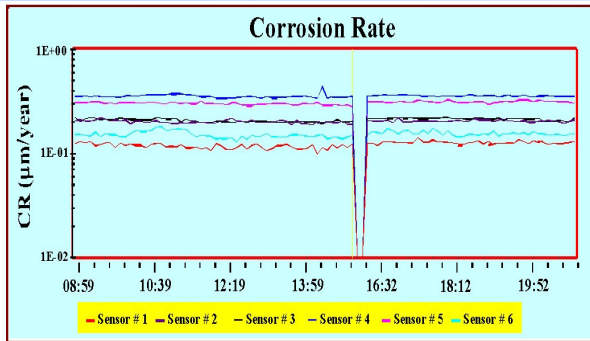
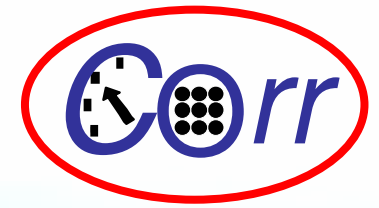


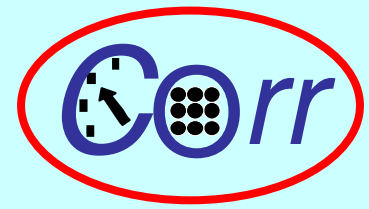
# Coupled Multielectrode Sensor (CMS) Analyzers Probes and Software for Online and Real-time Monitoring of Localized and General Corrosions



## Corr Instruments

San Antonio, Texas , USA Phone: 210 748-4073 Fax: 210 696-1126  
[www.corrinstruments.com](http://www.corrinstruments.com) [info@corrinstruments.com](mailto:info@corrinstruments.com)

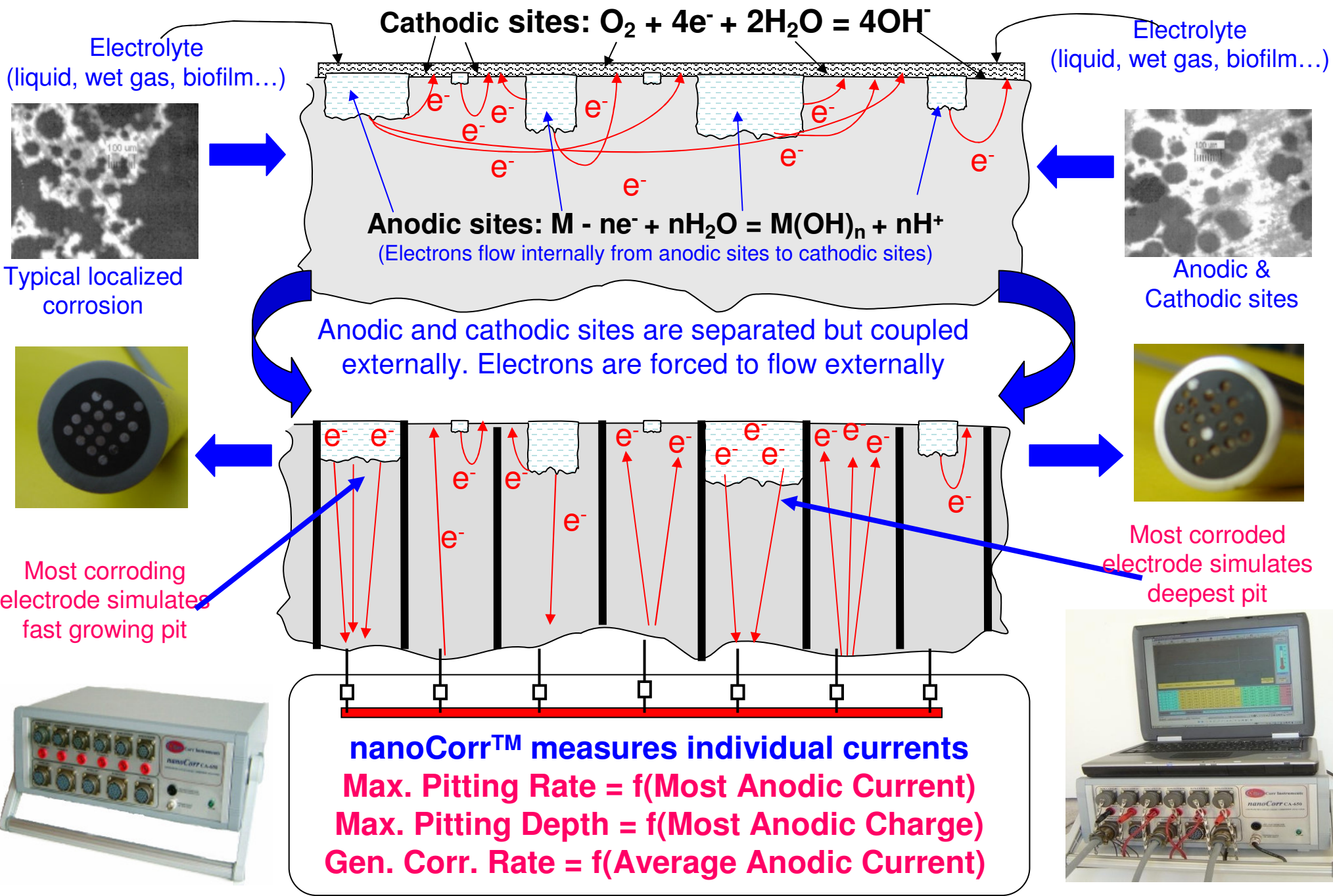
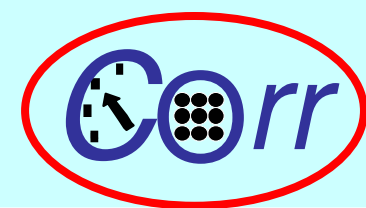
# General Features of CMS Analyzer



