

InteliCharger 240 24

**Inovative advanced battery
charger**

SW version 1.0.0

1 Document information	3
2 Charger overview	6
3 Wiring	8
4 Charger setup and operation	10
5 Standards and certifications	16
6 Mechanical specifications	17
7 Technical data	18

Table of contents

1 Document information	3
1.1 Clarification of Notation	3
1.2 About this guide	3
1.3 Legal notice	3
2 Charger overview	6
2.1 General description	6
2.2 Package content	6
2.3 Main characteristics	6
3 Wiring	8
3.1 AC input wiring diagram	8
3.2 Battery output wiring diagram	8
3.3 Wires parameters	9
4 Charger setup and operation	10
4.1 Front panel description	10
4.2 Detailed description	10
AC input terminal	10
Charging current level	10
Battery output terminal	10
Signal output terminals	11
Status indicators	11
Battery type selection	12
Boost charge selection	12
Power supply mode	13
Battery care	13
Charging curve	13
Diagnostic checks	14
Protection	14
Thermal behavior	14
Rail mounting	15
5 Standards and certifications	16
6 Mechanical specifications	17
7 Technical data	18

1 Document information

1.1 Clarification of Notation

Note: This type of paragraph calls the reader's attention to a notice or related theme.

IMPORTANT: This type of paragraph highlights a procedure, adjustment etc., which can cause a damage or improper function of the equipment if not performed correctly and may not be clear at first sight.

Example: This type of paragraph contains information that is used to illustrate how a specific function works.

1.2 About this guide

This guide describes IntelliCharger 240 24. This guide provides general information on how to install, configure, operate and maintain the charger.

1.3 Legal notice

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Please note that possible cyber-attacks cannot be fully avoided by the below mentioned recommendations and set of measures already performed by ComAp, but by following them the cyber-attacks can be considerably reduced and thereby to reduce the risk of damage. ComAp does not take any responsibility for the actions of persons responsible for cyber-attacks, nor for any damage caused by the cyber-attack. However, ComAp is prepared to provide technical support to resolve problems arising from such actions, including but not limited to restoring settings prior to the cyber-attacks, backing up data, recommending other preventive measures against any further attacks.

Warning: Some forms of technical support may be provided against payment. There is no legal or factual entitlement for technical services provided in connection to resolving problems arising from cyber-attack or other unauthorized accesses to ComAp's Products or Services.

General security recommendations and set of measures

1. AccessCode

- Change the AccessCode BEFORE the device is connected to a network.
- Use a secure AccessCode – ideally a random string of 8 characters containing lowercase, uppercase letters and digits.
- For each device use a different AccessCode.

2. Password

- Change the password BEFORE the device enters a regular operation.
- Do not leave displays or PC tools unattended if an user, especially administrator, is logged in.

3. Controller Web interface

- The controller web interface at port TCP/80 is based on http, not https, and thus it is intended to be used only in closed private network infrastructures.
- Avoid exposing the port TCP/80 to the public Internet.

4. MODBUS/TCP

- The MODBUS/TCP protocol (port TCP/502) is an instrumentation protocol designed to exchange data between locally connected devices like sensors, I/O modules, controllers etc. From its nature it does not contain any kind of security – neither encryption nor authentication. Thus it is intended to be used only in closed private network infrastructures.
- Avoid exposing the port TCP/502 to the public Internet.

5. SNMP

- The SNMP protocol (port UDP/161) version 1,2 is not encrypted. Thus it is intended to be used only in closed private network infrastructures.
- Avoid exposing the port UDP/161 to the public Internet.

General security recommendations and set of measures

1. Production mode

- Disable production mode BEFORE the controller is put into regular operation.

2. User accounts

- Change password for the existing default administrator account or replace that account with a completely new one BEFORE the controller is put into regular operation mode.
- Do not leave PC tools (e.g. IntelliConfig) unattended while a user, especially administrator, is logged in.

