PV20 and PV30 pellet burners

User manual

DK9904B6

1   Contents

2   General

The instruction manual is an integral and essential part of the product and must be kept by the user or system manager. The owner / user shall read and understand this manual before installation and operation of the burner. This manual is intended for all users and contains general information, installation instructions and handling with following burners: PV20a, PV20b, PV20a+, PV20b+, PV30a, PV30b, PV30a+, PV30b+.

The manufacturer of the equipment, Pelltech OÜ, demands that the operator of the device is competent and has sufficient knowledge in the field. The manufacturer does not take responsibility any damage done to the equipment, personal injury, harm to animals or property damage if an incompetent person or persons performs work for which he is not qualified or if the person operating of the device fails to observe the instructions contained in the manual.

> **NOTICE!** Operator is the person or persons responsible for the installation, operation, adjustment, maintenance, cleaning, repair or removal of the machinery.

2.1   Unit description

PV20 and PV30 pellet burners are designed for solid fuels combustion in form of pellets. The burner operates automatically and does not require supervision. The burner is designed to work with central heating boilers for solid fuels, as well as several models of gas or oil boilers with a combustion chamber enabling the collection of ash. The burner is an ecological device as it uses fuel from renewable sources. It also features a small demand for electricity.

Main technical data and dimensions are given in section Specification. Main components of the burner and their locations are shown on Figure 1.

2.2   References to other documents

In this document are references made to: **DK0391 – Software and problem handling manual for PV20…PV500**

2.3   Data plate

Pellet burner PV 30b		No32xxxx
Year of production	2020	
Electrical supply	230V	
Max heat input	27kW	
Emission class	5	
Noise emission	52dB	
Power consumption at stand-by	17 W	
Manufacturer: Pelltech OÜ, Sära tee 3, Peetri, Estonia		

3   Safety

Read and follow these directions carefully. Read the safety instructions carefully before installation. Always follow the safety instructions during installation and during maintenance. **Follow the safety instructions on the warning and notice!**

Installation, operation, service and other work must be carried out by qualified personnel in accordance with local codes and regulations.

Proper installation of the burner is necessary for safe and efficient operation. Installing this product improperly may result to damage of the goods. Contact your local building inspector to obtain any necessary permits or inspection guidelines before installing the product. Contact local building or fire officials about restrictions and installation inspection requirements in your area. Contact your local authority (such as municipal building department, fire department, fire prevention bureau, etc.) to determine the need for a permit. A working smoke detector is required and must be installed in the same room as the burner.

3.1   Safety instructions for installation, use and service

The owner / user shall read and understand this manual before installation and operation of the burner. For proper function and to avoid accidents and damage, these instructions must be followed. Wrong handling and incorrect settings can result in injury, damage and / or malfunction of the equipment.

Following instructions apply:

- Do not start the burner before it is connected to the boiler and the boiler is connected to the chimney.
- To guarantee the efficiency of the appliance and ensure that it functions correctly, it is vital that qualified personnel perform annual maintenance.
- When the burner is connected to the main power supply the burner casing must always be mounted.
- Always make sure that the burner is unpluged from the main power supply before performing any cleaning or maintenance.
- Keep children away and do not touch the equipment during operation.
- Make sure that no flammable or liquid materials are stored in the boiler room or vicinity of the boiler.
- It is recommended to wear a respirator while handling pellets.
- The boiler room where the burner is installed must fulfill all rules and recommendations in accordance with local codes and regulations.
- All electrical installation, plumbing, chimney sweeping and service work shall be done by certified and qualified personnel in accordance with local codes and regulations.

3.2   Safety instructions regarding maintenance and cleaning

Touching live components can result in life threatening injuries. After switching the control unit off, there are still live components inside the control unit until enclosure:
- Switch OFF the power supply, e.g. a mains, and check the system is disconnected.

Hot surfaces and fluids can lead to burns:
- Before maintenance and cleaning work, switch OFF the system and let it cool down.
- Never touch hot surfaces on the boiler, burner, flue system or pipework.
- Wear suitable personal protective equipment.

Hot surfaces and fire from aperatures can result in severe burns:
- Doors, covers and aperatures fastened shut with screws must not be opened during heating operation.
- Allow hot components to cool down before removing.

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When operating the ash container, there is a risk of fire and burns:
- Wear suitable personal protective equipments.
- Only dispose the hot ash in fireproof containers with covers.

Disposal of hot ash in an unsuitable vacuum cleaner creates a risk of fire from ignition of filters and plastics:
- Use an ash vacuum cleaner that is specially designed for this purpose.
- Never use domestic vacuum cleaners made of plastic with fabric/paper filters.

Wood dust, pellet dust, cinders and soot pose a risk to the eyes, skin and airways:
- Wear suitable personal protective equipment, especially breathing equipment and safety goggles.

3.3 Warnings

> **NOTICE:** Observe the country-specific regulations on the disposal of materials, waste and system components.

- Changing the construction of the burner without written permission from the manufacturer is forbidden.
- For personal and operational safety, use only spare parts provided or approved by Pelltech OÜ in order to avoid any damage to the burner and dangers resulting from it. Use of spare parts not provided or approved by Pelltech OÜ will void the warranty.
- Welding is allowed only after disconnecting the burner from electric supply. The circuit board must be removed from the burner.
- Never open boiler door while the burner is in operation. Before carrying out any cleaning or maintenance operations, disconnect the appliance from the mains power supply using the system switch and/ or the relevant external components and let it cool down.
- The appliance must not be used by anyone with little experience and knowledge, unless they are supervised or have been instructed to use the appliance by the person in charge of its safety.

3.4 Notice

- Manufacturer of burners has right to make changes in construction of burner and its firmware.
- Manufacturer of burners declares the materials of the burner meet all the chemical, mechanical and thermal requirements.
- Present user manual is original user manual for PV20 and PV30 burner models.

4 Set of components

The burner is shipped with following components included:

1. Grate
2. Burner
3. Brackets for hose (2x)
4. Flange
5. Ceramic seal
6. 7-pole boiler connector
7. Hose 1m
8. External auger's fixating chain 1m
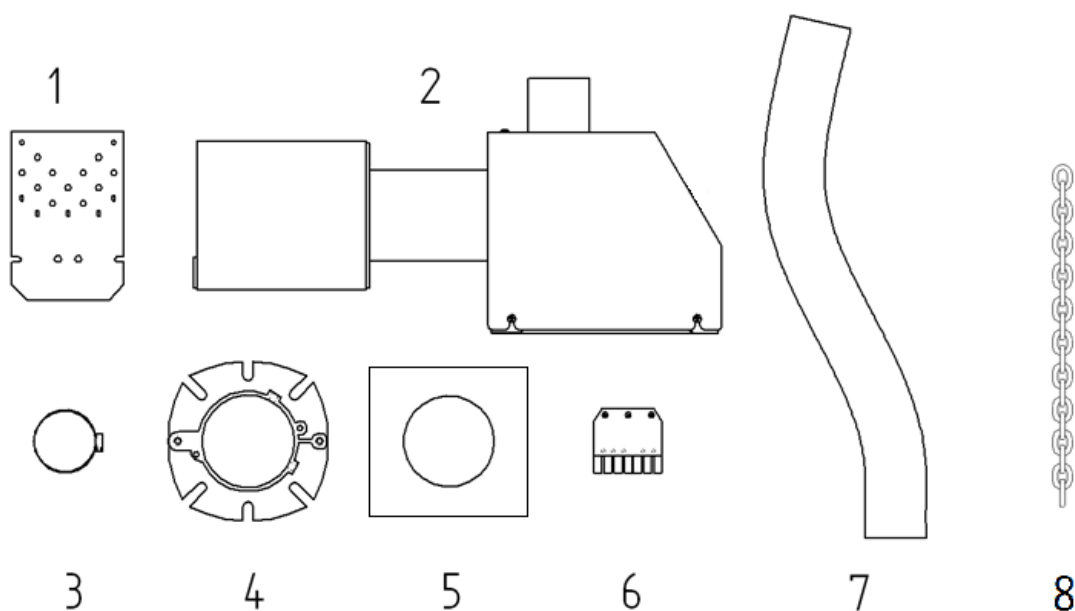
5   Description

Burner models PV20 and PV30 were originally designed as cheaper replacement burner for existing heating systems with oil burners. Both burners can be mounted to new oil, biomass or universal boilers. The burner is multistage type, meaning it can vary its output power according to the needs of the required heat. Both burners have similar construction and working principles. They differ only by size of burning chambers and maximal output capacity.

PV20 / PV30 burners are connected to the boiler with a standard 90 mm flange (similar to oil burners).

Unique electric ignition and automatic power level control make the pellet burner using easier through the whole year. No pilot flame is used in burning procedure. All burners are equipped with several safety devices such as a safety thermostat, melting hose, temperature sensor and a back-up battery.

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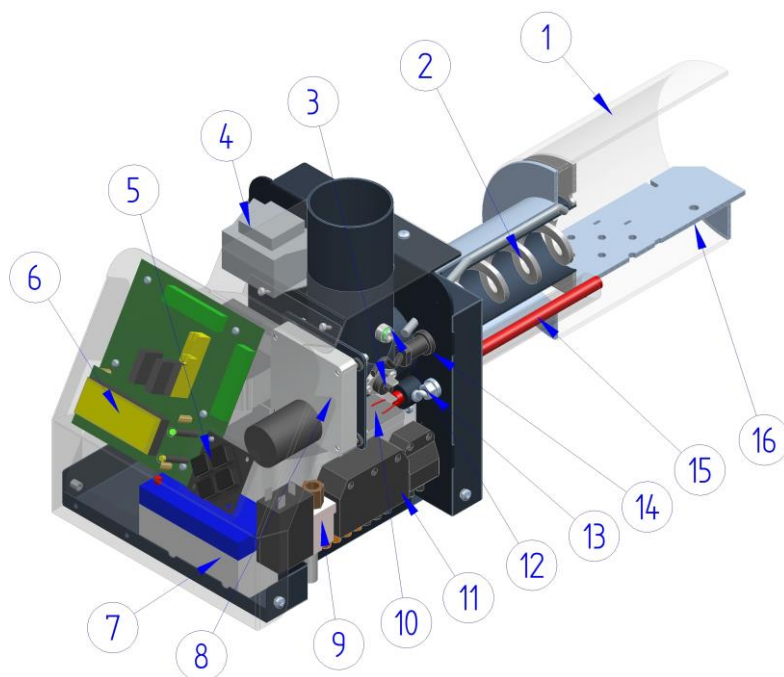
Figure 1 Burner main components

1.	Burning chamber	The place where pellets are burnt.
2.	Feeder auger's spiral	Transports pellets to the burning chamber.
3.	Safety thermostat	Turns off the mains and external auger, when feeder augers temperature rises above limit.
4.	Power supply	230/12V transformer for el. supply of controller and feeder auger.
5.	User interface buttons	Enables to move in menus and set or change burner parameters.
6.	User interface screen	2-row screen to display burner status and to change its settings.
7.	Battery	Enables to empty feeder auger and finish burning pellets in burning chamber when mains power is lost or safety thermostat has turned burner off.
8.	Feeder auger motor	Rotates feeder spiral in order to transport pellets to burning chamber.
9.	Pneumo valve (B-models)	Controls air flow at self-cleaning cycle.
10.	Fan	Blows air to burning chamber according to actual burner power level.
11.	Sockets	For connecting the mains supply, boilers thermostat and external auger.
12.	Fuel level sensor	Optical sensors that detect the fuel in feeder tube. Sensor consists of transmitter – receiver pair.
13.	Mounting nut	M6 nut connects burning chamber to burner housing.
14.	Flame sensor	Optical sensor to detect flame in burning chamber.
15.	Igniter	Electrical heating element that heats up the air and ignites pellets.
16.	Grate	Grate with air supply holes made of heat resistant 4mm steel 253MA on what pellets burn.

