

ENTROPIE BOILER TT115

1000–20000 kW; 110°C; 10 bar

Acceptance at the workshop:
according to the European Pressure Equipment Directive PED (2014/68/EU)

CE-Marking on the Pressure Vessel:
according to the European Pressure Equipment Directive PED (2014/68/EU)

Design code: EN 12953

Purpose of TT115 Boilers

The type TT115 boilers are three-way gas-tube boilers with power from 1.0 to 20.0 MW.

TT115 boilers are manufactured in accordance with the requirements of the Technical Regulations of the Customs Union:

- “On Machinery and Equipment Safety”;
- “On Over-Pressurized Machinery and Equipment Safety”.

Type TT115 boilers are designed for heat supply to buildings and structures, for support of various purpose production processes.

Scope: in stationary, packaged modular type and transportable boiler houses used in closed and open heat supply systems.

Boilers can be transported by rail, road and water transport, in accordance with the rules of goods transportation valid on each type of transport. Boilers are delivered in one assembled transportable unit.

Warranty period, if transportation, storage, mounting and operation conditions are observed:

- when operating on natural gas and diesel fuel, 36 months from the date of commissioning, but maximum 42 months from the date of shipment from the manufacturing plant;
- when operating on heavy fuel (fuel oil, crude oil, etc.), 12 months from the date of commissioning, but maximum 18 months from the date of shipment from the manufacturing plant.

The optimal choice for reliable operation:

- wide performance range. Heat power of boilers is 1000 to 20000 kW;
- wide range of possible configurations. In full or partial versions, the boilers are equipped with automatic monitoring and control systems ENTROMATIC of 100MS or 110MS series, with all the required sensors and safety devices, that makes operation of the boilers reliable and safe;
- the slip joint between the flame tube and the boiler body. With some standard sizes of boilers,



General appearance of TT115 boiler

where necessary, the joint in a form of a floating bushing is used, which allows to achieve high cyclic strength;

- versatility of the face door design. The unique design of hinge units allows for the selection of the opening direction (left/right) which allows to place the equipment ergonomically in the boiler room;
- burner mounting using a burner plate or extension flange. This solution allows to install the burner device of any manufacturer. Long and short burner heads are no longer a problem;
- full opening of the face door with the burner device. Routine maintenance and cleaning of heat exchange surfaces do not require burner dismounting. The front tube sheet, the inner surface of the flame tube and the flue tubes of second and third ducts are fully accessible for inspection and cleaning;
- the presence of the inspection hatch in the upper part of the boiler. Allows to inspect the water chamber of the boiler for deposits buildup and monitor the general state of heat-exchanging surfaces;
- robust base. The base design is made of steel channels. The weight load from the boiler filled with water is uniformly distributed over the supporting area. The boiler does not require additional fastening to embedded elements of the base when installed in stationary boiler rooms;
- compatibility with various types of burners. Correct operation with automatic multi-stage and modulated burners;
- non-freezing heating medium. Application of ethylene glycol solutions as a heat medium is possible, that minimizes the probability of boiler circuit freezing.

- **High efficiency at the minimum operational expenses:**

maximum values of operating efficiency among this class boilers. High efficiency is achieved in the following ways:

1. Intensive convective heat transfer. Three-way design and optimally selected heat-exchanging surfaces, including the reversing chamber completely flowed round by the heat medium, allow for maximum utilization of the flue gases energy by transferring it to the heat medium circulating within the boiler.
2. Intense radiant heat transfer. The smooth-wall cylindrical flame tube is completely washed by the heat medium, that allows accept maximum radiation of the flame and transfer the accepted heat to the heat medium.
3. Accurate selection of the ratio of cross sections of flue tubes of the second and third ducts provides for minimum values of aerodynamic resistance. while retaining the large area of heat-exchanging surfaces.
4. High-quality heat insulation. Rockwool mats with low values of thermal conductivity coefficients are used for heat insulation of the boiler body, that minimizes the energy loss to the environment through the boiler casing;

- boiler unit. Fully equipped boiler, including the burner device, automation module, electrical cabinets, all the necessary sensors and safety devices, piping, pump module. This solution allows to get a fully operational boiler without additional costs for piping and installation, that is economically viable and guarantees correct selection of the components.

Manufacturability and quality — in details:

- high-quality rolled sheets and pipes. Sheets and pipes produced by leading Russian steel mills are used for manufacturing the boilers. All the materials are subject to incoming inspection for compliance with physical properties and chemical composition of the declared steel grades selected on the basis of strength calculations for each boiler size;
- multi-level quality control at all production stages. Certified laboratory performs non-destructive and visual measuring inspection in accordance with the requirements of the inspection chart of each product;
- mandatory hydraulic tests. Each product is subjected to hydraulic testing at the final manufacturing stage;
- maximum automation of the manufacturing process. Automatic welding is used in the manufacture. The work centers are equipped with all necessary equipment and accessories, that has a positive effect on correct assembling ability of products and high-quality preparation of the edges of parts to be welded.

Operation of TT115 Boilers

The type TT115 boiler is a gas-tube three-course boiler. The schematic diagram of the TT115 boiler operation is shown in the Fig.

Fuel combustion takes place in the combustion chamber formed by Flame Tube (1), Rear face (25) and Torispherical head of reversing chamber (5). The flue gases generated in the combustion chamber turn round in the First reversing chamber (4), formed by the Rear face (25) and the Torispherical head of reversing chamber (5), and enter in the Flue tubes of second channel (2), move through them to the region of Front face (24), thus giving part of their energy to the heat medium circulating in the boiler volume confined

by the Flame tube (1), Front face (24), Rear face (25), Torispherical head of reversing chamber (5), Flue tubes of second channel (2), Flue tubes of third channel (3), Shell of boiler outer casing (27) and Torispherical head of boiler casing (26). After leaving the Flue tubes of second channel (2) the gases which transferred part of their energy turn round in Second rotating chamber (6), formed by the Front door lining (7) and the front side of the Front face (24), and through the Flue tubes of third channel (3) move in the opposite direction towards the Torispherical head of boiler casing (26), also transferring part of their thermal energy to the heating medium circulating in the boiler cavity. After leaving the Flue tubes of third

channel **3**, the gases enter in the Smoke box **28**, from which they leave the boiler through Nozzle for exhaust gases **18**.

