Manual and Installation book of boiler
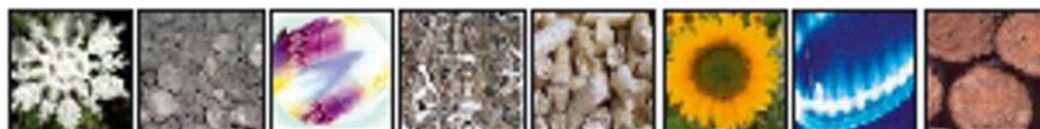
Sigma Holzgas 18-60kW

Manual and Installation book of boiler
Table of contents

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1) Short description
1.1) Gasification technology

The wood gas (ger. holzgas) comes in the process of gasifing of the wood. This is the mixture of flammable gases: the oxide of carbon, hydrogen and methane, and also incombustible -- nitrogen, the dioxide of carbon, water steam. The composition of the gas depends on many factors as: from current temperature in the hearth of the gas generator, the moisture of the loaded fuel and other.

The gasifing of solid fuels is technology counting above 200 years. On the beginning XIX w. it was used so-called urban gas to the supply of cookers, street lamp and to industrial aims. It was produced from the carbon then. Generally -- the artificially formed gas from the gasifing of the solid fuel is called the generator gas.

Technology this consists in the working on the solid fuel with series of thermo-chemical reactions, the flammable gas becomes in the result of them. Gasifing just defines oneself this cycle of conversions. This process holds in the device called gas-generator.

The type- matter of the wood gas can look as follows:

oxide of the carbon of CO   **19%**
hydrogen H2   **18%**
methane CH4   **1,25%**
dioxide of the carbon   12%
steam water H2O   2,50%
nitrogen N2   the rest

From these exchanged, only three first gases (coloured) are flammable. Remaining do not burn and make up only unnecessary ballast, in the principle they thin the gas and reduce its fuel value. From this regard it would be good to remove them. However nitrogen from the wood gas can't be removed (the basic component of air, in which we gasify the wood), then can the water steam relatively easily humid from the gas in the cooler. The content of the dioxide of the carbon depends first of all from the temperature in the gas-generator (if higher, the more CO and less CO2).
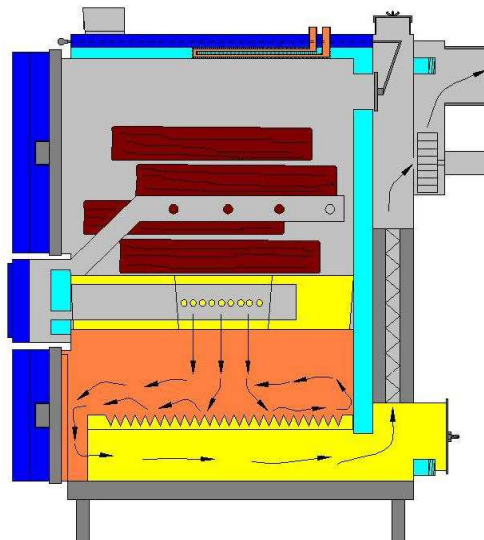
1.2) Boiler

Boiler of type Westfalia Holzgas on first throw of the uninitiated eye does not differ from the usual boiler on the wood. It has hearth, loading chamber and ash-pan. The difference of working is however considerable -- it burns in it not from the bottom to the top, but inversely. There is the loading chamber at the top and the transformation of the wood follows in the wood gas in this chamber. There is the nozzle below the chamber in which burning the wood gas mixed previously with the air, which flows in from outside, follows. This element is made from the heat-proof material. There is the ash-pan, in which burning down the mixture of the wood gas with the air follows, under the nozzle. The boiler on the wood gas from the back possesses accompanying flue gas to the chimney, in this place the exchanger of warmth allowing to the heating of water from hot flue gas is assembled.

The boilers of type Westfalia Holzgas are designed to heating up water in c. h. installations which computational temperature of supply do not cross 85 °C. They can be used in c. h. installations of flat, council or productive buildings, which users require automatic feeding of fuel. Boilers can be assembled both in modern and conventional heating installations.

Boiler steering has the possibility of pump regulation also loading storage tank.

Boiler of type Westfalia Holzgas utilizes wood in gasification process using energy contained in wood with efficiency three times higher than traditional boilers. Smoke and other emissions are cut to a very low level, making our boilers nature friendly.

All works relating equipments of boiler room, way of installing boiler as well as his exploitation must be realized compatible with valid norms and regulations.

2) Technical data

Type	Unit	Sigma 20	Sigma 30	Sigma 50
Power Range (Output):	kW	14,9-24	25-32	45-59
Fuel:		**Wood** (max. humidity 20%, max 50cm long)		
Efficiency:	%	> 89,90		
Boiler Water Volume:	dm^3	145 L	165 L	180 L
Max. Working Pressure:	bar	2		
Min. Inlet Temp.	^{o}C	65		
Max. Outlet temp.	^{o}C	85		
Flue gases Temperature:	^{o}C	>160	>160	>160
Noise:	dB	52 -65dB (A)		
Recommended Chimney Underpressure	Pa	20-25		
CO2 emission	mg/m³	4800	4820	4950

Recommended Chimney's Intersection	mm	160	160	180
Inlet/Outlet Diameter	"	1,5	1,5	2
Bottom Outlet Diameter	"	1/2	1/2	1/2
Weight:	kg	490	540	600
Power Consumption	W	82	82	90

2.1) Outtake Fan WC170
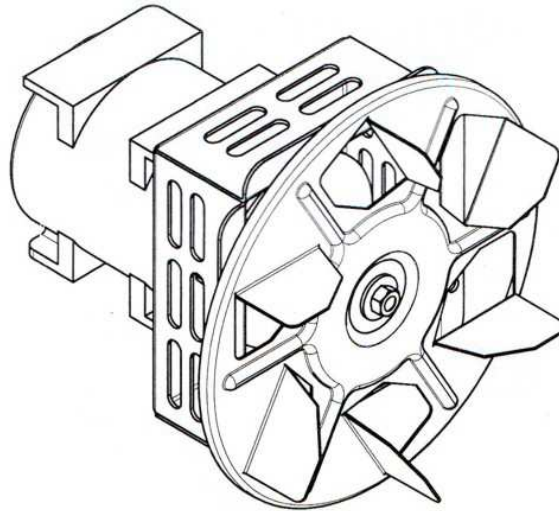
2.1.1) Technical data

Power supply	-230V, 50Hz	Temp. of surroundings	0=40°C
Power consumption	82W	Temp. of fumes	do 350°C
Expense of air	38⁻UM /11	Loudness	65dB
Number of gears	1	Class of tightness	IP44
Rotational speed	2400obr/min	Class of isolation	F
Condenser of the engine	3µF/450V	Mass	2,2kg
Kind of the work	continuous	Supply wire	0,6m
External dimensions		186x174x174mm *(lg. x wid. x h.)*	

2.1.2) Wiring diagram
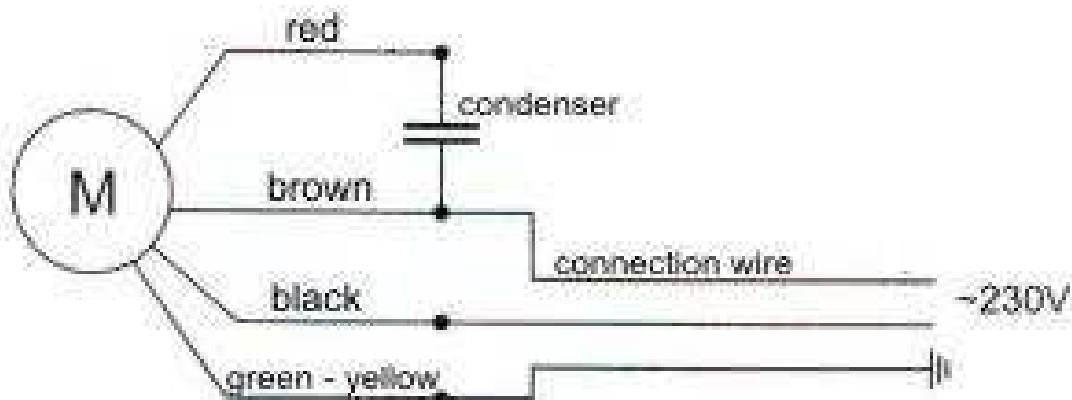
### 2.1.3) Placing in mounting hole

- Unscrew mounting plate
- Mount fan Wheel, plate and the engine together.
- Screw the plate with mounted fan into the mounting hole.


2.2) Structure of the boiler:

The structure of boiler was worked out on basics of long term researching with idea about high thermal comfort, exploational and with care about ecology. The boiler has the three pass structure in shape of vertical and horizontal convective channels, making the surface of heat exchange. The combustion space is partly tiled with fire-clay which attends as catalyst of combustion process. The body of boiler is made from certified steels and welded in cover of argon. Westfalia Holzgas is equipped in ceramic burner nozzle and ceramic deflectors.

