BOILER CONTROLLERS

iGNEO

estyma electronics

NEW LINE BOILER CONTROLLERS

We are pleased to present a new versatile line of boiler controllers from IGNEO with new unprecedented capabilities. The IGNEO family of controllers has been developed by Estyma electronics based upon their many years of experience in the design, manufacture and implementation of automatic boiler controls. There has been particular emphasis on the quality of the combustion process, enhanced control of the heating systems and trouble-free performance. The design and manufacture of our equipment is made in accordance with the certified quality management system ISO 9001:2008.

WALL

COMPACT

SLIM

Main design objectives

1. High quality combustion - economy and ecology
2. Easy expansion and adjustment of the heating system to the user needs
3. Intuitive handling
4. Multiple mounting possibilities
5. Breakdown free operational life

Implemented solutions

For combustion to be effective it must be supplied with both adequate fuel and air.
The second condition for correct combustion is a suitably high temperature in the combustion chamber so that the gases, which arise during an incomplete combustion, that also carry a large amount of energy (including carbon monoxide CO), can be burnt off (carbon monoxide CO post-combustion produces carbon dioxide 2CO) and give heating energy
To meet said criteria we used two technologies: A broadband Lambda oxygen sensor measures the amount of oxygen in the exhaust gases and the Fuzzy Logic furnace power control method.

LAMBDA oxygen sensor

By measuring the amount of oxygen in the exhaust gas the controller selects, in real time, the optimum amount of air needed for combustion. Any adjustment of the amount of air without using the Lambda oxygen sensor, even with a gas analyzer, is only appropriate for very specific conditions in which this regulation occurs. These conditions are a chimney draft, dependent upon the weather conditions, warmth of the chimney and dirtiness; cleanliness of the burner and boiler heat exchanger; quality, type and moisture of the fuel. Because of the variability of these conditions, one-time adjustment without the use of the Lambda oxygen sensor is subject to a significant error, very often in practice more air is adjusted than is required. This causes lower efficiency of the furnace and thus higher fuel consumption and higher emissions of harmful substances. Consequently there is a faster build up of dirt in the boiler exchanger which further decrease the efficiency of the device.

Just using a Lambda oxygen sensor on its own is not enough. The probe must be suitable for this purpose. In view of the wide measurement range required it is necessary to use a broadband sensor. For this reason, we used a modern, 6-wire probe made by Bosch with an oxygen pump, a Nernst cell and built-in heater, which allows the measurement of relatively low temperatures in the exhaust gas. In addition, it is also necessary to have expertise in controlling the combustion process with the measurement of the oxygen: experience that we possess. This is because we were the first in Poland to use this method, and successfully introduced this solution for mass production.

Fuzzy Logic II

This is an algorithm that governs the power of the furnace in order to keep continuity in the combustion process. This provides a high temperature in the combustion chamber, and also maintains the required temperature of the heating element in the boiler. Interruption of the combustion process which takes place in the case of two-stage digital controllers (burn on - burn off) is very disadvantageous because it does not provide appropriate heating in the combustion chamber.

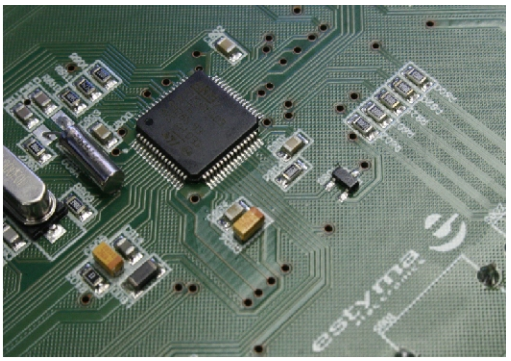
The Fuzzy Logic method is particularly suitable for difficult to write mathematical processes, such as combustion. This method is based on so-called expert rules and fuzzy data. By contrast to the traditional PID algorithm, Fuzzy Logic can be perfectly matched to the process.

The Fuzzy Logic controlling algorithm, can have any number of expert rules and from the quality of these rules and the blurring of input data, that may be numerous, the controlling algorithm is dependent upon both these effects and subsequent actions.

This is why the use of the Fuzzy Logic algorithm by itself does not guarantee success. A set of rules are required for a good combustion process, and we have gained this experience from many years of controlling the combustion of various types of fuel, in particular those derived from biomass.

What is the difference between Fuzzy Logic and Fuzzy Logic II? Well, Fuzzy Logic II is our newer algorithm which contains more expert rules and other rules of blurring variables.

