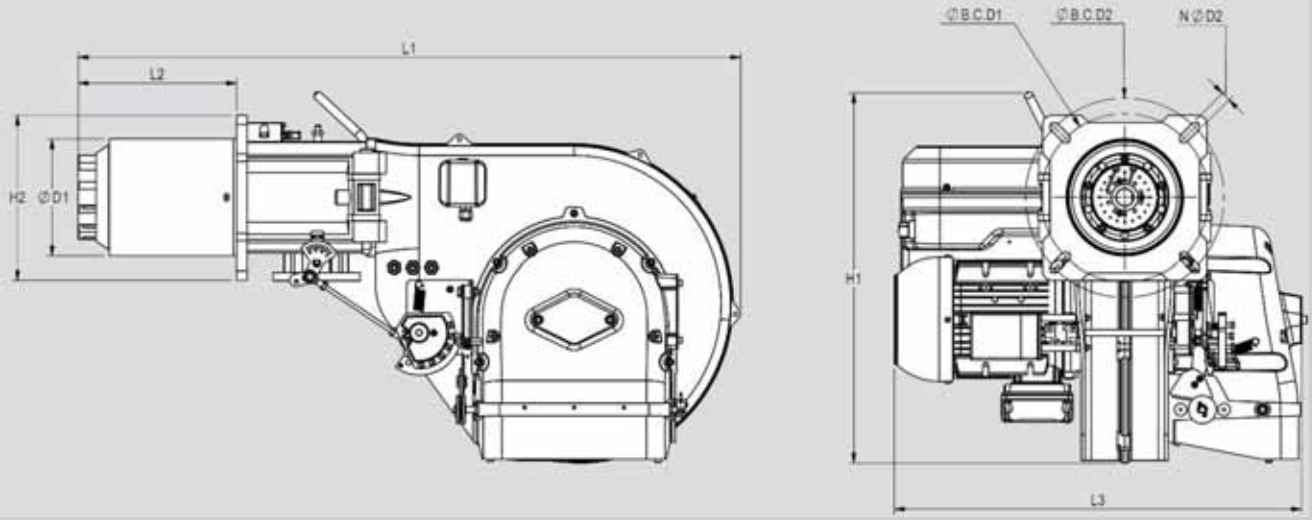
RGB-MC Series burner include Ventilation system with AC motor, Ignition transformer, and electrodes, electrical panel with power contactors, fuses, relays, central controller, air pressure switches, soundproofing material, Lamp signals for operational supervision, etc.

- 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

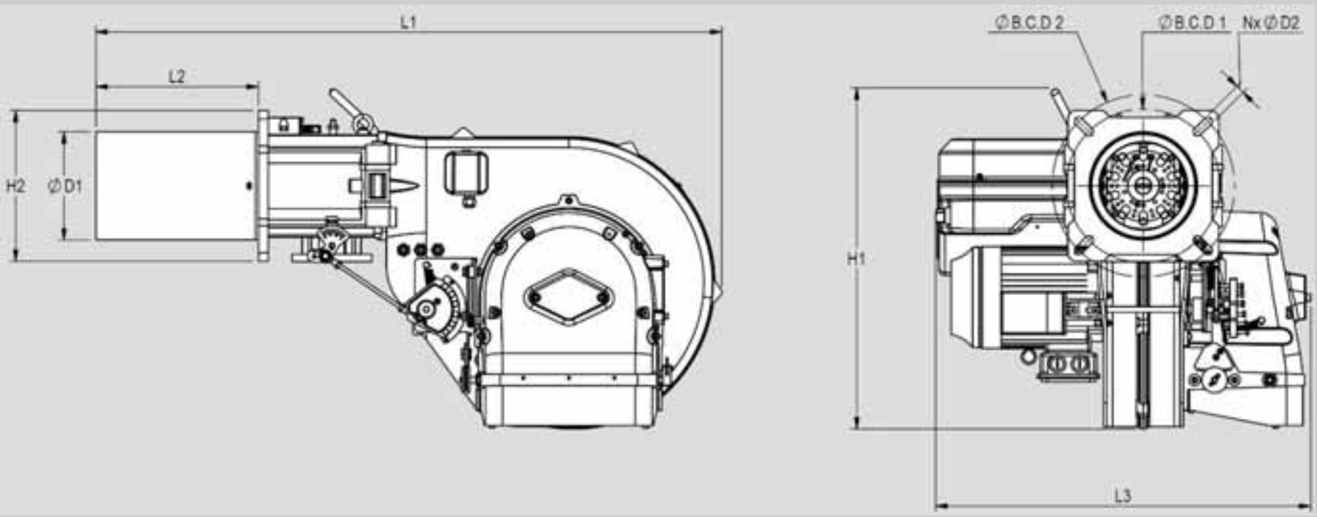
General Dimension of RGB-MC series

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



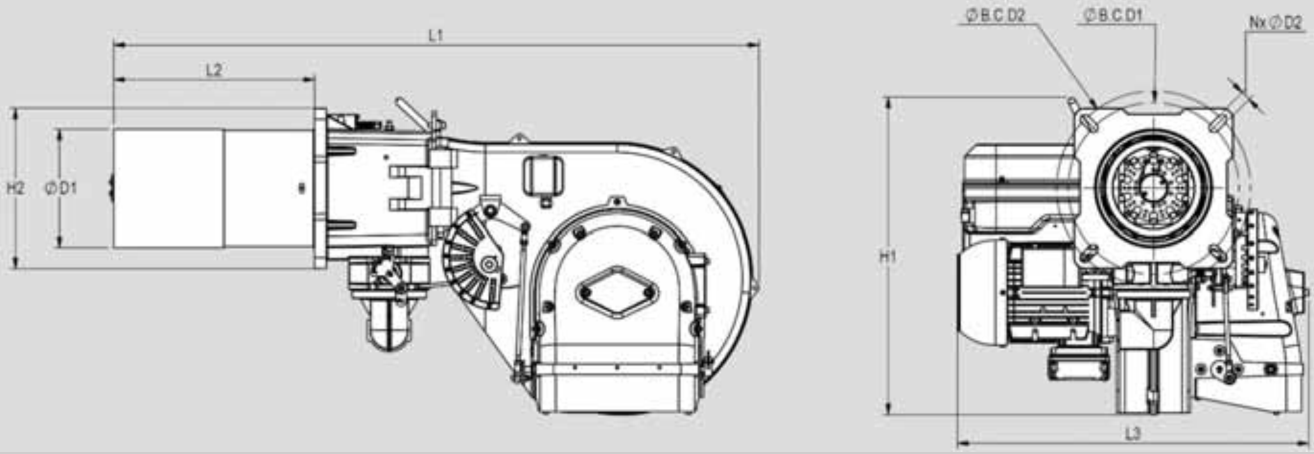
Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C.D.1	B.C.D.2
RGB-MC-85/LN	1068	255	641	598	265	193	15	4	270	320
RGB-MC-130/LN	1072	260	586	598	265	193	15	4	270	320

RGB-MC-110, RGB-MC-145



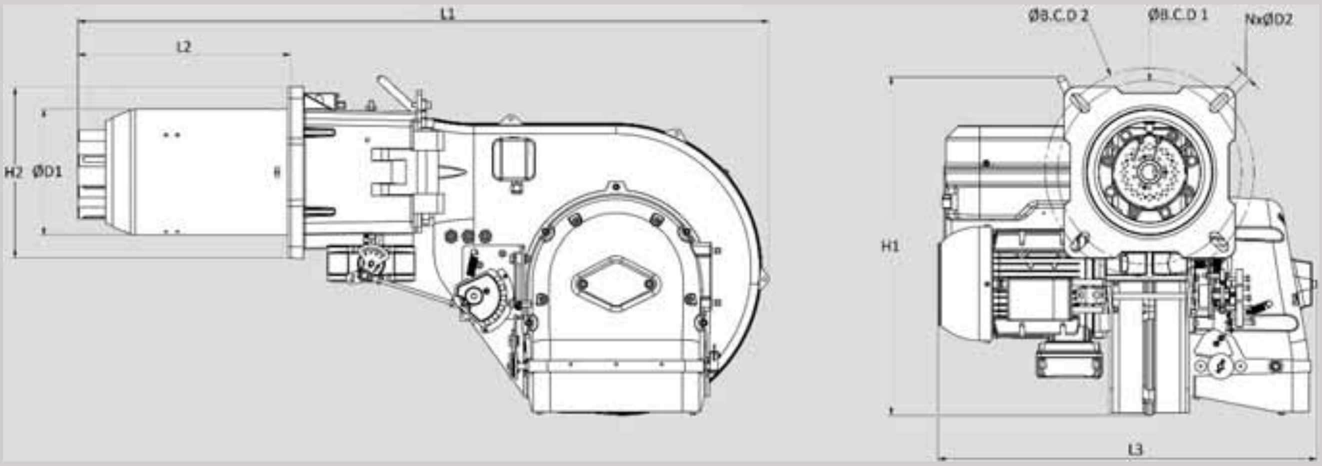
Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C.D.1	B.C.D.2
RGB-MC-110	1066	254	643	598	265	184	15	4	270	320
RGB-MC-145	1097	285	643	598	265	194	15	4	270	320

RGB-MC-205



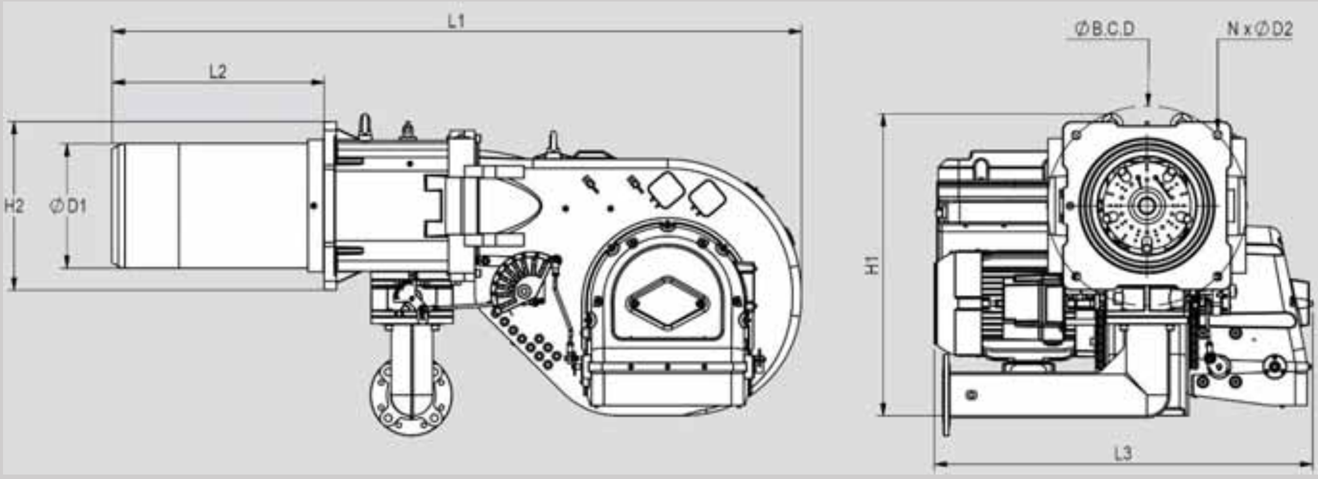
Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C.D1	B.C.D1
RGB-MC-205	1229	388	666	600	302	223	18	4	323	367

RGB-MC-255/LN



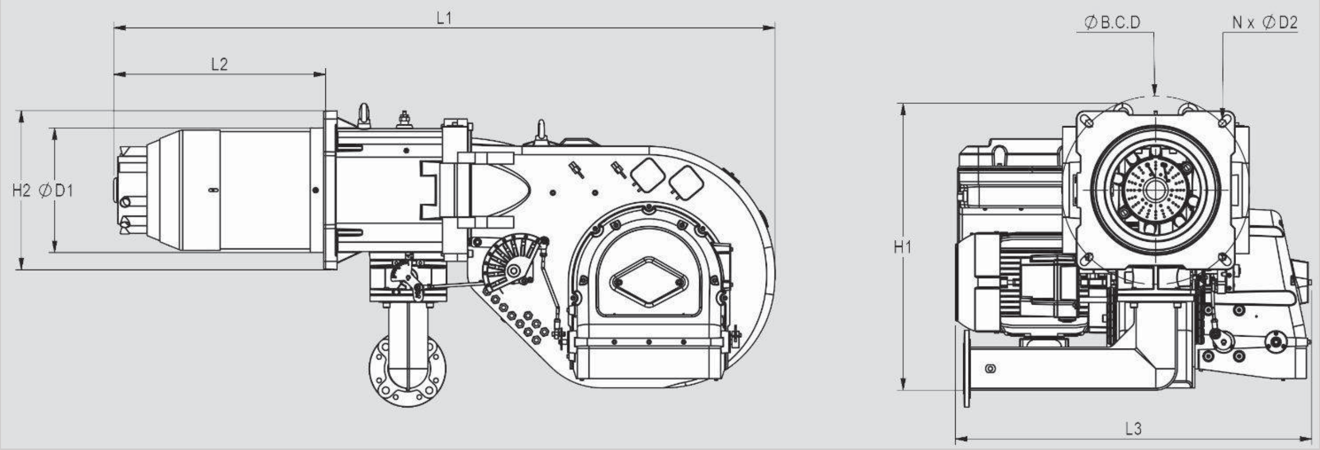
Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C.D.1	B.C.D.2
RGB-MC-255/LN	1214	374	762	598	300	226	18	4	323	368

RGB-MC-305, RGB-MC-385



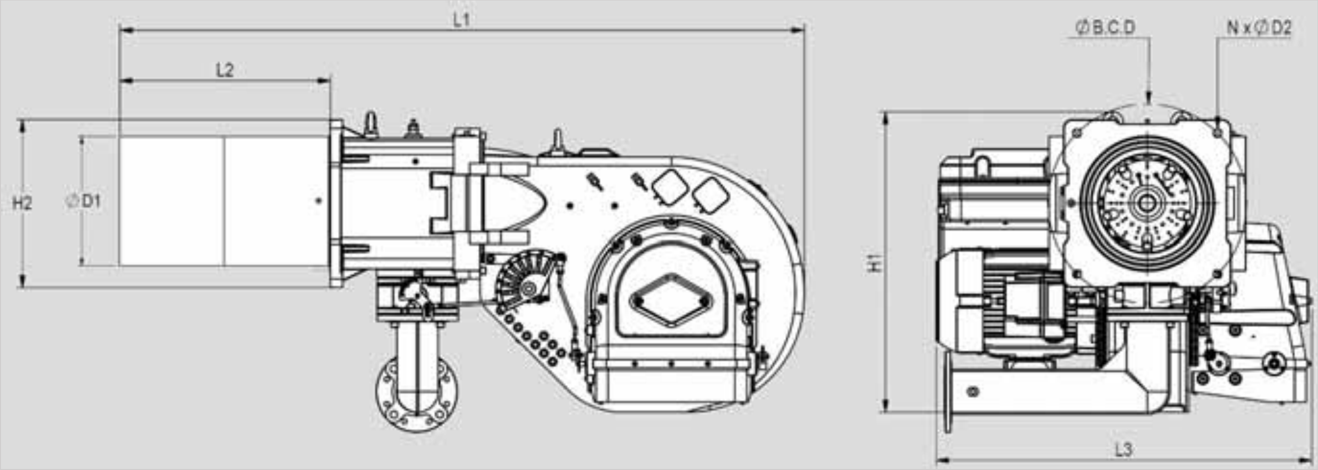
Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C. D
RGB-MC-305	1689	519.5	927	741	413	328	20	4	490
RGB-MC-385	1689	519.5	927	741	413	328	20	4	490

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

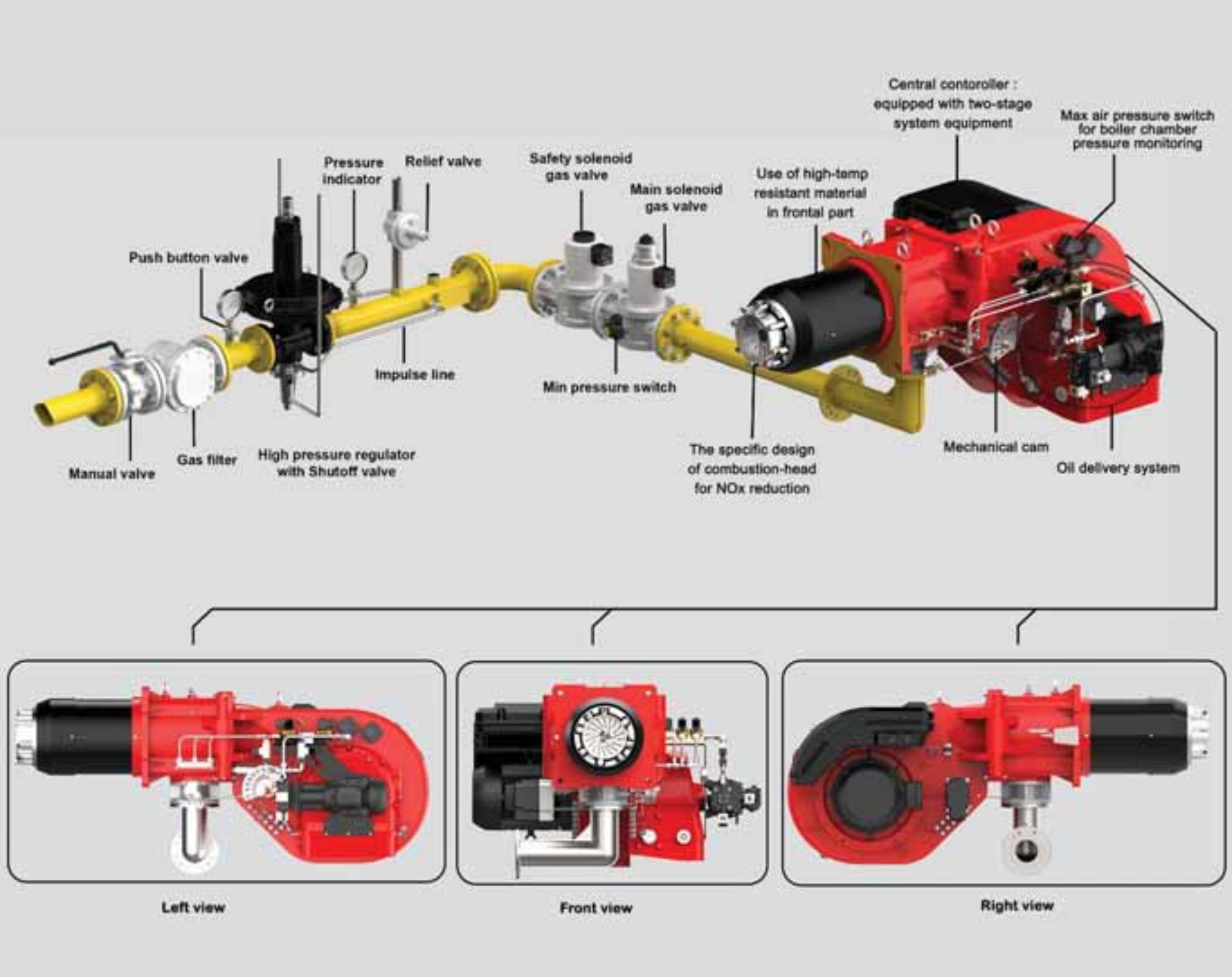
RGB-MC-605



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.

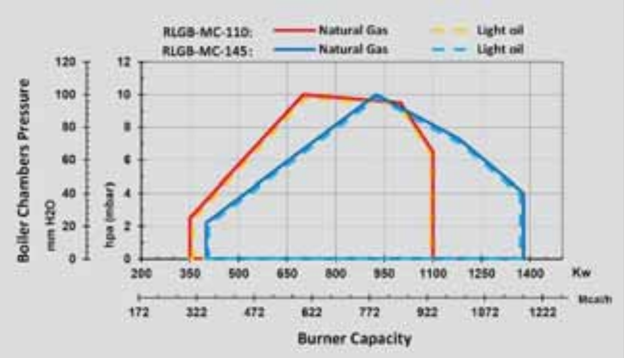
RLGB-MC series raadman burner:



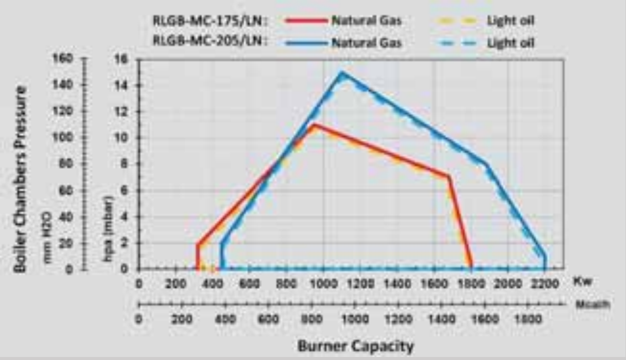
Burner selection: capacity and working diagram

Dual-fuel Burner

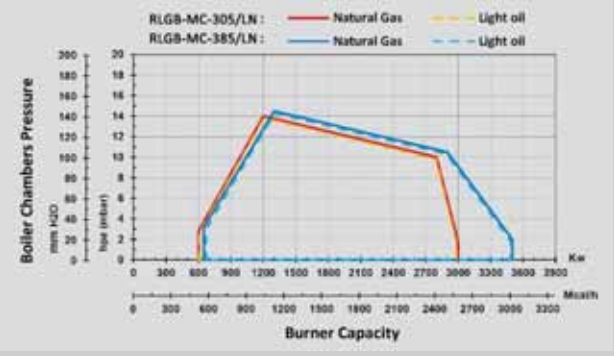
Burner	Capacity (KW)	Turn down
RLGB-MC-110	NG: 350-1100	1:3
	LFO: 350-1100	1:3
RLGB-MC-145	NG: 400-1380	1:4
	LFO:400-1380	1:4



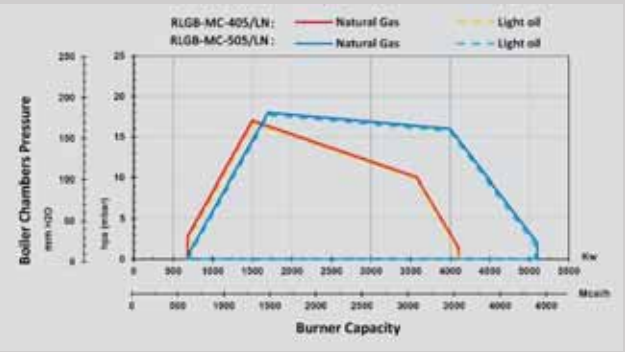
Burner	Capacity (kW)	Turn down
RLGB-MC-175/LN	NG:320-1800	1:5
	LFO: 320-1800	1:5
RLGB-MC-205/LN	NG:450-2200	1:5
	LFO:450-2200	1:5



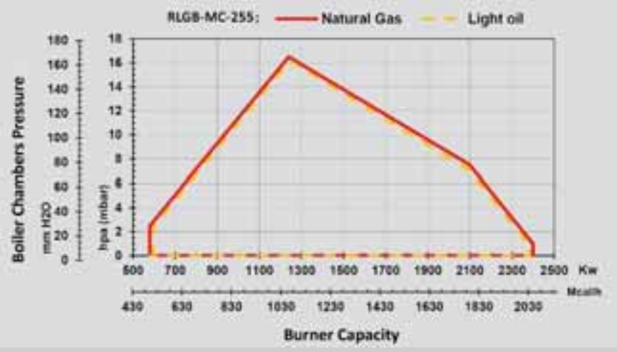
Burner	Capacity (kW)	Turn down
RLGB-MC-305/LN	NG:600-3000	1:5
	LFO: 600-3000	1:5
RLGB-MC-385/LN	NG:650-3500	1:5
	LFO:650-3500	1:5



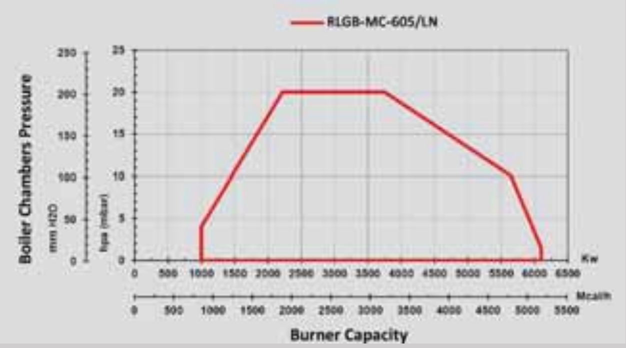
Burner	Capacity (KW)	Turn down
RLGB-MC-405/LN	NG: 680-4100	1:6
	LFO: 680-4100	1:6
RLGB-MC-505/LN	NG: 700-5100	1:7
	LFO:700-5100	1:7



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).

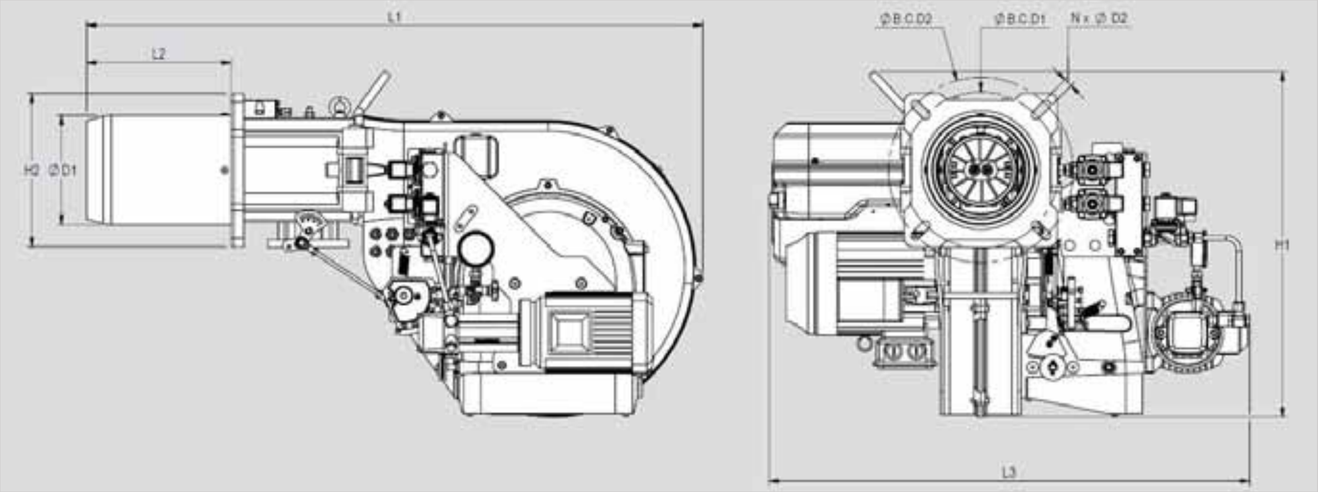
Technical data: RLGB-MC series (Dual-fuel burner)

- 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

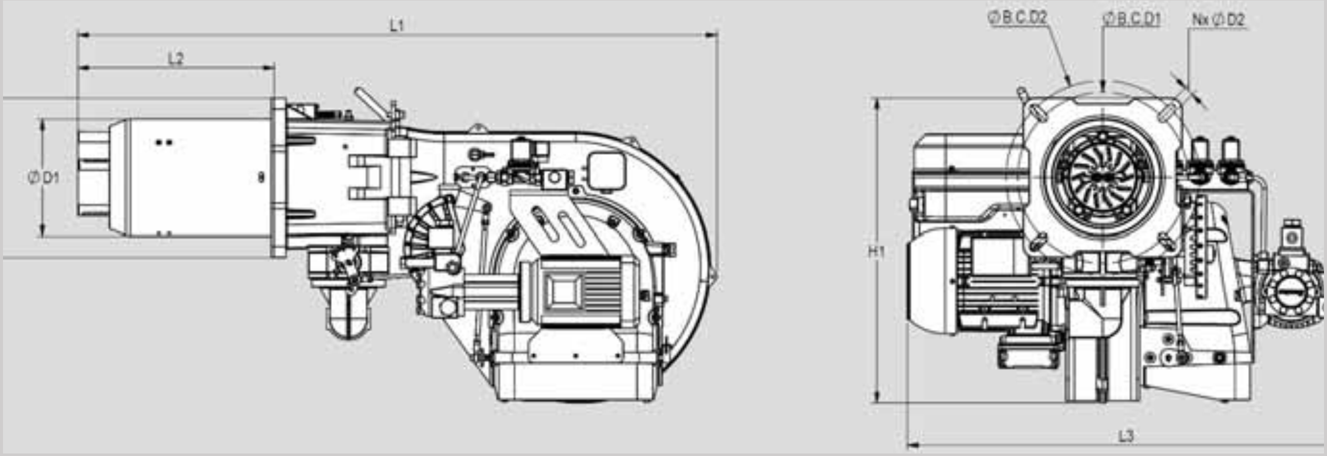
General dimension of RLGB-MC series

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

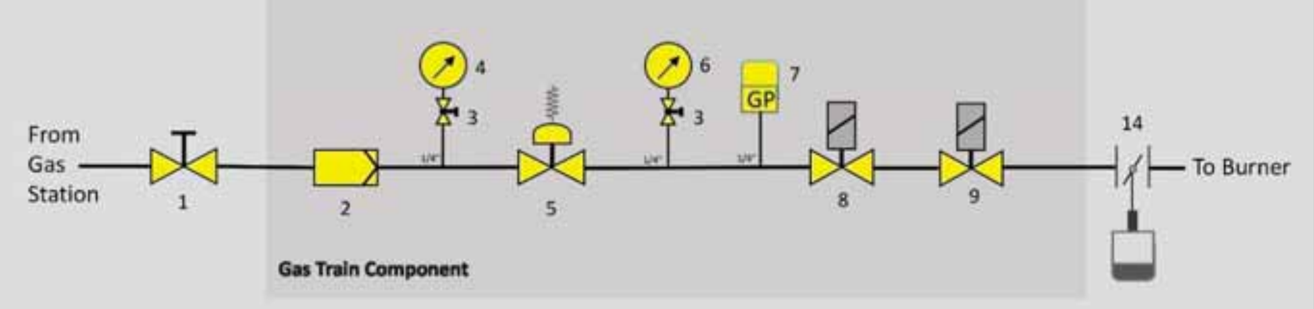
RLGB-MC-175/LN, RLGB-MC-205/LN



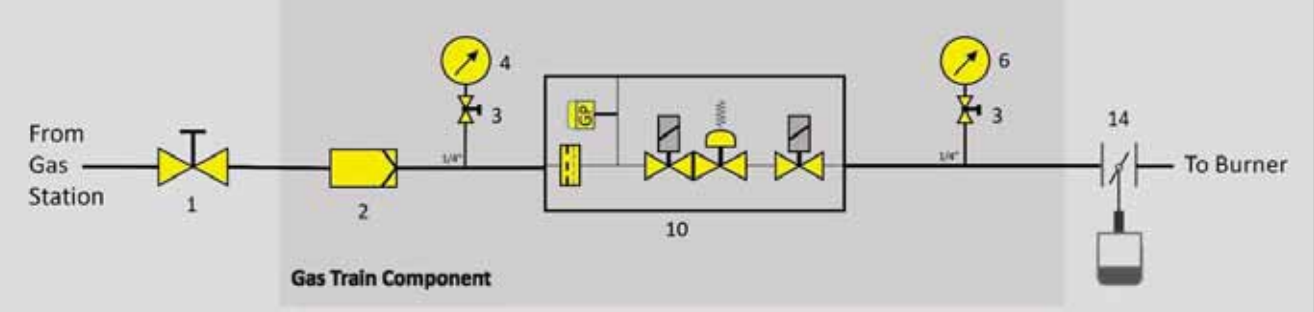
Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C. D1	B.C. D2
RLGB-MC-175/LN	1213	373	875	598	300	226	18	4	323	367
RLGB-MC-205/LN	1213	373	875	598	300	226	18	4	323	367

Gas train diagram:

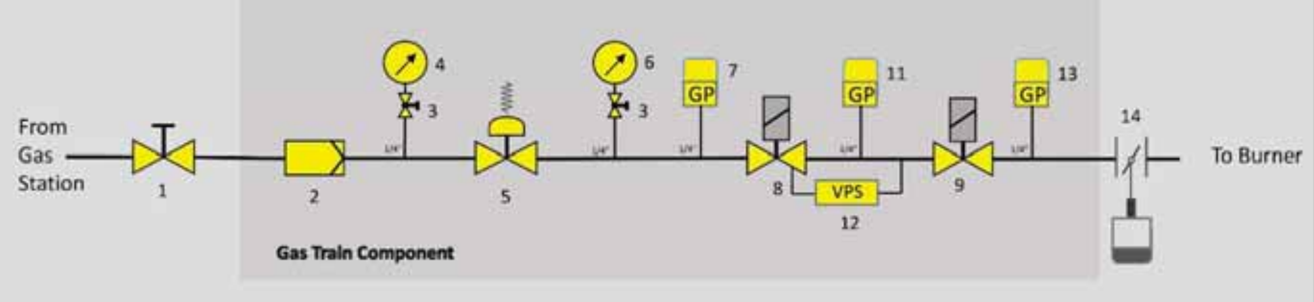
GT1(Pressure input<500 mbar, separated items)



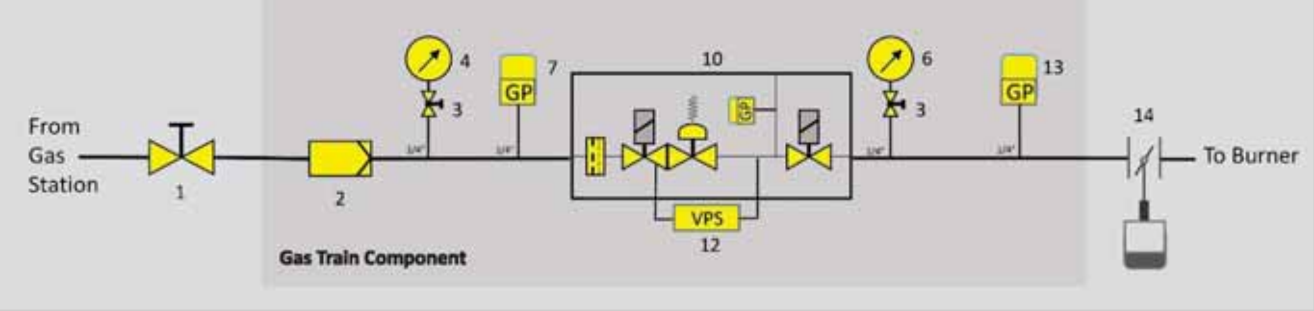
GT2 (Pressure input<500 mbar, multi bloc gas train)



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.

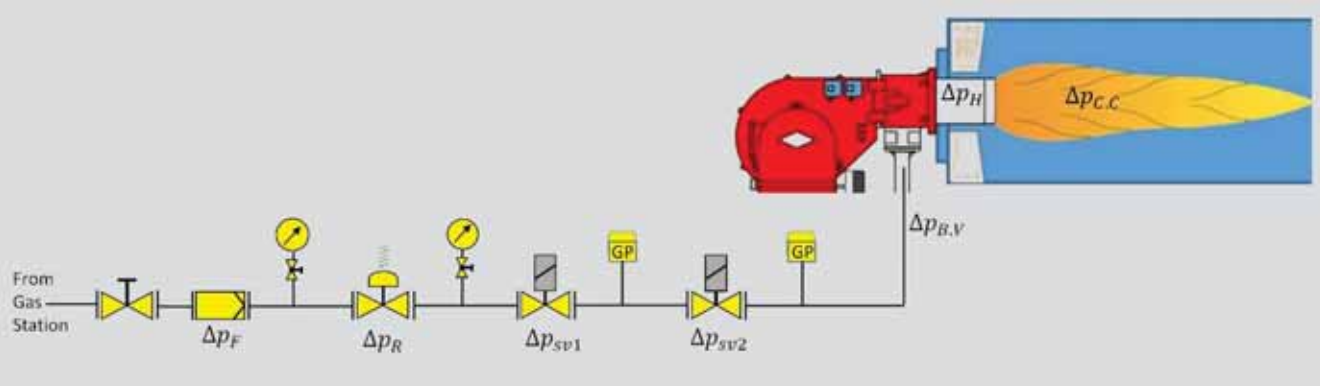
Break points in the valve train

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

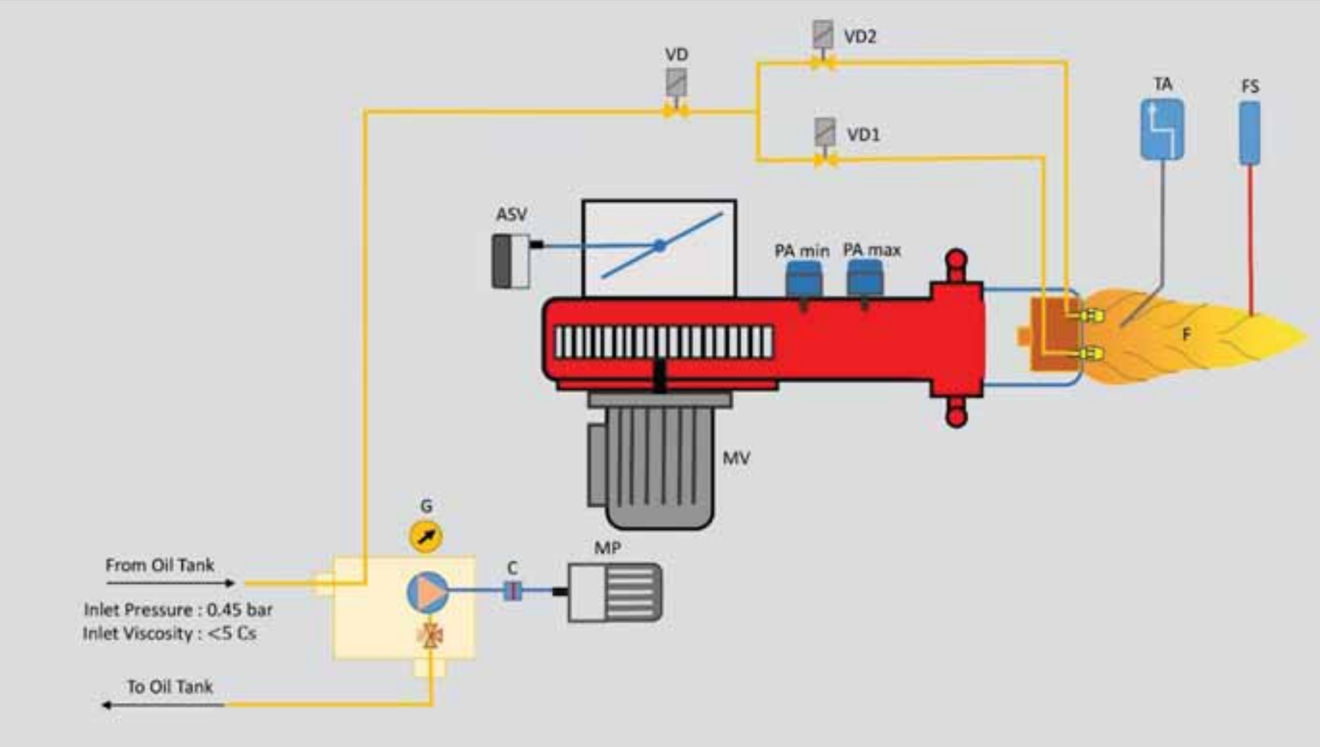


Min Input Pressure= $\Delta P_{\text{Filter(F)}}$+ $\Delta P_{\text{Regulator(R)}}$+ $\Delta P_{\text{Safety solenoid valve(sv1)}}$+ $\Delta P_{\text{main solenoid valve(sv2)}}$+ $\Delta P_{\text{batterfly valve(B.V)}}$+ $\Delta P_{\text{Combustion Head(H)}}$+ $\Delta P_{\text{Combustion chamber(C.C)}}$

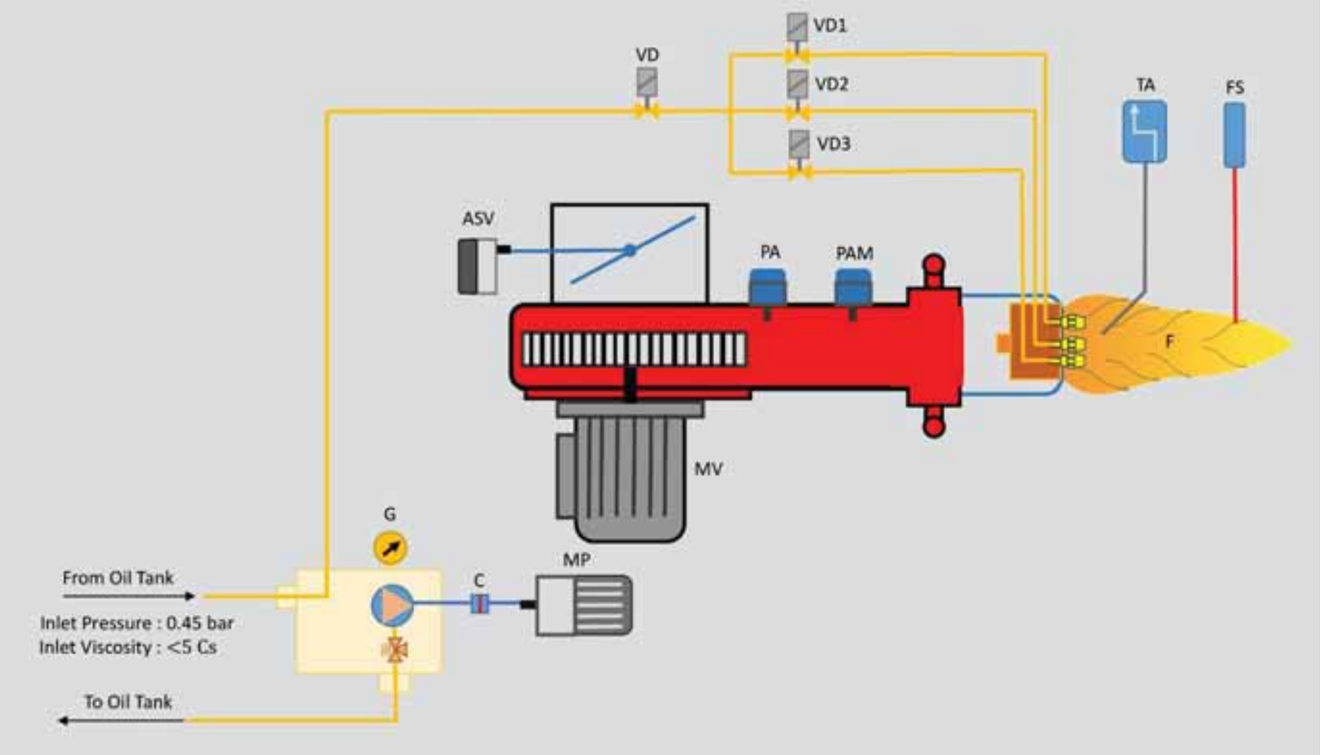
Min output pressure of regulator= $\Delta P_{\text{Safety solenoid valve(sv1)}}$+ $\Delta P_{\text{main solenoid valve(sv2)}}$+ $\Delta P_{\text{batterfly valve(B.V)}}$+ $\Delta P_{\text{Combustion Head(H)}}$+ $\Delta P_{\text{Combustion chamber(C.C)}}$

Oil delivery system

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



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

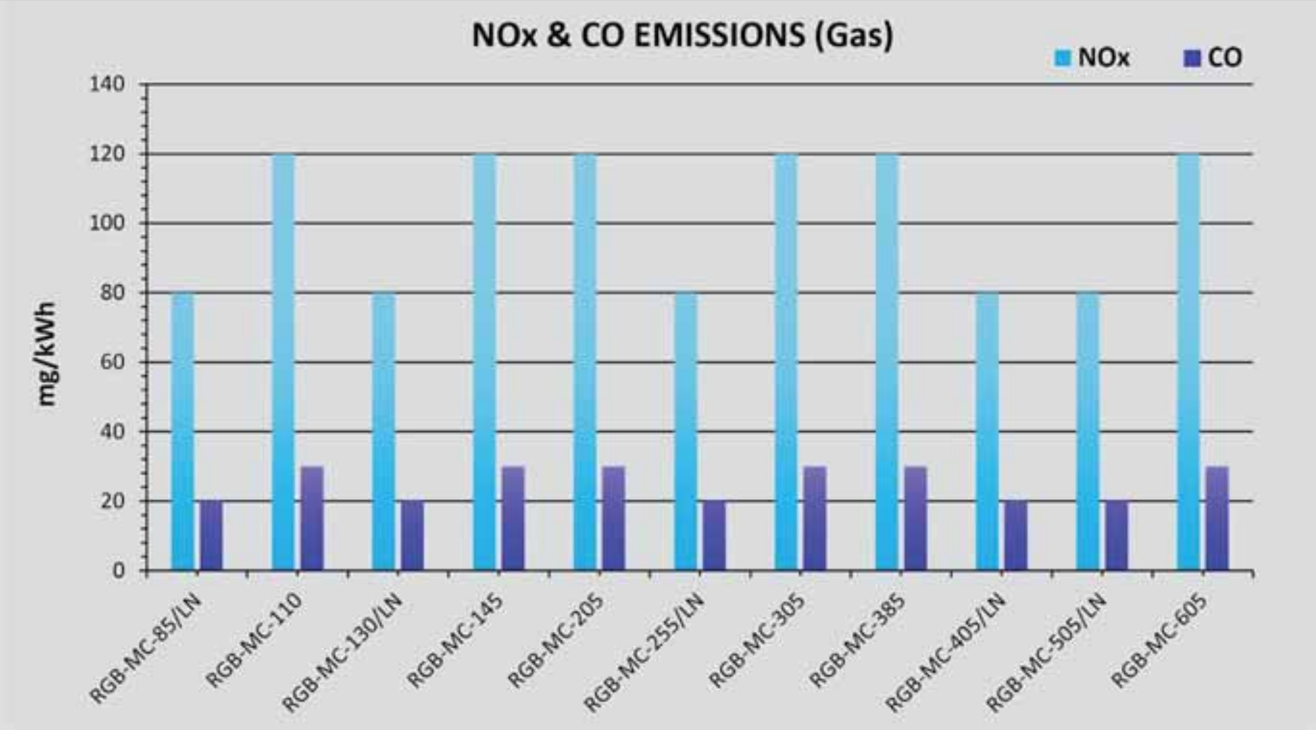


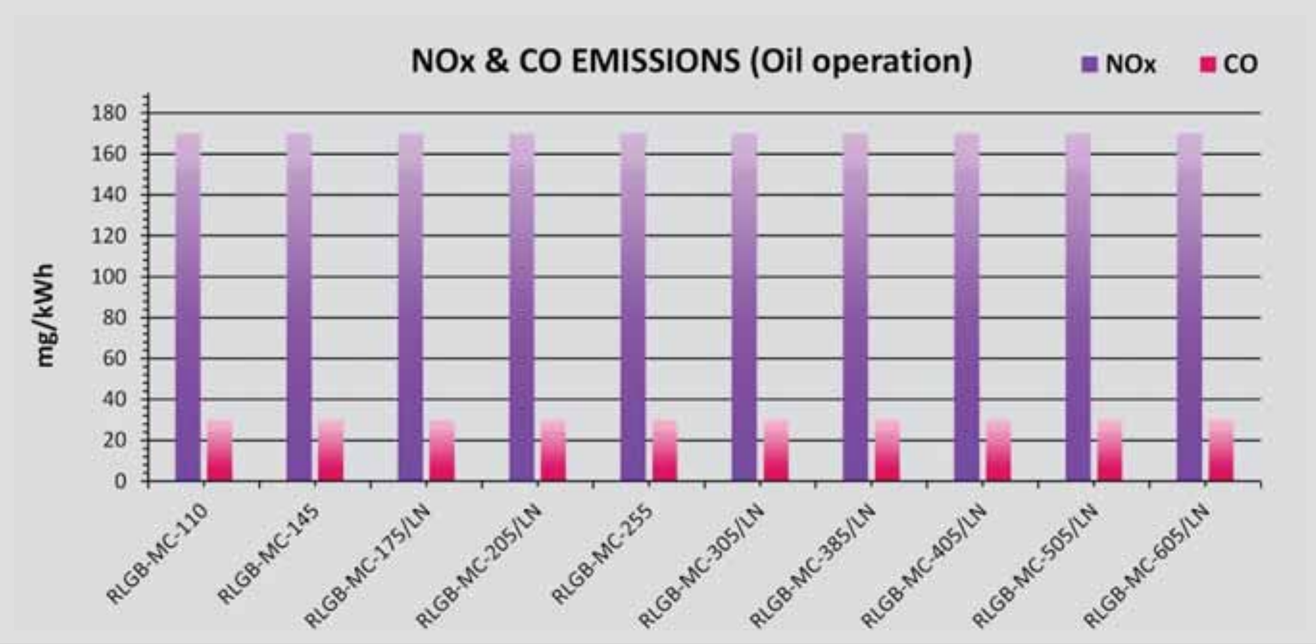
MV: Fan motor
MP: Pump motor
FS: Flame sensor
VD: Light oil safety valve

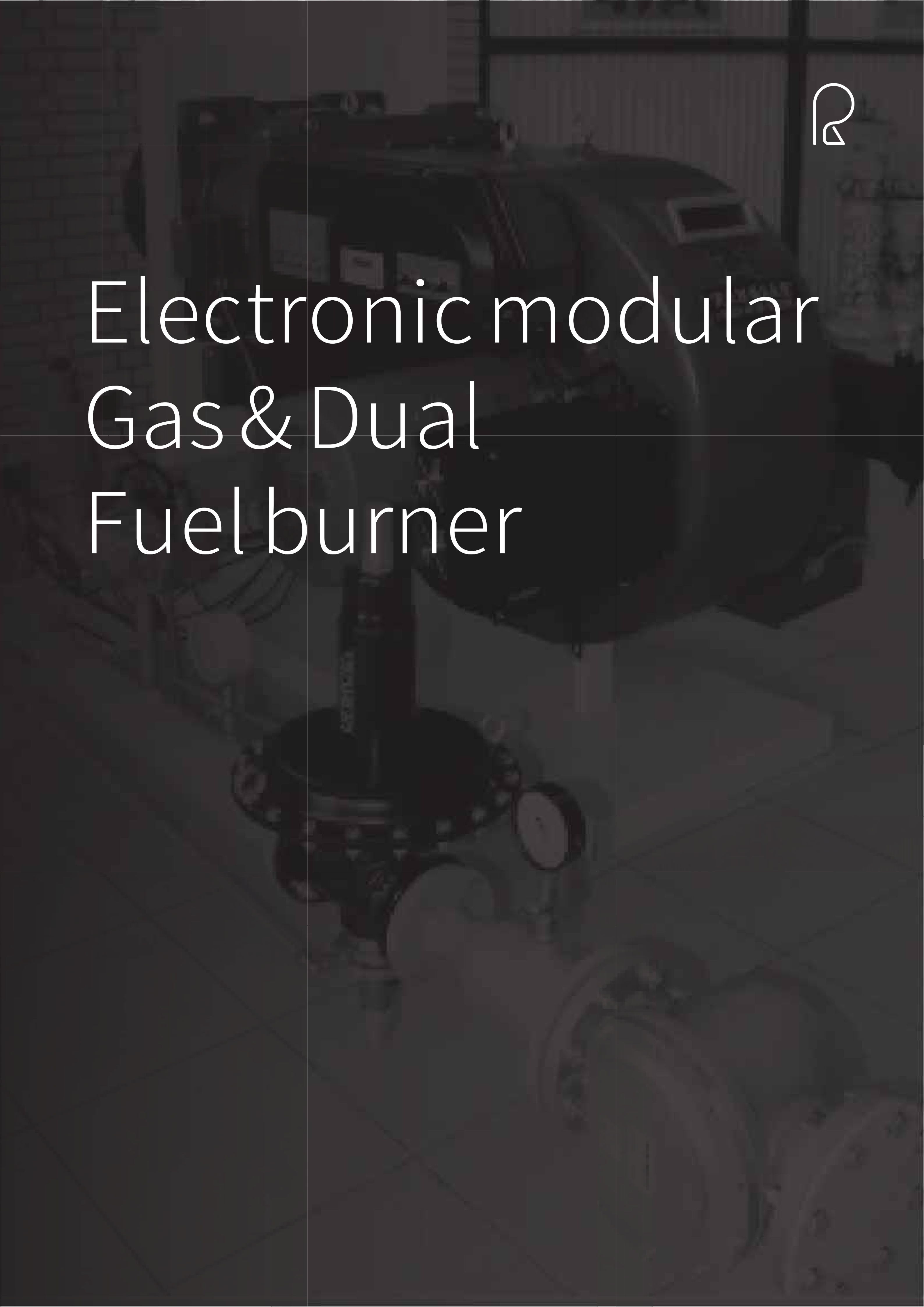
VD1: Light oil delivery valve Stage 1
VD2: Light oil delivery valve Stage 2
VD2: Light oil delivery valve Stage
TA: ignition transformer

C: Coupling
G: Gauge
F: Gas or oil flame
ASV: Air damper servomotor
PA: Air pressure switch

Emission


NOx & CO EMISSIONS (Gas)
NOx
CO
mg/kWh
140
120
100
80
60
40
20
0
RGB-MC-85/LN
RGB-MC-110
RGB-MC-130/LN
RGB-MC-145
RGB-MC-205
RGB-MC-255/LN
RGB-MC-305
RGB-MC-385
RGB-MC-405/LN
RGB-MC-505/LN
RGB-MC-605


NOx & CO EMISSIONS (Oil operation)
NOx
CO
mg/kWh
180
160
140
120
100
80
60
40
20
0
RLGB-MC-110
RLGB-MC-145
RLGB-MC-175/LN
RLGB-MC-205/LN
RLGB-MC-255
RLGB-MC-305/LN
RLGB-MC-385/LN
RLGB-MC-405/LN
RLGB-MC-505/LN
RLGB-MC-605/LN



Electronic modular Gas & Dual Fuel burner

R LG B-M- 255/ * / FGR

Option: FGR*

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: Modular Light Oil, Heavy Oil: Two/Three Stage Progressive
M/M:	Natural Gas, LPG: Modular Light Oil, Heavy Oil: Modular

B: Burner

Type of Fuel

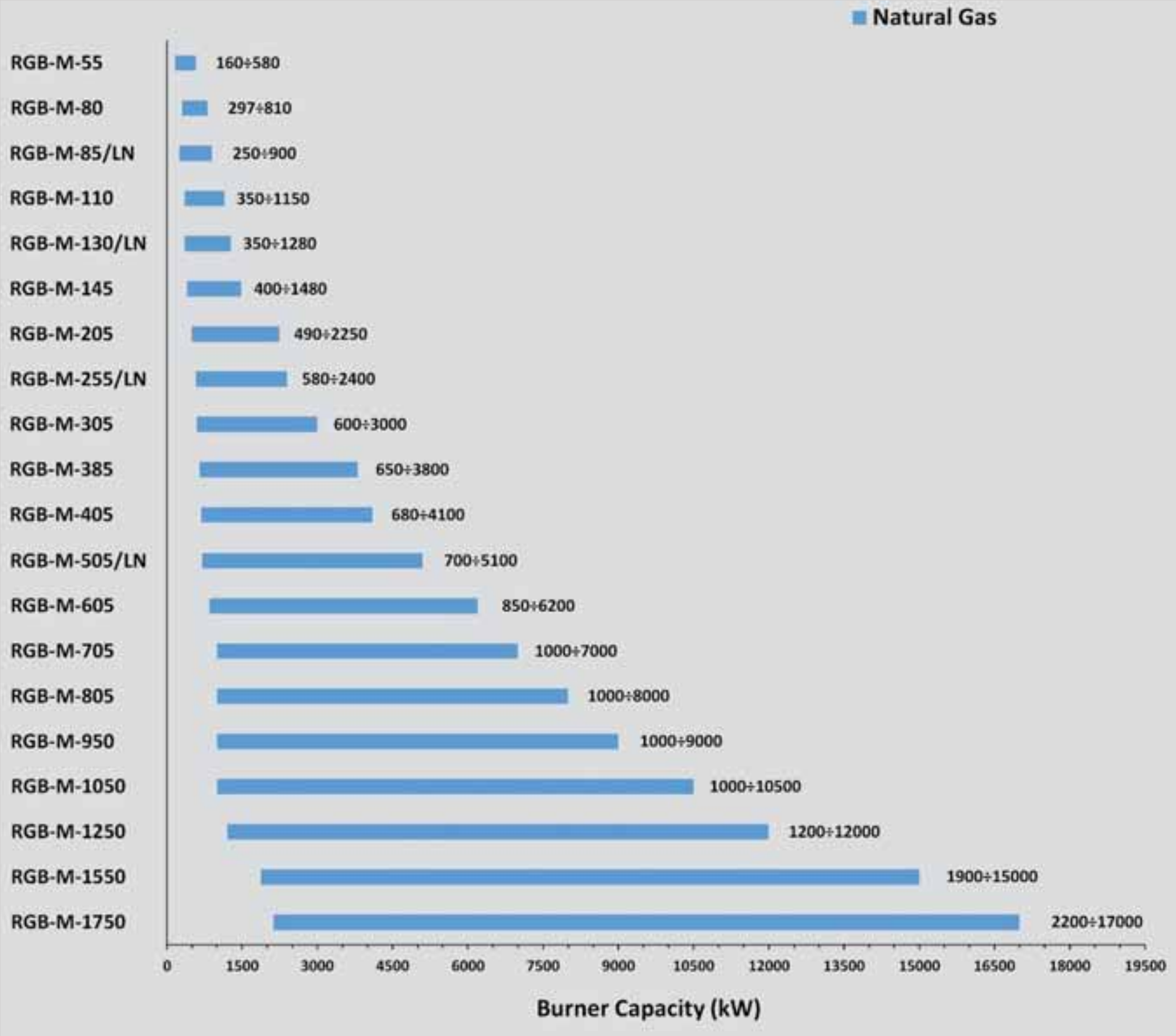
G:	G=Natural gas
GP:	G=Natural gas, P=Propane
LG:	L=Light oil, G=Natural gas
LGP:	L=Light oil, G=Natural gas, P=Propane
LHG:	L=Light oil, H=Heavy oil, G=Natural gas
LHGP:	L=Light oil, H=Heavy oil, G=Natural gas, P=Propane

Product Family Name: RAADMAN

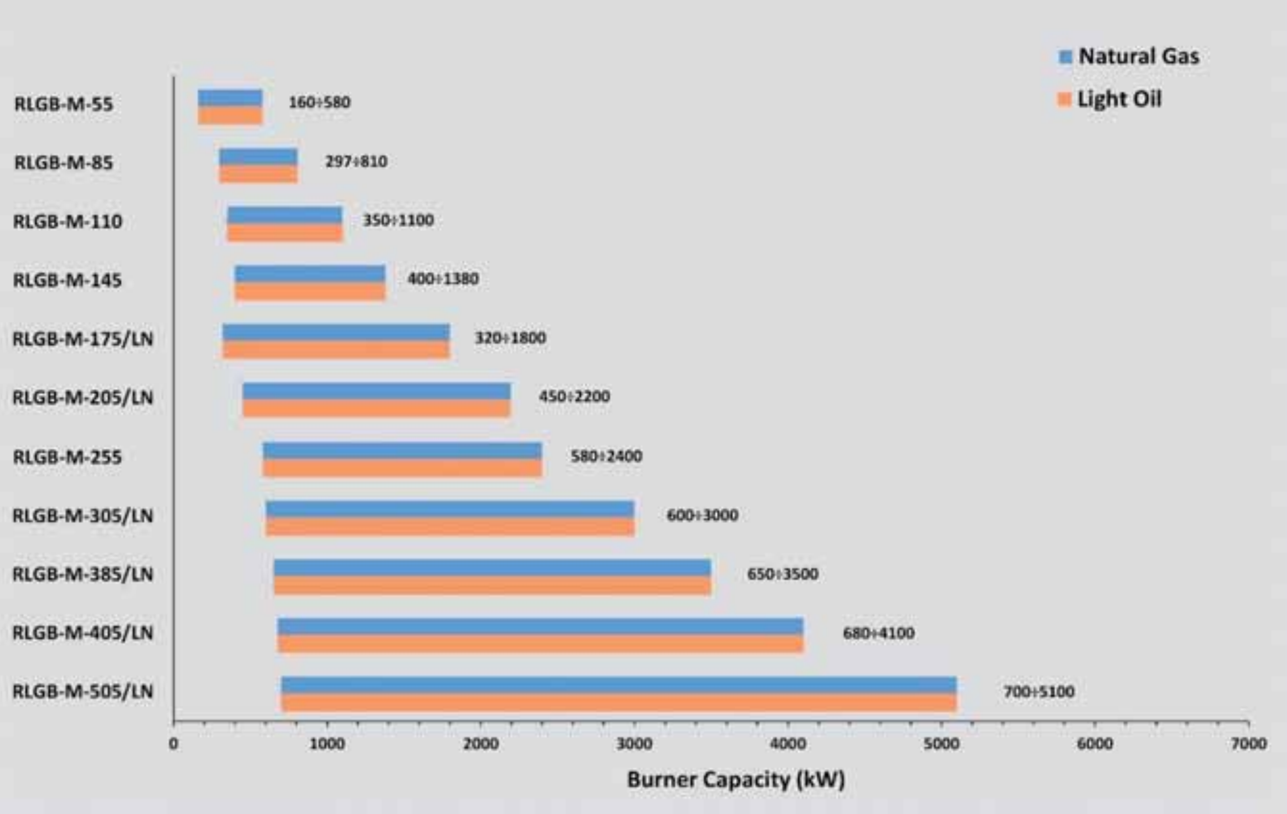
*FGR=Flue Gas Recirculation

Firing Ranges:

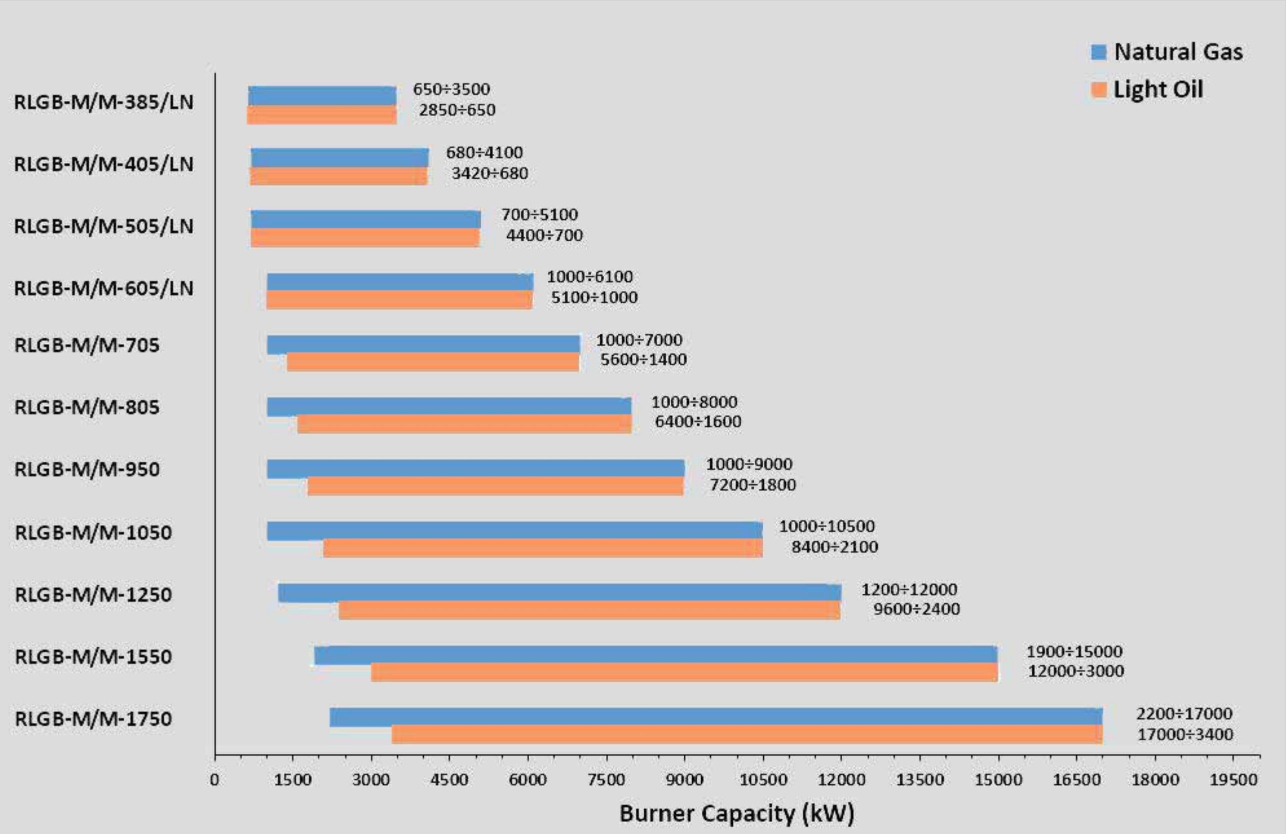
Gas burners (RGB-M Series):



Dual Fuel burners (RLGB-M Series):



Dual Fuel burners (RLGB-M/M Series)



Classification of RAADMAN Modular Burners

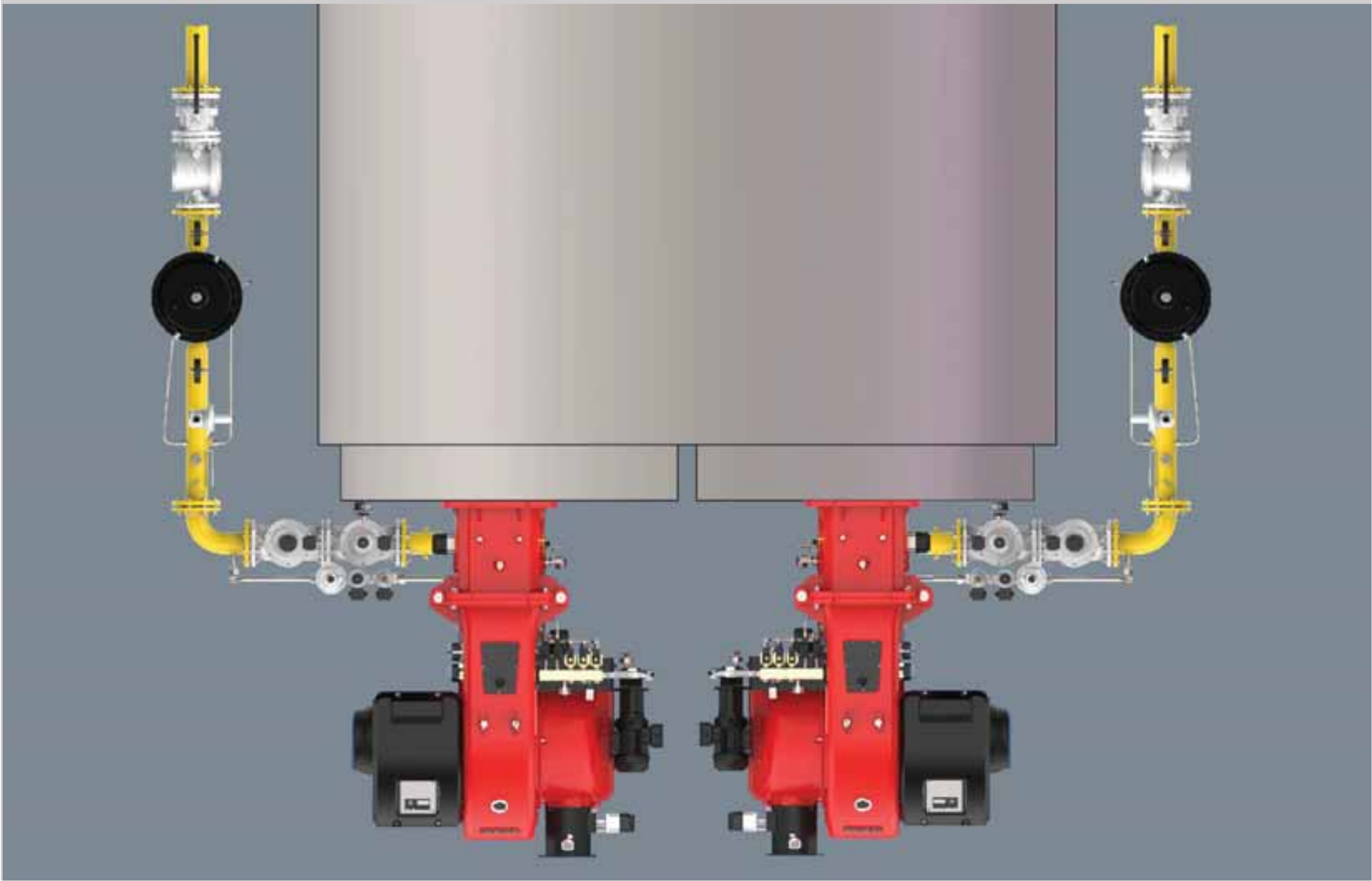
Gas burners (RGB-M Series) P20
- Modulating Gas Burners
- Low NOx Gas Burners

Dual Fuel burners (RLGB-M Series) P32
- Modulating Dual Fuel Burners
- Low NOx Dual Fuel Burners

Dual Fuel burners (RLGB-M/M Series) P40
- Full Modulating Dual Fuel Burners
- Low NOx Ful Modulating Dual Fuel Burners

Technical and Functional Features

- Highly efficient gas/oil burners for domestic and industrial application
- Compatible with all types of combustion chambers according to EN303 standard
- Designed for maximize efficiency and fuel cost savings
- Based on Iran national standard ISIRI-7595 and ISIRI 7594 (BS-EN676 and BS-EN267) for gas and oil fuel, respectively.
- Compact design with enclosed aluminum air housing
- High-quality with low-emissions combustion
- Sound proofing materials incorporated in the air suction circuit
- Full electronic modular operation with air/gas ratio control
- Ability of running with Variable Speed Drive (VSD) for reduction in noise level and increase the life expectancy of fan wheel motor.
- Ability of working with either of pressure based or Air/steam atomizers in dual fuel version.
- Ability of running with FGR technology for further reduction in NOx level (option)
- Light weight and optimized geometry
- Simple Installation, adjustment and maintenance



Electronic modular operation

Fossil fuel burners are often used as the principal medium for delivering energy to industrial furnaces and Boilers. Increasing focus on reducing energy costs has led manufacturers to concentrate on new burner design techniques and important advances in efficiency gains have been made over the years. As one of the most effective strategies are burner management and control systems.

Fully modulating burners are designed to safely operate throughout its firing range from high fire to low fire. The most common turndown ratings in commercial boilers range from 1-3 up to 1-10. Turndown is how far the burner firing rate can be lowered and still effectively fire. 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.

Each RAADMAN burners with identification of –M- or –M/M- are equipped with an electronic microprocessor management panel, which controls the air damper servomotor as well as the fuel servomotors. Using electronic modulation, hysteresis is prevented by the precise control of the separated in independent servomotors and the software linked by can-BUS.

The high precision regulation is due to the absence of mechanical clearance normally found in mechanical regulation cams on traditional modulating burners. The LAMTEC Burner Tronic BT300 or Etamatic OEM as well as Siemens LMV2/3, LM51/52 as the most popular brands, are frequently used in RAADMAN Modular burners. There burner Control Systems combines the benefits of an electronic fuel/air ratio controller with an electronic burner control unit. Up to five motorized actuators can be assigned to modulate air and fuel drives with the option of an additional module to add variable speed drive control for the combustion air fan.

Additional modules are available for field bus interfacing, load control and dual fuel operation.

These modular systems include many standard burner functions as standard; these include: integrated valve proving, ambient temperature compensation, flame monitoring and operating hours and system start-up counters. Oxygen trim, CO control, load control and dual fuel functionality are all available options that are used to further enhance system benefits, flexibility and efficiency. These controllers particularly suited for use on mono-bloc burners.

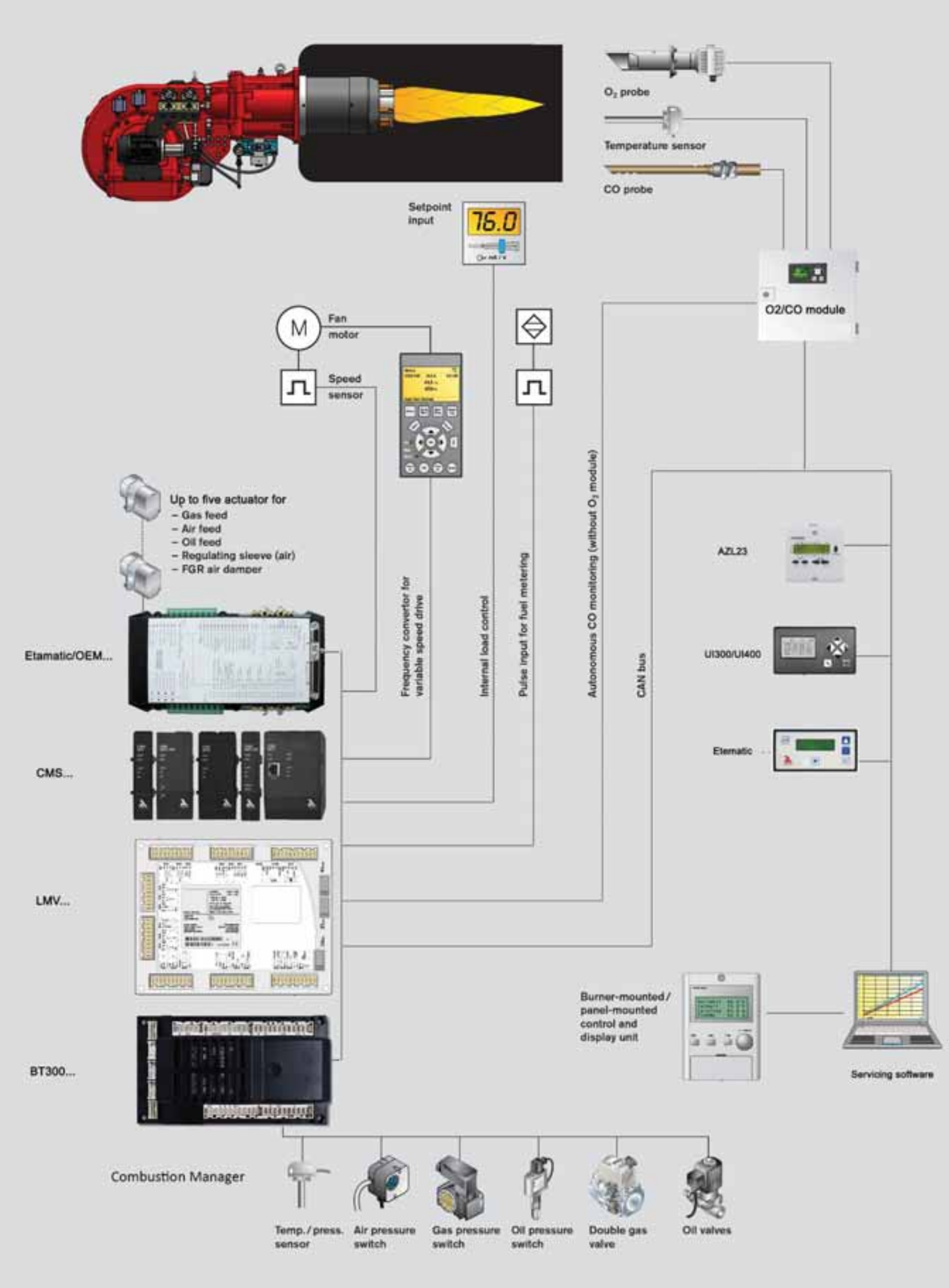
The fuel/air ratio curves and operating parameters are set and adjusted using either the UI300 HMI or AZL50 for LAMTEC and Siemens respectively or using their LSB Remote Software's. The fuel/air ratio can be optimized to compensate for combustion variables by implementing oxygen trim or CO control to ensure the burner operates to its maximum possible efficiency.

The burner and fuel/air ratio controller can be adjusted for a wide range of combustion tasks by setting parameters. In the case of BT300, Etamatic OEM or LMV2/3/5, oil and gas can be set to start with and without a pilot burner. The integrated valve proving system can be run before ignition or after the shutdown of the burner. In the case of operation with gas, starting without pre-purge is possible in accordance with BS-EN676 and BS-EN 267.

Key features and benefits include:

- Integrated linkage-less control, burner flame safeguard and modulation PID control
- Single or dual fuel (or multi fuel) application
- Controls up to 5 independent actuators for optimal efficiency in low NOx burner application.
- Integrated PID temperature/ pressure controller with auto tune for extremely accurate process control
- Variable Speed Drive control with actual RPM speed sensor provides reliable, efficient and safe control of the combustion air blower
- Optional O_2-CO trim
- Integrated gas valve proving system that checks for leak on every burner cycle for increased safety.
- Up to 10 programmable points per fuel-air ratio curve for greater flexibility and tighter control
- 999 highly repeatable actuator position for precise control
- Digital positioning feedback from actuators ensure unmatched repeatability
- Independent ignition position
- Ability of being connected to building management system using different type of protocols
- World-wide approvals and technical supports

Burner Management System overview



A look to the future:

With Low-NOx burners

NOx gases play an important role in the formation of smog, producing the brown haze often observed over cities, particularly during the summer. When exposed to the UV rays in sunlight, NOx molecules break apart and form ozone (O3). The problem is made worse by the presence in the atmosphere of volatile organic compounds (VOC), which also interact with NOx to form dangerous molecules. Ozone at the ground level is a serious pollutant, unlike the protective ozone layer much higher up in the stratosphere.

Nitrogen oxides form when oxygen and nitrogen from the air interact during a high-temperature combustion event. Heating industry and industrial burners, in particular, produce large amounts of nitrogen oxides.

The idea of Low NOx burners is control fuel and air mixing at each burner in order to create larger and more branched flames. Peak flame temperature is thereby reduced, and results in less NOx formation. The improved flame structure also reduces the amount of oxygen available in the hottest part of the flame thus improving burner efficiency.

FGR Technology

Flue gas recirculation (FGR) can be a highly effective technique for lowering NOx emissions from burners, and it's relatively inexpensive to apply. Most of the early FGR work was done on boilers, and investigators found that recirculating up to 25% of the flue gases through the burner could lower NOx emissions to as little as 25% of their normal levels.

With FGR technology, consisting of a temperature sensor and flue gas damper with an actuator connected to a flange, a portion of the exhaust (flue) gas circulates back into the combustion zone to decrease the flame temperature and reduce the flame nitrogen-oxide (NOx).

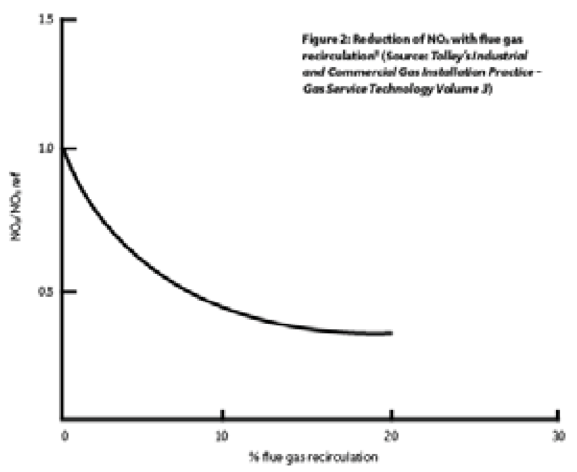
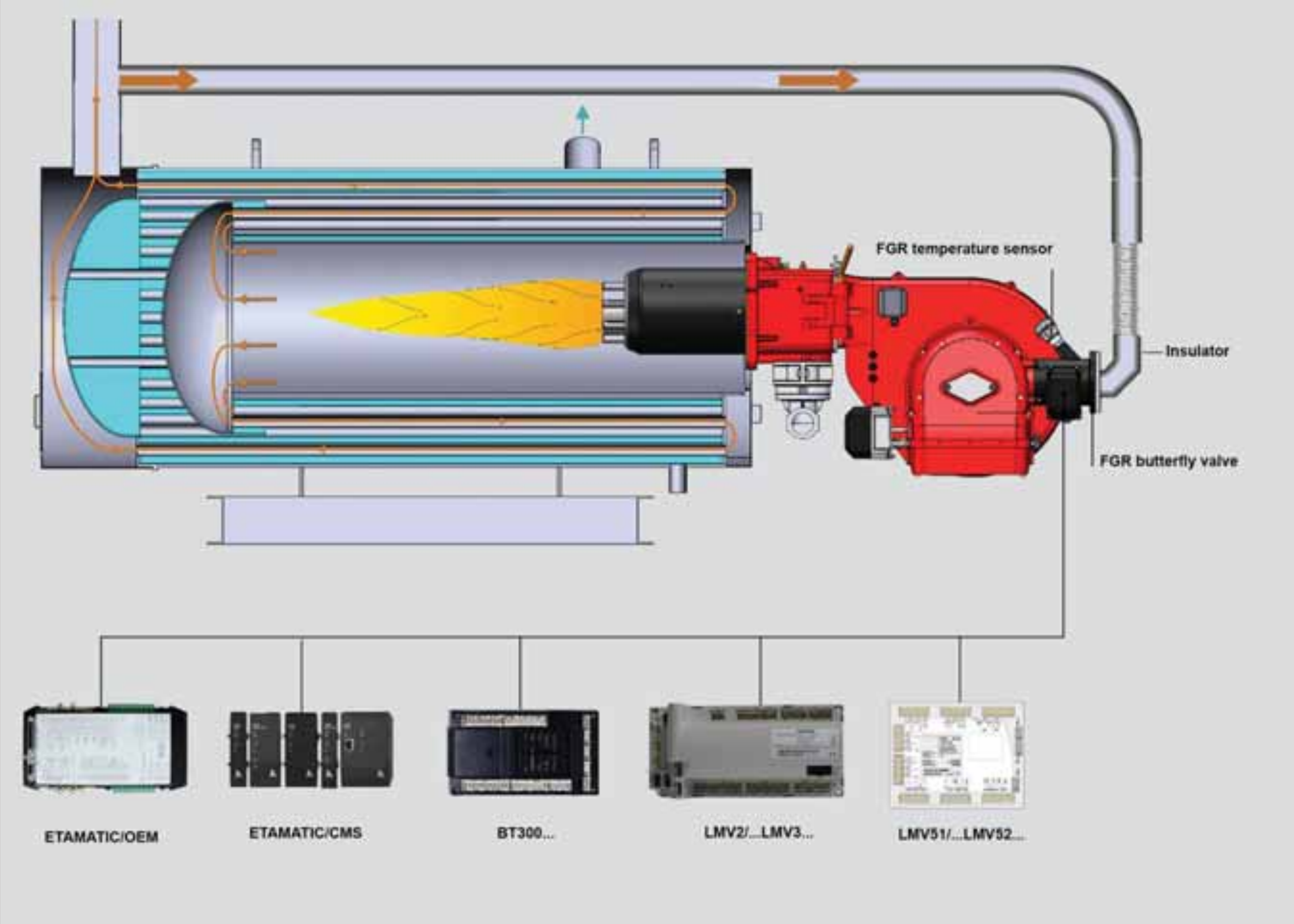


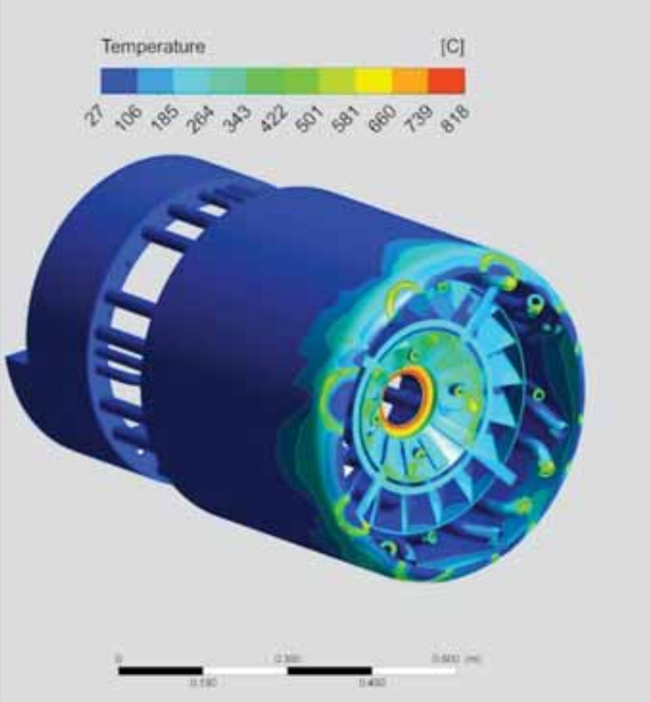
Figure 2: Reduction of NO_x with flue gas recirculation[3] *(Source: Tolley's Industrial and Commercial Gas Installation Practice – Gas Service Technology Volume 3)*

When FGR is used, because of reduction in radiation heat transfer, boiler efficiency may decrease typically in the range of 0.25 percent to 1 percent, depending on the amount of FGR added. Plant experience shows that the combination of low NOx burners with re-burning using FGR system reduces the NOx level to approximately lower than 40 mg/kWh.



