

## **Universal control box for air condition with the application MED (W,2W,WR)**

**ELP14R18-MOD  
ELP14R18-BAC MS-TP**



***Technical documentation***

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## 1. General information



The control box can be handled by untrained personnel.

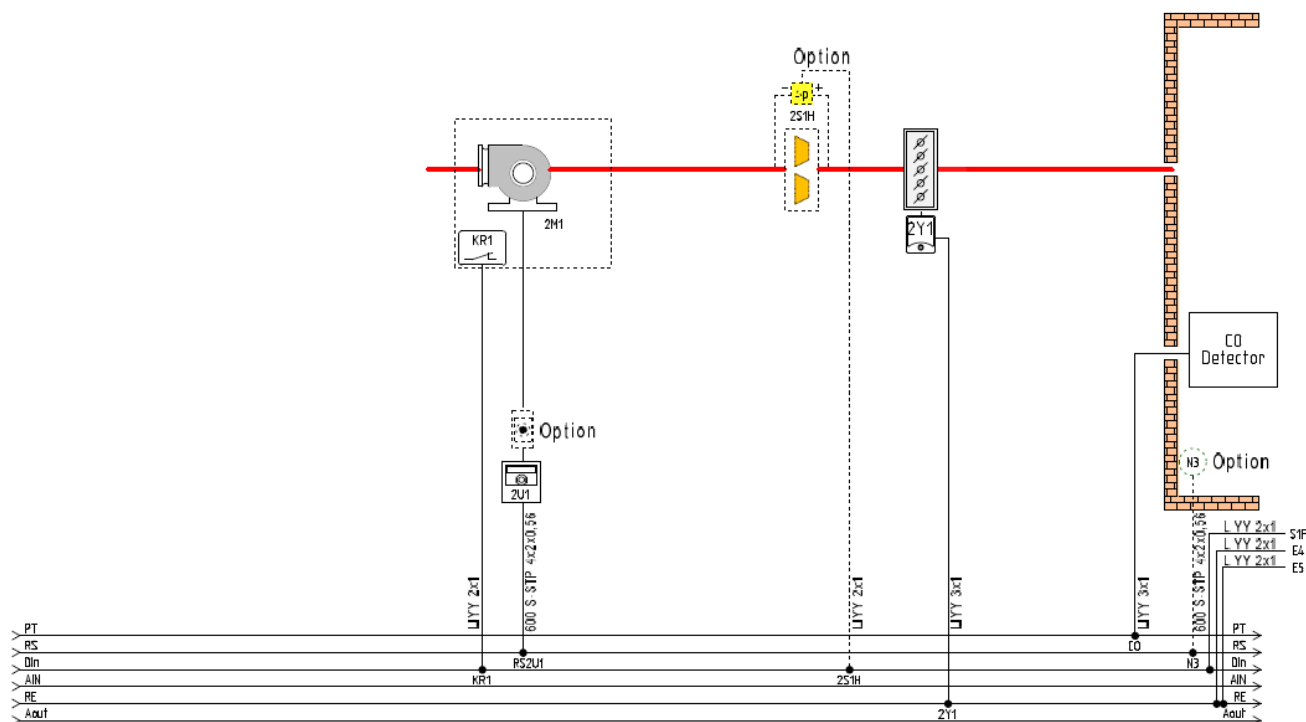
EL-...-...-...-... controller conforms with requirements of the following standards:

PN-EN 60335-1:2004, PN-EN 60439-1:2003, PN-EN 60439-3:2004, PN-EN 50082-1:1999; PN-EN 50081-1:1996

Intended use

— Exhaust, Double Exhaust or Exhaust and Reserve Exhaust Air Handling Units

Example: MED-W



**2. Encryption of control boxes**

Type
W – exhaust
2W – double exhaust
WR – exhaust + reserve exhaust

### 3. System operations

*Tab. 1. The functions of the Air Handling Units.*






Functionality	Triggering condition	Description
Starting fans in ventilation mode	- set the mode 1 gear, 2 gear, CALENDAR	- The opening external damper - Enabling the fan motor on chosen gear
Starting fans in CO detection mode	- set the mode Stop-auto - detector CO (Alarm 1)	- The opening external damper - Enabling the fan motor on first gear
	- set the mode Stop-auto - detector CO (Alarm 2)	- The opening external damper - Enabling the fan motor on second gear

#### 4. Symbols and wiring

The elements of automation should be installed in accordance with application scheme and the following standards:

- control cables type LIYY, LIYCY (do not use twisted-pair cable as control cables) and control cables type YLY and communication cables PROFIBUS DP typ BUS O2YS(St)CY 1×2×0,64/2,6 mm should be wired according the chart presented in electric chart and technical demands of this application,
- cables' cross-sections were chosen to be installed in 100m long metal cable tray,
- in order to communicate adjuster, inverter and BMS it has to be used wires type shielded - shielded twisted pair (each pair is twisted and shielded and all together are shielded), type PROFIBUS DP typ BUS O2YS(St)CY 1×2×0,64/2,6 mm,
- there is not allowed to put cables responsible for communication together with control cables and power supply cables. For communication cables needs to be provided separate cable routes,
- inverter should be installed not more than 100m away from the controller,
- HMI panel should be installed not more than 100m away from the controller,
- there is not allowed to use one cable simultaneously for more than one function/equipment. There is an obligation for each hardware/function to have autonomic cable,
- there is not allowed to use twisted-pair cable as control cables for signals on/off 24V, 230V, 0-10VDC.

Tab. 3 Cables description.

