nanoCorr™ Coupled Multielectrode Sensor (CMS)

Analyzers and Probes

Metal Samples in association with Corr Instruments now offers nanoCorrTM coupled multielectrode sensor (CMS) analyzers and probesfor real-time and online localized corrosion monitoring and electrochemical studies.

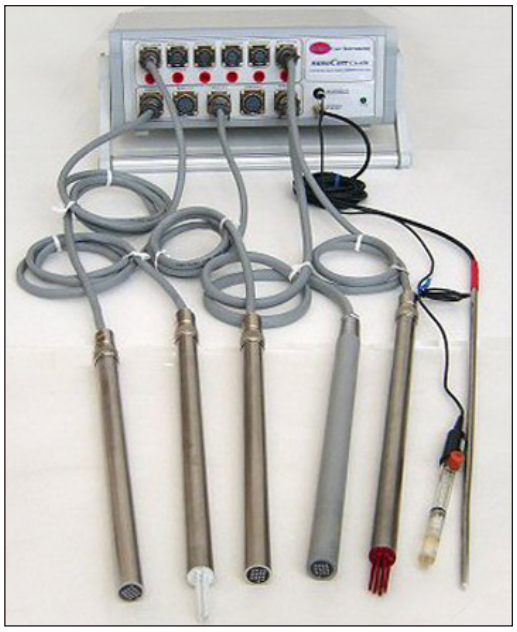
Used with CorrVisualTM software, a wide range of multielectrode probes, and innovative seals, QueonTM, the nanoCorrTM analyzer makes the online and real-time monitoring of localized corrosion and most types of general corrosions quick, easy and reliable in liquids, soils, concrete, and humid gases under normal temperature and pressure or high-temperature and high-pressure conditions. Our nanoCorrTM analyzers were developed on the basis of the coupled multielectrode array sensor technology patented by a major international research organization, and backed by several other U.S. and international pending patents. They are highly sensitive and reliable for all types of non-uniform corrosions including localized corrosions. They are also the only type of corrosion instruments in the world that have ever been claimed to be quantitative for monitoring localized corrosion below mill-per-year or micron-per-year levels.

Principle of Coupled Multielectrode Sensor Analyzers

When a metal undergoes non-uniform corrosion, particularly localized corrosion such as pitting corrosion or crevice corrosion, electrons are released from the anodic sites where the metal corrodes and travel to the cathodic sites where the metal corrodes less or does not corrode. In a coupled multielectrode sensor, there are multiple miniature electrodes made of materials identical to the engineering component of interest. Statistically, some of the electrodes have the properties that are close to the anodic sites and others have the properties that are close to the cathodic sites of the corroding metal.

When the miniature electrodes are electrically isolated from each other but coupled together by connecting each of them to a common joint through an external circuit, the electrodes that have the properties close to the anodic sites simulate the anodic areas, and the electrodes that have the properties close to the cathodic sites simulate the cathodic areas of the corroding metal. The electrons released from the anodic electrodes are forced to flow through the external circuit to the cathodic electrodes. Thus there are anodic currents flowing into the more corroding electrodes and cathodic current flowing out of the less corroding or non-corroding electrodes. The resulting electrical currents are measured and the localized or non-uniform corrosion rates are determined by nanoCorrTM analyzers.

nanoCorr™ Analyzers



Specifications for nanoCorr™ CMS Analyzers and Corrosion Monitoring System:

- Number of independent probes for simultaneous measurements: up to 12
- Number of electrodes on each probe: up to 100
- Number of pH or ORP electrodes: up to 3 (S-Models only)
- Number of channels to receive analog signals from other meters such as humidity, pressure or flow pressure transducers: up to 3 (S-Models only)
- Corrosion current accuracy: <10 pA depending on noise of environments
- Corrosion rate accuracy: <10 nm/year or ~4x10-4 mil/ year for typical applications
- Number of channels for probe potentials or corrosion potentials: up to 12
- Temperature channel: 1
- RS-232 (with up to 50' cable) or RS-485 (with up to 4000' cable) connection between the corro sion analyzer and a computer.
- Dimensions (H x W x D): 120 mm x 350 mm x 260 mm.
- Typical weight: 12 lb (5.5 kg).
- Operating environment: 0 to 50oC.
- Power supply: 120 V ± 10% or 120V/220 V±10%; 45 to 65 Hz frequency.
- Maximum sampling rate: <30 seconds for a 50-electrode-probe.

