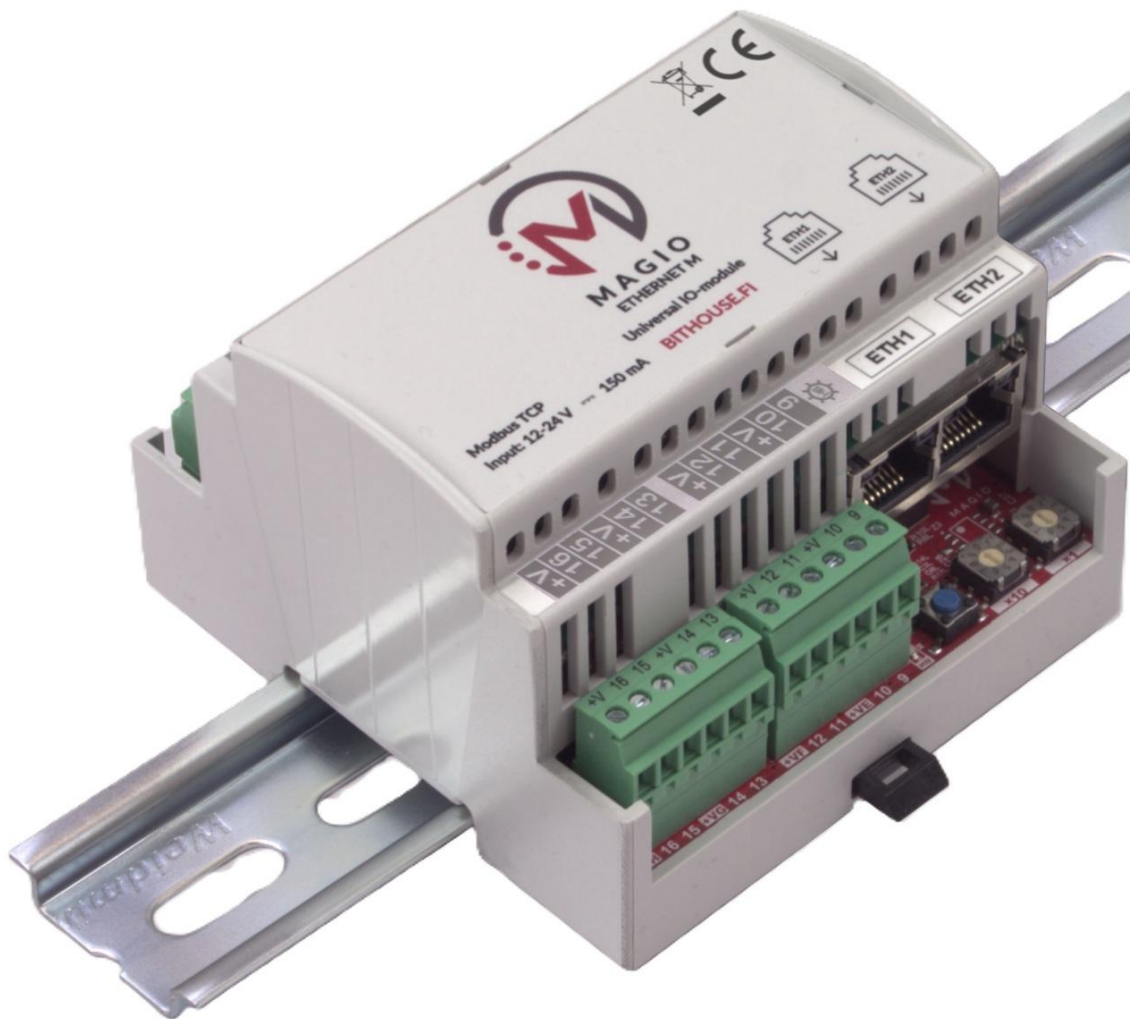

MAGIO ETHERNET M

I/O-MODULE

DATA SHEET



·:BITHOUSE:·
every bit matters

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About the document

Document scope

This document describes the **Magio Ethernet M I/O-module**, including installation and maintenance information.

Safety information

Intended use

The product is intended for building automation and light industrial applications.

Only appropriately trained personnel are authorized to work on and with this product. They must be familiar with applicable standards and regulations.

The product must be used in accordance with all applicable safety requirements, regulations and instructions provided in the product documentation, including this data sheet.

Only recommended conductors/cables and accessories/equipment may be used with the product.

