corrosion analysis

Corrosion Analysis Instruments

All concrete structures are subject to aggressive influences which cause degradation over time. Especially susceptible are marine structures and buildings such as car parks or bridges where chlorides from de-icing salts penetrate through the concrete cover to corrode the reinforcing steel. The cost of replacing this infrastructure is prohibitive. Preemptive maintenance costs can be drastically reduced if problem areas are identified at an early stage through the use of non-destructive test methods such as potential and resistivity mapping combined with cover depth measurements.

Resipod / Resipod Bulk Resistivity

Resipod is a fully integrated 4-point Wenner probe designed to measure the surface resistivity of concrete in a completely non-destructive test. It is the most accurate instrument available, extremely fast and stable and packaged in a robust waterproof housing designed to operate in a demanding site environment. The Resipod Bulk Resistivity model, provides in addition the capability to carry out bulk resistivity measurements on concrete cylinders as a quality control check.

Canin+

The Canin+ is an instrument for corrosion monitoring allowing rapid, comprehensive tests of the site and provides an assessment of locations where corrosion is likely to take place before the rust becomes visible. This corrosion monitoring allows the user to reduce the costs of corrective maintenance significantly.

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Application Overview

Quality Control Applications	Resipod	Bulk Resestivity	Canin+
Surface Resistivity Indication of Concrete's Ability to Resist Chloride Ion Penetration (AASHTO TP95-11)	●		
Bulk resistivity test (alternative to surface resistivity method)	●	●	
Site Applications			
Detailed Mapping of Corrosion Potentials			●
Concrete resistivity mapping	●	●	
Empirical Indication of corrosion rate	●	●	
Determination of concrete resistivity for cathodic protection systems and repairs	●	●	

Additional Corrosion related Instruments

Hygropin Moisture Meter

Excess moisture in concrete can be fatal to a floor covering installation. To prevent mildew and major damage, the flooring industry requires smart testing solutions to check surfaces for moisture prior to installing floor coverings or coatings.

The Hygropin provides the smallest available sensor on the market, minimising damage to the surface and reducing the installation efforts immensely. Due to the small air volume of the test sleeve, the humidity equilibrium process is extremely fast.

Profoscope Rebar Detector

Cover depth measurements are a necessary complement to potential and resistivity mapping. The Profoscope is used to accurately determine the location of rebars and their cover depth beneath the surface. It can also assess the rebar diameter.

The Profoscope+ has all the features of the classic Profoscope. In addition, the instrument can record measurement data, manually or automatically. This increases testing efficiency on the construction site.

resipod

Resipod

Durability of new structures can be improved by rigorous quality control of the concrete's resistance to chloride ingress. The surface resistivity test has now established itself as a simpler and faster alternative to the more laborious rapid chloride permeability test.
For assessment of existing structures, resistivity mapping complements the half cell potential mapping as it has been proven that there is a direct link between concrete resistivity and the likelihood of corrosion and the corrosion rate.

Unmatched Features

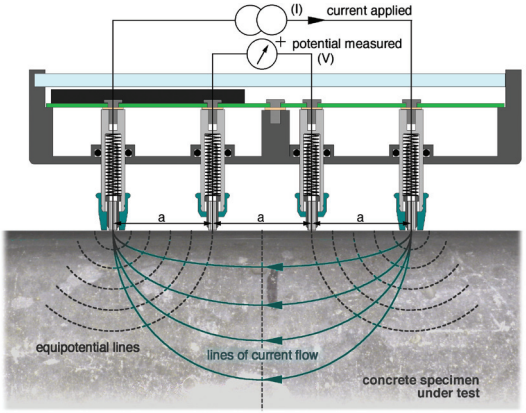
Despite being extremely simple to use, Resipod provides a variety of features that are unique in a concrete surface resistivity instrument.

