LEROY SOMER

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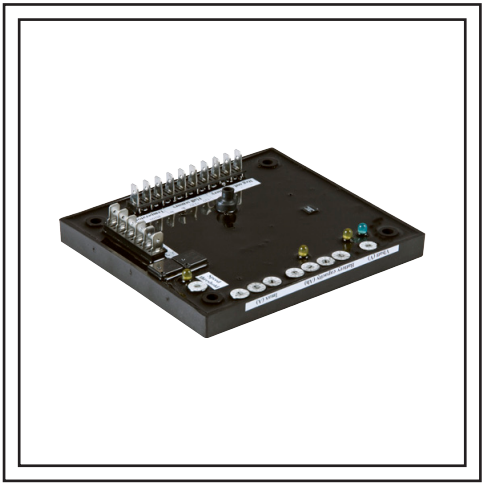
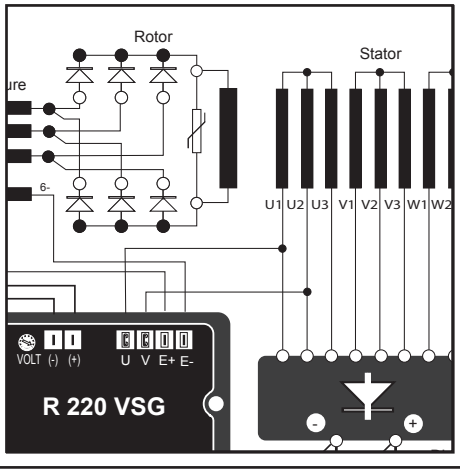


This manual is to be given to the end user



R220 VSG + CCM

A.V.R. multi batteries dedicated

Installation and maintenance

R220 VSG + CCM
A.V.R.

This manual concerns the alternator A.V.R. which you have just purchased.

We wish to draw your attention to the contents of this maintenance manual. By following certain important points during installation, use and servicing of your A.V.R., you can look forward to many years of trouble-free operation.

SAFETY MEASURES

Before using your machine for the first time, it is important to read the whole of this installation and maintenance manual.

All necessary operations and interventions on this machine must be performed by a qualified technician.

Our technical support service will be pleased to provide any additional infor-mation you may require.

The various operations described in this manual are accompanied by recommen-dations or symbols to alert the user to potential risks of accidents. It is vital that you understand and take notice of the following warning symbols.

This A.V.R. can be incorporated in a machine marked C.E.

WARNING

Warning symbol for an operation capable of damaging or destroying the machine or surround-ing equipment.

Warning symbol for general danger to personnel.

Warning symbol for electrical danger to personnel.

R220 VSG + CCM
A.V.R.

CONTENTS

All such operations performed on the A.V.R. should be undertaken by personnel trained in the commissioning, servicing and maintenance of electrical and mechanical components.

The R220 VSG is an IP00 product. It must be installed inside a unit so that this unit's cover can provide IP20 minimum total protection (it must only be installed on LS alternators in the appropriate location so that when viewed externally, it has a higher degree of protection than IP20).

R220 VSG + CCM
A.V.R.

1 - SUPPLY

1.1 - SHUNT excitation system

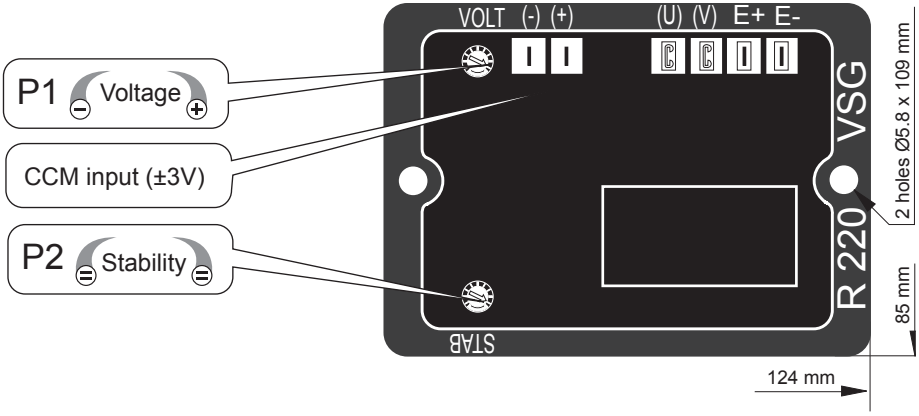
The alternator with Shunt excitation is self-excited with an **R 220 VSG + CCM** voltage regulator.
The regulator monitors the exciter excitation current as a function of the alternator output voltage. Very simple in design, the alternator with shunt excitation has no sustaining short-circuit capacity.

