ENTROPIE boiler TT300

20–60 MW 160 °C 16 bar

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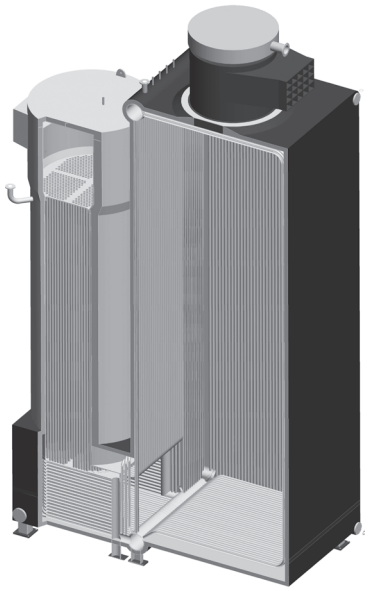
Field of application of TT300 boiler

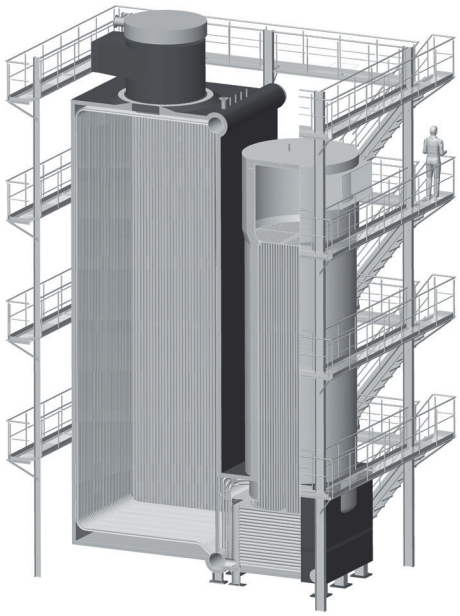
High-temperature hot water ENTROPIE boilers TT300 are mass produced with a rated heat capacity range from 20 to 60 MW, with a working water pressure up to 1,6 MPa, and a maximum water temperature at the boiler outlet of 160 °C.

The boilers are designed for use as a part of heating, ventilation, and hot-water supply systems of industrial and household purpose, as well as for providing engineering processes of various purposes.



General view of TT300 boiler

The manufacturer guarantees reliable and safe operation of the boiler during 36 months from the date of putting into operation, but no more than 42 months from the date the boiler is delivered by the manufacturer provided that the customer observes the conditions of storage, transportation, installation and operation.



*General view of TT300 boiler with ladders and maintenance sites (*the maintenance sites are optional and should be ordered separately on request)*

Operation of ENTROPIE boiler TT300

Hot water ENTROPIE boiler TT300 is a combined gas-tight water/fire-tube structure which is operated with excess pressure of combustion products and forced coolant circulation.

The boiler is designed and produced in a modular design configuration. The boiler structure provides complete evacuation of water and sludge, air bleeding from all elements where air locks may form while filling and starting.

The boilers are equipped with maintenance (18) and inspection holes (11), (17) designed for carrying out inspection, cleaning, safe corrosion protection works, installation and removal of dismountable internal devices, repair and monitoring of boilers.

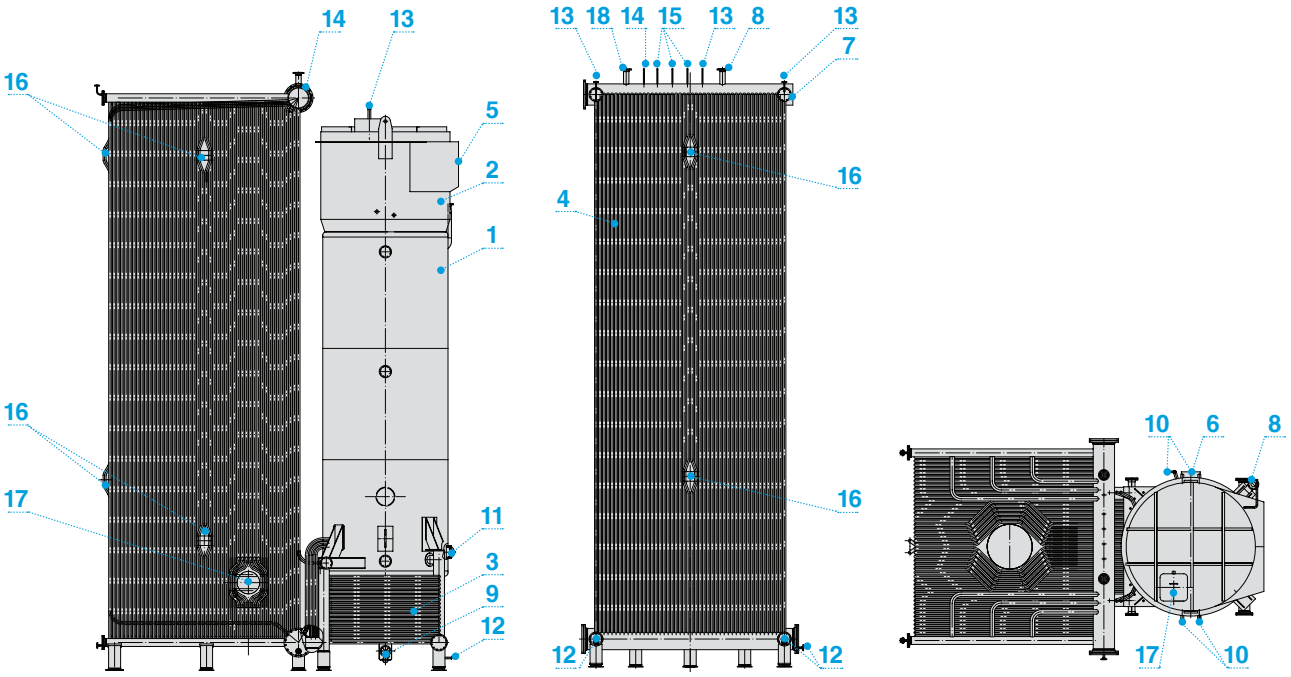
The vertical firebox of the boiler consists of gas-tight membrane tube panels. The combustion products are transferred from the firebox (4) into the fire-tube convection section with a large water volume, which is also filled vertically.

