INTERNATIONAL CORROSION CONTROL INC.

INTERPROVINCIAL CORROSION CONTROL COMPANY LTD.

Leaders in the Cathodic Protection Industry … since 1957

RUSTROL® SYSTEMS

PRODUCT INFORMATION: Gradient Control Systems (GCS)



Product:

Rustrol® **Gradient Control Systems (GCS)***

End User:

- Electrical Utilities
- Oil/Petrochemical Industries
- Pipeline Operators

Background:

The Rustrol® **Gradient Control Systems *(GCS)**** provide for a reliable, maintenance-free grounding/safety grid *(ie. Mat, Cable, or Ribbon)*, capable of reducing and/or preventing the potential shock hazard to personnel and equipment, typically associated with exposure to "Step & Touch" voltages.

IEEE Standard 80 *(latest revision)* details acceptable "Step & Touch" voltage criteria and provides the safe limits of potential differences that can exist within independent structures exposed to electric shock hazards. Consideration must be provided for the physical phenomena by which AC, AC Power Systems and Lightning can effect a typical metallic structure such as pipelines.

The Rustrol® **Gradient Control Systems *(GCS)**** provide a conducting path to the electrical utilities grounding network, utilizing the Rustrol®, Model: SSP or DCD *(ie. DC-Decoupling Device)*. The Solid State DC-Decoupler Device maintains a high resistance to low-voltage DC, ensuring cathodic protection design criteria will not be compromised for the primary structure *(ie. pipeline)*. In addition, the Rustrol®, Model: SSP or DCD *(ie. DC-Decoupling Device)*, will maintain electrical characteristics of low impedance to AC, hence free to conduct AC induced voltages, AC Fault Currents and/or lightning exposure that may occur on the pipeline.

Applications:

The Rustrol® **Gradient Control System - Mat™ *(GCS-M)**** is utilized primarily to limit shock risks caused by localized "Step & Touch" voltage potentials, that often occur within Valve Stations, Electrical Substations and enroute of pipelines at Test Station locations. In accordance with NACE International Standard SP0177 *(latest revision)*, to reduce electrical "Step & Touch" voltages in areas where the general public and/or operating personnel may come in contact with a primary structure *(ie. pipeline)* that is exposed to hazardous potentials, gradient control mats should be considered.

The Rustrol® **Gradient Control System - Copper Cable™ *(GCS-CC)**** is often utilized for AC mitigation of hazardous voltages. This grounding/AC mitigation technique should be connected to the primary structure *(ie. pipeline)* in series arrangement through a DC-Decoupling Device. The DC-Decoupling Device will eliminate the concern of dissimilar metals, which would otherwise create a galvanic corrosion cell between the pipeline and copper cabling. The Rustrol®, Model: SSP or DCD *(ie. DC-Decoupling Device)* will effectively isolate the primary structure *(ie. pipeline)* from copper cabling, maintaining high resistance to low-voltage DC and ensuring low impedance to AC voltage/current. Hazardous “Step & Touch” voltages induced onto the primary structure will be safely mitigated to ground/earthing.

The Rustrol® **Gradient Control System - Zinc Ribbon™ *(GCS-ZR)**** offers application advantages similar to copper cable installation as outlined above. The Rustrol® Gradient Control System - Zinc Ribbon™ *(GCS-ZR)** is typically connected to the primary structure *(ie. pipeline)* in series arrangement through a DC-Decoupling Device at designated intervals to eliminate or reduce the coating stress voltage associated with high AC voltages originating from the Electric Power Transmission Corridor.

Advantages:

- Eliminates “Step & Touch” shock hazard
- Limits and provides control to the risk of AC Corrosion
- Provides effective Grounding/Earthing, ensuring the safety of operating personnel and the general public
- Maintains Coating Stress Voltages within Acceptable Limits
- Capable of reducing the potential difference of hazardous AC voltages at Isolating Flange/Monolithic Assemblies
- Safely Conducts Hazardous AC Fault Currents through to Ground/Earth
- Disperses Lightning Safely through to Ground/Earth
- Mitigates AC induced voltages/currents

Rustrol® Gradient Control Systems (GCS)*

The Rustrol® **Gradient Control Systems** ***(GCS)**** could be installed in series arrangement with Rustrol® **Cathodic Isolator®**, Model: **CI**, Model: **SSP**, or Rustrol® **DC-Decoupler™** Model: **DCD** for superior performance.

