

# EDrive Flexis Pro

## Service manual

HIGH-FREQUENCY BATTERY CHARGER



<b>1. Introduction</b>	<b>3</b>
<b>2. Operational safety</b>	<b>3</b>
<b>3. Technical parameters</b>	<b>4</b>
3.1 Description of the charger and its function	4
3.2 Technical parameters	6
3.3 Marking of chargers and its options	9
3.4 Blockdiagram of the charger	10
3.5 Description of power units	11
3.6 Control system FLEXIS	14
<b>4. Charger installation</b>	<b>17</b>
<b>5. Charger operation</b>	<b>18</b>
5.1 General instructions	18
5.2 Frontpanel description	18
5.2.1 Charging of one type of battery	19
5.2.2 Automatic recognition of battery	21
5.2.3 Manual selection from more batteries	21
5.2.4 Automatic selection according to battery voltage	21
5.2.5 Automatically via the identification module	22
5.3 Charger setting – frontpanel	25
5.4 Configuration programme AXIFF	25
5.4.1 Installation of AXIFF software	25
5.4.2 Connection of the charger to PC and installation of drivers for different operation systems	25
5.4.3 Description of AXIFF SW	40
5.4.4 Creation of users charging curves	40
5.4.5 Upgrade of charging curves	40
5.4.6 Firmware upgrade	41
<b>6. Optional equipment</b>	<b>41</b>
6.1 Identification module	41
6.2 Temperature sensor	42
6.3 Signal column – remote indication	42
6.4 Relay signalization	43
6.5 Remote control	43
6.6 Other optional equipment	44
<b>7. Storage and delivery</b>	<b>45</b>
<b>8. Service</b>	<b>45</b>
8.1 Spare parts	46
8.2 Case opening and exchange of component parts	47
<b>9. Failures</b>	<b>47</b>
<b>10. Explanations and Abbreviations</b>	<b>50</b>

## 1. Introduction

FLEXIS chargers are designed for industrial use, mainly for charging of traction batteries (lead-acid, gel, LiFePO<sub>4</sub>,...) for electric forklifts or handling and cleaning technology. Chargers are intended for charging of batteries with Unom 12V-96V and current from 25 to 225A. (Chargers of other power on request). Chargers are of modular construction, consist of control unit and power module(s) (input 1ph 230VAC or 3ph 400VAC). Important operating data are displayed on display during the charging. Chargers are fully programmable, parameters of single charging cycles are saved in charging archive.

Manual must be accesible to the operator of charger.

If you required service manual in better graphic quality, contact us.

Verification of conformity is content with hardware and software chargers. Contents of the manual is continuously monitored and any adjustments or repairs. They are included in subsequent editions. Nevertheless, you can not exclude possible deviations, it is not possible to guarantee full agreement.

## 2. Operational safety

The following requirements must be met when operating the chargers:

- chargers are for indoor use only
- proper ventilation must be insured during charging
- charger can be connected only to a regular main supply
- prevent spark ejection and open flame near the battery, explosion hazard during charging!
- charger must not be operated without the cover
- charge only chargeable batteries
- during the charging do not touch the wires leading to the battery terminals
- do not transfer the charger during the charging
- it is not allowed to disconnect the battery during the charging
- charger may be operated only by qualified staff
- changes of charger parameters may be made only by a service engineer

**WARNING:**

Disobedience to instructions marked by this icon could lead to damage of device, injury or life hazard.

**INFORMATION:**

This icon calls attention to advices and informations important for effective and trouble-free function of the device.

**OPTIONAL EQUIPMENT:**

This icon marks possibilities of the charger equipped with any of extra options.

### 3. Technical parameters

#### 3.1 Description of the charger and its function

Industrial HF chargers FLEXIS are intended for charging of traction batteries used for supply of electric forklift trucks and other devices powered by deep cycle batteries. It is destined for batteries with voltage from 12V to 96V, output current, according to type, from 25 to 225A. Mains supply either 230VAC or 3x400VAC.

Chargers are modular designed and consist of parallel connected power modules and control system.

- summary of the charger types can be found in table in chapter 3.2
- summary of the power modules can be found in table in chapter 3.5



Power modules are managed by microprocessor controlled control unit via digital CAN BUS communication. Control unit provides operation of charging process, signalization of charging stages and saving data to internal memory. Chargers are fully settable with possibility of external control. Chargers can be equipped with optional equipment (Identification module, temperature sensor, ...).

Chargers can, except standard charging, run also in regeneration modes: *equalization* a *desulphation*.

#### Equalization

It is equalizing charge for unification voltage and electrolyte density of individual battery cells. The equalizing charge must be performed on a fully charged battery. It is recommended use it at least 1x a month or every 20th charge cycle. This extends the battery life and the ability to use its full capacity.

#### Desulphation

Battery sulphation takes a place when lead battery discharge and lead sulphates settles on lead plates of single cells. Sulphated plates leads to reducing of capacity of battery, thats why desulphation takes its place. Charging with very low current degrades sulphates from lead plates and battery reclaims its full capacity.



Chargers can be equipped with aeration pump for electrolyte mixing (EUW). Air bubbles mix electrolyte, charging is better-balanced and charging time is shorter.

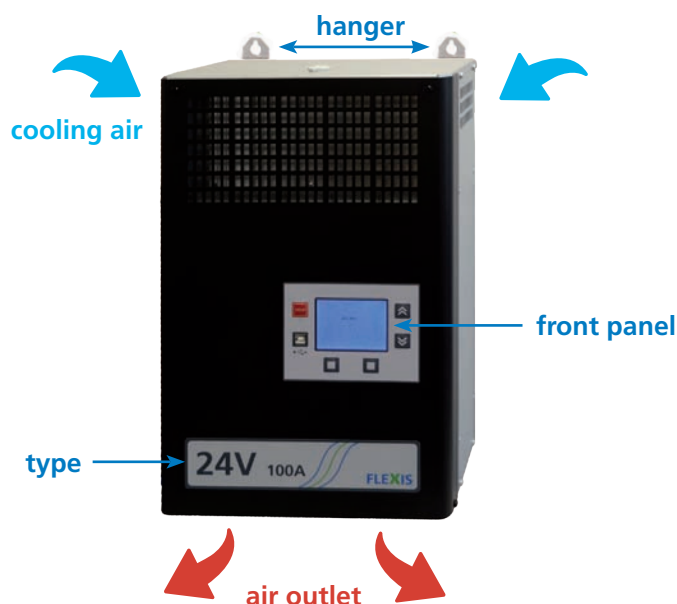


Chargers can be connected to data net with possibility of its monitoring and possibility of setting of the chargers via AXInet SW.



### IP20 design

Chargers are standardly in cases with IP20 protection intended for indoor use. Forced ventilation provides cooling.



### IP54 design

For dusty environment or for outdoor use are chargers designed in IP54 case, with additional fans and filters.



Chargers are designed for three shift operation.

Parameters of the charging are set via PC with configuration SW AXIFF, some parameters could be set directly on frontpanel of the charger.

### Possibility of charging of more different batteries with one charger:

#### A. Manual selection from more batteries

Enable to use charger for up to 20 different batteries with preset parameters.

- voltage, capacity and charging curve must be set
- selected batteries must be checked in „Use“ column
- aeration can be set only if the type of charger is EUW

For more information see chapter 5.4.

#### B. Automatical selection by voltage level

Enable to choose batteries on the base of its voltage.

- voltage, capacity and charging curve must be set
- selected batteries must be checked in „Use“ column
- aeration can be set only if the type of charger is EUW

For more information see chapter 5.4.

#### C. Selection by IM

Batteries equipped with identification modules are recognized automatically and charging proceed according to set parameters.

Enable to use one charger for different batteries.

- every IM have to be programmed
- voltage, capacity and charging curve must be set
- aeration can be set only if the type of charger is EUW

For more information see chapter 5.4



## 3.2 Technical parameters

Nominal supply voltage	one-phase 1 N PE 230V ±15% 50/60Hz or three-phase 3 N PE 400V +15%/-10% 50/60Hz
Nominal power input	see the table of types on next page
Input protection	single-pole or three-pole circuit breaker in charging station wiring size according to charger, C or D type characteristics
Inrush switch-on current	$\leq I_{nom}$
Efficiency	up to 94%
Protection class	I
Pollution class	2
Degree of protection	IP20, IP54
Degree of protection after charger opening	IP00
Electric strenght input - output	4,2 kVDC
Output voltage tolerance in measuring	±1%
Output current tolerance in measuring	±2%
Safety (LVD)	EN 60950-1
Electromagnetic compatibility (EMC )	EN 61000-6-2, EN 61000-6-4
Case colour	typically black or any customized
Mounting	hanging in vertical position/ equipped with a stand standing on horizontal surface
Charger cooling	internal ventilators
Placing of the in- and outputs	bottom side of the charger
Operating environment	-10°C to +40°C, max. rel. humidity 80%, non-condensing
Storage	in dry conditions -25°C up to +80°C max. rel. humidity 80%, non-condensing
Temperature sensor – dimensions	Ø 6mm, length 50mm, cable length 1,5m
Range of temperature measurement	-10°C up to 80°C
Electrolyte level sensor – dimmensions / voltage	Ø 8mm, length 150mm / 5 up to 9VDC

Types of chargers – IP20

Nominal output voltage (V)	Output current (A)	Type	Case		Weight (kg)		Mains protection (A)	Nominal input current (A)
			without air pump	with air pump	without air pump	with air pump		
24	60	FLEXIS 24E60	FF170	FF170	13	15	10	8,7
	100	FLEXIS 24E100	FF170	FF170	13	15	16	14,1
	100	FLEXIS 24D100	FF170	FF170	14	16	6	4,9
	200	FLEXIS 24D200	FF250	FF250	25	26	10	9,8
48	50	FLEXIS 48E50	FF170	FF170	13	15	16	14,1
	50	FLEXIS 48D50	FF170	FF170	14	16	6	4,9
	100	FLEXIS 48D100	FF170	FF170	18	20	10	8,0
	150	FLEXIS 48D150	FF250	FF250	27	28	16	12,9
	200	FLEXIS 48D200	FF250	FF250	30	31	20	16,0
80	25	FLEXIS 80E25	FF130	FF250	13	16	16	14,1
	25	FLEXIS 80D25	FF130	FF250	14	17	6	4,9
	50	FLEXIS 80D50	FF130	FF250	17	20	10	8,0
	75	FLEXIS 80D75	FF250	FF330	26	30	16	12,9
	100	FLEXIS 80D100	FF250	FF330	28	32	20	16,0
	125	FLEXIS 80D125	FF330	FF550	37	42	25	20,9
	150	FLEXIS 80D150	FF330	FF550	40	45	32	24,0
	175	FLEXIS 80D175	FF550	FF550	49	54	32	28,9
	200	FLEXIS 80D200	FF550	FF550	52	56	40	32,0
	225	FLEXIS 80D225	FF720	FF720	63	65	40	36,9

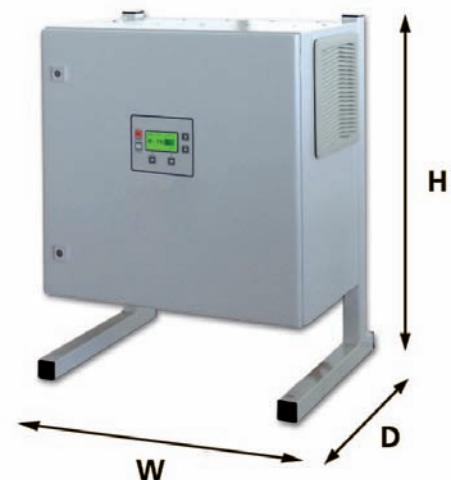
Case	Dimensions (mm)			Position of mounting holes (mm)	
	H	W	D	X	Y
FF170	477	302	169	230	515
FF250	477	302	254	230	515
FF330	477	302	339	230	515
FF550	477	547	339	499	515
FF720	477	717	339	669	515



Types of chargers – IP54

Nominal output voltage (V)	Output current (A)	Type	Case	Weight (kg)	Mains protection (A)	Nominal input current (A)
24	60	FLEXIS 24E60 P	S	26	10	8,7
	100	FLEXIS 24E100 P	S	29	16	14,1
	100	FLEXIS 24D100 P	S	29	6	4,9
	200	FLEXIS 24D200 P	M	40	10	9,8
48	50	FLEXIS 48E50 P	S	26	16	14,1
	50	FLEXIS 48D50 P	S	26	6	4,9
	100	FLEXIS 48D100 P	S	29	10	8,0
	150	FLEXIS 48D150 P	M	42	16	12,9
	200	FLEXIS 48D200 P	M	44	20	16,0
80	25	FLEXIS 80E25 P	S	26	16	14,1
	25	FLEXIS 80D25 P	S	26	6	4,9
	50	FLEXIS 80D50 P	S	29	10	8,0
	75	FLEXIS 80D75 P	M	42	16	12,9
	100	FLEXIS 80D100 P	M	44	20	16,0
	125	FLEXIS 80D125 P	L	52	25	20,9
	150	FLEXIS 80D150 P	L	55	32	24,0
	175	FLEXIS 80D175 P	L	64	32	28,9
	200	FLEXIS 80D200 P	L	67	40	32,0

Case	Dimensions H x W x D (mm)	
	without stand	with stand
S	600 x 380 x 210	800 x 380 x 210
M	600 x 380 x 350	800 x 380 x 350
L	600 x 600 x 350	800 x 600 x 350



### 3.3 Marking of chargers and its options

#### FLEXIS aabcc d e

- aa – nominal output voltage (24V, 36V, 48V, 72V, 80V, 96V, ...)
- b – type of power mains E – 1ph 230VAC, D – 3ph 400VAC
- cc – maximal output current
- d – EUW or EUW2 – charger equipped with airpump for electrolyte mixing  
– empty – charger without airpump
- e – number of charging protection


Examples of marking:

