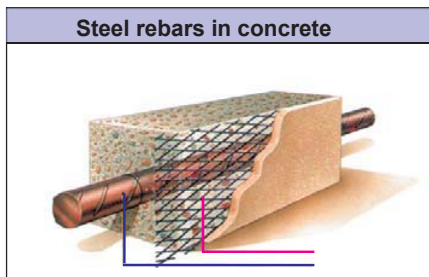
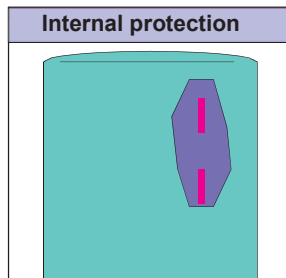
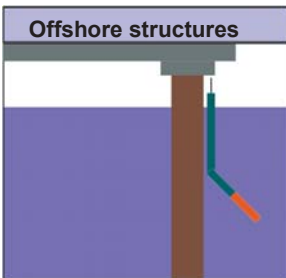
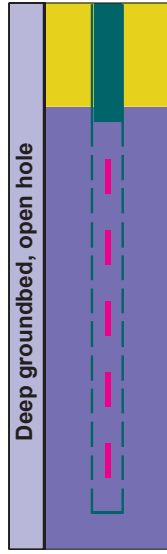
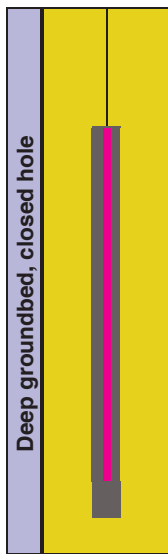
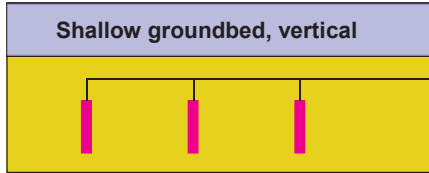
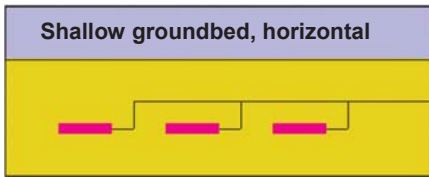


Types of groundbeds and anode applications



Anode material



IMPRESSED CURRENT ANODES

Mixed Metal Oxide (MMO)

Document No.: PSE-04-300-R622

Sheet: 1 of 2

Mixed Metal Oxide (MMO) anodes

This material consists of a high purity titanium substrate with an applied coating consisting of a mixture of oxides. The titanium serves as a support for the oxide coating. Titanium functions as a "valve metal" which forms thin, self-healing, adherent oxide film which is acid resistant and resist the passage of anodic current. The oxide is formed on the titanium substrate by thermal decomposition of precious metal salts that have been applied onto the substrate

Technical Data

Base metal	Titanium
MMO-coating, standard	12 g/m ²
MMO-layer thickness	approx. 5.0 μm
Max. phase/interphase voltage	8.0 V
Max. current density	11 A/dm ²
Consumption rate	approx. 0.01 g/A year

Rod Anodes

Rod anodes as screw-in types with pressure resistant head structure are widely used for internal protection of pipes, tanks, condensers and other process equipment.



Dimensions

Rod length	150 up to 2500 mm
Rod diameter	4 / 6 / 8 / 10 / 12 / 16 / 20 / 25 mm

Plate Anodes

Plate anode structure consist of anode plate assembled and sealed inside a support frame consisting of impact resistant plastic material.

Plate anodes are used for offshore structures and sluices



Dimensions

Plate length	max. 800 mm
Plate width	max. 800 mm
Plate thickness	0.5 - 10 mm

Mesh Anodes

Mesh anodes are used for protection of steel reinforced concrete structures.



Max. current density	18.0 mA/m ²	27.5 mA/m ²	33.0 mA/m ²
Coating	Mixed precious metal oxide	Mixed precious metal oxide	Mixed precious metal oxide
Substrate (Grade 1/ASTM B265)	Titanium	Titanium	Titanium
Width per coil	1 m	1 m	1 m
Length	10 m	10 m	10 m
Weight	120 to 130 kg	220 to 230 kg	220 kg
Mesh size	76 x 35 mm	76 x 35 mm	62 x 20 mm
Resistivity, longitudinal direction	0.120 Ω/m	0.060 Ω/m	0.060 Ω/m
Current distributor wire, diameter	3 mm	3 mm	3 mm
Length (uncoated)	100 m	100 m	100 m
or Current distributor flat profile			
Thickness	1 - 1.5 mm	1 - 1.5 mm	1 - 1.5 mm
Width	5 - 10 mm	5 - 10 mm	5 - 10 mm
Length (uncoated)	1 m	1 m	1 m

Tubular Anodes

The tubular anodes are assembled as anode chain for deep groundbed installation. The cable " feed through " centre connection ensures that current passes from the centre of any tube to the next. The materials used for the different parts of anodes and anode chains are suitable for satisfactory performance with regards to low pH-value and high chloride content of water as well as high concentration of chlorine gas if all plastic components of anodes (cables, caps etc.) are made of PVDF.



