Base Load Power Hub (BLPH)

NDT PROCEDURE

Document Number: 1724000049-NDT-PRO-00005

Document Class: 2

Roberto Mastantuono
Level 3 UNI EN ISO 9712:2012
UT-RT-LT-ET-VT-PT-MT

Rev.	Date	Description	Prepared	Reviewed	Approved
05	31/07/2024	Accepted for Construction (AFC)	AD	SC	RM
04	10/06/2024	Accepted for Construction (AFC)	AD	SK	CA
03	20/05/2024	Accepted for Construction (AFC)	AD	SK	CA
02	03/05/2024	Accepted for Construction (AFC)	AD	SK	CA
01	01/03/2024	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	Accepted for Construction (AFC)
03	Accepted for Construction (AFC)
04	Accepted for Construction (AFC)
05	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 5
1.1 PROJECT OVERVIEW 5
1.1.1 Project Location 5
1.1.2 Project Concept 6
2 DOCUMENT SCOPE 8
2.1 REFERENCES 8
2.2 DEFINITIONS AND ABBREVIATIONS 8
3 VISUAL TEST 9
3.1 PURPOSE 9
3.2 APPLICABILITY 9
3.3 OPERATIONAL MODALITY 9
3.4 SURFACE PREPARATION 10
3.5 SAFETY 11
4 DIMENSIONAL CHECK 12
4.1 PURPOSE 12
4.2 PROCEDURES FOR IMPLEMETIONAL OF DIMENSIONAL CONTROL 12
4.3 NON-COMPLIANCE 12
4.4 CERTIFICATION 12
4.5 ANNEX 12
5 PENETRANT INSPECTION 14
5.1 SCOPE 14
5.2 REFERENCE DOCUMENT 14
5.3 PERSONAL 14
5.4 PRODUCTS USED 14
5.5 SURFACE PREPARATION 15
5.6 PENETRANT APPLICATION 15
5.7 PENETRANT REMOVAL 15
5.8 DEVELOPER APPLICATION 15
5.9 EXAMINATION 16
5.10 SAFETY 16

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

5.11 ACCEPTANCE STANDARD 16
5.12 CLEANING AFTER EXAMINATION 16
5.13 REPORT 16

6 MAGNETIC PARTICLE EXAMINATION 18
6.1 SCOPE 18
6.2 PERSONNEL QUALIFICATION 19
6.3 NDT EXTENSION 19
6.4 SURFACE PREPARATION 19
6.5 CONSUMAVLES 20
6.6 EXAMINATION 20
6.7 PARTICLES APPLICATIONS 21
6.8 VIEWING AND SAFETY CONDITION 21
6.9 DEMAGNETIZATION 21
6.10 ACCEPTANCE CRITERIA 22
6.11 WELD REPAIR 22
6.12 REPORT 22
6.13 ATTACHMENT 22

List of Figures

Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map 5
Figure 2 - Wind Park Details 6
Figure 3 – BLPH Concept 6

List of tables

Table 1 - Reference Documents 8
Table 2 - Definitions and Abbreviations 8

List of Attachments

None

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.

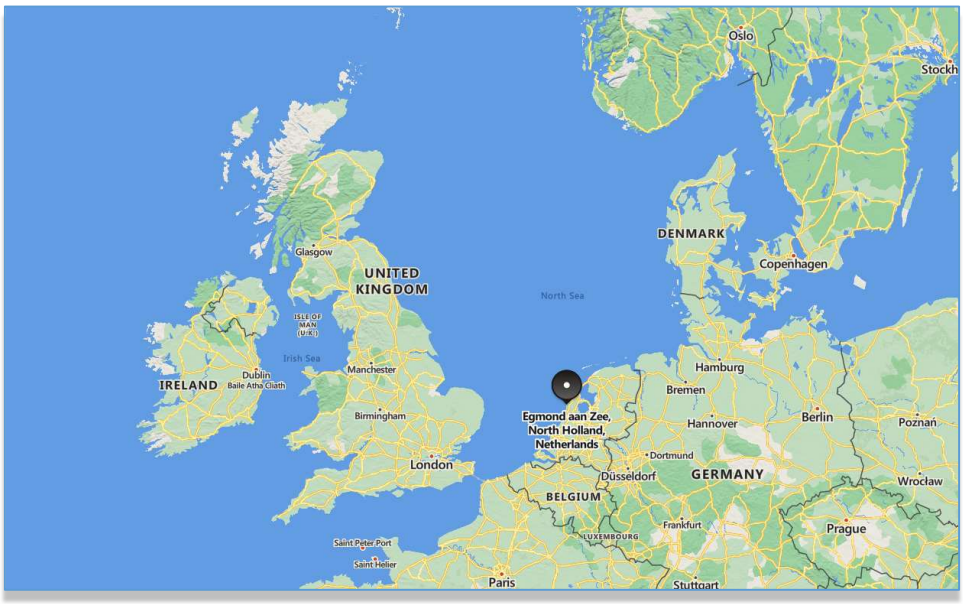


Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map

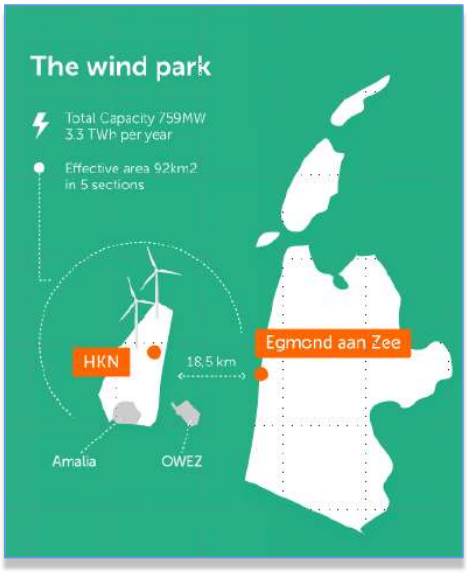


Figure 2 - Wind Park Details

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.

