

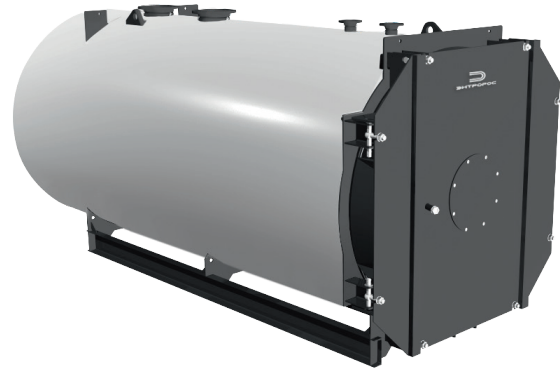
Field application TT100 boilers

ENTROPIE boilers TT100 are three-way hot water gas-fired boilers with capacity ranging from 1.0 to 16.5 MW.

Fuel type: gas, liquid fuel. The capacity is specified for use with gaseous and light liquid fuel. In using special non-standard types of gaseous, light liquid as well as heavy liquid fuel, it is necessary to ask the manufacturer of the boiler about its capacity.

ENTROPIE boiler TT100 are designed to provide engineering processes for various purposes.

The boilers can be transported by railway, road and water transport in accordance with the goods transportation regulations applicable for each kind



General view of TT100 boiler

of transportation. Boilers are delivered as a single transportable pre-assembled unit.

Principle operation TT100

ENTROPIE boilers TT100 is designed as a three-way gas-fired boiler.

The flue tube **1** of the combustion chamber and the boiler body have a cylindrical shape. Convective heating surfaces are formed by fire tubes of the second & third passes **2**, **3**, located axisymmetrically around the combustion chamber. The two-three row layout of the second pass fire tubes provides a high rate of heat transfer, thus increasing the boiler efficiency.

The fully flushable first reversal chamber **4** is formed by the rear tube plate and torispherical head **5**. The second reversal chamber **6** is formed by the front tube plate and by an indentation in the lining of the boiler door **7** made in a special configuration for the type of burner.

The boiler front door **8** can be fully opened with the burner **9** installed in the direction most convenient for the customer (location of the hinges should be specified when ordering). With the front door open, easy access to the combustion chamber and fire tubes is provided when undertaking maintenance and cleaning of the boiler. Inspection and cleaning of the

first reversal chamber is undertaken via the combustion chamber.

To inspect the boiler, an sight-hole **10** is provided on the coolant side on the upper part of the body.

The flue gas collector is cleaned via the inspection hole **11** of the boiler's flue gas collection chamber.

The water inlet and outlet **12**, **13** as well as the emergency valve **14** are located on top of the boiler. ENTROPIE boiler TT100 with capacity of 2000 kW or more have two emergency valves. Nozzles for temperature sensors are provided at the water inlet **12** and outlet **13**.

A water guiding element **15** is installed under the water inlet, providing the most effective intra boiler distribution of the coolant.

A wide shell side and a large volume of water in the boiler provide the best operating conditions within the entire range of heat output.

The burner plate **16** is designed for the installation of the burner on the front door. The flame in the

combustion chamber can be visually inspected via the sight glass **17**.

The flue gas outlet **18** is located in the upper part of the rear wall of the boiler and is fitted with a connecting flange.

For uniform distribution of the weight load, the boiler has two steel load-bearing supports **19** welded to the lower part of the boiler body. The boiler can be installed on an even, sturdy floor that is capable of withstanding the load, without needing to use an additional base.

The high-efficiency thermal insulation **20** of the boiler consists of laminated mineral fibre mats with a thickness of 100 mm. The boiler surface is fitted with a chequered aluminium coating, which gives the boiler an impressive appearance throughout its service life **21**. The drainage pipe **22** in the lower part of the boiler allows the coolant to be fully removed. A drain nozzle

23 is provided in the lower part for condensate removal.

