

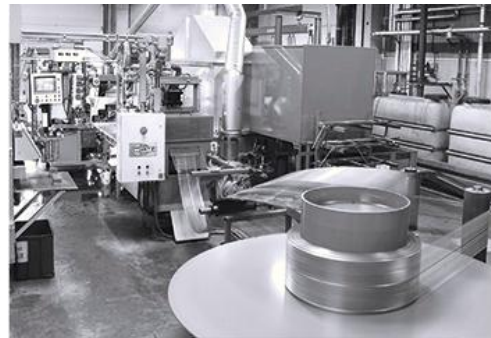
ALBA 2026 SO25

„compare charging strategies in simulated
drive cycles: low temperature “

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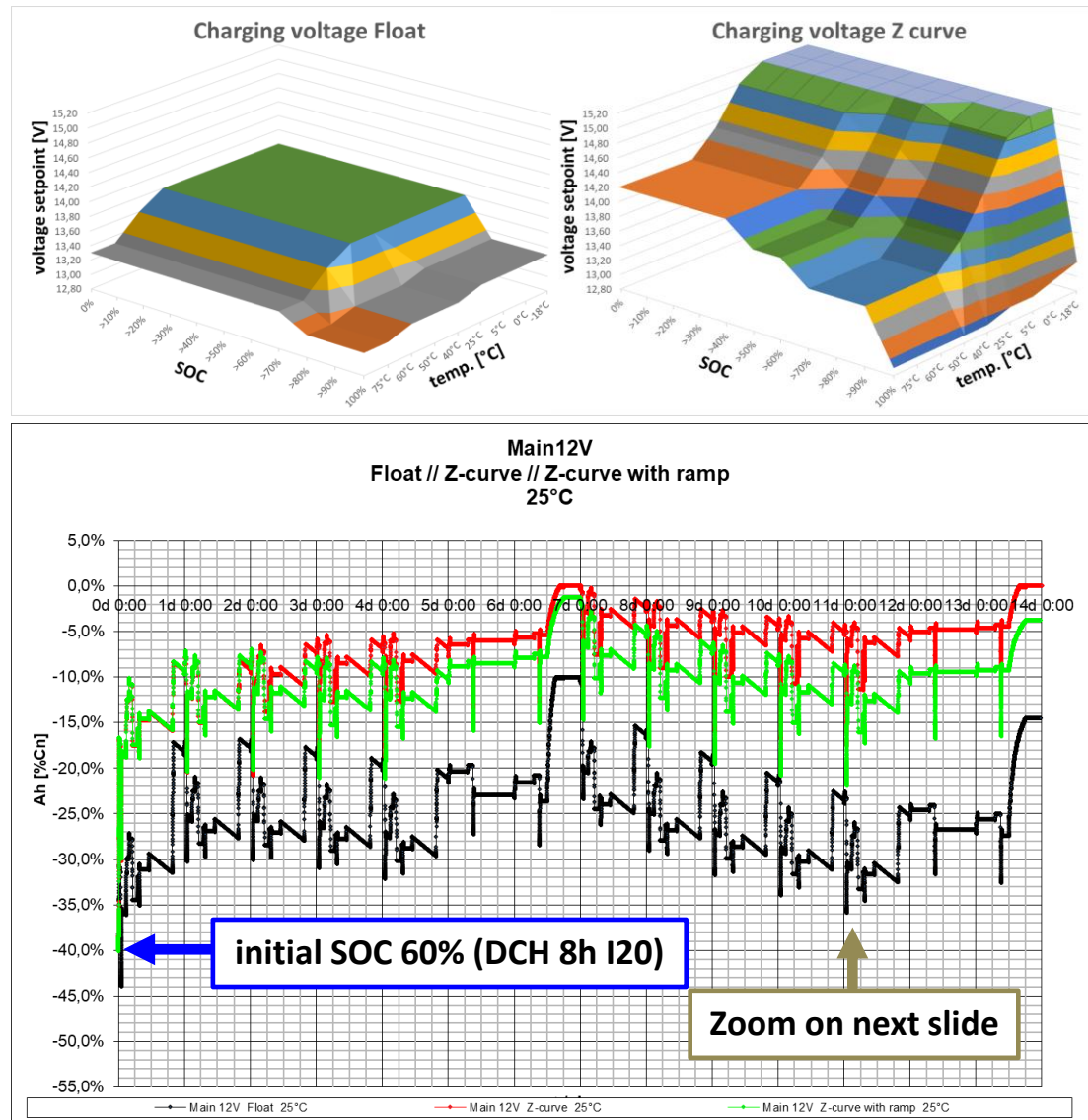
Low temperature tests

- **"Main 12V" cycle**
(known from previous years ALBA)
 - low temp (25°C / 3°C)
 - Kindergarten commuter, low-mileage driver
 - high Ah throughput
 - start SOC 60%
- **3 different charging strategies**
 - Float
 - Z-curve with low voltage
 - 13.8V / 13.3V SOC based
 - Z-curve "-32mV/K"
 - SOC based voltage set points
 - Z-curve "-32mV/K" with 5min Ramps
 - with 5min Ramps
 - SOC based voltage set points

Batteries: MOLL 12V 70Ah EFB+

No significant water loss at 25°C (<0,1g/Ah)

