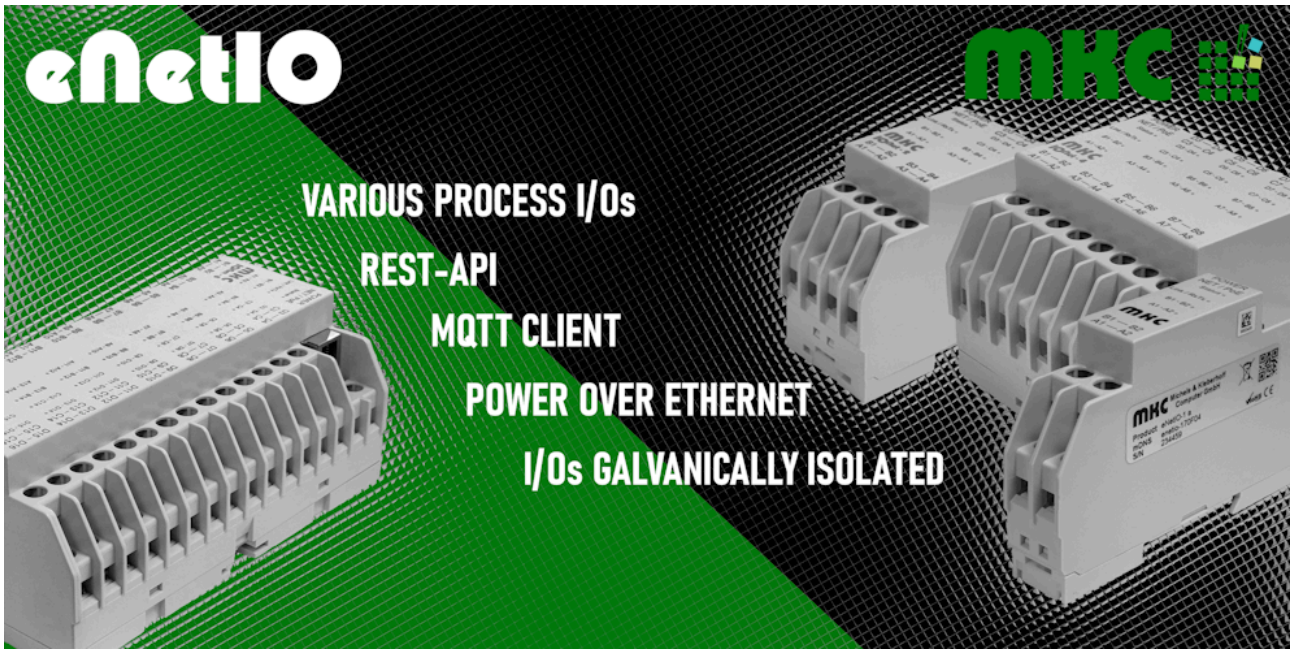
eNetIO

Technical Manual



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Manual Versions

Changes to the manual are indicated by an increase in the edition number. Manuals whose edition is identified by a letter are provisional and may not yet fully correspond to the final product. The first edition that is no longer to be regarded as provisional begins with the number ‘1’.

Manual Versions			
Issue	Changes	Date	
1	First version (not EN)	07.12.22	MW
2	Delivery versions and delivery status (not EN)	05.11.24	GW
3	Design overhauled, Delivery versions, Section 4.7, Section 5	01.10.26	MW

Delivery Versions (October 2026)

All delivery versions refer to the catalogue valid at the time this manual was compiled. You can find the latest information at the addresses given above.

You can find all the Variants of the eNetIO devices currently in use on our website.

