



Smart Concrete  
Testing Technologies™

## Wireless Temperature and Strength Sensor for Concrete

**SmartRock™ is a rugged, mobile-based wireless sensor that is fully embedded in fresh concrete to monitor its in-place temperature and strength during construction.**

### How to use SmartRock™ in 3 Easy Steps

1. Install Sensor<sup>1</sup>
2. Pour Concrete
3. Obtain Sensor Data

### Overview

SmartRock is the most widely used wireless concrete sensor in the world, helping construction companies build structures faster, safely, and more efficiently. These user-friendly sensors are easily installed in the concrete formwork (on the rebar) before pouring to monitor in-situ temperature and maturity according to ASTM C1074. The wire-free logger continuously records the measured temperature of any concrete pour in real-time. These results are then downloaded and analyzed automatically onsite (to determine the in-place concrete strength) using the free SmartRock app (available for both Android/iOS mobile devices).

### Applications

- Formwork removal timing
- Post-tensioning
- Optimizing curing conditions
- Saw cutting
- Controlling quality in the field
- Monitoring temperature gradients in mass concrete
- Opening roads to traffic

*"The SmartRock has been a good investment in that it's extremely user friendly, convenient, and saves us time. I especially love that it's wireless because now we don't have to go looking under blankets to find sensors or worry about making a physical connection. This alone saves us an hour every time we record temperature."*

Allan Hayes

Construction Quality Manager at Regional Rail Partners



## Features

### Hardware

- Wire-free and wireless technology
- Rugged and waterproof design
- Easy installation and activation by tying the wires together
- Extended temperature sensor cable for mass concrete
- Long battery life
- Patents pending

### Software

- Real-time data display (e.g. temperature, strength, max-min values, and graphs)
- Maturity calibration database
- Free Android and iOS apps for smartphones and tablets
- Project management tools including live data sharing
- Full PDF reporting and CSV data exporting
- Giatec 360 Cloud Dashboard (user/data management, predictive analytics, and more!)
- Integration with project management applications (e.g. Procore)



## Technical Specifications

<b>Reading Range</b>	-30 to 80 °C (-22 to +176 °F)
<b>Accuracy</b>	± 1°C
<b>Measurement Frequency</b>	Once every 15 mins (for 2 month of data)
<b>Wireless Signal Range</b>	Up to 8 meters (26 feet)
<b>Dimensions</b>	38 x 38 x 12 mm (1.5 x 1.5 x 0.5 inches)
<b>Temperature Cable Length</b>	40cm (16 inches)/ 3m (10 feet)
<b>Battery Life</b>	Up to 4 months after installation
<b>Data Communication and Analysis</b>	Android and iOS app Giatec 360 Cloud Dashboard
<b>Standards</b>	ASTM C1074 (Approved by ACI 318, CSA A23.1, most of USDOT specifications)



Wire-Free Wireless Technology



Free Android and iOS App



Easy Activation and Installation



Cloud Dashboard

<sup>1</sup> The SmartRock sensor should be installed at a max depth of 5cm (2 in) from the surface.  
The temperature/maturity sensor can be embedded as deep as 3m (10 ft) in the concrete.



# SmartRock™ Plus



Empower contractors, know your concrete, win more business

## What is SmartRock Plus?

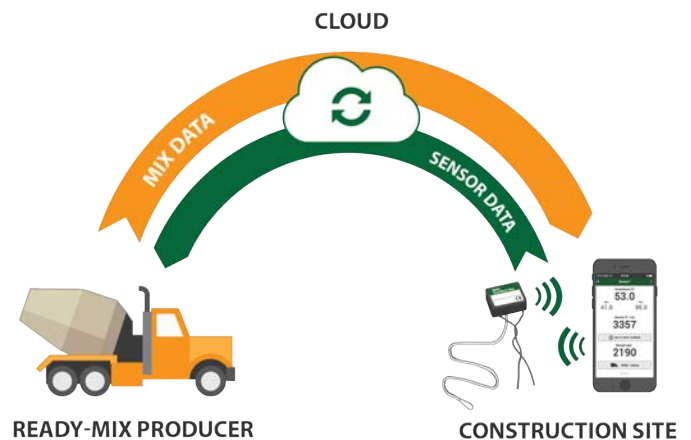
SmartRock Plus is a value-added solution offered by high-quality ready-mix producers that enables their contractors to see real-time concrete temperature and strength data. Conventionally, contractors are left to their own devices when monitoring the quality and curing conditions of their concrete. With SmartRock Plus, producers can simplify this process for contractors and gain valuable data on their concrete in return. Concrete mixes from producers can be upsold as Smart™ mixes to their clients. Contractors then install the fully embedded wireless sensors and use the SmartRock Plus application to connect to the sensor. Once connected, real-time data can be obtained on the job site, which allows producers to also monitor results remotely.

