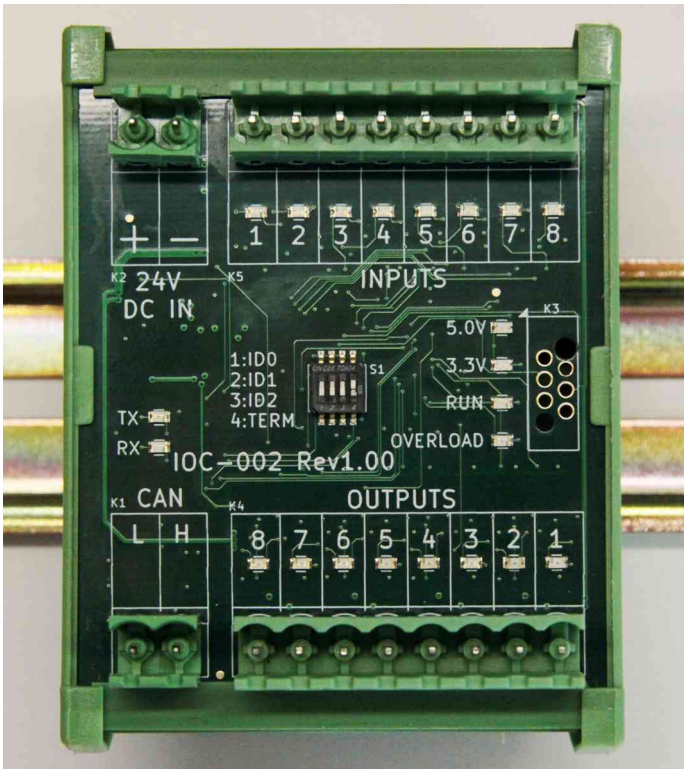
IOC-002

CAN bus controlled 8 channel I/O module
Revision 1.20 / 24.07.2024
0010-000010



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IOC-002

CAN bus controled 8 channel I/O module

Revision 1.20

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1 Technical specifications and maximum ratings

If not explicitly stated all values are rated for a module supply voltage of 24.0 VDC and an ambient temperature of 25°C.

Parameter	Min	Typ	Max	Units
Supply voltage	21.5	24	26.5	VDC
Module supply power	-	-	1	W
CAN bus data rate	-	1	-	MBit
Ambient operating temperature	-20	-	+60	°C
Relative humidity (non-condensing)	-	-	90	%

Table 1: Technical specifications

Parameter	Min	Typ	Max	Units
Output voltage digital high level	23.2	23.7	-	VDC
Output voltage digital low level	-	0	0.6	VDC
Output current[1]	-	-	1000	mA
Input voltage digital high level	21.5	24	30	VDC
Input voltage digital low level	-	0	12	VDC
Input power dissipation	-	-	50	mW

Table 2: Maximum ratings

Operating the module outside the limits listed above is **not allowed** and may lead to permanent damage.

1 sum of all 8 output channels

2 Connectors and controls

2.1 Overview

The DIN rail mounted module has an 8 positions terminal block for the inputs and one for the outputs. The power supply and the CAN bus are each connected by means of a 2 positions terminal block.

