Base Load Power Hub (BLPH)

OTP: UPS System UP-200F1 10kVA

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1 INTRODUCTION

1.1 Project Overview

Crosswind, a Shell and Eneco joint venture, was awarded the tender to develop the offshore Hollandse Kust Noord (HKN) wind farm, located 18.5km off the coast of Netherlands near the town of Egmond aan Zee. The consortium plans to have HKN operational in 2023 with an installed capacity of 759MW generating at least 3.3TWh per year. This is sufficient renewable power to supply more than 1 million Dutch households with green electricity.

Offshore wind farms produce intermittent electricity and balancing these dips and peaks and integrating this electricity into the national energy system requires new technologies. For this reason, the offshore wind farm will include several new technologies that could be implemented at full-scale in the future. The new technologies being explored include a floating solar park, a short-duration battery storage as well as long-term storage via green hydrogen produced by water electrolysis and subsequently consumed in a fuel cell. The combination of these individual measures, herein referred to as the Base Load Power Hub (BLPH) will ensure a continuous power supply regardless of the wind situation.

1.2 Project Location

The Hollandse Kust Noord (HKN) wind farm is located 18.5km off the coast of the Netherlands near the town of Egmond aan Zee.

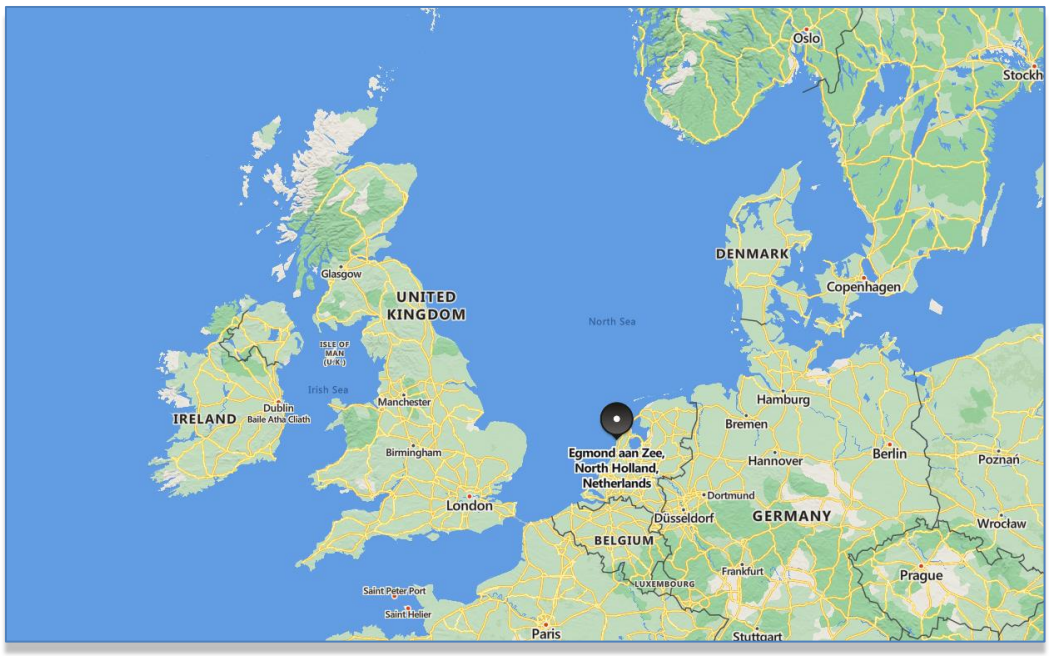


Figure 1 - HOLLANDSE KUST NOORD WIND PARK Location Map

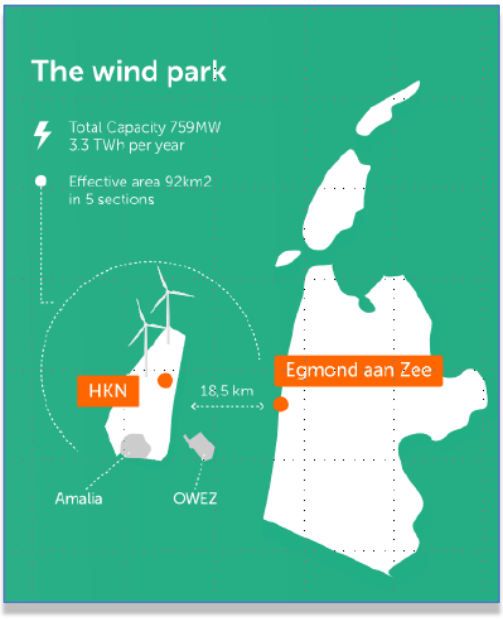


Figure 2 - Wind Park Details

The wind farm will consist of No. 69 x 11.5MW wind turbine generators each to be installed on a dedicated monopile structure. A 70th monopile is located on coordinates E 590719.1, N 5841602.3 and is reserved for installing the platform accommodating the BLPH. The monopile structure was designed and installed by Van Oord Offshore Wind (VooW) and therefore not part of the BLPH scope.

1.3 Project Concept

All components included in the BLPH will be integrated onshore on a topside and installed in an offshore location within the boundaries of the HKN wind farm. At its simplest, the BLPH will store energy during periods of high electricity generation from renewable sources (a wind turbine generator and the floating solar PV farm) and release it during periods of low generation. In practice. It is expected that the energy stored will supplement generation from renewable sources to ensure that at least 1.0MW of power is exported to the electrical grid regardless of wind/solar availability.

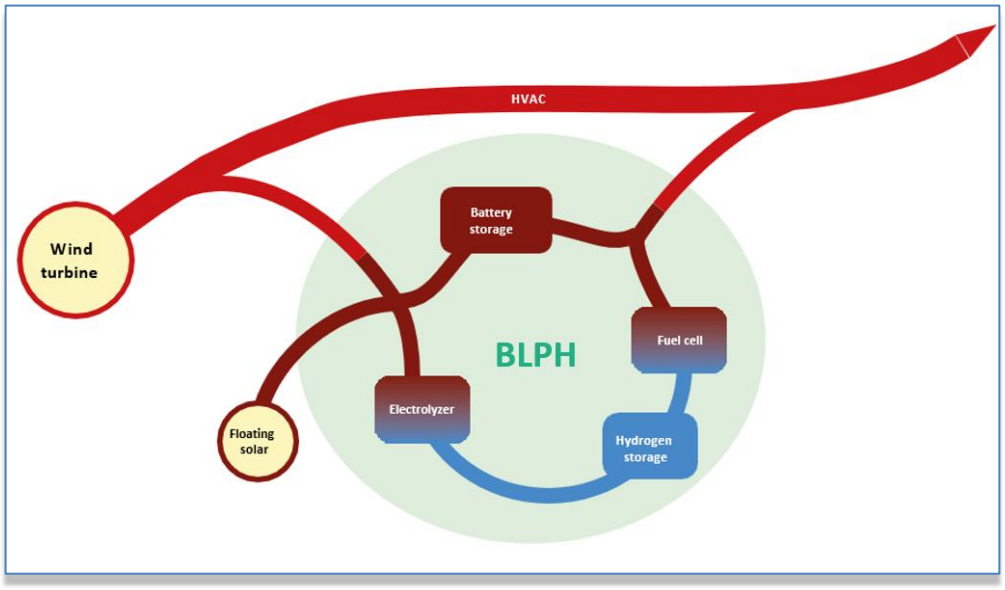


Figure 3 – BLPH Concept

Electricity in the BLPH will be stored in the form of electrons in a battery energy storage system (BESS) as well as converted into green hydrogen via water electrolysis. When the power output from the connecting wind turbine drops to below 1 MWe, the BLPH will return its stored energy to supplement the remaining power output. This will be by discharging the BESS, while stored hydrogen will be converted back into electricity using a fuel cell to extend the discharge duration.
The purpose of the BLPH is to function as a testbed for the integration of energy storage technologies with renewable generation. It is expected that equipment installed on the BLPH will operate as Normally Unmanned Installation for at least two (2) years with no or minimal maintenance and it will have its own independent control room with the ability to communicate with Crosswind's control room.

2 DOCUMENT SCOPE

The purpose of this document is to describe the methodology and the planned actions to be implemented for the preparation and execution of Mechanical Completion, Pre-commissioning, Commissioning & Start-Up activities to be performed on the PLANT, including COMPANY PROVIDED ITEMS, at the onshore premises of CONTRACTOR located in Milan (Italy) offices and Piomboni yard - Marina di Ravenna (Italy).

CONTRACTOR, pursuant to CONTRACT and PROJECT requirements, shall implement an exacting methodology, complete with a distinct set of tools and documentation to meet the following key objectives:
Perform the Mechanical Completion, Pre-commissioning and Commissioning on the WORKSITE to the maximum extent possible so as to minimise the commissioning operations on SITE;

- Ensure safety for the people, environment and facilities during the execution of the Commissioning activities at WORKSITE,
- Ensure integrity and operation of the equipment for their lifetime in accordance with PROJECT design and specifications,
- Plan a smooth and flawless execution of the Commissioning activities avoiding unforeseen downtimes and delays.

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Achievement of the above objectives shall be obtained by:

- Defining and prioritizing a predetermined sequence of the Mechanical Completion checks, Pre-commissioning and Commissioning tests and tasks,
- Checking, testing systematically and exhaustively all the components of PLANT in compliance with PROJECT approved procedures and CONTRACT terms, managed by a dedicated team of inspectors, technicians and field engineers who will perform the Mechanical Completion, Pre-commissioning, Commissioning and Start-Up tasks and subsequently record the results via discipline specific check, inspection and test sheets (ITR's) & where applicable via discrete Operational Test Procedures (OTP's).
- Ensuring full traceability of the performed checks and tests, through implementation of a dedicated Project Completions Management System (CMS) containing individual references to all tagged items.

3 OTP SUMMARY

3.1 Test Objective

The operating test of UPS AC system is executed to ensure that the system is started up in a safe and controlled manner and to verify the correct operation according to the project requirements.