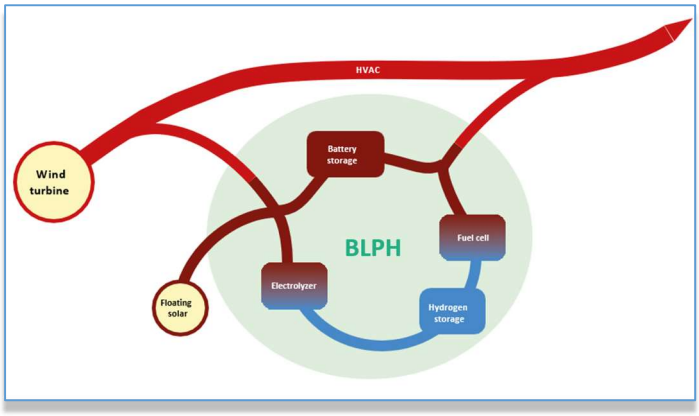


Figure 3 – BLPH Concept

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.

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-PML-QHSE-QP-00002	Project Quality Plan
K559-2254-MT-SPE-001	Structural Fabrication Specification
EEMUA 158	Construction for fixed offshore structures
UNI EN ISO 17637	Non-Destructive testing of welds-Visual testing of fusion-welded joints

Table 1 - Reference Documents

2.2 DEFINITIONS AND ABBREVIATIONS

COMPANY or Client (CPY):	Crosswind
CONTRACTOR (CTR):	ROSETTI MARINO S.p.A.
PROJECT:	HOLLANDSE KUST NOORD WIND PARK Project
CA	Certification Agency
DS	Surveyor
EXP	Expediting dept.
LOG	Logistic Dept.
NDE	Non Destructive Examination
PQR	Procedure Qualification Record
QC	Quality Control Dept.
QCI	Quality Control Inspector
SC	Sub-contractor
WI	Welding Inspector
WLD	Welding Dept.
WQR	Welder Qualification Record
WPS	Welding Procedure Specification

Table 2 - Definitions and Abbreviations

3 VISUAL TEST

3.1 PURPOSE

This procedure describes the methods and requirements for the execution of the visual inspection, when is required by the Code of reference or by the specifics applicable in order, as specified in point 3.3.

The purpose of this procedure is to establish the arrangements for implementing the dimensional inspection of components and finished devices

3.2 APPLICABILITY

This document is intended to be applicable to the dimensional control carried out on all components and welds performed on manufactured pieces for internal order and therefore a supply destined to third parties.

This procedure describes the methods and requirements for the execution of the visual inspection, when is required by the Code of reference or by the specifics applicable in order.

3.3 OPERATIONAL MODALITY

This procedure is applied to the control of elements manufactured at the Alex Sistemi SpA or at its suppliers.

The visual inspection is used to determine:

- the assembly of parts to be welded, the configuration of the welding preparations according to their specifications
- The conditions, the appearance and the absence of coarse discontinuities of welded joints, before further non-destructive testing or any possible heat treatment
- the conditions of the finished element, both in the raw state and as welded or worked by machines according to the demands of the drawing.

Test results should be evaluated within the time allowed by the parameters of acceptability of the referencing Code or the specifications applied in order.

As a general criterion, to be used in the absence of further acceptance parameters, should be adopted the following recommendations:

- preparation of welding: verify the compliance of the drawing' s preparation or of the specification of related welding. Verify the absence of peelings, burning flame's cutting and other discontinuities that may be produced by flaws in welding.
- welding: check the conformity of the weld's cordon to the drawing or to the related welding specification, in particular, the height of the throat in the corner welds and the excess thickness of welding for joints head to head. Verify that the weld's cordon is sufficiently free from marginal incisions to the

cordon and from other rough surface irregularities and also verify that the reduction in thickness caused by these discontinuities is not higher than the lower of 1mm and 10% of the thickness welded and that the minimum thickness calculated is guaranteed. The cracks are not allowed independently from their size (see examples in the following figures).

• Finished components: verify that all surfaces are free from rough incisions, excessive amounts of weld spatter, weld slag residues and dirt in general

3.4 SURFACE PREPARATION

The examination surface and the adjacent area shall be dry and free of rust, grease, oil, water, welding flux, weld spatters or any other impediments for the application of paints and related products.

The weld shall be prepared by grinding if necessary, to assure that the examination shall be performed properly and that the surface condition of the weld is not causing misleading interpretations of the results.VIEWING CONDITION

The surface to be examined shall be sufficiently lighted by natural or artificial light (a minimum light intensity of 500 lx is required on the surface to be examined).

Examination shall be performed using a direct viewing at a distance of 600 mm from the surface and the viewing angle shall be minimum 30° in conditions of adequate visibility of parts to be examined; in case of limited access the remote viewing by inspection mirrors can be used. The surface and the adjacent area to be examined shall be clean and free of all dirt, grease, paint, spatter, heavy oxidation, etc., that may interfere with the examination.

Visual weld examination shall be carried out if necessary by using the following equipment:

- Inspection mirror
- Misalignment gauge
- Magnifying lens X2 to X5
- Radius gauge
- Various set of weld gauges for measuring fillet welds,reinforcement,undercuts,misalingnment etc.

VISUAL EXAMINATION PROCEDURE EXECUTION OF VISUAL EXAMINATION

Visual examination shall be performed during the following operations:

- After cutting and beveling parts to be welded
- After fit-up
- After welding
- After performing repairs by grinding.

