



# CATALOG

## *ONSHORE CATHODIC PROTECTION SYSTEM*

**PERPRO**  
Anti Corrosion Company



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**CATHODIC PROTECTION RECTIFIERS & RELATED EQUIPMENT**

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● *SMART CONTROL*

● *PRECISION*

● *CUSTOMIZED*

● *MANUAL / AUTO*

● *SCR / DIODE DRY/OIL TYPE*

● *SWITCH MODE DRY TYPE*

● *ENCLOSURE*

## **INDEX**

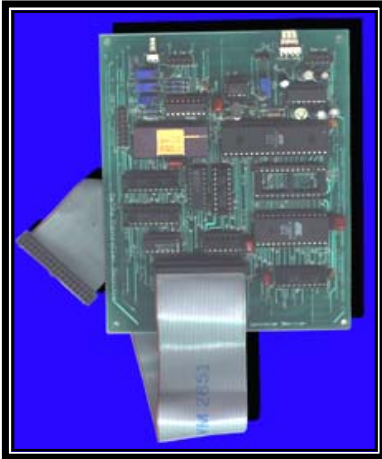
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## OVERVIEW

Corrosion control by **Cathodic Protection** a highly specialized field which is more an art rather than science and one of the widely used "tools" for the control of electrochemical corrosion. It is defined as the reduction or elimination of corrosion by making the metal a cathode by means of an impressed direct current or attachment to a sacrificial anode (magnesium, aluminum or zinc)



*Control Board For RC-Series Controller*



*Oil Type Explosion Proof NEMA 4 CP Rectifier*



*Oil Type Transformers with Tap Setting Assembly*

In design, various size and design of **Cathodic Protection Transformer Rectifier** can not be avoided since design of plant and environment very special for each case.

Updating Technology such as PLC/DCS which applied to plant design also much be considered to **Cathodic Protection Transformer Rectifier** with concept to minimized maintenance.

**PERPRO** come with all above concept and making **Cathodic Protection Transformer Rectifier** with wide range.

- Manual Tap Setting
- Manual Smooth Adjustable Setting
- Auto Potential Independent Operation
- Auto Potential with Communication Unit.
- Dry Type (Diode/SCR and Switch Mode)
- Oil Type

**PERPRO** in plant operation supported by

- Transformer manufacturer specialist
- Metal work shop fabrications
- Metal cleaning and painting shop complete with oven room
- Assembly work shop complete with testing equipment.

**Electrical test performance at Cathodic Protection Transformer Rectifier** shall be as following:

- AC Volt Input
- AC Amperes Input
- Apparent Watts Input
- True Watts Input
- Power Factor
- DC Volt Output
- DC Amperes Input
- DC Watts Output
- Conversion Efficiency
- Dielectric Strength
- Transformer Insulation Primary Winding
- Transformer Insulation Secondary Winding
- Stack AC and DC to Ground
- Ripple Voltage at Full Output

**PERPRO** supported with experience professional teams, research and development teams, constantly updating production quality which in the end of result will be keep customer in satisfied and convenience.

**PERPRO** always keep the opinion that with our products Customer always getting best performance from their Cathodic Protection System

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## **SWITCH MODE DRY TYPE CATHODIC PROTECTION TRANSFORMER RECTIFIERS**

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### **FEATURES**

- Precision Controlled with Microprocessor Unit (Autopotential)
- 1 Ph or 3 Ph AC Input
- 50 Hz or 60 Hz Frequency Input
- Manual, Constant Current, Constant Voltage as Standard Operation
- Parallel Module Installation with Single Operation Control
- Low Heat Dissipation & Low Ripple Output
- Suitable for Hazardous and Clean Area
- Filter Harmonic on Board
- Magnetic Breakers on Primary
- Diode protection on DC Output
- Fused on Output Current
- Lightning Protection on AC Input & DC Output
- Analog or Digital Metering Unit
- Minimum 1.5 mm Steel Enclosure
- ANSI / IEC Standard



### **SPECIFICATIONS**

- Each Module 300 Watt with Light Indicator
- Ambient Temperature 40°C
- Voltmeter & Ammeter Class 1.5% Accuracy
- Painting Oven Ral 7032 / ANSI 61 Light Grey
- Core Ferrite Suitable up to 100 kHz.
- Ripple Less than 0,5%
- Efficiency More than 90%
- Manual Smooth Adjustment
- Constant Current & Constant Voltage Selector
- Auto Potential for Applied RC-Series Controller

**SWITCH MODE TRANSFORMER RECTIFIER MODULE**

## DRY TYPE CATHODIC PROTECTION TRANSFORMER RECTIFIERS

### FEATURES

- Precision Controlled with Microprocessor Unit
- 1 Ph or 3 Ph AC Input
- 50 Hz or 60 Hz Frequency Input
- Smooth or Step Adjustment DC Voltage Output
- Automatic or Manual Operation Mode
- Heat Sunked Silicone Stacks
- Heat Exchanger Unit c/w Double Blower and Thermo Setting \*)
- Isolating Transformer to reduce Harmonic Wave
- Full Wave Silicone Controlled Rectifier
- Magnetic Breakers on Primary
- Diode protection on DC Output
- Fused on Output Current
- Lightning Protection on DC Output
- Analog or Digital Metering Unit
- 2 mm or 3 mm Steel Sheets as Request
- ANSI / IEC Standard



**DRY TYPE UNIT TRANSFORMER RECTIFIER**

### SPECIFICATIONS

- Standard Custom Rectifier Ratings
- Ambient Temperature 40°C
- Voltmeter & Ammeter Class 1.5% Accuracy
- Painting Oven Ral 7032 / ANSI 61 Light Grey
- Bridge Rectifier Diode or SCR
- Coarse Tap combine with Fine Tap for Diode
- Smooth Adjustment Tap Setting for SCR
- Auto Potential for Applied RC-Series Controller

**Note : \*) Available upon requested**

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## **OIL TYPE CATHODIC PROTECTION TRANSFORMER RECTIFIERS**

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### **FEATURES**

- ➔ Precision Controlled with Microprocessor Unit
- ➔ 1 Ph or 3 Ph AC Input
- ➔ 50 Hz or 60 Hz Frequency Input
- ➔ Smooth or Step Adjustment DC Voltage Output
- ➔ Automatic or Manual Operation Mode
- ➔ Heat Sunked Silicone Stacks
- ➔ Shell Diala B Transformers Oil Cooled
- ➔ Isolating Transformer to Reduce Harmonic Wave
- ➔ Full Wave Silicone Controlled Rectifier
- ➔ Magnetic Breakers on Primary
- ➔ Diode protection on DC Output
- ➔ Fused on DC Output
- ➔ Lightning Protection on DC Output
- ➔ Analog or Digital Metering Unit
- ➔ 3 or 5 mm Steel Oil Casing Standard
- ➔ ANSI / IEC Standard



**OIL TYPE UNIT TRANSFORMER RECTIFIER**

### **SPECIFICATIONS**

- Standard Custom Rectifier Ratings
- Ambient Temperature 40<sup>0</sup>C
- Voltmeter & Ammeter Class 1.5% Accuracy
- Painting Oven Ral 7032 Light Grey
- Bridge Rectifier Diode or SCR
- Coarse Tap combine with Fine Tap for Diode
- Smooth Adjusment Tap Setting for SCR
- Auto Potential for Applied RC-Series Controller

## **RECTIFIER CONTROLLER RC-Series**

A micro processor based cathodic protection rectifier controller, only six keypads for all operations, 16 X 2 characters of LCD, and so easy for use

The RC-Series can operate in

- > **CONSTANT CURRENT**
- > **CONSTANT VOLTAGE**
- > **AUTOPOTENTIAL**

The RC-Series has four different references input.

