

InteliCharger 480 24 20A

SW version S175

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1 Document information

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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 480 24 20A. This guide provides general information on how to install, configure, operate, and maintain the charger.

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






















































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).

1.4 Document history

Revision number	Related sw. version	Date	Author
1	S175	10.3.2022	Prasad Bhuneshwar

1.5 Symbols in this manual

	3 x Phases		Connector - male		GSM		Resistive sensor RPTC
	Active current sensor		Contact		GSM modem		RS 232 male
	AirGate		Contactor		IG-AVRi		RS 232 female
	Alternating current		Controller simplified		IG-AVRi TRANS		Starter
	Analog modem		Current measuring		Jumper		Switch - manually operated
	Battery		Current measuring		Load		Transformer
	Binary output		Diode		Mains		USB type B male
	Breaker contact		Ethernet male		Mains		USB type B female
	Breaker contact		Ethernet female		Mobile provider		Voltage measuring
	Breaker		Fuel solenoid		Passive current sensor		Wifi / WAN / LAN
	Breaker		Fuse		Pick - up		
	Breaker		Fuse switch		Relay coil		
	Capacitor		Generator		Relay coil of slow-operating		
	Coil		Generator schematic		Resistor		
	Connector - female		Grounding		Resistor adjustable		

2 System overview

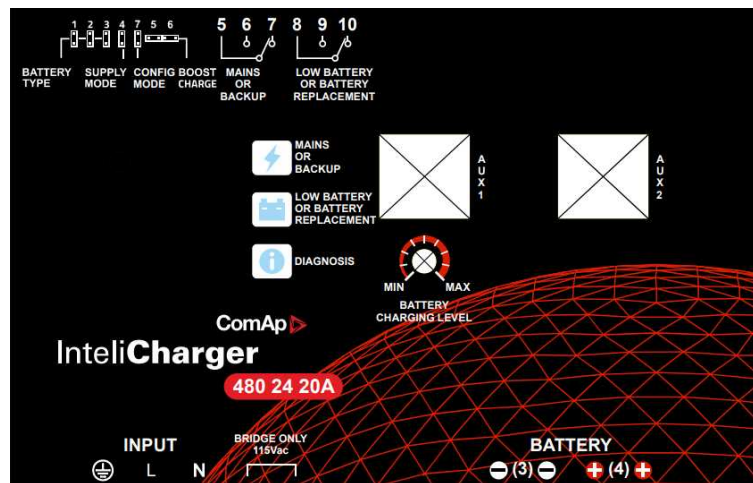
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2.1 General description

The IntelliCharger 480 24 20A 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, Ni-Cd and Li-ion battery type. A rugged casing with bracket for DIN rail mounting provides IP20 protection degree.

2.2 Package content



- IntelliCharger 480 24 20A
- 3 Jumpers

2.3 Main characteristics

- Wide input voltage range.
- Battery charging output 24 V DC, 20 A.
- Suited for the following battery types: Open Lead Acid, Sealed Lead Acid, Gel, Ni-Cd and Li-ion battery type.
- Automatic battery status diagnosis.
- Four charging stages: Recovery, Boost, Absorption and Float. Switched mode power supply technology for battery charging.

- Power Supply mode.
- High efficiency ($\geq 91\%$).
- Protected against short circuit, reversed polarity, overload and over temperature.
- Signal output terminal (voltage free contact) for faulty battery state. Signal output terminal (voltage free contact) for Main's power input fail signaling.
- IP20 protection.
- Temperature compensated charging.
- MODBUS RTU communication.
- DIN rail mounting.

3 Wiring

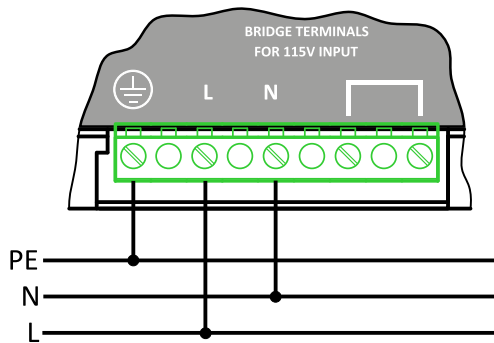
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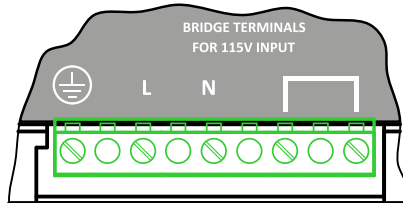
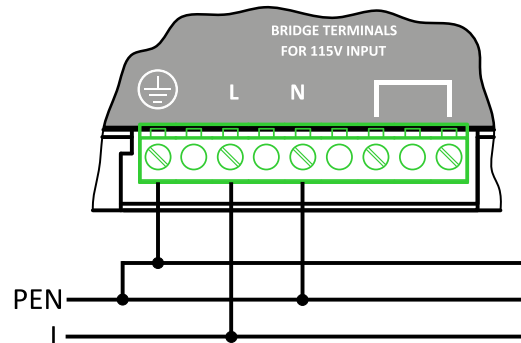
3.1 AC input wiring diagram