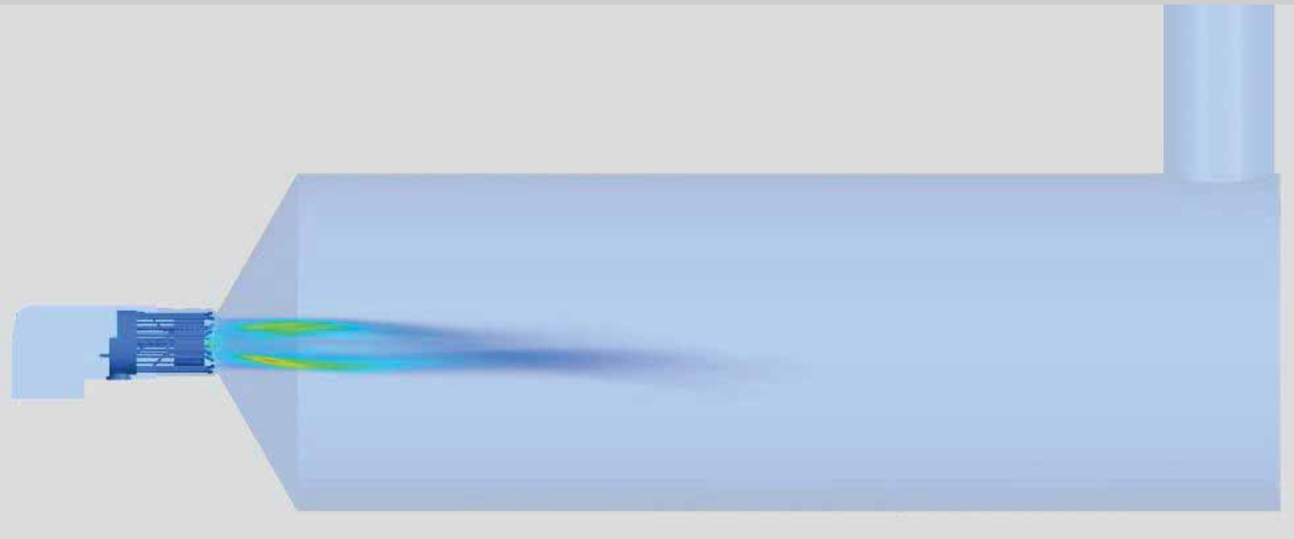
We are delighted to gratefully guarantee the best performance of our productions in order to meet our customer demands.

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 modeling 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.



Ventilation system:

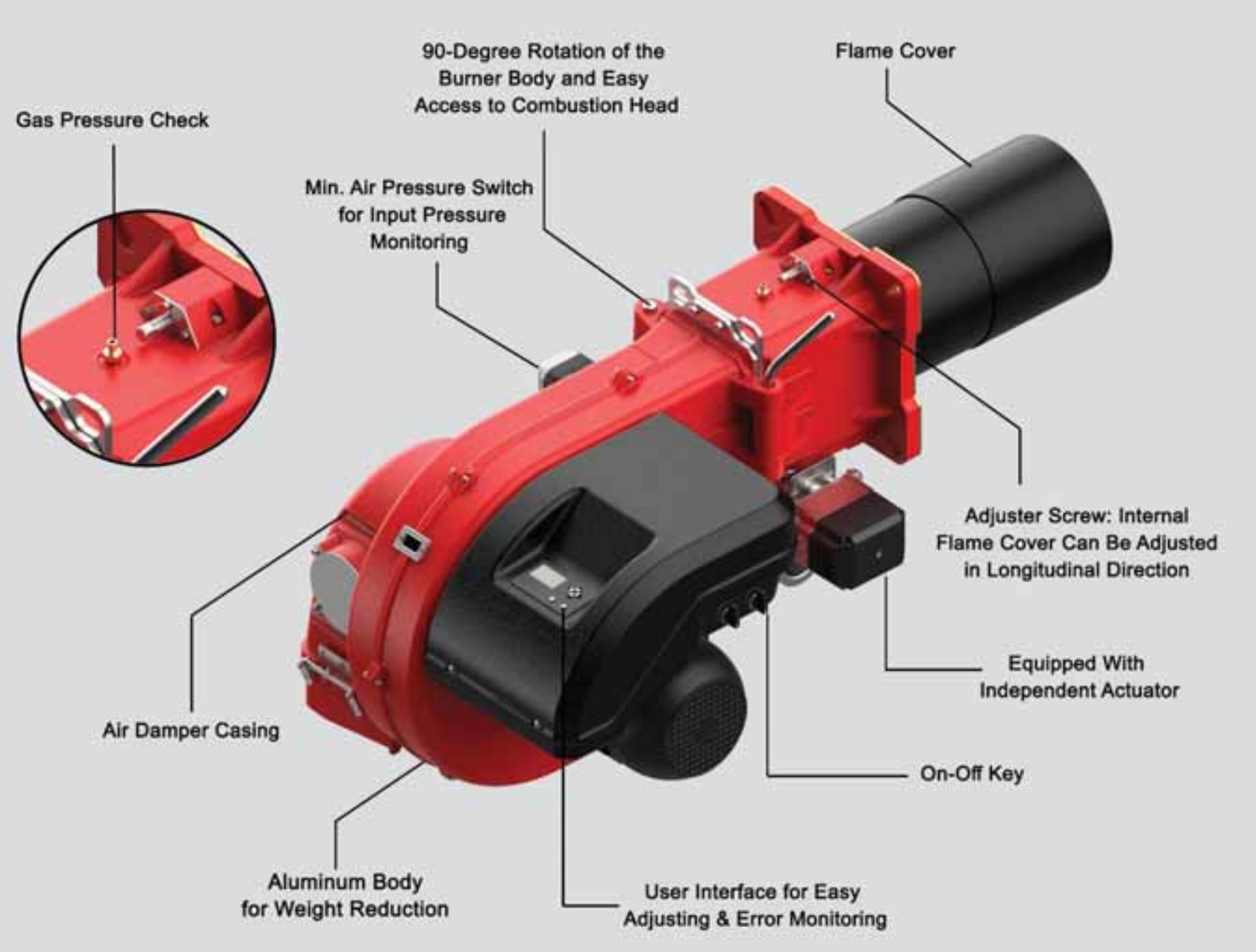
The Fan blade design is the result of extensive research and analysis resulting in high-performing and efficient centrifugal fans. Our R&D team will make sure our fans will comply with all safety certifications at the design stage, to make sure the fans are stable, reliable, and safe.

Thanks to improved CFD simulations and FEM analysis, blade design is optimized from both a structural and aerodynamic point of view simultaneously, also helping to provide customized solutions for market requirements. Our team surveys cover complex step-by-step analysis of a centrifugal fan from its design to an advanced CFD & FEA simulation, including FSI and modal analysis.

Gas burners (RGB-M Series)

Gas burners (RGB-M Series):

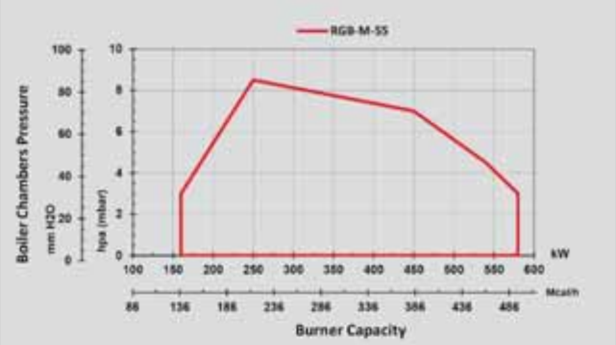
RGB-M Series or RAADMAN Modular gas burners, covering a firing range from 160 to 17000 kW, are designed for a wide range of domestic and industrial applications. All RAADMAN modular burners are equipped with LAMTEC or SIEMENS electronic control system with capability of full air/gas ratio control throughout entire burner operating range. These burners have been tested and evaluated based on Iran national standard ISIRI-7595 (BS-EN 676). According to performed experiments, the values of CO even in low excess air operation is lower than 30 mg/kWh (In some cases, values close to zero have also been reported). The precise design of combustion head results a full gas-air mixture that guarantees high efficiency levels in all various applications. Burner superior design accompanied by high quality electronic devices have also resulted a further improvement in boiler's performance in order to decrease the fuel cost and emissions.



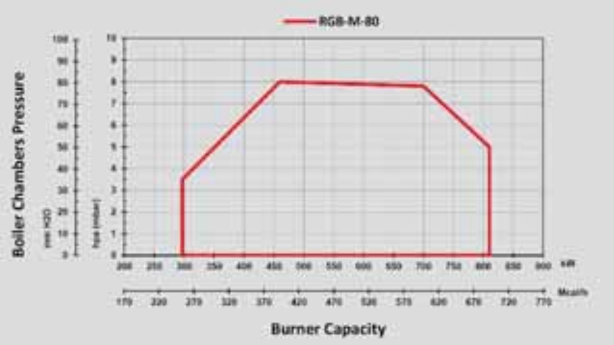
Burner Selection: Capacity and Working diagram

Modulating Gas Burner

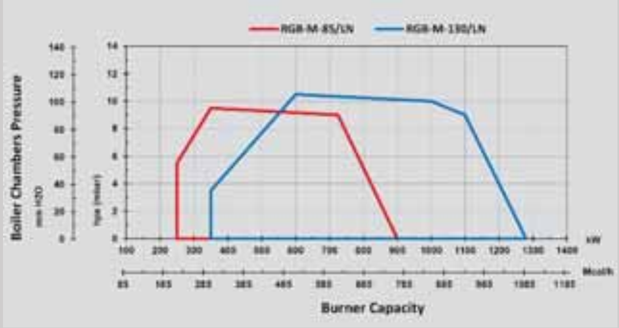
Burner	Capacity (kW)	Turn down
RGB-M-55	NG:160-580	1:3



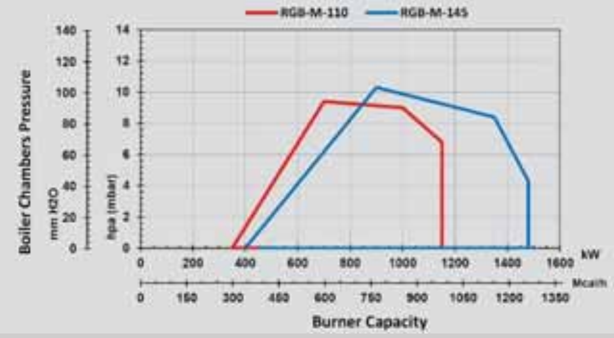
Burner	Capacity (kW)	Turn down
RGB-M-80	NG:297-810	1:3



Burner	Capacity (KW)	Turn down
RGB-M-85/LN	NG:250-900	1:3
RGB-M-130/LN	NG:350-1280	1:3

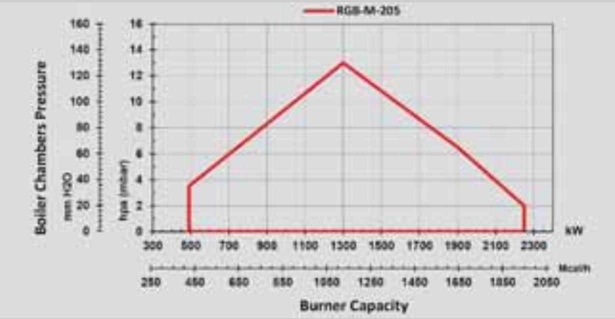


Burner	Capacity (KW)	Turn down
RGB-M-110	NG: 350-1150	1:3
RGB-M-145	NG: 400-1480	1:4



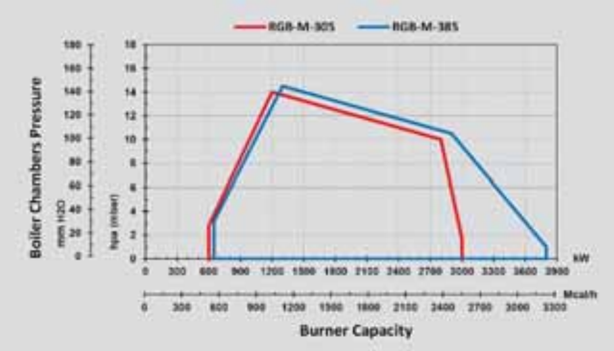
Burner	Capacity (KW)	Turn down
RGB-M-205	NG:490-2250	1:4

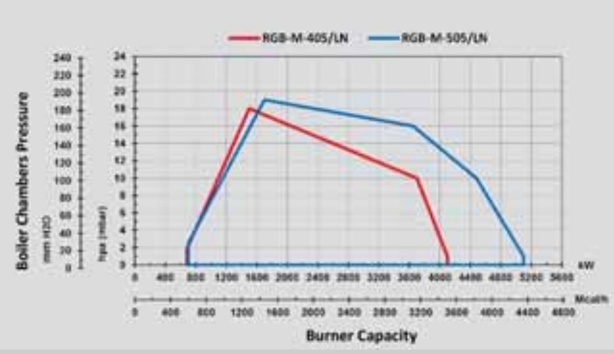
Burner	Capacity (KW)	Turn down
RGB-M-255/LN	NG:580-2400	1:4



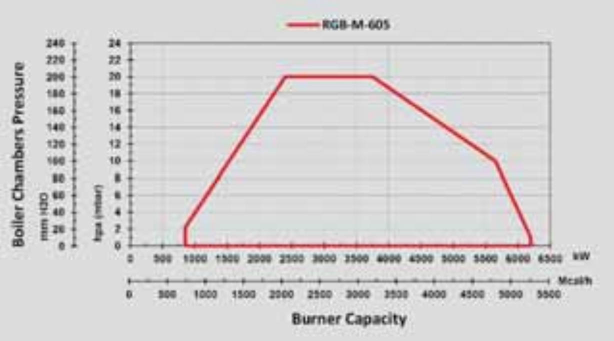
Burner	Capacity (KW)	Turn down
RGB-M-305	NG:600-3000	1:5
RGB-M-385	NG:650-3800	1:5

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





Burner	Capacity (KW)	Turn down
RGB-M-605	NG: 850-6200	1:7



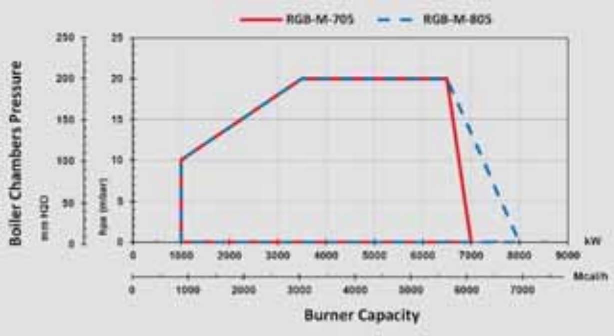
Special Note:

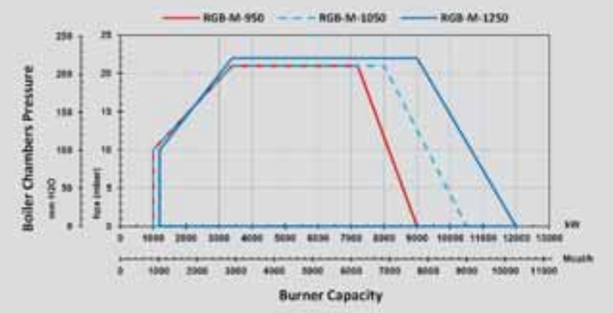
Working diagrams for gasous fuel burners are certified in accordance with BS-EN 676.

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

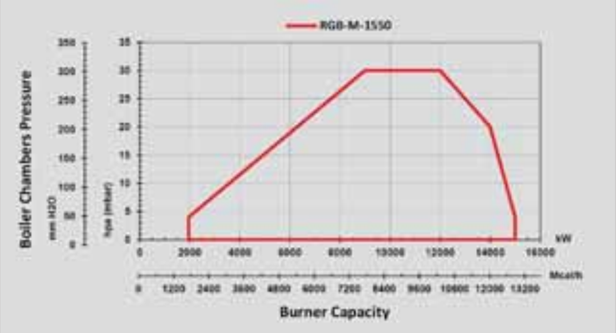
Burner	Capacity (KW)	Turn down
RGB-M-705	NG: 1000-7000	1:7
RGB-M-805	NG: 1000-8000	1:8*

Burner	Capacity (KW)	Turn down
RGB-M-950	NG: 1000-9000	1:9*
RGB-M-1050	NG: 1000-10500	1:10*
RGB-M-1250	NG: 1200-12000	1:10*





Burner	Capacity (KW)	Turn down
RGB-M-1550	NG: 1900-15000	1:8*



Burner	Capacity (KW)	Turn down
RGB-M-1750	NG: 2200-17000	1:8*

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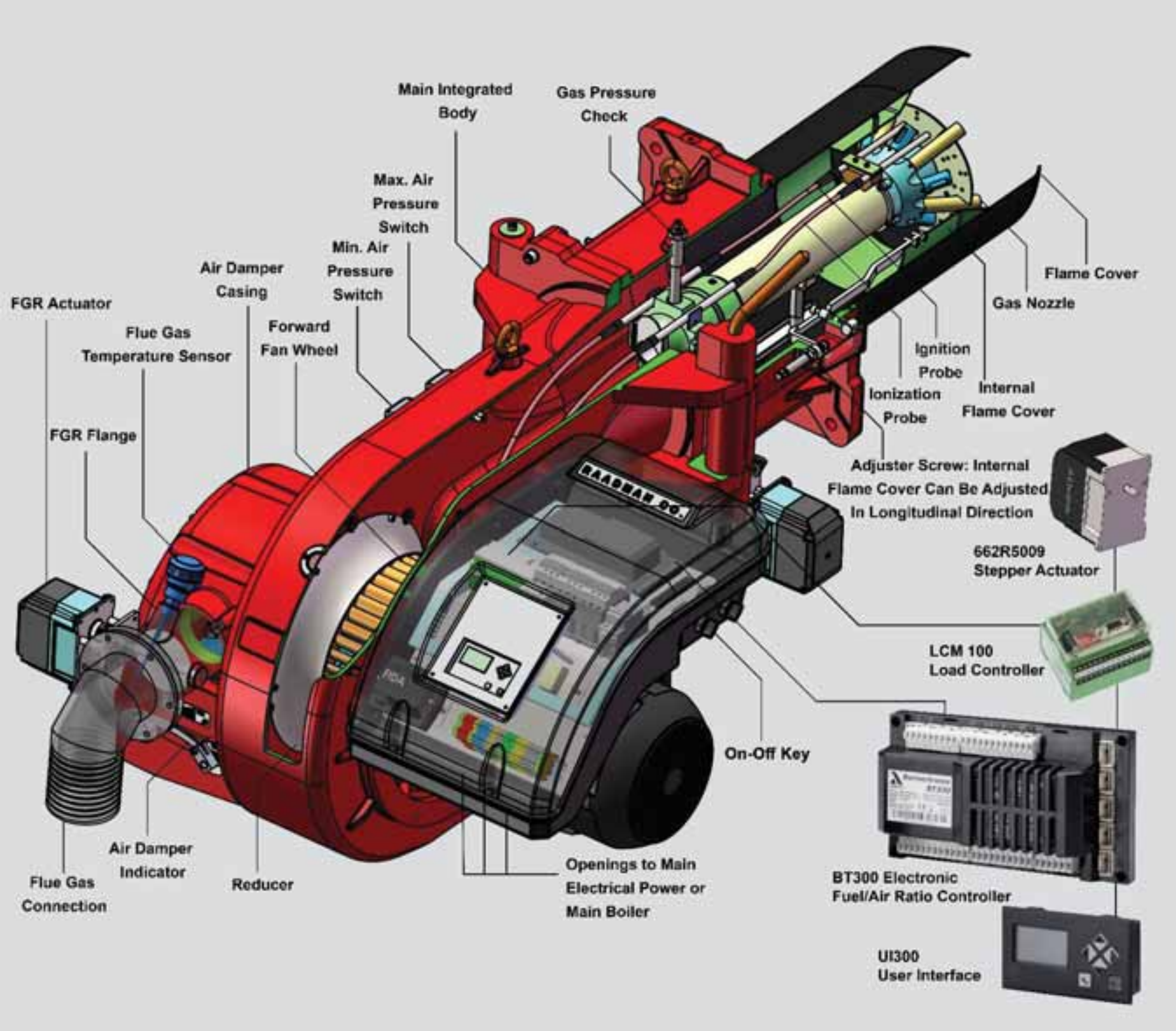
* Special note: Turn-down ratio higher than (1:8, 1:9, 1:10, etc.) are accessible for the burner with the head actuator. Otherwise, without a head actuator, the max turn-down ratio is 1:6.



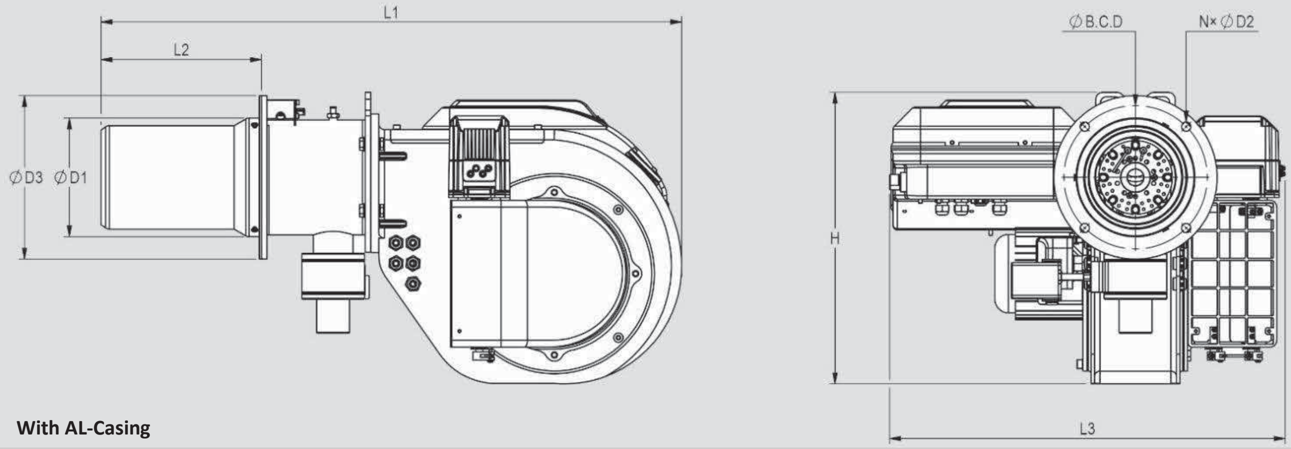
Technical data: RGB-M Series

- N.G operation: Electronic Modular

Power system		Power management system				
Burner	Motor(kW/PH/V/HZ/rpm)	Controller		Actuator (N.M)		
		Brand	Model	Air	Fuel	Head
RGB-M-55	0.75/3/380-400/50/2840	LAMTEC	BT320	1.2	0.8	--
RGB-M-80	1.1/3/380-400/50/2840	LAMTEC	BT320	1.2	1.2	--
RGB-M-85/LN	1.5 /3 /380-400 /50 /2840	LAMTEC	BT320			--
		SIEMENS	LMV3…	1.2	1.2	
RGB-M-110	1.5 /3 /380-400 /50 /2840	LAMTEC	BT320			--
		SIEMENS	LMV3…	1.2	1.2	
RGB-M-130/LN	2.2 /3 /380-400 /50 /2840	LAMTEC	BT320			--
		SIEMENS	LMV3…	3	1.2	
RGB-M-145	2.2 /3 /380-400 /50 /2840	LAMTEC	BT320			--
		SIEMENS	LMV3…	3	1.2	
RGB-M-205	4 /3 /380-400 /50 /2840	LAMTEC	BT320			--
		SIEMENS	LMV3…	3	1.2	
RGB-M-255/LN	5.5 /3 /380-400 /50 /2840	LAMTEC	BT320			--
		SIEMENS	LMV3…	3	1.2	
RGB-M-305	7.5 /3 /380-400 /50 /2900	LAMTEC	BT320			--
		SIEMENS	LMV3…	3	1.2	
RGB-M-385	7.5 /3 /380-400 /50 /2900	LAMTEC	BT320			--
		SIEMENS	LMV3…	3	1.2	
RGB-M-405/LN	11 /3 /380-400 /50 /2900	LAMTEC	BT320	9	1.2	--
		SIEMENS	LMV3…	10	1.2	
RGB-M-505/LN	11 /3 /380-400 /50 /2900	LAMTEC	BT320	9	1.2	--
		SIEMENS	LMV3…	10	1.2	
RGB-M-605	15 /3 /380-400 /50 /2900	LAMTEC	BT320	9	1.2	--
		SIEMENS	LMV3…	10	1.2	
RGB-M-705	18.5 /3 /380-400 /50 /2840	LAMTEC	BT320	9	3	--
		SIEMENS	LMV 3…	10	3	
RGB-M-805	18.5 /3 /380-400 /50 /2840	LAMTEC	ETAMATIC-OEM	20	6	20
		SIEMENS	LMV 5…	20	3	
RGB-M-950	22 /3 /380-400 /50 /2840	LAMTEC	ETAMATIC-OEM	20	6	20
		SIEMENS	LMV5…	20	3	
RGB-M-1050	22/3 /380-400 /50 /2840	LAMTEC	ETAMATIC-OEM	20	6	20
		SIEMENS	LMV 5…	20	3	
RGB-M-1250	30/3 /380-400 /50 /2840	LAMTEC	ETAMATIC-OEM	20	6	20
		SIEMENS	LMV 5…	20	3	
RGB-M-1550	45/3 /380-400 /50 /2900	LAMTEC	ETAMATIC-OEM	20	6	30
		SIEMENS	LMV 5…	20	3	37
RGB-M-1750	55/3 /380-400 /50 /2900	LAMTEC	ETAMATIC-OEM	20	6	30
		SIEMENS	LMV 5…	20	3	37

General Dimension of RGB-M-Series

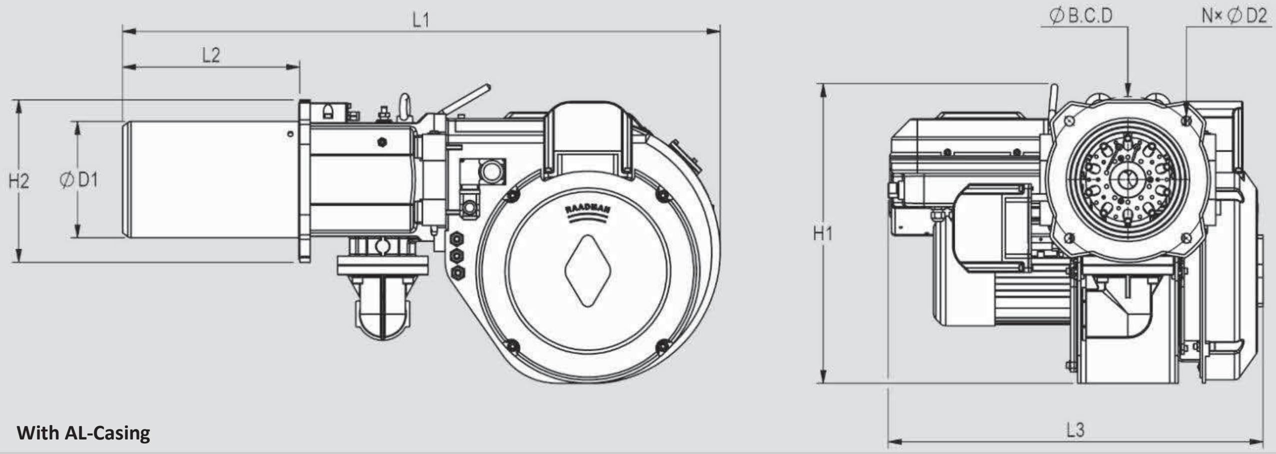
RGB-M-55



With AL-Casing

Burner Type	L_1	L_2	L_3	H	D_1	D_2	D_3	N	B.C.D
RGB-M-55	850	235	576	427	178	13.5	240	4	210

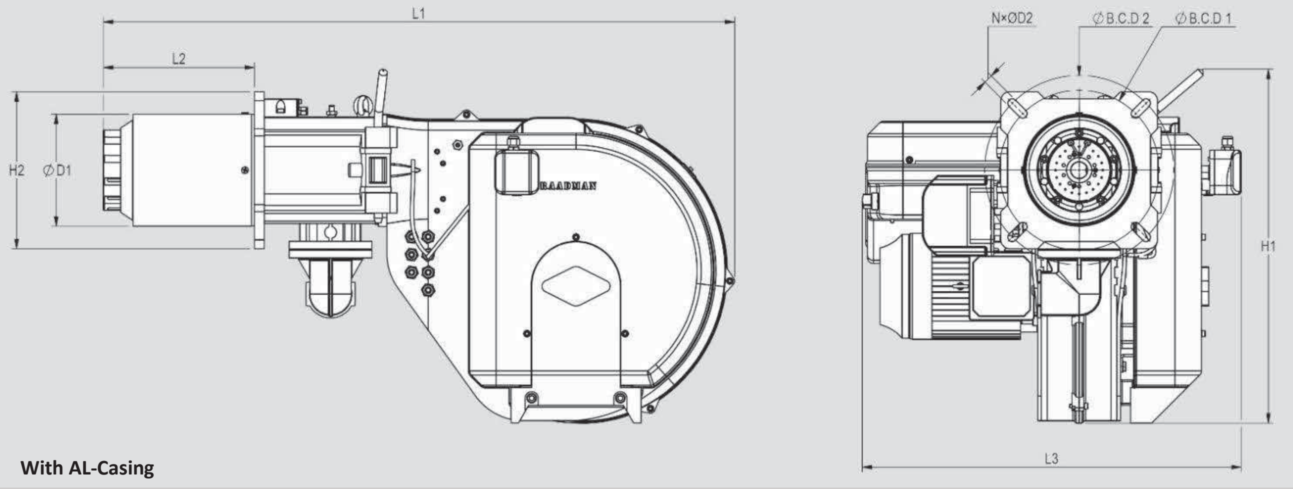
RGB-M-80



With AL-Casing

Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C.D
RGB-M-80	921	273	578	461	254	183	15	4	255

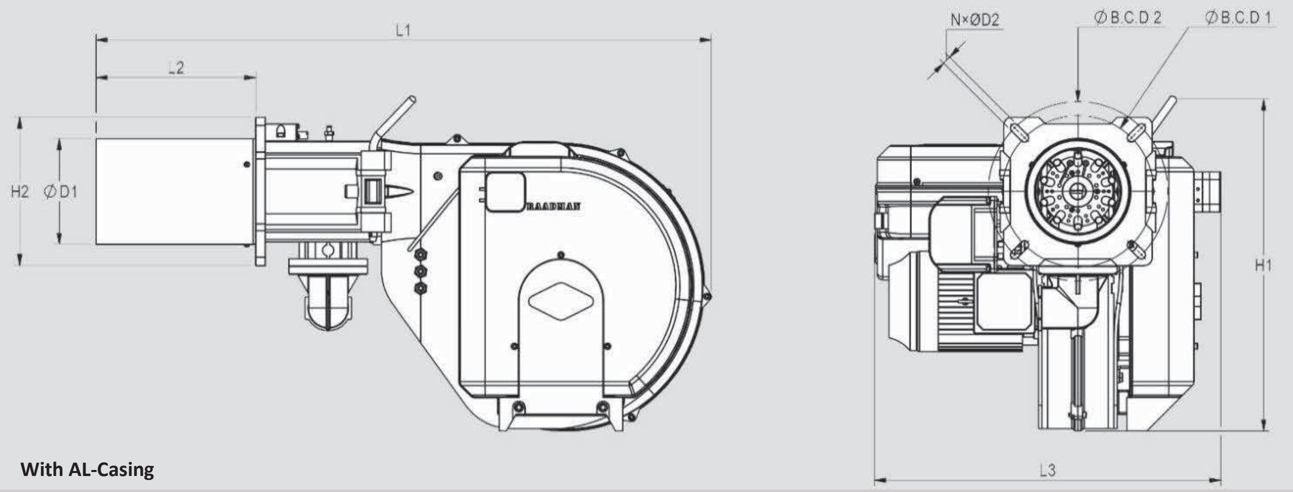
RGB-M-85/LN, RGB-M-130/LN



With AL-Casing

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-M-85/LN	1068	255	641	598	265	193	15	4	270	320
RGB-M-130/LN	1072	260	586	598	265	193	15	4	270	320

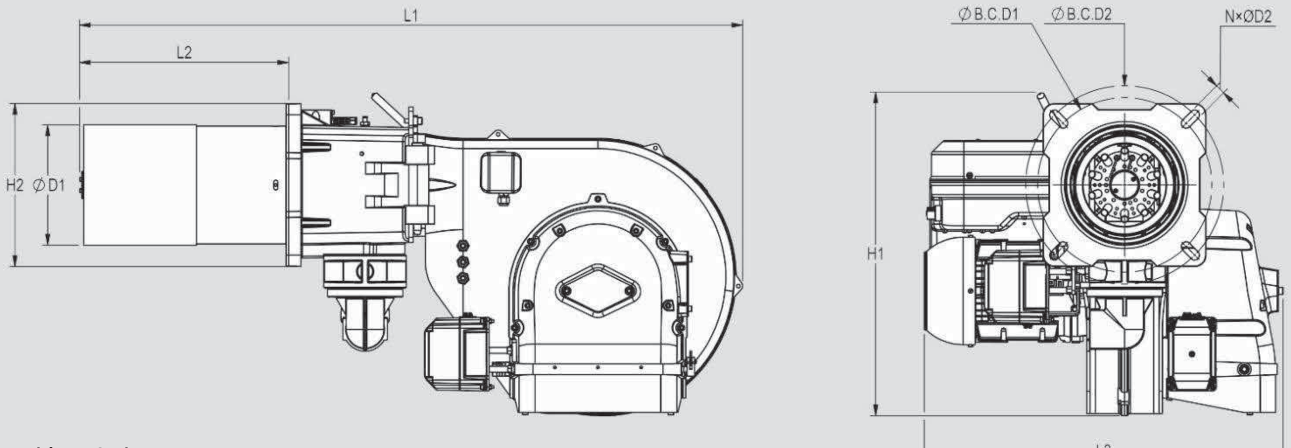
RGB-M-110, RGB-M-145



With AL-Casing

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-M-110	1066	254	638	598	265	184	15	4	270	320
RGB-M-145	1097	285	638	598	265	194	15	4	270	320

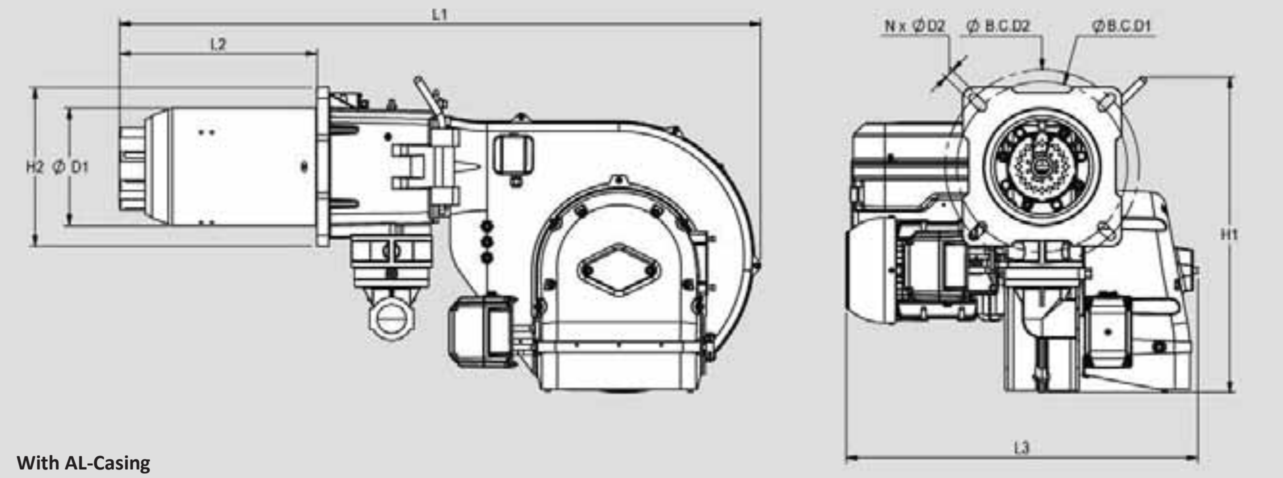
RGB-M-205



With AL-Casing

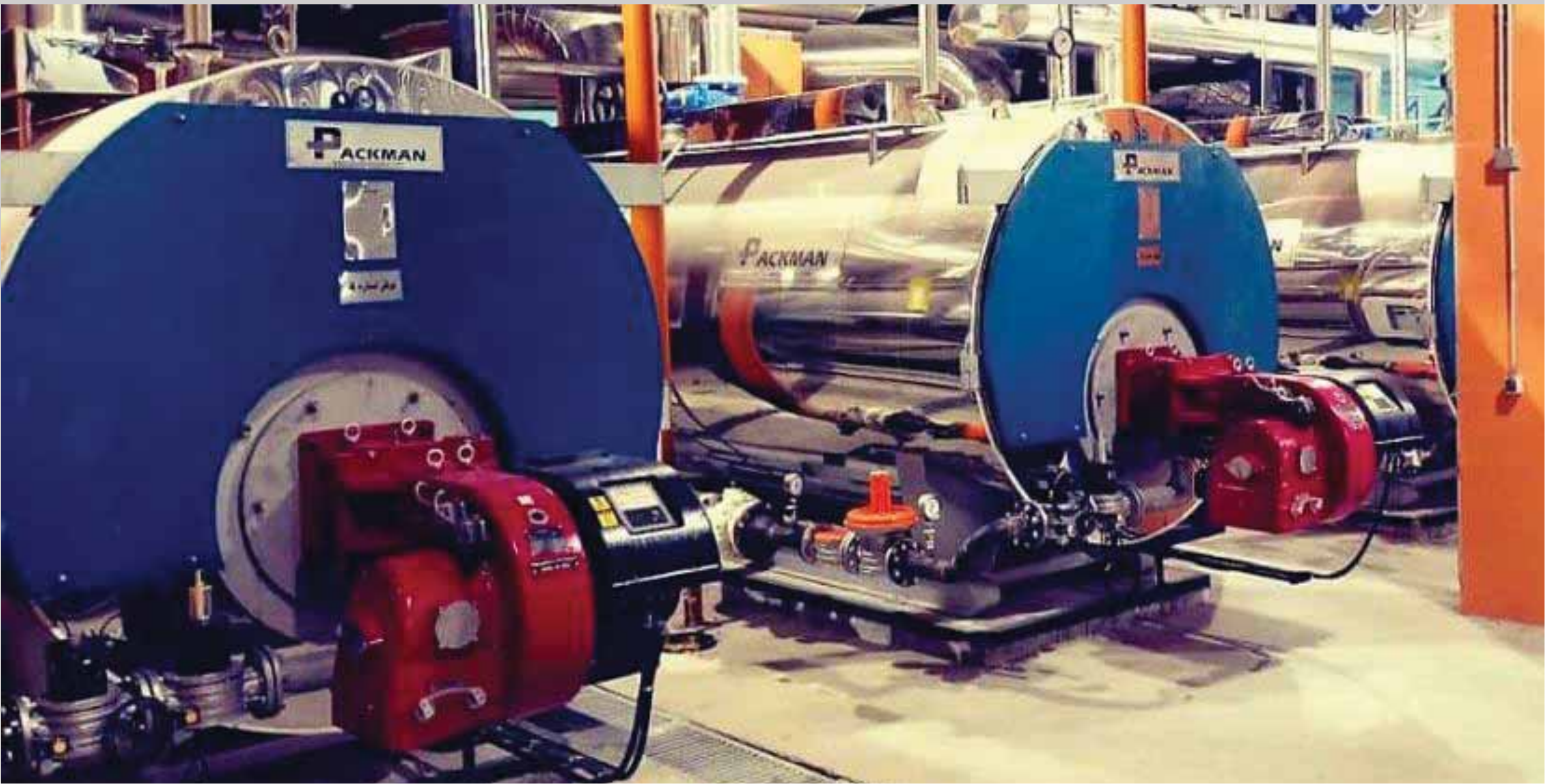
Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C.D.1	B.C.D.2
RGB-M-205	1229	387.5	665	598	301	223	18	4	323	367

RGB-M-255/LN

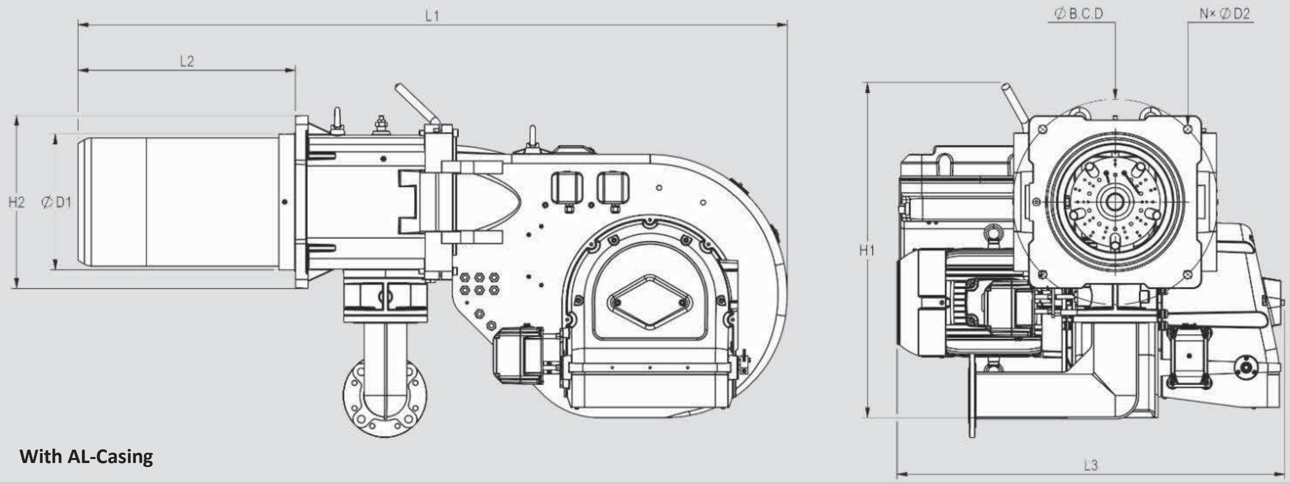


With AL-Casing

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-M-255/LN	1214	374	762	598	300	226	18	4	323	368



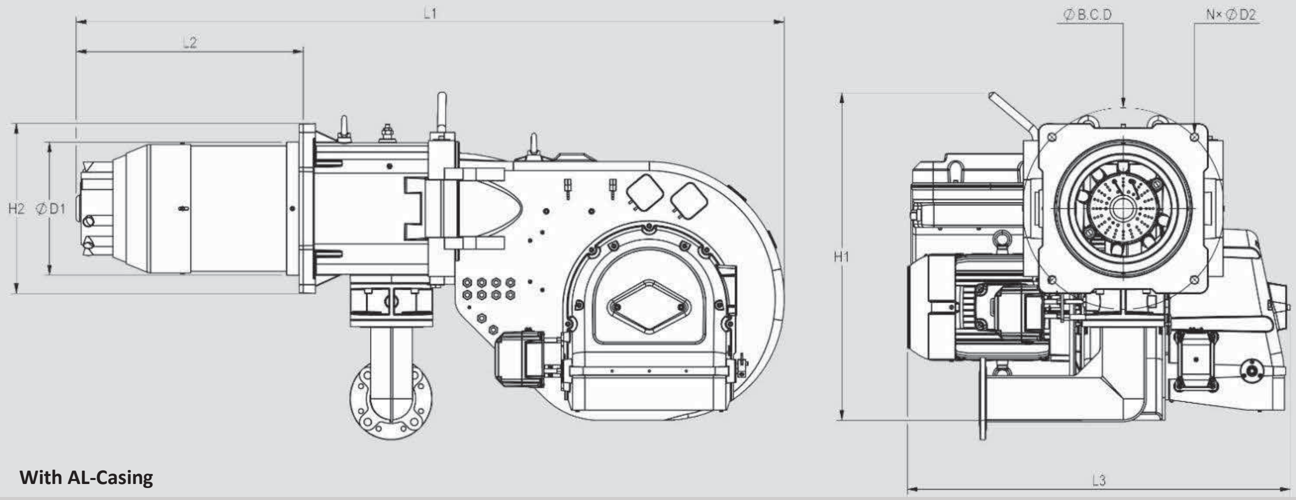
RGB-M-305, RGB-M-385



With AL-Casing

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

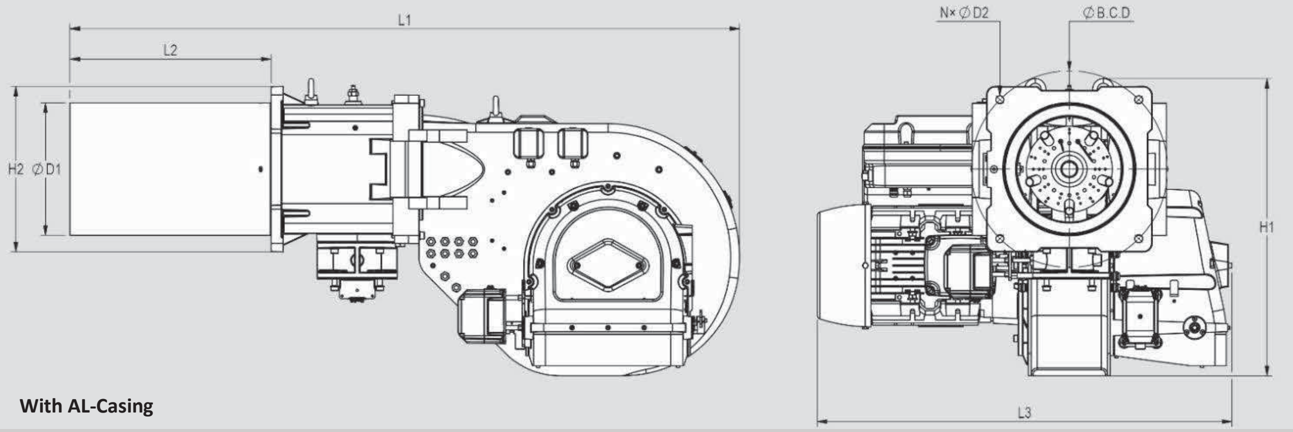
RGB-M-405/LN, RGB-M-505/LN



With AL-Casing

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

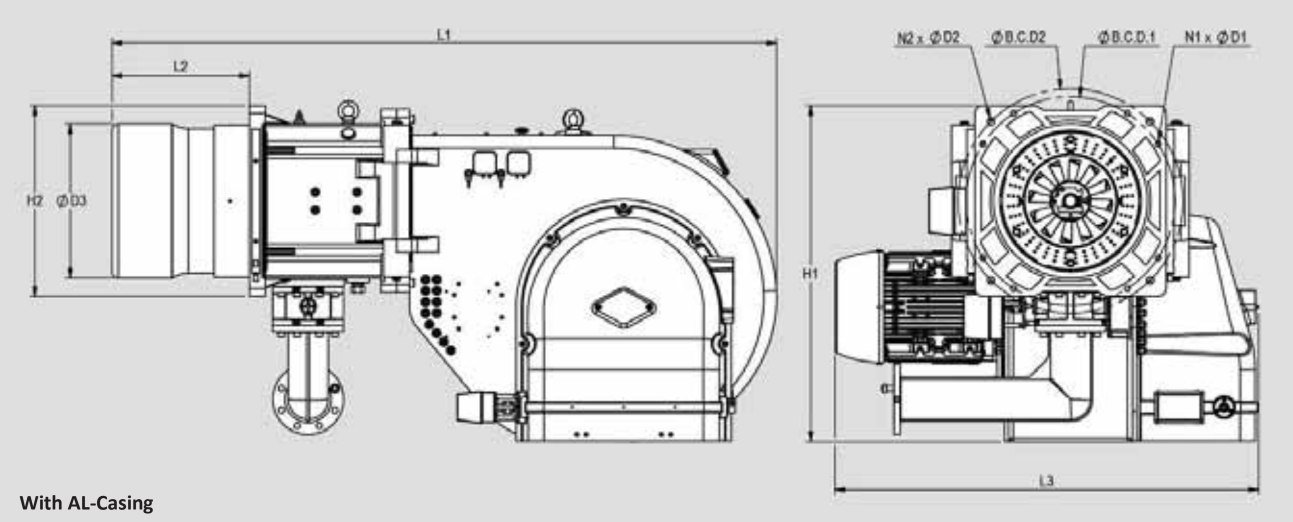
RGB-M-605



With AL-Casing

Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C. D
RGB-M-605	1671	502	1035	741	413	334	20	4	490

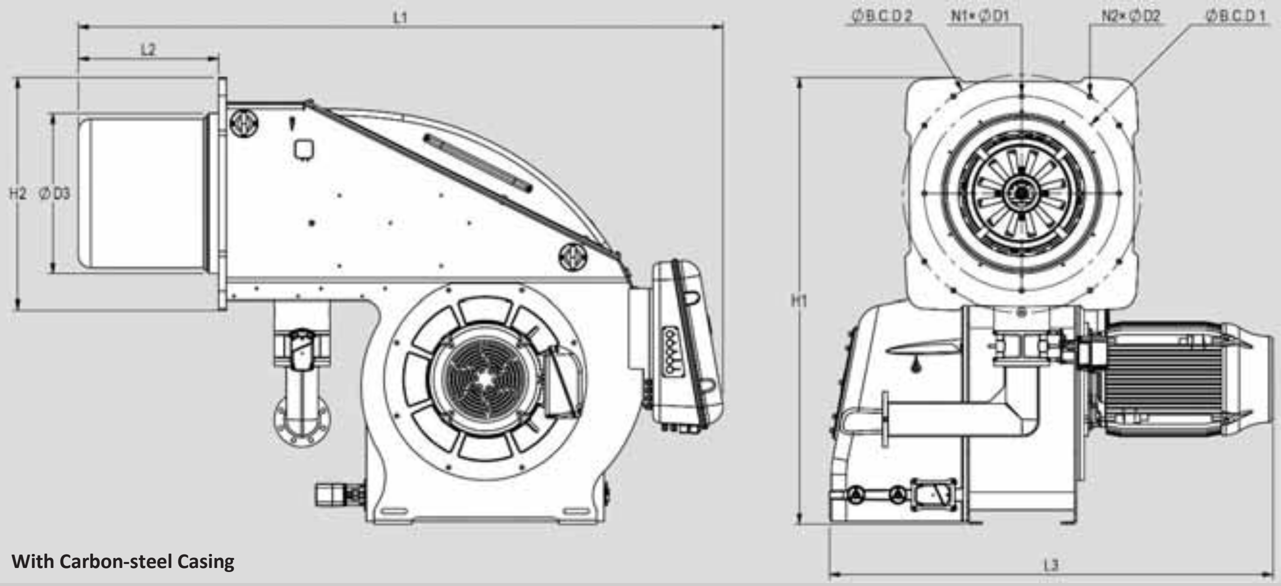
RGB-M-705, RGB-M-805, RGB-M-950, RGB-M-1050, RGB-M-1250



With AL-Casing

Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	D_3	N_1	N_2	B.C.D1*	B.C.D2*
RGB-M-705	1830	363	1123	960	501	----	22	405	---	4	----	590
RGB-M-805	1830	363	1123	960	501	----	22	405	---	4	----	590
RGB-M-950	2069	428	1328	1046	595	17.5	22	484	8	4	650	700
RGB-M-1050	2069	428	1328	1046	595	17.5	22	484	8	4	650	700
RGB-M-1250	2062	421	1314	1046	595	17.5	22	490	8	4	650	700

RGB-M-705, RGB-M-805, RGB-M-950, RGB-M-1050, RGB-M-1250, RGB-M-1550, RGB-M-1750



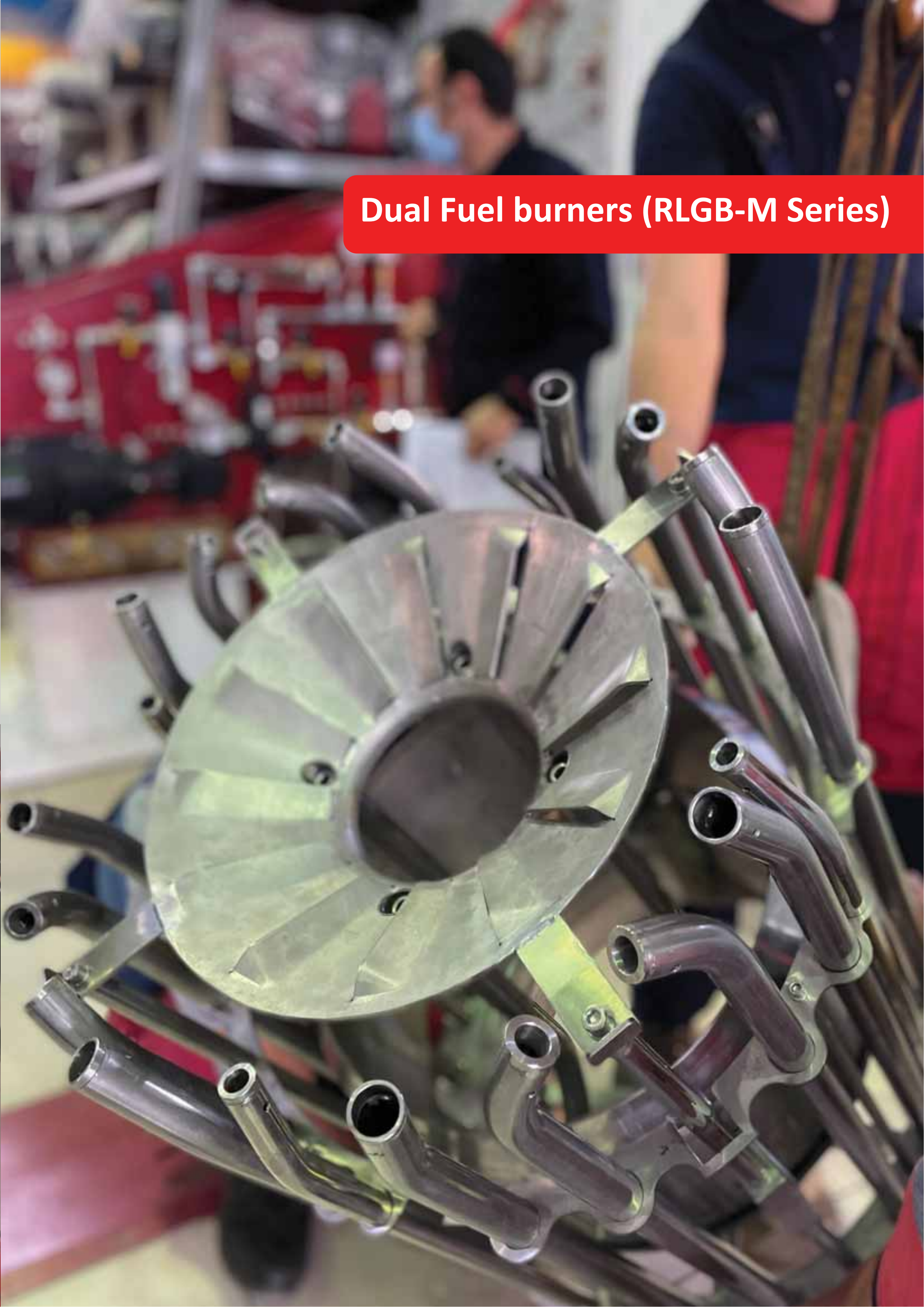
With Carbon-steel Casing

Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	D_3	N_1	N_2	B.C.D1*	B.C.D2*
RGB-M-705	2122	363	1123	960	501	----	22	405	---	4	----	590
RGB-M-805	2122	363	1123	960	501	----	22	405	---	4	----	590
RGB-M-950	2361	428	1328	1046	595	17.5	22	484	8	4	650	700
RGB-M-1050	2361	428	1328	1046	595	17.5	22	484	8	4	650	700
RGB-M-1250	2354	421	1314	1046	595	17.5	22	490	8	4	650	700
RGB-M-1550	2548	555	1752	1768	921	17	17	635	4	8	770	940.5
RGB-M-1750	2548	555	1752	1768	921	17	17	635	4	8	770	940.5

*** Note:**

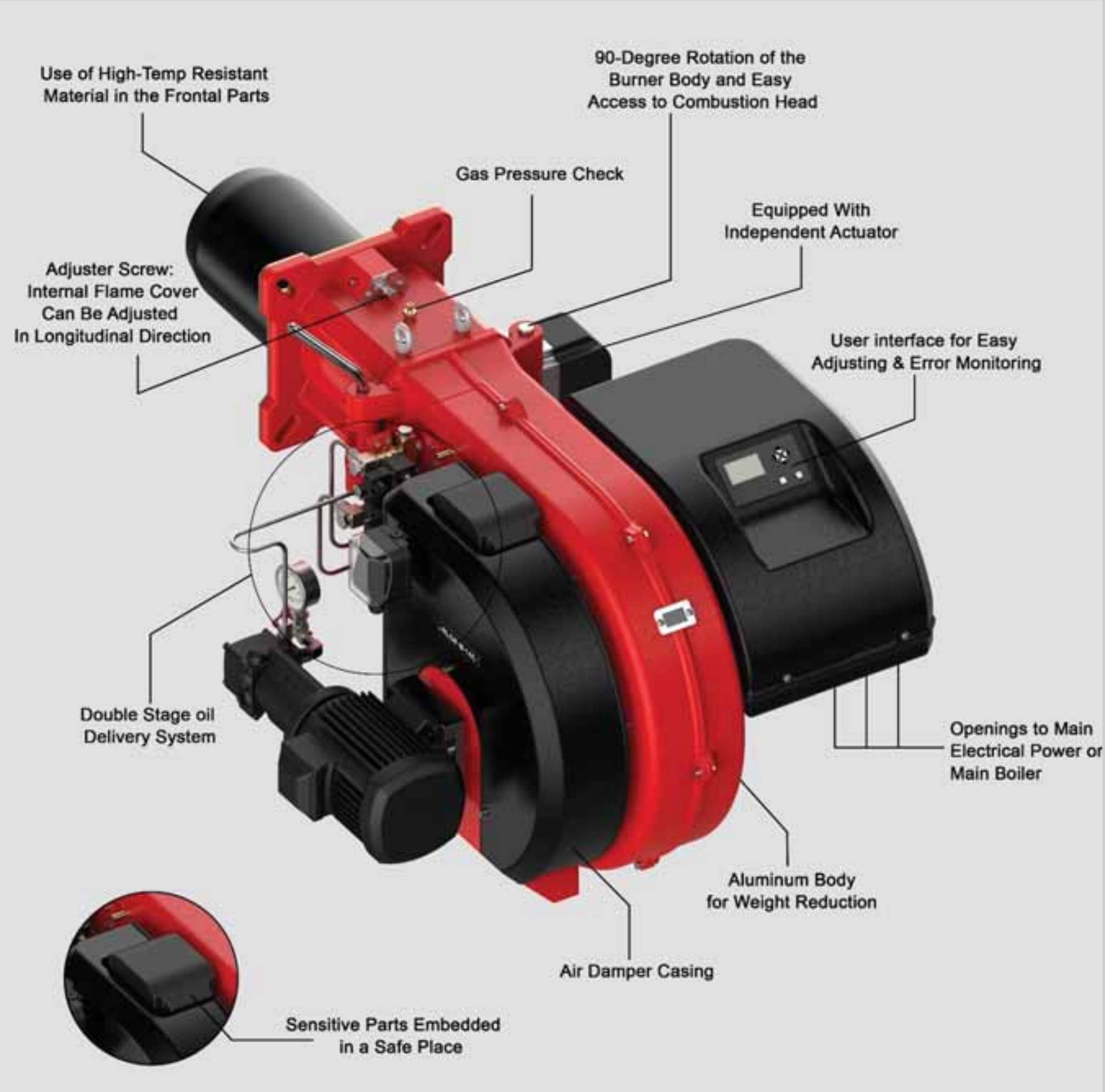
For the hole patterns of the burner flange, kindly refer to the burner technical proposals while placing an order.

Dual Fuel burners (RLGB-M Series)



Dual Fuel burners (RLGB-M Series):

RLGB-M Series or RAADMAN Modulating dual fuel burners, covering a firing range from 700 to 17000 kW, are designed for a wide range of domestic and industrial applications. These burners have been tested and evaluated based on Iran national standard ISIRI-7595 (BS-EN 676) and ISIRI-7594 (BS-EN 267) for gas and oil operation respectively. According to performed experiments, the values of CO during low excess air operation is lower than 30 mg/kWh (in some cased very close to Zero). The precise design of their combustion head results a full gas-air mixture that guarantees high efficiency levels in all various applications. These burners are equipped with LAMTEC and SIEMENS control system with capability of full air/gas ratio control throughout entire burner operating range as well as devices of well-known European companies such as Dungs, Kromschroder and Suntec. Burner superior design accompanied by high quality electronic devices have also resulted a further improvement in boiler's performance in order to decrease fuel cost and emissions.

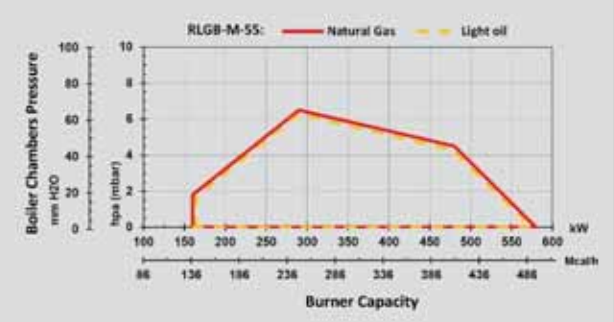


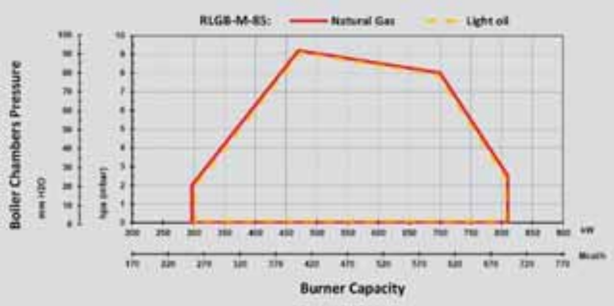
Burner Selection: Capacity and Working diagram

Modulating Dual-fuel Burner

Burner	Capacity (kW)	Turn down
RLGB-M-55	NG:160-580	1:3
	LFO: 160-580	1:3

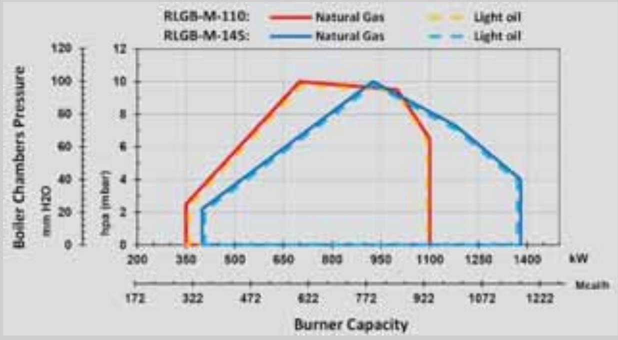
Burner	Capacity (kW)	Turn down
RLGB-M-85	NG:297-810	1:3
	LFO: 297-810	1:3

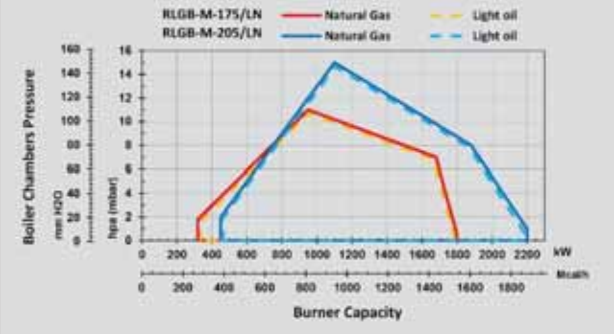




Burner	Capacity (KW)	Turn down
RLGB-M-110	NG: 350-1100	1:3
	LFO: 350-1100	1:3
RLGB-M-145	NG: 400-1380	1:4
	LFO:400-1380	1:4

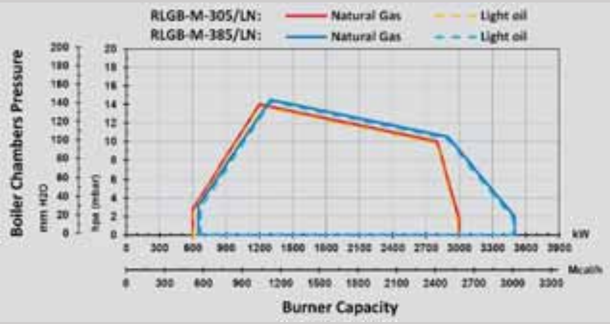
Burner	Capacity (kW)	Turn down
RLGB-M-175/LN	NG:320-1800	1:5
	LFO: 320-1800	1:5
RLGB-M-205/LN	NG:450-2200	1:5
	LFO:450-2200	1:5

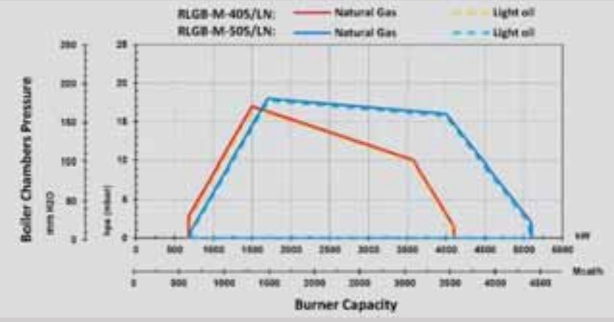




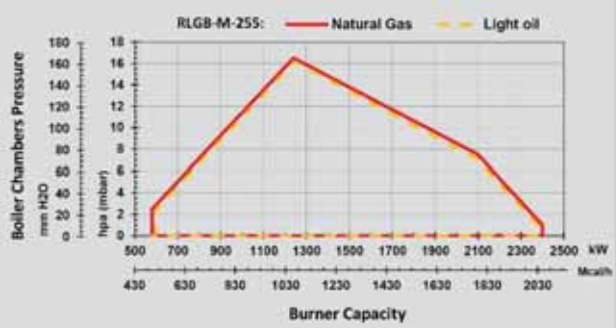
Burner	Capacity (kW)	Turn down
RLGB-M-305/LN	NG:600-3000	1:5
	LFO: 600-3000	1:5
RLGB-M-385/LN	NG:650-3500	1:5
	LFO:650-3500	1:5

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



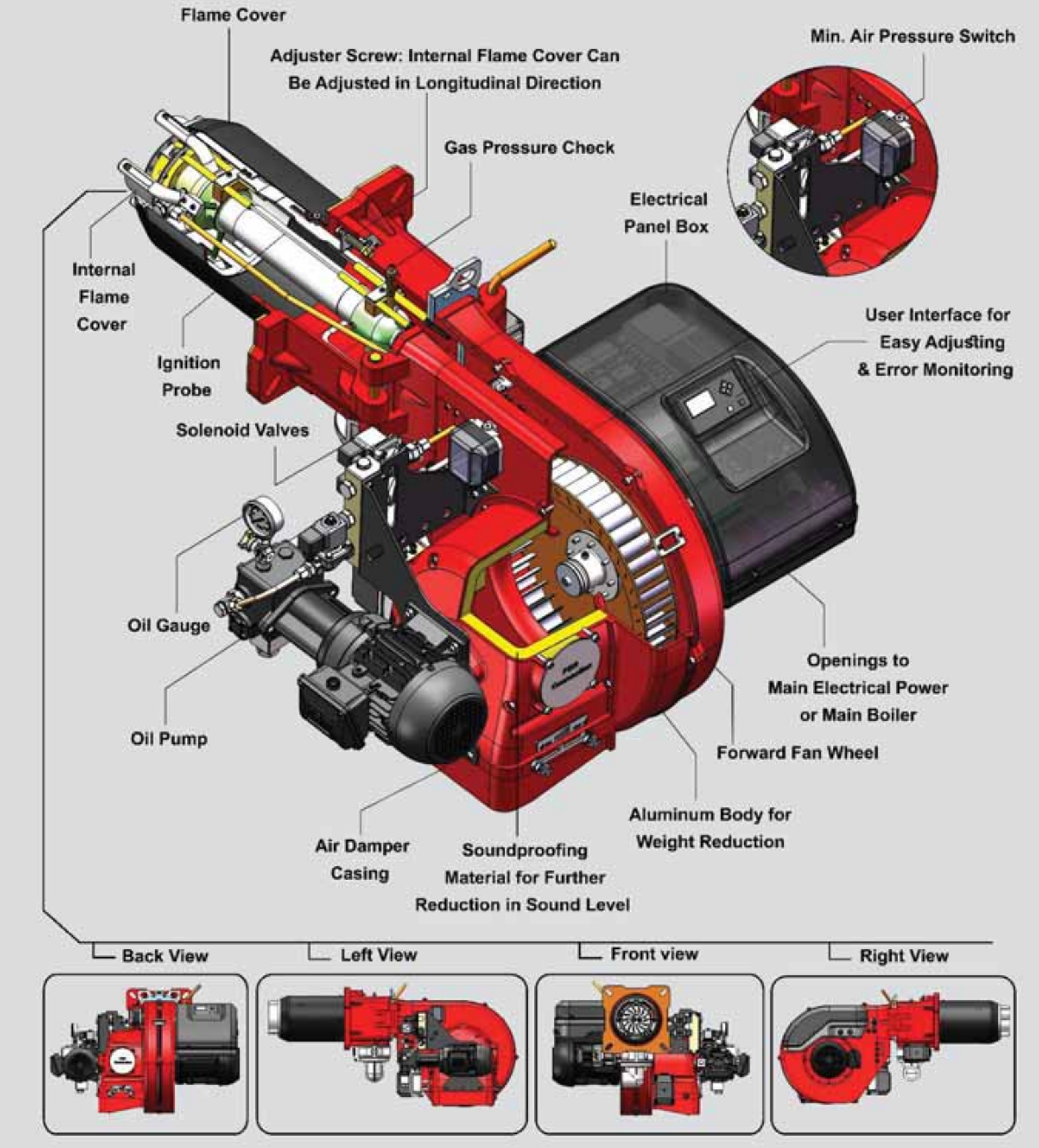


Burner	Capacity (KW)	Turn down
RLGB-M-255	NG:580-2400	1:4
	LFO:580-2400	1:4



The working diagrams for natural gas and light fuel oil are certified in accordance with BS-EN 676 and BS-EN 267 respectively.