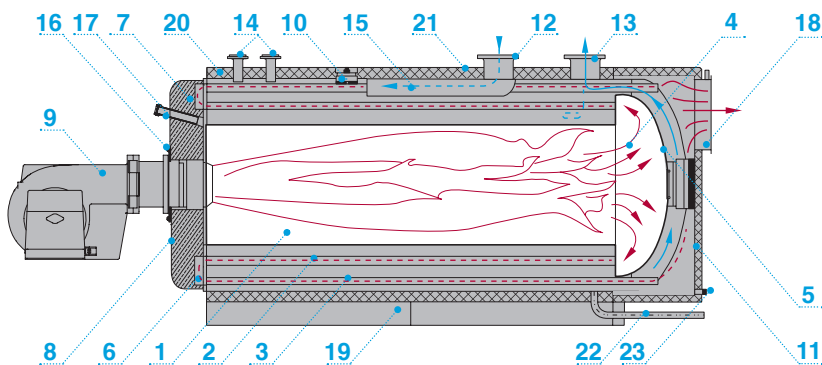
To move the boiler during installation and handling operations, lifting eyes are provided on the boiler body, located symmetrically with respect to the boiler center of mass.

The three-way diagram of the boiler gas path with low heat density of the combustion chamber provides a convenient setup of the boiler's combustion modes and minimum release of hazardous combustion products.

The boiler's low aerodynamic resistance allows for optimal selection of the burner.

Fastening of the first reversal chamber of the boiler on a single supporting-sliding anchor, or a rigid anchor for boilers over 8.0 MW, provides compensation of cyclic thermal stresses and, thus, a long service life of the boiler.

Diagram of TT100 boiler



- | | | |
|----------------------------------|----------------------------|---------------------------------------|
| 1 Flue tube | 7 Front door lining | 13 Water outlet |
| 2 Second pass fire tubes | 8 Boiler front door | 14 Emergency valve |
| 3 Third pass fire tubes | 9 Burner | 15 Water guiding element |
| 4 First reversal chamber | 10 Sight-hole | 16 Burner plate |
| 5 Torispherical head | 11 Inspection hole | 17 Sight glass |
| 6 Second reversal chamber | 12 Water inlet | 18 Flue gas removal outlet |
| | | 19 Steel load-bearing supports |
| | | 20 Heat insulation |
| | | 21 Chequered aluminium coating |
| | | 22 Drainage pipe |
| | | 23 Drain nozzle |

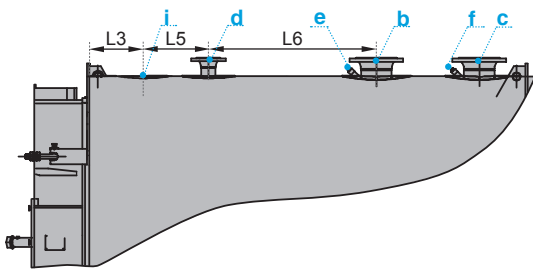
Technical specification TT100 boilers

Rated heat output**, kW	1000	1500	2000	2500	3000	3500	5000	6000	7000	8700	10,000	13,000	16,500
Maximum water temperature, °C	110												
Minimum water temperature at the boiler inlet, °C	60												
Maximum operating pressure of water, bar	6												
Minimum water flow rate, m³/h	Not regulated												
Minimum capacity of the first stage of burner, %	Not regulated												
Efficiency*, %	93.5	92.0	92.6	92.3	92.5	93.5	94.8	94.9	93.4	93.7	94.2	92.6	93.7
Rated water flow rate for $\Delta t = 15^\circ\text{C}^*$, m³/h	58	88	117	146	175	204	292	350	408	508	583	759	963
Hydraulic resistance of water path at the coolant flow rate for $\Delta t = 15^\circ\text{C}$, kPa	1.79	4.03	3.50	5.85	2.14	2.92	6.34	4.10	6.48	5.89	6.11	6.54	6.63
Flue gas flow rate*, kg/s	0.44	0.67	0.88	1.11	1.32	1.53	2.16	2.58	3.06	3.79	4.33	5.73	7.19
Aerodynamic resistance of gas path for maximum capacity*, Pa	242	616	773	934	830	1146	1670	1850	1190	1343	1355	1573	1990
Temperature of outgoing flue gas*, °C	165	196	184	190	186	165	139	136	167	161	151	184	162
Firebox volume, m³	0.9	0.9	1.3	1.5	2.2	2.4	3.3	4.1	5.2	6.6	8.6	10.8	13.8
Boiler water volume, m³	1.9	1.9	2.7	2.8	3.9	4.4	5.3	6.2	7.4	9.6	11.4	16.0	20.0
Dry boiler weight (weight tolerance 4.5 %), kg	3333	3333	4626	5051	6712	7307	9195	10,834	13,580	16,566	19,018	21,780	28,055

