

# Unical



## BAHR'12



### HIGH PRESSURE STEAM BOILER, THREE PASS REVERSE FLAME 96% EFFICIENCY

OUTPUT RANGE	from 204 kW (300 kg/h) to 4089 kW (6000 kg/h)							
TYPE	OR		HPO			HP		
	smooth pipe		ESA pipe			ESALU pipe		
FUEL	gas, light & heavy oil		gas, light oil			gas		
DESIGN PRESSURE								
12 bar (higher pressure on request)								
MODELS	300	400	500	600	800	1000	1250	1500
	1750	2000	2500	3000	3500	4000	5000	6000

## DESCRIPTION

**High pressure steam generator, with flame inversion, smooth tubes and turbulators. Efficiency 90% (1) for OR version, 94% (1) for HP version, and up to 96% (1) for EC versions.**

The BAHR'12 series is a family of smoke tube steam generators, flame inversion with a wet bottom. The standard version is designed for a safety pressure up to 12 bar (higher pressure available on request) and a steam production from 300 to 6000 kg/h. It can work with liquid or gaseous fuels. Each model is complete with adjustments and safety accessories for automatic operation and easy starting.

In accordance with current legislation, each generator range is subjected to a conformity assessment by a Notified Body. Compliance with the Essential Safety Requirements of the European Directive PED 2014/68 / EU is evidenced by the CE marking.

### General characteristics:

For the flame inversion principle, the combustion gases from the furnace return to the front, from where they are pushed into the tube bundle, conveyed to the smoke chamber and discharged into the chimney. The appliance is sized to ensure low thermal loads in the combustion chamber and low surface loads.

■ **Boiler body:** designed in compliance with the EN 12953-3: 2016 standard, with set-in type tube plates, it consists of a cylindrical shell and a wet bottom furnace in high-quality steel. The furnace is of the smooth type, or bowling hoop (wave) according to the powers.

The body is equipped with 2 still pipes diam. 100 mm for housing all safety and control devices.

All the materials used are accompanied by manufacturing certificates certifying the chemical and mechanical characteristics and the controls during the production cycle and therefore their suitability for use. Welding is performed by suitably qualified personnel, according to approved procedures, and subjected to Non-Destructive Testing, according to an internal "Manufacturing and Control" plan. Upon completion of manufacturing, each generator body is subjected to hydraulic testing in compliance with requirement 7.4 - Annex I of Directive PED 2014/68 / EU.

■ **The smoke pipes:** making up the tube bundle, are welded to the tube plates. Each tube is equipped with a helical or inserted turbulator, depending on the type of tubes used.

■ **Front door:** built in welded steel sheet internally lined with a layer of insulating material and a layer of high-thickness refractory material. It is mounted on hinges that allow for quick opening and adjustment. If necessary, it is possible to reverse the opening direction. The door is also equipped with a self-cleaning flame sight glass for controlling combustion during the burner operation.

■ **Rear smoke chamber:** it is made of welded steel sheet and is fixed to the pressurized body by means of bolts for easy removal. It is equipped with a suitable cleaning door and flue gas connection with a horizontal axis of a diameter suitable for the power of the generator. The smoke chamber of the OR-HP-HPO models is designed to house an integrated and extractable economizer, while the OR series models can be equipped with an external economizer.

■ **Base:** consists of a frame made of steel profiles, welded to the tube plates and closed by steel plates.

■ **Service gangway:** located in the upper part of the generator, it consists of a steel section frame, covered with checkered plate on the walkway and completed, on request, by a parapet with

handrail and access ladder, compliant with the EN ISO 14122 Standard.

■ **Insulation:** the outer shell is thermally insulated with a high-density rock wool mattress, 100 mm thick, bound with thermosetting resins, conveniently supported and externally protected by the 10/10 mm thick pre-painted aluminum casing. The front upper part of the body is also insulated with rock wool covered externally by a metal box.

