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TECHNICAL BULLETIN

TO	:	**Yanmar Marine Distributors and Dealers**
MODEL	:	**Models equipped with Valeo alternator(s). (YM- and JH)**
SUBJECT	:	**Charging Li-ion batteries**
REF. No.	:	**YMTQTB17-007**
DATE	:	**June 21, 2017**

1. Purpose

More and more we receive questions if we can support the use of Lithium based batteries.
Li-ion batteries have some distinct advantages over lead acid batteries. For example:

- Absorption of high charging rates till almost full. This results in a shorter charging time.
- Lighter, smaller and longer life (more cycles)
- Higher discharge percentage possible. (less Ah capacity needed to install).

After tests we did, in combination with our presently used Valeo alternator, we conclude we can charge Li-ion batteries quickly and safely but installation and component selection is very important.

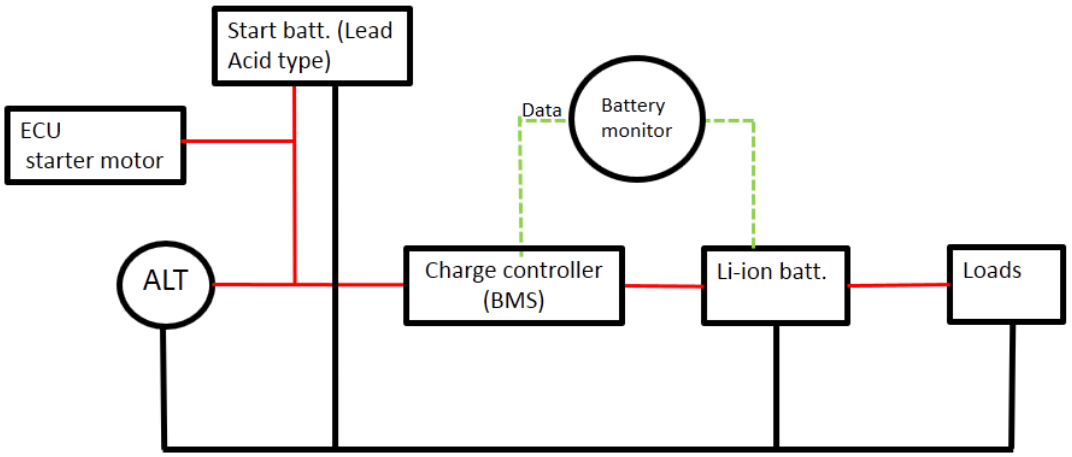
2. Details

Li-ion batteries (only LiFePO4 chemistry allowed!) have a somewhat lower voltage during charging than regular lead-acid batteries. This will increase the average charging current and thus the load on the alternator. Further the voltage of Li-ion is much more constant during charging. This results again in a raise in average charging current.
To protect the alternator the BMS (Battery Management System) must limit the charging current.
For the alternators supplied with our YM and JH range the following limits go:

12V/125A	128990-77250	Valeo alternator	limit: 100 A.
24V/65A	129677-77250	Valeo alternator:	limit: 50 A.

The current is controlled by the BMS supplied by the manufacturer of the Li-ion battery.

Principle of minimum set up:



red: positive power cable
black: negative power cable
green: communication

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3. Important notes for installation and commissioning.

- Use only LiFEPO4 type batteries. This is the general supplied type for marine use.
  Check with battery supplier for maximum charging current. There is no maximum capacity (apart from financial ones).

- Use battery, BMS and battery monitor matched to each other from one supplier.

- Carefully respect the installation requirements of the supplier.

- Use oversized cables. Voltage drops greatly influences the charging performance!

  Total cable length and diameter recommendation:

12V/125A	max. 6 meter	50 mm2
12V/125A	max. 10 meter	70 mm2
24V/65A	max. 6 meter	25 mm2
24V/65A	max. 10 meter	35 mm2

  Use correct crimp eyes and used calibrated crimp tools.

- Always keep a lead acid battery in the system directly connected to the alternator.
  This to supply the engine ECU and starter motor and prevent spikes in the system when the BMS stops the charging of the li-ion battery.

- The alternator can get very hot and is the most heat critical component in the engine bay!
  Typical 150-200°C skin temperature can occur, lots of heat (typical 500-1000 Watt) is produced.
  Ensure ample supply of cool air from outside the engine room directed to the alternator.
  Ensure 100 mm. space around the alternator or install highly polished metal sheet to reflect the radiation and protect the engine room insulation.

- At commissioning check all components (connectors, breakers, switches) for voltage drop and heating up during heavy charging.

- Install a main switch close to the battery (some suppliers supply an emergency breaker controlled by the BMS of the batteries for this).

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4. Warning for secondary alternator.

- Depending the characteristics of the BMS a spike may occur at the end of charging. This is potentially dangerous for the on-board electronics and the regulator of the alternator itself.

- Check with the supplier for a correct and smooth ramp down of charging.

5. Maintenance.

- The alternator is more heavily loaded. Higher wear of belts and pulleys as well as a somewhat shorter service life of the alternator can be expected.

- For battery, BMS etc. check the documentation of the supplier.

6. warranty.

The warranty will remain unchanged under following conditions:

- Correct selection and installation of the components.

- Alternator is not defective from overheating. See important installation notes under 3.

- Only our Valeo alternators have been checked and validated for Li-ion charging.
  Other alternator types are for risk of the installer.

- Damage from voltage spikes from suddenly disconnected batteries are not covered warranted.

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