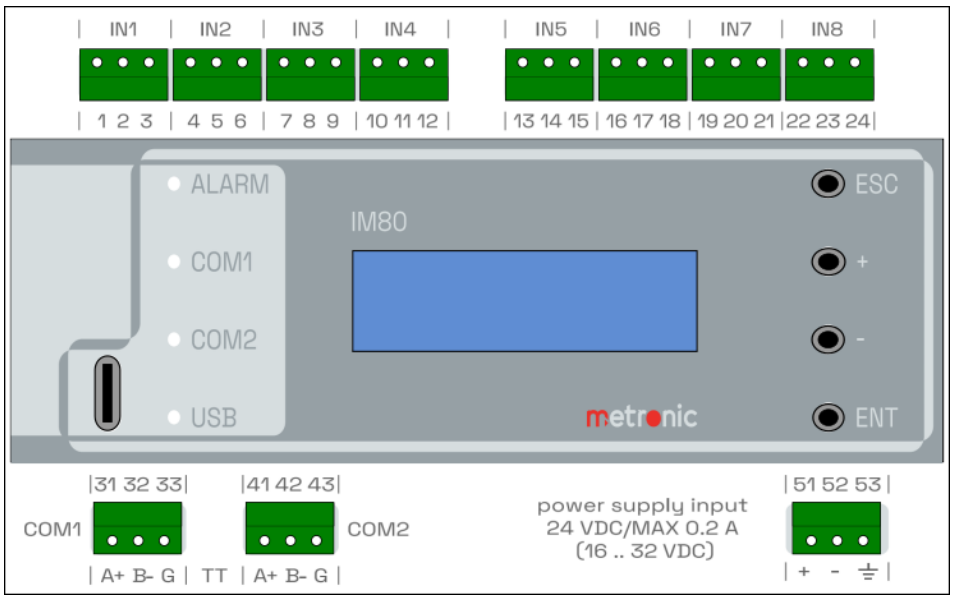



# IM80

8-CHANNEL PROGRAMMABLE ANALOG INPUT MODULE
Type I, U, TC and RTD

**TECHNICAL AND OPERATIONAL DOCUMENTATION**
**Version: 250606 EN**

metronic

Before installing the device, read the entire manual carefully, especially the sections on the environment, health and safety.

The device has been manufactured in accordance with the requirements of European Union directives.

The manual should be kept in a safe place close to the place where the device is installed at all times.

The manufacturer reserves the right to make changes to some functions in connection with the continuous improvement of the device's design.

# 1 Table of contents

# 1 GENERAL INFORMATION

The safe use of the product can only be guaranteed if it is correctly installed, put into operation, used and maintained by qualified personnel (see the following subsections for more information), in accordance with the operating instructions. In order to avoid danger, it is also necessary to comply with general recommendations for safety tools and devices.

**Used markings**


Equipment protected by double insulation or insulation reinforcement.


Reference potential clamp (functional ground). Do not use for electrical safety.


Caution, Danger of electric shock.


Caution, risk of danger, see accompanying documentation.


Attention, electrostatic discharge of sensitive circuits. Do not touch or operate the appliance without proper precautions against electrostatic discharge.


Important notes and information


Use of the product for other than its intended purpose or improper installation of the product, any type of modification to the product, or repairs not in accordance with the following instructions may:

- cause damage to the product or property,
- cause injury or death to staff,
- void the warranty,
- invalidate the designation CE.

The product may be exposed to interference above the limits given in EN 61326 if the product is:

- The product or its wiring is located near the radio transmitter.
- Excessive interference occurs in the supply voltage. Power line (AC) protections should be installed if interference with the supply voltage is likely. Protections should combine filtering, suppression, surge and pulse arresters.
- Mobile phones and portable radios may cause interference if used within approximately 1 m of the product or its wiring. The actual distance necessary will vary depending on the installation and transmitter power.


This device is a Class A device. In such cases, its users may be required to take appropriate countermeasures.

## Cleaning and maintenance

Metronic I&C products do not require any maintenance. Clean the exterior of the appliance from time to time with a dry, minty cloth. Do not use solvents or abrasives to clean the device. They can cause discoloration or scratch the surface of the device.

## Returning a product

Customers and distributors must note that in accordance with European Environment, Health and Safety law, when returning products to Metronic ACP, information must be provided on any hazards and precautions to be taken due to residual contamination or mechanical damage that may pose a danger to health, safety or the environment. This information must be provided in writing, including safety data sheets for any substances considered dangerous or of concern.

# 2 PURPOSE OF THE DEVICE, BASIC FUNCTIONS

The IM80 is a precision programmable analog input module designed for use in a distributed measurement or control system. Eight analog channels allow you to connect resistance temperature transmitters (RTDs) or thermocouples (TCs). The input signals are processed in an 18-bit A/D converter. Data received from the converter are digitally linearized and processed by a microprocessor system, and then made available to the master system via the COM1 communication port (RS-485 / Modbus RTU). The second COM2 communication port (RS-485 / Modbus RTU) allows you to connect additional IM80 modules to increase the number of measurement channels.

The IM80 allows you to record selected channels in the internal memory at a user-selectable recording frequency. The data is saved in the form of csv text files. The archive files are accessible to the user via the USB-C connector on the front panel.

The device is designed for panel mounting on the TS35 rail or directly on the mounting plate. The wires are connected to detachable screw strips. The input signals are supplied from the top of the housing, while the power supply and data transmission line are fed from the bottom.

## 2.1 Analog inputs

The device has eight analogue measurement inputs marked IN1 to IN8. The inputs are multiplexed using electronic keys. The signals are measured by two precise A/D converters with a resolution of 18 bits, operating in a parallel system with four channels each. The input circuit is galvanically separated from the other parts of the device. The measurement inputs are not separated from each other.

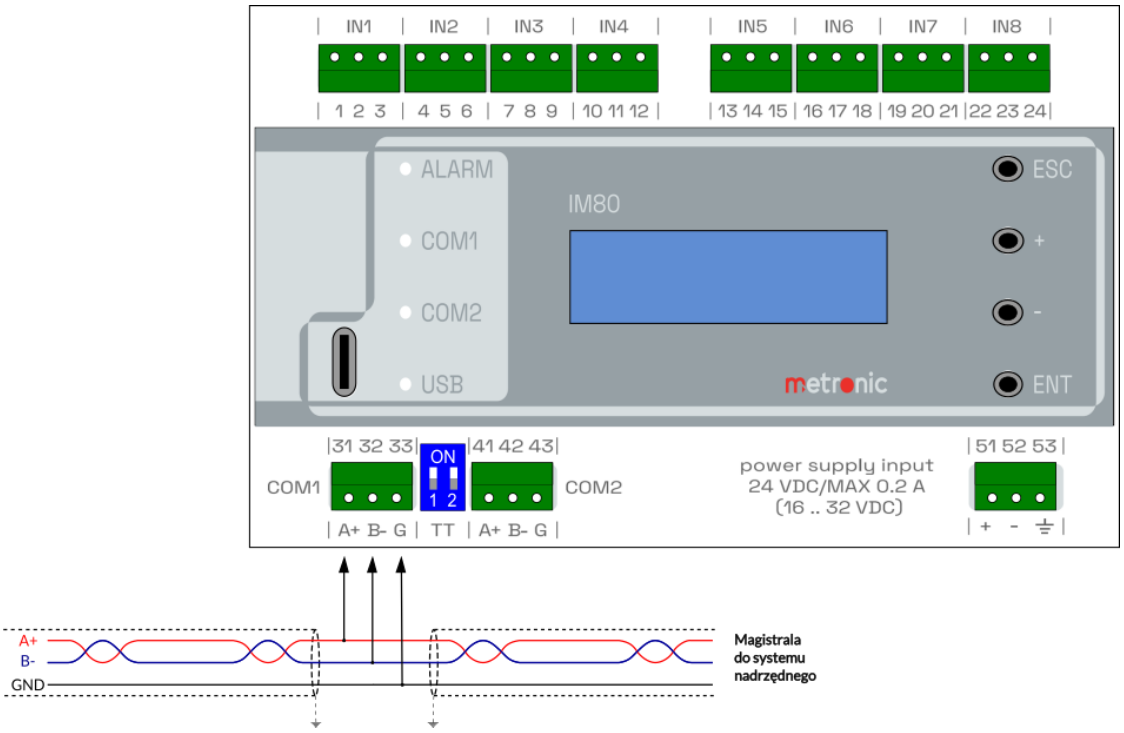
**Measurement inputs:**

- current 0 / 4 .. 20mA with external power supply
- 3-w or 2-w resistive temperature sensors of the type Pt100, Pt1000, Ni100, Cu50, Cu53, KTY-81
- thermocouples
  type B, E, J, K, L, N, R, S, T, U
  with the possibility of compensation of the temperature of the reference weld (cold ends) with a constant value, a Pt100 sensor connected to channel 8 or an internal sensor
- measurement of resistance with linear characteristics in the range of 0 .. 400 Ω and 0 .. 4000 Ω
- measurement of voltage with linear characteristics in the range of -0,2 .. +0,2 V and -1,3 .. +1,3 V (value displayed in mV)