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5.1   Model differences

PV20b / 30b models differ from **PV20a / 30a** by having built-in pneumatic cleaning system controlled by burners controller. This feature significantly prolongs the cleaning period. In order to use this feature, air compressor is needed in the boiler room.

PV20a+ / PV20b+ and **PV30a+ / PV30b+** are equipped with built-in under-pressure sensor. It enables to control flue gas fan and keep stable under-pressure in the boiler. This feature improves burning quality and increases efficiency coefficient of burning procedure.

5.2   Principal function

The PV20/PV30 burners are designed to be installed in a boiler and fuelled with wood pellets. The external auger transports the pellets from a pellet container to the burner. The burner's controller board tests main safety components, monitors and regulates the burning procedure, starts and stops the burner automatically according to the boiler temperature. Electrical ignitor ignites the pellets. The burner starts to work when the boiler thermostat switches on. Burner runs until the pre-set maximum boiler temperature (switch-off temperature) has been reached. After that burner finishes burning procedure and goes to waiting status.

Should main supply interruptions occur, the burner will finish the burning procedure safely thanks to built in back-up battery. If there is a safety risk, the burner will perform controlled shutdown.

5.3   Safety devices

The burner will be in every moment monitored by controller board to ensure safe and faultless operation. Back-burning is the biggest danger risk at burners working procedure. Back-burning appears when usual pressure or draught conditions have changed in boiler's combustion chamber. Since the burner will perform self-test before every starting process – it is not necessary to inspect the safety devices of the burner regularly.

The burner has following safety devices (Figure 2) against back-burning and other dangerous situations.
1. Temperature sensor
2. Controller
3. Back up battery
4. Safety thermostat
5. Melting hose
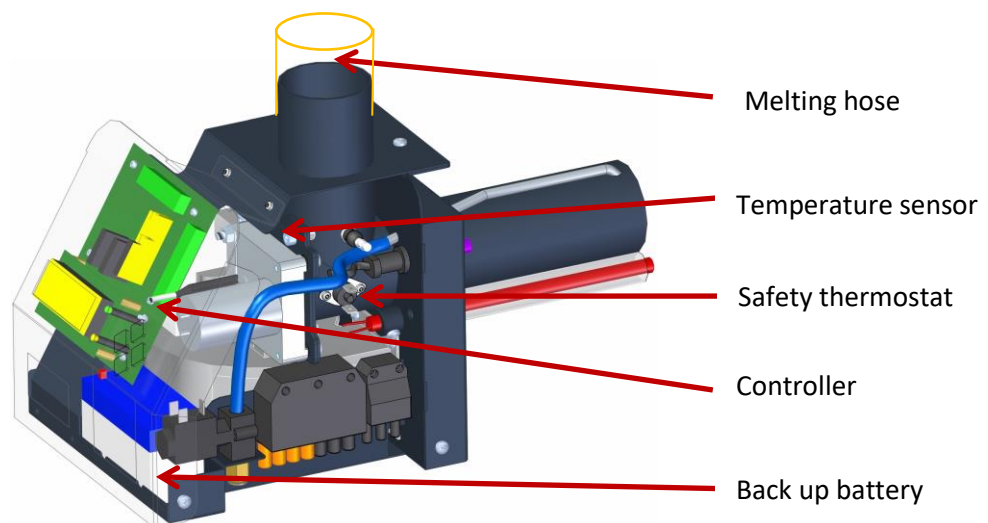
- **Burners controller board:** Controller is always monitoring burners work. If any kind of abnormal activities should occur that would obstruct normal operation, the burner will make controlled shutdown.
- **Flame sensor:** The flame sensor monitors that the unit is burning after the start sequence begins and during operation mode.
- **Temperature sensor:** Monitors the temperature of the pellet feeding tube. In case of higher temperature than normal, the burner will automatically go into end cycle of burning process.
- **Back up battery:** If mains supply is lost, the burner runs on backup battery power and feeder auger transports pellets from feeder's tube to the burning chamber. Battery voltage is checked always at startup and continuously monitored during the operation.
- **Safety overheat thermostat:** Switches off the main power supply if the burner is overheated. Feeder auger is unloaded by using battery power. Thermostat is triggered at 65°C and has to be reset manually.
- **Melting hose:** The external auger is connected to the burner with a special hose, which is made from easily melting polyurethane material. Such measurement avoids entrance of the flame from burner into external auger and pellet container.

5.4   Specification

Description	Unit	PV20	PV30
Heat output range	kW	6 - 18	8 - 27
Fuel	-	Premium pellets 6…8mm	
Max. fuel consumption	kg/h	4.2	6.2
Min. furnace diameter	mm	≥350	≥370
Min. furnace lenght	mm	350	400
Max. flue gas amount (at 150°C)	m³/h	50	75
Required chimney diameter	mm	≥100	≥100
L *total lenght*	mm	540	570
L1 *burner housing lenght*	mm	230	230
L2 *burning chamber lenght*	mm	170	200
øD *burning chanber diameter*	mm	146	162
øD1 *burning chamber neck diameter*	mm	88.9	88.9
øD2 *internal feeder inlet diameter*	mm	60	60
H *total height*	mm	240	240
H1 *burner housing height*	mm	200	200
W *total width*	mm	220	230
W1 *burner housing width*	mm	205	205
Burner weight	kg	11.5	12.5
Emission class EN 15270	-	5	
Noise level	dB	52	
Permiss. working temperature	°C	0 - 60	
Mains supply voltage	VAC	220-240	
El. power at ignition	W	570	
El. power at nominal heat output	W	59	
El. power at standby	W	17	

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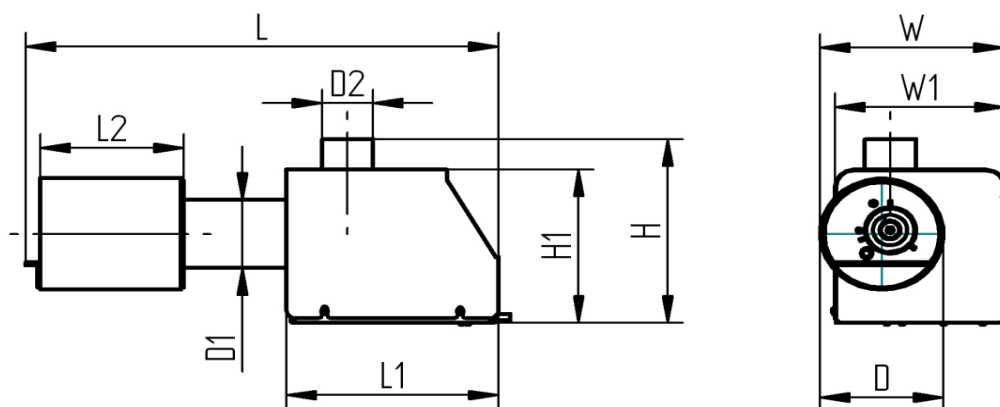
Figure 3 Main measurements

5.5 Pellets

Wood pellets are an environmentally-friendly biofuel type. The advantages of the pellets are the significantly lower prices compared to other fuel varieties, simplicity and convenience. Wood pellets are a product made by compressing renewable biomass - generally residuals from the wood and/or agricultural products industry. Pelletized biomass is a high density, low moisture product with a high heating value that burns cleanly, consistently and efficiently. Pellets have to be stored in a dry and ventilated room.

In PV20b/ PV20b+/ PV30b/ PV30b+ only quality ENplus-A1, ENplus-A2 and EN-B wood pellets can be used.

In PV20a/ PV20a+/ PV30a/ PV30a+ only quality Enplus-A1 wood pellets can be used.

Table 2 Wood pellets properties

Raw material	Sawdust, cutter shavings , logging residues, stem wood, bark, chemically untreated wood
Energy potential	4,6-4,8 MWh/t
Weight	650-670 kg/m^3
Volume of 1 ton	1,5-1,6 m^3
Diameter	6 or 8 mm
Length	3,15..40 mm
Fines content	< 1%
Moisture content	< 10 %
Ash content	< 3%
Ash fusion	> 1100 $^{\circ}$C
To replace 1000 l light oil	ca 2 tons or 3 m^3

NOTICE: Nominal power of the burners is given for the use of pellets produced in accordance with DIN or DIN Plus Specifications. For pellets with other combustion parameters, in particular with a different calorific value, ash level and moisture – the power of the burner may be different, usually smaller.

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Burner, external auger and container form common system. The size and location of the pellet container depends on the needs and possibilities of the 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°. Figure 13
- The container could be closed with a cover.

5.6   Pellet quality

Not all wood pellets make good fuel. It is always a good idea to review the pellet's analysis and try some before committing to several tons. Higher pellet quality allows for more efficient operation. Many variables contribute to the quality of a wood pellet. Many of these have been identified and are regularly tested for by most pellet manufactures and distributors.

Pellet material: Pellets should be made of softwood or hardwood or some combination of the two. Pellets should smell like wood. If not, then other materials may have been used in their manufacturing process. Examples are cardboard and paper that produce excessive ash and require chemical binders to hold the pellets together. All wood pellets (100% wood) don't require binders and rely on the lignin in the wood to hold the pellets together. A few all-wood pellets dropped in a glass of water should swell up quickly. If they don't swell up, this may be an indication that the pellets are not entirely made of wood.

6   Installation

6.1   Requirements to the boiler and boiler room

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

- 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.
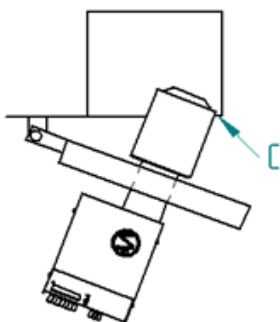
Figure 5 Burning chamber has to reach out of the boiler

- The door of the boiler must have a 90 mm opening (placement opening for the oil burner).
- The thickness of the boiler door must be less than 100mm.

- Size of surface of the heat exchanger must be ≥ 0,067 m²/kw.
- If boiler water content is <100 l, additional accumulation tank is needed.
- Boiler must allow temperature up to 95°C.
- If there is not sufficient negative pressure (less than - 5Pa) in the furnace flue gas fan must be installed.
- 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. The pitch will arise which will damage the stone chimney. In this case a stainless steel pipe should be installed into the chimney.
- The boiler must be positioned on a non-combustible substrate.

> **NOTICE:** It is recommended to use a flue gas analyzer for adjusting the burner. The burner should also be adjusted when pellet quality is switched.

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. Figure 5 below illustrates the situation. Point C is critical.

In order to keep door width minimum and boiler opening as small as possible, a double hinge solution can be used. As double hinges add another degree of free movement, the boiler's door must be closed on both sides.