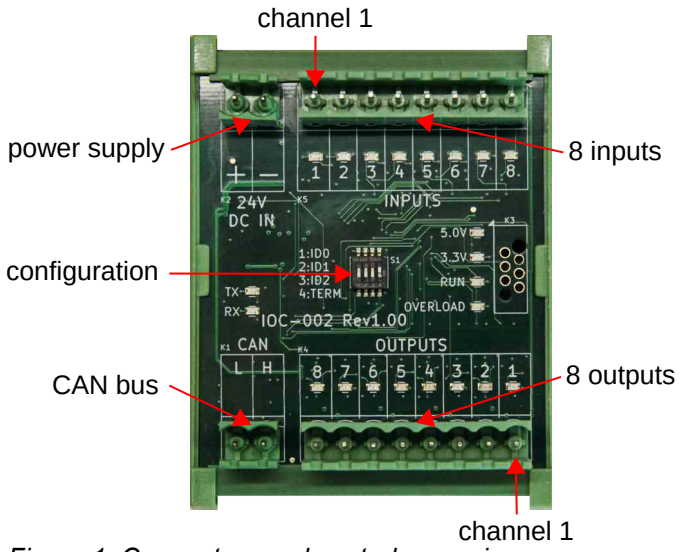


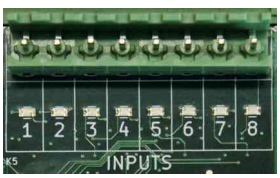
Figure 1: Connectors and controls overview

The termination and the CAN bus address of the module can be configured by means of DIP switches.

2.2 Power supply

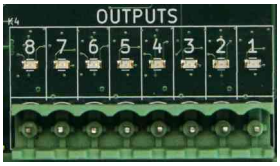
The power supply connector **K2** is labeled **24V DC IN**. The connection is made by means of a 2 positions terminal block. The module is powered nominally by 24 VDC while respecting any tolerances. The power supply input is protected against reverse polarity.

2.3 Inputs



The connector **K5** for the 8 inputs is labeled **INPUTS**. The connection is made by means of an 8 positions terminal block. The inputs numbered left to right in ascending order. Each input is associated with a green LED.

2.4 Outputs



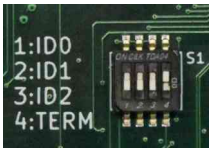
The connector **K4** for the 8 outputs is labeled **OUTPUTS**. The connection is made by means of an 8 positions terminal block. The outputs are numbered left to right in **descending** order. Each output is associated with a red LED.

2.5 CAN bus communication

The connector **K1** used to connect the CAN bus is labeled **CAN L H**. The connection is made by means of a 2 positions terminal block.

2.6 CAN bus configuration

The module's CAN bus address and the bus termination is configured by means of a DIP switch bank consisting of 4 DIP switches.



The DIP switch bank is labeled **S1**.

The **switches 1 – 3** are used to configure the module's CAN bus address while **switch 4** is use to configure the CAN bus termination.

The bus termination has to be enabled on the two devices residing closest to the two ends of the bus.

Position of switch 4 (TERM)	bus termination state
off	disabled
on	enabled

Table 3: Configuration of CAN bus termination

NOTE: wrong termination settings almost always lead to communication problems.

The addressing capabilities allow for up to 8 IOC-002 modules to be used on the same CAN bus. This in turn allows access to a total of 64 inputs and 64 outputs.

Position of switch			Module address
Switch 3 (ID2)	Switch 2 (ID1)	Switch 1 (ID0)	
off	off	off	0
off	off	on	1
off	on	off	2
off	on	on	3
on	off	off	4
on	off	on	5
on	on	off	6
on	on	on	7

Table 4: Configuration of module CAN bus address

Operating two or more modules with identical addresses on the same CAN bus is possible but will be sensible only in very special uses cases.

A **module address of 0** is configured by default.

3 LED indicators

Various state information is displayed by means of LEDs. This documentation uses the following symbols for the different states of LEDs:


off (not lit)


permanently on


regular slow blinking (500ms on / 500ms off)


regular fast blinking (250ms on / 250ms off)

The IOC-002 module makes use of green and red LEDs only.

3.1 General module state indicators

The general state of the IOC-002 module is indicated by 3 green LEDs labeled **5.0V**, **3.3V** and **RUN**. Another red LED labeled **OVERLOAD** completes the general state indicators.