Dimensions

Tube length	1000 mm
Tube Diameter	25.1 / 40.0 / 45.0 / 50.8 mm

IMPRESSED CURRENT ANODES

Mixed Metal Oxide (MMO)

Document No.: PSE-04-300-R622

Sheet: 2 of 2

MMO Flex Anodes / Piggy-Bag Anode

MMO Flex-Anodes can be assembled using Wire Anodes (ASTM B348) or Ribbon Anodes (ASTM B265) which have been coated with Mixed Metal Oxide Coating.

MMO consists of $\text{IrO}_2/\text{Ta}_2\text{O}_5$ and is suitable for use in all cathodic protection applications. Because mixed metal oxides have an extremely low consumption rate, the titanium substrate remains constant throughout the design life of the anode.

Based upon accelerated life testing, conducted by an independent laboratory, MMO coating has been proven to be equivalent or superior to other mixed metal oxide coatings which are currently being used; a copy of this test report is available upon conditional request.

Strict quality control procedures are followed throughout the entire coating process, to guarantee proper coating adhesion and loading. Also, MMO Anodes are tested using an X-Ray Fluorescence Spectrometer, to ensure production of the highest quality product, which is fundamental in every step of the manufacturing process.

MMO Flex-Anodes are a flexible, packaged linear anode assembly. The linear anode is packaged in a highly absorbent fabric sleeve. This sleeve is sewn using poly four-thread double interlocking stitch, which prevents the seam from separating during installation, or when stored in high temperature conditions. The sleeve is filled using a high quality, calcined petroleum coke.



APPLICATIONS

- Buried Piping
- In-plant Pipework
- Vessels and Tanks

Characteristics:

- Anode to cable connection is resin filled and Helium tested for an effective seal of connection.
- Fabric Sleeve is available in 1.5" to 3" Diameters with a variety of lengths available.
- Available with outputs ranging from 16 mA/ft. to 400 mA/ft.
- Flexible and lightweight makes for efficient installation.
- Packaged using high quality calcined petroleum coke in a highly absorbent fabric sleeve.
- Reduces requirement for in plant isolation.

General Specifications:

MMO Wire Diameter	1 mm	1.5 mm	3 mm
Titanium Substrate	ASTM B348 Grade I / II		
Mixed Metal Oxide Catalyst	Ir-Ta		
Current Output for 20 Years Life	67 mA/m	89 mA/m	195 mA/m
Current Output for 30 Years Life	45 mA/m	65 mA/m	130 mA/m
Current Output for 50 Years Life	28 mA/m	41 mA/m	78 mA/m
Backfill	Calcined Petroleum Coke		
Sock material	Porous Non-Woven Fabrics		
Sock Dimension	38 mm Diameter		
Length per Reel	150 Meters (Customizable length as per request)		

IMPRESSED CURRENT ANODES

Open Hole Replaceable Deep Groundbeds

Document No.: PSE-04-500-R622

Sheet: 1 of 1

uPVC Casing



These casings withstand external pressure loading which is caused by geological formation, the depth of the groundbed, the ratio of borehole diameter to casing diameter and the position of dynamic water levels.

Perforated casings are provided with slots which run perpendicular to the pipe axis for higher collapse resistance as compared to pipes having longitudinal slots.

The perforated (open) casings have a minimum of 20 % slotted surface for a low resistance increase factor.

Microfine PP wire mesh is durably fixed over the perforated area of the casings to prevent entry by silt or foreign particles after installation.

Both perforated and unperforated casing sections are supplied with threaded joints which allow quick assembly on site.

Rigid uPVC is chemically resistant against all types of groundwater, seawater, brines, diluted acids and alkalines.