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

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



> for TN-C (L, PEN)



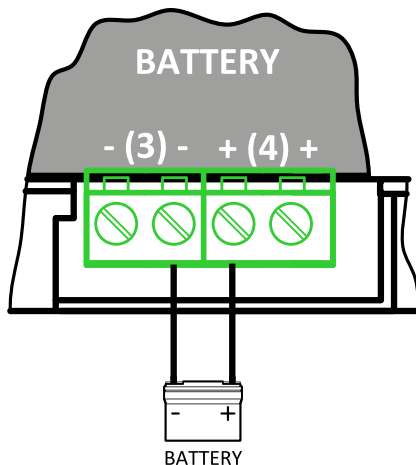
When 115 VAC input voltage is used bridge corresponding terminals on AC input terminal block (see left).

Note: Use appropriate wire cross-section. See Wires parameters (page 8) for details.

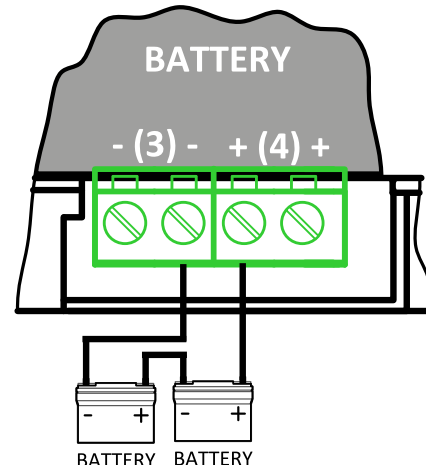
3.2 Battery output wiring diagram

IntelCharger 480 24 20A supports single 24 V output. It is possible to connect two 12 V batteries in series. Connect the battery between pins 3 (–) and 4 (+). Fuse position example is for installations where ‘–’ battery pole is grounded.

For Single 24V battery output



For two 12V batteries connected in series



Note: See *Wires parameters (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	All In On (Size)
In	4.0	6.0	30 – 10	0.8 – 1.0 Nm	7 mm	Size 3 and 4
Out	4.0	6.0	30 – 10	0.8 – 1.0 Nm	7 mm	Size 3 and 4
Signal	0.2 – 2.5	0.2 – 2.5	24 – 14	0.5 – 0.6 Nm	7 mm	All types

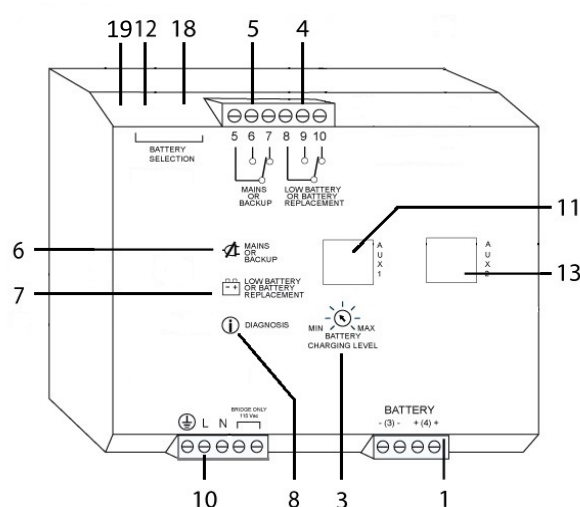
Note: Connection by the screw, type 2.5 mm² or 4.0 mm² terminal blocks. Wiring terminal shall be marked to indicate the proper connection for the power supply. Use copper cables only, for supply connections, use wires suitable for at least 75 °C.

