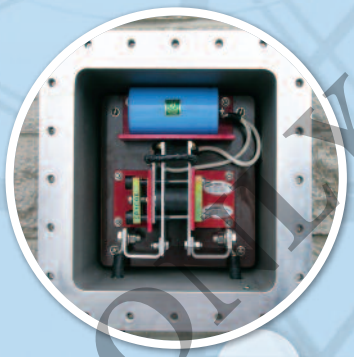
SSP | SURGE PROTECTOR

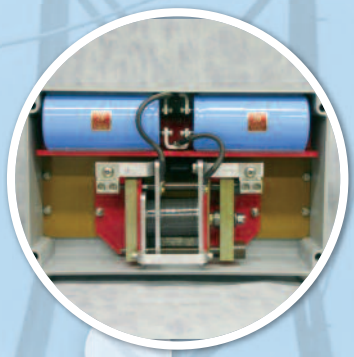
RUSTROL® SYSTEMS

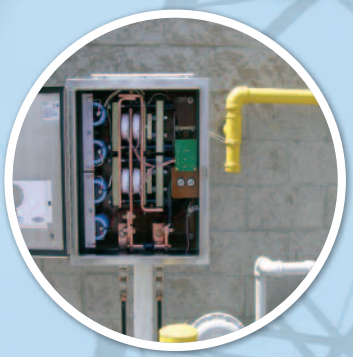
SSP | SURGE PROTECTOR

The Rustrol® Cathodic Isolator®, Solid State Surge Protector, Model: SSP effectively blocks the DC current needed for cathodic protection, while simultaneously providing an effective AC continuity grounding path for:

- AC Fault Currents
- Lightning Protection
- Mitigation of Induced AC Voltages
- Power Switching Surge Currents







- ☑ Non-Electrolytic
- ☑ High Blocking DC Voltage
- ☑ Fail Safe
- ☑ Maintenance-Free

Email: Contact@Rustrol.com
Central Fax: 905-333-4313

The Rustrol® Cathodic Isolator® Solid-State Surge Protector Model: **SSP** is entirely electronic/electrical construction throughout, similar to the Model: CI. The Cathodic Isolator® Model: SSP remains the preferred product choice by "End-Users" for cathodic protection applications whereby the need to block the protective DC current at the isolating assembly *(flange/monolithic joint)* remains crucial; maintaining a safe and effective electrical grounding path is paramount. The Cathodic Isolator® Model: SSP maintains safety standards for effective grounding within International Codes, including criteria set forth within the National Electrical Code (NEC) and Canadian Standards Association (CSA).

The Rustrol® Cathodic Isolator®, Model: **SSP-ATEX** is CE listed, ATEX/IECEx certified under the European Directive 2014/34/EU and the IECEx Scheme for equipment intended for use in Gas and Dust Explosive Atmospheres, in accordance to IEC and EN Standards.

The IECEx Certificate of the Rustrol® Cathodic Isolator®, Model: SSP-ATEX is accepted by Certification Bodies in thirty-three (33) IECEx member countries including the European Community, Australia, Brazil, Canada, China, India, Japan, Korea, Russia, United Kingdom, USA, and many other leading countries.

In addition, the Rustrol® Cathodic Isolator®, Model: **SSP-ETL** is bearing the cETLus Listed Mark for use in Class 1, Division 2, Groups A, B, C & D Hazardous *(Classified)* Locations; in compliance with the latest North American Safety Standards *(ANSI, ISA and CSA)*.

The Rustrol® Cathodic Isolator®, Model: SSP can be manufactured either to European/International Standards, Model: SSP-ATEX, or North American Standards, Model: SSP-ETL, and certified accordingly. The "End-User" must select one (1) criteria for Product Certification.

*All Models of the Rustrol® Cathodic Isolator® Solid-State Surge Protector are available mounted within Underwriters Laboratories Classified Enclosures, File No. E81696 (FTRV), & (FTRV7).

Model: SSP SELECTION GUIDE

Cathodic Isolator® - Solid State Surge Protector - Model: SSP

Standard assembly is installed in a performance test rated moulded Non-Metallic enclosure, suitable for indoor/outdoor applications *(IP67 Certified; Equivalent to NEMA 4, 4X, 6P)*, complete with access cover and cable termination fittings.

AC Fault Current Exposure - 1 cycle @ 60 Hz rms: *(1 cycle @ 50 Hz rms, Refer to Drawing No. SSP-00)*

- ☑ 7 kA
- ❑ 10 kA
- ❑ 15 kA
- ❑ 20 kA
- ❑ 35 kA
- ❑ 50 kA
- ❑ 70 kA

(Refer to Drawing No. SSP-00 for detailed specifications @ 1, 3, 10 & 30 cycle. 50 or 60 Hz rms: visit web site)

Surge/Lightning Protection:

Standard assembly, peak surge current @ 8/20 μsec. waveform

☑ Primary @ 100,000 Amperes

DC Voltage Threshold @ 3 volts

Standard assembly @ -3.0/+1.0 volts DC

Optional Voltage Threshold Settings Available (i.e. –6/+6, –4/+4, –4/+2, –6/+1 volts DC or other)

Mitigation of Induced AC-Steady State *(@ 50 or 60 Hz rms)*

Selection range 0-100 Amperes, as specified by the customer.

