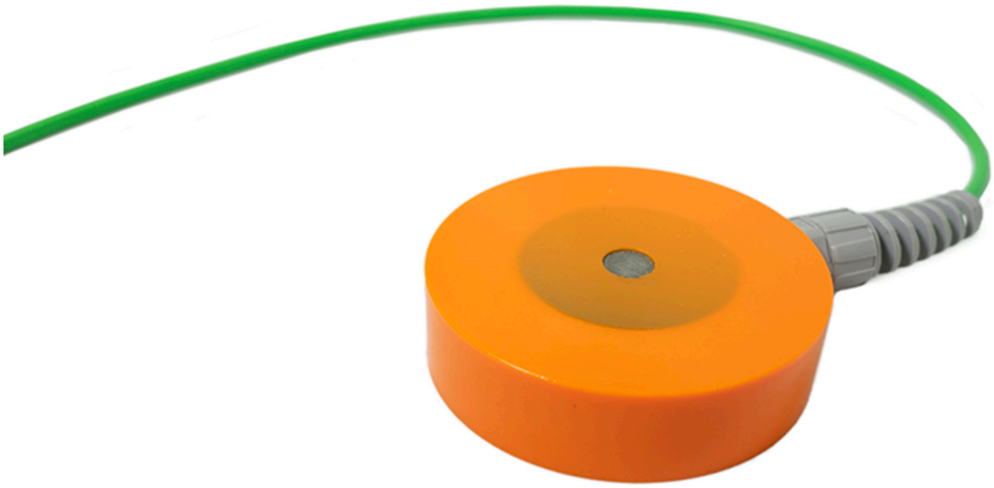
AC Coupon

Model ACC3 for Permanent Burial



Accurate

Due to an unprecedented level of public awareness towards new and existing oil and gas infrastructure, building new pipelines is increasingly difficult. Part of the solution is to use existing rights-of-way with other pipeline operators or energy utilities.

However, high-voltage AC power lines can induce high AC voltages along nearby buried pipelines with high-performance coatings such as fusion bonded epoxy or three-layer polyolefin. This can result in risks to the pipelines due to AC corrosion, and to the public and company personnel due to shock hazards on above-ground pipeline appurtenances. The ACC3 coupon can be used to assess AC corrosion and shock hazards based on the criteria in NACE standards SP21424-2018 and SP0177-2019.

Corrosion Service developed the ACC3 based on the latest research to allow pipeline operators to more accurately monitor the risk of AC corrosion. This will help operators avoid unnecessary AC mitigation due to false positives but remain sensitive to the worst case for AC corrosion.

Simple

The ACC3 is suitable for use with new and existing pipelines. Installation is quick and efficient since this coupon can be positioned next to the monitored structure in holes excavated by hand or by hydrovac. The AC coupon is typically connected to a pipeline at test posts through a shunt resistor (e.g., 10 Ω). After a short stabilization period, the AC voltage (shock hazards), and AC and DC current densities (AC corrosion) can be recorded.

Our distribution hubs can send in-stock ACC3 AC coupons to any project in the world with a short lead time.

Features & Benefits

+ Improved ability to simulate coating holidays due to the customizable coating thickness 20 mils, 40 mils, 80 mils or custom to meet customer's project demands.
+ Coating holiday size 1 cm^2 or 1 in^2.
+ Non-conductive surface surrounding the bare area optimized to limit electrical field distortion while maintaining a compact installation size.
+ Designed to allow for coupon pointing up placement to match the orientation of coating holidays with the highest AC current densities.
+ Weighted carbon steel core with removable coating for corrosion rate measurements as per ASTM G1-03.
+ Stamped with a serial number protected from corrosion for improved traceability.

CORROSION SERVICE

SAM-PCP-19-0001_REV4

Ordering

ACC3-T-H-L-S-C

T: Coating Thickness - 20 mils, 40 mils or 80 mils

H: Holiday Size - 1C (1 cm^2) or 1N (1 in^2)

L: Cable length - Indicate the desired length in metres

S: Cable size - 12 (#12 AWG)

C: Cable Colour - G - Green, B - Black (Slug Coupon Use)

Example: ACC3-20-1C-15-12-G

20 mils thick simulated pipeline coating, 1 cm^2 holiday size, 15 meters of #12 AWG green cable.

Features & Benefits

- + Accurate AC corrosion risk assessment to avoid unnecessary mitigation costs.
- + Regular monitoring provides the pipeline operator with historical and current operating conditions, identifies areas requiring AC mitigation, and validates the effectiveness of AC mitigation systems.
- + Improved ability to simulate corrosion rates by allowing for the lateral extension of the corrosion pit under the coating.
- + Compatible with remote monitoring and conventional survey equipment.
- + Compatible with new and existing test stations.

Example of AC Coupon Measurements with an ACC3

The 24-hour average AC voltage recorded across a 10 Ω shunt connected to a 1 cm^2 ACC3 was 50.0 mV and the DC voltage was 1.5 mV. The maximum AC pipe-to-soil voltage was 5.0 V.

The average DC current density of 1.5 A/m^2 exceeds the 1 A/m^2 limit and the AC current density of 50.0 A/m^2 exceeds the 30 A/m^2 limit. Therefore, there is a risk of AC corrosion at this location based on NACE SP21424-2018 and mitigation will be required.

The maximum AC pipe-to-soil voltage is below the 15 V steady-state touch voltage limit, indicating no shock hazard under normal operating conditions.

Step - by - Step Assessment

Survey Data

Surface area of the coupon: S_{Coupon} = 1.0 cm^2
Shunt resistor: R_{Shunt} = 10.0 Ω
DC voltage measured across shunt resistor (average): $V_{DC\ Shunt}$ = 1.5 mV
AC voltage measured across shunt resistor (average): $V_{AC\ Shunt}$ = 50.0 mV
AC voltage measured with a pipeline connection and portable reference electrode (maximum): $V_{AC\ Pipeline}$ = 5.0 V

Equations

(1) $I_{Shunt} = V_{Shunt} / R_{Shunt}$

(2) $i_{Coupon} = I_{Shunt} / S_{Coupon}$

Calculations

AC current density:

(1) $I_{AC\ Shunt} = V_{AC\ Shunt} / R_{Shunt}$ = 50.0 mV / 10.0 Ω = 5.00 mA
(2) $i_{AC\ Coupon} = I_{AC\ Shunt} / S_{Coupon}$ = 5.00 mA / 1.0 cm^2 = 5.00 mA/cm^2 or 50.0 A/m^2

DC current density:

(1) $I_{DC\ Shunt} = V_{DC\ Shunt} / R_{Shunt}$ = 1.5 mV / 10.0 Ω = 0.15 mA
(2) $i_{DC\ Coupon} = I_{DC\ Shunt} / S_{Coupon}$ = 0.15 mA / 1.0 cm^2 = 0.15 mA/cm^2 or 1.5 A/m^2

Interpretation

Risk of AC corrosion: compare to criteria in Section 6 of NACE standard SP21424-2018
Risk of shock hazard: compare to criteria in Section 5 of NACE standard SP0177-2019

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