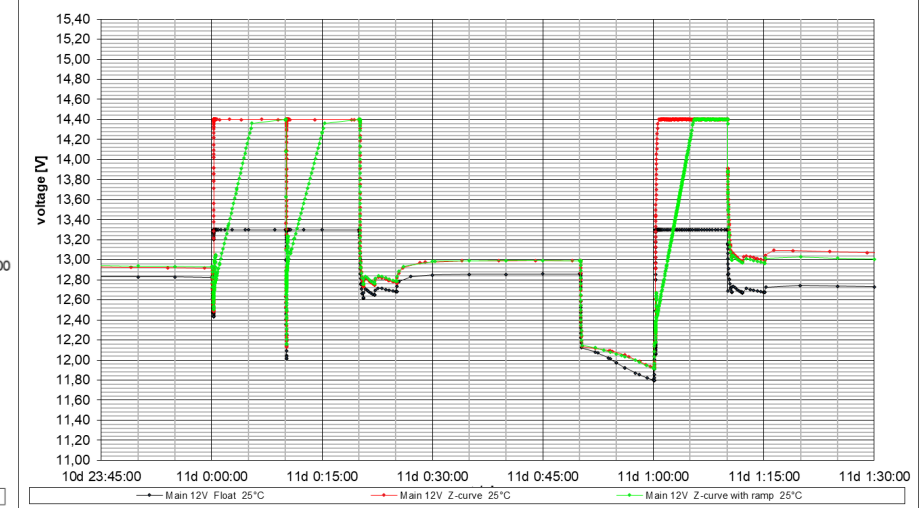
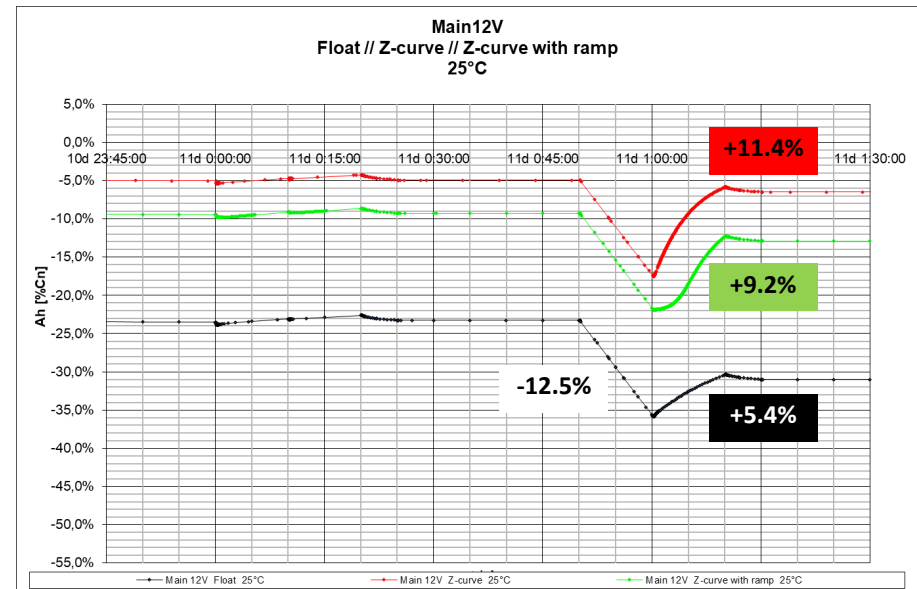
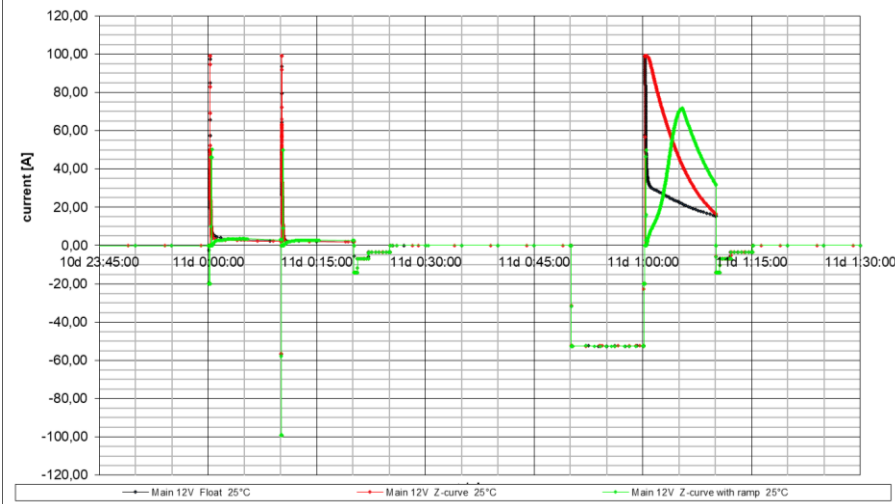
No waterloss at 3°C (<0,01g/Ah)



ALBA 2026 SO25 - "compare charging strategies in simulated drive cycles: low temperature"

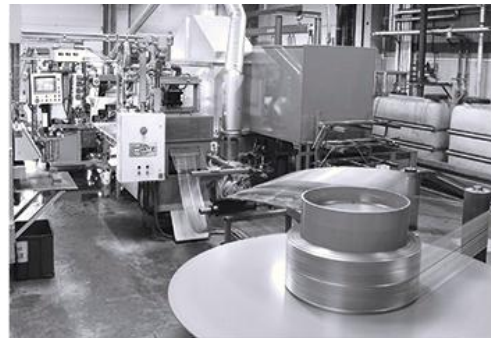
Findings:

- Each charging strategy results in a SOC level at which the battery operates stably
- Sufficient recharging requires higher voltage (14.4V vs. 13.3V)
- Charging with Z-curve will keep the battery at a higher SOC level (even after initial discharge to 60%)
- 5min ramps are rather counterproductive for short charges
- Water loss is not higher than with Z-curve than Float charge at low temperatures