- ❑ 12 amps
- ❑ 24 amps
- ☑ 36 amps
- ☑ 48 amps
- ❑ 75 amps
- ❑ 100 amps

Optional *(As Specified by the Customer):*

- ❑ ATEX/IECEx Certified
- ❑ cETLus Certified
- ❑ Cable Termination - Standard - Internal
  - Optional - External
- ❑ Submersible enclosure *(NEMA 6P/IP68 certified)*
- ❑ Free-Standing Fibreglass Pedestal Mount
- ❑ Special finishes *(specify)*

SSP – 07 – SL – 03 – A48 – ***specify***

(Typical Ordering Code)

Interprovincial Corrosion Control Company Limited
Burlington, Ontario, Canada

International Corrosion Control Inc.
Lewiston, New York, USA

TEL: 1-905-634-7751 **FAX: 1-905-333-4313**

RUSTROL® SYSTEMS

www.Rustrol.com

INTERNATIONAL CORROSION CONTROL INC.

INTERPROVINCIAL CORROSION CONTROL COMPANY LTD.

Leaders in the Cathodic Protection Industry … since 1957

DCD DC DECOUPLER

PRODUCT INFORMATION: DC-Decoupler™

Product:

Rustrol® **DC-Decoupler™** Model: **DCD**

End User:

- Oil and Gas Transmission Pipelines
- Refinery and Petrochemical Industries
- Electrical Utilities
- Tank Farm/Oil Depot Facilities

Background:

The Rustrol® **DC-Decoupler™** Model: **DCD** is an enhanced development to the Rustrol® Product Line. The DC-Decoupler™'s unique features are based on the proven Rustrol® technology utilizing solid-state design and superior test proven, quality components throughout the construction. The DC-Decoupler™ Model: **DCD** is typically utilized within applications of light/moderate *(ie. non-continuous)* exposure of AC mitigation. The standard **DCD** Product Line provides an economical engineered solution in a compact, lightweight, ready to mount assembly.

Applications:

The Rustrol® **DC-Decoupler™** Model: **DCD** device is designed to protect personnel and equipment from electrical disturbances. The DC-Decoupler™ device blocks DC current associated with cathodically protected structures, *(ie. Pipelines, On-Grade or Buried Storage Tanks, etc.)* and provides an effective and continuous conductive path to the Utilities Grounding/Earthing Network for all other forms of Electrical Exposures, such as:

- Lightning/Surge Currents
- AC Fault Currents
- AC Induced Voltages
- Over-Voltage Protection

The Rustrol® **DC-Decoupler™** Model: **DCD** is capable of reducing the potential difference across Isolating Flange Assemblies and/or Monolithic Isolating Joints to well below the industry accepted criteria (*ie. <10 volts AC rms*).

The Rustrol® **DC-Decoupler™** Model: **DCD** is versatile and can be used in numerous applications, including coupling the primary structure *(ie. pipes, valves, pumps, etc.)* in series through the DC-Decoupler™ to Gradient Control Systems.

Typical Applications include:

- Pipeline AC Mitigation/AC Discharger
- Isolating Joint Protection
- Decoupling from the Gradient Control Systems

Advantages:

- Product Certification—ATEX/IECEx, QPS, KCS
- Rustrol®, an Industry Leader for Safe DC Isolation
- Fail-Safe Design; Grounding Criteria Assured
- Compact; Ready to Mount Design
- Maintenance-Free Performance
- Eliminate "Step & Touch" Potential Risk
- Maintains coating Stress Voltages within Acceptable Limits
- No additional Mounting Accessories required for Installation
- No Structure Compromise Required for Installation *(ie. Flange Drilling)*

