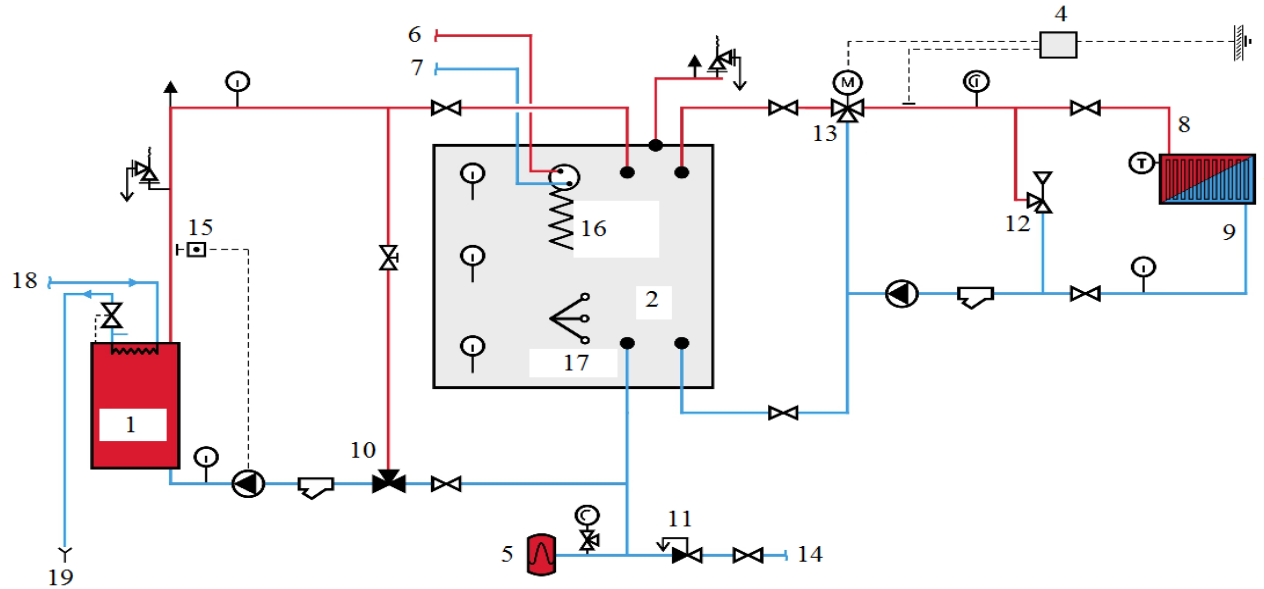


BOILERS. SCHEMES OF SOLID FUEL INSTALLATION

e-learning material

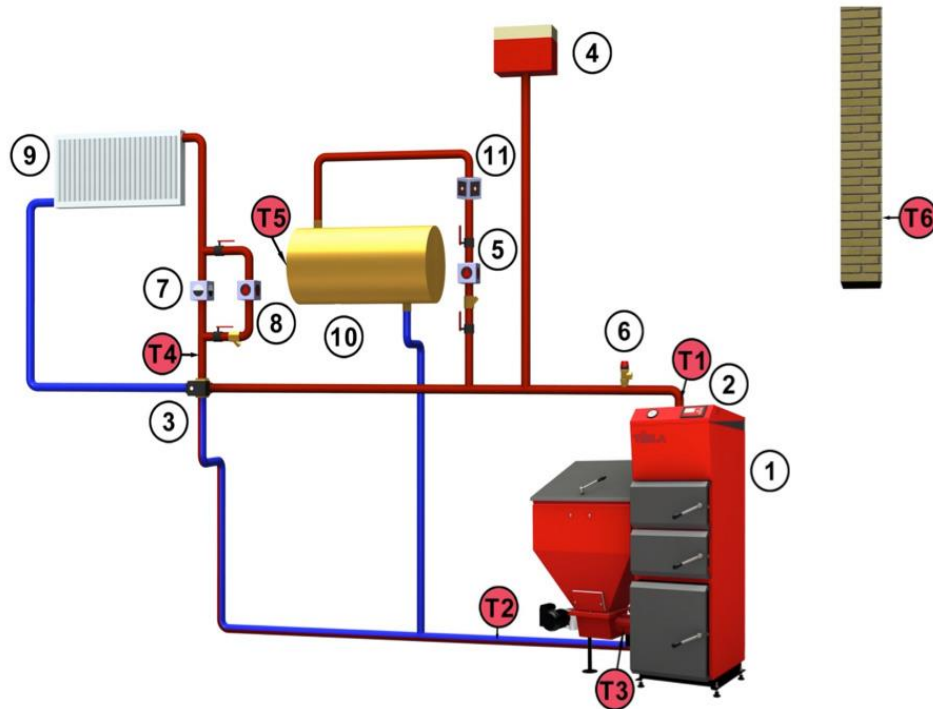


1 – boiler; 2 – accumulation tank; 3 – radiators; 4 – automatic control processor of heating system; 5 – expansion vessel; 6 – hot water; 7 – from water supply; 8 – to the heating system; 9 – from the heating system; 10 – three-motion mixing valve; 11 – automatic system filling valve; 12 – bypass valve; 13 – three-motion mixing valve with electric actuator; 14 – water from water supply; 15 – contact thermostat for pump control; 16 – domestic water heating coil; 17 – electric heating elements; 18 – from water supply; 19 – to sewers

Fig. 1. Boiler house technological scheme for solid fuel

<http://www.kalvis.lt/produktai/k-2-121>

The installation of pellet boiler:



1 – boiler; 2 – boiler controller;

3 – four- way mixing valve;

4 – open expansion vessel; 5 – hot water pump;

6 – protective valve;

7 – diferencialo valve;

8 – central heating pump,

9 – radiator , 10 – hot water accumulator;

11 – four- way valve;

T1 – boiler's temperature sensor;

T2 – temperature sensor of return water;