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Poster slides

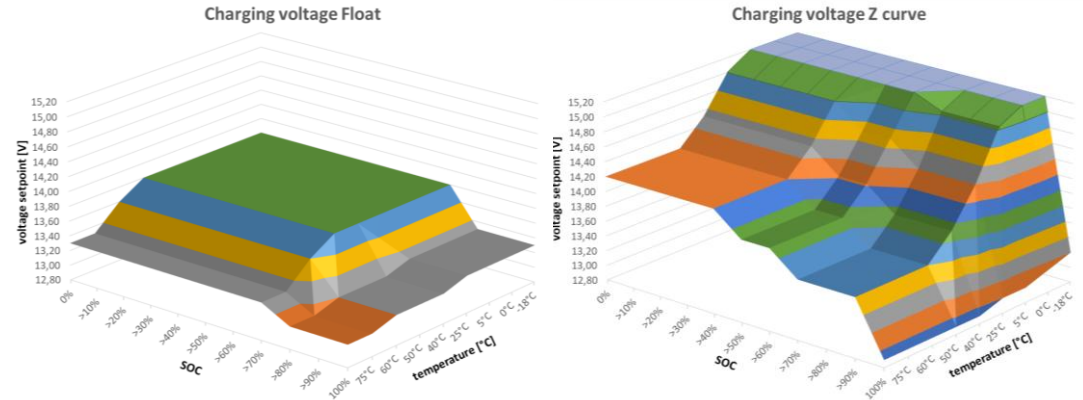


Low temperature tests

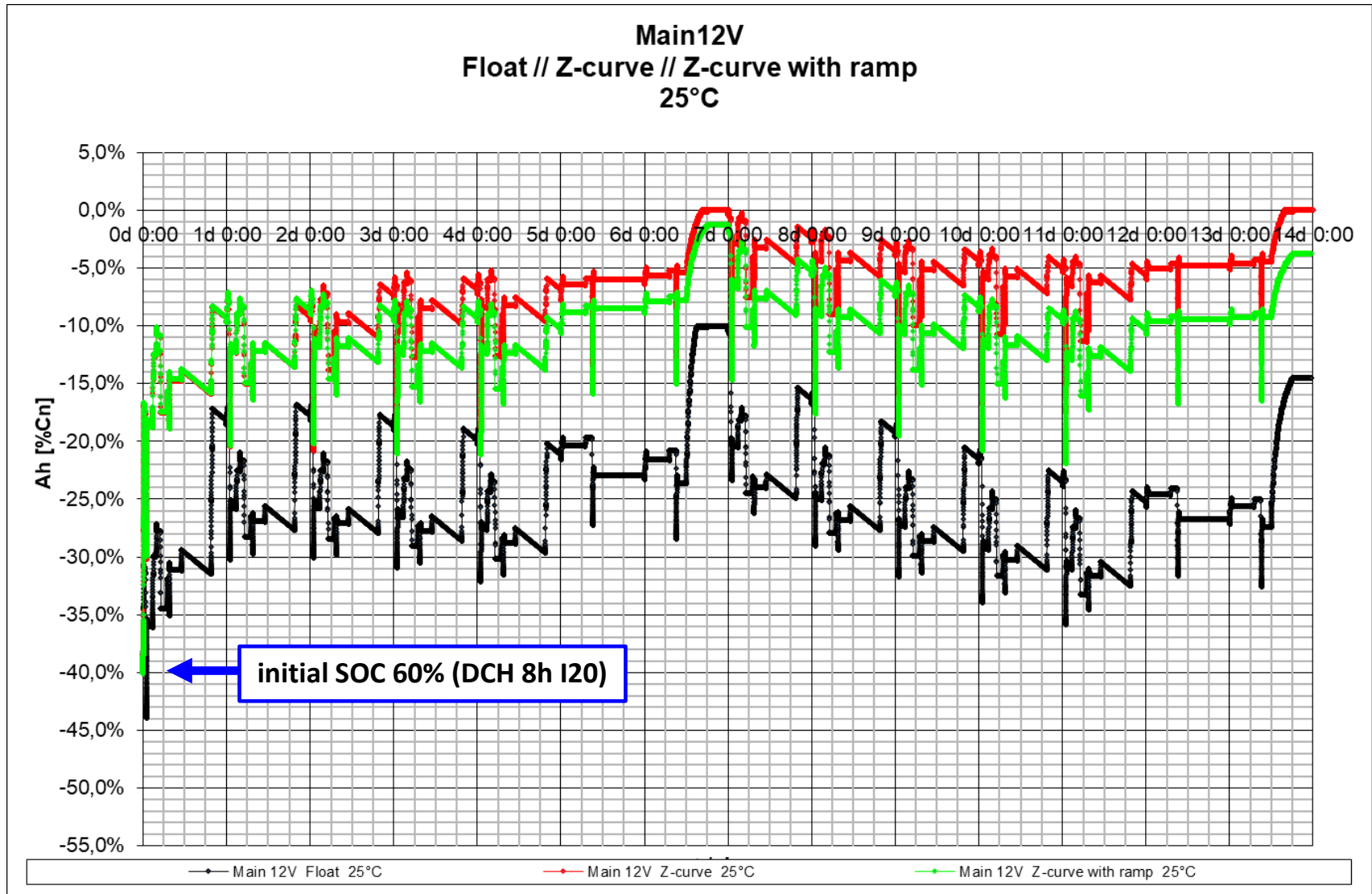
- **"Main 12V" cycle**
(known from previous years ALBA)
 - low temp (25°C / 3°C)
 - Kindergarten commuter, low-mileage driver
 - high Ah throughput
 - start SOC 60%
- **3 different charging strategies**
 - Float
 - Z-curve with low voltage
 - 13.8V if SOC <80% (on plug) @25°C/3°C
 - 13.3V if SOC ≥80% (on plug) @25°C/3°C
 - 13.8V if SOC <50% (trip) @25°C/3°C
 - 13.3V if SOC ≥50% (trip) @25°C/3°C
 - Z-curve "-32mV/K"
 - SOC based voltage set points
 - Z-curve "-32mV/K" with 5min Ramps
 - with 5min Ramps
 - SOC based voltage set points

