GECO®

INSTRUCTIONS FOR CONTROLLER

GH21PB

FOR CONTROLLING CENTRAL HEATING BOILERS FIRED WITH PELLETS AND OATS

USER MANUAL

We strongly recommend that you familiarise yourself fully with the contents of this manual before installing and using any of our devices. If you have any questions, please contact us between 08:00 and 16:00

Table of contents

1. Description of controller

The GH21PB controller is assembled using microprocessor techniques utilizing automatic surface mounting.

This controller is a device used to control the process of preparing domestic hot water (the DHW circuit), and provides support for the main circuit (circuit CH). Parameters can be adapted according to the condition and the type of boiler.

The controller is equipped with a system to guard against power failure and various types of interference. The controller identifies each emergency and gives a visual and audio warning.

The controller automatically supports three installation configurations, which meet the requirements of the installer fully. The device supports four temperature sensor inputs (one PT1000 sensor), optical input for flame sensor (option), standard thermostat , additional output for room panel GA03HA GECO , and five outputs for external devices.

2. Technical specifications

Supply voltage	230V ~ +10% -15%		
Operating temperature	od +5°C do +40°C		
Humidity	od 20% do 80% RH		
Fuse – Fan, Feeder	3,15A		
Sensor type	NTC 2,2kΩ; PT1000		
Sensor temperature operating range	NTC:	0°C÷100°C	
	PT1000:	0°C÷400°C	

Resistance characteristics of NTC sensor	
Temp. °C	Resistance Ω
0	7174,89
10	4374,83
20	2747,10
30	1774,91
40	1172,09
50	795,08
60	547,95
70	384,62
80	275,86
90	202,37
100	149,16

Resistance characteristics of PT1000 sensor	
Temp. °C	Resistance Ω
0	1000,00
50	1194,00
100	1385,10
150	1573,30
200	1758,60
250	1941,00
300	2120,50
350	2297,20
400	2470,90
450	2641,80
500	2809,80
550	2974,90
600	3137,10

Input	Maximum continuous load	
DHW P./Mix P./Feeder	1A	250W
CO Pump	1A	250W
Fan*	1A	250W
Feeder*	1A	250W
Lighter	3A	750W

When a contactor or relay proxy is connected, use a dedicated blowout system (eg varistor). Omission of this security measure may result in malfunction or damage to the controller output.

3. Requirements for electrical installation

WARNING!

Only a person with a valid license to carry out electrical installation work can install the controller wiring and connection technologies. It is recommended that the work is carried out by a qualified installation engineer. The following are the basic requirements for the electrical power supply for this particular controller:

1. Repairs, maintenance and other work on the system can be carried out only after disconnecting the main power supply.
2. The room in which the controller is to be installed should be equipped with 230V/50Hz electrical system in accordance with the applicable regulations.
3. The controller should be supplied from a dedicated circuit 230VAC/50Hz grid, protected by a circuit breaker.
4. The controller power cable should have a cross section minimum mechanical strength of 1.5 [mm2]
5. The cable must be protected from mechanical damage, by keeping it in a duct or housing

4. Graphic and text descriptions of driver connection

When the cable has been prepared, you will be ready to connect the power to the controller and temperature sensors, thermostats and other devices:

- The 230 V power supply should be connected to the controller using the terminals marked "L" and "N".
- The NTC temperature sensor must be connected to the inputs in accordance with the instructions set out in the tables in section 8: "System Installation". Please note that the number of sensors supported depends on the type of installation, and unused sensors do not have to be connected to inputs.
- Flame sensor, standard thermostat and reed relay must be connected to the inputs in accordance with the instructions set out in the tables in section 8: "System Installation".
- The room panel GA03HA must be connected to a separate input, as described.
- Technological equipment (pumps / fan / feeders and lighter) should be connected to the outputs, as described in the tables in section 8, System Installation and according to the selected installation
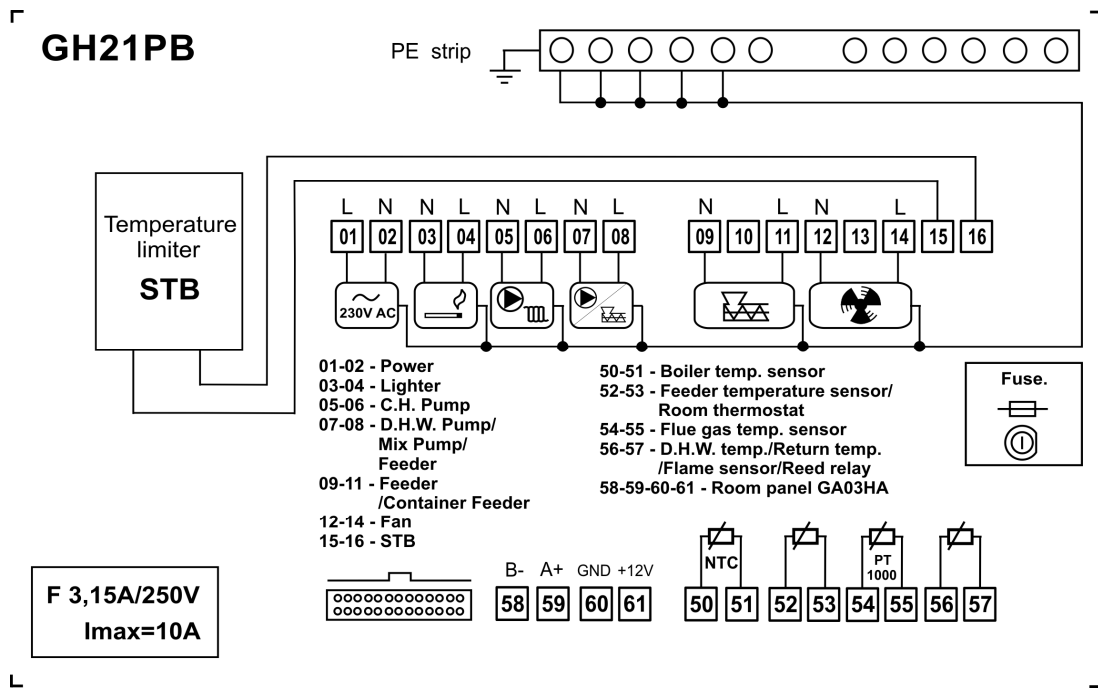
Input parameters are described in the following tables:

Description of controller inputs – temperature sensors		
Temperature sensor	**Type of input**	**Controller designation**
Water flowing from the boiler	NTC	50-51
Fuel Feeder	NTC	52-53
Flue gas	PT1000	54-55
Water in the DHW boiler*/ Return temp.*	NTC	56-57
Description of controller inputs – room thermostat		
Type of room thermostat	**Type of input**	**Controller designation**
GA03HA dedicated room panel - GECO	RS485	58-59-60-61
Standard thermostat	-	52-53
Description of controller inputs – digital		
Flame sensibility sensor on the grate	**Type of input**	**Controller designation**
Flame sensor*	Optical sensor	56-57
Reed relay*	Optical sensor	56-57

*Only in particular schema

Description of controller outputs – technological equipment		
Device installed	**Type of input**	**Controller designation**
Lighter	Relay	03-04
CH pump	Relay	05-06
DHW pump/ Mix pump/ Feeder burner	Relay	07-08
Feeder**	TRIAC	09-11
Fan	TRIAC	12-14

**The type of feeder is depend of schema which were choose.

GH21PB

PE strip

Temperature limiter
STB

L	N	N	L	N	L	N	L		N	L	N	L		L
01	02	03	04	05	06	07	08		09	10	11	12	13	14	15	16

230V AC

01-02 - Power
03-04 - Lighter
05-06 - C.H. Pump
07-08 - D.H.W. Pump/
      Mix Pump/
      Feeder
09-11 - Feeder
      /Container Feeder
12-14 - Fan
15-16 - STB

50-51 - Boiler temp. sensor
52-53 - Feeder temperature sensor/
      Room thermostat
54-55 - Flue gas temp. sensor
56-57 - D.H.W. temp./Return temp.
      /Flame sensor/Reed relay
58-59-60-61 - Room panel GA03HA

Fuse.

F 3,15A/250V
Imax=10A

B- A+ GND +12V

| 58 | 59 | 60 | 61 |

NTC

PT 1000

| 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 |

☞ *ONLY A QUALIFIED WIRING TECHNICIAN MAY CONNECT DEVICES TO THE GH21PB CONTROLLER.*
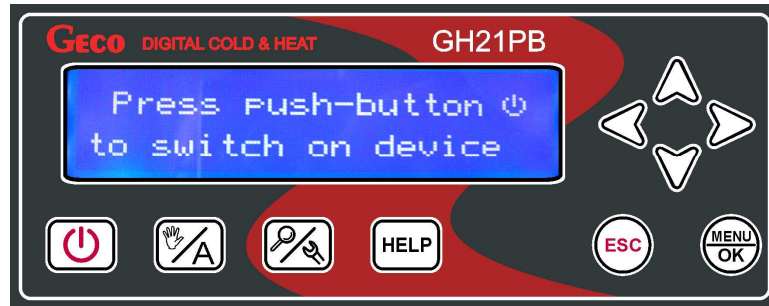
5. Controller modes

The controller can be operated in five modes:

- **Standby** – returns the controller to the state before loss of power. The controller algorithm is not implemented, the clock operates in real time, and the chosen installation settings are stored.
- **Automatic** - There are two sub-modes, heating and sustaining

  Firing up - this is the first step of automatic mode, precede heating mode.

  Heating – in this mode, the algorithm is implemented in the control mode selected depending on the type of fuel and heating installations requirements.

  Sustaining - the controller enters this mode if the boiler temperature reaches the set point. In this mode, an individually prepared algorithm is implemented.

  Sustain Room - the controller enters this mode if the boiler temperature is block by room thermostat or room panel GA03HA.

- **Manual** – This mode is used only to validate the on / off (tests) for each installation of technological equipment, so when you are sure that tests are finished, go to the automatic mode.

- **Alarm** – Characterised by the occurrence of an alarm that prevents further operation of the equipment or the occurrence of a warning, which allows the user to accept temporary operation under warning conditions accepted by the user with the awareness that it is temporary in nature. When the fault is resolved, the driver returns to the mode it was in before.

5.1. Standby mode

After the installation procedure described in the previous chapter, the GH21PB driver is turned on standby. In this mode, the screen displays a message about how to select automatic or manual mode.

When the controller is in standby mode, you can switch to manual mode using the button ⏻. During normal operation, it is possible to return the controller to standby mode at any time, by pressing the button ⏻.

In standby mode, all outputs and the alarm sound signal are disabled. When the controller is switched to automatic mode, the display shows the actual temperature of the water in the boiler, the set temperature, and information about the controller mode.

5.2. Automatic mode – Firing up

The first step in automatic mode is firing up. Firing up controls the fuel feeder, fan and heater in such a way that the device goes straight into automatic mode (if the parameter S34=0, the igniter switch cycle is ignored – the controller does not support heater ignition)

Commencement and completion of firing up is dependent on the sensitivity of the flame, and the retort is read by an optical flame sensor.

After three failed attempts to ignite the boiler flame, alarm number 14 – flame extinguished – is activated. The controller operating in automatic mode will signal 'firing up' with text information in the top part of the screen – 'Firing up'. **The firing up mode is active only in standard regulation.**

5.3. Automatic mode - Heating

In automatic mode, the controller implements the control algorithm for the chosen heating schema, according to the heating regulation option chosen. Basic information about the system, displayed on the main screen, includes current and set boiler temperature, and operating mode. The user may choose from three heating regulation options: Standard, grid mode and pump only.
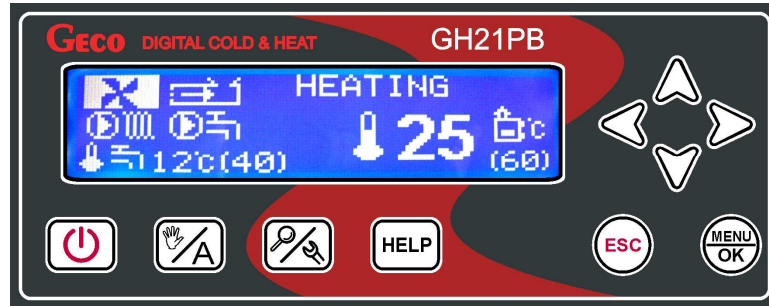
In automatic heating mode, the controller displays text information in the top part of the screen:

   HEATING – when the standard regulation option is set

   GRID MODE H– when the grid mode option is set

   PUMP ONLY – when the pump only mode is set

A detailed description of non-standard heating regulation options can be found in section 7.

