GSC SuperAnode

Installation guide

The product is indicated as GSC SuperAnode.

This product is used in the protection of reinforced concrete constructions against rebar-corrosion. GSC SuperAnode is a sacrificial galvanic anode specifically designed for giving electrochemical protection, known as cathodic protection, for the prevention of corrosion of the concrete steel reinforcement. The current required for cathodic protection is provided by the galvanic link of the steel reinforcement and the zinc being part of the anode. No external power source or whatsoever is necessary.

The presence of chloride-based salts within the concrete can be a threat to the passivation layer (protective oxyde-layer) on the carbon steel reinforcement of the concrete. Also, variations in the concrete cover on top of the reinforcement, the quality of the concrete cover and the content of the chlorides around the reinforcement will cause similar corrosive circumstances. These circumstances will cause local corrosion cells. These places are called anodes. Other locations of the reinforcement, where the circumstances are relatively less corrosive and aggressive, remain passivated (passive oxyde-layer). These locations are called cathodes.

The combination of anodic and cathodic locations results in electrochemical reactions (redox-reactions) if the distance between the anode and cathode will be relatively small. These electrochemical reactions will convert the steel of the reinforcement into iron-oxydes (rust) at the anodic locations. Those corrosion products (rust) formed, can be 5 to 10 times the volume of the original steel reinforcement. For this reason, the tension in the concrete will eventually lead to crack and spall the concrete cover. The loss of steel and concrete will eventually weaken the construction and be a threat to the safety.

The GSC SuperAnode has been therefore designed to function as an additional anode replacing all the anodic locations of the reinforced concrete construction. It is applied upon the concrete surface. The zinc is electrically linked with the steel reinforcement through a current distributor. In this way the electric circuit is completed because electric current flows through the adhesive layer and concrete by means of ionic conductance (both materials are so-called electrolytes). Since zinc has a natural potential which is more electronegative than the steel reinforcement, the zinc becomes the anode after installation and forms a new corrosion cell in which the reinforcement is forced to be the cathode.
In this way the corrosion process within the concrete is transferred to the zinc-layer avoiding futural spalling and cracking of the concrete.

1. Installation procedures

The GSC SuperAnode is a discrete zinc-anode imbedded in an ionic conductive paste. Before application the packing material is removed manually, and the anode is ready for installation.

These anodes can be offered in 6 different types to meet any specification of need and service life:

GSC SuperAnode 70
GSC SuperAnode 105
GSC SuperAnode 10/10 o 10/20
GSC SuperAnode 30/10 or 30/20

System monitoring can be performed according to ISO standard 12696. Monitoring equipment can be supplied by your distributor together with the anodes on request. Be aware that monitoring equipment designed for an impressed current CP-system is not always compatible with a CP-system based on galvanic anodes, specifically when current-densities are monitored.

The installation procedure includes the following steps:

1. Check accessibility of the construction and take precautions, if necessary,
2. Prepare the concrete surface,
3. Localize the reinforcement,
4. Check electric continuity of the reinforcement,
5. If required, perform additional potential mapping of the reinforcement to indicate the degree and extend of expected corrosion,
6. Install the GSC SuperAnode
7. Make electric connections of the reinforcement with the anode,
8. Check electric connections with a resistance meter,
9. Patch the concrete,
10. Check polarisation of the reinforcement by use of reference electrodes.

It is recommended to keep up a logbook in which all steps are described and checked. Situations which differ from the installation procedures must be indicated accurately in the logbook and checked and signed by the supervisor prior to proceed.

In case certain situations is not clear how to handle the anodes properly, we recommend contacting your distributor prior to proceed with the installation.

Each step of the installation procedure is described in detail below.

2. Prepare the concrete surface.

Prior to install the anodes the concrete should be prepared in the following manner (please check manufacturer's spec of the repair mortar):

1. Remove all deteriorated concrete, dirt, oil, grease, and all bond-inhibiting materials from surface. Be sure repair area is not less than 5cm in depth.

2. In case the depth of the repair area is less than 5cm and cannot be enlarged for proper anode installation, please check with your distributor.

3. Preparation work should be done by high pressure water blast (over 20,000 psi), scabbler, or other appropriate mechanical means to obtain an exposed aggregate surface with a minimum surface profile of 2mm for proper mortar adhesion.