Delivery Versions				
Order Number	Number of Digital Inputs (12-230V AC/DC)	Number of Digital Outputs (Relay, NO)	Number of Analog Inputs (0-24mA)	Number of analog Outputs (0-24mA)
eNetIO-1-a	1	1	0	0
eNetIO-2-ab	3	3	0	0
eNetIO-2-ac	5	1	0	0
eNetIO-2-ad	1	5	0	0
eNetIO-2-ah	1	1	4	0
eNetIO-2-ai	3	1	2	0
eNetIO-2-aj	1	1	0	2
eNetIO-4-abbb	7	7	0	0
eNetIO-4-accc	13	1	0	0
eNetIO-4-addd	1	13	0	0
eNetIO-4-ahhh	1	1	12	0
eNetIO-4-aiii	7	1	6	0
eNetIO-4-ajjj	1	1	0	6
eNetIO-8-abbbbbbb	15	15	0	0
eNetIO-8-acccccccc	29	1	0	0
eNetIO-8-adddddddd	1	29	0	0

Further variants, special configurations, adaptations to your process environment, etc. are available by arrangement. If you have any requests, suggestions or critical comments, please do get in touch with us.

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1 Introduction

Under the name **eNetIO**, MKC is launching a range of affordable, network-compatible measurement and control modules for DIN rail mounting. Systems **eNetIO-1, eNetIO-2, eNetIO-4 and eNetIO-8** are available, with 2, 6, 14 or 30 process I/O points respectively (connection options for sensors and actuators)

The devices are powered via the network connection, in accordance with the IEEE 802.3af standard (Power over Ethernet, PoE). The complex process of setting up a conventional power supply with all its well-known problems, such as

- proprietary solutions from various manufacturers
- different plug-in power adaptors
- country-specific regulations (plug types, mains voltages and frequencies)
- wiring that must be carried out by an electrician (230V)

is no longer necessary and is therefore a thing of the past.

The consistent use of these decentralised smart devices also eliminates the need for the previously costly cabling of actuators and sensors to the central control computer. Communication with the devices installed in the process takes place via the network infrastructure (Ethernet, TCP/IP) available in every company. Regardless of whether these devices are used in a decentralised manner, their full functionality can be maintained in the event of a power cut by connecting them to a central uninterruptible power supply (UPS). Alternatively, the **eNetIO** can also be powered via terminal blocks (18–48 V DC, reverse-polarity protected).

The fundamental problem with Ethernet regarding the predictability of transmission times (collisions) can be solved by using “switches.” These connect the sender and receiver of a connection virtually directly to each other. This makes the full transmission bandwidth available without interruptions from other users. As a result, predictable cycle times in the millisecond range can be achieved with the **eNetIO** family and higher-level systems (PLC, PC, etc.).

The **eNetIO** family consists of a base unit (**eNetIO-1**) and several optional add-ons, which can be fittet into housing variants **eNetIO-2, eNetIO-4** and **eNetIO-8**. **eNetIO-2** therefore consists of the basic unit and an add-on, a **eNetIO-4** consists of the basic unit and up-to three add-ons and a **eNetIO-8** consists of the basic unit and up-to seven add-ons. These add-ons can be combined as required to suit the customer’s needs. Thanks to this flexible design, the suitable **eNetIO** controller can be supplied for a wide range of applications. This reduces the cost per data point, as only the inputs and outputs required on site are installed.

The user interface is displayed using a standard browser. This allows the **eNetIO** to be configured and operated from any network-enabled computer. All critical settings are protected by a username and password.

The data is stored in JSON format. Data can be exchanged via a REST API or MQTT. Integration with existing automation software (e.g. Home Assistant, Node-RED) or your own control software is possible without significant programming effort. Further details on the interfaces can be found on our website (www.enetio.com).

MKC’s clear definition and disclosure of the transfer method enables users to implement their own transfer functions quickly and easily within their own processes.

1.1 Notes on the Information Contained in This Manual

Numerical Data

Hexadecimal numbers are denoted in this manual by a leading dollar sign “$”. Other common notations for hexadecimal numbers, such as the prefix “0x” or the suffix “h”, are given in the literature. They are mentioned here solely for the sake of completeness. To improve the readability of long hexadecimal numbers, they are divided into groups of four from the right by a full stop. This full stop has no mathematical significance.

Logic Level

All logic levels are referred to as “HIGH” and “LOW” in this manual. Signals described as active-low are indicated by the prefix “/”.