Label	State	Meaning / Troubleshooting
5.0V	●	Internal 5V power supply okay.
	○	Internal 5V power supply is missing. Make sure the 24V power supply is working and polarized correctly. Another cause of this LED not turning on could be the triggering of the integrated melting fuse due to excess supply voltage or current consumption. This melting fuse can be replaced by the user after consultation of EETS GmbH regarding the correct type.
3.3V	●	Internal 3.3V power supply okay.
	○	Internal 3.3V power supply is missing. In case the 5V LED too is off, please see above. Otherwise the module has to be repaired.
RUN	◑	Normal state, the module is running error free.
	○	In case the OVERLOAD LED is simultaneously blinking fast then the supply voltage is too high (also consult OVERLOAD). Otherwise the firmware does not run and the module has to be repaired.
	◔	Check the supply voltage, it is too low. Make sure the supply voltage corresponds to the values found in section *Technical specifications and maximum ratings*.
	●	The firmware is not running and the processor has stopped. If this situation persists after having disconnected all outputs and restarted the module, it has to be repaired.

Table 5: Meaning of module state indicator LEDs

Label	State	Meaning / Troubleshooting
0VERL0AD		No overload and no excess temperature, module is running.
		The module has detected either excess current on its outputs, an excess temperature or the supply voltage is too high. **In any of these cases, all outputs are turned off (left floating)**. In case of the supply voltage being too high the RUN LED is turned off too. In case of excess temperature, the cause has to be searched and eliminated. After some time for cooling down, the module can be restarted by means of the CAN bus or by powering it off and on again. In case of overload or short circuit of the outputs the cause has to be searched and eliminated. Since all outputs are turned off in case of an overload or short circuit we recommend the following troubleshooting procedure: disconnect **all** loads from module, turn the module off and on again and then reconnect the loads **successively**. Once the cause of the overload is eliminated the module can be restarted by means of the CAN bus or by disconnecting the power supply for a moment.

Table 5: Meaning of module state indicator LEDs

3.2 Inputs

Each input is equipped with a green LED indicating the presence of some voltage.

State	Meaning
	A voltage is present at the input. The LED can lit up even if the voltage at the input is too low for a logical HIGH level according to *Table 1: Technical specifications*. In case the voltage on the input is too low for level transition from LOW to HIGH, there will be **no** corresponding message emitted on the CAN bus.
	There is no voltage present at the input.

Table 6: State of LED input indicator

Basically the indicator LED follows the voltage detected on the input.

3.3 Outputs

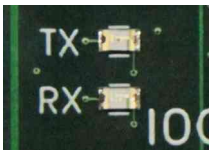
Each output is equipped with a red LED indicating the actual state.

State	Meaning
	The output is connected to the positive terminal of the supply voltage (24 VDC rail) and drives a load (push).
	The output is turned off. The output might be connected to the negative terminal of the power supply voltage (0 VDC rail) and drive a load (pull). Alternatively the output may be completely disconnected from the power supply (floating), **not** being able to drive any load. The floating state of an output is active during current overload or excess temperature condition and can also be set by the corresponding CAN message.

Table 7: State of LED output indicator

Naturally an output's LED indicator can blink. In this case the state of change is set by the respective CAN bus message. Basically the indicator LED follows commands received by means of CAN bus messages.

3.4 CAN bus communication



Two LEDs are used to indicate the traffic on the CAN bus. A red LED labeled **TX** indicates transmission of data while a green LED labeled **RX** indicates reception of data.

Please note that it is not mandatory for both LEDs to turn on and off to indicate correct communication on the CAN bus. However if both LEDs are **permanently** lit this indicates a problem on the CAN bus. It is then recommended to check the CAN bus itself, all devices connect to it as well as its correct termination.

4 Wiring

All digital inputs and outputs are galvanically coupled with one another as well as with the power supply of the IOC-002 module.

4.1 Digital input

All 8 digital inputs are to be wired according to the following schematic. Inputs that are left floating are reported as logical 0.

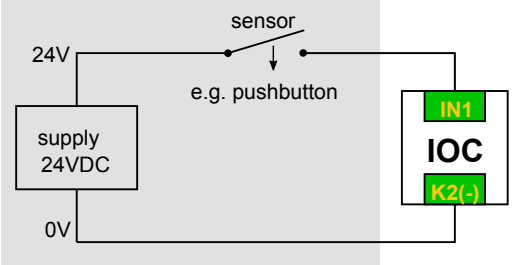


Figure 2: Wiring digital input

4.2 Digital output

An output wired as *push output* has an active (logical 1) output level of 24V. All outputs wired like this share the same 24V power supply which in addition powers the IOC-002 module itself by means of connector K2.

