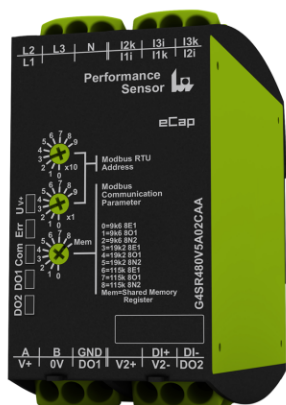




1- or 3-phase voltage-, current-, power- and energy meter with Modbus RTU interface

Status: **Available** Data sheet created: **05.12.2024**

Item Number: 2394800 - Serie: Gamma - EAN: 9008662016415



- ✓ GAMMA industrial design
- ✓ Overall width 45mm / 1.77in
- ✓ 1 and 3-phase voltage-, current-, power-, power factor- and energy meter, power peak detection, frequency, total harmonic distortion (THD) with all harmonics (up to the 20th)
- ✓ Up to 277 V a.c. (line to neutral) / 480 V a.c. (line to line)
- ✓ 5A AC for use with external CTs only (up to 2500A)
- ✓ One digital input and two digital outputs
- ✓ Measured values provided via Modbus RTU / RS485 interface
- ✓ Modbus RTU transmission parameters may be set on eCap front
- ✓ Firmware update via Modbus RTU interface
- ✓ Configurable via Modbus RTU interface

Description

Precise and fast universal power and net quality meter for applications with high accuracy. The eCap measures voltages, currents, power, power factor, energy, frequency as well as total harmonic distortion (THD) with all harmonics (up to 20th) and allows fully galvanically isolated transmission via the integrated Modbus RTU / RS485 interface. The required Modbus addresses for the measured values are listed in a separate Modbus register address document available on the website along with the eCap product. A single digital input and two digital outputs can be read and both outputs can be separately written via the Modbus RTU interface. All communication parameters may be set on the front of the device without any additional software. The status LEDs on the front of the eCap give a convenient indication about the device and communication condition.

General information

Short description 1- or 3-phase voltage-, current-, power-, net quality and energy meter with Modbus RTU interface

Item Number 2394800

EAN 9008662016415

Main category Measurement Technology

Series Gamma

Type G4SR480V5A02CAA

Design Industrial design

Supply 12-48V d.c.

Dimensions 45 x 90 x 103 mm

Application notes

Future firmware updates or pre-configurations of the eCap may be performed by integrated Modbus RTU interface. The 'Tele Modbus Configurator' allows to configure the eCap and display the measured values and the version of the eCap. For further information or questions about the product please visit our website.

Device must be restarted when setting the parameters!

Safety advice

Safety advice



Danger! Never carry out work on live parts!
Danger of fatal injury!

Do not use the product in case of obvious damage like loose parts, cracks, etc.!
In case of obvious damage, the device must be replaced by qualified personnel!

Always adhere to safety instructions and warnings!

External switch and circuit-breaker requirements:

- a) A switch or circuit-breaker must be included in the installation
- b) It must be suitably located and easily reached
- c) It must be marked as the disconnecting device for the equipment

Always open or disconnect circuit from power-distribution system (or service) of building before installing or servicing current transformers.

The current transformers may not be installed in equipment where they exceed 75 percent of the wiring space of any cross-sectional area within the equipment.

Restrict installation of current transformers in an area where it would block ventilation openings.

Restrict installation of current transformers in an area of breaker arc venting.

Not suitable for Class 2 wiring methods. [2] Not intended for connection to Class 2 equipment. [2]

Secure current transformer and route conductors so that the conductors do not directly contact live terminals or bus.



WARNING: To reduce the risk of electric shock, always open or disconnect circuit from power-distribution system (or service) or building before installing or servicing current transformers.

Position unit so it can easily and quickly be disconnected from mains power.

Operation only permitted with external current transformers!

Do not ground current transformers on secondary side!

Consider wiring between current transformers and this device as neutral.

Wiring between current transformers and device has same insulation requirements as neutral conductor.



