

TERNOX 2S



PRESSURIZED THREE-PASS HOT WATER BOILER

RANGE

from 2200 to 15000 kW

WORKING TEMPERATURE

up to 110°C

OPERATION WITH

natural gas, LPG, light oil, heavy oil jet burners

Low NO_x
version MODELS

2200

3050

3800

5000

6300

7500

9500

11300

14000

STD
version MODELS

2500

3500

4500

5800

7000

8500

10200

12500

15000

CERTIFICATION IN OUTPUT RANGE/Low NO_x emissions

DESCRIPTION

High pressure packaged hot water boiler, three-pass fire tube, horizontal design.

TERNOX 2S is a family of packaged smoke tube hot water boilers, genuine three-pass, and wet back. Standard safety pressure up to 6 bar (higher pressure available on request) and output from 2200 to 15000 kW. It can be operated with liquid or gaseous fuels. Designed and manufactured according to EN 303-1. CE certification.

Design features:

By means of the three-pass design the smoke gases in the combustion chamber are diverted to the front through the first set of fire tubes by the reversing chamber; then reversed again by the frontal smoke box to the second smoke tube sections and discharged through the chimney connection. The appliance is designed to ensure low heating loads in the combustion chamber, low superficial loads and low NOx emissions (with Low NOx burners).

- **Boiler body:** is made of a cylindrical shell and a wet back furnace, welded to tube plates, 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, their suitability for use as well. The welding seams are carried out by qualified personnel in compliance to certified procedures. Once the boilers have been manufactured they are subjected to hydraulic testing.
- **Smoke tubes:** made of high quality steel, are welded to tube plates, and are without helical turbulators.
- **Reversing chamber:** is built in welded steel plate, completely water-cooled, and connected to the rear smoke-box.
- **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. One or two doors are present according

the boiler's capacity, for cleaning and inspection. Close to the burner hole is present a self-cleaning sight glass for combustion control during boiler operation.

- **Rear smoke-box:** is built in welded steel plate, completely cladded internally with a layer of insulation material and with a layer of high density refractory material. Door for cleaning and inspection is present as well. Complete with an horizontal chimney connection with a diameter sized to the boiler's output. The rear smoke-box can be accessorized with and external economizer or condenser.
- **The base:** is built with a steel frame, welded to the tube 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 rock wool cladding binded with high density, thick thermosetting resins, suitably supported and covered externally in aluminum.

Standard equipment: ⁽¹⁾

- Blind burner plate.
- Lifting lugs.
- Document folder enclosing:
 - Installation, operation and service manuals.
 - Water characteristics: requirements concerning the quality of water supply, the water in the boiler, frequency and type of sample tests to do.

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

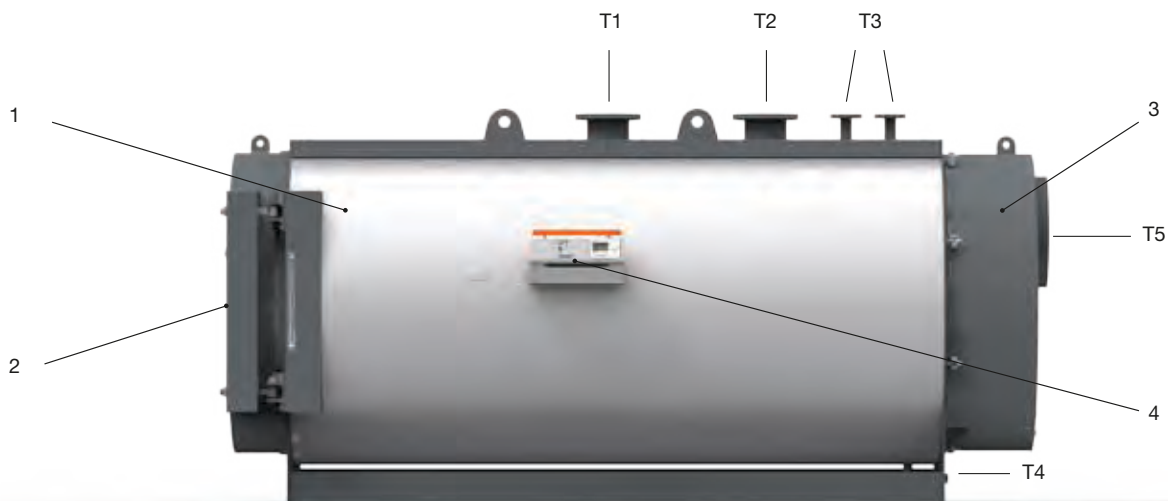
Optional accessories:

- Economizer to increase boiler efficiency, available either for gas or light oil fuel.
- Condensing heat recovery unit, available for gaseous fuel only.

MAIN COMPONENTS

1. Boiler body
2. Front door
3. Rear smoke chamber
4. Board panel

- T1. Flow
- T2. Return
- T3. Expansion vessel connection
- T4. Boiler drain
- T5. Chimney connection



TECHNICAL DATA (STD version)

Model TERNOX 2S STD	Nominal output	Nominal input	Efficiency at full load	Efficiency at part load (30%)	Water content	ΔP smoke side	Smoke side pressure	Empty Weight	CONNECTIONS (\emptyset)			
									T1/T2	T3	T4	T5
	kW	kW	%	%	lt	mbar	bar	kg	\emptyset mm	\emptyset mm	\emptyset mm	\emptyset mm
2500 STD	1800÷2500	1951÷2753	92.25÷90.8	94.25÷92.8	3790	3.8÷7.5	6	5500	200	50	1"1/2	570
3500 STD	2350÷3500	2537÷3848	92.64÷90.95	94.64÷92.95	4750	7.5÷8.0	6	7000	200	65	1"1/2	620
4500 STD	3000÷4500	3239÷4950	92.62÷90.9	94.62÷92.9	6400	3.6÷8.5	6	8200	250	80	1"1/2	660
5800 STD	4000÷5800	4324÷6381	92.5÷90.9	94.5÷92.9	8060	4.4÷9.5	6	10000	250	80	1"1/2	660
7000 STD	5100÷7000	5528÷7705	92.25÷90.85	94.25÷92.85	9760	4.9÷9.5	6	11500	250	100	1"1/2	720
8500 STD	5700÷8500	6169÷9377	92.4÷90.65	94.4÷92.65	11480	4.8÷11	6	13500	250	100	1"1/2	820
10200 STD	8400÷10200	9128÷11192	92.02÷91.14	94.02÷93.14	14960	8.3÷12.5	6	17300	300	100	1"1/2	820
12500 STD	10100÷12500	11012÷13789	91.71÷90.65	93.71÷92.65	24100	8.9÷14.0	6	25500	300	125	60	820
15000 STD	12200÷15000	13251÷16458	92.07÷91.14	94.07÷93.14	27300	9.7÷15.0	6	30000	350	125	60	1000