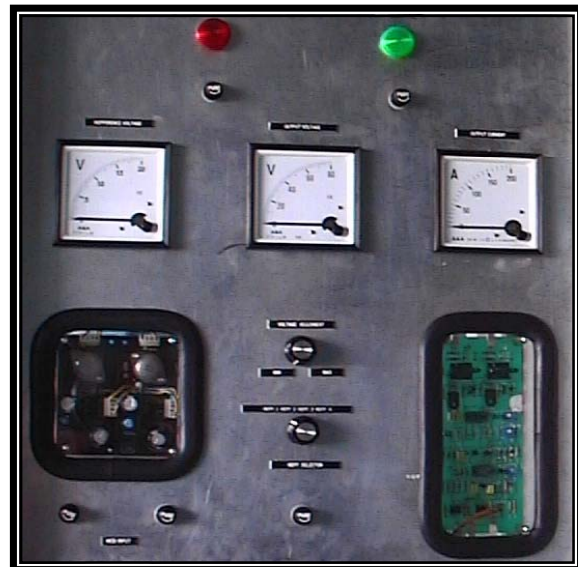
In autopotential mode, it controls on the lowest reference to structure potential measured and can control on the average or instant OFF potential.

The RC-Series trough RS-485 have capability to communication with PC under Windows Programs, each others unit and become Master or Slave.

This advantage will be covered customer demand for control all RC-series at field from 1 (one) unit only such as Current Interrupter.

### Specifications

<b>Input</b>	Voltage	: 220/380/270/480VAC 1/3Ph.
	Freq.	: 50/60 Hz
<b>Output</b>	Voltage	: 0 ~ VDC RATING
	Current	: 0 ~ ADC RATING
<b>Feedback</b>	Quantity	: 4 diff. ref. input
	Resolusi	: 12 bit / 4026
	Range	: +1000 ~ -3000mV
	Impedance	: higher than 10M
<b>Display*</b>	Type	: dot matrix LCD
	Character	: 16 X 2
<b>Enclosure</b>		: Indoor
		: Outdoor
		: Corrosion Area
		: Hazardous Area
<b>Standard</b>		: IEC
		: Ansi/NEMA



**"APPLICATION FOR DRY TYPE CP TR"**

\* Available upon request



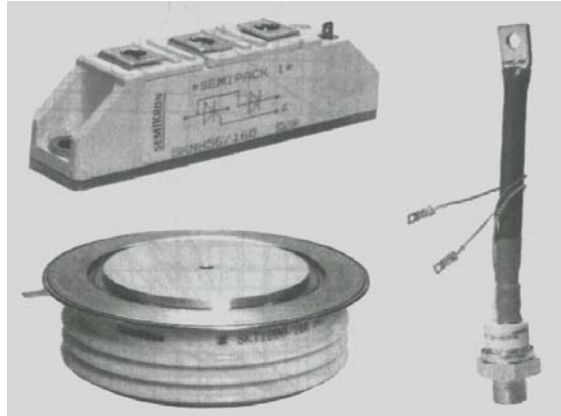
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## RECTIFIER ACCESSORIES

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### BRIDGE RECTIFIERS

400 Volt minimum rating applied to giving safety for Cathodic Protection Rectifier operation. Replacement of SCR shall be same type or consult manufacture since drive current may differ and affect to Rectifier operation.



### CIRCUIT BREAKER

TREC standard assembly for circuit breaker is Molded Case Circuit Breakers with voltage rating as per customers AC rating voltage. MCCB current rating selection shall be same or above load current multiply by 1.15.



## HOW TO ORDER TRANSFORMER RECTIFIER

<b>A</b>	<b>O</b>	<b>38</b>	<b>3</b>	<b>5</b>	<b>50</b>	<b>50</b>	<b>NEMA 4X</b>
<p>↓</p> <p><b>CONTROL</b>            T = Manual Tap            S = Smooth Adjust            A = Auto            SM = Switch Mode</p>	<p>↓</p> <p><b>COOLING</b>            D = AIR            O = OIL</p>	<p>↓</p> <p><b>V. INPUT</b>            10 = 100V            12 = 120V            24 = 240V            38 = 380V            48 = 480V</p>	<p>↓</p> <p><b>PHASE</b>            1 = 1 Ph            3 = 3 Ph</p>	<p>↓</p> <p><b>FREQ.</b>            5 = 50Hz            6 = 60Hz</p>	<p>↓</p> <p><b>V, OUT</b>            50 = 50VDc            60 = 60VDc</p>	<p>↓</p> <p><b>I. OUT</b>            50 = 50ADc            100 = 100ADc            800 = 800 Adc</p>	<p>↓</p> <p><b>ENCLOSURE</b>            ANSI STANDARD            IEC STANDARD            EXPLOSION PROOF.</p>



### PT. PERINTIS PROTEKSI SEJAHTERA

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 E-Mail : [perpro@perintis-proteksi.com](mailto:perpro@perintis-proteksi.com)

## RELATED EQUIPMENT



## EXPLOSION PROOF ENCLOSURE

### FEATURES-SPECIFICATIONS

#### Features

- **Copper-Free Cast Aluminum Construction.** High strength, lighter in weight, corrosion resistant
- **Fewer Cover Bolts.** Computer-aided design lessens the number of cover bolts by eliminating corner bolts. Reduces installation and maintenance time
- **Gasketed Flange.** Nitrile (BUNA-N) "O" ring gasket is located inside bolt circle to prevent water seeping into enclosure
- **Ductile Mounting Lugs.** Lugs are made of ductile aluminum alloy to adjust to irregular mounting surfaces without damaging enclosure. Enclosure size 8x12x6 and larger furnished with bi-directional mounting lugs which may be positioned either vertically or horizontally to facilitate mounting
- **Hinges.** All enclosure sizes 8x12x6 and larger are supplied as standard with hinges mounted on the left side. Smaller enclosures are drilled for field installation of two Killark HINGE-9 assemblies or can be installed at factory by adding SU2 to catalog number. For hinges to be located in other positions, specify when ordering
- **Recessed Flange Notches.** Flanges are notched to allow for easier cover opening with prying instrument without flange damage
- **Conduit Openings.** Enclosures are cast with wall thickness suitable for drilling and tapping of conduit openings in all sides and back of boxes. Conduit size and location information is found on dimensional chart (see page E38). Conduits can be factory or field installed
- **Mounting Pan Bosses.** Mounting pan bosses are pre-drilled at factory for field mounting of optional mounting pan

#### Material/Finish

- **Enclosure:** Copper-free aluminum (less than 4/10 of 1%)
- **Hinges:** Aluminum with stainless steel hardware
- **Cover Bolts:** Steel with a cadmium plate, gold chromate finish or zinc plate with yellow chromate finish
- **Optional Mounting Pans:** Sheet aluminum
- **Optional Windows:** Tempered soda lime glass
- **Aluminum Lacquer Paint Finish Standard**

#### Applications

- Locations made hazardous due to the presence of flammable gases or vapors, combustible dust, or easily ignitable fibers and flyings, and areas which are subject to corrosion, weather and dampness
- Petroleum Refineries, Chemical and Petrochemical plants with indoor and outdoor processes
- Applications requiring junction, pull and/or splices boxes
- Enclosure to house control stations, meters, relays, starters, circuit breakers, terminal blocks and other equipment or devices



**Class I, Div. 1 & 2, Groups B,C,D**  
**Class I, Zones 1 & 2, Groups IIB+H<sub>2</sub>, IIA**  
**Class II, Div. 1 & 2, Groups E,F,G**  
**Class III, Div. 1 & 2**  
**NEMA 3, 4, 4X, 7(B,C,D), 9(E,F,G)**  
**CENELEC - EEx d IIC, T6 or T5**  
**(with CEN suffix)**



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## **RELATED EQUIPMENT**

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### **STAINLESS STEEL ENCLOSURE**



**can be used for junction box, bonding box, current control box or etc.**

Material : SS 304/316  
Thickness : 1.5 mm or per used request  
Protection : IP 66/NEMA 4x  
Dimension : follow user requirement  
Mounting : Wall Bracket or  
Free Standing  
Finishing : Natural / Powder Coating

**EXCELLENT AT CORROSION RESISTANCE**

### **MILD (CARBON) STEEL ENCLOSURE**



**can be used for junction box, bonding box, current control, electrical panel and etc.**

Material : Mild Steel  
SPCC Steel  
Thickness : 1.5 mm or  
per user request  
Protection : IP 55  
Dimension : follow user  
requirement  
Mounting : Wall Bracket or  
Free standing  
Finishing : Powder Coating  
Color : RAL7032 or others