2 - R220 VSG A.V.R. + CCM

2.1 - R 220 VSG characteristics

- Storage : -55°C ; +85°C
- Operation : -40°C ; +65°C
- Voltage regulation: ± 0.5%.
- Voltage supply/sensing range 12 to 70 V (30 to 67 Hz)
- Rapid response time (500 ms) for a transient voltage variation amplitude of ± 20%

- Voltage setting **P1**
- Stability setting **P2**.
- Power supply protected by 8 A fuse, slow-blow action (tolerates 10 A for 10 s)
The fuse is impregnated in the resin, therefore it can not be replaced.
- Variable frequency from 30 Hz to 67 Hz.
- The size of the screwdriver tip used to adjust the potentiometer is 2.5 mm.



2.2 - CCM characteristics

The CCM general view is given by the following figure:

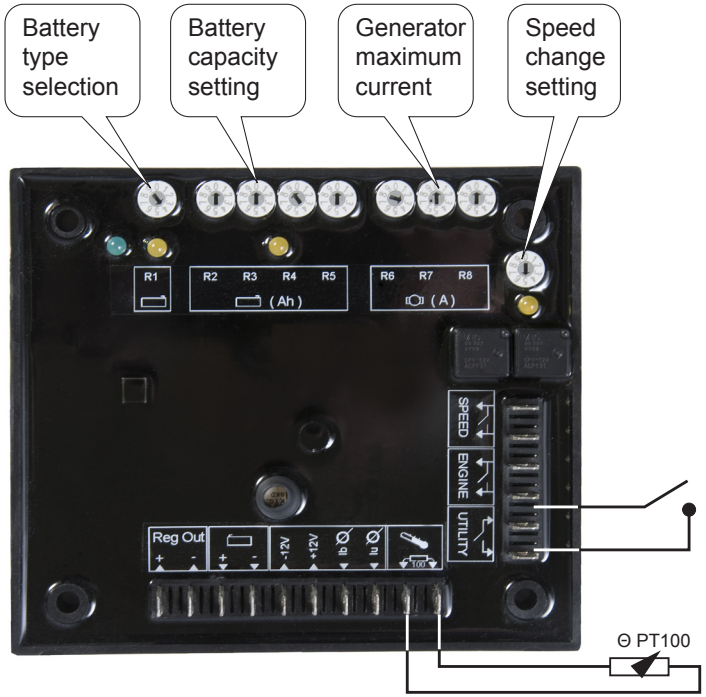


Figure 1 :
Charge Control Module overview
This module is mainly composed by rotating switches and Faston terminals:

2.2.1.Rotating switches

A. Battery type selection
One rotating switch is dedicated to the battery type selection. The assignments list is the following:
- position 1: OPzV
- position 2: SBS EON
- position 3: Evolion
- position 4: A600 Solar

The remained positions (5 to 9) are reserved for future assignments (A600 Solar by default).

B. Battery capacity setting
C batt. = (R2 x1000+R3x100+R4x10+R5x1)
Four (4) rotating switches: selection of battery capacity from 0 to 1999 Ah.

C. Generator maximum current
I max = (R6x100+R7x10+R8x1)
Three (3) rotating switches: current selection from 0 to 398A. This allows to prevent the genset unexpected shutdown during normal work.

D. Speed change setting (R9)
One (1) rotating switch which defines the current threshold from which the engine will change its speed. The positions 1, 2… 8 and 9 respectively correspond to 10%, 20% …80% and 90% of the generator maximum current. The position 0 will is interpreted as 10%.

2.2.2 - CCM terminals description

A. Regulator link (Reg Out)
Two terminals allow communication between the CCM and the AVR (see annex).

B. Battery sensing (Batt)
Two(2) terminals connected to the diodes bridge output. This voltage is not only used for sensing but also for supplying the CCM (see annex). These terminals (and so the CCM) are designed to withdraw 150Vdc without damage.

C. Current sensing (LEMs)
Four (4) terminals for two current sensors: one for load current measurement and the other for battery current measurement (see annex). These two LEM share the same supply: +12V and -12V.

The supported LEM are the LF 306-S (or any closed loop current sensors with 1/2000 ratio). Only positive currents are measured.

Warning : The LEM supply polarity must be respected to avoid damage.

D. Temperature sensing (PT100)
Two terminals for measuring the battery set temperature. This is used to adapt the charge strategy to weather conditions.

