

Discrete anodes for impressed current cathodic protection of reinforcement steel in concrete structures

Uses

Ebonex is a discrete Impressed Current Cathodic Protection (ICCP) anode, specifically designed to protect steel elements in concrete and some steel framed structures from corrosion. The anode utilises an innovative ceramic/titanium composite combined with an integral gas venting system. The system includes Ebofix Grout, which is a high density, acid buffering grout used for long-term performance.

Ebonex anodes are available in a range of sizes, which provide excellent design flexibility. Ebonex discrete anodes are able to provide sufficient performance to satisfy the 100mV potential shift requirement for Cathodic Protection as specified under National Association of Corrosion Engineers (NACE) RP0290 & the European Standard EN12696 - Cathodic Protection of Steel in Concrete.

Typical Applications

- Bridges
- Tunnels
- Steel framed buildings
- Car parks
- Reinforced concrete in marine environments

Advantages

- Gas venting - no build-up of anodic gases. Can be installed under fiber-reinforced polymer (FRP) strengthening systems, membranes, and coatings.
- Embedded installation - no added dead weight or increase to physical dimensions of structure from thick overlays.
- Long lasting - longest life expectancy of any discrete CP anode - in excess of 50 years, depending upon design.
- Low anode consumption - long term stability of anode at current densities up to 900 mA/m².
- Highest level of protection - satisfies the 100mV criteria for effective cathodic protection.
- Proven technology - field verified performance.
- Cost competitive compared with other types of CP installations.
- Deep installation - addresses multi-levels of steel in difficult access areas.
- High operating current - suitable for use in areas of high steel density.
- Versatile - can be used in new construction as a preventative measure.



How Does it Work?

Ebonex works by distributing sufficient electrical current to overcome on-going corrosion in the structure. The Ebonex anodes are connected to an external DC power supply, which provides the electrical current that mitigates corrosion activity. According to industrial standards, an ICCP system is considered effective when the steel is sufficiently polarised to result in a 100mV depolarisation once the system has been turned off.

Level of Protection	Description	Ebonex
Corrosion Prevention	Preventing new corrosion activity from initiating	
Corrosion Control	Significantly reduce ongoing corrosion activity	
Cathodic Protection	Highest level of protection intended to stop ongoing corrosion	✓

Design Criteria

Ebonex is a discrete Cathodic Protection anode system providing long-term durability to both new and existing structures under highly aggressive conditions. In line with other cathodic protection systems, Ebonex discrete anode systems must be designed by corrosion specialists and installed by approved contractors.

Anode Diameter	Current rating per 100mm Anode length* (mA)
10mm Ebonex	2.8
12mm Ebonex Plus	5.1
18mm Ebonex Plus	7.9

*Anodes lengths supplied to order - typical lengths 75-600mm

Standards Compliance

Ebonex discrete anodes satisfy the 100mV potential shift requirement for effective cathodic protection as specified under NACE (National Association of Corrosion Engineers) Standard RP 0290-90.

The design of Ebonex discrete anodes follows comprehensive criteria established for the patented 'Ebonex' (TM) system, described in patent no. PTC/GB99/00359, developed by Atraverda Ltd.

Specification Clause

Where indicated, cathodic protection to reinforced concrete elements shall be provided by Ebonex discrete composite anodes. Ebonex anodes shall be capable of maintaining long term stability at current densities of up to 110mA/m² (of anode surface), for the specified design life. The Ebonex discrete anodes shall be gas vented and shall be grouted in place using Ebofix Grout, a thixotropic high density, acid buffering grout used for long-term performance.

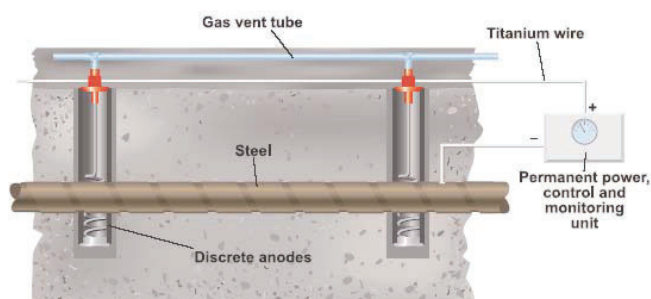
Installation Instructions

Preparation

Ebonex discrete anodes are installed in pre-drilled holes 4 to 8mm larger than the nominal Ebonex discrete anode diameter and typically no further than 600 mm apart (unless otherwise approved by the Engineer). The holes and Ebonex discrete anodes should be located to minimise their proximity to the steel reinforcement in order to provide an even current distribution to the steel within the local vicinity.

