E7110-8R relay output module controls eight independent electromagnetic relays according to incoming digital data. Each relay channel can be set by Modbus commands to ON, OFF or PWM mode with configured period.

The device can be used in a variety of automation systems to provide interfacing between actuators and various types of sensors and proximity switches.

The Module operates in RS485 network using Modbus RTU / ASCII protocols selected automatically. The device is a Slave unit, so the Fieldbus network must include a Master unit, e.g. a PC with running SCADA system, controller or regulator. The device is delivered with configuration software. PC with RS485/USB adapter (e.g. Evikon E1087) is used to configure the device.

The product complies with the 2004/108/EC and 2014/30/EU Directives on electromagnetic compatibility
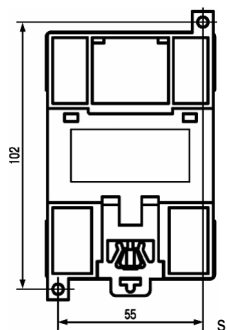
Security requirement

Always adhere to the safety provisions applicable in the country of use. The voltage on terminal contacts of the device is life-threatening. Only trained personal can operate the module.

Operating conditions

Non ATEX-rated indoor spaces without aggressive gases, at atmospheric pressure (86...106,7 kPa), -10...+55 °C and 0...80% RH without condensation.

Installation and connection

The device is mounted to the wall or 35 mm DIN-rail and should be installed in the cabinet providing protection from moisture, dust and unauthorized access.

To connect the device proceed as follows.
Collect the cables for connection of the device to the sensors, power source and RS485 interface cable.
— connect the device to the power source;
— connect the device to actuators;
— connect discrete sensors to the device inputs;
— connect the device to RS485 interface;
— apply power to the device;
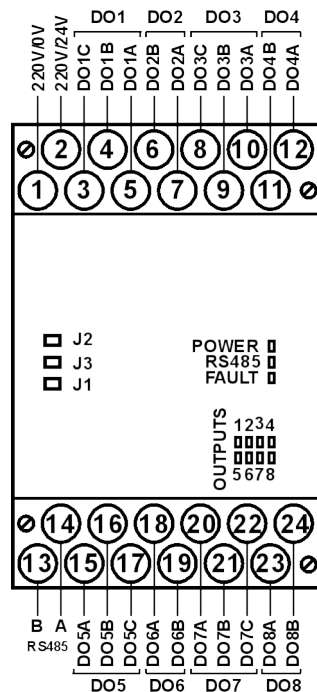Device may be powered by DC or AC power source.

Power the device through the supply line, which is not connected to the heavy-duty equipment. Installation of the power switch in the outer circuit is recommended. Powering of an external equipment through the device power terminals is forbidden. Independent DC supply unit mounted in the same electrical cabinet must be used to power the device. To connect external devices via RS485 interface use two-wire circuit. Overall length of all connections via RS485 interface should not exceed 1200 m. Switch off power for both units while connecting. Use twisted pair cable, respect polarities. The A cable is connected to A output of the device, cable B — to B output. Use cables with copper stranded wires with cross-section not exceeding 0,75 mm^2 to ensure the reliability of electrical connections. Strip and dip cable ends beforehand. Stripped end of the cable should not protrude over the terminal block.

We recommend to use screened cables and line interference filter to protect circuits from external inducted interferences.

Front panel. Terminal contacts, jumpers and LED indicators

Jumpers functionality:
- J1 — write protection.
Factory setting: open (write protection is off)

- J2 — return to factory network settings. By default J2 is open

- J3 – for manufacturer's service. J3 should be open during operation

LED indicators on the front panel

OUTPUTS 1...8: light when the output is on
POWER: lights when power is on
RS485: blinks when data communication is in progress
FAULT: lights if RS485 data communication time-out occurs