ATTENTION: Only qualified and authorized personnel may install, wire, commission, decommission and maintain the Performance Sensor unit and its associated components. Before working on the product, switch off all sources of power which are connected to the device, including the power supply, and secure it against being switched on again. Protection against impairment: The device must be used as prescribed by the manufacturer. Failure to observe these instructions may result in personal injury, property damage, or economic loss.



ATTENTION: Never open a current transformer (CT) secondary circuit with primary current applied. Wiring between the CTs and the Performance Sensor must include a shorting terminal block in the CT secondary circuit. The shorting of the secondary with primary current present allows other connections to be removed if needed. An open CT secondary with primary current applied produces a hazardous voltage, which can lead to personal injury, property damage, or economic loss.

IMPORTANT

The Performance Sensor unit is not designed for nor intended for use as a circuit protective device. Do not use this equipment in place of a motor overload relay or circuit protective relay.

^[2] the requirements only apply if UL approval is required for the device or system.

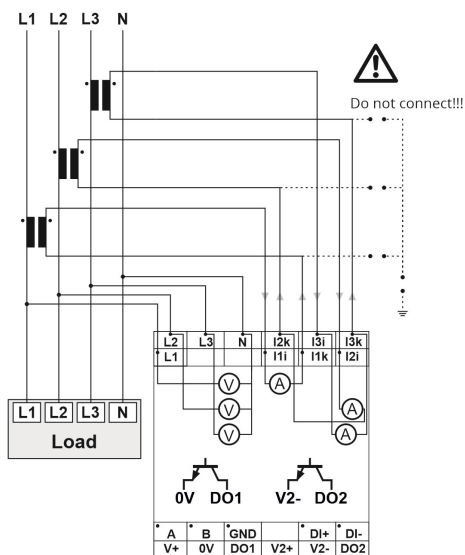


Functions and measurands

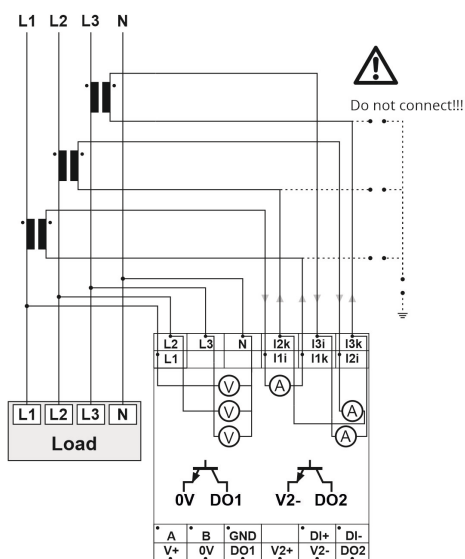
Amount of measurands

11

Line to neutral voltage measurement U_{1rms} , U_{2rms} , U_{3rms} (UL-N)

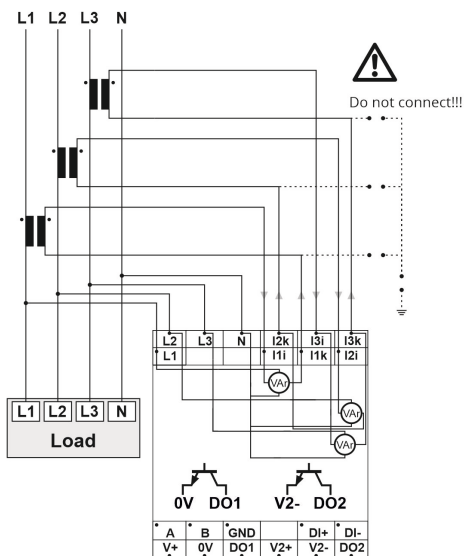


Current measurement I_{1rms} , I_{2rms} , I_{3rms} (cM)

