

PELLET BURNER PV 350

INSTRUCTION MANUAL

v1.1

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|----------|--|-----------|
| <u>1</u> | <u>PRODUCT DESCRIPTION</u> | <u>3</u> |
| <u>2</u> | <u>SAFETY RULES</u> | <u>3</u> |
| <u>3</u> | <u>WARNINGS</u> | <u>4</u> |
| <u>4</u> | <u>INSTALLATION INSTRUCTIONS</u> | <u>5</u> |
| 4.1 | <u>BOILER REQUIREMENTS</u> | <u>5</u> |
| 4.2 | <u>PELLET CONTAINER</u> | <u>6</u> |
| 4.3 | <u>INSTALLATION OF BURNER</u> | <u>6</u> |
| 4.4 | <u>INSTALLATION OF FEEDING AUGER</u> | <u>7</u> |
| 4.5 | <u>ELECTRICAL CONNECTIONS</u> | <u>7</u> |
| <u>5</u> | <u>OPERATION</u> | <u>9</u> |
| 5.1 | <u>Safety system</u> | <u>9</u> |
| 5.2 | <u>FUEL AND REFILLING</u> | <u>9</u> |
| 5.3 | <u>INITIAL START-UP</u> | <u>9</u> |
| 5.4 | <u>ADJUSTING THE BURNER</u> | <u>10</u> |
| 5.5 | <u>STARTING, STOPPING, STATUS</u> | <u>12</u> |
| 5.6 | <u>THE WORKING PROCESS OF THE BURNER</u> | <u>13</u> |
| 5.7 | <u>Cleaning</u> | <u>14</u> |
| <u>6</u> | <u>MAINTENANCE</u> | <u>16</u> |
| 6.1 | <u>Trouble-shooting</u> | <u>16</u> |
| 6.2 | <u>Specifications:</u> | <u>18</u> |

1 PRODUCT DESCRIPTION

PV 350 is a fully automatic burner with ash removal system. The burner is intended to be used with 6 or 8mm wooden pellets.

The unique construction of PV 350 allows it to be used with different liquid fuel, solid fuel and universal boilers.

The unique electrical ignition and automatic choice of output level makes using this pellet burner very easy all year round. The burning process does not use pilot flame.

The burner is equipped with a sprinkle system and a melting chute for protection against back-burning.

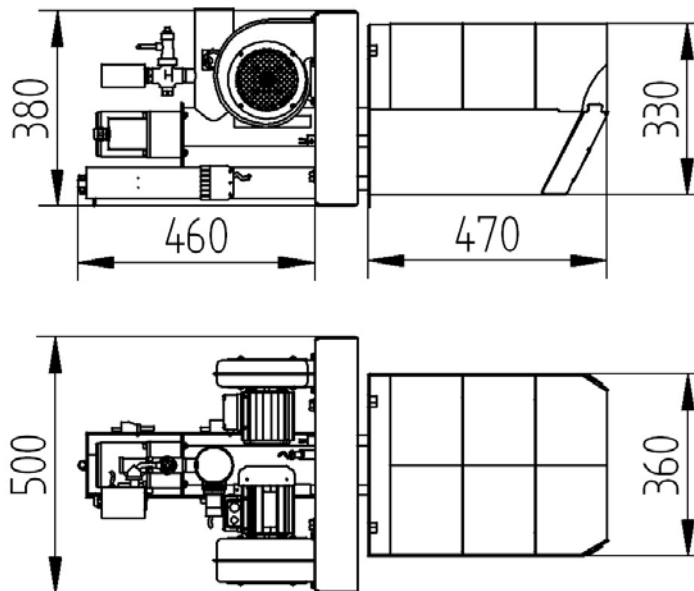


Figure 1: Dimensions

2 SAFETY RULES

- Do not start the burner before it is connected to the boiler and the boiler is connected to the chimney.
- The negative pressure in the furnace must be at least 5 Pa while the burner is operating.
- The pellet burner is designed to work with 6-8 mm diameter pellets.

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

All electrical connections must be done by trained professionals.

- You must not store flammable materials near the burner.
- It is recommended to wear a respirator while handling pellets.

3 WARNINGS

- You must not change the construction of the burner without written permission from the manufacturer
- 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 electrical connections must be made by a qualified professional.