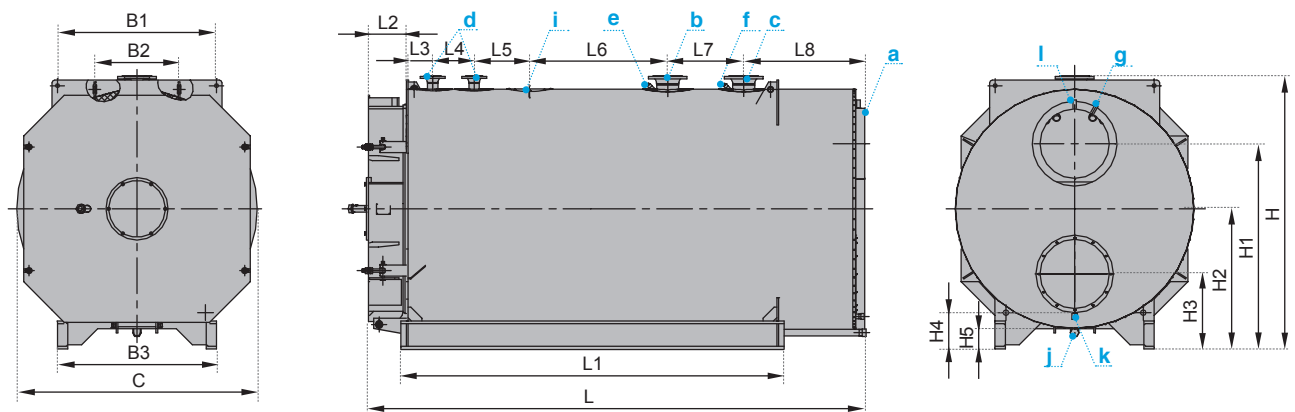
* Indicated for natural gas 8000 Kcal/m³

** The heat output value is indicated for standard gaseous and light liquid fuel.

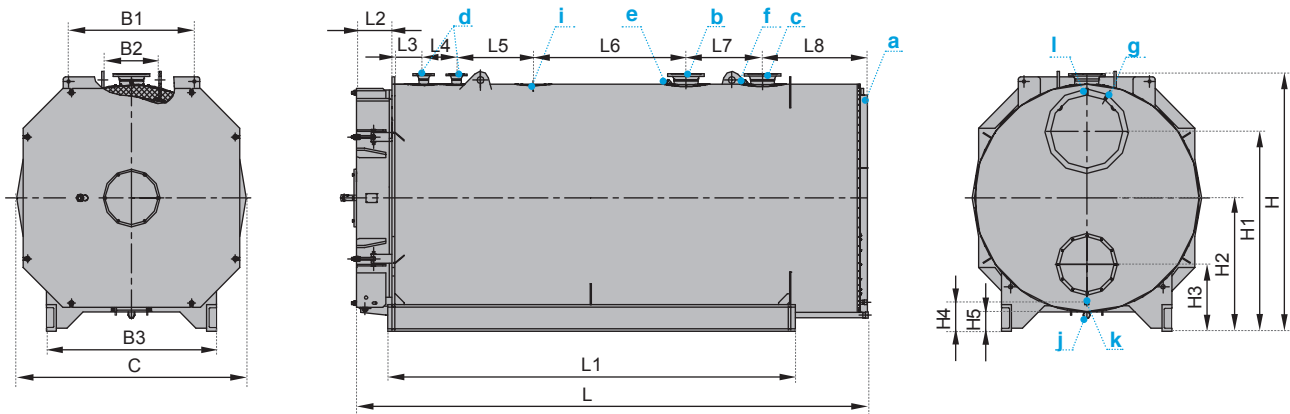
Overall and connecting dimensions of TT100 boilers



