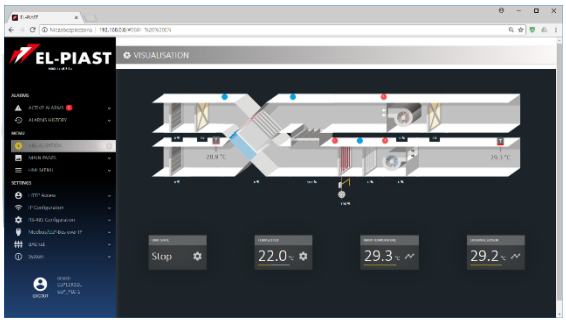
Operation instruction

Control system EL-PIAST MAX L+ with MAX application

WWW.VENTIAIR.COM

Software version from 6.4

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



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The device is manufactured in accordance with the European standard EN1886, EN13053

This documentation must always be handed over to the customer!
In case of non-compliance with the conditions stated in this documentation, VentiAir s.r.o. reserves the right to refuse the warranty.

Version 02/2022

1 CONTENTS

2 GENERAL INFORMATION

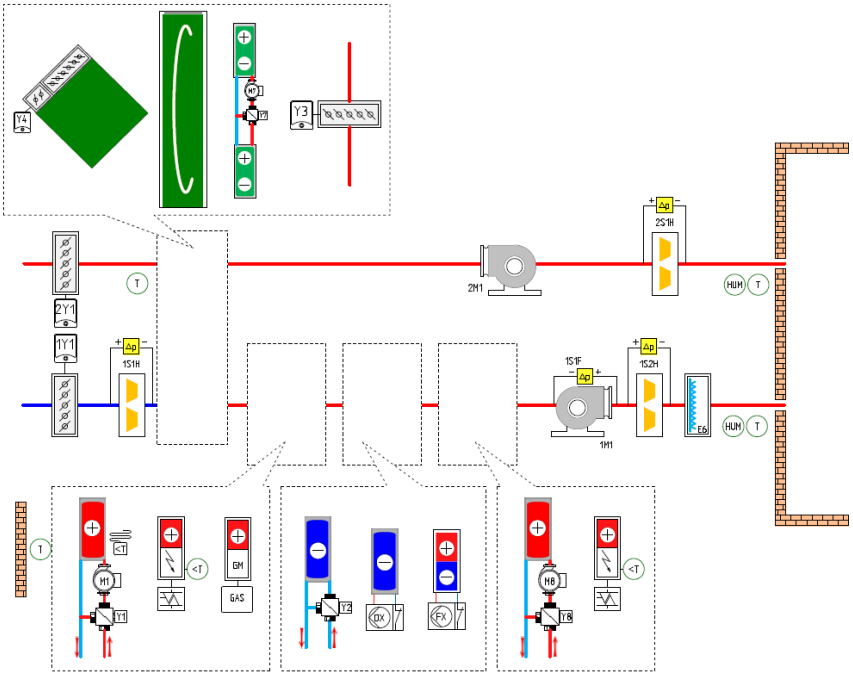
The control box can be handled by untrained personnel.

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

2.1 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
- Systems with a humidifier
- Systems with thermodynamic dehumidification
- Systems with secondary water or electric heater (thermodynamic dehumidification)

In systems with dehumidification / humidifier an ELP14R18 extension module is required.



3 ENCRYPTION OF CONTROL BOXES

Type	Recovery	Heater	Secondary heater	Cooler or heater/cooler	Humidification
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 E – electric	W - water F – DX FX – reverse DX unit	O – dehumidification N - humidifier

The universal control box MAX after the right configuration of the controller, offers the work one of the 1242 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	-	_

622	NW	-	GM	-	W	_	-	W	-	ON
623	NW	-	GM	-	W	W	-	W	-	ON
624	NW	-	GM	-	W	E	-	W	-	ON
625	NW	-	GM	-	W	_	-	F	-	N
626	NW	-	GM	-	W	_	-	F	-	ON
627	NW	-	GM	-	W	W	-	F	-	ON
628	NW	-	GM	-	W	E	-	F	-	ON
629	NW	-	GM	-	W	_	-	FX	-	N
630	NW	-	GM	-	W	_	-	FX	-	ON
631	NW	-	GM	-	W	W	-	FX	-	ON
632	NW	-	GM	-	W	E	-	FX	-	ON
633	NW	-	GM	-	E	_	-	_	-	N
634	NW	-	GM	-	E	_	-	W	-	N
635	NW	-	GM	-	E	_	-	W	-	ON
636	NW	-	GM	-	E	E	-	W	-	ON
637	NW	-	GM	-	E	_	-	F	-	N
638	NW	-	GM	-	E	_	-	F	-	ON
639	NW	-	GM	-	E	E	-	F	-	ON
640	NW	-	GM	-	E	_	-	FX	-	N
641	NW	-	GM	-	E	_	-	FX	-	ON
642	NW	-	GM	-	E	E	-	FX	-	ON
643	NW	-	GM	-	GAS	_	-	_	-	N
644	NW	-	GM	-	GAS	_	-	W	-	N
645	NW	-	GM	-	GAS	_	-	W	-	ON
646	NW	-	GM	-	GAS	E	-	W	-	ON
647	NW	-	GM	-	GAS	_	-	F	-	N

27	N	-	M	-	E	_	-	FX	-	_
28	N	-	M	-	GAS	_	-	_	-	_
29	N	-	M	-	GAS	_	-	W	-	_
30	N	-	M	-	GAS	_	-	F	-	_
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35	N	-	_	-	W	_	-	_	-	N
36	N	-	_	-	W	_	-	W	-	N
37	N	-	_	-	W	_	-	F	-	N
38	N	-	_	-	W	_	-	FX	-	N
39	N	-	_	-	E	_	-	_	-	N
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60	N	-	M	-	GAS	_	-	W	-	N
61	N	-	M	-	GAS	_	-	F	-	N
62	N	-	M	-	GAS	_	-	FX	-	N
63	NW	-	_	-	_	_	-	W	-	_
64	NW	-	_	-	_	_	-	F	-	_
65	NW	-	_	-	_	_	-	FX	-	_
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72	NW	-	_	-	W	_	-	F	-	O
73	NW	-	_	-	W	W	-	F	-	O
74	NW	-	_	-	W	E	-	F	-	O

648	NW	-	GM	-	GAS	_	-	F	-	ON
649	NW	-	GM	-	GAS	E	-	F	-	ON
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692	2NW	-	O	-	_	_	-	FX	-	_
693	2NW	-	O	-	W	_	-	_	-	_
694	2NW	-	O	-	W	_	-	W	-	_
695	2NW	-	O	-	W	_	-	W	-	O

VentiAir s.r.o. Adolfovice 512 - Bělá pod Pradědem Czech Republic, IČ: 06935320

75	NW	-	_	-	W	_	-	FX	-	_
76	NW	-	_	-	W	_	-	FX	-	O
77	NW	-	_	-	W	W	-	FX	-	O
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80	NW	-	_	-	E	_	-	W	-	_
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170	NW	-	K	-	GAS	_	-	FX	-	_

744	2NW	-	K	-	E	_	-	W	-	_
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746	2NW	-	K	-	E	E	-	W	-	O
747	2NW	-	K	-	E	_	-	F	-	_
748	2NW	-	K	-	E	_	-	F	-	O
749	2NW	-	K	-	E	E	-	F	-	O
750	2NW	-	K	-	E	_	-	FX	-	_
751	2NW	-	K	-	E	_	-	FX	-	O
752	2NW	-	K	-	E	E	-	FX	-	O
753	2NW	-	K	-	GAS	_	-	_	-	_
754	2NW	-	K	-	GAS	_	-	W	-	_
755	2NW	-	K	-	GAS	_	-	W	-	O
756	2NW	-	K	-	GAS	E	-	W	-	O
757	2NW	-	K	-	GAS	_	-	F	-	_
758	2NW	-	K	-	GAS	_	-	F	-	O
759	2NW	-	K	-	GAS	E	-	F	-	O
760	2NW	-	K	-	GAS	_	-	FX	-	_
761	2NW	-	K	-	GAS	_	-	FX	-	O
762	2NW	-	K	-	GAS	E	-	FX	-	O
763	2NW	-	G	-	_	_	-	_	-	_
764	2NW	-	G	-	_	_	-	W	-	_
765	2NW	-	G	-	_	_	-	F	-	_
766	2NW	-	G	-	_	_	-	FX	-	_
767	2NW	-	G	-	W	_	-	_	-	_
768	2NW	-	G	-	W	_	-	W	-	_
769	2NW	-	G	-	W	_	-	W	-	O
770	2NW	-	G	-	W	W	-	W	-	O
771	2NW	-	G	-	W	E	-	W	-	O
772	2NW	-	G	-	W	_	-	F	-	_
773	2NW	-	G	-	W	_	-	F	-	O
774	2NW	-	G	-	W	W	-	F	-	O
775	2NW	-	G	-	W	E	-	F	-	O
776	2NW	-	G	-	W	_	-	FX	-	_
777	2NW	-	G	-	W	_	-	FX	-	O
778	2NW	-	G	-	W	W	-	FX	-	O
779	2NW	-	G	-	W	E	-	FX	-	O
780	2NW	-	G	-	E	_	-	_	-	_
781	2NW	-	G	-	E	_	-	W	-	_
782	2NW	-	G	-	E	_	-	W	-	O
783	2NW	-	G	-	E	E	-	W	-	O
784	2NW	-	G	-	E	_	-	F	-	_
785	2NW	-	G	-	E	_	-	F	-	O
786	2NW	-	G	-	E	E	-	F	-	O
787	2NW	-	G	-	E	_	-	FX	-	_
788	2NW	-	G	-	E	_	-	FX	-	O
789	2NW	-	G	-	E	E	-	FX	-	O
790	2NW	-	G	-	GAS	_	-	_	-	_
791	2NW	-	G	-	GAS	_	-	W	-	_

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

792	2NW	-	G	-	GAS	_	-	W	-	O
793	2NW	-	G	-	GAS	E	-	W	-	O
794	2NW	-	G	-	GAS	_	-	F	-	_
795	2NW	-	G	-	GAS	_	-	F	-	O
796	2NW	-	G	-	GAS	E	-	F	-	O
797	2NW	-	G	-	GAS	_	-	FX	-	_
798	2NW	-	G	-	GAS	_	-	FX	-	O
799	2NW	-	G	-	GAS	E	-	FX	-	O
800	2NW	-	M	-	_	_	-	_	-	_
801	2NW	-	M	-	_	_	-	W	-	_
802	2NW	-	M	-	_	_	-	F	-	_
803	2NW	-	M	-	_	_	-	FX	-	_
804	2NW	-	M	-	W	_	-	_	-	_
805	2NW	-	M	-	W	_	-	W	-	_
806	2NW	-	M	-	W	_	-	W	-	O
807	2NW	-	M	-	W	W	-	W	-	O
808	2NW	-	M	-	W	E	-	W	-	O
809	2NW	-	M	-	W	_	-	F	-	_
810	2NW	-	M	-	W	_	-	F	-	O
811	2NW	-	M	-	W	W	-	F	-	O
812	2NW	-	M	-	W	E	-	F	-	O
813	2NW	-	M	-	W	_	-	FX	-	_
814	2NW	-	M	-	W	_	-	FX	-	O
815	2NW	-	M	-	W	W	-	FX	-	O
816	2NW	-	M	-	W	E	-	FX	-	O
817	2NW	-	M	-	E	_	-	_	-	_
818	2NW	-	M	-	E	_	-	W	-	_
819	2NW	-	M	-	E	_	-	W	-	O
820	2NW	-	M	-	E	E	-	W	-	O
821	2NW	-	M	-	E	_	-	F	-	_
822	2NW	-	M	-	E	_	-	F	-	O
823	2NW	-	M	-	E	E	-	F	-	O
824	2NW	-	M	-	E	_	-	FX	-	_
825	2NW	-	M	-	E	_	-	FX	-	O
826	2NW	-	M	-	E	E	-	FX	-	O
827	2NW	-	M	-	GAS	_	-	_	-	_
828	2NW	-	M	-	GAS	_	-	W	-	_
829	2NW	-	M	-	GAS	_	-	W	-	O
830	2NW	-	M	-	GAS	E	-	W	-	O
831	2NW	-	M	-	GAS	_	-	F	-	_
832	2NW	-	M	-	GAS	_	-	F	-	O
833	2NW	-	M	-	GAS	E	-	F	-	O
834	2NW	-	M	-	GAS	_	-	FX	-	_
835	2NW	-	M	-	GAS	_	-	FX	-	O
836	2NW	-	M	-	GAS	E	-	FX	-	O
837	2NW	-	OM	-	_	_	-	_	-	_
838	2NW	-	OM	-	_	_	-	W	-	_
839	2NW	-	OM	-	_	_	-	F	-	_

219	NW	-	M	-	W	_	-	F	-	_
220	NW	-	M	-	W	_	-	F	-	O
221	NW	-	M	-	W	W	-	F	-	O
222	NW	-	M	-	W	E	-	F	-	O
223	NW	-	M	-	W	_	-	FX	-	_
224	NW	-	M	-	W	_	-	FX	-	O
225	NW	-	M	-	W	W	-	FX	-	O
226	NW	-	M	-	W	E	-	FX	-	O
227	NW	-	M	-	E	_	-	_	-	_
228	NW	-	M	-	E	_	-	W	-	_
229	NW	-	M	-	E	_	-	W	-	O
230	NW	-	M	-	E	E	-	W	-	O
231	NW	-	M	-	E	_	-	F	-	_
232	NW	-	M	-	E	_	-	F	-	O
233	NW	-	M	-	E	E	-	F	-	O
234	NW	-	M	-	E	_	-	FX	-	_
235	NW	-	M	-	E	_	-	FX	-	O
236	NW	-	M	-	E	E	-	FX	-	O
237	NW	-	M	-	GAS	_	-	_	-	_
238	NW	-	M	-	GAS	_	-	W	-	_
239	NW	-	M	-	GAS	_	-	W	-	O
240	NW	-	M	-	GAS	E	-	W	-	O
241	NW	-	M	-	GAS	_	-	F	-	_
242	NW	-	M	-	GAS	_	-	F	-	O
243	NW	-	M	-	GAS	E	-	F	-	O
244	NW	-	M	-	GAS	_	-	FX	-	_
245	NW	-	M	-	GAS	_	-	FX	-	O
246	NW	-	M	-	GAS	E	-	FX	-	O
247	NW	-	OM	-	_	_	-	_	-	_
248	NW	-	OM	-	_	_	-	W	-	_
249	NW	-	OM	-	_	_	-	F	-	_
250	NW	-	OM	-	_	_	-	FX	-	_
251	NW	-	OM	-	W	_	-	_	-	_
252	NW	-	OM	-	W	_	-	W	-	_
253	NW	-	OM	-	W	_	-	W	-	O
254	NW	-	OM	-	W	W	-	W	-	O
255	NW	-	OM	-	W	E	-	W	-	O
256	NW	-	OM	-	W	_	-	F	-	_
257	NW	-	OM	-	W	_	-	F	-	O
258	NW	-	OM	-	W	W	-	F	-	O
259	NW	-	OM	-	W	E	-	F	-	O
260	NW	-	OM	-	W	_	-	FX	-	_
261	NW	-	OM	-	W	_	-	FX	-	O
262	NW	-	OM	-	W	W	-	FX	-	O
263	NW	-	OM	-	W	E	-	FX	-	O
264	NW	-	OM	-	E	_	-	_	-	_
265	NW	-	OM	-	E	_	-	W	-	_
266	NW	-	OM	-	E	_	-	W	-	O

840	2NW	-	OM	-	_	_	-	FX	-	_
841	2NW	-	OM	-	W	_	-	_	-	_
842	2NW	-	OM	-	W	_	-	W	-	_
843	2NW	-	OM	-	W	_	-	W	-	O
844	2NW	-	OM	-	W	W	-	W	-	O
845	2NW	-	OM	-	W	E	-	W	-	O
846	2NW	-	OM	-	W	_	-	F	-	_
847	2NW	-	OM	-	W	_	-	F	-	O
848	2NW	-	OM	-	W	W	-	F	-	O
849	2NW	-	OM	-	W	E	-	F	-	O
850	2NW	-	OM	-	W	_	-	FX	-	_
851	2NW	-	OM	-	W	_	-	FX	-	O
852	2NW	-	OM	-	W	W	-	FX	-	O
853	2NW	-	OM	-	W	E	-	FX	-	O
854	2NW	-	OM	-	E	_	-	_	-	_
855	2NW	-	OM	-	E	_	-	W	-	_
856	2NW	-	OM	-	E	_	-	W	-	O
857	2NW	-	OM	-	E	E	-	W	-	O
858	2NW	-	OM	-	E	_	-	F	-	_
859	2NW	-	OM	-	E	_	-	F	-	O
860	2NW	-	OM	-	E	E	-	F	-	O
861	2NW	-	OM	-	E	_	-	FX	-	_
862	2NW	-	OM	-	E	_	-	FX	-	O
863	2NW	-	OM	-	E	E	-	FX	-	O
864	2NW	-	OM	-	GAS	_	-	_	-	_
865	2NW	-	OM	-	GAS	_	-	W	-	_
866	2NW	-	OM	-	GAS	_	-	W	-	O
867	2NW	-	OM	-	GAS	E	-	W	-	O
868	2NW	-	OM	-	GAS	_	-	F	-	_
869	2NW	-	OM	-	GAS	_	-	F	-	O
870	2NW	-	OM	-	GAS	E	-	F	-	O
871	2NW	-	OM	-	GAS	_	-	FX	-	_
872	2NW	-	OM	-	GAS	_	-	FX	-	O
873	2NW	-	OM	-	GAS	E	-	FX	-	O
874	2NW	-	KM	-	_	_	-	_	-	_
875	2NW	-	KM	-	_	_	-	W	-	_
876	2NW	-	KM	-	_	_	-	F	-	_
877	2NW	-	KM	-	_	_	-	FX	-	_
878	2NW	-	KM	-	W	_	-	_	-	_
879	2NW	-	KM	-	W	_	-	W	-	_
880	2NW	-	KM	-	W	_	-	W	-	O
881	2NW	-	KM	-	W	W	-	W	-	O
882	2NW	-	KM	-	W	E	-	W	-	O
883	2NW	-	KM	-	W	_	-	F	-	_
884	2NW	-	KM	-	W	_	-	F	-	O
885	2NW	-	KM	-	W	W	-	F	-	O
886	2NW	-	KM	-	W	E	-	F	-	O
887	2NW	-	KM	-	W	_	-	FX	-	_

267	NW	-	OM	-	E	E	-	W	-	O
268	NW	-	OM	-	E	_	-	F	-	_
269	NW	-	OM	-	E	_	-	F	-	O
270	NW	-	OM	-	E	E	-	F	-	O
271	NW	-	OM	-	E	_	-	FX	-	_
272	NW	-	OM	-	E	_	-	FX	-	O
273	NW	-	OM	-	E	E	-	FX	-	O
274	NW	-	OM	-	GAS	_	-	_	-	_
275	NW	-	OM	-	GAS	_	-	W	-	_
276	NW	-	OM	-	GAS	_	-	W	-	O
277	NW	-	OM	-	GAS	E	-	W	-	O
278	NW	-	OM	-	GAS	_	-	F	-	_
279	NW	-	OM	-	GAS	_	-	F	-	O
280	NW	-	OM	-	GAS	E	-	F	-	O
281	NW	-	OM	-	GAS	_	-	FX	-	_
282	NW	-	OM	-	GAS	_	-	FX	-	O
283	NW	-	OM	-	GAS	E	-	FX	-	O
284	NW	-	KM	-	_	_	-	_	-	_
285	NW	-	KM	-	_	_	-	W	-	_
286	NW	-	KM	-	_	_	-	F	-	_
287	NW	-	KM	-	_	_	-	FX	-	_
288	NW	-	KM	-	W	_	-	_	-	_
289	NW	-	KM	-	W	_	-	W	-	_
290	NW	-	KM	-	W	_	-	W	-	O
291	NW	-	KM	-	W	W	-	W	-	O
292	NW	-	KM	-	W	E	-	W	-	O
293	NW	-	KM	-	W	_	-	F	-	_
294	NW	-	KM	-	W	_	-	F	-	O
295	NW	-	KM	-	W	W	-	F	-	O
296	NW	-	KM	-	W	E	-	F	-	O
297	NW	-	KM	-	W	_	-	FX	-	_
298	NW	-	KM	-	W	_	-	FX	-	O
299	NW	-	KM	-	W	W	-	FX	-	O
300	NW	-	KM	-	W	E	-	FX	-	O
301	NW	-	KM	-	E	_	-	_	-	_
302	NW	-	KM	-	E	_	-	W	-	_
303	NW	-	KM	-	E	_	-	W	-	O
304	NW	-	KM	-	E	E	-	W	-	O
305	NW	-	KM	-	E	_	-	F	-	_
306	NW	-	KM	-	E	_	-	F	-	O
307	NW	-	KM	-	E	E	-	F	-	O
308	NW	-	KM	-	E	_	-	FX	-	_
309	NW	-	KM	-	E	_	-	FX	-	O
310	NW	-	KM	-	E	E	-	FX	-	O
311	NW	-	KM	-	GAS	_	-	_	-	_
312	NW	-	KM	-	GAS	_	-	W	-	_
313	NW	-	KM	-	GAS	_	-	W	-	O
314	NW	-	KM	-	GAS	E	-	W	-	O