4 INSTALLATION INSTRUCTIONS

4.1 Boiler requirements

In order to install the burner, the boiler 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.
- 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 fulfil 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. Refer to illustration below.
- Boiler door must have openings for feed screw, air holes etc and four 13mm holes for fixing the burner. See figure below.

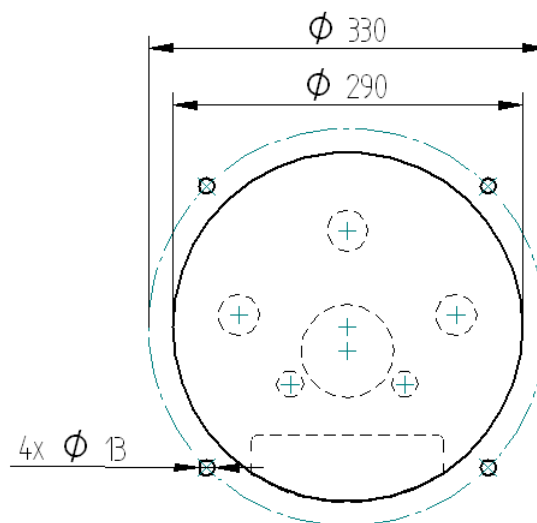


Figure 2: Boiler door mounting holes

4.2 Pellet container

The burner, the auger and the pellet container are a common system. The size and the location of the pellet container depends of 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 litres (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.

4.3 Installation of burner

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

- Spanner no. 19 for fixing the burning chamber and back side to the boiler
- Cross-head screwdriver for fixing igniters

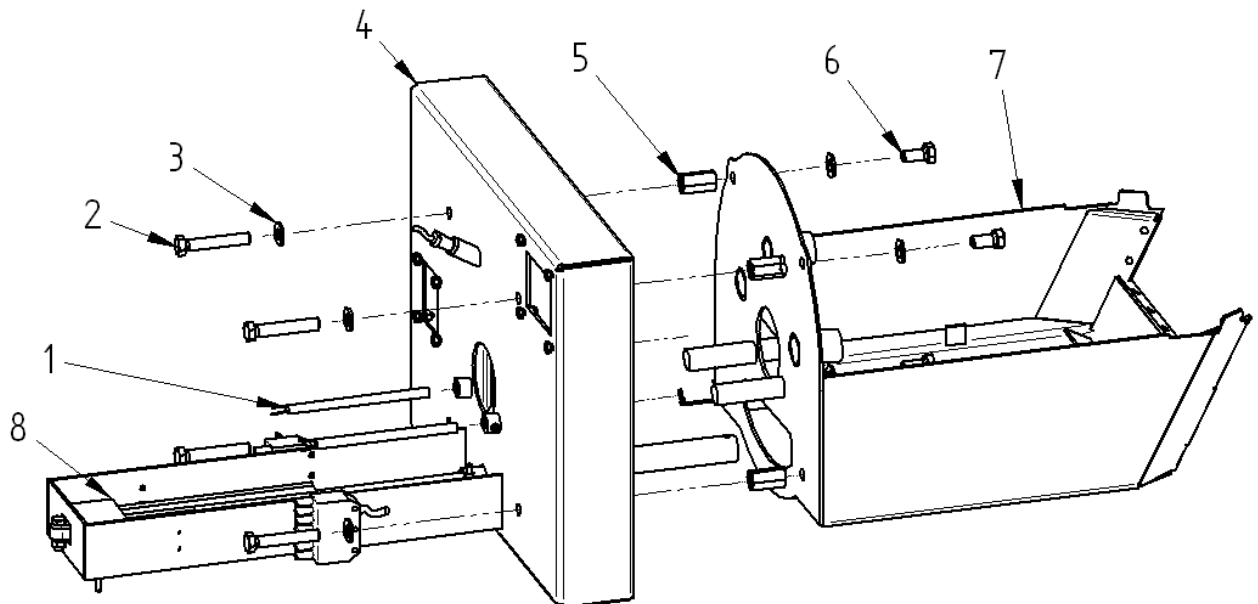


Figure 3: Installation

- 1 – Igniter (2x)
- 2 – M12x70 bolt (4x)
- 3 – Washer 13mm (8x)
- 4 – Backside of burner
- 5 – M12x36 coupling nut (4x)
- 6 – M12x25 bolt (4x)
- 7 – Burning chamber
- 8 – Linear actuator for ash removal

1. Separate the burning chamber from rest of the burner by removing four bolts
2. Install the burning chamber to boiler's door. Use the supplied coupling nuts to fix the chamber.