3. AirGate Key

- Change the AirGate Key BEFORE the device is connected to the network.
- Use a secure AirGate Key – preferably a random string of 8 characters containing lowercase, uppercase letters and digits.
- Use a different AirGate Key for each device.

4. MODBUS/TCP

- The MODBUS/TCP protocol (port TCP/502) is an instrumentation protocol designed to exchange data between locally connected devices like sensors, I/O modules, controllers etc. By its nature it does not contain any kind of security – neither encryption nor authentication. Thus it is intended to be used only in closed private network infrastructures.
- Avoid using MODBUS/TCP in unprotected networks (e.g. Internet).

5. SNMP

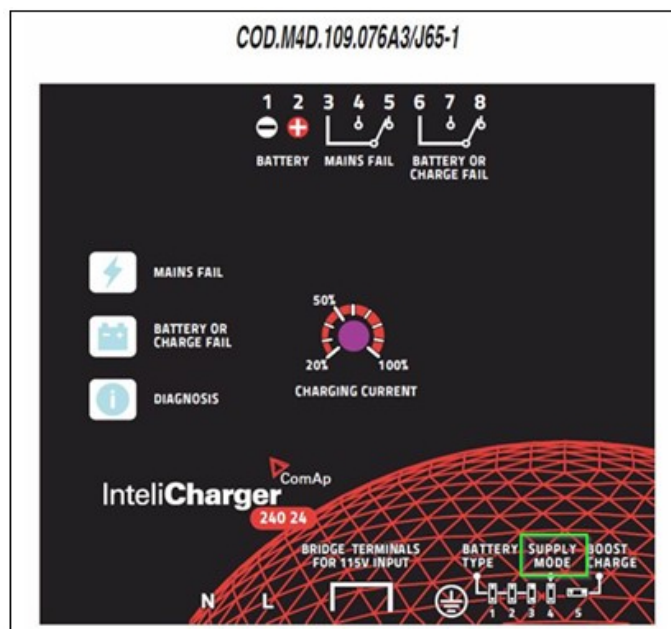
- The SNMP protocol (port UDP/161) version 1 and version 2 are not encrypted. They are intended to be used only in closed private network infrastructures.
- Avoid using SNMP v1 and v2 in unprotected networks (e.g. Internet).

2 Charger overview

2.1 General description

The IntelliCharger 240 24 is an advanced, automatic, multi-stage battery charger using “Switched mode technology” and “Battery care philosophy”, suited to meet the most advanced requirements of battery manufacturers. The battery care concept is based on algorithms that implement automatic battery charging, battery life optimization, flat batteries recovery and real time diagnosis. The real time auto-diagnostic system monitors battery faults such as cells in short circuit, accidental reverse polarity connection, disconnection of the battery. These faults can be easily detected and fixed by help of blink code of diagnostic LED during the charger installation and operation. Charger is suited for all battery types. By jumper setting it is possible to change parameters of charging curve for: Open Lead Acid, Sealed Lead Acid, Gel and NiCd–NiMH battery type. A rugged casing with bracket for DIN rail mounting provide IP20 protection degree.

2.2 Package content



- IntelliCharger 240 24
- 3 Jumpers

2.3 Main characteristics

- Wide input voltage range.
- Battery charging output 24 V: 2–10 A.
- Suited for the following battery types: Open Lead Acid, Sealed Lead Acid, Lead Gel and NiCd–NiMH.
- Automatic battery status diagnosis.
- Four charging stages: Recovery, Bulk, Absorption and Float.
- Switched mode power supply technology.
- High efficiency ($\geq 88\%$).

- Protected against short circuit, reversed polarity, overload and over temperature.
- Signal output terminal (voltage free contact) for discharged or damaged battery and charging fail signaling.
- Signal output terminal (voltage free contact) for Mains power input fail signaling.
- IP20 protection.
- DIN rail mounting.

