

BATTERY CHARGER

- serie KF -

HIGH FREQUENCY

USER MANUAL

Software Revision ver.500

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1. SAFETY PRECAUTIONS

- 1 Before to start using the KF Charger, read these instructions carefully.
- 2 Installation and Service operations can be done by qualified personnel only.
- 3 To prevent the risk of electric shock, don't touch uninsulated portions of the KF Charger and the Battery.
- 4 Manually stop the charger before to disconnect the battery.
- 5 The charger is suitable for indoor installation, in enviroment with abundant ventilation.
- 6 Don't use the charger near flammable materials.
- 7 Don't obstruct the ventilation slots and leave sufficient free space around the unit.
- 8 Don't expose the charger to liquids or excessive dust.
- 9 Check the conditions of cables and accessories on a regular basis, and replace them immediately if they get damaged.
- 10 Don't extend the battery cables. Replace them, if necessary, with cables of the same type, length, section and insulation as the original ones.
- 11 During the installation of the charger, make sure to connect the EARTH conductor properly, and respect all the applicable Safety Standards.
- 12 Don't modify any part of the charger. Any modification, applied without written authorization of the manufacturer, may generate unsafe operating conditions and will void the warranty.

2. DESCRIPTION

The KF is a series of battery chargers that are based on High frequency switchmode converter, based on MOSFET technology.

This system offers very high electrical efficiency, near unity power factor and very low output current ripple, moreover it features a real universal charging capability: multi-voltage, multi-current, multi-application.

The KF chargers are available in a variety of models, with threephase input. The standard models are listed in the following table, while customized models are available on request.

The control panel is complete and easy to use: four coloured LEDs indicate the state of the charge, while a 2x16 character dot matrix display gives complete information and error messages in plain text (multilingual).

A three button flat membrane keyboard is used for programming and data review.

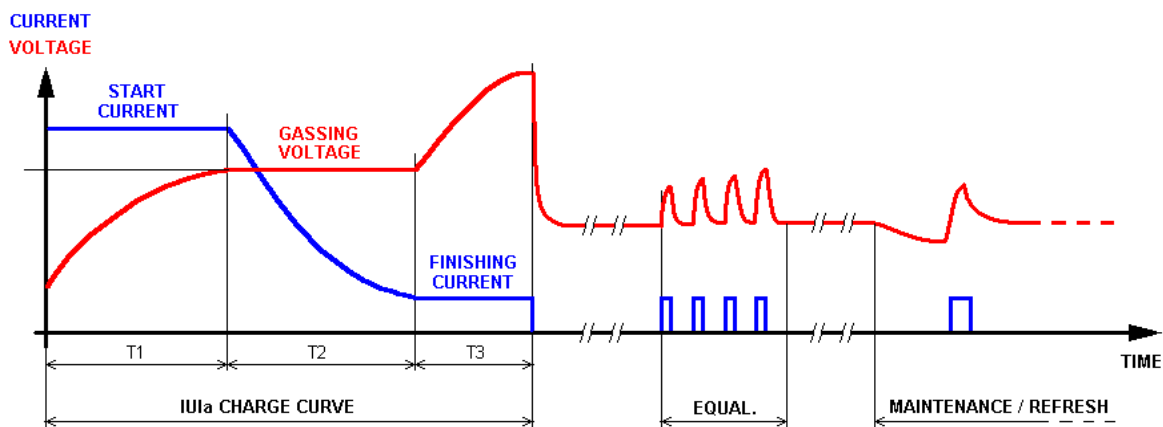
A unique feature of the KF charger is the automatic recognition of the battery. For each battery, the user can program the TYPE (Flooded Lead Acid, GEL, AGM), the CAPACITY (from 5Ah to 2500Ah) and the desired charging current.

The KF charger calculates automatically the ideal charge curve for the given parameters.

While the programming and operation of the KF can be done using a simplified and automatic form, expert users have the possibility to adjust the charge parameters and options without limits (Gassing Voltage, Temperature Limits, Equalization Mode, Refresh Mode and much more).

The charging curve of the KF charger is based on the "IEI" (or "IUla") system, but instead of applying a pre-defined charge curve to the battery, the charger calculates all the parameters (Currents, Voltage Limits, Maximum Times) according with the Battery Data and the User programming.

Moreover, the curve is dynamically adjusted while the charge is in progress, depending on the real status of the battery.



The KF Charger is suitable for Conventional and Opportunity charging applications.

It's equipped with a Real-Time Clock, which allows the user to program the desired start time of the day, the full charge time window and to schedule the weekly equalize cycles.

The KF Charger saves the results of the last 250 charge in the built-in data logger.

3. INSTALLATION

Conditions of use:

- Temperature (operation): from 0°C to 50°C.
- Temperature (storage): from -20°C to 60°C.
- Relative Humidity: less than 75 %.