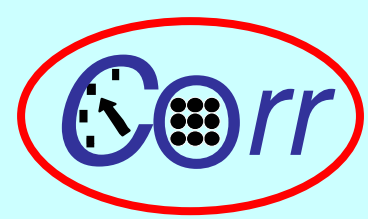
**The nanoCorr™ Coupled Multielectrode Sensor (CMS) Analyzers are the world's first compact commercial CMS instruments for online and real-time corrosion monitoring. The nanoCorr™ CMS Analyzers are highly sensitive and reliable, with a precision of a few nanometers/year or  $4 \times 10^{-4}$  mil/year for localized corrosion rates.**

**The CMS technology measures the flow of electrons from corroding electrodes to one or more cathodes. The multiple electrodes in a CMS probe simulate the anodic macro-cells or the active pitting or crevice corrosion sites on a corroding metal. This technology is especially suitable for localized corrosions and most types of general corrosions. Thanks to the CMS technology, nanoCorr™ Analyzers have made possible the online monitoring of localized corrosions and data interpretations by ordinary laboratory testers and field operators. The user-friendly analyzers provide real-time and easy-to-understand output signals, including the maximum penetration rate ( $\mu\text{m}/\text{year}$  or  $\text{mil}/\text{year}$ ) and the cumulative penetration depth ( $\mu\text{m}$  or  $\text{mil}$ ). These signals can be directly used to optimize corrosion control strategies.**

# Principle of Coupled Multielectrode Sensors and nanoCorr™ Analyzers for Localized and General Corrosion



# Applications of CMS Probes



In conjunction with our multielectrode probes and CorrVisual™ software, nanoCorr™ Analyzers can be used for online and real-time monitoring of pitting corrosion, crevice corrosion, and most types of general corrosion in:

- Aqueous solutions
- Humid gases
- Solid deposits
- Soil/Concrete
- Oil-Water Mixture
- Bio-films
- H<sub>2</sub>S Systems
- Cathodically protected systems

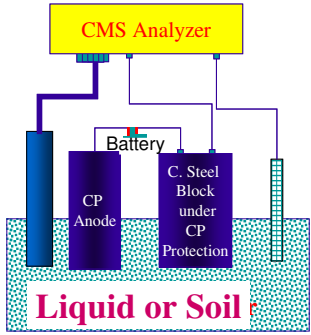
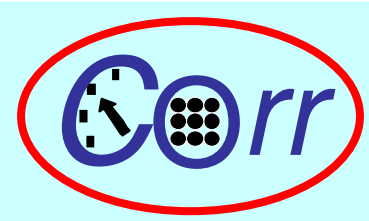
High-temperature [up to 1700 °F (950 °C)] and high-pressure [up to 3,000 psi (20 MPa)] systems such as:

- Super critical water systems
- Steam generators / nuclear reactors
- Furnaces
- Fireside components of boilers
- Flue gas systems

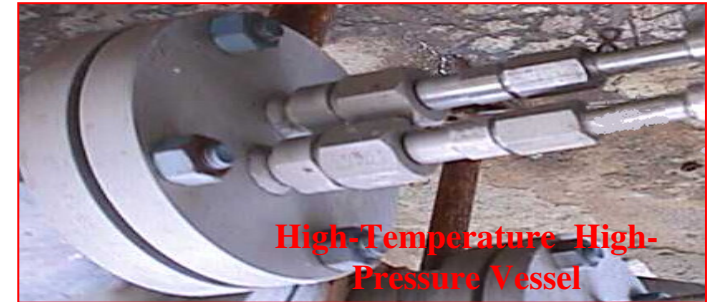
The analyzers can be used to evaluate or measure:

- Effectiveness of cathodic protections
- Corrosion inhibitors
- Coating qualities
- Crevice Corrosions
- Repassivation potentials/polarization curves for a large number of specimens