4 Charger setup and operation

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4.1 Front panel description



- 1 Battery output terminal
- 3 Charging current level
- 4 Battery or charge fail signal output terminal
- 5 Mains fail signal output terminal
- 6 Mains fail indicator
- 7 Battery or charge fail indicator
- 8 Diagnostic indicator
- 10 AC input terminal
- 11 Aux 1 for temperature sensor probe
- 12 Supply Mode function selector
- 13 Aux 2 for Modbus RTU
- 18 Battery type selector
- 19 Boost charge selector

4.2 Detailed description

4.2.1 Input AC Supply

Single Phase Switching Power Supplies L, N, PE.

BRIDGE ONLY for input 115 Vac, and connect L, N, PE.

4.2.2 Battery Connection

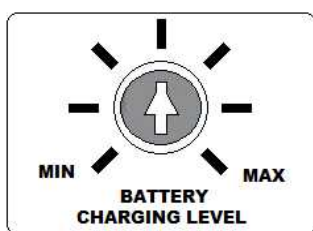
Connect the battery between pin: 3 (–) and 4 (+).

4.2.3 Output Load

If Present on the device, connect this Output to the load 1 (–). 2 (+).

(Output Load It is to supply Auxiliary Load)

4.2.4 Charging Level Current



To protect the battery from excessive charging currents, the device allows you to limit the maximum charge current by adjusting the trimmer. It allows you to limit from max in up to 10 % of current I_n . To determine the maximum battery charge current, see the battery manufacturer's Data Sheet, if it is not possible, consider that on average the maximum charge current is 10% of Ah's rated battery current; The data is suitable for both Lead Acid and Ni-Cd batteries.

4.2.5 Back Up and Fault: Relay and LED Conditions

Signal Ports

- > No.5 Relay Contact: 5, 6, 7
- > No.6: Led

FAULT: Low Battery, Battery Replacement, Faulty Battery, or Faulty System

- > No.4 Relay Contact: 8,9,10
- > No.8: Led DIAGNOSIS: Battery charger mode, or Diagnosis of the system through "blinking code."

Signal Output port true table		Port N°5 - Led N°6 Mains/Back-Up		Port N°4 - Led N°7 Fault Battery	
		5-6 Closed	5-7 Closed	8-9 Closed (OK)	8-10 Closed
Mains Input Vac	ON	led Off		led Off	
	OFF		led on (1)	led Off	
Battery or system Fault?	YES	led Off			led on
	NO	led Off		led Off	

Note:

- (1) Contact relay Mains/Back switches at least 5 seconds after disconnection of Power.
 (2) See Diagnosis Led

4.2.6 Display Signals

- > No.6: Led Mains/Back Up: Input Mains On/Off
- > No.7: Led Low Battery, Fault connections systems, Battery replacement.
- > No.8: Led Battery charge mode,
- > No.8: Led DIAGNOSIS: Battery charge mode,
- > Led Diagnosis. Diagnosis of the system through "blinking code" signal Light.

4.2.7 Charging Mode STATUS

	Status (Led)	Diagnosis (No.8)	Fault Battery (No.7)
Charging Type	Float	1 Blink/2 sec	OFF
	Absorption	1 Blink/sec	OFF
	Boost	2 Blink/sec	OFF
	Recovery	5 Blink/sec	OFF

4.2.8 Faulty Battery / Faulty System

Signal Output port true table		Port N°2 - Led N°6 Mains/Back-Up		Port N°1 - Led N°7 Fault Battery	
		5-6 Closed	5-7 Closed	8-9 Closed (OK)	8-10 Closed
Mains Input Vac	ON	led Off		led Off	
	OFF		led on (1)	led Off	
Battery or system Fault?	YES	led Off			led on
	NO	led Off		led Off	

Note:

1. Performed only at powerup if Power Supply function is enabled. DO NOT connect a battery with reverse polarity after the powerup if Power Supply function is enabled.
2. Not performed if Power Supply function is enabled.
3. Performed only in Config mode and if Life test is enabled via Modbus.

4.2.9 Display Signals

- No.6: Led Mains/Back Up: Input Mains On/Off
- No.7: Led Low Battery, Fault connections systems, Battery replacement.
- No.8: Led Battery charge mode,
- No.8: Led DIAGNOSIS: Battery charge mode,
- Led Diagnosis. Diagnosis of the system through "blinking code" signal Light.

