MANUAL

FOR INSTALLATION AND OPERATION OF AUTOMATED MODULATING WOOD PELLET BURNER FROM SERIES “GP 45 IV”

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The manufacturing company thanks you for the contribution of your choice.

The manufacturing company provides this manual in help to the team that will install, adjust and service this wood pellet burner, as well as to the customer that will operate it.

The manufacturing company requires that the technicians performing the above presented procedures has passed training course for the activities performed with the product.
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1. USER INFORMATION RELATED TO THE SAFETY.

The installation and operation manual of the automated modulating wood pellets burner from series „GP 45 IV“ is designated for end users and authorized servicing specialists.

The user must know that:

- All activities related to the wood pellet burner installation must be performed only by authorized installers, which have acquired legal rights for such activities from the local authorities;
- All activities related to the electrical installation must be performed only by electricians;
- The initialization in operation, including visual check of the heating installation, adjustment and burner start up, must be performed by certified technician, authorized by the manufacturing company representatives;

Please observe the following rules during installation, initial start up, adjustment and operation initialization of automated modulating wood pellet burner from series “GP 45 IV”:

- All legal provisions related to the safety techniques;
- Environment protection provisions;
- Installation, initial start up and adjustment provisions;
- The harmonized EU provisions, applicable in the relevant country;

Please strictly observe the presented safety instructions, in order to avoid risks and harms to people, properties, as well as to environment polluting.

Please pay attention to the following symbols from the current manual book:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>!</td>
<td>Danger: This symbol warns the users about possible human health risks.</td>
</tr>
<tr>
<td>🚨</td>
<td>Warning: This symbol warns the users about possible risks and harms to properties and environment.</td>
</tr>
<tr>
<td>📝</td>
<td>Information: This symbol provides additional information to the users.</td>
</tr>
</tbody>
</table>

Notation “GP IV” is used in the present manual book, which includes the wood pellet burner model “GP 45 IV” with heating output of 45kW. The wood pellet burners from series “GP IV” are modification of the already known pellet burners from series “GP”.

For your safety it is important to become well familiar and read carefully the present instruction, before performing any activities over the installation and operation of this appliance. Non-observance of the instructions below might lead to damages and fatal consequences, for which the manufacturing company will not take responsibility.
2. DESCRIPTION AND ADVANTAGES OF AUTOMATED WOOD PELLET BURNER FROM SERIES “GP 45 IV”.

The automated modulating “GP 45 IV” series burner used for utilization of wood pellets is designated for mounting to hot water boilers and other appliances. The burner utilizes wood pellets and other types of biomass, described below, as the produced heating energy is utilized by the hot water boiler’s body heat exchanging surfaces, in which the burner is mounted.

The pellet burner from series “GP 4 IV” complete kit consists of:
- Main module with removable fire-grate – 1 unit;
- Fuel transport auger – 1 unit;
- Flexible pipe – 1 pc, with tightening brackets – 2 pcs;
- A pair of working gloves – 1 set;
- Operation manual book – 1 pc;
- Main module package – 1 pc;
- Transport auger package – 1 pc;

The pellet burner from series “GP 45 IV” can utilize the following types of fuel:
- Wood pellets with diameter Ø 6-8 mm, category ENplus-A1 according to standard EN 14961-2:2010 or category: A, AB, B according to the methodic developed and used by the burner manufacturing company;
- Dry nuts (from cherries, from morello);
- Mixture of pellets and dry nuts (for example 50% - 50% ratio);
- Other biomass with pellet shape, but after test approval in the burner’s manufacturing company laboratory.

The pellet burner from series “GP 45 IV” is fitted with:
- Microprocessor controller for management of the burner’s modules operation;
- Display with keyboard, showing the burner operation mode and for adjustment of the burner operation parameters;
- Firing air fan (fresh air) with Holl sensor that regulates the fan rotation frequency;
- Electrical heating element, for fuel ignition (primary firing);
- Transport auger, for automated fuel feeding from a hopper to the burner;
- Combustion chamber, for establishment of optimized burning process;
- Removable fire-grate, providing easy cleaning of the combustion chamber;
- Photo-sensor for dynamic monitoring of the burning process;
- Reversible thermo-sticker for indication of the system operation mode and the necessity of cleaning, of either the appliance or the chimney to which it is mounted;
- Irreversible thermo-sticker for indication of registered overheating of the burner, a precondition for warranty claim disapproval.

The burner is equipped with:
- Automatic fuel firing system;
- Automatic system for fuel feeding to the combustion chamber;
- Safety system, which block the burner fuel inlet, in case the pellets feeding pipe has been overheated due to emergency situations;
- Photo-sensor for dynamic monitoring of the burning process;
- System for modulation of the firing air flow rate during the fuel ignition process;
- System for modulation of the burner operation mode, which provides optimal operation modes and low fuel consumption;
- Availability for periodical performance of final combustion with blowing, used for cleaning followed by new automatic restart.
Advantages of the burner:

- The burner is designated to utilize biomass, which makes it ecologically clean and does not contribute to environment polluting;
- Serves for changing hot water boilers fuel component, which previously have used fossil fuels – oil, gas, coal;
- Easy for mounting to boilers that are manually refueled with solid fuels – coal, firewood, without necessity of significant reconstruction of the boiler installation;
- The price of the produced heat energy from biomass utilization, as local energy source, is less influenced than the global fuel prices, which makes the cost of the acquired energy more competitive compared to the convectional heating sources;
- The burner is automated and provides operation comfort near to that provided by burners utilizing fossil fuels (for example liquid or gaseous fuel), which provides availability for usage in systems equipped with programmable room thermostat;
- The burner is equipped with automatic fuel ignition system;
- Automatic operation of the burner, availability for smooth operation adjustment, compatibility with room thermostat (weekly programmer), which guarantees maximum heat comfort and fuel economy;
- Modulation of the operating process, providing optimal operation parameters and constant high efficiency;
- Simplified installation and adjustment of the burner, which accelerates the installation works;
- Availability for utilization of biomass with pellet shape (wood pellets), dry cherry nuts and others, according to the requirements presented in the fuel characteristics table;
- High efficiency;
- Low levels of harmful emissions;
- Automatic fuel feeding from a hopper, which is built according to the local conditions (the hopper is not part of the burner delivery kit);
- Simplified maintenance and servicing;
- Minimum operation costs.
3 TECHNICAL DATA OF AUTOMATED WOOD PELLET BURNER FROM SERIES “GP 45 IV”

Heating-technical parameters of automated pellet burner from series “GP 45 IV” operating with wood pellets are presented in Table 3.1.

Table 3.1. Heating-technical parameters of automated pellet burner from series “GP 45 IV” operating with wood pellets.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burner model</td>
<td>-</td>
<td>GP 45 IV</td>
</tr>
<tr>
<td>Nominal heating output</td>
<td>kW</td>
<td>45</td>
</tr>
<tr>
<td>Heating output adjustment range</td>
<td>kW</td>
<td>14-45</td>
</tr>
<tr>
<td>Used fuel</td>
<td>-</td>
<td>Wood pellets, dry cherry nuts</td>
</tr>
<tr>
<td>Wood pellets category, according to EN 14961-2</td>
<td>-</td>
<td>ENplus-A1</td>
</tr>
<tr>
<td>Used pellets categories (according to the burner manufacturing company classification)</td>
<td>-</td>
<td>A, AB, B</td>
</tr>
<tr>
<td>Wood pellets consumption at nominal heating output</td>
<td>kg/h</td>
<td>9.6</td>
</tr>
<tr>
<td>Needed air quantity for efficient burning process</td>
<td>kg/h</td>
<td>75-90</td>
</tr>
<tr>
<td></td>
<td>m³/h</td>
<td>70-84</td>
</tr>
<tr>
<td>Average wood pellet consumption in the heating installation</td>
<td>kg/h</td>
<td>5.0-7.0</td>
</tr>
<tr>
<td>Wastes from fuel combustion</td>
<td>Ash</td>
<td>The quantity depends on the fuel ash content and the operation mode</td>
</tr>
</tbody>
</table>

The automated pellet burner from series “GP” is designated for utilization of wood pellets that comply with the presented classifications, according to standard EN 14961-2, category ENplus-A1 and to the pellets categorization developed by the burner manufacturing company. As an exception it is allowed to utilize non-complying to the specification wood pellets, only for a short period of time (in a few hours), mostly with higher ash content, which will require more frequent cleaning of the ash gathered on the burner’s fire-grate and over the appliance heat exchanging surfaces, to which the burner is mounted.

The presented values for average wood pellets consumption in the heating installation refer to buildings and premises with good heat isolation and sealed window frames.
The dimensions and technical parameters of automated wood pellet burner from series “GP 45 IV” are presented in Table 3.2.