# Applications of nanoCorr Analyzers and CMS Probes in Liquids, Gases, Soil, Concrete or under Deposits



Cathodic Protection



Air or Wet Gas

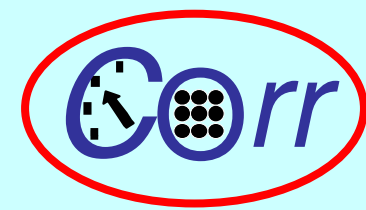
Probe

Probe

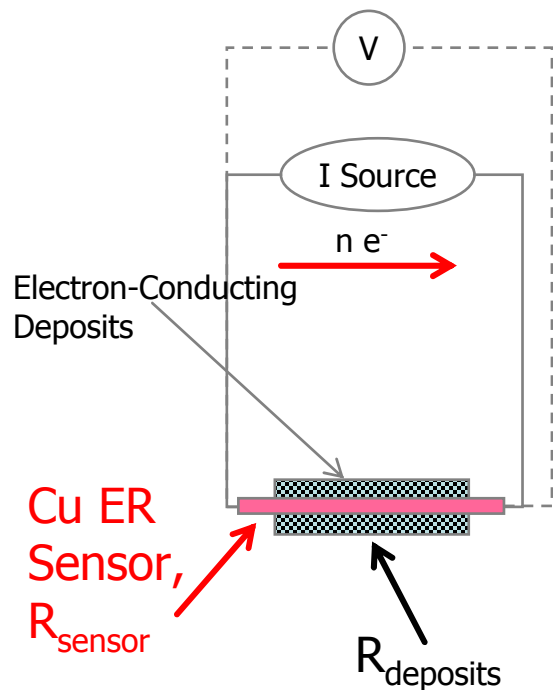
Oil and Water Mixture



# Effects of H<sub>2</sub>S on CMS Probes Can Be Avoided or Minimized by Using Smaller Coupling Resistors

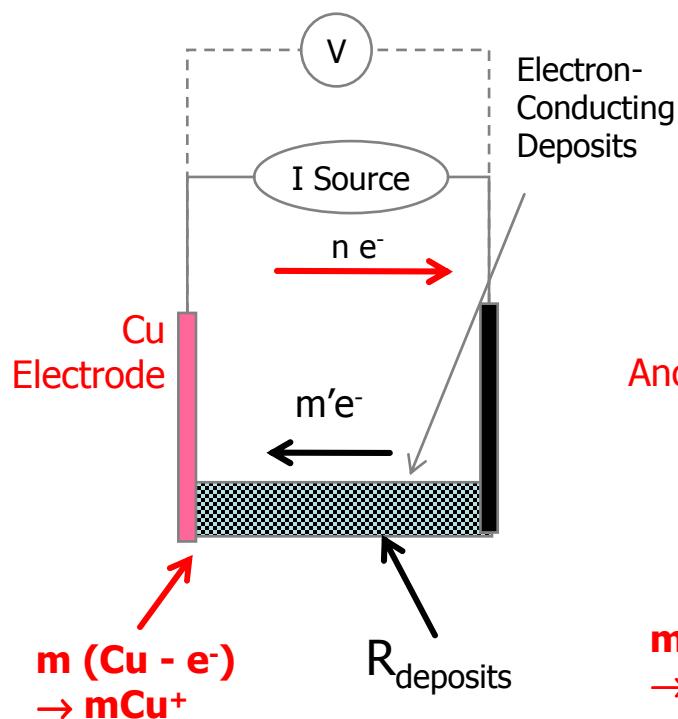


### ER Probe



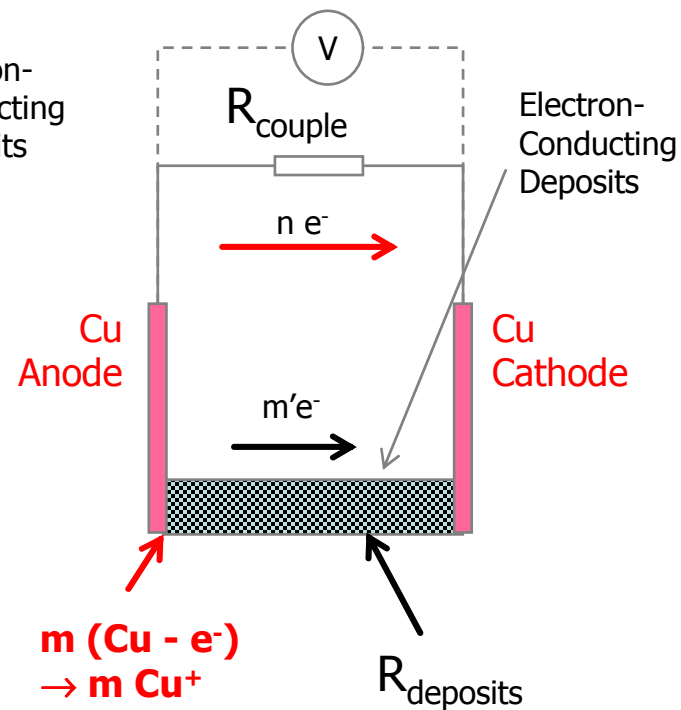
If  $R_{deposits}$  low,  
 $R(\text{measured}) < R(\text{sensor})$   
 Bridging Effect

