Manuals+ — User Manuals Simplified.

SmartUP

**SmartUP V1
Smart Up
Module Battery
Data Monitor**

SmartUP V1 Smart Up Module Battery Data Monitor Instruction Manual

Contents

SmartUP

SmartUP V1 Smart Up Module Battery Data Monitor

SmartUP Product Information

Specifications

- Designed for monitoring and controlling lead-acid batteries
- Data displayed in numerical and graphic form
- Ensures correct battery use and charging
- Provides reports on anomalies and abnormalities
- Comes with optional accessories like SmartViewII

Description and operation

Features
SmartUP is a device designed for monitoring and controlling lead-acid batteries. Its main features are:

- measurement of instantaneous battery data: voltage, current, available Ah and temperature. An indication of the amount of Ah present in the battery is given by the LEDs on the panel (§1.4 Signals via LEDs)
- presence of RTC (Real Time Clock) to link the collected measurements to date and time
- storage of historical data. Past battery activity can be viewed on a PC using the SmartViewII software. The data collected can be viewed grouped by work cycle or by day. For each work cycle, the data are provided in numerical and graphic form
- data download to PC. All data is sent to the SmartViewII PC program via the USB connection
- data download directly to USB key. With SmartView, you can import data from a USB key.
- statistical analysis. SmartViewII contains a number of features that provide statistics that allow you to assess the correctness of battery use and charging and to report any anomalies
- possibility of interfacing with SmartKey devices (system that controls access to the trolley and stores events and shocks).

The following accessories are supplied as an option:

- External temperature probe for immersion
- electrolyte level probe.

Duty Cycle

The term Duty cycle refers to a sequence consisting of a discharge phase followed by a charging phase. Since a cycle change is forced in the event of a new association, power outage, or long inactivity after a charge, this definition should be understood as a guideline. Another exception is if the Feeding option is set (see §1.6 Feeding Bottle).

The transition from the discharge phase to the charging phase takes place after 2 minutes of charging, to avoid misunderstandings due to the presence of a charge recovery device during braking (in the latter case we will speak of energy recovery and the input charge will be counted in "Recovered Capacity").

In the discharge phase , the Discharge Capacity is counted; two situations that may arise in the event of excessive discharge are also highlighted: the "Under-discharge Time" indicates the time in which the voltage remains below the programmed Under-Discharge Voltage (see §4.3 Programming of working parameters) and the Discharge Capacity Below AhBS (indicates the capacity used below the threshold of (100-AhBS)% of the battery's Rated Capacity). Finally, within the discharge phase, Self-Discharged Capacity and Recovered Capacity are counted.

Within the charging phase , a distinction is made between a First Phase (the part of the charge that precedes the achievement of the programmed 2^ Phase Threshold Voltage), a Second Phase (the part of the charge that follows the achievement of the 2^ Phase Threshold Voltage) and the Overcharge, (which corresponds to any excess charge beyond the hypothetical achievement of 109% of the Nominal Capacity).

For a detailed overview of the information provided by SmartViewII (TAB Info and TAB Info OLD), see the SmartViewII man

SmartViewII: TAB Info OLD

Anomaly

The SmartViewII program provides indications of abnormalities found in the cycle.

Anomaly	Description	LED Anom.
1^Phase Safety Timer	During charging, the battery voltage did not reach the "Threshold Voltage 2^ Phase" within the "Safety Time 1^ Phase" (see §4.3 Programming of working parameters)	X
2^Phase Safety Timer	During charging, in 2^ Phase, the battery charge has not reached the nominal capacity within the "2^ Phase Safety Time" (see §4.3 Programming of working parameters)	X
Ah Security	During charging, the battery reached 110% capacity before moving on to 2^ Phase	
Battery Discharged under Ah BS	During discharge, the battery capacity has dropped below the "Low Battery Threshold (AhBS)" (see §4.3 Programming the battery parameters). work)	
Poor battery performance	The battery has been under-discharged for a time ≥ "Under-discharge check" when the remaining capacity in the battery is ≥ (Nominal Capacity – Low Battery Threshold) (see §4.3 Programming Working parameters)	
Low battery electrolyte level	Electrolyte level probe reports electrolyte below the minimum level (*)	X
Incorrect Programming/Relay breakdown	With SmartCB selected (see §4.3 Programming Parameters work) there is a charging current despite the "Charge Relay" open	
Anomalia EEprom/RTC	A break in the memory of the SmartUP device or RTC is detected	

The "X" in the "LED Anom." column indicates that there is an LED signal for the indicated anomaly.
(*) The "Low electrolyte level" anomaly is displayed by activating the anomaly LED and indicated on the SmartView Info TAB for all and only the time it is active. However, the anomaly remains memorized and can be viewed in the "Info OLD" TAB.