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



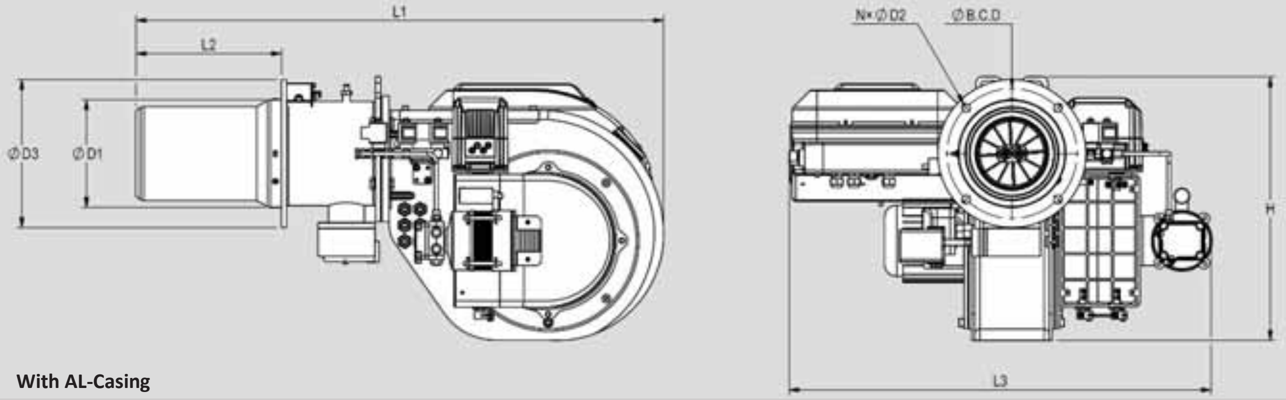
Technical data: RLGB-M-Series

- N.G operation: Electronic Modular
- LFO operation: II or III Stage

	Power system	Power management system				
Burner	Motor(kW/PH/V/HZ/rpm)	Controller		Actuator(N.M)		
		Brand	Model	Air	Fuel	Head
RLGB-M-55	0.75 /3 /380-400 /50 /2840	LAMTEC	BT340	1.2	0.8	--
RLGB-M-85	1.1 /3 /380-400 /50 /2840	LAMTEC	BT340	1.2	1.2	--
RLGB-M-110	1.5 /3 /380-400 /50 /2840	LAMTEC SIEMENS	BT340 LMV2…	1.2	1.2	--
RLGB-M-145	2.2 /3 /380-400 /50 /2840	LAMTEC SIEMENS	BT340 LMV2…	3	1.2	--
RLGB-M-175/LN	4 /3 /380-400 /50 /2840	LAMTEC SIEMENS	BT340 LMV2…	3	1.2	--
RLGB-M-205/LN	5.5 /3 /380-400 /50 /2840	LAMTEC SIEMENS	BT340 LMV2…	3	1.2	--
RLGB-M-255	5.5 /3 /380-400 /50 /2840	LAMTEC SIEMENS	BT340 LMV2…	3	1.2	--
RLGB-M-305/LN	7.5 /3 /380-400 /50 /2940	LAMTEC SIEMENS	BT340 LMV2…	3	1.2	--
RLGB-M-385/LN	7.5 /3 /380-400 /50 /2940	LAMTEC SIEMENS	BT340 LMV2…	3	1.2	--
RLGB-M-405/LN	11 /3 /380-400 /50 /2940	LAMTEC SIEMENS	BT340 LMV2…	9 10	1.2	--
RLGB-M-505/LN	11 /3 /380-400 /50 /2940	LAMTEC SIEMENS	BT340 LMV2…	9 10	1.2	--

General Dimension of RLGB-M-Series

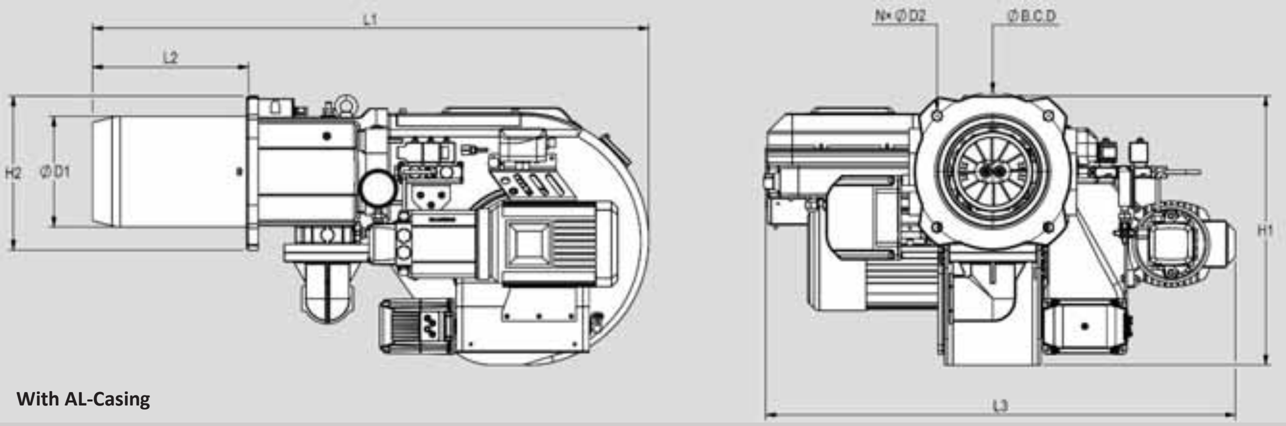
RLGB-M-55



With AL-Casing

Burner Type	L_1	L_2	L_3	H	D_1	D_2	D_3	N	B.C. D
RLGB-M-55	853	235	685	427	178	13.5	240	4	210

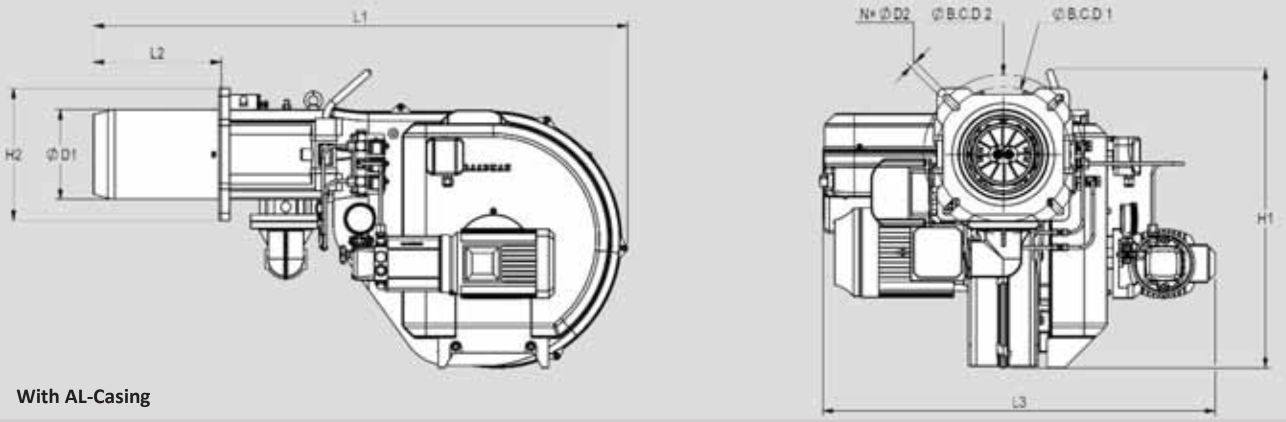
RLGB-M-85



With AL-Casing

Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C. D
RLGB-M-85	871	222.5	763	436	250	179	15	4	255

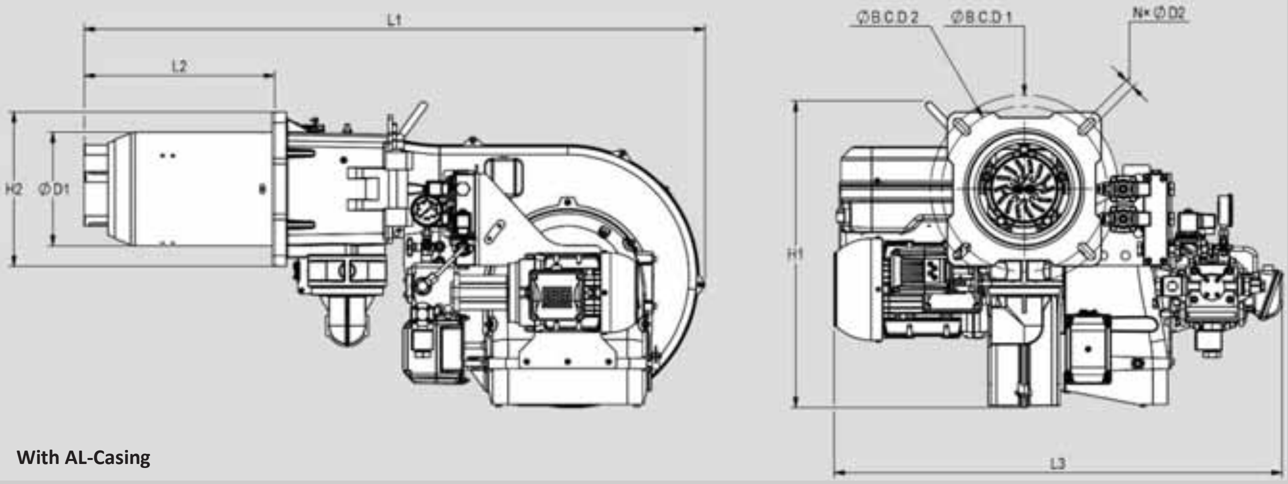
RLGB-M-110, RLGB-M-145



With AL-Casing

Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C.D1	B.C.D2
RLGB-M-110	1068	255.5	791	598	265	184	15	4	270	320
RLGB-M-145	1068	255.5	791	598	265	184	15	4	270	320

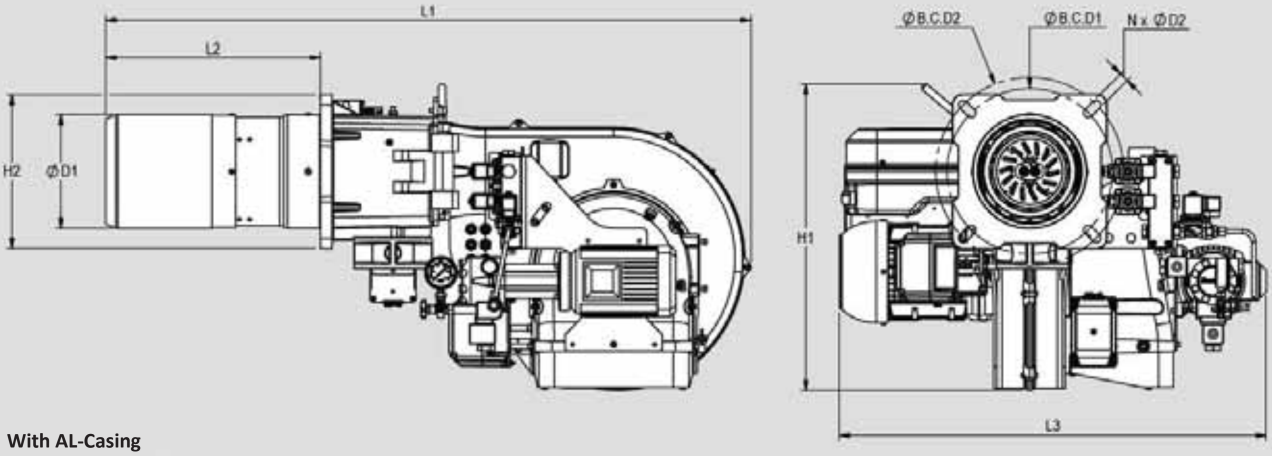
RLGB-M-175/LN, RLBB-M-205/LN



With AL-Casing

Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C.D1	B.C.D2
RLGB-M-175/205/LN	1213	373	875	598	302	226	18	4	323	367

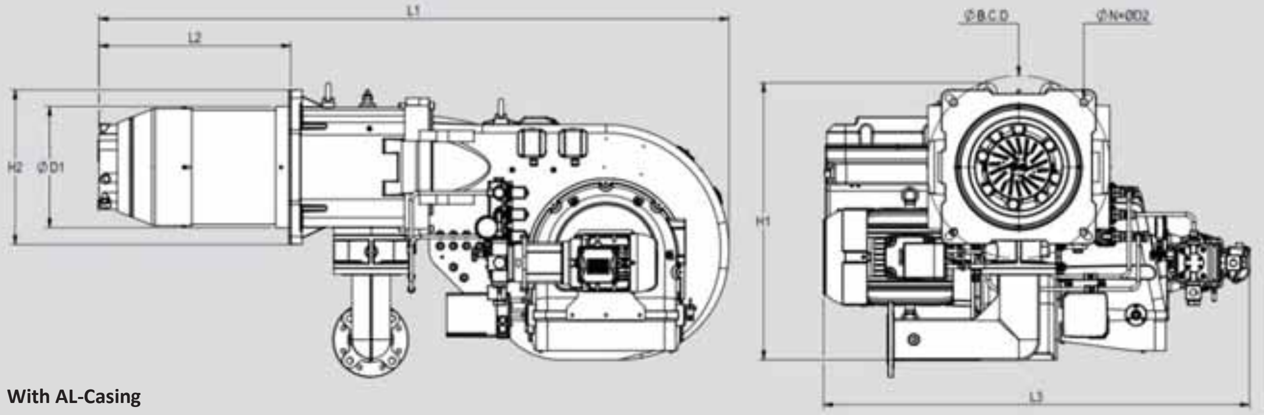
RLGB-M-255



With AL-Casing

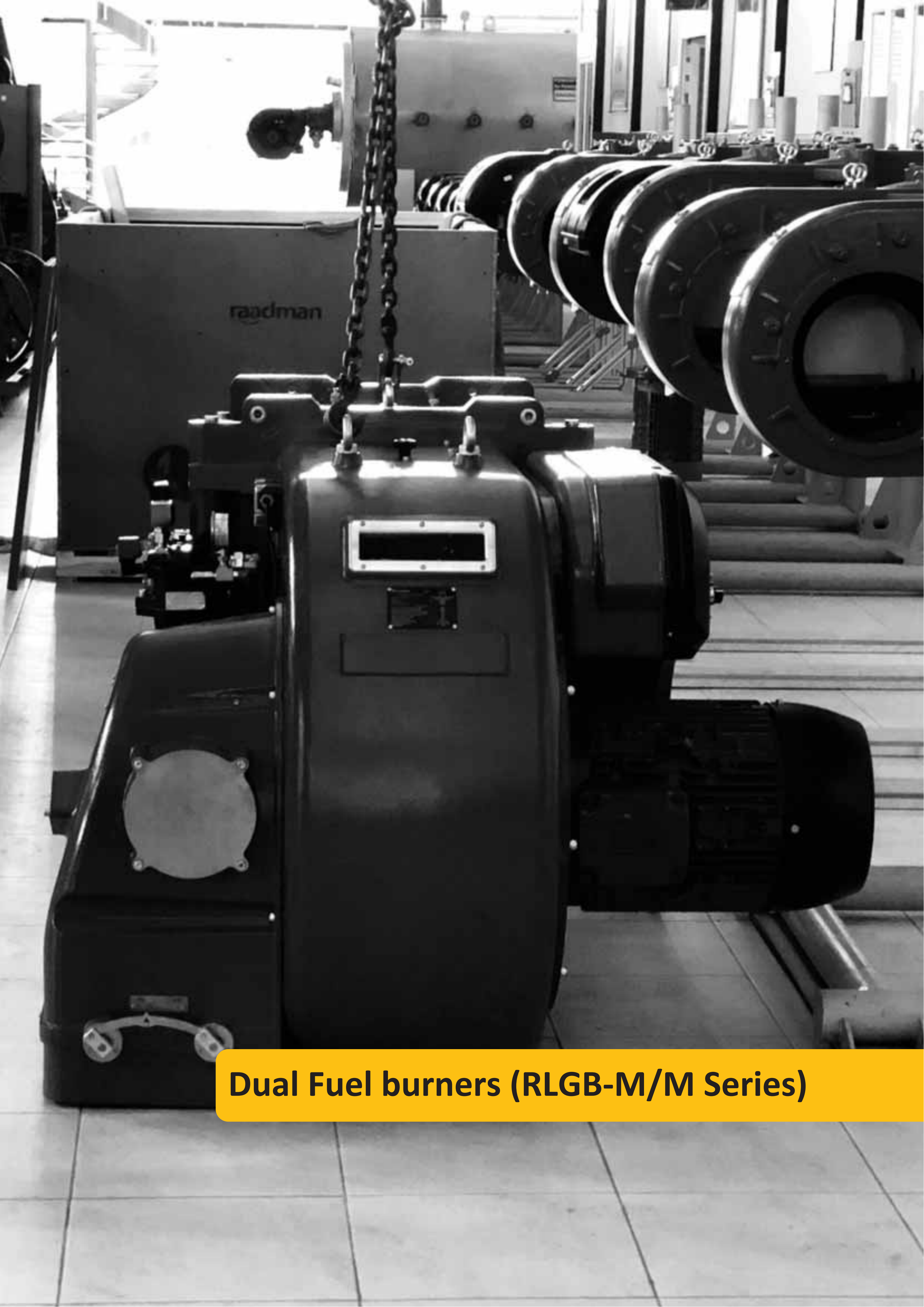
Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C.D1	B.C.D2
RLGB- M-255	1260	419	833	598	302	223	18	4	323	367

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



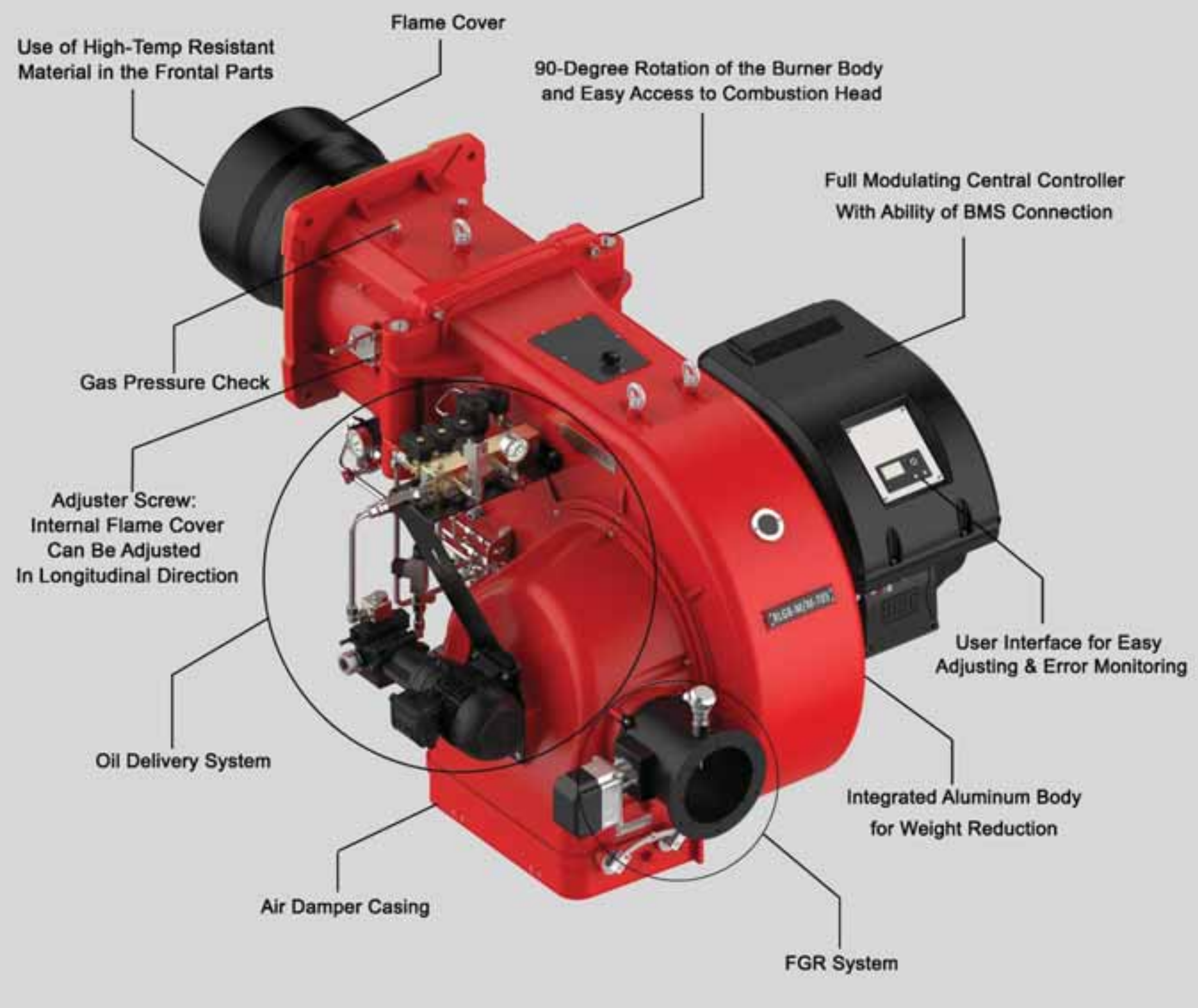
With AL-Casing

Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C. D
RLGB-M-305/LN	1683	514	1137	741	413	328	20	4	490
RLGB-M-385/LN	1683	514	1137	741	413	328	20	4	490
RLGB-M-405/LN	1683	514	1249	741	413	328	20	4	490
RLGB-M-505/LN	1683	514	1249	741	413	328	20	4	490
RLGB-M-605/LN	1680	511.5	1245	741	413	340	20	4	490



Dual Fuel burners (RLGB-M/M Series)

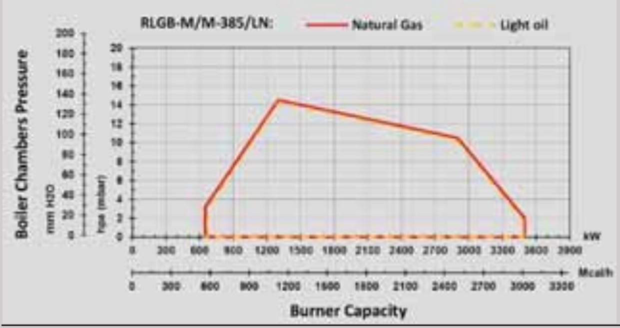
Dual Fuel burners (RLGB-M/M Series):

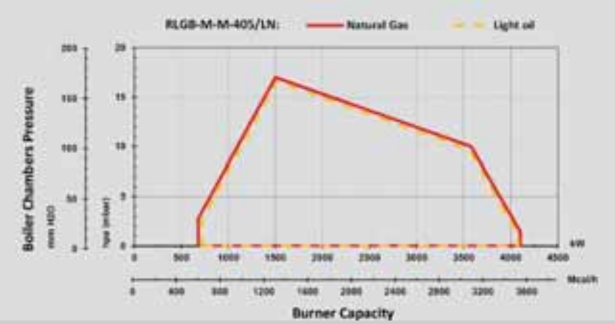


Burner Selection: Capacity and Working diagram

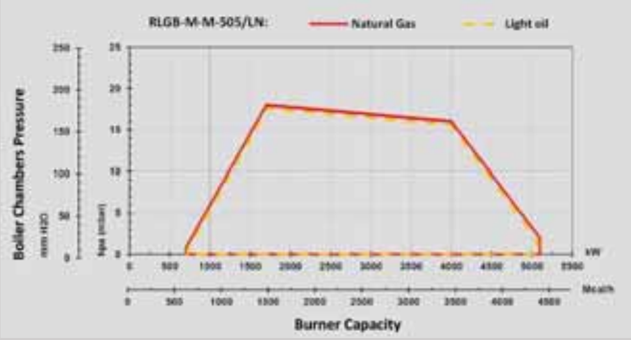
Modulating Dual-fuel Burner

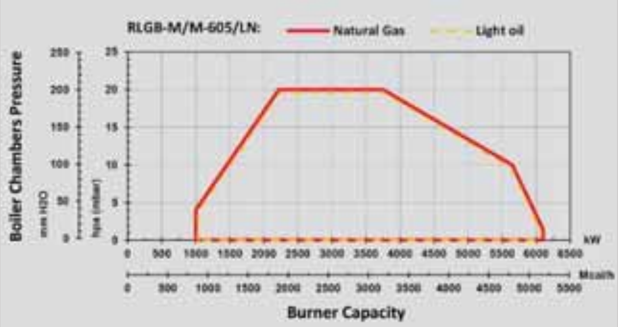
Burner	Capacity (kW)	Turn down	Burner	Capacity (kW)	Turn down
RLGB-M/M-385/LN	NG:650-3500 LFO: 650-3500	1:5 1:5	RLGB-M/M-405/LN	NG:680-4100 LFO: 680-4100	1:6 1:6



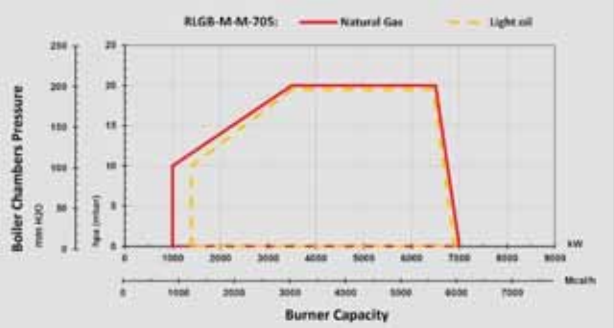


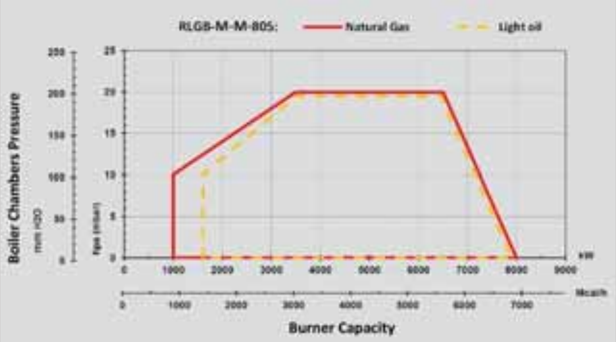
Burner	Capacity (KW)	Turn down	Burner	Capacity (KW)	Turn down
RLGB-M/M-505/LN	NG: 700-5100 LFO: 700-5100	1:7 1:7	RLGB-M/M-605/LN	NG: 1000-6100 LFO: 1000-6100	1:6 1:6



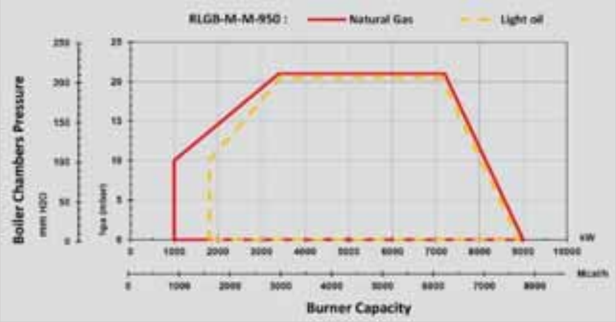


Burner	Capacity (kW)	Turn down	Burner	Capacity (kW)	Turn down
RLGB-M/M-705	NG:1000-7000 LFO: 1400-7000	1:7 1:5	RLGB-M/M-805	NG:1000-8000 LFO: 1600-8000	1:8* 1:5

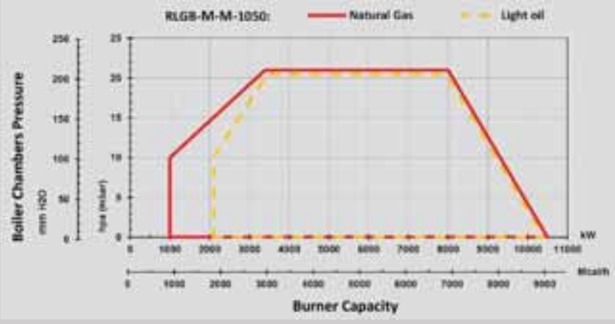




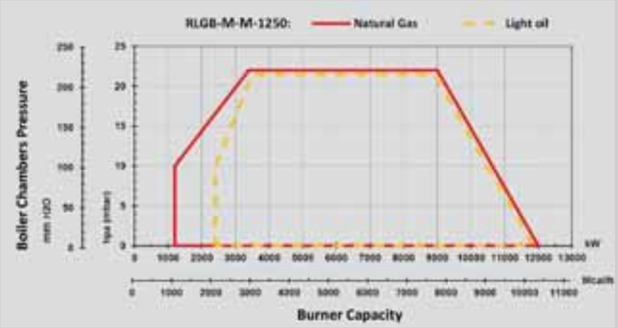
Burner	Capacity (KW)	Turn down
RLGB-M/M-950	NG: 1000-9000	1:9*
	LFO: 1800-9000	1:5



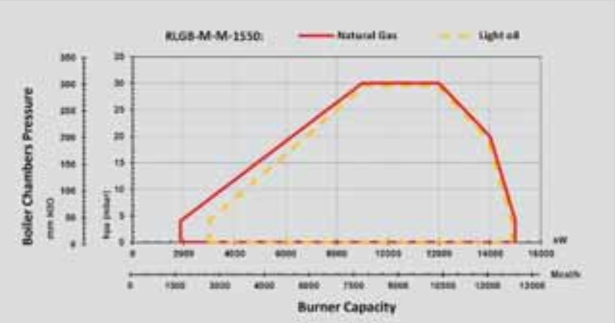
Burner	Capacity (KW)	Turn down
RLGB-M/M-1050	NG:1000-10500	1:10*
	LFO: 2000-10500	1:5



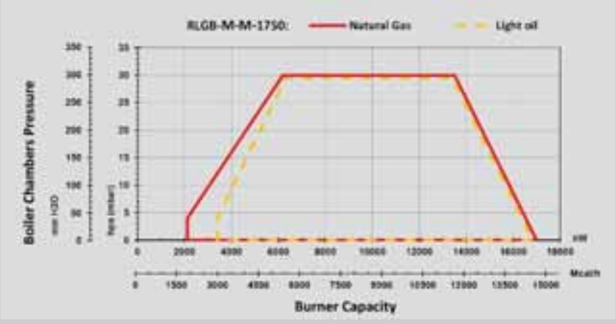
Burner	Capacity (kW)	Turn down
RLGB-M/M-1250	NG:1200-12000	1:10*
	LFO:2400-12000	1:5



Burner	Capacity (kW)	Turn down
RLGB-M/M-1550	NG:1900-15000	1:8*
	LFO: 3100-15000	1:5



Burner	Capacity (kW)	Turn down
RLGB-M/M-1750	NG:2200-17500	1:8*
	LFO:3500-17000	1:5



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* Special note: Turn-down ratio higher than (1:8, 1:9, 1:10, etc.) are accessible for the burner with the head actuator. Otherwise, without a head actuator, the maximum turn-down ratio is 1:6.

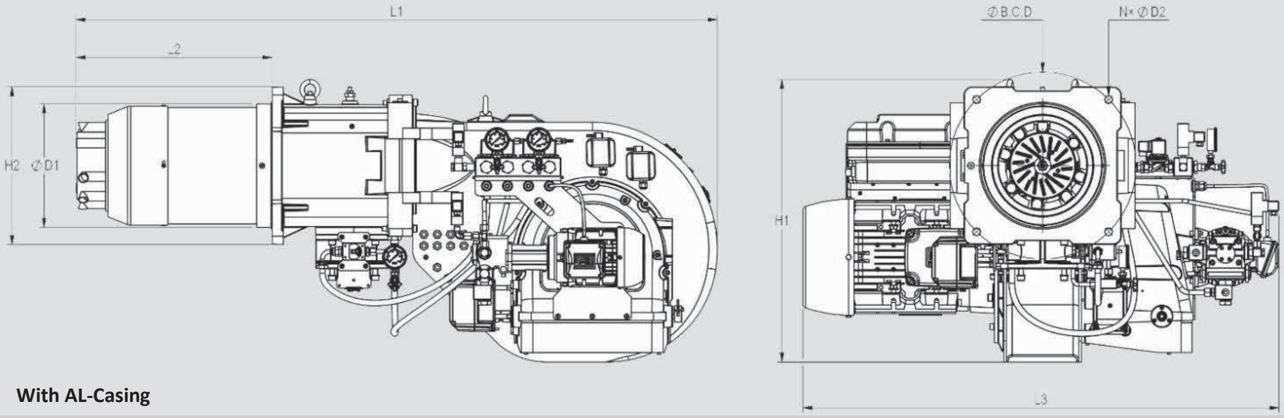
Technical data: RLGB-M/M-Series

- N.G operation: Electronic Modular
- LFO operation: Electronic Modular

	Power system	Power management system				
Burner	Motor(kW/PH/V/HZ/rpm)	Controller		Actuator (N.M)		
		Brand	Name	Air	Fuel	Head
RLGB-M/M-385/LN	7.5 /3 /380-400 /50 /2840	LAMTEC	BT340	3	3	--
		SIEMENS	LMV2…			
RLGB-M/M-405/LN	11 /3 /380-400 /50 /2840	LAMTEC	BT340	9	3	--
		SIEMENS	LMV2…	10		
RLGB-M/M-505/LN	11 /3 /380-400 /50 /2840	LAMTEC	BT340	9	3	--
		SIEMENS	LMV2…	10		
RLGB-M/M-605/LN	15 /3 /380-400 /50 /2840	LAMTEC	BT340	9	3	--
		SIEMENS	LMV2…	10		
RLGB-M/M-705	18.5/3 /380-400 /50 /2840	LAMTEC	BT340	9	3	--
		SIEMENS	LMV2…	10		
RLGB-M/M-805	18.5/3 /380-400 /50 /2840	LAMTEC	ETAMATIC-OEM	20	6	20
		SIEMENS	LMV5…		20	
RLGB-M/M-950	22/3 /380-400 /50 /2840	LAMTEC	ETAMATIC-OEM	20	6	20
		SIEMENS	LMV5…		20	
RLGB-M/M-1050	22/3 /380-400 /50 /2840	LAMTEC	ETAMATIC-OEM	20	6	20
		SIEMENS	LMV5…		20	
RLGB-M/M-1250	30/3 /380-400 /50 /2840	LAMTEC	ETAMATIC-OEM	20	6	20
		SIEMENS	LMV5…		20	
RLGB-M/M-1550	45/3 /380-400 /50 /2900	LAMTEC	ETAMATIC-OEM	20	6	30
		SIEMENS	LMV5…		20	37
RLGB-M/M-1750	55/3 /380-400 /50 /2900	LAMTEC	ETAMATIC-OEM	20	6	30
		SIEMENS	LMV5		20	37

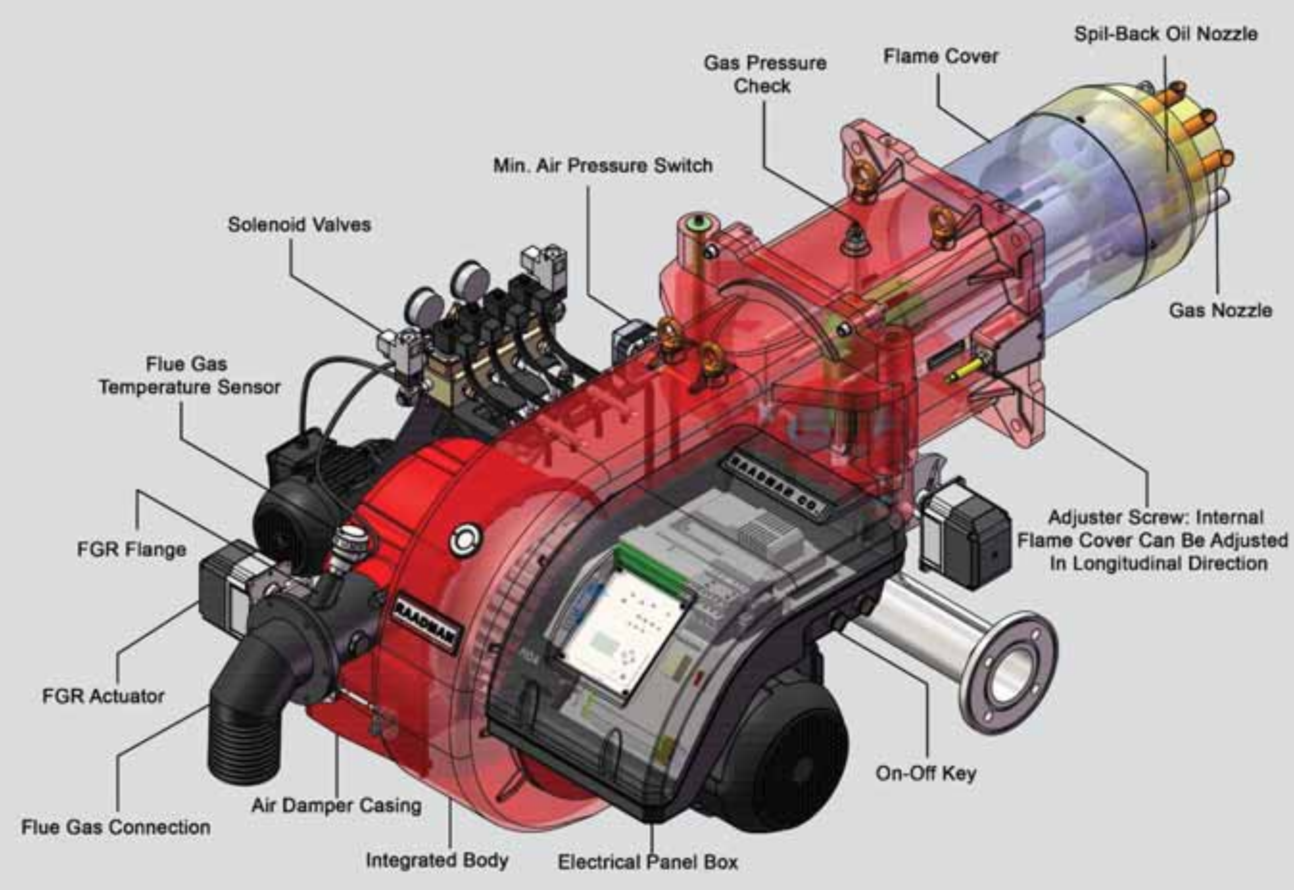
General Dimension of RLGB-M/M-Series

RLGB-M/M-385/LN, RLGB-M/M-405/LN, RLGB-M/M-505/LN, RLGB-M/M-605/LN

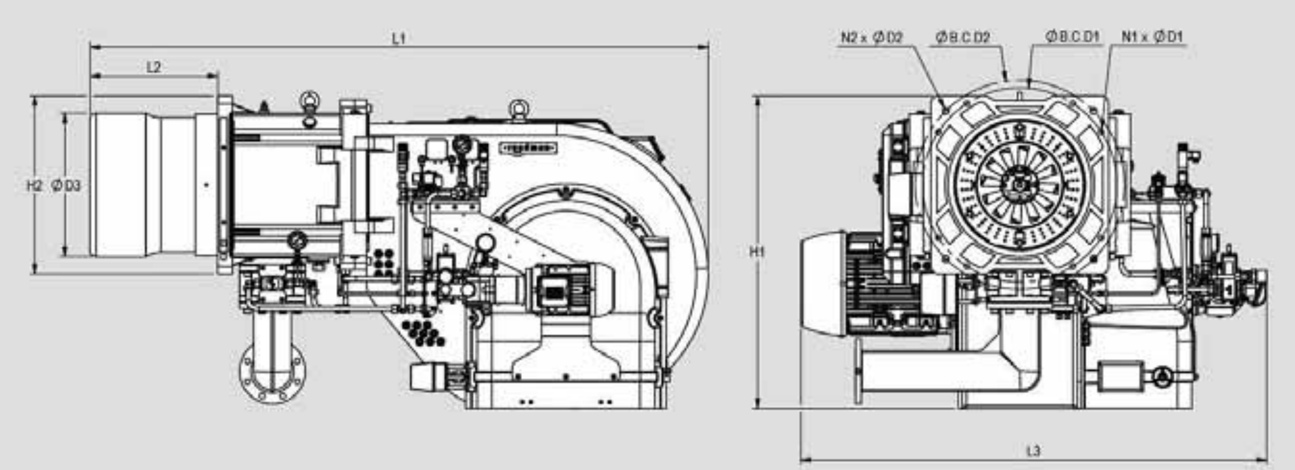


With AL-Casing

Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	N	B.C. D
RLGB-M/M-385/LN	1683	514	1249	741	413	328	20	4	490
RLGB-M/M-405/LN	1683	514	1249	741	413	328	20	4	490
RLGB-M/M-505/LN	1683	514	1249	741	413	328	20	4	490
RLGB-M/M-605/LN	1680	511.5	1245	741	413	340	20	4	490



RLGB-M/M-705, RLGBM/M-805, RLGB-M/M-950, RLGB-M/M-1050, RLGB-M/M-1250

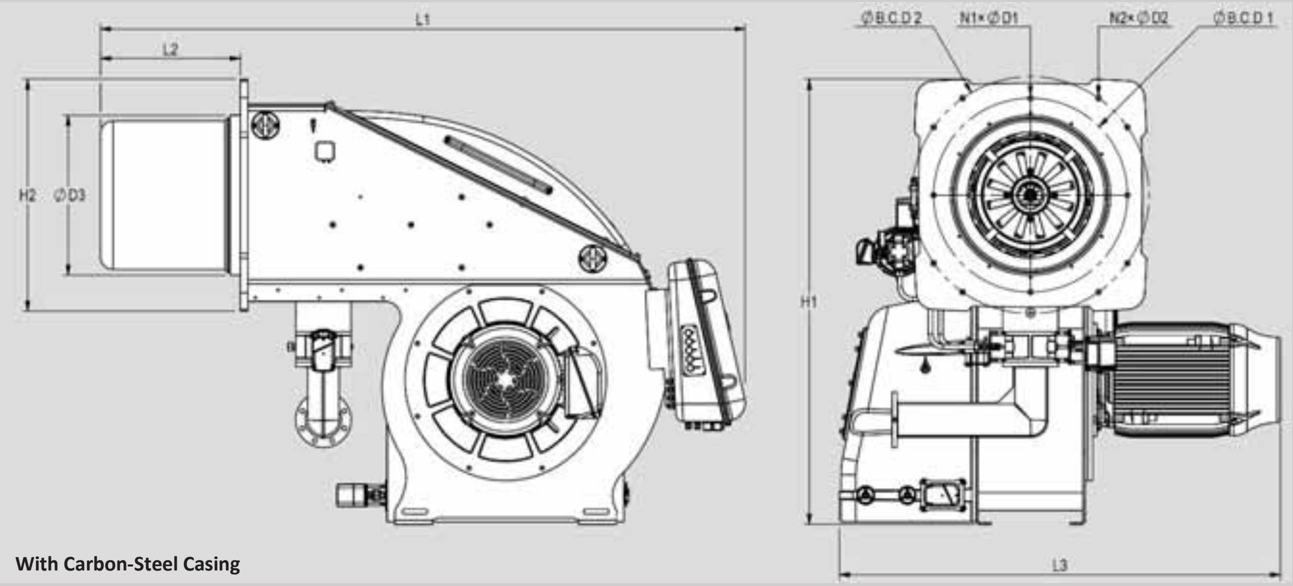


With AL-Casing

Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	D_3	N_1	N_2	B.C.D1*	B.C.D2*
RLGB-M/M-705	1830	363	1371	960	502	----	22	405	---	4	----	590
RLGB-M/M-805	1830	363	1371	960	502	----	22	405	---	4	----	590
RLGB-M/M-950	2069	428	1559	1046	595	17.5	22	484	8	4	650	700
RLGB-M/M-1050	2069	428	1559	1046	595	17.5	22	484	8	4	650	700
RLGB-M/M-1250	2062	428	1609	1046	595	17.5	22	490	8	4	650	700

RLGB-M/M-705, RLGBM/M-805, RLGB-M/M-950, RLGB-M/M-1050, RLGB-M/M-1250

RLGB-M/M-1550, RLGB-M/M-1750



With Carbon-Steel Casing

Burner Type	L_1	L_2	L_3	H_1	H_2	D_1	D_2	D_3	N_1	N_2	B.C.D1*	B.C.D2*
RLGB-M/M-705	2122	363	1123	960	501	---	22	405	---	4	----	590
RLGB-M/M-805	2122	363	1123	960	501	---	22	405	---	4	----	590
RLGB-M/M-950	2361	428	1312	1046	595	17.5	22	480	8	4	650	700
RLGB-M/M-1050	2361	428	1312	1046	595	17.5	22	480	8	4	650	700
RLGB-M/M-1250	2354	420	1312	1046	595	17.5	22	496	8	4	650	700
RLGB-M/M-1550	2548	555	1752	1768	921	17	17	635	4	8	770	940.5
RLGB-M/M-1750	2548	555	1752	1768	921	17	17	635	4	8	770	940.5

* **Note:** For the hole patterns of the burner flange, kindly refer to the burner technical proposals while placing an order.


PACKMAN

Gas train components

Ball valve: To isolate the system from any other train in boiler room (Excluded from the burner gas train)

Filter: To protect rest of the system from any debris or dust that may be carried with gas stream. Debris may for example consist of parts accidently left in the pipe during construction.

Regulator: To keep the input pressure of a fluid to a desired value at its output. Based on the input pressure of the gas line, they are divided in two categories: Low pressure regulator, High pressure regulator.

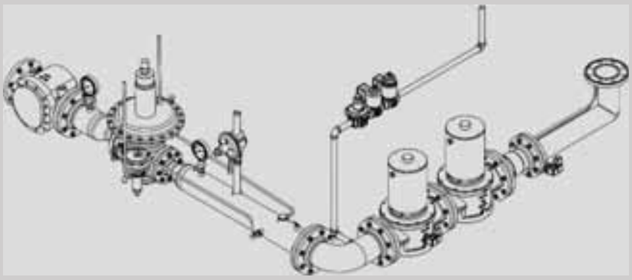
Safety Valve: Single-stage solenoid valve, normally when closed, fast opening, fast closing, manual limitation of flowing gas volume by adjusting main volume.

Main valve: Single-stage solenoid valve, normally when closed, slow opening, fast closing. Opening time adjustment with fast stroke range, Main volume adjustment.

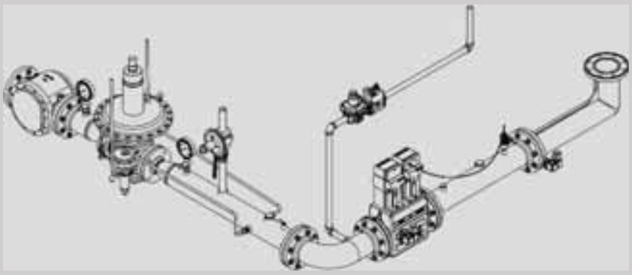
Based on ISIR-7595 and ISIRI-7594 (BS-EN 676 and BS-EN 267), any burners higher than 70 Kw must include two gas valves for further safety operation.

Gas train selection

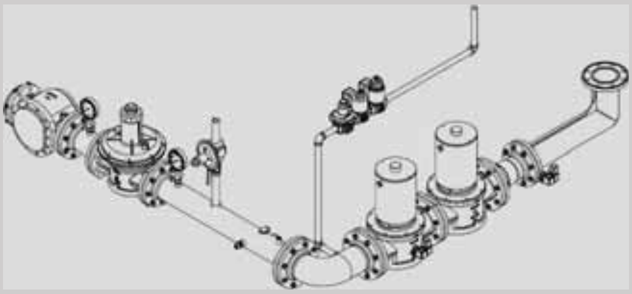
High-pressure gas supply, standard version
Used when:
Input pressure is between 360 mbar and 4 bar.
The total pressure loss in gas valves, Butterfly gate valve and combustion chamber resistance does not exceed 200 mbar.

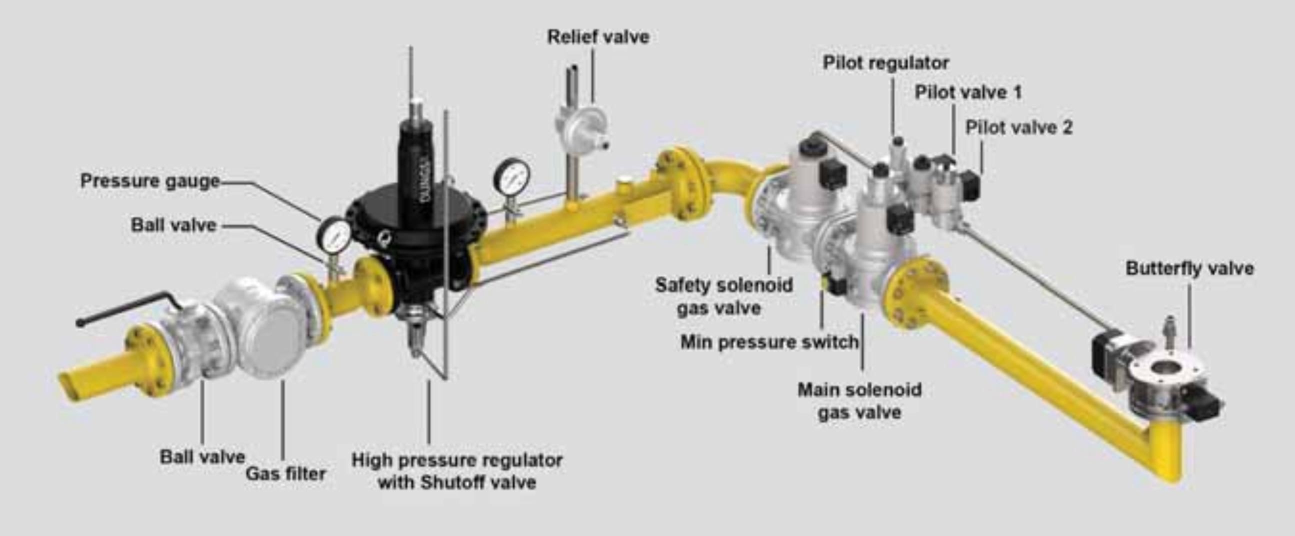


High-pressure gas supply, Multi bloc version
Used when:
Input pressure is between 360 mbar and 4 bar.
The total pressure loss in gas valves, Butterfly gate valve and combustion chamber resistance does not exceed 350 mbar.



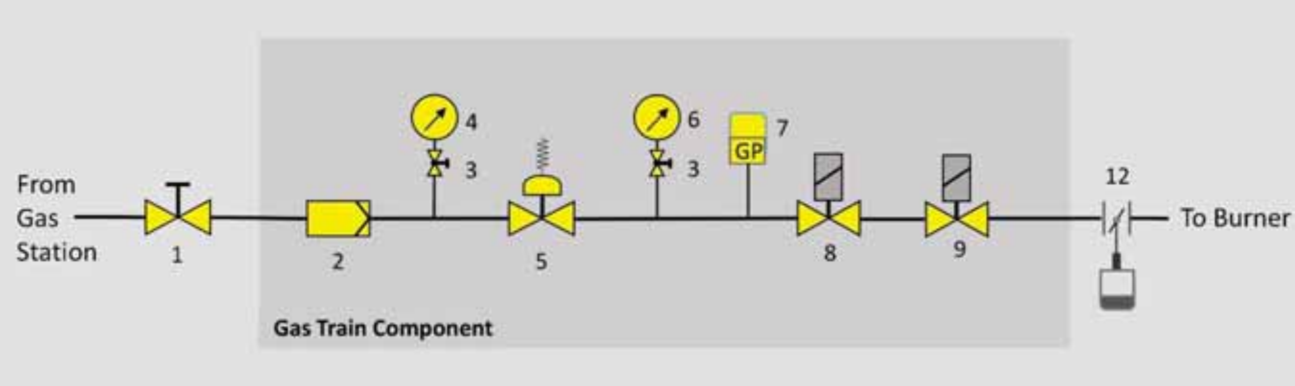
Low-pressure gas supply
Input pressure is < 360 bar
The total pressure loss in gas valves, Butterfly gate valve and combustion chamber resistance does not exceed 200 mbar.



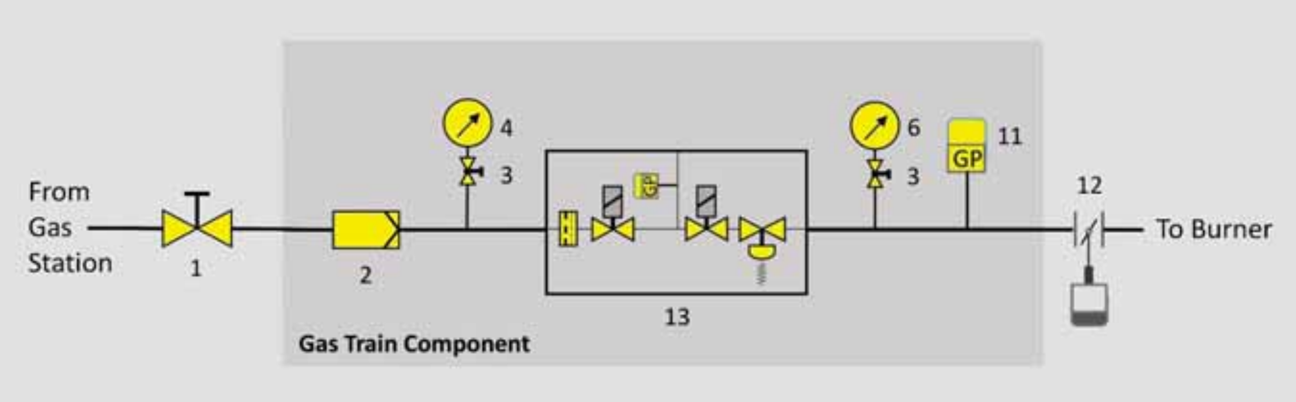


Gas Train Diagram

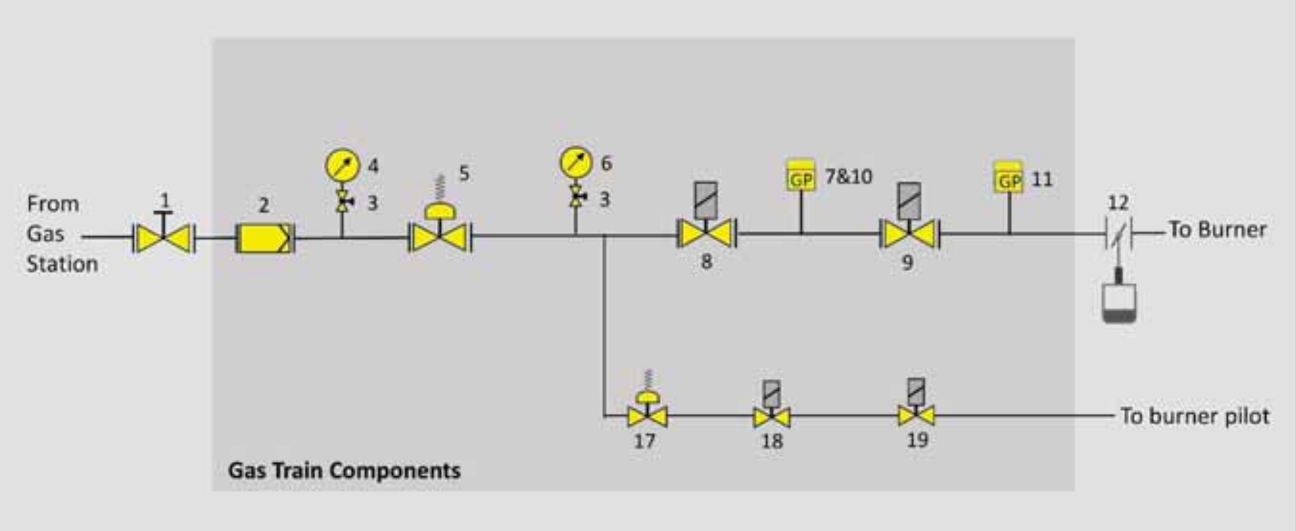
GT1 (Pressure input<360 mbar, separated items)



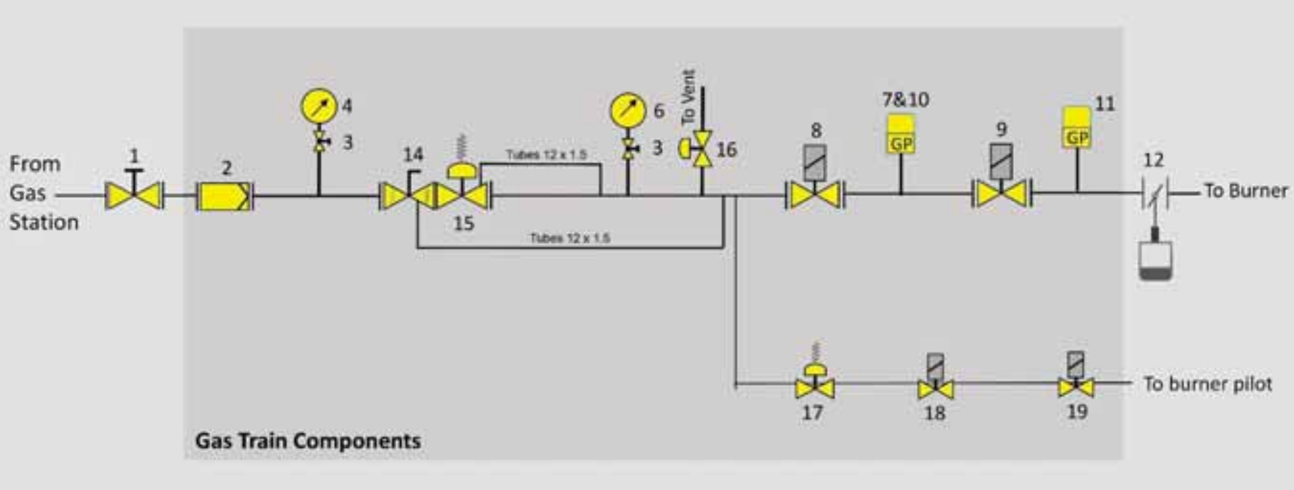
GT2 (Pressure input<360 mbar, multi bloc gas train)



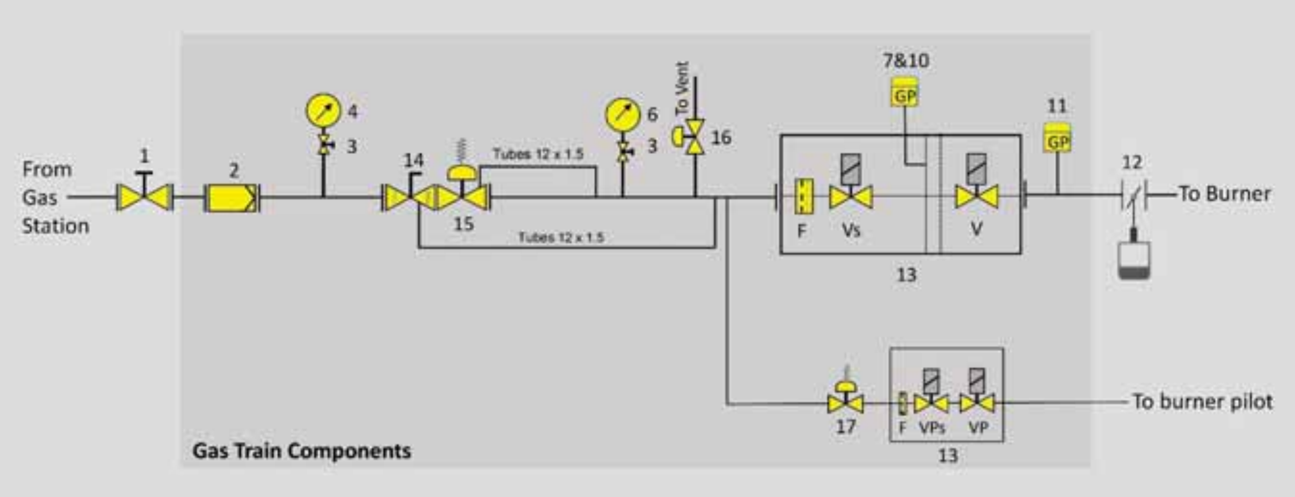
GT3 (Pressure input<360 mbar, separated gas train, with pilot)



GT4 (Pressure input>360 mbar, separated gas train, with pilot)



GT5 (Pressure input>360 mbar, multi block gas train, with pilot)



1: Ball valve
2: Gas filter
3: Push button 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: Leak Test gas pressure switch
11: Max gas pressure switch
12: Butterfly valve
13: Multi-Block Solenoid Valve
14: Shut-off valve
15: High pressure regulator
16: Relief valve
17: Pilot regulator
18: Pilot valve 1
19: Pilot valve 2

Gas Train Size

RGB-M Series

	Gas model	Gas train size	Main Solenoid valve size	ΔP B. V	ΔP C.H* (mbar)
RGB-M-55	GT-1	Rp 1 ½	Rp 1 ½	2	7.2
	GT-2	Rp 1 ½	Rp 1 ½		
RGB-M-80	GT-1	Rp 1 ½	Rp 1 ½	2	10.3
	GT-2	Rp 1 ½	Rp 1 ½		
RGB-M-85/LN	GT-1	Rp 1 ½	Rp 1 ½	2	11.7
	GT-2	Rp 1 ½	Rp 1 ½		
RGB-M-110	GT-1	Rp 2	Rp 2	2	9
	GT-2	Rp 2	Rp 2		
RGB-M-130/LN	GT-1	Rp 2	Rp 2	2	22.5
	GT-2	Rp 2	Rp 2		
RGB-M-145	GT-1	Rp 2	Rp 2	2	8.6
	GT-2	Rp 2	Rp 2		
RGB-M-205	GT-1	Rp 2	Rp 2	3	14.5
	GT-2	Rp 2	Rp 2		
RGB-M-255/LN	GT-1	DN65	DN65	3	24.9
	GT-2	Rp 2	Rp 2		
RGB-M-305	GT-1	DN65	DN65	4	20.6
	GT-2	Rp 2	Rp 2		
RGB-M-385	GT-1	DN80	DN80	4	31.7
	GT-2	DN65	DN65		
RGB-M-405/LN	GT-1	DN80	DN80	4	47
	GT-2	DN65	DN65		
RGB-M-505/LN	GT-1	DN80	DN80	4	56
	GT-2	DN65	DN65		
RGB-M-605	GT-1	DN80	DN80	4	62.8
	GT-2	DN65	DN65		
RGB-M-705	GT-3	DN100	DN100	4	80
	GT-4	DN80	DN80		
RGB-M-805	GT-3	DN100	DN100	5	72
	GT-4	DN80	DN80		
RGB-M-950	GT-3	DN100	DN100	5	76
	GT-4	DN80	DN80		
RGB-M-1050	GT-3	DN100	DN100	5	100
	GT-4	DN80	DN80		
RGB-M-1250	GT-4	DN100	DN100	5	126
	GT-5	DN100	DN100		
RGB-M-1550	GT-4	DN100	DN100	7	110
	GT-5	DN100	DN100		
RGB-M-1750	GT-4	DN100	DN100	7	120
	GT-5	DN100	DN100		

RLGB-M Series

	Gas model	Gas train size	Main Solenoid valve size	ΔP B. V	ΔP C.H* (mbar)
RLGB-M-55	GT-1	Rp 1 ½	Rp 1 ½	2	14
	GT-2	Rp 1 ½	Rp 1 ½		
RLGB-M-85	GT-1	Rp 1 ½	Rp 1 ½	2	6.2
	GT-2	Rp 1 ½	Rp 1 ½		
RLGB-M-110	GT-1	Rp 2	Rp 2	2	9
	GT-2	Rp 2	Rp 2		
RLGB-M-145	GT-1	Rp 2	Rp 2	2	13
	GT-2	Rp 2	Rp 2		
RLGB-M-175/LN	GT-1	Rp 2	Rp 2	3	17
	GT-2	Rp 2	Rp 2		
RLGB-M-205/LN	GT-1	DN65	DN65	3	21.5
	GT-2	Rp 2	Rp 2		
RLGB-M-205/LN	GT-1	DN65	DN65	3	27.8
	GT-2	Rp 2	Rp 2		
RLGB-M-305/LN	GT-1	DN65	DN65	4	23
	GT-2	Rp 2	Rp 2		
RLGB-M-385/LN	GT-1	DN80	DN80	4	27.3
	GT-2	DN65	DN65		
RLGB-M-405/LN	GT-1	DN80	DN80	4	44
	GT-2	DN65	DN65		

RLGB-M/M Series

	Gas model	Gas train size	Main Solenoid valve size	ΔP B. V	ΔP C.H* (mbar)
RLGB-M/M-385/LN	GT-1	DN65	DN65	4	31.4
	GT-2	DN65	DN65		
RLGB-M/M-405/LN	GT-1	DN80	DN80	4	47
	GT-2	DN65	DN65		
RLGB-M/M-505/LN	GT-1	DN80	DN80	4	56
	GT-2	DN65	DN65		
RLGB-M/M-605/LN	GT-1	DN80	DN80	4	62.8
	GT-2	DN65	DN65		
RLGB-M/M-805	GT-3	DN100	DN100	5	72
	GT-4	DN80	DN80		
RLGB-M/M-950	GT-3	DN100	DN100	5	76
	GT-4	DN80	DN80		
RLGB-M/M-1050	GT-3	DN100	DN100	5	100
	GT-4	DN80	DN80		
RLGB-M/M-1250	GT-4	DN100	DN100	5	126
	GT-5	DN100	DN100		
RLGB-M/M-1550	GT-4	DN100	DN100	7	110
	GT-5	DN100	DN100		
RLGB-M/M-1750	GT-4	DN100	DN100	7	120
	GT-5	DN100	DN100		

*Combustion head

Special Note:

The above gas train sizes are proposed based on the costumer's requests and the limits of the projects while placing an order. Therefore, we kindly ask the readers that assume this information as an initial and most likely offers.

Experience the resplendence of precision and conformity with us!

Modular oil delivery system

Generally, two types of atomizing principle are utilized in raadman modular oil burners:

Pressure based spill back lances/atomizers:

All raadman pressure based atomizing modular oil burners are equipped with a burner lance and a fly-back oil atomizer. The burner-lance is especially suitable for use in or on an oil burner and is designed to operate spill back atomizers with integrated shut-off needle. The strong spring on the actuating rod pushes the needle in closed position. This ensures a reliable shut-off under all circumstances.

Fuel, branched off from the supply line actuates the piston for opening, either controlled by two external solenoid valves or by one 3/2 solenoid valve. The piston has a fixed travel. While opening, the needle inside the atomizer is retracted in the correct position by means of a spring at the back of the atomizer against a fixed stop on the needle itself.

During the pre-purge period of the burner, the needle is keeping the orifice closed and the fuel circulates through the lance at pre-set supply and return pressure. On energizing both solenoid valves and the 3/2 solenoid valve, even after long idle intervals, there is immediate atomization guaranteeing perfect ignition.

The burner-lance is suitable for supply pressures from 20 up to 40 bar and fuel temperatures up to 140°C.

Air or Steam lances/atomizers

All raadman air/steam atomizing modular oil burners are equipped with a special burner lance and an air/steam atomizer. The burner-lance is designed to operate 32-Y atomizers with compressed air or steam.

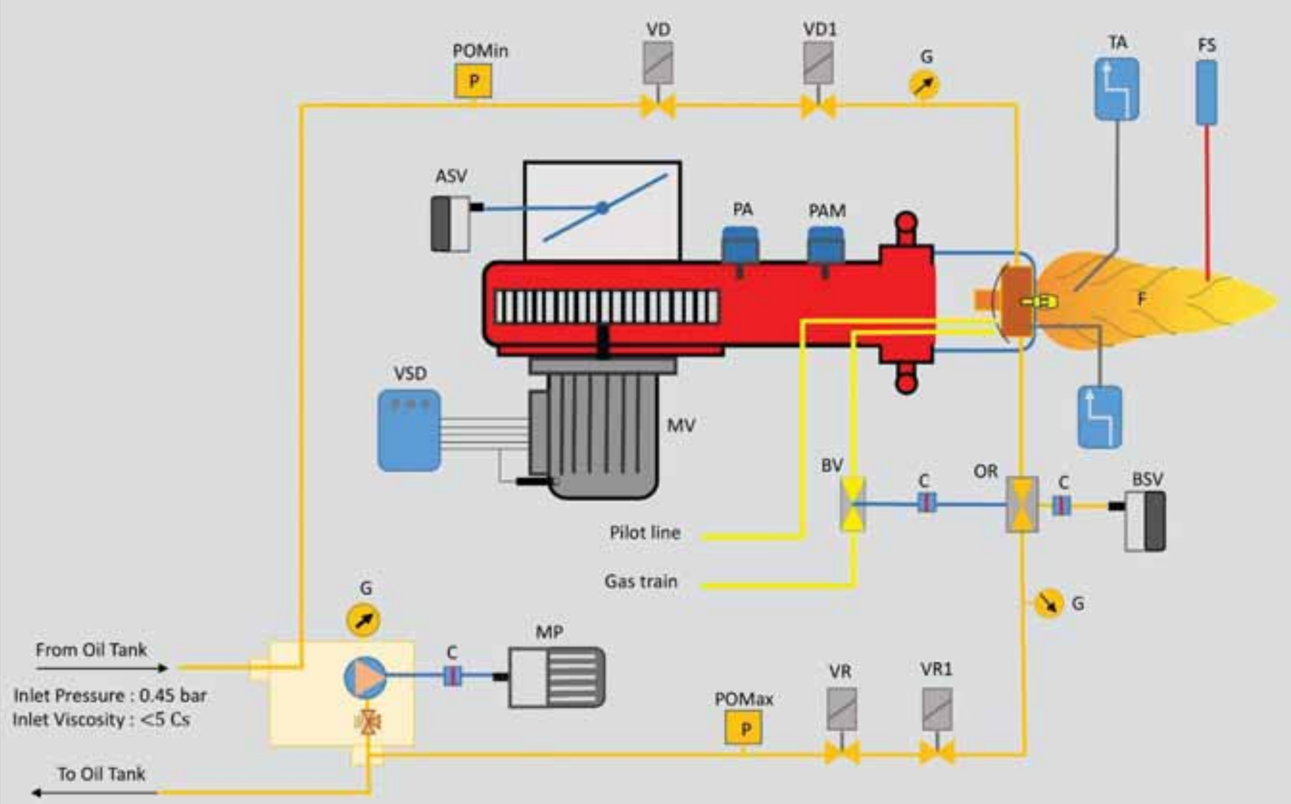
The strong spring on the actuating rod pushes the needle in closed position. Compressed air, controlled by an external 3/2 solenoid valve, actuates the piston for opening. The piston has a fixed travel, pulling the needle in the correct position when it opens.

During the pre-purge period of the burner, the needle is keeping the central orifice in the reverse disc closed. On energizing the 3/2 solenoid valve, even after long idle intervals, there is immediate atomization guaranteeing perfect ignition.

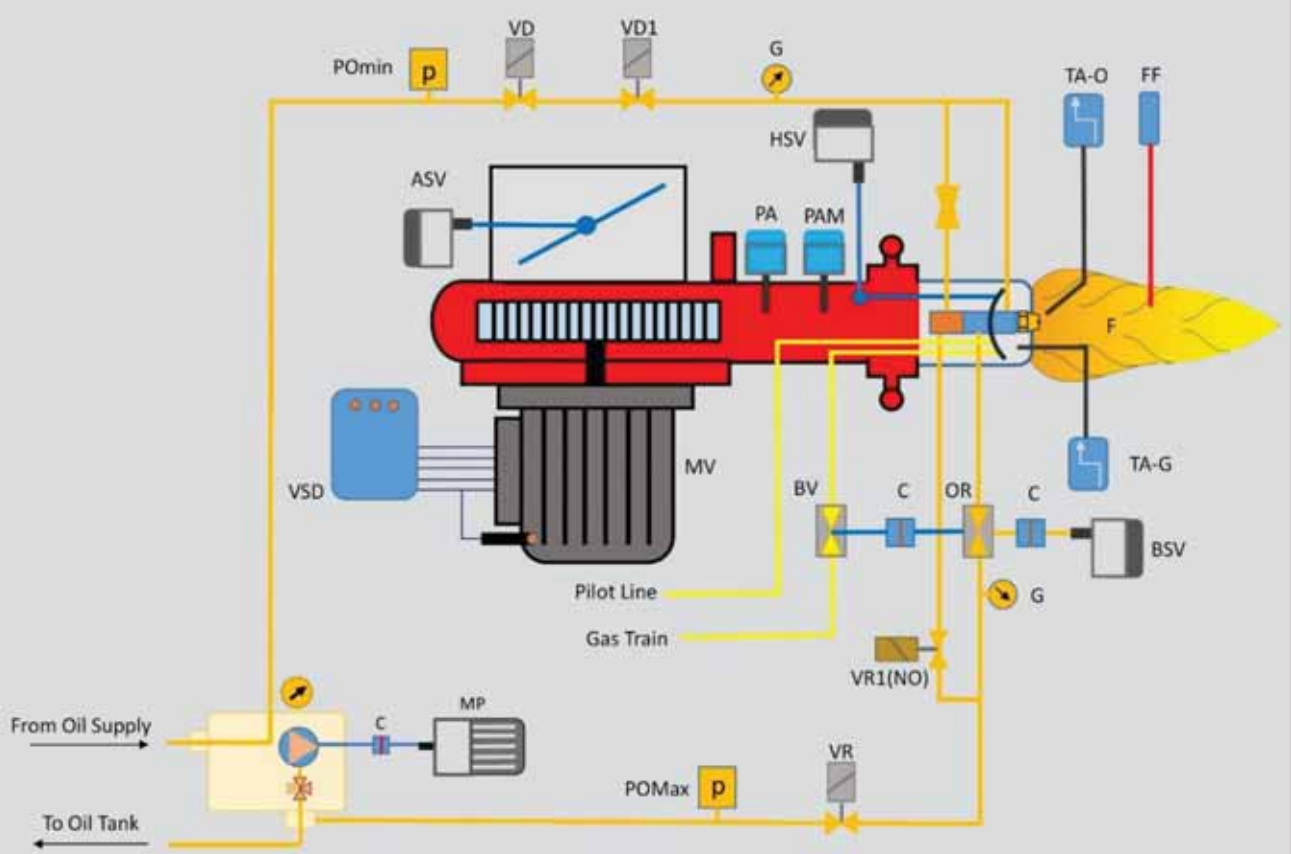
The burner-lance is suitable for supply pressures up to 16 bar and fuel temperatures up to 140°C.

Modulating Dual Fuel Burner type:

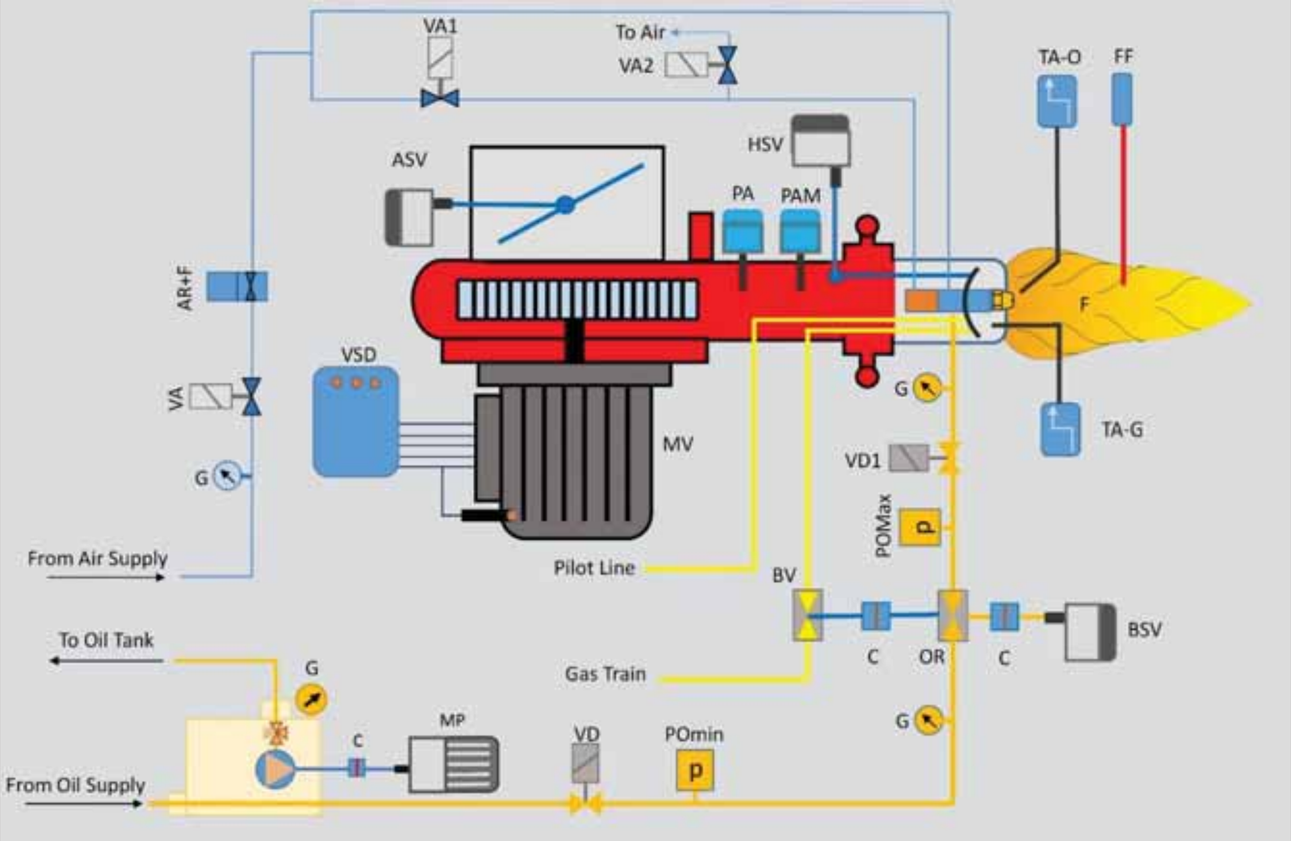
Type OL-I: (Pressure based atomizer – without closing needle)



Type OL-II: (Pressure based atomizer with closing needle)



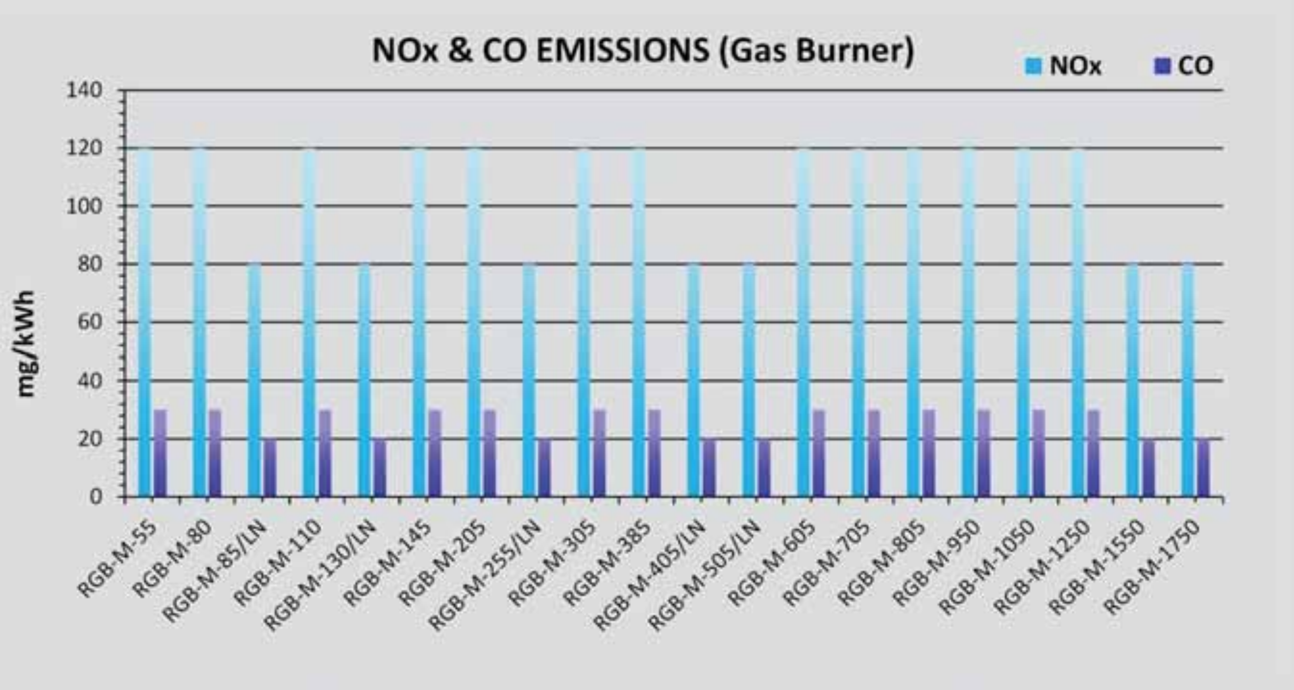
Type OL-III: (Air/Steam Atomizing technology with closing needle)



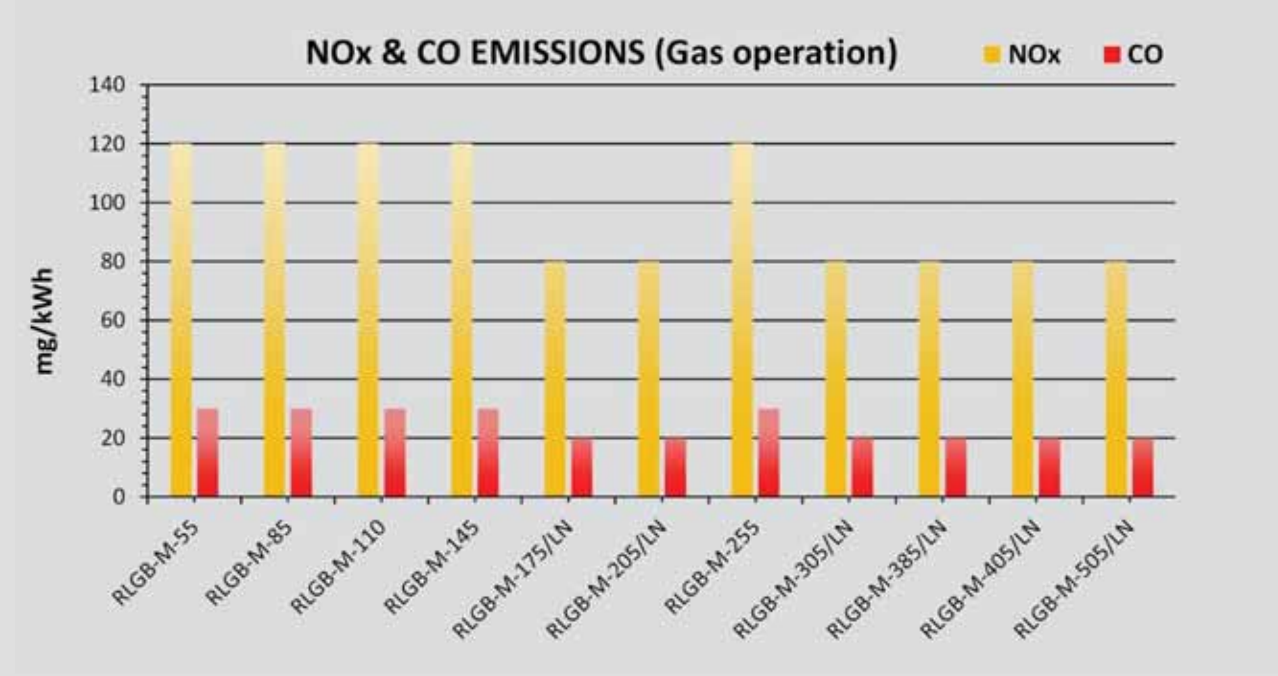
MP: Pump motor
FF: Flame sensor
VR: Return solenoid valve
VR1: Return solenoid valve
VR1(NO): Return solenoid valve (N.O)
VD: Light oil safety valve (N.C)
VD1: Light oil delivery valve (N.C)
VA1: Air solenoid valve1
VA2: Air solenoid valve2
PA: Min. Air pressure switch
PAM: Max. air pressure switch
POmin: Min oil pressure switch
POMax: Max oil pressure switch
VA: Air Valve
AR+F: Air regulator and filter
TA: Flame Scanner
FS: Flame Sensor
F: Gas or oil flame
TA-O: Oil ignition transformer
TA-G: Gas ignition transformer
BSV: Butterfly valve servomotor
ASV: Air damper servomotor
HSV: Head servomotor (Optional)
BV: Butterfly valve
OR: Oil Regulator
MV: Fan motor
VSD: Variable speed drive(optional)
C: Coupling
G: Gauge

Emissions:

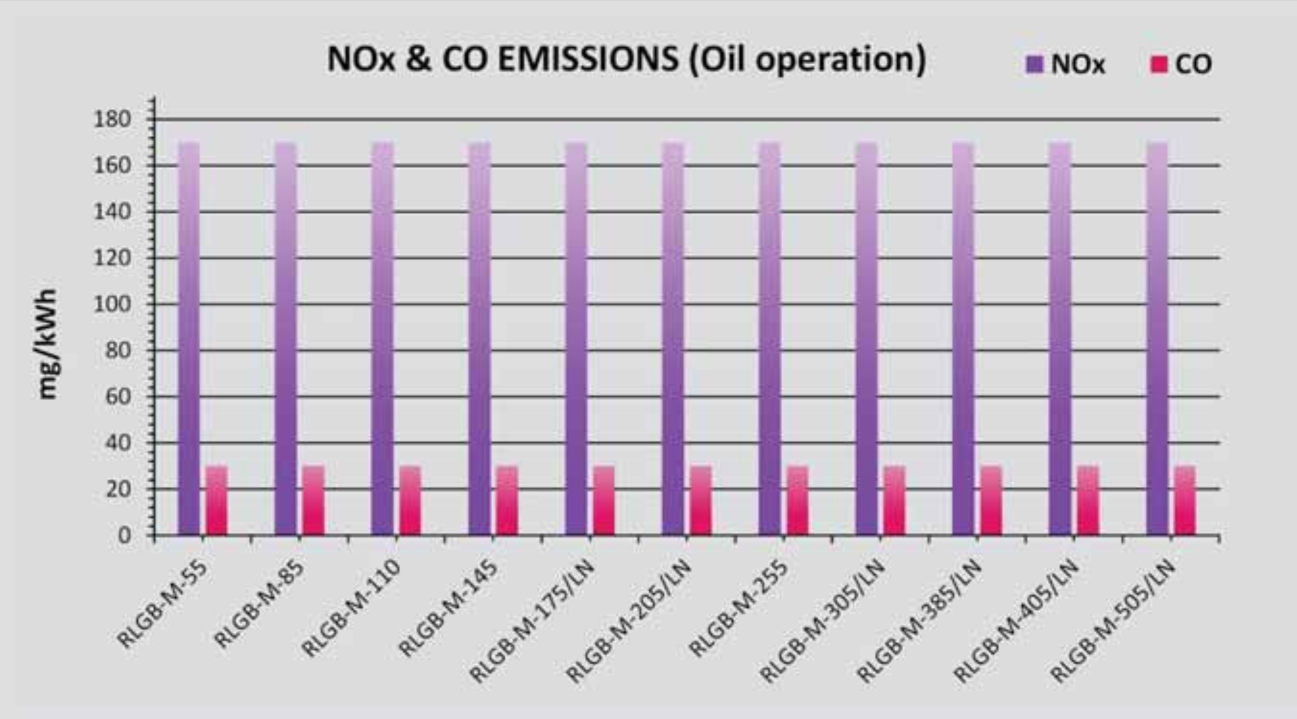
RGB-M Series:



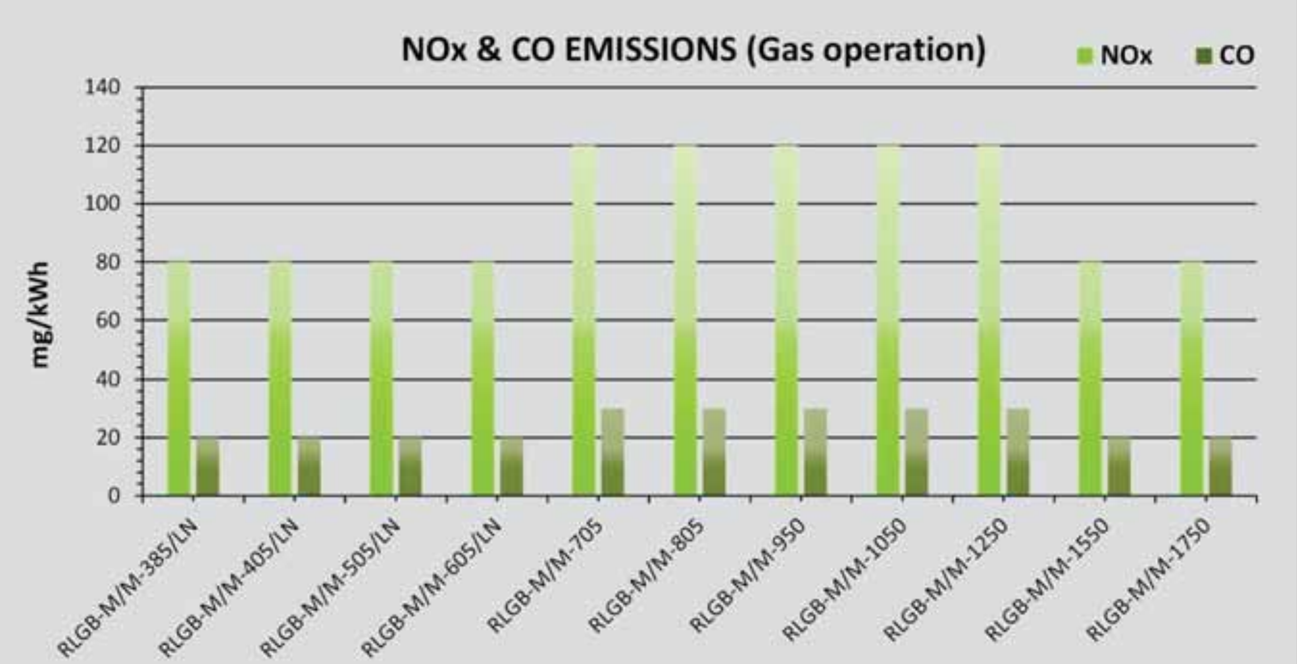
RLGB-M-Series: (Gas operation)



RLGB-M Series: (Oil operation)

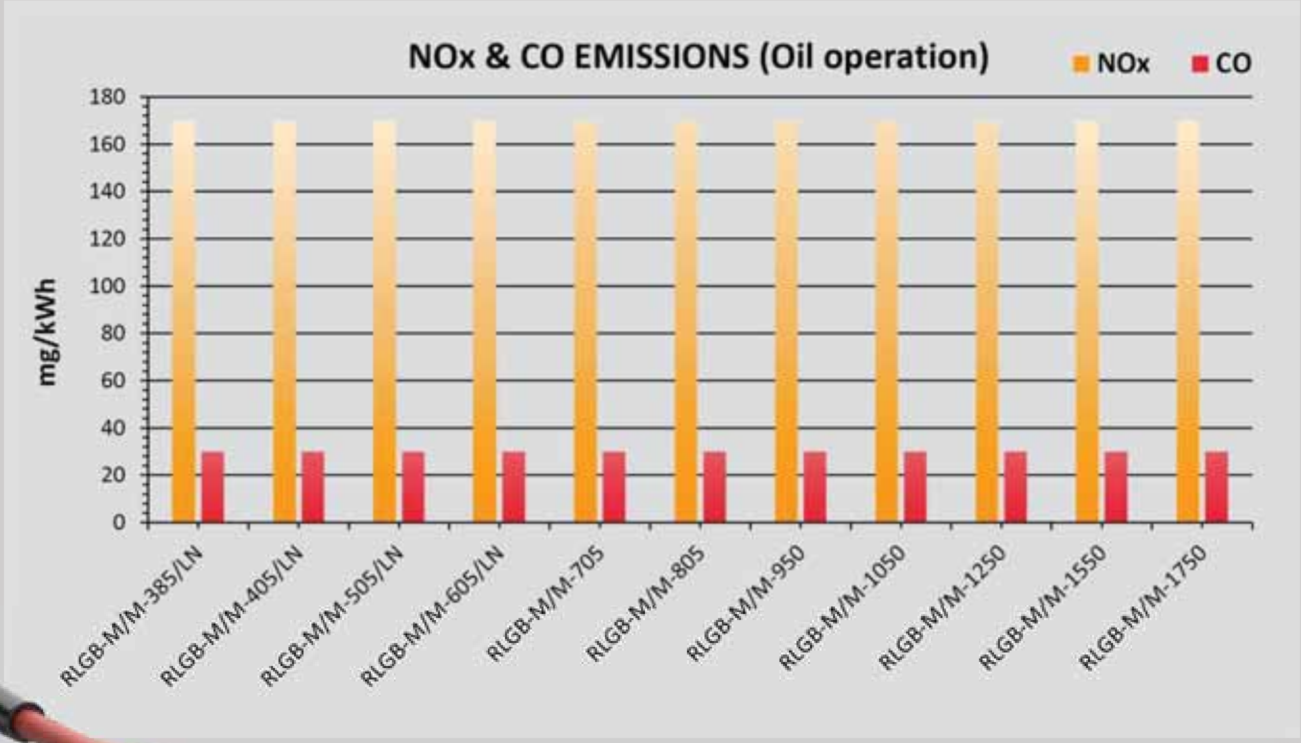


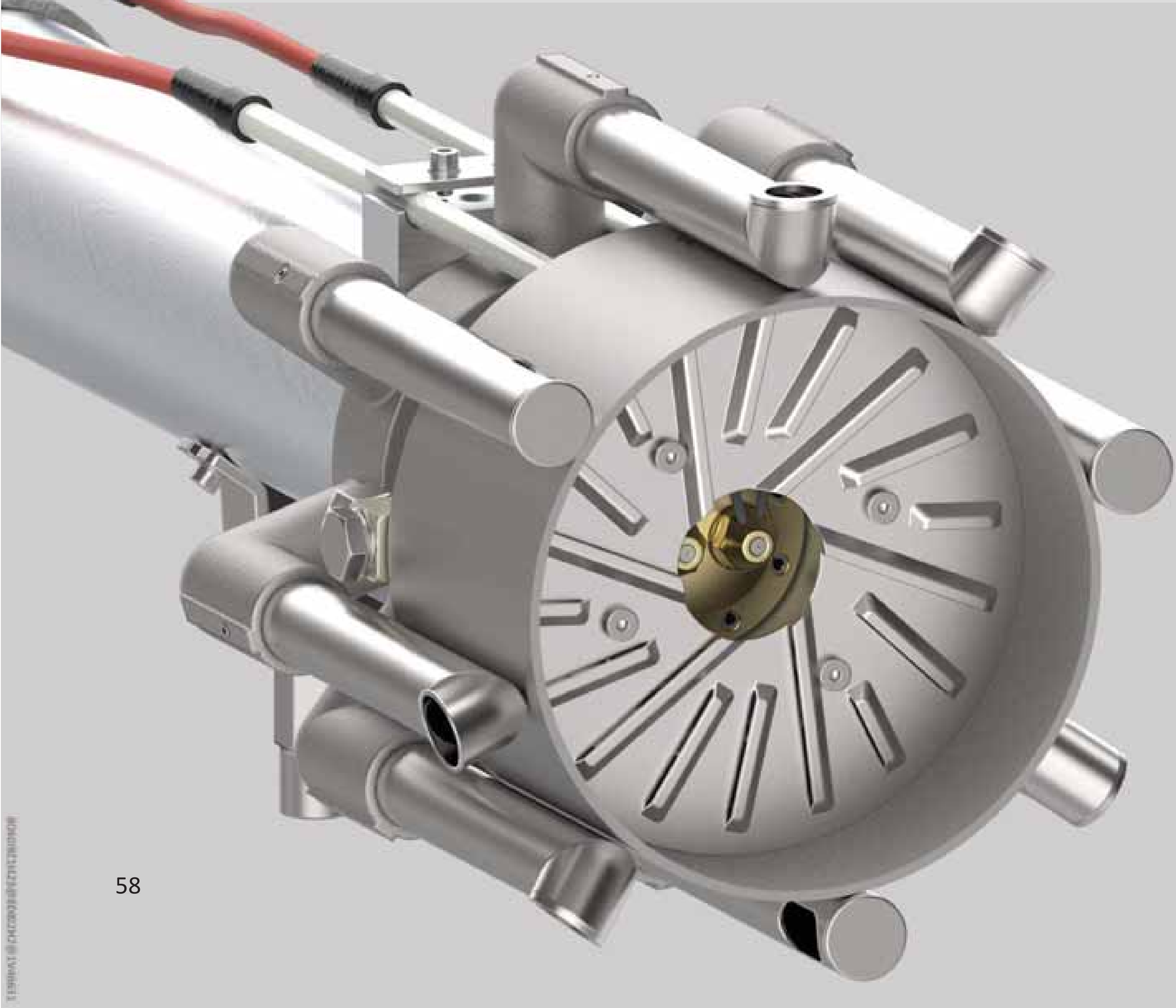
RLGB-M/M-Series: (Gas operation)



The superiority of Low NOx combustion

RLGB-M/M-Series: (Oil operation)





Extra options which could be ordered with us:

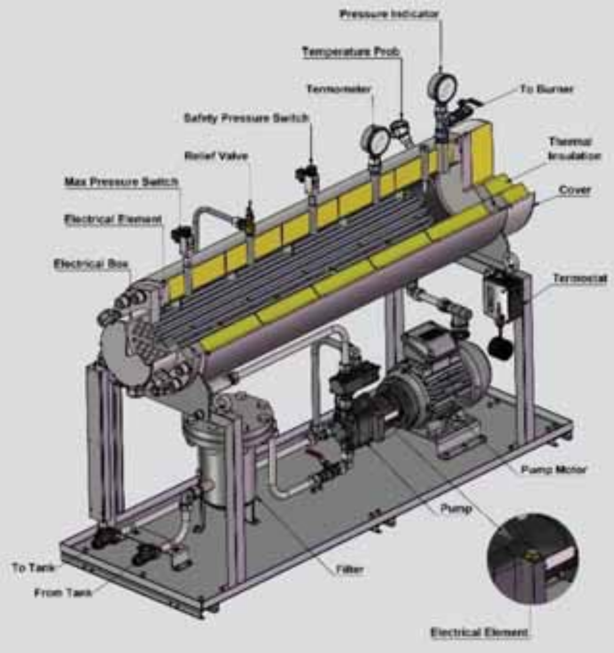
O_2-CO regulation

Combustion processes must be monitored and regulated in order to save energy and avoid damage to the environment, property and health. Based on the technology of zirconium dioxide prob, O2 trim is an innovative concept for binary burner regulation to create a dynamic and self-optimizing method which would further reduce exhaust gas losses in industrial combustion systems. Nowadays two types of trimming are common between combustion facility utilizers: O2-CO trim with Lamtec combi probes or Siemens QGO sensors

Variable Speed drive (VSD)

A variable-speed drives-VSD is a type of motor drive used in electro-mechanical drive systems to control AC motor speed and torque by varying motor input frequency and, depending on topology, to control associated voltage or current variation. VFDs may also be known as 'VFDs' (variable-frequency drive), ‘AFDs' (adjustable-frequency drives), 'ASDs' (adjustable-speed drives), 'AC drives', 'micro drives', 'inverter drives' or, simply, 'drives'. Using this speed controller can reduce the electrical energy consumption up 35 %.