c PS us CERTIFIED ELECTRICAL SAFETY KCS IEC IECEx CE Ex ATEX

Rustrol® **DC-Decoupler™** Model: **DCD**, Operating Characteristics

	Rustrol® DC-Decoupler™ Model: DCD-02.5	**Rustrol® DC-Decoupler™ Model: DCD-06.3**	**Rustrol® DC-Decoupler™ Model: DCD-07.0**	**Rustrol® DC-Decoupler™ Model: DCD-10.0**
AC Fault Current Ratings	*rms* / 50 Hz / 60 Hz 1 cycle / 2.3 kA / 2.5 kA 3 cycles / 1.7 / 1.8 10 cycles / 1.5 / 1.6 30 cycles / 1.3 / 1.4	*rms* / 50 Hz / 60 Hz 1 cycle / 5.8 kA / 6.3 kA 3 cycles / 5.0 / 5.4 10 cycles / 4.1 / 4.4 30 cycles / 2.2 / 2.4	*rms* / 50 Hz / 60 Hz 1 cycle / 6.5 kA / 7.0 kA 3 cycles / 5.0 / 5.4 10 cycles / 4.2 / 4.5 30 cycles / 3.7 / 4.0	*rms* / 50 Hz / 60 Hz 1 cycle / 9.2 kA / 10 kA 3 cycles / 8.0 / 8.7 10 cycles / 5.7 / 6.2 30 cycles / 5.0 / 5.4
DC Leakage Current	≤ 7.5 mA	≤ 7.5 mA	≤ 7.5 mA	≤ 7.5 mA
Fail-Safe Design	Yes	Yes	Yes	Yes
Connection Terminals	Standard - Flange Mount Assembly *(FMA)* Distinctive Design: Compact, Lightweight Ready to Install Optional - Optional Terminal *(OT)*, Dual Terminal Post *(DT)* Bottom Side of Enclosure, Internal Terminal *(IT)*			
Certifications	ATEX and IECEx KCS CE Mark QPS	II 3D Ex nA IIC T6 Gc (-20°C ≤ Ta ≤ +50°C) II 3D Ex tc IIIB T60°C Dc (-20°C ≤ Ta ≤ +50°C) Class I, Div. 2, Groups A, B, C and D, T6 Class I, Zone 2, AEx nA, IIC T6 Gc Ex nA IIC T6 Gc -20°C≤ Ta ≤ +50°C		Class II, Div. 2, Group G, T60°C Zone 22 AEx tc IIIB T60°C Dc Ex tc IIIB T60°C Dc

Model: **DCD** Selection Guide

Rustrol® DC-Decoupler™ - Model: DCD

Standard assembly is installed in a performance test rated moulded Non-Metallic enclosure, suitable for indoor/outdoor applications *(IP67 Certified; Equivalent to NEMA 4, 4X, 6P)*, complete with access cover and cable termination fittings.

AC Fault Current Exposure - 1 cycle @ 60 Hz rms: *(1 cycle @ 50 Hz rms, Refer to Drawing DCD-00)*

- ☑ 02.5 kA
- ❑ 07.0 kA
- ❑ 06.3 kA
- ❑ 10.0 kA

(Refer to Drawing No. DCD-00 for Detailed Specifications @ 1, 3, 10 & 30 cycle @ 50 or 60 Hz rms: visit web site)

Surge/Lightning Protection:

Standard assembly, peak surge current rating

☑ Primary @ • 100kA @ 4/10 μs • 75kA @ 8/20 μs • 50kA @ 10/350 μs

(Optional Lightning (OL) • 150kA @ 4/10μs • 100kA @ 8/20μs • 100kA @ 10/350μs)

DC Voltage Threshold

Standard assembly @ -3.0/+1.0 volts DC

Optional Voltage Threshold Settings Available (i.e. –6/+6, –4/+4, –4/+2, –6/+1 volts DC or other)

Mitigation of Induced AC-Steady State *(@ 50 or 60 Hz rms)*

Selection range 0-100 Amperes, as specified by the customer.

❑ 0 amp (*no AC Mitigation*)

❑ 12 amps ❑ 24 amps ❑ 36 amps ☑ 48 amps ❑ 75 amps ❑ 100 amps

(Intermittent Non-Continuous Exposure for AC Mitigation)

Optional *(As Specified by the Customer):*

- ❑ ATEX/IECEx Certified
- ❑ QPS Certified
- ❑ KCS Certified
- ❑ Cable Termination - Standard - FMA
  - Optional - OT, DT or IT
- ❑ Optional Lightning - OL
- ❑ Submersible Enclosure *(NEMA 6P/IP68 certified)*
- ❑ Free-Standing Fibreglass Pedestal Mount
- ❑ Special finishes

DCD – 02.5 – SL – 03 – A48 – *specify*

(Typical Ordering Code)

Interprovincial Corrosion Control Company Limited
Burlington, Ontario, Canada

International Corrosion Control Inc.
Lewiston, New York, USA

TEL: 1-905-634-7751 **FAX: 1-905-333-4313**

RUSTROL® SYSTEMS

www.Rustrol.com

CATHODIC isolator ISOLATOR® cathodic

The key to safe and efficient underground corrosion control.

The unique Cathodic Isolator® meets stringent grounding requirements for safety — with no sacrifice in electrical isolation effectiveness.

RUSTROL® SYSTEMS

Rustrol®'s solid-state Cathodic Isolator® offers the safest electrical isolation for efficient cathodic protection.