Activities shall be developed as follows:

- Onshore pre-commissioning and commissioning activities at Contractor site (WORKSITE)
    - PHASE 1: UPS START UP with battery banks first charging and discharging tests
    - PHASE 2: UPS OPERATIONAL AND FUNCTIONAL TESTS
    - PHASE 3: COMMUNICATION TESTS with PCS and ESD systems.
- Offshore commissioning (SITE)
    - Visual inspection of all components, UPS start up with Black Start.

3.2 System Boundary Limits

See below the affected systems and subsystems on the Overall Single Line Diagram

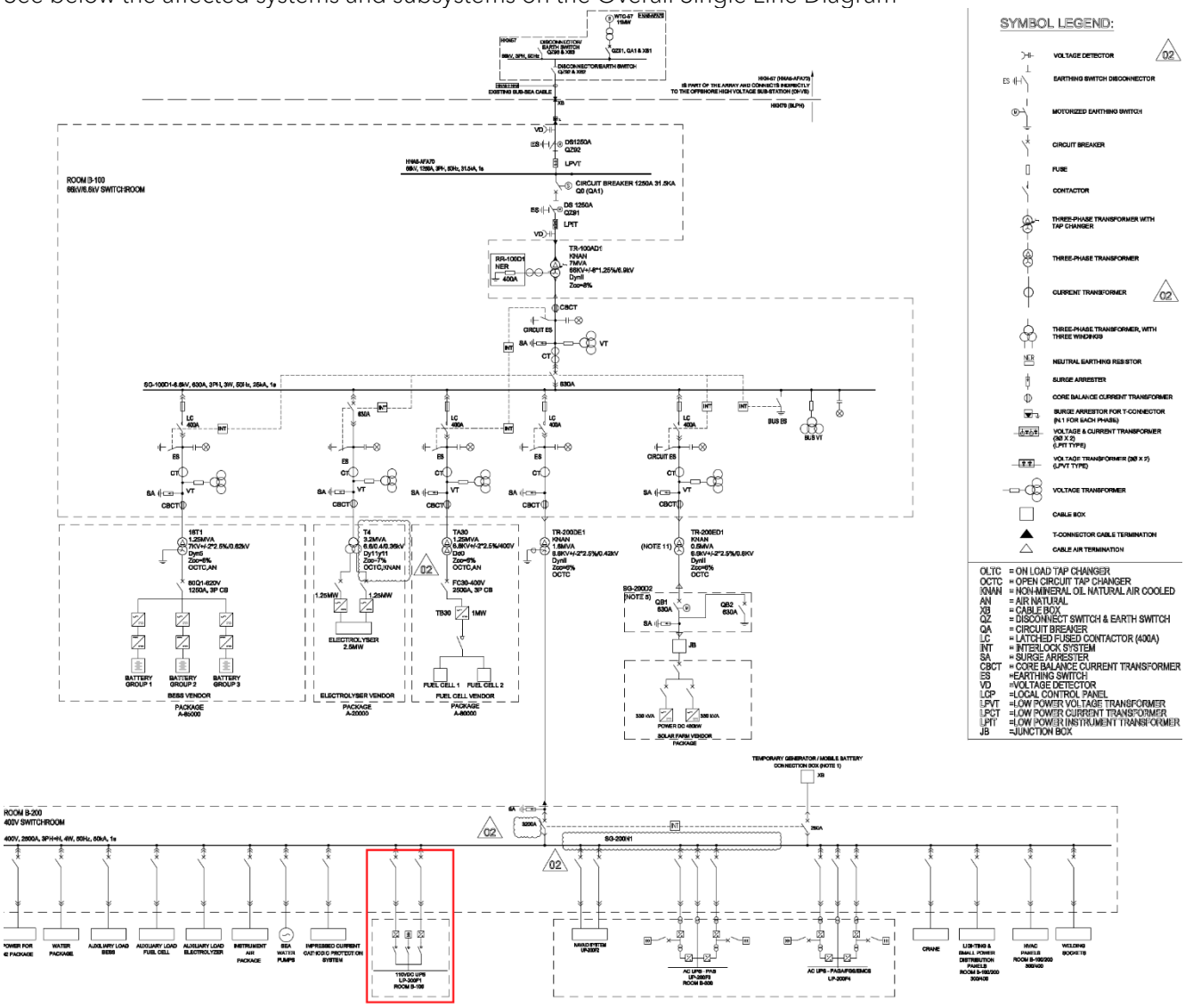


Figure 4 – OTP System Boundary Limits

3.3 Test and System Description

This document is related to the following systems/ subsystems:

- 83-00: 400/230V Switchboard SG-200N1
- 83-20: 400/230V Distribution Board DP-200N1
- 84-10: 110V DC UPS - 10KVA (UP-200F1)
- 84-10: 110V UPS DISTRIBUTION BOARD (UP-200F1)
- 84-10: UPS BATTERY RACK BANK (BA-200F1)

- 84-10: UPS CUT OFF BREAKER (CB-200F1)
- 79-00: EMERGENCY SHUTDOWN SYSTEMS (SIS)
- 87-10: PROCESS CONTROL SYSTEM (PCS)

All equipment is installed inside Technical Room B-100.

These parts of the system shall be tested at worksite and at site.

The UPS are metal enclosed prefabricated self-supporting type, for floor installation in compliance to the requirements of IEC 61439 1&2.
The UPS main data are the following:

GENERAL CHARACTERISTICS CLIMATIC CONDITION:
- Installation: Marine Offshore-Indoor
- Design Ambient Temperature: -8,4+40°C
- Rel. Humidity average 95%

ENCLOSURES:
- Type: Floor Standing
- Cell Type: MCC/F
- Finish Colour: RAL 7035

CONNECTIONS:
- Cable Compartment Access: Front (Incoming & Outgoing)
- Cable Entry From: Top
- Cabinet Access: Front

POWER SUPPLY:
- Rated Service Voltage: 110V
- Rated Frequency: 50 Hz
- Cabinet Rated Current: 100 A

BUSBARS:
- Busbars: 3P+PE
- Maximum Operating Temperature: 70°C
- Protection: External IP 31

BATTERY:
- Configuration 1x100%
- Autonomy :30 MIN
- Temp. Design: -8,4 – 40 °C
- Humidity :95%
- Number of batteries = 10
- Rated battery Voltage = 12V
- Nominal Battery System Voltage = 120 V
- Lead ACID VLRA GEL
- Capacity 150 Ah
- Recharge: 10h
- Float Charge: 2,25 V
- Boost Charge: 2,25 V

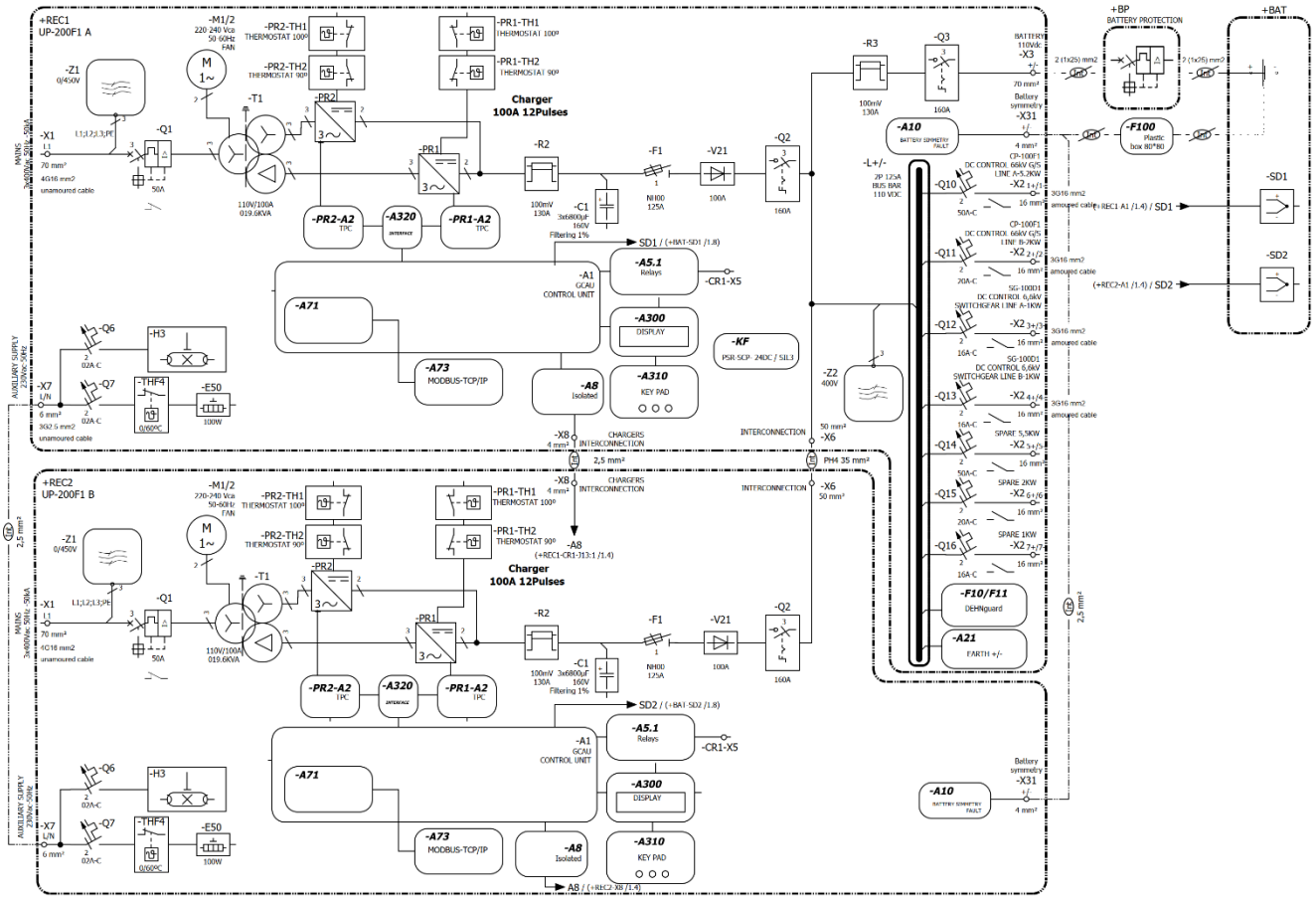


Figure 5 – UPS Single Line Diagram Block

The basic Single Line Diagram of the UPS and relevant connections is shown in the document 123A90-DDL-EL-DG-20158 "Overall/Key Single Line Electrical Diagram".