The overall and connecting dimensions of boilers with a heat output of 1000 kW and 1500 kW provide for one safety pipe (d); in addition, these boilers have no slinging holes (distance B1). Dimensions L3, L5 and L6 in accordance with this drawing.



Overall and connecting dimensions of boilers with a heat output of 1000–3500 kW

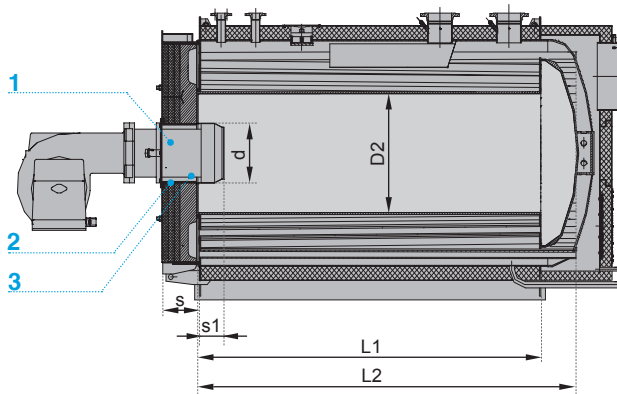


Overall and connecting dimensions of boilers with a heat output of 4200–16,500 kW

Rated heat output, kW		1000	1500	2000	2500	3000	3500	5000	6000	7000	8700	10,000	13,000	16,500	
Flue gas outlet, DN	a	350	350	500	500	500	500	650	650	800	800	900	1000	1000	
Water inlet, DN	b	125	125	150	150	200	200	200	250	250	300	300	350	400	
Water outlet, DN	c	125	125	150	150	200	200	200	250	250	300	300	350	400	
Safety valve, DN	d	50	50	65	65	65	65	80	80	100	100	125	125	125	
Temperature sensor (inlet)	e	G 1/2-B													
Temperature sensor (outlet)	f	G 1/2-B													
Flue gas temperature sensor	g	G 1/2-B													
Inspection hole, mm	i	252×190													
Boiler water drainage	j	G1 1/2-B								50mm					
Condensate removal	k	G1-B													
Draft and heat gauge	l	G 1/2-B													
Length, mm	L	3036	3036	3340	3590	3974	4374	4674	4963	5249	5651	6280	6805	7465	
Width, mm	B	1540	1540	1740	1740	1940	1940	2100	2200	2360	2500	2680	2860	3060	
Height, mm	H	1768	1768	1968	1968	2168	2168	2328	2438	2574	2710	2900	3074	3276	
Length of supporting frame, mm	L1	2294	2294	2522	2772	3047	3447	3730	4003	4200	4500	5220	5470	6135	
Door width, mm	L2	225	225	275	275	325	325	325	325	327	325	325	329	329	
Distance, mm	L3	345	345	178	178	178	178	278	276	448	606	481	414	574	
Distance, mm	L4	-	-	300	300	300	300	300	300	470	500	500	500	600	
Distance, mm	L5	300	300	350	400	400	400	700	700	470	490	500	440	850	
Distance, mm	L6	730	730	855	1000	1200	1550	1400	1400	1500	1500	1850	2000	1700	
Distance, mm	L7	400	400	550	550	600	600	700	800	900	1000	1400	1600	2000	
Distance, mm	L8	1036	1036	820	875	959	1009	959	1148	1134	1216	1210	1506	1396	
Distance, mm	B1	-	-	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	
Distance, mm	B2	598	598	598	598	634	634	750	750	920	960	980	1040	1060	
Width of supporting frame, mm	B3	910	910	1152	1152	1152	1152	1556	1556	1580	1800	1800	1820	1940	
Distance, mm	H1	1360	1360	1520	1520	1720	1720	1805	1888	1970	2070	2130	2364	2514	
Distance, mm	H2	910	910	1010	1010	1110	1110	1205	1260	1314	1370	1490	1564	1664	
Distance, mm	H3	560	560	540	540	560	560	605	660	614	620	740	614	614	
Distance, mm	H4	233	233	233	233	233	233	263	263	237	213	263	227	230	
Distance, mm	H5	116	116	116	116	116	116	146	142	116	92	142	116	116	