Each of the inputs can be programmed to work with a different measurement signal. The type of measurement signal is selected in the menu. For a 0/4..20mA signal, an armature must be set inside the device. The measurement algorithm also performs the function of detecting sensor failures, but not all fault conditions are detected. Signals from inputs IN1 to IN8 after conversion to measurement results in engineering units are assigned to channels IN1 to IN8.

## 2.2 Communication port COM1 (RS-485)

The module has an RS-485 serial communication port marked COM1, separated from the rest of the chips, intended for the transmission of results to the master system. The port allows you to connect up to 256 receivers to the bus with a maximum length of 1300 m. Communication is carried out in accordance with the Modbus RTU (Slave) protocol. The transmission speed is set in the range of 9.6 kbps to 115.2 kbps. A detailed description of the communication and registers can be found in the chapter MODBUS RTU TRANSMISSION PROTOCOL.

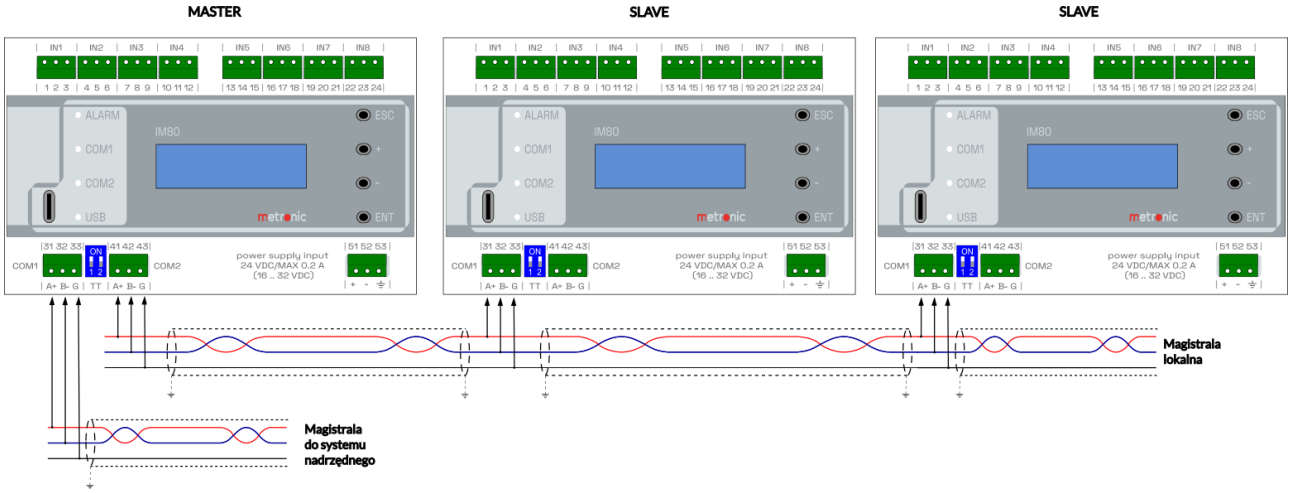



According to the original RS-485 standard, up to 32 devices can be connected to one pair of wires. However, most modern devices with this interface allow you to connect more receivers. In the case of a mixed configuration, it is necessary to pay attention to the total line load.

The current specification of the RS-485 standard requires a two-wire bus (A+, B-) and a potential equalization cable (G) between the lines transmitters/receivers. Earlier versions of the standard assumed only two lines (A+, B-). It is suggested to connect using three lines A+, B-, G, but a two-wire connection should also work properly in many cases. To achieve high transmission speeds over longer distances, special data cables should be used and bus terminating at both ends should be ensured.

## 2.3 Communication port COM2 (RS-485)

The module has a second RS-485 serial communication port marked COM2, also separated from the rest of the chips. It is designed to connect additional IM80 modules in order to expand the number of measurement results "seen" by the master system. In this configuration, the results from the additional modules are mapped to the first module. Communication is carried out in accordance with the Modbus RTU protocol, with the COM2 port operating in Master mode.




The module can have up to 64 remote results configured, at positions IN9 to IN72. Each remote value is configured by specifying the device address (1 .. 247), register address (30000 .. 39999, 40000 . 49999, 300000 . 365535, 400000 . . 465535), and the type of numeric value (uint(16b), int(16b), uint(32b), uint(32b)sw, int(32b), int(32b)sw, float(32b), float(32b)sw, int(64b), double(64b)). In the case of several results, when the same type of variable is read from successive registers, the device automatically groups the results into one or more commands with the length resulting from the Modus RTU specification.

## 2.4 Supply

The device is powered from a DC voltage source. a 24 VDC power supply with an output power of at least 6 W installed in the same measuring cabinet or near the module is recommended for power supply. It is permissible to power more modules from one power supply with correspondingly higher power.

Power supply not supplied with the module.

## 2.5 User interface faceplate

For servicing purposes, the instrument is equipped with an alphanumeric backlit display of 2x 16 characters of the LCD type. Four buttons can be used to program all instrument settings. The display also allows you to view the measurement results and read the RS485 port configuration, software version and serial number. Four tri-color LEDs – ALARM, COM1, COM2, USB – allow for quick verification of the device's operation. The UCB-C port is used to copy the current configuration of the instrument and to upload a new configuration. In addition, the socket is used for service update of the instrument's software.

## 2.6 LEDs – description of signaling

When switching on the power supply, all LEDs should light up in the order of red, green, blue, signalling that the device is starting up.

**ALARM**

- Normal operation (measurement):
- blue light up when a RANGE error appears on one of the inputs (the resistance/voltage measurement is within the measurement range of the input, but outside the range of the sensor characteristics
- green lighting up when the -W- status appears on one of the channels (waiting for the result)
- red light up in case of other errors that appear on the measurement input (exceeding the sensor range up/down, ADC error)
- If the diode is not lit, it means that all measurement inputs are working correctly

**COM 1**

- A short green light means that the correct frame intended for the device – "query" is received (it can be almost invisible at higher transmission speeds)
- A short blue light means that the correct frame is sent from the device – „response”
- A short red light indicates that an error code has been sent (e.g. in response to a query for a register value outside the range of available registers on the device or when receiving a command not supported by the device)
- three red lights up after 100 ms means incorrect initialization of the Modbus RTU Slave port (service information in faulty state)

**COM 2**

- A short blue glow indicates that a request has been sent to other devices – "query" (may be almost invisible at higher bit rates)
- A short green light means that the correct answer has been received from another device – „response”
- A short red light indicates an incorrect answer or a timeout for the response