Table 3.2. Dimensions and technical parameters of automated wood pellet burner from series “GP 45 IV”.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burner model</td>
<td>-</td>
<td>GP 45 IV</td>
</tr>
<tr>
<td>Weight</td>
<td>Main module</td>
<td>kg</td>
</tr>
<tr>
<td>Weight</td>
<td>Fuel feeding auger</td>
<td>kg</td>
</tr>
<tr>
<td>Overall dimensions (WxLxH)</td>
<td>Main module</td>
<td>mm</td>
</tr>
<tr>
<td>Overall dimensions (WxLxH)</td>
<td>Fuel feeding auger</td>
<td>mm</td>
</tr>
<tr>
<td>Power supply</td>
<td>-</td>
<td>L1, N, PE, 50Hz; 230V;</td>
</tr>
<tr>
<td>Electricity consumption</td>
<td>Nominal mode</td>
<td>A</td>
</tr>
<tr>
<td>Electricity consumption</td>
<td>Ignition mode</td>
<td>A</td>
</tr>
<tr>
<td>Electric power</td>
<td>W</td>
<td>&lt;100 + 800 (with ignition)</td>
</tr>
<tr>
<td>Electric protection</td>
<td>-</td>
<td>IP20</td>
</tr>
</tbody>
</table>

Recommended fuel parameters are presented in Table 3.3.

Table 3.3 Recommended fuel parameters.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Granules(pellets) diameter</td>
<td>mm</td>
<td>6 - 8</td>
</tr>
<tr>
<td>Recommended fuel caloricity (lower burning point)</td>
<td>MJ/kg</td>
<td>&gt;17.2</td>
</tr>
<tr>
<td>Recommended fuel caloricity (lower burning point)</td>
<td>kWh/kg</td>
<td>&gt;4.7</td>
</tr>
<tr>
<td>Wood pellets category according to standard EN 14961-2</td>
<td></td>
<td>ENplus-A1</td>
</tr>
<tr>
<td>Wood pellets category</td>
<td>A, AB, B</td>
<td></td>
</tr>
<tr>
<td>Ash content</td>
<td>%</td>
<td>See table 3.4</td>
</tr>
<tr>
<td>Water content</td>
<td>%</td>
<td>Max. 8 – 10%</td>
</tr>
</tbody>
</table>

The wood pellets classification depending on their physical parameters and in accordance to the methodic developed and implemented by the burner manufacturing company is presented in Table 3.4.

Table 3.4. Wood pellets classification depending on their physical parameters and in accordance to the methodic developed and implemented by the burner manufacturing company.

<table>
<thead>
<tr>
<th>Pellets category</th>
<th>$A^d$</th>
<th>DU</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$A^d \leq 0.6%$</td>
<td>$DU \geq 97.0%$</td>
</tr>
<tr>
<td>AB</td>
<td>$A^d \leq 0.6%$</td>
<td>$DU &lt; 97.0%$</td>
</tr>
<tr>
<td>B</td>
<td>$0.6 &lt; A^d \leq 1.0%$</td>
<td>$DU \geq 97.0%$</td>
</tr>
<tr>
<td>BC</td>
<td>$0.6 &lt; A^d \leq 1.0%$</td>
<td>$DU &lt; 97.0%$</td>
</tr>
<tr>
<td>C</td>
<td>$1.0% &lt; A^d \leq 2.0%$</td>
<td>$DU \geq 97.0%$</td>
</tr>
<tr>
<td>CD</td>
<td>$1.0% &lt; A^d \leq 2.0%$</td>
<td>$DU &lt; 97.0%$</td>
</tr>
<tr>
<td>D</td>
<td>$2.0% &lt; A^d \leq 3.0%$</td>
<td>$DU \geq 97.0%$</td>
</tr>
<tr>
<td>DE</td>
<td>$2.0% &lt; A^d \leq 3.0%$</td>
<td>$DU &lt; 97.0%$</td>
</tr>
<tr>
<td>E</td>
<td>$A^d &gt; 3.0%$</td>
<td>$DU \geq 97.0%$</td>
</tr>
<tr>
<td>EF</td>
<td>$A^d &gt; 3.0%$</td>
<td>$DU &lt; 97.0%$</td>
</tr>
</tbody>
</table>
Where,

\[ A_d \] – ash content of dry mass, [%];

\[ DU \] – mechanical durability, [%];

With the acceptance of the new European Union wood pellets standard (EN 14961-2) in 2010, new certificates, ENplus for pellets used in boilers for domestic purposes and EN-B for industrial pellets used in industrial boilers, are introduced. The standard ENplus defines two quality categories: A1 and A2. In category A1 are implemented the most strict limits for ash content in the pellets. In category A2 the ash content is up to 1.5%. For industrial pellets the EN-B certificate is applied, which is with significantly decreased quality requirements.

Table 3.5 European standard for wood pellets EN 14961-2.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Dimension</th>
<th>ENplus-A1</th>
<th>ENplus-A2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter</td>
<td>mm</td>
<td>6 (± 1)</td>
<td>6 (± 1)</td>
</tr>
<tr>
<td>Length</td>
<td>mm</td>
<td>3.15 ≤ L ≤ 40 (^1))</td>
<td>3.15 ≤ L ≤ 40 (^1))</td>
</tr>
<tr>
<td>Bulk Density</td>
<td>kg/m(^3)</td>
<td>≥ 600</td>
<td>≥ 600</td>
</tr>
<tr>
<td>Caloricty</td>
<td>MJ/kg</td>
<td>≥ 16.5</td>
<td>≥ 16.5</td>
</tr>
<tr>
<td>Water content</td>
<td>%</td>
<td>≤ 10</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Dust</td>
<td>%</td>
<td>≤ 1 (^3))</td>
<td>≤ 1 (^3))</td>
</tr>
<tr>
<td>Mechanical durability</td>
<td>%</td>
<td>≥ 97.5 (^4))</td>
<td>≥ 97.5 (^4))</td>
</tr>
<tr>
<td>Ash content</td>
<td>% (^2))</td>
<td>≤ 0.7</td>
<td>≤ 1.5</td>
</tr>
<tr>
<td>Ash melting point</td>
<td>°C</td>
<td>≥ 1200</td>
<td>≥ 1100</td>
</tr>
<tr>
<td>Chlorine content</td>
<td>% (^2))</td>
<td>≤ 0.02</td>
<td>≤ 0.03</td>
</tr>
<tr>
<td>Sulfur content</td>
<td>% (^2))</td>
<td>≤ 0.05</td>
<td>≤ 0.05</td>
</tr>
<tr>
<td>Nitrogen content</td>
<td>% (^2))</td>
<td>≤ 0.5</td>
<td>≤ 0.5</td>
</tr>
<tr>
<td>Copper content</td>
<td>mg/kg</td>
<td>≤ 10</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Chromium content</td>
<td>mg/kg</td>
<td>≤ 10</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Arsenic content</td>
<td>mg/kg</td>
<td>≤ 1</td>
<td>≤ 1</td>
</tr>
<tr>
<td>Cadmium content</td>
<td>mg/kg</td>
<td>≤ 0.5</td>
<td>≤ 0.5</td>
</tr>
<tr>
<td>Mercury content</td>
<td>mg/kg</td>
<td>≤ 0.1</td>
<td>≤ 0.1</td>
</tr>
<tr>
<td>Lead content</td>
<td>mg/kg</td>
<td>≤ 10</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Nickel content</td>
<td>mg/kg</td>
<td>≤ 10</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Zinc content</td>
<td>mg/kg</td>
<td>≤ 100</td>
<td>≤ 100</td>
</tr>
</tbody>
</table>

\(^1\) no more than 1% from the pellets can be longer than 40 mm, maximum length of 45 mm;

\(^2\) the data are determined with dry mass;

\(^3\) particles <3.15 mm, fine particles, before deliver of the goods;

\(^4\) for measurements, performed with Lignotester maximum allowed value ≥ 97.7 mass %;
4 CONSTRUCTION DESCRIPTION OF AUTOMATED WOOD PELLET BURNER FROM SERIES “GP 45 IV”

4.1. GENERAL CONDITIONS

The pellet burner from series “GP 45 IV” consists of the following components/modules:

- The main part of the system is a main module that consists of:
  - Combustion chamber, which forms the conditions for optimal burning process and is made of high quality stainless steel;
  - Combustion chamber fire-grate, which is easy removable and provides availability for cleaning of the ash deposits;
  - Air distribution tract, which provides uniform supply of firing air and also air for cooling of the burner’s parts;
  - Electrical heating element, which serves for primary ignition of the fuel, positioned in the combustion chamber under the tilted part of the fire-grate;
  - Firing air supply fan, equipped with sensor for reading the rotation frequency and availability for regulation;
  - Photo-sensor for monitoring of the burning process, mounted on the burner’s side for its easy cleaning;
  - Emergency temperature sensor for protection from the so called “back fire” in the main module’s fuel inlet pipe;
  - Control module for monitoring and managing the burner operation;
  - Display module with keyboard, used for visualization of the burner operation mode and for performing all necessary adjustments;
  - Connector for the fuel transport auger, used for the auger power supply;
  - Reversible thermo-sticker, used for monitoring of the temperature in specific zone of the burner and for evaluating the necessity for cleaning of the appliance to which it is mounted, or for evaluating the necessity of inspection of the chimney draught;
  - Irreversible thermo-sticker, for indication of registered overheating of the burner, precondition for warranty claim denial.