The coolant is supplied to the lower area of the convection section (1), passes the convection and transition sections (3), arrives to the gas-tight panels of the firebox (4), flows along water-tube gas-tight panels of the firebox from the lower to upper outlet collector.

In this way, effective counter-flow circulation is provided in all parts of the boiler.

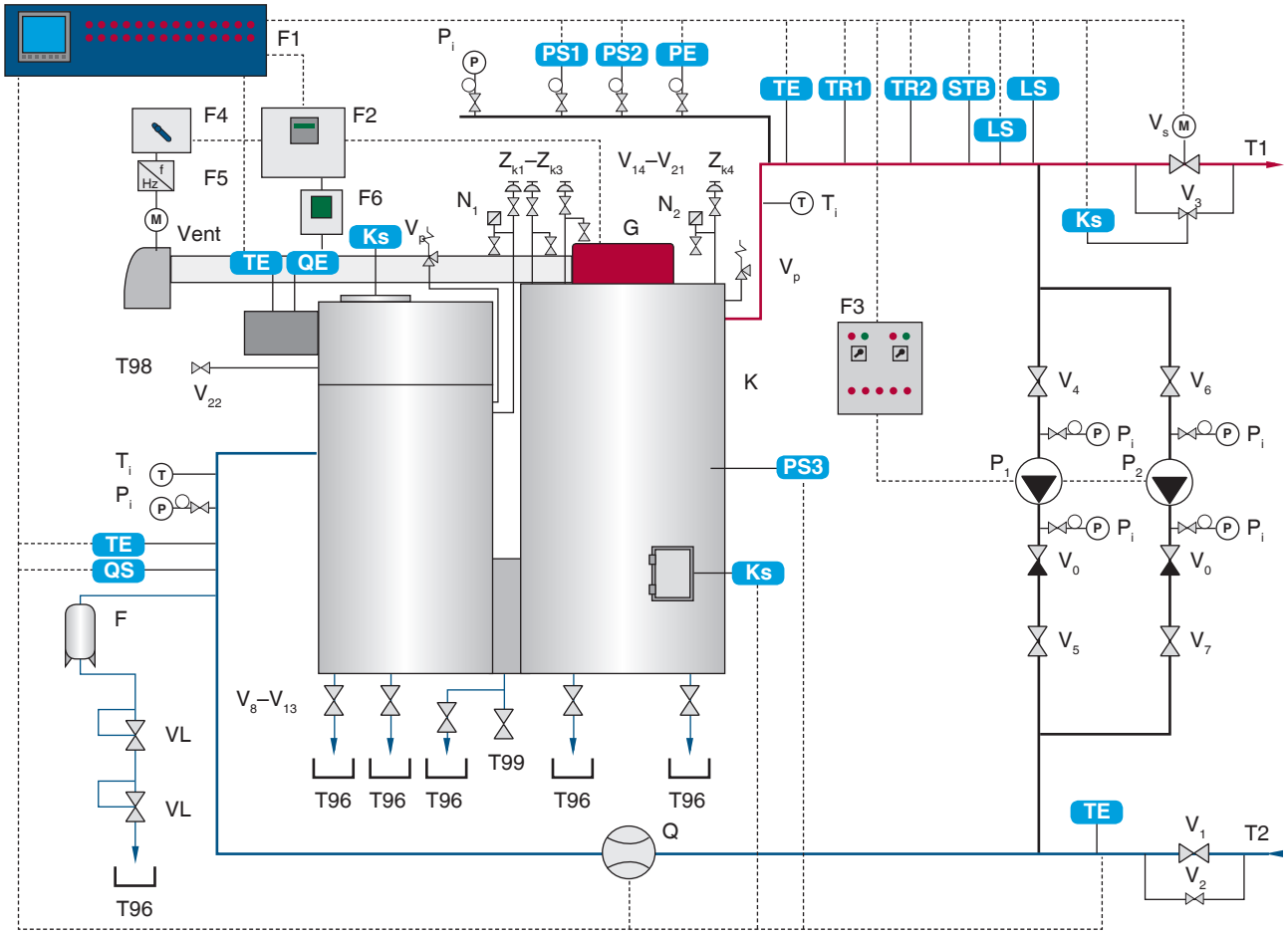
The firebox and the convection section are supplied in prefabricated transport units which are connected to each other at the installation site.

