



Pellet burner PV 180a

User manual

Table of content

Table of content.....	2
Description.....	5
Fuel.....	7
Installation.....	7
Boiler requirements.....	8
Pellet container.....	11
Burner.....	12
External auger.....	20
Electrical connections.....	21
Operation.....	23
Starting.....	23
Log.....	24
Settings.....	25
Refilling fuel.....	27
Maintenance.....	27
Working principle.....	29
Testing.....	29
Cleaning.....	29
Loading.....	29
Igniting.....	30
Preburn.....	30
Burning.....	30
Auger control.....	30
Fuel level detection.....	30
Output power levels	30
Hold flame.....	31
End burn.....	31
End blow.....	31
Controller board description.....	32
Problems and solutions.....	34

Safety precautions

Do not start the burner before it is connected to the boiler and the boiler is connected to the chimney.

It is recommended to wear a respirator while handling pellets.

The boiler room where the burner is installed must fulfill all rules and recommendations given by authorities.

All electrical connections must be done by trained professionals.

No flammable materials must be stored near the burner.

Warnings

- Changing the construction of the burner without written permission from the manufacturer is forbidden.
- Use only spare parts provided or approved by the manufacturer in order to avoid any damage to the burner and dangers resulting from it
- Welding is allowed only after disconnecting the burner from electric supply. The circuit board must be removed from the burner.
- Do not open any boiler door while the burner is in operation.

The burner complies with following directives and standards

Directive 2004/108/EC

Directive 2006/95/EC

Directive 2001/95/EC

Directive 2006/42/EC

EN 15270 2008

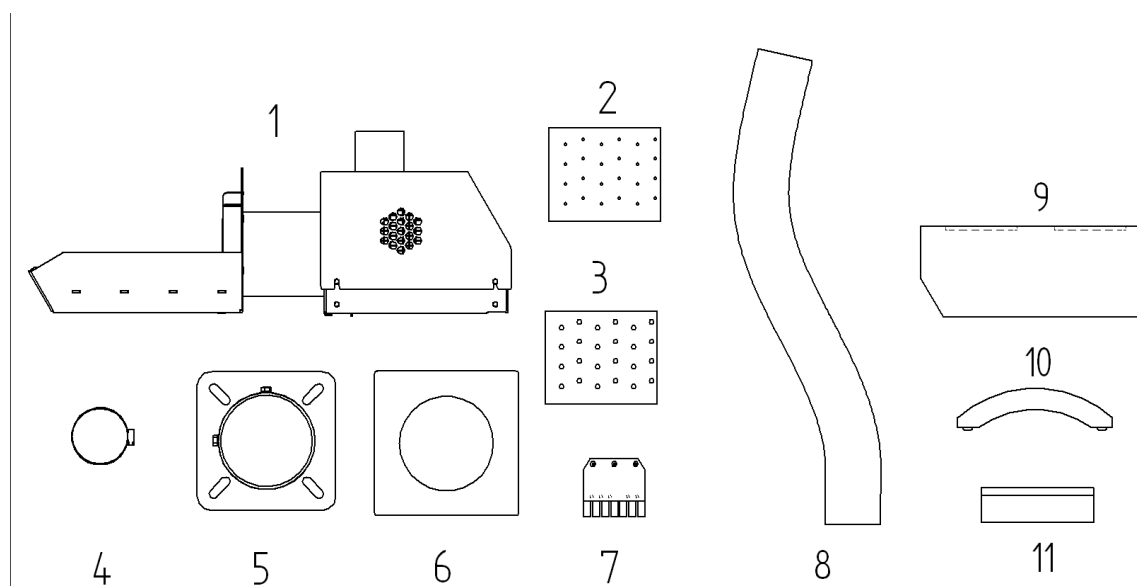
EN 230 2005

EN 60370-2-5 2002

Package content

The burner is shipped with following components included:

1. **Burner**
2. **Bottom grate (smaller holes)**
3. **Upper grate (bigger holes)**
4. **Brackets for hose (2x)**
5. **Flange**
6. **Ceramic seal**
7. **7-pole boiler connector**
8. **Hose**
9. **Ceramic stones (side) – 2 pieces**
10. **Ceramic stone (cover) – 2 pieces**
11. **Ceramic stone (end)**



Description

PV 180a is a pellet burner that is intended to be used with 6 or 8mm wooden pellets. You cannot use any other fuel to run this burner.

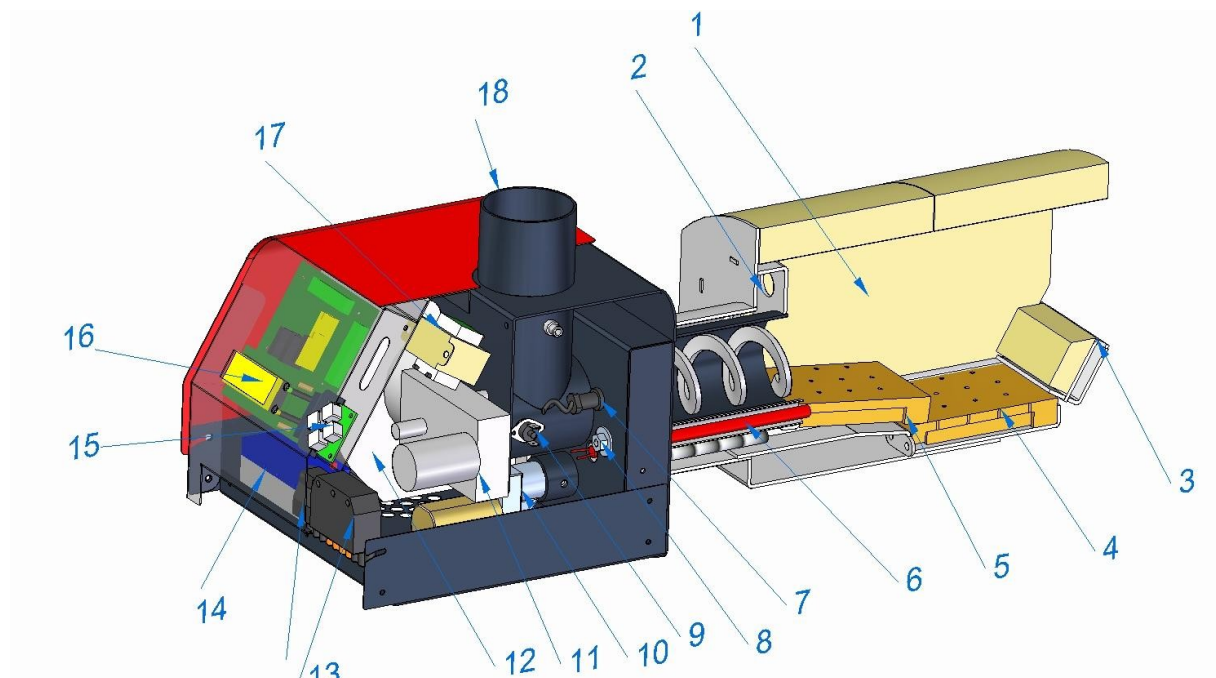
The unique construction of PV 180a allows it to be used with different boilers: liquid fuel, solid fuel and universal boilers. The PV 180a burner is connected to the boiler with a 129 mm flange (similar to oil burners).

The burner is equipped with a safety thermostat, a melting chute, temperature sensor and auxiliary battery for protection against back-burning.

Burner main components are shown on Figure 1

- | | |
|----------------------------|-----------------------|
| 1. Ceramic burning chamber | 11. Feed screw motor |
| 2. Secondary air holes | 12. Fan |
| 3. Tertiary air holes | 13. Plugs |
| 4. Moving grate | 14. Backup battery |
| 5. Grate | 15. Keyboard |
| 6. Ignitor | 16. Display |
| 7. Flame sensor | 17. Mains transformer |
| 8. Burner connecting nut | 18. Fuel level sensor |
| 9. Safety thermostat | 19. Fuel inlet |
| 10. Grate motor | |

Figure 1 Burner main components



PV 180a

Figure 2 Dimensions

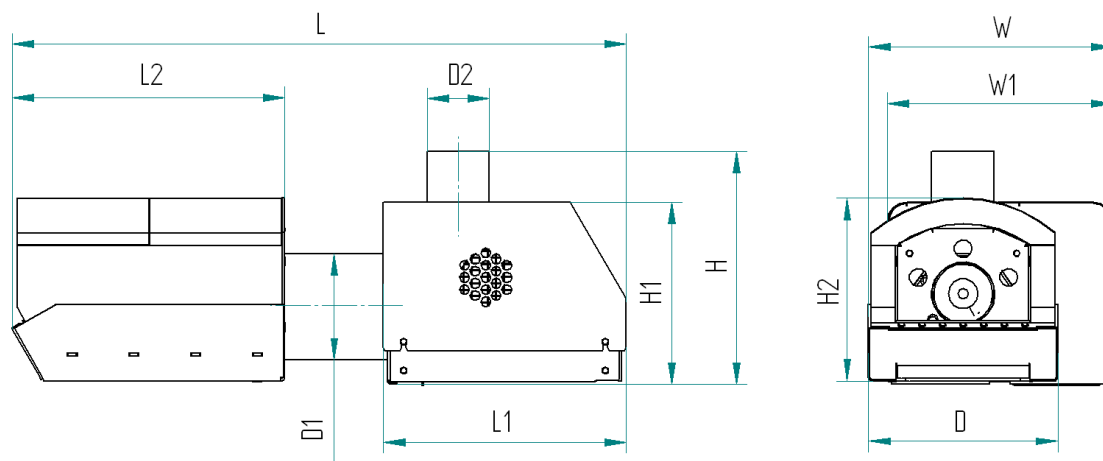


Table 1 Specification

	Unit	PV 180a
L total length	mm	746
L1 burner body length	mm	295
L2 burning chamber length	mm	331
D burning chamber width	mm	310
ØD1 burning chamber neck diameter	mm	129
ØD2 internal feeder inlet diameter	mm	76
H total height	mm	283
H1 burner housing height	mm	221
H2 burning chamber height	mm	241
W total width	mm	297
W1 burner housing width	mm	274
Mass	kg	44
Supply voltage	VAC	220-240
Power max	W	620
Power average	W	60 - 120
Power at standby	W	7
Noise	dB	58
Emission class¹	-	5
Operating temperature	C°	0-60
Nominal heat input	kW	180
Min heat input	kW	80

1. According to EN 15270

Fuel

PV 180a uses premium wooden pellets as fuel. Wood pellets are concentrated and homogenized fuel made from sawdust and cutter shavings. Pellets are pressed with high temperature. No extra materials are added, pellets are held together by a natural ingredient found in wood – lignin. Pellets are CO₂-neutral, renewable fuel. Pellets must be stored in a dry and ventilated room. It is recommended to wear a respirator when handling pellets.

