



INDUSTRIAL BURNERS **TBR SERIES**

06 | 2018



baltur
Energy for People



TBR Series

A reliable resource
for those seeking **Energy**





HIGH
FLEXIBILITY



HIGH
PERFORMANCE

INDUSTRIAL BURNERS: TBR

Dual-block burners from TBR series are specifically designed for applications on civil and industrial systems featuring large thermal power and in particular to be installed on water-tube heat generators. The technology used for flame geometry adjustment according to the type of combustion chamber allows the use of **TBR** series burners in a number of industrial applications, such as:

- Incinerators
- Gravel or asphalt dryers
- "D-Shape" water-tube heat generators
- Vertical water-tube heat generators
- Multi-burner heat generators
- Furnaces
- Petrolchemical plants
- Revamping

TBR series allows reaching a high level of "customisation and flexibility" in the product configuration, thus implementing technical solutions fully focused on the engineering needs of the final user.

In particular, development and design of **TBR** series aimed at ensuring that preventive and standard maintenance operations can be carried out, by specialised personnel, in an easy and simple way. All the burners in this series are provided with a combustion head extraction system that allows the operator to easily and quickly accessing all the internal parts of the burner.

The use of this type of burners in combination with a fuel adduction system, a fan, an

electrical panel, allows implementing modular and flexible system solutions.

The range includes 11 models, available for use with liquid and gaseous fuel, configured in versions with mechanical or electronic cam, single-fuel or bi-fuel, covering a power range from 0.5 MW to 50 MW. Models with greater power are available upon request.

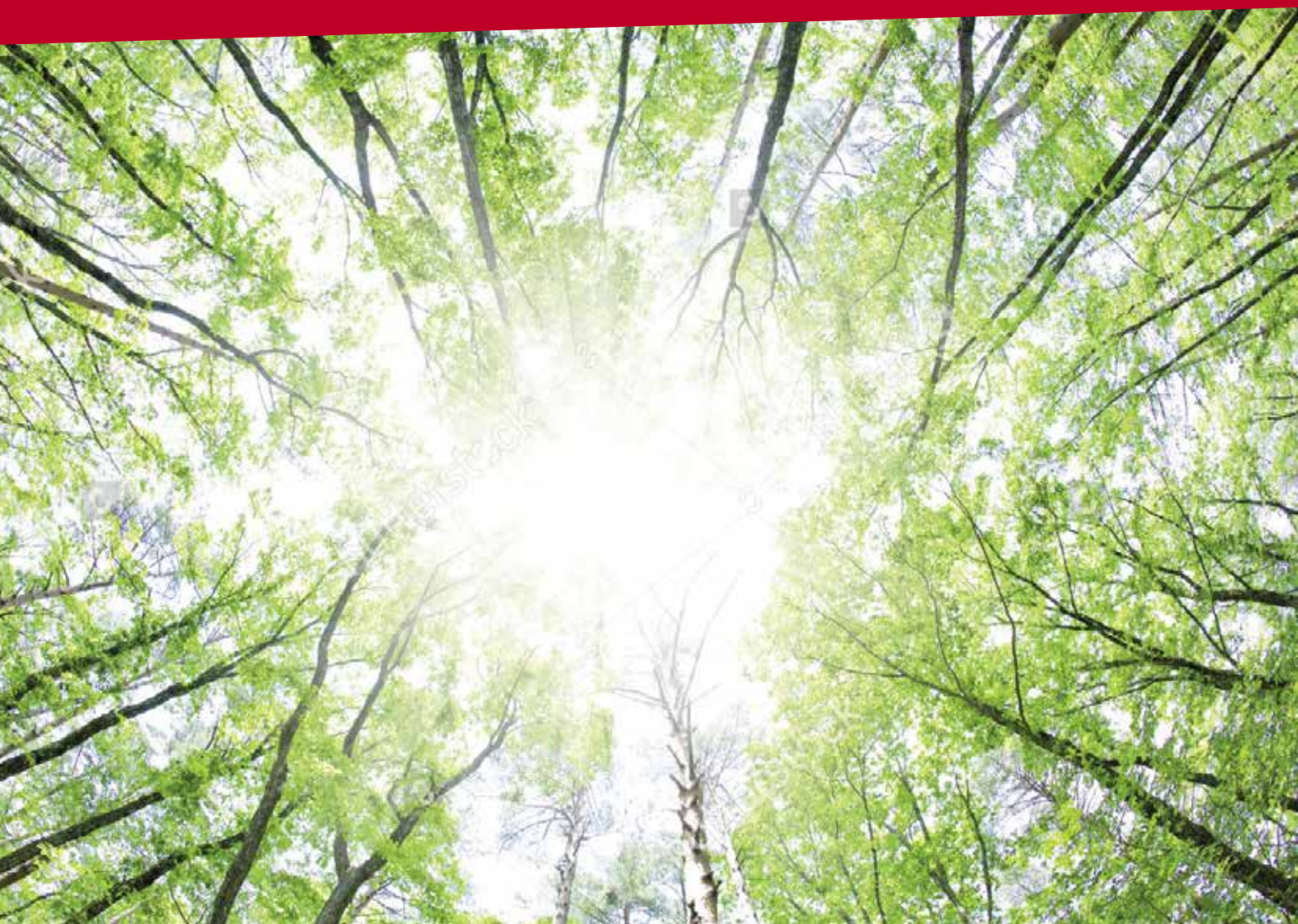
The new **TBR** range has been manufactured in compliance with the European standards and directives, using only certified and CE marked components.





TBR Series

Suitable solutions for several applications





**SAVINGS
ON THE COSTS OF
MANAGEMENT**



**EASY
MAINTENANCE**

NEW DESIGN AND LAYOUT:

The new **TBR** series features an innovative design and a very functional and versatile layout.

The sanded steel metal frame of the burner ensures a greater protection and preservation of paint over time. Micro-textured, bi-colour painting makes the product appearance agreeable.

COMBUSTION AIR TEMPERATURE:

Standard construction up to 60°C.
Special construction for temperatures of up to 250°C.

ENERGY SAVING:

The electronic version is equipped with electronic control that allows a precise regulation of the air-fuel mix when the heat load changes, optimising energy consumption.

Combustion optimisation systems can be used with TBR burners to ensure a remarkable cost saving.

AIR INLET POSITION:

Combustion air may be let in from above, below, right or left.

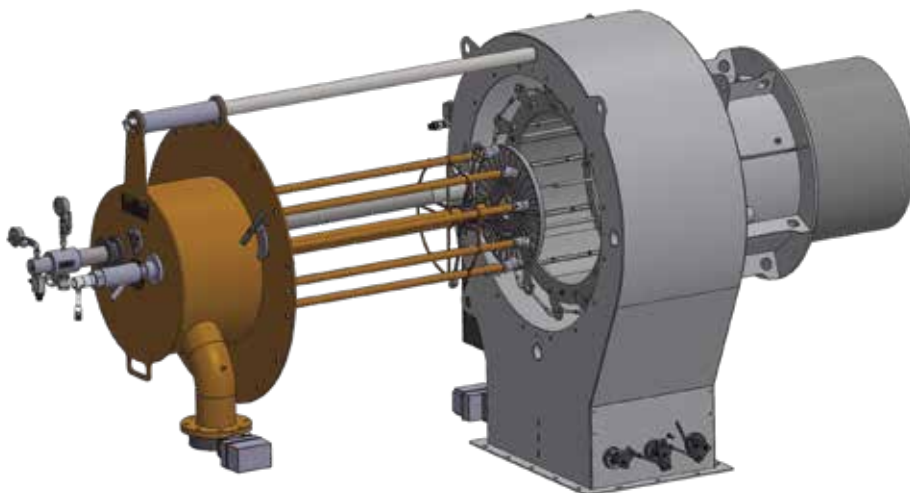
NEW COMBUSTION HEAD

CONCEPT:

The new combustion head concept allows adapting combustion and relevant emissions according to the type of combustion chamber. For gaseous fuel versions, the new “lance” design with adjustable nozzles provides for flexible combustion systems for several applications, also to reach low NO_x levels with and without FGR. Furthermore, thanks to the new design, an easy and immediate access to the combustion head is ensured.

EASY MAINTENANCE:

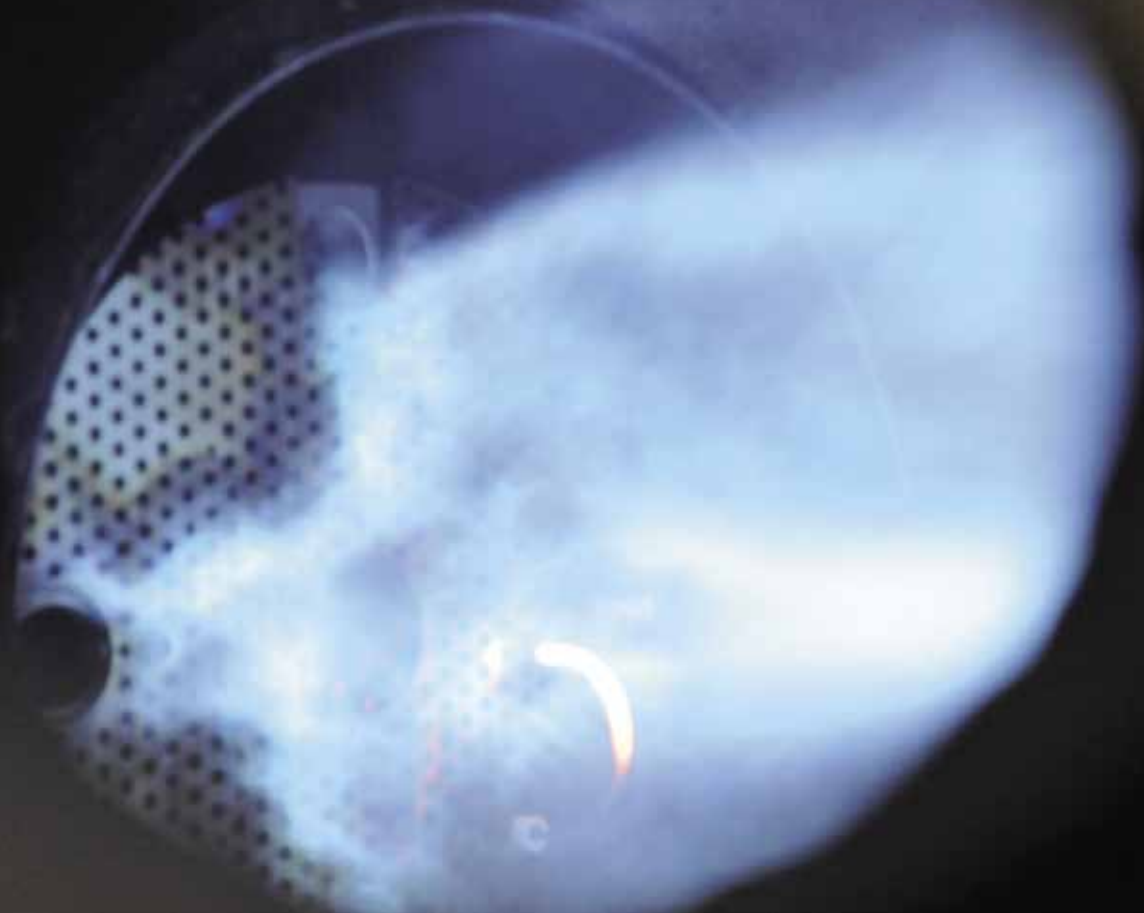
Maintenance operations are easy and quick. By simply removing the fastening screws and some electrical connections, a sliding system on bearings allows full access to the mixing head and the internal components.

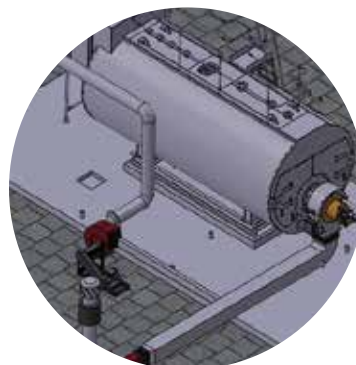
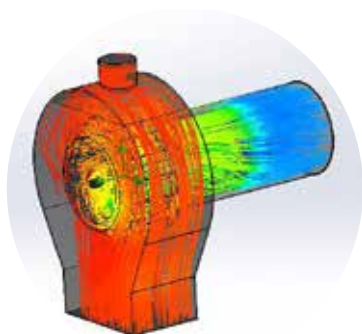




TBR Series

New technologies, low nitrogen oxide emissions





LOW NO_x TECHNOLOGY WITH FGR SYSTEM

The dual-block burners, series **TBR** from model 4 to 50, are designed and set to be combined with an external recirculation system of the combustion gas, called FGR (Flue Gas Recirculation).

The FGR technology consists in mixing the burner intake combustion air with combustion gasses from the heat generator chimney on which it is installed. Thanks to the mixing between combustion air, fumes (percentage that in the new range can reach 40% of total fume flow rate) and fuel that creates near the burner combustion head, a flame generates, whose adiabatic temperature is significantly lower than the one generated with a burner without FGR.

The effect is that the "Thermal NO_x" (main cause of nitrogen oxide formation) generation mechanism is drastically slowed down.

The result that may be obtained is the reduction of NO_x values between 15 and 40%, always depending on the specific application.

The figure below shows an example of application with TBR series burner and FGR system, developed with auxiliary fan equipped with inverter that takes an amount of combustion fumes from the chimney and conveys it directly in the air

adduction channel downstream of the main burner fan.

Moreover, a servo-controlled damper is installed in the recirculated combustion fume channel, controlled by the system electronic adjustment, in order to:

- Avoid fume recirculation when not required.
- Activate fume recirculation only when the temperature is correct.



Functions, features, symbols





SYMBOLS

1

TBR

2

20

3

GLA

4

MEVCO

5

FGR

6

AC

7

AIB

8

FR

1

TBR - Type of burner

TBR The Best Register

2

20 - Cut It

4-6-9-12-16-20-26-32-38-44-50

3

GLA - Fuel

G natural gas

B biogas

P L.P.G.

L diesel

LA diesel with compressed air assisted atomisation

N fuel oil with vapour assisted atomisation

NS fuel oil with assisted atomisation

GL gas/diesel combination

GN gas/fuel oil combination

GNS gas/fuel oil combination with vapour assisted atomisation

4

MEVCO - Air gas control

MC with mechanical cams

ME with electronic cams

MEV with electronic cams and inverters

MEV O2 with electronic cams and inverter and O2 control

MEV CO with electronic cams and inverters and CO control

5

FGR - Fume recirculation

FGR with fume external recirculation system at 50° C

6

AC - Hot air

/ for combustion air temperature operation at 20° C

AC for combustion air temperature operation at 250° C

7

AIB - Air supply

AIB air inlet from below

AIL air inlet from left

AIT air inlet from above

AIR air inlet from right

8

FR - Fuel supply*

FR from right

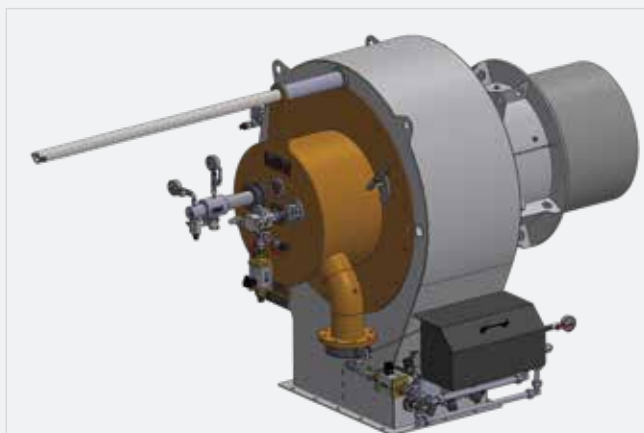
FL from left

FB from below

* this is the supply system of gaseous fuel



TECHNICAL AND FUNCTIONAL FEATURES



Model: Gas-Diesel



Model: Diesel

Modulating type industrial burner, suitable for fuels such as:

1. Natural gas
2. Biogas
3. LPG
4. Diesel
5. Fuel oil
6. Gas-Diesel combination
7. Gas-Fuel oil combination

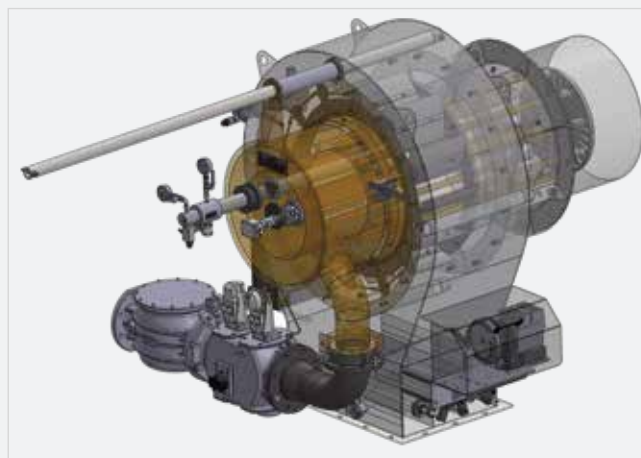
- Modulation ratio 1:8 for gas, 1:4 for diesel and fuel oil.
- The variation between minimum and maximum capacity is controlled electronically by a servo motor that uses a cam with variable profile and a lever system to adjust the intake of both combustion air and fuels at the same time (MC version).
- Electronic servo motors directly connected to combustion air and liquid fuel regulation components (ME version).
- The combustion air that reaches the head is adjusted by the main input throttle valves. The servomotor varies the heat output through a PID-type electronic

adjustment system, while keeping an optimal generator overall heat efficiency rating.

- The manual adjustment flame setting allows adjusting the stator blade system used to generate a swirl flow with high number of variable swirls. The flame setting adjustment varies between 0° and 80°.
- AISI 321 bladed flame disc to create the flame root stability area.



DESIGN CHARACTERISTICS



The burner consists of:

- body made of sanded and painted steel sheet fitted with connection flange and insulating gasket;
- manual adjustment flame setting;
- flame pipe in special steel resistant to high temperatures;
- air/fuel mixing and combustion head;
- flame disk;
- flame visor;
- multiple throttle shutters for automatic adjustment of combustion air;
- dampers fitted on bearings;
- continuous air/fuel intake modulation unit consisting of electric servomotor, cam with variable profile and relative transmission of command to the air dampers and gas throttle valve (MC version);
- continuous air/fuel intake modulation unit consisting of electronic servomotors directly connected to regulation components for the simultaneous air calibration
- combustion air and fuel (ME version);
- throttle valve for gas flow rate adjustment;
- direct ignition with Gas pilot (ignition with electrodes is provided only for models 4 and 6);
- gas adduction unit on gas distributor in combustion head;
- flame detection with UV and IR sensor;
- box containing terminals for connection to the main power board, ignition transformer and manual modulation control;
- electrical system for IP54 protection.



PRODUCT CONFIGURATION	TBR..G MC	TBR..L MC	TBR..N MC
Steel metal frame with sanding treatment and powder coating	•	•	•
AISI 321 metallic diffuser	•	•	•
AISI 321 metallic diffuser with extended length	◦	◦	◦
Diffuser holder metallic sleeve	•	•	•
Combustion head extraction system	•	•	•
Gas plenum chamber with lances provided with adjustable nozzles	•	ND	ND
Burner closing plate provided with centring system and atomisation lance	ND	•	•
Modulation unit with protection cover	•	•	•
Air/fuel modulation check	•	•	•
Piston-type liquid fuel flow rate regulator	ND	•	•
Modulation signal: 4-20 mA or 0-10V INPUT	◦	◦	◦
Diesel atomization lance	ND	•	•
Throttle valve for gas flow rate modulation	•	ND	ND
Servomotor with mechanical cam	•	•	•
Manual variable geometry flame setting	•	•	•
Lifting eyebolts	•	•	•
Flame display	•	•	•
Combustion head gas pressure port	•	•	•
Intermittent operation - 1 stop every 24h -	•	•	•
Continuous operation - 1 stop every 72h -	•	•	•
Intermittent operation diesel ignition pilot	ND	◦	◦
Continuous operation diesel ignition pilot with ionisation pilot flame detection	ND	◦	◦
Intermittent operation gas ignition pilot (GAS or LPG)	•	•	•
Continuous operation gas ignition pilot (GAS OR LPG) with ionisation pilot flame detection	◦	◦	◦
Pilot supply with compressed air	◦	◦	◦
Cable and ignition electrodes	•	•	•
Gas train for ignition pilot (GAS or LPG)	•	•	•
- gas pilot operation valve	•	•	•
- gas pilot safety valve			
- minimum pressure switch			
- pressure regulator with filter			
Diesel train for diesel ignition pilot	◦	◦	◦
- diesel ON-OFF safety valve			
- diesel pressure regulator			
Adjustable flame sensor support	•	•	•
UV flame sensor	•	•	•
Selective frequency flame sensor	◦	◦	◦
Version for pre-heated combustion air up to 250°C	◦	◦	◦
Flame sensor for continuous operation	◦	◦	◦
Flame sensor cooling system preparation	•	•	•
Multiple air dampers	•	•	•
Air pressure port	•	•	•
Electrical connection pull box	•	•	•
Ignition transformer	•	•	•
Operation with continuous ventilation	◦	◦	◦
Preset for "AIR COOLING SYSTEM" with external fan cooling	◦	◦	◦
Supplied with the burner:	•	•	•
- Stud bolt screws, nuts and washers for fastening to boiler			
- Stud bolt screws, nuts and washers for fastening gas ramp			
- Burner flange seal			
- Instruction manual	◦	◦	◦
Protection rating IP65			
Fumigated wood packaging			



PRODUCT CONFIGURATION	TBR..GL MC	TBR..GN MC
Steel metal frame with sanding treatment and powder coating	•	•
AISI 321 metallic diffuser	•	•
AISI 321 metallic diffuser with extended length	◦	◦
Diffuser holder metallic sleeve	•	•
Combustion head extraction system	•	•
Gas plenum chamber with lances provided with adjustable nozzles	•	•
Burner closing plate provided with centring system and atomisation lance	ND	ND
Modulation unit with protection cover	•	•
Air/fuel modulation check	•	•
Piston-type liquid fuel flow rate regulator	•	•
Modulation signal: 4-20 mA or 0-10V INPUT	◦	◦
Diesel atomization lance	•	•
Throttle valve for gas flow rate modulation	•	•
Servomotor with mechanical cam	•	•
Manual variable geometry flame setting	•	•
Lifting eyebolts	•	•
Flame display	•	•
Combustion head gas pressure port	•	•
Intermittent operation - 1 stop every 24h -	•	•
Continuous operation - 1 stop every 72h -	•	•
Intermittent operation diesel ignition pilot	◦	◦
Continuous operation diesel ignition pilot with ionisation pilot flame detection	◦	◦
Intermittent operation gas ignition pilot (GAS or LPG)	•	•
Continuous operation gas ignition pilot (GAS OR LPG) with ionisation pilot flame detection	◦	◦
Pilot supply with compressed air	◦	◦
Cable and ignition electrodes	•	•
Gas train for ignition pilot (GAS or LPG)	•	•
- gas pilot operation valve	•	•
- gas pilot safety valve		
- minimum pressure switch		
- pressure regulator with filter		
Diesel train for diesel ignition pilot	◦	◦
- diesel ON-OFF safety valve		
- diesel pressure regulator		
Adjustable flame sensor support	•	•
UV flame sensor	•	•
Selective frequency flame sensor	◦	◦
Version for pre-heated combustion air up to 250°C	◦	◦
Flame sensor for continuous operation	◦	◦
Flame sensor cooling system preparation	•	•
Multiple air dampers	•	•
Air pressure port	•	•
Electrical connection pull box	•	•
Ignition transformer	•	•
Operation with continuous ventilation	◦	◦
Preset for "AIR COOLING SYSTEM" with external fan cooling	◦	◦
Supplied with the burner:	•	•
- Stud bolt screws, nuts and washers for fastening to boiler		
- Stud bolt screws, nuts and washers for fastening gas ramp		
- Burner flange seal		
- Instruction manual	◦	◦
Protection rating IP65		
Fumigated wood packaging	•	•



PRODUCT CONFIGURATION	TBR..G ME	TBR..L ME	TBR..N ME
Steel metal frame with sanding treatment and powder coating	•	•	•
AISI 321 metallic diffuser	•	•	•
AISI 321 metallic diffuser with extended length	◦	◦	◦
Diffuser holder metallic sleeve	•	•	•
Combustion head extraction system	•	•	•
Gas plenum chamber with lances provided with adjustable nozzles	•	ND	ND
Burner closing plate provided with centring system and atomisation lance	ND	•	•
Modulation unit with protection cover	•	•	•
Air/fuel modulation check	•	•	•
Piston-type liquid fuel flow rate regulator	ND	•	•
Modulation signal: 4-20 mA or 0-10V INPUT	◦	◦	◦
Diesel atomization lance	ND	•	•
Throttle valve for gas flow rate modulation	•	ND	ND
Servomotor with mechanical cam	•	•	•
Manual variable geometry flame setting	•	•	•
Lifting eyebolts	•	•	•
Flame display	•	•	•
Combustion head gas pressure port	•	•	•
Intermittent operation - 1 stop every 24h -	•	•	•
Continuous operation - 1 stop every 72h -	•	•	•
Intermittent operation diesel ignition pilot	ND	◦	◦
Continuous operation diesel ignition pilot with ionisation pilot flame detection	ND	◦	◦
Intermittent operation gas ignition pilot (GAS or LPG)	•	•	•
Continuous operation gas ignition pilot (GAS OR LPG) with ionisation pilot flame detection	◦	◦	◦
Pilot supply with compressed air	◦	◦	◦
Cable and ignition electrodes	•	•	•
Gas train for ignition pilot (GAS or LPG)	•	•	•
- gas pilot operation valve			
- gas pilot safety valve	•	•	•
- minimum pressure switch			
- pressure regulator with filter			
Diesel train for diesel ignition pilot			
- diesel ON-OFF safety valve	◦	◦	◦
- diesel pressure regulator			
Adjustable flame sensor support	•	•	•
UV flame sensor	•	•	•
Selective frequency flame sensor	◦	◦	◦
Version for pre-heated combustion air up to 250°C	◦	◦	◦
Flame sensor for continuous operation	•	•	•
Flame sensor cooling system preparation	•	•	•
Multiple air dampers	•	•	•
Air pressure port	•	•	•
Electrical connection pull box	•	•	•
Ignition transformer	•	•	•
Operation with continuous ventilation	•	•	•
Preset for "AIR COOLING SYSTEM" with external fan cooling	◦	◦	◦
Supplied with the burner:			
- Stud bolt screws, nuts and washers for fastening to boiler	•	•	•
- Stud bolt screws, nuts and washers for fastening gas ramp			
- Burner flange seal			
- Instruction manual			
Preparation for FGR	◦	◦	◦
Use of inverter on air fan	◦	◦	◦
Use of O ₂ and CO control	◦	◦	◦
Protection rating IP65	◦	◦	◦
Fumigated wood packaging	•	•	•

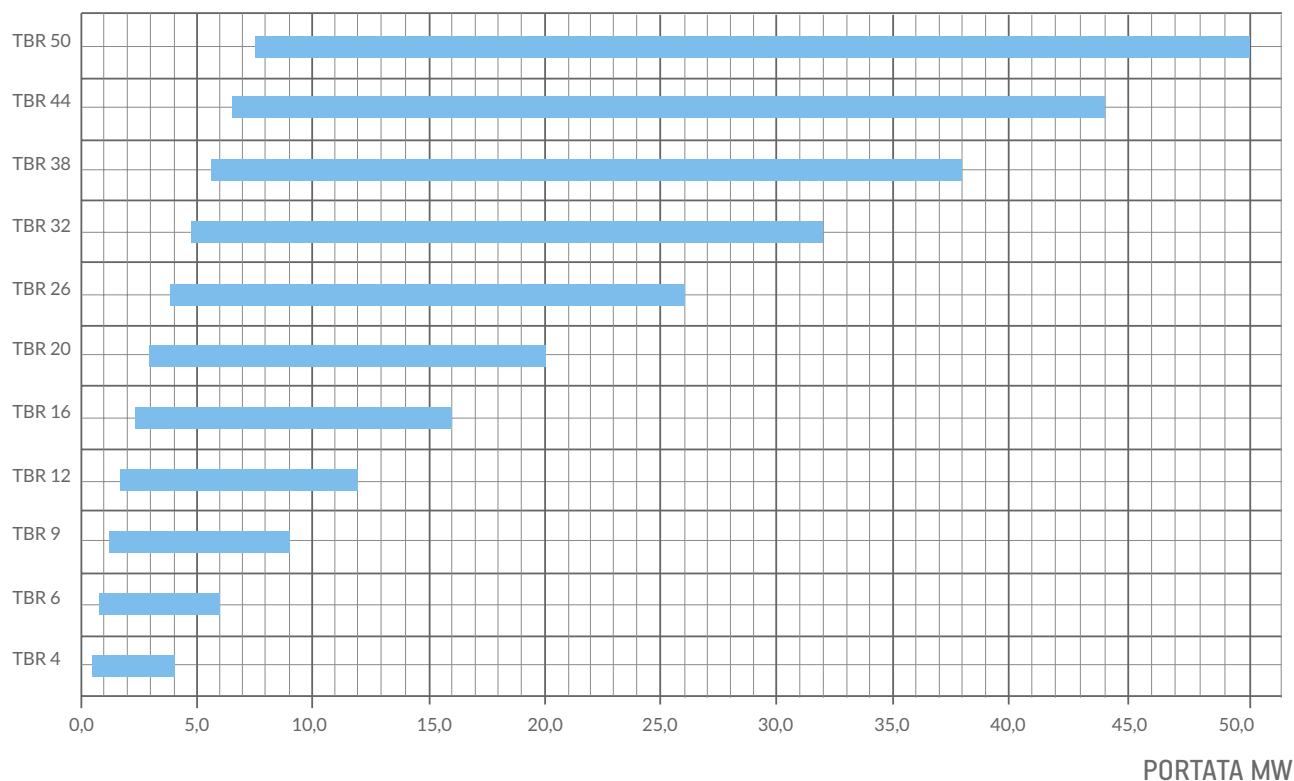


PRODUCT CONFIGURATION	TBR..GL ME	TBR..GN ME
Steel metal frame with sanding treatment and powder coating	•	•
AISI 321 metallic diffuser	•	•
AISI 321 metallic diffuser with extended length	◦	◦
Diffuser holder metallic sleeve	•	•
Combustion head extraction system	•	•
Gas plenum chamber with lances provided with adjustable nozzles	•	•
Burner closing plate provided with centring system and atomisation lance	ND	ND
Modulation unit with protection cover	•	•
Air/fuel modulation check	•	•
Piston-type liquid fuel flow rate regulator	•	•
Modulation signal: 4-20 mA or 0-10V INPUT	•	•
Diesel atomization lance	•	•
Throttle valve for gas flow rate modulation	•	•
Servomotor with mechanical cam	•	•
Manual variable geometry flame setting	•	•
Lifting eyebolts	•	•
Flame display	•	•
Combustion head gas pressure port	•	•
Intermittent operation - 1 stop every 24h -	•	•
Continuous operation - 1 stop every 72h -	•	•
Intermittent operation diesel ignition pilot	◦	◦
Continuous operation diesel ignition pilot with ionisation pilot flame detection	◦	◦
Intermittent operation gas ignition pilot (GAS or LPG)	•	•
Continuous operation gas ignition pilot (GAS OR LPG) with ionisation pilot flame detection	◦	◦
Pilot supply with compressed air	◦	◦
Cable and ignition electrodes	•	•
Gas train for ignition pilot (GAS or LPG)		
- gas pilot operation valve		
- gas pilot safety valve	•	•
- minimum pressure switch		
- pressure regulator with filter		
Diesel train for diesel ignition pilot		
- diesel ON-OFF safety valve	◦	◦
- diesel pressure regulator		
Adjustable flame sensor support	•	•
UV flame sensor	•	•
Selective frequency flame sensor	◦	◦
Version for pre-heated combustion air up to 250°C	◦	◦
Flame sensor for continuous operation	•	•
Flame sensor cooling system preparation	•	•
Multiple air dampers	•	•
Air pressure port	•	•
Electrical connection pull box	•	•
Ignition transformer	•	•
Operation with continuous ventilation	•	•
Preset for "AIR COOLING SYSTEM" with external fan cooling	◦	◦
Supplied with the burner:		
- Stud bolt screws, nuts and washers for fastening to boiler		
- Stud bolt screws, nuts and washers for fastening gas ramp	•	•
- Burner flange seal		
- Instruction manual		
Preparation for FGR	◦	◦
Use of inverter on air fan	◦	◦
Use of O ₂ and CO control	◦	◦
Protection rating IP65	◦	◦
Fumigated wood packaging	•	•