Environmental Specifications

PARAMETER	VALUE	NOTE
Operating temperature	0–45°C	
Humidity	RH < 95 % (non-condensing)	

Disposal / Recycling

WEEE business products reception points:

www.elker.fi/en/reception-points-for-business-products/

About the Product

Product overview

Magio Ethernet M is a small I/O module enclosed and mounted on a DIN-rail. Casing dimensions are 88x97x62 mm.

- 16 universal I/O connection points
- Modbus RTU bus
- 2 Ethernet connectors

The module also provides the **operating voltage** for the actuator, enabling the measurement of the actuator input current. Malfunctioning actuators can be easily detected when the behaviour of the input current changes outside preset limits, thus generating an alarm in the system.

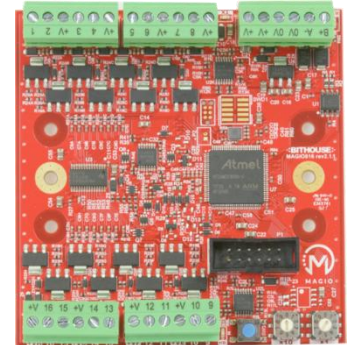
- Operating voltage: regulated 12...24 V_{DC}
- Card current consumption: nominally 75 mA (24 V = 1,8 W)
- Max load
 - 1 A / channel
 - 6 A the whole board

Magio Ethernet M is available with screw or spring connectors. Max 1,5 mm² wire for connectors.

Technical Specifications

Dimensions

ASSEMBLY	PARAMETER	VALUE	NOTE
MAGIO Serial M card	Width	84 mm	
	Height	87 mm	
MAGIO Serial M DIN rail enclosure	Width	88 mm	5 DIN-modules
	Height	91 mm	
		97 mm	w. DIN latch
	Depth	62 mm	
	Weight	178 g	
Connectors	Mounting		Screw or spring
Conductor	Cross-section	1,5 mm ²	



Magio Serial M board



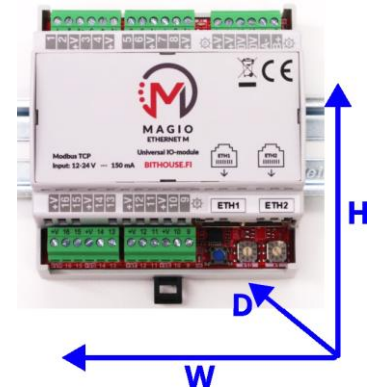
Ethernet-card

Electrical ratings

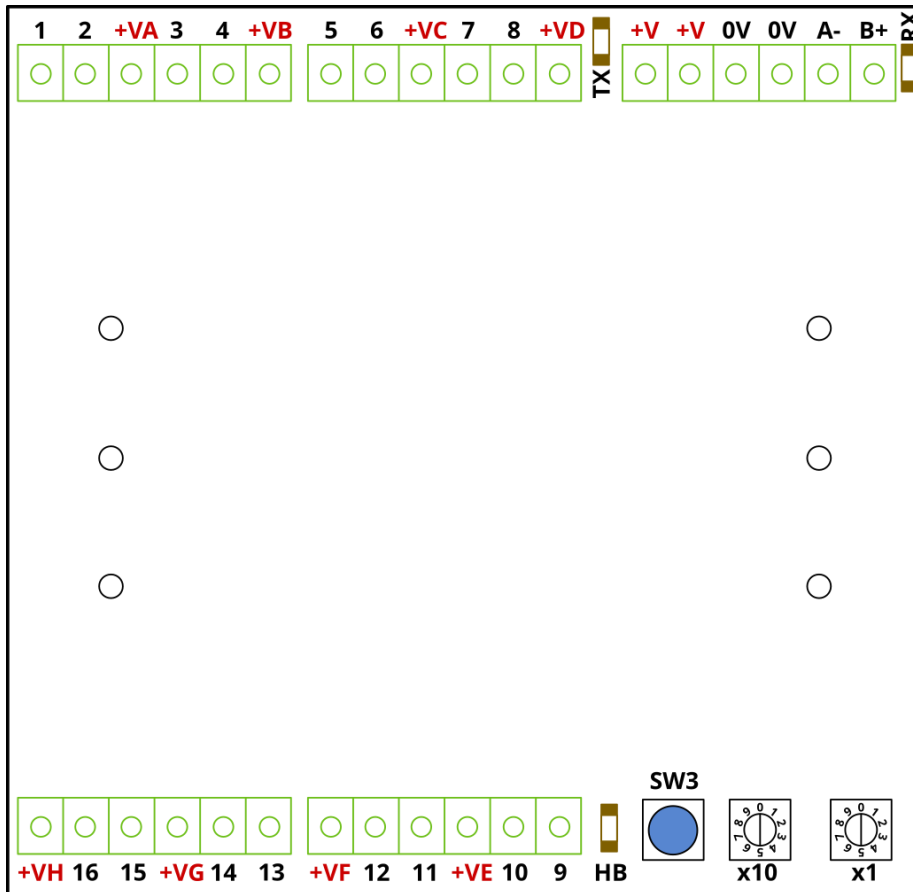
PARAMETER	VALUE	NOTE
Operating voltage	12...24 V _{DC}	Regulated
Nominal power consumption	150 mA	
Maximum load	6 A	Total board
	1 A	Per channel

