

Technical Note

# Performance and Durability Requirements for Rechargeable Industrial, LMT and Electric Vehicle Batteries

Version 1.1

December 2024

## Revision History

Version	Date	Description
1.1	December 2024	Updated title of document and added CSS-OD Battery Cabinet 102.4 kWh
1.0	September 2024	Initial Version

## Overview

CSS-OD Battery Cabinet 102.4 kWh in accordance with Article 10 of Regulation (EU) 2023/1542

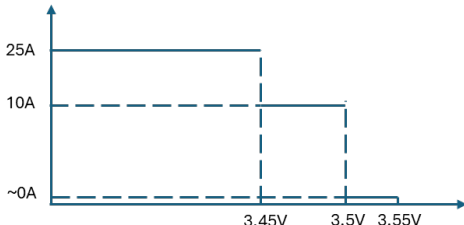
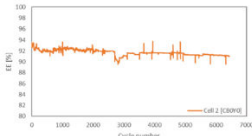
**Name:** Outdoor Commercial Storage System (CSS-OD)

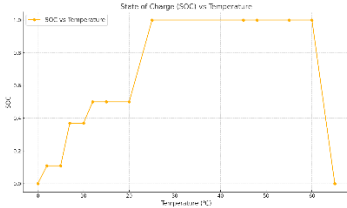
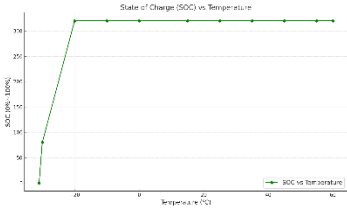
**Model:** CSS-OU-20

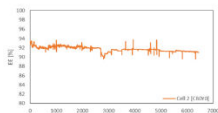

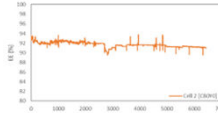
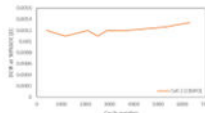
**Ratings:** 102.4KWh