NOTE: The "Low electrolyte level" abnormality state occurs after 3 minutes of continuous reporting by the probe. The anomaly status returns after 10 seconds of continuous lack of signaling. Since some probes provide delayed signaling, the actual time of activation and deactivation of the anomaly depends on the type of probe used.
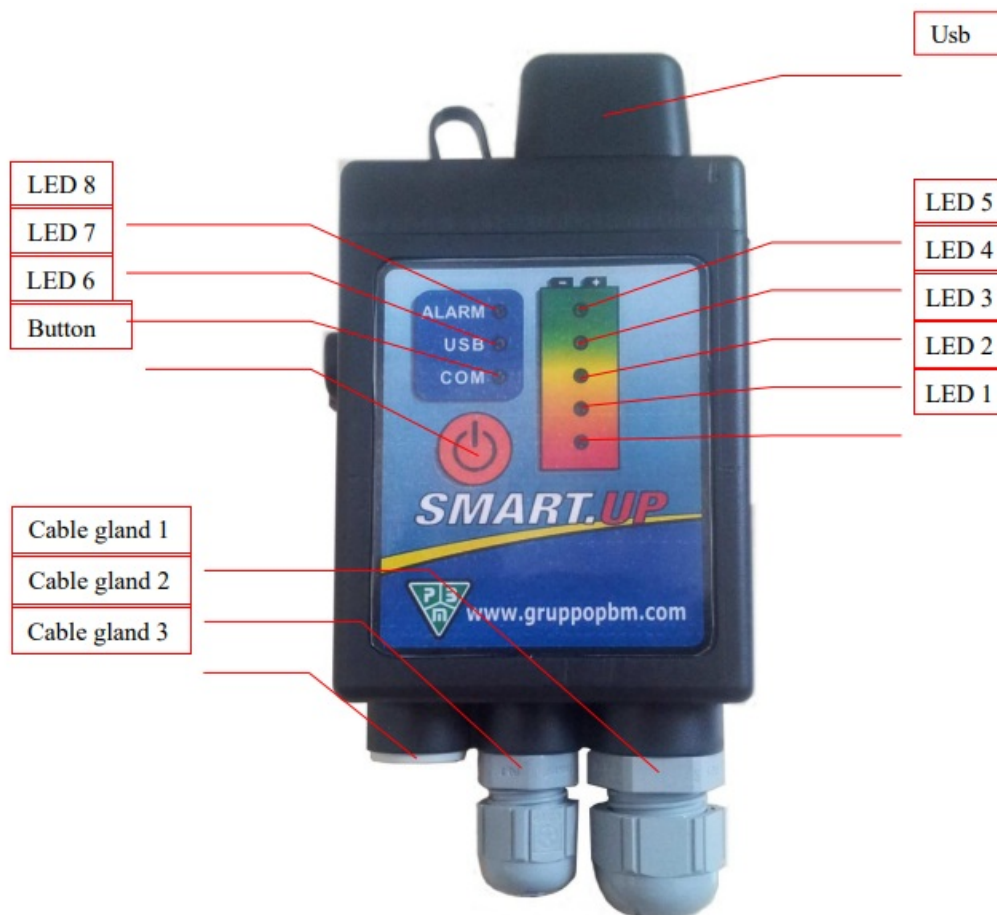
Signals via LEDs
The LEDs on the device provide useful information including an indication of the amount of charge present in the battery and possibly signals relating to some anomalies. The following cases are distinguished:

LED 1 flashing light	Battery capacity not exceeding (100-AhBS)% of rated capacity Battery
Led 1 access	Battery capacity greater than (100-AhBS)% and less than 40% of the battery
LEDs 1 and 2 lit	Battery capacity not less than 40% and less than 60% of the battery
LEDs from 1 to 3 lit	Battery capacity not less than 60% and less than 80% of the battery
LEDs from 1 to 4 lit	Battery capacity not less than 80% and less than 95% of the battery
LEDs from 1 to 5 lit	Battery capacity not less than 95% of the battery
Periodic switching off of the LEDs from top to top the bass (sequence from Led 5 to Led 1)	Download phase
Periodic switching on of the LEDs from bottom to bottom the top (sequence from Led 1 to Led 5)	Charging Phase
LED 3 flashing	Blocking of the Emergency Charging Forks, see §1.7 Locking functions

LED 4 flashing	Carriage lock actuated (due to scheduling), see §1.7 Functions of block
LED 5 flashing	Fork lock actuated (due to low battery), see §1.7 block
Led 6 (COM) lampeggiante	Communication via usb cable
LED 7 (USB) flashing	When saving data on a USB key, the LED flashes with a period of 1 second
Led 8 (ALARM) access	Anomaly found in the current cycle

Note: AhBS is a parameter that can be programmed via SmartViewII. If a value of less than 60% is assigned, the reports will differ from those shown in the table with regard to the first LED from the bottom which will still flash with a battery capacity not exceeding (100-AhBS)%.