Refilling must be carried out before the storage runs empty. In case it happened, burner has to be restarted and the loading time can be up to 20 minutes that external auger has enough time to refill itself.

Table 2 Pellet properties

Raw material	sawdust and cutter shavings
Calorific value	4700-5100 kWh/ton
Volume weight	ca 650-670 kg/m ³
Volume of 1 ton	1.5-1.6 m ³
Diameter	6-10 mm
Length	3-5 x diameter
Water content	8-10 %
Ash content	Ca 0.5%
To replace 1000 l light oil	ca 2 tons or 3 m ³

Installation

You will need the following tools in order to install the burner:

- Spanner no. 13 for fixing the flange of the burner to the boiler
- Spanner no. 10 for connecting the body of the burner with the burning camber and fix the bottom grate holder
- Cross-head screwdriver for fixing the cover of the burner
- 6 mm hex wrench for fixating the boiler to the flange

In order to install the burner, the boiler must correspond to the following requirements:

- The door of the boiler must have a 130 mm opening (placement opening for the oil burner).
- The thickness of the boiler door must be less than 90mm
- The construction of the boiler must make it possible to open the door of the boiler with the burner connected and removing ash from the furnace. If the door of the boiler is too narrow for opening it with the burner, then extra hinges must be installed.

- If there is not sufficient (less than 5Pa) negative pressure in the furnace, a draught fan should be installed for the exhaust gases.
- The boiler room where the burner is installed must fulfill all rules and recommendations given by authorities.
- The boiler must be positioned in a way that there is enough space for cleaning the burner, the boiler and the smoke pipe and removing the ash.

If flue gas temperature at the top of the chimney is less than 80C°, there is a risk of condensation. In this case a pipe should be installed throughout the length of the chimney.

Note: It is recommended to use a flue gas analyzer for adjusting the burner. The burner must be adjusted using the flue gas analyzer also when you change the size or the quality of the pellets.

Boiler requirements

Pellet burners need regular cleaning and therefore boiler construction must allow the door to be opened without removing the burner. The minimum size of opening in boiler depends on the position of door hinges and vice versa. Figure 3 below illustrates the situation. Point C is critical.

In order to keep door width minimum and boiler opening small, a double hinge solution can be used. As double hinges add another degree of freedom, door must be fastened on both sides. Slide-out doors with guide rails is also an option.

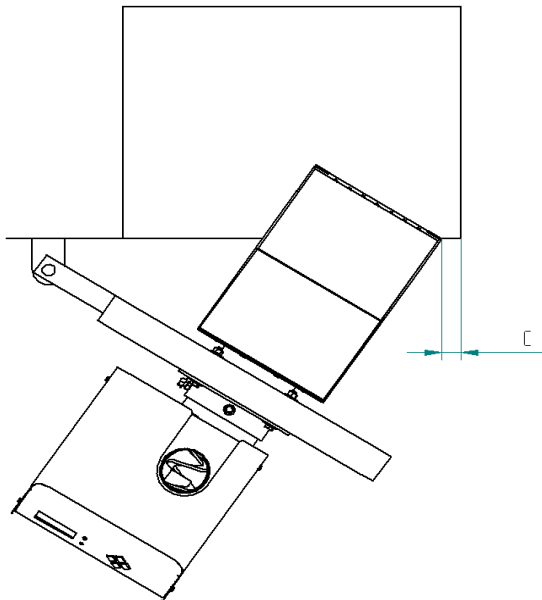


Figure 3 Hinge position and boiler opening size considerations

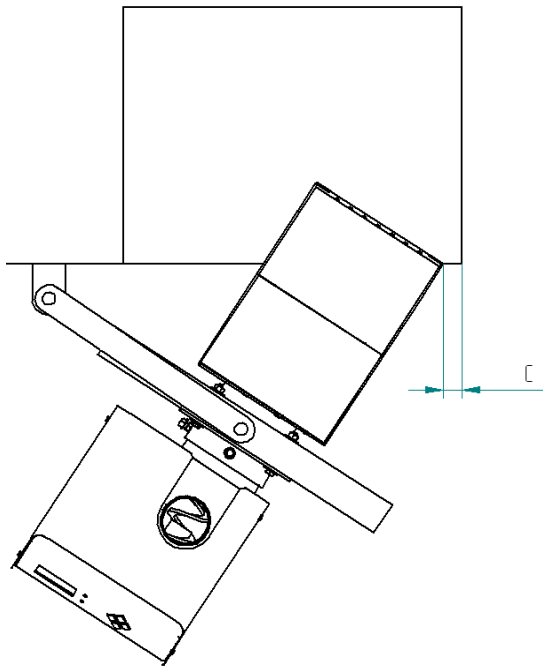


Figure 4 Double hinges

Boiler firebox length L (Figure 5) should be at least 2,5 x the length of the burning chamber. For PV 180a, minimum of 800 mm is acceptable (leaving L1 min. 480mm). The height should be enough to leave H1 below the burner min. 100mm for ash.

Minimum dimensions L and H for PV 180a: $L \geq 800\text{mm}$; $H \geq 470\text{mm}$.

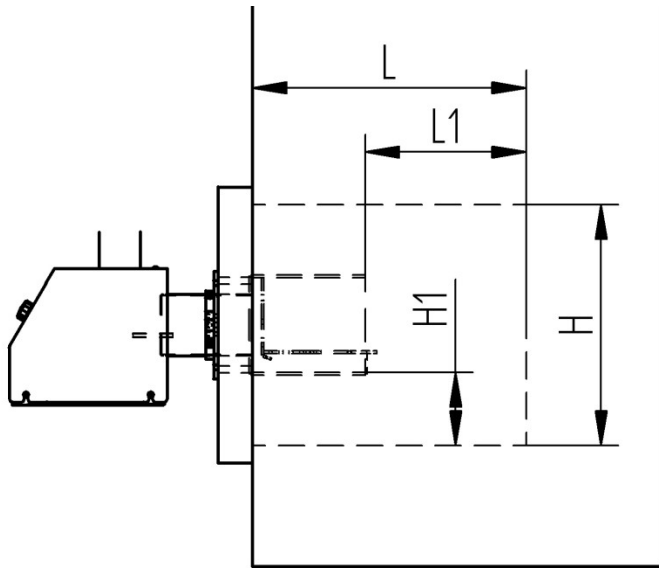


Figure 5 Boiler firebox requirements

Burner is mounted to door using supplied oil burner flange. Bolt hole circle diameter and bolt sizes can be customized by using custom flanges. D1 and D2 given in Table 3 are only valid with supplied flanges.

Table 3 Mounting holes for boiler door

	Unit	
$\varnothing D$ hole for burning chamber neck	mm	132
$\varnothing D1$ flange bolt ring diameter	mm	170..210
$\varnothing D2$ bolt holes	mm	13

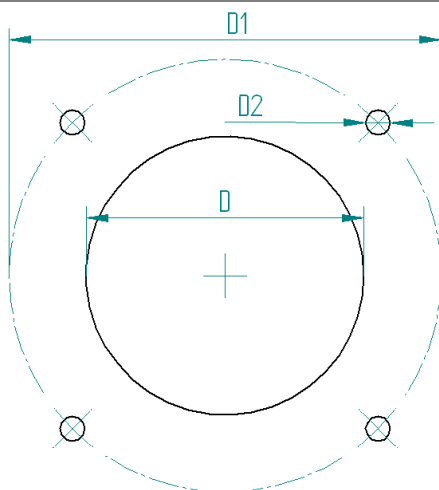
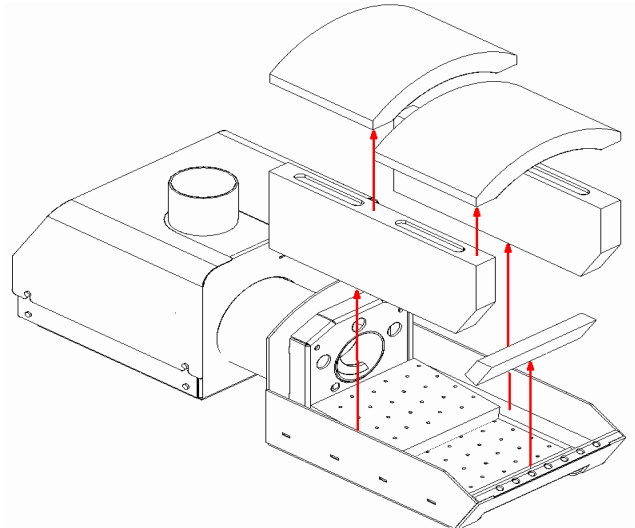