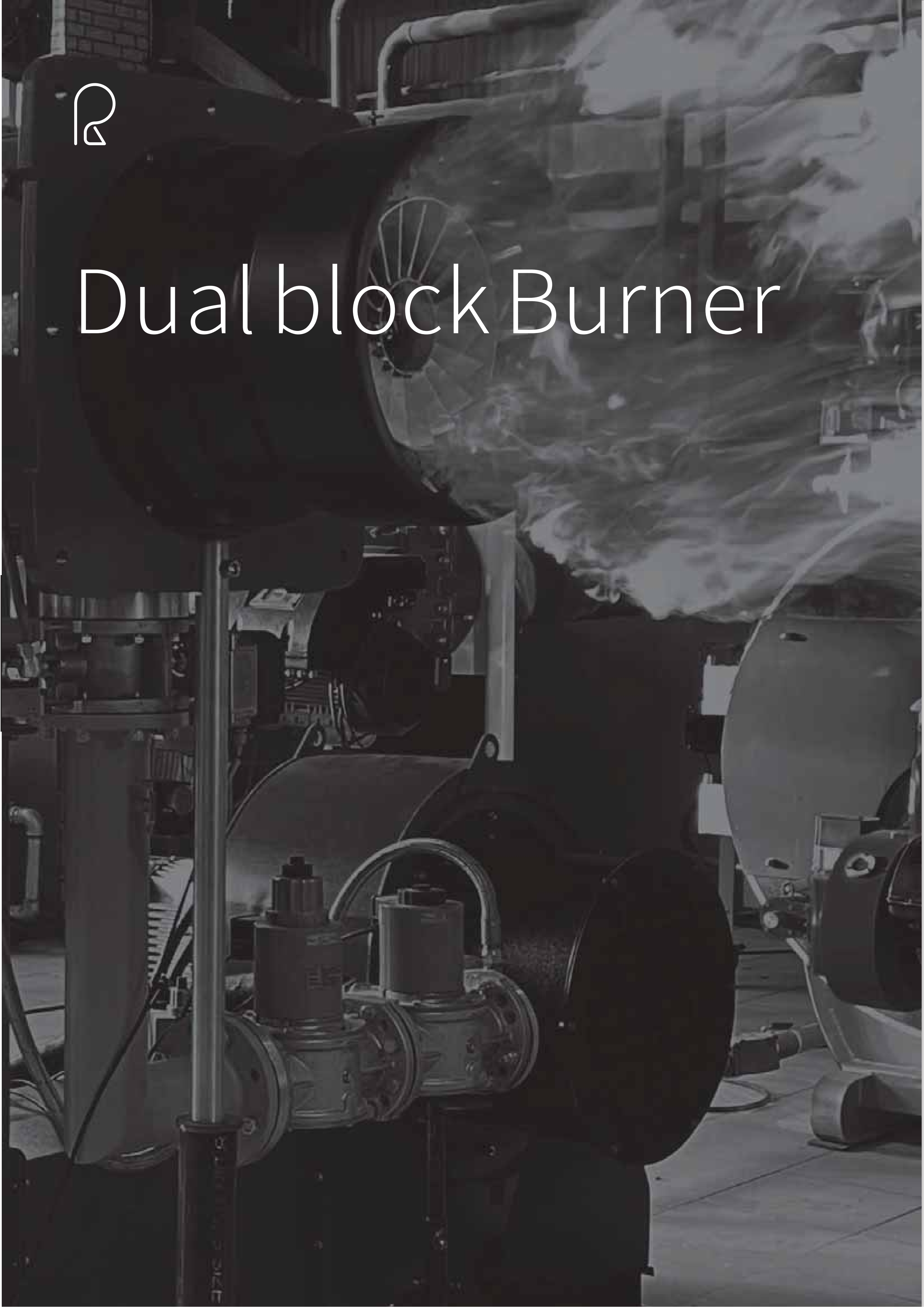
Oil Heater



The Packman heavy fuel oil preheaters are designed for efficiently heating heavy oil to adjust the proper viscosity for the burner. The design is based on the general conditions such as the type and properties of the heavy fuel oil, pressure requirements of the pump and temperature as well as the desired operating points in the process. Electrical heavy fuel oil heater directly heat fuel by converting electrical energy in the heating elements to thermal energy. The thermal energy is then transferred from the heating electrical elements to the fluid.

The unit skids are designed in order to prepare heavy fuel oil with max viscosity 10 Cst at 130°C and outlet pressure of 25 mbar.

Dual block Burner



R LG B- M/M-1250 / * -DB-FGR

Option: FGR*

DB: Dual Block Burner

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: Modular Light Oil, Heavy Oil: Two/Three Stage Progressive
M/M:	Natural Gas, LPG: Modular Light Oil, Heavy Oil: Modular

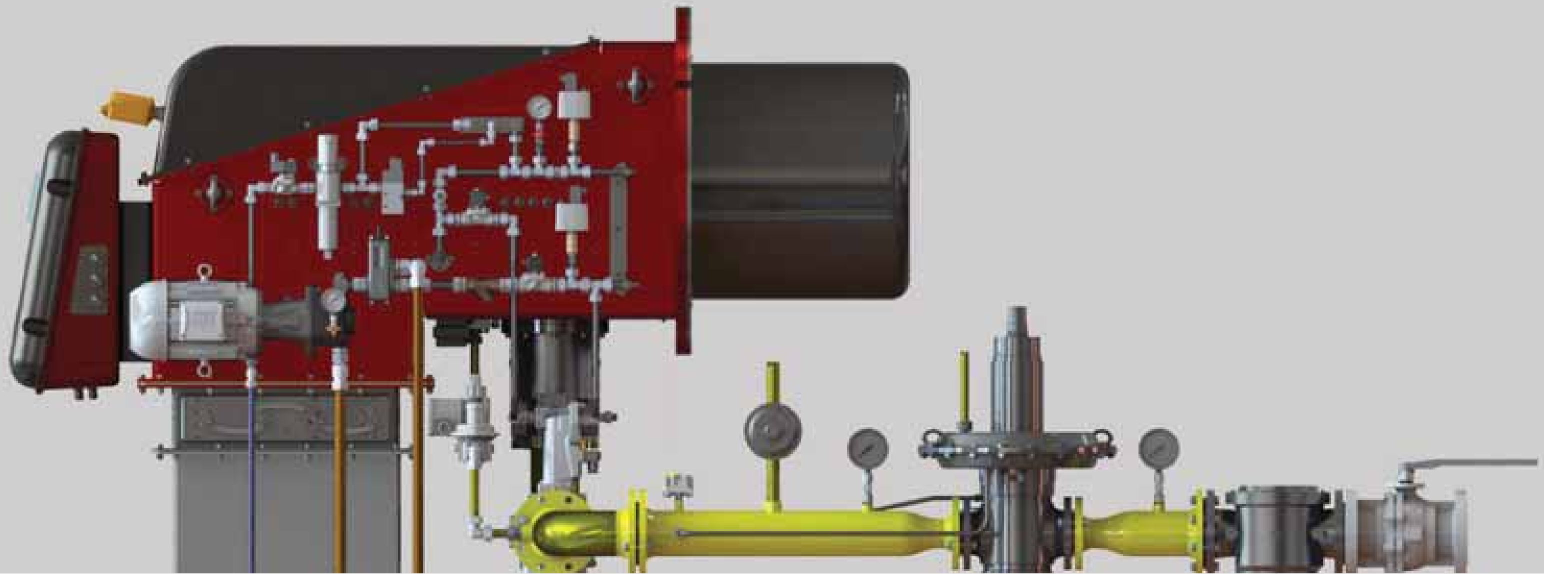
B: Burner

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

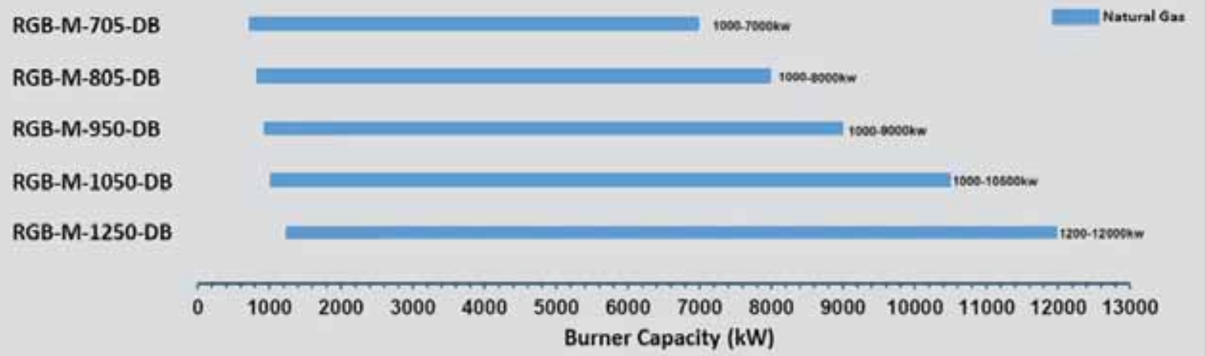
Product Family Name: RAADMAN

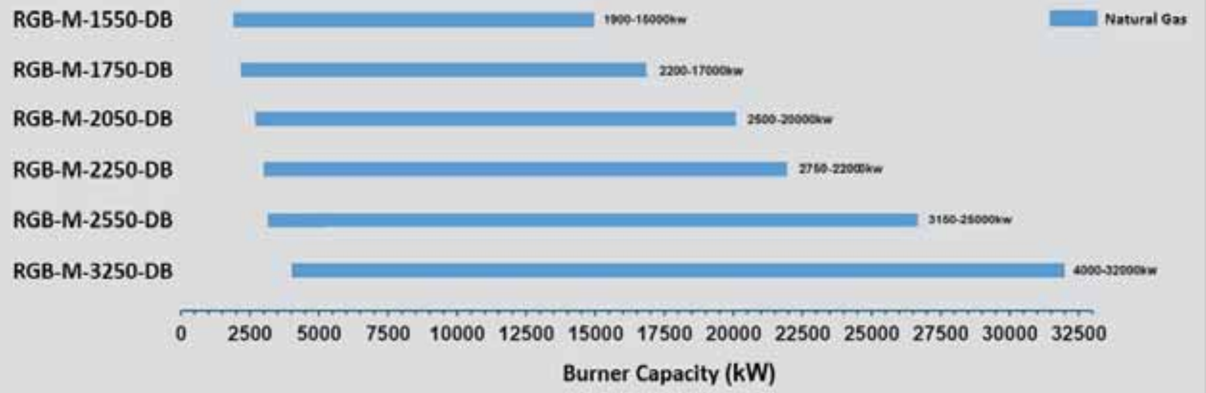
*FGR=Flue Gas Recirculation



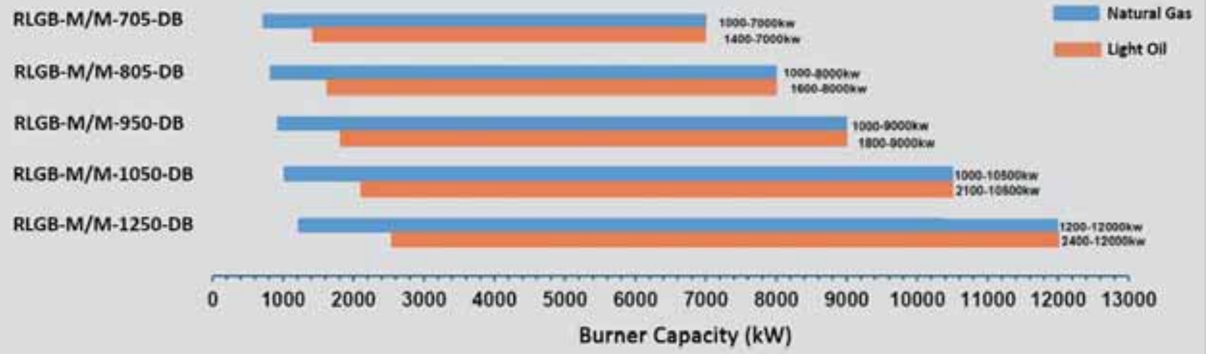
Firing rate

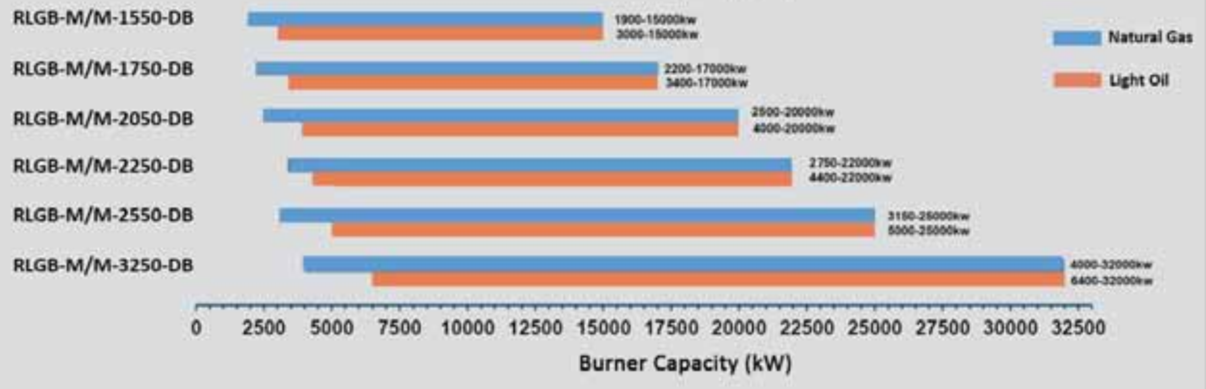
Gas Burners (RGB-M-... -DB series)





Dual-Fuel Burners (RLGB-M/M-...-DB)

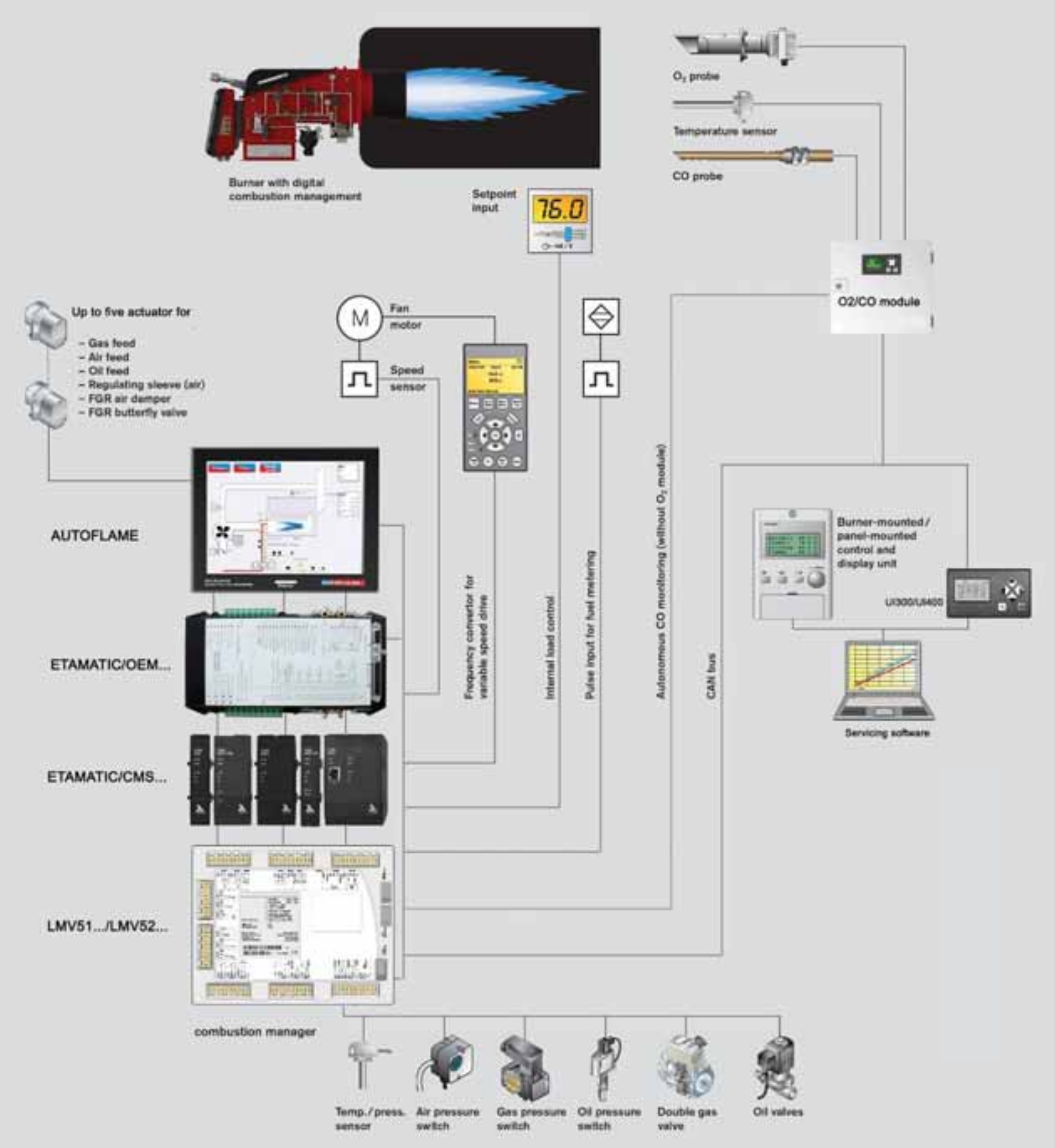




Special note: High turn-down ratio are only accessible for burners with heads actuator. Otherwise they would cover a firing range with 1:5 or 1:6 turn-down ratio.

Burner management system

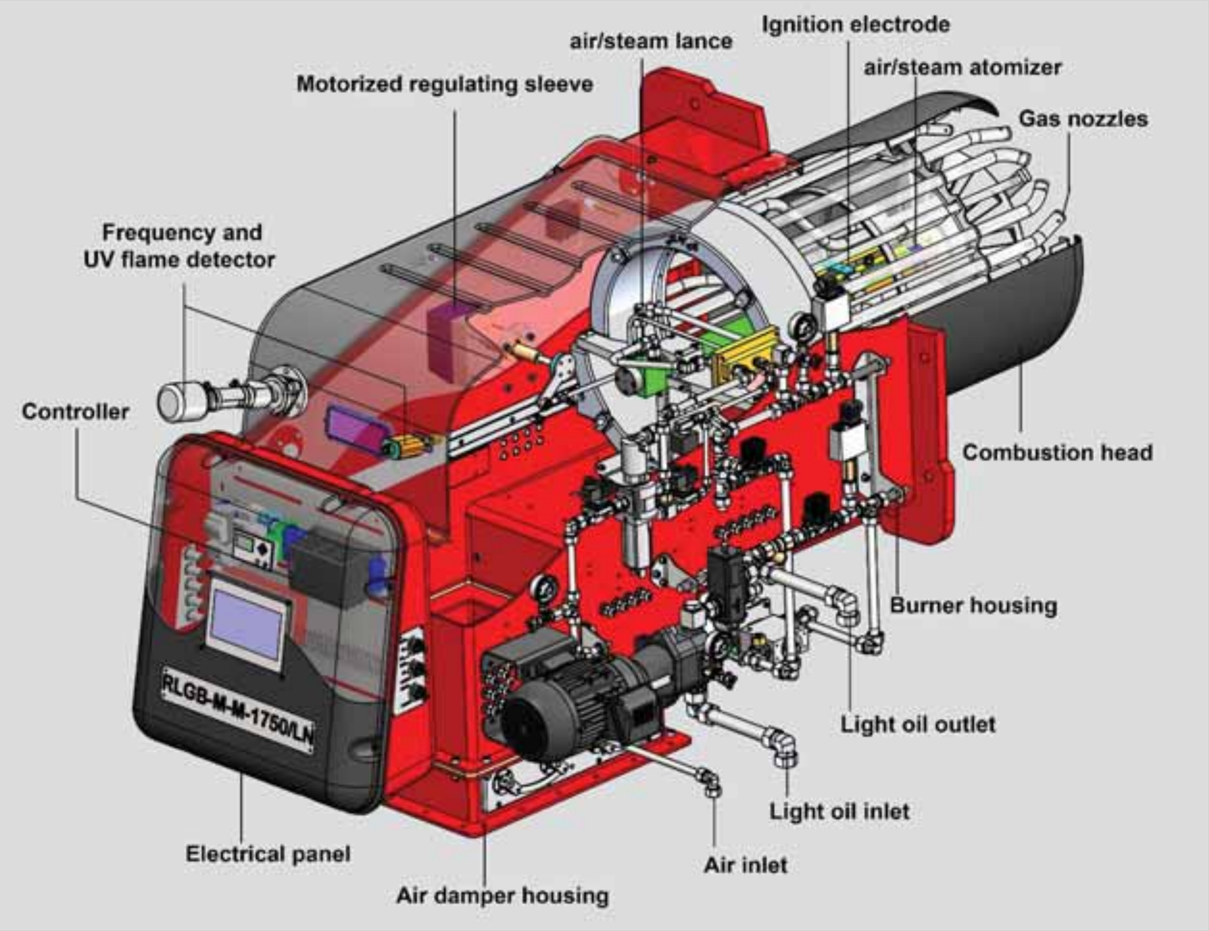
Full electronic modulating burners are designed to safely operate throughout its firing range from high fire to low fire. The most common turndown ratings in **DB-Series** burner are 1:8 up to 1:10. High turndown is used to reduce the burner cycling and maintain a consistent temperature or pressure in the boiler. This is crucial if the boiler is used in an industrial process that requires a consistent temperature or pressure. **DB-Series** burners are equipped with an electronic microprocessor management panel, which controls the air damper servomotor, fuel servomotors as well as head regulating sleeve. Using electronic modulation, hysteresis is prevented by the precise control of the separated in independent servomotors and the software linked by can - bus. The LAMTEC, AUTOFLAME, ETAMATIC / CMS combustion managers or Siemens LMV51/52, as the most popular brands, are frequently used in **DB-Series** raadman Modular burners. This burner Control System combines the benefits of an electronic fuel/air ratio controller with an electronic burner control unit. Up to five motorized actuators can be assigned to modulate air and fuel drives with the option of an additional module to add variable speed drive control for the combustion air fan.



Additional modules are available for field bus interfacing, load control and dual fuel operation. These modular systems include many standard burner functions as standard; these include: integrated valve proving, ambient temperature compensation, flame monitoring and operating hours and system start-up counters. Oxygen trim, CO control, load control and dual fuel functionality are all available options that are used to further enhance system benefits, flexibility and efficiency. These controllers particularly suited for use on mono-bloc burners.

Key features and benefits include:

- Integrated linkage-less control, burner flame safeguard and modulation PID control
- Single or dual fuel application
- Controls up to 5 independent actuators for optimal efficiency in low NOx burner application.
- Integrated PID temperature/ pressure controller with auto tune for extremely accurate process control
- Variable Speed Drive control with actual RPM speed sensor provides reliable, efficient and safe control of the combustion air blower
- Integrated gas valve proving system that checks for leak on every burner cycle for increased safety.
- Optional O2-CO trim
- Up to 10 programmable points per fuel-air ratio curve for greater flexibility and tighter control
- 999 highly repeatable actuator position for precise control
- Digital positioning feedback from actuators ensure unmatched repeatability
- Independent ignition position
- Ability of being connected to building management system using different type of protocols
- World-wide approvals and technical supports



A look to the future:

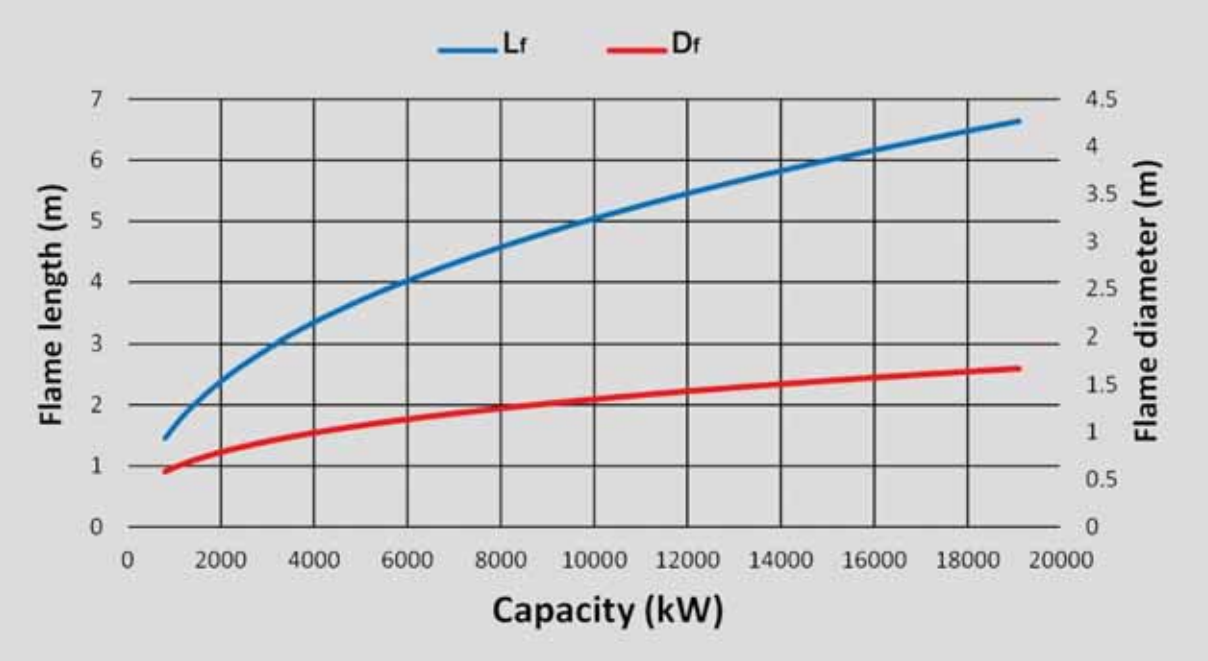
With Low-NOx burners

NOx gases play an important role in the formation of smog, producing the brown haze often observed over cities, particularly during the summer. When exposed to the UV rays in sunlight, NOx molecules break apart and form ozone (O_3). The problem is made worse by the presence in the atmosphere of volatile organic compounds (VOC), which also interact with NOx to form dangerous molecules. Ozone at the ground level is a serious pollutant, unlike the protective ozone layer much higher up in the stratosphere.

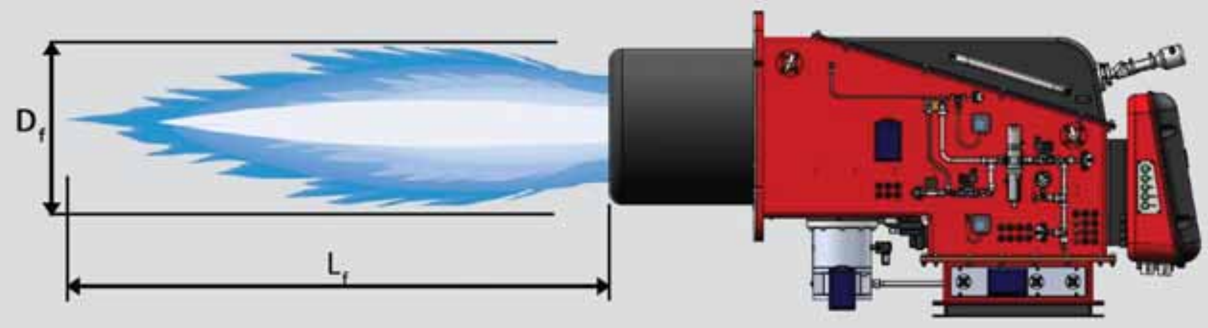
Nitrogen oxides form when oxygen and nitrogen from the air interact during a high-temperature combustion event. Heating industry and industrial burners, in particular, produce large amounts of nitrogen oxides.

The idea of Low NOx burners is control fuel and air mixing at each burner in order to create larger and more branched flames. Peak flame temperature is thereby reduced, and results in less NOx formation. The improved flame structure also reduces the amount of oxygen available in the hottest part of the flame thus improving burner efficiency.

Flame dimension

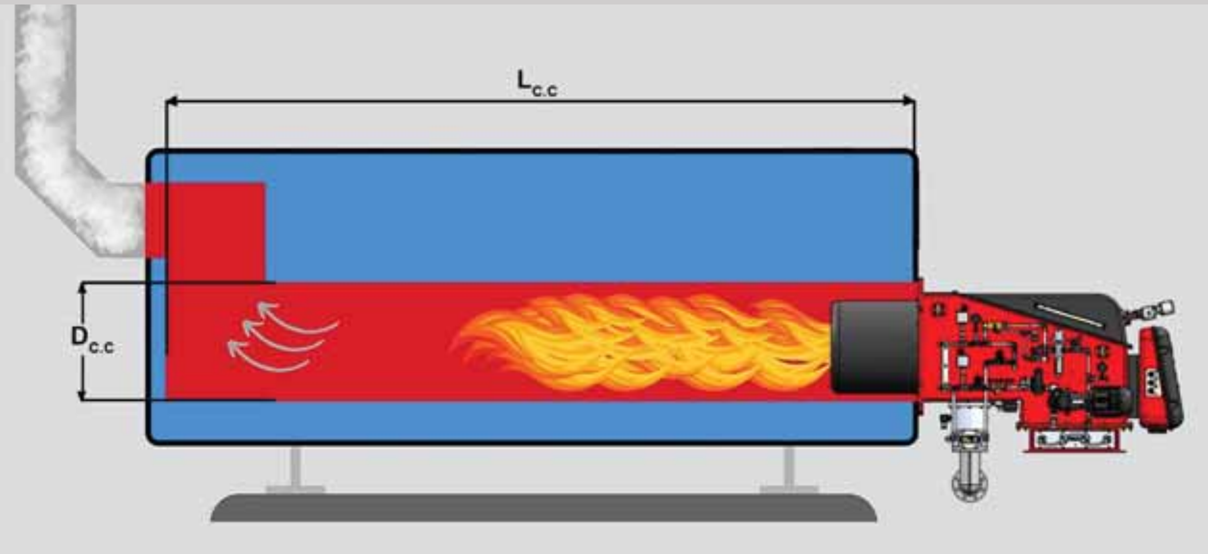


The flame dimensions which play an effective role in the burner efficiency and influence their compatibility to the boiler combustion chamber geometry, are presented in the above diagram.



Suggested combustion chamber dimension:

The raadman burners can be appropriately selected for all boilers which are according to the BS-2790, BS-855, EN-303, BS-EN 12953-3.



FGR technology

Flue gas recirculation (FGR) can be a highly effective technique for lowering NOx emissions from burners, and it's relatively inexpensive to apply. Most of the early FGR work was done on boilers, and investigators found that recirculating up to 25% of the flue gases through the burner could lower NOx emissions to as little as 25% of their normal levels.

With FGR technology, consisting of temperature sensor and flue gas damper with actuator both connected on a flange, a portion of the exhaust (flue) gas circulates back into the combustion zone to decrease the flame temperature and reduce nitrogen-oxide (NOx).

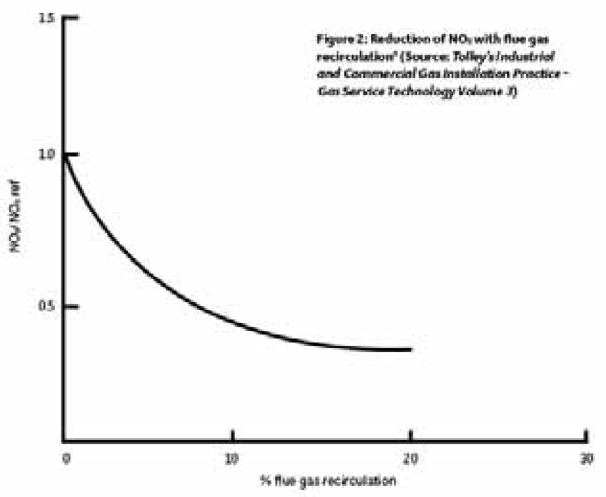
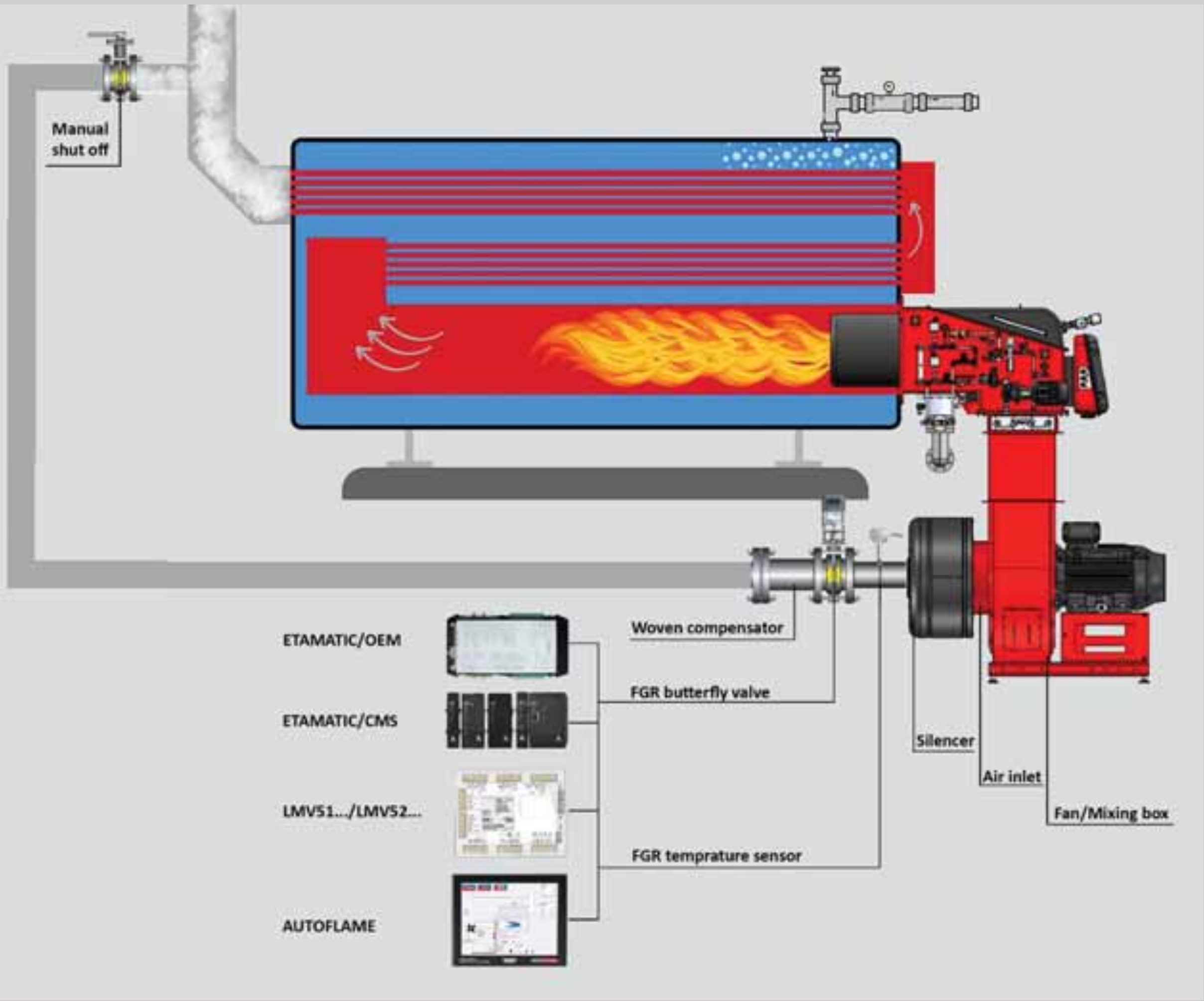


Figure 2: Reduction of NO_x with flue gas recirculation[1] (Source: *Tolley's Industrial and Commercial Gas Installation Practice – Gas Service Technology Volume 3*)

When FGR is used, because of reduction in radiation heat transfer, boiler efficiency may decrease, typically in the range of 0.25 percent to 1 percent, depending on the amount of FGR added. Plant experience shows that the combination of low NOx burners with re-burning using FGR system, reduces the NOx level to approximately lower than 40 mg/kWh.

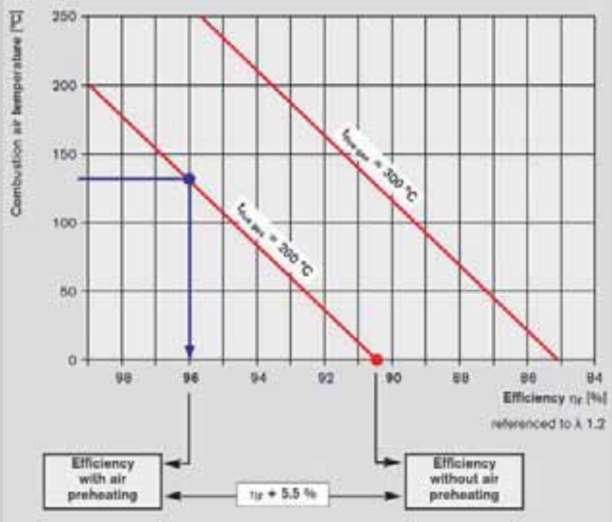


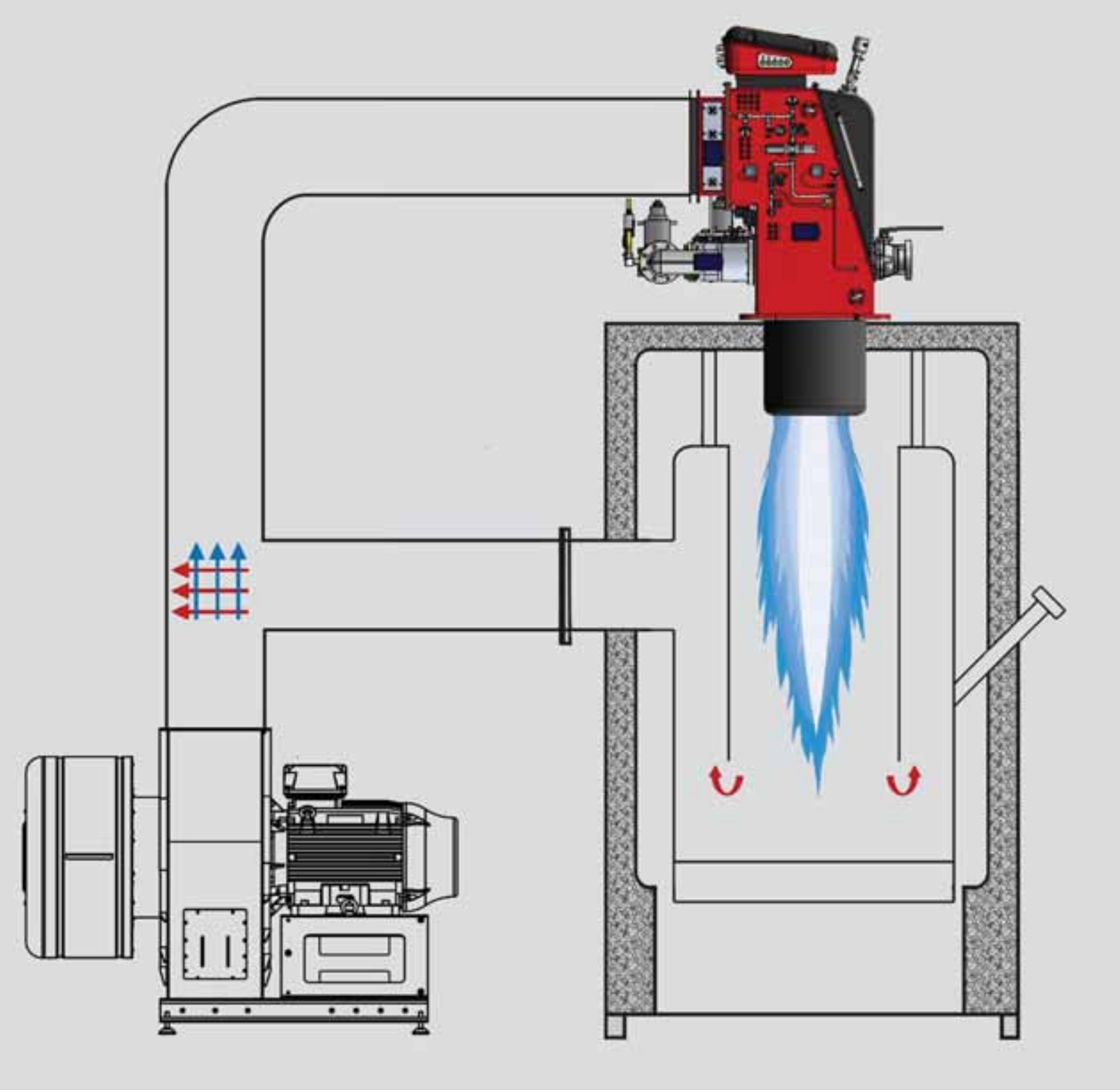
Heat generators with very high medium temperatures can exploit less of the heat in the flue gases. Consequently, flue gas temperatures are always higher than the medium temperature. Without additional heat exchangers, a lot of energy will be lost to the atmosphere and wasted. One way of utilizing this energy is through the use of hot-air versions of the DB-series dual-bloc burners.

A cross-flow heat exchanger between the combustion air duct and the flue gas system draws heat from the hot flue gas and transfers it to the combustion air. Using this method, combustion air can be heated to temperatures of up to 250 °C, making efficiency increases of up to 10 percent possible.

Despite these extreme conditions, the burners can achieve NOx values in the range of 100–150 mg/Nm³.

Efficiency increases of up to 10 percent with 250 °C hot-air in DB-Series burners



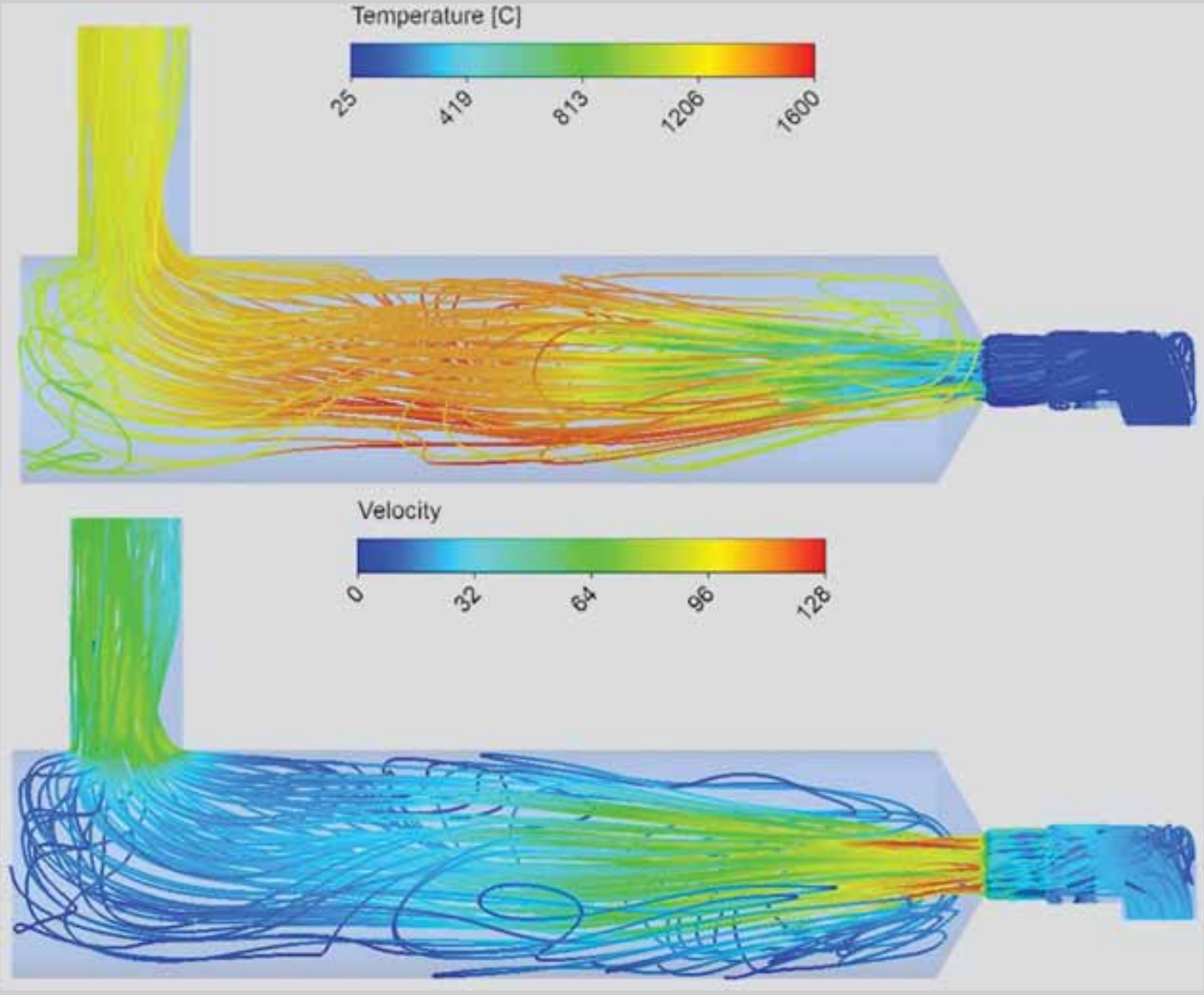


CFD experts in R&D department

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. While this simplified chemistry includes adequate information to predict flow patterns and local heat transfer, these models lack sufficient information to accurately predict NOx and CO production. Alternatively, the NOx chemistry is decoupled from the main calculation and obtained using post-processing techniques. CFD coupled with cold-flow physical modeling and hot-flow burner tests provides a powerful analytical tool to develop accurate, timely, and cost-effective burner designs.

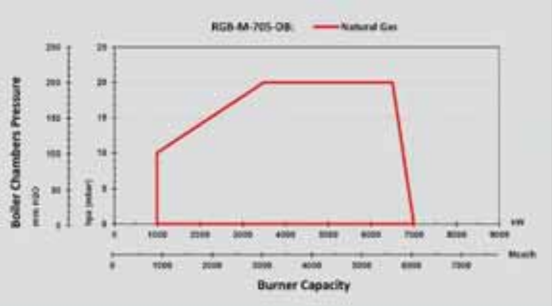
Packman R&D Department is accustomed to working on custom engineered solutions, and our sales applications and thermofluidic engineering department are ready to assist with complex applications. As part of our design and engineering process, we have the ability to use Computational Fluid Dynamics (CFD) modeling to predict product performance or adjust product design prior to burners being installed in the field.



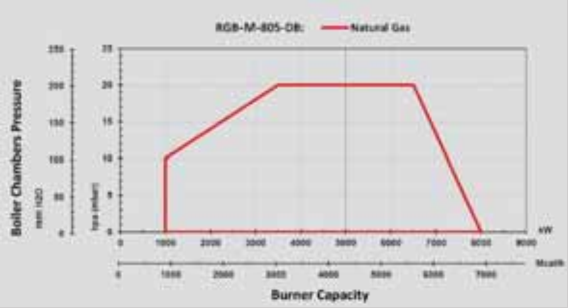
Burner selection: capacity and working diagram

Modulating Gas Burner

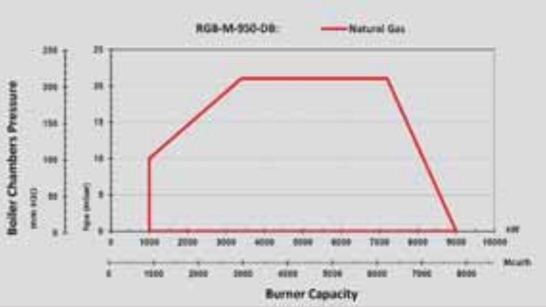
Burner	Capacity (kW)	Turn down
RGB-M-705-DB	NG:1000-7000	1:7



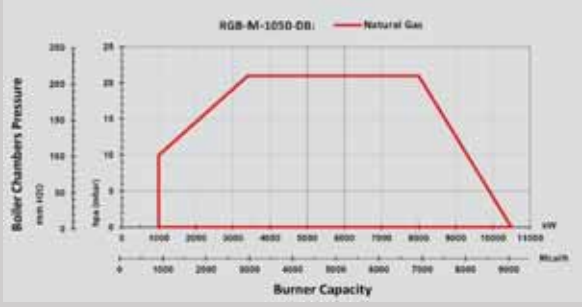
Burner	Capacity (kW)	Turn down
RGB-M-805-DB	NG:1000-8000	1:8*



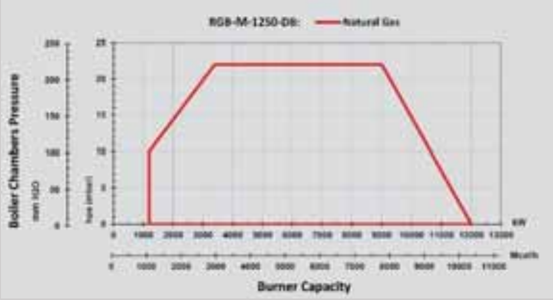
Burner	Capacity (kW)	Turn down
RGB-M-950-DB	NG:1000-9000	1:9*



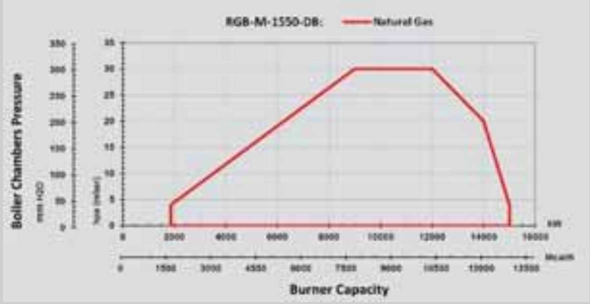
Burner	Capacity (kW)	Turn down
RGB-M-1050-DB	NG:1000-10500	1:10*



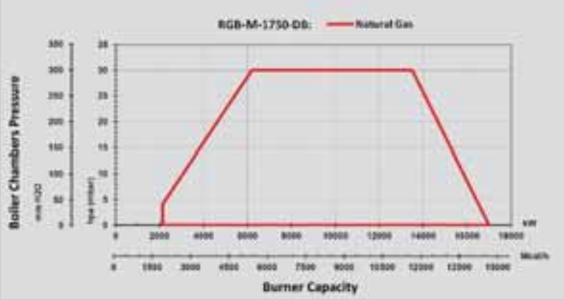
Burner	Capacity (kW)	Turn down
RGB-M-1250-DB	NG:1200-12000	1:10*



Burner	Capacity (kW)	Turn down
RGB-M-1550-DB	NG:1900-15000	1:8*



Burner	Capacity (kW)	Turn down
RGB-M-1750-DB	NG:2200-17000	1:8*

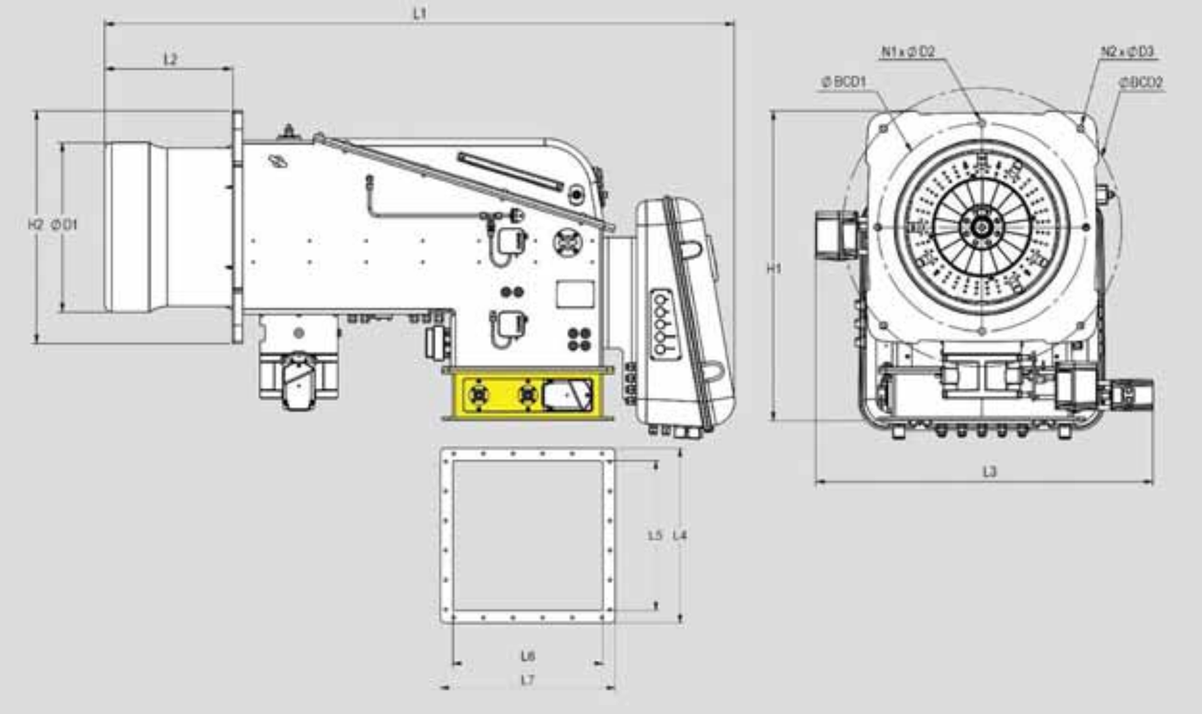


About working diagram

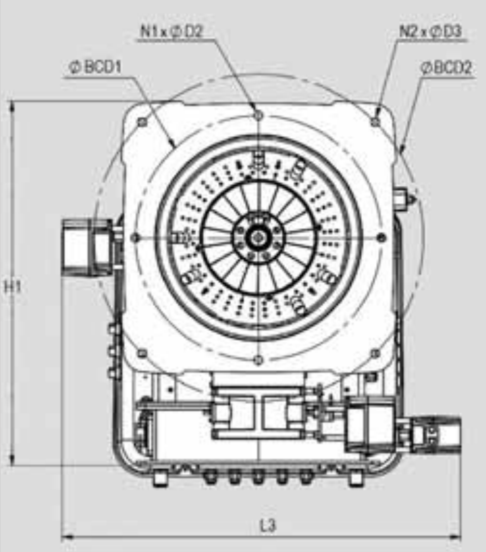
Working diagram for gas burner certified in accordance with EN 676.

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.

General dimension: RGB-M-...-DB series



Burner Type	L1	L2	L3	L4	L5	L6	L7	H1	H2	D1
RGB-M-705-DB	1631	363	992	534	450	418	487	833	598	400
RGB-M-805-DB	1631	363	992	534	450	418	487	833	598	400
RGB-M-950-DB	1845	427	1095	584	500	418	487	874	660	480
RGB-M-1050-DB	1845	427	1095	584	500	418	487	874	660	480
RGB-M-1250-DB	1838	420	1095	584	500	418	487	874	660	480
RGB-M-1550-DB	2196	508	995	650	556	556	650	1256	872	590
RGB-M-1750-DB	2196	508	995	650	556	556	650	1256	872	590
RGB-M-2050-DB	2196	508	995	650	556	556	650	1256	872	590
RGB-M-2250-DB	2196	508	995	650	556	556	650	1256	872	590
RGB-M-2550-DB	2196	508	995	670	556	556	670	1256	872	590
RGB-M-3250-DB	2200	511	1241	670	556	556	670	1100	868	618



Burner Type	D2	D3	N1	N2	B.C.D1	B.C.D2
RGB-M-705-DB	21	21	4	4	540	700
RGB-M-805-DB	21	21	4	4	540	700
RGB-M-950-DB	20	20	4	4	590	790
RGB-M-1050-DB	20	20	4	4	590	790
RGB-M-1250-DB	20	20	4	4	590	790
RGB-M-1550-DB	20	20	4	8	770	940
RGB-M-1750-DB	20	20	4	8	770	940
RGB-M-2050-DB	20	20	4	8	770	940
RGB-M-2250-DB	20	20	4	8	770	940
RGB-M-2550-DB	20	20	4	8	770	940
RGB-M-3250-DB	20	20	4	8	770	875

Note:

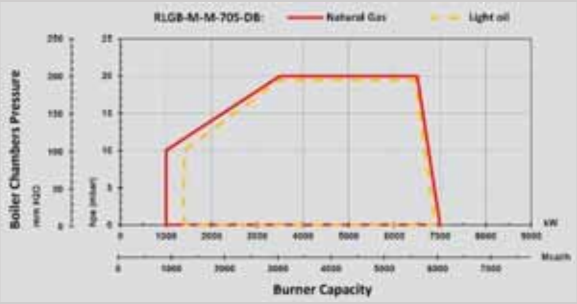
Since to the project-based scenario of DB-Series burners, we strongly recommend to contact us for exact dimensions for a superior plant arrangement

Thanks to the air/steam atomizing technology as well as the well-known pressure base spill back oil atomizers, we are delighted to gratefully guarantee the best performance of our productions in order to meet our customer demands.

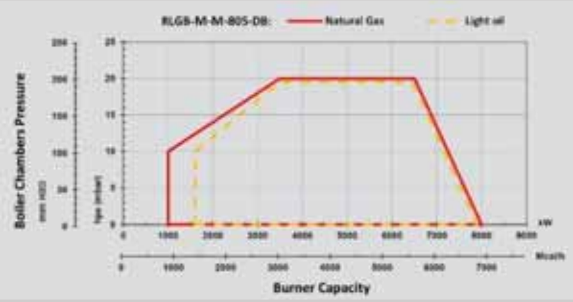
Burner selection: capacity and working diagram

Modulating Dual Fuel Burner

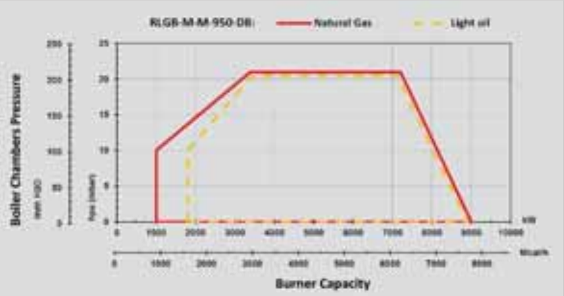
Burner	Capacity (kW)	Turn down
RLGB-M/M-705-DB	NG:1000-7000 LFO: 1400-7000	1:7



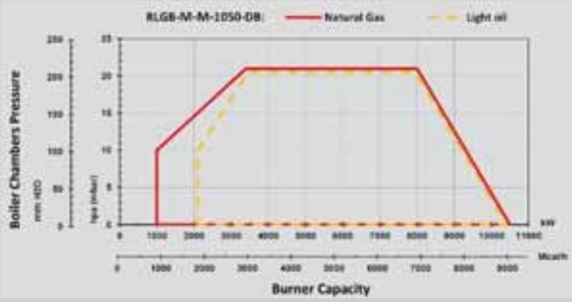
Burner	Capacity (kW)	Turn down
RLGB-M/M-805-DB	NG:1000-8000 LFO1600-8000	1:8*



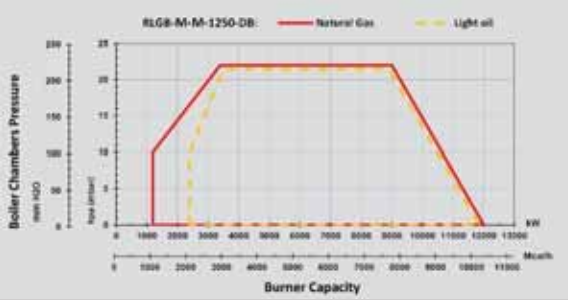
Burner	Capacity (kW)	Turn down
RLGB-M/M-950-DB	NG:1000-9000 LFO: 1800-9000	1:9*



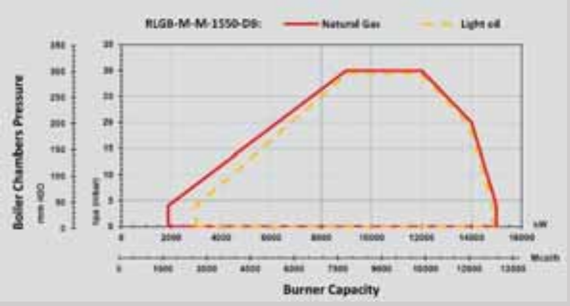
Burner	Capacity (kW)	Turn down
RLGB-M/M-1050-DB	NG:1000-10500 LFO:2100-10500	1:10*



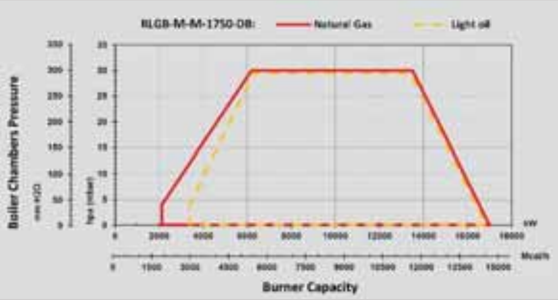
Burner	Capacity (kW)	Turn down
RLGB-M/M-1250-DB	NG:1200-12000 LFO:2400-12000	1:10*



Burner	Capacity (kW)	Turn down
RLGB-M/M-1550-DB	NG:1900-15000 LFO:3000-15000	1:8*



Burner	Capacity (kW)	Turn down
RLGB-M/M-1750-DB	NG:2200-17000 LFO:3400-17000	1:8*

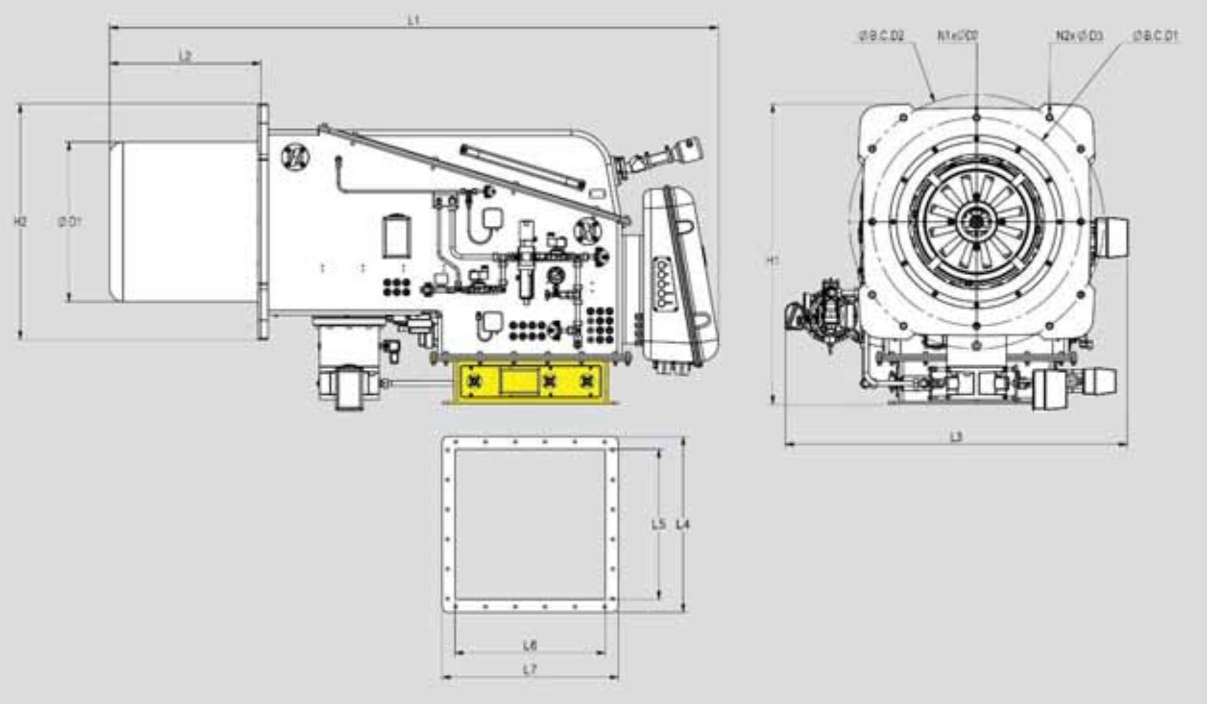


About working diagram

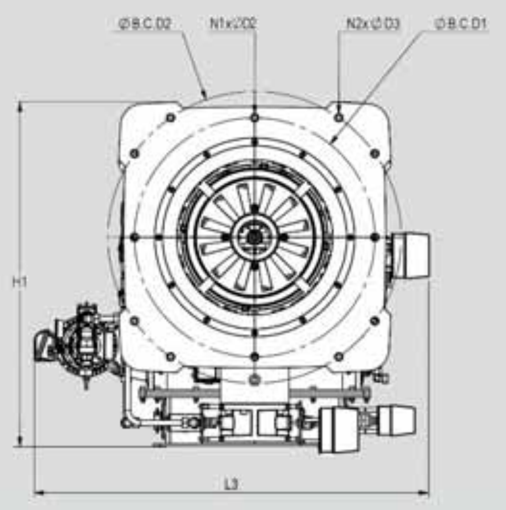
The working diagrams for natural gas and light fuel oil are certified in accordance with BS-EN 676 and BS-EN 267 respectively.

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.

General dimension: RLGB-M/M-...-DB series



Burner Type	L1	L2	L3	L4	L5	L6	L7	H1	H2	D1
RLGB-M/M-705-DB	1631	363	992	534	450	418	487	833	598	400
RLGB-M/M-805-DB	1631	363	992	534	450	418	487	833	598	400
RLGB-M/M-950-DB	1845	427	1095	584	500	418	487	874	660	480
RLGB-M/M-1050-DB	1845	427	1095	584	500	418	487	874	660	480
RLGB-M/M-1250-DB	1838	420	1095	584	500	418	487	874	660	480
RLGB-M/M-1550-DB	2196	508	1263	650	556	556	650	1256	872	590
RLGB-M/M-1750-DB	2196	508	1263	650	556	556	650	1256	872	590
RLGB-M/M-2050-DB	2196	508	1263	650	556	556	650	1256	872	590
RLGB-M/M-2250-DB	2196	508	1263	650	556	556	650	1256	872	590
RLGB-M/M-2550-DB	2196	508	1263	650	556	556	650	1256	872	590
RLGB-M/M-3250-DB	2200	511	1241	670	556	556	670	1100	868	618



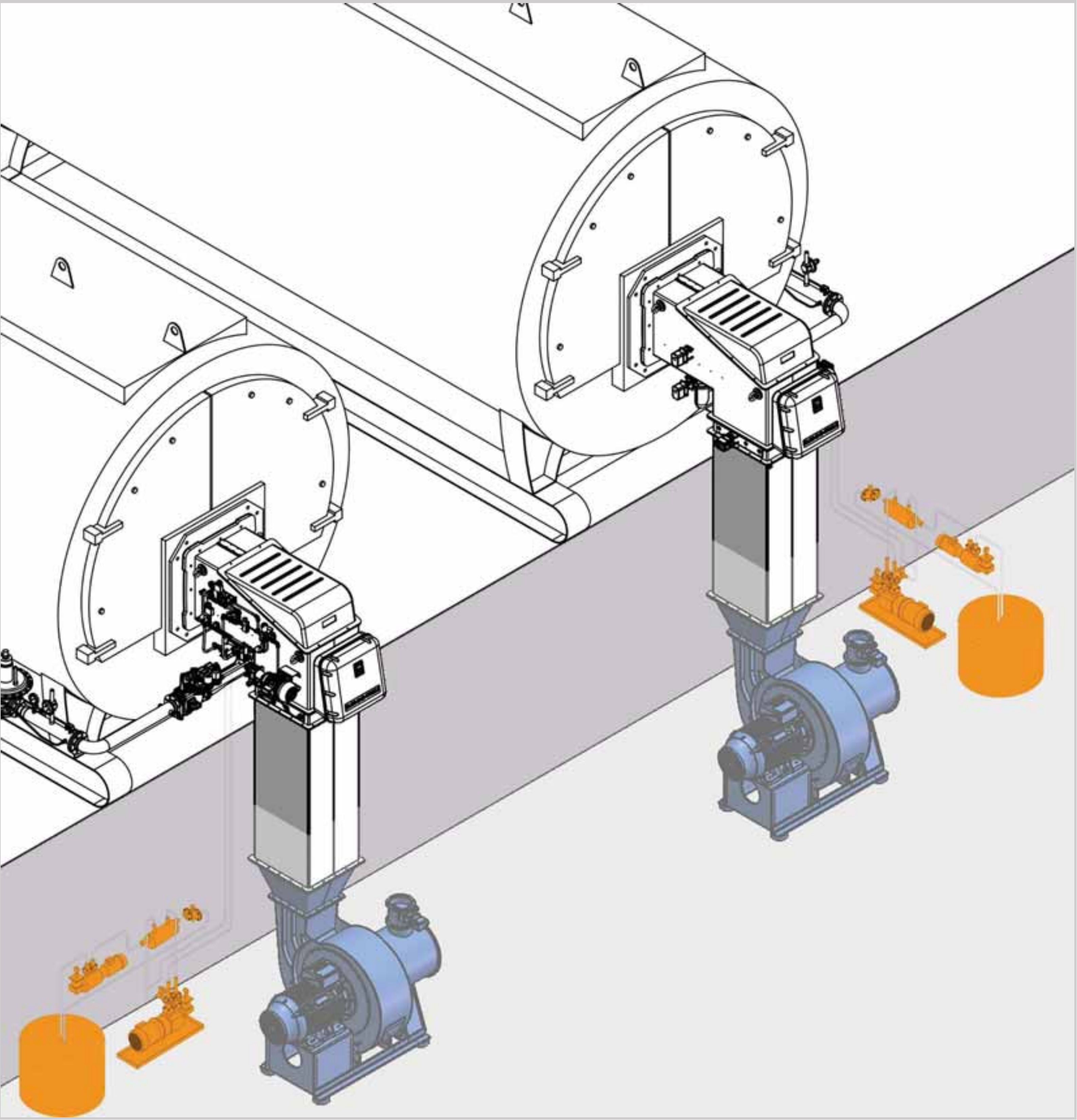
Burner Type	D2	D3	N1	N2	B.C.D1	B.C.D2
RLGB-M/M-705-DB	21	21	4	4	540	700
RLGB-M/M-805-DB	21	21	4	4	540	700
RLGB-M/M-950-DB	20	20	4	4	590	790
RLGB-M/M-1050-DB	20	20	4	4	590	790
RLGB-M/M-1250-DB	20	20	4	4	590	790
RLGB-M/M-1550-DB	20	20	4	8	770	940
RLGB-M/M-1750-DB	20	20	4	8	770	940
RLGB-M/M-2050-DB	20	20	4	8	770	940
RLGB-M/M-2250-DB	20	20	4	8	770	940
RLGB-M/M-2550-DB	20	20	4	8	770	940
RLGB-M/M-3250-DB	20	20	4	8	770	875

Note:

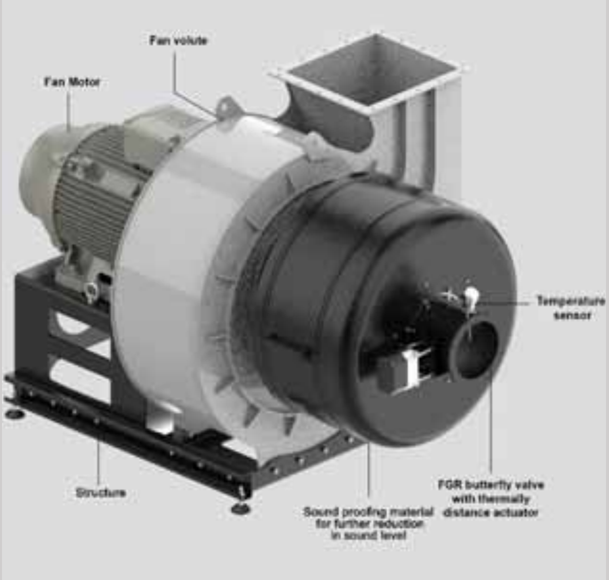
Since to the project-based scenario of DB-Series burners, we strongly recommend to contact us for exact dimensions for a superior plant arrangement

Perfectly matched components by:

Ability of installing the second burner bloc as well as fuel combustion accessories on the other floors.

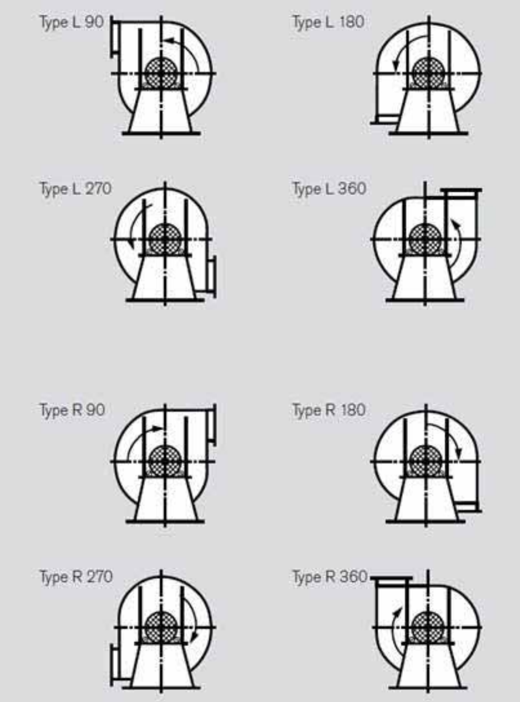


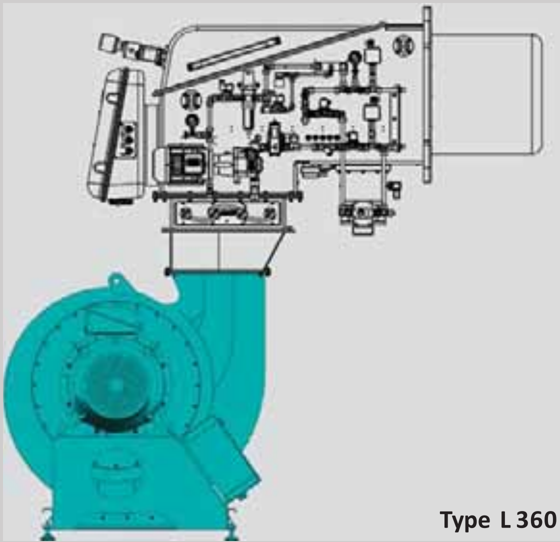
Air block



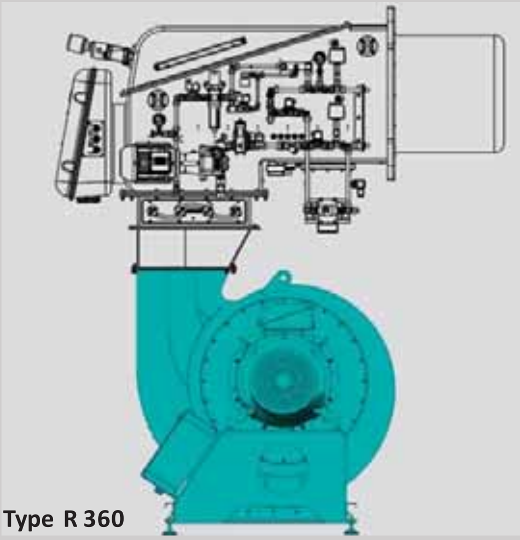
Note: The housing arrangement is to be considered as viewed from the drive side of the fan. Subsequent alteration of the alignment of the fan to its base is not possible, as the two parts are welded together during manufacture.