During fuel combustion in the combustion chamber, the flame radiation works effectively, it transfers the heat to the walls of Flame tube **1** and further to the heating medium circulating in the boiler cavity. When gas moves through the Tubes of second channel **2** and the Tubes of third channel **3** the heat transfer to the heating medium is carried out by convection.

Visual inspection of the flame deployed in the Flame tube **1**, is performed through the Sight glass **17**, located on the face wall of the boiler Front door **8**.

The boiler front door **8** can be fully opened in any direction with the Burner device **9** installed on it. The initial opening direction should be specified when ordering the boiler. Subsequently, the opening direction can be changed individually. When the front door is opened, access is provided for inspection and cleaning of the internal heat exchange surfaces of the boiler on the gas side, such as Flue tubes of second channel **2**, Flue tubes of third channel **3**, Flame tube **1**, Front face **24**.

To clean the Flue tubes of second channel **2** and Flue tubes of third channel **3** special cleaning kits shall be used. When cleaning Flue tubes of second channel **2** the deposits of combustion products are pushed into the First rotating chamber **4**, from where they are removed through the Flame tube **1**, which inner surface is accessible for inspection and cleaning when boiler Front door **8** is opened. When cleaning Flue tubes of third channel **3**, the deposits of combustion products are pushed into Smoke box **28**, from where they are removed through Inspection hatch of smoke box **11**.

In the upper part of the boiler, Inspection hatch of the water cavity **10** is located. This hatch is designed to inspect the internal heat exchange surfaces of the boiler on the water side. Heating medium inlet nozzles **12**, heating medium outlet nozzle **13** and emergency line Nozzles **14** are located on top of the boiler. Special unions are located on the heating medium inlet and outlet nozzles, they are used for installation of temperature sensors.

On boiler outer casing Shell **27**, on the water side, in the area of heating medium inlet Nozzle **12**, Water guiding element **15** is located. This element ensures

effective organization of the heating medium movement in the boiler volume.

To mount the Burner device **9** on the Boiler front door **8** an adapter is used — Burner plate **16** or, if necessary, an extension flange. The burner plate (extension flange) is ordered separately and is designed directly for a particular Burner device. By default, the boilers are equipped with blind burner plate.

For uniform distribution of the weight load of a boiler filled with heat medium, the design uses Steel bearing supports **19**. The boiler on these supports can be placed on a flat, robust floor without building an additional foundation. The supports attachment to the floor embedded members is not required, except for the case when the boiler is installed in modular boiler-rooms transported in assembled state.

For boiler Heat insulation **20**, the lamellar rockwool mats with low thermal conductivity are used; this significantly reduces the factor q_5 (heat losses to environment through boiler casing) below the rated value (0.5 % Q). From the outside, the boiler is lined with Corrugated aluminum coating **21**, which allows to keep attractive appearance throughout its service life.

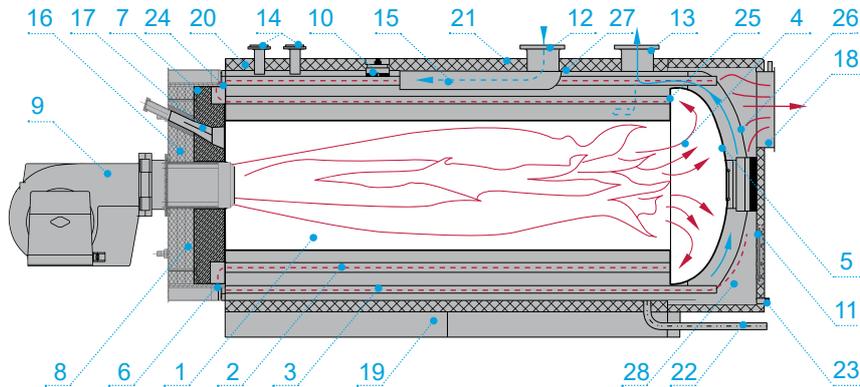
Boiler drain nozzle **22** is located in the boiler bottom part and serves to completely or partially drain the heat medium from the internal cavity. Smoke box drain nozzle **23** is located in its bottom and is used to drain the condensate produced in the Boiler in case of cold start-ups.

In the top part of the boiler on outer housing Shell **27**, there are special lifting eyes which serve as slinging points during boilers transportation, loading and unloading. The three-way scheme of the boiler gas channel with low thermal factor of the combustion chamber ensures easy setting of the boiler combustion modes and minimizes the NOx content in the exhaust flue gases.

Low aerodynamic resistance of the boiler and the corresponding overall dimensions of the flame tube ensure optimal selection of burner.

Installation of the first reversing chamber of the boiler on same supporting-sliding or rigid (for boilers above 8.0 MW) anchor ensures compensation for cyclic thermal stresses and, thereby, long service life of the boilers.