888	2NW	-	KM	-	W	_	-	FX	-	O
889	2NW	-	KM	-	W	W	-	FX	-	O
890	2NW	-	KM	-	W	E	-	FX	-	O
891	2NW	-	KM	-	E	_	-	_	-	_
892	2NW	-	KM	-	E	_	-	W	-	_
893	2NW	-	KM	-	E	_	-	W	-	O
894	2NW	-	KM	-	E	E	-	W	-	O
895	2NW	-	KM	-	E	_	-	F	-	_
896	2NW	-	KM	-	E	_	-	F	-	O
897	2NW	-	KM	-	E	E	-	F	-	O
898	2NW	-	KM	-	E	_	-	FX	-	_
899	2NW	-	KM	-	E	_	-	FX	-	O
900	2NW	-	KM	-	E	E	-	FX	-	O
901	2NW	-	KM	-	GAS	_	-	_	-	_
902	2NW	-	KM	-	GAS	_	-	W	-	_
903	2NW	-	KM	-	GAS	_	-	W	-	O
904	2NW	-	KM	-	GAS	E	-	W	-	O
905	2NW	-	KM	-	GAS	_	-	F	-	_
906	2NW	-	KM	-	GAS	_	-	F	-	O
907	2NW	-	KM	-	GAS	E	-	F	-	O
908	2NW	-	KM	-	GAS	_	-	FX	-	_
909	2NW	-	KM	-	GAS	_	-	FX	-	O
910	2NW	-	KM	-	GAS	E	-	FX	-	O
911	2NW	-	GM	-	_	_	-	_	-	_
912	2NW	-	GM	-	_	_	-	W	-	_
913	2NW	-	GM	-	_	_	-	F	-	_
914	2NW	-	GM	-	_	_	-	FX	-	_
915	2NW	-	GM	-	W	_	-	_	-	_
916	2NW	-	GM	-	W	_	-	W	-	_
917	2NW	-	GM	-	W	_	-	W	-	O
918	2NW	-	GM	-	W	W	-	W	-	O
919	2NW	-	GM	-	W	E	-	W	-	O
920	2NW	-	GM	-	W	_	-	F	-	_
921	2NW	-	GM	-	W	_	-	F	-	O
922	2NW	-	GM	-	W	W	-	F	-	O
923	2NW	-	GM	-	W	E	-	F	-	O
924	2NW	-	GM	-	W	_	-	FX	-	_
925	2NW	-	GM	-	W	_	-	FX	-	O
926	2NW	-	GM	-	W	W	-	FX	-	O
927	2NW	-	GM	-	W	E	-	FX	-	O
928	2NW	-	GM	-	E	_	-	_	-	_
929	2NW	-	GM	-	E	_	-	W	-	_
930	2NW	-	GM	-	E	_	-	W	-	O
931	2NW	-	GM	-	E	E	-	W	-	O
932	2NW	-	GM	-	E	_	-	F	-	_
933	2NW	-	GM	-	E	_	-	F	-	O
934	2NW	-	GM	-	E	E	-	F	-	O
935	2NW	-	GM	-	E	_	-	FX	-	_

315	NW	-	KM	-	GAS	_	-	F	-	_
316	NW	-	KM	-	GAS	_	-	F	-	O
317	NW	-	KM	-	GAS	E	-	F	-	O
318	NW	-	KM	-	GAS	_	-	FX	-	_
319	NW	-	KM	-	GAS	_	-	FX	-	O
320	NW	-	KM	-	GAS	E	-	FX	-	O
321	NW	-	GM	-	_	_	-	_	-	_
322	NW	-	GM	-	_	_	-	W	-	_
323	NW	-	GM	-	_	_	-	F	-	_
324	NW	-	GM	-	_	_	-	FX	-	_
325	NW	-	GM	-	W	_	-	_	-	_
326	NW	-	GM	-	W	_	-	W	-	_
327	NW	-	GM	-	W	_	-	W	-	O
328	NW	-	GM	-	W	W	-	W	-	O
329	NW	-	GM	-	W	E	-	W	-	O
330	NW	-	GM	-	W	_	-	F	-	_
331	NW	-	GM	-	W	_	-	F	-	O
332	NW	-	GM	-	W	W	-	F	-	O
333	NW	-	GM	-	W	E	-	F	-	O
334	NW	-	GM	-	W	_	-	FX	-	_
335	NW	-	GM	-	W	_	-	FX	-	O
336	NW	-	GM	-	W	W	-	FX	-	O
337	NW	-	GM	-	W	E	-	FX	-	O
338	NW	-	GM	-	E	_	-	_	-	_
339	NW	-	GM	-	E	_	-	W	-	_
340	NW	-	GM	-	E	_	-	W	-	O
341	NW	-	GM	-	E	E	-	W	-	O
342	NW	-	GM	-	E	_	-	F	-	_
343	NW	-	GM	-	E	_	-	F	-	O
344	NW	-	GM	-	E	E	-	F	-	O
345	NW	-	GM	-	E	_	-	FX	-	_
346	NW	-	GM	-	E	_	-	FX	-	O
347	NW	-	GM	-	E	E	-	FX	-	O
348	NW	-	GM	-	GAS	_	-	_	-	_
349	NW	-	GM	-	GAS	_	-	W	-	_
350	NW	-	GM	-	GAS	_	-	W	-	O
351	NW	-	GM	-	GAS	E	-	W	-	O
352	NW	-	GM	-	GAS	_	-	F	-	_
353	NW	-	GM	-	GAS	_	-	F	-	O
354	NW	-	GM	-	GAS	E	-	F	-	O
355	NW	-	GM	-	GAS	_	-	FX	-	_
356	NW	-	GM	-	GAS	_	-	FX	-	O
357	NW	-	GM	-	GAS	E	-	FX	-	O
358	NW	-	_	-	_	_	-	W	-	N
359	NW	-	_	-	_	_	-	F	-	N
360	NW	-	_	-	_	_	-	FX	-	N
361	NW	-	_	-	W	_	-	_	-	N
362	NW	-	_	-	W	_	-	W	-	N

936	2NW	-	GM	-	E	_	-	FX	-	O
937	2NW	-	GM	-	E	E	-	FX	-	O
938	2NW	-	GM	-	GAS	_	-	_	-	_
939	2NW	-	GM	-	GAS	_	-	W	-	_
940	2NW	-	GM	-	GAS	_	-	W	-	O
941	2NW	-	GM	-	GAS	E	-	W	-	O
942	2NW	-	GM	-	GAS	_	-	F	-	_
943	2NW	-	GM	-	GAS	_	-	F	-	O
944	2NW	-	GM	-	GAS	E	-	F	-	O
945	2NW	-	GM	-	GAS	_	-	FX	-	_
946	2NW	-	GM	-	GAS	_	-	FX	-	O
947	2NW	-	GM	-	GAS	E	-	FX	-	O
948	2NW	-	_	-	_	_	-	W	-	N
949	2NW	-	_	-	_	_	-	F	-	N
950	2NW	-	_	-	_	_	-	FX	-	N
951	2NW	-	_	-	W	_	-	_	-	N
952	2NW	-	_	-	W	_	-	W	-	N
953	2NW	-	_	-	W	_	-	W	-	ON
954	2NW	-	_	-	W	W	-	W	-	ON
955	2NW	-	_	-	W	E	-	W	-	ON
956	2NW	-	_	-	W	_	-	F	-	N
957	2NW	-	_	-	W	_	-	F	-	ON
958	2NW	-	_	-	W	W	-	F	-	ON
959	2NW	-	_	-	W	E	-	F	-	ON
960	2NW	-	_	-	W	_	-	FX	-	N
961	2NW	-	_	-	W	_	-	FX	-	ON
962	2NW	-	_	-	W	W	-	FX	-	ON
963	2NW	-	_	-	W	E	-	FX	-	ON
964	2NW	-	_	-	E	_	-	_	-	N
965	2NW	-	_	-	E	_	-	W	-	N
966	2NW	-	_	-	E	_	-	W	-	ON
967	2NW	-	_	-	E	E	-	W	-	ON
968	2NW	-	_	-	E	_	-	F	-	N
969	2NW	-	_	-	E	_	-	F	-	ON
970	2NW	-	_	-	E	E	-	F	-	ON
971	2NW	-	_	-	E	_	-	FX	-	N
972	2NW	-	_	-	E	_	-	FX	-	ON
973	2NW	-	_	-	E	E	-	FX	-	ON
974	2NW	-	_	-	GAS	_	-	_	-	N
975	2NW	-	_	-	GAS	_	-	W	-	N
976	2NW	-	_	-	GAS	_	-	W	-	ON
977	2NW	-	_	-	GAS	E	-	W	-	ON
978	2NW	-	_	-	GAS	_	-	F	-	N
979	2NW	-	_	-	GAS	_	-	F	-	ON
980	2NW	-	_	-	GAS	E	-	F	-	ON
981	2NW	-	_	-	GAS	_	-	FX	-	N
982	2NW	-	_	-	GAS	_	-	FX	-	ON
983	2NW	-	_	-	GAS	E	-	FX	-	ON

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363	NW	-	_	-	W	_	-	W	-	ON
364	NW	-	_	-	W	W	-	W	-	ON
365	NW	-	_	-	W	E	-	W	-	ON
366	NW	-	_	-	W	_	-	F	-	N
367	NW	-	_	-	W	_	-	F	-	ON
368	NW	-	_	-	W	W	-	F	-	ON
369	NW	-	_	-	W	E	-	F	-	ON
370	NW	-	_	-	W	_	-	FX	-	N
371	NW	-	_	-	W	_	-	FX	-	ON
372	NW	-	_	-	W	W	-	FX	-	ON
373	NW	-	_	-	W	E	-	FX	-	ON
374	NW	-	_	-	E	_	-	_	-	N
375	NW	-	_	-	E	_	-	W	-	N
376	NW	-	_	-	E	_	-	W	-	ON
377	NW	-	_	-	E	E	-	W	-	ON
378	NW	-	_	-	E	_	-	F	-	N
379	NW	-	_	-	E	_	-	F	-	ON
380	NW	-	_	-	E	E	-	F	-	ON
381	NW	-	_	-	E	_	-	FX	-	N
382	NW	-	_	-	E	_	-	FX	-	ON
383	NW	-	_	-	E	E	-	FX	-	ON
384	NW	-	_	-	GAS	_	-	_	-	N
385	NW	-	_	-	GAS	_	-	W	-	N
386	NW	-	_	-	GAS	_	-	W	-	ON
387	NW	-	_	-	GAS	E	-	W	-	ON
388	NW	-	_	-	GAS	_	-	F	-	N
389	NW	-	_	-	GAS	_	-	F	-	ON
390	NW	-	_	-	GAS	E	-	F	-	ON
391	NW	-	_	-	GAS	_	-	FX	-	N
392	NW	-	_	-	GAS	_	-	FX	-	ON
393	NW	-	_	-	GAS	E	-	FX	-	ON
394	NW	-	O	-	_	_	-	_	-	N
395	NW	-	O	-	_	_	-	W	-	N
396	NW	-	O	-	_	_	-	F	-	N
397	NW	-	O	-	_	_	-	FX	-	N
398	NW	-	O	-	W	_	-	_	-	N
399	NW	-	O	-	W	_	-	W	-	N
400	NW	-	O	-	W	_	-	W	-	ON
401	NW	-	O	-	W	W	-	W	-	ON
402	NW	-	O	-	W	E	-	W	-	ON
403	NW	-	O	-	W	_	-	F	-	N
404	NW	-	O	-	W	_	-	F	-	ON
405	NW	-	O	-	W	W	-	F	-	ON
406	NW	-	O	-	W	E	-	F	-	ON
407	NW	-	O	-	W	_	-	FX	-	N
408	NW	-	O	-	W	_	-	FX	-	ON
409	NW	-	O	-	W	W	-	FX	-	ON
410	NW	-	O	-	W	E	-	FX	-	ON

984	2NW	-	O	-	_	_	-	_	-	N
985	2NW	-	O	-	_	_	-	W	-	N
986	2NW	-	O	-	_	_	-	F	-	N
987	2NW	-	O	-	_	_	-	FX	-	N
988	2NW	-	O	-	W	_	-	_	-	N
989	2NW	-	O	-	W	_	-	W	-	N
990	2NW	-	O	-	W	_	-	W	-	ON
991	2NW	-	O	-	W	W	-	W	-	ON
992	2NW	-	O	-	W	E	-	W	-	ON
993	2NW	-	O	-	W	_	-	F	-	N
994	2NW	-	O	-	W	_	-	F	-	ON
995	2NW	-	O	-	W	W	-	F	-	ON
996	2NW	-	O	-	W	E	-	F	-	ON
997	2NW	-	O	-	W	_	-	FX	-	N
998	2NW	-	O	-	W	_	-	FX	-	ON
999	2NW	-	O	-	W	W	-	FX	-	ON
1000	2NW	-	O	-	W	E	-	FX	-	ON
1001	2NW	-	O	-	E	_	-	_	-	N
1002	2NW	-	O	-	E	_	-	W	-	N
1003	2NW	-	O	-	E	_	-	W	-	ON
1004	2NW	-	O	-	E	E	-	W	-	ON
1005	2NW	-	O	-	E	_	-	F	-	N
1006	2NW	-	O	-	E	_	-	F	-	ON
1007	2NW	-	O	-	E	E	-	F	-	ON
1008	2NW	-	O	-	E	_	-	FX	-	N
1009	2NW	-	O	-	E	_	-	FX	-	ON
1010	2NW	-	O	-	E	E	-	FX	-	ON
1011	2NW	-	O	-	GAS	_	-	_	-	N
1012	2NW	-	O	-	GAS	_	-	W	-	N
1013	2NW	-	O	-	GAS	_	-	W	-	ON
1014	2NW	-	O	-	GAS	E	-	W	-	ON
1015	2NW	-	O	-	GAS	_	-	F	-	N
1016	2NW	-	O	-	GAS	_	-	F	-	ON
1017	2NW	-	O	-	GAS	E	-	F	-	ON
1018	2NW	-	O	-	GAS	_	-	FX	-	N
1019	2NW	-	O	-	GAS	_	-	FX	-	ON
1020	2NW	-	O	-	GAS	E	-	FX	-	ON
1021	2NW	-	K	-	_	_	-	_	-	N
1022	2NW	-	K	-	_	_	-	W	-	N
1023	2NW	-	K	-	_	_	-	F	-	N
1024	2NW	-	K	-	_	_	-	FX	-	N
1025	2NW	-	K	-	W	_	-	_	-	N
1026	2NW	-	K	-	W	_	-	W	-	N
1027	2NW	-	K	-	W	_	-	W	-	ON
1028	2NW	-	K	-	W	W	-	W	-	ON
1029	2NW	-	K	-	W	E	-	W	-	ON
1030	2NW	-	K	-	W	_	-	F	-	N
1031	2NW	-	K	-	W	_	-	F	-	ON

411	NW	-	O	-	E	_	-	_	-	N
412	NW	-	O	-	E	_	-	W	-	N
413	NW	-	O	-	E	_	-	W	-	ON
414	NW	-	O	-	E	E	-	W	-	ON
415	NW	-	O	-	E	_	-	F	-	N
416	NW	-	O	-	E	_	-	F	-	ON
417	NW	-	O	-	E	E	-	F	-	ON
418	NW	-	O	-	E	_	-	FX	-	N
419	NW	-	O	-	E	_	-	FX	-	ON
420	NW	-	O	-	E	E	-	FX	-	ON
421	NW	-	O	-	GAS	_	-	_	-	N
422	NW	-	O	-	GAS	_	-	W	-	N
423	NW	-	O	-	GAS	_	-	W	-	ON
424	NW	-	O	-	GAS	E	-	W	-	ON
425	NW	-	O	-	GAS	_	-	F	-	N
426	NW	-	O	-	GAS	_	-	F	-	ON
427	NW	-	O	-	GAS	E	-	F	-	ON
428	NW	-	O	-	GAS	_	-	FX	-	N
429	NW	-	O	-	GAS	_	-	FX	-	ON
430	NW	-	O	-	GAS	E	-	FX	-	ON
431	NW	-	K	-	_	_	-	_	-	N
432	NW	-	K	-	_	_	-	W	-	N
433	NW	-	K	-	_	_	-	F	-	N
434	NW	-	K	-	_	_	-	FX	-	N
435	NW	-	K	-	W	_	-	_	-	N
436	NW	-	K	-	W	_	-	W	-	N
437	NW	-	K	-	W	_	-	W	-	ON
438	NW	-	K	-	W	W	-	W	-	ON
439	NW	-	K	-	W	E	-	W	-	ON
440	NW	-	K	-	W	_	-	F	-	N
441	NW	-	K	-	W	_	-	F	-	ON
442	NW	-	K	-	W	W	-	F	-	ON
443	NW	-	K	-	W	E	-	F	-	ON
444	NW	-	K	-	W	_	-	FX	-	N
445	NW	-	K	-	W	_	-	FX	-	ON
446	NW	-	K	-	W	W	-	FX	-	ON
447	NW	-	K	-	W	E	-	FX	-	ON
448	NW	-	K	-	E	_	-	_	-	N
449	NW	-	K	-	E	_	-	W	-	N
450	NW	-	K	-	E	_	-	W	-	ON
451	NW	-	K	-	E	E	-	W	-	ON
452	NW	-	K	-	E	_	-	F	-	N
453	NW	-	K	-	E	_	-	F	-	ON
454	NW	-	K	-	E	E	-	F	-	ON
455	NW	-	K	-	E	_	-	FX	-	N
456	NW	-	K	-	E	_	-	FX	-	ON
457	NW	-	K	-	E	E	-	FX	-	ON
458	NW	-	K	-	GAS	_	-	_	-	N

1032	2NW	-	K	-	W	W	-	F	-	ON
1033	2NW	-	K	-	W	E	-	F	-	ON
1034	2NW	-	K	-	W	_	-	FX	-	N
1035	2NW	-	K	-	W	_	-	FX	-	ON
1036	2NW	-	K	-	W	W	-	FX	-	ON
1037	2NW	-	K	-	W	E	-	FX	-	ON
1038	2NW	-	K	-	E	_	-	_	-	N
1039	2NW	-	K	-	E	_	-	W	-	N
1040	2NW	-	K	-	E	_	-	W	-	ON
1041	2NW	-	K	-	E	E	-	W	-	ON
1042	2NW	-	K	-	E	_	-	F	-	N
1043	2NW	-	K	-	E	_	-	F	-	ON
1044	2NW	-	K	-	E	E	-	F	-	ON
1045	2NW	-	K	-	E	_	-	FX	-	N
1046	2NW	-	K	-	E	_	-	FX	-	ON
1047	2NW	-	K	-	E	E	-	FX	-	ON
1048	2NW	-	K	-	GAS	_	-	_	-	N
1049	2NW	-	K	-	GAS	_	-	W	-	N
1050	2NW	-	K	-	GAS	_	-	W	-	ON
1051	2NW	-	K	-	GAS	E	-	W	-	ON
1052	2NW	-	K	-	GAS	_	-	F	-	N
1053	2NW	-	K	-	GAS	_	-	F	-	ON
1054	2NW	-	K	-	GAS	E	-	F	-	ON
1055	2NW	-	K	-	GAS	_	-	FX	-	N
1056	2NW	-	K	-	GAS	_	-	FX	-	ON
1057	2NW	-	K	-	GAS	E	-	FX	-	ON
1058	2NW	-	G	-	_	_	-	_	-	N
1059	2NW	-	G	-	_	_	-	W	-	N
1060	2NW	-	G	-	_	_	-	F	-	N
1061	2NW	-	G	-	_	_	-	FX	-	N
1062	2NW	-	G	-	W	_	-	_	-	N
1063	2NW	-	G	-	W	_	-	W	-	N
1064	2NW	-	G	-	W	_	-	W	-	ON
1065	2NW	-	G	-	W	W	-	W	-	ON
1066	2NW	-	G	-	W	E	-	W	-	ON
1067	2NW	-	G	-	W	_	-	F	-	N
1068	2NW	-	G	-	W	_	-	F	-	ON
1069	2NW	-	G	-	W	W	-	F	-	ON
1070	2NW	-	G	-	W	E	-	F	-	ON
1071	2NW	-	G	-	W	_	-	FX	-	N
1072	2NW	-	G	-	W	_	-	FX	-	ON
1073	2NW	-	G	-	W	W	-	FX	-	ON
1074	2NW	-	G	-	W	E	-	FX	-	ON
1075	2NW	-	G	-	E	_	-	_	-	N
1076	2NW	-	G	-	E	_	-	W	-	N
1077	2NW	-	G	-	E	_	-	W	-	ON
1078	2NW	-	G	-	E	E	-	W	-	ON
1079	2NW	-	G	-	E	_	-	F	-	N

459	NW	-	K	-	GAS	_	-	W	-	N
460	NW	-	K	-	GAS	_	-	W	-	ON
461	NW	-	K	-	GAS	E	-	W	-	ON
462	NW	-	K	-	GAS	_	-	F	-	N
463	NW	-	K	-	GAS	_	-	F	-	ON
464	NW	-	K	-	GAS	E	-	F	-	ON
465	NW	-	K	-	GAS	_	-	FX	-	N
466	NW	-	K	-	GAS	_	-	FX	-	ON
467	NW	-	K	-	GAS	E	-	FX	-	ON
468	NW	-	G	-	_	_	-	_	-	N
469	NW	-	G	-	_	_	-	W	-	N
470	NW	-	G	-	_	_	-	F	-	N
471	NW	-	G	-	_	_	-	FX	-	N
472	NW	-	G	-	W	_	-	_	-	N
473	NW	-	G	-	W	_	-	W	-	N
474	NW	-	G	-	W	_	-	W	-	ON
475	NW	-	G	-	W	W	-	W	-	ON
476	NW	-	G	-	W	E	-	W	-	ON
477	NW	-	G	-	W	_	-	F	-	N
478	NW	-	G	-	W	_	-	F	-	ON
479	NW	-	G	-	W	W	-	F	-	ON
480	NW	-	G	-	W	E	-	F	-	ON
481	NW	-	G	-	W	_	-	FX	-	N
482	NW	-	G	-	W	_	-	FX	-	ON
483	NW	-	G	-	W	W	-	FX	-	ON
484	NW	-	G	-	W	E	-	FX	-	ON
485	NW	-	G	-	E	_	-	_	-	N
486	NW	-	G	-	E	_	-	W	-	N
487	NW	-	G	-	E	_	-	W	-	ON
488	NW	-	G	-	E	E	-	W	-	ON
489	NW	-	G	-	E	_	-	F	-	N
490	NW	-	G	-	E	_	-	F	-	ON
491	NW	-	G	-	E	E	-	F	-	ON
492	NW	-	G	-	E	_	-	FX	-	N
493	NW	-	G	-	E	_	-	FX	-	ON
494	NW	-	G	-	E	E	-	FX	-	ON
495	NW	-	G	-	GAS	_	-	_	-	N
496	NW	-	G	-	GAS	_	-	W	-	N
497	NW	-	G	-	GAS	_	-	W	-	ON
498	NW	-	G	-	GAS	E	-	W	-	ON
499	NW	-	G	-	GAS	_	-	F	-	N
500	NW	-	G	-	GAS	_	-	F	-	ON
501	NW	-	G	-	GAS	E	-	F	-	ON
502	NW	-	G	-	GAS	_	-	FX	-	N
503	NW	-	G	-	GAS	_	-	FX	-	ON
504	NW	-	G	-	GAS	E	-	FX	-	ON
505	NW	-	M	-	_	_	-	_	-	N
506	NW	-	M	-	_	_	-	W	-	N