Model	PV20	PV30
Min. furnace total length - L	350	400
Min. furnace diameter - H	350	370
Min. distance under the burning chamber – H1	100	100
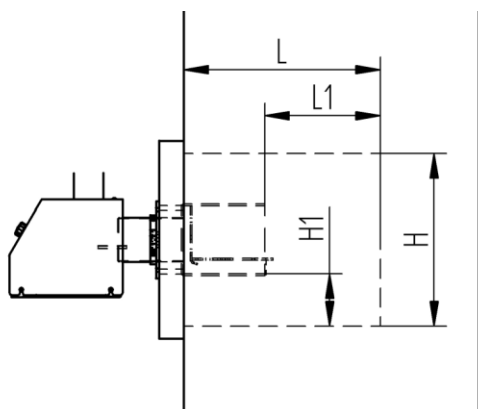
Figure 6 Required measurements for boilers firebox

The burner is mounted to boilers door using supplied oil burners mounting flange. Bolt hole circle diameter and bolt sizes can be customized by using custom flanges. D1 and D2 given in Table 3 and Figure 7 are valid only with supplied flanges.
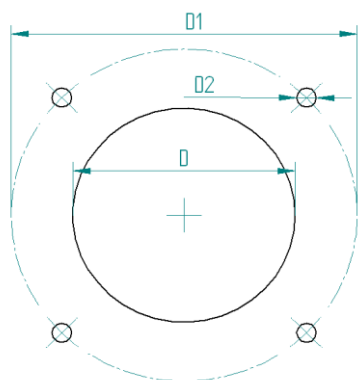
Table 3 Mounting hole measurements

Measurement	Unit	Value
ØD *hole for burning chamber neck*	mm	90
ØD1 *flange bolt ring diameter*	mm	130..150
ØD2 *bolt holes*	mm	8..9

Figure 7 Mounting holes with supplied flange for boiler door

6.2   Boiler room clearances

In order to enable safety installation and later maintenance, follow recommended clearance dimensions. Minimal clearance dimensions in centimeters are in brackets.

A- Container
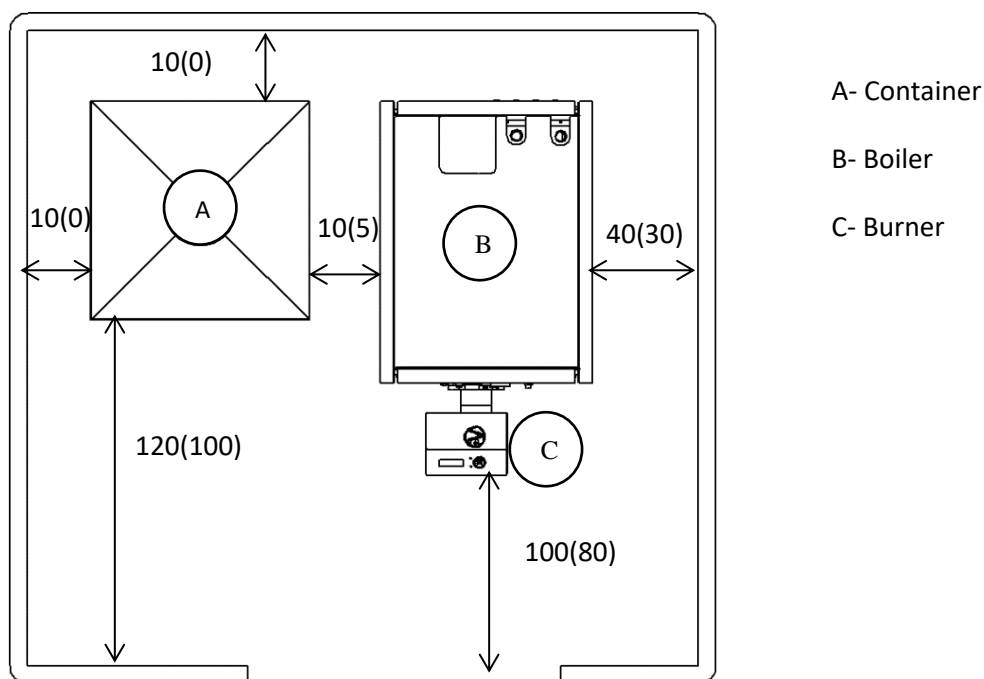
B- Boiler

C- Burner

Figure 8 Boiler room clearances in cm

6.3   Installation of the burner to the boiler's door

Following tools are needed to install the burner:

- spanner no. 13
- spanner no. 10
- crosshead screwdriver
- 4 mm hex wrench

In order to install the burner properly, follow the steps:

1. Remove the red cover of the burner by loosening 4 screws of the cover. There is no need to remove the screws.
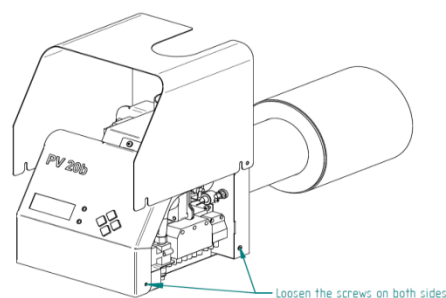
Figure 9

2.   Remove the burning chamber from the burner: release M6 nut (**Figure 10**) that connects burning chamber to burners body. Separate the halves of the burner by pulling the burning chamber and slightly turning it at the same time.
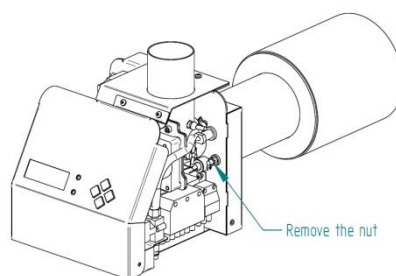
Figure 10
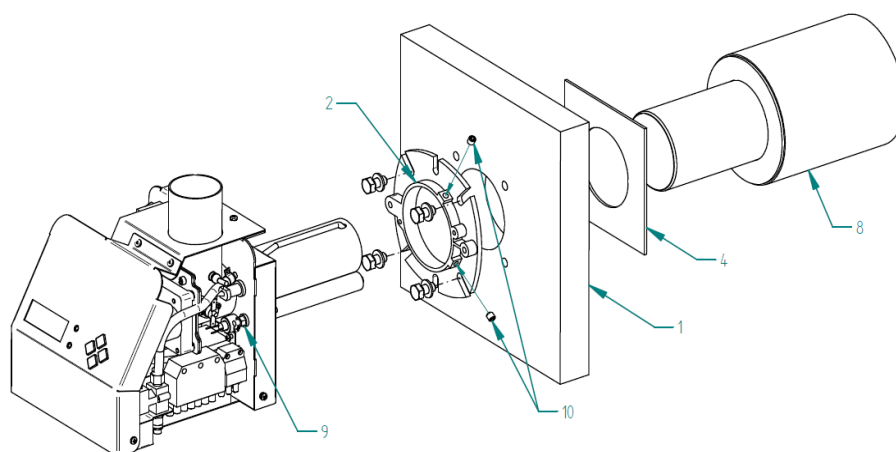
Figure 11 Assembly to boiler's door

3. Fix the flange (2) to boilers door (1). Make sure that opening of flange and the opening of the boiler's door are alligned.

4. Fix the burning chamber (8) to boilers door (1). For that you need to put ceramic seal (4) on the narrower side of the burning chamber and then put the chamber through the door of the boiler in a way that the

rear wall of the burning chamber would lean on the door of the boiler. Fixate the burning chamber with two grub screws (10) to the flange.

5. Connect housing of the burner to burning chamber like it was done before disassembling in step 2.

6. Fixate the halves of the burner with a M6 nut. The nut has to be fastened tight but not too hard.

7. Make sure the halves of the burner are connected correctly – igniters end tip should be at the same level with the burning chambers backwall. The tube of the feeder auger must reach through its opening.

NOTICE: After installation of the burner make sure that end of the igniter is positioned through its opening and not stuck behind back wall. Igniter must not be in direct touch with pellets or flame. Otherwise it will burn out rapidly.

NOTICE: The burning chamber must be mounted in a way that the burning grate will be as horizontal as possible. The connection between the burner and the boiler must be tight in order to avoid any leakage of flue gases.

NOTICE: Warranty ticket must be filled out by installer after installation and commissioning.
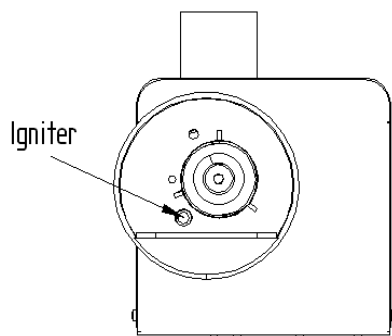
Figure 12 Right placement of igniter

6.4   External auger

The external auger transports pellets from the pellet container to the burner. The burner controls the work of the external auger. The external auger is connected to the burner with a special Ø 60mm hose. The hose is made of melting polyurethane material and acts as a safety measure against back-burning. External auger can be fixed to a ceiling or container depending on conditions at the site. Figure 13 depicts correct installation of external auger.

External auger has to be installed as follows:
 • Hang auger to ceiling or fixate it to the boiler in the way mentioned below.
 • Install hose between auger and burner. Fixate hose with 2 brackets from both ends.
 • Connect auger's cable to burner. Make sure that plug is surely connected with socket.

Make sure, that:
 • The vertical distance between the output of external auger and burner is 400 – 700 mm.
 • The horizontal distance between the output of external auger and burner is 100 – 200 mm. It ensures that the hose will melt incase of back-burning.

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- The raising angle of the auger doesn't exceed 45° to ground, otherwise the auger doesn't manage to transport enough pellets.
- In order pellets can fall freely into burner, the falling angle must be between 50° and 85°.
- Plug of the external auger is surely connected with burner's socket.
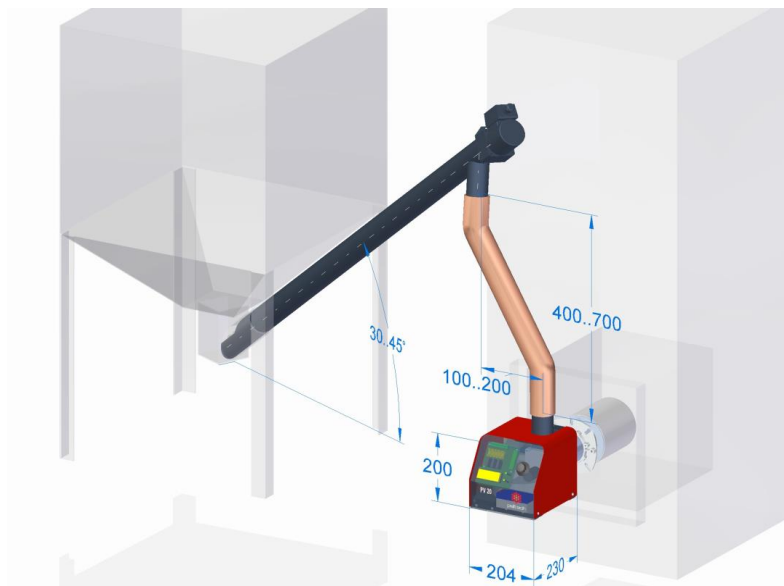
Figure 13 External auger placement

6.5 Electrical connections

The burner is equipped with a standard oil burner plug (under red cover on right side) that has 7 contacts. There are different connection schemes used for different boilers. Most of the times burner is connected to the boiler with a 5-wire cable (**Error! Reference source not found.**). Possible is also 4-wire connection. In both cases connection of boiler thermostat 'Tt' is different. In **Error! Reference source not found.** there are depicted socket connection diagrams of external auger, flue gas fan and boiler.