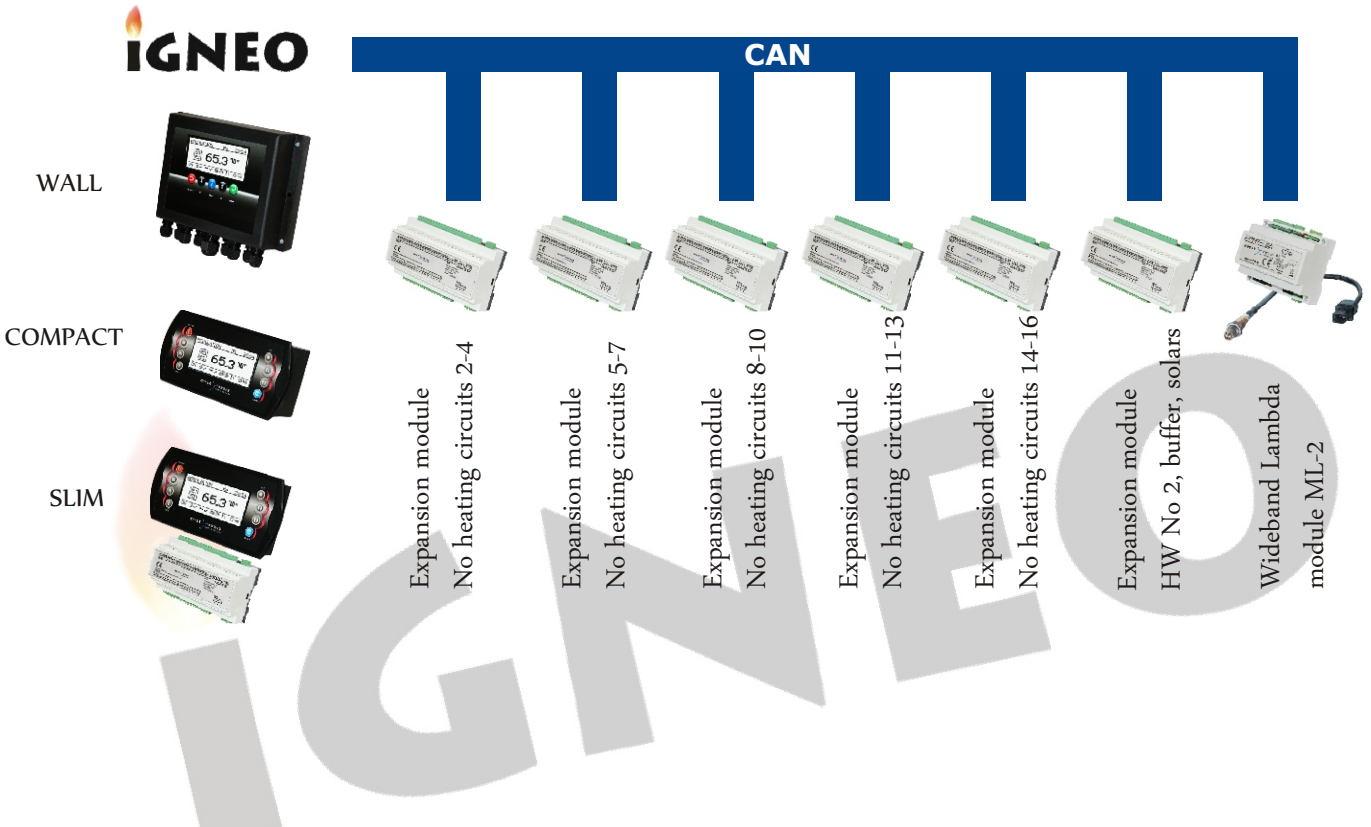
Advanced combustion control algorithms require high computational power, so we used a modern 32-bit processor with ARM core (core is commonly used: for instance, in mobile phones).



Expansion of the system

Today's heating systems can be very complex and different, which is why we decided to build our system based on enlargement modules. Thanks to this automation, the system can be tailored to almost any user's needs.

Communication between the expansion modules is a very important issue because it has a decisive impact on both the correct and reliable performance of the heating system. We had a choice between two communication interfaces, the well-proven RS485, which we used in our older generation of products, as well as the modern CAN which is famed for its reliability and which is also widely used in the automotive industry. In view of the security of the system and the possibility of a modern microcontroller, we of course chose the CAN bus.