Bus protocols

CONNECTOR	PROTOCOL	NOTE
RS485	Modbus RTU	
Ethernet	Modbus TCP	

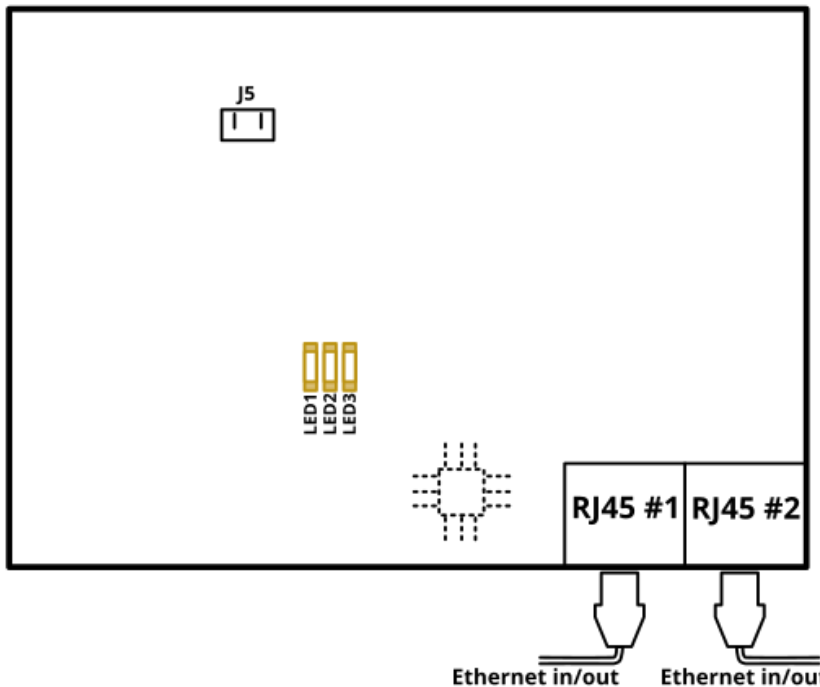


Connectors and Components



CONNECTOR	DESCRIPTION
1...16	I/O channel
+V, +VA, +VB, ... +VH	12...24 V _{DC} power input. Physically linked on the PCB
0V	DC-voltage supply ground ground
A-, B+	RS485 bus

COMPONENT	DESCRIPTION
x10, x1	RS485: address switch
RX-LED	RS485: data moving on the bus
TX-LED	RS485: data sending from card
HB-LED	Heartbeat
SW3	Settings pushbutton



LIITIN	KUVAUS
RJ45 #1 (ETH1) RJ45 #2 (ETH2)	2-port Ethernet switch. Ports are interchangeable.

Operating Voltage

Operating voltage: regulated 12...24 V_{DC}

Regulated voltage

The voltage supplied must be regulated – a raw rectified current is unsuitable for the device. Regulation ensures voltage stability under varying conditions such as load changes.

PE and 0V connecting

0 V_{DC} and PE (Protective Earth) must be connected either at or outside the power supply (using a direct wire or an approx. 10 µF capacitor). This prevents measurement errors, especially regarding resistance measurements.