## 2.3) Special features of Sigma Holzgas:
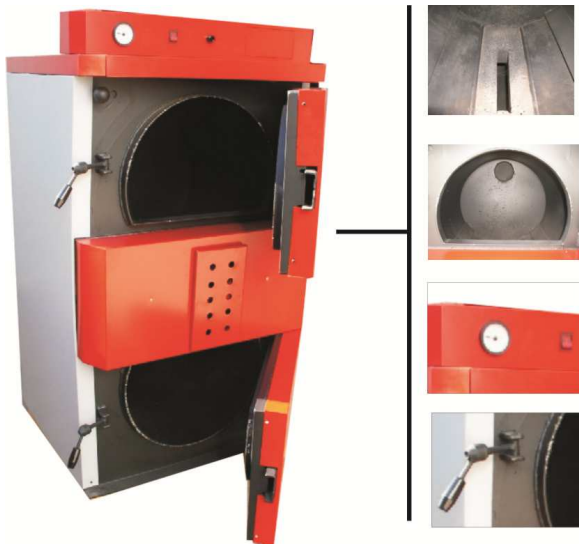
- Low exploitation cost
- Easy and simple service
- Long wood up to 50cm long
- Efficiency > 90 %
- Fuel loadings - once for 8 -12 hours
- Boiler power modulation 70-100 %
- Small ash quantity
- Electronic controller with temperature sensor built in
- Nature friendly
- Produced of certify steel

2.4) Dimensions of Sigma Holzgas:
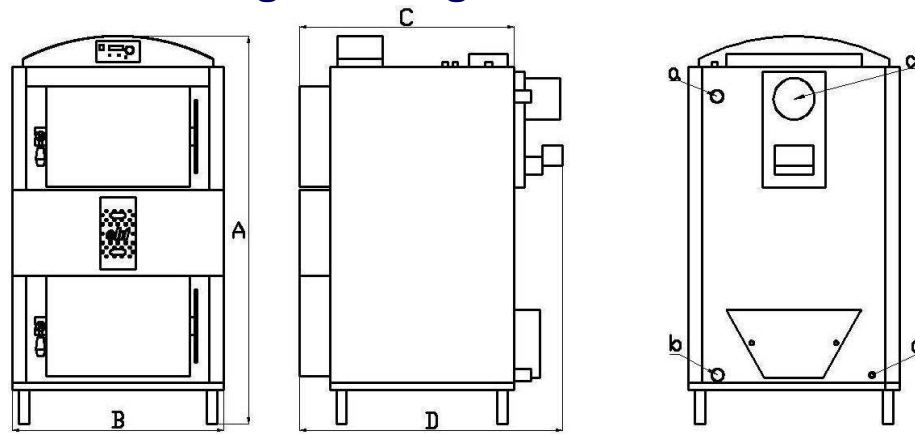
mm	Sigma 20	Sigma 30	Sigma 50
A	1510	1510	1510
B	725	825	825
C	840	840	960
D	1030	1030	1150
a	1,½"	1,½"	2 "
b	1,½"	1½"	2 "
c	½"	½"	½"
d	ø160	ø160	Ø200

2.5) Schema of Westfalia Holzgas:

Rear view   Side view   Front view
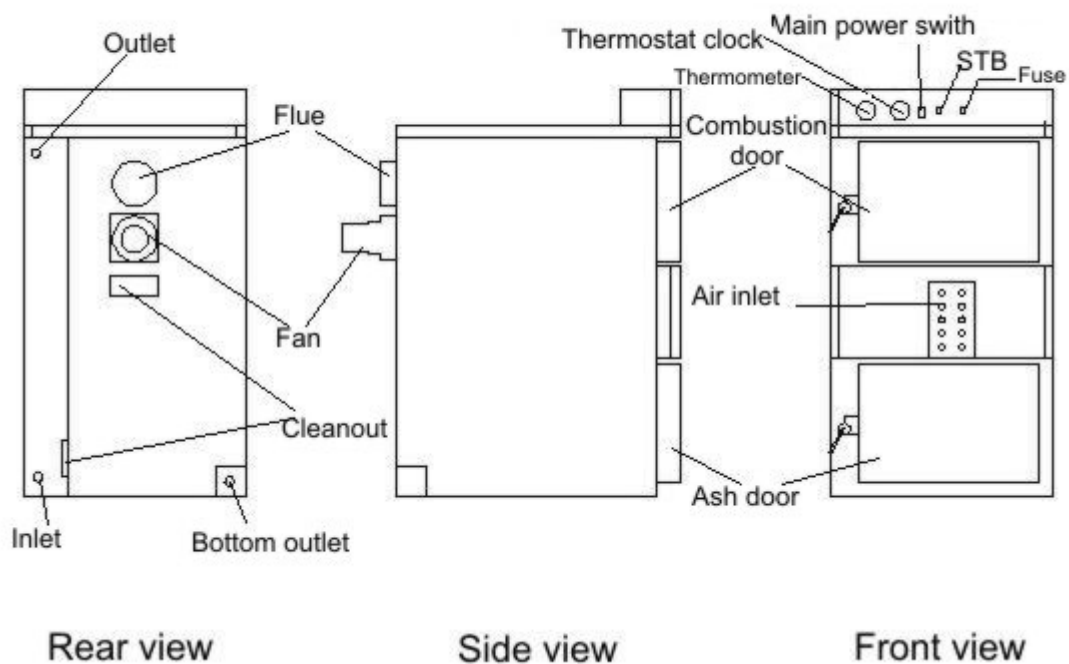
3) Fuel

✓ Wood with humidity up to 25%
✓ Chunks dimensions 30-50cm

The wood has to be dry! The efficiency of the boiler falls together with growing moisture of the wood, settling tartly substances increases and the life of the boiler drops. Power and proper functioning of the boiler are guaranteed near maximum moisture the wood to 20%.

The energetic properties of the most popular species of the wood:

Wood type	Thermal efficiency per 1 kg		
	kcal	MJ	kWh
Spruce	3900	16,25	4,5
Birch	3750	15,50	4,3
Oak	3600	15,10	4,2
Beech	3450	14,40	4,0

4) Using and Service

4.1) Assembly:

1. Fit the ceramic burner nozzle to the boiler via the rectangular hole located inside of boiler.
2. Mount the ceramic deflectors into their place inside the lower chamber.

1.

2.

4.2) Burning

Put wood-chips or sawdust as base, then put inside little pieces of wood. At the top put chunks of wood and set the fire with half-open ash doors and full open shutter.

After firing close fire-doors and turn on work and adjust required temperature on regulator.

The attemperation is done with help of the mechanical regulator (shutter) of fireplace and with help of the electronic automatics mastering the work of fan.

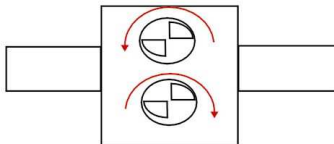## 4.3) Setting air inlets

1.

2.

3.

Upper shutter is responsible for main air inlet.
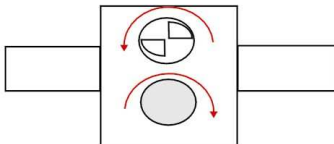 Lower shutter is responsible for secondary air inlet.

The position of the shutter of regulating opening in the front plate of the casing during exploitation:

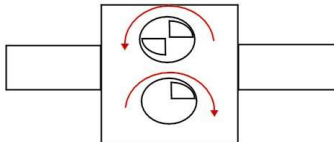| Shutter position	Power	Burning time (in hours)
Max. open	Nominal (full)	2
Open on 1/2	70% nominal	3
Closed	Minimum	5

1

2

3

4.4) Cleaning the burner.

When is cooled down completely it is ready for cleaning. Take the burner nozzle of the assembly hole, remove the deflectors from the lower chamber. The parts can now be worked with for cleaning.
To ensure best boiler operation, cleaning should be done frequently. This guarantees the best fuel efficiency. The better the boiler is set up the longer the intervals between cleaning.

4.4.1) Clearing the deflectors and burner nozzle...

- Remove the ash and any cinders from the unit.
- Remove any wood left in the unit.
- Remove the tight rope.

- Take out the ceramic nozzle.

- Remove the ceramic deflectors from the lower chamber.

- Brush them gently with **soft** brush.

- Vacuum the left ash, do not touch the ceramic elements with vacuum head.

4.4.2) clearing the boiler...

The boiler should be emptied from ash and all of the surfaces should be brushed in order to remove soot particles.
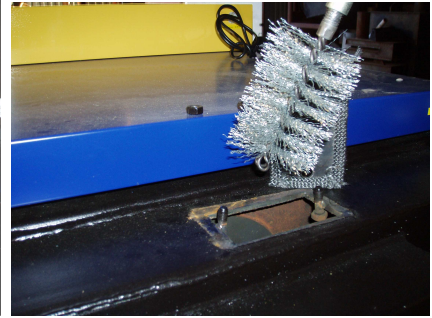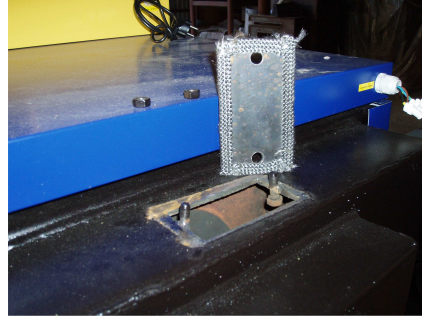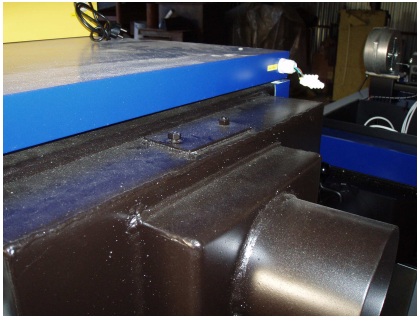
Pay particular attention to ash in the exhaust deflector and the flue pipe. The flue pipe does NOT clean itself. You must do this yourself. An old vacuum cleaner is the best method.
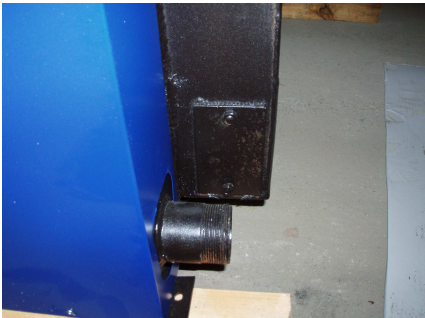

4.4.3) Clearing the exchanger...