## Standard PERPRO TYPICAL MMO TUBULAR ANODE SIZES

Anode	Anode Length cm (in.)	Anode Dia. cm (in.)	Anode Weight lbs/kg	Amps Per Tube
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### **COKE- SOIL & FRESH WATER with 20yr design life**

2.5C/FW20YR	50 (20)	1.9 (3/4)	2 (0.9)	2.5
4C/FW20YR	61 (24)	1.9 (3/4)	2 (0.9)	4
5C/FW20YR	100 (40)	1.9 (3/4)	3 (1.3)	5
8C/FW20YR	122 (48)	1.9 (3/4)	3 (1.3)	8
4C/FW20YR	50 (20)	2.5 (1)	2 (0.9)	4
5C/FW20YR	150 (60)	2.5 (1)	5 (2.3)	5
8C/FW20YR	225 (90)	2.5 (1)	6 (2.7)	8
8C/FW20YR	100 (40)	2.5 (1)	4 (1.8)	8
10C/FW20YR	300 (120)	2.5 (1)	8 (3.6)	10
13C/FW20YR	100 (40)	2.5 (1)	4 (1.8)	13

### **SEA WATER with 20 year design life**

8SW20YR	50 (20)	1.9 (3/4)	2 (0.9)	8**
15SW20YR	100 (40)	1.9 (3/4)	3 (1.3)	15**
10SW20YR	50 (20)	2.5 (1)	2 (0.9)	10**
20SW20YR	100 (40)	2.5 (1)	4 (1.8)	20**
33SW20YR	100 (40)	2.5 (1)	4 (1.8)	33**
50SW20YR	122 (48)	3.2 (1.25)	6 (2.7)	50**

### **MUD with 20 year design life**

2M/20YR	61 (24)	1.9 (3/4)	2 (0.9)	2
4M/20YR	122 (48)	1.9 (3/4)	3 (1.3)	4
2M/20YR	50 (20)	2.5 (1)	2 (0.9)	2
7M/20YR	100 (40)	2.5 (1)	4 (1.8)	7
10M/20YR	122 (48)	3.2 (1.25)	6 (2.7)	10

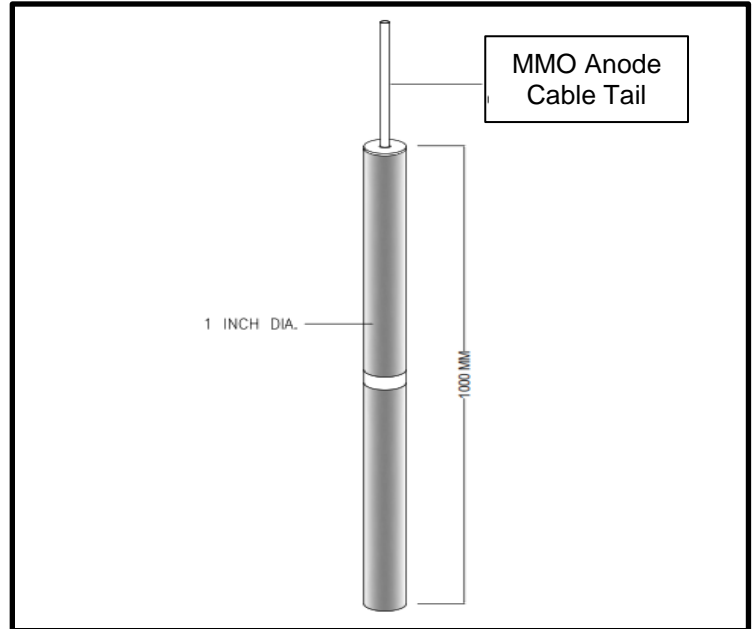
**Contact PERPRO for additional Tubular Anode sizes**

### NOTES

- \* Reduce current 50% for operation below 5 degrees C. Impurities may also affect rating.
- \*\* Reduce current 50% for operation below 10 degrees C. Impurities may also affect rating.

1) The backfill chosen must be high grade of fluid calcined petroleum coke with low electronic resistivity and a low contact resistance from particle to particle as well as between the anode and the coke particles (Loresco<sup>R</sup> SC-3 or equal). A vent pipe (Perporated PVC Pipe or equal) and centralizers must be used.

2) This current rating applies when the anode is totally immersed in water.



## CABLE FOR TUBULAR MMO ANODE

### **HMWPE INSULATION**

8 AWG (8.4 mm <sup>2</sup> )	HMWPE	0.087 lb/ft (0.130kg/m)
6 AWG (13.3 mm <sup>2</sup> )	HMWPE	0.122 lb/ft (0.182kg/m)
4 AWG (21.2 mm <sup>2</sup> )	HMWPE	0.175 lb/ft (0.260kg/m)
2 AWG (33.6 mm <sup>2</sup> )	HMWPE	0.260 lb/ft (0.387kg/m)
1/0 AWG (53.5 mm <sup>2</sup> )	HMWPE	0.405 lb/ft (0.603kg/m)

### **FLUOROPOLYMER INSULATION**

(Choose Kynar®, Halar® or "Fluoro". "Fluoro" = either Halar or Kynar)

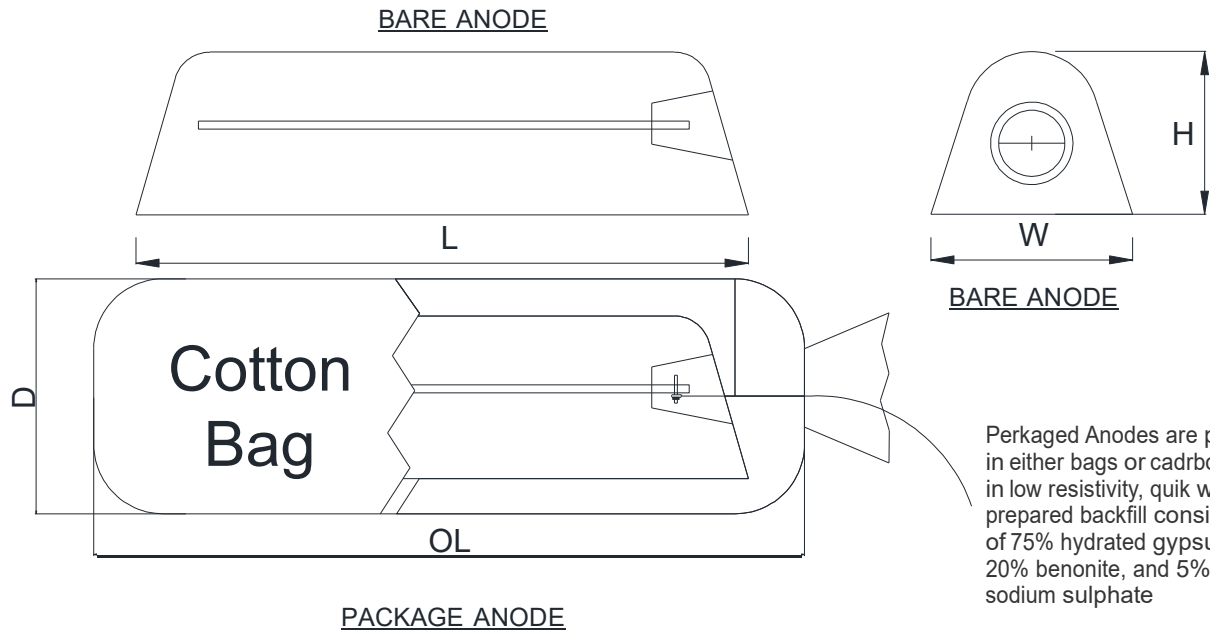
8 AWG (8.4 mm <sup>2</sup> )	Fluoro/HMWPE	0.083 lb/ft (0.124kg/m)
6 AWG (13.3 mm <sup>2</sup> )	Fluoro/HMWPE	0.120 lb/ft (0.179kg/m)
4 AWG (21.2 mm <sup>2</sup> )	Fluoro/HMWPE	0.177 lb/ft (0.263kg/m)
2 AWG (33.6 mm <sup>2</sup> )	Fluoro/HMWPE	0.260 lb/ft (0.387kg/m)
1/0 AWG (53.5 mm <sup>2</sup> )	Fluoro/HMWPE	0.395 lb/ft (0.588kg/m)