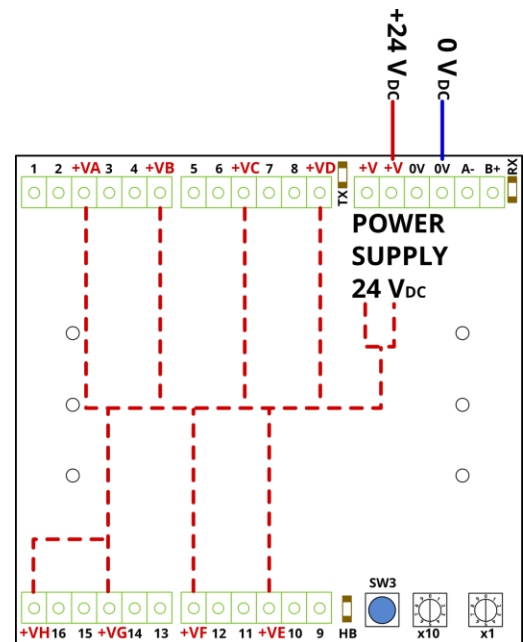
12...24 V_{DC}

Special care must be taken to ensure the supply voltage stays above the lower limit. A supply voltage below 12 V may cause errors in the 1-10 V signal.

Daisy-chaining the power

The card's supply voltage is connected to the +V and 0V terminals located next to the bus connector. Power can be daisy-chained from these terminals to another Magio card, within the limits of the maximum current.

For analog signals, the odd-numbered terminal adjacent to the I/O point is always reserved for the signal ground (0 V). This allows actuators or transmitters, including their power supply, to be connected directly to a single channel pair without external terminal blocks. The channel mode of other channels can also be set to ground (0 V) to simplify wiring.



Internal wiring connects the +V supply voltage to the power terminals located next to the I/O points.

Number of Channels

The universal I/O points can be programmed into any operating mode: DI, DO, AI, AO, or ground (0 V). These modes can be freely mixed within the same module, with the number of available terminals being the only limiting factor.

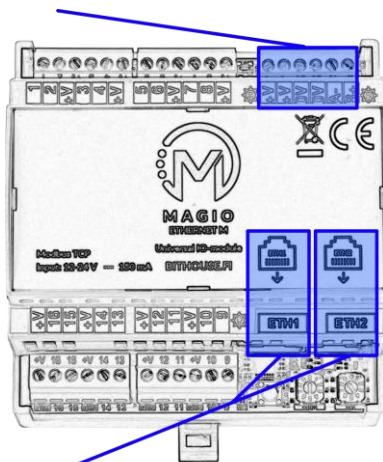
- Digital points (DI, DO) require **one** I/O terminal.
- Analog points (AI, AO) require **two consecutive** I/O terminals.
 - The odd numbered terminal is ground (0 V).

The Magio Ethernet M I/O module supports up to 16 digital or eight analog inputs/outputs. Analog signals occupy two consecutive terminals, where the even-numbered terminal is for the signal and the adjacent lower odd-numbered terminal serves as ground (0 V) – for example, terminals 2 and 1.

Communication Buses

RS485

- **Modbus RTU Slave**
- Baud rate: 1200...115200 bps, format 8E1, 8O1, or 8N2.
 - Default: **19200 bps, 8E1.**
 - Baud rate and parity are configured via Modbus-registers (see instructions)
- Slave address 01...99 selected with rotary switches x10 and x1.
- Recommended maximum number of devices: 30 pcs (Unit Load limitation).
- Slave shares the same register map as Modbus TCP.



TCP <-> RS485 Passthrough

- Port **503**, Unit ID other than 255.
- Modbus TCP ↔ Modbus RTU bridge:
 - TCP traffic is routed to the RS485 port.
- Baud rate and parity are configured in Modbus registers.

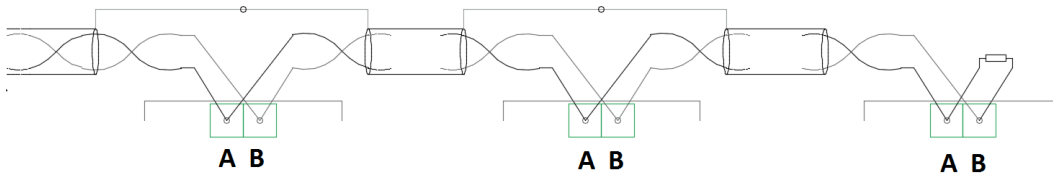
Ethernet

- Modbus TCP slave:
 - Port **502** or **503**, Unit ID **255**.
 - Concurrent connections: 2.
 - Direct Ethernet gateway to Modbus registers.
 - Hardware switch build in.

Procedures

Operating the bus

Physical wiring



Terminals A and B are wired in parallel ($A \leftrightarrow A$; $B \leftrightarrow B$). The cable must be a twisted pair (e.g. CAT6). It is also recommended to tie signal grounds between boards to the same potential.