## Drive Profit

At Giatec's suggested retail price, producers can sell the sensors at a competitive price, while still maintaining profit. Alternatively, Giatec partners can upsell their concrete per cubic yard, as Smart™ mixes, depending on the state of their local market.

## SmartRock™ Plus Enables Producers to Achieve:

- Brand differentiation in local market
- Stronger customer loyalty
- Performance analytics and visibility on all mixes and projects
- Market share expansion



Be A Tech Leader



Eliminate Low Breaks



Enhance Customer Success



Remote Jobsite Monitoring

## Benefit to Contractors

Producers simply need to calibrate each mix for strength using the maturity method (ASTM C1074) and upload the data to the SmartRock Plus cloud. Contractors then select their producer in the mobile app to view the list of mixes available to them, which are continuously maintained by the producer. Once a mix is selected and the sensors are installed, contractors automatically obtain concrete temperature and strength information. This real-time data helps contractors optimize critical operations, such as; formwork removal, post-tensioning, and opening roads to traffic, etc.





*"Stoneway has successfully offered SmartRock Plus to construction companies in Seattle working on high-rise structures and concrete pavements. Contractors immediately see the value as they can obtain real-time strength information on the jobsite through this novel mobile-based technology."*

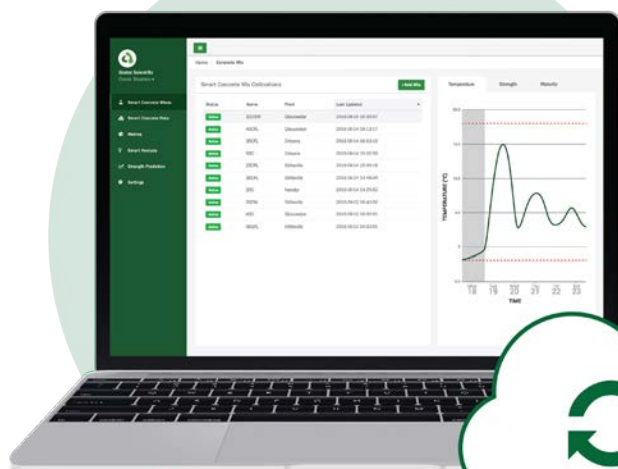
Greg McKinnon  
Operations Manager - Stoneway Concrete

## Jobsite Mix Performance

SmartRock Plus, as an IoT solution in the concrete industry, combines wireless sensors with mobile and cloud-based applications to make field data available for ready-mix producers. This data can be used to analyze jobsite and concrete mix performance.

In addition, ready-mix producers will benefit from:

- Online access to jobsite data
- Project-based mix performance results
- Field data to reduce cement usage
- Control of their concrete testing procedures
- Mix calibration submittals



## Some of our SmartRock Plus Partners





## Wireless Temperature and Humidity Sensor for Concrete

**BlueRock™ is a rugged waterproof sensor for wireless monitoring of relative humidity and temperature in concrete from fresh stage to hardened stage.**

### Overview

BlueRock™ can be placed in the concrete at the pouring time to monitor the temperature and relative humidity of concrete in situ. The continuous measurements are recorded on the BlueRock™ memory and can be downloaded at any time during the concrete setting and hardening using BlueRock™ mobile app on smartphone or tablet.

