User guide

Advanced IO

Binary (trans. rel.)

v.1.1

INDUSTRY

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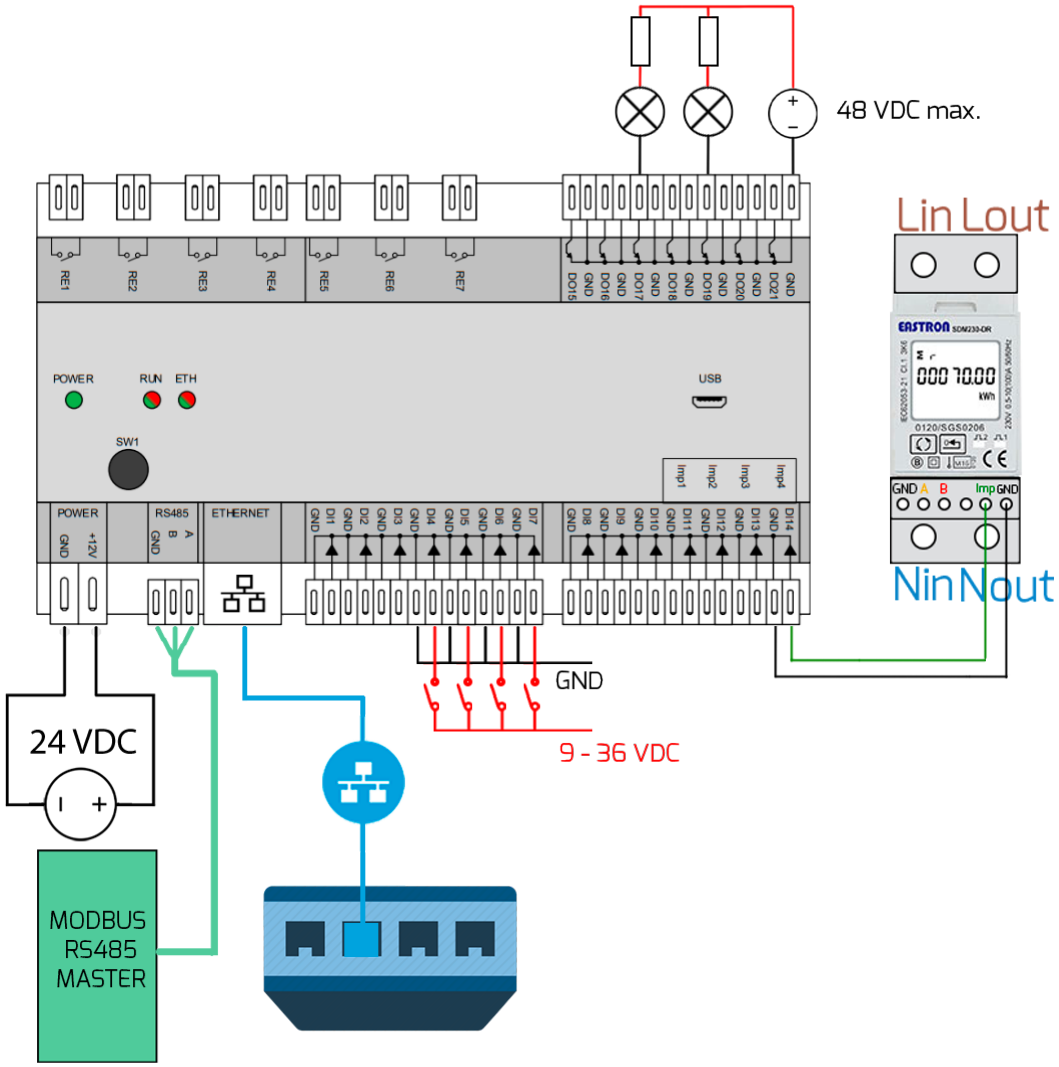
1. System schematic



2. Basic parameters

2.1. System description

Advanced IO Binary is a compact device with a large array of input/output interfaces. Thanks to a large amount of digital inputs, it can monitor up to fourteen sensors with digital output. Four of the digital inputs include an impulse counting function and can be used to connect measuring devices with impulse output. The device includes seven transistor outputs with maximum switching current 3 A and maximum switching voltage 48 VDC, as well as seven relays for switching larger loads with maximum current 8 A and voltage 250 VAC.
The whole device can be a part of the Industry 4.0 platform and is controlled through a serial interface RS485 using the industrial communication protocol Modbus/RTU, or through ethernet interface using the industrial communication protocol Modbus/TCP.
The device can be easily mounted on a DIN rail