3.4 Safety Devices

- Appropriate Personnel Protective Equipment (PPE) and safety equipment e.g., safety shoes, safety glasses, hand gloves, helmet, earplugs etc. are available and must be used in line with the site requirements.
- Warning safety signs are to be posted with restricted access to essential personnel only.
- Adequate firefighting equipment.
- Specific details will be provided as part of the individual activity risk assessment prepared for each Permit to Work, which is a mandatory requirement for energizing items of equipment. Arc flash protection is not foreseen during execution of this OTP.
- PPE Will be Arc Flash Cat. 1.

3.5 HSE Management

All necessary safety precautions must be taken to avoid any risk for personnel injury.

- All personnel involved in this operational test shall be competent for the tasks they will be required to undertake
- Place safety / warning signs and segregate the entire area with barrier tapes (safety barriers) of a colour distinguished (blue and white) from those used for construction activities

- Restrict access into area only to authorized personnel
- Conduct "Toolbox Talk" with all personnel prior to starting test work
- Appropriate Personnel Protective Equipment (PPE) and safety equipment e.g. safety shoes, hand gloves, helmet, earplugs etc. are available and must be used in line with the site requirements
- All activities carried out on the project shall be performed in accordance with the "Permit to Work" system Doc. PRO-HSE-23
- Electrical and mechanical isolations are to be assured as per Doc. PRO-HSE-08 and "Commissioning and start-up operation" procedure.
- Observe and enforce all international codes and regulations to safeguard personnel, plant and environment.
- Ensure that the working area is clean, tidy, well illuminated and that access and escape routes are free from obstructions.

Before starting work on any of the activities in this OTP it is the responsibility of the persons performing the work to:

- Familiarize themselves with the plant/equipment to be worked on
- Ensure they are aware of all other work activities that are taking place, or due to take place
- If necessary, re-plan any situation/activity
- Ensure proper communications between parties involved in the execution of the OTP
- Read the relevant Vendor documentation for the equipment covered by this OTP and observe any special requirements and limitations recommended or imposed by Vendor
- Verify that all personnel involved in the implementation of this procedure are familiar with its content as well as the associated safety requirements (Toolbox Talk)

3.6 Acceptance Criteria

Before Power ON:
Visual inspection and verification are a crucial step to identify any obvious issues with the installation, such as loose connections, missing components, or damage to the equipment.

Crosschecking the installation with engineering documentation ensures that the installation is done correctly and according to the manufacturer's guidelines. These steps can help identify any missing or incorrect components, and wrong connections.

Applicable panels:

- SS84-00 UPS-200F1

Refer Overall SLD with Marked-up Sub-systems.

After Power ON:
Powering ON the unit is an essential step to verify that the equipment is functioning correctly. Observing if everything is OK and any alarm will help detect possible errors or malfunctions.

Phase 1 will prove:

- Voltage, frequency and phase sequence to the terminals of Incoming 1&2 (Rectifier) are according to specification
- UPS startup

Charging/Discharging of battery banks

Phase 2 will prove:

- Unit Synchronization

- Powering of one unit at the time will show A in normal operation and B in stand-by and vice versa.
- Installation and functionality of Battery breakers
- Unit changes to Battery operation
- Output / Distribution as per specification
- Black Start Operation

Phase 3 will prove:

- Test functionality of UPS and Test communication Modbus TCP-IP with PCS

4 DOCUMENTS REFERENCES AND ABBREVIATIONS

4.1 Reference Documents

4.1.1 Company Documents and Standards

Document ID	Document Title
[1] K559-2254-CG-PHI-001	Commissioning Philosophy
[2] K559-2254-EL-ELL-002	BLPH Electrical Load List (CCS MODE 2(A) 'HOT STANDBY')
[3] K559-2254-EL-ELL-003	BLPH Electrical Load List (CCS MODE 3(C) 'DISCHARGING')
[4] K559-2254-EL-ELL-004	BLPH Electrical Load List (CCS MODE 4(A) 'COLD STANDBY')
[5] K559-2254-EL-ELL-005	BLPH Electrical Load List (CCS MODE 4A(D) 'EMERGENCY MODE (Island))
[6] K559-2254-EL-ELL-006	BLPH Electrical Load List (CCS MODE 5(D) 'POWER OUT (Blackout))
[7] K559-2254-PR-PHI-001	Main process control philosophy

Table 1: Company Key Reference Documentation

4.1.2 Project Documents

Document ID	Document Title
[1] 123A90-PML-PM-LIS-01001	Master Document Register
[2] 123A90-PML-PM-PL-00001	Project Execution Plan
[3] 123A90-PML-QHSE-PL-00001	Project HSE Plan
[4] 123A90-PRO-HSE-23	RM Yard Permit To Work Procedure
[5] 123A90-PML-COM-PL-03002	Mechanical Completion & Commissioning Execution Plan
[6] 123A90-PML-COM-PRO-03007	Commissioning Strategy
[7] 123A90-PML-COM-LIS-03011	System/Sub-Systems List
[8] 123A90-PML-COM-LIS-03012	System/Sub-System Boundary Limit Diagrams

Document ID	Document Title
[9] 123A90-PML-COM-PRO-03038	Leak Test Procedure
[10]123A90-PML-COM-SP-03032	Pre-Commissioning Functional Test Sheet Template Collection (ITR-B)
[11]123A90-PML-COM-SP-03014	Commissioning TDS - Temporary Equipment & Facilities
[12]123A90-PML-COM-PRO-03019	OTP – Onshore Performance & Integrated Test Procedure
[13]123A90-PML-COM-LIS-03034	Inhibit-Override Register
[14]123A90-PML-COM-LIS-03035	PSV Calibration Register
[15]123A90-PML-COM-PRO-03036	OTP - Black Start Procedure
[16]123A90-PML-COM-LIS-03024	Commissioning Spare Parts and Consumables List
[17]123A90-PML-COM-PRO-03022	Initial offshore START-UP procedures
[18]123A90-PML-COM-SP-03057	Worksite WEF (Work Execution Flow Scheme)
[19]123A90-PML-COM-SP-03058	Site WEF (Work Execution Flow Scheme)
[20]123A90-PML-COM-RE-03001	Commissioning Final Dossier (ITR-B)
[21]123A90-PML-QHSE-PRO-00116	Flushing and Cleaning Procedures
[22]123A90-PML-QHSE-SP-00118	Mechanical Completion Check Sheet Template Collection (ITR-A)
[23]123A90-PML-QHSE-RE-00115	Mechanical Completion Final Dossier (ITR-A)
[24]123A90-PML-QHSE-PRO-00117	Punch list Management Procedure
[25]123A90- 123A90-PML-COM-PRO-03041	OTP - Hydrogen Storage & Venting Systems
[26]123A90- 123A90-PML-COM-PRO-03042	OTP - Sea Water Intake & Fresh Water Treatment Syst.
[27]123A90- 123A90-PML-COM-PRO-03043	OTP - Instrument Air System
[28]123A90- 123A90-PML-COM-PRO-03055	OTP - Nitrogen Generation System
[29]123A90- 123A90-PML-COM-PRO-03045	OTP - HV Switchgear & 66 kV Transformer Systems
[30]123A90- 123A90-PML-COM-PRO-03046	OTP - MV Switchgear & 6.6 kV Transformer Systems
[31]123A90- 123A90-PML-COM-PRO-03047	OTP - LV Switch Boards & LV Distribution Board Syst.
[32]123A90- 123A90-PML-COM-PRO-03048	OTP - Lighting & Small Power Systems
[33]123A90- 123A90-PML-COM-PRO-03049	OTP - Electrical Heat Tracing Systems
[34]123A90- 123A90-PML-COM-PRO-03050	OTP - DC UPS System 10kVA UP-200F1
[35]123A90- 123A90-PML-COM-PRO-03051	OTP - Data Network Systems
[36]123A90- 123A90-PML-COM-PRO-03053	OTP - Navaid System
[37]123A90- 123A90-PML-COM-PRO-03054	OTP - F&G and ESD C&E Logics

Document ID	Document Title
[38]123A90-PML-QHSE-PRO-00120	Proverlis Management Procedure
[39]123A90-PML-COM-PRO-03056	OTP – Document Template
[40]123A90-PML-COM-PRO-03059	OTP - AC UPS System 35kVA UP-200F3
[41]123A90-PML-COM-PRO-03060	OTP - AC UPS System 15kVA UP-200F4

Table 2: Reference Project Deliverables

4.1.3 Vendor Documents

Document ID	Document Title
[1] 1723002197-COM-LIS-00001	SPARE PART INDEX REGISTER (COMMISSIONING AND OPERATION)
[2] 172400372-QC-ITP-00002	INSPECTION AND TEST PLAN
[3] 1724000372-EL-DA-00004	GENERAL ARRANGEMENT AND DIMENSIONAL DRAWINGS
[4] 1724000372-EL-DS-00005	UPS & BATTERIES TECHNICAL DATA SHEET
[5] 1724000372-EL-DG-00007	AC UPS SINGLE LINE DIAGRAM AND INTERCONNECTING DIAGRAM
[6] 1724000372-EL-DG-00009	AC UPS-WIRING DIAGRAM & TERMINAL SCHEDULE INCLUDING EQUIPMENTS LIST &BILL OF MATERIAL
[7] 1724000372-EL-DG-00011	AC UPS-BATTERY LAYOUT AND INTERCONNECTING DIAGRAM
[8] 1724000372-EL-CAL-00012	BATTERY SIZING CALCULATION
[9] 1724000372-EL-CAL-00013	HEAT DISSIPATION
[10] 1724000372-EL-LIS-000014	I/O LIST
[11] 1724000372-EL-PRO-00015	PAINTING PROCEDURE
[12] 1724000372-EL-PRO-00017	UPS-FACTORY ACCEPTANCE TEST PROCEDURE
[13] 1724000372-EL-PRO-00019	UPS-SITE ACCEPTANCE TEST PROCEDURE/PRE - COMMISSIONING/COMMISSIONING PROCEDURE
[14] 1724000372-QC-LIS-00020	EQUIPMENT MANUFACTURE RECORD BOOK (FINAL DOSSIER)-INDEX
[15] 1723002197-QC-LIS-00021	EX CERTIFICATION LIST
[16] 1723002197-EL-LIS-00022	ATEX DOCUMENTATION
[17] 1723002197-QC-PRO-00055	PACKING, SHIPPING, HANDLING AND STORAGE PROCEDURES
[18] 1724000372-EL-MAN-00024	INSTALLATION, OPERATING AND MAINTENANCE MANUAL (INCLUDING SITE ERECTION INSTRUCTIONS AND PROCEDURES)