Figure 6 Mounting holes with supplied flanges for boiler door

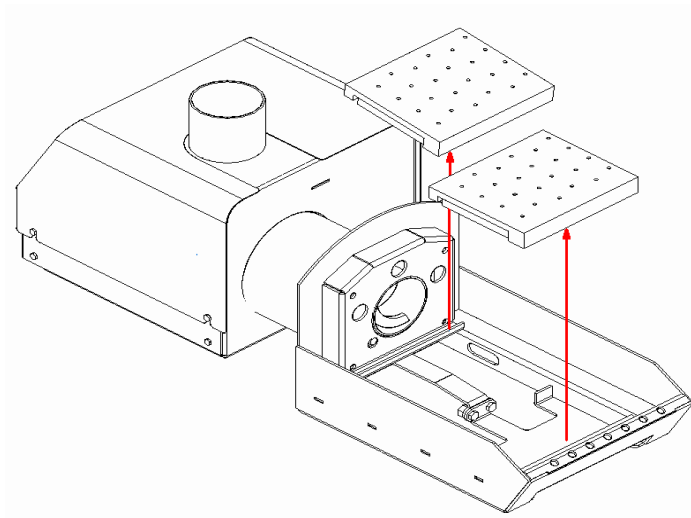
Burner

In order to install the burner properly, you must go through the following steps:

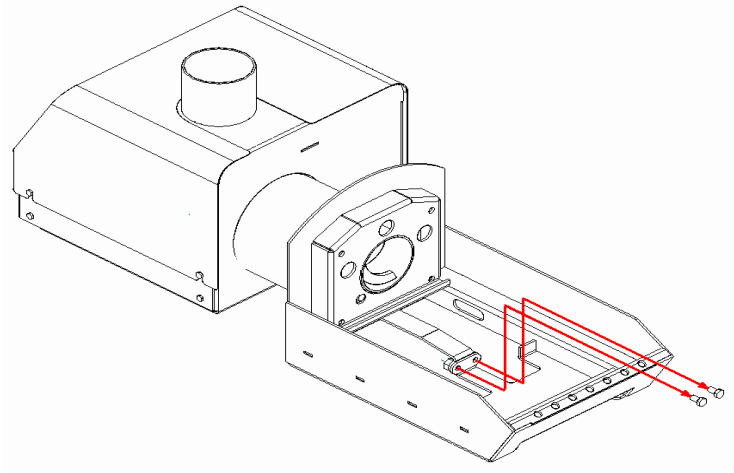
1. Remove carefully ceramic stones and the transparent joil from stones.



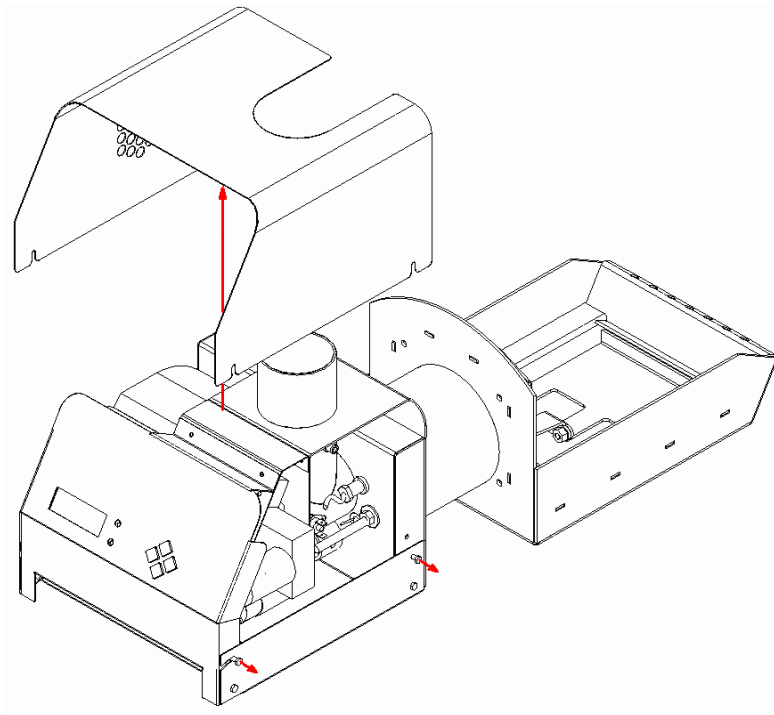
2. Remove upper and lower burning grates.



3. Remove the bolts from bottom grate holder

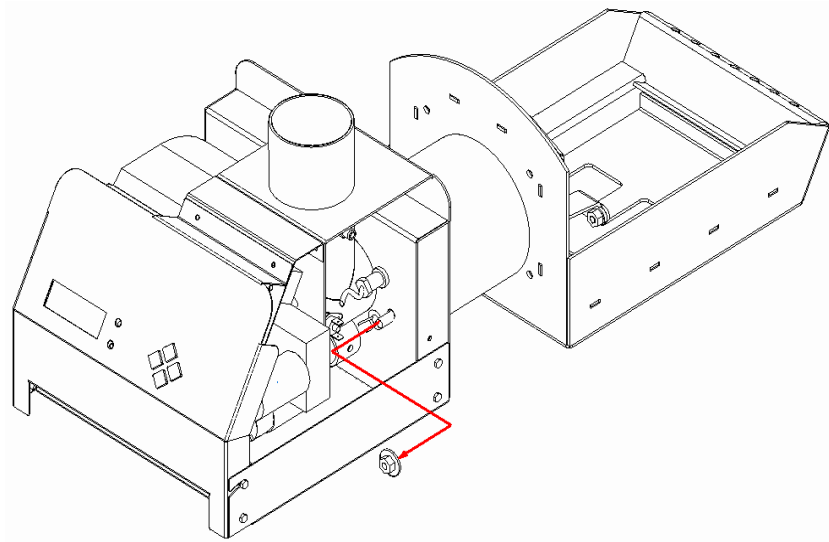


4. Remove the cover of the burner by loosening 4 screws of the cover. There is no need to remove the screws

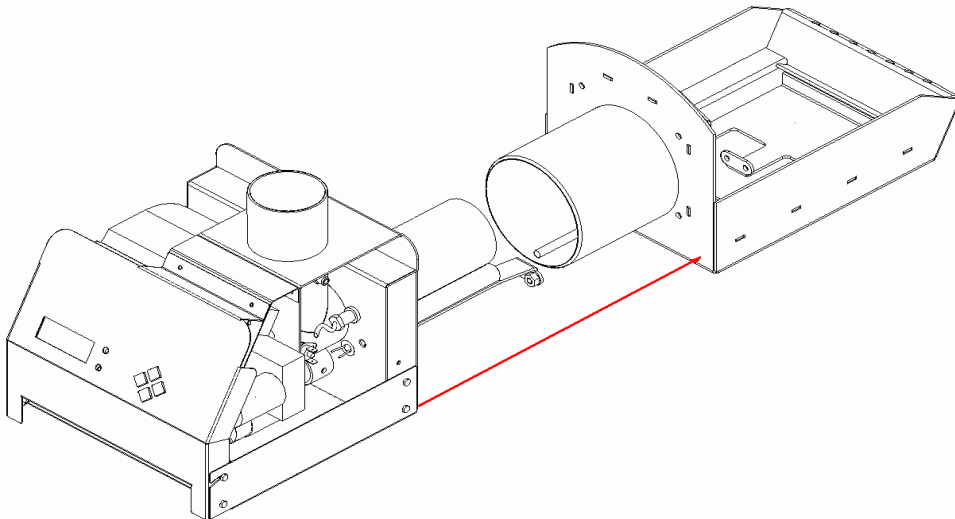


PV 180a

5. Remove the M8 nut (13 mm wrench) that connects the halves of the burner.

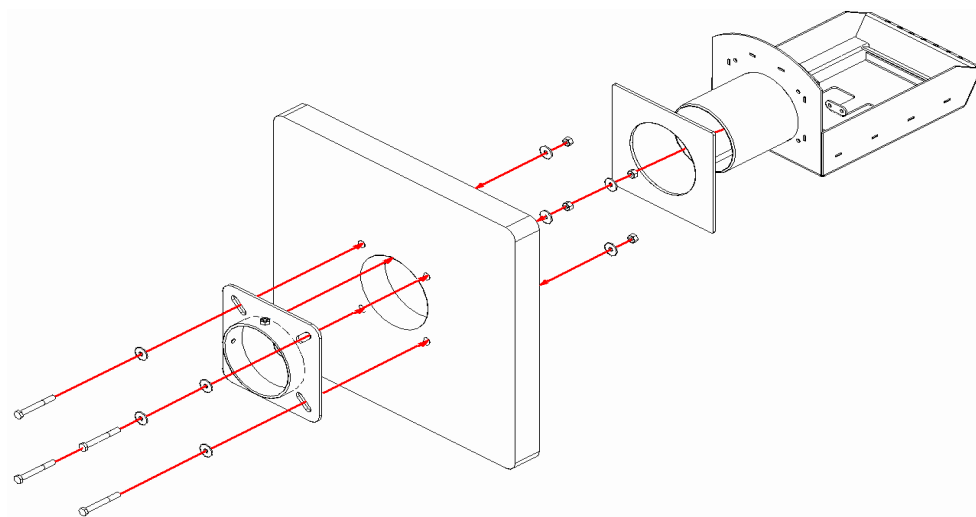


6. Separate the halves of the burner by pulling the burning chamber and slightly rotating it at the same time.

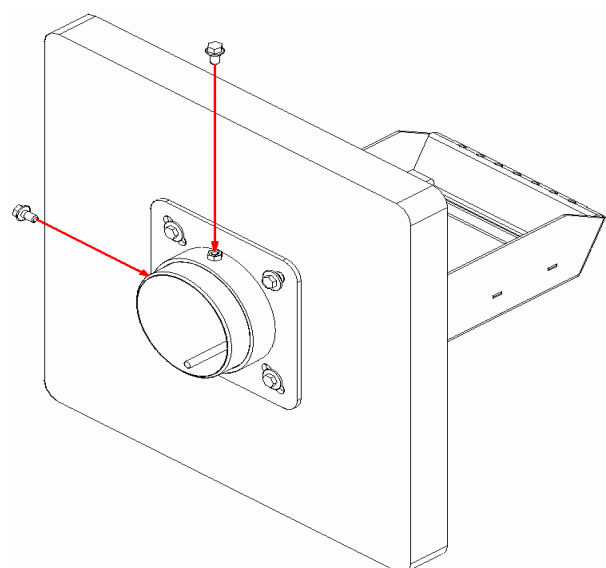


7. Fix the flange of the burner to the door of the boiler. Put a ceramic seal on the neck of the burning chamber. Put the chamber neck through the boiler door and flange. The rear wall of the burning chamber has to lean on the door of the boiler.