FLEXIS 48D100 EUW – Unom = 48V, I<sub>max</sub> = 100A, 3ph 400V mains, Airpump

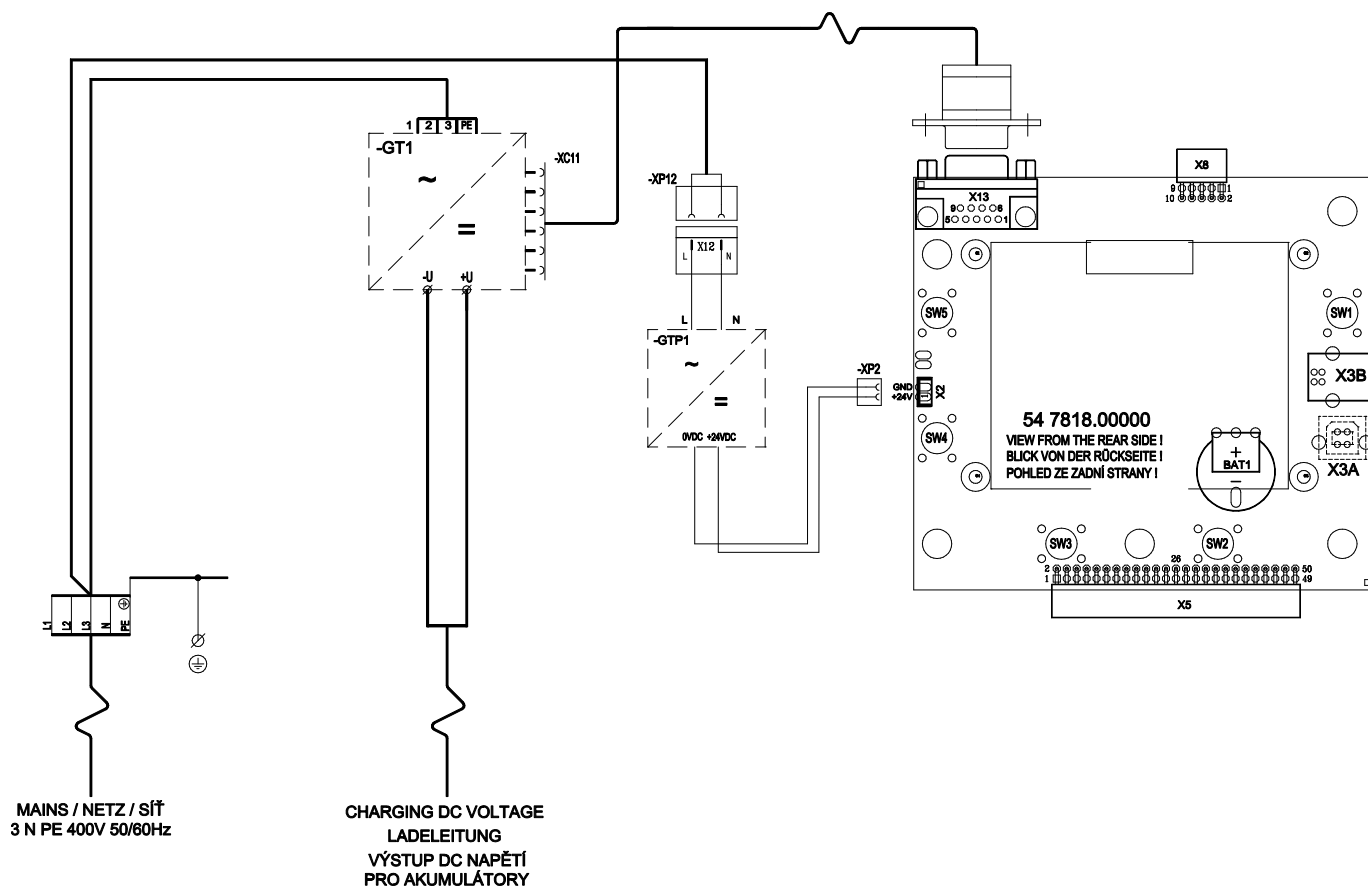
FLEXIS 24E100 - Unom = 24V, I<sub>max</sub> = 100A, 1ph 230V mains

#### Serial label

Serial label contains informations:

manufacturer	<b>AXIMA</b>	<b>BATTERY CHARGER</b>	
type of charger	TYPE <b>FLEXIS 24D100EUW</b>	SN <b>ABCDEF</b>	serial number
input parameters	INPUT <b>400</b> V <b>50</b> Hz <b>3 N PE</b> <b>4,9</b> A <b>3,4</b> kVA		symbol for waste management
output parameters	OUTPUT <b>24</b> VDC <b>100</b> A	<b>IP20/00</b>	charger protection
date of manufacture	DATE <b>ABCD</b> WEIGHT <b>18,5</b> kg <b>CE</b>		weight / CE mark

### 3.4 Blockdiagram of the FLEXIS CPU



### 3.5 Description of power units


Power unit (module) is HF switch mode power supply, fully controllable. Modules can be connected in parallel to achieve required power. Modules are controlled by control system, communication runs via digital CANBUS. There are few LEDs on the module for signalization of its stages.

#### AX4M

INPUT	AX4MV	AX4MP
Rated supply voltage	3ph 400V, 50/60Hz	1ph 230V, 50/60Hz
Input supply voltage range	3ph 360...460V AC / 470...650V DC*	1ph 195...265V AC / 260...470V DC*
Rated power input	3390VA	3250VA (1950VA)**
Nominal input current	4,9A	14,2A (8,5A)**
Inrush current	< Inom	
Recommended input protection	3P 6 A, characteristic C	1P 16 A (10A)** , characteristic C
* with external overcurrent protection		** AXMP24-60

OUTPUT	AX4MV24 / AX4MP24	AX4MV48 / AX4MP48	AX4MV96 / AX4MP96
Rated output voltage	24V DC	48V DC	96V DC
Output voltage adjustability	0...35V DC	0...70V DC	0...140V DC
Output voltage tolerance	± 1%		
Output voltage ripple	< 0,25V <sub>pp</sub>	< 0,25V <sub>pp</sub>	< 0,3V <sub>pp</sub>
Rated output current	100A (60A)**	50A	25A
Output current adjustability	0...100A (0...60A)**	0...50A	0...25A
Output current tolerance	± 2%		
Efficiency	93% / 90%	93% / 90%	94% / 91%
Power factor	0,92 / 0,99		

OUTPUT PROTECTION	AX4MV24 / AX4MP24	AX4MV48 / AX4MP48	AX4MV96 / AX4MP96
Independent overvoltage protection	< 40V	< 80V	< 160V
Overcurrent protection by fuse	✓	✓	✓
Electronic overcurrent protection	✓	✓	✓
Reversion of polarity protection	✓	✓	✓

CONNECTIBILITY, IP PROTECTION	AX4M – all types
Weight	6kg
Panel mounting	4 x screw M5
Operating conditions	-10 °C to +40 °C, max. relative humidity 80%, non-condensing
Storage	in dry rooms -25°C to +80°C, max. relative humidity 80%, non-condensing
Protection	IP20, except output terminals
Input / output	0,5 - 2,5mm <sup>2</sup> / 2 x screw M8
Output terminals	



## AX5MV

INPUT	AX5MV – all types
Rated supply voltage	3ph 400V, 50/60Hz
Input supply voltage range	3ph 360...460V AC / 470...650V DC*
Rated power input	5550VA
Nominal input current	8,0A
Inrush current	< I <sub>nom</sub>
Recommended input protection	3P 10 A, characteristic C

\* with external overcurrent protection

OUTPUT	AX5MV48	AX5MV96	AX5MV220	AX5MV400
Rated output voltage	48V DC	96V DC	220V DC	400V DC
Output voltage adjustability	0...70V DC	0...140V DC	0...300V DC	0...600V DC
Output voltage tolerance	± 1%			
Output voltage ripple	< 0,25V <sub>pp</sub>	< 0,3V <sub>pp</sub>	< 0,5V <sub>pp</sub>	< 1V <sub>pp</sub>
Rated output current	100A	50A	24A	12A
Output current adjustability	0...100A	0...50A	0...24A	0...12A
Output current tolerance	± 2%			
Efficiency	92%		94%	
Power factor	0.94			

OUTPUT PROTECTION	AX4MV48	AX4MV96	AX4MV220	AX4MV400
Independent overvoltage protection	< 80V	< 160V	< 340V	< 670V
Overcurrent protection by fuse	✓	✓	✓	✓
Electronic overcurrent protection	✓	✓	✓	✓
Reversion of polarity protection	✓	✓	✓	✓

CONNECTIBILITY, IP PROTECTION	AX4MV48	AX4MV96	AX4MV220	AX4MV400
Weight	9kg			
Panel mounting	4 x screw M6			
Operating conditions	-10 °C to +40 °C, max. relative humidity 80%, non-condensing			
Storage	in dry rooms -25°C to +80°C, max. relative humidity 80%, non-condensing			
Protection	IP20, except output terminals		IP20	
Input / output	0,5 - 2,5mm <sup>2</sup> / 2 x screw M8		up to 16mm <sup>2</sup>	
Output terminals				

## General informations

SAFETY	all types
LVD	EN 60950-1
Protection class	I
Pollution class	2

EMC	all types
EMC emissions	EN 61000-6-4
EMC resistivity	EN 61000-6-2
Harmonic current emissions	EN 61000-3-2



## Description of power unit

### X1 – configuration pin field

### X2 – connector for programming

- only for service, please don't use it

### X3 – CAN connector

- connector, type D-Sub 9 (Cannon 9)
- signals on connector are galvanic separated

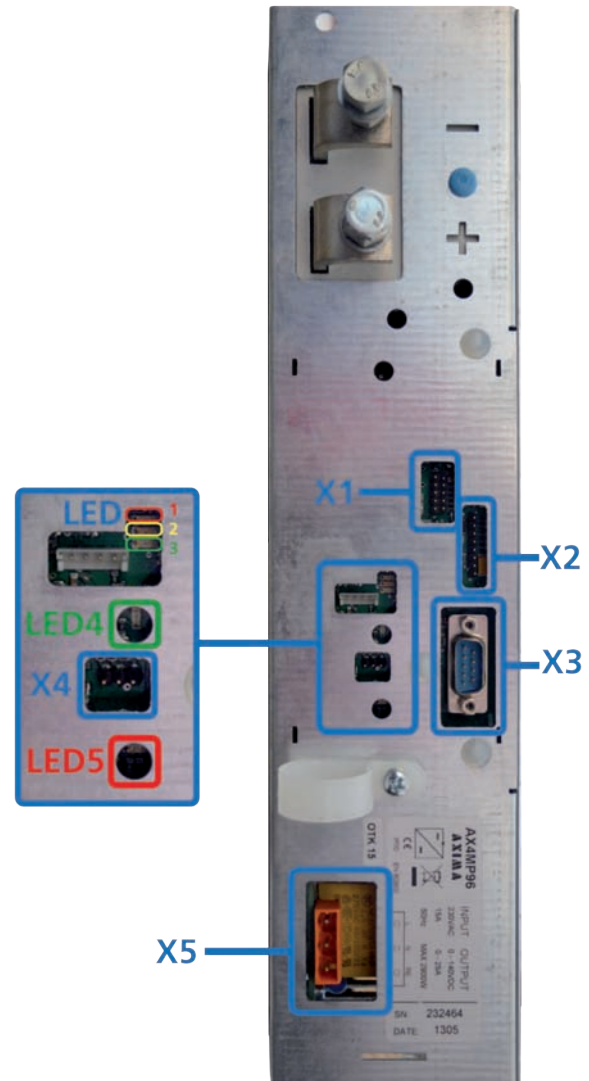
- pin 1 - offline
- pin 2 - CAN L
- pin 3 - GND
- pin 4 - offline
- pin 5 - GND
- pin 6 - GND
- pin 7 - CAN H
- pin 8 - offline
- pin 9 - external power supply +5V (cca 50 mA)

### X4 – connector for external control systems such as. AXIF108

- use a cable with connector JST XH 3pin, cable can be ordered in a length of 0.7 m
- output voltage of about  $\pm 13V$ , not stabilized, the maximum current consumption is 200 mA
- voltage is electrically connected with the output source

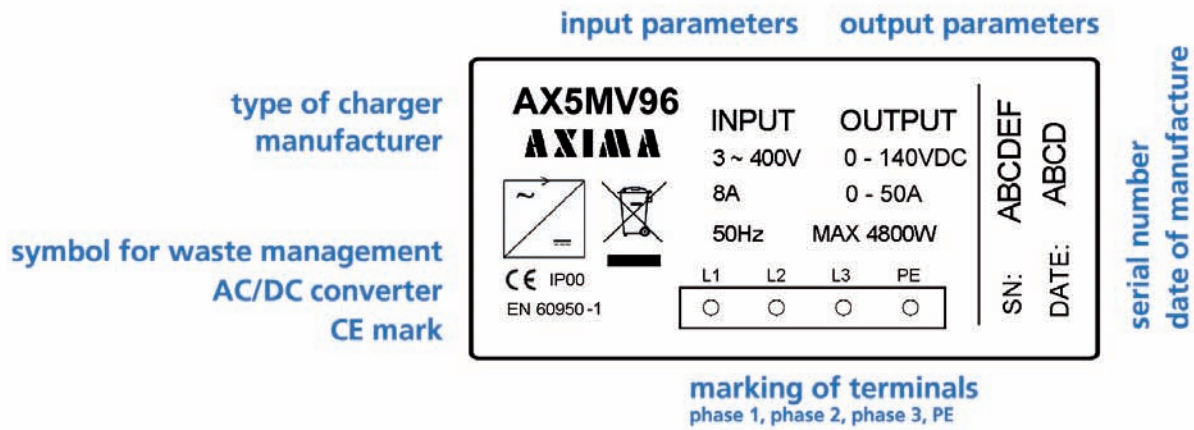
### X5 – power supply connector WAGO, spacing 7,62 mm

- AX4MV a AX5MV
  - counterpart WAGO 231-704/026-000 - direct
  - or WAGO 732-124/026-000 - angular
- AX4MP
  - counterpart WAGO 231-703/026-000 - direct
  - or WAGO 732-123/026-000 - angular



LED	Colour	Signification
1	red	<ul style="list-style-type: none"> <li>• failure</li> <li>• if lights, module don't work properly</li> <li>• overheating</li> <li>• low voltage of inner power supply</li> <li>• overvoltage on output</li> </ul>
2	yellow	<ul style="list-style-type: none"> <li>• failure</li> <li>• if blinking, communication with control system failed</li> </ul>
3	green	<ul style="list-style-type: none"> <li>• OK</li> <li>• if lights, module works properly</li> </ul>
4	green	<ul style="list-style-type: none"> <li>• function of inner power supply OK</li> <li>• if lights, inner power supply works properly</li> </ul>
5	red	<ul style="list-style-type: none"> <li>• failure of power supply</li> <li>• if lights, module don't work properly</li> <li>• undervoltage on input</li> <li>• overvoltage on input</li> <li>• one phase missing, module works on 2 phases at power lower than 1000 W</li> </ul>

## Description of production label of power unit



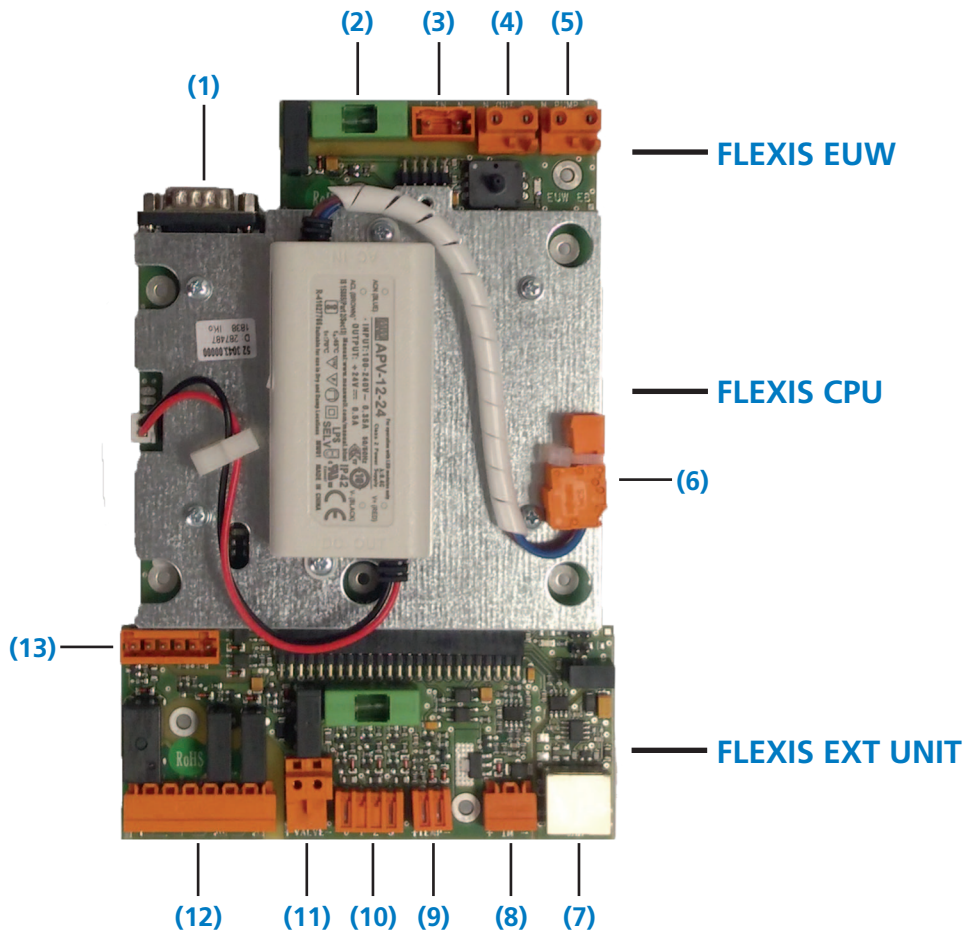
## 3.6 Control system FLEXIS

CPU controls charging proces, signalization of charging stages and saves data about charging. CPU is placed on frontpanel of the charger. It consists of display, 5 buttons and USB connector for communication with PC. Different options can be connected to this system, see chapter 6.