The continuous monitoring of concrete relative humidity and temperature can be used as a QC/QA method. By knowing the level of humidity in the concrete, flooring companies can optimize the timing of floor covering installation (such as resilient flooring, epoxy coating, or wood) based on the type of concrete materials used. Unlike the current destructive and time-consuming methods that measure only one data point at the testing time and require drilling a hole in concrete, BlueRock™ offers an embedded wireless solution for continuous measurement and accurate monitoring of internal humidity variations in concrete over time.

### Applications

- Drying level in concrete floors
- Effectiveness of curing conditions
- Optimization of flooring installation
- Water penetration in concrete
- Monitoring of humidity gradients



## Features

### Software

- Real-time data display (e.g. humidity and temperature)
- Free Android and iOS apps for smartphones and tablets
- Interactive plotting of data
- Easy data organization among different embedded sensors
- Full report generation in .csv or.pdf format

### Hardware

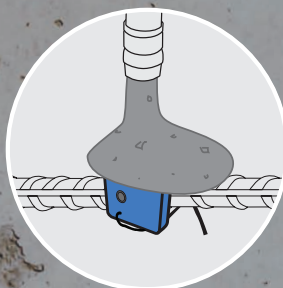
- Wireless technology
- Rugged and waterproof design
- Continuous measurement and recording of humidity and temperature with customizable data recording frequency.
- Memory capable of recording up to 2500 data points
- Easy installation and activation by tying the wires together
- Long battery life (up to 2 years after installation)<sup>3</sup>
- Patents pending

## How to use BlueRock™ in 3 easy steps

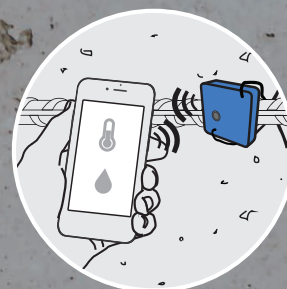
### 1. Install Sensor\*



### 2. Pour Concrete



### 3. Read Sensor



## Technical Specifications

	Reading Range	Accuracy <sup>1</sup>
Temperature	-30°C to 60°C (-22°F to 140°F)	± 1°C (± 1.8°F)
Relative Humidity <sup>2</sup>	0 to 100%	20% - 80%, ±2% <20% or >80%, ±3% Hysteresis ±1%

<sup>1</sup> Accuracies are tested at Outgoing Quality Control at 25°C and 3.0V. Values exclude hysteresis and long-term drift and are applicable to non-condensing environments only.

\* Sensors should be installed within 5cm (2 inches) below the surface of concrete

Wireless Signal Range	up to 8 meters* (26 feet)
Dimensions	39 x 39 x 20 mm (1.5 x 1.5 x 0.7 inches)
Battery Life	up to 2 years
Data Communication and Analysis	Free Android and iOS app

<sup>2</sup> Normal operating range: 0 to 80% RH, beyond this limit the sensor may read a reversible offset with slow kinetics (+ 3% RH after 60h at humidity > 80% RH)

<sup>3</sup> Operating at room temperature with periodical connections to the sensor



## Wireless Sensor for Concrete Resistivity and Temperature

**SmartBox™ is a compact wireless device for the measurement and monitoring of electrical resistance and temperature in fresh concrete.**