5.4. Automatic mode - sustain

   The controller enters this mode if the temperature in the boiler reaches that set by the user in the parameters menu. The fuel feeder and fan are disabled, for the time set by the user in the 'sustain time' parameter.
   The controller will exit sustain mode and return to automatic mode, if the temperature of the boiler falls below the value set in installation parameter 'boiler temperature hysteresis', which can be edited by the user. The central heating pump works in the same way as in automatic mode.

   When working in automatic mode sustain, text information is shown in the top part of the screen:

MAINTAIN – when the standard option is set

SUSTAIN ROOM – when controller is block by thermostat or room panel GA03HA

GRID MODE M– when grid mode is set

In the PUMP ONLY mode maintain mode not exist.

A detailed description of non-standard heating regulation options can be found in section 7.

5.5. Manual mode

   In manual mode, the controller does not implement the control algorithm, and the number and type of technological devices connected is dependent on the user, who takes responsibility for the correct operation of the equipment. On the main screen, the actual and set boiler temperature is always displayed. The choice of heating regulation option does not affect the operation of the system in manual mode. In this case, the user has full control over what equipment will be operated by the controller.
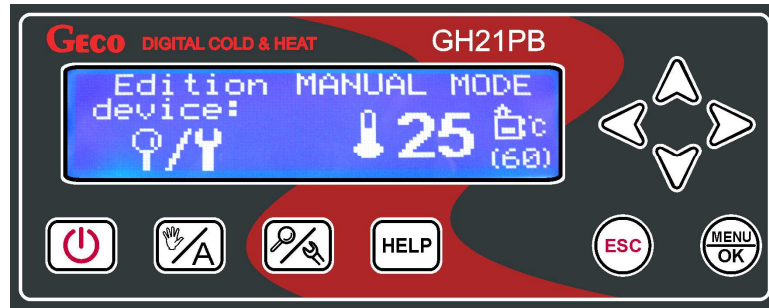
After entering the manual mode, operation of all equipment will be stopped automatically. The controller working in automatic mode displays text information at the top of the screen – 'MANUAL MODE'.

5.6. Alarm/warning mode

Alarm - The controller goes into alarm mode when one of the required sensors fails or is disconnected, or when the cable is broken. The controller will signal that the sensor in question is required. When the fault is repaired, the controller returns to the mode it was in before. The controller will not enter alarm mode when the sensor fault has been repaired. Any changes to components should be done with the controller turned off.

Warnings - The controller switches to warning mode when the DHW/returning sensor fails or is disconnected, or when the cable is broken. The controller then gives information about the warning, and the types of operations conditionally possible without the sensor. The user must always accept operations that are conditional on the lack of sensor, each time the controller is restarted. This applies only to those sensors which do not affect the safe operation of the heating system. After repairing the sensor problem or removing the cause of the interference, the controller returns to the mode in which it was previously operating. Any changes to components should be made with the controller turned off.
The other functions of the warning mode are to give information when the hot water tank has not been disinfected, or the temperature in the feeder has not been raised. The controller exits the warnings mode when one of the warnings is UW10 or UW17.
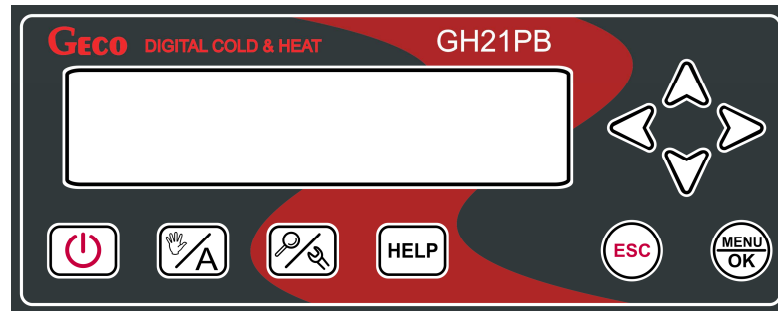
All service like changing sensor or device, should be perform when the controller is switch off.

When the user accept controller emergency work conditionally possible without the sensor, the controller inform user about problem to resolve by show exclamation mark in the bottom center of the display. The mark disappear when sensor is fix.

6. Operating the controller

Operating the controller is described in this chapter. It includes turning it on, using the keyboard, a working preview of the measuring system, reading text or characters on the screen, and editing the parameters available to the user.
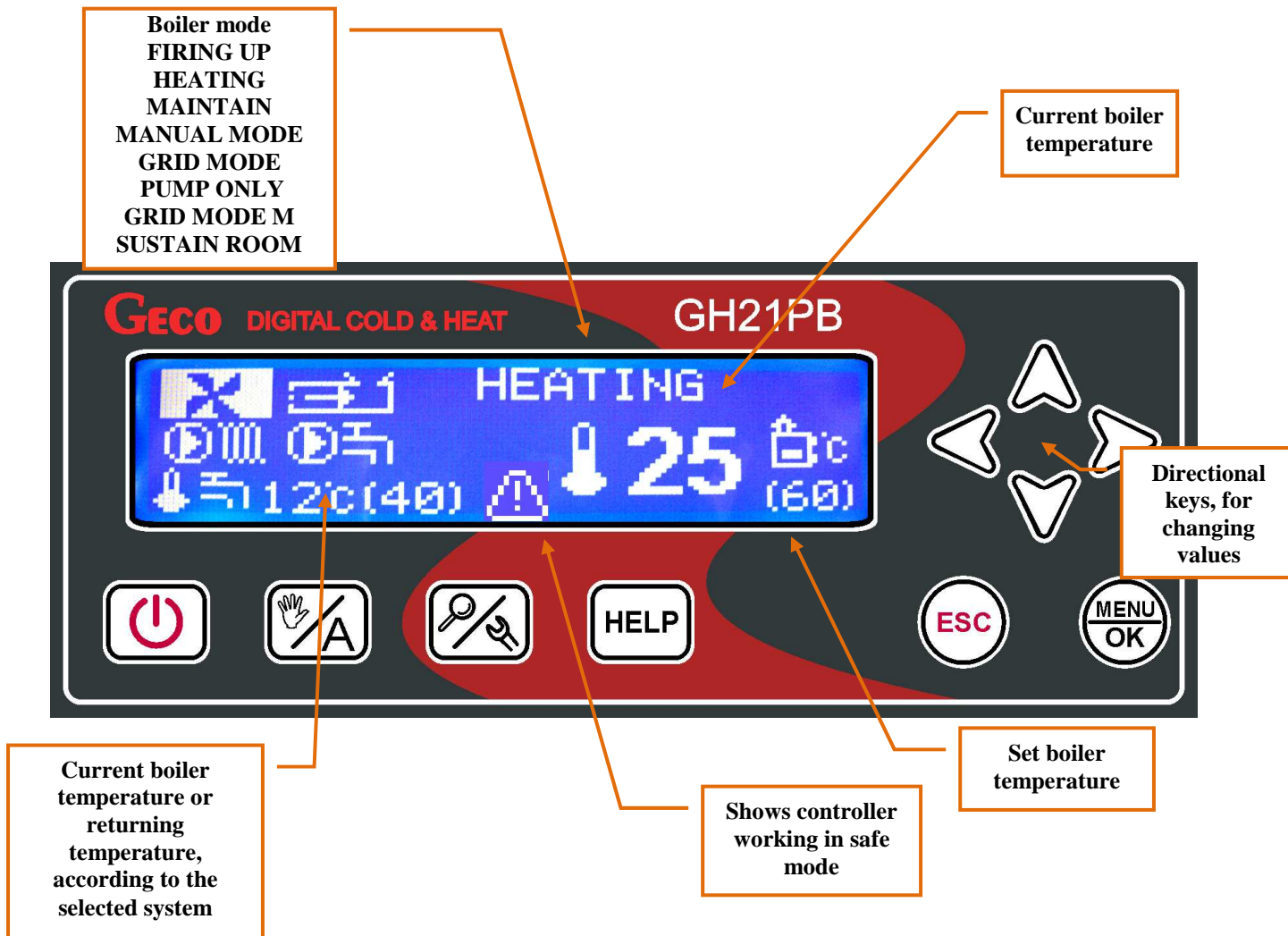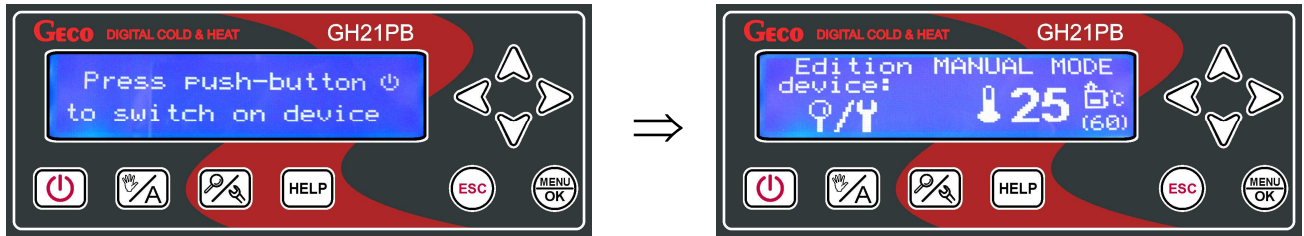
6.1. Controller fascia panel

Button	Description	Function
⏻	Turn on/off	The main screen appears
✋/A	Change modes Switch between manual and automatic	In the 'boiler mode bar', Manual Mode appears, or in the case of Automatic Mode.
🔍🔧	Automatic mode allows a view of devices, temperature and accompanying features. In manual mode, view temperature and accompanying features, and see devices which can be dited.	The screen shows temperature, devices and accompanying features
HELP	From the main screen, go to the user help menu. From the alarm and warnings screen, go to Data service	The screen shows help for users. The screen shows product information and service helpline information.
MENU OK	Confirm change. Enter Menu from the main screen	Saves change Goes to Menu from the main screen
ESC	Exit without confirming changes. Hold the button for three seconds to go to the main screen	Exit to previous screen or higher level menu
▷	Right arrow Quickly go to boiler output temperature screen from the main screen.	Move to the next column or row on the right. The screen displays boiler output temperature.
◁	Left arrow Quickly go to boiler output temperature screen from the main screen.	Move to the next column or row on the left. The screen displays boiler output temperature.
△	Up arrow Increase value	Go to the next position above Increase the value by one step
▽	Down arrow Decrease value	Go to the next position below Decrease the value by one step

6.2. Operating the controller – main screen

When first connected to a power source, the controller turns on in standby mode. The function button ⏻ is used to turn the controller on/off, and to move from standby to manual mode.

Boiler mode
FIRING UP
HEATING
MAINTAIN
MANUAL MODE
GRID MODE
PUMP ONLY
GRID MODE M
SUSTAIN ROOM

Current boiler temperature

Directional keys, for changing values

Current boiler temperature or returning temperature, according to the selected system

Shows controller working in safe mode

Set boiler temperature

6.3. Preview of system operations

The controller offers a quick preview of system operations. When you press the button in any mode, you can preview all the major parameters of the controller, temperature measured by the controller, device status, and active / inactive control functions.