E. Utility
Two terminals for taking into account the presence or not of the grid. The description will be given further.

F. Engine stop and start (Engine)
Two (2) terminals for starting and stopping the engine depending of the battery state of charge. Explanation will be given further.

G. Speed change (Speed)
Two (2) terminals allowing to change the genset speed according to the Current threshold (see above section) and depending on the battery state of charge.

2.2.3 - How does the CCM work

The following convention will be used is this section

Vch: maximum charge voltage (or equalizing voltage)

Vfl: floating voltage

C: Battery capacity

Vd: Lower voltage alarm threshold

Imax: maximum current that the generator can provide;

Ib and Iu: respectively battery current and load (user's) current.

2.2.3.1 - Charging strategy

The charge module works in charge mode at constant voltage with 2 levels of voltage.

A. Charge with a current limited to a threshold given in annex.

B. Charge at constant voltage Vch until the current is less than 0.03C during 1 minute.

C. Each 60 charge cycles, a charge in floating mode at constant voltage Vfl is achieved for some batteries types (see annex). During this floating charge mode, the CCM will go back to charge mode if the current is higher than 0.08C during 5 succesive minutes.

NB: The first floating charge for those batteries will be done after 5 normal charges.

D. Discharge phase with genset OFF until either 40% of the battery capacity is consumed or the battery voltage is less than Vd.

2.2.3.2 - Light-Emitting Diode (LED) status

A.Charging LED :

A1. Yellow ON: CCM charges at constant voltage Vch

A2. Yellow flashing: Vch is not reached yet or the module does not succeed to reach this voltage

B. Floating LED :

B1. Green ON: CCM charges at constant voltage Vfl

B2. Green Flashing: CCM is in discharge mode or is trying to reach the floating voltage Vfl

C. Current limitation LED

C1. Yellow ON: the CCM is limiting the charge current at a threshold, as defined in annex, or at Imax = $I_u + I_b$

C2. Yellow flashing: the module is trying to limit the current or has temporarily shut down the engine due to emergency condition: If during charge mode, the CCM is not able to limit the current, it will stop the engine to avoid damages. The CCM will start again the engine and restart the charge process two (2) minutes later.

D. Speed change LED

The Speed status LED will be ON when the speed relay is activated.

2.2.4. Relays and dry contact

A. Speed relay

A1. The relay has to go to high speed when the current is higher than the value defined by the “speed change” rotating switch

A2.The relay is forced to high speed when the engine is started by the ON/OFF relay
A3. The relay must go to low speed when these two following conditions are achieved:

- The charge current is less than 90% of the current defined the “speed change” rotating switch

- At least 5 minutes elapsed from the moment the relay has been forced to “High speed”

B. Engine ON/OFF relay

The relay is ON if the engine has to be started, OFF if not.

C.Utility dry contact

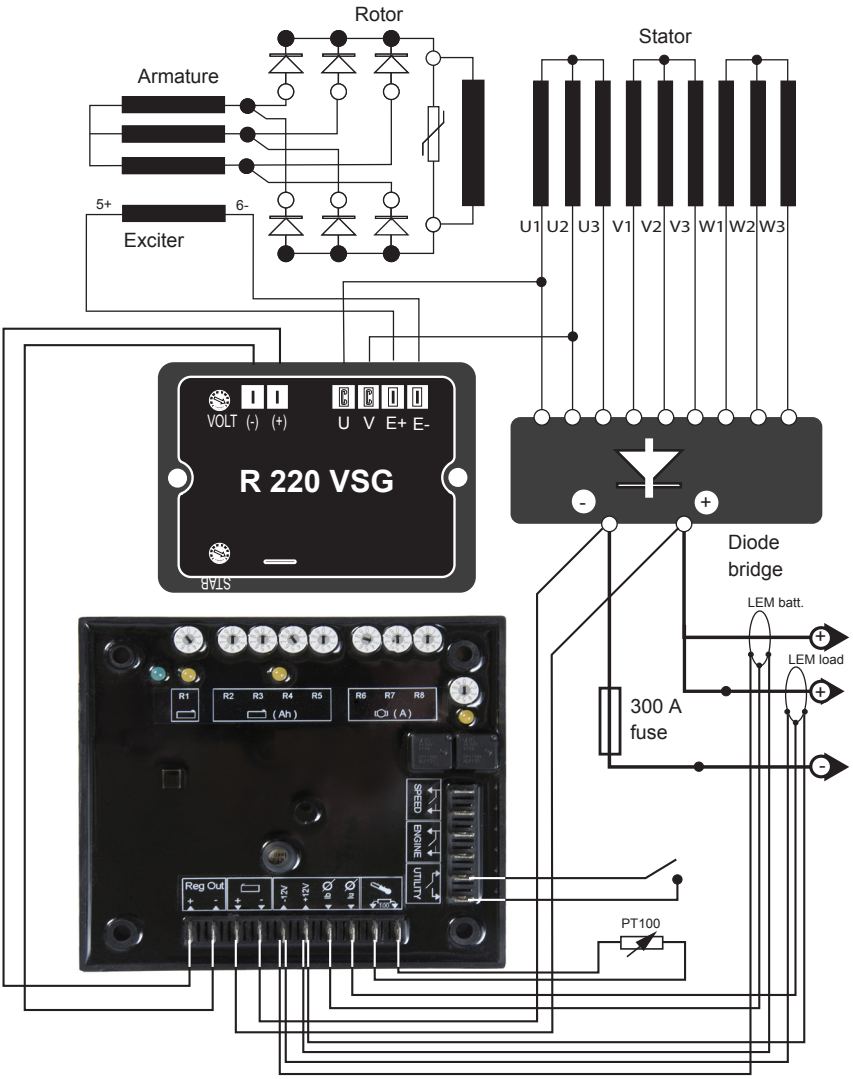
C1..Dry contact closed: utility ON
If the Grid is ON, the CCM stops the engine during the duration of the grid presence and then starts the engine to finish the charge process. If the grid appears during discharge phase, the current going through the battery is integrated over the grid presence to evaluate the state of charge of the battery.