The uniquely designed Cathodic Isolator® developed by Rustrol® Systems, effectively confines the current needed for cathodic protection, while providing a safe grounding path during all types of electrical disturbances.

PROVEN CATHODIC PROTECTION.

Cathodic protection, proven by decades of service in a variety of applications, prevents corrosion of buried or submerged metallic structures.

Cathodic protection is most efficiently and uniformly applied when the primary structure is electrically isolated — i.e., all metallic/electrical contacts with foreign metallic structures are eliminated.

Electrical isolation provides three major benefits:

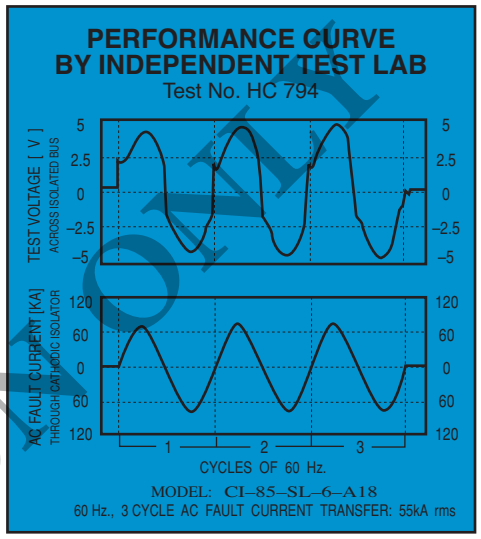
- ☐ Restriction of the required protective current to the surface of the primary structure to produce a uniform polarized level of protection
- ☐ Minimization of stray DC current interference
- ☐ Prevention of galvanic current between metallic structures.

SAFE CATHODIC ISOLATION.

Cathodic isolation is a superior form of electrical isolation. Cathodic isolation maintains stringent electrical grounding requirements and confines the protective current at the surface of the primary structure. The result is highly effective, uniform protection against corrosion.

The Rustrol® Cathodic Isolator® meets safety standards for effective grounding within the National Electrical Code, and conforms to the need for safe operating practices accepted worldwide, i.e., not to exceed the 15 volt rms (caution) potential most often stipulated by design.

The Cathodic Isolator® provides all of the advantages of electrical isolation necessary for Cathodic Protection by blocking the protective current at the electrical isolating device — such as across a pipeline isolating flange. As soon as the potential across the isolating flange exceeds the pre-set voltage threshold, the Rustrol® Cathodic Isolator® responds instantly.