Boiler diagram



1 Convection section
2 Flue box
3 Transition section
4 Firebox
5 Flue gas outlet
6 Water inlet
7 Water outlet
8 Safety valves
9 Condensate drain
10 Agent feed
11 Inspection hole
12 Water drain
13 Air outlet, vacuum shutter
14 Temperature sensor
15 Manometers
16 Sight glass
17 Maintenance hole
18 Safety system pipe

Diagram of boiler TT300



Main equipment
K – water-tube ENTROPIE boiler TT300,
G – standard burner of boiler,
Ven – burner fan,
P – circulating pumps.

Control boards
F1 – boiler automatic controls ENTROMATIK 300,
F2 – burner control board,
F3 – power panel for pumps,
F4 – power panel for fan,
F5 – variable speed controller,
F6 – oxygen analyzer.

Valves
V_S – electrically operated valve,
V – shut-off valve,
V_O – check valve,
Z – automatic air-relief valve,
N – vacuum shutter,
V_P – safety valve,
V_3-V_2 – relief valve,
VL – direct action valve,
E – expansion tank.

I&C devices
TE – temperature sensor 4–20 mA,
PE – pressure sensor 4–20 mA,
QS – water flow rate sensor,
LS – boil-off protection sensor,
Q – flow meter,
PS1 – minimal pressure switch,
PS2 – maximal pressure switch,
PS3 – firebox maximal pressure switch,
TR1 – 1st stage restricting thermostat,
TR2 – 2nd stage restricting thermostat,
STB – stand-by thermostat,
LS – boil-off protection sensor,
T_i — thermometer,
P_i — manometer,
QE – oxygen sensor,
Ks – limit switch.

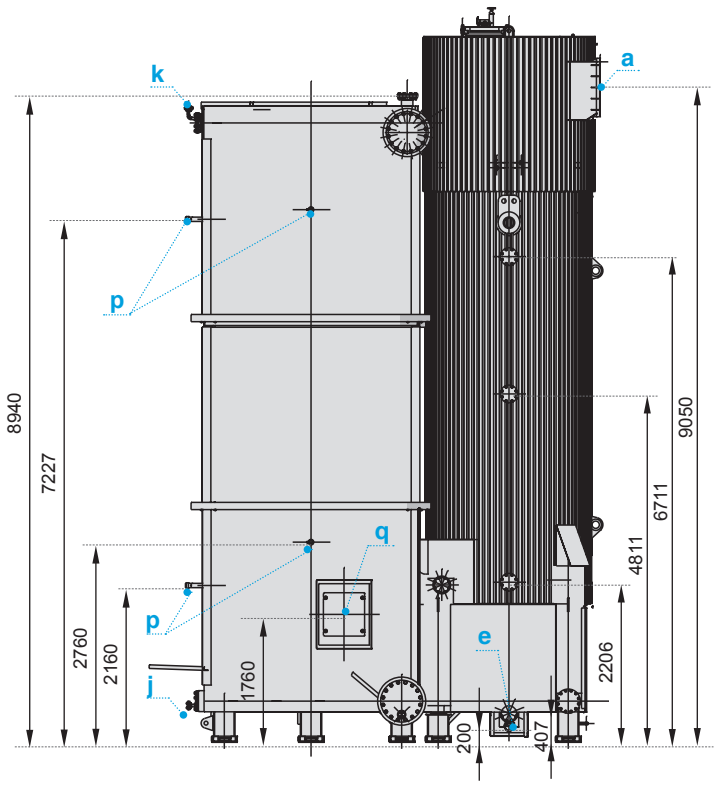
Pipeline
T1 – consumer supply line,
T2 – consumer return line,
T96 – drainage pipeline,
T98, T99 – direct/return line of washing circuit.