- Electrically driven outer transport auger, which transports the fuel from a hopper to the burner, depending on the burner operation mode. The auger consists of motor-gear with electric motor, equipped with integrated overheating protection, pipe for transferring the fuel to the drop hole (where it drops down by gravity) and to the flexible pipe;

- Flexible pipe, made of special transparent thermo-resistant material (in case of fire it does not separate harmful or toxic substances), which connects the auger and the main module.

The main burner modules and their positioning are presented in Figure 4.1.
Figure 4.1. Main modules positioning of burner from series “GP 45 IV” (side view).

Main module’s components of a burner from series “GP IV” are presented on Figure 4.2 and Figure 4.3.
Figure 4.2. Main module section view and components of burner from series “GP 45 IV”.

- Interface panel (display + keyboard)
- Emergency sensor protecting from “back fire”
- Photo-sensor
- Combustion chamber
- Burner’s control pc-board
- Burner’s power supply cable
- Plug for managing and power supply of the fuel transport auger
EXPLANATION:

- The reversible (self-recovering) liquid crystal thermo-sticker serves for indication of the temperature in the zone where it is attached. This temperature indicates also the burner operation mode and the flue gas resistance within its route to the appliance’s chimney, to which the burner is mounted. The initial condition of the thermo-sticker is such that all of its temperature scale zones are dark colored. When the temperature increases the surface of the scale zones become lighter, corresponding to the operating temperature. Increase of the temperature in this zone indicates the necessity for cleaning of the appliance from the ash deposits and/or the flue gas extraction line. When it cools down the sticker reverse to its previous condition and color;

- The irreversible (not recovering) liquid crystal thermo-sticker is indicator for (at least once) overheating of the burner’s pellet inlet pipe. This sticker has single action and when it reaches critical temperature its color changes irreversibly. At initial condition its indication element color is white and after its critical temperature has been reached it becomes dark.

In case that the fuel transport auger of the burner has to be supported, then a telescopic support can be ordered, as an optional equipment to the burner, which provides availability for adjustment of the auger tilting angle and its stable positioning (Figure 4.4).
4.2. CONSTRUCTIONAL MEASURES FOR INCREASING THE OPERATION SAFETY OF THE BURNER FROM SERIES “GP 45 IV”

- The ignition and burning processes are monitored by micro-processor logic module;
- The ignition and burning processes are monitored by photo-sensor and if the fuel does not fire after two attempts for ignition, then the burner transits to “Stop” mode with relevant indication for transiting to such mode;
- If during operation the fuel hopper has been depleted the burner transits to “Stop” mode with respectively activated indication for transition in such mode;
- The flexible pellets transport pipe is transparent and is made of special temperature-resistant material;
- There are stickers (labels) indicating the proper operation and handling of the burner;
- The burner is equipped with safety components for protection against fuel firing (occurrence of the so called “back fire”):
  - Dropping flap chamber, which cuts the pellets flow from the transport auger to the main module. The chamber depth is around 250mm. Besides that the transport auger is connected to the burner through flexible pipe, which is not full with fuel. There is small doze of fuel in the burner, which burns completely while the transport auger operation is paused and there is no risk of reverse firing of the fuel;
  - Emergency temperature sensor, positioned on the burner’s fuel feeding pipe, which activates when the surface temperature in this zone exceeds 90 – 95°C. If during operation this sensor registers temperature increase (90 – 95°C), then the transport auger stops and the system transits to emergency mode, respectively the burner operation stops as well. This is indicated on the burner’s display with the sign “STOCKER FAULT”. After removing the normal operation disturbance reason the burner can be started again by switching off and then on its power supply (restarting);
The reversible thermo-sticker from liquid crystals, which indicates the current temperature value in its attachment zone, serves for easy evaluation of the system operation mode, where the burner is installed and the necessity for cleaning of the appliance and/or the chimney tract/line.
5. MOUNTING AND INSTALLATION.

5.1. MAIN REQUIREMENTS FOR INSTALLATION OF AUTOMATED WOOD PELLET BURNER FROM SERIES “GP 45 IV”.

- The burner has to be positioned in a way that provides enough free space for its servicing and cleaning;
- The burner has to be mounted to an appliance (hot water boiler, other heat energy consumer) in a way that provides availability for easy servicing and cleaning from the ash residues;
- It is not allowed to mount the burner to appliance that is installed in living premises, including corridors;
- The burner mounting to an appliance must be performed by a qualified technician only;
- The installation and maintenance of the automated pellet burner must be performed by specialized companies, which have acquired legal rights for such activities;
- The automated pellet burner from series “GP” must be connected to the electrical supply system by an authorized electrician only;
- Before initialization of the burner in operation the heat energy consuming devices working order must be ensured;
- The burner servicing/handling must be performed by adult persons only, which are well familiar with the appliance operation manual book.

The burner mounting to a hot water boiler (consuming appliance) has to be done by bolts (or studs) and nuts. It is required to fasten the burner to the appliance with the use of a tool (for example wrench). It is not allowed to fasten it by hand. The mounting and removal of the burner must be performed by an eligible person equipped with proper tools.

5.2. BURNER INSTALLATION.

The burner installation to an appliance requires preliminary prepared project, complying with the acting norms and regulations.

- In case the heat consuming appliance is a hot water boiler, then the requirements of standard BNS EN 303-5/2000 – “Central heating hot water boilers - part 5: Central heating solid fuel hot water boilers with nominal heating output of maximum 300 kW – terminology, requirements, tests and notation” must be observed;
- In case the heat consuming appliance is not a hot water boiler, then the prescribed standard requirements for the relevant appliance type, must be observed;
- Fire safety requirements;
- To the electrical supply network - BNS EN 60335-1/1997 – “Safety of domestic electrical devices”

Observe the chimney draught requirements, presented in the hot water boiler’s technical data table, when installing the burner to the boiler.
5.3. OVERALL AND CONNECTION DIMENSIONS OF THE BURNER’S MAIN MODULE.

When mounting the burner to an appliance the installation requirements have to be observed, as well as the main module dimensions presented on the next figures.

Figure 5.1. Main module of a pellet burner from series “GP 45 IV”, isometric view – both sides view.

The coupling dimensions of the burner’s main module, which must be observed when mounting and installing the appliance, are presented on figures 5.2, 5.3 and 5.4.
Figure 5.2. Main module overall dimensions of a burner from series “GP 45 IV” (side view).

Figure 5.3. Main module overall dimensions of a burner from series “GP 45 IV” (top view).
5.4. POSITIONING AND MOUNTING OF THE BURNER’S MODULES

The main module of the burner from series “GP” must be mounted horizontally to the appliance that will consume the generated heat energy, produced by the fuel combustion. Depending on the appliance type a technical evaluation for the main module position has to be performed, so reliable operation, easy cleaning, servicing and maintenance are ensured, as well as for reliable and high efficient co-operation of the burner and the heat energy consuming appliance. The main burner module has to be installed to the heat energy consuming appliance by using the attached sealing.

The fuel transport auger must be positioned near to the burner, so it can be connected to the main module by the flexible pipe, through which the fuel from the auger drops. It is also recommended to ensure 45° tilt angle between the transport auger axis and the horizontal plane, which ensures optimal operation conditions for the auger motor and for the burning process. The bottom (suction) part of the auger has to be positioned in the lowest point of the fuel hopper, so its constant filling is ensured. The fuel transport auger and the fuel hopper have to be positioned in a way providing easy manipulation with the burner’s main module, for the purposes of cleaning and servicing, as well as for proper mounting of the feeding flexible pipe.

To ensure optimal operation conditions of the fuel transport auger it is recommended to use a fuel hopper model “BP” – manufactured by the burner manufacturer. This hopper is not part of the “GP” series burner standard delivery kit.
The auger tilt angle change leads to change in the fuel consumption and respectively to the burner’s heating output:
- decreasing the auger tilt angle leads to increased fuel consumption, respectively to increased heating output;
- increasing the auger tilt angle leads to decreased fuel consumption, respectively to decreased heating output.

Schematic view for installation of the fuel transport auger is presented on Figure 5.5.

Figure 5.5. Schematic view for installation and positioning of the fuel transport auger.

The auger on the above figure is equipped with support bar, which is additional option (not standard equipped) to the burner delivery kit. The tilt angle between the auger axis and the horizontal plane has to be $45^\circ$.

The fuel transport auger can be mounted to a fuel hopper that provides capacity up to 650 kg of wood pellets (Figure 5.6).
5.5. INFORMATION ABOUT INSTALLATION POSSIBILITIES OF PELLET BURNER FROM SERIES “GP” AND JOINT OPERATION WITH HOT WATER BOILERS.

