Unical®
STEAMER

BAHR'12

BAHR'12

Product description

The range of high pressure, fire tube, reverse flame, BAHR'12 steam boilers have been designed to operate with a maximum allowable working pressure of PS=12* bar.

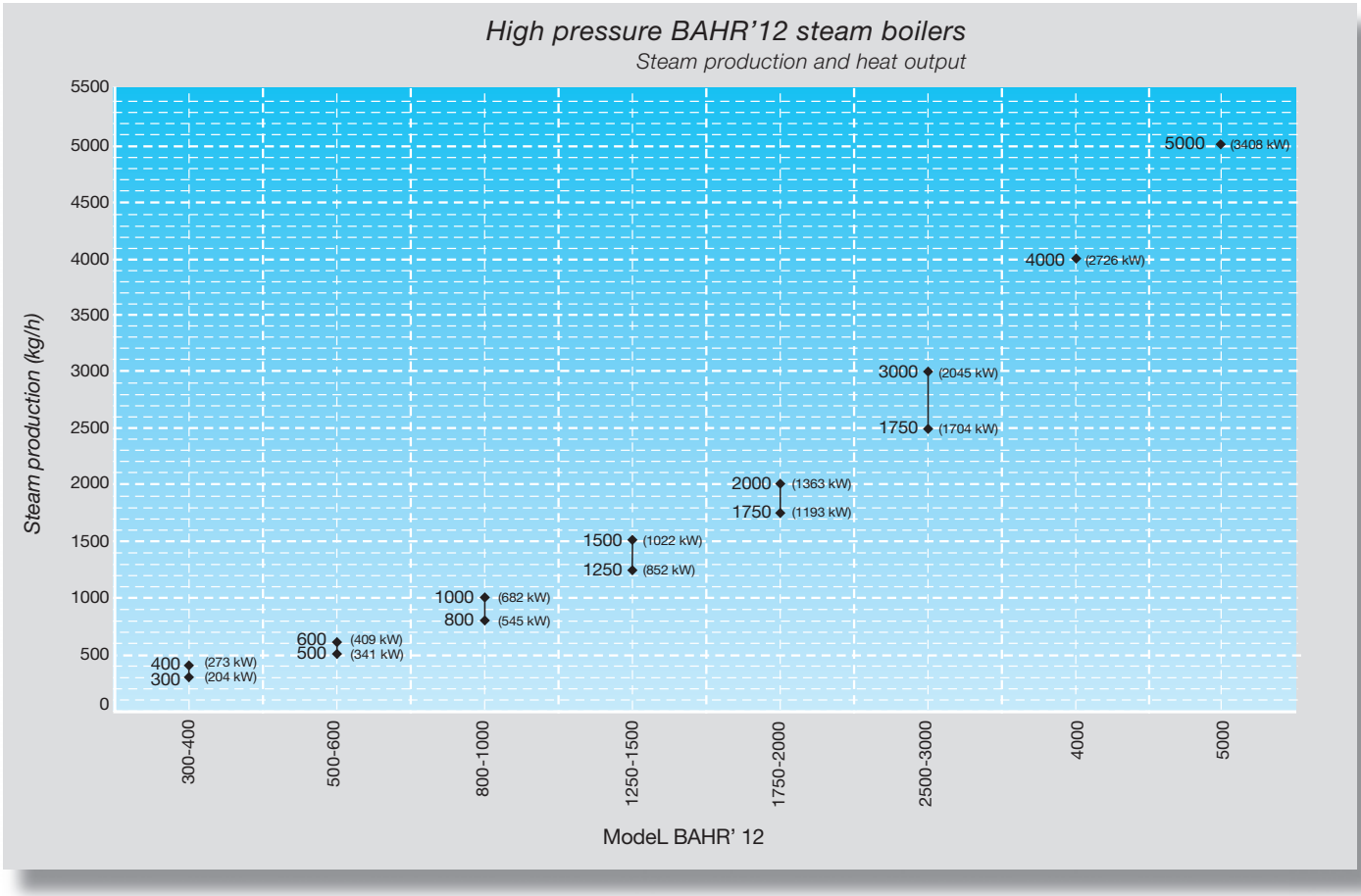
The range includes 14 models which can produce between 300 to 5000 kg/h of steam.
The main technical features for each model are indicated in the table below.