### LPR Probe



$m + m' = n$   
 If  $R_{deposits}$  low,  
 $n(\text{measured rate}) > m(\text{true rate})$   
 Bridging Effect

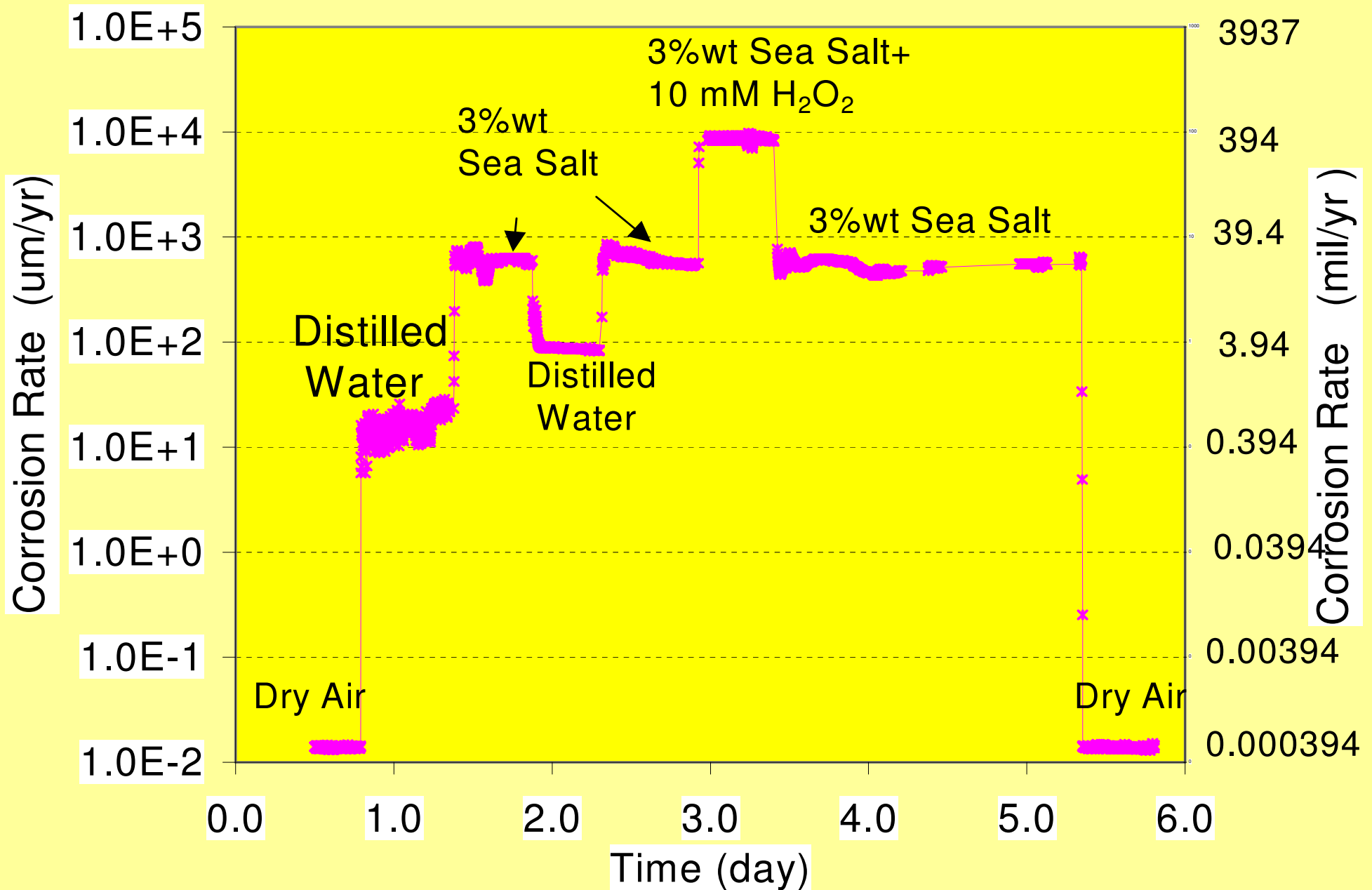
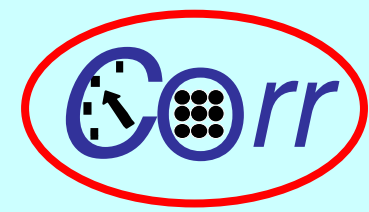
### CMAS Probe