Caution! The connection between the burner and the boiler must be tight in order to avoid any leakage of smoke gases.

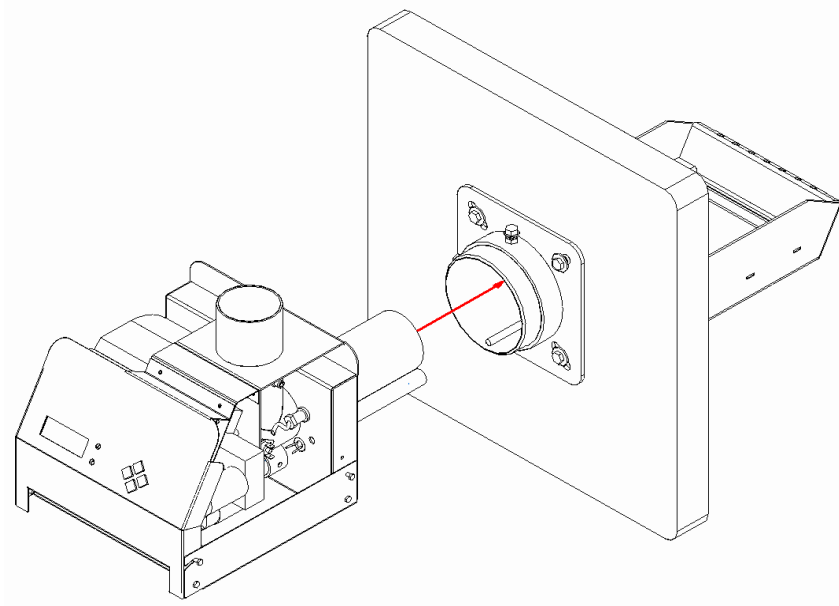


8. Fixate the burning chamber to the flange with two M8 bolt. Make sure the burning chamber is placed horizontal.

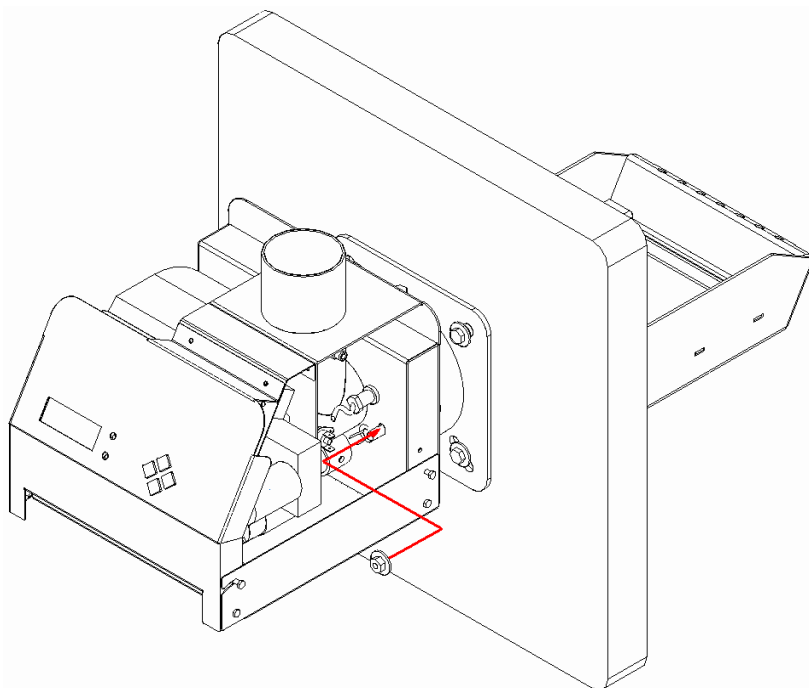


PV 180a

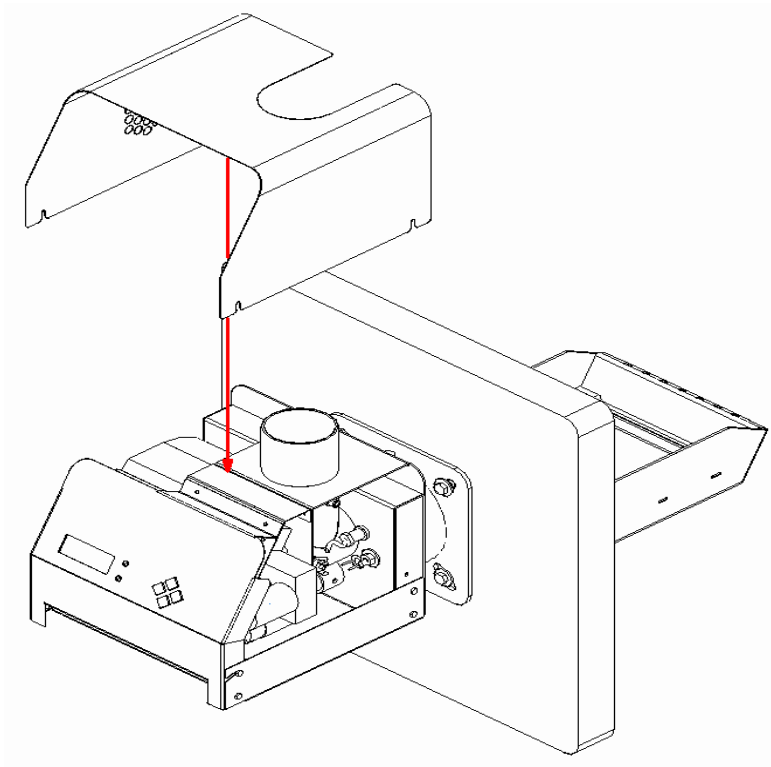
9. Connect the burner body to the burning chamber like it was before disassembling: push the burner body and slightly rotate it at the same time. Be sure that the burner halves are correctly connected.



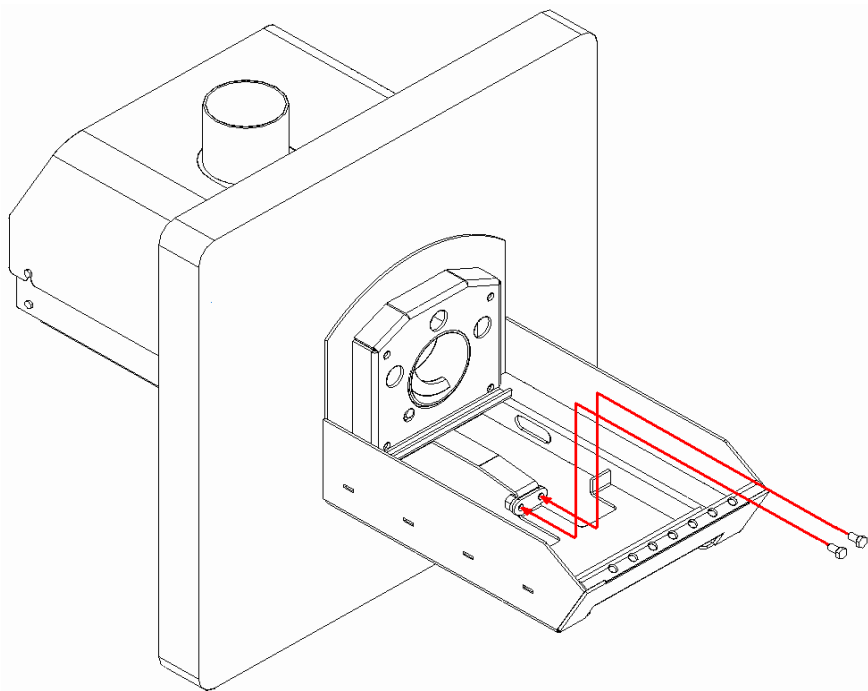
10. Fixate the halves of the burner with a M8 nut. The nut has to be rolled tight but not too hard.