4.2.10 Charging Mode STATUS

	Status (Led)	Diagnosis (No.8)	Fault Battery (No.7)
Charging Type	Float	1 Blink/2 sec	OFF
	Absorption	1 Blink/sec	OFF
	Boost	2 Blink/sec	OFF
	Recovery	5 Blink/sec	OFF

4.2.11 Faulty Battery / Faulty System

Auto Diagnosis	Reverse polarity or high battery Voltage (Over 32.5Vdc for CBI 24xxA) (1)	1 Blink/pause	ON
	Battery Not connected (2)	2 Blink/pause	ON
	Element in Short Circuit (2)	3 Blink/pause	ON
	Bad battery; Internal impedance Bad or Bad battery wire connection (2)(3)	5 Blink/pause	ON
	Life test not possible (2)	6 Blink/pause	ON
	Internal fault	9 Blink/pause	ON

Note:

1. Performed only at powerup if Power Supply function is enabled. DO NOT connect a battery with reverse polarity after the powerup if Power Supply function is enabled.
2. Not performed if Power Supply function is enabled.
3. Performed only in Config mode and if Life test is enabled via Modbus.

4.2.12 Auxiliary Output "AUX 1"

Connection for RJTEMP temperature sensor cable.

4.2.13 Battery Charge in Temperature Compensation Environment

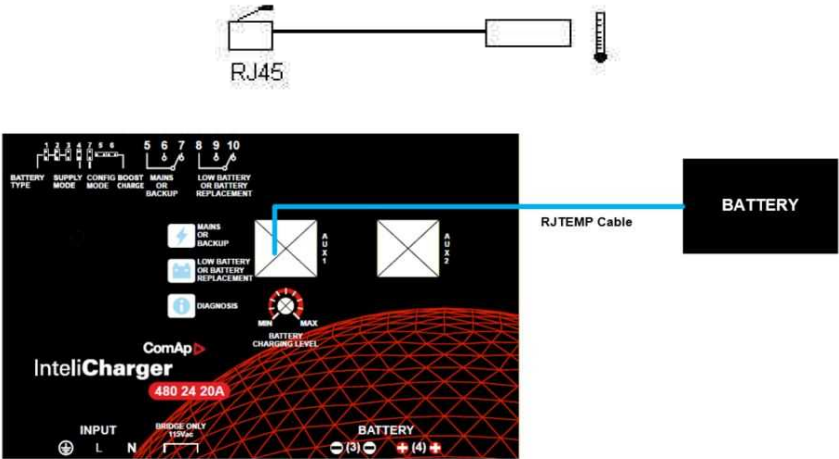
Note: No. 11 Remove the window label to find the connector: Auxiliary Output "AUX 1".

It is possible to connect the Temperature sensor probe and apply it on the battery. The function of the probe is for temperature battery compensation. With this it is possible to active the specifications of the EN54-4 fire norm.

Connecting to Auxiliary output AUX1 the cable RJTEMP (supplied separately), the battery charger will vary the voltage depending on the temperature:

Fast Charge: Open Lead, AGM, Gel	Float charge: Open Lead, AGM, Gel
+/- 5mV/°C x n. of Cells from -8°C to +60°C +140 ÷ -200 mV/Cell compared to the value at 20°C	+/- 3mV/°C x n. of Cells from -20°C to +60°C +120 ÷ -120 mV/Cell compared to the value at 20°C
Fast Charge: Ni-Cd	Float charge: Ni-Cd
+/- 2.5 mV/°C x n. of Cells from -20°C to +60°C +120 ÷ -120 mV/Cell compared to the value at 20°C	+/- 2.5 mV/°C x n. of Cells from -20°C to +60°C +120 ÷ -120 mV/Cell compared to the value at 20°C

The device stops to charge the battery If the temperature is less than -20°C or greater than +60°C. The sensor placed on cable RJTEMP must be applied on the battery.

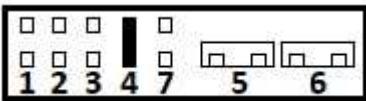
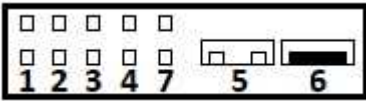


4.2.14 Battery Management Configurations

Completely automatic, all devices are suitable to charge most battery types thank to User Selectable charging curves. They can charge open lead acid, sealed lead acid, Gel, Ni-Cd and Li-Ion. It is possible to change or add other charging curves connecting the device to a portable PC.

Note: Switch off the system before Setting the jumper. Only jumper in position 6 is Refreshed also with power ON.

Battery Type chemistry Selection	Jumper Position	Float charge (Volt/Cell)	Fast charge (Volt/Cell)
Open Lead		2.23	2.35
(AGM) Low		2.25	2.35
Gel Battery		2.30	2.35
NiCd		1.4 (12V:10 cells) (24V:20 cells) (48V:40 cells)	1.45 (12V:10 cells) (24V:20 cells) (48V:40 cells)
Li-Ion		3.45 (12V:4 cells) (24V:8 cells)	3.65 (12V:4 cells) (24V:8 cells)
Config Mode (2)		Configure by DPY351 or ADELVIEWSystem.	

