



**LOW PRESSURE STEAM BOILER, THREE PASS REVERSE FLAME
UP TO 97% EFFICIENCY**

OUTPUT RANGE	from 94 kW (140 kg/h) to 2683 kW (4000 kg/h)								
TYPE	STD			HPO			HP		
	smooth pipe			ESA pipe			ESALU pipe		
FUEL	gas, light & heavy oil			gas, light oil			gas		
DESIGN PRESSURE				0,98 bar					
DESIGN TEMPERATURE				119,6°C					
MODELS	140	160	200	300	400	500	600	800	1000
	1250	1500	1750	2000	2500	3000	3500	4000	-

DESCRIPTION

Low pressure steam boiler, three pass reverse flame, with efficiency from 91% up to 97%⁽¹⁾ according the installed smoke tube (STD, HPO, HP).

DE 1 is a family of packaged smoke tube steam boilers, three pass reverse flame, wet back. Standard safety pressure up to 0.98 bar and output from 140 to 4000 kg/h. It can be operated with liquid or gaseous fuels. Every model is complete with regulations and safety accessories for automatic operation and easy commissioning.

In compliance to the current laws, each steam boiler undergoes a conformity assessment, carried out by a Notified Body. The conformance to the essential safety requirements demanded by the European Pressure Equipment Directive 2014/68/UE (PED) is guaranteed by the CE mark.

Design features:

By means of the reverse flame principle the smoke gases in the combustion chamber are diverted to the front, then reversed again to the smoke tube sections and discharged through the chimney connection. The appliance is designed to ensure low heating loads in the combustion chamber and low superficial loads.

- **Boiler body:** is made up of a cylindrical shell and a wet back furnace, made of high quality steel. All the materials have certificates attesting their chemical and mechanical characteristics, the controls are carried out during each production stage, and, theirs suitability for use as well. The welding seams are carried out by qualified personnel in compliance to certified procedures and are subjected to Non Destructive Tests, in accordance to an internal "Manufacturing and Control" program. Once the boilers have been manufactured they are subjected to hydraulic testing in accordance to the requirement 7.4 – Annex I, laid down in the Directive 2014/68/UE (PED).
- **Smoke tubes:** made of high quality steel, are welded to tube plates. Pipes are equipped with steel turbulators or fitted with aluminum and/or steel inserts according the installed smoke tube.
- **Front door:** is built in welded steel plate, completely cladded 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 quickly opened. Moreover, the door is fitted with a self-cleaning sight glass for combustion control during boiler operation.
- **Rear smoke-box:** is built in welded steel plate and fixed on to the tube plate by nuts for an easy access to it. It is fitted with a small door for cleaning purposes and the horizontal flue connection (vertical on request), with a diameter sized to the boiler's output. The rear smoke-box is pre-arranged for the installation of an integral economizer.
- **Basement:** is built with a steel frame, welded to the tube plates and closed with steel plates.
- **Walkway:** positioned on the top part of the boiler, is made of steel, covered with chequered plate and completed; on request with handrail and access ladder.
- **Insulation:** the shell is thermally insulated with a 100 mm rock wool cladding binded with high density, thick thermosetting resins, suitably supported and covered externally in 10/10 thick enamelled aluminum. The frontal parts of the boiler are also insulated with rock wool and covered externally with a metallic box.

Standard equipment: ⁽²⁾

- 1 steam main globe valve.
- 1 lever weighted safety valve ⁽³⁾
- 2 reflecting level indicators, with flanged connections, purging and cut-off cocks.
- Control board panel IP55 400V - 3+N - 50Hz complete with:
 - 1 large manometer with 3 way cock for manometer calibration.
 - 1 safety pressure switch with manual reset onto the board panel, CE PED certified.
 - 1 limit working pressure switch.
 - 1 regulation pressure switch for two stages burners or probe for modulating burners.
 - 2 safety minimum level switches, with manual reset CE certified.
 - 2 water level probes for ON-OFF pump regulation.
- Feeding group complete with 2 centrifugal pumps.
- Valve assembly for feeding circuit, with relevant pipes already fitted.
- Automatic group for level control.
- 1 manual bottom blowdown valve.
- Man-hole on top and hand-hole on water side.
- Integral steam drier for high steam quality.
- Blind burner plate.
- Turbulators (STD version) or special high efficiency pipes fitted with inserts (HPO, HP versions).
- Lifting lugs.
- Document folder enclosing:
 - Manufacturer's Declaration of Conformity in compliance with the Annex VII of the European Directive 2014/68/UE (PED)
 - Installation, operation and service manuals.
 - Certificates of safety components.
 - Control board's electric schemes and related Declaration of Conformity.
 - Water characteristics: requirements concerning the quality of water supply, the water in the boiler, frequency and type of sample tests to do.

