Base Load Power Hub (BLPH)

OTP – Nitrogen Generation Package

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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.

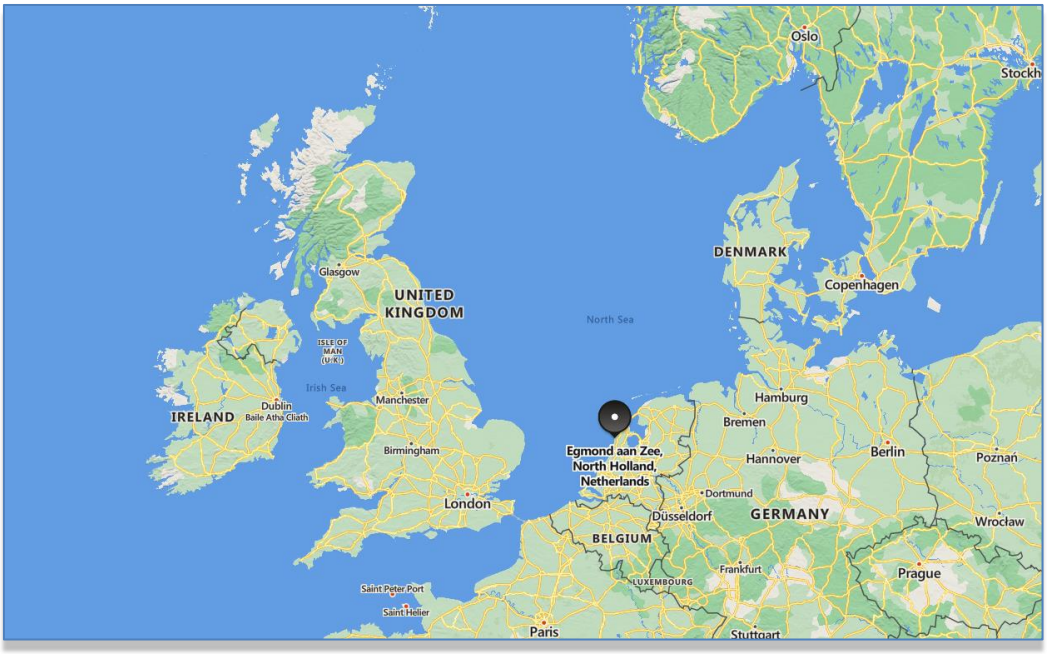


Figure 1 - HOLLANDSE KUST NOORD WIND PARK Location Map

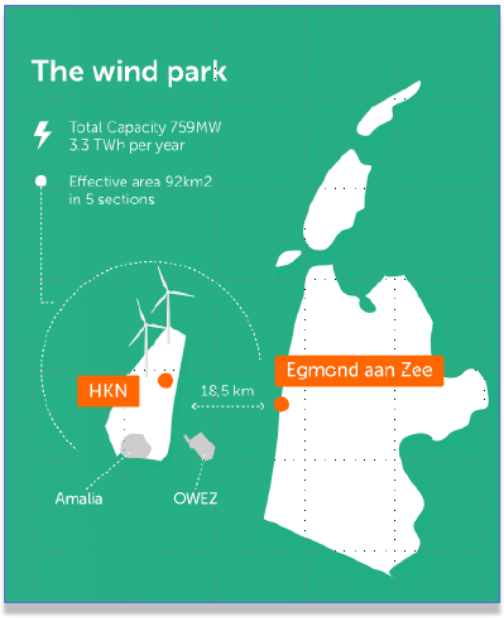


Figure 2 - Wind Park Details

The wind farm will consist of No. 69 x 11.5MW wind turbine Generations 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 topsides 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 Generation 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.

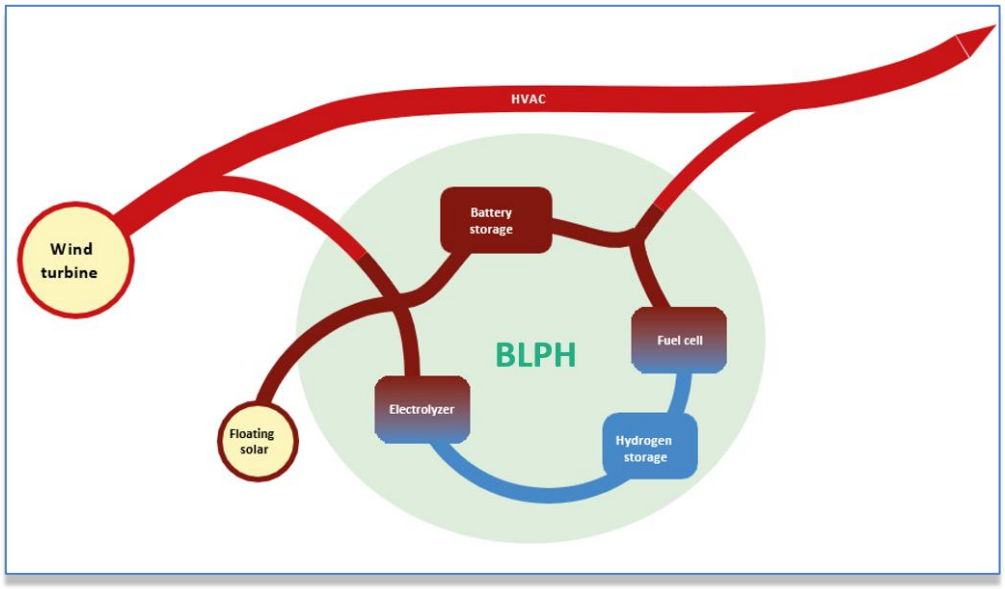


Figure 3 – BLPH Concept

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.

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 the Nitrogen Generation Package 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.

The scope of this document is to explain the principal procedure for inspection and test the Nitrogen Generation Package.