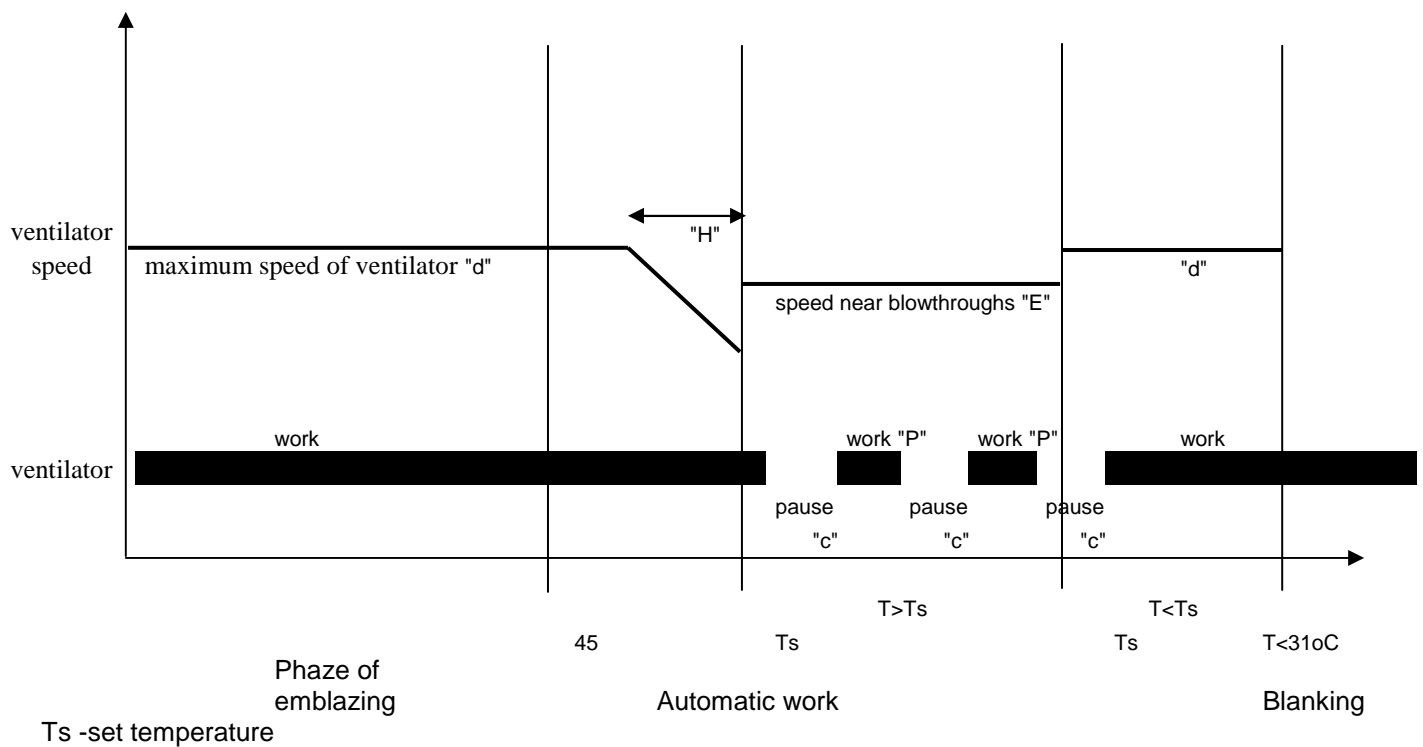- Upper cleanout

- Lower cleanout

4.4.4) Starting up after cleaning ...

Reassemble the burner nozzle and fit deflectors into boiler. Load the boiler partly and light it normally.

5) Controller RK 2001W
5.1) Schematic diagram of work:

ventilator speed

maximum speed of ventilator "d"

"H"

speed near blowthroughs "E"

"d"

ventilator

work

work "P"   work "P"   work

pause "c"   pause "c"   pause "c"

T>Ts   T<Ts

45   Ts   Ts   T<31oC

Phaze of emblazing   Automatic work   Blanking

Ts -set temperature

6) Using and service
6.1) Fuel
- ✓ pit-coal type 31 and 32 assortment nut O I and O II
- ✓ pea coal Gk
- ✓ coal-fines MI
- ✓ substitutionaly wood (humidity up to 20%)

6.2) Control
6.2.1) Application

RK-2001W controller is a device designed for temperature control of solid fuel fired boilers. The temperature of the boiler is kept on level set by the user by controlling the speed of the blow-in fan. The controller constantly monitors the temperature of water in the boiler, shows it on the display and controls the central heating pump. To enable more precise temperature control of heated rooms the controller has been equipped with an input for room thermostat connection. The controller also enables controlling of the hot water tank pump.
In case of no fuel, the controller has an option to turn on gas or oil boiler (additional option).

6.2.2) Connection

Before turning on the controller by master switch, connect controller, fan and the central heating pump power leads to appropriate sockets in the rear of the

controller. The temperature sensor should be placed in a measurement hole in the boiler.

Outputs of the controller that are not used may remain unconnected.

6.2.3) Operation

After turning the controller on all the elements of the display are lit for a while to check if they are working properly. The controller, when power appears, returns to its last state before turning off or power loss.

Front panel of the controller (Pic. 1) consists of:

1-Master switch
2-Display, indicating boiler temperature and parameters
3-Room thermostat indicator
4-Boiler thermostat knob
5-Central heating pump work indicator
6-STOP/choose parameters/erase alarms button
7-START/choose parameters button
8-Start programming /confirm parameters settings button
9-Hot water pump work indicator

Picture 1. Front panel of the RK-2001W controller

Basic operation of the controller is carried out by setting the desired temperature with boiler thermostat knob, other functions are carried out according to parameters programmed in service mode. The change in the boiler temperature setting is shown on the display for a few seconds, e.g. [C 55] and this value means the temperature of the water in the boiler which the controller will be trying to achieve. You can also check this value by pressing OK button

for a short time. After pressing START button the fan starts to work and the control process begins. STOP button stops the fan for example to add fuel.

If the controller is not in user or service mode the display shows water temperature in the boiler and the last character on the display defines the mode which the controller is currently in:

for example: [50º-] - STOP mode

[50ºC] - WORK mode

[50ºc] - hold up of burning in WORK mode

[50ºU] – heating of hot water in SUMMER mode

[50°u] - hold up of burning in SUMMER mode

[50ºd] – total bacteria control – heating up of hot water up to 75ºC.

6.2.4) Setting up the user parameters.

Holding OK button enters the user mode and allows reviewing and is indicated by fast flashing of the room thermostat indicator. You can look through the parameters with < and > arrow buttons. After choosing the desired parameter you can switch to the change mode of the parameter by pressing OK button - it is indicated by the value of the parameter flashing.

Change of the parameter is done by pressing - or + buttons. You can confirm new settings by pressing OK button and after that the controller allows choosing another parameter (with < > buttons). If you do not want to change the parameter value with the < or > button choose [End] and press OK or wait for 1 minute – the controller will exit the user mode and will indicate the temperature of the water in the boiler

CAUTION: If in the controller the hot water pump is turned off, in the user menu, after pressing OK, you can only read the set temperature value of the boiler thermostat.

Table 1. Service parameters list

Display	Parameter	Min	Max	Step	Factory default
C 40	Boiler desired temperature	L 40	H 90	1˚C	L 40
co C	Central heating pump work when "C" (pump off when "-")	-	C		C
cu u	"d" heating up – total bacteria control in hot water tank	u	d		u
50˚	Water temperature in hot water tank				
End	Exit from user mode after pressing OK				

(1)   Boiler work temperature

The boiler set temperature [C 40] – is the temperature which the controller will try to achieve in WORK mode.

It is set by direct turning of the knob and is indicated by a short display.

(2) Central heating pump work [co C] – WINTER/SUMMER mode – character "C" indicates that the central heating pump is working. In summer time the heating can be turned off by choosing the value "-" with the (-) button which means turning off the central heating pump.

(3) Total bacteria control in the hot water tank – heating up - the controller allows to manually launch the total bacteria control process in the boiler. Choosing the "d" value with (+) button starts the process in which the boiler is trying to achieve the temperature of 75˚C in the hot water tank. In order to start the total bacteria control process the boiler should be in WORK mode (this mode can be turned on by START button). E.g. [70˚d] will appear on the display. After reaching 75˚C in the hot water tank the controller will return to its state before choosing this option.

> **CAUTION:** the total bacteria control function can switched on at night when the water from the hot water tank is not used to prevent the users from burn injury.

(4) Water temperature readout in hot water tank [u50˚] – this parameter shows the measured temperature value in the hot water tank.

(5) Exit from user mode – choosing the [End] on the display and pressing OK button causes exit from the parameter setting. Exit from this mode will also occur if no button is pressed for 1 minute.

6.2.5) Parameter setting – the service mode

Holding OK button for more than 3 seconds enters the service mode where you can review and change the parameters. It is indicated by slow flashing of the room thermostat indicator. You can look through parameters with < and > arrow buttons. After choosing the desired parameter you can enter the parameter setting mode which is indicated by this value flashing. The change of the value will occur after pressing – or + button. Pressing OK button will confirm the changes. After that the controller allows choosing another parameter with < > buttons. If you do not want to change the parameter value with the < or > button we choose [End] and pres OK or wait for 1 minute – the controller will exit the service mode and will start indicating the temperature of the water in the boiler.