*15 bar version available on request

In compliance to the current laws, the family of low pressure steam boilers BAHR'12 has undergone a conformity assessment carried out by a Notified Body. The conformance to the essential safety requirements laid down by the European Pressure Equipment Directive 97/23/CE is guaranteed by the CE marking placed on the technical data plate affixed on the front tube plate.

3 years warranty

Thanks to its particular technical construction, synonymous of quality and safety, BAHR'12 is supplied with a 3 year guarantee.



In detail

KEY:

1 - *Pressure gauge*
2 - *Manual reset safety pressure switch*
3 - *Working pressure switches*
4 - *Boiler vessel*
5 - *Flame inspection hole*
6 - *Burner plate*
7 - *Front door*
8 - *Control panel*
9 - *Water level indicator*
10 - *Feeding pump/s*
11 - *Boiler drain*
12 - *Smoke chamber with flue spigot and inspection and maintenance door*
13 - *Spring actuated safety valve*
14 - *Main steam valve*
15 - *Self-testing low water level safety switch, with manual reset*
16 - *Automatic water level control and supplementary low level probe, with manual reset*

General features

The steam boiler is formed by a cylindrical, wet bottom furnace, in which the flame develops and where the inversion of the combustion products takes place. The flue gasses then flow into the tube bundle and are converged towards the rear smoke chamber from which they are discharged to the chimney.
The appliance is designed in order to ensure low heating loads in the combustion chamber and low superficial loads.

- ***FURNACE*** of reversed flame, wet bottom, pressurised, floating type
- ***TUBE BUNDLE*** welded to the tube plates.
- ***TURBULATORS***: appropriately shaped, inserted inside the tube bundle in order to optimize heat exchange.
- ***FRONT DOOR***: heavily insulated thanks to the insulation/ refractory material
- ***REAR SMOKE CHAMBER*** insulated and complete with access and cleaning door.
- ***INSULATION*** of the shell with 100 mm thick, high density, rock wool material
- ***CASING*** in 12/10 mm thick pre-painted aluminium
- ***STEEL WALKWAY*** in checker plate positioned in the upper part.
- ***UNDERFRAME*** made in welded steel to ensure a stable support on the boiler room floor
- ***CONTROL PANEL*** box (IP 55 protection level) tested and certified, containing the components necessary for automatic boiler operation, with visual and audible alarms.
- ***ELECTRICAL FEEDING PUMP*** (VERTICAL on request) with suitable flow rates and delivery head (on request a double pump version is available).
- ***DOUBLE WORKING PRESSURE SWITCH*** for two-stage burner operation
- ***INIETTORE VAPORE*** per l'alimentazione di emergenza

Composition of the supply

The range of BAHR'12 steam boilers are supplied in enbloc version, complete with:

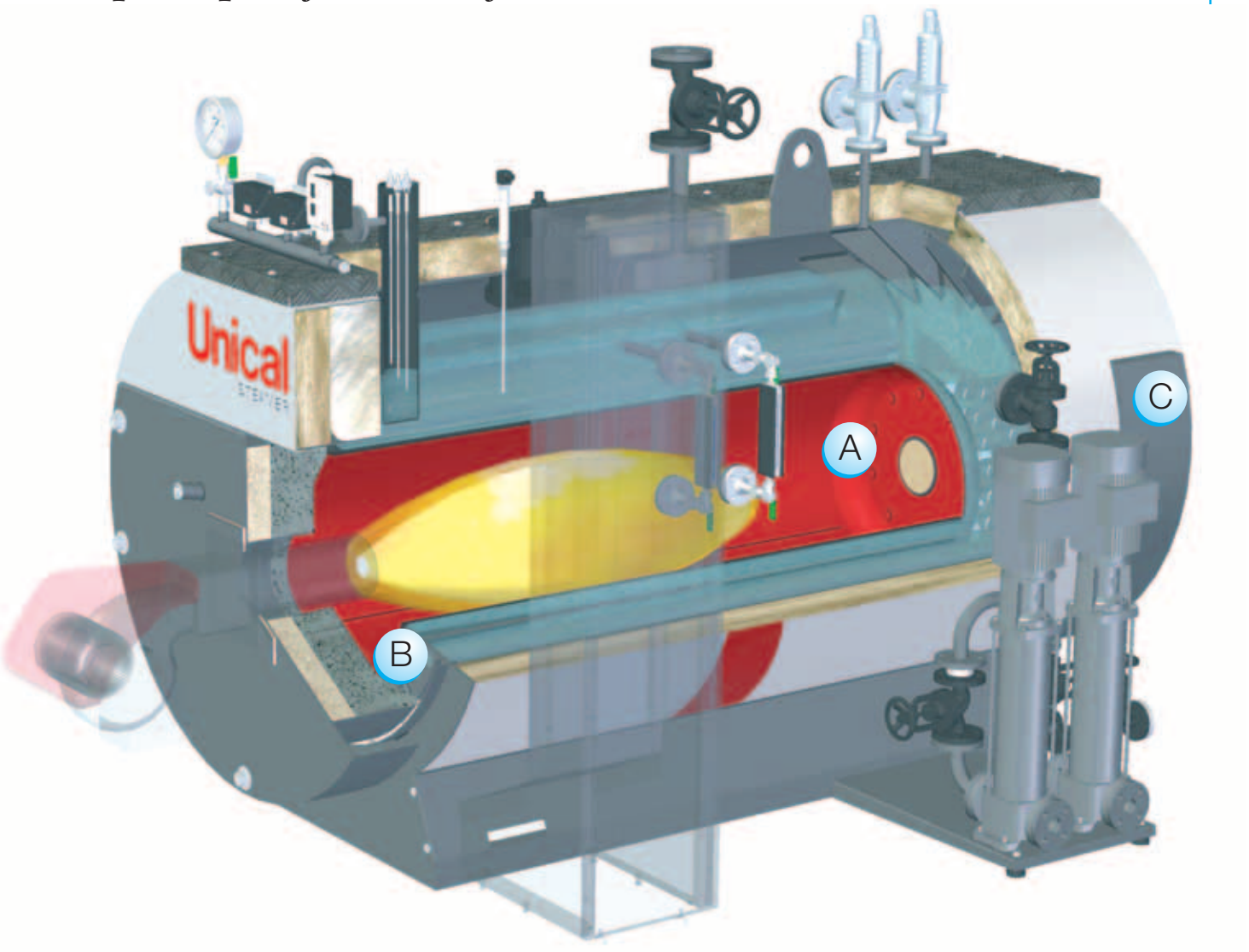
- Manhole
- Humidity separator on the main steam valve
- Front door with flame inspection hole and burner plate
- Rear smoke chamber with inspection and maintenance door
- Rock wool thermal insulation and powerpainted steel casing
- Turbulators
- Support documentation:

  - Manufacturer's conformity declaration according to Annex VII of Pressure Equipment Directive (PED).
  - Enclosures to the conformity declaration concerning the controls and tests carried out, on each single equipment, during the manufacturing phase;
  - Installation, use and servicing manual;
  - Certification related to the safety components installed (PED conformity declarations, Instruction manual);
  - Diagram of the electrical feed pump's working curves;
  - Control panel's electrical wiring diagram and relevant conformity declaration;
  - Instruction sheets and electrical/functional wiring diagrams of the adjustment components fitted and of the burner (supplied on request).
  - Technical sheet regarding the quality of the feeding/ making-up and operating water, with the parameters which have to be subjected to periodical controls, maximum and minimum acceptability limits, frequency of the controls and servicing required.

