Base Load Power Hub (BLPH)

DC UPS - SITE ACCEPTANCE TEST PROCEDURE / PRE-COMMISSIONING / COMMISSIONING PROCEDURES

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Revision / Change Log

Rev.	Description
00	Issue for Review (IFR)
01	Accepted for Construction (AFC)

HOLDS LIST

No.	Description
1	
2	
3	
4	

Table of contents

Description	Sheet
COVER	1
REVISION / CHANGE LOG	2
HOLDS LIST	2
TABLE OF CONTENTS	3
DC UPS - TAG: UP-200F1	4

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DC UPS - TAG: UP-200F1

SITE ACCEPTANCE TEST / PRE-COMMISSIONING / COMMISSIONING PROCEDURE

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AEG POWER SOLUTIONS

Site Acceptance Test Report		Document-No.: 14189_SAT_1_00
Type:	**DC UPS System**	**Tag No.: UP-200F1**

Project name: Hollandse Kust Noord (HKN) wind farm	**Order-No.:** 4400007525

Configuration and Serial No.: **Installed:**

UP-200F1-A - Protect RCS TPRe 110V-100A - Serial No.: …….. ☐

UP-200F1-B - Protect RCS TPRe 110V-100A - Serial No.: …….. ☐

CB-200F1 - Battery Fuse Box 125A - Serial No.: …….. ☐

BA-200F1 - Battery 110V-150Ah 10 x FLG12-150 …….. ☐

Participants:	Company:	Date / Signature:
1.		
2.		
3.		
4.		
5.		

Remark:

Site Acceptance Test must be performed by a skilled AEG technician.

Josè Cuneo	Rev. 00	Cassina de' Pecchi	21.10.2024

Site Acceptance Test Report		Document-No.: 14189_SAT_1_00
Type:	**DC UPS System**	**Tag No.: UP-200F1**

Content:

1. Informations and Basic Datas: 3
2. Visual Inspection....5
3. Starting 6
4. Functional tests: 7
5. MODBUS Adapter 10
6. Alarm Test: 11
7. Battery test: 12
8. Black start procedure validation test: 13

Site Acceptance Test Report		Document-No.: 14189_SAT_1_00
Type:	**DC UPS System**	**Tag No.: UP-200F1**

1. Informations and Basic Datas:

SCOPE
This procedure describes the methods for checking the DC UPS system, once installed on site, to ensure that it works correctly and it meets the operational requirements

REFERENCE DOCUMENTS
1724000372-EL-DA-00003 DC UPS - GENERAL ARRANGEMENT
1724000372-EL-DG-00006 DC UPS - SINGLE LINE DIAGRAM
1724000372-EL-DG-00008 DC UPS - WIRING DIAGRAM & TERMINAL SCHEDULE
1724000372-EL-DG-00010 DC UPS - BATTERY LAYOUT AND INTERCONNECTION

TESTING EQUIPMENT & ACCESSORIES
Digital Multimeter, Clamp-meter and Dummy Load

Site Acceptance Test Report		Document-No.: 14189_SAT_1_00
Type:	**DC UPS System**	**Tag No.: UP-200F1**

CHARGER A

RECTIFIER

Input voltage (V) …… Frequency (Hz) …… Number of phases ……...

Float voltage (V) …… Charge voltage (V) ……

Output current (A) …… Battery current limit (A) …….

CONFIGURATION

Single unit ☐ Redundant system ☐ Redundant parallel system ☐

CHARGER B

RECTIFIER

Input voltage (V) …… Frequency (Hz) …… Number of phases ……...

Float voltage (V) …… Charge voltage (V) ……

Output current (A) …… Battery current limit (A) …….

CONFIGURATION

Single unit ☐ Redundant system ☐ Redundant parallel system ☐

BATTERY

BATTERY

Type …… Capacity (Ah) ……. Number of strings / cells ……...

Autonomy …… @ Load ……..

Site Acceptance Test Report		Document-No.: 14189_SAT_1_00
Type:	**DC UPS System**	**Tag No.: UP-200F1**

2. Visual Inspection

1) Visual Check	Check
• Equipment installation aspects and details	
• Cleanliness of cabinets (internally and externally)	
• Fuses and Circuit breakers rating and related connection cables	
• Control switches and push-buttons	
• Components identification	
• Alarms identification	
• All connections fully tightened	
• Grounding connection	
• All labels correct	
2) Pre-Energization Check	
• Electronic cards and related connections	
• Relays	
• Cooling fans	
• Wiring and plugs connections	
• Fuses and fuse alarm contacts	
• Instruments	
• Power switches, circuit breakers and contacts	
• Marking of components	
• Cable polarity marking	
• Input phase marking	

Site Acceptance Test Report		Document-No.: 14189_SAT_1_00
Type:	**DC UPS System**	**Tag No.: UP-200F1**

3. Starting

Rectifier start	**Result**
Input phase sequence	.....
Float voltage correct setting	.....
High-rate voltage correct setting	.....