The automated pellet burner from series „GP“ is individual module (requiring electrical supply and signal – assignment for operation), that can be mounted to heat energy consuming appliance. The practice shows that in most cases the heat energy consumer is a hot water boiler for local heating installations. The manufacture company had accomplished continues tests for compatibility, reliability and efficiency of the burner and series of popular hot water boilers. Depending on the hot water boiler construction it is possible to use additional transitional components and modules, which improve the system operation: pellet burner – hot water boiler and ensure, and increase its efficiency and reliability.

The flexible pipe must be linked to the transport auger and the main module, so it is fully stretched (without bents and hangings, where the fuel or fuel dust could be gathered) and after that it has to be fastened with the attached brackets.
6. **INITIALIZATION OF AUTOMATED WOOD PELLET BURNER FROM SERIES “GP 45 IV” IN OPERATION.**

The automated modulating pellet burner from series “GP 45 IV” must be initiated in operation only by specialized company, authorized for such activities.

### 6.1. MAIN REQUIREMENTS ABOUT THE USED FUEL.

- To ensure complete fuel burning/utilization it is necessary to use only dry fuel. It is recommended to store the fuel in dry ventilated premises;
- It is forbidden to store the fuel next to the appliance to which the burner is mounted or at distance less than 400 mm;
- The optimal recommended distance between the appliance (to which the burner is mounted) and the fuel is minimum 1000 mm. It is better to store the fuel in a neighbor premise;
- All fire safety requirements during the burner installation to the designated appliance must be observed. It is recommended to have a fire-extinguisher on an easy accessible and safe place.

### 6.2. INITIALIZATION OF AUTOMATED WOOD PELLET BURNER FROM SERIES “GP 45 IV” IN OPERATION.

**GENERAL CONDITIONS:**

- The burner handling must be performed in comply with the operation and maintenance manual;
- The operation mode of the system: pellet burner from series “GP” and heat energy consumer must provide minimum under-pressure (pressure lower than the atmospheric) in the appliance combustion chamber, within the range of 5-20 Pa;

Non compliance with this requirement might lead to emergency operation modes or to inefficient burner operation. The under-pressure value in the combustion chamber of the heat energy consuming appliance depends on the chimney draught and other modules (for example flue gas extraction fan). Operation modes not complying with this requirement could be indicated by the reversible thermo-sticker temperature value.

- Any intervention over the system operation, that might endanger the health of the servicing personal or to any other indirectly related persons is forbidden;
- During operation the burner must be periodically inspected by the servicing/handling personal/customer;
- The user must not perform repairs over the system’s modules. If a problem occurs during its operation, the user must ask for competent assistance by a servicing company;
- It is forbidden to increase the burner heating output over its nominal output;
- The ash residues from the burning process have to be gathered in fireproof containers equipped with covers and after their cooling to ambient temperature should be dumped at proper for the purpose places.
6.2.1. INTERFACE CONTROL PANEL OF AUTOMATED WOOD PELLET BURNER FROM SERIES “GP IV”.

Figure 6.1 represents interface control panel with display of an automated pellet burner from series “GP IV”.

Figure 6.1. Interface control panel with display and keyboard for pellet burner from series “GP IV”.

Interface control panel components and their functions:
- Button “S” – is used for submenu choice and for confirmation of settings;
- Button “-” – is used for decreasing the selected value from the controller menu;
- Button “+” – is used for increasing the selected value from the controller menu;
- Button “Esc” – is used for canceling a parameter change from the controller menu and to exit a chosen menu.

The above described buttons on the burner’s interface control panel can also perform different function, which will be shown on the display.

6.2.2. CONNECTING AND POWERING THE BURNER.

All activities over the burner’s electrical installation or adjustments that require removal of its covers or other components protecting its electrical parts from touching by hand must be performed by eligible person.

The burner must be connected to the electrical installation of the appliance to which it is mounted by observing the safety technique rules. The power supply cable and the attached wiring diagram for connection to the power supply and the main control module of the burner must be used.

The fuel transport auger is mounted in the fuel hopper and is positioned in a way providing the necessary fuel feeding rate and is also filled with fuel.
The circulations water temperature sensor must be mounted in a muff for measurement of the hot water boiler outlet water temperature or must be screwed in threaded orifice (depending on the sensor type).

6.2.3. SWITCHING ON THE BURNER FROM SERIES “GP”.

The burner switching on is performed by the appliance power supply to which it is mounted. If the burner has been in operation mode (or in “hot reserve”) but the power supply has been interrupted, it automatically starts/continues operation when the power supply has been restored.

During operation of the burner flue gasses are possible to flow through the unsealed parts, eventually through the fuel inlet flexible pipe, if the appliance to which it is mounted is not sealed properly. It is recommended to seal these parts and to adjust the burner’s heating output in order to prevent flow of smoke out of the appliance. The same effect can be monitored during the transition seasons, autumn and spring, when the natural chimney draught is decreased due to higher environment temperature.

The electrical heating elements, which are positioned over the combustion chamber fire-grate, activate during the ignition mode. This zone heats to very high temperatures and could be considered as a risk from burning, in case it is touched by hand – it is not allowed to perform any manipulation in the combustion chamber zone. If it is necessary to mix (spread) or remove fuel, then proper personal protection equipment and tools must be used.

At initial burner operation start the fuel transport auger must be filled with pellets – this is continues process requiring more time. The auger must be connected to external power source through its standard plug and to wait until the pellets start to drop down through the auger’s upper opening. After that plug the auger to the burner’s main module power supply outlet.

The burner’s main module constantly checks if the fuel transport auger is connected to it and if this condition is not fulfilled it activates an emergency mode. In order to turn it back to normal operation mode the auger’s power supply cable must be plugged in and the module restarted.

If the auger was plugged out of the burner’s main module (the controller reads such situation as an emergency mode – i.e. no electric motor plugged) and the burner was switched on, then an emergency mode activates and the burner does not operate. In order to reset the alarm it is necessary to switch off and then back on the burner’s main power supply, but after the auger has been plugged in the burner’s main module.

The burner operates by preliminary installed algorithm based in its control module. The optimal parameters for operation are adjusted in the manufacturer company factory and their change is not required.
6.2.4. BURNER FROM SERIES “GP” OPERATION METHOD.

The pellet burner starts operation when the following conditions are provided:

- The main burner module is mounted to the appliance designated for joint operation;
- Presence of electrical supply;
- Activated start from the display module;
- Installed circulations water temperature sensor – in case that such method is used for regulation of the burner operation mode;
- Lack of emergency alarm signals;
- Transport auger and fuel hopper are filled with pellets;

When these conditions are completed the control module executes the following algorithm:

- Electrical power is submitted which activates the external fuel transport auger, the ignition heating element and the firing (fresh) air fan;
- After expiry of the preliminary set time (by the manufacturer), that provides refueling of the combustion chamber with the so called “ignition” doze of pellets needed for initial firing, the transport auger power supply stops and it switches off;
- After the burner photo-sensor registers presence of burning process the electrical heating elements power supply stops. After a period of time the burner smoothly reaches the assigned heating output. If the sensor does not register a presence of flame in a preliminary set period of time then the system performs second attempt for ignition and the fuel transport auger activates again by repeating the same algorithm as described above. The ignition attempts are limited to two;
- In case of successful ignition of the fuel the burner transits to nominal operation mode, which is achieved by periodical fuel feeding and pause for its burning. The times for feeding and pause are set in the burner’s control module software, as its heating output can be changed by the operation output levels;

The choice of maximum heating output level - 5\textsuperscript{th} is not recommended. It is used to increase the output if a lower caloricity pellets are used or for short time demand for higher output. It is recommended to operate the burner between 1 to 4\textsuperscript{th} level, as with 4\textsuperscript{th} level the nominal heating output can be achieved.

- The control is achieved by a NTC sensor that determines the circulations water operation temperature:
  - When the assigned temperature is almost reached the burner’s control module decreases its heating output (the so called modulation of the operating mode);
  - If the circulations water temperature decreases the burner restores its heating output.
- It during operation the signal for operation has been lost (for example from a room thermostat), the burner will shut down by performing the algorithm described above;
- If the burner is not in operation and it receives signal for start, it will perform the above described algorithm for operation. The same condition is valid if the circulations water temperature is lower than the assigned temperature in the burner control module;
- If the fuel does not ignite from the first attempt then the control module automatically performs second attempt, as the number of ignition attempts are two (defined by the manufacturer). In case of unsuccessful second attempt it is possible to have gathered fuel over the main module’s fire-grate. It is necessary to determine and remove the reason for unsuccessful ignition, as well as to clean the main module’s fire-grate from the fuel deposits;
If the fuel deposits over the burner’s fire-grate are not cleaned and followed by successful ignition (for example after burner restart), it could lead to hard firing of relatively bigger quantity of fuel, leading to excessive flue gas smoke separation as its firing might lead to explosive firing. Such conditions increase the possibility for mechanical damage of the appliance to which the burner main module is mounted.