**Manufacturer:** SolarEdge Technologies GmbH

**Address:** Werner-Eckert-Straße 6 81829 München, Germany

No.	Technical Parameters	Parameter Value	Test Condition & Method																		
1	Rated capacity (Ah)	2*100 Ah	<p>The battery cabinet contains two clusters of 512V/100Ah each. The capacity test procedure below is per cluster:</p> <ol style="list-style-type: none"><li>Fully discharge the battery at constant current of 50A to minimum cell voltage of 2.8V.</li><li>Fully charge the battery at constant current of 50A to maximum cell voltage of 3.45V, then charge at a decreasing current (see curve below) to maximum cell voltage of 3.6V.</li><li>Repeat step 1 and record the capacity obtained.</li></ol> 																		
2	Capacity fading (%)	<p>20% at 3500 cycles</p> <p>30% at 6000 cycles</p>	<p>Capacity fading is measured according to the procedure described in item no.1 (Rated capacity).</p> <p>Test conditions:</p> <ul style="list-style-type: none"><li>Ambient temperature: 25±2°C</li><li>Charging and discharging C-rate: 0.5C</li></ul> <p>Energy Efficiency at 25°C cycle life 25°C 100%DOD 1C</p>  <table><tr><th>ICBIDV</th><th>Cycle</th><th>Capacity Retention (%)</th><th>Capacity Vs Nominal (%)</th><th>EE (%)</th><th>average T max (all cycling)</th></tr><tr><td>Cell 2 BOL</td><td>1</td><td>100.00</td><td>105.67</td><td>93.56</td><td>30.88</td></tr><tr><td>Cell 2 EOL</td><td>6437</td><td>71.93</td><td>75.16</td><td>91.62</td><td>30.88</td></tr></table>	ICBIDV	Cycle	Capacity Retention (%)	Capacity Vs Nominal (%)	EE (%)	average T max (all cycling)	Cell 2 BOL	1	100.00	105.67	93.56	30.88	Cell 2 EOL	6437	71.93	75.16	91.62	30.88
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No.	Technical Parameters	Parameter Value	Test Condition & Method																								
3	Power (W)	<div>Per each Cluster:</div> <ul style="list-style-type: none"><li>25.2kW at 20% SoC</li><li>25.6kW at 0%-100% SOC @ -20 to 60°C</li></ul>	<div>Test conditions:</div> <ul style="list-style-type: none"><li>50A discharge current</li></ul> <table><tr><td>Cell temperature/°C</td><td>-31</td><td>-30</td><td>-20</td><td>-10</td><td>0</td><td>15</td><td>25</td><td>35</td><td>45</td><td>55</td><td>60</td></tr><tr><td>SOC</td><td>0%</td><td>0%</td><td>80</td><td>320</td><td>320</td><td>320</td><td>320</td><td>320</td><td>320</td><td>320</td><td>320</td></tr></table>	Cell temperature/°C	-31	-30	-20	-10	0	15	25	35	45	55	60	SOC	0%	0%	80	320	320	320	320	320	320	320	320
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SOC	0%	0%	80	320	320	320	320	320	320	320	320																
4	Power fading (%)	<ul style="list-style-type: none"><li>0%-100% SoC</li><li>Charging<ul style="list-style-type: none"><li>7&lt;°C&lt;10: 26%</li><li>2&lt;°C&lt;5: 78%</li></ul></li><li>Discharging<ul style="list-style-type: none"><li>-20&lt;°C&lt;-30: 75%</li></ul></li></ul>	<ul style="list-style-type: none"><li>Charging</li></ul> <div></div> <ul style="list-style-type: none"><li>Discharging</li></ul> <div></div>																								
5	Internal resistance (Ω)	0.27±0.05mΩ per cell	Impedance (1KHz)																								
6	Internal resistance increase (%)	<div>2.6% at 3500 cycles</div> <div>8.8% at 6000 cycles</div>	<div>Test conditions:</div> <ul style="list-style-type: none"><li>Ambient temperature: 25±2°C</li></ul>																								