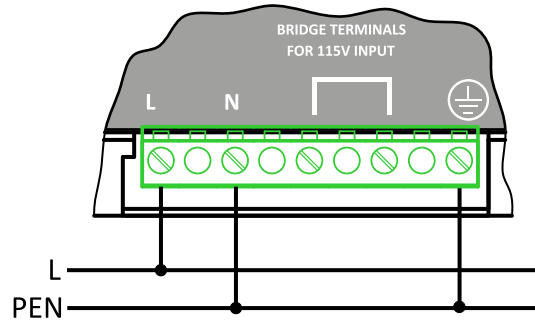
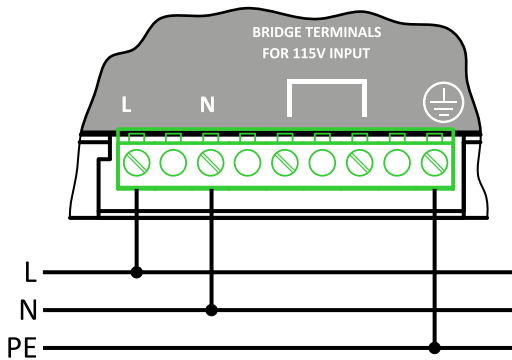
3 Wiring

3.1 AC input wiring diagram

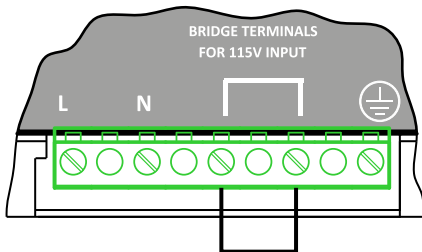
With respect to mains earthing system used, please choose proper AC input wiring.

> for TN-S (L, N, PE)

> for TN-C (L, PEN)



115 V_{AC} input voltage



When 115 V_{AC} input voltage is used bridge corresponding terminals on AC input terminal block (see left).

Note: Use appropriate wire cross-section. See *Wires parameters* (page 9) for details.

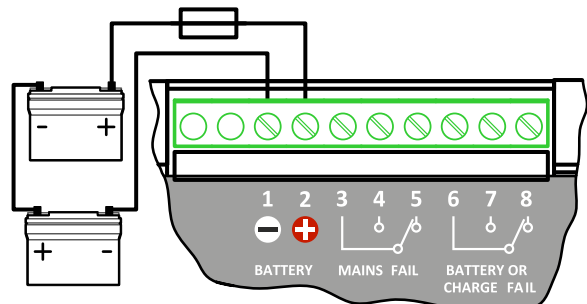
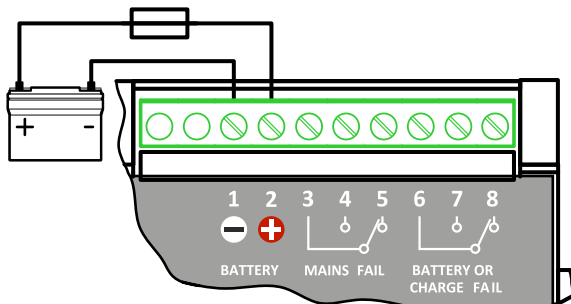
3.2 Battery output wiring diagram

InteliCharger 240 24 support single 24 V output. It is possible to connect two 12 V batteries in series.

Fuse position example is for installations where '-' battery pole is grounded.

> for single 24 V battery connection

> for two 12 V batteries connection in series



Note: See *Detailed description* (page 10) for charger configuration details.