C2. Dry contact open: Utility OFF
If the grid is OFF during the discharge phase, the CCM will continue the battery discharge phase until reaching 40% of the battery total capacity.

2.2.5. Reset of cycle number before floating.

The number of charge/discharge cycles without floating is reset to 60 if the user acts like following :
- the utility input is closed while the battery type selection rotating switch (R1) is positionned to 0 for at least 5 seconds.

2.3 - WIRING AND CONNECTION DIAGRAM



3-INSTALLATION - COMMISSIONING

3.1 - Electrical checks on the AVR

- Check that all connections have been made properly as shown in the attached wiring diagram.
- Check that CCM input (±3V) is connected.

3.2 - Settings

The machine is tested and set at the factory. When first used with no load, make sure that the drive speed is correct and stable (see the nameplate). After operational testing, replace all access panels or covers.
The only possible adjustments to the machine should be made on the AVR.

3.2.1 - R 220 VSG setting (shunt system)

Initial potentiometer settings

- **P1** potentiometer (AVR voltage adjustment): fully anti-clockwise.
- Remote voltage adjustment potentiometer: centre position.

Run the alternator at its rated speed. If the voltage does not increase, the magnetic circuit should be remagnetized (see section 3.3).

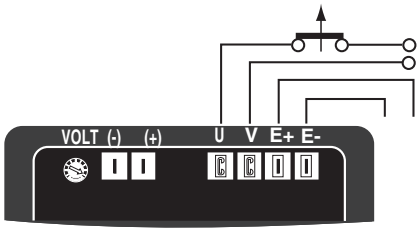
- Turn the AVR voltage adjustment potentiometer **P1** slowly until the output voltage rated value is obtained.
- Adjust the stability setting using **P2.**
  Clockwise: increase the rapidity.
  Anti-clockwise: decrease the rapidity.

3.2.2 - Special type of use

WARNING

Excitation circuit E+, E- must not be left open when the machine is running : AVR damage will occur.

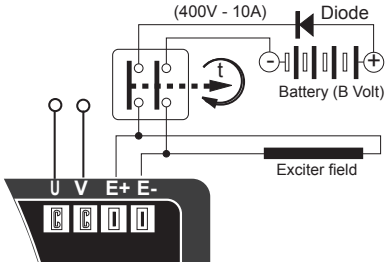
3.2.1.1 - R220 VSG field weakening (SHUNT)



The exciter is switched off by disconnecting the AVR power supply (1 wire U or V).
Contact rating : 16A - 250V alt.

The power supply contactor must only be closed when the alternator is not being driven

3.2.1.2 - R220 VSG field forcing



Battery must be isolated from the earth.

Exciter field may be at line potential.