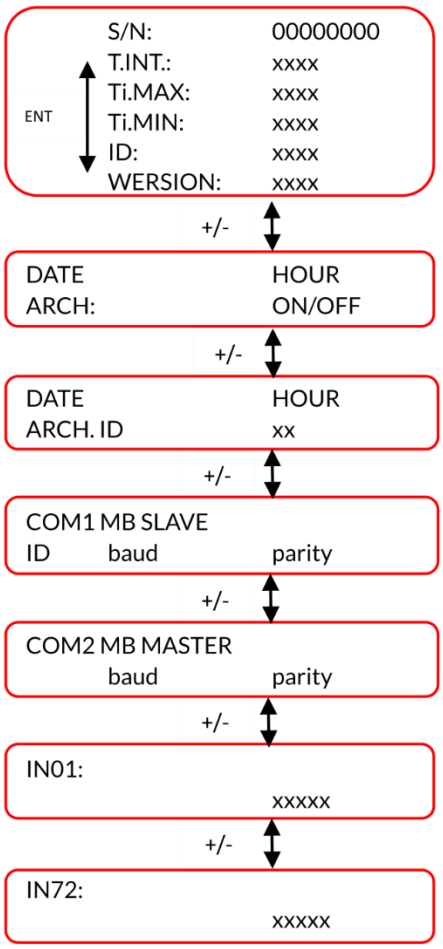
**USB**

- blue light up means the USB port is ready for communication
- green light up means that the USB stick (flash drive) has been correctly detected and is ready to copy files
- red light indicates an error detecting the USB flash drive (e.g. file format errors)
- pulsing in blue indicates that files are being copied

## 2.7 Alphanumeric display

### Information screens for basic settings and measurements

Information screens




General information screen

Enable/disable archive recording [ ENT ]

Creating an archive with a new issue [ ENT ]

Information screen COM1

Information screen COM2

Measurement and remote inputs enabled

## 2.8 Archive

The IM80 allows you to record selected channels in the 2 GB internal memory with a recording frequency of 1s to 24h selected by the user. The data is saved in the form of text files with the extension .csv . Files can be created on a daily, weekly, or monthly basis. The archive files are accessible to the user via the USB-C connector on the front panel.

The IM80 creates two types of AD archive files – data file, AE – event file. The file precedes the device ID, ends with the archive number, then is the date the archive was created.

- eg. 01AD04_250505.csv
- eg. 01AE04_250505.csv

## 2.9 Updating the Instrument Software

To call the firmware update mode, log in with the ADMIN password, turn off the power supply of the device, turn the power back on while holding the ENT button until the ALARM LED starts pulsing green. The ALARM LED continues to pulse until a USB flash drive with a firmware file with a .bin extension is detected. When copying a file to the internal FLASH memory, the ALARM and USB LEDs will alternate between blue and green until the firmware update process is complete.

Other incorrect operating states during the update are signaled by the ALARM LED:

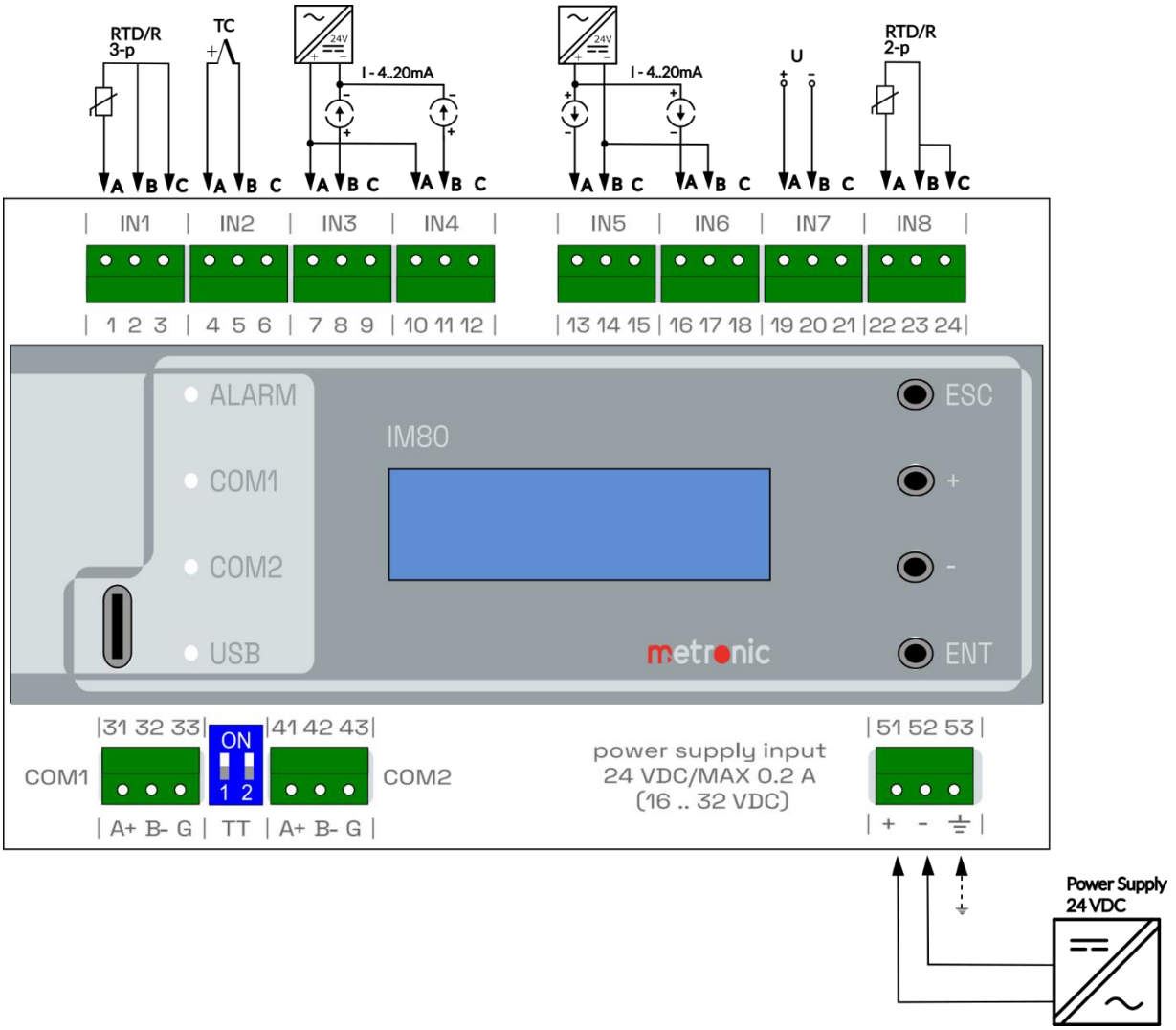
- when attempting to enter the update without first logging in, the ALARM LED will light up red for 5 seconds and then the device will reboot,
- in case of incorrect initialization of the USB memory, the ALARM LED will pulse red in sequence 1 light up and pause 2s,
- in the event of a file error (no file on USB or file with incorrect size) the ALARM LED will be red, in a sequence of 2 short lights and a pause of 2s,
- in case of an error in writing the FLASH memory, the ALARM LED will be red, in a sequence of 3 short lights and a pause of 2s,
- in case of an error in erasing the FLASH memory, the ALARM LED will be red, in a sequence of 4 short lights and a pause of 2s,
- if the user removes the USB key during the update, the ALARM LED will pulse continuously in red.

Interrupting the update in the middle of it, turning off the power or other error results in incorrect operation of the device, and in most cases the instrument does not start. You should then repeat the update from the beginning.

## 3 INSTALLING THE TRANSMITTER IN THE FIELD

The device is suitable for installation in measuring cabinets on the TS35 rail or directly on the mounting plate with two screws. In the upper and lower front part of the enclosure there are sockets with detachable screw connectors, adapted to connect a cable with a maximum cross-section of 1.5 mm2. The sensor signals are connected to eight three-position strips in the upper part. COM1, COM2 communication ports and power supply – up to three three-position strips in the lower part, with the lower strips coded to avoid accidental switching of connectors.

Between the COM1 and COM2 connectors there is a switch for activating the RS485 bus termination, marked TT, switch 1 refers to COM1, and switch 2 – COM2. Line termination should be activated (ON position) only on devices located at both ends of the bus.




For two-wire (2-p) RTDs, connect the B and C terminals with a bridge. Bridges, 8 pcs, are supplied with the device.