3.3 Wires parameters

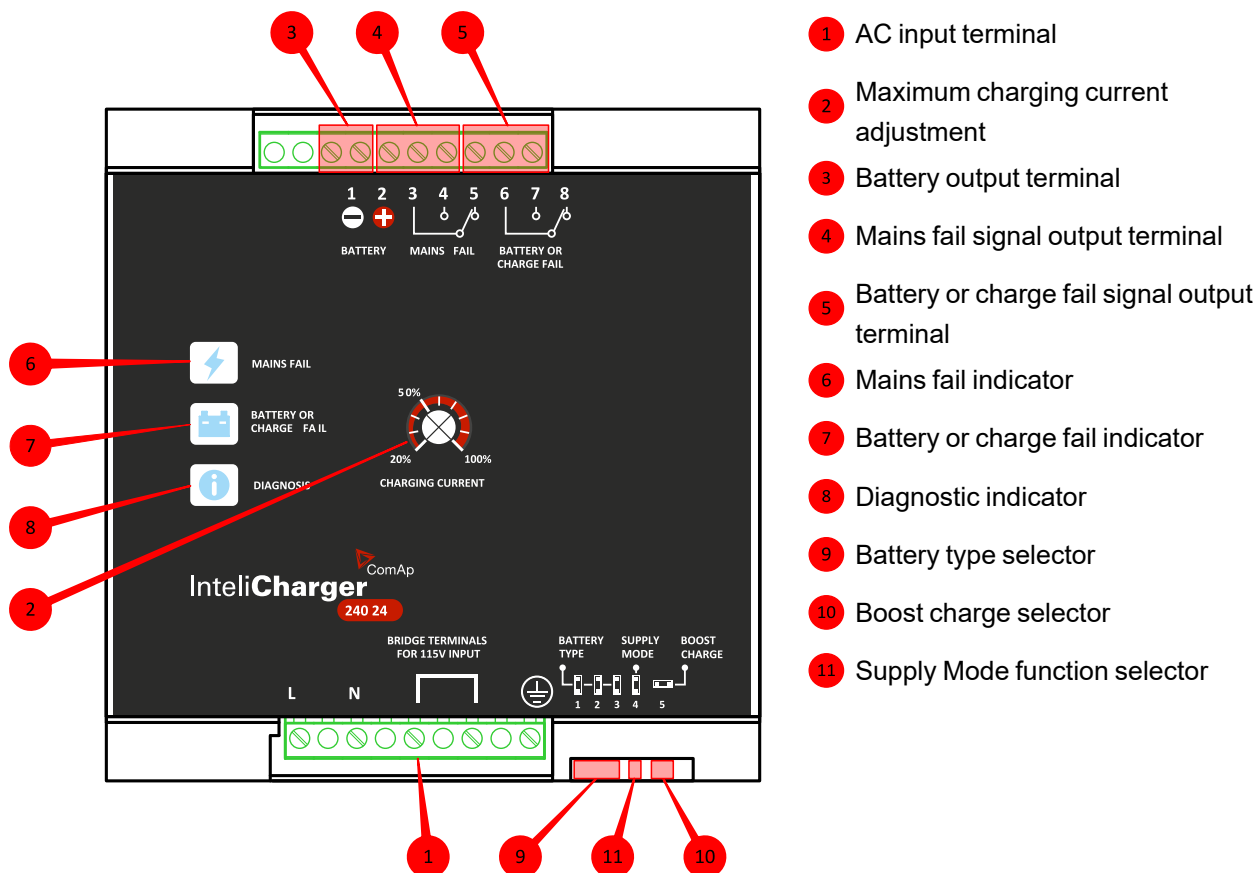
Use wires with following parameters for all connection type (Input / Output / Signal):

Solid [mm ²]	Stranded [mm ²]	AWG [–]	Torque [Nm]	Stripping length [mm]
0.2–2.5	0.2–2.5	24–14	0.5–0.6	7

Note: The connection is made by the screw type 2.5 mm² terminal blocks. Use only copper cables that are designed for operating temperatures higher than 75 °C.

4 Charger setup and operation

4.1 Front panel description



4.2 Detailed description

1 AC input terminal

Use 3 wires connection (L - phase, N - neutral, PE - protective earth) according to description in chapter **AC input wiring diagram** (page 8).