- If the photo-sensor does not register presence of burning process during operation, the fuel ignition algorithm starts again;
- If there are two unsuccessful attempts for ignition, for example if the fuel hopper has been depleted, the burner shuts down the main algorithm and transits to emergency mode, followed by message indication on the control module display. This is an indication for the user that his intervention for removing the cause is required. After the emergency cause is removed the burner can be started again by its consecutive switching off and on (restart). This can be performed also by cutting off the appliance main power supply, to which it is connected.

Before starting the burner its fire-grate must be checked for presence of unburned fuel or ash deposits and respectively it must be cleaned from the residues.

- If the power supply has been cut off the burner will start automatically when it is restored.

During operation the burner may transit to final combustion and blowing only if the cleaning option during operation is activated – parameter “Max.comb.time” which can be found in the „Advance menu” (the access is password protected).

6.2.5. PARAMETERS FOR OPERATION ADJUSTMENT OF A BURNER FROM SERIES “GP”.

The burner’s control module parameters are factory adjusted and it is not necessary to be changed by the user and/or other servicing personal. In order to achieve optimal and economic operation conditions of the burner it is necessary to select an output level that is enough to provide them. The practice shows that according to the system heat consumption the permanent burner operation provides optimal fuel consumption.

The display and the controller keyboard indicate information about the burner operation mode. The controller operation parameters adjustment has to be performed by trained specialist.
6.2.6. DESCRIPTION OF THE MENU, START AND ADJUSTMENT OF THE BURNER’S OPERATION PARAMETERS.

Figure 6.2. Display start screen of automated pellet burner from series “GP IV”.

After the software has been loaded (after a few seconds) a question appears on the display: (Activate ?):

Figure 6.3. A menu for starting automated pellet burner from series “GP IV”, with invitation question.

To start the burner operation press the button "S", as presented on the above figure.

After the burner operation has been started the display shows a message, presented on the next figure.
Figure 6.4. The display shows information about the burner’s control module operation mode – in this case the system checks the fresh (firing) air fan.

![Display showing control module operation mode](image)

**TEST - BLOWING**

32° FC: 0%

S  –  +  ESC

**“TEST – BLOWING”** – shows the operation mode – the fresh air fan performs preliminary blowing of the burner's fire-grate (shows the current phase of the burner ignition).

**32°** – shows (on the left bottom corner of the display, over the button "S") the water temperature in the boiler (degrees Celsius). The temperature value is indicated if a boiler water temperature sensor is installed and activated from the controller menu;

**FC: 0%** – shows the light intensity registered by the photo-sensor, in percent – displayed in the right bottom corner, over the button “ESC”.

Figure 6.5. The display indicates information about the burner operation mode – in this case it is ignition fuel doze firing.

![Display showing burner operation mode](image)

**IGNITION 1**

150

32° FC: 0%

S  –  +  ESC
After primary blowing by the fan the burner feeds ignition fuel doze and the process of firing begins. The display shows "IGNITION 1" – first attempt for ignition, which has to be completed within a defined period of time, adjusted in the control module software.

The burner’s control module is factory programmed with optimal settings for operation. The burner can operate within a discreet number of heating output levels. The last, maximum level of the burner’s heating output is adjusted to achieve higher output than its nominal – this mode should be chosen when the used fuel is with lower caloricity or when the heat energy consumption is higher than the burner’s nominal output.

Operation modes at maximum heating output, exceeding the burner’s nominal, are recommended for short periods of time (total usage up to 10 hours per heating season), because such modes could lead to increased heat loads over the burner’s construction and to decrease its life resource.

The practice shows that the factory set parameters do not require additional adjustment, even if different fuel types are used.

The manufacture company reserves its right to make changes over the appliance settings values, without obligation to inform the end customers.

- The parameter values, which define the heating output of a burner from series “GP” are determined under the following conditions:
  - The utilized wood pellets are with diameter 6 mm from category ENplus-A1 (category A, see the wood pellets categorization table);
  - The tilt angle between the fuel transport auger axis and the horizontal plane is 45°;
  - The ash content (mineral inflammable mass) does not change significantly the fuel burning heat value (its caloricity), but requires specialized construction of the burner’s main module, in order to achieve efficient and economic burning process. Therefore the fuel compatibility and efficiency have to be checked and utilized in the appliance after approving results;
  - The manufacture company reserves its right to change the default values of the parameters, which control the burner operation, without obligation to inform its customers;
  - The heating output level factory settings, providing optimum burner operation, are presented in Table 6.1;
  - The presented heating output levels determine the heating output and the burner operation mode;
  - The burner initial adjustment has to be performed by trained servicing technician, as no other adjustments by the end user are required after that;
  - Next follows a description of how to determine the fuel consumption and respectively calculation of the burner heating output:
    - Switch on the burner;
    - Take off the fuel feeding flexible pipe from the burner module and direct it to a container (for example plastic bag, utensil or other), where to gather the fuel dropped by the auger;
    - An authorized technician has to choose “Advance menu” and activate the parameter “Stoker adj.”. EXPLANATION: the access to this menu is password protected;
    - As a next step leave the auger operating for 6 minutes. The pellets quantity gathered in the container has to be weigh (measured) and registered in the controller by using the buttons with indicated directing information. After that the burner operation has to be activated again. If known and necessary the pellets
caloricity can be entered in the controller. The factory set caloricity value for wood pellets is 4.8 kWh/kg. After the data input it must be saved by choosing the relevant button from the menu – the information on the control module display provides directions for performance of the necessary steps from the initial adjustment procedure. After performing the initial set up the burner provides guaranteed heating output.

6.2.7. ADJUSTMENT OF THE BURNER OUTPUT ACCORDING TO THE HEAT CONSUMPTION.

For optimal, reliable and efficient operation of a burner from series “GP” and a heat consuming appliance – result from the burning process, it is recommended to adjust the burner according to the heat consumption which will be covered. This can be achieved by adjusting its heating output by selecting suitable output level as presented in Table 6.1.

The adjustment of the burner’s heating output does not require additional firing air flow rate adjustments (fresh air fan), as it is performed automatically by the factory set program in the burner’s control module.

6.2.8. NOMINAL OPERATION MODE OF THE BURNER.

After completion of the burner starting process (the fuel in the burner combustion chamber has been fired successfully) and the heat consuming appliance has been heated and tempered, it can be said that the system operates in nominal mode. All adjustments and checks over the burner (and the heat consuming appliance) operation have to be performed in nominal mode. It is necessary to assign the burner heating output to correspond to the consumed heat energy by the appliance, in nominal operation mode.

In nominal heating output mode the so called “hot test” should be performed over the system, according to the acting regulations.

The firing air flow rate is highly important about the system (burner – appliance) operation mode and its efficiency. When the air quantity is less than the optimal, it leads to incomplete fuel burning. Also when the air consumption is higher than the optimal, it leads to cooling of the burning zone and again to incomplete fuel burning. Therefore free air access must be provided (to the burner as well as to the premise where it is installed), that will be transferred to the burning zone by the burner’s fan, allowing to achieve optimal parameters and economic operation of the appliance.

6.2.9. OPERATION MODE OF THE AUTOMATED WOOD PELLET BURNER FROM SERIES “GP IV”.

After successful fuel firing the burner transits to stabilization of the burning process and the display shows the following information (Figure 6.6):
Figure 6.6. The display shows information about the burner operation mode – transition mode – transition from ignition to burning process stabilization in minimum heating output operation mode.

```
TRANS. : 10kW
32° FC: 65%
```

**TRANS.:10kW** – shows that the burner is in transition phase for stabilization of the burning process, with heating output 10 kW.

After completing the transition mode the burner transits to operation mode as presented on Figure 6.7.

Figure 6.7. The display shows information about the burner heating output level in maximum output mode.

```
COMBUST 5 50kW
72° FC: 98%
```

**COMBUST 5 – 50kW** – shows the burner heating output level (in this case 5th level and the burner heating output is 50 kW);
**“72°”** – indicates the water temperature, °C;
**“FC: 98%”** – indicates the light intensity registered by the photo-sensor, %.
6.2.10. USER MENUES FROM THE BURNER’S CONTROLLER.

The burner menu can be entered by pressing and holding the button “S”. To exit the chosen submenu press the button “Esc”.

Figure 6.8. Pressing the button “S” provides availability to choose submenu from the burner’s control module.

6.2.11. USER MENUES FROM THE BURNER’S CONTROLLER.

6.2.12. MENU „EFFECT LEVEL”.

Figure 6.9. Menu „EFFECT LEVEL” – choice of heating output level of a burner from series “GP IV”.

In this menu the desired operation heating output level of the burner can be chosen.

Table 6.1 presents the heating output values, achieved by the burner operation according to the selected output level.
Table 6.1. Heating output of a pellet burner from series “GP 45 IV” according to the heating output level.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td></td>
<td>GP 45 IV</td>
</tr>
<tr>
<td>Heating output level</td>
<td>kW</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>kW</td>
<td>14.0</td>
</tr>
<tr>
<td>2</td>
<td>kW</td>
<td>25.0</td>
</tr>
<tr>
<td>3</td>
<td>kW</td>
<td>35.0</td>
</tr>
<tr>
<td>4</td>
<td>kW</td>
<td>45.0</td>
</tr>
<tr>
<td>5</td>
<td>kW</td>
<td>50.0</td>
</tr>
</tbody>
</table>

It is recommended to operate the pellet burner up to 4-th heating output level inclusive, as 5-th level should be used exceptionally only for short periods of time.