* Specifications may be changed at manufacturers discretion without notice or at customer's request.

Model S-50: Measures real-time corrosion rates, corrosion potentials, temperature and other parameters simultaneously from four independent Coupled Multielectrode probes, three pH or three ORP probes, or three other transducers for parameters such as conductivity, humidity, flow, and pressure.

Model A-18: Measures up to 18 electrodes of one to two independent probes. Has three standard military connectors for different combina- tions of probes, an additional one channel for temperature, and two channels for the corrosion potentials of probes.

Model S-18: In addition to the features of A-18, Model S-18 also measures up to three pH or three ORP probes, or three other transducers for parameters such as conductivity, humidity, flow, and pressure.

Model A-36: Measures up to 36 electrodes of one to four independent probes. Has six standard military connectors for different combinations of probes, an additional one channel for temperature, and four channels for the corrosion potentials of probes.

Model S-36: In addition to the features of A-36, Model S-36 also measures up to three pH or three ORP probes, or three other transducers for parameters such as conductivity, humidity, flow, and pressure.

Model A-50: Measures up to 50 electrodes of one to six independent probes. Has eleven standard military connectors for different combinations of probes, an additional one channel for temperature, and six channels for the corrosion potentials of probes.

PittingCorr Model M-16: These analyzers are the economical version of the Coupled Multielectrode Sensor (CMS) Analyzers. Measures up to 16 electrodes of one probe. Has one standard military connector for corrosion probe, one channel for temperature probe (thermocouple), and one channel for the corrosion potential of the probe (reference electrode). Corrosion rate: 1 µm/yr to 1 cm/yr (0.04 to 400 mil/yr).

Coupled Multielectrode Sensor Probes

CMS probes are made from user-specified sensing materials, including carbon steels, stainless steels, and nickel-, aluminum-, and copper-based alloys. They can also be made from customer supplied materials that have the same microstructure/heat treatment as the system component materials to be monitored.

The size of the sensing electrode varies from 0.1 to 3 mm (0.004” to 0.12”) in diameter, depending on the application. Typical numbers of electrodes in a CMS probe are 9, 16 or 25 for online corrosion monitoring and vary from 8 to 100 for laboratory corrosion and electrochemical studies. Other sizes and numbers of electrodes are available.

CMS Probes with Flush Mounted Electrodes

Typical Applications:

Quantitative Corrosion Monitoring and Electrochemical Studies for:

- Pitting corrosion
- Inhibitor evaluation
- Cathodic/anodic protection
- Crevice corrosion
- General corrosion (most types)

in the following environments:

- Aqueous solution
- Humid gases
- Soil
- Oil-water mixture

CMS Probes with Exposed Electrodes

Typical Applications:

Quantitative Corrosion Monitoring of:

- Pitting corrosion
- Cathodic/anodic protection effectiveness
- Coating evaluation
- Crevice corrosion
- General corrosion (most types)

in the following environments:

- Aqueous solution
- Soil
- Oil-water mixture
- Under coating

Exposed electrodes increase the sensing signal for an extremely low corrosion rate and reduce the effect of crevice between the electrodes and the insulation materials. An exposed electrode can be painted with coatings and be used for undercoating corrosion monitoring.

CMS Probes for High Temperatures and High Pressures

Typical Applications:

Quantitative or Qualitative Corrosion Monitoring of:

- Pitting corrosion
- Crevice corrosion
- General corrosion (most types)

in the following environments:

- Super critical water systems
- Steam generators
- High pressure pipelines
- High temprature and/or high pressure reactors
- Furnaces
- Fireside of boilers
- Flue gas stacks

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