Universal control box for air condition with the application MAX

Controllers ELP11R32L

Inverters with Modbus control:
Danfoss FC51, Danfoss FC101, LG IC5, LG IG5, EC Blue, EBM

Technical documentation

EL-Piast Sp. z o.o.
ul. Marszałka Józefa Piłsudskiego 74
50-020 Wrocław
tel. +48 604 072 020

www.el-piast.com

Contents

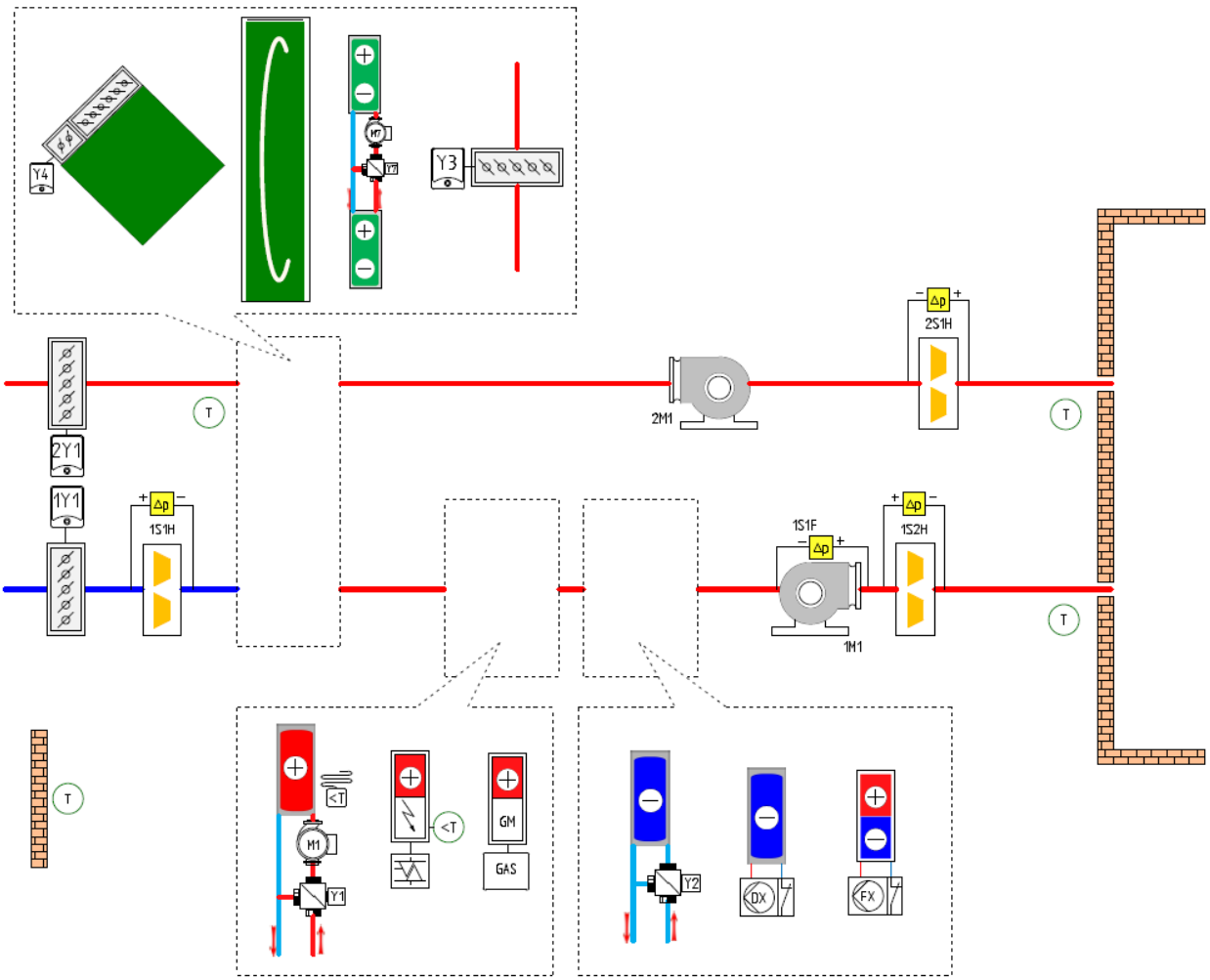
1. General information

The control box can be handled by untrained personnel.

EL-…-…-…-…-… controller conforms with requirements of the following standards: PN-EN 61439-1:2011, PN-EN 61439-3:2012, PN-EN 61000-6-1:2008, PN-EN 61000-6-3:2008

Intended use

- Supply and Supply & Exhaust Air Handling Units
- Systems with water heaters, electric heaters, gas heaters
- Systems with water cooler, DX cooler
- System with reverse DX unit
- Systems with rotary heat exchanger, plate heat exchanger, glycol run around coils or mixing chamber



2. Encryption of control boxes

Type	Recovery	Heater	Cooler or heater/cooler
N - supply NW - supply/exhaust 2NW – 2xsupply/2xexhaust	O – rotary heat exchanger K – plate heat exchanger G – glycol - run around coils M - mixing chamber OM – rotary heat exchanger and mixing chamber KM – plate heat exchanger and mixing chamber GM – glycol run around coils and mixing chamber	W – water E – electric GAS – gas heater	W - water F – DX FX – reverse DX unit

The universal control box MAX after the right configuration of the controller, offers the work one of the 258 ventilation systems introduced below arrangements for the guidance:

1	N	-	_	-	_	-	W
2	N	-	_	-	_	-	F
3	N	-	_	-	_	-	FX
4	N	-	_	-	W	-	_
5	N	-	_	-	W	-	W
6	N	-	_	-	W	-	F
7	N	-	_	-	W	-	FX
8	N	-	_	-	E	-	_
9	N	-	_	-	E	-	W
10	N	-	_	-	E	-	F
11	N	-	_	-	E	-	FX
12	N	-	_	-	GAS	-	_
13	N	-	_	-	GAS	-	W
14	N	-	_	-	GAS	-	F
15	N	-	_	-	GAS	-	FX
16	N	-	M	-	_	-	_
17	N	-	M	-	_	-	W
18	N	-	M	-	_	-	F
19	N	-	M	-	_	-	FX
20	N	-	M	-	W	-	_
21	N	-	M	-	W	-	W
22	N	-	M	-	W	-	F
23	N	-	M	-	W	-	FX
24	N	-	M	-	E	-	_
25	N	-	M	-	E	-	W
26	N	-	M	-	E	-	F
27	N	-	M	-	E	-	FX
28	N	-	M	-	GAS	-	_
29	N	-	M	-	GAS	-	W
30	N	-	M	-	GAS	-	F
31	N	-	M	-	GAS	-	FX
32	NW	-	_	-	_	-	W
33	NW	-	_	-	_	-	F
34	NW	-	_	-	_	-	FX
35	NW	-	_	-	W	-	_
36	NW	-	_	-	W	-	W
37	NW	-	_	-	W	-	F
38	NW	-	_	-	W	-	FX

39	NW	-	_	-	E	-	_
40	NW	-	_	-	E	-	W
41	NW	-	_	-	E	-	F
42	NW	-	_	-	E	-	FX
43	NW	-	_	-	GAS	-	_
44	NW	-	_	-	GAS	-	W
45	NW	-	_	-	GAS	-	F
46	NW	-	_	-	GAS	-	FX
47	NW	-	O	-	_	-	_
48	NW	-	O	-	_	-	W
49	NW	-	O	-	_	-	F
50	NW	-	O	-	_	-	FX
51	NW	-	O	-	W	-	_
52	NW	-	O	-	W	-	W
53	NW	-	O	-	W	-	F
54	NW	-	O	-	W	-	FX
55	NW	-	O	-	E	-	_
56	NW	-	O	-	E	-	W
57	NW	-	O	-	E	-	F
58	NW	-	O	-	E	-	FX
59	NW	-	O	-	GAS	-	_
60	NW	-	O	-	GAS	-	W
61	NW	-	O	-	GAS	-	F
62	NW	-	O	-	GAS	-	FX
63	NW	-	K	-	_	-	_
64	NW	-	K	-	_	-	W
65	NW	-	K	-	_	-	F
66	NW	-	K	-	_	-	FX
67	NW	-	K	-	W	-	_
68	NW	-	K	-	W	-	W
69	NW	-	K	-	W	-	F
70	NW	-	K	-	W	-	FX
71	NW	-	K	-	E	-	_
72	NW	-	K	-	E	-	W
73	NW	-	K	-	E	-	F
74	NW	-	K	-	E	-	FX
75	NW	-	K	-	GAS	-	_
76	NW	-	K	-	GAS	-	W

77	NW	-	K	-	GAS	-	F
78	NW	-	K	-	GAS	-	FX
79	NW	-	G	-	_	-	_
80	NW	-	G	-	_	-	W
81	NW	-	G	-	_	-	F
82	NW	-	G	-	_	-	FX
83	NW	-	G	-	W	-	_
84	NW	-	G	-	W	-	W
85	NW	-	G	-	W	-	F
86	NW	-	G	-	W	-	FX
87	NW	-	G	-	E	-	_
88	NW	-	G	-	E	-	W
89	NW	-	G	-	E	-	F
90	NW	-	G	-	E	-	FX
91	NW	-	G	-	GAS	-	_
92	NW	-	G	-	GAS	-	W
93	NW	-	G	-	GAS	-	F
94	NW	-	G	-	GAS	-	FX
95	NW	-	M	-	_	-	_
96	NW	-	M	-	_	-	W
97	NW	-	M	-	_	-	F
98	NW	-	M	-	_	-	FX
99	NW	-	M	-	W	-	_
100	NW	-	M	-	W	-	W
101	NW	-	M	-	W	-	F
102	NW	-	M	-	W	-	FX
103	NW	-	M	-	E	-	_
104	NW	-	M	-	E	-	W
105	NW	-	M	-	E	-	F
106	NW	-	M	-	E	-	FX
107	NW	-	M	-	GAS	-	_
108	NW	-	M	-	GAS	-	W
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110	NW	-	M	-	GAS	-	FX
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112	NW	-	OM	-	_	-	W
113	NW	-	OM	-	_	-	F
114	NW	-	OM	-	_	-	FX

115	NW	-	OM	-	W	-	_
116	NW	-	OM	-	W	-	W
117	NW	-	OM	-	W	-	F
118	NW	-	OM	-	W	-	FX
119	NW	-	OM	-	E	-	_
120	NW	-	OM	-	E	-	W
121	NW	-	OM	-	E	-	F
122	NW	-	OM	-	E	-	FX
123	NW	-	OM	-	GAS	-	_
124	NW	-	OM	-	GAS	-	W
125	NW	-	OM	-	GAS	-	F
126	NW	-	OM	-	GAS	-	FX
127	NW	-	KM	-	_	-	_
128	NW	-	KM	-	_	-	W
129	NW	-	KM	-	_	-	F
130	NW	-	KM	-	_	-	FX
131	NW	-	KM	-	W	-	_
132	NW	-	KM	-	W	-	W
133	NW	-	KM	-	W	-	F
134	NW	-	KM	-	W	-	FX
135	NW	-	KM	-	E	-	_
136	NW	-	KM	-	E	-	W
137	NW	-	KM	-	E	-	F
138	NW	-	KM	-	E	-	FX
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142	NW	-	KM	-	GAS	-	FX
143	NW	-	GM	-	_	-	_
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145	NW	-	GM	-	_	-	F
146	NW	-	GM	-	_	-	FX
147	NW	-	GM	-	W	-	_
148	NW	-	GM	-	W	-	W
149	NW	-	GM	-	W	-	F
150	NW	-	GM	-	W	-	FX
151	NW	-	GM	-	E	-	_
152	NW	-	GM	-	E	-	W
153	NW	-	GM	-	E	-	F
154	NW	-	GM	-	E	-	FX
155	NW	-	GM	-	GAS	-	_
156	NW	-	GM	-	GAS	-	W
157	NW	-	GM	-	GAS	-	F
158	NW	-	GM	-	GAS	-	FX
159	2NW	-	_	-	_	-	W
160	2NW	-	_	-	_	-	F
161	2NW	-	_	-	_	-	FX
162	2NW	-	_	-	W	-	_
163	2NW	-	_	-	W	-	W
164	2NW	-	_	-	W	-	F
165	2NW	-	_	-	W	-	FX
166	2NW	-	_	-	E	-	_
167	2NW	-	_	-	E	-	W
168	2NW	-	_	-	E	-	F
169	2NW	-	_	-	E	-	FX
170	2NW	-	_	-	GAS	-	_
171	2NW	-	_	-	GAS	-	W

172	2NW	-	_	-	GAS	-	F
173	2NW	-	_	-	GAS	-	FX
174	2NW	-	O	-	_	-	_
175	2NW	-	O	-	_	-	W
176	2NW	-	O	-	_	-	F
177	2NW	-	O	-	_	-	FX
178	2NW	-	O	-	W	-	_
179	2NW	-	O	-	W	-	W
180	2NW	-	O	-	W	-	F
181	2NW	-	O	-	W	-	FX
182	2NW	-	O	-	E	-	_
183	2NW	-	O	-	E	-	W
184	2NW	-	O	-	E	-	F
185	2NW	-	O	-	E	-	FX
186	2NW	-	O	-	GAS	-	_
187	2NW	-	O	-	GAS	-	W
188	2NW	-	O	-	GAS	-	F
189	2NW	-	O	-	GAS	-	FX
190	2NW	-	K	-	_	-	_
191	2NW	-	K	-	_	-	W
192	2NW	-	K	-	_	-	F
193	2NW	-	K	-	_	-	FX
194	2NW	-	K	-	W	-	_
195	2NW	-	K	-	W	-	W
196	2NW	-	K	-	W	-	F
197	2NW	-	K	-	W	-	FX
198	2NW	-	K	-	E	-	_
199	2NW	-	K	-	E	-	W
200	2NW	-	K	-	E	-	F
201	2NW	-	K	-	E	-	FX
202	2NW	-	K	-	GAS	-	_
203	2NW	-	K	-	GAS	-	W
204	2NW	-	K	-	GAS	-	F
205	2NW	-	K	-	GAS	-	FX
206	2NW	-	G	-	_	-	_
207	2NW	-	G	-	_	-	W
208	2NW	-	G	-	_	-	F
209	2NW	-	G	-	_	-	FX
210	2NW	-	G	-	W	-	_
211	2NW	-	G	-	W	-	W
212	2NW	-	G	-	W	-	F
213	2NW	-	G	-	W	-	FX
214	2NW	-	G	-	E	-	_
215	2NW	-	G	-	E	-	W
216	2NW	-	G	-	E	-	F
217	2NW	-	G	-	E	-	FX
218	2NW	-	G	-	GAS	-	_
219	2NW	-	G	-	GAS	-	W
220	2NW	-	G	-	GAS	-	F
221	2NW	-	G	-	GAS	-	FX
222	2NW	-	M	-	_	-	_
223	2NW	-	M	-	_	-	W
224	2NW	-	M	-	_	-	F
225	2NW	-	M	-	_	-	FX
226	2NW	-	M	-	W	-	_
227	2NW	-	M	-	W	-	W
228	2NW	-	M	-	W	-	F

229	2NW	-	M	-	W	-	FX
230	2NW	-	M	-	E	-	_
231	2NW	-	M	-	E	-	W
232	2NW	-	M	-	E	-	F
233	2NW	-	M	-	E	-	FX
234	2NW	-	M	-	GAS	-	_
235	2NW	-	M	-	GAS	-	W
236	2NW	-	M	-	GAS	-	F
237	2NW	-	M	-	GAS	-	FX
238	2NW	-	OM	-	_	-	_
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241	2NW	-	OM	-	_	-	FX
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244	2NW	-	OM	-	W	-	F
245	2NW	-	OM	-	W	-	FX
246	2NW	-	OM	-	E	-	_
247	2NW	-	OM	-	E	-	W
248	2NW	-	OM	-	E	-	F
249	2NW	-	OM	-	E	-	FX
250	2NW	-	OM	-	GAS	-	_
251	2NW	-	OM	-	GAS	-	W
252	2NW	-	OM	-	GAS	-	F
253	2NW	-	OM	-	GAS	-	FX
254	2NW	-	KM	-	_	-	_
255	2NW	-	KM	-	_	-	W
256	2NW	-	KM	-	_	-	F
257	2NW	-	KM	-	_	-	FX
258	2NW	-	KM	-	W	-	_
259	2NW	-	KM	-	W	-	W
260	2NW	-	KM	-	W	-	F
261	2NW	-	KM	-	W	-	FX
262	2NW	-	KM	-	E	-	_
263	2NW	-	KM	-	E	-	W
264	2NW	-	KM	-	E	-	F
265	2NW	-	KM	-	E	-	FX
266	2NW	-	KM	-	GAS	-	_
267	2NW	-	KM	-	GAS	-	W
268	2NW	-	KM	-	GAS	-	F
269	2NW	-	KM	-	GAS	-	FX
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272	2NW	-	GM	-	_	-	F
273	2NW	-	GM	-	_	-	FX
274	2NW	-	GM	-	W	-	_
275	2NW	-	GM	-	W	-	W
276	2NW	-	GM	-	W	-	F
277	2NW	-	GM	-	W	-	FX
278	2NW	-	GM	-	E	-	_
279	2NW	-	GM	-	E	-	W
280	2NW	-	GM	-	E	-	F
281	2NW	-	GM	-	E	-	FX
282	2NW	-	GM	-	GAS	-	_
283	2NW	-	GM	-	GAS	-	W
284	2NW	-	GM	-	GAS	-	F
285	2NW	-	GM	-	GAS	-	FX

3. System operations

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

Functionality			Triggering condition	Description
Starting fans			- set the mode 1 gear, 2 gear, 3 gear STAND-BY, CALENDAR	- The opening external damper - Enabling the supply fan motor (air supply) fans or motors supply and exhaust fans (air supply exhaust)
Temperature control	Description		- Set the mode 1 gear, 2 gear, 3gear Standby, Calendar	- Comparing the current temperature measured by the sensor lead to a set point set on the controller or room unit and the activation of heat exchangers / cooling - Reduction of the minimum and maximum air temperature
	Heating	Water heater	- Temperature of the primary control sensor is below the set temperature	- Increasing the flow of fluid (water or glycol solution) by the water heater - Activation of the antifreeze function the system temperature is too low for the heater (thermostat)
		Electric heater		- Continuous increase in power electric heater - Cooling of the heater during the transition from work mode to stop mode, the system - Study of overheating heater thermostat
		GAS heater		- Continuous increase in power gas heater - Cooling of the heater during the transition from work mode to stop mode, the system - Alarm contact test of the gas heater automation
		Reverse Direct Expansion unit	- Temperature of the primary control sensor is below the set temperature - WINTER season occures	- Continuous increase of heating power - Cooling down the unit when switching from work mode to stop of the system
	Cooling	Water cooler	- Temperature of the primary control sensor is above the desired temperature	- Increasing the flow of fluid (water or glycol solution) through the cooler
		Cooler with direct expansion		- Activation of one, two stage compressor unit - used to block activation of the cooling system at low temperatures (factory setting 13 ° C) - The minimum time the compressor is running (even if the switching signal is not fed) and minimum rest period (even if the switching signal is given)
		Reverse Direct Expansion unit	- Temperature of the primary control sensor is above the desired temperature - SUMMER season occures	- Continuous increase of cooling power - Cooling down the unit when switching from work mode to stop of the system
Energy recovery systems		Cooling recovery	- Set the mode 1 gear, 2 gear, 3gear Standby, Calendar - Outside temperature higher than the temperature of exhaust sensor 1 ° C	- Attaching the recovery the system (START / STOP) - Activation of the antifreeze function of the heat recovery system for low temperature in exhaust part of recovery or low temperature glycol temperature Cooling recovery is disabled by default (to activate it you need to change the parameter Settings/Recovery/Work mode to Summer/Winter
		Heat recovery	- Set the mode 1 gear, 2 gear, 3gear Standby, Calendar - Outside temperature lower than the temperature of exhaust sensor 1 ° C	

Mixing chamber	- Set the mode 1 gear, 2 gear, 3gear Standby, Calendar - Work in heating sequence	- regulation of opening damper of air on with controllers - the degree of mixing air blown off from the room with outside air blown in depends from the difference of the temperature measured by the sensor of the ventilation and the set temperature - the regulation of the degree of mixing air is appearing before or after the adjustment of cooling and heating devices depending on placing the priority for the mixing chamber or the heater/cooler - possible of activation of the function of heating up: in the event that the environmental temperature will be below the set temperature the arrangement is undergoing heating into the sequence, head offices with the recirculation will be working with the minimum quantity of fresh air (factory settings min 30% open the damper of outside air) and next the adjuster will start adjusting the temperature with the heater - blocking of the mixing chamber in the sequence of the cooling

In the process of adjusting the temperature for the heating mode (according to the factory settings) the following switching on sequence of the heat exchangers occure:

- heat recovery,
- reverse DX unit in heating mode,
- mixing chamber,
- heater

Is it possible to change the switching on sequence of the mixing chamber and heater.

