ARDEX BRX 60 LO

Sacrificial Zinc Anodes for Cathodic Prevention

Simple and easy installation

Cost-effective and attractive

No wiring installation or external power source needed

Compatible with ARDEX BR Repair Mortars

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ARDEX BRX 60 LO

Sacrificial Zinc Anodes for Cathodic Prevention

DESCRIPTION

ARDEX BRX 60 LO Low Output Anodes are for use within concrete where repairs due to reinforcement corrosion are required. The anodes provide cathodic prevention to incipient anodes (halo effect) or corrosion control to limit corrosion rates of corroding bars embedded in original concrete. It is the recommended system for use in conjunction with the ARDEX BR Repair Mortar Range, specifically ARDEX BR 340 and ARDEX BR 460 Flow for ultimate corrosion prevention.

The core of the ARDEX BRX 60 LO Anode is a 60gm sheet of zinc coated with a patented activation paste. The paste is based on keeping the zinc active in the pH range just below neutral. The zinc-paste reaction produces non-expansive reaction products that do not block the cells effectiveness.

The zinc sheet is rolled and flattened to a multilayer strip sandwiching a galvanized steel strip used to connect the anode to the steel. The zinc strip is cast in a high performance grout that provides resistive current control.

The ARDEX BRX 60 LO Anode is 125 x 50 x 25mm and is fully compatible with ARDEX BR Repair Mortars.

AREAS OF APPLICATION

ARDEX 60 LO can be applied to:

- Columns, beams and slabs
- Balconies
- Precast and in-situ cast façades
- Pipes
- Foundations
- Wharf beams & soffits
- Car parks
- Retaining walls
- Tunnel linings

BENEFITS

Compared to impressed current systems:

- No complex design
- No wiring installation or external power source needed
- No regular checking and adjustment of current supply
- Simple and easy installation
- Cost-effective and attractive
- No risk to prestressing from over protection

Compared to Lithium Hydroxide Anodes:

- Zinc corrosion products are non-expansive
- Weak porous mortar surround not required
- Zinc corrosion products do not block anode
- Anode current output by activator design

APPLICATION AREAS

When an anode is connected to a reinforcing grid, it throws current to all the steel around it that it is electrically connected to, not just the bars that need protection. All this steel drawing current will deplete the anode and reduce its life. In order to conserve the anodes, exposed steel should be coated with ARDEX BR 10 SP Zinc-rich Primer. This insulates the steel so that current will not flow to it, and the anode will only protect the reinforcement that has not been coated. This affects mainly steel outside of the patch but may also be at holes in the coating. Steel outside of the patch might be in two different states. It may have been protected from corrosion by the more active reinforcement in the patch areas. This un-corroded steel is treated as corrosion prevention. Only a small polarisation is required to achieve protection. If, however, this steel has started to corrode, but has not caused damage (determined by breakout at a few locations), then anode design should be based on corrosion control.
The table below shows the application rate required for corrosion control and cathodic prevention depending on the amount of steel to be protected.

Increasing Polarisation

Increasing Steel Area to Polarise

Steel Ratio	Prevention	Control
	ARDEX BRX 60 LO	ARDEX BRX 60 LO
<0.3	750 (600)	450 (375)
0.3 - 0.6	600 (500)	400 (325)
0.6 - 0.9	500 (400)	350 (275)
0.9 - 1.2	450 (350)	300 (225)
1.2 - 1.5	400 (250)	275 (200)
1.5 - 1.8	350 (200)	250 (175)
1.8 - 2.1	300 (175)	225 (150)

INSTALLATION

The installation procedure includes the following steps:

1. Check accessibility of the construction and take precautions if necessary
2. Prepare the concrete surface
3. Locate the reinforcement
4. Check electric continuity of the reinforcement
5. If required, perform additional potential mapping of the

reinforcement to indicate the degree and extent of expected corrosion
6. Install the ARDEX BRX 60 LO Anode
7. Make electric connections of the reinforcement with the anode
8. Check electric connections with a resistance meter
9. Patch the concrete

Prepare the concrete surface
Prior to installing the anodes, the concrete should be prepared in the following manner (refer to respective, compatible ARDEX Repair Mortar Technical Datasheet):
1. Remove all deteriorated concrete, dirt, oil, grease, and all bond-inhibiting materials from surface. Ensure that the 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 contact ARDEX Technical Services.
3. Preparation work should be done by high pressure water blast 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. Where corrosion has occurred due to the presence of chlorides, the steel should be high pressure washed with clean water after mechanical cleaning.