3.2 System Boundary Limits

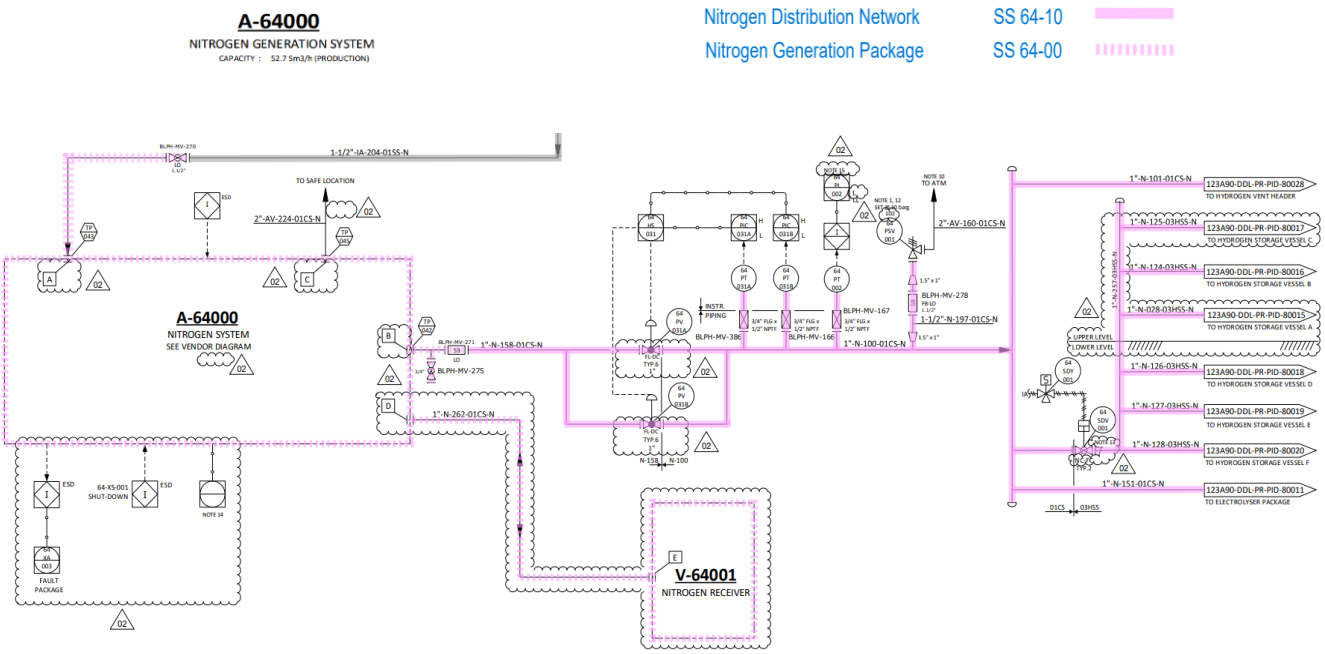


Figure 4 – System Boundary Limits

3.3 Test and System Description

This document is related to the following system:

- 64-00: Nitrogen Generation Package

All equipment must be properly installed in according with vendor document 1724000437-PR-PID-00018. The limits of the system are defined in document 1724000437-PR-PID-00018.

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

The Nitrogen Generation Package data are the following:

- Max Operating Pressure 12barg
- Operating Pressure 9 barg
- Operating Temperature range -10 / +80°C

Main components of the Package:

- C-64001A/B PSA (Pressure Swing Absorption) TOWERS
- S-64001A/B PSA AFTER - FILTERS
- V-64001 N2 RECEIVER

3.4 Safety Device

- 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.
- Warning safety signs are to be posted with restricted access to essential personnel only.
- Adequate firefighting equipment.

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, safety glasses, 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 connections.

After Power ON:
Turning on the units is an essential step in verifying the correct operation of the equipment. Observing that all wiring has been done correctly and in the event of an alarm will help us detect possible errors or malfunctions.

Phase 1: Preparation and Package Operations Tests

The Local Control Panel 64-LP-001 will be powered through power supply from AC 35KVA UPS (UP-200F3) 230V MCB Q42, Subsystem SS 84-10 and Auxiliary Power supply from Distribution Board DP-200N1 230V MCB Q30, Subsystem SS 83-20.

Phase 1 will prove correct:

- Verify the CPU & additional components there are in power on and the instrumentation on the Local Control Panel are in service.
- Loop check and C&E the Nitrogen Generation Package is completed.
- For the functional test of the Nitrogen Generation Package is required the SS 63-00 Instrument Air Package in service.

Phase 2: Validation of Communication and I/O

Remote control, monitoring and safety systems will be managed as follows:

- Profinet communication to Network Cabinet B-400-NET-00 and PCS System.
- Hardwired connections to SIS System.

Phase 2 will validate the following:

- Verify the Profinet Communication from PCS to Local Control Panel 64-LP-001 is operational.
- Verify loop check from SIS to Local Control Panel 64-LP-001 with C&E test.

Performing the steps in this OTP as per engineering documents is crucial to ensure that the equipment is operating correctly and that it meets the desired design specifications. Observing the results will help identify any issues that may arise during the operation.

Overall, following these steps shall provide a comprehensive and effective way to verify the equipment installation and functionality.

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 documents And Standards*

These documents were produced in FEED and made available to RM for info. They have subsequently been superseded by Detailed Design, similar or same deliverables.

4.1.2 Project Documents

[1] 123A90-PML-PM-LIS-01001	Master Document Register
[2] 123A90-PML-COM-PL-03002	Mechanical Completion & Commissioning Execution Plan
[3] 123A90-PML-COM-LIS-03011	System/Sub-Systems List
[4] 123A90-PML-COM-LIS-03012	System/Sub-System Boundary Limit Diagrams
[5] 123A90-PML-COM-PRO-03007	Commissioning Strategy
[6] 123A90-PML-COM-PRO-03038	Leak Test Procedure
[7] 123A90-PML-COM-SP-03032	Pre-Commissioning Functional Test Sheet Template Collection (ITR-B)
[8] 123A90-PML-COM-SP-03014	Commissioning TDS - Temporary Equipment & Facilities
[9] 123A90-PML-COM-PRO-03019	OTP – Onshore Performance & Integrated Test Procedure

[10]	123A90-PML-COM-LIS-03034	Inhibit-Override Register
[11]	123A90-PML-COM-LIS-03035	PSV Calibration Register
[12]	123A90-PML-COM-PRO-03036	OTP - Black Start Procedure
[13]	123A90-PML-COM-LIS-03024	Commissioning Spare Parts and Consumables List
[14]	123A90-PML-COM-PRO-03022	Initial offshore START-UP procedures
[15]	123A90-PML-COM-RE-03001	Commissioning Final Dossier (ITR-B)
[16]	123A90-PML-QHSE-PRO-00116	Flushing and Cleaning Procedures
[17]	123A90-PML-QHSE-SP-00118	Mechanical Completion Check Sheet Template Collection (ITR-A)
[18]	123A90-PML-QHSE-RE-00115	Mechanical Completion Final Dossier (ITR-A)
[19]	123A90-PML-QHSE-PRO-00117	Punch list Management Procedure
[20]	123A90- 123A90-PML-COM-PRO-03041	OTP - Hydrogen Storage & Venting Systems
[21]	123A90- 123A90-PML-COM-PRO-03042	OTP - Sea Water Intake & Fresh Water Treatment Systems
[22]	123A90- 123A90-PML-COM-PRO-03043	OTP - Instrument Air System
[23]	123A90- 123A90-PML-COM-PRO-03055	OTP - Nitrogen Generation System
[24]	123A90- 123A90-PML-COM-PRO-03045	OTP - HV Switchgear & 66 kV Transformer Systems
[25]	123A90- 123A90-PML-COM-PRO-03046	OTP - 6.6 kV Switchgear & Transformer Systems
[26]	123A90- 123A90-PML-COM-PRO-03047	OTP - LV Switch Boards & LV Distribution Board Systems
[27]	123A90- 123A90-PML-COM-PRO-03048	OTP - Lighting & Small Power Systems
[28]	123A90- 123A90-PML-COM-PRO-03049	OTP - Electrical Heat Tracing Systems
[29]	123A90- 123A90-PML-COM-PRO-03050	OTP - DC UPS System 10KVA UP-200F1
[30]	123A90- 123A90-PML-COM-PRO-03051	OTP - Data Network Systems
[31]	123A90- 123A90-PML-COM-PRO-03053	OTP - Navaid System
[32]	123A90- 123A90-PML-COM-PRO-03054	OTP - F&G and ESD C&E Logics
[33]	123A90-PML-COM-SP-03057	Worksite WEF (Work Execution Flow Scheme)
[34]	123A90-PML-COM-SP-03058	Site WEF (Work Execution Flow Scheme)
[35]	123A90-PML-QHSE-PL-00001	Project HSE Plan
[36]	123A90-PML-QHSE-PRO-00120	Proverlis Management Procedure
[37]	123A90-PML-COM-PRO-03056	OTP – Document Template