In the process of adjusting the temperature for the cooling mode (according to the factory settings) the following switching on sequence of the cooling exchangers occure:

- water cooler or DX cooler or reverse DX cooler in cooling mode

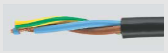
It is possible to activate the cooling recovery but please make sure that Air Handling Unit has been adapted for this.

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.

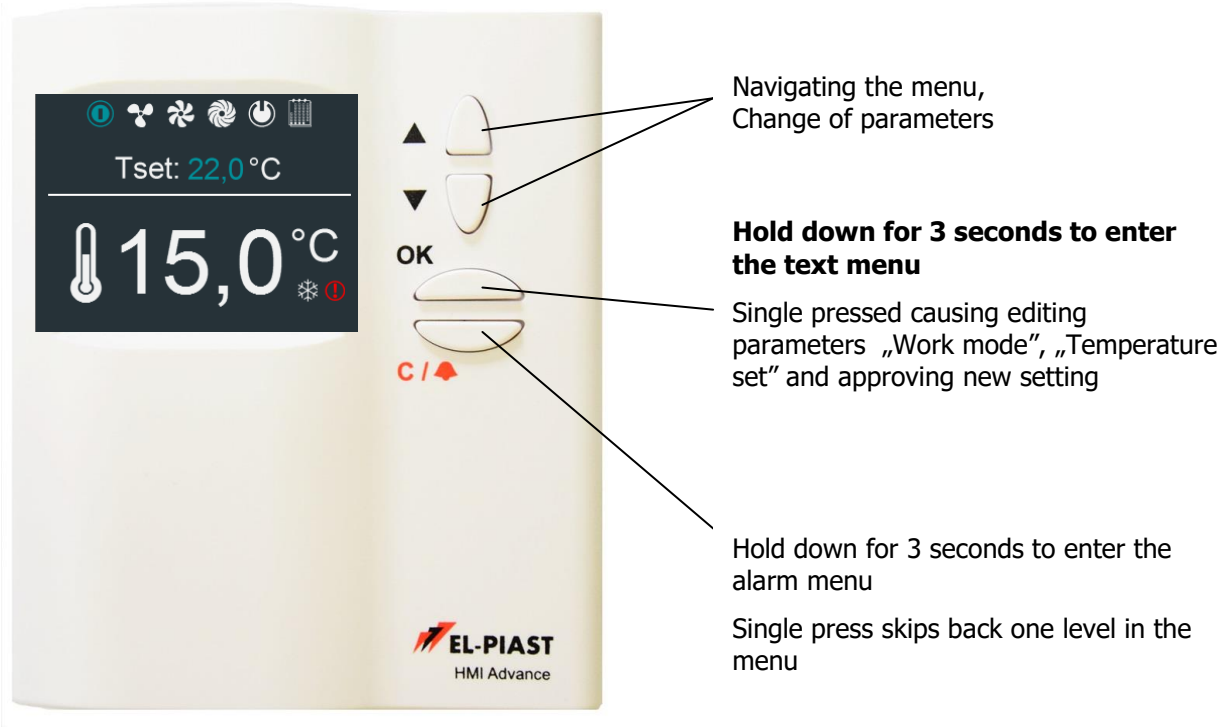
Symbol from the application scheme	Description	Type of the wire	Number of x cross - section in mm^2
S1F	Cooperation with the station controller fire-protective	(2)	2x1
S1	License for the start (service STOP)	(2)	2x1
Y1	Actuator of the valve of the water heater	(4)	3x1
M1	Connecting of the circulation pump the water heater	(1)	3x1,5
FM1	Protecting the circulation pump of the water heater	-	-
KM1	Relay/contactor of the circulation pump of the water heater	-	-
S2F	Thermostat frost-resistant of water heater on the side of air	(2)	2x1
Y2	Actuator of the valve of the water cooler	(4)	3x1
Y3	Actuator of the dumper of the recirculation	(4)	3x1
Y4	Actuator of the cross exchanger	(4)	3x1
Y7	Actuator of the valve of glycol in glycol AHU of the recuperation	(4)	3x1
M7	Connecting the pump of the AHU of the glycol recuperation	(1)	3x1,5
FM7	Protecting the pump of the AHU of the glycol recuperation	-	-
EM7	Signal of attaching the pump of the glycol recuperation	(2)	2x1
KM7	Relay/contactor of the pump of the glycol recuperation	-	-
AFX	Alarm signal of the reverse DX unit	(2)	2x1
DEF	Defrost signal of the reverse DX unit	(2)	2x1
YFX	Signal 0-10V for the reverse DX unit	(4)	3x1
EFX	On-Off control signal for reverse DX unit	(2)	2x1
H/C	Cooling mode signal for reverse DX unit	(2)	2x1
S5F	Alerting signal AHU cooling/chiller	(2)	2x1
Y9	Signal 0-10 V for the freon cooler	(4)	3x1
E1	Signal of attaching the AHU cold	(2)	2x1
CX1	Signal of the controller of the I step of the cold AHU dry contact NO	(2)	2x1
CX2	Signal of the controller of the II step of the cold AHU dry contact NO	(2)	2x1
S.GAS	Alarm signal from gas heater	(2)	2x1
E.GAS	On-Off signal of the gas heater	(2)	2x1
Y.GAS	Signal 0-10 VDC for gas heater	(4)	2x1
S4F.NE 9,10	Alarm signal of electric heater	(2)	2x1
Y.NE 3,4	Signal 0-10 V for the electric heater	(3)	2x1
F1M1.2	Protecting the engine of the air blowing	-	-
1U1.2	Connecting powering the ventilator for converters supply	(5)	Attachment B
1M1.2	Connecting powering the engine of the team	(1)	Attachment B

	of the fan inlet		
RS1U1.2	The control signal link RS485 for supply frequency converter	BUS O2YS(St)CY	1×2×0,64/2,6
E1U1.2	START/STOP signal and change gears for supply frequency converter (if we don't use control RS485)	(2)	4x1
1UA1.2	Signal confirming supply frequency converter works	(2)	2x1
F2M1.2	Protecting the exhaust engine	-	-
2U1.2	Connecting powering the ventilator for converters exhaust	(5)	Attachment B
2M1.2	Connecting powering the engine of the team of the fan outlet	(1)	Attachment B
RS2U1.2	The control signal link RS485 for exhaust frequency converter	BUS O2YS(St)CY	1×2×0,64/2,6
E2U1.2	START/STOP signal and change gears for exhaust frequency converter (if we don't use control RS485)	(2)	2x1
2UA1.2	Signal confirming exhaust frequency converter works	(2)	2x1
9U1	Power of converter of rotational exchanger 9U	(1)	Attachment B
9UV1	Signal 0-10 V for the converter of rotational exchanger 9U	(4)	3x1
9UA1	No alarm signal from the converter of rotational exchanger 9U	(2)	2x1
1Y1	Actuator of the dumper of air blown in	(2) or (4) when 0-10V	3x1
2Y1	Actuator of the dumper of air blown off	(2) or (4) when 0-10V	3x1
B1	Temperature sensor of air blown in	(4)	2x1
B2	Temperature sensor of air blown off	(4)	2x1
B3	Sensor of the outdoor temperature	(4)	2x1
B4	Sensor of the air temperature of the recuperation blown off behind the AHU (at glycol recovery use contact sensor)	(4)	2x1
B5	Leading the optional temperature sensor	(4)	2x1
B8	Temperature sensor of the back water of the heater (optional)	(4)	2x1
B13	Exhaust CO2 meter sensor (optional)	(4)	3x1
B18	Supply fan pressure sensor (optional)	(4)	3x1
B19	Exhaust fan pressure sensor (optional)	(4)	3x1
1S1F	Differential pressure switch of fan of the air blowing (optional)	(2)	2x1
2S1F	Differential pressure switch of fan of the outlet (optional)	(2)	2x1
1S1H	Differential pressure switch of filter of the preliminary air blowing	(2)	2x1
1S2H	Differential pressure switch of filter of the secondary air blowing	(2)	2x1
2S1H	Differential pressure switch of filter of the	(2)	2x1

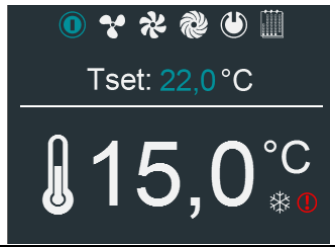
	preliminary outlet		
E5	Confirming the start – dry contact NO	(2)	2x1
E4	Collective alerting signal – dry contact NO	(2)	2x1
N1	Controller	-	-
N2	Panel HMI Tiny	(3)	7x1
N3	Panel HMI Advance - communication (max 100m)	BUS O2YS(St)CY	1×2×0,64/2,6
	Panel HMI Advance – power supply (max 100m)	(2)	2x1

5. HMI and Controller specification

HMI Advance



Main menu icons:

		Setting the operating mode: „Stop", „1 gear", „2 gear", „3 gear", „Stand-by" „Calendar"
	Tset: 22,0 °C	Setting the setpoint temperature
	15,0 °C	Read the temperature from the leading sensor
	❄	Frost recovery active
	!	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, than 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.

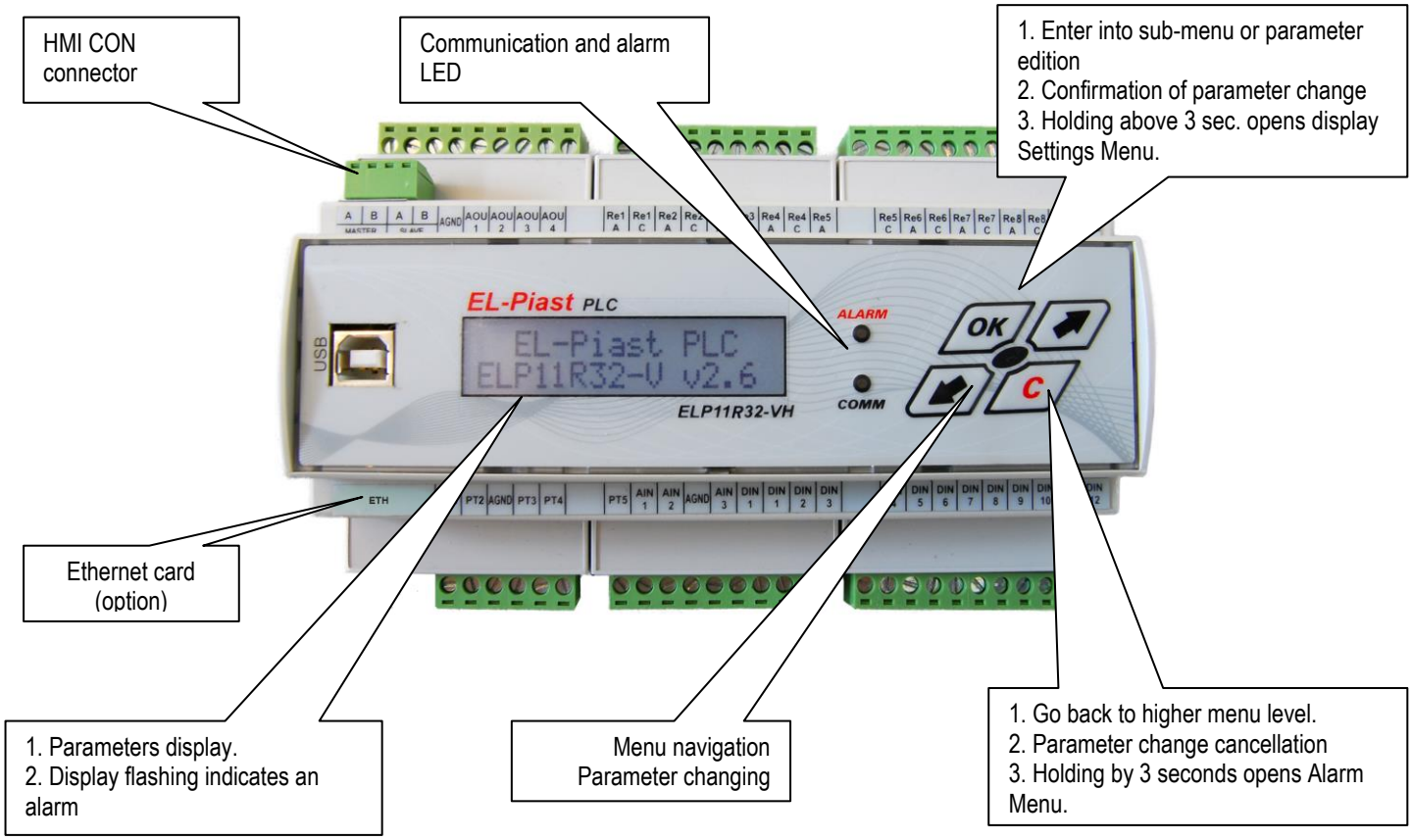
The USB connection is used to download the application control.
If the application does not meet the control requirements of the customer, contact the manufacturer or supplier, you can adapt to the requirements of the application and upload it using any PC.

ELP11R32L-MOD-RTU – communication Modbus RTU with BMS through the RS485 (connector RS485 Master)

ELP11R32L-MOD-IP - with built in Ethernet card is possible communication Modbus TCP/IP (connector RJ45)

ELP11R32L-BAC-MSTP – communication with BMS through the BACnet MS-TP (connector RS485 Master)

ELP11R32L-BAC-IP – communication with BMS through the BACnet IP (connector RJ45 Ethernet card which is built in controller in place marked as ETH), built-in routing BACnet MS-TP / IP.



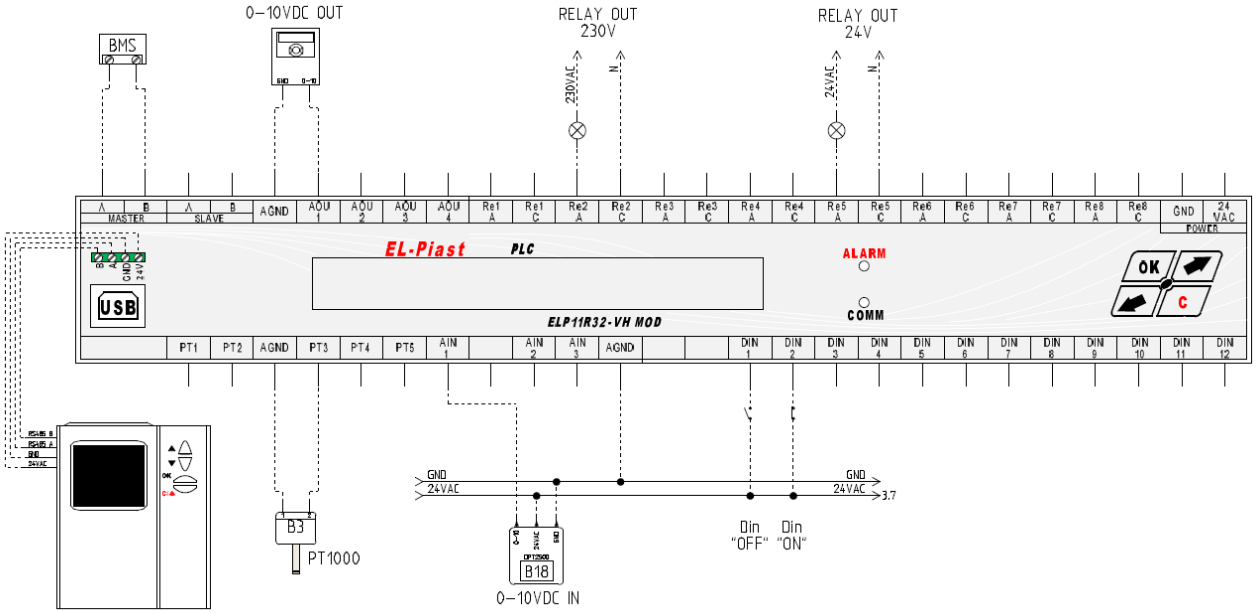
Longer holding of OK button (more than about 3 seconds) display enters Display Settings Menu.

Parameter description:

Communication period – period of communication between the display and the controller (default value: 0,5 second).
Contrast – display contrast
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, than go to alarm menu, else go to the first chart of main menu).
Master bus mode – possibility to choose type of communication link Master as BACnet or Modbus
Master bus com speed – seed communication for link Master (RS485).
BACnet Instance – number of Instance for link BACnet

To exit menu - press C key.

5.1 Example connection of controller's inputs/outputs



5.2. 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 (supply, supply/exhaust, water heater, electric heater, water cooler, DX cooler, glycol – run around coils, plate heat exchanger, rotary heat exchanger, mixing chamber)
2) accessing menu and configuration:
   Starting time – the ability to set the time after which the system can start working
   DIN12 function – activation of one of the two digital input functions DIN12. Alarm A_StopS1 - the input acts as a service switch, ON/OFF - the input acts as a remote switch-on signal (if the operating mode is set to another option than STOP).
   Fan inverter type – the possibility of choose fan inverter type controlled by Modbus RS485 (LG IC5, IG5, Danfoss FC51, Danfoss FC101, EC Blue, EBM)
   EC Blue – possibility of setting the Modbus address of the speed controller built into the EC motor.
   Constant Airflow Rate – possibility of activation of the fans working with constant pressure
   Pressure switch of fan – there is an ability to activate the supply fan static pressure test using the pressure switch marked as 1S1F and exhaust fan pressure using the pressure switch marked as 2S1F.

Supply 0-10VDC – the possibility of activation of one of the analog outputs as a signal 0-10VDC airflow rate of the supply air fan (make sure the output is not used for other purposes in the application)
Exhaust 0-10VDC – the possibility of activation of one of the analog outputs as a signal 0-10VDC airflow rate of the exhaust air fan (make sure the output is not used for other purposes in the application)
HMI Tiny – There is ability to active panel „HMI Tiny" which is using when the reference temperature is done by the knob in the HMI Tiny (for this purpose used the analog input Ain2), start/stop the system is realized by Din12
Exhaust temperature sensor – there is ability to deactivation exhaust temperature sensor, when the exhaust sensor is inactive function Eco is inactive and is not possible to determine the possibility of heat recovery (mixing chamber opens whenever you need heating)
Alarm A_ColdRec – when the alarm is active – alarm A_ColdRec frost of recovery visible in the alarm menu all the time during the freezing,
when is Inactive – alarm A_ColdRec frost of the recovery invisible in the alarm menu, while the alarm in history is written with the moment of an alarm frost, and on graphical screen of HMI freezing icon appears during frost recovery.
Recovery sensor – option of protection against frost recovery (temperature sensor or pressure switch)
HE control – Option to select the type of electric heater control (applies to analog output 0-10VDC - Aout1), smoothg control 0-10VDC or PWM control 0/10VDC
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).
Tset change – ramp change of setpoint temperature (elimination of sudden change of setting for smooth operation of temperature regulators)
Regulator - the possibility of activation one of the two types of control "1" sum of temperature controllers: the main, lim.min., lim.max., "2" new cascade control in which the start-up of the system taking place only with the supply air temperature controller for the time specified in "Settings/Temperature/Tset ramp" and after this time (when the leading sensor is different from the supply temperature sensor) an additional leading temperature controller is activating and generating temperature set setpoint of the supply controller.
Analog outputs – the possibility of rescale the output signal 0-10VDC to 2-10VDC (please check signals compliance with manuals of damper or valve actuators)
Tcom – communication time with one frequency inverter
Twait – response time for communication with all frequency inverters

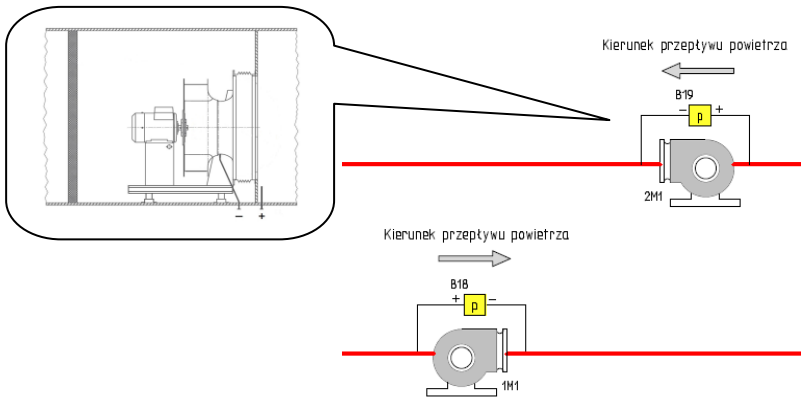
After the configuration of the arrangement one should switch the service mode on DISABLED and to conduct the activating procedure of the arrangement.