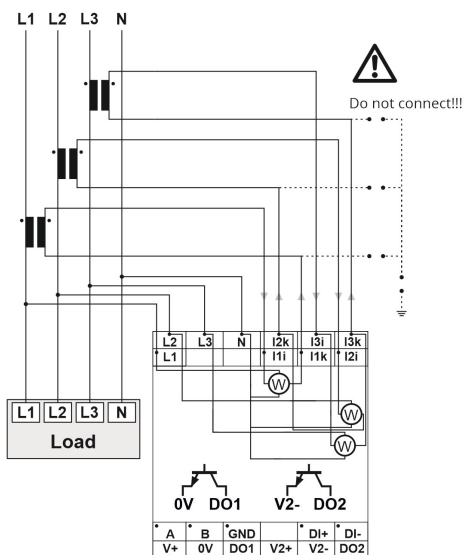




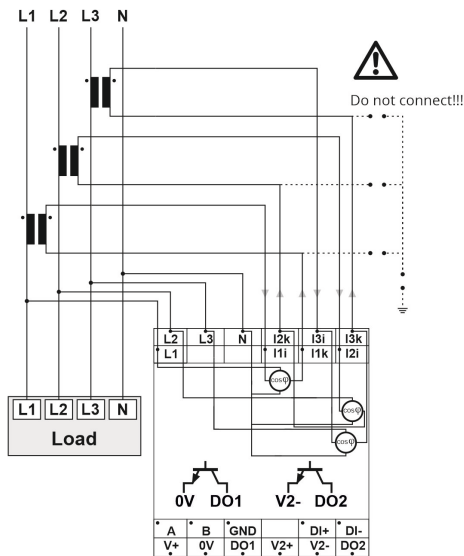
Reactive power measurement Q1, Q2, Q3, Qtotal (rPM)



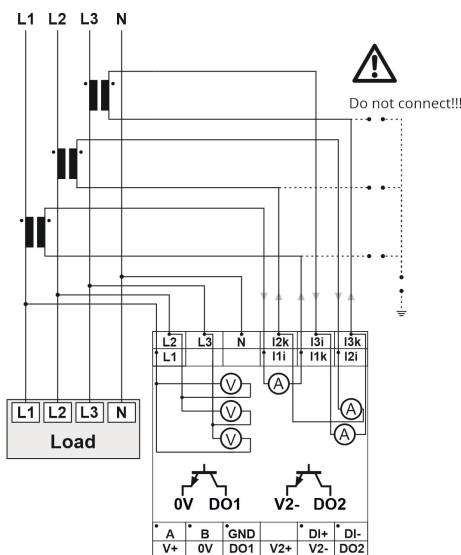
Active power measurement P1, P2, P3, Ptotal (aPM)



Power factor measurement PF1, PF2, PF3, PFtotal (pFM)



Line to line voltage measurement U12rms, U23rms, U31rms (ULL)



Indicators

Supply/time lapse 1	Green LED „Uv+“ on: indication of supply voltage
Communication State	Yellow LED "Com" flashes: indication of communication
Error / monitoring function	Red LED „Err“ on: indication of communication and general errors
Output state 1	Yellow LED DO1 on: digital output DO1 is active
Output state 2	Yellow LED DO2 on: digital output DO2 is active



Mechanical design

Housing material	Self-extinguishing plastic housing
Housing - protection degree	IP40
Mounting	Mounted on DIN-Rail TH 35x(7.5-15) according to IEC 60715:2017, inside low-voltage switchgear[4] and controlgear assemblies[4]. For use in industrial control panel and/or installed within a dedicated Listed electrical/fire/mechanical enclosure ²
Terminals/connections	Shockproof terminal connection according to DGUV 3 (screwdriver PZ1 required)
Terminals - protection degree	IP20
Mounting position	any
Max. Tightening Torque	0.5 Nm / 4.4 lb-in
Wiring	Wiring of all terminals: Copper, stranded or solid wire

- 1 x 0.5 to 2.5mm² / AWG 20 to AWG 14 with/without multicore cable end
- 1 x 4mm² / AWG 12 without multicore cable end
- 2 x 0.5mm² / 2 x AWG 20 with/without multicore cable end
- 2 x 1.0mm² / 2 x AWG 18 with/without multicore cable end
- 2 x 1.5mm² / 2 x AWG 16 with/without multicore cable end

Terminal capacity	Wire temperature minimum rating $\geq 75^{\circ}\text{C}$ ²
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² the requirements only apply if UL approval is required for the device or system.