Hardware Configuration

Refer to the circuit board diagram for the positions of all jumpers and solder bridges. Position 1 of a jumper or solder bridge is highlighted by an additional mark. Jumpers and connectors are generally marked with “J” or “X”. All solder bridges are marked “JB”. In the description of the individual configuration options, the fields highlighted in grey indicate the board’s factory settings.

Delivery Versions

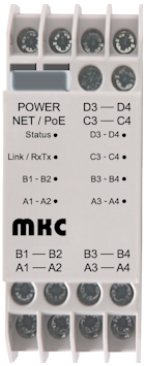
The delivery versions listed above are currently available. This does not guarantee that all these versions will remain available. MKC reserves the right to discontinue production of this hardware or software for technical reasons without prior notice.

Provisional Specifications

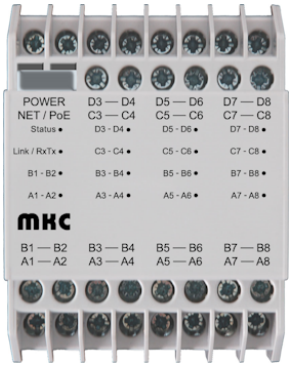
In this version of the manual, several chapters are still provisional; these sections are marked with the text ***'TDB: ...'*** in the relevant places.

2 Technical Data

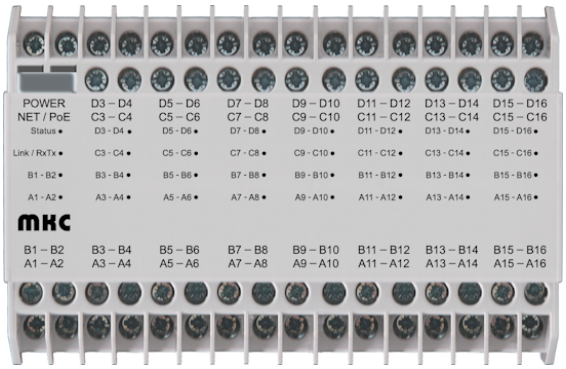
(a) eNetIO-1



(b) eNetIO-2



(c) eNetIO-4



(d) eNetIO-8

Figure 1: Device view

- Enclosure for top-hat rail mounting conforming to standard EN 60715 35mm
- Dimensions eNetIO−1: L: 90 mm, H: 60 mm, W: 17,5 mm (1 TE)
- Dimensions eNetIO−2: L: 90 mm, H: 60 mm, W: 35,0 mm (2 TE)
- Dimensions eNetIO−4: L: 90 mm, H: 60 mm, W: 70,0 mm (4 TE)
- Dimensions eNetIO−8: L: 90 mm, H: 60 mm, W: 140,0 mm (8 TE)
- IP code: IP20
- Ambient temperature:
  - Operation: 0 to 50°C
  - Storage: −40 to +80°C
- Cooling via natural convection (no fan)
- Relative humidity: 0 to 90%, non-condensing
- Power over Ethernet (PoE, IEEE802.3af) as power supply
  - see Section 3 Power Supply
  - Alternativ external power supply (18 - 48V DC, polarity proof)
- Network
  - 100Base-TX / RJ45
  - Web-Server (HTTP)
  - Transmission of measurement data via REST or via HTTP (Intranet / Internet)
- Process-I/O on screw-type terminal (galvanic isolated)
  - Internal analog input to monitor the device temperature
  - see Section 4 Variants eNetIO-X-aYYYYYYY
  - Non-volatile data storage for storing all parameters and the current states of remanent outputs
  - Monitoring of the system via hardware-watchdog

2.1 Included Hardware and Accessories

- Device **eNetIO**
- Magnet (necessary for factory reset)

Custom modifications (OEM) to the homepage or data exchange are generally possible. Additionally, enhancements that allow the device to be used as a standalone controller can be implemented at any time.

2.2 Available Software

The data exchange interfaces comply with industry standards. The data is stored in JSON format. Data can be exchanged via our REST API or using the MQTT protocol. The documentation and examples can be found at www.enetio.com

Additional examples to integrate the eNetIO in Node-RED are also available there.

