Base Load Power Hub (BLPH)

FAT PROCEDURE

Document Number: 1724000049-QC-PRO-00056

Document Class: 2

Rev.	Date	Description	Prepared	Reviewed	Approved
04	31/07/2024	Accepted for Construction (AFC)	AD	SK	CA
03	18/06/2024	Accepted for Construction (AFC)	AD	SK	CA
02	21/05/2024	Issue for Review (IFR)	AD	SK	CA
01	25/03/2024	Issue for Review (IFR)	AD	SK	CA
0	22/02/2024	Issue for Review (IFR)	AD	SK	CA

ALEXSISTEMI spa

This document undergoes an issuance cycle within EDMS Fusionlive". Its distribution is electronically controlled. Once printed shall be considered as "NOT CONTROLLED" copy

Revision / Change Log

Rev.	Description
0	Issue for Review (IFR)
01	Issue for Review (IFR)
02	Issue for Review (IFR)
03	Accepted for Construction (AFC)
04	Accepted for Construction (AFC)

HOLDS LIST

No.	Description
1	
2	
3	
4	

This document undergoes an issuance cycle within EDMS Fusionlive". Its distribution is electronically controlled. Once printed shall be considered as "NOT CONTROLLED" copy

Table of contents

1 INTRODUCTION 7

1.1 PROJECT OVERVIEW 7

1.1.1 Project Location 7

1.1.2 Project Concept 8

1.1.3 Plant and Equipment 9

2 DOCUMENT SCOPE 10

2.1 REFERENCES 10

2.2 DEFINITIONS AND ABBREVIATIONS 11

3 PURPOSE OF FAT 12

3.1 TASTING TASKS 12

3.2 ENVIRONMENTAL NEEDS 12

3.3 TESTS PHASE AND PASS/FAIL CRITERIA 13

4 TEST PLAN 13

4.1 ABOUT WITNESS TESTS 14

4.2 LOCATION OF TEST 14

4.3 SCOPE OF TEST 14

4.4 PERSONNEL REQUIREMENTS 14

4.5 SAFETY REQUIREMENTS 15

4.6 RESPONSIBILITY 15

4.7 TEST AREA 15

4.8 SAFE AREA 16

4.9 PERSONAL SAFETY EQUIPMENT 16

5 CUSTOMER PRESENCE 17

6 NOTIFICATION 17

7 TEST RECORD 17

8 TEST FAILURE 17

This document undergoes an issuance cycle within EDMS Fusionlive". Its distribution is electronically controlled. Once printed shall be considered as "NOT CONTROLLED" copy

8.1 MINOR FAILURE 17
8.2 MAJOR FAILURE 17
9 TEST PROCEDURES 18
9.1 DIMENSIONAL CHECK AND VISUAL INSPECTION 18
9.1.1 Test Scope 18
9.1.2 Test Requirements 18
9.1.3 Reference Documentation 18
9.1.4 Acceptance (Pass/fail Criteria) 18
9.1.5 Test Equipment 19
9.1.6 Procedure 19
9.1.7 Results Table 19
9.2 PAINTING CHECK 21
9.2.1 Test Scope 21
9.2.2 Test Requirements 21
9.2.3 Acceptance (Pass/Fail Criteria) 21
9.2.4 Measurement Equipment 21
9.2.5 Procedure 21
9.2.6 Result Table 21
9.3 CHECK OF NAMEPLATES 23
9.3.1 Test Scope 23
9.3.2 Acceptance (Pass/Fail Criteria) 23
9.3.3 Test Equipment 23
9.3.4 Procedure 23
9.3.5 Result Table 23
9.4 CHECK OF COMPONENTS TYPE AND POSITION 25
9.4.1 Test Scope 25
9.4.2 Reference Documents 25
9.4.3 Test Requirements 25
9.4.4 Acceptance (Pass/Fail Criteria) 25
9.4.5 Measurement Equipment 25
9.4.6 Procedure 25
9.4.7 Result Table 25
9.5 CHECK AND FUNCTIONAL TEST OF LIGHTING SYSTEM 27
9.5.1 Test Scope 27

This document undergoes an issuance cycle within EDMS Fusionlive". Its distribution is electronically controlled. Once printed shall be considered as "NOT CONTROLLED" copy

9.5.2 Procedure 27
9.5.3 Result Table 28
9.6 CHECK OF GROUNDING SYSTEM 29
9.6.1 Test Scope 29
9.6.2 Test Equipment 29
9.6.3 Procedure 30
9.6.4 Acceptance (Pass/Fail Criteria) 30
9.6.5 Result Table 30
9.7 CHECK OF CERTIFICATES AND FINAL DOCUMENTATION 32
9.7.1 Test Scope 32
9.7.2 Instruments 32
9.7.3 Acceptance (Pass/Fail Criteria) 32
9.7.4 Result Table 32
9.8 HVAC FUNCTIONAL AND IDENTIFICATION TEST 34
9.8.1 Test Scope 34
9.8.2 Test Reports 34
9.8.3 Acceptance Criteria 35
9.8.4 Measurement Equipment 37
9.8.5 Result Table 37
9.9 * FIRE & GAS FUNCTIONAL TEST AND EQUIPMENTS 39
9.9.1 Test Scope 39
9.9.2 Acceptance Criteria 39
9.9.3 Measurement Equipment 39
9.9.4 Result Table 39

This document undergoes an issuance cycle within EDMS Fusionlive". Its distribution is electronically controlled. Once printed shall be considered as "NOT CONTROLLED" copy

List of Figures

Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map 7
Figure 2 - Wind Park Details 8
Figure 3 – BLPH Concept 8

List of tables

Table 1 - Reference Documents 10
Table 2 - Definitions and Abbreviations 11

List of Attachments

Attachment 1

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.

1.1.1 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.