VISUAL EXAMINATION ON BEVELS

For visual examination of bevels ends , the following shall be verified:

- All surfaces shall be clean and free from paint , oil , scale , rust and any other deleterious foreign material prior to welding. Degreasing shall be applied where applicable.
- Bevels are in accordance wuth applicable Welding Procedure Specification (WPS) and applicable shop drawings

VISUAL EXAMINATION ON FIT-UP

For visual examination of fit-up, the following shall be verified:

- Root face and root opening of the joint are in accordance with Welding Specifications and applicable shop drawings
- Tack welds are removed prior to final welding.

VISUAL EXAMINATION ON WELD

During visual examination of welds, the following shall be verified:

- Complete removal of extraneous material resulting from the use of temporary alignments near the joint
- Possible arc strikes
- Possible surface defects such as visible cracks, craters, undercut
- Profile of the weld face and the height of any excess weld metal meet the requirements of the acceptance standard.
- Weld reinforcement.

3.5 SAFETY

- Visual test personnel should follow the company's safety procedures and wear the relevant PPE.
- By way of explanation, the main risks are: handling of heavy and bulky loads, blunt objects, presence of flammable fluids, corrosive substances, presence of metal burrs and oxidised objects, etc.

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

4 DIMENSIONAL CHECK

4.1 PURPOSE

The purpose of this procedure is to establish the arrangements for implementing the dimensional inspection of components and finished devices

4.2 PROCEDURES FOR IMPLEMENTATION OF DIMENSIONAL CONTROL

The dimensional control is intended to check the consistency of components or finished parts with the dimensions shown on drawings, in compliance with the specified tolerances

The dimensional inspection will be carried out using instruments duly calibrated.

4.3 NON-COMPLIANCE

Any anomaly detection will be provided through the issue of non-compliance according to the specific procedure.
The acceptance criteria shall be in accordance with TABLE 14 as per EEMUA_158

4.4 CERTIFICATION

At the end of each test, will be marked a signature and date in the Plan of manufacture and testing by the staff who carried out these checks.
And if requested during contractual phase, will be issued a report of the inspection carried out (Mod. P12.1 VT- DR) based on reference code requirements, specific contractual or control plan, in accordance with ISO 17637

This report shall contain the following information:

- the name of the component manufacturer;
- the name of the testing body, if different from
- the identity of the object tested; d) the material
- the type of joint; f) the material thickness
- the welding process
- an acceptance criteria
- the imperfections exceeding the acceptance criteria and their location
- the extent of testing with reference to drawings as appropriate
- the test devices used
- the result of testing with reference to acceptance criteria
- the name of tester and date of test.

4.5 ANNEX

Mod. P12.1 VT- DR – Visual Test & Dimensional Check

ALEX SISTEMI spa

COMPANY WITH QUALITY SYSTEM CERTIFIED BY DNV = ISO 9001 =

Doc. Name: VISUAL TEST & DIMENSIONAL CHECK		Report No.
OUR JOB	Date	Page 1/1

Cliente *Customer*	Ordine *Order*
Progetto *Project*	Descrizione *Description*
Codice Mat. *Mat. Code*	QCP QCP:

Condizioni d'esame – Test conditions -

Norme di riferimento / *Reference standard*	ASME V						
Procedura di controllo / *Test procedure*	- ASME V Art. 9 – Procedure PQVT						
Criteri di accettabilità / *Acceptance criteria*							
Condizioni superficiali / *Surface finish*	X	Saldato *As welded*		Molato *Ground*		Lav. di macch. *Machined*	Forgiato *Forged*

Tipo di controllo - Examination Method -

Metodo diretto / *Direct Method*	X	Metodo remoto / *Remote method*	NA
Apparecchiatura/ *Equipment*	Caliper and handable light	No. ---	
Preparazione superficiale *Surface preparation*	Sounding		
Allegati *Annexes*	---		

Risultati del controllo - Test results -

Dwg	Mark	Item/Detail	Qty.	% Check	Measured	Result

Valutazione finale – Final evalutation

X	Positivo *Positive -*	---	Negativo *Negative -*

ALEX SISTEMI SPA	CUSTOMER	FINAL CUSTOMER	3RD PARTY BODY
VT Level II			

Mod. P12.1 VT-DR Rev.0

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

5. PENETRANT INSPECTION

5.1 SCOPE

This procedure covers the examination and evaluation of carbon and stainless steel material and welds in all shapes and sizes using colour contrast solvent/water removable penetrants.

5.2 REFERENCE DOCUMENT

- K559-2254-MT-SPE-001 Structural Fabrication Specification
- EEMUA 158 Construction Specification for fixed offshore structures
- ISO 3452- 1 Non destructive testing – Penetrant testing – Part: General principles
- ISO 9712 Non destructive testing -Qualification and certification of NDT personnel

5.3 PERSONNEL

The examiner who carries out dye penetrant test and evaluates indication on all the other welds shall be qualified as a Level 2 or 3 in the applicable method and on the relevant product sector in accordance with the requirements of ISO9712. The operator shall have a valid near vision acuity test, which permits reading, a minimum of Times Roman N°4.5 or equivalent letters Jaeger 1 at not less than 30 cm with one or both eyes, either corrected or uncorrected. Colour vision shall be sufficient that the candidate can distinguish contrast between the colours used in NDT method.

5.4 PRODUCTS USED

Only product families described in QPL AMS 2644 shall be used.
"Product family" means the penetrant, removal agent, and developer.

It is not recommended to mix products from different manufacturers because it would not ensure the effectiveness of the PT. To verify the effectiveness make the Test Panel.

For Stainless steel the products to be used shall not contain sulphur and halogen in more than 0.1% in weight and this will be declared by the producer of the penetrant products

MATERIALI PENETRANTI - Penetrant materials		
PULITORE (SOLVENTE) Cleaning (Solvent)	DR-62 spray	or equivalent
PENETRANTE (CONTRASTO DI COLORE) Penetrant (Color contrast)	DP51 spray	or equivalent
SVILUPPATORE LIQUIDO NON ACQUOSO Non acqueous liquid Developer	D100 spray	or equivalent

5.5 SURFACE PREPARATION

a. Surface to be examined may be in the as-welded, as-rolled or as-forged condition, but grinding may be necessary in certain cases when surface irregularities could mask unacceptable discontinuities.
b. Prior to penetrant application, the surface to be examined and all adjacent areas within at least 25 mm shall be cleaned with solvent to remove any dirt, grease, scale, welding flux, weld spatter, oil or other matter which could interfere with the examination.
c. After solvent cleaning the surface shall dry by normal evaporation for at least 5 minutes before applying the penetrant.