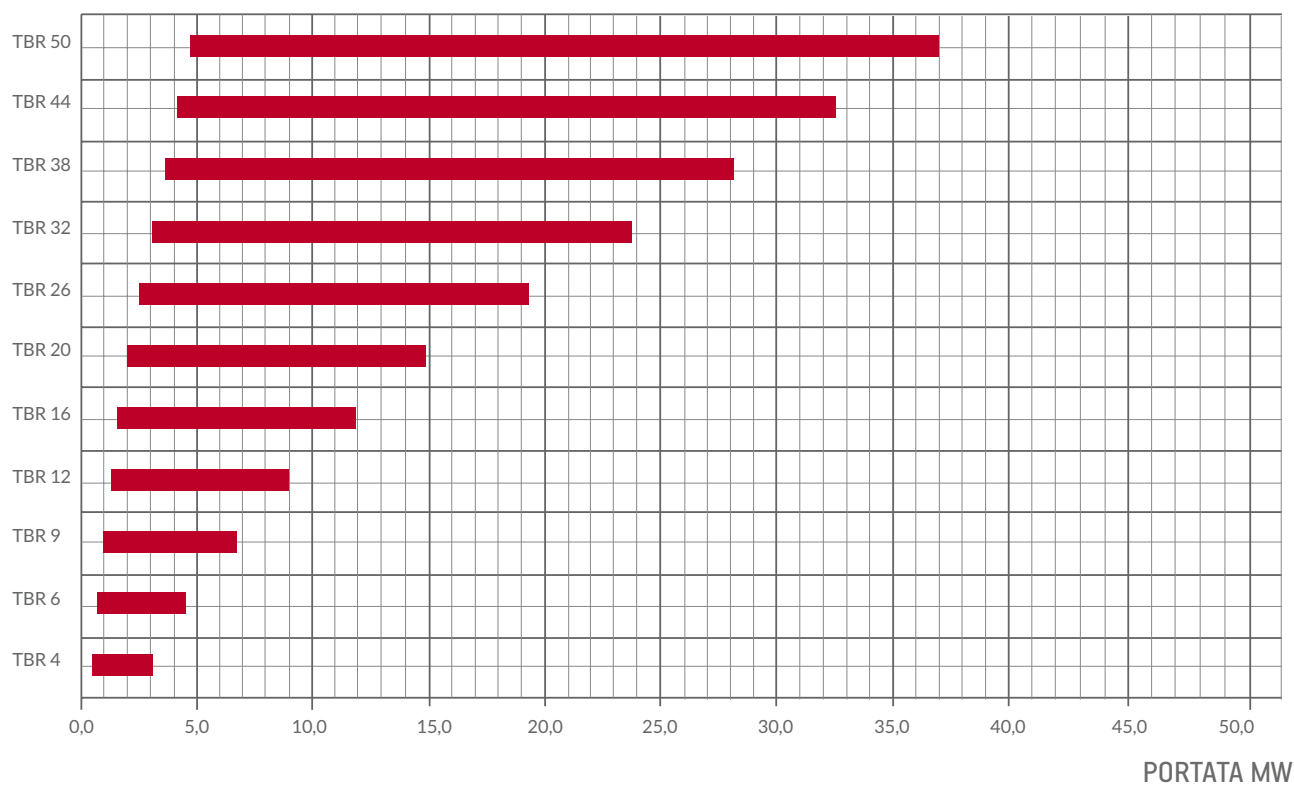


OPERATING RANGE

TBR 4-50 - 20°C



TBR 4-50 - 250°C





OPERATING DATA

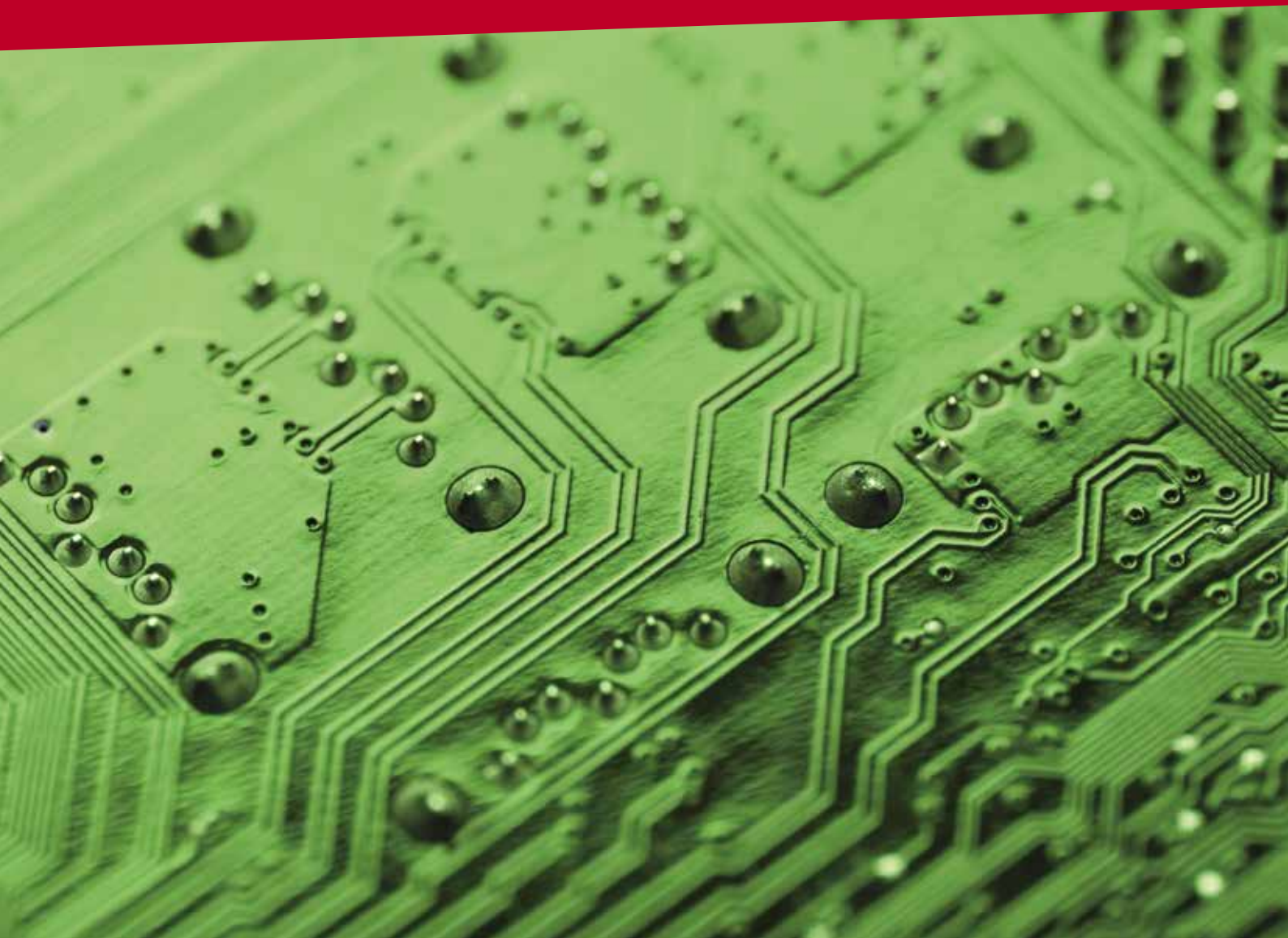
MODEL		TBR 4	TBR 6	TBR 9	TBR 12	TBR 16	TBR 20	TBR 26	TBR 32	TBR 38	TBR 44	TBR 50
Thermal power (1) kW (min-max)		500 - 4,000	750 - 6,000	1,125 - 9,000	1,500 - 12,000	2,000 - 16,000	2,500 - 20,000	3,250 - 26,000	4,000 - 32,000	4,750 - 38,000	5,500 - 44,000	6,250 - 50,000
Boiler size t/h												
Modulation ratio - GAS		8 : 1	8 : 1	8 : 1	8 : 1	8 : 1	8 : 1	8 : 1	8 : 1	8 : 1	8 : 1	8 : 1
Modulation ratio DIESEL		4 : 1	4 : 1	4 : 1	4 : 1	4 : 1	4 : 1	4 : 1	4 : 1	4 : 1	4 : 1	4 : 1
Modulation ratio FUEL OIL		4 : 1	4 : 1	4 : 1	4 : 1	4 : 1	4 : 1	4 : 1	4 : 1	4 : 1	4 : 1	4 : 1
Ignition system		Direct with electrodes*		With ignition pilot								
Max combustion air temperature		250 °C										
Min-max operation temperatures °C		-15 °C										
Air suction direction		See page 19-22										
Gas train connector flange		See page 24-25										
Ramp direction		See page 19-22										
Ignition pilot train inlet connections		-	-	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
Ignition pilot diameter		-	-	48 mm	48 mm	60 mm	60 mm	60 mm	60 mm	60 mm	80 mm	80 mm
DIESEL inlet connections FUEL OIL		1/2"	1/2"	1/2"	1/2"	3/4"	3/4"	3/4"	3/4"	1"	1"	1"
DIESEL outlet connections FUEL OIL		1/2"	1/2"	1/2"	1/2"	3/4"	3/4"	3/4"	3/4"	1"	1"	1"
Power supply voltage V/Ph/Hz		230/I/50										
kW auxiliary MAX power	Version G - L	0.4										
	Version GL	0.5										
MAX. total absorption A	Version G - L	1.7										
	Version GL	2.2										
Ignition transformation	VI - V2	230 V/2 x 8 kV		230 V/I x 8 kV								
	II - I2	I A/20 mA										
Protection rating		IP 54										
Compliant with standards		EN 676 - EN 267 - EN 746-2										

* Only "L" (light oil) and "N" (heavy oil) version: for "G", "GL", "GN", the ignition is with gas pilot (48 mm).



TBR Series

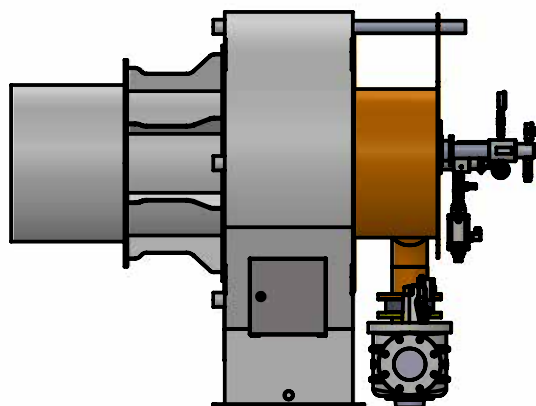
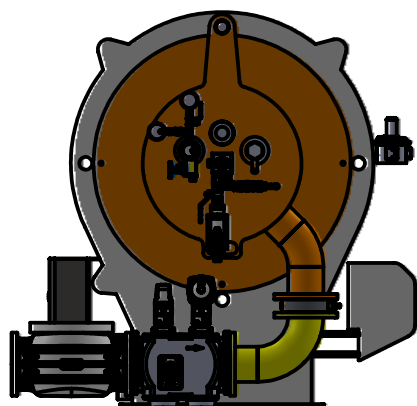
Dimensions, controls, gas trains, accessories



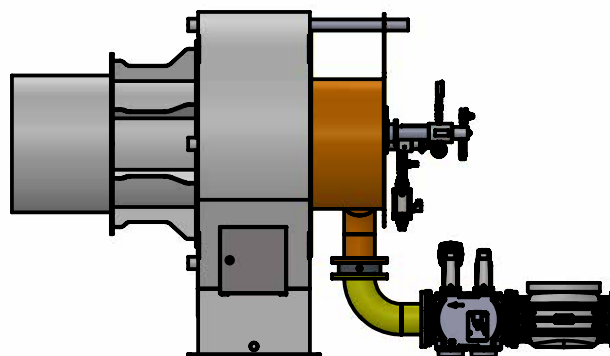
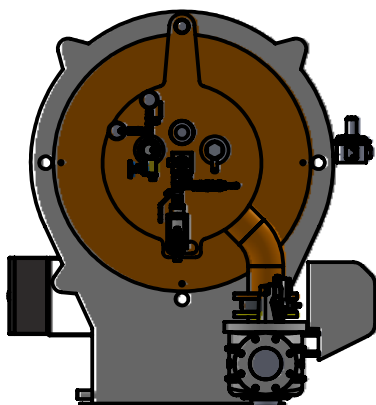


RAMP AND BURNER DIRECTION

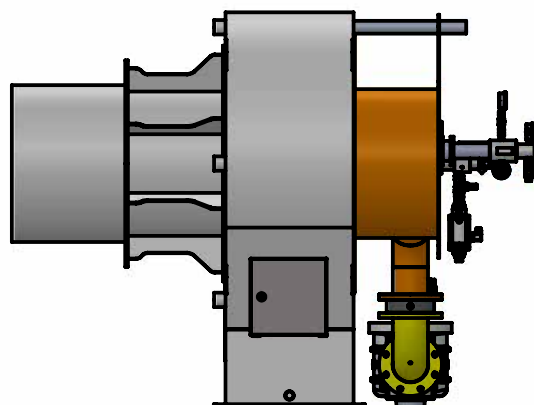
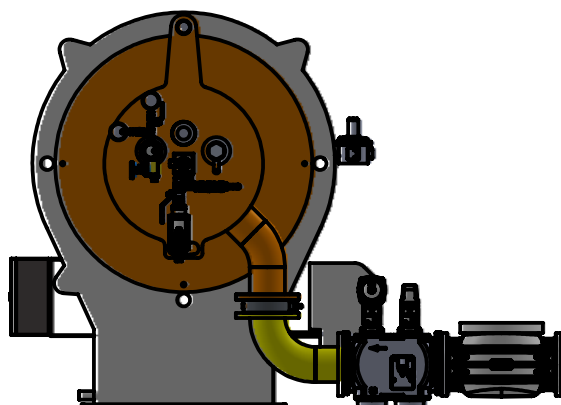
Burners of **TBR** series are designed to be fully versatile, therefore they can be installed on the heat generator in several directions, as shown in the figures below:



FLOOR



FLOOR

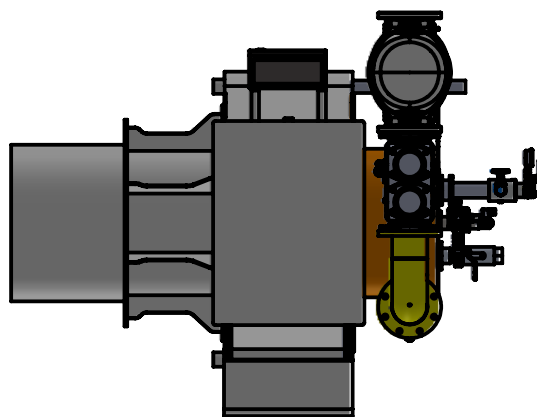
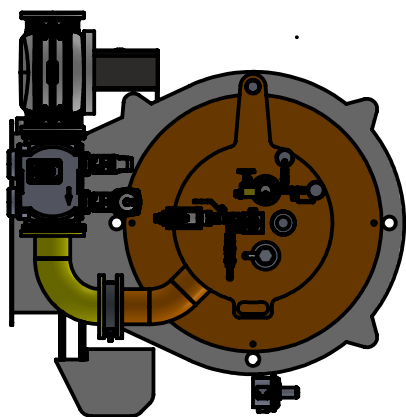


FLOOR

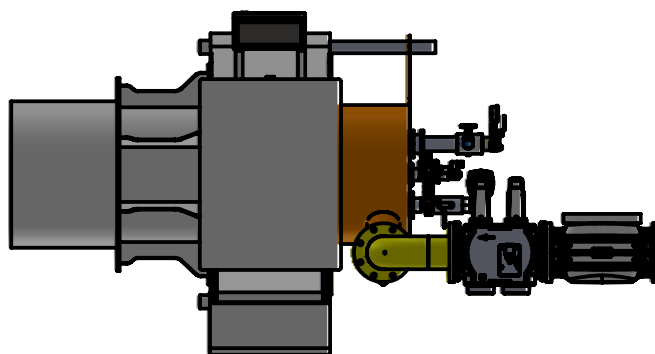
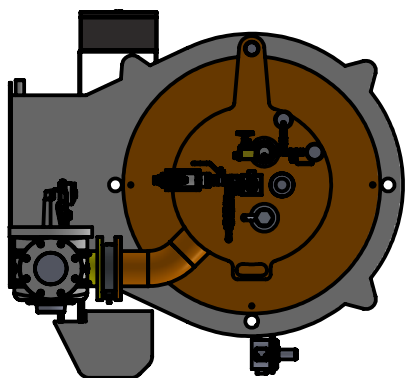


RAMP AND BURNER DIRECTION

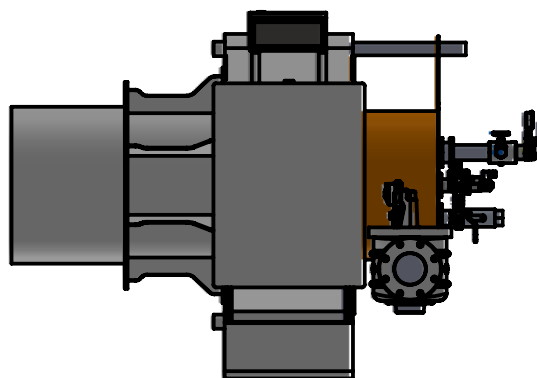
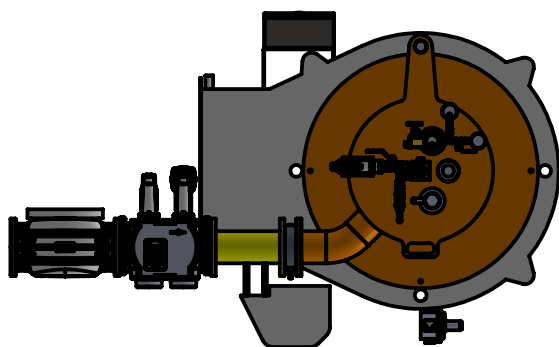
Burners of **TBR** series are designed to be fully versatile, therefore they can be installed on the heat generator in several directions, as shown in the figures below:



FLOOR



FLOOR

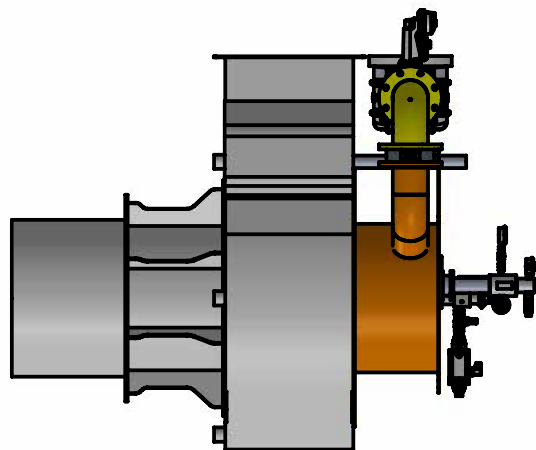
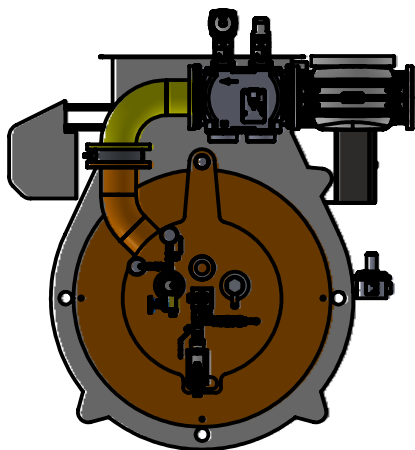


FLOOR

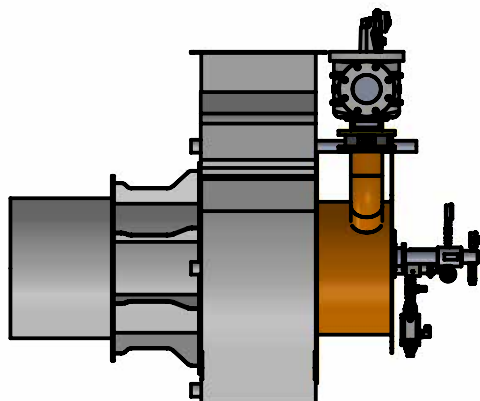
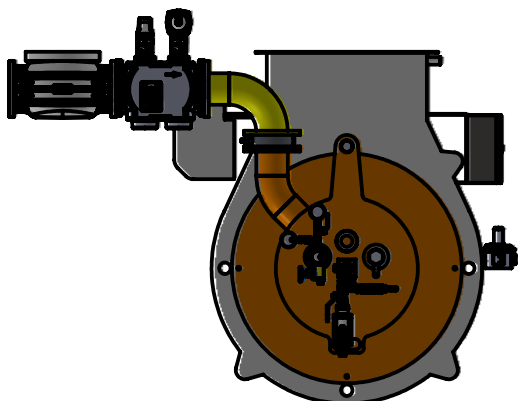


RAMP AND BURNER DIRECTION

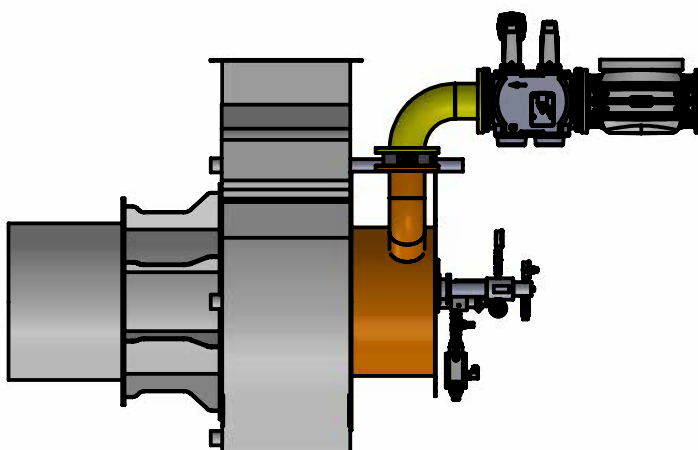
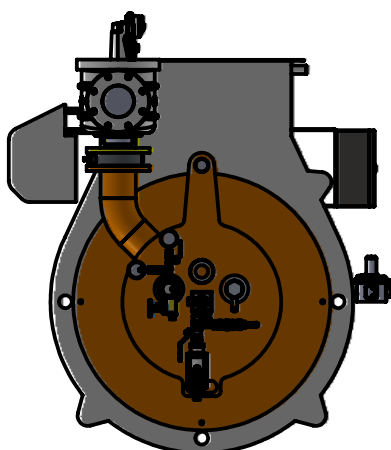
Burners of **TBR** series are designed to be fully versatile, therefore they can be installed on the heat generator in several directions, as shown in the figures below:



FLOOR



FLOOR

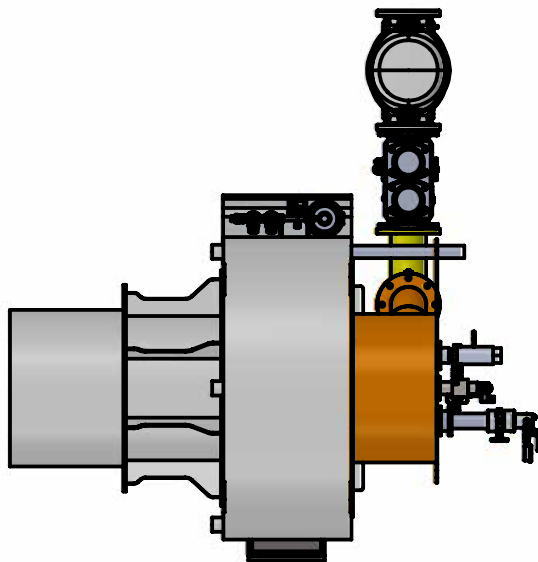
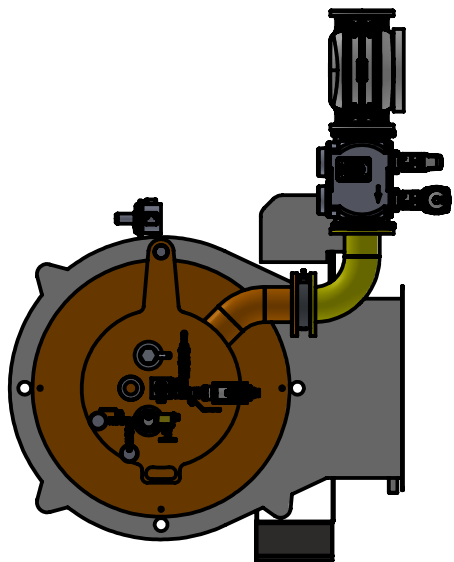


FLOOR

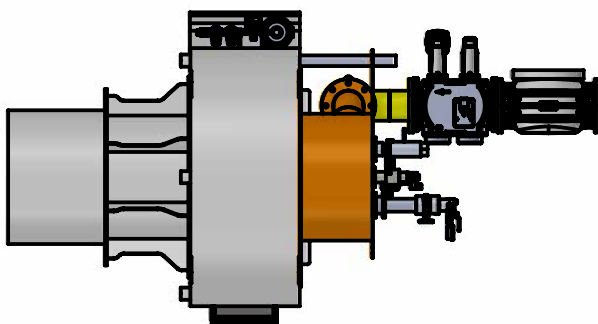
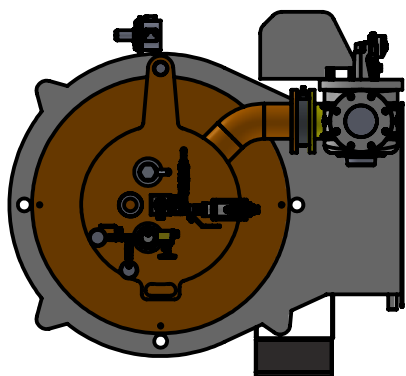


RAMP AND BURNER DIRECTION

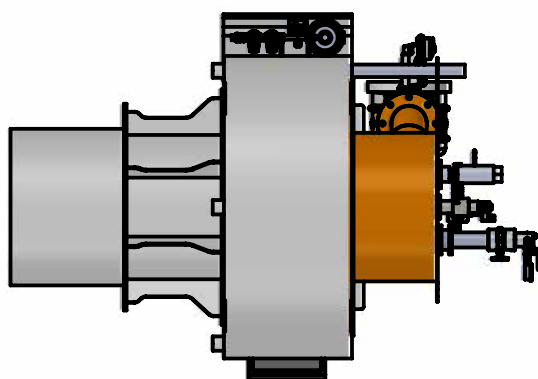
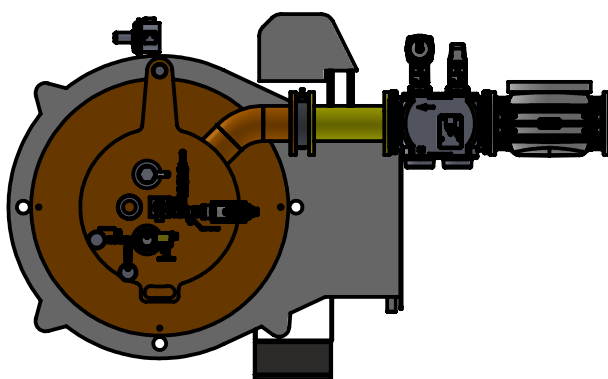
Burners of **TBR** series are designed to be fully versatile, therefore they can be installed on the heat generator in several directions, as shown in the figures below:



FLOOR



FLOOR

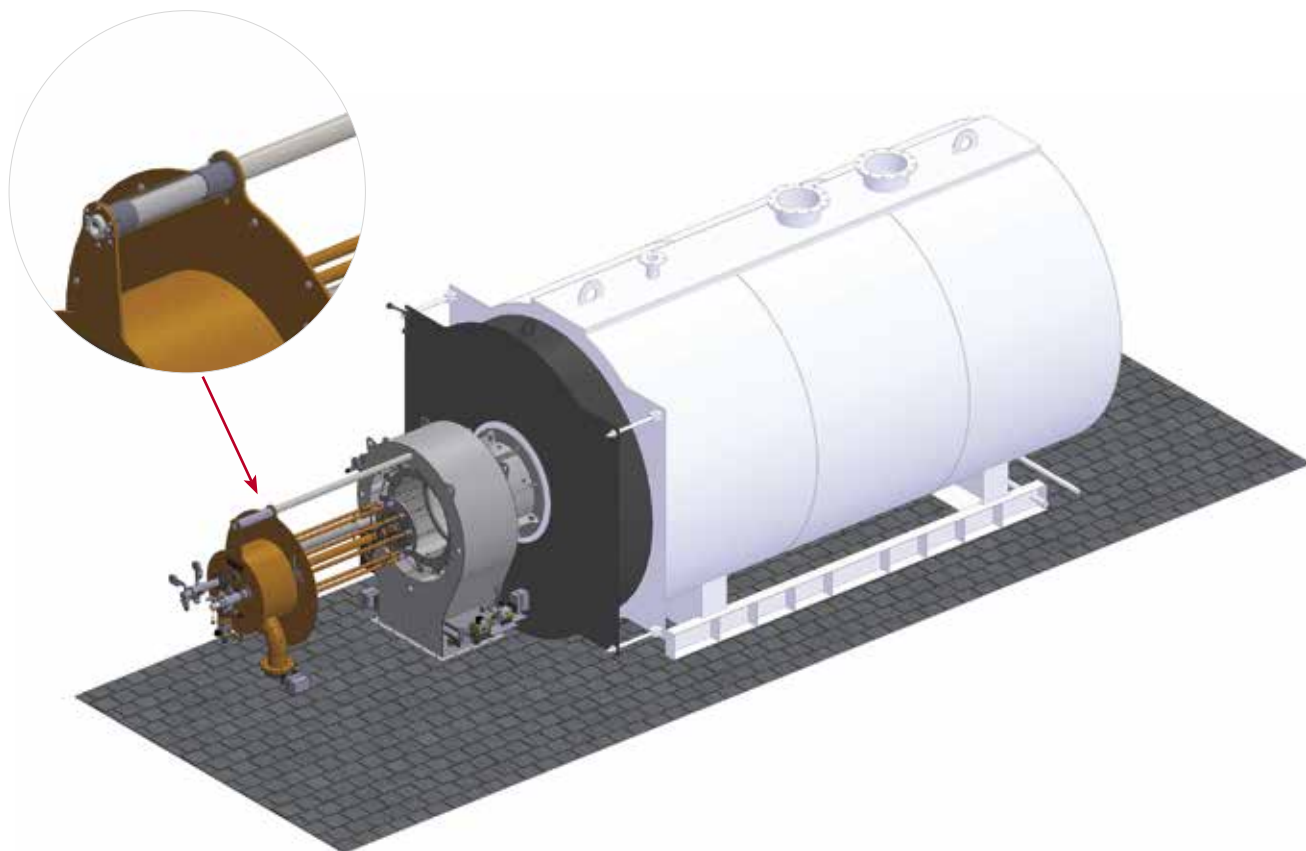


FLOOR

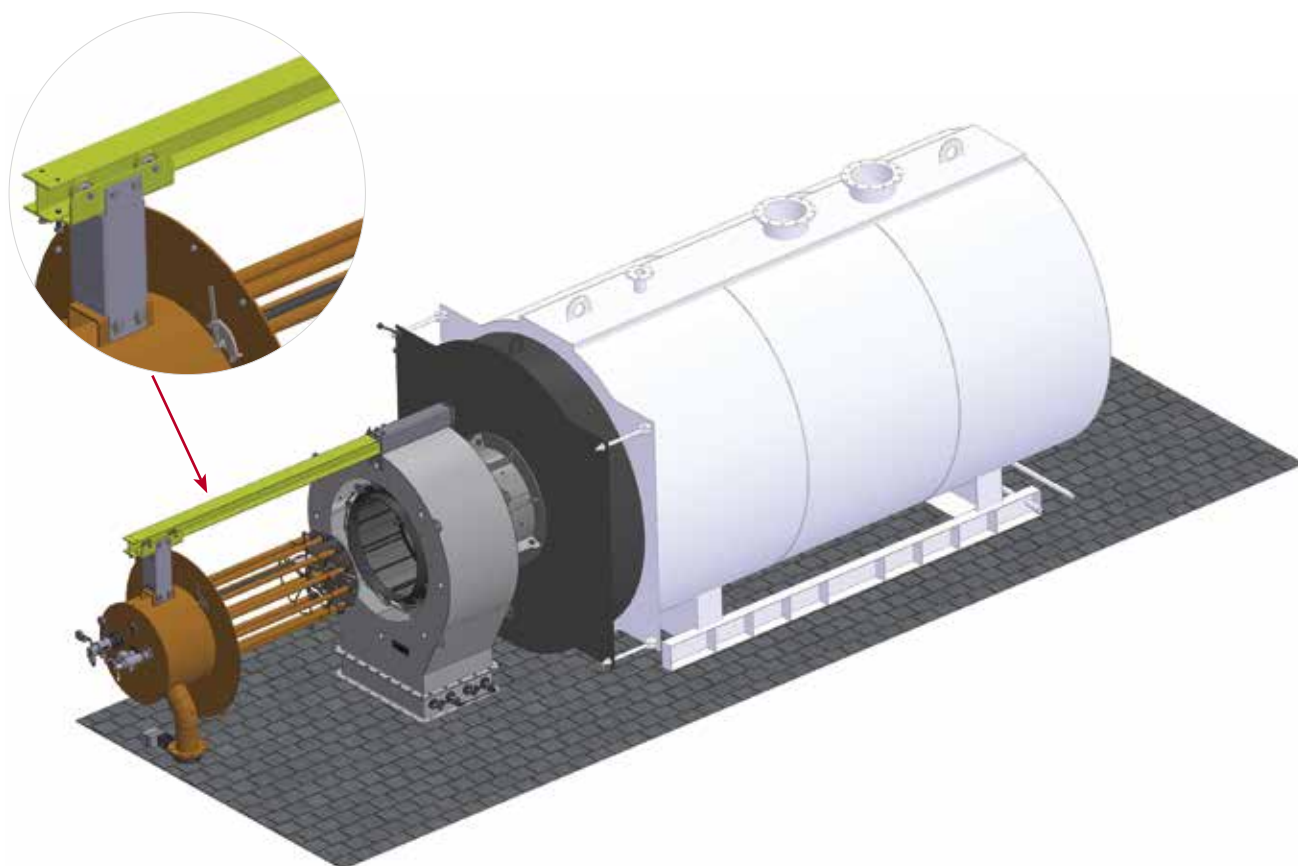


COMBUSTION HEAD EXTRACTION SYSTEM

Models TBR 4.... 20

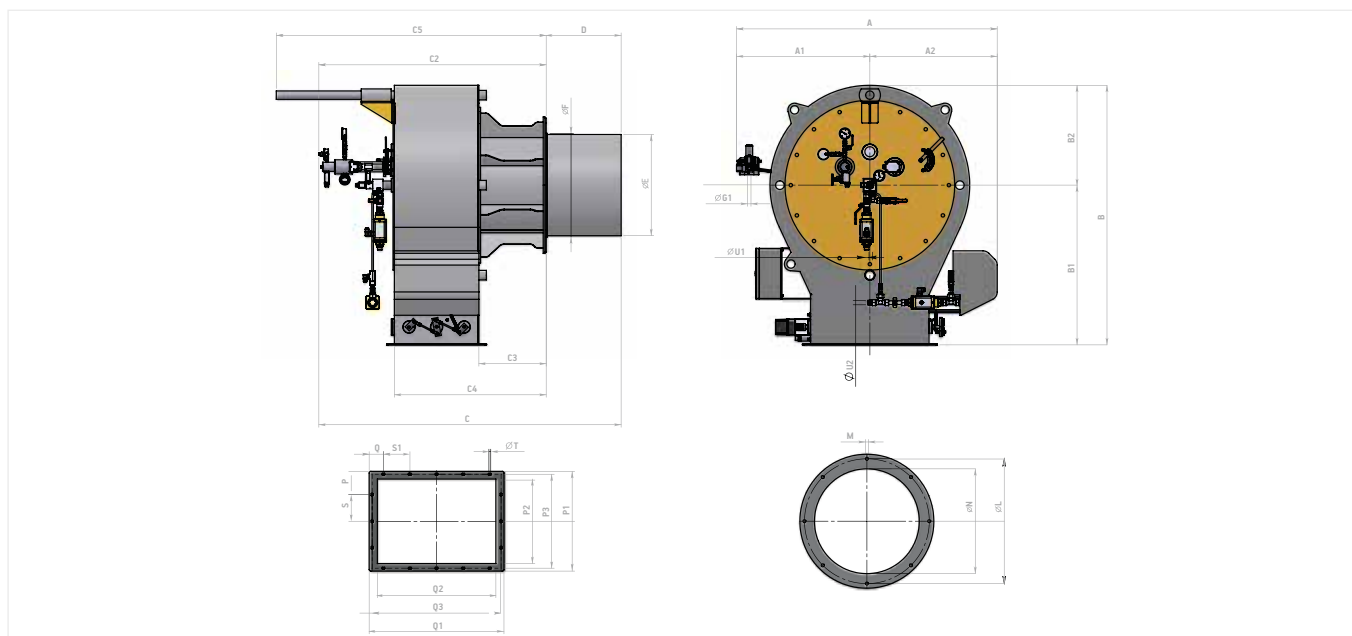


Models TBR 32.... 50





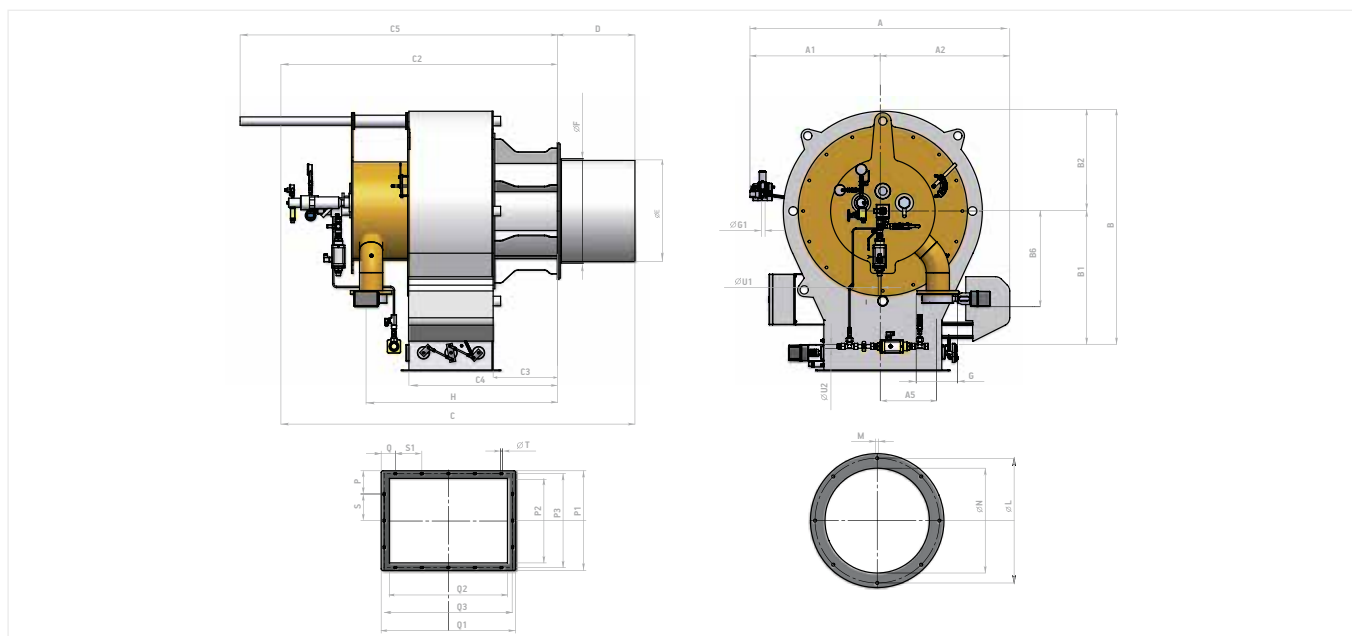
TBR...L - TBR..N



MODEL	TBR 4	TBR 6	TBR 9	TBR 12	TBR 16	TBR 20	TBR 26	TBR 32	TBR 38	TBR 44	TBR 50	
A	1180 (985)	1180 (985)	1335 (1240)	1335 (1240)	1600 (1450)	1600 (1450)	1835 (1750)	1835 (1750)	OPTIONAL			
A1	580	580	660	660	800	800	952	952				
A2	600 (405)	600 (405)	675 (580)	675 (580)	800 (650)	800 (650)	885 (800)	885 (800)				
A5	N.D.											
B	965	965	1180	1180	1560	1560	2000	2000				
B1	590	590	720	720	960	960	1200	1200				
B2	375	375	460	460	600	600	800	800				
B6	N.D.											
C	1264	1306	1521	1521	1718	1738	1937	1937				
C2	864	906	1071	1071	1268	1288	1437	1437				
C3	230	230	270	270	380	400	500	500				
C4	518	518	670	670	888	908	1150	1150				
C5	1436	1436	1790	1790	2226	2266	2800	2800				
D	400	400	450	450	450	450	500	500				
Ø E	340	348	418	480	548	608	700	770				
Ø F	355	360	432	494	560	622	728	790				
G1	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"				
L	400	400	536	536	750	750	900	900				
M	N.8 M14	N.8 M14	N.8 M14X**	N.8 M14X**	N.8 M16X83	N.8 M16X83	n.8 m16x83	N.8 M16X83				
N	370	370	450	450	630	630	820	820				
P	100	100	87.5	87.5	135	135	95	95				
P1	360	360	470	470	600	600	760	760				
P2	288	288	400	400	508	508	650	650				
P3	324	324	435	435	565	565	650	650				
Q	85	85	97.5	97.5	80	80	144.5	144.5				
Q1	480	480	570	580	810	810	1040	1040				
Q2	402	402	510	510	712	712	930	930				
Q3	444	444	545	545	775	775	775	988				
S	100	100	87,5	87,5	135	135	95	95				
S1	150	150	125	125	160	160	123,5	123,5				
T	N.14 x M10	N.14 x M10	N.14XM10	N.14XM10	N.16XM10	N.16XM10	N.28XM10	N.28XM10				
U1	1/2"	1/2"	1/2"	1/2"	3/4"	3/4"	3/4"	3/4"				
U2	1/2"	1/2"	1/2"	1/2"	3/4"	3/4"	3/4"	3/4"				



TBR...G - TBR..GL - TBR..GN



MODEL	TBR 4	TBR 6	TBR 9	TBR 12	TBR 16	TBR 20	TBR 26	TBR 32	TBR 38	TBR 44	TBR 50
A	1180 (985)	1180 (985)	1335 (1240)	1335 (1240)	1600 (1450)	1600 (1450)	1835 (1750)	1835 (1750)	OPTIONAL		
A1	580	580	660	660	800	800	952	952			
A2	600 (405)	600 (405)	675 (580)	675 (580)	800 (650)	800 (650)	885 (800)	885 (800)			
A5	270	270	280	280	360	330	410	410			
B	965	965	1180	1180	1560	1560	2000	2000			
B1	590	590	720	720	960	960	1200	1200			
B2	375	375	460	460	600	600	800	800			
B6	430	430	450	450	555	555	735	735			
C	1581	1631	1845	1845	2089	2089	2404	2404			
C2	1140	1140	1350	1350	1640	1630	1905	1905			
C3	230	230	270	270	380	400	500	500			
C4	355	355	815	815	1135	1135	1480	1480			
C5	1753	1761	2114	2114	2597	2617	3267	3267			
D	400	400	450	450	450	450	500	500			
Ø E	340	348	418	480	548	608	700	770			
Ø F	355	360	432	494	560	622	728	790			
G	DN65	DN80	DN100	DN100	DN125	DN125	DN150	DN150			
G1	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"			
H	726	726	878	878	1116	1136	1478	1478			
L	400	400	536	536	750	750	900	900			
M	N.8 M14	N.8 M14	N.8 M14X**	N.8 M14X**	N.8 M16X83	N.8 M16X83	N.8 M16x83	N.8 M16X83			
N	370	370	450	450	630	630	820	820			
P	100	100	87,5	87,5	135	135	95	95			
P1	360	360	470	470	600	600	760	760			
P2	288	288	400	400	508	508	650	650			
P3	324	324	435	435	565	565	650	650			
Q	85	85	97.5	97.5	80	80	144.5	144.5			
Q1	480	480	570	580	810	810	1040	1040			
Q2	402	402	510	510	712	712	930	930			
Q3	444	444	545	545	775	775	775	988			
S	100	100	87,5	87,5	135	135	95	95			
S1	150	150	125	125	160	160	123,5	123,5			
T	N.14 x M10	N.14 x M10	N.14XM10	N.14XM10	N.16XM10	N.16XM10	N.28XM10	N.28XM10			
U1	1/2"	1/2"	1/2"	1/2"	3/4"	3/4"	3/4"	3/4"			
U2	1/2"	1/2"	1/2"	1/2"	3/4"	3/4"	3/4"	3/4"			

NOTE: values in brackets refer to version ME.

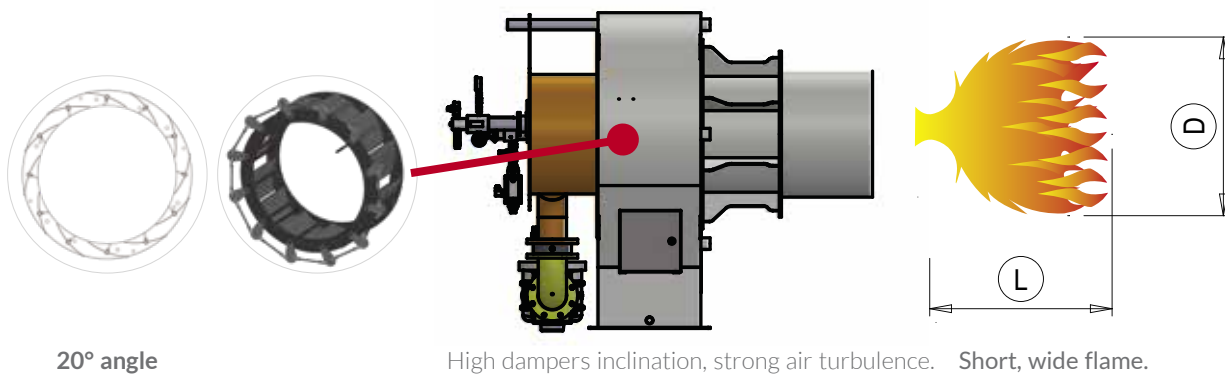
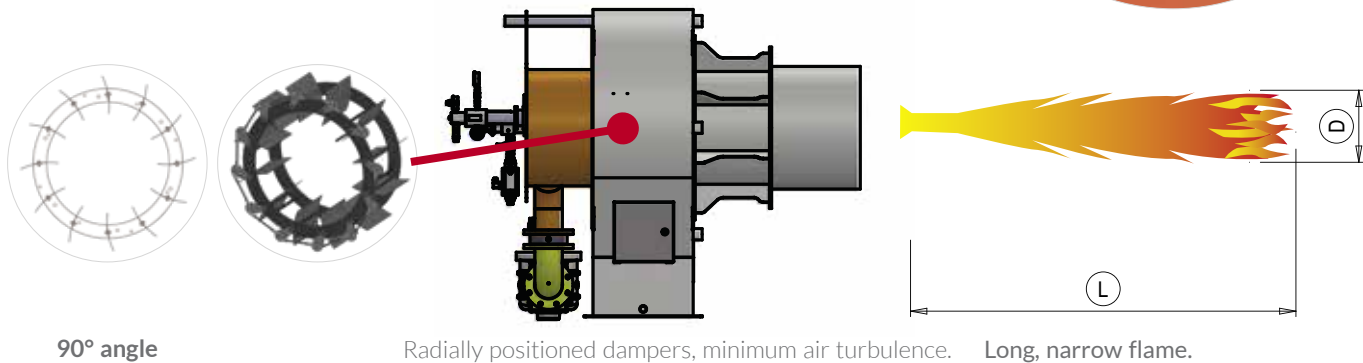


FLAME ADJUSTMENT AND SIZES

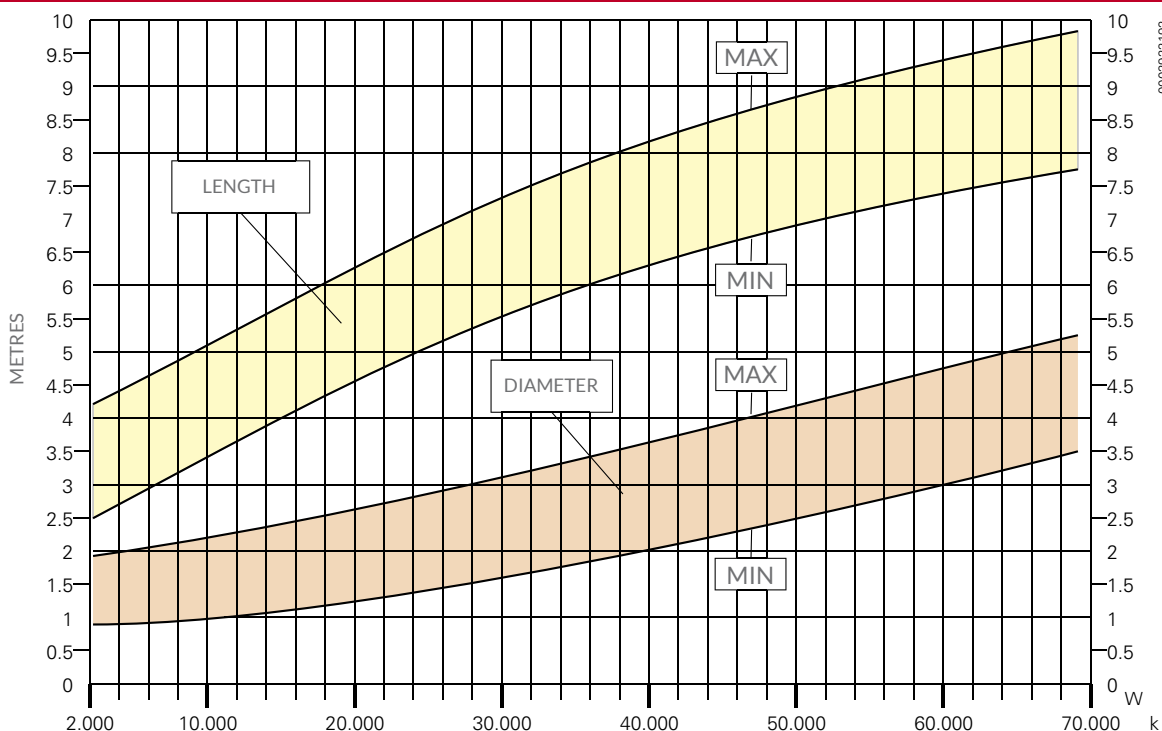
Variable geometry flame

The burner is equipped with an air regulator on the combustion head, used to modify, within broad limits, the shape of the flame (diameter-length) to adapt it to the furnace geometry.

Adjustment is carried out using the control (RH image), by selecting the opening angle of dampers that compose the regulator, changing the combustion air flow geometry.

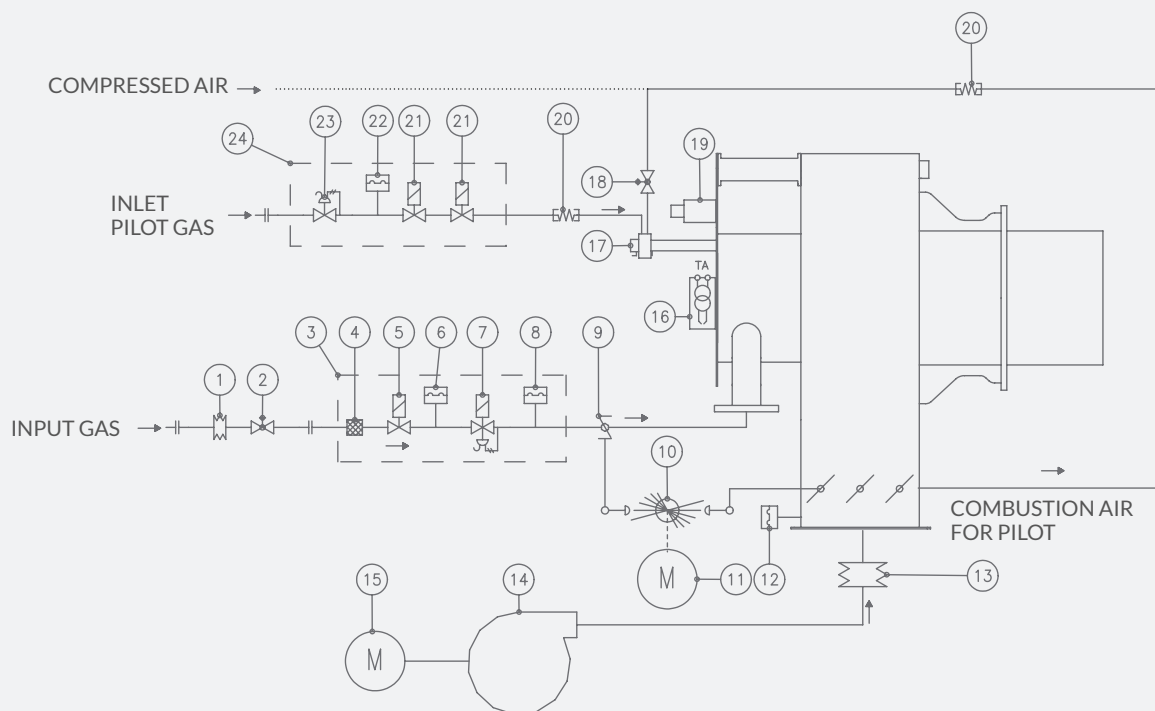


FLAME SIZE DIAGRAM



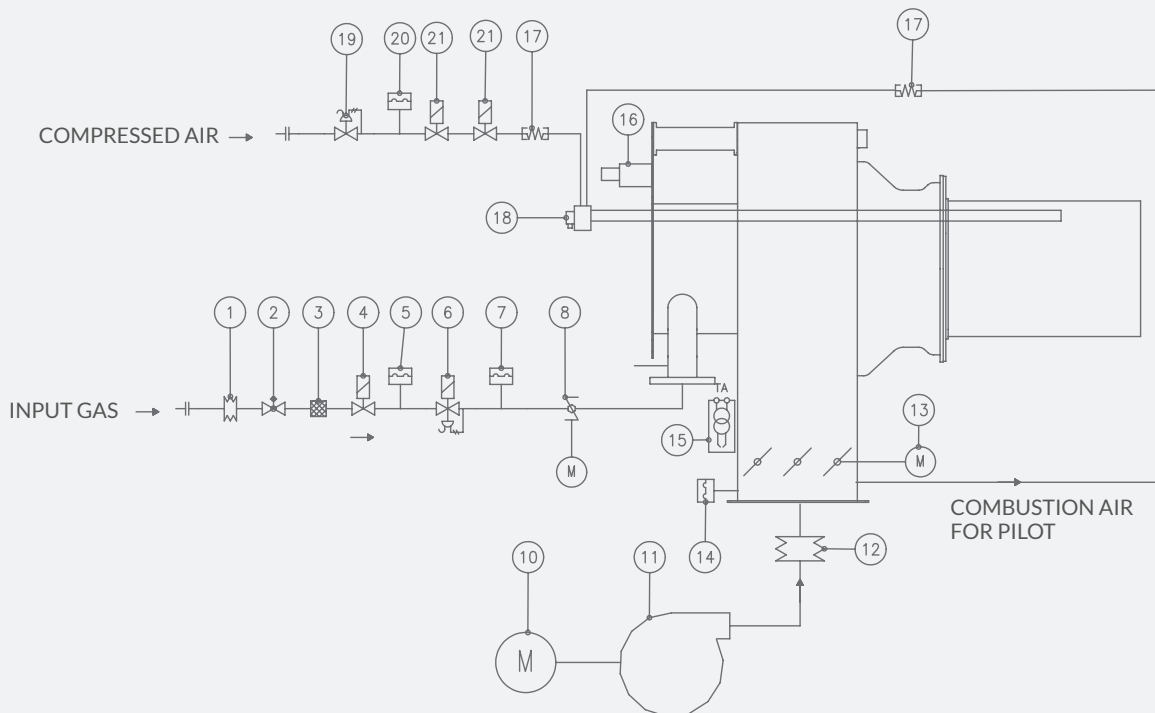


TBR G MC FUNCTIONAL DIAGRAM



- | | | |
|---|--------------------------------|---------------------------------|
| 1 Gas vibration-proof joint. | 9 Butterfly gas valve. | 17 Gas ignition pilot. |
| 2 Ball valve. | 10 Mechanical cam. | 18 Air flow manual regulator. |
| 3 Main gas train. | 11 Modulation servomotor. | 19 Flame detection sensor. |
| 4 Gas filter. | 12 Air pressure switch. | 20 Hose. |
| 5 Safety solenoid valve. | 13 Air vibration-proof joint. | 21 Pilot safety solenoid valve. |
| 6 Minimum pressure switch and seal control. | 14 Fan. | 22 Minimum gas pressure switch. |
| 7 Operating solenoid valve with pressure regulator. | 15 Fan motor. | 23 Gas pressure regulator. |
| 8 Maximum gas pressure switch. | 16 Pilot ignition transformer. | 24 Pilot gas train. |

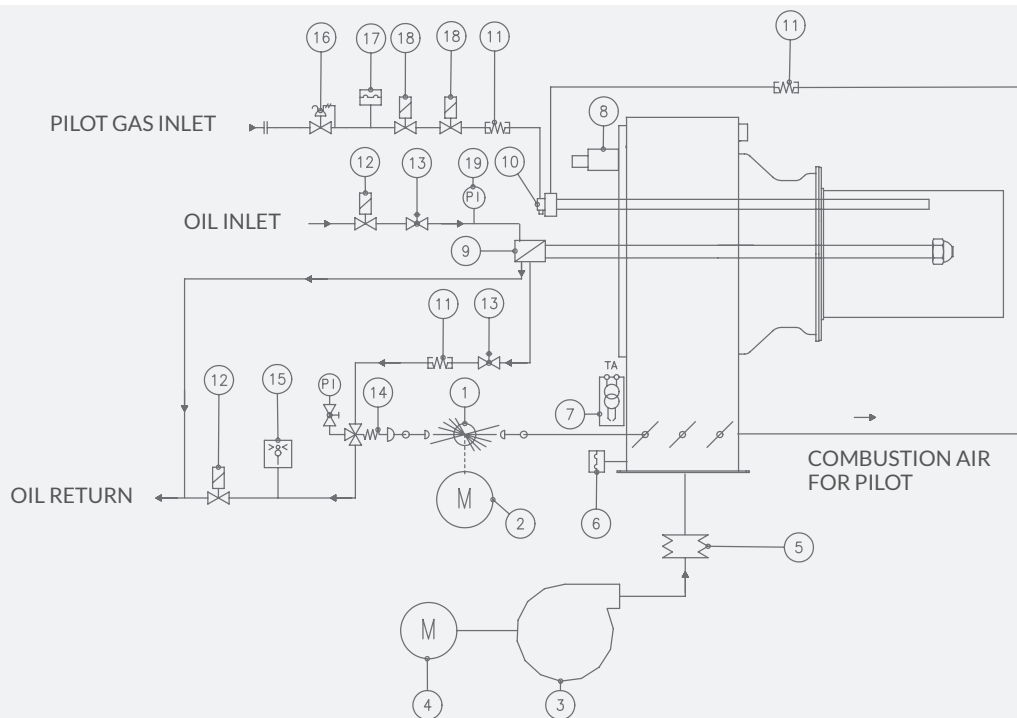
TBR G ME FUNCTIONAL DIAGRAM



- | | | |
|---|--------------------------------|---------------------------------|
| 1 Gas vibration-proof joint. | 9 Butterfly gas valve. | 17 Gas ignition pilot. |
| 2 Ball valve. | 10 Mechanical cam. | 18 Air flow manual regulator. |
| 3 Main gas train. | 11 Modulation servomotor. | 19 Flame detection sensor. |
| 4 Gas filter. | 12 Air pressure switch. | 20 Hose. |
| 5 Safety solenoid valve. | 13 Air vibration-proof joint. | 21 Pilot safety solenoid valve. |
| 6 Minimum pressure switch and seal control. | 14 Fan. | 22 Minimum gas pressure switch. |
| 7 Operating solenoid valve with pressure regulator. | 15 Fan motor. | 23 Gas pressure regulator. |
| 8 Maximum gas pressure switch. | 16 Pilot ignition transformer. | 24 Pilot gas train. |