[4] it is not part of the UL, cUL listing

Supply circuit

Supply	A limited power source (LPS according to UL/IEC 60950-1 or UL/IEC 62368) or Class 2 limited power source must be used.
Terminals/connections	V+, 0V
Supply voltage d.c.	12 ... 48 V d.c.
Supply voltage tolerance d.c.	-5% ... +10%
Rated consumption d.c.	$\leq 1\text{ W}$ (typ. 0.4 W) @ No load at RS485 Modbus RTU Interface, no load at Digital Output 1
Duty cycle	100 % (continuous operation possible)
Recovery time	$\geq 500\text{ ms}$ (acts as reset)
Drop-out voltage	typ. 9.6 V d.c.
Protection against electric shock	Protective separation by reinforced insulation across supply circuit and sensor inputs.

Interface

Type	Modbus RTU/RS485, 5V Transceiver
Terminals	A, B, GND
Baudrate	9k6 = 9600 baud / 19k2 = 19200 baud / 115k = 115200 baud (Standard: 9600 baud)
Data length	8 Bits
Parity	E - even, O - odd, N - none
Modbus Register	See further documents
Number of stopbits	1 or 2
Protection against electric shock	Protective separation by reinforced insulation across RS485 interface and Sensor Inputs. Separation by functional insulation across RS485 interface and supply circuit



Digital Input

Terminals	DI+, DI-
Voltage threshold	typ. 8 V d.c.
Maximum input voltage	55 V d.c.
Current threshold	typ. 1 mA
Input resistance	typ. 8 kOhm
Protection against electric shock	Protective separation by reinforced insulation across Digital Input and all other circuits

Measurement circuit - voltage

Category	Category One Sensor Inputs
Voltage waveform	Sine
Earthing systems	TT, TN, IT[3] for 277/480V
Measurement category	CAT III 300V (acc. to UL/IEC 61010-2-030)
Terminals	L1, L2, L3, N
Nominal voltage	≤ 277 V a.c. (LN, phase-to-neutral voltage) / 480 V a.c. (LL, phase-to-phase voltage)
Working frequency	46 ... 63 Hz (63 Hz ... 400 Hz pending)
Measurement range 1-phase mains	0 to 277 V a.c.
Measurement range 3-phase mains	3~ 0 to 277 V a.c. (phase-to-neutral voltage) / 480 V a.c. (phase-to-phase voltage)
Voltage overload capacity	319 VrmsLN (phase-to-neutral voltage) / 552 VrmsLL (phase-to-phase voltage)
Input resistance	typ. 450 k Ω (L1 ... L3 to N)
Rated impulse withstand voltage	6 kV
Measurement method	True RMS

Measurement circuit - current

Category	Category Two Sensor Inputs
Type	Indirect measurement via external current transformers. Nominal CT output current: 5 A
Earthing systems	TT, TN, IT[3] for 277/480V [1]
Measurement category	CAT III 300V (acc. to UL/IEC 61010-2-030) [1]
Terminals	I1i-I1k, I2i-I2k, I3i-I3k
Working frequency	46 ... 63 Hz (63 Hz ... 400 Hz pending)
Measurement range	≤ 5 A rms
Overload capacity	8 Arms @ t < 5 s
Crest factor	≤ 2.8 (14 Apk max.)
Input resistance	typ. 10 m Ω
Rated impulse withstand voltage	6 kV
Measurement method	True RMS
Initial resistance	[1] this applies to the primary side of the current transformers; [3] not evaluated for UL / USA, Canada installation.



