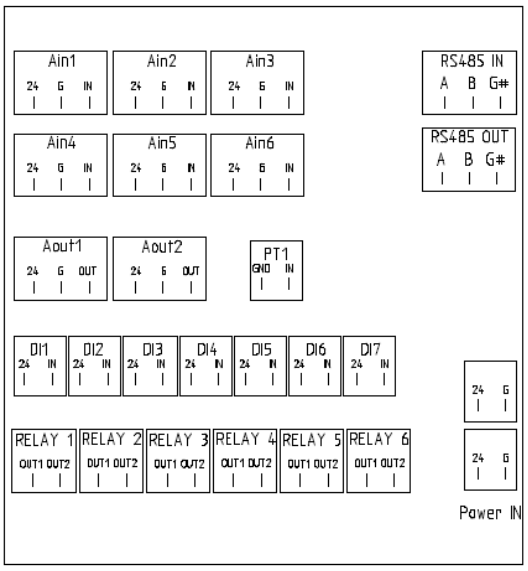
I/O expansion module BMMU2



1. Description

BMMU2 is an I/O module that extends the PLC controller's functions. One of the module's application can be controlling 2 On/Off or 3-point actuators and analogue ones.

Special features of the device include: BACnet and Modbus protocol support, slave device management (frequency drives, other modules), all types of EL-Piast's HMI based on communication on the RS-485 support.

BMMU2 series modules have a factory preloaded application that allows to use the module as an I/O extension, regardless of the version of the module, list of variables in the version of the "BMM-…asEXT v1" application is fixed. Pay attention to use the addresses assigned to specific I/O available in the module.

2. Technical detailes

	BMMU2 24	**BMMU2 230**
Supply voltage	24 V AC/DC	230V AC
Communication ports:	RS-485	RS-485
Communication protocols:	Modbus RTU, BACnet	Modbus RTU, BACnet
Relays NO type	6 pcs. 5A	6 pcs. 5A
Digital Inputs	7 pcs. (nominal voltage 24 V AC/DC	7 pcs. (nominal voltage 24 V AC/DC
Analog Inputs (voltage/current)	(6 pcs. 0..10V/6 pcs. 0..20mA)	(6 pcs. 0..10V/6 pcs. 0..20mA)
Analog Outputs	(2 pcs. 0..10V)	(2 pcs. 0..10V)
Temperature Inputs	1 pc. PT1000 (range -256…166°C)	1 pc. PT1000 (range -256…166°C)
Dimensions	22,5 x 109 x 124	22,5 x 109 x 124

3. Setting of the communication parameters

The BMM2 controller can be controlled from a master controller or BMS with a communication port Modbus RTU or BACnet MS-TP in standard RS-485. The BMM2 address is set using DIP Switch in the range of 1-256 (Modbus RTU) or 1-127 (BACnet MS-TP).

Protocol selection using 4PIN DIP Switch, pin No. 4

4PIN DIP Switch, pin 4 off - Modbus RTU communication, default communication parameters: transmission speed 9600 bps, 8 bits frame, 2 stop bits, no parity, address setting via 8PIN DIP Switch in the range 1-256

4PIN DIP Switch, pin 4 on - BACnet MS-TP communication in Autodetect mode, communication parameters are automatically matched to the master controller setting on which the communication parameters must be fixed, setting the Optimizer address with the 8PIN DIP Switch within 1-127

4. Modbus RTU communication

The PLC Controller – module BMM series has implementation of Modbus RTU protocol. To make the coupling with network, connect the RS-485 bus port on the terminal RS-485-1 of the controller. The setting of communication parameters described in section 3 of this manual.

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.

5. BACnet MS-TP communication

BACnet variables should be searched after connecting the powered controller and entered the relevant settings of BACnet network (see section 3).

