

Firma / Company

FRIWO Gerätebau GmbH

Gerätetyp / Type: LEV500/14/4.2/8.5
Artikelnr. / Part-No.: 1960948
Zeichnungsnr. / Drawing-No.: 15.5437.511-00
Datum / Date: 30.07.2020

Sachbearbeiter Verkauf / Contact Sales: Frederick Balzer
Sachbearbeiter Mechanik / Contact Mech. Eng.: Brian Phan
Sachbearbeiter Elektronik / Contact Elec. Eng.: Long Le
Freigabe App. / Approved App. PRFFR
Freigabe / Approved KSTXU

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We may ask you to return one signed copy of the specification for our records as having your approval. Unless you do not enter your objection to the latest specification issue without delay, your acceptance and release for production on the basis of this specification is deemed to be given.

Kundenfreigabe / Customer Release:

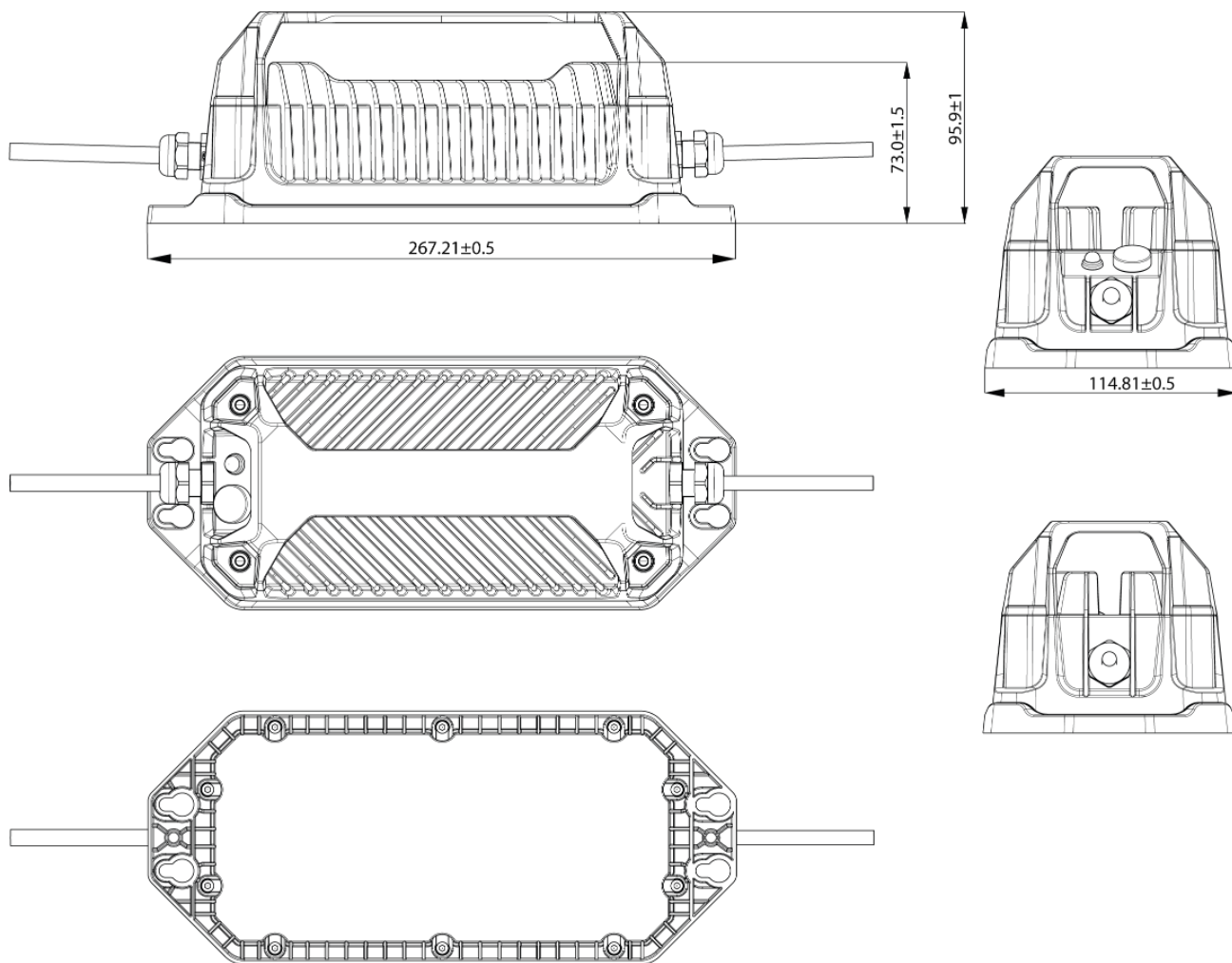
Datum / Date:

Unterschrift / Signature:

Index / Rev.	Datum / Date	Name	Einzelheit / Detail
Ⓐ	2021/3/1	Brian	P003681788,MR2021-4-11031:change start charge voltage from 29V-...
Ⓑ	2021/4/19	Brian	PCR P003711815,MR2021-4-11220: Add approval marks ENEC, SIQ and ...
Ⓒ	2021/9/28	Brian	PCR P003788533,MR2021-4-11750: Add UKCA Sign in bottom labeling, see point 2.1.1

1 Gehäuse / Housing:

Material: Aluminium, Plastic/ Plastik
 Farbe Boden / bottom colour: schwarz / black
 Farbe Deckel / cover colour: schwarz / black
 Farbe des Griffs / handle colour: schwarz / black

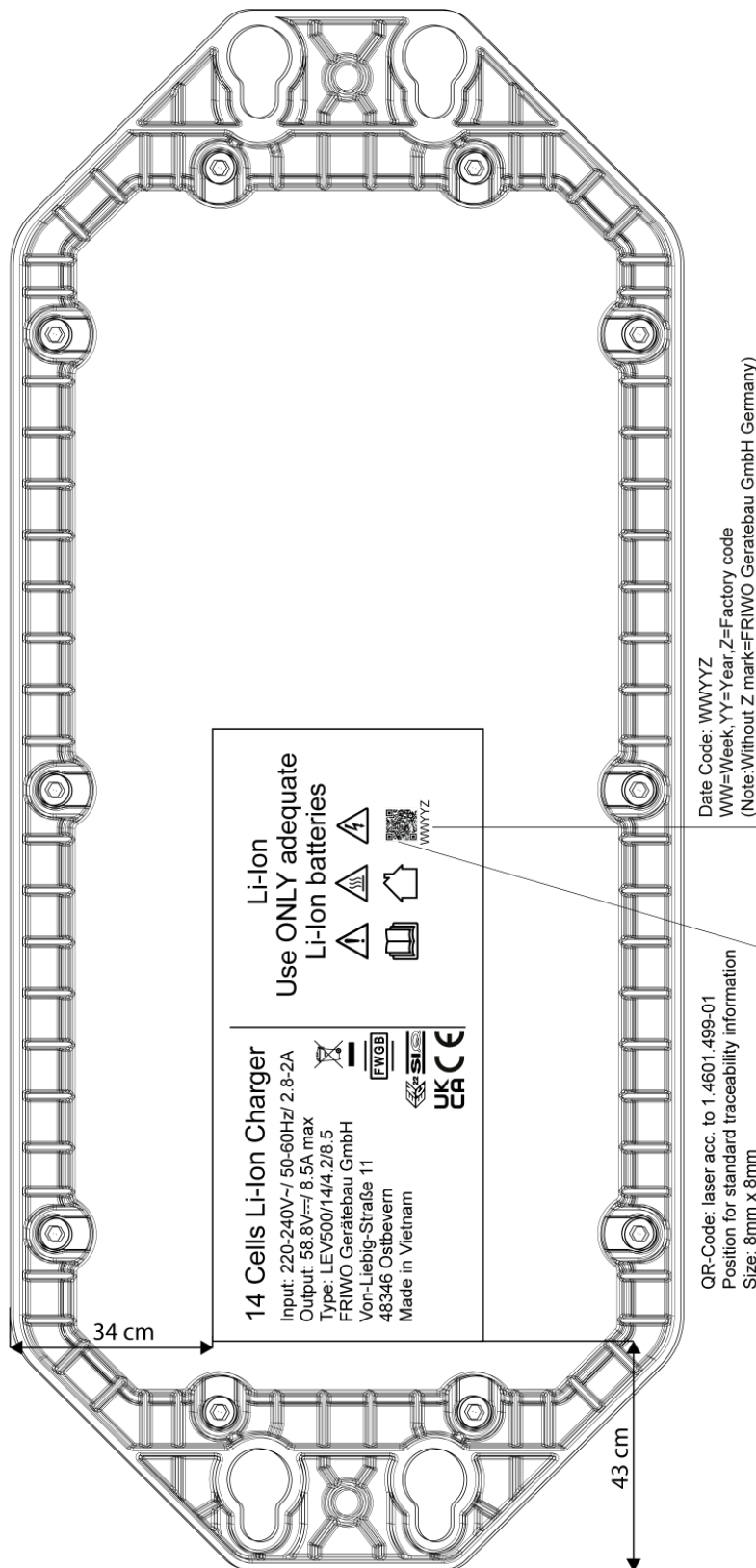


2 Gehäuseaufschriften / Housing labelling:

2.1 Bodenbeschriftung / Bottom labelling

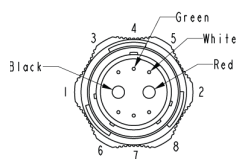