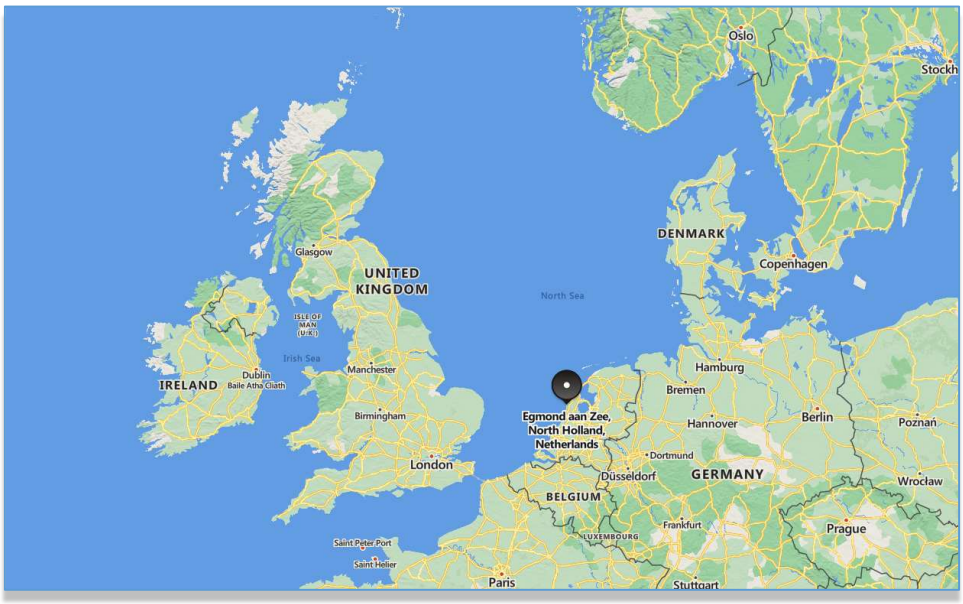


Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map

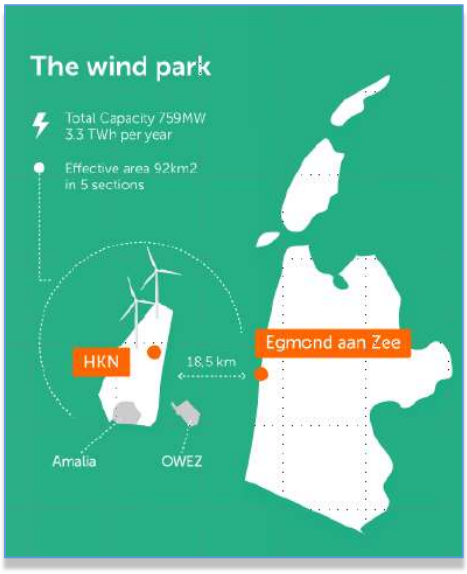


Figure 2 - Wind Park Details

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 located on coordinates E 590719.1, N 5841602.3 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.

1.1.2 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 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.

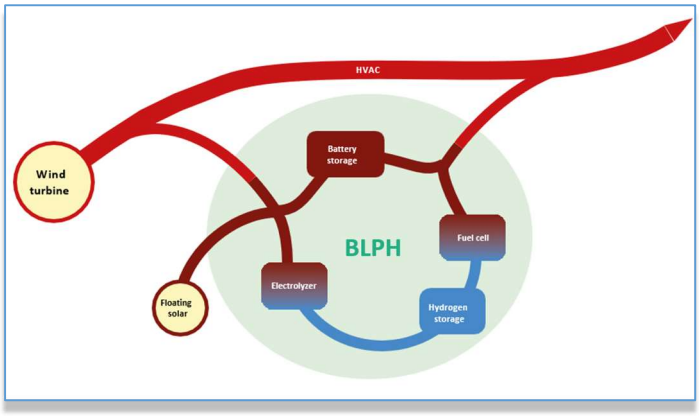


Figure 3 – BLPH Concept

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 s 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.

1.1.3 Plant and Equipment

- HV (66KV 6.6KV) SWITCH ROOM B-100
- LV (400V) SWITCH ROOM B-200
- AC UPS EQUIPMENT ROOM B-300
- I&T EQUIPMENT ROOM B-400

This document undergoes an issuance cycle within EDMS Fusionlive". Its distribution is electronically controlled. Once printed shall be considered as "NOT CONTROLLED" copy

2 DOCUMENT SCOPE

The scope of this document is to provide the criteria and the operating ways to verify the quality and the design requirements related to the shelter. The purpose is to give objective evidence that all engineering, design and specification requirements are correctly understood, accounted for, verified, and recorded.

2.1 REFERENCES

Doc. No.	Description
123A90-DDL-EL-DL-20104	Electrical Equipment Layout - HV Switchroom B-100
123A90-DDL-EL-DL-20111	Electrical Cable Routing Layout - HV Switchroom B-100
123A90-DDL-EL-DL-20122	Lighting & Socket Layout - HV Switchroom B-100
123A90-DDL-EL-DG-20129	Lighting & Socket Circuit Diagr. - HV Switchroom B-100
123A90-DDL-EL-DL-20136	Earthing & Lightning Layout - HV Switchroom B-100
123A90-PML-QHSE-QP-00002	Project Quality Plan
1724000049-MAT-PRO-00004	Painting Procedure
1724000049-NDT-PRO-00005	NDT Procedure
K559-2254-EL-PHI-002	Electrical System Description & Design Philosophy
K559-2254-IC-PHI-001	Control Systems Philosophy
K559-2254-PM-PHI-001	Equipment and System Tag Numbering
IEC 61439-1	Low-voltage switchgear and controlgear assemblies - Part 1: General rules
NFPA 90A	Standard for the Installation of Air-Conditioning and Ventilating Systems

Table 1 - Reference Documents

This document undergoes an issuance cycle within EDMS Fusionlive". Its distribution is electronically controlled. Once printed shall be considered as "NOT CONTROLLED" copy

