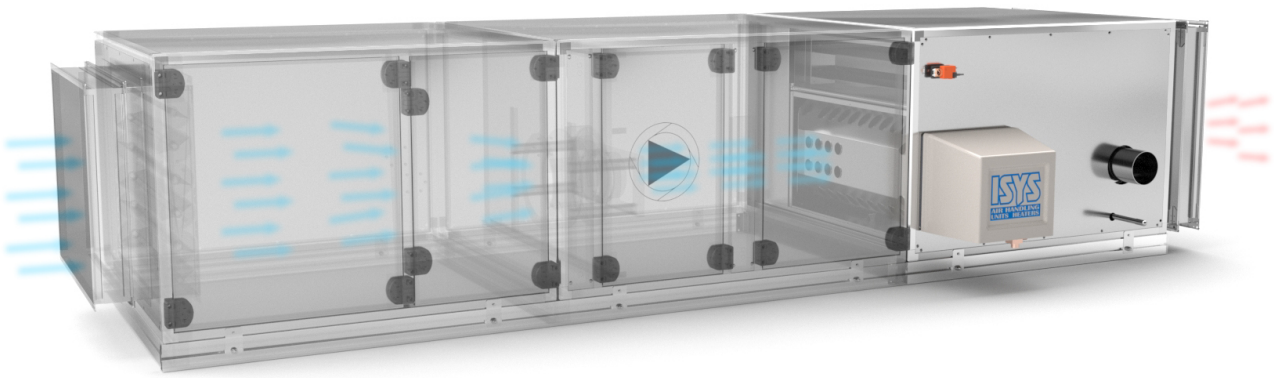
I-01-01 - IS energy modules



Condensation Air Heater Burning Gaseous Fuels
Condesnation Energy Module of Air Handling Units
en3.1.0- ISM010V-v3.11

Nazwa dokumentu:	Nr dokumentu:	Edycja:	Obowiązuje od:
IS energy modules	I-01-01	en3.1.0	2021-02-09

Spis treści

1 Intorduction

1.1 General description

The heating module is a device designed to generate heat, which is transferred by forced convection to the air used for ventilation or heating. The heat in the heating module is generated during the gas combustion process and transferred to the ventilation air via a flue gas / air heat exchanger. The heating module can be used as a component of an air handling unit installed in a section of such a unit or as a free standing unit mounted in the air intended for ventilation, e.g. behind the ventilation unit.

The IS module is a device designed for modulating operation in the full range offered, it is not adapted to continuous operation in two-state mode (on / off) (more information in the chapter: 3). Most of the devices are mounted on the roof, where short chimney risers are sufficient. In case when installation is in a place other than the roof, a chimney riser should be designed (more information in the chapter: 4.4).

Pamiętaj! The lengths of the chimneys can be checked in the table 1.2.

The heating module is a compact device in the shape of a cuboid, which allows easy installation in the ventilation unit section. For air handling units with an air flow greater than the nominal flow through the heating module, a By-pass system is used. The heat exchanger used is designed for overpressure operation, which means that the fan forcing the air flow through the heat exchanger **must** be in front of the module. The energy module includes:

- heat exchanger with optional by-pass system,
- burner,
- control cabinet with a set of sensors.

1.2 Energy modules

1.2.1 Types of energy modules

Modules are available for use inside the air handling unit and as free-standing modules added to the ventilation duct [1] Additionally, it is possible to multiply homogeneouse IS modules by creating sets of modules (and their free-standing equivalents), which increases modulation range of the whole set. such sets are equipped with an additional controller, whose task is to manage the operation of individual modules in the set, so that the user controls the team in the same way as a single module.

Pamiętaj! The additional controller used in the set of IS energy module (Multi-EM) ensures even distribution of work and heat loads to each of the modules included in the set.

1.3 Namecodes of enegry modules

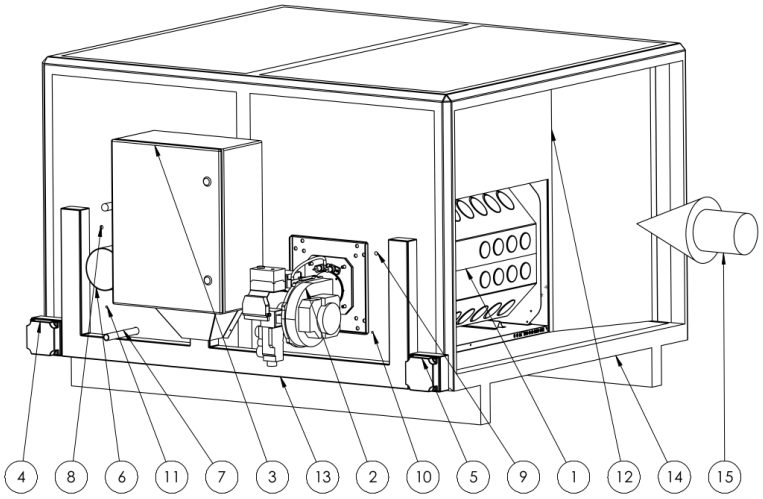
Below is a diagram of the full code of the energy module (together with a description of the individual sections):
IS-NOMINAL_POWER-MULTIPLICITY-WORKPLACE-SIDE-VERSION

NOMINAL_POWER Three-digit code indicating the nominal power of the module. For sets, the code indicates the nominal power of a single IS module. The codes are available in the table 1.1.

MULTIPLICITY Defines how many energy modules work in a given application. Operation of two to four devices is possible, thanks to which the set can achieve a greater heating power and a greater range of modulation. Available choices:

- 1 - single
- 2 - double

[1] Dimensions of free-standing modules should be consulted with the manufacturer.



Nr	Element	Nr	Element
1	Heat exchanger	9	Sheath for safety thermostat
2	Burner	10	Sheath for airflow sensor (+)
3	Control cabinet	11	Sheath for airflow sensor (-)
4	Duct thermostat cabinet	12	Blends
5	Safety thermostat cabinet	13	Cable channel
6	Flue gas connection	14	Air handling unit
7	Condensate discharge port	15	Air flow direction powietrza
8	Sheath for duct thermostat		

1.1: Description of an energy module

- 3 - triple
- 4 - quadruple

WORKPLACE It defines the place of work of the device that can work built inside the air handling unit or as a free-standing device within the ventilation duct. Available choices:

- 1 - built inside the air handling unit
- 2 - free-standing device

SIDE The operating side determines which side of the module the burner [2] is. Available choices:

U - universal, the module can ultimately be used as left or right, sensor sheaths are duplicated [3][4]

P - right

L - left

VERSION determines the location of the burner (B), chimney (Ch) and condensate discharge port (Co) relative to the service side:

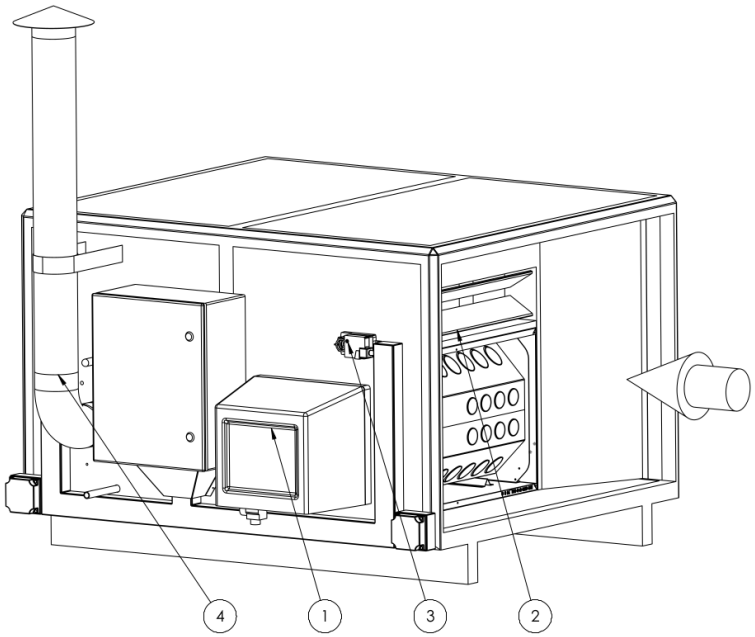
1 - all connections on the operating side

Sample device codes:

IS-020-1-1-P-1 A single energy module, for installation inside the air handling unit, with the right operating side

IS-060-2-1-U-1 A set of two modules, for installation inside the air handling unit, without a defined operating side

[2] Looking at the module from the front, i.e. from the attacking air side
[3] Requires more mounting holes when mounting the module
[4] This option cannot be used in combination with free-standing modules (WORKPLACE - 2)



Nr	Element	Nr	Element
1	Burner cover	3	By-pass actuator
2	By-pass	4	Flue gas system

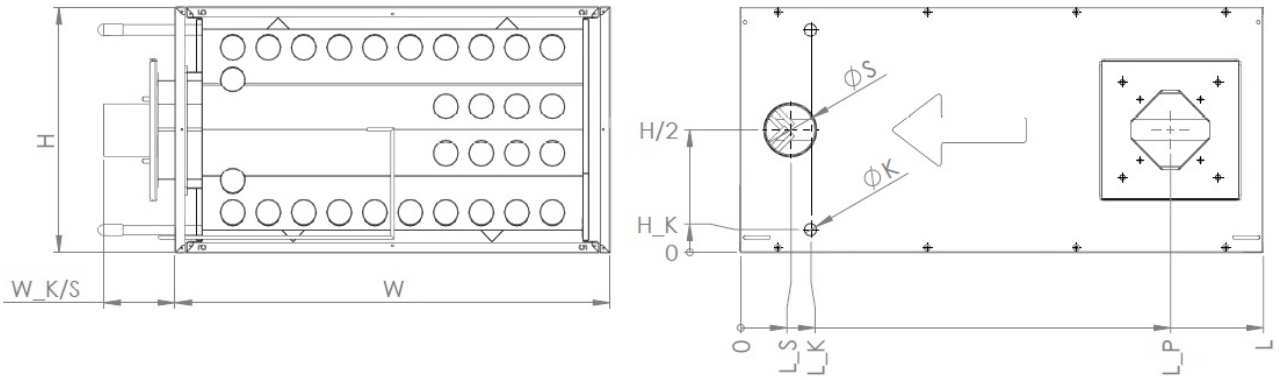
1.2: Description of an energy module equipped with additional accessories.

IS-100-1-2-L-1 A single energy module, in a free-standing housing, with a left operating side

IS-250-3-2-P-1 A set of three modules, in a free-standing housing, with the right operating side

1.4 IS energy module

Below are tables describing the basic parameters of IS energy modules.