Table 2. Service parameters list

Display	Parameter	Min	Max	Step	Factory defaults
∏100	Fan max work power or max power when ∏r 0-10	50	100	10%	100
∏r 1	automatic fan speed control and time of fan start	--,0	10	1	1
∏n 5	Fan work time	--,5	60	1s	5
∏u 6	Fan pause time	1	99	1min	6
P 40	Central heating pup launch temperature	30	70	1˚C	40

Ph 2	Central heating pup launch hysteresis	1	10	1˚C	2
Pc 2	Pause time of central heating pump with 30 sec. work periods	--,1	99	1min	2
u 50	Tap hot water desired temperature	30	60	1˚C	50
uh 5	hot water heating hysteresis	1	9	1˚C	5
ur 0	No hot water-0, hot water priority-1, no hot water priority-2, mixing pump-3	0	2	1	0
L 40	Minimum boiler temperature	30	65	1˚C	40
H 90	Maximum boiler temperature	80	90	1˚C	90
h 5	Boiler temperature hysteresis	1	10	1˚C	5
A 99	Boiler overheating temperature	90	99	1˚C	99
Fd60	Fuel shortage testing time with burning, increase by 5˚C	1	99	1min	60
Fb30	Fuel shortage testing time in WORK mode and burning out.	1	99	1min	30
Ar 0	Additional output: 0-FUEL, 1-ALARM, 2-MIX	0	2	1	0
Prod	Return to factory defaults after pressing OK				
outP	Central heating pump output testing, press OK - launch	outP	out1		
outП	Fan output testing, press OK - launch	outП	out2		
outr	Oil boiler launch output testing, press OK – launch boiler	outr	out3		
outu	Hot water pump output testing, press OK - launch	outr	out4		
End	Exit the service mode after pressing OK				

In the table above, the first column represents example display indications, in the next columns there are: parameter description, minimum and maximum values allowed to set, step of the parameter during the setup. The last column shows factory defaults to which you can return by choosing [Prod] option.

(1)   Fan work parameters

Fan power [П100] - this value defines power of the fan. When "Пr" parameter is set to "0-10" this is the maximum power of the fan which can be achieved during automatic fan control.

Automatic fan speed control [Пr 1] - it is on, when this parameter is set to "0-10" and causes automatic fan speed decrease when temperature of water in the boiler reaches desired temperature. If this parameter is set to "-", the fan automatic smooth speed control is disabled and the fan can work with power set by "П" parameter. Setting parameter value in range from 0 to 10 means time in minutes of the smooth fan speed increase from 40% to value of "П" - for smooth boiler start.

Fan work time [Πr 1] - time of turning the fan on for a while, to remove accumulated gases. Setting the parameter to "--" turns this function off. This function can be active in WORK mode.

Fan pause time [Nu 6] - time between fan work periods

(2) Central heating pump work parameters

Central heating pump launch temperature [P 40] – the value of temperature of the water in the boiler which causes start of the central heating pump. Central heating pump works independently from the control process and is launched additionally in case of boiler overheat.

Central heating pump launch hysteresis [Ph 2]- this parameter defines what value should the boiler water temperature decrease by, below the launch temperature, so that the pump turns off.

Repeat launch time of the central heating pump [Pc 2] - in STOP mode or when room thermostat circuit is open, the central heating pump is launched for 30 seconds to mix water in heating circulation. This parameter defines the repeat time of launches of the pump.

Setting the parameter to "--" turns this function off.

(3) Preparation of domestic hot water

The controller has additional output allowing to control the hot water tank loading pump by the UM (UM-1) module.

The hot water temperature [u50] – temperature value which will be kept in the hot water tank. The heating hysteresis of the hot water heating [uh5] – value which the temperature in the tank has to decrease by so that the hot water pump turns on in order to heat up the water in the tank.

Parameter [ur 1] – the [ur 0] value indicates no sensor or hot water pump. The sensor is not taken into account in testing failures, i.e. it can remain unconnected and in the user parameter menu there is only the boiler thermostat set temperature displayed.

[ur 1] value – hot water pump working with priority

[ur 2] value – hot water tank working without priority

[ur 3] value- means controlling of the returning water mixing pump in the boiler with the launch temperature of [u 50] and hysteresis [uh 5].

(4) Setting of boiler work temperature range

Minimum boiler temperature [L 40] - minimum temperature which can be set with the boiler thermostat knob.

Maximum boiler temperature [H 90] - maximum temperature which can be set with the boiler thermostat knob.

Boiler temperature hysteresis [h 5] - this parameter defines what value should temperature of water in the boiler decrease by, below temperature set with the thermostat knob, so that the fan turns on.

(5) Protection against boiler overheating

Boiler overheating temperature [A 99] - value, exceeding which causes permanent turn off of the fan to prevent boiler overheating. After the temperature increases above 80°C the central heating pump is turned on to cool down the boiler. Overheating mode is shown by indicating error [E 2] on the display. It can be turned off by pressing STOP button, but only when temperature decreases below this temperature.

Fan turn off also occurs in case of damage of the boiler temperature sensor which is shown on the display with error [E 1].

STB - the controller has additional protection against overheating which is independent from the processor. In case the temperature increases over 95°C, the control process is turned off by turning the fan off and launching the central heating pump. The fan and the pump are turned on to the control process again when temperature drops below 89°C.

STB circuit enables more precise boiler work control and reduces overheating possibility.

(6)   No fuel

No-fuel testing time during fuel firing start [Fd60] - after switching to WORK mode, if water temperature does not increase by 5°C in programmed time, the control process will be turned off and the display will show the message: [FUEL].

You can return to previous mode by pressing STOP button. No fuel testing time during fuel firing is finished after the set temperature is achieved.

No-fuel testing time during work mode [Fb30] - in WORK mode, if temperature of water in the boiler decreases below temperature set with the thermostat, by hysteresis value, and does not increase by 5°C in the programmed time, the control process will be turned off and the display will show the message: [FUEL].

You can cancel the alarm by pressing STOP button.

(7)   Additional output

Additional output [Ar 0] – the controller has been equipped with an output that allows connection of the UM module. When the Ar parameter has the UM module value "0" it may control the oil or gas boiler – if such boiler exists in the heating circuit. After switching the controller with the main power switch the additional boiler is turned off and it turns on again when there is no fuel in the solid fuel boiler. This function is useful in heating systems where there is a solid fuel boiler used to cut the heating costs. After erasing the "no fuel" alarm by pressing STOP button the additional boiler is again turned off and the controller works again. Setting parameter [Ar] to "1" allows controlling the additional alarm signaling system with the UM module – which occurs on the controller.

When Ar parameter is set to "2" the UM module allows controlling the mixing valve servo-motor in the central heating circuit depending on the room thermostat input. In this case the work of central heating pump depends only on the boiler temperature.

(8)   Factory defaults

The controller allows returning to standard settings set by the producer by choosing [Prod] and pressing OK button. After activating this function, the controller sets each parameter showed in the table.

(9)   Output testing

To make checking the controller work easier, it is possible to test output circuits which control the fan and the pump, and the additional boiler launching system. This function is available in service mode, only if the control process is off, i.e. the controller was in STOP mode before switching to service mode. By choosing [outP] on the display and pressing OK button you can turn on the central heating pump for a while, by choosing [outП] and pressing OK you can turn on the fan and by choosing [outr] and pressing OK you can turn the additional boiler on (if the additional module is connected). Choosing [outu] allows testing the hot water pump output.

(10)   Exiting service mode

By choosing [End] option on the display and pressing OK button you can exit parameter setting mode.

The controller also exits service mode, when no buttons are pressed for 1 minute.

6.2.6) Additional functions

To improve comfort in heated rooms, the controller has been equipped with an input that allows connecting any kind of room thermostat with contact output. When temperature in the room is below desired temperature, the central heating pump is turned on and the room thermostat indicator is lit.

It means that the boiler should keep temperature set by the room thermostat knob. After reaching desired temperature in the room, the room thermostat indicator turns off, the central heating pump is turned off and the boiler switches to mode in which it keeps burning at minimum temperature.

CAUTION. In case of not having room thermostat in the system, the room thermostat input contacts must be short-circuited.

6.2.7) Controller failures

The controller is constantly testing if its internal circuits and temperature sensor are working correctly. After detection of fault, it stops the fan, turns on the central heating pump and shows proper error message on the display. In case of failure please turn off the controller, plug the central heating pump to the power source, ensure appropriate fuel firing in the boiler and contact the service.