2.2 DEFINITIONS AND ABBREVIATIONS

COMPANY or Client (CPY):	Crosswind
CONTRACTOR (CTR):	ROSETTI MARINO S.p.A.
PROJECT:	HOLLANDSE KUST NOORD WIND PARK Project

Table 2 - Definitions and Abbreviations

AC	Voltage Alternating Current
Ah	Ampere-Hour
ATEX	ATmospheric EXplosible
BS	British Standard
CAT	Category
CENELEC	Committee for Electrotechnical
DC	Voltage Direct Current
EMT	Electrical Metallic Conduit
Kg/mm2	Kilogram per square meter
Km/H	Kilometer per Hour
IEC	International Electrotechnical Commission
IEE	Institute of Electrical Engineers
IEEE	Institute of Electrical and Electronic Engineers
IP	Ingress Protection
IRP	Inter Refineries Pipeline Project
IS	Intrinsically Safe
ISO	International Standard Organization
ITU	International Telecommunications Union
JB	Junction Box
MCT	Multi-Cable Transit
Ni-Cd	Nickel-Cadmium
NC/NO	Normally Close / Normally Open
PCS	Passive Cooled Shelter
PVC	Polyvinyl Chloride
RTU	Remote Terminal Unit
SCADA	Supervisory Control and Data Acquisition
SLHDPE	Super-Linear High Density Polyethylene
TIA/EIA	Telecommunications Industry Association/Electronics Industries Association
XLPE	Telecommunications Industry Association/Electronics Industries Association
W	Watts (in Power)

3 PURPOSE OF FAT

The purpose of the FAT is to give objective evidence that all engineering, design and specification requirements are correctly understood, accounted for, verified, and recorded.

FAT shall be performed for all Shelters for this PO and will be witnessed by Client. The applicability of the test is subjected to the Project ITP.

3.1 TESTING TASKS

The overall test activities will be performed with the test setup equipment under the control of the test executor and some witnesses.

The main steps that will be performed are the following:

- Verification of the test procedures and the related documentation availability;
- Preparation of the test setup;
- Execution of the test with respect to the Test Procedure and completion of the test report;
- Signing of the test procedures by the test executor and the witness.

3.2 ENVIRONMENTAL NEEDS

The acceptance test will be conducted with the deliverable items and a set of general-purpose tools. The detailed description for each test procedure is reported in the following chapters.

This document undergoes an issuance cycle within EDMS Fusionlive". Its distribution is electronically controlled. Once printed shall be considered as "NOT CONTROLLED" copy

3.3 TESTS PHASE AND PASS/FAIL CRITERIA

For each test procedure a set of pass/fail criteria will be defined (it is also possible that each test has a different criteria) in order to establish an acceptance procedure.

Where acceptance and rejection criteria are not established they shall be defined to the greatest practical by written standards or by samples.

The main possibilities are the following:

- All the steps are successfully performed (the test passes)
- Some steps fail but the function under test is verified (the test passes after Customer approval)
- Some steps fail but the function under test is not verified (the test fails)
- Some steps fail but with a dedicated action the correct function shall be recoverable (the test must be repeated)

If the test fails, a related NCR have to be opened.

4 TEST PLAN

1	DIMENSIONAL CHECK AND VISUAL INSPECTION
2	PAINTING CHECK
3	CHECK OF NAMEPLATES
4	CHECK OF COMPONENTS TYPE AND SIZE
5	CHECK AND FUNCTIONAL TEST OF LIGHTING SYSTEM
6	CHECK OF GROUNDING SYSTEM
7	CHECK OF CERTIFICATES AND FINAL DOCUMENTATION
8	ALL CHECKS/TESTS FOR HVAC SYSTEM

4.1 ABOUT WITNESS TESTS

4.2 LOCATION OF TEST

The Tests are to take place in Alex Sistemi Spa (AS) factory, located in Ossona (Milan) and Inveruno (Milan), Italy, in indoor and outdoor areas.

4.3 SCOPE OF TESTS

Successful completion of the tests listed within this document will lead to Factory Acceptance of the Products and release the Products for delivery to the Customer. The Customer / Contractor will be expected to sign the Factory Acceptance Certificate. The Products shall be prepared for shipment only after all the parties witnessing the tests certify the satisfactory completion of the FAT.

FAT shall be performed for all PCS for this PO and will be witnessed by Client. The applicability of the test is subjected to the Project ITP

4.4 PERSONNEL REQUIREMENTS

Alex-sistemi will nominate a test supervisor who will ensure that tests are carried out in accordance with this test plan. The test supervisor may carry out the tests or nominate other personnel. The test supervisor has responsibility for signing test records. The test supervisor shall be technically competent, with a good understanding of the specific mechanical and electrical aspects, and also specific project uses. Alex-sistemi SpA will have available electrical / instrument technicians ready to assist whenever necessary during testing. The Customer, Contractor, End User or Buyer will nominate a test approver who will ensure that witnessed tests are carried out in accordance with this test plan. The test approver has responsibility for signing test records.

Additional personnel nominated by Alex-sistemi SpA and the Buyer may be present during the tests.

This document undergoes an issuance cycle within EDMS Fusionlive". Its distribution is electronically controlled. Once printed shall be considered as "NOT CONTROLLED" copy

4.5 SAFETY REQUIREMENTS

AS has a policy of absolute protection of the worker and of anyone who enters in his workshop. During the FAT must observe the following rules.

4.6 RESPONSIBILITY

AS has appointed a Safety Officer, that is in charge of legal requirements on safety at work.

The Safety Officer works with the Plant Manager and the Project Manager of the contract until all safety standards are met.

The Plant Manager and Project Manager have the power and duty to stop the test if there are not adequate safety measures.

Only the workers can use AS's equipment for testing, handling or lifting.