T3 – temperature sensor for fuel feeding;

T4 – temperature sensor for central heating;

T5 – temperature sensor of hot water;

T6 – temperature sensor for outdoors

Fig.2. Principal scheme for installation of pellet boiler

<http://katilaitekla.lt/produktas/draco-duo-versa/>

Building's boiler house:



Fig. 3. Installation of boiler house

<http://lv.construct-yourself.com/repair-installation-and-construction/heating-and-ventilation/heat-accumulators-for-heating-boilers.html>

Boiler made from heat resistant steel or coke.



Fig. 4. Solid fuel boiler with built-in temperature sensor

<http://lt.construct-yourself.com/repair-installation>

For safe operation of the boiler these devices must be mounted and maintained (Figure 5):

1. Manometers;
2. Air valves;
3. Protective pressure valves;

Protective pressure valves (3) can be calibrated for maximum pressure of 3 bar.

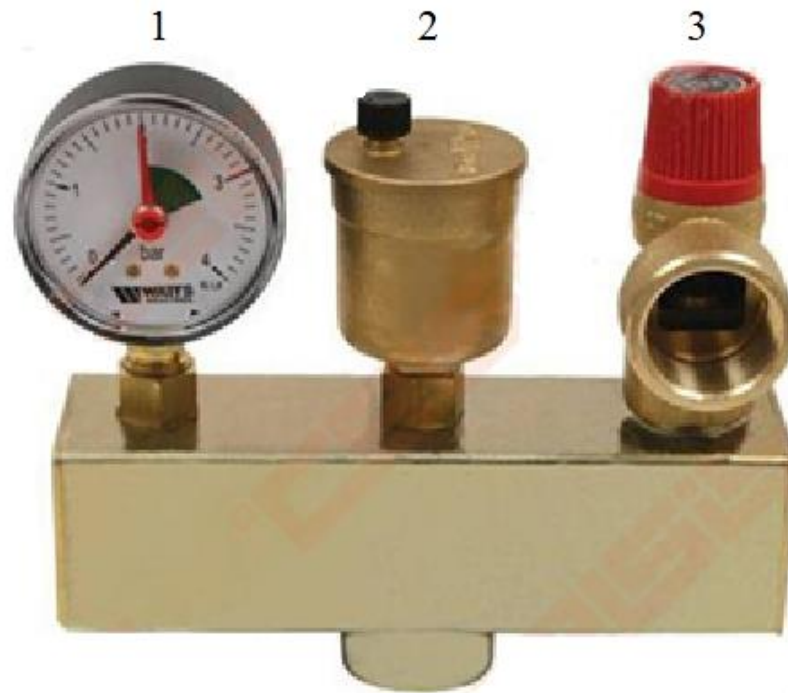


Fig.5. Boiler's protection

<https://www.celsis.lt/Namo-inzinerines-sistemas/Apsaugos-grupe-WATTS>

Protective element, belonging to the group of the pressure limiters, should withstand short-term exceedances of temperature and pressure.