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7	Energy round trip efficiency (%)	91% EoL	<p>Energy round trip efficiency is measured according to the procedure described in item #1 (Rated capacity).</p> <p>Test conditions:</p> <ul style="list-style-type: none"><li>Ambient temperature: 25±2°C</li></ul> <div><p>Energy Efficiency at 25°C cycle life 25°C 100%DOD 1C</p><table><tr><th>[C30V10]</th><th>Cycle</th><th>Capacity Retention (%)</th><th>Capacity Vs Nominal (%)</th><th>EE (%)</th><th>average T max (All cycling)</th></tr><tr><td>Cell 2 BOL</td><td>1</td><td>100.00</td><td>105.07</td><td>93.58</td><td>30.88</td></tr><tr><td>Cell 2 EOL</td><td>6437</td><td>71.53</td><td>75.36</td><td>91.02</td><td>30.88</td></tr></table></div>	[C30V10]	Cycle	Capacity Retention (%)	Capacity Vs Nominal (%)	EE (%)	average T max (All cycling)	Cell 2 BOL	1	100.00	105.07	93.58	30.88	Cell 2 EOL	6437	71.53	75.36	91.02	30.88																																																																																																																																																																																																																																																																																																																		
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8	Energy round trip efficiency fading (%)	2.74% BoL to EoL	<ul style="list-style-type: none"><li>According to test results:</li></ul> <p>(93.58%-91.02%) / 92.58%=2.74%</p> <div><p>Energy Efficiency at 25°C cycle life 25°C 100%DOD 1C</p><table><tr><th>[C30V10]</th><th>Cycle</th><th>Capacity Retention (%)</th><th>Capacity Vs Nominal (%)</th><th>EE (%)</th><th>average T max (All cycling)</th></tr><tr><td>Cell 2 BOL</td><td>1</td><td>100.00</td><td>105.07</td><td>93.58</td><td>30.88</td></tr><tr><td>Cell 2 EOL</td><td>6437</td><td>71.53</td><td>75.36</td><td>91.02</td><td>30.88</td></tr></table></div>	[C30V10]	Cycle	Capacity Retention (%)	Capacity Vs Nominal (%)	EE (%)	average T max (All cycling)	Cell 2 BOL	1	100.00	105.07	93.58	30.88	Cell 2 EOL	6437	71.53	75.36	91.02	30.88																																																																																																																																																																																																																																																																																																																		
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9	Expected lifetime in cycle-life	A least 6000 cycles  (with 70% capacity fading)	<p>Testing Method:</p> <div><p>Energy Efficiency at 25°C cycle life 25°C 100%DOD 1C</p><table><tr><th>[C30V10]</th><th>Cycle</th><th>Capacity Retention (%)</th><th>Capacity Vs Nominal (%)</th><th>EE (%)</th><th>average T max (All cycling)</th></tr><tr><td>Cell 2 BOL</td><td>1</td><td>100.00</td><td>105.07</td><td>93.58</td><td>30.88</td></tr><tr><td>Cell 2 EOL</td><td>6437</td><td>71.53</td><td>75.36</td><td>91.02</td><td>30.88</td></tr></table></div> <div><p>DCIR at 50% SOC - 25°C cycle life 25°C 100%DOD 1C according to RPT tests</p><table><tr><th>Cell 2 (E30V10)</th><th>cycle number</th><th>DCIR (mΩ)</th></tr><tr><td></td><td>400</td><td>0.0010</td></tr><tr><td></td><td>1000</td><td>0.0010</td></tr><tr><td></td><td>2000</td><td>0.0010</td></tr><tr><td></td><td>3000</td><td>0.0010</td></tr><tr><td></td><td>4000</td><td>0.0010</td></tr><tr><td></td><td>5000</td><td>0.0010</td></tr><tr><td></td><td>6000</td><td>0.0010</td></tr><tr><td></td><td>7000</td><td>0.0010</td></tr><tr><td></td><td>8000</td><td>0.0010</td></tr><tr><td></td><td>9000</td><td>0.0010</td></tr><tr><td></td><td>10000</td><td>0.0010</td></tr><tr><td></td><td>11000</td><td>0.0010</td></tr><tr><td></td><td>12000</td><td>0.0010</td></tr><tr><td></td><td>13000</td><td>0.0010</td></tr><tr><td></td><td>14000</td><td>0.0010</td></tr><tr><td></td><td>15000</td><td>0.0010</td></tr><tr><td></td><td>16000</td><td>0.0010</td></tr><tr><td></td><td>17000</td><td>0.0010</td></tr><tr><td></td><td>18000