**Description of terminal tlocks**

| Clamp No. | Description | |
|---|---|---|
| **Top Strip** | | |
| 1 | clamp A (for TC and U: U+) | IN1 |
| 2 | clamp B (for TC and U: U-) | |
| 3 | clamp C (for RTD) | |
| 4 | clamp A (for TC and U: U+) | IN2 |
| 5 | clamp B (for TC and U: U-) | |
| 6 | clamp C (for RTD) | |
| 7 | clamp A (dla TC and U: U+) | IN3 |
| 8 | clamp B (for TC and U: U-) | |
| 9 | clamp C (dla RTD) | |
| 10 | clamp A (for TC and U: U+) | IN4 |
| 11 | clamp B (for TC and U: U-) | |
| 12 | clamp C (for RTD) | |
| 13 | clamp A (for TC and U: U+) | IN5 |
| 14 | clamp B (for TC and U: U-) | |
| 15 | clamp C (for RTD) | |
| 16 | clamp A (for TC and U: U+) | IN6 |
| 17 | clamp B (for TC and U: U-) | |
| 18 | clamp C (for RTD) | |
| 19 | clamp A (for TC and U: U+) | IN7 |
| 20 | clamp B (for TC and U: U-) | |
| 21 | clamp C (for RTD) | |
| 22 | clamp A (for TC and U: U+) | IN8 |
| 23 | clamp B (for TC and U: U-) | |
| 24 | clamp C (for RTD) | |
| **Bottom strip** | | |
| 31 | RS-485 clamp A+ | COM1 |
| 32 | RS-485 clamp B- | |
| 33 | RS-485 clamp G (GND1 mass) | |
| 41 | RS-485 clamp A+ | COM2 |
| 42 | RS-485 clamp B- | |
| 43 | RS-485 clamp G (GND2 mass) | |
| 51 | Supply +24 V= | Supply (imput) |
| 52 | Supply -24 V= | |
| 53 | GND, functional ground (internally shorted with clamp 52) | |

# 4 PROGRAMMING SETTINGS

## 4.1 Login, password ADMIN

From the user level, it is only possible to view the measurement results. To be able to change the settings, save or load the configuration via the USB-C connector, you need to log in with a password as ADMIN. To enter the login, hold down the ESC button for approx. 4 seconds.

> ADMIN password on a brand new device: AAAAA
> It is recommended to change this password to a different one.

The device has a second level of access marked SERVICE. This level also allows the device to be calibrated. The SERVICE password is not available to the user as standard.

## 4.2 Programming settings from the front panel

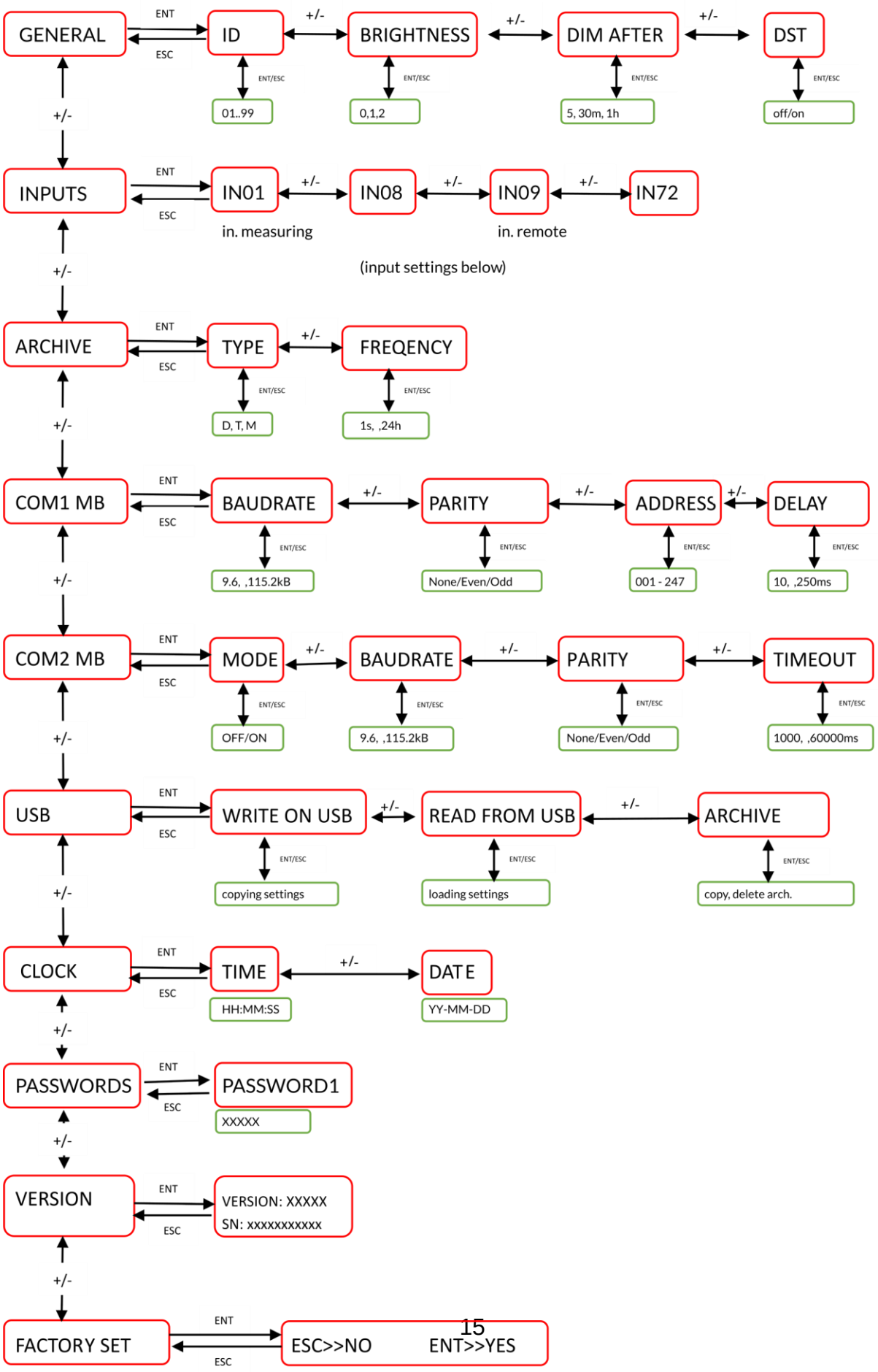
After logging in with the ADMIN password, the configuration menu is available.

Changes are made with 4 keys.

ENT – input, approval.

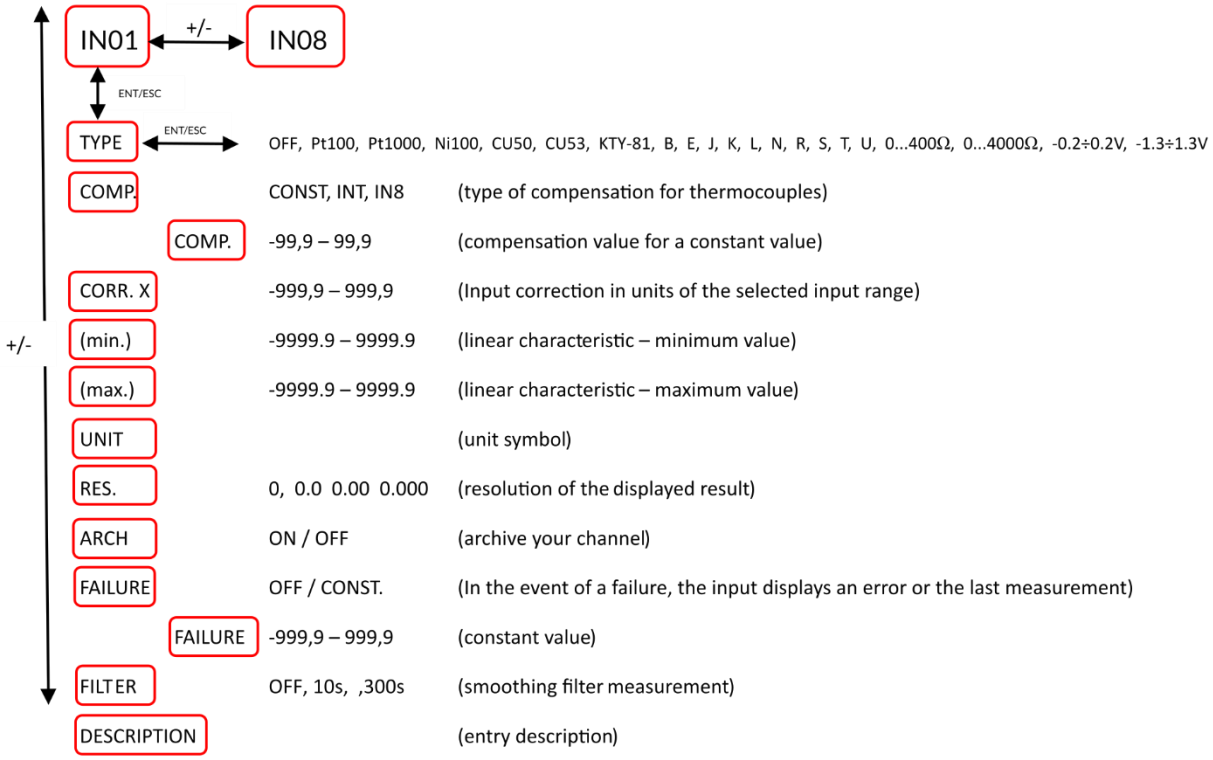
ESC – exit, return.