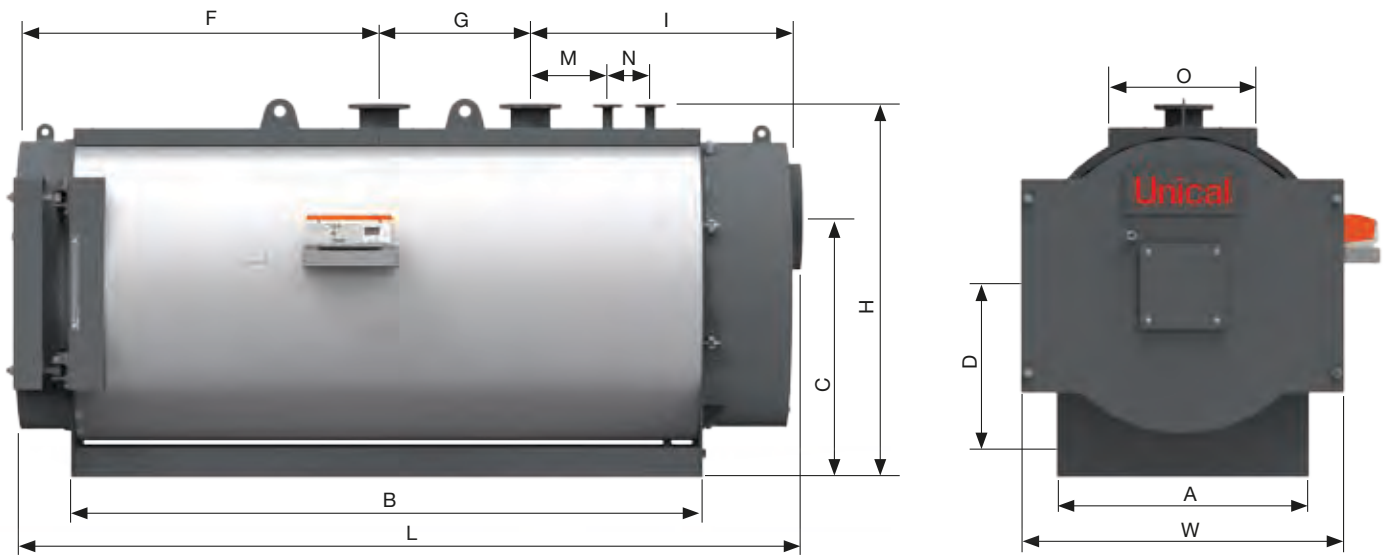
TECHNICAL DATA (Low NOx version)

Model TERNOX 2S Low NOx	Nominal output	Nominal input	Efficiency at full load	Efficiency at part load (30%)	Water content	ΔP smoke side	Smoke side pressure	Empty Weight	CONNECTIONS (\emptyset)			
									T1/T2	T3	T4	T5
	kW	kW	%	%	lt	mbar	bar	kg	\emptyset mm	\emptyset mm	\emptyset mm	\emptyset mm
2200 Low NOx	1800÷2200	1951÷2406	92.25÷91.45	94.25÷93.45	3790	3.8÷5.7	6	5500	200	50	1"1/2	570
3050 Low NOx	2350÷3050	2537÷3329	92.64÷91.62	94.64÷93.62	4750	3.5÷6.0	6	7000	200	65	1"1/2	620
3800 Low NOx	3000÷3800	3239÷4144	92.62÷91.7	94.62÷93.7	6400	3.6÷6.0	6	8200	250	80	1"1/2	660
5000 Low NOx	4000÷5000	4324÷5457	92.5÷91.62	94.5÷93.62	8060	4.4÷6.9	6	10000	250	80	1"1/2	660
6300 Low NOx	5100÷6300	5528÷6892	92.25÷91.41	94.25÷93.41	9760	4.9÷7.6	6	11500	250	100	1"1/2	720
7500 Low NOx	5700÷7500	6169÷8215	92.4÷91.3	94.4÷93.3	11480	4.8÷8.4	6	13500	250	100	1"1/2	820
9500 Low NOx	8400÷9500	9128÷10377	92.02÷91.55	94.02÷93.55	14960	8.3÷10.7	6	17300	300	100	1"1/2	820
11300 Low NOx	10100÷11300	11012÷12390	91.71÷91.2	93.71÷93.2	24100	8.9÷11.3	6	25500	300	125	60	820
14000 Low NOx	12200÷14000	13251÷15294	92.07÷91.54	94.07÷93.54	27300	9.7÷12.9	6	30000	350	125	60	1000

PRODUCT PLUS VALUES

- **FLEXIBILITY**
thanks to the certification in output range
- **LOW EMISSIONS NO_x < 80 mg/kWh**
thanks to the reduction of the specific thermal load for Low NOx version
- **FURNACE BOTTOM**
completely wet
- **JUST ONE FRONT DOOR**
(up to the model 10200)
with self centring closing system completely adjustable
- **TWO FRONT DOORS**
(from model 12500) tube bundles cleaning facility
- **DOOR INTERNAL INSULATION**
in super light recyclable refractory concrete
- **BODY INSULATION**
with anti-tearing mineral wool mattress
- **BOARD PANEL**
thermo-mechanical or electronic
- **POSSIBLE COMBINATION**
with one/two stage or modulating burners, operated on gas/LPG, light oil or heavy oil
- **EASY TRANSPORTATION**
thanks to the upper lifting lugs and the strong frame side members