Type of the wire	Draw	Description	Description
(1)		Multiple strand cable with copper strands in PVC jacket	Nominal voltage: 450/750V Operating temperature: -40 do 70°C
(2)		Cables with multiple, flexible copper strands in PVC jacket	Nominal voltage: 450/750V Operating temperature: -40 do 70°C
(3)		Communication cables (PROFIBUS DP typ BUS O2YS(St)CY 1×2×0,64/2,6 mm) with copper strands, screened with copper wires, in PVC jacket	Nominal voltage: 100V Operating temperature: - 30 do 70°C
(4)		Cables with multiple, flexible copper strands, screened with copper wires, in PVC jacket	Nominal voltage: 450/750V Operating temperature: -40 do 70°C
(5)		Power cable with copper strands, screened with copper wires, in PVC jacket	Nominal voltage: 450/750V Operating temperature: -40 do 70°C

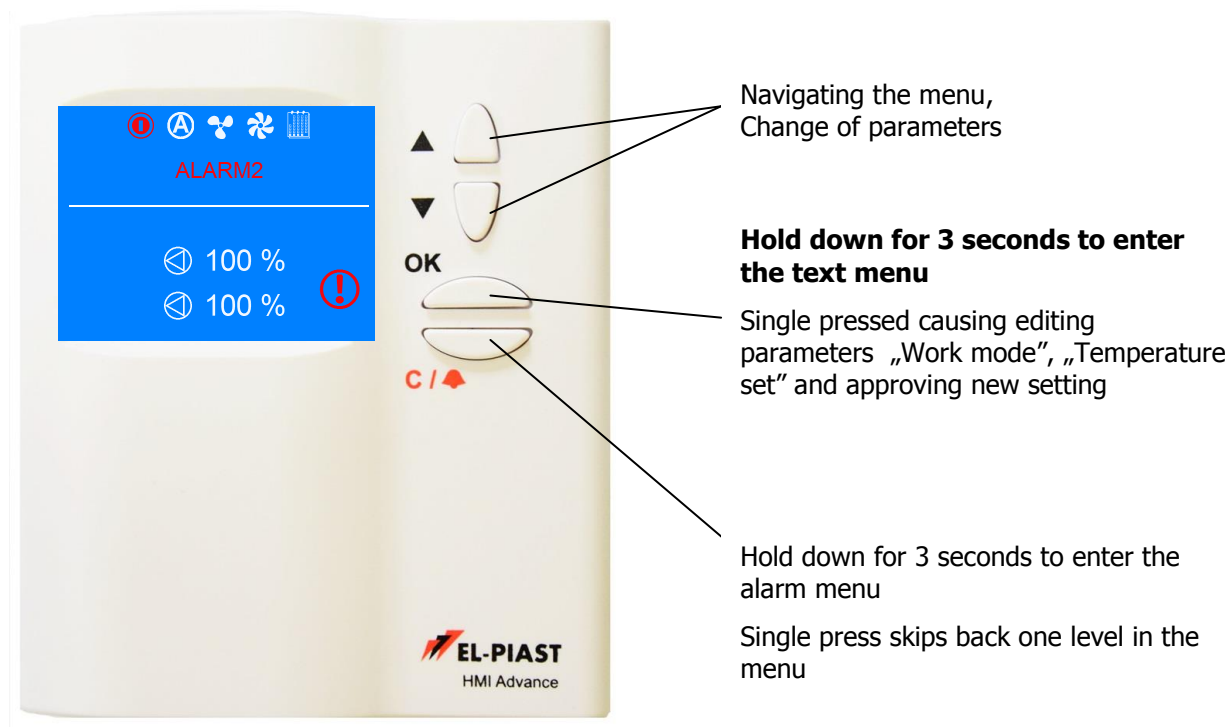
Power cables for the control box, pumps and fan motors shall be installed in accordance with the scheme and wiring list. Cable dimensions were selected based on long-term power load assumption accordance with the standard EN/PN-IEC 60364-5-523.

Tab. 4 The standard cable list and symbols of schemes.

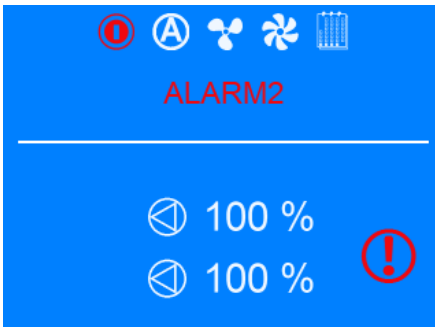


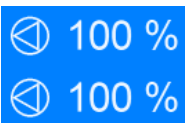

Symbol from the application schema	Description	Typ of the wire	Number of x cross - section in mm <sup>2</sup>
S1F	Cooperation with the station controller fire-protective	-	-
KR1	limit switch compartment fan 1	(2)	2x1
KR2	limit switch compartment fan 1	(2)	2x1
FM1	Protecting the circulation pump of the water heater	-	-
F2M1,2	Protecting the exhaust engine	-	-
2U1,2	Connecting powering the ventilator for inverters exhaust	(5)	Attachment B
2M1,2	Connecting powering the engine of the team of the fan outlet	(1)	Attachment B
RS2U1,2	Modbus RS485 signal for exhaust inverters	BUS O2YS(St)CY	1x2x0,64/2,6
2Y1	Actuator of the dumper of air blown off	(2)	3x1
2Y2	Actuator of the dumper of air blown off (reserve part)	(2)	3x1
2S1H	Differential pressure switch of filter of the preliminary outlet	(2)	2x1
2S2H	Differential pressure switch of filter of the preliminary outlet (reserve part)	(2)	2x1
CO Detector	Alarm 1 and alarm 2 signals od CO detector	(2)	3x1
E.A2	The signal indicating the alarm currently occurring CO 2 detector ( warning sign )	(2)	2x1
E5	Confirming the start – dry contact NO	(2)	2x1
E4	Collective alerting signal – dry contact NO	(2)	2x1
N1	Controller	-	-
N2	Panel HMI Tiny	(4)	7x1
N3	Panel HMI - 216 Advance (max 100m) – communication	BUS O2YS(St)CY	1x2x0,64/2,6
	Panel HMI - 216 Advance (max 100m) – power supply	(2)	2x1

## 5. HMI and Controller specification

### HMI Advance



### Main menu icons:

		Setting the operating mode: „Stop“, „Stop-Auto“, „1 gear“, „2 gear“, „Calendar“
		CO Detector Alarm
		Activation of 1 <sup>st</sup> or 2 <sup>nd</sup> fan
		The summary alarm activated

After pressing "OK" (about 1 second) display changes to the text menu of the operating system automation.

Single pressed causing editing parameters „Work mode“, „Temperature set“ and approving new setting.

After longer time holding down the keys „▲“ and „▼“ at the same time (about 3 seconds), display changes to the display's setup menu.



HMI parameter description:

**Minimal brightness** – minimal brightness of the highlight

**Maximal brightness** – maximal brightness of the highlight

**Activity time** – time of activity, after this time the display is dimmed

**After activity time** – action undertaken after activity time (1. nothing, 2. if alarm occurred, then go to alarm menu, else go to the first chart of main menu).

**T sensor offset** – the adjustment of the temperature sensor measuring in the HMI

**Menu skin** – Skin selector of the HMI

**Communication settings** – communication settings menu of the HMI and RS485 Master interface settings of the ELP controller

To exit menu - press C key.