1080	2NW	-	G	-	E	_	-	F	-	ON
1081	2NW	-	G	-	E	E	-	F	-	ON
1082	2NW	-	G	-	E	_	-	FX	-	N
1083	2NW	-	G	-	E	_	-	FX	-	ON
1084	2NW	-	G	-	E	E	-	FX	-	ON
1085	2NW	-	G	-	GAS	_	-	_	-	N
1086	2NW	-	G	-	GAS	_	-	W	-	N
1087	2NW	-	G	-	GAS	_	-	W	-	ON
1088	2NW	-	G	-	GAS	E	-	W	-	ON
1089	2NW	-	G	-	GAS	_	-	F	-	N
1090	2NW	-	G	-	GAS	_	-	F	-	ON
1091	2NW	-	G	-	GAS	E	-	F	-	ON
1092	2NW	-	G	-	GAS	_	-	FX	-	N
1093	2NW	-	G	-	GAS	_	-	FX	-	ON
1094	2NW	-	G	-	GAS	E	-	FX	-	ON
1095	2NW	-	M	-	_	_	-	_	-	N
1096	2NW	-	M	-	_	_	-	W	-	N
1097	2NW	-	M	-	_	_	-	F	-	N
1098	2NW	-	M	-	_	_	-	FX	-	N
1099	2NW	-	M	-	W	_	-	_	-	N
1100	2NW	-	M	-	W	_	-	W	-	N
1101	2NW	-	M	-	W	_	-	W	-	ON
1102	2NW	-	M	-	W	W	-	W	-	ON
1103	2NW	-	M	-	W	E	-	W	-	ON
1104	2NW	-	M	-	W	_	-	F	-	N
1105	2NW	-	M	-	W	_	-	F	-	ON
1106	2NW	-	M	-	W	W	-	F	-	ON
1107	2NW	-	M	-	W	E	-	F	-	ON
1108	2NW	-	M	-	W	_	-	FX	-	N
1109	2NW	-	M	-	W	_	-	FX	-	ON
1110	2NW	-	M	-	W	W	-	FX	-	ON
1111	2NW	-	M	-	W	E	-	FX	-	ON
1112	2NW	-	M	-	E	_	-	_	-	N
1113	2NW	-	M	-	E	_	-	W	-	N
1114	2NW	-	M	-	E	_	-	W	-	ON
1115	2NW	-	M	-	E	E	-	W	-	ON
1116	2NW	-	M	-	E	_	-	F	-	N
1117	2NW	-	M	-	E	_	-	F	-	ON
1118	2NW	-	M	-	E	E	-	F	-	ON
1119	2NW	-	M	-	E	_	-	FX	-	N
1120	2NW	-	M	-	E	_	-	FX	-	ON
1121	2NW	-	M	-	E	E	-	FX	-	ON
1122	2NW	-	M	-	GAS	_	-	_	-	N
1123	2NW	-	M	-	GAS	_	-	W	-	N
1124	2NW	-	M	-	GAS	_	-	W	-	ON
1125	2NW	-	M	-	GAS	E	-	W	-	ON
1126	2NW	-	M	-	GAS	_	-	F	-	N
1127	2NW	-	M	-	GAS	_	-	F	-	ON

507	NW	-	M	-	_	_	-	F	-	N
508	NW	-	M	-	_	_	-	FX	-	N
509	NW	-	M	-	W	_	-	_	-	N
510	NW	-	M	-	W	_	-	W	-	N
511	NW	-	M	-	W	_	-	W	-	ON
512	NW	-	M	-	W	W	-	W	-	ON
513	NW	-	M	-	W	E	-	W	-	ON
514	NW	-	M	-	W	_	-	F	-	N
515	NW	-	M	-	W	_	-	F	-	ON
516	NW	-	M	-	W	W	-	F	-	ON
517	NW	-	M	-	W	E	-	F	-	ON
518	NW	-	M	-	W	_	-	FX	-	N
519	NW	-	M	-	W	_	-	FX	-	ON
520	NW	-	M	-	W	W	-	FX	-	ON
521	NW	-	M	-	W	E	-	FX	-	ON
522	NW	-	M	-	E	_	-	_	-	N
523	NW	-	M	-	E	_	-	W	-	N
524	NW	-	M	-	E	_	-	W	-	ON
525	NW	-	M	-	E	E	-	W	-	ON
526	NW	-	M	-	E	_	-	F	-	N
527	NW	-	M	-	E	_	-	F	-	ON
528	NW	-	M	-	E	E	-	F	-	ON
529	NW	-	M	-	E	_	-	FX	-	N
530	NW	-	M	-	E	_	-	FX	-	ON
531	NW	-	M	-	E	E	-	FX	-	ON
532	NW	-	M	-	GAS	_	-	_	-	N
533	NW	-	M	-	GAS	_	-	W	-	N
534	NW	-	M	-	GAS	_	-	W	-	ON
535	NW	-	M	-	GAS	E	-	W	-	ON
536	NW	-	M	-	GAS	_	-	F	-	N
537	NW	-	M	-	GAS	_	-	F	-	ON
538	NW	-	M	-	GAS	E	-	F	-	ON
539	NW	-	M	-	GAS	_	-	FX	-	N
540	NW	-	M	-	GAS	_	-	FX	-	ON
541	NW	-	M	-	GAS	E	-	FX	-	ON
542	NW	-	OM	-	_	_	-	_	-	N
543	NW	-	OM	-	_	_	-	W	-	N
544	NW	-	OM	-	_	_	-	F	-	N
545	NW	-	OM	-	_	_	-	FX	-	N
546	NW	-	OM	-	W	_	-	_	-	N
547	NW	-	OM	-	W	_	-	W	-	N
548	NW	-	OM	-	W	_	-	W	-	ON
549	NW	-	OM	-	W	W	-	W	-	ON
550	NW	-	OM	-	W	E	-	W	-	ON
551	NW	-	OM	-	W	_	-	F	-	N
552	NW	-	OM	-	W	_	-	F	-	ON
553	NW	-	OM	-	W	W	-	F	-	ON
554	NW	-	OM	-	W	E	-	F	-	ON

1128	2NW	-	M	-	GAS	E	-	F	-	ON
1129	2NW	-	M	-	GAS	_	-	FX	-	N
1130	2NW	-	M	-	GAS	_	-	FX	-	ON
1131	2NW	-	M	-	GAS	E	-	FX	-	ON
1132	2NW	-	OM	-	_	_	-	_	-	N
1133	2NW	-	OM	-	_	_	-	W	-	N
1134	2NW	-	OM	-	_	_	-	F	-	N
1135	2NW	-	OM	-	_	_	-	FX	-	N
1136	2NW	-	OM	-	W	_	-	_	-	N
1137	2NW	-	OM	-	W	_	-	W	-	N
1138	2NW	-	OM	-	W	_	-	W	-	ON
1139	2NW	-	OM	-	W	W	-	W	-	ON
1140	2NW	-	OM	-	W	E	-	W	-	ON
1141	2NW	-	OM	-	W	_	-	F	-	N
1142	2NW	-	OM	-	W	_	-	F	-	ON
1143	2NW	-	OM	-	W	W	-	F	-	ON
1144	2NW	-	OM	-	W	E	-	F	-	ON
1145	2NW	-	OM	-	W	_	-	FX	-	N
1146	2NW	-	OM	-	W	_	-	FX	-	ON
1147	2NW	-	OM	-	W	W	-	FX	-	ON
1148	2NW	-	OM	-	W	E	-	FX	-	ON
1149	2NW	-	OM	-	E	_	-	_	-	N
1150	2NW	-	OM	-	E	_	-	W	-	N
1151	2NW	-	OM	-	E	_	-	W	-	ON
1152	2NW	-	OM	-	E	E	-	W	-	ON
1153	2NW	-	OM	-	E	_	-	F	-	N
1154	2NW	-	OM	-	E	_	-	F	-	ON
1155	2NW	-	OM	-	E	E	-	F	-	ON
1156	2NW	-	OM	-	E	_	-	FX	-	N
1157	2NW	-	OM	-	E	_	-	FX	-	ON
1158	2NW	-	OM	-	E	E	-	FX	-	ON
1159	2NW	-	OM	-	GAS	_	-	_	-	N
1160	2NW	-	OM	-	GAS	_	-	W	-	N
1161	2NW	-	OM	-	GAS	_	-	W	-	ON
1162	2NW	-	OM	-	GAS	E	-	W	-	ON
1163	2NW	-	OM	-	GAS	_	-	F	-	N
1164	2NW	-	OM	-	GAS	_	-	F	-	ON
1165	2NW	-	OM	-	GAS	E	-	F	-	ON
1166	2NW	-	OM	-	GAS	_	-	FX	-	N
1167	2NW	-	OM	-	GAS	_	-	FX	-	ON
1168	2NW	-	OM	-	GAS	E	-	FX	-	ON
1169	2NW	-	KM	-	_	_	-	_	-	N
1170	2NW	-	KM	-	_	_	-	W	-	N
1171	2NW	-	KM	-	_	_	-	F	-	N
1172	2NW	-	KM	-	_	_	-	FX	-	N
1173	2NW	-	KM	-	W	_	-	_	-	N
1174	2NW	-	KM	-	W	_	-	W	-	N
1175	2NW	-	KM	-	W	_	-	W	-	ON

555	NW	-	OM	-	W	_	-	FX	-	N
556	NW	-	OM	-	W	_	-	FX	-	ON
557	NW	-	OM	-	W	W	-	FX	-	ON
558	NW	-	OM	-	W	E	-	FX	-	ON
559	NW	-	OM	-	E	_	-	_	-	N
560	NW	-	OM	-	E	_	-	W	-	N
561	NW	-	OM	-	E	_	-	W	-	ON
562	NW	-	OM	-	E	E	-	W	-	ON
563	NW	-	OM	-	E	_	-	F	-	N
564	NW	-	OM	-	E	_	-	F	-	ON
565	NW	-	OM	-	E	E	-	F	-	ON
566	NW	-	OM	-	E	_	-	FX	-	N
567	NW	-	OM	-	E	_	-	FX	-	ON
568	NW	-	OM	-	E	E	-	FX	-	ON
569	NW	-	OM	-	GAS	_	-	_	-	N
570	NW	-	OM	-	GAS	_	-	W	-	N
571	NW	-	OM	-	GAS	_	-	W	-	ON
572	NW	-	OM	-	GAS	E	-	W	-	ON
573	NW	-	OM	-	GAS	_	-	F	-	N
574	NW	-	OM	-	GAS	_	-	F	-	ON
575	NW	-	OM	-	GAS	E	-	F	-	ON
576	NW	-	OM	-	GAS	_	-	FX	-	N
577	NW	-	OM	-	GAS	_	-	FX	-	ON
578	NW	-	OM	-	GAS	E	-	FX	-	ON
579	NW	-	KM	-	_	_	-	_	-	N
580	NW	-	KM	-	_	_	-	W	-	N
581	NW	-	KM	-	_	_	-	F	-	N
582	NW	-	KM	-	_	_	-	FX	-	N
583	NW	-	KM	-	W	_	-	_	-	N
584	NW	-	KM	-	W	_	-	W	-	N
585	NW	-	KM	-	W	_	-	W	-	ON
586	NW	-	KM	-	W	W	-	W	-	ON
587	NW	-	KM	-	W	E	-	W	-	ON
588	NW	-	KM	-	W	_	-	F	-	N
589	NW	-	KM	-	W	_	-	F	-	ON
590	NW	-	KM	-	W	W	-	F	-	ON
591	NW	-	KM	-	W	E	-	F	-	ON
592	NW	-	KM	-	W	_	-	FX	-	N
593	NW	-	KM	-	W	_	-	FX	-	ON
594	NW	-	KM	-	W	W	-	FX	-	ON
595	NW	-	KM	-	W	E	-	FX	-	ON
596	NW	-	KM	-	E	_	-	_	-	N
597	NW	-	KM	-	E	_	-	W	-	N
598	NW	-	KM	-	E	_	-	W	-	ON
599	NW	-	KM	-	E	E	-	W	-	ON
600	NW	-	KM	-	E	_	-	F	-	N
601	NW	-	KM	-	E	_	-	F	-	ON
602	NW	-	KM	-	E	E	-	F	-	ON

1176	2NW	-	KM	-	W	W	-	W	-	ON
1177	2NW	-	KM	-	W	E	-	W	-	ON
1178	2NW	-	KM	-	W	_	-	F	-	N
1179	2NW	-	KM	-	W	_	-	F	-	ON
1180	2NW	-	KM	-	W	W	-	F	-	ON
1181	2NW	-	KM	-	W	E	-	F	-	ON
1182	2NW	-	KM	-	W	_	-	FX	-	N
1183	2NW	-	KM	-	W	_	-	FX	-	ON
1184	2NW	-	KM	-	W	W	-	FX	-	ON
1185	2NW	-	KM	-	W	E	-	FX	-	ON
1186	2NW	-	KM	-	E	_	-	_	-	N
1187	2NW	-	KM	-	E	_	-	W	-	N
1188	2NW	-	KM	-	E	_	-	W	-	ON
1189	2NW	-	KM	-	E	E	-	W	-	ON
1190	2NW	-	KM	-	E	_	-	F	-	N
1191	2NW	-	KM	-	E	_	-	F	-	ON
1192	2NW	-	KM	-	E	E	-	F	-	ON
1193	2NW	-	KM	-	E	_	-	FX	-	N
1194	2NW	-	KM	-	E	_	-	FX	-	ON
1195	2NW	-	KM	-	E	E	-	FX	-	ON
1196	2NW	-	KM	-	GAS	_	-	_	-	N
1197	2NW	-	KM	-	GAS	_	-	W	-	N
1198	2NW	-	KM	-	GAS	_	-	W	-	ON
1199	2NW	-	KM	-	GAS	E	-	W	-	ON
1200	2NW	-	KM	-	GAS	_	-	F	-	N
1201	2NW	-	KM	-	GAS	_	-	F	-	ON
1202	2NW	-	KM	-	GAS	E	-	F	-	ON
1203	2NW	-	KM	-	GAS	_	-	FX	-	N
1204	2NW	-	KM	-	GAS	_	-	FX	-	ON
1205	2NW	-	KM	-	GAS	E	-	FX	-	ON
1206	2NW	-	GM	-	_	_	-	_	-	N
1207	2NW	-	GM	-	_	_	-	W	-	N
1208	2NW	-	GM	-	_	_	-	F	-	N
1209	2NW	-	GM	-	_	_	-	FX	-	N
1210	2NW	-	GM	-	W	_	-	_	-	N
1211	2NW	-	GM	-	W	_	-	W	-	N
1212	2NW	-	GM	-	W	_	-	W	-	ON
1213	2NW	-	GM	-	W	W	-	W	-	ON
1214	2NW	-	GM	-	W	E	-	W	-	ON
1215	2NW	-	GM	-	W	_	-	F	-	N
1216	2NW	-	GM	-	W	_	-	F	-	ON
1217	2NW	-	GM	-	W	W	-	F	-	ON
1218	2NW	-	GM	-	W	E	-	F	-	ON
1219	2NW	-	GM	-	W	_	-	FX	-	N
1220	2NW	-	GM	-	W	_	-	FX	-	ON
1221	2NW	-	GM	-	W	W	-	FX	-	ON
1222	2NW	-	GM	-	W	E	-	FX	-	ON
1223	2NW	-	GM	-	E	_	-	_	-	N

603	NW	-	KM	-	E	_	-	FX	-	N
604	NW	-	KM	-	E	_	-	FX	-	ON
605	NW	-	KM	-	E	E	-	FX	-	ON
606	NW	-	KM	-	GAS	_	-	_	-	N
607	NW	-	KM	-	GAS	_	-	W	-	N
608	NW	-	KM	-	GAS	_	-	W	-	ON
609	NW	-	KM	-	GAS	E	-	W	-	ON
610	NW	-	KM	-	GAS	_	-	F	-	N
611	NW	-	KM	-	GAS	_	-	F	-	ON
612	NW	-	KM	-	GAS	E	-	F	-	ON
613	NW	-	KM	-	GAS	_	-	FX	-	N
614	NW	-	KM	-	GAS	_	-	FX	-	ON
615	NW	-	KM	-	GAS	E	-	FX	-	ON
616	NW	-	GM	-	_	_	-	_	-	N
617	NW	-	GM	-	_	_	-	W	-	N
618	NW	-	GM	-	_	_	-	F	-	N
619	NW	-	GM	-	_	_	-	FX	-	N
620	NW	-	GM	-	W	_	-	_	-	N
621	NW	-	GM	-	W	_	-	W	-	N

1224	2NW	-	GM	-	E	_	-	W	-	N
1225	2NW	-	GM	-	E	_	-	W	-	ON
1226	2NW	-	GM	-	E	E	-	W	-	ON
1227	2NW	-	GM	-	E	_	-	F	-	N
1228	2NW	-	GM	-	E	_	-	F	-	ON
1229	2NW	-	GM	-	E	E	-	F	-	ON
1230	2NW	-	GM	-	E	_	-	FX	-	N
1231	2NW	-	GM	-	E	_	-	FX	-	ON
1232	2NW	-	GM	-	E	E	-	FX	-	ON
1233	2NW	-	GM	-	GAS	_	-	_	-	N
1234	2NW	-	GM	-	GAS	_	-	W	-	N
1235	2NW	-	GM	-	GAS	_	-	W	-	ON
1236	2NW	-	GM	-	GAS	E	-	W	-	ON
1237	2NW	-	GM	-	GAS	_	-	F	-	N
1238	2NW	-	GM	-	GAS	_	-	F	-	ON
1239	2NW	-	GM	-	GAS	E	-	F	-	ON
1240	2NW	-	GM	-	GAS	_	-	FX	-	N
1241	2NW	-	GM	-	GAS	_	-	FX	-	ON
1242	2NW	-	GM	-	GAS	E	-	FX	-	ON

4 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 - WINTER operation mode (in unit with secondary heater)	- 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

		Secondary water heater	- Temperature of the primary control sensor is below the set temperature - SUMMER operation mode	- 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)
		Secondary 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
		Reverse Direct Expansion unit	- Temperature of the primary control sensor is below the set temperature - WINTER season	- 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	- 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
Humidifier	- relative humidity is less than the set value - WINTER mode	- switching on the humidifier and increasing its control
Dehumidification	- relative humidity is greater than the set point - SUMMER mode	- switching on the water cooler and secondary heater for thermodynamic dehumidification - if dehumidification is more than 30% = stopping the recovery operation (another possibility of recovering with delay from drying out)

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 occur:

- 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.

Is it possible to change the switching on sequence of the reverse DX 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 occurs:

- 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.

5 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

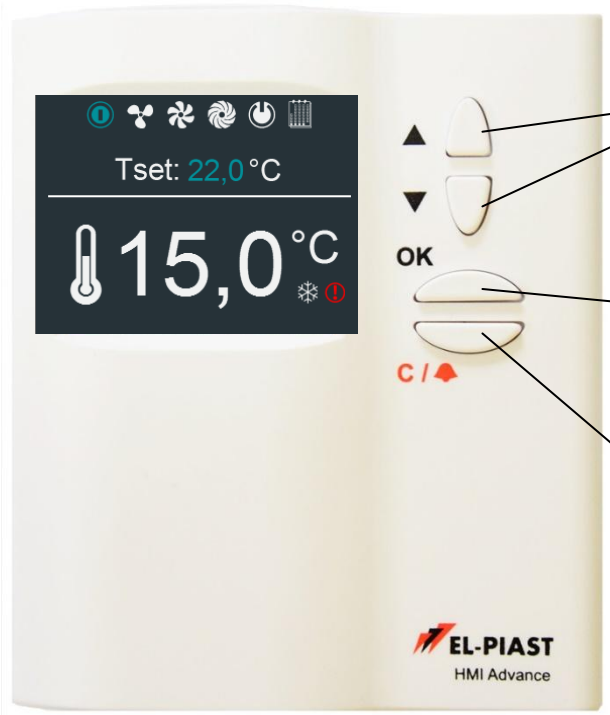
Symbol from the application scheme	Description	Type of the wire	Number of x cross - section in mm^2
S1F	Cooperation with the station controller fire-protective	(2)	2x1
S1	License for the start (service STOP)	(2)	2x1
Y1	Actuator of the valve of the water heater	(4)	3x1
M1	Connecting of the circulation 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	(2)	2x1

	AHU dry contact NO		
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 of the fan inlet	(1)	Attachment B
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 preliminary outlet	(2)	2x1
E5	Confirming the start – dry contact NO	(2)	2x1
E4	Collective alerting signal – dry contact NO	(2)	2x1
N1	Controller	-	-
N2	Panel HMI Tiny	(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
B9	Supply air humidity sensor	(4)	3x1
B10	Extract air humidity sensor	(4)	3x1
S7F	Alarm signal from humidifier	(2)	2x1
E6	On-Off signal of the humidifier	(2)	2x1
Y11	Signal 0-10 VDC for humidifier	(4)	2x1
Y8	Actuator of the valve of the secondary water heater	(4)	3x1
M8	Connecting of the circulation pump the secondary water heater	(1)	3x1,5
S4F2	Alarm signal of secondary electric heater	(2)	2x1
EHE2	On-Off signal of the secondary electric heater	(2)	2x1
YHE2	Signal 0-10 V for the secondary electric heater	(4)	2x1

6 HMI AND CONTROLLER SPECIFICATION

6.1 HMI ADVANCE



Navigating the menu,
Change of parameters

Hold down for 3 seconds to enter the text menu

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

Hold down for 3 seconds to enter the alarm menu

Single press skips back one level in the menu

6.2 HMI COMPACT

Navigating the menu,

Change of parameters

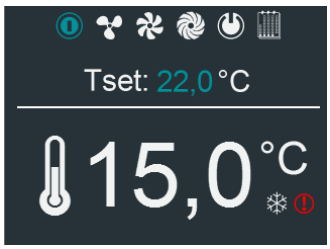
Hold down for 3 seconds to enter the text menu

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

Hold down for 3 seconds to enter the alarm menu

Single press skips back one level in the menu

6.3 MAIN MENU ICONS

		Setting the operating mode: „Stop”, „1 gear”, „2 gear”, „3 gear”, „Stand-by” „Calendar”
		Setting the setpoint temperature
		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.

6.4 TOUCH PANEL 4,3` AND 7`

HMI has the ability to support graphical screens (created from JPG, PNG files), SLIDEBAR menu support, and TEXT menu support.

The main screen of the HMI is visible on the first screen, it is a graphic menu, moving between graphic screens occurs after moving the screen to the left or right.

The SLIDEBAR submenu selection menu is available when the screen is moved from top to bottom (being in the graphic menu).

From the SLIDEBAR menu, there are submenus: MAIN MENU, CALENDAR, ALARMS, GRAPH. The entry on the submenu follows after pressing the icon with the appropriate description of the submenu.
The exit from the submenu occurs after moving the screen from the left to the right.
The HMI set has its internal settings, in order to enter them one should simultaneously press any 3 points on the screen and hold it for about 3 seconds.