Usb	USB port
Cable gland 1	Power cables
Cable Gland 2/Cable Gland 3	Electrolyte level probe CAN BUS temperature probe RS485 I2C Bus Auxiliary input

Estimation of completed charging

Thanks to the features described above, SmartUP is able to accurately estimate the capacity present in the battery. There are two different ways to determine the achievement of full charge. The first (traditional, time-based) provides that the battery is considered charged after the duration of the charge following the exceeding of the 2^ Phase Threshold Voltage has reached the 2^ Phase Charge Time (see §4.3 Programming of working parameters). The second mode (Ah), on the other hand, provides that the charge is evaluated as complete when the reinstated capacity added to that present in the battery at the time of the start of charging is equal to the nominal capacity. The Default setting is to choose the Ah method (see §4.3 Programming working parameters).

NOTES

- Alignment (see §5 Alignment) only takes place after a full time charge has been performed.

Baby feeding

The term "bottle charging" refers to the mode of use with which the battery is repeatedly charged and discharged for short periods and small capacities (as is the case for example in AGVs – Automatic Guided Vehicles). In this situation there would be a proliferation of work cycles that would lead to a rapid exhaustion of memory and a substantial unreadability of the data. In such cases, by setting the "Bottle feeding" item in programming (§4.3 Programming working parameters), it is possible to reduce the daily number of cycles: in this mode, in fact, a new cycle is generated only if a discharge occurs after the sum of the cycle charge times has already exceeded one hour.

Lock functions

The SmartUP device has two functions that are based on the measurement of the capacity level in the battery to inhibit the operation of the forklift and/or fork lock, through the NO (Normal Open) contact of a relay.
These functions require that the relay contact be wired to a circuit in the truck that may limit its functionality (e.g., the circuit that blocks operation when the operator is not seated).

- **No Bottle Charging**: At the end of the charging phase, if the percentage of Ah in the battery is higher than that programmed in No Bottle Feeding (see §4.3 Programming working parameters), the trolley is enabled for normal use (the NO contact is closed). Conversely, if the battery capacity is less than this programmed percentage, use is inhibited (the NO contact is left open). Setting the parameter to 0% (as default) deactivates the function.
- **Fork** Lock: During discharge, as long as the battery level does not drop below (100-Fork Lock)%, normal operation is allowed (the NO contact is closed). When the capacity falls below this threshold, normal use is instead inhibited (the NO contact is left open).

NOTE: To avoid interrupting maneuvers during a phase of intense use, the lock is performed 30 seconds after the last maneuver.
The default value of the programmable parameter "Fork Lock" is 80%.

The device also provides the following locking function, to prevent the use of the trolley outside working hours.
Cart Lock: it is possible to set, for each day of the week, the time (start and end) in which to force the cart lock. If the two times coincide, the block does not take place. The Timeout parameter indicates the amount of time that the cart must be idle before the lock is enforceable
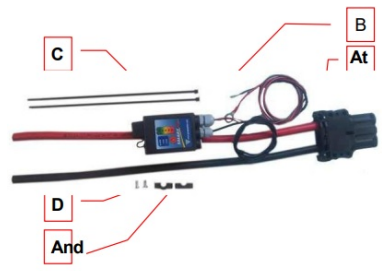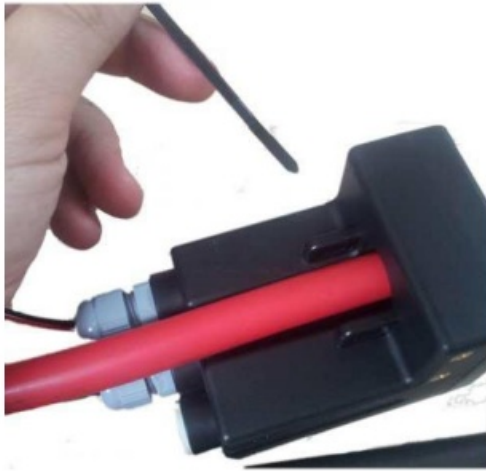

Button Use

- if the USB key is inserted and the button is pressed for a duration of 5 seconds, the data download from SmartUP to the USB key begins. The data download takes about 2 minutes, during which the yellow communication LED flashes. At the end of the data download, the yellow communication LED will be off.
- if the Fork Lock situation is reached during unloading , pressing the button ensures an additional usable capacity bonus equal to 4% of the nominal capacity
- if during a work cycle the utilities are blocked for Opportunity Prevention, pressing the button disables the lock for that cycle
- Within 6 minutes of powering, repeatedly pressing the button forces the amount of ampere hours in the battery with an increase of 20% of the nominal capacity at each press (warning: it does not align). This function is useful if the Fork Lock function is selected, to allow normal use of the truck after SmartUP is installed before the alignment charge is carried out