Panel Advance HMI can be connected to the input of the HMI CON (located at the upper side of the driver around the USB connector) or RS485 master (if it is not used to transfer information management system BMS). There is a possibility of simultaneous connecting two panels to the RJ45 connector and RS485 Master. If a sensor leading temperatures is a sensor in panel check HMI whether there is a chosen sensor leading Adjusting/temperature/sensor in accordance with connecting on the menu.

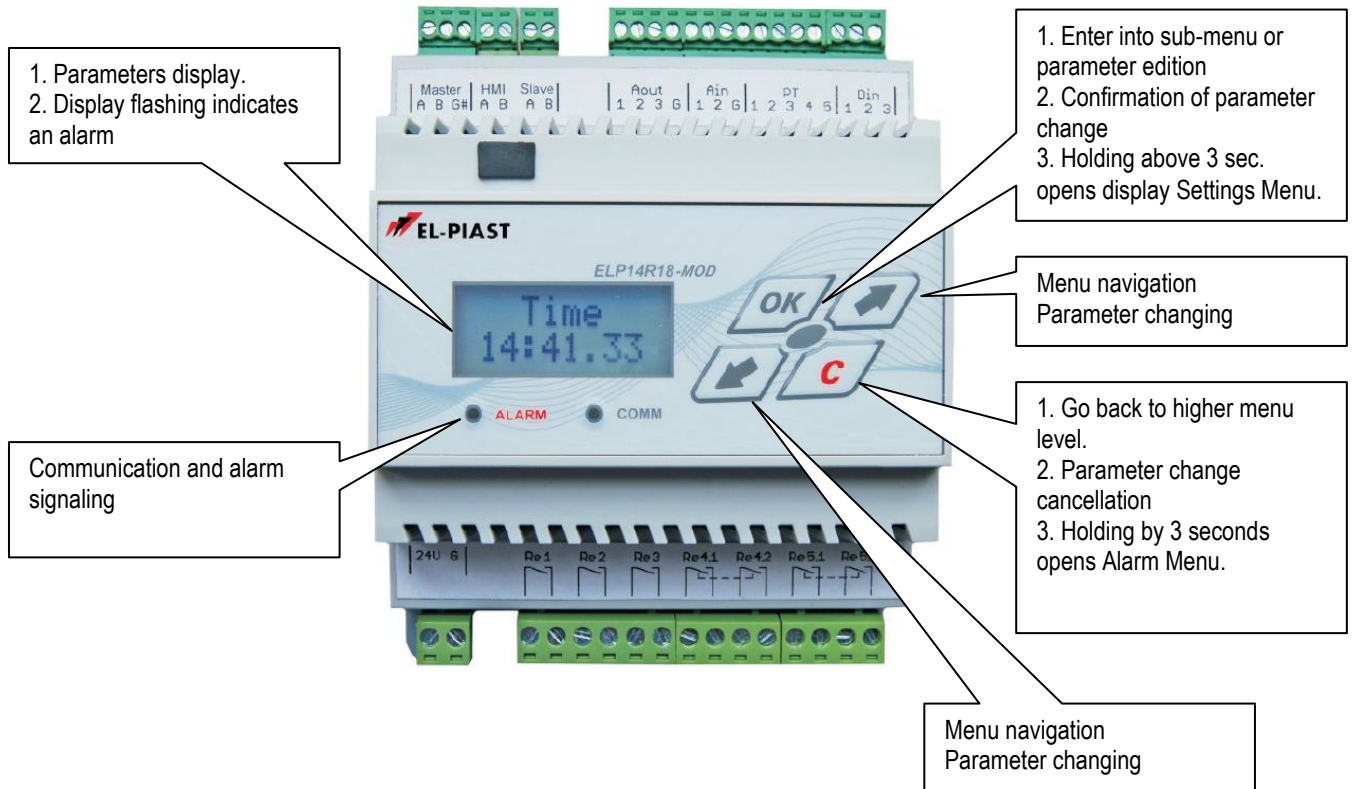
Panel HMI Advance has a jumper "simple/ext" which the opening causes the work for panel with the partly hidden menu, this function won't let the service of the object the entry in "service menu" where we are making the configuration of the ventilation arrangement in.

On the controller screen ELP... the function „simple/ext“ is inactive.

**The USB connection is used to download the application control.  
If the application does not meet the control requirements of the customer,  
contact the manufacturer or supplier, you can adapt to the requirements of the  
application and upload it using any PC.**

ELP14R18-Mod – communication Modbus RTU with BMS through the RS485 (connector RS485 Master)

ELP14R18-Bac – communication with BMS through the BACnet MS-TP (connector RS485 Master)



Longer holding of OK button (more than about 3 seconds) display enters Display Settings Menu.

Parameter description:

**Contrast** – display contrast

**Minimal brightness** – minimal brightness of the highlight

**Maximal brightness** – maximal brightness of the highlight

**Backlight time** – time of activity, after this time the display is dimmed

**After backlight time** – action undertaken after activity time (1. nothing, 2. if alarm occurred, than go to alarm menu, else go to the first chart of main menu).

**Master bus speed** – RS Master speed setting (9600)

**Modbus address** – MAC address of the Modbus

To exit menu - press C key.

Panel Advanced HMI can be connected to the input of the HMI CON (located at the upper side of the driver around the USB connector) or RS485 master (if it is not used to transfer information management system BMS). You can simultaneously connect two room units HMI CON connector and RS485 master - in this case we can not connect the controller with the BMS facility.

Panel HMI Advanced has a jumper "simple / ext" the opening adjuster will work with partially hidden menu, this function will use the object to enter the "Service menu" in which we make the ventilation system configuration.

The menu driver is always visible in its entirety.

**The USB connection is used to download the application control. If the application does not meet the control requirements of the customer, contact the manufacturer or supplier, you can adapt to the requirements of the application and upload it using any PC.**

### **5.1. Service menu - configuration**

Panel HMI Advance has a jumper "simple/ext" which the opening causes the work for panel with the partly hidden diet, this function won't let the service of the object the entry in "service menu" which we are making the configuration of the ventilation arrangement in.

The access to the service menu protected is a password (default: **1111**).