Requirements for external current transformers

General information	For use with Listed Energy-Monitoring Current Transformers. [2] Please note the safety advice for current transformers. The Current Transformers must be rated for the maximum working voltage in the application.
Application information	Please select the frequency range of the current transformers according to the application within the permissible operating range of 46 Hz to 400 Hz.
Initial resistance	[2] the requirements only apply if UL approval is required for the device or system.
Rated power	$\geq 2.5\text{VA}$
Transformation ratio	0.2 up to 500
Primary rated current	1A a.c. up to 2500A a.c.
Secondary rated current	5A a.c.
Precision class	0.1S up to 3
Maximum cable length from current transformer to eCap terminals	AWG 18 or $1\text{ mm}^2 \leq 1\text{ m}$; AWG 16 or $1.5\text{ mm}^2 \leq 1.5\text{ m}$; AWG 14 or $2.5\text{ mm}^2 \leq 2.5\text{ m}$; AWG 12 or $4\text{ mm}^2 \leq 4\text{ m}$;

Accuracy - Voltage Inputs

Category	Category One Sensor Inputs
Base accuracy*	$\leq 0.15\%$
Frequency influence*	$\leq 0.005\% / \text{Hz}$
Repetition accuracy*	$\leq 0.02\%$
Temperature influence*	$\leq 0.005\% / ^\circ\text{C}$
* waveform sine / accuracy relative to upper range value 277 V a.c. (phase-to-neutral) @ 50 Hz, +25 °C	

Accuracy - Current Inputs

Category	Category Two Sensor Inputs
Base accuracy*	$\leq 0.25\%$
Frequency influence*	$\leq 0.01\% / \text{Hz}$
Repetition accuracy*	$\leq 0.05\%$
Temperature influence*	$\leq 0.015\% / ^\circ\text{C}$
* waveform sine / accuracy relative to full scale value 5 A a.c. @ 50 Hz, +25 °C	

Accuracy - Active Power P

Base accuracy*	$\leq 0.5\%$
Frequency influence*	$\leq 0.015\% / \text{Hz}$
Repetition accuracy*	$\leq 0.1\%$
Temperature influence*	$\leq 0.02\% / ^\circ\text{C}$
* waveform sine / accuracy relative to full scale value @ 50 Hz, +25 °C, phase shift 0 degrees	

Accuracy - Reactive Power Q

Base accuracy*	$\leq 0.5\%$
Frequency influence*	$\leq 0.015\% / \text{Hz}$
Repetition accuracy*	$\leq 0.1\%$
Temperature influence*	$\leq 0.02\% / ^\circ\text{C}$
* waveform sine / accuracy relative to full scale value @ 50 Hz, +25 °C, phase shift 30 degrees	



Accuracy - Apparent power

Base accuracy* $\leq 0.5 \%$

Frequency influence* $\leq 0.015 \%$ / Hz

Repetition accuracy* $\leq 0.1 \%$

Temperature influence* $\leq 0.02 \%$ / °C

* waveform sine / accuracy relative to upper range value @ 50 Hz, +25 °C

Accuracy - Active energy W

Base accuracy* $\leq 1.5 \%$

Frequency influence* $\leq 0.02 \%$ / Hz

Temperature influence* $\leq 0.025 \%$ / °C

* waveform sine / accuracy relative to full scale value @ 50 Hz, +25 °C, phase shift 0 degrees

Accuracy - Reactive energy EQ

Base accuracy* $\leq 1.5 \%$

Frequency influence* $\leq 0.02 \%$ / Hz

Temperature influence* $\leq 0.025 \%$ / °C

* waveform sine / accuracy relative to full scale value @ 50 Hz, +25 °C, phase shift 30 degrees

Accuracy - frequency f

Base accuracy* $\leq 5 \text{ mHz}$ (typ. 1mHz)

Temperature influence* $\leq 0,15 \text{ mHz}$ / °C

Resolution* $\leq 1 \text{ mHz}$

* 46 ... 63 Hz, +25 °C, waveform sine, measurement with stable input voltages

Output Circuits

Type Solid state open collector outputs (Power MOSFET), normally open (NO)

Protection of the outputs Integrated Short Circuit Protection with Auto Restart, Integrated Over-Current Protection

Digital Output 1

Supply The output-circuit is powered by the Supply circuit of the unit. A Limited Power Source (LPS according to UL/IEC 60950-1 or UL/IEC 62368) or Class 2 limited power source must be used.

Terminals DO1

Protection against electric shock Protective separation by reinforced insulation across Digital Output 1 and Sensor Inputs

Maximum output voltage 55 V d.c.