Possibility of heating system

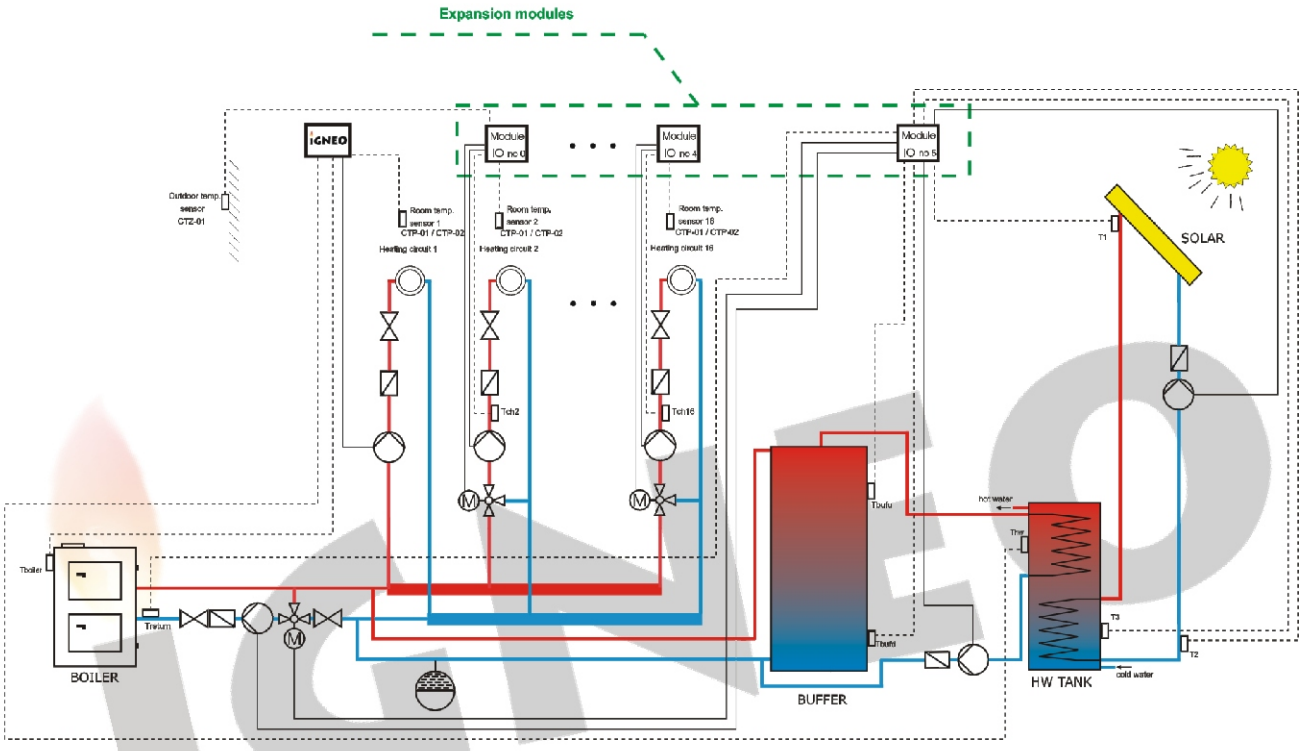
- 16 circuits of central-heating, which can be equipped with circulating pumps, mixing valves with actuators, room temperature sensors (2 types), power supply central-heating temperature sensors, and controls dependent upon the type of weather. Each circuit is regulated independently including the weekly time program, and automatic shutdown of the heat in summer.

- 2 hot water circuits with a circulating pump and heated water sensors. Each circuit has a separate weekly time program, and a single heating function.

- a heat storage tank (buffer) with two temperature sensors on the top and bottom of a buffer, a charging pump and mixing valve with an actuator, sustained set-point return flow temperature of heating water to the boiler, time program loading buffer,

- a system of solar panels controlling a solar pump equipped with three sensors: temperature collector, feed temperature collector and the temperature of the prepared water, and real-time calculation of solar power, the function of solar protection against freezing and overheating, and the flushing function (especially useful in vacuum collectors).

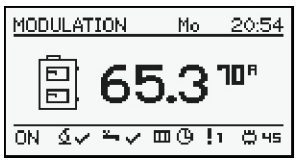
IMPORTANT!
Scheme does not include all elements of the system.

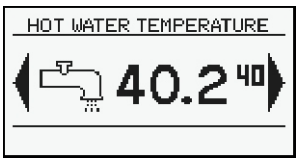


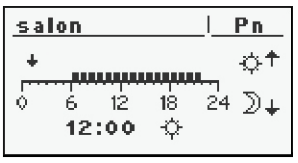
Intuitive operation

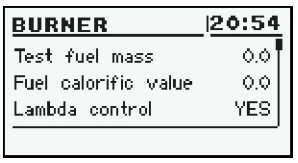
Particular emphasis has been put on the versatile controllers, so that their operation and configuration remains both simple and intuitive.

- To achieve this, we primarily used a large, easy to read graphical display with a luminous resolution of 132x64 with dimensions of 95x40mm.
- LED status colours (green, orange, red) indicate the current status of the device.
- A buzzer which indicates whether the button is pressed on, or the alarm condition.
- Button" info" allows a view and a description of each parameter.
- Two types of menu set the basic parameters easily and quickly along with the main menu for setting all parameters.
- For enhanced security and easy maintenance the controllers feature a history of the last 20 alarms with dates and approval. The alarm history is stored in a non-volatile memory, so after a loss of power the alarms are still readable.









Multiple mounting possibility

An important advantage of the new IGNEO line of controllers is the three types of casings in which they appear. Thanks to this, it is possible to choose the proper regulator depending on the purpose and the conditions of the installation. Each type has a diverse number of inputs and outputs.