Physical Material Properties

Properties	Value	Unit	Test method
Elasticity Modulus	2500 to 3000	N/mm ²	DIN EN ISO 178
CHARPY-Impact Strength at 20 °C for uPVC; normal toughness	approx. 3 to 5	kJ/m ²	DIN EN ISO 179
Density	approx. 1.4	g/cm ³	DIN 53479
Tensile Strength	approx. 45 to 55	N/mm ²	DIN EN ISO 527-2
Impact Resistance	max. 10 % breakage		Following DIN EN ISO 179
Vicat Softening Point, Temperature	80	°C	DIN EN ISO 306

Dimensions

Casing type	K	K	KV	K	KV
Nominal diameter ND (mm)	150	175	175	200	200
Outer diameter (mm)	165	195	195	225	225
Wall thickness (mm)	7.5	8.5	11.5	10.0	13.0
Outer diameter over socket (mm)	176	205	211	241	247
Collapse resistance (N/mm ²)	0.7	0.6	1.6	0.7	1.5
Weight (kg/m)	5.5	7.4	9.8	10.0	12.8
Delivery length (m)	5.78	5.78	5.78	5.78	5.78
Thread (trapezoidal), DIN 4925	T	T	T	T	T

Accessories



Centraliser
for centralisation of casings in the borehole during installation



Hoisting device with steel insert
for lifting and lowering the pipe sections



Steel Clamp
for fixing casing segments during installation



Sealing Plug
for the bottom end of the casing or sump pipe



Wooden Clamp
for fixing the casing to the top foundation



Super Conducting Earth Contact Backfill

Loresco type SC-3 is designed specifically for deep anode systems.



Loresco type SC-3 is a dust-free product and, according to EPA extraction tests, is extremely pure and complies with regulations governing buried products. SC-3 mixes easily with water and may be pumped into deep anode systems. Loresco SC-3 is designed to promote electronic flow between the anode surface and itself.

Loresco SC-3 is produced specifically for cathodic protection applications using an exclusive multi-step process. First, a high quality base carbon with desired characteristics is selected. Next, this carbon is calcined to a minimum temperature of 1250° C under exacting and controlled standards. This step results in semi-graphitized carbon particles with excellent conductivity. Then, to further improve bulk conductivity, the surfaces of the individual particles are half-modified to enhance the contact conductance. This breakthrough in surface alteration ensures maximum electronic current transfer with positive anode contact. The surface alteration on the particle surfaces is not easily removed and stands up to the vigorous application methods in all field requirements.

Loresco SC-3 has a bulk density of 74 lbs. per cubic foot. The fixed carbon content is greater than 99.35% by weight. The bulk density and high fixed carbon content coupled with the assured low resistivity medium allows for longer groundbed life at a lower operating cost.

Loresco SC-3 is designed to be used in impressed current cathodic protection systems, deep or shallow. Specify Loresco SC-3 Super-Conducting Premium Earth Contact Backfill. For high current installations, Loresco SC-3 is recommended.

Installation

Loresco SC-3 has excellent pumping qualities and when agitated in water, takes on the characteristics of heavy mud. A recommended mix is seven gallons of water per one hundred pounds. After installing SC-3, allow twenty-four hours settling time before energizing. The modified surface of the carbon particles in SC-3 will achieve positive electrical contact by settling. Vibrating or compacting is not necessary.

Material Description

Loresco SC-3 is a surface modified, blended, and sized carbon backfill.

Specification

Bulk Density: 74 lbs. per cubic foot
Predominantly round particles
All particles surface modified for maximum electrical conductivity
Particle sizing: To be dust free with a maximum particle size of 1 mm
Minimum calcination temperature of base materials is 1250° C
Base materials are calcined under ISO 9002 quality control
No de-dusting oils are used during the manufacture of base particles

Shipping Data

Loresco SC-3 is shipped in fifty (50) pound (22.7 kg) coated, woven polypropylene bags. SC-3 may be stored outside for limited periods (not to exceed four hundred hours of sunlight). Pallets are available with fifty bags per pallet. Proven export packaging is also available.

IMPRESSED CURRENT ANODES

Groundbed Head Structure Typical

Document No.: PSE-04-603-R622

Sheet: 1 of 1

Head Structure Typical

The wellhead structure is designed for use in conjunction with deep well anode groundbeds.

The square hollow steel structure is internally coated by a special coating material of PVDF to be resistant against chlorine gas.

The wellhead structure consists also vent pipes, anode chain fixing device and a special conduit connection between the wellhead and the anode junction box (AJB) to prevent gas entering to the AJB.

The optional crash barrier protects the wellhead structure against physical damage caused by vehicles.

Crash barrier, cables, wooden clamp, cables, steel surface casing, uPVC-casing and concrete foundations are not parts of well head structure.

Head structure with crash barrier for deep groundbeds



Structure specially designed for use in oilfields etc.