TT115 Boiler Diagram



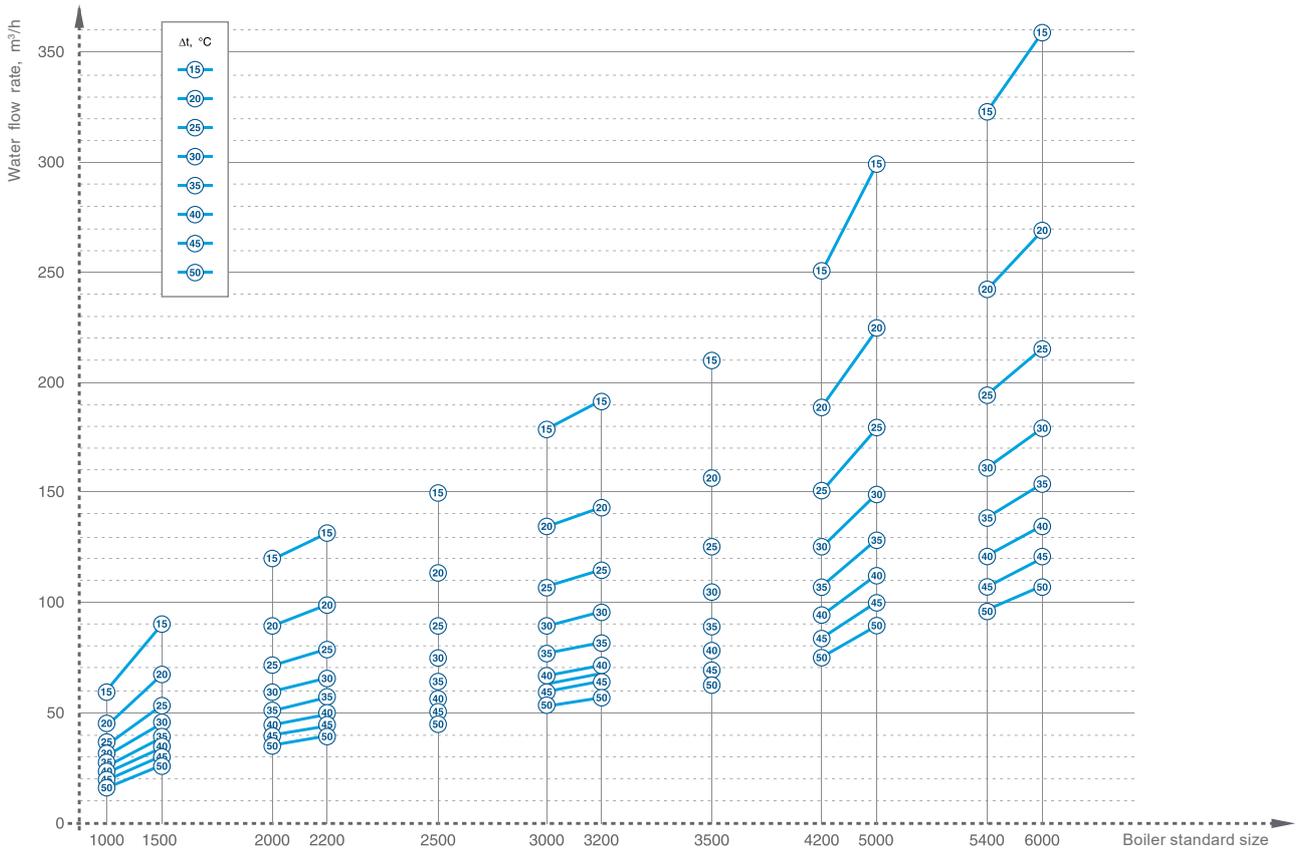
- | | | |
|---|----------------------------------|---|
| 1 Flame tube | 8 Boiler front door | 15 Water guiding element |
| 2 Flue tubes of second channel | 9 Burner device | 16 Burner plate |
| 3 Flue tubes of third channel | 10 Water cavity inspection hatch | 17 Inspection hole |
| 4 First reversing chamber | 11 Inspection hatch of smoke box | 18 Exhaust gases outlet nozzle |
| 5 Torispherical head of reversing chamber | 12 Heating medium inlet nozzle | 19 Steel bearing supports |
| 6 Second reversing chamber | 13 Heating medium outlet nozzle | 20 Boiler heat insulation |
| 7 Front door lining | 14 Emergency line nozzles | 21 Corrugated aluminium coating |
| | | 22 Boiler drain nozzle |
| | | 23 Drain nozzle of smoke box |
| | | 24 Front face (tube sheet) |
| | | 25 Rear face (tube sheet) |
| | | 26 Torispherical head of boiler housing |
| | | 27 Shell of boiler outer casing |
| | | 28 Smoke box |

Technical Specifications of TT115 Boilers

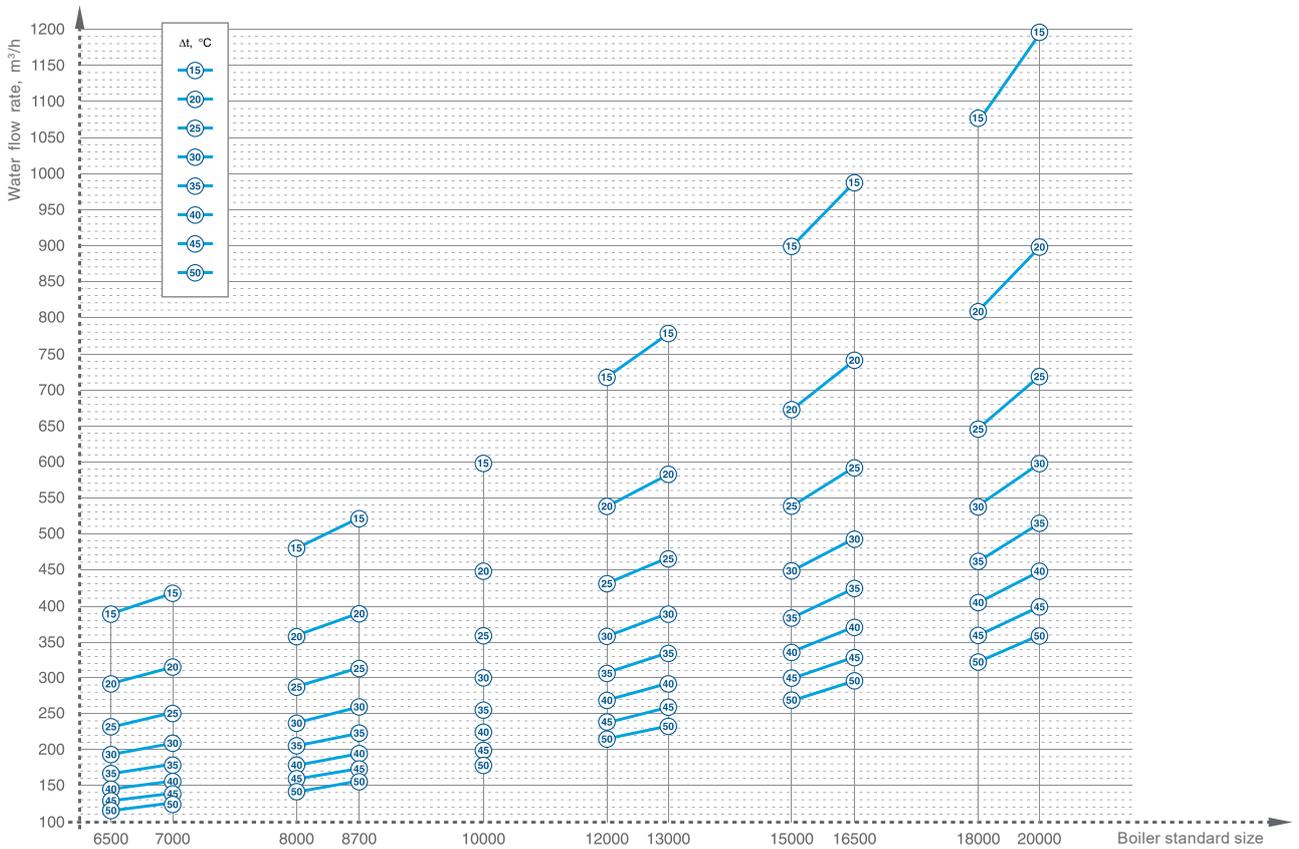
Parameter description	Value
Maximum temperature at boiler outlet, °C	110
Minimum temperature at boiler inlet, °C	60
Maximum working overpressure of water, MPa	1.0
Minimum water flow rate, m ³ /h	Not regulated
Minimum power of first stage of burner, %	10
Specified service life, years, min	25
Specified service life, hours, min	200000