Protective valve must be installed at the highest point of the boiler.

Between boiler and Protective valve there must not be long piping, closing or other elements.

Protective group, is assigned for closed heating systems according EN 12828, whose capacity up to 50 kW.



Fig.6. Boiler's protective group with insulation

<http://www.elstava.lt/katiliniu-ir-sildymo-sistemu-iranga/katilu-apsauga-aprismas>

GAS FUEL BOILERS

Natural gas burnt in gas boilers, which combustion heat is pretty high: about 35 MJ / Nm³.

Size, nm³ – normal cubic meter (ambient temperature 0°C and pressure $p = 0,1$ MPa)

Gas boiler *control* methods:

- ✓ By using room's regulator: The boiler is switched on or off depending on the temperature of the room, at which room's regulator unit is installed.
- ✓ Equitherm regulation is adjusted by using outdoor's sensor: boiler selects temperature of the heating water according to outside's temperature;
- ✓ By using sensors of outdoor and room.

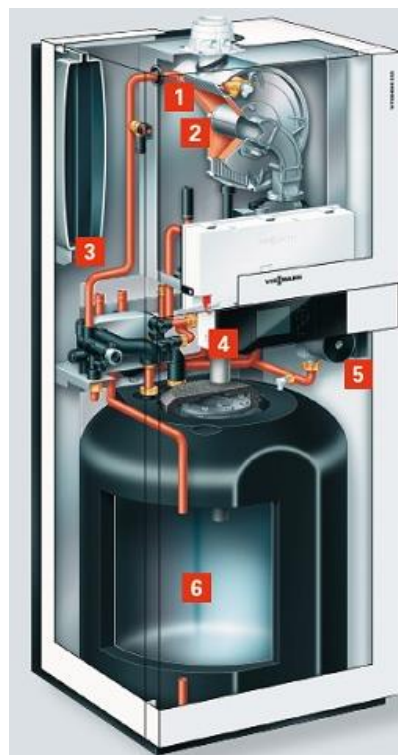


Fig.7. Vitodens 222 gas boiler (4,8-19 kW)

<http://e.saurida.lt/dujinis-katilas-vitodens-222-fs2b037>

In apartments, where *heated floor areas* are 30 – 200 m², and small demand of hot water, it is recommended to choose wall-hanging gas boilers.

In floor areas of 200 m², where demand of hot water is higher, it is recommended to choose wall-hanging caldron with high-speed hot water boiler, which guarantees a greater amount of hot water and more uniform temperature.

Condensing gas boilers (Figure 8).

The main advantage of these boilers – high coefficient of efficiency (approximately 15% greater than in conventional).

Condensing boiler reaches that kind of coefficient of efficiency only then, when water temperature falling into heating system is not greater than 50°C, and returning – 30°C.

Boilers coefficient of efficiency can be over 100%, if *condensing economizer* is installed.

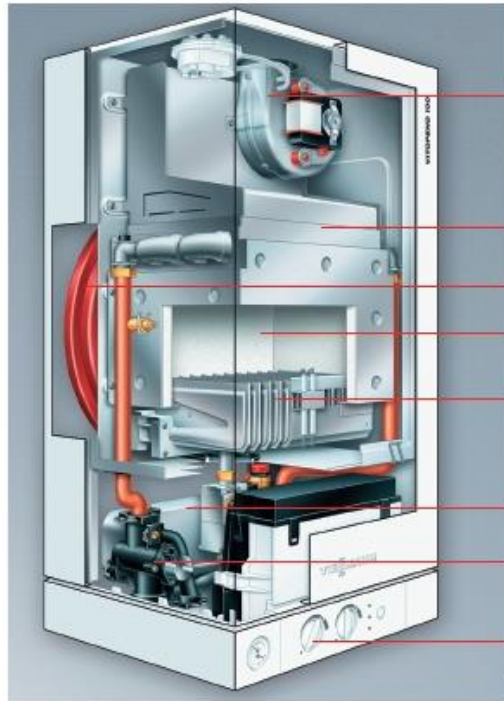
Traditionally, boiler effectiveness, boiler coefficient of efficiency is always less than 100%.