Basic versions of CPU FLEXIS:

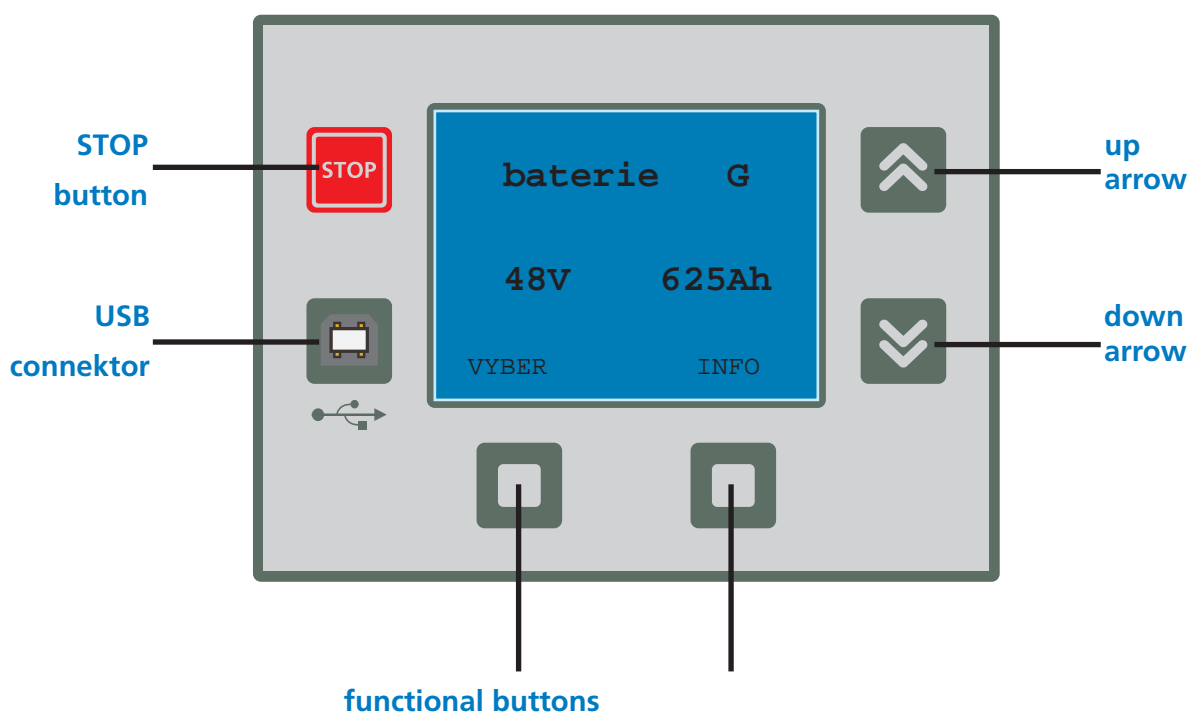
Name and order number	Use
FLEXIS CPU	standard
FLEXIS EXT UNIT	extension board
FLEXIS EUW 54 7821.00000	extension board for EUW

Description of control system: FLEXIS CPU + FLEXIS EXT UNIT + FLEXIS EUW



- (1) CAN - internal use
- (2) pump fuse
- (3) mains input
- (4) mains voltage
- (5) pump
- (6) power supply
- (7) CAN - external use
- (8) identification module (IM)
- (9) temperature sensor
- (10) LED signalization
- (11) water valve
- (12) signalization relay
- (13) inputs

Frontpanel description:





## 4. Charger installation

Placing:

- hanging on the wall – mounting with M5 - M8 screws
- on the floor hanging on a stand

Chargers are designed for operation in a vertical position.



Chargers must be placed in standard and equally ventilated inner premises with temperature up to +40°C. Charger has to be protected against acid aerosol from the battery. Charging station has to have optimally dimensioned ventilation.

Minimal side distance between the chargers and other devices or walls has to be kept.

Ventilation holes mustn't be covered!

If chargers are placed in a dusty environment, IP54 housing with a built-in filter must be used. The filter must be regularly cleaned or replaced. If the charger is destroyed due to heavy dustiness, warranty repair cannot be applied.

Chargers are equipped with standard mains cables, before connecting check the mains voltage.

Input of the chargers has to be protected by circuit breaker.

If the length of charging cables has to be changed, it is necessary to change new cable resistance in AXIFF setting programme.

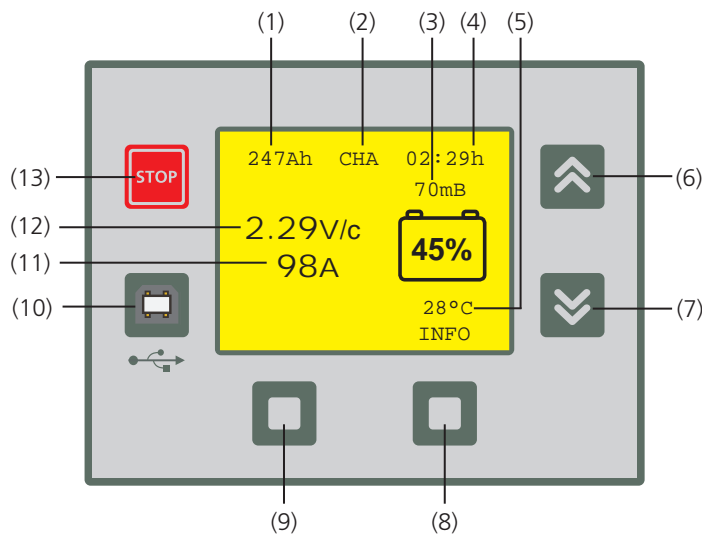
Positive pole of charging cables is marked red.

## 5. Charger operation

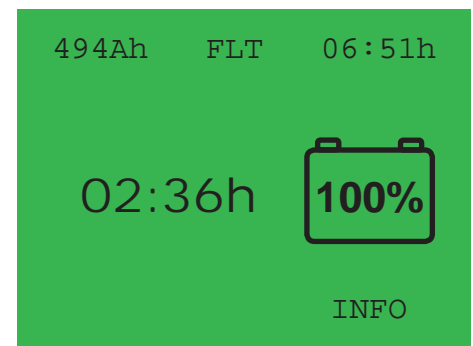
### 5.1 General instructions

- check the mains and charging cables before connecting of the charger into the mains
- check the voltage and the type of the battery, its parameters have to correspond with type and setting of the charger
- charging, after connecting of the battery, proceed automatically

### 5.2 Frontpanel description



- (1) Ah supply (2) charging phases (3) pressure (4) charging time  
(5) battery temperature (6) button up (7) button down  
(8) (9) function buttons (10) USB connector (11) charging current  
(12) battery voltage (V/cell) (13) "STOP" button



**Display colours:**

- blue** – standby mode (no battery connected)
- yellow** – charging or regeneration modes
- green** – battery charged
- red** – error

During the charging is displayed on display:

- delivered Ah
- code of charging phase (TST-test of the battery, CHA-charging, PST-final charging, FLT- float phase, MNT-maintaining charging, EQU-equalization, DES-desulphation)
- lapsed time from start of charging (hh:mm)
- voltage/cell (V/c) or battery voltage (V) or estimated time to end of charging cycle or alternating data
- output current (A)
- eventually display shows supposed time to end of charging instead of voltage and current values
- failure code (chapter 9)
- battery temperature, if the temperature sensor is used
- pressure, if pressure sensor is used
- after end of charging cycle is displayed: time from end of charging; duration of last charging cycle; delivered Ah; in case the temp. sensor is used - actual battery temperature

## 5.2.1 Charging of one type of battery

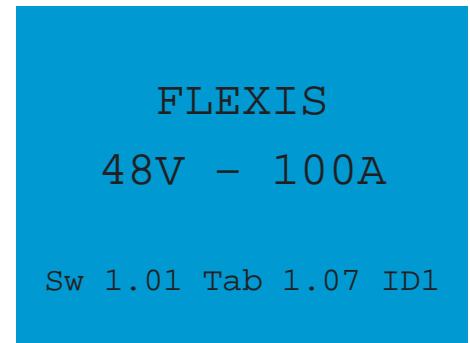
### Connect charger to the mains

on blue display are displayed these informations for 5s:

- type of charger
- FW version
- version of charging curves table
- ID of the charger (ID)

Then the charger switch to standby mode.

The default setting for standby mode display with blue backlight, unless set otherwise in the AXIFF configuration program.



### Now it is possible to connect the battery

display turns to yellow, informations about battery are displayed:

- voltage (V)
- capacity (Ah)
- charging curve
- actual battery voltage (V/cell)

### Charging starts automatically 10s after battery connecting

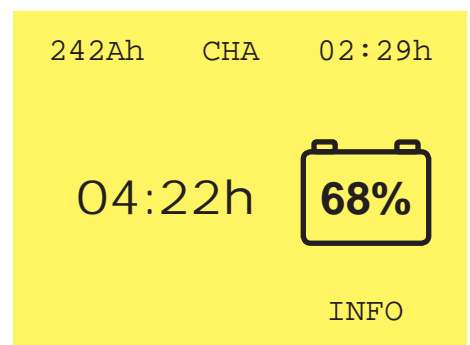
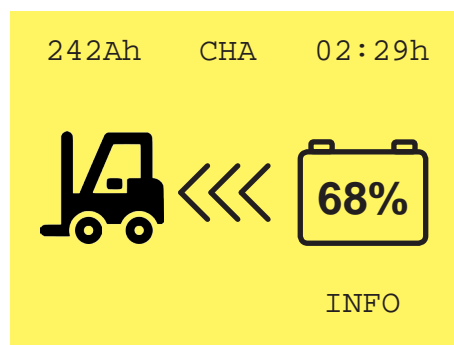
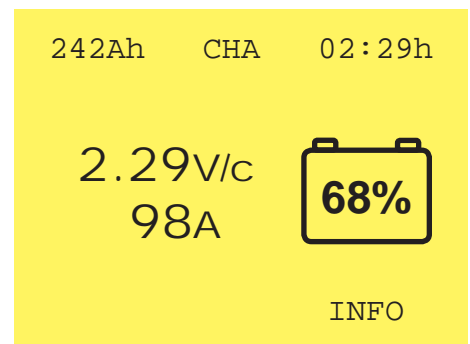
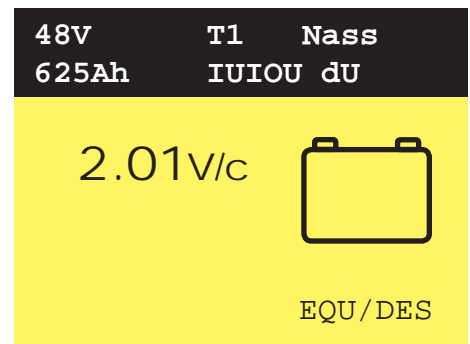
display shows actual charging data:

- delivered capacity (Ah)
- charging phase
- charging duration (hh:mm)
- eventually failurecode

### According to option:

1. time to end of charging and percentage battery capacity
2. actual battery voltage (V/cell) and current (A)
3. current battery voltage (V) and current (A)
4. to change the previous choices at a certain time interval according to the settings

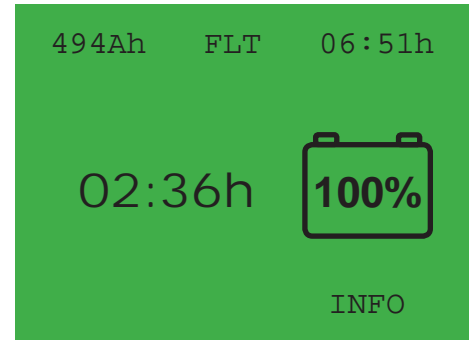
If the battery voltage is lower than 2,1V/cell (Pb batteries), test of battery internal impedance by current of 2%Cnom for 10 seconds initiates. If voltage during these 15s gets over 2,37V/cell, charging stops or continue according to choice in conf. programme AXIFF.



**Charging terminates automatically, without pressing STOP button**

display lights green with these data:

- delivered capacity during the charging cycle (Ah)
- duration of last charging cycle (hh:mm)
- time from end of charging cycle (hh:mm)
- icon of charged battery
- appropriate failurecode



If the battery has to be disconnected during the charging process (yellow display), terminate the process by pressing the STOP button and disconnect the battery.

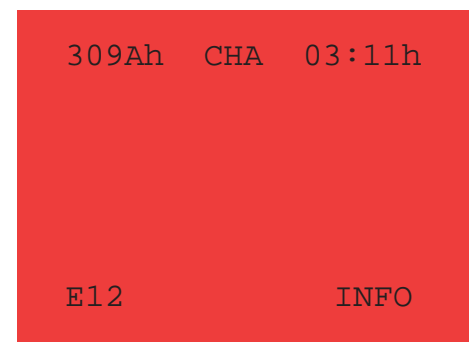


Caution: if the charger is disconnected from the supply network before the battery is disconnected, the charging cycle will not be recorded.

**Failure during the charging**

display is red with these data:

- delivered capacity (Ah)
- duration of the charging cycle (hh:mm)
- failurecode





### 5.2.2 Automatic recognition of battery

After connection battery is automatically recognized and charging started

### 5.2.3 Manual selection from more batteries

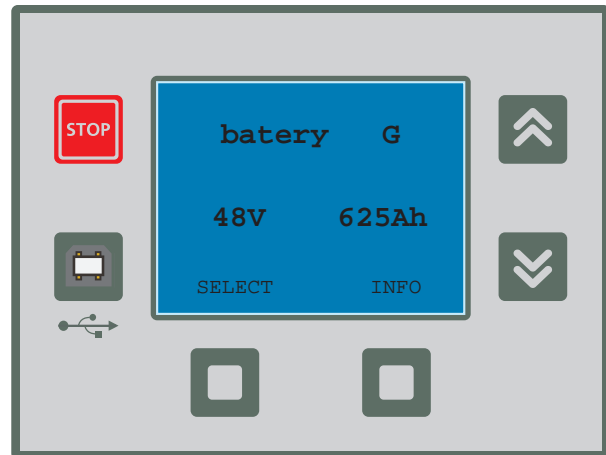
Enable to use charger for up to five different batteries. It is necessary to choose the battery and confirm. Charging proceed in the same way like mentioned above - see chapters 5.2 a 5.3.

Way of identification of batteries

manual choose from more batteries

Use	Battery name	Voltage V	Capacity Ah	Charging curve	Char. current A/100Ah	Aeration
<input checked="" type="checkbox"/>	A	24.0	375	T1	16.0	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	B	24.0	560	T1	16.0	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	C	24.0	875	T3	16.0	<input type="checkbox"/>
<input checked="" type="checkbox"/>	D	36.0	390	T4	16.0	<input type="checkbox"/>
<input checked="" type="checkbox"/>	E	36.0	480	UT1	14.0	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	F	48.0	500	T4	16.0	<input type="checkbox"/>
<input checked="" type="checkbox"/>	G	48.0	625	T7	14.0	<input type="checkbox"/>
<input checked="" type="checkbox"/>	H	48.0	750	T11	16.0	<input type="checkbox"/>
<input checked="" type="checkbox"/>	I	48.0	930	T7	14.0	<input type="checkbox"/>
<input checked="" type="checkbox"/>	J	80.0	500	T4	16.0	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	K	80.0	625	T9	16.0	<input checked="" type="checkbox"/>

Aeration pump setting



### 5.2.4 Automatic selection according to battery voltage

After connection, the battery type is detected automatically on the basis of its voltage. Battery type confirmation and the starting of the charging process can be initiated automatically or by pressing the "START" button. Charging then occurs in the standard aforementioned manner.