1) connect and configure frequency inverters.
2) check the correctness of connections and the reaction of inputs/outputs to the state of sensors, detectors, switching inputs elements and executing outputs elements.
3) test selection of the leading sensor.
4) start up the unit and check the process of the temperature control.
5) check and select appropriate settings of temperature adjusters (in order to slow down one should reduce the *Kp* parametric or/and increase the parameter *Ti*)
6) fill up the activating card of the system and permanently fasten the copy of the card to the control box (attachment D)

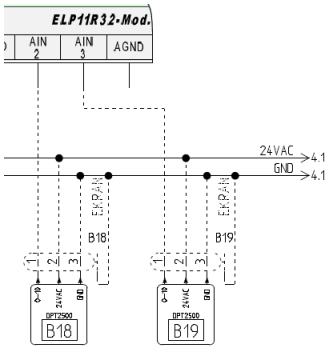
The service menu has options of the emulation of inputs and forcing outputs. For the correct work of the system emulation and forcing functions must be disabled.

5.3. System configuration - constant air flow of fans

In the system equipped with the measuring air flow system, we install additional pressure sensors on the fans according to the drawing below.



and connect the sensors to the controller as below



REMARK:
- In addition, after initial start up, set the measuring range in the sensor according to the measuring range in the controller (maximum), then start up the ventilation system and check the pressure at the required performance.
- After determining the required pressure, set the measuring range of the sensor to the closest to the preset pressure (with 30% reserve for adjustment).
- Then set the parameters of the constant flow of PI regulator, so that the system stabilizes as soon as possible without over-regulation (Setting / Regulators / PI constant air flow).

5.4. Tuning of the PI regulators

Properly executed tuning of PI regulators, the work of the Air Handling Unit on the air flow rate specified in the selection card of the unit, proper selection of the unit's components (recommended analog control each of heating/cooling exchanger), the system operation on site where there are no sudden changes of temperature due to generation of large amount of heating/cooling by other devices, allow you to get a stable leading temperature control to an accuracy of ± 0.1 ° C.

In order to check the current accuracy of temperature control you can go to the "Service Menu/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.

If you do not achieve a satisfactory effect of the temperature control process you should:

- check that the system is working at full airflow rate (compare the fans inverter frequency with frequency of operation specified in the Selection Card of the AHU or with the data obtained from the results of air flow rate measurements)
- check the correct operation of actuators and control systems of the heaters, coolers, heat recovery systems,
- check the correct operation of the air dampers,
- check the installation of temperature sensors,
- check the tuning of PI regulators.

Using the "Service Menu/Configuration/Regulator" check the currently selected type of temperature regulator (**recommended type "2"**).

Regulator type „1" - sum of temperature controllers: the main, lim.min., lim.max.,

The name in menu:	Factory settings	Recommended settings
Heating PI	Kp = 1	Kp = 1
	Ti = 60s	Ti = 60s
Cooling PI	Kp = 1	Kp = 1
	Ti = 60s	Ti = 60s
Supply PI (limit Tmin sup, Tmax sup)	Kp = 1	Kp = 1
	Ti = 90s	Ti = 45s

Supply PI of the controller type „1" has to be always faster than Heating and Cooling PI.

Limit temperature parameters „Tmin supply", Tmax supply" have to be different by at least 5°C from the temperature set.

In the lack of stabilization using recommended settings, increase Ti setting of each of the controller by 10 seconds may be preferred (max. up to 120 seconds).

Lack of stabilization of the such selected settings may indicate an error in the selection of heating/cooling exchangers, their improper operation, lack of required in accordance with the AHU selection card, thermal parameters of the heating/cooling exchangers.

Regulator type „2” - a new cascade regulator in which the start-up of the system taking place only with the supply air temperature regulator for the time specified in menu "Settings/Temperature/Tset ramp" and after this time (when the leading sensor is different from the supply temperature sensor) an additional leading temperature regulator is activating and generating temperature setpoint of the supply regulator.

The name in menu:	Factory settings **(recommended)**
Heating PI	Kp = 1
	Ti = 60s
Cooling PI	Kp = 1
	Ti = 60s
Supply PI (limit Tmin sup, Tmax sup)	Kp = 1
	Ti = 90s

Supply PI regulator type "2" may be faster or slower than the heating and cooling PI, the slower the smaller oscillations at the minimum and maximum supply temperature but slower response to the limit.

Limit temperature parameters „Tmin supply”, Tmax supply” may be close to the temperature set.

In the lack of stabilization using recommended settings, increase Ti setting of each of the controller by 10 seconds may be preferred (max. up to 120 seconds).

Lack of stabilization of the such selected settings may indicate an error in the selection of heating/cooling exchangers, their improper operation, lack of required in accordance with the AHU selection card, thermal parameters of the heating/cooling exchangers.

5.5. Standard functions of controller’s inputs/outputs

Digital inputs (State of the NC access - giving for accessing DIN... enclosing the digital input causes stretching 24 VAC)		During the correct work of the system	The lack of the required state is causing alarm
Din 1	Fire alarm	compact	A_AF
Din 2	Thermostat frost protection of the water heater	compact	A_ThHWair, A_3xThHWair
	Alarm of the electric heater	compact	A_ThHE, A_3xThHE
	Alarm of the gas heater	compact	A_ThGAS, A_3xThGAS
Din 3	Alarm of the unit of the DX cooler	obtuse *	A_CX
Din 4	Differential pressure switch of the supply filter	obtuse	A_SupFilter
Din 5	Differential pressure switch of the supply secondary filter	obtuse	A_SupFilter2
	Defrost reverse freon	obtuse	-
Din 6	Differential pressure switch of the exhaust filter	obtuse	A_ExhFilter
Din 7	Differential pressure switch of the supply fan	compact	A_SupPres
Din 8	Differential pressure switch of the exhaust fan	compact	A_ExhPres
Din 9	Confirmation of the supply fan work	compact	A_SupFC
Din 10	Confirmation of the exhaust fan work	compact	A_ExhFC
Din 11	Confirmation of the rotary heat exchanger work	compact	A_Rot
Din 12	Service switch	compact	A_StopS1

Analogue inputs devices (Signal inputs devices 0-10VDC)	
Ain 1	CO2 sensor (optional)
Ain 2	HMI Tiny (option selectable if constant pressure is not selected)
	Supply air pressure sensor (optional)
Ain 3	Exhaust air pressure sensor (optional)

Temparature sensors PT1000		The damaged temperature sensor is causing alarm
PT1	Supply	A_Tsup
PT2	Exhaust (optional)	A_Texh
PT3	Outside	A_Tout
PT4	Exhaust after recovery or glycol contact sensor	A_Trec
PT5	Return water of the water heater	A_TbackWater

Digital outputs, state OFF - ReC/ReA output obtuse, ON state - ReC/ReA output shorted		
Re1	Pump of the water heater	relay
	Electric heater	relay
Re2	Pump of the glycol run around coils heat exchangers	relay
	Start rotational recovery	relay
Re3	Pump of the water cooler	relay
	1 step of a refrigerating unit	relay
	Start reverse DX unit	relay
Re4	2 step of a refrigerating unit	relay
	Cooling mode of reverse DX unit	relay
Re5	Air dampers of the Supply/Exhaust	relay
Re6	Fans Start/Stop	relay
Re7	Confirmation of work	relay
Re8	Group alarm	relay

Analogue outputs (Signal outputs 0-10VDC)	
Aout1	Heater (water or electric)
Aout2	Cooler (water or DX) or reverse DX unit (heating/cooling)
Aout3	Mixing chamber (10-0V), air dampers supply/exhaust (0-10V)
Aout4	Recovery heat/cool (plate exchanger, rotary exchanger or glycol run around coils)

* possibility of the negation of the digital input in the menu settings/DX cooler

In the service menu you can activate any relay outputs as a confirmation of work or group alarm. When activated, make sure that the output is not used in the application.

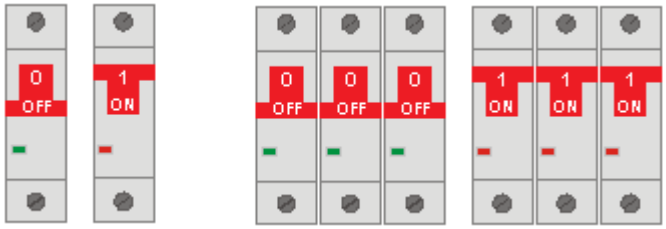
6. Control service

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

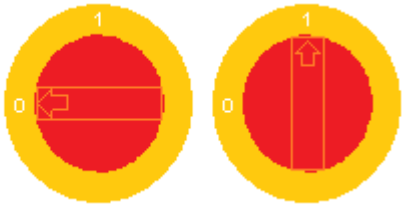
Start-up of the device

Operate Switch Q1M into position ON.

„1-ON” (synthetic switchboard)



„1” (metal switchboard)



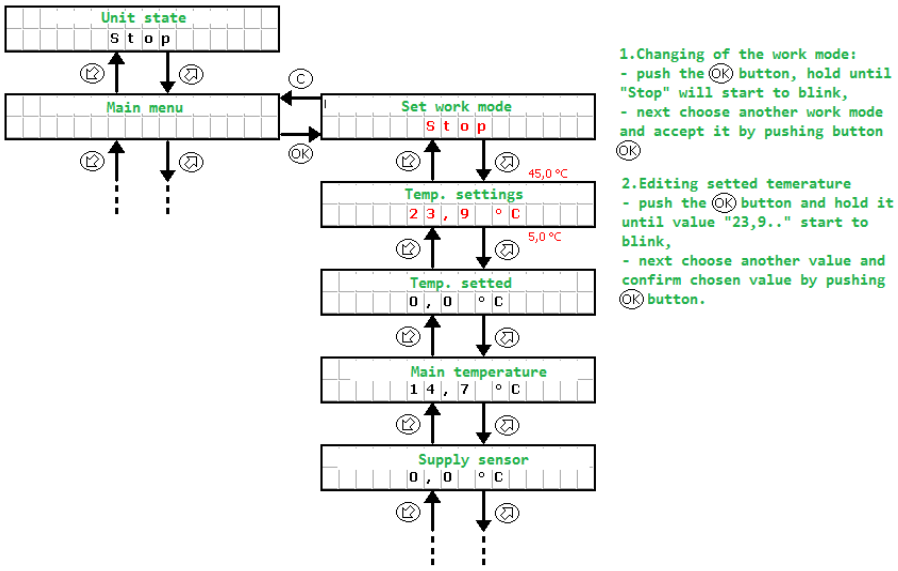
The device is starting-up if:
- signal S1 on DIN12 input of the controller is shorted
- signal S1F on DIN1 input of the controller is shorted

and
- parameter ***„Set work mode”*** on the controller or on the HMI is set to any option other than ***Stop***.

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

Changing the temperature set if as panel a “menu” was chosen

Parameter ***“Set temperature”*** in the main menu of controller or HMI.



Handling of the HMI Advanced has been described in point 5 of this manual.

6.1 Alarms

Alarms are indicated by display flashing and red continuous lighting LED on the controller or HMI, Re8 relay output of the controller is set ON.

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	Reaction of the system, proceeding
		Digital inputs
A_AF	Declining	Cooperation with fire alarm control panel. **Alarm is OFF** – lack of fire, on digital input appeared signal 24VAC **Alarm is ON** – fire appeared, on digital input doesn't appeared signal 24VAC 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 alarm). **Digital input: Din1**
A_ThHWair **A_3xThHWair**	Declining Blocking	Heater anti-frost protection is accomplished by anti-frost thermostat **Alarm is OFF** – temperature measured right after the heater is higher than temperature set on thermostat, on input digital input is signal 24VAC **Alarm is ON** – temperature measured right after the heater is lower than temperature set on thermostat, signal 24VAC doesn't appear on input digital Reaction on Alarm is ON: system is stopped, heater efficiency will stay on 100% level, until thermostat is warm enough. After thermostat is warmed up, in alarm menu user has to be confirm that process is finished. After conformation in alarm menu and lack of low temperature of thermostat, system comes back to the state of work. If during one hour, alarm A_ThHWair will appear 3 times, system is stopped and alarm A_3xThHWair will be displayed which needs to be confirmed as well. **Digital input: Din2**
A_ThHE, **A_3xThHE**	Declining Blocking	Protection against overheating of the electric heater on the input signal is input to the alarm relay HE module mounted on the control box power and control electric heater: Normal state - heater temperature is low, the digital input signal is 24VAC Alarm conditions - the temperature of the heater is too high, there is no 24VAC on the digital input

		Responding to an alarm condition: the system operates without heating until resolution of overheating, after the disappearance of overheating alarm disappears and takes the work out of the heater, and three times in one hour speech A_ThHE alarm system will stop working and display A_3xThHE alarm that requires confirmation. **Digital input: Din2**
A_ThGAS, A_3xThGAS	Declining Blocking	Protection of the gas heater, the input is fed from the non-potential alarm relay of the gas heater control module: Normal state - the digital input signal is 24VAC Alarm conditions - there is no 24VAC on the digital input Responding to an alarm condition: the system operates without heating until resolution of overheating, after the disappearance of overheating alarm disappears and takes the work out of the heater, and three times in one hour speech A_ThGAS alarm system will stop working and display A_3xThGAS alarm that requires confirmation. Able to change the NO to NC **Digital input: Din2**
A_CX	Declining	Cooperation with alarm contact chiller: Normal state - there is no alarm unit, there is no 24VAC on the digital input signal Alarm conditions - an alarm unit, the digital input signal is 24VAC The response to the state of emergency: information signal Able to change the NO to NC **Digital input Din3**
A_FX	Declining	Cooperation with alarm contact reverse Freon unit: Normal state - there is no alarm unit, there is no 24VAC on the digital input signal Alarm conditions - an alarm unit, the digital input signal is 24VAC The response to the state of emergency: information signal Able to change the NO to NC **Digital input Din3**
A_SupFilter	Declining	Study the degree of contamination of the supply air filter with switch: Normal state - dirty limit, the pressure difference before and after the filter is below the set on the pressure switch, there is no 24VAC on the digital input signal Alarm conditions - dirt unacceptable pressure difference before and after the filter is above the set on the pressure switch, the digital input signal is 24VAC 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 **Digital input Din4**
A_SupFilter2	Declining	Study the degree of contamination of the air supply fine filter with pressure switch: Normal state - dirty limit, the pressure difference before and after the filter is below the set on the pressure switch, there is no 24VAC on the digital input signal Alarm conditions - dirt unacceptable pressure difference before and after the filter is above the set on the pressure switch, the digital input signal is 24VAC 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 **Digital input Din5** **ATTENTION!!! In the reversible DX unit it is possible to activate the defrost function. After activation, the Din5 input only performs the defrost function and does not perform the dirty filter function.**
A_ExhFilter	Declining	Study the degree of contamination of the exhaust filter with switch: Normal state - dirty limit, the pressure difference before and after the filter is below the set on the pressure switch, there is no 24VAC on the digital input signal Alarm conditions - dirt unacceptable pressure difference before and after the filter is above the set on the pressure switch, the digital input signal is 24VAC 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 **Digital input Din6**
A_SupPres	Blocking	The test proper operation of the supply air fan with switch: Normal state - 30 seconds after the start of the test is whether there is fan pressure, differential pressure upstream and downstream of the fan should be above the set on the pressure switch, the digital input signal is 24VAC Alarm state - 30 seconds after the start there is no fan pressure, differential pressure upstream and downstream of the fan is below the set on the pressure switch, there is no 24VAC on the digital input signal

		Responding to an alarm condition: the system is stopped, check the fan and determine the cause of the lack of compression, and the cause of the alarm must be acknowledged and operate the system **Digital input Din7**
A_ExhPres	Blocking	The test proper operation of the supply air fan with switch: Normal state - 30 seconds after the start of the test is whether there is fan pressure, differential pressure upstream and downstream of the fan should be above the set on the pressure switch, the digital input signal is 24VAC Alarm state - 30 seconds after the start there is no fan pressure, differential pressure upstream and downstream of the fan is below the set on the pressure switch, there is no 24VAC on the digital input signal Responding to an alarm condition: the system is stopped, check the fan and determine the cause of the lack of compression, and the cause of the alarm must be acknowledged and operate the system **Digital input Din8**
A_SupFC	Blocking	The test proper operation of the inverter supply fan with inverter alarm contact (confirmation of work): Normal state - immediately after the power is not an alarm inverter, inverter alarm contact is closed, the digital input signal is 24VAC Alarm conditions - directly after the power inverter alarm occurs, the inverter alarm contact is open, there is no 24VAC on the digital input signal 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 **Digital input Din9**
A_ExhFC	Blocking	The test proper operation of the inverter supply fan with inverter alarm contact (confirmation of work): Normal state - immediately after the power is not an alarm inverter, inverter alarm contact is closed, the digital input signal is 24VAC Alarm conditions - directly after the power inverter alarm occurs, the inverter alarm contact is open, there is no 24VAC on the digital input signal 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 **Digital input Din10**
A_Rot	Blocking	The test of proper operation of the frequency drive of the heat recovery wheel through the inverter alarm contact: Normal state - there is no alarm inverter, inverter alarm contact is closed, the digital input signal is 24VAC, the work of the recovery

		Alarm conditions - an alarm inverter, inverter alarm contact is open, there is no 24VAC on the digital input signal, the work without recovery Responding to an alarm condition: the system operates without recovery, check the inverter and how to connect the controller and the motor, determine the cause of the error, and the cause of alarm disappears automatically and recovery back to work as the demand resulting from the process temperature **Digital input Din11**
A_StopS1	Declining	Examination of the maintenance switch: Normal state - there is a notification service disconnect switch contact is closed, the digital input signal is 24VAC State of emergency - there is a notification service disconnect switch contact is open, there is no 24VAC on the digital input signal Responding to an alarm condition: the system is stopped with the behaviour of the alarm functions (heating of the heater in winter), after removing the cause of alarm disappears automatically and the system returns to work (There is an option to disabled this alarm and use this digital input Din12 as remote signal of START/STOP) **Digital input Din12**
Sensor inputs PT1000		
A_Tsup	Blocking	The test proper operation of air temperature sensor: Normal state - there is no alarm, sensor connected Alarm conditions - an alarm occurs, the sensor disconnected or damaged Responding to an alarm condition: the system is stopped, check the sensor and how to connect to the controller, determine the cause of the error, and the cause of the alarm must be confirmed and the system started-up again **Sensor input PT1**
A_Texh	Blocking	The test proper operation of exhaust air temperature sensor: Normal state - there is no alarm, sensor connected Alarm conditions - an alarm occurs, the sensor disconnected or damaged Responding to an alarm condition: the system is stopped, check the sensor and how to connect to the controller, determine the cause of the error, and the cause of the alarm must be confirmed and the system started-up again **Sensor input PT2**
A_Tout	Blocking	The test proper operation of the outdoor temperature sensor: Normal state - there is no alarm, sensor connected Alarm conditions - an alarm occurs, the sensor disconnected or damaged Responding to an alarm condition: the system is stopped, check

		the sensor and how to connect to the controller, determine the cause of the error, and the cause of the alarm must be confirmed and the system started-up again **Sensor input PT3**
A_Trec	Blocking	The test proper operation of exhaust temperature sensor for recovery (or glycol contact sensor): Normal state - there is no alarm, sensor connected Alarm conditions - an alarm occurs, the sensor disconnected or damaged Responding to an alarm condition: the system is stopped, check the sensor and how to connect to the controller, determine the cause of the error, and the cause of the alarm must be confirmed and the system started-up again **Sensor input PT4**
A_TbackWater	Blocking	The test proper operation of return water temperature sensor with heater: Normal state - there is no alarm, sensor connected Alarm conditions - an alarm occurs, the sensor disconnected or damaged Responding to an alarm condition: the system is stopped, check the sensor and how to connect to the controller, determine the cause of the error, and the cause of the alarm must be confirmed and the system started-up again **Sensor input PT5**
A_Tmain	Blocking	The test proper operation of the temperature sensor lead: Normal state - there is no alarm, sensor connected Alarm conditions - an alarm occurs, the sensor disconnected or damaged Responding to an alarm condition: the system is stopped, check the sensor lead and how to connect to the controller, determine the cause of the error, and the cause of the alarm must be confirmed and the system started-up again **Entry depends on the choice of the leading sensor**
Other alarms		
A_ComSupFC1,2	Declining	The study proper communication between controller and inverter of the supply fan: Normal state - there is no alarm, correct communication Alarm conditions - an alarm occurs, communication is not correct Responding to an alarm condition: the system is stopped, check the inverter and how to connect to the controller, determine the cause of the error, and the cause of the system automatically returns to normal operation
A_ComExhFC1,2	Declining	The study proper communication between controller and inverter of the exhaust fan: Normal state - there is no alarm, correct communication Alarm conditions - an alarm occurs, communication is not