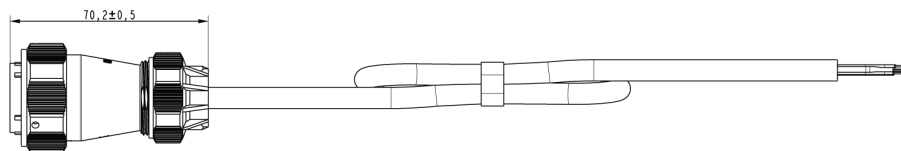
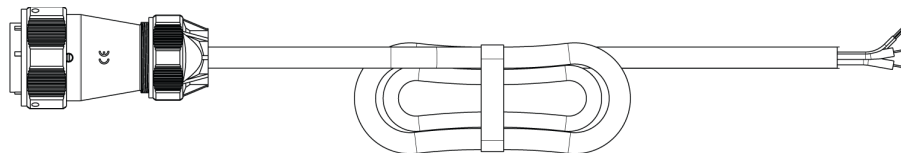
2.1.1

15.5437.501-05VN (Marking with laser)



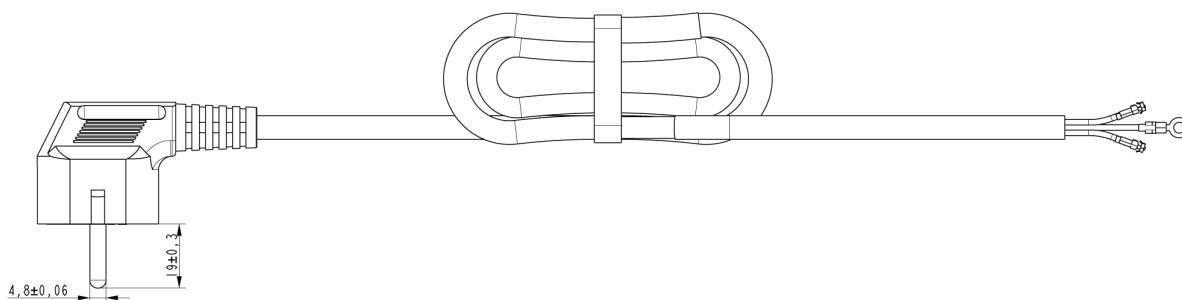
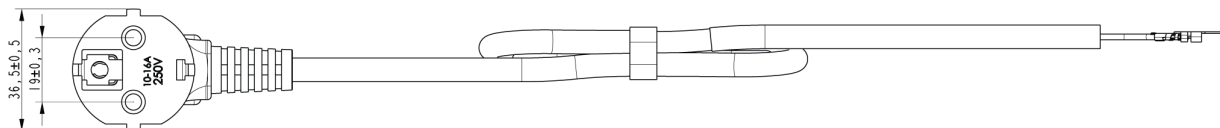
3 Leitungen / Leads:

- 3.1** Ausgangsleitung / output lead: 15.5437.503-00
 Länge / length: 1200 mm
 Querschnitt / cross section: 2CxAWG16 and 2CxAWG20
 Farbe / colour: schwarz / black
 Polarität / Polarity: siehe Zeichnung / see drawing



- (1) Black: Power (-)
 (2) Red: Power (+)
 (4) Green: CANL
 (5) White: CANH
 Bridge wire from Pin 3 to Pin 1

- 3.2** Netzleitung / mains lead: 15.5437.504-00
 Länge / length: 1000
 Querschnitt / cross section: 3X0,75 mm²
 Farbe / colour: schwarz / black