When [E 1] error appears on the display, it means fault in the boiler sensor circuit or temperature below 0°C. [E 2] is displayed if boiler overheats. [E 3] error means fault and overheating at the same time. Appearing of [E 1] error on the display after erasing it by pressing STOP button, in spite of temperature decreasing below 90°C, may mean permanent damage of boiler temperature sensor (e.g. if the boiler has been overheated above 150°C). In case of programming the sensor and central heating pump in the service mode the controller tests the hot water sensor circuit. Appearing of fault [E8] means damage or lack of hot water sensor.
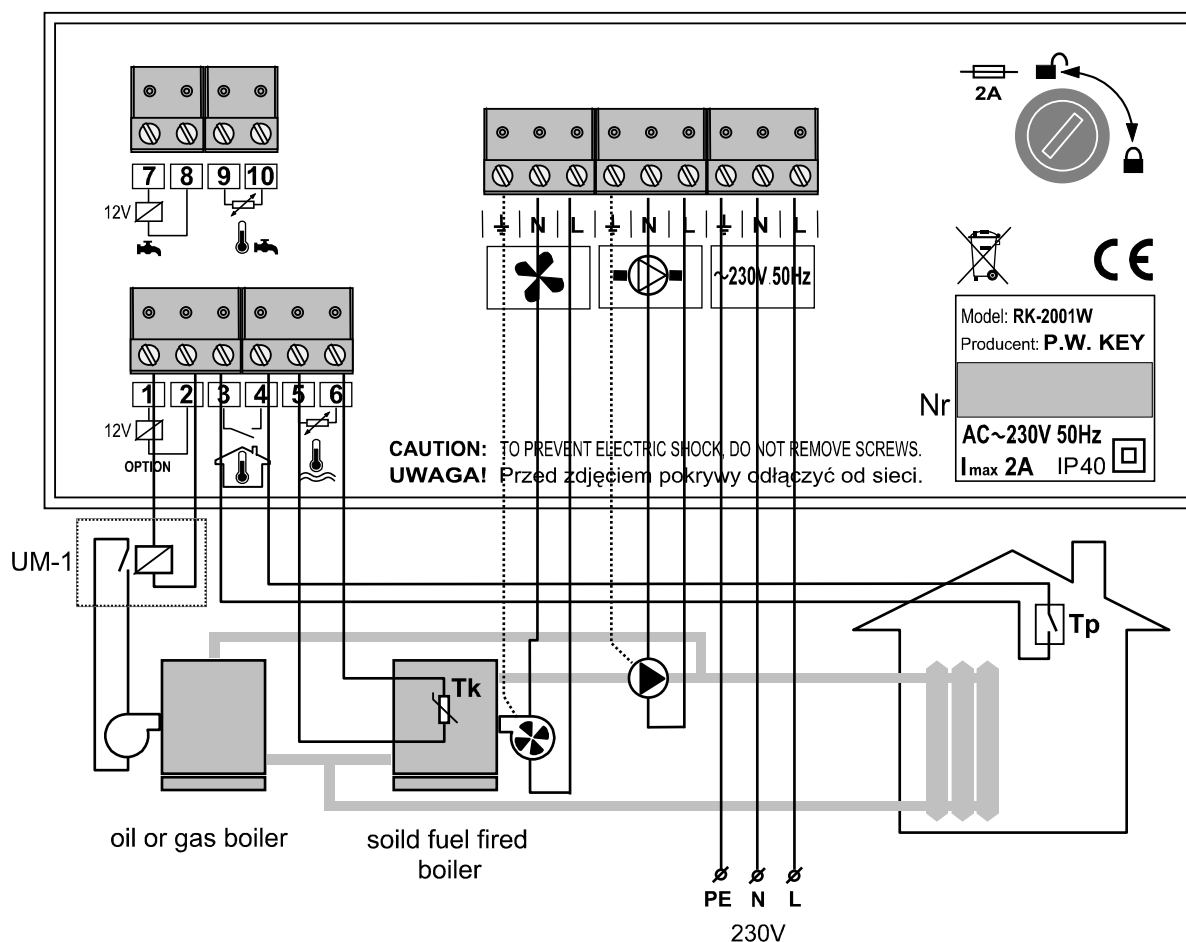
Picture. 2. RK-2001W connection diagram
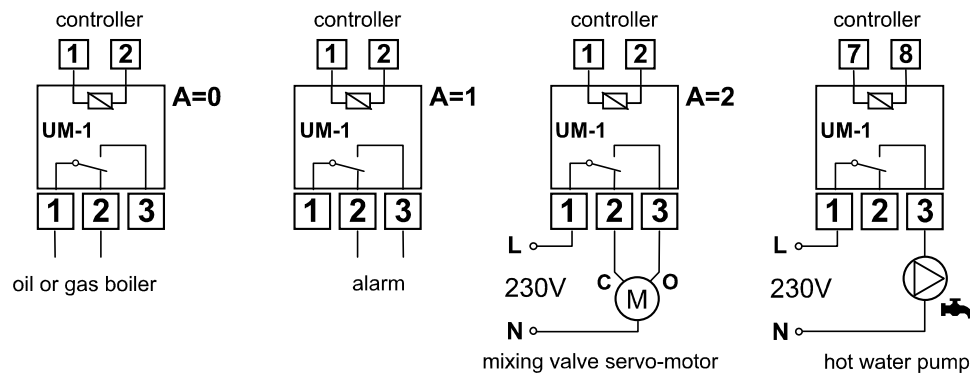
Picture. 3 UM-1 module connection diagram

6.2.8) Controller removal

In case the removal is necessary proceed as follows:
- turn the master switch off
- disconnect the power of the boiler
- remove the controller from the slot in the boiler
- disconnect all connectors with leads from the controller

6.2.9) Specifications

Voltage:	230V ± 10%, 50Hz
Power consumption:	<4VA
Temperature measurement range:	0–99°C ± 1°C
Boiler temperature adjustment range:	30–90°C ± 1°C
Programmed boiler overheating protection:	90 –99°C ± 1°C
Hardware boiler overheating protection (STB):	>95°C ± 1°C
Central heating pump launch temperature:	30–70°C ± 1°C
Hot water temperature adjusting range:	30-60°C ± 1°C
Total fan-out:	total max 2A/230V
Dimensions (HxWxD):	80x170x100 mm

6.2.10) Notes

Display	Parameter	User
∏100	Fan max work power or max power when ∏r 0-10	
∏r 1	automatic fan speed control and time of fan start	
∏n 5	Fan work time	
∏u 6	Fan pause time	
P 40	Central heating pup launch temperature	
Ph 2	Central heating pup launch hysteresis	
Pc 2	Pause time of central heating pump with 30 sec. work periods	
u 50	Tap hot water desired temperature	
uh 5	hot water heating hysteresis	

|	
ur 0	No hot water-0, hot water priority-1, no hot water priority-2, mixing pump-3
L 40	Minimum boiler temperature
H 90	Maximum boiler temperature
h 5	Boiler temperature hysteresis
A 99	Boiler overheating temperature
Fd60	Fuel shortage testing time with burning, increase by 5°C
Fb30	Fuel shortage testing time in WORK mode and burning out.
Ar 0	Additional output: 0-FUEL, 1-ALARM, 2-MIX

7) System

7.1) Standards

- Heating System – during installation and operation of the boiler it is very important to keep safe distance from the inflammable materials. The boiler is allowed to work only in open type heating systems!
- Electrical installation – the boiler's power supply is 230V/50Hz
- Chimney – It must be done with respect to current norms and regulations. Due boiler gasses temperature 90-100 C it is obligatory to put the INOX or other material tubes into the chimney. Required chimney draught is 0,1 – 0,2 mbar. Installation according to ADJ does entail some testing of the chimney, which may be carried out by a sweep
- Important sources of guidance installers: 98/37/EEG; 89/336/EEG; 73/23/EEG; EN 55014-1, 1993 /A1, 1997; EN 55014-1; EN 55014-2 C1 1998; EN 61000-3-2; EN 61000-4-2, -3-4-5-6-11, Level2; EN 50165; EN 50165 C1; EN 60335-1; EN 303-5; EN 12809; EN 13394

7.2) Localization of the boiler:

- Placing on flammable foundation.
- place the boiler on non-flammable and thermal insulating pad which should protrude not less than 20 mm outside boiler's dimensions;
- If the boiler is located in the basement it is required to place it on a base raised not lower than 50 mm over floor's level. The boiler and the fuel hopper must stand vertically and can be levelled using the regulating screw in fuel hopper's leg.
- The (230V/50Hz) electric socket should be easy to access.
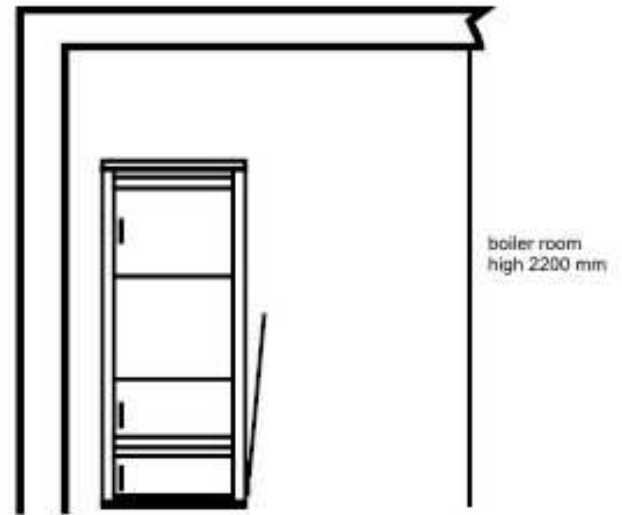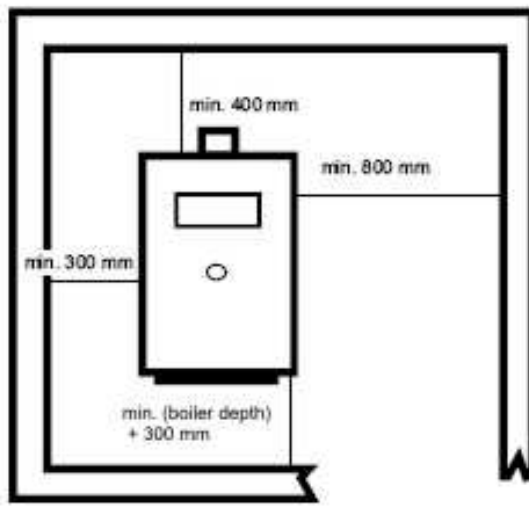
7.3) Ventilation:
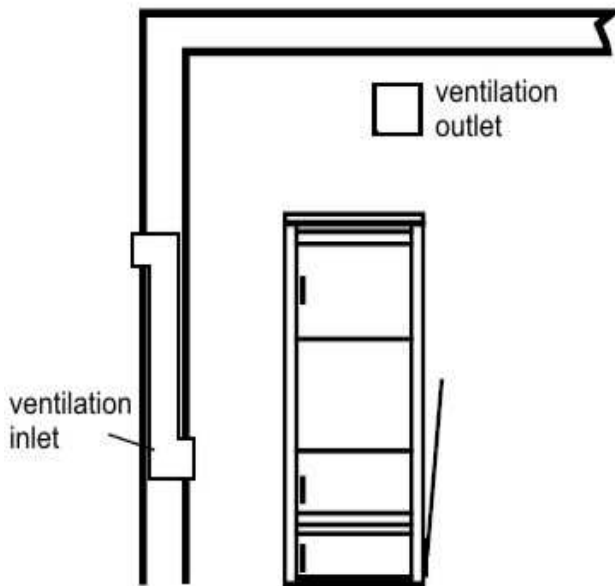
Accordantly with regulations each boiler room has to have the ventilation inlet and outlet in aim of assurance of correct boilers work and users safety. Lack of ventilation inlet or it's stocking is the most frequent cause of incorrect work of boiler (the humidity, condense water, impossibility of higher temperature obtainment). Ventilation outlet has instead in task of offtake from room used air and harmful gases. In boiler room with chimney with natural draught it is not it allowed to use mechanical ventilation.