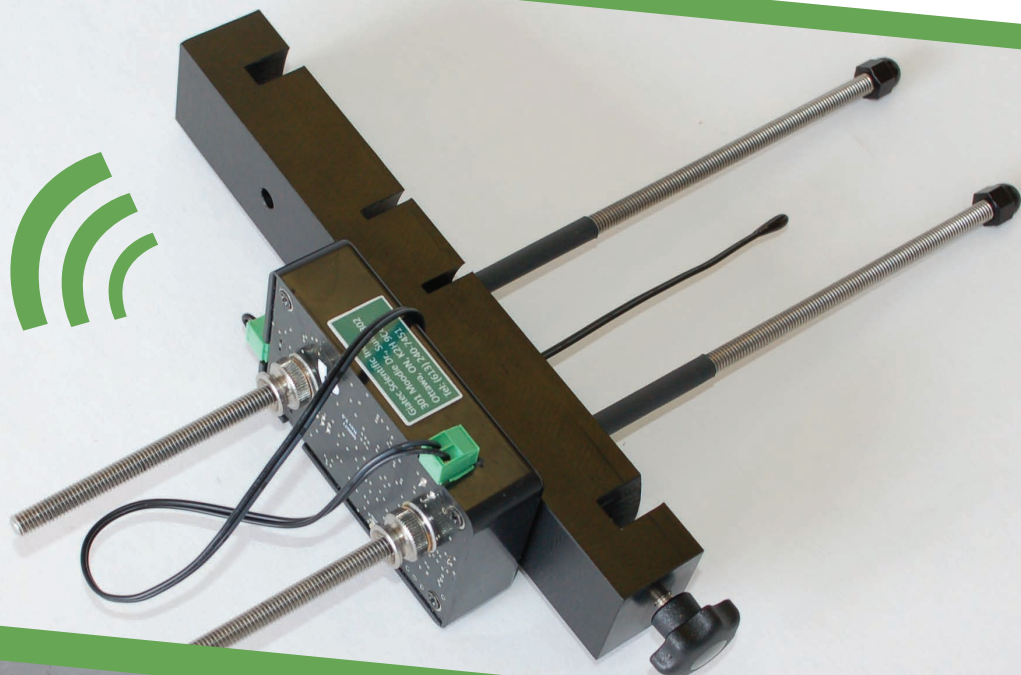
### Overview

The electrical resistivity of fresh concrete has been shown to provide a good indication on the water content as well as setting and hardening of concrete. SmartBox™ provides an efficient tool for various research studies in these areas.

The continuous measurements are recorded on the SmartBox™ and can be downloaded using the mobile application on Android smartphone or tablet.

### Application

- Water content in fresh concrete
- Prediction of setting time
- Setting time measurement
- Crack detection in concrete







## Features

### The SmartBox™ device features:

- Wireless technology
- Compact design
- Simultaneous measurement of electrical resistance and temperature
- Optimized frequency for fresh concrete
- Long battery life (up to 3 months)
- Mobile application for Android smartphone and tablet
- Easy data sharing
- Patent pending



## Technical Specifications

### General

Reading Range	Measurement Frequency	Accuracy	Measurement Time
1 - 3000 $\Omega$	10 KHz	$\pm 2\%$	<1s

### Operating Conditions

Type	Value
Operating Temperature	-20 ~ 45°C (-4 - 113°F)
Operating Humidity	10 ~ 90%
Battery Charger Specification	Input: 100-240Vac (50-60Hz)/ Output: 5Vdc (500mA)
Dimensions of SmartBox™ Unit	88 x 55 x 22mm (3.5 x 2.2 x 0.9 inches)
Data Communication and Analysis	Free Android app

## The Most Advanced Wireless Rebar Corrosion Rate Measurement Device

iCOR® is a novel, compact, and comprehensive NDT tool for detailed corrosion evaluation of reinforced concrete structures WITHOUT the need for an electrical connection to rebar.

### Overview

iCOR® utilizes wireless technology to transmit data to a tablet, where data can be stored, analyzed, and visualized. Moreover, the tablet app offers a powerful post-processing tool and an easy way to share the results with other team members. iCOR® can significantly save time, human resources, and cost, and increase reliability in the condition assessment of concrete structures.

### Applications

- Detection of corrosion in the reinforcement
- Measurement of corrosion rate in concrete structures
- Measurement of in-situ electrical resistivity of concrete minimizing the effect of rebar
- Measurement of corrosion potential of rebar (ASTM C876)
- Assessment of concrete durability on site
- Rehabilitation and repair of concrete structures