Rated heat capacity, kW	1000	1500	2000	2200	2500	3000	3200	3500	4200	5000	5400	6000
Rated water flow rate depending on Δt , m ³ /h	See the Diagram											
Hydraulic resistance of water channel at heat medium flow rate depending on Δt , Pa	See the Diagram											
Operating efficiency, %	minimum 94											
Efficiency at maximum load, %	93.9	91.9	92.8	92.3	92.1	92.5	92.2	93.5	95.4	94.8	94.5	94.1
Efficiency when using heat exchanger, %	96.6	95.6	95.8	95.5	95.3	95.4	95.2	95.7	96.7	96.4	96.1	95.9
Exhaust gas temperature, °C	153	194	176	185	191	181	188	160	123	133	141	149
Exhaust gas temperature in the presence of heat exchanger, °C	97	118	115	120	125	123	127	115	96	102	107	112
Exhaust gases flowrate, kg/s	0.43	0.65	0.86	0.96	1.09	1.30	1.39	1.50	1.77	2.12	2.29	2.56
Aerodynamic resistance of gas channel for maximum power, Pa	238	627	775	973	964	836	975	1157	1126	1685	940	1203
Furnace volume, m ³	0.86	0.86	1.36	1.36	1.48	2.21	2.21	2.46	3.29	3.29	4.22	4.22
Boiler water volume, m ³	1.86	1.86	2.66	2.66	2.76	3.89	3.89	4.39	5.14	5.14	6.42	6.42
Dry boiler weight (tolerance for weight 4.5 %), kg	3274	3360	4688	4810	5277	6992	7175	7811	9629	9881	11073	11363

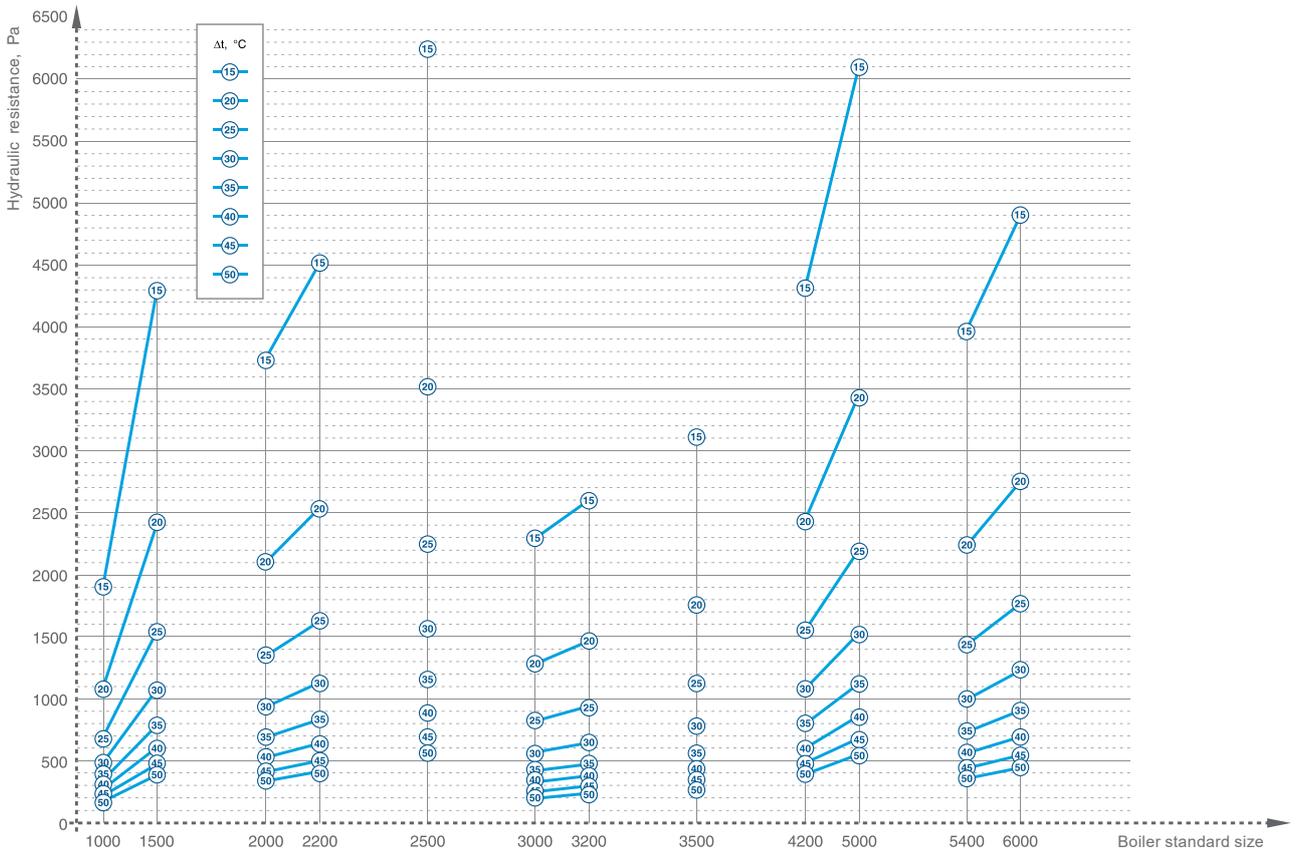
Nennwärmeleistung, kW	6500	7000	8000	8700	10000	12000	13000	15000	16500	18000	20000
Rated water flow rate depending on Δt , m ³ /h	See the Diagram										
Hydraulic resistance of water channel at heat medium flow rate depending on Δt , Pa	See the Diagram										
Operating efficiency, %	minimum 94										
Efficiency at maximum load, %	93.6	93.3	94.0	93.6	94.2	92.9	92.5	94.1	93.7	95.0	94.7
Efficiency when using heat exchanger, %	95.9	95.7	95.9	95.6	95.8	95.0	94.7	95.8	95.6	96.3	96.0
Exhaust gas temperature, °C	159	165	152	159	147	175	183	150	158	130	137
Exhaust gas temperature in the presence of heat exchanger, °C	112	116	113	118	113	130	136	113	118	104	109
Exhaust gases flowrate, kg/s	2.79	3.01	3.41	3.73	4.26	5.18	5.64	6.39	7.06	7.60	8.47
Aerodynamic resistance of gas channel for maximum power, Pa	1045	1243	1162	1416	1358	1381	1670	1662	2077	1268	1614
Furnace volume, m ³	5.14	5.14	6.54	6.54	8.56	10.77	10.77	13.75	13.75	16.78	16.78
Boiler water volume, m ³	7.40	7.40	8.91	8.91	12.12	16.00	16.00	20.00	20.00	24.74	24.74
Dry boiler weight (tolerance for weight 4.5 %), kg	13854	14216	16699	17136	20006	23538	24155	29359	30128	38198	39198