Quality guarantee

The boilers are manufactured and tested according to the requirements of PED and the procedures indicated in our company's Quality System EN ISO 9001-2000.

The principle of reversed flame



The passage of the flue gasses takes place at first:

- inside the furnace (A) in which the flame develops (1°st passage) and where the reversion of the combustion products takes place (2° passage)

and subsequently:

- inside the tube bundle (B) through which they are converged into the rear smoke chamber (C) from where they are discharged to the chimney.

Special turbulators, which optimize heat exchange, are fitted inside the tube bundle.

Design features

Boiler body

It is formed by a cylindrical shell, furnace, wet bottom and high quality P265 GH steel tube plates, as stated in the standard EN 10028-2, suitably sized in accordance to the VSG design code and CTI (Italian Thermotechnical Commitee) recommendations, and in compliance to the current standards in force.

All the materials employed have certificates attesting their chemical and mechanical properties, the controls carried out during each production stage, and therefore, their suitability for use.

The welding seams are carried out with electric arc by qualified personnel in compliance with certified W.P.S. and are subjected to, in accordance to an internal "Manufacturing and Control" program, to Non Destructive Tests.

The fire tubes of the tube bundle are built in high quality stainless steel and welded to the tube plates by qualified automatic procedures; subsequently they will be subjected to a light expanding operation which will enable the same tubes to be placed near to the front tube plate so as to avoid dangerous lime scale deposits. Finally, the tubes will be trimmed by spot-facing so as to eliminate the plate's protrusions.

Once the boilers have been manufactured they are subjected to hydraulic testing in accordance to the requirement 7.4 – Annex VII, laid down in the Directive 97/23/CE (PED).

Front door

The front door is built in welded steel plate, completely insulated internally with a layer of insulation material and with a layer of high density refractory material.

The door is fitted with hinges which enable it to be easily adjusted and opened quickly. Moreover, the door is fitted with a self-cleaning flame inspection hole conveniently positioned for combustion control during boiler operation.

The burner plate connection is screwed onto the door which, supplied blind, can be drilled to the type of burner selected by the customer.

Rear smoke chamber

This is built in welded steel plate and fixed on to the tube plate by nuts, so as to enable, when needed, to remove it easily.

It is fitted with a cleaning door and an horizontal flue connection, with a diameter suitably sized to the boiler's output.

Basement and walkway

The basement is constituted by a frame, in steel profiles welded to the tube plates and closed with steel plates. The walkway, positioned on the top part of the boiler, is also made in steel, covered with chequered plate and completed, on request, with handrail and access ladder.

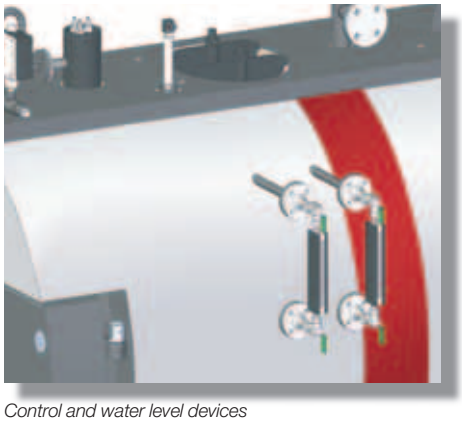
Insulation of the shell and frontal parts

The outer shell is thermally insulated with a rock wool cladding binded with high density, thick thermosetting resins, suitably supported and covered externally in 12/10 mm thick pre-painted aluminium.
The frontal parts of the boiler are also insulated with rock wool and covered externally with a steel sheet.