The configuration of the arrangement with the service menu consists on:

- 1) change of the type of the Air Handling Unit (inlet, inlet+reserve, water heater, electric heater, water cooler, freon cooler, mix chamber)
- 2) accessing menu and configuration:
  - Contact work** – there is an ability to active one of the relay output as a confirmation of work (make sure that the output is not used for other purpose in the application).
  - Contact alarm** – there is an ability to active one of the relay output as a collective alarm (make sure that the output is not used for other purpose in the application).
  - Vent.1 0-10VDC** – the possibility of activation of one of the analog outputs as a signal 0-10VDC airflow rate of the 1<sup>st</sup> air fan (make sure the output is not used for other purposes in the application)
  - Vent.2 0-10VDC** – the possibility of activation of one of the analog outputs as a signal 0-10VDC airflow rate of the 2<sup>nd</sup> air fan (make sure the output is not used for other purposes in the application)
  - Fan inverter type** – the possibility of choose fan inverter type controlled by Modbus RS485 (LG IC5, IG5 lub Danfoss FC51)

After the configuration of the arrangement one should switch the service mode on DISABLED and to conduct the activating procedure of the arrangement.

- 1) check the correctness of connections and the reaction of inputs/outputs to the state of detectors, switching inputs elements and executing outputs elements.
- 2) fill up the activating card of the system and permanently fasten the copy of the card to the control box (attachment D)

The service menu has options of the emulation of inputs and forcing outputs. For the correct work of the system emulation and forcing functions must be disabled.

## 5.2. Standard functions of controller's inputs/outputs

<b>Digital inputs</b> (State of the NC access - giving for accessing DIN... enclosing the digital input causes stretching 24 VAC)		During the correct work of the arrangement	The lack of the required state is causing alarm
Din 1	Fire central	compact	A_StopSystem
Din 2	Work permit - limit switch compartment fan .	compact	A_OpenVent
Din 3	Differential pressure switch of filter	obtuse	A_Filter

<b>Temperature sensors PT1000</b>		The compact input with GND is causing
PT1	CO detector – alarm 1	Work on 1 <sup>st</sup> gear
PT2	CO detector – alarm 2	Work on 2 <sup>nd</sup> gear
PT3	-	-
PT4	-	-
PT5	-	-

<b>Digital outputs</b> , excluded state - ReC/ReA exit obtuse, attached state - ReC/ReA exit compact		
Re1	Work	relay
Re2	Alarm	relay
Re3	CO detector – alarm 2 (light warning LED)	relay
Re4.1	Damper of the outlet 1	relay
Re4.2	Damper of the outlet 3 (shared part in reserve system)	relay
Re5.1	Damper of the outlet 2	relay
Re5.2	Damper of the outlet 3 (shared part in reserve system)	relay

<b>Analogue outputs devices</b> (Signal outputs devices 0-10VDC)	
Aout1	Ventilator 1
Aout2	Ventilator 2
Aout3	-

**In the service menu you can activate any relay outputs as proof of works or collecting alarm. When activated, make sure that the output is not used in the application.**

## 6. Control service

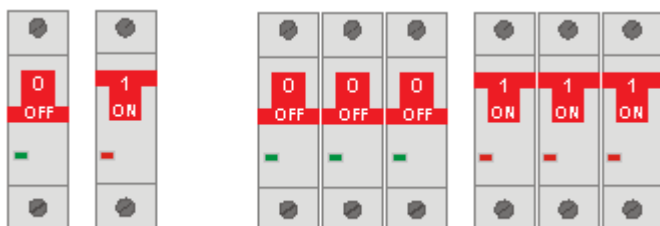


Before start-up by the user the control box should be connected and checked by authorized personnel.

### **Start-up of the device**

Operate Switch Q1M into position ON.

„1-ON” (synthetic switchboard)



„1” (metal switchboard)



The device is starting-up if:

- isn't appear neither of the alarms of the locking operation of the system and
- parameter **„Set work mode”** on the controller or on the HMI is set to any option other than **Stop**.

**ATTENTION:** After the power supply disruption, the system automatically returns to work with the last used settings (settings before the power supply disruption).

### 6.1 Alarms

Alarms are indicated by display flashing and red continuous lighting LED on the controller or HMI.

Information on the alarm can be read from **„Alarm Menu”**. Entering Alarm menu – by holding pressed of „C” key during about 3 second.

In case of blocking alarm, it is necessary to reset the alarm before restart of automation system will be possible. To reset the alarm one should enter Alarm Menu, choose proper alarm and hold OK. button for some time. If the source of the alarm is still active, the alarm will be supported and „\*” symbol will appear at its description, denoting confirmation of the alarm. If source of the alarm have passed or will pass after confirmation of the alarm, alarm will be reset.

#### **List of alarms**

ALARMS	Alarm type	System reaction
Digital input		
A_StopSystem	Blocking	<p>Cooperation with fire alarm control panel.</p> <p><b>Alarm is OFF</b> – lack of fire, on digital input appeared signal 24VAC  <b>Alarm is ON</b> – fire appeared, on digital input doesn't appeared signal 24VAC</p> <p>Reaction on alarm ON: system is stopped until the fire won't be eliminated; after the fire is extinguished system is coming back to the working mode (state before</p>

		alarm).
		<b>Digital inputs Din1</b>
A_OpenVent	Blocking	<p>Protection work in an open chamber fan</p> <p><b>Alarm is OFF</b> – on digital input appeared signal 24VAC  <b>Alarm is ON</b> – on digital input doesn't appeared signal 24VAC</p> <p>Reaction on alarm ON: system is stopped until the chamber fan won't be closed; after the closed you have to confirm alarm).</p> <p><b>Digital input: Din2</b></p>
A_Filter	Declining	<p>Study the degree of contamination of the air filter with switch:</p> <p><b>Normal state</b> - dirty limit, the pressure difference before and after the filter is below the set on the pressure switch, the digital input signal is not 24VAC  <b>Alarm conditions</b> - dirt unacceptable pressure difference before and after the filter is above the set on the pressure switch, the digital input signal is 24VAC</p> <p>Responding to an alarm condition: the system works, it is a dirty filter alarm is displayed in the case of an alarm should immediately replace the filter with a new one, work with a dirty filter reduces the expenditure control and may cause it to rupture which can lead to contamination and damage to the heat exchanger / cooling from the customer's fault</p> <p><b>Digital inputs Din3</b></p>
<b>Other Alarms</b>		
A_FC1,2	Blocking	<p>The test proper operation of the inverter supply fan with inverter alarm contact (confirmation of work by Modbus RS485 communication):</p> <p>Normal state - immediately after the power is not an alarm inverter  Alarm conditions - directly after the power inverter alarm occurs</p> <p>Responding to an alarm condition: the system is stopped, check the inverter and how to connect the controller and the fan, determine the cause of the error, and the cause of the alarm must be acknowledged and operate the system</p> <p><b>Modbus RS485 Slave communication</b></p>
A_In_Emulation	Declining	<p>Emulation of inputs:</p> <p>Normal state - there is no alarm, no input is in emulation mode  Alarm state - at least one of the digital inputs, analog, PT1000 is in emulation mode</p> <p>Responding to an alarm: the driver does not react to physical changes emulated input, the system works to the value of the emulator in the service menu</p>
A_OutForce	Declining	<p>Forcing output:</p> <p>Normal state - there is no alarm, no output is in forcing  Alarm state - at least one of the digital outputs, analog mode is forcing</p> <p>Responding to an alarm condition: the system works, however, forced output does not respond to the control algorithm, is set by the "force outputs" in the service menu</p>