6. Addresses of variables - Modbus RTU and BacNet MS-TP

Variables to read the state of Inputs/Outputs

Adres (DEC)		Variable	Decription	States	Type		Read [R] / Write [W]
BacNet	Modbus				BacNet	Modbus	
0	0	Din1	Reading the state of the digital input DI1	0 - disabled, 1 - enabled	BV	Coil 0	R
1	2	Din2	Reading the state of the digital input DI2	0 - disabled, 1 - enabled	BV	Coil 32	R
2	4	Din3	Reading the state of the digital input DI3	0 - disabled, 1 - enabled	BV	Coil 64	R
3	6	Din4	Reading the state of the digital input DI4	0 - disabled, 1 - enabled	BV	Coil 96	R
4	8	Din5	Reading the state of the digital input DI5	0 - disabled, 1 - enabled	BV	Coil 128	R
5	10	Din6	Reading the state of the digital input DI6	0 - disabled, 1 - enabled	BV	Coil 160	R
6	12	Din7	Reading the state of the digital input DI7	0 - disabled, 1 - enabled	BV	Coil 192	R
7	14	Din1_7	Reading the state of digital inputs DI1...DI7 (variable 16 BIT)	0 - disabled, 1 - enabled	BSV	Coil 512...528	R
8	16	FreqDin1	The frequency measured by digital input Din1	1Hz = 256 (22Hz = 22*256 = 5632 = 0x1600)	AV	Register	R
9	18	FreqDin2	The frequency measured by digital input Din2	1Hz = 256 (22Hz = 22*256 = 5632 = 0x1600)	AV	Register	R
10	20	FreqDin3	The frequency measured by digital input Din3	1Hz = 256 (22Hz = 22*256 = 5632 = 0x1600)	AV	Register	R

11	22	FreqDin4	The frequency measured by digital input Din4	1Hz = 256 (22Hz = 22*256 = 5632 = 0x1600)	AV	Register	R
12	24	FreqDin5	The frequency measured by digital input Din5	1Hz = 256 (22Hz = 22*256 = 5632 = 0x1600)	AV	Register	R
13	26	FreqDin6	The frequency measured by digital input Din6	1Hz = 256 (22Hz = 22*256 = 5632 = 0x1600)	AV	Register	R
14	28	FreqDin7	The frequency measured by digital input Din7	1Hz = 256 (22Hz = 22*256 = 5632 = 0x1600)	AV	Register	R
15	30	CountDin1	Starts counter of digital input Din1	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R
16	32	CountDin2	Starts counter of digital input Din2	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R
17	34	CountDin3	Starts counter of digital input Din3	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R
18	36	CountDin4	Starts counter of digital input Din4	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R
19	38	CountDin5	Starts counter of digital input Din5	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R
20	40	CountDin6	Starts counter of digital input Din6	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R
21	42	CountDin7	Starts counter of digital input Din7	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R
22	44	Ain1	Reading the value of analog input AI1	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R
23	46	Ain2	Reading the value of analog input AI2	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R
24	48	Ain3	Reading the value of analog input AI3	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R
25	50	Ain4	Reading the value of analog input AI4	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R
26	52	Ain5	Reading the value of analog input AI5	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R
27	54	Ain6	Reading the value of analog input AI6	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R
28	56	Pt1	Reading the value of PT1000 sensor, input PT1	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R
29	58	Dout1	Reading the state of the digital output DO1	0 - disabled, 1 - enabled	BV	Coil 928	R
30	60	Dout2	Reading the state of the digital output DO2	0 - disabled, 1 - enabled	BV	Coil 960	R
31	62	Dout3	Reading the state of the digital output DO3	0 - disabled, 1 - enabled	BV	Coil 992	R
32	64	Dout4	Reading the state of the digital output DO4	0 - disabled, 1 - enabled	BV	Coil 1024	R
33	66	Dout5	Reading the state of the digital output DO5	0 - disabled, 1 - enabled	BV	Coil 1056	R
34	68	Dout6	Reading the state of the digital output DO6	0 - disabled, 1 - enabled	BV	Coil 1088	R
35	70	Dout1_6	Reading the sate of digital outputs DO1...DO6 (variable 16 BIT)	0 - disabled, 1 - enabled	BSV	Coil 2592...2608	R
36	72	Aout1	Reading analog output value Aout1	1V = 256 (10V = 10*256 = 2560 = 0xA00)	AV	Register	R
37	74	Aout2	Reading analog output value Aout2	1V = 256 (10V = 10*256 = 2560 = 0xA00)	AV	Register	R

The variables controlling the states of outputs (without limit switches, without the memory state before the power supply reset). **According to factory settings variables marked in bold are changing state of the outputs.**