2 Charging current level

Using this adjusting element it is possible to set max. charging current for battery. The current adjustment goes from 20–100 % of charger nominal current I_n . Set the maximum charging current (in A) as 20–100 % of the battery capacity (in Ah).

3 Battery output terminal



Connect the battery between pin 1 (- polarity) and pin 2 (+ polarity).

➤ use two batteries (12 V) for 24 V charger output

See chapter **Battery output wiring diagram** (page 8) for details.

4 5 Signal output terminals


Isolated, voltage free, output contacts of mains fail alarm relay (pin 3,4 and 5) are active under AC input fail conditions. See details in table below.

Mains fail?	Relay output pair		Fail indicator
	pin 3–4	pin 3–5	
YES	open	closed	 – led on
NO	closed	open	 – led off

Note: For better system reliability set up at least 5 s input delay when signal is further processed, for example by PLC.

Isolated, voltage free, output contacts of battery or charge fail alarm relay (pin 6,7 and 8) are active under low battery, wrong battery connection, charging fail or battery to be replaced conditions. See details in table below.


Battery or charge fail?	Relay output pair		Fail indicator
	pin 6–7	pin 6–8	
YES	open	closed	 – led on
NO	closed	open	 – led off

Note: In Recovery the Battery or charge fail indicator  is OFF but the Relay is in failure mode (pin 6–8 closed) to indicate a battery with very low voltage.

Relay contact rating





Max	30 V _{DC} , 1 A 60 V _{AC} , 1 A	Resistive load (EN 60947-4-1)
Min	5 V _{DC} , 1 mA	Min. permissive load.

6 7 8 Status indicators








 Mains fail indicator.

 Battery or charge fail indicator.

 Diagnostic indicator.

Charging phase	Diagnostic indicator	Fail indicator
Float	1 blink / 2 s	 – led off
Absorption	1 blink / s	 – led off
Bulk	2 blink / s	 – led off
Recovery	5 blink / s	 – led off

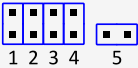
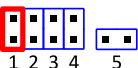


Charger diagnosis

State	Diagnostic indicator	Fault indicator
Reverse polarity or high battery voltage	1 blink / pause	 – led on
Battery not connected (Power supply mode)	2 blink / pause	 – led on
Cell in short circuit	3 blink / pause	 – led on
Overload or Short circuit on the load side	4 blink / pause	 – led on
Bad battery: Internal impedance or battery connection problem (Life Test result)	5 blink / pause	 – led on
Life test not possible	6 blink / pause	 – led on
Internal fault	9 blink / pause	 – led on

9 Battery type selection

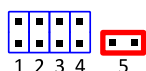
InteliCharger 240 24 is completely automatic charger suitable to charge most battery types. Charger can charge open lead acid, sealed lead acid, gel and NiCd–NiMH batteries.

IMPORTANT: Power off the charger before setting the jumper.

Battery type	Jumper position	Standard Bulk, Absorption, Float cell / battery voltage	Bulk, Absorption cell / battery voltage in Boost mode
Open lead		2.23 V / 26.76 V	2.40 V / 28.80 V
Sealed lead		2.25 V / 27.00 V	2.40 V / 28.80 V
Gel		2.30 V / 27.60 V	2.40 V / 28.80 V
NiCd–NiMH		N/A	N/A

Note: For NiCd–NiMH batteries end-of-charge is determined by negative ΔV detection of battery voltage (-5 mV/cell). If no negative ΔV but only a “flat” profile is detected fast charge is terminated after 10 min. General end-of-charge timeout set to 16 h. Float charge current is regulated at 10% of max current corresponding to trimmer position. In order to detect end-of-charge negative ΔV , charging current must be set at least at 30% of nominal battery capacity ($0.3 C$). With lower values of charging current negative ΔV detection is not guaranteed.