The staff of the Customer, the End User or its representatives (Inspectors) present during the tests cannot use this equipment for testing, handling or lifting.

The staff of the Customer, the End User or its representatives (Inspectors) present during the tests shall follow the provisions of the Plant Manager or Project Manager or the Safety Officer.

The staff of the Customer, the End User or its representatives (Inspectors) present during the tests will be identified at the entrance of AS (via a personal document, passport, identity card or driving license, provided with a photo and issued by government).

All responsibilities and names are listed in the organization charts exposed in the work areas.

4.7 TEST AREA

The test area must be properly marked and isolated.

The emergency plan, the location of fire suppression equipment, emergency exits, first aid kits and names of employees in first aid and fire suppression should be clearly marked in the appropriate panels hanging on the walls.

They can access the test Area:

- AS Manager;
- workers engaged in testing, handling and lifting;
- the staff of the Customer, the End User or its representatives (Inspectors) present during the tests, but only for the observation of test results; during handling or lifting they must remain in Safe Area.

4.8 SAFE AREA

The Safe Area must be properly marked and isolated. Must be able to access to toilets and drinking water.

The emergency plan, the location of fire suppression equipment, emergency exits, first aid kits and names of employees in first aid and fire suppression should be clearly marked in the appropriate panels hanging on the walls. The staff of the Customer, the End User or its representatives (Inspectors) present during the tests, must always remain in the Safe Area, except as outlined above

4.9 PERSONAL SAFETY EQUIPMENT

People present at the test must wear:

- SHOES: AS managers, workers, staff of the Customer, the End User or its representatives (Inspectors) present during the tests shall wear safety shoes, ever.
  The staff of the Customer, the End User or its representatives (Inspectors) present during the tests must arrive already equipped with their own shoes, which are not provided by AS.

  The staff of the Customer, the End User or its representatives (Inspectors) present during the tests to not wear safety shoes, they may still access the Safe Area, but not the test area.

  They will therefore only observe the test from Safe Area and conducting the review of the results in test reports.
- GLASSES: workers must wear safety glasses when performing risky for their eyes.
- HELMET: workers must wear protective helmets when performing lifting and handling, or when there is a suspended load.
  When there are suspended loads or handling and lifting the staff of the Customer, the End User or its representatives (Inspectors) present during the tests must remain in the Safe Area.
- GLOVES: workers must wear gloves when performing risky for the hands or vibrations.
- DRESS: all workers must wear appropriate safety clothing, forever.

Helmet, gloves, glasses, safety clothing are not required to staff the Customer, the end Customer or his representatives (Inspectors) present during the tests.

5 CUSTOMER PRESENCE

AS shall notify to Customer the Final Inspection Date(s) 20 working days before

6 NOTIFICATION

The tests described in the next chapters must be performed by the AS staff for each PCS.

AS will require the Customer presence to attend FAT Tests for only one PCS (Witness), while for others will only require a Rewiev of the documents.

7 TEST RECORD

The test supervisor will ensure that a test log is maintained throughout the acceptance testing. The test log will record performance of tests, variations from test procedures (planned or unplanned), test failures and re-tests. All entries shall be cross-referenced to this test plan. Where appropriate, printouts may be appended to the test log. The test log shall consist of a copy of the Factory Acceptance Test plan document that is marked up regularly during each individual test.

8 TEST FAILURE

Test failure will be categorized by agreement of the test supervisor and test approver.

8.1 MINOR FAILURE

Failure is limited to one small part of the Product. This failure is logged, corrected and the test is re-started from the point where it occurred. This category of failure shall not prejudice continued testing of the remainder of the system.

8.2 MAJOR FAILURE

This failure (mechanical or electrical) affects operation of the Product and no further testing will take place until this has been corrected. Correction of this failure may prejudice previous tests, hence the entire test shall be repeated from the beginning.

This document undergoes an issuance cycle within EDMS Fusionlive". Its distribution is electronically controlled. Once printed shall be considered as "NOT CONTROLLED" copy

9 TEST PROCEDURES

9.1 DIMENSIONAL CHECK AND VISUAL INSPECTION

9.1.1 Test Scope

Verify the items conformity to the specified features here below listed.

Verify the items sizes and the interfaces positions/measures correspondence to the specified values.

9.1.2 Test Requirements

Verification of the listed points.

Positive verification (including tolerances) of the measurements.

9.1.3 Reference documentation

Comply to the requirements and relevant tolerances according to UNI EN ISO 13920 Class B.

DIMENSIONAL TOLERANCE

TOLLERANCE FOR LINEAR DIMENSION

class of tollerance	≥ 2 ≤ 30	> 30 ≤ 120	> 120 ≤ 400	> 400 ≤ 1000	> 1000 ≤ 2000	> 2000 ≤ 4000	> 4000 ≤ 8000	> 8000 ≤ 12000	> 12000 ≤ 16000	> 16000 ≤ 20000	>20000
B	± 1	± 2	± 2	± 3	± 4	± 6	± 8	± 10	± 12	± 14	± 16

NOTE: - nominal dimensional range "L" in mm - Tollerance "t" in mm.

9.1.4 Acceptance (Pass/Fail Criteria)

All the highlighted quotas in the GA drawing shall be comply with the above table of tolerance.