Adres (DEC)		Variable	Decription	States	Type		Read [R] / Write [W]
BacNet	Modbus				BacNet	Modbus	
38	76	**SetDout1**	Setting of output state DO1	0 - disabled, 1 - enabled	BV	Coil 1216	R / W
39	78	**SetDout2**	Setting of output state DO2	0 - disabled, 1 - enabled	BV	Coil 1248	R / W
40	80	**SetDout3**	Setting of output state DO3	0 - disabled, 1 - enabled	BV	Coil 1280	R / W
41	82	**SetDout4**	Setting of output state DO4	0 - disabled, 1 - enabled	BV	Coil 1312	R / W
42	84	**SetDout5**	Setting of output state DO5	0 - disabled, 1 - enabled	BV	Coil 1344	R / W
43	86	**SetDout6**	Setting of output state DO6	0 - disabled, 1 - enabled	BV	Coil 1376	R / W
44	88	SetDout1_6	Setting of output state DO1...DO6 (variable 16 BIT)	0 - disabled, 1 - enabled	BSV	Coil 3392...3408	R / W
45	90	**SetAout1**	Setting of the analog output Aout1	1V = 256 (10V = 10*256 = 2560 = 0xA00)	AV	Register	R / W
46	92	**SetAout2**	Setting of the analog output Aout2	1V = 256 (10V = 10*256 = 2560 = 0xA00)	AV	Register	R / W

The variables controlling the states of outputs (with limit switches at 100 000, with the memory state before the power supply reset)

Adres (DEC)		Variable	Decription	States	Type		Read [R] / Write [W]
BacNet	Modbus				BacNet	Modbus	
47	94	SetPermDout1	Setting of output state DO1	0 - disabled, 1 - enabled	BV	Coil 1504	R / W
48	96	SetPermDout2	Setting of output state DO2	0 - disabled, 1 - enabled	BV	Coil 1536	R / W
49	98	SetPermDout3	Setting of output state DO3	0 - disabled, 1 - enabled	BV	Coil 1568	R / W
50	100	SetPermDout4	Setting of output state DO4	0 - disabled, 1 - enabled	BV	Coil 1600	R / W
51	102	SetPermDout5	Setting of output state DO5	0 - disabled, 1 - enabled	BV	Coil 1632	R / W
52	104	SetPermDout6	Setting of output state DO6	0 - disabled, 1 - enabled	BV	Coil 1664	R / W
53	106	SetPermDout1_6	Setting of the outputs state DO1...DO16	0 - disabled, 1 - enabled	BSV	Coil 4192...4208	R / W
54	108	SetPermAout1	Setting of the analog output Aout1	1V = 256 (10V = 10*256 = 2560 = 0xA00)	AV	Register	R / W
55	110	SetPermAout2	Setting of the analog output Aout1	1V = 256 (10V = 10*256 = 2560 = 0xA00)	AV	Register	R / W

Variables for reading and editing - menu settings

Adres (DEC)		Variable	Decription	States	Type		Read [R] / Write [W]
BacNet	Modbus				BacNet	Modbus	
56	112	OfsPt1	Measurement offset of PT1000 sensor, input PT1	1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R / W