### **EPR/CSPE INSULATION**

6 AWG (13.3 mm <sup>2</sup> )	EPR/CSPE	0.150 lb/ft (0.223kg/m)
4 AWG (21.2 mm <sup>2</sup> )	EPR/CSPE	0.220 lb/ft (0.327kg/m)
2 AWG (33.6 mm <sup>2</sup> )	EPR/CSPE	0.265 lb/ft (0.394kg/m)
1/0 AWG (53.5 mm <sup>2</sup> )	EPR/CSPE	0.510 lb/ft (0.759kg/m)

# PERPRO

## MAGNESIUM ANODES



Typical Electrochemical Properties

Capacity	1200Amps/Hrs/Lb.
Efficiency	50 - 58%
Consumption Rate	7.96 Kg/Amps.Yrs
Closed Circuit Potencial	-1.50 to -1.75v
Open Circuit Potencial	-1.70 to -1.78v

Alloy compositions	
Element	%
Aluminium (Max)	0,010
Manganese (Min)	0.50 - 1.30
Iron (Max)	0,030
Nickel (Max)	0.001
Copper (Max)	0,020
Other (Max)	0,300
Magnesium	Balance

PRODUCT NO.	MODEL NO.	WEIGHT				ANODE DIMENSIONS									
		BARE		PKDG		WIDTH ( W )		HEIGHT ( H )		LENGTH ( L )		DIAMETER ( D )		OVERALL LENGTH ( OL )	
		LBS	KG	LBS	KG	IN	MM	IN	MM	IN	MM	IN	MM	IN	MM
PERPRO MG 9 HP	9D3	9	4,1	27	12,2	3,5	89	3,75	95	14	356	6	152	17	432
PERPRO MG 17 HP	17D3	17	7,7	45	20,4	3,5	89	3,75	95	25,75	654	7,5	191	34	864
PERPRO MG 32 HP	32D3	32	14,5	70	31,8	5,5	140	5	127	20,5	521	8	203	28	711
PERPRO MG 60 HP	4x4x60	60	27,2	125	56,7	4	102	4	102	60	1524	7	178	64	1626

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 perpro@perintis-proteksi.com  
 Website : www.perintis-proteksi.com



## PERPRO JUNCTION BOXES



### APPLICATION

Junction boxes for positive and negative current distribution and control, and for resistance bonding are available to meet exact client specification.

Suitable for onshore and marine environments in safe and hazardous areas.

**When specifying a Cathodic Protection Junction Box assembly please clarify specific hardware and components required.**

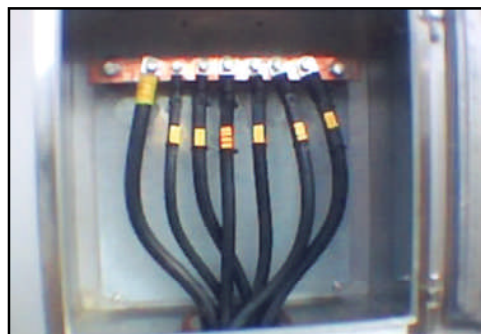
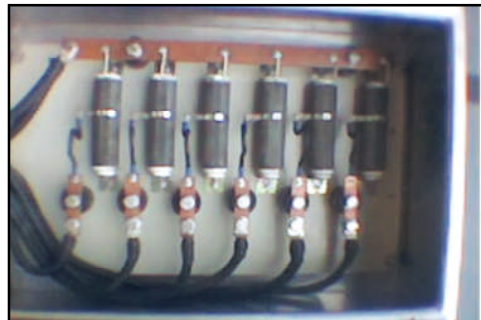
### ENCLOSURES

- Stainless Steel 316 & 304
- Galvanized and Painted
- Painted Mild Steel
- Aluminium

Please also specify IP, NEMA or Hazardous area classification required.