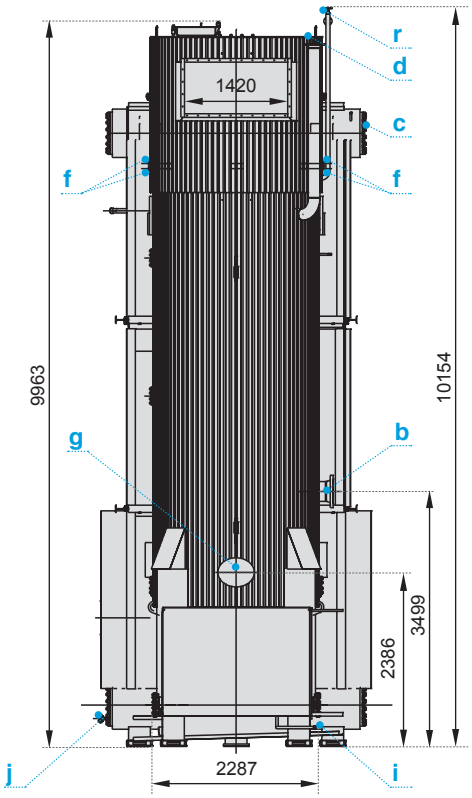
Technical characteristics

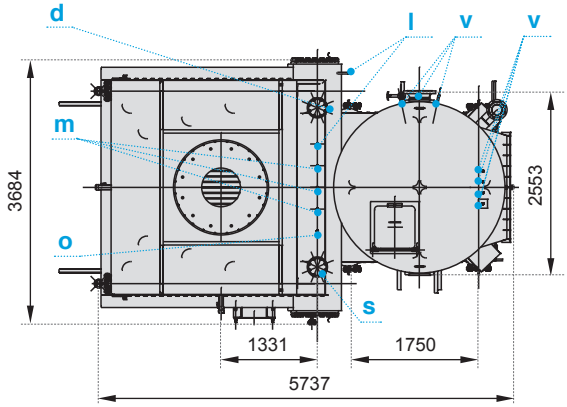
Description of indicator	Numerical value		
Rated heat output, MW	**20**	**40**	**60**
Operating pressure (gauge) of water in boiler, bar, max	16		
Water pressure at the boiler outlet, bar, at rated mode, min	9		
Water temperature at the boiler inlet, °C, min	70		
Water temperature at the boiler outlet, °C, max	160		
Water temperature drop at the boiler inlet and outlet, °C, max	80		
Hydraulic resistance, kPa, max	1,91	5,57	12,4
Aerodynamic resistance, Pa	2610	3260	3210
Heat output adjustment range in relation to the rated output, %	30–100		
Water flow rate via the boiler (dT = 80 K), m^3/h	221	443	665
Boiler water volume, m^3	17,1	30,3	41,4
Dry boiler weight (weight tolerance 4.5 %), kg	43586	69733	98936
Designated service life, years, min	25		
Assigned resource, h, min	150000		
Assigned storage time, months	36		
Continuous operation time between scheduled maintenance service related to the necessary outage of the boiler, h, min	5000		
Efficiency, %			
- for natural gas operation - for diesel oil operation - for fuel oil operation	No less than 95* No less than 94* No less than 93*		
Temperature of outgoing flue gas at nominal load, °C			
- for natural gas operation - for diesel oil operation - for fuel oil operation	130* 130* 140*		

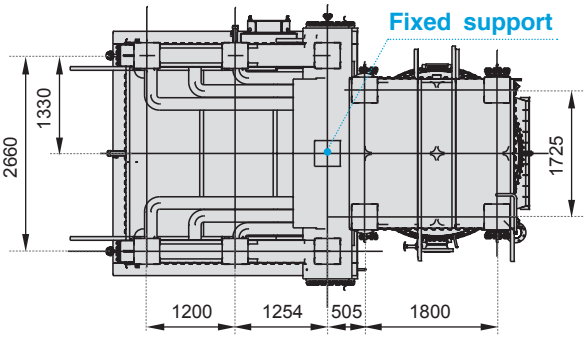
* These values are specified when ordering.