4 Verpackung / Packaging

4.1 Einzelverpackung / Individual packaging: 15.5437.556-10

mit Beschriftung * / with printing *

PRODUCT DESCRIPTION: LEV CHARGER
 PART-NO.: 1960948
 SPEC.-NO.: 15.5437.511-00
 INPUT: 220-240VAC
 OUTPUT: 58.8VDC/8.5A max

4.1.1 Aussenabmessungen / Outer dimensions: 322mm x 192mm x 112mm

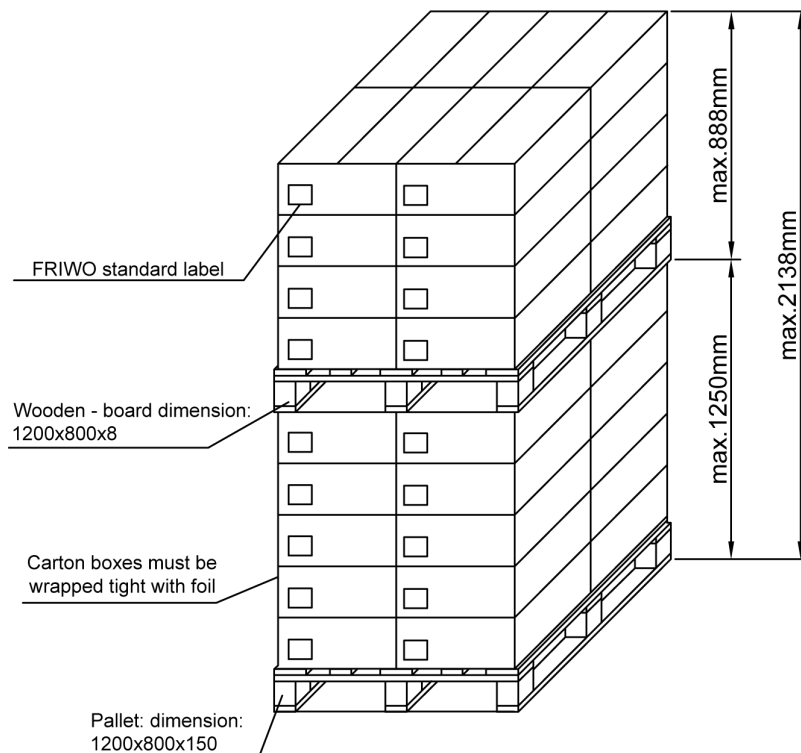
4.2 Sammelverpackung / bulk packaging: Karton 15.5437.556-00/ Carton 15.5437.556-00

4.2.1 Aussenabmessungen / Outer dimensions: 598mm x 341mm x 219mm

4.3 Anzahl der Geräte pro Umkarton /
 amount of units per master carton: 5

4.4 Gewicht pro Stück / weight per unit: 2215 g

4.5 Verpackungsvorschriften / packaging specification:



Master packing

Notes:

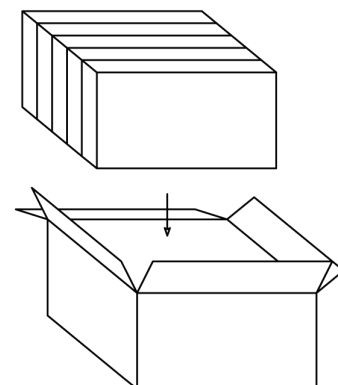
- 1) 5 pcs per Carton
- 2) 4 cartons per layer
- 3) 5 layers on 1st pallet + 4 layers on 2nd pallet

1 Stack (5-layer-pallet and 4-layer-pallet)
 = (100pcs + 80pcs)
 = 180 pcs per stack

22 pallets (11 stacks of each type)
 = 1980 pcs

48 pallets (24 stacks of each type)
 = 4320 pcs

Inner packing with box 15.5437.556-10



4.5.1 Aufkleber für Karton/ Label for cardboard box, Maßstab/ scale 1 : 2

Master carton label only for Asia production/ In Europe will be used the standard (ROMEO) label