Terminal contacts functionality

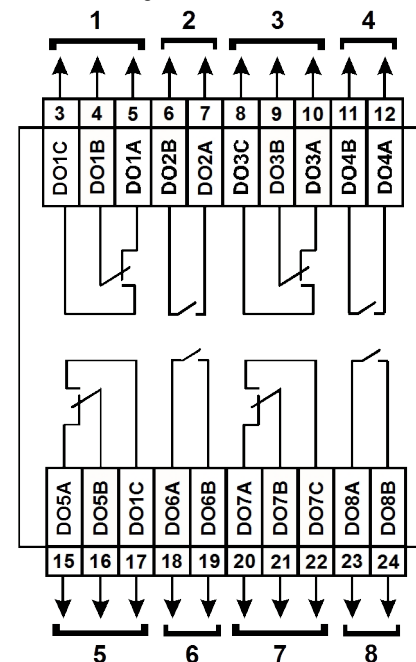| Contact	Function	Contact	Function
1	AC 90...264 V power supply or DC power supply 20...375 V negative	13	RS485 B
2	AC 90...264 V power supply or DC power supply 20...375 V positive	14	RS485 A
3	Discrete Output 1C (DO1)	15	Discrete Output 5A (DO5)
4	Discrete Output 1B (DO1)	16	Discrete Output 5B (DO5)
5	Discrete Output 1A (DO1)	17	Discrete Output 5C (DO5)
6	Discrete Output 2B (DO2)	18	Discrete Output 6A (DO6)
7	Discrete Output 2A (DO2)	19	Discrete Output 6B (DO6)
8	Discrete Output 3C (DO3)	20	Discrete Output 7A (DO7)
9	Discrete Output 3B (DO3)	21	Discrete Output 7B (DO7)
10	Discrete Output 3A (DO3)	22	Discrete Output 7C (DO7)
11	Discrete Output 4B (DO4)	23	Discrete Output 8A (DO8)
12	Discrete Output 4A (DO4)	24	Discrete Output 8B (DO8)
Note For outputs 1,3,5,7 A is normally closed contact, B switch-over and C normally open contact			
For outputs 2.4.6.8 A is switch-over and B is normally open contact			

General technical data

Power supply	90...264 VAC (nominal 220 V) 47...63 Hz or 20...375 VDC (nominal 24 V)
Power consumption	<6 VA
Discrete outputs number	8
Discrete outputs type	Electromagnetic relay, 4 A at max voltage 250 VAC/50 Hz ; cos φ>0,4 or 24 VDC
Digital interface	RS485, Modbus RTU or ASCII
Max. baudrate	115200 bit/s
Dimensions	(63 ×110 ×73) ±1 mm
Weight	<0.5 kg
Protection class	IP20 front panel, IP00 terminal block

Discrete outputs

The device is equipped with eight relay outputs (max. 4 A). Each relay may operate independently in PWM mode. Outputs are controlled via RS485 network.
Four of relay outputs have normally open and normally closed terminals, and four have only normally open terminals.

E7110-8R connection diagram

Outputs control in Modbus RS485 network

Discrete outputs may be controlled either by command to generate PWM signal or by group on/off command.

PWM signals generated by device's outputs are determined by period and duty cycle. PWM period is set with **THPD** parameter or via corresponding Modbus register. It is saved to non-volatile memory of the device and cannot be changed while module is running.

PWM duty cycle is transmitted via RS485 network in the range between 0 and 1000. PWM duty cycle is set for each output independently in corresponding Modbus registers. The command for writing to register is 16 (0x10), for reading 3 (0x03) or 4 (0x04).

Maximum PWM pulse duration is 50 ms. This value cannot be modified.