6.5 PANEL CONNECTION AND USER RESTRICTION FUNCTION

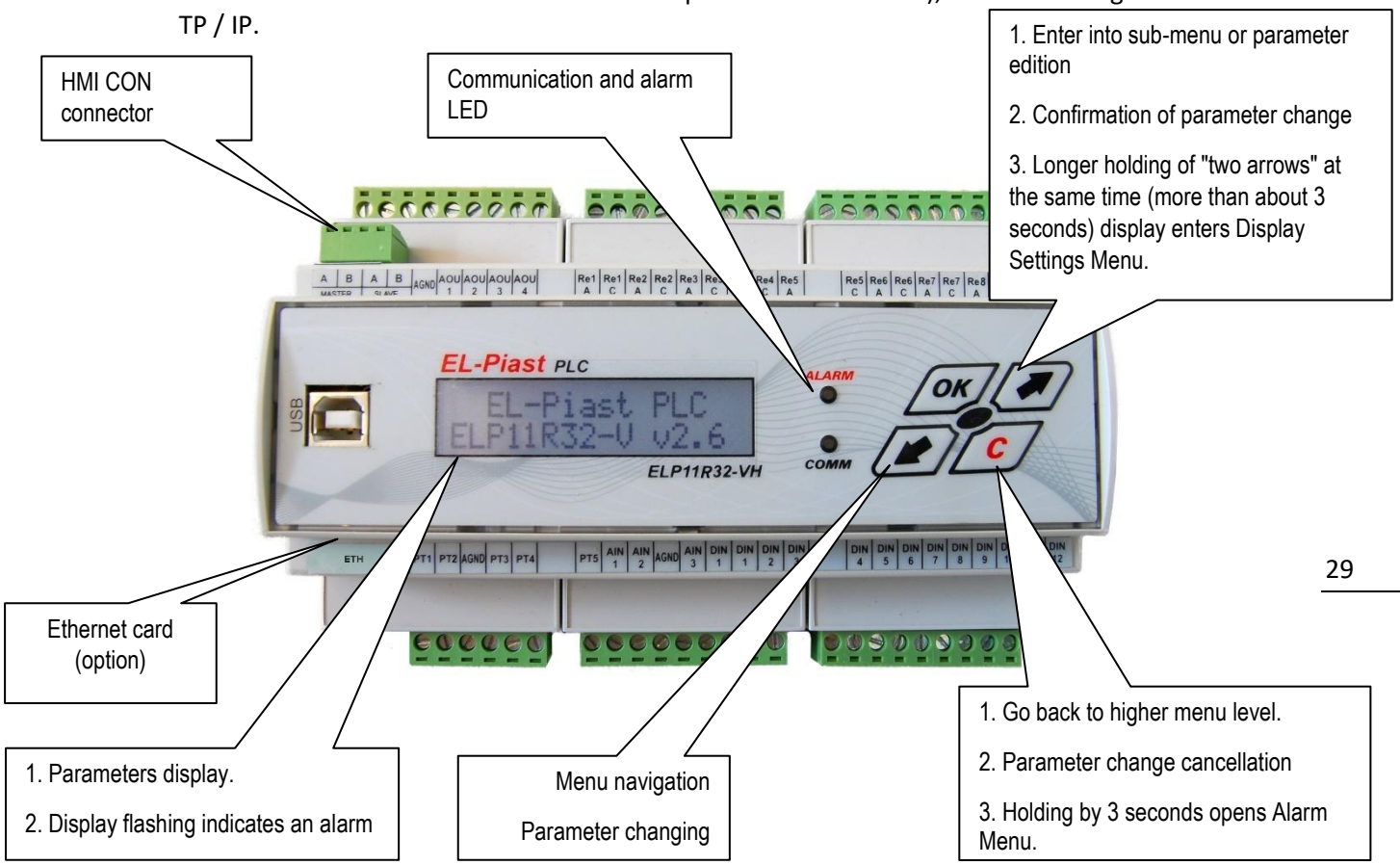
Panel Advance HMI and Compact HMI can be connected to the input of the HMI CON (located at the upper side of the driver around the USB connector) or RS485 master (if it is not used to transfer information management system BMS). There is a possibility of simultaneous connecting two panels to the RJ45 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 Advance HMI and Compact HMI 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.

6.6 REGULATOR

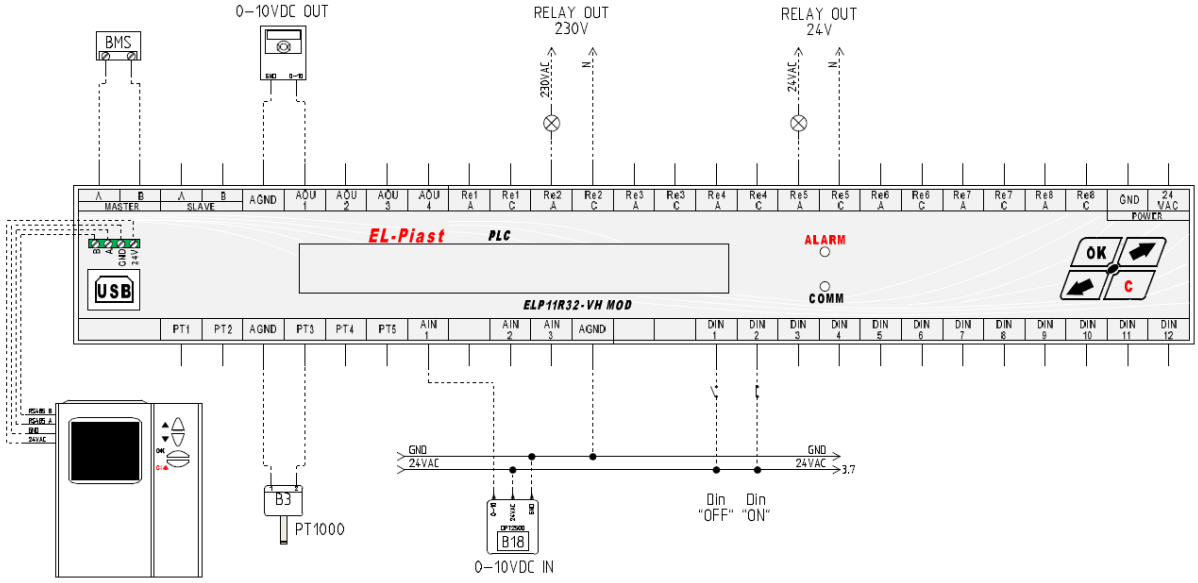
ELP11R32L-MOD-RTU+ – communication Modbus RTU with BMS through the RS485 (connector RS485 Master)
ELP11R32L-MOD-IP+ - with built in Ethernet card is possible communication Modbus TCP/IP (connector RJ45)
ELP11R32L-BAC-MSTP+ – communication with BMS through the BACnet MS-TP (connector RS485 Master)
ELP11R32L-BAC-IP+ – 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 "two arrows" at the same time (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.

6.7 EXAMPLE CONNECTION OF CONTROLLER'S INPUTS/OUTPUTS



6.8 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
   DIN5 function - possibility to activate one of the two digital input functions DIN5. 1S2H - the input fulfils the function of the secondary supply part filter, DEF - the input acts as the defrost signal of the reversing unit.
   DIN6 function - possibility to activate one of the two digital input functions DIN6. 2S1H - the input fulfils the function of the extract air filter, CO detector - the input fulfils the function of the CO detector signal, useful in systems with gas heaters, exceeding the central heating causes stopping with blockade of the control panel operation.
   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, Eura Drive)
   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 or with constant flow (m3 / h)

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 multi - the possibility of activating the system with touch panel in the HMI multi function
AHU number - possibility to set the displayed control panel name
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), smooth control 0-10VDC or PWM control 0/10VDC
PWM period - PWM signal period (default 10s)
PWM limit - limitation of the maximum power of the PWM controlled heater
Phe (% Psup) - linear limitation of the maximum power of the electric heater depending on the control of the supply air fans
Start ramp - after the start signal of the reversing unit, the 0-10VDC signal increases smoothly
A_FX - selection of the type of alarm: **disappearing** - during the alarm, start and 0-10V signals are given, return to operation after the cause of the alarm stops, **blocking** - during the alarm, start and 0-10V signals are turned off, return to operation after the reason alarm and alarm confirmation
Umin, Umax - setting the minimum, maximum output voltage 0-10VDC for the connected system
Control signal - setting of the 0-10VDC signal control method: min> max, max> min, Auto min> max, Auto max> min, signal type "Auto" is a linear inverse relationship in winter and summer
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)
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 (in the case of EC motors without a display, address settings must be made using the controller).

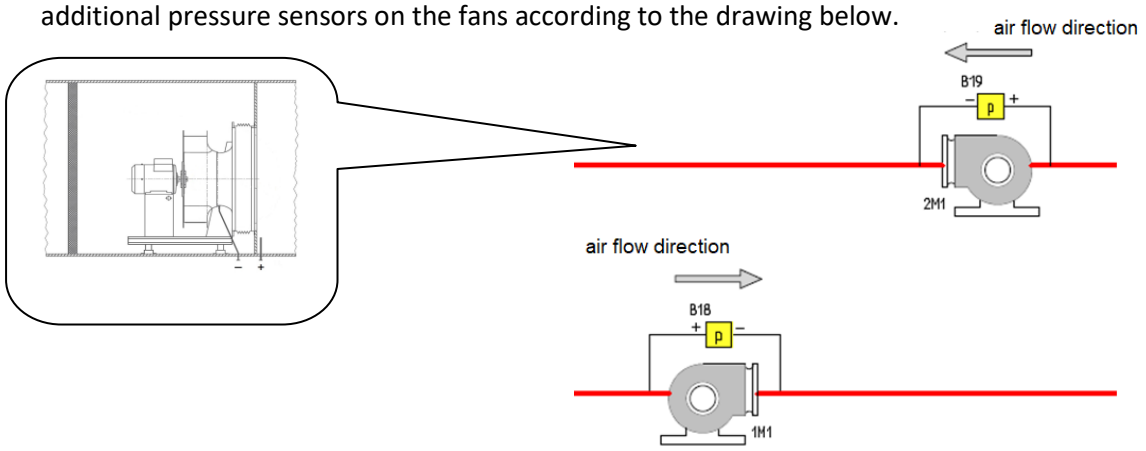
2) check the correctness of connections and the reaction of inputs/outputs to the state of sensors, detectors, switching inputs elements and executing outputs elements.
3) test selection of the leading sensor.
4) start up the unit and check the process of the temperature control.
5) check and select 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.

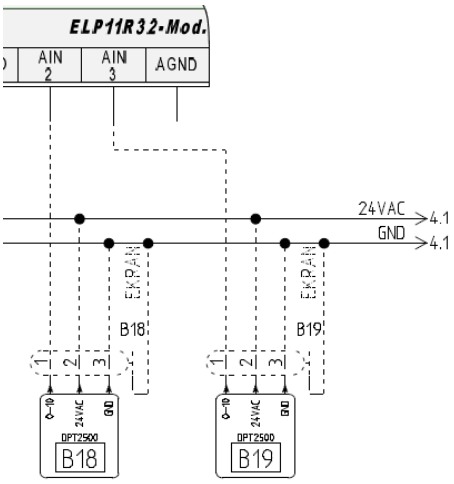
6.9 SYSTEM CONFIGURATION - CONSTANT AIR FLOW OF FANS

ATTENTION!!! Pressure regulation can be done in two ways:

- Regulation of constants pressure in channels, it is used in systems in which VAV regulators. In the system with the constant air pressure, we install additional pressure sensors on the ducts.
- Constants flow regulation is possible in systems with axial fans equipped with the possibility of a measuring orifice for connecting the pressure sensors of the fans. For these fans, the manufacturer provides a K factor that allows you to change the pressure measurement to flow measure. 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:



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).

6.10 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.

Cascade regulator - a 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 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.

6.11 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	closed	A_AF
Din 2	Thermostat frost protection of the water heater	closed	A_ThHWair, A_3xThHWair
	Alarm of the electric heater	closed	A_ThHE, A_3xThHE
	Alarm of the gas heater	closed	A_ThGAS, A_3xThGAS
Din 3	Alarm of the unit of the DX cooler	open *	A_CX
Din 4	Differential pressure switch of the supply filter	open	A_SupFilter
Din 5	Differential pressure switch of the supply secondary filter	open	A_SupFilter2
	Defrost reverse freon	open	-
Din 6	Differential pressure switch of the exhaust filter	open	A_ExhFilter
	CO detector	open	A_HighCO
Din 7	Differential pressure switch of the supply fan	closed	A_SupPres
Din 8	Differential pressure switch of the exhaust fan	closed	A_ExhPres
Din 9	Confirmation of the supply fan work	closed	A_SupFC
Din 10	Confirmation of the exhaust fan work	closed	A_ExhFC
Din 11	Confirmation of the rotary heat exchanger work	closed	A_Rot
Din 12	Service switch	closed	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)

Temperature 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.

6.12 EXTENSION MODULE (ON THE ELP1418MOD CONTROLLER)

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 therequired state is causing alarm
-			
Din 1	Failure humidifier	open	A_Hum
Din 2	Electric heater alarm	closed	A_ThHEsec, A_3xThHsec
Din 3	Reserved	-	-

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 therequired state is causing alarm
Din 1	Failure humidifier	open	A_Hum
Din 2	Electric heater alarm	closed	A_ThHEsec, A_3xThHsec
Din 3	Reserved	-	-

Analogue inputs devices (Signal inputs devices 0-10VDC)	
Ain 1	Humidity supply air sensor (option)
Ain 2	Humidity exhaust air sensor (option))/ Humidity supply air sensor (in supply unit)

Temperature sensors PT1000		The damaged temperature sensor is causing alarm
PT1	Reserved	-
PT2	Reserved	-
PT3	Reserved	-
PT4	Reserved	-
PT5	Reserved	-

Digital outputs, state OFF - ReC/ReA output obtuse, ON state - ReC/ReA output shorted		
Re1	On-Off signal of the humidifier	relay
Re2	Pump of the secondary water heater	relay
	Secondary electric heater	relay
Re3	Reserved	relay
Re4	Reserved	relay
Re5	Reserved	relay

Analogue outputs (Signal outputs 0-10VDC)	
Aout1	Humidifier
Aout2	Secondary heater (water, electric)
Aout3	Reserved

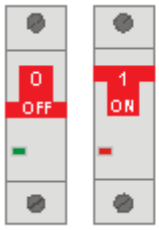
7 CONTROL SERVICE

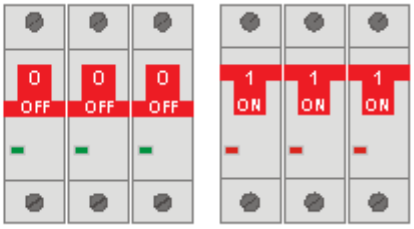
Before start-up by the user the control box should be connected and checked by authorized personnel.

Start-up of the device

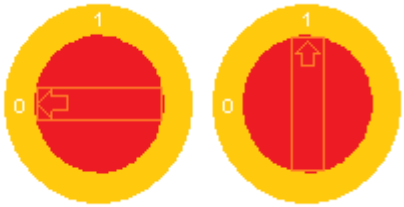
Operate Switch Q1M into position ON.

„1-ON" (synthetic switchboard)





„1" (metal switchboard)



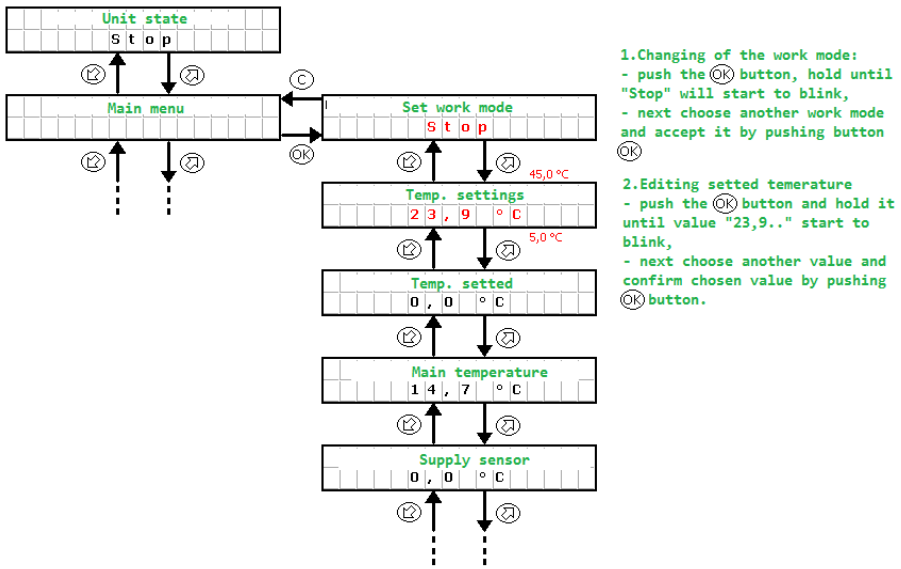
The device is starting-up if:
- signal S1 on DIN12 input of the controller is shorted
- signal S1F on DIN1 input of the controller is shorted

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

ATTENTION: 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.

7.1 STAND-BY MODE

In order to save energy, the automation system allows you to work in the standby mode, this mode is selected using the "Operation mode" setting in the main menu of the controller or in the calendar. Depending on the demand, it is possible to set the standby mode only for heating, cooling or for heating and cooling (see section 7.3).

The system reactions are described below when switching from operating mode to standby (heating).

System I - stopped system,

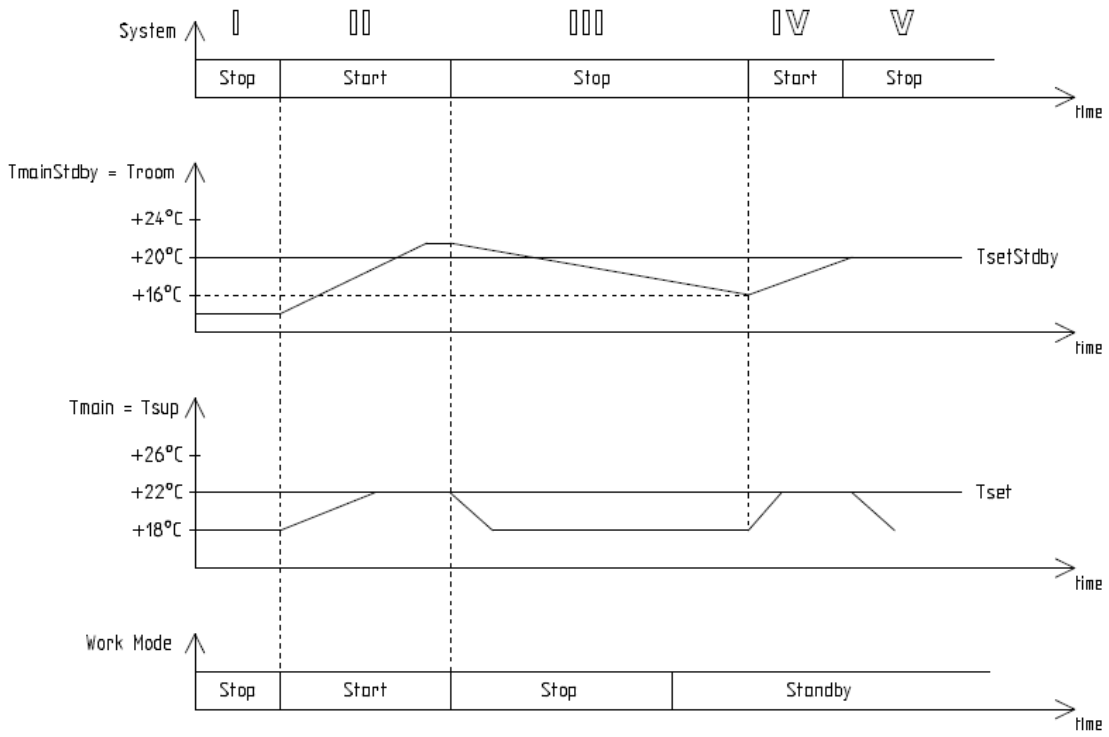
System II - the system is switched on to work, the fans and heat / cold exchangers are activated, the temperature regulation (in this case Tsup - supply air) is adjusted to the set temperature of 22 ° C,

System III - stopped system, supply air temperature and room is reduced,

System IV - the system is switched on to work due to the attainment conditions, the temperature drop of the leading standby mode (in this case Troom - room) by the hysteresis value of 4 ° C, from the setpoint of standby mode TsetStdby = 20 ° C, the temperature control of the ventilation unit takes place with respect to the main sensor (in this case Tsup - supply),

System V - system stopped due to reaching the set standby temperature (Troom = TsetStdby).

ATTENTION:
For correct operation of the system in standby mode, it is recommended to use an additional room temperature sensor (connected to the PT5 input) located in a representative room. You can also use the HMI panel for this purpose. Indication of supply and extract temperature sensors can be unreliable in this operating mode.



7.2 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_DX	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**
	Blocking	Cooperation with the alarm contact of the reversing unit: Normal state - there is no alarm of the reversible aggregate, there is no 24VAC signal on the digital input Alarm state - there is a reversible unit alarm, 24VAC signal on the digital input

		Response to an alarm state: blocking of the control signals: start and 0-10VDC to the cause of the alarm and acknowledgment of the alarm The NO setting can be changed to NC **Digital input Din3**
	We choose the type of A_FX alarm in the service menu	
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_HighCO	Blocking	Testing the extent of CO exceeded threshold 1 detector: Normal state - acceptable CO level, no 24VAC signal on the digital input Alarm state - CO level exceeded, 24VAC signal on the digital input Reaction to the alarm state: stopped system, check the reason for exceeding the CO threshold, after removing the cause, confirm the alarm and start the system (function used in systems with gas heaters) **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**
A_Hum	Declining	Cooperation with the humidifier alarm contact: Normal state - no alarm, no 24VAC signal on the digital input Alarm state - an alarm occurs, the 24VAC signal is on the digital input Reaction to an alarm state: information signal **N1.2 controller digital input Din1**
A_ThHEsec, **A_3xThHEsec**	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_ThHEsec alarm system will stop working and display A_3xThHEsec alarm that requires confirmation. **N1.2 controller digital input Din2**
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 operation 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** **ATTENTION!!! IN CASE OF DEHUMIDIFICATION ACTIVATION SOME HEATING, SOME COOLER AND SUPPLY/EXHAUST SYSTEM IS REQUIRED** **ATTENTION!!! IN THE CASE OF THE SECONDARY HEATING ACTIVATION ACTIVE DEHUMIDIFICATION IS REQUIRED**

		ATTENTION!!! THERE IS NO POSSIBILITY TO SET THE PRIMARY HEATER AS ELECTRIC / GAS AND SECONDARY WATER
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
A_In_EmulN1.2	Declining	Emulation of inputs N1.2: 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_OutForceN1.2	Declining	Forcing output N1.2: 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
A_ComN1.2	Declining	Alarm no communication N1 main controller with extension controller - N1.2: Normal state - no alarm, communication correct Emergency state - an alarm occurs, no communication Response to the alarm state: the system stopped until the correct communication returns. Default address of the driver - extension module N1.2: "34 DEC"

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.