1.3: Podstawowe wymiary

	IS-010	IS-015	IS-020	IS-025	IS-030	IS-040	IS-050	IS-060	IS-070	IS-080
L [mm]	1000	1000	1000	1040	1040	1040	1040	1040	1040	1040
W [mm]	700	700	700	865	865	865	865	865	865	1080
H [mm]	350	350	350	350	350	350	485	485	485	485
H/2 [mm]	175	175	175	175	175	175	242.5	242.5	242.5	242.5
L_S [mm]	140	140	140	140	140	140	100	100	100	100
L_P [mm]	830	830	830	870	870	870	855	855	855	855
L_K [mm]	116	116	116	116	116	116	140	140	140	140
H_K [mm]	45	45	45	45	45	45	45	45	45	45
W_K/S [mm]	140	140	140	140	140	140	140	140	140	140
ØK [mm]	20	20	20	20	20	20	20	20	20	20
ØS [mm]	80	80	80	80	80	80	130	130	130	130
Masa [kg]	110	110	110	140	140	140	190	190	190	205
	IS-090	IS-100	IS-120	IS-130	IS-150	IS-170	IS-200	IS-250	IS-300	IS-350
L [mm]	1040	1040	1120	1120	1120	1120	1120	1220	1250	1250
W [mm]	1080	1080	1240	1240	1240	1390	1390	1530	1760	1870
H [mm]	485	485	615	615	615	750	750	880	940	1140
H/2 [mm]	242.5	242.5	307.5	307.5	307.5	375	375	440	470	570
L_S [mm]	100	100	100	100	100	100	100	120	125	145
L_P [mm]	855	855	935	935	935	935	935	960	935	935
L_K [mm]	140	140	185	185	185	185	185	225	220	285
H_K [mm]	45	45	45	45	45	45	45	45	45	45
W_K/S [mm]	140	140	140	140	140	140	140	140	140	140
ØK [mm]	20	20	20	20	20	20	20	20	20	20
ØS [mm]	130	130	140	140	140	140	140	140	140	160
Masa [kg]	205	205	265	265	265	320	320	530	640	680

Tabela 1.1: Wymiary modułów grzewczych IS

	IS-010	IS-015	IS-020	IS-025	IS-030	IS-040	IS-050	IS-060	IS-070	IS-080
Moc cieplna Hi [kW]	10-2	15-2	20-2	25-2	35-3	40-4	50-5	60-6	70-7	80-8
Przepływ powietrza przez moduł [m^3/h]	745-150	1120-150	1500-150	1900-150	2650-265	3000-300	3750-375	4500-450	5250-525	6000-600
Spadek ciśnienia na module[5][Pa]	75	75	75	75	80	125	85	110	150	145
Sprawność [%]	93-105	93-105	93-105	93-105	93-105	93-105	93-105	93-105	93-105	93-105
Wypływ kondensatu [l/h]	1,4	1,4	1,4	1,4	1,5	1,5	2,5	2,5	2,5	3,7
Króciec gazu gwint zewnętrzny	G 3/4	G 3/4	G 3/4	G 3/4	G 3/4	G 3/4	G 3/4	G 3/4	G 3/4	G 1
Min. ciśnienie gazu[6][7] G20,G27 \G31 [mbar]	20 \37	20 \37	20 \37	20 \37	20 \37	20 \37	20 \37	20 \37	20 \37	20 \37
Max. ciśnienie gazu[7] [mbar]	60	60	60	60	60	60	60	60	60	60
Maks. długość komina [m] zobacz 4.4.1	6	6	6	6	6	6	6	6	6	6
Pobór mocy el. [kW]	0,3	0,3	0,3	0,3	0,3	0,3	0,4	0,4	0,4	0,4
Ilość gazu / powietrza do spalania **wartości szacunkowe, G20** [m^3/h]	1 / 10	1,5 / 15	2 /20	2,5 / 25	3 / 30	4 / 40	5 / 50	6 / 60	7 / 70	8 / 80
	IS-090	IS-100	IS-120	IS-130	IS-150	IS-170	IS-200	IS-250	IS-300	IS-350
Moc cieplna Hi [kW]	90-9	110-11	120-12	130-13	150-15	170-17	200-20	250-25	300-30	350-35
Przepływ powietrza przez moduł [m^3/h]	6700-670	8580-820	9000-900	9700-970	11200-1120	12500-1250	15000-1500	19000-1900	22400-2240	26500-2650
Spadek ciśnienia na module[5][Pa]	180	235	230	240	250	230	250	250	250	250
Sprawność [%]	93-105	93-105	93-105	93-105	93-105	93-105	93-105	93-105	93-105	93-105
Wypływ kondensatu [l/h]	3,7	3,7	5,5	5,5	5,5	6,9	6,9	7,5	8,5	10
Króciec gazu gwint zewnętrzny	G 1	G 1	G 1	G 1	G 1	G 1	G 1	G 1 1/2	G 1 1/2	G 1 1/2
Min. ciśnienie gazu[6][7] G20,G27 \G31 [mbar]	20 \37	20 \37	20 \37	20 \37	20 \37	20 \37	20 \37	20 \37	20 \37	20 \37
Max. ciśnienie gazu[7] [mbar]	60	100	100	100	100	100	100	100	100	100
Maks. długość komina [m] zobacz 4.4.1	6	6	6	6	6	5	5	4	4	4
Pobór mocy el. [kW]	0,4	0,4	0,4	0,4	0,4	0,5	0,5	0,5	0,5	0,5
Ilość gazu / powietrza do spalania **wartości szacunkowe, G20** [m^3/h]	9 / 90	11 / 110	12 / 120	13 / 130	15 / 150	17 / 170	20 / 200	25 / 250	30 / 300	35 / 350

Tabela 1.2: Parametry modułów grzewczych IS

Pamiętaj! Pay attention to whether the clear width of the air handling unit allows the installation of the device. Condensate port, flue gas port and burner inlet flanges protrude from the device, which increases the space required for installation (during installation). If the total width of the device (with ports mentioned) exceeds the width of the AHU, make sure that it is possible to remove the AHU side panel during installation.

Pamiętaj! If the air handling unit (or other source of supplied air) airflow exceeds the airflow through the IS Module given in the table above, see chapter 1.7.

[5]Given pressure drop is related to the maximum airflow of IS module.
[6]The minimum pressure of gas for an application in Hungary is 25 mbar.
[7]The measurement should be performed at the input of the governor, according to the diagram 4.12.

Uwaga! The on-site gas installation **must provide** operating pressure within the range specified in the table **during operation** of the device!

1.5 Sets of multiple IS energy modules

The sets of energy modules consist of individual IS modules. By default, energy modules are identical (homogeneous), IS modules placed on top of each other. If you need to connect different IS modules or arrange them in different relation to each other, please contact the manufacturer. Coding of IS sets is descirbed in chapter 1.3.

Pamiętaj! There is a possiblity of installing sets of IS with free-standing housing. See chapters :1.3 oraz 1.6.

Uwaga! In the case of a set of energy modules, they cannot be used in cascade (one after the other)! This will result in reduced efficiency of the heat exchanger and the heat exchanger itself will be subject to destruction as a result of wrong heat exchange.

1.6 Energy modules in free-standing housing

The parameters of energy modules and sets of energy modules in free-standing housing are analogous to their IS counterparts. Free-standing multiple modules are in one housing with exchangers on top of each other as standard. Module dimensions are available from the manufacturer.

1.7 By-Pass

If the air handling unit or other source of supplied airflow exceeds the maximum flow through the IS Module and the pressure drop resulting from exceeding the maximum flow through the IS Module is too high, the use of a By-Pass should be considered. This system allows to increase the value of the maximum air flow through the IS Module indicated in 1.2 and dynamically controls the pressure drop on the IS Module. By-Pass can be set :

- Manually - in the case of a manual throttle opening mechanism, the By-pass position must be set during the heating module start-up procedure so that the measured pressure drop on the heating module corresponds to the pressure drop given in the table 1.2. The position of the By-Pass **cannot be changed**, and the port dedicated to the actuator should not be connected. Manually controlling the By-Pass system is not recommended.
- Automatically - in the case of automatic control of the By-pass, its extreme (min./max.) positions must be determined (using mechanical stops on the actuator) during the heating module start-up procedure. The maximum opening of the damper should correspond to the pressure drop across of the heating module given in the table 1.2.

1.7.1 Automatic operation of By-Pass

The IS Module control cabinet can control the By-Pass actuator, thus ensuring optimal operation of the IS Module, therefore the use of manual dampers is not recommended.
The actuators used by manufacturer are 24 V DC actuators and controlled by the signal 0 V - 10 V DC. In the case of self-construction of the damper, the user can use an identical actuator or use the above-mentioned signal 0 V - 10 V DC in own automation.

1.8 Work cycle

The burner work cycle of the energy module in operation is shown below.

1.4: Burner work cycle.

Pamiętaj! For correct operation, the superior automatics must maintain the START and STOP signals for at least 15 minutes. During operation, in order to maintain thermal comfort, the power signal should be appropriately modulated (more information in the chapter: 3.3).

Uwaga! After the burner has been turned off, the external fan of the air handling unit should work for at least 300 seconds to cool down the heat exchanger of the energy module. The air flow rate (ventialation air) should be the same as at was before turning off the energy module or be set to 100%.

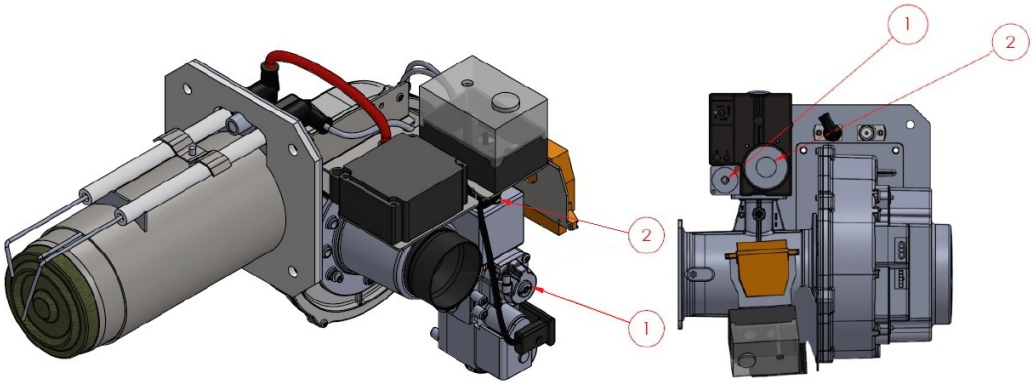
1.9 Control shutdown of the device

According to the legislative requirements, the burner controller must perform a burner shutdown check once a day. It is not signaled in any way and it is not the result of incorrect operation.

2 ISP - premix burner

2.1 Description

The burner is an element of the energy module responsible for generating thermal energy, which is transferred to the ventilation air through the heat exchanger.
The main property of premix burners is their modulated operation, consisting in changing the thermal power depending on the given control voltage 0 V-10 V.
The efficiency of the burner depends on the thermal power and is obtained using advanced technology of air-gas mixture production together with ongoing regulation of the amount of air and gas to be burned.
This technology bases on the fact that the gas valve supplies fuel in an appropriate ratio to the amount of air (parameters set by the manufacturer). In the event of a reduction in the amount of fuel air - the valve reduces the amount of gas, while maintaining combustion parameters at an optimal level. If the fuel air runs out, the valve does not supply gas - this makes the device safe. The premix in combination with the air-gas valve maintains the so-called clean burner combustion with very low emissions: CO $<$ 500 ppm, NOx $<$ 35 ppm.



2.5: ISP premix burner

Nr	Regulatory element
1	Adjustment of compensation
2	Adjustment of CO_2

2.2 Basic burner components

ISP burners consist of:

- Fan EBM series G1G 1xx or NRG137
- Solenoid (gas electrovalve) VK 4125, VR 4xx or GB-ND 057 xxx
- Venturi 45.900.xxx, VMU xxx or 55724.10000
- Flame controller DKG 972-N
- Electrodes: ignition and ionization
- Burner head
- High voltage transformer

2.3 Burner operation description

2.3.1 Preset of gas/air mixture

The fuel for the energy module burner is a mixture of air and gas. The mixing of air and gas takes place inside the fan rotor chamber.
The air drawn in by the rotor passing through a calibrated Venturi causes a vacuum that sucks in the gas. The ratio of air pressure to gas pressure is 1:1. These proportions can be adjusted with the compensation screw (located in the gas valve). The manufacturer supplies the device with adjusted compensation, and the sealed screw.
The second adjustment - power adjustment, can be carried out with a screw installed in the Venturi, which adjusts the maximum amount of gas. This affects the reduction of the carbon dioxide content in the flue gas (modifies the compensation curve - factory set).
The installed control cabinet(ISA) of energy module controls the speed of the burner fan motor as a function of the control signal from the superior controller. By adjusting the rotation speed of the fan motor, the amount of air and gas changes, and thus the power of the burner is also changed. The minimum and maximum fan speed parameters are programmed in the ISA controller and cannot be changed by the user or installer.
The gas pressure should be within the range given in the table 1.2. ISP burners use an ionization probe to detect the flame.

2.3.2 Combustion air

The combustion air must be clean and free from contamination. ISP burners can take air through an air intake, but such installations and installations requiring air filtration should be consulted with the manufacturer.