3. Install the backside. The tube of internal screw must go through hole on the back wall of burning chamber.
4. Install igniters. The tips of igniters must reach as deep into burning chamber as internal feeding screw. Ensure the tips of igniters are not touching any metal parts inside the burning chamber.

4.4 Installation of feeding 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 auger can be fixed to a storage or ceiling depending on the conditions at the installation site.

While installing the auger you must keep in mind that:

- The raising angle of the auger must be between 30° - 45°
- The end of the exit tube of the auger and the input of the burner must not be aligned. The recommended horizontal distance is 10-20cm.
- The distance between the input of the burner and the exit tube of the auger must be at least 25 cm vertically – recommended distance is 45-70cm.

4.5 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 cable that has 5 wires. It is also possible to connect with a cable that has 4 wires.

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

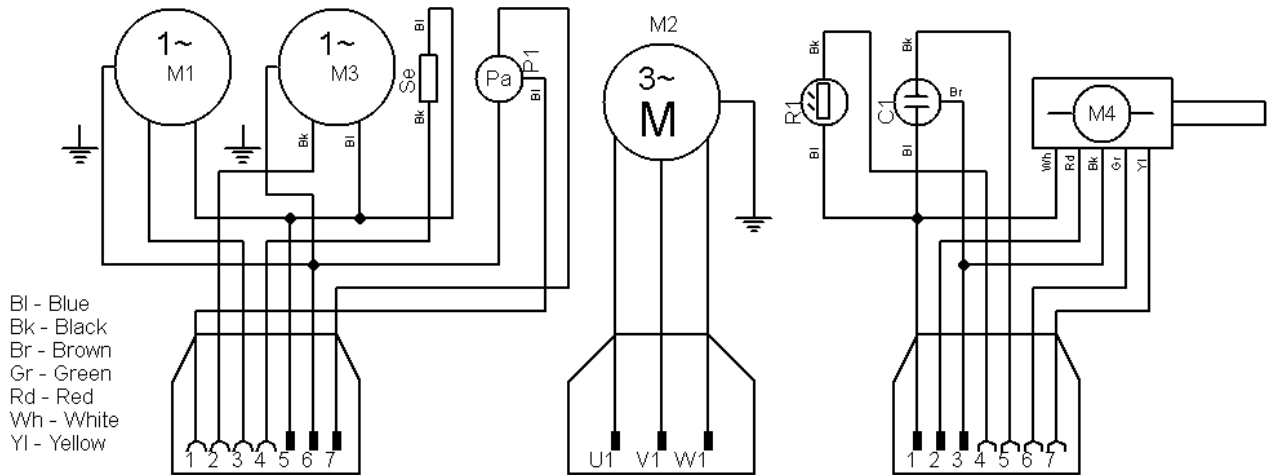


Figure 4: Burner back side electrical schematic

- M1 – Primary air fan
- M2 – Secondary air fan
- M3 – Internal feed screw
- M4 – Linear actuator for ash removal
- C1 – Fuel sensor
- P1 – Under-pressure (draught) sensor
- R1 – Flame sensor
- Se – Igniter

5 OPERATION

5.1 Safety system

The safety system of burner includes a sprinkle system and a melting hose between the auger and the burner. The sprinkle activates when the temperature of inner auger rises abnormally high causing water to extinguish the fire. The burning chamber should be cleaned from ash after such condition has occurred.

The hose melts in case of burning in inner auger (back burning). Therefore it is necessary to ensure that the burner and the auger are not aligned. The distance between the opening of auger and the burner should be between 10 – 20cm (see installation instructions).

5.2 Fuel and refilling

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.

| | |
|-----------------------------|-------------------------------|
| 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 |

Pellets must be stored in a dry and ventilated room. It is recommended to wear a respirator when handling pellets.

Only premium class pellets can be used with PV 20 / PV 30. Refilling must be carried out before the storage runs empty. In case it happened, the auger must be started manually until pellets start to drop from the auger continuously. For more information about starting the auger see chapter 5.5.