This document undergoes an issuance cycle within EDMS Fusionlive". Its distribution is electronically controlled. Once printed shall be considered as "NOT CONTROLLED" copy

9.1.5 Test Equipment

Measuring tape

9.1.6 Procedure

Visual inspection shall be carried out with maximum accuracy. It consists of the verifications described below:

CONFIGURATION:	The item configuration shall be as indicated in the Final Drawings.
DIMENSIONAL:	The external dimension of the shelter indicated on the Final Drawings excluding their accessories.
DAMAGE FREE:	There shall be no type of damage caused by transport, handling, product failures.
SAFETY ASPECT:	Projecting and overhanging edges shall be kept to a minimum. Edges and corners shall be rounded.
EXTERNAL TREATMENT:	External surfaces (except the masked surfaces required) shall be treated against environmental corrosion. External shelter colour: RAL 7035 LIGHT GREY Painting shall be free from scabs, blisters, cracks, voids, scratches and other defects that can affect the treatment reliability.
ACCURACY:	Verify the goodness and quality of the works and the level of their accuracy.
CLEANING:	Verify the item is properly clear before delivery (free from grease or oil spots, dust, dirtiness or other extraneous material).
SUPPLY COMPOSITION:	Verify supply completeness. Verify the bolt torque values before and after the proof test execution. All the measure return a value in the range specified.

Using test equipment as appropriate, according to Arrangement Drawing dimensions shall be verified and recorded.

9.1.7 Results Table

The results of the test shall be recorded on Mod P13.1

* SAMPLE "For Example"

ALEXSISTEMI spa

COMPANY WITH QUALITY SYSTEM CERTIFIED BY DNV = ISO 9001 =

Doc. Name:
Dimensional Check and Visual Inspection
Report No.

OUR JOB xxx | Date xxxxx | Page 1

COMPANY:	Ordine Order
P/N:	Descrizione: Description
S/N:	FAT procedure:

LOCATION : ON SITE ☐ OFF SITE ☐

DATE OF TEST:

REFERENCE DRAWING:

REFERENCE DOCUMENT:

Inspection List	measured	YES	NO	N.A.
Check all the dimensions indicated below on the drawing:				

Comments:

ALEX SISTEMI *Quality Assurance*	Customer	Final Customer	3rd Part	other

Mod.P13.1

9.2 PAINTING CHECK

9.2.1 Test Scope

Verify the compliance to requirements described on Painting Specification.

9.2.2 Test Requirements

Verification of the painting with document of reference.

9.2.3 Acceptance (Pass/Fail Criteria)

The Dry Film Thickness should be correspond to the Standard Requirements

9.2.4 Measurement Equipment

Thicknessmeter - Elcometer 456 / Fisher Dualscope MP4C

9.2.5 Procedure

Verify the Dry Film Thickness of the final paint layer.

The measure should be taken in 5 points in each PCS side (4 sides).

9.2.6 Results Table

The results of the test shall be recorded on Mod 1.4.2

This document undergoes an issuance cycle within EDMS Fusionlive". Its distribution is electronically controlled. Once printed shall be considered as "NOT CONTROLLED" copy

* SAMPLE "For Example"

ALEXSISTEMI spa

Doc. Name: PAINTING CHECK		Report No. Mod 1.4.2
OUR JOB	Date	Page 1/1

COMPANY:	Ordine Order
EPC CONTRACTOR:	Descrizione: Description: Passive Cooled Shelter
P/N: S/N:	FAT procedure:

LOCATION: ON SITE ☒ OFF SITE ☐

DATE OF TEST:

REFERENCE DRAWING:

REFERENCE DOCUMENT:

Inspection List	YES	NO	N.A.
1 **Verification of paint and color code according to design specification**			
Visual Check External Color walls, roof, base frame RAL			
Visual Check External Color doors RAL			
Layer thickness of external coating µm 320 total			
Painting shall be free from scabs, blisters, cracks, voids, scratches and other defects that can affect the treatment reliability			
Ladder,Handrails (HDG)			

Comments:

** Touch-up and cleaning are required before proceeding with packaging*

ALEX SISTEMI *Quality Assurance*	Customer	Final Customer	3rd Part	other

Mod1.4.2

9.3 CHECK OF NAMEPLATES

9.3.1 Test Scope

Verify the nameplate conformity to the requirement specified on Approval Drawings.

9.3.2 Acceptance (Pass/Fail Criteria)

Positive Verification

9.3.3 Test Equipment

None

9.3.4 Procedure

Visual inspection shall be carried out with maximum accuracy.

It consists of the verifications with the label below:

IDENTIFICATION AND MARKING - NAMEPLATE: a nameplate shall be attached to the item.

9.3.5 Results Table

The results of the test shall be recorded on Mod 1.4.3

This document undergoes an issuance cycle within EDMS Fusionlive". Its distribution is electronically controlled. Once printed shall be considered as "NOT CONTROLLED" copy

* SAMPLE "For Example"

ALEXSISTEMI spa

Doc. Name: NAMEPLATES AND LABELLING INSPECTION		Report No. Mod 1.4.3
OUR JOB	Date	Page 1/1

COMPANY:	Ordine Order
EPC CONTRACTOR:	Descrizione: Description: Passive Cooled Shelter
P/N: S/N:	FAT procedure:

Comments:

LOCATION: ON SITE ☒ OFF SITE ☐

DATE OF TEST:

REFERENCE DRAWING:

REFERENCE DOCUMENT:

Inspection List	MEASURED	YES	NO	N.A.
All lamps installed are identified with label				
All Light Push Buttons installed are identified with label				
All door switches are identified with label				
Verify External nameplates				
External bulk head lights verifications				
Certificate (ex) shall be checked for lights.				
Lighting cable routing, cable tray inspection etc.				
Lux level shall be measured and recorded as per approved MR requirements.				

Test Equipment: none

ALEX SISTEMI *Quality Assurance*	Customer	Final Customer	3rd Part	other

Mod1.4.3

9.4 CHECK OF COMPONENTS TYPE AND POSITION

9.4.1 Test Scope

This clause has been prepared to verify the size and type of components installed inside and outside the PCS.

9.4.2 Reference Documents

Device layout

Equipment layout

9.4.3 Test Requirements

Verify the correspondence of size and quantity of components installed on shelter refer to last version of the General arrangement Drawing

Verify the installation and position of all the components/equipment described in the GA

9.4.4 Acceptance (Pass/Fail Criteria)

The verification should be pass.