The bus settings

Magio Serial M communicates over a Modbus RTU bus. The serial communication parameters:

- Parity/stop bits
- Baud rate

are set using the x10 and x1 rotary switches as follows:

1. Press the **SW3** button. The **HB-LED** flashes at a fast, steady rate (setting mode). Bus communication is suspended. ***)**
2. Turn the x10 and x1 switches to the positions shown in the table below.
3. Activate the settings by holding down the button for **approx. 2 seconds**. The HB-LED flashes faster than in the set mode. Release the button.
4. Turn the switches back to the desired Modbus address.
5. Save the settings to non-volatile memory (two options). To indicate saving, the HB-LED flashes faster than in the set mode for 2 seconds.
 - a. Press the button to resume bus communication with the new settings immediately.
 - b. The card saves the settings automatically after 30 seconds.

***)** The board automatically returns to normal mode after 30 seconds. Do the changes within this time frame.

Default settings for communication parameters are **8E1** and **19200** ("address" 15).

ROTARY SWITCH			
x10		SWITCH POSITION	x1
PARITY	STOP BITS		BPS
Even	1	1	1 200
Even	2	2	2 400
None	1	3	4 800
None	2	4	9 600
Odd	1	5	19 200
Odd	2	6	38 400
		7	57 600
		8	115 200

LED-indicators

- The HB-LED (heartbeat) indicates the normal function of the card
 - Setting mode and saving mode indicated separately (see table below)
- The RX-LED flashes when the card reads a byte from the bus.
 - This does not indicate whether the bus settings are correct.
- The TX-LED flashes when the card responds to a packet received from the bus.

RS485-LED (RX, TX)

STATUS	RX-LED	TX-LED
RS485 not connected OR broken bus cable.	ON	ON
RS485 one wire (A/B) connected. The other one broken.	ON	ON
RS485 wiring ok, no traffic on bus.	ON	ON
RS485 A/B cross-wired, no traffic on bus.	OFF	OFF
RS485 A/B cross-wired, traffic detected.	Blinking	OFF
RS485 correctly connected, traffic detected on other devices.	Blinking	ON
RS485 correctly connected, traffic detected also on this card .	Blinking	Blinks when the card responds

HB-LED

STATUS	HB-LED		
	ON	OFF	DURATION
Normal	1900 ms	100 ms	Continuous
RS485-setting mode	250 ms	250 ms	Continuous (30 s timeout)
RS485-setting mode; saving to memory	75 ms	75 ms	2 s
EEPROM-save	75 ms	25 ms	2 s
IP-reset	75 ms	25 ms	10 s

Polarity detection

The card attempts to detect if the RS485 bus A and B terminals are connected wrong way round (inverted). For this detection to function, biasing resistors must be connected to the bus. These are typically connected only to the bus master device. If the card detects that the connection is inverted, the TX LED remains off.

Wiring Examples

The examples use channels 1 and 2. Key Modbus registers:

DESCRIPTION	REGISTER	DATA TYPE
Channel mode, CH1	0	uint16
Channel mode, CH2	1	uint16
Present value, CH1	100	int16
Present value, CH2	101	int16

Channel mode values (written to register 0 or 1):

VALUE	CHANNEL MODE
1	Ground
4	AI resistance
5	AI voltage
6	AI high current
7	AI low current
8	AO voltage
10	DI
11	DI ext. voltage
12	Pulse counter
13	DO
14	PWM
20	PT1000
21	NI1000
22	NI1000-LG
23	NTC10

Present value engineering units / scaling:

CHANNEL MODE		UNIT / MULTIPLIER
4	AI resistance	1 Ohm
5	AI voltage	1 mV
6	AI high current (or 1: Ground)	0.1 mA
7	AI low current	0.01 mA
8	AO voltage	10 mV (0.1 %)
20...23	Temperature	0.1°C

A comprehensive description of registers can be found on [MAGIO Modbus register list](#).

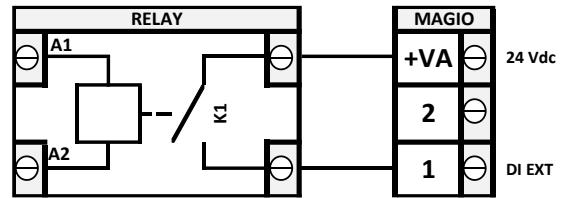
Digital input wiring examples (DI)

Digital signals can use both even and odd terminals as ground (unlike analog signals).

DI-EXT

Digital input where supply voltage is fed via contact.

The K1 contact in the diagram must be potential-free.

