SDP

Sepehr Danesh Pooya

Competence in Cathodic Protection Systems

Sepehr Danesh Pooya Overview	SDP Overview
Remote Monitoring and Control	Remote Monitoring and Control
Aluminum Anodes Zinc Anodes Magnesium Anodes Pre-packaged Magnesium Anodes Ribbon Anodes	Sacrificial Anodes
MMO Titanium Anodes Ribbon MMO Titanium Anodes Canister MMO Titanium Anodes High Silicon Chromium Cast Iron Anodes - 3" × 60" and 2" × 60" Tubular High Silicon Chromium Cast Iron Anodes Canisters High Silicon Cast Iron Anodes Metallurgical Coke and Calcined Petroleum Coke U PVC - Casing	Impressed Current Anodes
TCS Series of Manual CP Rectifier (O63 Model, Oil-Cooled) CTR Series of SCR Controlled CP Rectifier (Oil-Cooled and Air-Cooled) VTR Series of Manual Controlled CP Rectifier (AMV Model, Air-Cooled) RRU Series of Automatic CP Rectifier (Oil-Cooled and Air-Cooled)	Transformer Rectifiers
Solar Power Units	Solar Systems
Compensating Current Limitation Unit Junction Box Test Stations	Boxes
Cables Cathodic Protection Cable Kynar Splicing Kits Handy Cap Welding Thermit Welding Thermit Welding Material Selection Guide Pin Brazing	Cables and Connections
Flange Insulation Monolithic Insulating Joints Pipe/Sleeve End Seals and Insulators Zinc Earthing Cell Surge Protection Polarization Cell Lightning Protection Systems	Insulations and Earthings
Cu/$CuSO_4$ Reference Electrode Ag/AgCl Portable Reference Electrode Zn/$ZnSO_4$ Reference Electrode	Reference Electrodes
Mobile Data Collection WTW Pocket Multi-Parameter Instrument STING R1 Deep Earth Resistivity Meter	Measuring Equipments
Buried Warning Tapes	Other

SEPEHR DANESH POOYA OVERVIEW

SDP Co. is organized with a vision of providing engineering services and manufacturing for Authorities and Clients located in Iran and Middle-East.

This company has utilized its ability through production, technology and engineering activities in fulfilling industrial requirements such as:

- Oil and Gas Industries (offshore & onshore)
- Petrochemical industry
- Energy
- Cement Industries

SDP Co. carries out its business under five separate functional divisions as follow:

- Engineering Design and R&D
- Manufacturing and Fabrication
- Installation, Commissioning and Maintenance
- Strategic Planning and Project Control
- Financial and Commercial

We continuously strive to perform all of our projects with the best quality to satisfy clients requirements, using the qualified engineers and specialists. We realized that our success is largely dependent upon customer satisfaction witch is directly involved within each member products and managed projects.
SDP Co. is a Company having a powerful blend of management experience, young, dynamic and technical expertise.

MANUFACTURING:

Sepehr Danesh Pooya Co. is capable of constructing and producing all the components of cathodic protection systems by having an area of 4000 square meters in Khoramdasht Industrial Township, located at 15th kilometer of Tehran road to Jajrood and by having the productive, technical and engineering machinery and equipments.
At present, more than 60 persons are engaged in working in the productive sections of Sepehr Danesh Pooya Co., more than 16 persons of whom have higher education.