7.3.1) Ventilation inlet

- The channel of ventilation inlet should have dimension of 50 % area of chimney intersection, no fewer than 20 x 20 cm
- Channel should be 1m over floor
- In ventilation hole or in channel should be installed device to control of air flow, however such to forbid decrease of intersection more than to 1/5
- Ventilation duct should be made from incombustible material

7.3.2) Ventilation outlet

- Channel should be made of brick and min. intersection of it should be 25% of chimney intersection however not smaller than 14 x 14 cm
- Inlets can not have any closing it intersection devices

- Spout should be under ceiling of room, led out on roof at least 1,5 m
- Ventilation duct should be made from incombustible material

7.4) Chimney connection:

- Flues should be made in accordance with current regulations.
- To reduce the resistances of flow of flue gases the connection with chimney should be led in straight line and possible change of direction should be made with gentle arcs.
- Boilers can be assembled into flues from brick with aligned internal welds
- Combustion duct should begin from floor line
- About 30cm. over floor should be to situated cleanout with tight lock
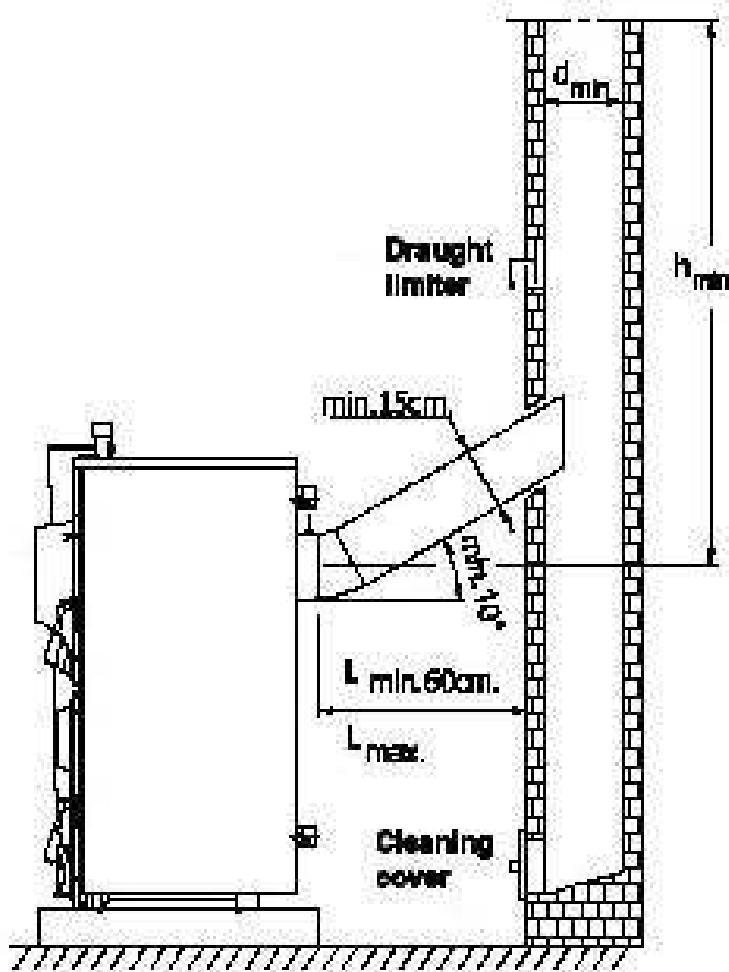
- Intersection should be approximate to square with regard on smaller resistances of flue gases flow
- The minimum intersection of chimney amounts 20 x 20 cm
- The dams of brick between duct and wall should not be smaller than 12cm
- Chimney should be led out over roof
- The location of chimney outlet depends from the degree of roof droop and stages of the flammability. The roof with angle of droop to 12º - the chimneys should stand over roof ridge 0.6m, roof with angle of droop over 12º - the chimneys should stand over roof ridge in case of easily flammable coverings 0,6m however in case of incombustible or difficultly flammable covering, the outlet can occur 0,3m over roof ridge.
- Assembly of draught regulator is recommended, which in case of too big underpressure in chimney opens and suck in the air from the boiler room and does not pull it through boiler causing the temperature uncontrolled rise. Interrupter this should be set on required value in dependence from power of boiler

8) Parts

013.
012.
011.
014.
010.
06.
03.
04.
020.
01.
02.
05.
030.
032.
031.
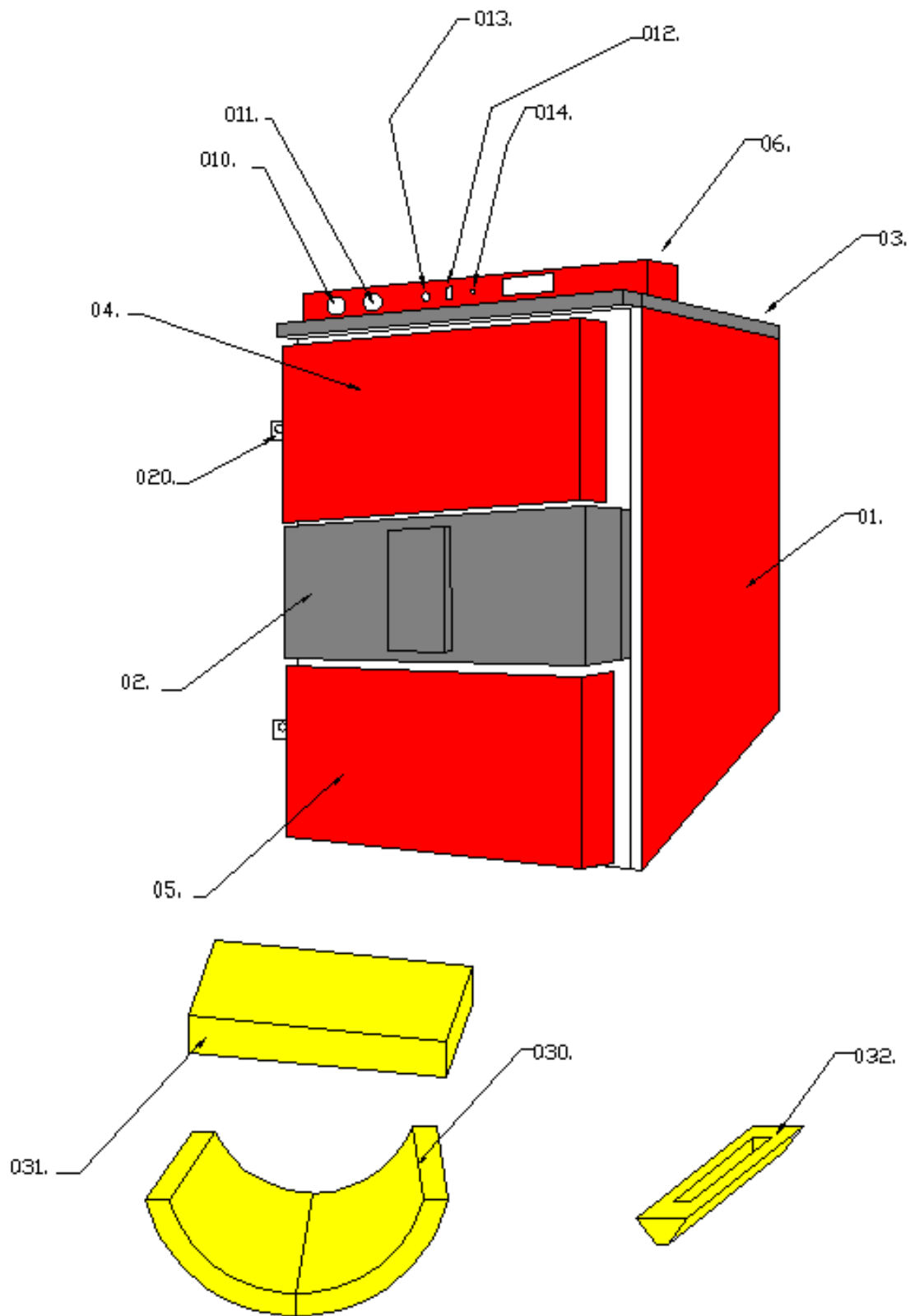
No.	Part Description	Serial Number
01.	Left Side Casing	F.h.b.l.01
02.	Front Casing	F.h.p.02
03.	Top Casing (Hat)	F.h.g.03
04.	Door Casing Upper	F.h.d.g.04
05.	Door Casing Lower	F.h.d.d.05
06.	Steering Panel	F.h.p.s.06
07.	Right Side Casing	F.h.b.p.07
010.	Thermometer	F.h.t.010
011.	Thermostat	F.h.t.011
012.	Power Switch WA-12PS	F.h.ł.012
013.	STB	F.h.STB.013
014.	Fuse Nest FU max 4A	F.h.g.b.014
020.	Door Locking	F.h.z.d.020
030.	Ceramic Deflector Lower Part	F.h.c.s.d.030
031.	Ceramic Deflector Upper Part	F.h.c.s.g.031
032.	Ceramic Nozzle	F.h.d.s.032