LOCATION - *Choose your installation location to:*

- Avoid temperature and humidity extremes.
- Minimize moisture and dust.
- Provide adequate air circulation to prevent the build up of fumes.
- Do not install unit where it will be exposed to direct sunlight.



CONNECTION OF THE AC INPUT

The charger must be connected to the AC input using an adequate cable and plug, with disconnect switch and fuses.

The AC input wires have to be connected to the AC INPUT TERMINAL BLOCK, that is located on the internal panel.



Make sure to tighten the terminal block screws with the proper torque, and pull each wire separately in order to verify that they are mounted properly.

AC INPUT VOLTAGE 3X THREE PHASE

AC INPUT VOLTAGE 3x208/240/400/480 VAC

Please, before to install to AC Input, check the label of the charger, in particular the input.

Consider that the unit was designed for work around +/-5% of the input defined in the label.

BATTERY CHARGER <small>12-40 Volt, 0-60 Amps, 12 cells Flooded or sealed battery Up to 800 AH.</small>		KF3		 <i>Made in Italy</i>	
OUTPUT DC Vnom - Inom					
SERIAL NR.					
		Weight 15 Kg			
INPUT AC	3x400	7 A	KVA	3	
			Hz	50/60	
 www.bassi.eu					

In this picture INPUT is 3x400 Vac
This charger model is available in:

a) 3x208/240 Vac 60Hz

OR

b) 3x400Vac 50Hz

OR



c) 3x480 Vac 60Hz

AC INPUT VOLTAGE 1X SINGLE PHASE

AC INPUT VOLTAGE 1 x 110/230

Please, before to install to AC Input, check the label of the charger, in particular the input.

Consider that the unit was designed for work around +/- 5% of the input defined in the label.

BATTERY CHARGER 12-40 Volt, 0-60 Amps, 12 cells Flooded or sealed battery Up to 800 AH.		KF1	 <i>Made in Italy</i>
OUTPUT DC Vnom - Inom			
SERIAL NR.			
		Weight	15 Kg
INPUT AC	1x230	7 A	KVA 3
		Hz	50/60
 www.bassi.eu			

In this picture INPUT is 1x230 Vac
 This model of charger is available in:
 a) 1x110/208/240 Vac 60Hz

OR

b) 1x230Vac 50Hz

4. PROGRAMMING

PRELIMINARY CONTROLS

Before to proceed with the programming sequence and before to connect a battery, make sure that the KF charger has been installed by a qualified electrician, according with the instructions reported in this manual.

Before to use the charger, it's necessary to control that the ventilation slots are not obstructed, and that all the safety precautions reported in this manual are respected.

STARTUP SEQUENCE

Turn on the charger by moving the main switch to position "1".

The charger will perform an automatic test of the control circuits, and will wait for a random delay on start.

The display will visualize the following messages.

BASSI
KF - CHARGER

SYSTEM CHECK
PLEASE WAIT ...

SYSTEM READY
MAX xxx V - xxx A

SYSTEM READY
DATE TIME

USER PROGRAMMING MODE**ATTENTION!**

Before to program the charger, disconnect the battery.

This condition is necessary in order to activate the User Programming Mode.

Only expert users should modify the settings of the charger.

HOW TO ACTIVATE USER PROGRAMMING MODE

- Press the button DOWN and keep it pressed for 3 seconds
The display will show the message:



EDIT PASSWORD

- Enter the Programming Password.
The display will show the message:



MOD. SETTING

HOW TO MODIFY A VALUE

- Scroll between the programmable values using the UP/DOWN buttons.
- In order to modify a value, press ENTER and keep it pressed for 2 seconds, until the cursor will start blinking over the value that can be modified.
- Modify the value using the UP/DOWN buttons.
- Confirm the modified value by pressing ENTER for 2 seconds, until the cursor will disappear. At this point the new value will be saved.

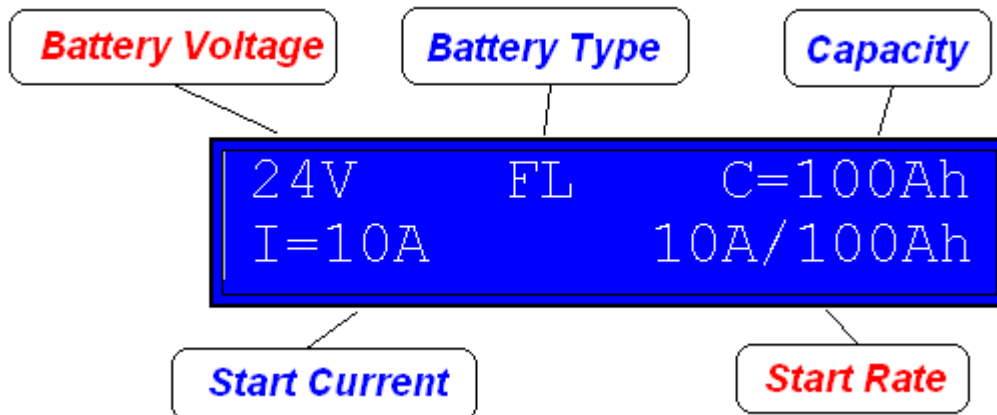
HOW TO RETURN TO NORMAL MODE

- Press the buttons UP and DOWN simultaneously.