DIMENSIONS

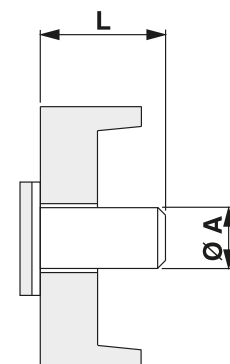


Model TERNOX 2S STD	W	L	H	A	B	C	D	F	G	I	M	N	O
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
2500 STD	1710	4225	2010	1350	3370	1400	1030	1940	820	1465	420	230	800
3500 STD	1830	4711	2120	1450	3824	1480	1080	1954	1140	1617	570	250	800
4500 STD	1980	5134	2360	1550	4174	1620	1180	2017	1380	1737	550	300	800
5800 STD	2180	5639	2580	1710	4626	1780	1300	2451	1400	1788	600	300	800
7000 STD	2320	5875	2700	1850	4840	1870	1350	2505	1510	1860	550	350	880
8500 STD	2400	6420	2870	1900	5350	1980	1460	2035	2590	1795	480	350	880
10200 STD	2650	6772	3080	2080	5632	2080	1560	1406	3450	1916	550	350	1000
12500 STD	3210	7211	3715	2400	6236	2700	1480	1643	3500	2068	650	400	1470
15000 STD	3320	7761	3910	2500	6736	2750	1583	1693	4000	2068	650	400	1470

Model TERNOX 2S Low NOx	W	L	H	A	B	C	D	F	G	I	M	N	O
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
2200 Low NOx	1710	4225	2010	1350	3370	1400	1030	1940	820	1465	420	230	800
3050 Low NOx	1830	4711	2120	1450	3824	1480	1080	1954	1140	1617	570	250	800
3800 Low NOx	1980	5134	2360	1550	4174	1620	1180	2017	1380	1737	550	300	800
5000 Low NOx	2180	5639	2580	1710	4626	1780	1300	2451	1400	1788	600	300	800
6300 Low NOx	2320	5875	2700	1850	4840	1870	1350	2505	1510	1860	550	350	880
7500 Low NOx	2400	6420	2870	1900	5350	1980	1460	2035	2590	1795	480	350	880
9500 Low NOx	2650	6772	3080	2080	5632	2080	1560	1406	3450	1916	550	350	1000
11300 Low NOx	3210	7211	3715	2400	6236	2700	1480	1643	3500	2068	650	400	1470
14000 Low NOx	3320	7761	3910	2500	6736	2750	1583	1693	4000	2068	650	400	1470

BURNER HEAD TUBE DIMENSIONS

BOILER TYPE	øA mm	L (min/max) mm
2200 Low NOx / 2500 STD	400	370/520
3050 Low NOx / 3500 STD	400	370/520
3800 Low NOx / 4500 STD	500	410/560
5000 Low NOx / 5800 STD	500	410/560
6300 Low NOx / 7000 STD	500	410/560
7500 Low NOx / 8500 STD	500	450/650
9500 Low NOx / 10200 STD	500	450/650
11300 Low NOx / 12500 STD	650	450/650
14000 Low NOx / 15000 STD	650	450/650



CONDENSER “COND” (optional) FOR RANGE 2500 ÷ 7000 kW

Condensers are available as optional kits for the heat recovery of flue gases.

Medium efficiency recovery:

6÷8% at 100% load, return temp. 60°C

Material: stainless steel, aluminium

BOILER TYPE	CONDENSER TYPE
2200 Low NOx / 2500 STD	COND 2500
3050 Low NOx / 3500 STD	COND 3500
3800 Low NOx / 4500 STD	COND 4500
5000 Low NOx / 5800 STD	COND 5800
6300 Low NOx / 7000 STD	COND 7000

Steel pressurised boilers TERNOX 2S with condenser reach four stars of efficiency ★★★★★

The inlet temperature at the boiler return connection must be > 55°C in any working conditions.