Functional Setting	Jumper Position	Function
Power Supply Function (3)		Jumper Present: Power supply function enabled.
Boost - Fast Charge Enable (1)		Jumper present: Fast Charge enabled. It is possible remote Fast Charge enabling by RTCONN cable

Note:

1. Jumper present in Fast Charge means also that every 288h, the device goes in "Cycling Refresh Charging". This mode continues for 85 minutes at the same voltage condition: 2.35V/Cell; for Lead Acid Batteries.
2. When this selection it is possible to change the parameters of the chemistry selected.
 - a. First, you must select the battery chemistry
 - b. Select "Config Mode".
 - c. Change the parameters with DPY351 or ADELVIEWSystem. After update, it is possible to disconnect the programmer and use the device as a standalone device.
 - d. If you remove the "Config Mode" all parameters, come back to default chemistry selection.

4.2.15 Power supply mode

This function allows the Battery Charger to function like a Power Supply. To enable this function the operator must insert a jumper in Pos. 4 Enable Power Supply with the CB unpowered. When the device is turned ON, we will have voltage to the output terminals OUTPUT BATTERY even if the battery is not present. If there is no fault deactivated, the alarm relay and the LED DIAGNOSIS indicate the charging status. In Back Up (no Mains) and cell voltage < 2.18V (Pb batteries) or < 1.31V (NiCd batteries) for more than 30 sec. the device turns off completely.

4.2.16 Auxiliary Output "AUX 2"

Connection for MODBUS, HMI via RJ45 connector.

4.2.17 Modbus

Some devices are provided of Modbus "RTU" communication protocol port, which requires the only one device be the Master, all the others must be slave.

Hardware interface: RS485.

The unit is a **SLAVE** in a MODBUS network. The slave units are compliant to the following specifications:

Transmission mode:	MODBUS RTU
Electrical Interface:	RS485 half-duplex serial line
Baud rate:	4800 / 9600 / 19200 / 38400 (default) bps
Data format:	8 data bits
Parity:	even (default) / odd / none

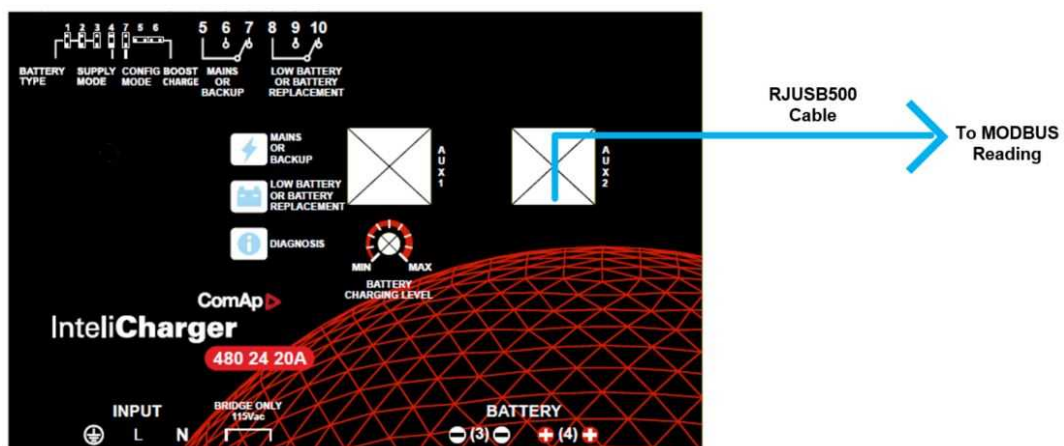
Stop bits:	1 (parity odd or even) / 1 or 2 selectable (parity none)
Slave address:	configurable in the range 1 (default) to 247
Connector type:	RJUSB500 Cable
Cable:	Shielded twisted pair, 8-wire RJ-45 plug