IGNEO WALL - the controller in the casing is designed for surface mounting or directly on the device. A compact design is intended in particular, for use in boilers with relatively small amounts of actuating equipment and autonomous burners. It does not require additional casings and assembly in the device.

IGNEO COMPACT - controller in casing for recessed installation in the boiler, burner or switching cabinet. The compact design is intended in particular, for use in boilers with more actuators. Actuating devices and sensors are connected directly to the panel.

IGNEO SLIM - a modular controller with a very thin operating panel (depth 25mm), which is for recessed installation in a boiler or a switching cabinet, and the module inputs and outputs, which are connected to sensors and actuators. It is designed for the most powerful boilers.

The entire line of IGNEO controllers have identical menus and the same versatility for expansion modules based on enlargement.

Safety and reliability

To ensure reliable operation of the heating automation system we have used a series of technical solutions to increase reliability. These are the result of our years of experience. Selected risks and the solutions:

Atmospheric discharges and surges in the grid from the power supply.

The power supply of our products has been designed with an emphasis on reliability, even under theoretically impossible events. To achieve this, the power supply circuit we have used incorporates the following security elements:

- magneto,
- 2 varistors in the high-voltage,
- varistor low voltage side,
- 3 filter capacitors on the high voltage,
- compensating reactor in the high voltage.

Atmospheric discharges and surges from the sensors.

Input circuits are designed so that even the occurrence of surges on the cable connecting the sensor controller, will not be damaged. To achieve this we used the following security elements in each entry:

- RC low-pass filter.
- Bi-directional Transil diodes.

Exposure of the output circuits of the induced voltages from the actuators and contacts.

To minimize any negative impact we used:

- RC-type silencers,
- varistors,
- outputs of semiconductor built on a Snubberless triacs ST company, the current limit is 16A.

Moisture, dust, pollution and exposure to vibration.

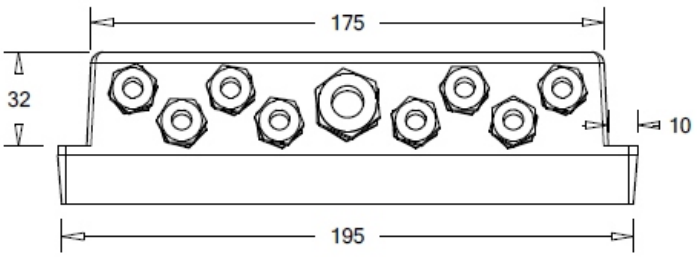
These factors are most often found in boiler rooms, they are disruptive to other electronic devices. To minimize their negative impact we have used:

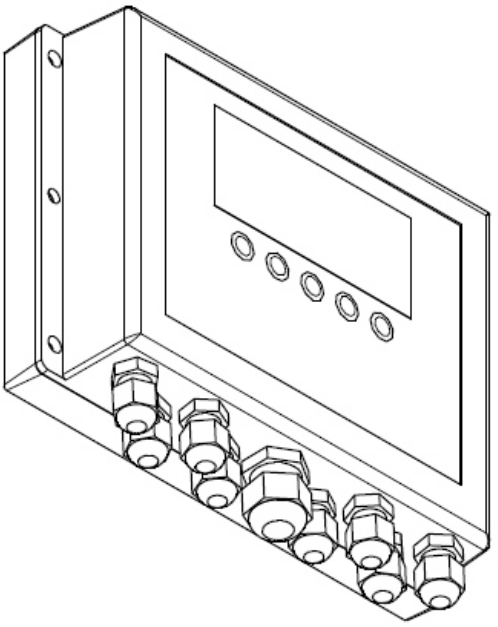
- high quality double-sided printed circuit boards.
- lead - free surface mounts with automatic optical controls.
- lead - free through hole assembly of components using the highest quality Japanese solder adhesives,
- after being assembled, the integrated circuits are washed and painted with lacquer electrical insulation, which increases resistance to moisture and dirt.

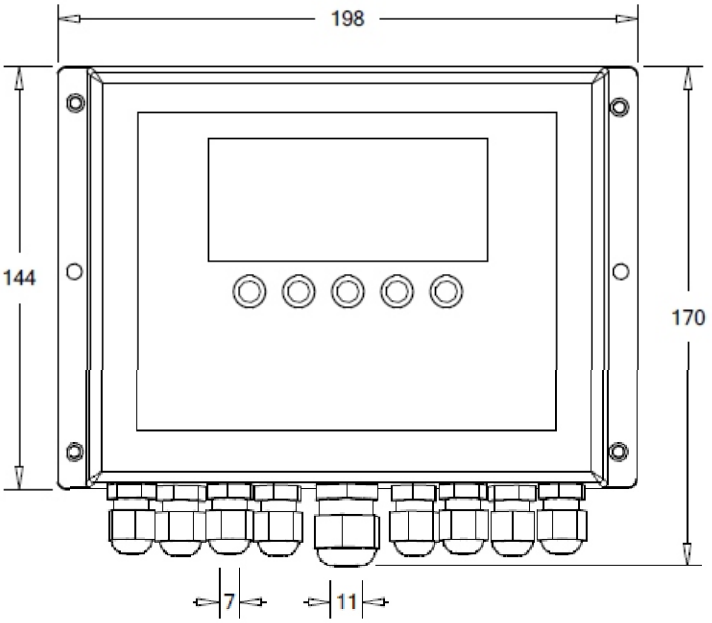
The repeatability of the production process and quality control.