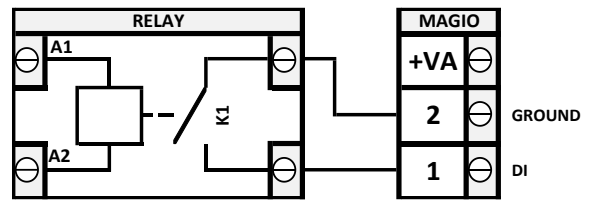


MODBUS

- 1) Set register **0** (channel 1) to value **11** (digital input, external voltage).
- 2) Read the present value of channel 1 from register **100**, in which:
0 = DI OFF
1 = DI ON

DI

Digital input where ground (0 V) is routed through the contact.



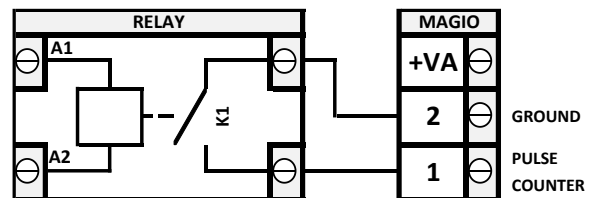
MODBUS

- 1) Set register **0** (channel 1) to value **10** (digital input).
- 2) Set register **1** (channel 2) to value **1** (ground).
Note. Using second channel is optional. You can also connect the ground with a direct wire.
- 3) Read the present value of channel 1 from register **100**, in which:
0 = DI OFF
1 = DI ON

DI Pulse counter

Wiring identical to DI.

The recommended maximum number of pulse inputs per card is 4 (if measuring high-speed/tightly-timed pulses).



MODBUS

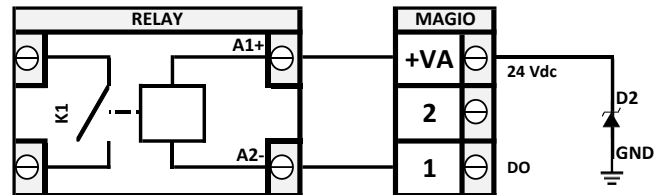
- 1) Set register **0** (channel 1) to value **12** (pulse counter).
- 2) Set register **1** (channel 2) to value **1** (ground).
Note. Using second channel is optional. You can also connect the ground with a direct wire.
- 3) Read the present value of channel 1 from register **100**.
- 4) The present value can be adjusted by writing the desired value to the same register or writing the channel's offset to register **600**.

Digital output wiring examples (DO)

DO 2-wire (potential-free)

Potential-free control implemented with an external relay. Terminal 1 is the switched ground and +VA provides continuous supply voltage.

The TVS diode (D2) protects against overvoltage spikes (>24 V).



MODBUS

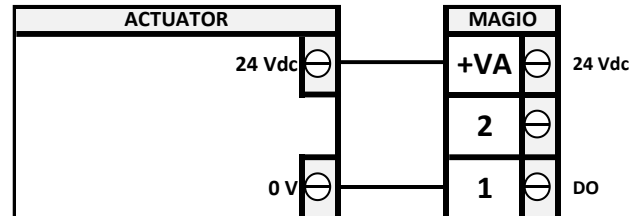
- 1) Set register **0** (channel 1) to value **13** (digital output).
- 2) Set values in register **100** as follows:
0 = DO OFF
1 = DO ON

DO 2-wire (direct / non-isolated)

Terminal 2 is the switched ground and +VA is the continuous power supply.

Note: the output has a 100 kΩ pulldown resistor.

Note: The grounding transistor shuts down under excessive load (e.g. short circuit).



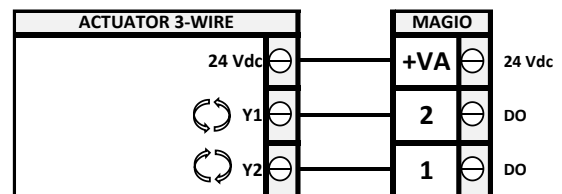
MODBUS

- 1) Set register **0** (channel 1) to value **13** (digital output).
- 2) Set values in register **100** as follows:
0 = DO OFF
1 = DO ON

DO 3-wire

Terminals 1 and 2 switch ground to drive the actuator open or closed. +VA is continuous supply voltage.

If the actuator requires two +24 V control signals and one ground, an interposing relay must be used.