WARNING: All electrical connections of the burner must be made by a qualified professional.
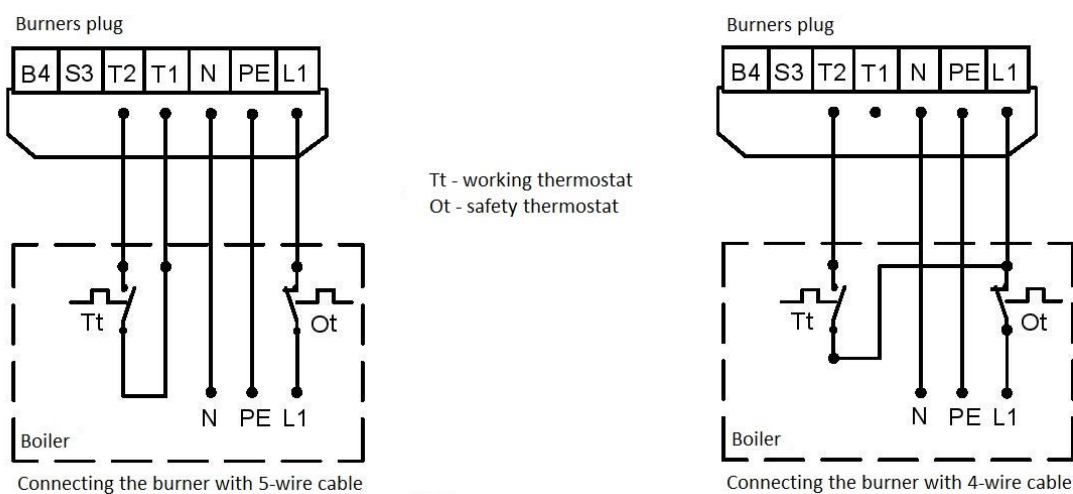
Figure 14 Burner connections

7   Operation and service

7.1   User interface

The burner can be observed and controlled from the front panel on user interface Figure 15. LCD screen (1) displays main menu and set-up menus, info menu and burner's actual statuses and status history. Yellow LED (2) indicates the presence of flame in burning chamber. If yellow LED blinks, the burner is out of normal operation or switched off. Green LED (3) indicates existence of fuel in the burner. Last burner's status can be seen on lowest row of STATUS menu. The burner displays two last statuses or error message. To move back in history of statuses push "up" (↑) button. Shown are 30 last statuses in burners memory together with duration in hours, minutes or seconds. To change parameters use "up" or "down" (↑↓) buttons to enter to desired menu. Confirm entrance with OK. Change with "up" or "down" (↑↓) buttons desired parameter. To confirm the change, press OK. Press ESC button to go back to STATUS menu. Main actions of OK and ESC buttons are described in Table 4.
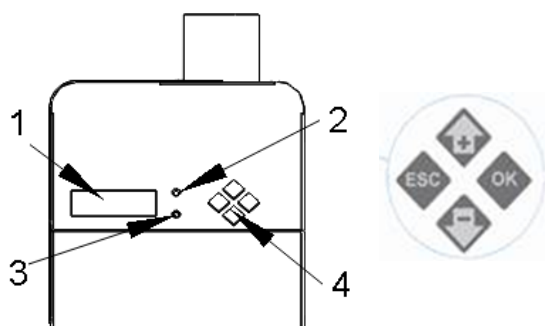
1. 2-row LCD display

2. Yellow LED indicates existence of the flame in the burning chamber

3. Green LED indicates existence of fuel in the burner

4. User interface control buttons

Figure 15 User interface front panel

Table 4 User interface OK and ESC buttons

Button	Pushing time	Action
OK	Less than 3 seconds	1. Entering into sub-menu 2. Confirming setting (when blinks)
OK	More than 3 sec	Resetting error status and turning burner ON
OK	More than 3 sec in INFO menu's submenu COUNT	Resetting pellets interim counter
OK	More than 3 sec in NO POWER status	Switching burner and battery OFF
ESC	Less than 3 seconds	Moving back in menu. Cancelling setting (when blinks)
ESC	More than 3 seconds	Turning burner OFF
OK + ESC	More than 3 seconds	Burner's reset
OK + ↑ or ↓	More than 3 sec in INFO menu's U=… I= … submenu	Starts burners self cleaning. (Since software 3.91.18)

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7.2   Initial start up

Before initial start-up the burner ensure that:
- The neck of burning chamber fits correctly to burner's housing.
- The M6 nut that connects burner's housing and burning chamber is tightened.
- The grate is placed correctly into burning chamber. The back edge of grate has to be against the back wall of burning chamber and fixator stub is inside the chamber.

Grate has to be against the back wall

Stopper of grate has to be inside of burning chamber
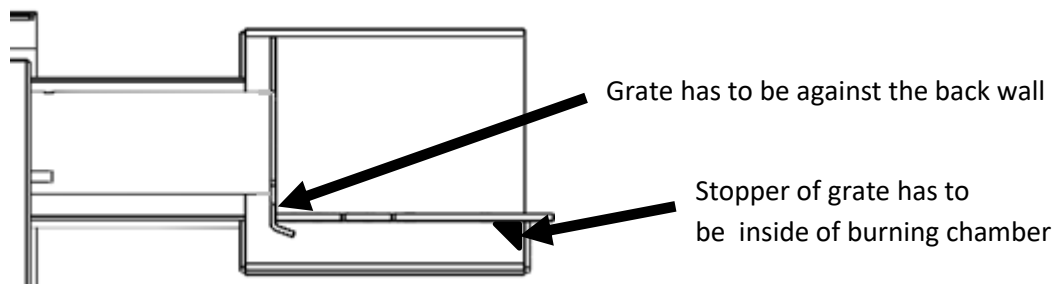
Figure 16 Grate's correct placement

- Igniter is not stuck behind buring chamber's back wall and its end is on same level with end of its holder tube and does not reach out from it. Igniter must not be in direct touch with pellets and flame.
- Boiler thermostat is installed correctly and is functioning properly.
- Boiler thermostat is turned to lowest temperature.
- The external auger is connected to the burner according to Figure 13.
- The smoke duct is connected to the chimney, the dampers for smoke gases are open and draft is sufficient. When the burner is operating, underpressure inside the boiler should be 4 - 6 Pa.
- Boiler's air hatches are closed and air goes through the boiler.
- Electrical plugs of external auger and boiler on burner's right side are pushed fully into outlets.

7.3   Starting and stopping

To turn on the burner:
- turn on the boiler's main switch. If burner displays STOPPED, set in main menu BURNER from OFF to ON or push OK button more than 3 seconds
- turn boiler's thermostat to desired temperature

To stop the burner:
- turn boiler's thermostat to lowest temperature or
- set in main menu BURNER from ON to OFF or
- push ESC button more than 3 seconds

In all cases the burner stops working when all pellets in burning chamber are burnt and turns safely to STOPPED status.

WARNING: Never turn off a working burner from boilers main switch. Use the boilers thermostat for that. In order to complete burning procedure safely let the burner to burn all fuel in burning chamber. Never leave burner unattended when you had to stop boilers work by turning boiler off from mains switch in any reason.

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7.4   Refilling fuel

Fuel can be added at any time during the operation. If the container runs empty before new fuel is added, pour more fuel into container and restart the burner by pressing OK button down for 3 seconds or switching from main menu BURNER ON. Starting will take more time because external auger has to be loaded as in initial start up.

7.5   Log description

Log screen STATUS menu displays last and actual events (burner statuses). Burner displays in STATUS menu last row actual status or error message and their duration. Statuses that remain upper of last row are in historical sequence and start from down to up. Use "up" (↑) button to move back in history. Burner changes its statuses based on received input signals from sensors and parameters set by user.

Burner statuses are described in Table 5.

Table 5 Burner statuses

Status	Description
STOPPED	Burner is turned off from main menu.
WAITING	Burner is turned on and waits for boiler's thermostat to switch on. There are no time limit for WAITING status. Feeder auger works periodically at WAITING time and makes ½ rotations after every 2 minutes. When thermostat switches on, burner goes to TESTING.
TESTING	At this state burner will run a short self-test to ensure everything is working normally. Any failure will turn off the burner and will require attention.
CLEANING (only B models)	Burner's burning chamber is cleaned with pressurised air. Cleaning takes place: • always after switching burner on or resetting error state • at interrupted work after time set in PAR48 after first testing • at uninterrupted work after reaching double time set in PAR48. Burner will be stopped to perform CLEANING Time between two cleaning cycle can be set from PAR48 and length of blowing pressurised air from PAR49.
LOADING	At this state internal feeder will feed the pellets to burning chamber. Maximum load time is limited to 5 minutes in normal conditions and 20 minutes when burner has been STOPPED or run empty of pellets. Igniter is pre-heated in the end of LOADING cycle. Igniter is switched on for max 1 min in order to save its lifetime. At the LOADING time, external auger holds permanent fuel level in the feeder tube. Depending on the level sensor signal, the external auger is turned on or off.
IGNITING	The pellets are in burning chamber ingnited. Igniter and fan are working until photocell recognizes the flame. To avoid overheating igniter works 50 second cycles, staying on time defined in PAR85. In ignition mode the fan blows hot air according to rotations set in PAR8. If flame is not detected for 4 min 10 sec then the burner will do LOADING2.
LOADING 2	If flame is not detected after 4 min 10 sec second small amount of pellets according to PAR25 is delivered to burning chamber. New attempt of ignition. If flame is not detected in second IGNITION, E24IGNITION is displayed.

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PRE-BURN	The purpose of pre-burn mode is to fully ignite the pellets that were loaded for ignition. Only fan blows, igniter is switched off. Pellets start to burn. Pre burn consists of 1-4 cycles with duration 30-80seconds each. Little amount of fuel is added between cycles. PRE-BURN time and number of igniting cycles is pre-set with PAR41 and PAR42.
BURNING	This is the main operation status in burner operation. Burner can operate on 11 different power levels. There are 6 main power levels, which can be selected and adjusted and 5 virtual power levels between main levels that can't be adjusted or selected. For every power level fan speed is fixed with PAR1...6. The fan speeds for virtual levels are calculated as average from previous and next main level speed. 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: • external auger is started after level sensor does not recognize fuel in burner and internal feeder has done 1/2 rotations set in PAR81 • external auger is stopped when level sensor recognize fuel in burner for more than ½ seconds, set in PAR82 Burner will enter E28LEVEL fault condition in following cases: • fuel loading timeout (no signal for specified period of time) • fuel unloading timeout (signal lasts longer than specified period of time)
HOLD FLAME	HOLD FLAME mode purpose is to avoid burner start-up procedures when BURNING cycle is much longer than WAITING status. In HOLD FLAME mode, minimum fuel and air amount is delivered into burning chamber. HOLD FLAME mode can be switched from burner main menu to ON, OFF or AUTO. When HOLD FLAME is selected as AUTO then burner will turn the mode on or off depending of WAITING time: • if time between two sequential WAITING states has been shorter than set in PAR11, then HOLD FLAME mode is switched on • if HOLD FLAME time has been longer than set in PAR12 (30-90 min), HOLD FLAME mode is swiched off AUTO status lasts time set in PAR12 and ends with END BURN cycle. In HOLD FLAME cycle, burner is fed pellets every 127 seconds and air is blowed as set in PAR10.
END BURN	Boiler has reached estimated temperature and boiler thermostat has switched burner off. No fuel is added in this state. External auger is stopped, feeder and fan work until all fuel is burnt.
END BLOW	Photocell doesn`t recognize flame in the burning chamber, fan keeps on working with speed set in PAR9 up to all pellet coal is burnt. That state lasts time set in PAR27, after flame dissapearence.