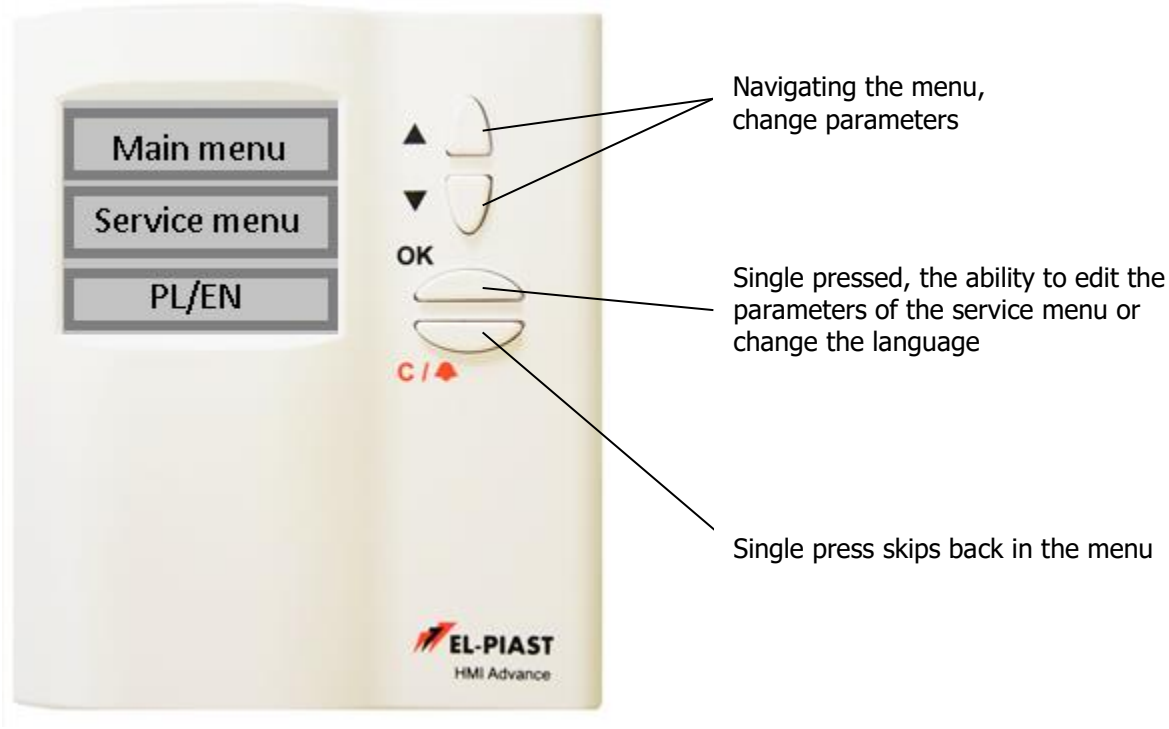
57	114	TypeDin1	Selecting the type of digital inputs (input set as fast can measure the frequency up to 1kHz while controller's power supply is 24VDC)	0 - Slow AC/DC, 1 - Fast DC	BV	Coil 1824	R / W
58	116	TypeDin2			BV	Coil 1856	R / W
59	118	TypeDin3			BV	Coil 1888	R / W
60	120	TypeDin4			BV	Coil 1920	R / W
61	122	TypeDin5			BV	Coil 1952	R / W
62	124	TypeDin6			BV	Coil 1984	R / W
63	126	TypeDin7			BV	Coil 2016	R / W
64	128	ResDin1	Counter restet of starts of digital inputs	0 - inactive, 1 - active	BV	Coil 2048	R / W
65	130	ResDin2			BV	Coil 2080	R / W
66	132	ResDin3			BV	Coil 2112	R / W
67	134	ResDin4			BV	Coil 2144	R / W
68	136	ResDin5			BV	Coil 2176	R / W
69	138	ResDin6			BV	Coil 2208	R / W
70	140	ResDin7			BV	Coil 2240	R / W
71	142	TypeAin1	Input type selection Ain 1…6	0 - "0-10VDC", 1 - "0-20mA"	BV	Coil 2272	R / W
72	144	TypeAin2			BV	Coil 2304	R / W
73	146	TypeAin3			BV	Coil 2336	R / W
74	148	TypeAin4			BV	Coil 2368	R / W
75	150	TypeAin5			BV	Coil 2400	R / W
76	152	TypeAin6			BV	Coil 2432	R / W
77	154	TypeSetDout	Selecting the type of control variables of the digital outputs states Dout 1…6	0 - SetDoutX 1 - SetPermDoutX 2 - SetDout1_16 4 - SetPermDout1_16	MSV	Register	R / W
78	156	TypeSetAout	Selecting the type of control variables of the analog outputs states Aout1…2	0 - SetAoutX 1 - SetPermAoutX 2 - SetAout1_16 4 - SetPermAout1_16	MSV	Register	R / W
79	158	ModComDetAct	Activation of the module communication test with a master Modbus device (internal communication test)	0 - inactive, 1 - active	BV	Coil 2528	R / W
80	160	ModComDetTime	Measuring time of lost communication	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R / W
81	162	ModComDetOK	Module's communication status with Modbus master device	0 - lack, 1 - correct	BV	Coil 2592	R
82	164	VarComDetAct	Activation of the test connection with a master device (cyclic change in the value of the variable "VarComDet")	0 - inactive, 1 - active	BV	Coil 2624	R / W
83	166	VarComDetTime	The cycle time of changes in the value required for communication recognized as correct	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R / W
84	168	VarComDetOK	Module's communication status with master device	0 - lack, 1 - correct	BV	Coil 2688	R
85	170	VarComDet	Test communication variable through cyclical changes in the value of 0/1	0 / 1	BV	Coil 2720	R / W
86	172	LostComDout1	Setting the state of outputs Dout1…66 in case of lack of communication with the master device (when set to 1 or 3 takes	0 – do not change, 1 – set Off , 3 – set On	MSV	Register	R / W
87	174	LostComDout2			MSV	Register	R / W
88	176	LostComDout3			MSV	Register	R / W
89	178	LostComDout4			MSV	Register	R / W