		correct Responding to an alarm condition: the system is stopped, check the inverter and how to connect to the controller, determine the cause of the error, and the cause of the system automatically returns to normal operation
A_ColdRec	Declining	Study the possibility of appearing the recovery frost using exhaust air temperature sensor after recovery (or contact temperature sensor in glycol run around heat recovery system) Normal state - there is no alarm, high temperature Alarm conditions - an alarm occurs, low temperature Responding to an alarm condition : decrease the recovery efficiency, The system works without recovery or with reduced modulation **It is possible to use the pressure control switch (Service menu / Recovery sensor)** **When the pressure switch is used, the PT4 and GND short-circuits initiate the anti-frost response**
A_ThHWwater **A_3xThHWwater**	Declining Blocking	Heater protection against freezing by contact sensor B8 on the water heater return Normal state - temperature of the contact sensor is higher than the set on the controller or panel Alarm conditions– temperature of the contact sensor is lower than the set on the controller or panel Responding to an alarm condition: the system STOP, the heater 100% until the temperature on the water heater return rise above setpoint. After crossing the temperature measured by the contact sensor, system backs to work, after 3 times occurrence of the alarm A_ThHWwater within an hour, system stopping the opperation and alarm A_3xThHWwater is displayed, alarm requires confirmation
A_Code	Blocking	The alarm indicating allowed configuration of air handling unit in service menu/type of air handling unit **ATTENTION!!! IN CASE OF SUPPLY AHU SELECTION, SYSTEM RECOVERY MAY ONLY BE MIXING CHAMBER** **ATTENTION!!! IN CASE OF REVERSE DX UNIT ACTIVATION, WATER OR DX COOLER ACTIVATION IS NOT POSSIBLE**
A_In_Emul	Declining	Emulation of inputs: 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 Responding to an alarm: controller does not react to physical changes emulated input, the system works with the value of the emulator in the service menu
A_OutForce	Declining	Forcing output: Normal state - there is no alarm, no output is in forcing Alarm state - at least one of the digital outputs, analog mode is

		forcing 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

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

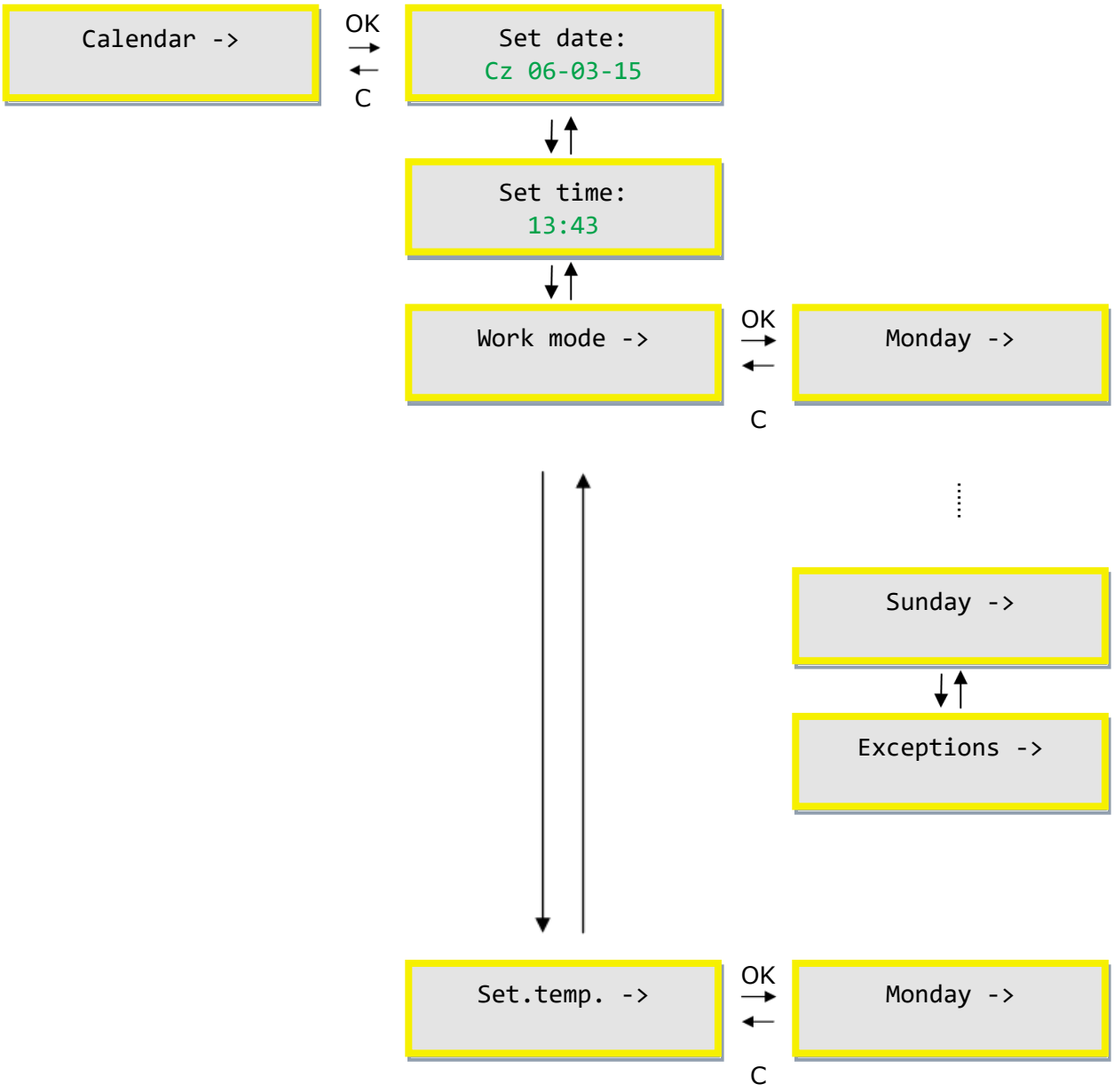
Name	Default value	Decription
State of the AHU	Service mode	**Service mode** – the arrangement is in the course of the configuration, lack of ability of the start of the arrangement, active protective functions of chosen exchangers heating/cooling **Stop -** the AHU is stopped, air dampers are closed , fans do not work, active protective functions of the AHU **Alarm - stop** – 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 **Preliminary warming up -** in case of the low outdoor temperature preliminary warming up is taking place in AHU with the water heater **Warming up -** in AHU with the water-heater at reporting the alert from the thermostat frost-resistant warming the water-heater up is taking place **Cooling -** in AHU with the electric, gas heater and the DX cooler, DX reverse stopping the functioning of fans is taking place late cooling from stopping the functioning of the heater or/and cooler **Work 1,2,3 step -** correct work on 1,2 or 3 step of fans
Main menu	-	Choice of the work mode of AHU, the set temperature of the leading sensor, the reading of temperatures and states of the functioning of the fans and heating/cooling exchangers
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/DE	-	Choice of the language menu (Polish/English/German).

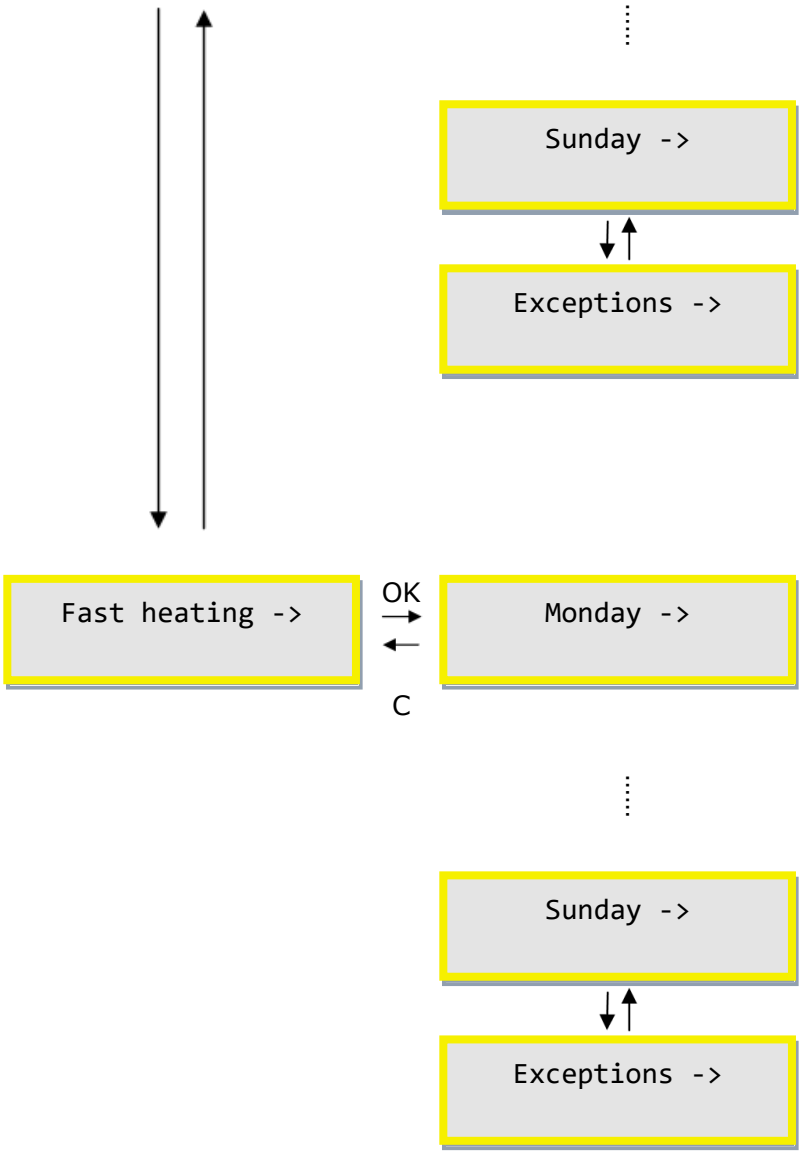
7.2 Calendar

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.

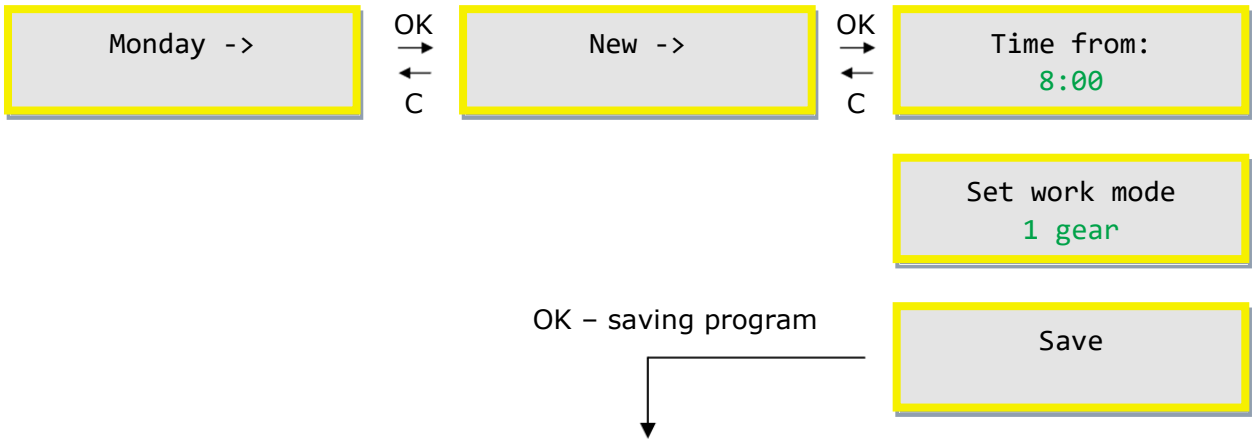
Program includes parameters:
Work mode – possible selections: Stop, Start 1 step, Start 2 step Start 3 step and the Stand-by.
Temperature set – temperature setting
Fast heating - there is possibility of activate fast heating using a mixing chamber (there is in system with mixing chamber)

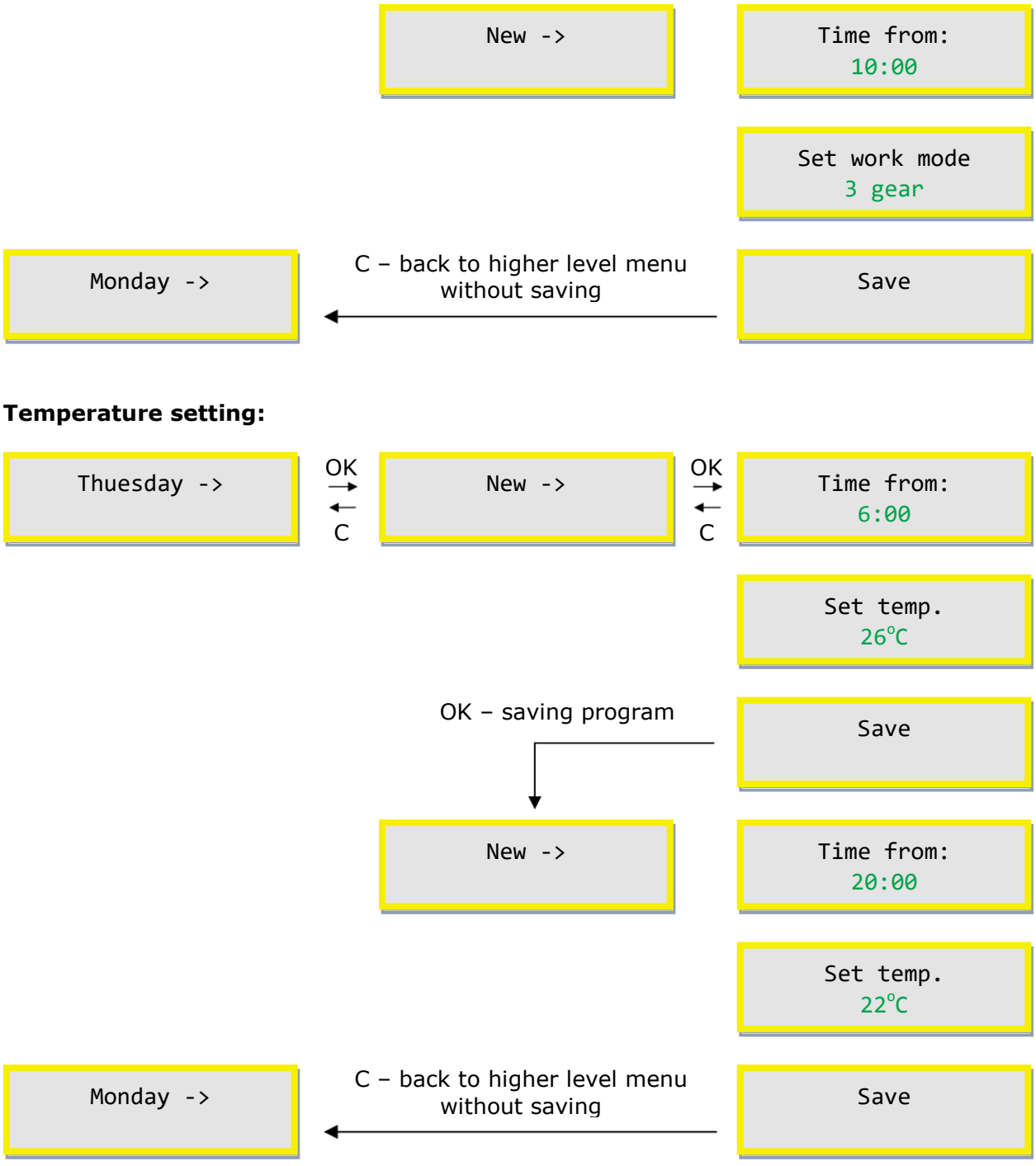
Calendar menu:




Sunday ->
Exceptions ->
Fast heating ->
OK
C
Monday ->
Sunday ->
Exceptions ->

Work mode:


Monday ->
OK
C
New ->
OK
C
Time from:
8:00
Set work mode
1 gear
OK – saving program
Save



Temperature setting:

7.3 Settings

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

Tab. 5 Settings menu.

Group	Name	Default	Description
Temperatures	Main sensor	Supply	***HMI CON*** *- temperature control according to the temperature sensor in the room unit HMI terminal connected by HMI CON* ***HMI RS485*** *- temperature control by temperature sensor HMI room unit connected via RS485 interface* ***Supply*** *- temperature control by temperature sensor supply* ***Exhaust*** *- temperature control by the exhaust temperature sensor* ***PT5*** *- temperature control by temperature sensor connected to sensor input PT5*
	Eco temp. difference	15°C	***Eco temp. difference*** *– this is used both for heating and cooling, which does not allow the heating/cooling when the outdoor temperature is higher/lower the set point temperature of the exhaust sensor (the function is only active in the supply and exhaust systems)*
	Start time	300 s	***Start time*** *- fall time increased setpoint (and activation delay of the cascade temperature regulator, if it is active)*
	Tset correction	5°C	***Tset correction*** *- adjustment to increase the set point and minimum air temperature at the start of the system*
	Offset	-	*adjustment of the temperature sensors measuring*

Season	*Operating mode*	*Auto*	*Important for activation of the cooling regulator and operating mode of the reverse DX unit.* ***Auto*** *- the season automatically determined on the basis of the outdoor temperature sensor* ***Winter*** *- manual setting of winter operating mode* ***Summer*** *- manual setting of summer operating mode*
	Summer temperature	*20°C*	***Summer temperature*** *- setting the outside temperature threshold above which the system is operating in summer mode, the reverse DX unit can operate in cooling mode*
	-	*4°C*	***Hysteresis -*** *hysteresis setpoint for "Temp.summer" threshold, outdoor temperature drop below the "Temp.summer" - "hysteresis" difference causes the system to operate in winter mode, the reverse DX unit can operate in heating mode*
Standby mode	*Main sensor*	*HMI CON*	***HMI CON*** *- enabling the system to operate the sensor in the room unit HMI terminal connected by HMI CON* ***HMI RS485 Master*** *- enabling the system to operate the sensor in the room unit HMI connected via RS485 Master* ***Exhaust*** *- enabling the system to operate the exhaust temperature sensor* ***PT5*** *- enabling the system to operate the temperature sensor connected to sensor input PT5*
	Active for	*Heating and cooling*	***Heating*** *– system will start when the sensor temperature falls below the leading standby mode, the set temperature of the hysteresis mode* ***Cooling*** *– system will start when the temperature sensor exceeds a leading standby mode, the set temperature of the hysteresis mode* ***Heating and cooling*** *– system will start when the temperature sensor lead stand will rise or fall below or above the melting point of the hysteresis mode, standby*

	Standby hysteresis	*4°C*	***Standby hysteresis** – the difference in temperature sensor mode and set point temperature below which the system will be enclose when in standby mode*
Vent.	*-*	*10 s*	***Starting delay** - the time from the start throttle operation of the fans*
		15 s	***Damp.off delay** - The time from switching on operation mode "Stop" and start stopping fans to start closing the air dampers actuators of the AHU*
		30 s	***Pressure delay** - the time of operation of the fans after the pressure test on the filters.*
		180 s	***Cooling time** - the time from the operating mode "1,2,3 gear" in the operating mode "Stop" and stopping the electric heater and/or DX cooler to stop the fans (cooling is at the lowest efficiency).*
	Air flow control	*0,1*	***Kp** – constant air volume ragulator gain*
		30s	***Ti** – integration constant of the constant air volume regulator*
		-	***Pressure setpoint 1,2,3 gear** – setpoint of supply/exhaust fan pressure for constant air flow control*
		-	***Sensor range -** setting of the pressure sensor range (setting must be identical to the physical range setting on the pressure sensor)*
		ATTENTION!!! Constant air flow adjustment is possible in systems with axial fans equipped with the possibility to connect the pressure sensors of the fans.	
	Supply	*... %*	*Setting efficiency supply fan for 1,2,3 gear*
	Exhaust	*... %*	*Setting efficiency exhaust fan for 1,2,3 gear*
	RS485	*Active*	***Sup. via RS485** - activate communication with inverter supply fan*
		Active	***Exh. Via RS 485** - activation of communication with the exhaust fan inverter*
		Active	***2. Sup. via RS485** - activate communication with secondary inverter supply fan*