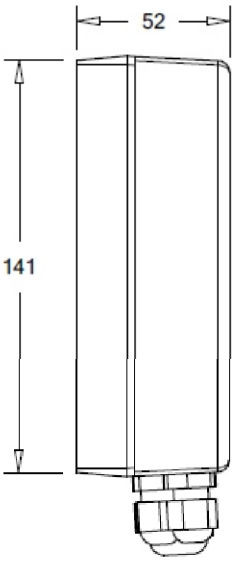
- Each device passes quality control at many stages of production. The quality process is documented and recorded.
- Installation of each unit is finished with an inspection by an automated electrical tester with quality records maintained on a computer system,
- The design and manufacture of our equipment is made in accordance to the certified quality management system ISO 9001:2008.

IGNEO Wall dimensions

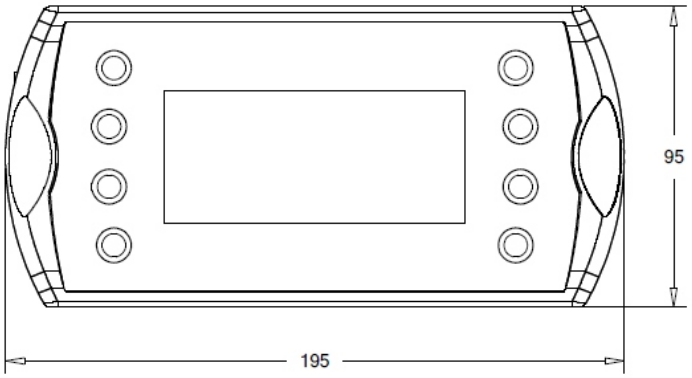


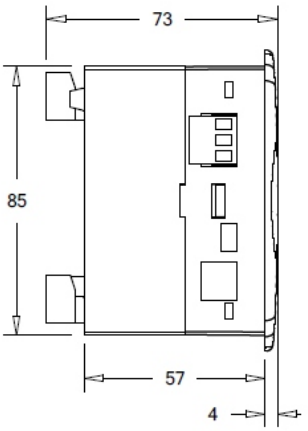


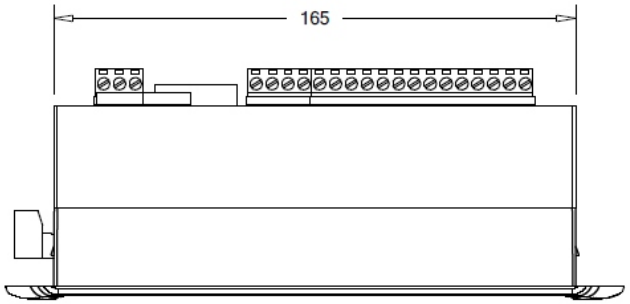