3 Power Supply

The eNetIO is powered via the network interface using PoE (Power over Ethernet) or via the alternative power supply. If the alternative power supply (18 - 48V DC, reverse-polarity protected) is selected via the POWER terminals, the connection must be made using a sufficiently insulated connection cable.

- Voltage: 1500 Volt
- Isolation gap: ≥ 2mm

Depending on the device the power consumption is max. 8W.

Attention:	
	Keep the device away from water, fire, moisture or hot environments.
	Do not attempt to disassemble, repair or modify the device.
	Do not use damaged cables with the device.
	Do not operate the device outside the device specifications.
	All work on all terminals must be carried out with the appliance switched off and de-energized.
	Dangerous voltages (e.g. mains voltage) may be present on the terminals of the eNetIO. touching these live terminals can lead to life threatening injuries.

4 Variants eNetIO-X-aYYYYYYY

The eNetIO is available in various variants, which can be differentiated on the basis of the order number.

eNetIO-X-a YYYYYYY

Add-on
b = 2 digital inputs + 2 digital outputs
c = 4 digital inputs
d = 4 digital outputs
h = 4 analog inputs
i = 2 digital inputs + 2 analog inputs
j = 2 analog outputs
blank = Slot not populated

Base unit

Size
1 = 1 TE (0 add-ons)
2 = 2 TE (1 add-on)
4 = 4 TE (3 add-ons)
8 = 8 TE (7 add-ons)

Product family
eNetIO

4.1 Base Unit ‘a’

The base unit “a” is a card, which is used in all case variants (**eNetIO-1-a, eNetIO-2-aY, eNetIO-4-aYYY, eNetIO-8-aYYYYYYY**). This unit includes the main controller, an internal analog input to monitor the temperature, a digital input and a digital output. These are accessible via screw-type terminals.

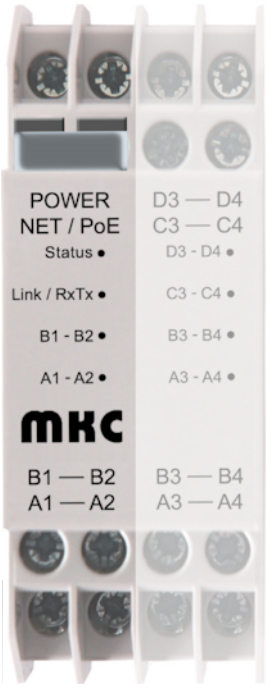
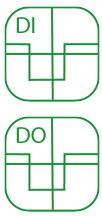


Figure 2: eNetIO-1-a



- Terminal A
  - Digital output
  - Relay, NO (normally open, contact material AgNi)
  - Rated current 6A, starting current 15A
  - Rated voltage 250V~, max switching voltage AC 440V~
  - Maximal switching power 1500VA
  - Contact endurance (VDE0660, VDE 0631, UL 508)
    - $>1x10^5$ at 6A and 250V~
    - $>5x10^5$ at 6A and 30V~
    - $>3x10^6$ at 0.3A (L/R=30ms) and 50V=
  - Implemented output functions
    - “Bistable Switch”
    - “Monostable Switch”
  - Implemented Behavior after a Reset
    - Transient
    - Remanent
  - During system startup (power-on or reset), the digital outputs are inactive. When the device is initialized, the state configured by the user is output.
- Terminal B
  - Digital input
  - 12 - 230V AC/DC
  - Input resistance: >50KΩ
  - Sampling interval: ca 2ms
  - Input filter with adjustable weighted arithmetic mean

The process I/O available at the terminals are galvanically isolated according to the following specifications:

- Voltage: 3000 Volt
- Isolation gap terminal A/B ↔ Device: ≥ 4mm
- Isolation gap A ↔ B: ≥ 2mm

4.2 Base Unit ‘b’

The add-on “b” is a card with two digital inputs and two digital outputs. If this expansion is used in housing variant **eNetIO-2**, it corresponds to device name **eNetIO-2-ab**.