4. Reinforcing Steel: Steel reinforcement should be thoroughly prepared by mechanical cleaning to remove all traces of rust at least there where the anodes are installed. Where corrosion has occurred due to the presence of chlorides, the steel should be high pressure washed with clean water after mechanical cleaning.

3. Localize the reinforcement if necessary

The best and easy way to localizing the reinforcement is by use of rebar locator, which accurately locates reinforcing bars and welded wire meshes. Some rebar locators also measure the concrete cover and determines the diameter of the bars.

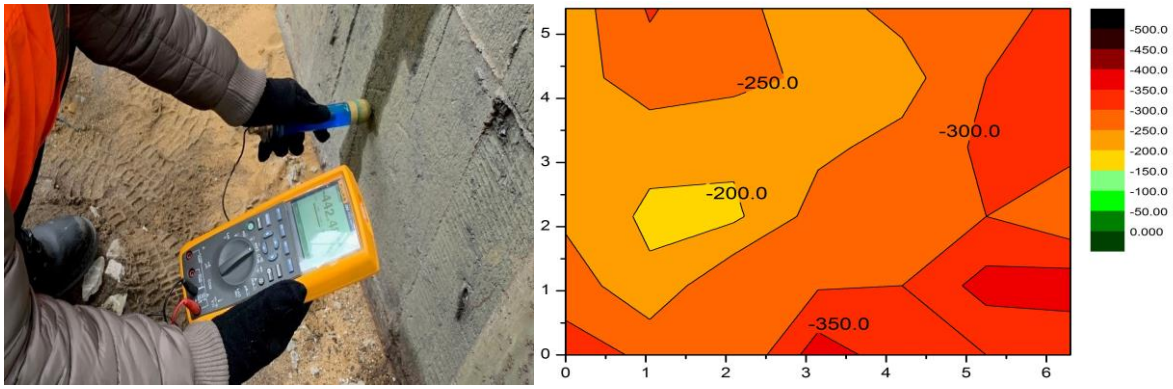
4. Check electric continuity of the reinforcement

After making the right mechanical connection check the electric continuity of the reinforcement using a digital multimeter. Contact is obtained by using so called alligator clips. Switch the central knob of the multimeter to the resistance position (ohm) and measure the resistance. The criterion for continuity is less than 1 ohm (DC-) resistance.

5. If required, perform additional potential mapping of the reinforcement to indicate the degree and extend of expected corrosion.

If a selective approach is desired due to economic reasons potential mapping of all concrete elements involved should be considered. During mapping the values are logged as computer-tables and later on, with special software, processed as corrosion-graphics. This type of software analyses potential-values and gradients, and calculates for each measuring location the possible chance of active corrosion. After the interpretation the results are presented as colour-cards. By using this measuring method hundreds of square meters of concrete surface per hour can be mapped and processed.
For further information about this technique and making the right interpretations, please contact our distributor or refer to the following standards:

ASTM, C876-91, 1991, Standard Test Method for Half-Cell Potentials of Uncoated Reinforcing Steel in Concrete (USA and international).