### Composition of the standard supply: <sup>(2)</sup>

- n. 1 steam outlet shut-off flow valve
- n. 2 spring-loaded safety valves
- n. 2 reflective level indicators, with flanged connections, shut-off and drain valves
- n. 1 large dial pressure gauge with 3-way tap for gauge calibration
- n. 1 safety pressure switch with manual reset from the electrical panel, CE PED certified
- n. 1 limit pressure switch
- n. 1 regulation pressure switch for two-stage burner (high / low flame) or pressure probe for modulating burners
- n. 2 low water level safety probes, with self-diagnosis, with manual reset from the control panel, CE certified
- n. 2 water level probes for pump ON-OFF
- n. 1 vertical centrifugal pump for water loading
- Water supply circuit with shut-off flow valve downstream of the pump and disc check valve
- n. 1 group of water drain / sludge discharge, with quick opening manual valve
- Manhole 420x320 mm in the upper part and a DN150 inspection port in the lower part of the outer shell
- Moisture separator on the steam outlet, for a high-titer steam without dripping
- Blind burner plate (on request it can be drilled according to customer specifications)
- Turbulators in steel, aluminum or steel + aluminum depending on the model
- Lifting hooks
- Electrical panel, IP55 400V - 3 + N - 50Hz
- Standard documentation supplied <sup>(3)</sup>:
  - EC declaration of conformity of:
    - pressure equipment (boiler body)
    - pressure equipment safety valve(s).
    - pressure equipment safety pressure switch
    - pressure equipment minimum level safety probes
  - electrical panel (if supplied)
  - feed pump/s (if supplied)
  - economizer (if provided)
  - economizer safety valve (if supplied)
  - assembly with assessment according to Modules B+D (only for models with PS ≤ 15 bar)
  - warranty
  - manufacturer's declaration concerning the operation of the pressure equipment
  - installation, use and maintenance manual for the boiler and any accessories provided
  - drawing of the steam generator completely equipped
  - wiring diagram of the electrical panel (if supplied)

(1) This value is intended with economizer and may change according working pressure and load conditions.

(2) The quantity and the model may vary according to the configuration.

(3) The above documentation will be provided in electronic format, except for the use and maintenance manual which will be supplied in paper format together with the equipment

## OPTIONAL ACCESSORIES AND SPECIAL VERSIONS

### Options:

- "Second boiler water feed pump" kit
- "Inlet water filter" kit
- EC kit: integrated economiser, extractable from the side (instrument side) to further increase the value the efficiency of the generator, without affecting the dimensions, equipped with connection pipes and downstream thermometer.  
The EC economizer kit is specific to each model and is available for both, gas and diesel versions.  
Upon request: pressure gauges upstream and downstream of the economizer, upstream thermometer, wafer type ball valves of shut-off and by-pass, safety valve.
- "Maximum level safety" kit
- "TDS" kit
- "Automatic bottom drain" kit
- Burner plate drilled according to burner requirements
- Burner