Options:

- Spring actuated safety valve
- Kit of "Second boiler water feeding pump"
- Kit of "maximum safety level"
- Kit TDS (Total Dissolved Salts)
- Kit of "Automatic de-sludging" (Blow down)
- Kit of "72 hr exemption" for standard steam boiler *
- Pre-drilled burner plate
- Oil or gas fired burner
- * Supplied with electronic board panel Schuster, model IML (Industrial Multi Logic) or IMC

Special versions

BAHR'UNO 24 hr / 72 hr

- Equipped with either "IML" or "IMC board panel" and "Kit 72 hr" to obtain:
 - the certification for operation "without continuous surveillance" for model until 2000 kg/h
 - the certification for operation "without continuous surveillance" up to a maximum of 72 hr for model over 2000 kg/h.

EC / HPOEC / HPEC versions

- To increase more the already high steam boiler efficiency, without influencing the dimensions the boilers are already preset to fit, on request (in the factory or later, on the field), the economizer Kit EC, which is specific for each model and is available for both, gas and oil versions.

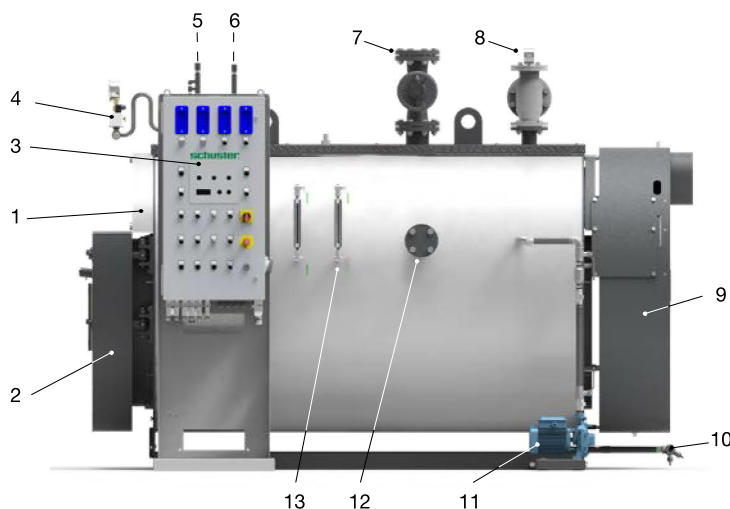
(1) This value is intended with economizer and may change according working pressure and load conditions.

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

(3) 2 safety valves for the models over 2000 kg/h. On the request spring operated safety valves.

MAIN COMPONENTS

1. Boiler body
2. Front door
3. Board panel
4. Instruments assembly
5. Level safety sensors
6. Capacitive level transmitter
7. Steam valve
8. Safety valve
9. Rear smoke chamber
10. Drain
11. Pump feeding group
12. TDS connection
13. Level gauge