7.6   Output power levels

Burner has 6 pre-set output power levels. For every level, program calculates correct fuel amount that depends on fuel's calorific value and burner's internal feeder productivity. The feeder productivity for normal, light and heavy pellets can be changed from main menu. For normal pellets it is 30 gramms per rotation. Calculated amount of fuel is divided into periodic feeding cycles. In every cycle internal feeder makes half rotation. For every power level there is different pre-set fan rotation speed.

Burner selects the output level between pre-set min and max powers. If burning time has lasted more than set in PAR15, in next burning cycle burner will increase one power level up. If burning time has been less than set in PAR16, in next burning cycle burner decreases one power level down.

7.7   Main menu and settings

Press OK button to enter main menu. Use "up" or "down" (↑↓) buttons to move in menus. Press OK to enter for changing set up values or see burner's information. The existing burner's value or info is displayed. To change settings value press OK again. Existing value starts to blink. Using "up" or "down" (↑↓) buttons select new value and confirm the choice by pressing OK. Pressing ESC takes you back to STATUS menu.

Table 6 Main menu

	Menu's name	Description	Default settings	Options
1	STATUS	Submenu with status and error info	-	
2	INFO	Burner's technical info	-	
3	BURNER	Burner's turning ON/OFF	OFF	ON/OFF
4	HOLD FLAME	Hold flame activated	OFF	ON/OFF/AUTO
5	PELLETS	Fuel quality options	NORM	NORM/LIGHT/HEAVY
6	POWER	Power level selection	AUTO	PV20 AUTO/6/12/14/16/18/20 PV30 AUTO/9/18/21/24/27/30
7	BASE AIR	Fan speed change at once for all power levels	0	-2/-1/0/+1/+2/+3/+4/+5
8	LANGUAGE	Language options	ENG	*Annex 3 Table of languages*
9	PARAMETERS	Parameters menu		

STATUS menu displays last events (burner states) and their duration. All durations are described in form mm:ss ('m' in the middle) or hh:mm ('h' in the middle). Last row of the log shows the current state. All burner's statuses are described in Table 5.

```
PRE-BURN 02m10
BURNING 03h:24
```

INFO menu displays main burner's indicators like:
- VER 3.91.18 7877   - firmware version
- U=13.6V   - battery voltage
- I=0.2 A 1.2/0.1A   - feeder motor actual and starting currents
- T_{in}=23°C   - burners input tube's temperature
- Tot= 6t 555.9kg   - total amount of pellets in tons and kilos
- Cnt= 5110.9kg   - interim amount of pellets burnt in kilos (resettable from INFO menu)
- F=24/25±1 0/35rps - fan's speed (24 actual speed of primary fan/25 set-up speed of fan, ±1 added base air rotations, 0/35 same for secondary fan)
- -2Pa 28%   - underpressure in burning chamber (28% displays flue gas fan's power useage)
- P=12/16 kW   - actual and pre-set power level
- T=22.3 ^{o}C   - TMP1 external sensor's temperature

The main idea of **HOLD FLAME** function is to reduce permanent ON-OFF cycles. This function is useful if burner's BURNING time is much longer than WAITING time. For an example 1 hour of BURNING time and

10 minutes of WAITING time. In HOLD FLAME state the burner will work on 2kW power. If HOLD FLAME is switched <u>ON</u> from main menu the burner goes to HOLD FLAME always after BURNING for time set in PAR11. If boilers working thermostat switches on before time set in PAR11, burner goes back to BURNING state. If boiler working thermostat doesn't switch on before time set in PAR11, the burner finishes burning with END BURN and END BLOW states. The length of HOLD FLAME is settable from PAR12. If HOLD FLAME is set to <u>AUTO</u> in, then HOLD FLAME will be activated if two sequential WAITING times have been shorter than set in PAR11. The length of state in this situation is with PAR12.

Menu **PELLETS** enables to select between 3 pre-set fuel quality options. Depending on fuel quality, the weight of pellets and its caloric value may differ in same volume. Normal weight for pellets is 650...670 kg/m^3. If pellets density is smaller i.e they are lighter, then with one rotation less pellets will be delivered into burning chamber. This can be compensated by selecting LIGHT from PELLETS menu. Now burner delivers <u>more</u> pellets into burning chamber. If pellets are heavier than normal HEAVY has to be selected in PELLETS menu. Now burner delivers <u>fewer</u> pellets into burning chamber. In general case there is no need to make changes in PELLETS menu. **Notice:** Weight of pellets can be manually changed in PAR21...PAR23.

Menu **POWER** determines caloric productivity of burner in kilowatts. Power is calculated by reading the rotations of the feeder auger, taking into account average caloric value of 1kg of pellets. It is possible to pre-set particular power level value or AUTO - automatically selected value. In AUTO status burner selects necessary power level depending on time when is needed to achieve pre-set temperature. Burner changes its capacity that is determined by parameters MIN POWER (PAR13) and MAX POWER (PAR14). If burner cannot achieve pre-set temperature in certain time (PAR15) it will rise its power automatically one level up and continues rising power up until reaching maximum level (PAR14) or boiler has achieved pre-set temperature. If boiler achieves pre-set temperature faster than set in PAR16 burner will work one power level lower in next cycle. Power will be reduced as long as burner has reached minimal power level (PAR13).

Menu **BASE AIR** increases or decreases speed of fans in all power levels by same number of rotations according actual need for combustion air.

Menu **LANGUAGE** enables user to select between 17 different languages.

Menu **PARAMETERS** gives overview of burner's default, min and max settings. The menu enables fine tuning of the particular burner. Short description of parameters is given in "DK0391 - Software and problem handling manual for PV20...PV500".

7.8   Self-cleaning and maintenance

All burner models of PV20/ PV30 need regular maintenance. The frequency of it depends on quality of pellets and intensity of heating. Average frequency is once a month.

Despite pellet burners PV20b/ PV30b have pneumatic self cleaning system, the ash collects under and on the grate and has to be removed manually. If ash gets under the grate, then it closes air channels, grate heats up and gets deformed (Photo 1). That reduces burning quality. Even normal quality pellets contain up to 1.5% ash. Low quality pellets contain more ash and nonburning substantces.

Depending on pellets quality the maintenance frequency may vary.

Self-cleaning system consists of compressor, pressure hose, pneumatic valve and metallic tube welded onto feeder auger tube. Burner makes self-cleaning:

- Every time after the end of TESTING when burner is switched ON or error message is reset.
- After interrupted working time set in PAR48 (minutes) after next TESTING status.
- After double uninterrupted working time set in PAR48 (minutes).

Self-cleaning is made by blowing compressed air into burning chamber and thus cleaning it from collected ash and non-burned residues. Ash is blown from burner into boiler's ashbox. Length of blow time in ½ seconds is set from PAR49. Depending on the quality of the pellets, it might be necessary to set self-cleaning time shorter or longer (PAR48).

Photo 1 Defrormed grate and burned-out burning chamber

In order to avoid grate's and burning chamber's deformation both have to be cleaned separately.
To clean the grate:

1. Turn burner off from boiler's thermostat and let it cool down for at least one hour.
2. Unplug burner's cable.
3. Open boilers door and take grate off from burning chamber.
4. Remove collected ash from burning chamber with brush or vacuum ash cleaner. Make sure all grate holes are clean.
5. Clean the boiler. Cleaning frequency of boiler depends on its type and intensity of heating.
6. Place grate correctly back to burning chamber as shown in Figure 16. Wrongly placed grate reduces air supply and efficiency of burning. The grate of PV20b must not be replaced with grate of PV30b and vice verse.
7. Close boiler's door.
8. Plug in cable, start the burner and turn thermostat to desired temperature.

ATTENTION! MANUFACTURER OF PELLET BURNERS DON'T PRESCRIBE TIME PERIOD OF BOILER CLEANINGS. BOILER HAS TO BE CLEANED FROM ASH AND NON-BURNING RESIDUES BEFORE THEY GET TOUCHED WITH BURNERS BURNING CHAMBER. The ash and non-burning residues are perfect heat insulators. If burning chamber is surrounded with ash and non-burning residues so its normal ventilation is distracted. It causes fast overheating, out-burning and deformation of the burning chamber. **ATTENTION! DEFORMATION AND OUT-BURNING OF BURNING CHAMBER CAUSED BY NOT-IN-TIME MADE CLEANING IS NOT MANUFACTURING DEFECT AND IS NOT WARRANTY OBJECT.**

NOTICE: From time to time the pellets container has to be cleaned from collected saw dust. If there is too much saw dust collected, the external auger can't reach pellets and NO PELLETS error message is displayed.

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8   Replacing the components

Warning! Remove the burner from power circuit before opening the burner's case and replacing the components.

Warning! Follow always polarity when connecting battery. In case the battery is wrongly reconnected, it will ruin the controller and it is dangerous to the person.

Warning! Connect burner to mains only if first panel is rised up and fixated with screw. It is against danger caused by incorrect connecting battery polarity.

Notice! If you find that replacing components may turn out too complicated to you, it is recommended to appeal to specialist.

The locations of burner's replacement components are presented on Figure 17.
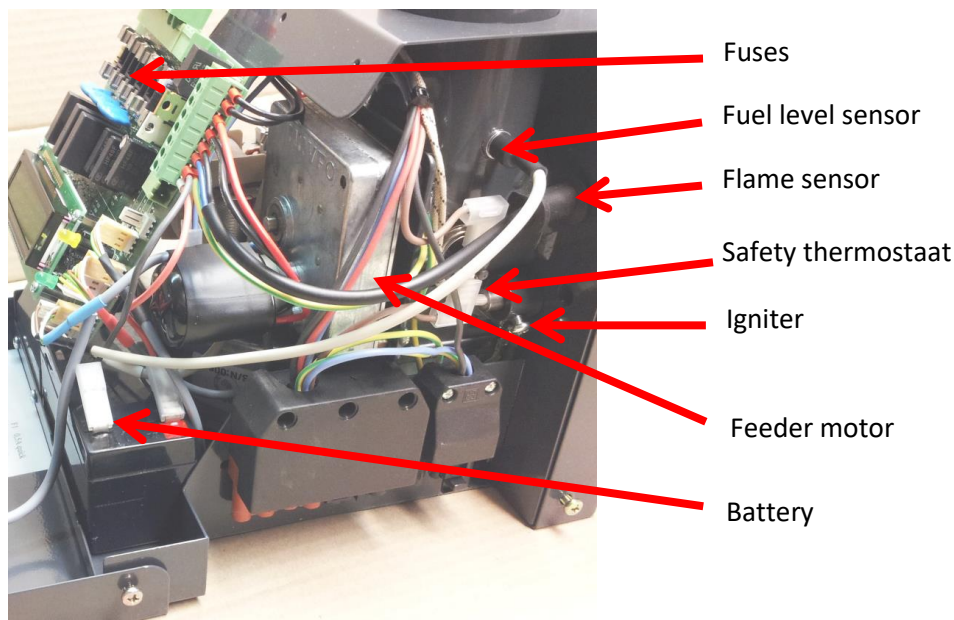
Figure 17 Replacement components

8.1   Replacing igniter

For replacing the igniter a small flat screwdriver and a cross-head screwdriver are needed.
1. Be sure that burner has cooled down and disconnected from power circuit.
2. Remove burner's red cover by loosening 4 screws (2 on both sides).
3. Disconnect igniter's wires from screw connector X1.
4. Turn loose the screw that attaches the igniter to its case.
5. Open boilers door to get access to the burning chamber.
6. Press igniter into burning chamber and take it out through the burning chamber.
7. Swirl the wires of new igniter together and put them through the burning chamber into the socket of igniter.
8. Push the igniter so deep into its case that the igniter's end would be on the same level with burning chamber's rear wall.
9. Tighten the fixing screw again and make sure that the igniter's other end would not be in touch with the rear wall of the burning chamber.