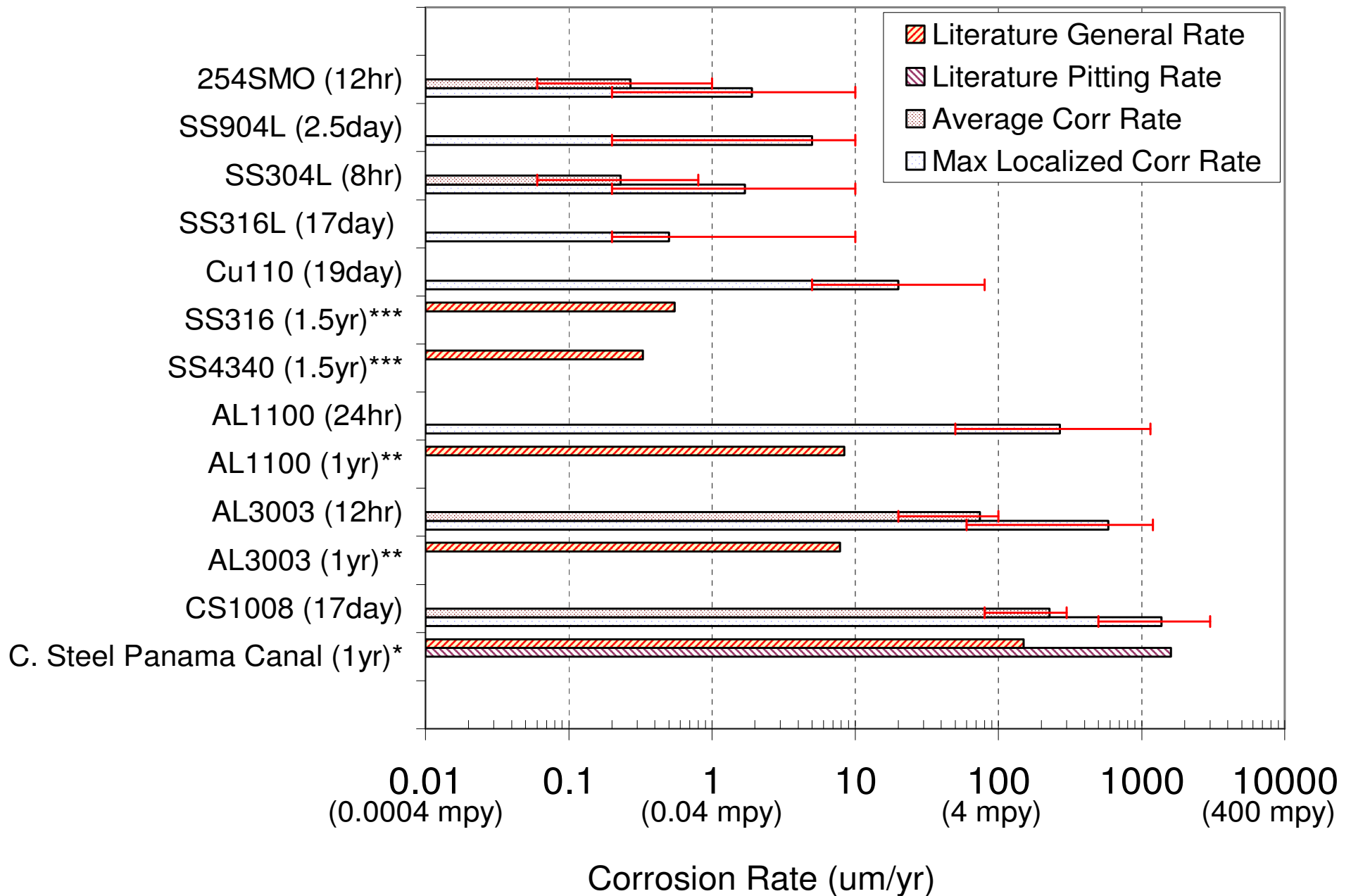
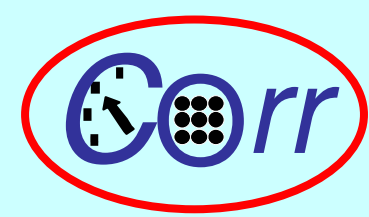
$m = n + m'$   
 If  $R_{couple} \ll R_{deposits}$   
 $n(\text{measured rate}) \rightarrow m(\text{true rate})$   
 No Bridging Effect

**Special Case: Effects of H<sub>2</sub>S Can Be Avoided**

# Probe Sensitivity and Responsiveness

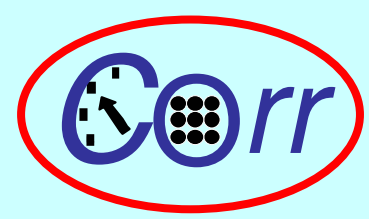


# Comparison of Localized and General Corrosion Rates from CMS Probes with Literature Data



\*—from Southwell and Alexander, 1970; \*\*—from Hollingsworth and Hunsicker, 1987; \*\*\*—from Pelensky, et.al 1976.