90	180	LostComDout5	precedence over the settings SetDout, SetPermDout)		MSV	Register	R / W
91	182	LostComDout6			MSV	Register	R / W
92	184	LostComAout1	Response to the loss of communication output Aout1	0 - do not change, 1 - "SetLostComAout1"	MSV	Coil 2944	R / W
93	186	SetLostComAout1	Setting of the value during the loss of communication for output Aout1	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R / W
94	188	LostComAout2	Response to the loss of communication output Aout2	0 - do not change, 1 - "SetLostComAout1"	MSV	Coil 3008	R / W
95	190	SetLostComAout2	Setting of the value during the loss of communication for output Aout2	1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R / W
96	192	E_Din1	Emulation of digital inputs Din1...Din7 (when set to 1 or 3 takes precedence over the physical state of the input)	0 – no emulation, 1 – set open, 3 – set close	MSV	Register	R / W
97	194	E_Din2			MSV	Register	R / W
98	196	E_Din3			MSV	Register	R / W
99	198	E_Din4			MSV	Register	R / W
100	200	E_Din5			MSV	Register	R / W
101	202	E_Din6			MSV	Register	R / W
102	204	E_Din7			MSV	Register	R / W
103	206	Em_Ain1	Emulation of analog inputs Ain1...Ain6 (when set to 1 takes precedence over the physical state of the input)	0 - inactive, 1 - active	MSV	Coil 3296	R / W
104	208	E_Ain1		1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R / W
105	210	Em_Ain2		0 - inactive, 1 - active	MSV	Coil 3360	R / W
106	212	E_Ain2		1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R / W
107	214	Em_Ain3		0 - inactive, 1 - active	MSV	Coil 3424	R / W
108	216	E_Ain3		1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R / W
109	218	Em_Ain4		0 - inactive, 1 - active	MSV	Coil 3488	R / W
110	220	E_Ain4		1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R / W
111	222	Em_Ain5		0 - inactive, 1 - active	MSV	Coil 3552	R / W
112	224	E_Ain5		1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R / W
113	226	Em_Ain6		0 - inactive, 1 - active	MSV	Coil 3616	R / W
114	228	E_Ain6		1 = 256 (22 = 22*256 = 5632 = 0x1600)	AV	Register	R / W
115	230	Em_Pt1	Emulation of PT1000 sensor input Pt1 (when set to 1 takes precedence over the physical state of the input)	0 - inactive, 1 - active	MSV	Coil 3680	R / W
116	232	E_Pt1		1°C = 256 (22 °C = 22*256 = 5632 = 0x1600)	AV	Register	R / W
117	234	F_Dout1	Forcing of digital outputs Dout4...Dout6 (when set to 1 or 3 takes precedence over the settings SetDout, SetPermDout)	0 – no forcing, 1 – forcing Off, 3 – forcing On.	MSV	Register	R / W
118	236	F_Dout2			MSV	Register	R / W
119	238	F_Dout3			MSV	Register	R / W
120	240	F_Dout4			MSV	Register	R / W
121	242	F_Dout5			MSV	Register	R / W
122	244	F_Dout6			MSV	Register	R / W
123	246	Fo_Aout1	Forcing of analog outputs Aout1...Aout2 (when set to 1 precedence over variables control	0 - inactive, 1 - active	MSV	Coil 3936	R / W
124	248	F_Aout1		1V = 256 (10V = 10*256 = 2560 = 0xA00)	AV	Register	R / W

125	250	Fo_Aout2	the state of output SetAout, SetPermAout)	0 - inactive, 1 - active	MSV	Coil 4000	R / W
126	252	F_Aout2		1V = 256 (10V = 10*256 = 2560 = 0xA00)	AV	Register	R / W
127	254	A_InEmul	Alarm of module inputs emulation ELPM…	0 – no alarm, 1 - alarm occurs	BV	Register	R
128	256	A_OutForce	Alarm of module inputs forsing ELPM…	0 – no alarm, 1 - alarm occurs	BV	Register	R

7. Setting and operation using HMI room unit

ELPM-…asEXT application of the ELPM modules has been equipped with the ability to configure by connecting the room unit HMI Advance to link RS485-1 and setting appropriate parameters menu (the order of menu items in accordance with the order and descriptions of the list of variables).



7.1 Main menu

Name	Default value	Description
Main menu	-	Reading the current status of the inputs/outputs and the ability to make output settings
Settings	-	It allows you to configure additional functions.
PL/EN	PL	Selecting the menu language (Polish/English).
v1.4 01-03-17 ELPM-...	-	The current version of the software and the module name