



KOP2300 Battery charger

User`s manual



1. Introduction

KOP2300 battery chargers are modern fully automatic devices suitable not only for charging but also for maintaining and monitoring the batteries. The charger stores data about charging times and Ah charged. This data may be accessed for further analysis. The device is protected against reverse polarity and short circuit, has adjustable time limitations for every charging phase, battery temperature monitoring and compensation and current reduction at elevated ambient temperatures.

Your battery charger was programmed for a specific battery type by your dealer. Make sure the charging profile suits your battery type. To change the charging profile for a specific battery type, parameters can only be programmed with a PC software package and a programming interface. The programming parameters allow the charger's profile to suit the battery type. Up to five charging phases can be programmed with separate values for charging voltages, currents, charging times, temperature compensation and other control functions. Please contact your dealer for further information.

When programming the charging profile always follow the battery manufacturer's recommendations.

**Please read the operating and safety instruction carefully
before using or installing the KOP2300 battery charger!**

2. Start of the charging process

Establish a safe connection between the battery and the charger first. Then plug the mains connector. When removing the connection, remove the mains plug from the mains first, before disconnecting the battery.

The charger type is shown first after the charger has been connected to the mains and then the measured values as the battery voltage – see the following page.

The charging time depends on battery size and state of charge. If the battery was only slightly loaded, then the charging process will complete faster. At high ambient temperatures or when exposed to strong sunlight, the charging current is reduced and the charging time increased accordingly.

The charger can remain connected to the battery permanently. The current consumption from the battery is less than 0.2mA.

3. Mechanical installation

The following things must be considered during the installation:

a. Ensure the distance from the walls or other objects

Ensure the distance from the walls or other objects. Leave enough space (at least 10cm) between the cooling openings and other objects or walls, so that the air can circulate well.

b. Avoid the heat build-up

Despite very high efficiency quite a lot of heat arises. Therefore, the charger must only be installed in places with enough air exchange. Otherwise, the air temperature rises in the vicinity of the device and the charging current may be reduced or the device may turn off.

c. Horizontal mounting



Mount the charger on a flat surface as shown on the image. The device can withstand higher stress due to vibration and shock in the horizontal position.

d. Vertical mounting



The cables and terminals must be on the lower side as shown on the image.

IMPORTANT:

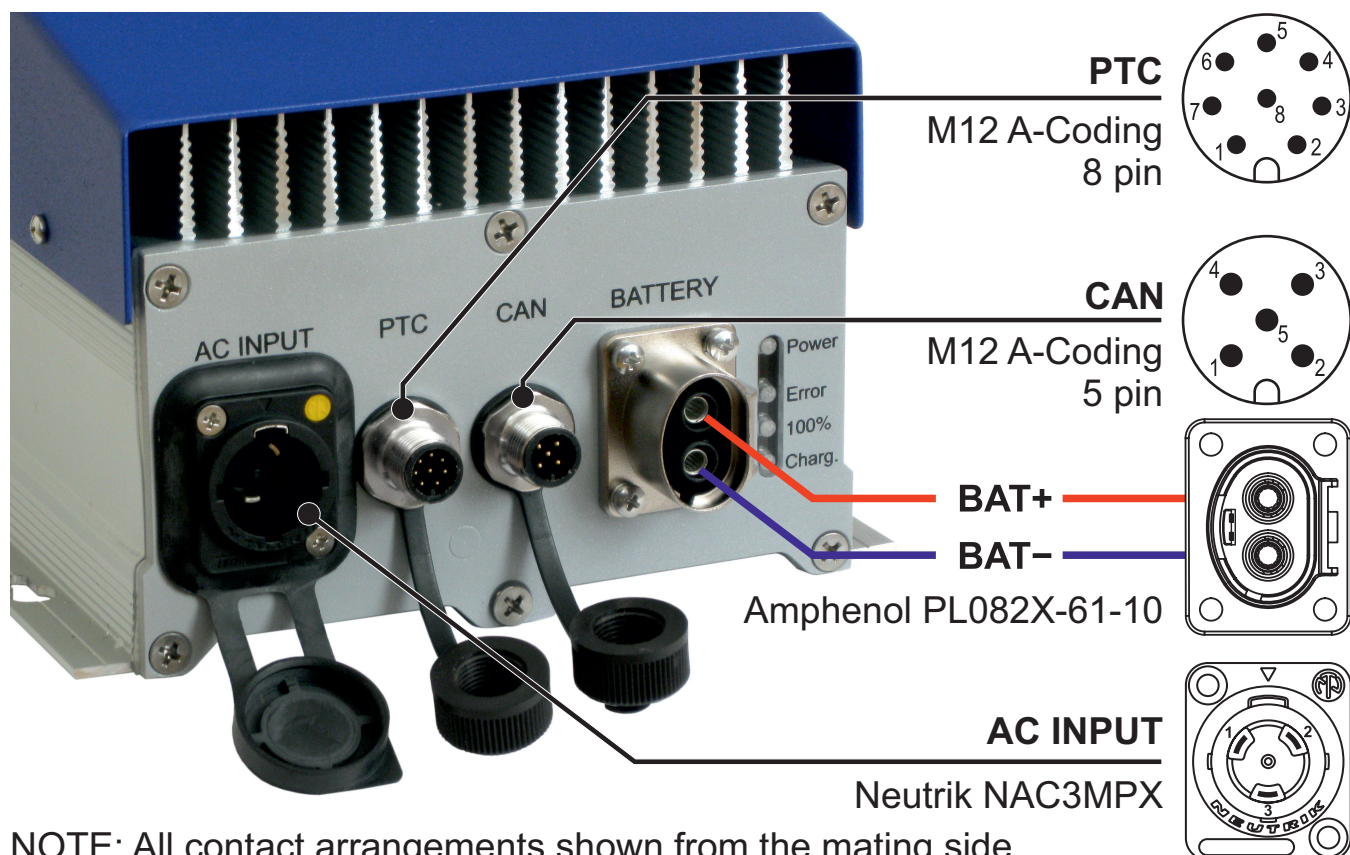
The charger should not be mounted vertically in applications such as electric vehicles, since high shock and vibrations are common in such applications.