All information on the work of the heating system are divided into categories and placed on separate screens. Move between the screens by using the buttons △ ▽. At the bottom of every screen there is a text description of the item. Move between items on the screen using the buttons ◁ ▷.


The curser shows the position on the screen. The current device is shown by the negation of the icon corresponding to the device. Current additional functions are shown in the same way. System temperature preview is possible in all controller modes. In the manual mode, it is also possible to switch devices on and off.
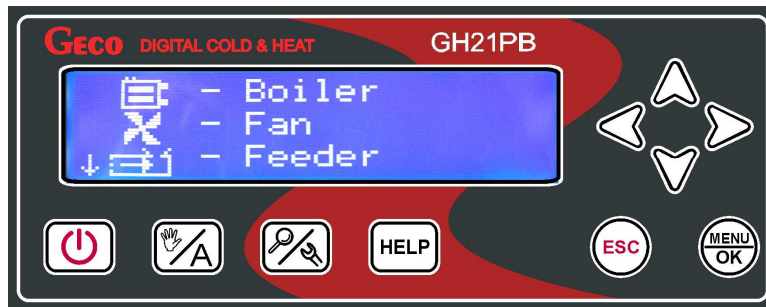
6.4. Help button

Using the button HELP from the main screen opens the help menu, from where the user can get service information and descriptions of all icons displayed on the controller's screens.
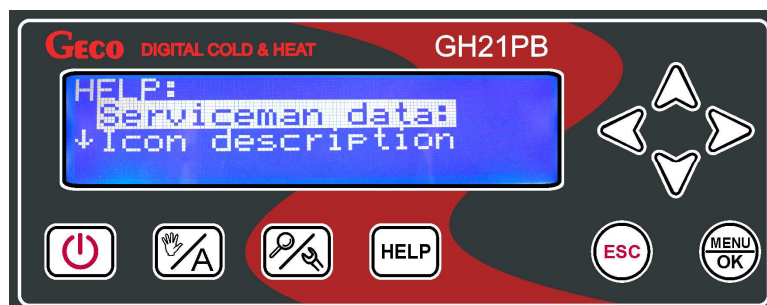
Basic information about the boiler and controller manufacturer is available:
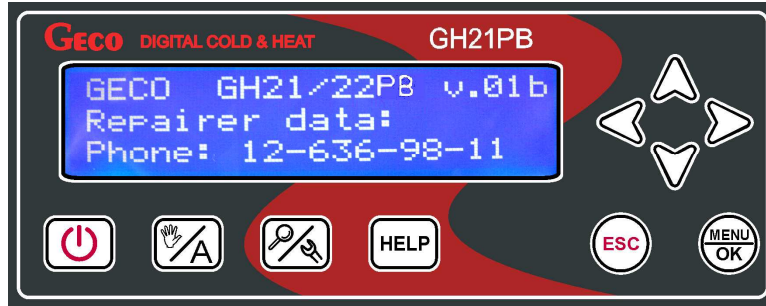
All of the controller's icons are described in text:

USING THE BUTTON [HELP] *FROM ALARM MODE TAKES YOU TO SERVICE INFORMATION. THE FOLLOWING IS DISPLAYED ON THE SCREEN: CONTROLLER MODEL, PROGRAMME NUMBER, AND TELEPHONE CONTACT DETAILS FOR THE MANUFACTURER OR TECHNICIAN.*

6.5. Manual mode

Pressing the button ✋/A in automatic mode switches the controller to manual mode, and immediately stops all devices.

In this mode, the user can manually turn on/off the lighter, fan, feeder, heating pump and hot water pump, independently of each other. To do this, press the button 🔧 which will open the screen for editing the devices.
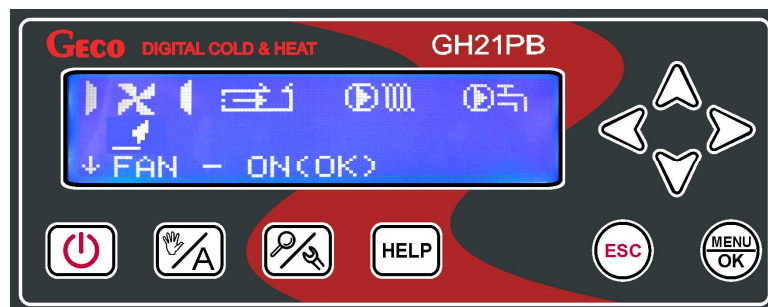
After moving to the desired position on the screen, according to the information text at the bottom, using the button MENU/OK will switch on and off the selected device. The cursor shows the position on the screen. The device to be switched on or off is indicated by a backlit icon.

6.6. Controller menu – Graphic tree

```
                                    MENU

   User settings    Installation settings    Operation record    Controller panel
                                                                      setting

   Boiler temperature   Configuration        Alarms and          Choose language
                        layout               warnings

   Temperatura          Hot utility water    Boiler run time     Date and time
   DHW/Return           (optional)

   Fan speed            Summer mode          Emergency work      Display selection
                        (optional)           time

   Feeder working       Anti-Legionella      Exceeding                    Standard
   time                 (optional)           maximum
                                             temperature

   Feeder stop          Factory settings     Power supply                 Profile 1
   time                                      outage

   Maintain time        Boiler temperature
                        hysteresis

                        DHW temperature
                        hysteresis (optional)

                        Control mode

                               Standard

                               Fire grid mode

                               Pump only

                        Anti-stop function

                               Standard

                               Complete

                               Inactive
```

6.6.1 User settings

Description of user settings parameters	Min	Min	Factory settings
Set boiler temperature	*'S3'*	*'S4'*	50°C
Set DHW temperature (optional)	35	65	40°C
Set returning temperature (optional)	40	60	50°C
Fan speed	1	10	5
Feeder operation time	2	250	15s
Feeder operation interval time	5	250	45s
Sustain time	1	250	5min

- **Set boiler temperature** – Temperature that the boiler will reach. The range is from 'S3' parameter to 'S4' parameter.   Temperature set up in the room panel GA03HA is overriding.
- **Set DHW temperature** – Temperature to which the boiler will rise. This parameter is available for users only when the DHW (temp DHW)/additional mixer pump (temp returning) option is selected. The range is from 35°C to 65°C.
- **Set returning temperature** – Temperature which is returning to the boiler from the layout. This parameter is available for users only when the additional mixer pump (temp returning) option is selected. The range is from 40°C to 60°C.
- **Fan speed** – This parameter sets the fan speed, i.e., the amount of air supplied. It allows the selection of fan speed depending on the quality and type of fuel used.
  The range is from 1 to 10.
- **Feeder operation time** – This parameter describes the length of time that the fuel feeder is connected in HEAT mode, in standard setting. The range is from 2 s to 250 s.
- **Feeder operation interval time** – This is the interval between each supply of fuel to the boiler in HEATING mode. The range varies from 5 s to 250 s. Only available in standard setting.
- **Sustain time** – The time after which the controller switches on the fan and feeder, specified by the manufacturer to prevent the boiler shutting down in sustain mode. The range is from 5 min to 250 min.

6.6.2 Installation settings

Description of installation parameters	Min	Min	Factory settings
System configurations: (1) - K1: Boiler + CH + CONTAINER FEEDER* (2) - K2: Boiler + CH + DHW (3) - K3: Boiler + CH + Mixer	1	3	1
DHW priority (optional)	No	Yes	No
Summer mode (optional)	No	Yes	No
Anti-Legionella (optional)	No	Yes	No
Factory settings	No	Yes	-
Boiler temperature hysteresis	2	10	3°C
Temperature hysteresis of DHW/returning (optional)	2	10	5°C
Regulation option: (1) - Standard (2) – Fire grid mode (3) – Pump only	1	3	1
Anti-stop function: (1) - Standard (2) - Complete (3) - Inactive	1	3	1

*Operating the feeder container is run by adjust value of service parameter

- **System configuration** – Allows selection of the heating system operated by the controller, with an additional pump or without. A description of the system is in section 8.
- **DHW priority** – Activating the function makes water heating the primary function of the Controller. A description of the functions in section 7.
- **Summer mode** – This function turns off the central heating pump and the boiler operates only to heat water. A description of this function is in section 7.
- **Anti-legionella** – This is aimed at limiting the growth of bacteria of the genus legionella pneumophila in the hot water. A description of this function is in section 7.
- **Factory settings** – restore all user and service parameters in the controller.
- **Boiler temperature hysteresis –** value of the boiler temperature hysteresis, at which sustain mode is exited and heat mode is resumed.
- **DHW temperature hysteresis** – value of DHW temperature hysteresis, at which the pump returns to hot water mode, or exits sustain mode.
- **Regulation option** – Allows customisation of the system operation algorithm according to type of fuel and technical capabilities. A description of this function is in section 7.
- **Anti-stop function** – Allows a security function for connected devices, which guards against system deterioration during the summer months. A description of this function is in section 7.

6.6.3 Operation history

Operation history is where information on all controller malfunctions and custom activities is stored. All failures and irregularities identified by the programme are stored and archived according to whether they are alarms or warnings.

Operation history menu:

Additional information is stored to help the user or service technician identify any irregularities in system operation. The types of events recorded in operation history are:

Alarms and warnings – The controller can store the last 8 alarm conditions detected. Alarms and comments are displayed in a chronological list, with the most recent at the top. Alarms are indicated with the symbol AL, and warnings with UW, along with information about the type of problem and the date and precise time at which it occurred.

All new alerts appear on the operation history list alongside an envelope icon, indicating an 'unread' alert that needs the attention of the user or a service engineer. The envelope icon disappears when the alert has been read.
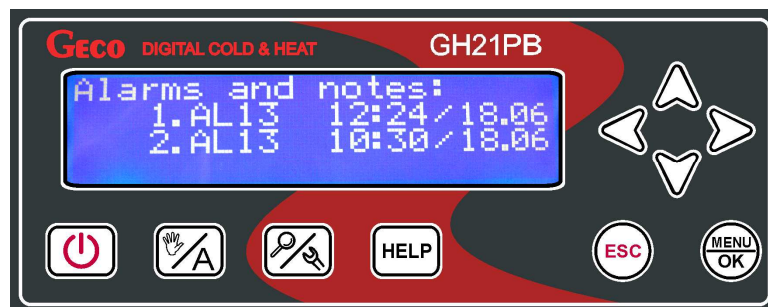
Boiler operating time - The screen shows the operating time, in automatic heating and sustain mode. The time is measured by the hour [h].

Emergency work time – The screen shows safe mode operating time, without breakdown of feeder and fan, measured by the hour [h].

Exceeding maximum temperature – The screen shows the number of times the maximum temperature of 85°C has been exceeded, displayed in number of incidences.
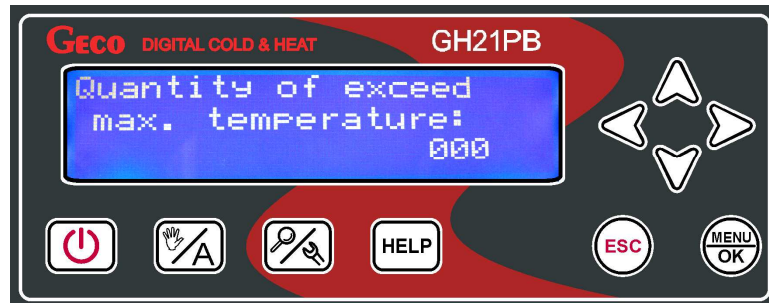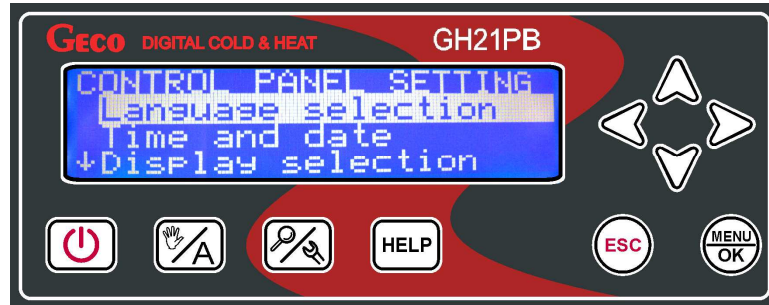

Power failure – The screen shows the number of times that power to the controller has failed, displayed in number of incidences.