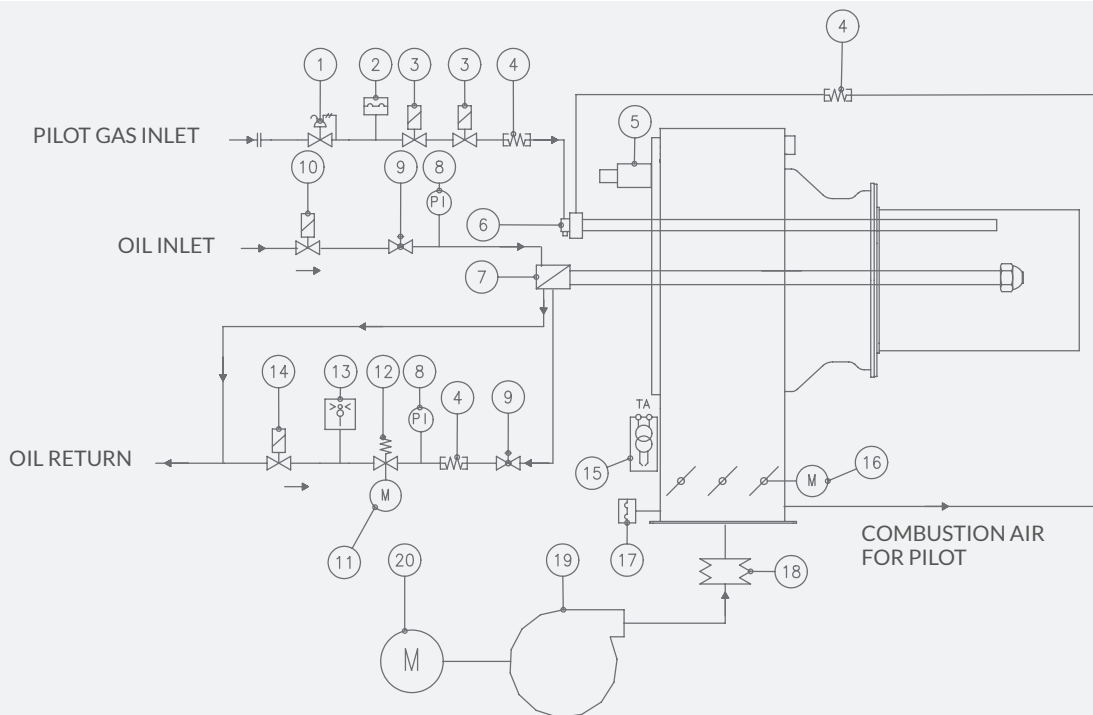


TBR L MC FUNCTIONAL DIAGRAM



- | | | |
|------------------------------|--|---|
| 1 Mechanical cam. | 8 UV flame sensor. | 15 Oil pressure switch. |
| 2 Modulation servomotor. | 9 Diesel lance with incorporated solenoid valve. | 16 Gas pressure regulator. |
| 3 Fan. | 10 Gas pilot. | 17 Gas pressure switch for pilot control. |
| 4 Fan motor. | 11 Hose. | 18 Pilot solenoid valve. |
| 5 Air vibration-proof joint. | 12 Circuit 110V-50Hz solenoid valve. | |
| 6 Air pressure switch. | 13 Ball valve. | |
| 7 Ignition transformer. | 14 Oil pressure regulator. | |

TBR L ME FUNCTIONAL DIAGRAM



- | | | |
|--|---|-------------------------------|
| 1 Gas pressure regulator. | 9 Ball valve. | 17 Air pressure switch. |
| 2 Gas pressure switch for pilot control. | 10 Circuit input 110V-50Hz solenoid valve. | 18 Air vibration-proof joint. |
| 3 Pilot solenoid valves. | 11 Oil servomotor. | 19 Fan. |
| 4 Flexible pipe. | 12 Two-way SA pressure regulator. | 20 Fan motor. |
| 5 UV flame sensor. | 13 Oil pressure switch. | |
| 6 Gas pilot. | 14 Circuit return 110V-50Hz solenoid valve. | |
| 7 Diesel lance with incorporated solenoid valve. | 15 Ignition transformer. | |
| 8 Oil pressure gauge. | 16 Air servomotor. | |



The diagram illustrates a gas engine system with the following components and connections:

- Inlets and Returns:**
 - GAS INLET:** Enters from the left, passing through components 1, 2, 3, 4, 5, 6, 7, and 8.
 - PILOT GAS INLET:** Enters from the top left, passing through components 25, 26, 27, and 28.
 - OIL INLET:** Enters from the top left, passing through components 20 and 21.
 - OIL RETURN:** Exits from the bottom left, passing through components 24 and 23.
 - COMBUSTION AIR FOR PILOT:** Enters from the bottom right, passing through component 13.
- Engine and Associated Components:**
 - Engine (16):** The central component, a gas engine.
 - Compressor (11):** Driven by motor (12), it feeds into the engine.
 - Valves and Actuators:** Various valves (17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28) and actuators (15, 14) are distributed throughout the system.
 - Pressure Transducer (P1):** Located near the oil inlet.
 - Motor (M):** Multiple motors are shown, including one driving the compressor (12) and others (10, 9) driving actuators.
 - Flow Indicators:** Arrows indicate the direction of flow for gas, oil, and air.

- | | | |
|---|---|--|
| 1 Anti-vibration joint. | 11 Fan. | 21 Ball valve. |
| 2 Ball valve. | 12 Fan motor. | 22 Oil pressure regulator. |
| 3 Gas filter. | 13 Air vibration-proof joint. | 23 Oil pressure switch. |
| 4 Safety solenoid valve. | 14 Air pressure switch. | 24 Circuit return 110V-50Hz solenoid valves. |
| 5 Minimum gas pressure switch and seal control. | 15 Ignition transformer. | 25 Gas pressure regulator. |
| 6 Operating solenoid valve with pressure regulator. | 16 UV flame sensor. | 26 Gas pressure switch for pilot control. |
| 7 Maximum pressure switch. | 17 Diesel lance with incorporated solenoid valve. | 27 Pilot solenoid valve. |
| 8 Butterfly gas valve. | 18 Gas pilot. | 28 Oil pressure gauge. |
| 9 Mechanical cam. | 19 Hose. | |
| 10 Modulation servomotor. | 20 Circuit input 110V-50Hz solenoid valve. | |

The diagram illustrates the fluid supply system for a combustion chamber. It includes three main inlet lines: PILOT GAS INLET, OIL INLET, and GAS INLET. The PILOT GAS INLET line (top) features a pressure indicator (PI) and a flow control valve (18). The OIL INLET line (middle) includes a pressure indicator (PI) and a flow control valve (17). The GAS INLET line (bottom) has a pressure indicator (PI) and a flow control valve (16). The system also includes an OIL RETURN line (left) with a pressure indicator (PI) and a flow control valve (15). The GAS INLET line is connected to a combustion air supply system (right) via a pressure indicator (PI) and a flow control valve (14). The combustion air supply system includes a pressure indicator (PI) and a flow control valve (13). The diagram is labeled with various components and their connections, including a pressure indicator (PI) and a flow control valve (18).

- | | | |
|---|---|--|
| 1 Anti-vibration joint. | 11 Fan. | 21 Ball valve. |
| 2 Ball valve. | 12 Air vibration-proof joint. | 22 Circuit return 110V-50Hz solenoid valves. |
| 3 Gas filter. | 13 Air servomotor. | 23 Oil pressure switch. |
| 4 Safety solenoid valve. | 14 Air pressure switch. | 24 Two-way SA pressure regulator. |
| 5 Minimum gas pressure switch and seal control. | 15 Ignition transformer. | 25 Oil servomotor. |
| 6 Operating solenoid valve with pressure regulator. | 16 UV flame sensor. | 26 Gas pressure regulator. |
| 7 Maximum pressure switch. | 17 Diesel lance with incorporated solenoid valve. | 27 Gas pressure switch for pilot control. |
| 8 Butterfly gas valve. | 18 Gas pilot. | 28 Pilot solenoid valve. |
| 9 Gas servomotor. | 19 Hose. | 29 Oil pressure gauge. |
| 10 Fan motor. | 20 Circuit input 110V-50Hz solenoid valve. | |



The table below shows the configuration of the controls installed as standard on all versions and the options that can be activated upon request (optional).

CONTROL CONFIGURATION	TBR.. MC	TBR.. ME
Panel electric protection rating IP 55	•	•
Electrical panel	•	•
Control unitLFL	•	ND
Control unitLGK	•	ND
Control unitLME73	•	ND
Control unitBURNER PROTM	•	ND
Control unitBURNER PROF	•	ND
Control unitETAMATIC OEM	ND	•
Control unitETAMATIC OEM/S (ME-V inverter versions)	ND	•
Control unitCMS	ND	•
Control unitSLATE	ND	◦
Intermittent operation (1 stop every 24h)	•	•
Continuous operation (1 stop every 72h)	•	•
Power check LC3	•	Included*
Power check RWF 55	◦	
Valve seal check LDU 11	•	Included
Fan motor star/triangle start	•	•
Door-lock switch	•	•
Protection fuses	◦	◦
Power meter	•	•
Thermal relay	•	•
Burner command switch	•	•
Emergency button	•	•
Alarm reset button	•	on LCD display
Manual/automatic switch	•	ND
Voltage indicator light	•	•
Appliance shut-down indicator light	•	•
Fan motor shutdown indicator light (ME-V inverter version excluded)	•	•
Valve seal control shutdown indicator light	•	on LCD display
Generic shutdown indicator light	•	•
Dry contacts	•	◦
Remote start/stop		◦
Programming unit	ND	◦
Programming software	ND	◦
PC connection cable (10 m)	ND	◦
Output load feedback board 4-20 mA	ND	◦
Remote set-point board	ND	◦
Remote reset board	◦	◦
BUS interface board	ND	◦
Siren	◦	◦
Special power supply voltage	◦	◦
O ₂ control	ND	◦
O ₂ /CO control	ND	◦
FGR external fume recirculation	ND	◦
Inverter	ND	◦

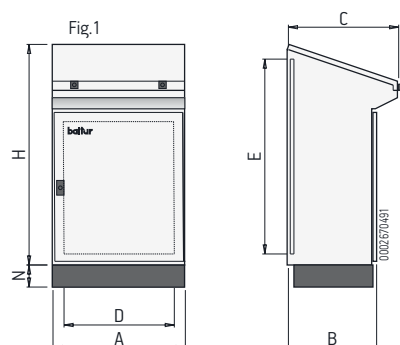


ELECTRICAL PANEL

The size and type of electrical panel vary according to the configuration of the burner used (e.g. electronic cam or mechanical cam burner) and to the number of commands and controls that it must manage, therefore a specific control panel is designed, dimensioned and supplied for each application. Components such as equipment, remote control switches, thermal relays and protections are fixed on a DIN metal bar inside the panel, while switches, warning lights, regulators and indicators are fixed and visible on the panel shelf. The electrical panel protection rating is IP55. Furthermore, the control panel is provided with a PID power regulator for load modulation. Usually this regulator is combined with a modulation kit that must be chosen according to the type of system (pressure or temperature probe). The previous table lists the “standard supply statuses” of control panels in mechanical and electronic cam versions; moreover, some special constructions

are provided on specific request of the customer. The electric panel consists of:

- burner control and command equipment;
- gas valve seal control equipment;
- modulation electronic regulator;
- main switch/disconnector with panel holder block;
- control switches;
- remote control switches;
- protection thermal relays;
- auxiliary relays;
- protections with fuses;
- operation, shut-down and control signals with warning lights;
- connection terminal boards.



MODEL	Fig.	A	B	C	D	E	H	N
QL06	Fig. 1	600	405	525	500	875	1000	100

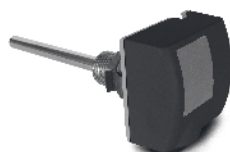
Model	Packing dimensions		
	L	D	H
	mm		
QL06	1520	755	721

MODULATION PROBES

Probe choice

Depending on the parameter to be controlled: temperature (°C) or pressure (bar), choose the adjustment range comprising the operating value of the boiler.

When this value is between two adjustment ranges, choose the lower one.



Temperature probe kit for IB... G MC

MODEL	Temperature	Probe type	Probe length	Connection Male
98000023	0 °C ÷ 130 °C	PT 1000	85 *)	R 1/2"
98000021	0 °C ÷ 500 °C	PT 1000	200 *)	G 1/2"
98000022	0 °C ÷ 1100 °C	Thermocouple	425 *)	R 1/2"

Temperature probe kit for IB... G ME

MODEL	Temperature	Probe type	Probe length	Connection Male
98000035	0 °C ÷ 500 °C	PT 100	100 *)	G 1/2"

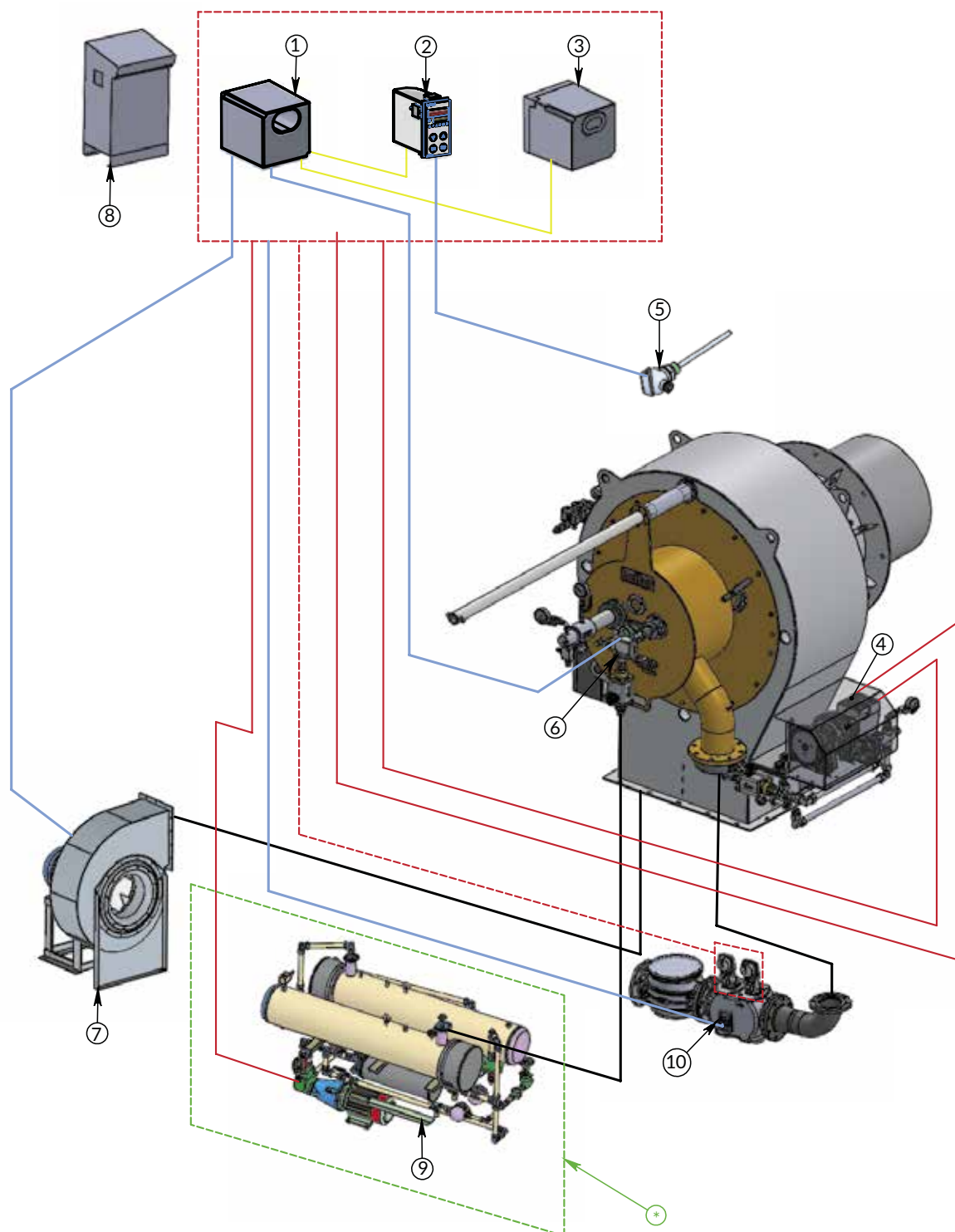
Steam pressure probe kit

MODEL	Steam pressure	Signal output	Connection Male
98000045	0 ÷ 1 bar	0 ÷ 10 V	G 1/2"
98000046	0 ÷ 10 bar	0 ÷ 10 V	G 1/2"
98000047	0 ÷ 16 bar	0 ÷ 10 V	G 1/2"
98000048	0 ÷ 25 bar	0 ÷ 10 V	G 1/2"
98000049	0 ÷ 40 bar	0 ÷ 10 V	G 1/2"

Notes:

For different modulation values contact our Technical Assistance Service.

*) Different lengths upon request.

**TBR G MC, TBR GL MC CHECK DIAGRAM (standard versions)**

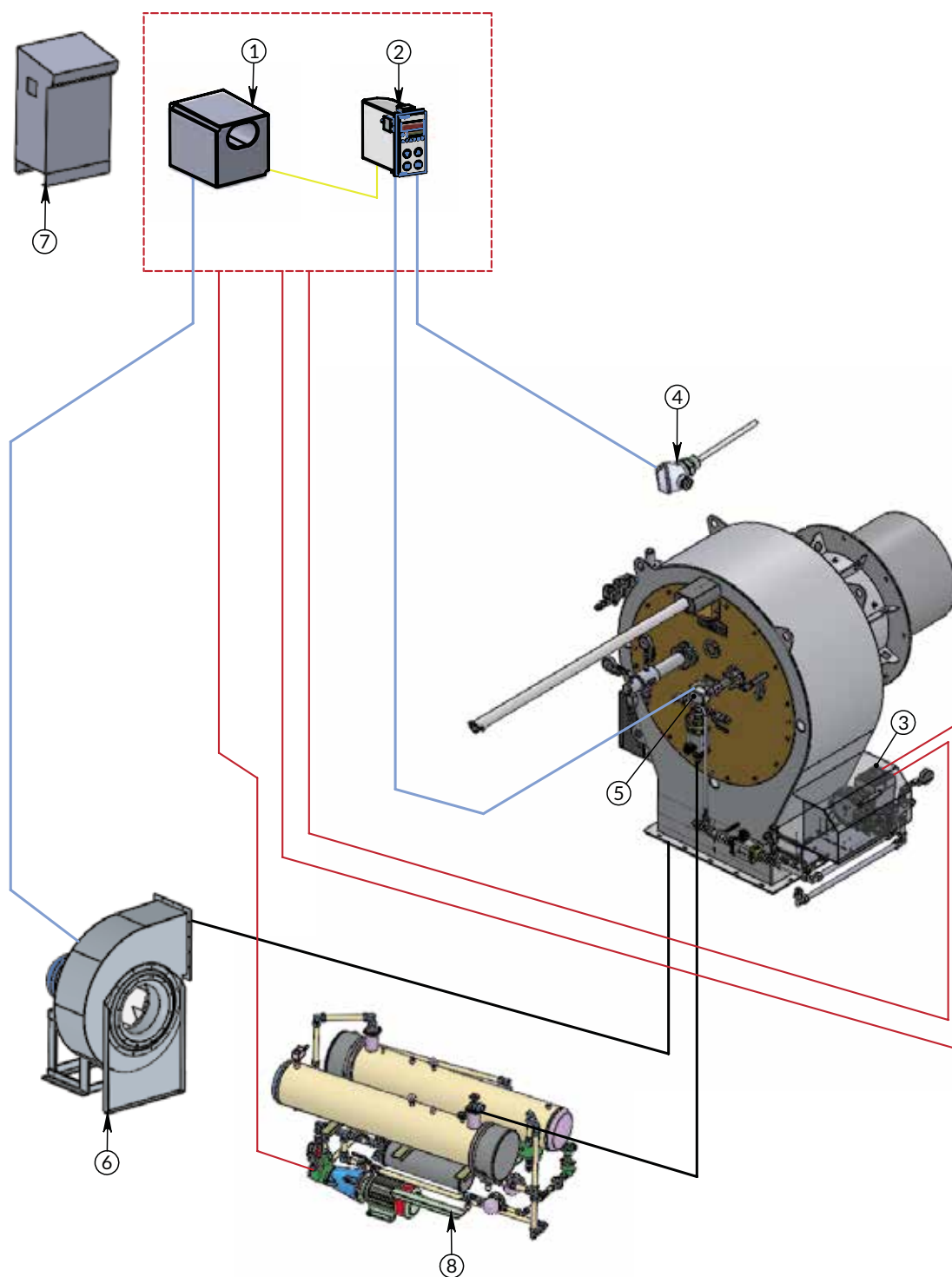
1. LFL check
2. P.I.D. power check LC3
3. Valve sealing check LDU11
4. Air-gas regulation actuator
5. The temperature sensor
6. Flame detection sensor
7. Fan
8. Electrical panel
9. Diesel pumping unit
10. Valve sealing check

- Input signal in control panel
- Output signal in control panel
- Electrical connections inside the electrical panel
- Mechanical control

* for GL MC versions only



TBR L MC CHECK DIAGRAM (standard version)



1. LFL check
2. P.I.D. power check LC3
3. Air-gas regulation actuator
4. The temperature sensor
5. Flame detection sensor
6. Fan
7. Electrical panel
8. Diesel pumping unit

- Input signal in control panel
- Output signal in control panel
- Electrical connections inside the electrical panel
- Mechanical control



ETAMATIC (S) FUNCTIONAL DIAGRAM

INPUTS

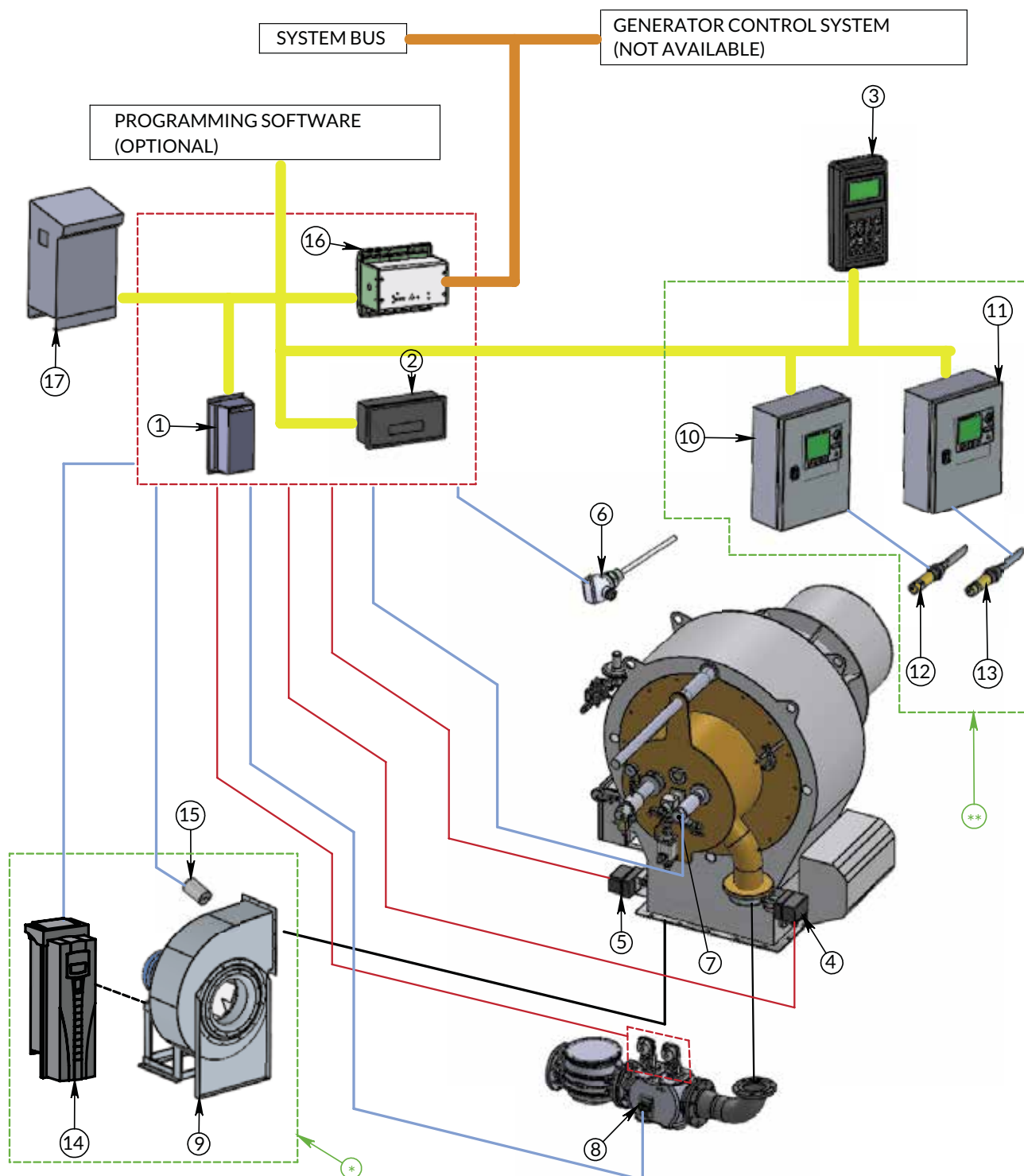
24V digital inputs	
→	Burners "ON"
→	Flame sensor signal....
→	Gas safety sequence
→	Version check
→	MAX oil pressure
→	Set-point change
→	Flame ignition signal/MAX gas pressure
→	General safety sequence
→	Oil safety sequence
→	Fuel selection
→	Oil min.pressure/vaporisation pressure
→	Valve sealing test
→	Differential air pressure switch
Return signals from servomotors	
→	Channel 2 signal (potentiometric)
→	Channel 1 signal (potentiometric, speed, current 4...20 mA)
→	Channel 3 signal (potentiometric)
→	Channel 4 signal (potentiometric)
Load/power check	
→	External power regulator (potentiometric, DPS current 4...20 mA)
→	Generator PT1000 probe
→	External thermostat (current)
Communication inputs (through modules) between LSB and external BUS (Ethernet, Profibus, Modbus, Interbus)	
Digital inputs (LSB)	
→	Stand-by mode
→	Continuous ventilation
→	Ignition high frequency detection
→	Version error
Analogue inputs (LSB)	
12 analogue inputs available for special activations	

OUTPUTS

Burner sequence solenoid valves	
Gas valve 1	→
Gas valve 2	→
Depending on the type of supply	
Oil valve	→
Ignition valve	→
Gas valve 1	→
Fan	→
Oil pump "ON"	→
ETAMATIC control fault	→
Servo motor activation	
Channel 1 (DPS or current)	→
Channel 2 (DPS or current*) * Through LSB module	→
Channel 3 (DPS)	→
Channel 4 (DPS)	→
Load/power outputs	
Internal load output (current)	→
Communication inputs (through modules) between LSB and external BUS (Ethernet, Profibus, Modbus, Interbus)	
Digital inputs (LSB)	
Operation type: pre-ventilation, start up, operating, post-ventilation	→
Fuel used	→
Activation status information: ignition position reached, ignition frequency reached	→
Analogue inputs (LSB)	
O ₂ actual value	
Set-point channel 2	
Flame intensity	



TBR G ME CHECK DIAGRAM (all versions)



1. ETAMATIC OEM (S) control
2. User interface
3. Programming unit (optional)
4. Gas damper actuator
5. Air damper actuator
6. The temperature sensor
7. Flame detection sensor
8. Valve sealing check
9. Fan
10. Transmitter with CO probe display mod. LT2 (optional)
11. O2 probe transmitter
12. O2 probe mod. LS2 (optional)

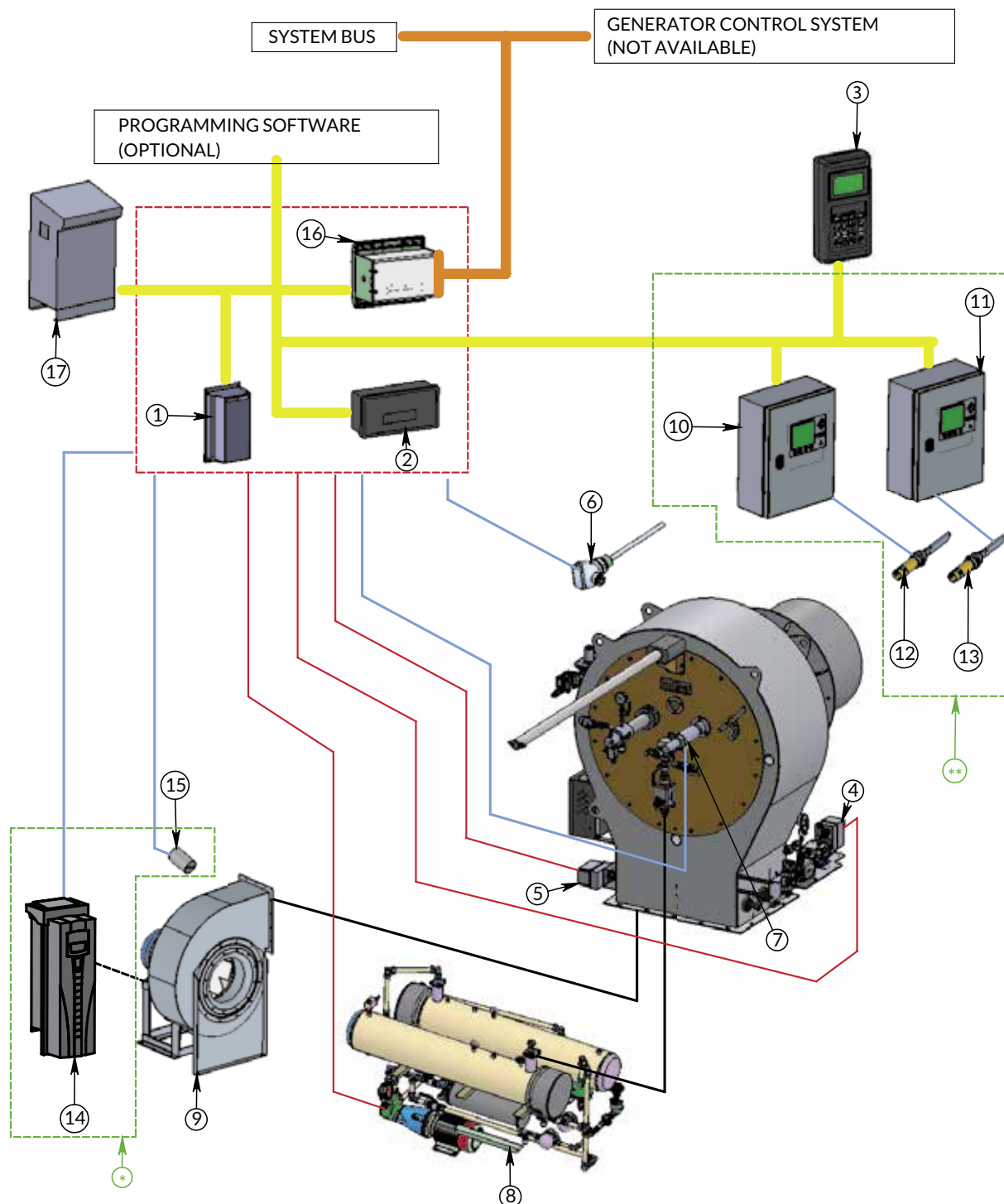
13. CO probe mod. KS1 (optional)
14. Inverter (optional)
15. Speed sensor
16. BUS interface board (optional)
17. Electrical panel