[38]	123A90-PML-COM-PRO-03059	OTP - AC UPS System 35kVA UP-200F3
[39]	123A90-PML-COM-PRO-03060	OTP - AC UPS System 15kVA UP-200F4
[40]	123A90-PML-COM-PRO-03061	OTP – Electrolyser (CPI)
[41]	123A90-PML-COM-PRO-03062	OTP – Fuel Cell (CPI)
[42]	123A90-PML-COM-PRO-03063	OTP – BESS (CPI)

Table 2: Project Documents

4.1.3 Vendor Documents

Document ID	Document Title
[1] 1724000437-MD-LIS-00001	SMIR - SUPPLIER MASTER INFORMATION REGISTER
[2]1724000437-QC-ITP-00002	INSPECTION TEST PLAN (ITP)
[3] 1724000437-MAC-SP-00003	SYSTEM/PACKAGE FUNCTIONAL DESCRIPTION
[4] 1724000437-MAC-CE-00004	PACKAGE CAUSE EFFECT MATRIX /LOGIC DIAGRAMS
[5] 1724000437-MAC-DA-00005	CERTIFIED PACKAGE GENERAL ARRANGEMENT AND DIMENSIONAL OUTLINE DRAWINGS (INCLUDING: NAMEPLATE, BASEFRAME, FOUNDATION LOADS, NOZZLES LOADS, NOZZLES LIST, BATTERY LIMITS, CoG)
[6] 1724000437-MAC-DD-00006	EQUIPMENT SECTIONAL DRAWING WITH BILL OF MATERIAL
[7] 1724000437-MAC-DD-00007	PACKAGE 3D MODEL DRAWING AND ELECTRONIC FILE
[8] 1724000437-MAC-DD-00008	PACKAGE PIPING SCHEMATICS AND BILL OF MATERIALS
[9] 1724000437-MAC-DG-00009	PACKAGE WIRING DIAGRAM INCLUDING LAYOUT OF PACKAGE CONTROL PANEL
[10] 1724000437-ST-RE-00010	PACKAGE STRUCTURAL CALCULATION REPORT INCLUDING FIXING POINTS and LIFTING POINTS
[11] 1724000437-MAC-DS-00011	EQUIPMENT DATA SHEETS INCLUDING MOTORS, AIR COMPRESSOR, DRYERS, ETC.
[12] 1724000437-MAC-DS-00012	PACKAGE EQUIPMENT NOISE DATA SHEETS INCLUDING AIR COMPRESSOR, DRYERS, ETC.
[13] 1724000437-MAC-DS-00013	INSTRUMENT DATA SHEETS
[14] 1724000437-EL-LIS-00014	ELECTRICAL LOAD LIST
[15] 1724000437-IN-LIS-00015	I/O LIST
[16] 1724000437-IN-LIS-00016	INSTRUMLIST WITH SET POINTS/CONTROL/ALARM/SHUTDOWN
[17] 1724000437-EL-LIS-00017	CABLES LIST
[18] 1724000437-PR-PID-00018	PACKAGE P&ID
[19] 1724000437-NDT-PRO-00019	NDT PROCEDURES INCLUDING PERSONNEL QUALIFICATIONS

Document ID	Document Title
[20] 1724000437-WEL-LIS-00020	WELDING BOOK (WPS, PQR, WELDERS QUALIFICATIONS, WELDING MAPS, ETC.)
[21] 1724000437-MAT-PRO-00021	PAINTING PROCEDURE
[22] 1724000437-QC-PRO-00022	HYDROSTATIC AND OR PNEUMATIC TEST PROCEDURE
[23] 1724000437-QC-PRO-00023	FAT (FACTORY ACCEPTANCE TEST) PROCEDURE
[24] 1724000437-QC-DB-00024	MANUFACTURERS RECORD BOOK (FINAL DOSSIER)
[25] 1724000437-QC-LIS-00025	MANUFACTURERS RECORD BOOK (FINAL DOSSIER) - INDEX
[26] 1724000437-MAC-LIS-00026	ATEX REGISTER
[27] 1724000437-MAC-LIS-00027	ATEX DOCUMENTATION
[28] 1724000437-COM-LIS-00028	SPARE PARTS LIST (2 YEARS AND COMMISSIONING & START-UP)
[29] 1724000437-MAC-MAN-00029	INSTALLATION, OPERATING AND MAINTENANCE MANUAL (INCLUDING SITE ERECTION INSTRUCTIONS AND PROCEDURES)
[30] 1724000437-QC-PRO-00030	HANDLING, PRESERVATION AND PACKAGING PROCEDURE

Table 3: *Vendor Documents*

4.2 Acronyms and Abbreviations

Acronyms and Abbreviations	Description
AOC	Achievement of Commissioning
BLPH	Base Load Power Hub
BESS	Battery Energy Storage System
C&E	Cause & Effects
CCR	Centra Control Room
CCS	Central Control System
CCTV	Closed Circuit Television
CMS	Completions Management System
CPI	Company Provided Item
CSU	Commissioning & Start-Up
E&I	Electrical & Instrumentation
EMCS	Electrical Monitoring & Control System
ESD	Emergency Shut Down
F&G	Fire & Gas
FAT	Factory Acceptance Test
FT	Functional Test

Acronyms and Abbreviations	Description
GALT	Gross Air Leak Test
HAZID	Hazard Identification Studies
HAZOP	Hazard and Operability Studies
HKN	Hollandse Kust Noord
HSE	Health, Safety, & Environment
HSSE	Health, Safety, Security & Environment
HV	High Voltage
HVAC	Heating, Ventilation and Air Conditioning
ICSS	Integrated Control and Safety System
ITR	Inspection & Test Record
LC	Locked Closed
LO	Locked Open
LOTO	Lock-Out / Tag-Out
LV	Low Voltage
OCC	Onshore Commissioning Complete
OEM	Original Equipment Manufacturer
OICT	Onshore Utility Commissioning Complete
OMAR	Operating Modes Assurance Review
OR	Operations Readiness
ORR	Operations Readiness Review
OTP	Operational Test Procedure (Commissioning)
PACO	Process Automation, Control and Optimisation
PCS	Process Control System
PC&C	Pre-Commissioning & Commissioning
PID (P&ID)	Piping and Instrumentation Diagram
PSV	Pressure Safety Valve
PSSR	Pre Start-up Safety Review
PTW	Permit to Work
PV	PothoVoltaic
PVP	Piping and Vessels Preparation
RFC	Ready for Commissioning
RFO	Ready for Operation
RFSA	Ready For Sail Away
RFSU	Ready For Start-Up

Acronyms and Abbreviations	Description
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
SMIR	Supplier Master Information Register
SoF	Statement of Fitness
TIV	Technical Integrity verification
UPS	Uninterruptible Power Supply
VHF	Very High Frequency
VooW	Van Oord Offshore Wind
VSAT	Very Small Aperture Terminal
VSAT	Very Small Aperture Terminal
WEF	Work Execution Flow Scheme

Table 4: *Acronyms and abbreviations*

5. OTP TEST REQUIREMENTS – 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 MECH commissioning superintendent from Contractor
- 1 E&I commissioning supervisor from Contractor
- 1 MECH commissioning technicians from Contractor
- 1 Vendor technician
- 1 Operator workstation field engineer (phase 2)

5.1.2 Test Duration Estimate

The test duration should be as follows:

- 1 day PHASE 1
- 1 day PHASE 2

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

5.1.3 Vendor Assistance

Vendor COES SRL will provide a qualified specialist to assist with all aspects of commissioning of the Nitrogen Generation Package.