+/- - scrolling.

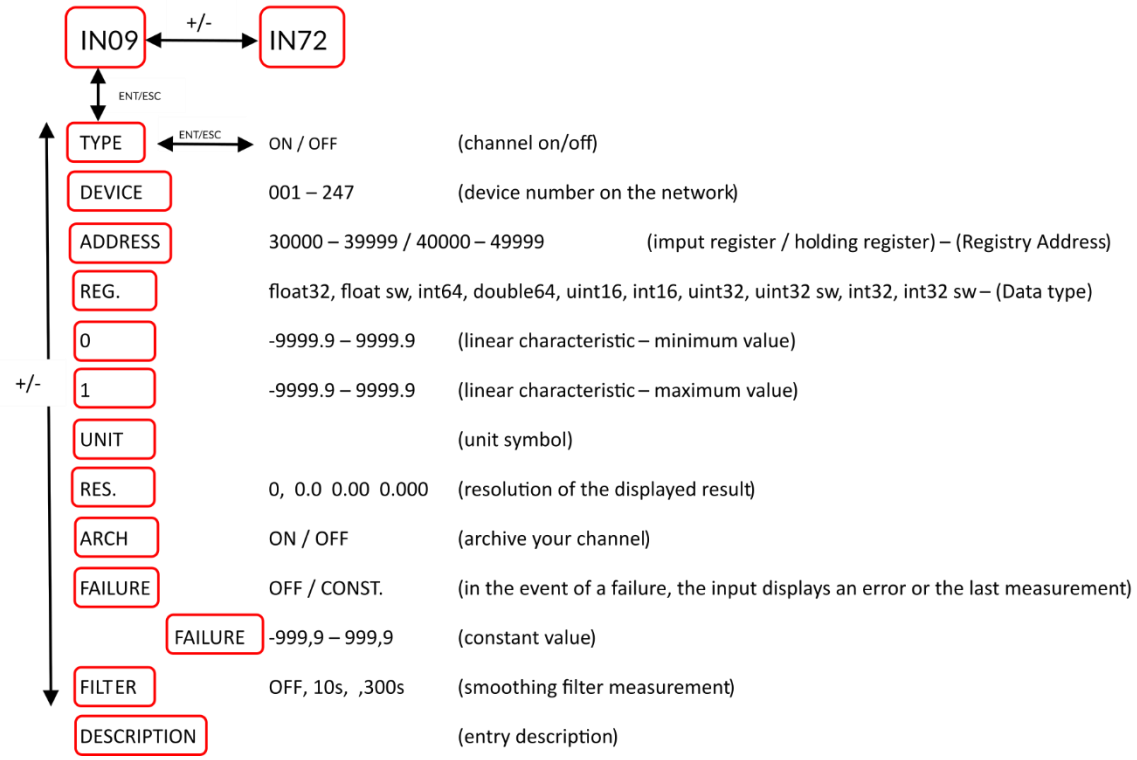

GENERAL
ENT
ESC
ID
+/-
BRIGHTNESS
+/-
DIM AFTER
+/-
DST
ENT/ESC
01..99
0,1,2
5, 30m, 1h
off/on
+/-
INPUTS
IN01
IN08
IN09
IN72
in. measuring
in. remote
(input settings below)
ARCHIVE
TYPE
FREQENCY
D, T, M
1s, ,24h
COM1 MB
BAUDRATE
PARITY
ADDRESS
DELAY
9.6, ,115.2kB
None/Even/Odd
001 - 247
10, ,250ms
COM2 MB
MODE
OFF/ON
TIMEOUT
1000, ,60000ms
USB
WRITE ON USB
READ FROM USB
copying settings
loading settings
copy, delete arch.
CLOCK
TIME
DATE
HH:MM:SS
YY-MM-DD
PASSWORDS
PASSWORD1
XXXXX
VERSION
VERSION: XXXXX
SN: xxxxxxxxxxx
FACTORY SET
ESC>>NO
ENT>>YES

## INPUTS

(Settings - measurement inputs)




(Settings - remote inputs)

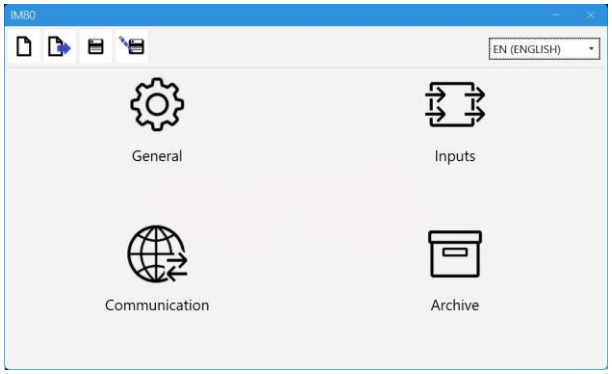


## 4.3 Programming settings using a program on a PC

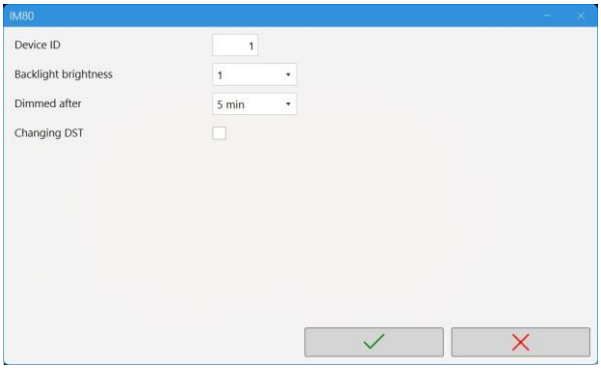
To configure the device, a program for a computer with the Microsoft Windows operating system is available. Setting up the instrument on your PC is intuitive. If you have a larger number of instruments, you can store individual device configurations as files. The program also allows you to view the configuration read from the device. Reading the configuration from the device and loading the new configuration is done via a USB flash drive. The USB-C connector on the front panel is used for this purpose.

Below are examples of screens for setting up the instrument.