Connector name	AUX2
Pinout (fig. below)	A = pin 2, B = pin 1, Common = pin 3

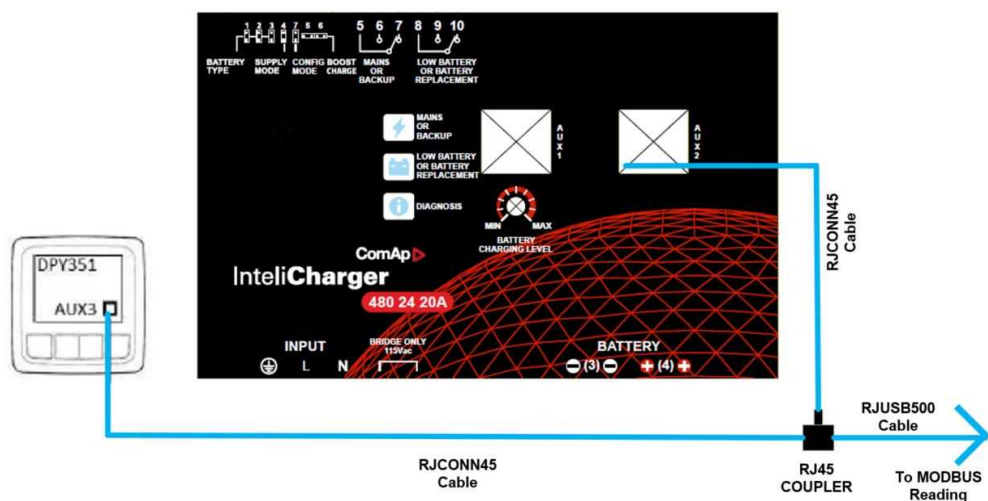
Connections for MODBUS, HMI

To connect the device in Modbus field, please use AUX2.

- Port: AUX 2 No. 13: MODBUS connection via RJUSB500 cable.



- RJ45COUPLER is a RJ45 T-connection for daisy chain with HMI or PC.

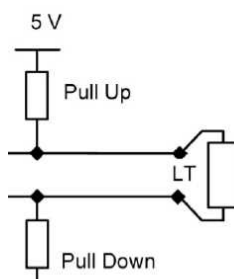


- RJCONN45: It is a normal IT cable also provided by ADELSYSTEM. It is possible to connect in daisy chain up to 3 devices, max distance 100 m, from the Output AUX2.
- RJUSB500 is a cable interfacing RS485 – USB, max length 2 m for the connection to PC.

Bus Termination (Size 3)

Inside the device are present the following electric diagram for the polarization of the Modbus line. Fail-safe:

- 560 Ohm (Pull Up) at 5 V
- 560 Ohm (Pull Down) at 0 V
- Terminations: 120 Ohm (LT) between lines



4.2.18 Battery care

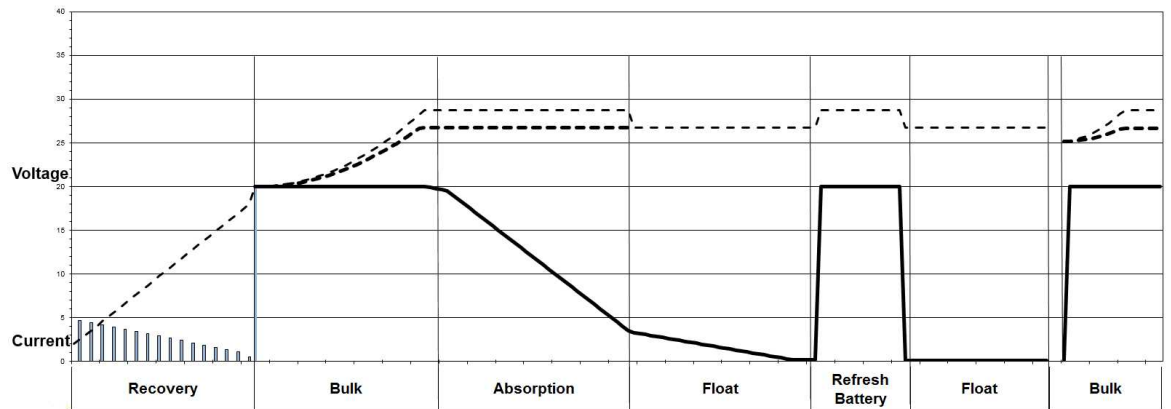
The Battery Care philosophy is based on algorithms that implement rapid and automatic charging, battery charge optimization, flat batteries recovery and real time diagnosis. The real time auto-diagnostic system monitors battery and charging process during the installation and operation. Faults such as 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, Ni-Cd and Li-ion battery type. 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, can recognize batteries with a short-circuited cell.