Montage

Materials needed:

- n° 1 Phillips screwdriver (PH1 type)
- n° 1 3mm Allen key
- n° 1 x 4mm Allen key

5.A		
		Feed the positive pole cable (cable red) inside of hole of Form
		SmarUP
		A) **DINxxx type connector** **B)** Smartup **in mode** C) Plastic cable ties D) Grapevines E) Cable lock

Secure the positive terminal cable (red cable), with the cable ties provided
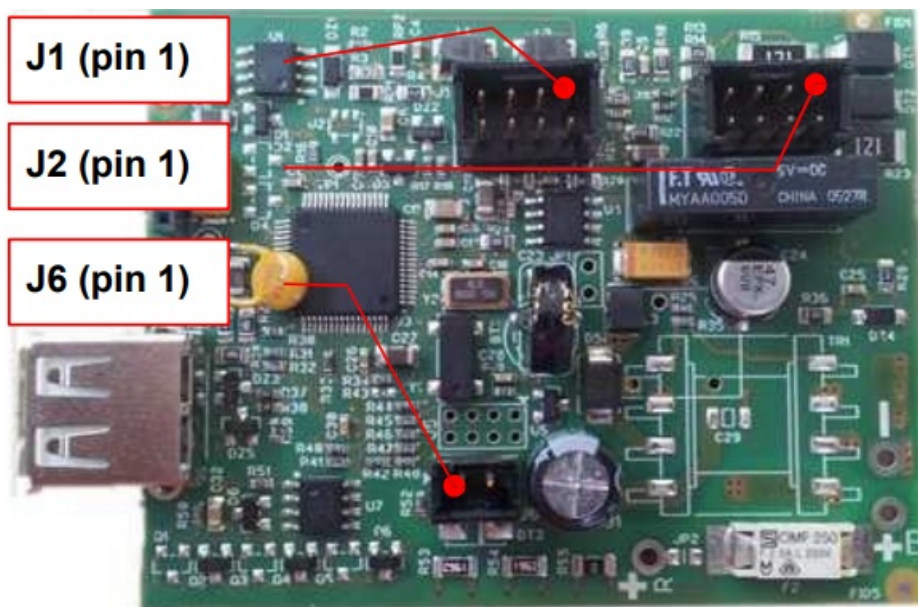
Mounting for rated currents less than or equal to 100 A

5.B	
	Route the positive terminal cable (red cable) 2 or more times into the hole of the **SmarUP Module.**
	Secure the positive terminal cable with the grommet on the side of the **SmarUP Module.**
Parametri Nominali Tensione Batteria — 24 (Volt) Ah Batteria — 690 (Ah) Corrente Caricabatterie — 12 (A) Corrente Sensore di Hall -> Γ 200 / 2 = 200 (A) **Scarica** Anti Biberonaggio — 0 (%) (0 = Off) Blocco Forche 30 (sec) 0 (%) (0 = Off)	Using SmartViewII, set the number of times the positive terminal cable passes through the Hall effect sendor. Image before sending parameters
Parametri Nominali Tensione Batteria — 24 (Volt) Ah Batteria — 690 (Ah) Corrente Caricabatterie — 12 (A) Corrente Sensore di Hall -> Γ 200 / 2 = 100 (A) **Scarica** Anti Biberonaggio — 0 (%) (0 = Off) Blocco Forche 30 (sec) 0 (%) (0 = Off)	Image after sending parameters

Accessory connection

The following steps are used to install the following external accessories:

- immersion temperature probe, type PT1000 two-wire
- Electrolyte Level Sensor
- Auxiliary input 0÷10 V
- RS485
- CANBUS
- Relay contact

The operations are optional and independent of each other. For simplicity, connectors J1, J2 and J6 will be shown with their connections in tabular form. The pins will need to be crimped onto type…….. connectors

CONNECTOR	POLY	DESCRIPTION	
J1	1	–	Auxiliary input 0 ÷ 10 V
	3	+	
	5		PT1000
	7		
	2	3,3V	External I2CBUS
	4	GND	
	6	SCL	
	8	SDA	

CONNECTOR	POLY	DESCRIPTION	
Day 2	2	A (+)	RS485
	4	B (-)	
	6	DC with pin 4 to insert the terminator	
	1	CANL	CANBUS
	3	CANH	
	5	DC with pin 3 to insert the terminator	
	7	Normally open	Relay Dry Contact
	8	Common	

CONNECTOR	POLY	DESCRIPTION

J6	1	signal +	Electrolyte level probe
	2	signal-	

Communication with SmartKey (J2 Connector)

Communication with the SmartKey viewer takes place via RS485 serial port.
The connection is made via a two-wire cable. One side of the cable is connected to the SmartUP, the other to the auxiliary contacts of the battery connector.