CONSTRUCTION CHARACTERISTICS OF COND

Heat exchanger flue / water, realized in the tube bundle made of special patented stainless steel AISI 316 L tubes, equipped with special multilamellar and progressive aluminum / silicon / magnesium inserts, completely rolled.

- Flanged connections for water inlet and outlet
- Box for connection boiler/chimney
- Connection for condensate drain
- Smoke temperature measuring point



COND 2500		TERNOX 2500 2S STD	TERNOX 2200 2S Low NOx
COMBUSTION CHAMBER INPUT min/max	kW	1951 / 2753	1951 / 2406
RECOVERY (load 100%, Return temperature 60°C) min/max	%	6.15 / 7.85	6.15 / 7.07
EFFICIENCY WITH COND (load 100%, Return temperature 60°C) min/max.	%	98.40 / 98.65	98.40 / 98.52
COND 3500		TERNOX 3500 2S STD	TERNOX 3050 2S Low NOx
COMBUSTION CHAMBER INPUT min/max	kW	2537 / 3848	2537 / 3329
RECOVERY (load 100%, Return temperature 60°C) min/max	%	5.72 / 7.64	5.72 / 6.85
EFFICIENCY WITH COND (load 100%, Return temperature 60°C) min/max.	%	98.35 / 98.59	98.35 / 98.47
COND 4500		TERNOX 4500 2S STD	TERNOX 3800 2S Low NOx
COMBUSTION CHAMBER INPUT min/max	kW	3239 / 4951	3239 / 4144
RECOVERY (load 100%, Return temperature 60°C) min/max	%	5.71 / 7.68	5.71 / 6.76
EFFICIENCY WITH COND (load 100%, Return temperature 60°C) min/max.	%	98.34 / 98.57	98.34 / 98.46
COND 5800		TERNOX 5800 2S STD	TERNOX 5000 2S Low NOx
COMBUSTION CHAMBER INPUT min/max	kW	4324 / 6381	4324 / 5457
RECOVERY (load 100%, Return temperature 60°C) min/max	%	5.78 / 7.44	5.78 / 6.69
EFFICIENCY WITH COND (load 100%, Return temperature 60°C) min/max.	%	98.28 / 98.34	98.28 / 98.31
COND 7000		TERNOX 7000 2S STD	TERNOX 6300 2S Low NOx
COMBUSTION CHAMBER INPUT min/max	kW	5529 / 7705	5529 / 6892
RECOVERY (load 100%, Return temperature 60°C) min/max	%	6.06 / 7.66	6.06 / 6.96
EFFICIENCY WITH COND (load 100%, Return temperature 60°C) min/max.	%	98.31 / 98.51	98.31 / 98.37

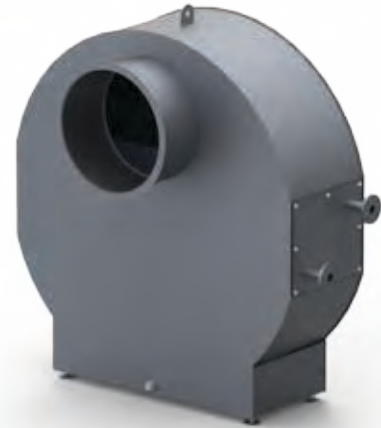
ECONOMIZER (optional)

The economizers for the recovery of the residual heat from the smokes at the outlet of the boiler, are available as optional kits.

Average efficiency recovery: 3 to 4%, with remarkable fuel saving.

Material: Carbon steel; on request stainless steel.