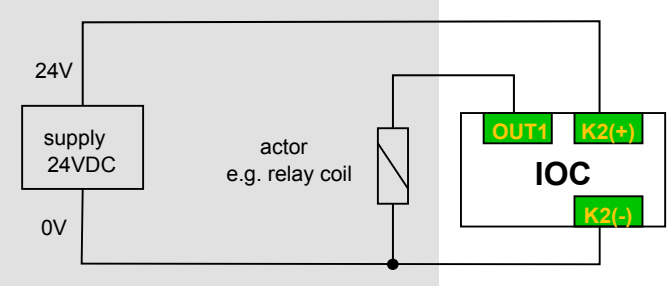


Figure 3: Wiring digital output (push variant)

An output wired as *pull output* has an active (logical 0) output level of 0V. Outputs wired like this may have distinct 24V power supplies as long as all their negative potentials are connected to the negative potential of supply powering the IOC-002 module.

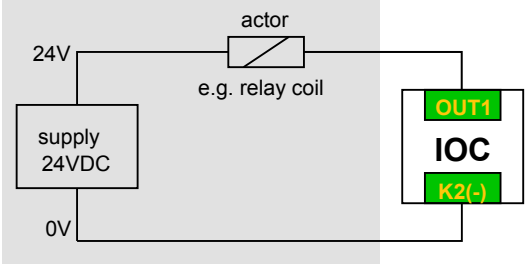


Figure 4: Wiring digital output (pull variant)

5 Mechanics

5.1 Housing

The IOC-002 uses a DIN rail mountable housing holding the PCB. Sideways the housing consists of two end plates while the backside consists of two mounting brackets for standard DIN rails. Only the LEDs, DIP switches and connectors are accessible from the front side of the module.

Enclosure type:	Horizontal DIN rail mountable PCB holder consisting of: profile, attached DIN rail mounting brackets and screwed end plates
Outer dimensions:	88 x 67 x 57 mm (incl. terminal block)
PCB holder:	73 x 63.6 mm
Mounting type:	Clamp mounting on DIN rail EN 60 715, TH35
Material:	Profile, self-extinguishing PVC - FR - UL94V-0 DIN rail brackets and end plates Nylon 6.6 - FR - UL94V-0
Color:	green

5.2 Connectors

All terminal blocks can be connected by connectors equipped with either screwed or spring clamps having a pitching of 5.08 mm. The module ships with screwed clamp connectors.

Number of positions:	2 and 8
Pitching:	5.08 mm
Cable dimensions:	0.08 – 2.5 mm² (AWG 28 - 12)
Rated voltage:	24 V
Rated current:	12 A

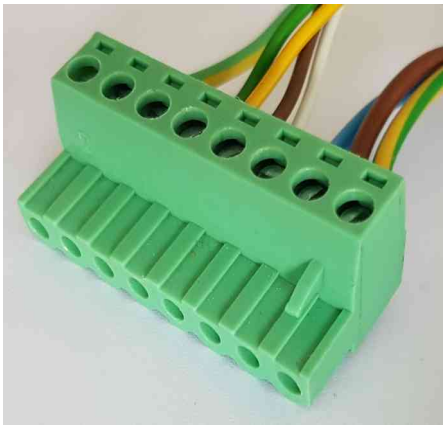


Figure 5: Connector 8 positions

5.3 Mounting

The two DIN rail mounting brackets on the backside of the enclosure are equipped with a plastic cam having a spring effect. Mounting the enclosure on a DIN rail does not require any tool, just some light pressure until it engages.