5.6 PENETRANT APPLICATION

a. It is important that the temperature of the surface to be processed is within the range of 10°C to 38°C.
b. The penetrant shall be applied by spraying using pressurized containers which are not rechargeable, or by brush within a maximum time of 15 minutes.
c. The minimum penetration time is 15 minutes (20 minutes if the temperature is between 5 °C and 10 °C).

5.7 PENETRANT REMOVAL

When the penetration time in 6.c has elapsed, excess penetrant shall be removed as follows:
a. When using solvent as remover, excess penetrants shall be removed by wiping with a cloth or absorbent paper, repeating the operation until most traces of penetrant have been removed. The remaining traces shall be removed with cloth or absorbent paper moistened with solvent.
b. When using water as remover, excess penetrant shall be removed with a water spry at pressure not over 2,7 Bar and temperature between 10°C and 40°C.
Subsequently the area shall be dried with cloth or absorbent paper.

5.8 DEVELOPER APPLICATION

Immediately following the penetrant removal, the developer shall be applied by spraying, within a maximum time interval of 15 minutes.
The developer shall be thoroughly agitated prior to and during its application to ensure dispersion of the suspended particles.
The developer shall be applied so that a thin, even coat covers the entire surface. The spray nozzles shall not be closer to the surface than 300 mm during application of the developer.

5.9 EXAMINATION

The examination shall be performed with an adequate illumination (min. 1076Lux) and a visual angle not greater than 60°.
Every indication on the developer may mean the possible presence of a discontinuity. Final evaluation shall be made after allowing the penetrant to bleed out for a least 10 minutes but no longer than 30 minutes.
If the surface to be examined is so large that complete examination cannot be made within the prescribed time, then only portions shall be examined at one time.

5.10 SAFETY

- Visual test personnel should follow the company's safety procedures and wear the relevant PPE.

- By way of information, the main risks are: use of highly volatile and flammable chemicals, handling of heavy and bulky loads, blunt bodies, presence of flammable fluids, corrosive substances, presence of metal burrs and oxidised objects, etc.

- It is required that the use of the techniques described herein, as they are carried out mainly with spray cans, be carried out under ventilated conditions and that consumable products are used and stored under the conditions recommended by the manufacturer.

- In addition, it is required that consumable products are correlated with the relevant safety data sheets and technical data sheets and in accordance with national legislation

.

- The use of products for expired penetrant liquids (penetrant liquid, removal solvent and developer) is not allowed.

5.11 ACCEPTANCE STANDARD

Acceptance criteria shall be in accordance with EEMUA_158:2014,S7.5.5

5.12 CLEANING AFTER EXAMINATION

After examination all checked surfaces shall be cleaned from development and penetrant with solvent or water and dry with clothes or forced air.

5.13 REPORT

A report shall be prepared using the form “Mod. P17.1 PT”.



ALEX SISTEMI

COMPANY WITH QUALITY SYSTEM CERTIFIED BY DNV = ISO 9001 =

Doc. Name: NDE PENETRANT DYE TEST REPORT | Report No. 17.1 Rev.0

OUR JOB | Date | Page 1/1

CUSTOMER:	PO:
JOB:	DESCRIPTION:
ITEM:	DATE:

CONDIZIONI D'ESAME - Test conditions

Norme di riferimento / Reference standard	ASME V						
Procedura di controllo / Test Procedure	ASME V, art.6 – Procedure PQPT						
Criteri di accettabilità / Acceptance criteria	CSA W59 - 2018						
condizioni superficiali / Surface finish	X	Saldato As welded		Molato Ground		Lav. di macch. Machined		Forgiato Forged

MATERIALI PENETRANTI - Penetrant (accordance with AMS 2644)

PULITORE (SOLVENTE) Cleaning (Solvent)	Water
PENETRANTE (CONTRASTO DI COLORE) Penetrant (Color contrast)	ELITE K71B2p spray
SVILUPPATORE LIQUIDO NON ACQUOSO Non acqueous liquid Detector	ELITE D112A spray

TECNICA - Technique

PULIZIA INIZIALE – (Precleaning)	Spray con solvente / Solvent spray
APPLICAZIONE PENETRANTE – (Penetrant application)	Spruzzo manuale / - Manual Spray
TEMPO DI PENETRAZIONE – (Penetration time)	5 ÷ 20 min
RIMOZIONE PENETRANTE – (Penetrant removal)	Water spray
ASCIUGATURA – (Drying)	air
APPLICAZIONE SVILUPPATORE – (Detector application)	Spruzzo manuale Manual Spray
TEMPO DI SVILUPPO – (Development time)	10 ÷ 30 min.
INTENSITA' DI ILLUMINAZIONE – (Light intensity)	Luce naturale/ artificiale–Light natural or artificial ≥ 1000 lux
PULIZIA FINALE – (Final Cleaning)	Spray con solvente / / Solvent spray
ALTRO – (Other)	//

Dwg	Mark	Item/Detail	Qty	% Check	Result

Valutazione finale – Final Evalutation

	Positivo/Positive		Negativo/Negative

Alex Sistemi SPA	CUSTOMER	FINAL CUSTOMER	3RD PARTY BODY
PT Level II ISO 9712:2012			

Mod. P17.1 PT Rev.0

6. MAGNETIC PARTICLE EXAMINATION

6.1 SCOPE

This procedure establishes the method for the execution, examination and evaluation of magnetic particle inspection to detect discontinuities on surface and sub-surface of ferromagnetic materials.