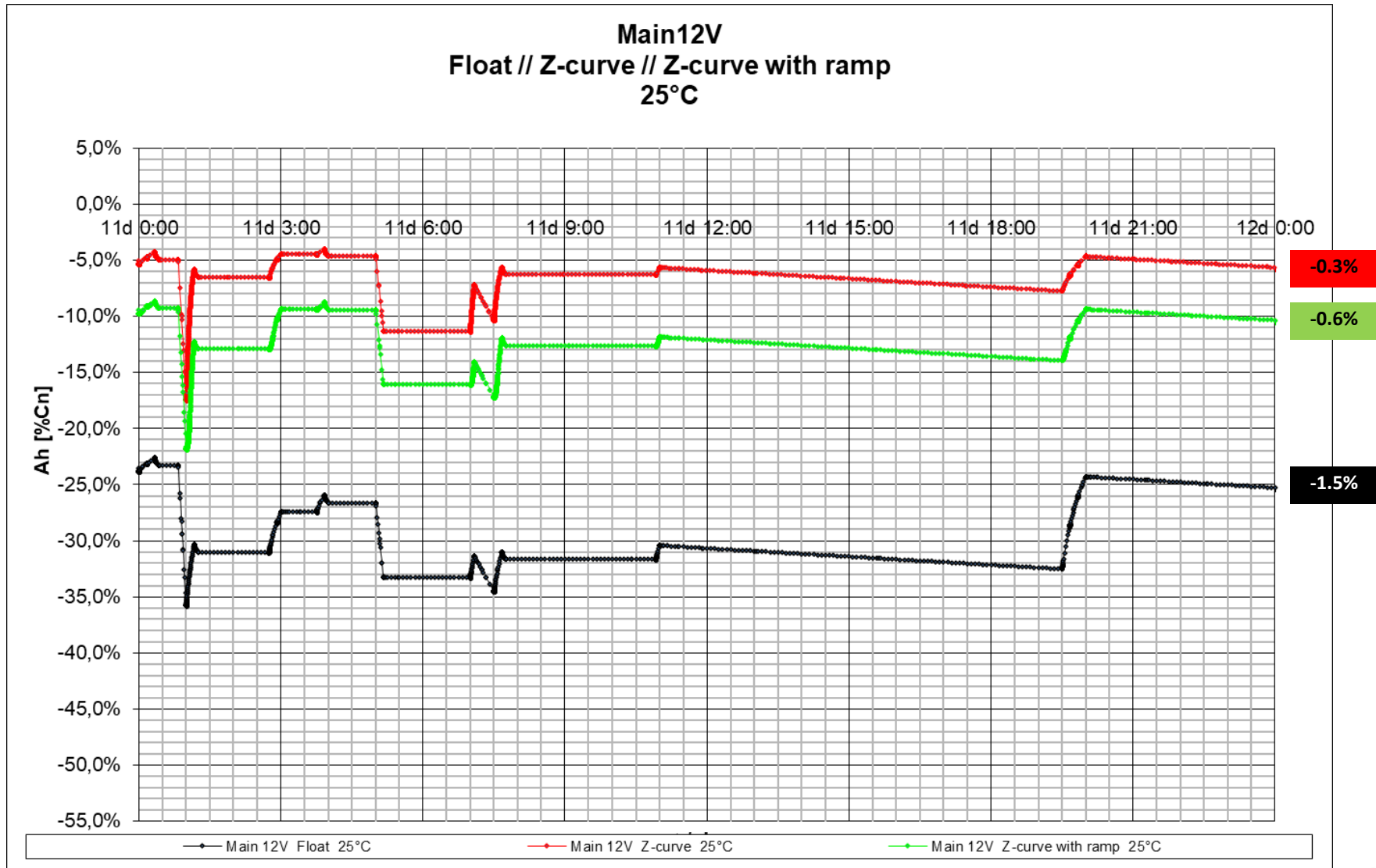
Batteries: MOLL 12V 70Ah EFB+

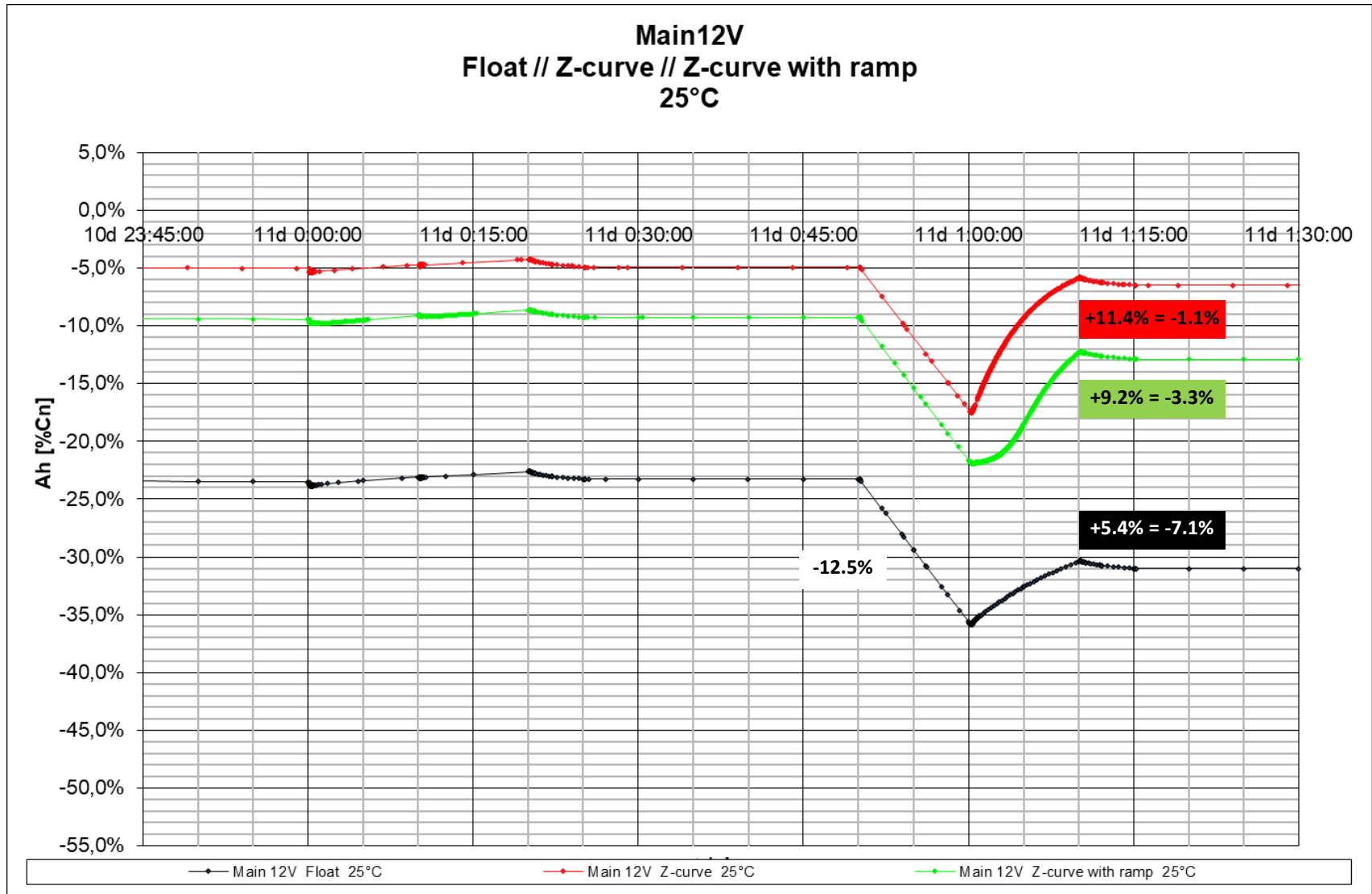
No significant water loss at 25°C (<8g)
No waterloss at 3°C (<1g)