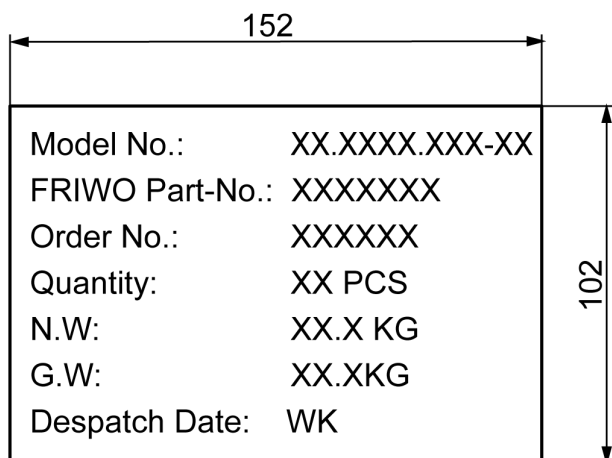
Adhesive label 1821105 for master carton

labeled on the long side bottom left

Colour: white

Printing colour: black

M 1:2



N.W = Net weight

G.W = Gross weight

WK = Week (Printing the produce date after WK.) For example:01,02,03 ...

5 Allgemeine Prüfbedingungen / General test conditions

Alle nachstehend aufgeführten Werte werden bei +20°C Raumtemperatur und nach 15 Minuten Einschaltdauer gemessen.

All values listed below are measured at an ambient temperature of +20°C and after 15 minutes of operation.

Operating temperature:	-20°C...+50°C derating start: typ. 35°C
Storage temperature:	-40°C...+70°C
Operation Humidity:	10% to 95%
Storage Humidity:	10% to 95%
Water protection:	IP65 except connectors
Protection class:	I
Operation Environment:	Indoor Use

5.1 Input data

Rated input voltage:	220-240Vac
Operable voltage range:	198 – 264Vac
Rated input frequency:	50-60Hz
Operable frequency range:	47 – 63Hz
Input current :	2800mA @198Vac
Input power:	533W @ 58,5V/8,5A <1,2W @ Stand by

5.2 Output data

Charging voltage Range:	28-58.8Vdc
Battery configuration:	14S Li-ion battery
Charge current:	0 - 8,5A
Charge time limit:	Timer = 8h
Output power (max):	500W
Reverse current:	Charger not connected to mains 0.4mA @ Vcharge = 58.8V Charger in Stop mode 0.2mA @ Vcharge = 58.8V
Max efficiency:	≥ 93%
Power factor (PF):	> 0.96 @230VAC, >50% Load