This method involves magnetizing an area to be examined and applying ferromagnetic particles to the surface.

This procedure applies also to qualification of welders and welding procedures.

The welds shall be tested at 100% of external surface and internal surface if accessible if accessible.

Final Non-Destructive Tests (NDT) shall not be carried out sooner than 48 hours after completion of welding.

Doc. No.	Description
K559-2254-MT-SPE-001	Structural Fabrication Specification
EEMUA_158	Construction Specification for fixed offshore structures
EN ISO 9934-1	Non Destructive testing – Magnetic particle examination. Part 1: General principles
ISO 9712	Non-destructive testing – Qualification and certification of NDT personnel

Table 3 - Reference Documents

6.2 PERSONNEL QUALIFICATION

The examiner who carries out magnetic particle test and evaluates indication on all the other welds shall be qualified as a Level 2 or 3 in the applicable method and on the relevant product sector in accordance with the requirements of ISO9712.

The operator shall have a valid near vision acuity test, which permits reading, a minimum of Times Roman N°4.5 or equivalent letters Jaeger 1 at not less than 30 cm with one or both eyes, either corrected or uncorrected.

Colour vision shall be sufficient that the candidate can distinguish contrast between the colours used in NDT method.

6.3 NDT EXTENSION

The extend shall be in accordance to Spec. K559-2254-MT-SPE-001 and will reported on design drawings and inspection test plan

6.4 SURFACE PREPARATION

Prior to magnetic particle examination, the surface to be examined and all adjacent areas within at least 1" (25,4 mm) shall be free of all dirty, grease, scale or other extraneous matter that could interfere with the examination.

If and when necessary, surfaces to be examined can be cleaned by grit or metal blasting.

The weld shall be prepared by grinding if necessary, to assure that the examination shall be performed properly and that the surface condition of the weld is not causing misleading interpretations of the results.

For butt weld requiring cap to be ground flush for inspection purposes final MT examination shall be performed after cap removal.

The status of the weld shall be reported in MT inspection report.

All temporary attachments for scaffolding, temporary bracings, temporary lifting appliances, moved supports, equipment or piping, etc., shall be removed and inspected by MT.

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

6.5 CONSUMABLES

In all cases the magnetic detection media shall be of a wet suspension type, a contrast white lacquer shall be applied to surfaces to be inspected after cleaning and prior to magnetization, in order to improve the contrast and to facilitate the mobility of the magnetic particles.

Lacquer is to be applied by spraying (also from spray cans).

Black magnetic powder shall be used as an examination medium.

The following materials shall be used:

a) wet particles:

CGM LK 35 BLACK COLOUR

ELITE – BLACK MAGNETIC INK BW2

b) white lacquer:

CGM VECOPLAST

WHITE BACKGROUND LACQUER WBL5

Or equivalent.

Particles shall be used within the temperature range limitations set by the manufacturer of the particles.

6.6 EXAMINATION

Visual examination shall be performed prior to start magnetic particle examination.

The Magnetic examination shall be performed not earlier than 48 hours after completion weld.

The technique shall be carried out in the continuous mode and test shall be performed at least in two perpendicular directions to detect any discontinuities regardless their position and orientation (see Attachment 1).

Magnetization shall be made using sufficient overlap to assure 100% coverage at the required sensitivity of the controlled areas.

To ensure detection of imperfections in all orientations, the welds shall be magnetized in two directions approximately perpendicular to each other with a maximum deviation of 30°.

Electromagnetic yoke (A.C. alternative current) shall be used.

Each alternative current electromagnetic yokes shall be verified prior to every use, establishing their lifting force equal or more than 4,5 kg at the maximum pole spacing that will be used.
Magnetic field adequacy and direction indicator shall be used to check magnetic field adequacy (see attachment 2).
For the structural steels in welds, a tangential field between 2kA/m to 6kA/m is required.

6.7 PARTICLES APPLICATIONS

Magnetic suspension solution shall be applied, during application of magnetic force (continuous method), by means of a sprayer to provide a homogeneous distribution.

The magnetizing current shall be turned on after the particles have been applied.

Flow of particles shall stop with the application of current.

Wet particles applied from aerosol spray cans may be applied before and/or after magnetizing current is applied.

Wet particles may be applied during the application of magnetizing current if they are not applied directly to the examination area and are allowed to flow over the examination area or are applied directly to the examination area with low velocities insufficient to remove accumulated particles

6.8 VIEWING AND SAFETY CONDITION

All the testing area shall be easily accessible in safety condition; if necessary, the part shall be moved, to avoid that limited access could interfere with the test results.

The area under test shall be evenly illuminated at a level of not less than 500 lx (lux) daylight or artificial light.

Light meters shall be calibrated at least once a year or whenever a meter has been repaired.

If meters have not been in use for one year or more, calibration shall be done before being used.

- Visual test personnel should follow the company's safety procedures and wear the relevant PPE.

- By way of information, the main risks are: use of highly volatile and flammable chemicals, handling of heavy and bulky loads, blunt bodies, presence of flammable fluids, corrosive substances, presence of metal burrs and oxidised objects, etc.

- It is required that the use of the techniques described herein, as they are carried out mainly with spray cans, be carried out under ventilated conditions and that consumable products are used and stored under the conditions recommended by the manufacturer.

- In addition, it is required that consumable products are correlated with the relevant safety data sheets and technical data sheets and in accordance with national legislation

.

- The use of products for expired penetrant liquids (wet magnetic particle type, removal solvent and white coating) is not allowed.