Note. One safety pipe (d) is provided on boilers with a heat output of 1000 kW and 1500 kW; in addition, these boilers have no slinging holes (distance B1). Dimensions L3, L5 and L6 in accordance with the diagram on page 21.

Dimensions TT100 boiler firebox



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

Burner installation

Rated heat output, kW	1000	1500	2000	2500	3000	3500	5000	6000	7000	8700	10,000	13,000	16,500
Diameter of installation hole, d, mm	300	300	380	380	450	450	450	450	500	590	590	730	730
Thickness of cover, taking into account the adapter plate, s, mm	247	247	297	297	347	347	347	347	349	347	347	351	351
Installation size of burner, s1, mm	20–60												
Firebox diameter, D2, mm	650	650	780	780	900	900	1000	1100	1180	1280	1380	1500	1600
Flue tube length, L1, mm	2225	2225	2435	2685	2975	3375	3650	3926	4105	4475	5105	5405	6105
Firebox length, L2, mm	2459	2459	2708	2958	3293	3693	3990	4279	4503	4895	5540	5891	6614

Selecting and installing of the burner

The aerodynamic characteristics of the burners and their placement should ensure that the flame fills the firebox uniformly without affecting the walls, and prevent any areas becoming stagnant or poorly ventilated within the firebox volume.

Burners to be used with ENTROPIE boilers TT100 must have a forced air supply with a regulated air excess factor. Starting up burners, combustion chamber blowing, operation, and shutdown should be performed automatically.

ENTROPIE boiler TT100 are operated with excess pressure in the firebox. In selecting burners, it is necessary to take into account the following factors:

- length and diameter of the firebox,
- aerodynamic drag of the boiler.

Hot water ENTROPIE boiler TT100 can be operated with rotary fan combined burners designed for combustion of gas and liquid fuel. To order a hot water ENTROPIE boiler TT100 complete with burner, it is necessary to

indicate the gas pressure in case of using gas as the main or reserve fuel.

When ordering a burner, check that its connecting dimensions and its flame head dimensions comply with the technical requirements for the boiler and this technical data sheet. An additional extension and/or intermediate flange must be ordered when the burner is fitted with a short or long flame head.

The burner gas line must contain a compensator. This will relieve mechanical loads on the gas pipeline, both during boiler operation and in case of accidental changes in the position of the boiler front door after opening/closing during maintenance and cleaning of the boiler.

The burner is equipped according to the manufacturer's requirements. The burner flame head must be completely inserted in the firebox.

The space between the burner flame head and rigid heat insulation of the boiler front door should be

sealed with an elastic heat-insulating material attached to the boiler (this should be installed around the perimeter of the burner hole on the front door).

Burner devices should provide safe and efficient operation of boilers.

Burner devices should have a data sheet issued by the manufacturer that includes general information (manufacturer's name and address, serial number, date of production, design solutions, main dimensions, working media parameters, type, capacity, adjustment range, main technical characteristics, etc.).

Quality of boiler water

Operating the boiler without pre-boiler or intra-boiler water treatment is prohibited.

Special attention should be paid to the quality of the boiler water, which in most cases is the main factor affecting the service life of the boiler and the boiler unit as a whole.

The water regime must ensure the boiler operates without its parts being damaged by lime-scale or sludge deposits, or as a result of metal corrosion, mostly caused by deviating from the standard quality indicators given in the table.

The water composition at the boiler inlet should comply with the specified indicator values. The method of water treatment must be selected by a specialized organisation.