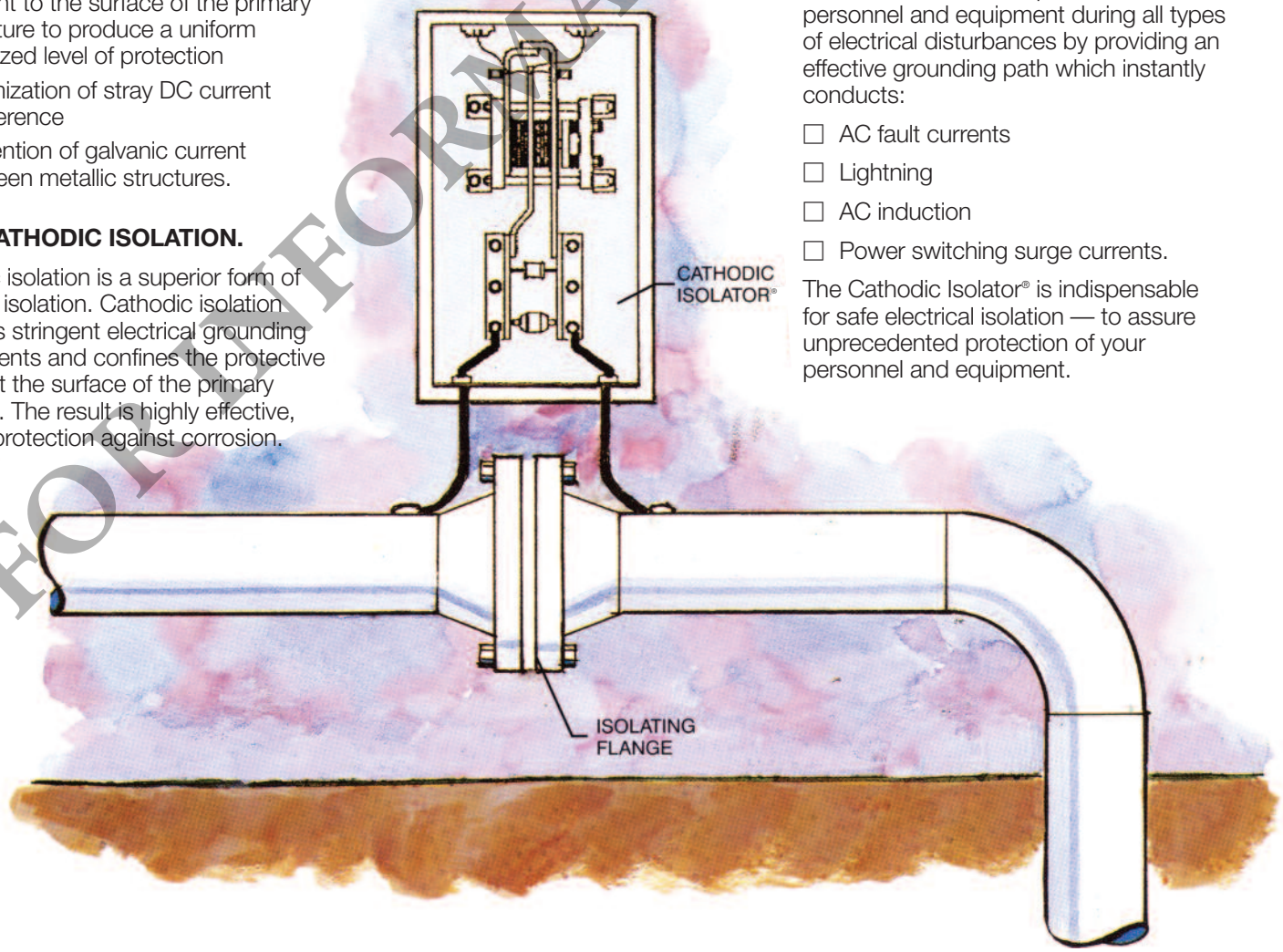


VERSATILE PROTECTION

The Cathodic Isolator® protects personnel and equipment during all types of electrical disturbances by providing an effective grounding path which instantly conducts:

- ☐ AC fault currents
- ☐ Lightning
- ☐ AC induction
- ☐ Power switching surge currents.

The Cathodic Isolator® is indispensable for safe electrical isolation — to assure unprecedented protection of your personnel and equipment.



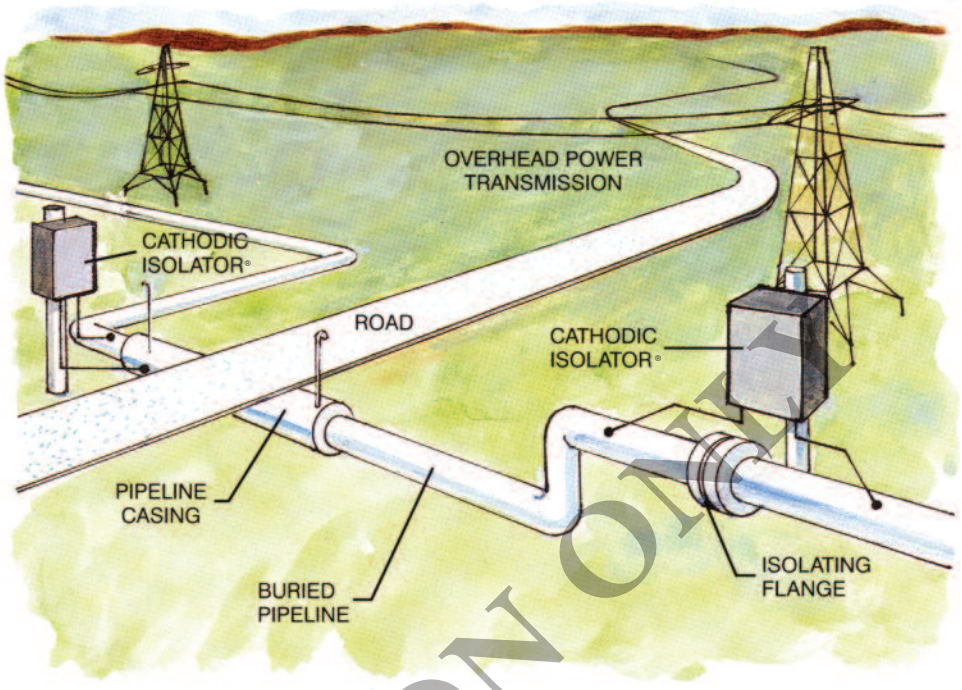
RUSTROL®'S PROVEN QUALITY ASSURES RELIABLE OPERATION.

Unique developments in electronic circuitry are incorporated in the Rustrol® solid-state Cathodic Isolator® to assure acute sensitivity; instant response; and fail-safe, maintenance-free operation in a non-electrolytic environment.

The Cathodic Isolator® and associated hardware feature the most advanced and reliable components now available. Each critical component is precisely machined and carefully assembled to meet Rustrol®'s exceptionally stringent quality assurance standards. The easy-to-mount standard NEMA 4 enclosure simplifies installation.

Research and development models have undergone thorough acceptance-testing by independent high-current test facilities and have been fully approved (test data available upon request).