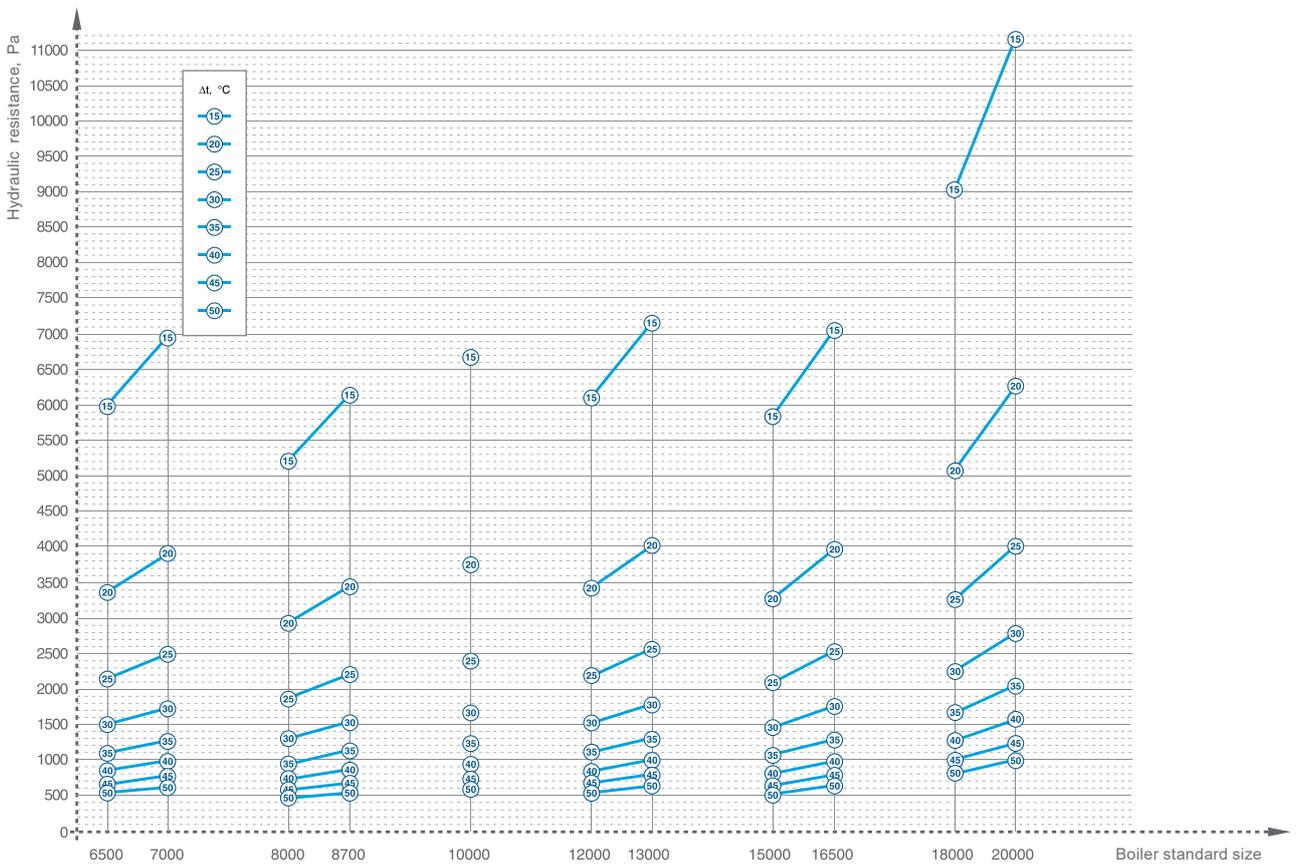
Dependence of water flow rate of TT115 boilers on Δt