PARAMETERS 1 – 2 - 3 – 4 - 5 : BATTERY INFORMATION

For each battery voltage that is supported by the charger, it's possible to set the TYPE, CAPACITY and desired START CURRENT.

For each supported battery voltage, the display shows this setup page:



It's possible to scroll between each battery voltage using the buttons UP/DOWN.

The fields identified by the BLUE labels (Type, Capacity, Start Current) are editable, while the fields identified by the RED labels are NOT editable, as the battery voltage is fixed, and the Start Rate is automatically calculated as percent of Current over Capacity (A/100AH).

Programmable values: TYPE

- FL – Flooded Lead Acid
- GE – Gel Cell
- AG – AGM
- NN – Type Unknown

CAPACITY

From 5 to 2500 Ah

START CURRENT

From 2A to the maximum supported by the charger

NOTES:

The values programmed in these setup pages will be used when the charger recognizes the batteries automatically, using the VOLTAGE DRIVEN MODE (see next pages).

EXAMPLE SETTINGS

Battery A) Lead Acid type, 12 cells, 24 V nominal, 600 Ah, Start Current 100A

```
24V    FL    C=600Ah  
I= 100A    16A/100Ah
```

Battery B) Lead Acid type, 18 cells, 36 V nominal, 1000 Ah, Start Current 250A

```
36V    FL    C=1000Ah  
I= 250A    25A/100Ah
```

In this example, when batteries with nominal voltages 24 V or 36 V will be connected to the charger, they will be always recognized as type A or type B, using the "VOLTAGE DRIVEN" recognition mode.

PARAMETER 6: GASSING VOLTAGE

Programmable values: from 2.35 to 2.50 V/Cell, or TEMPERATURE COMPENSATED

Default value: 2.40 V/cell

```
GASSING VOLTAGE  
2.40 V/e1
```

NOTES:

The charging algorithm of the KF charger is adaptive, so it's capable of adjusting the charging curve even if the gassing voltage of the battery deviates significantly from the programmed value. For this reason, this parameter should be modified only when using non-standard batteries, or if the operating temperature is extremely low or high.

When a battery temperature probe (optional) is used, the charger can calculate the gassing voltage dynamically, in order to compensate the effect of the temperature of the electrolyte.

In order to activate this function, it's sufficient to reduce the gassing voltage below 2.35 V/cell. In this case, the message "TEMP. COMPENSAT." will appear.

```
GASSING VOLTAGE  
TEMP. COMPENSAT.
```

PARAMETER 4: MAXIMUM VOLTAGE

Programmable values: from 2.40 to 3.00 V/Cell, or DISABLED

Default value: 2.80 V/cell

NOTES: This parameter sets a maximum limit for the cell voltage. If this limit is reached, the charge is terminated and a specific error message is given.

PARAMETER 5: TEMPERATURE FOLD BACK AMP ACTION

TEMP.AMP.REDUCT
1.5 Amps/100Ahrs

Programmable values: DISABLE, from 0.1 to 5.0 Amps/100Ahrs

Default value: 1.5 Amps/100Ahrs

NOTES: This parameter allows to adjust the reduction of Amps when the temperature of the battery increase more than 105°F/40°C
In most of the cases the default value of 1.5 Amps/100Ahrs works well, but sometimes it can be useful to modify this setting, depending on the status of the battery and on the operating cycle.

IMPORTANT: This parameter works only if the temperature probe is well installed in the battery.

PARAMETER 6: EQUALIZE DURATION

Programmable values: from 1 to 8 hours

Default value: 6 hours

NOTES: This parameter allows to adjust the duration of the weekly Equalize cycle.
In most of the cases the default value of 4 hours works well, but sometimes it can be useful to modify this setting, depending on the status of the battery and on the operating cycle.

IMPORTANT: The battery will be equalized only during the programmed time window (See parameters 13 and 14). If the Equalize time window is not set, or it's set too short, the battery will not receive a sufficient Equalize.

PARAMETER 7: DATE and TIME

Programmable values: Month/Day/Year, Hour/Minutes

Default value: Eastern Time (GMT-5)

NOTE: It's fundamental to keep the Real Time Clock set to the correct date and time, in order to use all the time base functions. The Charger calculates the Day of the Week automatically, however it's necessary to adjust the Clock manually in Daylight saving time periods.

PARAMETER 8: START TIME WINDOW

Programmable values: From 00.00 to 23:59

Default value: From 00.00 to 23:59



START BEG<->END
00:00 23.59

(disabled change of minutes)

NOTE: This parameter sets a time window during the day in which the charger is allowed to start a new charge cycle.