### 5.2.5 Automatically via the identification module

After connection of battery is battery automatically recognized – this has to be confirmed by press of START button, charging proceeds like described above.

## 5.3 Charger setting – frontpanel

On frontpanel can be set:

- battery parameters
- process of equalization and desulphation
- delayed charging
- operating data
- password

Setting on frontpanel could be used just by charging of one type of battery and by automatical selection according to IM.

### Description of setting

- to enter the setting mode press both right buttons together for approx. 5s
- in this mode is possible to set battery parameters, equalization, desulphation, delayed charging and change the password
- use right buttons like shifts up and down, selection confirm by press of SELECT button
- use RETURN button for reversion or to leave the setting menu

<b>battery</b>	voltage	set value
	capacity	set value
	curve	set value
	current	set value
	euw	check if using
	ident.modul	check if using
<b>equalization</b>	current	set value
	time	set value
	pulse count	set value
	equ once	check if using
<b>desulphation</b>	current	set value
	time des.	check if using
	time	set value
	auto des.	check if using
<b>postponed start</b>	postponed start	check if using and set time
<b>operating data</b>	time to end	check if using
	voltage (V/cell)	check if using
	battery voltage (V)	check if using
<b>new password</b>	new password	numeric code setting

Note: in regime „automatically according to IM“ is not possible to change battery parameters.



**Manufacturers of the battery cannot be held responsible for damages or issues caused by incorrect charger settings. In the event of uncertainty over user settings, please contact your supplier.**

**Item BATTERY**

- there is possible to set battery voltage, charging curve, main charging current, use of EUW and of IM.

- **Voltage**

- set nominal battery voltage and confirm by SAVE or leave by RETURN
  - 24V chargers – Unom settable from 2V (1 cell) up to 24V (12 cells)
  - 48V chargers – Unom settable from 12V (6 cells) up to 48V (24 cells)
  - 80V chargers – Unom settable from 12V (6 cells) up to 110V (55 cells)

- **Capacity**

- set battery capacity C5 and confirm by SAVE or leave by RETURN
- capacity can be set in range from 10Ah to 9999Ah. Maximal value of battery capacity depends on maximal current of charger and on set current/100Ah in item Current

- **Curve**

- choose suitable charging curve and confirm by SAVE or leave by RETURN

- **Current**

- set main charging current I1 and confirm by SAVE or leave by RETURN
- maximal value of charging current depends on maximal current of charger and on set battery capacity in item Capacity

- **EUW**

- by SELECT button select use or nonuse of EUW system
- parameters of EUW can be set in FLEXIS SW, if it is to contrary, default setting is used

- **Ident. modul (IM)**

- by SELECT button select use or nonuse of IM module
- IM can be set in FLEXIS SW, if it is to contrary, default setting is used

**Item EQUALIZATION**

- there is possible to set current, time, pulse count and equ once

- EQU settings from the front panel is possible only with curves UT, with preset curves, this option is disabled

- **Current**

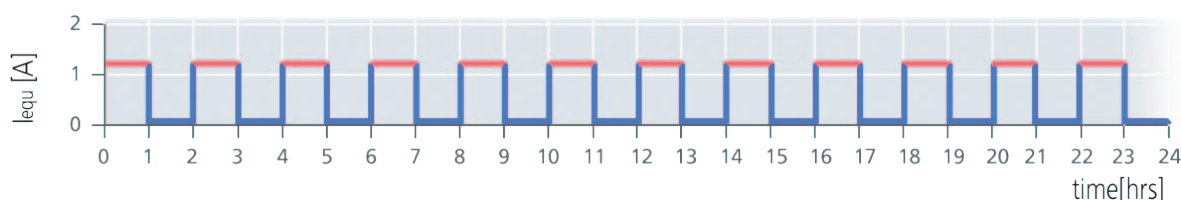
- set current of equalization and confirm by SAVE or leave by RETURN
- recommended value is 1,3A/100Ah for Pb batteries and 1,0A/100Ah for gel batteries

- **Time**

- set duration of equalization in hours and confirm by SAVE or leave by RETURN
- maximal value is 168 hours, recommended time is 24 hours

- **Pulse count**

- set pulse count and confirm by SAVE or leave by RETURN
- example – 24hrs equalization, 12 pulses, I<sub>equ</sub> 1,3A
- if the count of pulses = 0 - the current is steady for set time



- **Equ once**
  - if selected, equalization proceeds once after next charging cycle
  - can be used e.g. after service inspection

#### **Item DESULPHATION**

- there is possible to set current, time des., time and auto des.

- **Current**
  - set current of desulphation and confirm by SAVE or leave by RETURN
  - recommended value is 1,3A/100Ah for Pb batteries and 0,8A/100Ah for gel batteries
- **Time des.**
  - if this selection is choosen, desulphation runs for set time; if it is not choosen, desulphation runs up to set voltage
- **Time**
  - set duration of desulphation in hours and confirm by SAVE or leave by RETURN
  - maximal value is 168 hours, recommended time is 72 hours
- **Auto des.**
  - if selected, desulphation is started automatically after battery is connected in case of high internal resistance of battery (voltage increases to fast during initial test)

#### **Item POSTPONED START**

- if selected, postponed start of charging is activated, charging starts in set time automatically after battery is connected  
- set time for start of charging and confirm by SAVE or leave by RETURN



**If combination of postponed charging and manual start of charging is selected, it is necessary to press Start-button to activate postponed charging!**

**If postponed charging and manual start of charging is selected, it is possible to start charging cycle immediately by two presses of START-button.**

#### **Item OPERATING DATA**

- if selected by button SELECT is possible change items for show on display  
- select one or more of the items and confirm by SELECT button

#### **Item NEW PASSWORD**

- if the password is entered, menu of charger will be protected against unauthorized use  
- new password for menu opening can be entered – follow instructions on display  
- 0000 = no password

#### **How to proceed when password is lost**

- open FLEXIS software and login
- download data from charger
- in folder „Frontpanel of charger“ click „Lock of menu“
- upload data to charger
- in folder „Frontpanel of charger“ unclick „Lock of menu“
- upload data to charger
- on frontpanel of charger is now possible to enter new PIN

## 5.4 Configuration programme AXIFF

Configuration programme is intended for detailed setting of the charger via PC. It allows reading of data saved in charging archive and its print, it allows also inspection of the charger.

### 5.4.1 Installation of AXIFF software

Programme runs on standard operating systems Windows (XP, 7, 8 and 10). It is recommended, during installation, to switch off UAC (users account control) and install the programme like an admin.

#### Installation:

- A. Select AXIFF\_Setup\_V...exe (current version)
- B. Select language
- C. Launch the installation, follow default settings

### 5.4.2 Connection of the charger to PC and installation of drivers

- A. Connect charger to the mains, don't connect the battery
- B. Use USB cable (type A-B) to connect charger
- C. Communication should be set automatically, if the communication is not set automatically, it is necessary to install drivers, drivers can be found in C:/ Program Files / AXIFF / DRIVERS



**Battery mustn't be connected to charger during communication**

### 5.4.3 Description of AXIFF SW

Configuration programme AXIFF is intended for setting of FLEXIS and FORTIS chargers. It enables setting of all important parameters. At FLEXIS chargers, which have an internal memory, it allows also download of archive of last 2000 charging cycles and shows detailed informations about last charging cycle. Login users could use the programme in full range, from data download to configuration of parameters.

Without login it is possible to download, see and save archive of charging.

This windows appears after programme start:

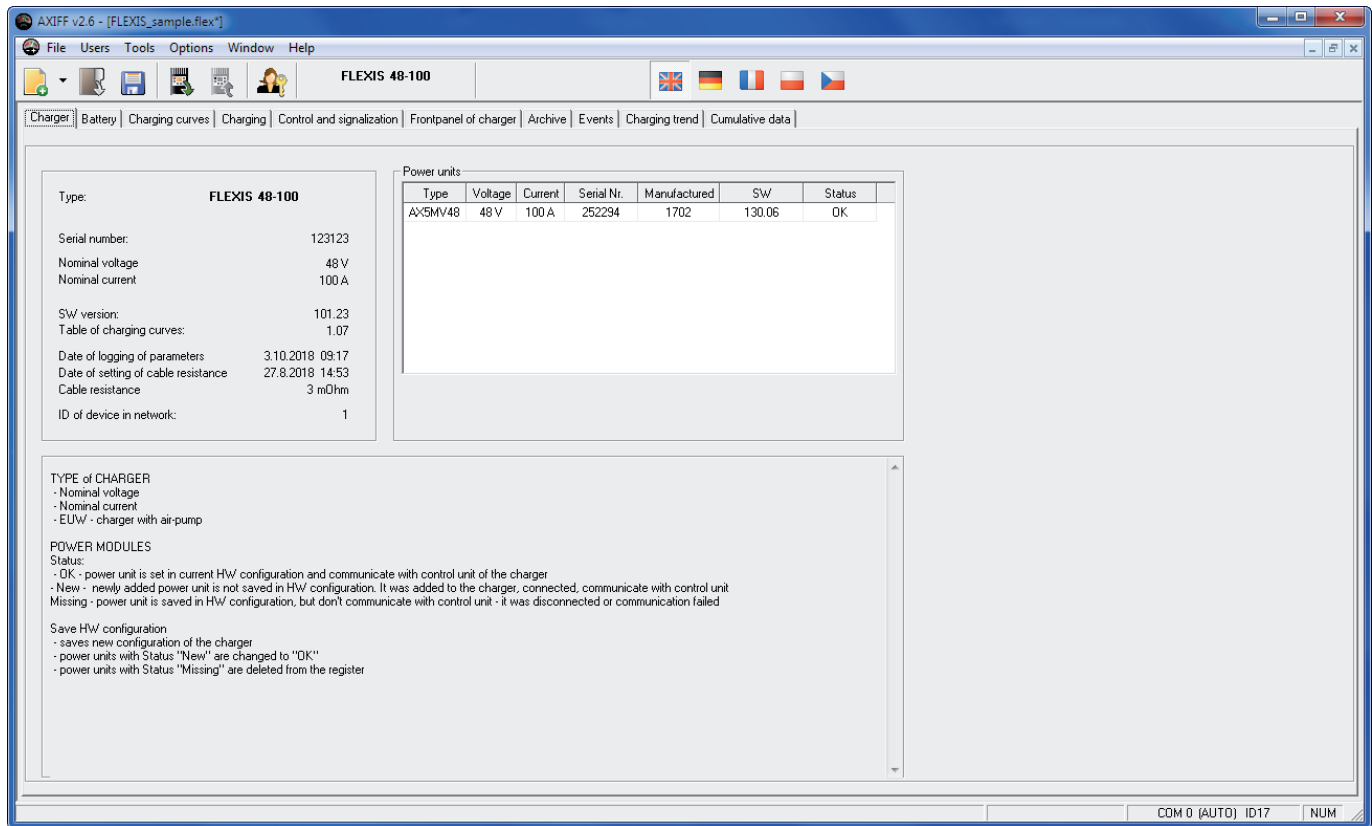


#### Download data from the charger:

- Menu / File / Download data...
- Click to the icone with green arrow in fast select menu
- Click to icone „Read from charger“ on surface

**For communication use USB cable type A-B.**

### Window „Charger“ after login:



### Menu bar contains following items:

<b>A) File</b>	data download to PC, data saving, charging curves update, printing of data, ...
<b>B) Users</b>	login, change of password, after login - user editing
<b>C) Tools</b>	setting of the charger, time and date, cable resistance, IM programming, HW analysis, erase of intended data, ...
<b>D) Options</b>	language selection, possibility to set communication between PC and the charger
<b>E) Window</b>	allows to set window shape and ordering
<b>F) Help</b>	documentation and informations about the SW

### Detailed description:

#### A) FILE

- *Download data (Ctrl+D)* – reads data from charger
- *Upload data to charger (Ctrl+U)* – writes data to charger
- *New* – enable to configure new setting of charger
- *Open (Ctrl+O)* – opens data from saved file
- *Save (Ctrl+S)* – save changed parameters
- *Save as* – saves configuration to the file
  - allows format conversion from old .file to new .flex, file .file could be saved as .flex, picture on charger display has to be reloaded
- *Upgrade curves* – enable to load file with charging characteristics
- *Save curves* – save actual table of charging curves to the file
- *Print* – for print select items



**Charger has to be connected with USB cable during download. Battery mustn't be connected to charger during communication.**



**Parameters will be changed – check the set parameters correspondent with battery type.**

## B) USERS

- *login (Ctrl+L)* – enable to login to programme and change parameters, upload parameters  
default login data are: *User name – admin, Password - password*
- *Change password* – enable to change login password; old and new password must be entered
- *Edit users* – enable to add or delete users accounts, every user can have own password

## C) TOOLS

- *Device setup* – Makes possible to enter Serial Number into device and to set device ID in network - standardly 1, if more chargers are connected to AXInet, every of them has to have its unique ID.
- *Set time* – enable to update time and date in device, time and date in device abide by time and date in PC
- *Setting of cable resistance* – cable resistance must be set according to the cross-section and lenght of charging cables, both charging cables must be considered (+ and -)

Approximate values:

Square / mm <sup>2</sup>	10	16	25	35	50	70	95
Resistance / mΩ per 1m	1,8	1,1	0,7	0,5	0,35	0,25	0,17
Value for setting 1m of cables	3,6	2,2	1,4	1	0,7	0,5	0,34

- *Programming IM* – see „selection by IM“ chapter BATTERY (page 31)



**It is possible to download data from IM by click on button „Read from IM“.**



**Don't connect battery with IM before Programming IM is activate – if it happens, it can start charging with wrong parameters.**

- *Hardware test* – allows to control external signalization, external control, power units fans and function of airpump, by click to appropriate button will be the function switched on/off, if there is connected any input, button for input will be displayed green
- *HW Analysis* – allows analyze charger modules, after press the „Start“ button will be start communication with modules and the records are written to the table, after press the „Stop“ button the table can be saved in .csv format to selected folder
- *Reset maintenance interval* – reset of a counter of maintenance interval – statement will start from zero



**Maintenance interval is possible to set in folder „Frontpanel of charger“ – Service inspection.**

- *Reset of airpump errors* – if charger is blocked because of airpump failures over-run, it is possible to unblock it by this button

## D) OPTIONS

- *Communication* – Provides communication between PC and device

Connection type:

*COM*

Serial port – shows COM ports for communication

Auto – must be checked

ID of device in network – standardly 1, if charger is connected to datanet, every number must be unique

*TCP/IP*

Device name – IP adress – IP address of device, Name – name of device (optional)

ID of device in network - standardly 1, if charger is connected to datanet, every number must be unique

## E) WINDOWS

- allows to minimalize or maximalize opened windows, range windows into cascade order and also to select between opened windows

## F) HELP

- *Documentation* – here are saved documents relevant to FLEXIS charger
- *About* – information about the SW