11. Place back the burner cover and fix the screws again.

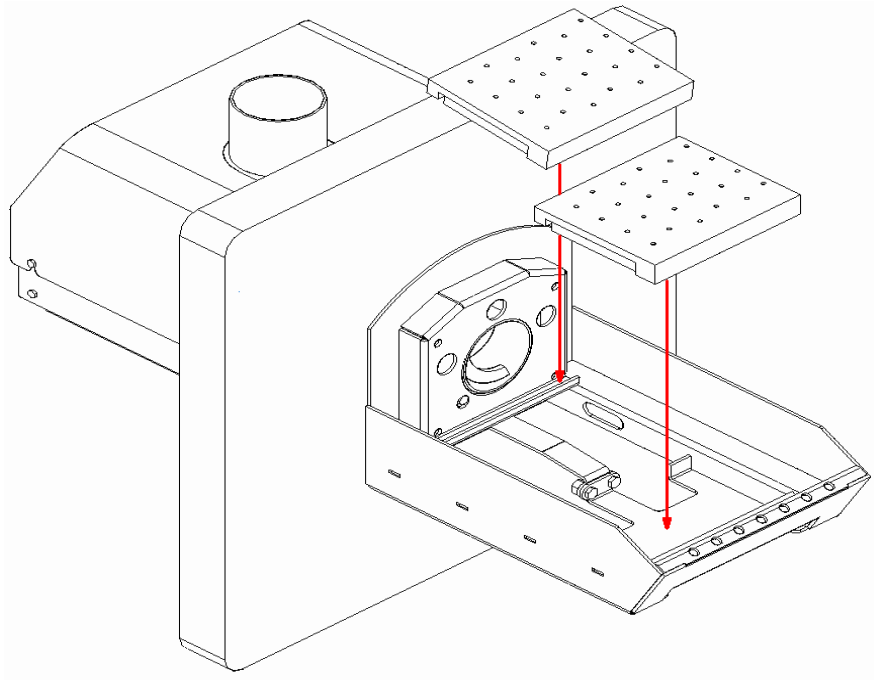


12. Place back the bolts and fix the bottom grate holder.

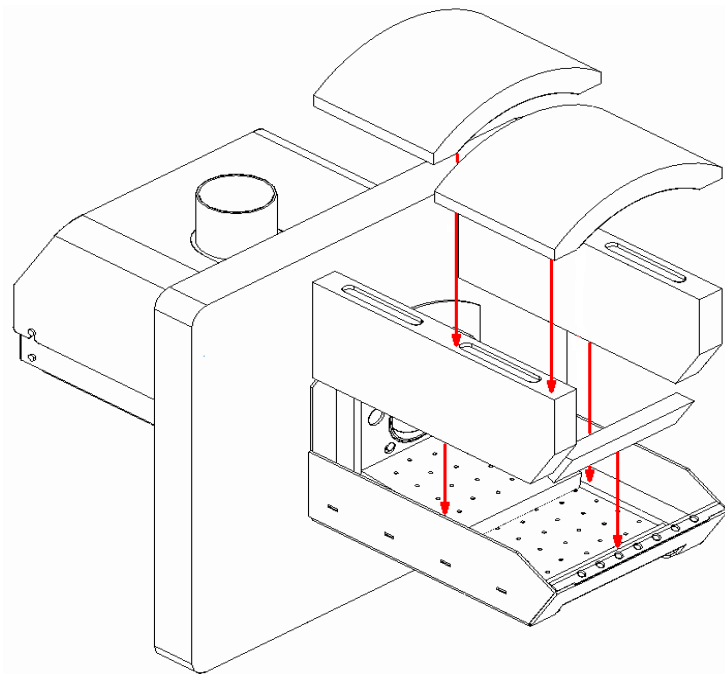


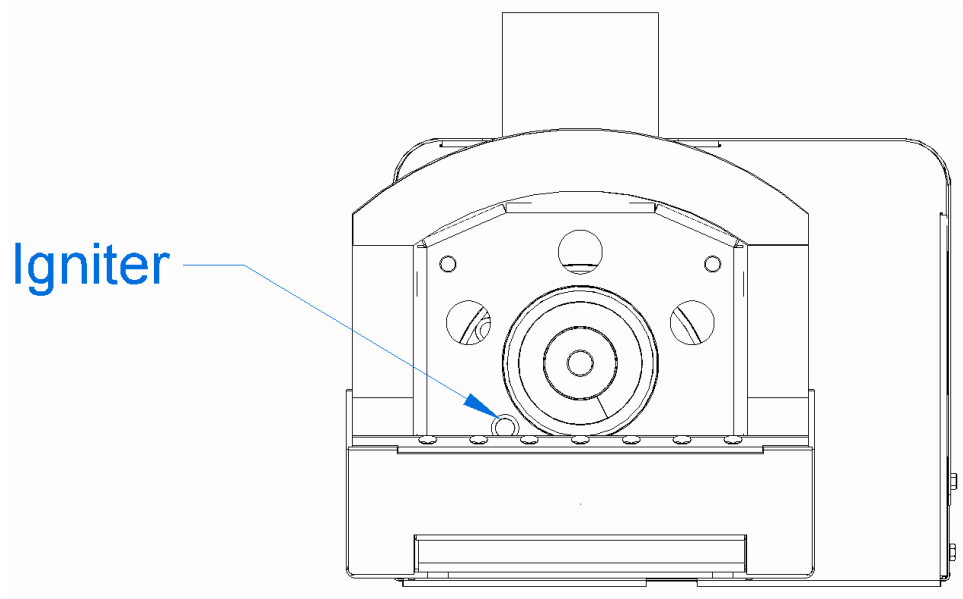
PV 180a

13. Place back the lower grate (smaller holes) and then the upper grate (bigger holes).



14. Place carefully back ceramic stones.





Caution! After the installation of the burner always make sure that the end of the igniter is positioned through its opening and not stuck behind the dividing wall.

Pellet container

The burner, the auger and the pellet container are a common system. The size and the location of the pellet container depends on the needs and possibilities of the specific boiler room. While choosing the pellet container you must keep in mind that:

- If the pellet container is in the same room as the boiler, then the size of the pellet container must not exceed 500 liters (approx. 350kg).
- The container must be made of fireproof materials.
- The container must be positioned in a way that the raising angle of the feeding auger does not exceed 45°.

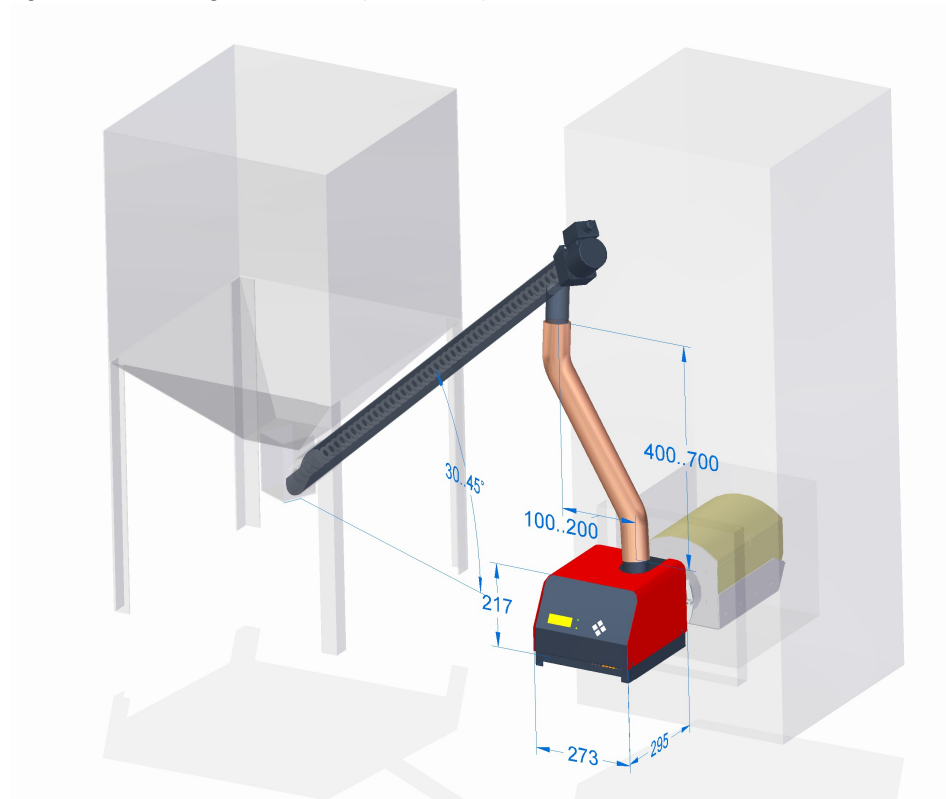
It is advisable to use a container that can be closed with a cover.

External auger

A feeding auger transports pellets from the pellet container to the burner. The burner controls the work of the auger. The auger is connected to the burner with a special hose. The hose is made of melting material that acts as a safety measure against back-burning. The upper side of auger (with motor) must be fixed (with delivered chain) to a storage or to some other object nearby.

Figure 7 shows correct position for external auger. As the hose is a safety device, it must be placed strictly as described below. The vertical distance between auger outlet and burner inlet must be in range of 400..700mm and horizontal displacement 100..200mm (typical auger angle 30°..45°). External auger cannot be installed in position with angle greater than 45°. The hose must be in angle of 50° or more to ensure free falling of the fuel.

Figure 7 External auger installation (units in mm)



Electrical connections

The burner is equipped with a standard oil burner plug that has 7 contacts. There will be different connection schemes used for different boilers. Usually the burner is connected to the boiler with a 5-wire cable. It is also possible to connect with a 4-wire cable.

Caution! All electrical connections of the burner must be made by a qualified professional.