5.1.4 Items Postponed to C&E OTP

- Not Applicable

5.1.5 Items HARDWIRED to be TESTED

Signal tag:	Signal description:
64-PT-051	PSA inlet pressure
64-PT-052 64-PT-053	PSA tower pressure
64-PT-057	PSA outlet pressure
64-PT-059	N2 receiver pressure
64-PDIT-056	Post-filter pressure drop
64-AT-051	Outlet O2 content
64-XY-051 64-XY-052 64-XY-053 64-XY-054 64-XY-055 64-XY-056 64-XY-057 64-XY-058 64-XY-059 64-XY-060 64-XY-061	Pneumatic on-off valves actuation
64-XV-051 64-XV-052 64-XV-053 64-XV-054 64-XV-055 64-XV-056 64-XV-057	PSA towers change-over and regeneration
64-XV-058	N2 discharge
64-XV-059	N2 discharge
64-XV-060 64-XV-061	Post-filters change-over

Table 5: Items HARDWIRED to be Tested

5.1.6 Items HARDWIRED & PROFINET to be TESTED

Signal tag:	Signal description:
64-XA-003	A-64000 Nitrogen PKG fault
64-XS-001	SHUT-DOWN A-64000 Nitrogen PKG
PROFINET	Refer to parameter list Appendix 7.6

Table 6: *Items HARDWIRED & PROFINET to be Tested*

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 of Nitrogen Generation Package, installed and put in operation during the WORKSITE phase:

- 64-00: Nitrogen Generation System

5.2.3 Status of Required Associated Subsystems

PHASE 1: Preparation and Package Operations Tests
Subsystems required RFC for Commissioning of Nitrogen Generation Package:

- SS 83-20 Distribution Board DP-200N1 230V
- SS 84-10 AC 35KVA UPS (UP-200F3) 230V
- SS 88-00 Earthing System
- SS 63-00 Instrument Air Package

PHASE 2: Validation of Communication and I/O
Subsystems required RFC for Commissioning of Nitrogen Generation Package:

- SS 83-20 Distribution Board DP-200N1 230V
- SS 84-10 AC 35KVA UPS (UP-200F3) 230V
- SS 88-00 Earthing System
- SS 63-00 Instrument Air Package
- SS 86-00 Server Cabinet
- SS 86-00 Network Cabinet
- SS 79-00 SIS (ESD)
- SS 87-10 PCS System Cabinet

5.2.4 Special Tools & Test Equipment

The following special tool and Test Equipment are required:

- Continuity tester (Multimeter)
- Toolbox
- Hart Communicator
- Portable radios (2 pcs + 1 per Technical Room)

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

5.2.5 Consumable List

- Not applicable

5.2.6 Commissioning Spare Parts

- See reference doc. N. 1724000437-COM-LIS-00028

5.2.7 Temporary Facilities

- Not applicable

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. 1724000437-QC-PRO-00023).			
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 5.2.4.			
10.	System(s) isolations as per LOTO procedure defined within HSSE Permits to Work and Commissioning procedures duly prepared and approved			
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
1.	Check related punch list 'B' items and confirm acceptability for start of commissioning activities.			
2.	Verify that all relevant associated systems / subsystems are completed.			
3.	Verify and confirm the completion of the final connections between the UPS (UP-200F3) MCB Q42 and the Local Control Panel 64-LP-001.			
4.	Verify and confirm the completion of the final connections between the Distribution Board DP-200N1MCB Q30 and the Local Control Panel 64-LP-001.			

5.3.3 Mechanical Preparation

Step	Description	Result	Verified by	Date
1.	Check the correct flow direction of the valves			

5.3.4 Instrument Preparation

Step	Description	Result	Verified by	Date
1.	Check related punch list 'B' items and confirm acceptability for start of commissioning activities.			
2.	Verify that all relevant associated systems / subsystems are ready.			

3.	Check Inhibit and Override register has been prepared and validated.			
4.	Verify that relevant equipment/ components are available and in operation for start of commissioning activities.			
5.	Verify availability of test equipment as per section 5.2.4.			

5.3.5 Piping Preparation

Step	Description	Result	Verified by	Date
1.	Verify the completion of piping in conformity with system battery limit.			

5.3.6 Additional Discipline Preparation

- Not applicable

5.4 OTP TEST STEPS – ONSHORE WORKSITE (PHASE 1 & PHASE 2)

In the following steps the functionality of the Nitrogen generation Package shall be tested:
SS 64-00: Nitrogen Generation Package.

5.4.1 Test Preparation

Need to Verify:

- SS 83-20 Distribution Board DP-200N1 230V is available.
- SS 84-10 AC 35KVA UPS (UP-200F3) 230V is available.
- SS 86-00 Server Cabinet is available.
- SS 86-00 Network Cabinet is available.
- SS 79-00 SIS (ESD) is available.
- SS 87-10 PCS System Cabinet is available.
- SS 63-00 Instrument Air Package is available.

All systems and subsystems involved in this procedure must be ready for commissioning and available.

5.4.2 Test Steps PHASE 1: Preparation and Package Operations Tests

Step	Description	Result	Verified by	Date
Energization of Nitrogen Generation Package				
PHASE1: Preparation and Package Operations Tests				
Verify related ITR-B's for System 64-00 are completed.				

Step	Description	Result	Verified by	Date
1	Verify that all manual valves are aligned with the process as per vendor document 1723000437-PR-PDI-00018.			
2	Check and confirm that the MCB Q42 from UPS (UP-200F3) and Distribution Board DP-200N1 MCB Q30 230V are ready for power on.			
3	Check with reference vendor document 1724000437-MAC-DG-00009 sheet 21; 22 the following protection devices are open: 20QF1 and 21QF1.			
4	Confirmed the above we can proceed with energization of the Local Control Panel 64-LP-001.			
5	Close the MCB Q42 from UPS (UP-200F3) and with reference vendor doc. 1724000437-MAC-DG-00009 sheet 22 verify that power supply 230V is present on the terminal strip X2:1-2 Voltage_____V.			
6	Close the MCB Q30 from Distribution Board DP-200N1and with reference vendor doc. 1724000437-MAC-DG-00009 sheet 21 verify that power supply 230V is present on the terminal strip X1:1-2 Voltage_____V.			
7	Confirmed the steps 4 and 5 let's procced with energization of the CPU1, CPU2, I/O RACK SCALANCE and PN/PN COUPLER. with reference vendor doc. 1724000437-MAC-DG-00009 sheet 44; 45.			
8	Check that there are no alarms present and that all instrumentation on the Nitrogen Generation Package are powered.			
9	With reference Vendor Doc 1724000437-MAC-DG-00009 sheet 21 verify the correct functionality: internal light, anticondensation resistor and service socket.			
10	Verify loop check and alarm setting with reference vendor doc. 172400437-IN-LIS-00015, see sheet 4.			