6.6.4 Controller settings

Settings for the controller, which do not effect heating system operations, can be found in the controller settings panel.

Controller settings parameters:

Choose language – The controller allows the user to choose from one of several language settings.
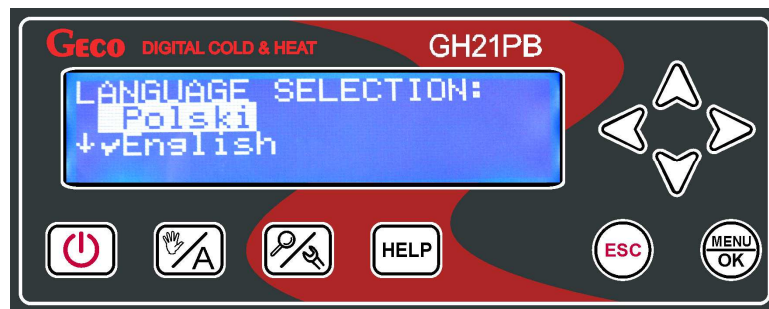
Date and time – In order to ensure that all of the controller functions work correctly and at the optimum level, set the correct time and date.
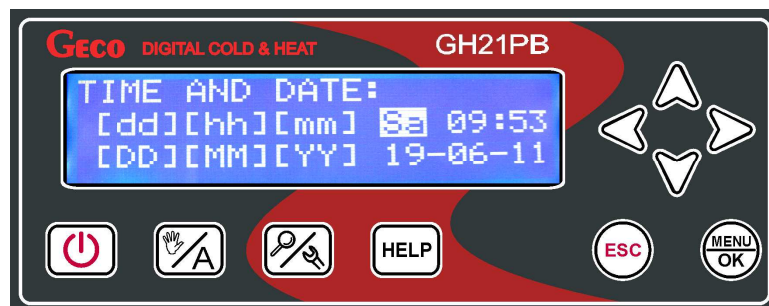
Choose screen – The user can set a personal profile screen, and customise the type of information that will be shown. The settings menu offers several choices, with 'standard' set by default.
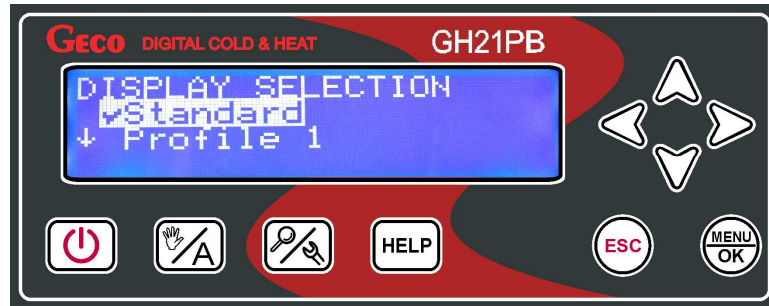
7. Description of additional functions

7.1. DHW priority (hot water)

The GH21PB controller can be set to pump hot water as a priority. If you select this mode, water heating becomes the primary function of the controller, with heating (CH) secondary. This is only available in the second configuration. To enable this function, set the value to "yes" in the menu.

To enable this function, set the value to '**YES**' in the main menu.

7.2. Summer function

The GH21PB controller is equipped with a summer mode, which can be used in the summer to turn off the CH pump so that the boiler only heats water. For this function to work, a system installation supporting a DHW pump must be selected. This is only available in the second configuration.

To enable this function, set the value to '**YES**' in the main menu.

7.3. Anti-legionella function

The controller is equipped with an Anti-legionella function, aimed at limiting the growth of bacteria of the genus legionella pneumophila in the hot water.

Legionella bacteria develop in aqueous environments, and the optimum temperature for their growth is from 38-42 C. These bacteria also contribute to blockages in hot water systems, hot water heaters and tanks. Legionella bacteria cause a non-specific variant of pneumonia known as Legionnaires' disease, or legionellosis. Legionellosis has been officially recognised by the Ministry of Health as an infectious disease.

The anti-legionella function performed by the GH21PB controller aims to ensure that the hot water tank is not a favourable environment for legionella bacteria.

To activate the function, set the value to '**YES**' in the menu.

Duration and operation of this function is shown in system operation preview by negation of the 'LE' symbol. Go to the system operation preview by pressing the button ⌨. This function takes priority over all others, and is the first to be implemented by the controller. When the function is activated, the temperature of water in the boiler is raised to 70 C and maintained for ten minutes. The function can be activated at any time by the user. If, after 120 minutes following activation, the temperature is not reached, the controller switches off the function and displays text information showing that the function could not be implemented. This is only available in the second configuration.

> *SWITCHING ON THE ANTI-LEGIONELLA FUNCTION WILL INCREASE THE TEMPERATURE OF DOMESTIC WATER TO 70C. USE EXTREME CAUTION WHEN USING HOT WATER TO AVOID SCALDING!!!*

7.4. GA03HA room panel

The GH21PB controller is adapted to communicate with GECO's GA03HA room panel, enabling an easy overview of the boiler from the comfort of your home.

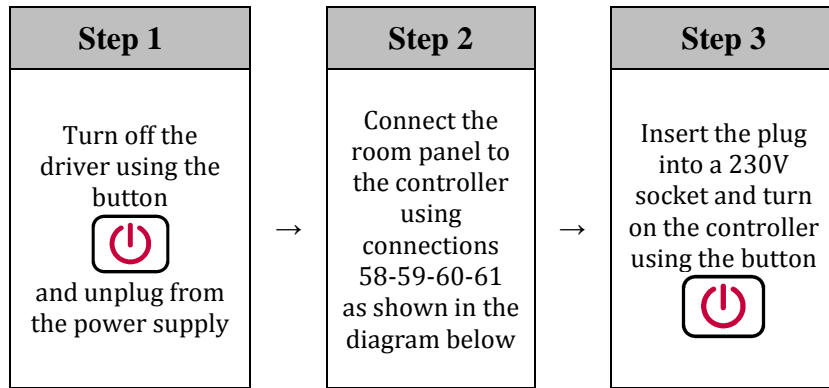Connecting the GH21PB controller to the GA03HA room panel allows:

- Changing the boiler output temperature setting

- Changing the DHW (hot water) or returning temperature setting

- All alarms to be viewed in text format

- Monitoring of the heating system operations

- Monitoring of the operation of devices (fan, feeders, CH pump, DHW pump, lither);

- Monitoring of all temperature measurements

- Possibility of adjust by user set temperature in day-week heating program

> *Proper communication between the panel and controller is shown by the icon ▦ on the controller panel, in negation in the system operation preview screen* ⌨

    If the GA03HA room panel is correctly connected to the controller, it will be automatically detected by the controller and does not require any additional steps or settings from the user. In this case, the controller works according to settings communicated by the room panel. Disconnecting the room panel or damage to the cable connecting the panel to the controller turns off lights behind the icon ⊞ on the screen of the GA03HA room panel.

Follow these steps in order to connect the GH21PB controller to the GA03HA room panel:

Step 1		Step 2		Step 3
Turn off the driver using the button ⏻ and unplug from the power supply	→	Connect the room panel to the controller using connections 58-59-60-61 as shown in the diagram below	→	Insert the plug into a 230V socket and turn on the controller using the button ⏻

GH21PB Controller strip terminal   **GA03HA Room Panel strip terminal**

RS-B	58	—	A
RS-A	59	—	B
GND ⊥	60	—	C
+12V DC	61	—	D
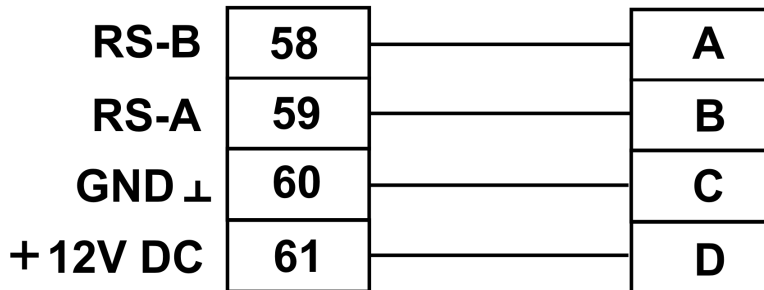
Diagram for connecting the GA03HA room panel to the GH21PB controller

7.5. Standard room termostat

    The GH21PB controller can cooperate with external room thermostat which can put coal boiler in blockade position when temperature is reach in room.

    During blockade position C.H. pump stay off after 4 minutes, for the moment when temperature in room is Reach (short circuit contact). The boiler start working in maintain operation mode. The controller GH21PB passing from automatic operation to maintain operation mode just from time to time, when the boiler temperature is higher than minimum temperature adjust in F03 service parameter or when HUW circulation require automatic operation controller (it depend of HUW Prioriti). When room thermostat put controller in block the position, the boiler is in maintain operation mode and boiler temperature fall down less than F03 service parameter or HUW circulation need heating, than the controller come back to automatic operation mode until both conditions will be accomplish.

The controller supports the room panel of our manufacture. The controller responses to the panel orders if the controller is under the automatic operation mode. Where the malfunction occurs to the connection with the panel, the controller will resume the operation with the user programmed settings. The illuminated dot on the segment on the left-hand side of the display shows that the communication link is operable.

7.6. Fuel feeder temperature detection

The GH21PB controller has the additional option to protect against temperature in the fuel feeder tray rising above the permitted level, preventing the flame from heating the fuel.

Fuel feeder temperature detection works in automatic mode the boiler (Fire up, Automatic, sustain, alarm). When the temperature measurement exceeds that set in parameter S14, the fuel feeder activates for the duration set in parameter S16, in order to remove lit fuel from the feeder. The fan is turned off for the duration of the time set in S16. When the time set in parameter S15 expires, the controller regains control of the maximum feeder temperature. When the feeder T > S14, the fan stops, and the fuel feeder is activated for the duration of S16.The controller will display the message U17 'increased temperature in the feeder'. At the same time, overheating is indicated in preview on the controller, by the backlit negated overheating feeder symbol.

When feeder T > 90^0C the fan is stopped completely, the fuel feeder is connected for twice the duration of S16, and the display shows alarm AL11 'maximum feeder temperature exceeded'.

☞ ***IF S14=0 THE FEEDER SENSOR IS TURNED OFF, AND FEEDER OVERHEATING AND FEEDER TEMPERATURE DETECTION DO NOT WORK.***

7.7. Boiler extinguished detection

7.7.1 Out of fuel

If during automatic mode for the time set in parameter F09 the temperature of the water flowing from the boiler is less than the value set in parameter F08, then the controller finds that the boiler has expired and AL13 occurs. If S8=0, detection of the temperature in the boiler is switched off. If during automatic mode for the time set in parameter S9 temperature in the flue falls below the value set in parameter S11, the controller finds that the boiler has expired and AL13 occurs. If S11 = 0, detection of the temperature in the flue is turned off.

7.7.2 Sharp decline in temperature of water leaving the boiler

When in automatic mode the temperature of water leaving the boiler is lower than 10 C and in a short time does not increase by 4 C, the CH pump and hot water pumps are turned off and the controller enters boiler extinguished detection mode.

The controller waits for the time set in parameter S10, to check whether there is an increase of 4 C.
- When this temperature rise YES occur, detection mode ends, and the heating and hot water pumps are connected.
- When this NO occur, this means that that fuel has gone out and the controller returns alarm AL13.

7.8. Anti-Stop function

The GH21PB controller includes an anti-stop option, a security measure which guards against system deterioration during the summer months. The function turns on the device for a few minutes every seven days, to ensure performance throughout the year.