Dependence of water flow rate of TT115 boilers on Δt . Continued

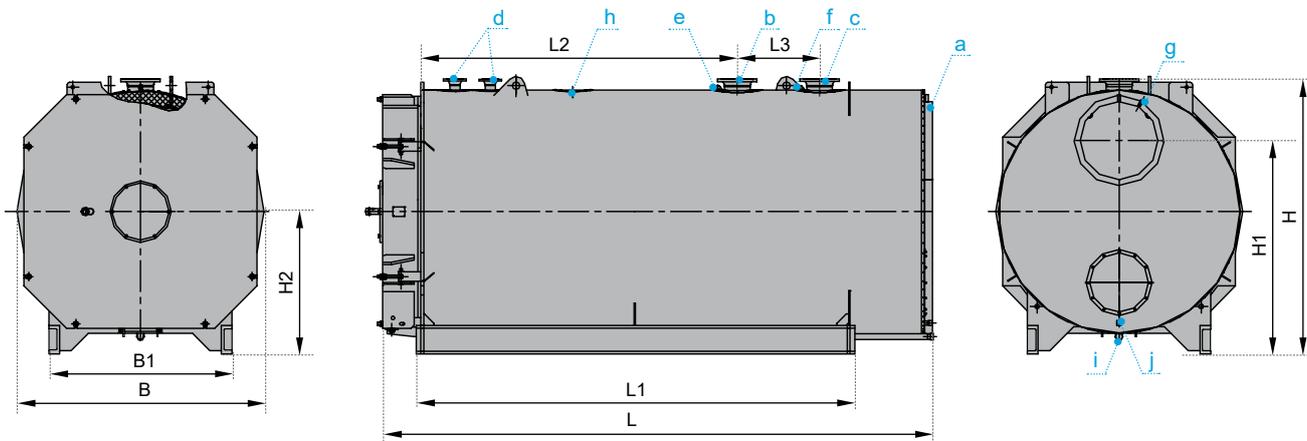


Dependence of hydraulic resistance of TT115 boilers on Δt



Dependence of hydraulic resistance of TT115 boilers on Δt . Continued

Overall and connecting dimensions of TT115 boilers



Overall and connecting dimensions

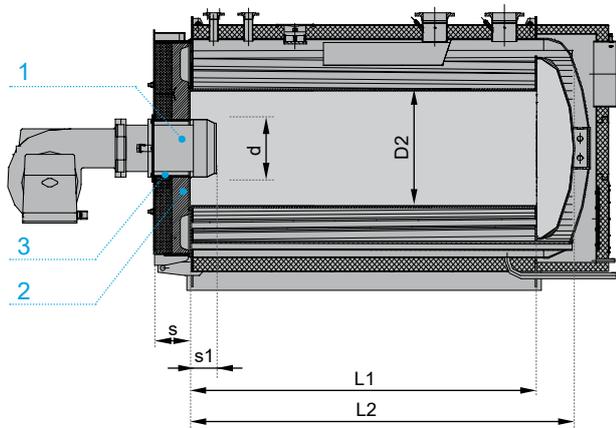
Rated heat capacity, kW		1000	1500	2000	2200	2500	3000	3200	3500	4200	5000	5400	6000
Nozzle description	Designation												
Exhaust gases outlet, DN, mm	a	350	350	500	500	500	500	500	500	650	650	650	650
Heating medium inlet, DN, mm	b	125	125	150	150	150	200	200	200	200	200	250	250
Heating medium outlet, DN, mm	c	125	125	150	150	150	200	200	200	200	200	250	250
Safety valve, DN, mm	d	2×50	2×50	2×65	2×65	2×65	2×65	2×65	2×65	2×80	2×80	2×80	2×80
Temperature transmitter, heating medium inlet	e	G ½ — B											
Temperature transmitter, heating medium outlet	f	G ½ — B											
Temperature transmitter, flue gases outlet	g	G ½ — B											
Water cavity inspection hatch, mm	h	252×190											
Boiler water drainage	i	G 1½ — B											
Smoke box condensate drainage	j	G 1 — B											

Rated heat capacity, kW		6500	7000	8000	8700	10000	12000	13000	15000	16500	18000	20000
Nozzle description	Designation											
Exhaust gases outlet, DN, mm	a	800	800	800	800	900	1000	1000	1000	1000	1000	1000
Heating medium inlet, DN, mm	b	250	250	300	300	300	350	350	400	400	400	400
Heating medium outlet, DN, mm	c	250	250	300	300	300	350	350	400	400	400	400
Safety valve, DN, mm	d	2×100	2×100	2×100	2×100	2×125	2×125	2×125	2×125	2×125	2×125	2×125
Temperature transmitter, heating medium inlet	e	G ½ — B										
Temperature transmitter, heating medium outlet	f	G ½ — B										
Temperature transmitter, flue gases outlet	g	G ½ — B										
Water cavity inspection hatch, mm	h	252×190										
Boiler water drainage	i	G 1½ — B										
Smoke box condensate drainage	j	G 1 — B										

Rated heat capacity, kW		1000	1500	2000	2200	2500	3000	3200	3500	4200	5000	5400	6000
Overall dimensions	Designation												
Boiler height, mm	H	1768	1768	1968	1968	1968	2168	2168	2168	2328	2328	2482	2482
Centerline height of flue gases exhaust nozzle, mm	H1	1360	1360	1520	1520	1520	1720	1720	1720	1805	1805	1888	1888
Centerline height of door opening, mm	H2	910	910	1010	1010	1010	1110	1110	1110	1205	1205	1282	1282
Boiler length, mm	L	3038	3038	3340	3340	3590	3978	3978	4353	4674	4674	4940	4940
Support frame length, mm	L1	2294	2294	2522	2522	2772	3047	3047	3447	3730	3730	4003	4003
Boiler width, mm	B	1540	1540	1740	1740	1740	1940	1940	1940	2100	2100	2244	2244
Support frame width, mm	B1	910	910	1152	1152	1152	1152	1152	1152	1556	1556	1556	1556
Distance from boiler front to heating medium inlet nozzle, mm	L2	1365	1365	1683	1683	1878	2078	2078	2428	2676	2676	2674	2674
Distance between heating medium inlet and outlet nozzles, mm	L3	400	400	550	550	550	600	600	600	700	700	800	800

Rated heat capacity, kW		6500	7000	8000	8700	10000	12000	13000	15000	16500	18000	20000
Overall dimensions	Designation											
Boiler height, mm	H	2574	2574	2710	2710	2900	3074	3074	3276	3276	3606	3606
Centerline height of flue gases exhaust nozzle, mm	H1	1970	1970	2070	2070	2130	2364	2364	2514	2514	2679	2679
Centerline height of door opening, mm	H2	1314	1314	1370	1370	1490	1564	1564	1664	1664	1829	1829
Boiler length, mm	L	5234	5234	5626	5626	6273	6801	6801	7461	7461	7923	7923
Support frame length, mm	L1	4200	4200	4500	4500	5220	5470	5470	6135	6135	6530	6530
Boiler width, mm	B	2360	2360	2500	2500	2680	2860	2860	3060	3060	3390	3390
Support frame width, mm	B1	1580	1580	1800	1800	1800	1820	1820	1940	1940	1940	1940
Distance from boiler front to heating medium inlet nozzle, mm	L2	2886	2886	3098	3098	3329	3352	3352	3724	3724	3722	3722
Distance between heating medium inlet and outlet nozzles, mm	L3	900	900	1000	1000	1400	1600	1600	2000	2000	2000	2000