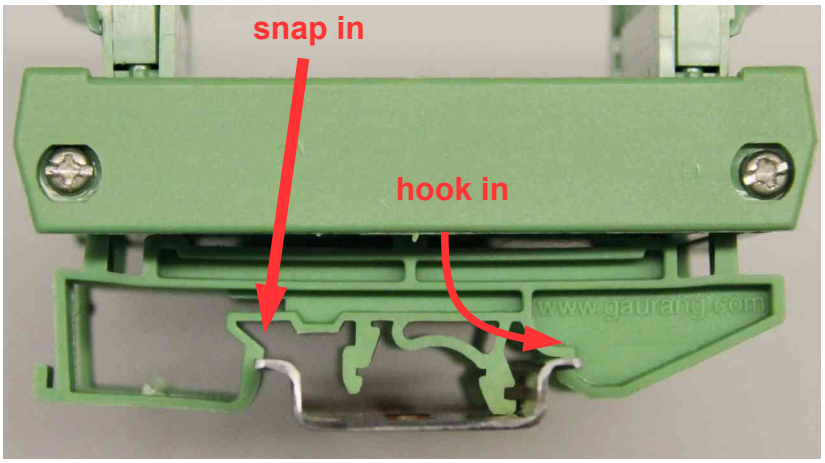


Figure 6: Hooking the module to the DIN rail

To remove the module from a DIN rail a screw driver is required. The screw driver is used to push/pull the plastic cam of the two brackets until they unhook from the rail.

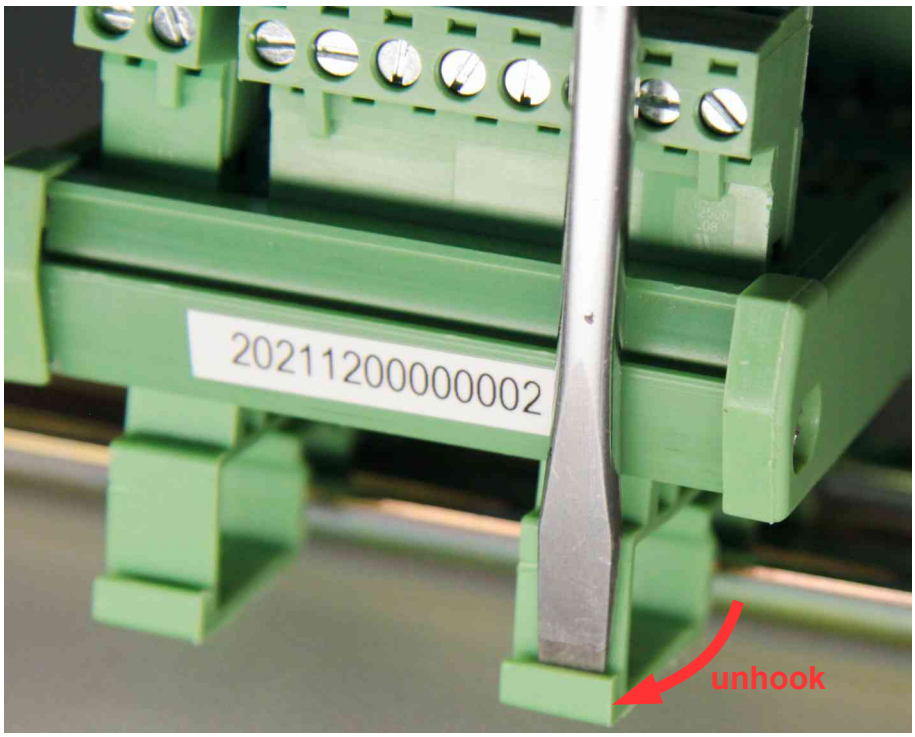


Figure 7: Unhooking the module from the DIN rail

5.4 Outer dimensions

including connectors (no cable)