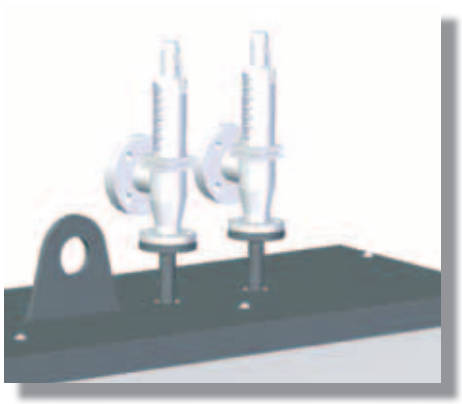
Control and safety devices

Control and water level devices

- Two retroreflection water level gauges
- Automatic water level control, fitted with two conductivity probes and electronic regulator
- Low water level control immersed in a separate tank
- Supplementary low water level probe



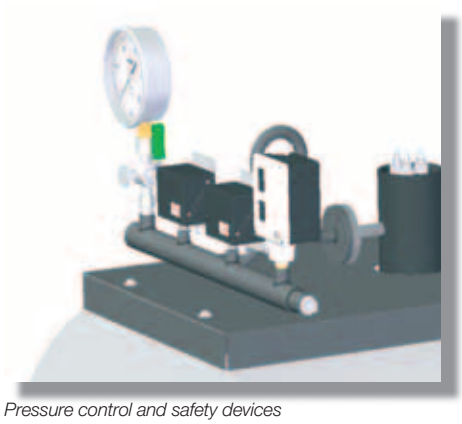
Control and water level devices



Dual spring actuated safety valve

Pressure control and safety devices

- Two working pressure switches for two-stage burner operation
- Manual reset safety pressure switch
- Two spring actuated safety valves

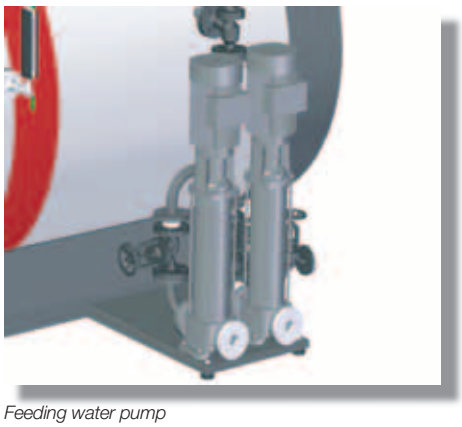


Pressure control and safety devices

Control panel

Electrical feeding pump/s

(Vertical version available on request)



Feeding water pump

All the safety accessories have been approved in the IV category according to the European Pressure Equipment Directive 97/23/CE.