3.3 - Electrical faults

Fault	Action	Effect	Check/Cause
No voltage at no load on start-up	Connect a new battery of 4 to 12 volts to terminals E- and E+, respecting the polarity, for 2 to 3 seconds	The alternator builds up and its voltage is still correct when the battery is removed.	- Lack of residual magnetism
		The alternator builds up but its voltage does not reach the rated value when the battery is removed.	- Check the connection of the voltage reference to the AVR - Faulty diodes - Armature short-circuit
		The alternator builds up but its voltage disappears when the battery is removed	- Faulty AVR - Field windings disconnected - Main field winding open circuit - check the resistance
Voltage too low	Check the drive speed	Correct speed	Check the AVR connections (AVR may be faulty). - Check the CCM connection - Field windings short-circuited - Rotating diodes burnt out - Main field winding short-circuited - Check the resistance
		Speed too low	Increase the drive speed (Do not touch the AVR voltage pot. (P2) before running at the correct speed.)
Voltage too high	Adjust AVR voltage potentiometer	Adjustment ineffective	Faulty AVR
Voltage oscillations	Adjust AVR stability potentiometer		- Check the speed : possibility of cyclic irregularity - Loose connections - Faulty AVR - Speed too low when on load (or U/F bend set too high)
Voltage correct at no load and too low when on load (*)	Run at no load and check the voltage between E+ and E- on the AVR		- Check the speed (or U/F bend set too high)
			- Faulty rotating diodes - Short-circuit in the main field. Check the resistance - Faulty exciter armature.
(*) Caution : For single-phase operation, check that the sensing wires coming from the AVR are correctly connected to the operating terminals			
Voltage disappears during operation	Check the AVR, the surge suppressor, the rotating diodes, and replace any defective components	The voltage does not return to the rated value.	- Exciter winding open circuit - Faulty exciter armature - Faulty AVR - Main field open circuit or short-circuited

Warning : after operational testing, replace all access panels or covers.

4 - SPARE PARTS

4.1 - Designation

Description	Type	Code
A.V.R. A.V.R.	R 220 VSG CCM	AEM 110 RE 035 AEM 056 CT 001

4.2 - Technical support service

Our technical support service will be happy to provide any information you require.

When ordering spare parts, you should indicate the complete machine type, its serial number and the information indicated on the nameplate.

Part numbers should be identified from the exploded views and their description in the parts list.
Our extensive network of «service stations» can dispatch the necessary parts without delay.
To ensure correct operation and the safety of our alternators, we recommend the use of original manufacture spare parts.
In the event of failure to comply with this advice, the manufacturer cannot be held responsible for any damage.

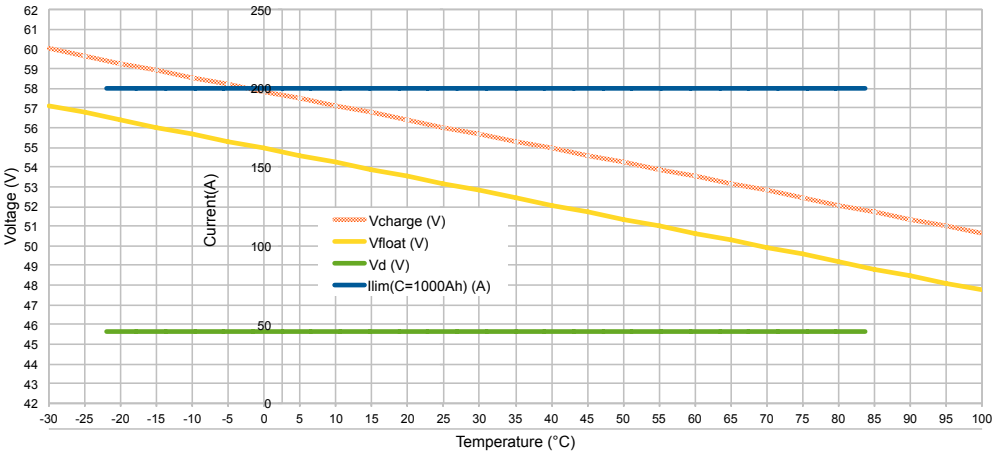
5 - ANNEX

Types of batteries supported by the CCM

5.1 - Battery 1: OpZV type

End of charge condition: the charge current is less than 3% of the total capacity of the battery
Switch to charge mode condition: 40% of the total capacity of the battery has been consumed in discharge mode.
Maximum charge duration: 12hours
Normal duration of floating mode: 14hours
Switch from floating to charge mode condition: Ibatt = 8% of the total capacity of the battery
Minimum duration of floating: 5min
Number of cycles between two floating modes: 59

