# HYPOBATT

Hyper powered vessel battery charging system

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## DOCUMENT HISTORY

| Document Version | Date | Author \| Organization | Description |
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| **0.1** | 2025-09-02 | T. Gerrits \| Heliox | Initial version |
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# LIST OF FIGURES

# 1. EXECUTIVE SUMMARY

This document encompasses the proof material to show the implementation of the Hyper vessel charging DEMO. Within the WP3 scope, 4 main items have been realized in accordance with the system architecture D3.1. The implemented hardware will be shown in the following sections, i.e.:

- **Container base frame**: for cable management and ease of installation
- **Multi-MW charger** (D3.4): the power conversion equipment
- **Dry cooler**: to retrieve hot air from the charger and release it to the ambient
- **DC outlet dispenser**: to perform charging steps and communicate between the charger and the Frisia E-I electric catamaran vessel (EV)

The combination of container base frame, multi-MW charger, and dry cooler are visualized as one assembled set, equal to the composition that will be used during the DEMO in WP5.

Additionally, an installation manual is being developed based on the learnings experienced during placement of the system, and on discussions with the WP5 use-case partners. As agreed with the project team, the installation manual is to be added as an appendix to D3.4. At the point of writing, this manual focusses on the high-level placement on site, rather than the details of connections. The latter needs input from functional testing as is planned for Q4 2025.

Finally, in the last chapter, the functional verification and power circulation performance testing is explained with some results and pictures. Therein an explanation is given on the first results gained.

# 2. IMAGES OF THE DEMONSTRATOR

## 2.1 Baseframe


*Figure 1 placement of baseframe at testing site*

## 2.2 Multi-MW charger


*Figure 2 placement of the multi-MW charger on the baseframe*

## 2.3 Dry cooler


*Figure 3 placement of the dry cooler on top of the baseframe and multi-MW charger*

## 2.4 Assembled combination for DEMO


*Figure 4 assembled combination of baseframe, multi-MW charger container and dry cooler on top* ***viewpoint****: left; LV DC output side with cable connections behind bottom doors, right: AFE2 power conversion and protection compartment doors, far-right: bottom grid-iron for tranformer air-intake.*


*Figure 5 assembled combination of baseframe, multi-MW charger container and dry cooler on top* ***viewpoint****:left image: left side: MV switchgear doors, right side: AC connection for testing. Right image: left side: bottom grid-iron for tranformer air-intake, right side: AFE1 power conversion and protection compartment doors.*

## 2.5 Internal components in MW charger container

*Figure 6 cooling station with left: manifold supply (top) and return (bottom), behind that the pumping station, right: heat exchanger with fans.*

*Figure 7 Mounted MV switchgear set and MV cables installation*

*Figure 8 LV DC and control side during installation check and testing start-up*

*Figure 9 LV AC air-circuit breakers and pre-charging compartment*

## 2.6 DC outlet dispenser

*Figure 10 external cabinet of the DC outlet dispenser (glands grouped per DC-field, to be connected with dedicated tooling due to small mutual distances).*

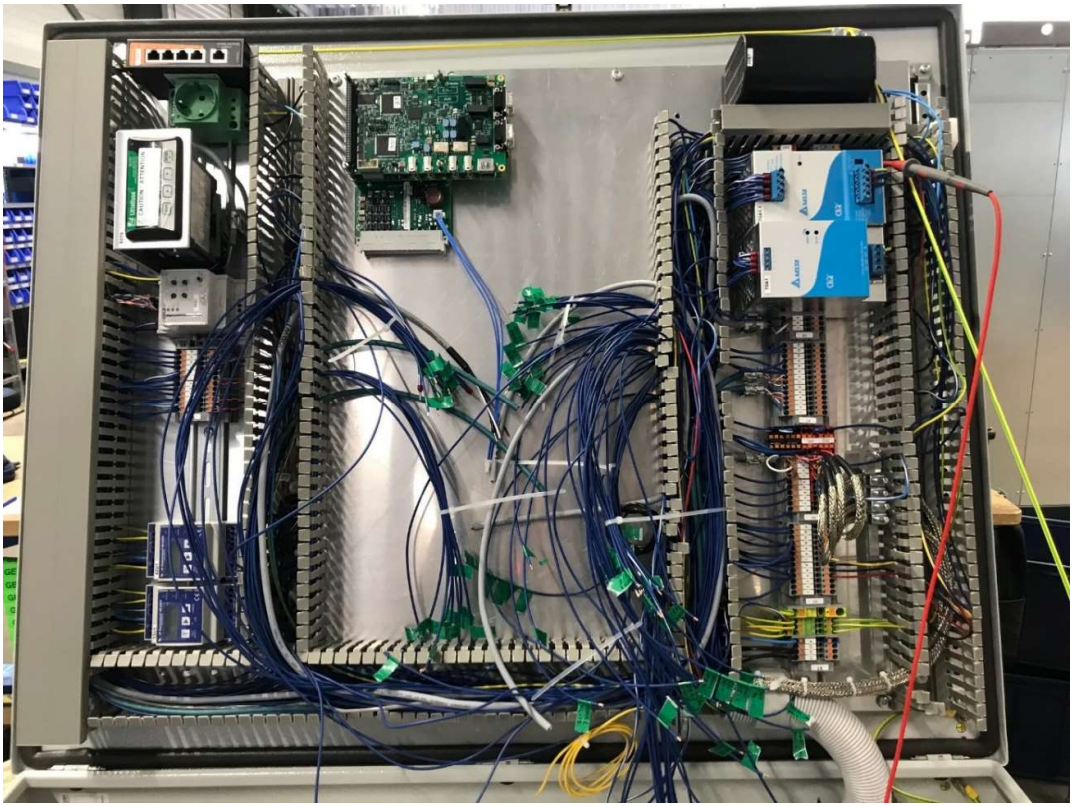


*Figure 11 internal control section of the DC outlet dispenser (missing the central controllers still)*