## 9) Boiler installation systems:

Symbol	Description	Symbol	Description
	safety valve		reducing valve (at joining of water supply over 6 bar only)
	manometer		outflowing crater
	thermometer		heat consumer
	expansion tank	(R)	radiator heating circuit
	return valve	(F)	underfloor heating circuit
	return valve to shut off	(L)	ventilator heating circuit
	flap trap gravity operated	(S)	swimming pool heat exchanger
	air vent	b1	hot water tank thermostat
	manual mixing valve	b2	flue gas thermostat
	stop valve	b3	minimum thermostat
	dirt catcher	b4	safety temperature limiter
	regulating valve	b5	accumulator tank thermostat
	relief valve	v1	outside temperature sensor
	thermal valve	v2	clip-on sensor boiler circuit
	drain tap	v3	forward temperature sensor
(1)	heating pump	v4	boiler temperature sensor
(2)	hot water tank loading pump	v5	hot water tank sensor
(3)	boiler circuit pump	v6	water tank sensor
(4)	transfer pump	v7	remote control
(5)	loading pump	v8	differential temperatrue sensor
	hot water tank loading valve	v12	accumulator tank sensor top
	reversing valve	v13	accumulator tank sensor bottom
	motor mixing valve	v14	sensor solar collector outlet
	two-way valve	v15	sensor solar collector inlet
	thermostat valve	v16	sensor solar tank

F   forward
R   return
BF   boiler forward
BR   boiler return
WF   hot water tank forward
WR   hot water tank return
HF   heating forward
HR   heating return
SF   solar forward
SR   solar return
C   circulation

pipework and fittings on customer's side (F / R)

➤ Open system

The bottom of the safety tank must be placed:

- In natural circulation systems or with pump on heating water $H \geq 0.3$ [m] over the highest point of the system.
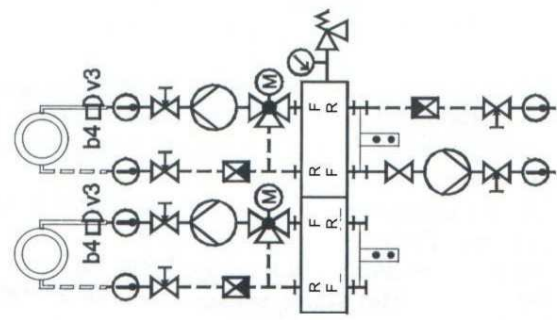- In systems with pump installed on return water: $H \leq 0.7Hp$ [m]

1 boiler
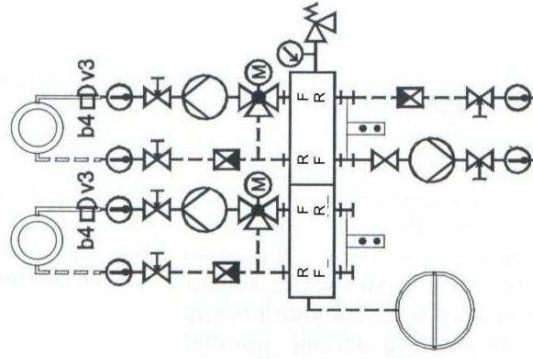2 heating and 1 hot water circuit
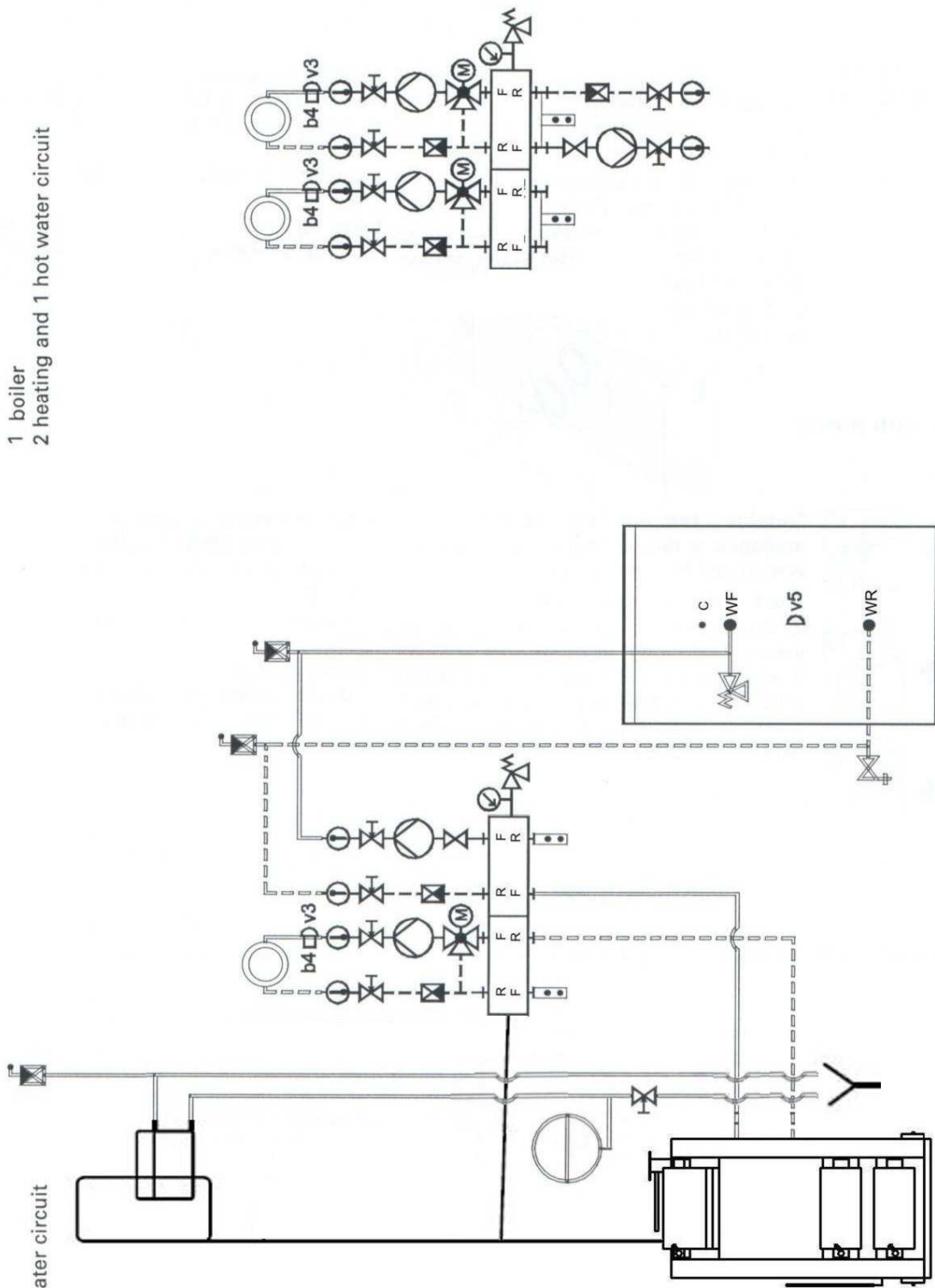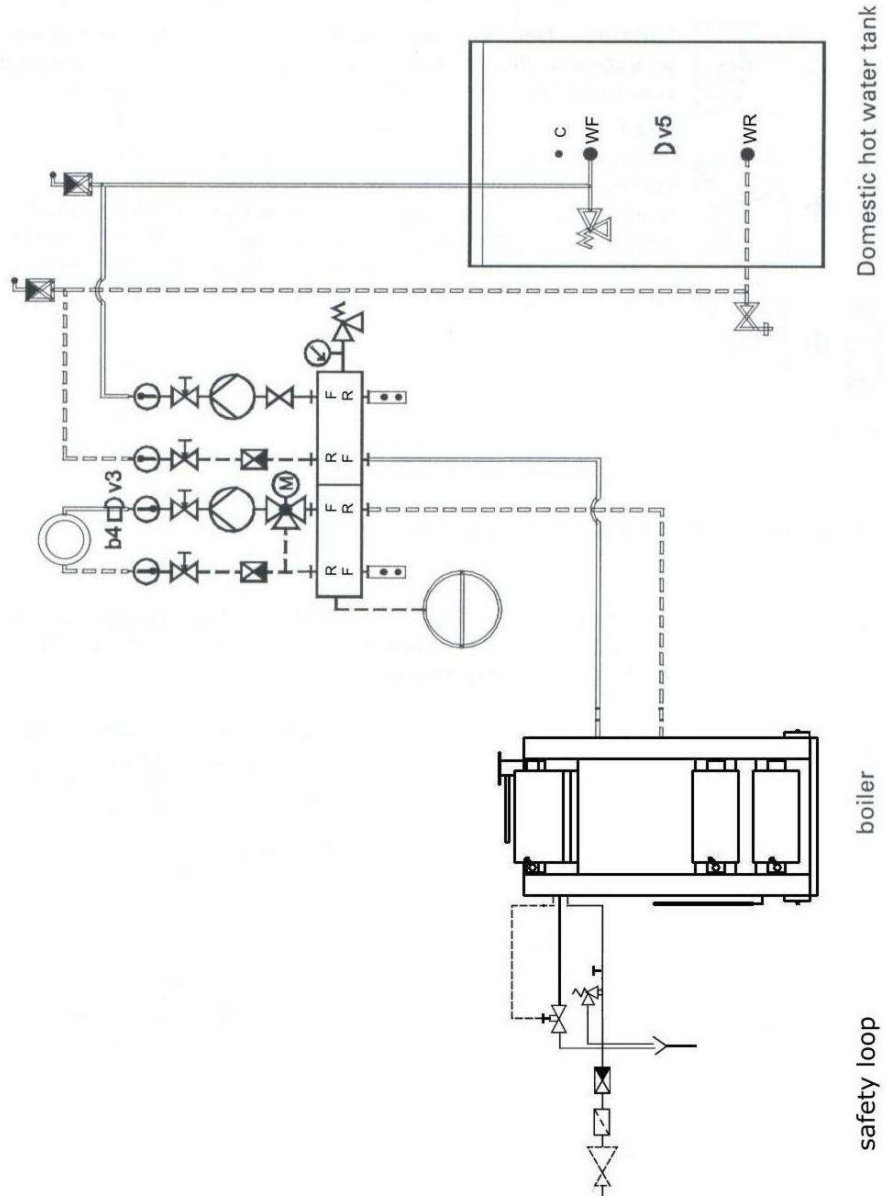
b4 v3