Table 3: Vendor Reference Documentation

4.2 Acronyms and Abbreviations

Acronyms / Abbreviations	Description
AIS	Automatic Identification System
AHU	Air Handling Unit
AOC	Achievement of Commissioning

Acronyms / Abbreviations	Description
C&E	Cause & Effects
CCS	Central Control System
CCTV	Closed Circuit Television
CMS	Completions Management System
CPI	Company Provided Item
CRS	Comments Response Sheet
CSU	Commissioning & Start-Up
E&I	Electrical & Instrumentation
EMCS	Electrical Monitoring & Control System
ESD	Emergency Shut Down
FAT	Factory Acceptance Test
FT	Functional Test
F&G	Fire & Gas
GALT	Gross Air Leak Test
HAZID	Hazard Identification Studies
HAZOP	Hazard and Operability Studies
HKN	Hollandse Kust Noord
HV	High Voltage
HVAC	Heating, Ventilation and Air Conditioning
HSE	Health, Safety, & Environment
ICSS	Integrated Control and Safety System
ITR	Inspection & Test Record
LC	Locked Closed
LO	Locked Open
LoSH	Limits of System Handover
LOTO	Lock-Out / Tag-Out
LV	Low Voltage
MC	Mechanical Completion
MDR	Master Document Register
MOC	Management of Change
NUI	Normally Unmanned Installation
OEM	Original Equipment Manufacturer
OMAR	Operating Modes Assurance Review
OTP	Operational Test Procedure (Commissioning)
OR	Operations Readiness

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Acronyms / Abbreviations	Description
ORR	Operations Readiness Review
PACO	Process Automation, Control and Optimisation
PCS	Process Control System
PID (P&ID)	Piping and Instrumentation Diagram
PSV	Pressure Safety Valve
PTW	Permit to Work
PVP	Piping and Vessels Preparation
PC&C	Pre-Commissioning & Commissioning
PSUA	Pre Start-Up Audit
PSSR	Pre Start-up Safety Review
RFC	Ready for Commissioning
RFO	Ready for Operation
RFSA	Ready For Sail Away
RFSU	Ready For Start-Up
SAT	Site Acceptance test
SECE	Safety Environmental Critical Element
SIF	Safety Instrumentation Function
SIL	Safety Integrity Level
SIMOPS	Simultaneous Operations & Maintenance
SIS	Safety Instrumented System
SLD	Single Line Diagram
SoF	Statement of Fitness
TA	Technical Authority
TQ	Technical Query
TIV	Technical Integrity verification
UPS	Uninterruptible Power Supply
VHF	Very High Frequency
VSAT	Very Small Aperture Terminal

Table 4: Acronyms and Abbreviations

5 OTP AT ONSHORE WORKSITE

This chapter refer to the activities on the Contractor worksite (construction yard).

5.1 Planning and Manpower

5.1.1 Planned tasks with estimated manpower

Estimated manpower for the entire duration of the Test:

- 1 E&I commissioning superintendent
- 1 E&I commissioning supervisor from Contractor
- 1 E&I commissioning technicians from Contractor
- 1 Vendor technician
- 1 PCS/ESD Workstation Operators (phase 3)

5.1.2 Test duration estimate

The test duration should be as follows:

- 3 days approx.

If necessary, the estimated time can be extended in order to complete all required pre-commissioning and commissioning activities.

5.1.3 Vendor Assistance

Equipment vendor 3W Power S.p.A. will provide a qualified specialist to assist with all aspects of commissioning of the UPS-200F1 system.

5.1.4 Items Postponed to C&E OTP

Not applicable

5.1.5 HOLDS

Not applicable

5.2 OTP Test Requirements – Onshore WORKSITE

5.2.1 Pre-Commissioning Achievement

Prior the commissioning operation starts, the relevant pre-commissioning ITRs should be fully signed.

5.2.2 Commissioning Achievement

The commissioning achievement will be the successful operation, functionality and safeguarding test of UPS, installed and put in operation during the WORKSITE phase:

- 83-00: 400V Switchboard SG-200N1
- 83-20: 400V Distribution Board DP-200N1
- 84-00:230V UPS AC UP-200F1

5.2.3 Status of Required Associated Subsystems

PHASE 1 UPS START UP

Subsystems required RFC for Commissioning of UPS

- 83-00 400V Switchboard SG200N1
- 83-20 Distribution board DP-200N1
- 88-00: Earthing System
- 83-99: Temporary Yard 400/230V Main and auxiliary power supplies
- 84-00: UPS AC UP-200F1

PHASE 2 UPS OPERATIONAL AND FUNCTIONAL TESTS

Subsystems required RFC for Commissioning of LV Power Distribution:

- 83-00 400V Switchboard SG200N1
- 83-20 Distribution board DP-200N1
- 88-00: Earthing System
- 83-99: Temporary Yard 400/230V Main and auxiliary power supplies
- 84-00: UPS AC UP-200F1

PHASE 3 COMMUNICATION TESTS with PCS and ESD systems

Subsystems required RFC for Commissioning of UPS:

- 83-00 400V Switchboard SG200N1
- 83-20 Distribution board DP-200N1
- 88-00: Earthing System
- 83-99: Temporary Yard 400/230V Main and auxiliary power supplies
- 84-00: UPS AC UP-200F1
- 79-00: SIS (ESD)
- 87-10: Process Control System (PCS)

5.2.4 Special Tools & Test Equipment

The following special tool and Test Equipment are required (see vendor document 1723002197-EL-LIS-00053):

- Voltage, frequency, continuity tester (Multimeter)
- Phases sequence tester
- Infrared temperature instrument
- Temporary Load Bank (Rated 10kVA)
- Portable radios
- 230VAC/24VDC temporary stabilized power supply

TESTING & MEASUREMENT INSTRUMENT USED			
Type	Serial N.	Calibration certificate	Validity

5.2.5 Consumable List

Not applicable

5.2.6 Commissioning Spare Parts

Reference is made to 3W document 1723002197-COM-LIS-00052 "Commissioning and operation Spare Parts Index Register" regarding the UPS spare parts.

5.2.7 Temporary Facilities

Phase 1 and Phase2: Temporary Load Bank for battery discharge tests and UPS functional test with rating 10kVA.

5.3 OTP Description – Onshore WORKSITE

5.3.1 OTP Test Preparation

Step	Description	Result	Verified by	Date
1	System Ready for Commissioning Certificate (RFC) is issued and approved.			
2	No Mechanical Completion or Pre-commissioning punch list 'A' items are outstanding against the system to be commissioned.			
3	Factory Acceptance Test Procedure has been carried out successfully (refer to Doc. 1723002197-QC-PRO-00045)			
4	All personnel involved in the implementation of this procedure are familiar with its content as well as with associated safety requirements (Toolbox Talk to be conducted before initiation of activities).			
5	A final walkdown of the system has been completed, to ensure that the system and the area are ready for commissioning.			
6	Check that areas are free for work and escape routes are clear of any obstructions.			
7	All safety barriers and warning signs have been installed.			
8	Ensure that proper communications have been established between parties involved in the implementation of the procedure.			
9	Verify availability of test equipment and consumables as per section 3.2.4.			
10	System(s) isolations as per LOTO procedure defined within HSSE Permits to Work and Commissioning procedures duly prepared and approved. Particular attention will be given to LOTO isolation of UPS outgoing MCB feeders.			
11	All yard personnel have been duly notified by dedicated LUN (Livening Up Notification) that the system(s) is ready for commissioning.			

5.3.2 Electrical Preparation

Step	Description	Result	Verified by	Date
12	Check related punch list 'B' items and confirm acceptability for start of commissioning activities.			
13	Verify that all relevant associated systems / subsystems are completed.			
14	Check that grounding and bonding are in accordance with applicable documents.			
15	Review and confirmation of protection settings on up-stream LV Switchboards feeder power supply circuit breakers.			
16	Verify finalization of UPS 'A', 'B' and Units internal power and auxiliary circuit connections in accordance with manufacturers documentation.			
17	Verify finalization of the auxiliary contact connection between UP-200F1 UPS Unit 'A' and UPS MAIN DISTRIBUTION SWITCHBOARD SG-200N1 related to acquisition of the simultaneous CLOSED status of three circuit breakers INCOMER UPS 'A', IN-COMER UPS 'B'			

5.3.3 Mechanical Preparation

Not applicable.

5.3.4 Instrument Preparation

Step	Description	Result	Verified by	Date
18	Check related punch list 'B' items and confirm acceptability for start of commissioning activities.			
19	Verify that all relevant associated systems / subsystems are ready.			
20	Check Inhibit and Override register has been prepared and validated.			
21	Verify that relevant equipment/ components are available and in operation for start of commissioning activities.			

5.3.5 Piping Preparation

Not applicable

5.3.6 Additional Discipline Preparation

Not applicable.

5.4 OTP Test Steps – Onshore WORKSITE - PHASE 1

During the PHASE 1 will be tested:

- Startup UPS 'A' and 'B'
- First charge of battery rack (12 hours)
- Discharge of battery rack (10 hours)
- Second recharge rack (battery bank in normal operation)

5.4.1 Test Preparation

Need to Verify:

- 400V Power supply is available
- All systems and subsystems involved in this procedure must be ready for commissioning and available.