BOILER TYPE	ECONOMIZER TYPE
2200 Low NOx / 2500 STD	Eco type 1
3050 Low NOx / 3500 STD	Eco type 2
3800 Low NOx / 4500 STD	Eco type 3
5000 Low NOx / 5800 STD	Eco type 4
6300 Low NOx / 7000 STD	Eco type 5
7500 Low NOx / 8500 STD	Eco type 6
9500 Low NOx / 10200 STD	Eco type 7
11300 Low NOx / 12500 STD	Eco type 8
14000 Low NOx / 15000 STD	Eco type 9



TECHNICAL FEATURES



Heat exchanger smoke / water with exchange battery with finned pipes suitable for operation with natural gas / LPG or light oil.

- Flanged connections for water inlet and outlet
- Box for connection boiler /chimney
- Connection for condensates drain
- Smoke temperature measuring point

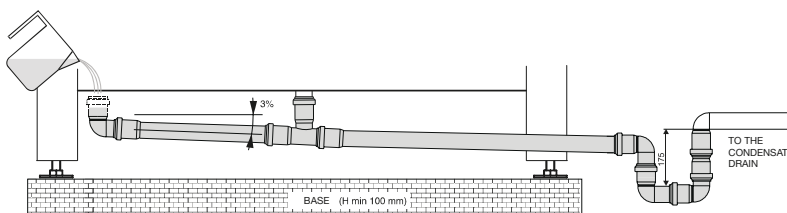
The economizers are available in **two versions**:

- Version for operation with gaseous fuels
- Version for operation with light oil or dual fuel (gas & oil) burners

CONDENSATES DRAIN WITH ECONOMIZER OR CONDENSER

The economizers are endowed with connection for condensate drain in sewage, that has to be:




- Realized in such way to prevent the spillage of the combustion products in the environment or in sewage;
- Sized and realized so that to allow the correct evacuation of the condensates avoiding possible leakages;
- Installed in such way that the freezing of the condensate cannot take place under the foreseen operation conditions.



- Minimum height of the siphon requested by the Standard
- Minimum height with the boiler operating at its maximum capacity.

In case in which was not possible to create a base of 100 mm, it is possible to position the boiler on the floor level and to create a sump at least 100 mm deep in order to lodge the siphon.

BOARD PANELS (optional)

STANDARD code 21057	MASTERMODUL MASTERBISTADIO code 38779 code 37895	CASCATAMODUL CASCATABISTADIO code 37900 code 37901
		
<p>The standard board panel is equipped with:</p> <ul style="list-style-type: none"> • Series of switches • Thermometer • Safety thermostat • Two stage working thermostat • Minimum temperature thermostat (for C.H. pump – inside the board panel) 	<p>The board panels MASTER MODUL and MASTERBISTADIO, for high temperature working, are equipped with:</p> <ul style="list-style-type: none"> • E8 controller • Lago Basic controller for burner • Outer temp. sensor • Boiler temp. sensor • D.H.W. storage tank temperature sensor • C.H. flow temp. sensor • Primary circuit temperature sensor • Series of switches • Safety thermostat 	<p>The board panels CASCATAMODUL e CASCATABISTADIO are equipped with:</p> <ul style="list-style-type: none"> • Lago Basic controller for burner • Boiler temperature sensor • Series of switches • Safety thermostat

THERMOREGULATION E8 (optional)



SYSTEM OPTIMIZATION



BOILER HEATING OPTIMIZATION

The heating controller, on the basis of the timer/heating programme set by the user, once the system's characteristics have been evaluated, will activate the function for automatically bringing forward the heating ignition time so as to ensure that the set temperature is reached at the time requested by the user.



FAST SET TEMPERATURE

This is obtained by calculating the optimum ignition start-up time. This calculation can be carried out taking into consideration the outdoor temperature or the room temperature.



OVERHEATING PROTECTION

The boiler's safety temperature is controlled via the pump's overrun time, in order to get rid of any thermal inertia.



SELF-ADAPTION

Through the elaboration of data transmitted by the room sensor, this function adjusts the boiler's output to the building's characteristics, ensuring a constant monitoring of the indoor temperature on the basis of the variation of the outdoor temperature, keeping in consideration the building's thermal inertia and the contribution of "free" heat (solar radiation, internal heat sources etc).