1 boiler
1 heating and 1 hot water circuit

b4 v3

Domestic hot water tank

c
WF
D v5
WR

boiler

➢ Closed systems

1 boiler
2 heating and 1 hot water circuit

1 boiler
1 heating and 1 hot water circuit

Domestic hot water tank

boiler

safety loop

- 29 -

Solar collector

TSE

TSA

System distributor

F1
v5
F2
v6
R2
TSB
R1

acumulation tank

b4 v3

45°

boiler

1 boiler
1 Accumulator tank.
1 Heating- and 1 Hot water circuit

safety loop

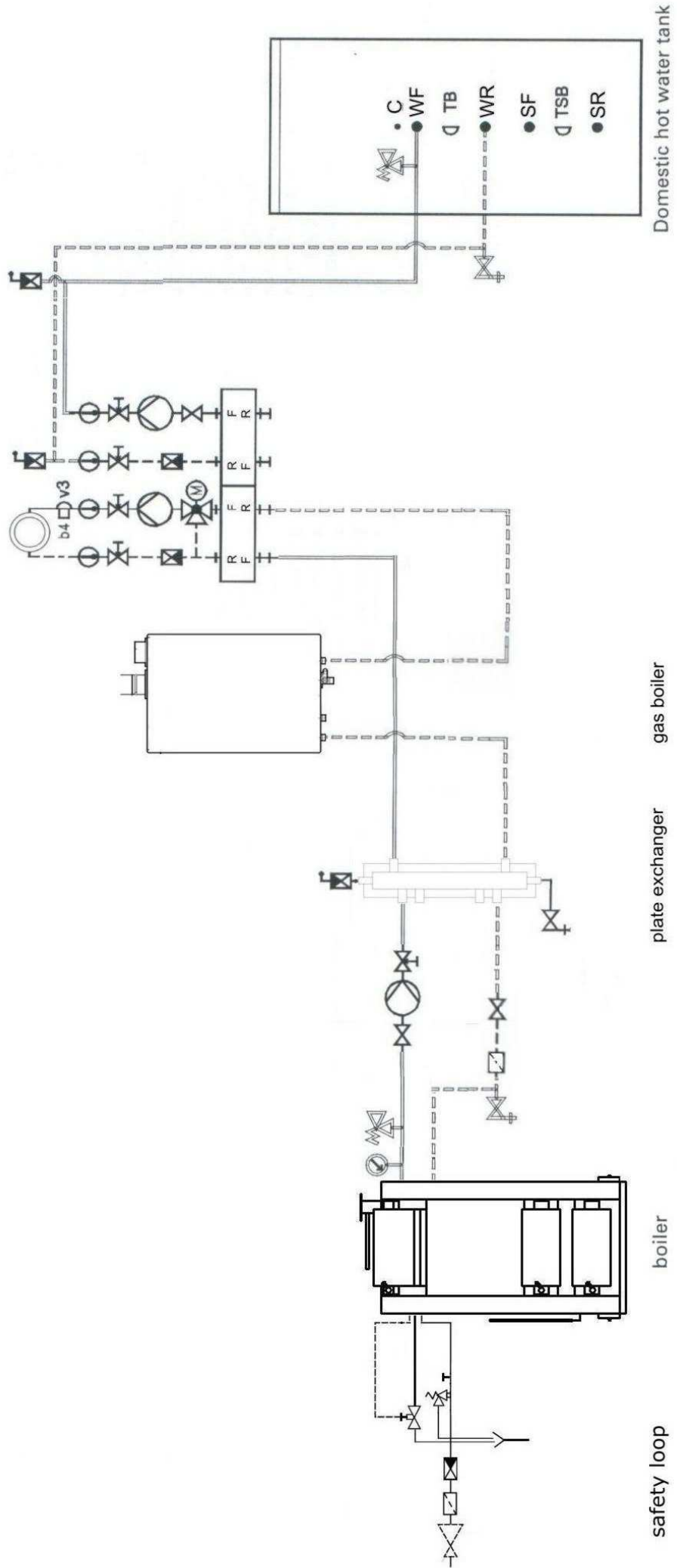1 boiler
1 Accumulator tank
2 Heating- and1 hot water circuit

Domestic hot water tank

C
WF
TB
WR
SF
TSB
SR

boiler

Accumulator tank

TPO
F
R1
TSB

Solar collector

TSA

TSE

1 boiler
1 Accumulator tank
1 Heating- and 1 hot water circuit

An additional switching valve is to be fitted in the return when the accumulator tank is solar charged!

Domestic hot water tank

- C
- WF
- TB
- WR
- SF
- TSB
- SR

v3

b4
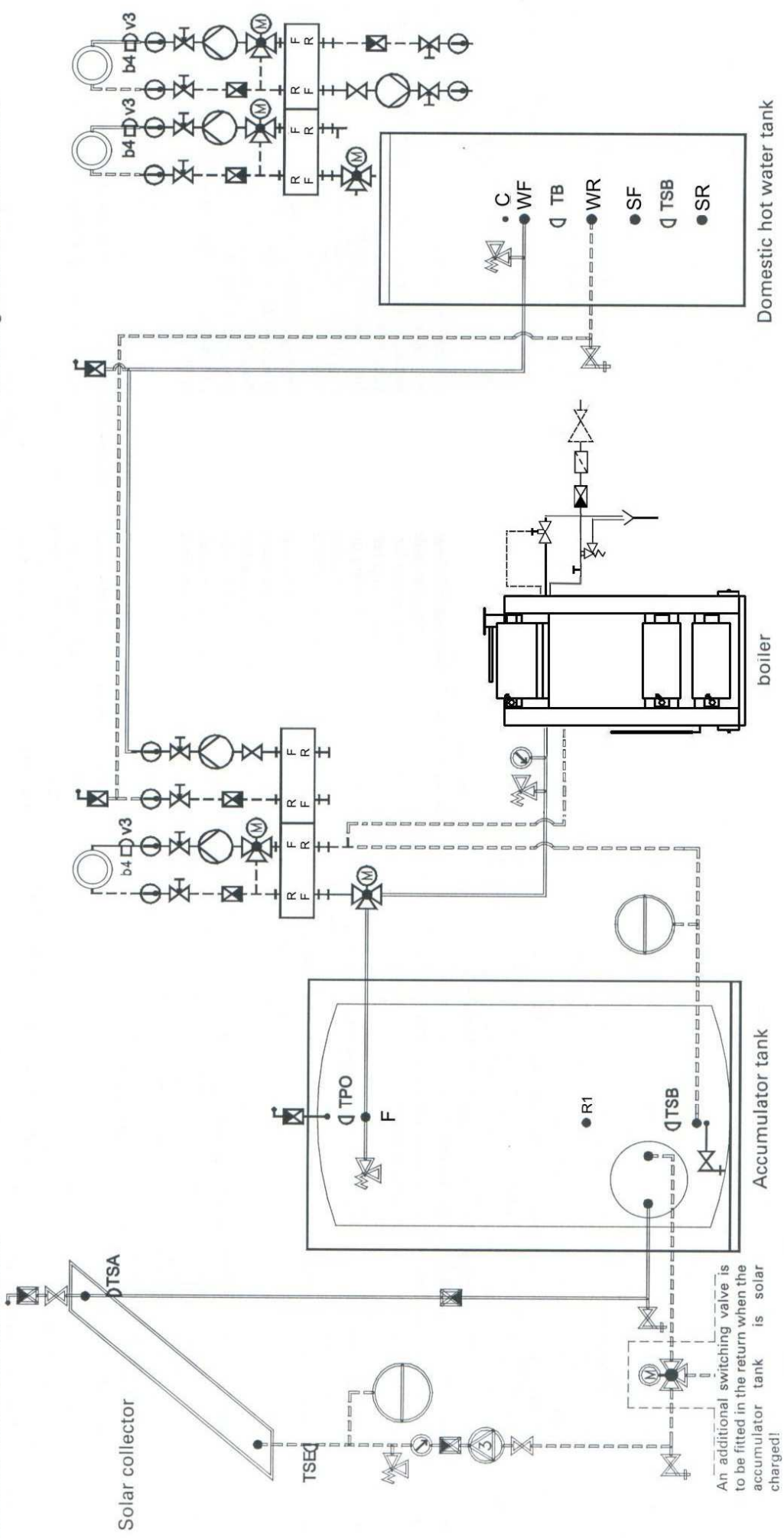
gas boiler

plate exchanger

boiler

safety loop

1 solid fuel boiler
1 gas boiler
1 plate exchanger
1 Heating- and 1 hot water cirquit