- Electrical bus connections
-  Input signal in control panel
-  Output signal in control panel
- Mechanical control

* for G ME-V versions only
** for G ME-V O2 CO versions only



TBR L ME CHECK DIAGRAM (all versions)



1. ETAMATIC OEM (S) control
2. User interface
3. Programming unit (optional)
4. Diesel pressure regulator actuator
5. Air damper actuator
6. The temperature sensor
7. Flame detection sensor
8. Diesel pumping unit
9. Fan
10. Transmitter with CO probe display mod. LT2 (optional)
11. O2 probe transmitter
12. O2 probe mod. LS2 (optional)

13. CO probe mod. KS1 (optional)
14. Inverter (optional)
15. Speed sensor
16. BUS interface board (optional)
17. Electrical panel

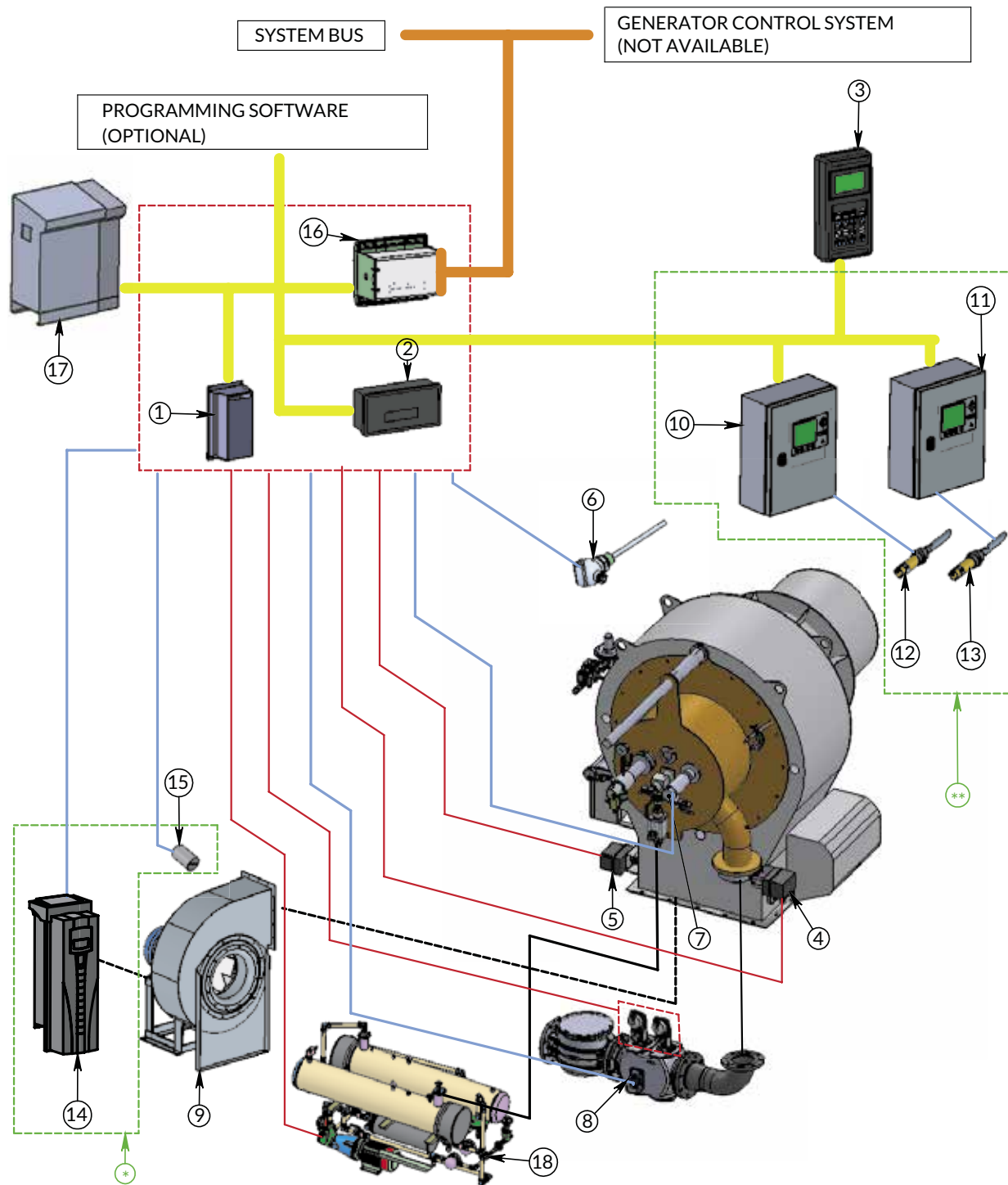
— Electrical bus connections
— Input signal in control panel
— Output signal in control panel
— Mechanical control

* for G ME-V versions only

** for G ME-V O2 CO versions only



TBR GL ME CHECK DIAGRAM (all versions)



1. ETAMATIC OEM (S) control
2. User interface
3. Programming unit (optional)
4. Gas damper actuator
5. Air damper actuator
6. The temperature sensor
7. Flame detection sensor
8. Valve sealing check
9. Fan
10. Transmitter with CO probe display mod. LT2 (optional)
11. O2 probe transmitter
12. O2 probe mod. LS2 (optional)
13. CO probe mod. KS1 (optional)

14. Inverter (optional)
15. Speed sensor
16. BUS interface board (optional)
17. Electrical panel
18. Diesel pumping unit

Yellow line: Electrical bus connections
 Blue line: Input signal in control panel
 Red line: Output signal in control panel
 Black line: Mechanical control

* for G ME-V versions only
 ** for G ME-V O2 CO versions only



O₂ - CO

In thermal processes of combustion it is convenient to operate in such a way as to obtain the complete oxidation of all of the fuel, avoiding that significant amounts of unburnt products remain in the combustion products. In principle, the complete combustion of the fuel may also be obtained by employing the stoichiometric amount of combustion air.

In practice, however, it is necessary to operate with more combustion air than the stoichiometric minimum, to ensure almost complete oxidation of the fuel. However, if the excess air is greater than a given value, there is the risk of an excessive flame cooling and subsequent increase of considerable losses of heat dissipated to the chimney and increase of pollutant emissions. It is therefore clear that it is necessary to keep the air-fuel ratio within a suitable range, able to ensure the maximum combustion yield and the minimum air pollution.

The determination of the excess air is done through the measurement of the % quantity of oxygen in the exhaust fumes. The system for oxygen active control comprises:

- a zirconium oxide probe positioned at the combustion chamber outlet or in the chimney,
- a check and adjustment equipment.

The regulator, through the probe, monitors and measures the value of oxygen in the fumes and, controlling a servomotor, it changes the amount of combustion air automatically, keeping the air/fuel

ratio optimal, thus guaranteeing high performance with low pollution.

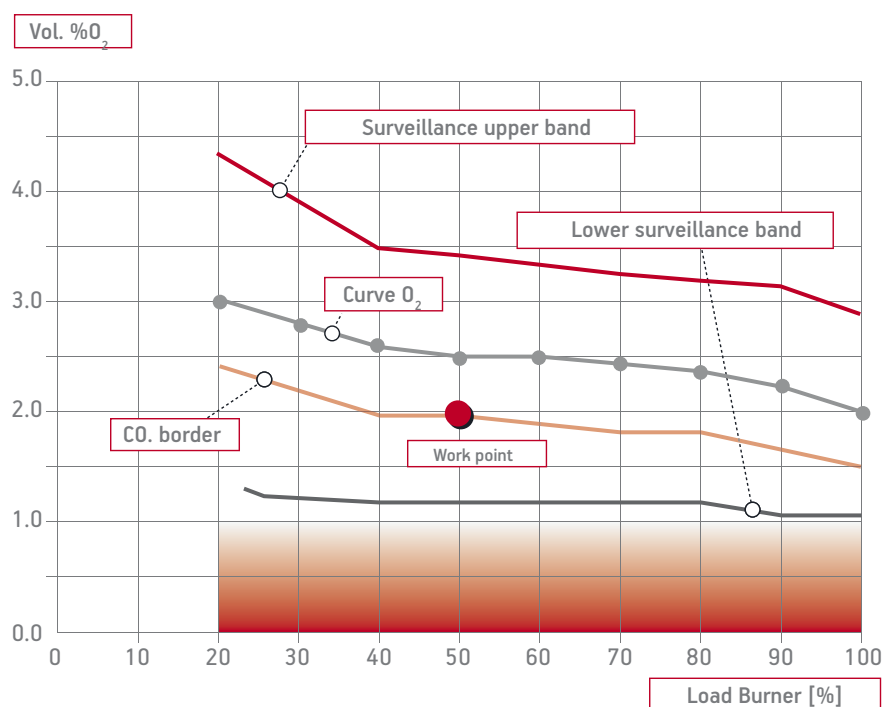
The advantages of this system can be better understood with an example:

- system power from 6MW
- natural gas fuel
- use: 50 weeks per year, 5 days per week, 16 hours per day.
- by adding the O₂ control on the system where the oxygen percentage can be reduced by 2.5%, the energy saving that can be reached is: 52TEP (Tonne oil equivalent) and 142 tonnes per year of CO₂, equal to 2%.

Even better, only for gas burners, is the return that can be achieved by controlling CO.

In this case the combustion air is further reduced (using also an inverter, if any) through the air servo motor, until some tens of CO ppm are detected in the chimney.

With the CO control it is possible to ensure the minimum possible excess air in the whole operating range and to increase energy efficiency by further 0.5% with respect to O₂ control.



The oxygen values are indicative and refer to heat generators with 3 smoke passes. The optimal oxygen values can change according to the type of boiler.



INVERTER

Energy costs and the pollution connected to its production lead us to pay increasing attention to the consumption of primary energy. Therefore, it is necessary to manufacture systems with increasingly higher yield. Today non-dissipative regulation systems are preferred, as they reduce losses to a minimum. As is known, the fan motor of a burner in standard configuration absorbs an electrical power from the mains that can be assumed as constant when burner operating power varies.

In fact, fan air flow rate is adjusted only by the adjustment dampers, which close when the power requested decreases, thus limiting air inlet section. In this way a greater load loss is induced, which dissipates a part of the electrical power provided by the fan motor.

In this configuration, the fan has a fairly constant rotation rate, which produces the maximum noise with any partial operation load. It is possible to improve the situation by integrating a static frequency converter inside the control panel, which changes the fan rotation rate when the burner power changes. The frequency converter receives the signal that regulates the number of revolutions directly from the electronic regulator of the burner.

Air dampers, that in TBR models are installed on the burner, perform a fine adjustment of air flow rate and the adjustment of air dynamic pressure to the combustion head, in particular during transient phases.

The use of the frequency converter allows for substantial savings on electricity consumption to power the fan, with peaks of 70% at minimum burner output and a weighted average annual reduction of approximately 30%.

Example:

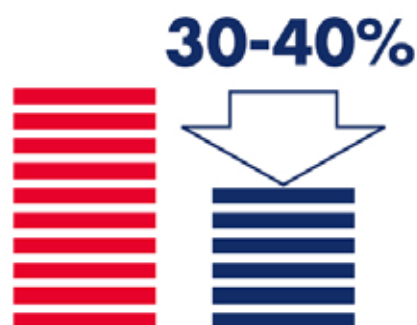
- Gas burner TBR 9 G ME-V
- Thermal power 9 MW
- Supplied by a fan with approx 22 kW motor

Assuming installation in a process system and therefore a burner operation equal to 6,000 hours/year, the following results:

- average consumption without inverter 145,000 kWh/year,

- average consumption with inverter 90,000-100,000 kWh/year.

This means a saving of primary energy of 30 to 40 %



The second major benefit arising from the use of an inverter for fan revolution adjustment is the remarkable reduction of noise pressure at partial burner loads, with peaks that can reach 30% at minimum burner output with respect to the standard solution with air flow control carried out exclusively by the dampers and fan always at motor rated speed.





FAN DIMENSIONING

DATABASE FOR FAN SELECTION

Search to be performed according to:

- operation condition
- features of combined burner

QaSm³/h

Combustion air flow rate

Pst

mbar

System total static pressure

CALCULATION OF COMBUSTION AIR FLOW RATE **Qa**

The combustion air flow rate is directly proportional to the flow of burnt fuel. To calculate air flow rate **Qa** required for combustion of a gaseous fuel (whose **Hi** lower calorific power is known), it is necessary to know the fuel flow rate and the percentage value of residual oxygen contained in the fumes.

Qc calculation (fuel flow rate)

$$Q_c = P_f / H_i$$

QcSm³/h or kg/h

Fuel flow rate

O₂

%

Dry smoke residue oxygen

HikWh/Sm³ or kW/h/kg

Lower calorific power

Pf*

kW

Thermal output at furnace

*If the datum available is the heat generator rated thermal output **Pn** (kW) and its efficiency η , thermal output at furnace is calculated as: **Pf = Pn/η**

Qa calculation (combustion air flow rate)

$$Q_a = (Q_c \times K_c) / f_c^*$$

QaSm³/h

Combustion flow rate

QcSm³/h or kg/h

Fuel flow rate

Kc

-

Air flow per fuel unit (Diag.1)

fc

-

Correction factor (Tab. 2)

* Correction factor of the air flow depending on intake air temperature and altitude above sea level.

fc = 1.000 if Ambient Temp. = 15°C. Atmospheric pressure = 1013 mbar and Altitude = 0 masl.

USEFUL PRESSURE CALCULATION OF HU FAN

In order to choose the fan to match to the burner, the System static pressure must be known. This value is obtained from all the load losses and the actual working conditions (Air temperature and altitude), deriving from the single components of the thermal system:

$$P_{st} = P_{cc} + \Delta P_{tc} + \Delta P_{pa} + \Delta P_{ca}$$

Pcc

mbar

Combustion chamber compression

ΔPtc

mbar

Combustion head load loss

ΔPpa

mbar

Pre-heating load loss

ΔPca

mbar

Air pipe load loss

As a consequence: **Hu ≥ Pst**

Hu calculation (fan useful minimum pressure)

$$H_u \geq P_{cc} + (\Delta P_{tc} / f_c) + \Delta P_{pa} + \Delta P_{ca}$$

Pcc → the value must be given by the boiler manufacturer, specifying the installation conditions.

ΔPtc_{eff}* → combustion head load loss, obtained in std. conditions (Diagram 2), corrected by **fc** factor (Table 2) according to air temperature and altitude conditions: **fc = 1** with air 15°C, atmospheric pressure 1013 mbar and 0 masl.

The value is determined as a function of the swirler adjustment (which is determined as a function of geometry and combustion chamber dimension on which the TBR is installed).

Load loss of combustion head in standard reference conditions is obtained from the graphs relevant to the various burner models.

For each TBR series model the above mentioned graphs contain the burner load losses, depending on two different swirler adjustments:

- Swirler at 20°
- Swirler at 90°

ΔPpa → the value must be given by the manufacturer of the pre-heating system.

ΔPca → to be determined according to the size and geometry of the air pipes.



FAN SELECTION EXAMPLE

DATABASE

DIATHERMIC OIL generator with three smoke passes	Pn	kW	12500	Generator power
	η	%	92	Generator efficiency
	Pcc	mbar	13	Combustion chamber counter-pressure
	H	masl	1500	Altitude
	Tac	°C	210	Combustion air temperature
	Ta	°C	30	Room temperature
	ΔPpa	mbar	4	Pre-heater load loss
	O₂	%	4	Dry smoke residue oxygen
	Methane	-	-	Fuel
	Hi	kWh/Sm ³	9.7	Lower calorific power
	Air channel	-	-	Length 15 m. Straight duct + 3 90° curves



CALCULATION OF COMBUSTION AIR FLOW RATE Qa

Qc calculation (fuel flow rate)

$$Q_c = P_f / H_i = (P_n / \eta) / H_i = (12,500 / 0.92) / 9.7 = 13,587^{(1)} / 9.7 = 1400.7 \text{ Sm}^3/\text{h}$$

⁽¹⁾ Value of P_f (furnace power)

Qa calculation (fuel flow rate)

$$Q_a = (Q_c \times K_c) / f_{c^*} = (1400.7 \times 12^{(2)}) / 0.793^{(3)} = 21,196 \text{ Sm}^3/\text{h}$$

⁽²⁾ Value obtained from Diagram 1, according to the type of fuel (Natural gas) and value O₂ (4%)⁽³⁾ Value obtained from Diagram 2, according to the room air temperature (30°) and altitude (1500 masl)

USEFUL PRESSURE CALCULATION OF HU FAN

According to P_f = 13,587 kW, the burner model to be used is TBR 20 G ME

Because of the combustion chamber geometry, Swirler adjustment must be at approx. 30°. In the diagram of TBR 20, it is possible to note, in the required power item, that the combustion head load loss on air side is approx. 25 mbar (in Standard conditions).

$$\Delta P_{tceff} \text{ TBR 20 G ME} = (\Delta P_{tc} / f_c) = 25^{(5)} / 0.498^{(6)} = 50.2 \text{ mbar}$$

For model TBR 20 G, the value of combustion head load loss on air side, at maximum power (20,000 kW), is 66.5 mbar (see diagram on page 46), therefore TBR 20 G ME is suitable for the application.

⁽⁵⁾ value obtained from Diagram on page 46.⁽⁶⁾ value obtained from Table 2, according to the combustion air temperature (210°C) and altitude (1500 masl).

Hu calculation (fan useful minimum pressure)

$$H_u = P_{cc} + (\Delta P_{tc} / f_c) + \Delta P_{pa} + \Delta P_{ca} = 13 + 50.2 + 4 + 3^{(7)} = 70.2 \text{ mbar}$$

⁽⁷⁾ according to the given air pipe data, we can consider a load loss P_{ca} = 3 mbar

FAN choice

Data:

$$Q_a = 21,196 \text{ Sm}^3/\text{h}$$

$$H_u = 70.2 \text{ mbar}$$



DIRECTION AND ROTATION

Fans are chosen according to the needs of each installation, depending on the combustion air flow rate and temperature, the counter-pressure in combustion chamber, the plant altitude and the maximum level of noise allowed.

Supply status

The fan consists of:

-fan;

-electric motor;
-protection grille on suction side;
-anti-vibration and compensation joint.

To order a fan please indicate:

-combustion air flow rate [Q_{tot}];
-air total pressure [P_{tot}];
-direction
-maximum noise level.

ANTICLOCKWISE (LG)



LG 90°



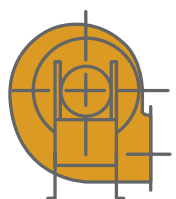
LG 135°



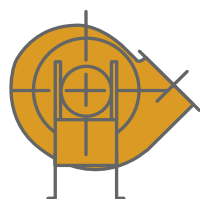
LG 180°



LG 225°



LG 270°



LG 315°



LG 0°

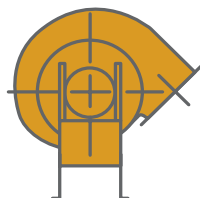


LG 45°

CLOCKWISE (RD)



RD 90°



RD 135°



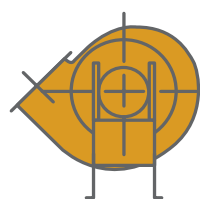
RD 180°



RD 225°



RD 270°



RD 315°



RD 0°



RD 45°



VENTILATION

DIAGRAM 1: air flow per fuel unit referred to the most common fuels.

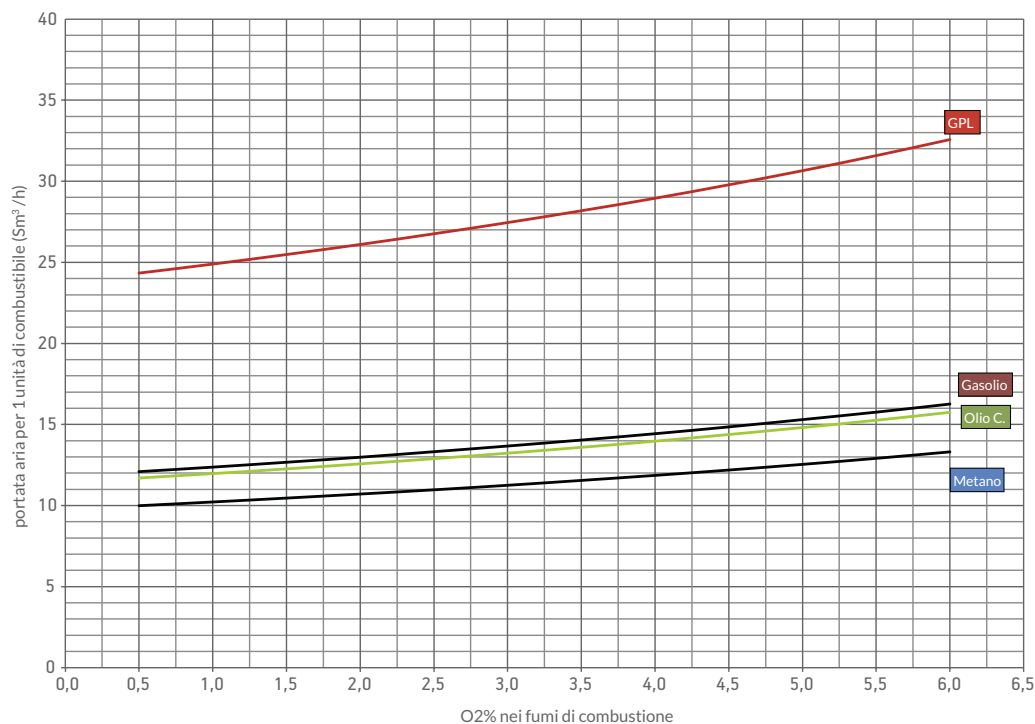


TABLE 2: correction factor (fc) of the flow depending on intake air temperature and altitude above sea level.

factor fc	Air temperature (°C)															
	0	10	15	20	30	50	70	90	110	130	150	170	190	210	230	250
0	1.055	1.018	1.000	0.983	0.951	0.892	0.840	0.793	0.752	0.715	0.681	0.650	0.622	0.596	0.573	0.551
100	1.042	1.006	0.988	0.971	0.939	0.881	0.830	0.784	0.743	0.706	0.673	0.643	0.615	0.589	0.566	0.544
200	1.030	0.994	0.977	0.960	0.928	0.871	0.820	0.775	0.734	0.698	0.665	0.635	0.608	0.582	0.559	0.538
300	1.018	0.982	0.965	0.948	0.917	0.860	0.810	0.766	0.726	0.690	0.657	0.627	0.600	0.575	0.553	0.531
400	1.006	0.970	0.953	0.937	0.906	0.850	0.801	0.757	0.717	0.681	0.649	0.620	0.593	0.569	0.546	0.525
500	0.994	0.959	0.942	0.926	0.895	0.840	0.791	0.748	0.709	0.673	0.642	0.613	0.586	0.562	0.540	0.519
600	0.982	0.947	0.931	0.915	0.885	0.830	0.782	0.739	0.700	0.665	0.634	0.605	0.579	0.555	0.533	0.513
700	0.970	0.936	0.920	0.904	0.874	0.820	0.772	0.730	0.692	0.657	0.626	0.598	0.572	0.549	0.527	0.507
800	0.959	0.925	0.909	0.893	0.864	0.810	0.763	0.721	0.683	0.649	0.619	0.591	0.565	0.542	0.520	0.501
900	0.947	0.914	0.898	0.882	0.853	0.801	0.754	0.712	0.675	0.642	0.611	0.584	0.559	0.535	0.514	0.494
1000	0.936	0.903	0.887	0.872	0.843	0.791	0.745	0.704	0.667	0.634	0.604	0.577	0.552	0.529	0.508	0.489
1100	0.924	0.892	0.876	0.861	0.833	0.781	0.736	0.695	0.659	0.626	0.597	0.570	0.545	0.523	0.502	0.483
1200	0.913	0.881	0.866	0.851	0.823	0.772	0.727	0.687	0.651	0.619	0.589	0.563	0.539	0.516	0.496	0.477
1300	0.902	0.870	0.855	0.841	0.813	0.763	0.718	0.679	0.643	0.611	0.582	0.556	0.532	0.510	0.490	0.471
1400	0.891	0.860	0.845	0.830	0.803	0.753	0.709	0.670	0.635	0.604	0.575	0.549	0.526	0.504	0.484	0.465
1500	0.880	0.849	0.834	0.820	0.793	0.744	0.701	0.662	0.628	0.596	0.568	0.543	0.519	0.498	0.478	0.460
1600	0.870	0.839	0.824	0.810	0.783	0.735	0.692	0.654	0.620	0.589	0.561	0.536	0.513	0.492	0.472	0.454
1700	0.859	0.829	0.814	0.800	0.774	0.726	0.684	0.646	0.612	0.582	0.554	0.529	0.507	0.486	0.466	0.448
1800	0.848	0.818	0.804	0.790	0.764	0.717	0.675	0.638	0.605	0.575	0.548	0.523	0.500	0.480	0.461	0.443
1900	0.838	0.808	0.794	0.781	0.755	0.708	0.667	0.630	0.597	0.568	0.541	0.516	0.494	0.474	0.455	0.438
1950	0.833	0.803	0.789	0.776	0.750	0.704	0.663	0.626	0.594	0.564	0.538	0.513	0.491	0.471	0.452	0.435
2000	0.828	0.798	0.785	0.771	0.746	0.700	0.659	0.622	0.590	0.561	0.534	0.510	0.488	0.468	0.449	0.432
2100	0.817	0.789	0.775	0.762	0.736	0.691	0.651	0.615	0.583	0.554	0.528	0.504	0.482	0.462	0.444	0.427
2200	0.807	0.779	0.765	0.752	0.727	0.682	0.643	0.607	0.575	0.547	0.521	0.498	0.476	0.456	0.438	0.421
2300	0.797	0.769	0.756	0.743	0.718	0.674	0.635	0.600	0.568	0.540	0.515	0.491	0.470	0.451	0.433	0.416
2400	0.787	0.759	0.746	0.734	0.709	0.665	0.627	0.592	0.561	0.533	0.508	0.485	0.464	0.445	0.427	0.411
2500	0.777	0.750	0.737	0.724	0.701	0.657	0.619	0.585	0.554	0.527	0.502	0.479	0.459	0.440	0.422	0.406
2600	0.768	0.741	0.728	0.715	0.692	0.649	0.611	0.577	0.547	0.520	0.496	0.473	0.453	0.434	0.417	0.401
2700	0.758	0.731	0.719	0.706	0.683	0.641	0.603	0.570	0.540	0.514	0.489	0.467	0.447	0.429	0.412	0.396
2800	0.749	0.722	0.710	0.698	0.675	0.633	0.596	0.563	0.534	0.507	0.483	0.461	0.442	0.423	0.406	0.391
2900	0.739	0.713	0.701	0.689	0.666	0.625	0.588	0.556	0.527	0.501	0.477	0.456	0.436	0.418	0.401	0.386
3000	0.730	0.704	0.692	0.680	0.658	0.617	0.581	0.549	0.520	0.495	0.471	0.450	0.430	0.413	0.396	0.381

**HEAD LOSSES ON AIR SIDE**

Identify the burner thermal output on the abscissa axis (kW).

Mark the value in vertical in the curve of the swirler position.

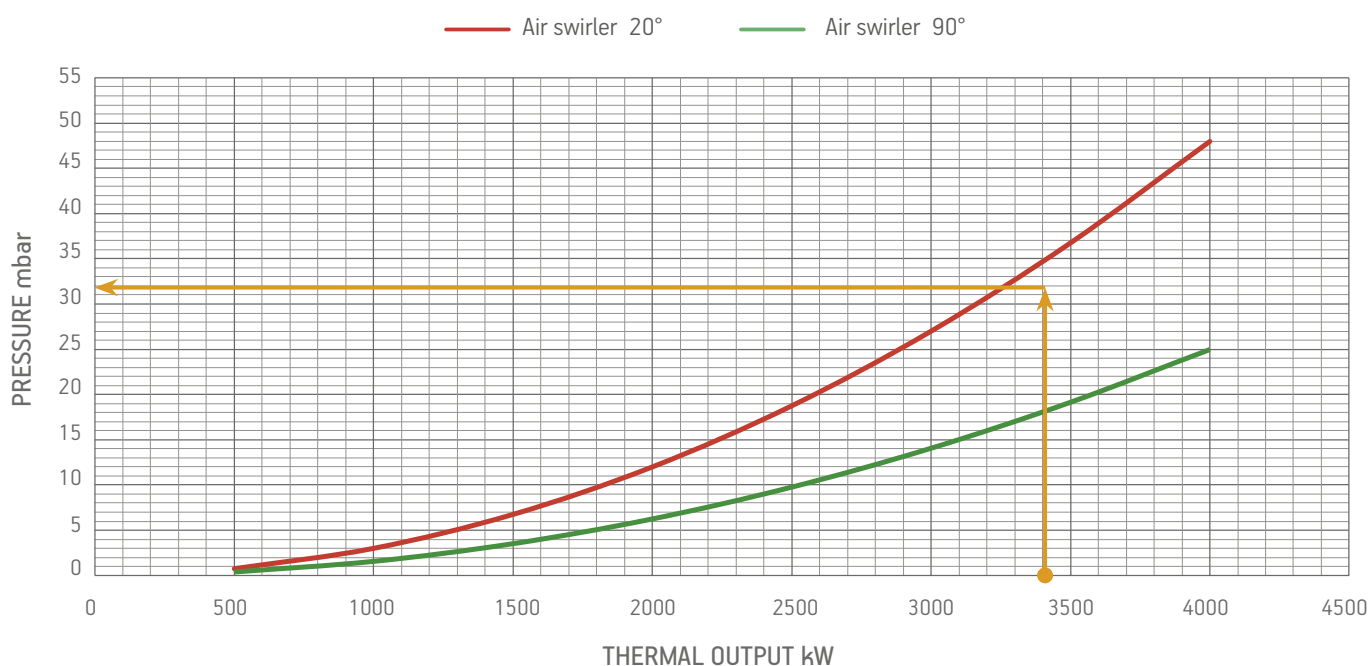
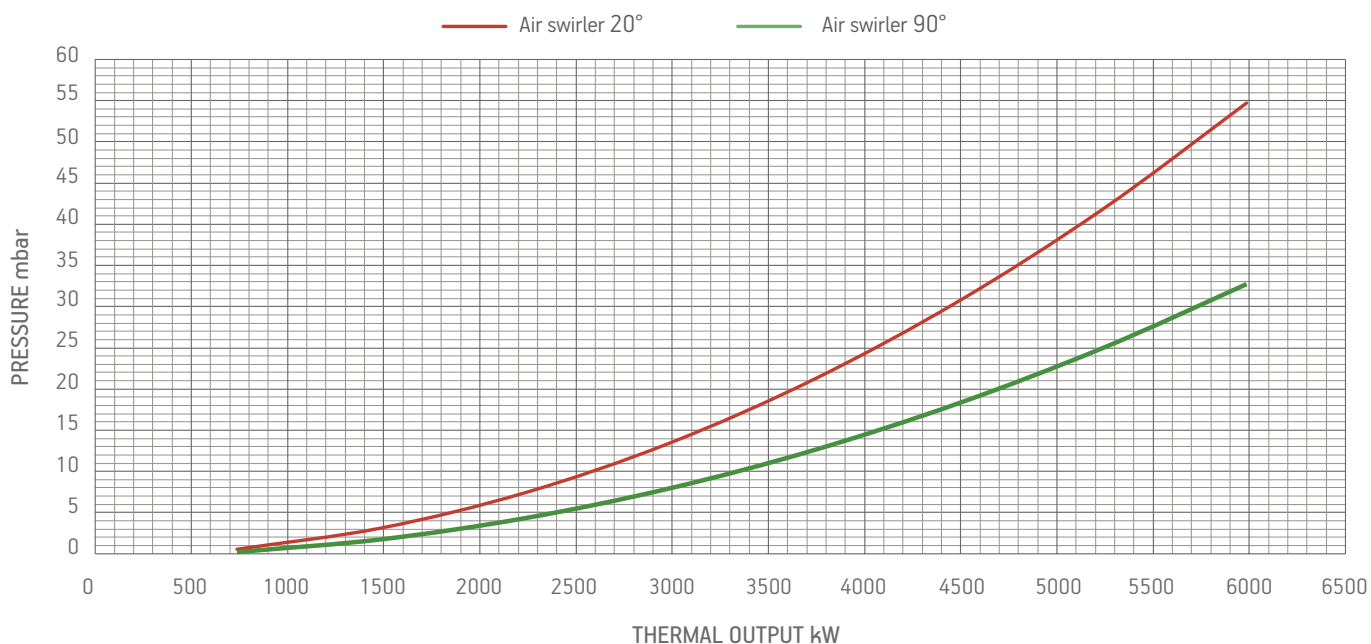
Move horizontally to the axis of ordinates (mbar).