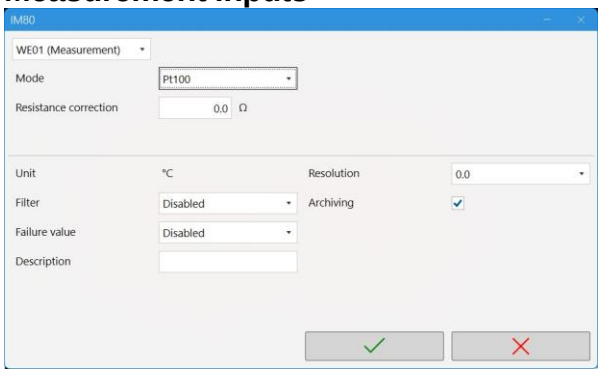
### Screen



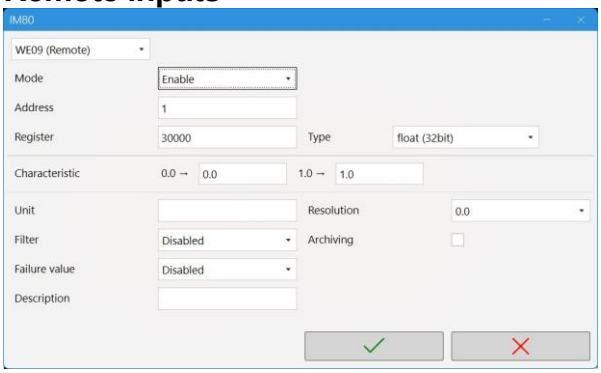

### General settings



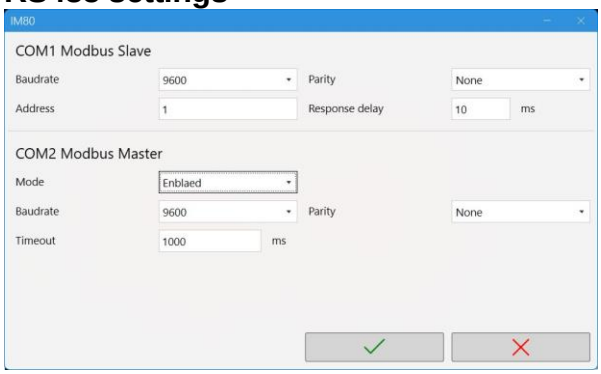

### Measurement inputs



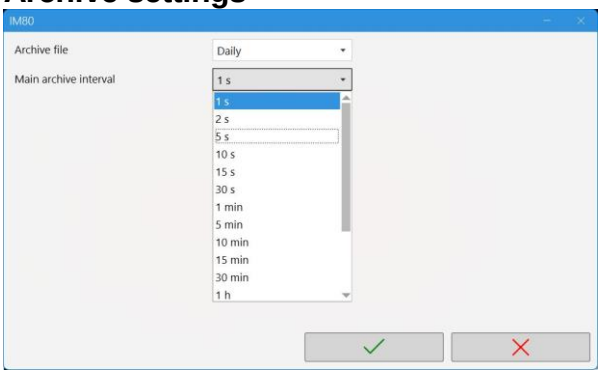

### Remote inputs




### RS485 settings




### Archive settings



# 5 SPECIFICATIONS

| ANALOG INPUTS | |
|---|---|
| Number of inputs | 8 (IN1 .. IN8), multiplexed with electronic keys |
| Galvanic separation between channels | Lack |
| Galvanic separation from the supply voltage | 250VAC; 1500VAC for 1 min |
| Maximum Input Voltage | ±30 VDC or 30$V_{p-p}$ (between any ABC terminals) |
| **RTD input configuration** | |
| Measuring range | 0..4000 Ω |
| Sensor current | 250 μA |
| Sensor connection method | 3-wire or 2-wire |
| Cable resistance compensation in a 3-wire connection | Automatic or fixed correction in the range –10 Ω do 10 Ω |
| Wire resistance compensation in 2-wire connection | A fixed adjustment in the range of –10 Ω do 10 Ω |
| **TC Input Configuration** | |
| Measuring range | -140 .. +140 mV |
| Compensation of the reference weld | External Pt100 sensor at WE8 input<br>Internal temperature measurement<br>Constant value entered by the user |
| Reference weld compensation range | -50,0 °C to +100,0 °C |
| Maximum resistance of the compensation cables (leading to the sensor) | 2 x 300 Ω |
| Measurement accuracy | According to the table for the sensor type |
| **R-type input configuration** | |
| Transducer resistance range | 0 .. 400 Ω<br>0 .. 4000 Ω |
| Processing characteristics | Linear |
| Sensor connection method | As for RTD |
| Measurement accuracy (for ambient temperature of 25°C) | According to the table for the sensor type |
| **Input Configuration I** | |
| Measuring range | 0 ..20mA<br>4 .. 20mA |
| Processing characteristics | Linear |
| Sensor connection method | Two-wire external power supply |
| Measurement accuracy ($T_a$= +25°C) | <±0,1 % measurement accuracy |
| **U-type input configuration** | |
| Voltage range | -0,2 .. +0,2 V<br>-1,3 .. +1,3 V |
| Processing characteristics | Linear |
| Sensor connection method | Two-wire |
| Measurement accuracy (for ambient temperature 25°C) | <±0,1 % measurement accuracy |

| REMOTE INPUTS | |
|---|---|
| Number of inputs: | 64 (WE9 .. WE72), Read over COM2 protocol, Modbus RTU |
| Scope of supported registers: | 30000 .. 39999, 300000 .. 365535<br>40000 .. 49999, 400000 .. 465535 |
| Supported number format | uint(16b), int(16b),<br>uint(32b), uint(32b)sw, int(32b), int(32b)sw,<br>float(32b), float(32b)sw,<br>int(64b), double(64b) |
| **SERIAL PORT COM1 / RS-485 / SLAVE** | |
| Signals output on the connector | A+, B-, G (GND1 – reference potential) |
| Galvanic isolation | Yes, 500 V |
| Load | 256 receivers / transmitters |
| Transmission Protocol | Modbus RTU (slave) |
| Maximum Line Length | 1300 m |
| Baud | 9,6 / 19,2 / 38,4 / 57,6 / 115,2 kbps |
| Parity check | Even / Odd / None |
| Frame | 1b start, 8b data, 1b CRC, 1b stop (CRC= Odd/Even)<br>1b start, 8b data, 1b stop (CRC= None) |
| Maximum differential voltage A+ – B- | +/-14 V |
| Maximum voltage A(+) – G or B(-) – G | -7 V ... +12 V |
| Minimum transmitter output | 1,5 V (at $R_0$=54 Ω) |
| Minimum receiver sensitivity | 200 mV / $R_{WE}$=96 kΩ |
| Minimum data line impedance | 54 Ω |
| Short circuit / thermal protection | Yes / Yes |
| **SERIAL PORT COM2 / RS-485 / MASTER** | |
| Signals output on the connector | A+, B-, G (GND2 – reference potential) |
| Galvanic isolation | Yes, 500 V |
| Load | 256 receivers / transmitters |
| Transmission Protocol | Modbus RTU (master) |
| Maximum Line Length | 1300 m |
| Baud | 9,6 / 19,2 / 38,4 / 57,6 / 115,2 kbps |
| Parity check | Even / Odd / None |
| Frame | 1b start, 8b data, 1b CRC, 1b stop (CRC= Odd/Even)<br>1b start, 8b data, 1b stop (CRC= None) |
| Maximum differential voltage A+ – B- | +/-14 V |
| Maximum voltage A(+) – G or B(-) – G | -7 V ... +12 V |
| Minimum transmitter output | 1,5 V (at $R_0$=54 Ω) |
| Minimum receiver sensitivity | 200 mV / $R_{WE}$=96 kΩ |
| Minimum data line impedance | 54 Ω |
| Short circuit / thermal protection | Yes / Yes |