10 Boost charge selection



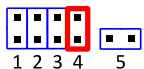
Set jumper on position 5 to enable boost charging. Using this option charging voltage in Bulk and Absorption stage is adjusted to 28.80 V (2.40 V / cell).

This option is not applicable for NiCd–NiMH batteries.

Note: It is allowed to set this option when charger is powered.

11 Power supply mode

When pin '4' is bridged, the charger functions similarly to a power supply unit and delivers 27V DC (approx.) regardless of whether a battery set is connected.



When pin '4' is bridged and battery is connected, output voltage is the float charging voltage and depends on battery type selected. See **Battery type selection (page 12)** for details. Maximum output current in power supply mode is the same as maximum charging current. When the battery is not connected, no voltage output is available at pins 1-2. The charger therefore does not report a fault if the batteries are missing, i.e., "Battery / Charge Fail" is not triggered.

If pin 4 is not bridged, a missing or defective battery is recognized, and output "Battery / Charge Fail" is triggered as an error similar to normal battery charger operating condition.

Battery care

The Battery Care philosophy is based on algorithms that implement rapid and automatic charging, battery charge optimization, flat batteries recovery and real time diagnosis. The realtime auto-diagnostic system monitors battery and charging process during the installation and operation. Faults such as cells in short circuit, accidental reverse polarity connection, disconnection of the battery, can be easily detected and fixed by help of blink code of diagnosis indicator. The charger is suited for all battery types. It is possible to choose predefined charging curves for Open Lead Acid, Sealed Lead Acid, Gel and NiCd–NiMH battery. Battery reliability in time is guaranteed by continuously testing the internal impedance status. It avoids any possible risk of damages and grants also a permanent, reliable and safe connection of the battery to the charger. The system, through a battery stimulation circuit with algorithms of evaluation of the detected parameter, is able to recognize batteries with a short-circuited cell.

Charging curve

Automatic multi-stage operation and real time diagnosis allows fast recharge and recovery of deeply discharged batteries, adding value and reliability to the system hosting the IntelliCharger 240 24 device. The type of charging is Voltage stabilized and Current stabilized IUoU.

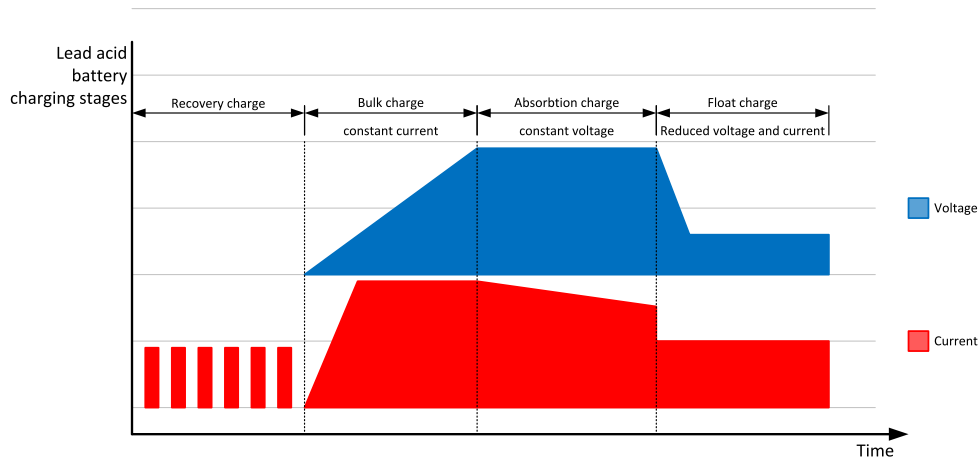
Each of four charging stage is identified by a flashing code on the Diagnosis indicator.

To maintain the output battery voltage in lower levels, don't enable boost charging. (No jumper set in position 5.)

There are four charging stages:

- > recovery
- > bulk
- > absorption
- > float.