8 CONTROL OPERATION

8.1 Main menu

Tab. 4 Main menu

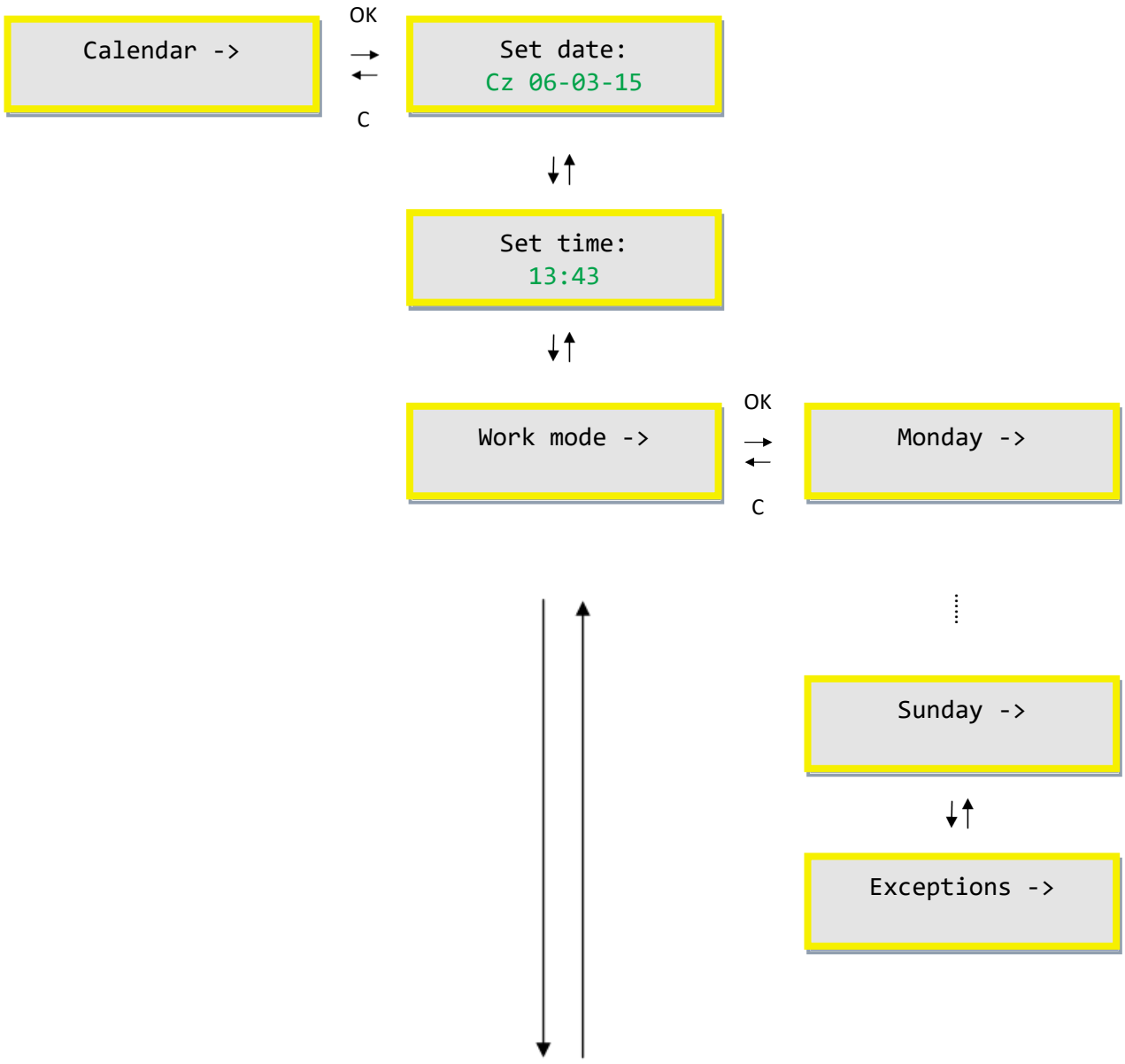
Name	Default value	Description
State of the AHU	Service mode	**Service mode** – the arrangement is in the course of the configuration, lack of ability of the start of the arrangement, active protective functions of chosen exchangers heating/cooling **Stop** - the AHU is stopped, air dampers are closed , 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).

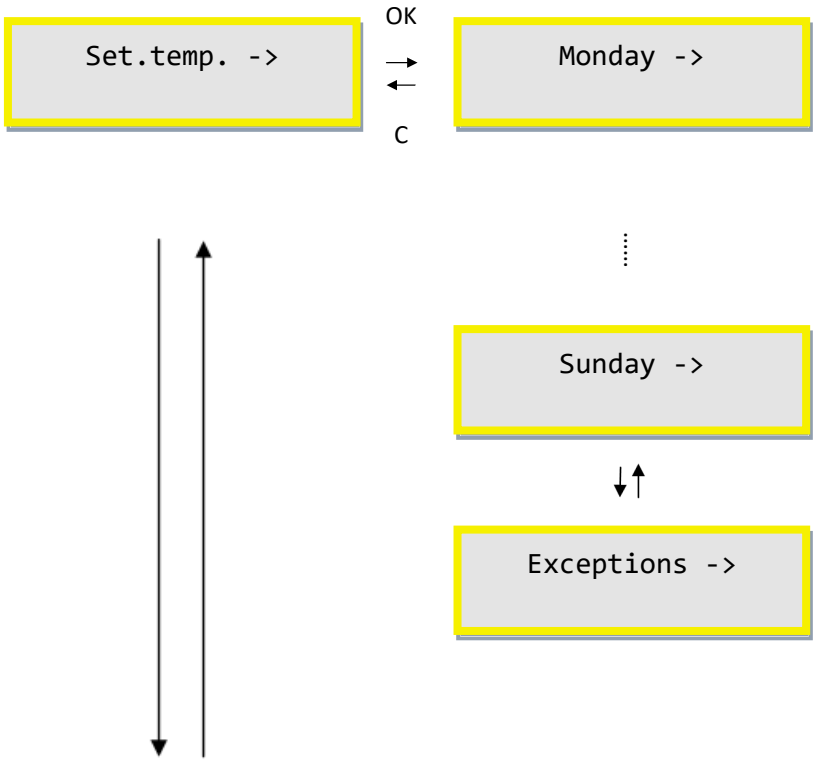
8.2 CALENDAR

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.

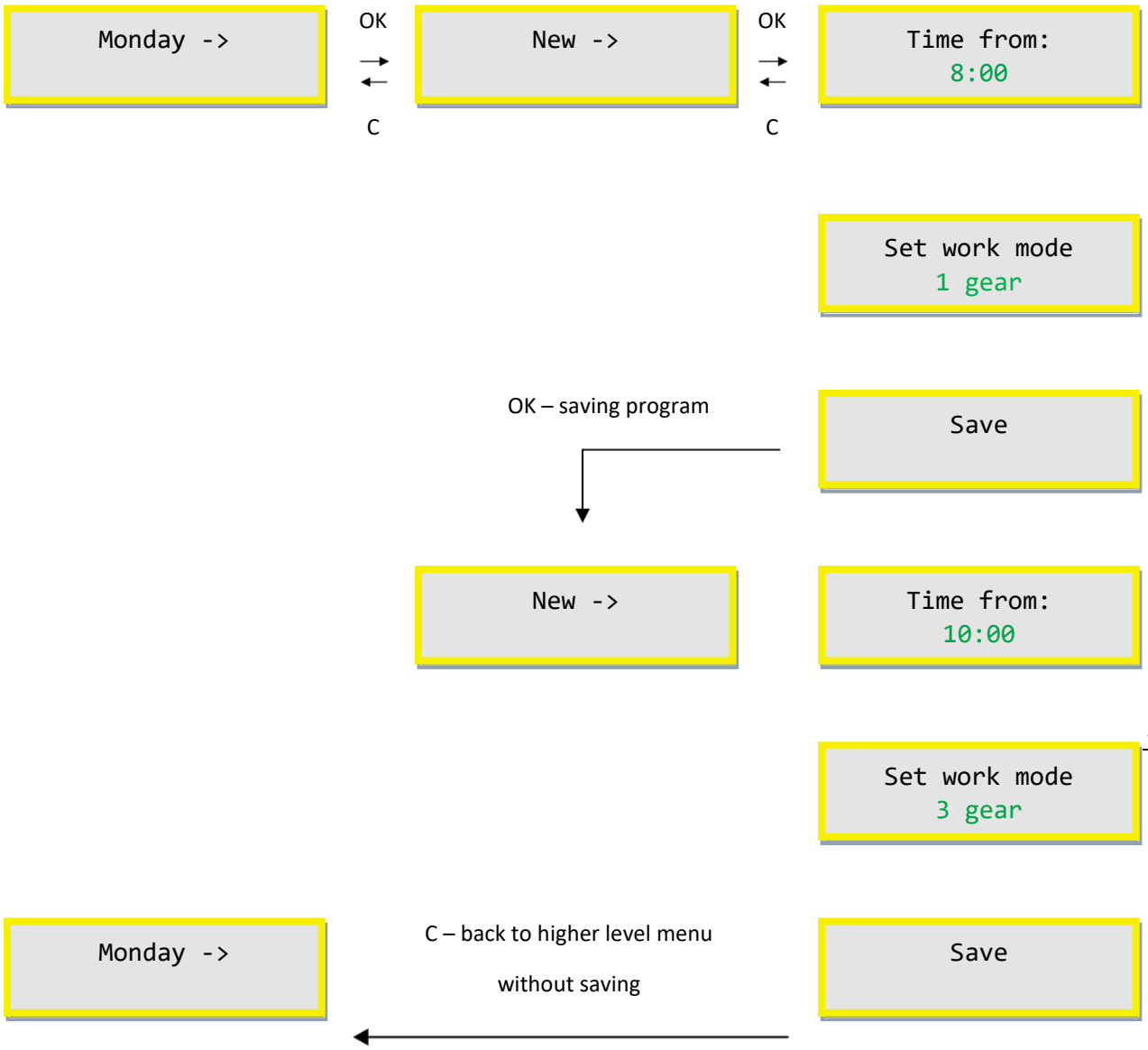
Program includes parameters:
Work mode – possible selections: Stop, Start 1 step, Start 2 step Start 3 step and the Stand-by.
Temperature set – temperature setting
Fast heating - there is possibility of activate fast heating using a mixing chamber (there is in system with mixing chamber)

Calendar:

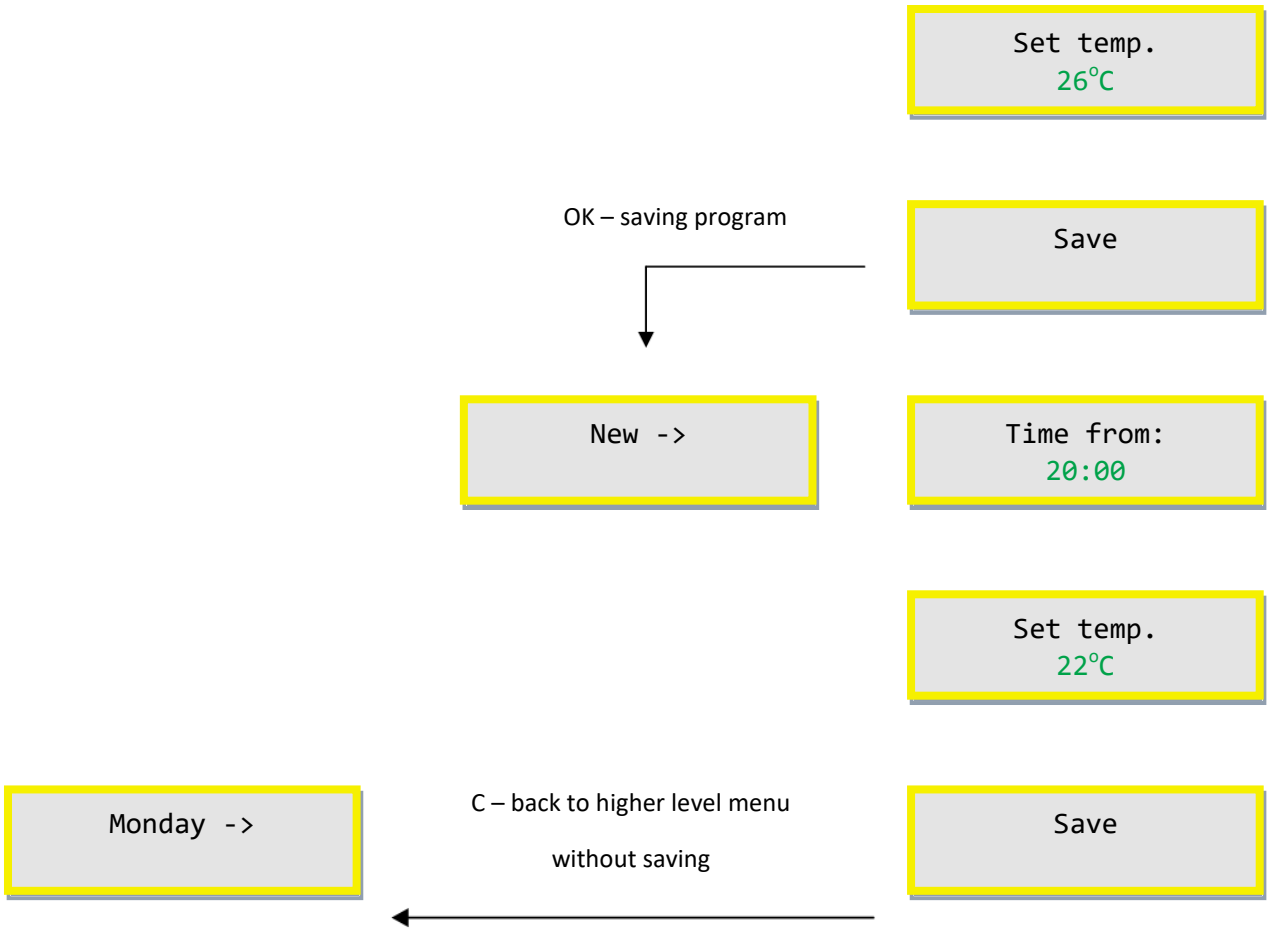




Work mode:



Temperature setting:



8.3 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*** RS***485*** *- 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	Mode	Tout	The choice of the season switching method: Tout - switching from external temperature, switching thresholds set to rigidly Tset - switching from the outside temperature, switching thresholds depending on the actual set temperature
	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
	Tout		
	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
	Tset		
	StartH	2°C	Start heating (winter) – Tout<Tset-StartH
	StopH	1°C	Stop heating (winter) – Tout>Tset-StopH
	StartC	2°C	Start cooling (summer) – Tout>Tset+StartC
	StopC	1°C	Stop cooling (summer) – Tout<Tset+StopC
Humidity	Maximum air humidity	75%	Limiting the supply air humidity
	Limiting sensor	Inactive	It is possible to choose whether there is a limiting or only regulating sensor in the air handling units
	Main sensor	Exhaust	The sensor for leading humidification can be selected

	Humidification	Winter	Humidifier operation mode setting - In SUMMER / WINTER mode, humidification is possible at any time of the year, in WINTER mode, moistening possible only in winter
	Humidification limit	90%	The setting of maximum power of the humidifier.
	Dehumidification limit	80%	The setting of maximum power of the dehumidification.
	Regulator	10%	Dead zone - setting above which the system starts the humidifying / dehumidification process
		1	Kp_humidity – humidity regulator gain
		90s	Ti_ humidity - integration constant of the humidity regulator
	Humidity supply air sensor	-	Measuring range of the humidity sensor - the ability to set the measuring range of the humidity sensor
	Humidity exhaust air sensor	-	Measuring range of the humidity sensor - the ability to set the measuring range of the humidity sensor
Standby mode	Temperature setting	18°C	Temperature setpoint - setpoint temperature setting of the leading standby sensor (whereby the temperature is controlled according to the lead temperature sensor and the temperature setpoint from the main menu)
	Main sensor	*HMI CON*	***HMI CON*** *- enabling the system to operate the sensor in the room unit HMI terminal connected by* HMI *CON* ***HMI*** RS***485 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.*
		100%	Supply - set the efficiency of the supply air fan during the cooling process (100% means the maximum setpoint from the fan gear settings)
		100%	Exhaust - set the efficiency of the extract air fan during the cooling process (100% means the maximum setpoint from the fan gear settings)
	Air flow control	0,1	Kp – constant air volume regulator 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)
		-	Flow set 1,2,3 gear - set value of air flow in the supply / exhaust part for operation on 1,2,3 gear (calculated from the pressure measured on the fan and factor K)
		-	K - supply / extract fan factor, required for calculating the flow value from the pressure measured on the fan
		-	Number of fans - we calculate the total flow of setpoint and measurement of all supply / extract fans
		ATTENTION!!! Pressure regulation can be done in two ways: 1. Regulation of constant pressure in channels, it is used in systems in which VAV regulators. In the system with the constant air pressure, we install additional pressure sensors on the ducts. 2. Constant flow regulation is possible in systems with axial fans equipped with the possibility of a measuring orifice for connecting the pressure sensors of the fans. For these fans, the manufacturer provides a K factor that allows you to change the pressure measurement to flow measure. In the system equipped with the measuring air flow system, we install additional pressure sensors on the fans according to the drawing below.	
	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.address – address of the inverter supply fan
		2	Exh.inv.address – address of the inverter exhaust fan
		3	2.Sup.inv.address – address of the secondary inverter supply fan
		4	2.Exh.inv.address – 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*
		4°C	RecHist - hysteresis work permit recovery, heat recovery possible when Texh> Tout + RecHist
		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*

	Delay of pump shutdown	0s	Delayed pump off time - delay in switching off the water heater circulation pump
	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
		-20°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 reverse DXr NO/NC
		NO	Contact cooling - possibility to select the type of cooling mode contact of the reverse DX unit NO/NC
		No response	**No response** – the defrost signal from the revers condensing unit causes no system response **Low speed** - the defrost signal from the revers condensing unit will reduce the speed of the fans **Unit stop** - the defrost signal from the revers condensing unit will shut down the unit
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)
	Work mode	Winter	Winter – possible heat recovery Summer/winter – possible heat and cold recovery
	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*

8.4 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 active** – 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.
	Humidity	None	**None** - there is no humidity control in the system **Humidifier** - the system is equipped with a humidifier, 0-10VDC signal control, start / stop signal and a return alarm signal **Dehumidification** - a system equipped with thermodynamic dehumidification functions
	Secondary 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

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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

ATTENTION!!! IN CASE OF DEHUMIDIFICATION ACTIVATION SOME HEATING, SOME COOLER AND SUPPLY/EXHAUST SYSTEM IS REQUIRED

ATTENTION!!! IN THE CASE OF THE SECONDARY HEATING ACTIVATION ACTIVE DEHUMIDIFICATION IS REQUIRED

ATTENTION!!! THERE IS NO POSSIBILITY TO SET THE PRIMARY HEATER AS ELECTRIC / GAS AND SECONDARY WATER

Configuration	Start time	10s	**Start time** – the ability to set the time after which the system can start working
	DIN5 function	Inactive	**DIN5 function** - possibility to activate one of the two digital input functions DIN5. 1S2H - the input fulfils the function of the secondary supply part filter, DEF - the input acts as the defrost signal of the reversing unit.

	DIN6 function	2S1H	**DIN6 function** - possibility to activate one of the two digital input functions DIN6. 2S1H - the input fulfils the function of the extract air filter, CO detector - the input fulfils the function of the CO detector signal, useful in systems with gas heaters, exceeding the central heating causes stopping with blockade of the control panel operation.
	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, Eura Drive)
	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 in a given gear in accordance with the power settings **Constant pressure** - fan operation with a power dependent on the constant pressure regulator (pressure on the duct) **Constant flow** - fan operation with a power dependent on the constant flow (pressure on the fan, conversion to m3 / h)

	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 Multi	Inactive	**HMI Multi** - the possibility of activating the system with touch panel in the HMI multi function
	Layout number	1	Set the AHU number in the HMI multi function
	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
	Electric heater	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
		10s	**PWM period** - PWM signal period (default 10s)
		100%	**PWM limit** - limitation of the maximum power of the PWM controlled heater
		-	**Phe (% Psup)** - linear limitation of the maximum power of the electric heater depending on the control of the supply air fans
	Reverse freon	120 s	**Start ramp** - after the start signal of the reversing unit, the 0-10VDC signal increases smoothly

	unit	Fading	**A_FX** - choosing the type of alarm " Fading - during the alarm, start and 0-10V signals are given, return to operation after the cause of the alarm has ceased Blocking - during the alarm, start and 0-10V signals are turned off, return to operation after the cause of the alarm stops and the alarm has been acknowledged
		0,10V	**Umin, Umax** - setting the minimum, maximum output voltage 0-10VDC for the connected system
		min>max	**Control signal** - setting of the 0-10VDC signal control method: min> max, max> min, Auto min> max, Auto max> min, signal type "Auto" is a linear inverse relationship in winter and summer
	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)
	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.