2.2. System parameters

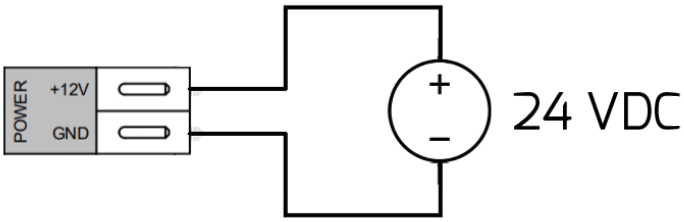
Communication interface	1x Ethernet 1x RS485
IO interface	10x digital input 9-48 VDC/5mA 4x digital input 9-48 VDC/5mA with an option to be configured as impulse type S0 (or similar) 7x transistor output 48VDC/3A 7x relay output 250 VAC/8A
Temperature range	-20 to +50°C
Power supply voltage	24 VDC
Power consumption	max. 2 W
Dimensions	162 x 90 x 63 mm
Mount	DIN rail

Relay contacts	
Maximum load	8 A / 250 VAC
Transistor outputs	
Maximum load	3 A / 48 VDC
Digital inputs	
Voltage range	9 - 48 VDC
Odber prúdu	max. 5 mA

3. Detailed connection schematics

3.1. Power supply

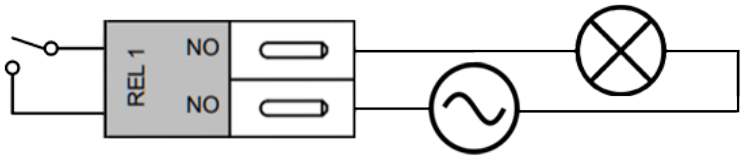
The device requires an external DC power supply, able to provide at least 5 W of power at 24 V.



3.2. Outputs

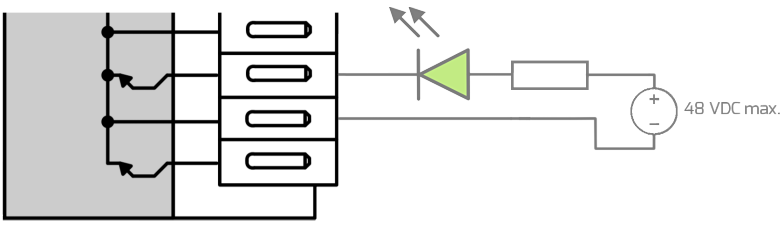
3.2.1. Relay outputs

Connect the electromagnetic contacts according to the following schematic.
The maximum load for alternating current is 8 A/230 VAC.



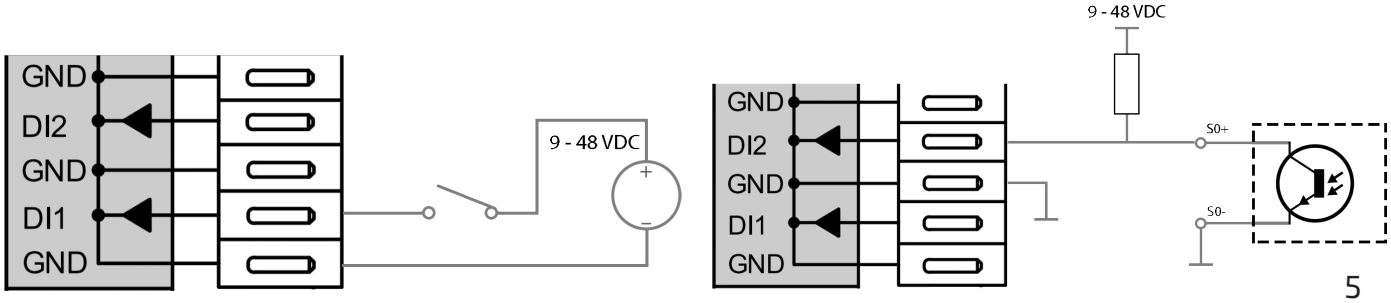
3.2.2. Transistor outputs

Connect the transistor contacts according to the following schematic.
The maximum load for direct current is 3 A/48 VDC.
Attention, power supply polarity must adhere.



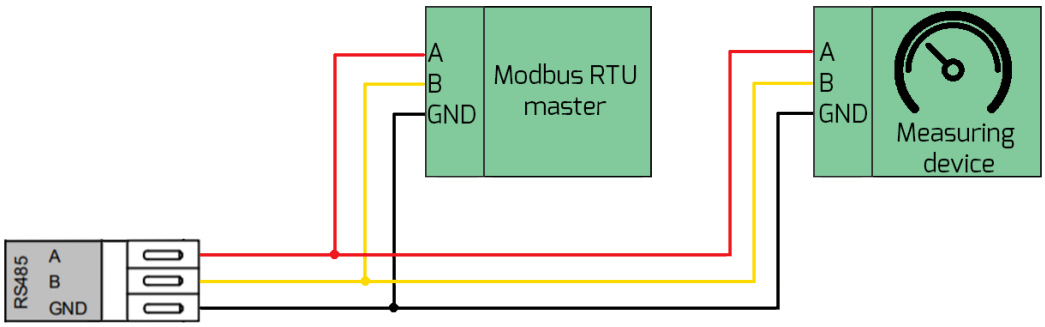
3.3. Digital inputs

The voltage range for digital inputs is 9 to 48 VDC. Lower voltage can lead to inaccurate detection of the signal, higher voltage can damage the device. The polarity of the input must adhere.
Digital inputs can be used to connect sensors with active digital output (flood sensor, position, etc.).
Digital inputs DI3 and DI4 implement an impulse detection feature and can be connected to devices with impulse output (S0 or similar).