Step	Description	Result	Verified by	Date
11	Confirmed the steps from 1 to 9 let's proceed with start in local mode from Local Control Panel 64-LP-001.			
12	Before starting the sequence in local mode verify: 1. Instrument Air Package SS: 63-00 is running with network pressurized. 2. Front LCP 64-LP-001: • Lamp 230V SERVICE 64-XL–001 is on • Lamp 230V UPS 64-XL-002 is on • Lamp 24V 64-XL-004 is on • Lamp ALARM 64-XA-001 is off			
13	Rotate the selector 64-HS-004 in local mode and start pushbutton 64-HS-001. Verify in the front LCP the running status lamp 64-XL-003 is on, (the sequence is starting). Verify the start sequence in local mode with vendor document 172400437-MAC-CE-0004.			
14	The four phases of the operational cycle are listed below: PHASE 1: Tower C-64001A Generation - Tower C-64001B Depressurization. PHASE2: Tower C-64001A Equalization - Tower C-64001B Equalization. PHASE 3: Tower C-64001A Depressurization - Tower C-64001B Generation. PHASE 4: Tower C-64001A Equalization - Tower C-64001B Equalization. Verify the description phases with vendor document 1723000437-MAC-SP-00003 sheet 13;14.			
15	During the testing verify the: PSA inlet pressure 64-PT-051 is > 8 barg. • …… barg. C-64001A 64-PT052 is > 8 barg. • …… barg. C-64001B 64-PT053 is > 8 barg. • …… barg.			

Step	Description	Result	Verified by	Date
	Oxygen analyser 64-AT-051 (If measured oxygen concentration is higher than the set value 3%, automatically the valve 64-XV-058 is closed and the valve 64-XV-059 is open, to vent the out of spec nitrogen to the atmosphere. Differential post filter 64-PDIT-056 (In case of high pressure drop 0,5 bar, the after-filter in stand-by condition shall be put on-line). PSA tower outlet pressure 64-PT-057 is > 7.5 barg. • …….. barg. N2 receiver pressure 64-PT-059 is > 7.5 barg. • …….. barg. For information the set point alarms are defined in the vendor document 1724000437-IN-LIS-00016 sheet 2.			
16	Function test Acceptance criteria: • Oxygen < 3%…….. [ ] OK • Inlet pressure > 8 barg …… [ ] OK • Outlet pressure > 7.5 barg …. [ ] OK			
17	After Validation of the process parameters detailed above proceed to stop the sequence, press the stop pushbutton 64-HS-002.			
18	The shutdown Nitrogen Generation Package is given by the: • Emergency push button 64-SBM-001 • Cumulative critical alarm 64-XS-003.			

5.4.3 Test preparation PHASE 2: Validation of Communication and I/O

Step	Description	Result	Verified by	Date
PROFINET Communication Nitrogen Generation Package				
PHASE2: Validation of Communication and I/O				
Verify related ITR-B's for System 64-00 are completed.				

Step	Description	Result	Verified by	Date
1.	Check and confirm all panels are involved as per section 5.4.1 are available.			
2.	Verify the interface Profinet Communication from PCS System to Control Local Panel 64-LP-001 is available and has no communication problems.			
3.	Verify the Profinet signal and alarms setting from 64-LP-001 to HMI/workstation with vendor document 1724000437-MD-LIS-00015 and parameter list in appendix 7.6			
4.	Verify the hardwiring signal from 64-LP-001 to SIS in the HMI/workstation: • 63-XA-003: N2 PKG fault • 63-XS-001: SHUT-DOWN N2 PKG.			
5.	During the step 3 to 4 verify and confirm the correct animation in the graphic page in the control room HMI/workstation.			
6.	Confirmed the steps from 1 to 5 let's proceed with start the Nitrogen Generation Package in remote mode from workstation located in temporary yard CCR. Verify the start sequence with vendor document 172400437-MAC-CE-0004 and 1724000437-IN-LIS-00016 sheet 2.			
7.	Refer to Step 14 and 15 of PHASE 1			
8.	After Validation of the process parameters, give the remote stop sequence command from the temporary yard CCR.			
9.	Start once again the Nitrogen Generation PKG in remote mode from workstation located in temporary yard CCR and validate the trip signal from send from SIS (64-XA-001). Confirm Instrument Air Package stopped, then reset tip signal and confirm Package ready to start.			
10.	Confirm validation of the process parameters list attached to section 7.6 …….. [ ] OK			

5.4.4 OTP Worksite Tests Notes and Remarks

5.4.5 OTP Worksite Tests Certifying Authority Table of Attendances

Name and Surname	Certifying Authority	Position	Signature

5.4.6 OTP Worksite Test Final Signatures and Company Acceptance

Name and Surname	Company Representative	Position	Signature

5.5 POST TEST CONDITIONS

the previous chapters are successfully performed.

- All necessary tests are performed and accepted for that system.
- All Communication Cables are tested and completed.
- All panels are in normal operation and no alarm pending.

5.6 REINSTATEMENT AND PRESERVATION TASKS

- 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 safety condition and that they are operational.
- 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 test overview

The propose of this test is to recheck the good condition and operation of all equipment and the commissioning of the Nitrogen Generation Package.

6.1.2 Planned tasks with estimated manpower

Estimated manpower for the entire duration of the Test:

- 1 MECH 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 day.

If necessary, the estimated time can be extended in order 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 HOLD

- Not applicable

6.2 OTP TEST REQUIREMENT – OFFSHORE SITE

6.2.1 Pre-Commissioning Achievement

- Not applicable

6.2.2 Commissioning Achievement

The final commissioning achievement will be the successful operation, functionality and safeguarding test of the Nitrogen Generation system, installed and put in operation during the WORKSITE IN ONSHORE phase. During the Offshore SITE phase, the system will be thoroughly inspected prior to energization and start up. The activities will be concluded with remote start and stop commands from the CCR installed in the final configuration.

6.2.3 Status of Required Associated Subsystem

Subsystems required for Commissioning of Nitrogen Generation Package:

- SS 83-20 Distribution Board DP-200N1 230V.
- SS 84-10 UPS (UP-200F3) 230V.
- SS 87-10 PCS SYSTEM.
- SS 79-00 SIS SYSTEM.
- SS 86-00 NETWORK CABINET.
- SS 86-00 SERVER CABINET.
- SS 88-00 Earthing System.

6.2.4 Special Tools & Test Equipment

The following special tool and Test Equipment are required:

- Continuity tester (Multimeter)
- Hart communicator
- Toolbox
- Portable radios (2 pcs + 1 per Technical Room)

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

6.2.5 Consumable List

- Not applicable

6.2.6 Commissioning Spare Parts

The commissioning spare parts are indicated in the document 1724000437-COM-LIS-00028"Commissioning Spare Parts".