5.4.1.1 UPS Start-Up Procedure

Step	Description	Result	Verified by	Date
START-UP UPS				
	Preparation before start-up:			
1	*Before start-up, check that the default equipment data tallies with the battery data*			
2	*Before start-up, check that the equipment is earthed in accordance with regulations*			
3	*Make sure that the ventilation grids are never covered during operation*			
4	Check the battery cut off Q3 breaker is open.			
5	Set the load interrupter switch Q1 to the "OFF" position.			
6	Remove the protective cover from the connection panel			
7	Check connection of the mains voltage for the rectifier.			
8	Measure the mains voltage at connection terminal X1 (outer conductor/outer conductor): the mains voltage is U~ = 400 V			

Step	Description	Result	Verified by	Date
9	Check the Phase rotation at connection terminal X1: L1, L2 and L3 clockwise rotation			
10	Disconnect the mains voltage for the rectifier			
11	Resolve any problems identified			
12	Replace the protective cover on the connection panel.			
13	Confirm absence of anomalies preventing UPS start-up.			
Starting UP the UPS 'A'				
14	Set the load interrupter switch Q1 to the "OFF" position			
15	Connect the mains voltage for the rectifier.			
16	Connect the mains voltage for the auxiliaries' circuit			
17	Set the load interrupter switch Q2 to the "ON" position.			
18	Check the functionality of Rectifier on the controller display A300			
19	Set the output interrupter switch Q1 to "ON" position			
20	Check the battery breaker Q3 voltage and polarity			
21	Set the battery interrupter switch Q3 to "ON" position			
22	Set the external battery cut-off interrupter switch Q0 to "ON" position			
23	Check the correct connection of the battery and charging status on controller display A300			
24	The first UPS 'A' unit is now in operation.			
Starting UP the UPS 'B'				
25	Set the load interrupter switch Q1 to the "OFF" position			

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Step	Description	Result	Verified by	Date
26	Connect the mains voltage for the rectifier.			
27	Set the load interrupter switch Q2 to the "ON" position.			
28	Check the functionality of Rectifier on the controller display A300			
29	Set the output interrupter switch Q1 to "ON" position			
30	The second UPS unit is now in operation.			

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5.4.1.2 Charge And Discharge Battery bank

Here follows the installed battery type datasheet:

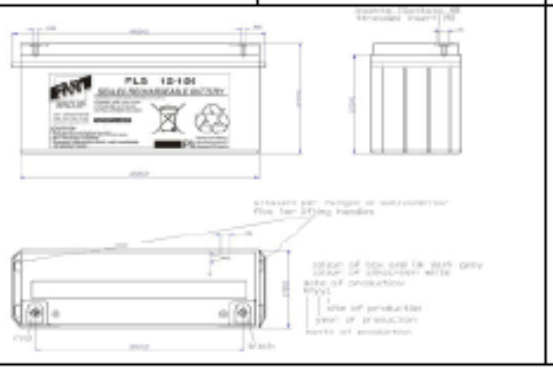
FAAM

FLG 12-150

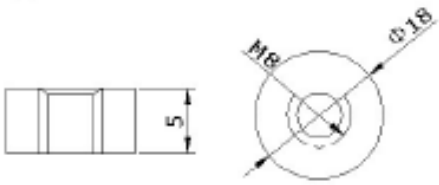
DIMENSIONAL FEATURES

Nominal Voltage Nominal Capacity (20 hours)		12V 150Ah (Vfin 1,8Vpc at 20°C)
Dimensions	Length Width Box Height Total Height	485±2mm 172±2mm 240±2mm 240±2mm
Drawing n° 4 00327-0		Weight 47,5 Kg ± 5%
Standard Terminal		Female screw type : M8

Nominal Capacity (100Hr) 229Ah (Vfin 1,8pc at 20°C)
Gel technology VRLA (Valve Regulated Lead Acid)
ABS FV-0 container and lid
Battery sealed no maintenance
Design life >12 years (at 20°C) "Long Life"
Standards: IEC EN 60896 Parts 21 and 22



Bolt-and-nut terminal
Bolt Type:M8



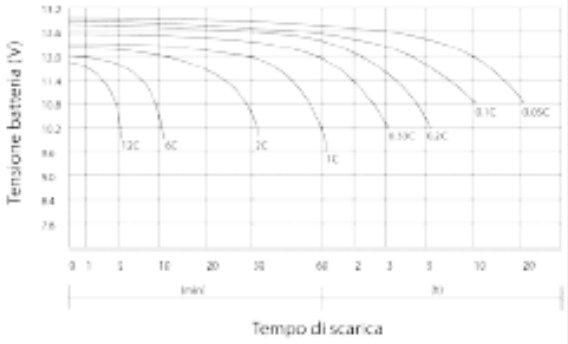
(in mm)

ELECTRIC FEATURES

Characteristics

Capacity	20 hours rate (Vfin 1,8pc at 20°C)	150,00Ah
	10 hours rate (Vfin 1,8pc at 20°C)	135,00Ah
	5 hours rate (Vfin 1,7pc at 20°C)	118.60Ah
	3 hours rate (Vfin 1,7pc at 20°C)	103,95Ah
	1 hour rate (Vfin 1,6pc at 20°C)	86,01Ah
Capacity affected by temperature	40°C	102%
	20°C	100%
	0°C	85%
Internal Resistance 3,9 mΩ ±10%	SCC 3250 A ±10%	
Constant Voltage Charge – Cycle use	Initial Charging Current less than 45 A Voltage 14,4–15,0V at 20°C Temperature Coefficient –30 mV/°C	
Constant Voltage Charge – Stand by use	No limit on Initial Charging Current Voltage 13,5–13,8V at 20°C Temperature Coefficient –20 mV/°C	

Discharge curves @ 20°C



Constant Current(Amp) and Constant Power (Watt/Cell) Discharge Table at 20°C

Final V./Time		5min	15min	30min	60min	90min	120min	180min	300min	480min	600min
9.9V	A	204,28	144,89	101,40	85,79	67,98	57,46	34,72	23,82	16,42	14,18
	W	554,04	416,51	274,48	176,47	142,95	107,70	70,94	48,71	36,42	30,49
10.2V	A	185,64	143,39	98,38	70,44	55,82	47,18	34,65	23,72	16,35	13,97
	W	538,86	403,20	265,95	170,99	138,51	104,36	70,52	48,43	36,21	30,43
10.8V	A	149,11	124,90	93,46	68,80	54,51	46,08	34,26	23,34	16,09	13,50
	W	505,97	380,38	250,90	161,31	130,67	98,45	69,14	47,48	35,50	29,83

Step	Description	Result	Verified by	Date
Battery bank FIRST Charging operation (commissioning charge)				
In charger only mode the rectifier is on and charging the battery. There is no output voltage, and the load is not supplied.				
This mode can be used to fully charge the battery before operation. This activity will be performed with Vendor Technician.				
Verification of system status for CHARGING:				
31	Perform first full commissioning charge of Battery Bank with duration 12 hours. N.B. The UPS unit must be recalibrated by vendor filed engineer for the purpose of the test. Commissioning charge voltage setting equal to: .....V With reference to Annex 001 '12h Capacity charge test record' start recording measurements at beginning of charging cycle every 30 minutes. ANNEX 001 12H CAPACITY CHARGE TEST RECORD			
After successful completion of above steps record Battery Bank terminal voltage.				
32	Record Battery Bank Terminal voltage. Record results in: "ANNEX 002 - BEFORE DISCHARGE BANK"			
After successful completion of above steps prepare for Battery Bank Discharge test.				
Verification for system status for DISCHARGING:				
33	Verify that Batteries are disconnected from UPS, cut off breaker Q2 is open.			
34	With vendor field service engineer connect temporary load bank to DC output of UPS.			
35	The Discharge tests will be performed with a constant discharge current of 13,5A for the duration of the 10h test.			

Step	Description	Result	Verified by	Date
36	Verify that all connections between UPS and temporary Load Bank are correct			
37	Verify and confirm that auxiliary power supply for Load Bank is OK.			
After completion of above verification steps continue with following steps and record results in relevant attached ANNEX documents. Records measurements in intervals of 30 minutes. During each measurement record ambient temperature.				
38	Perform discharge of Battery Bank for 10h. Record results in: "ANNEX 03 - DISCHARGE BANK"			
Battery Re-Charge				
Verification for system status for CHARGING:				
39	N.B. The UPS unit must now be recalibrated by vendor field engineer to the normal voltage value for the UPS normal operation. UPS Normal Voltage battery charging calibration equal to: V			
40	Proceed with recharging of battery bank A under normal operation UPS charging conditions and monitor periodically battery voltages for a period of 10 h. Confirm normal operation of UPS 'A' with no alarms and battery bank voltages after 10 hours period.			

5.4.2 OT WORKSITE Phase 1 – Tests Notes and Remarks

5.4.2.1 OTP Worksite Phase 1 - Tests Certifying Authority Table of Attendances

Name and Surname	Certifying Authority	Position	Signature

5.4.2.2 OTP WORKSITE Phase 1 - Tests Final Signatures and Company Acceptance

Name and Surname	Company Representative	Position	Signature

5.4.3 OTP Steps WORKSITE - PHASE 2

It is foreseen that previous sections are successfully performed.

The cabinet UPS is available, and all necessary tests are performed and accepted for that system.
All Cables are pulled up, tested and yard temporary power supply is completed and available.
UPS AC is working in normal operation and no alarm pending.

In the following steps the functionality of UPS shall be tested for:
- SS 83-00: 400V Switchboard SG-200N1 Main power supply feeders
- SS 83-20: 400V Distribution Board DP-200N1 Aux. power supply feeder
- SS 84-00: 230V UPS UP-200F1

Powering ON the unit is an essential step to verify that the equipment is functioning correctly. Observing if everything is OK and any alarm will help detect possible errors or malfunctions.