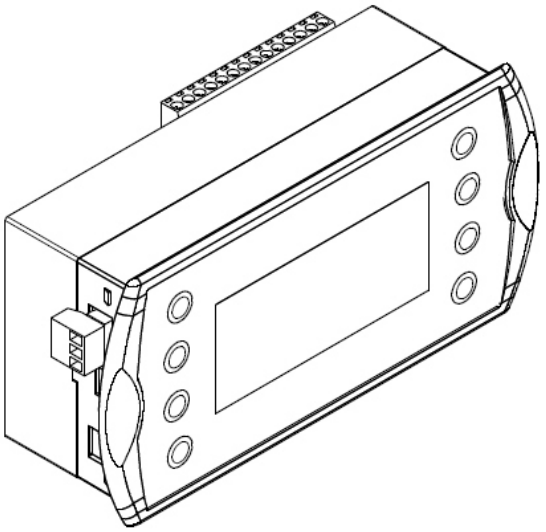


IGNEO Compact dimensions

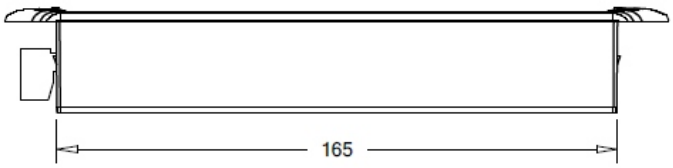


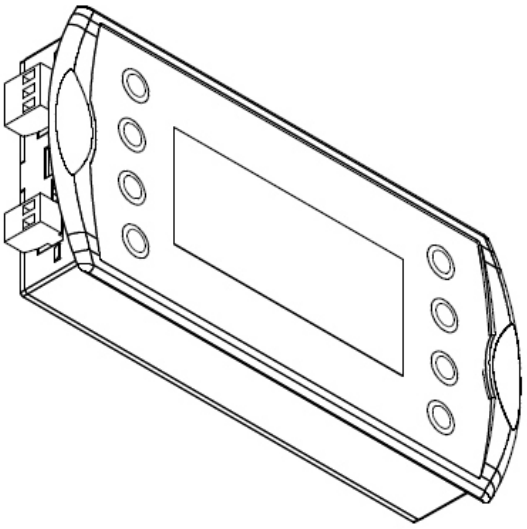


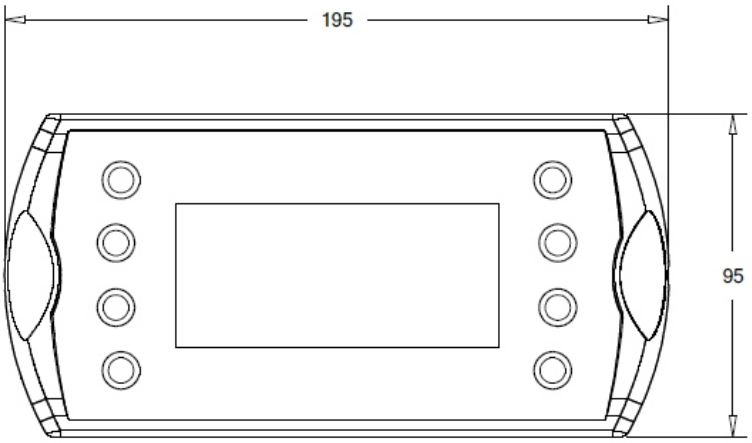


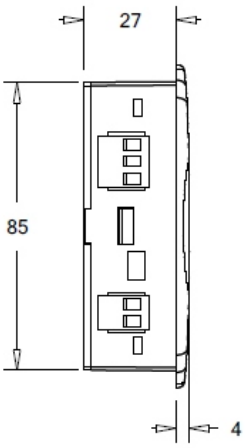


IGNEO Slim dimensions

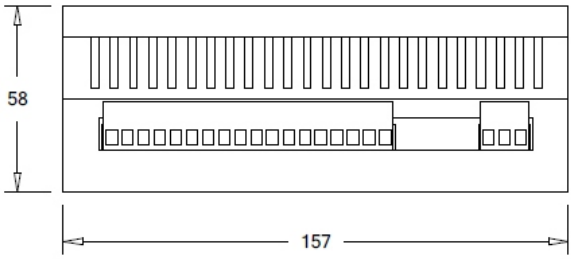


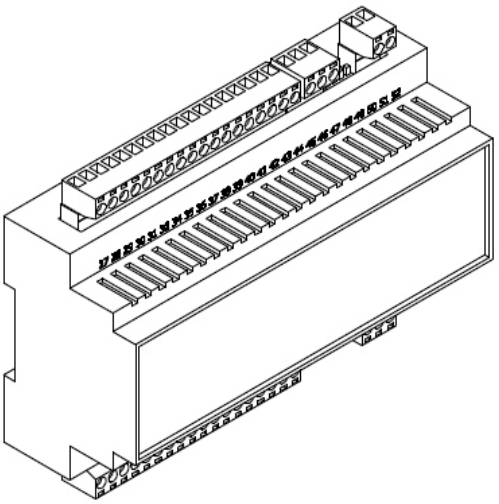


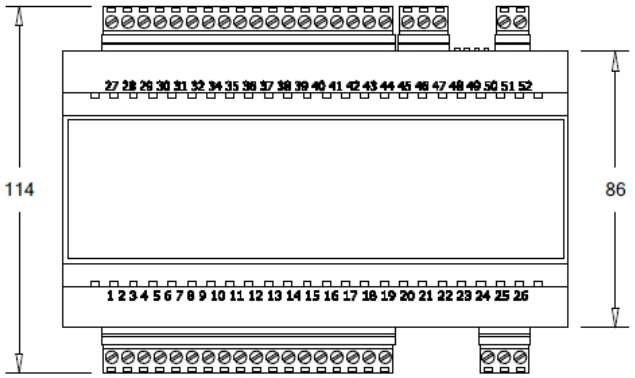


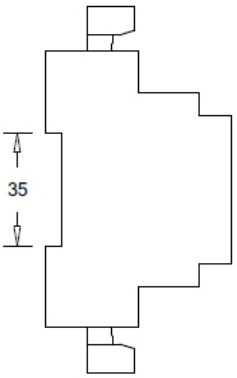


Module (I/O) Slim dimensions









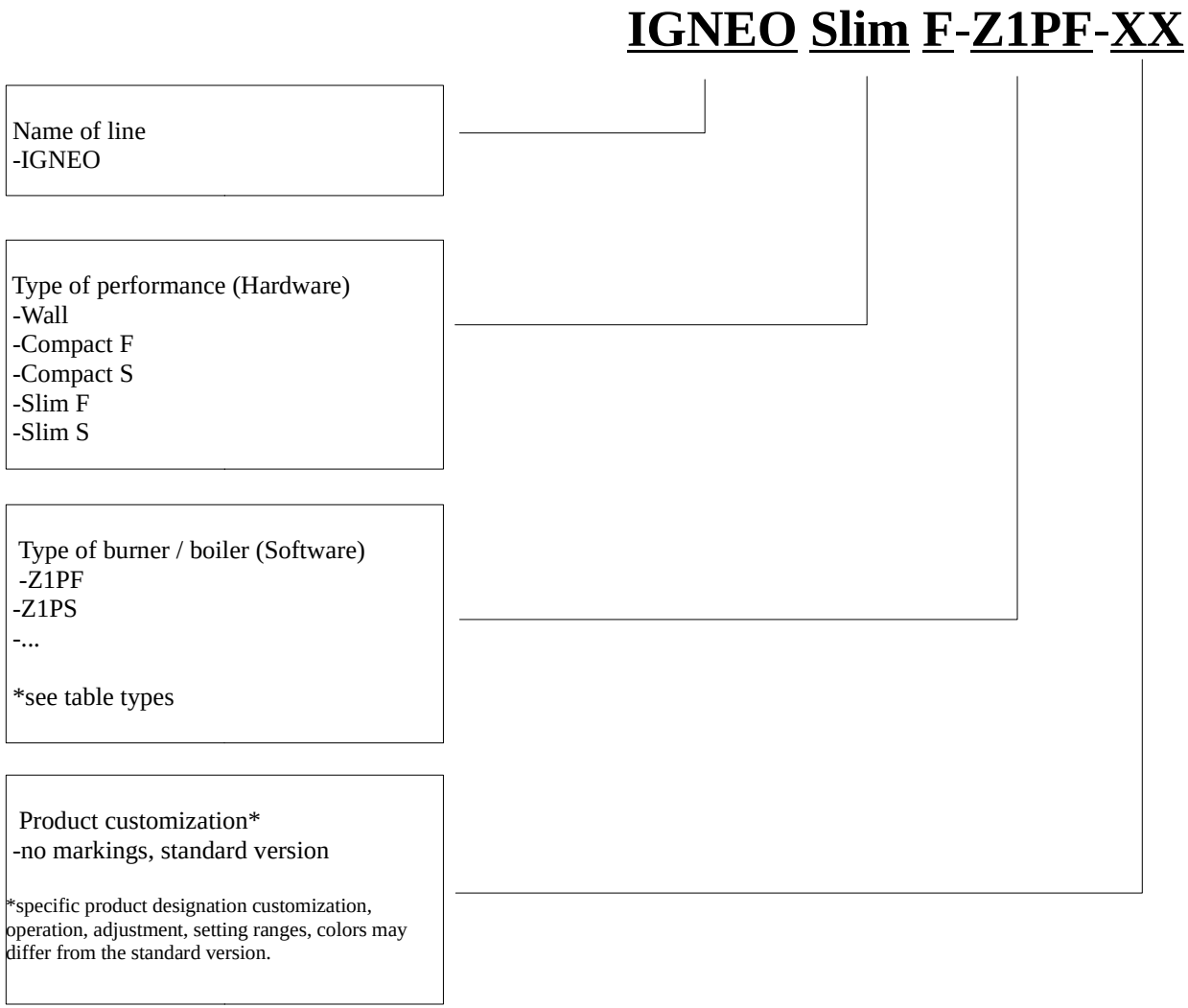
Types of controllers IGNEO:

Using the table:
Find an appropriate type of burner / boiler, and then select the type of controller.
☒ regulator exists in the embodiment
☑ element necessary for proper operation
☐ element indicated to work properly

Wall	Compact	Slim	Description of the burner / boiler	Marking the burner / boiler	Feeder 1 (tank feeder)	Feeder 2 (burner feeder)	Igniter	Blower	Photocell	Exhaust gas sensor	T burner / feeder	Lambda probe, combustion control	Lambda probe, oxygen measurement without regulation	Motor of air distribution primary / secondary	Cleaning burner	Ash removal / exchanger cleaning	Place for Your function PROFESSIONAL
																	