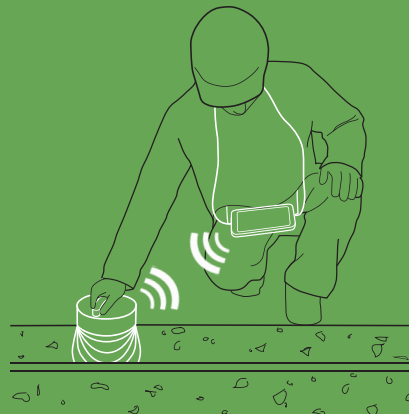
### Features

- **Fast:** measurements within seconds
- **Real-time:** contour mapping of corrosion rate, electrical resistivity and corrosion potential
- **Directional:** corrosion measurement in two perpendicular directions (i.e. horizontal or vertical rebar)
- **Accurate:** comparable results to laboratory techniques
- **Non-destructive:** for use on existing structures
- **Easy-to-use:** requires minimum training
- **Non-subjective:** algorithm-based interpretations
- **Efficient:** detect initial signs of corrosion
- **Cost effective:** multiple parameters in a single measurement for durability assessment



## Patented Technology

iCOR® benefits from the patented CEpra technology that makes it possible to estimate the corrosion rate of rebar through a non-invasive approach. This means that the need for connecting the device to the rebar (which is the case for other commercial devices) is eliminated in iCOR®. This makes iCOR® the most convenient corrosion rate measurement device in the field as well as offering an innovative research tool for laboratory studies.



Giatec iCOR®



Other Commercial Devices

*"This is my first experience performing corrosion detection and I am very happy with the iCOR. All the results obtained from the iCOR have shown consistent results compared with other non destructive testing methods. The application is very user-friendly providing me very clear and useful information on-site which allowed me to perform time effective measurements."*



Milad Moghaddas  
Project Coordinator/  
Engineer, QuakeWrap Inc.

## Technical Specifications

Testing Time	3 to 30 seconds
Corrosion Rate Range	0 to 500 $\mu\text{m}$ / year
Corrosion Potential Range	-800 to +200 mV / CSE
Electrical Resistivity Range	0 to 10,000 $\Omega \cdot \text{m}$
Operating Temperature	0 ~ 45 °C (32 to 113 °F)
Operating Humidity	20 ~ 90% RH
Dimensions	184 x 116.5 mm (DxH)
Weight	1kg
Data Communication and Analysis	Android App



Real-time



Fast



Accurate



Easy-to-use



## Half-Cell Potential Corrosion Mapping

### XCell™ offers the most convenient tool for half-cell corrosion mapping of reinforced concrete structures.

Relationship between the potential values (CSE) and corrosion probability

Measured Potential (mV)	Probability of Steel Corrosion Activity
>- 200mV	Less than 10%
-200 mV to -350mV	Uncertain
<-350 mV	More than 90%

### Overview

XCell™ is a novel tablet/smartphone-based NDT device for fast, accurate, and efficient detection and in-situ analysis of corrosion in reinforced concrete structures based on ASTM C876. XCell™ benefits from an advanced wirelessly-enabled maintenance-free sensor that measures the corrosion potential and sends it wirelessly to a tablet for generating half-cell contour plots (i.e., corrosion maps) in real-time. The results can easily be shared with team members or the engineering office. Giatec XCell™ significantly reduces the labor cost associated with the data collection and subsequent contour plot generation and reporting.

### Applications

XCell™ can be used for efficient and accurate corrosion mapping according to the ASTM C876, "Standard Test Method for Half-Cell Potentials of Uncoated Reinforcing Steel in Concrete." The results are analyzed using the Android-based application onsite for the identification of locations with high probability of corrosion. The output includes an equipotential contour map for the examined area. The measured potential values are indicative of corrosion probability. The contour plots are color coded for more clarity.



## FEATURES

- Single-person operation device
- Maintenance-free electrode
- Tablet/smartphone operation device
- Easy grid generation (on tablet or smartphone)
- Fast data assignment to grid points
- Real-time contour plotting
- Automated temperature correction
- Easy data sharing
- Wireless technology
- Verification kit



## Technical Specifications

### General

Type	Value
Voltage Measurement Range	$\pm 1000$ mV
Measurement Resolution	0.1 mV
Sampling Rate	1s
Input Impedance	>10M ohm
Temperature Measurement Range	0 ~ 50°C (32 - 122°F)
Temperature Measurement Accuracy	0.5°C (0.9°F)
Data Communication and Analysis	Android App
Probe Weight	250 gr