SLOPE OFFSET (HEATING SLOPE DISTANCE)

The boiler temperature that is required for a mixed circuit is calculated by adding to the calculated temperature setting for the heating circuit temperature the heating slope distance. The heating slope distance compensates for sensor tolerances and heat loss up to the mixer.



VALVE OPENING TIME

Based on the characteristics of the servomotor



NUMBER OF BURNER IGNITIONS

It stabilizes the number of ignitions of each burner.



BURNER RUN HOURS

It stabilizes the run hours of each burner.



FROST PROTECTION MODE

The frost protection operation mode prevents the CH system from freezing by automatically switching heating operation on. In the frost protection mode, the room temperature for all the heating circuits is set to 5°C and the storage tank sensor frost protection is activated when the temperature drops below 10°C.

SETTING



PROGRAMME SETTING

The heating programmes can be set daily or weekly, with more than one On-Off firing times or temperature reductions during the arch of the day.



MULTIPLE ZONE CONTROL

With the same heating control device you can control 2 independent circuits with different characteristics, though having ensured all the described functions, including the deep sliding temperature function.



0-10 VOLT SIGNAL

the great flexibility of the E8 also permits the TERNOX 2S set point to be controlled by an external control signal. This will enable, having at disposal an even more complex system, to exploit all the heating control's functions.



MANAGEMENT OF UP TO 15 MIXED CIRCUITS

controlled by the outdoor sensor.

ENERGY SOURCES CONTROL



INTEGRATION WITH RENEWABLE ENERGY SOURCES

As for example: solar systems and/or solid fuel fired boilers.

BOARD PANELS FLAT_W (optional)

- Management of boiler safety devices with signalling on the burner start terminal board and alarms (boiler safety devices + burner block cumulative)
- Possible anti-condensation pump management
- 3Ph - 400V - 50Hz Power supply; burner power supply, transformer for auxiliary burner power supply
- Metal containment cabinet with IP54 protection rating, size H=700, L=500, D=250, held up by ground support
- Digital control instrument for controlling operating temperatures on the panel, 0-10V input for generator set-point remote control
- Built according to European standards



BOARD PANELS IML_W (optional)

- Control PLC, 7" touch screen display with graphic interface, remote communication via Modbus, 0-10V input for generator set-point control, etc.
- Single, two-stage and three-stage or modulating burner control
- Boiler safety devices management with alarm signals
- Possible anti-condensation pump management
- 3Ph - 400V - 50Hz Power supply; burner power supply, transformer for auxiliary burner power supply
- Metal containment cabinet with IP54 protection rating, size H=1000, L=500, D=250, held up by ground support
- Built according to European standards



BOILER SAFETY KIT (optional)

- Instrument wood log to be mounted on the boiler flow, complete with all connections required for the on-site safety and control instrumentation and in particular:
 - pressure gauge valve with test flange
 - large dial thermometer and pressure gauge of an adequate scale
 - minimum and maximum safety pressure switch
- manifold with siphon to position the pressure gauge and pressure switches
- 2 manually resettable safety thermostats
- Available upon request: EC approved safety valves with adequate calibration pressure, designed to discharge the total boiler power.



LADDER AND WALKWAY KIT (optional)

Ladder and walkway with carbon steel railing, painted with special rust-proof paint and welded by joints that ensure the correct coupling of every element.
Easy access to the boiler is guaranteed by:

- a handrail welded to the frame;
 - steps with non-slip inserts.
- The ladder position and handrail layout can be agreed upon at the time of order, to fit the installation site of the generator.



HIGH EFFICIENCY OPTION

Option to supply a generator with 94-95% efficiency levels.

An aluminium profile, bound by rolling, is positioned within the smoke pipes forming the tube bundle of the third flue gas pass, namely in the end section, to significantly increase efficiency. This allows you to increase the exchange surface without increasing the

generator size or adding external devices, as a result of a higher pressure drops (counter pressure) of the boiler body.

Aluminium multiradial sheets

External steel pipe



BREVETTO
Unical
PATENT