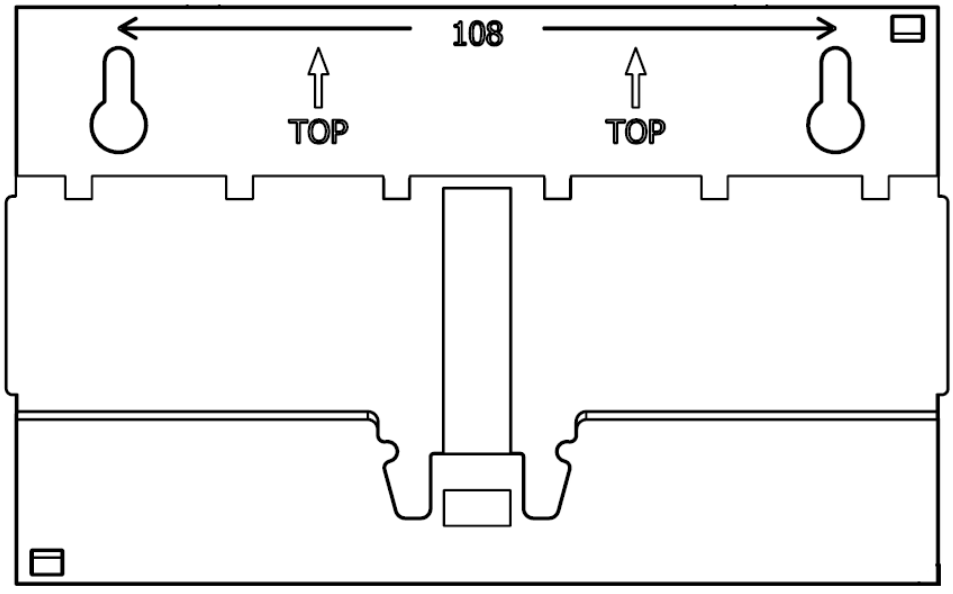
| Supply | |
|---|---|
| Supply voltage | 24 VDC (16 ... 32 VDC) |
| Power Consumption | 1.5 W typically, 4,8 W max |
| **FACEPLATE** | |
| Display Type | Alphanumeric LCD, 2x 16 characters, with backlight |
| Character height | 4,5 mm |
| Signaling | 4 tri-colour LEDs |
| Keyboard | 4 Buttons |
| Port USB | USB-C, USB 2.1 |
| **TERMINAL BLOCKS** | |
| Connection of input signals (top strip) | 8 plug-type screw three-terminal connectors, maximum conductor cross-section 1,5 $mm^2$ |
| Power connection, COM1, COM2 ports (bottom terminal block) | 3 plug-type screw three-terminal connectors, maximum conductor cross-section 1,5 $mm^2$ |
| **WORKING CONDITIONS** | |
| Operating Ambient Temperature | 0 ... +50 °C |
| Storage Temperature | -10 ... +70 °C |
| Operating Relative Humidity | 5 ... 90 % non-condensing |
| **MECHANICAL DIMENSIONS – HOUSING** | |
| Housing Type | For mounting on TS-35 |
| Dimensions (H x W x D) | 90.5 mm X 142.5 mm X 62 mm (64.5 mm with connectors) |
| Mass | ok. 0,3 kg |
| Protection | IP30 |

## Temperature Sensor Type Table

| RTD Sensor Table | | |
|---|---|---|
| **Sensor Type** | **Measurement range** | **Accuracy** |
| Pt100, Pt1000<br>(EN 60751+A2:1995) | -50 .. 300°C<br>-200 °C .. +850 °C | ±0,5 °C (typ. ±0,3 °C)<br>±1,0 °C (typ. ±0,6 °C) |
| Ni100<br>(DIN43760 /08-1985) | -60 °C .. +250 °C | ±0,5 °C (typ. ±0,3 °C) |
| Cu50, Cu53<br>(GOST6651-2009) | -180 °C .. +200 °C | ±0,5 °C (typ. ±0,3 °C) |
| KTY81<br>(NXP Rev05-25.04.2008) | -55 °C .. +150 °C | ±0,5 °C |
| Linear resistance | 0 .. 400 Ω<br>0 .. 4000 Ω | ±0,5 Ω (typ. ±0,3 Ω)<br>±1,0 Ω (typ. ±0,6 Ω) |

| Thermocouple Table (TC) | | |
|---|---|---|
| **Sensor Type** | **Measurement range** | **Accuracy (1)** |
| J (Fe-CuNi)<br>(EN 60584-1:1995) | -210 °C .. +1200 °C<br>(comp. range -50 °C .. +100 °C) | ±1,0 °C (typ. ±0,5 °C) |
| K (NiCr-NiAl)<br>(EN 60584-1:1995) | -270 °C .. +1372 °C<br>(comp. range -50 °C .. +100 °C) | ±1,0 °C (typ. ±0,5 °C) |
| N (NiCrSi-NiSi)<br>(EN 60584-1:1995) | -270 °C .. +1300 °C<br>(comp. range -50 °C .. +100 °C) | ±2,0 °C (typ. ±1,0 °C) |
| R (PtRh 13-Pt)<br>(EN 60584-1:1995) | -50 °C .. +1768 °C<br>(comp. range -50 °C .. +100 °C) | ±2,0 °C (typ. ±1,0 °C) |
| S (PtRh 10-Pt)<br>(EN 60584-1:1995) | -50 °C .. +1768 °C<br>(comp. range -50 °C .. +100 °C) | ±2,0 °C (typ. ±1,0 °C) |
| T (Cu-CuNi)<br>(EN 60584-1:1995) | -200 °C .. +400 °C<br>(comp. range -50 °C .. +100 °C) | ±1,0 °C (typ. ±0,5 °C) |
| E (NiCr-CuNi)<br>(EN 60584-1:1995) | -270 °C .. +1000 °C<br>(comp. range -50 °C .. +100 °C) | ±1,0 °C (typ. ±0,5 °C) |
| B (PtRh30-PtRh6)<br>(EN 60584-1:1995) | +250 °C .. +1820 °C<br>(without compensation) | ±2,0 °C (typ. ±1,0 °C) |
| L (Fe-CuNi)<br>(DIN43710) | -200 °C .. +900 °C<br>(comp. range -50 °C .. +100 °C) | ±1,0 °C (typ. ±0,5 °C) |
| U (Cu-CuNi)<br>(DIN43710) | -200 °C .. +600 °C<br>(comp. range -50 °C .. +300 °C) | ±1,0 °C (typ. ±0,5 °C) |
| Line Voltage | -0,2 .. +0,2 V<br>-1,3 .. +1,3 V | < ±0,2% full range |

(1) – For TC elements, the given accuracy does not take into account the error in the compensation path.




Rear view
Mounting hole position

# 6 CHANGIN INPUTS HARWARE CONFIGURATION

| | |
|---|---|
| ! | Input configuration changes must be made prior to commencing device installation. |

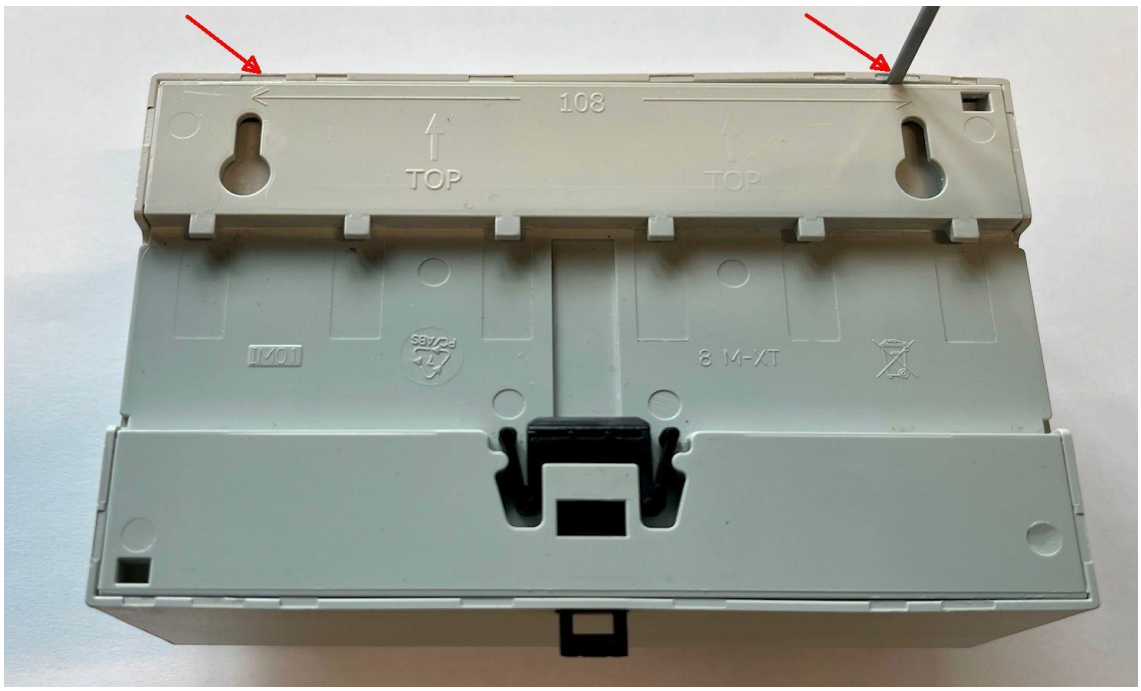
| | |
|---|---|
| ! | Do not touch internal components without proper electrostatic discharge (ESD) protection |

| | |
|---|---|
| ! | Ensure that the device is disconnected from the power supply. |