**Attention: Working in forcing or emulation mode can cause damage to the ventilation system caused by the user. Changes I/O in emulation or forcing mode should only be done by qualified and trained personnel.**

#### **Alarm reset**

In case of blocking alarm, it is necessary to reset the alarm before restart of automation system will be possible. To reset the alarm one should enter Alarm Menu, choose proper

alarm and hold OK. button for some time. If the source of the alarm is still active, the alarm will be supported and „\*” symbol will appear at its description, denoting confirmation of the alarm. If source of the alarm have passed or will pass after confirmation of the alarm, alarm will be reset.

## 7. Control operation

### 7.1 Main menu

Tab. 4 Main Menu

Name	Default value	Decription
State of the AHU	Service mode	<p><b>Service mode</b> – the arrangement is in the course of the configuration, lack of ability of the start of the arrangement,</p> <p><b>Stop</b> - the AHU is stopped, air dampers are closed , fans do not work,</p> <p><b>Alarm - stop</b> – the AHU is stopped, an at least one blocking alarm is appearing, check the list of alarms, describe the reason for the failure, after repairing erase the blocking alarm</p> <p><b>Work 1,2 step</b> - correct work on 1,2 step of fans</p>
Main menu	-	Choice of the work mode of AHU, states of the functioning of the fans
Calendar	-	Enables the programming of the calendar. Thorough description in the 7.2 subsection Calendar.
Settings	-	Parameters of the control system. Thorough description in the 7.3 subsection Settings.
Service menu	-	Enables the configuration of the AHU.
PL/EN/RU	-	Choice of the language menu (Polish/English/Russian).



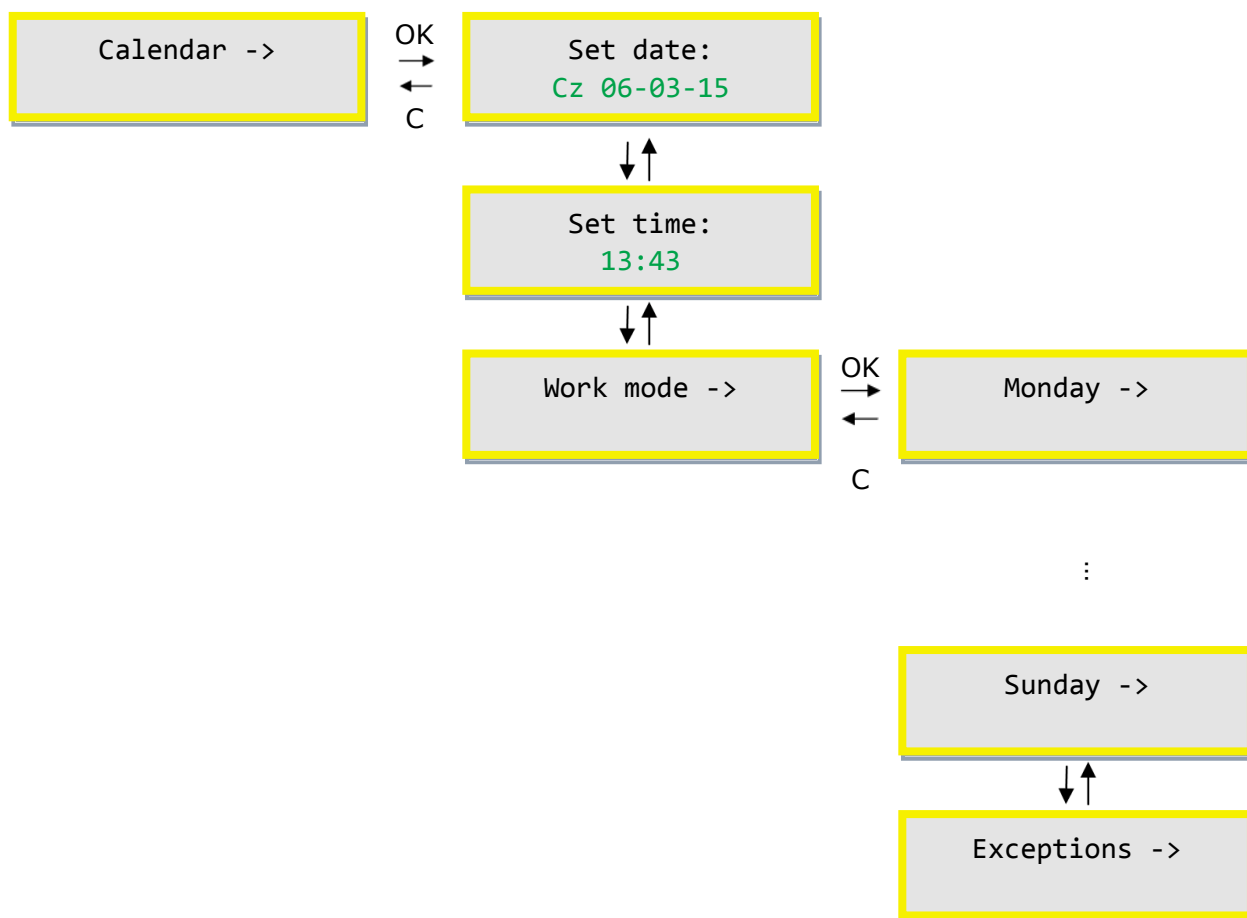
## 7.2 Calendar

In Calendar options one can set date and time of real time clock. When operating mode is set at „**Calendar**” control will be realized according to recorded programs. Programs can cover a day or exceptions.