6.9 DEMAGNETIZATION

After testing with alternating current, residual magnetization will normally be low for low carbon steels, and there will generally be no need for demagnetization of the object

6.10 ACCEPTANCE CRITERIA

The acceptance criteria shall be in accordance with EEMUA_158:2014, S7.5.5

All surfaces to be examined shall be free of the following:

- Relevant linear indications
- Relevant rounded indications greater than 4mm
- 4 or more relevant rounded indications in a line, separated by 1,5mm or less (Edge to Edge)
-

- Relevant indications

A "relevant" indication is that caused by defect rather than by weld geometry.

- Linear Indication

A "linear" indication is one having a length greater than three times the width. Intermittent and aligned indications shall be treated as a linear indication.

- Rounded Indication

A "rounded" indication is one having circular or elliptical shape with the length equal or less than three times the width.

Any questionable or doubtful indications shall be re-examined (after cleaning of the surface) to determine whether or not they are relevant; in case of doubt, it's possible to use other NDT method for identification and confirmation of suspected flaw indications.

6.11 WELD REPAIR

All defects after repair with a new magnetic particle examination, shall be carried out all over the interested area including 50 mm on either side of defects.
The examination after repair shall be performed not earlier than 48 hours after completion weld.
Welding repairs (or replaced welds) shall be examined with the methods prescribed for the original WPS.

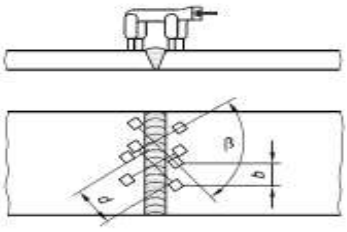
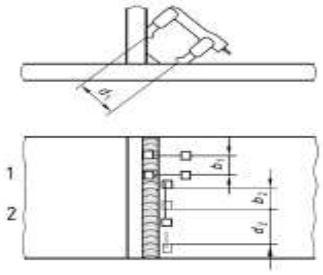
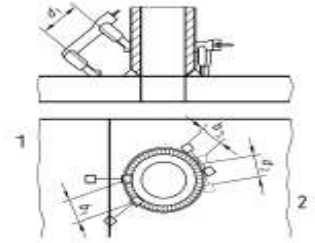
6.12 REPORT

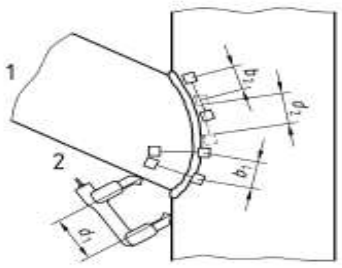
A report will be drawn up using a specific form

6.13 ATTACHMENT

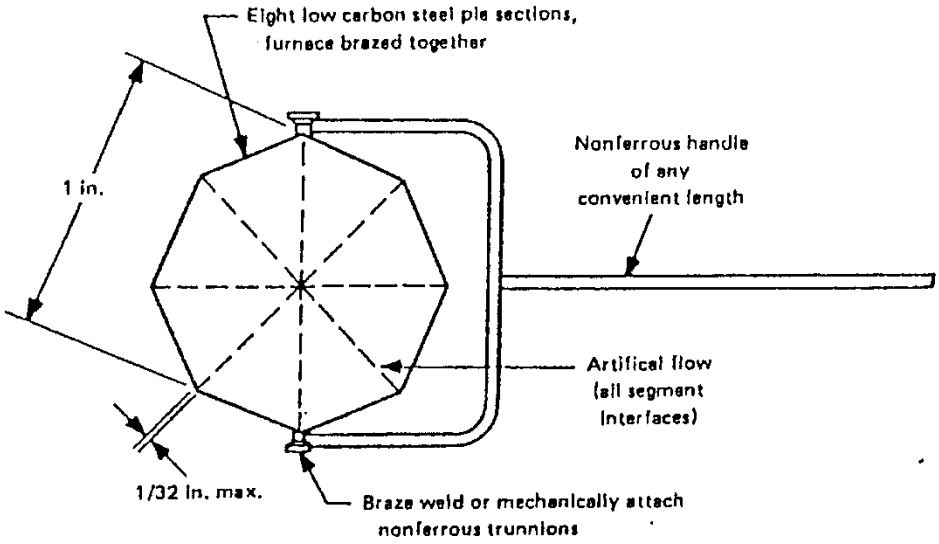
Attachment 1 - Example of an area to be examined by yoke magnetization technique
Attachment 2 – Magnetic particle field indicator
Attachment 3 – Sample Examination Report

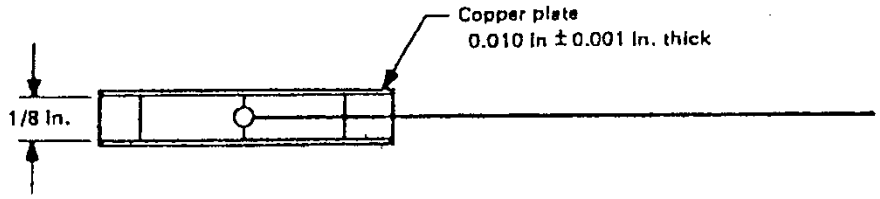
Attachment 1 - Example of an area to be examined by yoke magnetization technique.