PHASE 2 will be performed through permanent power supply feeder arrangements.
PHASE 2 will prove correct:
- Voltage, frequency and phase sequence to the terminals of Incoming A&B (Rectifier) are according to specification.
- Powering of one unit at the time will show UPS 'A' in normal operation and UPS 'B' in stand-by and vice versa.
- Installation and functionality of Battery breakers
- Charging of batteries and batteries current
- Black start operation
- Output / Distribution as per specification

5.4.3.1 Verify UPS Unit 'A'

These steps are required for initial verification of the UPS Unit 'A'.

The following power supplies are available:
- Auxiliaries power supply from DP-200N1
- Main power supplies from SG-200N1

Step	Description	Result	Verified by	Date
SS 84-10 UPS SYSTEM INITIAL VERIFICATION				
1	Verify all metallic parts are correctly earthed as per engineering documentation			
2	Verify that all UPS internal circuit breakers and fuses are in the close / on position and UPS healthy with no alarms			
3	Verify that the battery cut-off breaker Q0 related to Battery Bank is in the close / on position			

Step	Description	Result	Verified by	Date
4	Verify and confirm availability of temporary power supply on main input terminals			

5.4.3.2 Verify UPS UNIT 'B'

These steps are required for initial verification of the UPS Unit 'B'.

The following power supplies are available:
- Auxiliaries power supply from DP-200N1
- Main power supplies from SG-200N1

Step	Description	Result	Verified by	Date
SS 84-10 UPS SYSTEM INITIAL VERIFICATION				
5	Verify all metallic parts are correctly earthed as per engineering documentation			
6	Verify that all UPS internal circuit breakers and fuses are in the close / on position			
7	Verify and confirm availability of temporary power supply on main input terminals			

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Step	Description	Result	Verified by	Date
UPS 'A' & 'B' Functional test				
1.	Confirm that main breaker QF1 on both Incoming A & B are CLOSED (A7/+03 SG200N1) & (A7/+04 SG200N1)			
2.	Confirm that Battery bank is powered ON, and Battery MCCB box is overridden from ESD (selector switch S2 in position Override) and breaker Q0 are CLOSED			
3.	Confirm there is no alarms present on HMI A300 on UPS UP-200F1.			
4.	Breaker status: UPS 'A' Q1 – CLOSED UPS 'B' Q1 – CLOSED UPS 'A' Q2 – CLOSED UPS 'B' Q2 – CLOSED UPS 'A' Q3 – CLOSED UPS 'A' & UPS 'B' Q0 - CLOSED			
RECTIFIER A1 OF UPS 'A' MAINS FAILURE.				
This check is performed for one unit at a time, starting with unit 'A'. Afterwards unit 'A' is in standby and unit 'B' is in normal operation, with load connected of 10kVA.				
5.	Open the MCCB in A7/+03 of SG-200N1 SWBD			
6.	Check the incoming AC voltage on terminals X1: 1U,1V,1W. (Expected Value 0 V) Vin =……V Check the incoming AC current through UPS 'A' control panel HMI -A300 (Expected value 0 A): Ain = ……A Check the DC voltage in output on terminals X6: (Expected Value 110V) Vout= …… V Check the output DC current through UPS 'A' control panel HMI -A300 (Expect Value Equal to 0 % of Nominal Current): Aout=……A			

Step	Description	Result	Verified by	Date
RECTIFIER A1 OF UPS 'A' MAINS RETURN				
7.	Close the MCCB in A7/+03 of SG-200N1 SWBD			
8.	Check the incoming AC voltage on terminals X1: 1U,1V,1W. (Expected Value 400 V) Vin =……V Check the incoming AC current through UPS 'A' control panel HMI -A300 (Expected value Equal to 50% of Nominal Current): Ain = ……A Check the DC voltage in output on terminals X6: U,V,W (Expected Value 110V) Vout= …….. V Check the output AC current through UPS 'A' control panel HMI -A300 (Expect Value Equal to 50% of Nominal Current): Aout=……A			

PARALLEL OPERATION UPS 'A' and UPS 'B' Switching OFF UPS 'B' via MCCB of SG200N1				
9.	Open MCB of A7/+04 of the UPS 'B' in SG-200N1			
10.	Verify UPS 'A' takes over 100% Load via HMI - A300: AC Load voltage and DC load current on display.			
RECTIFIER A1 OF UPS 'B' MAINS FAILURE				
11.	This check is performed for one unit at a time, starting with unit A. Afterwards unit B is in standby and unit A is in normal operation, with load connected of 10kVA.			
12.	Open the MCCB in A7/+04 of SG-200N1 SWBD			

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13.	Check the incoming AC voltage on terminals X1: 2U,2V,2W.(Expected Value 0 V) Vin =…… V Check the incoming AC current through UPS 'A' control panel HMI -A300 (Expected value 0 A) : Ain = ……A Check the DC voltage in output on terminals X6: (Expected Value 110V) Vout= …… V Check the output AC current through UPS 'B' control panel HMI -A300 (Expect Value Equal to 0% of Nominal Current): Aout=……A			
RECTIFIER A1 OF UPS 'B' MAINS RETURN				
14.	Close the MCB in A7/+04 of SG-200N1 SWBD			
15.	Check the incoming AC voltage on terminals X1: 2U,2V,2W. (Expected Value 400 V) Vin =……V Check the incoming AC current through UPS 'B' control panel HMI -A300 (Expected value 50% of nominal current A) : Ain = ……A Check the DC voltage in output on terminals X6: (Expected Value 110V) Vout= …… V Check the output DC current through UPS 'A' control panel HMI -A300 (Expect Value Equal to 50% of Nominal Current): Aout=……A			

PARALLEL OPERATION UPS 'A' AND UPS 'B' Switching OFF UPS 'A' via MCCB of SG200N1				
16.	Open MCCB of A7/+03 of the UPS 'A' in SG-200N1			
17.	Verify UPS 'B' takes over 100% Load via HMI-A300: DC Load voltage and DC load current on display.			
UPS 'A' RESTORATION				
18.	Close MCCB of A7/+03 of the UPS'A' in SG200N1			
PARALLEL OPERATION UPS 'A' AND UPS 'B' Switching OFF UPS 'B' via MCCB of SG200N1				
19.	Open MCCB of A7/+04 of the UPS 'B' in SG-200N1			
20.	Verify UPS 'A' takes over 100% Load via HMI-A300: DC Load voltage and DC load current			
UPS'B' RESTORATION				
21.	Close MCCB of A7/+04 of the UPS'B' in SG200N1			

5.4.3.3 Black Start Operation

Step	Description	Result	Verified by	Date
Black Start				
With Black Start it is possible to energize the system with only the batteries when the rectifier mains supply is unavailable. UPS is switched OFF at start of this test.				
Verification for system status				
1.	Verify that Rectifier mains breaker(s) Q1 (UPS A and UPS B) for Incoming 1 and Incoming 2 are in: Open position The rectifier main supplies are not available.			

Step	Description	Result	Verified by	Date
2.	Verify that Q2 output interrupters (UPS A and B) and internal battery cut-off breaker Q3 (UPS A) are in: Open position			
3.	Measure and record battery bank terminal voltages, confirm suitability to perform Black Start procedure, minimum voltage ideally ≥120 V: Battery Bank: …….....……. V			
4.	Verify that Output breaker(s) Q10, Q11, Q12, Q13, Q14, Q15,Q16 are in: Open position Consumers must be volt free			
Black Start procedure				
IMPORTANT: The DC capacitors must be charged before connecting the UPS to the batteries.				
5.	BLACK START UPS 'A' With reference to battery cut off breaker enclosure (CB-200F1) locate the following: - Selector switch S1 ON-OFF - Selector switch S2 NORMAL-OVERRIDE			
6.	Rotate selector switch S2 from position NORMAL to position OVERRIDE (ESD healthy signal not available).			
7.	In order to proceed with the UPS internal energization sequence, it is necessary to now close external battery cut-off breaker Q0. UPS 'A' & UPS 'B' Q0 - CLOSED			
8.	Rotate the selector switch S1 from position OFF to position ON (shunt resistor internally connected to enable pre-charging of UPS capacitors)			
9.	Confirm power up of UPS 'A' controller HMI - A300 within 10 seconds of rotated selector switch S1 to ON position			
10.	When, and only when the controller HMI -A300 will be powered up proceed to close battery cut off breaker Q0.			
11.	Rotate the selector switch S1 from position ON to position OFF.			

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Step	Description	Result	Verified by	Date
12.	The DC output voltage is available for essential loads (N.B. Autonomy will be limited to the residual charge remaining on the battery bank, it is important to re-energize the incoming AC main UPS incoming power supplies as possible). Proceed to close the followings MCBs: Q10, Q11, Q12, Q13,Q14,Q15,Q16.			
13.	Once essential loads will be operational and platform operational status normal it will be possible to reset the black start scenario.			
14.	Verify the main AC incoming power supply of UPS 'A' from SG-200N1 A7/+03.			
15.	Verify that UPS 'A' Q1 incoming circuit breaker is in: Close position			
16.	Check the Display Controller A300 is functioning and rated incoming input voltage visible			
17.	Verify that UPS 'A' Q2 output circuit breaker is in: Close position			
18.	Verify on Display Controller A300 all system voltages are correct, and battery bank is under charge.			
19.	Verify the main AC incoming power supply of UPS 'B' from SG-200N1 A7/+04.			
20.	Verify that UPS 'B' Q1 incoming circuit breaker is in: Close position			
21.	Check the Display Controller A300 is functioning and rated incoming input voltage visible			
22.	Verify that UPS 'B' Q2 output circuit breaker is in: Close position			
23.	Verify on Display Controller A300 all system voltages are correct, parallel operation with UPS 'A' is confirmed together with the equal power supply to final loads and battery bank 50%/50%.			
24.	With reference the battery cut off breaker enclosure CB-200F1 rotate the selector switch as follows: -Selector switch S2 NORMAL position			
25.	The battery cut off breaker should remain closed and connected as per normal UPS operation.			