9.4.5 Measurement Equipment

Measuring tape

9.4.6 Procedure

Visual inspection shall be carried out with maximum accuracy. It consists of the verifications above described.

9.4.7 Results Table

The results of the measurement shall be recorded on Mod 1.4.4

This document undergoes an issuance cycle within EDMS Fusionlive". Its distribution is electronically controlled. Once printed shall be considered as "NOT CONTROLLED" copy

* SAMPLE "For Example"

ALEXSISTEMI spa

COMPANY WITH QUALITY SYSTEM CERTIFIED BY DNV = ISO 9001 =

Doc. Name: CHECK OF COMPONENTS TYPE AND SIZE	Report No. Mod 1.4.4
OUR JOB xxx	Date xxxxx / Page 1

COMPANY:	Ordine Order
P/N:	Descrizione: Description
S/N:	FAT procedure:

LOCATION : ON SITE ☐ OFF SITE ☐

DATE OF TEST:

REFERENCE DRAWING:

REFERENCE DOCUMENT:

Inspection List	YES	NO	N.A	
Verify the presence of the following components:				

Comments:

ALEX SISTEMI *Quality Assurance*	Customer	Final Customer	3rd Part	other

Mod 1.4.4

9.5 CHECK AND FUNCTIONAL TEST OF LIGHTING SYSTEM

9.5.1 Test Scope

The scope is to test the functionality of the lighting system

9.5.2 Procedure

To perform this test, the lighting system will be temporary connected by using Alex-Sistemi power supply.

Verify the correct configuration and installation of the lamps and light switch base on electrical layout drawing.

Switch on the lamps using the devoted light switch to verify proper functionality of lighting system; if any backup light fixture is installed (with batteries) the emergency lights shall be tested.

In addition to a basic function test of the lighting system, lux levels at floor elevation should be measured for both normal and emergency fittings. The autonomy of the emergency light fittings should be measured (batteries to be fully charged before starting test).

During normal operation both lighting systems will be in operation, providing the required illumination levels. The emergency lighting shall illuminate escape routes, emergency exits and ladders and panels. These luminaries shall have an integrated Ni-CD battery with autonomy time of 3 hours in all area.

The Emergency Light Test, fixed emergency lighting shall be installed at strategic points in the installations and the emergency luminaires shall have integral battery packs to avoid complete darkness during emergency/lack of energy.

All the lights will be power off and then it will check the battery autonomy of emergency lights.

Battery autonomy shall be minimum 30 minutes.

The required illumination levels, measured at the working plane (0.8m) or 1m above the floor level in a horizontal plane, shall be as given in the table below except walkways and escape routes:

For walkways and escape routes calculation surfaces must be at the elevation 0.00m.

The illumination level indicated in the below table shall be used as a basis for the design of new installations unless higher illumination levels are required by national or local regulations in the country of installation.

The illumination levels apply when the luminaries are dirty: i.e. after taking account of the following fouling factors:

Fouling factor of 0.80 for all plant areas and for outdoor non-plant areas;

Fouling factor of 0.85 for indoor non-plant areas.

Recorded lighting measurements to be reported on equipment room layouts.

Location	E_{mean} (LUX)	Notes
Control Rooms		
General, including front of panel	300 - 500	See note 1
Rear of panels	50	
Auxiliary rooms	150 / 300	See note 2
Outdoor near entrances	150	
Plant Areas		
Operating areas requiring operator intervention (pumps, compressors, valves, manifolds, loading arms)	150	
Local control and monitoring points (Indicating instruments, gauges and control devices)	75	
Level gauges (see-through) to be lit from behind by single tube fluorescent luminaries		
Access ways (walk ways, platforms, stairways, ladders, module roofs)	25	
Non-operational areas with limited attendance, e.g. tank farms without equipment requiring regular operator intervention	0.5	
Non-Plant Areas		
Switchrooms, including relay and auxiliary rooms	200	

Table 3 - Required Illumination Levels

Note:

1. For control rooms, control of the illumination level should be possible either by switching off rows/groups of luminaires, or by use of electronic dimmers, or both.
   - 300 lux applies at night and 500 lux during the daytime.

2. For auxiliary rooms, the illumination level should be controlled by switching each lamp in a twin fitting from separately controlled circuits or by switching alternative fittings.
   - 150 lux applies for normal access and 300 lux for maintenance activities

3. For Embarkation area emergency lux level should be 5lux.

4. For other areas emergency lux level should be 11lux(avg) and 1 lux(min).

9.5.3 Results Table

The results shall be recorded on Mod 1.4.6

9.6 CHECK OF GROUNDING SYSTEM

9.6.1 Test Scope

This test procedure has been issued to verify the safety and functionality of grounding system installed inside the shelter.

9.6.2 Test Equipment

Tools and equipment necessary to perform testing described in this procedure are reported in below Table:

Description	Model – number	Cal. Required
Insulation continuity tester	IR4056/20 710811	Yes
Multimeter	HT GSC 59	Yes

Identification of hearting points measured and relative test results.

The test will be conducted obtaining 5 different measurement and the peak and average should be less than the maximum value required.

Measurement point	Required	Measured
	200 mΩ	1
		2
		3
		4
		5
		Average

9.6.3 Procedure

Verify that all ground connection points are conveniently marked.

Verify that all shelter metal electrical panels and JBs are connected by grounding strip, with impedance less than 200 mΩ . Verify that the shelter door is grounded by grounding strip.

Verify that the internal earthing system are connected to the external earting points and relative impedance

9.6.4 Acceptance (Pass/Fail Criteria)

Pass = fully compliant or with accepted deviation;

Fail = not compliant.