The Rustrol® **Gradient Control System - Mat™** ***(GCS-M)**** is utilized primarily to limit shock risks caused by localized "Step & Touch" voltage potentials.

The Rustrol® Gradient Control System - Mat™ *(GCS-M)** should be large enough to extend through and beyond the entire area on which people may be standing when contacting the affected structure.

The Rustrol® Gradient Control System - Mat™ *(GCS-M)** is Pre-Fabricated approx. 1200mm x 1800mm (4'0" x 6'0") hot dip galvanized steel mat, made from 150mm x 150mm (6.0" x 6.0") welded mesh, approx. 6.35mm (1/4") diameter, complete with connector, bolt, nut and lock washer. Order Code: ***GCS-M***

The Rustrol® **Gradient Control System - Copper Cable™** ***(GCS-CC)**** is often utilized for AC mitigation of hazardous voltages. This grounding/AC mitigation technique should be connected to the primary structure *(ie. pipeline)* in series arrangement through a DC-Decoupling Device.

The Rustrol® Gradient Control System - Copper Cable™ *(GCS-CC)** is AWG #2/0 Stranded Bare Copper Wire that should be buried within low-resistivity grounding backfill compatible with all copper grounding systems. Order Code: ***GCS-CC***

The Rustrol® **Gradient Control System - Zinc Ribbon™** ***(GCS-ZR)**** is typically connected to the primary structure *(ie. pipeline)* in series arrangement through a DC-Decoupling Device at designated intervals to eliminate or reduce the coating stress voltage associated with high AC voltages originating from the Electric Power Transmission Corridor.

The Rustrol® Gradient Control System - Zinc Ribbon™ *(GCS-ZR)** is typically installed within a unique blend of *ICCC*'s "Select Backfill" that consists of Premium Hydrated Gypsum and Wyoming Bentonite.

The Rustrol® Gradient Control System - Zinc Ribbon™ *(GCS-ZR)** is a zinc ribbon, standard, 13mm x 15mm (1/2" x 9/16"), manufactured to meet ASTM Standard B418, Type II, *(latest revision)*. Order Code: ***GCS-ZR***

Related Products:

The following Rustrol® products could be utilized with Rustrol® Gradient Control Systems *(GCS)*:*

The Rustrol® Cathodic Isolator®, Model: **CI**, Model: **SSP**, and Rustrol® DC-Decoupler™ Model: **DCD** are dynamic Solid-State DC Decoupling Devices capable of providing an effective path for all forms of Electrical Exposures including:

- AC Fault Currents.
- Lightning/Surge Currents.
- AC Induced Voltages.
- Power Switching Surge Currents.

Rustrol® Cathodic Isolator®, Model: **CI**
The Rustrol® Cathodic Isolator®, Model: CI is typically utilized where higher AC fault current conditions and/or higher DC Voltage Thresholds are to be retained on the cathodically protected structure *(ie. pipeline, storage tank, etc.)*. The Rustrol® Cathodic Isolator®, Model: CI Product Line is available to provide DC Voltage Thresholds to meet the "End-User's" requirements, typically with the range of 2.5 - 20 volts DC blocking potential.

Rustrol® Cathodic lsolator®, Model: **SSP**
The Rustrol® Cathodic lsolator®, Solid-State Surge Protector™ , Model: SSP is utilized where AC Mitigation and/or Lightning exposure are the primary concern to the "End-User" and where there is lower AC Fault Current exposure. Typically, the Model: SSP is provided with a Voltage Threshold of up to 3 volts DC.

Rustrol® DC-Decoupler™ , Model: **DCD**
The standard DCD Product Line provides an economical engineered solution in a compact, lightweight, ready to mount assembly. The Rustrol® DC-Decoupler™, Model: DCD is typically utilized within applications of light/moderate *(ie. non-continuous)* exposure of AC mitigation.

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***DISCLAIMER:** The information contained herein may not be suitable for every situation, the "End-User" acknowledges that every location is subject to unique electrical exposure. *ICCC* shall not be liable for any loss of profit or any other commercial damages, including but not limited to special, incidental, consequential, or other damages. Any use thereof is at the End-User's independent discretion.