2.4 Instructions for starting and servicing the ISP burner

2.4.1 Starting the ISP burner

The premix burners are adapted and tested for gas, which is indicated on the energy module's type plate. Before switching the burner on, check the following:

- whether the type of gas available matches the type on the energy module's type plate,
- whether the electrical installation and control signals are in accordance with the diagram with in this manual or with another adapted and supplied with the heating module by the manufacturer
- is the gas pressure compatible with the value required for the device to work,
- is there a closing Start / Stop circuit (bridge) connection of terminals 1 and 2 of the PLZ terminal,
- whether (after checking the above points) the main power switch in the SM cabinet is on,
- is there a control voltage 0 V-10 V DC on the module control inputs - terminals 3 and 4 of the PLZ terminal in the ISA cabinet.

During the first start it may happen that the burner will not ignite due to the presence of air in the gas pipes and the heater will continue to block. Repeat the procedure until the burner ignites or repeat venting the gas path.

2.4.2 Flue Gas Analysis

The flue gas analysis should be carried out by an authorized service in accordance with the schedule. The flue gas analysis value should be within the range given in the table below.

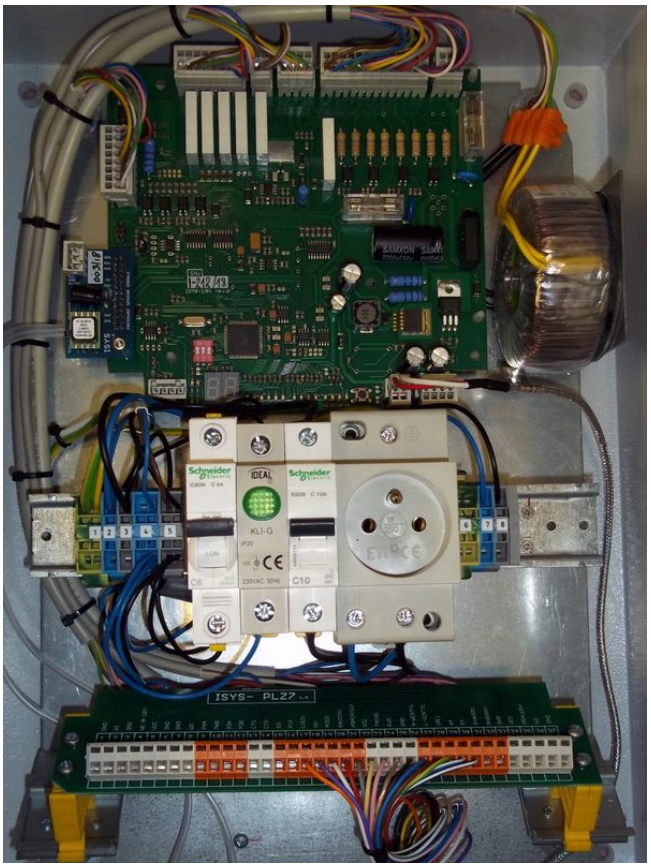
2.4.3 Adaptation to other types of gases

Conversion to a different type of gas may only be carried out by an authorized service center.

	Unit	Max power	Min power
O_2	%	3,5 -6	3,5 -8
CO_2	%	$\sim$ 9,2	$\sim$ 9,2
CO	ppm	$<$500	$<$500
NOx	mg h/kW	$\leqslant$ 260	$\leqslant$ 260

Tabela 2.3: Valid exhaust gas analysis values.

3 Description of ISA-010



3.6: ISA-010.

The IS module is a device designed for modulating operation in the full range offered, it is not adapted to continuous operation in two-state mode (on / off) .

Uwaga! Continuous (long-term) operation of the IS Module in two-state mode will lead to thermomechanical damage to the heat exchanger, which will not be considered in warranty claims (chapter: 3.8) !. We invite you to audit the IS Modules control in order to eliminate the above-described problems, thanks to which these devices will ensure high quality of heat supply to the air. More information at: bok@isys-group.pl

Automation process is intended to protect the correct way the energy module is operating. It is equipped with a microprocessor controller, appropriate electrical protections and a connection terminals to which electrical power supply 230 V AC should be connected, as well as appropriate control signals. Signals about the energy module's operating status and information about occurring alarms can also be taken from the PLZ7 terminal. The main task of contral cabinet is to control the burner power. This is done in three ways.

- The start/stop signal that starts and stops the burner, and the voltage signal controlling the burner power from 0 V to 10 V.0 V means minimum power, and 10 V means maximum power.
- Start/stop signal is not used. The burner does not work at a control voltage below 2 V. At control voltage 2 V, the burner switches on and works with minimum power. 10 V means that the burner works at maximum power. At control voltage 1 V the burner switches off.
- Using RS 485 modbus RTU. Neither start/stop signal nor control signal is used.

3.1 Software version check

To check current software version (since software 3.8), one should :

- power off device by circuit breaker F1,
- wait 5 s and power on device again with circuit breaker F1,
- read current version from controller display.

Pamiętaj! After powering off the device will stop working. After switching on the device will return to work in its current state.

3.2 Signal Start/Stop

The start/stop signal is realized by a potential-free contact (terminals 1 and 2 on the PLZ rail).
Start / Stop signal logic:

- Open contact - the heating module receives a stop signal (STOP).
- Closed contact - the heating module receives a start signal (START).

The control cabinet of the IS module may not start the burner if the START signal is applied in too short time interval from the previous STOP signal. If, after this time has elapsed, the START signal is still given, the control cabinet will resume operation - check the IS module operation cycle, chapter 1.8.

Uwaga! The maximum current load is 1 A, 24 V DC.

3.3 Procedure for starting IS Module

In order to start it correctly, the IS module follows the start-up procedure. The operating cycle of the device is described in chapter : 1.8. The ISA-010 automatics allows for 5 ignition attempts before it issues an error signal or a work confirmation signal (chapter:6). The time after which the IS module signals its status (chapter: 3.6.4) is:

Correct ignition in approach I:	115s	Confirmation of state
Correct ignition in approach II:	275s	Confirmation of state
Correct ignition in approach III:	435s	Confirmation of state
Correct ignition in approach IV:	595s	Confirmation of state
Correct ignition in approach V:	755s	Confirmation of state
An error signal is issued in case of no ignition after V approaches:	895s	Error/fault

The times given are inicative.

3.4 Description of the energy module control

The IS Module can be controlled in the variants described in chapter 3. The result of the control is to provide information about the demand for power of the device. The various stages of the device's operation are described below.

- The energy module is not working. Display shows **00**.
- Switching on the energy module (depending on control method). If the signal was given at the time of starting the fan motors, the display will show **08** informing about delay for air flow through the module. When an airflow is detected, the display shows **01**. After that, the combustion chamber is ventilated (for at least 60 s).

- Switching on the flame controller. The display shows **02**. The burner sets its parameters to ignition values. Time 10 s.
- Igntion, display shows **03**.
- After correct ignition, the burner will set its parameters to the minimum power value, and then will start **modulated operation** depending on the power control given. The display alternately shows **04** and the current burner power expressed in PWM.
- To stop the burner operation, open the start/stop signal contact. The display will show **07** meaning the flue gas removal cycle from the combustion chamber (for at least 60 s). After this time, the burner stops and the display shows **00**.

If the burner does not ignite while **03** is displayed, the failed ignition attempt is canceled. Display shows **06**. The combustion chamber is ventilated, display shows **07** (for at least 60 s). The burner then starts the ignition procedure from the beginning.
After 5 unsuccessful ignition attempts, the display shows E1. The procedure in this case is described in section Errors and malfunctions.

3.5 Operation of security systems

The principles of energy module protection systems are described below:

Safety thermostat STB during normal operation its contact is closed. When the module overheats, it will open thus permanently switching off the burner. Display shows **E2**. Return to operation is possible after the cause of overheating has ceased and the thermostat has been manually unlocked.

Duct thermostat TK protects against too high temperature in the air duct. After exceeding the set temperature in the channel, the display shows textbfF1

Flue gas temperature sensor CTS controls the exhaust gas temperature. When the set temperature is exceeded, **E2** appears on the display and disappears automatically when the exhaust gas temperature is lowered.

Air flow detection module protects the module against work with too low air flow. The message on the **E6** display disappears automatically after the air flow through the exchanger increases.

Condensate level sensor CK detection system for too high condensate level in the heat exchanger (or drain). Activation is indicated by an **E1** error.

Flue gas pressure switch flue gas pressure switch that detects chimney pollution. Activation is indicated by an **E1** error.

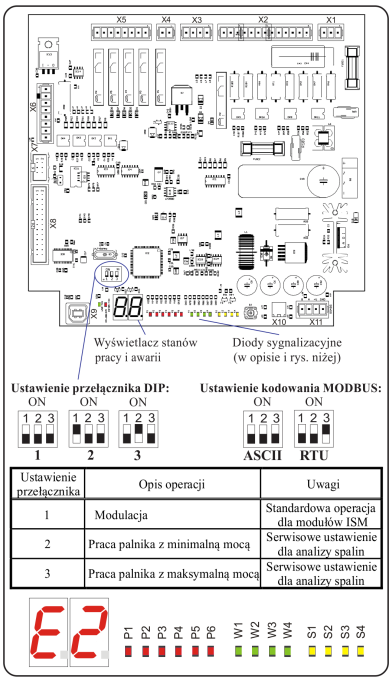
External other normally closed (potential-free) contacts from other protections can be connected in series with the start / stop signal contact.

Pamiętaj! The signal controlling the burner power **must be** correlated with the unit's fan output. Maximum fan output induces maximum burner output. Reduced AHU fan flow should reduce the burner control signal.

If the airflow of the AHU fan is greater than the maximum air flow through the heating module, a By-Pass (chapter 1.7 should be used in a configuration such that the heat exchanger resistance is not lower than the maximum resistance (table 1.2).

3.6 Work and failure statuses

The energy module controller is equipped with a display and a set of LEDs describing the current operating states and module failures in real time.



Ustawienie przełącznika	Opis operacji	Uwagi
1	Modulacja	Standardowa operacja dla modułów ISM
2	Praca palnika z minimalną mocą	Serwisowe ustawienie dla analizy spalin
3	Praca palnika z maksymalną mocą	Serwisowe ustawienie dla analizy spalin

3.7: Display and LEDs on the energy module controller.

3.6.1 Operating states on the IS-ST5 controller

During normal module operation, the burner operation phases are displayed on the display of operation states and failure of the ISP IS-ST5 modulation controller:

00 No operation (the burner does not receive a START signal)

08 Waiting for air flow through the module

01 Pre-purge of the combustion chamber

02 Checking the state of the flame controller

03 Ignition of the burner (ignition spark, opening of the solenoid valve)

04 Modulated burner operation

05 Work in service mode [8]

06 Clearing the burner control unit failure

07 After-purge of the combustion chamber

3.6.2 Faults displayed on the IS-ST5 controller

Self-diagnosis the IS-ST5 controller can communicate the following errors:

[8] option not available to the user

Uwaga! Faults signaled by IS Energy Module are for informational purposes only. This signal should not be used in the safety chain of an AHU unit!