IMPORTANT:

Observe the additional warnings (see the table). Do not make any holes on the chassis, as components can be damaged.

Mount the charger on a flat surface.

4. Connections



NOTE: All contact arrangements shown from the mating side.

Pinout of the CAN connector

1	Shield	
2	+12V-CAN	12V power supply (max.100 mA)
3	GND-CAN	Power supply common
4	CAN-H	CAN-High data signal
5	CAN-L	CAN-Low data signal

The signals on the CAN connector are galvanically separated from the battery. There is no CAN Bus termination resistor in the charger.

Pinout of the PTC connector

1	+12V	12V power supply (max. 150mA)
2	RELAY	Ext. relay (coil between pins 1 and 2)
3	GND-D	Ground connection for +12V and BMS
4	BMS-IN / KOP-USB	
5	NC	Not connected
6	PTC	Battery temperature sensor
7	GND-PTC	Ground connection for the PTC
8	+12V	12V power supply

The signals on the PTC connector are not galvanically separated from the battery.

Pinout of the mains (AC INPUT) connector

1	L	Phase
2	PE	Protective earth
3	N	Neutral

5. Functions of the charger software (standard version)

a. Mains current limiter

The mains current, it is limited to max. 13A for 230V systems, and to max. 16A for 120V systems. KOP2300 automatically detects the mains voltage.

Comment:

For 230V mains voltage and full output power the charger needs approx. 10.5A from the socket. At low mains voltage, the mains current would increase at the same power, but this would be reduced to max. 13A. In the short term, the current can also be somewhat higher than 13A in the case of very fast mains voltage fluctuations.

If the mains voltage drops below approx. 90VAC, the KOP2300 charger is switched off. After the mains voltage rises again, the charging is restarted where it was interrupted.

b. CAN Bus

The standard firmware version supports the external display. For support of special functions, like e.g. communication with the BMS, please contact Piktronik d.o.o..

c. Relay output

The relay output is switched on when the 230V mains voltage is connected. Other software options for the relay output on request.

d. Ambient temperature

If the ambient temperature is under -15°C when the charger is connected to the mains then the start of charging may be delayed by up to 10 minutes. The LED's are OFF during this time.

If other functions are required, the charger software can also be updated later via the CAN connector with the ALL-USB programming adapter.

NOTE: The charger has very low power consumption. Therefore, depending on the function, LED's on the charger and the external display KOP-DIS1 can remain switched on for more than 5 seconds after the mains plug has been disconnected.

6. LED functions

Power	100%	Charging	Error	Function
flashing	OFF	OFF	OFF	No firmware loaded or bad firmware version (bootloader is active).
ON	OFF	OFF	OFF	No battery connected or battery completely empty.
ON	OFF	flashing	flashing	Battery voltage under the minimal parameter value. The Charging and Error LED's are flashing intermittently.
ON	ON	OFF	OFF	Charger waits for the programmed automatic restart or battery voltage under the minimal parameter value.
ON	OFF	ON ^{*)}	OFF	Charging with full current ^{*)}
ON	OFF	flashing ^{*)}	OFF	Charging with reduced current – the battery is almost completely charged ^{*)}
ON	OFF	OFF	flashing	Error – see the table in Chapter 8. Number of consecutive LED flashes defines the error number.