# More Information



**Download Publications, References  
and Example Applications from Our  
Web:**

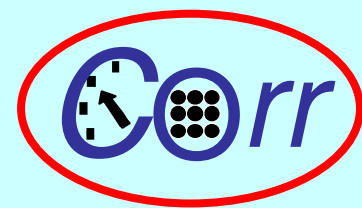
[http://www.corrinstruments.com/publications\\_downloads.html](http://www.corrinstruments.com/publications_downloads.html)

call: (210) 748-4073 or (210) 413-5875 or (210) 696-0067

**Email: [info@corrinstruments.com](mailto:info@corrinstruments.com)**



# Model A-50 nanoCorr™ Multielectrode Analyzers



## Specifications\*

### Sensitivity/ Range:

- 0.00002 to 25 mm/yr (0.0008 to 1000 mil/yr) for Pitting or General Corrosion Rate
- <10 pA ( $10^{-11}$  A) corrosion current; 0.1 pA resolution

### Number of independent probes for simultaneous measurements:

- Six 8-electrode or 9-electrode probes,
- Three 16-electrode probes,
- Two 25-electrode probes, or
- One 50-electrode probes

### Temperature and Reference probes:

- One channel temperature measurement
- One Reference electrode for corrosion potentials for all corrosion probe

### Communication :

- RS-232 (with up to 50' [15 m] cable) or RS-485 (with up to 4000' [1200 m] cable) connection between analyzer and a computer.
- 4-20 mA or 0 -5 V real time analog outputs for signals to plant DCS (optional)

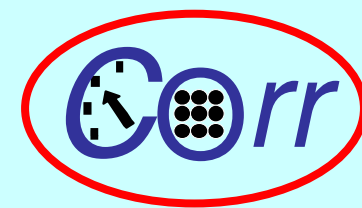
### Other Facts:

- Maximum sampling rate: <30 seconds for six 8-electrode probes
- 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 50°C
- Power supply: 120 V  $\pm$  10% or 120V/220 V $\pm$ 10%; 45 to 65 Hz frequency

\* Specifications may be changed without notice



# Model S-50 nanoCorr™ Multielectrode Analyzers



## Specifications\*

### Sensitivity/Range:

- 0.00002 to 25 mm/yr (0.0008 to 1000 mil/yr) for Pitting or General Corrosion Rate
- <10 pA ( $10^{-11}$  A) corrosion current; 0.1 pA resolution

### Number of independent probes for simultaneous measurements:

- Four 9-electrode probes,
- Three 16-electrode probes,
- Two 25-electrode probes, or
- One 50-electrode probes

### Temperature, pH, ORP, Reference Channels:

- One temperature probe
- One reference electrode for corrosion potentials of all corrosion probes
- Up to 3 pH, 3 ORP or 3 other DC signals

### Communication:

- RS-232 (with up to 50' [15 m] cable) or RS-485 (with up to 4000' [1200 m] cable) connection between analyzer and a computer.
- 4-20 mA or 0 -5 V real time analog outputs for signals to plant DCS (optional)

### Other Facts:

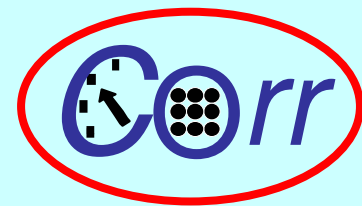
- Maximum sampling rate: <30 seconds for 6 of 8-electrode probes
- Dimensions (H x W x D): 120 mm x 350 mm x 260 mm
- Typical weight: 12 lb (5.5 kg)
- Operating environment: 0 to 50°C
- Power supply: 120 V  $\pm$  10% or 120V/220 V $\pm$ 10%; 45 to 65 Hz frequency



pH, ORP, Temp,  
Reference or Others

\* Specifications may be changed without notice

# Model S-36 nanoCorr™ Multielectrode Analyzers



## Specifications\*

### Sensitivity/Range:

- 0.00002 to 25 mm/yr (0.0008 to 1000 mil/yr) for Pitting or General Corrosion Rate
- <10 pA ( $10^{-11}$  A) corrosion current; 0.1 pA resolution

### Number of independent probes for simultaneous measurements:

- Four 9-electrode probes,
- Two 16-electrode probes,
- One 25-electrode probe, or
- One 36-electrode probe

### Temperature, pH, ORP, Reference Channels:

- One temperature probe
- One reference electrode for corrosion potentials of all corrosion probes
- Up to 3 pH or 3 ORP or 3 other DC signals

### Communication :

- RS-232 (with up to 50' [15 m] cable) or RS-485 (with up to 4000' [1200 m] cable) connection between analyzer and a computer.
- 4-20 mA or 0 -5 V real time analog outputs for signals to plant DCS (optional)