There are three settings for this function:
- Standard – all devices in the system, except for the feeder tray
- Complete – all devices in the system
- Inactive– function inactive

The anti-stop function can only be activated in manual mode. When this function is active, the user cannot control devices connected to the system. Manual control of external devices is only possible when this function is turned off.

7.9. Standard mode

The factory set default mode for the GH21PB is "Standard mode". This algorithm is designed to control pellet-fired boilers. In this mode, all five external devices are supported. When this mode is active, the main screen displays the text 'HEAT' during operations or 'MAINTAIN' to indicate that the correct temperature has been reached. The mode can be changed by the user, by entering the system parameters and changing from standard mode.

7.10. Grid mode

The GH21PB controller allows the heating regulation algorithm to be changed to 'grid mode', which does not support the feeder tray and lighter. It is usually used when the type of fuel is being changed, for example to wood or green waste paper. The controller operates the boiler, fan and pumps as normal. When this mode is activated the main screen shows the text 'grid mode' or 'grid-sustain' in heating mode.

This type of regulation can be changed by the user, by changing the parameters of the standard mode in the system. Note that the change should be temporary, and that the system performs optimally only with standard settings.

Ignition mode is not active in Fire grid mode

7.11. Pump only mode

The GH21PB controller allows the heating regulation algorithm to be changed to 'pump only' mode. In this mode, neither the feeder nor the fan are supported. The controller not support lighter. It is usually used when the type of fuel is being changed, for example to wood or any other combustible eco-fuel without fan support. The controller only operates the pumps. When this mode is activated, the main screen shows the text 'pump only' in heating mode.

This type of regulation can be changed by the user, by changing the parameters of the system to turn off the standard heating regulation mode. Note that the change should be temporary, and that the system performs optimally only with standard settings.

7.12. Operation history

Operation history is where information on all controller malfunctions and custom activities is stored. All failures and irregularities identified by the programme are stored and archived according to whether they are alarms or warnings.
Additional information in this function includes details from the boiler manufacturer verifying warranty information, such as number of power failures, exceeding the maximum temperature, etc.

7.13. Reed relay

This is kind of sensor which co-operate with feeder. This is the sensor of feeder burner breaking pins. The controller is calculate the average value time of feeder rotation and control during automatic mode. In case of no feeder rotation detection ALARM 9 is appear.
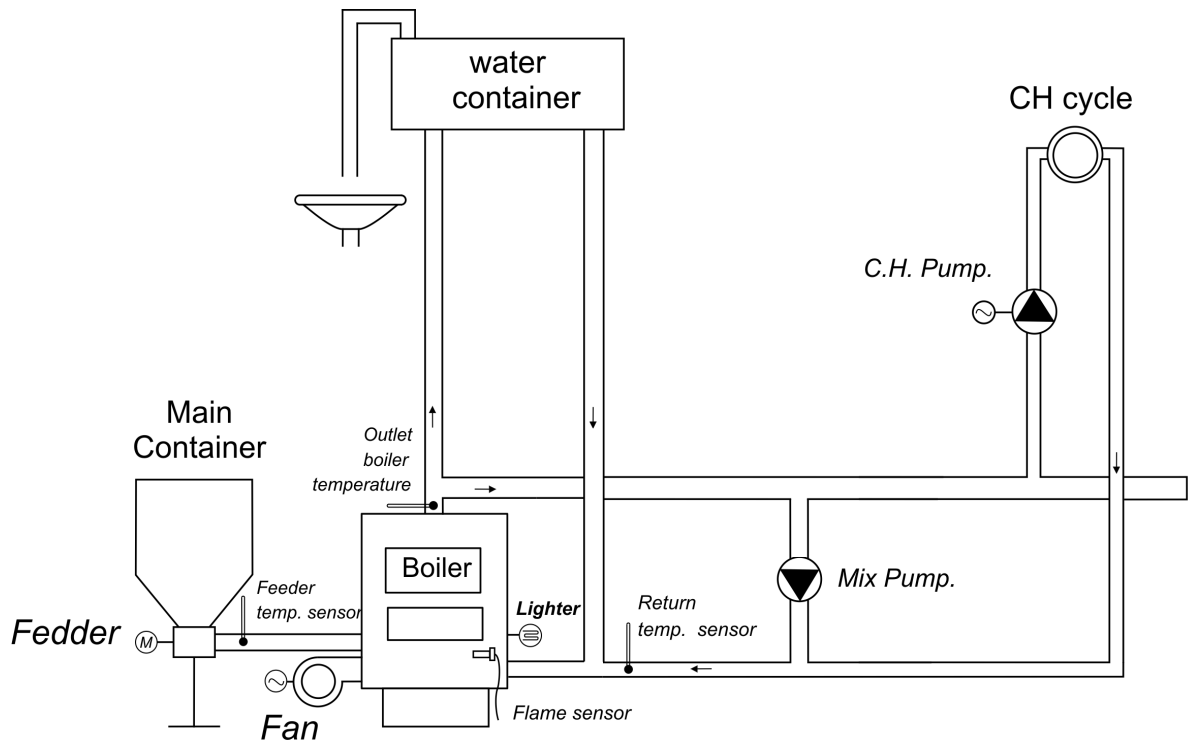
8. System installation

8.1 Heating installation number 1
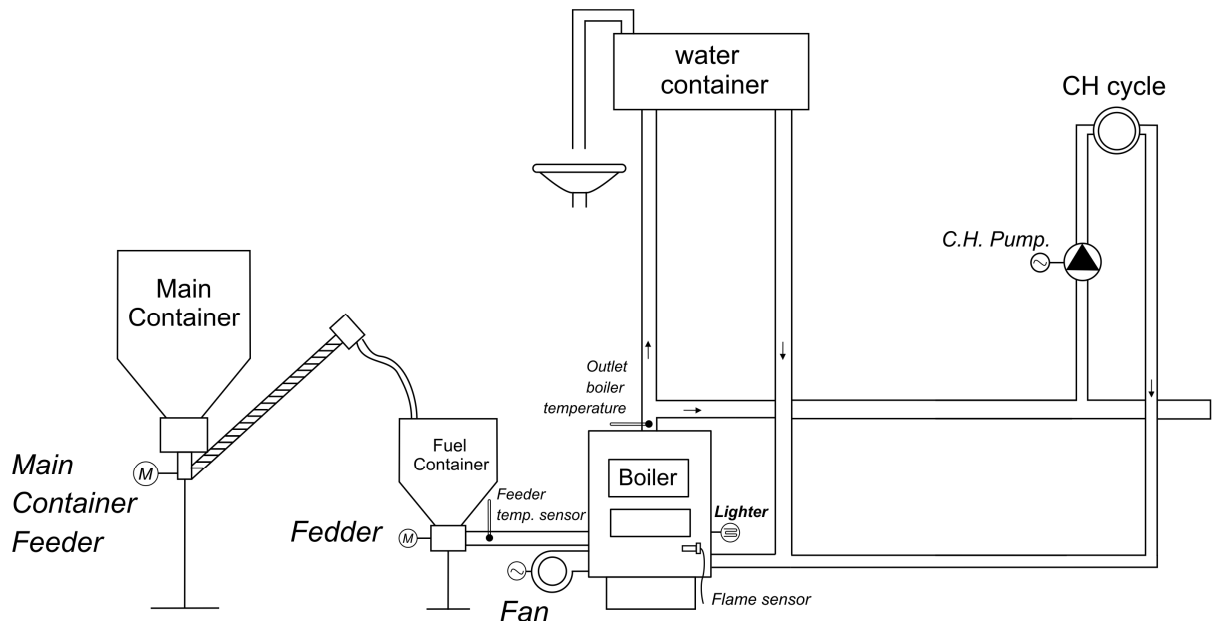
The following list specifies the parameters available to the user, along with the assignment of outputs for attached devices and inputs for temperature sensors.

Diagram 1 - Summary of user parameters		
Parameter	**Range**	**Factory settings**
Set temperature of boiler	50 ÷ 85	50°C
Feeder operation time	2 ÷ 250	15s
Feeder operation interval time	5 ÷ 250	45s
Sustain time	1 ÷ 250	5min
Fan speed	1 ÷ 10	5
Diagram 1 - Assignment of controller outputs		
Output	**Device connected**	
O3-O4	Lighter	
O5-O6	CH pump	
O7-O8	Burn Feeder*	
O9-11	Burn feeder / Container Feeder*	
12-14	Fan	
Diagram 1 - Assignment of controller inputs		
Input	**Description**	
50-51	Sensor for water temperature leaving the boiler	
52-53	Fuel feeder temperature sensor/ Room thermostat	
54-55	Flue gas temperature sensor	
56-57	Flame sensor (Option) / / Reed relay (option)	
58-59-60-61	GECO GA03HA room panel (optional)	

*The outputs are consistent when container feeder is active in service parameter.

8.2 Heating installation number 2
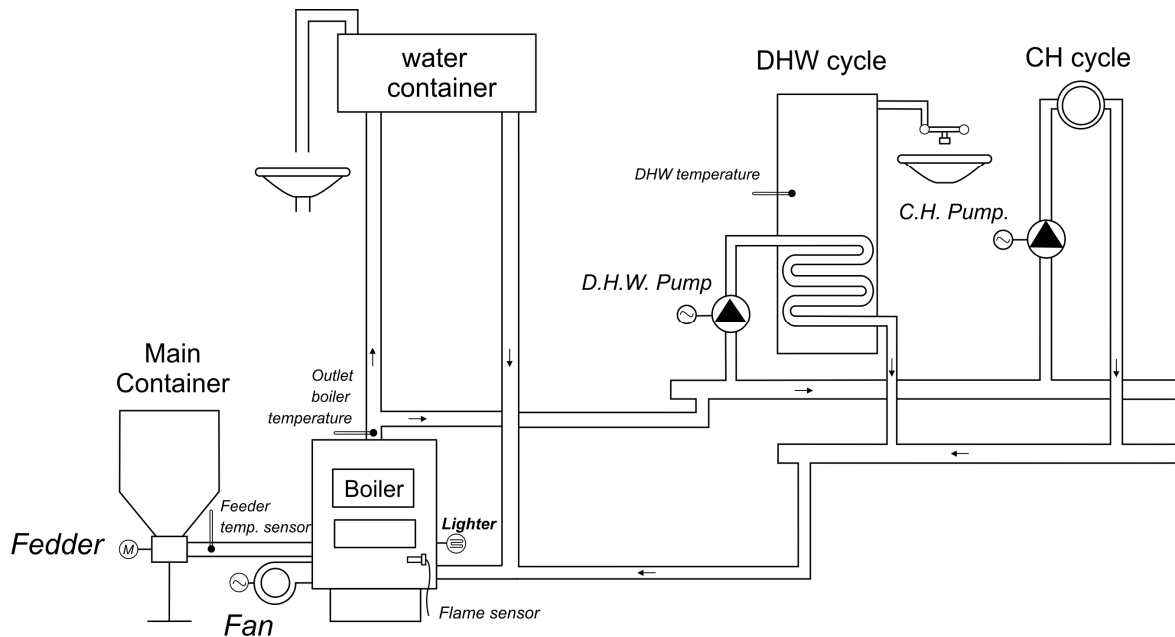
The following list specifies the parameters available to the user, along with the assignment of outputs for attached devices and inputs for temperature sensors.