Duty cycle in Modbus register	Relay output status
0	OFF
1000	ON
between 0 and 1000	PWM signal with duty cycle proportional to transmitted value

When group on/off command is received, the device stops generating PWM signals and turns outputs to the set state, where they remain until next group command or PWM duty cycle setting command is coming. To send group on/off command:
– write bit mask to 50 (0x32) register with 16 (0x10) command or
– write bit mask to coils address space with 15 (0x0F) command.
When command 16 is used, bit value from 0 to 15 is saved to the register. Bits from 0 to 3 refer to outputs from 1 to 4,bits from 4 to 15 are always equal to zero. If output is on, bit value is 1, if output is off, bit value is 0.
When command 15 is used,the following is specified:
– initial output address – from 0x0000 to 0x0003;
– number of outputs to be set – from 0x0001 to 0x0004;
– number of bytes (in transmitted bit mask) – 0x01;
– output value (bit mask). If output is on, bit value is 1.
Note PWM period, safe state parameters, and other output characteristics may be changed via Modbus protocol. These data are saved to device non-volatile memory which has limited overwriting capacity (ca. 1 million). We don't recommend to change PWM period and safe state parameters as frequently as PWM duty cycle is transmitted.

Fault mode

If no signal is received from Master device during the time specified by **t.out** (maximum network timeout) parameter, module's outputs switch to safe, or fault, mode. The **t.out** parameter is set for all outputs at once, the safe condition is specified for each output independently. Safe mode is set for each output independently with **O.Alr** parameter, which determines PWM duty cycle and may take value 0...100%. This parameter may be modified via Modbus protocol while operating. For the list of registers used to set the safe condition, see Annex 1.
Parameter **t.out** is set in the range 0...600 s via configurator or Modbus network. If **t.out** value is 0, the parameter is out of service and the output does not turn to safe state.
When the device turns to the safe state, the LED indicator FAULT lights on the front panel. If a request from master device comes in fault mode, the LED indicator turns off, but outputs state does not change until a correct value is received from the Master

Return to factory settings

If user defined values of network parameters are lost, reset the device to the factory network settings to connect it to the computer.
To return to factory network settings proceed as follows:
1. Turn off the device
2. Open the face panel by lifting it with a hard thin instrument (e.g. a small screwdriver)
3. Set the J2 jumper. The device operates with factory network settings, but stores previously set parameters
4. Turn on the device
Warning! The voltage on some elements of the device's printed board could be fatal. Never touch the printed board or let foreign objects inside the device.
5. Launch the E7110 Configurator application

6. Set the factory network setting in the network configuration window or press the button "Factory network settings". Connection with the computer is now established using factory network settings.
7. Select "**Device: read all**" or open **Network parameters** folder to see the device network parameters.
8. Write down the device network parameters.
9. Close the configurating program
10. Turn off the device, take away the J2 jumper, close the front panel of the device
11. Turn on the device and launch the configurating program
12. Set the parameters recorded earlier in the Connection with the device window
13. Press Connect and select "**Device: Check connection**" to check the connection to the device.

Network parameters factory settings

Parameter	Description	Factory setting
bPS	Baudrate, bit/s	9600
LEn	DWL, bit	8
PrtY	Dataword parity check	0
Sbit	Number of stop-bits	1
A.Len	Network address length, bit	8
Addr	Base address	16
Rs.dl	Response delay in RS485 network, ms	2

Hardware data protection

Due to electromagnetic interferences data stored in device non-volatile memory may be lost. The lost data, mostly configuration parameters, may be partly restored using configuration soft.
To protect data in non-volatile memory, de-energize the device, open the front panel and connect the jumper J1.
To reconfigure the device cut off the power, open the front panel and disconnect the jumper J1.

Relay outputs check

To check the relay outputs of your module for correct operation, proceed as follows:
─ connect the module to the PC via RS485 adapter,
─ launch configuration software and establish the connection
─ go to I /O Status menu (see Configurator E7110 User manual)
─ set output duty cycle 0 or 1. Contacts will close or open.
─ measure the resistance of relay contacts (closed and open). The resistance of closed contacts should not exceed 1 Ohm, the resistance of open contacts should be more than 2 MOhm.

Delivery set:

E7110-8R relay output module.
All necessary software may be downloaded from manufacturer's website. Please contact your distributor for more information.