Rustrol®'s experienced technical staff provides knowledgeable product support. Engineering services to design and commission a system for your special applications are available from our professional consultants upon request.



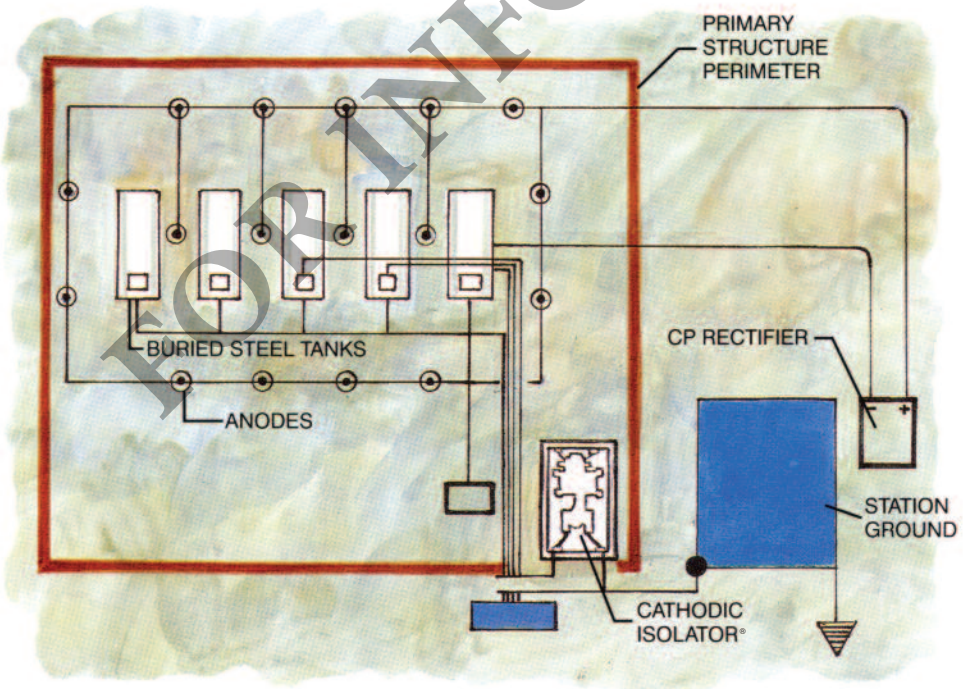
MITIGATION OF INDUCED AC

APPLICATIONS FOR COST-EFFECTIVE OPERATION.

Along with performing a key role in safe and effective corrosion control, the Rustrol® Cathodic Isolator® also serves to reduce both the capital and maintenance costs of cathodic protection systems.

Cost-effective applications include:
☐ AC fault-current protection across isolating flanges and other devices
☐ mitigation of induced AC on pipelines and other structures
☐ lightning protection for equipment, including cathodic-protection rectifier systems
☐ de-coupling of the primary structure (e.g., fueling facility, pipe-type cable systems, etc.) from contact with the electrical utilities grounding network.

And these are just a few typical applications for the Rustrol® Cathodic Isolator®. Other possibilities are limited only by one's imagination.



TYPICAL TANK FARM

CHECK THIS UNMATCHED COMBINATION OF BENEFITS.

- ☑ ***Solid-state construction***
- ☑ ***Non-electrolytic***
- ☑ ***Maintenance-free***
- ☑ ***Simplified installation***
- ☑ ***Versatile protection***
- ☑ ***Fail-safe operation***
- ☑ ***Test-proven performance***

CATHODIC ISOLATOR® SELECTION GUIDE

Cathodic Isolator® (CI):

Standard assembly is installed in a performance test rated, NEMA-4 aluminum enclosure, complete with access cover and locking hasp.

AC Fault Current Exposure:

(as specified by the customer)

- ☐ 5 kA - 1 cycle @ 60 hz rms
- ☐ 10 kA - 1 cycle @ 60 hz rms
- ☐ 20 kA - 1 cycle @ 60 hz rms
- ☑ 30 kA - 1 cycle @ 60 hz rms
- ☐ 40 kA - 1 cycle @ 60 hz rms
- ☐ 50 kA - 1 cycle @ 60 hz rms
- ☐ 60 kA - 1 cycle @ 60 hz rms
- ☐ 75 kA - 1 cycle @ 60 hz rms
- ☐ 85 kA - 1 cycle @ 60 hz rms
- ☐ 100 kA - 1 cycle @ 60 hz rms

(Refer to Drawing No. CI-00 for detailed specifications; applicable ratings @ 50 Hz rms are available).

Surge/Lightning Protection (SL):

Standard assembly, peak surge current @ 8/20 μ sec.

- ☑ Primary @ 100,000 Amperes
- ☐ Secondary @ 70,000 Amperes

Voltage Threshold:

Standard assembly @ 6 volts rms or as specified by the customer within the suggested range of 2.5-20 volts rms.