^{*)} This LED functions depend ON the charger parameters – consult your Piktronik dealer.

7. Technical characteristics

Charger type	KOP2300
Nominal voltage	48V
Charging current	45A
Minimal starting voltage	23.0V
Adjustable charging voltage range	42.4V to 59,5V
Typ. efficiency at 230 V	96%
Power factor	> 0.95, typ. 0.99 at full power and 230V
Mains voltage	90V - 264V / 47 - 63Hz
Mains current	max. 13A at 230V systems (16A at 120V)
Standby current from the battery	< 0.2mA
Output power	max. 2300W
Dimensions (L x W x H)	407 x 159 x 140 mm
Weight	5.6kg
Environmental protection grade	IP65
Approvals	EN 55022 Class B, EN 60950, EN 61000-3-2, EN 61000-3-3, EN 61000-4-2, EN 61000-4-5, EN 61000-4-6, EN 61000-4-11, EN 61000-6-2, EN 61000-6-3

8. Error list

Error number and description

- 1 Charger temperature sensor or cooling fan failed
- 2 Charging time limit has been exceeded
- 3 Battery temperature sensor failed or not connected or shorted
- 4 Internal charger temperature too high
- 5 Battery voltage too high at the start of the charging
- 6 Battery temperature too low during charging
- 7 Battery temperature too high during charging
- 8 Charger disconnected from the battery during charging
- 9 Incorrect parameter checksum
- 10 Bad value from the power module
- 11 Incorrect parameter values
- 12 Internal problem with the power module
- 13 The charging current measurement is outside of the tolerances
- 14 Internal problem with measurement or voltage regulation

Please provide that error number when the supplier or manufacturer is contacted.

9. Troubleshooting

Issue	Remedy
LED's on the device do not turn on after connection to the mains socket	Check the mains connection. Check if the mains voltage is present.
Charging does not start	Check the battery connection, battery voltage, fuses and connection to the BMS.
Battery voltage is too low	The battery voltage is lower than the minimum value at which the charger is allowed to start.

10. General information

- ◆ Read the manual thoroughly.
- ◆ The charger must be used with the original cables only. Do not change, shorten, extend or short circuit the cables.
- ◆ Remove the mains plug from the mains socket first before breaking the battery connection.
- ◆ Only rechargeable batteries can be used. Do not connect any non- rechargeable batteries (like dry-cell batteries) to the charger.
- ◆ The charger must be used for the correct battery type only.
- ◆ Do not install the charger inside motor-homes, campers or caravans.
- ◆ Check the charger for cable, housing and connector damages before use. Do not operate the charger when damaged.
- ◆ There are no user serviceable parts inside. Refer servicing to qualified service personnel.
- ◆ Do not expose the charger to rain, moisture, direct sunlight or dust.
- ◆ Always disconnect the mains after charging and generally when the device is not in use. During the trickle charge the charger remains attached to the mains.
- ◆ Observe the warnings on the last page of this manual.

11. Warnings

COOLING	Do not cover the charger housing and protect it from direct sunlight or other heat sources. The charging current is reduced at elevated ambient temperatures and the charging time increases accordingly. The built-in fan must be able to cool the electronics well.
CONNECTION	Output currents are very high. Select the correct wire/cable size, use ferrules for wire ends, keep contact points clean and properly connect the output terminals.
FUSES	The fuse in the charger is not a sufficient protection for the battery cable from the battery to the charger. A corresponding fuse must be located in the immediate vicinity of the battery terminal.
MAINS CONNECTION	The line current is limited by the charger firmware - please see technical data. Please check if the wall socket and the mains fuse meet this current.
BATTERY TYPE / SIZE	Use this charger for the pre-set battery type and size only, otherwise the battery may not be fully charged or the battery can be damaged or it's life time can be reduced.
LITHIUM BATTERIES	Lithium batteries are very sensitive to overcharging and overheating. The charger can regulate only the total voltage, but can not recognize states of individual cells. Therefore, the charger should only be used together with a battery management system.
LEAD-ACID BATTERY GASSES	Lead-acid batteries produce hydrogen-oxygen gases, which can be explosive, and sulfuric acid that can cause severe burns. Make sure the working area is well-ventilated. Cigarettes or any open fires or sparks may cause an explosion. Keep all ignition sources away from the battery.
ACIDS	Battery acid can damage your eyes and skin. In the event of an accident, flush with water and seek medical help immediately. Use proper personal protective devices when handling a damaged or leaking battery. Treat the material used to clean up the battery acid spill as hazardous waste.
TOXIC SUBSTANCES	Batteries contain hazardous materials. Among others, lead and antimony are toxic substances. Waste lead-acid and many other battery types are hazardous waste and must be treated according to the Battery Disposal Regulations.

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