The likelihood of 8 housings arrangement based on the customer request

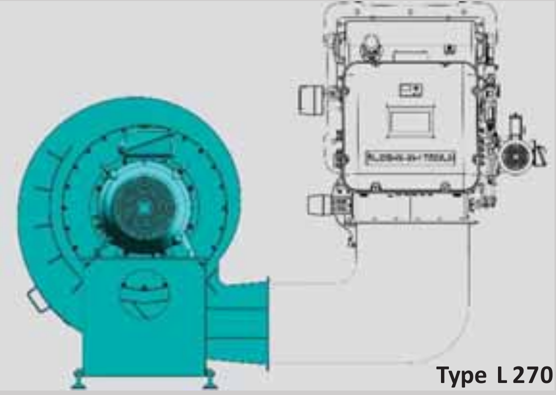




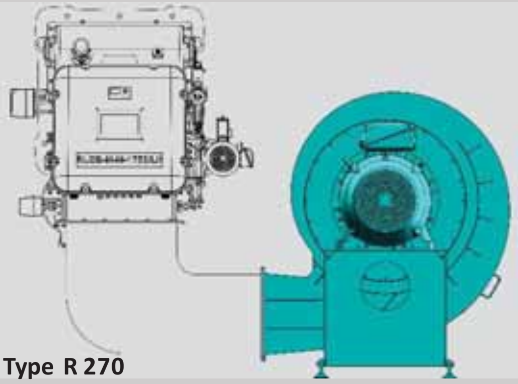
Type L 360



Type R 360



Type L 270

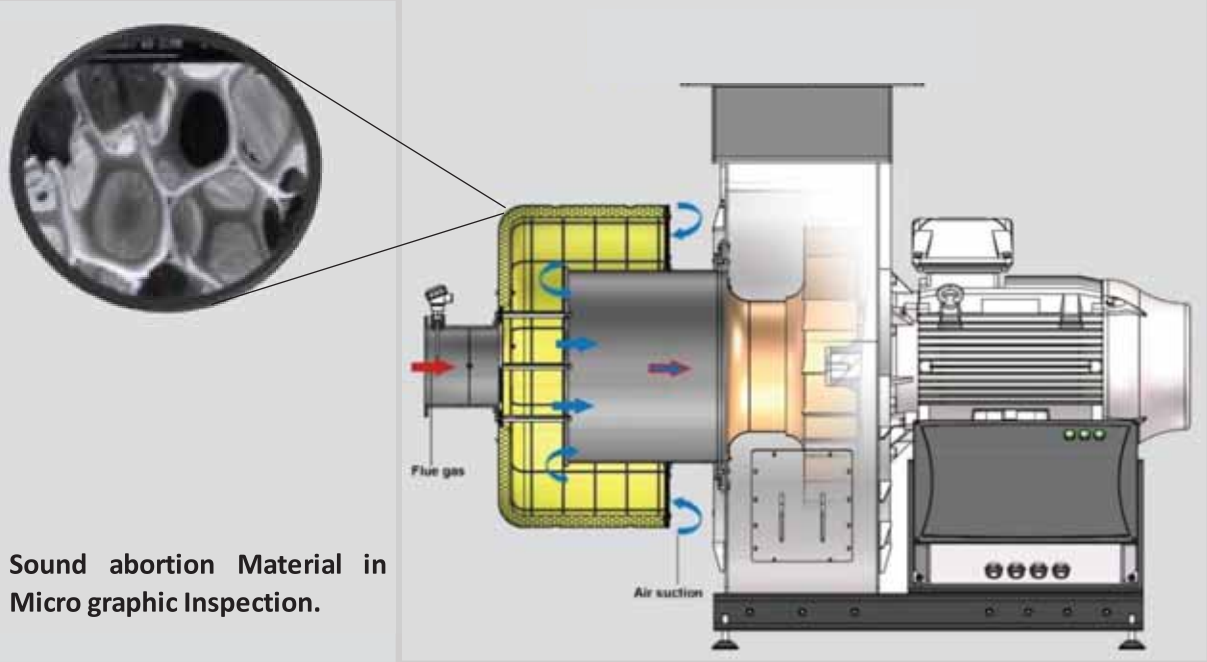


Type R 270

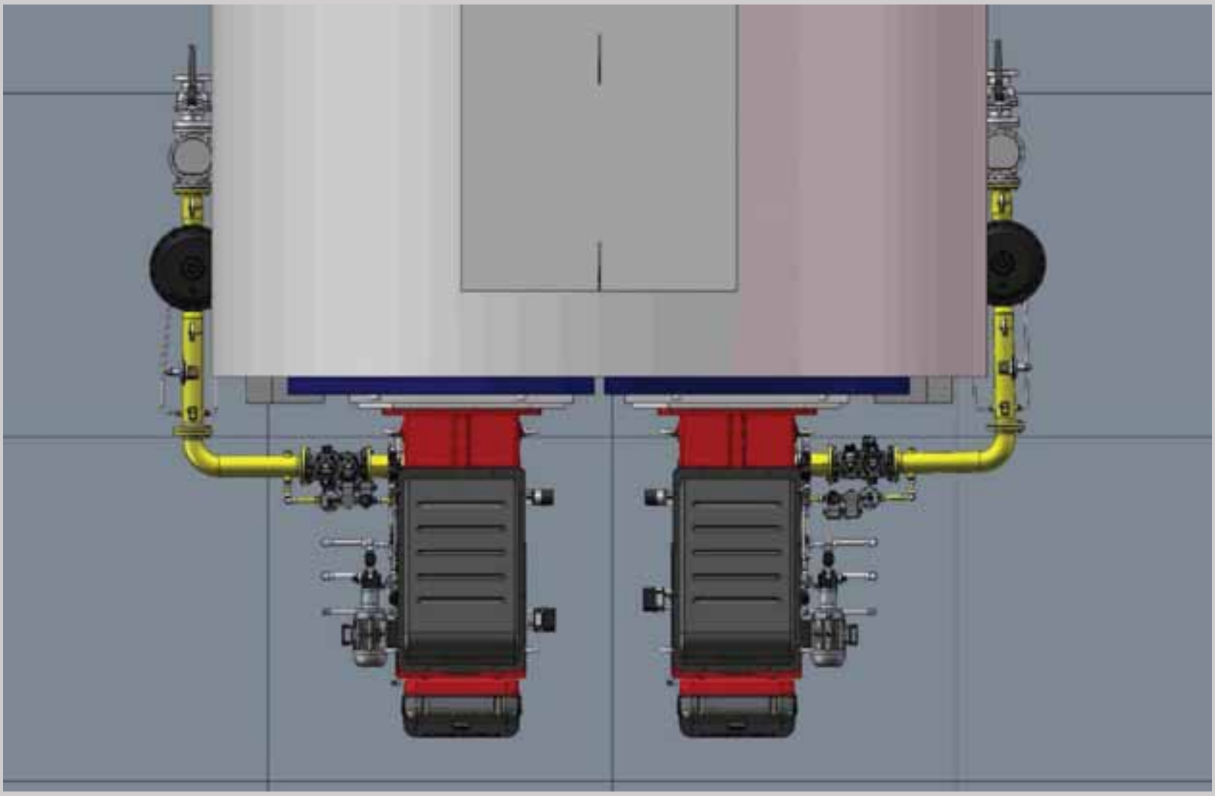
Noise suppression

Acoustic absorption refers to the process by which a material, structure, or object takes in sound energy when sound waves are encountered, as opposed to reflecting the energy. Part of the absorbed energy is transformed into heat and part is transmitted through the absorbing body. The energy transformed into heat is said to have been 'lost'.

When sound from a loudspeaker collides with the walls, the sound's energy is reflected, part is transmitted, and part is absorbed into the walls. Just as the acoustic energy was transmitted through the air as pressure differentials (or deformations), the acoustic energy travels through the material which makes up the wall in the same manner. Deformation causes mechanical losses via conversion of part of the sound energy into heat, resulting in acoustic attenuation, mostly due to the wall's viscosity. Similar attenuation mechanisms apply for the air and any other medium through which sound travels.



Sound abortion Material in Micro graphic Inspection.



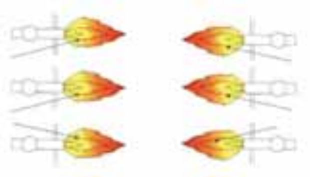
Reliable flame monitoring

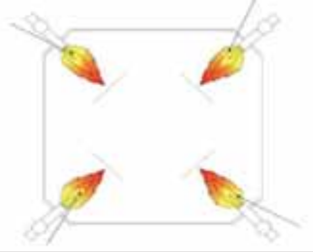
Flame monitoring plays a crucial role when it comes to reliability and safety.
Determination of the best method of flame monitoring takes into account not only the burner and the fuel to be combusted, but also how the system operates and the conditions inside the combustion chamber.
Heat generators with one flame per combustion chamber are easier to monitor than those with multiple flames. In the latter case, it also depends whether the flames are firing into the combustion chamber from the same or opposing directions.
Biomass plant and waste incinerators need a flame monitoring system that is not affected by extraneous flames.
DB series are for plant with multiple burners firing from different directions into a single combustion chamber, and for process plant with various flame sources. The flame scanners monitor each flame separately via up to ten load-dependent switching thresholds for each fuel.

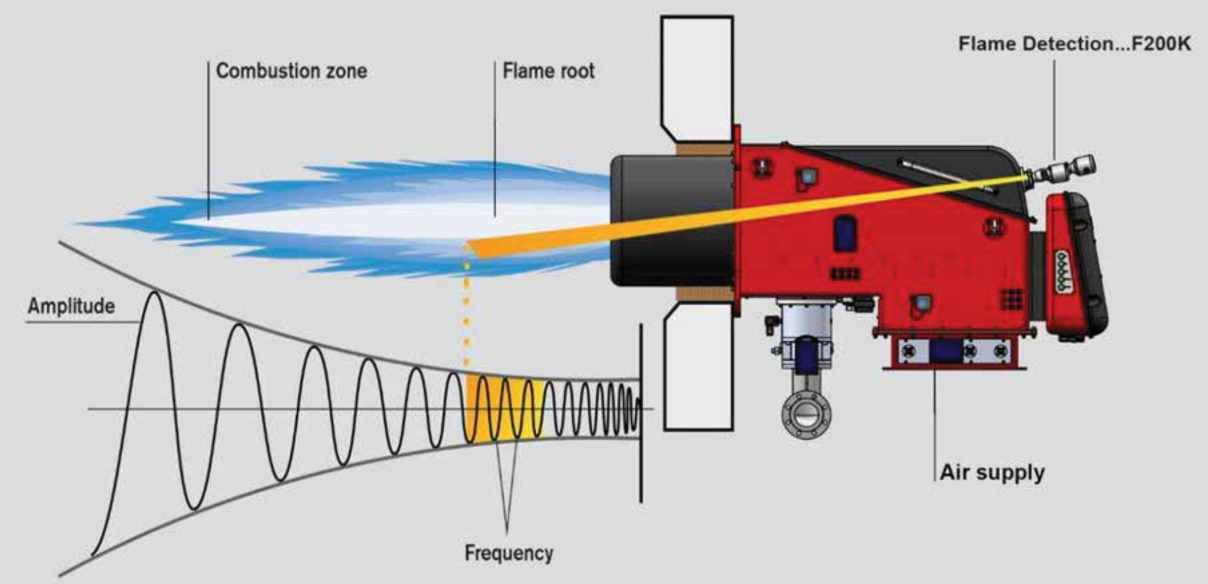
LAMTEC- F200K

The compact flame scanner is composed of a cylindrical casing comprising an axial light incidence aperture, a processing status indicator at the rear of the unit and operational controls which can be accessed by removing the cover.

The device is connected through an integrated standard plug and using a connection cable required for this with coupler.



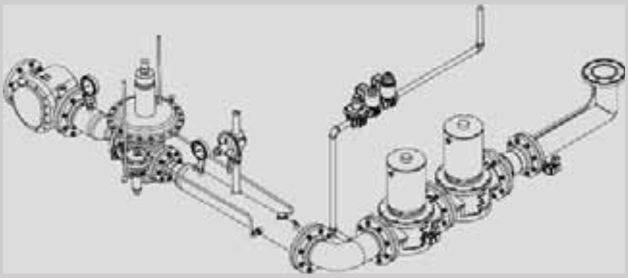




Gas train

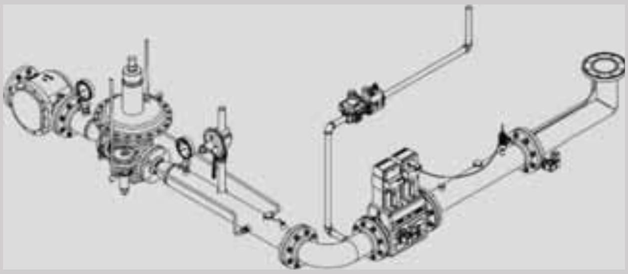
High-pressure gas supply, standard version

Used when:
Input pressure is > 500 mbar
The total pressure loss in gas valves, Butterfly valve and combustion chamber resistance does not exceed 200 mbar.



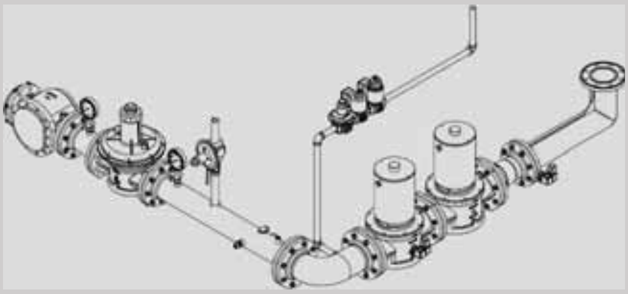
High-pressure gas supply, Multi bloc version

Used when:
Input pressure is > 500 mbar
The total pressure loss in gas valves, Butterfly valve and combustion chamber resistance does not exceed 550 mbar.



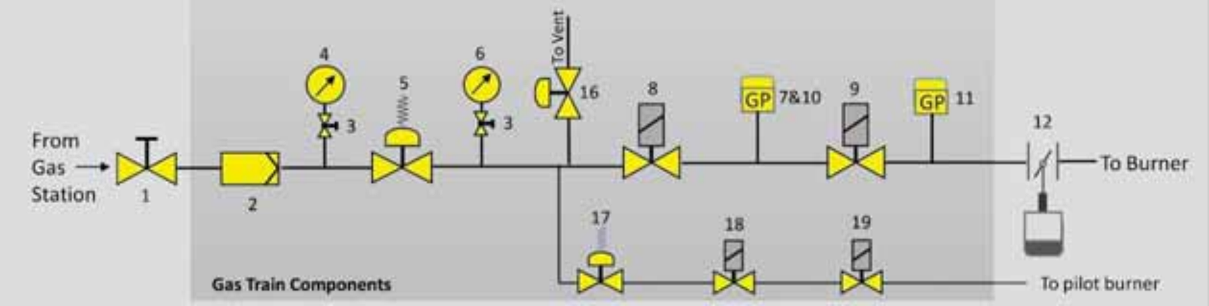
Low-pressure gas supply

Input pressure is < 500 bar
The total pressure loss in gas valves, Butterfly gate valve and combustion chamber resistance does not exceed 200 mbar

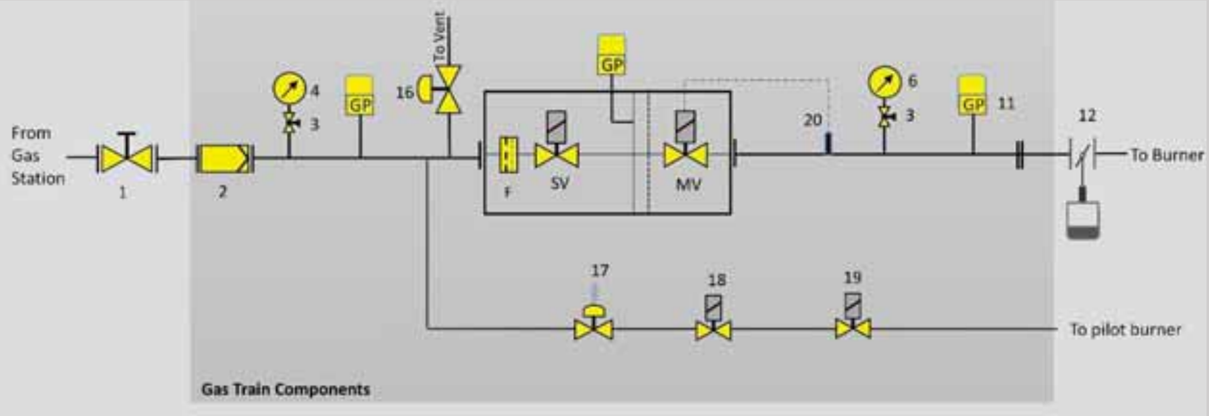


Gas train selection

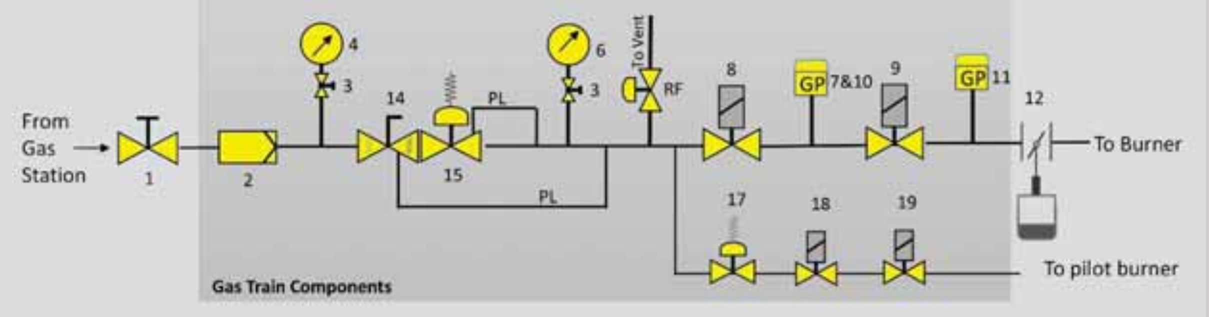
GT1



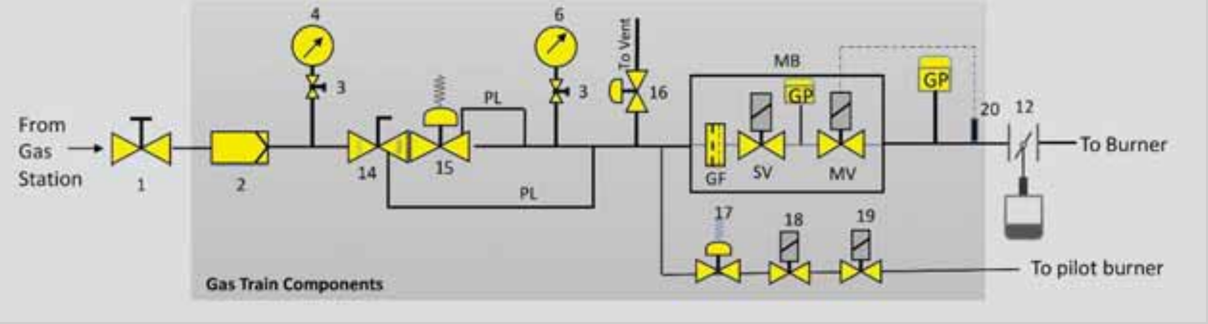
GT2



GT3



GT4



1: Ball valve
2: Gas filter
3: Push button 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: Leak Test gas pressure switch
11: Max gas pressure switch
12: Butterfly valve
13: Multi-Block Solenoid Valve
14: Shut-off valve
15: High pressure regulator
16: Relief valve
17: Pilot regulator
18: Pilot valve 1
19: Pilot valve 2
20. Pressure transmiter

RGB-M-...-DB Series

Burner	Gas Model	Gas Trian Size	ΔP B. V	ΔP C.H* (mbar)
RGB-M-705-DB	GT-1	DN80	4	80
	GT-2	DN65		
	GT-3	DN80		
	GT-4	DN65		
RGB-M-805-DB	GT-1	DN100	5	72
	GT-2	DN80		
	GT-3	DN80		
	GT-4	DN80		
RGB-M-950-DB	GT-1	DN100	5	76
	GT-2	DN80		
	GT-3	DN80		
	GT-4	DN80		
RGB-M-1050-DB	GT-2	DN80	5	100
	GT-3	DN80		
	GT-4	DN80		
RGB-M-1250-DB	GT-2	DN100	5	85
	GT-3	DN100		
	GT-4	DN100		
RGB-M-1550-DB	GT-2	DN100	7	110
	GT-3	DN100		
	GT-4	DN100		
RGB-M-1750-DB	GT-2	DN100	7	120
	GT-3	DN100		
	GT-4	DN100		
RGB-M-2050-DB	GT-2	DN125	--	--
	GT-4	DN100		
RGB-M-2250-DB	GT-2	DN125	--	--
	GT-4	DN100		
RGB-M-2550-DB	GT-2	DN125	17	90
	GT-4	DN100		
RGB-M-3250-DB	GT-2	DN125	27	145
	GT-4	DN125		

RGLB-M/M-...-DB Series

Burner	Gas Model	Gas Trian Size	ΔP B. V	ΔP C.H* (mbar)
RLGB-M/M-705-DB	GT-1	DN80	4	80
	GT-2	DN65		
	GT-3	DN80		
	GT-4	DN65		
RLGB-M/M-805-DB	GT-1	DN100	5	72
	GT-2	DN80		
	GT-3	DN80		
	GT-4	DN80		
RLGB-M/M-905-DB	GT-1	DN100	5	76
	GT-2	DN80		
	GT-3	DN80		
	GT-4	DN80		
RLGB-M/M-1050-DB	GT-2	DN80	5	100
	GT-3	DN80		
	GT-4	DN80		
RLGB-M/M-1250-DB	GT-2	DN100	5	85
	GT-3	DN100		
	GT-4	DN100		
RLGB-M/M-1550-DB	GT-2	DN100	7	110
	GT-3	DN100		
	GT-4	DN100		
RLGB-M/M-1750-DB	GT-2	DN100	7	120
	GT-3	DN100		
	GT-4	DN100		
RLGB-M/M-2050-DB	GT-2	DN125	--	--
	GT-4	DN100		
RLGB-M/M-2250-DB	GT-2	DN125	--	--
	GT-4	DN100		
RLGB-M/M-2550-DB	GT-2	DN125	17	90
	GT-4	DN100		
RLGB-M/M-3250-DB	GT-2	DN125	27	145
	GT-4	DN125		

Oil delivery system

Pressure based spill back lances/atomizers:

The burner-lance is especially suitable for use in or on an oil burner and is designed to operate spill back atomizers with integrated shut-off needle. The strong spring on the actuating rod pushes the needle in closed position. This ensures a reliable shut-off under all circumstances.

Fuel, branched off from the supply line actuates the piston for opening, either controlled by two external solenoid valves or by one 3/2 solenoid valve. The piston has a fixed travel. While opening, the needle inside the atomizer is retracted in the correct position by means of a spring at the back of the atomizer against a fixed stop on the needle itself.

During the pre-purge period of the burner, the needle is keeping the orifice closed and the fuel circulates through the lance at pre-set supply and return pressure. On energizing both solenoid valves and the 3/2 solenoid valve, even after long idle intervals, there is immediate atomization guaranteeing perfect ignition.

The burner-lance is suitable for supply pressures from 20 up to 40 bar and fuel temperatures up to 140°C.

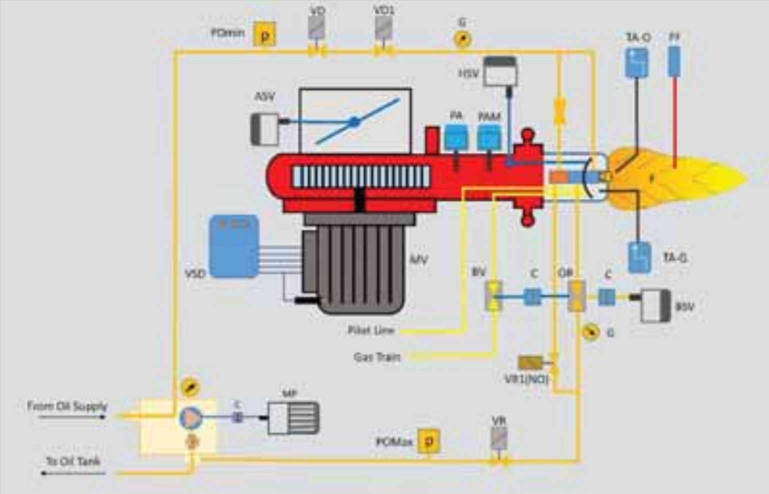
Air/Steam lances/atomizers

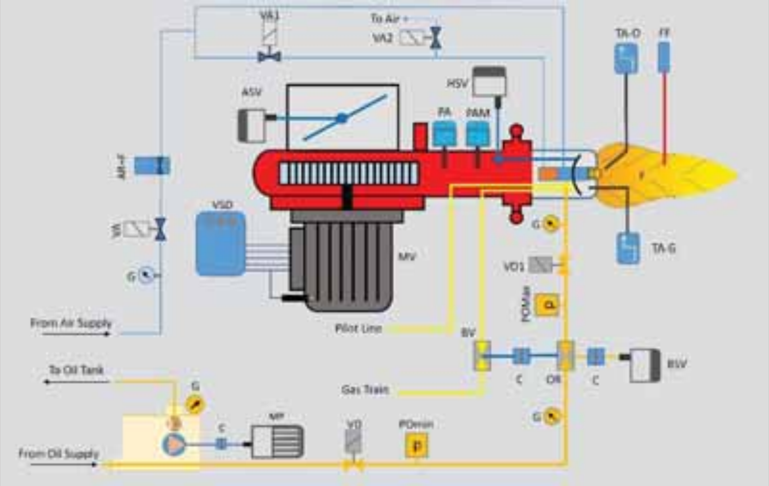
The burner-lance of with shut-off needle is especially suitable for use in or on an oil burner and is designed to operate 32-Y atomizers with compressed air or steam.

The strong spring on the actuating rod pushes the needle in closed position. Compressed air, controlled by an external 3/2 solenoid valve, actuates the piston for opening. The piston has a fixed travel, pulling the needle in the correct position when it opens.

During the pre-purge period of the burner, the needle is keeping the central orifice in the reverse disc closed. On energizing the 3/2 solenoid valve, even after long idle intervals, there is immediate atomization guaranteeing perfect ignition.

The burner-lance is suitable for supply pressures up to 16 bar and fuel temperatures up to 140°C.





Extra options which could be ordered with us:

O_2-CO regulation

Combustion processes must be monitored and regulated in order to save energy and avoid damage to the environment, property and health. Based on the technology of zirconium dioxide prob, O2 trim is an innovative concept for binary burner regulation to create a dynamic and self-optimizing method which would further reduce exhaust gas losses in industrial combustion systems. Nowadays two types of trimming are common between combustion facility utilizers: O2-CO trim with LAMTEC combi probes or Siemens QGO sensors

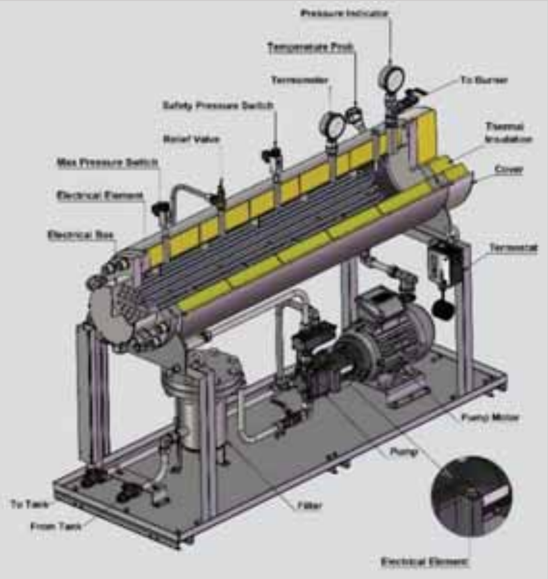
Variable speed drive (VSD)

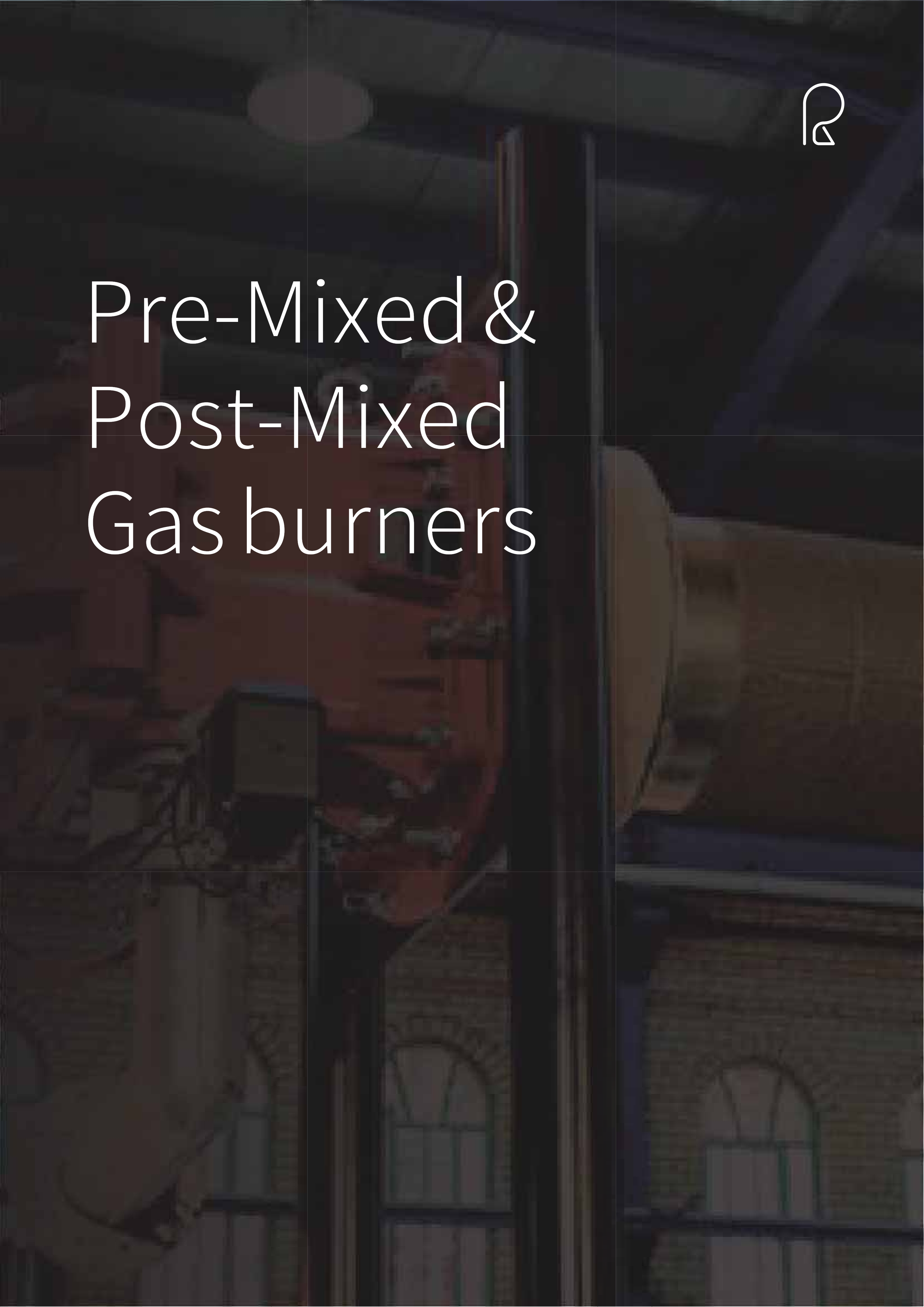
A variable-speed drives-VSD is a type of motor drive used in electro-mechanical drive systems to control AC motor speed and torque by varying motor input frequency and, depending on topology, to control associated voltage or current variation. VFDs may also be known as 'VFDs' (variable-frequency drive), ‘AFDs' (adjustable-frequency drives), 'ASDs' (adjustable-speed drives), 'AC drives', 'micro drives', 'inverter drives' or, simply, 'drives'. Using this speed controller can reduce the electrical energy consumption up 35 %.

Heavy oil heater

The Packman heavy fuel oil preheaters are designed for efficiently heating heavy oil to adjust the proper viscosity for the burner. The design is based on the general conditions such as the type and properties of the heavy fuel oil, pressure requirements of the pump and temperature as well as the desired operating points in the process. Electrical heavy fuel oil heater directly heat fuel by converting electrical energy in the heating elements to thermal energy. The thermal energy is then transferred from the heating electrical elements to the fluid.

The unit skids are designed in order to prepare heavy fuel oil with max viscosity 10 Cst at 130°C and outlet pressure of 25 mbar.





Pre-Mixed & Post-Mixed Gas burners

RPB-M-125 /PM

PE: Pre-Mixed Gas Burner

PM: Post-Mixed Gas Burner

Reference of approximate Capacity x 10 kW

Operation:

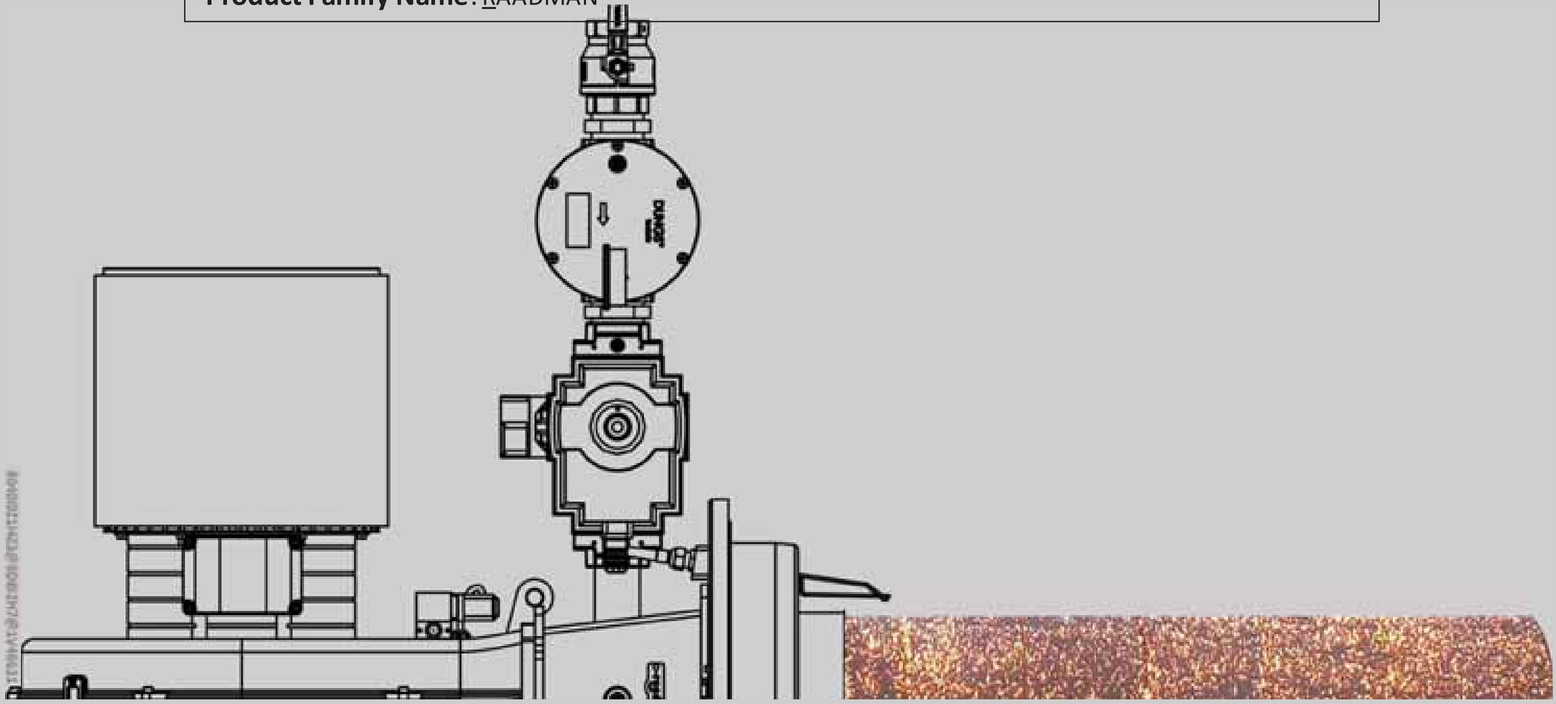
Blank:	Two Stage or One Stage
M:	Natural Gas, LPG: Modular Light Oil, Heavy Oil: Two/Three Stage Progressive
MC:	Natural Gas, LPG: Mechanical Modular Light Oil, Heavy Oil: Two/Three Stage Progressive
MS:	Natural Gas, LPG: Mechanical Staging Light Oil, Heavy Oil: Two/Three Stage Progressive
M/M	Natural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

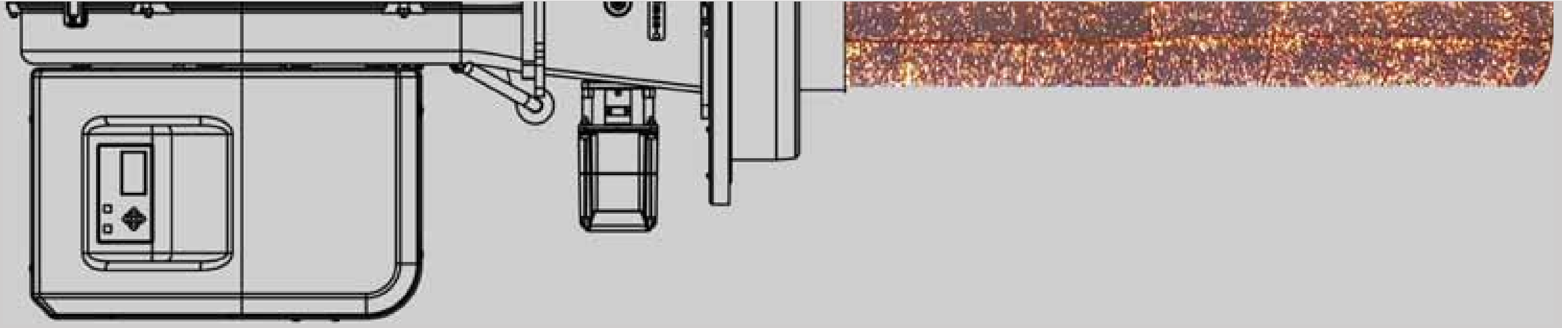
B: Burner

Type of Fuel

P	Pre-Mixed or Post-Mixed Gas Burner
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

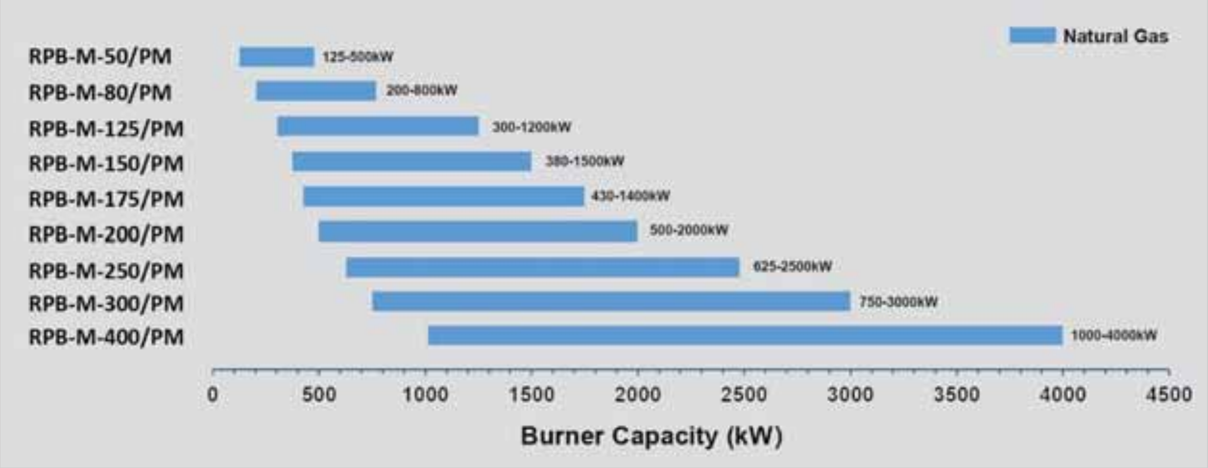
Product Family Name: RAADMAN



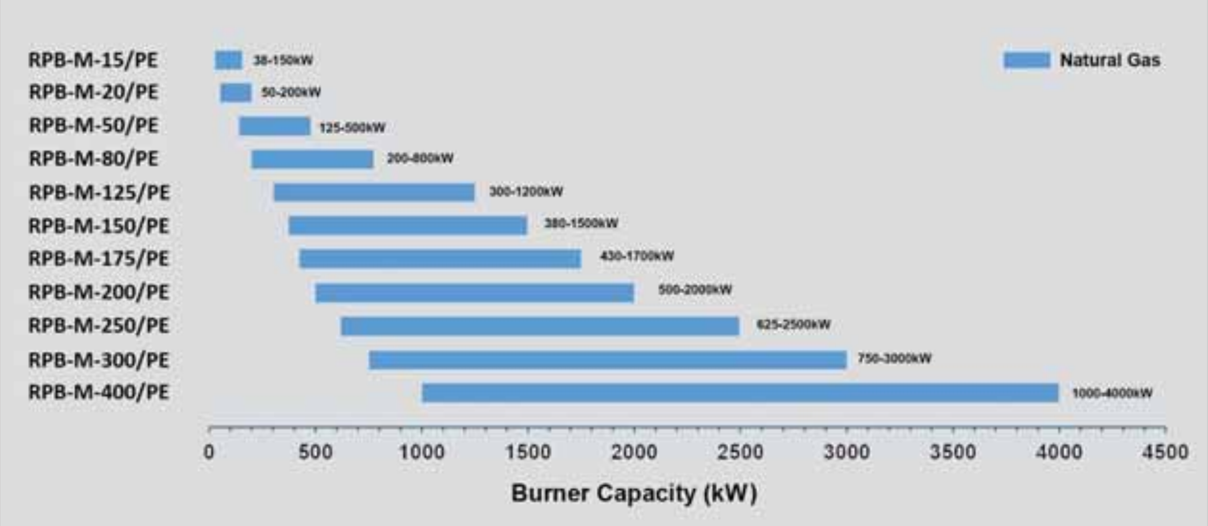


Firing rate

Post-Mixed Burner

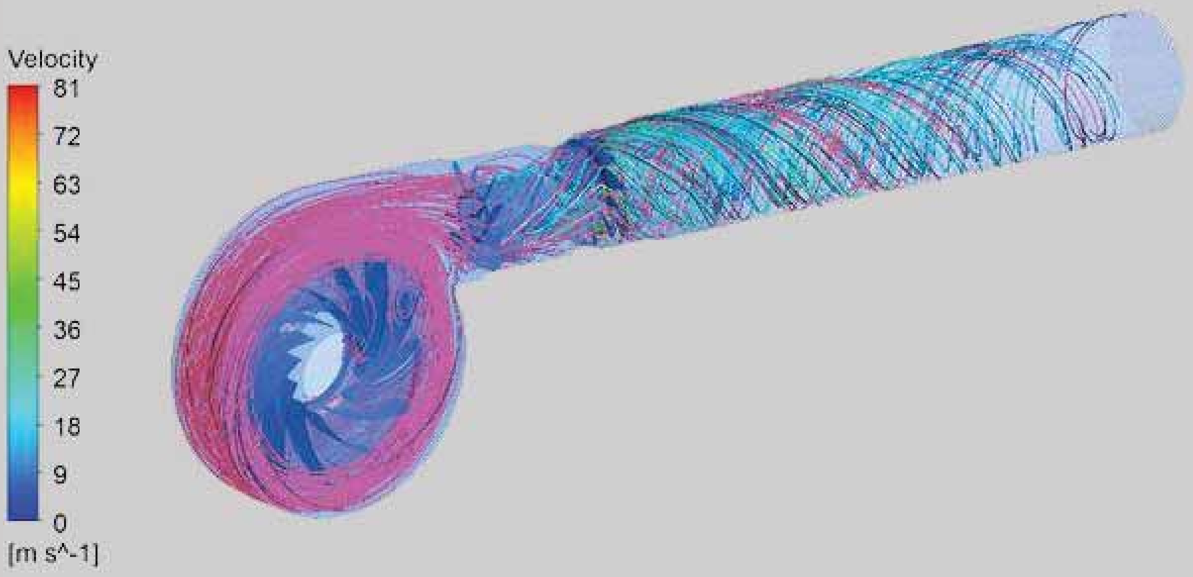


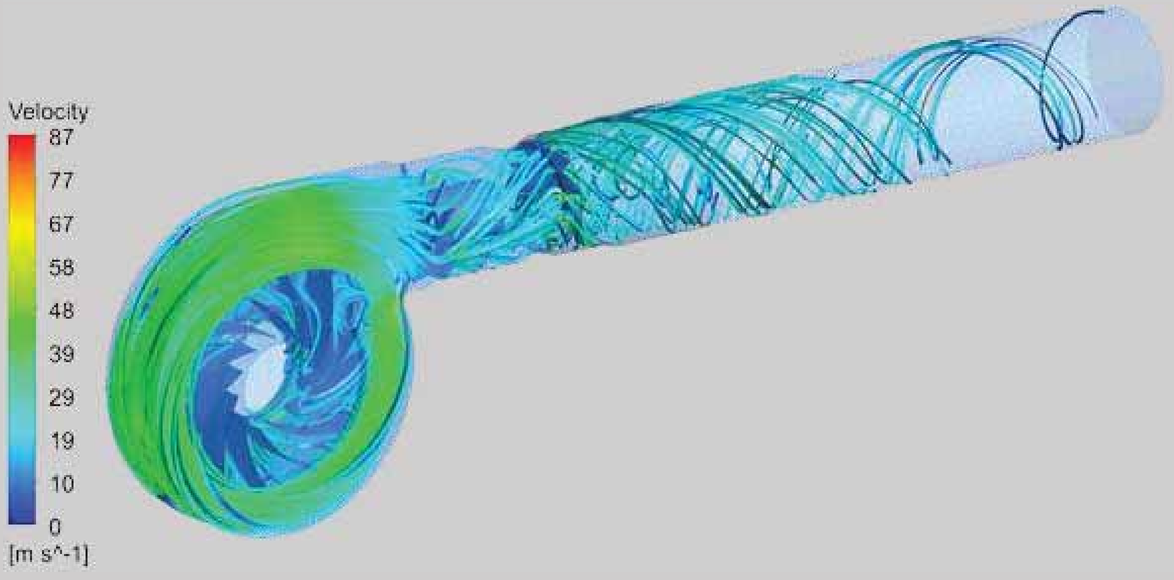
Pre-Mixed Burner



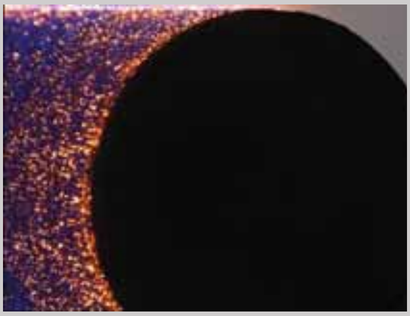
CFD experts in R&D department

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.





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.

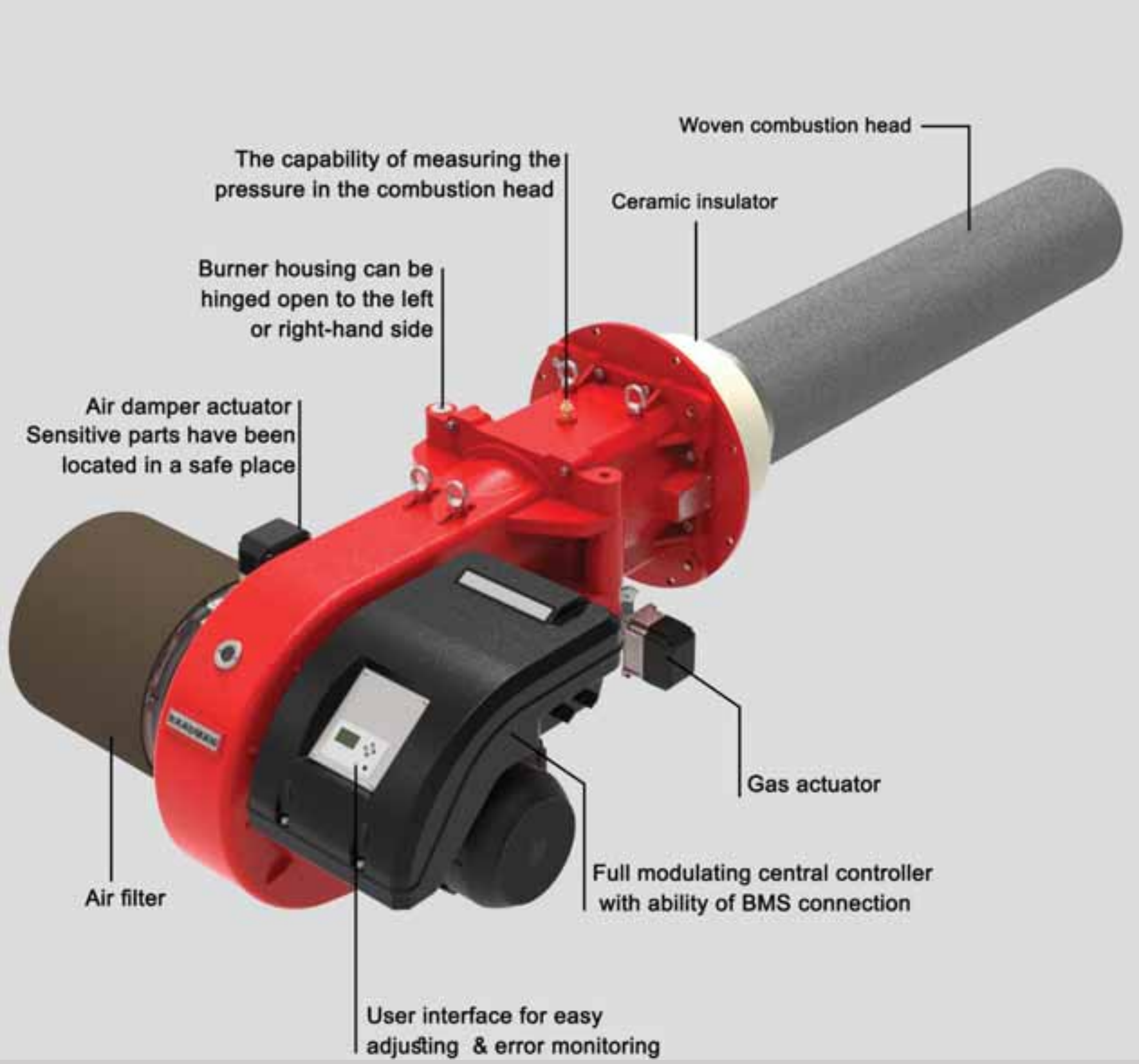
Electronic modular operation

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 in 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.

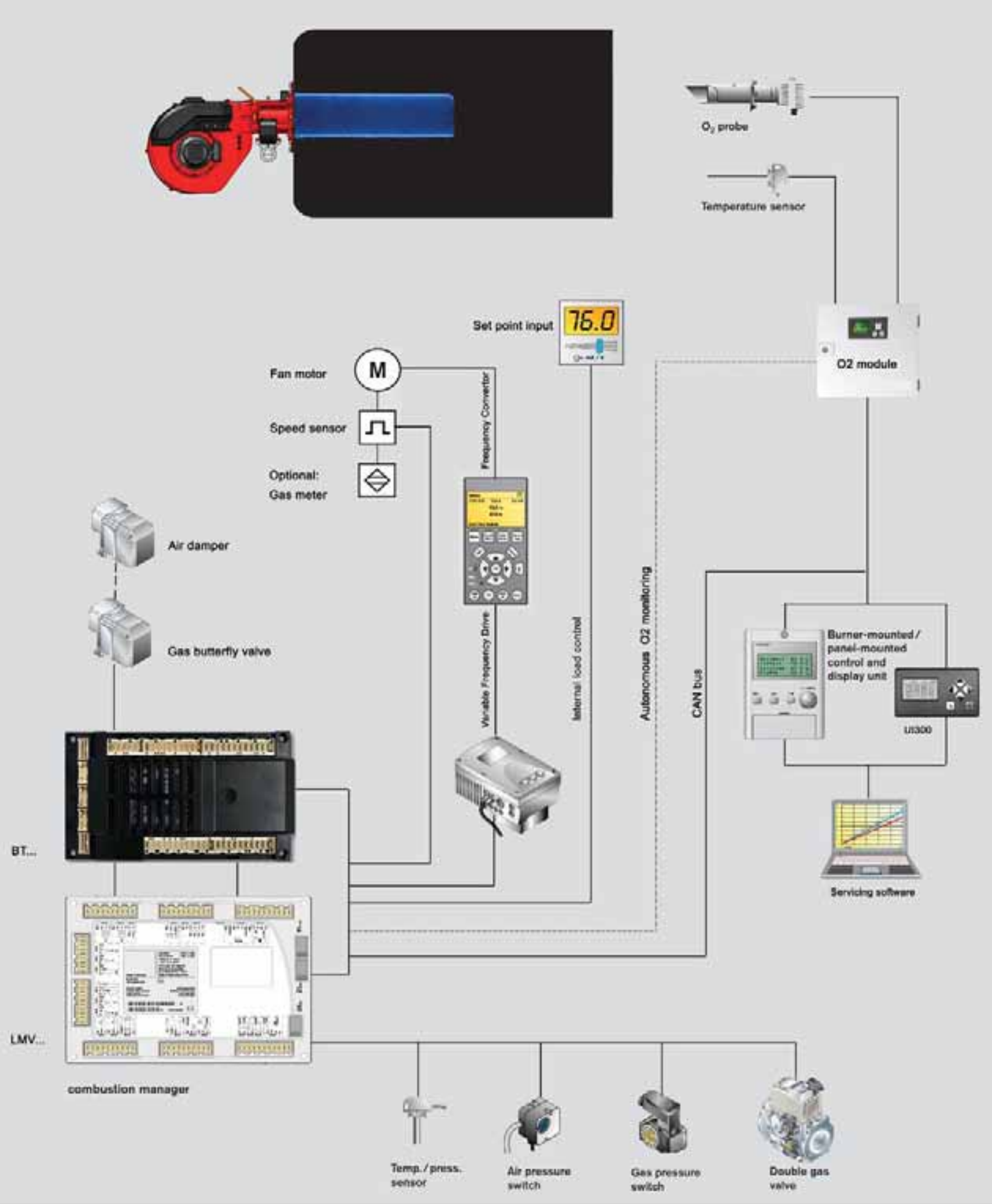
Post-Mixed raadman burners

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.



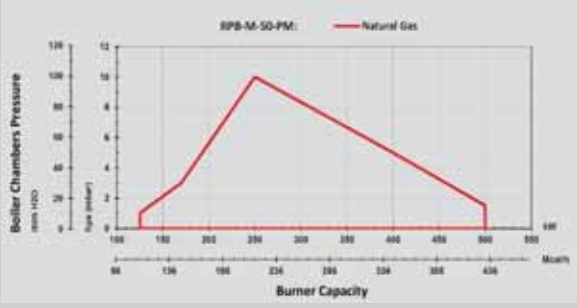
Post-mixed burner management system



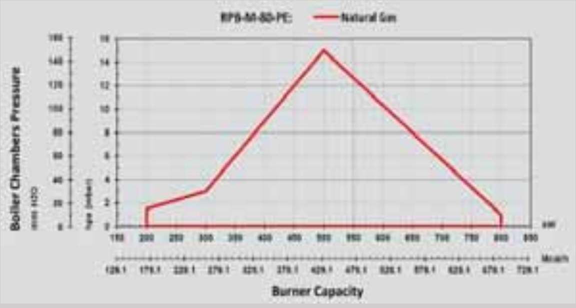
Burner selection: capacity and working diagram

Post-Mixed Burner

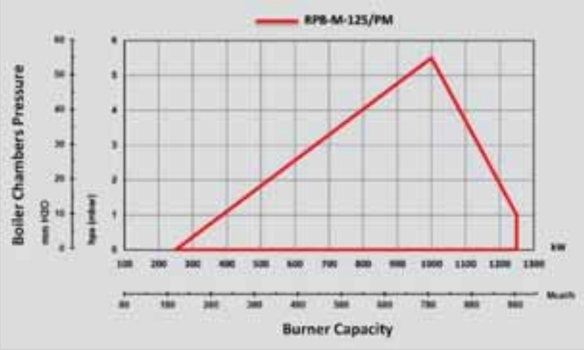
Burner	Capacity (kW)	Turn Down
RPB-M-50/PM	NG:125-500	1:4



Burner	Capacity (kW)	Turn Down
RPB-M-80/PM	NG:200-800	1:4



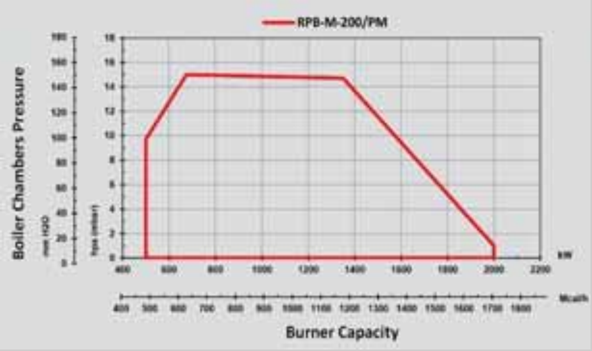
Burner	Capacity (kW)	Turn Down
RPB-M-125/PM	NG:300-1200	1:4



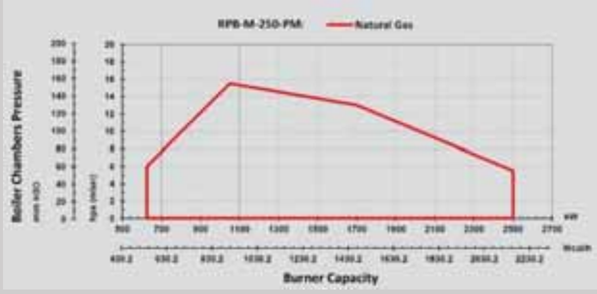
Burner	Capacity (kW)	Turn Down
RPB-M-150/PM	NG:375-1500	1:4

Burner	Capacity (kW)	Turn Down
RPB-M-175/PM	NG:425-1700	1:4

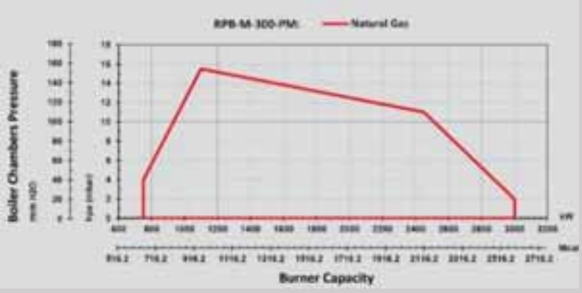
Burner	Capacity (kW)	Turn Down
RPB-M-200/PM	NG:500-2000	1:4



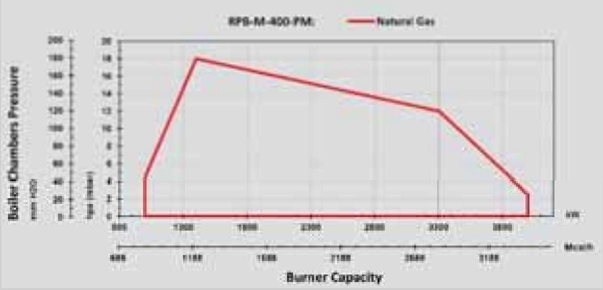
Burner	Capacity (kW)	Turn Down
RPB-M-250/PM	NG:625-2500	1:4



Burner	Capacity (kW)	Turn Down
RPB-M-300/PM	NG:700-3000	1:4



Burner	Capacity (kW)	Turn Down
RPB-M-400/PM	NG:200-4000	1:4



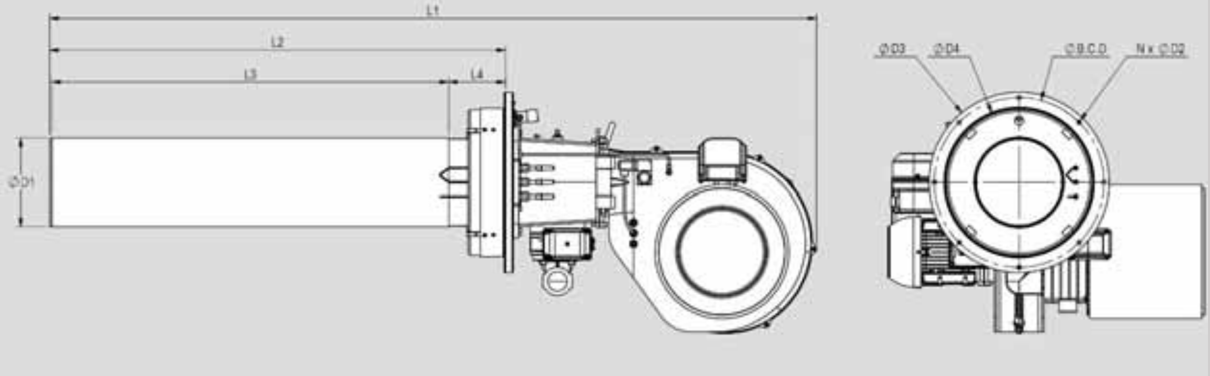
About working diagram

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.

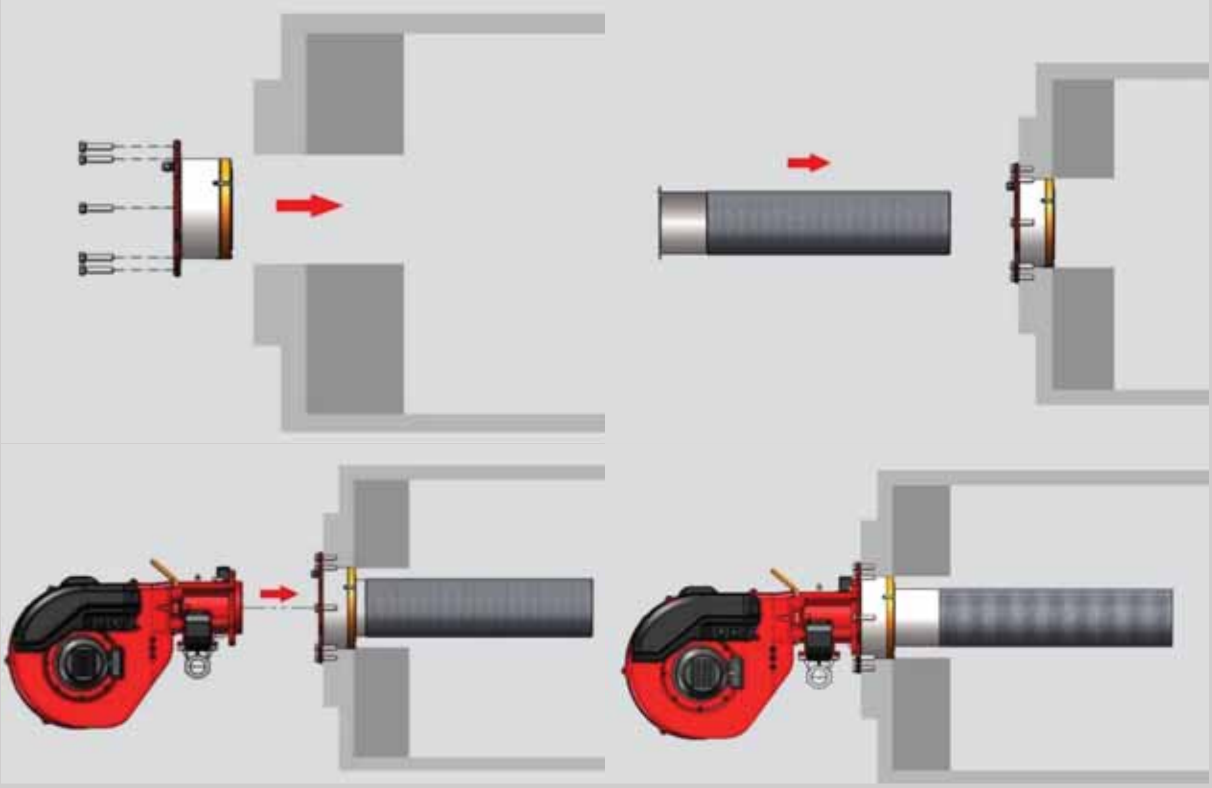
The real sense of mixing

General dimension: Post-mixed burner



Burner Type	L1	L2	L3	L4	D1	D2	D3	D4	B.C.D	N
RPB-M-50/PM	1161	461	300	161	200	11	460	364	435	8
RPB-M-80/PM	1328	608	450	158	245	11	510	419	480	8
RPB-M-125/PM	1720	841	674	161	245	11	510	419	480	8
RPB-M-150/PM	1891	1010	843	161	245	11	510	419	480	8
RPB-M-175/PM	2031	1150	983	161	245	11	510	419	480	8
RPB-M-200/PM	2171	1290	1123	161	245	11	510	419	480	8
RPB-M-250/PM	2267	1378	1145	208	300	11	580	470	550	8
RPB-M-300/PM	2813	1591	1374	211	300	11	580	477	550	8
RPB-M-400/PM	2985	1746	1455	286	350	13.5	655	570	620	8

Installation and removal of post-mixed burners

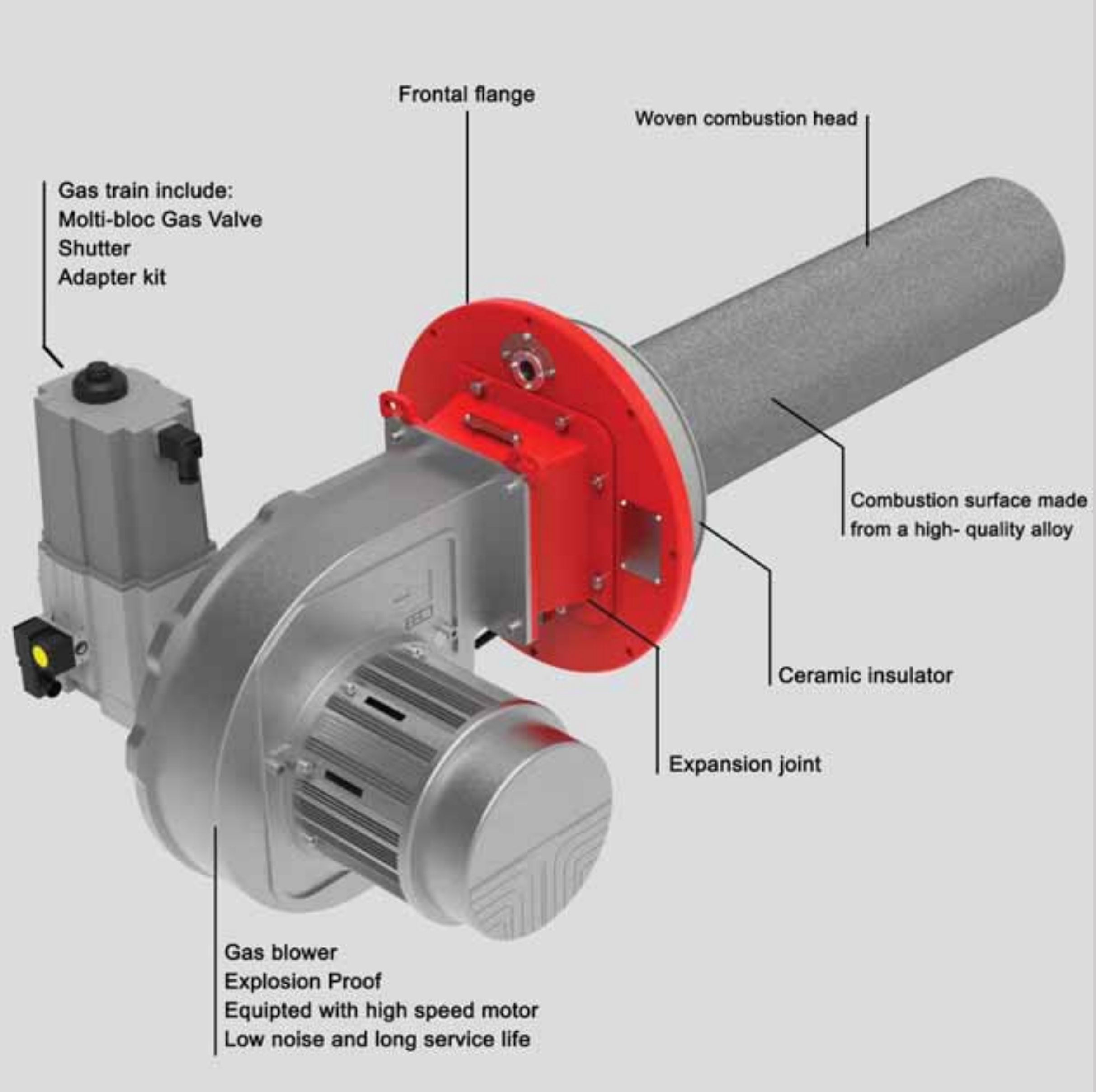


PACKMAN Low NOx Post-Mixed burner
Capacity: 750 - 3000 kW

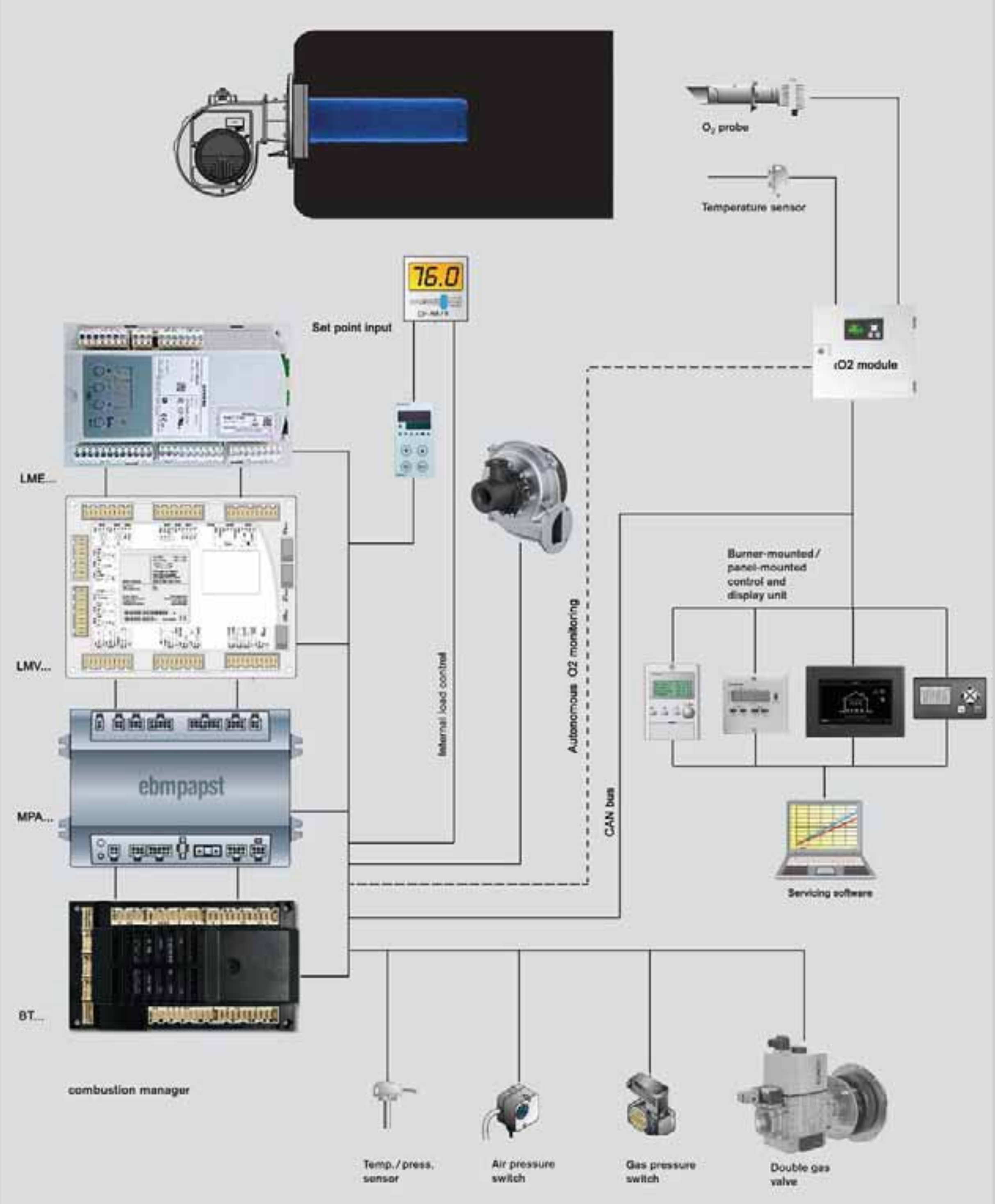
Pre-Mixed raadman burner

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.



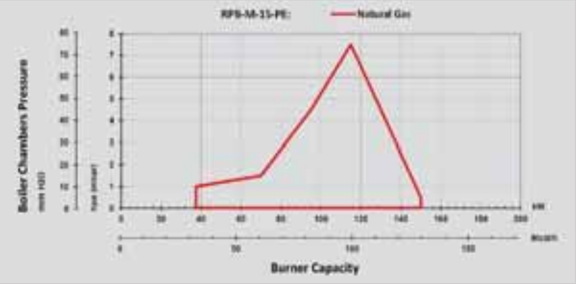
Pre-mixed burner management system

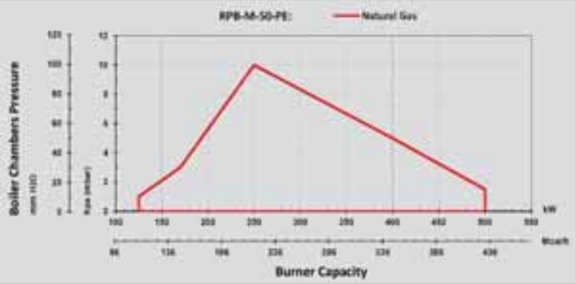


Burner selection: capacity and working diagram

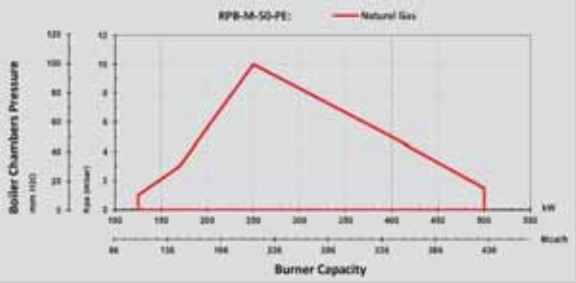
Pre-mixed Burner

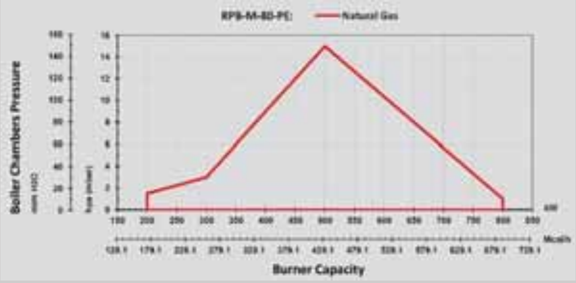
Burner	Capacity (kW)	Turn Down	Burner	Capacity (kW)	Turn Down
RPB-M-15/PE	NG:38-150	1:4	RPB-M-20/PE	NG:50-200	1:4





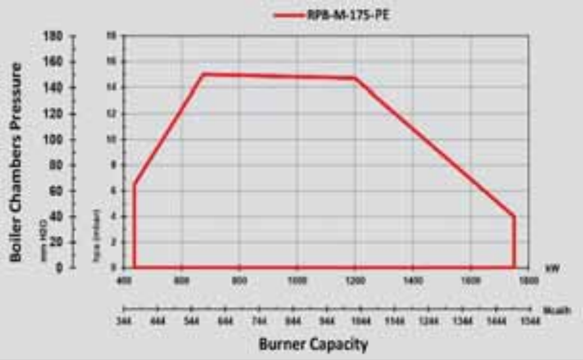
Burner	Capacity (kW)	Turn Down	Burner	Capacity (kW)	Turn Down
RPB-M-50/PE	NG:125-500	1:4	RPB-M-80/PE	NG:200-800	1:4



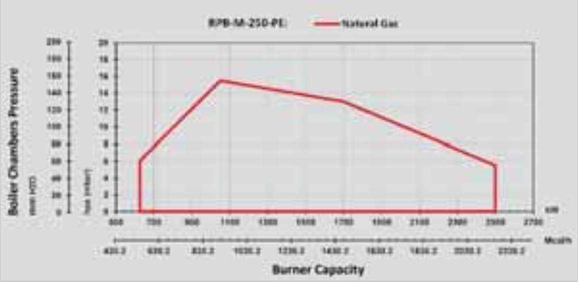


Burner	Capacity (kW)	Turn Down	Burner	Capacity (kW)	Turn Down
RPB-M-125/PE	NG:300-1200	1:4	RPB-M-150/PE	NG:375-1500	1:4

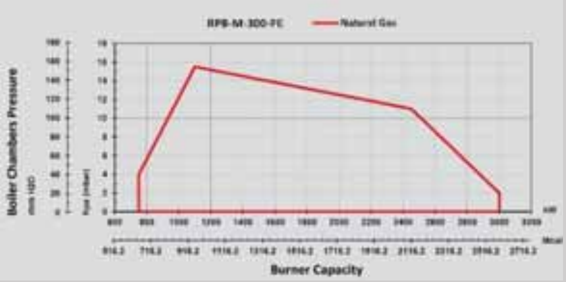
Burner	Capacity (kW)	Turn Down	Burner	Capacity (kW)	Turn Down
RPB-M-175/PE	NG:425-1700	1:4	RPB-M-200/PE	NG:500-2000	1:4



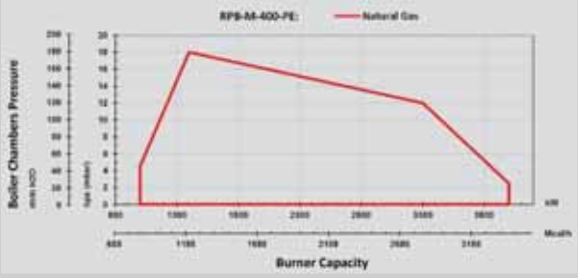
Burner	Capacity (kW)	Turn Down
RPB-M-250/PE	NG:625-2500	1:4



Burner	Capacity (kW)	Turn Down
RPB-M-300/PE	NG:750-3000	1:4



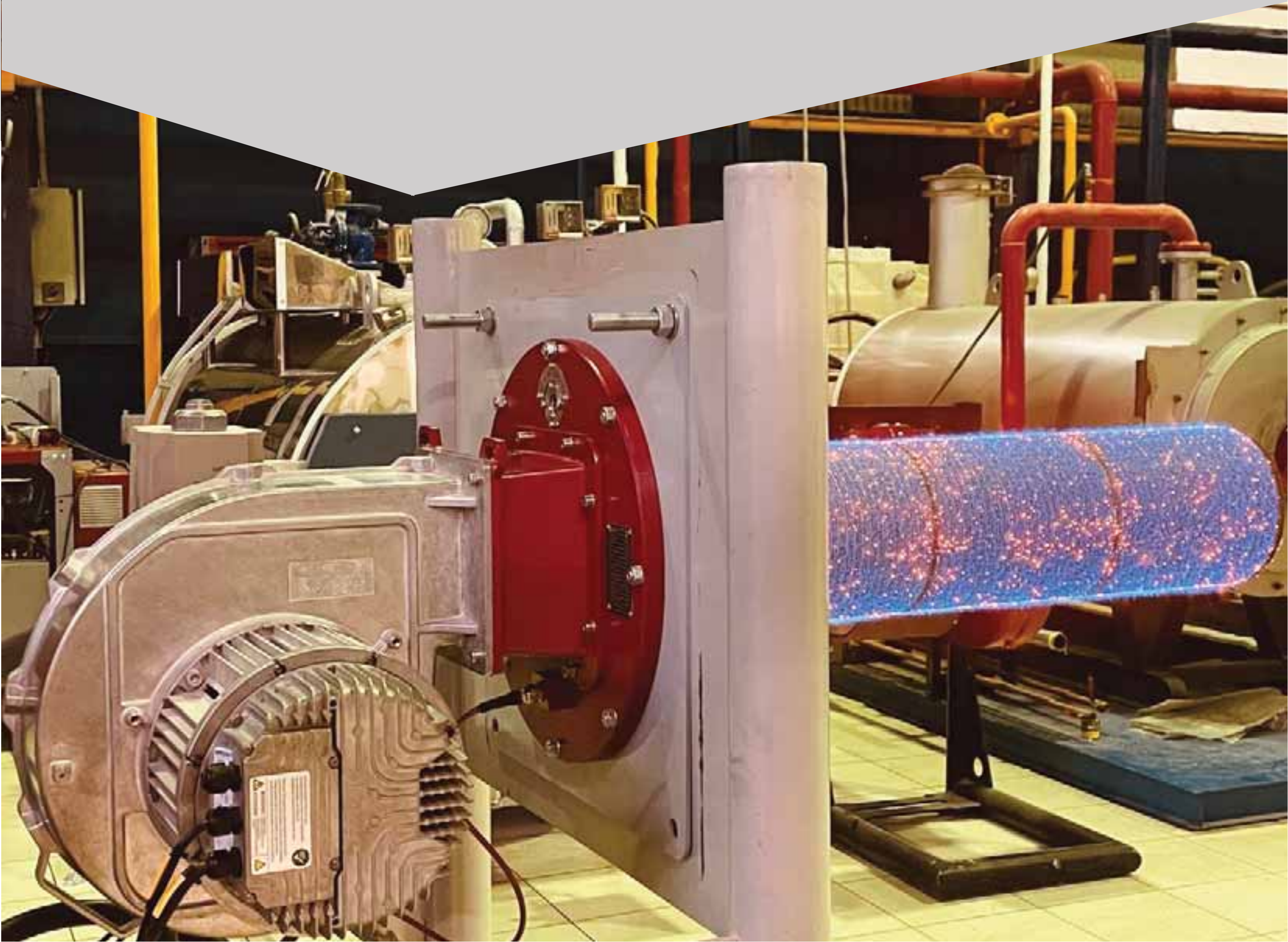
Burner	Capacity (kW)	Turn Down
RPB-M-400/PE	NG:1000-4000	1:4



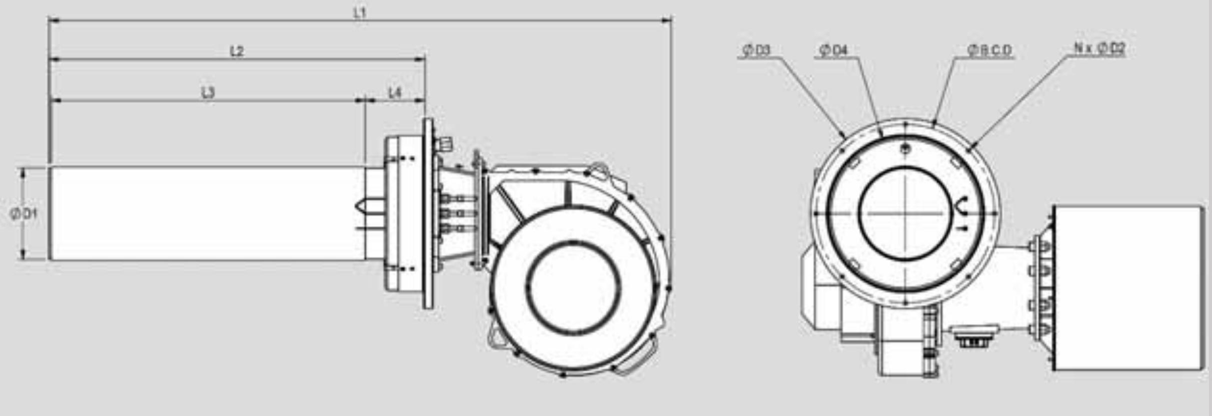
About working diagram

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.