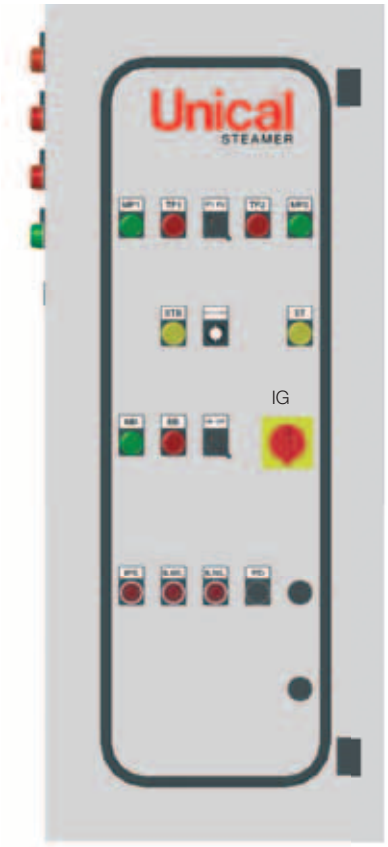
Control Panel

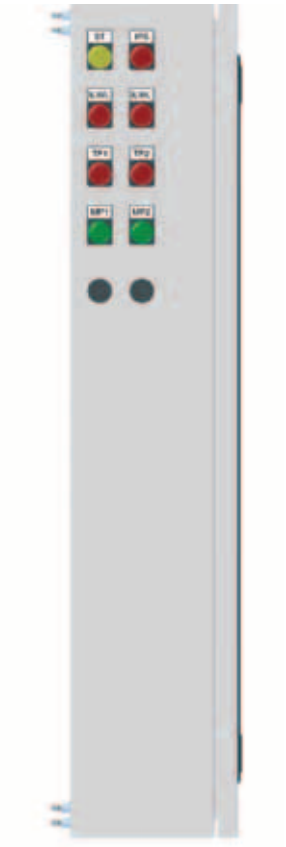
It is built inside a steel cabinet (IP 55 protection level) containing the electrical devices and relative connections. The control panel is supplied with a rapid multipolar connection already wired to the boiler's instrumentation and to the pump and is pre-set to be wired to the 3-phase mains voltage of 400 V a.c. - 50 Hz.

LAYOUT standard control panel

Manoeuvring components, and operation and alarm indications on the control panel:

- Mains switch (disconnecting switch) with door lock, ***IG***
- Power ON indicator, ***ST***
- Selector key for pump, ON/OFF, or its connection to the water level control device, ***AUT - 0 - MAN***
- ***ON-OFF*** burner key selector
- Burner ON indicator, ***MB***
- Burner lock-out indicator, ***BB***
- Pump running indicator, ***MP***
- Warning lamp for pump thermal protection circuit, ***TP***
- Electronic indicator alarm automatic pump operation, ***CL***
- Push button with blinking warning lamp for manual reset of safety pressure switch, ***IPS***
- Push button with blinking warning lamp for manual reset of safety low water level control, ***ILWL***
- Blinking alarm key and manual reset supplementary low water level probe, ***ILWL***
- Push button with blinking warning lamp for self-testing of supplementary low water level probe, ***PD***



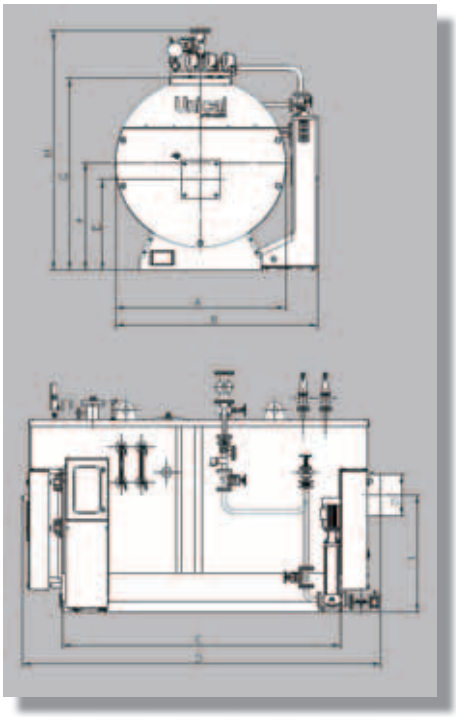


If a second pump (on request) is installed, the control panel is fitted with a selector key for choosing the pump (I-II) and for the repetition of the working status indicators for the second pump.

Dimensions and technical data
(in the configuration of maximum overall dimensions)