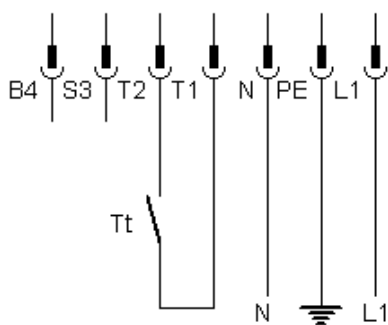


Figure 7 Burner 5-wire connection

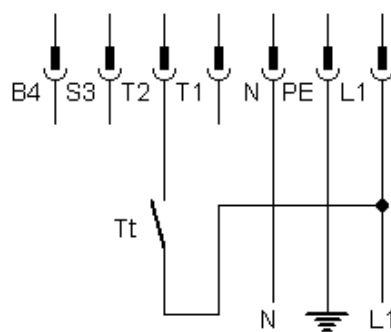
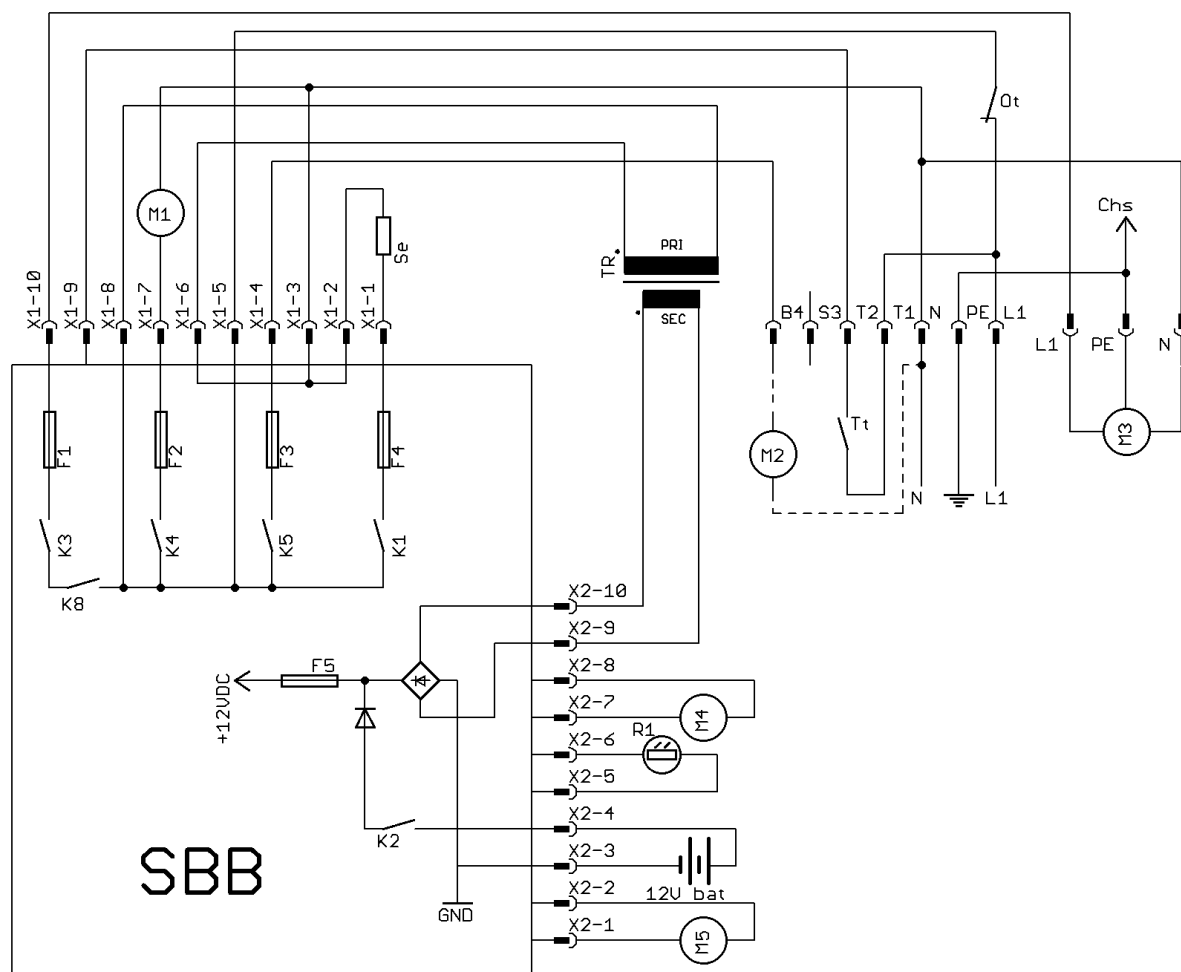


Figure 8 Burner 4-wire connection

PV 180a



Chs – Chassis grounder

M1 – Fan

M2 – Flue gas fan*

M3 – External auger

M4 – Internal feeder

M5 – Grate motor

Ot – Safety thermostat

R1 – Flame sensor

SBB – Controller board

Se – Igniter

TR – Transformer

Tt – Boiler thermostat

*Flue gas fan M2 is installed only if there is not enough draught. The flue gas fan is not included with burner.

Operation

The burner is controlled via user interface on the front panel. LCD screen (1) displays settings menu, event log etc. Yellow light (2) shows the presence of flame in burning chamber. Or if blinking, the burner is out of normal operation. Status can be seen on log screen. Green light (3) indicates if there is fuel in the burner. To move in menus, use up and down buttons, to change parameter, press OK, to go back to LOG press “ESC” button.

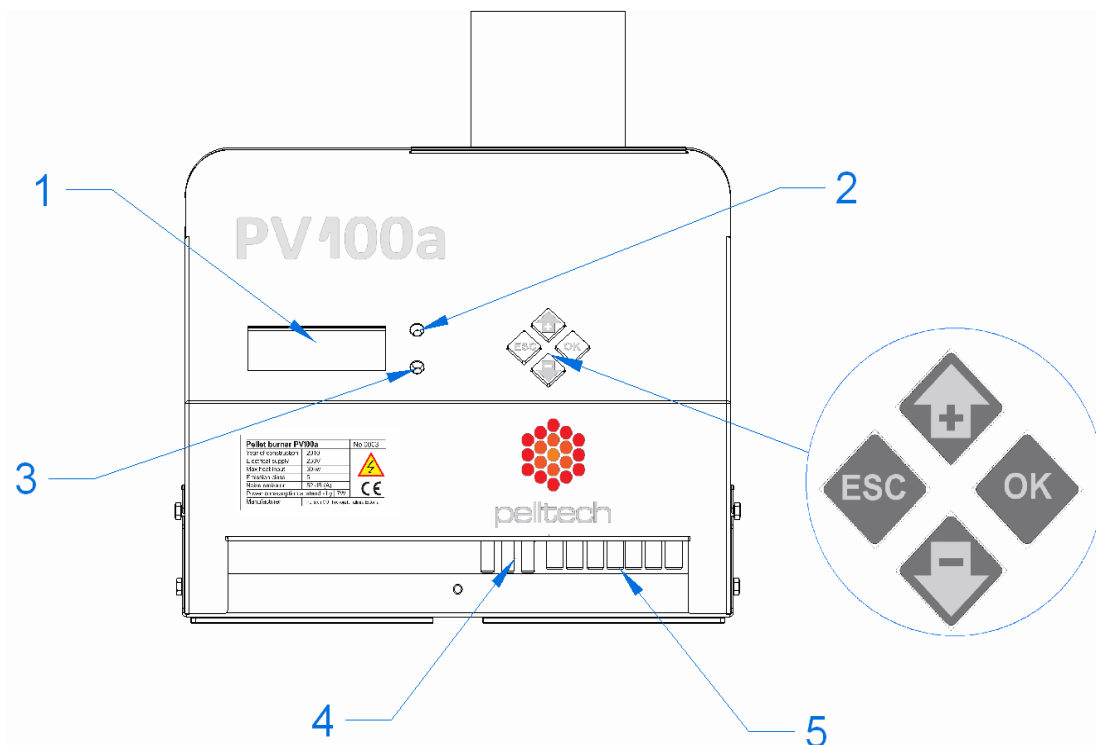


Figure 9 Front panel

- 1 – display
- 2 – yellow led, showing the flame in the burner
- 3 – green led, showing the fuel in the burner
- 4 – Plug for auger connection
- 5 – Plug for boiler connection

Starting

Prior to the initial start-up of the burner make sure that:

- The burner is connected to the boiler
- The boiler thermostat is installed and is functioning properly
- The boiler thermostat is turned to lowest temperature
- The external auger is installed and connected to the burner

- The smoke duct is connected to the chimney, the dampers for smoke gases are open and there is sufficient draught. When the burner is operating, the negative pressure inside the boiler must stay between 4-6 Pa.

To turn on the burner, switch on boiler main switch. If burner displays 'Stopped', then go to settings menu and change parameter 'Burner' from OFF to ON. The display shows 'Waiting'. Now turn boiler thermostat to desired temperature. The burner will go to Loading-state. If this is the first run, external auger needs to be filled with pellets. It can take up to 20 minutes.

To stop the burning, turn boiler thermostat to lowest point. The burner will now finish the process after all fuel is burnt.

Caution! Never turn off a working burner from the main switch of the boiler. Use the thermostat switch for that purpose. In order to stop safely, let the burner burn empty. Do not leave the burner unattended when it has been necessary to use the emergency stop.

Log

Log screen displays last events (burner states) and their duration. All states are described in Table 4. The duration is in form mm:ss ('m' in the middle) or hh:mm ('h' in the middle). For example "Igniting 01m25 means the burner ignition state lasted 1minute and 25 seconds.

Last row of the log shows current state. To reach the last row, press the "down" button, until you reach the current state. The duration of current state updates every second or minute.

Table 4 Burner states

Status	Description
STOPPED	The burner is not switched on.
WAITING	The burner is switched on and waiting for command from the thermostat of the boiler.
TESTING	Testing the fan, battery, feeder.
CLEANING	Removing ash from burning chamber
LOADING	Loading pellets into burner for ignition after the command from boiler thermostat.
LOADING2	Second try if the first ignition was not successful.
IGNITING	Loaded amount of pellets are in the burning chamber, igniter and fan are working till photocell recognizes flame.
PREBURN	Only the fan is working, the igniter is off. Pellets start burning properly.
BURNING	Status of normal working: External auger works by level sensor, internal auger and fan are working by. Photocell must see the flame.
HOLD FLAME	Boiler has reached an estimated temperature and boiler thermostat switched off, pilot flame is held in the burning chamber.
BURN END	Boiler has reached an estimated temperature and boiler thermostat switched off

	the burner. The external auger has stopped, the internal feeder and fan are still working until all fuel is burned.
END BLOW	When photocell doesn't see any flame only the fan keeps on working with minimum speed in order to make sure there is no fuel in burner.
NO PELLETS	Level sensor does not detect pellets
NO FLAME	There is no flame in the burner more than 120 seconds during burning.
OVERHEAT	Temperature in the burner has reached preset temperature and burner turned off.
IGN.ERROR	Flame is not recognized after ignition
LEVEL ERR	Level dose not reached or level dose not disappear at burning time
FEEDER ERR	Jam in feeder or feeder rotation is not detected
FAN ERROR	Fan rotation problem
GRATE ERROR	Grate is stucked.
BATTERY LOW	Battery is not connected or empty
NO POWER	Supply power is not detected – burner works on battery

Settings

To enter settings menu, press OK. To go back to log screen, press "ESC".