Cart Control Mode (J2 Connector)

The functions of blocking or limiting the activities of the utilities require you to wire the relay contact on the device.

Electrolyte level probe installation (J6 connector)

7.E	
	Place the Level Sensor inside a battery element (the automatic refill cap has been used in the figure; alter natively, a hole can be drilled in the element cover). For power supply, positioning and setting of the thre shold level, refer to the probe manufacturer's instruct ions. Since the input is galvanically isolated, the sensor c an be mounted on any element of the battery.

Depending on the type of probe used and the input to which it is connected, the "Electrolyte sensor" parameter must be programmed via SmartView in the Programming TAB (see §4.3 Programming working parameters).
The table shows the options that can be selected in the drop-down menu.

Off	Probe not installed.
Presence of water	Select whether the probe generates signal in case of electrolyte level above threshold (el ectrolyte level OK). Probe wired to terminals 8 (signal) and 10 (common).
Absence of water	Select whether the probe generates signal in case of below threshold electrolyte level (lo w electrolyte level). Probe wired to terminals 8 (signal) and 10 (common).

Programming

Once installed, the SmartUP needs to receive some information to function properly. To do this, you need to connect a PC equipped with the SmartViewII for Windows program via USB cable.

Preparation

- Connect USB cables
- Launch the SmartViewII program
- Enter Level 2 Password
- Press the connect button

Date/Time Setting

- Select the "Programming" TAB
- Press the "Set Clock" button1
- Select the "Monitor" tab and check the date and time box to make sure the data is correct

Programming of working parameters
The working parameters are those that allow the SmartUP to correctly collect data during normal operation; they must therefore be filled in with great care.
For more details, please refer to the SmartViewII program user manual.

-

SmartViewII: Programming the Working Parameters

Select the "Programming" TAB
- Fill in the following fields:

6.A		Remove the USB port protection cap
		Insert the USB stick
		Press the button for about 5 seconds, until the USB LED (Led7) starts flashing Wait for the data download to finish (about 1 minute and 40 seconds). The LED7 turns off. Take out the USB key
		Close the protective cap of the USB port

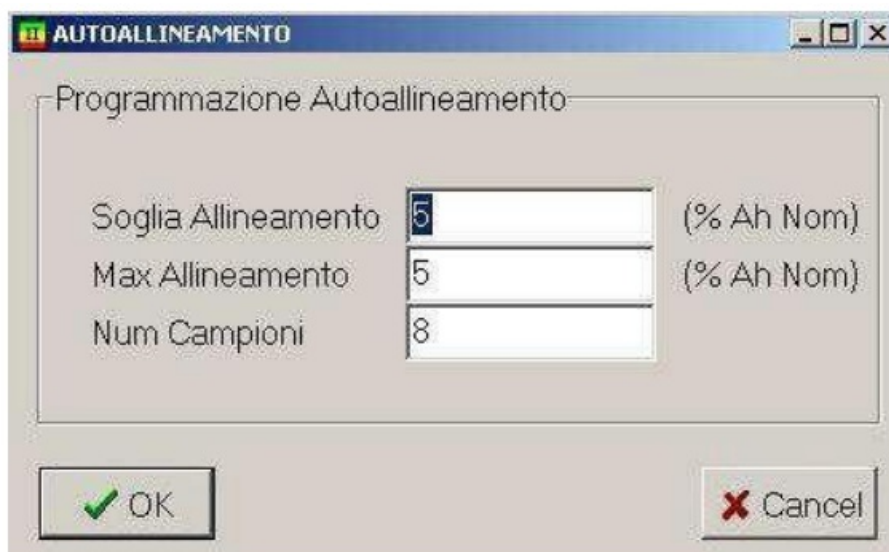|	
Battery voltage	Battery voltage rating
Ah Battery	Nominal battery capacity
Current Charger	Charger current rating
Hall Sensor Current	Current sensor rating If the positive terminal cable is routed through the Hall effect sensor several times, indicate the lap number. Example:
Graph Sampling Time	Sampling time for stored voltage and current graphs (1, .., 127 min / 1, .., 127 sec); (default: 6 min) NOTE: If indicated in seconds, the duration of the cycles will be a maximum of one hour