Overall and connecting dimensions of ENTROPIE boiler TT300 20 MW



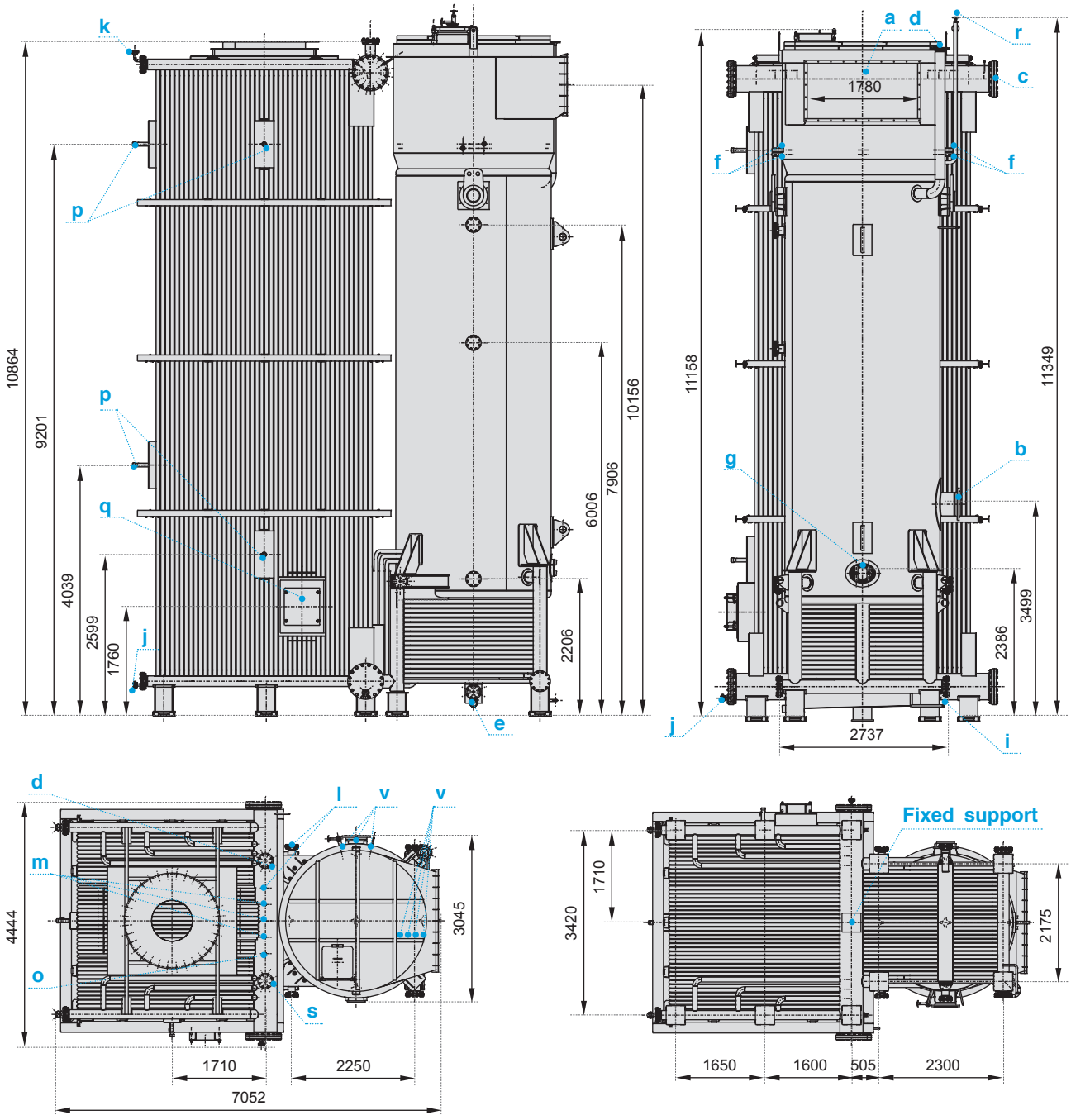






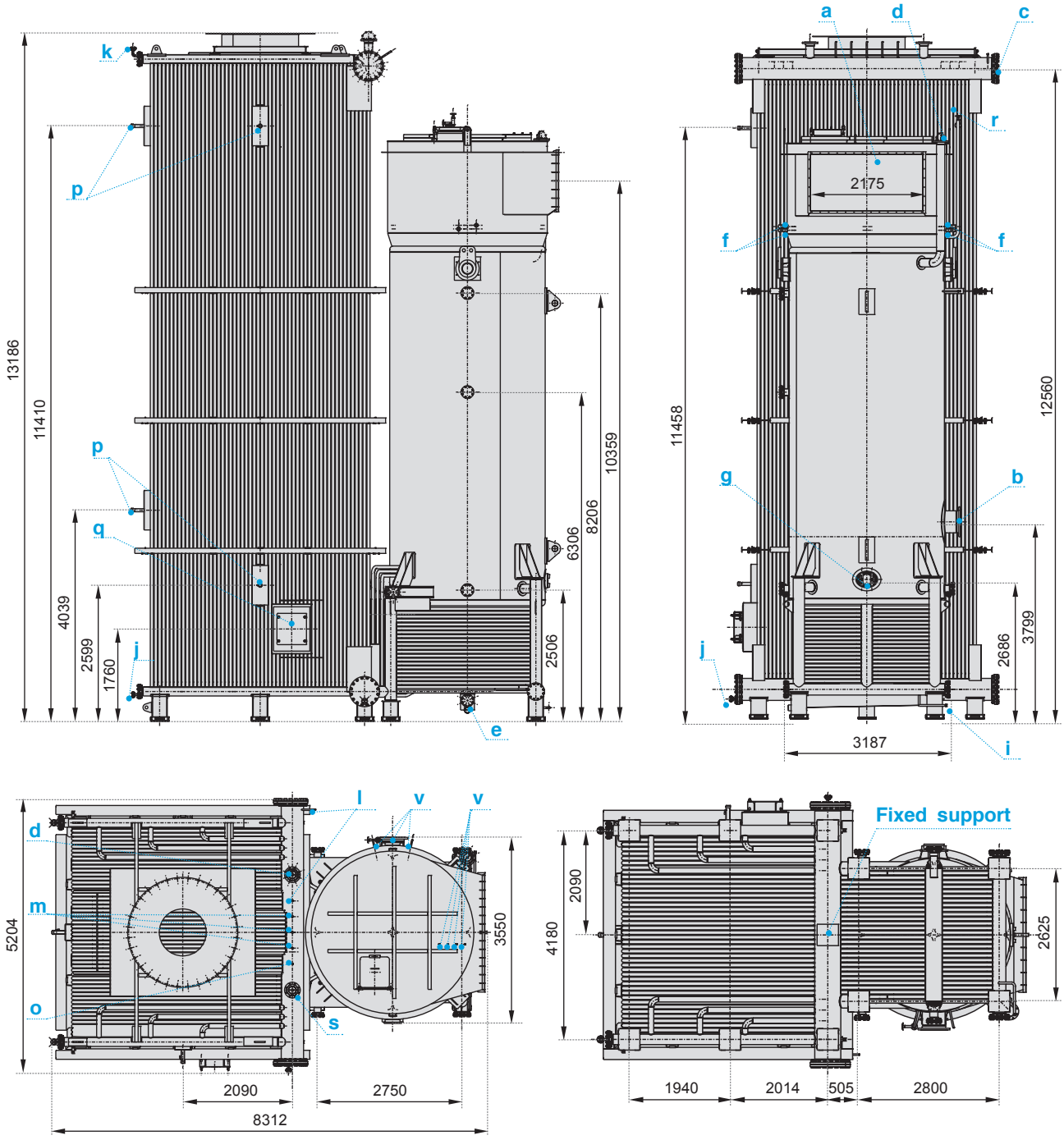
Symbol	Designation	Quantity	Nominal diameter, DN (axb)	Nominal pressure, PN	
			mm	MPa	kgf/cm²
a	Flue gas outlet	1	1420x710	0,01	0,1
b	Water inlet	1	350	1,6	16
c	Water outlet	1	400	1,6	16
d	Safety valve	2	150	1,6	16
e	Condensate drain	1	100	0,1	1
f	Agent supply	4	50	1,6	16
g	Inspection hole	1	230x330	1,6	16
i	Water drain	1	G 1-B	1,6	16
j	Water drain from lower collector	3	25	1,6	16
k	Firebox air vent	2	25	1,6	16
l	Temperature sensor	2	G 1/2-B	1,6	16
m	Manometers	3	G 1/2-B	1,6	16
o	Main collector air vent	1	G 1/2-B-50	1,6	16
p	Sight glass	4	50	0,01	0,1
q	Maintenance hole	1	400	0,01	0,1
r	Convection section air vent	1	20	1,6	16
s	Safety system pipe	1	150	1,6	16
v	Nozzles for sensors	7	G 1/2-B	1,6	16

Overall and connecting dimensions of ENTROPIE boiler TT300 40 MW



Symbol	Designation	Quantity	Nominal diameter, DN (axb)	Nominal pressure, PN	
			mm	MPa	kgf/cm²
a	Flue gas outlet	1	1780x892	0,01	0,1
b	Water inlet	1	350	1,6	16
c	Water outlet	1	400	1,6	16
d	Safety valve	2	150	1,6	16
e	Condensate drain	1	100	0,1	1
f	Agent supply	4	50	1,6	16
g	Inspection hole	1	230x330	1,6	16
i	Water drain	1	G 1-B	1,6	16