	Material type: Ferromagnetic material	*Dimensions in mm*
1		$75 \le d \le 250$ $b_1 \le 0.5d$ $b_2 \le d - 50$ (minimum overlap 50) $b \approx 90°$
2		$d_1 \ge 75$ $b_1 \le 0.5d_1$ $b_2 \le d_2 - 50$ (minimum overlap 50) $d_2 \ge 75$
3		$d_1 \ge 75$ $d_2 \ge 75$ $b_1 \le 0.5\ d_1$ $b_2 \le d_2 - 50$ (minimum overlap 50)

	Material type: Ferromagnetic material	*Dimensions in mm*
4		$d_1 \ge 75$ $d_2 \ge 75$ $b_2 \le d_2 - 50$ (minimum overlap 50) $b_1 \le 0.5\ d_1$

Attachment 2 – Magnetic particle field indicator





MAGNETIC PARTICLE FIELD INDICATOR

Attachment 3 – Sample Examination Report

B&M

CERTIFICATO di CONTROLLO MAGNETOSCOPICO
MAGNETIC PARTICLE EXAMINATION CERTIFICATE
B&M Safe Controls S.n.c. – Cassano Magnago (VA) – Italy
Phone: +39-0331-202764 – belcore-safecontrols@alice.it

N°
DATA DI ESECUZIONE: DATE OF EXAMINATION

DATI DEL CERTIFICATO - CERTIFICATE DATA

CLIENTE: CLIENT	ORDINE: P. O.	Ns. COMM.: OUR JOB	
OGGETTO: SOBJET	DISEGNO: DRAWING	PCQ / FASE: QCP / PHASE	
NORMA-SPEC./ACC CODE- SPECIFICATION/ACC	PROCEDURA: PROCEDURE	REV. REV.	QUANTITA': QUANTITY
MATERIALE: MATERIAL	DIAMETRO / SPESS. DIAMETER / THK.	MARCATURA (N.F. / Colata): MARKING (S.N. / Heat Number)	

TECNICA DI MAGNETIZZAZIONE - MAGNETIZATION TECNIQUE

APPARATI E PARAMETRI EQUIPMENTS AND PARAMETERS	TIPO CORRENTE CURRENT TYPE	INTENSITA' INTENSITY	INTENSITA' DI CAMPO MAGNETIC FIELD STRENGHT	DISTANZA DISTANCE	APPARATO (Marca e Modello) EQUIPMENT (Trade Mark and Model)
☐ PUNTALI PRODS	-	- Ampere	- A/m	- mm	-
☑ GIOGO YOKE	Lifting power verified, > 4,5 Kg	N.A.	Checked with ASME Magnetic Field Indicator	> 100 mm	DIMART
☐ BANCALE CURRENT FLOW TECHNIQUE	-	- Ampere	- A/m	N.A.	-
☐ BOBINA COIL	-	- Ampere	- A/m	- mm	-

METODO DI ISPEZIONE - INSPECTION METHOD

PRODOTTI CONSUMABLE PRODUCTS	PARTICELLE MAGNETICHE MAGNETIC PARTICLE					SOSPENSIONE IN SUSPENSION IN			PRODOTTI (Marca e Modello) CONSUMABLE PRODUCTS (Trade Mark and Model)
COLORE COLOUR	NERO BLACK	GRIGIO GREY	BLU BLUE	ROSSO RED	GIALLO YELLOW	ACQUA WATER	OLIO OIL	CHEROSENE KEROSENE	
☐ SECCO DRY	☐	☐	☐	☐	☐	☐	☐	☐	
☑ UMIDO WET	☑	☐	☐	☐	☐	☐	☐	☐	TIEDE MAGNAFLUX FERROFLUX-650.2
☐ FLUORESCENTE FLUORESCENT	☐	☐	☐	☐	☐	☐	☐	☐	
ILLUMINAMENTO MINIMO MINIMUM LIGHTING INTENSITY	1076 ☑ Lux ☐ μWatt /cm²					VERNICE DI CONTRASTO CONTRAST COATING ☑			TIEDE MAGNAFLUX FERROFLUX-696.1

SORGENTE DI ILLUMINAZIONE LIGHTING EQUIPMENT ☑ LUCE AMBIENTE DAY LIGHT ☑ LUCE ARTIFICIALE BULB LIGHT ☐ LUCE NERA BLACK LIGHT

ESTENSIONE DEL CONTROLLO EXTENSION OF EXAMINATION ☐ 10% ☐ 20% ☐ 100% ☐ .....

CONDIZIONI SUPERFICIALI - SURFACE CONDITION

☐ SABBIATO SAND BLASTED ☐ SPAZZOLATO BRUSHED ☐ LAMINATO AS ROLLED ☐ FORGIATO AS FORGED ☐ LAVORATO MACHINED ☐ SALDATO AS WELDED

PULITURA DOPO IL CONTROLLO CLEANING METHOD AFTER EXAMINATION **SOLVENTE SOLVENT** | SMAGNETIZZAZIONE DEMAGNETIZATION ☐ RICHIESTA REQUIRED ☐ NON RICHIESTA NOT REQUIRED

NOTE - REMARKS

INDICAZIONI RILEVATE DETECTED INDICATION ☐ NESSUNA NONE ☐ VEDI SCHIZZO ALLEGATO SEE ATTACHED SKETCH .....

VALUTAZIONI EVALUATION ☐ CONFORME CONFORM ☐ NON CONFORME NOT CONFORM ☐ RIPARARE E RICONTROLLARE TO REPAIR AND TO RECHECK

OPERATORE: OPERATOR	APPROVATO DA: APPROVED BY	ISPETTORE / CLIENT INSPECTOR / CLIENT	ISPETTORE / CLIENT INSPECTOR / CLIENT
Alessandro Belcore EN 473 - ISO 9712 - SNT TC 1A *Level II*			

Attachment 4 – NDT Level 3 Qualifications



PND

CENTRO ITALIANO
DI COORDINAMENTO
PER LE PROVE
NON DISTRUTTIVE

Via C. Pisacane, 46
20025 Legnano (MI)
PEC: info@pec.clopnd.it
C.F. e P.I. 09510020150

ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO

CERTIFICATO DI LIVELLO 3
LEVEL 3 CERTIFICATE

N° 38893/PND/C

Si certifica la qualificazione per esami in Prove Non Distruttive al **LIVELLO 3**
*This is to certify qualification by examinations in Non-Destructive Testing at the **LEVEL 3***

di / of

Mastantuono Roberto

nato a / *born in* **Carate Brianza (MB)**

il / *on* **28 febbraio 1982**

per il metodo / *for the method:*

Magnetoscopia (MT)

per i settori / *for the sectors:*

Collaudi pre e in servizio che comprendono la fabbricazione

(c; f; w; t; wp)

Il presente certificato viene rilasciato in conformità alla Norma UNI EN ISO 9712:2022.
This certificate is issued according to UNI EN ISO 9712:2022.