The productive equipment of this company consists of :

a. Different land & aerial furnaces and controlled atmosphere
b. Different hitting & hydraulic presses
c. Different plastic & elastic injection
d. Different aluminum & joints injection
e. Tools & molding

a- Different Land & Aerial Furnaces and Controlled Atmosphere

In this section, the company is able to produce different zinc, aluminum and magnesium anodes, considering existing equipment and furnaces which are fully designed and constructed based on the new standards. It is worth mentioning that Sepehr Danesh Pooya Co. is the only company which has technical, engineering and productive technologies of magnesium alloys melting.

b- Different Hitting & Hydraulic Presses

In the pressing section different hitting and hydraulic presses causes to have the ability to construct and produce different industrial components and presently a general section of the spare parts relevant to petrochemical, oil & automobile manufacturing and home appliances industries are being performed.

c- Different Plastic & Elastic Injection

In this section, having different plastic injection machinery enables us to produce plastic components up to 205 kilograms and presently above mentioned machinery provides a general section of plastic components, oil automobile manufacturing and home appliances industries.

d- Different Aluminum & Joints Injection

In this section, having aluminum (die-cast) equipment enables us to produce under-pressure molding parts up to 3 kilograms. Aluminum, Zinc and Magnesium components are qualified by having high physical & mechanical properties. The produced products could meet any type of standard, due to non–existence of fault.

e- Tools & Molding

In this section, by having experienced staffs and benefiting from different filings machinery such as CNC, spark, cutting and different derail machines as well as special productive tools enables constructing all industrial moulds such as plastic, ramrod matrix and die-cast. This section protects other productive sections well; therefore, production of any industrial components is possible due to existence of the mentioned section .

MAJOR SERVICES OF SDP CO. :

- SITE SURVEYS & INSPECTIONS SERVICES
- ENGINEERING DESIGN, PLANNING AND R&D SERVICES
- INSTALLATION AND COMISSIONING SERVICES
- BACK-UP SERVICES
- TRAINING

SITE SURVEYS & INSPECTIONS SERVICES:

Site surveys are undertaken to evaluate the corrosion behaviour of different environments, cathodic protection monitoring, underwater inspection of structures, anodes, and coatings, earthing & lightning activities by means of soil, water, location, stray current testing and so on.

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SDP Co. undertakes the following surveys and inspections:

- Soil Resistivity Survey
- CAT (Current Attenuation Test) Survey
- DCVG (Direct Current Voltage/Gradient) Survey
- Current Requirement /Drainage Survey
- CIPS (Close Interval Potential) Survey
- Stray Current Interference Survey
- Polarization and On/Off Potential Survey
- Coating Resistance Survey
- Anode Bed Resistance Survey
- Buried Structures Natural Potential Survey
- Overhead Line Effect on Buried Structures Survey
- (SRB) Sulphur Reduced Bacteria Survey
- pH Survey
- Carbonate and Sulphate Ions Survey
- Grounding System Resistance Survey
- Contact Voltage (Touch and Step Voltages) Survey
- Lightning Protection Installation Survey
- Lightning Protection Level Survey

- Internal Cathodic Protection and Microbial Corrosion Monitoring and inspections.

- Potential Profile, Current Distribution Survey of Power Plants, Take off yards and substations

- Subsea Platform Inspection for maximum depth of 40 meters including repair, wet welding, cutting, anode inspection (cleaning, montage, re-montage, photography) and NDT tests (MPI, FMD & thickness testes)

- Subsea Pipeline Inspection for maximum depth of 40 meters including coating & concrete repairs, anode installations, TP potential reading, span installation, wet welding, cutting, anode inspection (cleaning, montage, re- montage, photography)

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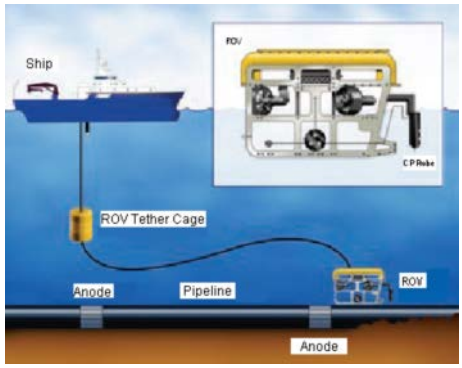
- Marine Services and Anode Installations for offshore structures including plattforms, ships, vessels, jetties and piers.

- Remotely Vehicle Operated (ROV) survey down to 1000 meters depth with cooperation of SUBSPECTION Co, UK.