3.4. RS485

RS485 serves communication purposes through the Modbus RTU protocol with the master control unit (chapter 5).



4. USB interface

The interface is intended for maintenance purposes. It is not required in an ordinary workload. After connecting the device to PC it will appear as a virtual COM port. It uses the same commands as TCP server.
USB can be used to update the device firmware (requires special software).

USB interface	
Communication speed	115200 baud
Format	8 bit
Parity	none
Stop bit	1

5. Modbus communication

5.1. Factory settings

The whole system can be administered using Modbus TCP protocol.
To use Modbus/TCP communication, the device must be connected to the network via ethernet cable.
The device appears as TCP slave in the modbus communication.
To use several devices in one network, they need to be assigned different IP addresses.
Setting a different IP address is possible by rewriting the holding registry 8 to 11. Then you must set the log. 1 coil 24.

Modbus TCP factory settings	
IP address	192.168.0.100
Subnet mask	255.255.255.0
Gateway	192.168.0.1
Modbus port	502

AdvancedIO Binary can be administered via Modbus RTU which requires the connection of differential pairs of RS485 and GND. To use several devices, they need to be assigned different RTU addresses. This is possible by connecting to the device through modbus TCP protocol and writing the address into holding registry 20.

Modbus RTU factory settings	
RTU address	1
Factory communication settings	
Communication speed	115200 Bits/s
Format	8 Bits
Parity	none
Stop bit	1

5.2. Modbus registers

5.2.1. Input registers

		Data type	Order of registers	RAW range from	RAW range to	OpenDAF address	OpenDAF object type	OpenDAF data type
0	FW version year	uint16		0	65535	$a/3:1	measurement	integer
1	FW version month	uint16		1	12	$a/3:2	measurement	integer
2	FW version day	uint16		0	31	$a/3:3	measurement	integer
16 - 19	Impulse count on DI11 input (impulse count 1)	uint64	little endian	0	4294967295	$a/ul4@3:17	measurement	long
20 -23	Impulse count on DI12 input (impulse count 2)	uint64	little endian	0	4294967295	$a/ul4@3:21	measurement	long
24 - 27	Impulse count on DI13 input (impulse count 3)	uint64	little endian	0	4294967295	$a/ul4@3:25	measurement	long
28 - 31	Impulse count on DI14 input (impulse count 4)	uint64	little endian	0	4294967295	$a/ul4@3:29	measurement	long

($a - unit address)

5.2.2. Holding registers

		Data type	RAW range from	RAW range to	OpenDAF address	OpenDAF object type	OpenDAF data type
0	IP address of device, first octet (standard: 192)	uint16	0	255	$a/4:1	measurement / command	integer
1	IP address of device, second octet (standard: 168)	uint16	0	255	$a/4:2	measurement / command	integer
2	IP address of device, third octet (standard: 0)	uint16	0	255	$a/4:3	measurement / command	integer
3	IP address of device, fourth octet (standard: 100)	uint16	0	255	$a/4:4	measurement / command	integer
4	IP subnet mask, first octet (standard: 255)	uint16	0	255	$a/4:5	measurement / command	integer
5	IP subnet mask, second octet (standard: 255)	uint16	0	255	$a/4:6	measurement / command	integer
6	IP subnet mask, third octet (standard: 255)	uint16	0	255	$a/4:7	measurement / command	integer
7	IP subnet mask, fourth octet (standard: 0)	uint16	0	255	$a/4:8	measurement / command	integer
8	IP gateway, first octet (standard 192)	uint16	0	255	$a/4:9	measurement / command	integer
9	IP gateway, second octet (standard 168)	uint16	0	255	$a/4:10	measurement / command	integer
10	IP gateway, third octet (standard 0)	uint16	0	255	$a/4:11	measurement / command	integer
11	IP gateway, fourth octet (standard 1)	uint16	0	255	$a/4:12	measurement / command	integer
12	TCP port of modbus communication (standard: 502)	uint16	1	65535	$a/4:13	measurement / command	integer
13	MAC address, first octet	uint16	0	255	$a/4:14	measurement / command	integer
14	MAC address, second octet	uint16	0	255	$a/4:15	measurement / command	integer
15	MAC address, third octet	uint16	0	255	$a/4:16	measurement / command	integer
16	MAC address, fourth octet	uint16	0	255	$a/4:17	measurement / command	integer
17	MAC address, fifth octet	uint16	0	255	$a/4:18	measurement / command	integer
18	MAC address, sixth octet	uint16	0	255	$a/4:19	measurement / command	integer
19	TCP port of text protocol communication (standard: 5000)	uint16	1	65535	$a/4:20	measurement / command	integer
20	Modbus RTU RS485 address	uint16	1	254	$a/4:21	measurement / command	integer
21	Modbus RTU RS485 communication speed (change applied after reset) 0-9600 1-19200 2-38400 3-57600 4-115200	uint16	0	4	$a/4:22	measurement / command	integer
22	Modbus RTU RS485 parity (change applied after restart) 0-None 1-Even 2-Odd	uint16	0	2	$a/4:23	measurement / command	integer