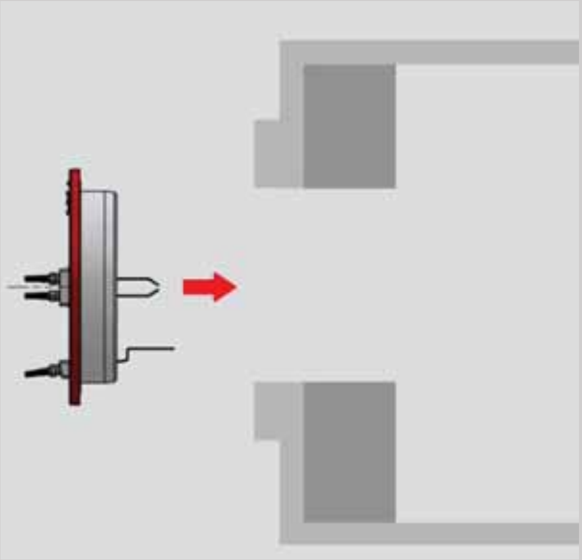


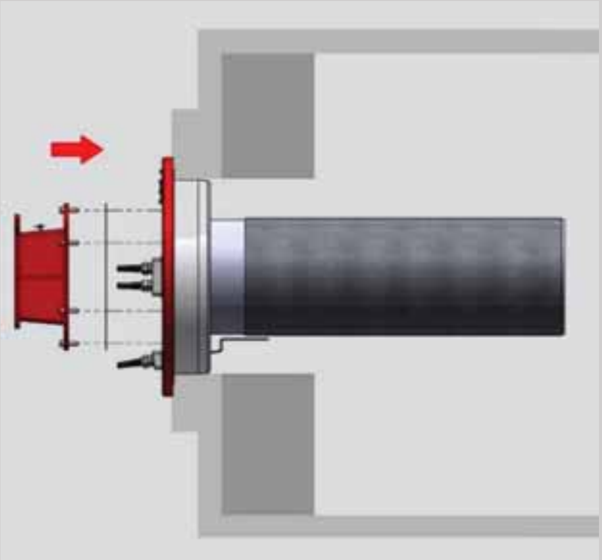
General dimension: Pre-mixed burner

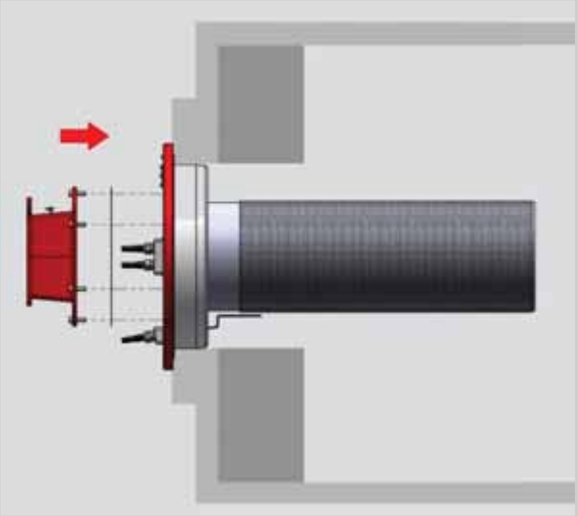


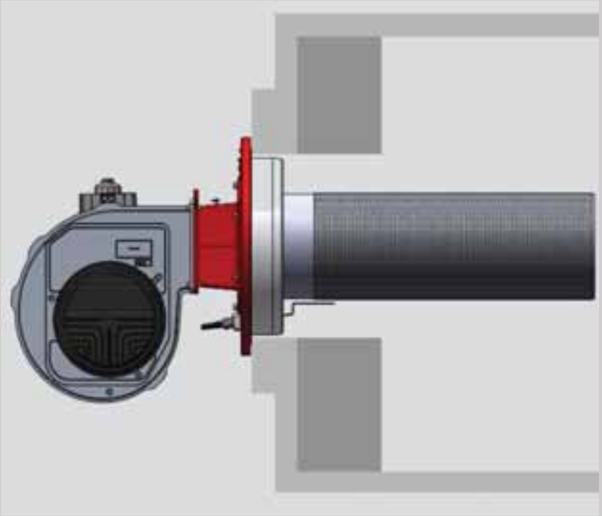
Burner Type	L1	L2	L3	L4	D1	D2	D3	D4	B.C.D	N
RPB-M-15/PE	745	442	204	238	98	6.6	285	228	265	8
RPB-M-20/PE	838	515	272	238	98	6.6	285	228	265	8
RPB-M-50/PE	920	461	300	161	200	11	460	364	435	8
RPB-M-80/PE	1192	617	450	161	245	11	510	419	480	8
RPB-M-125/PE	1424	841	674	161	245	11	510	419	480	8
RPB-M-150/PE	1668	1010	843	161	245	11	510	419	480	8
RPB-M-175/PE	1806	1150	983	161	245	11	510	419	480	8
RPB-M-200/PE	1948	1290	1123	161	245	11	510	419	480	8
RPB-M-250/PE	2053	1362	1145	211	300	11	580	475	550	8
RPB-M-300/PE	2630	1591	1374	211	300	11	580	475	550	8
RPB-M-400/PE	2782	1746	1455	286	350	13.5	670	574	620	8

Installation and removal of pre-mixed burners



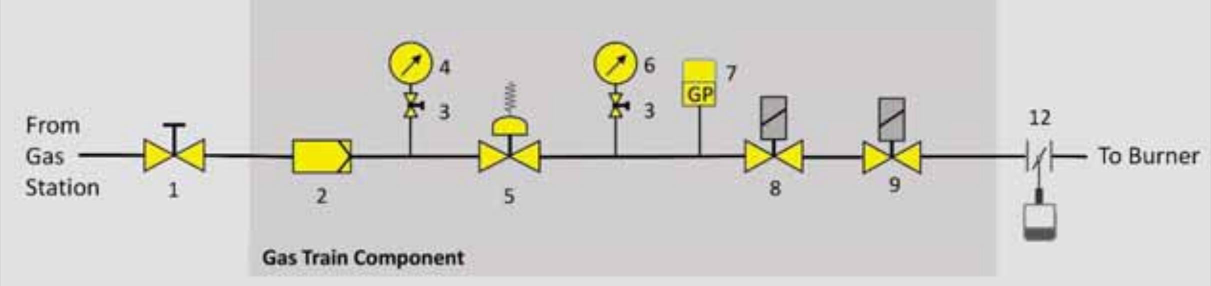




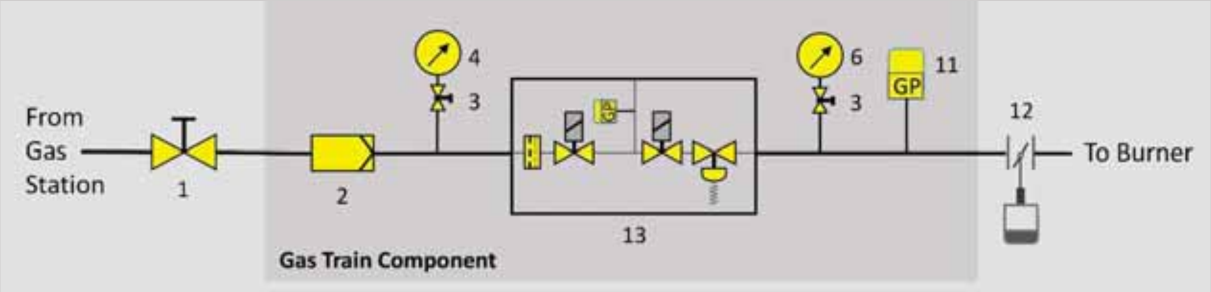


Gas train selection (Post-mixed)

GT1



GT2



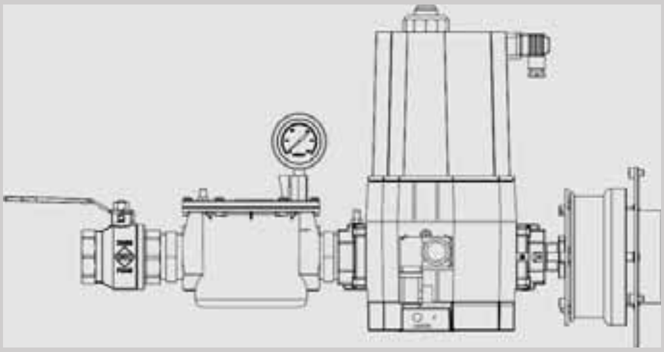
1: Ball valve
2: Gas filter
3: Push button valve
4: Pressure Gauge
5: Pressure regulator (Low-pressure)
6: Pressure Gauge
7: Min gas pressure switch
8: Safety gas valve
9: Main gas valve
10: Leak Test gas pressure switch
11: Max gas pressure switch
12: Butterfly valve
13: Multi-Block Solenoid Valve

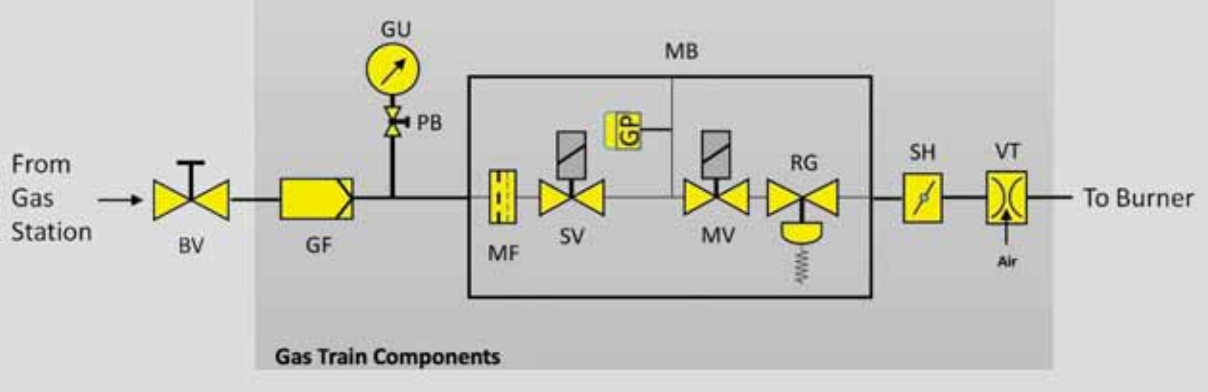
RPB-M series

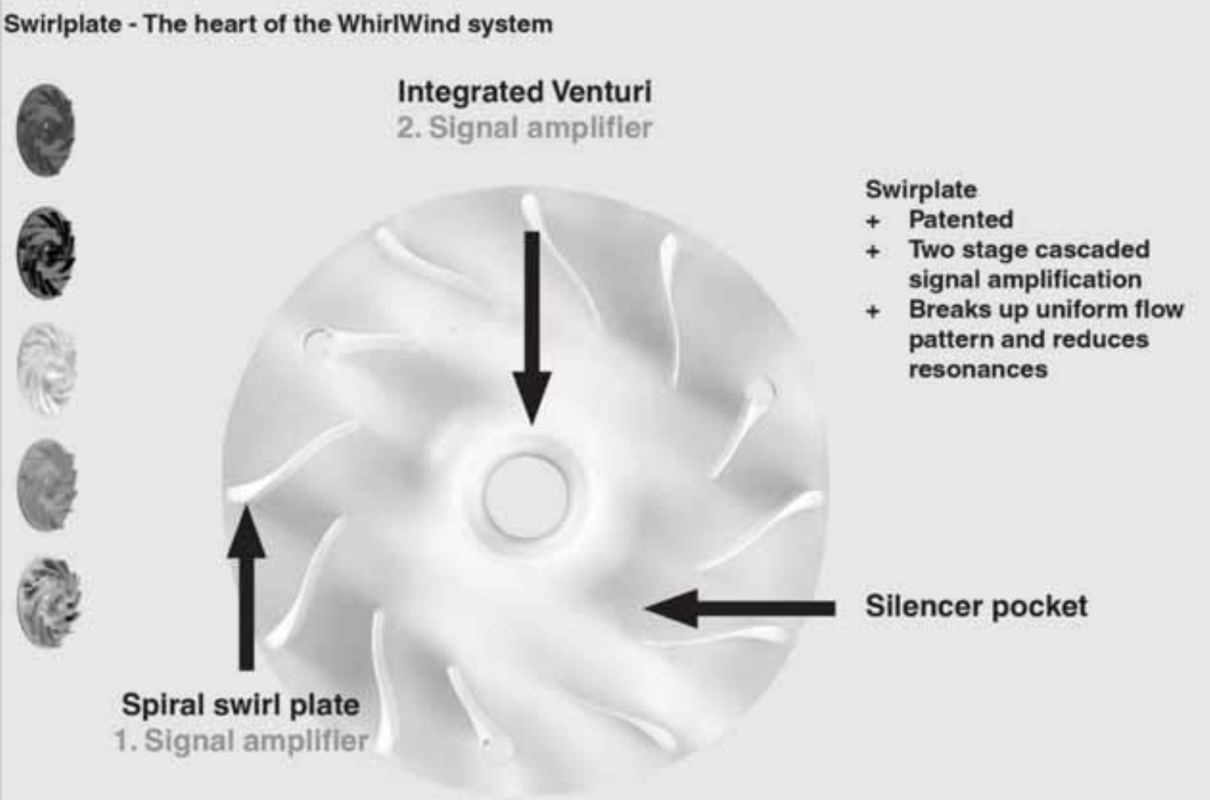
Burner	Gas model	Gas Trian Size
RPB-M-50/PM	GT-1	Rp 1 ½
	GT-2	Rp 1 ½
RPB-M-80/PM	GT-1	Rp 1 ½
	GT-2	Rp 1 ½
RPB-M-125/PM	GT-1	Rp 2
	GT-2	Rp 2
RPB-M-150/PM	GT-1	Rp 2
	GT-2	Rp 2
RPB-M-175/PM	GT-1	Rp 2
	GT-2	Rp 2
RPB-M-200/PM	GT-1	Rp 2
	GT-2	Rp 2
RPB-M-250/PM	GT-1	DN65
	GT-2	Rp 2
RPB-M-300/PM	GT-1	DN65
	GT-2	Rp 2
RPB-M-400/PM	GT-1	DN80
	GT-2	DN80

Pre-mixed gas burner

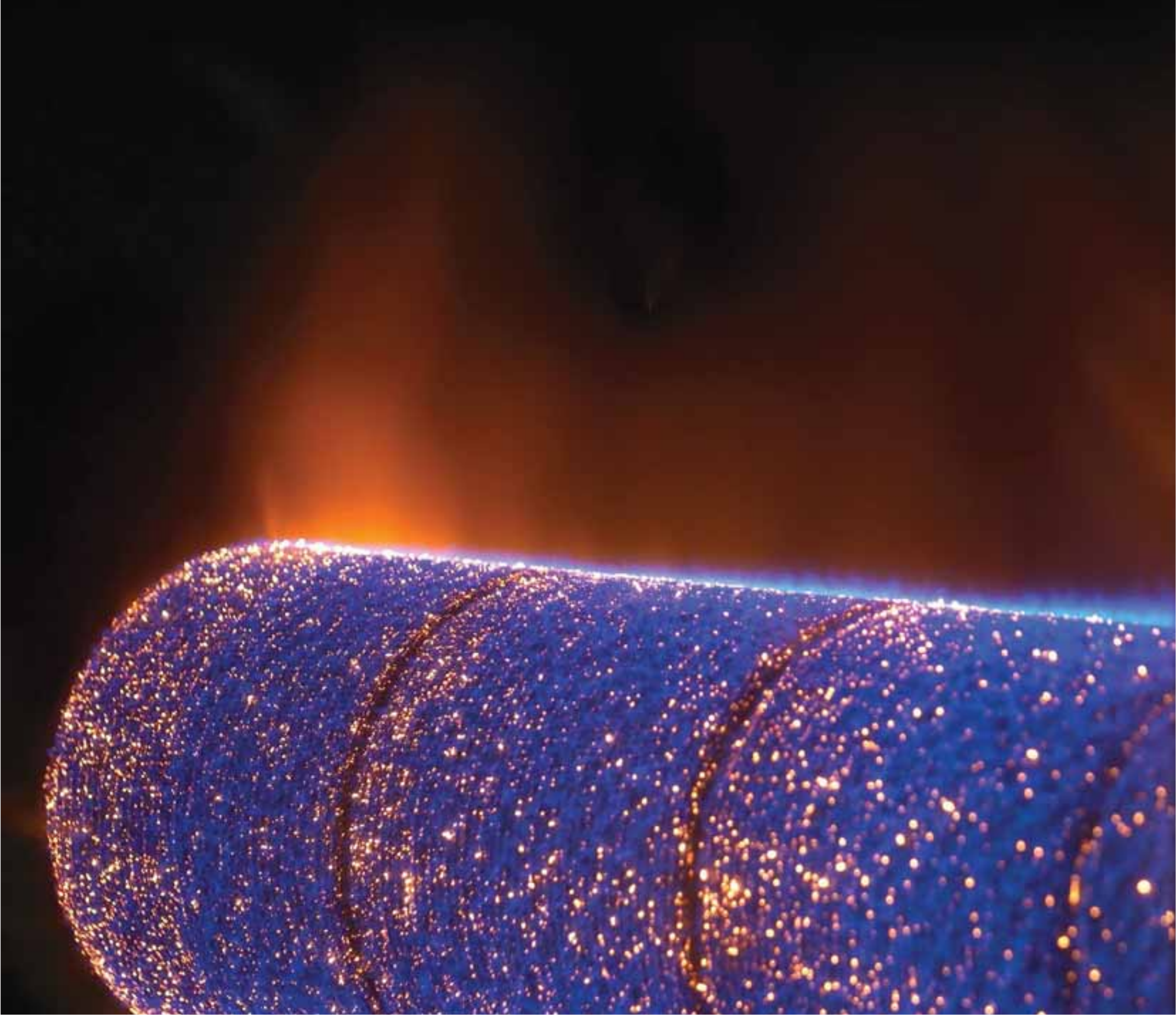
In premix burners, a venturi is used before fan to mix fuel and air. The gas line used in these burners is a multiblock gas line. This block consists of two solenoid valves, a regulator and a microfilter.



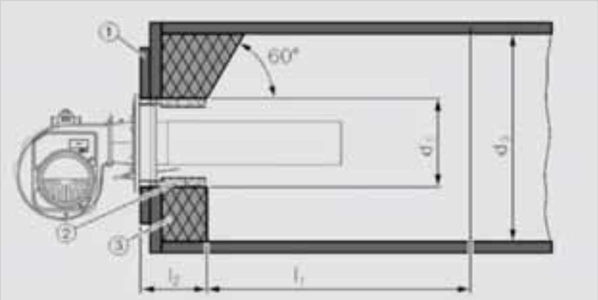


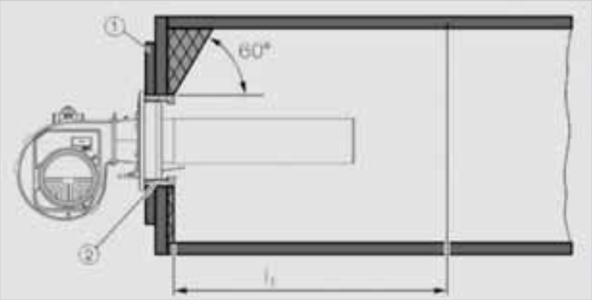


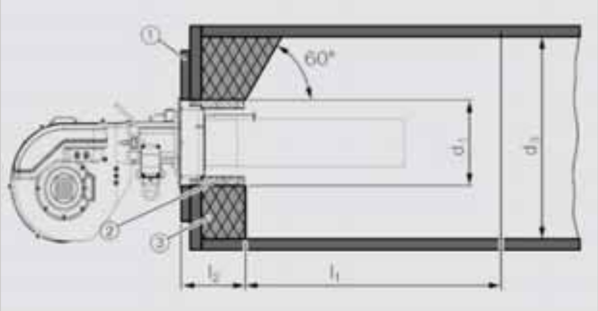
Thanks to **Ultra Low NOx** combustion technology, we are delighted to gratefully guarantee the best performance of our productions in order to meet our customer demands.

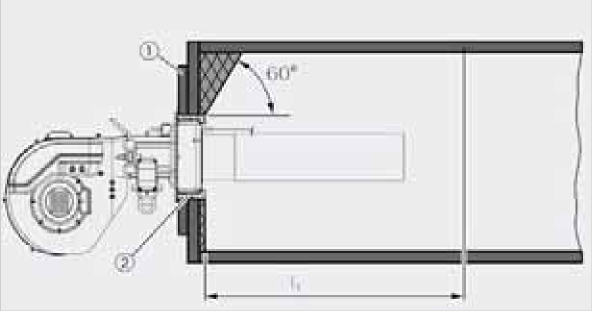


Minimum Combustion chamber size









Legend
1 Mounting plate
2 Gap
3 Refractory / insulation
Note: The boiler door refractory / insulation may be tapered (≥ 60°).

D1 Minimum boiler opening	
RPB-M-50/P--, RPB-M-80/P--,	370 mm
RPB-M-125/P--, RPB-M-150/P--, RPB-M-175/P--, RPB-M-200/P--	425 mm
RPB-M-250/P--, RPB-M-300/P....................	485 mm
RPB-M-400/P	585 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....................	485 mm
RPB-M-400/P	585 mm
I1 Minimum combustion chamber length	
RPB-M-50/P--	525 mm
RPB-M-80/P--	770 mm
RPB-M-125/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--	1390 mm
RPB-M-300/P--	1600 mm
RPB-M-400/P--	1800 mm
I2 Maximum boiler door depth, including refractory / insulation	
RPB-M-50/P--...	200 mm
RPB-M-80/P , 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
RPB-M-400/P	300 mm

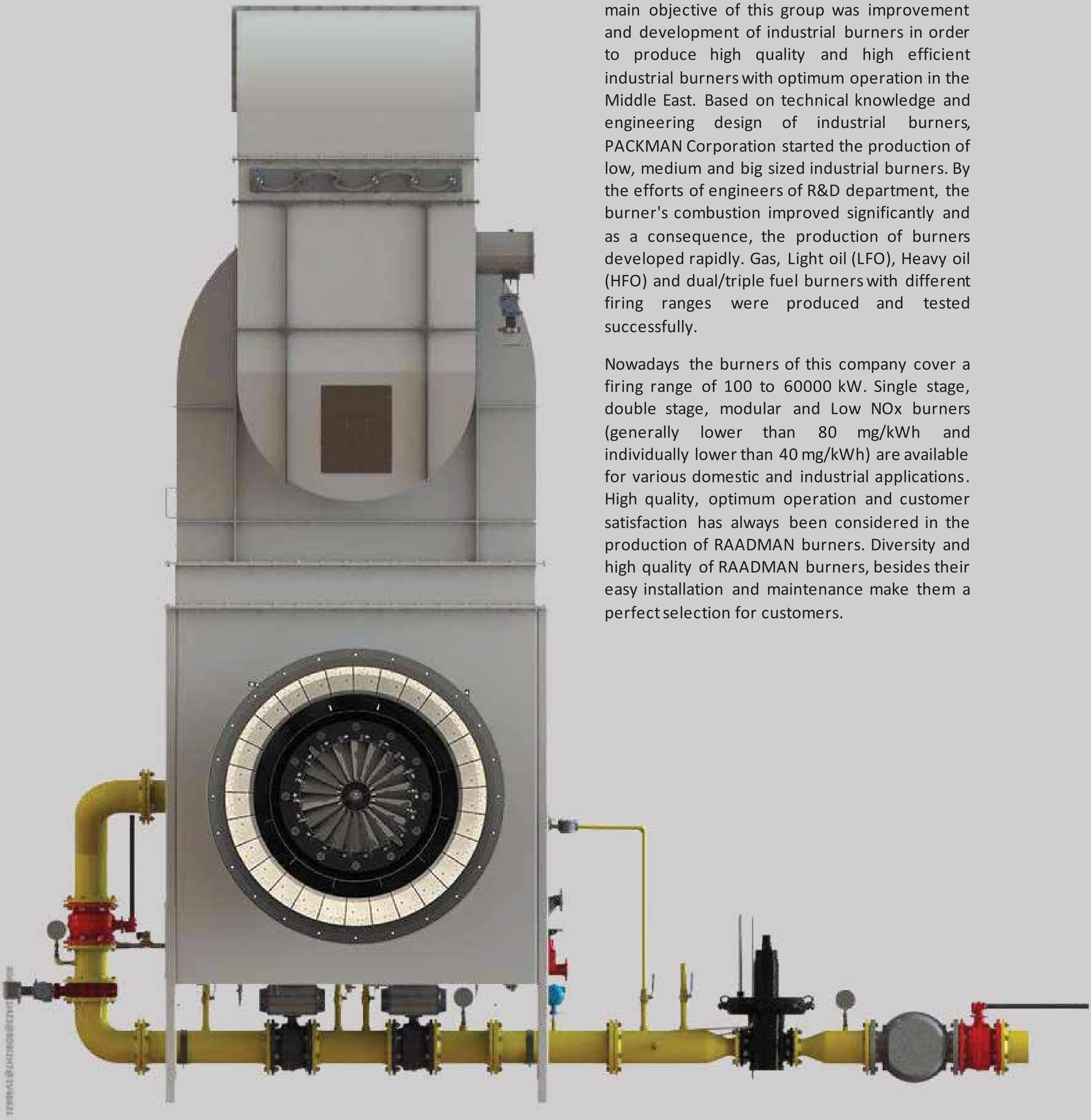
Power Plant Burner

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 honorfully 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 high 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 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 customers.



A computer rendered picture of a 5 MW extremely short flame burner. For a 6 ton/hour, 30 bar, water-tube packaging boiler

Water tube boilers

The ability of water tube boilers to be designed without the use of excessively large and thick-walled pressure vessels makes these boilers particularly attractive in applications that require dry, high-pressure, high-energy steam, including steam turbine power generation.

Owing to their superb working properties, the use of water tube boilers is highly preferred in the following major areas:

- Variety of process applications in industries
- Chemical processing divisions
- Pulp and Paper manufacturing plants
- Refining units
- Power Plants

Besides, they are frequently employed in power generation plants where large quantities of steam (ranging up to 500 kg/s) having high pressures i.e. approximately 16 megapascals (160 bar) and high temperatures reaching up to 550°C are generally required.

A water tube boiler can be defined as a Steam boiler in which the flow of water in the tubes, as well as hot gases, enclose the tubes. Not like fire tube boilers, this boiler attains high-pressures, as well as high-steam capabilities, can be achieved. This is because of condensed tangential pressure on tubes which is known as hoop stress.

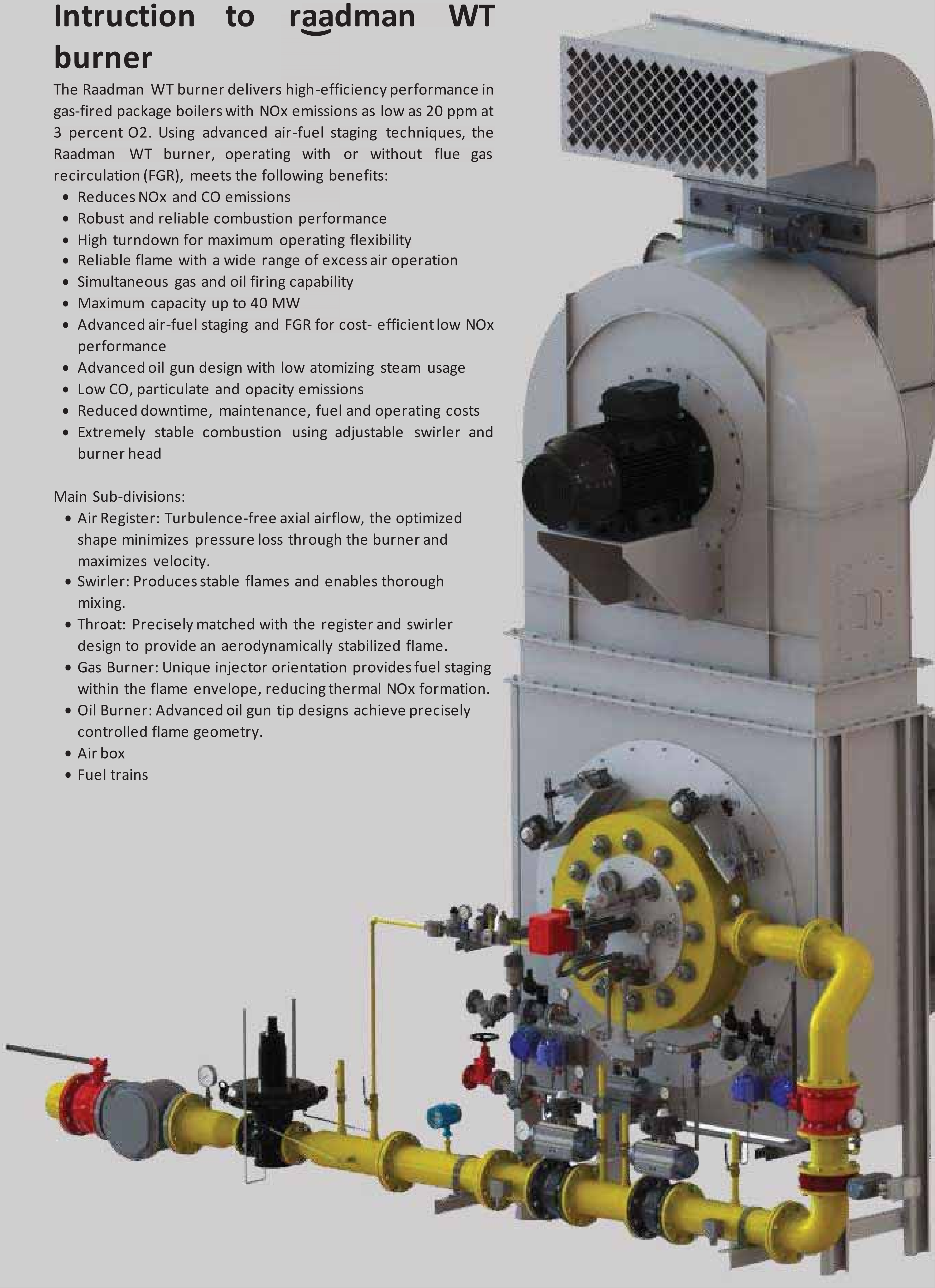
Intruction to raadman WT burner

The Raadman WT burner delivers high-efficiency performance in gas-fired package boilers with NOx emissions as low as 20 ppm at 3 percent O2. Using advanced air-fuel staging techniques, the Raadman WT burner, operating with or without flue gas recirculation (FGR), meets the following benefits:

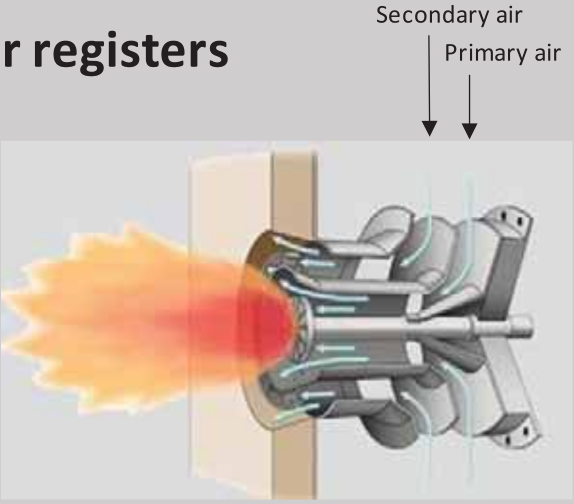
- Reduces NOx and CO emissions
- Robust and reliable combustion performance
- High turndown for maximum operating flexibility
- Reliable flame with a wide range of excess air operation
- Simultaneous gas and oil firing capability
- Maximum capacity up to 40 MW
- Advanced air-fuel staging and FGR for cost- efficient low NOx performance
- Advanced oil gun design with low atomizing steam usage
- Low CO, particulate and opacity emissions
- Reduced downtime, maintenance, fuel and operating costs
- Extremely stable combustion using adjustable swirler and burner head

Main Sub-divisions:

- Air Register: Turbulence-free axial airflow, the optimized shape minimizes pressure loss through the burner and maximizes velocity.
- Swirler: Produces stable flames and enables thorough mixing.
- Throat: Precisely matched with the register and swirler design to provide an aerodynamically stabilized flame.
- Gas Burner: Unique injector orientation provides fuel staging within the flame envelope, reducing thermal NOx formation.
- Oil Burner: Advanced oil gun tip designs achieve precisely controlled flame geometry.
- Air box
- Fuel trains



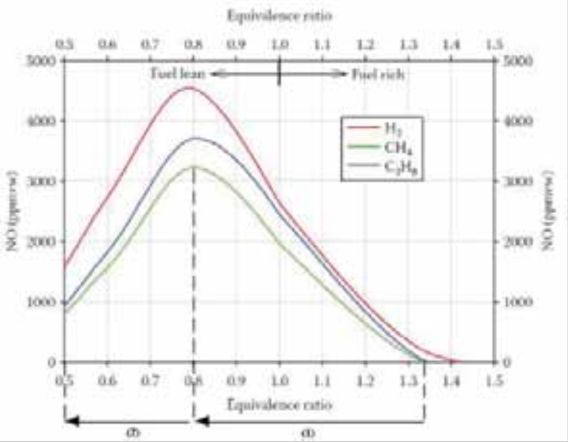
Primary-secondary air and air registers



The basis of design is to develop a stratified flame structure with specific sections of the flame operating fuel-rich and other sections operating fuel-lean. The burner design thus provides for the internal staging of the flame to achieve reductions in NOx emissions while maintaining a stable flame.

Staging of the air into the combustion zone serves to slow down the combustion process and separate the flame into different zones, some that operate fuel-rich and some that operate fuel-lean.

The fuel-rich and fuel-lean zones both combust at lower peak temperatures than a uniform fuel air mixture, resulting in lower thermal NOx formation. The combustion products from these two zones then combine to complete the combustion process and result in the completed oxidation of the fuel. By creating a fuel-rich zone in the front part of the flame, one can also reduce the conversion of fuel-bound nitrogen to NOx and thereby lower fuel NOx formation as well.



Raadman WT burners are equipped with two air registers suitable for any kind of liquid and/or gaseous fuel with the possibility to fire one or more fuels at the same time. Combustion air is divided into “primary” and “secondary” flows resulting in stratified combustion

This solution allows a general reduction of combustion temperature and therefore lowers thermal NOx generation. They are provided with a series of gas lances made from stainless steel which can be adjusted during the operation. These lances injected the larger part of fuel gas; a small quantity is injected trough a central gas gun to ensure the flame stability.

When a mixed gas/oil application is requested, a liquid atomizer replaces the central gas gun.

Air vorticity is generated and guaranteed by the vanes which formed each air register. The position of such vanes is set during the start - up phases and is important to control the flame intensity and shape which are different from one combustion chamber to another or from one fuel to another. The air registers vanes can be controlled manually or motorized or pneumatically. depending on the type of hazardous area to adjust the amount of combustion air

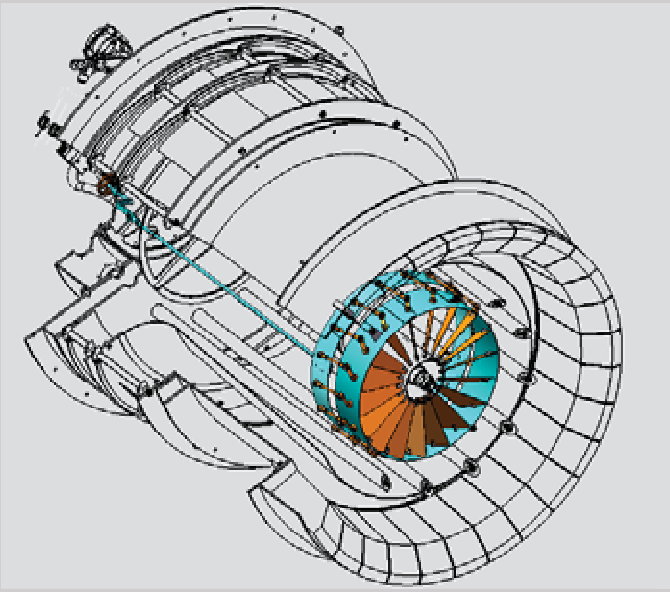
Gas fuel is distributed through an external plenum and a series on gas lances each of which is provided with a skew faced “multi jets” nozzle which can be adjusted and rotated to optimize gas distribution without halting burner operation.

Raadman WT burners are designed to meet low NOx requirements while providing high combustion efficiency and extreme versatility. Typical applications of these type burners include forced or balance draft boilers as and process heaters.

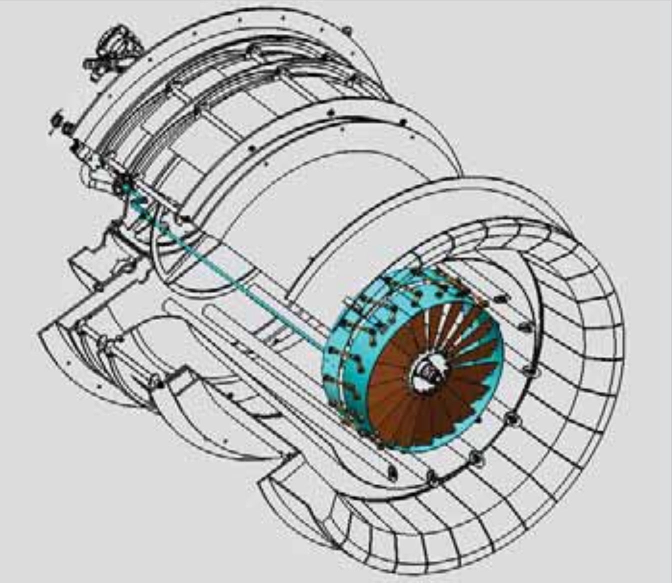
Blade adjustment

A small amount of primary air, typically 10 to 20% of the total combustion air, is routed down the center of the burner. New burner designs employ a curved bladed swirler, to impart rotational momentum to this primary air. This swirled primary air creates a rotational vortex in the front of the burner, which serves several functions. It entrains a portion of fuel, creating a fuel-rich region immediately in front of the burner. The swirling primary air also generates a reverse flow in the form of a self-generating annular vortex that helps recirculate hot combustion gases from within the flame zone, thereby providing additional ignition energy to the fuel-air mixture and increasing the mass flow in this region to limit peak temperatures. In addition to controlling NOx formation, operating under fuel rich conditions results in the production of combustion intermediates that can result in the destruction of previously formed NOx. In a reducing environment, NO can act as an oxidizer to react with these combustion intermediates, resulting in the reduction of NO to N2. As such, NO, necessarily formed to satisfy the requirements of establishing a strong flame front, can be scavenged by this mechanism. to achieve complete fuel burnout at minimum excess air, the burner design must provide for fuel-lean zones to directly interact with the center fuel-rich sections. Creating a secondary air zone where the majority of the combustion air is introduced (65 to 90%) accomplishes this. The air injected into this zone is typically injected axially, with little or no swirl.

Blade angle is adjusted with axial movement of the rod connected to an annular plate. Annular plate is linked with swirler vanes that adjust their angle. also adjusted blades can control the flame dimensions.



Opened blade: low swirl;
For longer flame shapes



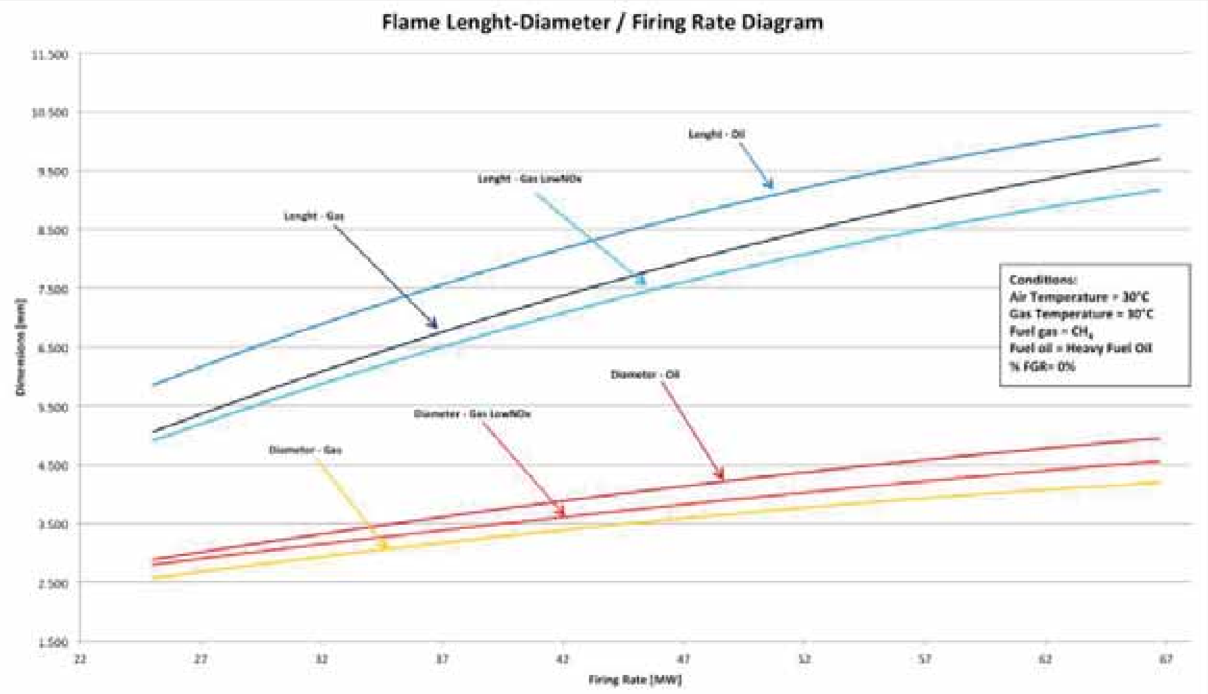
Closed blade: High swirl;
For much shorter flame shapes

Flame shape and dimension

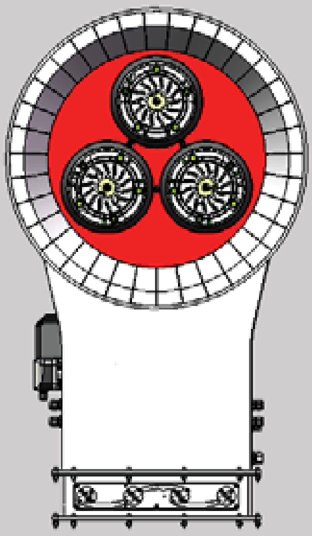
Burners have different flames depending on their utilizations. While fire tube boilers require a long flame with a small diameter, water tube boilers often require short flame but large diameter burners. In general, the flame length of water tube burners is 2 to 2.5 times the flame diameter.

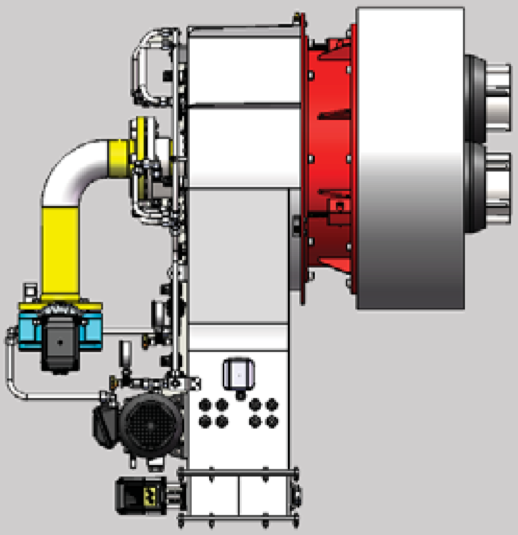
Raadman WT burners have a ball shaped flame with substantial swirl (swirl number is higher than 0.6). The flame has hot reverse flow into the center and cold forward flow at sides. There is intense mixing and the secondary jet velocity is more than the primary jet velocity. The flame is used for combustion chambers which are more or less cubicle in shape.

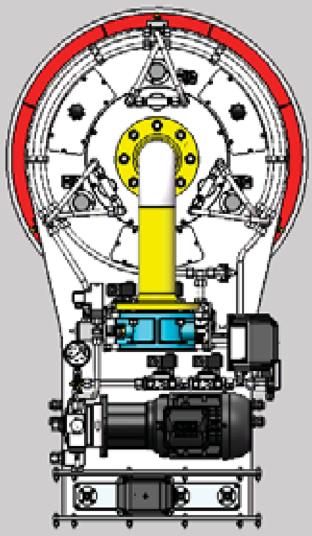
Estimated flame dimensions



Using the unlimited subdivide flames, with a single combustion air register, we can offer any flame shapes for a much better combustion fitted the chamber of the target boiler.





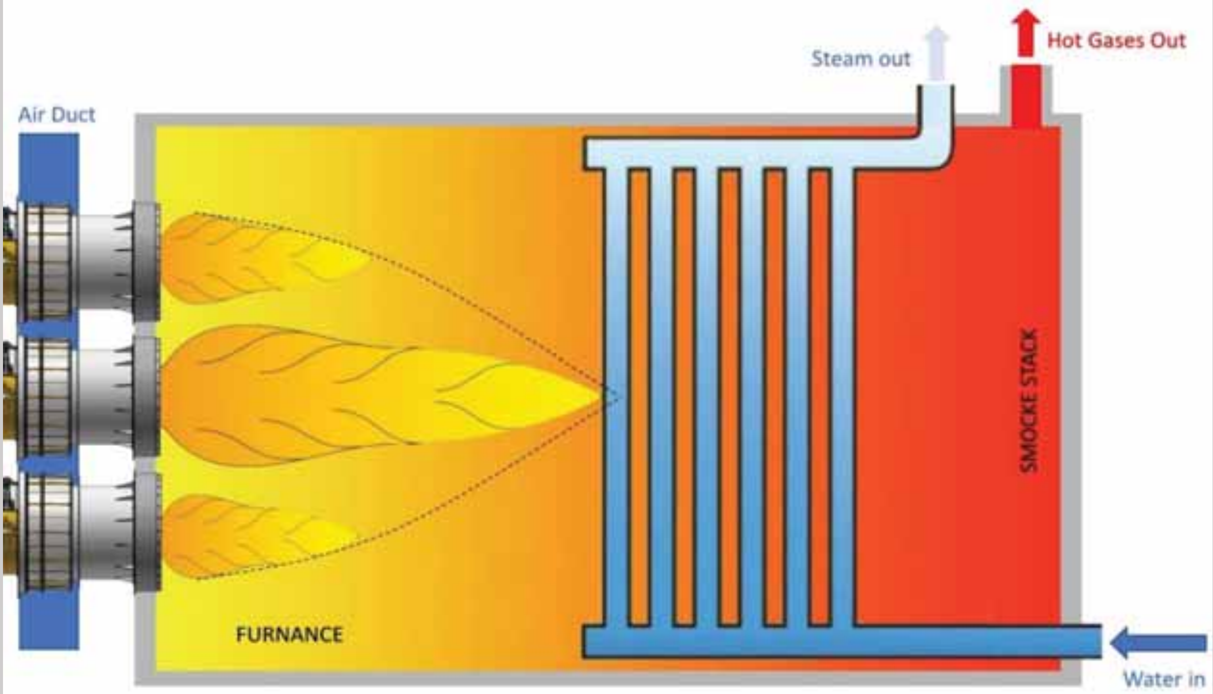


raadman WT burner for multi-burner boilers

To achieve higher capacities, use several burners in industrial water tube burners. In Industrial boilers, the simultaneous use of two burners is common, the flame shape of each is adjusted using air register vanes and swirler. These boilers have a common air box that the whole boiler air enters this air box and by adjusting theair register and swirler the shape of flame and the heat capacity of each flame will be adjusted.

The shape of the flame is such that each burner has a separate small flame, but eventually all burners will have a single large flame.

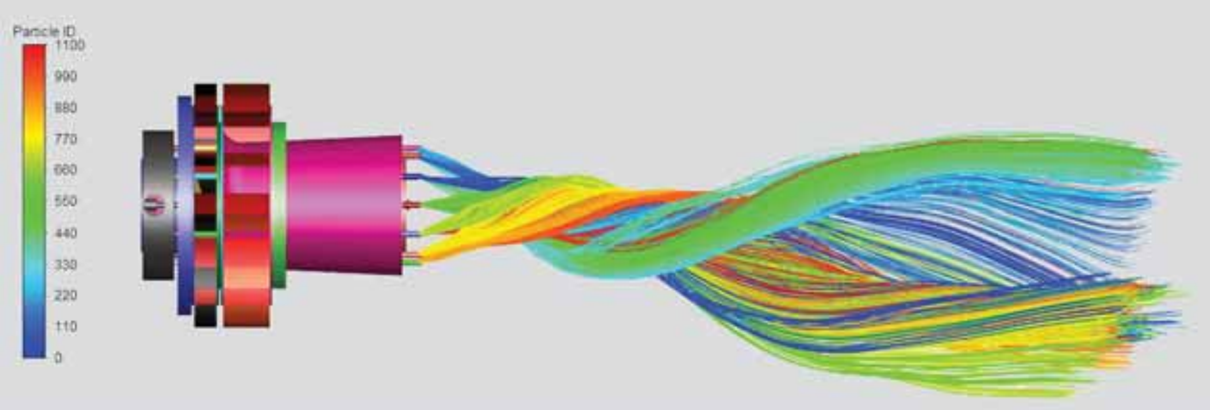
As a result of many observations of multiple-burner, oil and gas firing equipment, on a wide range of boiler designs, it has been concluded that the proper airflow distribution to each burner is essential in order to control flame shape, flame length, excess air level, and overall combustion efficiency. Proper airflow distribution consists of equal combustion airflow between burners, uniform peripheral velocity distributions at the burnerinlets, and the elimination of tangential velocities within each burner. If the unit has been designed with windbox FGR, the O2 content must be equal between the burners, and this is accomplished by balancing the FGR distribution to each burner.

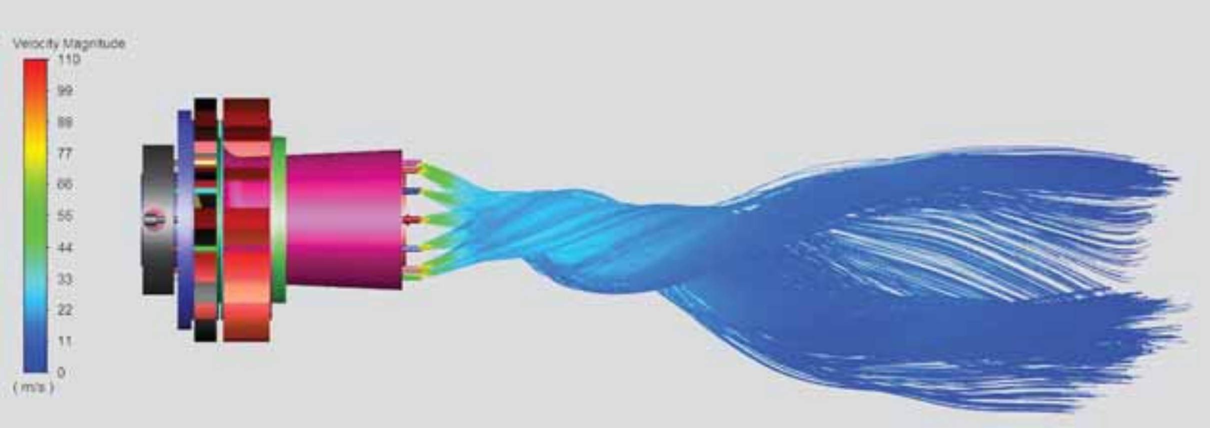


CFD experts in R&D department

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. While this simplified chemistry includes adequate information to predict flow patterns and local heat transfer, these models lack sufficient information to accurately predict NOx and CO production. Alternatively, the NOx chemistry is decoupled from the main calculation and obtained using post-processing techniques. CFD coupled with cold-flow physical modeling and hot-flow burner tests provides a powerful analytical tool to develop accurate, timely, and cost-effective burner designs.

Packman R&D Department is accustomed to working on custom engineered solutions, and our sales applications and thermofluidic engineering department are ready to assist with complex applications. As part of our design and engineering process, we have the ability to use Computational Fluid Dynamics (CFD) modeling to predict product performance or adjust product design prior to burners being installed in the field.





Igniting technology

The most powerful ignitors are based on high energy systems developed over decades of experience in applications requiring safe and reliable operation, such as power generation plants and steam generating utilities. The High Energy ignition systems ensure a number of robust intermittent sparks realized by the energy accumulated by a capacitor, providing more powerful ignition capacity than high tension arc electrodes. The Ignitors includes gas electric ignitors, light oil electric ignitors, without or with premixed air, suitable for continuous operation, as well as the direct spark ignitor for light up of heavy oil. Usually, the igniters are an integral part of the supply of burners or combustion systems

The ignitors can be supplied with in-built flame scanners or ionization flame rods, with automatic retraction drivers and with power supply units for installation in any environment and hazardous area. High Energy Electric Ignitor has been capable to withstanding to every temperature which could be present inside wind box and which can be up to 350 °C, and the discharge head itself must withstand to the very high radiation temperature close to the burner flame. The ignitor consists of three main parts, namely: Control Box, in which the power for the discharge is generated High Voltage Armored Cable, used to carry this power to the ignitor itself The Special Ignitor End, at which the discharge occurs across a semiconductor gap We can provide ignitors for a wide range of application and for any kind of industrial process as industrial boilers for steam/ power generation which burners where installed on boilers front wall or at boilers corners (tangential combustion), refinery or industrial furnace, thermal oxidizers and process heaters and so on.

Reliable flame monitoring

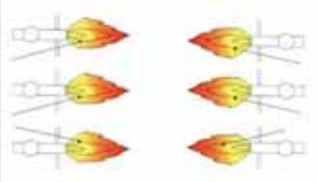
Flame monitoring plays a crucial role when it comes to reliability and safety.
Determination of the best method of flame monitoring takes into account not only the burner and the fuel to be combusted, but also how the system operates and the conditions inside the combustion chamber.
Heat generators with one flame per combustion chamber are easier to monitor than those with multiple flames. In the latter case, it also depends whether the flames are firing into the combustion chamber from the same or opposing directions.
Biomass plant and waste incinerators need a flame monitoring system that is not affected by extraneous flames.

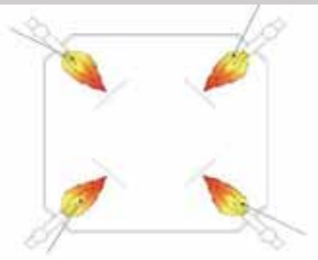
DB series are for plant with multiple burners firing from different directions into a single combustion chamber, and for process plant with various flame sources. The flame scanners monitor each flame separately via up to ten load-dependent switching thresholds for each fuel.

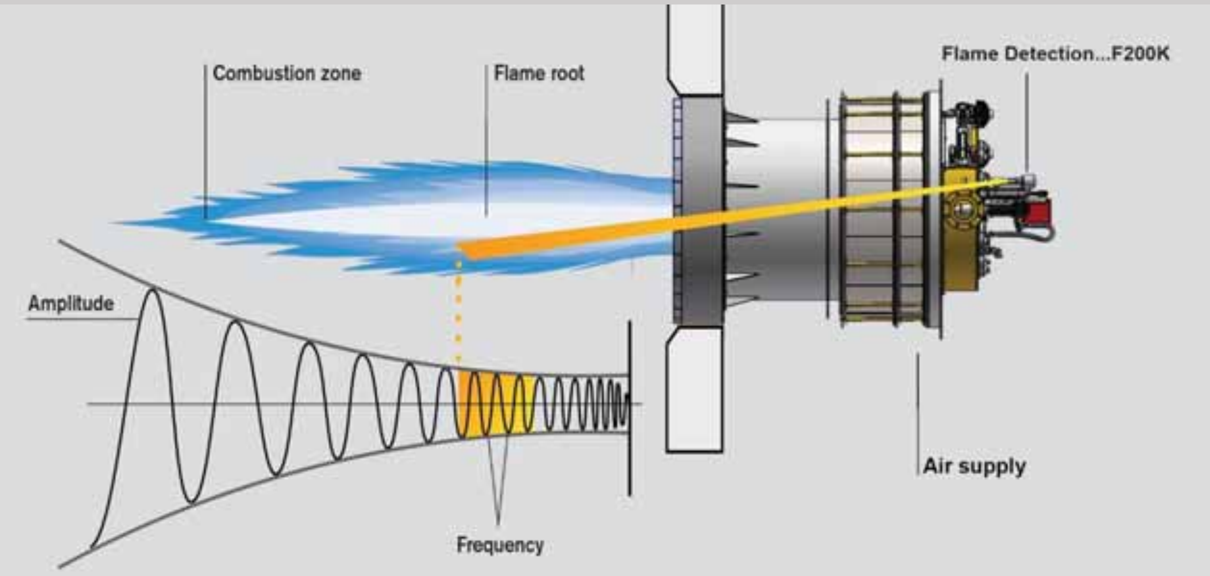
Lamtec - F200K, F300K

The compact flame scanner is composed of a cylindrical casing comprising an axial light incidence aperture, a processing status indicator at the rear of the unit and operational controls which can be accessed by removing the cover.

The device is connected through an integrated standard plug and using a connection cable required for this with coupler.







Thanks to the air/steam atomizing technology as well as the superior design of primary/secondary air registers, we are delighted to gratefully guarantee the best performance of our productions in order to meet our customer demands.

Fuel types and simultaneous combustion

Oil Burner: Controlling Precise Flame Geometry

The steam or mechanical atomizers on our low-emission utility boiler-burners achieve precisely controlled flame geometry that creates substantial NOx reductions over conventional oil-fired burners. The low-energy-consuming steam atomizer provides a turndown ratio as high as 8:1, with less than 7% steam-to-fuel oil ratio. This atomizer eliminates the need for a more complex constant differential system and operates at a constant pressure.

Gas Burner: Setting New Standards in Staging

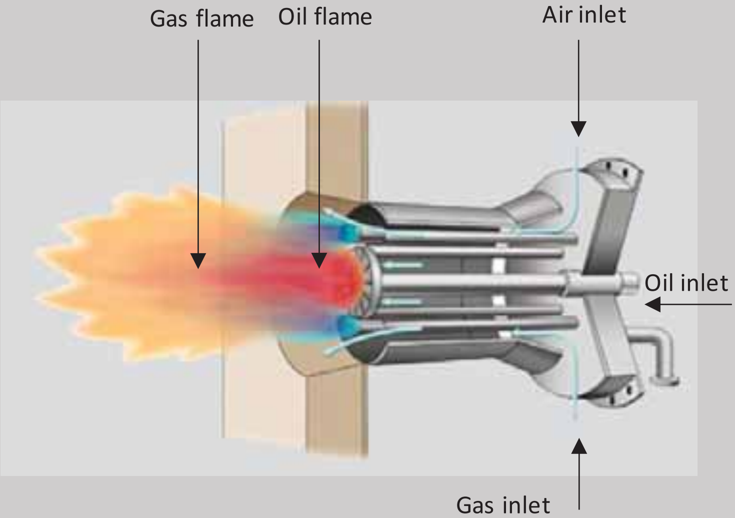
Raadman WT burners effectively control NOx by staging fuel and air. Using both a multi-poker injector and center-fired gas burner, fuel-rich and fuel-lean zones are created within the flame envelope. The ratio of center-fired gas to poker gas, together with poker orientation and location, is carefully optimized for each application.

Simultaneous gas and oil firing

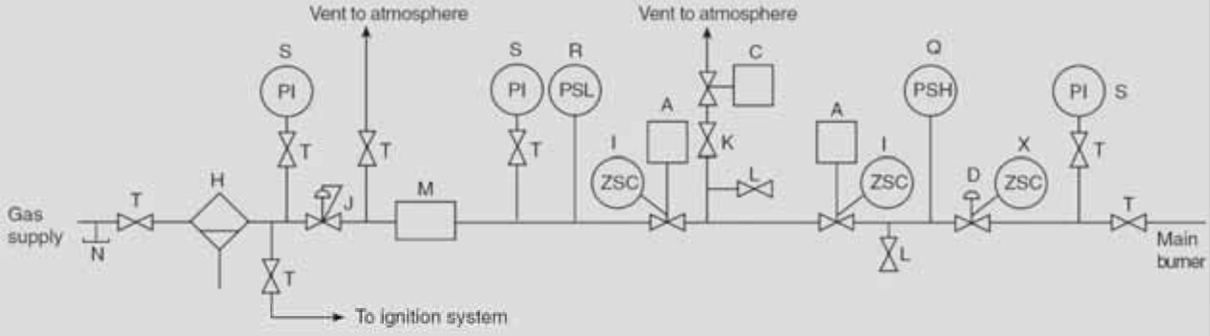
Raadman WT burners offer the flexibility of simultaneous gas and oil firing. This gives you the options of firing oil and gas in the same burner, or gas in some and oil in others based on your specific needs. Our burners allow you to switch fuels at various loads without affecting the boiler operation.

In the center of the register, the fuel oil sprayer with swirler is furnished. Surrounding the exterior of this swirler, multiple gas spuds (Spoke nozzle) are furnished, where intimate air/gas mixing is facilitated by primary air flows from outside the swirler.

- Wide turn down range 8:1
- Oil and gas firing in combination available
- LNG, LPG, HFO, and LFO gases fuel singular burning available
- Low NOx option available



Gas train – meeting the requirements of NFPA-85



A Safety shutoff valve, spring closing (N.C)
C Vent valve, spring opening (NO)
D Gas flow control valve H Gas strainer
I Closed Position interlock on valve safety shutoff
J Constant gas pressure regulator valve
K Vent line manual shutoff valve for leakage testing (locked or sealed open)
L leakage test connection M Gas meter (optional)
N Drip leg
Q High gas pressure switch
R Low gas pressure switch
S Pressure gauge
T Manual shutoff valve
X Low fire start switch
Note: NC = normally closed, deenergized
NO = normally open, deenergized

Note: Safety shutdown interlocks (not shown)

Pressure based spill back lances/atomizers:

The burner-lance is especially suitable for use in or on an oil burner and is designed to operate spill back atomizers with integrated shut-off needle. The strong spring on the actuating rod pushes the needle in closed position. This ensures a reliable shut-off under all circumstances.

Fuel, branched off from the supply line actuates the piston for opening, either controlled by two external solenoid valves or by one 3/2 solenoid valve. The piston has a fixed travel. While opening, the needle inside the atomizer is retracted in the correct position by means of a spring at the back of the atomizer against a fixed stop on the needle itself.

During the pre-purge period of the burner, the needle is keeping the orifice closed and the fuel circulates through the lance at pre-set supply and return pressure. On energizing both solenoid valves and the 3/2 solenoid valve, even after long idle intervals, there is immediate atomization guaranteeing perfect ignition.

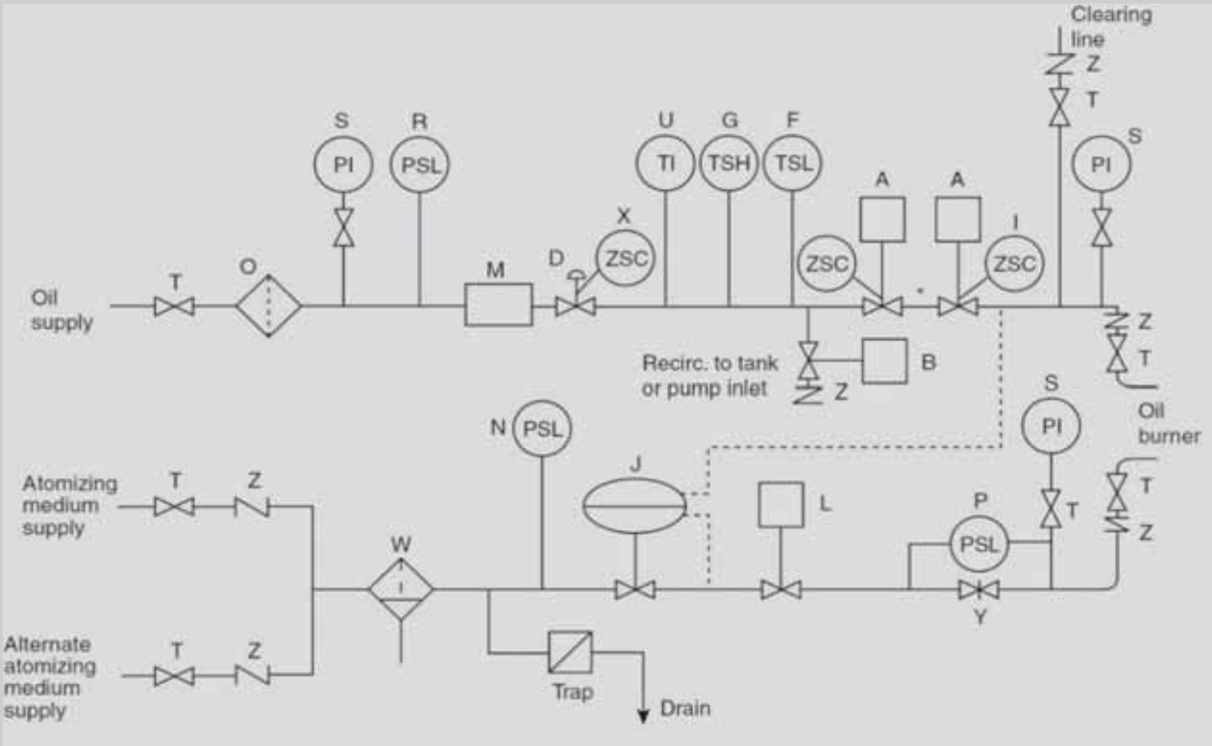
The burner-lance is suitable for supply pressures from 20 up to 40 bar and fuel temperatures up to 140°C.

Air/Steam lances/atomizers

The burner-lance of with shut-off needle is especially suitable for use in or on an oil burner and is designed to operate Y series atomizers with compressed air or steam. The strong spring on the actuating rod pushes the needle in closed position. Compressed air, controlled by an external 3/2 solenoid valve, actuates the piston for opening. The piston has a fixed travel, pulling the needle in the correct position when it opens.

During the pre-purge period of the burner, the needle is keeping the central orifice in the reverse disc closed. On energizing the 3/2 solenoid valve, even after long idle intervals, there is immediate atomization guaranteeing perfect ignition. The burner-lance is suitable for supply pressures up to 16 bar and fuel temperatures up to 140°C.

Typical fuel and atomizing medium supply systems and safety controls for oil burner (Based on NFPA-85)



A Safety shutoff valve, spring closing (NC)
B Oil recirculation valve atomizing (NO) (optional for unheated oil)
D Oil flow control valve
F Low oil temperature switch (not applicable for unheated oil)
G High oil temperature switch (not applicable for unheated oil)
I Closed position interlock on safety shutoff valve
J Atomizing medium differential control valve
L Automatic atomizing medium differential shutoff valve
M Oil meter (optional)
N Low atomizing medium pressure switch
O Oil strainer
P Atomizing medium flow interlock differential switch, or pressure interlock switch
R Low pressure switch
S Pressure gauge
T Manual shutoff valve
U Oil temperature gauge (optional for unheated oil)
W Atomizing medium strainer
X Low fire start switch
Y Atomizing medium flow orifice
Z Check valve

Note: NC= normally closed, deenergized
NO=normally open, deenergized

Note:

Safety shutdown interlocks (not shown)

FGR

One of the first methods of NOx reduction was the use of flue gas recirculation (FGR), whereby a portion of the stackgases was returned and mixed with the combustion air to the burner. This added additional mass flow into the combustion zone across which the heat release was distributed, and thereby lowered the temperature and accompanying thermal NOx formation. The introduction of FGR into the combustion air increases the overall mass of the reactants, and hence the products, in the combustion process. The increased mass, as well as the increased reactant diffusion time requirement, reduces the overall flame temperature. The fact that the flue gases being returned also have very low oxygen levels, typically 2 to 4%, resulted in a lowering of the volumetric oxygen concentration entering the combustion zone, which also helps to retard NOx formation by limiting oxygen availability. FGR was added to many conventional burners, and could result in NOx reduction ranging from 20 to 75%, dependingon the amount added, the fuel being fired, and the initial NOx level. The problems with FGR addition to conventionalburners were three-fold:

(1) additional fan capacity had to be used to transport the hot flue gases to the burner combustion air system, resulting in increased capital and operating costs;

(2) very high levels of flue gases were often required to reduce NOx emissions to acceptable levels;

(3) high rates of FGR, typically over 20%, decreased the flame temperature to the point where burner operation began to become unstable.

Presenting the edge of burner technology at 20th HVAC Exh.
Tehran, 1400

Water
Solution

Water Treatment Proucts
ROMAN

ABOUT
ROMAN

PACKMAN industrial group has been operating since 1975. Supplying fresh water is one of long-term goals of this company for the independence of Iran in the water related industries.

In this regard, the Daaryaab project has been defined in Packman Company with the presence of more than a hundred experts, including engineers and university faculty members.

The ROMAN project is one Daaryaab's sub-projects. ROMAN's name is a combination of Packman's company name and the word RO (Reverse Osmosis) and is indicative of the field of work of this company in the direction of providing fresh water by reverse osmosis.

The working group of the ROMAN project consists of summa cum laude graduates of the country's universities with scientific degrees of doctorate, master's degree and bachelor's degree in chemical engineering, mechanical engineering and electrical engineering. This working group has made every effort to fully meet the needs of the country in this area by using the expert force inside the country and trusting the scientific connections with various scientific and industrial centers in the world.

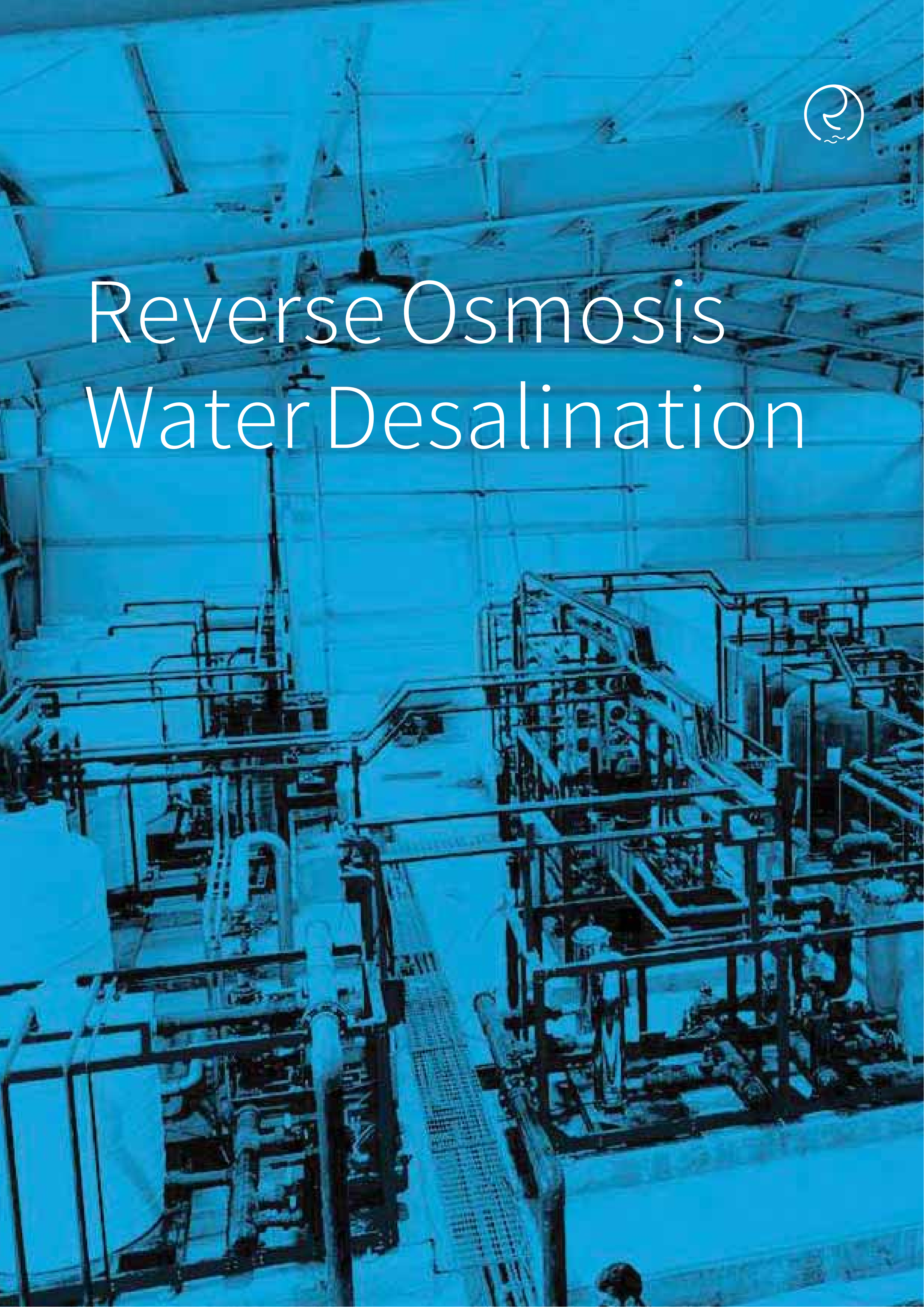
The relevant areas are:

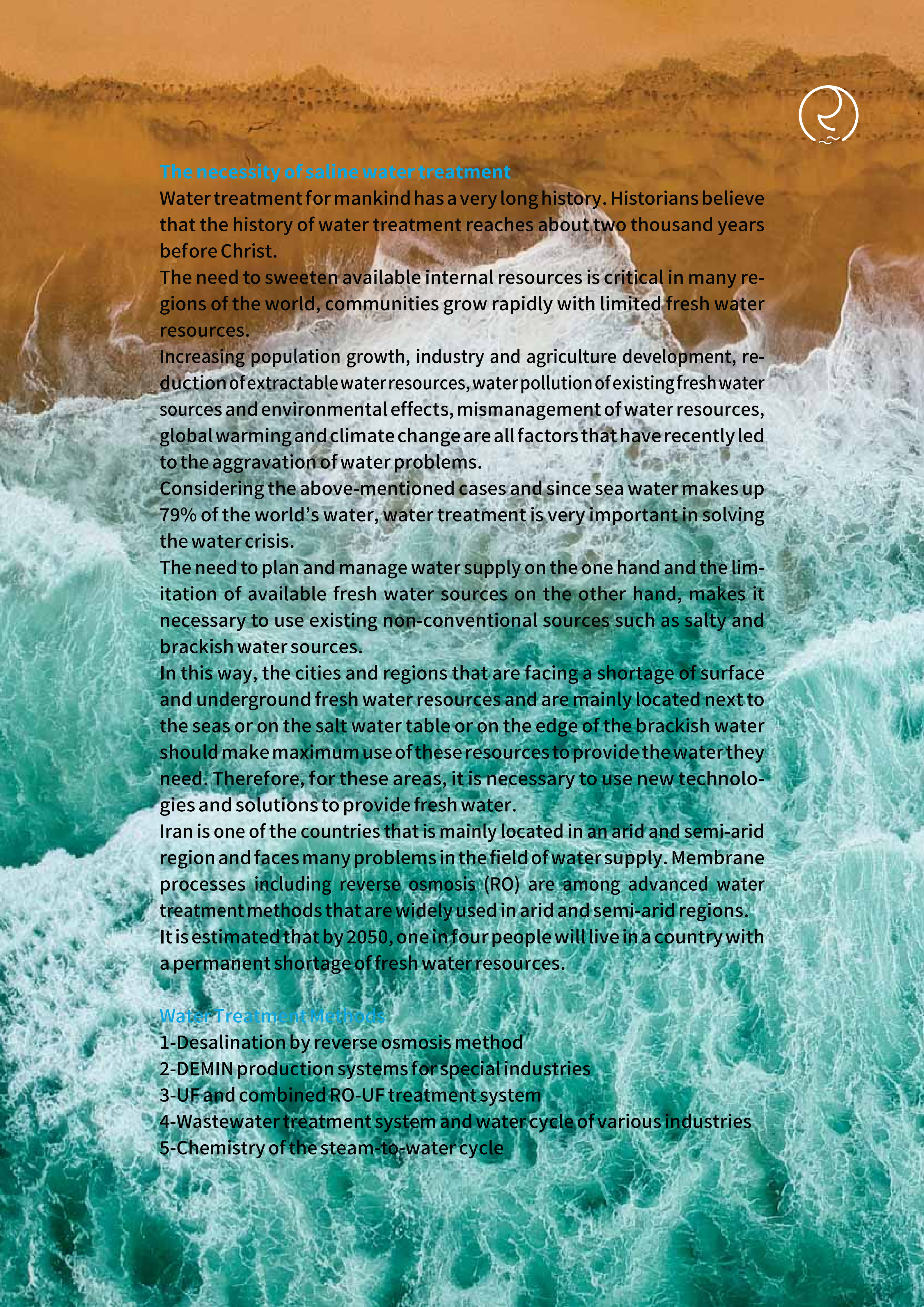
- Water and wastewater treatment using reverse osmosis desalination systems
- Demineralized water (DEMIN) production systems for special industries
- Ultrafiltration and combined RO-UF treatment systems
- Wastewater treatment system and water cycle of various industries
- Chemistry of the steam-to-water cycle

List of Water Treatment Products
ROMAN

Scan to view the site

Reverse Osmosis Water Desalination





The necessity of saline water treatment

Water treatment for mankind has a very long history. Historians believe that the history of water treatment reaches about two thousand years before Christ.

The need to sweeten available internal resources is critical in many regions of the world, communities grow rapidly with limited fresh water resources.

Increasing population growth, industry and agriculture development, reduction of extractable water resources, water pollution of existing fresh water sources and environmental effects, mismanagement of water resources, global warming and climate change are all factors that have recently led to the aggravation of water problems.

Considering the above-mentioned cases and since sea water makes up 79% of the world's water, water treatment is very important in solving the water crisis.

The need to plan and manage water supply on the one hand and the limitation of available fresh water sources on the other hand, makes it necessary to use existing non-conventional sources such as salty and brackish water sources.

In this way, the cities and regions that are facing a shortage of surface and underground fresh water resources and are mainly located next to the seas or on the salt water table or on the edge of the brackish water should make maximum use of these resources to provide the water they need. Therefore, for these areas, it is necessary to use new technologies and solutions to provide fresh water.

Iran is one of the countries that is mainly located in an arid and semi-arid region and faces many problems in the field of water supply. Membrane processes including reverse osmosis (RO) are among advanced water treatment methods that are widely used in arid and semi-arid regions.

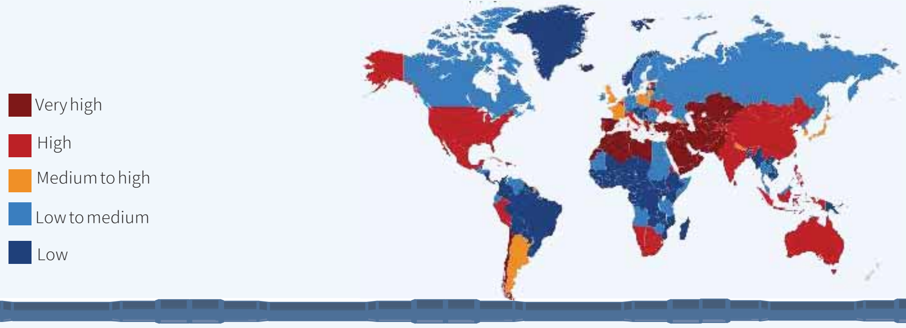
It is estimated that by 2050, one in four people will live in a country with a permanent shortage of fresh water resources.

Water Treatment Methods

1-Desalination by reverse osmosis method
2-DEMIN production systems for special industries
3-UF and combined RO-UF treatment system
4-Wastewater treatment system and water cycle of various industries
5-Chemistry of the steam-to-water cycle

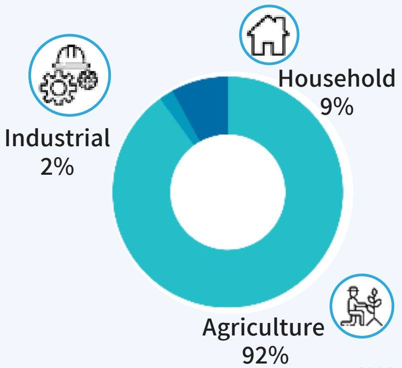
Iran as the fifth most consuming country in the world in 2020

Forecasting the ratio of water use to water supply (water stress) in year 2040



of the total water resources %92

The amount of water consumed in Iran's agricultural sector Currently, Iran uses 83% of its total renewable freshwater resources, while international norms suggest a ceiling of 40% to ensure environmental sustainability and meet the increasing demand of a growing population.



The water consumption of each sector in the year 2020

Arid and semi-arid areas make up nearly 60% of the country

260mm average annual rainfall of the country

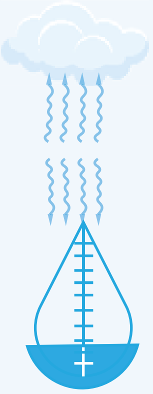
70% of which evaporates directly

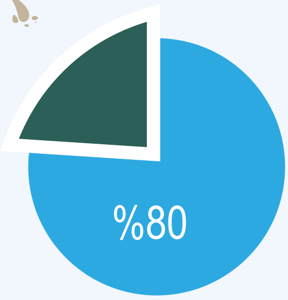
Water evaporation is three times the world in Iran

The total water evaporation capacity in the country is equivalent to 3 times the water consumption in the agri cultural sector

Average annual evaporation potential in Iran is 2100

Average rainfall in Iran is 1/3 of the world





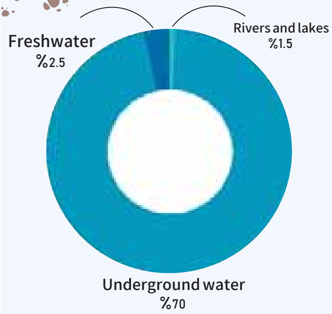
The consumption of the whole country
96 billion cubic meters equal to
80% of the country's water resources

Comparison with global statistics
Water consumption per person in Iran is 2 times the world standard consumption

Global standard
140 liters

~

Consumption per Iranian
300 liters



Water sources of deep wells and salt and fresh water in the world
is only 2.5% of the fresh water available

● **The necessity of desalination of existing saline water resources is more important than ever**

Desalination By Reverse Osmosis Method

Reverse osmosis is a form of filtration under pressure and the filter of which is a semi-permeable membrane. The force required to overcome the osmotic pressure in reverse osmosis water desalination is created by using high pressure pumps. Therefore, water enters the dilute side from the thick side by passing through the semi-permeable membrane. This semi-permeablemembrane can remove many types of molecules and ions from water, therefore, it is used in both industrial processes and drinking water production.

The pressure required for the pump depends on the salt concentration in the water to overcome the osmotic pressure. This technology can remove viruses and chemical substances such as metal ions, lead, arsenic, fluoride, radium, etc. and radioactive substances such as plutonium, radioactive and strontium, which cause water pollution.