</td><td>0.0010</td></tr><tr><td></td><td>19000</td><td>0.0010</td></tr><tr><td></td><td>20000</td><td>0.0010</td></tr><tr><td></td><td>21000</td><td>0.0010</td></tr><tr><td></td><td>22000</td><td>0.0010</td></tr><tr><td></td><td>23000</td><td>0.0010</td></tr><tr><td></td><td>24000</td><td>0.0010</td></tr><tr><td></td><td>25000</td><td>0.0010</td></tr><tr><td></td><td>26000</td><td>0.0010</td></tr><tr><td></td><td>27000</td><td>0.0010</td></tr><tr><td></td><td>28000</td><td>0.0010</td></tr><tr><td></td><td>29000</td><td>0.0010</td></tr><tr><td></td><td>30000</td><td>0.0010</td></tr><tr><td></td><td>31000</td><td>0.0010</td></tr><tr><td></td><td>32000</td><td>0.0010</td></tr><tr><td></td><td>33000</td><td>0.0010</td></tr><tr><td></td><td>34000</td><td>0.0010</td></tr><tr><td></td><td>35000</td><td>0.0010</td></tr><tr><td></td><td>36000</td><td>0.0010</td></tr><tr><td></td><td>37000</td><td>0.0010</td></tr><tr><td></td><td>38000</td><td>0.0010</td></tr><tr><td></td><td>39000</td><td>0.0010</td></tr><tr><td></td><td>40000</td><td>0.0010</td></tr><tr><td></td><td>41000</td><td>0.0010</td></tr><tr><td></td><td>42000</td><td>0.0010</td></tr><tr><td></td><td>43000</td><td>0.0010</td></tr><tr><td></td><td>44000</td><td>0.0010</td></tr><tr><td></td><td>45000</td><td>0.0010</td></tr><tr><td></td><td>46000</td><td>0.0010</td></tr><tr><td></td><td>47000</td><td>0.0010</td></tr><tr><td></td><td>48000</td><td>0.0010</td></tr><tr><td></td><td>49000</td><td>0.0010</td></tr><tr><td></td><td>50000</td><td>0.0010</td></tr><tr><td></td><td>51000</td><td>0.0010</td></tr><tr><td></td><td>52000</td><td>0.0010</td></tr><tr><td></td><td>53000</td><td>0.0010</td></tr><tr><td></td><td>54000</td><td>0.0010</td></tr><tr><td></td><td>55000</td><td>0.0010</td></tr><tr><td></td><td>56000</td><td>0.0010</td></tr><tr><td></td><td>57000</td><td>0.0010</td></tr><tr><td></td><td>58000</td><td>0.0010</td></tr><tr><td></td><td>59000</td><td>0.0010</td></tr><tr><td></td><td>60000</td><td>0.0010</td></tr><tr><td></td><td>61000</td><td>0.0010</td></tr><tr><td></td><td>62000</td><td>0.0010</td></tr><tr><td></td><td>63000</td><td>0.0010</td></tr><tr><td></td><td>64000</td><td>0.0010</td></tr><tr><td></td><td>65000</td><td>0.0010</td></tr><tr><td></td><td>66000</td><td>0.0010</td></tr><tr><td></td><td>67000</td><td>0.0010</td></tr><tr><td></td><td>68000</td><td>0.0010</td></tr><tr><td></td><td>69000</td><td>0.0010</td></tr><tr><td></td><td>70000</td><td>0.0010</td></tr><tr><td></td><td>71000</td><td>0.0010</td></tr><tr><td></td><td>72000</td><td>0.0010</td></tr><tr><td></td><td>73000</td><td>0.0010</td></tr><tr><td></td><td>74000</td><td>0.0010</td></tr><tr><td></td><td>75000</td><td>0.0010</td></tr><tr><td></td><td>76000</td><td>0.0010</td></tr><tr><td></td><td>77000</td><td>0.0010</td></tr><tr><td></td><td>78000</td><td>0.0010</td></tr><tr><td></td><td>79000</td><td>0.0010</td></tr><tr><td></td><td>80000</td><td>0.0010</td></tr><tr><td></td><td>81000</td><td>0.0010</td></tr><tr><td></td><td>82000</td><td>0.0010</td></tr><tr><td></td><td>83000</td><td>0.0010</td></tr><tr><td></td><td>84000</td><td>0.0010</td></tr><tr><td></td><td>85000</td><td>0.0010</td></tr><tr><td></td><td>86000</td><td>0.0010</td></tr><tr><td></td><td>87000</td><td>0.0010</td></tr><tr><td></td><td>88000</td><td>0.0010</td></tr><tr><td></td><td>89000</td><td>0.0010</td></tr><tr><td></td><td>90000</td><td>0.0010</td></tr><tr><td></td><td>91000</td><td>0.0010</td></tr><tr><td></td><td>92000</td><td>0.0010</td></tr><tr><td></td><td>93000</td><td>0.0010</td></tr><tr><td></td><td>94000</td><td>0.0010</td></tr><tr><td></td><td>95000</td><td>0.0010</td></tr><tr><td></td><td>96000</td><td>0.0010</td></tr><tr><td></td><td>97000</td><td>0.0010</td></tr><tr><td></td><td>98000</td><td>0.0010</td></tr><tr><td></td><td>99000</td><td>0.0010</td></tr><tr><td></td><td>100000</td><td>0.0010</td></tr></table></div>	[C30V10]	Cycle	Capacity 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