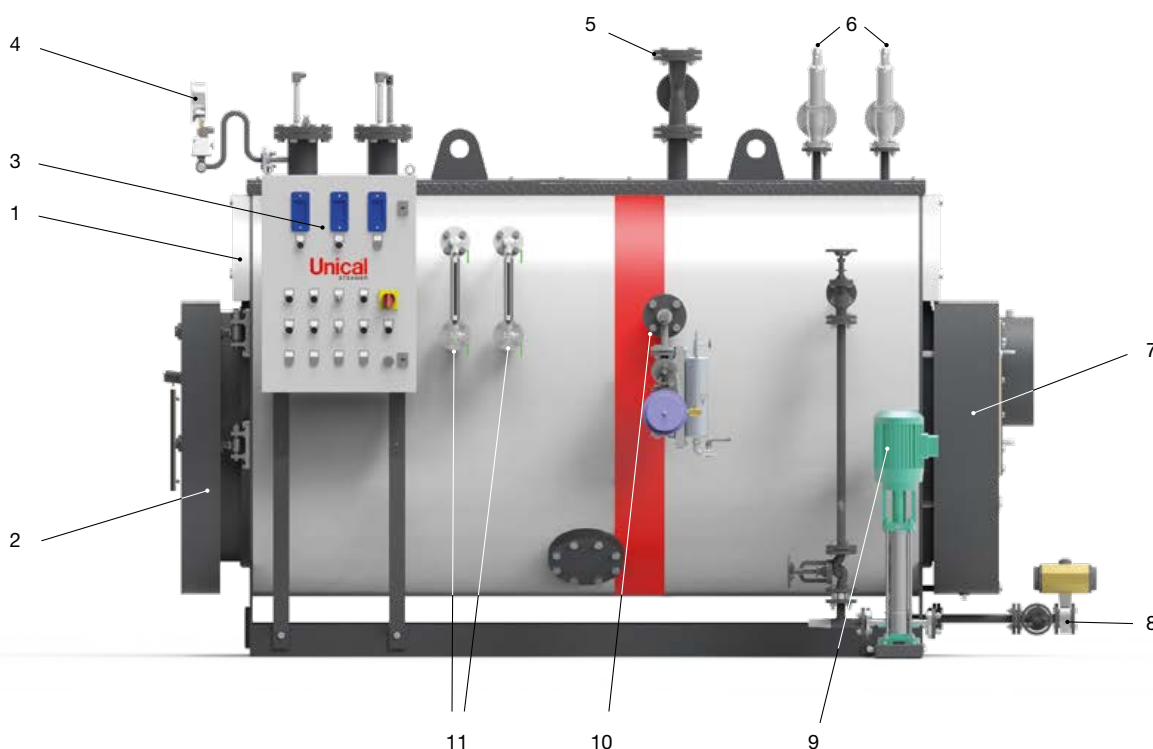
### Special versions

#### BAHR'12 24 hr / 72 hr

- equipped with dedicated panel and "24 hr KIT" to obtain the certification to operate "without continuous supervision" up to a maximum of 24 hours
- equipped with dedicated panel and "72 hr KIT" to obtain certification to operate "without continuous supervision" up to a maximum of 72 hours

## MAIN COMPONENTS

- |                         |                       |
|-------------------------|-----------------------|
| 1. Boiler body          | 7. Rear smoke chamber |
| 2. Front door           | 8. Drain              |
| 3. Electric panel board | 9. Pump feeding group |
| 4. Instruments assembly | 10. TDS connection    |
| 5. Steam valve          | 11. Level gauge       |
| 6. Safety valves        |                       |