## Tool bar contains following icons:

<b>New</b>	enable to create new data file with battery parameters, accessible only for manufacturer
<b>Open</b>	enable to load data from file in computer
<b>Save</b>	enable to save data to file in computer
<b>Download data</b>	enable to download data from charger, data can be downloaded by mouse click to download icon in toolbar (green arrow)
<b>Upload data to charger</b>	changed data can be written to charger by mouseclick to upload icone in toolbar (red arrow)
<b>Login</b>	data can be changed and uploaded to charger after login  <b>Default login data:</b> Login: admin Password: password



## Folders bar contains following items:

<b>A) Charger</b>	enables to enter type of charger and here are also general informations about charger, such as serial number, nominal voltage, nominal current, FW version, version of table of charging curves, date of logging of parameters, date of last calibration, cable resistance and Id of device in network
<b>B) Battery</b>	enables to choose way of identification of battery and set informations about battery and required charging parameters
<b>C) Charging curves</b>	enable to choose and set charging characteristics, there are preset programmable curves (T) and possibility to create and save up to 20 users characteristics (UT) at preset curves (Txx) is possible to change charging current I1
<b>D) Charging</b>	setting parameters of battery charging
<b>E) Control and signalization</b>	enable to use inputs and outputs on control board of charger
<b>F) Frontpanel of charger</b>	enable to setting language, text on charger display etc.
<b>G) Archive</b>	in charging archive are recorded all important parameters of every charging cycle
<b>H) Events</b>	some important events and their date and time are recorded
<b>I) Charging trend</b>	trend of last charging cycle is recorded every 10min and charging diagram is displayed
<b>J) Cumulative data</b>	data about general operation of charger are registered

## Detailed description:

### A) CHARGER

#### Power units:

- here are informations about mounted power modules, such as type, voltage, current, serial nr., manufactured (date - yyww), SW version, status
- every connected module is logged, when connected, status is „OK“, when the module is disconnected, status is „Missing“
- after change of the configuration (exchange) of power units it can be confirmed by „Save HW configuration“ button, if it is not confirmed, old (removed) module will be displayed with status „Missing“

### B) BATTERY

#### Way of identification of battery:

- *charging of one type of battery (voltage, capacity)*
  - voltage, capacity, charging curve and charging current must be set
- *automatic recognition of battery*
  - allows automatic recognition and charging any type of Pb battery with liquid electrolyte
  - voltage, charging time and charging curve must be set
- *manual selection from more batteries*
  - enable to use charger for up to 20 different batteries – A, B, C,...
  - voltage, capacity and charging curve must be set
  - selected batteries must be checked in „Use“ column
  - aeration can be set only if the type of charger is EUW
- *automatical selection by voltage level*
  - enable to choose batteries on the base of its voltage
  - voltage, capacity and charging curve must be set
  - selected batteries must be checked in „Use“ column
  - aeration can be set only if the type of charger is EUW



**On same voltage level can be charged only batteries with similar capacity (max. 20% difference in capacity). Battery voltages can not be too close (e.g. 72V and 80V). Battery voltage must correspond to range of voltage of charger.**

- *selection by IM*
  - batteries equipped with identification modules are recognized automatically and charging proceed according to set parameters
  - enable to use one charger for different batteries
  - every IM have to be programmed: voltage, capacity and charging curve must be set
  - aeration can be set only if the type of charger is EUW



**If the choice „Start charging even over IM failure” is not selected, just batteries with IM will be charged.**

Identification module can be programmed separately or already installed on battery.

### Programming IM

- open AXIFF software, login, open folder battery, choose way of identification by IM
- press „Switch on IM” button - “PROGRAM IM” message must be shown on display of charger
- connect IM to charger
- fill in all parameters (code of battery, voltage, capacity, charging curve), optionally click also „Use aeration” and „Use temperature sensor”
- press „Write to IM” button
- message must be shown on display of charger
- press „Switch off IM” button
- disconnect the battery with IM
- Press „Switch off IM” button



**Selection „Use aeration” is available just for the types with aeration pump (EUW).**

### Aeration pump setting

- parameters are standardly set in production
- Min.. Max. pump pressure – range of pressure in aeration circuit (default setting 30..200mbar)
- Min.. pump pressure X mbar X s after shutoff - after switch-off of the pump is the pressure is measured in set time (default setting is 30mbar; 2s)
- Aeration pump ON – duration of airpump operation (default setting is 3min)
- Aeration pump OFF – duration of airpump-off state (default setting is 7min)
- Indicate E53 error after XX airpump failures – after detection of xx airpump failures (E51, E52, E54) is displayed aggregate error E53 and airpump is OFF for the rest of charging cycle
- Block charger after XX airpump failures – after xx airpump failures (E51, E52, E53, E54) is current charging cycle finished, than the charger is blocked. Reset of E55 failures by service company is necessary
- Decrease current at pump failure – when airpump failure is detected (E53 or E51 and E52 for longer than 1min), charging current in main phase is reduced to 80% of I<sub>max</sub>



**After installation check tightness of aeration system – during charging is pressure–value displayed on display.**



**During installation of the charger with airpump control whole aeration system (on charger and on battery). Leaks in hoses or in connector can cause malfunctions of aeration system!**

### C) CHARGING CURVES

- *Table of charging curves* – number of actual table of charging curves
- *Choose* – when marked, charging curve is chosen
- *Curve number* – T.. preset charging curve for traction batteries – some parameters can be adjusted (Battery type, Curve, I1)
  - UT.. users charging curve – can be create by copy of any other curve, than adjusted and saved:
    - by click with right mouse button choose any charging curve
    - select „Copy this curve to“ and choose the Nr. of curve
    - confirm by „Yes“ and than can be new curve adjusted (all parameters can be modified)



**Manufacturers of the battery charger cannot be held responsible for damages or issues caused by incorrect charger settings. In the event of uncertainty over user settings, please contact your supplier.**

- *Battery type* – preset charging curves are for batteries: Standard - wet (Nass) – lead-acid batteries (PzS, PzB)
- *Gel* – gel batteries (PzV, GiV, GiS)
- *Cell voltage V* – nominal voltage/cell
- *Curve* – type of battery care - it is possible to display the chart of charging curve by right mouse button
- *Umin (V/cell.)* – minimal voltage/cell for start of charging. If voltage of battery is lower, charging do not start
- *I1 (A/100Ah)* – main charging current (I1 phase)
- *tmax I1 (h:m)* – maximal duration of phase I1 (main charging phase)
- *Reaction* – if Tmax of I1 phase is overruned:

–	no reaction
»	transit to next stage
x	stop of charging
E»	transit to next stage with error
Ex	stop of charging with error

- *U1 (V/cell.)* – reach of gass voltage, start of U1 period (constant voltage phase)
- *tmin U1 (h:m)* – minimal duration of stage U1
- *Function of time in U1 phase* – calculation of maximal duration of U1 phase (constant voltage phase)
  - $tU1 * tI1$  – maximal duration of U1 phase is given by duration of I1 phase multiplied by the constant from right column (tU1 (max)) (constant/number)
  - $tU1 - tI1$  – maximal duration of U1 phase is entered in right column (tU1 (max)), from entered value (time) is deducted real duration of I1 phase (constant current phase)
  - $tU1 (max) (h:m)$  – maximal duration of phase U1 – constant voltage phase - in case, that in previous column (function of time in U1 phase ) is entered formula, is valid: if  $tU1 - tI1$  is entered – unit is time: hh:mm, if  $tU1 * tI1$  is entered – unit is the constant/number
  - ( $tI1$  – real duration of I1 phase (constant current phase + precharging = main charging phase))
- *Reaction after tmax U1* – same as for tmax I1
- *I2 (A/100Ah)* – current in I2 stage (postcharging current)
- *dU/dt (m)* – measuring of voltage divergence in set time. If dU is lower than 10mV/cell in set time – charging is stopped
- *Charging factor* – amount of energy (Ah) supplied into the battery during charging cycle (100% = 80% discharged battery)

- *tmin I2 (h:m)* – minimal duration of I2 phase (final charging); if 0 is set, minimal time for this phase is unset
- *function of time in I2 phase* – calculation of maximal duration of I2 phase (constant current 2 phase – final charging)
  - tI2\*tI1* – maximal duration of I2 phase is given by duration of I1 phase multiplied by the constant from right column (tI2 (max)) (constant/number)
  - tI2-tU1* – maximal duration of phase I2 is entered in right column (tI2 (max)), from the entered value is deducted real duration of phase U1
  - tI1+tU1* – maximal duration of phase I2 is entered in right column (tI2 (max)), to the entered value is added real duration of phase U1
  - tI2 \* (tI1 + tU1)* – maximal duration of I2 phase is given by multiplication of constant entered in right column (tI2 (max)) and summation of real duration of I1 and U1 phases
  - tI2(max) (h:m)* – maximal duration of I2 phase (postcharging), in case, that in previous column (Function of time in I2 phase ) is entered formula, is valid:
    - if *tI2\*tI1* is entered – unit is the constant/number
    - if *tI1-tU1* is entered – unit is time: hh:mm
    - if *tI1+tU1* is entered – unit is time: hh:mm
    - if *tI2 \* (tI1 + tU1)* is entered – unit is the constant/number
  - tI1* – real duration of I1 phase (constant current phase + precharging = main charging phase)
  - tU1* – real duration of U1 phase (constant voltage phase phase of reducing of current)
- *Reaction after tmax I2* – same as for tmax I1
- *Umax I2 (V/cell)* – maximal voltage in stage I2 (maximal voltage which can be reached in final charging phase)
  - if entered voltage is reached, transition to „Reaction after Umax I2“ comes
  - if entered voltage is not reached, charging ends according to selected charging curve (dU/dt; cf)
- *Reaction after Umax I2* – same as for tmax I1
- *U float ON (V/cell)* – voltage level, on which starts float voltage, this value must be lower than / same as the value of „Ufloat (V/cell)“
- *U float (V/cell)* – float voltage level, recommended values are 2,23V/cell (lead-acid) and 2,25V/cell (gel)
- *I float (A/100Ah)* – maximal current of float charging
- *tm ON (h)* – time of start of maintenance charging – if charger stays connected after charging cycle
- *Im (A/100Ah)* – current of maintenance charging
- *tm (h:m)* – duration of maintenance charging
- *Um OFF (V/cell)* – if battery during maintenance charging reaches entered value, maintenance charging is stopped



**Float charging and maintaining charging mustn't be entered together.**

- *Tbat MAX (°C)* – if temperature sensor or IM AXIM982 is used, temperature of battery is checked every two minutes. Maximal temperature for battery is possible to set in this column. If maximal temperature is reached charger responses according to setting in folder „Charging“
- *U/K (mV/cell/K)* – temperature compensation of charging voltage – output voltage is changed according to battery temperature by constant - XmV/cell/K
- *Iequ (A/100Ah)* – max. current of equalization
- *tequ* – duration of equalization in hours
- *Number of pulses* – number of current pulses during equalization process

### D) CHARGING

Charger	Battery	Charging curves	Charging	Control and signalization	Frontpanel of charger	Archive	Events	Charging trend	Cumulative data																																								
<div> <div> <b>Start of charging</b> <input type="checkbox"/> Manual start of charging           <input type="checkbox"/> Start charging in the case of IM-failure           <input type="checkbox"/> Postponed charging           Start charging at: <input type="text" value="22:00"/> </div> <div> <b>Equalization</b> <input type="checkbox"/> After finish of <input type="text" value="20"/> cycles           <input checked="" type="checkbox"/> After charging of deep discharged battery           <input checked="" type="checkbox"/> Weekend equalization           From: <input type="text" value="Saturday"/> To: <input type="text" value="Sunday"/>           From: <input type="text" value="12:00"/> To: <input type="text" value="22:00"/> </div> <div> <b>Desulphation</b> Desulphation current: <input type="text" value="1.3"/> A/100Ah           Duration of desulphation: <input type="text" value="72"/> h           <input checked="" type="checkbox"/> Permit automatic start of desulphation         </div> </div> <div> <b>Temperature and electrolyte state</b> <input type="checkbox"/> Use temperature sensor           Reduce current when sensor failed or when is reached TbatMAX on: <input type="text" value="50"/> %           <input type="checkbox"/> Stop charging at failure of temperature sensor           <input type="checkbox"/> No charging at low level of electrolyte         </div> <div> <b>Water refilling</b> <input type="checkbox"/> Use water refilling / signalization           <input checked="" type="radio"/> According to electrolyte level           Cycles for water refilling: <input type="text" value="5"/> <input checked="" type="radio"/> Only at weekend equalization           Water refilling duration 24,36V: <input type="text" value="01:30"/> m:s           Water refilling duration 48V: <input type="text" value="03:00"/> m:s           Water refilling duration 72,80,96V: <input type="text" value="06:00"/> m:s         </div> <div> <b>Time - schedule of charging</b> <table border="1"> <thead> <tr> <th>Day</th> <th>From</th> <th>To</th> <th>Charging curve</th> <th>Opp.</th> </tr> </thead> <tbody> <tr><td>Monday</td><td><input type="text" value="00:00"/></td><td><input type="text" value="00:00"/></td><td>UT1 Lead acid IUa OPF</td><td><input type="checkbox"/></td></tr> <tr><td>Tuesday</td><td><input type="text" value="00:00"/></td><td><input type="text" value="00:00"/></td><td>UT1 Lead acid IUa OPF</td><td><input type="checkbox"/></td></tr> <tr><td>Wednesday</td><td><input type="text" value="00:00"/></td><td><input type="text" value="00:00"/></td><td>UT1 Lead acid IUa OPF</td><td><input type="checkbox"/></td></tr> <tr><td>Thursday</td><td><input type="text" value="00:00"/></td><td><input type="text" value="00:00"/></td><td>UT1 Lead acid IUa OPF</td><td><input type="checkbox"/></td></tr> <tr><td>Friday</td><td><input type="text" value="00:00"/></td><td><input type="text" value="00:00"/></td><td>UT1 Lead acid IUa OPF</td><td><input type="checkbox"/></td></tr> <tr><td>Saturday</td><td><input type="text" value="00:00"/></td><td><input type="text" value="00:00"/></td><td>UT1 Lead acid IUa OPF</td><td><input type="checkbox"/></td></tr> <tr><td>Sunday</td><td><input type="text" value="00:00"/></td><td><input type="text" value="00:00"/></td><td>UT1 Lead acid IUa OPF</td><td><input type="checkbox"/></td></tr> </tbody> </table> </div>										Day	From	To	Charging curve	Opp.	Monday	<input type="text" value="00:00"/>	<input type="text" value="00:00"/>	UT1 Lead acid IUa OPF	<input type="checkbox"/>	Tuesday	<input type="text" value="00:00"/>	<input type="text" value="00:00"/>	UT1 Lead acid IUa OPF	<input type="checkbox"/>	Wednesday	<input type="text" value="00:00"/>	<input type="text" value="00:00"/>	UT1 Lead acid IUa OPF	<input type="checkbox"/>	Thursday	<input type="text" value="00:00"/>	<input type="text" value="00:00"/>	UT1 Lead acid IUa OPF	<input type="checkbox"/>	Friday	<input type="text" value="00:00"/>	<input type="text" value="00:00"/>	UT1 Lead acid IUa OPF	<input type="checkbox"/>	Saturday	<input type="text" value="00:00"/>	<input type="text" value="00:00"/>	UT1 Lead acid IUa OPF	<input type="checkbox"/>	Sunday	<input type="text" value="00:00"/>	<input type="text" value="00:00"/>	UT1 Lead acid IUa OPF	<input type="checkbox"/>
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Sunday	<input type="text" value="00:00"/>	<input type="text" value="00:00"/>	UT1 Lead acid IUa OPF	<input type="checkbox"/>																																													

#### Start of charging

- *Manual start of charging* – if checked, charging is started by press of START button
- *Start charging in the case of IM failure* – if selected, it will charge also batteries with no IM with parameters set in configuration SW
- *Postponed charging* – if checked, charging starts in set time automatically after battery is connected

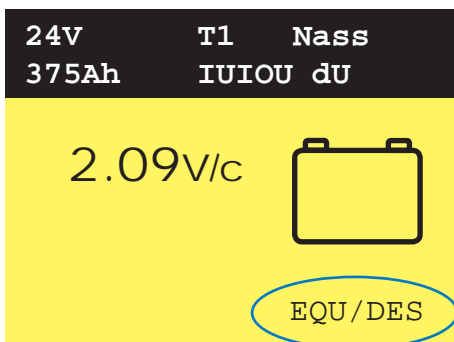


If postponed charging is selected, it is possible to start charging cycle immediately by press of Start-button. If combination of postponed charging and manual start of charging is selected, it is necessary to press Start-button to activate postponed charging! If postponed charging and manual start of charging is selected, it is possible to start charging cycle immediately by two presses of Start-button.

