



CATHODIC PROTECTION SYSTEMS FOR
THE OFFSHORE OIL AND GAS SECTOR



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METEC PRODUCTION PROCESS WITH PHOTOS

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METEC SARL



METEC SARL YARD



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METEC BRACELET ANODES



METEC FLUSH MOUNTED ANODES



METEC STAND OFF ANODES



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1) METEC PRESENTATION

Metec Group was founded in 1996 and is today one of the leading companies in corrosion control.

Metec Group is the market leader in supply of Cathodic Protection systems to the offshore oil and gas industry, with two factories located one in Tunisia and one in England with furnace capacity for high quality and flexible deliveries with short notice. We offer the global offshore oil and gas market the most competitive short lead time Cathodic Protection Systems within the industry.

Our Tunisian facility is in the market leader for production of pipeline anodes spanning from diameters 2" – 48". All Metec Group sacrificial anode foundries are equipped with the latest state of the art automated production equipment to ensure the highest level of quality for corrosion protection of our client's offshore assets.

We have over 30 years of experience in supplying stand off and flush mounted anodes for client offshore jacket foundations. We can offer completely welded and or coated anode insert arrangements minimising the fabricators after work before installation of anodes at the yard.

We can also assist in design, manufacture, and even installation assistance, and offer retro fit anodes for any project extensions required, for example:

- Stand Off Anodes
- Flush Mounted Anodes
- Tower Anodes for Pile Clusters
- Retrofit Anodes
- Design
- Voltage Potential Surveys

In Genova site in Italy our engineering specializes in the design, field survey, installation and commissioning of corrosion control systems. Our resources are available worldwide ensuring that all technical requirements and conditions are met.

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We ensure that all equipment and materials are obtained and supplied to specified customer requirements. We use modern and advanced analysis techniques like vacuum emission- and Optical Emission spectrometry for the quality assurance of raw materials and to ensure the chemical composition of the final products.

We can supply anodes according to the specifications from recognized societies like DNV, Norsok, Qatargas, Nace, ect...

METEC GROUP has the knowledge, experience and expertise gained from many years of operation to provide answers to corrosion problems.

Our offices in England, Tunisia and Italy , employs a skilled and experienced team of engineers and technicians who are able to solve or assist in solving your corrosion problems.

2) SCOPE

Scope of this document is the description of manufacturing process, supply, test and inspection of sacrificial anodes.

3) REFERENCES

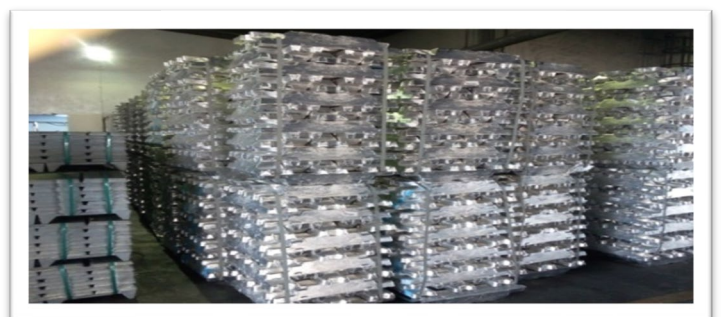
This document is based upon the following reference documents:

- NACE SP0492
- NACE TM0190-98
- DNV RP B401

4) ANODES DESIGN AND CALCULATION

Calculations will be performed by Metec engineering department on the basis of **Project requirements**.

5) ALUMINIUM RAW MATERIAL:



Anodes will be manufactured in METEC foundry location in Tunisia according to the activities and details herein included. Raw materials will be aluminium or Zinc ingots with highest purity.

In case of aluminium anodes; Indium and Zinc will be added to base material on the basis of the required ranges.

6) STEEL INSERT MATERIAL



All anodes steel insert will be fabricated from low carbon steels of weldable quality with the product Carbon Equivalent value $CE \leq 0.41\%$ and carbon content $C \leq 0.23\%$.

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In case of Bracelet anodes, welding of the flat bar to round bar will be carried out in our workshop by qualified welder in accordance with AWS D1.1. Welding Procedure Specification and Welding Qualification records will be submitted prior production. Insert arrangement will be performed in METEC workshop. Certificate 3.1 will be provided.