E1 No ignition

E2 Device overhaet - open contact (operational) of the STB thermostat

E3 Wrong number of pulses from the fan, burner disconnected

E4 Failed to clear the fault on the burner control unit - faulty flame controller

E5 No signals from the burner control unit - the burner cable is damaged

E6 No signal from the air flow switch - no airflow required through the IS Module

E7 Faulty CTS (flue temperature sensor)

E8 Low gas pressure - no signal from gas pressure switch - gas pressure switch open[9]

E9 Exceeded maximum flue gas temperature

F1 The TK duct thermostat contact is open

F2 Too frequent start cycles

3.6.3 Display of operating status or faults by signal diodes

During operation of burner, on the IS-ST5 controller information about specific operating states is signaled (except for the display described above) with LED indicators:

P1 Switching on the flame controller

P2 Clearing the burner failure

P3 Burner failure (external signaling)

P4 Burner operation confirmation (external signaling)

P5 Switching on 10 V to control the module By-pass actuator

P6 Switching on external cooling e.g. for a heating module

W1 Burner start operation (shorting of W1 contact or exceeding of 2V control voltage)

W2 TK operation (lighting of the LED means the TK state is closed)

W3 Shorted PPP mechanical pressure switch, or minimal air flow through the digital converter detected

W4 Minimum gas pressure switch

S1 Burner confirmation

S2 Burner alarm

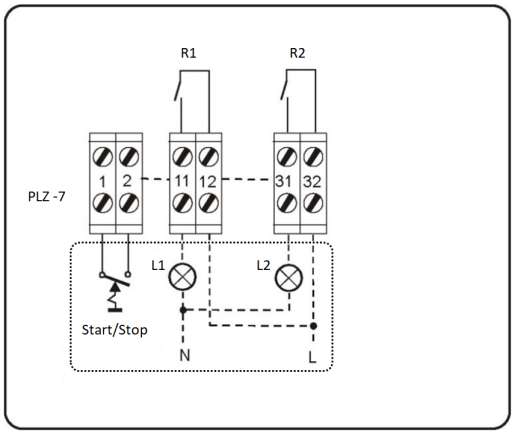
S3 Burner flame power supply

S4 Burner solenoid valve activation

[9] applies to VR electrovalves.

3.6.4 External signaling

It is possible to get signals from ISA-010 for external purposes, as shown below.



R1,R2	Styki bezpotencjałowe	Potential-free contacts
L1	Awaria Modułu IS	IS Module failure
L2	Potwierdzenie pracy	Confirmation of state

3.8: Diagram of connection of external signaling of IS Module.

Pamiętaj! The *confirmation of state* signal is a signal that confirms the operation of the device, during which the burner operates with a stable flame. This signal is an information signal, it is not used to introduce changes to the working parameters of the higher-level automation!
There are phases of (correct) operation of the IS Module, during which the described signal is not displayed. Additionally, there may be a situation where the IS module will try to restart ignition after an unplanned interruption (for example, a temporary lack of combustion gas), then the *operation confirmation* signal will not be issued until a stable flame is obtained, even though the device was still working properly - expected correct working conditions!

3.7 Duct temperature sensor of master control cabinet

Uwaga! The placement of the temperature sensor has a direct influence on the correct control of the IS Module and its service life. An incorrectly positioned sensor can lead to permanent damage to the IS Module!

Control of the IS Module by the superior automatics (air handling unit) is most often based on the temperature sensor readings in the installation duct. The placement of the temperature sensor influences the quality of control and correct operation of the IS Module.

Uwaga! Placing the sensor too close (below 4 m) after the IS Module will result in too fast response thus distortion of steering signal of IS Module, therefore the master controller will activate the IS Module too often, shortening its life!

For the most optimal readings of the temperature sensor it should be as far behind the IS Module in the installation as possible. This will provide a place for the supplied air to uniform the temperature in the cross-section of the ventilation duct.

3.7.1 Duct temperature sensor of master control cabinet with IS Module equipped with By-Pass

In appliances where an IS Module with a By-Pass is used, the temperature distribution directly behind the Module should be taken into account. The heated air will be blown in the shadow of the Module, and cool air in the shadow of the By-Pass. It is **inappropriate** to position the sensor directly after the Module, either at the height of the Module or the By-Pass, as the temperature readings will not be averaged. Make sure that the sensor measures the temperature in a place where the hot and cool air flows **are mixed**.

3.8 Start counter

Manufacturer predicts up to 500 starts monthly. Exceeding this value may result in damage to heat exchanger, which will not be recognized as warranty repaired damage.

3.9 Brief guidelines for a supervisory automation system

The most important guidelines for the IS module management system are presented below.

Power regulation Heating of cubature objects is most often characterized by large time constants. Therefore, when using the PID controller, both the specificity of the heated object and the heating device should be taken into account. Too fast reaction of the control system may lead to temperature overshoots in the ventilation duct, which the controller may react to with frequent stops of the IS Heating Module, which comes down to two-position control.

Temperature measurement We recommend that the temperature measurement takes place as far as possible after the IS Module, thanks to which the average value of the temperature in the duct will be measured.

Device control Due to the specificity of gas heating module operation, the shortest correct operation cycle should be 30 minutes. The minimum duration of the START signal is 15 minutes, the minimum duration of the STOP signal is also 15 minutes.

Failure signals Failure signal **is not** a safety signal! In the event of an IS Module failure, the unit is safely stopped and supplies no heat. Emergency stop of the IS module **does not require** stopping the air handling unit.

Operation confirmation signal The operation confirmation signal is a signal confirming that the device has obtained a stable flame. When the device is in standby mode, this signal is not issued, which does not mean that the device is not working. The signal means that heat is generated and its appearance indicates the moment when the PID controller should be reset and start the control.

3.9.1 Requirement of less power than minimal power of IS module

The (transitional) periods in which the demand for thermal power is lower than the minimum power of the device used are the periods in which the IS Module will operate in two settings. The increased frequency of the start / stop cycles is unavoidable, so every effort should be made to:

- by caring for the device, eliminate repeated start / stop cycles during normal operation,
- minimize the number of start / stop cycles during transitional periods.

In order to shorten the length of the transition periods, it is necessary to ensure the appropriate minimum power of the device already at the design stage - the lower the minimum power, the shorter the transition periods will be. The second way will be to additionally extend the time constants of the regulator controlling the IS Module. The variant most beneficial for the user's comfort will be a set of devices, one of which will provide a low minimum power and the other a high maximum power.

3.9.2 Examples of registered work of the IS Module

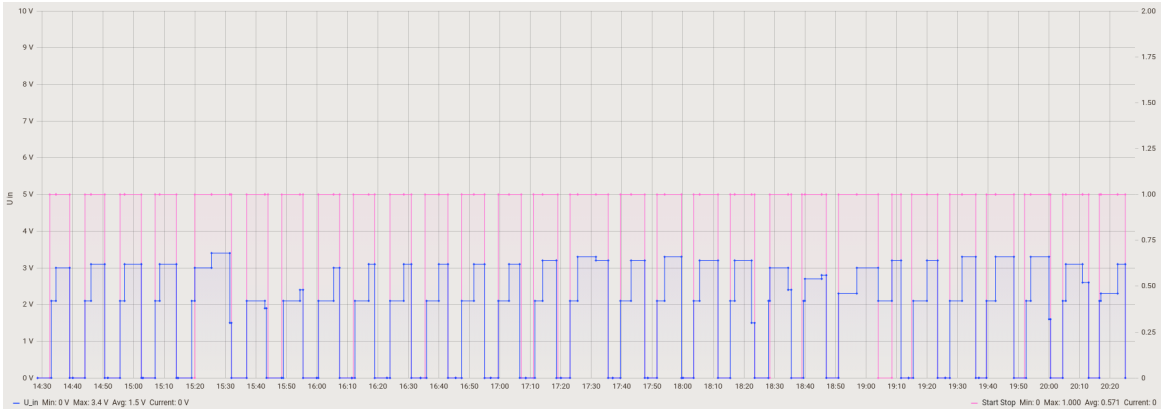
Below are examples of registered IS work. The examples shown here intentionally show different time periods to show the scale of the problem.

Modulated work, correct

3.9: U - steering voltage, Start/Stop - start/stop signal value

The above graphic shows the correct control of the IS Module. In the presented period (approx. 30 days), the device continuously modulated the power depending on the needs and the STOP signal was not generated by the superior control.

Two-state work, incorrect



3.10: U - steering voltage, Start/Stop - start/stop signal value

The graphic above shows incorrect control of the IS Module, which shortens its life and does not provide thermal comfort for the user. In addition, **the manufacturer reserves the right to refuse warranty services** due to improper use. A period of 6 hours is shown during which the device performed 29 starting cycles, often with a START signal shorter than 10 minutes. It is worth noting that the device was driven to a power greater than the minimum. Operation as shown in the above graphic unnecessarily generates heat surplus, which the superior automation compensates by switching off the device. In the described example, the time constant adopted in the superior automation is too small and / or the channel temperature sensor is placed too close to the IS Module. Additionally, the power in the cycle itself is not properly selected - if the device was turned on with the START signal and controlled with the minimum power, it can be said with high probability that the superior automation would not generate the STOP signal with such frequency. An additional negative effect of frequent ignitions is the fact that it occurs at a power greater than the minimum, which in principle generates additional temporary energy surpluses and increased fuel costs.

4 Installation and connections

General rules for installing the energy module:

- The heating module must be located behind the ventilation air fan. Operation on IS Module installed in front of the ventilator of the AHU may result in thermomechanical damage to the heat exchanger - installations of this type should be consulted with the manufacturer (bok@isys-group.pl).
- Insert the heating module into the empty section of the air handling unit [10]. Make holes for the burner, flue gas outlet and condensate port, as well as additional sensors in the air handling unit panel.

  Pamiętaj! If the module is equipped with a burner cover, its mounting frame should be placed so that it does not interfere with the holes for the sensors and the cover does not interfere with the burner and gas path.

  Secure the module to the base of the air handling unit section using a bracket. Blind free spaces above and next to the module, for example with a sheet metal blind, to force air flow through the heat exchanger. If necessary, mount the By-pass before beforehand. If there is not enough space in the AHU for the use of By-Pass big enough, the manufacturer allows the installation of a smaller By-Pass and a screen with previously made holes.

  Uwaga! Leave at least 1 m empty space for the module with power $<$120 kW and 1.5 m for the module with power $\geqslant$120 kW from the nearest element inside the air handling unit (usually a fan/fan motor).

  Pamiętaj! When blending the energy module, make sure that the details used for this purpose are rigid enough. This will ensure that there is no vibration and noise during the operation of the ventilation unit fan.

  Pamiętaj! By default, all openings/holes should be made in the control panel panel on the service side. Before installation, make sure which version the heating module has been made/ordered.
- Make electrical connections in accordance with the wiring diagram attached to the device.

  Pamiętaj! Cable routes should be laid in installation troughs. If the trough cannot be used, UV resistant hoses should be used. Cable routes should be parallel to the main axes of the exchange.
- Make the connection to the flue system. If the device is installed on the roof, the flue system should consist of an element connecting the horizontal flue outlet to the chimney draft (tee with condenser or knee), a straight section that will protrude above the AHU, an roof topping and the mounting bracket. If the device requires a long chimney, it should be designed in accordance with the regulations. With a chimney length over 2 m, chimney installations should be designed by a qualified person.
- Make the connection to the condensate output. If the device is located on the roof, the connection is optional. It should be remembered that if the condensate output is extended, the condensate may freeze, therefore heating cables should be used. If the module is located indoors, a siphon should be connected to the condensate outlet connection. All elements of the condensate drain system should be installed below the condensate drain pipe.

  Uwaga! Leaving the condensate connector open will lead to condensate retaining under the heating module. This can create an ice crust that will be dangerous for people on the roof. The condensate connection **must** be connected to the condensate collection system correctly.

[10] Applies to modules to be built inside the air handling unit

> Pamiętaj! If the module is equipped with a condensate level sensor, screw it onto the threaded connection of the heating module so that the sensor connection is vertically above the connector. The whole should be covered with a protective silicone hood.

- After installing the module, mount the burner and the ISA010 cabinet with automation. The cabinet should be installed on the air handling unit section near the burner entrance. Remember to insert the flue gas temperature sensor into the appropriate sheath before closing the device. After closing the module, it may be very troublesome or impossible to properly install this element.

> Pamiętaj! The ISA010 cabinet should be placed in such a way that it is possible to connect the burner (cable length 1.5 m).

- Connect the burner with a cable with a plug, which is connected to the terminal block in the ISA010 cabinet (Make sure that the cable plug is connected to the burner correctly). This cable is rolled up and fastened under the cabinet during transport.
- To the X5 terminal block in the ISA010 cabinet, connect the 230V AC power supply properly secured from the field electrical installation. Connect the remaining automation devices according to the device electrical diagram.
- Connect the air flow sensor connectors (protruding from the module) using flexible hoses to the prepared connectors in the ISA010 cabinet - connector at the burner to "+", connector at the chimney to -"in the ISA010 cabinet.
- Put the cover over burner.