9.6.5 Results Table

The results of the test shall be recorded on Mod 1.4.6

* SAMPLE "For Example"

ALEXSISTEMI spa

DNV

Doc. Name: ELECTRICAL TESTS		Report No. Mod 1.4.6
OUR JOB	Date	Page 1/1

COMPANY:	Ordine Order
EPC CONTRACTOR:	Descrizione: Description
P/N: S/N:	FAT procedure:

LOCATION: ON SITE ☐ OFF SITE ☐

DATE OF TEST:

REFERENCE DRAWING:

REFERENCE DOCUMENT:

Inspection List	YES	NO	N.A.
Check of grounding system			
Check and functional test of lighting system			

Comments:

ALEX SISTEMI *Quality Assurance*	Customer	Final Customer	3rd Part	Other

Mod1.4.6

9.7 CHECK OF CERTIFICATES AND FINAL DOCUMENTATION

Check the certificates of the main materials and components used for the manufacture of the shelter reported on the form and the compilation of the final test reports, as indicated by ITP

9.7.1 Test Scope

Verify the certificates of main materials and components used for shelter fabrication.

9.7.2 Instruments

N/A

9.7.3 Acceptance (Pass/Fail Criteria)

Main materials and components should have a certificate of conformity issued by original manufacturer.

9.7.4 Results Table

The certificates of the final NDE performed must be recorded on Mod P13.1

The certificates of main materials and components shall be recorded on Mod 1.4.9

This document undergoes an issuance cycle within EDMS Fusionlive". Its distribution is electronically controlled. Once printed shall be considered as "NOT CONTROLLED" copy

* SAMPLE "For Example"

ALEXSISTEMI spa

DNV·GL

Doc. Name: RAW MATERIAL CERT. LIST		Report No. Mod. 1.4.9
OUR JOB	Date	Page 1/1

COMPANY:	**Ordine** **Order**
EPC CONTRACTOR:	**Descrizione:** **Description** Passive Cooled Shelter
P/N: **S/N:**	**FAT procedure:**

Pos.	Supplier	Material	Cert. No.	Pages
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

Alex Sistemi SPA	CUSTOMER	FINAL CUSTOMER	3RD PARTY BODY
Quality Assurance			

Mod. 1.4.9

9.8 HVAC FUNCTIONAL AND IDENTIFICATION TEST

9.8.1 Test Scope

The identification test shall verify the correct marking of every part that makes up the HVAC matching it with layout.
The Functional Test serves to verify that HVAC System works properly (e.g. On / Off, Heating / Cooling based on a set point) and his compliance with Cause&Effect Matrix (alarms, shutdown, etc..).
Pressurizing system,will be tested to verify only the overpressure ambient as per values in P&Id.
The Performance Test shall verify the HVAC system capability to cool air inside the shelter at the specified conditions. In particular, the Performance Test shall verify the capability of the HVAC System to keep temperature as set by means of switched ON electrical heaters simulating heat losses as stated on Thermal Calculation. All electrical equipment installed shall be suitable and designed for operation without degradation of its performance at 40°C, regardless of their location.
All instruments shall be designed to be capable of operating continuously and efficiently when the ambient temperature reaches 45°C, regardless of their location.

The HVAC functional test must be followed with a full system PERFORMANCE test. Supplier to provide performance procedure test step descriptions and include related acceptance criteria.

Following shall be checked:

- Visual check of the HVAC panel, including inspection of wiring (aspect, painting, finish, welding, sheet metal, lifting ring, locks, screwed and bolted connection, proper conductors laying, proper devices mounting, conformity to the wiring diagrams, labels)

- Full panel electrical / control operation & function test (remote control and signalling, inter-tripping, automatic sequences if any, etc.) shall be demonstrated to COMPANY by simulation of field devices.
All exchanged signals with ICSS reported on project documentation shall be tested e verified, both hardwired and via Modbus. These tests will be performed by means of a CONTRACTOR's terminal device.

- Dielectric test
- Dimension controls (terminals, busbar and wires, clearances and creepage distances, fixation axis, overall dimensions)

- Quality and quantity check for wearable parts and spare parts according to the specification

- Checking of protective measures and of the electrical continuity of the protective circuits. A test report of the acceptance tests shall be issued.

The HVAC PERFORMANCE test is to verify the design and sizing of the HVAC system.

1. Acceptance (Pass/Fail Criteria)
The test shall guarantee tthe achievement and maintenance of the project internal temperature set point, appropriately set with both units.

After reaching the set point value, if the next average measurement, to be carried out after 1 hour

of operation, still returns values lower than or equal to the set point, the test will be passed.

2. Measurement Equipment
Temperature data Logger
Air Flow Meter

3. Procedure
a. If the test is carried out in climatic conditions different from design rooms (devices turned off and/or autumn/winter external temperature) the test can be conducted anyway: the important thing is to simulate (with the use of a heater or a heat blower) internal dissipation + solar radiation as per thermal calculation. The design conditions must be reproduced.
b. Measure the temperature inside the shelter, with the HVAC system turned off. The measurement must be taken at the 4 corners and in the center, 5 total measurements. Take the average between them and use this value as the starting one. Once the design condition has been reached, i.e. with a temperature higher than the maximum internally required, the test can begin.
c. Turn on one of the two HVAC units, make sure that the set point is the project one, exit the shelter making sure to close the door. The internal environment must be isolated from the external one.
d. Every 15 minutes, enter the shelter and take the same 5 measurements described in point 2. When the average is less than or equal to the set point, exit the shelter and return after 1 hour. Take the measurements again and take the average.
e. Repeat step "d" with the HVAC unit first on standby.
- The cooling performance is measured by verifying if the design temperature parameter is maintained inside the shelter.
- The duration of the test is 1 hour for each unit HVAC

9.8.2 Test Reports

The HVAC System test shall guarantee the functionality as per Cause & Effect document showing both units and relevant interchange.
Here below the operational steps to be followed:
- Review contractual documents and drawings/scheme of the HVAC system.
- Shelter Inspection before functional and overpressure test about his readiness.
- The following is a general list of items that will be checked: o External ductwork installed according to the drawings, with no damages and properly coupled.
o Building components such as dampers, doors and ventilation grilles and their proper installation.
o All instruments/devices are in good order and in operation (differential pressure switch, temperature probe, etc...).