### Operating Conditions

Type	Value
Operating Temperature	0 ~ 45°C (32 ~ 113°F)
Operating Humidity	20 ~ 90%
Storage Humidity	5 ~ 90%
Dimensions of XCell™ Probe	32mm x 260mm (DxL)



## Surface Electrical Resistivity of Concrete

**Surf™ offers the fastest and most accurate technology for the measurement of surface resistivity.**

### Applications

- Performance-based quality control of concrete
- Estimation of chloride diffusion coefficient of concrete
- Service life design of concrete structures
- Estimation of the remaining life of concrete structures
- Crack detection in concrete elements under load
- Monitoring the setting time in fresh concrete

### Overview

Surf™ is a laboratory test device for rapid, easy, and accurate measurement of the surface electrical resistivity of concrete based on the four-probe (Wenner-Array) technique according to AASHTO TP 95-11, and ASTM. Surf™ has a unique and customized setup, which enables the measurement of electrical resistivity with high accuracy by reducing the duration of test and minimizing the ambient effects.

The patented technology automatically measures resistivity around the concrete specimen using four channels of 4-probe array (located at 90° from each other). The PC software generates the required reports according to the standard specifications. The measurements can be used to estimate the resistance to the penetration of chloride ions in concrete. The qualitative relation between rapid chloride penetrability test, RCPT (ASTM C1202), and the surface electrical resistivity of concrete is presented.

Relationship between surface resistivity and chloride penetrability

Chloride Penetration	56-Day Rapid Chloride Permeability Charge Passed as per ASTM C1202 (Coulombs)	Surface Resistivity @ 23°C/ 73°F (k $\Omega$ cm)
High	>4000	<10
Moderate	2000-4000	10-15
Low	1000-2000	15-25
Very Low	100-1000	25-200
Negligible	<100	>200



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## Features

- Patented technology
- Fully compliant with both AASHTO TP95 and the upcoming ASTM standard
- Fast measurement (8 measurements < 15s)
- Four-channel surface resistivity meter
- Variable frequency (13 - 100 Hz)
- Limiting moisture loss
- Automatic report generation with PC software
- Fresh concrete testing/crack detection applications
- Optional hand-held probe option

## Technical Specifications

### General

Type	Value
Measurement Channels	4
Measurement Display on LCD	Yes
LCD Display Area	65x33mm
Dimensions of Device	200x160x70mm
Software	Surf™ Data Monitor

### Operating Conditions

Type	Value
Operating Temperature	15°C - 45°C (59 - 113°F)
Operating Humidity	20% - 80%
Storage Temperature	-20°C - 70°C (-4 - 158°F)
Operating Voltage/Current	100-240 V, 50/60Hz

### Measurement Time

Frequency	Single Measurement Time	Testing Time (8 measurements)
13 - 100 Hz	1.5 seconds	<15 seconds

### Reading Range and Accuracy

Reading Range	Frequency Range	Accuracy
0.1 - 100 KΩ cm	13-100 Hz	± (0.1+1%)
100 - 1000 KΩ cm	13-100 Hz	± (1+1%)

## Concrete Electrical Resistivity Meter

**RCON2™ employs AC impedance technique for the accurate and fast readings that can be continuously obtained using its customizable and user-friendly operating software for various concrete materials.**

### Overview

RCON2™ is an advanced tool for the bulk electrical resistivity measurement of concrete. RCON2™ employs an AC impedance measurement for accurate and fast readings that can be continuously obtained using its customizable and user-friendly operating software for various concrete materials. The electrical resistivity of concrete can be simply related to their pore network characteristics such as pore size and their connectivity, moisture content in the pores, and pore solution chemistry. In concrete materials, the electrical resistivity is correlated with important durability parameters such as permeability and diffusivity.

### Applications

In addition, this non-destructive test can be easily conducted on fresh or hardened concrete specimens at different ages or various stages of hydration in order to study workability, setting, and durability performance of concrete. The electrical resistivity method has also been applied to investigate corrosion of rebar in concrete, creep, aggregate segregation, and freeze and thaw of concrete since they affect the pore network properties.