- Wide measuring range (0 to ca. 1000 kΩcm)
- Fast and accurate delivery of measuring results
- Highest resolution available for a surface resistivity instrument
- Meets the AASHTO standard (38 mm, 1.5” probe spacing)
- Current flow indication and poor contact indication
- USB connection and dedicated PC software
- Designed to float (waterproof according to IPX7)

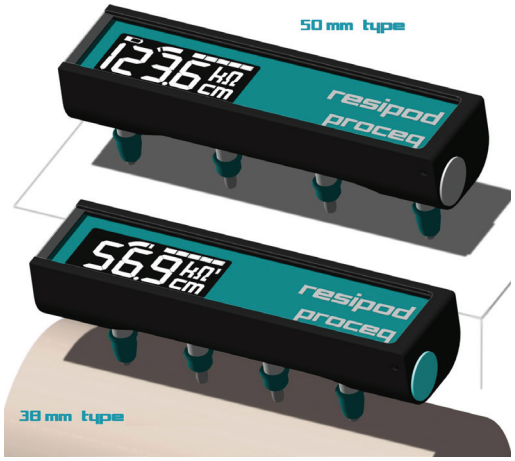
The Measurement Principle

Operating on the principle of the Wenner probe, the Resipod is designed to measure the electrical resistivity of concrete or rock. A current is applied to the two outer probes, and the potential difference is measured between the two inner probes. The current is carried by ions in the pore liquid. The calculated resistivity depends on the spacing of the probes.

Resistivity $\rho = 2\pi aV/I$ [kΩcm]



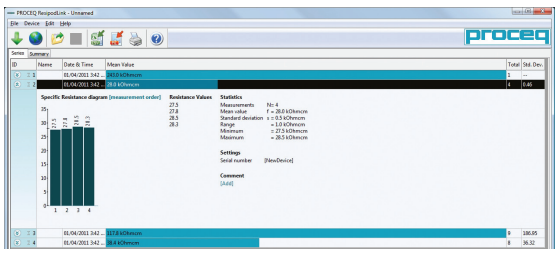
Resipod Models and Probe Spacing



A wider probe spacing provides a more consistent reading when measuring on an inhomogeneous material like concrete. However, if the spacing is too wide, there is more danger of the measurement being affected by the reinforcement steel. The industry standard 50 mm probe spacing has long been seen as a good compromise.

The 38 mm (1.5”) model is designed specifically to comply with the AASHTO TP 95-11 standard for “Surface Resistivity Indication of Concrete’s Ability to Resist Chloride Ion Penetration”.

ResipodLink Software



The collected measurement values can then be analyzed comfortably with the Resipod Link PC tool.

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... more than 50 years of know-how you can measure!

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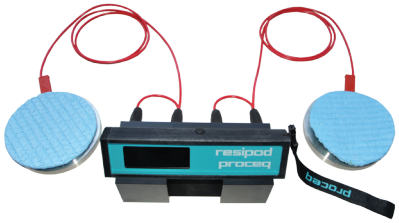
bulk resistivity

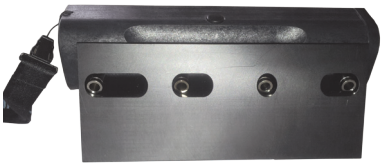
Resipod Bulk Resistivity

The bulk resistivity test is an alternative method to the surface resistivity test for quality control of standard 4" x 8" concrete cylinders. Resipod Bulk Resistivity provides all of the standard Resipod functionality and in addition comes supplied with the necessary accessories for carrying out the bulk resistivity test, including a stand for convenient measuring.



Bulk resistivity set

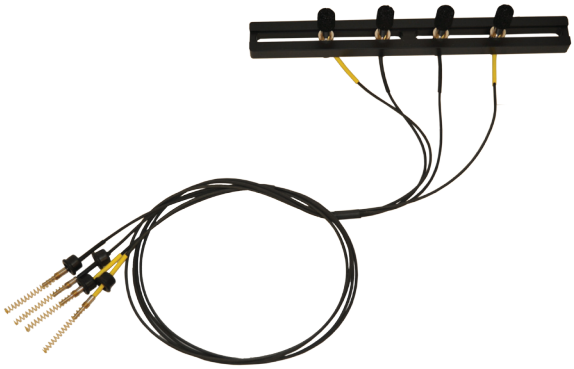
38 mm Resipod in stand



50 mm Resipod in stand

Accessory: Extension Cable Set

The extension cable set allows the user to vary the space between the probes. This is particularly useful when measuring on concrete mixes with large aggregates, as the probe spacing should exceed the maximum aggregate size. The desired probe spacing can be set using the ResipodLink software and communicated to the Resipod. This sets the necessary correction value to the calculated resistivity. The holder provided with the set allows for probe spacing up to 85mm. The Resipod software allows for larger spacing.