Diagram 2 – summary of user parameters		
Parameter	**Range**	**Factory settings**
Set temperature of boiler	50 ÷ 85	50°C
Feeder operation time	2 ÷ 250	15s
Feeder operation interval time	5 ÷ 250	45s
Sustain time	1 ÷ 250	15min
Fan speed	1 ÷ 10	5
Set temperature of tank	35 ÷ 65	40°C
Diagram 2 - Assignment of controller outputs		
Output	**Connected devices**	
O3-O4	Lighter	
O5-O6	CH pump	
O7-O8	DHW pump	
O9-11	Feeder	
12-14	Fan	
Diagram 2 - Assignment of controller inputs		
Input	**Description**	
50-51	Sensor for water temperature leaving the boiler	
52-53	Fuel feeder temperature sensor / Room thermostat	
54-55	Flue gas temperature sensor	
56-57	DHW temperature sensor	
58-59-60-61	GECO GA03HA room controller (Optional)	

8.3 Heating installation number 3

The following list specifies the parameters available to the user, along with the assignment of outputs for attached devices and inputs for temperature sensors.

Diagram 3 – Summary of user parameters		
Parameter	**Range**	**Factory settings**
Set boiler temperature	50 ÷ 85	50°C
Feeder operating time	2 ÷ 250	15s
Feeder delay time	5 ÷ 250	45s
Sustain time	1 ÷ 250	5min
Fan speed	1 ÷ 10	5
Returning temperature	40 ÷ 60	50°C
Diagram 3 – Assignment of controller outputs		
Output	**Connected devices**	
O3-04	Lighter	
05-06	CH pump	
07-08	Mix pump	
O9-11	Feeder	
12-14	Fan	
Diagram 3 – Assignment of controller inputs		
Input	**Description**	
50-51	Sensor for water temperature leaving the boiler	
52-53	Fuel feeder temperature sensor / Room thermostat	
54-55	Flue gas temperature sensor	
56-57	Return temperature sensor	
58-59-60-61	GECO GA03HA room panel (Optional)	

9. Controller algorithms for technological devices

9.1   Firing up mode - Fan, feeder, header

9.1.1   Setting without flame sensor

Operation of this mode is indicated by text information at the top of the screen: 'FIRING UP'. Firing up controls the fuel feeder, fan and heater in such a way that the device goes straight into automatic mode (if the parameter S34=0, the igniter switch cycle is ignored – the controller does not support heater ignition)
The fan runs continuously at the yield set in parameter S36, and the controller also indicates whether the feeder, fan and heater are turned on.
Connection and operation of the heater are indicated by a negated heater icon on the controller's preview screen (press button).

The ignition mode is automaticly finish when temperature of flue gas reach value of S54. When during the time adjust in S55 service parameter, temperature of the flue gas air is not reach the value of S54 , the ALARM 14 is appear.

The ignition mode is active only in standard regulation!

When flue gas sensor is broken the firing up mode is not active.

9.1.2   Setting with flame sensor

Operation of this mode is indicated by text information at the top of the screen: 'FIRING UP'. Firing up controls the fuel feeder, fan and heater in such a way that the device goes straight into automatic mode (if the parameter S34=0, the igniter switch cycle is ignored – the controller does not support heater ignition) The fan runs continuously at the yield set in parameter S36, and the controller also indicates whether the feeder, fan and heater are turned on. Connection and operation of the heater are indicated by a negated heater icon on the controller's preview screen (press button).
If during firing up the flame sensor detects a flame (the sensitivity drops below the value of parameter S38), firing is complete and the controller moves to automatic operation.

The firing up process follows this procedure:
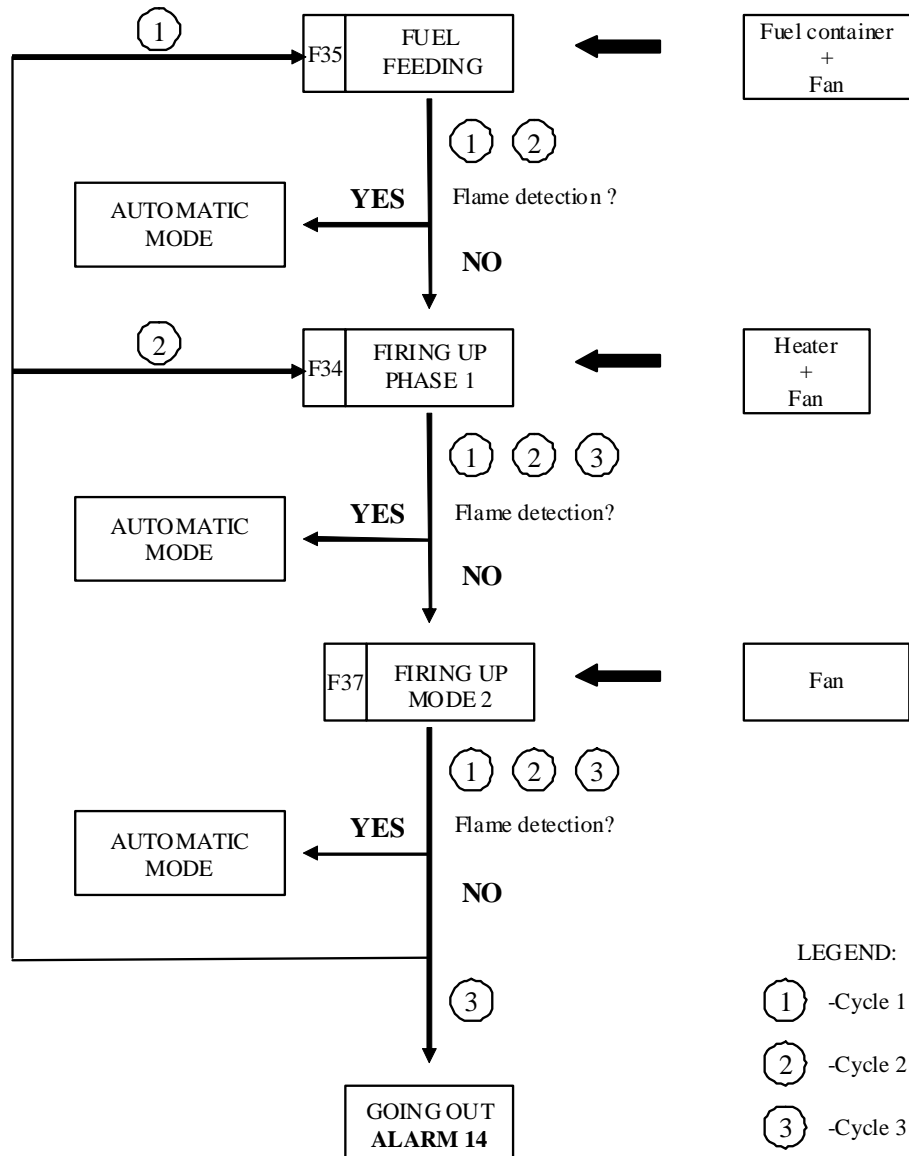
The ignition mode is active only in standard regulation!

9.2   Heating mode – Fan.

The fan starts with the speed set in the parameter "Fan speed".

When the flue sensor is enabled ('S11'> 0), airflow is limited if the temperature exceeds the value of 'S42'° C. The more the temperature exceeeds 'S42'° C, the greater the limitation, and the fan is cut off completely if the temperature exceeds S42+50 ° C.

9.3   Heating mode – Feeder

The feeder is working according of user parameters: "Feeder working time" and "Feeder stop time".

9.4   Maintain mode – Feeder and Fan

The controller enters this mode if the boiler temperature reaches the value set by the user in the "set boiler temperature." or controller will be block by thermostat or room panel GA03HA.

The fuel feeder and fan remain off in this mode, for the time set by the user in "maintain time". After this time, the controller will activate the feeder and the fan according to the manufacturer set time in service parameter S20.

The fan will operate longer than the feeder for the time set in parameter S18 in to burn the fuel already added. The controller will exit SUSTAIN mode and return to HEAT, if the boiler temperature falls to the value of 'set boiler temperature – S05). The heating pump works the same as in HEAT mode.

9.5   CH pump – firing up, heating, maintain mode.

In automatic HEAT mode, the CH pump is activated when the boiler temperature is equal to or greater than the temperature value set in service parameter S06 (the factory set default is 40^0C). Connection and operation of the CH pump are indicated by a negated CH pump icon light in 'preview system operations' .

The controller will stop the pump if the water temperature falls to the pump connection temperature minus 4ºC. (if the pump connection temperature is 40^0C, the disconnection temperature is 36^0C). CH pump disconnection and break in operation are indicated by a non-negated CH pump icon light in 'preview system operations' .

9.6   DHW/mixer pump – firing up, heating, maintain mode.

The DHW pump is activated when the temperature of water leaving the boiler is higher than 40^0C and greater than the temperature of the water in the boiler (so as not to cool the DHW in the boiler), and when the boiler temperature is lower than that set by the user in the parameter 'set DHW temperature'. Connection and operation of the DHW pump are indicated by a negated DWW pump icon light in 'preview system operations' . DHW pump disconnection and break in operation are indicated by a non-negated DHW pump icon light in 'preview system operations' .

9.7   Container feeder – firing up, heating, maintain mode.

Feeder tray operation is selected by choosing service parameter setting S41=1, and installation number 1. The feeder tray runs cyclically, according to the value set by the user in parameters 'fuel feeder operation time' and 'fuel feeder downtime' in heating mode.

In maintain mode, the feeder tray works according to the setting in parameter S20. Connection and operation of the feeder tray are indicated by a negated feeder tray icon light on the 'preview controller operations' screen (press button ⌧).

10. Alarms

The controller has 13 alarms, including eight which will stop the controller for safety reasons and three that are warnings. For each alarm or warning, the number is displayed, along with text information describing the problem, and an audible alarm will sound. When multiple alarms occur, the details are displayed cyclically.

Exiting the alarm is only possible by pressing the button ⏻, with the exception of alarm AL12 (overheating boiler), which the controller automatically exits when the temperature falls below the value set in S17, 4°C. When the user accepts conditional operations, the alarm is swithched off but is activated again every time the controller is turned on.

Types of alarm

- **AL1** → Blown fuse/temperature limiter tripped
- **AL2** → Damage to water leaving boiler temperature sensor
- **AL3** → Damage to fuel feeder temperature sensor
- **AL4** → Damage to DHW/returning water temperature sensor
- **AL7** → Damege of flue gas sensor;
- **AL9** → Damage of reed relay/ No feeder rotation
- **AL11** → Maximum fuel feeder temperature exceeded
- **AL12** → Overheating boiler
- **AL13** → Boiler extinguished
- **AL14** → Flame extinguished

Type of warning:

- **UW4** → Damage to DHW/returning water temperature sensor
- **UW10** → Anti-Legionella function not performed
- **UW17** → Increased temperature in fuel feeder

**Alarm 1** – Blown fuse/temperature limiter tripped

This alarm occurs when the controller detects a zero signal from the power supply for two seconds. This may be caused by a blown fuse or tripped temperature limiter.

Button [HELP] – goes to service data, and the controller is stopped.
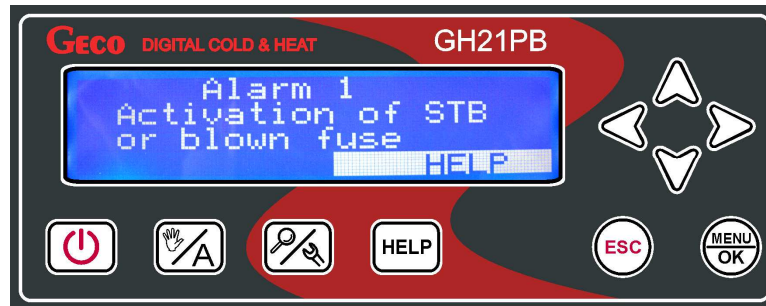
Alarm 2 - Damage to water leaving boiler temperature sensor

This alarm occurs when the NTC 2.2k sensor for testing the temperature of water from the boiler is damaged or not properly connected. Button [HELP] – goes to service data, and the controller is stopped.
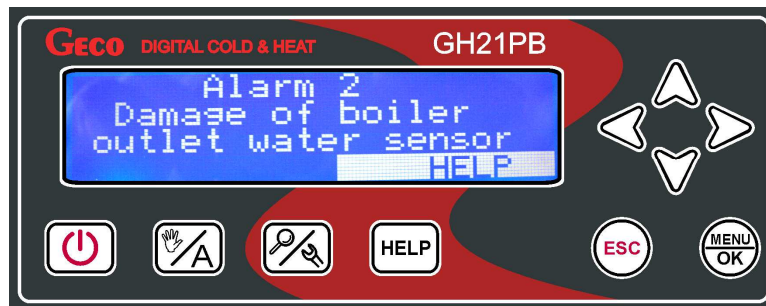
Alarm 3 - Damage to fuel feeder temperature sensor

The user can force safe mode when the fuel feeder temperature sensor is damaged. Safe mode operation will continue until the controller is turned off, or the power is cut. After one of these events the controller returns to manual or automatic mode, determines that the sensor is faulty, and stores this as an alarm, so the operator must force safe mode again. In save mode, the controller will continue to operate without the fuel feeder temperature sensor.