Fig. 8. Condensing gas boiler

<http://attack.lt/produkcija/kondensaciniai--pakabinami/attack-kzt-plus-25-kw-turbo.html>

Gas boiler:



- 1 – heat exchanger;
- 2 – cylinder burner;
- 3 – expansion vessel;
- 4 – regulator;
- 5 – circulation pump;
- 6 – water heater.

Fig. 9. Design of gas boiler

<http://e.saurida.lt/dujinis-katilas-vitopend-100-wh1d145>

CENTRAL HEATING BIOFUEL BOILER HOUSES

By burning wet biofuel, boiler's coefficient of efficiency can be 110 or 120%.

Condensing economizers of the biofuel boilers additionally produces about 20-25% of heat.

By installing condensing economizer, ambient pollution is reduced, because of impurities removed from smoke:

- 90-95 % of solid particles – ashes;
- over 90 % SO_x ;
- over 90 % HCl (by burning straws, peats);
- over 90 % ammonia and other odorous substances.

Biofuel boilers (without condensing economizer) coefficient of efficiency (CE) reaches 85-88 %.

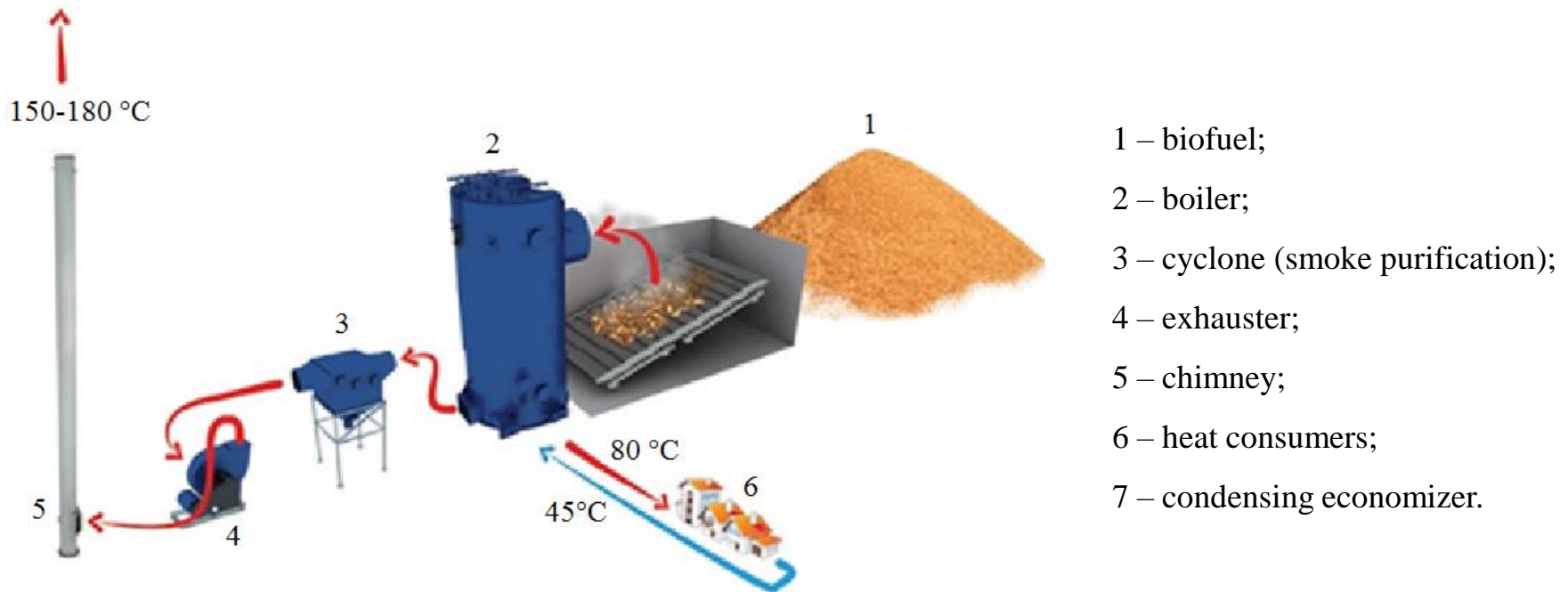


Fig. 10. The principal scheme of biofuel boiler

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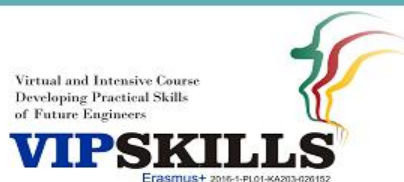
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