#### Equalization

- After finish of X cycles – if check, equalization is performed automatically after end of every X charging cycle. (Default setting: lead-acid: 1,3A/100Ah/24hrs; gel: 1,0A/100Ah/24hrs) – Setting of equalization – see charging curves
- After charging of deep discharged battery – if checked, equalization is performed after connection of battery which has less than 98% of Unom/cell

Equalization can be started manually by short press of button in waiting period (waiting period runs 10s after battery is connected to charger).



#### Weekend equalization

- select time interval for equalization - FROM - TO
- if the battery is charged and remains connected to the charger, equalization start at the set time - FROM,

- If the charging still proceeds in the time frame FROM - TO and the charging process ends in this time frame, equalization starts immediately after end of the regular charging cycle,
- equalization finishes in the set time TO
- if the equalization proceeds in the set time frame (FROM - TO) and the battery is disconnected and connected again, than the standard charging proceeds and after its end proceeds equalization again (if it is still in the time frame FROM - TO),
- time interval FROM - TO is the time frame in which the equalization proceeds, duration of equalization is set in the folder charging curves,
- if equalization interval overlaps with „Time – schedule“ and option Opportunity charging is selected, than the Time-schedule is expressed.

### Desulphation

*Desulphation current* – current of desulphation, recommended value is 1,0 – 1,3A/100Ah for lead-acid batteries; 0,8A/100Ah for gel batteries

*Duration of desulphation* – for time – there is possible set time of desulphation in hours

- according to voltage – charging by desulphation current according to formula or until voltage  $U_{max12}$  (V/cell) is reached – setting in charging curves

*Permit automatical start of desulphation* – if checked and voltage during initial test of battery increases too fast, desulphation is initiated automatically



**If the internal impedance of battery during the test is too high, error F11 is displayed.  
If the selection „Permit automatical start of desulphation“ is not selected and internal impedance during the test is too high, charging is stopped with F11 error.**

### Temperature measurement

Enable to measure battery temperature by temperature sensor, protect battery against overheating.

**Use temperature sensor** – if clicked, temperature sensor is used.

Reduce current when sensor failed or when is reached  $T_{batMAX}$  on X% – at failure of sensor or when critical temperature is reached (setting in charging curve), main charging current is reduced to entered value (%). Error E94 appears on display (default setting is 50%). If battery gets cool during the phase of reduced current, charging starts with  $I_{max}$  again.

Stop charging at failure of temperature sensor – When error on temperature sensor occurs, charging cycle is stopped. Error E94 appears on display.

If „No charging at low level of electrolyte“ is selected, control of electrolyte level after battery connecting is activated. If electrolyte level is low, warning appears on display and charging won't start. The battery has to be disconnected and the water refilled.

### Water refilling

Use Water refilling – activates automatical water refilling.

Water valve is switched by relay 1–4 in tab „Control and signalization“. „Water valve“ must be selected at the appropriate column.



**In case the charger is used for more batteries is this function bounded. It doesn't recognize single batteries and fill water every X cycle!  
For this function is necessary to install electrical water-filling valve!**

#### 1. According to electrolyte level

- If AXIM detects low electrolyte level, water refilling starts after finish of the charging cycle,
- If „No charging at low level of electrolyte“ is selected, electrolyte level is checked after connection of the battery; if the level of electrolyte is low, display shows notification „Low level of electrolyte - water refilling“ and the relay for the water valve is switched on for preset time. After refilling is the electrolyte level checked once more. If it is OK, charging starts. If electrolyte level is still low, display shows notification „Low level of electrolyte F18“ - display lights red. Charging doesn't start. Error notification stops showing on the display and the notice is written into the tab Events after disconnecting of the battery.

#### 2. Automatic after X cycles

- after end of X set charging cycle starts water refilling,
- Opportunity charging cycles, set in „Time – schedule of charging“ „Opp“, are not included as a standard charging cycles.

### 3. Weekend equalization

- water refilling performs only at weekend equalization, after 2 hours of equalization charging stops, water valve is opened after 10 seconds for preset time, after water refilling the equalization continues.

Water refilling time is adjustable according to battery type/Nr. of cells:

Battery rated voltage (Nr. of cells)	Entered voltage range	Recommened time for water refilling
24 V (12); 36 V (18)	1,2 V – 47,9 V	1:30 minutes
48 V (24)	48,0 V – 71,9 V	3:00 minutes
72 V (36); 80 V (40); 96 V (48)	72,0 V – 96 V	6:00 minutes

### Time – schedule of charging

- select the time interval for charging with different charging curve, in the set interval is used selected charging curve instead of the regular charging curve selected in folder battery or charging curves
- By check of „Opp“ is selected opportunity charging - for more read bellow,
- outside the interval set in the „Time schedule of the charging the charging proceeds according to curve selected in tab Battery,
- if the charging proceeds (in set period FROM - TO) and the time interval finishes (TO), continuance of charging depends on the choice „Opp“ (Opportunity):
  - if „Opp“option is selected, charging finishes and new charging cycle starts according to curve in the tab Battery, all standard conditions for start of charging ( $U < 2,30V/cell$ , temperature...) have to be satisfied
  - if option „Opp“ isn't selected, charging continues to full charge of the battery according to charging curve ( set in time schedule) or to battery disconnecting from the charger, after new connection of the battery to the charger, charging starts according to charging curve set in the tab Battery,
- If the charging starts with standard charging curve (set in the tab Battery), it continues also in the FROM-TO interval untill its end or untill battery disconnecting.

### Opportunity charging

Utilization of idle time for charging. Charging current of 25A-35A/100Ah is used. Chargers are placed in working area and the time necessary for forklift connection is minimal. Battery is usually charged with IUa charging curve up to 2,4V/cell, usually max. to 80-85%. Battery is fully charged up to 100% of its capacity once a day.

- Opportunity charging usually proceeds by the curves IUa OPP or IU0U OPP with higher curent I1,
- conditions for start of charging and for saving into the archive are changed when option Opp. is selected:
  - Charging starts immediatelly after the battery is connected, no test of the battery is performed
  - EQU and DES can't be selected,
  - Equalization nor desulphation won't proceed,
  - Display will show information Opp. (at standard charging shows CHA).
  - Data in tab „Charging trend“ won't be archived,
  - Each cycle will be registered in Archive
  - Opportunity charging cycles are written in Cumulative dates like a separate record „Nr. of cycles in opportunity“.



**E) CONTROL AND SIGNALIZATION****External control**

There are two independent inputs on control board for remote control of start, stop and pilot line.

*Input 1, 2*

*Unused* – no function assigned

*Start* – external start button activated

*Stop* – external stop button activated

*Pilot-line* – interconnexion of pilot line circuit is condition for start of charging, disconnection of this circuit stops the charging, after follow-up interconnection starts new charging cycle

*Other* – for custom made solutions

**Relay signalization**

*Relay 1, 2, 3* – these relays could signal several stages of charging. These relays are potential free. It could also switch on external cooling.

*Relay 4* – is designed for switching air pump and optional external charging of the charger in version with protection IP54, it also allows status indication as relay 1, 2, 3. Contacts are not potential-free, they are 230VAC.

*Relay 5* – is designed to switch the water valve, it also allows signals to be indicated as relay 1, 2, 3. The relay contacts are not potential-free, they have a voltage of 24VDC.

*Unused* – relay unused

*Charger in operation* – ready to charging

*Ubat after connecting less than X V/cell* – Voltage of connected battery is under setted value

*Charging* - all phases of charging cycle

*I<sub>max</sub> stage* – phase I1, constant voltage phase

*Uconst stage* – phase U1 – constant voltage phase; decrease of current

*Main charging finished* – I1 phase – main charging is finished

*PST stage* – postcharging phase I2

*Float stage* – charging finished, float charging activated

*Charging finished* – charging finished, battery is charged

*Equalization* – equalization stage

*Desulphation* – desulphating stage

*Pilot-line switched on* – circuit of pilot line is closed

*Charger under voltage* – Charger is connected to mains

*Failure - relay ON* – if failure occurs - relay switches on

*Failure - relay OFF* – if failure occurs - relay switches off

*Service inspection* – allert to service inspection

*Water valve* – water refilling system is working

*Postponed signalization (stage charged)* – relay switch on 1 hour after end of charging

*External cooling* – switching of external fan / heating of the charger (IP54 case)

*External heating* – switching of external heating of the charger (IP54 case)

*Other* – dedicated for optional/custom made SW





**Relay 4 is NOT potential-free, on its contacts is voltage 230VAC!**  
**Relay 5 is NOT potential-free, on its contacts is voltage 24VDC!**



#### **LED signalization**

Every charger can be equipped with signal column (standardly 3 coloured WERMA LED 24V) and every colour can signalize any assigned function – it can light continuously or it can flash (possibility of 2 functions for one colour part).

Connection diagram: see chapter 6

In left column choose the LED light (1-3) and its function (lighting or blinking).

In right column assign state which should be signalized by this LED:

*Unused* – Position on the column unused

*Charger in operation* - ready to charging

*Deep discharge* – deep discharged battery connected

*Charging* – all phases of charging cycle

*I<sub>max</sub> stage* – main charging phase

*U<sub>const</sub> stage* – constant voltage phase

*PST stage* – final charging phase

*Float stage* - float charging (charging finished)

*Charging finished* – charging finished, battery is charged

*Equalization* – equalization stage

*Desulphation* – desulphating stage

*Charger under voltage* – charger connected to mains

*Failure* – failure of the charger

*Postponed signalization (stage charged)* – relay switch on 1 hour after end of charging

*External heating* – heating of the charger

*Other* – dedicated for optional/custom made SW



**Only one stage can be assigned to one LED and its function. Assignment of signalization of more stages to one LED and its function causes disfunction.**

#### **F) FRONTPANEL OF CHARGER**

##### **Control panel of charger:**

*Language* – select the language of device – English, German, Czech, Polish

*Lock of menu* – forbid the possibility to open the menu of charger. Parameters can not be changed on frontpanel of charger

*Service inspection* – if clicked, appeal to the service inspection will be displayed:



*After operative hours* – after count of entered working hours is reached – only hours of charging are counted

*After months* – after count of entered months is reached

*Summertime* – for automatic time change

#### **Text on display:**

In waiting phase can be displayed eight-line entered text or jpg, gif or bmp picture.

*Eight-line text* – there can be entered eight-line text (maximally 20 marks per line)

*Picture 320x240* – coloured picture in format bmp can be entered – maximal resolution 320x240 pixels

#### **G) ARCHIVE**

- in charging archive are recorded all important parameters of every charging cycle



**For better overview can be some parameters sorted by filter (placed in left upper corner). By use of filter are displayed only filtered charging cycles with event (All charging cycles; Ex error; Fx error; Equalization; Desulphation; Cycles stopped by user). Every parameter can be sorted uplink or downlink by click to its heading.**

*Ord. nr.* – ordinal number of charging cycle. Maximal nr. is 2000, after 2000 is reached, sequencing starts from 1 again

*Date and time* – date and time of start of charging cycle

*Tab. version* – version of charging curves table

*Battery ID* – Identification Nr. of battery – in case of use of choice from more batteries (IM)

*Charging curve* – Nr. of charging characteristics (setting in bookmark „charging curves“)

*Charging current* – current in main phase of charging

*Time* – duration of whole charging cycle

*Capacity* – total supplied capacity during whole charging cycle

*Time of period I1* – Duration of main charging phase

*Capacity of period I1* – Charged capacity during main phase

*Time of period U1* – Duration of phase U1 (constant voltage phase)

*Capacity of period U1* – Capacity charged during phase U1

*Time of period I2* – Duration of postcharging phase

*Capacity of period I2* – Capacity charged during postcharging

*Start voltage V<sub>cell</sub>* – Voltage of battery after connecting

*Final voltage V<sub>cell</sub>* – Voltage at the end of charging

*Final I* – absolute value of current at the end of charging cycle

*Final °C* – Temperature of battery after charging

*F errors* – Codes of F errors recorded during charging

*E errors* – Codes of E errors recorded during charging

*Info* – Additional info

## H) EVENTS

Some important events and their date and time are recorded.

*Date and time* – moment when the event happens

*Code of event* – there are several recorded events:

- Connected to power mains
- Disconnect from power mains
- Deep discharged battery connected
- Save data
- Delete cumulative data
- Delete charging archive
- Calibration
- Delete aeration pump errors – count of deleting of cumulative errors of airpump
- Module error code (see table of fault reporting on p. 48)

*Info* – additional informations, e.g. V/cell, ...

## I) CHARGING TREND

Trend of last charging cycle is recorded every 10min and charging diagram is displayed – voltage, current, temperature of battery (in case the temp. sensor is used).

*Date and time* – moment of record

*U* – actual voltage (V/cell)

*I* – actual current (A)

*T* – actual temperature

## J) CUMULATIVE DATA

Data about general operation of charger are enregistered

- Total charged capacity – number of Ah supplied during all charging cycles
- Total capacity charged during postcharging – number of Ah supplied during all PST phases
- Total charging time – duration of all charging cycles
- Total number of charging cycles – number of all charging cycles
- Number of finished cycles – nr. of cycles with standard end of charging
- Cycles stopped by operator – nr. of cycles stopped by stop button
- Cycles stopped by disconnecting of the battery – nr. of cycles stopped by improper disconnecting of the battery
- Nr. of cycles finished by error
- Deep discharged battery (U) – low voltage after connexion of battery (less than 98% of  $U_{nom}$ , E11 occurs on display)
- Deep discharged battery (Capacity) – in main charging phase was delivered more than 90% of  $C_{nom}$  (failure E24 occurs on display)
- Aeration pump errors – errors from E51 to E55

### 5.4.4 Creation of users charging curves

It is possible to make up to 20 users charging curves in table of charging curves, use follow steps:

- in fold *Charging curves* choose any curve like a sample for users charging curve
- click to the curve by right mouse-button
- choose the option „Copy this curve to“ and select any UT curve ... (already existing charging curves are marked by check mark)
- confirm copy to user curve
- it is possible to change all parameters of user curve
- to use this curve it is necessary to choose this curve and upload data to the charger

### 5.4.5 Upgrade of charging curves

Table of charging curves can be upgraded:

- open File/Upgrade curves in menu
- choose and mark .flxc file with new curves and select Open

- report of success of upgrade is displayed
- new curves have default setting

Upgrade of the curves with already existing user curves:

- open File/Upgrade curves in menu
- choose and mark .flxc file with new curves and select Open
- the question „Delete old user curves?“ is displayed
- if YES is selected - old user curves are erased
- if NO is selected - old user curves are kept/saved

### 5.4.6 Firmware Upgrade

To upgrade FW of the charger follow these instructions:  
If charger is switch-on it has to be in standby mode.