6.2.7 Temporary Facilities

- Not applicable

6.3 OTP DESCRIPTION – OFFSHORE SITE

6.3.1 OTP Test Preparation

Step	Description	Result	Verified by	Date
1.	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).			
2.	A final walkdown of the system has been completed, to ensure that the system and the area are ready for start-up.			
3.	Verify availability of test equipment as per section 6.2.4.			
4.	All personnel have been duly notified that the system(s) is ready for start-up.			

6.3.2 Electrical Preparation

Step	Description	Result	Verified by	Date
1.	Verify that all relevant associated systems / subsystems are ready.			

6.3.3 Mechanical Preparation

Step	Description	Result	Verified by	Date
1.	Verify that all relevant associated systems / subsystems are ready.			

6.3.4 Instrument Preparation

Step	Description	Result	Verified by	Date
1.	Verify all Panels are available as per section 6.2.3			

6.3.5 Piping Preparation

Step	Description	Result	Verified by	Date
1.	Verify that all relevant associated systems / subsystems are ready.			

6.3.6 Additional Discipline Preparation

- Not applicable

6.4 OTP TEST STEPS – OFFSHORE SITE

6.4.1 Test Preparation

Need to confirm availability of the following systems:

- SS 83-20 Distribution Board DP-200N1 230V (MCB Q42) is available.
- SS 84-10 UPS (UP-200F3) 230V (MCB Q30) is available.
- SS 87-10 PCS SYSTEM is available.
- SS 79-00 SIS SYSTEM is available.
- SS 86-00 NETWORK CABINET is available.
- SS 86-00 SERVER CABINET is available.
- SS 63-00 Instrument Aie Package is available.

All systems and subsystems involved in this procedure must be ready and available.

6.4.2 Test Steps

Step	Description	Result	Verified by	Date
Energization of Nitrogen Generation Package				
System 64-00 is completed.				
1.	Check and confirm that the MCB Q42 from UPS (UP-200F3) and MCB Q30 from distribution Board DP-200N1 230V are ready for power on.			
2.	Confirmed the above we can proceed with energization of the LCP 64-LP-001.			
3.	Check on the LCP 64-LP-001 that voltage is available for the control circuit and for starting.			
4.	Confirm the Instrument Air Package is ready for starting			
5.	Confirmed the steps from 1 to 4, the Nitrogen Generation Package is ready for start-up.			
6.	Turn the selector 64-HS-004 in local mode and start pushbutton 64-HS-001. Check the correct starting sequence and: • Inlet pressure > 8barg			

Step	Description	Result	Verified by	Date
	……..….. [ ] OK • Outlet pressure >7.5 barg ……..….. [ ] OK • Oxygen < 3% ……..….. [ ] OK			
7.	The test will only give a positive result if the required parameters are reached. After Validation of the process parameters, give the stop from local 64-HS-002.			
8.	Repeat the sequence of start and stop remotely from the CCR (permanent Central Control Room).			

6.4.3 OTP Site Tests notes and Remarks

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

- The previous chapters are successfully performed.
- All panels are in normal operation and no alarm pending.

6.6 REINSTATEMENT AND PRESERVATION TASKS

After the test are completed, the system is left in a safe condition and that it is operational.