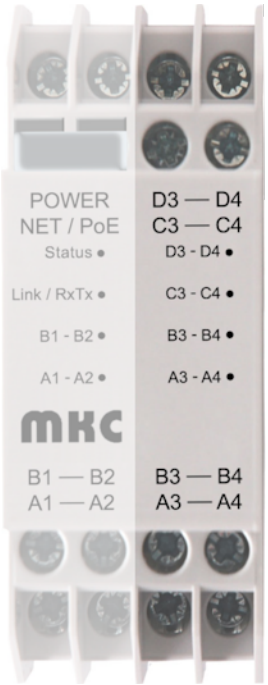


Figure 3: eNetIO-2-ab

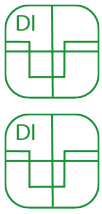
- Terminal A and B
  - Digital output
  - Relay, NO (normally open, contact material AgNi)
  - Rated current 6A, starting current 15A
  - Rated voltage 250V~, max switching voltage AC 440V~
  - Maximal switching power 1500VA
  - Contact endurance (VDE0660, VDE 0631, UL 508)
    - $>1x10^5$ at 6A and 250V~
    - $>5x10^5$ at 6A and 30V~
    - $>3x10^6$ at 0.3A (L/R=30ms) and 50V=
  - Implemented output functions
    - “Bistable Switch”
    - “Monostable Switch”
  - Implemented Behavior after a Reset
    - Transient
    - Remanent
  - During system startup (power-on or reset), the digital outputs are inactive. When the device is initialized, the state configured by the user is output.
- Terminal C and D
  - Digital input
  - 12 - 230V AC/DC
  - Input resistance: >50KΩ
  - Sampling interval: ca 2ms
  - Input filter with adjustable weighted arithmetic mean

The process I/O available at the terminals are galvanically isolated according to the following specifications:

- Voltage: 3000 Volt
- Isolation gap terminal A/B/C/D ↔ Device: ≥ 4mm
- Isolation gap A ↔ B: ≥ 2mm
- Isolation gap C ↔ D: ≥ 2mm

4.3 Base Unit ‘c’

The add-on “c” is a card with four digital inputs. If this expansion is used in housing variant **eNetIO-2**, it corresponds to device name **eNetIO-2-ac**.



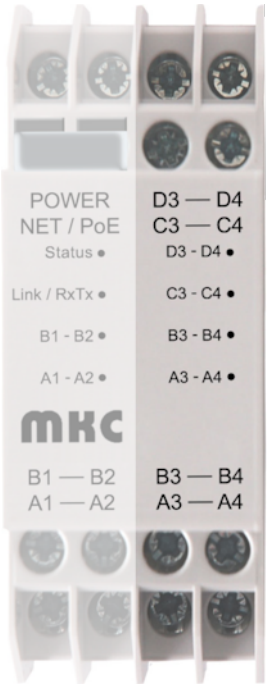
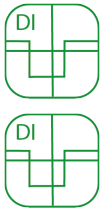


Figure 4: eNetIO-2-ac



- Terminal A, B, C and D
  - Digital input
  - 12 - 230V AC/DC
  - Input resistance: >50KΩ
  - Sampling interval: ca 2ms
  - Input filter with adjustable weighted arithmetic mean

The process I/O available at the terminals are galvanically isolated according to the following specifications:

- Voltage: 3000 Volt
- Isolation gap terminal A/B/C/D ↔ Device: ≥ 4mm
- Isolation gap A ↔ B: ≥ 2mm
- Isolation gap C ↔ D: ≥ 2mm

4.4 Base Unit ‘d’

The add-on “d” is a card with four digital outputs. If this expansion is used in housing variant **eNetIO-2**, it corresponds to device name **eNetIO-2-ad**.