#### Method 1

- switch-on the charger (connect to the mains)
- interconnect charger and PC by USB cable
- run AXIFF config software
- click on Tools
- click on Firmware Upgrade
- click on Open and select right file (.dfu)
- click on Upgrade
- press and hold down left lower button under the display for 2s
- wait for the upgrade finish
- switch off the charger from the mains, wait 5s and connect it again, display lights blue and new FW version is displayed

#### Method 2

- charger has to be switched off, disconnected from mains
- interconnect charger and PC by USB cable
- press and hold both down buttons under the display
- still hold the buttons and at the same time connect charger to the mains
- charger switch on but the display stays switched off
- run AXIFF config software
- click on Tools
- click on Firmware Upgrade
- click on Open and select right file (.dfu)
- click on Upgrade
- wait for the upgrade finish
- switch off the charger from the mains, wait 5s and connect it again, display lights blue and new FW version is displayed

#### Method 3

- switch-on the charger (connect to the mains)
- interconnect charger and PC by USB cable
- press and hold both buttons under the display and both buttons right from display (shifts) for approximately 5s, until display switch off
- run AXIFF config software
- click on Tools
- click on Firmware Upgrade
- click on Open and select right file (.dfu)
- click on Upgrade
- wait for the upgrade finish
- switch off the charger from the mains, wait 5s and connect it again, display lights blue and new FW version is displayed

**If upgrade will not be successful, repeat the upgrade again and do it only according to Method 2!**

## 6. Optional equipment



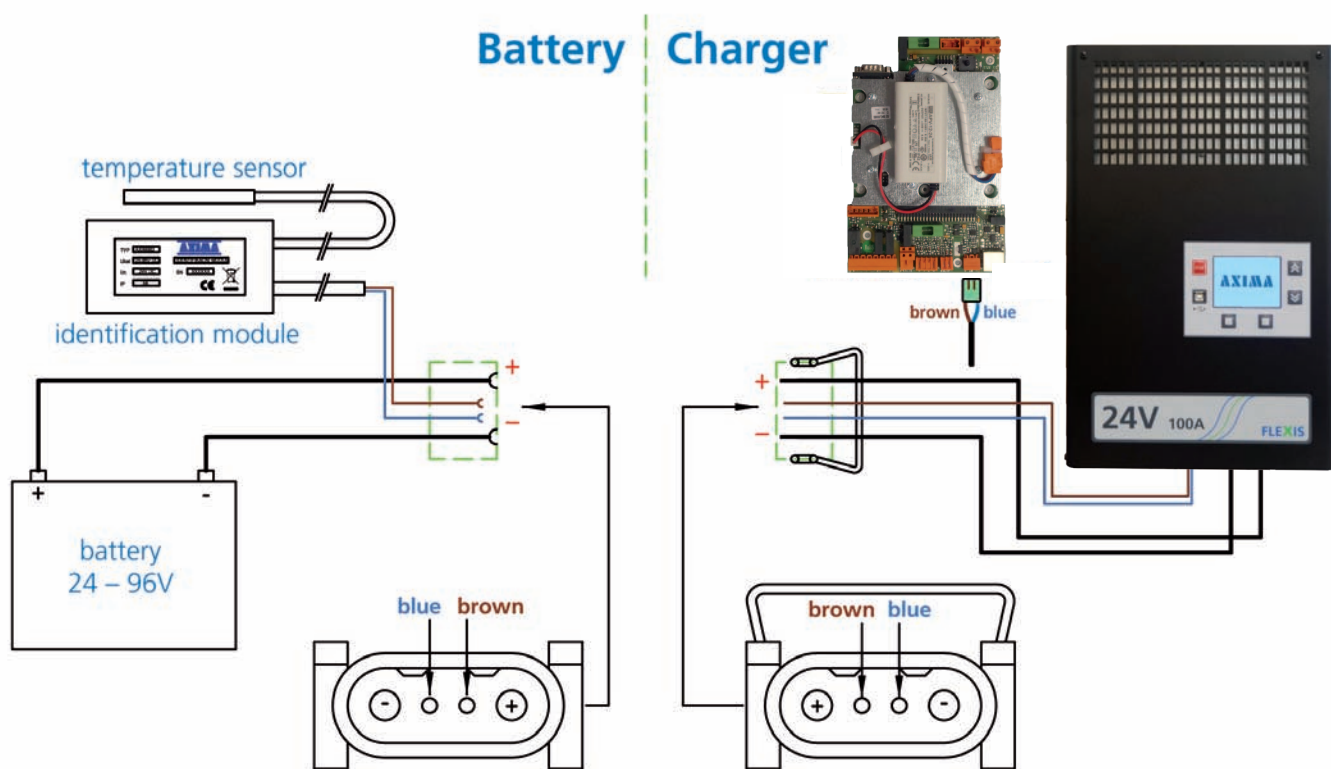
### 6.1 Identification module

Identification module holds saved parameters and allows identification of different types of batteries. One charger can be used for charging of more batteries equipped with IM.

#### Installation:

IM is placed in a suitable position on the battery using two-side adhesive tape. It is connected to the charger by two wires. They serve for the supply of the module and also for communication between the IM and the charger. + and – polarity is marked on the uP board. Connection to the charger is through auxiliary contacts of charging connector.

- AXIM981 – standard module for battery recognition
- AXIM982 – IM equipped with temperature sensor – allows to check battery temperature and compensation of charging voltage according to battery temperature, temperature sensor is placed in the middle of the battery engaged between the cells



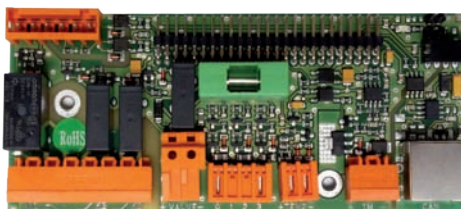
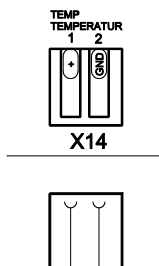


## 6.2 Temperature sensor

Temperature sensor allows to check battery temperature and compensation of charging voltage according to battery temperature. Temperature sensor is placed in the middle of the battery engaged between the cells. Connection to the charger is through auxiliary contacts of charging connector.

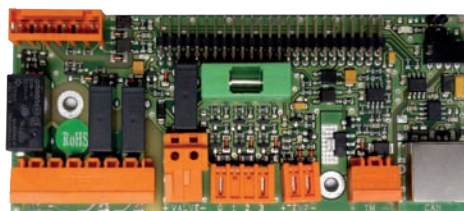
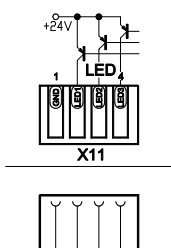
If temperature sensor or IM AXIM982 is used, temperature of battery is checked every two minutes. It has two functions:

- compensation of charging voltage according to battery temperature
- protection against overheating



## 6.3 Signal column – remote indication

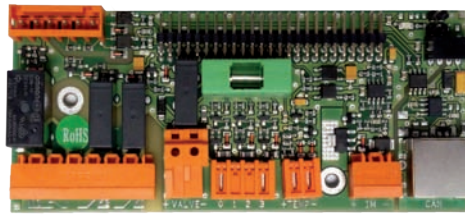
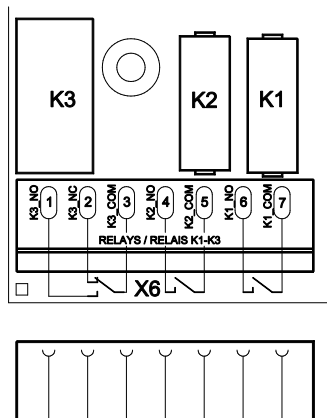
External 1-3 coloured signal column can be used. Single stages and phases of charging cycle can be signaled by flashing or lighting of different colours. Use 24VDC LED lights.





#### 6.4 Relay signaling

Different stages and phases of charging cycle can be signaled by three independent potential-free relays. See chapter 5.4 for setting. Resistive rated load is 5A/250VAC or 5A/30VDC.



#### 6.5 Remote control

The charger can be remotely controlled by connecting 24V DC to the WAGO terminal marked "IN1" and "IN2". Terminal for remote control is located on the down side of the control board.

To the Input 1 can be assigned: - Start - Stop - Pilot-line - Other

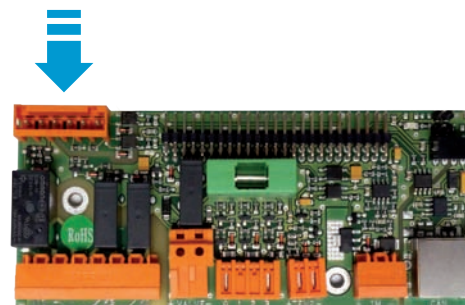
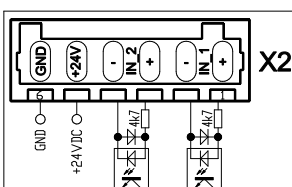
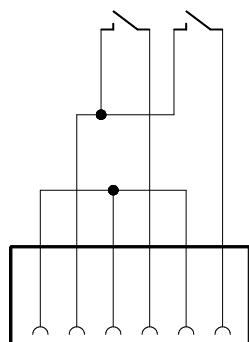
To the Input 2 can be assigned: - Start - Stop - Pilot-line - Other

For external start of charging is necessary to close the contact shortly for approximately 0,5s.

For external stop of charging is necessary to close the contact shortly for approximately 0,5s.

Pilot-line is an equivalent of start-stop, connexion of pilot-line is also condition for charging. After connexion of pilot-line starts charging, when the pilot-line is disconnected, charging stops.

See chapter 5.4 for setting.



## 6.6 Other optional equipment

Item	Description	Necessary to order	Group
AXI FF MONO200	for case FF170, FF250		support stand
AXI FF MONO300	for case FF330, FF550, FF720		support stand
AXI FF ROBUST	incl. holder for a balancer		support stand
AXI FF CAGE	for service charger		support stand
FLEXIS CPU MAX	exchange of standard CPU for CPU MAX		control board
FORTIS CPU MAX	exchange of standard CPU for CPU MAX		control board
AXI FF PILOT	start and stop of charging by two wire pilot line charging proceeds only during the pilot line is short connected	FLEXIS EXT UNIT - auxiliary contacts for battery connector (if a battery connector is a part of delivery)	pilot-line
AXI FF 1LED	signalization column on the top of the battery charger one signal light: green incl. cable and connector Wago	FLEXIS EXT UNIT	signalization column
AXI FF 2LED	signalization column on the top of the battery charger two signal lights: red, green incl. cable and connector Wago	FLEXIS EXT UNIT	signalization column
AXI FF 3LED	signalization column on the top of the battery charger three signal lights: red, yellow, green incl. cable and connector Wago	FLEXIS EXT UNIT	signalization column
AXI FF RAMI R/G	signalization light for panel ( for on-board battery charger) incl. cable and connector Wago	FLEXIS EXT UNIT	signalization light
AXIM981x	box AXIM981		battery identification and measuring of battery temperature
AXIM982x	box AXIM982 with temperature sensor and two-pole-cable	FLEXIS EXT UNIT - auxiliary contacts for battery connector (if a battery connector is a part of delivery)	battery identification and measuring of battery temperature
AXIM983x	box AXIM982 with temperature sensor and electrolyte sensor	FLEXIS EXT UNIT	battery identification and measuring of battery temperature
AXI FF IMC	cable 54 4091.00000, Wago connector, cable gland	FLEXIS EXT UNIT - auxiliary contacts for battery connector (if a battery connector is a part of delivery)	battery identification
AXI FF SEN20M	temperature sensor with 2 meter cable	FLEXIS EXT UNIT - auxiliary contacts for battery connector (if a battery connector is a part of delivery)	measuring of battery temperature
AXI FF SEN37M	temperature sensor with 3,7 meter cable	FLEXIS EXT UNIT - auxiliary contacts for battery connector (if a battery connector is a part of delivery)	measuring of battery temperature
AXI FF TC	cable for temperature sensor, Wago connector, cable gland	FLEXIS EXT UNIT - auxiliary contacts for battery connector (if a battery connector is a part of delivery)	measuring of battery temperature
AXI FF AQUA230	output for solenoid valve 230VAC (cable, connector Wago, connector Wieland incl. counterpart)	FLEXIS EXT UNIT	control system for aquamatic
AXI FF AQUAX	output for solenoid valve potential free contact (cable, connector Wago, connector Wieland incl. counterpart)	FLEXIS EXT UNIT	control system for aquamatic
AXI FF STOP	box with STOP button and 4m cable inc. Wago	FLEXIS EXT UNIT	remote stop button
AXI FF STARTSTOP	box with START and STOP buttons and 4m cable incl. Wago	FLEXIS CPU MAX	remote start and stop buttons



## 7. Storage and delivery

The charger is provided in a pre-assembled state and comes with an User instruction. Each charger is pre-tested for operability.

Items are shipped wrapped in cardboard packaging. During transportation and storage it is crucial to heed information contained in appended labels: protection against extreme weather conditions (rain, snow); protection against knocks and falls; which way up the package must face.

During any kind of additional handling, the charger must be transported in appropriate packaging.

The charger must be stored in a dry interior environment with temperatures ranging from -25°C to +80°C with relative humidity not in excess of 80% (non-condensing).

## 8. Service



**In case of a defective charger contact your dealer for assistance. Never try to repair the charger yourself.**

### Warranty

The charger is covered by a standard two year warranty from time of purchase.

In the event the product develops a fault, please contact your supplier.

Do not under any circumstances attempt to repair a faulty unit.

## 8.1 Spare parts

Order number	Name	Use
AX5MV48	Power unit	
AX5MV96	Power unit	
AX4MV24	Power unit	
AX4MV48	Power unit	
AX4MV96	Power unit	
AX4MP24-60	Power unit	
AX4MP24	Power unit	
AX4MP48	Power unit	
AX4MP96	Power unit	
AX5MV220	Power unit	
FLEXIS CPU	Control unit	
FLEXIS EXT UNIT	Extension board	
FLEXIS EUW1	Extension board with air pump	
FLEXIS EUW2	Extension board with two air pumps, built in module	
FLEXIS EUW2+	Extension board with two air pumps	
WE64080000	base	
WE64420075	LED lighting part green	
WE64430075	LED lighting part yellow	
WE64440075	LED lighting part red	
D-IS22-RG-24V DC	on board pilot light	
70 30 01700	Transformer 400V/200V with protection	for mains without zero-wire
76 10 02730	Connector WAGO 231-302/026-000 (2pin)	FLEXIS: X9; for AXIM
76 10 02750	Connector WAGO 231-702/026-000 (2pin 7,62)	FLEXIS: X12; connection 230VAC
76 10 02740	Connector WAGO 231-703/026-000 (3pin 7,62)	connection of 230VAC to Power unit
76 10 02700	Connector WAGO 231-704/026-000 (4pin 7,62)	connection of 3x400VAC to Power unit
76 10 02020	Connector WAGO 734-203 (3pin)	FLEXIS: X14; Temperature sensor
76 10 02040	Connector WAGO 734-204 (4pin)	FLEXIS: X11; Signal columns
76 10 02060	Connector WAGO 734-206 (6pin)	FLEXIS: X2,X6; Relays outputs, Digital inputs
76 10 00530	Connector WAGO 231-632	FLEXIS: X7; EUW - air pump
88 90 00100	EUW Pump	
WB96.032.4053.1	Connector on frontpanel (for Aquamatic)	
WB96.031.5053.1	Connector on cable (for Aquamatic)	

## 8.2 Case opening and exchange of component parts

If it is necessary to open the case of the charger from any reason, **it is always necessary to disconnect the charger from the mains and the battery from the charger!**

To find out the spareparts contact your supplier. Always mention exact marking of required part.