7. APPENDICES

7.1 Vendor SAT Procedure (where applicable)

7.2 Proverlis Summary System Reports

7.3 Equipment Related Technical Queries (where applicable)

7.4 As Built Documentation (where applicable)

7.5 Management of Change – Summary Table of Tasks and Details of Affected Related documentation (where applicable).

7.6 Profinet Signals Table

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PROFINET SIGNALS TABLE

N. BYTE	N. BIT	DATA TYPE	TAG	DESCRIPTION	MEANING
	0	BOOL		SPARE	ALARMS
	1	BOOL		SPARE	
	2	BOOL		SPARE	
	3	BOOL		SPARE	
	4	BOOL		SPARE	
	5	BOOL		SPARE	
	6	BOOL		SPARE	
0	7	BOOL		SPARE	
	0	BOOL		SPARE	
	1	BOOL		SPARE	
	2	BOOL		SPARE	
	3	BOOL		SPARE	
	4	BOOL		SPARE	
	5	BOOL		SPARE	
	6	BOOL		SPARE	
1	7	BOOL		SPARE	
	0	BOOL		SPARE	
	1	BOOL		SPARE	
	2	BOOL		SPARE	
	3	BOOL		SPARE	
	4	BOOL		SPARE	
	5	BOOL		SPARE	
	6	BOOL		SPARE	
2	7	BOOL		SPARE	
	0	BOOL		NITROGEN GENERATOR - GENERAL ALARM	0 = OK, 1 = ALARM
	1	BOOL		SPARE	
	2	BOOL		SPARE	
	3	BOOL		SPARE	
	4	BOOL		SPARE	
	5	BOOL		SPARE	
	6	BOOL		SPARE	
3	7	BOOL		SPARE	
	0	BOOL		VALVE UV-001 ALARM	0 = OK, 1 = ALARM
	1	BOOL		VALVE UV-002 ALARM	0 = OK, 1 = ALARM
	2	BOOL		VALVE UV-003 ALARM	0 = OK, 1 = ALARM
	3	BOOL		VALVE UV-004 ALARM	0 = OK, 1 = ALARM
	4	BOOL		VALVE UV-005 ALARM	0 = OK, 1 = ALARM
	5	BOOL		VALVE UV-006 ALARM	0 = OK, 1 = ALARM
	6	BOOL		VALVE UV-007 ALARM	0 = OK, 1 = ALARM
4	7	BOOL		VALVE UV-008 ALARM	0 = OK, 1 = ALARM
	0	BOOL		VALVE UV-009 ALARM	0 = OK, 1 = ALARM
	1	BOOL		SPARE	
	2	BOOL		SPARE	
	3	BOOL		SPARE	
	4	BOOL		SPARE	
	5	BOOL		SPARE	
	6	BOOL		SPARE	
5	7	BOOL		SPARE	
	0	BOOL		SPARE	
	1	BOOL		SPARE	
	2	BOOL		SPARE	
	3	BOOL		SPARE	
	4	BOOL		SPARE	
	5	BOOL		SPARE	
	6	BOOL		SPARE	
6	7	BOOL		SPARE	
	0	BOOL	Meas001.AlmLL	INLET PRESSURE TRANSMITTER - LOW LOW ALARM (LL)	0 = OK, 1 = ALARM
	1	BOOL	Meas001.AlmL	INLET PRESSURE TRANSMITTER - LOW ALARM (L)	0 = OK, 1 = ALARM
	2	BOOL	Meas001.AlmH	INLET PRESSURE TRANSMITTER - HIGH ALARM (H)	0 = OK, 1 = ALARM
	3	BOOL	Meas001.AlmHH	INLET PRESSURE TRANSMITTER - HIGH HIGH ALARM (HH)	0 = OK, 1 = ALARM
	4	BOOL	Meas002.AlmLL	TOWER 1 PRESSURE TRANSMITTER - LOW LOW ALARM (LL)	0 = OK, 1 = ALARM
	5	BOOL	Meas002.AlmL	TOWER 1 PRESSURE TRANSMITTER - LOW ALARM (L)	0 = OK, 1 = ALARM
	6	BOOL	Meas002.AlmH	TOWER 1 PRESSURE TRANSMITTER - HIGH ALARM (H)	0 = OK, 1 = ALARM
7	7	BOOL	Meas002.AlmHH	TOWER 1 PRESSURE TRANSMITTER - HIGH HIGH ALARM (HH)	0 = OK, 1 = ALARM
	0	BOOL	Meas003.AlmLL	TOWER 2 PRESSURE TRANSMITTER - LOW LOW ALARM (LL)	0 = OK, 1 = ALARM
	1	BOOL	Meas003.AlmL	TOWER 2 PRESSURE TRANSMITTER - LOW ALARM (L)	0 = OK, 1 = ALARM
	2	BOOL	Meas003.AlmH	TOWER 2 PRESSURE TRANSMITTER - HIGH ALARM (H)	0 = OK, 1 = ALARM
	3	BOOL	Meas003.AlmHH	TOWER 2 PRESSURE TRANSMITTER - HIGH HIGH ALARM (HH)	0 = OK, 1 = ALARM
	4	BOOL	Meas004.AlmLL	OUTLET B PRESSURE TRANSMITTER - LOW LOW ALARM (LL)	0 = OK, 1 = ALARM
	5	BOOL	Meas004.AlmL	OUTLET B PRESSURE TRANSMITTER - LOW ALARM (L)	0 = OK, 1 = ALARM
	6	BOOL	Meas004.AlmH	OUTLET B PRESSURE TRANSMITTER - HIGH ALARM (H)	0 = OK, 1 = ALARM
8	7	BOOL	Meas004.AlmHH	OUTLET B PRESSURE TRANSMITTER - HIGH HIGH ALARM (HH)	0 = OK, 1 = ALARM
	0	BOOL	Meas005.AlmLL	PRESSURE TRANSMITTER INSTRUMENT AIR RECIEVER - LOW LOW ALARM (LL)	0 = OK, 1 = ALARM
	1	BOOL	Meas005.AlmL	PRESSURE TRANSMITTER INSTRUMENT AIR RECIEVER - LOW ALARM (L)	0 = OK, 1 = ALARM
	2	BOOL	Meas005.AlmH	PRESSURE TRANSMITTER INSTRUMENT AIR RECIEVER - HIGH ALARM (H)	0 = OK, 1 = ALARM
	3	BOOL	Meas005.AlmHH	PRESSURE TRANSMITTER INSTRUMENT AIR RECIEVER - HIGH HIGH ALARM (HH)	0 = OK, 1 = ALARM
	4	BOOL	Meas006.AlmLL	OXYGEN TRANSMITTER - LOW LOW ALARM (LL)	0 = OK, 1 = ALARM
	5	BOOL	Meas006.AlmL	OXYGEN TRANSMITTER - LOW ALARM (L)	0 = OK, 1 = ALARM
	6	BOOL	Meas006.AlmH	OXYGEN TRANSMITTER - HIGH ALARM (H)	0 = OK, 1 = ALARM
9	7	BOOL	Meas006.AlmHH	OXYGEN TRANSMITTER - HIGH HIGH ALARM (HH)	0 = OK, 1 = ALARM
	0	BOOL	Meas007.AlmLL	DIFFERENTIAL PRESSURE TRANSMITTER OUTLET FILTERS - LOW LOW ALARM (LL)	0 = OK, 1 = ALARM
	1	BOOL	Meas007.AlmL	DIFFERENTIAL PRESSURE TRANSMITTER OUTLET FILTERS - LOW ALARM (L)	0 = OK, 1 = ALARM
	2	BOOL	Meas007.AlmH	DIFFERENTIAL PRESSURE TRANSMITTER OUTLET FILTERS - HIGH ALARM (H)	0 = OK, 1 = ALARM
	3	BOOL	Meas007.AlmHH	DIFFERENTIAL PRESSURE TRANSMITTER OUTLET FILTERS - HIGH HIGH ALARM (HH)	0 = OK, 1 = ALARM
	4	BOOL		SPARE	
	5	BOOL		SPARE	
	6	BOOL		SPARE	
10	7	BOOL		SPARE	
	0	BOOL	Meas001.BadPV	INLET PRESSURE TRANSMITTER - BAD PROCESS VALUE	0 = OK, 1 = ALARM
	1	BOOL	Meas002.BadPV	TOWER 1 PRESSURE TRANSMITTER - BAD PROCESS VALUE	0 = OK, 1 = ALARM
	2	BOOL	Meas003.BadPV	TOWER 2 PRESSURE TRANSMITTER - BAD PROCESS VALUE	0 = OK, 1 = ALARM
	3	BOOL	Meas004.BadPV	OUTLET B PRESSURE TRANSMITTER - BAD PROCESS VALUE	0 = OK, 1 = ALARM
	4	BOOL	Meas005.BadPV	PRESSURE TRANSMITTER INSTRUMENT AIR RECIEVER - BAD PROCESS VALUE	0 = OK, 1 = ALARM
	5	BOOL	Meas006.BadPV	OXYGEN TRANSMITTER - BAD PROCESS VALUE	0 = OK, 1 = ALARM
	6	BOOL	Meas007.BadPV	DIFFERENTIAL PRESSURE TRANSMITTER OUTLET FILTERS - BAD PROCESS VALUE	0 = OK, 1 = ALARM
11	7	BOOL		SPARE	
	0	BOOL		PLANT SHUTDOWN ALARM (SIS)	1 = ALARM — PLANT STATUS
	1	BOOL		PLANT GENERAL ALARM	1 = READY
	2	BOOL		PLANT READY	1 = IN OPERATION
	3	BOOL		PLANT IN OPERATION	0 = LOCAL (PLC), 1 = REMOTE (DCS)
	4	BOOL		PLANT IN REMOTE MODE	
	5	BOOL		SPARE	
	6	BOOL		SPARE	
12	7	BOOL		SPARE	
	0	BOOL		NITROGEN GENERATOR COMMAND	1 = RUN COMMAND
	1	BOOL		SPARE	
	2	BOOL		SPARE	
	3	BOOL		SPARE	
	4	BOOL		NITROGEN GENERATOR RUNNING	1 = RUNNING
	5	BOOL		SPARE	
	6	BOOL		SPARE	
13	7	BOOL		SPARE	
	0	BOOL		VALVE UV-001 OPEN COMMAND	1 = OPEN COMMAND
	1	BOOL		VALVE UV-002 OPEN COMMAND	1 = OPEN COMMAND
	2	BOOL		VALVE UV-003 OPEN COMMAND	1 = OPEN COMMAND
	3	BOOL		VALVE UV-004 OPEN COMMAND	1 = OPEN COMMAND