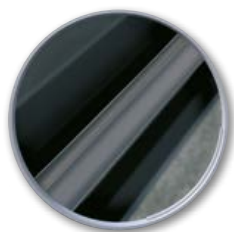
## TECHNICAL DATA

Model	Steam production	Nominal output *	Nominal input OR **	Nominal input HPO **	Nominal input HP **	Water content at level	Total volume	ΔP smoke side OR	ΔP smoke side HPO	ΔP smoke side HP	Burner head min. length	Burner head max. dia.
	kg/h	kW	kW	kW	kW	l	l	mbar	mbar	mbar	mm	mm
300	300	204	226.7	221.7	217	540	730	2.2	2.9	3.7	340	210
400	400	273	303.3	296.7	290.4	540	730	2.6	3.4	4.2	340	210
500	500	341	378.9	370.7	362.8	820	1030	2.8	3.6	4.5	340	240
600	600	409	454.4	444.6	435.1	820	1030	3.5	4.3	5.1	340	240
800	800	560	622.2	608.7	595.7	1080	1500	3.8	4.4	5.1	380	240
1000	1000	700	777.8	760.9	744.7	1080	1500	4.2	5.0	5.8	380	240
1250	1250	852	946.7	926.1	906.4	1555	2195	4.5	5.2	5.9	400	280
1500	1500	1022	1135.6	1110.9	1087.2	1555	2195	5.1	5.9	6.7	400	280
1750	1750	1193	1325.6	1296.7	1269.1	2005	2810	5.5	6.1	6.7	420	280
2000	2000	1363	1514.4	1481.5	1450	2005	2810	6.0	6.8	7.6	420	280
2500	2500	1704	1893.3	1852.2	1812.8	2890	3950	6.8	7.2	7.6	420	360
3000	3000	2045	2272.2	2222.8	2175.5	2890	3950	7.0	7.8	8.6	420	360
3500	3500	2386	2651.1	2593.5	2538.3	3370	4600	7.3	8.1	9.0	450	360
4000	4000	2726	3028.9	2963.0	2900	4155	5780	8.0	8.8	9.6	450	400
5000	5000	3408	3786.7	3704.3	3625.5	5800	7730	8.6	9.6	10.4	450	400
6000	6000	4089	4543.3	4444.6	4350	6760	8600	8.8	10.0	11.2	450	420

\*with feeding water temperature = 80°C and pressure = 12 bar

\*\* According working pressure and load conditions

## TYPE OF PIPES



## SMOOTH PIPES

The smooth smoke pipes, constituting the tube bundle, suitable for gas, light and heavy oil operation, increase the thermal exchange and allow the removal of the residual combustion products. They are formed by pipes with, inside, helical turbulators.

**Efficiency up to 90%**

in function of working pressure of the boiler.

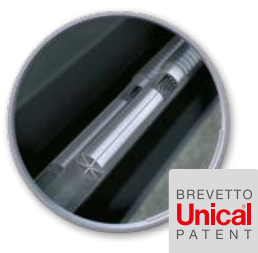


## ESA PIPES

The ESA smoke pipes (UNICAL patent), constituting the tube bundle, suitable for gas and light oil operation, increase the thermal exchange and allow the removal of the residual combustion products. They are formed by pipes with, inside, six 60° sectorial pipes. The adoption of the ESA pipes allowed to reach high performances in terms of efficiency, with important reduction in terms of running costs, fuel consumption and polluting emissions.

**Efficiency up to 92%**

in function of working pressure of the boiler.



## TUBI ESALU

The ESALU smoke pipes (UNICAL patent), constituting the tube bundle, suitable for gas, allow to reach a very high thermal exchange. They are formed by pipes with, inside, special inserts of different types and shapes. The adoption of the ESALU pipes allowed to reach high performances in terms of efficiency, with important reduction in terms of running costs, fuel consumption and polluting emissions.

**Efficiency up to 94%**

in function of working pressure of the boiler.

## PRODUCT PLUS VALUES

- **EXCELLENT WATER EFFICIENCY**  
up to 96% with special pipes ESALU and economiser
- **EFFICIENT THERMAL INSULATION**  
given by:
  - high total thickness, made by joining two rock wool layers with aluminium foil
  - insulation between the casing and the hot parts of the boiler body for thermal bridges elimination
- **REVERSIBLE DOOR OPENING**  
hinges and closing bolts adjustment in all directions
- **UPPER PLATFORM WALKWAY**
- **ELECTRIC PANEL BOARD**  
electromechanical or electronic, expandible (optional)
- **POSSIBLE COMBINATION**  
with one, two, three stage or modulating burners
- **IMPLEMENTABLE FUNCTIONS**  
boiler and board panel designed for the integration of optional kits, also with boiler already installed