Starting procedure

Initial state : Charger is OFF
Input circuit breaker Q1 is open
Output switch (Q2) and battery switch (Q3) are open

Starting : Close output switch Q2
Charger is powered ON by closing the input circuit breaker Q1
Then close battery switch Q3
Only the charger subject to the test is ON
The mains is adjusted to its nominal value

Shut-down procedure

Initial state : Charger is ON
Input circuit breaker Q1 is closed
Output switch (Q2) and battery switch (Q3) are closed

Shut-down : Open input circuit breaker Q1
Charger is powered OFF
Then open the output switch Q2
The load is still connected to the battery through the switch Q3
Open the battery protection breaker (if the battery is connected)
Open the battery switch Q3

Site Acceptance Test Report		Document-No.: 14189_SAT_1_00
Type:	**DC UPS System**	**Tag No.: UP-200F1**

4. Functional tests:

Initial state : Charger is OFF
Input circuit breaker Q1 is open
Output switch (Q2) and battery switch (Q3) are open

Starting : Close output switch Q2
Charger is powered ON by closing the input circuit breaker Q1
Then close battery switch Q3
Only the charger subject to the test is ON
The mains is adjusted to its nominal value

Test description : The load is applied through a dummy load
The input and output electrical values shall remain within the acceptance criteria
The tests are done in floating and high rate mode

Rectifier and load output voltage : CHARGER 1

Mode	Rectifier output power	AC mains voltage	Rectifier output current	Rectifier output voltage to obtain (VBAT)	Measured rectifier output voltage	Load output voltage to obtain (VBAT-V21)	Measured load output voltage	Conformity (Yes/No)
Floating	……...	3x400Vac	……	136,8V +/-1%	V	136,1V+/-1%	V	
High rate	……...	3x400Vac	……	136,8V +/-1%	V	136,1V+/-1%	V	

(*) The rectifier voltage shall be corrected with the temperature compensation ratio if applicable.

Site Acceptance Test Report		Document-No.: 14189_SAT_1_00
Type:	**DC UPS System**	**Tag No.: UP-200F1**

Rectifier and load output voltage : CHARGER 2

Mode	Rectifier output power	AC mains voltage	Rectifier output current	Rectifier output voltage to obtain (VBAT)	Measured rectifier output voltage	Load output voltage to obtain (VBAT-V21)	Measured load output voltage	Conformity (Yes/No)
Floating	……...	3x400Vac	……	136,8V +/-1%	V	136,1V+/-1%	V	
High rate	……...	3x400Vac	……	136,8V +/-1%	V	136,1V+/-1%	V	

(*) The rectifier voltage shall be corrected with the temperature compensation ratio if applicable.

Site Acceptance Test Report		Document-No.: 14189_SAT_1_00
Type:	**DC UPS System**	**Tag No.: UP-200F1**

Parallel Operation (load transfer test)

Initial state : Both chargers are OFF
Input breakers (Q1) are open
Output switches (Q2) and battery switch (Q3) are open

Starting : Close output switches Q2
Chargers are powered ON by closing input breakers Q1
Battery switch Q3 remains open to simulate the worst condition (no battery)
The 2x chargers are now working and connected in parallel (floating mode)
The load is adjusted to 100% of the system nominal load
The mains is adjusted to its nominal value

Test description : To initiate the load transfer from redundant chargers to one charger, the relevant charger is stopped from mains
To initiate the load transfer to initial state, the relevant charger is turned ON from mains

Load transfer between the 2 chargers

Test	*Load transfer to charger 2*	*Recovery to initial state*	*Load transfer to charger 1*	*Recovery to initial state*
Acceptance criteria	No load supply interruption, the second charger takes 100% of the load	No load supply interruption. Return to dual redundant mode	No load supply interruption, the second charger takes 100% of the load	No load supply interruption. Return to dual redundant mode
Conclusion the test (OK/NOK)				

Load sharing between the 2 chargers

Switching ON CHARGER 1 and CHARGER 2
Load sharing approx. 50%

Parallel operation with load sharing 50% of CHARGER 1 and CHARGER 2

Result:

Site Acceptance Test Report		Document-No.: 14189_SAT_1_00
Type:	**DC UPS System**	**Tag No.: UP-200F1**

5. MODBUS Adapter

Incorporates Tests for:
MODBUS Adapter

Test to be performed for chosen failure messages, status messages and measuring values.