Sensor Temp. Ext. Present	External Temperature Sensor Selection
Electrolyte Sensor	Input selection and electrolyte level sensor operation
Working Current Threshold	See SmartViewII manual (default: 10A)
Anti Baby Feeding	Fork lock setting for anti-bdocking charging. See §1.7 Locking Functions
Fork Block	Fork lock setting for low battery. See §1.7 Locking Functions
Cart Lock	Cart Lock Time Setting Button. See §1.7 Locking Functions
Underdischarge	If the voltage is lower than the specified value (V/el) for the specified time (min), the capacity is forced to (100–AhBS)% of the rated capacity Ah Battery if greater than this value (default: 1.70 V/el, 30 min)
Low Battery Threshold (AhBS)	Discharging below (100-AhBS)% of rated capacity the battery is Reported Discharge (Default: 80%)
Self discharge	Self-discharge capacity every 24 hours (default: 1%)
Ah Method	Charging Mode Selection: Capacity (Yes) or Time (Off) (Default: YES)
Smart CB Control	Charging selection via SmartCB / SmartEnergy charger
Baby feeding	Time Cycle Count Selection (Opportunity Charging Mode) (default: No)
Auto Alignment Ah	Auto Alignment parameter setting access button
% Maj. Recharge	Percentage energy dissipated during charging (default: 7%)
Threshold Voltage 2^ Phase	Gas development threshold voltage. Determine the transition from the first to the second charging phase and related counts (default: 2.40 V/el)
Charging Time 2^ Phase	Time from exceeding the Threshold Voltage 2^ Phase to finish charging for timed and alignment cycle refills (default: 2:00 hours)
Safety Time 1^ Phase	If the voltage has not reached the 2^ Phase Threshold Voltage within this time, An alarm is generated (default: 10:00 hours)
Safety Time 2^ Phase	If the capacity has not reached the rated value within this time from reaching the Threshold Voltage 2^ Phase, an alarm is generated (default: 6:00 hours)
Autostart	Autostart time selection (active only with SmartCB selected)
Setup	Button for selecting autostart times day by day if the power saving function (only active with SmartCB selected)

Auto Alignment automatically corrects the Ah indication in the battery. The settable parameters indicate respectively the threshold beyond which the correction is performed, the maximum alignment that can be performed and the number of samples on which the Auto Alignment is based. Auto Alignment is only allowed if alignment has already been done (see §5 Alignment).
Default parameters:

Alignment Threshold	10%
Max Alignment	10%
Number of samples	8

-

Press the "Send data to SmartIC" button for the changes to take effect (for greater security, press the "Reread data from SmartIC" button and check that the parameters read are the desired ones)

NOTE: The programming of the working parameters can also be done beforehand, before installing the device on the battery.

Programming associations
Associations are those mnemonic parameters to which the work cycles and graphs collected by the SmartUP during normal operation refer. Whenever the cycles and graphs are downloaded to a PC, they will be recognizable and selectable thanks to these parameters.

NOTE: the parameters of the associations are optional and there is no constraint on their insertion; however, it is advisable to compile them by carefully choosing the names and codes used, avoiding that there are several devices with the same parameters.
For more details, please refer to the SmartViewII program user manual.

SmartViewII: Programming Associations

- Select the "Associations" TAB
- Fill in the following fields:

Customer	Indicative Testo of the Client
Retailer	Retailer indicative text
User	User's contact details
Battery ID	Indicative text of the battery serial number
Cart ID	Indicative text of the trolley serial number

Press the "Send Data" button and check that a new row appears in the table below with the filled parameters
NOTE: Programming associations can also be done earlier in the lab if all parameters are known.

Alignment
To make the SmartUP fully operational and allow it to collect and subsequently provide all the data, it is necessary to inform it about the real state of charge of the battery. This is called ALIGNMENT and only needs to be done once after connecting the device to the battery. During normal operation the SmartUP stays aligned by measuring and counting the charge entering and leaving the battery. The alignment procedure consists of performing a traditional full charge, i.e.:

- the battery voltage reaches the value indicated in the programming parameters by the parameter "Threshold voltage 2^ Phase" (default: 2.4V/el)
- continuous recharging after reaching this voltage value for a time not less than that indicated in the programming parameters by the parameter "Charging time 2^ Phase" (default: 2 hours).

At the end of the alignment procedure, all the LEDs in the synoptic battery are lit, indicating that the battery is charged.
It is recommended to perform the alignment with the battery not fully charged.

IMPORTANT: normally it is very simple to carry out the alignment: it is sufficient to recharge with a normal traditional charger. However, sometimes a recharge does not occur with the conditions expressed above. This can be due to various causes, including:

- The battery is already charged and the charger charges too short
- the battery voltage does not reach the threshold voltage 2^ Set phase (this happens, for example, in the case of gel battery chargers)
- The charger has a particular type of charging curve.

In these cases it is possible to change the value of the parameters "Threshold voltage 2^ Phase" and/or "Charging time 2^ Phase" by reducing the value in order to facilitate the achievement of alignment. However, it is suggested not to deviate much from the default values to avoid providing the SmartUP with incorrect information about the real state of charge of the battery.

NOTE: As long as the SmartUP is not aligned

- The red low battery LED flashes on the synoptic (unless the battery capacity has been forced by using the procedure described in §1.8 Button use)
- with SmartView:
    - in the Monitor TAB instead of the battery charge status there is the message "Ah alignment not carried out"
    - in the OLD Data TAB instead of the graphical representation of the cycle there is the message "Ah alignment not carried out"
    - elsewhere there are no references to battery charging.