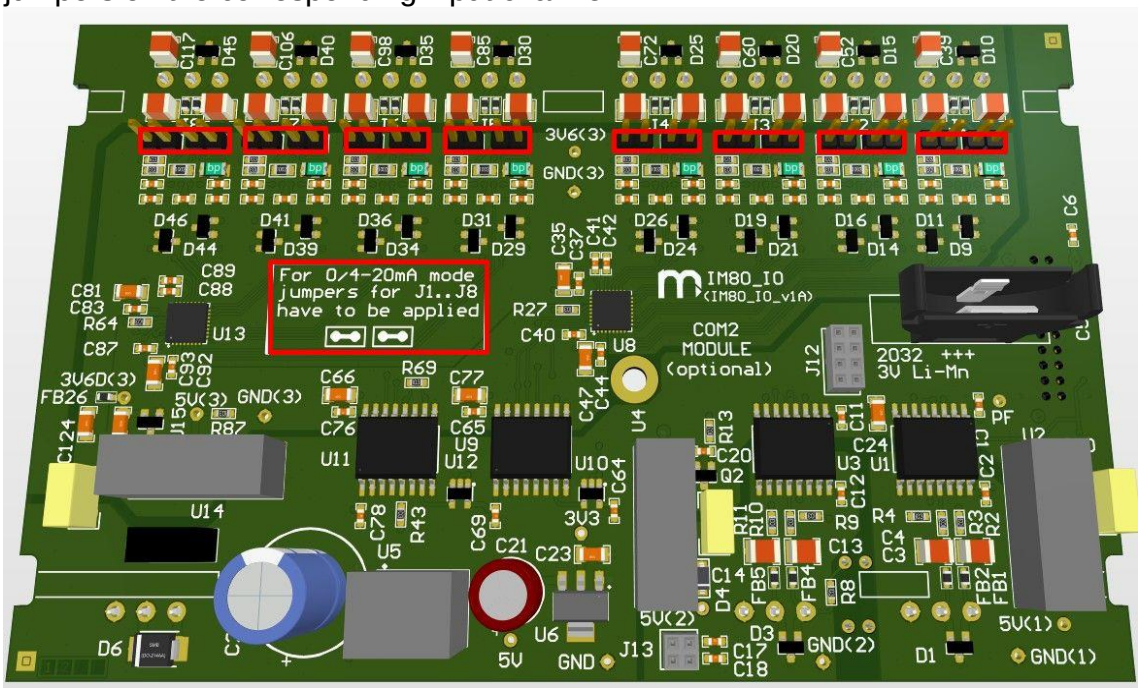
| | |
|---|---|
| ! | Enclosure disassembly must be performed by qualified personnel only. |

To configure the 0/4..20 mA current inputs, it is necessary to modify the internal jumper settings of the device. Jumper configuration must be carried out prior to sensor connection, parameter programming, and device installation. Disassembly of the instrument enclosure is required (to be performed exclusively by trained personnel).

Insert two flathead screwdrivers into the enclosure slot, lift the cover upwards, and slide it outwards.



Use the included jumpers to connect two pins; activating the selected input requires placing two jumpers on the corresponding input channel.



# 7 MODBUS RTU TRANSMISSION PROTOCOL

Measurement results (IN1 .. IN8) and remote results (IN9 .. IN72) read via COM2) are available in two formats: uint(16b) and float(32b) both as holding registers and input registers.

The other number formats can be used to read other devices via the COM2 port in Modbus RTU Master mode and are mapped to the registers for the WE9 inputs. WE72 including conversion to uint(16b) and float(32b) format.

## 7.1 Numeric value formats used on the device

| uint/int 16bit | *Reg (Bit 15…0)* | |
|---|---|---|
| | HByte | LByte |
| | 2. | 1. |

| uint/int/float 32bit | *Reg_L (Bit 15…0)* | | *Reg_H (Bit 31…16)* | |
|---|---|---|---|---|
| | HByte | LByte | HByte | LByte |
| | 2. | 1. | 4. | 3. |

| uint/int/float 32bit sw | *Reg_H (Bit 31…16)* | | *Reg_L (Bit 15…0)* | |
|---|---|---|---|---|
| | HByte | LByte | HByte | LByte |
| | 4. | 3. | 2. | 1. |

| int/double 64bit | *Reg_L (Bit 15…0)* | | *Reg_H (Bit 31…16)* | | *Reg_L (Bit 47…32)* | | *Reg_H (Bit 63…48)* | |
|---|---|---|---|---|---|---|---|---|
| | HByte | LByte | HByte | LByte | HByte | LByte | HByte | LByte |
| | 2. | 1. | 4. | 3. | 6. | 5. | 8. | 7. |

Numeric values in the floating point format are stored in accordance with the IEEE-754 standard for 32-bit floating point single or 64-bit floating point double.

## 7.2 Register addresses for measurement results in uint(16b) format

To get full information about the values of the measurement results in the uint(16b) format, the measurement result was multiplied by 10dp and "shifted" by 10000. The integer value encoded in this way contains information about positive and negative values and values after the decimal point. After reading the register, in order to "recover" the measurement value, mathematical operations must be performed according to the following formula:

$$result = \frac{register\ value - 10000}{10^{dp}}$$

*dp* – number of decimal places

The results in the format uint(16b) are displayed in order from the address 00 (dec).

| Measurement channel number | Registry Address (with Function Code) (dec) | Modbus register address (dec) |
|---|---|---|
| **IN1** | 300000 / 400000 | 00 |
| **IN2** | 300001 / 400001 | 01 |
| **IN3** | 300002 / 400002 | 02 |
| **IN4** | 300003 / 400003 | 03 |
| **IN5** | 300004 / 400004 | 04 |
| **IN6** | 300005 / 400005 | 05 |
| **IN7** | 300006 / 400006 | 06 |
| **IN8** | 300007 / 400007 | 07 |
| **IN9** | 300008 / 400008 | 08 |
| **…** | … | … |
| **IN72** | 300071 / 400071 | 71 |

If the device does not have available measurement results (input off, reading before the first measurement), then the value 10000 is substituted into the registers in the uint(16b) format. (dec) (2710 (hex)).

### 7.3 Register addresses for measurement results in float format(32b)

The results in float(32b) format are stored in sequence starting from address 100 (dec).

| Measurement channel number | Registry address (in 6-character notation) (dec) | Modbus register address (dec) |
|---|---|---|
| **IN1** | 300100 / 400100 | 100 |
| **IN2** | 300102 / 400102 | 102 |
| **IN3** | 300104 / 400104 | 104 |
| **IN4** | 300106 / 400106 | 106 |
| **IN5** | 300108 / 400108 | 108 |
| **IN6** | 300110 / 400110 | 110 |
| **IN7** | 300112 / 400112 | 112 |
| **IN8** | 300114 / 400114 | 114 |
| **IN9** | 300116 / 400116 | 116 |
| **…** | … | … |
| **IN72** | 300242 / 400242 | 242 |

If the device does not have available measurement results (input off, reading before the first measurement), then the NaN (Not a Number) value is substituted into the registers in float(32b) format.

### 7.4 Diagnostics and Error Codes

Only one sub-function is available – 00 data return. Supported error codes:

- 01 – abnormal function (in the case of diagnostics also incorrect subfunction).
- 02 – Invalid registry address.
- 03 – Invalid range of read data.
- 06 – The device is busy and cannot respond.

# 8 ENTITY PLACING ON THE EU MARKET

Producer: METRONIC AKP Sp. J.
31-426 Kraków, ul. Żmujdzka 3
Tel.: (+48) 12 312 16 80
www.metronic.pl

CE

The above-mentioned object of this declaration is in conformity with the relevant requirements of Union harmonisation legislation:

1. Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 concerning electromagnetic compatibility and specific standards:
   1.1. Resistance in industrial environments according to EN 61326-1:2013 (Table 2).
   1.2. Conducted and radiated emission Class A according to EN 61326-1:2013.
2. RoHS Directive 2011/65/EU.