If a battery is connected outside of this time window, the charger will remain in stand-by mode until the programmed Start time will be reached.

Once the charge cycle has begun, this time window is not considered anymore.

PARAMETER 9: FULL CHARGE TIME WINDOW

Programmable values: From 00.00 to 23:59
Default value: From 00.00 to 23:59

```
FULLCH BEG<->END  
00:00 23.59
```

NOTE:

(disabled change of minutes)

This parameter sets a time window during the day in which the charger is allowed to fully charge the battery and to let the battery go through the gassing / overcharge process.

Usually, this parameter is used in opportunity charging applications, with the purpose of avoiding useless gassing of the battery during the opportunity charging cycles, and to program a daily full charge of the battery.

Installation, Settings and Service operations can be done by qualified personnel only

Special OPPORTUNITY CHARGING settings:

```
FULLCH BEG<->END  
00:00 00.59
```

In this way the charger reach the gassing voltage point and it interrupt the charging.
For complete a good OPPORTUITY CHARGING setting you need to set 1 mn the parameter MAX TIME FULLCH. And you need to increase the hours of EQ weekly.

PARAMETER 10 and 11: EQUALIZE TIME WINDOW

Programmable values: Any day, from 00.00 to 23:59
Default value: From SATURDAY at 12.00 to SUNDAY at 22.00

```
EQ BEGIN TIME
SAT 12.00
```

```
EQ END TIME
MON 03.00
```

NOTE: (disabled change of minutes)
These parameters set a time window during the week in which the charger is allowed to fully charge and Equalize the battery. It's recommended to set a minimum Equalize time of 12 hours after the normal completion of the charge cycle.

PARAMETER 12: WATER LEVEL SENSOR (*optional)

Programmable values: - ENABLED
- DISABLED

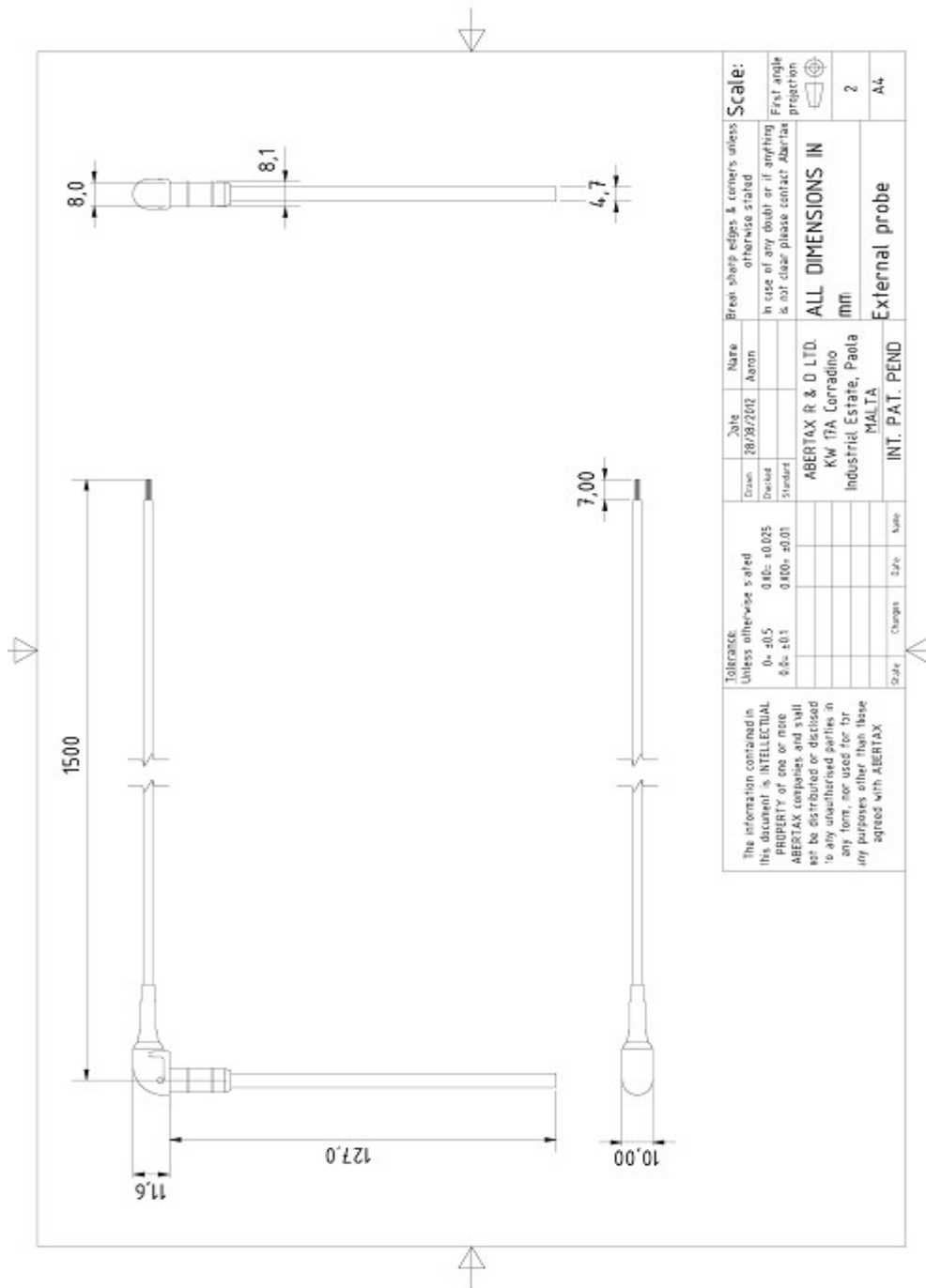
Default value: DISABLED

```
WATER LEVEL SENSOR
DISABLED
```