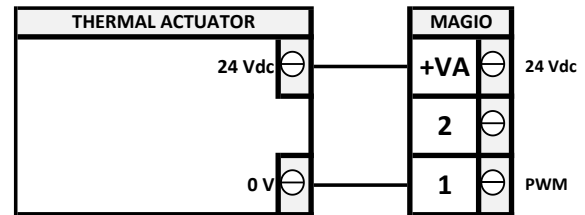
MODBUS

- 1) Set register **0** (channel 1) to value **13** (digital output).
- 2) Set register **1** (channel 2) to value **13** (digital output).
- 3) Set values in register **100** (channel 1) and **101** (channel 2) as follows:
0 = DO OFF
1 = DO ON

PWM

I/O terminal 1 is the switched ground used to control devices such as thermal actuators.

The PWM output is electrically identical to a DO output.



MODBUS

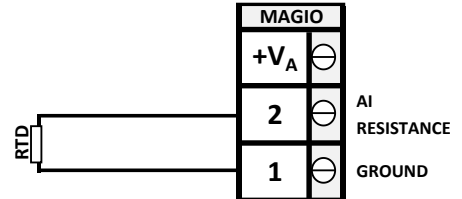
- 1) Set register **0** (channel 1) to value **14**.
- 2) Set value in register **100**. The coefficient of the value is 0.1 %.
 - Value 1 → active for 0.1 % of the cycle period (0.1 % * 10 s = 10 ms).
 - Value 1000 → active for 100 % of the cycle period.

Analog input wiring examples (AI)

Analog modes work only on even-numbered channels. The card automatically assigns the preceding odd-numbered channel to mode 1 (ground).

AI Resistance

Measurement range: 0 Ω ...1 M Ω .



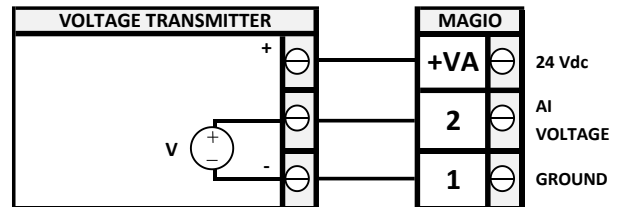
MODBUS

- 1) Set register **1** (channel 2) to value **4**.
- 2) Read the present value of channel 2 from register **101**, in which:
 - Value 1 = 1 Ω .
 - Value 32767 = 32767 Ω .

AI Voltage

Measurement range: 0...10 V.

The card can provide power to the transmitter. The measurement signal is connected to channel 2.



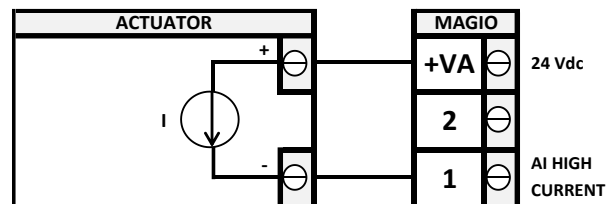
MODBUS

- 1) Set register **1** (channel 2) to value **5** (analog input voltage).
- 2) Read the present value of channel 2 from register **101**, in which:
 - Value 1 = 1 mV.
 - Value 10500 = 10500 x 1 mV = 10.5 V.

AI High Current (or Ground)

Measurement range: 0...1 A (*Note: Board total maximum current is 6 A*).

Less accurate than AI Low Current; intended for actuator status monitoring rather than precision metering. Can also be used on odd-numbered channels.



MODBUS

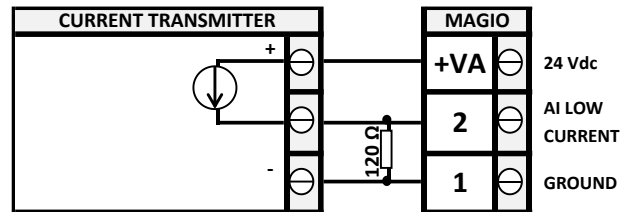
- 1) Set register **0** (channel 1) to value **6** (analog input high current).
- 2) Read the present value of channel 1 from register **100**, in which:
 - Value 1 = 0.1 mA.
 - Value 10000 = 10000 x 0.1 mA = 1000 mA = 1 A.

AI Low current

Measurement range: 0...20 mA.

Odd numbered terminal (1) is ground, even-numbered (2) is the measurement signal.

Requires a 120 Ω external resistor between terminals 1 and 2.



If a resistor of a different size is required, its value must be entered into the register. More detailed instructions are provided in MAGIO Modbus register list.

MODBUS

- 1) Set register **1** (channel 2) to value **7** (analog input low current).
- 2) Read the present value of channel 2 from register **101**, in which:
 Value 1 = 0.01 mA.
 Value 2000 = 2000 x 0.01 mA = 20 mA.