Technical Information Resipod

Range	0.1 – ca. 1000 kΩcm (depending on probe spacing)
Resolution (nominal current 200µA)	±0.2 kΩcm or ±1% (whichever is greater)
Resolution (nominal current 50µA)	±0.3 kΩcm or ±2% (whichever is greater)
Resolution (nominal current <50µA)	±2 kΩcm or ±5% (whichever is greater)
Frequency	40 Hz
Memory	Non volatile, ca. 500 measured values
Power Supply	>50 hours autonomy
Charger connection	USB type B, (5V, 100mA)
Dimensions	197 x 53 x 69.7 mm (7.8 x 2.1 x 2.7 inch)
Weight	318 g (11.2 oz)
Operating temperature	0° to 50°C (32° to 122°F)
Storage temperature	-10° to 70°C (14° to 158°F)

Ordering Information

Units	**Description**
381 10 000	Resipod, 50mm probe spacing, test strip, foam contact pads, charger with USB-cable, software, carrying strap, documentation and case.
381 20 000	Resipod, 38mm (1.5”) probe spacing, test strip, foam contact pads, charger with USB-cable, software, carrying strap, documentation and case.
381 30 000	Resipod Bulk Resistivity, 50mm probe spacing, test strip, foam contact pads, charger with USB-cable, software, carrying strap, documentation and case, Bulk Resistivity Set.
381 40 000	Resipod Bulk Resistivity, 38mm (1.5”) probe spacing, test strip, foam contact pads, charger with USB-cable, software, carrying strap, documentation and case, Bulk Resistivity Set.
Parts and Accessories	
381 01 088	Bulk Resistivity Accessory
381 01 050	Extension cable set
381 01 043S	Set of replacement foam contact pads (20 pieces)
381 01 038	Test strip
381 01 014	USB cover
391 80 110	Carrying strap
341 80 112	USB charger, global

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Corrosion of Rebars in Concrete

Accurate field potential measurements aid in detecting corrosion in rebars. Corrosion of steel in concrete is an electrochemical process. A potential field can be measured on the concrete surface by the use of an electrode, known as a half-cell and a high-impedance voltmeter. The Canin+ Corrosion Analyzing Instrument highlights corrosion activity before rust becomes visible. Early detection is a key factor in preventing an unanticipated structural failure.

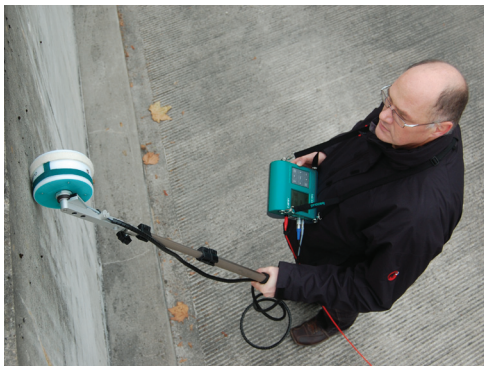
Application

In contrast to spot checks of carbonation depth and chloride penetration, the Canin+ system with the new Wheel Electrode allows a rapid, comprehensive test of the site and provides a fast assessment of locations where corrosion is likely to take place. Detailed analysis of the data is made easy with the Canin ProVista software. The new Wheel Electrodes (1 and 4-wheel versions) allow very fast measurements of large areas.

The right Probe for the Application

With its comprehensive selection of probes, the Canin+ system is ideally suited both for localized checks and also for the rapid scanning of large sites where access time is limited. Canin+ is ideally suited for assessment of corrosion potentials on large areas of 8,000 m² (83,000 sq.ft.) or multiples thereof, depending on the individual selectable grid size. 235,000 values can be stored in the indicating device. Up to 240 measurement values are displayed at a time in easy-to-read grey-scale allowing an on-site plausibility check of the readings. The display with backlight allows the user to work on sites with low visibility, e.g. underground car-parks.