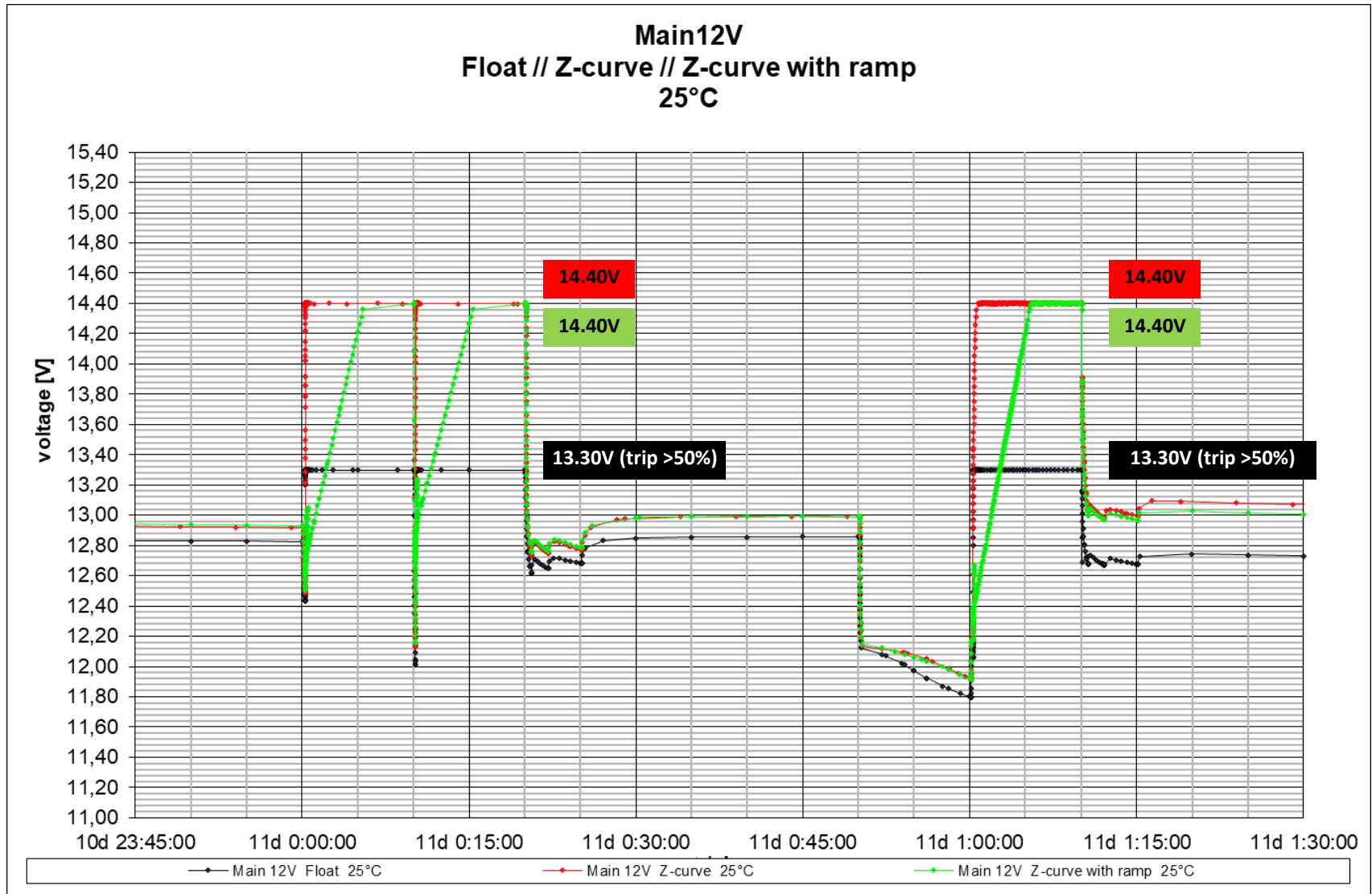


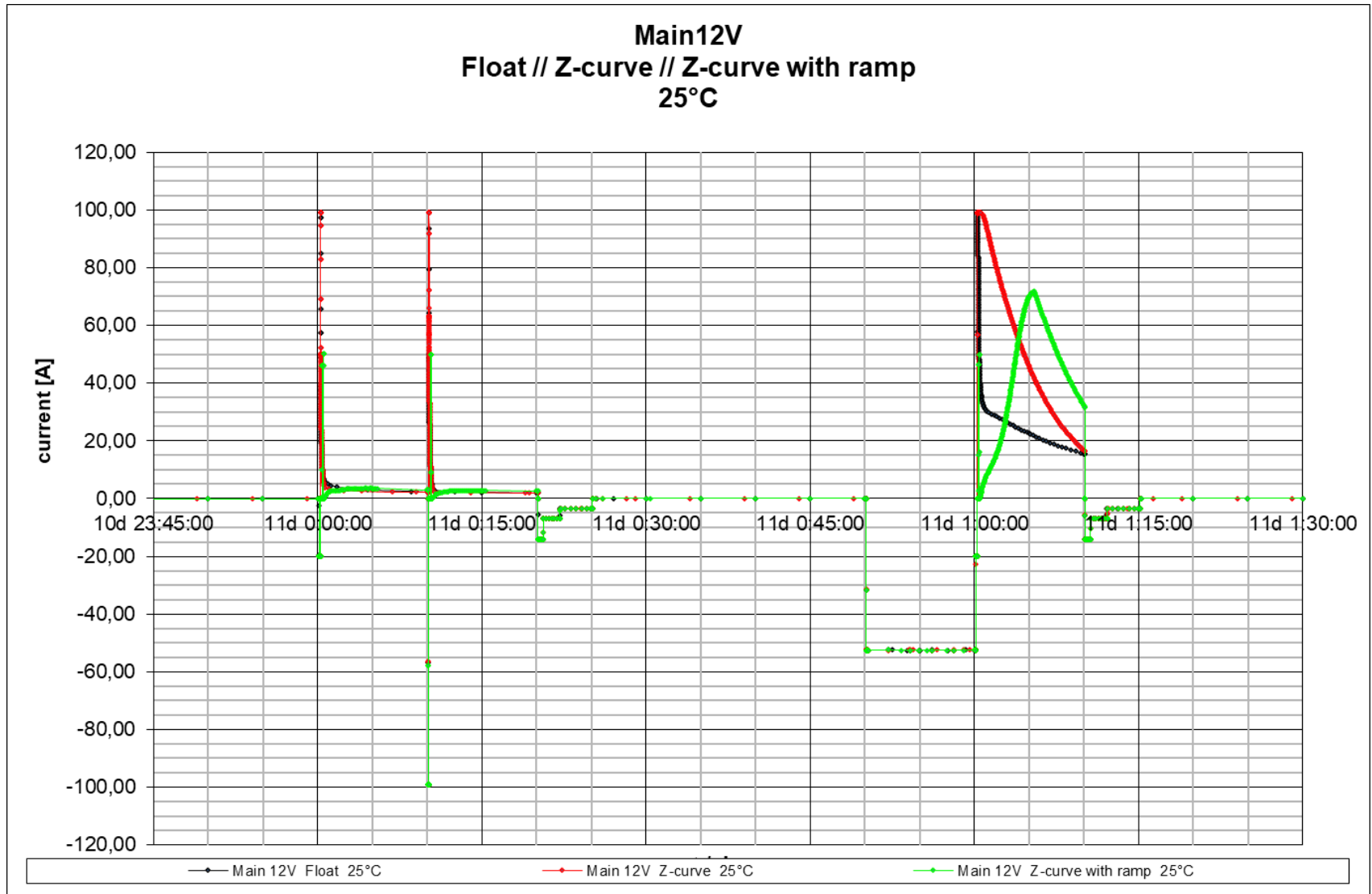
days 1 - 5	kindergarten shortened - with KOL resistor (EN DCA)
	7:00 trip 20' plus afterrun 5' (0.67%Cn)
	7:25 park 35', of which last 10min DCH 0.75C = 15*I20 (12.5%Cn)
	8:00 trip 10' plus afterrun 5' (0.67%Cn)
	8:15 park 1h30'
	9:45 trip 15'
	10:00 park 45'
	10:45 trip 10' plus afterrun 5' (0.67%Cn)
	11:00 park 3h, including 12:00 OTA: 10min 0.4C = 8*I20 (6.7%Cn)
	14:00 trip 5'
	14:05 park 25' with permanent 25min DCH 1.5*I20 (3.1% Cn)
	14:30 trip 10' plus afterrun 5' (0.67%Cn)
	14:45 park 3h10'
	17:55 trip 5'
	18:00 parking lights 8.5h 21.25%Cn DCH 0.5*I20
	2:30 charge transfer 30'
	3:00 parking lights 4h 10%Cn DCH 0.5*I20
days 6-7	kindergarten shortened - with KOL resistor (EN DCA)
	7:00 trip 30' plus afterrun 5' (0.67%Cn)
	7:35 park 6h25'
	14:00 trip 10'
	14:10 park 1h55' of which last 5min DCH 0.9C = 18*I20 (7.5% Cn)
	16:05 trip 20' plus afterrun 5' (0.67%Cn)
	16:30 park: 2.5h on day 6, 8.5h on day 7
	day 6, 19:00 on-plug 6h
	1:00 park 6h