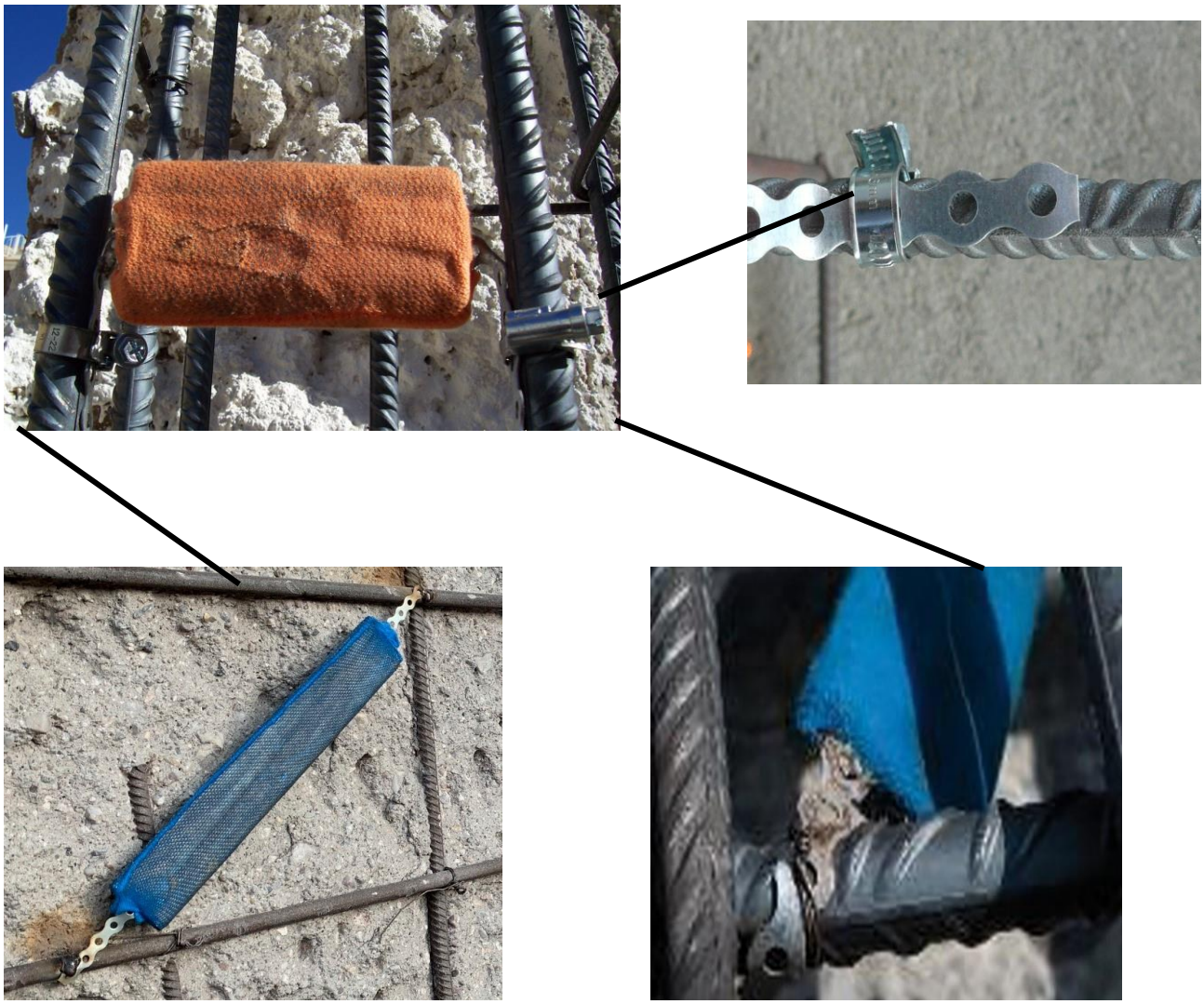
6. Install the GSC SuperAnode

When the area is prepared and clean find appropriated locations close to the bars with an anode distribution as best as possible described in the specification drawn up a corrosion specialist, accredited professional, or appropriate software.

If the area is smaller than a m^2 place enough anodes to get similar ratio as stated above.
Place and fix the anodes securely on the steel bars to ensure stable and long-lasting electrical contact and to prevent the anodes from moving and loosen during the repair mortar application or concrete casting. Be aware of enough spacing between the anode and the existing concrete. In that way the repair mortar or concrete can easily force its way around the anode and create a good adherence for sounding electrolytic continuity between the anode and the concrete structure.

7. Make electric connections of the reinforcement with the anode

Metallic or galvanized tire wraps or cable wires or hose clamps or welding can be used to connect the anode's current distributor on the rebar for secure and durable electric connection.



8. Check electric connections with a resistance meter

Each electric connection of the anode with the rebar is checked in a similar way as described in step no. 4.
Instead of making the contact with alligator clips directly on the connections, it could be checked by making contact directly with the current distributor bar of the anode and the reinforcement.

9. Patch the concrete

Finish the application by patching the concrete according to the manufactures spec. of the repair mortar.

Use, if possible, mineral based repair mortars only with very low PCC. A cement mortar containing many polymers will offer greater resistance to the passage of current and thus make the cathodic protection system less effective

GSC SuperAnode

Before applying the mortar saturate surface with clean water. Substrate should be saturated but surface dry with no standing water.

Be aware that the mortar will make good contact with the anode's paste all the way around and between the anode and the rebar.

10. Check polarisation of the reinforcement by use of reference electrodes.

If required, reference electrodes (RE) which are suitable for concrete are applied for monitoring purposes. Reference electrodes can be supplied together with GSC SuperAnodes upon request. For proper data storage and data interpretations contact our distributor or refer the ISO standard 12696.