Mitigation of Induced AC - Steady State @ 60 Hz rms:

Selection range 0-100 Amperes, as specified by the customer.

- ☑ 12 amps
- ☐ 24 amps
- ☐ 36 amps
- ☐ 48 amps
- ☐ 75 amps
- ☐ 100 amps

Optional Accessories:

(as specified by the customer)

- ☐ Potential meter
- ☐ Small arms proof enclosure
- ☐ Submersible enclosure
- ☐ Special finishes (specify)
- ☐ Test Port
- ☐ Quick disconnect wiring harness
- ☐ Any other features (specify)

CI- 30- SL- 6- A12- specify

(Typical ordering code)

Interprovincial Corrosion Control Company Limited

Head Office:
930 Sheldon Court, Burlington, Ontario, Canada, L7L 5K6
Regional Offices:
Montréal, Québec & Calgary, Alberta
International Corrosion Control Inc.
P.O. Box 441, Lewiston, New York, USA, 14092

Phone: (905) 634-7751 • **Fax: (905) 333-4313**

Website: www.Rustrol.com Email: contact@rustrol.com

RUSTROL® SYSTEMS

PRODUCT INFORMATION: Gas Gap™

Product: **Gas Gap™** Lightning Protector

End Users:

- Gas Transmission
- Oil/Petrochemical Industries
- Pipeline Operators
- Electrical Utilities

Background:

Cathodic Protection of buried and submerged metallic structures, *(i.e., pipelines, tanks, etc.)* requires the necessity to electrically isolate *(i.e., Flange, Monolithic Isolating Joints)* the primary structure from contact with the electrical utilities grounding network.

Lightning being one of the most unpredictable and destructive forces in nature, strikes the earth more than 90 million times a year. Electrically isolated metallic structures, *(i.e. pipelines)* are potentially dangerous because they are prone to an electrical charge, resulting in equipment damage and creating a safety hazard to employees and the general public alike.

Millions of dollars are lost each year because of lightning damage. Protect your valued structures from lightning exposure with the performance proven Rustrol® **Gas Gap™**.

Applications:

The Rustrol® **Gas Gap™** maintains the advantages of electrical isolation, necessary for assuring Cathodic Protection of the primary structure *(i.e. pipelines)*, while providing a safe grounding path during electrical disturbances. The Rustrol® **Gas Gap™** offers superior protection for personnel and equipment.

- Lightning Exposure •
- Power Surge Current Exposure •
- Equipotential Bonding of Cathodic Protection Systems •

Advantages:

The Rustrol® **Gas Gap™** provides unmatched performance such as:

- Fail-Safe Operation
- Maintenance-Free
- Low DC and AC Voltage Thresholds
- Performance Characteristics Un-Matched by typical Air-Filled Spark Gaps
- Long Product Life, maintaining stable characteristics

Rustrol® **Gas Gap**™ Operating Characteristics

Gas Gap™ Model No.	GG-100TS	GG-100TA	GG-100TC	GG-100QA
Lightning Impulse Discharge Current @ 8/20µsec	100 kA	100 kA	100 kA	100 kA
DC Spark-Over Voltage @ 100 V/s	100 V ± 20%	500 V ± 15%	100 V ± 20%	100 V ± 20%
AC Spark-Over @ 60 Hz	100 V ± 20%	500 V ± 15%	100 V ± 20%	100 V ± 20%
AC Spark-Over @ 50 Hz	70 V ± 20%	350 V ± 15%	70 V ± 20%	70 V ± 20%
Impulse Spark-Over Voltage @ 1 kV/µsec	Typical @ 650 V	Typical @ 950 V	Typical @ 650 V	Typical @ 650 V
Dimensions/Diameter/Length	1″ (25 mm) dia. x 3.5″ (90 mm)	2 3/8″ (60 mm) dia. x 6″ (150 mm)	2″ (50 mm) dia. x 6″ (150 mm)	2 3/4″ (70 mm) dia. x 13 3/8″ (340 mm)
Mounting Configuration	Standard Rustrol® Gas Gap™ assemblies are manufactured to be explosion resistant and are provided with 8″ (200 mm) of AWG multi-strand connecting cable and flange mounting brackets to accommodate up to 1″ (M30) bolt diameter. Optional cable length and mounting brackets available on request.			
Construction	Metal-Ceramics Complete with Shrink Tubing	Metal-Ceramics Polyurethane Sealed	Metal-Ceramics Stainless Steel Araldite Cast Resin	Metal-Ceramics Polyurethane Sealed
Typical Applications: IF - Flange Assembly IJ - Monolithic Joint	IF/IJ	IF/IJ	IF/IJ	IF/IJ Typical for Buried Applications
Exposure Frequency	Light/Moderate	Moderate	Moderate/Severe	Moderate
Certifications/Listings	CE	CE	CE Ex II 2G EEx m II T3*	CE
Fail-Safe Feature	✓	✓	✓	✓

REV. 3, FEBRUARY 2012

Interprovincial Corrosion Control Company Limited
Burlington, Ontario, Canada

International Corrosion Control Inc.
Lewiston, New York, USA

TEL: 1-905-634-7751
E-mail: Contact@Rustrol.com

RUSTROL® SYSTEMS

FAX: 1-905-333-4313
Website: www.Rustrol.com

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 Isolator®, Model: **SSP**
The Rustrol® Cathodic Isolator®, 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.