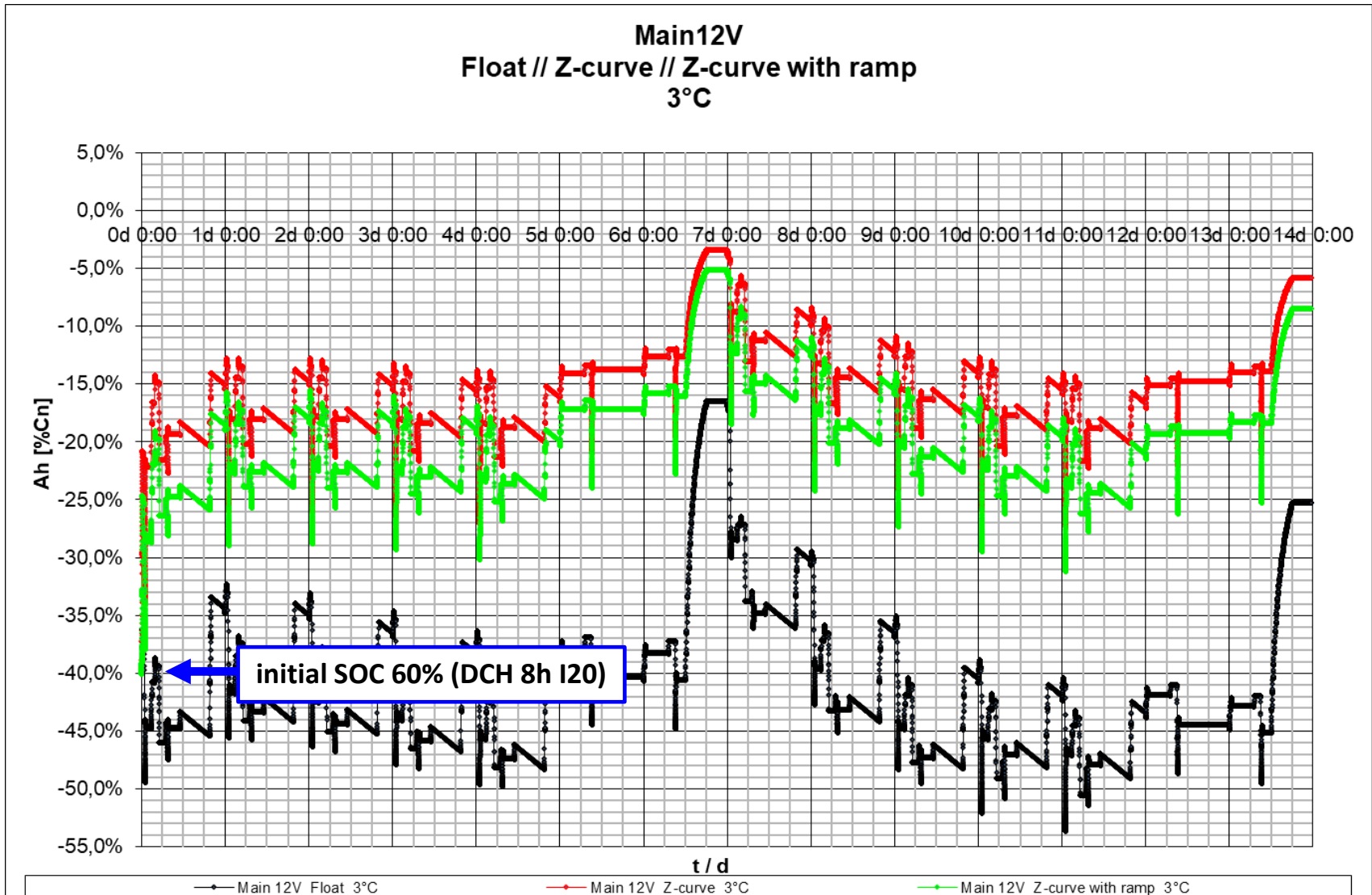


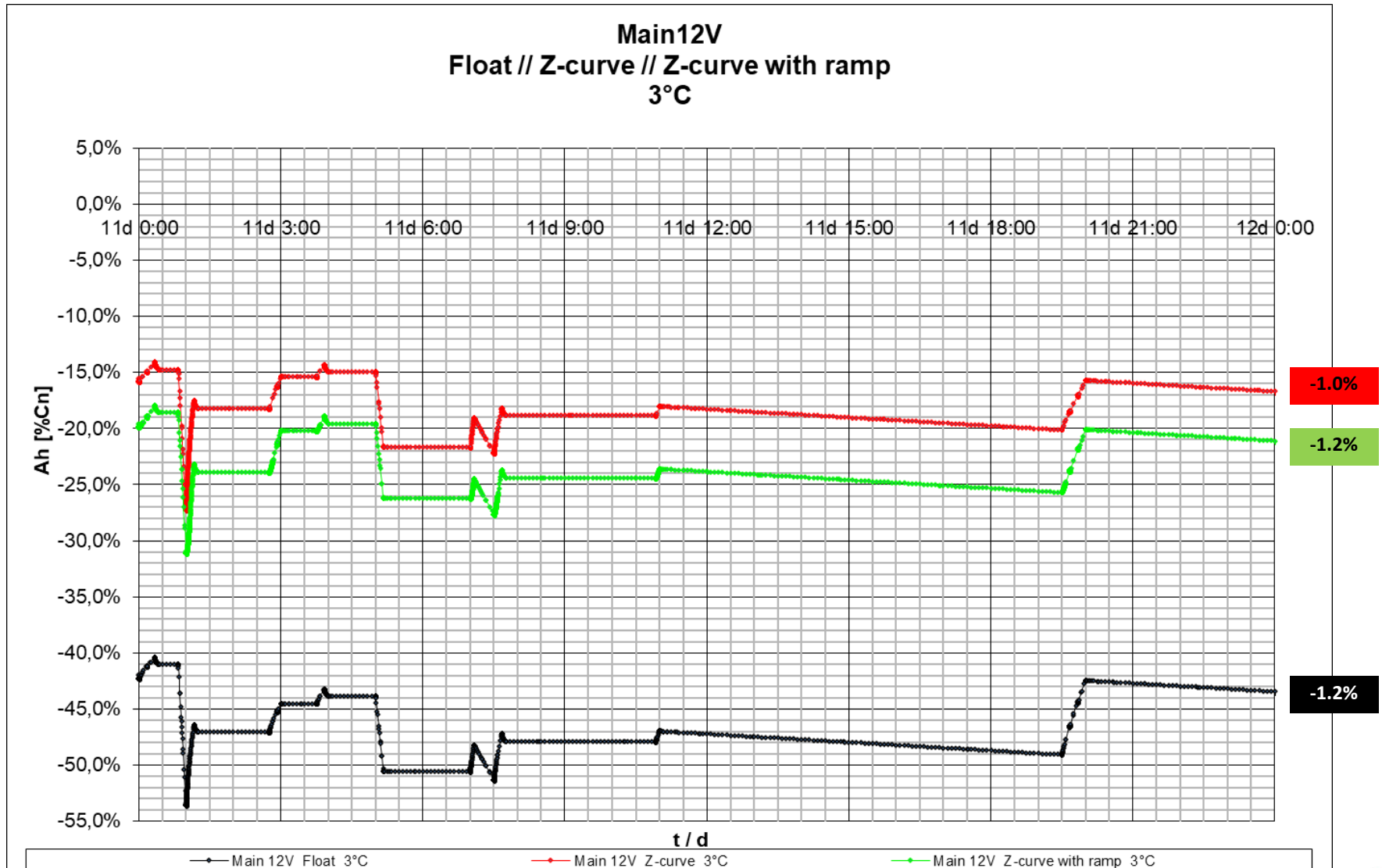