Designation	Checked
MODBUS Adapter	

MODBUS parameter table:

Label Lang. 1	Function	Value	Delay	Rel #	Rel. Qty	R. Latch	Led #	D. Latch	ShtDwn	Common	Label Lang. 2	ModBus Reg
HIGH MAINS VOLTS	Alarm	460,0 VAC	4s	1	1	---	0	---	---	Yes	V RED AC ALTA	40002
LOW MAINS VOLTS	Alarm	340,0 VAC	4s	1	1	---	0	---	---	Yes	V RED AC BAJA	40003
CHARGER FAULT	Alarm	NA	30s	2	1	---	0	---	---	Yes	FALLO CARGADOR	40004
HIGH BATT.VOLTS	Alarm	141,0 VDC	30s	0	1	---	0	---	---	Yes	V MAX BATERIA	40005
LOW BATT.VOLTS	Alarm	117,0 VDC	30s	5	1	---	0	---	---	Yes	V MIN BATERIA	40006
HIGH DC VOLTAGE	Alarm	147,0 VDC	10s	3	1	Yes	0	Yes	Yes	Yes	V MAX DC	40007
LOW DC VOLTAGE	Alarm	111,0 VDC	10s	4	1	---	0	---	---	Yes	V MIN DC	40008
Q1 OPEN	Alarm	0	4s	0	1	---	0	---	---	Yes	Q1 ABIERTO	40011
CTRL FLOATING	Forced Float	0	0s	0	1	---	0	---	---	---	CTRL FLOATING	40012
GROUND FAULT -	Alarm	0	4s	7	1	---	0	---	---	Yes	FALLO TIERRA -	40014
GROUND FAULT +	Alarm	0	4s	6	1	---	0	---	---	Yes	FALLO TIERRA +	40015
DISTRIB FAILURE	Alarm	0	4s	0	1	---	0	---	---	Yes	FALLO DISTRIB	40016
BATT SYMM FAULT	Alarm	0	4s	0	1	---	0	---	---	Yes	FALLO SIM. BAT.	40017
VENTILATION FAIL	Alarm	0	4s	0	1	---	0	---	---	Yes	FALLO VENTIL.	40018
CHARGER CURR.LIM	Alarm	NA	30s	0	1	---	0	---	---	Yes	I LIMIT. RECTIF	40019
HIGH CHARGR CURR	Alarm	110,0 A	10s	0	1	Yes	0	Yes	Yes	Yes	I RECTIFIC ALTA	40021
HIGH BATT. CURR	Alarm	16,5 A	10s	0	1	---	0	---	---	Yes	I BATERIA ALTA	40022
HIGH TEMPERATURE	Alarm	NA	0s	0	1	---	0	---	---	Yes	TEMPERATURA ALTA	40023
TEMP SENSE ERROR	Alarm	NA	0s	0	1	---	0	---	---	Yes	FALLO SONDA TEMP	40024
INTERNAL CHECK	Alarm	NA	0s	0	1	---	0	---	---	Yes	VERIF. INTERNA	40025
HIGH BATT. TEMP.	Alarm	45 °C	30s	0	1	---	0	---	---	Yes	TEMP. BAT. ALTA	40028
LONG CHARGE TIME	Alarm	NA	0s	0	1	---	0	---	---	Yes	TEMP CARGA LARGO	40030
NO PS VOLTAGE	Alarm	NA	0s	0	1	---	0	---	---	Yes	SIN ALIMENTACION	40031
CTRL FLOATING	Forced Float	0	0s	0	1	---	0	---	---	---	CTRL FLOATING	40034
ESD STOP BOOST	Alarm	4096	1s	0	1	---	0	---	---	Yes	ESD STOP BOOST	40035

Site Acceptance Test Report		Document-No.: 14189_SAT_1_00
Type:	**DC UPS System**	**Tag No.: UP-200F1**

6. Alarm Test:

Description	*Relay*	*Display*	*LED Box*	*Result (OK/NOK/Not applicable)*	
				CH 1	CH 2
MAINS FAULT	Yes	Yes	n.a.		
RECTIFIER FAULT	Yes	Yes	n.a.		
HIGH VOLTAGE C.C (147 Vdc)	Yes	Yes	n.a.		
LOW VOLTAGE D.C. (111 Vdc)	Yes	Yes	n.a.		
BATTERY LOW VOLTAGE (117 Vdc)	Yes	Yes	n.a.		
EARTH FAULT +	Yes	Yes	n.a.		
EARTH FAULT -	Yes	Yes	n.a.		
COMMON ALARM	Yes	Yes	n.a.		