Furnace dimensions of TT115 boiler



Burner installation

- 1 Burner flame head
- 2 Rigid thermal insulation of front door
- 3 Elastic heat insulating material

Rated heat capacity, kW	1000	1500	2000	2200	2500	3000	3200	3500	4200	5000	5400	6000
Diameter of installation hole, d, mm	300	300	380	380	380	450	450	450	450	450	450	450
Cover thickness considering adapter plate, s, mm	247	247	297	297	297	347	347	347	347	347	347	347
Burner installation dimension, s1, mm	20–60											
Heat chamber diameter, D2, mm	650	650	780	780	780	900	900	900	1000	1000	1100	1100
Length of flame tube, L1, mm	2225	2225	2435	2435	2685	2975	2975	3375	3650	3650	3926	3926
Combustion chamber length, L2, mm	2459	2459	2708	2708	2958	3293	3293	3693	3990	3990	4279	4279

Rated heat capacity, kW	6500	7000	8000	8700	10000	12000	13000	15000	16500	18000	20000
Diameter of installation hole, d, mm	500	500	590	590	590	730	730	730	730	740	740
Cover thickness considering adapter plate, s, mm	347	347	347	347	347	347	347	347	347	351	351
Burner installation dimension, s1, mm	20–60										
Heat chamber diameter, D2, mm	1180	1180	1280	1280	1380	1500	1500	1600	1600	1700	1700
Length of flame tube, L1, mm	4105	4105	4475	4475	5105	5405	5405	6105	6105	6500	6500
Combustion chamber length, L2, mm	4503	4503	4895	4895	5540	5891	5891	6614	6614	7071	7071

Selection and Installation of Burner

Burners should provide reliable ignition and steady burning of fuel without flame lift-off or backflash within the given range of operation modes, prevent dripping of fuel on the furnace surface.

Aerodynamic characteristics and placement of burners shall provide for uniform furnace filling by flame without flame impinging on the walls and prevent formation of stagnant and poorly ventilated areas in the furnace volume.

The customer can independently select the burners, with observing the requirements of the boiler Operating Manual and the recommendations of the burner manufacturer.

The burners used with TT115 boilers shall have forced air supply with controlled excess air ratio.

Burners start-up, combustion chamber blowdown, operation, shutdown shall be done automatically.

TT115 boilers are operated with overpressure in the combustion chamber. The following should be considered during burners selection:

- furnace length and diameter;
- aerodynamic resistance of boiler.

On TT115 boilers, it is permitted to use automatic multistage and modulated burners (gas, liquid fuel or combined).

The burners shall have a certificate of compliance with industrial safety requirements and provide cost-effective operation of burners.

Burners should have manufacturer's data sheet which indicates the key information (manufacturer's name and address, serial number, date of manufacture,

design solutions, dimensions, working fluid parameters, type, power, adjustment range, key technical parameters, etc.). Data sheet form shall be established by the manufacturer. All burners should be subject to appropriate tests (delivery and acceptance tests, certification tests, type tests) in due manner.

The fuel supply to burners, the requirements for shut-off, control and isolating (safety) valves, the list of necessary safety features and interlocks, as well as the requirements for fuel preparation and supply are specified for each type of fuel in accordance with the regulatory technical documentation.

Burner Installation

The burner device shall be installed by personnel of a specialized company that has permission to perform this type of work, in accordance with the requirements of burner manufacturer. Dimensions for burner installation are shown in the table.

Personnel performing the installation and further setting-up of the burner should be trained and provided with the necessary personal protection equipment. Before the burner installation, the shipping package shall be removed, and the burner shall be checked to make sure that it meets the design requirements developed for this boiler. Before installing the burner flame head, it is necessary to check that there is the thermal gasket between the boiler and the burner mounting plate.

After burner flame head installation in the boiler front door, the annular space between the burner Flame head **1** and Rigid heat insulation of front door **2** should be sealed with use of refractory heat insulation material **3**. Dimensions required for burner installation are given in the Figure and Tables.

Boiler Water Quality

Boilers operation without pre-boiler or intra-boiler water treatment is prohibited. Particular attention shall be paid to the boiler water quality; this in most cases is the governing factor affecting the life of boiler and all boiler equipment. Water conditions shall ensure boiler operation without damage of its elements due to scale and sludge deposits or as result of metal corrosion.

Water composition at the boiler inlet shall comply with the specified values of indicators.

The method of water treatment shall be chosen by the specialized company. Inside the boiler room there should always be a water treatment logbook, in which the water chemistry information of the boiler shall be regularly recorded. Non-freezing liquids are allowed for use as the heating medium upon agreement with the manufacturer.

Indicator description	Value
Font transparency, cm, no less than	30
Carbonate hardness, $\mu\text{g-eq/kg}$, max	700
Content of dissolved oxygen, $\mu\text{g/kg}$, max	50
Content of iron compounds (in Fe equivalent), $\mu\text{g/kg}$, max	500
pH value at 25 °C	7.0–11.0
Free carbon dioxide, mg/kg	None
Content of petroleum products, mg/kg, maximum	1.0

Boiler Configuration

There are several options for boiler delivery depending on the equipment: complete package, partial set and without complete set.

Complete package includes a boiler unit with installed equipment, burner, a set of parts and components according to the information specified in the questionnaire.

Due to factory installation, optimal and reliable operation of all boiler components is guaranteed.

Together with the boiler, sealing cotton wool is delivered to seal the annular gap between the flame head of burner and rigid thermal insulation of the front door, as well as

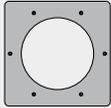
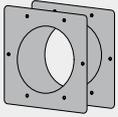
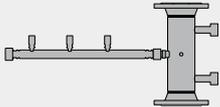
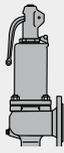
the companion flange of exhaust gas outlet nozzle (up to 6 MW inclusive, the exhaust gas outlet nozzle does not have a flange connection).

According to customer's request, the boiler can be delivered with partial set of equipment (boiler equipped with burner and relief valves, and operational documentation) or without complete set (boiler with operational documentation). In the latter case, the Customer shall independently outfit the boilers with burners, safety devices and automation.