The water treatment log-book shall be permanently kept in the boiler room, in which all data on the boiler water-chemical conditions should be recorded on a regular basis.

Description of indicator	Value
Transparency of water by font (using the Snellen method), cm, min	30
Carbonate hardness, mkg-equiv./kg, max	700
Content of dissolved oxygen, µg/kg, max	100
Content of iron compounds (in terms of Fe), µg/kg, max	500
pH value at 25°C	9.5–8.3
Free carbonic acid, mg/kg	None
Content of oil products, mg/kg, max	1.0

The use of non-freezing fluids as coolants is permitted as agreed with the manufacturer.

Boiler configuration

Several options of boiler delivery sets are available depending on the equipment: full delivery set, partial delivery set, or delivery without parts.

The full delivery set includes a boiler with burner equipment, set of parts and components installed according to the information specified in the questionnaire.

Manufacturer fits boilers with a control unit, necessary safety devices (for ensuring mode adjustment, parameter monitoring, boiler shutdown, reliable operation and safe maintenance), valves, pumps, actuators with necessary piping as well as a burner device (burners). Due to factory installation, the optimal and reliable operation of all boiler units is guaranteed.



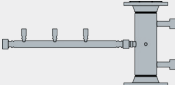





Sealing wool is supplied as part of the boiler delivery set for sealing the annular gap between the burner flame head and rigid thermal insulation of the front door.

At the customer's request, the boiler can be supplied with the partial delivery set equipment (boiler fitted with a burner and relief valves as well as operating documentation) or without parts (only the boiler and operating documentation). In the latter case, the customer will independently equip the boiler with burners, safety devices and automatic controls.

When ordering a boiler, it is necessary to select the type of delivery set and if necessary, agree on the scope of delivery.

Boiler accessories

At the customer's request, ENTROPIE can additionally supply the following boiler accessories:

	Plate for burner
	Flange for burner
	Collecting channel of the safety group for connecting sensors and monitoring devices
	Pressure limiters for minimum and maximum pressure
	Safety valves
	Temperature sensors
	Three-way valve
	SYR Water level limiter
Other accessories for boiler installation and maintenance	

Boiler placement

The distance from the boiler front to the boiler room wall must leave enough space for boiler maintenance and repair, but no less than 3 m. In this case, for boilers running on gaseous or liquid fuel, the distance from the protruding parts of the burner devices to the boiler room wall should be at least 1 m. The width of passageways between the boiler and the boiler room wall should be at least 1 m.

In case the boiler is installed near walls or columns, the insulation of the boilers should not be in close contact with the boiler room wall if there is no passageway, and there should be a minimum distance of 70 mm between them.

Deviations from the recommended distances are allowed but only within the distances specified in the local regulatory documents.