	4	BOOL		VALVE UV-005 OPEN COMMAND	1 = OPEN COMMAND	
	5	BOOL		VALVE UV-006 OPEN COMMAND	1 = OPEN COMMAND	
	6	BOOL		VALVE UV-007 OPEN COMMAND	1 = OPEN COMMAND	
14	7	BOOL		VALVE UV-008 OPEN COMMAND	1 = OPEN COMMAND	
	0	BOOL		VALVE UV-009 OPEN COMMAND	1 = OPEN COMMAND	
	1	BOOL		SPARE		
	2	BOOL		SPARE		
	3	BOOL		SPARE		
	4	BOOL		VALVE UV-001 OPEN	1 = OPEN	
	5	BOOL		VALVE UV-001 CLOSED	1 = CLOSED	
	6	BOOL		VALVE UV-002 OPEN	1 = OPEN	
15	7	BOOL		VALVE UV-002 CLOSED	1 = CLOSED	
	0	BOOL		VALVE UV-003 OPEN	1 = OPEN	
	1	BOOL		VALVE UV-003 CLOSED	1 = CLOSED	
	2	BOOL		VALVE UV-004 OPEN	1 = OPEN	
	3	BOOL		VALVE UV-004 CLOSED	1 = CLOSED	
	4	BOOL		VALVE UV-005 OPEN	1 = OPEN	
	5	BOOL		VALVE UV-005 CLOSED	1 = CLOSED	
	6	BOOL		VALVE UV-006 OPEN	1 = OPEN	
16	7	BOOL		VALVE UV-006 CLOSED	1 = CLOSED	
	0	BOOL		VALVE UV-007 OPEN	1 = OPEN	
	1	BOOL		VALVE UV-007 CLOSED	1 = CLOSED	
	2	BOOL		VALVE UV-008 OPEN	1 = OPEN	
	3	BOOL		VALVE UV-008 CLOSED	1 = CLOSED	
	4	BOOL		VALVE UV-009 OPEN	1 = OPEN	
	5	BOOL		VALVE UV-009 CLOSED	1 = CLOSED	
	6	BOOL		SPARE		
17	7	BOOL		SPARE		
18	/	REAL	Meas001.ProcValue	INLET PRESSURE TRANSMITTER - PROCESS VALUE	range 0..16 barg	**MEASURES**
22	/	REAL	Meas002.ProcValue	TOWER 1 PRESSURE TRANSMITTER - PROCESS VALUE	range 0..16 barg	
26	/	REAL	Meas003.ProcValue	TOWER 2 PRESSURE TRANSMITTER - PROCESS VALUE	range 0..16 barg	
30	/	REAL	Meas004.ProcValue	OUTLET B PRESSURE TRANSMITTER - PROCESS VALUE	range 0..16 barg	
34	/	REAL	Meas005.ProcValue	PRESSURE TRANSMITTER INSTRUMENT AIR RECIEVER - PROCESS VALUE	range 0..16 barg	
38	/	REAL	Meas006.ProcValue	OXYGEN TRANSMITTER - PROCESS VALUE	range 0..100%	
42	/	REAL	Meas007.ProcValue	DIFFERENTIAL PRESSURE TRANSMITTER OUTLET FILTERS - PROCESS VALUE	range 0..1 bar	
46	/	REAL		SPARE		
50	/	REAL		REAL PARAMETER 001		**PARAMETERS**
54	/	REAL		REAL PARAMETER 002		
58	/	REAL		REAL PARAMETER 003		
62	/	REAL		REAL PARAMETER 004		
66	/	REAL		REAL PARAMETER 005		
70	/	REAL		REAL PARAMETER 006		
74	/	REAL		REAL PARAMETER 007		
78	/	REAL		REAL PARAMETER 008		
82	/	REAL		REAL PARAMETER 009		
86	/	REAL		REAL PARAMETER 010		
90	/	INT		INTEGER PARAMETER 001		
92	/	INT		INTEGER PARAMETER 002		
94	/	INT		INTEGER PARAMETER 003		
96	/	INT		INTEGER PARAMETER 004		
98	/	INT		INTEGER PARAMETER 005	**To be defined according to Control Philosophy**	
100	/	INT		INTEGER PARAMETER 006		
102	/	INT		INTEGER PARAMETER 007		
104	/	INT		INTEGER PARAMETER 008		
106	/	INT		INTEGER PARAMETER 009		
108	/	INT		INTEGER PARAMETER 010		
110	/	TIME (DINT)		TIME PARAMETER 001		
114	/	TIME (DINT)		TIME PARAMETER 002		
118	/	TIME (DINT)		TIME PARAMETER 003		
122	/	TIME (DINT)		TIME PARAMETER 004		
126	/	TIME (DINT)		TIME PARAMETER 005		
130	/	TIME (DINT)		TIME PARAMETER 006		
134	/	TIME (DINT)		TIME PARAMETER 007		
138	/	TIME (DINT)		TIME PARAMETER 008		
142	/	TIME (DINT)		TIME PARAMETER 009		
146	/	TIME (DINT)		TIME PARAMETER 010		

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PROFINET SIGNALS TABLE

N. BYTE	N. BIT	DATA TYPE	TAG	DESCRIPTION	MEANING	
	0	BOOL		REMOTE START COMMAND	1 = START	REMOTE COMMANDS
	1	BOOL		REMOTE STOP COMMAND	1 = STOP	
	2	BOOL		SPARE		
	3	BOOL		REMOTE ALARMS ACKNOWLEDGE	1 = ACK	
	4	BOOL		LOCAL/REMOTE SELECTOR FROM DCS	0 = LOCAL, 1 = REMOTE	(double selector (hardware+software))
	5	BOOL		SPARE		
	6	BOOL		SPARE		
0	7	BOOL		SPARE		
	0	BOOL		SPARE		
	1	BOOL		SPARE		
	2	BOOL		SPARE		
	3	BOOL		SPARE		
	4	BOOL		SPARE		
	5	BOOL		SPARE		
	6	BOOL		SPARE		
1	7	BOOL		SPARE		
2	/	REAL		REAL PARAMETER 001		PARAMETERS
6	/	REAL		REAL PARAMETER 002		
10	/	REAL		REAL PARAMETER 003		
14	/	REAL		REAL PARAMETER 004		
18	/	REAL		REAL PARAMETER 005		
22	/	REAL		REAL PARAMETER 006		
26	/	REAL		REAL PARAMETER 007		
30	/	REAL		REAL PARAMETER 008		
34	/	REAL		REAL PARAMETER 009		
38	/	REAL		REAL PARAMETER 010		
42	/	INT		INTEGER PARAMETER 001		
44	/	INT		INTEGER PARAMETER 002		
46	/	INT		INTEGER PARAMETER 003		
48	/	INT		INTEGER PARAMETER 004		
50	/	INT		INTEGER PARAMETER 005	To be defined according to Control Philosophy	
52	/	INT		INTEGER PARAMETER 006		
54	/	INT		INTEGER PARAMETER 007		
56	/	INT		INTEGER PARAMETER 008		
58	/	INT		INTEGER PARAMETER 009		
60	/	INT		INTEGER PARAMETER 010		
62	/	TIME (DINT)		TIME PARAMETER 001		
66	/	TIME (DINT)		TIME PARAMETER 002		
70	/	TIME (DINT)		TIME PARAMETER 003		
74	/	TIME (DINT)		TIME PARAMETER 004		
78	/	TIME (DINT)		TIME PARAMETER 005		
82	/	TIME (DINT)		TIME PARAMETER 006		
86	/	TIME (DINT)		TIME PARAMETER 007		
90	/	TIME (DINT)		TIME PARAMETER 008		
94	/	TIME (DINT)		TIME PARAMETER 009		
98	/	TIME (DINT)		TIME PARAMETER 010		

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