Desalination is the most important application of reverse osmosis process in today's world. It consists of several parts: 50% desalination of sea water and brackish water, 40% high purity water for use in (pharmaceutical, electrical and energy production industries) and 10% urban and industrial water disinfection system

Ultrapure Water Or Demin Water

Demin water is used in high-pressure boilers, electronic industries and industries that require ultra-pure water. Two methods can be used to produce demin water: The first method is to use the RO Double device. Two reverse osmosis devices are used in series in this method. The second method is to use a RO reverse osmosis device with a resin system. RO reverse osmosis treatment with a resin system is the best way to produce completely pure water that does not contain any salts. In this method, first, The TDS of the water reaches close to zero by using RO device in reverse osmosis method. Then, the remaining ionized salts in the water are removed using a resin system.

The ion exchange resin used in this method is Mix Bed. This resin is able to remove cations and anions in water. This method is more economical than the Double RO method in producing completely pure water.

UF And Combined UF-RO Treatment Systems

Ultrafiltration (UF) is a membrane filtration process similar to reverse osmosis which moves water through a semi-permeable membrane using hydrostatic pressure.

Ultrafiltration is used as an agent to separate bacteria, viruses and other harmful contaminants from water, but ions and small molecules are not removed in this method. UF membranes remove dissolved substances with a size of 0.03 micron and larger. Suspended particles that are too large to pass through the membrane stick to the outer surface of the membrane and only fresh water and dissolved minerals pass through it. Ultra filters have the ability to remove sand, mud, clay, algae, microbes, bacteria, viruses and humic substances. Ions and small molecules are not removed in this method.

Although ultrafiltration is used to treatment surface water with very low salinity and produce drinkable water, but its main role is in the desalination industry as a pre-treatment of nano-filtration& reverse osmosis methods

Wastewater Treatment System & Water Cycle Of Various Industries

In the wastewater treatment process, the natural treatment process is tried to be done with a faster speed to remove the pollutants.

Wastewater contains impurities such as suspended materials, floating particles, waste materials, etc. Physical and biological processes are used for wastewater treatment in the conventional treatment process.

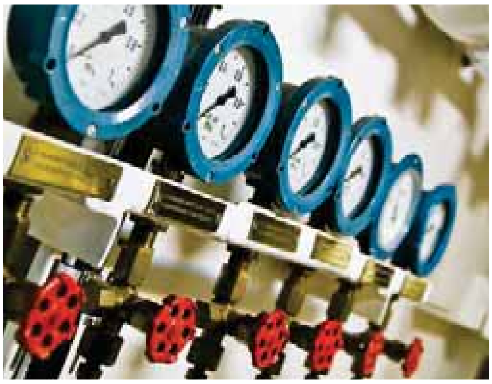
Different wastewater treatment methods are divided into three main categories: 1) Primary treatment (physical process), 2) secondary treatment (biological), 3) advanced treatment (combination of physical, chemical and biological methods).

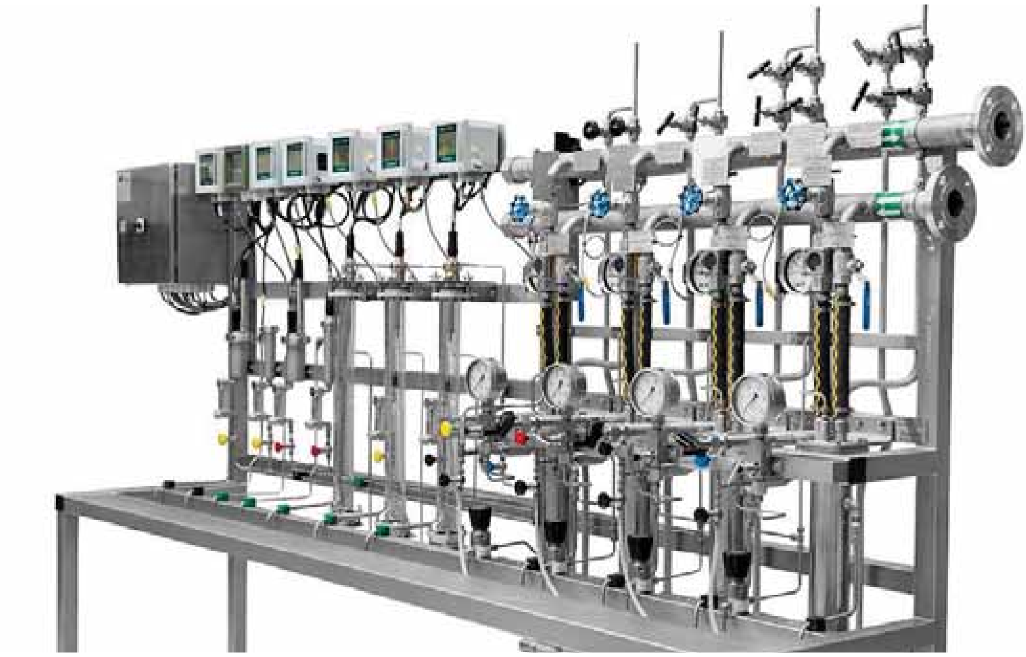
Each category of these treatment processes can include preliminary sedimentation units, disinfection and sludge management (sludge treatment & disposal).

It should be noted that, considering proper pre-treatment, the reverse osmosis process can be used in addition to sweetening salt water (such as sea water) to reuse polluted water during the production of industrial products such as steel, stone cutting factories and...

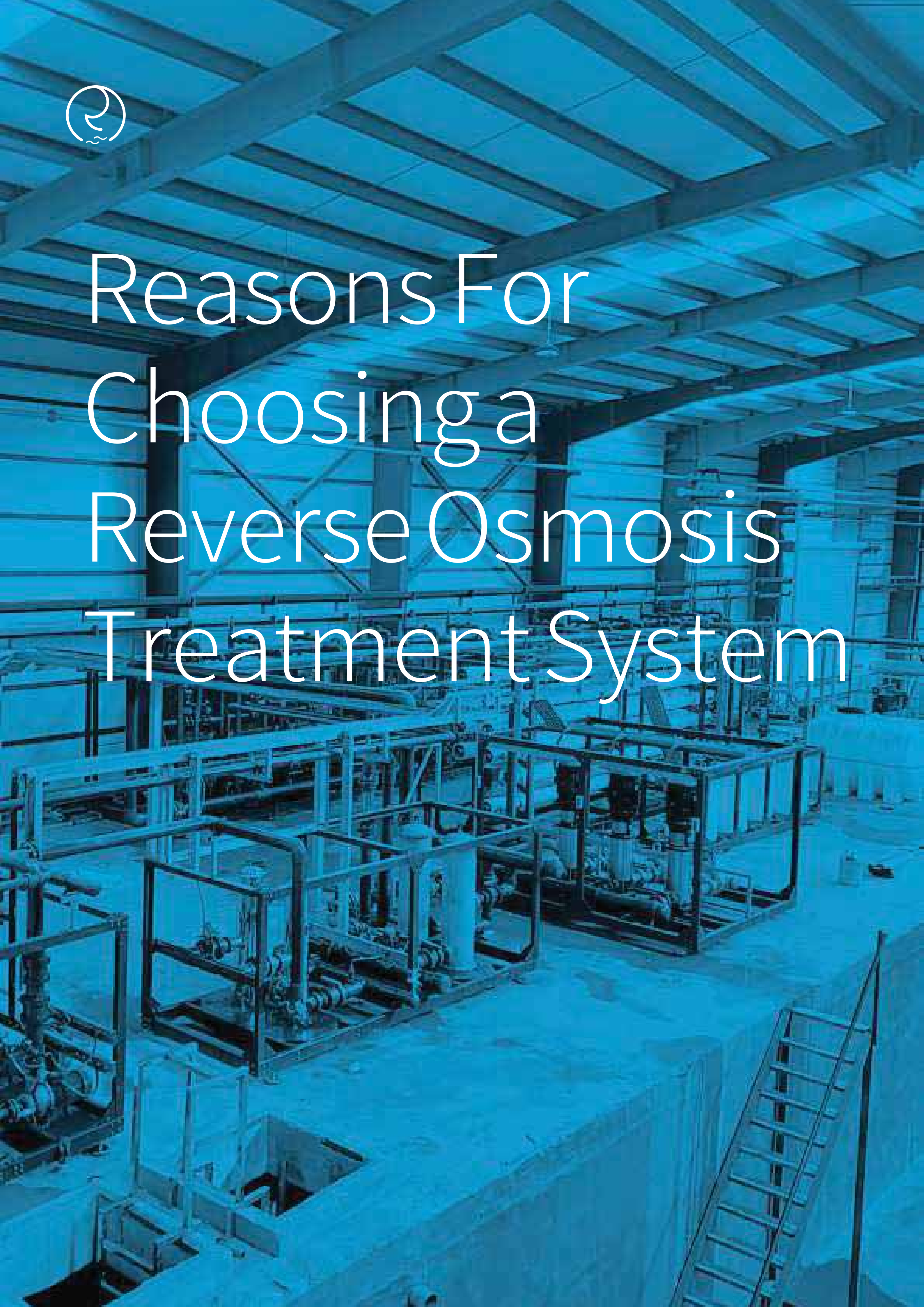
Chemistry Of Water Vapor Cycle

Steam production with good quality is required for active industrial boiler systems. Achieving this goal depends on the proper management of the water treatment process to control steam purity, deposits and corrosion. In addition, some impurities in boiler water, especially high alkalinity and organic matter, change the surface tension of water and allow small bubbles to collapse into larger bubbles. Larger bubbles create a larger foam layer, which results in higher heat transfer and lower vapor quality. As a result, it is very important to keep boiler water chemistry stable within the specified range. For this purpose, dosing systems are designed by the ROMAN group to release chemicals with a certain pressure and speed into the water.





Reasons For Choosing a Reverse Osmosis Treatment System



Reverse Osmosis Advantages

The Possibility of Using Infinite Resources of Sea Water& Underground Resources In This System

By using this system, fresh and potable water can be easily obtained in areas that are facing a shortage of fresh water or a water crisis and are close to the sea.

Improving The Water Color And Taste

The reverse osmosis system produces clear blue water by removing turbidity and dissolved ions (such as lead) that reduce the quality of water taste. As a result, water treated by reverse osmosis has a better taste compared to tap water.

Remove All Unwanted Particles Including Ions And Heavy Metals

The reverse osmosis treatment method is able to remove ions soluble in water such as lead, iron, manganese, etc. In addition to damaging industrial equipment, these ions also cause damage to health.

High Efficiency

Compared to water treatment by distillation method, water wastage is much less in the water treatment process by reverse osmosis when TDS < 4500 ppm. Typically, recovery amount in the RO system is approximately between 50 and 58%.

Economical And Low Energy Consumption

Compared to thermal methods of water purification, reverse osmosis consumes less energy and if the water TDS is lower than 45000 ppm and it does not have the problems related to high temperature or sedimentation, clogging and corrosion.

Reverse Osmosis Applications

Drinking Water Production

Pollutants such as lead, bacteria, viruses that can be transmitted by water, etc. in water have harmful effects on human health and body. Since the reverse osmosis system has the ability to remove these pollutants, it produces clear water without harmful pollutants.

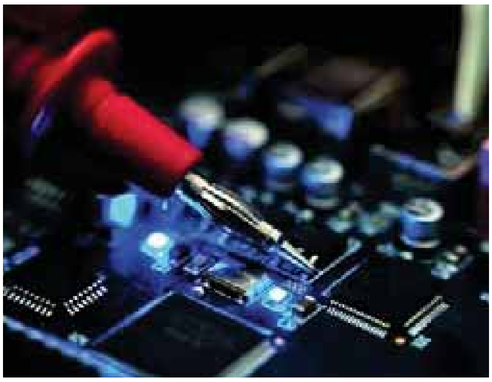
Chemical Industry

In this context, it is possible to supply water with the desired quality needed for the production of cosmetics and health products, water needed for the electroplating industry, water needed for the dyeing and printing industries, and water needed for laboratory washing using a reverse osmosis water purification system.

Food Industry

Preventing corrosion and sedimentation is one of the applications of water purification used in steam boilers. Because boilers are the most important part of the food production industry. In addition, the reverse osmosis system is also used in the food industry to concentrate liquids.

Electronics Industry



The reverse osmosis water treatment system in the electronics industry can be used to supply water needed for battery making, water needed for the production of microelectronics, and water used in the production of semiconductors, devices, and optical fiber.

Agriculture Industry

Desalination of industrial water in this industry is very important to prevent damage to agricultural products. As a result, the water used in the irrigation department is desalinated using a reverse osmosis filtration system so as not to harm the plants.

Water Supply For Heating & Cooling Systems

Low quality water entering the boiler increases energy consumption, reduces the quality and purity of produced steam, and ultimately reduces production and quality. Application of reverse osmosis is in the water supply circuit of the boiler and increases the reliability of production and reduces the cost of operation

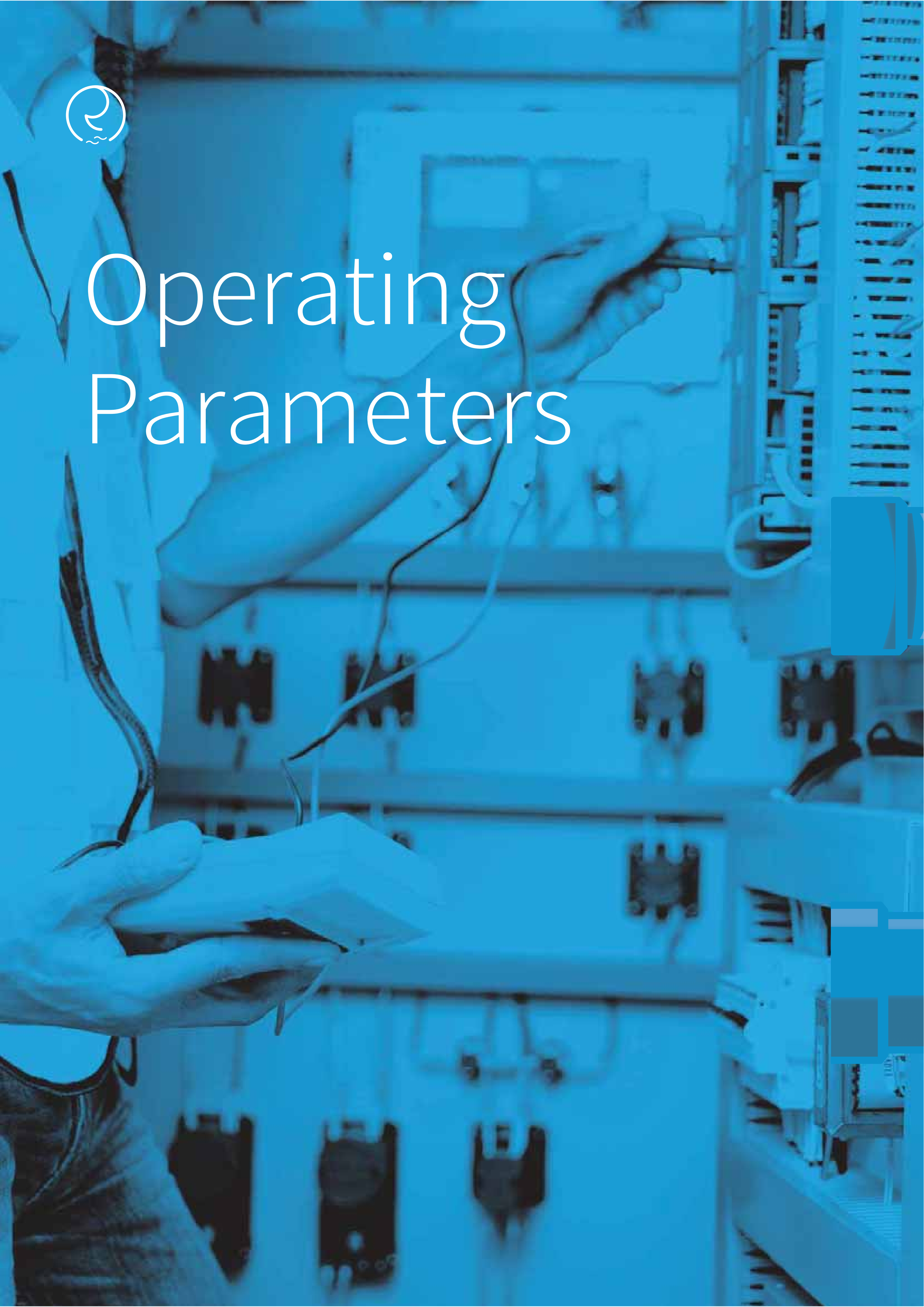
Pharmacology

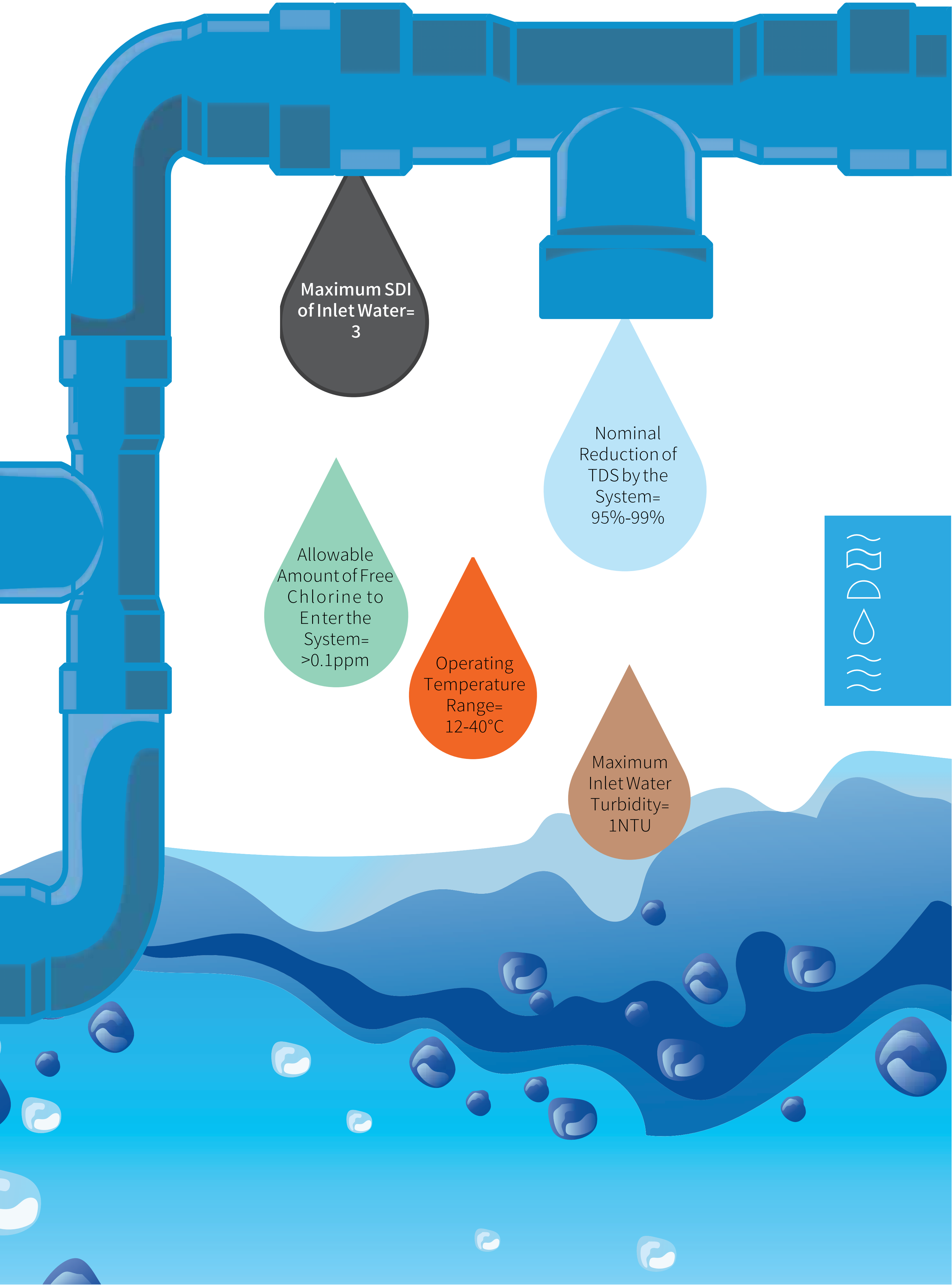
Due to the presence of salts and impurities in the drinking water of the urban water supply system, it sometimes makes it impossible to use this water in this industry. Reverse osmosis can be used to ensure the desired quality of this water, which can reduce impurities by 98%.

Power plant/Refinery/Petrochemical

Purification of the water used in the steam boiler prevents the formation of deposits in the turbine blades and the loss of its balance, which ultimately disrupts the electricity production process. As a result, the use of reverse osmosis water purification system in the power plant helps a lot in electricity production.

Operating Parameters





Maximum SDI of Inlet Water= 3

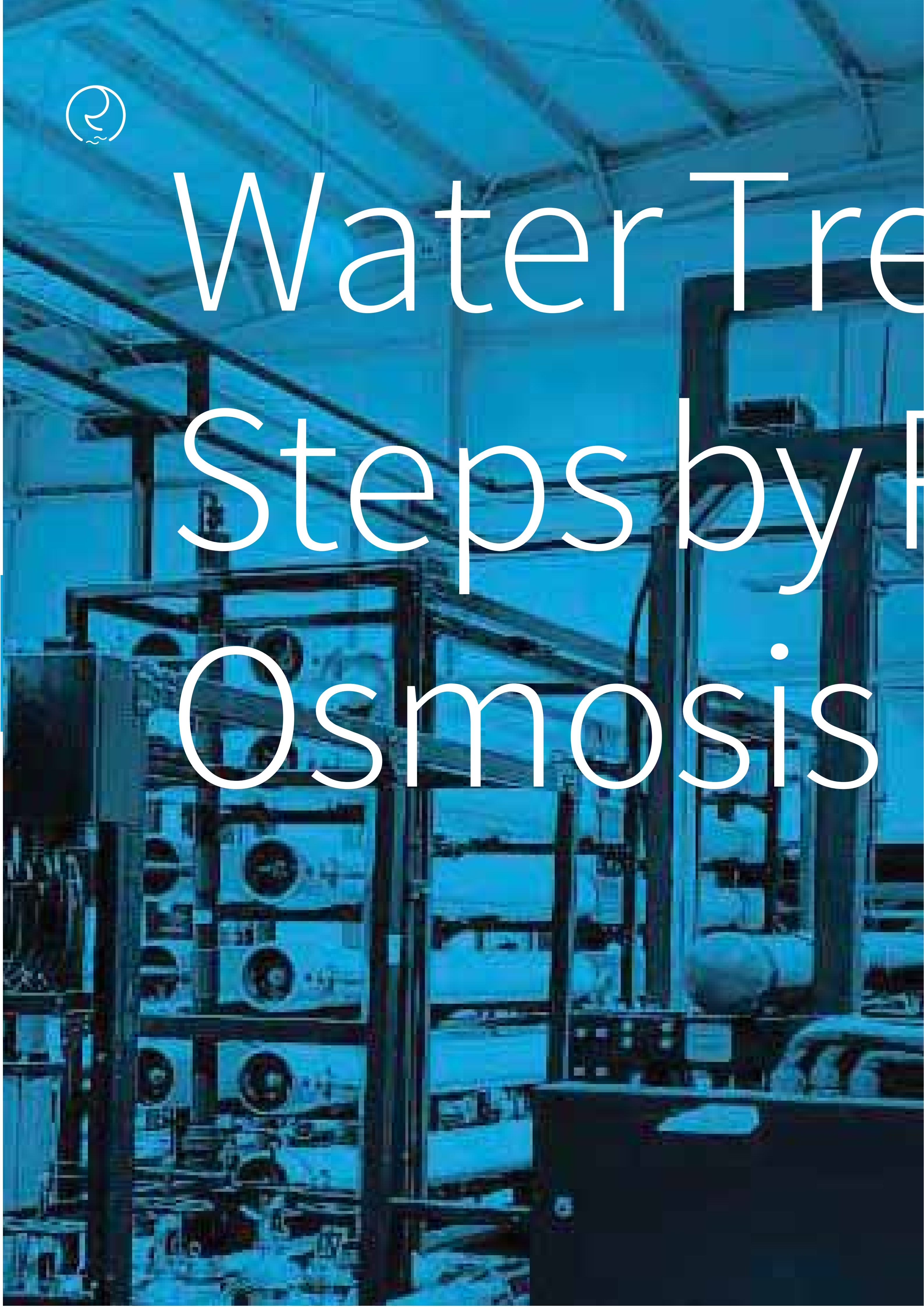
Nominal Reduction of TDS by the System= 95%-99%

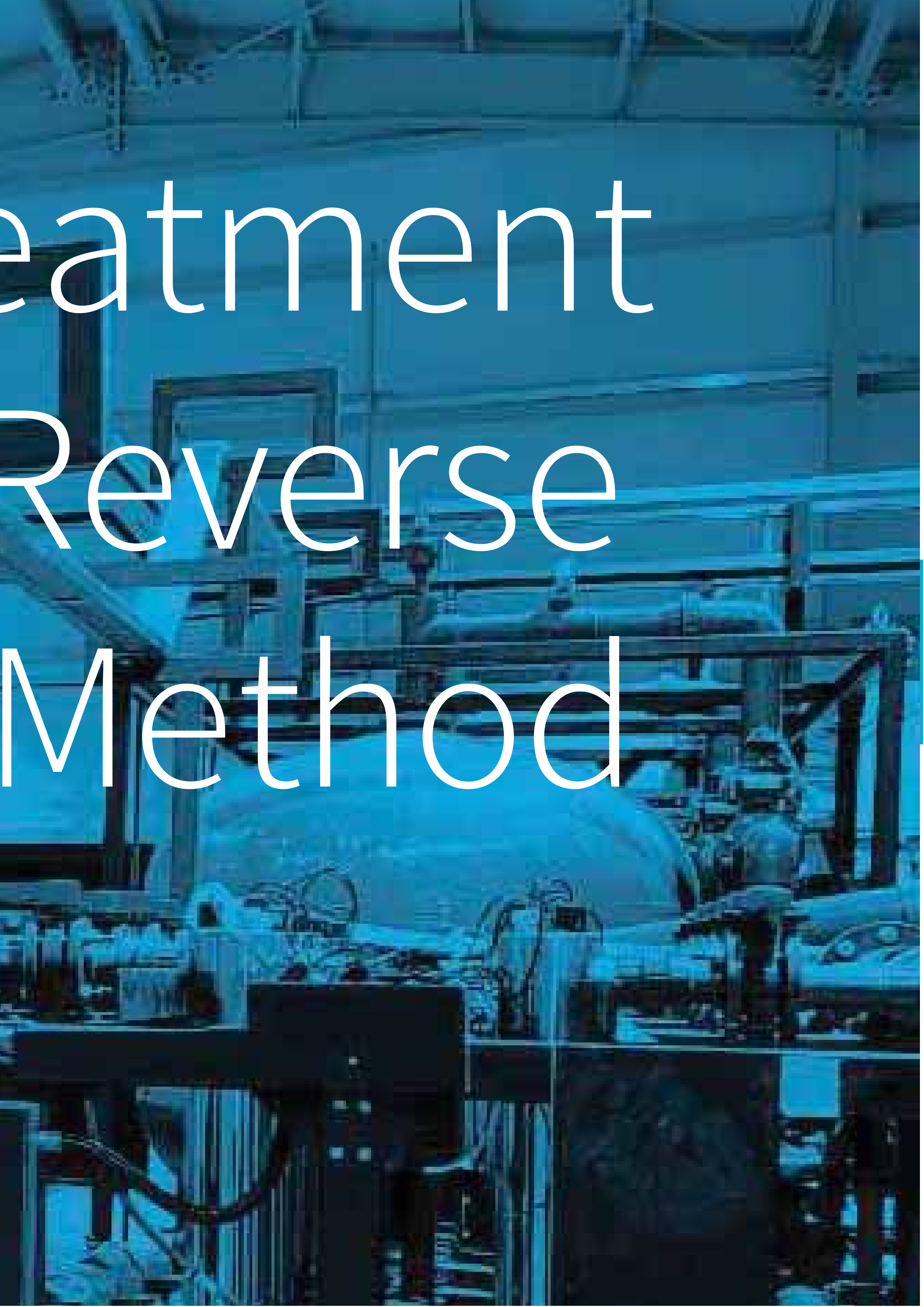
Allowable Amount of Free Chlorine to Enter the System= >0.1ppm

Operating Temperature Range= 12-40°C

Maximum Inlet Water Turbidity= 1NTU

Water Tre
Steps by
Osmosis





eatment
Reverse
Method

Water Treatment Steps By Reverse Osmosis

03

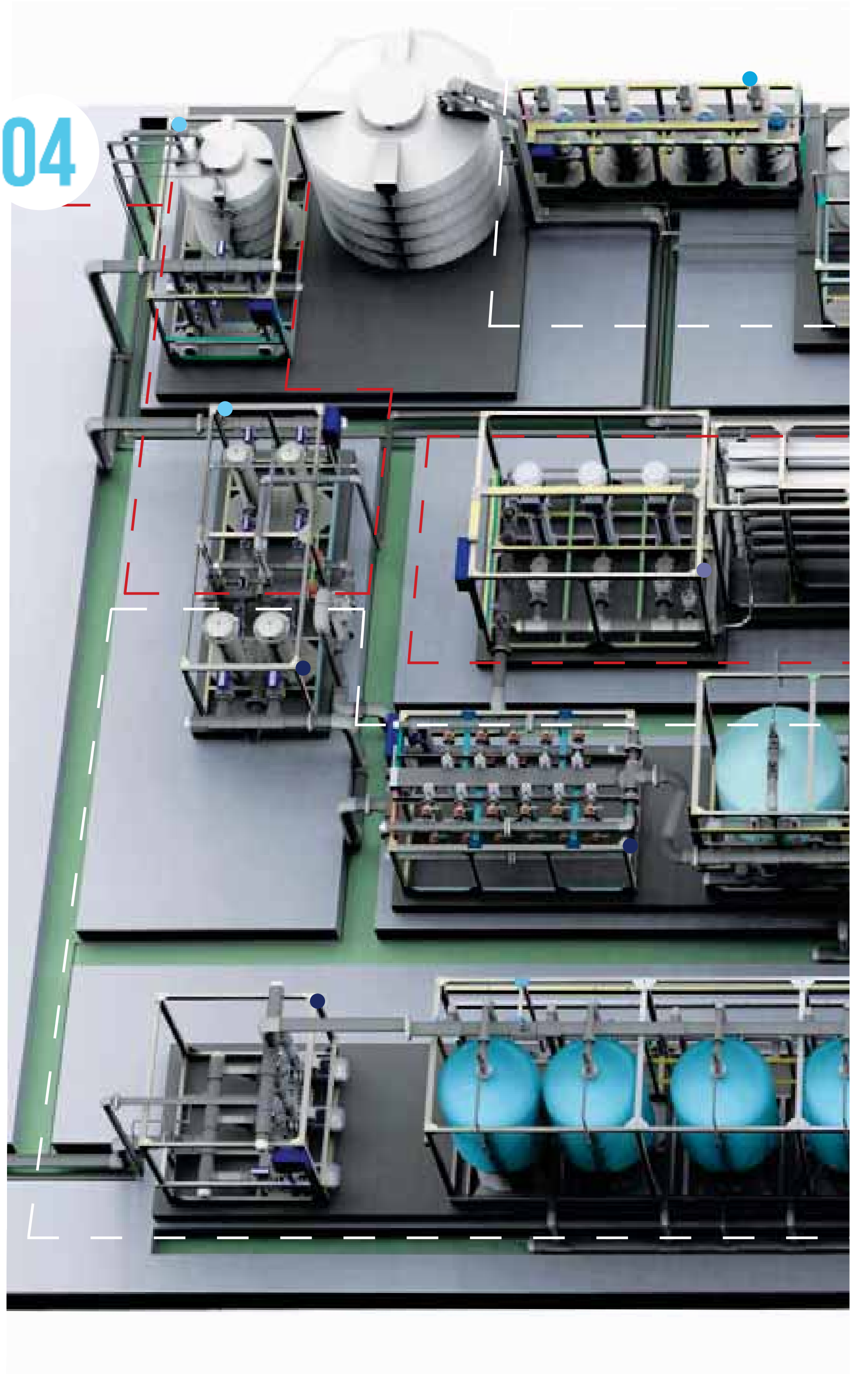
Post-Treatment Unit

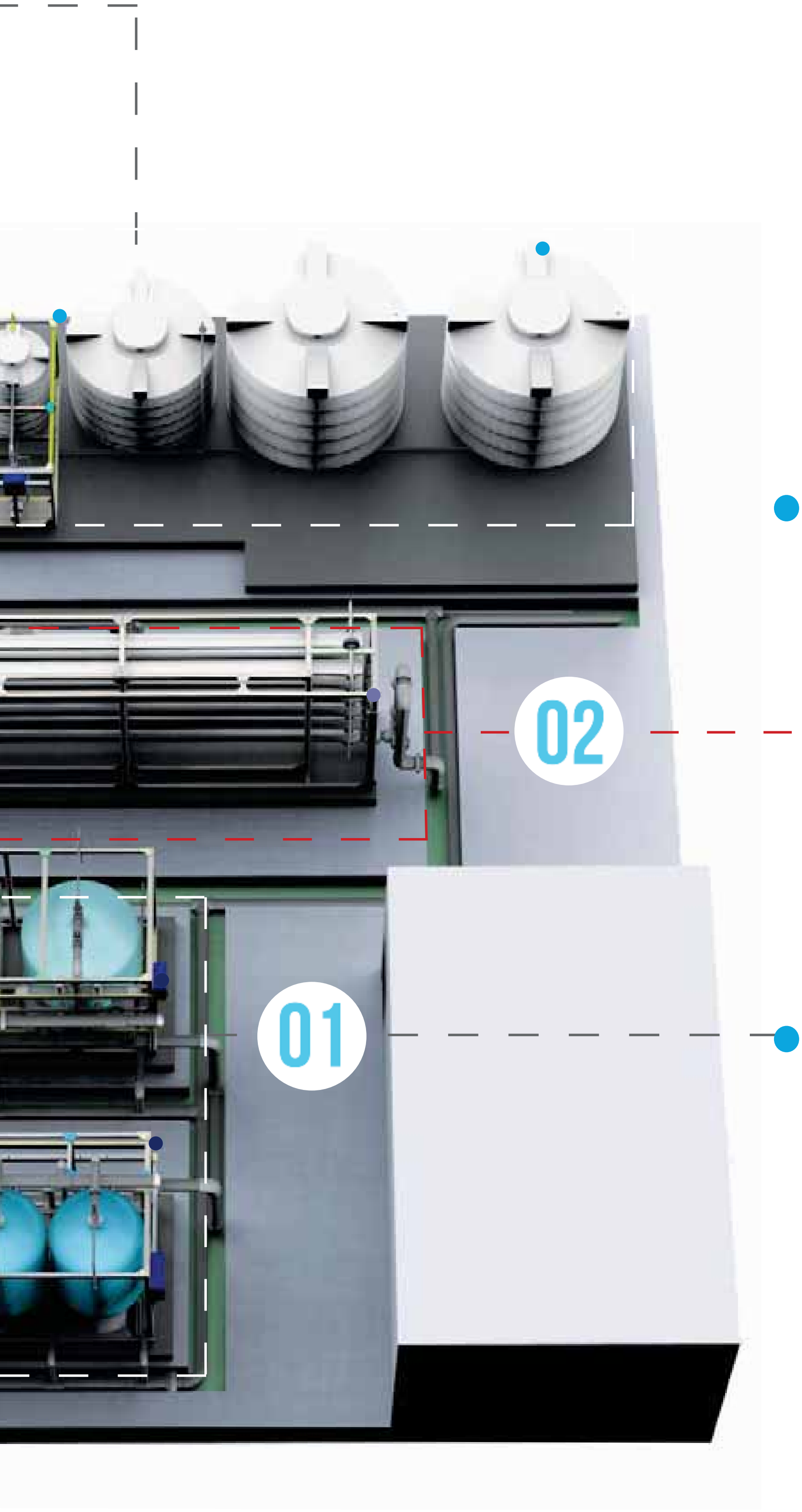
The available equipment is determined based on the sensitivity of the fresh water consumer unit. This section can includes disinfection system, TDS adjustment, PH adjustment, etc.

04

CIP & Flushing Unit

The chemical washing method is selected based on the type of clogging and the correct selection of this method has a significant impact on the performance and life of the membranes. Flushing: When the machine is stopped, the surface of the membranes must be washed with purified water to prevent the formation of deposits.





Treatment Unit
The water subjected to the pre-treatment process enters the pressure vessels by a high pressure pump that has a reverse osmosis membrane inside them.

Pre-Treatment Unit
Equipment such as sand filter, active carbon filter, cartridge filter, chemical dosing system (such as Antiscalant, sodium meta bisulfite, etc.), ultrafiltration, MBBR/MBR are selected according to the condition of raw water.

Pretreatment System Equipment

Sand Filters

This filter physically removes solid and suspended particles, mud & biological suspended particles up to 50 microns. In simpler words, sand filter reduces the turbidity of the water and, as a result, makes the water clearer.

Sand Filter

Carbon Filter

Activated carbon has an acceptable ability to remove color, odor, oil and grease, free water chlorine, with a very porous structure and a very high specific surface. It is also effective for reducing a wide range of minerals, chromate, sulfide, chlorine and chloramines.

Carbon Filter

Water Softener

In this method, the hard ions in the water (calcium and magnesium) are exchanged with the soft ions in the resins during the passage of the water through the resins. Water flow rate, desired water hardness and backwash time are effective factors in designing resin hardener with suitable capacity

Water Softener

Ultra Filtration

This system is used when BOD, SDI, COD and high turbidity indicators and TOC parameters should be in the range of 0-40 ppm, or for surface water treatment with very low salinity and water production. But its main role is in the desalination industry as a pre-treatment of nanofiltration and reverse osmosis methods.

Ultra Filtration

MBBR/MBR Filter

These filters will be used when inlet flow to reverse osmosis treatment system, is wastewater or the BOD/COD is very high and the TOC value is more than 40 ppm. Using ultrafiltration alone is not correct to purify this water, and in addition to RO, ultrafiltration is also harmful.

MBBR/ MBR Filter

PH Adjustment Dosing

Based on the analysis of the incoming water and the available ions, acidification will be used with a high saturation index to prevent the formation of sediment on membranes. Also, the permeate output from reverse osmosis has low pH and NaOH dosing can be used to balance the final

PH Adjustment Dosing

Dosing of Antiscalant Injection

It is used to minimize the deposits that form membranes in the RO process and dissolves.

the materials accumulated near the surface of the membrane and reduces the amount of deposits. Its selection depends on composition of the inlet water. Many of these materials are made with purpose of solving the problem of specific sediments.

Dosing of Antiscalant Injection

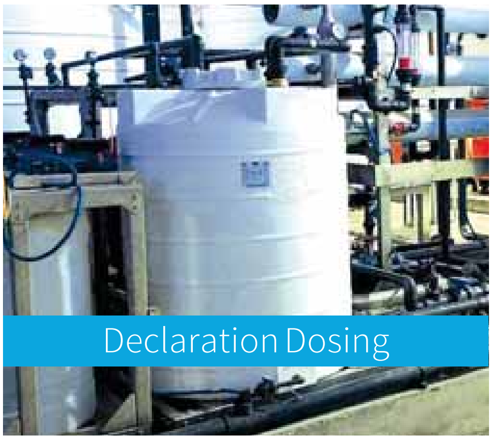
Chlorination Dosing

It is used in the pre-treatment of reverse osmosis and nanofiltration systems, with the aim of preventing biofouling, especially when surface water is used as a source of water supply. Chlorine must be removed before chlorine enters the membranes in order to prevent reverse osmosis membranes from oxidizing.

Chlorination Dosing

Declaration Dosing

Membranes will be oxidized by free chlorine, if the amount of free chlorine entering the reverse osmosis water is more than its allowed limit. Therefore, chemical dosages such as sodium bisulfite (SBS) or sodium metabisulfite (SMBS) will be used to remove this type of active chemical and prevent membrane damage.



Declaration Dosing

Ozone Generator

This system is used in pre-treatment to oxidize heavy metals such as iron, manganese, aluminum, etc., to reduce or eliminate organic, bacterial and microbial water pollution which will damage the membrane if it enters reverse osmosis with a high concentration

Ozon Generator

Heat Exchanger

The heat exchanger will be used to provide the optimal temperature for the reverse osmosis process when the temperature of the incoming water flow is variable in different seasons and is very low or very high compared to the designed state or the operating range of the membrane. It will change by changing this parameter.

Heat Exchanger

Cartridge Filter

In all reverse osmosis systems, Roman Group uses cartridge filters in the last part of the RO pre-treatment system just before the feed water enters the pressure pumps to protect these pumps and RO membranes from the dangers caused by the presence of suspended particles in drinking water.

Cartrige Filter

Chassis

The chassis design of ROMAN group reverse osmosis system is done in a special way according to the placement of the equipment. It is made with steel or stainless steel sheet and its thickness is determined based on the weight of the equipment under construction.

The number of chassis connections and equipment installation locations are determined precisely based on their working weight, dimensions and piping. All parts of the chassis are made with stainless steel material and can be fully assembled, disassembled and replaced with rusted or damaged parts. Bending is used in the construction of ROMAN group chassis and welding is not used in any way. This has led to easy construction, simple repairs and relocation, and increased production speed.

Also, the chassis design is such that it is resistant to rust and splashing of chemicals and it is easy to access all equipment and cleaning.

The chassis is analyzed statically and dynamically after the design so that it does not suffer any problem or damage while working on the site.

The chassis is covered with three layers of epoxy paint if the chassis material is not stainless steel.


Chassis


Chassis

High Pressure Pumps

Floor pumps and in some cases piston pumps are used to create pressure in reverse osmosis desalination devices. The impeller material of these pumps must be selected in such a way that it does not get damaged or corroded during the water treatment process.

High Pressure Pump

Pressure Vessel

All reverse osmosis systems have a fiberglass or stainless steel housing which can withstand high pressure and is responsible for maintaining and protecting the membrane. The pressure vessel is made to the size of the membrane and its structure is proportional to the shape of the membrane.

Pressure Vessel

Membrane

Reverse osmosis membranes are thin film composite or TFC. These membranes are used in many purification processes such as desalination due to their excellent mechanical properties and extraordinary rejection ratio.

Membrane

Piping

1.Low pressure: all communication pipes are of U-PUC type from the pre-treatment section to the high pressure pump.

2.High pressure: all communication pipes, valves and connections are of stainless steel type, from the high pressure pump to the produced water and waste water.

Piping

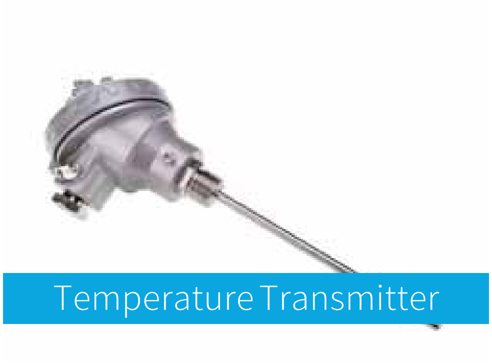
Instrumentation

Reverse osmosis systems are usually pressure transmitters, rotametric flowmeters with temperature transmitters, pressure transmitters, free chlorine sensors, TDS controllers, PH controllers, ORP sensors, etc., and we have introduced some of these equipment.

Instrumentation

Temperature Transmitter

The temperature of the flow entering system is controlled by temperature transmitter, because change in temperature will causes change the quality of purified water and even causes damage to the membrane in some cases.



Temperature Transmitter

Pressure Transmitter

The pressure transmitter measures pressure of liquids, fluids and gases. This instrument receives a weak electrical signal and converts it into an electrical signal to be sent to controllers, electronic circuits and monitoring systems. The main purpose of controlling the flow pressure is to prevent problems such as cavitation, to inform about the clogging of filters, etc.

Pressure Transmitter

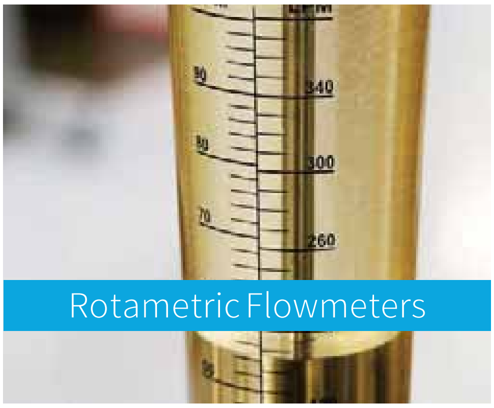
Free Chlorine Sensor

This device is used to know the amount of free chlorine in the water entering the reverse osmosis system and prevent damage to the membrane. Chlorine sensor is one of the most important sensors for various industries that use water.

Free Chlorine Sensor

Rotametric Flowmeters

They consist of a conical glass or plastic tube and a float. This tool is used to measure flow rate. Flow rate measurement is especially important to check process and project conditions when a fluid is passing through the facility.


Rotametric Flowmeters

ORP Sensor

The ORP oxidation reduction potential indicator is used to ensure the absence of free chlorine and the complete removal of this chemical. The Oxidation and Reduction Potential Index (ORP) controller is also used to ensure the absence of free chlorine and the complete removal of this chemical.


Orp Sensor

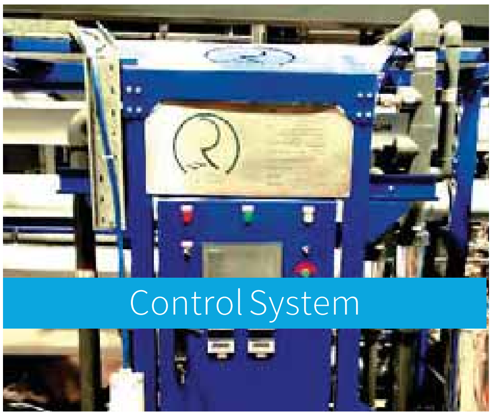
TDS

TDS meter is a device for measuring the amount of TDS or the concentration of dissolved solid particles. Due to the increase in electrical conductivity of the solution due to dissolved ionized solids such as salt or minerals, TDS meter measures the conductivity of the solution and based on that, it estimates amount of dissolved solids in the desired solution.

TDS

Control System

The ROMAN desalination control system is based on PLC control system with ability to send information and status of the device, which gives an accurate picture of the system.
The reference for precision instruments panel parts and standard layout is IEC.


Control System

Post- Treatment System Equipment

Deionization

Deionization system can be used for the secondary reduction of ions in purified water or to control a specific ion.ion exchange process takes place by removing the undesirable ions and replacing acceptable ions of solid resin.

Post-Treatment System Equipment Deionization

UV For Sterilization

This system is used in the post-treatment section to ensure the complete removal of microbial, viral and bacterial contamination in cases where the purified water is used for drinking.

Ultraviolet (UV) rays are effective against all microorganisms including bacteria, viruses, fungi, molds, yeasts and algae in the air and surfaces.

UV For Sterilization

Mineral Additives

Therefore, long-term use of this water is not useful for drinking because water treatment by reverse osmosis system has very few salts. For this reason, mineral additives are used to increase useful and essential ions needed by the human body.

Mineral Additives

NaOH Dosing

Due to the fact that pH of water treated by RO always decreases compared to the pH of the inlet flow to RO, according to the use of treated water, (for example, the pH of the water entering the boiler should be increased to 5.8).

Sodium hydroxide dosing is used to increase pH.

NaOH Dosing

CIP Unit Equipment

The CIP unit is an independent and basic unit for washing membranes. This unit is responsible for recovering the membranes with periodic acid and base washes and in some cases, do the daily drainage of the membranes with fresh water. The chemical washing method is selected based on the type of clogging and the correct selection of this method has a significant effect on the performance and life of the membranes.

A long delay in chemical washing after clogging of the membranes makes washing difficult and reduces the life and performance of the membranes after washing. It is also necessary to wash the system with purified water every time it stops, in cases where the water entering the membrane has the possibility of sedimentation.

CIP Tank

This tank is used to store washing solution during CIP operation. The material of this tank must have sufficient resistance against various acidic and alkaline chemical solutions. Also, an electric heater is used inside this tank to set the appropriate temperature during operation.

CIP Tank

CIP Pump

The CIP pump is selected according to the number of reverse osmosis filtration system membranes. The pump pressure is usually considered 5 bar. The pump material is also selected according to the chemical solutions used in the CIP operation so that it does not suffer from corrosion.

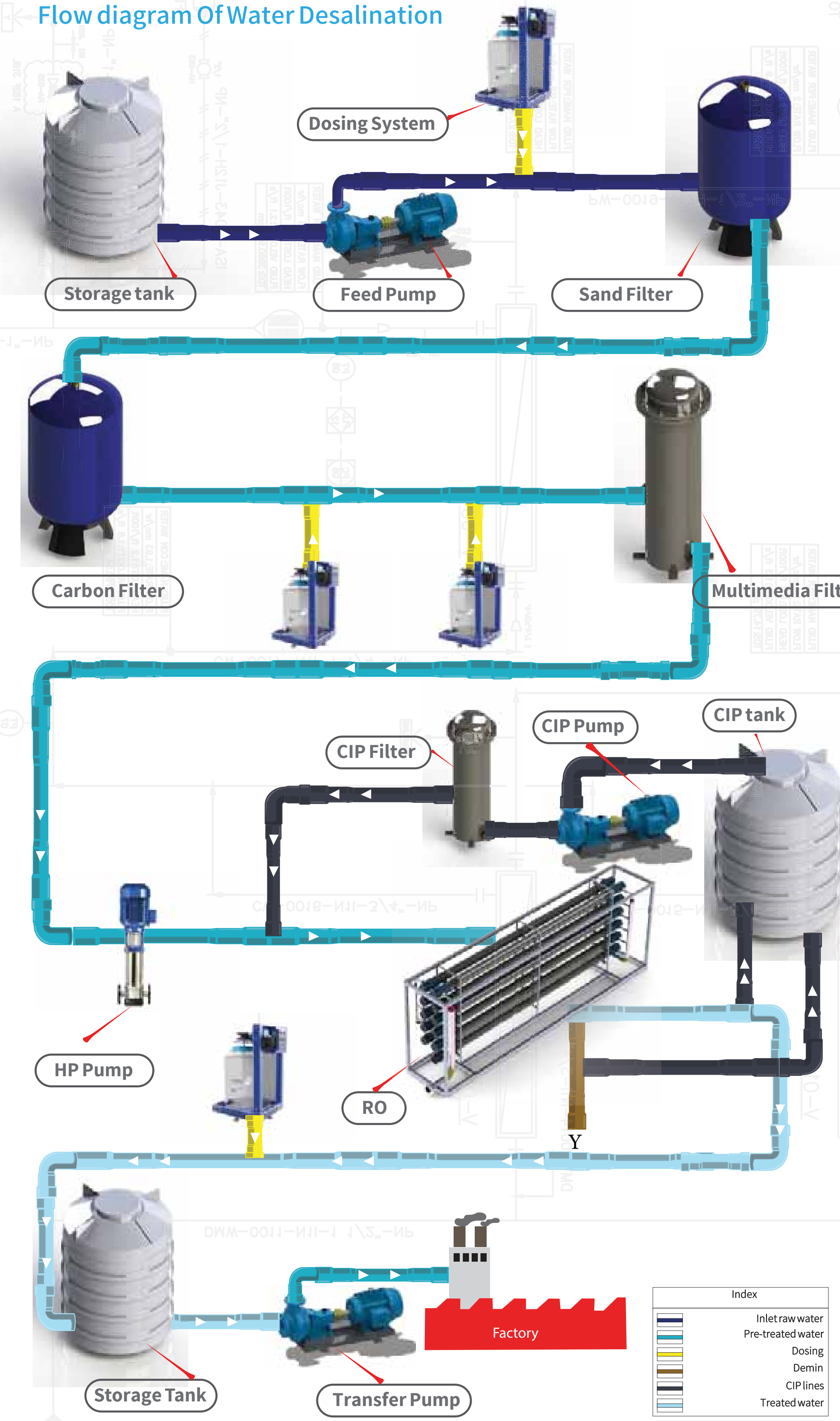
CIP Pump

Cartridge Filter

After passing through the membrane, washing solution returns to the tank. The return flow to tank can contain various contaminants such as mineral, biological or organic contamination. A cartridge filter is used to prevent these contaminations from re-contacting the membranes at the outlet of the CIP pump.

Cartridge Filter

Flow diagram Of Water Desalination



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Choosing the Reverse Osmosis System Membrane According To The TDS Of Input Feed

Currently, reverse osmosis (RO) membrane desalination is the dominant technology for producing fresh water from brackish water sources (seawater, brackish water, wastewater, etc.). Proper treatment and reduction of dissolved salts in feed water mainly depends on the choice of membrane. For this purpose, different types of membranes have been designed for water treatment. In the following, it is described the type of selected membrane, the efficiency of the system and the required energy of the system, according to the source of water used.

	Tap water	Brackish water	Sea water	Brine
Salinity (ppm)	1500>	30000>	35000-45000	35000-45000
Efficiency (%)	80	65-80	35-45	
Work pressure	15bar>	15-25bar	50-75bar	
Flask	30-35l/h.m2	25-30l/h.m2	15-20l/h.m2	
Membrane type	Tap/Brackish 4" "or 8	"Brackish 4" or 8	"Seawater 4" or 8	
Treatment method				Using thermal systems

Types Of Water Salinity

Conceptually, salinity is the amount of salt dissolved in water. Salts are water-soluble compounds such as sodium chloride, magnesium sulfate, potassium nitrate, and sodium bicarbonate. Operationally, a soluble substance is defined as a substance that can pass through a filter with very small pores (0.2 micrometers). Next, the type of water is specified according to salinity.

0 ppm	Fresh Water	0-5000 ppm ponds, lakes, rivers, streams and underground aquifers: • Optimal drinking water 500-100 ppm
+5000 ppm	Brackish Water	Estuaries, seas and saline lakes: • Caspian Sea 12000-13000 ppm • Baltic sea: 800 ppm • Agricultural irrigation limit: 200 ppm
+30000 ppm	Salty Water	• Persian Gulf: 39000-48000 ppm • Average sea water: 3470 ppm
+50000 ppm	Brines	• Brine pools with more than 5000 ppm

Flow Diagrams of Reverse Osmosis Based on Inlet Water Analysis

Water Without Special Chemical Compounds

Water does not need pre-treatment or special chemical dosing to improve the conditions of water entering RO if the water entering treatment system does not contain chemical or biological pollution and the ions dissolved in the water are chemically balanced. In this case, all undesirable water impurities will be removed or reduced by a simple pre-treatment and RO system. In this case, the pre-treatment system equipment is considered the simplest and will include sand filters, carbon filters, acid/sodium hydroxide dosing system, and cartridge filters. Water enters the main treatment system (RO) after going through the pre-treatment steps and creating suitable conditions to enter the RO device and thus impurities are removed from it.flow diagram of the reverse osmosis purification system is as follows:reverse osmosis treatment system flow diagram is as follows:

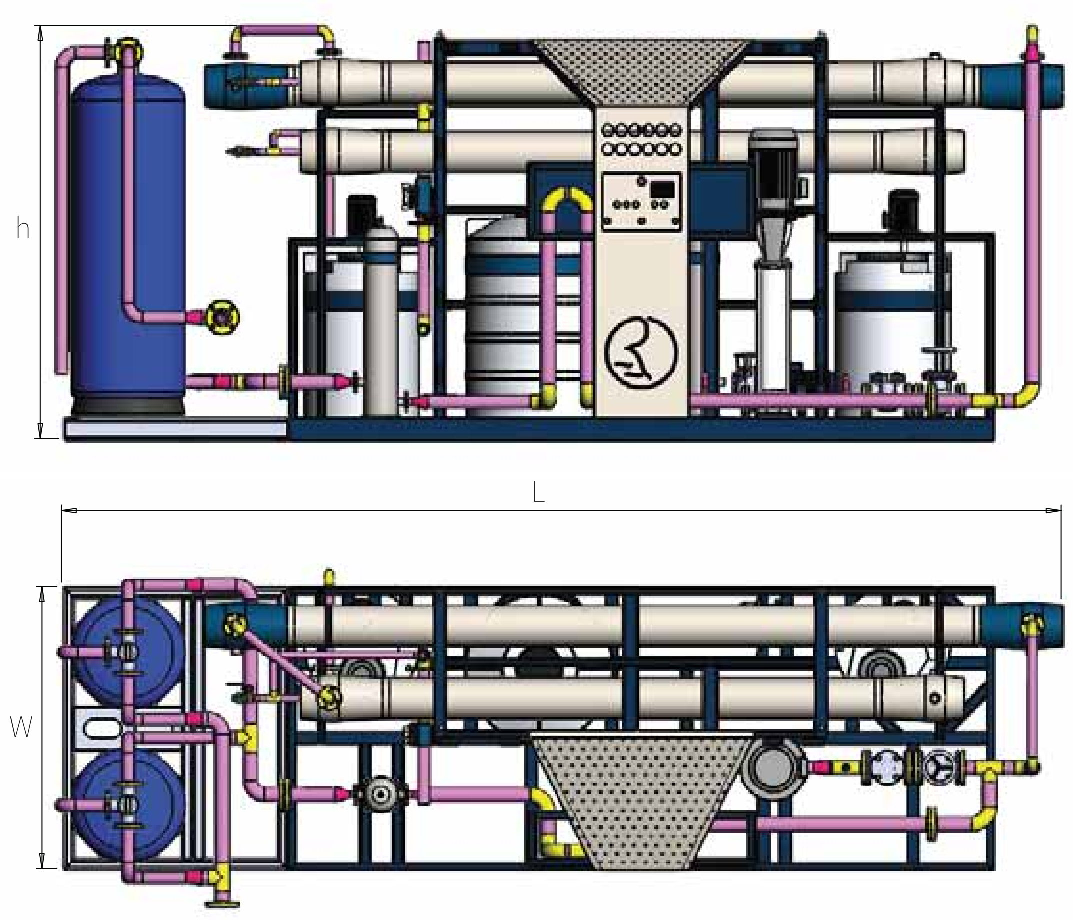
Water Containing a High Concentration Of Heavy Metal Ions

By designing a suitable pre-treatment system, it is possible to remove heavy metal ions if the water entering reverse osmosis system contains a high concentration of dissolved heavy metal ions (such as iron, manganese, aluminum, etc.) that can be oxidized. In this way, by preventing the entry of these types of ions, we will not witness the occurrence of sediments that interfere with the function of membrane. Pre-treatment system equipment can include chlorine injection system, ozone injection system, tank (to provide time for metals to oxidize), disk filter, sand filter, carbon filter, sodium meta bisulfite injection system, acid/sodium hydroxide injection system, dosing system antiscalant and finally cartridge filter if chlorine dosing and ozonation to water are used at the same time. The water enters the main treatment system (RO), after going through pre-treatment steps and creating suitable conditions for entering the RO device, and in this way, impurities are removed from it. The reverse osmosis treatment system flow diagram is as follows

Water Containing Chemical/Biological Pollution

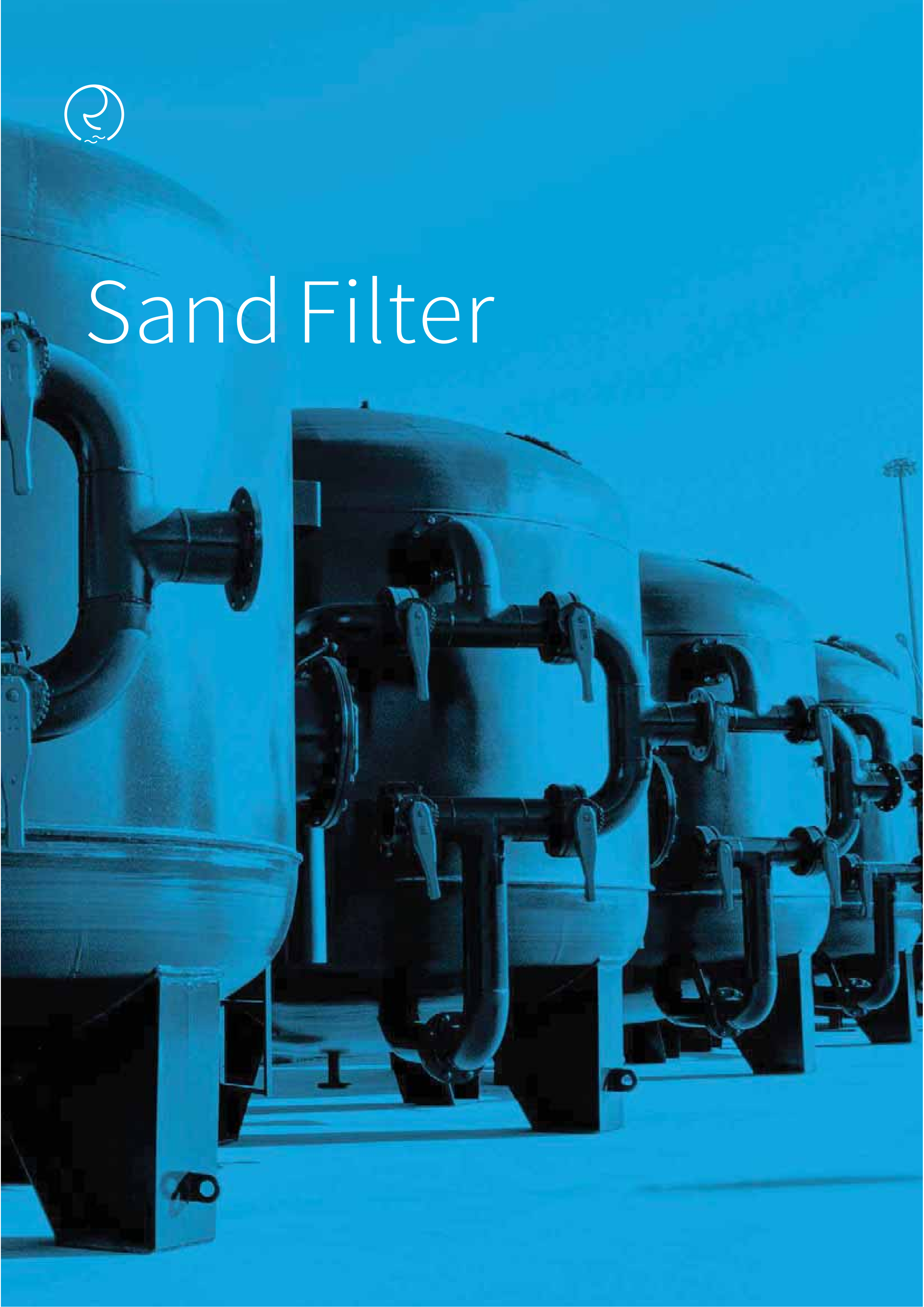
A suitable pre-treatment system should be considered which is effective in removing or reducing these parameters if the water entering the reverse osmosis treatment system contains chemical (COD/BOD), biological pollution and the concentration of heavy ions dissolved in should be optimal. This is done in order to reduce the chemical oxygen demand or biological oxygen demand of the water, and prevent damage to the RO membrane. Pre-treatment system equipment can include sand filter, carbon filter, and ultrafiltration system, water storage tank treated by ultrafiltration, acid/sodium hydroxide injection system, antiscalant injection system, and finally cartridge filter (it should be noted that in some circumstances, the chlorine injection system may also be added to this system). The water enters the main treatment system (RO), after going through pre-treatment steps and creating suitable conditions for entering the RO device, and in this way, impurities are removed from it. The reverse osmosis treatment system flow diagram is as follows.

Technical Specifications Of Reverse Osmosis Designed By ROMAN



Flow Rate (m^3/h)	Unit	2	5	10	15	20	25	30	35	40	45	50
Technical Data												
TDS Input	ppm	500-3000	500-3000	500-3000	500-3000	500-3000	500-3000	500-3000	500-3000	500-3000	500-3000	500-3000
Recovery	%	60	60	75	75	75	75	75	75	75	75	75
Feed Pressure	bar	11-15	9-13	12-18	12-17	12-18	14-19	12-18	14-19	13-18	13-19	13-19
TDS Output	ppm	27	31.1	34	33.7	34	32.5	32	29	31	30.1	30.4
Length	m	4	4	6	6	6	7	5	6	5	6	6
Width	m	1.5	2	2	2	2	2	2	2	2	2	2
Height	m	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5

Sand Filter



Product Description

Sand Filtration is a frequently used very robust method to remove suspended solids from water. The filtration medium consists of multiple layers of sand with different sizes and specific weight. Packman's pressure sand filters are mostly used to purify water. A process called backwash is necessary in specified intervals to clean the filter.

Applications for Sand Filtration

- Preparation of cooling water
- Treatment of waste water
- Production of drinking water
- Filtration in swimming pools
- Pre filtration for membrane systems
- Filtration of grey or surface water
- Iron removal from water

When the filters are loaded with particles, the flow direction is reversed and the flow rate is increased to clean the filter again. This step is called backwash. Cleaning time is determined by one of the following criteria's: The type of water, suspended solids concentration, oil and grease, COD/ BOD and iron contents. The arrangement of sand layers allow the largest dirt particles to be removed at top of the filter bed and smaller dirt particles being retained deeper in the media. This down-flow filtration permits delivery of high quality filtered water at much faster flow rates.

PACKMAN Sand Filter Properties

PACKMAN'S Sand Filters are used to filter water-insoluble particles with a diameter is larger than 1 NTU. These Filters which are used in swimming pools and industrial applications, are made of steel plates of ST37 grade (recommended for the manufacturing of pressure vessels with no direct fire contact). In case of customer's request, the filters can be made of 17MN4 (suitable for boiler construction) without any changes in product's price.
The Sand filters are vertical cylinders in different diameters with two heads. The diameter of the fitting, quantity of nozzles and filtration velocity are the most important features of sand filters.

The installed geyser on top of the sand filter, uniforms the water flow and causes water to pass through the silica substrate in a balanced manner.

Manufacturing Standards

ASME Sec VIII, Div. 1 is observed in construction of sand filter tanks.

Torispherical / Elliptical Head

PACKMAN's sand filter's head is Torispherical. This type of head has a longer life and a higher pressure strength compared to other shapes with the same thickness. The production price per kilo of these heads can reach to twice the price ratio of the usual heads on the market.

Welding Procedure

Welding is done with the Swedish ISBU submerged arc welding equipment. After constructing the tank and welding the lugs, the body of the tank is connected to the heads using a submerged welding method. The heads are welded internally and externally, which increases their life & strength. In the root pass, the TIG, argon or other welding methods with the 6010 cellulose electrode is used. The EW7018 electrode is used in the fill pass. The submerged method with EW7018 electrodes is than used in the cover pass.

Back Wash Piping

PACKMAN'S Sand Filters are equipped with necessary valve. If it is required, PACKMAN can also do the Back-Wash piping.

Silica And Filter

High grade silica with a purity of 98% with the following specifications will be delivered along with tanks:

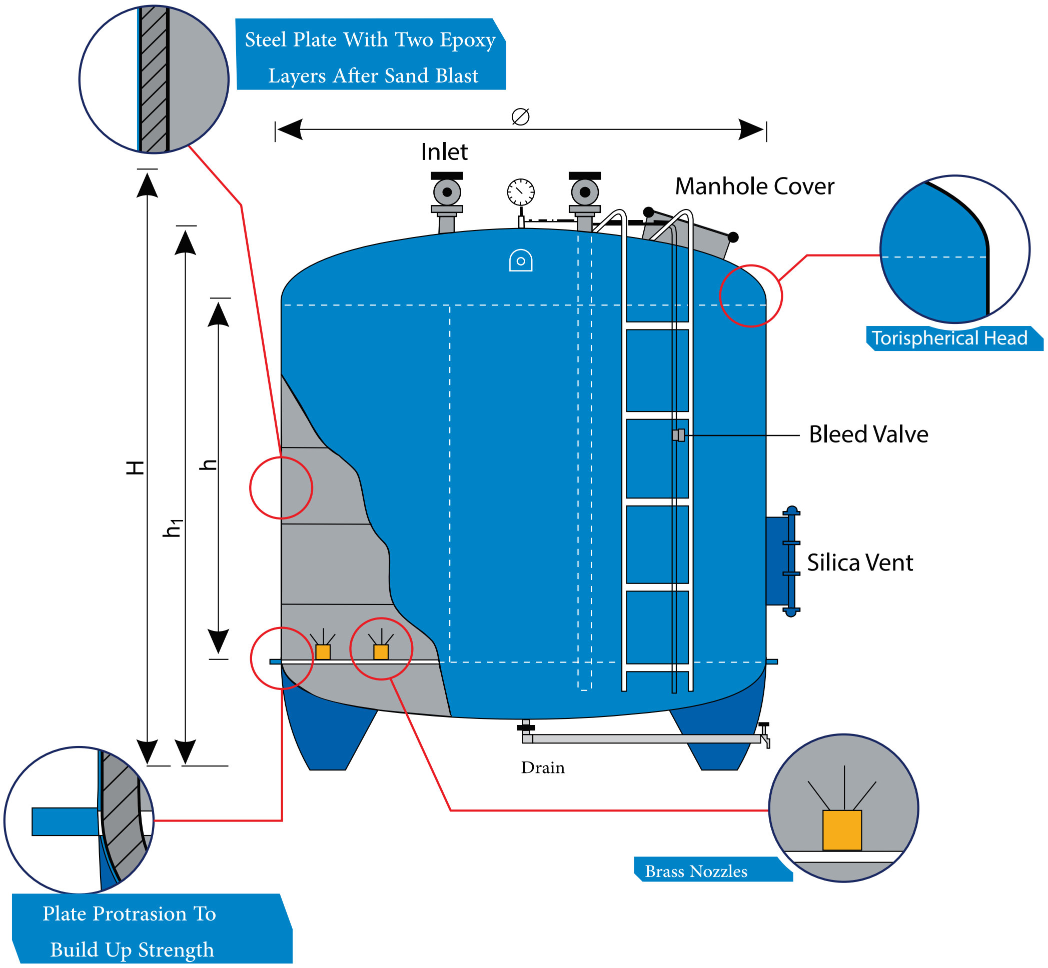
Silica Specification	
0.5-1.5 mm	Silica diameter-Grade 1
1.5-3 mm	Silica diameter-Grade 2
3-5 mm	Silica diameter-Grade 3
5-8 mm	Silica diameter-Grade 4
1 m	Total height of Silica
1.35	The silica uniformity coefficient inside the filters

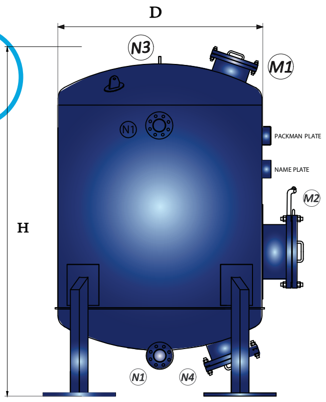
Sand Filter Coating

The outer coating of the sand filters consists of special industrial color and epoxy in three layers (275 microns thickness). The internal coating is made up of 100 micron thickness epoxy on a sandblasted layer.

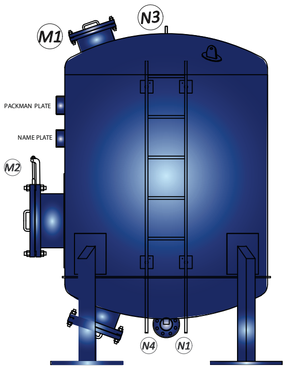
Nozzles

The nozzles used in PACKMAN'S sand filters are all made of brass, and for each square meter of sand surface, about 50 nozzles are placed, which makes the optimum washing procedure possible.

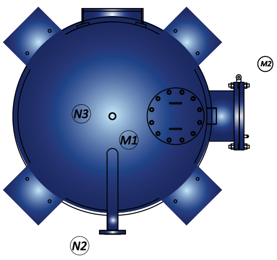




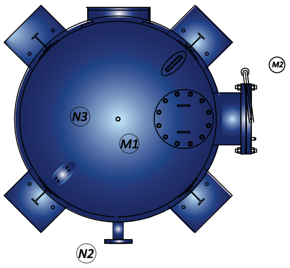
GENERAL VIEW



GENERAL VIEW



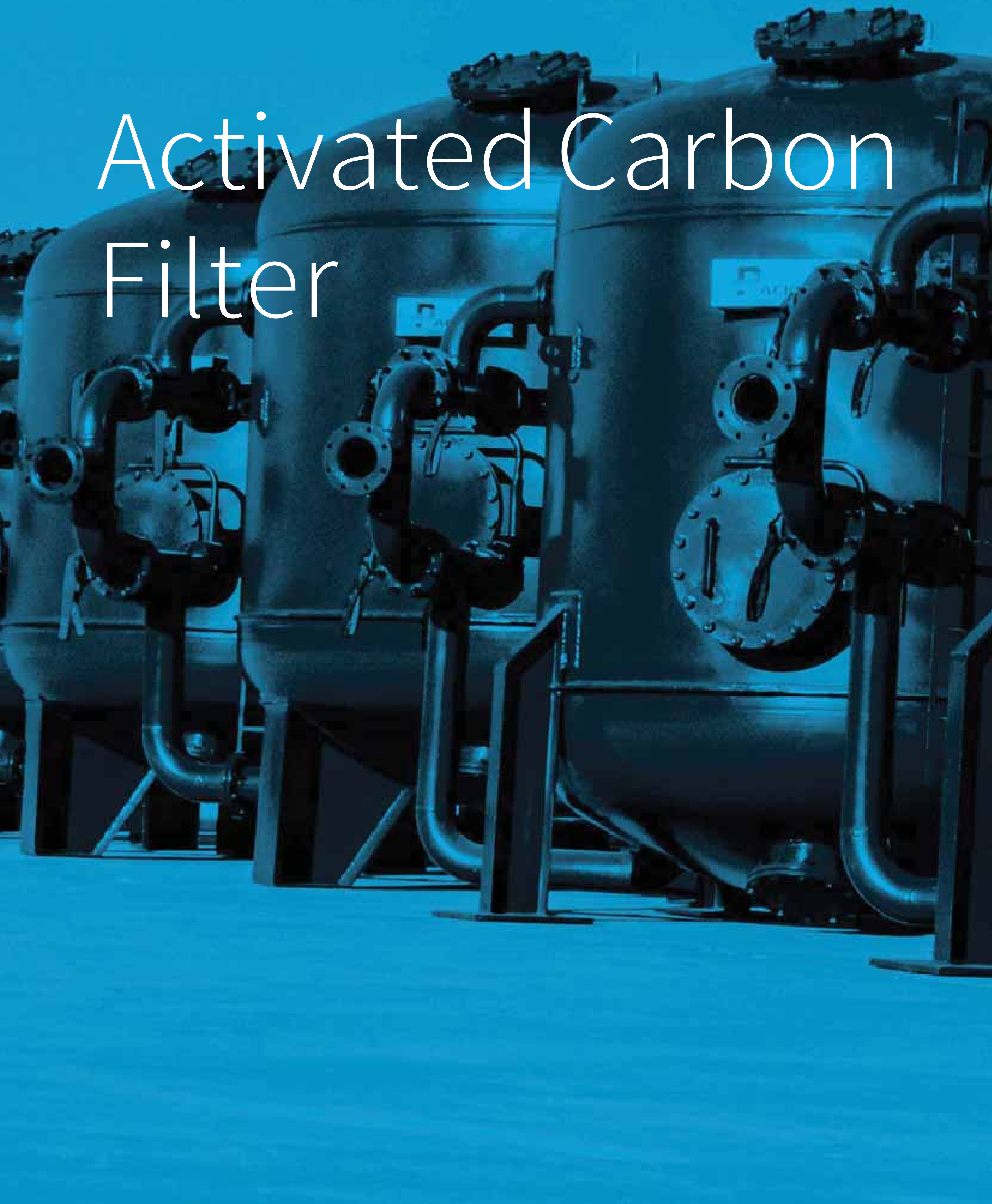
BOTTOM VIEW



TOP VIEW

Model		Unit	PSF -24	PSF -32	PSF -44	PSF -50	PSF -60	PSF -70	PSF -80	PSF -90	PSF -100	PSF -120
Technical Data												
Vessel Type		Type	Vertical									
Flowrate Capacity	6 gpm/ft^2	Gpm	18	33	60	80	120	160	210	265	325	470
	7 gpm/ft^2	Gpm	21	38	70	90	135	185	245	300	380	550
	8 gpm/ft^2	Gpm	24	43	70	110	155	210	280	350	435	625
Working Pressure		bar	4	4	4	4	4	4	4	4	4	4
Vessel Water Pressure Drop		bar	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Working Water Temperature		°C	55	55	55	55	55	55	55	55	55	55
Connectoins Size												
Inlet (N1)		in	1 1/4	1 1/2	2	2 1/2	3	4	5	5	5	6
Outlet (N2)		in	1 1/4	1 1/2	2	2 1/2	3	4	5	5	5	6
Hand Hole / Man Hole (N3)		in	10	14	14	16	16	16	16	16	16	16
Hand Hole / Man Hole (N4)		in	8	8	8	10	10	16	16	16	16	16
Man Hole (N5)		in	...	...	...	10	10	10	10	10	10	10
Vent (N6)		in	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Drain (N7)		in	1	1	1	1	1 1/4	2	2	2	2	2
Material												
Shell		Type	Carbon Steel									
Head												
Thickness												
Shell		mm	6	6	6	6	6	8	8	8	8	10
Head		mm	8	8	8	8	8	10	10	10	10	12
Vessel Dimensions												
Vessel Diameter (D)		mm	600	800	1,100	1,250	1,500	1,750	2,000	2,250	2,500	3,000
Height (H)		mm	1,600	1,800	2,300	2,300	2,500	3,000	3,000	3,000	3,000	3,700
Silica Sand												
Weight		kg	325	560	1,730	2,300	3,235	4,395	5,755	7,295	9,020	13,000

Activated Carbon Filter



Product Description

Activated Carbon Filter with a very porous structure and a very high specific surface is effective in removing a wide range of minerals, chromate, sulfide, chlorine and chloramines. This filter has an acceptable ability to remove color and odor. Another main use of this filter is to remove oil and grease from water. In case of not using sodium bisulfite solution, activated carbon can be used as a reverse osmosis pre-filter to prevent the attack of strong oxidants on the surface of the reverse osmosis membrane. These filters are used in preparation of facility water, industrial wastewater treatment and pre-treatment system, drinking water production, desalination pre-treatment system and also removing free chlorine from water. These filters are in form of vertical cylinders with two heads in different diameters and individually. The diameter of the fitting, quantity of nozzles and filtration velocity are the most important features of activated carbon filters.

The installed geyser on top of the activated carbon filter, uniforms the water flow and causes the water to pass through the activated carbon substrate in a balanced manner.

It should be noted that for the dimensions of filters, especially their diameter, the dimensions and sizes of the sand filters have been used, so the manufacturing process will not suffer any problems or changes.

Manufacturing Standards

ASME Sec VIII, Div. 1 is observed in construction of activated carbon filter tanks.

Torispherical / Elliptical Head

PACKMAN's Activated carbon filter's head is Torispherical or Elliptical. This type of head has a longer life and a higher pressure strength compared to other shapes with the same thickness. The production price per kilo of these heads is can reach to twice the price ratio of the usual heads on the market.

Welding Procedure

In the welding of Activated carbon filters, sub-powder welding machines of ISAB Sweden are used. After constructing the tank and welding the lugs, the body of the tank is connected to the heads using a submerged welding method. The lower head is welded by protruding of 6-pass nozzle plates from inside and outside, which increases the life of the weld and the strength of the lower head (which supports all the weight of water and resin).

The heads are welded internally and externally, which increases their life & strength. In the root pass, the TIG, argon or other welding methods with the 6010 cellulose electrode is used. The EW7018 electrode is used in the fill pass. The submerged method with EW7018 electrodes is than used in the cover pass.

Water Collection Nozzles

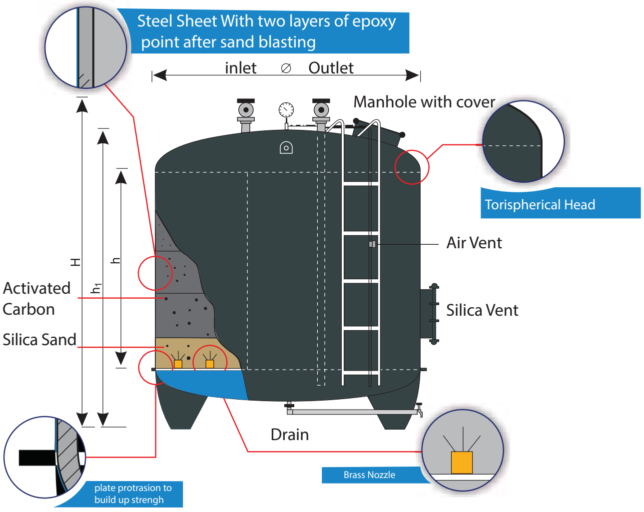
At the bottom of Packman's Activated carbon filters, there is a plate, on which nozzles are placed, which are responsible for collecting purified water. These nozzles are made of brass and about 50 nozzles are placed per square meter of the multimedia filter network surface, which makes the washing done optimally.

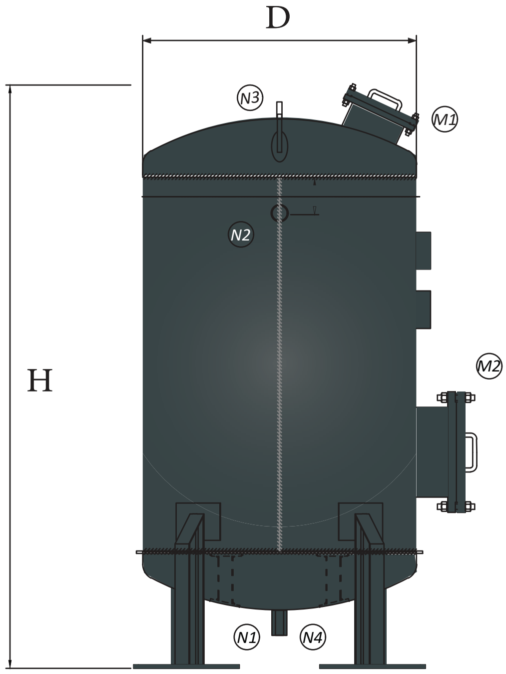
Covering Activated Carbon Filter

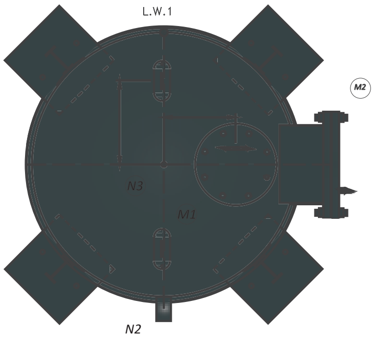
Activated carbon filter tanks are acid washed in preparation for paint. The outer coating of these filters is also made of special industrial paint and epoxy in three layers (thickness 275 microns) and 100 microns of color coating is applied from the inside.