NOTE:
This parameter sets a water sensor level alarm. If this value is enabled, and the external water sensor communicate to the charger NO WATER, the charge is terminated and a specific error message is given.

```
EMERGENCY STOP
WATER LEVEL LOW
```


This parameter works only if it is installed the water level sensor probe. In this case the default settings is ENABLED.



PARAMETER 13*: RANGE Pin INWORK (*optional)

Programmable values: - 0 % ↔ 0% (DISABLED)
0..100 ↔ 0..100

Default value: - 0 % ↔ 0% (DISABLED)

```
RANGE Pin INWORK
5% ↔ 95%
```

NOTE:

This parameter sets a range limit for the Power Input available during the charging. If this limit is reached, the charge is terminated and a specific error message is given.

```
EMERGENCY STOP
Pin TOO HI/LOW
```

This parameter works only if it is installed a external remote PWM signal, by this signal the charger knows the maximum power available in real time during charging. In this case the default settings is 5 % ↔ 95%. When the charger read the temperature during the charging it applied a temperature compensation voltage. With this external control the charger can use input KVA defined by external signal

PARAMETER 14*: Pin IN TEST (*optional)

Programmable values: - Value 0-100%

Default value: ..

```
Pin IN TEST
0%
```

NOTE:

This value works only if it is installed external remote PWM signal, by this signal the charger knows the maximum power available in real time during charging.

PARAMETER 15*: BATTERY RECOGNITION MODE (*optional)

Programmable values:

- VOLTAGE DRIVEN
- BATTERY ID MODULE (NOT AVAILABLE)
- AUTOMATIC (NOT AVAILABLE)

Default value: VOLTAGE DRIVEN

BATT. IDENTIFIC.
VOLTAGE DRIVEN

NOTE:

This parameter sets the method that the charger uses for the identification of the battery.

The **VOLTAGE DRIVEN** mode is based exclusively on the battery voltage at the moment of the connection to the charger.

PARAMETER 16*: EXTERNAL REMOTE CONTROL (*optional)

Programmable values:

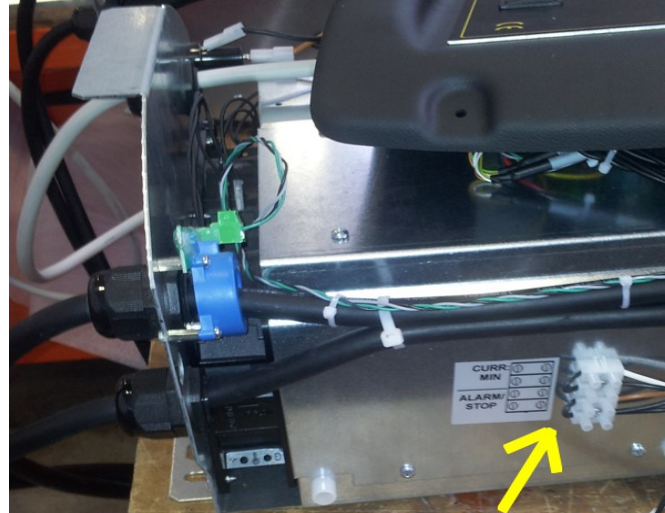
- DISABLED
- ENABLED (function ALARM enabled)
- RESTART AFTER (function ALARM/STOP and RESTART NEW CHARGING CYCLE enabled)
- Imin EXT.FORCED (function EQ low current mode enabled)

Default value: Imin EXT.FORCED

EXT: DIG INPUT
Imin EXT.FORCED

NOTE:

In the internal panel of the charger is located a terminal block with 4 pins. The operator can use nr.2 clean contacts in order to manage these nr.2 input sources.



Function: Manage STOP and RESTART ALARM/STOP.

If this contact is closed the charger will charge based his internal charging curve. (see PARAMETERS 1-2-3-4-5), if this contact is open, the charger will interrupt the charging. The charger will restart a new cycle if the contacts will be restored to close position

EXT: DIG INPUT → ENABLED

The charger will only interrupt the charging.
The user needs to close contact and switch OFF-ON the charger per restart new charging cycle.