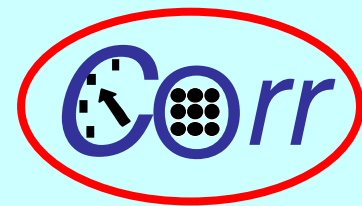
### Other Facts:

- Maximum sampling rate: <30 seconds for six 8-electrode probes
- 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 50°C
- Power supply: 120 V  $\pm$  10% or 120V/220 V $\pm$ 10%; 45 to 65 Hz frequency



\* Specifications may be changed without notice

# Model A-36 nanoCorr™ Multielectrode Analyzers



## Specifications\*

### Sensitivity/Range:

- 0.00002 to 25 mm/yr (0.0008 to 1000 mil/yr) for Pitting or General Corrosion Rate
- <10 pA ( $10^{-11}$  A) corrosion current; 0.1 pA resolution

### Number of independent probes for simultaneous measurements:

- Four 9-electrode probes,
- Two 16-electrode probes,
- One 25-electrode probes, or
- one 36-electrode probes



### Temperature and Reference probes:

- One channel temperature measurement
- One Reference electrode for corrosion potentials of all corrosion probes

### Communication :

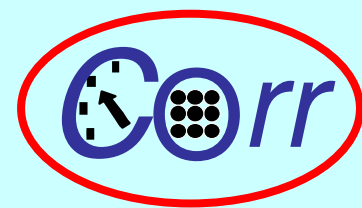
- RS-232 (with up to 50' [15 m] cable) or RS-485 (with up to 4000' [1200 m] cable) connection between analyzer and a computer.
- 4-20 mA or 0 -5 V real time analog outputs for signals to plant DCS (optional)

### Other Facts:

- Maximum sampling rate: <30 seconds for six 8-electrode probes
- 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 50°C
- Power supply: 120 V  $\pm$  10% or 120V/220 V $\pm$ 10%; 45 to 65 Hz frequency

\* Specifications may be changed without notice

# Model A-18 nanoCorr™ Multielectrode Analyzers



## Specifications\*

### Sensitivity/Range:

- 0.00002 to 25 mm/yr (0.0008 to 1000 mil/yr) for Pitting or General Corrosion Rate
- <10 pA ( $10^{-11}$  A) corrosion current; 0.1 pA resolution

### Number of independent probes for simultaneous measurements:

- Two 9-electrode probes or
- One 16-electrode probes

### Temperature and Reference probes:

- One channel temperature measurement
- One Reference electrode for corrosion potentials of all corrosion probe

### Communication :

- RS-232 (with up to 50' [15 m] cable) or RS-485 (with up to 4000' [1200 m] cable) connection between analyzer and a computer.
- 4-20 mA or 0 -5 V real time analog outputs for signals to plant DCS (optional)

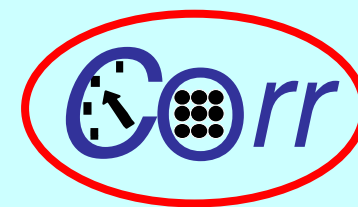
### Other Facts:

- Maximum sampling rate: <30 seconds for six 8-electrode probes
- 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 50°C
- Power supply: 120 V  $\pm$  10% or 120V/220 V $\pm$ 10%; 45 to 65 Hz frequency



\* Specifications may be changed without notice

# Model S-18 nanoCorr™ Multielectrode Analyzers



## Specifications\*

### Sensitivity/Range:

- 0.00002 to 25 mm/yr (0.0008 to 1000 mil/yr) for Pitting or General Corrosion Rate
- <10 pA ( $10^{-11}$  A) corrosion current; 0.1 pA resolution

### Number of independent probes for simultaneous measurements:

- Two 9-electrode probes or
- One 16-electrode probes

### Temperature, pH, ORP, Reference Channels:

- One temperature probe
- One reference electrode for corrosion potential of each corrosion probe ???
- Up to 3 pH or 3 ORP or 3 other DC signals

### Communication :

- RS-232 (with up to 50' [15 m] cable) or RS-485 (with up to 4000' [1200 m] cable) connection between analyzer and a computer.
- 4-20 mA or 0 -5 V real time analog outputs for signals to plant DCS (optional)

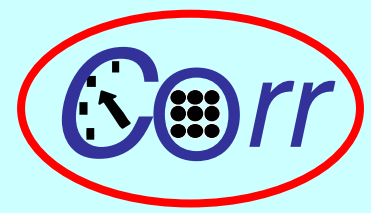
### Other Facts:

- Maximum sampling rate: <30 seconds for six 8-electrode probes
- 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 50°C
- Power supply: 120 V  $\pm$  10% or 120V/220 V $\pm$ 10%; 45 to 65 Hz frequency