Button [MENU/OK] – continues operation in safe mode.

When S14=0 than operate of feeder sensor is not active!
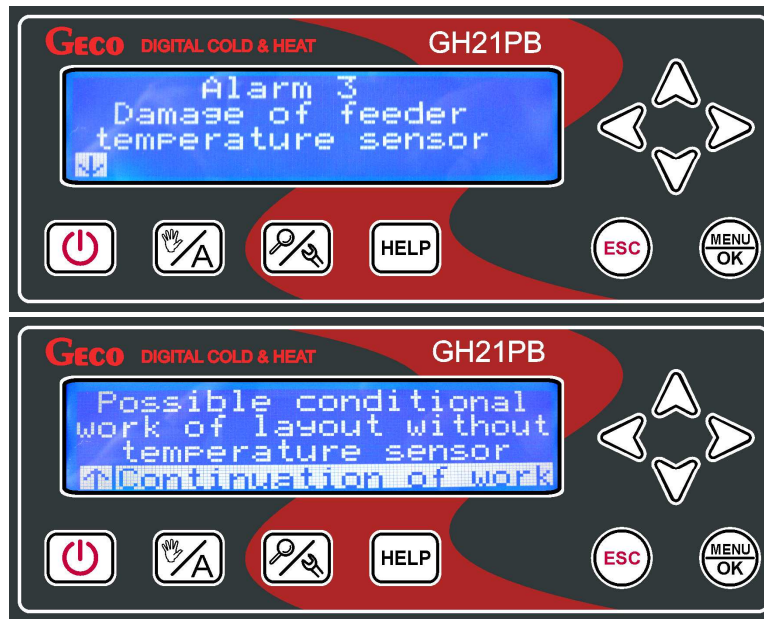
Alarm 4/Warning 4 - damage to DHW/returning water temperature sensor

Stan The alarm occurs when the NTC 2.2k NTC DHW/returning water temperature sensor is damaged or not properly connected. It occurs only when the heating configuration includes an additional DHW/Mixer pump.

When the service parameter 'S49' = 0, the alarm is reported as AL4. After confirmation by the user, the boiler can work in safe mode without the DHW/returning water temperature sensor.
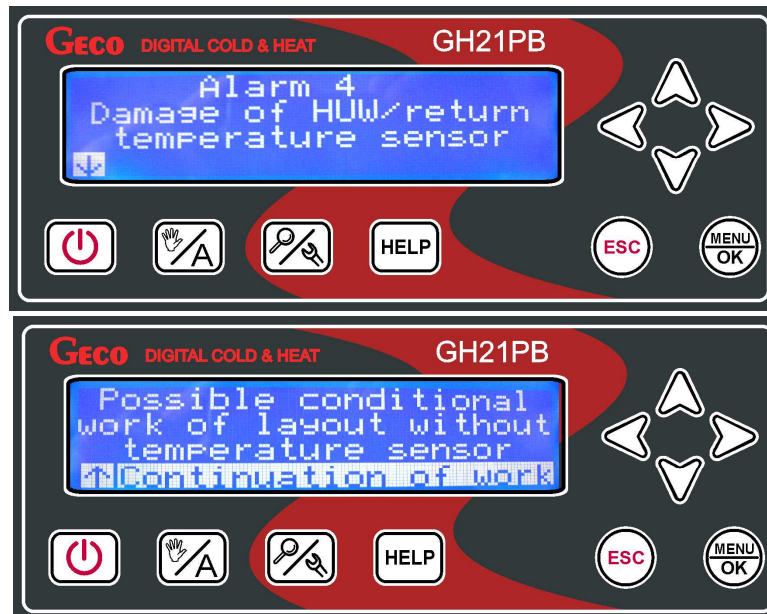
When parameter 'S49' = 1, warning UW4 occurs, then the controller switches to safe mode and the boiler operates without the DHW/returning water temperature sensor.
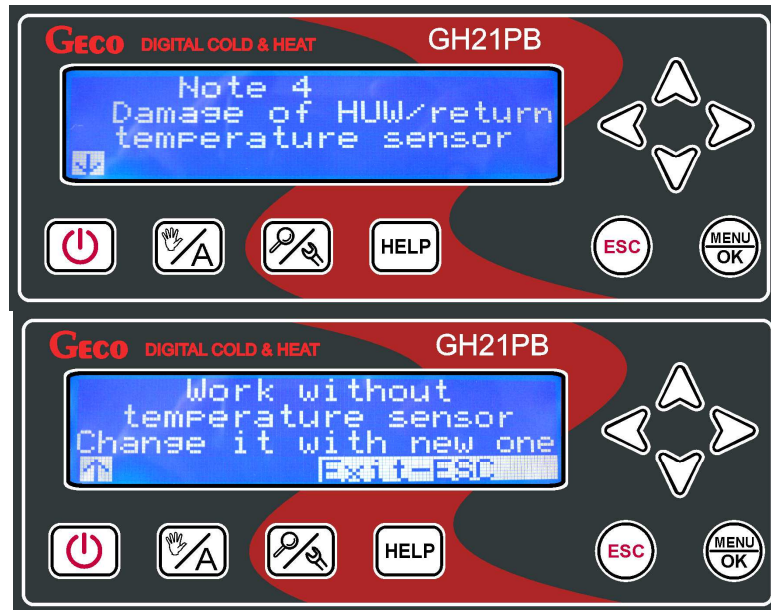
Operating in safe mode without a working DHW sensor reduces the boiler temperature to 65° C and control of the DHW pump operates according to the setting of service parameter S51. During safe mode, the DHW priority and Anti-legionella functions are not available. In safe mode without working returning water sensor, the mixer pump is switched off until the sensor is replaced.

Alarm 7/ - Damaged exhaust temperature sensor

This alarm is activated when the PT1000 sensor for measuring exhaust temperature is damaged or not properly connected. The alarm occurs in all heating system configurations.

After confirmation by the user, the boiler can operate in safe mode without an effective exhaust sensor. Please note that the FIRING UP mode is not active in the absence of an exhaust sensor.
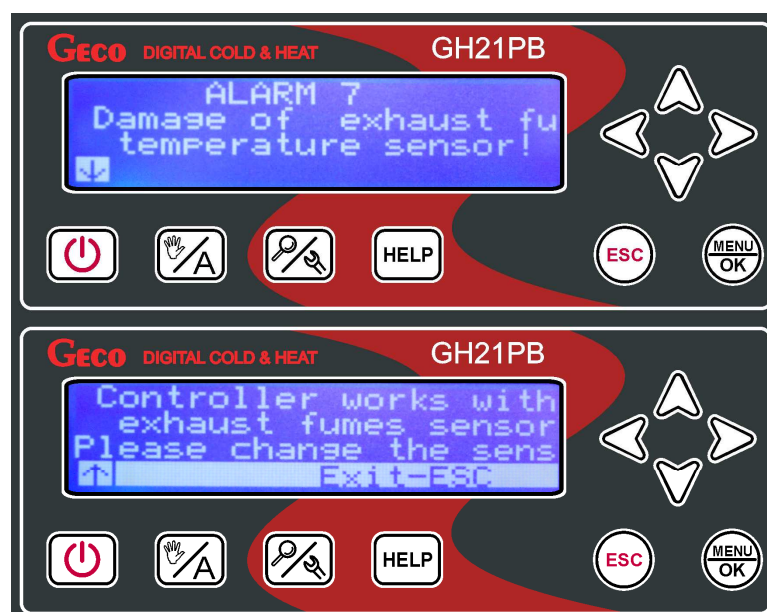
Alarm 9 - Fuel feeder not turning/ damage to reed relay

The controller shows an alarm when no feeder rotation is detected, according to the sensor value in the service parameters. The alarm is activated when the time between the pulses of the reed relay is greater than 1.25 · *'S19'·'S22'* [0.1s]. Safe mode operation continues until the controller is turned off or power is cut. After this, the controller determines the damage to the reed relay, and stores this as an alarm, so the operator must force safe mode again. In safe mode, the controller will continue to operate ignoring the reed relay input, as if the sensor had been turned off (S19)=0.
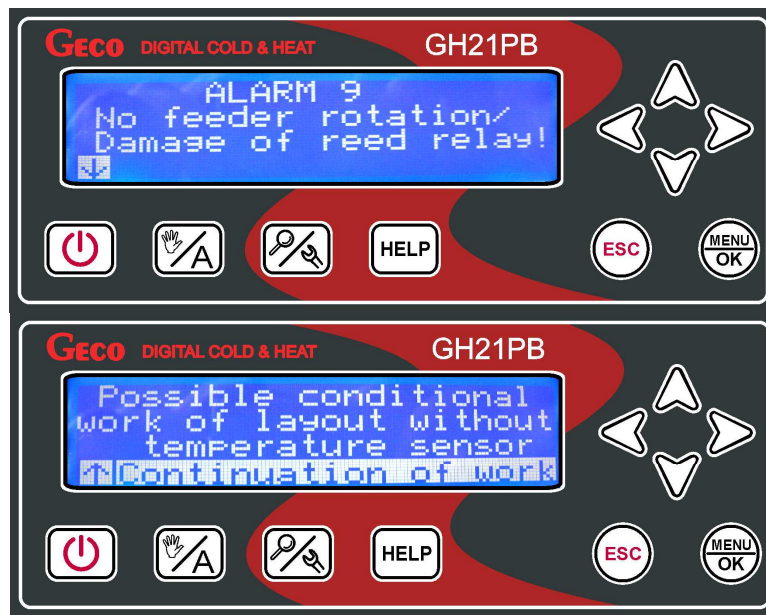
Warning 10 - Anti-legionella function not performed

This warning occurs only when the heating system is configured with an additional DHW pump and when the Anti-legionella function is activated. The warning occurs when the temperature in the boiler does not reach 70°C within 120 minutes of activation of the function.
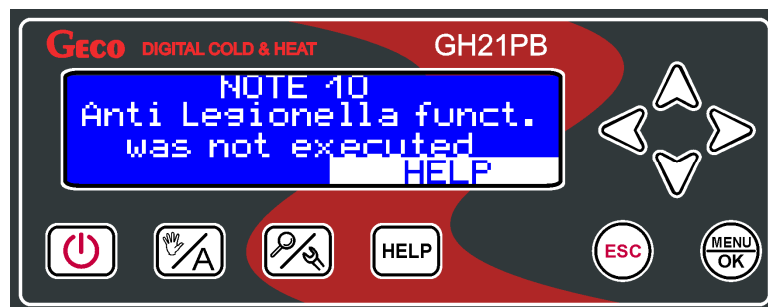
Alarm 11 - Maximum fuel feeder temperature exceeded

The controller shows an alarm when   maximum fuel feeder temperature exceeded, according to the sensor value in the service parameters. - *'S14'* > 0. The alarm is activated when the temperature *'T$_{feeder}$'* exceeds 90°C.

Alarm 12 - Overheating boiler

This alarm occurs when the temperature of water coming from the boiler exceeds that set in parameter *- 'S17'* [°C]. If the temperature of water from the boiler drops to four degrees below that set in'**S17**', the controller returns to work in manual or automatic mode, depending on how it was operating before alarm AL12 was activated.