9 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 variables:

Address 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	Hset	Hum.setting	1% = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
13	26	Hmain	Main humidity	1% = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
14	28	Hsup	Supply humidity	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
15	30	Hreg	Regulation humidity	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
16	32	E6	Start / stop signal to the humidifier	0 - stop, 1 - start	MSV	Coil 512	R
17	34	Y11	0-100% signal to the humidifier	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
18	36	Dehum	0-100% dehumidification signal	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
19	38	Vent	Vent.	0: Off, 1: On	MSV	Coil 608	R
20	40	PwrSup	Supply/Exhaust	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
21	42	PaSup	Supply	1pa = 256 (22pa = 22*256 = 5632 = 0x1600)	AV	Register	R
22	44	FlowSup	Measurement of the air flow of the supply air fan	1m3/h = 256 (22m3/h = 22*256 = 5632 = 0x1600)	AV	Register	R
23	46	PwrExh	Exhaust	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
24	48	PaExh	Exhaust	1pa = 256 (22pa = 22*256 = 5632 = 0x1600)	AV	Register	R
25	50	FlowExh	Measurement of the air flow of the exhaust air fan	1m3/h = 256 (22m3/h = 22*256 = 5632 = 0x1600)	AV	Register	R
26	52	Isup	Current	1A = 256 (22A = 22*256 = 5632 = 0x1600)	AV	Register	R
27	54	Fsup	Frequency	1Hz = 256 (22Hz = 22*256 = 5632 = 0x1600)	AV	Register	R
28	56	RPMsup	RPM	1rpm = 256 (22rpm = 22*256 = 5632 = 0x1600)	AV	Register	R
29	58	Usup	Voltage	1V = 256 (22V = 22*256 = 5632 = 0x1600)	AV	Register	R
30	60	FaultSup	Alarm code	1A = 1A (HEX) **www.el-piast.com/alarms-decoder**	AV	Register	R
31	62	ComSup	Communication	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
32	64	Isup2	Current	1A = 256 (22A = 22*256 =	AV	Register	R

				5632 = 0x1600)			
33	66	Fsup2	Frequency	1Hz = 256 (22Hz = 22*256 = 5632 = 0x1600)	AV	Register	R
34	68	RPMsup2	RPM	1rpm = 256 (22rpm = 22*256 = 5632 = 0x1600)	AV	Register	R
35	70	Usup2	Voltage	1V = 256 (22V = 22*256 = 5632 = 0x1600)	AV	Register	R
36	72	FaultSup2	Alarm code	1A = 1A (HEX) **www.el-piast.com/alarms-decoder**	AV	Register	R
37	74	ComSup2	Communication	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
38	76	Iexh	Current	1A = 256 (22A = 22*256 = 5632 = 0x1600)	AV	Register	R
39	78	Fexh	Frequency	1Hz = 256 (22Hz = 22*256 = 5632 = 0x1600)	AV	Register	R
40	80	RPMexh	RPM	1rpm = 256 (22rpm = 22*256 = 5632 = 0x1600)	AV	Register	R
41	82	Uexh	Voltage	1V = 256 (22V = 22*256 = 5632 = 0x1600)	AV	Register	R
42	84	FaultExh	Alarm code	1A = 1A (HEX) **www.el-piast.com/alarms-decoder**	AV	Register	R
43	86	ComExh	Communication	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
44	88	Iexh2	Current	1A = 256 (22A = 22*256 = 5632 = 0x1600)	AV	Register	R
45	90	Fexh2	Frequency	1Hz = 256 (22Hz = 22*256 = 5632 = 0x1600)	AV	Register	R
46	92	RPMexh2	RPM	1rpm = 256 (22rpm = 22*256 = 5632 = 0x1600)	AV	Register	R
47	94	Uexh2	Voltage	1V = 256 (22V = 22*256 = 5632 = 0x1600)	AV	Register	R
48	96	FaultExh2	Alarm code	1A = 1A (HEX) **www.el-piast.com/alarms-decoder**	AV	Register	R
49	98	ComExh2	Communication	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
50	100	Y1	Water heater	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
51	102	M1	Heater-pump	0: Off, 1: On	MSV	Coil 1632	R
52	104	Y8	Secondary Water heater	0 - stop, 1 - start	AV	Register	R
53	106	M8	Secondary Heater-pump	1% = 256 (22% = 22*256 = 5632 = 0x1600)	MSV	Coil 1696	R
54	108	HePwr	Electric heater	0 - stop, 1 - start	AV	Register	R
55	110	HeSecPwr	Secondary Electric heater	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R

56	112	GasPwr	GAS heater	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
57	114	Y2	Water cooler	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
58	116	E1	Water cooler	0 - stop, 1 - start	MSV	Coil 1856	R
59	118	Y9	DX cooler	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
60	120	DXstate	DX cooler	0 - stop, 1 - 1st degree, 2 - 2nd degree, 3 - 1st and 2nd degree	MSV	Register	R
61	122	YFX	FX reverse	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
62	124	H_C	FX reverse	0 - heating, 1 - cooling	MSV	Register	R
63	126	DEF	Defrost FX	0 - stop, 1 - start	MSV	Coil 2016	R
64	128	YRec	Recovery	1% = 256 (22% = 22*256 = 5632 = 0x1600)	MSV	Register	R
65	130	M7	Recovery-pump	0 - stop, 1 - start	MSV	Coil 2080	R
66	132	RecState	Recovery	0 - stop, 1 - start, 2, 3 - defrost	AV	Register	R
67	134	SetMix	Set mixing ratio	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
68	136	ThrMCh	Mixing chamber	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
69	138	ThrSuEx	Fresh air ratio	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
70	140	Throt	Fresh air ratio	0 - stop, 1 - start	MSV	Coil 2240	R

Settings Menu Variables

Address DEC		Variable name	HMI Name	States	Type		Read [R] /Write [W]
BacNet	Modbus				BacNet	Modbus	
71	142	Ch_Tmain	Main sensor	1: HMI (CON), 2: HMI (RS485), 3: Supply, 4: Exhaust, 5: PT5	AV	Register	R/W
72	144	EcoDiff	Eco temp.difference	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
73	146	StartReg	Start reg.	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
74	148	TsetCor	Tset correction	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
75	150	OfsPT1	PT1	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
76	152	OfsPT2	PT2	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
77	154	OfsPT3	PT3	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W

78	156	OfsPT4	PT4	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
79	158	OfsPT5	PT5	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
80	160	OfsHMICon	HMI (CON)	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
81	162	OfsHMIRS	HMI (RS485 Master)	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
82	164	SeasonMode	Season change mode	0 - Tout, 1 - Tset	MSV	Register	R/W
83	166	Season	Season	0 - Auto, 1 - Winter, 2 - Summer	MSV	Register	R/W
84	168	Tsummer	Summer temp	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
85	170	HistSum	Hysteresis	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
86	172	StartHistH	Tset mode hysteresis start winter (Tout<Tset-Hist)	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
87	174	StopHistH	Tset mode hysteresis stop winter (Tout>Tset-Hist)	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
88	176	StartHistC	Tset mode hysteresis start summer (Tout>Tset+Hist)	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
89	178	StopHistC	Tset mode hysteresis stop summer (Tout< Tset+Hist)	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
90	180	Hsmax	Maximum supply humidity	1% = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
91	182	HsupLim	Limiting sensor	0: Inactive, 1: Active	MSV	Coil 2912	R/W
92	184	ChHsmain	Hum.main sensor	0 - exhaust, 1 - supply	MSV	Coil 2944	R
93	186	TrybHum	Humidifier work mode	0 - Summer/Winter, 1 - Winter	MSV	Coil 2976	R
94	188	LimHum	Humidification limit	1% = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
95	190	LimOsusz	Dehumidification limit	1% = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
99	198	PIDHist	Dead zone for humidification	1% = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
100	200	Kp_desiccation	Kp humidification	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
101	202	Ti_desiccation	Ti humidification	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
102	204	HsV1	The lower threshold of the supply air humidity sensor	1V = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
103	206	HsV2	Upper threshold of the supply air humidity sensor	1V = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
104	208	Hs1	The lower humidity threshold of the supply air humidity sensor	1% = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W

105	210	Hs2	The upper humidity threshold of the supply air humidity sensor	1% = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
106	212	HeV1	The lower threshold of the exhaust air humidity sensor exhaust or supply limit	1V = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
107	214	HeV2	Upper threshold of the exhaust air humidity sensor exhaust or supply limit	1V = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
108	216	He1	The lower humidity threshold of the exhaust air humidity sensor exhaust or supply limit	1% = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
109	218	He2	The upper humidity threshold of the exhaust air humidity sensor exhaust or supply limit	1% = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
110	220	TsetStd	Setting the standby temperature	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
111	222	Ch_Tstd	Main sensor	1: HMI (CON), 2: HMI (RS485), 3: Exhaust, 4: PT5	MSV	Register	R/W
112	224	TstdbyAct	Main sensor	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
113	226	StdMode	Active for	1: Heating, 2: Cooling, 3: Heating/cooling	MSV	Register	R/W
114	228	StdHis	Standby hyster.	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
115	230	v1_t	Starting delay	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
116	232	DelThr	Damp.off delay	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
117	234	PresDel	Pressure delay	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
118	236	CoolingTime	Cooling time	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
119	238	SupCooling	Supply	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
120	240	ExhCooling	Exhaust	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
121	242	Kp_CP	Kp	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
122	244	Ti_CP	Ti	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
123	246	PaSZ1	Set press.gear 1	1pa = 256 (22pa = 22*256 = 5632 = 0x1600)	AV	Register	R/W
124	248	PaSZ2	Set press.gear 2	1pa = 256 (22pa = 22*256 = 5632 = 0x1600)	AV	Register	R/W
125	250	PaSZ3	Set press.gear 3	1pa = 256 (22pa = 22*256 = 5632 = 0x1600)	AV	Register	R/W

126	252	DPTrangeSup	Sensor range	1pa = 256 (22pa = 22*256 = 5632 = 0x1600)	AV	Register	R/W
127	254	FlowSZ1	Flow 1 gear preset for operation with constant supply flow rate (calculated from pressure and K factor)	1m3/h = 256 (22m3/h = 22*256 = 5632 = 0x1600)	AV	Register	R
128	256	FlowSZ2	Flow 2 gear preset for operation with constant supply flow rate (calculated from pressure and K factor)	1m3/h = 256 (22m3/h = 22*256 = 5632 = 0x1600)	AV	Register	R
129	258	FlowSZ3	Flow 2 gear preset for operation with constant supply flow rate (calculated from pressure and K factor)	1m3/h = 256 (22m3/h = 22*256 = 5632 = 0x1600)	AV	Register	R
130	260	Ksup	K factor for converting pressure into the flow of the supply part	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
131	262	VentSupQuant	Number of supply fans (calculated total flow of setpoint and measurement of all supply fans)	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
132	264	PaEZ1	Set press.gear 1	1pa = 256 (22pa = 22*256 = 5632 = 0x1600)	AV	Register	R/W
133	266	PaEZ2	Set press.gear 2	1pa = 256 (22pa = 22*256 = 5632 = 0x1600)	AV	Register	R/W
134	268	PaEZ3	Set press.gear 3	1pa = 256 (22pa = 22*256 = 5632 = 0x1600)	AV	Register	R/W
135	270	DPTrangeExh	Sensor range	1pa = 256 (22pa = 22*256 = 5632 = 0x1600)	AV	Register	R/W
136	272	FlowEZ1	Flow 1 gear preset for operation with constant exhaust flow rate (calculated from pressure and K factor)	1m3/h = 256 (22m3/h = 22*256 = 5632 = 0x1600)	AV	Register	R
137	274	FlowEZ2	Flow 2 gear preset for operation with constant exhaust flow rate (calculated from pressure and K factor)	1m3/h = 256 (22m3/h = 22*256 = 5632 = 0x1600)	AV	Register	R
138	276	FlowEZ3	Flow 2 gear preset for operation with constant exhaust flow rate (calculated from pressure and K factor)	1m3/h = 256 (22m3/h = 22*256 = 5632 = 0x1600)	AV	Register	R
139	278	Kexh	K factor for converting pressure into the flow of the exhaust part	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
140	280	VentExhQuant	Number of supply fans (calculated total flow of setpoint and measurement of all exhaust fans)	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
141	282	Sup1	Sup/exh min.	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
142	284	Sup2	Sup/exh med.	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W

143	286	Sup3	Sup/exh.max.	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
144	288	Exh1	Exh.min.	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
145	290	Exh2	Exh.med.	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
146	292	Exh3	Exh.max.	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
147	294	RSsup	Sup.via RS485	0: Inactive, 1: Active	MSV	Coil 4704	R/W
148	296	Rsexh	Exh.via RS485	0: Inactive, 1: Active	MSV	Coil 4736	R/W
149	298	RSsup2	2.Sup.via RS485	0: Inactive, 1: Active	MSV	Coil 4768	R/W
150	300	RSexh2	2.Exh.via RS485	0: Inactive, 1: Active	MSV	Coil 4800	R/W
151	302	FminS	Sup.freq.min.	1Hz = 256 (22Hz = 22*256 = 5632 = 0x1600)	AV	Register	R/W
152	304	FmaxS	Sup.freq.max.	1Hz = 256 (22Hz = 22*256 = 5632 = 0x1600)	AV	Register	R/W
153	306	FminE	Exh.freq.min.	1Hz = 256 (22Hz = 22*256 = 5632 = 0x1600)	AV	Register	R/W
154	308	FmaxE	Exh.freq.max.	1Hz = 256 (22Hz = 22*256 = 5632 = 0x1600)	AV	Register	R/W
155	310	AdrSup	Sup.inv.address	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
156	312	AdrExh	Exh.inv.address	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
157	314	AdrSup2	2.Sup.inv.address	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
158	316	AdrExh2	2.Exh.inv.address	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
159	318	TaccVent	T.acc.	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
160	320	TdecVent	T.dec.	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
161	322	RECproc	Recovery	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
162	324	FXproc	Reverse freon	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
163	326	MIXproc	Mixing chamber	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
164	328	h_c_proc	Heating/cooling	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R
165	330	Kp_Heat	Kp	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
166	332	Ti_Heat	Ti	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
167	334	Kp_Cool	Kp	1 = 256 (22 = 22*256 = 5632 =	AV	Register	R/W

				0x1600)			
168	336	Ti_Cool	Ti	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
169	338	PIcoolingAct	PI cooling	0 - summer, 1 - summer and winter	MSV	Register	R/W
170	340	DelOnPIcool	Starting delay	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
171	342	Kp_Blow	Kp	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
172	344	Ti_Blow	Ti	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
173	346	TminBlow	Tmin air blow	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
174	348	TmaxBlow	Tmax air blow	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
175	350	TsetBlowAct	TsetBlowAct	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
176	352	RecMode	Work mode	0: Inactive, 1: Winter, 2: Summer, 3: Winter/summer	MSV	Register	R/W
177	354	RecHist	Hysteresis of recovery permission	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
178	356	RecDown	Starting ramp	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
179	358	TlimRec	Frost limit	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
180	360	MinRot	Frost min.power	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
181	362	KpRec	Kp frost.prot	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
182	364	TiRec	Ti frost.prot	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
183	366	RotAl	Alarm pin	0: NO, 1: NC	MSV	Coil 5856	R/W
184	368	G_Sec	Set protection	0: Inactive, 1: Active	MSV	Coil 5888	R/W
185	370	G_SecDP	Stop period	1 day = 256 (22 days = 22*256 = 5632 = 0x1600)	AV	Register	R/W
186	372	G_SecT	Run time	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
187	374	InitT100	Preh.100% time	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
188	376	InitTscale	Preh.scale time	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
189	378	RampEn	Falling ramp	0: Inactive, 1: Active	MSV	Coil 6048	R/W
190	380	RampTime	Fall ramp	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W

191	382	Init_Tmin	Min T.out	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
192	384	InitVTmin	Min.Tout valve	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
193	386	Init_Tmax	Max T.out	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
194	388	InitVTmax	Max.Tout.valve	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
195	390	Tlim1	Pump work temp.	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
196	392	DelOffM1	Pump off delay	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
197	394	MinValve	Min.valve open	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
198	396	TbActive	B8 sensor	0: Inactive, 1: Active	MSV	Coil 6336	R/W
199	398	Tlim2	Frost temp.out.	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
200	400	TbStopFrost	Stop	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
201	402	TbStartFrost	Start	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
202	404	TbStopReg	Stop	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
203	406	TbStartReg	Start	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
204	408	KpBack	Kp	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
205	410	TiBack	Ti	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
206	412	HW_Sec	Set protection	0: Inactive, 1: Active	MSV	Coil 6592	R/W
207	414	HW_SecDP	Stop period	1day = 256 (22 days = 22*256 = 5632 = 0x1600)	AV	Register	R/W
208	416	HW_SecT	Run time	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
209	418	GasAl	GAS alarm	0: NC, 1: NO	MSV	Coil 6688	R/W
210	420	mBreakDX	Break time min.	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
211	422	mWorkDX	Work time min.	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
212	424	Tout_minDX	Temp.out work min.	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
213	426	negS5F	Alarm pin	0: NO, 1: NC	MSV	Coil 6816	R/W
214	428	II_IIIactiveDX	Stage 2	0: Inactive, 1: Active	MSV	Coil 6848	R/W
215	430	CascadeDX	Cascade	0: Inactive, 1: Active	MSV	Coil 6880	R/W

216	432	IistageDX	Stage 2	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
217	434	IIistageDX	Stage 3	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
218	436	mBreakFX	Break time min.	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
219	438	mWorkFX	Work time min.	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
220	440	Tout_minFX	Temp.out work min.	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
221	442	negAFX	Alarm pin	0: NO, 1: NC	MSV	Coil 7072	R/W
222	444	HCmode	Cooling pin	0: NO, 1: NC	MSV	Coil 7104	R/W
223	446	DefFunc	Defrost	0: Stop system, 1: Low gear, 2: No reaction	MSV	Register	R/W
224	448	ModeMix	Work mode	0: Manual, 1: Temperature, 3: Temp./CO2	MSV	Register	R/W
646	1292	MixMode	Work mode	1: Winter, 3: Winter/summer	MSV	Register	R/W
225	450	PrioMH	Priority to	0: Mix chamber, 1: Heating/cooling	MSV	Coil 7200	R/W
226	452	MinFresh	Min.fresh air	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
227	454	MaxFresh	Max.fresh air	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
228	456	FHEn	Fast heating	0: Inactive, 1: Active	MS	Register	R/W
229	458	TlimMCH	Temp.setpoint	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
230	460	HistMCH	Hysteresis	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
231	462	SetCO2	Set CO2	1ppm = 256 (22 ppm = 22*256 = 5632 = 0x1600)	AV	Register	R/W
232	464	Kp_CO2	Kp	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
233	466	Ti_CO2	Ti	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
234	468	ppmMin	0 V	1ppm = 256 (22 ppm = 22*256 = 5632 = 0x1600)	AV	Register	R/W
235	470	ppmMax	10 V	1ppm = 256 (22 ppm = 22*256 = 5632 = 0x1600)	AV	Register	R/W

Service menu variables

Address DEC		Variable name	HMI Name	States	Type		Read [R] /Write [W]
BacNet	Modbus				BacNet	Modbus	

236	472	ServiceMode	Service mode	0: Inactive, 1: Active	MSV	#ADR!	R/W
237	474	TYPE	Type	1: Supply, 2: Supply/exhaust, 4: 2xSup/2xexh	MSV	Register	R/W
238	476	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
239	478	REVERSE	Reverse freon	0: None, 1: Active	MSV	Coil 7648	R/W
240	480	COOL	Cooler	0: None, 1: DX, 2: Water	MSV	Register	R/W
241	482	HEAT	Heater	0: None, 1: Electric, 2: Water, 4: GAS	MSV	Register	R/W
242	484	DEH_HUM	Humidity control type	0 - inactive, 1 - humidifier, 2 - dehumidification, 3 - humidifier + dehumidification	MSV	Register	R/W
243	486	SEC_HEAT	Secondary heater (dehumidification)	0 - inactive, 1 - electric, 2 - water	MSV	Register	R/W
244	488	PowOnTime	Start time	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
245	490	FuncDin5	DIN5 function	0: Inactive, 1: 1S2H, 2: DEF	MSV	Register	R/W
246	492	FuncDin6	DIN6 function	0: Inactive, 1: 2S1H, 2: CO detector	MSV	Register	R/W
247	494	FuncDin12	DIN12 function	0: ON/OFF, 1: A_StopS1	MSV	Coil 7904	R/W
248	496	FanInverters	Fan inverter type	1: IC5,IG5, 2: FC51, 4: FC101, 8: EC Blue, 16: EBM, 32: Eura Drive	MSV	Register	R/W
249	498	ActualAdrECB	Actual address	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
250	500	AdrToSetECB	Address to set	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
251	502	ActiveConfigECB	Set address	0: No, 1: Yes	MSV	Coil 8032	R/W
252	504	StatusConfECB	Status	0: Com Ok, 1: In progress, 2: A_Com, 3: A_Com	MSV	Coil 8064	R/W
253	506	ActualAdrEBM	Actual address	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
254	508	AdrToSetEBM	Address to set	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R/W
255	510	ActiveConfigEBM	Set address	0: No, 1: Yes	MSV	Coil 8160	R/W
256	512	StatusConfEBM	Status	0: Com Ok, 1: In progress, 2: A_Com, 3: A_Com	MSV	Coil 8192	R/W
257	514	ConstPress	Const.pressure	0 - inactive, 1 - constant pressure, 3 - constant flow	MSV	Coil 8224	R/W
258	516	PresVent.	Ventilator pressure switch	0: Inactive, 1: 1S1F, 3: 1S1F/2S1F	MSV	Register	R/W
259	518	Sup0_10	Supply 0-10VDC	0: Inactive, 1: Aout1, 2: Aout2,	MSV	Register	R/W

				4: Aout3, 8: Aout4			
260	520	Exh0_10	Exhaust 0-10VDC	0: Inactive, 1: Aout1, 2: Aout2, 4: Aout3, 8: Aout4	MSV	Coil 8320	R
261	522	HMImulti	HMI multi function	0: Inactive, 1: Active	MSV	Coil 8352	R/W
262	524	AHUnumer	AHU number	1	AV	Register	R/W
263	526	Tiny	HMI Tiny	0: Inactive, 1: Active	MSV	Coil 8416	R/W
264	528	FrostAlarm	Alarm A_ColdRec	0: Inactive, 1: Active	MSV	Coil 8448	R/W
265	530	RecFrostProt	Recovery sensor	0: Pressure switch, 1: Temperature	MSV	Coil 8480	R/W
266	532	HEcontrol	HE control	0: 0-10VDC, 1: PWM	MSV	Coil 8512	R/W
267	534	PWMperiod	PWM period	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
268	536	PWMlimit	PWMlimit	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
269	538	PhePventAct	Phe (%Psup)	0: Inactive, 1: Active	MSV	Coil 8608	R/W
270	540	Psup1	Psup.min.	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
271	542	Phe1	Phe.min.	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
272	544	Psup2	Psup.max.	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
273	546	Phe2	Phe.max.	1% = 256 (22% = 22*256 = 5632 = 0x1600)	AV	Register	R/W
274	548	FXstart	Start signal ramp 0-10VDC control reversible unit	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
275	550	A_FXtype	Alarm unit type of alarm	0 - blocking, 1 - declining	MSV	Register	R/W
276	552	PrioFXheat	Heat priority for	0 - Reverse freon, 1 - Heater	MSV	Register	R/W
277	554	MinV	Umin. (FX control)	1V = 256 (22V = 22*256 = 5632 = 0x1600)	AV	Register	R/W
278	556	MaxV	Umax. (FX control)	1V = 256 (22V = 22*256 = 5632 = 0x1600)	AV	Register	R/W
279	558	YFXmode	Fx control signal	0 - min>max, 1 - max>min, 2 - Auto min>max, 4 - Auto max>min	MSV	Register	R/W
280	560	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
281	562	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
282	564	TexhAct	Exhaust sensor	0: Inactive, 1: Active	MSV	Coil 9024	R/W
283	566	TsetChT	Tset change	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
284	568	Ao1scale	Aout1	0 - "0-10VDC", 1 - "2-10VDC"	MSV	Coil 9088	R/W

