

Dear Walter,

Here are the answers to the questions about Limiter Rules from Hungary:

1) set the limit value:

- class mini - 20W/h or 1200W/minutes (62,5%)	abst.:37,5%	-----	20Wh/1200Wmin
- Eco, Mono 1, Hydro 1 - 53W/h or 3188W/min 53Wh/3188Wmin (75%)	higher (12,5%)	abst.(12,5%)	-----
- Mono 2 and Hydro 2 - 106W/h or 6376W/min (75%)	higher (12,5%)	abst.(12,5%)	----- 106Wh/6376Wmin
- FSRE - 159W/h or 9564W/min (62,5%)	abst.:37,5%	-----	159Wh/9564Wmin

note: (MDLE-4 works in Watt/hours, E-lim and Wozniak KLW 202 works in Watt/ minutes)

2) update limit value - yes / no / how ----- YES, two times in a year/season.

3) check accuracy of limiter - yes / no / how ----- YES, once a season or "Maviga Approved Types"

4) set min/max weight for limiter batteries - yes / no / how ----- NO (62%)

5) set slow down time before limiter cuts off the power - 10s / more / less ----- 10s (75%)

6) set the time after which limit will be renewed (allows the boat go back to the platform) - 60 s / more / less ----- 60s (81%)

7) check in - check out control:

- check correct placement of limiter in the boat (between battery and kill-switch) - yes / no / how ----- YES (56%)

- random check - limiter accuracy - yes / no / how ----- YES (81%)

- championship checks (hat system) - yes / no / how ----- NO (68%)

- .....

8) We suggest to change the software of the limiters so, that it "pumps" when it gives back the power after the 60 seconds.

My Friend,

I'm not in favour with all the votes, but this is the decision of the majority of Hungarian racers.

Regarding the technical points, I was trusted and asked by the others to answer. Here are my notices to the points:

1) Set limit values: The data Wh and Wmin proposed are not equal. 53Wh equals to 3180Wmin, 106Wh=6360Wmin and 159Wh=9540Wmin. I'd suggest to align the values so that the settable values result the same amount of energy. The best solution would be, if Mirek changed the software to count in Wmin or at least increased the resolution to 1/10th. This way MDLE4 could be set to 53,1Wh (=3186Wmin) or 53,2Wh (=3192Wmin). Still not 3188, but the Elim can be set in 6Wmin steps.

3) Check accuracy of limiters: To check the accuracy, there are two ways. Option one is to hook the limiter up for example to an etalon voltage and current, then read and compare what it measures. Of course, this is possible with a special device only, that can read the values. Martin Marriott's device makes it easy with the program box, but MDLE does not support this at the moment. If the 3 producers could agree to use the same protocol, that would allow the use of one checking device for all types of limiters. With this method we still don't know, how the summing algorithm works (that's another, more sophisticated way of possible cheating), but the checking process is faster than option two, which is the complete check of the limiter. It requires a power supply and a regulated current drain. In my mind it would work the way, it sends out full throttle servo pulses to the limiter, check the pulse width coming out from that, and count the energy consumed at the same time. When the returning pulses change (limit reached), we have the amount of energy that the actual limiter lets go thru, before slows down. These measurements takes time. Taking out of the boat, hooking up to the meter needs some time, and only doing the measurement itself, in case of a 53Wh limit with 12V and 60Amps, takes 4 minutes and 42 seconds. On one hand, we want to shorten the duration of the whole event, on the other hand, we want to check the limiters. This might be done only, if we had at least 6 measuring devices, and 6 trained persons who do the measurement after the run, because it have to be finished by the time the next group finishes his run. The devices will dissipate 720 watts in the summer, 6 devices besides each other... It will get very hot in continuous work. Just imagine the "Accuracy Check Station" with 4,3kW heating in midsummer. Not talking about the rushing. I wouldn't be among those people!  
So, by my opinion, it will not work at all.

I would suggest (and it coincides with a lot of Hungarian racer's wish) to have a list of "Naviga Approved" types of limiters (not too much at the moment), and we could only use those.

After that, it is the producer's responsibility to keep the limiters' accuracy in the acceptable tolerance. -By the way accuracy, we struggled with questions of 1% or 0.5%... But which voltage is measured? The one comes from the battery or the one that goes to the controller? (It's not the same because of the voltage drop on the current sensing resistor.) One other question: When the limit reached, there is 10 seconds time to slow down. This 10 second means 1,3% of the whole energy allowed! Is it in the energy allowed, or it is an extra 1.3%(error) ? I know, it should be as accurate as possible, but my very personal opinion is that, the repeatability and equality is more important, than the absolute accuracy.

4) Hungary suggests not to set min/max weight of limiter battery. (My personal opinion is to set (increased) minimal weight of ALL batteries. Finally, that would fulfil our goal, to lengthen the lifetime of the batteries.)

5) Hungary accepted 10 seconds. To be compatible with all limiters, 9 seconds also will be fine for us.

7) Random checks should be done by the complete check method, described above. Only one meter is needed. With this device and method we could check all types of limiters. Naviga will need some kind of testing device for approving limiters anyway.

8) I think, it is a good idea to show somehow, that the limit has been reached. For example, if I couldn't fully charge my battery for some reason, and the boat slows down, I am allowed to finish the lap slowly or even after some rest, unless the energy allowed was not used up. If the limit reached, there is no way

to continue the race. When the 60 seconds elapsed, the limiter chops the power for 1 second in every 2 secs. That behaviour of the boat clearly shows to everybody, that the limit is reached, and the judge can send him in the middle if the racer doesn't do it on his own. On the other hand, this "pumping" does not really affect the ability of driving the boat back to the pontoon.

I know, there are a lot of limiters out already, so modifying the firmware is not an easy task. But Mirek offered to do an upgrade to make the MDLE-4 more accurate. I think, neither this chopping, nor the change in counting means very big change in the sw. And none of them needs any modification in hardware.

Maybe Martin and Klaudiusz would do it also, because it can be a useful improvement.

Kind regards,

Csaba