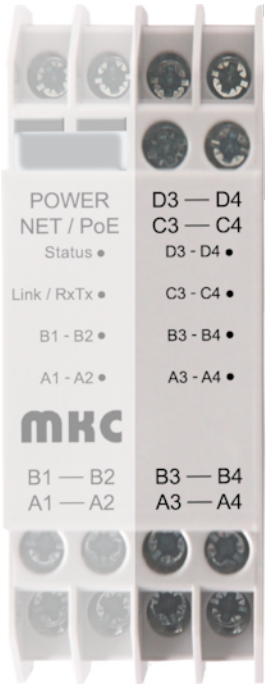


Figure 5: eNetIO-2-ad

- Terminal A, B, C and D
  - Digital output
  - Relay, NO (normally open, contact material AgNi)
  - Rated current 6A, starting current 15A
  - Rated voltage 250V~, max switching voltage AC 440V~
  - Maximal switching power 1500VA
  - Contact endurance (VDE0660, VDE 0631, UL 508)
    - $>1x10^5$ at 6A and 250V~
    - $>5x10^5$ at 6A and 30V~
    - $>3x10^6$ at 0.3A (L/R=30ms) and 50V=
  - Implemented output functions
    - “Bistable Switch”
    - “Monostable Switch”
  - Implemented Behavior after a Reset
    - Transient
    - Remanent
  - During system startup (power-on or reset), the digital outputs are inactive. When the device is initialized, the state configured by the user is output.

The process I/O available at the terminals are galvanically isolated according to the following specifications:

- Voltage: 3000 Volt
- Isolation gap terminal A/B/C/D ↔ Device: ≥ 4mm
- Isolation gap A ↔ B: ≥ 2mm
- Isolation gap C ↔ D: ≥ 2mm

4.5 Base Unit ‘h’

The add-on “h” is a card with four analog inputs. If this expansion is used in housing variant **eNetIO-2**, it corresponds to device name **eNetIO-2-ah**.

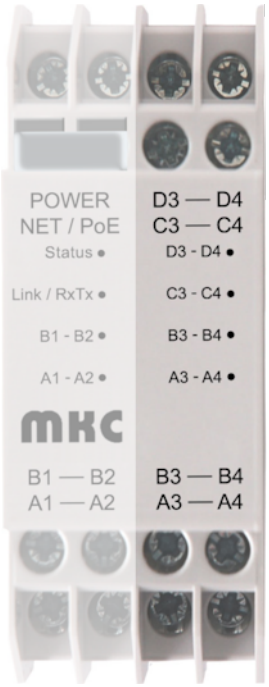
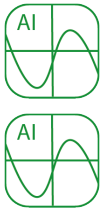


Figure 6: eNetIO-2-ah



- Terminal A, B, C and D
  - Analog input
  - ΔΣ-converter
  - Resolution: 0.763µA
  - Accuracy: 0.04% FSR (Full scale range: 25mA)
  - Sampling interval: ca 25ms
  - Polarity-proof
  - Measurement range: 0 - >24mA
  - Load: 50Ω
  - Input filter with adjustable weighted mean
  - Adjustable hysteresis

The process I/O available at the terminals are galvanically isolated according to the following specifications:

- Voltage: 3000 Volt
- Isolation gap terminal A/B/C/D ↔ Device: ≥ 4mm
- Isolation gap A ↔ B: ≥ 2mm
- Isolation gap C ↔ D: ≥ 2mm

4.6 Base Unit ‘i’

The add-on “i” is a card with two digital inputs and two analog inputs. If this expansion is used in housing variant **eNetIO-2**, it corresponds to device name **eNetIO-2-ai**.

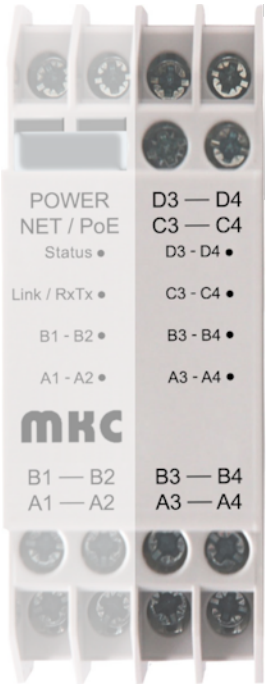
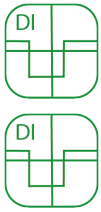