Locate the reinforcement if necessary
The best and most convenient way to locating the reinforcement is by using a rebar locator (cover-meter or GPR).

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 (W) and measure the resistance. Thecriterion for continuity is less than 1 Ohm (DC-) resistance.

If required, perform additional potential mapping of the reinforcement to indicate the degree and extend of expected corrosion.
If the areas of corroding bar that have not yet spalled needs to be identified electrical potential mapping of all concrete elements involved should be considered. Options for corrosively active areas include coating to prevent further contaminant ingress with an acceptance that some areas will still corrode and cause cracking and spalling or embedment of ARDEX BRX 60 LO Low Output Anodes to slow the corrosion rate. ARDEX can advise on other treatments that may be requried.

Install the ARDEX BRX 60 LO Anode
When the area is prepared and clean, find appropriated locations close to the bars with an anode distribution described in the table. Anodes should be located close to the edges of the repair for incipient anodes and midway between bars to be protected for corrosion control.

Place and fasten the anodes securely on the steel bars so electrical contact will not be lost during the repair mortar application or concrete casting. Build the patch repair in such a way that the anode surface is fully in contact with the patch repair material. 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 good adhesion with the paste for sound electrolytic continuity between the anode and the concrete structure.

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

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.

Patch the concrete
Finish the application by patching the concrete with a suitable ARDEX Repair Mortar (see respective Technical Datasheet for installation). Before applying the mortar, saturate the surface with clean water. Substrate should be saturated but surface dry (SSD) 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.

REPAIR SYSTEM
The typical system is that associated with cathodic prevention. In this system, the loose and fragmented concrete is removed and the area broken open to remove contaminated concrete around and along the reinforcement where corrosion is occurring. The reinforcement is then fully encapsulated with a coating of ARDEX BR 10 ZP Zinc-rich Primer to insulate the bar. The ARDEX BRX 60 LO Anodes are then inserted around the repair area to provide protection to the incipient anode areas.

The ARDEX system can also be applied to patch areas where

impressed current or sacrificial anode cathodic protection is being applied. In these cases the anode system is designed to fully protect all the embedded corroding reinforcement and so only loose concrete is removed. Sound contaminated concrete from behind/along the reinforcement does not need to be removed. ARDEX BR 10 ZP Zinc-rich Primer may be applied to the reinforcement to reduce the area over which the anode has to work but commonly this is not required.

Corrosion control is a half-way house between cathodic prevention and cathodic protection. Corroding reinforcement is protected but not to the same level as with cathodic protection. This slows the corrosion rate, sometimes to an insignificant level, but is not intended to stop corrosion.

Where corrosion control anodes are used in slots cut into the concrete, they can be doubled-up back-to-back using a cement grout at their interface and with the galvanized tags linked. In this approach the anodes can be connected in a string that is ultimately connected at each end to the rebar rather than connecting each anode to the rebar.

HOW ANODES WORK

Corrosion of reinforcement is an oxidizing process involving the reaction:

$$Fe \rightarrow Fe^{2}+ + 2e$$

A neutral iron atom loses 2 electrons and becomes a positively charged ion – this is the basis of steel corrosion. When zinc is connected to the reinforcement and both are in contact with the concrete (the elecrolyte) electrons flow from the zinc to the reinforcment:

$$Zn \rightarrow Zn^{2}+ + 2e$$

This eliminates the steel's tendency to loose electrons and transfers the corrosion process from the steel to the zinc. However, in this case, the zinc corrosion products are non-expansive so do not cause spalling.

DEFINITIONS

Cathodic Prevention

Application of a low current density to increase the chloride corrosion threshold for uncorroded steel such as incipient anodes (halos).

Corrosion Control

Application of moderate current density to significantly reduce the corrosion rate of corroding bars; e.g. bars not fully encapsulated by a repair.

Cathodic Protection

Application of sufficient current density to polarise corroding reinforcement such that corrosion is stopped.

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