### ACCESSORIES

- Resistors
- Shunt
- Support Frame
- Copper Link
- Terminals
- Security/Locking

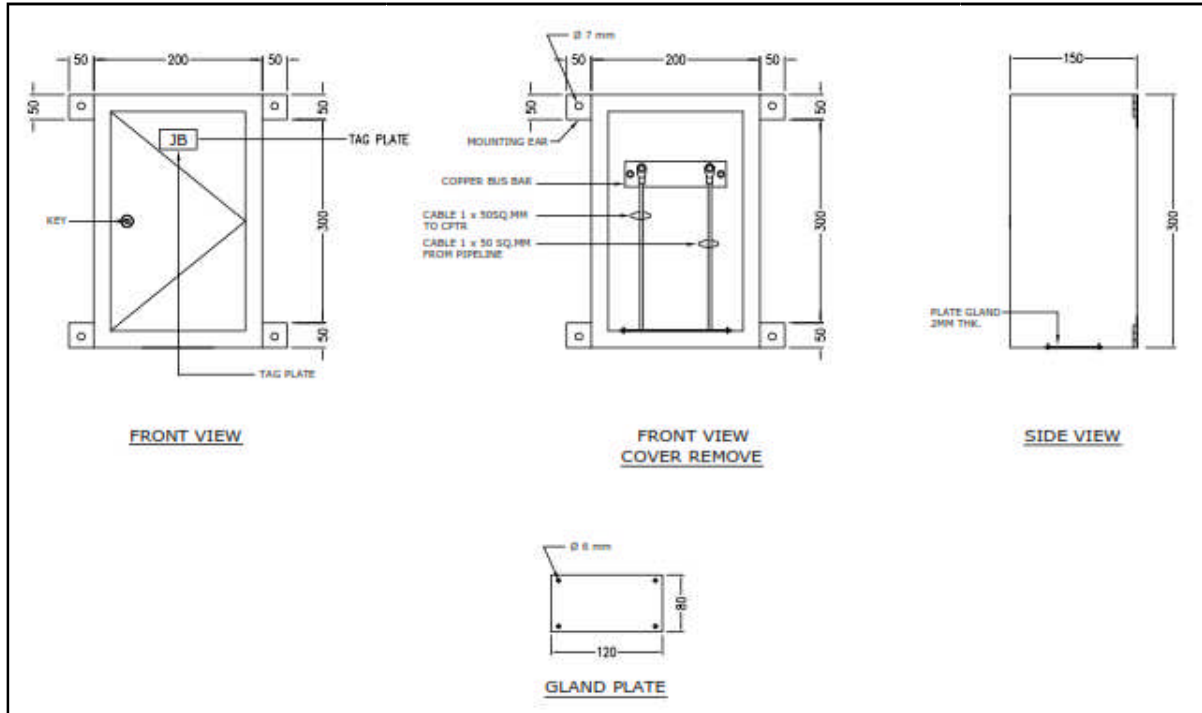


# PERPRO JUNCTION BOXES

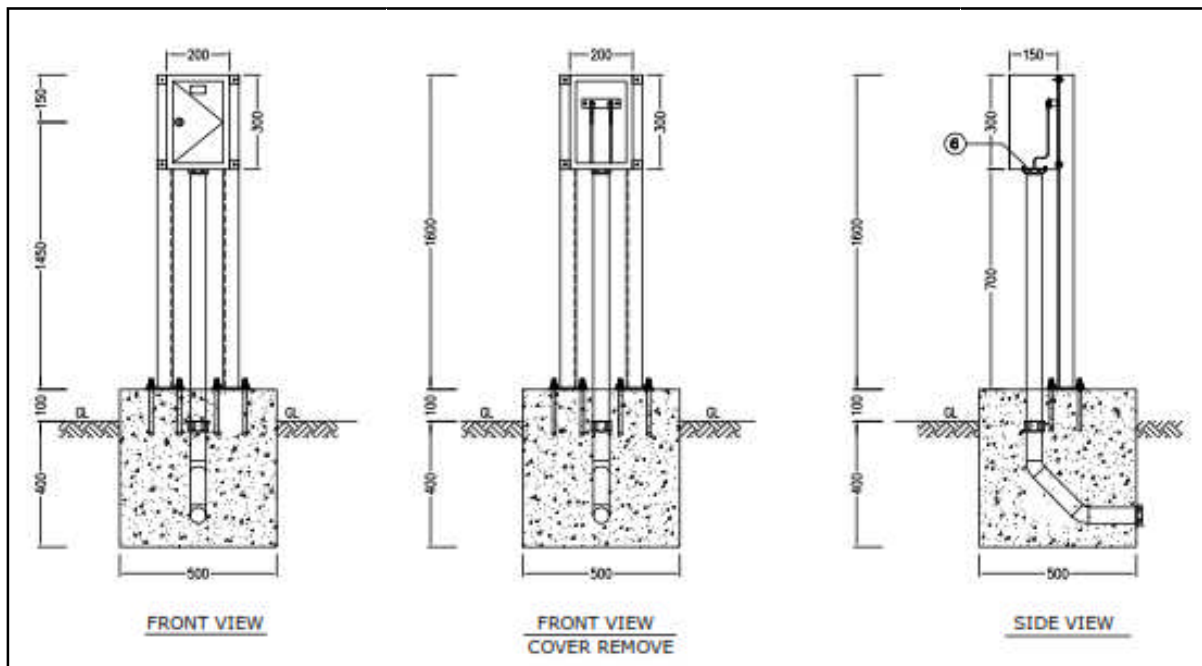


## CABLE ENTRY

Cable entry can be made by any type of proprietary cable gland, or by conduit and hub assemblies allowing the safe passage of multiple cables into the enclosures.



**Junction Box Dimensional**



**Typical Junction Box Support Arrangement**

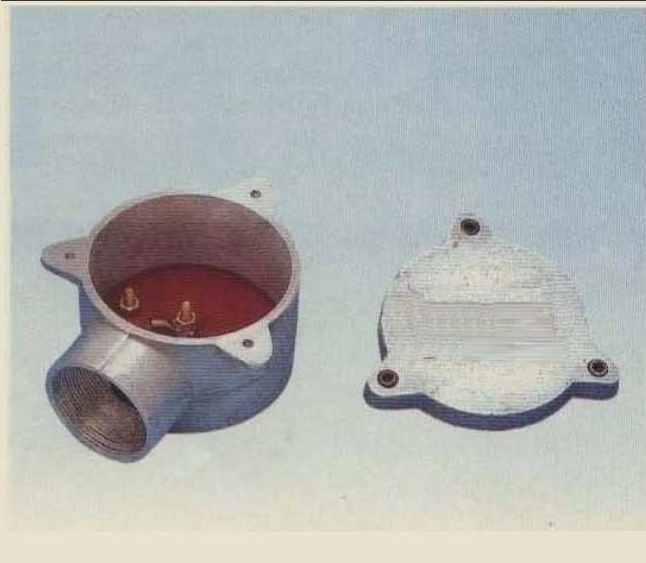


## PERPRO STAINLESS STEEL TEST BOX

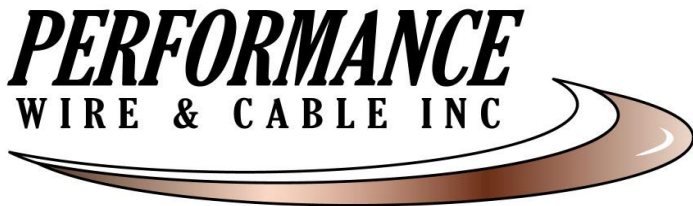


- > STAINLESS STEEL
- > DOOR WITH LOCKABLE
- > COMPLETE WITH TERMINAL PLATE AND BOLT + NUT
- > STAND PIPE MOUNTING

## PERPRO ALUMINIUM TEST BOX



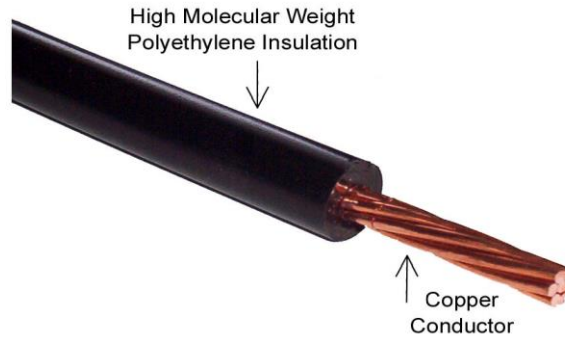
- CASTING ALUMINIUM ALLOY
- BOLT TYPE COVER
- COMPLETE WITH TERMINAL PLATE AND BOLT + NUT
- STAND PIPE MOUNTING



**PERFORMANCE WIRE & CABLE INC.**  
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## Cathodic Protection Cable

**Single conductor, 600 Volt**



### Description & Features :

Cathodic Protection Cable is a stranded copper conductor insulated with a black high molecular weight polyethylene ( HMWPE ) compound that provides excellent abrasion, crush, chemical, oil and moisture resistance.

### Application :

Suitable for direct burial for use in cathodic protection systems for pipelines, storage tanks, pilings, well casings, cables, marine crafts and other buried or water submerged metallic structures.

### Construction :

**Conductor:** Stranded Bare or Tinned Copper Conforms to ASTM B-3 & B-8

**Insulation:** Black high molecular weight polyethylene ( HMWPE ), Conforms to ASTM D 1248

**Temperature:** 75 degree C

**Voltage:** 600 volts

Conductor		Nominals (in )			WEIGHT	Nominal DC
AWG	Strand	Cond. O.D.	Insulation	O.D.	( Lbs./Mft )	Resistance
8	7	0.143	0.080	0.303	74	0.652
6	7	0.182	0.080	0.342	108	0.411
4	7	0.229	0.080	0.389	161	0.258
2	7	0.290	0.080	0.450	244	0.162
1	19	0.326	0.080	0.486	300	0.129
1/0	19	0.367	0.080	0.527	359	0.102

Custom put-ups available

This specification describes a single conductor cathodic protection cable. It is intended to carry a DC current to anodes and cathodes in a cathodic protection system.

The wire will be identified by surface ink printing indicating: Conductor size, manufacturer.

# **N2XY**

## **XLPE Insulated Non Armoured Power Cable**

(Copper Conductor, XLPE Insulated and PVC Sheathed)



Type of Cable	: N2XY
Rated Voltage	: 0.6/1 kV
Size Ranged	: 1 x 16 ... 500 mm <sup>2</sup> 2 x 1.5 ... 240 mm <sup>2</sup> 3 x 1.5 ... 300 mm <sup>2</sup> 4 x 1.5 ... 300 mm <sup>2</sup> 5 x 1.5 ... 50 mm <sup>2</sup>
Specification	: IEC 502 SPLN 43-6
Application	: For Electric Power Circuit
Identification of Cores	
Single-Core	: Black
Twin-Cores	: Light Blue, Black
Three-Cores	: Light Blue, Yellow, Black
Four-Cores	: Green, Light-Blue, Red, Yellow, Black

Other colour are available on request.

### Construction:

1. Conductor : Annealed Copper
2. Insulation : Extruded XLPE
3. Inner Sheath : Extruded PVC
4. Outer Sheath : Extruded PVC

# XLPE Insulated Non Armoured Power Cable

(Copper Conductor, XLPE Insulated and PVC Sheathed)

Type of Cable : N2XY  
Rated Voltage : 0.6/1 kV

Specification : IEC 502  
SPLN 43-6  
Other specification are available on request

## CONSTRUCTION

No. of Core	Size	Conductor		Wall Thickness		Approx Overall Diameter	Approx Net Weight	Standard Length	Packing
		Construction	No. of Wire	Insulation	Sheath				
-	mm <sup>2</sup>	-	-	mm	mm	mm	kg/km	m	-
1	16	rm	7	0.7	1.4	10.7	233	1,000	Drum
1	25	rm	7	0.9	1.4	12.5	343	1,000	Drum
1	35	rm	7	0.9	1.4	13.6	448	1,000	Drum
1	50	rm	19	1.0	1.4	15.1	578	1,000	Drum
1	70	rm	19	1.1	1.4	17.1	798	1,000	Drum
1	95	rm	19	1.1	1.6	19.0	1,067	1,000	Drum
1	120	rm	37	1.2	1.6	20.8	1,316	1,000	Drum
1	150	rm	37	1.4	1.6	22.8	1,608	500	Drum
1	185	rm	37	1.6	1.6	25.0	1,985	500	Drum
1	240	rm	61	1.7	1.8	27.9	2,567	500	Drum
1	300	rm	61	1.8	1.8	30.5	3,174	500	Drum
1	400	rm	61	2.0	2.0	33.9	4,014	500	Drum
1	500	rm	61	2.2	2.2	37.4	5,015	500	Drum