Table 5 Main menu

Menu nr	Menu parameter ENG	Description	Default value	Selection list
1	STATUS->	Submenu for status information * ¹		
2	INFO->	Information from burner devices * ²		
3	BURNER	Turn burner ON/OFF	OFF	ON/OFF
4	HOLD FLAME	Flame holding allowed * ³	OFF	ON/OFF/AUTO
5	PELLETS	Select fuel quality	NORMAL	NORMAL/LIGHT/HEAVY
6	POWER	Actual power level	AUTO	AUTO/80/100/120/140/160/180
7	BASE AIR	Fan speed correction for all fan speeds	0	-2/-1/0/+1/+2/+3/+4/+5
8	LANGUAGE	Language selection * ⁴	ENG	See language list
9	PARAMETERS ->	Parameter setup menu		

*1 – see "Status menu description"

*2 – see "Info menu description"

*3 – see "HOLD FLAME" status description

*4 – see "Languages" chapter

Table 6 Parameters menu

Parameter		Description	Unit	Value		
Nr	Name			Default	Min.	Max.
1	BURN AIR @80kW	Fan speed at power level 1	rps	30	15	50
2	BURN AIR @100kW	Fan speed at power level 2	rps	33	15	50
3	BURN AIR @120kW	Fan speed at power level 3	rps	36	15	50
4	BURN AIR @140kW	Fan speed at power level 4	rps	39	15	50
5	BURN AIR @160kW	Fan speed at power level 5	rps	42	15	50
6	BURN AIR @180kW	Fan speed at power level 6	rps	45	15	50
7	TESTING AIR	Fan speed for testing	rps	42	38	50
8	IGNITION AIR	Fan speed during ignition cycle	rps	45	20	35
9	BURN END AIR	Fan speed during end blow cycle	rps	20	10	30
10	HOLD FLAME AIR	Fan speed during hold flame cycle	rps	10	7	14
11	HOLD FLAME ON	In case of Hold flame is set on AUTO, flame holding activated after 2 waiting session, both less then 15 min.	min	15	5	30
12	HOLD FLAME OFF	In case of Hold flame is set on AUTO, there is maximum time for flame holding cycle.	min	60	30	90
13	MIN POWER	Minimum power level	kW	70	50	100
14	MAX POWER	Maximum power level	kW	90	50	100
15	AUTO POWER UP		min	60	30	120
16	AUTO POWER DOWN		min	30	15	45
21	PELLET NORMAL	Internal feeder production	g/rot	70	60	100
22	PELLET LIGHT	Internal feeder production	g/rot	65	60	100
23	PELLET HEAVY	Internal feeder production	g/rot	75	60	100
24	LOADING FEED	Feeder turns during loading cycle	rot	20	10	24
25	LOADING 2 FEED	Feeder turns during second loading cycle	rot	3	1	8
26	BURN END FEED		rot	18	10	25
30	SMOKEFAN ON	Smokefan is turned ON or OFF		OFF	ON/OFF	
31	SMOKEFAN 1	Smokegas fan speed for ignition, end blow, burn at power level 1 and 2	%	40	0	100
32	SMOKEFAN 2	Smokegas fan speed for burn at power level 3 and 4	%	60	0	100
33	SMOKEFAN 3	Smokegas fan speed for burn at power level 5 and 6	%	80	0	100
40	PHOTOCELL	Photocell sensitivity	%	84	50	100
41	PREBURN TIME	Preburn cycle lenght	s	25	15	80

PV 180a

42	PREBURN CYCLES		n	6	2	10
43	OVERHEAT TEMP	Maximum allowed burner temperature	°C	50	20	70
46	MAX.CURR x10mA	Feeder max current		160	72	216
48	CLEANING CYCL.	Counted burning time between cleanings (0=Cleaning OFF)	min	180	0	250
50	ON ERROR RELAY	Error output relay contacts (ON - NO or OFF -NC)		ON	ON/OFF	
99	MODEL VERSION	Load default settings for chosen burner model or change model type	0	100a	20a/30a/50a/100a	

Refilling fuel

The fuel storage must be refilled before it runs empty. Fuel can be added at any time during the operation. To add fuel, simply pour a new bag of pellets into your fuel storage.

If the storage runs empty before new fuel is added, the external auger must be loaded again as described in chapter Starting. Failing to do so will result 'Fuel error' due to fuel loading timeout.

Maintenance

Pellet burner PV 180a requires systematic maintenance. The maintenance period depends on the quality of the pellets and heating intensity. The average maintenance period is between 1 to 2 months. Although the burner has an automatic cleaning system, some ash collects on the grates and under the grates. Depending on the quality of the pellets, the maintenance period may vary.

To clean the burner:

1. Turn off the burner by turning the thermostat to 0.
2. Let the burner cool down for at least 1 hour.
3. Open the boiler's door to gain access to burning chamber
4. Remove carefully the cover stones from burning chamber.
5. Remove ash from the grates.
6. Remove the grates, make sure that all holes on the plate are clean.
7. Remove all residues collected under the grates.
8. Place back all removed burner parts.
9. Close the boiler's door to finish the maintenance and turn the thermostat to desired temperature.

NB! Check the boiler manual for boiler cleaning.

Feed screw motor

The condition of the feeding screw motor is crucial for safety. Therefore the motor must be replaced after every 2000 working hours or after 120-150 tons of pellets are burned or when the burner gives warning. Burnered pellets amount (in kg) is accessible from info-menu.

Battery

Battery must be replaced when the burner gives warning message or after 5 years. As the battery is also safety device, burner monitors the state of battery and blocks next work cycle if battery voltage is not within limits.

Fan

The air in boiler room contains dust that can deposit on fan bearings. The best cure is to keep boiler room as clean as possible. Otherwise the fan bearings can get stuck after several years of working and must be replaced.

Resetting safety thermostat

In case of overheating the burner flashes yellow indicator and displays message OVERHEAT. The safety thermostat must be reset manually. Thermostat is located on the horizontal tube of inner auger.

1. Make sure the burner has cooled down and disconnected from power supply.
2. Remove the cover by loosening 4 screws (2 on both sides)
3. Press small button on thermostat.
4. Connect power supply
5. Press OK for 5s
6. If indicator keeps flashing, you need to replace the thermostat.

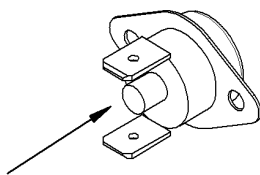


Figure 11: Resetting the safety thermostat

Working principle

Testing

Before every startup the burner tests itself. At testing time fan is turned on at maximum power. If its speed doesn't reach 30 rps, "fan error" will occur on display. Battery loading is turned off and feeder is turned on. If battery voltage is lower than 12V, "Battery low" error will occur. By testing the feeder has to make 1 full turn in 8 seconds, if it fails to do it, "feeder error" will occur.

Cleaning

To clean the burner, parameter 48 has to be turned ON. Before every working cycle, burner grate will be cleaned by pulling the lower grate under the upper grate and pushing away the ash by moving back. If the grate is stucked, it will move back and try again. After 1 minute trying and failing to move back to its right position, "grate error" will occur.

Loading

In the loading cycle, internal feeder loads correct amount of fuel into burning chamber needed for ignition. Loaded fuel amount is measured by counting internal feeder rotations. Loading is correctly ended when feeder has made 20 half-rotations (or as set in the par24). Internal feeder working depends on fuel level sensor:

- The feeder is started when level sensor recognizes fuel in burner for more than 1s,
- The feeder stops when feeder makes 1.5 rotations without fuel in burner.

External auger is holding permanent fuel level in the feeder tube all loading time depending on level sensor:

- The auger is started when level sensor does not recognize fuel in burner more than 1s.
- The auger is stopped when level sensor recognizes fuel in burner more than 5s.

Maximum loading time is limited with 5 minutes in normal working conditions and 20 minutes after manual start.

- Igniter is preheated in the end of loading cycle. When internal auger has made 10 half-rotations (par24 - 12) the igniter is turned on for preheating. If the igniter is turned on more than 1 minute at loading time, the igniter will be turned off.

Igniting

In ignition state the igniter is heated up and fan blows hot air through loaded pellets and ignites them.

Igniter is turned off after every 50 seconds to avoid overheating it, and turned on again after 20s .

Preburn

The purpose of preburn state is to fully ignite the pellets. No fuel is added at preburn. Fan works at the same speed as in ignition.

Burning

The running position of the burner. Fuel is periodically added and fan is keeping speed according to air table. Burning state lasts until boiler thermostat is switched off.

Auger control

External auger is holding permanent fuel level in the feeder tube during Burning state. The auger is controlled by fuel level sensor in following manner:

- Auger is started after level sensor does not recognize fuel in burner and internal feeder has done 2 half-rotations.
- Auger is stopped when level sensor recognize fuel in burner for more than 1s.

Fuel level detection

Pellet level in vertical feeder tube is detected by fuel level sensor (optical). Fuel is detected when pellets interrupt optical link between sensor pair.