All inserts will be grit-blasted according to standard **ISO 8501-1 grade Sa 2½** not more than 4 hours before anode casting operation to surface profile minimum average 75 microns. Insert surface will be checked for possible rust discoloration or contamination.

7) ANODE CASTING



Anodes casting will be in our foundry in Tunisia. Prior to start production, molds, inserts and casting equipment will be selected and checked. Anodes solidification will not be forced cooled and the cooling process will be at ambient temperature.

Before to start the production a Preproduction Qualification Test will be performed in presence of Contractor/Company.

During the PQT, ANODES will be used in a fit-up test (in case of bracelet anodes) and and destructive test in order to qualify the personnel, equipment and procedures for production and testing.

Before the PQT all documentation shall be approved.

8) ANODE COATING

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The anode underside surface (if required) is coated with epoxy paint. Coating will be as per client specification.

9) CHECKS AND TESTS

During production the following inspections and testing will be carried out:

a) Visual inspection

Visual check will be performed on 100% of welds and 100% of anodes surface to verify integrity and that no relevant defects are present such as cracks, shrinkage depression, cold shuts and other casting irregularities. Tolerances will be as per **Client specification**.

Visual inspection results will be indicated in the certificate of conformity at completion of works.

b) Destructive test



One anode per each type will be sectioned during the PQT, thereafter, during production, the required number of anodes per each type will be sectioned.

- Photos of sectioned anodes will be taken and submitted in final data book with report. Tolerances will be as per **NACE SP0492 otherwise as per client specification**.

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c) Weight and dimensional inspection



During production 100% of anodes will be weighed and measured and 10% of values will be recorded in weight and dimensional report. The average insert weight will be determined by weighing, at random, at least 10% of anode inserts.

Each sacrificial anode will be weighed after casting and the average insert weight deducted to give the effective net weight and recorded against the anode serial number. Tolerances will be as per **Client Specification**.

d) Alloy chemical analysis

Chemical composition will be in accordance to **client specification**.

Alloy chemical analysis will be performed in METEC laboratory, with optical emission spectrometer, on two samples from each lot. Samples with dia.50 mm taken one at the beginning and one at the end of each melt.

Samples taken from a unique melt will be marked by indelible ink with melt number including year, month, day, and furnace no.

Certificate 3.1 of chemical analysis will be issued on head sheet containing the following information:

- Document N°.
- Date of certificate;
- Client name and address
- Purchase Order N°.
- Type of alloy (Al-In-Zn)
- Heat N°.
- Anodes description & quantity
- Alloy chemical values
- Notes
- Lab. Signature



e) Electrochemical test performance

Electrochemical performance tests will be carried out in METEC laboratory on one sample each heat in natural seawater. All Tests to be performed in accordance with **Client Specification**.

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f) Electrical resistance test (Bracelet Anodes)

An electrical continuity test will be performed on a minimum of 5% of the cable connections made per shift between the free cable end and the anode core. The electrical resistance will not exceed 0.01 ohms.

g) Fitting Test (Bracelet Anodes)



A Number of anodes per each type (as per client specification) will be assembled and fitted around a pipe in the presence of COMPANY with the same external diameter as the externally coated pipe.

10) ANODES MARKING AND PACKING

Each anode will be marked, by automatic punch machine, on the outside face for identification with letters of size 7 mm according to including the following data:

- Company tag number;
- Anode material
- Heat Number;
- Individual anode number;
- Contractor name;
- Anode Weight.



Packing will be as per client requirement (in crates or on pallets).



11) DOCUMENTATION

At delivery, a certification data book will be submitted including:

- Unpriced Purchase order;
- Approved Job Quality control and inspection Plan;
- Approved drawing;
- Raw material certificates of chemical analysis;
- Mill certificates of core;
- Anodes alloy chemical analysis;
- Electrochemical tests certificates;
- Weight and dimensional report;
- Destructive test report;
- Packing List;
- Concession Records (if any);
- Release note;
- Manufacturing Specifications and Production Process control;

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