The value obtained is equivalent to the head loss on air side of the concerned burner.

Example:

thermal flow rate = 3400 kW burner = TBR 4
swirler angle = 30°

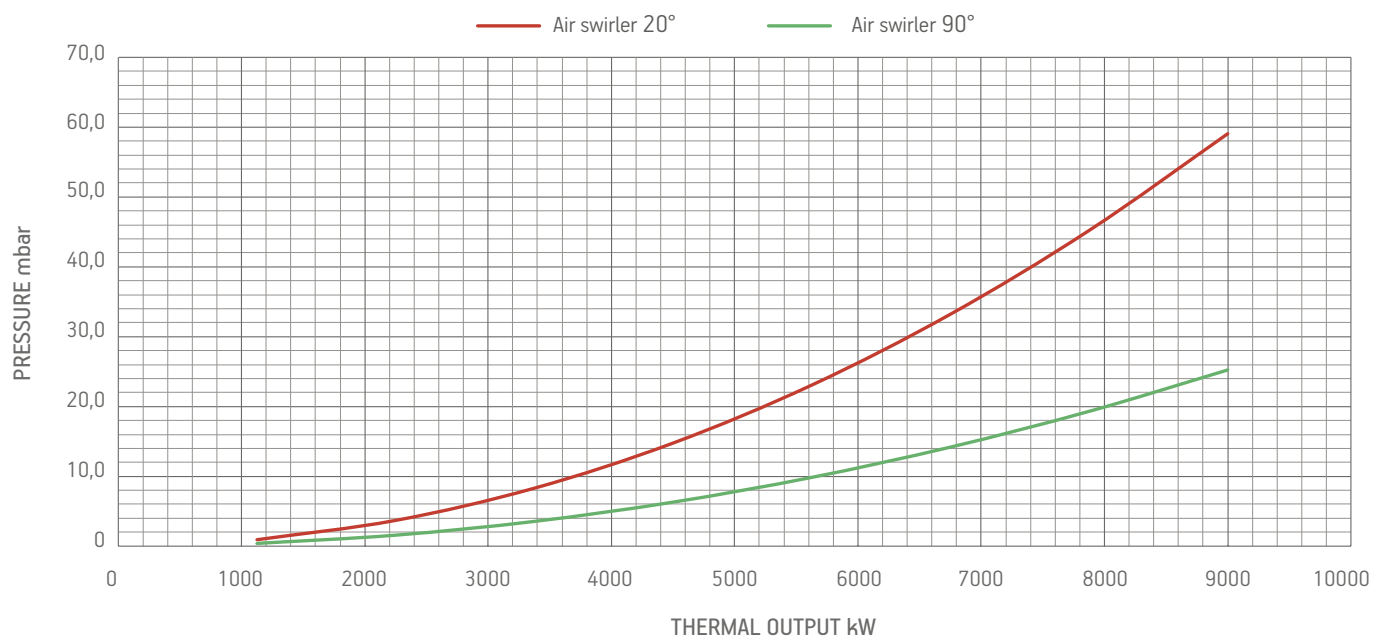
head loss on air side = 32 mbar

TBR 4**TBR 6**

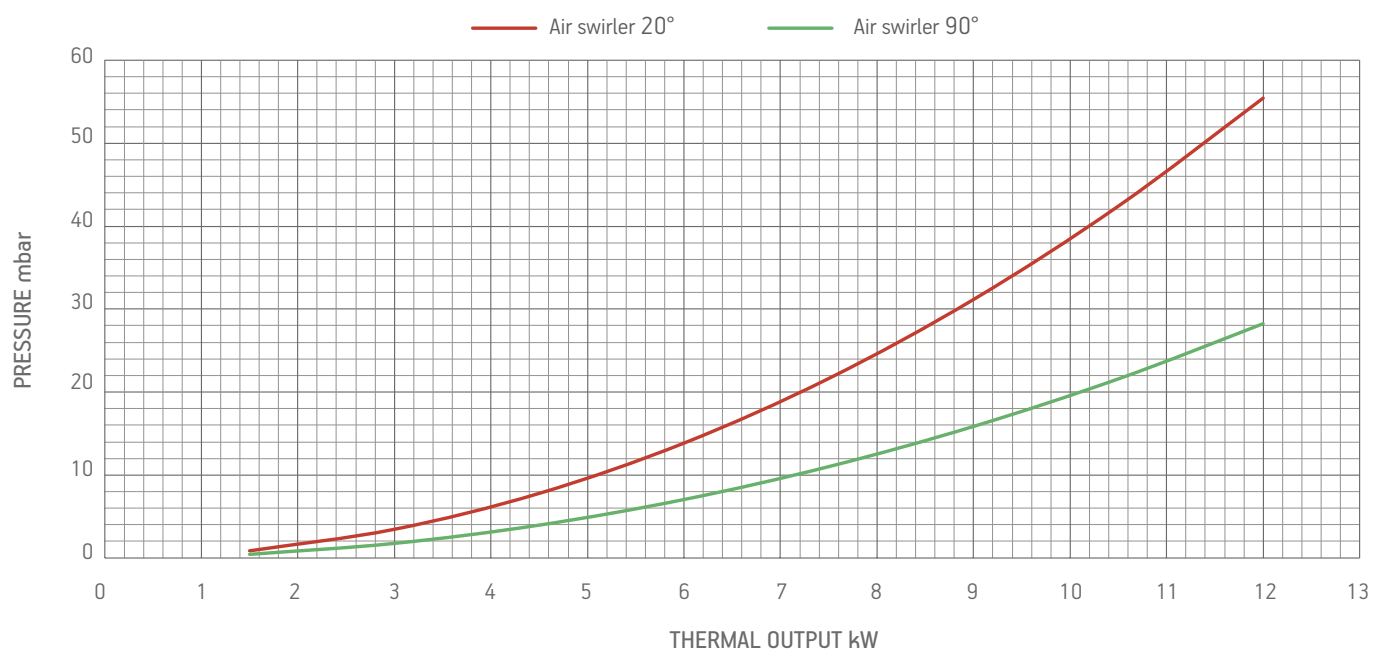


VENTILATION

TBR 9



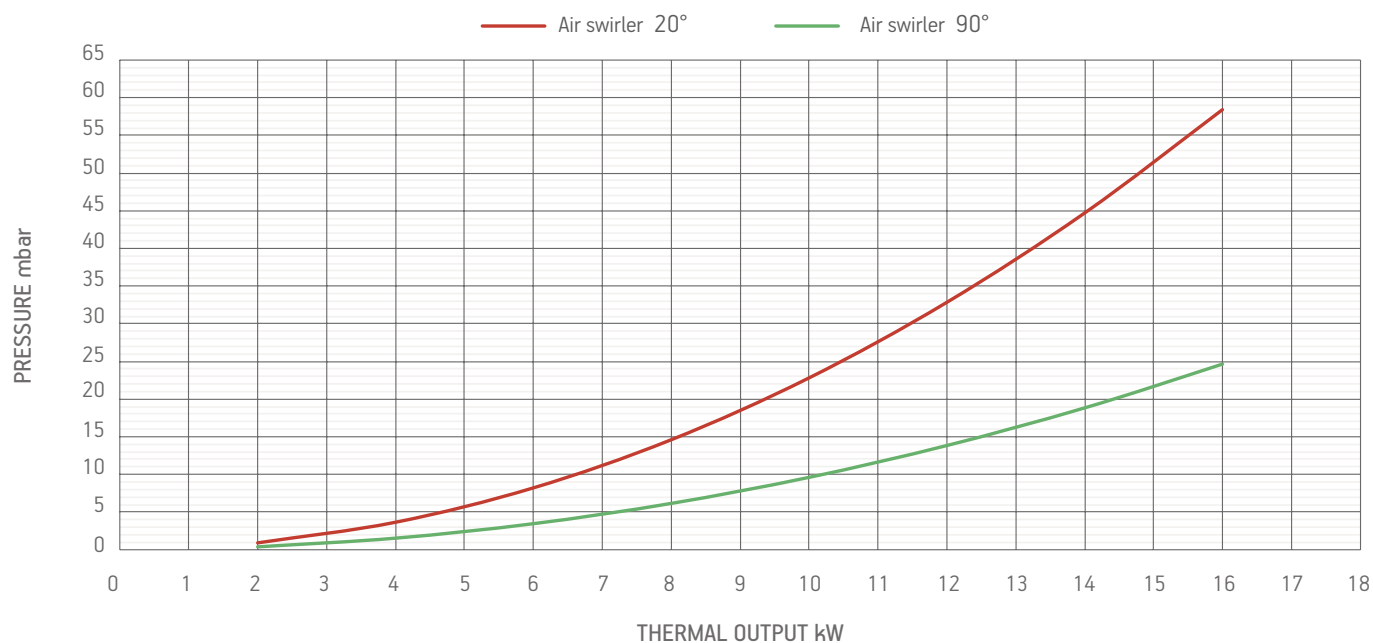
TBR 12



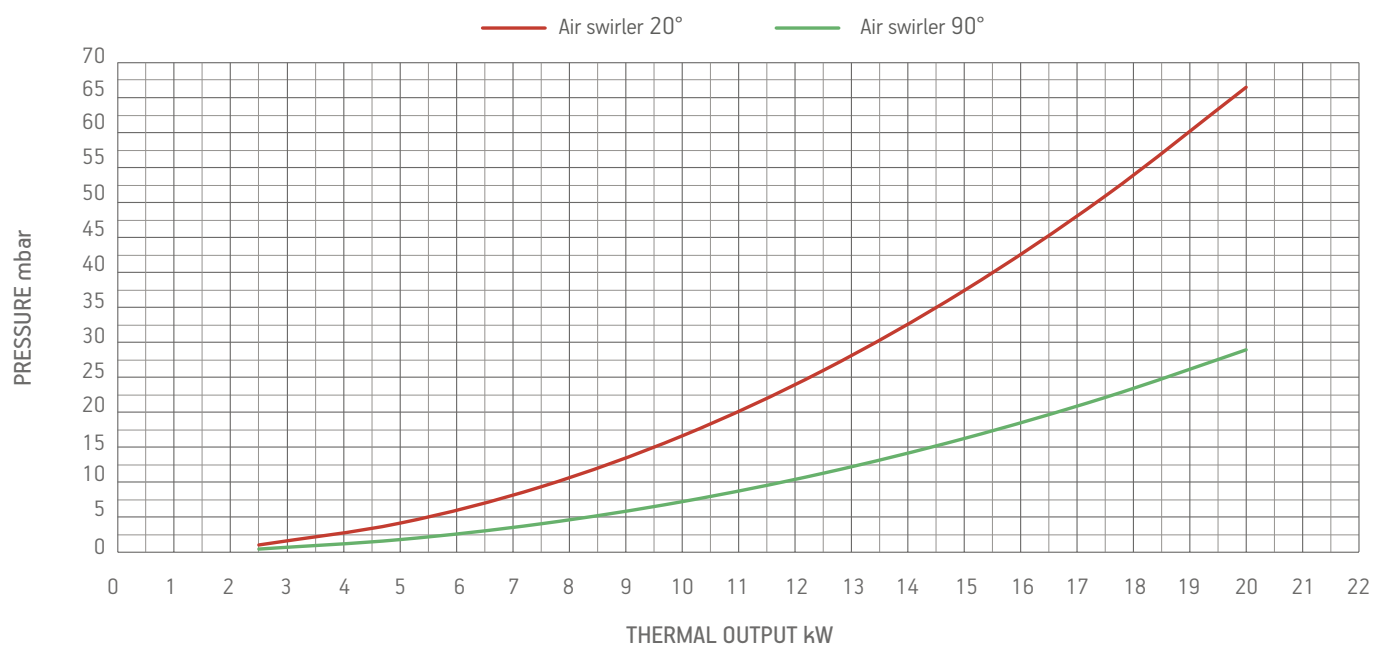


VENTILATION

TBR 16



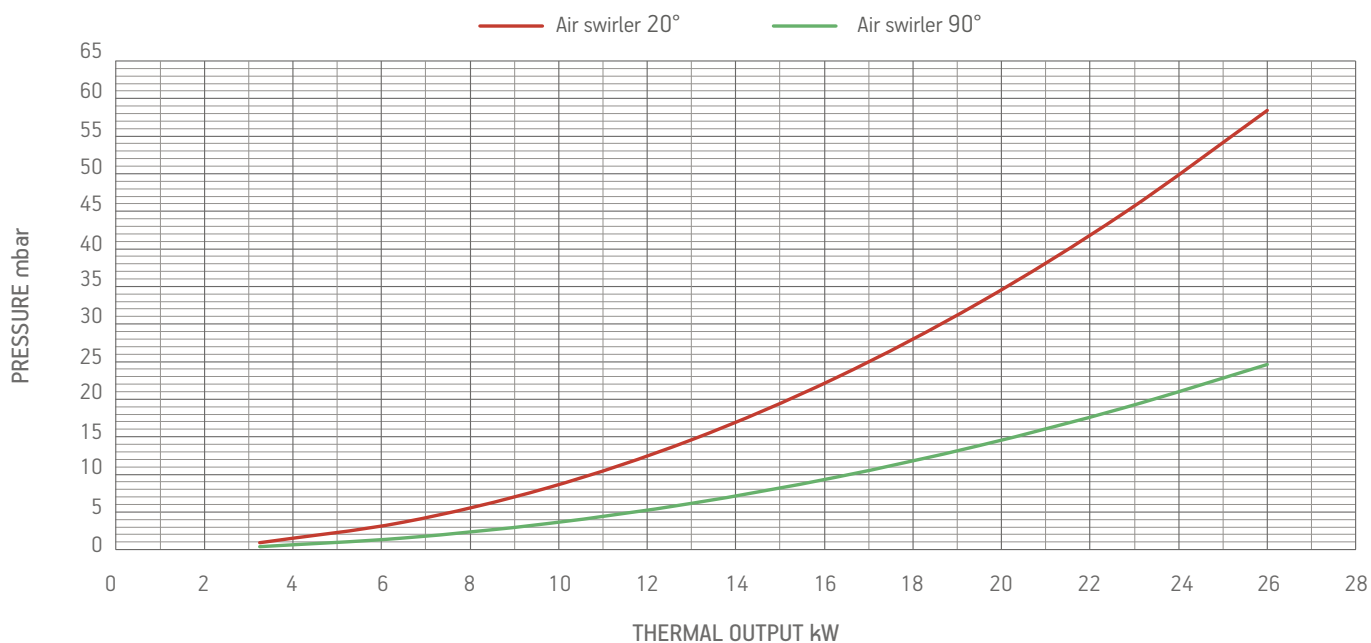
TBR 20



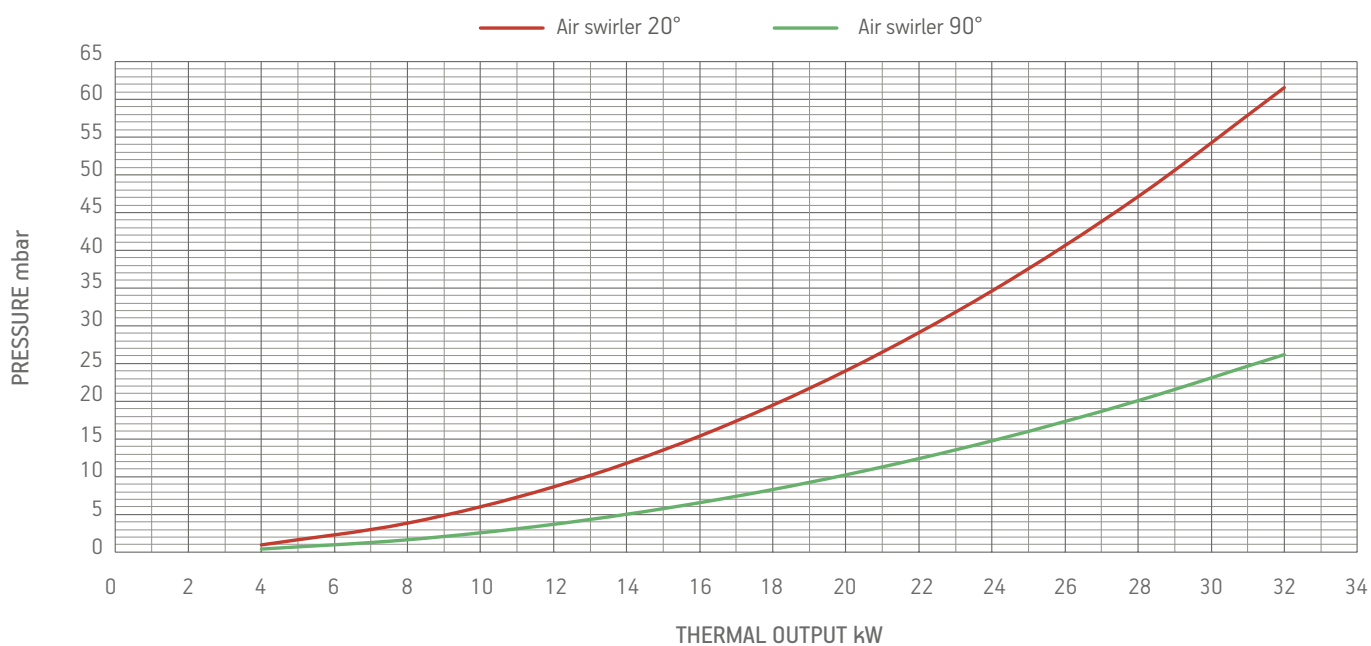


VENTILATION

TBR 26

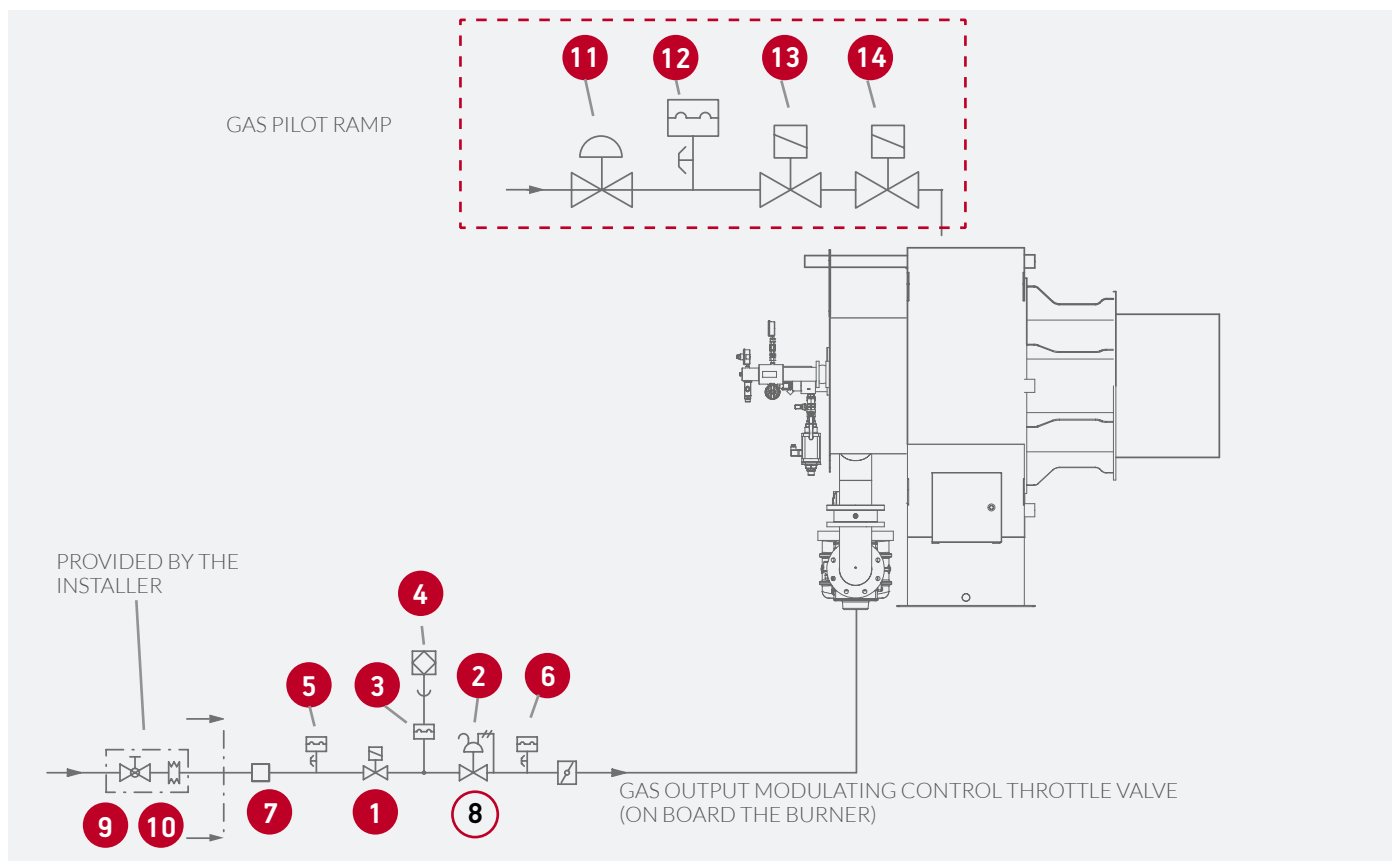


TBR 32





GAS SUPPLY, GAS TRAIN CONFIGURATION



DESCRIPTION	TBR ...MC	TBR ...ME
Electric protection rating IP 54	• (8)	• (8)
Electric protection rating IP 65	◦ (8)	◦ (8)
Operating gas valve with pressure regulator	• (2)	• (2)
Safety gas valve MAX 500mbar	• (1)	• (1)
Minimum gas pressure switch	• (5)	
Maximum gas pressure switch	• (6)	• (6)
Valve sealing check	• (4)	
Gas leak control pressure switch	• (3)	
Minimum gas pressure/sealing check pressure switch		• (3)
Gas filter	• (7)	• (7)
Pressure regulator with integrated filter (pilot ramp)	• (11)	• (11)
Minimum gas pressure switch (pilot ramp)	• (12)	• (12)
Ignition flame safety gas valve (pilot ramp)	• (13)	• (13)
Main gas valve for ignition flame with flow regulator (pilot ramp)	• (14)	• (14)
Pressure gauge kit with cock	◦	◦
Ball gas shut-off valve	◦ (9)	◦ (9)
Vibration-proof joint	◦ (10)	◦ (10)



GAS SUPPLY, GAS TRAIN CHOICE

It is possible to choose the most suitable gas ramp to match to the burner, using the diagram below.

First of all identify:

- The burnt flow rate of the burner Q_i [kW] to find along the abscissa axis.
- The gas pressure available at the train P_g (mbar) to find along the axis of ordinates.

Such pressure is obtained with the following formula:

$$P_g = P_a - P_c$$

Where:

P_a = pressure of the gas available in the network.

P_c = pressure in the combustion chamber of the

heat generator.

The intersection of the two lines defines the operating point of the gas ramp.

Choose the ramp characterized by the first curve below the operating point.

Example:

Burner Model: TBR 4 G ME

$Q_i = 2900$ kW

$P_a = 100$ mbar $P_c = 15$ mbar

$P_g = 100 - 15 = 85$ mbar

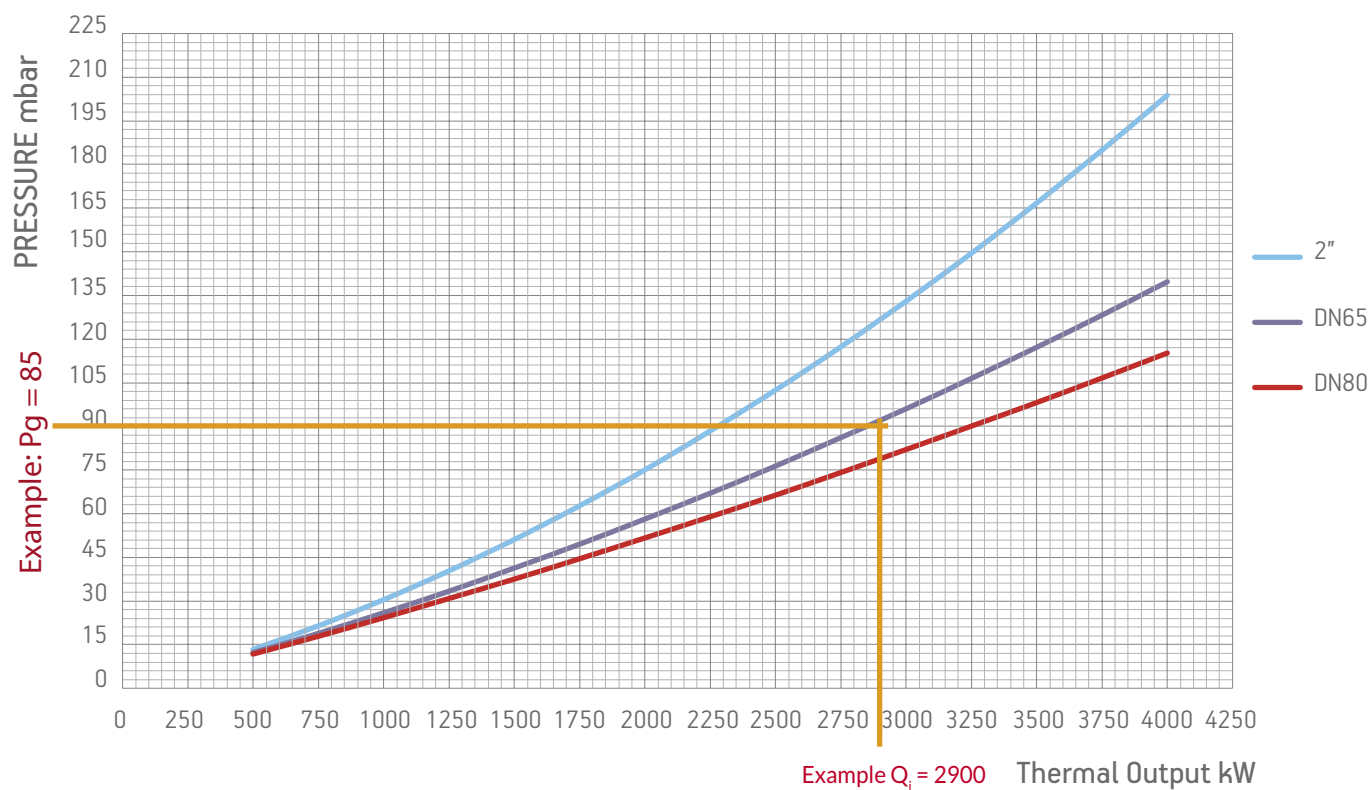
Choose red curve.

Order ramp:

Code 19990578 (Vers. ME)

LOAD LOSSES WITH NATURAL GAS TBR 4 G

(gas train with pressure regulator and combustion head)

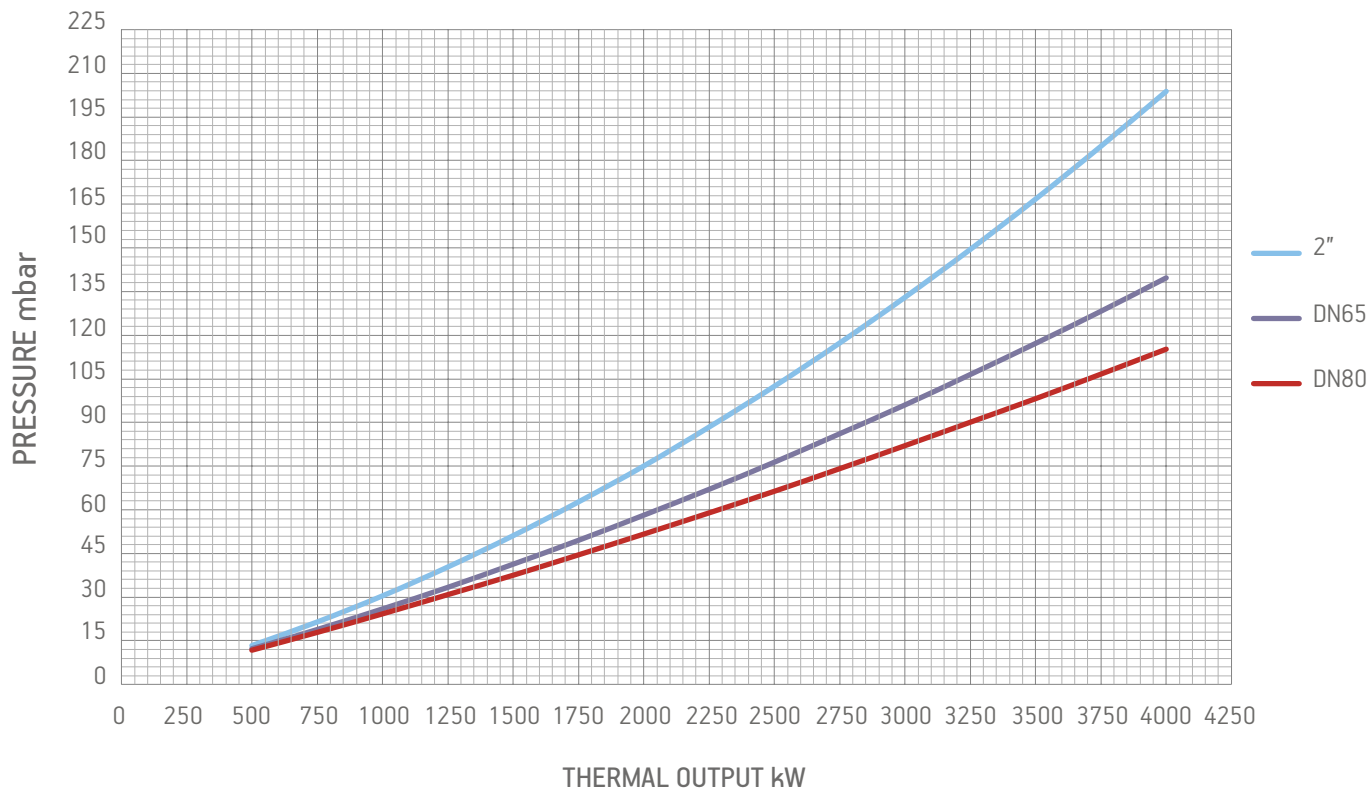


NOTE: For operating points that cannot be identified inside the diagram, please contact our sales office.