Alarm 13 – Boiler extinguished

The conditions for this alarms operation are checked when service parameter 'S8'> 0, S11>0 or 'S10'> 0. A detailed description of the operation of boiler extinguished detection function is in Section 7.6.

Alarm 14 – Ignition failed

This alarm informs of a failed ignition process. After three unsuccessful attempts to fire up the boiler in 'firing up' mode, Alarm 14 is activated. The alarm may also be caused by damage to the flame sensor.

Warning 17 - Increased temperature in fuel feeder

The controller shows an alarm when no feeder rotation is detected, according to the sensor value in the service parameter - **'S14'** > 0. The alarm is activated when the temperature **'T$_{feeder}$'** exceeds service parameter **'S14'**[°C].

When the value of **S14** is exceeded, the feeder and fan switch to the mode to disperse fuel from the feeder.
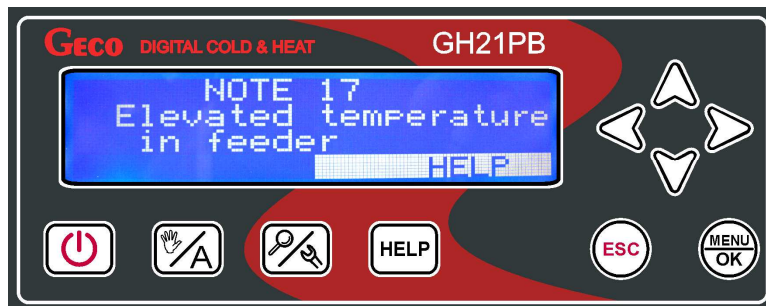
11. Temperature limiter (STB).

Regulator The GH21PB controller is equipped with an independently operating, automatic safety device called a temperature limiter (STB).

11.1. How it works

If the water temperature reaches 95C, the temperature limiter automatically stops the flow of fuel and air to the combustion chamber (the fuel feeder and fan are turned off). When the temperature drops to around **20⁰C** it is possible to manually reconnect

11.2. Reconnecting STB function

To restart the unit, press the 'reset' button, on the left hand side of the controller.

RESET

**Temperature limiter (STB)
reset button**
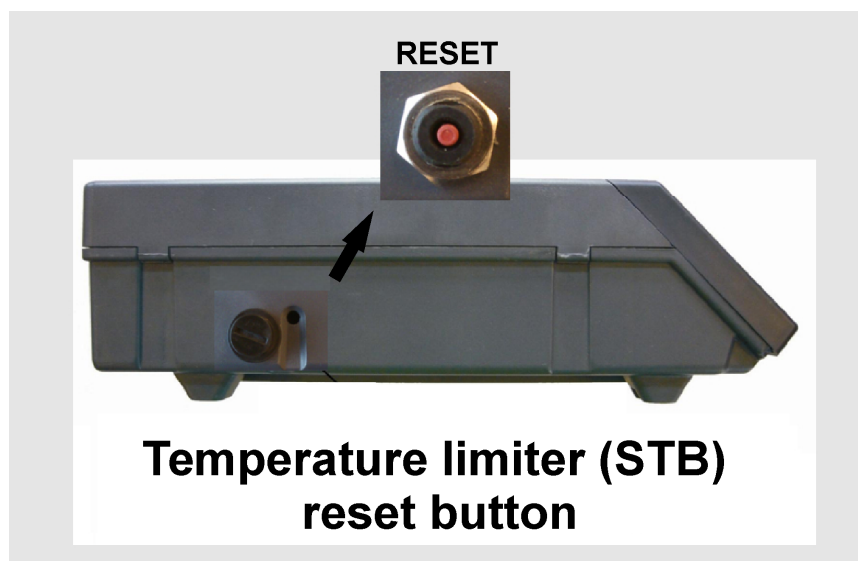
For safety reasons, the boiler does not automatically return to operation after the STB has been tripped.

 To turn the controller on again, double click the button ⏻

 - The first click of button ⏻ will cancel the alarm and turn off the controller

 - the second click of button ⏻ will reactivate the controller

 - pressing button A - puts the controller into automatic mode

☞ *Puncture or damage to the capillary of the temperature limiter indicates a leakage, which can lead to the GH21PB malfunctioning.*

In this event, disconnect the temperature limiter from the GH21PB controller, and replace it with a new device.
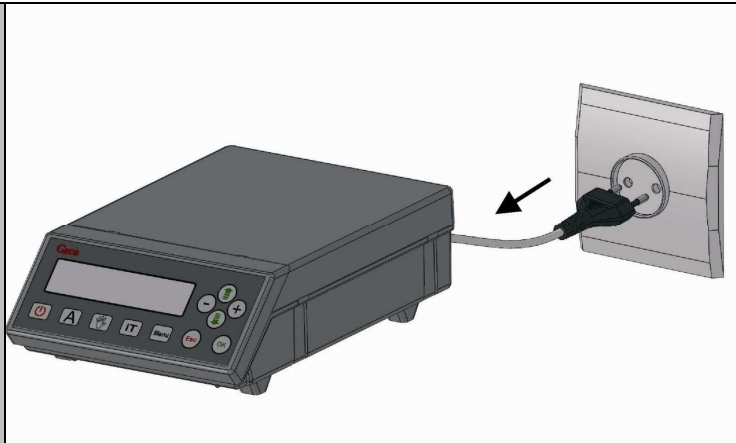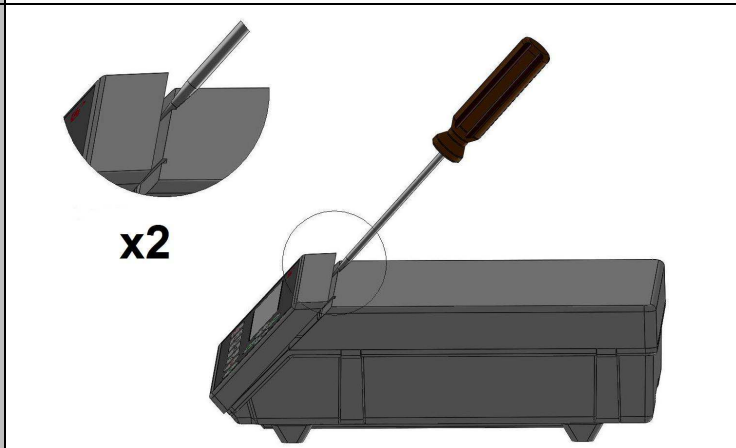
12. Loss of power

_____

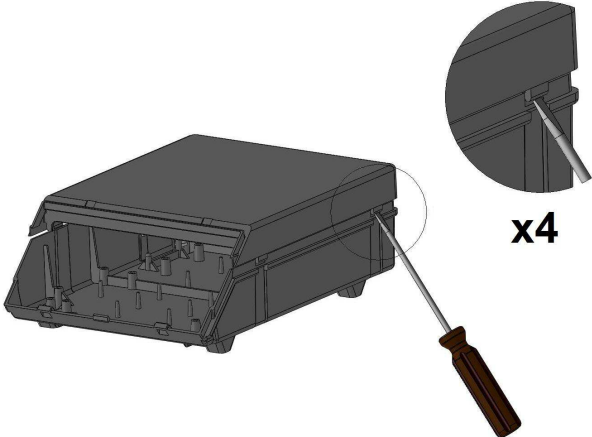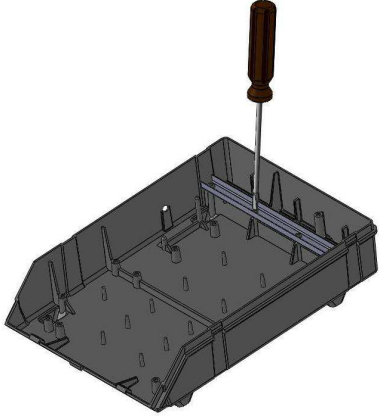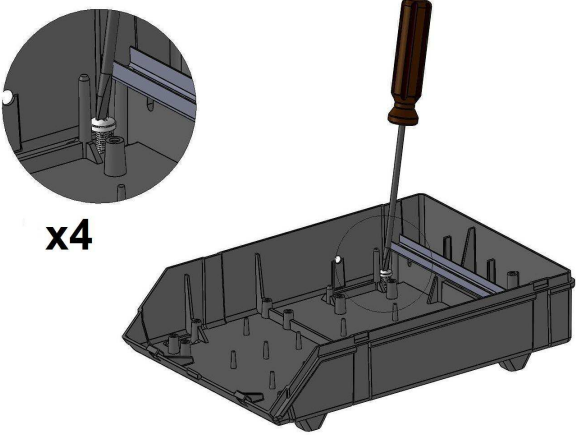After loss of power, the controller will return to the state it was in before the power was cut:
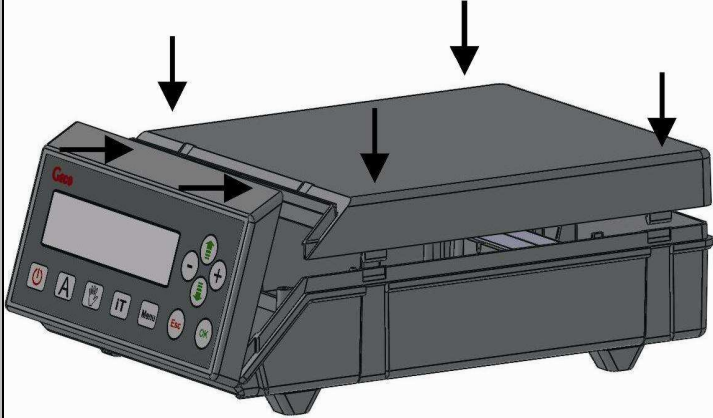
- If if was turned off, it will remain off

- If it was in preview mode, it returns to this state

- If it was in automatic mode, it will return to automatic mode according to preset parameters

- If it was in manual mode, it will return to manual mode, according to preset parameters

- If it was in alarm mode, it will remain off

## 13. In case of damage to the controller

If the controller malfunctions, contact the supplier/manufacturer of the boiler, or GECO, for technical advice. If the controller needs to be repaired or serviced, remove it completely from the boiler and send it along with its housing to the specified address.

Preparing to send the controller for servicing

Step 1 Disconnect the controller from the power supply (unplug from the wall socket)	
Step 2 Remove the front panel using a flathead screwdriver	

Step 3 Remove the housing cover using a flathead screwdriver	x4
Step 4 Disconnect the wires from the terminals, remove the cables from the sheaths, loosen the cable clamp strip and remove all cables from the outside of the controller.	
Step 5 Remove the controller from the boiler by unscrewing the 4 screws in the lower part the controller housing	x4
Step 6 Replace the top cover of the housing and front panel	

15. Information regarding the labeling and disposal of waste electronic and electrical equipment
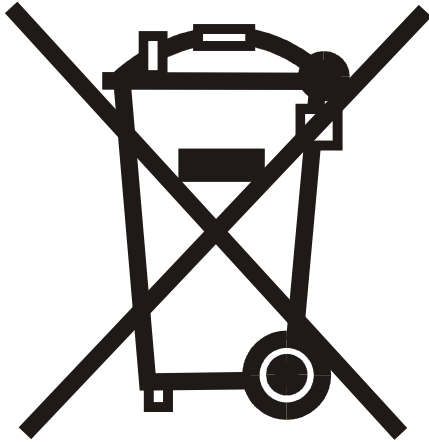
Warning!

This symbol on the product or on its packaging indicates separate collection of waste electrical and electronic equipment. This means that the product should not be disposed of with other household waste. Proper disposal of old and used electrical and electronic equipment will help prevent potential negative effects on the environment and on human health. The user is obliged to arrange the separation and disposal of equipment, which should be given to a collector of used equipment.

GECO®

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