10.Reconnect the wires back to connector X1 terminals 1 and 2.

> **NOTICE:** If igniter is out of its opening, then it will get to contact directly with pellets and flame. In that case iginiter burns out very quickly.
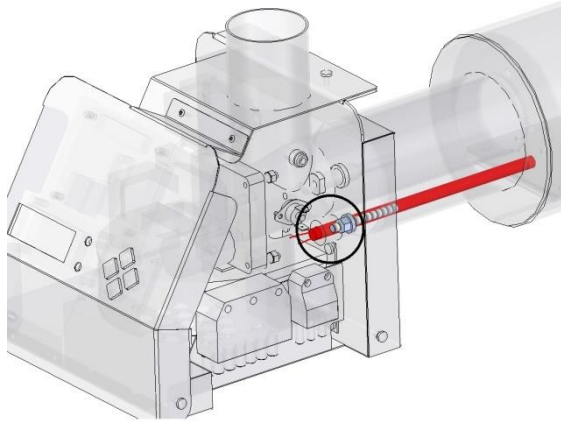
Figure 18 Placement of igniter   **Figure 19 Safety thermostat**
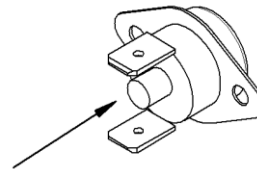
8.2 Resetting safety thermostat

When burner is overheated, the safety thermostat turns it off. Overheating may arise when draft in boiler is in wrong direction and pellets start the back-burning in feeder's tube. In case of overheating yellow LED indicator on burner flashes and E20TEMP message is displayed. Thermostat is located on the horizontal tube of feeder auger Figure 17.

The safety thermostat with button has to be reset manually. To do that:
1. Make sure the burner has cooled down and disconnected from power supply.
2. Remove burner's red cover by loosening 4 screws, 2 on both sides.
3. Press small button on thermostat.
4. Place red cover back.
5. Connect mains supply.
6. Press OK for 3 seconds to turn burner ON.
7. If flame indicator keeps on flashing and fuse F5 is well, replacement of thermostat is needed.

If mains supply returns but the message NO POWER remains in screen, restart burner by holding OK + ESC buttons down more than 3 seconds.

8.3 Replacing fuses

Burner's controller is protected against the errors of external devices with electrical fuses. Fuses may burn out in case e.g. foreign object gets into the fan or motor and blocks their work. Fuses are located in the upper side of the controller's plate and are labeled as F1...F4.

Replacing fuses:
1. Make sure the burner is removed from power supply.
2. Remove burner's red cover by loosening 4 screws (2 on both sides). See Figure 9.
3. Remove the fuse and check its' state with a tester or looking it against the light.

4. Replace the fuse with an equivalent one if necessary. The plastic cover of the fuse holder must be placed back directly not obliquely. Otherwise the cover might push the contacts far from each other and break the connection.
5. In case the fuse burns out again, the component which is connected to the fuse probably needs replacing.

8.4   Replacing fuel level sensors

The fuel level sensor consists of an optical transmitter and receiver which are alligned on either side of the vertical part of the feed screw's tube. Figure 1 pos 11.

The typical problem of the level sensor is getting dirty. Try cleaning them before replacing the sensor. While cleaning, it should be considered that lenses are made from plastic and they should not be scratched. The lens is getting dirty if there is no draft and the flue gases moves along the feed screw back to the burner. The soot and heat of the flue gas covers the surface of the sensor with an opaque layer. Sensors should not be replaced before you are absolutely sure that E28LEVEL error is caused by sensors. Sensors cleaned too often without direct need will get damaged sooner.

Replacing fuel level sensors:
1. Make sure that burner is removed from mains supply.
2. Remove burner's red cover by loosening 4 screws (2 on both sides).
3. Disconnect sensors from controller and and turn the sensors out from the boiler feeder's tube.
4. Install new sensors and follow while connecting cables: TRS is black sensor and RSV is transparent sensor.
5. Place back burners red cover and connect burner to supply mains.

8.5   Replacing flame sensor

The flame sensor may get dirty or melt during back-burning. For replacing the sensor a small flat screwdriver is needed for unconnecting the wires.
For checking and replacing:
1. Make sure that burner is disconnected from mains supply.
2. Remove burner's red cover by loosening 4 screws (2 on both sides).
3. Pull the sensor with rubber cover out of its nest and clean its transparent part with soft cloth and alcohol.
4. If sensor is melted disconnect wires from connector X2 and replace the sensor.
5. The connection order of sensor's wires is not important.
6. Place back burners red cover and connect burner to mains supply.

8.6   Replacing fan

For replacement small flat screwdriver and at least 18 mm long crosshead screwdriver (preferably with magnetic tip) are needed.

1. Make sure that burner is disconnected from mains supply.
2. Remove burner's red cover by loosening 4 screws (2 on both sides).
3. Disconnect **carefully** gray and blue wire from fan and cable from FAN socket on controller board.
4. Remove the rest of the plugs attached to the controller. Green plugs of X1 and X2 terminals must be pulled out in parallel direction of the plate.
5. Remove the tin attaching the controller that prevents the access to the fan.

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6. For accessing the screws of the fan, removing the battery is necessary. The battery is attached to the bottom with a double-sided tape.
7. Turn loose the four screws folding the fan and replace the fan. Do not forget connecting PE wire to upper right corner of the fan.
8. Place back the battery and controller with the tin. Chart inside the burner's front cover facilitates connecting the sensors.
9. Reconnect fan sensor to FAN socket and the rest of the plugs.
10. Reconnect gray and blue wires with the fan.
11. Place back burners red cover
12. Connect burner with mains supply.

8.7   Replacing feeder auger motor

The condition of the feeder auger's motor is crucial for safety. Failed feeder auger motor may cause back-burning therefore the motor must be replaced after every 2000 working hours or after 30 tons of pellets are burnt. Roughtly calculated amount of pellets burnt (in tons and kg) is accessible from INFO menus submenu COUNTER.

1. Disconnect burner from mains supply.
2. Remove burner's red cover by loosening 4 screws (2 on both sides).
3. Remove two upper screws fixing user interface tin.
4. Release two lower screws fixing user interface tin and pull tin back.
5. Unplug X1 and X2 terminals and control cables of fan, FDR (feeder), TEMP1, TRS, RSV and buttons.
6. Remove from X2 terminal red wires of feeder motor and pneumatic valve (connector 8), black wire of feeder motor (connector 7) and yellow-green earthing wire of feeder motor.
7. Remove two lower and one upper screw fixing controller's tin.
8. Pull controller's tin up and place beside.
9. Remove three M5 cap screws fixing motor to feeder's flange.
10. Pull motor with spiral out.
11. Release cap screw fixing auger spiral to motor's shaft and separate motor from spiral.
12. Remove three M5 nuts and four cap screws (three longer, one shorter) from motor.
13. Remove feeder sensor from motor.
14. Screw four cap screws, place feeder sensor and three nuts to new motor.
15. Place flange to new motor.
16. Place metal washer to motors shaft.
17. Place spiral to motor shaft and tighten grub screw to shaft of motor.
18. Fix flange with motor with three grub screws to feeder flange.
19. Place back controllers tin and fix it with three screws- two lower and one upper.
20. Place back user interface plate and fix it with 2 screws form corners.
21. Plug X1 and X2 terminals and control cables of fan, FDR (feeder), TEMP1, TRS, RSV and buttons.
22. Screw red wires of feeder motor and pneumatic valve (connector 8), black wire of feeder motor (connector 7) to terminal X2 and yellow-green earthing wire to feeder motor.
23. Turn user interface tin to vertical position and fix it with 2 upper screws.
24. Place back red cover and fix it with screws.
25. Connect burner to mains supply.

8.8   Replacing battery

When multiple power interruptions have occurred recently, the battery may just be empty. In that case the battery needs to recharge and replacing the battery is not neccessary. Batterys voltage has to be >11V.

Battery must be replaced after every 5 years or when the burner gives E48BATTERY message even though it has been recharged. As the battery is also safety device, burner monitors the state of battery and interrupts next work cycle if battery voltage is not within limits.

To replace battery:

1. Make sure that burner is disconnected from mains supply.
2. Remove burner's red cover by loosening 4 screws (2 on both sides).
3. Remove the wires from the battery.
4. Lift the battery to remove it from burners housing. Battery is fixated to housing with double sided tape.
5. Replace battery and fix it to base with new double side tape.
6. Reconnect battery wires.
7. Connect burner to mains supply.

> **WARNING:** Burners red wire goes together with the red (+) battery's contact and black wire goes with battery's black (-) contact. Wrong assembly of the battery ruins the controller and threatens people nearby.

9   Status change logics

Table 7 Status change logics

Status	Next Status	Change conditions
WAITING	TESTING	Boiler thermostat has switched on.
TESTING	CLEANING	All tests are done successfully. Time between cleanings set in PAR49 is reached.
	LOADING	All tests are done successfully.
	E48BATTERY	Battery voltage is below 11V.
	E40FAN	Fan does not reach 25 rps at PRE BURN.
	E36FEEDER	Feeder is not able to make 1 rot in 8 seconds.
LOADING	IGNITING	Feeder has made number rotations set in PAR24.
	E04PELLETS	Maximum LOADING time is reached.
	END BURN	Flame detected in burning chamber. Unknown start conditions.
IGNITING	PRE BURN	Flame sensor has recognized flame.
	LOADING 2	Max IGNITION time 255 seconds is reached and LOADING2 is not done.
	E24IGNITION	Max ignition time 255 seconds is reached and LOADING2 is done.
LOADING 2	IGNITING	Previous state was IGNITING, feeder has made 3 rotations (PAR25) .
PRE BURN	BURNING	Flame is continuously recognized more than 10 seconds.
	LOADING 2	No flame detected and LOADING2 is not done.
	E18FLAME2	LOADING2 is done and no stabile flame detected within 10 seconds.
BURNING	END BURN	Boiler's thermostat has switched off. (HOLD FLAME is OFF in main menu).
	HOLD FLAME	Boiler's thermostat has switched off.(HOLD FLAME is ON or AUTO in main menu).