4.2.19 Protection

- On the primary side: the device is equipped with an internal fuse. If the internal fuse is activated, it is most probable that there is a fault in the device. If happen, the device must be checked in the factory.
- On the secondary side Battery and load: The device is electrically protected against short circuits and overload.
- Polarity Inversion: the module it is automatically protected against inversion of battery polarity and connection of load inverted.
- Over current and output short circuit: the unit limits the output current (see the technical data).

4.2.20 Charging Curve

Automatic multi-stage operation and real time diagnostic allows fast recharge and recovery of deep discharged batteries, adding value and reliability to the system hosting the CBI device. The type of charging is Voltages stabilized and Current stabilized IUoU. Five charging phases are identified by a flashing code on a Diagnosis LED. To maintain the Output Load in lower Voltage state, don't put jumper in position 6, in this case no boost charge but only Float charge. Fast/Bulk Charge means also that every 288h, the device goes in "Cycling Refresh Charging" for 85 minutes at 2.4V/Cell. You can see details in charging curve diagram below:



4.2.21 Diagnostic checks

All CB devices support the user during installation and operation. A Blink code of Diagnosis Led allows to discriminate among various possible faults. Error conditions, “LED Battery Fault” ON and “LED Diagnosis” blinking with sequence; see Display Signal section.

- Test of quality wire connections: During Float charge the quality (resistance) on the battery connection is checked every 60 sec. This to detect if the cable connection has been properly made.
- Battery in Open Circuit or Sulphated: In Float charging mode, the All in One performs internal impedance test every 220 minutes.
- Reverse Polarity check: If the battery it is connected with inverted polarity, the All In One is automatically protected.
- Test of battery voltage connections: Appropriate voltage check, to prevent connection of wrong battery types, more or less than the nominal voltage.
- End of Charge check: When the battery is completely fully charged, the device automatically switches in Float charging mode.
- Check for Battery Cells in short circuit: Thanks to specific algorithms of evaluation, the CBs recognize batteries with cells in internal short circuit. In Float charge every 220 minutes test of element in short circuit.

4.2.22 Thermal behaviour

Surrounding air temperature 50°C. For ambient temperature of over 50°C, the output current must be reduced by 2.5% per °C. Max 70°C At the temperature of 70°C the output current will be 50% of In. The equipment does not switch off in case of ambient temperature above 70°C or thermal overload. The devices are protected for Over temperature conditions “worst case”; in this situation the device Shut-down the output and automatic restart when temperature inside fall.

4.2.23 DIN Rail mounting

The charger module must have a minimum vertical and horizontal distance of 10 cm to the other used DIN rail modules to guarantee sufficient auto convection for proper cooling. All modules must have a minimum vertical and horizontal distance of 10 cm to this power supply to guarantee sufficient auto convection. Depending on the ambient temperature and load of the device, the temperature of the housing can become very high.

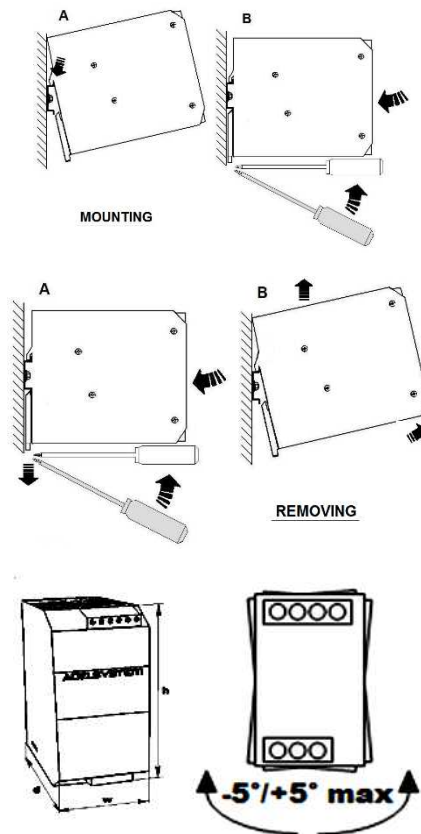


Image 4.1 DIN rail mounting


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!

5 Standards and certifications

5.1 Electrical Safety for Mounting

Device assembling: 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. Safety EN IEC 62368-1: 2014/AC:2015

 In According to EMC 2014/30/UE and Low voltage directive 2014/35/UE

5.2 Safety Standards

EN IEC 62368-1: 2014/AC:2015

5.3 EMC Standards Immunity

EN 61000-4-2, EN 61000-4-3, EN 61000-6-2, EN 61000-4-4, EN 61000-4-5.