4.1 Mounting options for IS modules

The heating modules can be installed inside the air handling unit in various variants, depending on the needs and the available space. The standard mounting method is mounting on the control panel's control panel.

4.1.1 Installation by the side panel of AHU

In this variant, the heat exchanger of the energy module is positioned inside the air handling unit in such a way that the operating panel of the module faces the inside of the air handling unit from the control panel. The AHU's light is obscured by diaphragms forcing air flow through the energy module's exchanger. All energy module connectors require holes in the control panel's panel. The ISA010 cabinet, ISP burner and cable routes are routed outside the control panel.

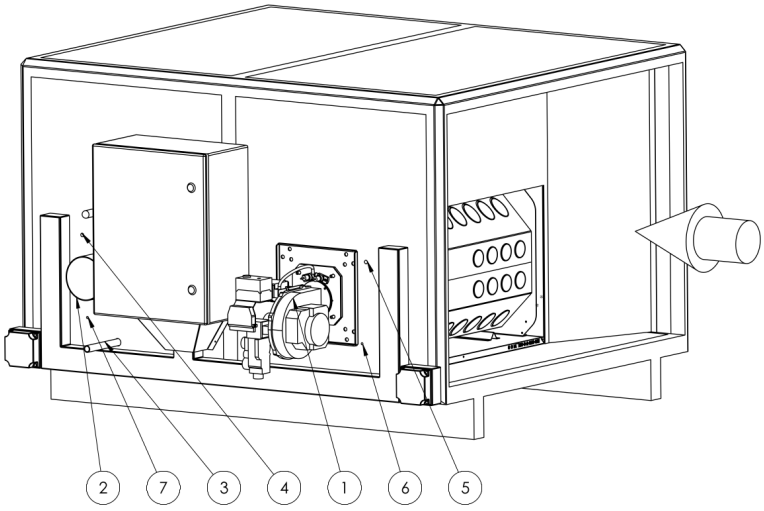
4.1.2 Installation inside an AHU unit, with a separate inspection chamber

In this variant, the heat exchanger does not adhere to the side inspection panel but is moved away from it by at least 700 mm, the installer must separate the inspection chamber, which:

- will be tightly separated from the ventilation duct.
- will be properly ventilated.
- will provide free access to the heating module apparatus..

Po odsunięciu modułu od ściany centrali montaż jest prowadzony w sposób analogiczny do standardowego.

> Pamiętaj! The wall separating the burner inspection chamber from the ventilation must be of adequate thickness - from 40 mm to 60 mm in order to ensure sealing of the burner seat (similar to the panel of a AHU unit) . If the installer has planned to separate the chamber with a thinner element, use the control panel panel adapter, which will thicken the wall locally.



Nr	Opening for	Nr	Opening for
1	Burner	5	Safety thermostat (STB)
2	Exhaust	6	Sensor of airflow (+)
3	Condensate drain	7	Sensor of airflow (-)
4	Duct thermostat (TK)		

4.11: Openings to be made in AHU side panel.

4.2 Review of required openings in the air handling unit panel

Pamiętaj! The by-pass hole (damper axis) is only required if the module is equipped with a damper.

Pamiętaj! When mounting the module with a heat exchanger in the universal version, remember about the hole for the second condensate drain.

Pamiętaj! When mounting a set of modules, all holes except the optional By-pass hole must be made for each module in the assembly.

4.3 Media connections

Uwaga! All installation work should be carried out only by qualified personnel.

4.3.1 Gas

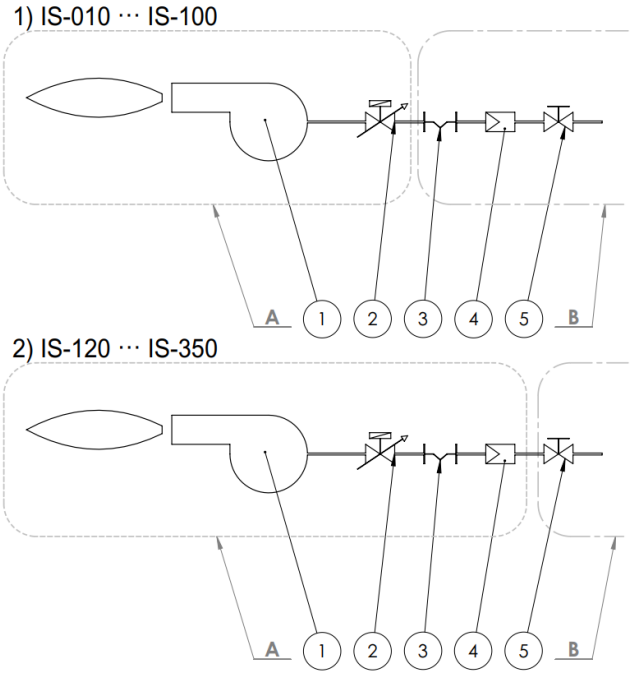
The gas installation for the energy module should be designed and made in accordance with applicable regulations.

Uwaga! The on-site gas installation **must provide** operating pressure within the range specified in the table **during operation** of the device!

Pamiętaj! The gas path buffer between the regulator and the energy module burner must be taken into account. Too short a path will prevent the burner from starting.

The burner electrovalve ends with a threaded connector, to which an installer with appropriate permissions can connect the gas installation. It is **required** that the burner be connected to the installation with a flexible

connector. The installation **must** also contain a governor and a manual valve (before governor) cutting off the gas supply to the burner in the area close to the burner.



Nr	Element of the gas installation
1	Burner
2	(Burner) Solenoid valve
3	Flexible joint
4	Governor
5	Shut-off valve
Nr	Delivered by
A	ISYS
B	Fitter

4.12: Diagram of ISP burner gas connection and scope of delivery.

Pamiętaj! ISYS może dostarczyć dodatkowe elementy instalacji gazowej również dla mniejszych Modułów IS (IS-010 do IS-100) na życzenie klienta.

Uwaga! It is important that the shut-off valve is located close to the burner, which will increase the safety of the object.

4.3.1.1 Gas governors

The manufacturer uses Pietro Fiorentini filter stabilizers, depending on the power of the IS Module, model 31053 or 31152.

4.3.2 Electricity

Uwaga! There is a risk of electric shock. All installation work must be carried out with the power off!

Single-phase power supply from the existing installation should be connected to the ISA010 cabinet. The power supply should be routed with a three-core cable with a cross-section of 2.5 mm^2, suitably protected by a G60 type circuit breaker on the site installation side. In the ISA010 cabinet, according to the diagram, electrical components are installed that perform the following functions:

- F1 - main power switch, which is also over-current protection.
- F2 - service socket power switch, which is also overcurrent protection.

- LZ - power on indicator.
- ISP controller IS-ST5, 230 / 17V transformer and air flow converter.

Optional electrical devices are:

- By-pass damper actuator.
- Power supply for the condensate neutralizer heater.

4.4 Chimney installation

Pamiętaj! The manufacturer can provide a basic chimney system, but it should be taken into consideration that this is a universal set, not adapted to the specific application of the heating module on site. The chimney system should be approved by a suitably qualified person.

The basic set of the chimney system consists of:

- Knee connecting the chimney to the horizontal pipe of the heat exchanger (this element must be double-barreled).
- Straight sections (in the basic set from one to three meter sections, depending on the size of the AHU).
- Mounting brackets.
- Rooftop.

4.4.1 Chimney systems

The elements used for the construction of chimney flues for heating modules should be made of stainless steel. Use pipe seals to avoid any condensate leaks. Only sealants dedicated to flue systems for gas appliances may be used.

Pamiętaj! The basic security measures in the context of chimney systems are:

- Preventing people from accidental touch.
- Routing the chimney system outlet to the correct height.

4.4.2 Selection of chimney systems elements

The values given in the table 1.2 are given for a chimney system consisting of(successively from the chimney connector of heat exchanger):

- Knee 90°
- Vertical straight section of the length given in the table 1.2
- Rooftop

Pamiętaj! The given values refer to a system with no horizontal elements. Each horizontal 1 m chimney shortens the maximum system length by 1.2 m!

Uwaga! If a flue system longer than specified in the table is needed 1.2 increase its diameter - consult the design with the designer.

4.5 Condensate

Uwaga! The energy module is a condensing device, please check local regulations for the discharge of condensate into the wastewater!

When connecting the condensate drain to the wastewater, the installer should consider the following aspects:

- Condensate drained directly to the base of the central unit/heating module during a negative outdoor temperature creates large, frozen surfaces that can threaten the health and life of persons operating the equipment and installations on the roof of the facility.
- Freezing condensation forms layers of ice that are stacked on top of each other, which causes a significant load on the roof surface at the point of freezing. Attempts to clean the roof in an emergency by mechanical picking of frozen condensate decks can damage the roof surface.
- In the external operating conditions of the device (for example: the control panel, with a energy module, located outside the operated facility) requires that such installation should be protected against freezing with adequate heating installation.
- Both, a condensate drain system equipped with a neutralizer and one without a neutralizer requires frost protection.
- For indoor installations, a siphon is required in the condensate drain system.

Pamiętaj! Use a siphon to prevent flue gas from escaping through the condensate drainage system.

4.6 Installation service by factory service

The manufacturer offers the installation of the purchased device in the ventilation unit section:

- delivered to the manufacturer,
- on site,
- at the manufacturer of the air handling unit.

The scope of assembly includes:

- mechanical assembly of the device,
- mechanical assembly of accessories purchased from the manufacturer.

Details of the requirements are available at serwis@isys-group.pl.

4.6.1 Installation of the chimney system

In the case of the assembly of the chimney system, the factory service will install the chimney delivered with the IS Module. Chimneys purchased from third parties will not be installed without prior agreement. Additionally, service will not be provided if there are collisions between the chimney system elements and other elements on the site - cornices, ceiling passages, etc. During assembly at the manufacturer's premises, the chimney system will be installed only up to the height of the air handling unit section, the remaining elements will be installed during the start-up service of the device.

4.6.2 Installation of the condensate neutralizer

In the case of a condensate neutralizer, the factory service will only install the neutralizer supplied with the IS Module in the immediate vicinity of the IS Module. In the case of a heated version, the factory service also insulates the conduit connecting the condensate connector with the neutralizer.

Uwaga! The factory service is not prepared to install the neutralizer directly on the roof of the building.

5 Operation

5.1 Necessary technical conditions

For proper operation of the energy module, fuel and electric power supply as well as condensate and flue gas evacuation systems must be carried out in accordance with applicable regulations. **The amount of air flowing through the module must be greater than the minimum** and the process of turning off the module must ensure cooling of the exchanger. Firstly, energy module must be stopped by opening the start / stop terminals of the burner (the module will stop working), than the AHU fan must still be working for **at least 5 minutes at full or recently used work point**.

Uwaga! It is not allowed to simultaneously switch off the AHU fan and the energy module in both automatic and manual modes. Failure to comply with the above indications may cause the safety thermostat to operate and may damage the module (thermal burnout of the exchanger).

5.1.1 Maintenance and repair requirements

General issues:

- make sure that devices and pipelines undergoing repairs or overhauls always have the correct labels on belonging to the given device and warning signs on repairs
- do not carry out any repairs on the equipment under voltage and gas in gas pipe.

The inspection should be carried out once a month during the heating period and once a quarter regardless of the working time. Please note the condition of the following:

- automation cabinets and other electrical apparatus
- burner
- flue system
- air filters (if used)
- ducts and air vents

Once every 3 months check the main fuel valve.
In addition, in order to maintain good condition and efficient operation of the heating module, it is necessary to annually and before each heating season:

1. Check the condition of the burner electrodes.
2. Check the burner head for dirt.
3. Check the condition of the air supply and flue pipes.
4. Check the condition of the Venturi.
5. Check the condensation siphon for cleanliness.
6. Check the cleanliness of the gas filter (Line Pressure Regulators).
7. Check the inlet pressure on the gas valve.
8. Check the operation of the device, test the operation of the flame control system and air pressure switch.
9. Check the ionization current.
10. Check the gas path for tightness around the burner.