Even with SmartUP not aligned, all the physical quantities measured during the cycle (voltages, currents, temperatures, times) and graphs are still stored.
NOTE: The alignment procedure must be repeated each time the SmartUP is deenergized.

Download data on USB key

The data download, in addition to being performed from a PC via SmartViewII software, can be performed on a USB stick. Once the data has been saved on a USB stick, it can be imported to the PC via SmartViewII.
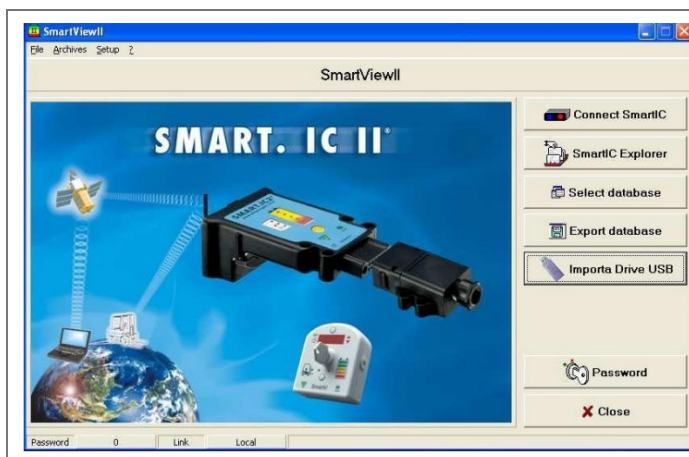
What to do

6.A	Remove the USB port protection cap
	Insert the USB stick
	Press the button for about 5 seconds, until the USB LED (Led7) starts flashing Wait for the data download to finish (about 1 minute and 40 seconds). The LED7 turns off. Take out the USB key
	Close the protective cap of the USB port

The file generated inside the USB key will have the following format
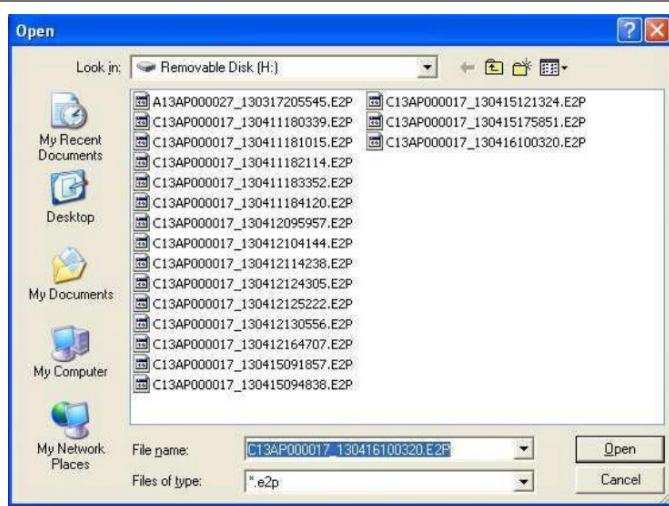XXXXXXXXXXX_YYMMGGHHMMSS. E2P
Where:

- XXXXXXXXXXX ➜ Matricola SmartUP
- YY ➜ Year
- MM Month
- DAY ➜ Day
- HH ➜ Hour MM ➜ Minutes SS ➜ Seconds
- tag. E2P ➜ File Extension