Back Wash Piping

Packman's Activated carbon filters have a water return valve, and if backwash piping is needed, it is possible with a written request and re-inquiry.

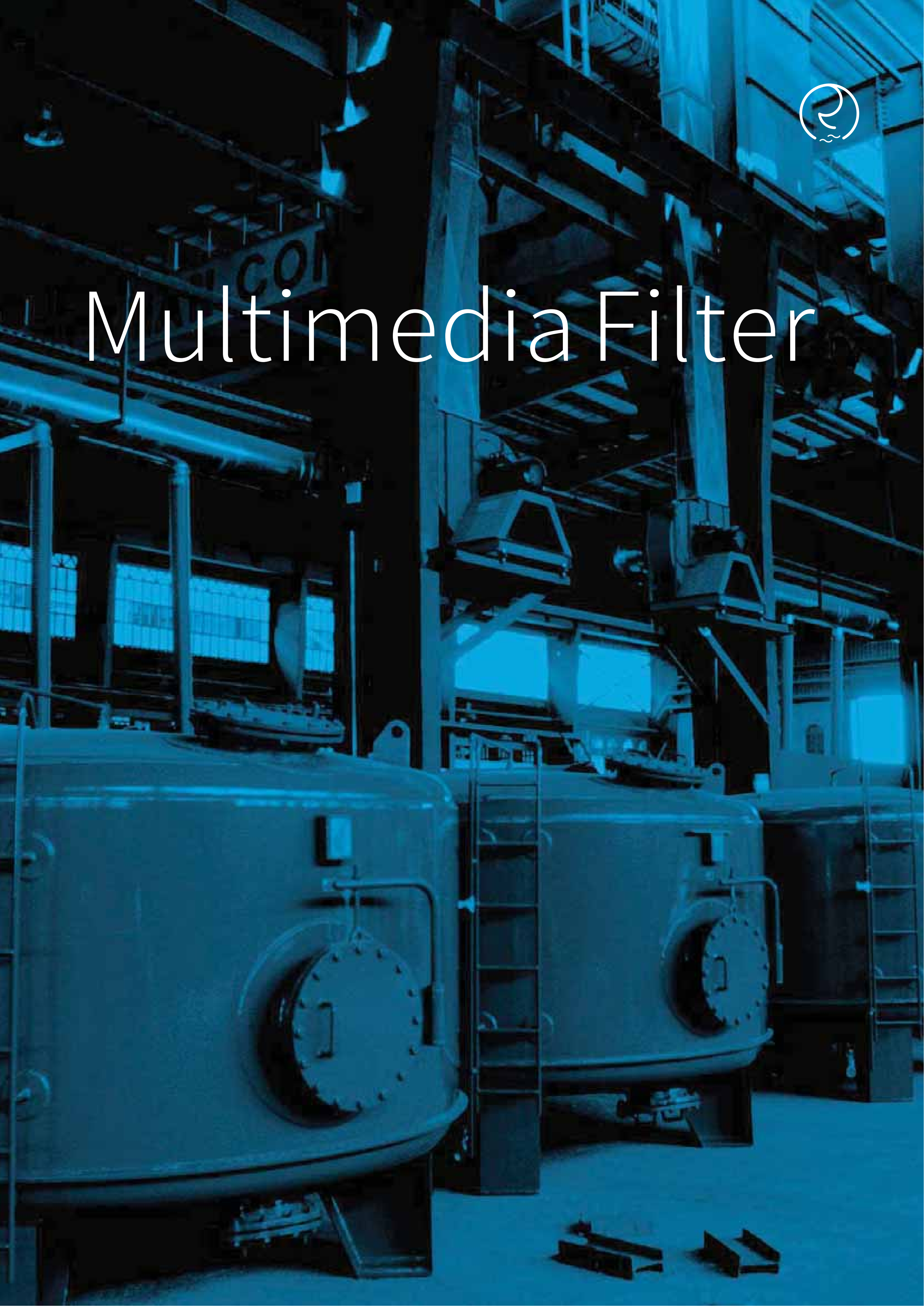






Model		Unit	PCF -24	PCF -32	PCF -44	PCF -50	PCF -60	PCF -70	PCF -80	PCF -90	PCF -100	PCF -120
Technical Data												
Capacity Based On Filtration Speed (m3/h)	15	m/h	4.3	7.6	14.3	18.5	26.5	36	47.2	59.7	73.6	106
	17	m/h	4.8	8.6	16.2	21	30	40.9	53.4	67.6	83.4	120.2
	20	m/h	5.6	10	19	24.6	35.4	48.1	62.9	79.5	98.2	141.4
Vessel water Pressure drop		bar	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Working water T emperature		°C	30	30	30	30	30	30	30	30	30	30
Connectoins Size												
Inlet (N2)		in	1,1/4	1,1/2	2	2,1/2	3	4	5	5	5	6
Outlet (N1)		in	1,1/4	1,1/2	2	2,1/2	3	4	5	5	5	6
Man Hole (M2)		in	10	14	14	16	16	16	16	16	16	16
Hand Hole (M1)		in	8	8	8	10	10	10	10	10	10	10
Manometer (N3)		in	1/2	1/2	1/2	1/2	1,1/4	1/2	1/2	1/2	1/2	1/2
Drain (N4)		in	1	1	1	1	1	2	2	2	2	2
Vessel Dimensions												
Vessel Diameter (D)		mm	600	800	1,100	1,250	1,500	1,750	2,000	2,250	2,500	3,000
Distance Of Head From Level (H)		mm	1,600	1,800	2,300	2,300	2,500	3,000	3,000	3,000	3,000	3,000
Carbon Weight												
Carbon		Kg	50	100	200	300	400	500	600	800	900	1200

Multimedia Filter



Product Description

Packman's Multimedia Filter generally consist of four layers of sand and one layer of carbon. In fact, these systems have the advantages of sand and carbon filters together. These filters are used to remove coarse insoluble particles along with chemical substances in water. These filters are in the form of vertical cylinders with two heads in different diameters and individually. The diameter of the fitting, quantity of nozzles and filtration velocity are the most important features of Multimedia filters. The installed geyser on top of the multimedia filter, uniforms the water flow and causes the water to pass through the activated carbon substrate in a balanced manner.

Manufacturing Standards

ASME Sec VIII, Div. 1 is observed in construction of Multimedia filter tanks.

Tori spherical / Elliptical Head

PACKMAN's Multimedia filter head is Torispherical or Elliptical. This type of head has a longer life and a higher pressure strength compared to other shapes with the same thickness.

Welding Procedure

In the welding of Multimedia filters, sub-powder welding machines of ISAB Sweden are used. After constructing the tank and welding the lugs, the body of the tank is connected to the heads using a submerged welding method.
The lower head is welded by protruding of 6-pass nozzle plates from inside and outside, which increases the life of the weld and the strength of the lower head (which supports all the weight of water and resin).
The heads are welded internally and externally, which increases their life & strength. In the root pass, the TIG, argon or other welding methods with the 6010 cellulose electrode is used. The EW7018 electrode is used in the fill pass. The submerged method with EW7018 electrodes is than used in the cover pass.

Water Collection Nozzles

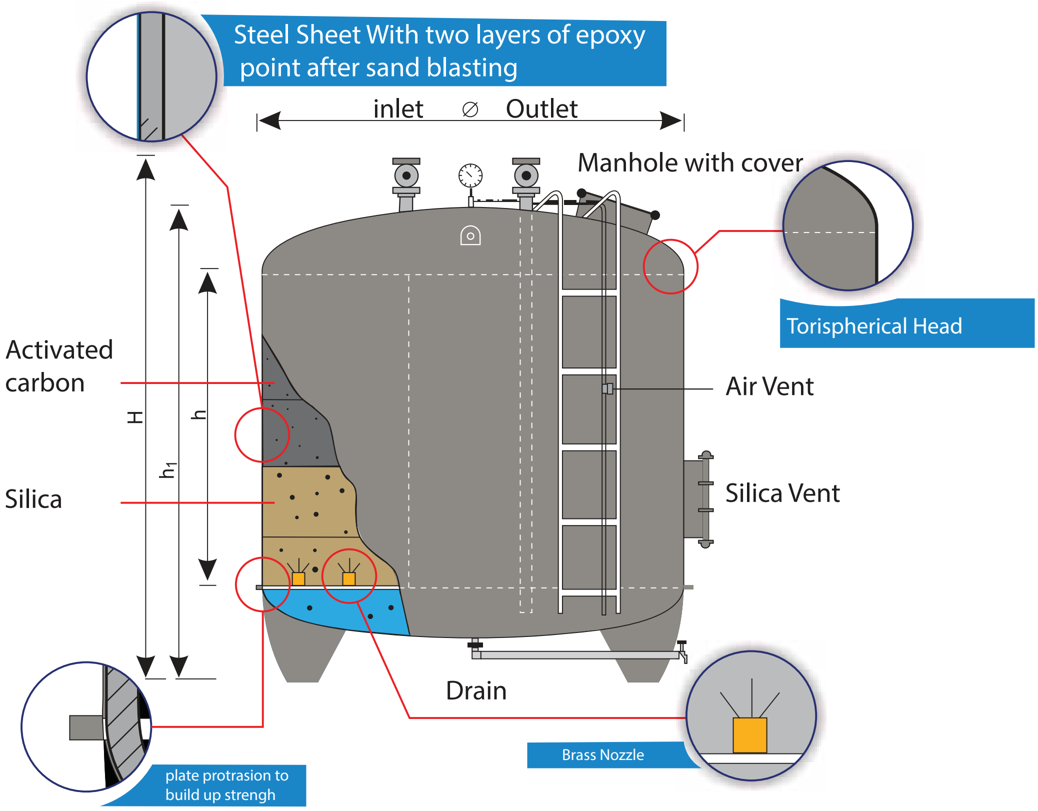
At the bottom of Packman's Multimedia filters, there is a plate, on which nozzles are placed, which are responsible for collecting purified water. These nozzles are made of brass and about 50 nozzles are placed per square meter of the multimedia filter network surface, which makes the washing done optimally.

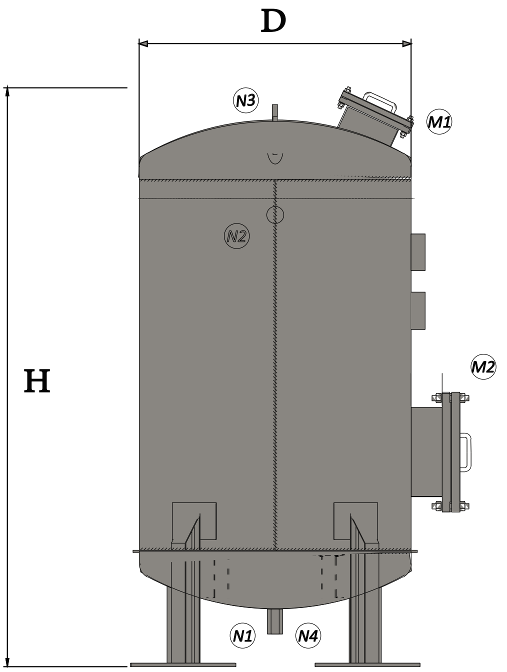
Covering Multimedia Filter

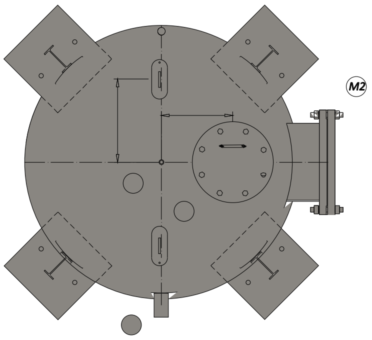
Multimedia filter tanks are acid washed (At the request of the client Sand Blast) in preparation for paint. The outer coating of these filters is also made of special industrial paint and epoxy in three layers (thickness 275 microns) and 100 microns of color coating is applied from the inside.

Beck Wash Piping

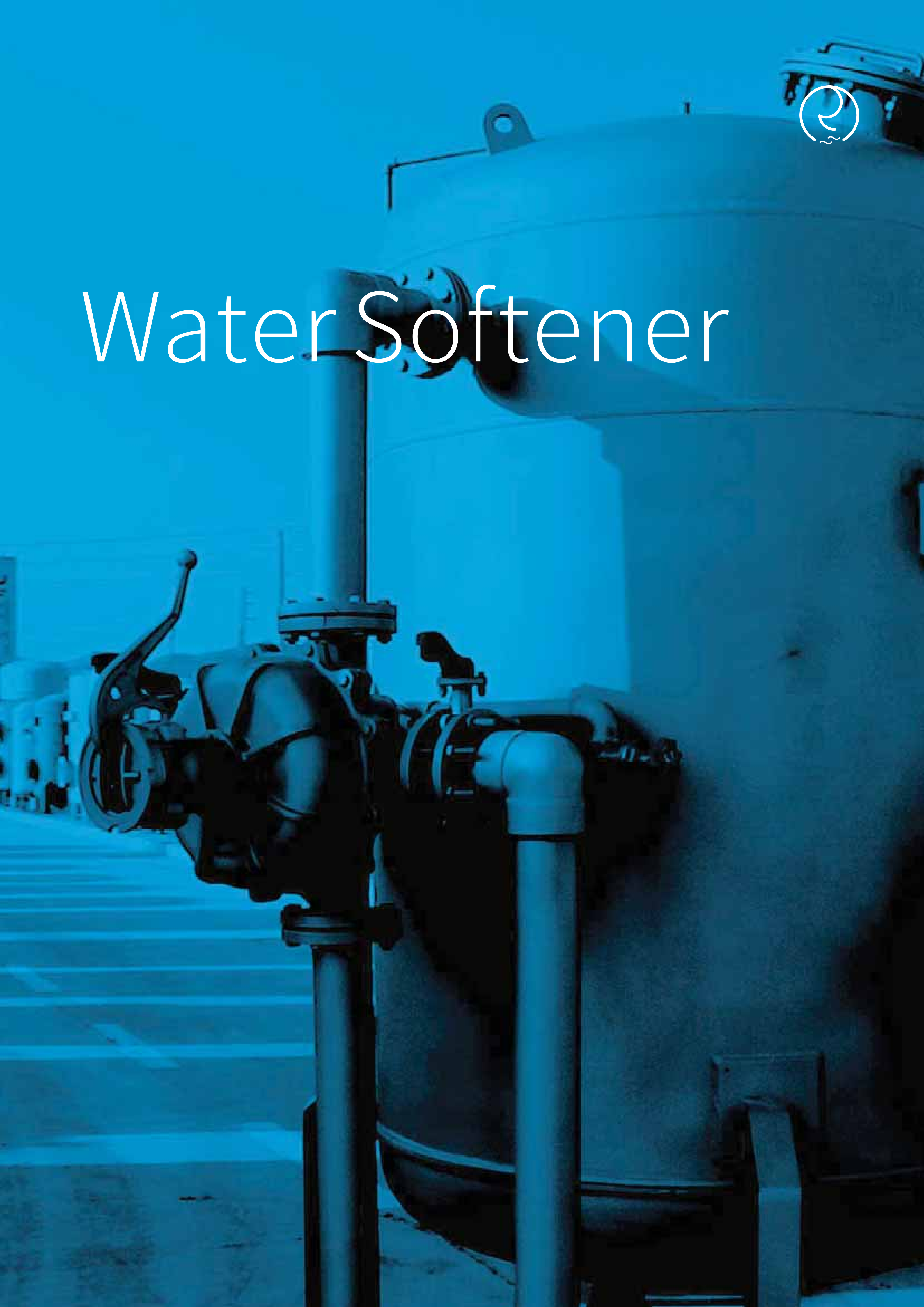
Packman's Multimedia filter have a water return valve, and if backwash piping is needed, it is possible with a written request and re-inquiry.







Model		Unit	PMF -24	PMF -32	PMF -44	PMF -50	PMF -60	PMF -70	PMF -80	PMF -90	PMF -100	PMF -120
Technical Data												
Capacity based on Filtration Speed (m^3/h)	15	m/h	4.3	7.6	14.3	18.5	26.5	36	47.2	59.7	73.6	106
	17	m/h	4.8	8.6	16.2	21	30	40.9	53.4	67.6	83.4	120.2
	20	m/h	5.6	10	19	24.6	35.4	48.1	62.9	79.5	98.2	141.4
Vessel Water Pressure drop		bar	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Working water temperature		°C	30	30	30	30	30	30	30	30	30	30
Connectoins Size												
Inlet (N2)		in	1,1/4	1,1/2	2	2,1/2	3	4	5	5	5	6
Outlet (N1)		in	1,1/4	1,1/2	2	2,1/2	3	4	5	5	5	6
Man Hole (M1 , M2)		in	10	14	14	16	16	16	16	16	16	16
Hand Hole		in	8	8	8	10	10	10	10	10	10	10
Manometer (N3)		in	1/2	1/2	1/2	1/2	1,1/4	1/2	1/2	1/2	1/2	1/2
Drain (N4)		in	1	1	1	1	1	2	2	2	2	2
Vessel Dimensions												
Vessel Diameter (D)		mm	600	800	1100	1250	1500	1750	2000	2250	2500	3000
Height or Length (Head to Head) (H)		mm	1900	2100	2600	2900	3000	3500	3500	3500	3800	3800
Silica And Carbon Weight												
Carbon		Kg	100	150	250	350	450	650	800	1000	1500	2000
Silica		Kg	400	700	1400	1800	2500	3500	4500	5500	7000	10000



Water Softener

Product Description

Water Softening is removal of calcium, magnesium, and certain other metal cations which exist in hard water. Use of soft water extends the lifetime of pipes and fittings by reducing or eliminating scale build-up. Water softening is usually achieved using lime softening or ion-exchange resins . When water is referred to as 'hard' this simply means, that it contains more minerals especially calcium and magnesium than ordinary water.

The degree of water hardness increases, when more calcium and magnesium dissolve.

Magnesium and calcium are positively charged ions. Because of their presence, other positively charged ions will dissolve less easily in hard water compared to water that does not contain calcium and magnesium.

PACKMAN'S Water softeners are specific ion exchangers that are designed to remove ions, which are positively charged. Softeners mainly remove calcium (Ca2+) and magnesium (Mg2+) ions. Calcium and magnesium are often referred to as 'hardness ions'. Softeners are sometimes even applied to remove iron. The softening devices are able to remove up to five milligrams per liter (5 mg/L) of dissolved iron. Softeners can operate automaticly, semi-automaticly, or manually. Each type is rated based on the amount of hardness it can remove before regeneration is necessary. A water softener collects hardness minerals it's conditioning tank and from time to time flushes them away to drain. When an ion exchanger is applied for water softening, it will replace the calcium and magnesium ions in the water with other ions, for instance sodium or potassium. These ions are added to the ion exchanger's reservoir as sodium and potassium salts (NaCl and KCl).

After a period of time, the resin beads become coated with minerals and must be cleaned or "recharged" to become effective again. The water softener's timer and/or controls automatically run the appliance through cycles to backwash, recharge, and rinse the beads. A control that is designed to recharge based on the amount of processed water is better than a timer that cycles the water on a scheduled basis because it operates based on need, not time. The result is savings in energy, salt, and water.

During a backwash cycle, the flow of water is reversed so that water is forced down the riser tube to the bottom of the tank so that it will flow up through the resin beads in the tank.

The unit flushes and expands the resin, washing off the beads and then carrying the minerals out through a drainpipe. A "brine tank" is paired with the mineral tank to help with the regeneration process. During the "brine draw" cycle, salty water (brine) is pumped from the brine tank into the resin tank. As the water flows down through the resin beads, it exchanges sodium with the hard-water ions, regenerating the electrical attraction of the resin beads. Then, when the brine tank is empty, a slow rinse begins, followed by a more forceful fast rinse. With both of these cycles, fresh water rinses excess brine from resin and expels it down the drain. Then the brine tank is refilled.

PACKMAN'S Water Softener's Properties

PACKMAN'S Water Softeners are made of steel plate of ST37 grade (recommended for the manufacturing of pressure vessels with no direct fire contact). In case of customer's request, the filters can be made of 17MN4 (suitable for boiler construction) without any change in product's price. The Water Softeners are vertical cylinders in different capacities and two types of single and double systems.

The installed geyser on top of the water softeners, uniforms the water flow and balanus the water pass through out the filter.

Manufacturing Standards

ASME Sec VIII, Div. 1 is observed in the construction of water softener tanks.

Torispherical / Elliptical Head

PACKMAN'S water softener tank's head are Torispherical. This type of head has a longer life and a higher pressure strength compared to other shapes with the same thickness. The production price per kilo of these heads can reach to twice the price ratio of the usual heads on the market.

Welding Procedure

Welding is done with Swedish ISBU submerged arc welding equipment. After constructing the tank and welding the lugs, the body of the tank is connected to the heads using a submerged welding method. In addition, the heads are welded internally and externally, which increases their life & strength. In the root pass, the TIG, argon or other welding methods with the 6010 cellulose electrode is used. The EW7018 electrode is used in welding fill pass. The submerged method with EW7018 electrodes in used in the cover pass.

Nozzles

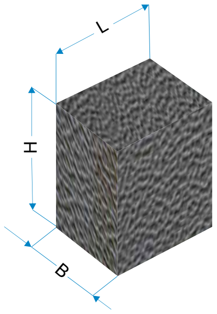
The nozzles used in PACKMAN'S water softeners are all made of brass, and for each square meter of resins, surface, about 50 nozzles are placed, which makes the optimum washing procedure possible.

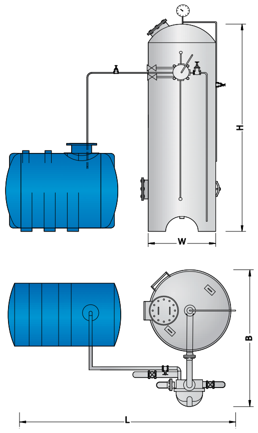
Silica and Resin of Water Softener

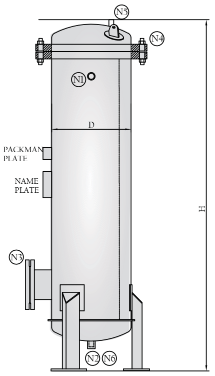
PACKMAN'S water softener's resin is the PUROLITE with a high ion exchange rate coefficient and a high quality silica with a purity of 98% which is used at the bottom of the tank.

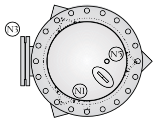
Product Capacity Calculation & Selection

$$\text{water Softener Capacity (Grain)} \quad \frac{\text{(Flow Rate (Gpm) x 60 x Washing cycle (hr)xWater Hardness (ppm)}}{17.1}$$



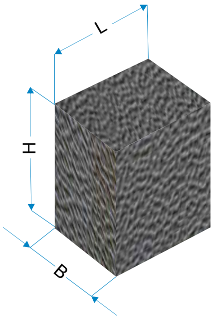


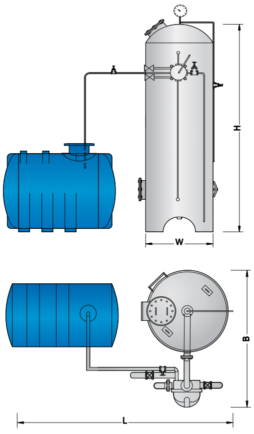


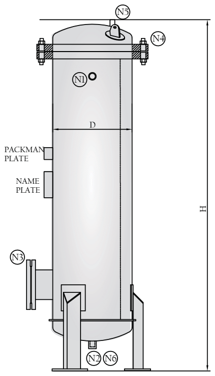


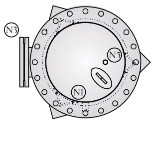
TOP VIEW

MODEL			PWS -3	PWS-6	PWS-9	PWS-12	PWS-15	PWS-18	PWS-21	PWS-24	PWS-30	PWS-36	PWS-45
SPECIFICATIONS													
Capacity (Grain)			30,000	60,000	90,000	120,000	150,000	180,000	210,000	240,000	300,000	360,000	450,000
Vessel Diameter (D) (mm)			320	320	320	400	460	510	510	510	560	600	600
(N1,N2) Inlet/Outlet Size (in.)			3/4”	3/4”	3/4”	1”	1”	1, 1/2”	1, 1/2”	1,1/2”	1,1/2”	1,1/2”	1,1/2”
Flow Rate	Service Flow Rates	average (gpm)	2.7	5.3	8.1	10.6	13.3	15.9	18.6	21.2	26.5	31.8	39.8
		Maximum (gpm)	4.4	8.8	13.3	17.7	22.1	26.5	30.9	35.3	44.2	53.1	66.3
	Regeneration (NaCl Injection)	Brine Flow Rate (gpm)	0.4	0.9	1.3	1.8	2.2	2.7	3.1	3.5	4.4	5.3	6.6
		Min.Req. Duration (min.)	22	22	22	22	22	22	22	22	22	22	22
	Rinse	Flow Rate (gpm)	1.6	3.2	4.8	6.4	8.1	9.5	11.1	12.7	15.9	19.1	23.9
		Min.Req. Duration (min.)	17	17	17	17	17	17	17	17	17	17	17
Resin		Bed Height (mm)	440	870	1060	800	790	760	890	840	890	1060	1130
		Volume(lit)	25	50	75	100	125	150	175	200	250	300	375
Silica Sand		Bed Height (mm)	3x70	3x70	3x70	3x70	3x70	3x70	3x70	3x70	3x70	3x100	3x100
		Weight (Kg)	21	21	24	45	54	69	69	81	99	138	165
Brine (10% NaCl Solution)		Nacl (Kg)	4	8	11	15	19	23	26	30	38	45	56
		Water (lit)	34	68	101	135	169	203	236	270	338	405	506
		Tank Volume(lit)	70	100	220	220	220	300	300	350	500	600	600
General Dimention	(H) Total Height (mm)		1,400	2,000	2,000	2,000	2,000	2,100	2,100	2,100	2,100	2,100	2,100
	Occupied Space (mm x mm)		560 x 450	560 x 450	580 x 500	790 x 650	830 x 700	880 x 740	880 x 740	960 x 790	950 x 780	950 x 780	1300 x 890
Total Pressure Drop (kPa)			8.2	31.2	44.3	26.7	25.5	23.8	32.8	29.8	32.3	47.8	53.8





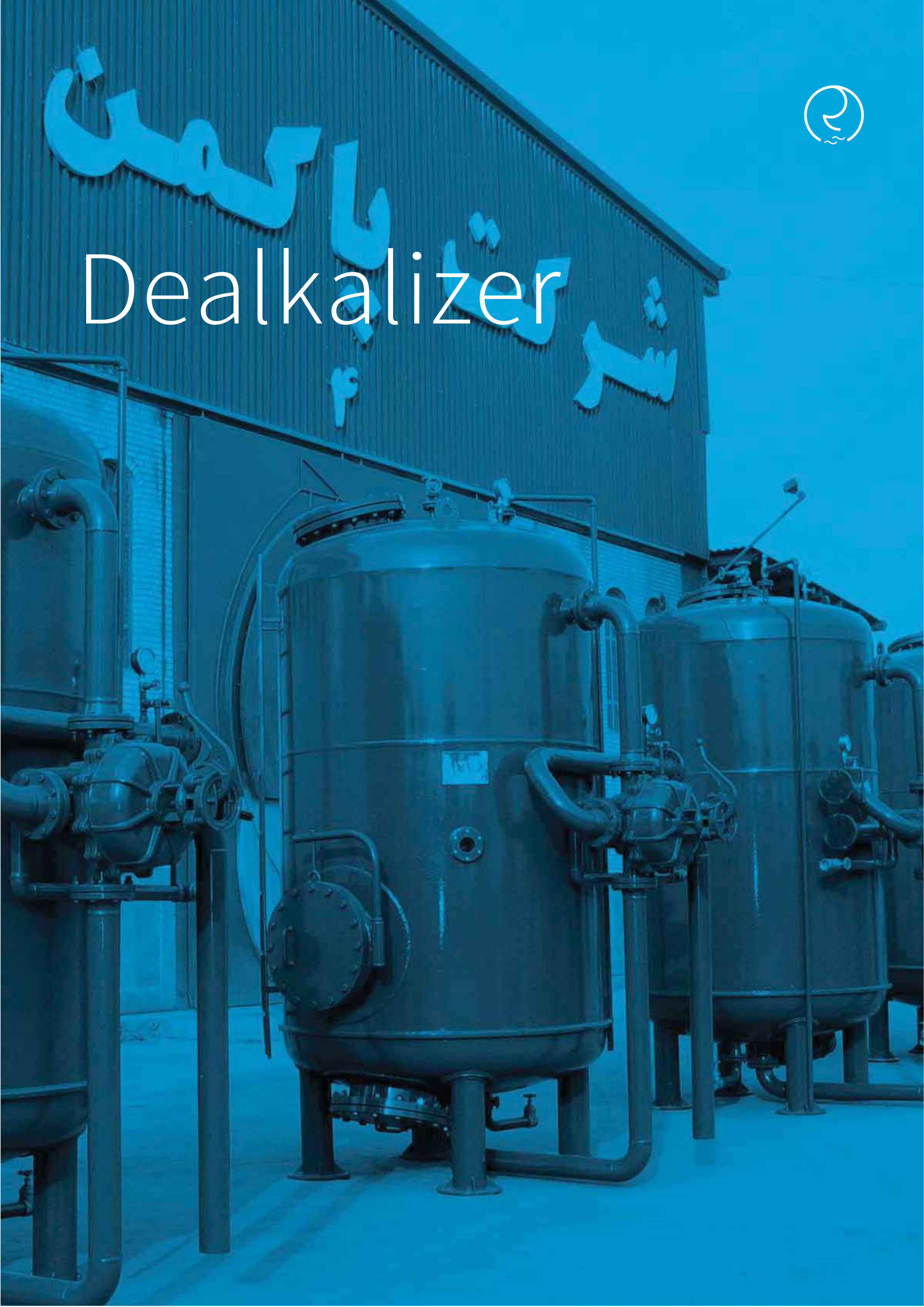




TOP VIEW

MODEL			PWS -54	PWS-75	PWS-96	PWS-120	PWS-150	PWS-180	PWS-200	PWS-220	PWS-250	PWS-300	PWS-360
SPECIFICATIONS													
Capacity (Grain)			540,000	750,000	960,000	1,200,000	1,500,000	1,800,000	2,000,000	2,200,000	2,500,000	3,000,000	3,600,000
Vessel Diameter (D) (mm)			800	900	1100	1100	1200	1200	1320	1320	1320	1500	1600
(N1,N2) Inlet/Outlet Size (in.)			2”	2”	2”	2,1/2”	2,1/2”	2,1/2”	4”	4”	4”	4”	4”
Flow Rate	Service Flow Rates	average (gpm)	47.7	66.3	84.8	106.1	132.5	159.2	177.6	193.5	220.8	265.1	318.2
		Maximum (gpm)	79.5	110.4	141.3	176.7	220.8	265.1	295.9	322.4	368.1	441.7	530.1
	Regeneration (NaCl Injection)	Brine Flow Rate (gpm)	8.1	11.1	14.1	17.7	22.1	26.5	29.6	32.2	36.8	44.2	53.1
		Min.Req. Duration (min.)	22	22	22	22	22	22	22	22	22	22	22
	Rinse	Flow Rate (gpm)	28.6	39.8	50.9	63.6	79.5	95.4	106.5	116.1	132.5	159.1	190.8
		Min.Req. Duration (min.)	17	17	17	17	17	17	17	17	17	17	17
Resin		Bed Height (mm)	1020	1240	1260	1270	1200	1220	1260	1280	1350	1420	1490
		Volume (lit)	450	625	800	1000	1250	1500	1675	1825	2075	2500	3000
Silica Sand		Bed Height (mm)	3x100	3x100	3x100	3x100	3x100	3x100	3x100	3x100	3x100	3x100	3x100
		Weight (Kg)	219	249	315	390	513	606	657	708	762	876	995
Brine (10% NaCl Solution)		Nacl (Kg)	68	94	120	150	188	225	251	274	313	375	450
		Water (lit)	608	844	1080	1350	1688	2025	2261	2464	2813	3375	4050
		Tank Volume(lit)	800	1000	1500	1700	2000	3000	3000	3000	3300	4200	5000
General Dimention	(H) Total Height (mm)		2200	2300	2400	2700	2800	2800	2800	2800	2800	3300	3400
	Occupied Space (mm x mm)		1380 x 1000	1510 x 1060	1600 x 1150	1770 x 1240	1900 x 1360	2230 x 1470	2280 x 1500	2330 x 1560	2380 x 1610	2480 x 1710	2580 x 1810
Total Pressure Drop (kPa)			43.9	65.3	67.0	67.5	60.8	62.3	66.3	68.6	76.5	83.2	92.7

Dealkalizer



Product Description

Alkalinity is a significant factor in the production of many goods including food and beverages, and textile dyes, but it plays an even more significant role in boiler operations. Hydroxide (OH) and carbon dioxide (CO2) are both produced from the breakdown of carbonate and bicarbonate ions during steam production. As the steam condenses, the carbon dioxide dissolves and forms carbonic acid (H2CO3) – a highly corrosive compound that deteriorates condensate return lines. The presence of hydroxide with carbon dioxide and bicarbonate may also lead to further corrosion.

Certain amine compounds and other chemical additives are necessary to help protect the condensate return lines from corrosion. However, these chemicals are costly, and their effectiveness limited by the amount of carbonic acid they can control. For this reason, alkalinity is often the defining factor in determining the cycles at which a boiler can be operated safely. High alkalinity may require that a boiler operate at shorter cycles, wasting energy and chemicals due to high blow down.

For this reason, in order to reduce the alkalinity of the water entering the boiler and prevent damage to the equipment, a dialkalizer can be used.

A dealkalizer works similar to a water softener, in that it utilizes ion exchange to remove unwanted ions from a water supply. However, rather than removing calcium and magnesium ions, dealkalization removes carbonate ions, exchanging them for chloride ions.

Two methods may be used for resin regeneration. The first uses salt and the second uses a salt-caustic combination (NaOH).

If just salt is used, water hardness should be 10 grains or less (<170 ppm) to prevent the precipitation of CaCO3. If a salt-caustic combination is used, water must be softened prior to being fed to the dealkalizers. In most cases where a dealkalizer is required, water should be softened to prevent boiler scale buildup. Salt-caustic combinations have a higher capacity for alkalinity before regeneration is required.

Generally, dealkalization can be used to treat water in boilers operating at less than 700 psi, with feedwater containing less than or equal to 50 ppm alkalinity, and with make-up of 1,000 gallons or more per day.

PACKMAN'S Dealkalizer's Properties

PACKMAN'S Dealkalizers are made of steel plate of ST37 grade (recommended for the manufacturing of pressure vessels with no direct fire contact). In case of customer's request, the filters can be made of 17MN4 (suitable for boiler construction) without any change in product's price. The Dealkalizers are vertical cylinders in different capacities and two types of single and double systems. The installed geyser on top of the Dealkalizers, uniforms the water flow and balanus the water pass through out the filter.

Manufacturing Standards

ASME Sec VIII, Div. 1 is observed in the construction of Dealkalizers tanks.

Torispherical / Elliptical Head

PACKMAN'S Dealkalizers tank's head are Torispherical. This type of head has a longer life and a higher pressure strength compared to other shapes with the same thickness. The production price per kilo of these heads can reach to twice the price ratio of the usual heads on the market.

Welding Procedure

Welding is done with Swedish ISBU submerged arc welding equipment. After constructing the tank and welding the lugs, the body of the tank is connected to the heads using a submerged welding method. In addition, the heads are welded internally and externally, which increases their life & strength. In the root pass, the TIG, argon or other welding methods with the 6010 cellulose electrode is used. The EW7018 electrode is used in welding fill pass. The submerged method with EW7018 electrodes in used in the cover pass.

Nozzles

The nozzles used in PACKMAN'S Dealkalizers are all made of brass, and for each square meter of resins, surface, about 50 nozzles are placed, which makes the optimum washing procedure possible.

Silica and Resin of Dealkalizers

PACKMAN'S Dealkalizers resin is the PUROLITE with a high ion exchange rate coefficient and a high quality silica with a purity of 98% which is used at the bottom of the tank.

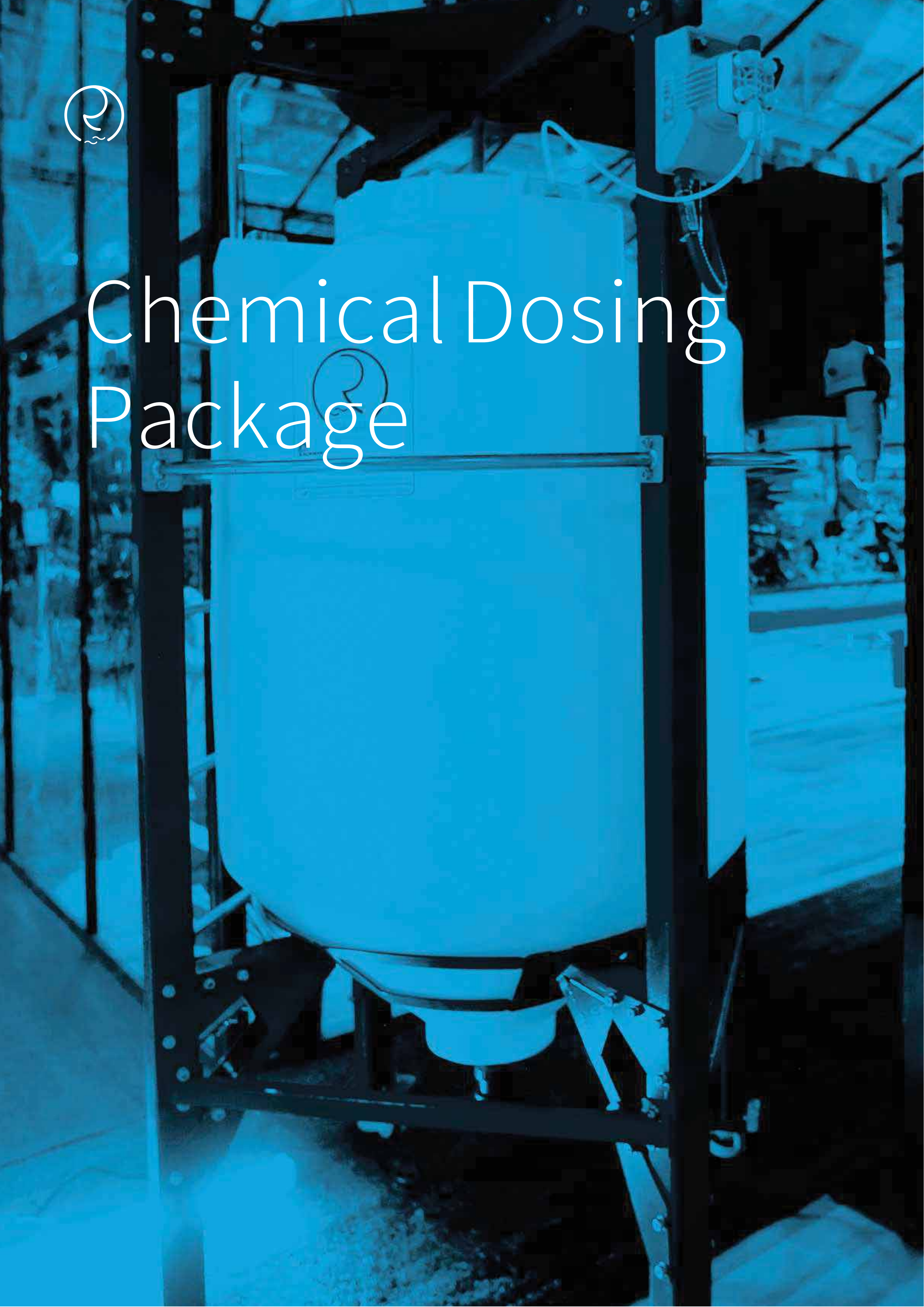
Model			Unit	PIX-3	PIX-6	PIX-9	PIX-12	PIX-15	PIX-18
Specifications									
Capacity			Grain	30,000	60,000	90,000	120,000	150,000	180,000
Vessel Diameter (D)			mm	270	270	300	400	450	500
Inlet/Outlet Size (in.)			in	3/4”	3/4”	3/4”	1”	1”	1 $^{1/2}$”
Flow Date	Service Flow Rates	Medium	gpm	2.7	5.3	8.1	10.6	13.3	15.9
		Maximum	gpm	4.4	8.8	13.3	17.7	22.1	26.5
	Regeneration (NaCl Injection)	Brine Flow Rate	gpm	0.4	0.9	1.3	1.8	2.2	2.7
		Min.Req. Duration	min	22	22	22	22	22	22
	Resin	Flow Rate	min	1.6	3.2	4.8	6.4	8.1	9.5
		Min. Req. Duration	min	17	17	17	17	17	17
Resin		Bed Height	mm	620	1220	1490	1120	1110	1070
		Volume	lit	40	80	120	160	200	240
Silica Sand		Bed Height	mm	3×70	3×70	3×70	3×70	3×70	3×70
		Weight	kg	21	21	24	45	54	69
Regeneration Solution (NaOH 2-6%)		NaOH	kg	4.5	6	13.5	13.5	13.5	18
		Water	lit	65.5	94	206.5	206.5	206.5	282
		Tank Volume	lit	70	100	220	220	220	300
Regeneration Solution (NaCl 2-10%)		NaCl	kg	7	10	22	22	22	30
		Water	lit	63	90	198	198	198	270
		Tank Volume	lit	70	100	220	220	220	300
General Dimensions	Height (Cap top)		mm	1710	2440	2815	2370	2370	2370
	Total Height		mm	1900	2700	3000	2600	2600	2600
	Occupied Space		mm x mm	730× 450	730× 450	760× 500	1030× 650	1080× 700	1150× 740
Total Pressure Drop			kPa	8.2	31.2	44.3	26.7	25.5	23.8
Charging Port			Type , in.	4	4	5	6	6	6
Collectors Access Port			Type , in.	4	4	5	6	6	6

Model			Unit	PIX-21	PIX-24	PIX-30	PIX-36	PIX-45
Specifications								
Capacity			Grain	210,000	240,000	300,000	360,000	450,000
Vessel Diameter (D)			mm	500	550	600	600	650
Inlet/Outlet Size (in.)			in	1 $^{1/2}$”	1 $^{1/2}$”	1 $^{1/2}$”	1 $^{1/2}$”	2”
Flow Date	Service Flow Rates	Medium	gpm	18.6	21.2	26.5	31.8	39.8
		Maximum	gpm	30.9	35.3	44.2	53.1	66.3
	Regeneration (NaCl Injection)	Brine Flow Rate	gpm	3.1	3.5	4.4	5.3	6.6
		Min.Req. Duration	min	22	22	22	22	22
	Resin	Flow Rate	min	11.1	12.7	15.9	19.1	23.9
		Min. Req. Duration	min	17	17	17	17	17
Resin		Bed Height	mm	1250	1180	1250	1490	1585
		Volume	lit	280	320	400	480	600
Silica Sand		Bed Height	mm	3×70	3×70	3×70	3×100	3×100
		Weight	kg	69	81	99	138	165
Regeneration Solution (NaOH 2-6%)		NaOH	kg	18	21	30	36	36
		Water	lit	282	329	470	564	564
		Tank Volume	lit	300	350	500	600	600
Regeneration Solution (NaCl 2-10%)		NaCl	kg	30	35	50	60	60
		Water	lit	270	315	450	540	540
		Tank Volume	lit	300	350	500	600	600
General Dimensions	Height (Cap top)		mm	2605	2520	2675	3000	3250
	Total Height		mm	2800	2800	2900	3200	3400
	Occupied Space		mm x mm	1150×740	1250×790	1240×780	1240×780	1690×890
Total Pressure Drop			kPa	32.8	29.8	32.3	47.8	53.8
Charging Port			Type , in.	6	6	8	8	8
Collectors Access Port			Type , in.	6	8	8	8	8

Model			Unit	PIX-54	PIX-75	PIX-96	PIX-120	PIX-150	PIX-180
Specifications									
Capacity			Grain	540000	750000	960000	1200000	1500000	1800000
Vessel Diameter (D)			mm	900	900	1100	1100	1320	1500
Inlet/Outlet Size (in.)			in	2”	2”	2”	2 1/2”	2 1/2”	4”
Flow Date	Service Flow Rates	Medium	gpm	47.7	66.3	84.8	106.1	132.5	159.2
		Maximum	gpm	79.5	110.4	141.3	176.7	220.8	265.1
	Regeneration (NaCl Injection)	Brine Flow Rate	gpm	8.1	11.1	14.1	17.7	22.1	26.5
		Min.Req. Duration	min	22	22	22	22	22	22
	Resin	Flow Rate	min	28.6	39.8	50.9	63.6	79.5	95.4
		Min. Req. Duration	min	17	17	17	17	17	17
Resin		Bed Height	mm	1173	1426	1449	1461	1380	1403
		Volume	lit	720	1000	1280	1600	2000	2400
Silica Sand		Bed Height	mm	3×100	3×100	3×100	3×100	3×100	3×100
		Weight	kg	219	249	315	390	513	606
Regeneration Solution (NaOH 2-6%)		NaOH	kg	48	60	90	102	120	180
		Water	lit	752	940	1410	1598	1880	2820
		Tank Volume	lit	800	1000	1500	1700	2000	3000
Regeneration Solution (NaCl 2-10%)		NaCl	kg	80	100	150	170	200	300
		Water	lit	720	900	1350	1530	1800	2700
		Tank Volume	lit	800	1000	1500	1700	2000	3000
General Dimensions	Height (Cap top)		mm	2588	2910	2990	3105	3105	3255
	Total Height		mm	2800	3100	3200	3300	3300	3400
	Occupied Space		mm x mm	1800×1000	2000×1060	2000×1150	2300×1240	2500×1360	2900×1470
Total Pressure Drop			kPa	43.9	65.3	67	67.5	60.8	62.3
Charging Port			Type , in.	8	8	8	10	10	10
Collectors Access Port			Type , in.	10	10	10	16	16	16

Model			Unit	PIX-200	PIX-220	PIX-250	PIX-300	PIX-360
Specifications								
Capacity			Grain	2000000	2200000	2500000	3000000	3600000
Vessel Diameter (D)			mm	1500	1500	1592	1750	1910
Inlet/Outlet Size (in.)			in	4”	4”	4”	4”	4”
Flow Date	Service Flow Rates	Medium	gpm	177.6	193.5	220.8	265.1	318.2
		Maximum	gpm	295.9	322.4	368.1	441.7	530.1
	Regeneration (NaCl Injection)	Brine Flow Rate	gpm	29.6	32.2	36.8	44.2	53.1
		Min.Req. Duration	min	22	22	22	22	22
	Resin	Flow Rate	min	106.5	116.1	132.5	159.1	190.8
		Min. Req. Duration	min	17	17	17	17	17
Resin		Bed Height	mm	1449	1472	1553	1633	1714
		Volume	lit	2680	2920	3320	4000	4800
Silica Sand		Bed Height	mm	3×100	3×100	3×100	3×100	3×100
		Weight	kg	657	708	762	876	995
Regeneration Solution (NaOH 2-6%)		NaOH	kg	180	180	198	252	300
		Water	lit	2820	2820	3102	3948	4700
		Tank Volume	lit	3000	3000	3300	4200	5000
Regeneration Solution (NaCl 2-10%)		NaCl	kg	300	300	330	420	500
		Water	lit	2700	2700	2790	3780	4500
		Tank Volume	lit	3000	3000	3300	4200	5000
General Dimensions	Height (Cap top)		mm	3370	3370	3485	3623	3795
	Total Height		mm	3500	3500	3700	3800	4000
	Occupied Space		mm x mm	3000×1500	3000×1560	3100×1610	3200×1710	3400×1810
Total Pressure Drop			kPa	66.3	68.6	76.5	83.2	92.7
Charging Port			Type , in.	12	12	12	12	12
Collectors Access Port			Type , in.	16	16	16	16	16

Chemical Dosing Package



Product Description

Chemicals are used to treat steam boiler systems based upon demand and mode of reaction of each chemical use. The theoretical versus actual consumption and the ease of control of these chemicals can vary according to many factors specific to each application. Dosages and controls of chemicals are affected by how and where they are fed. The reaction and residual part of the chemical dosage calculation equation can affect control and results. Looking at the reaction percent helps deciding whether it will work.The residual percent tells how easy it is to control. If all water, all pretreatment equipments, all condensate, all feed equipments, all operators, and all boilers were same, chemical treatment would become routine, rather simple, easy, and reliable. However, since each steam system is unique in many ways, there are plenty of opportunities to provide application expertise by under standing each specific condition and the associated problems.

Chemical injection packages are commonly used in production facilities in oil & gas industry. They prevent or mitigate wide range of problems that might negatively affect the production flow and/or process completion. Frames designs, manufactures and supplies custom-built injection systems for a broad range of process applications, including production processes, (produced) water treatment and hydrate control in pipelines and wells.

chemicals are transferred from tank to the injection point by means chemical injection pumps, while flow rates can be adjusted locally or remotely in order to ensure that the correct amount of chemicals is injected.

Technical Details

PACKMAN can provide a chemical injection system as a part of an int grated solution, thus reducing onsite installation and commissioning time.

PACKMAN multi-disciplinary engineering capability ensures that chemical injection system is designed in accordance with client specifications and local legislation. Being supplier-independent, Frames is in an excellent position to select best solutions, striking a balance between capital investment (CAPEX) and operating .

costs (OPEX). PACKMAN's Chemical Injection Packages are made of Polyethelene/ Triple Layer PE. Injection pressures up to 15,000 PSI or 1,034 bar (g) and flows from low m3/h to high m3/h.

Manufacturing Standards

ASME Sec VIII, Div. 1 is used in the construction of Chemical Injection Packages.Piping designed to code, such as ANSI, fabrication to ASME Section IX Vessels designed to code, such as ASME / PED / PD5500 & National Board Registered as required.

Welding Procedure

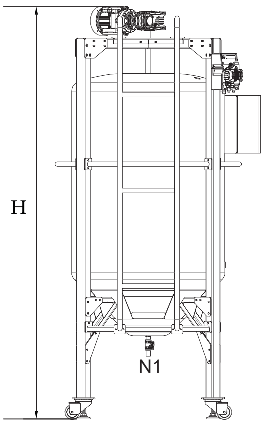
Welding is done by using Swedish ISBU submerged arc welding equipment. After constructing the tank and welding lugs body of the tank is connected to heads by welding with a submerged arc welding method. In addition, the head is welded internally and externally, which increases lifetime and strength of the heads. In welding root pass,TIG, argon or welding methods with the 6010 cellulose electrode is used. The EW7018 electrode is used in welding fill pass. The submerged method using EW7018 electrodes in welding cover pass.

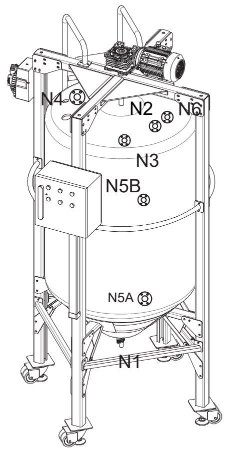
Product Selection

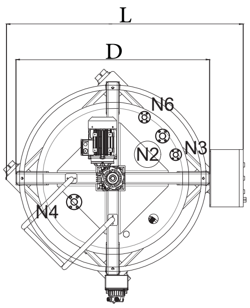
There are several different chemical approaches used to treat boilers and their selection and performance depend upon many factors. Some of these include:

- Feed-water characteristics.
- The type and reliability of external treatment Boiler type.
- Boiler pressure and heat flux.
- Steam load and variations in load.
- Waterside condition of boiler current and long-term goals of the program such as cleaning up scale or maintaining present conditions.
- Client and service provider preference.
- Steam purity requirements.
- Regulatory restrictions such as FDA requirements, other health and safety concerns, or process restrictions.
- Feed, testing, and control needs or restriction
- Economic considerations.
- Boiler room layout and number of boilers.

The dosage of sodium sulfite or other oxygen scavengers may be calculated by looking at their reaction rate to remove oxygen and then their residual dosage to provide a feed-water or boiler water residual. It is recommended to consult with authorized technicis for selecting the best chemical dosing package.







Model	Unit	CH-100	CH-150	CH-200	CH-500	CH-1000
Technical Data						
Vessel Type	-	Vertical				
Volume Capacity	litr	100	150	200	500	1000
Working Fluid Temperature	°C	35	35	35	35	35
Max Design Fluid Temperature	°C	50	50	50	50	50
Corrosion Allowance	mm	0	0	0	0	0
Connection Size						
Drain (N1)	in	1/2	1/2	1/2	1/2	1
Inlet (N2)	in	1	1	1	1	1
Level Switch (N3)	in	1/2	1/2	1/2	1/2	1/2
Chemical Insert (N4)	in	1	1,1/2	1,1/2	1,1/2	1,1/2
Water View (N5A)	in	1/2	1/2	1/2	1/2	1/2
Water View (N5B)	in	1/2	1/2	1/2	1/2	1/2
Outlet Pump (N6)	in	1/2	1/2	1/2	1/2	1/2
Material						
Vessel	-	Polypropylene				
Frame	-	Carbon Steel				
Vessel Dimentions						
Vessel Diameter (D)	mm	650	850	900	1010	1210
Vessel Lengeth(L)	mm	850	1050	1100	1235	1410
Vessel Height (H)	mm	988	1088	1651	2153	2255

green mindset
green future

Greenhouse Products Group
Greenman

ABOUT Greenman

Packman Company started its activity as a private corporation by five graduates from Technical Faculty of Tehran University with the aim of improving the level of technical knowledge in the country in 1975. Packman Company has always been a leader in country's industries with a strong background in the direction of producing equipment and providing services in the field of technical knowledge in various industries such as power plants, petrochemicals and oil, hospitals, construction, agriculture, etc., relying on their specialist forces ability.

Currently, there is a special opportunity for development of the agricultural industry in the country due to the climatic and geographical situation of Iran and the need for non-oil exports.

The GREENMAN sub-set has been established as a new design for agricultural industrial systems due to the traditional growth of the agricultural industry, which has led to waste of water and energy resources of the country, and since Packman Company is always ready to serve in industry and agriculture sector with the best quality.

GREENMAN is proud to be present in all areas of engineering design and equipment manufacturing alongside the industry's activists, relying on its capabilities in engineering, research and development, product production and process optimization.

These areas are:

- Heating, cooling, ventilation and humidity facilities
- Water treatment and irrigation facilities
- CO2 injection system
- Climate control system, power supply and lighting
- Energy systems and optimal design
- Cold storage and product storage

What Greeman does

GREENMAN specializes in agriculture and industrial greenhouses. This company is proud to cooperate with a group of expert and experienced engineers in fields of engineering and agriculture, considering the importance and delicacy of greenhouse issues.

Some of the engineering services provided by GREENMAN include:

- Design and modeling of cooling, heating and air conditioning systems with specialized greenhouse standards and using TRNSYS, ANSYS FLUENT and ENERGYPLUS software and...
- Designing all parts of the CO_2 dosing system According to greenhous cultivation and construction conditions.
- Designing new greenhouses with special and energy-oriented systems with the help of TRNSYS, ANSYSFLUENT and proprietary developed code at GREENMAN.
- Design of RO water purification system and fertilizer and chemical dosing package
- D3 modeling and providing piping maps of greenhouse facilities

List of Greenhouse Products Group
Greenman

Greenhouse Products **page**

HEATCO

HEATCO
Hot water Boiler With The Ability To CO_2 Injection

Maintaining the plant's comfort temperature is one of the most important issues in the optimal growth of greenhouse plants. For this purpose, various heat and cold production systems have been designed for the greenhouse. The central heating method is one of the most powerful methods for heating an industrial greenhouse unit. Greenman Company is a manufacturer of central heating boilers, equipped with thermal shock protection system, anti-condensate corrosion system, redesigned combustion chamber for carbon dioxide injection, Lonax burner with the lowest amount of production emissions and all electromechanical modular in various capacities. 100 kW to 20 MW capacity diversity allows the use of these boilers in the central heating system of any greenhouse. These boilers can be well connected with under floor heating system and CO2 injection system and not be damaged by thermal shocks caused by long distances.

Advantage

The main specifications of the burner and central heating boiler package are:

- Design based on standard designs include three-pass, wet back and high efficiency.
- The redesigned system to boiler protection from shocks caused by asymmetry of the thermal profile, changing the greenhouse heating requirement, Dynamic shock caused by off-season operation in order to CO_2 injection, heat exchange with a continuous logarithmic temperature difference compared to the path of combustion products to reduce the amount of pollution.
- Manufacture of hot water boilers according to EN 12953 standard
- Use of High Temperature Steel (17MN) and DIN17175 35.8 ST-European tube.
- Welding in accordance with WPS and PQR approved by reputable inspection companies.
- Fully automatic submerged welding with preheated A.W.S.E7018 electrodes.

- Stainless steel coating and 3-inch insulation with rock wool
- National standard plate of Iran
- Ability to monitor the buyer on the material of sheets, tubes and electrodes used during construction
- Practical supervision by the standard representative of Iran Quality and Standard Inspection Company

Capacity (kw)	Unit	100-20,000
Technical Data		
Pressure	bar	6-12
Temperature	C	90
Efficiency	-	92%
Fluid	-	Water

RECO

RECO
Combustion Products Condenser

Use of energy in the greenhouse cycle and new designs can increase productivity and return capital to the production cycle. The need to use carbon dioxide in combustion products can be an important matter considering the importance of CO2 injection in increasing the efficiency of the production process in the greenhouse. There are certain requirements for the use of CO2 in combustion products. Reducing the combustion products temperature is one of these requirements.
In addition to facilitating gas conditions for injection into the greenhouse, this work causes the return of thermal energy to the greenhouse cycle. A water to smoke exchanger is used for this purpose.

Thermal Capacity (kw)	Unit	50-1180
Technical Data		
Pressure	bar	6-10
Smoke hot side temperature	°C	60-240
Material	-	SS316L

PLANTA

PLANTA
Protective Monitoring System And Carbon Dioxide Dosing

Pollutants such as NOx and CO are the highest risk in the method of carbon dioxide extraction from combustion products. In addition to harming humans, these pollutants cause widespread damage to greenhouse products. Also, in addition to the destruction of dosing lines, the high temperature of the combustion products causes damage to the plants on the discharge route. A smart brain with the task of monitoring, checking, measuring and correcting the above parameters is essential to use the carbon dioxide extraction package.

Capacity (CFM)	Unit	300-4500
Technical Data		
Temperature	°C	60
Material	-	SS316L
Equipment	-	Equipped with air mixing damper, equipped with NOX and CO sensors

OPTICO

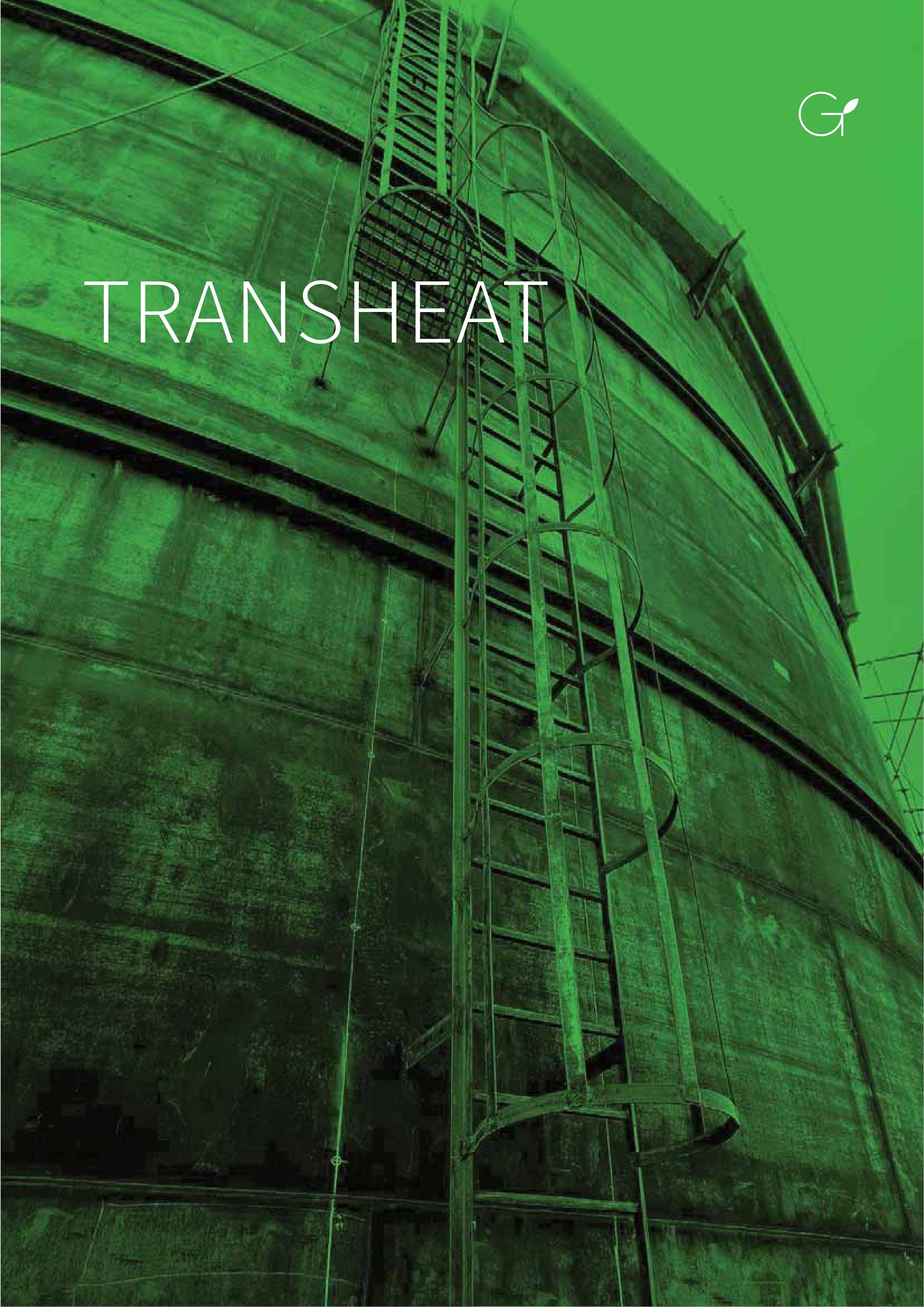
OPTICO

Heating Package And Carbon Dioxide Injection For Small Greenhouses

Greenhouse owners need a system that can simultaneously provide thermal energy for a small industrial greenhouse and supply its carbon dioxide and at the same time be affordable. Actually OPTICO is a CO_2 injection package consisting of a condensing boiler and a carbon dioxide dosing device which directly sends boiler exhaust fumes into the greenhouse for CO_2 injection. In addition to reducing the occupied space and initial cost, OPTICO has improved communication and coordination by substituting a condensing boiler for the three-pass boiler and smoke condenser assembly.

Capacity (kw)	Unit	100-600
Technical Data		
Pressure	bar	4-8
Temperature	C	80
Material	-	98%
Efficiency	-	SS316L

TRANSHEAT



TRANSHEAT

Buffer Tank To Support The CO_2 Injection System

Thermal energy storage buffer tank is necessary to prevent the boiler thermal energy waste during off-season CO_2 injection, increasing the greenhouse reliability coefficient in the supply of heating water and thermal energy storage for several hours.

Total volume (m³)	Unit	100-4000
Technical Data		
Pressure	bar	Atmospheric
Height	m	6-12

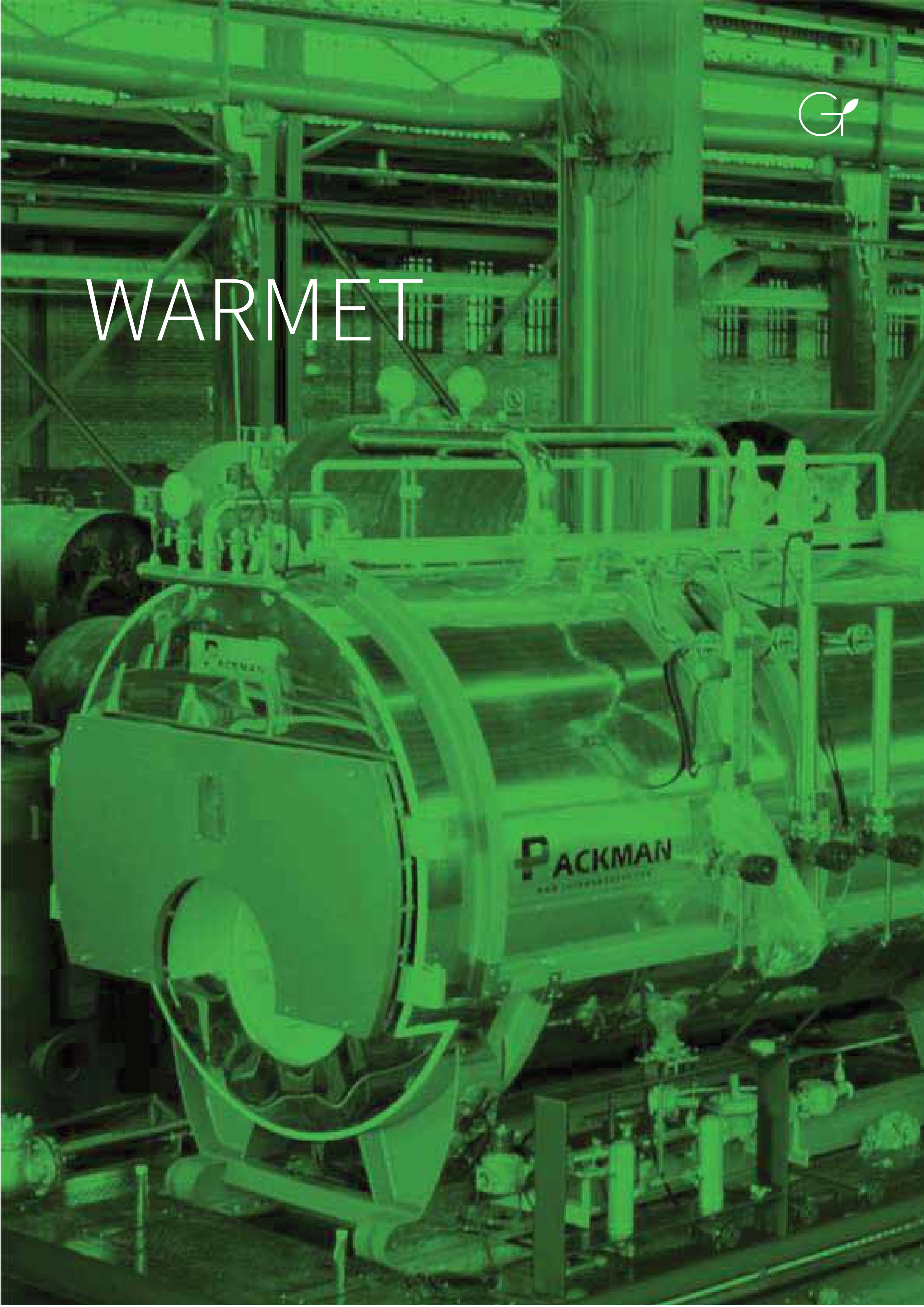
WINDA

WINDA
Air Cooler To Connect The Combustion Products Condenser

In CO2 injection system, the buffer tank is used to dissipate the boiler heat when necessary. The buffer tank stored heat is used for heating the greenhouse during the night. In some cases, the night heating load is not able to fully discharge the buffer tank. In this way, the air cooler is used to dissipate the heat of the buffer tank. Using an air cooler together with a buffer tank increases the number of possible days for CO2 injection. Air cooler is an air cooler with a fan, which reduces the temperature of the water due to the contact of the air with the pipes containing hot water in the ambient temperature. Normally, finned tubes are used to increase the efficiency and reduce the volume of the device.

Capacity	Unit	According to the customer's design and request
Technical Data		
Pressure	bar	0-100
Temperature	C	-40 - +250
Material	° -	Carbon steel/stainless steel finned aluminum
Efficiency	-	%98

WARMET



WARMET

Steam Package, Equipped With Control Equipment To Adjust Humidity And Temperature

In order to simultaneously increase humidity and temperature, some cultivations need direct injection of steam. A steam boiler is used for this purpose. The use of steam boilers requires initial costs for installation and operation by specialists. An automatic set in the form of a package is necessary for the greenhouse industry.

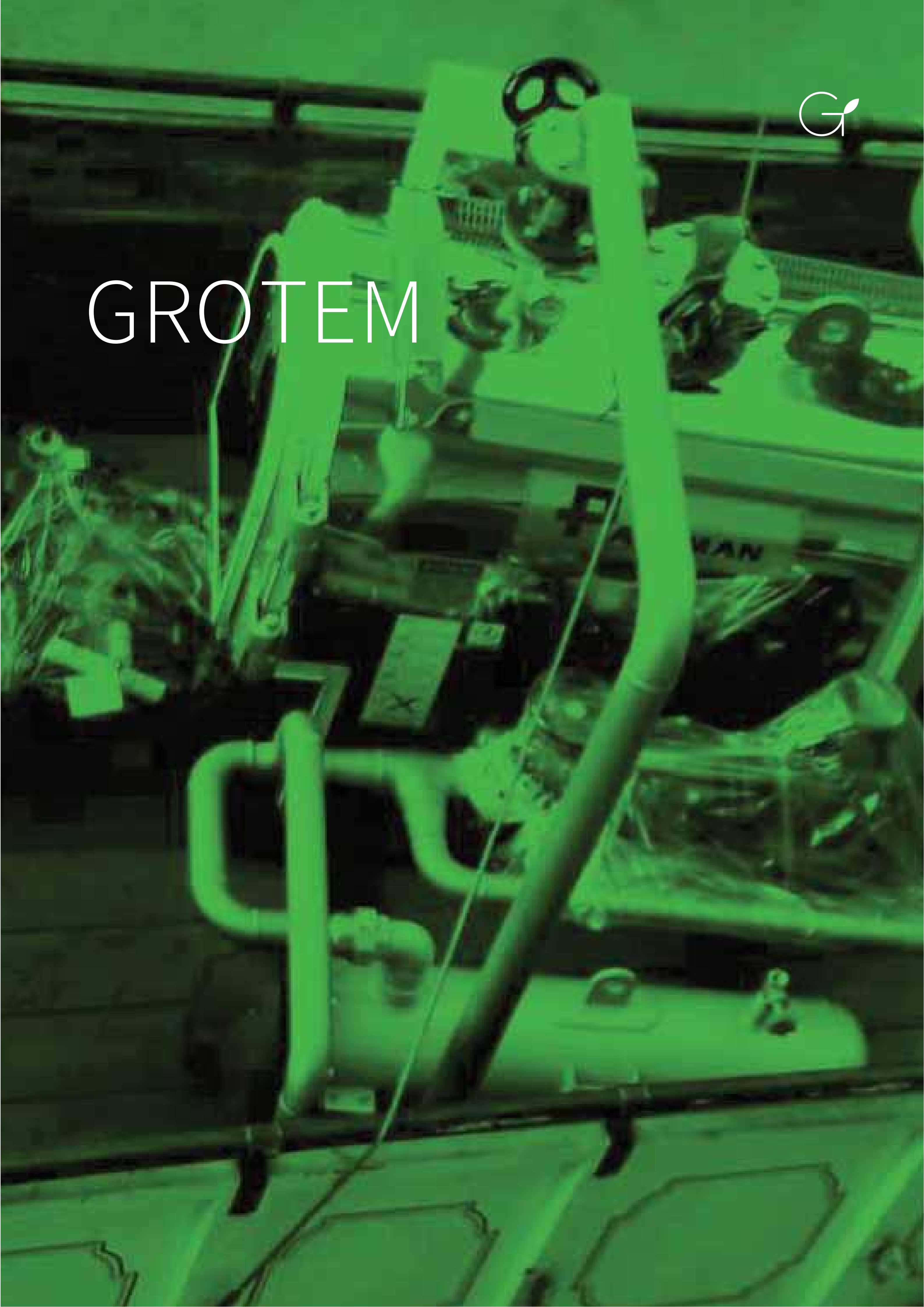
Capacity (kg/hr)	Unit	100-300
Technical Data		
Pressure	bar	1-10
Equipment	-	Pressure sensor, display, level controller, valves and pumps, temperature sensor, control system

FLORO

FLORO
Water Treatment Package Includes Pre-Treatment, RO System And Post-Treatment

There is a defined standard to irrigation water for greenhouse plants. Also, it is necessary to obtain water with low salts, considering the export aspect and also the protection of the cultivation bed. Agricultural water in most cities of Iran needs to be purified and change the compounds dissolved in the water due to the geographical conditions and the desert nature of most of the country's regions. GREENMAN uses reverse osmosis (RO) desalination devices to reduce the amount of dissolved salts in water. This device controls the amount of solutes, color and odor, bacteria, pH and other parameters by using pre-treatment, reverse osmosis treatment and post-treatment according to the need.

Discharge Capacity (m^3/hr)	Unit	300-4500
Technical Data		
Greenhouse Area	h	1-10
Max. Input TDS	ppm	2000
Min. Input TDS	ppm	100
Description	-	The analysis will help in the optimal design of the device



GROTEM

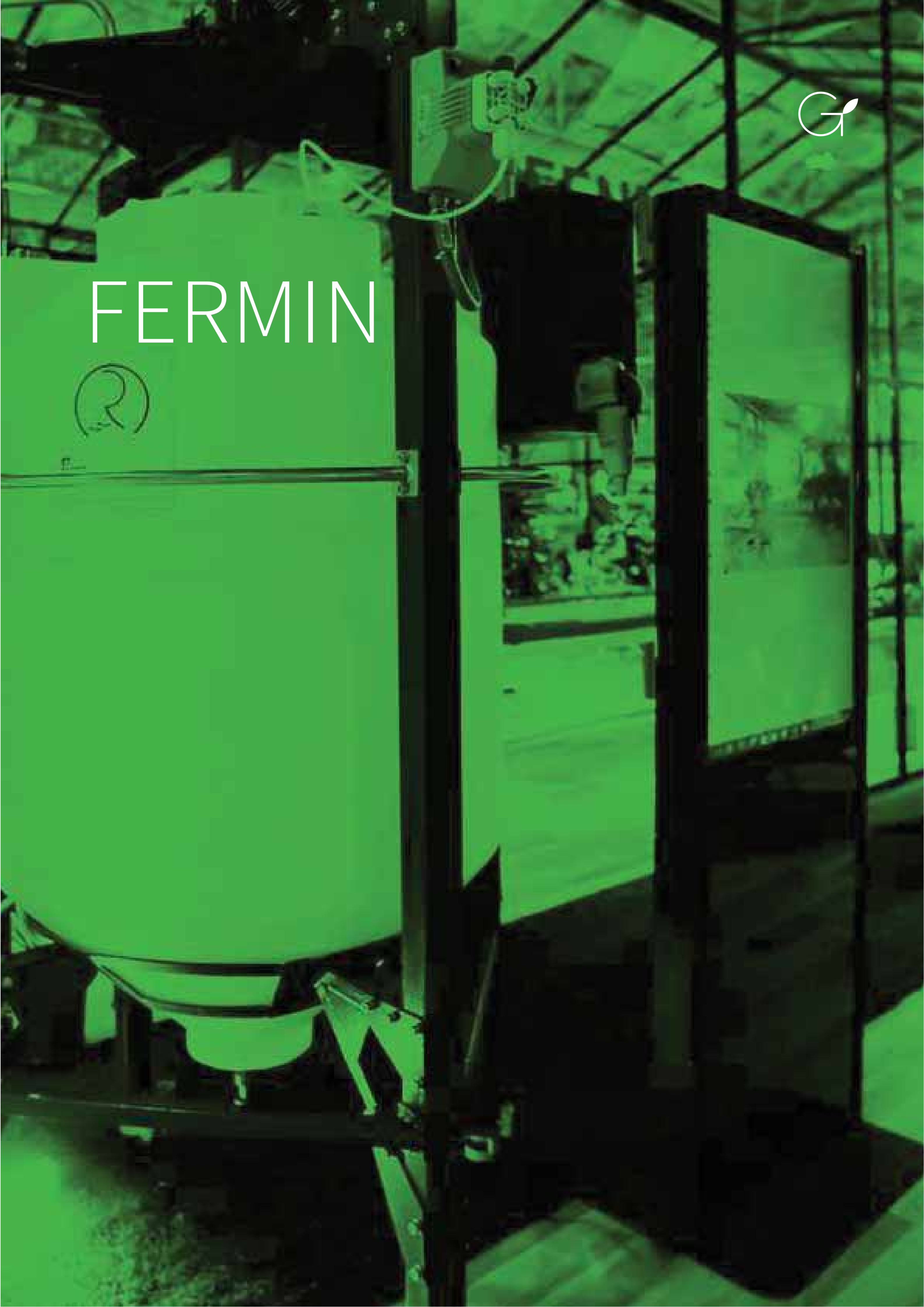
GROTEM

Irrigation And Feeding Water Pre-Heating Package

Plants irrigate with cold water reduces and even stops their growth. The ideal water temperature for irrigation is 17-22 degrees Celsius. It is necessary to heat the irrigation water to the desired temperature before storing it and starting irrigation in cold seasons. The irrigation preheat package is equipped with a boiler, heat exchanger, storage tank, control equipment and precise instruments and equipment to display the status of the equipment that keeps the irrigation water warm in the temperature range of 17-22 degrees.

Thermal Capacity (kw)	Unit	100-500
Technical Data		
Pressure	bar	6-10
Temperature	°C	80
Efficiency	-	86%
Fluid in transit	-	Water
Description	-	With the control system

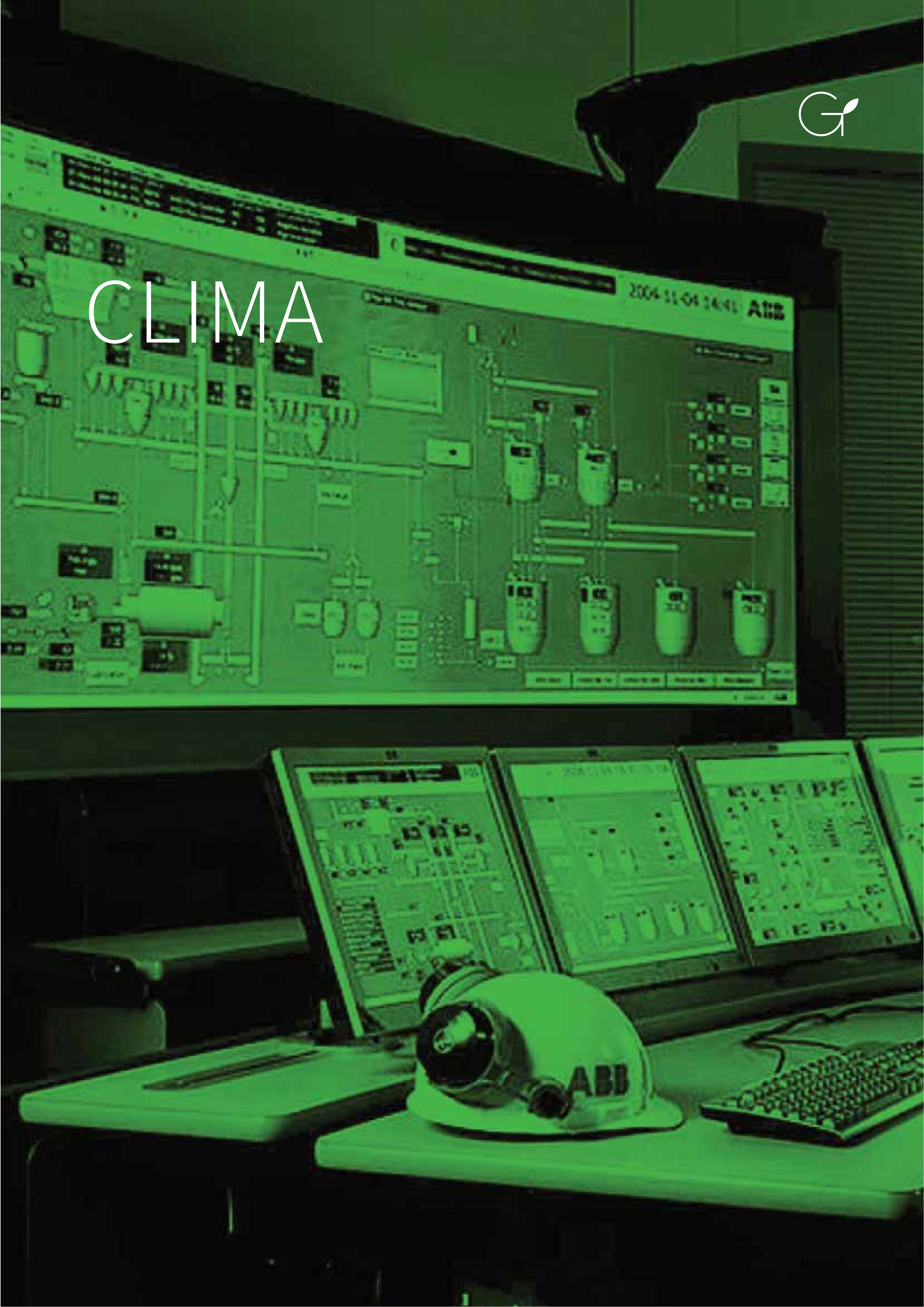
FERMIN



FERMIN
Feeding Control And Fertilizer Dosing Package

Plants need different amounts of nutrients and water in different periods of growth and productivity. In addition to increasing productivity and protecting plants, an automatic irrigation and fertilization system reduces the costs of traditional fertilizer use. GREENMAN's fertilizer dosing system is equipped with a precise control panel and various sensors. It also adds plant nutrients to irrigation water in PVC tanks.

CLIMA



CLIMA

Heating Control Panel, Carbon Dioxide, Buffer Tank And Energy Storage

Due to the large space and the complexity of environmental and internal factors in industrial greenhouses, the possibility of controlling the optimal conditions of the plant by a human operator is greatly reduced, and as a result, it is difficult to ensure product quality and plant safety. The smart greenhouse is a revolution in the agricultural industry. It increases the conditions and possibility of industrial agriculture through sensors and actuators using greenhouse climate control system and automation system. The greenhouse climate control device is a programmable and flexible monitoring and control system that measures and controls greenhouse variables including temperature, humidity, light, water and gases in the greenhouse by relevant sensors.

After receiving the information, the central controller calculates the amount of changes required by the system and sends the necessary commands to change the status of the operators so that the desired variable changes optimally. Also, this device is able to show the status of the greenhouse and input and output information on the screen and record the information on the memory.

Advantage

- Ease of greenhouse climate management
- Energy management and fuel consumption reduction
- Increasing the speed and accuracy and minimizing the human error of the workforce
- Time processing of information and timely change of operators
- Control of soil moisture and water temperature
- Light and gas concentration (CO_2) control
- Irrigation and fertilization parameters control
- Cooling and heating control
- Lighting, adjusting fans, ventilators and central ventilation system
- Increase the product quality and speed

Knowledge
Based

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