EXT: DIG INPUT → RESTART AFTER

The charger will interrupt the charging when contacts is open, and the charger will restart a new charging when the contact will be closed

Function: Manage EQ cycle with low DC current CURR.MIN.

If this contact is closed the charger will charge based his internal charging curve. (see PARAMETERS 1-2-3-4-5), if this contact is open, the charger will FORCE minimum output DC Current.

EXT: DIG INPUT → Imin EXT.FORCED

The charger will apply a very low DC output current, when the contact is open.

NOTE:

The charger will apply strategy with 15 secs of delay.

5. OPERATION

CONNECTION OF THE BATTERY AND AUTOMATIC RECOGNITION

Connect the Battery to the charger, using a connector of adequate size.
When the battery is correctly connected, the charger visualizes the following message:



BATTERY
CONNECTED

RECOGNITION WITH BATTERY ID MODULE (OPTIONAL)

If the Battery Recognition mode is set to BATTERY ID MODULE or AUTOMATIC, the charger will attempt to establish a wireless connection with the ID module. And the display will visualize the message:

VOLTAGE DRIVEN BATTERY RECOGNITION

If the Battery Recognition mode is set to VOLTAGE DRIVEN, the display will show the message:



BATTERY
RECOGNITION

At this point, the battery information are transferred to the charger and are visualized on the display, and the charger is now ready to start.

If the battery voltage cannot be recognized, the charger shows the message:



BATT. ANONYMOUS
PLEASE WAIT...

In this condition, the charger will wait the battery voltage stabilize, and will retry the automatic recognition.

If the battery voltage is particularly low, due to sulphation or overdischarge, it's possible to activate a DESULPHATATION / RECOVERY cycle, by pushing the button ENTER for 5 seconds. Please refer to Paragraph 8: "BATTERY DESULPHATATION".

AUTOMATIC START

Once the battery has been recognized, depending on the programmed start time window (Parameter 11), the charger may enter in stand-by mode, and the display visualizes the message:

DELAYED START
(hh.mm) A → (hh.mm) B

Where (hh.mm)A represents the clock time at that moment, and (hh.mm)B represents the programmed start time.

When the charge begins, the display visualizes the message:

PREPARING
TO CHARGE

BATTERY VOLTAGE TOO HIGH

If the battery voltage is higher than a maximum threshold, the charge will not start and the display visualizes the message:

BATTERY VOLTAGE
TOO HIGH !!!

If this message appears, it's recommended to verify that the nominal battery voltage matches the nominal voltage of the charger.

BATTERY VOLTAGE TOO LOW

If the battery voltage is lower than a minimum threshold, the charge will not start and the display visualizes the message:

BATTERY VOLTAGE
TOO LOW !!!

If this message appears, it's recommended to verify that the nominal battery voltage matches the nominal voltage of the charger.
Probably a wrong or damaged battery has been connected.

It's also possible that the battery has been deeply discharged, bringing the voltage below the minimum value required for the automatic start the charge.

In this case, it's possible to start the charge manually, by pushing the button DOWN for 5 seconds.

CHARGE CYCLE

When the preliminary controls are complete, the charge starts automatically, and the display visualizes the following information:

- Battery Voltage [Volt]
- Charging Current [Amps]
- Time of Charge [hours.minutes]
- Capacity Returned [Ah]

```
xx.x V      xxx A  
xxx Ah     x.x t
```

The KF Charger performs an IEL charge cycle, and the management of the charging curve is totally automatic.

Depending on the programming of the Full Charge time window (Parameter 12), when the battery reaches the 100% state of charge, the charger may suspend the charge (opportunity charge cycle). In this situation, the display visualizes the message:

```
DELAYED FULLCH.  
(hh.mm)A → (hh.mm)B
```

Where (hh.mm)A represents the real time at that moment, and (hh.mm)B represents the beginning of the Full Charge time window.

While the charge is in progress, it's always possible to scroll between different menu pages, using the buttons UP/DOWN:

- CHARGE STATE
 - Identifies the position in the charge curve, with reference to the picture blow.
- TEMPERATURE
 - Visualizes the temperature of the battery, if the optional probe is connected.
- HISTORY LOG
 - Visualizes the history log of the previous charge cycles. Refer to Paragraph 6 "History Log"

EMERGENCY STOP

If the battery doesn't reach the gassing voltage within a predefined time limit, the charger will suspend the charge, and it will visualize the message

EMERGENCY STOP
VGAS NOT REACHED

In this case, the charge cannot proceed, and it's necessary to disconnect the battery. It's recommended to control the battery for damaged cells.

The KF charger adjusts the maximum time limits automatically, depending on the battery capacity and the programmed charge current. This function is important to provide the maximum protection for the battery in any type of application.

AC INPUT BLACK OUT

If there is a black-out of the AC input, while the charge is in progress, the charger will shut down, while the charge parameters will remain in memory.