Permissible output current max. 500 mA

Output ON state voltage drop typ. 0.3 V d.c. @ 500 mA

Load Outputs for general purpose loads.

Digital Output 2

Supply Own power supply terminals V2+ V2- for output 2 required. A Limited Power Source (LPS according to UL/IEC 60950-1 or UL/IEC 62368) or Class 2 limited power source must be used.

Terminals DO2

Protection against electric shock Protective separation by reinforced insulation across Digital Output 2 and all other circuits

Operating voltage range 11.4 ... 55 V d.c.

Permissible output current max. 500 mA

Output ON state voltage drop typ. 0.3 V d.c. @ 500 mA

Load Outputs for general purpose loads.



Datasheet version

Datasheet version	V1.6.X
Version updates	V1.6.X* - Changes: New firmware version, new function implemented
*Key notes	*The information in the data sheet applies to the firmware version 1.6 specified here; x is a consecutive number for the database synchronization

Firmware Version

Firmware Version	V1.6
Version updates	New feature added: Measurement of total harmonic distortion with all harmonics (up to the 20th) for all voltages and currents.
General information	The technical data in this data sheet applies to the specified firmware version.

Ambient conditions and general specifications

Ambient temperature IEC	-25 ... +55 °C / -13 ... 131 F (in accordance with IEC 60068-1)
Ambient temperature UL	-25 ... +40 °C / -13 ... 104 F (in accordance with UL 508)
Storage temperature	-25 ... +70 °C / -13 ... 158F
Transport temperature	-25 ... +70 °C / -13 ... 158F
Relative humidity	15% ... 85% (in accordance with IEC 60721-3-3 class 3K3) not condensing
Vibration resistance	10 to 55 Hz 0.35mm / 0.01378 in (in accordance with IEC 60068-2-6)
Shock resistance	150 m/s² 11 ms (in accordance with IEC 60068-2-27)
Pollution degree	2, pollution level can be increased by installation in suitable enclosures (according to IEC 60664-1)
Installation altitude	Up to 2000 m above sea level
Installation	An external circuit-breaker, rated 16A, is required for mains installation to the unit
Product suitability	The device is intended for use in new installations, and may not be used in retrofit applications. [2]
Location	For indoor use only
Ventilation	No ventilation of surrounding air required
Cleaning	If necessary, the surface of the housing may be cleaned with a dry cloth, only when all sources of power are switch off
Installation note	Power contactors may cause significant disturbances. Therefore, the Performance Sensor should be mounted with a minimum distance of 5 cm to neighbouring power contactors.
Remark	[2] the requirements only apply if UL approval is required for the device or system.

Logistics

Minimum Quantity	1
Tariff Number	85364900
EAN	9008662016415
Country of Origin	AT
Product Weight (g)	207
Ampel-Status	Grün
ERP-Gesamtbestand	88



Available declarations / conformities

CE	Open document
REACH	Open document
WEEE	Open document
TSCA	Open document
RoHS	Open document
CMRT	Open document
c(UL)us	✓

Further documents

eCap Modbus Register Description V1.5	Download document
eCap Configurator	Download document
Tele Firmware Updater	Download document
eCap Modbus register table	Download document

Software

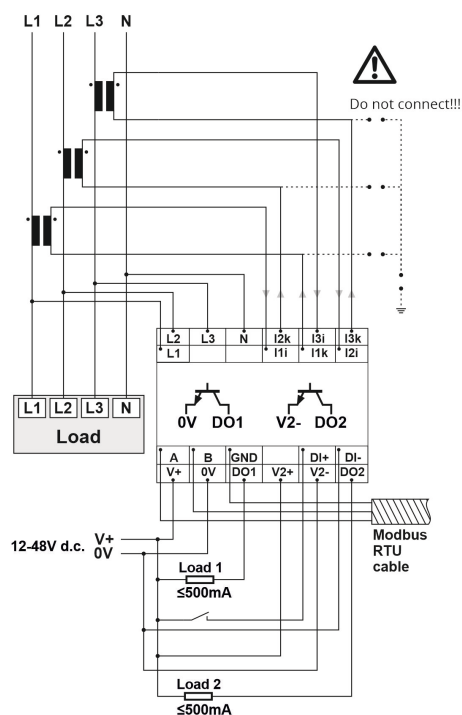
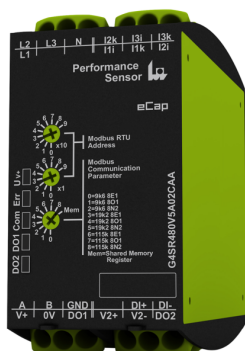
Firmware Updater	Download software
eCapConfigurator	Download software