Interprovincial Corrosion Control Company Limited
Burlington, Ontario, Canada

International Corrosion Control Inc.
Lewiston, New York, USA

TEL: 1-905-634-7751 **FAX: 1-905-333-4313**

www.Rustrol.com

GCS Brochure, Revision 1, Mar. 15, 2017

INTERNATIONAL CORROSION CONTROL INC.

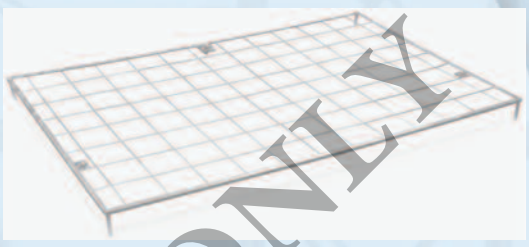
INTERPROVINCIAL CORROSION CONTROL COMPANY LTD.

Leaders in the Cathodic Protection Industry … since 1957

RUSTROL® SYSTEMS

PRODUCT INFORMATION: Gradient Control System - Mat™ *(GCS-M)**

Product: Rustrol® **Gradient Control System - Mat™** ***(GCS-M)****



End User:

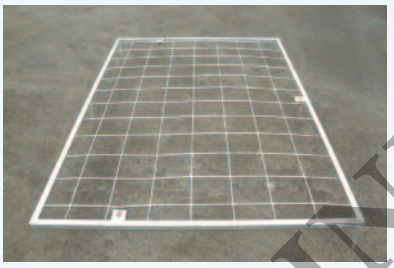
- Electrical Utilities
- Oil/Petrochemical Industries
- Pipeline Operators

Background:

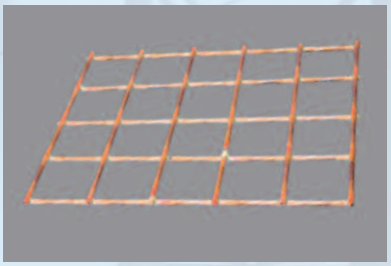
The Rustrol® **Gradient Control System - Mat™** ***(GCS-M)**** provides for a reliable, maintenance-free grounding/safety grid capable of reducing and/or preventing the potential shock hazard to personnel and equipment, typically associated with exposure to "Step & Touch" voltages.

The Rustrol® **Gradient Control Systems** ***(GCS)**** are provided in configurations as deemed necessary for numerous applications: Gradient Control System - Mat *(GCS-M)**, and/or Gradient Control Copper Cable/Zinc Ribbon *(GCS-CC or GCS-ZR)** , are typically connected to the primary structure *(ie. pipeline)* in series arrangement through a Rustrol® **Cathodic Isolator®**, Model: **SSP** or the Rustrol® **DC-Decoupler™**, Model: **DCD.**

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.



Galvanized Mat



Copper Mat

Specifications

1200mm x 1800mm *(4'.0" x 6'.0")* Approx.

Grid: 150mm x 150mm *(6".0 x 6".0)* Welded Mesh

Hardware: 3 Cable Termination Platforms with Connector Bolt, Nut and Lockwasher.

Gradient Control System - Mat™

ICCC Product Code	Description		Unit	Nominal Unit Wt.	
	Overall	Mesh Thickness (Approx.)		kg	lb.
GCS-M-64663-GS-3	Hot Dipped Galvanized Steel Mat	6.35mm (1/4")	1	13.50	30.0
GCS-M-64663-CC-1	Copper Clad Steel Mat	3.28mm (1/8")	1	1.80	4.0
GCS-M-64663-CC-2	Copper Clad Steel Mat	4.10mm (1/6")	1	2.75	6.0
GCS-M-64663-SC-2	Solid Copper Mat	4.10mm (1/6")	1	2.75	6.0
GCS-M-64663-SC-3	Solid Copper Mat	6.35mm (1/4")	1	4.00	9.0

Custom Gradient Mat Configuration available on request

Interprovincial Corrosion Control Company Limited
Burlington, Ontario, Canada

International Corrosion Control Inc.
Lewiston, New York, USA

TEL: 1-905-634-7751

RUSTROL® SYSTEMS

FAX: 1-905-333-4313

www.Rustrol.com

GCS-M Brochure, Revision 1, Mar. 22, 2017