Pamiętaj! Steps 1, 2, 3, 4, 5 and 6 must take place with the gas and electricity supply disconnected. Steps 7, 8 and 9 are carried out with the burner on - 10 with completely assembled gas path.

Checking the condition of the burner electrodes.

Disconnect and remove the burner. Check the condition of the ceramic insulation. Remove any oxidation on metal parts of the electrodes with sandpaper. Check the correct placement of the electrodes.

Checking the burner head for dirt

Unscrew the head from the burner. Visually check the head mesh for cleanliness. Use compressed air to remove any dirt on the head mesh.

Uwaga! Any breaks in the mesh continuity should be reported to the service immediately.

Checking the condition of the air supply and flue pipes

Check the condition of the cables visually or using appropriate tools. Remove any dust that collects at the air intake.

Checking the condition of the Venturi.

Remove dirt away while being careful not to get it inside the burner.

Checking the condensation siphon for cleanliness

The siphon should be cleaned every year. Remove waste if there are any. In the event of deposits or other impurities, the siphon should be checked more often.
After cleaning and before starting the device, remember to fill the siphon with water and close the control opening with the plug.

Checking the cleanliness of the gas filter (Line Pressure Regulators)

Remove the filter cartridge and visually assess the condition of the dirt. Clean the element with compressed air, and in the case of heavy dirt, replace the element with a new one.

Checking the inlet pressure on the gas valve

Perform a gas supply pressure check on the valve and check that it complies with the table 1.2. Check with the burner on and the maximum heating module power on.

Check the flame control system and the air pressure switch

With the burner operating, close the gas valves and check if the device is blocked. Open the gas valve again, unlock the device and check that the burner ignites again.
Then disconnect the high pressure tube from the air flow switch, wait until the burner stops and E6 appears on the display. Connect the tube to the pressure switch and check if the burner ignites again.

Ionization current control

The ionization control should be carried out by direct current measurement with a microamperometer in the following order

- turn off the module power supply
- disconnect the measuring connector on the ionization cable and connect a microamperometer to it
- switch on the power supply and wait for the burner to start working
- check the value of the flowing ionization current

This value must be higher than 5 µA. Lower values indicate that the electrode is placed incorrectly, oxidized or cracked.

5.2 Rules of conduct in case of failure, fire or other interferences of the module's work

1. Any emergency shutdown should be described in detail in the heating installation operating book.
2. Turning the device back on after emergency shutdown is only allowed after a review by the appropriate service. An entry, stating that the installation is operational, is required in the installation operating book.
3. When leakage in fuel lines is detected, immediately cut off the fuel supply with the valve. Notify proper authorities.
4. Rules of conduct in case of fire. Every employee is obliged to:
    - cut off the fuel supply
    - immediately alert with all available means:
        - employees in the vicinity of the fire
        - Fire Department
        - Company Fire Department
        - Director and Manager

In case of the fire :

1. Report to the Fire Department where it is burning, what is it burning, whether there is a danger to people and state your name and surname as well as telephone number
2. At the same time as alerting the Fire Department, immediately proceed with rescue and firefighting operation, complying with the orders of the person in charge of the action. When joining rescue and firefighting operation, remember the following rules:
    - shut down the power and cut off the fuel supply to rooms subject to fire or directly threatened in the further stage of its development
    - remove flammable liquids, compressed gas cylinders and valuable equipment and documents from the range of fire
    - at the moment when we do not use extinguishing agents, do not open doors and windows to rooms affected by fire
3. Secure the burn-out area:
    - by issuing a fire station to avoid secondary fire
    - by not organizing the burn-out area until the fire investigation is conducted

Pamiętaj! Who, despite the obligation, does not join the rescue and firefighting operation or refuses unjustly to execute the orders issued by the person managing the action, shall be subject to the penalty of deprivation of liberty for up to 2 years, restriction of liberty or a fine.

Pamiętaj! Who maliciously hinders or prevents the performance of fire brigade tasks - shall be punishable by imprisonment of up to 5 years.

5.3 Scopes and dates of visual inspections, surveys, tests and measurements

The installation should be inspected once a month during the heating period and once a quarter during the remaining time, paying particular attention to:

- operation of control and signaling systems
- condition of safety devices
- electric shock protection status
- tightness of fittings and pipelines
- mounting of the devices
- flue systems (chimneys)
- condition of filters and operation of valves

If irregularities were found during the inspection of the installation, they should be removed or submitted for repair.
Inspection of fittings and fuel pipelines installations should be carried out before and after each heating season and at least once during the heating period, in particular:

- detailed inspection
- checking all components of the supply and heating installation
- maintenance activities to the extent consistent with the factory documentation
- replacement of worn parts or components and removal of identified defects

The results of the review and the scope of maintenance and repair activities should be recorded in the heating system's operational documentation.
Protective measurements of power equipment should be carried out once a year.
The activities listed first should be carried out by the manufacturer's factory service (ISYS Sp.z o.o.) or an authorized service at least once a year. The notification is made by contacting the manufacturer.

5.4 Requirements for protection against electric shock, fire, explosion and other requirements for operational and environmental safety

- the employee servicing the burner installation should be thoroughly familiar with these operating instructions. The employee should also be well acquainted with the operation of installations and control devices cooperating with them
- after installing the burner, fittings and pipelines as well as the electrical installation, check the technical condition and confirm the results of the tests of effectiveness of electric shock protection
- devices and pipelines being under repair should be marked with appropriate orientation and warning signs
- no repairs may be made to the fuel supply pipelines of pressure equipment or equipment when device is working
- pay attention to the timeliness of inspections of fuel and electric installations it is forbidden to carry out any repairs of electrical installations without proper authorization
- it is forbidden to perform any repairs of fuel installations and heating devices without qualifications and service as well as training received by ISYS service
- before any repair or maintenance of heating devices, cut off the power supply (turn off the power, disconnect the power cables) and the fuel supply (cutting off the fuel supply with the shut-off valve)
- pay attention to the cleanliness of the devices

- access impediment to shut-off valves as well as access to supply and control cabinets of the installation is prohibited
- only a person with a valid E qualification certificate and trained in operating the device by an authorized ISYS service may be allowed to directly operate the burner installation

5.5 Requirements for those involved in the operation

- persons over 18 years of age who have been acquainted with health and safety regulations (records on the file) and have valid work admission may be admitted for direct service
- an employee servicing the burner installation should undergo periodic examinations in the scope of this manual for servicing the burner installation may be allowed an employee who has a valid E qualification certificate in the field of operation of power equipment and installations as well as control and measuring equipment

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6 Errors and malfunctions

Uwaga! Faults signaled by IS Energy Module are for informational purposes only. This signal should not be used in the safety chain of an AHU unit!

Pamiętaj! If the ignition attempt has failed several times, proceed as if an E1 error occurred.

E1

No flame appears

- No gas pressure (for solenoid valve VK4125) or unvented installation.
  - Measure the gas pressure at the solenoid valve inlet. Check that the gas valves are open and that there is gas in the system. Check that the gas regulator is not blocked. If there is a lack of gas, please contact the facility manager.
- No spark on the ignition electrode.
  - Check if the HV cable is plugged into the ignition transformer and electrode. Check the electrical continuity of the HV cable and replace if necessary. Check the ignition electrode setting. Check the correctness of connection and operation of the HV transformer and replace if necessary. Possible damage to DKG - replace.
- Nie otwiera się elektrozawór lub otwiera się na zbyt krótki czas.
  - Check solenoid valve cable and replace if necessary. Defective solenoid valve - replace it. If the solenoid valve opens for too short a time, the DKG is damaged - replace it.
- The condensate drain is blocked.
  - Clear condensate drain.
- The chimney draft is blocked.
  - Clear chimney draft.

No flame appears or appears, but when the HV transformer is turned off, it goes out.

- Dirty burner head.
  - Unscrew the burner head and clean with air at 6 bar-10 bar.
- The burner is set to a different gas type than it actually is in the installation.
  - Find out from the facility manager what type of gas is in the installation and adjust the solenoid valve for the given type of gas.

At the moment of firing a flame appears, but after switching off the HV transformer it goes out.

- Dynamic gas pressure too low (16 mbar)
  - Check the gas pressure at the solenoid valve inlet when firing the burner. If it is too small, please contact the facility manager.
- Incorrect electrical polarity of the ISA010 cabinet power supply.
  - Check the correct power supply of the ISA010 cabinet. Check whether the PE wire is connected.
- Damaged ionization cable, disconnected measuring connector or electrode cable removed.

- Check that the measuring connector is connected and that the cable is connected to the ionization electrode. Check the electrical continuity of the ionization cable and replace if necessary. Check the ionization electrode setting.

- Damaged ST5 controller.
  - Replace the controller and program according to the settings of the previous controller.

E2

The burner does not start but remains in purge mode.

- Faulty safety thermostat cable, unblocked or faulty thermostat.
  - Check the wiring to the thermostat. Press the reset button of the STB thermostat. Replace the thermostat.
- Faulty ST5 controller.
  - Replace the controller and program according to the settings of the previous controller.

The burner has turned off and is operating in combustion chamber purge mode. The STB thermostat has tripped.

- Overheated heat exchanger. Incorrectly set power limitation parameter depending on the pressure drop on the module.
  - Check parameter settings, whether they match the choice of pressure drop across the module or the documentation. Set the parameters correctly.
- Pressure transducer or ST5 controller defective.
  - Check parameter settings, whether they match the choice of pressure drop across the module or the documentation. Set the parameters correctly.

E3

The burner fan does not work.

- ISP burner not connected to ISA010 cabinet.
  - Check the correct connection of the burner to the automation. Connect the orange plug to the burner. Tighten the plug.
- Unplugged or damaged power supply or fan control cable.
  - Connect the power and/or fan control wires. Check power and control cables.
- Damaged burner fan.
  - Replace the fan.

E4

The burner does not start.

- Damaged steering wire of burner.
  - Check the electrical continuity of the alarm reset wire in the torch control lead. If damaged, replace the control cable.
- Damaged DKG.

- Replace DKG

- Damaged control harness wire in ISA010.
  - Check the electrical continuity of the alarm reset cable between the PLZ strip and the ST5 controller socket. Replace the control wiring harness in ISA010 if necessary.

- Damaged ST5.
  - Replace the controller and program according to the settings of the previous controller.

E5

The burner does not start

- Damaged steering wire of burner.
  - Check the electrical continuity of the alarm reset wire in the torch control lead. If damaged, replace the control cable.

- Damaged control harness wire in ISA010.
  - Check the electrical continuity of the alarm reset cable between the PLZ strip and the ST5 controller socket. Replace the control wiring harness in ISA010 if necessary

- Damaged ST5.
  - Replace the controller and program according to the settings of the previous controller.

E6

The burner does not start.

- No pressure drop across the module.
  - AHU fans off - start the AHU fans. Transmitter pressure tubes not connected to the exchanger tubes - check connections. Pressure tubes bent or damaged - check tubing for patency and condition. Blocked duct behind the heat exchanger, closed dampers - the facility manager should check and open the dampers, or unblock the ventilation duct.

- Damaged pressure transducer.
  - Replace pressure transducer.

E7

The burner does not start.

- CTS flue gas temperature sensor disconnected from the controller.
  - Connect the CTS plug to the ST5 controller socket.

- Damaged CTS.
  - Check/replace CTS.

- Damaged ST5
  - Replace the controller and program according to the settings of the previous controller.

E8

The burner does not start.

