SILVION LIMITED
The Brambles
Grantham Road,
Old Somerby, Grantham, Lincs
NG33 4AB UK
Tel: 01476 590932
Mob: 07872 857310
Email: sales@silvion.co.uk
Web: www.silvion.co.uk

SILVER/SILVER CHLORIDE REFERENCE ELECTRODES FOR CATHODIC PROTECTION

COMPANY PROFILE 2009

SILVION REFERENCE ELECTRODES

25 Years Service to the Corrosion Prevention Industry

Registered in England No: 6860239 VAT No: 975 9426 61

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1.0 INTRODUCTION

SILVION is the UK's leading designer, manufacturer and supplier of Silver/Silver Chloride (Ag/AgCl) reference cells for use in the cathodic protection (CP) industry and was established in April 1984 by an Electrochemist/Corrosion Scientist with considerable experience in the use and manufacture of Silver electrodes in the corrosion and battery industries.

SILVION is renowned worldwide in the Corrosion Prevention Industry and takes pride in offering our clients latest advancements of reference electrode technology and internationally acceptable quality products which provide accurate and reliable monitoring and control of CP systems for Onshore/Offshore Oil & Gas, Petrochemical, Power and Water, Marine and Concrete Structures.

SILVION have a highly qualified and experienced team of professionals which enables us to provide practical and economical solutions to meet or exceed our client's requirements. The Silvion range of products include Ag/AgCl reference cells for:

- Seawater Applications
- Potable Water Applications
- Soil Applications
- Concrete Applications
- Specialist Applications

Silvion offers our standard range of reference cells, specifically designed Ag/AgCl reference cells, pseudo reference cells or a combination of both.

Over the past 25 years Silvion has supplied over 60,000 various Ag/AgCl reference cells to projects in the UK, Europe, Middle East, North Africa, South Africa, Asia, New Zealand, USA & Canada

2.0 PRODUCTS

SILVION reference electrodes consist of an Acetal tube electrode body. The electrodes are manufactured using a "unique" advanced technique which results in a porous silver matrix being formed around a silver wire skeleton. This porous matrix increases the active area of the monitoring surface hundredfold and also enables the deposition of a larger quantity of silver chloride. The deposition is precisely controlled by electrolytic coating and provides high reliability, high stability, greater accuracy and increased life performance. A porous plug at one end of the assembly allows contact between the field environment and the silver chloride electrode via the electrolyte. An insulated lead wire connects the central silver wire which can be connected to a high input impedance voltmeter (10MOhm) when potentials are to be measured. For embedding in concrete or for use in soil or potable water the reference electrode contains either sodium chloride (NaCl) or potassium chloride (KCl) to stabilize the silver chloride concentration.

REFERENCE ELECTRODES FOR CONCRETE

SILVION are proud of the fact that our reference electrodes have been used in concrete Cathodic Protection systems since **1985**. Ag/AgCl reference electrodes are one of the key elements for the prevention of rebar corrosion in concrete and constitute the performance monitoring system for cathodic protection installations. Silvion electrodes are robust and have been specifically designed to allow permanent embedding in concrete. Our long life electrodes are suitable for high alkaline or chloride condition concrete and can be used for the monitoring of rebar/electrolyte potentials or for the control of DC power supplies

Applications

Bridges, Seawater Intakes, Marine Structures, Buildings, Cooling Water Towers

See Data Sheets : **Type WE10 Embeddable Electrode**

Type WE50 Embeddable Electrode

Type WE100 Embeddable Electrode

Type WE100M Embeddable Electrode

Existing concrete structures that require potential assessment surveys to be carried out usually have representative areas surveyed using an Ag/AgCl mapping electrode to check the reinforcement steel for corrosion activity.

SILVION Type ME100 mapping electrodes are designed for use with a high input impedence (10MOhm) voltmeter to measure direct potentials on the concrete surface. The electrodes have an integral sponge for intimate contact with the concrete. The electrodes are also supplied complete with a solid cap which should be fitted when the electrode is not in use to protect the ceramic contact disc.

See Data Sheet: **Type ME100 Mapping Electrode**

REFERENCE ELECTRODES FOR SEAWATER

Cathodic protection systems installed on steel structures in seawater need to be monitored and it is usual to use an Ag/AgCl reference electrode to measure the steel to electrolyte potential to determine the level of corrosion protection being afforded to the structure.

Portable Ag/AgCl reference electrodes are also used to measure structure/electrolyte potentials on steel structures in seawater to which cathodic protection has not been applied to determine if the structure is freely corroding or not.

