

## durAnode4 vertical



The durAnode4 vertical is the result of constant development of cathodic protection and is designed to be mounted in the soffit of structures and contains some unique features.

All exposed parts are made of titanium to ensure high durability, and can be completely hidden. Thus it can also be used in historic buildings to protect steel girders and places

where weight and dimension of structures are important, such as car parks or other types of bridges. It may also be used for hot spot protection which can reduce the costs without reducing the protection levels.

It consists of a titanium anode head and an active anode of MMO coated titanium.



*The black interference fit plug has a hole in it through which the grout is injected with a syringe. The clear plastic pipe allows the air to escape and leave a vacuum holding the grout until it cures.*

### Important features of the anode head

- By using a built-in resistor an adjustable and optimal current output and distribution can be established.
- This resistor, combined with a relatively small sized anode area, prevents major differences in current output, and allows a higher average current density than for a system with large anodes and no pre-resistor.
- The pre-resistor prevents short circuit of all anodes on a string in case of one single short circuit, and offsets the output in concrete at varying conductivity and this reduces the number of zones.
- Several durAnodes may be connected on a single feeder wire reducing the installation work by using a screw of Titanium that penetrates the insulation and makes a connection to the feeder wire. This means that the wire should not be stripped but just placed in the anode head.



### Specification for titanium anode head

Nominal head diameter	8 mm
Nominal head length	38 mm (others can be provided)
Composition	ASTM B348 grade 2 titanium
Description	Threaded internal in the upper end for the penetrating screw. Stub designed for welding to MMO coated perforated tube

### Specification for insulation

Composition	PVDF
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### Specification for resistor

Length determined	100 Ohm, 220 Ohm, 510 Ohm 1000 Ohm or 2000 Ohm
Type	Ceramic 0.4 W
Resistance	Various as specified, 0.25 %

### Specification for temperature compensator

Type	Bronze helicoil
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### Specification for penetrating pin

Composition	ASTM B348 grade 2 titanium
Size	5.5 mm threaded
Torque	To be inserted in head with factory set torque screwdriver

### Specification for black interference fit plug

Material	LDPE (low density polyethylene)
Diameter	26 mm with sealing fins included
Breathing tube	Clear PVC 2.5 mm diameter
Syringe injection point	5 mm diameter

### Further Information

Peter Vagn Nygaard: Phone. +45 42 62 71 44 / E-mail: pvn@force.dk.

### Important features of the active anode

- The active anode may be made in any length from 100 mm to several metres, and is micromesh folded to form an  $\varnothing$ 7-8 mm tube.
- By using the micromesh, the electrical conductance between the primary anode and the grout is improved compared to a massive rod. Also as there is mortar on the inside of the tube the amount of buffering capacity of the grout is effectively doubled.



### Specification for active anode

Nominal tube diameter	8 mm, tolerance $\pm$ 1mm
Standard lengths	100 mm to 550 mm (others can be provided), tolerance $\pm$ 2% of length
Composition	ASTM B265-08B grade 1 titanium
Coating composition	Mixed Metal Oxide (MMO)
Resistance	0.22 ohm per linear meter
Operating voltage	In theory the operating voltage of titanium in chloride contaminated concrete is approx 10V. In practice the max. voltage is 5-6V.

### Design life

From Lida® De Nora literature (DNOx CP Lida® 10-07) which gives a maximum current rating of 110 mA/m<sup>2</sup> for anode surface area (equivalent to approx. 5.3 mA per m of ribbon length).

From Lida® literature life expectancy of the anode is greater than 100 years at 110mA/m<sup>2</sup>. At 450mA/m<sup>2</sup> life expectancy is greater than 25 years.

### Current output

FORCE Technology recommends a maximum short time current density of 450mA/m<sup>2</sup> and 5V maximum voltage. This maximum output equates to 2.4 mA per 100 mm of active length. FORCE Technology has a specially formulated grout with very good flow ability and shrinkage properties and this is used as part of the durAnode system. It should be noted that the current output of the anode is strongly affected by the resistance of the concrete and the maximum voltage of 5V often limits the anode output.