IML electric panel board

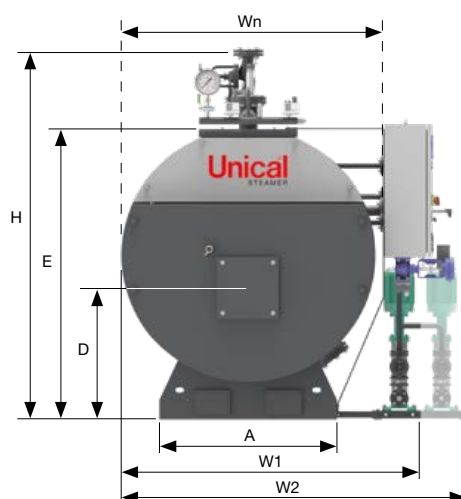
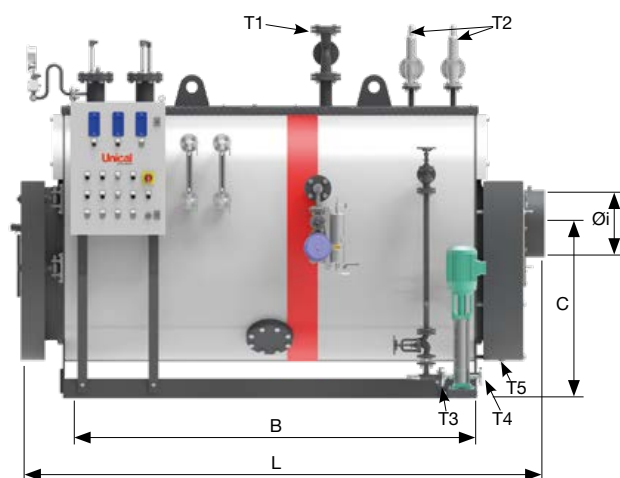


Very thick high quality insulation

- 1 Furnace
- 2 Evaporating chamber
- 3 Tube bundles
- 4 Still water pipe
- 5 Vertical axis pump



## DIMENSIONS



Model	Wn	W1	W2	L	H	A	B	C	D	E	Øi	T1	T2 OUT	T3	T4	T5	Empty weight	Total weight
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	DN	DN	DN	DN		kg	kg
300	1205	1462	1734	2212	1705	780	1550	815	635	1333	204	32	40	25	25	1"	1610	2205
400	1205	1462	1734	2212	1705	780	1550	815	635	1333	204	32	40	25	25	1"	1610	2205
500	1325	1587	1859	2421	1847	860	1750	880	668	1453	254	40	40	25	25	1"	2250	3070
600	1325	1587	1859	2421	1847	860	1750	880	668	1453	254	40	40	25	25	1"	2250	3070
800	1464	1734	1994	2835	2005	950	2120	965	720	1593	254	50	40	25	25	1"	2950	4230
1000	1464	1734	1994	2835	2005	950	2120	965	720	1593	254	50	40	25	25	1"	2950	4230
1250	1606	1888	2144	3195	2270	1090	2526	1103	806	1795	304	65	40	25	25	1"	3820	5485
1500	1606	1888	2144	3195	2270	1090	2526	1103	806	1795	304	65	40	25	25	1"	3820	5485
1750	1735	1998	2254	3503	2387	1200	2750	1189	849	1913	354	65	40	25	40	1"	4960	7140
2000	1735	1998	2254	3503	2387	1200	2750	1189	849	1913	354	65	40	32	40	1"	4960	7140
2500	2005	2283	2539	3852	2766	1386	2830	1405	991	2243	404	80	40	32	40	1"	7000	9890
3000	2005	2283	2539	3852	2766	1386	2830	1405	991	2243	404	80	40	32	40	1"	7000	9890
3500	2005	2283	2539	4079	2739	1470	3300	1405	991	2243	404	80	40	32	40	1"	7550	11200
4000	2240	2590	2865	4300	2995	1700	3300	1500	1045	2473	454	100	40	32	40	1"	9200	13335
5000	2405	2900	3200	4650	3262	1850	3599	1660	1085	2620	504	125	50	40	40	1"	10590	16390
6000	2405	2900	3200	4820	3262	1850	4000	1660	1085	2620	504	125	50	40	40	1"	11800	18560

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