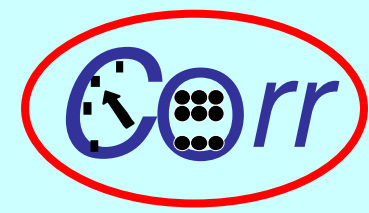


\* Specifications may be changed without notice

# Multielectrode Probes



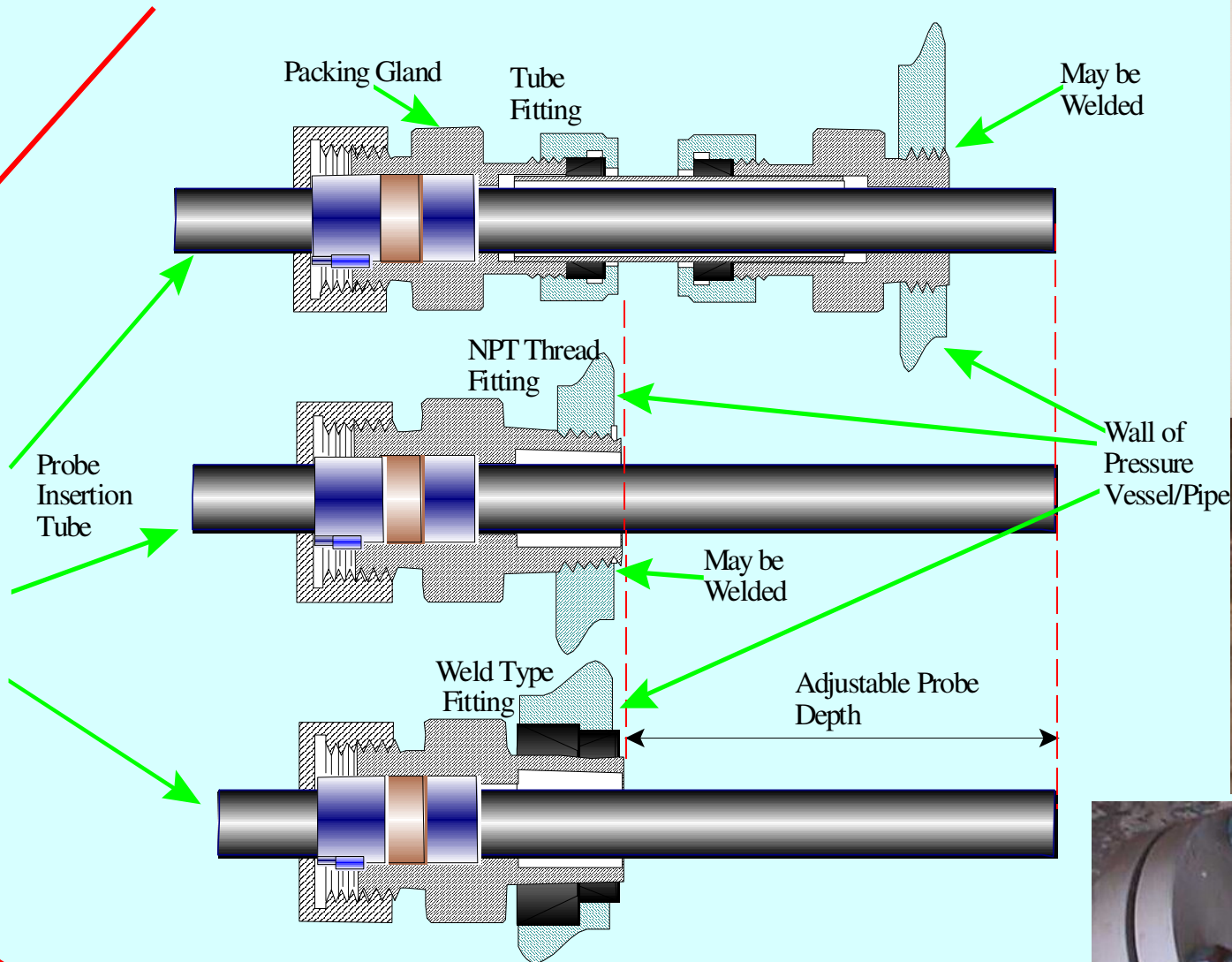
# Mounting Options of Depth-Adjustable Multielectrode Sensor Probes for High-Temperature and High-Pressure Applications



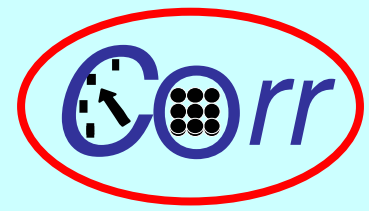
## High-Temperature and High-Pressure Probe Fitting



High-Temperature and High-Pressure Probe Insertion Tube



# Probes Selection Guide



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**Email:** [info@corrinstruments.com](mailto:info@corrinstruments.com)