### Features

- Fast (<5 Second)
- Accurate ( $\pm 2\%$ )
- AC measurement (Galvanostatic)
- Wide range of measurement frequencies (1Hz to 30kHz)
- Phase detection (0-180 degree)
- Stand-alone operation
- Continuous measurement
- User-friendly PC software
- Flexible sample holders
- Customizable setup
- USB connection to computer



Continuous  
measurement



Phase detection  
(0-180 degree)

## Technical Specifications

### Reading Range and Accuracy

Reading Range	Frequency Spectrum	Phase Measurement	Impedance Accuracy	Phase Accuracy
1-100 $\Omega$	1Hz – 30KHz	0-180°	$\pm 2\%$	5%
0.1-1K $\Omega$			$\pm 2$ digit	$\pm 3$ digit
1-10K $\Omega$				
10-100K $\Omega$				
0.1 – 1M $\Omega$	1Hz – 10KHz			

### Operating Conditions

Type	Value
Operating Temperature	15°C - 45°C (59 - 113°F)
Operating Humidity	20% - 80%
Storage Temperature	-20°C - 70°C (-4 - 158°F)
Storage Humidity	5% - 90%
Operating Voltage/ Current	100 – 240V, 50/60Hz
Dimensions	200 x 230 x 70mm
Data Acquisition Software (PC software)	Yes

### Measurement Time

Frequency	Sampling Time	Reading Time (minimum)
1Hz – 4Hz	5 seconds	10 seconds
5Hz – 30KHz	1 second	2 seconds

*"The RCON device is an amazing tool for the concrete arena. We have successfully used the RCON on a wide variety of projects. It's ease of use coupled with dating relating to permeability helps us determine the appropriateness of concrete mixtures and the impact of the constituents."*



Dr. Jon Belkowitz  
Intelligent Concrete.



## Rapid Chloride Permeability of Concrete

**Perma2™ is a laboratory test device for the measurement of the resistance of concrete against the penetration of chloride (RCPT) according to ASTM C1202, AASHTO T277, and ASTM C1760 standards.**

### Overview

The measurement data can be used to estimate the chloride diffusion coefficient of concrete for the service life prediction and durability-based design of concrete structures as well as the durability-based quality control of concrete.

### Applications

The ASTM C1202 test provides an indication of concrete resistance to the penetration of chloride. The correlations between test results (charged passed) and the long-term chloride penetrability of concrete established by ASTM C1202 are presented in Table 1.

The ASTM C1760 test provides an estimation for the bulk electrical conductivity of saturated specimens of hardened concrete. The results reveal a rapid indication (i.e., in one minute) of the concrete's resistance to the penetration of chloride by diffusion. The results of this test method can be also related to the apparent chloride diffusion coefficient that is determined using ASTM C1556 test method.



### Features

- Stand-alone operation
- Easy assembly
- Auto-sealable cells with rubber gasket and spacer (i.e. does not require caulking)
- Accurate ( $\pm 0.1$  mA)
- Flexible logging interval time (1 to 10 min)
- Automatic temperature control system
- Four measurement channels
- User-friendly PC software
- Customizable setup
- USB connection to computer
- Verification kit



Stand Alone Operation



Automatic temperature control system



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## Applications

- Concrete's ability to resist chloride ion penetration (ASTM C1202, AASHTO T277)
- Bulk electrical conductivity of concrete (ASTM C1760)
- Performance-based quality control of concrete
- Estimation of chloride diffusion coefficient of concrete
- Estimation of chloride migration coefficient of concrete
- Service life design of concrete structures
- Estimation of the remaining life of concrete structures

## Compliance

- Perma2™ device meets the specifications of ASTM and AASHTO standard for sample cell
- The only RCPT device that has CSA electrical safety certification mark for use in concrete laboratories

**Table 1:** Chloride ion penetrability based on charge passes (ASTM C1202)

Chloride Penetration	56-Day Rapid Chloride Permeability Charge Passes as per ASTM C1202 (Coulombs)
High	>4000
Moderate	2000-4000
Low	1000-2000
Very Low	100-1000
Negligible	<100