5.4.3.4 OTP Worksite Phase 2 Tests Notes and Remarks

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5.4.3.5 OTP Worksite Phase 2 - Tests Certifying Authority Table of Attendances

Name and Surname	Certifying Authority	Position	Signature

5.4.3.6 OTP WORKSITE Phase 2 - Tests Final Signatures and Company Acceptance

Name and Surname	Company Representative	Position	Signature

5.4.4 OTP Steps WORKSITE - PHASE 3

It is foreseen that previous chapters are successfully performed.

All systems fed from SWBD SG-200N1 and from DB DP-200N1 are available and ready to work, all necessary tests are performed and accepted for those systems.
All Cables are pulled up, tested and temporary power supply is completed and available.
LV Power Distribution Switchboards and Distribution Boards is working in normal operation and no alarm pending.

In the following steps will be defined the tests of all signals from/to UPS and SIS hardwired and via Modbus TCP-IP between PCS and UPS.

All I/O signals were tested and recorded through dedicated ITR-B precommissioning check sheets.
Verify and confirm that all related check sheets have been performed successfully.

5.4.5 Test Preparation

Verification of systems UPS UP-200F1.
All systems and subsystems involved in this procedure must be ready for commissioning and available.

To perform the signals test is mandatory that PCS Cabinet – Modbus TCP-IP network system - are already energized, available and ready to work.

To test all signals, refer to specific electrical pre-commissioning check sheets, they will be used for the specific validation of all I/O signals.

5.4.5.1 UPS UP-200F1 - I/O Instrumental I/O list

To test all signals, refer to specific electrical pre-commissioning check sheets, they will be the specific functioning of all I/O.

Following I/O signals groups List to be verified.

This I/O list concern the alarm, feedback and command reading.

Cabinet	FROM	SIGNAL_DESCRIPTION	TYPE ANALOG/DIGITAL	TERMINALS	Note
BOX BATTERY	SIS (ESD)	Disconnect DC UPS UP-200F1 Battery A	DO	XS008A	0 TRIP
UPSA/B		Battery room fan fault-charge inhibit	DO	X4/1-2	0 INIBIT

Step	Description	Result	Verified by	Date
1	Confirm correct and positive result of precommissioning Check Sheet for above signals I/O list Correct and positive results……☐			

5.4.5.2 UPS UP-200F1 - I/O Modbus TCP-IP list

With reference all register Modbus TPC-IP for PCS system, it attached the Modbus status list

- ***Register tables***

Alarm and event table:

Modbus Register (nMbHR)	Jbus Register (nJbR)	aRN (hex)	Variable	Range
40,002	1	0x1	High Mains Voltage	0 = No alarm, 1 = Alarm
40,003	2	0x2	Low Mains Voltage	
40,004	3	0x3	Charger Failure	
40,005	4	0x4	High Battery Voltage	
40,006	5	0x5	Low Battery Voltage	
40,007	6	0x6	High DC Voltage	
40,008	7	0x7	Low DC Voltage	
40,009	8	0x8	Ground Fault +	
40,010	9	0x9	Ground Fault -	
40,011	10	0xa	Spare 1	
40,012	11	0xb	Spare 2	
40,013	12	0xc	Spare 3	
40,014	13	0xd	Spare 4	
40,015	14	0xe	Spare 5	
40,016	15	0xf	Spare 6	
40,017	16	0x10	Spare 7	
40,018	17	0x11	Spare 8	
40,019	18	0x12	Charger Current Limit Indicator	
40,020	19	0x13	Battery Current Limit Indicator	
40,021	20	0x14	High Charger Current	
40,022	21	0x15	High Battery Current	
40,023	22	0x16	High Temperature	
40,024	23	0x17	Temperature Sensor Error	
40,025	24	0x18	Internal Communication Error	
40,026	25	0x19	Battery Test Fail	
40,027	26	0x1a	Battery Test Aborted	
40,028	27	0x1b	High Battery Temperature	
40,029	28	0x1c	High Float Current	
40,030	29	0x1d	Long Charge Time	
40,031	30	0x1e	No Power Supply Voltage	
40,032	31	0x1f	Battery in Operation	
40,033	32	0x20	Battery Symmetry Fault	

Table 5: Modbus TCP-IP PCS

Measurements and status:

Modbus Register (nMbHR)	Modbus register (nJbR)	aRN (hex)	Variable	Range
40,100	99	0x63	Mains Voltage	VAC / 10
40,101	100	0x64	Battery Voltage	VDC / 10
40,102	101	0x65	Load Voltage	VDC / 10
40,103	102	0x66	Charger Current	Positive Amps / 10
40,104	103	0x67	Battery Current	Signed Amps / 10
40,105	104	0x68	Ambient Temperature	Signed Celsius
40,106	105	0x69	Battery Temperature	Signed Celsius
40,107	106	0x6a	Battery Symmetry Voltage	VDC/10
40,108	107	0x6b	Common Alarm Relay	0: negated, 1: asserted
40,109	108	0x6c	Earth Fault Impedance	Signed earth fault in k-Ohm/10
40,110	109	0x6d	Charge Status	0: Float 1: Highrate 2: Commissioning 3: Battery test 4: Charger Off
40,111	110	0x6e	Remaining Charge Time	Minutes
40,112	111	0x6f	AhMeter	%
40,113	112	0x70	Equation 1	16-bit signed integer value of equation result this result is multiplied by a factor defined by EQ configuration parameter 'ModbusMultiplier ' , rounded to nearest integer value and clamped to [-32,768, 32,767]
40,114	113	0x71	Equation 2	
40,115	114	0x72	Equation 3	
40,116	115	0x73	Equation 4	
40,117	116	0x74	Equation 5	
40,118	117	0x75	Equation 6	
40,119	118	0x76	Equation 7	
40,120	119	0x77	Equation 8	
40,121	120	0x78	Equation 9	
40,122	121	0x79	Equation 10	
40,123	122	0x7a	Equation 11	
40,124	123	0x7b	Equation 12	
40,125	124	0x7c	Equation 13	
40,126	125	0x7d	Equation 14	
40,127	126	0x7e	Equation 15	
40,128	127	0x7f	Equation 16	

All holding registers in this table have a read-only access.

Table 6: Modbus Measure TCP-IP PCS

Step	Description	Result	Verified by	Date
2	Confirm correct and positive result of precommissioning Check Sheet for above signals I/O list Correct and positive results. ……..☐			

5.4.5.3 OTP WORKSITE Phase 3 - Tests Notes and Remarks

5.4.5.4 OTP WORKSITE Phase 3 - Tests Certifying Authority Table of Attendances

Name and Surname	Certifying Authority	Position	Signature

5.4.5.5 OTP WORKSITE Phase 3 - Tests Final Signatures and Company Acceptance

Name and Surname	Company Representative	Position	Signature

5.5 Post-test Conditions

All the electrical contacts which were disconnected for the testing purposes must be reconnected.
After functional tests have been completed, system / sub-systems are left in healthy and safety condition and that they are operational.

5.6 Reinstatement and Preservation Tasks

Generally, the system/ sub-system shall be reinstated at its initial condition; and the following activities must be carried out as minimum:

- all inhibition done for the test shall be removed (as per Inhibit / Override List)
- all equipment/devices shall be returned in healthy functional conditions.

NOTE : all preservation routines identified and required will be included in relevant Preservation ITR within the Proverlis Completions System.

6 OTP AT OFFSHORE SITE

6.1 Planning and Manpower

6.1.1 Offshore Site overview

It is expected that all precommissioning tests, systems energization and commissioning steps will have been successfully performed during the Onshore Phases.
Consequently, during the offshore SITE phase, the respective systems will be inspected prior to re-energization. No additional test steps will be required on these items of equipment, correct operation and functioning will be verified.

6.1.2 Planned tasks with estimated manpower

Estimated manpower for the entire duration of the Test:
- 1 E&I commissioning superintendent
- 1 E&I commissioning supervisor from Contractor
- 1 E&I commissioning technicians from Contractor

6.1.3 Test duration estimate

The test duration should be as follows:
- 0,5 days approx.

If necessary, the estimated time can be extended to complete all required pre-commissioning and commissioning activities.

6.1.4 Vendor Assistance

- Not applicable

6.1.5 Items Postponed to C&E OTP

- Not Applicable

6.1.6 HOLDS

- Not Applicable

6.2 OTP Test Requirements – Offshore SITE

6.2.1 Pre-Commissioning Achievement

- Not applicable

6.2.2 Commissioning Achievement

The commissioning achievement will be the successful operation, functionality and safeguarding test of Power distribution System LV, installed and put in operation during the WORKSITE phase:

The successful commissioning result, achieved during the WORKSITE commissioning phase for the functionality and safeguard of the UPS system, will allow for a smoother commissioning phase of the offshore SITE.
The systems and subsystems involved:
- 88-00: Earthing System
- 84-00: UPS System UP-200F1

- 83-00: 400V Switchboard SG-200N1
- 83-20: 400V Distribution board DP-200N1
- 79-00: SIS (ESD)
- 87-10: Process Control System (PCS)
- 86-00: Data Network - MODBU RTU Network Switchboard Medium Voltage and Low Voltage

6.2.3 Status of Required Associated Subsystems

The systems involved has been already energized and commissioned in WORKSITE Phase

6.2.4 Special Tools & Test Equipment

The following special tool and Test Equipment are required (see vendor document 1723002197-EL-LIS-00053):

- Voltage, frequency, continuity tester (Multimeter)
- Phases sequence tester
- Portable

TESTING & MEASUREMENT INSTRUMENT USED			
Type	Serial N.	Calibration certificate	Validity

6.2.5 Consumable List

- Not applicable

6.2.6 Commissioning Spare Parts

Reference is made to 3W document 1723002197-COM-LIS-00052 "Commissioning and operation Spare Parts Index Register" regarding the LV SWBD e DB commissioning spare parts are indicated in the document 1723002197-COM-LIS-00052 "Commissioning and operation Spare Parts Index Register".