- Controller parameter not turned off (for solenoid valves VK4125).
    - Use the service manipulator to disable the gas pressure switch check.
- Gas pressure is too low or too low.
    - Measure the gas pressure at the solenoid valve inlet. Check that the gas valves are open and that the gas regulator is not blocked. If there is a lack of gas, please contact the facility manager.
- Damaged gas pressure switch or pressure switch wires. Pressure switch not connected.
    - Check pressure switch operation and electrical continuity of wires. Check that the pressure switch is connected correctly. Replace lines or pressure switch if necessary.

F1

The burner does not start.

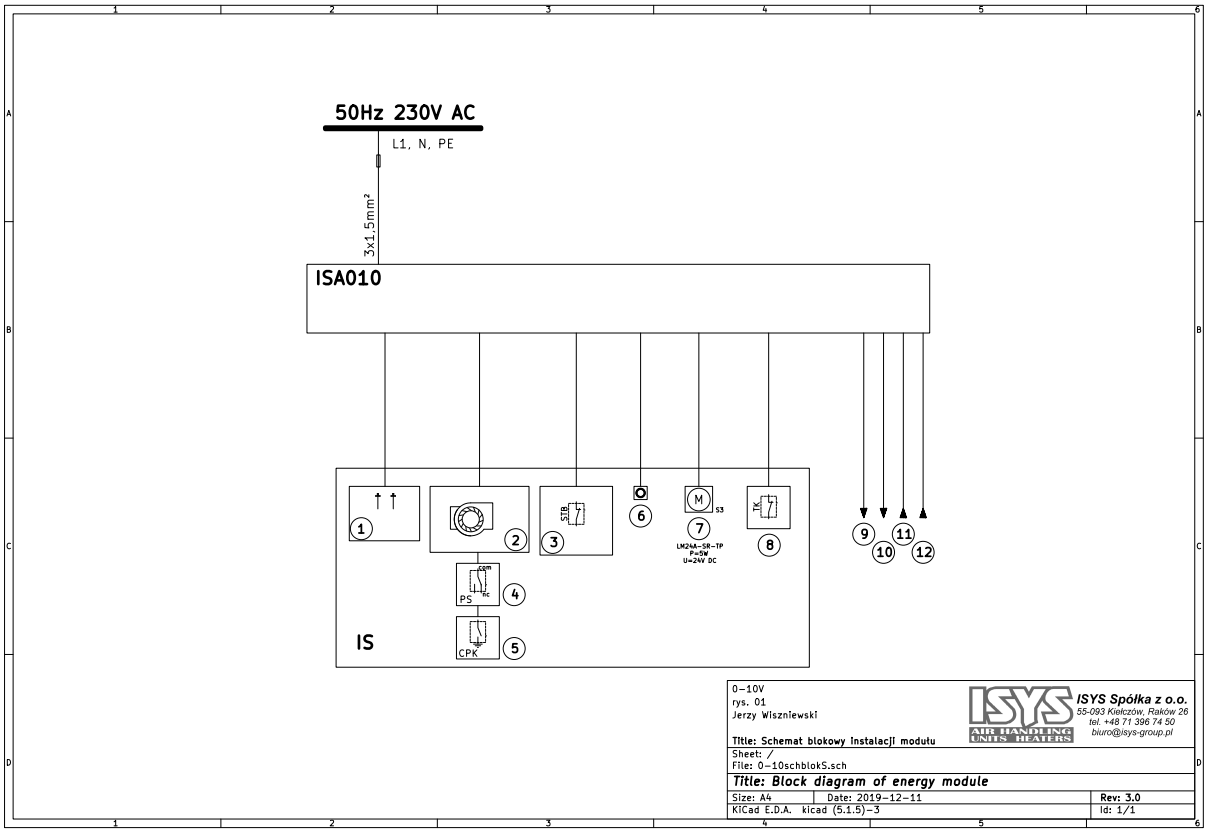
- TK duct thermostat disconnected.
    - Check if the thermostat is connected to the ISA010 cabinet - connect the thermostat. Check the electrical continuity of the connection cables. Replace the cables if necessary.

The burner was working but turned off.

- Too low set TK thermostat activation temperature.
    - If the exhaust gas temperature does not exceed 230C, set a higher thermostat temperature.
- Exchanger temperature too high.
    - If the exhaust gas temperature rises quickly and exceeds the 230C temperature, check the pressure transducer settings and the correctness of the transducer measurement by checking the pressure drop with another pressure gauge. Replace the pressure transducer if necessary. If it is intended to obtain a higher exchanger temperature, a higher thermostat response temperature should be set.

Pamiętaj! In the event of situation not described, or if it is impossible to solve the problem, it is recommended to contact the manufacturer.

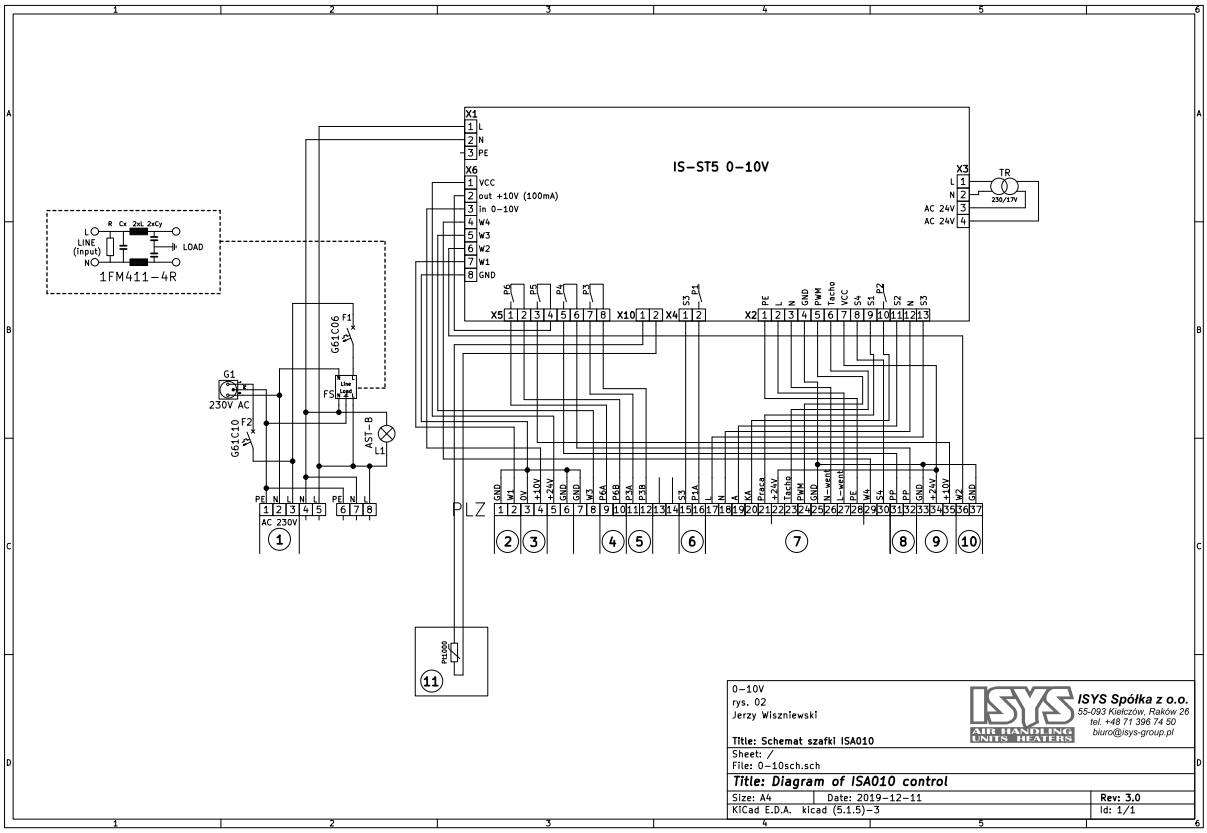
7 Diagrams



7.13: Block diagram.

Symbol	Opis	Description
1	Króćce pomiarowe przepływu powietrza	Sheaths for airflow sensor
2	Palnik	Burner
3	Termostat bezpieczeństwa STB	STB safety thermostat
4	Presostat spalin PS	Flue gas pressure switch PS
5	Czujnik poziomu kondensatu CPK	Condensate level sensor (CPK)
6	Czujnik temperatury spalin CTS	Flue gas temperature sensor CTS
7	Siłownik By-passu	By-pass actuator
8	Termostat kanałowy TK	Duct thermostat TK
9	Sygnał chłodzenie modułu	Energy module cooldown signal
10	Sygnał potwierdzenia pracy/awarii	State of device signal
11	Sygnał Start/Stop	Start/Stop signal
12	Sygnał mocy 0 V DC.	Control voltage 0 V DC.