j	Water drain from lower collector	3	25	1,6	16
k	Firebox air vent	2	25	1,6	16
l	Temperature sensor	2	G 1/2-B	1,6	16
m	Manometers	3	G 1/2-B	1,6	16
o	Main collector air vent	1	G 1/2-B-50	1,6	16
p	Sight glass	4	50	0,01	0,1
q	Maintenance hole	1	400	0,01	0,1
r	Convection section air vent	1	20	1,6	16
s	Safety system pipe	1	150	1,6	16
v	Nozzles for sensors	3	G 1/2-B	1,6	16

Overall and connecting dimensions of ENTROPIE boiler TT300 60 MW



Symbol	Designation	Quantity	Nominal diameter, DN (axb)	Nominal pressure, PN	
			mm	MPa	kgf/cm^2
a	Flue gas outlet	1	2175x1090	-	-
b	Water inlet	1	400	1,6	16
c	Water outlet	1	400	1,6	16
d	Safety valve	2	150	4	40
e	Condensate drain	1	100	-	-
f	Agent supply	4	50	1,6	16
g	Inspection hole	1	230x330	1,6	16
i	Water drain	1	G 1-B	1,6	16
j	Water drain from lower collector	3	25	1,6	16
k	Firebox air vent	2	25	1,6	16
l	Temperature sensor	2	G 1/2-B	-	-
m	Manometers	3	G 1/2-B	-	-
o	Main collector air vent	1	G 1/2-B-50	-	-
p	Sight glass	4	50	-	-
q	Maintenance hole	1	400	-	-
r	Convection section air vent	1	20	1,6	16
s	Safety system pipe	1	150	4	40
v	Nozzles for sensors	7	G 1/2-B	-	-

Burner selection

The design of ENTROPIE boiler TT300 provides the possibility to operate with modern high-efficiency automated fan burners designed for combustion of gaseous and liquid fuel.