Dimensions

BAHR'12	A	B	C	D	E	F	G	H	L	ø
Modello	*mm*	*mm*	*mm*	*mm*	*mm*	*mm*	*mm*	*mm*	*mm*	*mm*
300	1150	1480	1550	2315	635	755	1340	1555	815	219
400	1150	1480	1550	2315	635	755	1340	1555	815	219
500	1270	1600	1750	2515	685	815	1460	1725	880	258
600	1270	1600	1750	2515	685	815	1460	1725	880	258
800	1410	1740	2120	2885	745	885	1600	1870	945	358
1000	1410	1740	2120	2885	745	885	1600	1870	945	358
1250	1555	1885	2527	3322	860	1005	1790	2095	1075	408
1500	1555	1885	2527	3322	860	1005	1790	2095	1075	408
1750	1680	2010	2750	3545	905	1070	1920	2225	1170	408
2000	1680	2010	2750	3545	905	1070	1920	2225	1170	408
2500	1950	2280	2830	3625	1080	1265	2250	2595	1410	508
3000	1950	2280	2830	3625	1080	1265	2250	2595	1410	508
4000	2180	2510	3300	4095	1170	1380	2480	2865	1500	608
5000	2280	2610	3800	4595	1195	1405	2555	1525	1595	658



Technical data *(the values indicated are subject to variations. *For further details please contact the UNICAL STEAMER's technical office)*

Model			***300***	***400***	***500***	***600***	***800***	***1000***	***1250***	***1500***	***1750***	***2000***	***2500***	***3000***	***4000***	***5000***
HEAT OUTPUT	*Pn*	*kW*	210	280	350	420	560	700	875	1050	1225	1400	1750	2100	2800	3500
HEAT INPUT	*Q*	*kW*	241	322	402	483	644	805	1006	1207	1408	1609	2011	2414	3218	4023
STEAM PRODUCTION[*1]		*kg/h*	300	400	500	600	800	1000	1250	1500	1750	2000	2500	3000	4000	5000
MAX WORKING PRESSURE		*bar*							12,0							
WATER CONTENT LEVEL		*l*	525	525	760	760	1080	1080	1555	1555	2005	2005	2890	2890	4155	5800
PRESSURE LOSSES ON FLUE SIDE	*Δp*	*mbar*	2,2	2,6	2,8	3,5	3,8	4,2	4,5	5,1	5,5	6,0	6,8	7,0	8,0	8,8
MIN. LENGHT OF BURNER BLAST TUBE	*L*	*mm*	340	340	340	340	340	340	370	370	370	370	370	370	370	370
MAX BURNER BLAST TUBE DIAMETER	*ø*	*mm*	210	210	240	240	240	240	280	280	280	280	360	360	400	400
FLUE SPIGOT		*mm*	219	219	258	258	358	358	408	408	408	408	508	508	608	658
MAIN STEAM PIPE CONNECTION		*DN*	32	32	40	40	50	50	65	65	65	65	80	80	100	125
SECONDARY STEAM PIPE CONNECTION		*DN*	25	25	25	25	32	32	32	32	32	32	40	40	50	50
FEEDING WATER CONNECTION		*DN*	32	32	32	32	32	32	32	32	32	32	32	32	32	32
TDS CONNECTION		*DN*	*	*	*	*	20	20	20	20	20	20	20	20	20	20
DRAIN CONNECTION		*DN*	25	25	25	25	25	25	25	25	40	40	40	40	40	40
N. OF SAFETY VALVES		*n.*	2	2	2	2	2	2	2	2	2	2	2	2	2	2
SAFETY VALVE(S) DIAMETER		*DN*	25	25	25	25	25	25	25	25	25	25	25	25	25	32

*[*1] With feeding water temperature: 80°C.*

Operating notes

Automatic operation and exemption of qualified boiler operator

The built-in control panel has been designed and appropriately cabled in order to enable automatic boiler operation via the control and safety of water level and pressure devices indicated in the current legislation and described in the pertinent section.

Solely for operating purposes, the safety valve's maximum setting pressure is fixed at 12,0 bar. In this way, in compliance to current Italian laws in force, the BAHR'12 range of boilers with up to 3000 kg/h of steam production and 14,7 bar of working pressure, can obtain the partial exemption of the continuous presence of qualified boiler operator. In any case local laws and requirements MUST be taken into account for the country where the unit is installed.