When the AC input will be recovered, the charger will restart the charge cycle automatically, and the display will show the message:

RESTART AFTER
POWER SUPPLY OFF

AC INPUT FAULT

If there is a AC input MAINS FAULT, while the charge is in progress, the charger will display AC INPUT FAIL

In this case, the charge cannot proceed, and it's necessary to disconnect the battery., and Switch OFF → ON the unit with button 0-1
It's recommended to control the battery for damaged cells.

EMERGENCY STOP
AC INPUT FAIL

POWER STAGE FAULT

If there is a internal Power Stage, caused by internal damage, or temporarily critical condition the unit will stop immediately.

In this case, the charge cannot proceed, and it's necessary to disconnect the battery, and Switch OFF → ON the unit with button 0-1
It's recommended to control the battery for damaged cells



POWER STAGE FAULT

If there is a internal Power Stage, caused by internal high temperature, or internal damage, the unit will stop immediately.

In this case, the charge cannot proceed, and it's necessary to disconnect the battery., and Switch OFF → ON the unit with button 0-1
It's recommended to control the battery for damaged cells.



AUTOMATIC STOP

The charger shuts down automatically when the charge is correctly complete, and it will visualize the message:



At this time it's possible to disconnect the battery.

EQUALIZATION CYCLE

At the end of the charge, if the battery is left connected to the charger for a sufficient time, the charger activates the Equalize cycle automatically, based upon the programmed schedule.

If the charge cycle ends outside of the programmed Equalize time window, the charger remains in stand-by mode, and the display shows the message:

DELAYED EQUALIZE
DAY TIME

Where DAY and TIME represent the beginning of the programmed Equalize time window.

EQUALIZATION CYCLE – MANUAL ACTIVATION

During the charging of the battery the operator can scroll the menu of the display, and he can force a EQ manual cycle at the end of this cycle.

FORCE MANUAL EQ
ENABLED

REFRESH-MAINTENANCE

This function is useful to keep the battery in perfect condition when it's not used for an long period (weeks, months, ...).

It is sufficient to leave the battery connected to the charger. After a normal termination of the charge and the equalize cycle, the control board will activate the charger automatically for 15 minutes of refresh charge every day.

While the charger waits before to activate a Refresh cycle, the display shows the messages:

xx.x V R.END NR
xxx Ah x.x t

- Battery Voltage [Volt]
- Nr of Refresh cycles already given to the battery
- Total Time of Charge [hours.minutes]
- Total Capacity Returned [Ah]

During cycle Refresh, the display shows the same set of information that are visualized during the normal charge cycle.

DISCONNECTION OF THE BATTERY DURING THE CHARGE

WARNING !
DON'T DISCONNECT THE BATTERY DURING THE CHARGE.
RISK OF EXPLOSION!!!

If it's necessary to disconnect the battery while it's being charged, press the button UP for five seconds, in order to stop the charger manually.

The charger will suspend the charge and the display will show the message:



At this time it's possible to disconnect the battery.

Eventually, the charge can be restarted, by pressing the button UP for 5 seconds.

ANTI ARCING PROTECTION

The KF charger is equipped with a built-in Anti-Arcing protection.

In order to activate this function, it's necessary to add an optional wire loop, using a battery connector equipped with Auxiliary Pins.

Contact your local dealer for more information.

6. HISTORY LOG

The internal memory of the KF charger contains a log of the last >200 charge cycles.

The most significant parameters can be visualized on the display of the charger, while the complete history log can be accessed and downloaded through DoctorFleet.com management system.

The history log can be accessed at any moment, even while a charge cycle is in progress. It's sufficient to scroll the menu using the UP-DOWN buttons, until the display will visualize the first page of the most recent history log, that will have a format of this type:

```
01    24.0V    31.3V  
2009/06/01    10:30
```

At this point, press ENTER for 3 seconds, until the cursor will start blinking over the number 01 on the top left of the display.

The results of each charge cycle are represented on two or three pages. Use the UP-DOWN buttons to scroll between each record.

**PAGE A
(ALWAYS VISUALIZED)**

```
No    VSTART    VSTOP  
Start Date and Time
```

Where:

- No = Number of cycle (1 is the most recent)
- Vstart = Battery Voltage at the connection
- Vstop = Battery Voltage at the end of the charge
- Start Date and Time = Date and Time of the BEGINNING of the charge

PAGE B

(Not visualized if the battery recognition is set to VOLTAGE DRIVEN mode)

```
BATT .  xxxxxxxxx  
TYPE  VOLTAGE  CAP
```

Where:

- XXXXXXX = Identification number of the battery
(ZZZZZZZ if ID module was not found)
- TYPE = Battery Type
- VOLTAGE= Battery Nominal Voltage
- CAP= Battery Capacity

PAGE C

(Always visualized)

```
End Date and Time  
TT  HH.MM  AHRET
```

Where:

- End Date and Time = Date and Time of the TERMINATION of the charge
- TT = Charge Termination Code (see next paragraph)
- HH.MM= Total charge time
- AHRET= Total capacity Returned to the battery

CHARGE TERMINATION CODES**GROUP 1: CHARGE COMPLETED**

01

Charge completed successfully.