5.4 EMC Standards Emission

EN 61000-6-4, EN 61000-3-2 (see data sheet for each device)

5.5 Conformity to

EN60950/UL60950-1 and CSA C22.2 No. 60950-1-07 (Information Technology Equipment) – Safety – Part1: General Requirement.

Device is intended to be installed in a cabinet protected from external shocks or damages.

Electrical safety EN54-4 Fire Detection and fire alarm systems

DIN41772: Charging curve; DIN41773: Characteristic Curve for charging Lead Acid and Nickel-Cadmium batteries.

5.6 Approved

Devices, CBI2420A

EN60950 / UL60950-1 and CSA C22.2 No. 60950-1-07 (Information Technology Equipment) – Safety – Part1: General Requirement.

6 Mechanical specifications

Case	A rugged aluminum case for DIN rail mounting with top and bottom perforation for auto convection cooling.
Weight	1.5 kg (2.5 lbs)
Dimension (W×H×D)	150 mm × 115 mm × 135 mm (5.92" × 4.52" × 5.31")

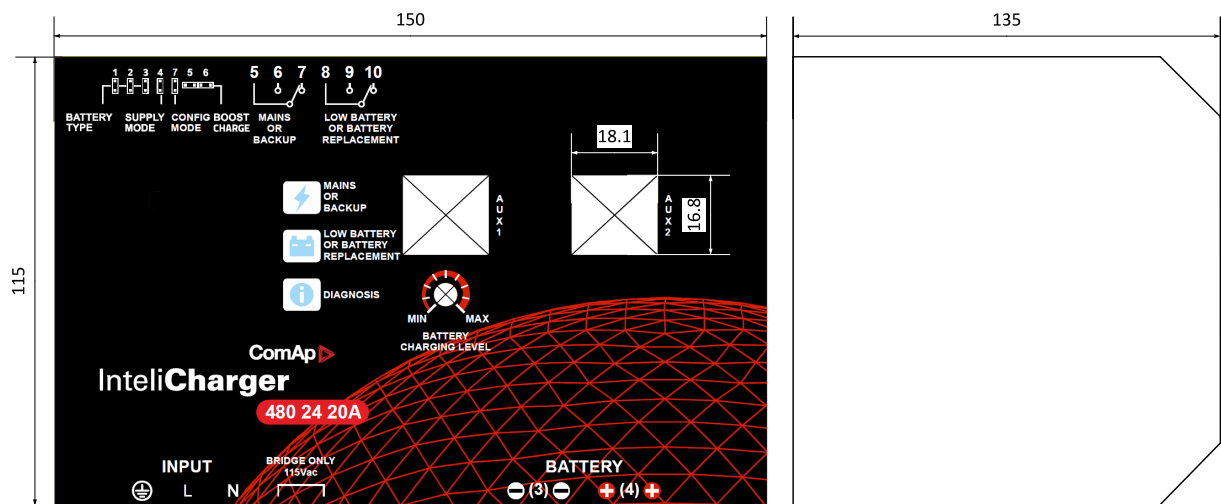


Image 5.1 Drawing and dimensions

Note: All dimensions are in mm.

7 Technical data

Input Data

Nominal Input Voltage (2 x Vac)	115 – 230 – 277
Input Voltage range (Vac)	90 – 135 / 180 – 305
Frequency	47 – 63 Hz
Input Current (115 – 230 Vac)	9 – 4.5 A
Internal Fuse	10 A
External Fuse (recommended)	16 A

Output Data

Boost charge (25 °C)	Lead Acid: 28.2 V NiCd: 29 V Li-Ion: 29.2 V
Trickle charge (25 °C)	Open Lead Acid: 26.7 V Sealed Lead Acid: 27 V Lead Gel: 27.6 V NiCd: 28 V Li-Ion: 27.6 V
Recovery Charge	2 – 20 V DC
Charging. Max	20 A, 5 %
Efficiency (50% of nominal)	91 %
Power Supply Mode	Yes

Operating Conditions

Ambient temperature (operation)	-25 ÷ +70 °C
De Rating Ta > 50 S°C	-2.5%(In) / °C
Ambient temperature Storage	-40 ÷ +85 °C
Humidity at 25 °C no condensation	95% to 25 °C
Cooling	Auto Convention
Protection Class (EN/IEC 60529)	IP20
Pollution Degree Environment	2
Dimensions (w-h-d)	150 × 115 × 135 mm
Weight	1.5 kg approx.

Protections

Detection of element in short circuit	Yes
Short-circuit protection	Yes
Overload protection	Yes
Over Voltage Output protection	Yes