TECHNICAL DATA

Modello	Steam production	Nominal output *	Nominal Input STD **	Nominal Input HPO **	Nominal Input HP **	Max. working pressure	Water content at level	Total volume	ΔP smoke side STD	ΔP smoke side HPO	ΔP smoke side HP	Burner head min. length	Burner head max. dia.
	kg/h	kW	kW	kW	kW	bar	l	l	mbar	mbar	mbar	mm	mm
140	140	94	104.4	102.2	98.9	0.98	310	410	2.0	2.3	2.6	340	210
160	160	107	118.9	116.3	112.6	0.98	310	410	2.3	2.5	2.8	340	210
200	200	134	148.9	145.7	141.1	0.98	310	410	2.6	2.9	3.2	340	210
300	300	201	223.3	218.5	211.6	0.98	568	730	2.2	2.7	3.2	340	210
400	400	268	297.8	291.3	282.1	0.98	568	730	2.6	3.3	4.2	340	210
500	500	335	372.2	364.1	352.6	0.98	814	1040	2.8	3.6	4.5	340	240
600	600	402	446.7	437.0	423.2	0.98	814	1040	3.5	4.3	5.1	340	240
800	800	537	596.7	583.7	565.3	0.98	1160	1545	3.8	4.4	5.1	380	240
1000	1000	671	745.6	729.3	706.3	0.98	1160	1545	4.2	5.0	5.8	380	240
1250	1250	838	931.1	910.9	882.1	0.98	1663	2250	4.5	5.2	5.9	400	280
1500	1500	1006	1117.8	1093.5	1058.9	0.98	1663	2250	5.1	5.9	6.7	400	280
1750	1750	1174	1304.4	1276.1	1235.8	0.98	2140	2890	5.5	6.1	6.7	420	280
2000	2000	1341	1490.0	1457.6	1411.6	0.98	2140	2890	6.0	6.8	7.6	420	280
2500	2500	1677	1863.3	1822.8	1765.3	0.98	2970	4060	6.8	7.2	7.6	420	360
3000	3000	2012	2235.6	2187.0	2117.9	0.98	2970	4060	7.0	7.8	8.6	420	360
3500	3500	2347	2607.8	2551.1	2470.5	0.98	3490	4770	7.6	8.5	9.5	450	400
4000	4000	2683	2981.1	2916.3	2824.2	0.98	4155	5780	8.6	9.8	11.0	450	400

* with feeding water temperature = 70°C and pressure = 1 bar

** According working pressure and load conditions

PRODUCT PLUS VALUES

- **EXCELLENT EFFICIENCY**
up to 97% with special ESALU and economiser
- **SMOKE CHAMBER PREARRANGEMENT**
for possible economiser integration, also with the boiler already installed
- **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
- **PLATFORM**
in checker plate, placed in the upper part
- **SIMPLIFIED ELECTRICAL CONNECTION**
via fast coupling connectors (optional)
- **BOARD PANELS**
electromechanical or electronic, expandable (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

TYPE OF PIPES

SMOOTH PIPES

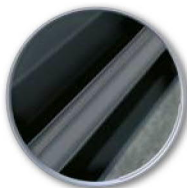
The smooth smoke pipes, suitable for gas, light and heavy oil operation, constituting the tube bundle, increase the thermal exchange and allow the removal of the residual combustion products.

They are formed by pipes with, inside, helical turbulators.

They are standard supplied for gas, light and heavy oil operation.

Efficiency up to 91%.

In function of working pressure of the boiler.



ESA PIPES

The ESA smoke pipes (patented), suitable for gas and light oil operation, constituting the tube bundle, 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. They are standard supplied for gas and light oil operation.

Efficiency up to 93%.

In function of working pressure of the boiler.



ESALU PIPES

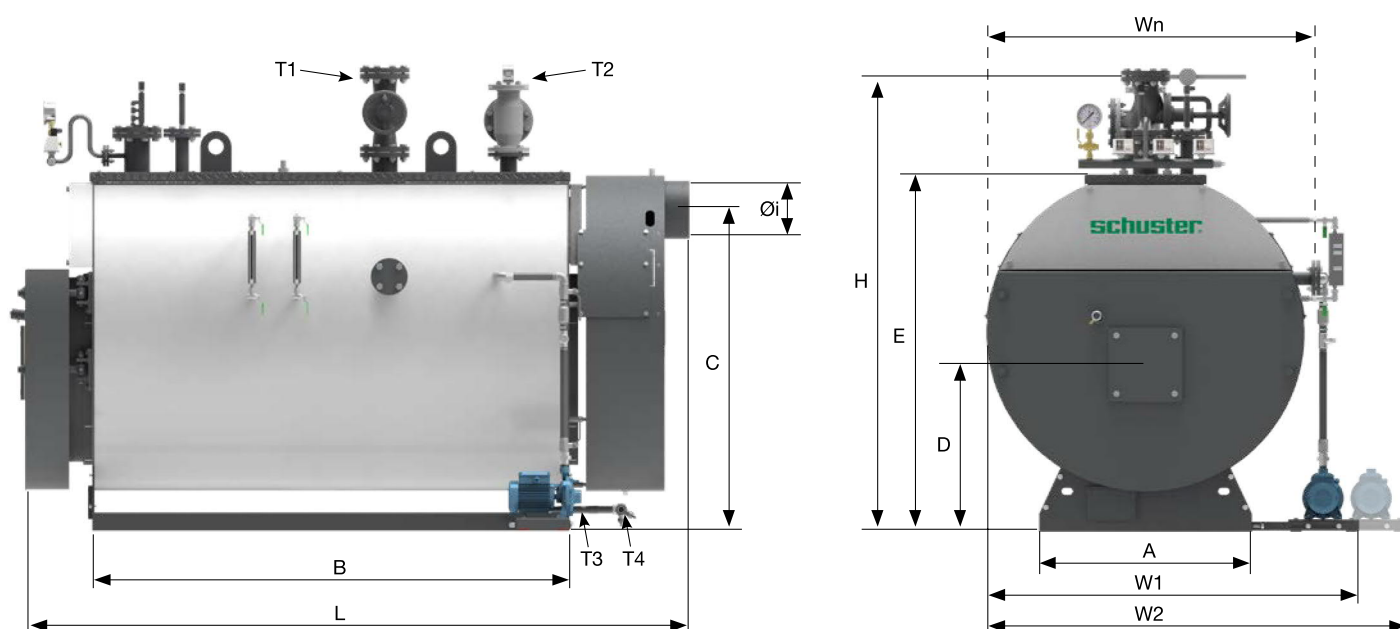
The ESALU smoke pipes (patented), suitable for gas, constituting the tube bundle, allow to reach a very high thermal exchange. They are formed by pipes with, inside, special inserts of different types and shapes. The adoption of the ESALU pipes allowed to reach high performances in terms of efficiency,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