6.2.7 Temporary Facilities

- Not applicable

6.3 OTP Description – SITE

In SITE (offshore) phase the first energization of main SWBD SG-200N1 will be done feeding the drawer A2/+08 via Temporary Diesel Generator and will be performed all steps starting with first energization.
NOTE: When it's confirmed the availability of permanent 66kV high voltage, the temporary power supply from the Temporary Diesel Generator will be removed. A final check on the correct functioning of the UPS system will be performed when BLPH will be energized via the permanent high voltage supply.

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6.3.1 OTP Test Preparation

Step	Description	Result	Verified by	Date
1	System Ready for Operation(from WORKSItE Phase) (RFO) Certificate is issued and approved.			
2	No blocking punch list items are outstanding against the system to be commissioned.			
3	System(s), (de)isolations as per LOTO procedure enclosed within commissioning Work Permits procedures prepared and approved			
4	Verify and confirm that all steps performed at WORKSITE of this procedure are completed without any pending issues that would prevent from proceeding with the offshore SITE PROCEDURE			
5	All personnel involved in the implementation of this procedure are familiar with this procedure as well as with associated safety requirements (Toolbox Talk to be conducted before initiation of activities).			
6	A final walkdown after hook-up of the system has been completed, any preservation items have been removed and to ensure that the system and the area are ready for energization for following items: UP-200F1 230V DC UPS SG-200N1 Main Switchboard DP-200N1 Distribution board			
7	Check that areas are free for work and escape routes are clear of any obstructions.			
8	Ensure that proper communications have been established between parties involved in the implementation of the procedure.			
9	Verify availability of test equipment and consumables as per chapters 6.2.4.			
10	Verify and confirm that the Temporary Diesel Generator is ready to start, that the diesel fuel tank is full.			
11	All personnel have been duly notified during dedicated daily SIMOPS meetings that the system(s) is ready for commissioning.			

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6.3.2 Electrical Preparation

Step	Description	Result	Verified by	Date
12	No blocking punch list items are outstanding against the system to be commissioned.			
13	Review and confirm no changes are required to be performed on existing protection settings.			
14	Verify and confirm that the Temporary Diesel Generator power cables connections have been tested with correct phase rotation before sail away. Perform walk down on Diesel Generator for a final check before energization			

6.3.3 Mechanical Preparation

Not applicable.

6.3.4 Instrument Preparation

Step	Description	Result	Verified by	Date
15	No blocking punch list items are outstanding against the system to be commissioned.			
16	Verify that all relevant associated control and protection systems / subsystems are ready.			
17	Verify as relevant Inhibit and Override list has been prepared and validated (as per JSA).			

6.3.5 Piping Preparation

Not applicable

6.3.6 Additional Discipline Preparation

Not applicable.

6.4 OTP Test Steps – Offshore SITE

The previous chapters must be successfully performed prior to commissioning of the UPS System.

In the next steps, the functionality of the UPS system will be tested:

- SS 84-00:110V UPS SYSTEM

6.4.1 Test Preparation

Verification of system and subsystem UPS.
Conduct system walkdown and thorough visual inspection of all related components.
Confirm no impediment to proceed with energization.

6.4.2 Energization of UPS UP-200F3.

Step	Description	Result	Verified by	Date
UPS 'A' & 'B' Energization				
1	Confirm that diesel generator power supply is energized to upstream switchboard SG-200N1. A7/+03-line A A7/+04-line B			
2	Set the load interrupter switch Q1 to the "OFF" position			
3	Connect the mains voltage for the rectifier.			
4	Set the load interrupter switch Q1 to the "ON" position.			
5	Check the battery cut off breaker voltage and polarity			
6	Locate selector switch S2			
7	Rotate selector switch S2 from position NORMAL to position OVERRIDE (ESD healthy signal not available at this time).			
8	Verify the main AC incoming power supply of UPS 'A' from SG-200N1 A7/+03			
9	Verify that UPS 'A' Q1 incoming circuit breaker is in: **Close position**			
10	Verify that UPS 'A' Q2, Q3 ,Q0 cut off circuit breakers are in: **Close position**			
11	Verify the main AC incoming power supply of UPS 'B' from SG-200N1 A7/+04			
12	Verify that UPS 'B' Q2 circuit breaker is in: **Close position**			
13	The first and second UPS units are now in operation, repeat the above STEPS to start the second UPS unit.			
14	Proceed to close on board MCBs to energize BLPH essential loads.			

Step	Description	Result	Verified by	Date
15	Once ESD protection system will be operational, deactivate battery cut-off breakers override via switch S2, consequently confirm correct UPS start-up with out any alarms.			

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6.4.3 OTP SITE Tests Notes and Remarks

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6.4.4 OTP SITE Tests Certifying Authority Table of Attendances

Name and Surname	Certifying Authority	Position	Signature

6.4.5 OTP SITE - Tests Final Signatures and Company Acceptance

Name and Surname	Company Representative	Position	Signature

6.5 Post-test Conditions

All the electrical contacts which were disconnected for the testing purposes must be reconnected.
After functional tests have been completed, system / sub-systems are left in healthy and safety condition and that they are operational.

6.6 Reinstatement tasks

Generally, the system/ sub-system shall be reinstated at its initial condition; and the following activities must be carried out as minimum:

- all inhibition done for the test shall be removed (as per Inhibit / Override List)
- all equipment/devices shall be returned in healthy functional conditions.

7 APPENDICES

7.1 Vendor SAT Procedure

7.2 Proverlis Summary System Reports

7.3 Equipment Related Technical Queries

7.4 As Built Documentation

7.5 Management of Change – Summary Table of Tasks and Details of Affected Related Documentation

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7.6 ANNEX CHARGE-DISCHARGE BATTERY RECORDS

7.6.1 ANNEX 001 12h CAPACITY CHARGE TEST RECORD

CROSSWIND

CROSSWIND BLPH PROJECT - COMMISSIONING PROCEDURE OF UPS SYSTEM UP-200F1 10kVA

UP-200F1 [ANNEX001]
SUBSYSTEM 84-00: BATTERY FIRST CHARGE RECORD SHEET DURATION 12HOURS

BATTERY RACK UPS-BAT-1 | 12h CAPACITY CHARGE TEST RECORD

ROSETTI MARI

N° Hours	0,00	0,30	1,00	1,30	2,00	2,30	3,00	3,30	4,00	4,30	5,00	5,30	6,00	6,30	7,00	7,30	8,00	8,30	9,00	9,30	10,00	10,30	11,00	11,30	12,00	Note:
Time (hh:mm)																										
Charge Voltage (V)																										14,4 V ~15,0 V at 20°C
Charge Current (A)																										INITIAL CHARGING CURRENT < 45A
Ambient Temp. (°C)																										
Battery Cell Temp. (°C)																										

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Battery N°	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	
4																										FAAM BATTERY,TYPE FLG 12-150 A
5																										FAAM BATTERY,TYPE FLG 12-150 A
6																										FAAM BATTERY,TYPE FLG 12-150 A
7																										FAAM BATTERY,TYPE FLG 12-150 A
8																										FAAM BATTERY,TYPE FLG 12-150 A
9																										FAAM BATTERY,TYPE FLG 12-150 A
10																										FAAM BATTERY,TYPE FLG 12-150 A
TERMINAL VOLT. n.1°n.10																										FAAM BATTERY,TYPE FLG 12-150 A

Table 7: DATA RECORD SHEET CHARGE BATTERY BANK

7.6.2 ANNEX 002 BEFORE DISCHARGE

CROSSWIND

CROSSWIND BLPH PROJECT - COMMISSIONING PROCEDURE OF UPS SYSTEM UP-200F1 10kVA

UP-200F1 [ANNEX 002]
SUBSYSTEM 84-00: BATTERY CHARGE / DISCHARGE RECORD SHEET

EQUIPMENT	BATTERY RACK UP-200F1	TEST MEASUREMENT:	ANNEX XX: BEFORE DISCHARGE

ROSETTI MARINO

BATTERY BANK TERMINAL VOLTAGE
AMBIENT TEMPERATURE .....°C BATTERY TEMPERATURE .....°C

CELL N°	TAG UTILITY / TYPE	MANIFACTURER	MODEL	LOCATION	VOLTAGE (V)	DATE	TIME	REMARKS
1	FAAM,TYPE FLG 12-150 Ah							
2	FAAM,TYPE FLG 12-150 Ah							
3	FAAM,TYPE FLG 12-150 Ah							
4	FAAM,TYPE FLG 12-150 Ah							
5	FAAM,TYPE FLG 12-150 Ah							
6	FAAM,TYPE FLG 12-150 Ah							
7	FAAM,TYPE FLG 12-150 Ah							
8	FAAM,TYPE FLG 12-150 Ah							
9	FAAM,TYPE FLG 12-150 Ah							
10	FAAM,TYPE FLG 12-150 Ah							

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Table 8: DATA RECORD SHEET BEFORE DISCHARGE BATTERY BANK

7.6.3 ANNEX 003 BATTERY DISCHARGE TEST RECORD WITH APPLIED LOAD RESISTIVE BANK

CROSSWIND

CROSSWIND BLPH PROJECT - COMMISSIONING PROCEDURE OF UPS SYSTEM UP-200F1 10kVA

UPS UP-200F1 [ANNEX 003]
SUBSYSTEM 84-00: BATTERY DISCHARGE RECORD SHEET

ROSETTI MARINO

	BATTERY RACK' UPS-BAT-1													10h CAPACITY DISCHARGE TEST RECORD WITH APPLIED RESISTIVE LOAD BANK							
N° Hours	0,00	0,30	1,00	1,30	2,00	2,30	3,00	3,30	4,00	4,30	5,00	5,30	6,00	6,30	7,00	7,30	8,00	8,30	9,00	9,30	10,00	Note:
Time (hh:mm)																						
Discharge Power (W)																						179W ..... W
Discharge Current (A)																						13,50A. ..... A
Ambient Temp. (°C)																						
Battery Cell Temp. (°C)																						
Battery Cell N°	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	(V)	
1																						
2																						
3																						
4																						
5																						
6																						
7																						
8																						
9																						

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Table 9: DATA RECORD SHEET DISCHARGE BATTERY BANK