5.3 Initial start-up

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 feeding auger of the burner 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 furnace must stay between 4-6 Pa

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.

5.4 ADJUSTING THE BURNER

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

The SETTINGS menu contains control parameters of the burner. The STATUS menu displays the status of the burner and numbers showing the duration of that status (either “min:sec” or “h:min”).

In order to move into the Status menu, use buttons “+” and “-“. Up to 30 status lines with their durations are displayed. Power supply blackout will erase this memory.

Use buttons “+”, “-“ and “OK” to navigate the menu. “OK” button activates the parameter where the cursor is. The number will start blinking and by using the “+” and “-“ buttons you can change the value of the parameter and confirm it by clicking OK again.

Table 1: Parameter menu

| Parameter | Unit | Default setting | Remarks |
|-----------|------------|-----------------|--|
| Burner | Start/Stop | | Starts the burner. Status “Off” will turn to “On”. |
| Auger | Start/Stop | | Starts the auger. |
| Auger | g/min | 180 | The productivity of the external auger is set separately for each device and is inserted in this line of the menu. This is the basis for the calculation of the duration of needed cycles. |
| Photocell | % | 84 | The sensitivity of the photocell is regulated usually between 80-95% from maximum in order to avoid it reacting too quickly. |
| Max power | kW | 350 | It is adjustable between 100 - 350kW, depending on boiler and the heating needs of the building. |
| Min power | kW | 100 | It is adjustable between 100 - 350kW, depending on boiler and the heating needs of the building. |
| Power | kW | 200/350 | The level of power that the burner is currently working. Possible range between powers is set by Max and Min powers. |
| Air | % | 37/40 | Each level of power is set with a necessary amount of air for burning measured by % of fans rotation. |

| | | | |
|---------------|---|---------|---|
| Base air | % | 100 | If it turns out to be necessary to increase or reduce the amount of air for all actions then by increasing/reducing the base air, it will influence all other air settings. |
| Ign.air | % | 46 | The amount of air at status IGNITION. |
| End air | g | 30 | The amount of air at status END BLOW. |
| Loading | g | 230/250 | Needed amount for ignition in grams. |
| Loading | s | 125 | The loading time of ignition amount to the burner in seconds. |
| Loading2 | s | 10 | The time for second attempt of ignition in seconds. |
| Preburn | s | 50/60 | The time needed for pellets to start burning properly in the burner. Status "PRE-BURN". |
| Language | | | It is possible to choose between different interface languages |
| Fact settings | | LOAD | Restores all factory settings |
| | | | |
| | | | |

5.5 STARTING, STOPPING, STATUS

Starting:

In order to start the burner, switch on the boiler. Then adjust the boiler thermostat to desired temperature (usually 60-80°C)

Stopping:

Adjust the boiler thermostat to a low temperature (adv. 0 °C).

Emergency stop:

Switch off the power supply.

NB! 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.

Manually start-stop auger:

Either by connecting the electric plug of the auger to the electric plug of the burner or choosing from the control panel: Auger – On – OK (appears "Auger Off"). , in order to stop the auger choose: Auger – Off – OK (appears "Auger On")

The control panel of the burner consists of an illuminated LCD display that has two lines, a yellow LED indicator and three control buttons.



The display gives the user information about the status and adjustment of the burner. The burner has two menus and in order switch from one to another you have to press the “+” and “-“buttons simultaneously.

Table 2: Status menu

| STATUS | Time | Remarks |
|---------------|-------------|---|
| STOPPED | - | The burner is not switched on. |
| WAITING | - | The burner is switched on and waiting for command from the thermostat of the boiler. |
| LOADING | 125 s | Loading pellets for ignition of the burner after the command from boiler thermostat. |
| LOADING 2x | 10 s | Second try if the first ignition was not successful. |
| IGNITION | Max 4min15s | Small amount of pellets are in the burner, ignitor and fan are working till photocell recognizes flame. |
| PRE-BURN | 50 s | Only the fan is working, the ignitor is off. Pellets start burning properly. |
| BURNING | Max 4 hours | Status of normal working: External auger, internal auger and fan are working. Photocell must see the flame. |
| END BURN | Max 240 s | Boiler has reached an estimated temperature and boiler thermostat is switching off the burner. The external auger is stopped, the internal auger and fan are still working until all fuel is burnt. |
| END BLOW | 120 s | 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 FLAME | - | The burner tried to ignite two times with no success or there is no flame in the burner more than 140 seconds during burning. |
| OVERHEAT | - | Temperature in inlet to internal auger has reached 95°C. |

5.6 THE WORKING PROCESS OF THE BURNER

PV 350 burner starts automatically when the temperature of boiler falls below temperature predetermined by thermostat. For optimum draught, fans are controlled by underpressure sensor. The burner control logic calculates its output power by knowing pellet energy content and feed rate.