☒	☒	☒	Pellet hopper (Z) 1 feeder (1P) Photocell (F)	Z1PF	☑		☑	☑	☑		☑	☐	☐				
☒	☒	☒	Pellet hopper (Z) 1 feeder (1P) Exhaust gases (S)	Z1PS	☑		☑	☑		☑	☑	☐	☐				
☒	☒	☒	Pellet hopper (Z) 2 feeders (2P) Photocell (F)	Z2PF	☑	☑	☑	☑	☑		☑	☐	☐				
☒	☒	☒	Pellet hopper (Z) 2 feeders (2P) Exhaust gases (S)	Z2PS	☑	☑	☑	☑		☑	☑	☐	☐				
☒	☒	☒	Pellet / coal retort (R)	R	☑			☑		☐	☑	☐	☐				
☒	☒	☒	Pellet / coal retort, igniter (RZ)	RZ	☑		☑	☑		☑	☑	☐	☐				
☒	☒	☒	Holzgas (H)	H				☑		☐			☐				
	☒	☒	Holzgas Lambda (HL)	HL				☑		☑		☐	☐	☐			
☒	☒	☒	Blowing / hopper (N)	N				☑		☐			☐				

Wall 	Compact 	Slim 	Description of the burner / boiler	Marking the burner / boiler	Feeder 1 (tank feeder)	Feeder 2 (burner feeder)	Igniter	Blower	Photocell	Exhaust gas sensor	T burner / feeder	Lambda probe, combustion control	Lambda probe, oxygen measurement without regulation	Motor of air distribution primary / secondary	Cleaning burner	Ash removal / exchanger cleaning	Place for Your function PROFESSIONAL
		☒	Pellet hopper (Z) 1 feeder (1P) Photocell (F) Burner cleaner (C) Ash removal / exchanger cleaning (O)	Z1PFCO	☑		☑	☑	☑		☑	☐	☐		☐	☐	
		☒	Pellet hopper (Z) 1 feeder (1P) Exhaust gases (S) Burner cleaner (C) Ash removal / exchanger cleaning (O)	Z1PSCO	☑		☑	☑		☑		☐	☐		☐	☐	
		☒	Pellet hopper (Z) 2 feeders (2P) Photocell (F) Ash removal / exchanger cleaning (O)	Z2PFO	☑	☑	☑	☑	☑		☑	☐	☐			☐	
		☒	Pellet hopper (Z) 2 feeders (2P) Exhaust gases (S) Ash removal / exchanger cleaning (O)	Z2PFO	☑	☑	☑	☑		☑	☑	☐	☐			☐	
	☒	☒	Pellet / coal retort (R) Ash removal / exchanger cleaning (O)	RO	☑			☑		☐	☑	☐	☐			☐	
	☒	☒	Pellet / coal retort, igniter (RZ) Ash removal / exchanger cleaning (O)	RZO	☑		☑	☑		☑	☑	☐	☐			☐	
☒	☒	☒	Holzgas (H) Ash removal / exchanger cleaning (O)	HO				☑		☐			☐			☐	
	☒	☒	Holzgas Lambda (HL) Ash removal / exchanger cleaning (O)	HLO				☑		☑		☐	☐	☐		☐	
☒	☒	☒	Blowing / hopper (N) Ash removal / exchanger cleaning (O)	NO				☑		☐			☐			☐	

Marking IGNEO regulators:



Examples of designation:

IGNEO Wall Z1PF
IGNEO Compact S-Z2PS
IGNEO Slim RZ

Support for additional components of the system:

Type of controller	Device	Primary controller In Slim version the basic module is CAN I/O no 6						Expansion module CAN I/O no 0 						Expansion module CAN I/O no 1, no 2, no 3, no 4 						Expansion module CAN I/O no 5 									Expansion module CAN I/O no 7 	Module Lambda ML-2 
	Function	HW1		CH1				Weather	Weather					CH5 - CH7, (no 1) CH8 – CH10, (no 2) CH11 – CH13, (no 3) CH14 – CH 15 (no 4)						Buffer				Solar				HW 2		Controlling additional elements of the boiler or heating system. Module dedicated for PROFESSIONAL line.	Measurement of oxygen in exhaust gases.
	Elements	HW pump	HW sensor	CH pump	Room temp sensor	CH mixer	CH sensor	Outdoor sensor	Outdoor sensor	CH pump	Room temp sensor	CH mixer	CH sensor	CH pump	Room temp sensor	CH mixer	CH sensor	BU pump	BU upper sensor	BU lower sensor	Return mixer	Return sensor	Solar pump	Solar sensor	Tank sensor	Flow sensor	HW pump	HW sensor	-12 analog inputs -6 relay outputs 230V -4 semiconductor outputs 230V	Broadband 6-wire Lambda sensor.
Wall 		☑		☑	☐			☑	☑	☐		☐		☐				☑			☐		☑				☑		☑	☑
Compact 		☑		☑	☐		☐	☑		☑	☐		☐	☑	☐		☐	☑			☐		☑				☑		☑	☑
Slim 		☑		☑	☐		☐	☑		☑	☐		☐	☑	☐		☐	☑			☐		☑				☑		☑	☑

☑ element(s) necessary for the function
☐ element(s) improving the function