Water quality

The current law (and a good practice) imposes an adequate treatment of the boiler's feeding water, with indications of the limit values for several specific parameters, which must not be exceeded.

This is in order to safeguard the boiler's structure from damages, due to corrosion or lime scale deposits, which can cause defects and accidents.

In the tables below the prescribed limit values are indicated.
The water level in the feeding water tank varies with the temperature, as indicated in the following table:

Feed water temperature (0°C)	*Positive water head (m)*
70	2
80	3
90	4

Warning:
• avoid using feed water with temperatures inferior to 60°C (suggested value 80°C)
• avoid temperatures exceeding 90°C in the condensate collection tank.

Feeding water

PARAMETER	*Unit*	*Working pressure range ≤ 15 Bar*	*Working pressure range ≤ 25 Bar*	*Minimum frequency analysis*
ph		7 ÷ 9,5	7 ÷ 9,5	*4 times a week*
Total hardness	*mg/l $CaCO_3$*	10	5	*4 times a week*
Oxygen (1)	*mg/l O_2*	0,1	0,05	*Monthly control*
Free carbon dioxide	*mg/l CO_2*	0,2	0,2	*Monthly control*
Iron	*mg/l Fe*	0,1	0,1	*Monthly control*
Copper	*mg/l Cu*	1	0,1	*Monthly control*
Oily substances	*mg*	1	1	*Monthly control*
Appearance	Clear, limpid, without persistent foam			

Note (1): Values valid for systems with a degassing device

Operating water

PARAMETER	*Unit*	*Working pressure range ≤ 15 Bar*	*Working pressure range ≤ 25 Bar*
ph		9 ÷ 11	9 ÷ 11
Total alkalinity	*mg/l $CaCO_3$*	1000	750
Total hardness	*mg/l $CaCO_3$*	10	5
Maximum conductivity	*µS/cm*	8000	7000
Silica	*mg/l SiO_2*	150	100
STD	*mg/l*	3500	3000
Appearance	Clear, limpid, without persistent foam		

Choosing the right burner

The BAHR'12 steam boilers can operate with gas and oil pressure-jet burners. For heavy oil fired applications or for use of Low NOx burners please contact Unical's Technical Service department.

We advise you to install two-stage or modulating burners which permit an optimal reply to the different heating loads required by the user. The BAHR'12 steam boilers are originally fitted with a double pressure adjustment switch for operation with a two-stage burner.

The front door incorporates a burner-support plate which, on the client's request, can be drilled to the flange of the selected burner.

In order to choose the right burner for a specific model it is necessary to consult the 'TECHNICAL DATA' table and in particular the furnace's output values and counterpressure (flue side pressure losses), values which have to fall within the operation range of the selected burner.

To this, you must add another extremely important information, which is the burner's head minimum L length, which has to be respected in order to avoid serious damage to the boiler itself.

WARNING: in compliance to the current law, the burner's maximum calibrated output must not exceed 15% of the furnace's output at the maximum continuous heating load.

Finally it is important to know at what altitude the boiler has to be installed. A burner which can fire correctly at sea level may not operate correctly at 1000 metres above sea level.

For the burner's correct installation and proper execution of the electrical connections and the various adjustments, please refer to the burner's installation manual; these operations must be carried out by qualified personnel (burner specialist) at the commissioning stage.

- ***After having installed the burner remember to fill the empty space between the burner blast tube and the hole in the front door with flame-resistant material (refractory insulation).***
- ***Remember to install the burner's connections in such a way that the front door can be opened completely when the burner has been installed.***

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UNICAL AG s.p.a. 46033 Casteldario - Mantova - tel. +39 0376 57001 - fax +39 0376 660556 - e-mail: info@unical-ag.com www.unical.ag
Stabilimento UNICAL STEAMER 37060 Trevenzuolo (VR) - zona artig. San Pierino - tel. 045 6683476 fax 045 7650594 e-mail: info@unical-ag.com