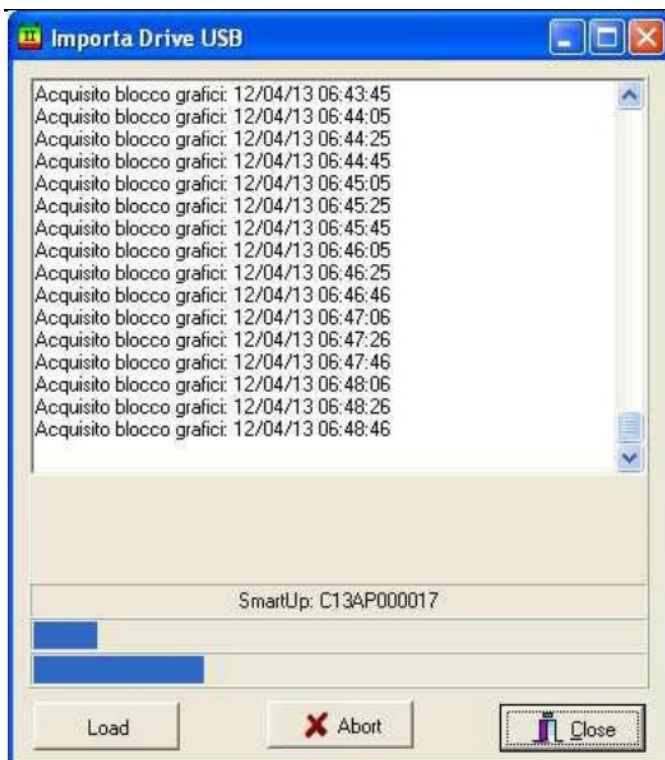## 7 Download data from sub key to pc

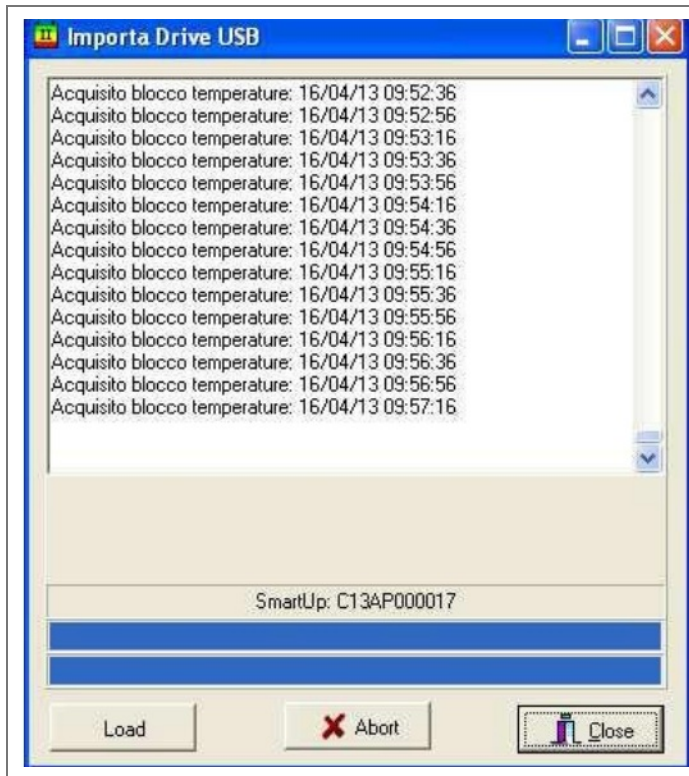|	
	Insert the USB key into the PC Press the "Import USB Drive" button

	Select the directory where the "E2P" files are contained Press the "Open" file
	Wait for the data import

When the data import is complete, press the "Close" button

TA1 – Special fitting codes (screws and accessories)

PHOTO	REF.	COMPONENT	MEASURE
	V1		4×10 round head
	V2		3×22 round head

Models

Features	SmartUP BASE	SmartUP PLUS
Current Sensor	√	√
Voltage sensor	√	√
Electrolyte sensor		√
EEprom size	64 Kb	128 Kb
Temperature sensor		√
Auxiliary analog input		√
I2C bus		√
RS485 non-isolated		√
Non-Insulated CANBUS		√
Relay		√
USB		√
Pulsante On/Off		√

Specifications

Some useful technical information is provided below.

STORABLE DATA

Storable work cycles	400
Current and voltage graph data	11400 samples (equivalent to 47 days with sampling every 6 minutes)
Temperature graph data (version only) SmartUP+)	11400 samples (equivalent to 47 days with sampling every 6 minutes)
SmartKey data (SmartUP + version only)	454 events
Daily data that can be stored	Working data is stored in memory for the last 30 days

OPERATING RANGE

T200 Current Size	Suitable for batteries from 100 to 340Ah
T400 Current Cutter	Suitable for batteries from 350Ah to 740Ah
T800 Current Cutter	Suitable for batteries from 750 to 1500Ah

ELECTRICAL CHARACTERISTICS

Power supply min ฺ max	18V ฺ 144V
Average power consumption	< 1.5W
Protection against internal breakage	Via fuse on power port
Contact Relay (SmartUP+ version only)	2A @ 30Vdc (Vmax = 50Vdc/Vac)
Operating Temperature	-20°C ฺ +50°C

PHYSICAL CHARACTERISTICS

Dimensions (external dimensions)	60mm x 60mm x 130mm
Weight	200g
Degree of protection	IP 54

Frequently Asked Questions

- **What is SmartUP used for?**
  SmartUP is designed for monitoring and controlling lead-acid batteries, providing essential data for proper battery management.
- **How do I detect anomalies with SmartUP?**
  Use the SmartViewII program to identify abnormalities in the battery cycle, indicated by LED signals on the device.
- **What do the different LED patterns signify?**
  The LED patterns on SmartUP indicate the battery's charge level, helping users understand the current state of the battery and any potential issues.

Documents / Resources

SmartUP V1 Smart Up Module Battery Data Monitor [pdf] Instruction Manual
V1 Smart Up Module Battery Data Monitor, V1, Smart Up Module Battery Data Monitor, Module Battery Data Monitor, Battery Data Monitor

References

- **User Manual**