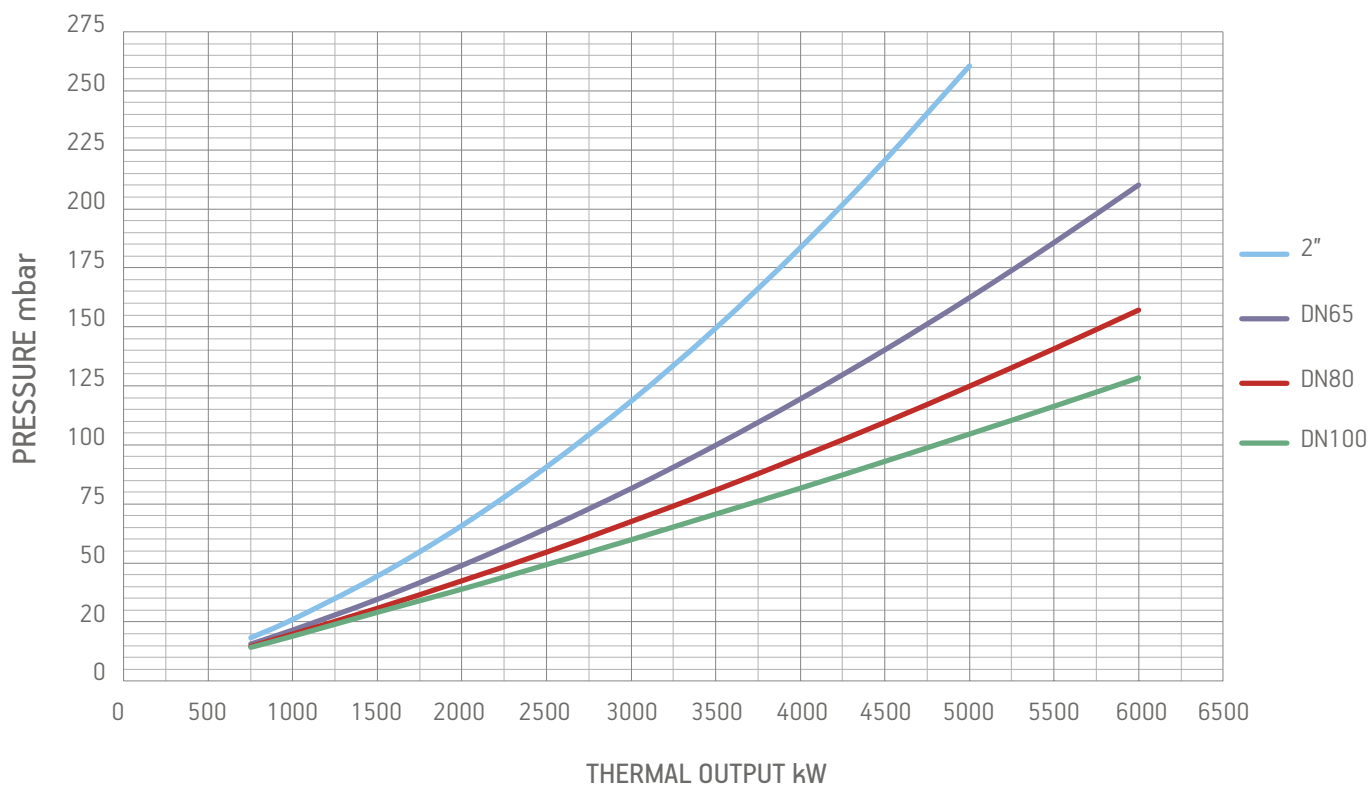


GAS SUPPLY, GAS TRAIN CHOICE

TBR 4G



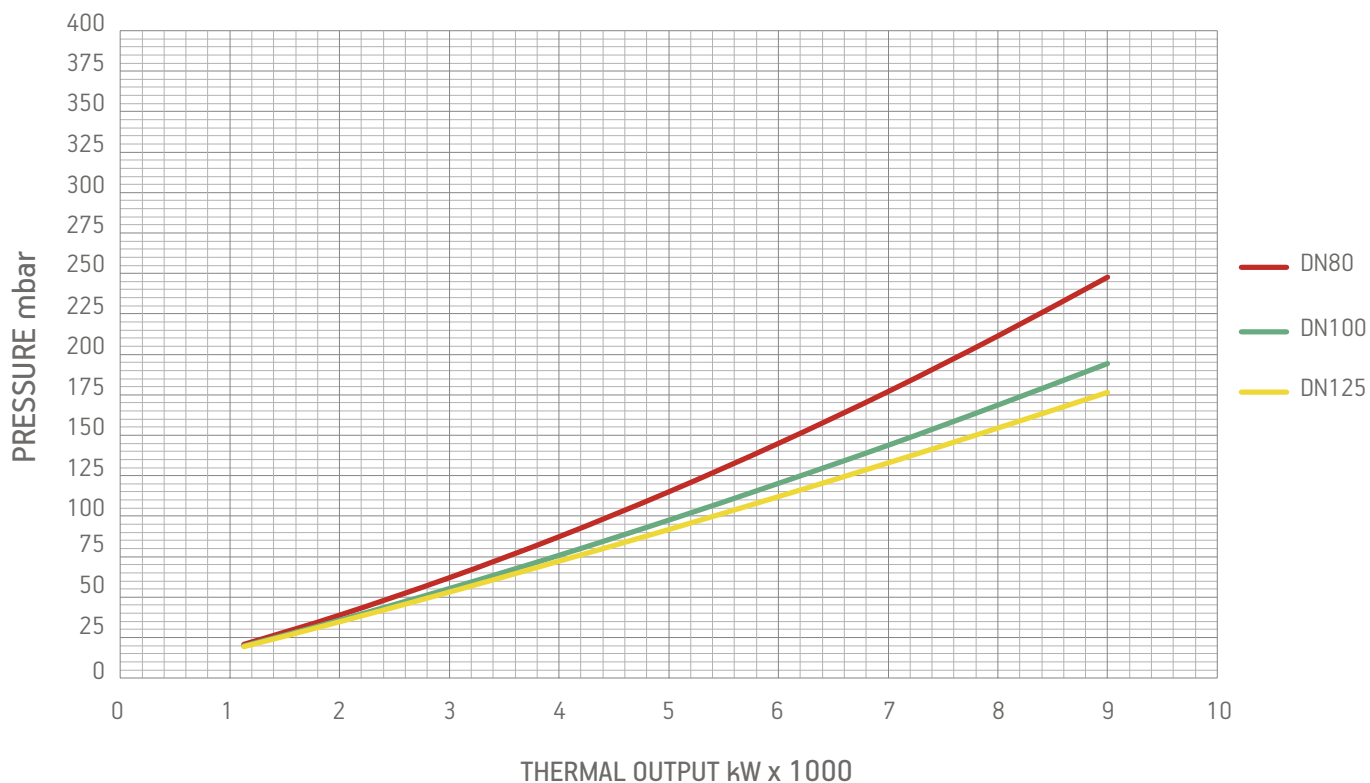
TBR 6G



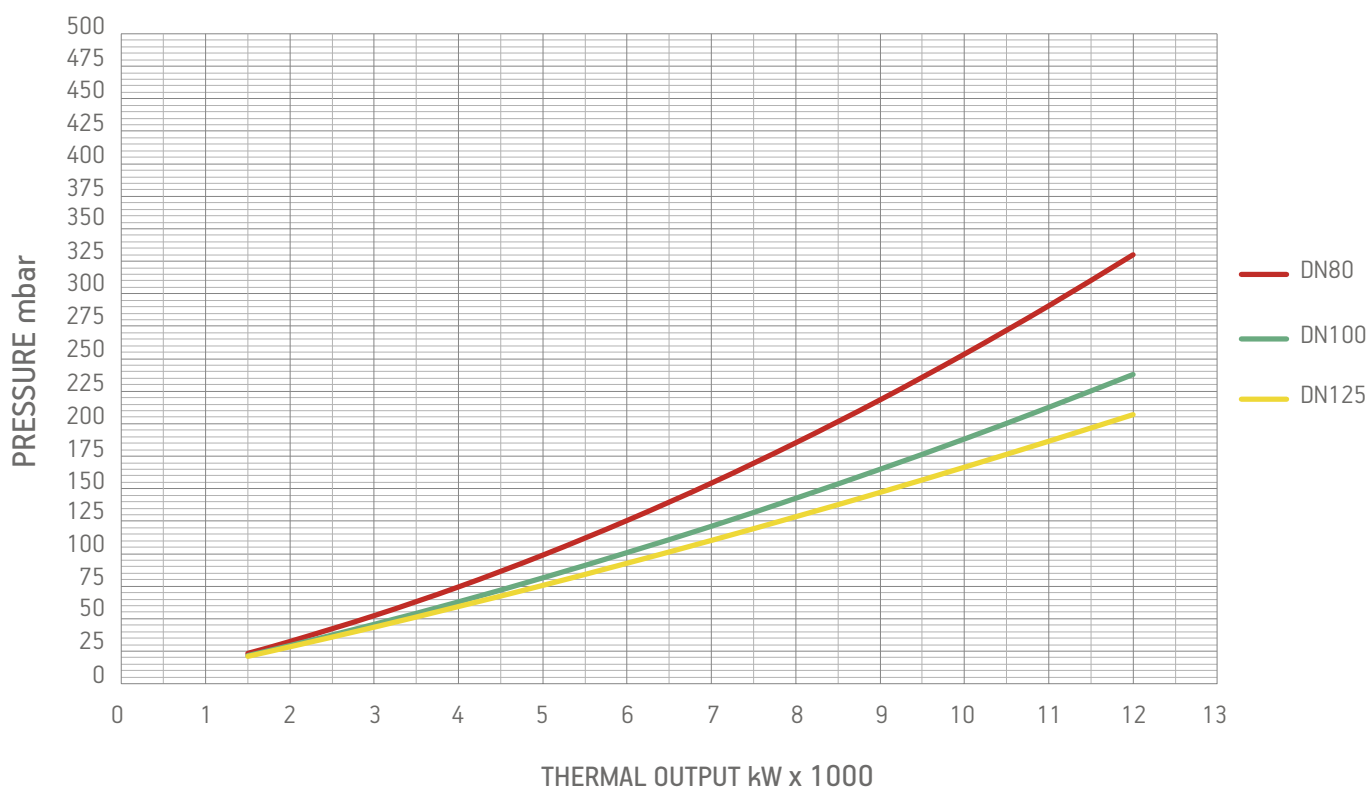


GAS SUPPLY, GAS TRAIN CHOICE

TBR 9G



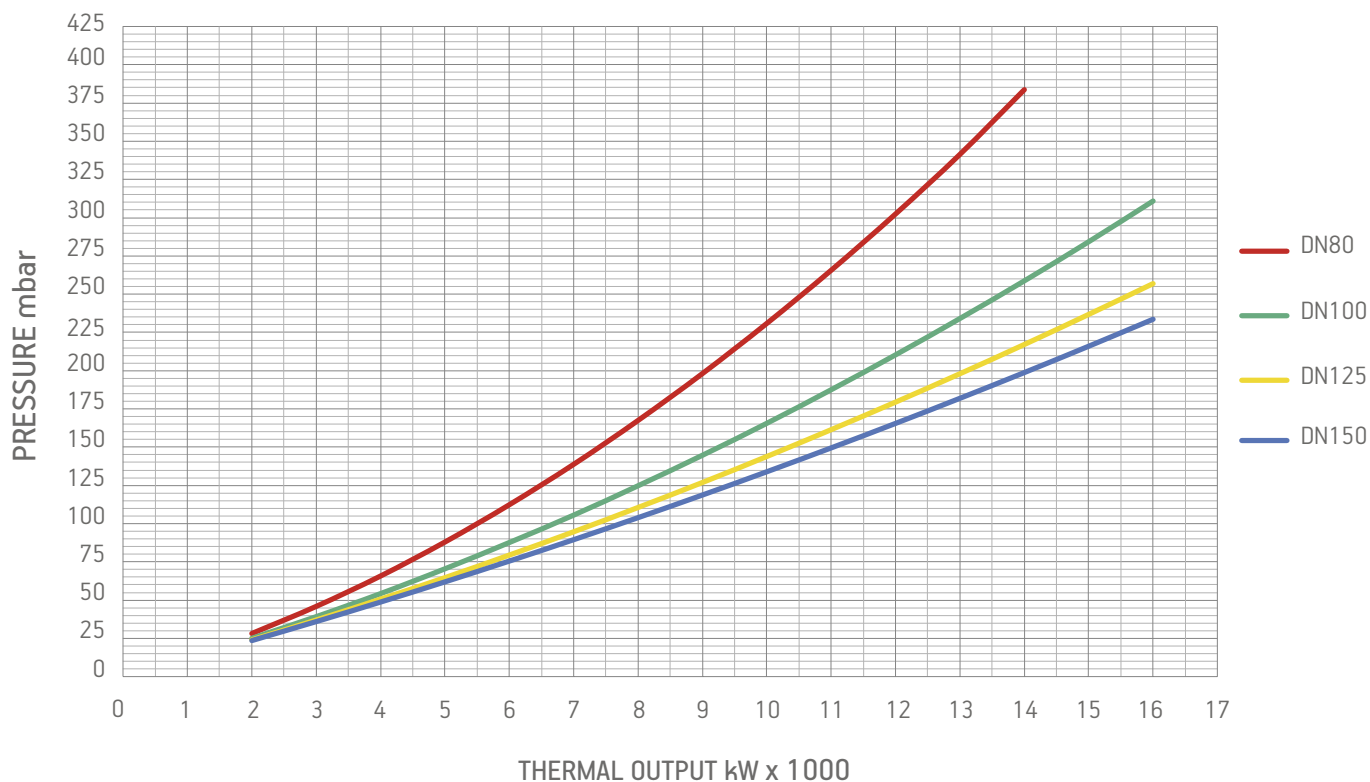
TBR 12G



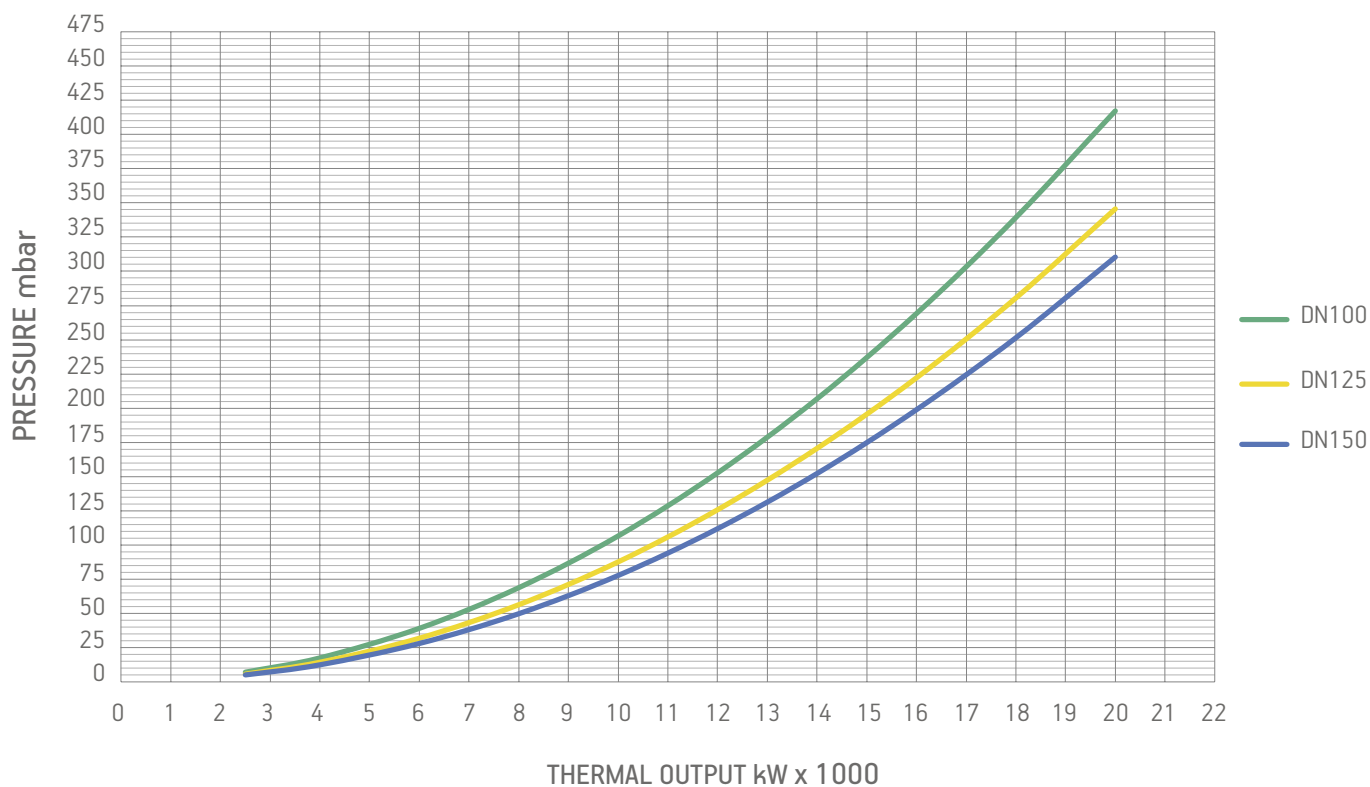


GAS SUPPLY, GAS TRAIN CHOICE

TBR 16



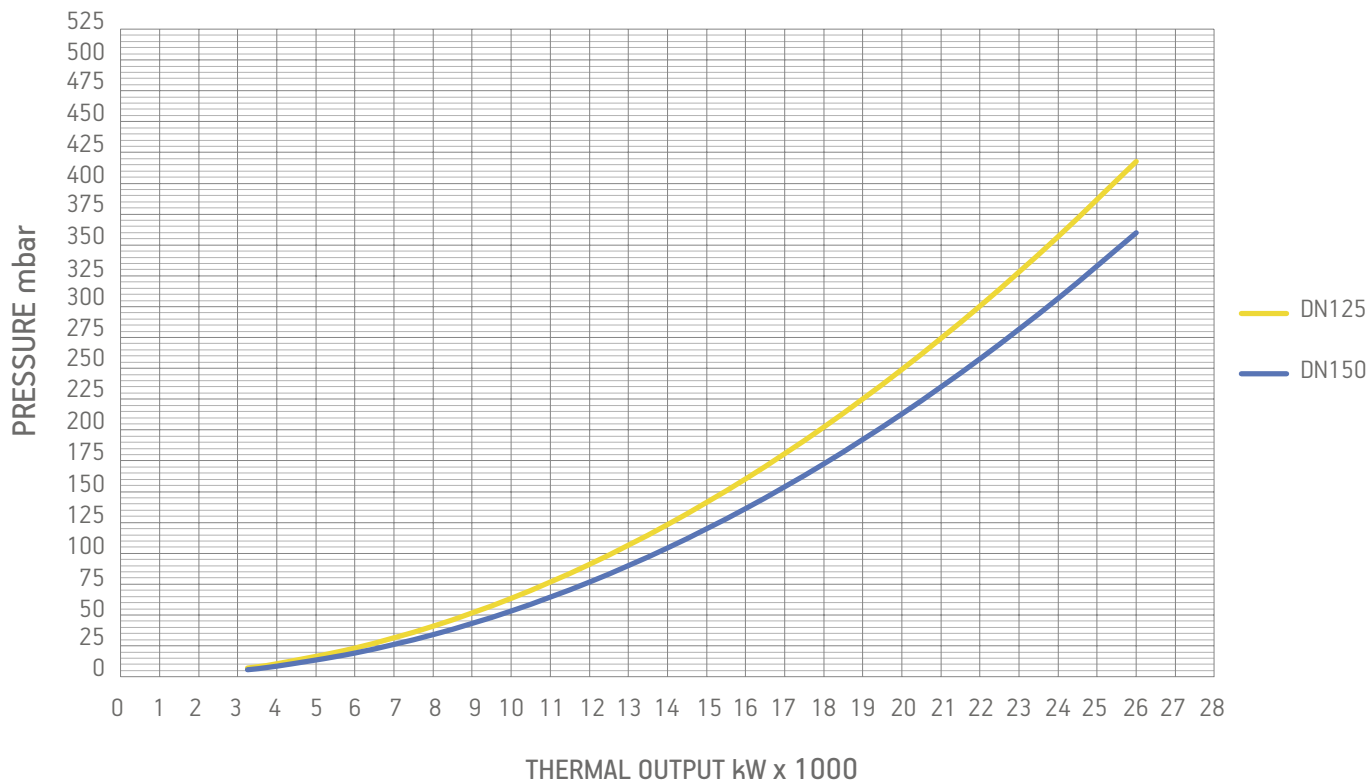
TBR 20G



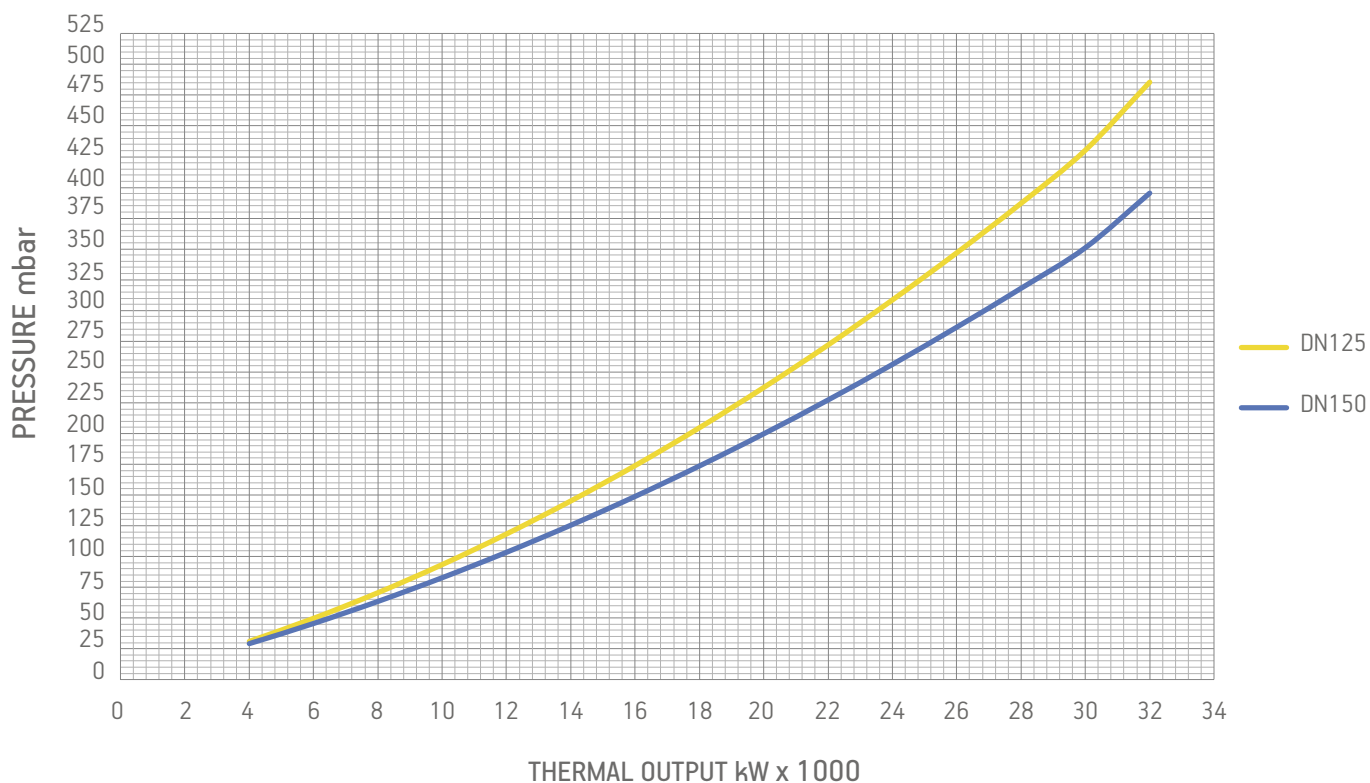


GAS SUPPLY, GAS TRAIN CHOICE

TBR 26G



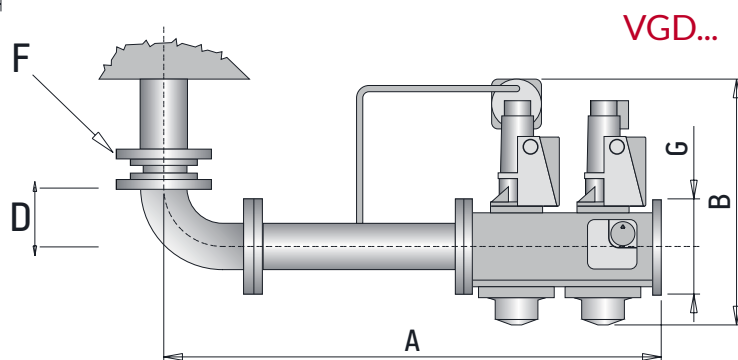
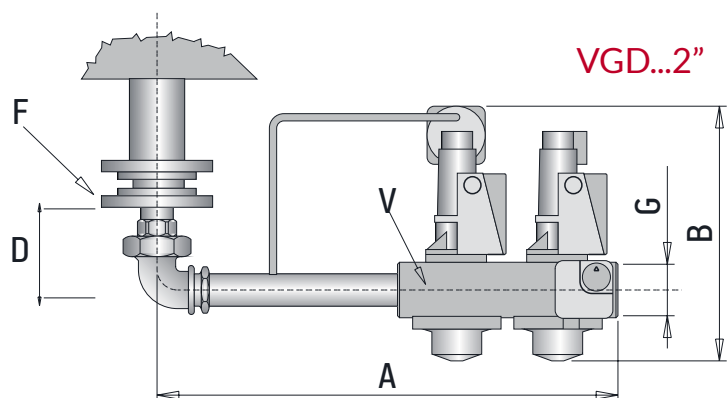
TBR 32G





AVAILABLE GAS TRAINS

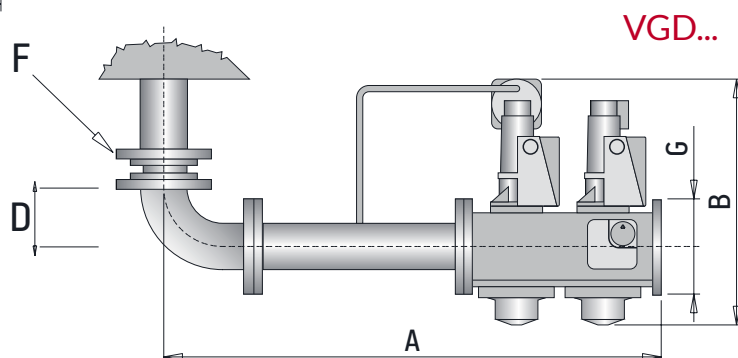
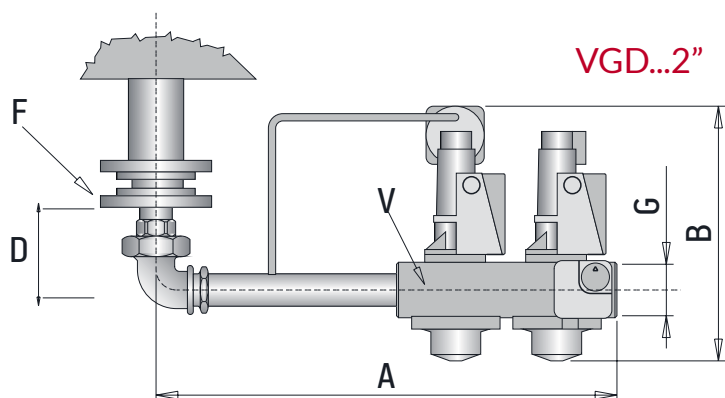
Burner Model								Train code	Train model	Dimensions						Weight (kg)
TBR 4 ME	TBR 6 ME	TBR 9 ME	TBR 12 ME	TBR 16 ME	TBR 20 ME	TBR 26 ME	TBR 32 ME			f	v	A	B	D	G	
•								19990524 + 96000035	MM20.503F120S-R2	DN65	2"	890	440	160	Rp 2"	19.8
•								19990577	MM40.065F120S-F065	DN65	DN65	975	430	135	DN65	27.6
•								19990578	MM40.080F120S-F065	DN65	DN80	1020	445	135	DN80	29.8
	•							19990631	MM20.503G250S-F080	DN80	2"	890	480	160	Rp 2"	19.8
	•							19990632	MM40.065G250S-F080	DN80	DN65	975	465	135	DN65	27.6
	•							19990633	MM40.080G250S-F080	DN80	DN80	1020	425	135	DN80	29.8
	•							19990634	MM40.100G250S-F080	DN80	DN100	1115	450	165	DN100	42.7
		•	•					19990639	MM40.080G250S-F100	DN100	DN80	1020	480	170	DN80	29.8
		•	•					19990640	MM40.100G250S-F100	DN100	DN100	1115	450	170	DN100	42.7
		•	•					19990641	MM40.125G250S-F100	DN100	DN125	1280	480	170	DN125	64.9
				•				19990647	MM40.080G250S-F125	DN125	DN80	1020	530	205	DN80	29.8
				•				19990648	MM40.100G250S-F125	DN125	DN100	1115	450	205	DN100	42.7
				•				19990649	MM40.125G250S-F125	DN125	DN125	1190	480	205	DN125	64.9
				•				19990650	MM40.150G250S-F125	DN125	DN150	1370	530	205	DN150	71.5
					•			19990655	MM40.100G360S-F125	DN125	DN100	1115	480	205	DN100	42.7
					•			19990656	MM40.125G360S-F125	DN125	DN125	1190	530	205	DN125	64.9
					•			19990657	MM40.150G360S-F125	DN125	DN150	1370	560	205	DN150	71.5
						•	•	19990661	MM40.125G360S-F150	DN150	DN125	1190	480	245	DN125	64.9
						•	•	19990662	MM40.150G360S-F150	DN150	DN150	1370	530	245	DN150	71.5