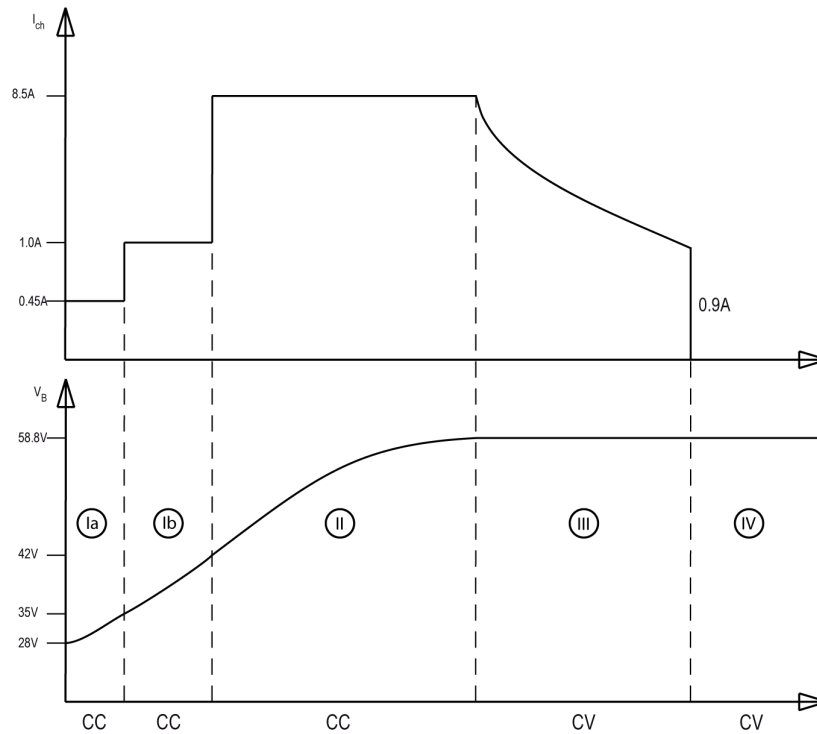
5.3 LED indication

Charger Status	Light status
Standby	The green LED is on
Pre-charge	The red LED is on
CC (Constant Current)	The red LED is on
CV (Constant Voltage)	The red LED is on
Finished	The green LED is on
OTP (Over temperature Protection)	The red LED is flash(1Hz), the green LED is off
CC&CV Time Up Protection	The green LED is on
Pre-charge timing protection	The red LED is blinking 2 times with frequency is 0.5Hz and off in 5s before next blinking, the green LED is off
OVP (Over Voltage Protection)	The red LED is blinking 3 times with frequency is 0.5Hz and off in 5s before next blinking, the green LED is off
Short Circuit Protection	The red LED is blinking 4 times with frequency is 0.5Hz and off in 5s before next blinking, the green LED is off
Reverse Polarity Protection	The red LED is blinking 6 times with frequency is 0.5Hz and off in 5s before next blinking, the green LED is off
CAN communication Failure	The red LED is blinking 7 times with frequency is 0.5Hz and off in 5s before next blinking, the green LED is off
Battery Failure	The red LED is blinking 8 times with frequency is 0.5Hz and off in 5s before next blinking, the green LED is off
Charger Internal Failure	The red LED is blinking 9 times with frequency is 0.5Hz and off in 5s before next blinking, the green LED is off

5.4 Charge characteristic

Simulation circuit for n = 14S Li-ion cells

Output characteristic: CCCCCV



	Output: V_{Batt} [V]	Output: I_{Charge} [mA]
Ia	Pre-charge	
	$28V \leq V_A \leq 35V$	$0.45A \pm 0.1A$
Ib	Pre-charge	
	$35V \leq V_A \leq 42V$	$1.0A \pm 0.15A$
II	Main-charge	
	$42V \leq V_A \leq 58.2V$	$8.5A \pm 0.5A$
III	Main-charge	
	$58.3V \leq V_A \leq 58.8V$	$900mA \pm 100mA \leq I_{Charge} \leq 8.5A$
IV	Main-charge	
	$V_B = 58.8V \pm 0.3V$	$I_{ch} = 0mA$

Ersatzschaltung/ equivalent circuit
with CAN interface

5.5 Charge sequence

Detection of battery insertion
Battery is detected if voltage $\geq 28V$

The charging sequence is divided into 4 steps dependent on the battery status
A complete main charge sequence (step II to step IV) is limited to max. 8h

- ① Pre charge
Characteristic: CC 450mA
Description: Battery is charged with constant current $I_{ch, pre} = 450mA$ for max. 15 minutes until voltage of 35V is reached
Remark: Only valid in case of a malfunction of BMS.
- Pre charge
Characteristic: CC
Description: Battery is charged with constant current I_{ch}^* , pre = 1.0A until voltage of 42V is reached.
- ② Main charge
Characteristic: CC
Description: Battery is charged with constant current $I_{ch}^* = 8.5A$ until battery voltage reaches $V_B = 58.2V$ ③
- ③ Main charge
Characteristic: CV
Description: Battery is charged with constant voltage of 58.8V until charge current drops 800 ... 1000mA
- ④ Stop mode
Characteristic: CV
Description: After end of charge, charge current is switched off
 $I_{ch}^*, 0mA$
Independent of phase II to III charging of battery is terminated in case of $V_B \geq 59.3V$

5.6 Optional CAN communication, ICS Message

Supports update firmware via CAN.

6 Protective functions

6.1 Over voltage protection: independent voltage regulation at 59V...63V

6.2 Short circuit protection

The charger will cut off the charge circuit to protect charger and battery

6.3 Over temperature protection

Charger detect the temperature inside charger, in case of too high temperature. Activation derating to maintain the temperature inside charger are not raised

6.4 Reverse polarity protection: when the battery polarity is reversely connected to the charger, the charger will not output.

7 Sicherheitsanleitung / Safety details:

Sicherheitsaufbau nach / Safety-standard acc. to :	IEC60335-1, EN60335-2-29
Schutzklasse / Protection class :	I
Trennung (prim.-sek.) / Separation (prim.-sec.) :	Galvanisch durch Wandler Galvanic by transformer
Kriech- und Luftstrecken / Creepage distance and clearance :	$\geq$ Kr : 6.4mm, Lu : 4mm ; Cr : 6.4mm, Cl : 4mm
Ableitstrom / Leakage current :	I Ableit $\leq$ 750 μ A I leak $\leq$ 750 μ A
Gemessen nach / According to : siehe / see www.friwo.de	EN60335-1
Hochspannungstest / High-voltage test :	$\geq$ 3kVac
Anwendungsbereich / Range of application :	Haushaltsgeräte household application
Umgebungstemperatur / Ambient temperature range :	-20°C bis / to +50°C
High-voltage test: Primary to secondary $\geq$ 3kV AC; Primary to earth $\geq$ 1,5kV AC;	

