

MMO Linear Anode (Sock Anode)

Jennings Anodes MMO Linear or Sock Anode, is an Impressed Current Anode suited to underground environments. MMO Linear Anodes can be installed to provide an ICCP system to protect newly constructed structures or to provide an economic ICCP system for existing structures. Common uses are to protect buried pipelines, the bottom of the above ground storage tanks, and buried metal structures in confined or congested spaces.

Advantages

1. Customized anode output and Life expectancy.
2. Life expectancy can be up to 50 years.
3. Lightweight packing reels ensure easy transportation & handling in the field. Easily cut to appropriate lengths or spliced to other lead cables or Linear Segments (Manual provided).
4. Cost Effective ICCP solution.

Linear Anodes Components

MMO Linear Anode consists of a high grade titanium wire (coated in Ir, Ta, Ru Mixed metal oxide) running in parallel with an insulated copper cable. The choice of the copper cable can be made from HMWPE, XLPE/PVC, Kynar/HMWPE or as per specification. The MMO Wire and the copper conductor are crimped together, sealed with epoxy resin & encapsulated in a Heat Shrink cap to ensure protection from water ingress. Connections are nominally made at 5M Intervals to ensure uniform current distribution along the length of the anode. Different connection intervals can be accommodated as required.

The MMO Wire / Cable assembly is centrally packed in a continuous Non Woven fabric housing filled with conductive coke backfill. The fabric housing is braided using a high tensile strength heavy duty compact braid assuring product integrity.



Mixed Metal Oxide Anodes

MMO Linear Anodes

Chemical Composition

| Anode | MMO Linear Anode (Sock Anode) |
|--------------------------|----------------------------------|
| Substrate of MMO Wire | ASTM B348 Grade I/II |
| | Solid Titanium |
| Coating | Ir-Ta Mixed Metal Oxide Catalyst |
| Anode Backfill | Calcium Petroleum Coke |
| Cable Connector Material | Copper |
| Sock Jacket Material | Porous non-woven fabric Housing |
| Sock Diameter | 1.5" (38 mm) |

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Electrochemical Properties

| Property | Testing Standard | Testing Result |
|---------------------------------|--|-------------------------------|
| 1.Cable Copper Conductor | | |
| Dimension | ASTM B - 263 | #6 AWG (Standard) |
| Connection Resistance | ASTM B - 193 | 3.08 × 10 ⁻³ Ohm.m |
| 2.MMO Wire | | |
| Dimension | ASTM B - 348 | PASS |
| Volume Resistivity | ASTM B - 193 | 9 - 11 mOhm.cm |
| 3.Coke Breeze Backfill | | |
| Fixed Carbon | ASTM D - 172 | 98.5% Min. |
| Resistivity | G.L.C.-C-12A, 10 bar (145psi) @23°C (73°F) | 0.1 Ohm.cm |
| 4.Cable Joint | | |
| Resistivity | ASTM B - 193 | 1.0 mOhm Max. |
| 5.Fabric Jacket | | |
| Weight | 80g/mv Min. | 80g/m ² |
| Bursting Strength | ISO 3303 | 500N Min. |
| Abrasion Resistance | ASTM D - 4157 | 100 Cycles to Failure |
| Fluid Resistance | 6 months Immersion Test | PASS |
| Chlorine Resistance | 6 months Immersion Test | PASS |
| UV Resistance | ASTM G-53: 8 hours @60°C (140°F) 4 hours @50 °C (122°F) | 55% Tear Strength Loss |

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Specification

| Anode Model | MMO Wire Diameter | Cable Specification | Current Output Rating | Life Expectancy |
|-----------------|-------------------|---------------------|-----------------------|-----------------|
| MMO - Linear100 | 1.5mm | #6 KYNAR/HMWPE | 100mA/ft (327mA/m) | ≥25 yrs. |
| MMO - Linear300 | 3.0mm | | 300mA/ft (983mA/m) | |

All weights and dimensions are nominal and subject to variation in material compositions and Jennings Anodes Foundry tolerance.

Quality Assurance & Testing

Jennings Anodes Quality Assurance and Manufacturing Quality Control procedures are strictly adhered to guarantee the ultimate performance and life of the linear anode.

| Testing | Chemical Composition | Anode Performance | Physical Appearance |
|---------------------|--|---|--|
| Standards & Methods | ISO 9001:2015 Quality Management System and Foundry Internal Standards of MMO Anodes Manufacture | | |
| | ASTM E120 | NACE TM0180; NACE TM0294;ASTM D3359 | Foundry ITP |
| Items | Chemical Analysis of Titanium Substrate | Structure and Thickness of the coating; Uniformity of coating thickness; Adhesion | Size and Weight, Permissible Variations; Anode Finish and Appearance |

Packing

Jennings Anodes MMO Linear Sock anode is normally packed on lightweight reels of 500ft. (152m). Bespoke lengths can be ordered.

| Anode Model | Packing Details | | | | | |
|------------------------------|---------------------|---------------|------------------------------|----------------|----------------|--|
| | Unit of Measurement | Reel Length | Reel Dimension | Net Weight | Gross Weight | Number of Reels |
| Jennings Anodes Linear Anode | Metre | 500ft. (152m) | Φ36" × 30" (Φ900 × 760mm) | 473lbs (215kg) | 540lbs (245kg) | 24 Reels / 20ft. Container 48 Reels / 40ft. Container |

Shipping Documents

Invoice, Packing List, Full Chemical, Physical & Performance Test Reports.