Pre-RMA testing
Lead Acid Batteries

9. Pre-RMA test form - Lead-acid battery

1. General

Product, system and fault information		
Date		
Model Number		
Serial Number		
Date of installation (if known)		
Date of failure (if known)		
Does the battery bank consist of an individual battery or multiple batteries?	☐	Multiple batteries.
	☐	Individual battery, go to 2.
How many batteries are connected in series?		
How many batteries or series strings are connected in parallel?		
Inspect the battery bank or ask for a photo of the battery bank showing the battery bank wiring. Is the battery bank wired conform to chapter 3 in the Wiring unlimited book?	☐	Yes.
	☐	No, no warranty.
Are all batteries in the battery bank the same model, age and capacity?	☐	Yes.
	☐	No, no warranty.

2. Initial check

visual check		
Is the battery case damaged?	☐	Yes, no warranty.
	☐	No.
Is the battery leaking acid?	☐	Yes, no warranty.
	☐	No.
Is the battery case swollen or deformed?	☐	Yes, no warranty.
	☐	No.
Does the battery weigh a few kilos less than its weight as listed in its datasheet?	☐	Yes, no warranty.
	☐	No.
Are the battery terminals damaged, badly corroded or have significant burn marks?	☐	Yes, no warranty.
	☐	No.

3. Battery usage check

Battery usage check		
Does the installation contain a battery monitor with a history menu, like a BMV or SmartShunt and/or is the system on the VRM portal? If a battery monitor is present, use its history information to check the below items. Alternatively, check the VRM portal, or talk to the end-user of the battery.	☐	The system has a battery monitor.
	☐	The system is on the VRM portal.
	☐	No battery monitor or on VRM.

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Battery usage check

Deepest discharge and the time since last full charge:

Has the battery been too deeply discharged and left for a few days in a deeply discharged state?

Background: an occasional deep discharge is not ideal but will not necessarily damage a battery. However, a battery will sustain unrecoverable damage if it is left in a deeply discharged state for more than a few days. This damage is not covered under warranty.

☐ Yes, no warranty.

☐ No.

☐ Unknown.

Average discharge:

Has the battery, on average, been too deeply discharged, well below 50% state of charge?

Background: Generally speaking, a lead-acid battery should not be discharged deeper than 50% of its rated battery capacity. Regularly deeply discharging a battery will significantly reduce its lifetime and damage the battery. This damage is not covered under warranty.

☐ Yes, no warranty.

☐ No.

☐ Unknown.

Cumulative Ah drawn:

Is the battery at the end of its lifetime? Has it produced more energy than what it has been designed for? Does the "Cumulative Ah drawn" parameter in the battery monitor history divided by the rated battery capacity exceed the battery's cycle life as listed in the datasheet?

Background: A battery is a consumable, it will wear out over time, and it will eventually need to be replaced when it has reached the end of its life. This is not covered under warranty.

☐ Yes, no warranty.

☐ No.

☐ Unknown.

Total charge cycles in relation to average discharge:

Is the battery at the end of its lifetime? Has it exceeded its designed cycle life? Does the "Total charge cycle" parameter in the battery monitor history exceed the battery's cycle life as listed in the datasheet while considering the average discharge?

Background: A battery is a consumable, it will wear out over time, and it will eventually need to be replaced once it has reached the end of its life. The deeper the average discharge, the shorter its cycle life will be. This is not covered under warranty.

☐ Yes, no warranty.

☐ No.

☐ Unknown.

Synchronisations in relation to total charge cycles:

Has the battery not always been fully charged? For example, the charger never reaches the float cycle, such as when there is not enough solar energy (winter) to charge the battery fully or when a generator is turned off before the charger has reached the float stage. Compare the battery monitor history "Synchronisations" and "Charge cycle" parameters. Is there a significant difference?

Background: A full charge is when the battery charger has reached the float stage. This can be checked by looking at the total charge cycles compared to the synchronisations. The battery monitor is synchronised each time the battery has been fully charged. If there is a big difference between the charge cycles and the synchronisations, this can indicate that the battery has not always been fully charged. Repeatedly not fully charging a battery will lead to battery damage and a reduced lifetime. However, do note that a difference between synchronisations and charge cycles can also have been caused by an incorrect configuration of the battery monitor.

☐ Yes, no warranty.

☐ No.

☐ Unknown.

The number of full discharges:

Has the battery often been very deeply discharged? Are there more than 25 full discharges in the battery monitor history?

Background: Habitually deeply discharging the battery will cause irreversible damage, and this damage is not covered under warranty.

☐ Yes, no warranty.

☐ No.

☐ Unknown.

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Battery usage check	
Maximum battery voltage:	
Has the battery voltage been above 15V? For example, due to a faulty or incorrectly configured battery charger?	☐ Yes, no warranty.
Background: A too high battery voltage will cause gassing in the battery, and if this is not stopped in time, this gas will escape via the battery emergency vent. The battery weight will reduce, or in a severe case, the battery case might swell up. The battery will sustain irreversible damage, and this damage is not covered under warranty.	☐ No. ☐ Unknown.

4. Functionality

Battery terminal voltage check	
Remove the battery from the battery bank. Measure its terminal voltage and write it down.	Battery voltage:
Charge the battery with a 3-stage charger. Ensure that the charger is set to the following: • Absorption voltage 14.2V. • Float voltage 13.5V. • Charge current 0.1C (Example for a 100Ah battery: 0.1 x 100Ah =10A charge current). Charge the battery until the battery charger has reached the float stage. (This can take up to 10 hours). Did the charger reach the float stage?	☐ Yes. ☐ No, the battery is faulty.
Disconnect the charger. Let the battery rest for 4 to 5 hours. Measure the battery voltage again and write it down.	Resting battery voltage:
Is the battery voltage significantly below 12.6 V?	☐ Yes, the battery is faulty. ☐ No.

Battery capacity check	
Note that Victron AGM and GEL batteries are deep cycle batteries and cannot be tested using hand-held battery testers. The only way to test the capacity of a deep cycle battery is first to charge the battery, then discharge it in a controlled manner and then calculate the battery capacity.	
Start with a fully charged battery. Connect a DC load (no bigger than 0.1C) to the battery. This can be a DC load bank, DC incandescent light globes or an inverter running a constant AC load. Turn the load on and write down the time.	Start time:
Measure and write down the DC current.	DC current:
Monitor the battery voltage. As soon as the voltage drops below 12V, turn the load off and write down the time.	End time:
How long was the total time?	Total time:
Calculate the battery capacity in Ah. Multiply the DC current (A) with the total time (h).	Calculated battery capacity:
Is the calculated battery capacity at least 75% of the rated battery capacity?	☐ Yes. ☐ No, the battery is faulty.

5. Remarks

Provide additional fault information or add issues not already covered in earlier questions

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6. RMA lodgement

For your information purposes, provide details after lodging the RMA		
RMA type:	☐	Warranty claim.
	☐	Non-warranty repair or replacement request.
RMA lodgement date		
Victron Energy RMA number		
Your reference number		

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