CAD Files

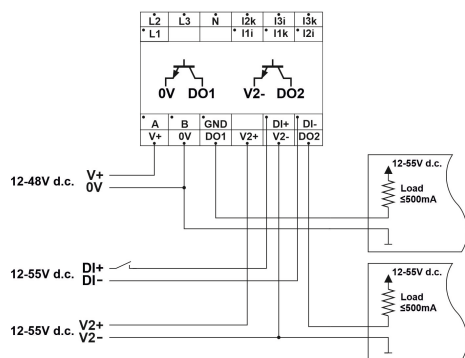
STEP_G4_en.STEP	Download file
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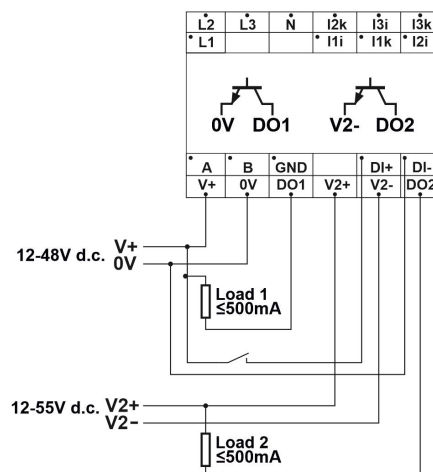
Media & drawings



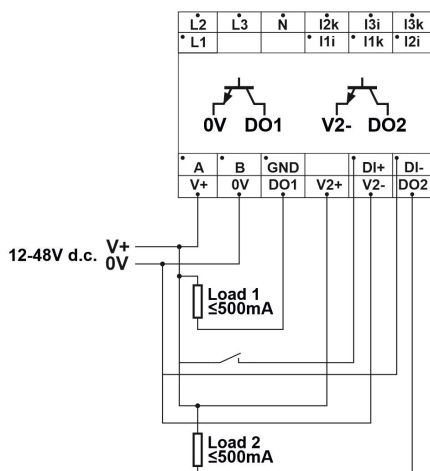
Wiring complete



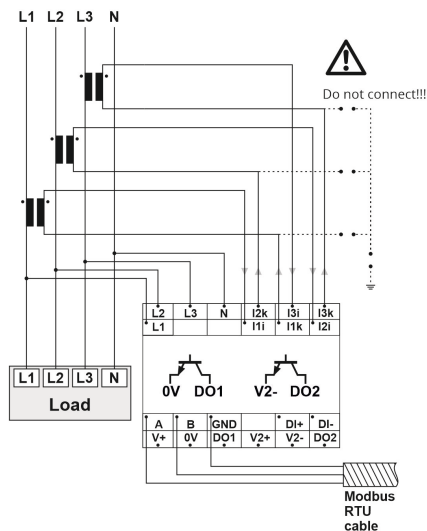
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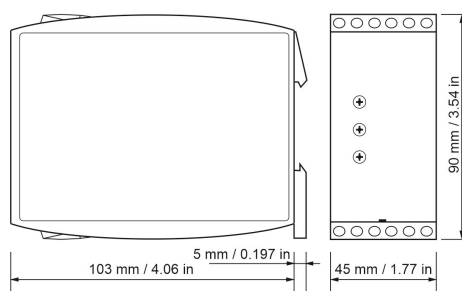
Wiring_PS_DI_DO_2 - variant 2



Wiring_PS_DI_DO_3 - variant 3



Wiring PS/Modbus



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