Feed rate is determined by speed and geometry of internal feed screw. Pellet level at the vertical tube of internal screw is held constant by fuel sensor. The sensor sends signal to main controller to start external auger periodically.

The burner checks the existence of two input signals during the working process:

- The signal from the boiler thermostat
- The existence of flame in the burner

Depending on the existence or absence of these signals, the working process of the burner is divided into different statuses. The burner stores information about 30 last statuses (burner log). The last line of the log shows the current status of the burner and the duration of it. The burner can be in the following statuses:

- **STOPPED** – The burner is not switched on and does not respond to input signals. In order to start the burner you must switch on the burner from the menu Settings. The burner will also start when you hold down the “OK” button for 3 seconds.
- **WAITING** – The burner is switched on and waiting for the command from the thermostat of the boiler.
- **LOADING** – Loading pellets for ignition of the burner after the command from boiler thermostat. The inner auger will transport the pellets to the burning chamber.
- **IGNITION** – Small amount of pellets are in the burner, igniter and fan are working until the photocell recognizes a flame. When it does recognize the flame, the burner will go to status PRE-BURN.
- **LOADING 2x** – Second try if the first ignition was not successful. Only the inner auger will work. Status IGNITION will follow again. If the second attempt is also not successful, the burner will stop and go to status NO FLAME.
- **PRE-BURN** - Only the fan is working, the igniter is off. Pellets start burning properly.
- **BURNING** - Status of normal working. Both the external and internal augers are working in cycles, providing the burner with sufficient amount of pellets for adjusted power. The power of the fan will depend on the adjusted power of the burner.
 - If in this status the photocell does not recognise flame for more than 2 minutes, the burner will go to status NO FLAME.
 - If the thermostat of the boiler switches off (the boiler reached desired temperature), then the burner will go to status END BURN
- **END BURN** - The boiler has reached the desired temperature. The external auger is stopped, the internal auger and fan are still working until all fuel is burnt. When the flame disappears, the burner will go to status END BLOW.
- **END BLOW** – The burner still has a small amount of burning fuel and ash. Only the fan will be working with minimum speed. The burner will go to status WAITING after 2 minutes.

- **OVERHEAT-** The burner will go to this status when the temperature inside the inner auger has exceeded 95°C. The safety thermostat will cut the power to the burner. Only the control panel will work. To restart the burner, check chapter ERRORS.

Note!

Always use the thermostat of the boiler for starting and stopping the burner. In order to start, switch the device to desired temperature. In order to stop, switch the device to 0.

5.7 Cleaning

Pellet burner PV 350 requires systematic maintenance. The maintenance period depends on the quality of the pellets and heating intensity.

To clean the burner:

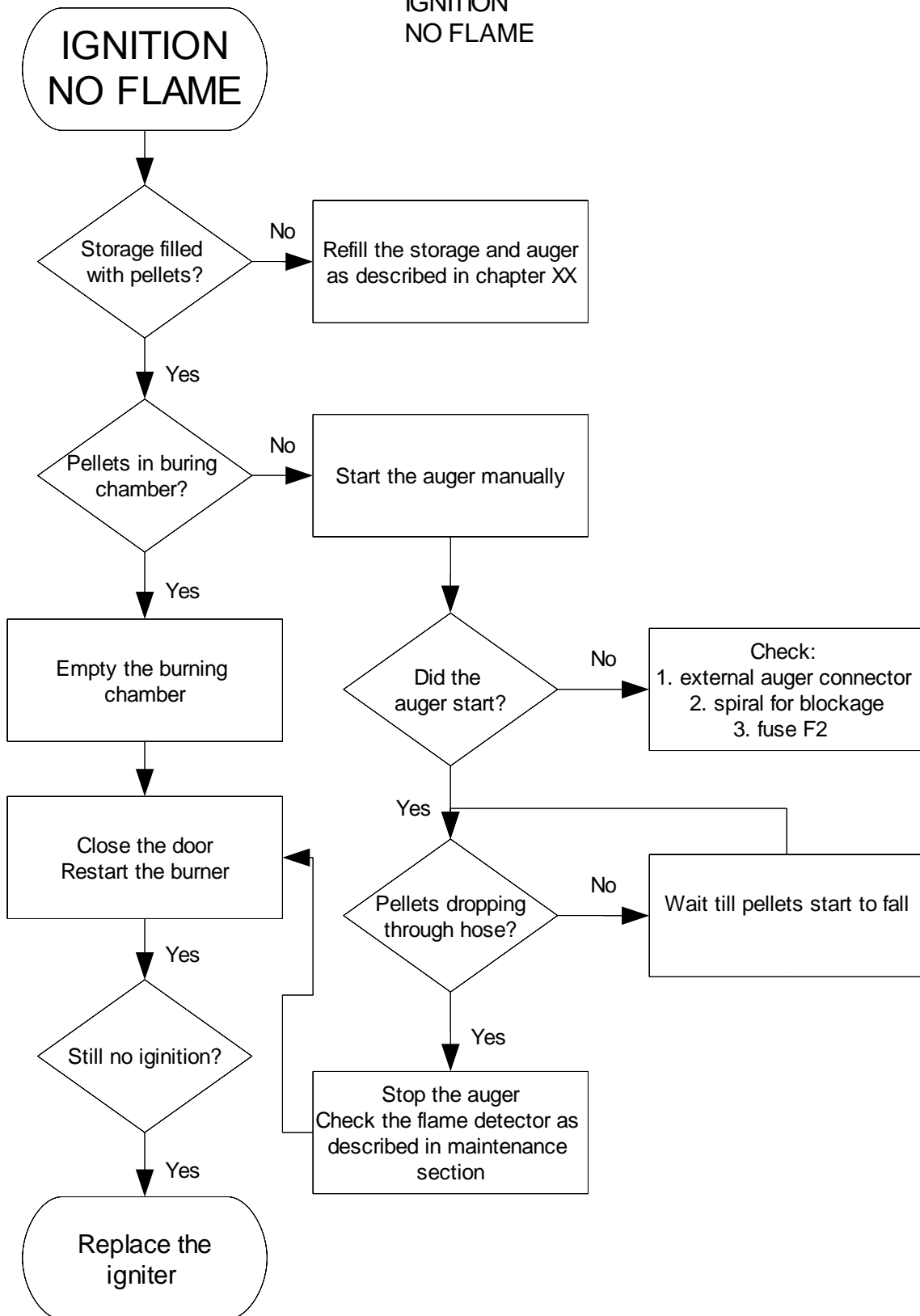
1. Turn off the burner by turning the thermostat to 0.
2. Let the burner cool down for at least 1 hour.
3. Open the boiler's door to gain access to burning chamber
4. Remove the grate and clean it from any residue. Make sure all holes on the plate are clean.
5. Remove ash from burning chamber
6. Clean the boiler. The frequency of cleaning the boiler depends on the type of the boiler and heating intensity. For more information about cleaning the boiler, please see boiler's user manual.
7. Put back the grate. Make sure the stopper of grate is touching the burning chamber from inside. Misaligned base plate will interfere the air flow and reduce burning efficiency.
8. Close the boiler's door to finish the maintenance and turn the thermostat to desired temperature.

The connection between the boiler and chimney must be completely tight. There must not be any extra draught in the smoke draught of the boiler. All cleaning and maintenance openings must be closed with covers.