## 9. Failures

### Failure identification

Appropriate failure code is displayed on the display in left down corner. Failures are described below in this document. For HW failures identification use table with overview of LED significance - above in this document. In case of failure please note these informations:

- type of the charger
- behavior of the device (after connecting to the mains, without battery, with connected battery, ...)
- failure code(s) on display
- light of LED and of display on CPU; light of LEDs on power unit
- in case it is possible to set the communication, send the data from the charger

### Exchange of the power unit and set of new HW:

- 1) dismount the right side cover (cases FF130, FF170, FF250, FF330); dismount the frontpanel - left part (cases FF550, FF720)
- 2) disconnect the Canon9 connector and connector of mains supply
- 3) unscrew the M8 screws on bars
- 4) unscrew belaying screw
- 5) take out the power unit
- 6) insert new power unit
- 7) secure the power unit with belaying screw
- 8) screw the M8 screws on bars (moment 22Nm)
- 9) connect the Canon9 connector and connector of mains supply
- 10) cover the charger

### Save the new module to FW of the charger:

- 1) open AXIFF programme, log in and download data from the charger
- 2) in fold Charger choose „Save HW configuration“

### Exchange of the filter mate at IP54 cases:

- 1) take out the protective grid
- 2) exchange the filter mate
- 3) put on the protective grid

## Fault reporting

Code	Failure description	Reason	Steps to remedy
<b>E1x</b>	<b>Incorrect initial conditions, battery failures, high battery, temperatures</b>		
E11	Voltage of battery lower than..98% of Unom/V/ cell., deep discharged battery.	<ul style="list-style-type: none"> <li>Battery is deeply discharged during operation</li> <li>Wrong setting</li> <li>Wrong callibration of charger</li> </ul>	<ul style="list-style-type: none"> <li>Check electrolyte level</li> <li>Discharge max. to 80% of capacity</li> <li>Check setting of charger</li> <li>Recalibrate the charger</li> </ul>
E12	Battery has been disconnected during charging without regular stop of charging by STOP button.	<ul style="list-style-type: none"> <li>Inadmissible interrupt of charging by disconnecting of connector during operation (charging)</li> </ul>	<ul style="list-style-type: none"> <li>To terminate the charging cycle use allways STOP button!</li> </ul>
E13	Battery temperature >TbatMAX: - if battery is connected to charger and its temperature is higher than set value, charging don't start - If temperature of battery overrun set value during charging, charging current falls to set value of and charging continues. If than temperature increase to (TbatMAX-2)°C, charging current decrease to I <sub>max</sub> .	<ul style="list-style-type: none"> <li>To high temperature of battery ambient</li> <li>Cycles of charging and discharging proceed with no break – increase of temperature</li> <li>Too high charging current</li> </ul>	<ul style="list-style-type: none"> <li>Lower enviroment temperature</li> <li>Make longer pauses between charging and discharging cycles</li> <li>Check setting of charger</li> </ul>
E14	Temperature of control unit >65°C: - if battery is connected to charger and inner temperature is higher than set value, charging don't start - If inner temperature of charger overrun set value during charging, charging current falls to value set in folder „Charging – Temperature measurement“ and charging continues. If than temperature decrease to (T-5)°C, charging current increase to I <sub>max</sub> .	<ul style="list-style-type: none"> <li>To high temperature of charger ambient</li> <li>Charger exceedingly coated by dust</li> </ul>	<ul style="list-style-type: none"> <li>Lower enviroment temperature.</li> <li>Clean up the charger</li> <li>If the charger is in IP54 case – clean up or change the filter inserts</li> </ul>
E15	Voltage of battery > U <sub>max</sub> (set in charging curve).	<ul style="list-style-type: none"> <li>Failure of power unit</li> <li>Failure of control unit</li> </ul>	<ul style="list-style-type: none"> <li>Repair/exchange of power unit</li> <li>Repair/exchange of control unit</li> </ul>
<b>E2x</b>	<b>Incorrect charging duration</b>		
E21	The constant current charging phase I1 is taking too long; charging terminates and fails.	<ul style="list-style-type: none"> <li>A faulty battery or incorrect charger settings</li> <li>Excessive battery capacity or insufficient charger current</li> </ul>	<ul style="list-style-type: none"> <li>Check the battery – electrolyte density, temperature, voltage of single cells</li> <li>Check setting of charger</li> </ul>
E22	Constant voltage phase U1 too long, charging goes further to next phase.	<ul style="list-style-type: none"> <li>Defective battery</li> <li>Wrong setting of charger</li> </ul>	<ul style="list-style-type: none"> <li>Check the battery – electrolyte density, temperature, voltage of single cells</li> <li>Check setting of charger</li> </ul>
E23	The constant current charging phase I2 is taking too long; charging terminates and fails.	<ul style="list-style-type: none"> <li>Defective battery</li> <li>Wrong setting of charger</li> </ul>	<ul style="list-style-type: none"> <li>Check the battery – electrolyte density, temperature, voltage of single cells</li> <li>Check setting of charger</li> </ul>
E24	During charging phase I1+ U1 more than 90% of nominal capacity is supplied.	<ul style="list-style-type: none"> <li>A completely flat battery</li> <li>Incorrect charger settings</li> </ul>	<ul style="list-style-type: none"> <li>Check the battery – electrolyte density, temperature, voltage of single cells</li> <li>Checking de-charging circumstances</li> <li>Checking charger setting</li> </ul>
<b>E3x</b>	<b>Deviations charging current</b>		
E31	Charging current I1 <80% of set value.	<ul style="list-style-type: none"> <li>One phase of three phase mains is missing</li> <li>Defective power unit</li> <li>Wrong calibration of charger</li> </ul>	<ul style="list-style-type: none"> <li>Check the mains</li> <li>Check power units of charger</li> <li>Recalibrate the charger</li> </ul>
E32	Charging current I1 >110% of set value.	<ul style="list-style-type: none"> <li>Defective power unit</li> <li>Wrong calibration of charger</li> </ul>	<ul style="list-style-type: none"> <li>Check power units of charger</li> <li>Recalibrate the charger</li> </ul>
<b>E5x</b>	<b>Failures of aeration system</b>		
E51	Low pressure in the aeration system failure of airpump or aeration piping. If the pressure is not restored and the correct pressure value is not reached within 1 minute, the charging current value decreases to the 80% I <sub>char</sub> value in the “charging” and the pump is not switched any more.	<ul style="list-style-type: none"> <li>Failure of airpump</li> <li>Pressure loss in piping system</li> </ul>	<ul style="list-style-type: none"> <li>Check the airpump</li> <li>Check piping system of aeration</li> </ul>

E52	High pressure in the aeration system, fault in the pump or in hose system. If the pressure is not restored and the correct pressure value is not reached within 1 minute, the charging current value decreases to the 80% Ichar value in the "charging" and the pump is not switched any more.	<ul style="list-style-type: none"> <li>• Clogged piping of aeration system.</li> </ul>	<ul style="list-style-type: none"> <li>• Check piping system of aeration</li> </ul>
E53	More than 5 faults of aeration system (pressure too low or too high) during the common charging cycle; the charging current value decreases to the 80% Ichar value in the "charging" and the pump is not switched any more.	<ul style="list-style-type: none"> <li>• Failure of airpump</li> <li>• Pressure loss in piping system</li> <li>• Clogged piping of aeration system.</li> </ul>	<ul style="list-style-type: none"> <li>• Check the airpump</li> <li>• Check piping system of aeration</li> </ul>
E54	Leakage in the air system, the pressure goes down too fast.	<ul style="list-style-type: none"> <li>• Pressure loss in piping system</li> </ul>	<ul style="list-style-type: none"> <li>• Check piping system of aeration</li> </ul>
E55	Charger blocked due to aeration system failures.	<ul style="list-style-type: none"> <li>• Blockage of charger due to overrun of setted nr. of failures E51, E52, E54.</li> <li>• Failure of airpump</li> <li>• Pressure loss in piping system</li> <li>• Clogged piping of aeration system.</li> </ul>	<ul style="list-style-type: none"> <li>• Check the airpump</li> <li>• Check piping system of aeration</li> <li>• Charger must be unblocked by service engineer</li> </ul>
<b>E9x</b>	<b>Failures of communication</b>		
E91	Failure of communication with IM at battery connecting.	<ul style="list-style-type: none"> <li>• IM is not used</li> <li>• IM is defective</li> <li>• IM is not programmed</li> <li>• Defective wiring or connector</li> </ul>	<ul style="list-style-type: none"> <li>• Connect, change or programme IM</li> <li>• Check connection between IM and charger</li> </ul>
E94	Failure at temperature check – temperature sensor or IM.	<ul style="list-style-type: none"> <li>• Defective temp. Sensor</li> <li>• Defective IM</li> <li>• Defective wiring or connector</li> </ul>	<ul style="list-style-type: none"> <li>• Change temperature sensor</li> <li>• Change IM</li> <li>• Check connection between temp. Sensor or IM and charger</li> </ul>
<b>F1x</b>	<b>Failures of the starting condition and failures of battery</b>		
F10	Power units with different voltage levels has been connected together.	<ul style="list-style-type: none"> <li>• Power units with different voltage levels</li> <li>• Wrong calibration</li> </ul>	<ul style="list-style-type: none"> <li>• Use right units</li> <li>• Calibrate the power units</li> </ul>
F11	Battery with high impedance. Voltage during initial test increase more than 19% of Unom/V/cell.	<ul style="list-style-type: none"> <li>• Deeply sulphated battery</li> </ul>	<ul style="list-style-type: none"> <li>• Check battery and its use</li> <li>• Check electrolyte density and voltage of single cells</li> </ul>
F12	The initial battery voltage is higher than 135% of Unom/V/cell, i.e. not suitable battery.	<ul style="list-style-type: none"> <li>• Battery with higher nominal voltage than is set in charger</li> </ul>	<ul style="list-style-type: none"> <li>• Check battery voltage</li> </ul>
F13	Battery voltage > 115% Unom, battery charging is initiated only after a rate fall below 115% Unom.	<ul style="list-style-type: none"> <li>• The battery is fully charged</li> </ul>	<ul style="list-style-type: none"> <li>• Disconnect battery</li> <li>• If mains connection is maintained, eventual voltage reduction will trigger automatic recharging</li> </ul>
F14	The battery voltage during the charging overruled setted value (Umax) – charging is stopped.	<ul style="list-style-type: none"> <li>• Defective battery</li> <li>• Defective wiring charging cable</li> <li>• Defective connector</li> <li>• Failure of charger</li> </ul>	<ul style="list-style-type: none"> <li>• Check the battery – electrolyte density, temperature, voltage of single cells</li> <li>• Check charging cable</li> <li>• Check functions of charger</li> </ul>
F15	Voltage monitors of single modules connected in parallel vary more than 3% of Unom.	<ul style="list-style-type: none"> <li>• Voltage monitor failed</li> </ul>	<ul style="list-style-type: none"> <li>• Exchange of power unit</li> </ul>
F16	Battery temperature during charging > (Tbat MAX+5)°C, charging is stopped.	<ul style="list-style-type: none"> <li>• Too high temperature of battery ambient</li> <li>• Cycles of charging and discharging proceed with no break – increase of temperature</li> <li>• Too high charging current</li> </ul>	<ul style="list-style-type: none"> <li>• Lower environment temperature</li> <li>• Make longer pauses between charging and discharging cycles</li> <li>• Check setting of charger</li> </ul>
F17	Output voltage during charging is lower than Umin (set in charging curve) – longer than 1min. or battery with lower voltage than is set was connected to charger	<ul style="list-style-type: none"> <li>• Voltage monitor failed</li> <li>• Battery was connected</li> </ul>	<ul style="list-style-type: none"> <li>• Exchange of power unit</li> <li>• Connect right battery type or change the chargers setting</li> </ul>
F18	Low level of electrolyte	<ul style="list-style-type: none"> <li>• Insufficient maintenance</li> <li>• Error automatical refilling</li> <li>• Wrong setting of switching valves</li> </ul>	<ul style="list-style-type: none"> <li>• Refill water to battery</li> <li>• Check function of aut. refilling</li> <li>• Check charger setting</li> </ul>
<b>F2x</b>	<b>Incorrect charging duration</b>		
F21	Constant current phase I1 runs too long, charging is stopped.	<ul style="list-style-type: none"> <li>• Defective battery</li> <li>• Wrong setting of charger</li> </ul>	<ul style="list-style-type: none"> <li>• Check the battery – electrolyte density, temperature, voltage of single cells</li> <li>• Check charger setting</li> </ul>

F23	Maximal duration of phase I2 overrunned.	<ul style="list-style-type: none"> <li>Battery is deeply discharged during operation</li> <li>Wrong setting</li> <li>Wrong calibration of charger</li> </ul>	<ul style="list-style-type: none"> <li>Check electrolyte level</li> <li>Discharge max. to 80% of capacity</li> <li>Check setting of charger</li> <li>Recalibrate the charger</li> </ul>
<b>F3x</b>	<b>Deviations of charging current</b>		
F31	The charging current <50% of the desired value, charging is stopped.	<ul style="list-style-type: none"> <li>One phase of three phase mains is missing</li> <li>Defective power unit</li> <li>Wrong calibration of charger</li> </ul>	<ul style="list-style-type: none"> <li>Check the mains</li> <li>Check power units of charger</li> <li>Recalibrate the charger</li> </ul>
F32	The charging current >120% of the desired value, charging is stopped.	<ul style="list-style-type: none"> <li>Defective power unit</li> <li>Wrong calibration of charger</li> </ul>	<ul style="list-style-type: none"> <li>Check power units of charger</li> <li>Recalibrate the charger</li> </ul>
F33	The charging current >120% of the Inom – value, charging is stopped.	<ul style="list-style-type: none"> <li>Defective power unit</li> <li>Wrong calibration of charger</li> </ul>	<ul style="list-style-type: none"> <li>Check power units of charger</li> <li>Recalibrate the charger</li> </ul>
F35	During charging has been charged more than 125% of nominal capacity.	<ul style="list-style-type: none"> <li>Defective battery</li> <li>Wrong setting of charger</li> </ul>	<ul style="list-style-type: none"> <li>Check the battery – electrolyte density, temperature, voltage of single cells</li> <li>Check setting of charger</li> </ul>
<b>F4x</b>	<b>Communication of control unit</b>		
F40	Communication with power unit failed.	<ul style="list-style-type: none"> <li>Wrong contact on wiring</li> <li>Defective control unit</li> <li>Defective power unit</li> </ul>	<ul style="list-style-type: none"> <li>Check wiring</li> <li>Repair/exchange control unit</li> <li>Repair/exchange power unit</li> </ul>

## 10. Explanations and Abbreviations

A	ampere (current)
Ah	ampere-hour
A/100Ah	current related to 100Ah capacity of battery
CE	mark designation of conformity to standards
Cnom	nominal battery capacity (in amp-hours)
°C	degree Celsius (temperature)
DES	desulphating
EQU	equalization
EUW	electrolyte mixing (aeration pump)
float	floating charging
h	hour
Hz	Hertz (frequency)
IM	identification module
Inom	nominal current
IP	degree of protection
I1, U1, I2	characteristic values of charging curve
kg	kilogram
kVA	power input
m	meter
maintenance	maintenance trickle charging after extra time
min	minute
s	second
SN	serial number
Unom	nominal voltage
V	volt (voltage)
V/cell	volt/cell of battery
VAC	alternating voltage
VDC	direct voltage
3 N PE	mains 3x400VAC/50-60Hz
1 N PE	mains 230VAC/50-60Hz

## Module fault reporting

(they are shown in EVENTS folder in program AXIFF)

F1	main error
F2	diodes overheating
F3	transistors overheating
F4	overvoltage on output of power supply unit
F5	output relay error
F6	CAN bus communication error
F7	internal supply error
F8	insufficient power

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