*Figure 12 internal power section of the DC outlet dispenser*

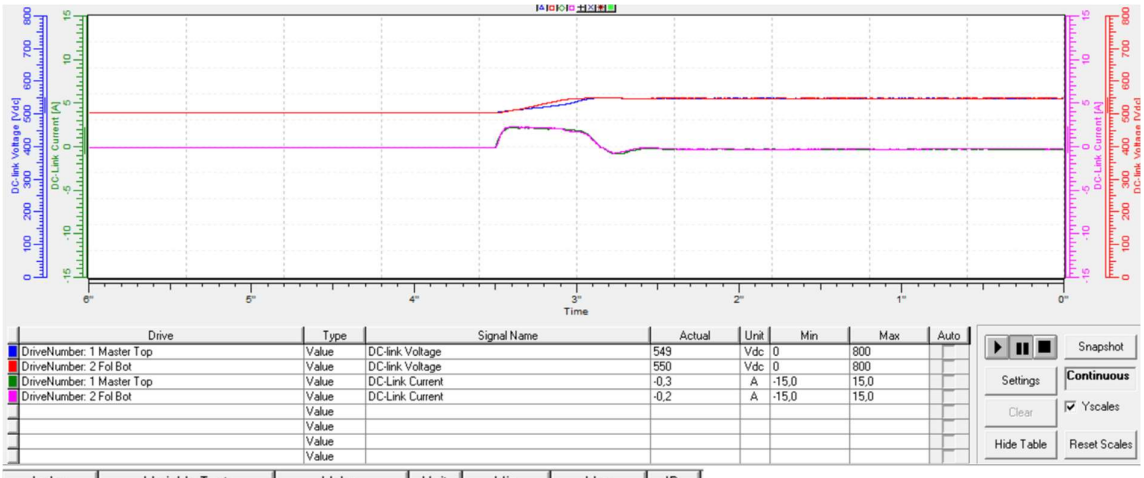
# 3. FUNCTIONAL PERFORMANCE VERIFICATION

## 3.1 Functional testing verification

- The functional performance verification of the HV section is detailed in Appendix A (in Dutch)
- The functional performance verification of the Container LV section is detailed in Appendix B (in Dutch)
- Declaration of Conformity of the Container is detailed in Appendix C (in Dutch)
- Inspection report of the Container is detailed in Appendix D (in Dutch)

## 3.2 Power conversion testing

The first results regarding power conversion testing are depicted in the following pictures. It proved to be very complex to start the 3 MW system from the weak grid connection available (63 A). This is due to the LC-filter in the power conversion section, which leads to a large reactive current flowing in between of the AFE drive and the building installation. Principally, a much larger grid connection is needed for that. As a result, the testing needed to be relocated to another site which allowed for the use of a 400 A AC connection (shown in Figure 5, left image) replacing the 63 A in the earlier test site.




| Drive | Type | Signal Name | Actual | Unit | Min | Max | Auto |
|---|---|---|---|---|---|---|---|
| DriveNumber: 1 Master Top | Value | DC-link Voltage | 549 | Vdc | 0 | 800 | |
| DriveNumber: 2 Fol Bot | Value | DC-link Voltage | 550 | Vdc | 0 | 800 | |
| DriveNumber: 1 Master Top | Value | DC-Link Current | -0,3 | A | -15,0 | 15,0 | |
| DriveNumber: 2 Fol Bot | Value | DC-Link Current | -0,2 | A | -15,0 | 15,0 | |
| | Value | | | | | | |
| | Value | | | | | | |
| | Value | | | | | | |
| | Value | | | | | | |

Snapshot
Settings
Continuous
Clear
Yscales
Hide Table
Reset Scales

| Index | Variable Text | Value | Unit | Min | Max | ID |
|---|---|---|---|---|---|---|
| P 2.6.1.1 | Current Limit | 90,0 | A | 0,0 | 90,0 | 107 |
| P 2.6.1.2 | ShortCircuitLevl | 800,0 | % | 0,0 | 800,0 | 1620 |
| P 2.6.1.3 | ShortCircuitTime | 200 | ms | 0 | 5000 | 1515 |
| P 2.6.1.4 | BridgeCurr.Limit | 0 / Enabled | | 0 | 1 | 1517 |
| P 2.6.1.5 | SC VoltageLimit | 150,00 | % | 0,00 | 150,00 | 1518 |
| P 2.6.1.6 | OutputActCurrLim | 5,0 | % | 0,0 | 300,0 | 1290 |
| P 2.6.1.7 | InputActCurrLim | 5,0 | % | 0,0 | 300,0 | 1289 |
| P 2.6.1.8 | OverCurrTripLim | 200,0 | % | 0,0 | 1000,0 | 1094 |

2x30kW connected to SKID capacitor bank, changing DC link voltage in 10% up

*Figure 13 DC voltage and current ramp-up behaviour of the 2x30kW connected to SKID capacitor bank, changing the DC link voltage in 10% up.*

# APPENDIX A – THE FUNCTIONAL PERFORMANCE VERIFICATION OF THE HV SECTION OF THE CONTAINER (IN DUTCH)

# APPENDIX B - THE FUNCTIONAL PERFORMANCE VERIFICATION OF THE CONTAINER LV SECTION (IN DUTCH)

# APPENDIX C – DECLARATION OF CONFORMITY (IN DUTCH)

# APPENDIX D - INSPECTION REPORT OF THE CONTAINER (IN DUTCH)