6 MAINTENANCE

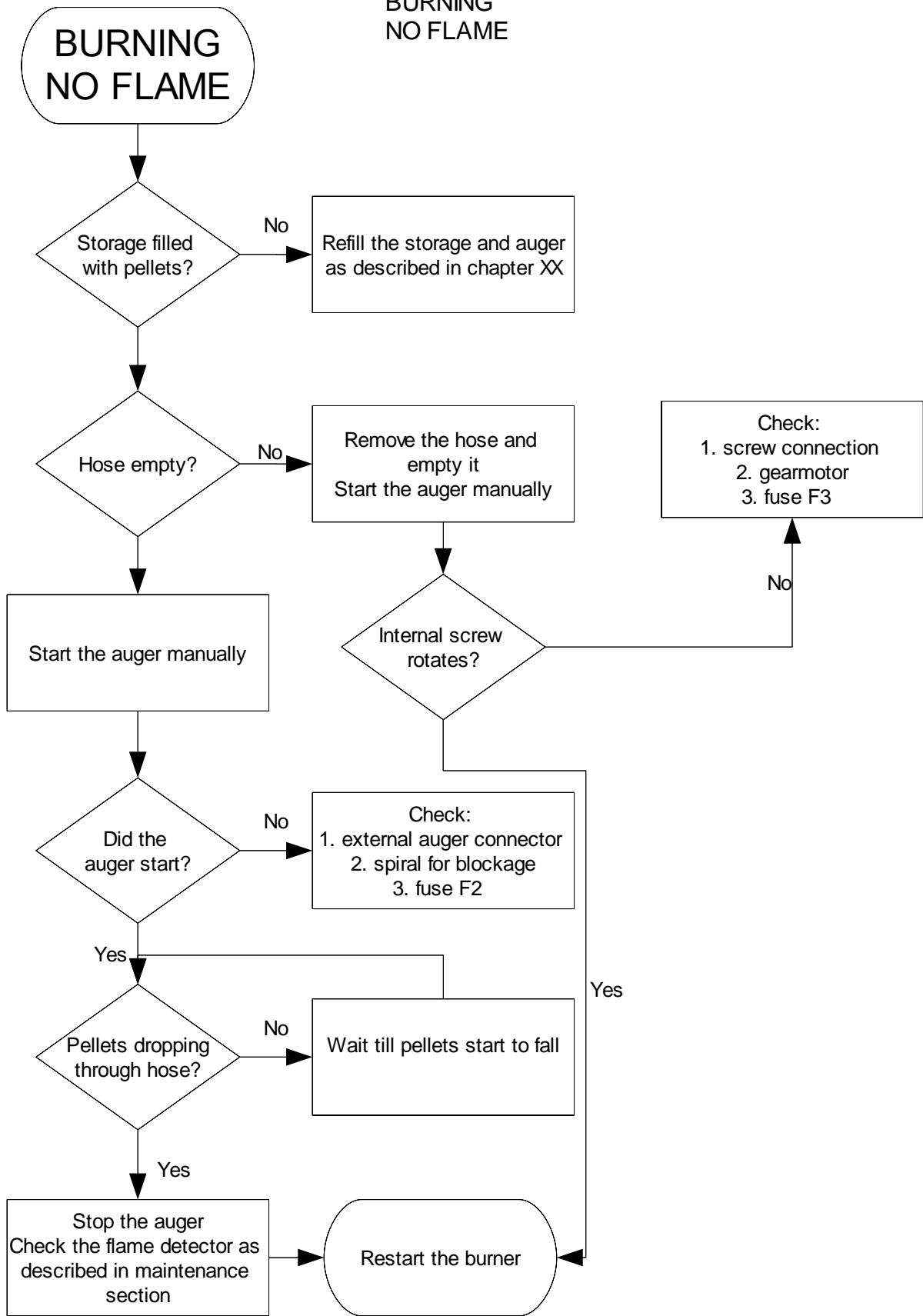
6.1 Trouble-shooting

Burner shows message
IGNITION
NO FLAME



Burner shows message

BURNING
NO FLAME



6.2 Specifications

| | | |
|-----------------------------------|-----------------------|---|
| | | |
| Fuel | Wood pellets 6...8 mm | |
| Max. output power (kW) | 350 | |
| Min. output power (kW) | 8 | |
| Power supply | 3x380V 3x16A | |
| Power – max. at ignition | 1200W | |
| Power – average at 350kW | 150W | |
| Power – standby | 4W | |
| Overall dimensions: | | |
| Length (mm) | 1050 | |
| Width (mm) | 500 | |
| Height (mm) | 380 | |
| Burning chamber outer dimensions: | | |
| Length (mm) | 470 | |
| Width (mm) | 380 | |
| Height(mm) | 340 | |
| Burner weight (kg) | - | - |
| Burner weight with package (kg) | - | - |

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