It is recommended to use modulated burners with forced air supply and with regulated air excess factor.

The burner model shall pass industrial tests and meet the requirements of DIN EN 267, 676.

The burner is selected depending on the boiler capacity, fuel type, and specified requirements for power control.

The burner devices shall provide reliable ignition and self-supporting fuel combustion without flame liftoff and blowback in a given range of operating modes and prevent appearance of fuel droplets on the firebox surface. The aerodynamic characteristics of the burners and their placement shall ensure that the flame fills the firebox uniformly without affecting the firebox wall and the transition section and prevent any areas becoming stagnant or poorly ventilated within the firebox volume.

The burner automatic controls shall provide starting up of burners, combustion chamber blowing, operation and shutdown in automatic mode. The burner shall be also equipped with automatic protection elements, the operation of which cuts off the fuel to the burner:

- in case of gaseous fuel pressure increase or decrease at the burner inlet;
- in case of liquid fuel pressure decrease at the burners inlet and at the outlet of control valves;
- in case of air pressure decrease at the burners inlet;
- in case of decrease in vacuum and/or pressure increase in the firebox;
- in case of flare failure of burners, which are not allowed to be switched off during boiler operation;
- in case of nozzle rotor component shutdown (if available);
- in case of malfunction of safety automatic controls or warning, including loss of voltage at these devices.

The standard configuration of ENTROPIE boiler TT300 can include a burner from the boiler manufacturer that meets all applicable regulations and rules and is the optimal choice for operation with the boiler.

In case of independent selection of the burner when ordering the boiler, it is necessary to specify its model and technical characteristics, which allow the manufacturer to prepare the mounting seat for burner and determine the material and shape of the lining correctly.

Information for independent selection of the burner is given in the table below.

TT300	20 MW	40 MW	60 MW
Firebox dimensions, mm	2660x2660x7590	3420x3420x9650	4180x4180x11960
The shape and composition of the air port are determined according to the information from the manufacturer of the burner			

Boiler delivery set

Individual parts and components of the boiler are selected by size and technical characteristics and assembled in modules ready for installation on the site.

Each supplied unit is packed in a protection film providing protection during adequate transportation and correct storage. Valve nozzle holes and flanges are protected against moisture and dirt.

Factory supply of the boiler includes four main units:

- firebox,
- transition section,
- convection section,
- flue box with a heat-exchange surface cleaner.

The boiler can be delivered additionally with maintenance sites.

Boiler placement

The distance from the boiler front to the wall and the floor structure of the boiler room shall leave enough space for maintenance and repair of the boiler and the burner. The width of passageways between the boiler and the boiler room wall shall be at least 1 m.

Maintenance of ENTRIOPIE boiler TT300 is via side access. The side passageway shall be wide enough to carry out maintenance and repair.

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

The width of the passageway between the boiler and the rear wall of the boiler room shall be wide enough for carrying out maintenance, repair, and installation of the connecting element of flue tube. In this case, the width of the passageway shall be at least 1 m.

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

Transportation

Subject to the approval of the customer and relevant authorities, the boiler can be transported by any mode of transport.

During boiler transportation, the open flange and fitting connections, cable insertions shall be plugged, all temporary openings shall be closed.

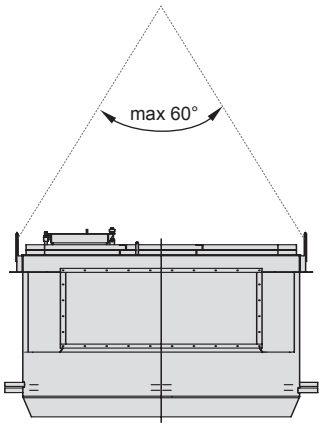
During transportation and storage it is necessary to take precautions in order to protect the boiler against mechanical damages.

Special slinging devices, namely, eye bolts, are provided for the process of loading, unloading, and placing the boiler (units, boiler elements) in its permanent location. Boiler slinging with the use of other elements is not allowed. Operation of hoisting devices shall prevent any sliding (dragging) of any part, unit and vehicles along the surfaces of storage areas.