Site Acceptance Test Report		Document-No.: 14189_SAT_1_00
Type:	DC UPS System	Tag No.: UP-200F1

7. Battery test:

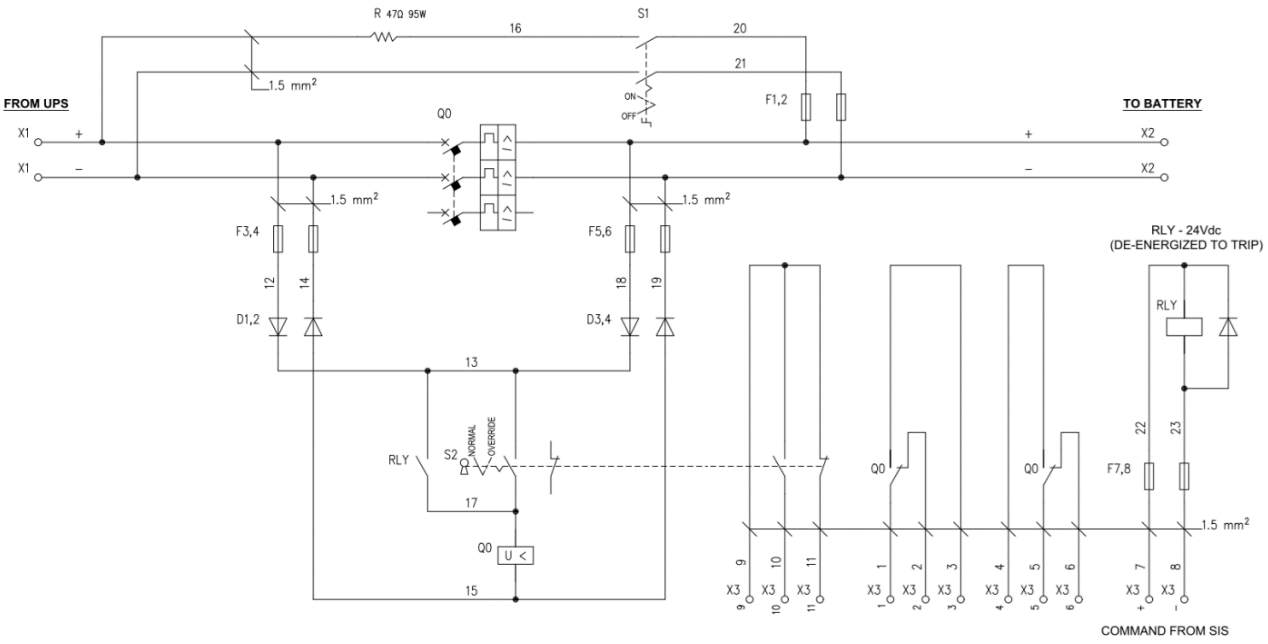
BATTERY		SHEET 1 / NR.:	REV.	OUR. RIF.:
CUSTOMER: Rosetti Marino	DISCHARGE TEST (Capacity test)	BATTERY TYPE:		CAPACITY Ah
		ELECTROLYTE TYPE:		DENSITY:
Nr. of blocks	Type :			

TIME (hour : min)	00:00	00:20	00:40	01:00	01:20	01:40	02:00	02:20	02:40	03:00	03:20	03:40	04:00	04:20	04:40	05:00
BLOCK N°	BLOCK / VOLTAGE															
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
TEMP. ELE. °C																

TIME (hour : min)	05:00	05:20	05:40	06:00	06:20	06:40	07:00	07:20	07:40	08:00	08:20	08:40	09:00	09:20	09:40	10:00
BLOCK N°	BLOCK / VOLTAGE															
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
TEMP. ELE. °C																

Site Acceptance Test Report		Document-No.: 14189_SAT_1_00
Type:	**DC UPS System**	**Tag No.: UP-200F1**

8. Black start procedure validation test:



Black Start procedure

The target is to allow the energization of the loads from the battery, while the battery charger being still de-energized.

- The operator shall put the selector S2 on "override" position (contact closed)
- The operator shall close the selector S1 to pre-charge the charger output DC capacitors
- Once the charger DC capacitors are charged and the voltage across Q0 power contacts is close to 0V (and at least >80% of the system DC nominal voltage), the operator shall close the breaker Q0
- The operator shall open the selector S1
- The site safety and SCADA systems restart and the RLY relay is automatically energized when all safety conditions are fulfilled. The charger is energized through its AC supply and then it can restart
- The operator shall put the selector S2 on "normal" position (contact open)
- The system returns to normal working conditions

Designation	Checked
BLACK START procedure	