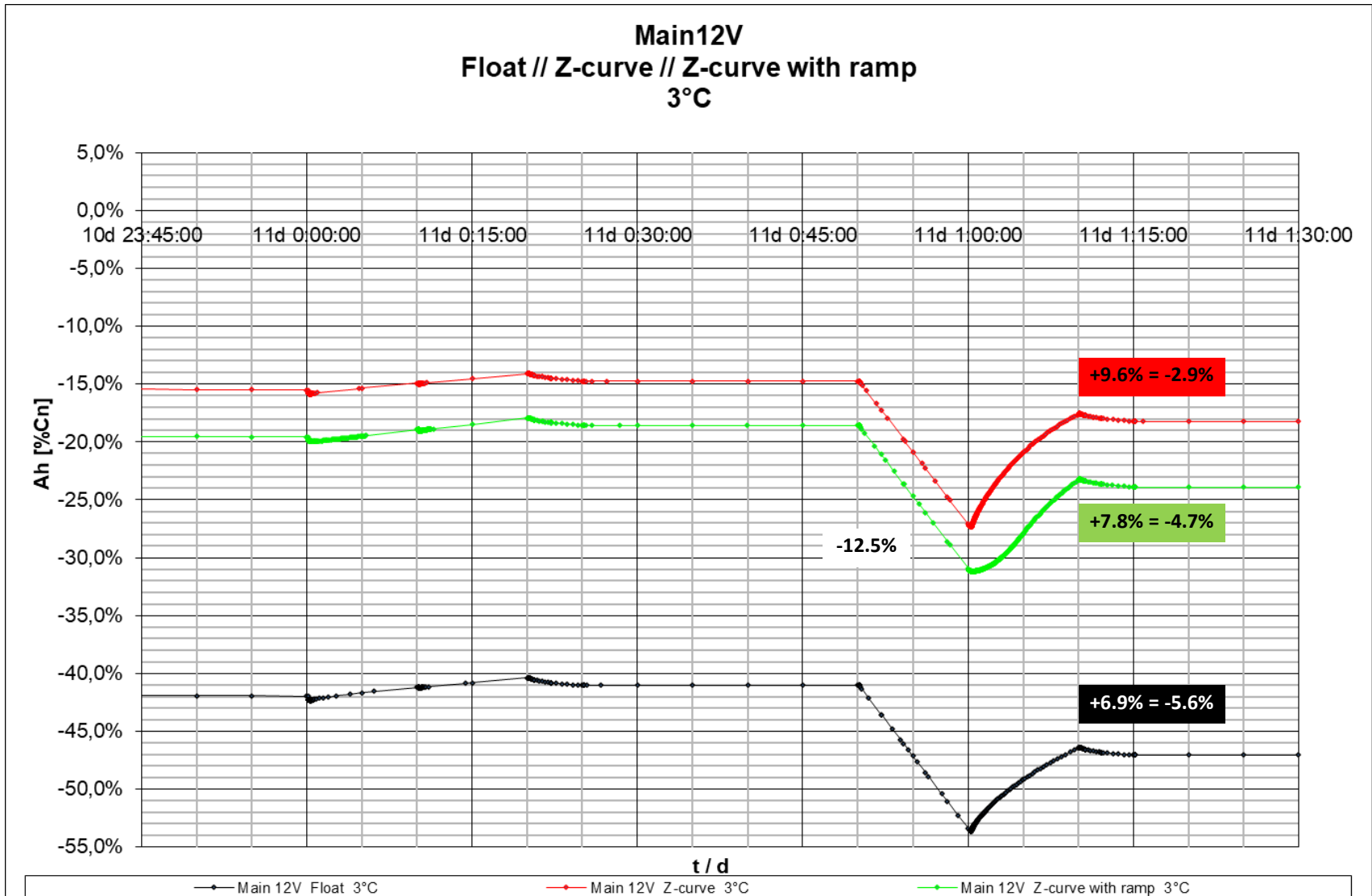


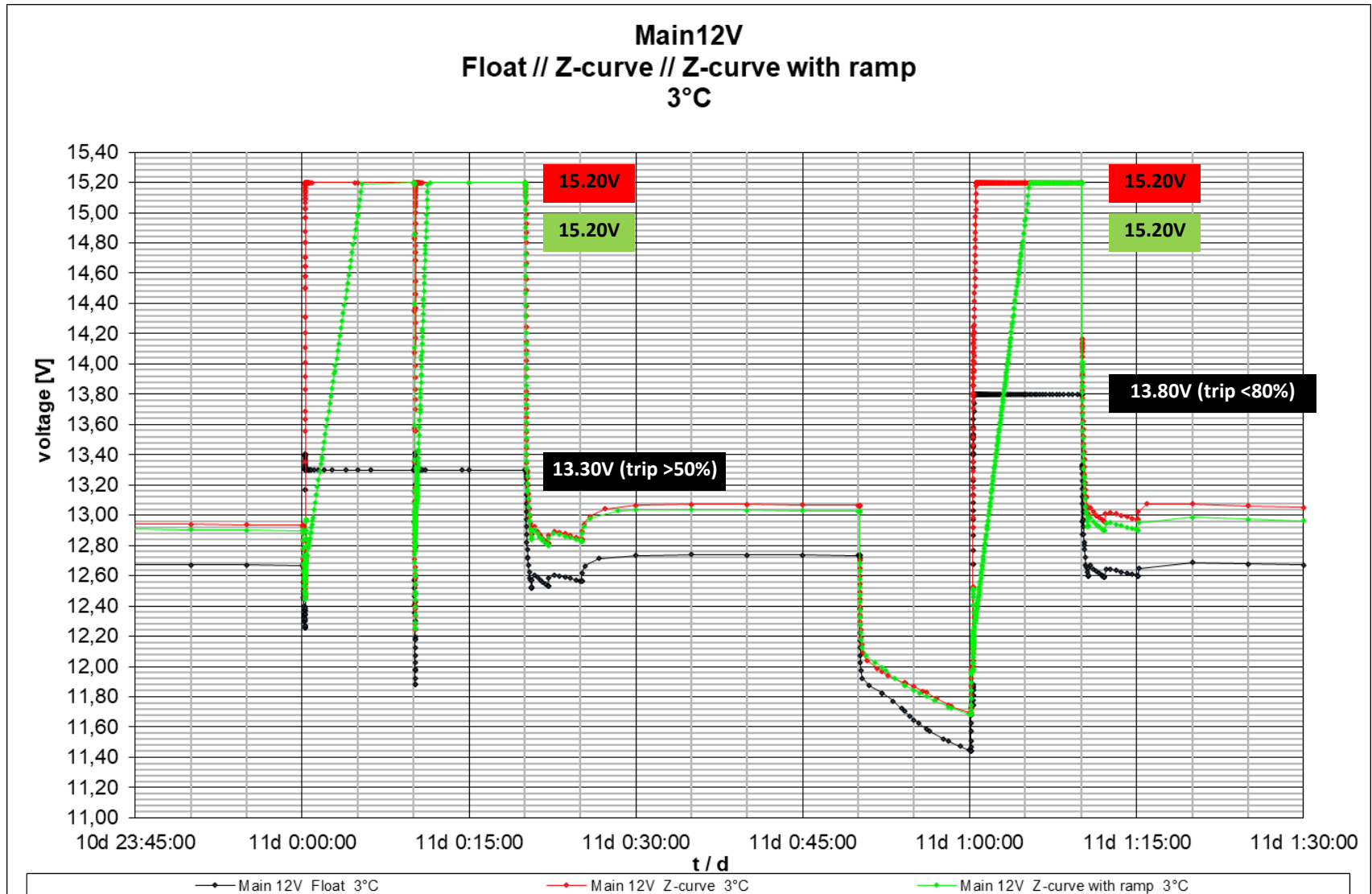