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	END BURN	Maximum burning time 4 hours is reached.
	END BURN -> END BLOW -> E28LEVEL	After 40 rotations of feeder pellets are continuously detected in feeder inlet.
	END BURN -> END BLOW -> E05PELLETS	Fuel level is not detected in feeder inlet in 4 min.
	E16FLAME	Flame is not recognised more than 2 minutes.
HOLD FLAME	BURNING	Boiler's thermostat has switched on.
	END BURN	Max HOLD FLAME time set in PAR12 is reached.
	END BURN -> END BLOW -> E05PELLETS	Fuel level is not detected in feeder inlet in 4 min.
END BURN	END BLOW	End of burning. Feeder has made number of rotations set in PAR26.
	BURNING	Boiler's thermostat has switched on, feeder has made less than 8 rotations and previous state was BURNING.
END BLOW	WAITING	Flame not recognized in time set in PAR27. Boiler's thermostat is switched off.
	STOPPED	Burner turned off from main menu. Flame not recognized in time set in PAR27.
	E28LEVEL	Flame not recognised in time set in PAR27. Error from: BURNING -> END BURN -> END BLOW -> E28LEVEL.
	E05PELLETS	Flame not recognised in time set in PAR27. Error from: BURNING -> END BURN -> END BLOW -> E05PELLETS.
NO POWER	WAITING	Main supply exists and burner is turned ON.
	STOPPED	Main supply exists and burner is turned OFF.
	LAST STATE	Power interruption has lasted less than 15 minutes. Burner continues work from last state.
	E06PELLETS	Power interruption has lasted more than 15 minutes and previous states were LOADING, LOADING2 or IGNITION.
	END BURN	Power interruption has lasted more than 15 minutes and previous states were PRE-BURN, BURNING or HOLD FLAME.
Any other	WAITING	Burner is turned ON.

10 Error messages and solutions

Error messages, error codes, their descriptions, explanations and ways of their elimination are described in "DK0391 - Software and problem handling manual for PV20…500".

11 Restoring factory settings

In order to restore factory /default settings select PAR99 and click OK, model of burner starts to blink, click OK again. It is prohibited to select for PAR99 that does not correspond to actual burner model.

12 Additional devices for PV burners

Additional devices that is possible to install to PV serial burners are described in manual "Additional devices for PV burners".

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It is possible to install following devices to PV burners:

1. Flue gas fan
2. Multipurpose ERR relay output
3. External boiler temperature sensor
4. External boiler pressure sensor
5. Internet module

13 Table of parameters

Closer description of parameters is given in "DK0391 - Firmware and problem handling manual for PV PV20...500 burners".

14 Risk assesments

14.1 Risk assesment of external devices and enviroment

External device	Risk condition	Failure description	Can be avoided with..
Fresh air inlet into boiler room	Lack of combustion air	Insufficient burning, soot formation in boiler	Correct fresh air inlet
	Permanent underpressure in boiler room	Smoke in boiler room, risk of backburning	
Room Silo	Silo collecting sawdust around the silo outlet	Pellets not delivered to burner	Correct construction of silo
Outside Silo	Silo collecting sawdust around the silo outlet	Pellets not delivered to burner	Correct construction of silo
	Air underpressure in silo	Smoke in boiler room, risk of backburning	Correct installation of silo
Pellet auger	Too much sawdust in pellets	Pellets not delivered by auger	Using pellets conforming EN 15210-1
	Rising angle too big	Pellets not delivered by auger	Horizontal angle of auger must be < 45° Figure 11
Melting hose	Too short or too vertical	Pass up pellets from burner or fire not getting in to container during back burning not assured	Correct position of pellet auger outlet and burner pellet inlet. Horizontal angle of hose must be 55°... 85° Figure 11
	Horizontal angle too small	Pellets collecting into hose and choke it up	
	Too loose	Pellets bend the hose and choke it up	Shorten the hose
Boiler door	Not in closed position at burner working time	Danger of fire	Use the door switch in burner power supply
Boiler overheat/ safety thermostat	Not installed	Danger of boiler overheating	Correct installation
Fluegas duct, chimney	Poor (variable) draft	Smoke in boiler room, risk of backburning	Use fluegas fan
	Got stuck, no draft	Smoke in boiler room, risk of backburning	Use draft sensor

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14.2 Risk assesment at installation of the pellet burner

Installation risks	Risk condition	Failure description	Can be avoided with..
Burner grate	Wrong position of burner grate	Inefficient combustion	Correct grate position. Figure 14
		Burn out of burning chamber	
Igniter position	Igniter positioned behind back wall of burning chamber	Inefficient (too long) igniting cycles	Correct igniter position. Figure 10
		No ignition	
	Igniter positioned out of back wall of burning chamber	Direct touch with pellets and fast burn out	
Burning chamber connection to burners body	Gap between chamber and body	Insufficient air supply, poor combustion and ignition	Correct connection

14.3 Risk assesment at maintenance of the pellet burner

Maintenance risks	Risk condition	Failure description	Can be avoided with..
Burner grate	Grate holes got stuck	Inefficient combustion	Regular cleaning
	Lot of ash under the grate	Inefficient combustion	
		Burn out or deformation of grate	
	Ash layer over 20mm on the grate	Inefficient combustion	
		Burn out of burning chamber	
	Ash layer over 60mm on the grate	Smoke back into boiler room, risk of backburning	
Fluegas duct, chimney	Poor (variable) draft	Smoke back in boiler room, risk of backburning. Pitch covers all sensors and may disable them.	
	Got stuck, no draft		

   	Danger to life and property
   	Danger to burner and boiler room
   	Danger to burning quality and burning chamber
   	No direct danger

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15 Annex 1 Electrical diagram
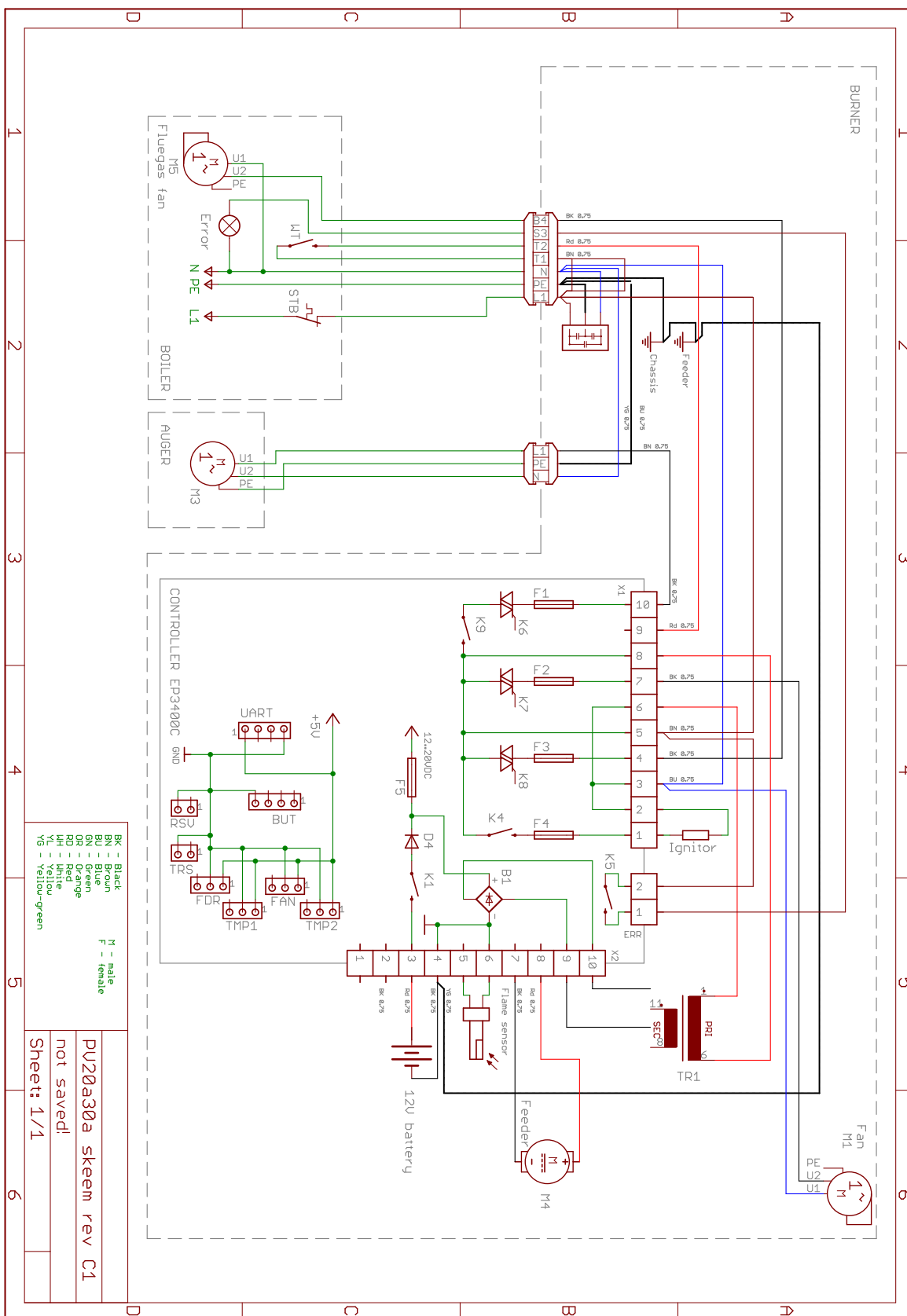
Figure 20 Electrical diagram EP3400C

SBB - Controller	X1, X2 – Connector terminals
GND – Chassis earthing terminal	TR1 - Transformer
M1 – Fan motor	Bat– 12V battery
M3 – External auger motor	RSV – Fuel level receiver sensor
M4 – Feeder motor	TRS – Fuel level transmitter sensor
M5[1] – Fluegas fan motor	FDR – Feeder sensor
F1…F4 - Fuses	TMP1 – Internal or external temperature sensor
UART – Modem connector	TMP2 – Underpressure sensor
BUT – Buttons connector	K5 – ERR relay output
FAN – Fan sensor	Ot – Safety thermostat
R1 - Ignitor	Tt – Boliers thermostat

[1] Flue gas fan is installed in case when the boiler draft is insufficent. Flue gas fas does not belong to set of burner.