		Active	***2. Exh. Via RS 485*** *- activation of communication with the secondary exhaust fan inverter*
		0 Hz	***Sup.freq.min.*** *– setting the minimum frequency of the supply air fan, corresponding setting performance 0%*
		60 Hz	***Sup.freq.max.*** *- setting the maximum frequency of the supply air fan, corresponding setting performance 100% (the maximum frequency should be chosen according to DTR and performance measurement)*
		0 Hz	***Exh.freq.min.*** *- setting the minimum frequency of the supply air fan, corresponding setting performance 0%*
		60 Hz	***Exh.freq.max.*** *- setting the maximum frequency of the supply air fan, corresponding setting performance 100% (the maximum frequency should be chosen according to manual and performance measurement)*
		1	***Sup.inv.adress*** *– address of the inverter supply fan*
		2	***Exh.inv.adress*** *– address of the inverter exhaust fan*
		3	***2.Sup.inv.adress*** *– address of the secondary inverter supply fan*
		4	***2.Exh.inv.adress*** *– address of the secondary inverter exhaust fan*
		60 s	***T.acc.*** *- start time inverters*
		60 s	***T.dec.*** *- the time to stop the inverter*
Part of regulation	*-*	*15%*	***Recovery*** *– Involved in the regulation of recovery (parameter editable)*
		15%	***Reverse DX unit*** *– participation in the regulation of the reverse DX unit (editable parameter)*
		15%	***Mixing chamber*** *- Involved in the regulation of the mixing chamber (parameter editable)*
		…%	***Heater/cooler*** *– participation in the regulation of the heater/cooler (read parameter)*

Temperature regulators	*PI heating*	*1*	***Kp** - heating regulator gain*
		60s	***Ti** – integration constant of the heating regulator*
	PI cooling	*1*	***Kp** – cooling regulator gain*
		60s	***Ti** – integration constant of the cooling regulator*
		Summer / Winter	***PI cooling** – activation of the cooling regulator only in summer or summer and winter*
		30s	***Start delay** - can be set for the delayed start of the cooling regulator*
	PI air blow	*1*	***Kp** – air regulator gain*
		90s	***Ti** – integration constant of the supply air regulator*
		15°C	***Tmin air blow** - minimum supply temperature (related to setting of the supply PI regulator)*
		40°C	***Tmax air blow** - maximum temperature of the supply (related to setting of the supply PI regulator)*
		…	***TsetBlowAct** – the current value of the supply air temperature regulator in the cascade regulator.*
Recovery	*-*	*450 s*	***Starting ramp** - after the start-up, system operates with recovery of 100% with the ramp descent to the current drive the recovery resulting from the process control*
		Winter	***Work mode:*** ***Summer** –possible cooling recovery* ***Winter** –possible heating recovery* ***Summer/Winter** – possible heating and cooling recovery*
		2°C	***Frost limit** - temperature below (sensor B4) which the function is acting frost-resistant*
		20%	***Frost min.power -** setting of the minimum rotary heat exchanger recovery during the frosting.*
		1	***Kp frost.prot** - gain of anti-frost function*
		60s	***Ti frost.prot** - integration constant of the anti-frost function*

	Pump protect.	*Active*	***Set protection** - a recurring feature of the pump*
		7days	***Period** - active when the protective function is active pump*
		30s	***Run time** - the active function is activated pump protection*
Heater	*Preheating*	*15s*	***Preh.100% time** - Time of preliminary with 100% open valve, irrespective of Tmin, Tmax scale*
		30s	***Preh.scale time** - Time of preliminary with proportional open valve, depending on the Tmin, Tmax scale and temperature of return water (if the sensor B8 is active)*
		Active	***Falling ramp** – the possibility to activate / deactivate the function of the falling ramp valve opening degree after preliminary heating*
		30s	***Fall ramp -** time of decrease after preliminary heating*
		0°C	***Min T.out** – maximum temperature scale to pre-heat*
		75%	***Min.Tout valve** – scale of the valve relative to the outside temperature*
		10°C	***Max T.out** – maximum temperature scale to pre-heat*
		15%	***Max.Tout.valve** – scale of the valve relative to the outside temperature*
	Pump work temp.	*5°C*	***Pump work temp.** - the temperature below which the pump is running all the time*
	Min.valve open	*10%*	***Min.valve open** - The minimum heating valve opening*
	Water frost	*Inactive*	***B8 sensor** – activation of protection heater the sensor on return water*
		10°C	***Frost temp.out.** – activation of Frost protection on the water side to the outdoor temperature which is lower than this parameter*
		15°C	***Frost - Stop** – the setting of return temperature below the system is working in Frost heating mode (during the stop)*

		20°C	***Frost - Start** – the setting of return temperature below the system is working in Frost heating mode (during the work)*
		25°C	***Regulation - Stop** – temperature setting of the return water of the water heater, when the temperature in low the valve is opening, regardless of main control signal heater (during the stop)*
		30°C	***Regulation - Start** – temperature setting of the return water of the water heater , when the temperature in low the valve is opening, regardless of main control signal heater (during the work)*
		1	***Kp** – regulator gain of the setpoint temperature on the water return*
		30s	***Ti** – integration constant of the setpoint temperature on the water return regulator*
	Pump protect	*Active*	***Set protection** - a recurring feature of the pump*
		7days	***Period** - active when the protective function is active pump,*
		30s	***Run time** - active when protective function is active pumps,*
GAS alarm	-	*NC*	***Alarm pin** – the possibility of choice the type of contact alarm DX cooler NO/NC*
DX cooler	-	*30s*	***Break time min.**– minimal stop time refrigerating unit*
		30s	***Work time min.** - the minimal working hours of a refrigerating unit*
		13°C	***Temp.out work min.** – the minimal outdoor temperature by which the functioning of a refrigerating unit is active*
		NO	***Alarm pin** – the possibility of choice the type of contact alarm DX cooler NO/NC*
		Inactive	***Stage 2** – the possibility of activation II step cooling*
		Inactive	***Cascade** – the possibility of activation cascade control two-stage DX cooler (1 – I step, 2 – II step, 3 – I i II step), use for two coolers of different efficiency*

		50%	***Stage 2*** *– the possibility of adjust threshold control signal level at which the II step of cooling is attached*
		75%	***Stage 3*** *– the possibility of adjust threshold control signal level at which the III step of cooling is attached (only on cascade)*
Reverse DX unit	*-*	*30s*	***Break time min.****– minimal stop time refrigerating unit*
		30s	***Work time min.*** *- the minimal working hours of a refrigerating unit*
		NO	***Alarm pin*** *– the possibility of choice the type of contact alarm DX cooler NO/NC*
		NO	***Contact cooling*** *- possibility to select the type of cooling mode contact of the reverse DX unit NO/NC*
Mixing chamber	*Work mode*	*Temperature*	***Hand*** *- the mixing chamber isn't participating in the process of the temperature control, CO2, the opening degree in main menu of the controller* ***Temperature*** *– the mixing chamber is participating in the process of the temperature control (when is the demand for heating there is increase in modulation of the mixing chamber and reducing the fresh air)* ***Temperature/CO2*** *– the mixing chamber is participating in the process of the temperature control (when is the demand for heating there is increase in modulation of the mixing chamber and reducing the fresh air, (In case of low level of fresh air in exhaust starts to increase level of fresh air)*
	Priority for	*Mix chamber*	***Heating/cooling*** *– in the process of the temperature control in the automatic mode of the mixing box, are holding shares one by one: 1. recovery, 2. heater/cooler, 3. mixing box* ***Mix chamber*** *- in the process of the temperature control in the automatic mode of the mixing box, are holding shares one by one: 1. recovery, 2. mixing box, 3. heater/cooler*

	Min. fresh air	*30%*	***Min. fresh air** – establishing minimal opening air dampers of the supply/exhaust of AHU in the automatic mode*
	Max. fresh air	*100%*	***Max. fresh air** – establishing maximum opening air dampers of the supply/exhaust of AHU in the automatic mode*
	Fast heating	*Inactive*	***Fast heating** – function enabling fast heating up the AHU to the set temperature. When the mode of the fast heating is active and a need of starting his action will appear air dampers entirely are closing the inflow of the fresh air to the moment of reaching the demanded temperature*
		20°C	***Temperature set point -** demanded temperature for the function of the fast heating*
		4°C	***Hysteresis** - Hysteresis of the Temperature set point*
	CO2 regulation	*600 ppm*	***Set CO2 –** demanded value of concentration CO2 in exhaust air*
		0,1	***Kp** – gain of the fresh air regulator*
		90s	***Ti** – integration constant of the fresh air regulator*
		-	***Sensor range** – the ability to set the measurement range of the CO2 sensor*

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*	***Active** – possible configuration of the AHU, lack of ability of the start of AHU, protective functions of the chosen arrangement active* ***Not avtive** – configuration of the AHU is not possible, the possibility of the AHU start-up*

AHU type	*Type*	*Supply*	***Supply –*** *Supply Air Handling Units* ***Supply/exhaust –*** *Supply and Exhaust Air Handling Units* ***2x Supply/exhaust –*** *Supply and Exhaust Air Handling Units with twin fans solution.*
	Recovery	*None*	***None*** *– in the AHU a system of the recovery exchanger wasn't applied* ***Cross****– AHU equipped with the Plate heat exchanger with damper actuator steered by signal 0-10 VDC* ***Rotary*** *– AHU equipped with the AHU of the rotary heat exchanger, equipped with the speed controller or the frequency inverter* ***Glycol*** *– AHU equipped with glycol run around coils, controlled by the valve actuator and pump* ***Mix chamber*** *– AHU equipped with the mixing chamber, controlled with one signal 0-10 VDC damper actuators of supply, exhaust and mixing chamber (0V-supply/exhaust OFF (closed), mixing chamber ON (open)* ***Cross, Rotary, Glycol / Mix chamber*** *– AHU equipped with one of the recovery system (plate heat exchanger, rotary heat exchanger or glycol exchanger) and mixing chamber*
	Reverse unit	*None*	***None*** *– in the AHU reverse unit wasn't applied* ***Active*** *– in the AHU reverse unit is applied*
	Cooler	*None*	***None*** *– in the AHU cooler wasn't applied* ***DX*** *– AHU equipped with the DX cooler, controlled by signal 0-10VDC and digital signals being used for switching 1 and 2 of degree of the cooling, from a refrigeration unit we are taking the failure signal* ***Water*** *– AHU equipped with the water-heater, controlled by the valve actuator and pump*

	Heater	*None*	***None*** *– in the AHU heater wasn't applied* ***Electric*** *– AHU equipped with the electric heater, controlled by signal 0-10 VDC or PWM 0/10VDC, start/stop signal and with reflexive alarm signal.* ***Water*** *– AHU equipped with the water-heater, controlled by the valve actuator and pump* ***Gas*** *– AHU equipped with the gas heater, controlled by signal 0-10 VDC, start/stop signal and with reflexive alarm signal.*

ATTENTION!!! IN CASE OF SUPPLY AHU SELECTION, SYSTEM RECOVERY MAY ONLY BE MIXING CHAMBER

ATTENTION!!! IN CASE OF REVERSE DX UNIT ACTIVATION, WATER OR DX COOLER ACTIVATION IS NOT POSSIBLE

Configuration	*Start time*	*10s*	***Start time*** *– the ability to set the time after which the system can start working*
	DIN12 function	*A_StopS1*	***A_StopS1*** *– opening of the DIN12 input will stop the system and display an alarm A_StopS1 (used when DIN12 input is a service stop)* ***ON/OFF*** *– opening of the DIN12 input will stop the system without displaying the alarm A_StopS1 (used when the DIN12 input function is a remote start/stop of the system)*
	Fan inverter type	-	*The possibility of choose fan inverter type controlled by Modbus RS485 (LG iC5, LG iG5A, Danfoss FC51, Danfoss FC101, EC Blue, EBM)*
	EC Blue	*247*	***Current address*** *- setting of the address currently set on the EC Blue fan*
		-	***Destination address*** *- setting of the address required for the EC Blue fan (see Settings/Fans/RS485 table)*
		No	***Set address*** *- load new address to the currently connected EC Blue fan (when performing this function, only one EC Blue fan should be turned ON, and after loading the settings, turn the EC Blue fan OFF and on again to enable the new address !!!)*

		Ok	***Status OK*** *– loading settings successful* ***Loading in progress*** *- the system while loading settings, with correct communication the loading takes about 2 seconds* ***Alarm*** *– problem loading settings (addresses, communication error)*
	EBM	*1*	***Current address*** *- setting of the address currently set on the EBM fan*
		-	***Destination address*** *- setting of the address required for the EBM fan (see Settings/Fans/RS485 table)*
		No	***Set address*** *- load new address to the currently connected EBM fan (when performing this function, only one EBM fan should be turned ON, and after loading the settings, turn the EBM fan OFF and on again to enable the new address !!!)*
		Ok	***Status OK*** *– loading settings successful* ***Loading in progress*** *- the system while loading settings, with correct communication the loading takes about 2 seconds* ***Alarm*** *– problem loading settings (addresses, communication error)*
	Constant air flow	*Inactive*	***Inactive*** *– fans work on a given gear in accordance with the air flow settings* ***Active*** *– fans operation with constant pressure regulator output*
	Ventilator pressure switch	*Inactive*	***Inactive*** *– in system there isn't pressure switch to test static pressure fan* ***1S1F*** *– in system there is pressure switch to test static pressure supply air fan* ***1S1F/2S1F*** *– in system there is pressure switch to test static pressure supply and exhaust air fan* ***Regardless of the setting in system with electric heater, pressure switch 1S1F is active and it has to be use as a protection of electric heater.***

	Supply 0-10VDC	*Inactive*	*The possibility of activation one of the analog outputs as a signal 0-10VDC airflow rate of the supply air fan (make sure the output is not used for other purposes in the application)*
	Exhaust 0-10VDC	*Inactive*	*The possibility of activation one of the analog outputs as a signal 0-10VDC airflow rate of the exhaust air fan (make sure the output is not used for other purposes in the application)*
	HMI Tiny	*Inactive*	*There is ability to active panel „HMI Tiny" which is using when the reference temperature is done by the knob in the HMI Tiny (for this purpose used the analog input Ain2), start/stop the system is realized by Din12*
	Alarm A_ColdRec	*Inactive*	***Active** – alarm A_ColdRec frost of recovery visible in the alarm menu all the time during the freezing,* ***Inactive** – alarm A_ColdRec frost of the recovery invisible in the alarm menu, while the alarm in history is written with the moment of an alarm frost, and on graphical screen of HMI freezing icon appears during frost recovery.*
	Recovery sensor	*Temperature*	***Temperature** – study of the frost recovery is carried out by means of a temperature sensor B4, which is installed in the exhaust recovery part, connected to the PT4 - GND input* ***Pressure switch** – study of the frost recovery is carried out by means of a pressure switch 2S1R, which is installed in the exhaust recovery part, connected to the PT4 - GND input*
	HE control	*0-10VDC*	***0-10VDC** – control of the electric heater by means of smooth signal 0-10VDC* ***PWM** – control of the electric heater by means of PWM signal 0-10VDC*
	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)*

	Exhaust temperature sensor	*Inactive*	*there is ability to deactivation exhaust temperature sensor, when the exhaust and outside sensor is inactive function Eco is inactive and is not possible to determine the possibility of heat recovery (mixing chamber opens whenever you need heating)*
	Change of Tset	*20s*	***Change of Tset** – ramp change of setpoint temperature (elimination of sudden change of setting for smooth operation of temperature regulators)*
	Regulator	*„2”*	*The possibility of activation one of the two types of regulation:* ***„1”** - sum of temperature regulators: the main, lim.min., lim.max.,* ***„2”** - new cascade control in which the start-up of the system taking place only with the supply air temperature regulator for the time specified in "Settings/Temperature/Tset ramp" and after this time (when the leading sensor is different from the supply temperature sensor) an additional leading temperature regulator is activating and generating temperature set setpoint of the supply regulator.*
	Analog outputs	-	*The possibility of rescale the output signal 0-10VDC to 2-10VDC (please check signals compliance with manuals of damper or valve actuators)*
	Tcom	0,3s	***Tcom** – communication time with one frequency inverter*
	Twait	2s	***Twait** – response time for communication with all frequency inverters*
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.

-	-	-	*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.*
Change the password	-	-	*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.*
Restore the default setting	-	-	*Restoring the initial values of all settings.*

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 lines to the MASTER port on the slat of the controller. The Modbus address is being placed on jumpers at the bottom of controller.

The default communication parameters:
- baud rate of 9600 bps (the ability to change from the level of inbuilt or external HMI)
- 8 bits frame
- 2 stop bits
- no parity

All variables are 32-bit values which are presented in Modbus protocol as an Input, Coil, Holding Register or Input Register in different address spaces.

Read and write data type Input and Coil:
Each variable is a 32-bit value. For example, a variable with the address in the table 0x0008 provides bits at binary addresses 8*32 … 9*32-1 for Input and Coil in Modbus standard.

Reading and writing data types Holding Register and Input Register:
The variables in this form for ease of integration with the BMS systems, are available in different address spaces.

- 0x0000 … 0x1000 – traditional representation according information below
  - **Multistate** – listed integer variable values correspond to the states described
  - **Decimal** – 32-bit value of the variable is treated as an integer type with sign,
  - **Fixed** – where the 8 least significant bits are used for fractional part, while the remaining 24 bits are part of a signed integer. It follows that the accuracy of Fixed value is 1/256. To scale the value represented in the Fixed form to the target (right), multiply it by 1/256 = 0,00390625.
- 0x1000 … 0x2000 – variable in Fixed format presented as an integer values without a fraction
- 0x2000 … 0x3000 – variable in Fixed format presented as a values with accuracy to one decimal place in decimal format. The value of 20.67 is shown as 206

- 0x3000 … 0x4000 – variable in Fixed format presented as a values with accuracy to tow decimal places in decimal format. The value of 20.67 is shown as 2067
- 0x4000 … 0x5000 – just like in the 0x0000 … 0x1000 but the variables are treated as 16-bit values. This means that the older 16-bit are not included. Addresses must be divided by two. For example, a variable from table with the address 0x0124 is available in 16-bit format at Modbus address 0x4092
- 0x5000 … 0x6000 – just like in the 0x1000 … 0x2000 but the variables are treated as 16-bit values. This means that the older 16-bit are not included. Addresses must be divided by two. For example, a variable from table with the address 0x0124 is available in 16-bit format at Modbus address 0x4092
- 0x6000 … 0x7000 – just like in the 0x2000 … 0x3000 but the variables are treated as 16-bit values. This means that the older 16-bit are not included. Addresses must be divided by two. For example, a variable from table with the address 0x0124 is available in 16-bit format at Modbus address 0x4092
- 0x7000 … 0x8000 – just like in the 0x2000 … 0x3000 but the variables are treated as 16-bit values. This means that the older 16-bit are not included. Addresses must be divided by two. For example, a variable from table with the address 0x0124 is available in 16-bit format at Modbus address 0x4092

Variables in the representation of Multistate and Decimal do not use in the address spaces 0x1000 ... 0x4000 and 0x5000 … 0x8000 because it loses the least significant 8 bits of each of the variables.
Addresses in the table are converted to the Modbus protocol as follows:

Address space	Calculating an address
0x0000 … 0x1000	Modbus Address = Address.
0x1000 … 0x2000	Modbus Address = 0x1000 + Address
0x2000 … 0x3000	Modbus Address = 0x2000 + Address
0x3000 … 0x4000	Modbus Address = 0x3000 + Address
0x4000 … 0x5000	Modbus Address = 0x4000 + (Address / 2)
0x5000 … 0x6000	Modbus Address = 0x5000 + (Address / 2)
0x6000 … 0x7000	Modbus Address = 0x6000 + (Address / 2)
0x7000 … 0x8000	Modbus Address = 0x7000 + (Address / 2)

NOTE: You can not make a record of a single 16-bit register at address spaces 0x1000 ... 0x4000. In this case, write the registers in pairs using command Preset Multiple Registers (0x10) which consists of a full value of the 32-bit variable. This means that the address of the start of the recording and the number of registers must be an even number.