Cut a chase with a minimum depth of 10mm and a width of 8mm into the concrete between the holes. This chase is used to accommodate the titanium feeder wire, interconnecting the Ebonex anodes and the gas-ventilation tubing. A 3mm saw cut can be used if the venting pipes are not interconnected.

Prior to application the holes and chases should be blown or vacuum cleaned of all debris and pre-soaked with water.



Mixing

Ebofix Grout should be mixed with a slow speed drill (400/500rpm) and spiral paddle. Place between 6.0 - 8.0 litres of drinking water, depending on required consistency, into a suitable mixing container and add one full 20kg bag of Ebofix Grout and mix for three minutes until fully homogeneous.

Installation

Standing water should be removed from the hole and the Ebofix Grout injected by hand pump to the rear of the hole to avoid air entrapment, ensuring sufficient is placed to cover the entire length of the active Ebonex discrete anode once installed. The thixotropic nature of Ebofix Grout will prevent significant flow from vertical and overhead holes. Wet each Ebonex anode with clean water, but do not immerse for more than 10 seconds, before gently inserting into the hole. Ensure the vent pipe is unobstructed and that sufficient tail wire remains exposed to enable connection with the feeder wire.

Place the Ebofix Grout within 30 minutes of mixing to gain benefit of the expansion system and allow to cure for a minimum of 24 hours, without physical disturbance. When cured the open end of the gas vent network can be directed to a well-ventilated location.

Connect strings of Ebonex discrete anodes together as recommended by the CP design engineer using coated or non-coated titanium feeder wire and electrical connectors or titanium crimp connectors. All wire jointing requires the use of titanium metal crimps, secured using an appropriate crimping tool. After connections have been made continuity should be tested with a resistance meter. Any reading found to have a resistance >1 Ohm requires re-crimping the connection. When the integrity of the connection is established the tail of each Ebonex discrete anode can be gently bent, thus settling the wire into the chased groove.

The chase is filled with a pre-bagged repair mortar or Ebofix Grout and left for at least 4 days before connecting to the power system.

Limitations

In chloride contaminated structures, particular attention should be paid to the control of applied voltage. Potentials greater than 7 volts should not be applied to the titanium connecting wires.

Performance of the Ebonex discrete anode is dependent upon the correct design, installation and maintenance of the Cathodic Protection system.

Ebonex

Supply

Ebonex discrete anodes are supplied with 500mm tail wire.

Ebonex Anode Type	Diameter x length (mm)	Material Code
10/100	10 x 100	FC312034-UNIT
10/150	10 x 150	FC312035-UNIT
18Plus/200	18 x 200	FC312057-UNIT
18Plus/300	18 x 300	FC312056-UNIT

(12mm Plus anode also available on specific request)

Vector Ebofix Grout 20kg MTO: FC312043-20KG

Vector Ebonex Wire Pack 40m MTO: FC312047-UNIT
Titanium feeder wire 40 m x 1.5 mm diameter

Vector Ebonex Crimp Pack 80PC MTO: FC312046-UNIT
80 titanium crimps

Vector Ebonex Crimping Tool MTO: FC312049-UNIT
Crimping tool plus plattens

Vector Ebonex Venting Pack MTO: FC312048-UNIT
20m PVC venting tube plus 40 connecting T-pieces

Vector Ebonex Connectors MTO: FC312045-UNIT
50 electrical connectors

Please note that all above products are Made-to-Order (MTO). Minimum Order Quantities (MOQ), Order Quantity Breaks and Lead Times apply. Please contact Customer Service or your Fosroc representative to place an order.

Storage

Store both the Ebonex discrete anodes and Ebofix Grout in dry conditions in their original unopened packaging.

Ebofix Grout has a shelf life of 12 months.

Important notice

Read this TDS carefully prior to use as application or performance data may change from time to time.

Product disclaimer

This Technical Data Sheet (TDS) summarises our best knowledge of the product, including how to use and apply the product based on the information available at the time. You should read this TDS carefully and consider the information in the context of how the product will be used, including in conjunction with any other product and the type of surfaces to, and the manner in which, the product will be applied. Our responsibility for products sold is subject to our standard terms and conditions of sale. Parchem does not accept any liability either directly or indirectly for any losses suffered in connection with the use or application of the product whether or not in accordance with any advice, specification, recommendation or information given by it.



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