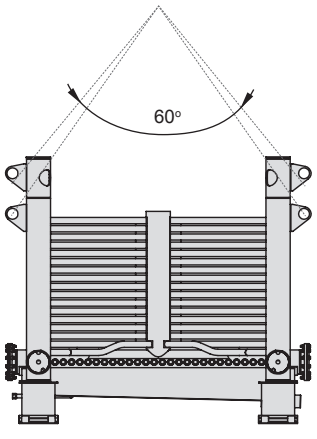
Slinging and lifting from other parts of the boiler is not allowed!

The boiler shall be loaded on a vehicle using cranes with the corresponding lifting capacity, equipped with beams and lifting devices.

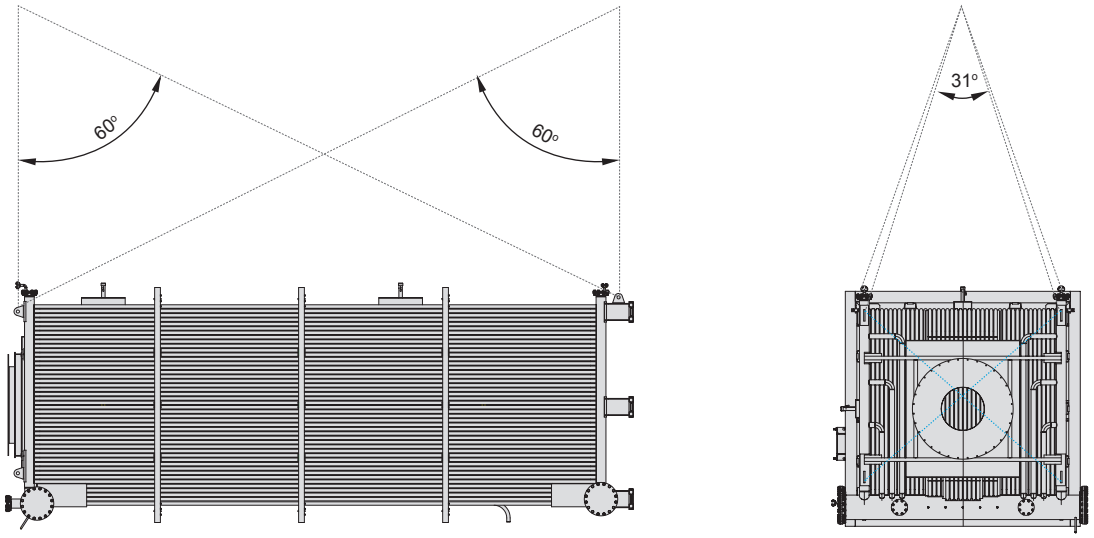
The boiler shall be secured to vehicles in accordance with the corresponding specifications for cargo handling and securing for each mode of transport.



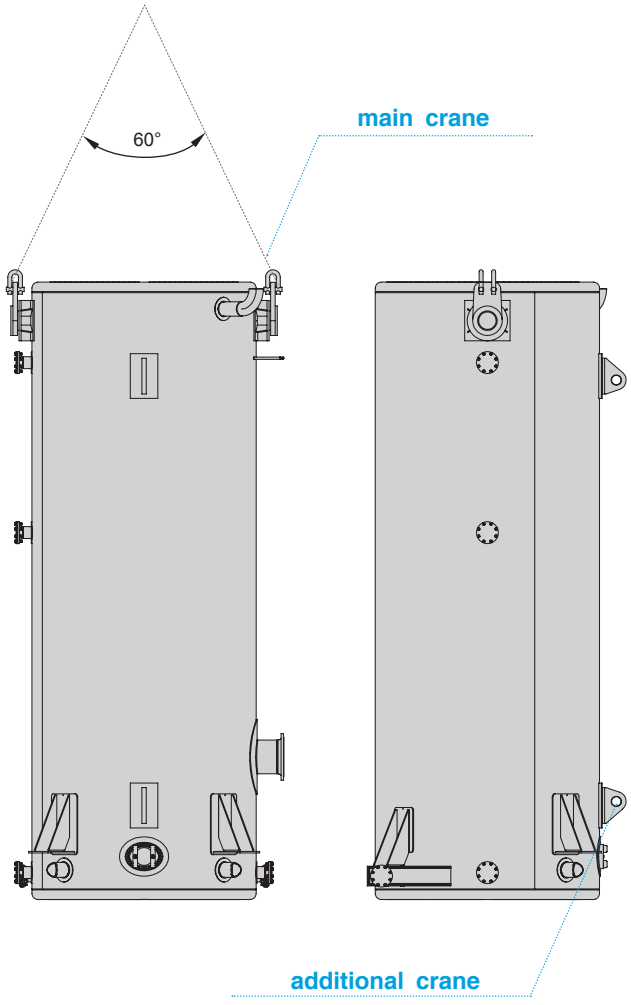
Slinging of flue box



Slinging of transition section



Firebox slinging. Change of transport position to operating position by means of two cranes (in order to avoid dragging)



Slinging of convection section