Main menu

Addres DEC		Variable name	HMI Name	States	Type		Read [R] /Write [W]
BacNet	Modbus				BacNet	Modbus	
0	0	UnitState	Unit state	0: Stop, 1: Work 1 gear, 2: Work 2 gear, 4: Work 3 gear, 8: Preheating, 16: Cooling, 32: Heating, 64: Alarm stop, 128: Service mode	MSV	Register	R
1	2	SeasonAct	Season	0: Transitional, 1: Winter, 2: Summer	MSV	Register	R
2	4	WorkMode	Set work mode	0: Stop, 1: 1 gear, 2: 2 gear, 4: 3 gear, 8: Standby, 16: Calendar	MSV	Register	R/W
3	6	Tset	Temp.setting	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
4	8	TsetActual	Temp.setted	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
5	10	Tmain	Main temperature	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R

6	12	B1	Supply sensor	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
7	14	B2	Exhaust sensor	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
8	16	B3	External sensor	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
9	18	B4	Recov.sens	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
10	20	B8	Back water sensor	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
11	22	CO2exh	Exhaust CO2	1ppm = 256 (22 ppm = 22*256 = 5632 = 0x1600)	AV	Register	R
12	24	Vent	Vent.	0: Off, 1: On	MSV	Coil 384	R
13	26	PwrSup	Supply/Exhaust	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
14	28	PaSup	Supply	1pa = 256 (22pa = 22*256 = 5632 = 0x1600)	AV	Register	R
15	30	PwrExh	Exhaust	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
16	32	PaExh	Exhaust	1pa = 256 (22pa = 22*256 = 5632 = 0x1600)	AV	Register	R
17	34	Isup	Current	1A = 256 (22A = 22*256 = 5632 = 0x1600)	AV	Register	R
18	36	Fsup	Frequency	1Hz = 256 (22Hz = 22*256 = 5632 = 0x1600)	AV	Register	R
19	38	RPMsup	RPM	1rpm = 256 (22rpm = 22*256 = 5632 = 0x1600)	AV	Register	R
20	40	Usup	Voltage	1V = 256 (22V = 22*256 = 5632 = 0x1600)	AV	Register	R
21	42	FaultSup	Alarm code	1A = 1A (HEX) **www.el-piast.com/alarms-decoder**	AV	Register	R
22	44	ComSup	Communication	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
23	46	Isup2	Current	1A = 256 (22A = 22*256 = 5632 = 0x1600)	AV	Register	R
24	48	Fsup2	Frequency	1Hz = 256 (22Hz = 22*256 = 5632 = 0x1600)	AV	Register	R
25	50	RPMsup2	RPM	1rpm = 256 (22rpm = 22*256 = 5632 = 0x1600)	AV	Register	R
26	52	Usup2	Voltage	1V = 256 (22V = 22*256 = 5632 = 0x1600)	AV	Register	R
27	54	FaultSup2	Alarm code	1A = 1A (HEX) **www.el-piast.com/alarms-decoder**	AV	Register	R
28	56	ComSup2	Communication	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
29	58	Iexh	Current	1A = 256 (22A = 22*256 = 5632 = 0x1600)	AV	Register	R
30	60	Fexh	Frequency	1Hz = 256 (22Hz = 22*256 = 5632 = 0x1600)	AV	Register	R
31	62	RPMexh	RPM	1rpm = 256 (22rpm = 22*256 = 5632 = 0x1600)	AV	Register	R
32	64	Uexh	Voltage	1V = 256 (22V = 22*256 = 5632 = 0x1600)	AV	Register	R
33	66	FaultExh	Alarm code	1A = 1A (HEX) **www.el-piast.com/alarms-decoder**	AV	Register	R
34	68	ComExh	Communication	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
35	70	Iexh2	Current	1A = 256 (22A = 22*256 = 5632 = 0x1600)	AV	Register	R
36	72	Fexh2	Frequency	1Hz = 256 (22Hz = 22*256 = 5632 = 0x1600)	AV	Register	R
37	74	RPMexh2	RPM	1rpm = 256 (22rpm = 22*256 = 5632 = 0x1600)	AV	Register	R
38	76	Uexh2	Voltage	1V = 256 (22V = 22*256 = 5632 = 0x1600)	AV	Register	R

39	78	FaultExh2	Alarm code	1A = 1A (HEX) **www.el-piast.com/alarms-decoder**	AV	Register	R
40	80	ComExh2	Communication	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
41	82	Y1	Water heater	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
42	84	M1	Heater-pump	0: Off, 1: On	MSV	Coil 1344	R
43	86	HePwr	Electric heater	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
44	88	GasPwr	GAS heater	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
45	90	Y2	Water cooler	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
46	92	E1	Water cooler	0: Off, 1: On	MSV	Coil 1472	R
47	94	Y9	DX cooler	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
48	96	DXstate	DX cooler	0: Stop, 1: 1 stage, 2: 2 stage, 3: 1,2 stage	MSV	Register	R
49	98	YFX	FX reverse	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
50	100	H_C	FX reverse	0: Heating, 1: Cooling	MSV	Register	R
51	102	DEF	Defrost FX	0: Off, 1: On	MSV	Coil 1632	R
52	104	YRec	Recovery	1% = 256 (22% = 22*256 = 5632 = 0x1600)	MSV	Register	R
53	106	M7	Recovery-pump	0: Off, 1: On	MSV	Coil 1696	R
54	108	RecState	Recovery	0: Off, 1: On, 2: Defrosting, 3: Defrosting	AV	Register	R
55	110	SetMix	Set mixing ratio	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
56	112	ThrMCh	Mixing chamber	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
57	114	ThrSuEx	Fresh air ratio	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
58	116	Throt	Fresh air ratio	0: Off, 1: On	MSV	Coil 1856	R

Settings menu

Addres DEC		Variable name	HMI Name	States	Type		Read [R] /Write [W]
BacNet	Modbus				BacNet	Modbus	
59	118	Ch_Tmain	Main sensor	1: HMI (CON), 2: HMI (RS485), 3: Supply, 4: Exhaust, 5: PT5	AV	Register	R/W
60	120	EcoDiff	Eco temp.difference	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
61	122	TsetDownTime	Start reg.	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
62	124	TsetCor	Tset correction	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
63	126	OfsPT1	PT1	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
64	128	OfsPT2	PT2	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
65	130	OfsPT3	PT3	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
66	132	OfsPT4	PT4	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
67	134	OfsPT5	PT5	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
68	136	OfsHMICon	HMI (CON)	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
69	138	OfsHMIRS	HMI (RS485 Master)	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
70	140	Season	Season	0: Auto, 1: Winter, 2: Summer	MSV	Register	R/W
71	142	Tsummer	Summer temp	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W

72	144	HistSum	Hysteresis	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
73	146	Ch_Tstd	Main sensor	1: HMI (CON), 2: HMI (RS485), 3: Exhaust, 4: PT5	MSV	Register	R/W
74	148	TstdbyAct	Main sensor	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
75	150	StdMode	Active for	1: Heating, 2: Cooling, 3: Heating/cooling	MSV	Register	R/W
76	152	StdHis	Standby hyster.	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
77	154	v1_t	Starting delay	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
78	156	DelThr	Damp.off delay	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
79	158	PresDel	Pressure delay	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
80	160	CoolingTime	Cooling time	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
81	162	Kp_CP	Kp	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
82	164	Ti_CP	Ti	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
83	166	PaSZ1	Set press.gear 1	1pa = 256 (22pa = 22*256 = 5632 = 0x1600)	AV	Register	R/W
84	168	PaSZ2	Set press.gear 2	1pa = 256 (22pa = 22*256 = 5632 = 0x1600)	AV	Register	R/W
85	170	PaSZ3	Set press.gear 3	1pa = 256 (22pa = 22*256 = 5632 = 0x1600)	AV	Register	R/W
86	172	DPTrangeSup	Sensor range	1pa = 256 (22pa = 22*256 = 5632 = 0x1600)	AV	Register	R/W
87	174	PaEZ1	Set press.gear 1	1pa = 256 (22pa = 22*256 = 5632 = 0x1600)	AV	Register	R/W
88	176	PaEZ2	Set press.gear 2	1pa = 256 (22pa = 22*256 = 5632 = 0x1600)	AV	Register	R/W
89	178	PaEZ3	Set press.gear 3	1pa = 256 (22pa = 22*256 = 5632 = 0x1600)	AV	Register	R/W
90	180	DPTrangeExh	Sensor range	1pa = 256 (22pa = 22*256 = 5632 = 0x1600)	AV	Register	R/W
91	182	Sup1	Sup/exh min.	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
92	184	Sup2	Sup/exh med.	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
93	186	Sup3	Sup/exh.max.	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
94	188	Exh1	Exh.min.	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
95	190	Exh2	Exh.med.	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
96	192	Exh3	Exh.max.	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
97	194	RSsup	Sup.via RS485	0: Inactive, 1: Active	MSV	Coil 3104	R/W
98	196	Rsexh	Exh.via RS485	0: Inactive, 1: Active	MSV	Coil 3136	R/W
99	198	RSsup2	2.Sup.via RS485	0: Inactive, 1: Active	MSV	Coil 3168	R/W
100	200	RSexh2	2.Exh.via RS485	0: Inactive, 1: Active	MSV	Coil 3200	R/W
101	202	FminS	Sup.freq.min.	1Hz = 256 (22Hz = 22*256 = 5632 = 0x1600)	AV	Register	R/W
102	204	FmaxS	Sup.freq.max.	1Hz = 256 (22Hz = 22*256 = 5632 = 0x1600)	AV	Register	R/W
103	206	FminE	Exh.freq.min.	1Hz = 256 (22Hz = 22*256 = 5632 = 0x1600)	AV	Register	R/W
104	208	FmaxE	Exh.freq.max.	1Hz = 256 (22Hz = 22*256 = 5632 = 0x1600)	AV	Register	R/W
105	210	AdrSup	Sup.inv.adress	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
106	212	AdrExh	Exh.inv.adress	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W

107	214	AdrSup2	2.Sup.inv.adress	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
108	216	AdrExh2	2.Exh.inv.adress	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
109	218	TaccVent	T.acc.	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
110	220	TdecVent	T.dec.	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
111	222	RECproc	Recovery	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
112	224	FXproc	Reverse freon	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
113	226	MIXproc	Mixing chamber	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
114	228	h_c_proc	Heating/cooling	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
115	230	Kp_Heat	Kp	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
116	232	Ti_Heat	Ti	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
117	234	Kp_Cool	Kp	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
118	236	Ti_Cool	Ti	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
119	238	PIcoolingAct	PI cooling	0 - latem, 1 - latem i zimą	MSV	Register	R/W
120	240	DelOnPIcool	Starting delay	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
121	242	Kp_Blow	Kp	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
122	244	Ti_Blow	Ti	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
123	246	TminBlow	Tmin air blow	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
124	248	TmaxBlow	Tmax air blow	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
125	250	TsetBlowAct	TsetBlowAct	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
126	252	RecMode	Work mode	0: Inactive, 1: Winter, 2: Summer, 3: Winter/summer	MSV	Register	R/W
127	254	RecDown	Starting ramp	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
128	256	TlimRec	Frost limit	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
129	258	MinRot	Frost min.power	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
130	260	KpRec	Kp frost.prot	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
131	262	TiRec	Ti frost.prot	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
132	264	RotAl	Alarm pin	0: NO, 1: NC	MSV	Coil 4224	R/W
133	266	G_Sec	Set protection	0: Inactive, 1: Active	MSV	Coil 4256	R/W
134	268	G_SecDP	Stop period	1dzień = 256 (22dni = 22*256 = 5632 = 0x1600)	AV	Register	R/W
135	270	G_SecT	Run time	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
136	272	InitT100	Preh.100% time	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
137	274	InitTscale	Preh.scale time	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
138	276	RampEn	Falling ramp	0: Inactive, 1: Active	MSV	Coil 4416	R/W
139	278	RampTime	Fall ramp	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
140	280	Init_Tmin	Min T.out	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
141	282	InitVTmin	Min.Tout valve	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W

142	284	Init_Tmax	Max T.out	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
143	286	InitVTmax	Max.Tout.valve	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
144	288	Tlim1	Pump work temp.	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
145	290	MinValve	Min.valve open	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
146	292	TbActive	B8 sensor	0: Inactive, 1: Active	MSV	Coil 4672	R/W
147	294	Tlim2	Frost temp.out.	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
148	296	TbStopFrost	Stop	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
149	298	TbStartFrost	Start	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
150	300	TbStopReg	Stop	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
151	302	TbStartReg	Start	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
152	304	KpBack	Kp	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
153	306	TiBack	Ti	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
154	308	HW_Sec	Set protection	0: Inactive, 1: Active	MSV	Coil 4928	R/W
155	310	HW_SecDP	Stop period	1dzień = 256 (22dni = 22*256 = 5632 = 0x1600)	AV	Register	R/W
156	312	HW_SecT	Run time	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
157	314	GasAl	GAS alarm	0: NC, 1: NO	MSV	Coil 5024	R/W
158	316	mBreakDX	Break time min.	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
159	318	mWorkDX	Work time min.	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
160	320	Tout_minDX	Temp.out work min.	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
161	322	negS5F	Alarm pin	0: NO, 1: NC	MSV	Coil 5152	R/W
162	324	II_IIIactiveDX	Stage 2	0: Inactive, 1: Active	MSV	Coil 5184	R/W
163	326	CascadeDX	Cascade	0: Inactive, 1: Active	MSV	Coil 5216	R/W
164	328	IistageDX	Stage 2	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
165	330	IIistageDX	Stage 3	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
166	332	mBreakFX	Break time min.	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
167	334	mWorkFX	Work time min.	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
168	336	negAFX	Alarm pin	0: NO, 1: NC	MSV	Coil 5376	R/W
169	338	HCmode	Cooling pin	0: NO, 1: NC	MSV	Coil 5408	R/W
170	340	DefFunc	Defrost	0: Stop system, 1: Low gear, 2: No reaction	MSV	Register	R/W
171	342	ModeMix	Work mode	0: Manual, 1: Temperature, 3: Temp./CO2	MSV	Register	R/W
172	344	PrioMH	Priority to	0: Mix chamber, 1: Heating/cooling	MSV	Coil 5504	R/W
173	346	MinFresh	Min.fresh air	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
174	348	MaxFresh	Max.fresh air	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
175	350	FHEn	Fast heating	0: Inactive, 1: Active	MS	Register	R/W
176	352	TlimMCH	Temp.setpoint	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
177	354	HistMCH	Hysteresis	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
178	356	SetCO2	Set CO2	1ppm = 256 (22 ppm = 22*256 = 5632 = 0x1600)	AV	Register	R/W

179	358	Kp_CO2	Kp	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
180	360	Ti_CO2	Ti	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
181	362	ppmMin	0 V	1ppm = 256 (22 ppm = 22*256 = 5632 = 0x1600)	AV	Register	R/W
182	364	ppmMax	10 V	1ppm = 256 (22 ppm = 22*256 = 5632 = 0x1600)	AV	Register	R/W

Service menu

Addres DEC		Variable name	HMI Name	States	Type		Read [R] /Write [W]
BacNet	Modbus				BacNet	Modbus	
183	366	ServiceMode	Service mode	0: Inactive, 1: Active	MSV	Coil 5856	R/W
184	368	TYPE	Type	1: Supply, 2: Supply/exhaust, 4: 2xSup/2xexh	MSV	Register	R/W
185	370	RECOVERY	Recovery	0: None, 64: Rotary, 32: Cross, 16: Glycol, 8: Mix chamber, 4: Rotary/mix chamb., 2: Cross/mix chamb., 1: Glycol/mix chamb.	MSV	Register	R/W
186	372	REVERSE	Reverse freon	0: None, 1: Active	MSV	Coil 5952	R/W
187	374	COOL	Cooler	0: None, 1: DX, 2: Water	MSV	Register	R/W
188	376	HEAT	Heater	0: None, 1: Electric, 2: Water, 4: GAS	MSV	Register	R/W
189	378	PowOnTime	Start time	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
190	380	FuncDin5	DIN5 function	0: Inactive, 1: 1S2H, 2: DEF	MSV	Register	R/W
191	382	FuncDin12	DIN12 function	0: ON/OFF, 1: A_StopS1	MSV	Coil 6112	R/W
192	384	FanInverters	Fan inverter type	1: IC5,IG5, 2: FC51, 4: FC101, 8: EC Blue, 16: EBM	MSV	Register	R/W
193	386	ActualAdrECB	Actual adress	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
194	388	AdrToSetECB	Adress to set	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
195	390	ActiveConfigECB	Set adress	0: No, 1: Yes	MSV	Coil 6240	R/W
196	392	StatusConfECB	Status	0: Com Ok, 1: In progress, 2: A_Com, 3: A_Com	MSV	Coil 6272	R/W
197	394	ActualAdrEBM	Actual adress	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
198	396	AdrToSetEBM	Adress to set	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
199	398	ActiveConfigEBM	Set adress	0: No, 1: Yes	MSV	Coil 6368	R/W
200	400	StatusConfEBM	Status	0: Com Ok, 1: In progress, 2: A_Com, 3: A_Com	MSV	Coil 6400	R/W
201	402	ConstPress	Const.pressure	0: Inactive, 1: Active	MSV	Coil 6432	R/W
202	404	PresVent.	Ventilator pressure switch	0: Inactive, 1: 1S1F, 2: 1S1F/2S1F	MSV	Register	R/W
203	406	Sup0_10	Supply 0-10VDC	0: Inactive, 1: Aout1, 2: Aout2, 4: Aout3, 8: Aout4	MSV	Register	R/W
204	408	Exh0_10	Exhaust 0-10VDC	0: Inactive, 1: Aout1, 2: Aout2, 4: Aout3, 8: Aout4	MSV	Coil 6528	R
205	410	Tiny	HMI Tiny	0: Inactive, 1: Active	MSV	Coil 6560	R/W
206	412	FrostAlarm	Alarm A_ColdRec	0: Inactive, 1: Active	MSV	Coil 6592	R/W
207	414	RecFrostProt	Recovery sensor	0: Pressure switch, 1: Temperature	MSV	Coil 6624	R/W
208	416	HEcontrol	HE control	0: 0-10VDC, 1: PWM	MSV	Coil 6656	R/W
209	418	Re_Work	Work - contact	0: Inactive, 1: Re1, 2: Re2, 4: Re3, 8: Re4, 16: Re5, 32: Re6, 64: Re7, 128: Re8	MSV	Register	R/W

210	420	Re_Alarm	Alarm - contact	0: Inactive, 1: Re1, 2: Re2, 4: Re3, 8: Re4, 16: Re5, 32: Re6, 64: Re7, 128: Re8	MSV	Register	R/W
211	422	TexhAct	Exhaust sensor	0: Inactive, 1: Active	MSV	Coil 6752	R/W
212	424	TsetChT	Tset change	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
213	426	RegType	Regulator	0: "1", 1: "2"	MSV	Coil 6816	R/W
214	428	Ao1scale	Aout1	0 - "0-10VDC", 1 - "2-10VDC"	MSV	Coil 6848	R/W
215	430	Ao2scale	Aout2	0 - "0-10VDC", 1 - "2-10VDC"	MSV	Coil 6880	R/W
216	432	Ao3scale	Aout3	0 - "0-10VDC", 1 - "2-10VDC"	MSV	Coil 6912	R/W
217	434	Ao4scale	Aout4	0 - "0-10VDC", 1 - "2-10VDC"	MSV	Coil 6944	R/W
218	436	Tcom	Tcom	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
219	438	Twait	Twait	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
220	440	MaxDiff	Difference	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
221	442	T1	T1	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
222	444	T2	T2	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
223	446	T3	T3	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
224	448	T4	T4	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
225	450	T5	T5	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
226	452	T6	T6	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
227	454	T7	T7	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
228	456	T8	T8	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
229	458	T9	T9	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
230	460	T10	T10	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
231	462	T11	T11	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
232	464	T12	T12	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
233	466	T13	T13	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
234	468	T14	T14	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
235	470	T15	T15	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
236	472	HistPeriod	Period	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
237	474	Reset	Reset	0: Off, 1: On	MSV	Coil 7584	R/W
238	476	_DIN1	Din1	0: Opened, 1: Closed	MSV	Coil 7616	R
239	478	_DIN2	Din2	0: Opened, 1: Closed	MSV	Coil 7648	R
240	480	_DIN3	Din3	0: Opened, 1: Closed	MSV	Coil 7680	R
241	482	_DIN4	Din4	0: Opened, 1: Closed	MSV	Coil 7712	R
242	484	_DIN5	Din5	0: Opened, 1: Closed	MSV	Coil 7744	R
243	486	_DIN6	Din6	0: Opened, 1: Closed	MSV	Coil 7776	R
244	488	_DIN7	Din7	0: Opened, 1: Closed	MSV	Coil 7808	R
245	490	_DIN8	Din8	0: Opened, 1: Closed	MSV	Coil 7840	R
246	492	_DIN9	Din9	0: Opened, 1: Closed	MSV	Coil 7872	R
247	494	_DIN10	Din10	0: Opened, 1: Closed	MSV	Coil 7904	R
248	496	_DIN11	Din11	0: Opened, 1: Closed	MSV	Coil 7936	R
249	498	_DIN12	Din12	0: Opened, 1: Closed	MSV	Coil 7968	R