Warranty

This product is warranted to be free from defects in material and workmanship for a period of one year from the date of original sale. During this warranty period Manufacturer will, at its option, either repair or replace product that proves to be defective. This warranty is void if the product has been operated in conditions outside ranges specified by Manufacturer or damaged by customer error or negligence or if there has been an unauthorized modification.

CE ⌧

Relay output module

E7110-8R
User manual

Evikon

E7110-8R_UM_EN ANNEX 1. RS485 networking using Modbus protocol

Reading, editing and saving of the parametres is performed using configurating sotfware. For more information see Configurator E7110 sotfware user manual. Parameters transmitted via RS485 network are called operational parameters.

Modbus addressing

Base address range in ModBus protocol is 1…247.
Broadcast address is 0.

Device parameters

To distinguish between operational parameters of the same type, use their network address. For example, if device's base address is 16, then to read or write the Output 1 status use corresponding parameter with network address 16, for Output 2 with network address 17 etc. The eight-channel module operates thus as eight one-channel devices.

General parameters

Name	Description	Permitted values	Factory settings
dEv	Device name	up to 8 symbols	MU110-8
vEr	Software version	up to 8 symbols	2.01

Configuration parameters

Parameter Name	Description	Permitted values	Factory settings
OUTPUT PARAMETERS			
O.ALr	Safe (fault) condition	0...100 [%]	0
THPD	PWM period when controlled by RS485	0...900 [s]	0
NETWORK PARAMETERS			
BPS	Baudrate, kbit/s	**0:** 2.4; **1:** 4.8; **2:** 9.6; **3:** 14.4; **4:** 19.2; **5:** 28.8 **6:** 38.4; **7:** 57.6; **8:** 115.2	9.6
LEn	DWL, bit	**0:**7, **1:**8	8
PrtY	Dataword parity check	**0:** no **1:** even **2:** odd	0
SBit	Number of stop-bits	**0**: 1 sbit **1**: 2 sbits	0
A.LEn	Network address length, bit	**0:** 8 **1:** 11	0
Addr	Base address	1...247	16
t.out	Max. network timeout	0...600 [s]	0
rS.dL	Response delay in RS485 network, ms	from 0 to 65535 [ms]	2

Due to hardware constraints the following parameter combinations cannot be used:
— **PrtY=0**, **Sbit=0**, **Len=0**
— **PrtY=1**, **Sbit=1**, **Len=1**
— **PrtY=2**, **Sbit=1**, **Len=1**

Modbus coils and registers

Parameter	Unit	Value	Type	Coil address (hex)	Coil address (dec)
Output 1 value	-	0 or 1	bool	0000	0000
Output 2 value	-	0 or 1	bool	0001	0001
...	-	0 or 1	bool	....	...
Output 8 value	-	0 or 1	bool	0007	0007

Parameter	Unit	Value	Type	Register address (hex)	Register address (dec)
Output 1 value	0.1%	0...1000	uint16*	0000	0000
Output 2 value	0.1%	0...1000	uint16	0001	0001
...	0.1%	0...1000	uint16	...	...
Output 8 value	0.1%	0...1000	uint16	0007	0007
Output 1 value in safe mode	0.1%	0...1000	uint16	0010	0016
Output 2 value in safe mode	0.1%	0...1000	uint16	0011	0017
...	0.1%	0...1000	uint16	...	...
Output 8 value in safe mode	0.1%	0...1000	uint16	0017	0023
Output 1 PWM period	s	1...900	uint16	0020	0032
Output 2 PWM period	s	1...900	uint16	0021	0033
...	s	1...900	uint16	...	...
Output 8 PWM period	s	1...900	uint16	0027	0039
Max. network timeout	s	0...600	uint16	0030	0048
Output value bit mask	-	0...225	uint16	0032	0050

* uint stands for unsigned unit 16
Notes: (1) For reading use commands 03 and 04; for writing to registers use command 16 (0x10), foe writing to coils command 15 (0x0F).
(2) In the registers of bitmasks MSB stands for the output with maximal number (bit = 1 is for output status "OFF")