285	570	Ao2scale	Aout2	0 - "0-10VDC", 1 - "2-10VDC"	MSV	Coil 9120	R/W
286	572	Ao3scale	Aout3	0 - "0-10VDC", 1 - "2-10VDC"	MSV	Coil 9152	R/W
287	574	Ao4scale	Aout4	0 - "0-10VDC", 1 - "2-10VDC"	MSV	Coil 9184	R/W
288	576	Tcom	Tcom	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
289	578	Twait	Twait	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
290	580	MaxDiff	Difference	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
291	582	T1	T1	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
292	584	T2	T2	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
293	586	T3	T3	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
294	588	T4	T4	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
295	590	T5	T5	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
296	592	T6	T6	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
297	594	T7	T7	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
298	596	T8	T8	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
299	598	T9	T9	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
300	600	T10	T10	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
301	602	T11	T11	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
302	604	T12	T12	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
303	606	T13	T13	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
304	608	T14	T14	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
305	610	T15	T15	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
306	612	HistPeriod	Period	1s = 256 (22s = 22*256 = 5632 = 0x1600)	AV	Register	R/W
307	614	Reset	Reset	0: Off, 1: On	MSV	Coil 9824	R/W
308	616	_DIN1	Din1	0: Opened, 1: Closed	MSV	Coil 9856	R
309	618	_DIN2	Din2	0: Opened, 1: Closed	MSV	Coil 9888	R

310	620	_DIN3	Din3	0: Opened, 1: Closed	MSV	Coil 9920	R
311	622	_DIN4	Din4	0: Opened, 1: Closed	MSV	Coil 9952	R
312	624	_DIN5	Din5	0: Opened, 1: Closed	MSV	Coil 9984	R
313	626	_DIN6	Din6	0: Opened, 1: Closed	MSV	Coil 10016	R
314	628	_DIN7	Din7	0: Opened, 1: Closed	MSV	Coil 10048	R
315	630	_DIN8	Din8	0: Opened, 1: Closed	MSV	Coil 10080	R
316	632	_DIN9	Din9	0: Opened, 1: Closed	MSV	Coil 10112	R
317	634	_DIN10	Din10	0: Opened, 1: Closed	MSV	Coil 10144	R
318	636	_DIN11	Din11	0: Opened, 1: Closed	MSV	Coil 10176	R
319	638	_DIN12	Din12	0: Opened, 1: Closed	MSV	Coil 10208	R
320	640	Ain_1	AIN1	1V = 256 (22V = 22*256 = 5632 = 0x1600)	AV	Register	R
321	642	Ain_2	AIN2	1V = 256 (22V = 22*256 = 5632 = 0x1600)	AV	Register	R
322	644	Ain_3	AIN3	1V = 256 (22V = 22*256 = 5632 = 0x1600)	AV	Register	R
323	646	PT_1	PT1	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
324	648	PT_2	PT2	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
325	650	PT_3	PT3	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
326	652	PT_4	PT4	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
327	654	PT_5	PT5	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
328	656	HMI_Con	HMI (CON)	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
329	658	HMI_RS	HMI (RS485 Master)	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
330	660	Re1	Re1	0: Off, 1: On	MSV	Coil 10560	R
331	662	Re2	Re2	0: Off, 1: On	MSV	Coil 10592	R
332	664	Re3	Re3	0: Off, 1: On	MSV	Coil 10624	R
333	666	Re4	Re4	0: Off, 1: On	MSV	Coil 10656	R
334	668	Re5	Re5	0: Off, 1: On	MSV	Coil 10688	R
335	670	Re6	Re6	0: Off, 1: On	MSV	Coil 10720	R
336	672	Re7	Re7	0: Off, 1: On	MSV	Coil 10752	R
337	674	Re8	Re8	0: Off, 1: On	MSV	Coil 10784	R
338	676	AO1	AOU1	1V = 256 (22V = 22*256 = 5632 = 0x1600)	AV	Register	R
339	678	AO2	AOU2	1V = 256 (22V = 22*256 =	AV	Register	R

				5632 = 0x1600)			
340	680	AO3	AOU3	1V = 256 (22V = 22*256 = 5632 = 0x1600)	AV	Register	R
341	682	AO4	AOU4	1V = 256 (22V = 22*256 = 5632 = 0x1600)	AV	Register	R
342	684	F_DIN1	Din1	0: No emulation, 1: Set opened, 3: Set closed	MSV	Register	R/W
343	686	F_DIN2	Din2	0: No emulation, 1: Set opened, 3: Set closed	MSV	Register	R/W
344	688	F_DIN3	Din3	0: No emulation, 1: Set opened, 3: Set closed	MSV	Register	R/W
345	690	F_DIN4	Din4	0: No emulation, 1: Set opened, 3: Set closed	MSV	Register	R/W
346	692	F_DIN5	Din5	0: No emulation, 1: Set opened, 3: Set closed	MSV	Register	R/W
347	694	F_DIN6	Din6	0: No emulation, 1: Set opened, 3: Set closed	MSV	Register	R/W
348	696	F_DIN7	Din7	0: No emulation, 1: Set opened, 3: Set closed	MSV	Register	R/W
349	698	F_DIN8	Din8	0: No emulation, 1: Set opened, 3: Set closed	MSV	Register	R/W
350	700	F_DIN9	Din9	0: No emulation, 1: Set opened, 3: Set closed	MSV	Register	R/W
351	702	F_DIN10	Din10	0: No emulation, 1: Set opened, 3: Set closed	MSV	Register	R/W
352	704	F_DIN11	Din11	0: No emulation, 1: Set opened, 3: Set closed	MSV	Register	R/W
353	706	F_DIN12	Din12	0: No emulation, 1: Set opened, 3: Set closed	MSV	Register	R/W
354	708	Em_Ai1	AIN1 emulation	0: Disabled, 1: Enabled	MSV	Coil 11328	R/W
355	710	E_Ai1	AIN1	1V = 256 (10V = 10*256 = 2560 = 0xA00)	AV	Register	R/W
356	712	Em_Ai2	AIN2 emulation	0: Disabled, 1: Enabled	MSV	Coil 11392	R/W
357	714	E_Ai2	AIN2	1V = 256 (10V = 10*256 = 2560 = 0xA00)	AV	Register	R/W
358	716	Em_Ai3	AIN3 emulation	0: Disabled, 1: Enabled	MSV	Coil 11456	R/W
359	718	E_Ai3	AIN3	1V = 256 (10V = 10*256 = 2560 = 0xA00)	AV	Register	R/W
360	720	Em_PT1	PT1 emulation	0: Disabled, 1: Enabled	MSV	Coil 11520	R/W
361	722	E_PT1	PT1	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
362	724	Em_PT2	PT2 emulation	0: Disabled, 1: Enabled	MSV	Coil 11584	R/W
363	726	E_PT2	PT2	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W

364	728	Em_PT3	PT3 emulation	0: Disabled, 1: Enabled	MSV	Coil 11648	R/W
365	730	E_PT3	PT3	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
366	732	Em_PT4	PT4 emulation	0: Disabled, 1: Enabled	MSV	Coil 11712	R/W
367	734	E_PT4	PT4	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
368	736	Em_PT5	PT5 emulation	0: Disabled, 1: Enabled	MSV	Coil 11776	R/W
369	738	E_PT5	PT5	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
370	740	Em_Hcon	Emul. HMI (CON)	0: Disabled, 1: Enabled	MSV	Coil 11840	R/W
371	742	E_Hcon	HMI (CON)	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
372	744	Em_Hrs	Emul. HMI (RS485 Master)	0: Disabled, 1: Enabled	MSV	Coil 11904	R/W
373	746	E_Hrs	HMI (RS485 Master)	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R/W
374	748	F_Re1	Re1	0: No force, 1: Force off, 3: Force on	MSV	Register	R/W
375	750	F_Re2	Re2	0: No force, 1: Force off, 3: Force on	MSV	Register	R/W
376	752	F_Re3	Re3	0: No force, 1: Force off, 3: Force on	MSV	Register	R/W
377	754	F_Re4	Re4	0: No force, 1: Force off, 3: Force on	MSV	Register	R/W
378	756	F_Re5	Re5	0: No force, 1: Force off, 3: Force on	MSV	Register	R/W
379	758	F_Re6	Re6	0: No force, 1: Force off, 3: Force on	MSV	Register	R/W
380	760	F_Re7	Re7	0: No force, 1: Force off, 3: Force on	MSV	Register	R/W
381	762	F_Re8	Re8	0: No force, 1: Force off, 3: Force on	MSV	Register	R/W
382	764	FoAO1	Aout1 Forcing	0: Disabled, 1: Enabled	MSV	Coil 12224	R/W
383	766	F_AO1	Aout1	1V = 256 (10V = 10*256 = 2560 = 0xA00)	AV	Register	R/W
384	768	FoAO2	Aout2 Forcing	0: Disabled, 1: Enabled	MSV	Coil 12288	R/W
385	770	F_AO2	Aout2	1V = 256 (10V = 10*256 = 2560 = 0xA00)	AV	Register	R/W
386	772	FoAO3	Aout3 Forcing	0: Disabled, 1: Enabled	MSV	Coil 12352	R/W
387	774	F_AO3	Aout3	1V = 256 (10V = 10*256 = 2560 = 0xA00)	AV	Register	R/W
388	776	FoAO4	Aout4 Forcing	0: Disabled, 1: Enabled	MSV	Coil 12416	R/W
389	778	F_AO4	Aout4	1V = 256 (10V = 10*256 = 2560 = 0xA00)	AV	Register	R/W

Alarm Variables

Address DEC		Variable name	HMI Name	States	Type		Read [R] /Write [W]
BacNet	Modbus				BacNet	Modbus	
390	780	ResetAlarms	Reset Alarms	0 - no reset, 1 - reset	MSV	Coil 12480	R/W
391	782	A_Code	Wrong central type code	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 12512	R
392	784	A_AF	Fire-prevention alarm	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 12544	R
393	786	A_StopS1	Alarm - S1 turned off	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 12576	R
394	788	A_ThHWair	Alarm of the thermostat frost-resistant	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 12608	R
395	790	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 12640	R
396	792	A_ThHWwater	Low temperature alarm of return water heater	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 12672	R
397	794	A_3xThHWwater	Low temperature alarm of return 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 12704	R
398	796	A_ThHE	Alarm of the thermostat electric heater	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 12736	R
399	798	A_3xThHE	Alarm of the thermostat electric heater (3 times appearance of the alarm within an hour)	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 12768	R
400	800	A_ThHEsec	Alarm of the thermostat secondary electric heater	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 12800	R
401	802	A_3xThHEsec	Alarm of the thermostat secondary electric heater (3 times appearance of the alarm within an hour)	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 12832	R
402	804	A_ThGAS	Alarm of the thermostat GAS heater	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 12864	R
403	806	A_3xThGAS	Alarm of the thermostat GAS heater (3 times appearance of the alarm within an hour)	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 12896	R
404	808	A_DX	Alarm of the freon cooler	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 12928	R
405	810	A_FX	Alarm of the freon reverse heater / cooler	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 12960	R
406	812	A_Hum	Alarm of humidifier	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 12992	R
407	814	A_RecFC	Alarm of the speed governor of	0 - an alarm is missing, 1 - an	BV	Coil 13024	R

			the rotational recuperation	alarm is appearing			
408	816	A_ColdRec	Alarm of frosting the recuperation	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 13056	R
409	818	A_SupFilter	Alarm of the dirty filter of the air blowing	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 13088	R
410	820	A_SupFilter2	Alarm of the dirty secondary filter of the air blowing	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 13120	R
411	822	A_ExhFilter	Alarm of the dirty filter of the outlet	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 13152	R
412	824	A_SupFC	Alarm of the fan of the air blowing	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 13184	R
413	826	A_ExhFC	Alarm of the fan of the outlet	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 13216	R
414	828	A_ComSupFC	Alarm lock of communication with the inverter supply	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 13248	R
415	830	A_ComSupFC2	Alarm lock of communication with the secondary inverter supply	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 13280	R
416	832	A_ComExhFC	Alarm lock of communication with the inverter exhaust	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 13312	R
417	834	A_ComExhFC2	Alarm lock of communication with the secondary inverter exhaust	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 13344	R
418	836	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 13376	R
419	838	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 13408	R
420	840	A_HighCO	CO exceeded alarm	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 13440	R
421	842	A_Tsup	Alarm of the temperature sensor of the air blowing	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 13472	R
422	844	A_Texh	Alarm of the temperature sensor of the outlet	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 13504	R
423	846	A_Tout	Alarm of the temperature sensor outside	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 13536	R
424	848	A_Trec	Alarm of the temperature sensor behind the recuperation	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 13568	R
425	850	A_TbackWater	Alarm of the contact temperature sensor return water heater	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 13600	R
426	852	A_Tmain	Alarm of the temperature sensor leading	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 13632	R
427	854	A_InEmul	Alarm of the emulation of entries of the controller	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 13664	R
428	856	A_OutForce	Alarm of pushing exits of the	0 - an alarm is missing, 1 - an	BV	Coil 13696	R

			controller	alarm is appearing			
429	858	A_InEmulN1_2	Alarm of the emulation of entries of the controller N1.2	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 13728	R
430	860	A_OutForceN1_2	Alarm of pushing exits of the controller N1.2	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 13760	R
431	862	A_ComN1_2	Alarm no communication with controller N1.2	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 13792	R
432	864	Alarm	Collective alarm	0 - an alarm is missing, 1 - an alarm is appearing	BV	Coil 13824	R

10 COMMUNICATION BACNET MS-TP WITH BMS SYSTEM

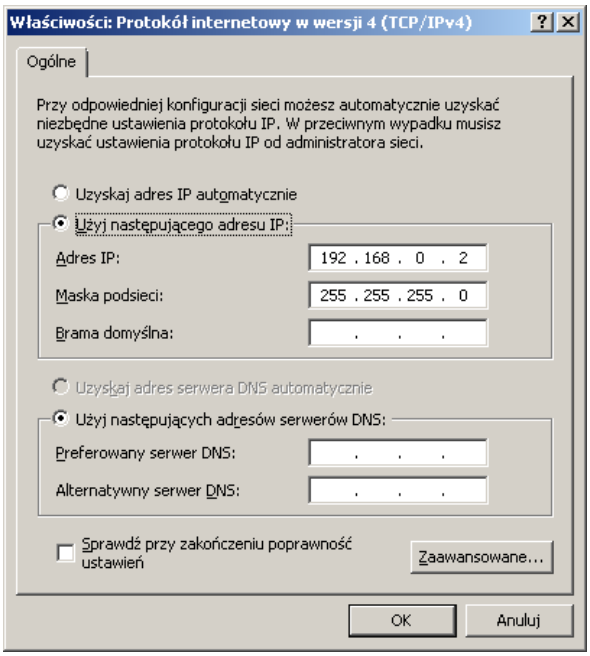
Variables BacNet should look after connecting the powered controller and the introduction of appropriate BacNet network settings (see item5)

11 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:

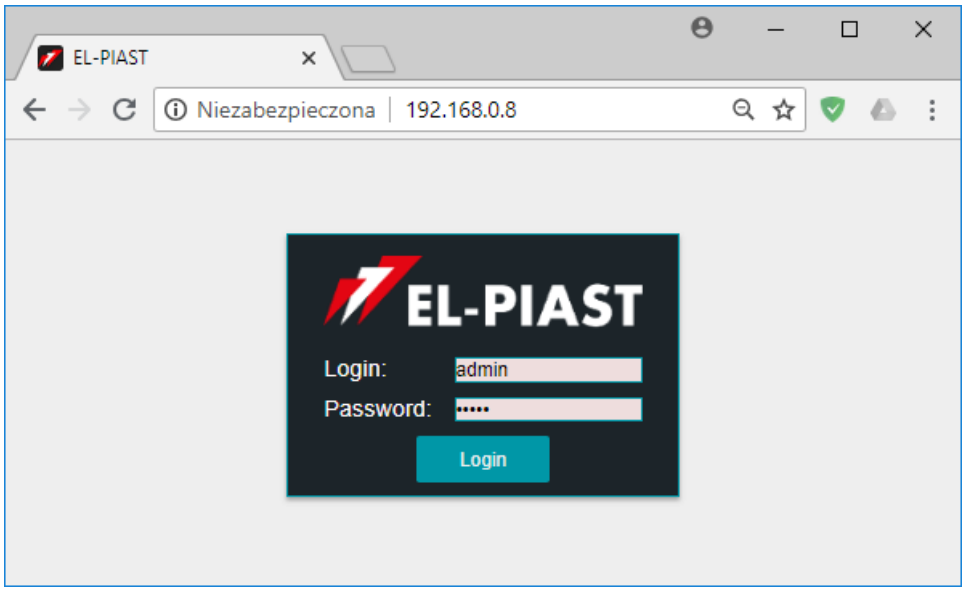
To connect from a local computer connected directly with a cable to Ethernet card ETH of the ELP11R32 controller you have to:

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

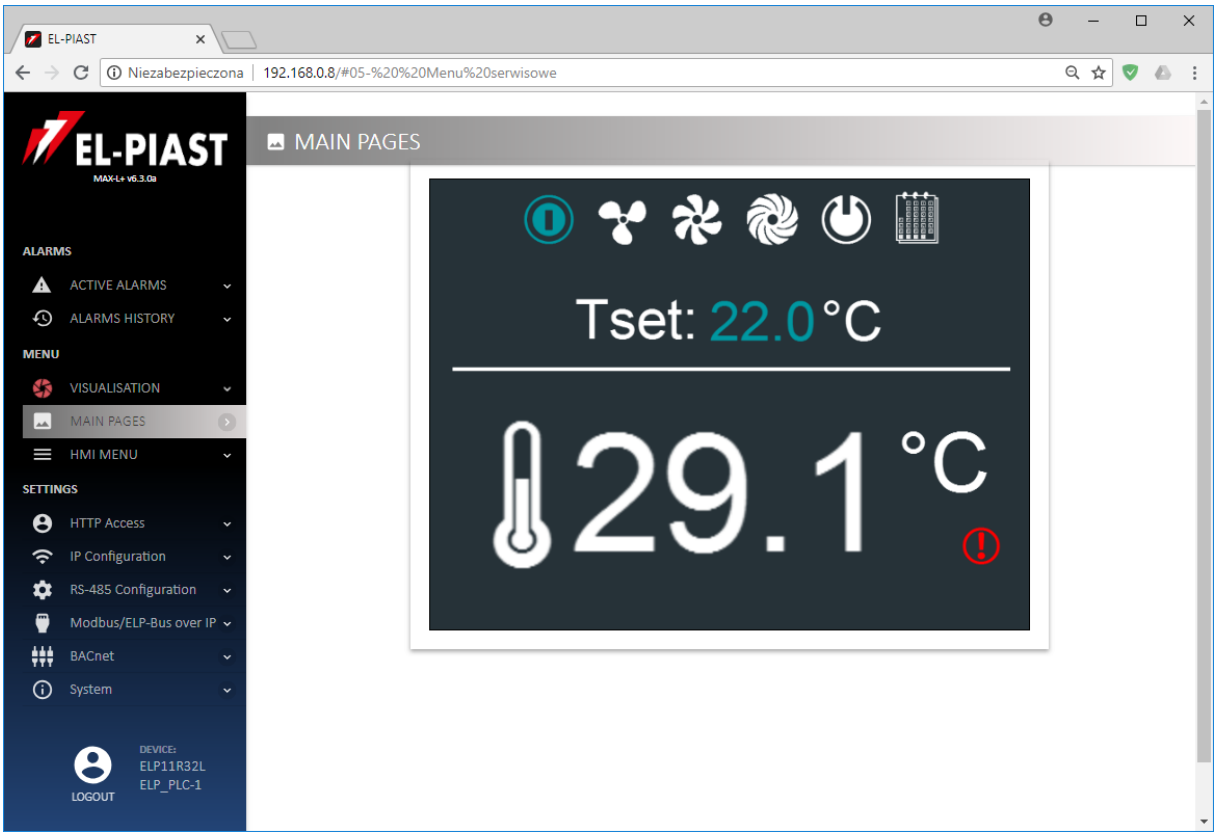


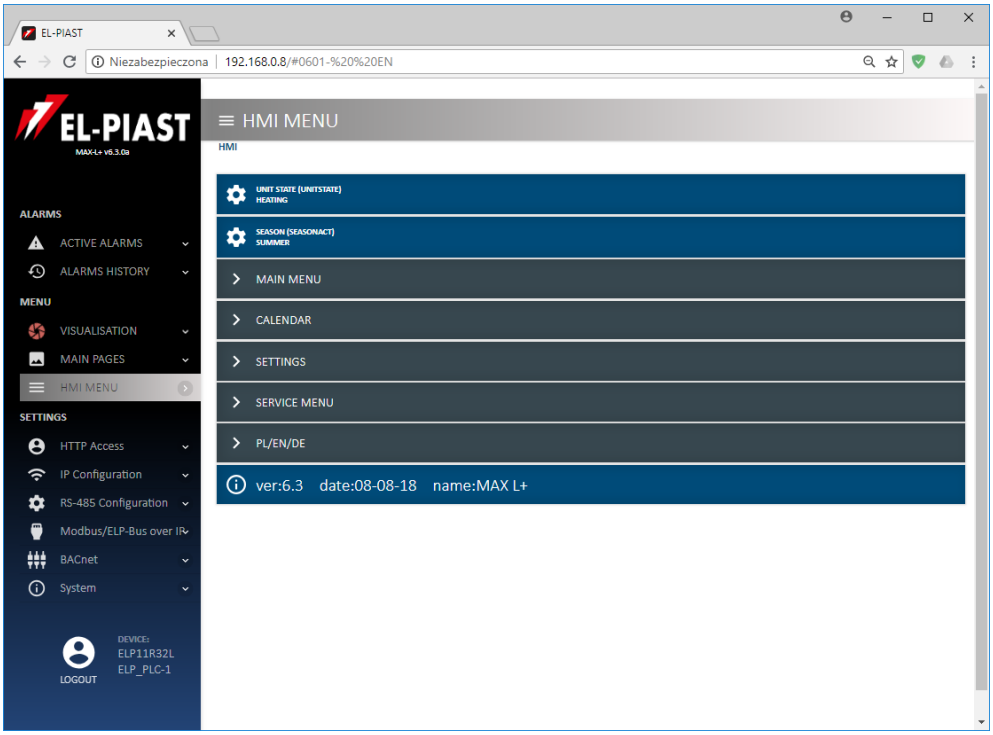
Then, open a Web browser and type the default controller address: 192.168.0.8

A window will appear where you should enter the default username: admin and password: admin



After entering the login and password and confirming "Login", the WEB PAGE screen will appear to operate the controller menu

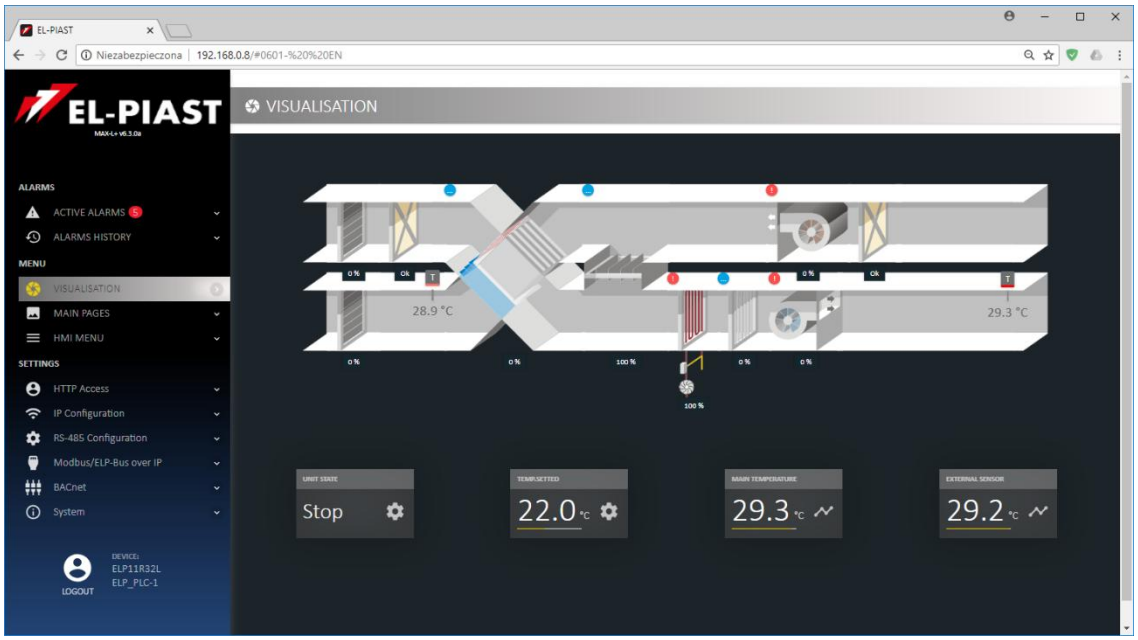




WARNING!!! The default ETH card firmware allows to use the "MAIN PAGE" text menu and the HMI Compact and HMI Advanced room menu menus "HMI MENU". The "VISUALIZATION" visualization screen on the controller's website is available only as a dedicated application for the universal application "MAX L v6.3 + 2018 08 08" or as an individual, additionally payable, with visualization acc. customer guidelines dedicated to the layout with a custom application.