To choose the „EFFECT LEVEL” menu press the button below ENTER – „S”. To switch to another menu press the button “+” located below the arrow on the display. The button “ESC” serves to exit the submenu and return to the main menu.

By entering the „EFFECT LEVEL” menu the user is allowed to choose one of the five heating output levels for burner operation.

Figure 6.10. Heating output level choice of a burner from series “GP IV”.

The desired heating output level of the burner can be chosen by using the buttons “+” and “−”. After that press the button “S” in order to confirm your choice. To exit the menu press the button “ESC”.

Pellet burner GP 45 IV
6.3. REGULATING THE BURNER’S HEATING OUTPUT.

The burner heating output regulation can be performed by adjusting the level defining its output. Information about the burner heating output for every level is presented in Table 6.1.

If the used fuel type has been changed (change of the wood pellets category) a new adjustment of the burner’s heating output level might be required.

6.3.1. DECREASING THE BURNER’S HEATING OUTPUT.

It can be achieved by reducing the burner’s heating output level, which decreases the assigned heating output and respectively the fuel consumption.

6.3.2. INCREASING THE BURNER’S HEATING OUTPUT.

The burner’s heating output increase can be achieved by increasing its heating output level, which increases the assigned heating output and respectively the fuel consumption.

If the heating output, respectively the fuel consumption, have been changed, the control module algorithm automatically changes the fresh air flow rate, supplied by the fan, which provides optimal operation mode within wide heating output range.

6.4. STOPPING THE BURNER OPERATION.

Stopping the burner operation can be achieved by its control module, which submits operation signal. Restore of the burner operation can be achieved by changing the control module adjustment, which commands the burner operation. In case operation is not needed for longer period of time, then the burner combustion chamber has to be cleaned from the ash deposits and also to cut off the appliance power supply to which it is connected.

6.4.1. STOPPING THE BURNER OPERATION BY THE SWITCH “START”.

By the switch “START” (which has to be installed by the servicing technician during the burner installation, according to the attached wiring diagrams) the burner can be switched on and respectively switched off. If it is switched off the display shows message “FINAL COMBUSTION”.

The burner stopping must be performed only by the switch “START”, and not by cutting off the appliance main power supply. By stopping the burner by the switch “START” it performs controlled shut down process, during which the appliance cools down, completes the rest fuel burning and saves the appliance reliability.

6.4.2. STOPPING THE BURNER OPERATION BY THE CONTROL MODULE MENU.

To stop the burner operation it is necessary to complete the following actions:

- Press and hold the button “ESC” for more than 5 seconds;
- Choose answer “YES” when asked to “Make final combustion?” on the display;
The choice for stopping the burner operation is shown as indication „Final combustion“ followed by burner stop.

Another method to stop the burner operation is from the control module menu „MAKE FINAL COMB.“

This option for stopping the burner operation should be used when there is remaining fuel in the burner’s fire-grate, in order to perform final combustion.

Figure 6.11. Choice of menu “MAKE FINAL COMB.”, which is used for stopping the operation of a burner from series “GP IV”.

Figure 6.12. The controller display indicates a question for stopping operation of a burner from series “GP IV”.
To initiate fuel final combustion the button “S” must be pressed, which is located below [YES]. To cancel the final combustion initiation or to return to the previous menu press the button “ESC”, located below [NO].

In case the pellet burner from series “GP” should be stopped from operation, an entire cleaning of the combustion chamber from the ash deposits has to be performed, as well as cleaning of the appliance heat exchanging surfaces, to which it is mounted, because the ash has corrosive influence over the steel surfaces, which reduces the life of the appliance. A prophylaxis of the burner by specialized servicing company has to be performed also. Observance of these procedures provide longer and reliable operation life of the burner.

If an operation stop signal is received by the burner the fuel feeding stops, but its fresh air fan continues operation. Therefore after receiving a stop signal the burner continues to burn and to generate heat energy, which makes it inert, respectively the entire heating system becomes inert. This feature is important if the radiators are equipped with thermostatic regulators (or other control components), which close the circulations water flow. As a consequence of this process the generated by the burner energy might not be “unloaded” and could lead to overheating of the appliance. Therefore in case a pellet burner from series “GP” is used and the heating system radiators are equipped with such thermostatic regulators (heads) it is necessary not to close them completely, and/or at least one of the radiators should not be equipped with such regulator, in order to ensure constant energy release in all operation modes.

6.5. SWITCHING OFF THE PELLET BURNER FROM SERIES “GP IV” BY EXTERNAL MODULE, CONTROLLING ITS OPERATION.

The burner switch off is achieved by interrupting its operation signal, which is submitted to the burner by external module or by performing the procedure for stopping its operation, as described in the previous chapter. When the burner transits from burning mode to pause mode or to “shut down” mode, then the control module performs the so called process of “controlled stopping”, during which the fresh air fan continues its operation and the controllers monitors the emergency signals. After the burner cools down its power supply has to be cut off. It is also recommended to clean the system burner-appliance from the ash deposits.

6.5.1. BURNER EMERGENCY SHUT DOWN.

During operation of the burner emergency mode situations are possible to occur. Such situations are read by the control module and it automatically performs prevention procedures. The burner controller transits to emergency mode by indicating an error code on the display. The alarm codes and other messages are presented in Table 7.2.

If an emergency situation occurs the failure/alarm code, shown on the display, must be checked and the relevant corrective measures should be taken, in order to remove the failure cause. After that the burner should be restarted from its power supply. Before restarting the burner it is necessary to clean its fire-grate from the ash deposits and fuel remaining;

In case of overheating (emergency situation) of the appliance to which the burner is mounted, the emergency thermostat activates, which is MANDATORY equipment and is not part of the burner’s delivery kit. The emergency cause must be diagnosed and removed. The emergency thermostat must be switched back on manually, so the burner can receive power supply signal.

Pellet burner GP 45 IV
In case the burner’s fuel inlet pipe has been overheated (it is also an emergency situation) a sensor activates, that monitors the temperature in this zone and prevents from the so called “back fire” to the fuel transport auger. After cooling of the main module the reason for the emergency must be determined and the relevant measures should be taken. After removing the reason for excessive temperature in the pipe (overheating) it could be required to replace the sensor with a new one.

6.6. MENU FOR VISUALIZATION OF ALARMS/ERRORS LIST, OCCURRED DURING OPERATION OF PELLET BURNER FROM SERIES „GP IV“.

In order to check the last errors/alarms, occurred during the burner operation, it is necessary to enter the menu “LOG”.

The log menu shows a list with the last 10 errors, occurred during burner operation. If a new error occurs, the oldest deletes and the newest one goes on top of the list.

Figure 6.13. The controller display shows the “LOG” menu with the error number and the relevant code.

Press the button “ESC” to exit the menu.

The error codes and their explanation are presented in Table 7.2.

6.7. RESTARTING THE PELLET BURNER OPERATION.

Burner restarting is required in situations when the burner operation is assigned but its control module had switched to protection mode, different from the nominal mode, and the burner is not operating. The display shows the message code, which has to be determined, the relevant measures for its removal has to be taken and after then the burner has to be restarted – it can be performed by switching off and then back on (restarting) the main module power supply (for example by switching the control panel power switch to which it is connected). Before restarting the burner it is recommended to check and clean its fire-grate.
6.8. DESCRIPTION OF THE THERMO-STICKERS FUNCTION FOR MONITORING THE SYSTEM CONDITION.

The thermo-sticker is used for measurement of the temperature in specific zone of the burner. By this measurement the system condition can be determined as well as the necessity for prevention measures and servicing actions over the appliance, to which the burner is installed and/or of the flue gas line and especially the chimney tract.

Figure 6.14. View of the reversible (self restoring) thermo-sticker that determines the burner operating temperature in the zone where it is labeled – increased temperature condition within 60 – 65°C.

![Thermometer scale ranging from 60°C to 65°C](image1)

Figure 6.15. View of the reversible (self restoring) thermo-sticker that determines the burner operating temperature in the zone where it is labeled – increased temperature condition within 65 – 75°C.

![Thermometer scale ranging from 65°C to 75°C](image2)

Figure 6.16. View of the reversible (self restoring) thermo-sticker that determines the burner operating temperature in the zone where it is labeled – increased temperature condition within 75 – 85°C.

![Thermometer scale ranging from 75°C to 85°C](image3)

The reversible thermo-sticker has to be checked at every servicing (visit by the user for refueling, cleaning, inspection, etc.) of the appliance and the burner. It shows the current temperature of the burner during operation and provides information about the ash contamination level and the necessity for cleaning, as well the chimney draught influence over the entire system – pellet burner – appliance – chimney.

