DESFA
Hellenic Gas Transmission System Operator

HELLENIC GAS TRANSMISSION SYSTEM OPERATOR

357-359, MESSOGION AVE.,
15231 ATHENS, GREECE
Tel.: 210 6501258
Fax : 210 6501551

TECHNICAL JOB SPECIFICATION
784/2
REVISION 0
DATE 05/04/2011

HIGH PRESSURE (HP) TRANSMISSION SYSTEMS

CATHODIC PROTECTION ANODE MATERIAL

QUALITY ASSURANCE PAGE

CHANGES LOG

REVISIONS LOG

0	05-04-2011	FIRST ISSUE	PQ DPT	V.G.
Rev. No	Rev. Date	REASON FOR CHANGE	Made By	Approved By

CONTENTS

REFERENCE DOCUMENTS

MIL-A-21412
[Anodes, corrosion preventive, magnesium alloy, cast or extruded shapes]

MIL-A-18001
[Anodes, sacrificial zinc alloy]

ELOT EN 10204
[Metallic products - Types of inspection documents]

ELOT EN 12438
[Magnesium and magnesium alloys - Magnesium alloys for cast anodes]

1.0 SCOPE

This Specification covers the design, fabrication and supply of standard design magnetite impressed current anodes for installation in horizontal or vertical ground beds. This specification also covers anode material for sacrificial anodes.

2.0 ANODE MATERIAL FOR "INSTALLATION WITH IMPRESSED CURRENT"

2.1 ANODE MATERIAL

The anodes shall be in accordance with the following specifications:

Magnetic anodes:		
Material	:	Magnetic Cast Anodes
Overall length	:	800 mm
Effective length	:	720 mm
Diameter	:	Minimum 60 mm
Gross weight	:	6,0 kgs
Magnetite weight	:	4,7 kgs
Consumption	:	Max. 20g/A/yr
Cables fitted	:	5 meters of 10 mm^2 XLPE/PVC insulated copper cable.
Internal resistance	:	<0,05

High Silicon Iron Anodes		
Material	:	Silicon Iron Anodes
Effective length	:	1200 mm
Diameter	:	50 mm
Gross weight	:	18,6, kgs
Consumption	:	Max. 500 g/A/yr
Cables fitted	:	5 meters of 10 mm^2 XLPE/PVC insulated copper cable.

All anodes shall be of the same cast when more than one anode is installed.

Silicon Anodes shall have a Chromium content of 5% in accordance with **ELOT EN 12438.**

The surface of the anode material shall be free from sand and slag. The size of any non metallic particles included in or adhering to the surface of the anode material shall not exceed 5 mm.

2.2 ANODE FEEDER CABLE CONNECTION

Each anode shall be equipped with feeder cable connection. A flat piece of iron shall be cast in the anode head to permit low-resistance connection of the feeder cable by brazing. The voltage drop across the brazing joint shall not exceed 3 mV when tested at 10 A.

To prevent damage to the anode head, each anode feeder cable connection shall be protected by a sturdy plastic pipe or heat shrinkable sleeve and sealed with epoxy resin.

Where it emerges from the epoxy resin sleeve, each anode feeder cable shall be protected by a neoprene sheath to prevent bending.

2.3 BACKFILLING

Coke breeze (size 5) shall be used as backfill, in a quantity corresponding to min. 0,9m^3 per anode for horizontal continuous coke beds.

Coke breeze backfill material shall be calcite petroleum coke meeting the following requirements:

a) Chemical Analysis

H_2O	0,04%
Volatiles	0,13%
Ash	0,42%
Si	0,034%
Fe	1,51%
C fixed	99,45%

b) Physical Data. Screen Analysis

Smaller than:

0,1 mm	14%
0,1-0,2 mm	32%
0,2 -0,4 mm	37%
0,4-0,6 mm	16%

Larger than:

0,6mm	1%

bulk density approx.	800 kg/m3
specific gravity	1,98
resistivity	≤10 ohm.cm

2.4 DELIVERY

Anodes shall be delivered in polystyrene packaging in a secure case.

3.0 ANODE MATERIAL FOR "INSTALLATION WITH SACRIFICIAL ANODES"

3.1 ANODE MATERIAL

When more than one sacrificial anode is used it shall be ensured that all anodes including backfill are of identical nature and made from one cast.

Magnesium or Zink Anodes according to the following specifications shall be used:

Magnesium Anodes:

Material	:	Magnesium Alloy Anodes
Alloy	:	AZ63
Purity of Alloy	:	In accordance with **MIL-A-21412A.**
Capacity	:	Min. per anode 400 mA for one year.
Weight	:	Min. 4 kg. Mg
Cables fitted	:	10 meters of 10 mm^2 XLPE/PVC insulated copper cable.
Packing	:	Each anode shall be supplied in a cotton bag containing a backfill.
Backfill composition	:	Powdered Gypsum 75% Granular Bentonite 20% Sodium Suphate 5%
Shipping	:	Anodes shall be transported in an airtight PVC sack in a solid transport box.
Total packaged weight	:	Min. 9 kg.

Zink Anodes:

Material	:	Zink Ribbon Anodes
Purity of Alloy	:	In accordance with **MIL-18-001-H**
Weight	:	Min. 0,8 kg. zink/meter
Cables fitted	:	5 meters of 10 mm^2 XLPE/PVC insulated copper cable.
Shipping	:	Anodes shall be transported in a solid transport box.

All anodes shall be of the same cast when more than one anode is installed.

3.2 DELIVERY

The individual anodes shall be packed in a strong PVC sack, in a secure case.

4.0 ALTERNATIVE ANODES

If other type of anodes than the above mentioned are used they shall be specified in detail and they shall be approved by the Owner Representative before placed in the project.

The minimum life time of the anodes shall be 20 years by operating current.

5.0 MATERIAL TESTS

The Manufacturer/Vendor shall perform material tests of the anodes in accordance with **ELOT EN 10204,** type 2.2.

Type test certificates of the anodes such as:

- chemical analysis
- measurement of material loss rate etc.

shall be available with the anodes.

The Manufacturer/Vendor shall provide factory tests certificates, such as, measurement of brazing joint resistance, etc.