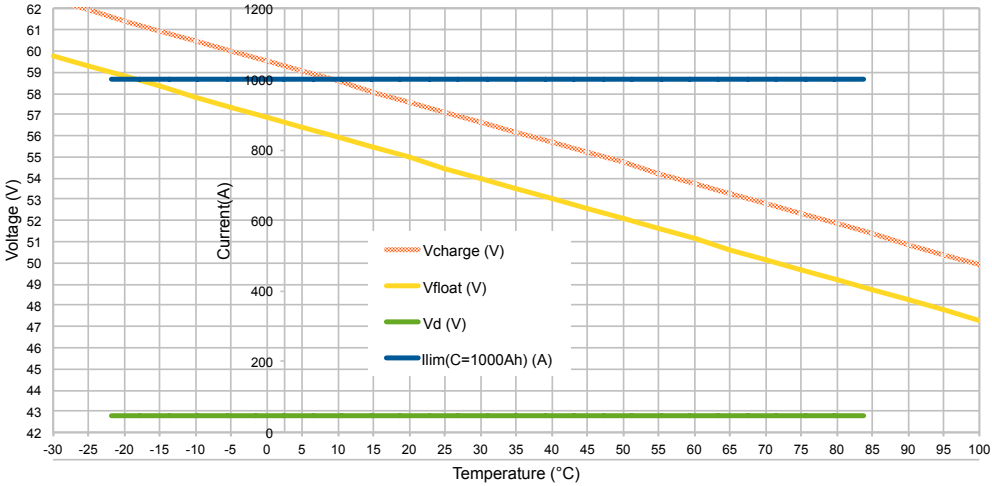
Charge caracteristics for OpZV type battery



5.2 - Battery 2: SBS EON type

End of charge condition: the charge current is less than 3% of the total capacity of the battery
Switch to charge mode condition: 40% of the total capacity of the battery has been consumed in discharge mode.
Maximum charge duration: 12hours
Normal duration of floating mode: 14hours
Switch from floating to charge mode condition: Ibatt = 8% of the total capacity of the battery
Minimum duration of floating: 5min
Number of cycles between two floating modes: 59

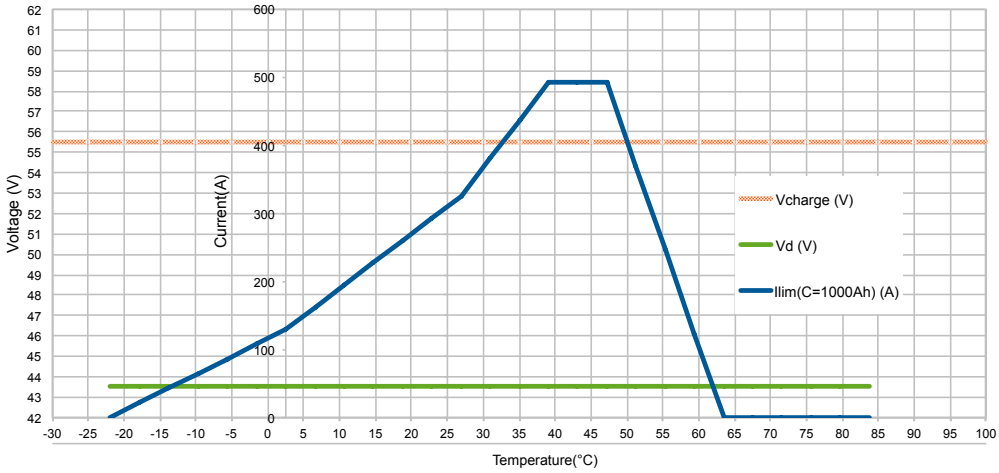
Charge characteristics for SBS EON type battery



5.3 - Battery 3: Saft Evolion type

End of charge condition: the charge current is less than 3% of the total capacity of the battery
Switch to charge mode condition: 40% of the total capacity of the battery has been consumed in discharge mode.
Maximum charge duration: 12hours
NB: No floating mode required

Charge characteristics for Saft Evolion type battery



5.4 - Battery 4: Exide A600 type

End of charge condition: the charge current is less than 3% of the total capacity of the battery
Switch to charge mode condition: 40% of the total capacity of the battery has been consumed in discharge mode.
Maximum charge duration: 16hours
Normal duration of floating mode: 8hours
Switch from floating to charge mode condition: Ibatt = 8% of the total capacity of the battery
Minimum duration of floating: 5min
Number of cycles between two floating modes: 59

Charge Characteristics for Exide A600 type battery