## CHARACTERISTICS

No. of Core	Size	Resistance at 20°C		Current Carrying Capacity at 30°C*		Short Circuit Current at 1 Sec.	AC Voltage Test
		Conductor	Insulation	In Ground	In Air		
-	mm <sup>2</sup>	Ohm/km	M. Ohm. km	Ampere		kA	kV/5 min
1	16	1.15	1,100	169	132	2.27	3.5
1	25	0.727	1,100	220	187	3.55	3.5
1	35	0.524	1,000	265	217	4.97	3.5
1	50	0.387	900	316	263	7.10	3.5
1	70	0.268	900	385	331	9.94	3.5
1	95	0.193	800	465	408	13.49	3.5
1	120	0.153	800	531	474	17.04	3.5
1	150	0.124	800	597	550	21.30	3.5
1	185	0.0991	800	680	633	26.27	3.5
1	240	0.0754	700	790	750	34.08	3.5
1	300	0.0601	700	901	871	42.60	3.5
1	400	0.0470	700	1,032	1,019	56.80	3.5
1	500	0.0366	700	1,180	1,088	71.00	3.5

Note \*: If site conditions are different. The tabulated current ratings should be multiplied by rating factors as show in table pages 51-56

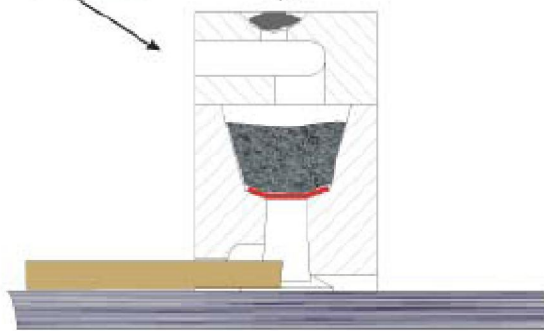
# thermOweld®

## EXOTHERMIC WELDS FOR CATHODIC PROTECTION

### Featuring thermOweld's EZ Lite Molds

Emissions are reduced  
by over 50% using  
new port design.

Hole in lid makes it much easier  
to ignite powder and extends  
the life of the flint gun.



## THERMOMOLDS

The copper thermite reaction takes place within a specially designed, fine graphite THERMOMOLD that permits free flow of molten metal to all sections of the weld cavity. The weld cavity is designed to allow easy removal of the THERMOMOLD from the finished joint to increase mold life. The average life of a THERMOMOLD is 50 to 100 welds depending on the care and treatment it receives. A set of instructions is packaged with each THERMOMOLD.



## THERMOWELD® WELD METAL

THERMOWELD® Powder is packed in moisture-resistant plastic cartridges that have tight fitting caps. These cartridges and the necessary steel discs are then packed in boxes that are hermetically-sealed. This insures the powder arriving in good condition, always dry and ready for fast positive ignition. THERMOWELD® Powder comes in two types; one for welding copper to copper, copper to steel and copper to rail and one for welding copper to cast iron. The size and weight (in grams) of the cartridge are marked on each individual cartridge.

STANDARD CARTRIDGE SIZE	CAST IRON CARTRIDGE SIZE	PACKED PER BOX
#15	—	20
#25	#25CI	20
#32	#32CI	20
#45	#45CI	20
#65	#65CI	20



ThermOweld® Powder is sold in box quantities only.

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**THERMOWELD® ACCESSORIES**



**38-0309-00 FLINT GUN**

The 38-0309-00 Flint Gun is used to ignite the starting powder. Each mold that is sold with a frame has a flint gun included. To order replacement flints, specify part # 38-0309-01.

# Royston Handy Cap™

## Corrosion Protection For Exothermic Grounding Connections

### What Is Royston Handy Cap?

The Royston Handy Cap is a prefabricated assembly specifically designed for Cathodic Protection leads to pipes and tanks. When pressed by hand into position over the anode lead wire weld it forms a thick, highly resistant electrical insulation seal over the weld, the end of the lead wire and the surrounding area of the pipe or tank.

### Features

- 1.) A top plastic sheet formed with an igloo shaped dome and entry tunnel for the lead wire.
- 2.) A special elastomeric compound in the plastic dome, which is firm enough to resist flow at all normally encountered application and operation temperatures, but soft enough to mold itself around and completely cover the irregular welded profile.
- 3.) On either side of the dome are a double row of parallel, flexibilizing serrations to assist with conforming around small diameter pipe.
- 4.) A base of Royston Tac-Coat, a black unbacked elastomeric tape with exceptional adhesive properties, for bonding firmly to the metal surface, when used with Royston Roybond 747.



### Usage

The Royston Handy Cap is easily applied and economical. They may be used on all anode lead wire and test wire weld areas. Royston Handy Cap is especially useful for welds on mill coated pipe where only a small part of the coating has been removed to permit installation of the thermite grounding connections.

They are ideal for use in limited access situations, because they can be manipulated easily and applied at arm's length.

### TYPICAL PROPERTIES

*Construction: Molded plastic cap filled with corrosion resistant compound on a base of thick elastomeric tape.*

Dimension:

Overall- 4" x 4"

Plastic Sheet- 2-3/4" x 4" (serrated)

Sheet Thickness- 10 mils

Plastic Dome- 1-5/8" diameter/  
0.8" height

Tape Thickness- 125 mils

Weight: 2.1 ± 0.4 oz

Application Temperature: -20°F to 120°F

Service Temperature: -40°F to 185°F

Shelf Life: At least one year



# Royston Handy Cap

## Ordering Information

Royston Handy Cap is packed 24 per carton. (Shipping weight is five lbs.) Royston Roybond 747 is available in:

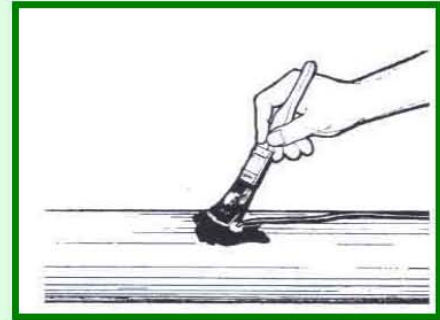
- 16 ounce aerosols—sufficient for 30 Caps
- One quart cans—sufficient for 200 Caps.

Call your local Royston representative or distributor or call Royston's direct at 800-245-3209 for prices, delivery, additional information or technical assistance.

*The technical data furnished is true and accurate to the best of our knowledge. However, no guarantee of accuracy is given or implied. We guarantee our products to conform to our Quality Control standards. We assume no responsibility for installation, coverage, performance or injuries resulting from use. Liability, if any, is limited to replacement of products determined to be defective by our Quality Control standards exclusive of labor for installation and/or subsequent damage resulting/ causing functional damage either directly or indirectly. Prompt reporting (within four (4) working days) of suspected defective product is required. Prices and cost data shown are subject to change without prior notice.*

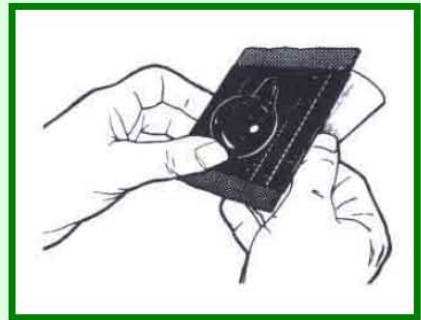
### Step 1

Clean all mud, dirt, grease, oil and other contaminants from the metal surface and any part of the mill applied coating which is to be covered. Apply a coat of Royston Roybond 747 and allow to dry to a non-glossy appearance, which will take about 5 minutes, depending on humidity and temperature.