Top view

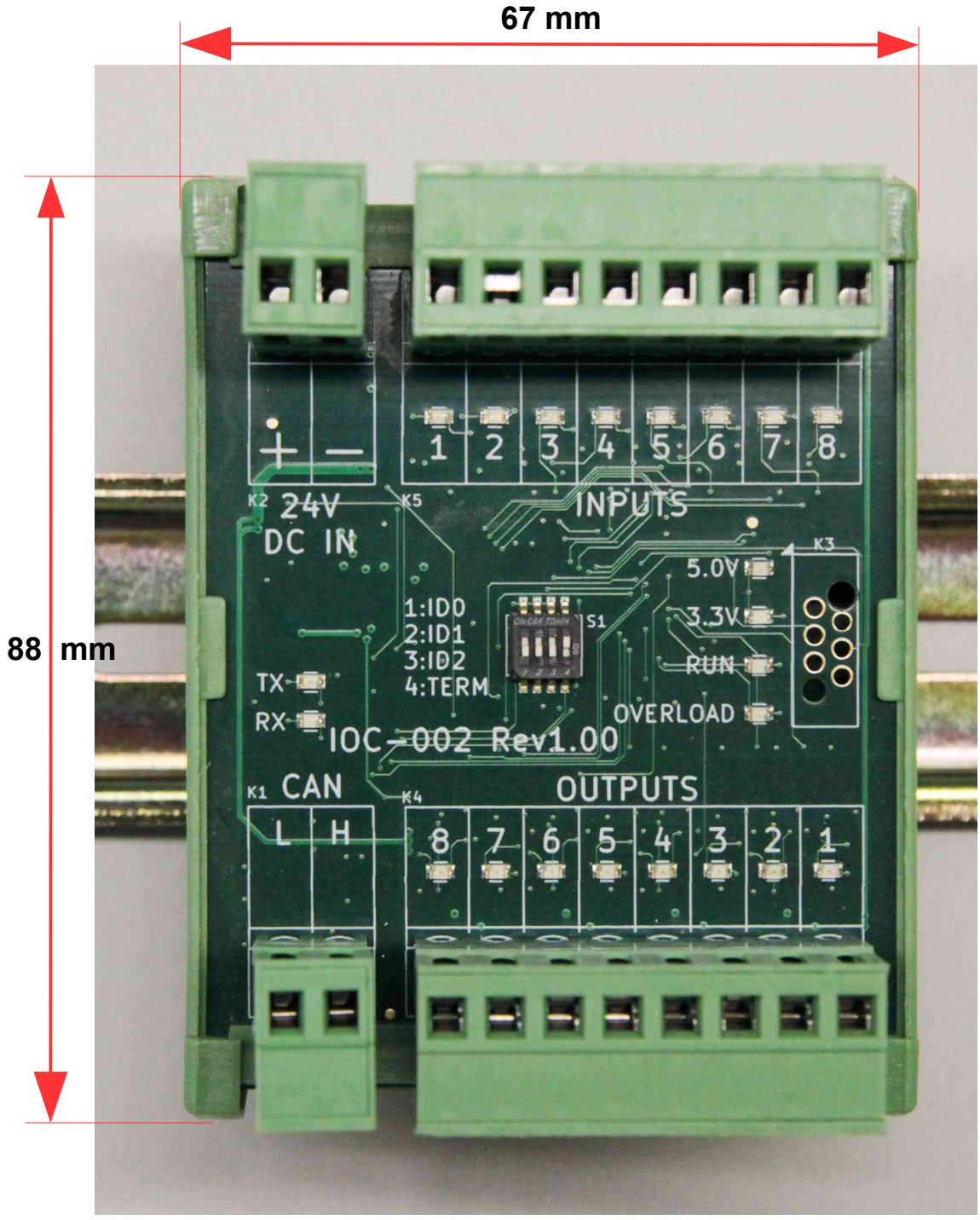


Figure 8: Outer dimensions (horizontally)