When ordering the boiler, you must select the type of set and, if necessary, agree the scope of delivery.

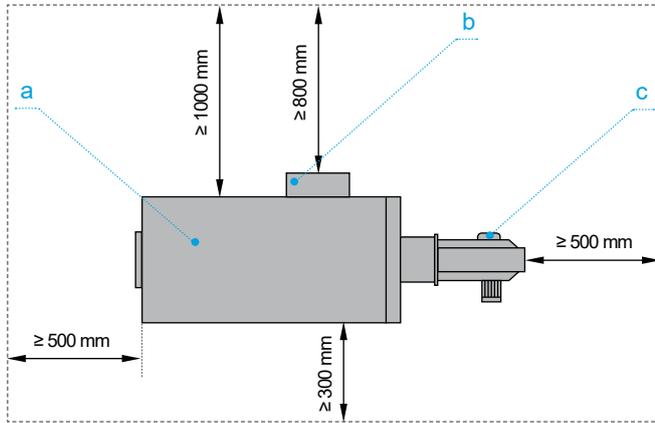
Boiler Accessories

Depending on the customer's desire, ENTROPIE can supply the following accessories for the boilers upon request:

	Burner plate
	Burner flange
	Safety group manifold for connecting sensors and instrumentation
	Limiters of minimum and maximum pressures
	Safety valves
	Temperature sensors
	Three-way valve
	Boil-off protection sensor
Other accessories for boilers installation and maintenance	

Boilers Layout

Space-planning and design solutions regarding location of the boilers shall comply with the applicable territorial norms and rules.



- a Boiler
- b Boiler Automation
- c Burner device

Recommended distances

Transportation

Boilers are packed in special covers. All nozzles and openings are closed. They can be transported by any mode of transport.

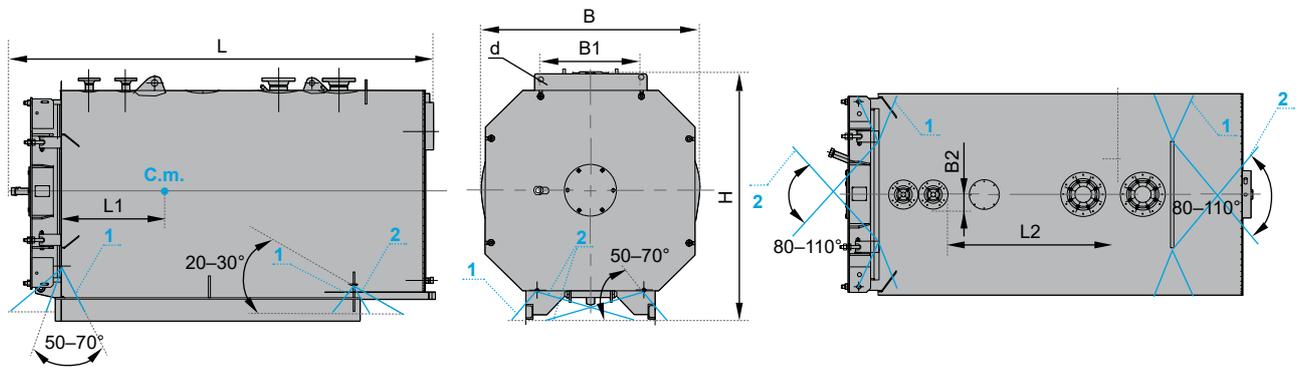
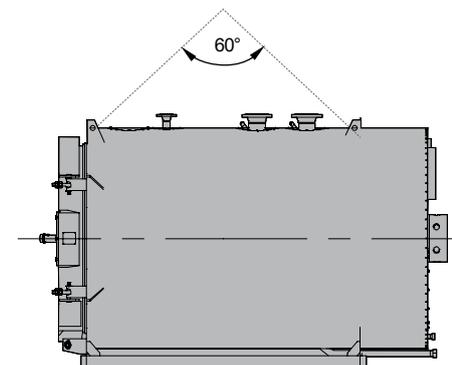


Diagram of boiler transportation



Schematic diagram of boiler slinging

Legend:

- — Center of gravity;
- — Fastening device;
- 1 — Protection against tipping;
- 2 — Diagonal fastening.

Description	Numeric value											
	Rated heat capacity, kW	1000	1500	2000	2200	2500	3000	3200	3500	4200	5000	5400
Length, L, mm	3183	3183	3486	3486	3736	4134	4134	4532	4832	4832	5101	5101
Width, B, mm	1540	1540	1740	1740	1740	1940	1940	1940	1980	1980	2244	2244
Height, H, mm	1768	1768	1968	1968	1968	2168	2168	2168	2328	2328	2482	2482
Distance, B1, mm	—	—	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150
Distance, B2, mm	299	299	299	299	299	317	317	317	375	375	375	375
Hole diameter, d, mm	—	—	28	28	28	28	28	28	28	28	28	28
Center of gravity, L1, mm	1121	1121	1217	1217	1351	1518	1518	1718	1833	1833	1913	1913
Distance, L2, mm	2107	2107	2328	2328	2578	2855	2855	3255	2300	2300	2325	2325
Weight, m, kg	3274	3360	4688	4810	5277	6992	7175	7811	9629	9881	11073	11363

Description	Numeric value										
	Rated heat capacity, kW	6500	7000	8000	8700	10000	12000	13000	15000	16500	18000
Length, L, mm	5397	5397	5789	5789	6439	6942	6942	7602	7602	8064	8064
Width, B, mm	2360	2360	2500	2500	2680	2860	2860	3060	3060	3390	3390
Height, H, mm	2574	2574	2710	2710	2900	3074	3074	3276	3276	3606	3606
Distance, B1, mm	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150
Distance, B2, mm	460	460	480	480	490	520	520	530	530	530	530
Hole diameter, d, mm	28	28	28	28	28	28	28	28	28	28	28
Center of gravity, L1, mm	2044	2044	2238	2238	2588	2795	2795	3155	3155	3401	3401
Distance, L2, mm	2655	2655	3400	3400	3800	3955	3955	4355	4355	4475	4475
Weight, m, kg	13854	14216	16699	17136	20006	23538	24155	29359	30128	38198	39198