02

Charge completed successfully.

Equalize NOT executed because battery was disconnected.

03

Charge completed successfully.

Equalize started but not completed, because battery was disconnected during the cool-down time before the Equalize cycle.

04

Charge completed successfully.

Equalize started but not completed, because battery was disconnected while the Equalize was in progress.

06

Desulphation cycle completed successfully.

07

Charge completed successfully.

Equalize completed successfully.

Refresh-Cycle NOT executed because battery was disconnected.

08

Charge completed successfully.

Equalize completed successfully.

Refresh-Cycle started but not completed, because battery was disconnected while the Refresh was in progress.

09

Charge completed successfully.

Equalize completed successfully.

Refresh-Cycle completed successfully.

10

Gassing voltage reached successfully.

Full charge NOT executed because time window Disabled.

12

Charge completed successfully.

Equalize completed successfully.

13
Charge completed successfully.
Termination by maximum time (dV/dt not reached)

14
Charge completed successfully.
Termination by maximum time limit during the Constant Voltage phase.

19
Charge completed successfully.
Termination by criteria dv/dt during Overcharge

GROUP 2: MANUAL STOP

11
Charge stopped manually, during a generic cooling state

20
Charge stopped manually, before to reach the gassing voltage.

21
Charge stopped manually, during the finishing charge.

22
Charge stopped manually, during eq.

23
Charge stopped manually, during refresh.

24
Charge stopped manually, during desulphation.

26
Charge stopped manually, during the constant voltage phase.

GROUP 3: BATTERY DISCONNECTED

30
The battery has been disconnected before the begin of the charge, while the charger was waiting for the programmed Start Time window.

31
The battery has been disconnected during the first part of the charge, before to reach the gassing voltage.

32

Successful Opportunity charging cycle.

The battery reached the gassing point, the charger entered in stand-by mode waiting for the Full Charge/Overcharge time window, and at that point the battery has been disconnected.

33 - 34

The battery has been disconnected during the finishing charge.

36

Charge never started.

The battery has been disconnected while the charger was trying to establish a wireless connection with the Battery Identification Module (WBM).

37

Charge never started.

The battery has been disconnected while the charger was communicating with the Battery Identification Module (WBM).

38

Desulphation cycle NOT completed.

The battery has been immediately disconnected, at the beginning of the Desulphation cycle

39

Desulphation cycle NOT completed.

The battery has been immediately disconnected, before to complete the programming of the Desulphation cycle.

40

Desulphation cycle NOT completed.

The battery has been disconnected while the Desulphation cycle was in progress.

41

Battery disconnected during the preparation of the cycle. Charge never started.

42

Battery disconnected during the calculation of the cycle. Charge never started.

43

Battery disconnected during the initial identification sequence. Charge never started

44

Battery disconnected during the constant voltage phase.

GROUP 4: EMERGENCY STOP

60

Emergency Stop!

Maximum voltage limit exceeded during first part of the charge, before to reach the gassing voltage.

61

Emergency Stop!

Maximum voltage exceeded during the finishing charge.

62

Emergency Stop!

Maximum voltage exceeded during the equalize cycle.

63

Emergency Stop!

Gassing voltage not reached within the predetermined time limit.

64

Charge never started.

Battery voltage was too LOW

65

Charge never started.

Battery voltage was too HIGH

66

Emergency Stop!

Maximum Current Limit Exceeded.

67

Emergency Stop!

Maximum voltage exceeded during the refresh cycle.

68

Emergency Stop!

Maximum temperature exceeded before to reach the gassing voltage.

69

Emergency Stop!

Maximum temperature exceeded during the finishing charge.

70

Emergency Stop!

Maximum temperature exceeded during the equalize cycle.

71

Emergency Stop!

Maximum temperature exceeded during the refresh cycle.

73

Emergency Stop!

The charger was not able to keep the battery at constant voltage.

74

Emergency Stop!

Battery temperature exceeded maximum programmed value during the constant voltage phase.

75

Emergency Stop!

Wrong/Unknown Battery.

76

Emergency Stop!

Maximum temperature exceeded during desulphation.

GROUP 5:**WARNING MESSAGES**

82

The battery has been disconnected while the charge was in progress, in a generic state.

83

Output fuse blown.

85

Communication problem with Wireless Battery Module.

86

Battery temperature probe malfunction

96

Battery voltage anonymous at the connection.

After 1 hour scale voltage to minus battery.

97

Battery voltage anonymous at the connection.

Complete fast charging cycle at low current.

98

Battery voltage out of range at the connection.

Recognition driven by voltage may not work correctly.

99

Black out of the AC input.

- End of Manual -