Side view

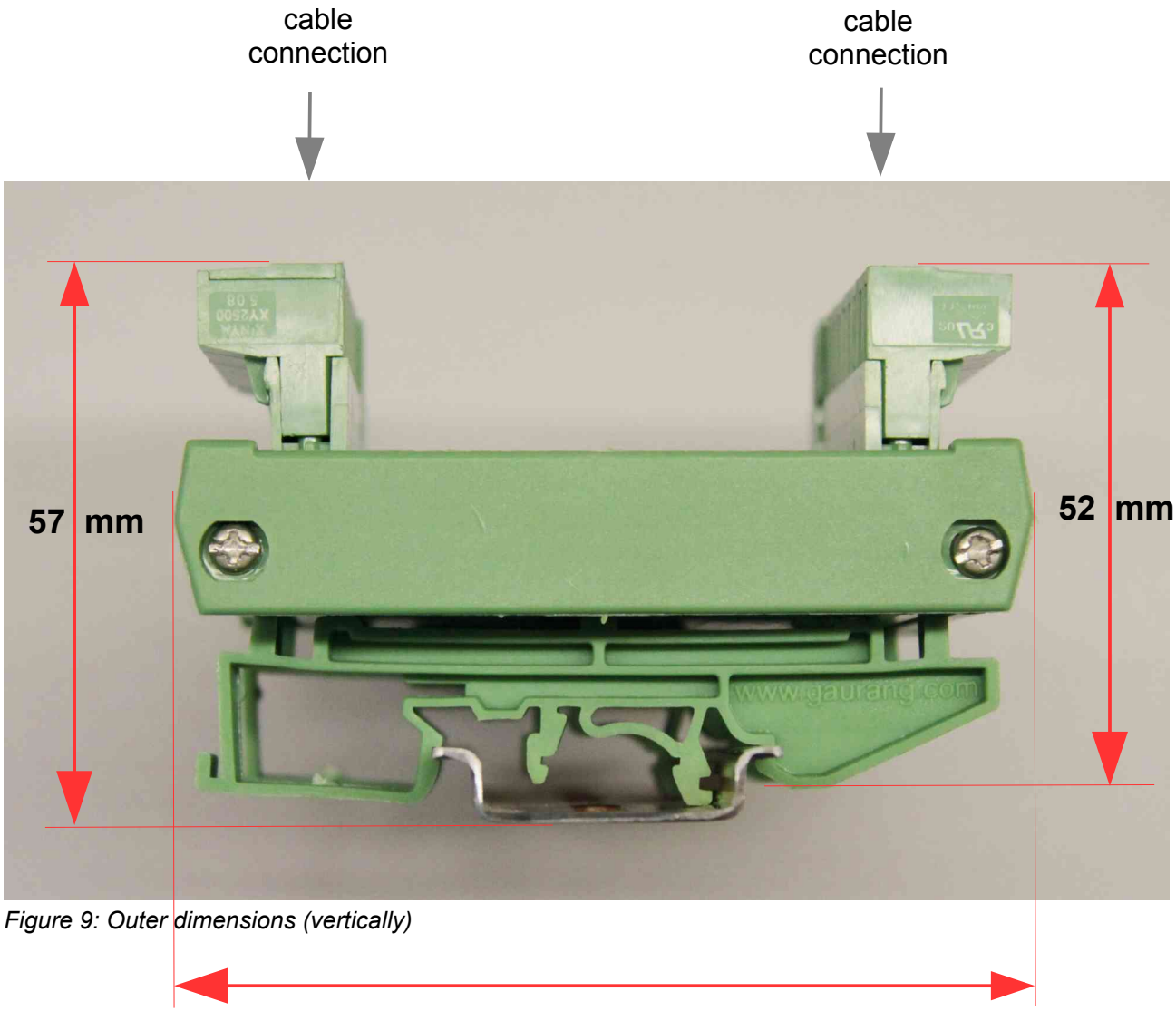


Figure 9: Outer dimensions (vertically)

6 List of revisions

Revision	Date	Comment
1.00	23.03.2021	first edition
1.10	08.10.2021	add description of RUN and OVERLOAD LEDs add sections *Mechanics* and *Outer dimensions*
1.20	24.07.2024	add section *Wiring*