You can see details in charging curve diagram below:



Diagnostic checks

- > **accidental battery cable disconnection**
 - » when detected, output power is switched off
- > **battery not connected**
 - » when detected, charger is switched to power supply mode
- > **reverse polarity**
 - » when detected, charger is automatically protected
- > **battery voltage**
 - » to prevent connection of wrong battery types, with higher or lower voltage than the nominal voltage
- > **end of charge**
 - » when battery is full, charger goes into float charging
- > **battery cells in short circuit**
 - » performed every 4 hours in float charge

Protection

- > **primary side**
 - » The charger is equipped with an internal fuse. If the internal fuse is blown, it is most probable that there is a fault in the device. If happen, the device must be checked by manufacturer.
- > **secondary side**
 - » The charger is electrically protected against short circuits and overload. Output current is electronically limited.
 - » The charger is automatically protected against reversed battery polarity.

Thermal behavior

Standard surrounding air temperature is up to 50 °C. For ambient temperature over this limit, the output current is reduced by 2.5 % per °C. Maximum temperature is 70 °C. At the temperature 70°C the output current will be 50% of nominal current. The charger does not switch off in case of ambient temperature above 70°C or in case of thermal overload. The device is protected for over temperature conditions "worst case". In this situation the device shut-down the output and automatically restart when internal temperature fall down into limits.

Rail mounting

The charger module must have a minimum vertical and horizontal distance of 10 cm to the other used DIN rail modules in order to guarantee sufficient auto convection for proper cooling.

It is allowed to install the unit only in horizontal positioning (DIN rail horizontal). Maximal inclination is $\pm 5\%$.

IMPORTANT: Depending on the ambient temperature and load of the charger, the temperature of the housing can become very high!

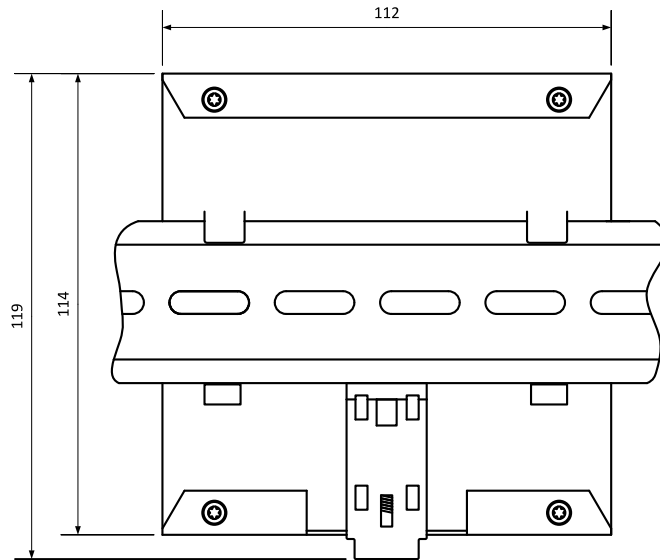


Image 4.1 DIN rail mounting

5 Standards and certifications

Electrical Safety:

Assembling device: IEC/EN 60950 (VDE 0805) and EN 50178 (VDE 0160).

Installation according: IEC/EN 60950.

Input / Output separation: SELV EN 60950-1 and PELV EN 60204-1. Double or reinforced insulation.

EMC Standards Immunity:

EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5.

EMC Standards Emission:

EN 61000-6-4, EN 61000-6-3, EN 61000-3-2

Standards Conformity:

Safety of Electrical Equipment Machines: EN 60204-1.

The CE mark in According to EMC 2004/108/EC and Low voltage directive 2006/95/EEC.

In conformity to:

IEC/EN 60335-2-29 Battery chargers; ; Electrical safety EN54-4 Fire Detection and fire alarm systems; 89/336/EEC EMC Directive; 2006/95/EC (Low Voltage); DIN41773 (Charging cycle); Emission: IEC 61000-6-4; Immunity: IEC 61000-6-2. CE.