AVAILABLE GAS TRAINS

Burner Model								Train code	Train model	Dimensions						
TBR 4 MC	TBR 6 MC	TBR 9 MC	TBR 12 MC	TBR 16 MC	TBR 20 MC	TBR 26 MC	TBR 32 MC			f	v	A	B	D	G	Weight (kg)
•								19990566	MM20.503C120S-F065	DN65	2"	890	440	160	Rp2"	19.8
•								19990567	MM40.065C120S-F065	DN65	DN65	975	430	135	DN65	27.6
•								19990568	MM40.080C120S-F065	DN65	DN80	1020	445	135	DN80	29.8
	•							19990635	MM20.503D250S-F080	DN80	2"	890	440	160	Rp2"	19.8
	•							19990636	MM40.065D250S-F080	DN80	DN65	975	430	135	DN65	27.6
	•							19990637	MM40.080D250S-F080	DN80	DN80	1020	445	135	DN80	29.8
	•							19990638	MM40.100D250S-F080	DN80	DN100	1115	480	165	DN100	42.7
		•	•					19990642	MM40.080D250S-F100	DN100	DN80	1020	445	170	DN80	29.8
		•						19990643	MM40.100D250S-F100	DN100	DN100	1115	480	170	DN100	42.7
		•						19990644	MM40.125D250S-F100	DN100	DN125	1280	530	170	DN125	64.9
			•					19990645	MM40.100D250S-F100	DN100	DN100	1115	480	170	DN100	42.7
			•					19990646	MM40.125D250S-F100	DN100	DN125	1280	530	170	DN125	64.9
				•				19990651	MM40.080D250S-F125	DN125	DN80	1020	445	205	DN80	29.8
				•				19990652	MM40.100D250S-F125	DN125	DN100	1115	480	205	DN100	42.7
				•				19990653	MM40.125D250S-F125	DN125	DN125	1190	530	205	DN125	64.9
				•				19990654	MM40.150D250S-F125	DN125	DN150	1370	560	205	DN150	71.5
					•			19990658	MM40.100D360S-F125	DN125	DN100	1115	480	205	DN100	42.7
					•			19990659	MM40.125D360S-F125	DN125	DN125	1190	530	205	DN125	64.9
					•			19990660	MM40.150D360S-F125	DN125	DN150	1370	560	205	DN150	71.5
						•	•	19990663	MM40.125D360S-F150	DN150	DN125	1190	530	245	DN125	64.9
						•	•	19990664	MM40.150D360S-F150	DN150	DN150	1370	560	245	DN150	71.5



**ACCESSORIES FOR CONNECTION TO THE NETWORK**

CE approved stainless steel anti-vibration and compensation joints complying with DIN 30681



Code	Model	Gas connector
97079999	BTGA	2" MM
97089999	BTGA	DN 65 - PN 16
97099999	BTGA	DN 80 - PN 16
97109999	BTGA	DN 100 - PN 16
97119999	BTGA	DN 125 - PN 16
97129999	BTGA	DN 150 - PN 16

CE approved ball valves

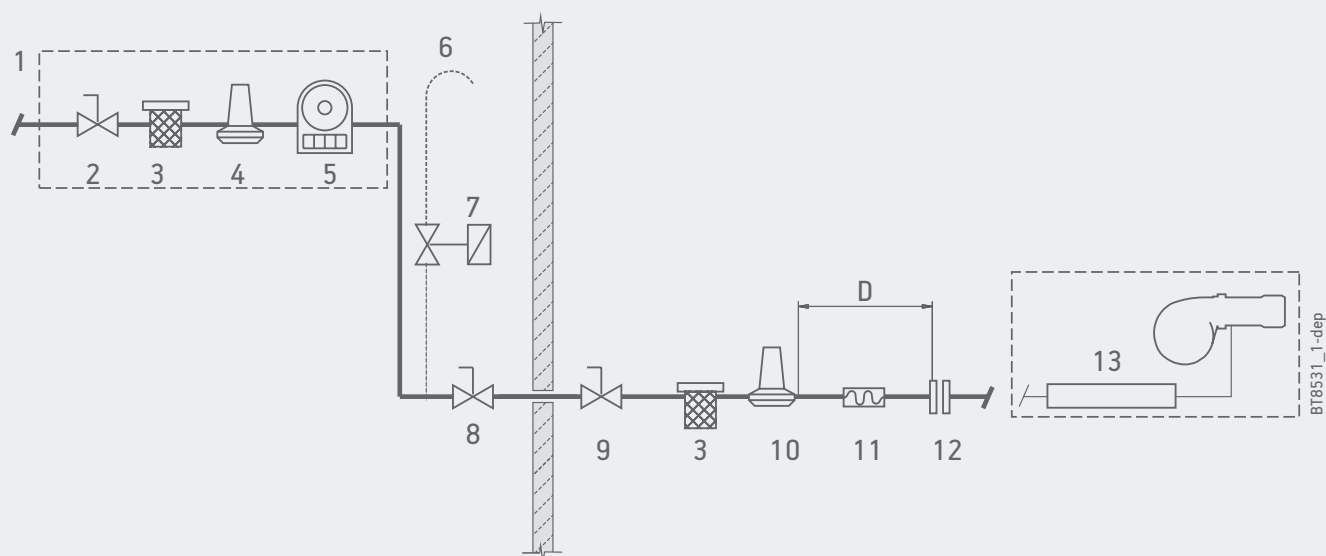


Code	Model	Gas connector
97739999	BTVS	2" FF
97749999	BTVS	DN 65 - PN 16
97759999	BTVS	DN 80 - PN 16
97769999	BTVS	DN 100 - PN 16
97179999	BTVS	DN 125 - PN 16
97189999	BTVS	DN 150 - PN 16

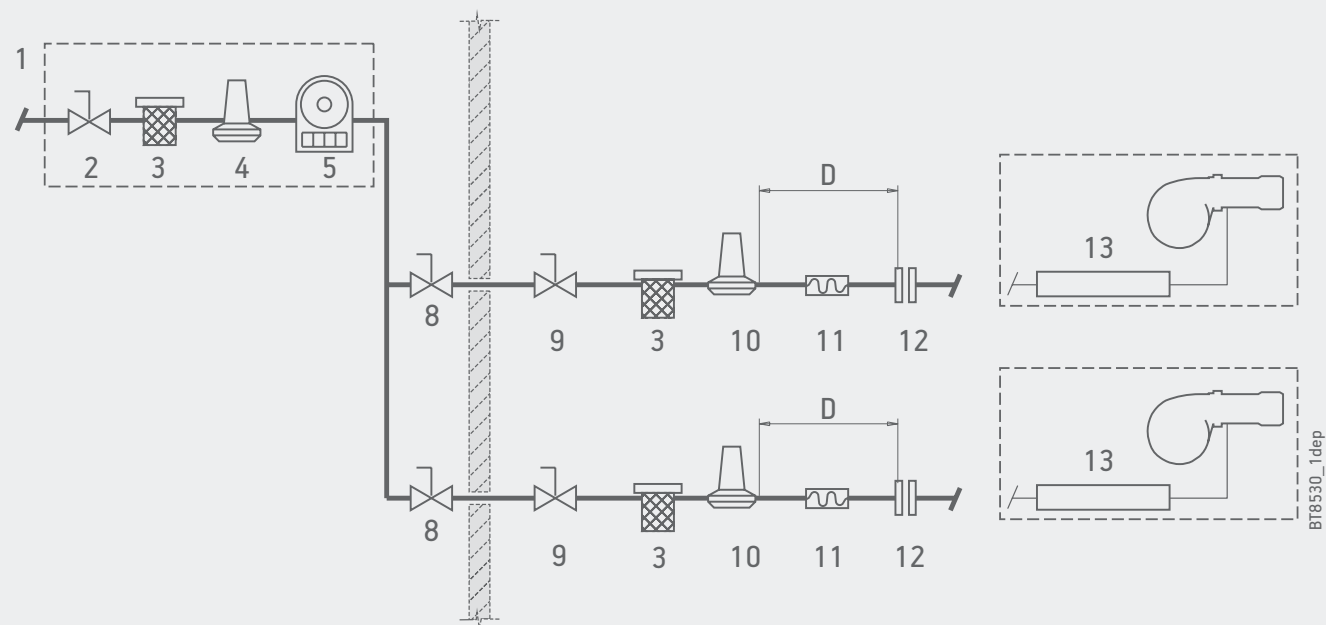


CONNECTION DIAGRAMS

Schematic diagram for connecting a burner to the medium pressure gas supply network.



Schematic diagram for connecting a burner to the medium pressure gas supply network.



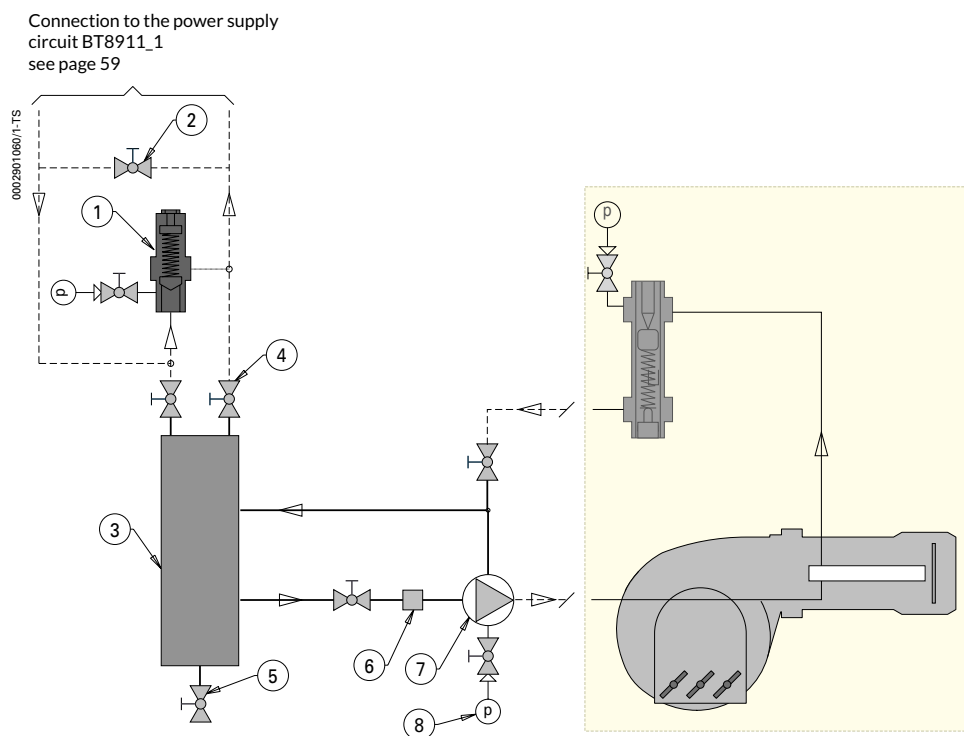
LEGEND:

- 1 Reduction and measurement control unit.
- 2 Shut-off cock.
- 3 Gas filter.
- 4 Pressure reducer.
- 5 Meter.
- 6 Wire mesh flame trap on discharge into the atmosphere.
- 7 Automatic vent valve, if necessary (it should discharge outside in a suitable place).
- 8 Emergency shut-off cock.
- 9 Ball cock.
- 10 Pressure reducer (suitable for the specific case).
- 11 Anti-vibration joint.
- 12 Flanged coupling.
- 13 Gas train.
- D Distance between pressure stabilizer (or regulator/stabilizer) and gas valves at least 1.5 - 2 m.



HYDRAULIC CIRCUIT DIESEL FILLING

Hydraulic diagram of CSG type pumping unit for burner only



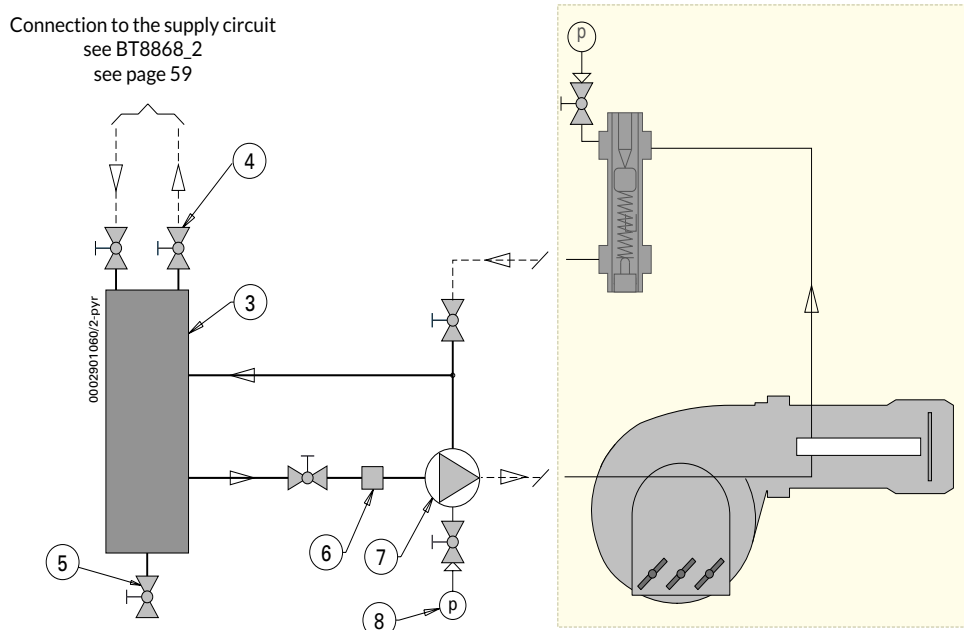
LEGEND

- 1 Pressure regulator adjustable from 0.5 to 3bar with 0-4bar pressure gauge for ring circuit.
- 2 By-pass normally closed.
- 3 Recovery and degassing tank.
- 4 Air/gas discharge valve, normally closed, slightly open only in case of gas discharge.

- 5 Water and system outlet.
- 6 Burner pump filter.
- 7 Burner pump motor with pressure regulator.
- 8 Pressure gauge (0-40bar).

- Piping to be performed by the installer.
- Ball valve responsibility of the client.

Hydraulic diagram of CSG type pumping unit for multiple burners

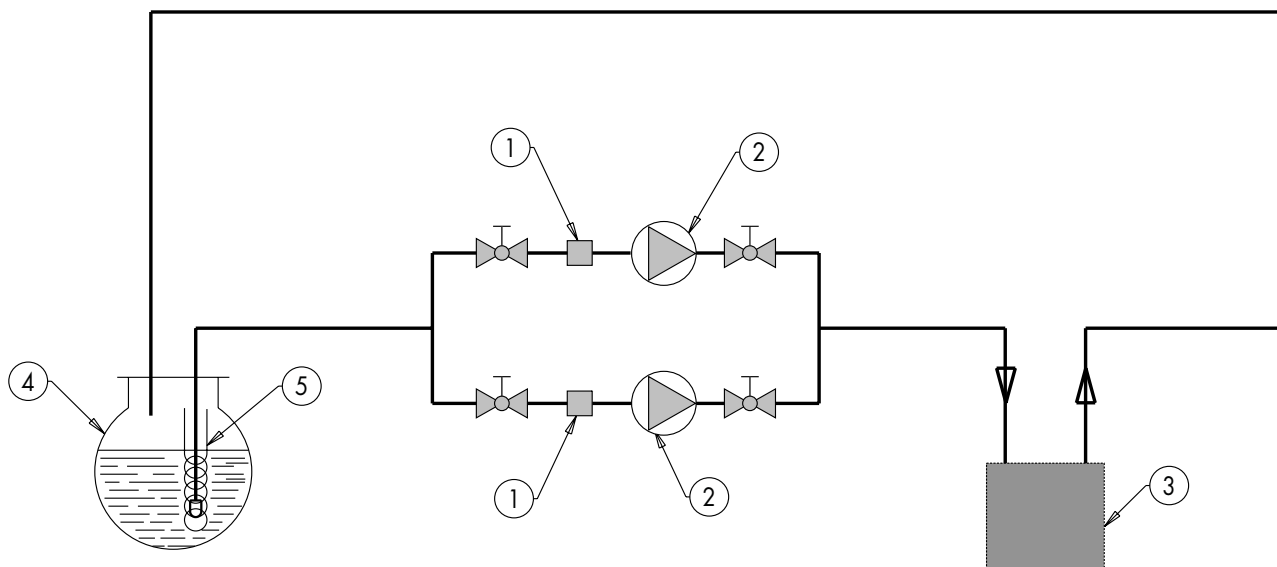




HYDRAULIC CIRCUIT DIESEL FILLING

Hydraulic block diagram of single burner supply system (ring-type circuit) (to be carried out by the installer)

BT8911_1

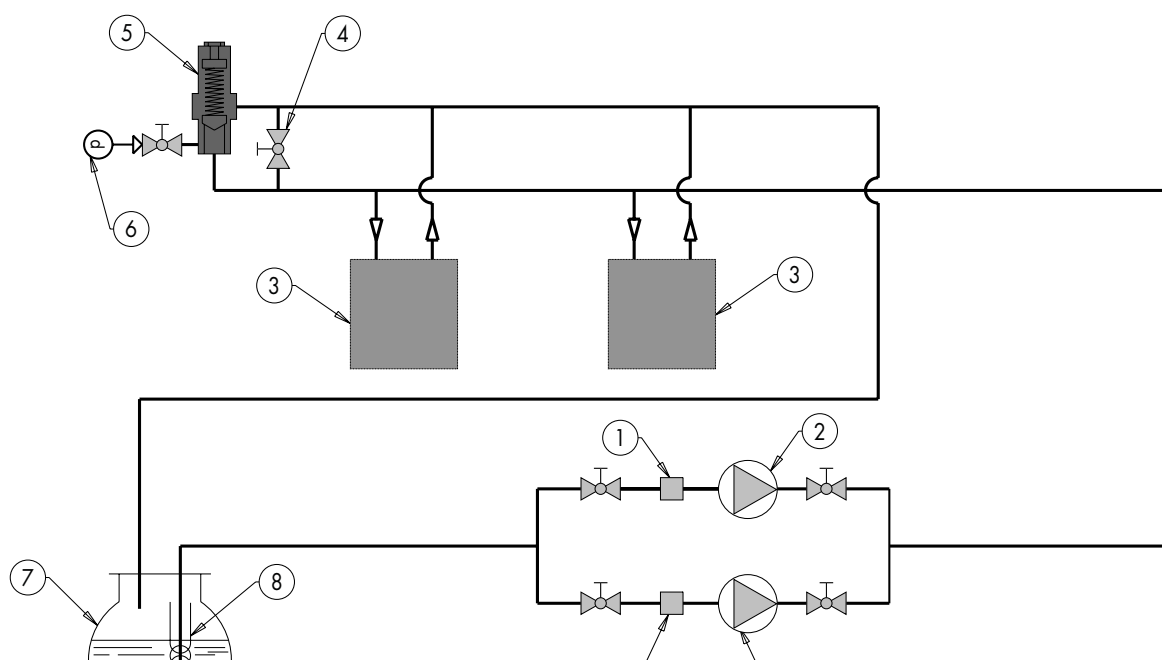


LEGEND

- | | |
|--|---|
| 1 Filter. | 6 Pressure gauge (0-4bar). |
| 2 Circulation pumps (one spare). | 7 Main tank. |
| 3 Burner pumping unit. | 8 Possible vapour or hot water heating of fuel to maintain, even during pauses, a sufficient temperature for flow in the pipes. |
| 4 By-pass (normally closed). | |
| 5 Pressure regulator, adjustable from 0.5 to 3bar. | |

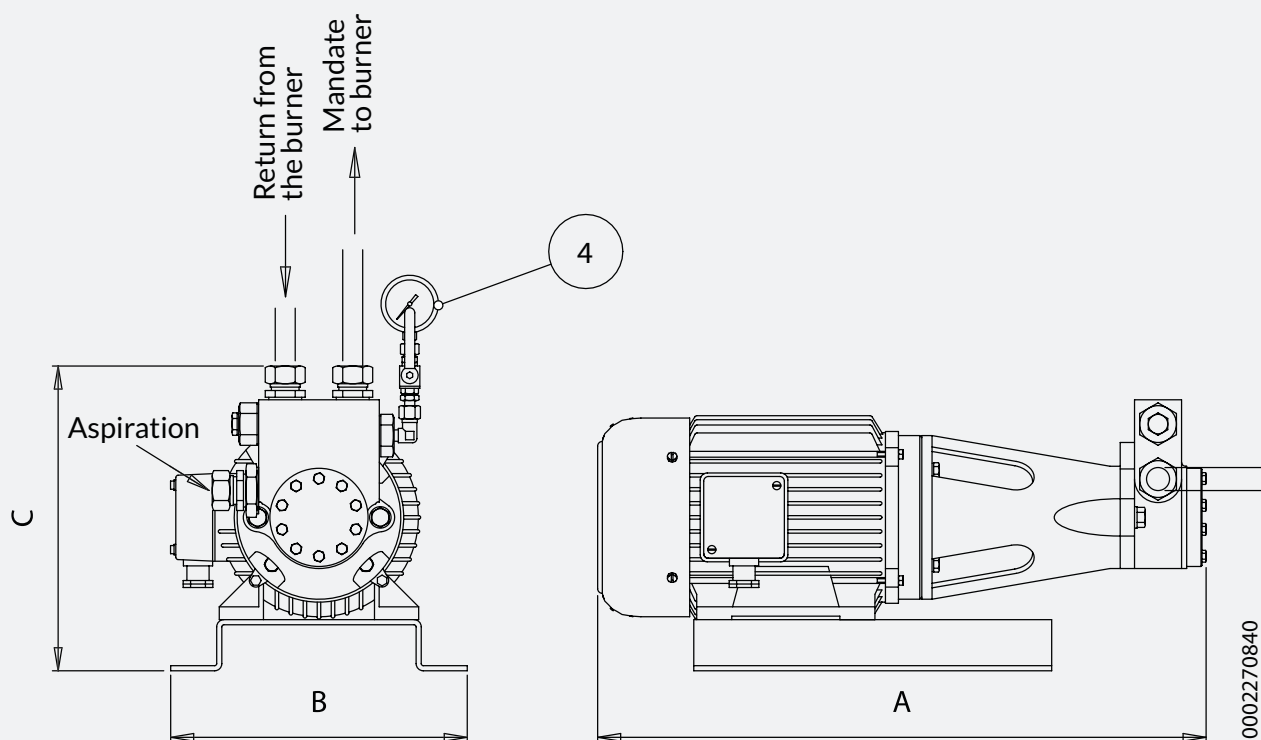
Hydraulic block diagram of multiple burner supply system (ring-type circuit) (to be carried out by the installer)

BT8868_2





PUMPING CONTROL UNIT



Supply status for disassembled pumping unit

The unit is composed of:

- pump with pressure regulator coupled to electric motor installed on metal base;

- self-cleaning filter;
- degassing tank complete with drain cock.

LEGEND

- 1 Recovery and degassing tank.
2 Fuel self-cleaning filter.

- 3 Burner pump motor with incorporated pressure regulator.
4 Pressure gauge (40 bar).

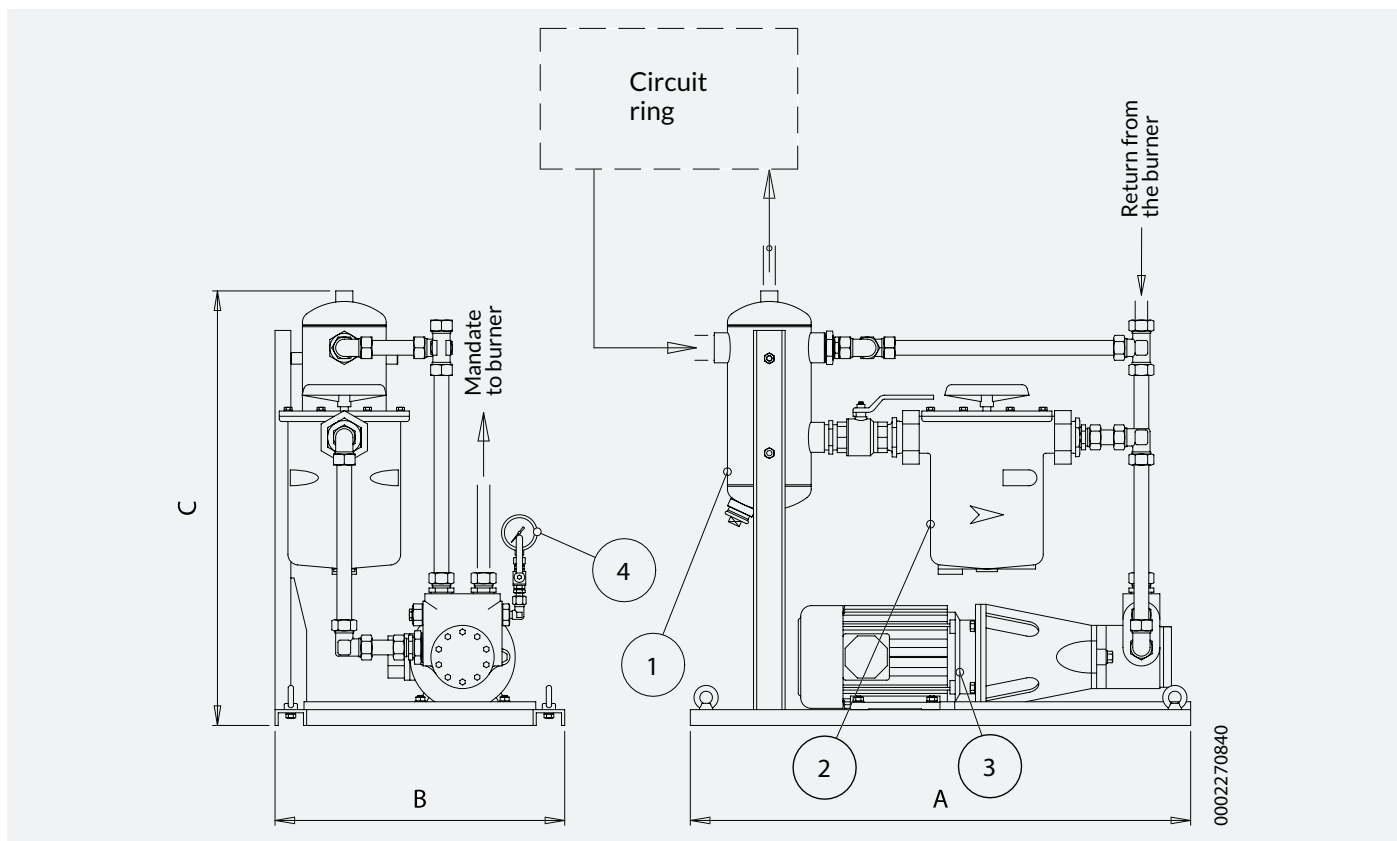
DIESEL DISASSEMBLED PUMPING UNITS

Hi=11.86 (kWh/kg) volume mass=0.85 (kg/dm³)

Burner Model	Maximum power (kW)	Nozzle flow rate (hg/h)	PUMP flow rate @25 bar (l/h)	Model	Electrical power supply (V/Hz)	Motor rotation speed (rpm)	Pump motor (kW)	PUMP flow rate @30 bar (l/h)	self-cleaning filter Ø	Ø pipes mm	A mm	B mm	C mm
TBR 4	4.000	337	833	CSG-350	3N/400/50	1.400	1,5	700	Rp 1"1/2	22	600	265	290
TBR 6	6.000	506	1.250	CSG-550	3N/400/50	1.400	2,2	1.200	Rp 1"1/2	22	610	290	305
TBR 9	9.000	759	2.355	CSG-800	3N/400/50	1.400	4,0	2.200	Rp 2"	28	720	290	310
TBR 12	12.000	1.012	3.200	CSG-1200	3N/400/50	1.400	4,0	3.000	Rp 2"	28	740	330	320
TBR 16	16.000	1.349	3.800	CSG-1400	3N/400/50	1.400	5,5	3.600	Rp 2"	28	800	400	340
TBR 20	20.000	1.686	5.150	CSG-1700	3N/400/50	1.400	7,5	4.800	Rp 2"	28	800	400	340
TBR 26	26.000	2.192	6.050	CSG-2200	3N/400/50	1.400	9,2	5.800	Rp 2"	42	800	400	340
TBR 32	32.000	2.698	6.666	CSG-2700	OPTIONAL								



PUMPING CONTROL UNIT



Supply status for electric pumping unit fully assembled on metal frame

Same components of disassembled unit.

WHEN ORDERING, PLEASE INDICATE THE CONTROL UNIT MODEL CHOSEN.

LEGEND

- 1 Recovery and degassing tank.
2 Fuel self-cleaning filter.

- 3 Burner pump motor with incorporated pressure regulator.
4 Pressure gauge (40 bar).

NOTES

- Pressure control valve kit for ring-type circuit code 98000330.

- Non-insulated degassing tank, threaded version complete with drain cock.

DIESEL PREASSEMBLED PUMPING UNITS

 $H_i = 11.86 \text{ (kWh/kg)}$ volume mass = $0.85 \text{ (kg/dm}^3\text{)}$

Burner Model	Maximum power (kW)	Nozzle flow rate (hg/h)	PUMP flow rate @25 bar (l/h)	Model	Electrical power supply (V/Hz)	Motor rotation speed (rpm)	Pump motor (kW)	PUMP flow rate @30 bar (l/h)	self-cleaning filter Ø	Ø pipes mm	A mm	B mm	C mm
TBR 4	4.000	337	833	CSG-350	3N/400/50	1.400	1,5	700	Rp 1"1/2	22	950	550	825
TBR 6	6.000	506	1.250	CSG-550	3N/400/50	1.400	2,2	1.200	Rp 1"1/2	22	950	550	825
TBR 9	9.000	759	2.350	CSG-800	3N/400/50	1.400	4,0	2.200	Rp 2"	28	950	550	825
TBR 12	12.000	1.012	3.200	CSG-1200	3N/400/50	1.400	4,0	3.000	Rp 2"	28	950	550	825
TBR 16	16.000	1.349	3.800	CSG-1400	3N/400/50	1.400	5,5	3.600	Rp 2"	28	950	550	825
TBR 20	20.000	1.686	5.150	CSG-1700	3N/400/50	1.400	7,5	4.800	Rp 2"	28	950	550	825
TBR 26	26.000	2.192	6.050	CSG-2200	3N/400/50	1.400	9,2	5.800	Rp 2"	42	950	550	825
TBR 32	32.000	2.698	6.666	CSG-2700	OPTIONAL								







Energy for People

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Code 0001101118 - Ver. 06/2018 - 200 AR