Burner will enter level detection fault condition in following cases:

1. Fuel loading timeout (no signal for specified period of time)
2. Fuel unloading timeout (signal lasts longer than specified period of time)

Output power levels

Burner has 6 preset output power levels. For every level, program calculates correct fuel amount depending of fuel calorific value and burner internal feeder productivity. The feeder productivity for normal, light and heavy pellets can be changed from setup menu (par21, par22, par23). For most pellets it is 70g per rotation. Calculated amount of fuel is divided into periodic feeding cycles. In every cycle internal feeder makes half rotation. If the calculated cycle comes to short (less than 11s) then the cycle length is doubled and fuel is fed with by full rotation of feeder. For every power level there is different preset fan rotation speed (air table).

Burner chooses the output level between preset min and max powers. When burning time has been more than 60 min (par 15), next time burner takes one level up, when burning time has been less than 30 min (par 16), next time burner takes one level down.

Hold flame

The main idea of this state is to reduce the number of igniting cycles. This state can be turned on automatically or manually in "hold flame" menu (ON/OFF/AUTO). If set to AUTO, burner goes to "hold flame" when the time between two startups is less than 10 minutes for 2 times. When "hold flame" lasts more than one hour, automatic mode is turned off and burner goes to "burn end" state. In "hold flame" state new fuel is fed after every 127s and fan is working by speed given by par10.

End burn

In the end burn state all fuel inside the burning chamber and feeder tube must be burned - no more fuel added from external auger. Internal feeder and fan keep on working as in previous states ("hold flame" or "burning"). After the feeder has made periodically 15 half-rotations (par26), the feeder starts working continuously until 32 half-rotations is made.

End blow

Only the fan keeps on working with speed shown in par9 to burn out all coals. Feeder is turned off. This state lasts until no flame is recognized plus one minute.

Table 7 Air table for PV 180a

Power [kW]	Fan [rps]	Cycle [s]*	Feeder [rot]*
80	30	30,5	2
100	33	24,5	2
120	36	20	2
140	39	17,5	2
160	42	15	2
180	45	13,5	2

* - cycle length and feeder rotations are different if feeder production changed in parameters setup

Controller board description

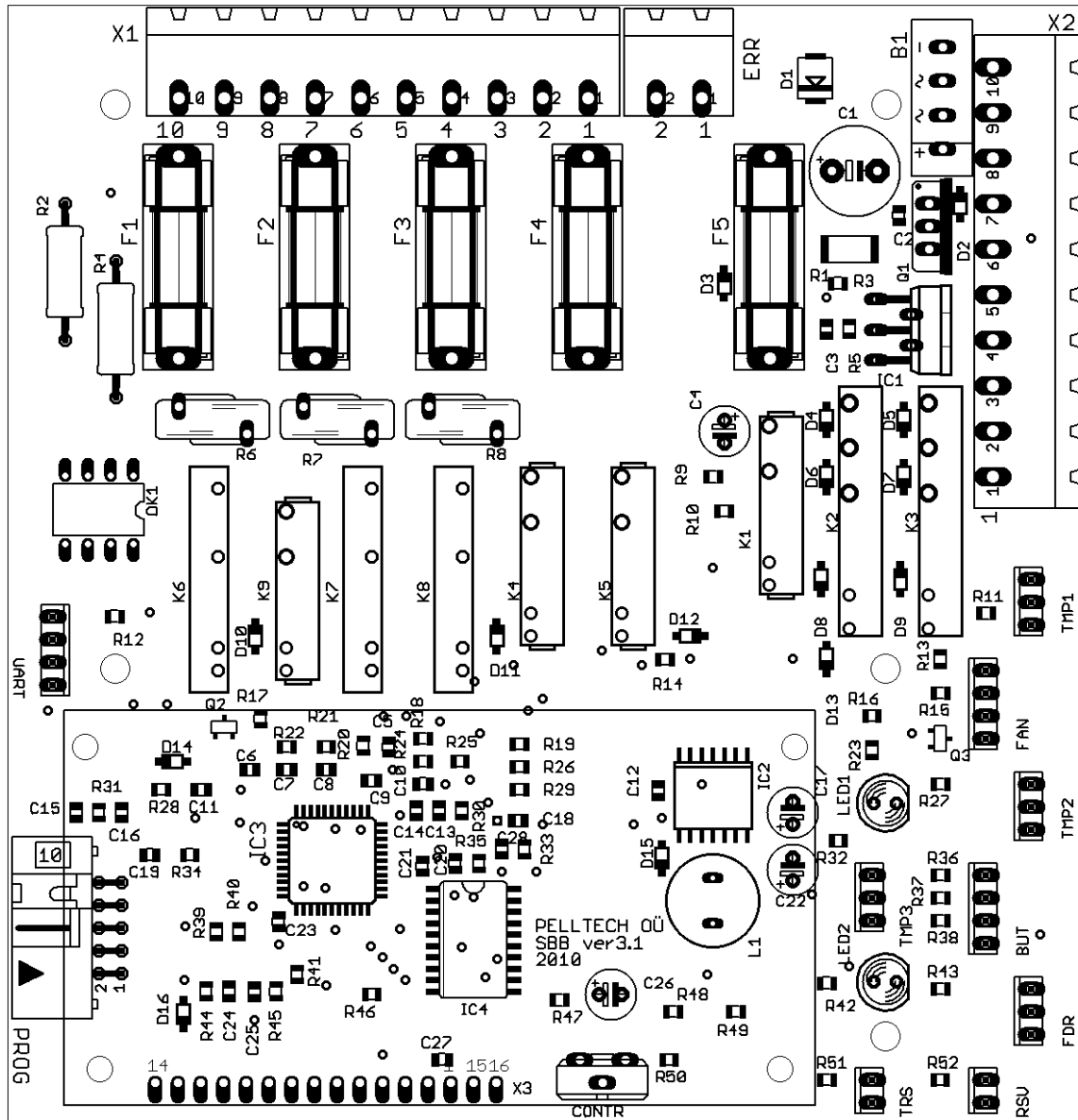


Figure 10 Controller board

Table 8 X1 and X2 connectors

X1	Description	X2	Description
1	Igniter	1	Grate motor+
2	Igniter	2	Grate motor-
3	N	3	Battery positive terminal
4	Flue gas fan	4	Battery negative terminal
5	Mains transformer	5	Flame sensor
6	Mains transformer	6	Flame sensor
7	Fan	7	Feed screw - (black)
8	L	8	Feed screw + (red)
9	Thermostat	9	Mains transformer
10	External auger	10	Mains transformer

BUT – User interface buttons

CONTR – LCD contrast and viewing angle adjustment

FAN – Internal air fan speed feedback sensor

FDR – Feed screw motor speed feedback sensor

TRS – Fuel level sensor transmitter (black marking)

RSV – Fuel level sensor receiver (white marking)

TEMP1 – Feed screw tube temperature sensor

TEMP2 – Ambient temperature sensor

TEMP3

UART – RS232 interface for external modem (5V TTL).

Fuses:

Fuse	Rating	Function
F1	0.5A quick	External auger
F2	1A quick	Fan
F3	0.5A quick	Flue gas fan
F4	3A quick	Igniter
F5	2A quick	Controller and feeder motor

Problems and solutions

Error states	Cause	Action
Stopped	This is actually not an error condition. Burner is turned OFF from menu.	To turn burner on: - hold down OK button at least 3s OR - change row BURNER from OFF to ON in setup menu
No pellets	Maximum loading time is reached (5 or 20 minutes) and not enough fuel from external auger for ignition is loaded	- check fuel in storage - check auger and auger connection to burner
	Fuel level is not detected in 4 minutes at burning time	- check the level sensors, clean them
No flame	Flame is disappeared at preburning time	- check the level sensors, clean them
	Flame is disappeared at burning time	- check the level sensors, clean them
	Flame is not disappeared in end blow state	- check photocell, clean it
Overheat	Burner internal temperature is reached over set-point as fixed in setup menu. Possibly back-burning is happened	- check burner temp. from INFO menu - check temp sensor connection - check burning chamber and clean it - check the chimney and under pressure (draught) in the boiler - check the internal feeder screw connection and rotation
Ignition error	Flame is not detected at ignition time	- check igniter and igniter fuse - check photocell
Level error	Fuel level in the burner has not disappeared at burning time	- Check the level sensors, clean them
Feeder error	Feeder has not made any rotations in 8 seconds at its running time	- check feeder sensor connection - check magnet on the feeder shaft
	Feeder motor current is reached 0,75A permanently in 0,2 second time	- check feeder screw connection - feeder can be blocked
Fan error	Fan has not reached 40 rps in 7 seconds at testing time with full power	- check fan sensor connection - check fan power connections
	Fan has not reached needed speed at burning time in 20 sec.	- check magnet on the fan shaft - check fan bearings and rotation
Grate error	Grate is stucked during the burner cleaning	- Clean the burning chamber manually as described in the "maintenance" chapter
Battery low	Battery voltage is less than 12V with load (working feeder)	- If there was a power failure then just wait when it is charged - replace the battery
No power	No network power	- check power connector, cables - check safety thermostat - check burner for backburn
	Safety thermostat has turned off the power - backburn	

Warranty

Warranty object is pellet burner PV 180a and auger PA1500+B or PA 2000+B.

Producer gives 2 years warranty from the date of sale for the burner and auger. Exemption is ignition element, for this item warranty is 1 year.

Warranty does not cover defects caused by an accident, misuse, abuse, improper installation or operation, lack of reasonable care, unauthorized medication, loss of parts, tampering, attempted repair by a not authorized person, power supply errors or using poor quality fuel.

WARRANTY SHEET

Burner type

PV 180a

Serial number

.....

Date of sale

.... / /

Customers contact details

.....

.....

.....

Installators name and signature

.....

WARRANTY SHEET

Burner type

PV 180a

Serial number

.....

Date of sale

...//

Customers contact details

.....

.....

.....

Installators name and signature

.....