- Pressurization shall be tested with HVAC System to ensure set points of temperature and humidity are maintained. Set point and temperature will be decided considering site test environment and not following destination site requirements.

- No missing components such as dampers, terminal boxes (if any), diffusers, etc…

- HVAC system is operating according to project design (Cause&Effect Matrix).

- Measurement of Pressure Value and record of final values: a pressurization value will be taken by a differential pressure meter to verify an Overpressure of ≥ 50 Pa in the shelter.

The measurement of the Overpressure (positive pressure) inside the shelter , also guarantees the flow direction of the air, which will be from the inside to the outside in case of door opening.
During the functional test the operator shall verify the redundancy of the pressurization and HVAC system (included in Cause & Effect document).
Auto-switch will be verified in case of one air conditioning /ventilation unit failure (Cause & Effect matrix).
The operator shall also verify the Noise level. The Maximum Allowable sound pressure level is 82 dB(A) at 1 m.

Testing simulation of all I/O interface signals with BLPH platform control system to be provided.

Actions Required:
- Switch ON the dummy load until the set point is reached
- The measurements will be taken at the four angles of the shelter and at the center, 1,5 meter height (5 measures)
- Record the average internal temperature with the probe
- When the average internal temperature rises the set point , the HVAC system will switch ON. The system shall be able to keep the average internal temperature under the set point value with the dummy load switched on
- Verify the average internal temperature for 1-hour
- During this test, a pressurization value will also taken by a differential pressure meter in order to verify an overpressure of >/= 50 Pa. (50)

The measurement of the inlet flow rate is detected with special instrumentation. (Air Flow Meter)

9.8.3 Acceptance Criteria

HVAC system has to guarantee the internal design conditions in the shelter.
All the components shall be available as per purchase order and Approved Drawings & data sheet.
HVAC system has to guarantee an average Temperature (as reported in the table) in the shelter with all the dummy loads switched ON..
For each test procedure a set of pass/fail criteria will be defined (it is also possible that each test has a different criteria) in order to establish an acceptance procedure.
Where acceptance and rejection criteria are not established, they shall be defined to the greatest practical by written standards or by samples

The main possibilities are the following:
- All the steps are successfully performed (the test passes)
- Some steps fail but the function under test is verified (the test passes after customer approval)
- Some steps fail but with a dedicated action the correct function shall be recoverable (the test must be repeated)
- Some steps fail whereby the function under test is not verified (the test fails)
If the test fails, a related NCR must be opened.

	Minimum and Maximum Indoor Conditions	
Module	**Minimum Design Temperature [K]**	**Maximum Design Temperature [K]**
B-100	+5	+35
B-200	+5	+35
B-300	+5	+35
B-400	+15	+25

9.8.4 Measurement Equipment

Meter or equivalent
Multifunction Meter Testo.

9.8.5 Results Table

The results of the measurement (temperature, humidity and pressure) shall be recorded on Mod.1.4.7

This document undergoes an issuance cycle within EDMS Fusionlive". Its distribution is electronically controlled. Once printed shall be considered as "NOT CONTROLLED" copy

* SAMPLE "For Example"

This document undergoes an issuance cycle within EDMS Fusionlive". Its distribution is electronically controlled. Once printed shall be considered as "NOT CONTROLLED" copy

ALEXSISTEMI spa

Doc. Name: CHECK AND FUNCTIONAL TEST OF HVAC SYSTEM		Report No. Mod 1.4.7
OUR JOB	Date	Page 1/1

VENDOR:	ALEX SISTEMI S.P.A.	JOB:	ALEX SISTEMI OFFER No:
BUYER:		PROJECT REF. No.:	PURCHASE ORDER No.: DATE:
COMPANY:			SCOPE OF WORK:
MATERIAL DESCRIPTION :			

LOCATION: ON SITE ☐

DATE OF TEST:

REFERENCE DRAWING:

REFERENCE DOCUMENT:

Inspection List	PASS	FAIL	N.A.	value
• Verify that required internal temperature is maintained.				
• Verify proper redundancy is ensured.				
• Ensure that only one HVAC Unit is Operating at a time.				
• Verify both the HVAC systems (System 1 and System 2) operate alternatively to ensure both the systems will be in operation one after the other.				
• Verify the total hrs of operation of the HVAC system per day as per the approved power consumption calculation and design considering the design conditions agreed and considered in the calculations are available during testing.				
• Verify power consumption of the HVAC system per as per the approved power consumption calculation and design considering the design conditions agreed and considered in the calculations are available during testing.				

Comments:
For details of the components mentioned above, please refer to the relevant Datasheet.

ALEX SISTEMI *Quality Assurance*	Customer	Final Customer	3rd Part	other

Mod1.4.7

9.9 FIRE & GAS FUNCTIONAL TEST AND EQUIPMENTS

*** "Scope of work Rosetti Marino"**

9.9.1 Test Scope

Scope of this test is to verify the functionality of F&G Panel and all the F&G equipment installed according to drawings and specifications.

1. Successful energizations of panel
2. F&G Equipment to be wired to F&G Panel
3. Complete Cause & Effects Sequence test
4. F&G Detectors calibration test

Before testing make sure that all circuits and output positions are safe and free of obstructions before switching on;
Power up the main switch and ensure that the contactors/relays are working;
Power up the output switch and make sure that the F&G Panel are working properly.
Switch off LFGS power supply to test battery backup.

9.9.2 Acceptance Criteria

Point listed above will be verified in accordance to the approved Fire & Gas System Layout Drawing, visual evidence and according to "Cause & Effect" F/G document.

9.9.3 Measurement Equipment

Multimeter

9.9.4 Results Table

N/A