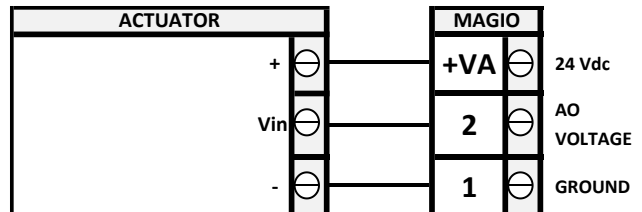
Analog output wiring examples (AO)

Analog modes work only on even-numbered channels. The card automatically configures the preceding odd-numbered channel to Ground (0 V).

AO

Control signal: 0–10 V.

The odd-numbered terminal (1) is ground, and the even-numbered terminal (2) is the control signal.



MODBUS

- 1) Set register **1** (channel 2) to value **8** (analog output voltage).
- 2) Set desired value to register **101**. The unit of the value is 0.1 % of 0–10 V range (10 mV).
 Value 1 → output voltage 0.01 V.
 Value 1050 → output voltage 10.5 V.

Web User Interface

Logging into the UI

The Ethernet ports incorporate an integrated hardware switch supporting loop detection (Rapid Spanning Tree Protocol – RSTP).

- Default IP address: 192.168.0.x, where x is the address selected via rotary switches (00...99)
- Netmask: 255.255.255.0
- Gateway: 192.168.0.1

The screenshot shows a web browser window with the title 'Magio Ethernet M'. The address bar shows 'http://192.168.0.15'. The page content is as follows:

Magio Ethernet M

Firmware versions

MAGIO card version: [11209]
Ethernet cape version: [20102].
Program bank A in use.

IP settings

NOTE: IP Settings have not been saved!

IP address:
Netmask:
Gateway:

AUTOLASTBYTE feature

Set last byte of IP address to 0 for automatic address based on rotary switches 10X & 1X. (Both switches 0 => address 100).
Current switch address: [15]. Feature in use: [YES].

MAC address

Manufacturer range: 78:13:05:BX:XX:XX
MAC:

Firmware upgrade

No file selected. ☐ Clear EEPROM

Browser view of UI

Login troubleshooting

If the web interface fails to open in the browser, check following:

- **Ethernet RJ45 LEDs:**

- Top-right LED: Activity LED (blinks when Ethernet traffic is active).
- Top-left LED: Link LED (illuminates when an active link is established).



- Connection can be verified via command line using the ping command in terminal.

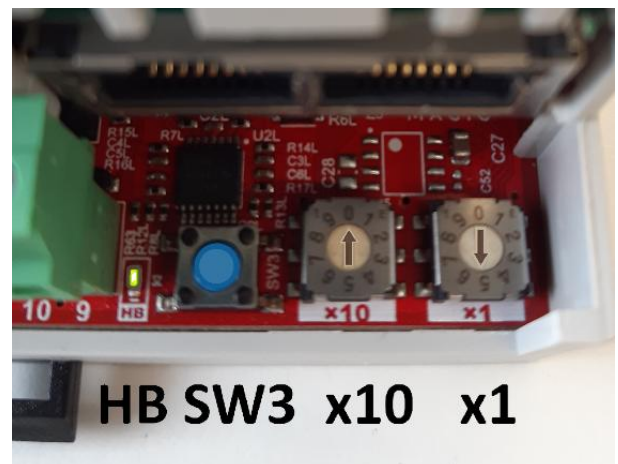
- ping 192.168.0.x

```
PS C:\Users\Bithouse> ping 192.168.0.15

Pinging 192.168.0.15 with 32 bytes of data:
Reply from 192.168.0.15: bytes=32 time=1ms TTL=64
Reply from 192.168.0.15: bytes=32 time=2ms TTL=64
Reply from 192.168.0.15: bytes=32 time=301ms TTL=64
Reply from 192.168.0.15: bytes=32 time=3ms TTL=64

Ping statistics for 192.168.0.15:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 301ms, Average = 76ms
PS C:\Users\Bithouse> |
```

- The URL must use **http://** (not **https://**)
- If changing the IP address via the rotary switches fails, **reset the IP address:**
 - Select the desired IP host number using rotary switches (x10 and x1).
 - Press and hold the **SW3** button until:
 - The **HB-LED** flashes rapidly (ON 75 ms, OFF 25 ms) and blinks for 10 seconds.



Related Documents

MAGIO Modbus register list

Contact information

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www.bithouse.fi/en