Direttore Generale
General Manager

Reggiani Michael
M. Reggiani

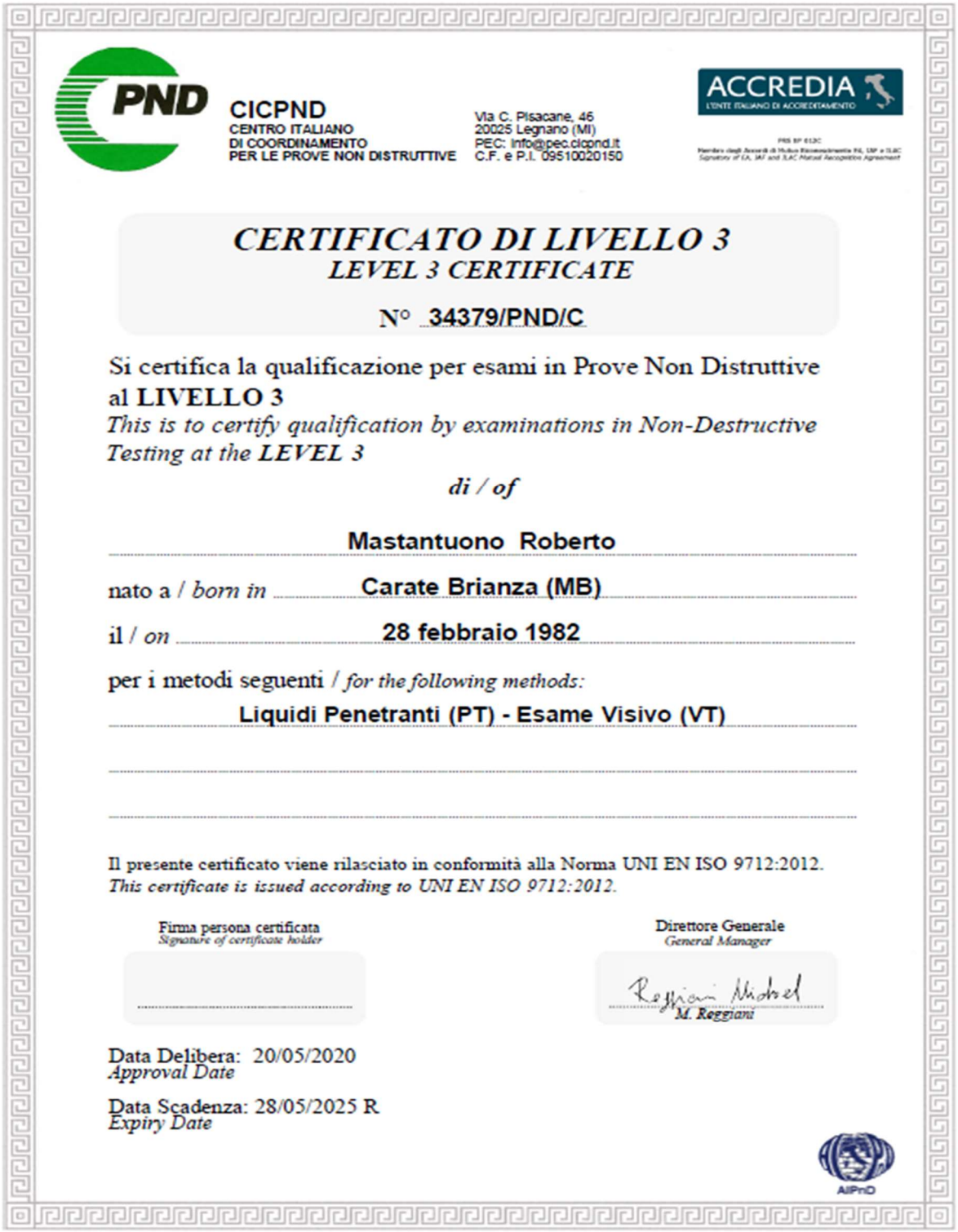
Data Delibera: 07/08/2024
Approval Date

Data Scadenza: 07/08/2029 C
Expiry Date

Approvazione per l'esecuzione di prove non distruttive secondo l'Allegato I paragrafo 3.1.3 della **Direttiva attrezzature in pressione 2014/68/UE/PED** (CEM/TR 15589 Route A).

AIPnD

Attachment 5 – NDT Level 3 Qualifications



PND CICPND
CENTRO ITALIANO
DI COORDINAMENTO
PER LE PROVE NON DISTRUTTIVE

Via C. Pisacane, 46
20025 Legnano (MI)
PEC: info@pec.cicpnd.it
C.F. e P.I. 09510020150

ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO

CERTIFICATO DI LIVELLO 3
LEVEL 3 CERTIFICATE

N° 34379/PND/C

Si certifica la qualificazione per esami in Prove Non Distruttive al **LIVELLO 3**
*This is to certify qualification by examinations in Non-Destructive Testing at the **LEVEL 3***

di / of

Mastantuono Roberto

nato a / *born in* **Carate Brianza (MB)**

il / *on* **28 febbraio 1982**

per i metodi seguenti / *for the following methods:*

Liquidi Penetranti (PT) - Esame Visivo (VT)

Il presente certificato viene rilasciato in conformità alla Norma UNI EN ISO 9712:2012.
This certificate is issued according to UNI EN ISO 9712:2012.

Firma persona certificata
Signature of certificate holder

Direttore Generale
General Manager

M. Reggiani

Data Delibera: 20/05/2020
Approval Date

Data Scadenza: 28/05/2025 R
Expiry Date

AIPnD