SILVION manufacture and supply two types of Ag/AgCl reference electrode. Type SW100 is a weighted portable electrode generally used to measure structure/electrolyte potentials at key selected test points where the electrode can be suspended and dropped from deck level into the water close to the structure. Type CCS1 permanent electrodes are generally installed below the low water level at pre-determined locations and used as sensing electrodes to control the output of the DC power supply. Type CCS1 can also be used as a portable reference electrode.

Applications

Jetties, Wharves, Offshore Structures, Seawater Intakes

See Data Sheets: **Type SW100 Portable Seawater Electrode**

Type CCS1 Portable or Permanent Seawater Electrode

REFERENCE ELECTRODES FOR SOIL

To ensure that satisfactory levels of cathodic protection are being achieved on buried structures and storage tank bottoms reference electrodes are permanently installed to measure structure/electrolyte potentials. They can also be used as a sensing electrode to control the the DC power supply to the CP systems.

SILVION, Type WE200 permanent reference electrodes have been specifically designed for direct burial in soil and can be installed along pipeline routes at key monitoring points eg: Test stations, drain point, cased crossings, isolation joints, HVAC parallelisms etc. and are also suitable for installation below tank bottoms to measure cathodic protection potential levels.

When installing the WE200 permanent reference electrode it is recommended to surround the electrode in a bentonite backfill.

Applications

Underground Pipelines, Underground In-Plant Pipework, Underground Tanks, Mounded Tanks, Above Ground Storage Tank Bottoms

See Data Sheet: **Type WE200 Electrode for Soil**

REFERENCE ELECTRODES FOR POTABLE WATER

SILVION Type WE300 Potable Water Electrodes have been specifically desiged to include a low ion electrolyte around the Ag/AgCl element and are used to monitor potential levels or to control the DC power supply output for cathodic protection systems installed inside water tanks. The WE300 can be permanently installed inside the water tank by securing to a suitable suspension rope and suspending the reference electrode from openings in the tank roof.

See Data Sheet: **Type WE300 Potable Water Electrode**

REFERENCE ELECTRODES FOR SPECIALIST APPLICATION

Since 1984 **SILVION** have been designing and manufacturing specialist silver/silver chloride reference electodes for a range of different applications some of which are detailed below:

- Specially designed electrodes for use with underwater corrosion monitoring equipment.
- Specially designed electrodes for marine vessels.
- Specially designed electrodes for cooling water process plant

3.0 KEY PERSONNEL

Dr S PATMANABAN- *SILVION Director*

Dr Pathmanaban, a considerably experienced electrochemist has a Ph. D from University of Manchester, UMIST the most distinguished university in the UK for studies in Corrosion Science and Electrochemistry. This education provided the platform for Dr Pathmanaban to develop a business based on the design and manufacture of 'SILVION' reference electrodes for use in Cathodic Protection Systems.

Dr Pathmanaban has been a leader in the Reference Electrode field for over 25 years and this is demonstrated by his in depth knowledge of the application requirements evidenced in his book

'*Cathodic Protection of Reinforcement Steel in Concrete* ' published by Butterworths

Mr R BRITTON - *SILVION Director*

Rob Britton has HNC qualifications and has been active in the Cathodic Protection industry for over 20 years. He has gained a wide experience of product manufacturing processes and QA/QC procedures for the corrosion prevention industry along with management of UK CP Companies.

Rob has worked in over 20 countries world wide including Europe, North Africa, Near East, Middle East and Far East on projects for the Oil, Gas, Petrochemical, Marine, Water and Power Industries.

4.0 QUALITY ASSURANCE

SILVION, are committed to quality and our policy is to achieve sustained, profitable growth by providing services which consistently meet or exceed the needs and expectations of our customers.

This level of quality is achieved through adoption of a system of procedures that reflect the competence of the Company to existing customers, potential customers, and independent auditing authorities.

5.0 HEALTH AND SAFETY

SILVION, work in accordance with Health & Safety at Work etc. Act 1974

Our policy is to ensure:

o The promotion of occupational health and safety.
o To comply with the requirements of the Health & Safety at Work Act 1974, The Management of Health & Safety at Work Regulations 1999.

Our aim is to systematically anticipate, identify and prepare for new or changing risks in the workplace

6.0 THE ENVIRONMENT

SILVION, is committed to safeguarding and improving the environment of the communities we serve and in which we operate.

Safeguarding the environment is an integral and fundamental element of our business strategy and we will adopt environmentally responsible practices throughout all our operations.

We are committed to the development and use of products, processes and services which reduce environmental damage and waste, and which optimise the use of our resources.

7.0 CONTACT DETAILS

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