6 Mechanical specifications

Case	A rugged aluminum case for DIN rail mounting with top and bottom perforation for auto convection cooling.
Weight	0.85 kg (1.9 lbs)
Dimension (W×H×D)	112 mm × 114 mm × 136 mm (4.41" × 4.48" × 5.35")

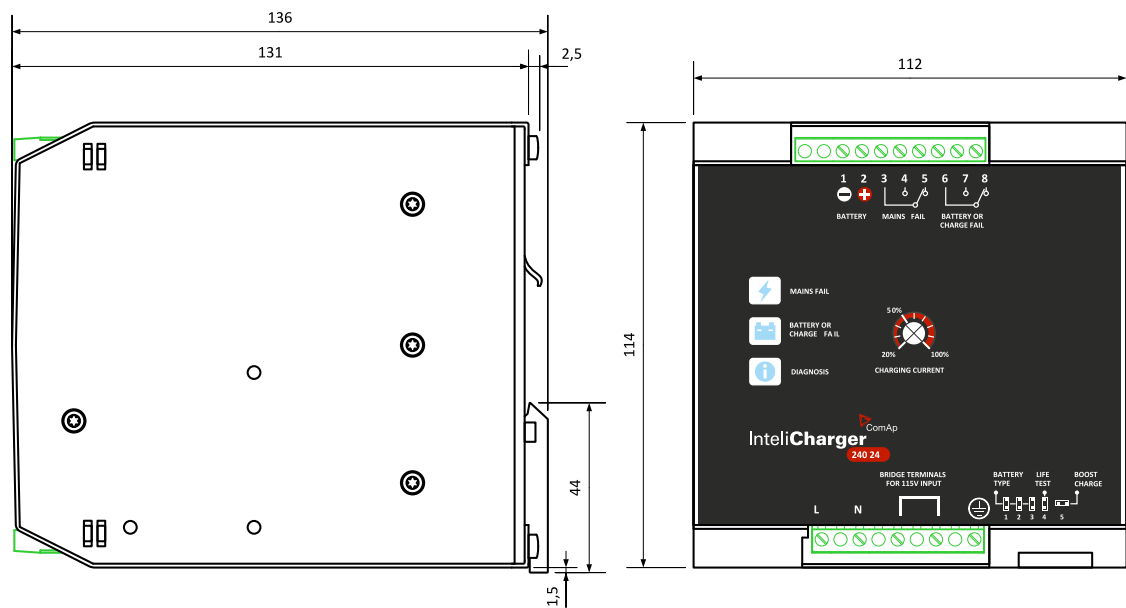


Image 6.1 Drawing and dimensions

7 Technical data

Input data

Nominal input voltage	115 / 230V _{AC}
Input voltage range	90–135 / 180–305V _{AC}
Inrush current (V _N and I _N load)	≤ 16 A, ≤ 5ms
Frequency	47–63 Hz ± 6 %
Input current (115 / 230 V _{AC})	3.3 / 2.2 A
Internal fuse	6.3 A
Recommended external fuse	16 A (MCB curve B)

Output data

Output V _{DC} / I _N	24 V _{DC} / 10A
Efficiency (50 % of I _N)	≥ 88 %
Ripple voltage	≤ 80 mV _{pp}

Protection

Short-circuit protection	Yes
Overload protection	Yes
Overvoltage output protection	Yes
Reverse battery polarity protection	Yes
Detection of element in short-circuit	Yes
Thermal protection	Yes

General data

Operating ambient temperature range	-25–+70 °C
Storage ambient temperature range	-40–+85 °C
Max humidity (25 °C)	95 %
IP protection class (EN/IEC 60529)	IP20
Reliability (MTBF IEC 61709)	> 300 000 h
Protection class (with PE connected)	I
Dimension (w×h×d)	112 mm × 114 mm × 136 mm
Weight	approx. 0.85 kg