Program includes parameter:

**Work mode** – possible selections: Stop, Stop-Auto, Start 1 step, Start 2 step.

### Calendar menu:



```

graph TD
    Monday1[Monday ->] -- OK --> New1[New ->]
    New1 -- C --> Monday1
    New1 -- OK --> Time1[Time from: 8:00]
    Time1 -- OK --> Set1[Set work mode 1 gear]
    Set1 -- OK --> Save1[Save]
    Save1 -- OK --> Time2[Time from: 10:00]
    Time2 -- OK --> Set2[Set work mode 2 gear]
    Set2 -- OK --> Save2[Save]
    Save2 -- OK --> New2[New ->]
    Save2 -- C --> Monday2[Monday ->]
  
```

The flowchart illustrates the sequence of screens and user actions for the 'New' menu. It starts with the 'Monday' menu, which leads to the 'New' menu upon pressing 'OK'. From the 'New' menu, pressing 'OK' leads to the 'Time from' screen (8:00), which then leads to 'Set work mode' (1 gear), and finally to 'Save'. Pressing 'OK' again leads to the 'Time from' screen (10:00), then to 'Set work mode' (2 gear), and finally to 'Save'. From this final 'Save' screen, pressing 'OK' leads back to the 'New' menu, and pressing 'C' leads back to the 'Monday' menu.

### 7.3 Settings

Access to the this settings is password protected (by default: **1111**).

Tab. 5 Settings menu.

Group	Name	Default	Description
Vent.	-	10 s	<b>Starting delay</b> - the time from the start throttle operation of the fans
		15 s	<b>Damp.off delay</b> - The time from switching on operation mode "Stop" and start stopping fans to start closing the air dampers actuators of the AHU
		30 s	<b>Pressure delay</b> - the time of operation of the fans after the pressure test on the filters.
		... %	Setting efficiency fan for 1,2,3 gear
	RS485	Active	<b>Inv. via RS485</b> - activate communication with inverter fan 1
		Active	<b>2. Inv. via RS485</b> - activate communication with inverter fan 2
		0 Hz	<b>Freq.min.</b> - setting the minimum frequency of the air fan, corresponding setting performance 0%
		60 Hz	<b>Freq.max.</b> - setting the maximum frequency of the air fan, corresponding setting performance 100% (the maximum frequency should be chosen according to DTR and performance measurement)
		1	<b>Inv.address</b> - address of the inverter 1 fan
		2	<b>2.Inv.address</b> - address of the inverter 2 fan
		60 s	<b>T.acc.</b> - start time inverters
		60 s	<b>T.dec.</b> - the time to stop the inverter
		0,3 s	<b>Tcom</b> - time communication with inverter
		2 s	<b>Twait</b> - waiting for a response in communication with the inverter

## 7.4 Service menu

Access to these settings is password protected (default: **1111**).

Tab. 6 Service menu

Name	Name	Default value	Description
Service mode	-	Active	<b>Active</b> – possible configuration of the AHU, lack of ability of the start of AHU, protective functions of the chosen arrangement active <b>Not active</b> – configuration of the AHU is not possible, the possibility of the AHU start-up
AHU type	Type	W	<b>W</b> – exhaust ventilator air control unit <b>2W</b> – doubled exhaust ventilator air control unit <b>WR</b> – exhaust + reserve exhaust ventilator air control unit
Configuration	Work - contact	Inactive	Optional activation of the one of the relay outputs as work conformation (make sure that output is not already used by application)
	Alarm – contact	Inactive	Optional activation of the one of the relay outputs as a group alarm (make sure that output is not already used by application)
	Inverter 1 0-10VDC	Inactive	The possibility of activation one of the analog outputs as a signal 0-10VDC airflow rate of the air fan 1 (make sure the output is not used for other purposes in the application)
	Inverter 2 0-10VDC	Inactive	The possibility of activation one of the analog outputs as a signal 0-10VDC airflow rate of the air fan 2 (make sure the output is not used for other purposes in the application)
	Fan inverter type	-	The possibility of choose fan inverter type controlled by Modbus RS485 (LG IC5, IG5 lub Danfoss FC51)
History of leading temperature	-	-	History of leading temperature which is written the last 15 measurements from the leading temperature sensor in the selected period of recording) and is given "deviation" which is the maximum difference of actual set point temperature and the last 15 measurements of the leading temperature sensor.

-	-	-	<i>Reading inputs, outputs of the controller, possibility of the emulation of inputs and forcing outputs of the controller during normal operation of the AHU, during the emulation or forcing activities alarm is reported but AHU is still normally working.</i>
<i>Change the password</i>	-	-	<i>Change of password of the access to the advanced options. Default password: 1111 Attention: losing, forgetting the password will cause loss of the possibility of amending of advanced parameters.</i>
<i>Restore the default setting</i>	-	-	<i>Restoring the initial values of all settings.</i>

## 8. Communication Modbus RTU

The controller has implementations of the Modbus RTU protocol. In order to make the network interface one should connect RS-485 trunk lines to the MASTER port on the slot of the controller. The Modbus address is being placed on ELP14R18 display as **MAC Address**. Longer holding of OK button (more than about 3 seconds) display enters Display Settings Menu.

Default parameters of the communication:

- MAC address 1
- transmission speed 9600 bps (possibility of amending from the level of inbuilt HMI or outside HMI)
- 8 bits of frame
- 2 bits of stop
- without parity

All variables are 32-bits with values of the type *Holding Register*. Modbus registers are 16-bits therefore one 32-bits variable is filling two 16-bits variables. The reading of variables is causing itself with Modbus 0x03 command, however writing single variable of the 16-bits using command of 0x06 or many variables with 0x10 command.

### Representatives of variables

In the table below all variables of the control system were described. Variables have a few numerical representations:

- **Multistate** - correspond to total values of the variable described states
- **Decimal** - the value of the variable is treated to 32-bits as the total type with the sign
- **Fixed** -point type in 8 least significant whipped-in is allocated for the fractional part, however 24 remaining bits are a total part with the sign.

Results from it that accuracy of the Fixed value it 1/256. In order to scale the value Fixed represented in the form on target (appropriate) one should multiply it through  $1/256 = 0.00390625$ .