Figure 6.17. View of the irreversible thermo-sticker (not self recovering) – picture of its normal condition, the burner’s pellet inlet pipe temperature had not been exceeded over the limit value – 104°C.

![Irreversible thermometer showing 104°C](image4)
The irreversible thermo-sticker activation is an indication for overheating of the burner’s inlet pellets pipe. The sticker condition cannot be recovered and it is necessary to remove the reason for its activation. After that the sticker has to be replaced with new one – to be performed by servicing technician. The activation of the sticker occurs when hot flue gases from the burning zone flow towards the flexible pipe that connects the auger and the burner’s main module, resulting from increased resistance in the chimney pipe lines or due to decreased chimney draught. Such situations are considered as emergency and are not covered by the burner’s warranty.


When cleaning the burner’s fire-grate it is necessary to remove it out of the so called combustion head of the burner’s main module, as presented on Figure 6.19 and Figure 6.20.

When cleaning the fire-grate it is required to ensure that its air supplying orifices are well cleaned, which provides effective burning process and optimal fire-grate cooling.
After complete cleaning of the fire-grate from the ash residues and other particles (for example slag or unburned fuel) it is necessary to install the fire-grate at its normal position. The fire-grate correct positioning can be achieved by tilting its opened side and tuck it under the burner’s main module fire-grate base.
Installation of the fire-grate can be completed in two steps:
- The fire-grate has to be positioned so its legs contact the bottom of the burner’s main module combustion head;
- Move the fire-grate so it completely fits the combustion head of the main module.

6.10. INTRODUCING THE USER WITH THE MAINTENANCE AND ADJUSTMENT PROCEDURES OF PELLET BURNER FROM SERIES “GP”.

It is required that the users are well introduced, in details, to the presented manual for operation of the burner, as well as to its operation, adjustment of the heating output level and the maintenance methods.

The combustion chamber cleaning from the ash deposits has to be performed periodically (at least once per day or at longer periods, depending on the fuel’s ash content, but no longer than 5 days of operation). The customer must shut down the burner by observing the instructions described in the above topics. This ensures effective fuel after burning and cooling of the combustion chamber. After cooling of the burner the ash residues have to be cleaned by using personal safety equipment and proper tools – working gloves, putty-knife.

Figure 6.21. A pair of working gloves, granted for easier and safer cleaning of the burner’s main module.

The flexible pellets feeding pipe has to be cleaned also, because during transportation of the pellets dust deposits could gather in the pipe, which might lead to difficult fuel supplying and to firing of the dust, in case of emergency situations caused by the penetration of hot flue gasses through it.

How to restart the burner – after removing the normal operation fault cause the burner restoring to operation can be achieved by switching off and then on (restarting) its main power supply.
6.11. SAFETY AND UNPREDICTED RISKS.

Risks related to the “GP” burner usage:

The automated pellet burner from series “GP” is designed and manufactured in compliance with the major safety European standards and directives. Danger conditions may occur in the following situations:

- The automated pellet burner from series “GP” has been improperly used;
- The pellet burner is installed by unqualified personal;
- The instructions for safe usage, presented in this manual, are not observed;

Unpredicted risks:

The pellet burner from series „GP“ is designed and manufactured in compliance with the acting safety standards. Although all possible risks, resulting by its improper usage, are preliminary considered, it is possible that the following situations may occur:

- Risks of burning, caused by the high temperature from the burning process in the combustion chamber, during cleaning the burning zone or unburned material in the fire-grate;
- Risks of electrical shock from indirect contact. The pellet burner from “GP” series is connected to the electrical network and the control modules are positioned in the control board, equipped with the necessary safety devices, protecting against overload and short circuit. The burner ground connection is mandatory and must be performed by an authorized technician. Opening the burner’s protection cover by unauthorized person is strictly forbidden;
- Risks of finger injuring during works of maintenance and cleaning. It is recommended to use proper personal safety equipment;
- Risk of strangulation in case of insufficient chimney draught, clogging of the convection line of the boiler, to which the burner from series “GP” is mounted, or improper sealing of the flue pipeline.

6.12. COMPLETING THE BURNER’S WARRANTY CARD.

The attached WARRANTY CARD has to be completed by filling in all of the required information in its fields. The stamp and signature fields have to be also completed in order to ensure the pellet burner from series “GP” WARRANTY CARD VALIDITY.
6.13. ACTIVITIES AFTER EXPIRY OF THE BURNER LIFE CYCLE PERIOD.

After expiry of the product life cycle, its extermination has to be performed in protective for the environment way. Its modules must be disassembled and transferred to second raw material redemption stations, by observing the principles for separate collection of wastes.
# 7. FAILURES AND TROUBLESHOOTING.

Table 7.1. Description of the failures during operation of pellet burner from series “GP IV” and the methods for their removal.

<table>
<thead>
<tr>
<th>No</th>
<th>Failure</th>
<th>Reason</th>
<th>Troubleshooting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>In case the burner is mounted to hot water boiler and the room temperature is low</td>
<td>Insufficient heating output</td>
<td>Increase the burner’s heating output level</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low assigned temperature</td>
<td>It is necessary to check the circulations water temperature assigned in the burner’s control module;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low assigned temperature of the room thermostat (if installed)</td>
<td>It is necessary to check the room thermostat temperature assignment;</td>
</tr>
<tr>
<td>2.</td>
<td>In case the burner is mounted to hot water boiler and the room temperature is high</td>
<td>Heating output exceeding the consumption</td>
<td>Decrease the burner’s heating output level</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High assigned temperature</td>
<td>It is necessary to check the circulations water temperature assigned in the burner’s control module;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High assigned temperature of the room thermostat (if installed)</td>
<td>It is necessary to check the room thermostat temperature assignment;</td>
</tr>
<tr>
<td>3.</td>
<td>The burner is switched on but there is not burning process</td>
<td>No assignment for operation</td>
<td>Check the operation assignment by the burner’s control module;</td>
</tr>
<tr>
<td>4.</td>
<td>Hard fuel ignition</td>
<td>Low quality pellets</td>
<td>It is necessary to change the pellets, probably their water content is higher than the required for normal operation of the appliance;</td>
</tr>
<tr>
<td>5.</td>
<td>The fuel ignition is accompanied by abnormal noise</td>
<td>Insufficient chimney draught</td>
<td>It is necessary to inspect the chimney and the appliance condition, to which the burner is mounted and to clean them from the ash deposits. After cleaning it could be required to adjust the system’s operation parameters – ask for servicing assistance;</td>
</tr>
<tr>
<td>6.</td>
<td>Overheating of the appliance to which the burner is mounted</td>
<td>No heating load or incorrect adjustment of the burner’s or the appliance heating output</td>
<td>It is necessary to perform inspection of the correct working order of the system burner-appliance and its eventual re-adjustment of the operation parameters – to be performed by specialist. After cooling of the consuming appliance and removal of the failure the emergency thermostat has to be deactivated (unscrew the protection cover, press the button and screw the cover back), and after that start the burner by restarting it;</td>
</tr>
<tr>
<td>7.</td>
<td>Fuel does not ignite</td>
<td>No fuel in the hopper</td>
<td>The fuel hopper that supplies the transport auger has to be refueled;</td>
</tr>
<tr>
<td>Lack of fuel in the burner combustion chamber</td>
<td>The process of ignition can be restored by restarting the burner;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presence of fuel over the burner’s fire-grate, but it is not fired or it has burned and there is no burning process</td>
<td>Clean the fuel deposits in the burner’s fire-grate; If the ignition element has been damaged or is not active it must be replaced;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incorrect operation of the photo-sensor, monitoring the burning process</td>
<td>The photo-sensor for monitoring of the burning process has to be adjusted or replaced – has to be performed by servicing specialist only;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8. The burner does not start or stops operation

| Lack of electrical power supply | Check if the burner display is operating and its indication signals. Check the appliance power supply working order, to which the burner is mounted and which supplies the burner with voltage 220 V, 50 Hz – to be performed by servicing specialist. Check the burner wiring according to the attached diagram. Check for loose electrical connections - to be performed by servicing specialist; |
| No start signal to the burner | Check if the burner receives start signal and its module’s electrical connections working order- to be performed by servicing specialist. Check for loose electrical connections. Check the operation module’s working order, which supplies voltage 220 V, 50 Hz - to be performed by servicing specialist; |
| There is operation signal but the burner is not operating | Inspect for presence of activated alarm – check the alarm signals list on the controller and its indication, presented in the next table; |

Blown fuses

To be performed by servicing specialist: check the fuses condition and if necessary replace them with the same type fuses (Warning: the fuses F1, F2, F3 and F4 are fast reacting);