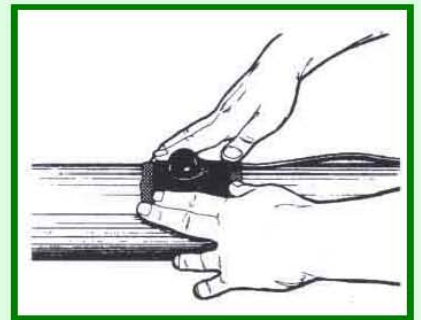
### Step 2

Remove the release paper from the bottom of the Royston Handy Cap. Bend the plastic sheet inward at the serrations when applying to small diameter pipe. Position and place the Royston Handy Cap on the welded area with the tunnel over the lead wire.



### Step 3

Push the dome of the cap firmly into the weld area. Now lift the lead wire away from the pipe and squeeze the black rubber compound completely around and underneath the wire. Then push the lead wire back down on the pipe and press the elastomeric compound into firm contact with the pipe over the entire area.



No further protection is necessary when Royston Handy Cap covers the entire exposed metal area. Uncovered areas should be protected by applying tape or mastic, such as Royston Roskote Mastic.

When coating or wrapping the Royston Handy Cap, remove the narrow strips of plastic release film on the top of the cap. This will assure maximum protection by effecting a positive waterproof seal.

**CHASE** corporation  
**Royston**  
ISO 9001 REGISTERED  
Advanced Technology  
in Anti-Corrosion  
Wraps and Coatings

# Copper / Copper Sulfate AccuRef 20 Permanent Reference Electrodes



Accuref 20  
Copper Sulfate  
Cat. #14630

## FEATURES & BENEFITS

- **Applications:** Direct burial in soil, assuming low (<500ppm) levels of chloride ion contamination. Accuref Silver/Silver Chloride electrodes are recommended for use in chloride ion contaminated soil
- **Low Freezing Point:**  $-20^{\circ}\text{C}$
- **Design Life:** 20 years (AccuRef 20)
- **High Purity:** Cu/CuSO<sub>4</sub> and triple de-ionized H<sub>2</sub>O
- **Cost:** Less expensive than most copper sulfate permanent electrodes
- **Tip:** Moisture absorbent ceramic tip
- **Evaporation:** Will not dry out at low humidity and/or high heat
- **Wire:** 25 feet of #12 AWG XLPE RHW-2 lead wire; cross-linked Polyethylene jacket, direct burial, low leakage, 600 V, 90°C Rating. Longer lengths of wire are available
- **Electrical Contact Surface Area:** Approximately 16.4 square inches (a cylindrical surface, 1.5 inches in diameter and 3.5 inches in length)

*Antifreeze is added to the solution to lower the freezing point to  $-20^{\circ}$  Centigrade. This enables the AccuRef Permanent Electrodes to survive a deep frost without freezing and cracking the electrode.*

Boiling point is  $100^{\circ}\text{C}$

AccuRef 20 contains 80 grams of high purity Cu 99.99% and 500 Milliliters of saturated Cu/CuSO<sub>4</sub>

Dimensions: 2.77" diameter, 15" long

Weight: 3.9 Pounds

*All specifications are subject to change*



# Scotchcast™ Power Cable Tap Splice Kit 90-B1

## Instructions

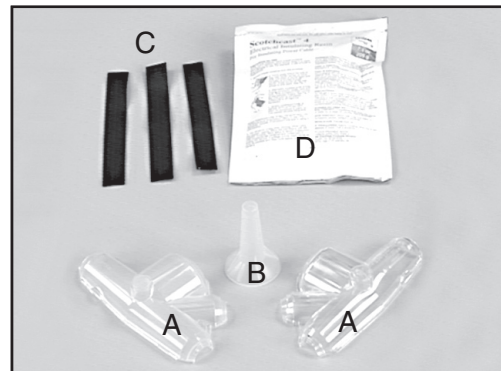
### 1.0 Applications

Designed for use in weather-exposed or direct-burial locations. For making tap or branch splices on unshielded, synthetic insulated cables rated up to a maximum of 1000 volts. These kits will accommodate the following connectors and conductor sizes:

Kit No.	Cable O.D.	Conductor Size	Sheath Opening
90-B1	Feeder Cable 1/2" to 13/16"	Split Bolt 1/0 AWG (max.)	3" maximum
90-B1	Branch Cable 3/8" (max.)	Crimped 2/0 AWG (max.)	3" maximum

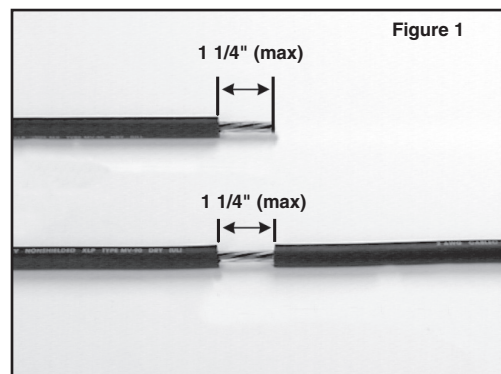
### 2.0 Kit Contents

Mold Body .....	A
Pouring Spout .....	B
Scotch® Electrical Tape 23.....	C
3M™ Scotchcast™ Resin 4.....	D



### 3.0 Prepare Cable

3.1 Thoroughly scrape all wax and dirt 3" back from each cable end. Prepare cable ends exactly as shown in Figure 1.



#### **CAUTION**

Working around energized electrical systems may cause serious injury or death. Installation should be performed by personnel familiar with good safety practice in handling electrical equipment. De-energize and ground all electrical systems before installing product.

## 4.0 Make Connection

- 4.1 Make connection according to instructions for connector being used. The mold will accept:  
a) Crimped type connectors up to 2/0 AWG      b) Split bolt connectors up to 1/0 AWG
- 4.2 **For Multi-Conductor cables**, stagger individual connections and insulate with Scotch 23 Electrical Tape. Sheath opening should not exceed 3". Use 3M™ Scotchlok™ Connector or indent-type connectors.

## 5.0 Install Mold Body

- 5.1 Trim mold ends with knife to fit cable slightly loose. Hold mold halves in place, centered over splice (bend branch cable to accommodate centering of mold). Snap mold halves together firmly. Check to see that both seams are carefully snapped together. Tape ends of mold body around cable to seal. Use supplied Scotch™ Electrical Tape 23 (see Figure 2).

**IMPORTANT: Stretch tape to 3/4 original width.**

- 5.2 Put pouring spout in hole.

*Note: The preferred pouring position is as indicated in Figure 3. This kit can, however be poured from either side if necessary. Cut thin membrane from port at top of desired pouring position. Insert pouring spout and plug remaining hole with small plastic plug provided in kit.*

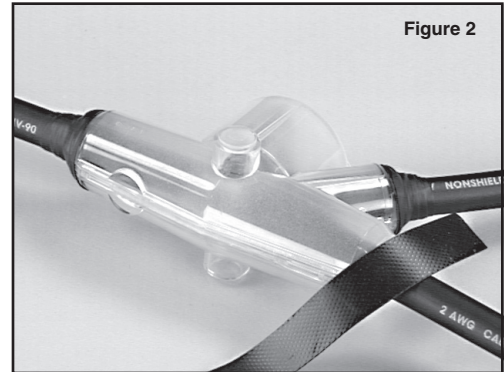


Figure 2

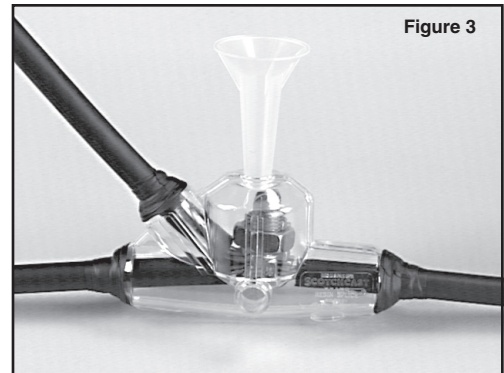


Figure 3

## 6.0 Pour Splice

- 6.1 Position splice level. Mix resin thoroughly per instructions on resin package. Pour resin until mold and spout are completely filled (see Figure 4). Refill spout after air escapes. When resin has solidified and cooled, splice may be put into service. Clip off spout, if desired (see Figure 5).