**Variables for the reading and the edition**

Address	Variable	Description	State
0x 02	Mode	Mode	0 - stop, 1 - stop auto, 2 - work I step, 4 - work II step, 8 - calendar
0x 04	ResAl	Erasing blocking alerts	0 - lack of erasing, 1 - erasing

**Variables read-only**

Address	Variable	Description	State
0x 06	Detector	Detector state	0 - no alarm, 1 - Alarm 1, 2 - Alarm 2, 3 - Alarm 2
0x 08	Thr1	As controlled of dumper 1	0 - stop, 1 - start
0x 0A	Thr2	As controlled of dumper 2	0 - stop, 1 - start
0x 0C	Vent1	Start/stop the signal of fan 1	0 - stop, 1 - start
0x 0E	Vent2	Start/stop the signal of fan 2	0 - stop, 1 - start
0x 10	ServiceMode	Service mode	0 - stop, 1 - start
0x 12	Work	Confirming of the work the system	0 - stop, 1 - start
0x 14	Pwr1	As controlled supply inverter 1	1% = 256 (22% = 22*256 = 5632 = 0x1600)
0x 16	Pwr2	As controlled supply inverter 2	1% = 256 (22% = 22*256 = 5632 = 0x1600)
0x 18	F1	Frequency inverter supply 1	1Hz = 256 (22Hz = 22*256 = 5632 = 0x1600)
0x 1A	F2	Frequency inverter supply 2	1Hz = 256 (22Hz = 22*256 = 5632 = 0x1600)
0x 1C	U1	Engine voltage supply fan 1	1V = 256 (22V = 22*256 = 5632 = 0x1600)
0x 1E	U2	Engine voltage supply fan 2	1V = 256 (22V = 22*256 = 5632 = 0x1600)
0x 20	I1	Engine current supply fan 1	1A = 256 (22A = 22*256 = 5632 = 0x1600)
0x 22	I2	Engine current supply fan 2	1A = 256 (22A = 22*256 = 5632 = 0x1600)
0x 24	A_StopSystem	Fire alarm	0 - an alarm is missing, 1 - an alarm is appearing
0x 26	A_OpenVent	Alarm of the opened ventilator zone	0 - an alarm is missing, 1 - an alarm is appearing
0x 28	A_Filter	Alarm of the dirty filter	0 - an alarm is missing, 1 - an alarm is appearing
0x 2A	A_FC1	Alarm of the inverter 1	0 - an alarm is missing, 1 - an alarm is appearing
0x 2C	A_FC2	Alarm of the inverter 2	0 - an alarm is missing, 1 - an alarm is appearing
0x 2E	A_ComFC1	Alarm lock of communication with the inverter 1	0 - an alarm is missing, 1 - an alarm is appearing
0x 30	A_ComFC2	Alarm lock of communication with the inverter 2	0 - an alarm is missing, 1 - an alarm is appearing
0x 32	A_InEmul	Alarm of the emulation of entries of the controler	0 - an alarm is missing, 1 - an alarm is appearing
0x 34	A_OutForce	Alarm of pushing exits of the controler	0 - an alarm is missing, 1 - an alarm is appearing
0x 36	Alarm	Collective alarm	0 - an alarm is missing, 1 - an alarm is appearing

**9. Communication Bacnet MS-TP with BMS system**

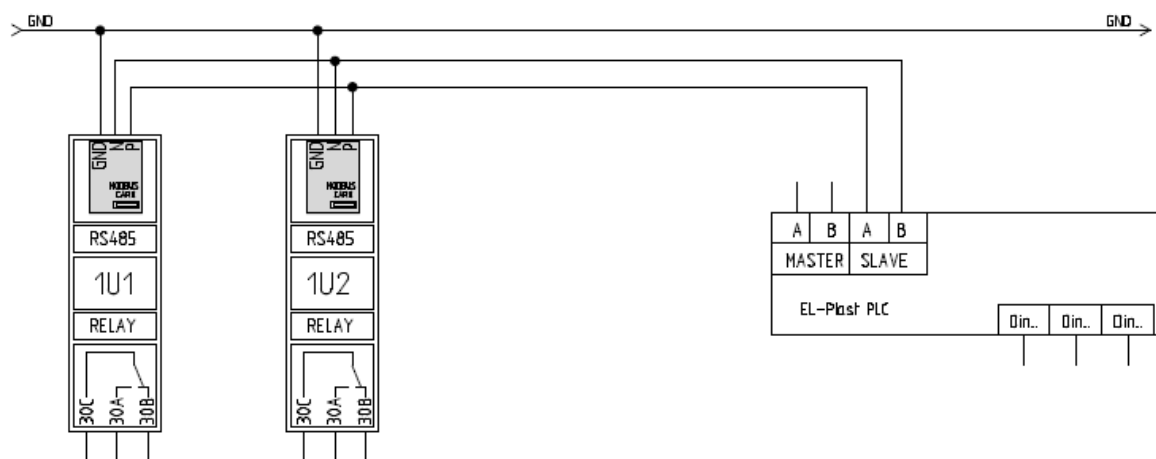
Variables BacNet should look after connecting the powered controller and the introduction of appropriate BacNet network settings (see item5)

## 10. Communication RS485 Slave, Modbus RTU with inverters LG IC5

<http://www.aniro.pl/do-pobrania/do-pobrania/finish/31-instrukcja-eng/16-ig5a-manual-v2-4-110131-1/0.html>



Example for system with 2W, WR



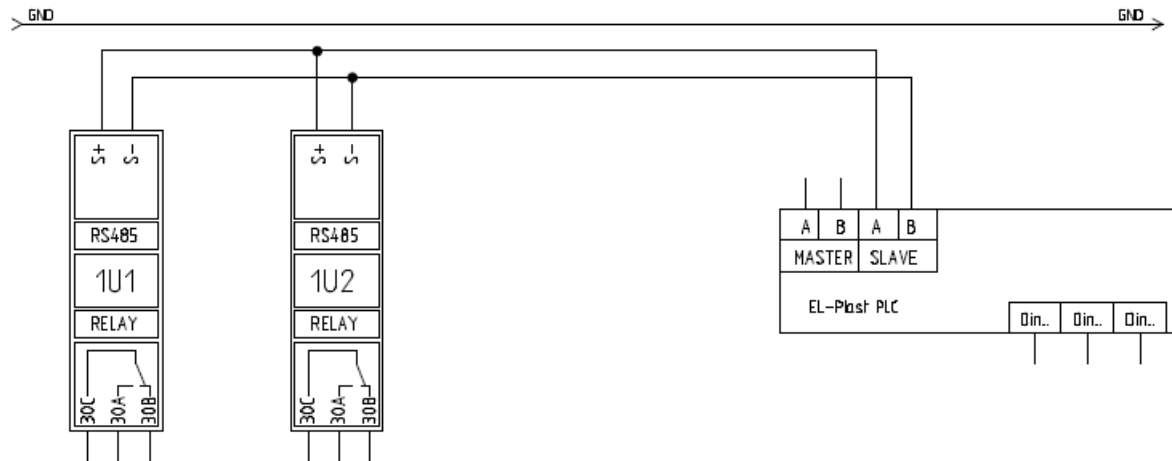
Configuration drive LG IC5 control RS485:

Code	Name	Value to be set	Description
drv	Control mode	3	Communication RS485
Frg	The method of frequency	8	Communication Modbus-RTU
F21	Maximum output frequency	<b>Fz max</b>	<b>Set individual</b>
F22	Rated motor frequency	...Hz	<b>Set individual</b>
F23	The minimum frequency reference	0.000	<b>Always enter the value</b>
F30	Characteristic U/F	<b>0</b>	Linear
F50	Motor overload protection	1	active
H30	Rated motor power	...kW	With the motor nameplate
H33	Rated motor current	...A	With the motor nameplate
I55	Relay function	12	Work without alarm
I60	Drive address	1	Inverter fan 1
		2	Inverter fan 2
I61	transmission speed	3	9600
I62	Reaction to loss of communication	2	stop
I63	Communication time	10.0	

**Fz max - frequency inverter for work at maximum efficiency fan (resulting from the adjustment of air distribution system). On the beginning should be entered the frequency of documentation. The same value must be entered in the menu Settings/Fans/RS485 in the "Maximum frequency supply/exhaust"**

## 11. Communication RS485 Slave, Modbus RTU with inverters LG IG5

Example for system with 2W, WR



Configuration drive LG IG5 control RS485:

Code	Name	Value to be set	Description
drv	Control mode	3	Communication RS485
Frq	The method of frequency	7	Communication Modbus-RTU
F21	Maximum output frequency	<b>Fz max</b>	<b>Set individual</b>
F22	Rated motor frequency	...Hz	<b>Set individual</b>
F23	The minimum frequency reference	0.000	<b>Always enter the value</b>
F30	Characteristic U/F	<b>0</b>	Linear
F50	Motor overload protection	1	active
H30	Rated motor power	...kW	With the motor nameplate
H33	Rated motor current	...A	With the motor nameplate
I55	Relay function	12	Work without alarm
I60	Drive address	1	Inverter fan 1
		2	Inverter fan 2
I61	transmission speed	3	9600
I62	Reaction to loss of communication	2	Stop
I63	Communication time	10.0	

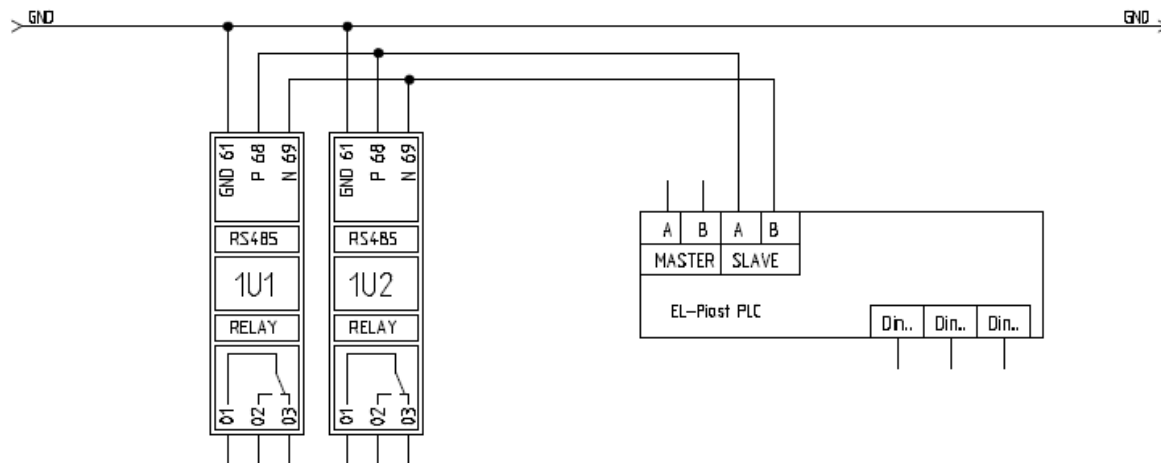
**Fz max - frequency inverter for work at maximum efficiency fan (resulting from the adjustment of air distribution system). On the beginning should be entered the frequency of documentation. The same value must be entered in the menu Settings/Fans/RS485 in the "Maximum frequency supply/exhaust"**



## 12. Communication RS485 Slave, Modbus RTU with inverters Danfoss FC51

<http://www.danfoss.com/poland/businessareas/drivessolutions/frequency+converters/vlt+micro+drive.htm>

Example for system with 2W, WR



Configuration drive Danfoss FC51 control RS485

Code	Name	Value to be set	Description
1-03	Characteristic U/F	0	Linear
1-20	Rated motor power	...kW	With the motor nameplate
1-24	Rated motor current	...A	With the motor nameplate
1-25	Rated motor speed	...rpm	With the motor nameplate
1-90	Motor overload protection	4	Emergency off ETR
3-02	The minimum frequency reference	0.000	<b>Always enter the value</b>
3-03	The maximum frequency reference	<b>Fz max</b>	Set individual
3-17	Control input	11	Modbus
4-14	Maximum output frequency	<b>Fz max</b>	Set individual
4-16	Output current limitation	110.0	-
5-40	Relay function	6	Work without alarm
8-01	Control	0	Digital and communication
8-02	Control	1	FC RS485
8-03	Wait to communication	10.0s	-
8-04	Lost communication reaction	2	Stop
8-30	Choose communication protocol	2	Modbus RTU
8-31	Drive address	1	Inverter fan 1
		2	Inverter fan 2
8-32	Transmission speed	2	9600
8-33	Parity FV port	3	No parity, 2 stop bits

**Fz max - frequency inverter for work at maximum efficiency fan (resulting from the adjustment of air distribution system). On the beginning should be entered the frequency of documentation. The same value must be entered in the menu Settings/Fans/RS485 in the "Maximum frequency supply/exhaust"**