Standard Copper / Copper Sulphate Rod Electrode for localized measurements

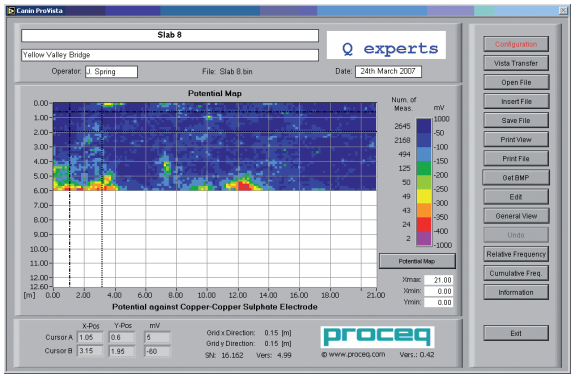


1-Wheel Electrode for fast scanning of large areas

4-Wheel Electrode for maximum measurement speed on large areas

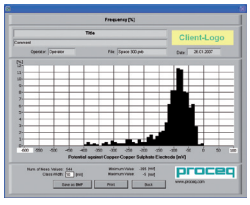
Canin ProVista

The Windows based software Canin ProVista makes it possible to download, present and edit data measured by the Canin+ in a fast and easy way using any PC. The program generates a potential map, a relative frequency and a cumulative frequency diagram and provides a chipping graph. This statistical presentation is the basis for an efficient interpretation of the half-cell potentials by the corrosion engineer.

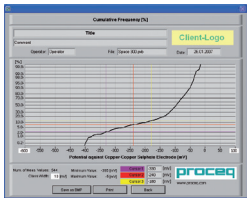


Potential Map

ProVista allows you to rotate and mirror files. Single potential maps can be combined to form a complete graph, representing the total investigated area. These features support the generation of measurement reports. Data can be easily exported to third party software.



Frequency Curve



Cumulative Frequency Curve

Technical Information Canin+

General	
Temperature range:	0° to 60°C
Display:	128 x 128 pixel graphic LCD with backlight
Impedance:	10 MΩ
Memory:	Non-volatile memory for simultaneous storage of up to 235'000 potential measurements (980 pages @ 240 measurements each organised in up to 71 objects)
Data Output:	RS 232 interface, with USB adapter
Battery Operation:	Six LR 6 batteries, 1.5 V for up to:
	- 60 hours (or 30 hours with activated backlight) during potential measurement
	- 40 hours (or 20 hours with activated backlight) during resistivity measurement
Case Dimensions:	580 x 480 x 210 mm (22.8" x 18.9" x 8.3")
Potential Measurement	
Measurement range:	-999 mV to +340 mV
Resolution:	1mV
Data Transfer:	CANIN ProVista software for downloading data and evaluation on PC

Ordering Information

Part No.	Description
330 00 201	**Canin+ Configuration with Rod Electrode** **Basic equipment** Indicating device Canin+, carrying strap, protection sleeve for indicating device, transfer cable, USB-serial adapter, operating instructions, carrying case Canin+ **Rod Electrode accessories** Rod electrode with spare parts, electrode cable 1.5 m (4.9 ft.), cable coil 25 m (82 ft.), Canin ProVista PC software on memory stick, bottle with copper sulphate 250 g
330 00 205	**Canin+ Configuration with Rod and Wheel Electrodes** **Basic equipment** (see item 330 00 201) with Rod Electrode accessories (see item 330 00 201) **Wheel Electrode accessories** 1-Wheel Electrode system, tool kit to wheel electrode system, bottle with citric acid 250 g

Accessories

330 01 004	**Canin+ 4-Wheel Electrode system,** 4-electrode cable, bottle with copper sulphate 250 g, bottle with citric acid 250 g, carrying case for the 4-Wheel system

330 01 001	Canin+ 1-Wheel Electrode
330 00 259	Canin+ Rod Electrode
330 00 286	Cable coil, l=25 m (82 ft), with clamp
330 00 322	Telescopic extension for Rod Electrode, with 3 m cable for CANIN+
330 00 320	Felt hoop for Wheel Electrode
330 00 285	Copper sulphate 250 g
330 00 290	Citric acid 250 g

Standard warranty
• Electronic indicating unit: 24 months • Mechanical & electromechanical parts: 6 months
Extended warranty
When acquiring a Canin+ unit, max. 3 additional warranty years can be purchased (for the electronic indicating unit). The additional warranty must be requested at time of purchase or within 90 days of purchase.

Standards & Guidelines applied

BS 1881, Part 201 (1986); UNI 10174 (1993)
ASTM C876-91 (1999)
DGZfP B3 (2008); SIA 2006 (1993)
RILEM TC 154-EMC (2003)

Warranty Information

Proceq is committed to providing complete support for the Canin+ by means of our global service and support facilities. Furthermore, each Canin+ Electronic indicating unit is backed by the standard Proceq 2-year warranty and extended warranty options.

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