Efficiency up to 95%.

In function of working pressure of the boiler.



DIMENSIONS



Model	Wn	W1	W2	L	H	A	B	C	D	E	Øi	T1	T2	T3	T4	Empty weight	Total weight
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm					kg	kg
140	1126	1370	1629	1800	1485	720	1100	725	580	1220	212	DN 50	DN 32	1"	1/2"	1100	1420
160	1126	1370	1629	1800	1485	720	1100	725	580	1220	212	DN 50	DN 32	1"	1/2"	1100	1420
200	1126	1370	1629	1800	1485	720	1100	725	580	1220	212	DN 50	DN 32	1"	1/2"	1100	1420
300	1225	1417	1687	2350	1630	780	1550	1167	635	1340	212	DN 65	DN 40	1"	1"	1460	2028
400	1225	1417	1687	2350	1630	780	1550	1167	635	1340	212	DN 65	DN 40	1"	1"	1460	2028
500	1342	1543	1813	2555	1800	860	1750	1266	685	1460	212	DN 80	DN 50	1"	1"	1840	2654
600	1342	1543	1813	2555	1800	860	1750	1266	685	1460	212	DN 80	DN 50	1"	1"	1840	2654
800	1495	1670	1945	2950	1980	950	2120	1379	745	1600	252	DN 100	DN 65	1"	1"	2240	3600
1000	1495	1670	1945	2950	1980	950	2120	1379	745	1600	252	DN 100	DN 65	1"	1"	2240	3600
1250	1628	1804	2061	3410	2220	1090	2527	1417	860	1790	302	DN 125	DN 80	1"	1"	3190	4853
1500	1628	1804	2061	3410	2220	1090	2527	1417	860	1790	302	DN 125	DN 80	1"	1"	3190	4853
1750	1756	1934	2215	3765	2350	1200	2750	1482	905	1920	352	DN 125	DN 100	1"	1 1/2"	3970	6110
2000	1756	1934	2215	3765	2350	1200	2750	1482	905	1920	352	DN 125	DN 100	1"	1 1/2"	3970	6110
2500	2030	2100	2386	3858	2725	1470	2830	1677	1080	2250	402	DN 150	DN 80 (2x)	1"	1 1/2"	5640	8610
3000	2030	2100	2386	3858	2725	1470	2830	1677	1080	2250	402	DN 150	DN 80 (2x)	1"	1 1/2"	5640	8610
3500	2030	2100	2386	4050	2725	1470	3330	1410	1080	2250	502	DN 150	DN 100 (2x)	1"	1 1/2"	6390	9880
4000	2300	2400	2680	4380	3192	1700	3430	1650	1165	2473	502	DN 200	DN 150 (2x)	1 1/2"	1 1/2"	6890	11045