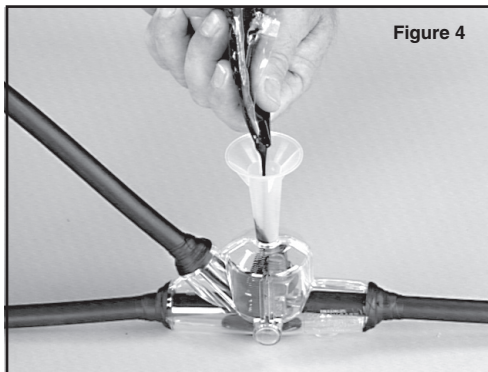


Figure 4

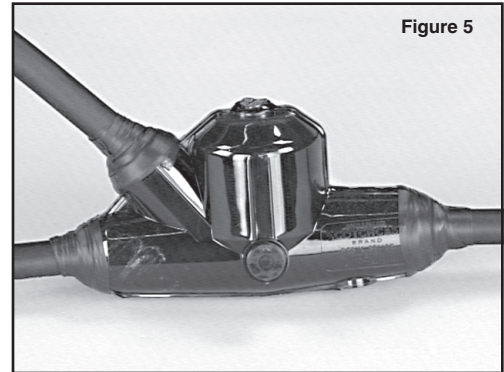


Figure 5



## LORESCO SC•3 EARTH CONTACT BACKFILL

### DESCRIPTION

Loresco SC•3 is the finest earth contact backfill in the Loresco line products. Loresco is already acknowledged around the world as a leader in cathodic protection.

A dramatic breakthrough in over thirty years of research has now produced a super-conducting premium earth contact backfill called Loresco SC•3. Once again, Loresco defines the standard for quality and performance in the cathodic protection industry.

Loresco SC•3 is designed specially for demanding anode systems which mandate a low resistivity medium. SC•3 is a dust free product and according to EPA extraction tests, is extremely pure and complies with regulations governing buried products.

Utilizing a modified industrial standard method for testing permeability (API RP-27), SC•3 will mitigate fluid interchange between aquifers. Loresco SC•3 is produced specially for cathodic protection applications using an exclusive multi-step process.

**FIRST**, a very high quality base carbon with desired characteristics is selected. **NEXT**, this carbon is calcined to a minimum temperature of 1250°C under very exacting and controlled standards. This step results in semi-graphitized carbon particles with excellent conductivity.

**THEN**, to further improve the bulk conductivity, the surfaces of the individual particles are modified to enhance the contact conductance. This breakthrough in surface alteration ensures maximum electronic current transfer with positive anode contact. **FINALLY**, a specially formulated surfactant is added to reduce particle surface tension for compact settling under water.

Loresco SC•3 has a bulk density of 74 lbs per cubic foot. The fixed carbon content is greater than 99% by weight. The bulk density and high fixed carbon content coupled with the assured low resistivity medium allows for longer groundbed life at a low operating cost.





## LORESCO SC•3 EARTH CONTACT BACKFILL

### INSTALLATION

Loresco SC•3, due to its dust-free manufacture, is simple to install by either mixing and pumping or by pouring dry. With deep anode systems, pumping from the bottom up is recommended. Loreasco SC•3 has superb pumping qualities due to the addition of surfactants and when agitated in water, takes on the characteristics of heavy mud. A recommended mix is seven gallons of water per one-hundred pounds. After installing SC•3, allow twenty-four hours settling time before energizing. The modified surface of the carbon particles coupled with the action of the surfactants in SC•3 will achieve positive electrical contact by settling. Vibrating or compacting is not necessary.

### SC•3 WORKS

Loresco SC•3 represents technology developed exclusively for high current cathodic protection installations. SC•3 will satisfy all functioning requirements for a premium earth contact backfill.

### MATERIAL DESCRIPTION

Loresco SC•3 is a surface modified, blended and sized carbon backfill with surfactants.

### SPECIFICATIONS

Fixed Carbon	99.35%
Ash	0.6%
Moisture	0.05%
Volatiles	nil [950°C]*
Bulk Density	74 lbs. per cubic foot

- > Predominantly round particles
- > All particles surface modified for maximum electrical conductivity and high current applications
- > Particle sizing to be dust free with a maximum particle size of 1mm
- > Minimum calcination temperature of base materials is 1250°C
- > Base materials are calcined under ISO:9002:2000 quality control
- > Surfactants are added to assist pumping and settling
- > No de-dusting oils are used during the manufacture of base particles

#### DRY VOLUME OF LORESCO TYPE SC3 REQUIRED VS. CYLINDRICAL HOLE SIZE

HOLE SIZE	CUBIC FT. PER LINEAL FT.	LBS. TYPE SC3 PER FT.	FT. TYPE SC3 PER 100 LBS.	LBS. SC3 PER 100 FT. OF HOLE
4"	.087	6.4	15.70	15.70
6"	.196	14.3	6.99	6.99
8"	.349	25.5	3.93	3.93
10"	.545	39.8	2.51	2.51
12"	.784	57.2	1.75	1.75

---

The logo for LORESCO, featuring the word "LORESCO" in a bold, red, sans-serif font with a yellow outline, oriented vertically.

Certified to  
ANSI/NSF  
Standard 60

## SC-3<sup>®</sup>

### SUPER CONDUCTING EARTH CONTACT BACKFILL

Loresco type SC-3 is designed specifically for demanding anode systems which mandate a low resistivity medium.

---

Loresco type SC-3 is a dust-free product and, according to EPA extraction tests, is extremely pure and complies with regulations governing buried products. Utilizing a modified industrial standard method for testing permeability (API RP-27), SC-3 will mitigate fluid interchange between aquifers.

Loresco SC-3 is produced specifically for cathodic protection applications using an exclusive multi-step process. First, a high quality base carbon with desired characteristics is selected. Next, this carbon is calcined to a minimum temperature of 1250° C under exacting and controlled standards. This step results in semi-graphitized carbon particles with excellent conductivity. Then, to further improve bulk conductivity, the surfaces of the individual particles are modified to enhance the contact conductance. This breakthrough in surface alteration ensures maximum electronic current transfer with positive anode contact. Finally, a specially formulated surfactant is added to reduce particle surface tension for compact settling under water.

Loresco SC-3 has a bulk density of 74 lbs. per cubic foot. The fixed carbon content is greater than 99.35% by weight. The bulk density and high fixed carbon content coupled with the assured low resistivity medium allows for longer grounded life at a lower operating cost.

Loresco SC-3 is the recommended product for high current installations. Specify Loresco SC-3 Super-Conducting Premium Earth Contact Backfill.

#### **Installation:**

Loresco SC-3, due to its dust-free manufacture, is simple to install by either mixing and pumping or by pouring. With deep anode systems, pumping from the bottom up is

recommended. Loresco SC-3 has superb pumping qualities due to the addition of surfactants and when agitated in water, takes on the characteristics of heavy mud. A recommended mix is seven gallons of water per one hundred pounds. After installing SC-3, allow twenty-four hours settling time before energizing. The modified surface of the carbon particles coupled with the action of the surfactants in SC-3 will achieve positive electrical contact by settling. Vibrating or compacting is not necessary.

**Material Description:**

Loresco SC-3 is a surface modified, blended, and sized carbon backfill with surfactants.

**Specifications:**

- Bulk Density: 74 lbs. per cubic foot
- Predominantly round particles
- All particles surface modified for maximum electrical conductivity
- Particle Sizing: To be dust free with a maximum particle size of 1 mm
- Minimum calcination temperature of base materials is 1250° C
- Base materials are calcined under ISO 9002 quality control
- Surfactants are added to assist pumping and settling
- No de-dusting oils are used during the manufacture of base particles

**Shipping Data:**

Loresco SC-3 is shipped in fifty (50) pound (22.7 kg) coated, woven polypropylene bags. SC-3 may be stored outside for limited periods (not to exceed four hundred hours of sunlight). Pallets are available with fifty bags per pallet. Proven export packaging is also available.





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Factory :

Kawasan Industri Greenland

International Industrial Center

( GIIC ) Blok CD No. 6A.

Kota Deltamas, Cikarang Pusat,

Bekasi, INDONESIA



**PERPRO**  
Anti Corrosion Company