Transportation

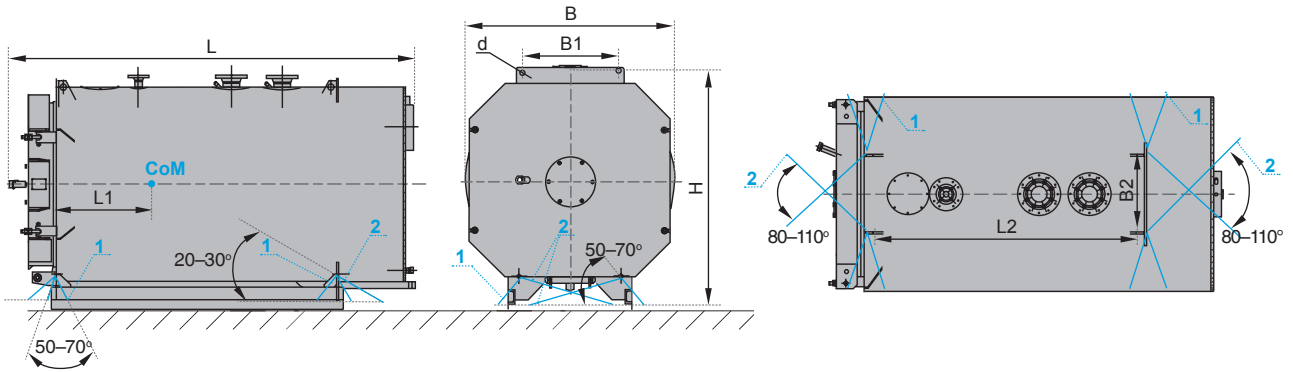


Diagram of transportation of boilers with a heat output of 1000–3500 kW

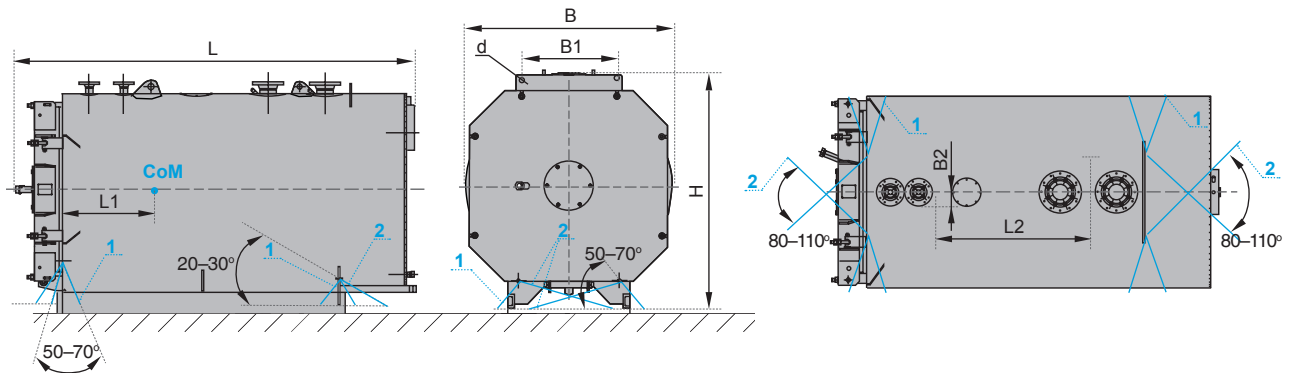


Diagram of transportation of boilers with a heat output of 4200–16,500 kW

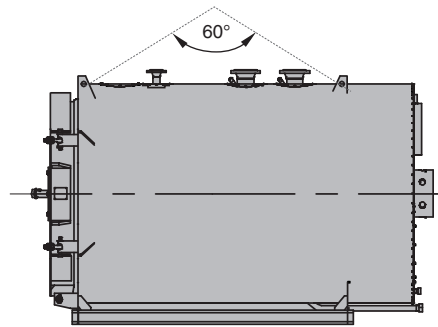


Diagram for boiler slinging

- – Center of mass
- – Means of fastening
- 1 – Tilt protection
- 2 – Diagonal fastening

Description	Numerical value													
Rated heat output, kW	1000	1500	2000	2500	3000	3500	5000	6000	7000	8700	10,000	13,000	16,500	
Length, L, mm	3181	3181	3486	3736	4130	4530	4829	5107	5398	5793	6425	6948	7609	
Width, B, mm	1540	1540	1740	1740	1940	1940	2100	2200	2360	2500	2680	2860	3060	
Height, H, mm	1768	1768	1968	1968	2168	2168	2328	2438	2574	2710	2900	3074	3276	
Distance, B1, mm	-	-	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	
Distance, B2, mm	598	598	598	598	634	634	375	375	460	480	490	520	530	
Diameter of transportation hole, d, mm	-	-	28	28	28	28	28	28	28	28	28	28	28	
Center of mass, L1, mm	1115	1115	1216	1343	1486	1685	1824	1937	2047	2233	2581	2775	3132	
Distance, L2, mm	2107	2107	2328	2578	2853	3253	2300	2325	2655	3400	3800	3955	4355	
Weight, m, kg	3333	3333	4626	5051	6712	7307	9195	10,834	13,580	16,566	19,018	21,780	28,055	