16 Annex 2 Controller EP3400C v2
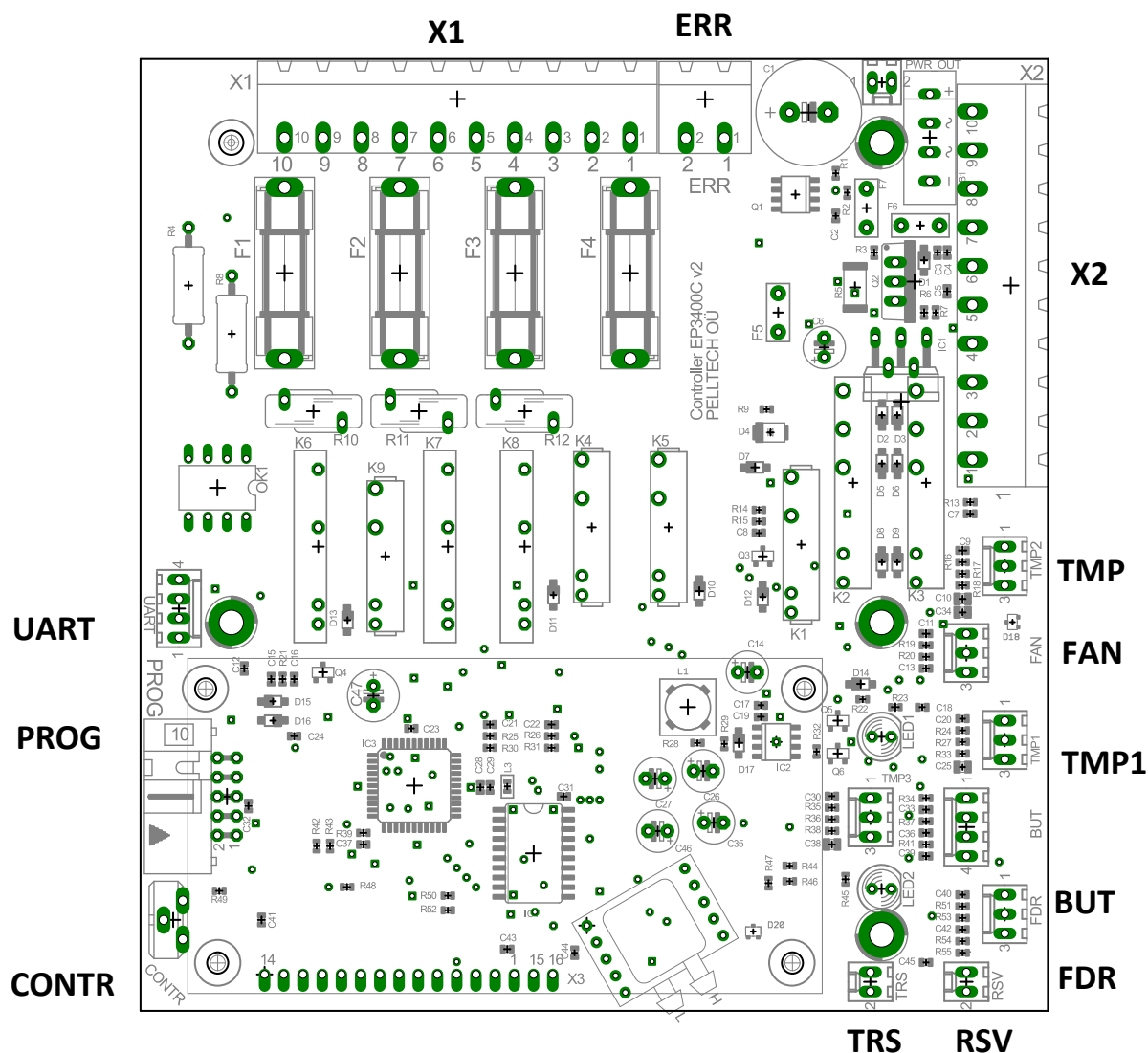
Figure 21 Controller EP3400C v2

X1	– 230V connector terminal	BUT	– Control buttons
X2	– 12V connector terminal	FDR	– Feeder auger rotation sensor
ERR	– ERR relay output	RSV	– Fuel level sensor receiver (white)
TMP1 – Feeder's tube temperature sensor or external temperature sensor		TRS	– Fuel level sensor transmitter (black)
FAN	– Fan rotation sensor	CONTR – LCD contrast adjustments	
TMP2	– Under pressure sensor	PROG	– Programming connector
TMP3	– Not in use	UART	– Modem connector

Table 8 Connectors X1 and X2

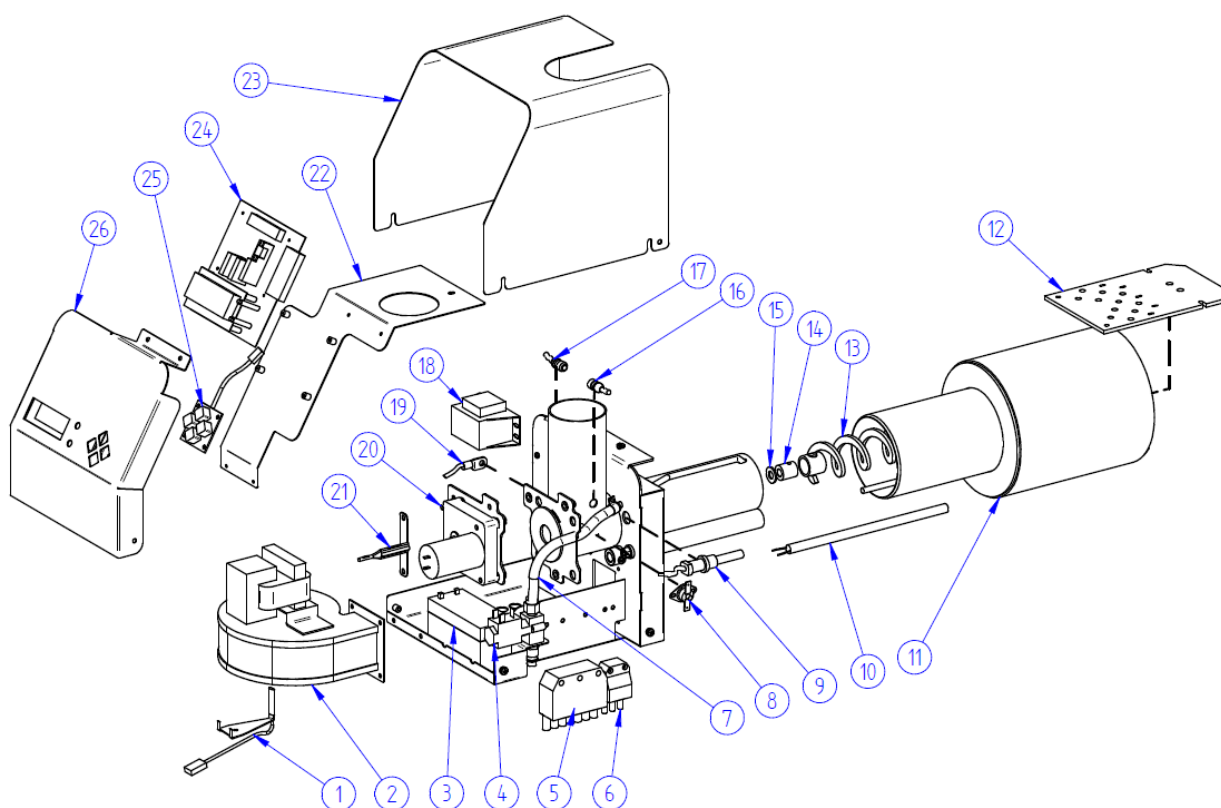| X1	Description	X2	Description
1	Igniter	**1**	-
2	Igniter	**2**	Pneumo valve "-" (black)
3	N – Supply mains	**3**	Battery "+" terminal (red)
4	Flue gas fan	**4**	Battery "-" terminal (black)
5	L – Supply mains	**5**	Flame sensor
6	Transformer 's primary winding	**6**	Flame sensor
7	Fan	**7**	Feeder auger "-" (black)
8	Transformer 's primary winding	**8**	Feeder auger „+" (red) and pneumo valve
9	Working thermostat	**9**	Transformer secondary winding
10	External auger	**10**	Transformer secondary winding

17 Annex 3 List of languages

Table 9 List of languages

	Language
ENG	English
SPA	Spanish
EST	Estonian
FIN	Finnish
FRA	France
GER	Germany
GRE	Greece
HRV	Croatian
LIT	Lithuanian
LAT	Latvian
NED	Dutch
POR	Portuguese
RUS	Russian
SLO	Slovenian
SRB	Serbian
SVK	Slovakian
SWE	Swedish

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18 List of spare parts

Pos	Product code	Description
1	AR9901	Fan sensor for PV20/30
2	MF9901	Fan with sensor for PV20
3	EA0001	Battery 12 V, 1,2 Ah for PV20/30/50/100/180
4	VV0002	Solenoid valve for PV20b/30b only
5	EU0008	Connector 7 pin (female)
6	EU0007	Connector 3 pin (male)
7	VV0005	Pneumatic hose 8 mm PV20b/30b only
8	EF0008	Safety thermostat 65° C for PV20/30/50/100/180/250
9	AL0002	Photo cell with rubber case for PV20/30/50 (cable 15 cm)
10	ER0001	Ignitor 400 W, 195 mm
11	LT9904	Burning chamber for PV20
11	LT9905	Burning chamber for PV30
12	LT9901	Grate for PV20
12	LT9902	Grate for PV30
13	US9901	Spiral for PV20/30/50
14	UP9804	Bunt for PV20/30/50 feeder spiral
15	-	M8 bronze washer

16	AO0003	Level sensor for PV20/30 (transmitter)
17	AO0004	Level sensor for PV20/30 (receiver)
18	ET0002	Power supply for PV20/30, 10VA
19	AT0001	Temperature sensor for PV20/30/100a,b,c/180a,b,c/250 (cable 24 cm)
20	MM9902	Feeder motor with sensor for PV20b/30b
21	AR9903	Feeder motor sensor for PV20b/30b
22	LK9906	Controller's tin
23	LK9904	Burner cover for PV20/30
24	EP3200	Controller for PV20a,b/30a,b/100a/180a
25	ES0002	Buttons for PV20a,b/30a,b/100a,b,c,d/180a,b,c,d
26	LK9905	Front panel with class for PV20/30

19 Declaration of conformity

DECLARATION OF CONFORMITY

We, Pelltech OÜ
     Sära tee 3, 75312 Peetri, Rae vald, Estonia
     www.pelltech.eu

Declare under sole responsibility that the machinery described as

**Pellet burner, Type: PV20a, PV20a+, PV20b, PV20b+,
                           PV30a, PV30a+, PV30b, PV30b+**

to which this certificate applies, is in conformity with the provisions of the
following directives and regulations.

2006/42/EC   Machinery directive
2014/30/EU   EMC Directive
2014/35/EU   Low Voltage Directive

Applied standards:

EN 15270:2008
EN 298:2012
EN 60335-1:2012
EN 60335-2-102:2016
EN 60730-1:2016
EN 60730-2-5:2015
EN IEC 61000-6-1:2019
EN 61000-6-3:2007

Tallinn 15.05.2020

Aavo Isak, CEO, member of board

20 Warranty

Warranty objects in this context are pellet burner PV20 and PV30 burner models and augers PA15XX or PA20XX.

Producer gives 2 years warranty from the date of sale for the PV20b and PV30b burners and PA15XX or PA20XX augers.

Warranty is valid only in the country where the burner is bought from.

2-year warranty for burning chamber is valid only in case when burning chamber and boiler are cleaned with sufficient care from ash and non-burning residues in the way that they can not cause deformation and out-burning of burning chamber.

Exeption is ignition element (igniter), for this item warranty is 1 (one) year.

The warranty does not apply if defects have occurred:

- by wrong mounting, incorrect operation of the product or defects caused by incorrect maintenance
- during transport and / or handling by the user
- improper installation by the installer
- misuse of the device
- unauthorized changes to the device design
- irregular cleaning and maintenance or failure to clean and maintain due to disturbances or interruptions caused by the external environment

Warranty is valid when user had not made changes in the construction and setup of the burner.

Warranty is valid only if the bottom half of the warranty ticket is filled in and sent or brought to the office of Pelltech OÜ Süra tee 3, Peetri, Rae vald, 75312 Harjumaa ESTONIA

Ph..+3726775277
www.pelltech.eu
info@pelltech.ee

21 Warranty ticket

NB: This ticket must be filled out by installer after installation and commissioning.

Burners model	**PV20 a/ b/ a+/ b+, PV30 a/ b/ a+/ b+**
Product serial number	……………………………………………….
Type of boiler	……………………………………………….
Recorded flue gas temperature	……………………………………………….
Recorded CO and CO2 content	……………………………………………….
Sales date	……………………………………………….
Installation/commissioning date	……………………………………………….

Owners contacts   Installer name and signature

Name   ………………………………………….   ……………………………………………….

Phone nr   …………………………………………   ……………………………………………….

City/village   ……………………………………………

Street/ House ……………………………………………………

Warranty is valid only if the bottom half of the warranty ticket is filled in and sent or brought to the office of Pelltech OÜ Süra tee 3, Peetri, Rae vald, 75312 Harjumaa ESTONIA

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