250	500	Ain_1	AIN1	1V = 256 (22V = 22*256 = 5632 = 0x1600)	AV	Register	R
251	502	Ain_2	AIN2	1V = 256 (22V = 22*256 = 5632 = 0x1600)	AV	Register	R
252	504	Ain_3	AIN3	1V = 256 (22V = 22*256 = 5632 = 0x1600)	AV	Register	R
253	506	PT_1	PT1	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
254	508	PT_2	PT2	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
255	510	PT_3	PT3	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
256	512	PT_4	PT4	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
257	514	PT_5	PT5	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
258	516	HMI_Con	HMI (CON)	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
259	518	HMI_RS	HMI (RS485 Master)	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
260	520	Re1	Re1	0: Off, 1: On	MSV	Coil 8320	R
261	522	Re2	Re2	0: Off, 1: On	MSV	Coil 8352	R
262	524	Re3	Re3	0: Off, 1: On	MSV	Coil 8384	R
263	526	Re4	Re4	0: Off, 1: On	MSV	Coil 8416	R
264	528	Re5	Re5	0: Off, 1: On	MSV	Coil 8448	R
265	530	Re6	Re6	0: Off, 1: On	MSV	Coil 8480	R
266	532	Re7	Re7	0: Off, 1: On	MSV	Coil 8512	R
267	534	Re8	Re8	0: Off, 1: On	MSV	Coil 8544	R
268	536	AO1	AOU1	1V = 256 (22V = 22*256 = 5632 = 0x1600)	AV	Register	R
269	538	AO2	AOU2	1V = 256 (22V = 22*256 = 5632 = 0x1600)	AV	Register	R
270	540	AO3	AOU3	1V = 256 (22V = 22*256 = 5632 = 0x1600)	AV	Register	R
271	542	AO4	AOU4	1V = 256 (22V = 22*256 = 5632 = 0x1600)	AV	Register	R
272	544	F_DIN1	Din1	0: No emulation, 1: Set opened, 3: Set closed	MSV	Register	R/W
273	546	F_DIN2	Din2	0: No emulation, 1: Set opened, 3: Set closed	MSV	Register	R/W
274	548	F_DIN3	Din3	0: No emulation, 1: Set opened, 3: Set closed	MSV	Register	R/W
275	550	F_DIN4	Din4	0: No emulation, 1: Set opened, 3: Set closed	MSV	Register	R/W
276	552	F_DIN5	Din5	0: No emulation, 1: Set opened, 3: Set closed	MSV	Register	R/W
277	554	F_DIN6	Din6	0: No emulation, 1: Set opened, 3: Set closed	MSV	Register	R/W
278	556	F_DIN7	Din7	0: No emulation, 1: Set opened, 3: Set closed	MSV	Register	R/W
279	558	F_DIN8	Din8	0: No emulation, 1: Set opened, 3: Set closed	MSV	Register	R/W
280	560	F_DIN9	Din9	0: No emulation, 1: Set opened, 3: Set closed	MSV	Register	R/W
281	562	F_DIN10	Din10	0: No emulation, 1: Set opened, 3: Set closed	MSV	Register	R/W
282	564	F_DIN11	Din11	0: No emulation, 1: Set opened, 3: Set closed	MSV	Register	R/W
283	566	F_DIN12	Din12	0: No emulation, 1: Set opened, 3: Set closed	MSV	Register	R/W
284	568	Em_Ai1	AIN1 emulation	0: Disabled, 1: Enabled	MSV	Coil 9088	R/W
285	570	E_Ai1	AIN1	1V = 256 (10V = 10*256 = 2560 = 0xA00)	AV	Register	R/W
286	572	Em_Ai2	AIN2 emulation	0: Disabled, 1: Enabled	MSV	Coil 9152	R/W
287	574	E_Ai2	AIN2	1V = 256 (10V = 10*256 = 2560 = 0xA00)	AV	Register	R/W

288	576	Em_Ai3	AIN3 emulation	0: Disabled, 1: Enabled	MSV	Coil 9216	R/W
289	578	E_Ai3	AIN3	1V = 256 (10V = 10*256 = 2560 = 0xA00)	AV	Register	R/W
290	580	Em_PT1	PT1 emulation	0: Disabled, 1: Enabled	MSV	Coil 9280	R/W
291	582	E_PT1	PT1	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
292	584	Em_PT2	PT2 emulation	0: Disabled, 1: Enabled	MSV	Coil 9344	R/W
293	586	E_PT2	PT2	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
294	588	Em_PT3	PT3 emulation	0: Disabled, 1: Enabled	MSV	Coil 9408	R/W
295	590	E_PT3	PT3	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
296	592	Em_PT4	PT4 emulation	0: Disabled, 1: Enabled	MSV	Coil 9472	R/W
297	594	E_PT4	PT4	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
298	596	Em_PT5	PT5 emulation	0: Disabled, 1: Enabled	MSV	Coil 9536	R/W
299	598	E_PT5	PT5	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
300	600	Em_Hcon	Emul. HMI (CON)	0: Disabled, 1: Enabled	MSV	Coil 9600	R/W
301	602	E_Hcon	HMI (CON)	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
302	604	Em_Hrs	Emul. HMI (RS485 Master)	0: Disabled, 1: Enabled	MSV	Coil 9664	R/W
303	606	E_Hrs	HMI (RS485 Master)	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
304	608	F_Re1	Re1	0: No force, 1: Force off, 3: Force on	MSV	Register	R/W
305	610	F_Re2	Re2	0: No force, 1: Force off, 3: Force on	MSV	Register	R/W
306	612	F_Re3	Re3	0: No force, 1: Force off, 3: Force on	MSV	Register	R/W
307	614	F_Re4	Re4	0: No force, 1: Force off, 3: Force on	MSV	Register	R/W
308	616	F_Re5	Re5	0: No force, 1: Force off, 3: Force on	MSV	Register	R/W
309	618	F_Re6	Re6	0: No force, 1: Force off, 3: Force on	MSV	Register	R/W
310	620	F_Re7	Re7	0: No force, 1: Force off, 3: Force on	MSV	Register	R/W
311	622	F_Re8	Re8	0: No force, 1: Force off, 3: Force on	MSV	Register	R/W
312	624	FoAO1	Aout1 Forcing	0: Disabled, 1: Enabled	MSV	Coil 9984	R/W
313	626	F_AO1	Aout1	1V = 256 (10V = 10*256 = 2560 = 0xA00)	AV	Register	R/W
314	628	FoAO2	Aout2 Forcing	0: Disabled, 1: Enabled	MSV	Coil 10048	R/W
315	630	F_AO2	Aout2	1V = 256 (10V = 10*256 = 2560 = 0xA00)	AV	Register	R/W
316	632	FoAO3	Aout3 Forcing	0: Disabled, 1: Enabled	MSV	Coil 10112	R/W
317	634	F_AO3	Aout3	1V = 256 (10V = 10*256 = 2560 = 0xA00)	AV	Register	R/W
318	636	FoAO4	Aout4 Forcing	0: Disabled, 1: Enabled	MSV	Coil 10176	R/W
319	638	F_AO4	Aout4	1V = 256 (10V = 10*256 = 2560 = 0xA00)	AV	Register	R/W

Alarms

Addres DEC		Variable name	HMI Name	States	Type		Read [R] /Write [W]
BacNet	Modbus				BacNet	Modbus	
320	640	ResetAlarms	ResetAlarms	0 - no reset, 1 - reset	MSV	Coil 10240	R/W
321	642	A_Code	Wrong central type code (do not set supply + glicol, rotary or cross recovery)	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 10272	R
322	644	A_AF	Fire-prevention alarm	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 10304	R
323	646	A_StopS1	Alarm - S1 turned off	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 10336	R

324	648	A_ThHWair	Alarm of the thermostat frost-resistant	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 10368	R
325	650	A_3xThHWair	Alarm of the thermostat frost-resistant (3 times appearance of the alarm within an hour)	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 10400	R
326	652	A_ThHWwater	Low temperature alarm of return water water heater	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 10432	R
327	654	A_3xThHWwater	Low temperature alarm of return water water heater (3 times appearance of the alarm A_ThHWwater within an hour)	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 10464	R
328	656	A_ThHE	Alarm of the themrostat electric heater	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 10496	R
329	658	A_3xThHE	Alarm of the termostat electric heater (3 times appearance of the alarm within an hour)	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 10528	R
330	660	A_ThGAS	Alarm of the themrostat GAS heater	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 10560	R
331	662	A_3xThGAS	Alarm of the termostat GAS heater (3 times appearance of the alarm within an hour)	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 10592	R
332	664	A_DX	Alarm of the freon cooler	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 10624	R
333	666	A_FX	Alarm of the freon reverse heater / cooler	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 10656	R
334	668	A_RecFC	Alarm of the speed governor of the rotational recuperation	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 10688	R
335	670	A_ColdRec	Alarm of frosting the recuperation	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 10720	R
336	672	A_SupFilter	Alarm of the dirty filter of the air blowing	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 10752	R
337	674	A_SupFilter2	Alarm of the dirty secondary filter of the air blowing	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 10784	R
338	676	A_ExhFilter	Alarm of the dirty filter of the oulet	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 10816	R
339	678	A_SupFC	Alarm of the fan of the air blowing	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 10848	R
340	680	A_ExhFC	Alarm of the fan of the outlet	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 10880	R
341	682	A_ComSupFC	Alarm lock of communication with the inverter supply	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 10912	R
342	684	A_ComSupFC2	Alarm lock of communication with the secondary inverter supply	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 10944	R
343	686	A_ComExhFC	Alarm lock of communication with the inverter exhaust	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 10976	R
344	688	A_ComExhFC2	Alarm lock of communication with the secondary inverter exhaust	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 11008	R
345	690	A_SupPres	Alarm of the fan of the air blowing (examined differential pressure switch)	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 11040	R
346	692	A_ExhPres	Alarm of the fan of the outlet (examined differential pressure switch)	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 11072	R
347	694	A_Tsup	Alarm of the temperature sensor of the air blowing	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 11104	R
348	696	A_Texh	Alarm of the temperature sensor of the outlet	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 11136	R
349	698	A_Tout	Alarm of the temperature sensor outside	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 11168	R
350	700	A_Trec	Alarm of the temperature sensor behind the recuperation	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 11200	R
351	702	A_TbackWater	Alarm of the contact temperature sensor return water heater	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 11232	R

352	704	A_Tmain	Alarm of the temperature sensor leading	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 11264	R
353	706	A_InEmul	Alarm of the emulation of entries of the controler	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 11296	R
354	708	A_OutForce	Alarm of pushing exits of the controler	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 11328	R
355	710	Alarm	Collective alarm	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 11360	R

9. Communication Bacnet MS-TP with BMS system

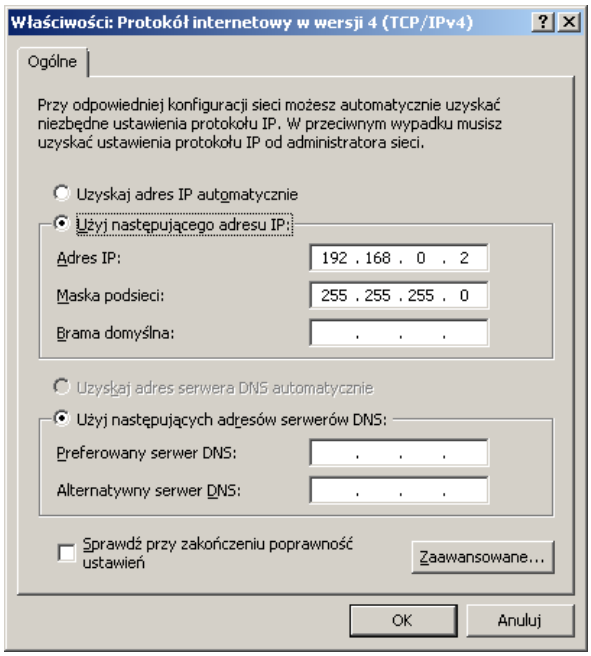
Variables BacNet should look after connecting the powered controller and the introduction of appropriate BacNet network settings (see item5)

10. Controls BY WEBSITE

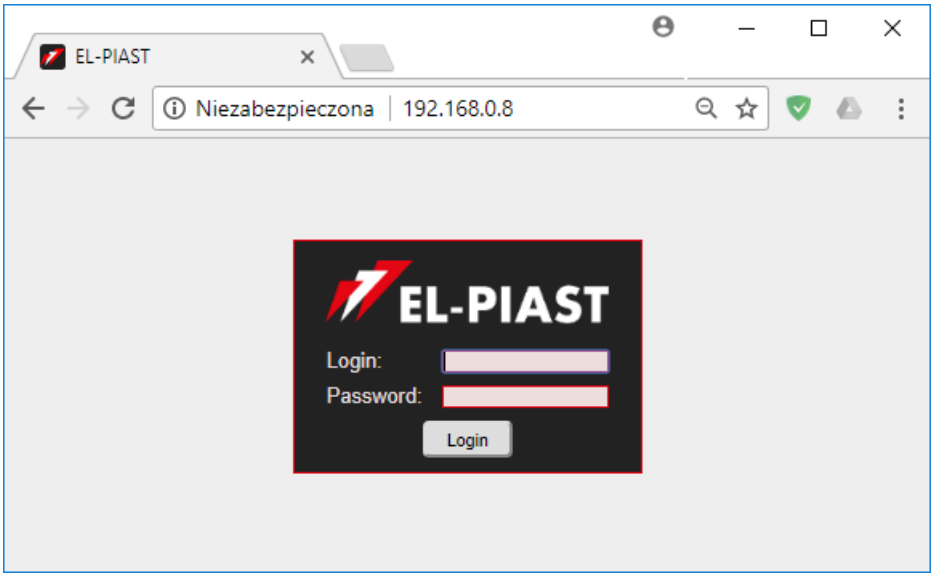
The controller is equipped with the ability of control through a website interface. The required hardware component is optional Ethernet card installed in the position marked below:

To connect from a local computer connected directly with a cable to Ethernet card ETH of the ELP11R32 controller you have to:

Change the settings of the computer's network card protocol TCP4 for the following values:



Then, open a Web browser and type the default controller address: 192.168.0.8
A window will appear where you should enter the default username: admin and password: admin

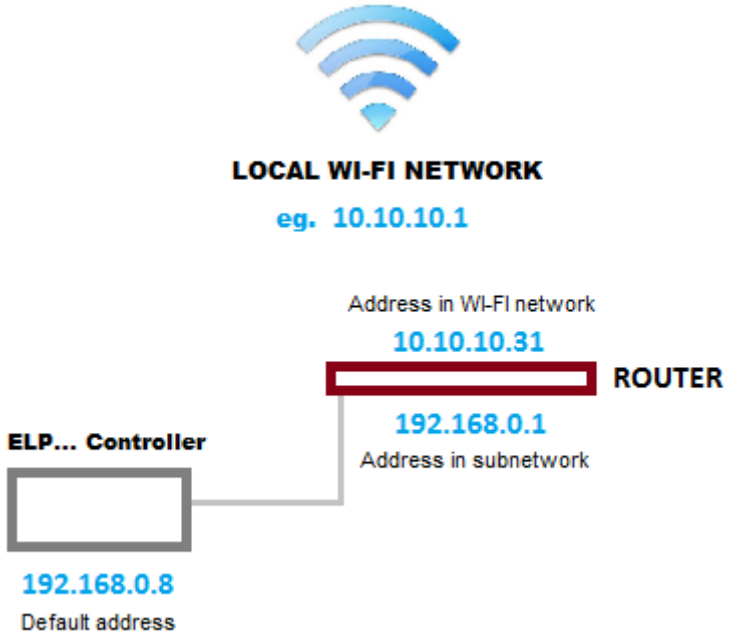


After entering the login and password, and approved by "Login" button, HMI controller screen appears in which we can make the settings and readings of full control menu (remember that all EL-Piast controllers are freely programmable and screens may vary depending on the function of the application).

The ELP11R32 controller has Ethernet interface, so in order to connect the controller wirelessly to a local wireless network (Wi-Fi), you need to apply additional router - as an access point to set up a local area network WIFI, then connect the ELP11R32 controller to the router. The network settings of the router and the ELP11R32 controller must comply. ELP11R32 ports have to be redirected to an external address of the router.

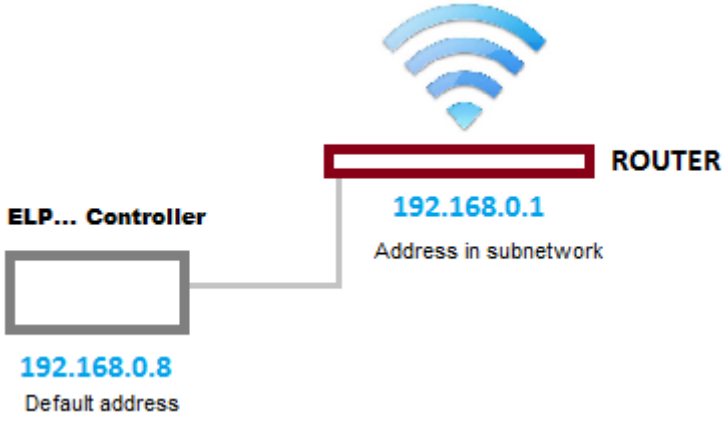
Here is a schematic example for different ways of connection:

Connection of the ELP11R32 controller to the local network via WIFI



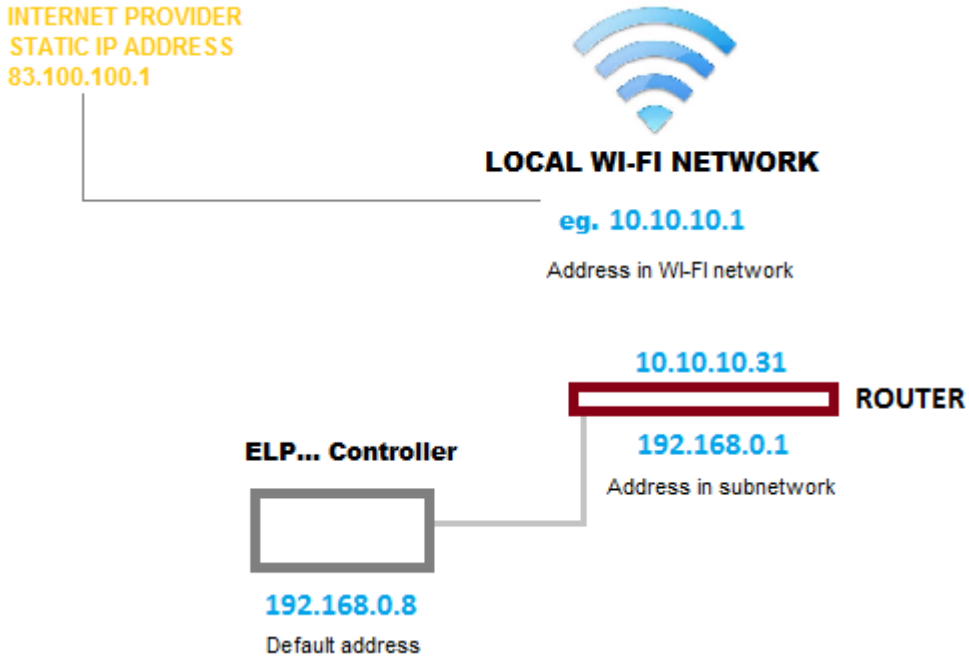
Router with port redirection: 80. From the ELP11R32 controller: 192.168.0.8:80 to sample external address of the router: 10.10.10.31. As a result we see ELP11R32 controller in local WIFI network.
By connecting with a local network we have an access to the ELP11R32 controller under the website http://10.10.10.31

1.Direct communication with the ELP11R32 controller through WIFI Router



Router with port redirection: 80. From the ELP11R32 controller: 192.168.0.8:80 to sample external address of the router: 192.168.0.1. As a result we see ELP11R32 controller in local WIFI network.
By connecting to dedicated network we have an access to the ELP11R23 controller under the website http://192.168.0.8

2. Connection of the ELP11R32 controller to the local network via WIFI with access from outside



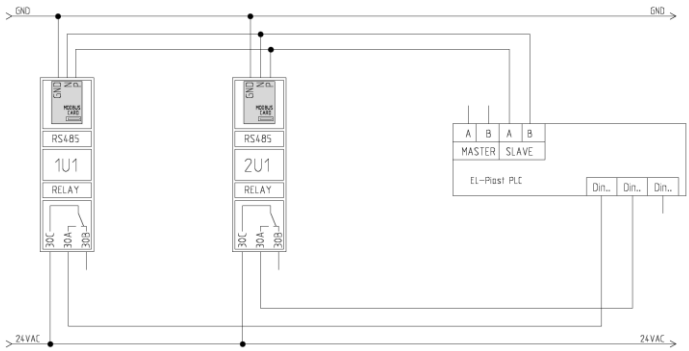
Port redirection on main Router from WIFI Router of ELP11R32 Controller: port:80 from IP:10.10.10.31 to outside IP port: 80 IP: 83.100.100.1

Router with port redirection: 80. From the ELP11R32 controller: 192.168.0.8:80 to sample external address of the router: 10.10.10.31. As a result we see ELP11R32 controller in local WIFI network.
By connecting with any internet connection we have an access to the ELP11R32 controller under the website http://83.100.100.1