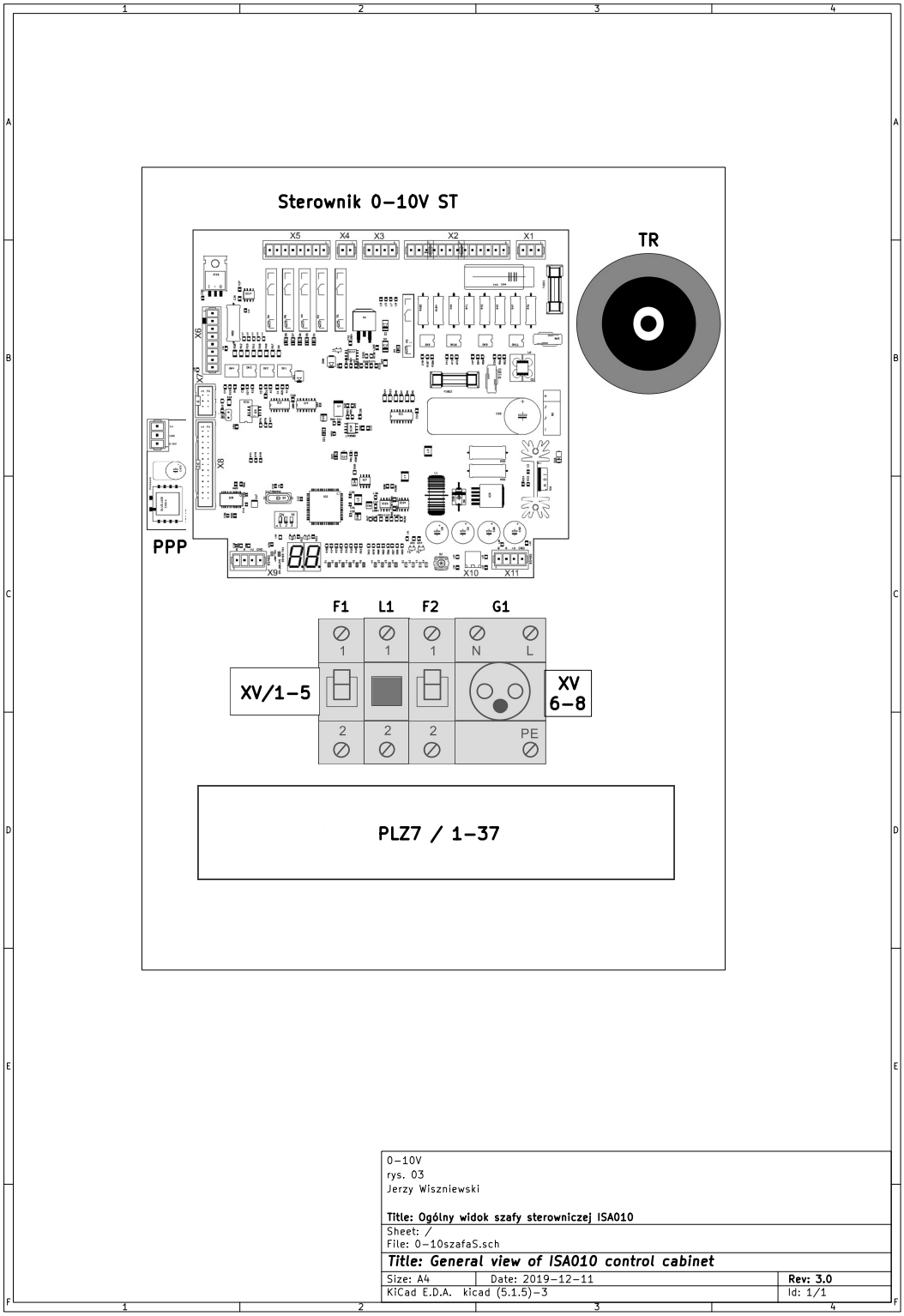
Tabela 7.4: Description of 7.13



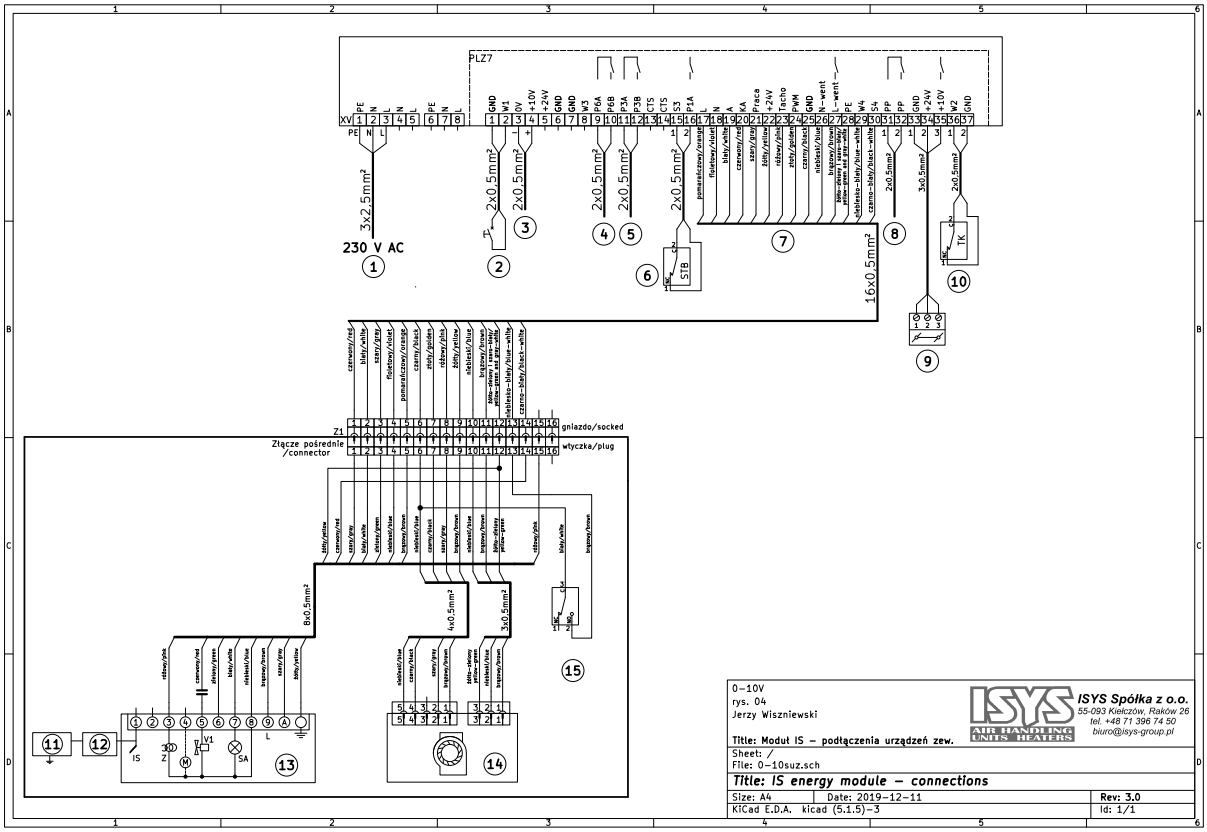
7.14: ISA010 electric diagram.

Symbol	Opis	Description
1	Zasilanie 230 V AC	Power supply 230 V AC
2	Sygnał Start/Stop	Start/Stop signal
3	Sygnał mocy 0 V DC.	Control voltage 0 V DC.
4	Sygnał chłodzenie modułu	Energy module cooldown signal
5	Sygnał awarii	Failure signal
6	Termostat bezpieczeństwa STB	STB safety thermostat
7	Przewód palnika (zakończony gniazdem)	Burner cable (ends with socket)
8	Potwierdzenie pracy	Confirmation of state (on/off) signal
9	Siłownik By-passu	By-pass actuator
10	Termostat kanałowy TK	Duct thermostat TK
11	Czujnik temperatury spalin CTS	Flue gas temperature sensor CTS

Tabela 7.5: Description of 7.14



7.15: Devices in ISA010 control cabinet.



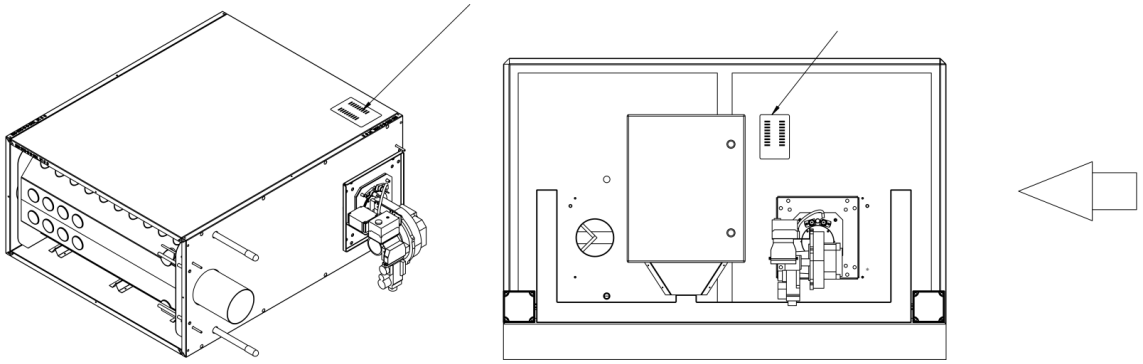
7.16: ISA010 connections.

Symbol	Opis	Description
1	Zasilanie 230 VAC	Power supply 230 VAC
2	Sygnał Start/Stop	Start/Stop signal
3	Sygnał mocy 0 V DC.	Control voltage 0 V DC.
4	Sygnał chłodzenie modułu	Energy module cooldown signal
5	Sygnał awarii	Failure signal
6	Termostat bezpieczeństwa STB	STB safety thermostat
7	Przewód palnika (zakończony gniazdem)	Burner cable (ends with socket)
8	Potwierdzenie pracy	Confirmation of state (on/off) signal
9	Siłownik By-passu	By-pass actuator
10	Termostat kanałowy TK	Duct thermostat TK
11	Czujnik poziomu kondensatu CPK	Condensate level sensor (CPK)
12	Presostat spalin PS	Flue gas pressure switch PS
13	Kontroler DKG	DKG controller
14	Wentylator palnika	Burner fan
15	Presostat ciśnienia (dla elektrozaworów serii VR)	Gas pressure switch (for electrovalves VR series)

Tabela 7.6: Description of 7.16

8 Device nameplate

The device comes with three copies of the nameplate. The first copy is factory attached to one of the insulation panels of the device. The other two copies are on the outer packaging of the pallet (stretch film). One of them, after mechanical assembly of the energy module, should be placed in a visible place on the external wall of the air handling unit, near the device. The last copy is intended for archiving along with the device's warranty card. Examples of nameplate locations are shown below.



8.17: Example locations of nameplate.

The nameplate contains basic device parameters, among others :

- Model name
- Heating power and fuel category
- Electrical supply
- Gas connector
- Degree of IP protection
- Country of destination
- Year of production

9 Appendix A

Guidelines for service work.

9.1 Conditions to be met before mechanical installation of the energy module inside the AHU

- completely mounted AHU
- pallet with a module (delivery) located by side of AHU
- access to electricity within a 50m radius
- ensured access to the AHU in accordance with health and safety rules

9.2 Conditions to be met before wiring the AHU

- heat exchanger mounted in the air handling unit
- access to electricity within a 50m radius
- ensured access to the AHU in accordance with health and safety rules

9.3 Conditions to be met before first run of energy module with ISA010 control cabinet

- heating module heat exchanger mounted in the AHU
- wired AHU (power supply and control signals introduced into the burner control cabinet and plugged into the terminal)
- mounted burner
- connected and ventilated gas installation protected by gas filter in front of the burner
- checked gas pressure in the system, in accordance with the device's manual
- chimney system installed
- electrical installation and gas supply accepted in accordance with applicable regulations
- working master automation of the AHU
- AHU running, possibility of demanding nominal air flow
- a person operating the master automation of the AHU should be present during the start-up procedure
- access to electricity within a 50m radius
- ensured access to the AHU in accordance with health and safety rules
- designated person to be trained in the operation and use of the device, training after start-up procedure

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10 Appendix B

Conversion of the supply medium

- In order to convert the heating module to a gas supply other than that prepared in the factory, call the manufacturer's authorized service center
- Conversion can be done on site (at user facility)
- Information on the gas supply requirements can be found on the type plate of the device

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11 Declaration of Conformity

DEKLARACJA ZGODNOŚCI

EC DECLARATION OF CONFORMITY

PRODUCENT	MANUFACTURER	ISYS SP. Z O.O.
ADRES	ADDRESS	RAKÓW 26, 55-093 KIEŁCZÓW
KRAJ	COUNTRY	PL

Oświadczamy, że wyrób/ Declare the following apparatus,

PRODUKT	PRODUCT NAME	KONDENSACYJNY OGRZEWACZ POWIETRZA SPALAJĄCY PALIWA GAZOWE	CONDENSATION AIR HEATER BURNING GASEOUS FUELS
		KONDENSACYJNY MODUŁ GRZEWCZY CENTRAL WENTYLACYJNYCH	CONDENSATION ENERGY MODULE OF AIR HANDLING UNITS
MODEL	MODEL NAME	IS-XXX	IS-XXX

Spełnia wymagania określone w dyrektywach/ Meet the essentials requirements covered by

2014/35/UE	DYREKTYWA NISKONAPIĘCIOWA	LOW VOLTAGE DIRECTIVE
2014/30/EU	DYREKTYWA KOMPATYBILNOŚCI ELEKTROMAGNETYCZNEJ	ELECTROMAGNETIC COMPABILITY DIRECTIVE
2016/426	ROZPORZĄDZENIE W SPRAWIE URZĄDZEŃ SPALAJĄCYCH PALIWA GAZOWE	REGULATION (EU) ON APPLIANCES BURNING GASEOUS FUELS

Powołując się na dokumenty/ According to documents

CSN-EN 60335-1:2012-A ED.3:2012	CSN-EN 60335-2-102 ED.2:2016	CDN EN 62233:2008
CSN-EN 55014-1 ED.3:2007	CSN EN 55014-2 ED.2:2017	CSN EN 61000-3-2 ED.4:2015
CSN EN 61000-3-3 ED.3:2014	CSN 61000-6-3 ED.2:2007	PN-EN 17082:2020

Kraje przeznaczenia / Destination countries

KRAJ PRZEZNACZENIA/ DESTINATION COUNTRY	KATEGORIA GAZU / GAS CATEGORY
PL	II_{2ELw3P}
DE, **PL**, RO	I_{2E}
BG, CH, CZ, HR, EE, GB, IE, IT, LT, LV, PT, RO, SE, SI, SK, HU	I_{2H}
CH, CZ, ES, GB, GR, IE, RO, SI, SK, TR, BE, FR, IT, LT, HR, PT, NL, **PL**	I_{3P}

Znakowanie CE/ CE marking

CE 18 1015

	CERTYFIKAT BADANA TYPU WE	EC TYPE EXAMINATION CERTIFICATE	E-30-00 : 936-18-REV.2/937-18-REV.1/938-18-REV1
	DATA DEKLARACJI	DECLARATION DATE	2020-09-11
	ROK ROZPOCZĘCIA ZNAKOWANIA	YEAR TO BEGIN AFFIXING CE MARKING	2014