Figure 7: eNetIO-2-ai



- Terminal A and B
  - Digital input
  - 12 - 230V AC/DC
  - Input resistance: >50KΩ
  - Sampling interval: ca 2ms
  - Input filter with adjustable weighted arithmetic mean
- Terminal C and D
  - Analog input
  - ΔΣ-converter
  - Resolution: 0.763µA
  - Accuracy: 0.04% FSR (Full scale range: 25mA)
  - Sampling interval: ca 25ms
  - Polarity-proof
  - Measurement range: 0 - >24mA
  - Load: 50Ω
  - Input filter with adjustable weighted mean
  - Adjustable hysteresis

The process I/O available at the terminals are galvanically isolated according to the following specifications:

- Voltage: 3000 Volt
- Isolation gap terminal A/B/C/D ↔ Device: ≥ 4mm
- Isolation gap A ↔ B: ≥ 2mm
- Isolation gap C ↔ D: ≥ 2mm

4.7 Base Unit ‘j’

The add-on “j” is a card with two analog outputs. If this expansion is used in housing variant **eNetIO-2**, it corresponds to device name **eNetIO-2-aj**.

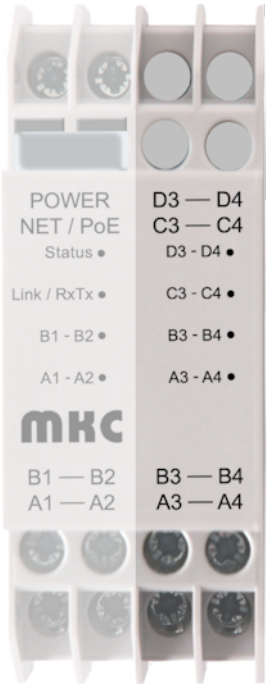


Figure 8: eNetIO-2-aj

- Terminal A and B
  - analog current-output
  - 16 bit converter
  - Output range: 0 - 20mA
  - Resolution: 0.3µa
  - Accuracy: 0.075% FSR (Full Scale Range: 20mA)
  - Load: 50 - 400Ω
  - short term short circuit proof (< 1 seconds)
  - Implemented Behavior after a Reset
    - Transient
    - Remanent

The right terminals A/B (terminal denomination with even numbers) carry the positive current potential.
The lieft terminals A/B (terminal denomination with odd numbers) carry the negative reference point of the current.

Instead of terminals C/D blind plugs are equipped.

- During system startup (power-on or reset), the analog outputs are inactive. When the device is initialized, the state configured by the user is output.

The process I/O available at the terminals are galvanically isolated according to the following specifications:

- Voltage: 3000 Volt
- Isolation gap terminal A/B ↔ Device: ≥ 2.9mm
- Isolation gap A ↔ B: ≥ 2mm

5 LED Status Indication

The eNetIO has color LEDs, which are placed on the top side. There is one LED assigned to each terminal. The factory settings have the following functions implemented.

LED	Color	Meaning
Status	🟢 ↔ ☼	Normal operating state
	🔴 ↔ ☼	DHCP (waiting for IP-address)
	🔴	Error occurred
Link / RxTx	🟠	Link status 100Mbit
	🟠 ↔ 🔴	Data transfer 100Mbit
	🟢	Link status 10Mbit
	🟢 ↔ ☼	Data transfer 10Mbit
A, B, C, D	🟢	-DO: Digital output active -DI: Digital input “High” -AO: Brightness depends on the value set at the output -AI: Brightness depends on the value measured at the input
	🔴	Error state

6 Delivery Status

All settings for operating the device are configured via the network. The device is shipped with the following default settings:

Network, RJ45, 10/100 MBit	
IP-Address, IP-Mask[1]	DHCP (192.168.015.100 / 24)[2]
mDNS-Address	Label
Administrator username[1]	user_su
Administrator password[1]	pass_su

- There is no router/gateway registered
- The network will be configured to the remote station automatically (Full/Half-Duplex, 10/100Base-TX)
- The MQTT-Client is deactivated

6.1 Username/password

The administrator account (SU) has the permission to change usernames and passwords for all accounts. For more information, see the documentation of the homepage.

Attention:	
	The website has three user accounts with different permissions. By default, the accounts are protected by a default password (see above) and should therefore be changed.

[1] Changeable
[2] Static IP will be set automatically, if no address is assigned within the first 120 seconds.