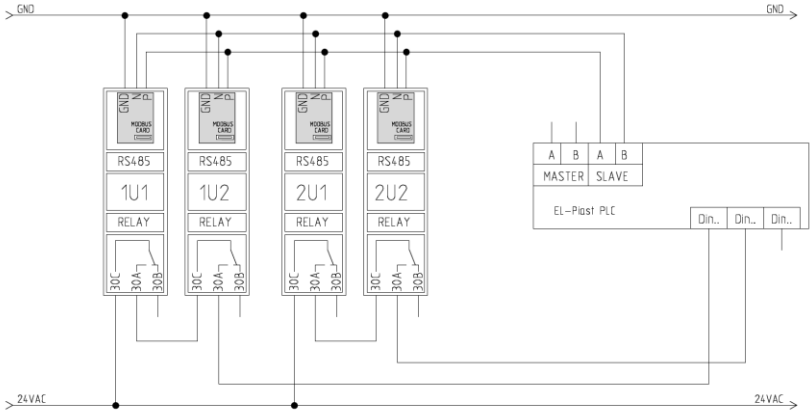
11. Communication RS485 Slave, Modbus RTU with inverters LG IC5

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 single supply, single exhaust



Example for system with double supply, double exhaust



Configuration drive LG IC5 control RS485:

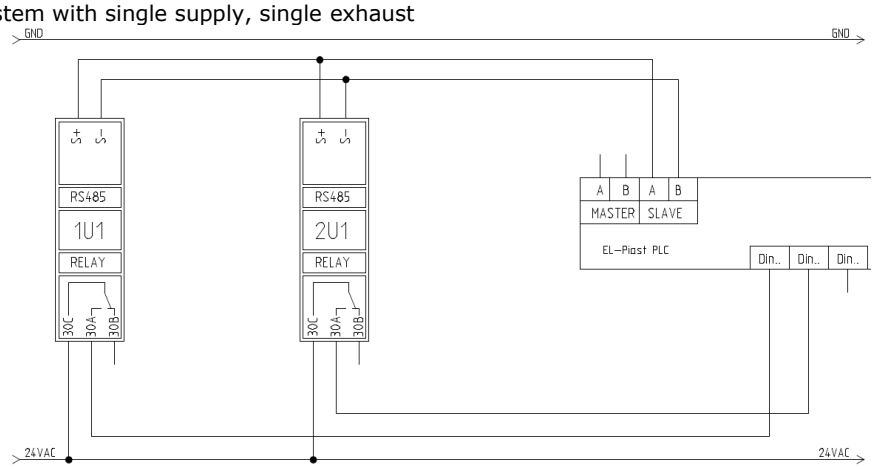
Code	Name	Value to be set	Description
drv	Control mode	3	Communication RS485
Frq	The method of frequency	8	Communication Modbus-RTU
F21	Maximum output frequency	**Fz max**	Set individual
F22	Rated motor frequency	…Hz	Set individual
F23	The minimum frequency reference	0.000	**Always enter the value**
F30	Characteristic U/F	**0**	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 witout alarm
I60	Drive address	1	Inverter supply fan
		2	Inverter exhaust fan
		3	Inverter 2 supply fan
		4	Inverter 2 exhaust fan
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 fan efficiency (resulting from the adjustment of air distribution system). Initially, enter the frequency from the Air Handling Unit documentation.

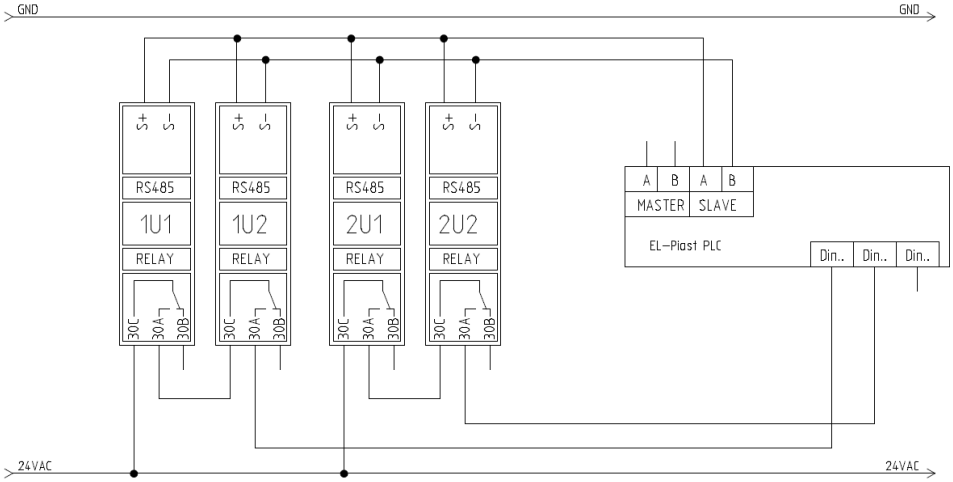
NOTE: The settings in the controller (Settings/Fan/RS485/Maximum frequency) must be at least 0.1Hz lower than Fzmax, otherwise the inverter may show control errors.

12. Communication RS485 Slave, Modbus RTU with inverters LG IG5

Example for system with single supply, single exhaust



Example for system with double supply, double exhaust



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	**Fz max**	Set individual
F22	Rated motor frequency	...Hz	Set individual
F23	The minimum frequency reference	0.000	**Always enter the value**
F30	Characteristic U/F	**0**	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 supply fan
		2	Inverter exhaust fan
		3	Inverter 2 supply fan
		4	Inverter 2 exhaust fan
I61	transmission speed	3	9600
I62	Reaction to loss of communication	2	Stop
I63	Communication time	10.0	

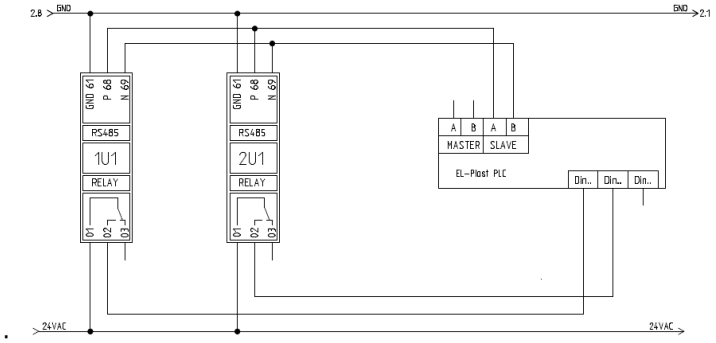
Fz max - frequency inverter for work at maximum fan efficiency (resulting from the adjustment of air distribution system). Initially, enter the frequency from the Air Handling Unit documentation.

NOTE: The settings in the controller (Settings/Fan/RS485/Maximum frequency) must be at least 0.1Hz lower than Fzmax, otherwise the inverter may show control errors.

13. 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 single supply, single exhaust



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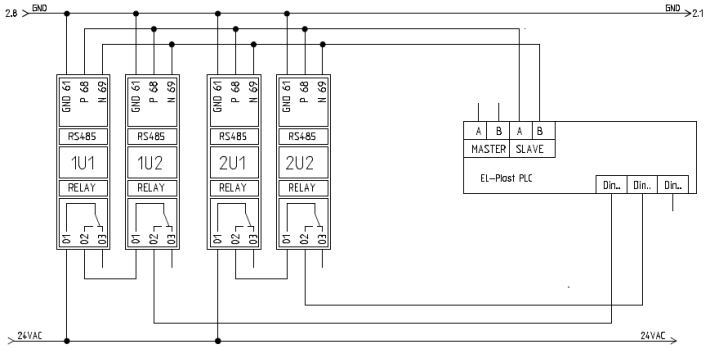
Example for system with double supply, double exhaust



Configuration drive Danfoss FC51 control RS485

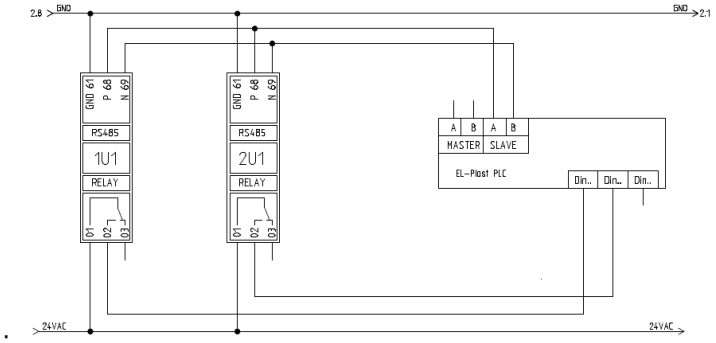
Code	Name	Value to be set	Description
1-03	Characteristic U/F	0	Linear
1-20	Rated motor power	...kW	With the motor nameplate
1-24	Rated motor current	...A	With the motor nameplate
1-25	Rated motor speed	...rpm	With the motor nameplate
1-90	Motor overload protection	4	Emergency off ETR
3-02	The minimum frequency reference	0.000	**Always enter the value**
3-03	The maximum frequency reference	**Fz max**	Set individual
3-17	Control input	11	Modbus
4-14	Maximum output frequency	**Fz max**	Set individual
4-16	Output current limitation	150,0	-
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 supply fan
		2	Inverter exhaust fan
		3	Inverter 2 supply fan
		4	Inverter 2 exhaust fan
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 fan efficiency (resulting from the adjustment of air distribution system). Initially, enter the frequency from the Air Handling Unit documentation.

14. Communication RS485 Slave, Modbus RTU with inverters Danfoss FC101

http://drives.danfoss.us/products/vlt/low-voltage-drives/vlt-hvac-basic-drive-fc-101/#/

Example for system with single supply, single exhaust



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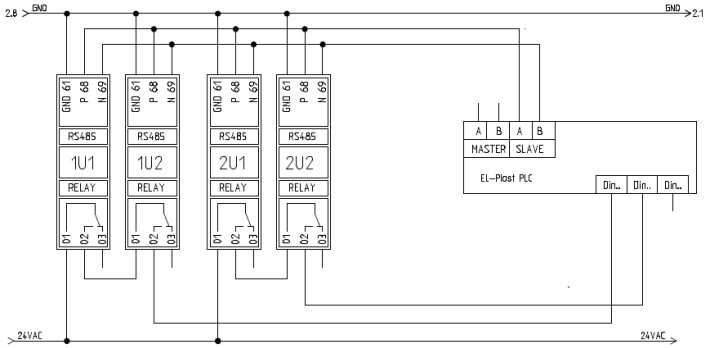
Example for system with double supply, double exhaust



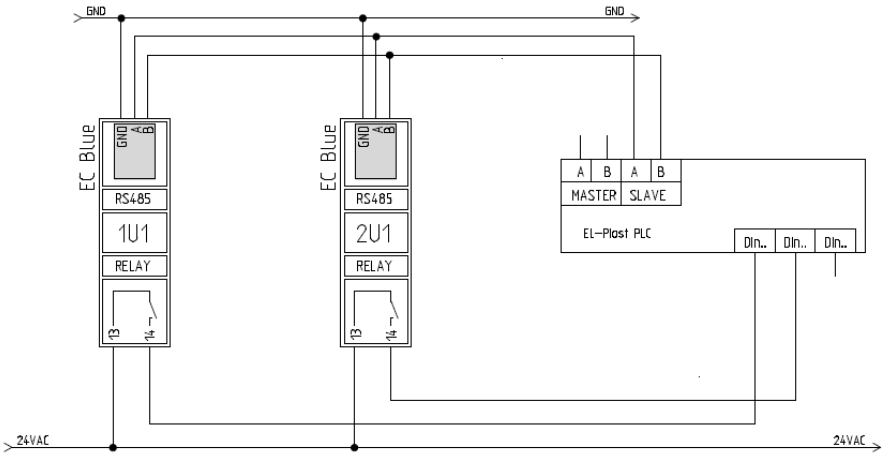
In addition, the DANFOS FC101 inputs must be shorted with numbers 12 and 27

Configuration drive Danfoss FC101 control RS485

Code	Name	Value to be set	Description
1-03	Characteristic U/F	3	-
1-20	Rated motor power	...kW	According to motor nameplate
1-24	Rated motor current	...A	According to motor nameplate
1-25	Rated motor speed	...rpm	According to motor nameplate
1-90	Motor overload thermal protection	4	Emergency off ETR
3-02	The minimum frequency reference	0.000	**Always enter the value**
3-03	The maximum frequency reference	**Fz max**	Set individual
3-17	Control input	11	Modbus
4-14	Maximum output frequency	**Fz max**	Set individual
4-18	Output current limitation	150,0	-
5-40	Relay function	06	Work without alarm
8-01	Control	0	Digital and communication
8-02	Control	1	FC PORT
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 supply fan
		2	Inverter exhaust fan
		3	Inverter 2 supply fan
		4	Inverter 2 exhaust fan
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 fan efficiency (resulting from the adjustment of air distribution system). Initially, enter the frequency from the Air Handling Unit documentation.

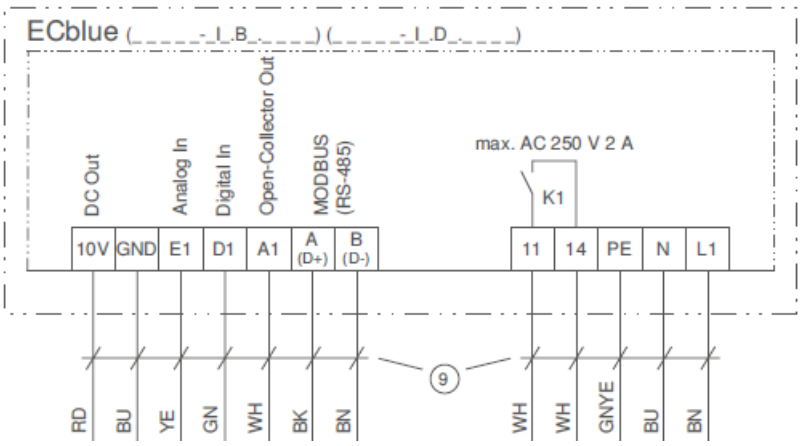
15. Communication RS485 Slave, Modbus RTU with EC Blue motors



Example for single supply, single exhaust.

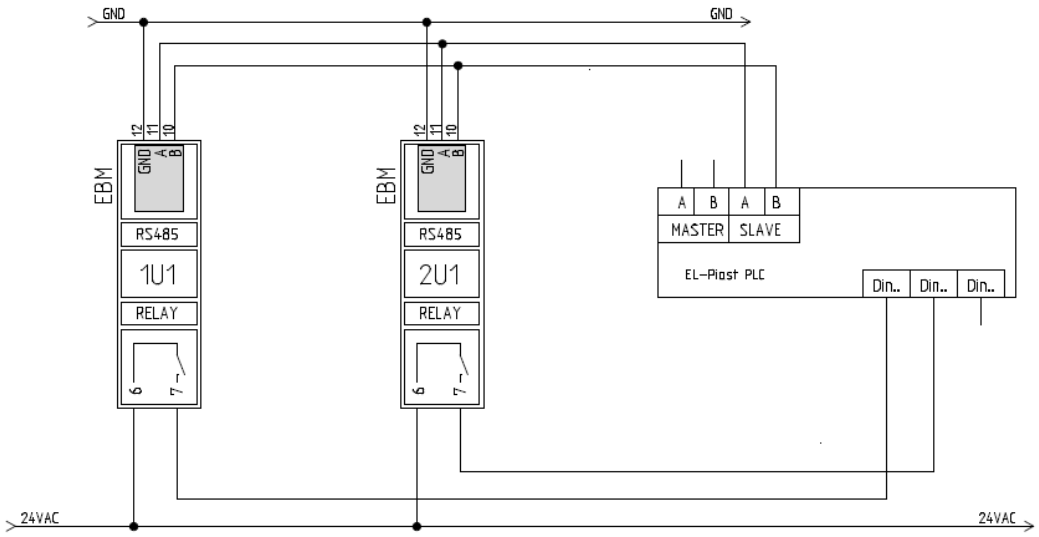
Wiring connection of EC Blue fan

Connection	Color of cable	Cable function
PE	yellow/green	Ground
N	blue	Power supply –„0”
L	brown	Power supply – phase
11	white 1	Motor status relay – closed -> work confirmation
12	white 2	
B	brown	RS-485 MODBUS
A	black	
GND	blue	„0” for control signal



EC Blue Fan Controller Configuration - Service Menu/Fans/EC Blue Address

16. Communication RS485 Slave, Modbus RTU with inverters EBM motors



Example for single supply, single exhaust.

Wiring connection of EC Blue fan

Cable nr.	Connection	Color of cable	Cable function
1,2	PE	yellow/green	Ground
3	N	blue	Power supply –„0”
5	L	black	Power supply – phase
6	NC	white 1	Motor status relay – closed -> work confirmation
7	COM	white 2	
10	RSB	brown	RS485 MODBUS
11	RSA	white	RS 485 MODBUS
12	GND	blue	„0” for control signal

EBM Fan Controller Configuration - Service Menu/Fans/EBM Address

17. 0-10VDC control in Danfoss FC51, LG IC5 and LG IG5 inverters in AHU configuration with rotary heat exchanger.

Configuration of LG IC5 or LG IG5 drives, 0-10VDC control:

Code	Name	Value to be set	Description
H93	Return to factory settings	1	All parameters
Drv	Control mode	1	Switching on forward work
Frq	The method of frequency	3	Terminal V1 – 0-10V
Acc	Acceleration time	30s	-
Dec	The stopping time	30s	-
F21	Maximum output frequency	**Fz max**	Set individual
F22	Rated motor frequency	…Hz	Set individual
F23	The minimum frequency reference	5.1	**Always enter this value**
F30	Characteristic U/F	**0**	Linear
F50	Motor overload protection	1	Active
H20	Power on start selection	1	Autorestart
H30	Rated motor power	…kW	According to motor nameplate
H33	Rated motor current	…A	According to motor nameplate
I7	Minimum voltage input V1	0,1V	Always enter this value
I8	The frequency corresponding to the voltage in parameter I7	5 Hz	Always enter this value
I9	Maximum voltage input V1	10V	Always enter this value
I10	The frequency corresponding to the voltage in parameter I9	…Hz	Set individual = Fzmax
I55	Relay function	12	Work without alarm

Fz max - frequency inverter for work at maximum fan efficiency (resulting from the adjustment of air distribution system). Initially, enter the frequency from the Air Handling Unit documentation.

Connection:
V1 – 0-10VDC control from the PLC controller
CM – „0” from the PLC controller
3A,3B – Potential-free relay - confirmation of operation
P1, CM – permanently jumper

Configuration of Danfoss FC51 drives, 0-10VDC control:

Code	Name	Value to be set	Description
0-51	Return to factory settings	9	After restoring AL80 appears to be confirmed by pressing the OFF RESET button on the inverter
1-03	Characteristic U/F	0	Constant torque
1-20	Rated motor power	...kW	According to motor nameplate
1-24	Rated motor current	...A	According to motor nameplate
1-25	Rated motor speed	...rpm	According to motor nameplate
1-29	Auto-tuning	3	After auto-tuning, confirm with OK
1-90	Motor overload thermal protection	4	Emergency off ETR
3-02	The minimum frequency reference	0.000	**Always enter the value**
3-03	The maximum frequency reference	**Fz max**	Set individual
3-15	Setpoint source 1	1	Analog Input 53
3-41	Acceleration time 1	30s	Acceleration time
3-42	The stopping time 1	30s	The stopping time
4-12	Minimum output frequency	0	Always enter this value
4-14	Maximum output frequency	Fz max	Set individual
4-16	Limiting output current	150.0	-
5-10	Determine the function of the multifunctional input 18	8	Start
5-40	Relay function	6	Work without alarm
6-10	Lower voltage scale (terminal 53)	0,1V	Always enter this value
6-11	Upper voltage scale (terminal 53)	10V	Always enter this value
6-14	The frequency corresponding to the voltage in parameter 6-10	5.000 Hz	Always enter this value
6-15	The frequency corresponding to the voltage in parameter 6-11	…Hz	Set individual = Fzmax
6-90	Output type 42	2	Digital Output
6-92	Digital Output function 42	60	Comparator 0
13-10 / 0	Comparative argument 0	12	Analog Input 53
13-11 / 0	Condition for the comparator 0	2	Larger than the limit
13-12 / 0	Comparator limit 0	0,1	Exceeding the value 0.1V on the input 53, will switch on the digital output 42 which will be set to 18 and switch on the inverter

Fz max - frequency inverter for work at maximum fan efficiency (resulting from the adjustment of air distribution system). Initially, enter the frequency from the Air Handling Unit documentation.

Connection:
55 – „0” from the PLC controller
53 – 0-10VDC control from the PLC controller
Relay 01, 02 – Potential-free relay - confirmation of operation
18, 42 – permanently jumper