($a - unit address)

		Data type	Order of registers	RAW range from	RAW range to	OpenDAF address	OpenDAF object type	OpenDAF data type
23 - 26	Setting value of impulse counter DI11	uint64	little endian	0	4294967295	$a/ul4@4:24	command	long
27 - 30	Setting value of impulse counter DI12	uint64	little endian	0	4294967295	$a/ul4@4:28	command	long
31 - 34	Setting value of impulse counter DI13	uint64	little endian	0	4294967295	$a/ul4@4:32	command	long
35 - 38	Setting value of impulse counter DI14	uint64	little endian	0	4294967295	$a/ul4@4:36	command	long

($a - unit address)

5.2.3. Coils registers

		Data type	RAW range from	RAW range to	OpenDAF address	OpenDAF object type	OpenDAF data type
0	Relay output 1	bool	0	1	$a/0:1	measurement / command	binary
1	Relay output 2	bool	0	1	$a/0:2	measurement / command	binary
2	Relay output 3	bool	0	1	$a/0:3	measurement / command	binary
3	Relay output 4	bool	0	1	$a/0:4	measurement / command	binary
4	Relay output 5	bool	0	1	$a/0:5	measurement / command	binary
5	Relay output 6	bool	0	1	$a/0:6	measurement / command	binary
6	Relay output 7	bool	0	1	$a/0:7	measurement / command	binary
14	Transistor output 15	bool	0	1	$a/0:15	measurement / command	binary
15	Transistor output 16	bool	0	1	$a/0:16	measurement / command	binary
16	Transistor output 17	bool	0	1	$a/0:17	measurement / command	binary
17	Transistor output 18	bool	0	1	$a/0:18	measurement / command	binary
18	Transistor output 19	bool	0	1	$a/0:19	measurement / command	binary
19	Transistor output 20	bool	0	1	$a/0:20	measurement / command	binary
20	Transistor output 21	bool	0	1	$a/0:21	measurement / command	binary
24	Log.1 sets new IP settings and automatically restarts the device	bool	1	1	$a/0:25	command	binary
25	Reset the device	bool	1	1	$a/0:26	command	binary
28	Writing the set value of impulse counter DI11	bool	1	1	$a/0:29	command	binary
29	Writing the set value of impulse counter DI12	bool	1	1	$a/0:30	command	binary
30	Writing the set value of impulse counter DI13	bool	1	1	$a/0:31	command	binary
31	Writing the set value of impulse counter DI14	bool	1	1	$a/0:32	command	binary
32	Discovery of the device (LEDs on the outputs will flash for 20 seconds)	bool	1	1	$a/0:33	command	binary

($a - unit address)

5.2.4. Input discrete registers

		Data type	RAW range from	RAW range to	OpenDAF address	OpenDAF object type	OpenDAF data type
0	Digital input 1	bool	0	1	$a/1:1	measurement	binary
1	Digital input 2	bool	0	1	$a/1:2	measurement	binary
2	Digital input 3	bool	0	1	$a/1:3	measurement	binary
3	Digital input 4	bool	0	1	$a/1:4	measurement	binary
4	Digital input 5	bool	0	1	$a/1:5	measurement	binary
5	Digital input 6	bool	0	1	$a/1:6	measurement	binary
6	Digital input 7	bool	0	1	$a/1:7	measurement	binary
7	Digital input 8	bool	0	1	$a/1:8	measurement	binary
8	Digital input 9	bool	0	1	$a/1:9	measurement	binary
9	Digital input 10	bool	0	1	$a/1:10	measurement	binary
10	Digital input 11	bool	0	1	$a/1:11	measurement	binary
11	Digital input 12	bool	0	1	$a/1:12	measurement	binary
12	Digital input 13	bool	0	1	$a/1:13	measurement	binary
13	Digital input 14	bool	0	1	$a/1:14	measurement	binary

($a - unit address)

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