An example of the control panel visualization screen for the universal application "MAX L v6.3 + 2018 08 08"

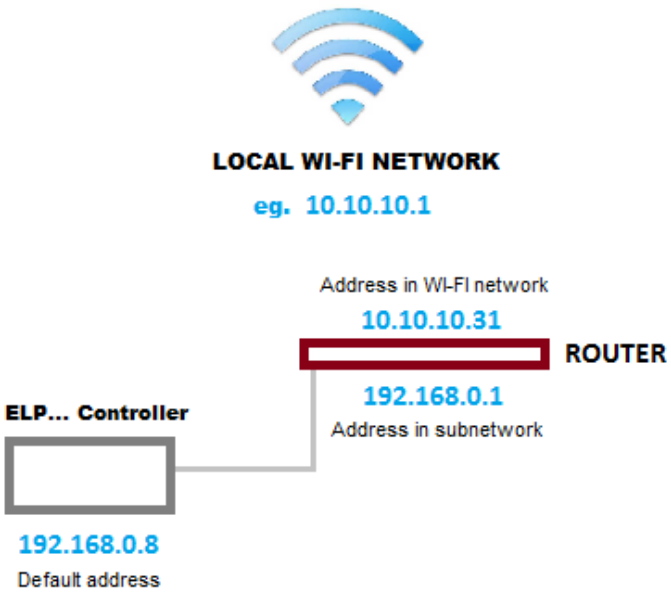
The control panel visualization screen in the universal application adapts to the selected code of the ventilation unit



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:

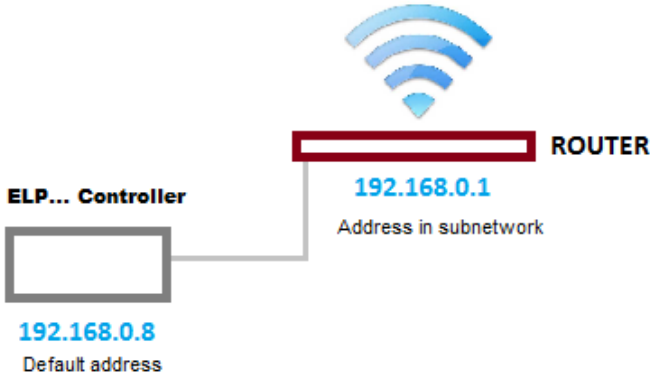
11.1 CONNECTION OF THE ELP11R32 CONTROLLER TO THE LOCAL NETWORK VIA WIFI



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

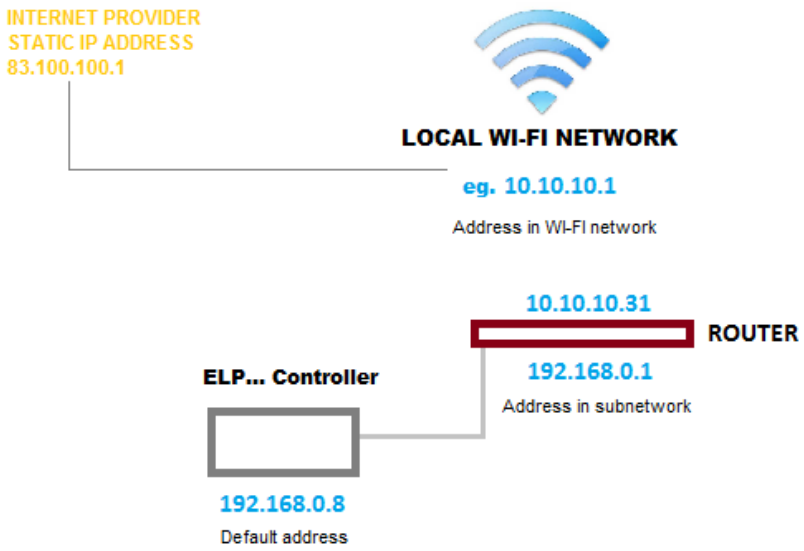
11.2 DIRECT COMMUNICATION WITH THE ELP11R32 CONTROLLER THROUGH WIFI ROUTER



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

11.3 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

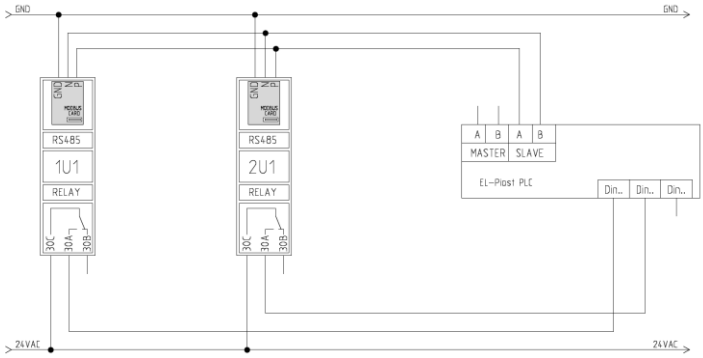
Router with port redirection: 80. From the ELP11R32 controller: 192.168.0.8:80 to sample external address of the router: 10.10.10.31. As a result we see ELP11R32 controller in local WIFI network.

By connecting with any internet connection we have an access to the ELP11R32 controller under the website http://83.100.100.1

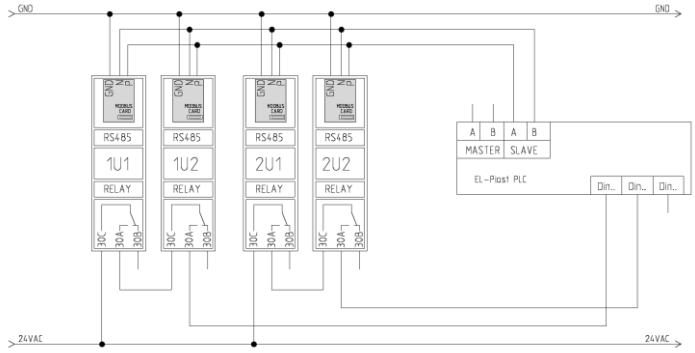
12 COMMUNICATION RS485 SLAVE, MODBUS RTU WITH INVERTERS LG IC5

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:

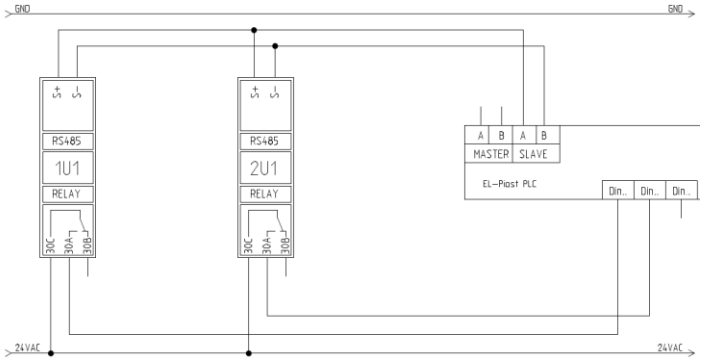
Code	Name	Value to be set	Description
drv	Control mode	3	Communication RS485
Frq	The method of frequency	8	Communication Modbus-RTU
F21	Maximum output frequency	**Fz max**	Set individual
F22	Rated motor frequency	...Hz	Set individual
F23	The minimum frequency reference	0.000	**Always enter the value**
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 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.

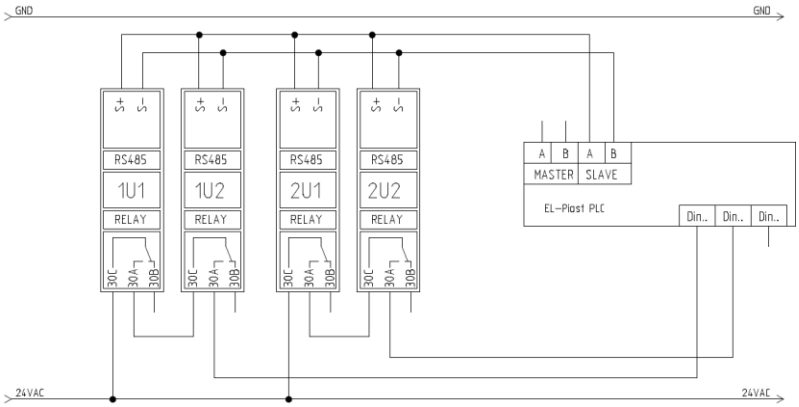
NOTE: The settings in the controller (Settings/Fan/RS485/Maximum frequency) must be at least 0.1Hz lower than Fzmax, otherwise the inverter may show control errors.

13 COMMUNICATION RS485 SLAVE, MODBUS RTU WITH INVERTERS LG IG5

Example for system with single supply, single exhaust



Example for system with double supply, double exhaust



Configuration drive LG IG5 control RS485:

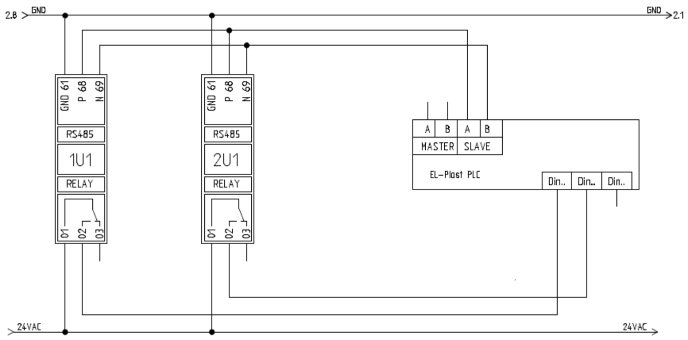
Code	Name	Value to be set	Description
drv	Control mode	3	Communication RS485
Frq	The method of frequency	7	Communication Modbus-RTU
F21	Maximum output frequency	**Fz max**	Set individual
F22	Rated motor frequency	...Hz	Set individual
F23	The minimum frequency reference	0.000	**Always enter the value**
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.

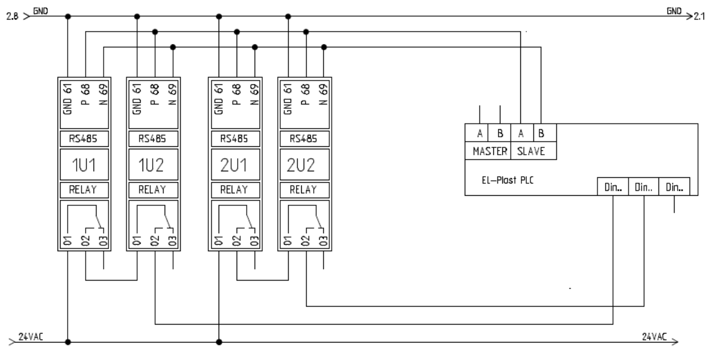
14 Communication RS485 Slave, Modbus RTU with inverters Danfoss FC51

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

Example for system with single supply, single exhaust



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

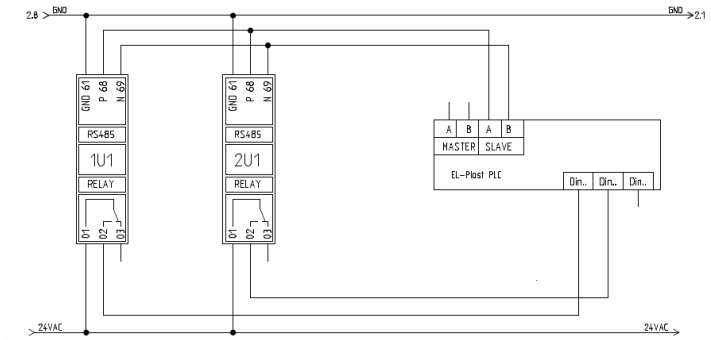
Fz max - frequency inverter for work at maximum fan efficiency (resulting from the adjustment of air distribution system). Initially, enter the frequency from the Air Handling Unit documentation.

15 COMMUNICATION RS485 SLAVE, MODBUS RTU WITH INVERTERS DANFOSS FC101

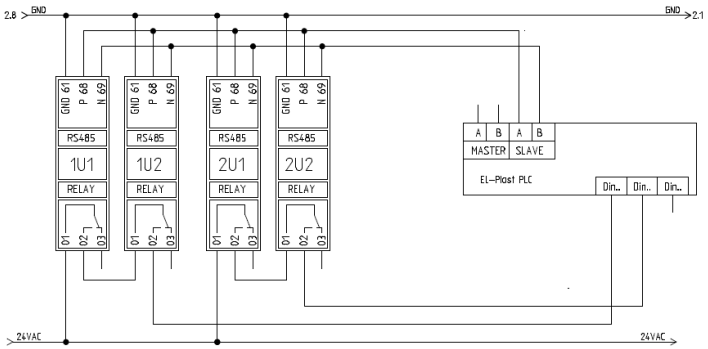
http://drives.danfoss.us/products/vlt/low-voltage-drives/vlt-hvac-basic-drive-fc-101/#/

Example for system with single supply, single exhaust

:



Example for system with double supply, double exhaust



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

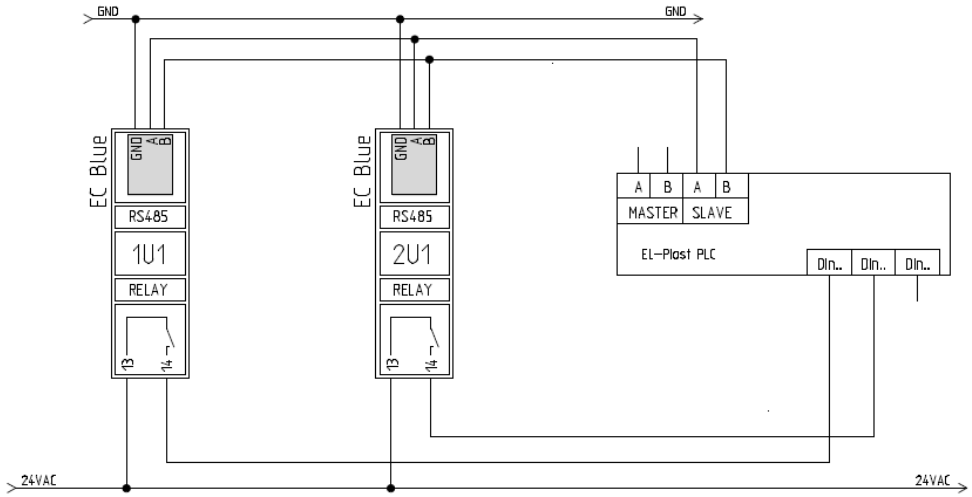
Configuration drive Danfoss FC101 control RS485

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.

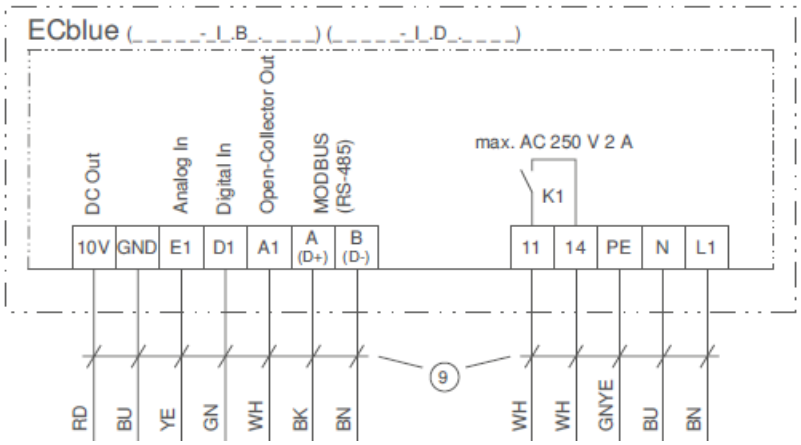
16 COMMUNICATION RS485 SLAVE, MODBUS RTU WITH EC BLUE MOTORS



Example for single supply, single exhaust.

Wiring connection of EC Blue fan

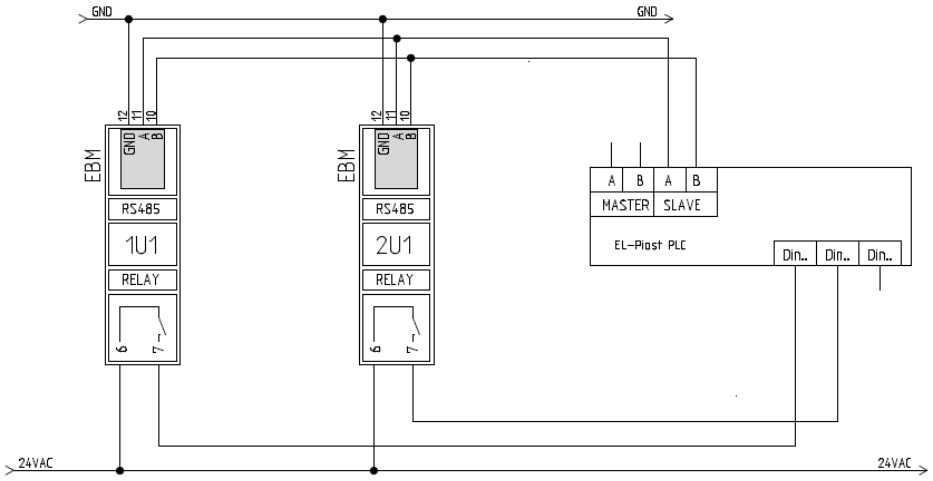
Connection	Color of cable	Cable function
PE	yellow/green	Ground
N	blue	Power supply –„0”
L	brown	Power supply – phase
11	white 1	Motor status relay – closed -> work confirmation
12	white 2	
B	brown	RS-485 MODBUS
A	black	
GND	blue	„0” for control signal



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

17 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

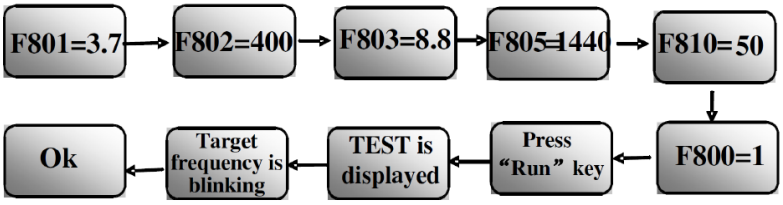
EBM Fan Controller Configuration - Service Menu/Fans/EBM Address

18 COMMUNICATION RS485 SLAVE, MODBUS RTU WITH INVERTERS EURA E800,E1000, E2000

Configuration drive EURA E800, E1000, E2000 control RS485

Code	Name	Value to be set	Description
F106	Control mode	2	Scalar U/F
F111	The maximum output frequency	**Fz max**	Individual setting
F118	Nominal frequency of the motor	...Hz	From the motor rating plate (50Hz / 60Hz)
F200	The source of the start command	4	Keyboard + terminal + Modbus RS485
F201	The source of the stop command	4	Keyboard + terminal + Modbus RS485
F203	The main source of frequency	10	Modbus RS485
F300	Relay function	5	Operation without alarm
F607	Current protection	1	Enabled
F608	Limit current%	130	Limit current
F613	Flying start	1	Enabled
F801	Rated engine power	...kW	From the motor rating plate
F802	Rated motor voltage	**... V**	From the motor rating plate
F803	Rated motor current	...A	From the motor rating plate
F805	The rated speed of the engine	... obr/min	From the motor rating plate
F810	Nominal frequency of the motor	...Hz	From the motor rating plate (50Hz/60Hz)
F800	Motor autotuning	1	**Before autotuning, it is necessary to enter the above parameters**

Example of engine parameterization 3,7kW, 400V, 1440 obr/min, 8,8A, 50Hz



After entering the motor parameters from the nameplate, press the green RUN button, the word TEST will appear. After the measurement, which should last up to about 1 minute, the drive is ready for operation.

F900	Drive address	1	Inverter supply fan
		2	Inverter exhaust fan
		3	Inverter 2 supply fan
		4	Inverter 2 exhaust fan
F901	Transmission type	2	RTU
F904	Transmission speed	3	9600
F905	Time to wait for communication	10.0	Response to the disappearance of communication - stop

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.

19 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