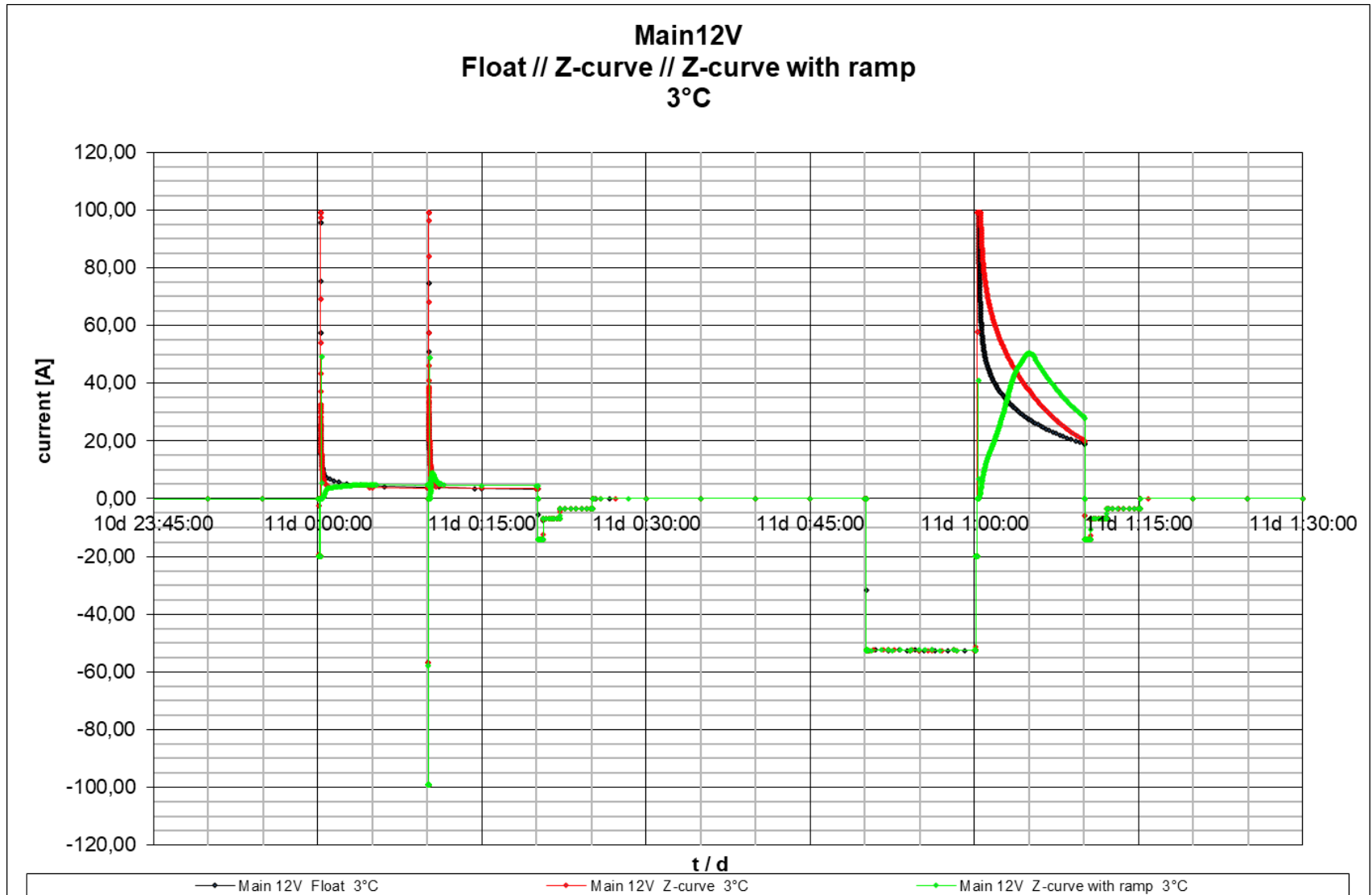












Your thoughts on the results