8 Allgemeine Hinweise / General indices:

- 8.1** The specific instructions related to the safe operation of this appliance is collated together in the front section of the user instructions
The height of the characters, measured on the capital letters, is at least 3 mm These instructions are also available in an alternative format, e.g. on a website
- 8.2** User manuals must be provided by FRIWO with the appliance so that the appliance could be used safely. If it is necessary to take precautions during user maintenance appropriate details must be given for contain the following:
- please read the directions for use before using the implementing
 - for indoor use only
 - a warning against the use of non-rechargeable batteries
 - information about the type of battery, the number of cells, the charging time and the nominal rating of the battery
 - a direction for all cells containing mercury, cadmium or lead as electro- chemical substances, that these batteries are subject to special waste disposal.
- 8.3** The user manual must be written in the official language of the country in which the appliance will be sold. For each language the instructions specified in 7.4 to 7.6 must be implemented together and in front of other instructions. The user manual must be available minimum in one additional format like on a website or on a DVD.
- 8.4** This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.
- 8.5** The external flexible cable or cord of this transformer cannot be replaced; if the cord is damaged, the transformer shall be scrapped. The supply cord cannot be replaced. If the cord is damaged the appliance should be scrapped.
- 8.6** For pluggable equipment, the socket-outlet shall be installed near the equipment and shall be easily accessible.
- 8.7** Because there is no communication between charger and battery pack, make sure that the BMS in the battery pack shall take the full responsibility for the safety protections of the battery packs.

9 EMC-specification

EMC requirements according to EN 55014-1 and EN 55014-2

9.1 Harmonic current emissions acc. to EN 61000-3-2 and EN 61000-3-3, class A

9.2 Immunity to electrostatic discharge (ESD) acc. to EN 61000-4-2

Discharge characteristic	Test level	Assessment criteria Uin 230Vac
Air discharge	±8kV	B
Contact discharge	±4kV	B
Indirect discharge	±4kV	B

9.3 Immunity to radiated electromagnetic field acc. to EN 61000-4-3

Test parameter / test characteristic: 80 - 1000 MHz; 80% AM (1kHz)

Test level	Assessment criteria
3V/m	A

9.4 Immunity to fast electric transients (burst) to EN 61000-4-4

Coupling	Test level	Assessment criteria Uin 230Vac
AC - input	2kV	B

9.5 Surge capability acc. to EN 61000-4-5

Surge voltage	Assessment criteria Uin 230Vac
±2kV (Line to Line)	B
±2kV (Line to Earth)	B

9.6 Immunity to conducted disturbances, induced by radio frequency fields acc. to EN 61000-4-6

Test characteristic: 0,15 - 230 MHz; 80% AM (1kHz)

Test level	Assessment criteria
3V	A

9.7 Immunity to voltage dips, short interruptions and voltage variations.

Test acc. to EN 61000-4-11

Test performed at $U_{in} = 230V_{ac}$

Voltage dips

Test level %Un	Voltage dips and short interruptions % Un	duration time of voltage dips (in halfsine)	Test result 48V battery
0	100	0.5	A
40	60	1	B
		5	B
		10	B
		25	B
		50	B

Voltage variations

Test level	Duration to decrease the voltage	Duration of the decrease d voltage	Duration to increase the voltage	Test result 48V battery
40%Un	2s $\pm$ 20%	1s $\pm$ 20%	2s $\pm$ 20%	B
0%Un	2s $\pm$ 20%	1s $\pm$ 20%	2s $\pm$ 20%	B

9.8 Assessment criteria

A Agreed operational behaviour within the specified limits.

B Time limited functional diminishment or malfunction during the tests is permitted. The function is self-reactivated by the unit following completion of the tests.

C Malfunction is permitted. The function can be reactivated either by reconnection to the mains or by operator intervention.

10 Warning!

- 10.1** All cells or battery packs to be charged must have an independent safety circuit. The safety circuit must protect the cells from over-discharge, over-temperature and over-charge. Failure to comply with this warning can result in serious injury, fire or explosion of the Li-Ion battery