9. The flame is dim and the chimney smokes

<p>| Low quality fuel | It is necessary to replace the fuel, its water content is probably higher than the normal required for normal operation of the burner; |
| Improper adjustment of the appliance | It is necessary to adjust the appliance operation parameters - to be performed by servicing specialist; |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10.</td>
<td>The burner starts but cannot transit to stable operation mode</td>
<td>Incorrectly positioned photo-sensor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The photo-sensor surface is dirty</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The photo-sensor is damaged – tracks of burning over its surface</td>
</tr>
<tr>
<td>11.</td>
<td>The burner operates unstable</td>
<td>Incorrect operation of the photo-sensor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The control module settings has been changed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Abnormal heating of the burner’s fuel inlet pipe</td>
<td>Insufficient chimney draught or dirty appliance</td>
</tr>
<tr>
<td>13.</td>
<td>Abnormal heating of the burner’s fuel inlet pipe and activation of its emergency thermostat</td>
<td>Low chimney draught or the appliance is clogged from ash particles</td>
</tr>
<tr>
<td>14.</td>
<td>Indication for increased temperature by the reversible thermo-sticker</td>
<td>Increased resistance in the flue gas extraction line or insufficient chimney draught</td>
</tr>
<tr>
<td>15.</td>
<td>Activation of the irreversible thermo-sticker, labeled on the pellets inlet pipe</td>
<td>Exceed of the operation temperature in this pipe, which in most cases is result by the flow of hot flue gasses through it</td>
</tr>
<tr>
<td>16.</td>
<td>Dirty and/or melted photo-sensor</td>
<td>Incorrect stopping of the burner operation</td>
</tr>
<tr>
<td>17.</td>
<td>Presence of unburned fuel in the ash-tray</td>
<td>Ineffective fuel combustion</td>
</tr>
<tr>
<td>18.</td>
<td>Slag deposits in the combustion chamber (melted mineral mass)</td>
<td>The used fuel is with high ash content and does not comply with the appliance requirements</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Burner operation with heating output over the nominal</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>19.</td>
<td>Alarm code, shown on the burner’s controller display</td>
<td>Problem in the burner operation</td>
</tr>
<tr>
<td>20.</td>
<td>The burner has stopped, but it operates after restarting</td>
<td>The photo-sensor submits wrong information to the control module</td>
</tr>
<tr>
<td>21.</td>
<td>High flue gas temperature (if a thermometer is installed)</td>
<td>Dirty heat exchanging surfaces depending on the appliance type and the operation mode</td>
</tr>
<tr>
<td>22.</td>
<td>Presence of smoke in the boiler room after period of operation</td>
<td>Dirty or clogged tract for extraction of the flue gasses out of the appliance – heat exchanger</td>
</tr>
<tr>
<td>23.</td>
<td>The burner stops when it reaches the assigned temperature or when it performs periodical intermediate stops for blowing, but shows message: “Error - final combustion failed”</td>
<td>Pellets with high ash content, fuel deposits in the pipe</td>
</tr>
<tr>
<td>24.</td>
<td>Other, not presented failures</td>
<td></td>
</tr>
</tbody>
</table>

**EXPLANATION:**

*: excessive heating of the pellets inlet pipe, in most cases resulting from contamination of the appliance’s heat exchanging surfaces, to which the pellet burner is mounted;

**: In case of insufficient chimney draught it is recommended to ask for servicing assistance – cleaning, chimney inspection or others.
Table 7.2. Description of the faults included in the controller menu „LOG” list from a “GP IV” series pellet burner.

<table>
<thead>
<tr>
<th>No</th>
<th>Alarm code</th>
<th>Description of the alarm</th>
<th>Troubleshooting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>10</td>
<td>Failed fuel ignition</td>
<td>Clean the burner’s fire-grate; Check for fuel in the hopper; Ask for servicing assistance;</td>
</tr>
<tr>
<td>2.</td>
<td>11</td>
<td>Flame dyes during burner operation</td>
<td>Ask for servicing assistance;</td>
</tr>
<tr>
<td>3.</td>
<td>12</td>
<td>Photo sensor fault</td>
<td>Ask for servicing assistance;</td>
</tr>
<tr>
<td>4.</td>
<td>13</td>
<td>PC motherboard temperature is too high</td>
<td>Switch off the burner until ; Ask for servicing assistance;</td>
</tr>
<tr>
<td>5.</td>
<td>14</td>
<td>The temperature sensor measured value is under 5°C</td>
<td>The circulations water is with dangerously low temperature and its freezing is possible; Ask for servicing assistance and installation inspection;</td>
</tr>
<tr>
<td>6.</td>
<td>15</td>
<td>The temperature sensor measured value is over 120°C</td>
<td>The circulations water is with dangerously high temperature. Overheating of the appliance and the heating system is possible; Ask for servicing assistance and inspection of the installation;</td>
</tr>
<tr>
<td>7.</td>
<td>16</td>
<td>PC motherboard failure</td>
<td>Ask for servicing assistance;</td>
</tr>
<tr>
<td>8.</td>
<td>18</td>
<td>Fan relay fault</td>
<td>Ask for servicing assistance;</td>
</tr>
<tr>
<td>9.</td>
<td>19</td>
<td>The fan is not rotating</td>
<td>Ask for servicing assistance;</td>
</tr>
<tr>
<td>10.</td>
<td>20</td>
<td>The fan rotates with improper speed</td>
<td>Ask for servicing assistance;</td>
</tr>
<tr>
<td>11.</td>
<td>21</td>
<td>Primary ignition is not completed</td>
<td>Check fuel quantity and the auger operation; Ask for servicing assistance;</td>
</tr>
<tr>
<td>12.</td>
<td>22</td>
<td>Fuel transport auger fault</td>
<td>Ask for servicing assistance;</td>
</tr>
<tr>
<td>13.</td>
<td>23</td>
<td>The photo sensor does not dim during final combustion</td>
<td>Ask for servicing assistance;</td>
</tr>
<tr>
<td>14.</td>
<td>24</td>
<td>Loss of light by the photo-sensor during operation and after ignition phase</td>
<td>Ask for servicing assistance;</td>
</tr>
</tbody>
</table>
Table 7.3. Description of faults/errors, shown on the control module display of a burner from series “GP IV”.

<table>
<thead>
<tr>
<th>No</th>
<th>Message shown on the display</th>
<th>Meaning</th>
<th>Troubleshooting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>IGNITION FAILED</td>
<td>-</td>
<td>Check for fuel and auger operation or ask for servicing assistance;</td>
</tr>
<tr>
<td>2.</td>
<td>LOST FIRE IN COMBUSTION</td>
<td>Looses fire during operation</td>
<td>Check the auger connection, restart the burner;</td>
</tr>
<tr>
<td>3.</td>
<td>STOKER FAULT</td>
<td>Auger connection is interrupted</td>
<td>Check the auger power supply, possible reason could be overheating of the pellets inlet pipe – check the thermo-stickers;</td>
</tr>
<tr>
<td>4.</td>
<td>TEMP- SENSOR LOW</td>
<td>Temperature sensor is switched off</td>
<td>Check NTC sensor connection</td>
</tr>
<tr>
<td>5.</td>
<td>PHOTOSENS</td>
<td>Photo sensor fault</td>
<td>Check the photo sensor condition, replace it if necessary – to be performed by servicing assistance;</td>
</tr>
<tr>
<td>6.</td>
<td>TEMP SENSOR OVERHEAT</td>
<td>High temperature read by the temperature sensor</td>
<td>Check the hot water boiler condition, cool down the appliance;</td>
</tr>
</tbody>
</table>
8. WIRING DIAGRAM OF AUTOMATED WOOD PELLET BURNER FROM SERIES “GP IV”.

The wiring diagram of automated pellet burner from series “GP 45 IV” is presented on Figure 8.1.
WARNING – remove the bridge in case of room thermostat and switch “START” installation.

Figure 8.1. Schematic wiring and connection diagram of automated pellet burner from series “GP 45 IV”.

Pellet burner GP 45 IV
WARRANTY CONDITIONS

The manufacturing company guarantees correct and trouble free operation of the pellet burner from series “GP” only if the installation and operation requirements during initialization and maintenance are observed.

The warranty period of the automated pellet burner start is considered from the date of completing and stamping its warranty card.

The pellet burner warranty starts from the day of initialization to operation, but no longer than 6 months from the date of purchase.

The warranty period of the product is 24 (twenty four) months.

The warranty is valid only when the purchase invoice and original warranty card are presented.

THE PRODUCT WARRANTY IS NOT VALID in the following situations:

- Damages over the pellet burner caused by improper storage, transport and/or unloading, which are not organized by the manufacturing company;
- Failures caused by natural disasters (earthquakes, fire, floods and others);
- The requirements for installation, operation and periodical maintenance, presented in the current manual book, are not observed;
- Attempts for removing any defect, performed by the buyer or other unauthorized persons;
- Changes over the pellet burner construction;
- Incorrect heating calculations and project design for mounting and installation of the generator;
- Failures for which the manufacturing company is not responsible/ which are not under control;
- Malfunctions and damages which are not caused by the pellet burner itself, but have led to failure in its construction;
- In case the irreversible thermo-sticker has been activated or in case it has been damaged or removed.

Every warranty repair must be written in the product warranty card.

The warranty period is interrupted for the period of time from the date of registering the warranty claim up to removal of the failure.