ENGINEERING, DESIGN, PLANNING AND R&D SERVICES:

The engineering and design phase is one of the key processes during the project execution stage. SDP Co. currently has a core staff of several engineers, all selected because of their unique alternative experience.
We are more than able to provide our clients with the project teams to meet the challenges presented by mature fields.
Advantages have been successfully involved in almost every advanced engineering project carried out. Clients have recognised, through the provision of project services, our ability to efficiently provide their requirements.

- Basic & Detailed Design of Cathodic Protection Systems for Pipelines, Tank Forms, Petrochemical Plates, Power Plants, vessels,harbours, Jetties, offshore and marine structures by both means of Galvanic and ICCP system (where applicable).
- Design and development of various types of CP trans/rectifier units
- Design and development of Special Power Supply units
- Design and development of RRU systems (Remote Rectifier Units)
- Design and development of RMU systems (Remote Monitoring Units)
- Design and development CP Remote Monitoring and Control systems.
- Design and development of GPS synchronized On/Off control of T/R units
- Project Design of SCADA based ICCP systems
- Project Management of ICCP Galvanic CP systems
- Project Design of Local Cathodic Protection of Oil and Gas and Energy Facilities
- Design and Planning of CP Installation of Special ICCP Anodes
- Design and Planning of Subsea and Offshore Structure CP Systems
- Design and Planning of Ships and Vessels ICCP Systems
- Design and Planning SCADA Communication Systems
- Design and Planning of ICCP Systems for Internal Cathodic Protection
- R&D of CP Systems of Reinforcing Steel in Concrete Structures
- R&D on AC Interference Analysis and Mitigation System Design
- R&D on Projects Safety and Economics

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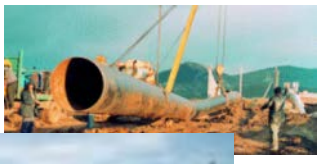
INSTALLATION AND COMISSIONING SERVICES:

SDP Co. has ability to provide installation and commissioning services for the following projects and systems relevant to Oil & Gas and Energy Industries.

- Deepwell and shallow groundbed installations
- ICCP systems for pipelines and storage tanks
- ICCP systems for congested area and tank farm
- Galvanic CP installation for pipelines, interior surfaces of storage tanks & farm tanks.
- SCADA based cathodic protection systems
- CP remote monitoring and control systems
- CP systems for marine structures and offshore pipelines
- Galvanic CP and ICCP systems for Ships, Vessels, Jetties and Piers



- Internal galvanic CP and ICCP systems for water tanks and boilers
- Galvanic CP and ICCP systems for reinforcing steel in concrete structures
- SCADA communication systems like wireless, satellite, GSM, fiber optics
- Industrial automation systems for petrochemical, energy and cement industries
- Complete crude and products storage tanks installations
- Crude oil and petrochemical storage tanks safety and protection instruments
- Ribbon anode installation for new constructed storage tanks
- ICCP system for existing tanks using horizontal drilling technology.
- Installation and replacement of permanent reference electrodes under the tank bottom plate for further potential monitoring proposes via horizontal drilling technology.

BACK-UP SERVICES:

SDP maintains close contact with the market to tailor products complying with client requirements. The considerable experience has ensured that we can provide complete back-up services from initial design to final commissioning and maintenance.

TRAINING:

Operator and maintenance training can be tailored to meet customer needs and SDP CO. comprehensive range of maintenance and support services provide a further level of back up, as appropriate.

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Remote Monitoring and Control

How does it work?

The remote monitoring and control technique enables the remote supervision of separated technical systems with the help of the communication technology.
The fundamental functions of the control can be subdivided into several sub ranges, like entering and alarming, switching, controlling and adjusting, as well as long-term archiving of all system relevant operational data of the cathodic protection stations.

When do you need Monitoring?

- If you want to reduce the operating cost
- If you want to achieve the perfect transparency of your systems
- If you want to eliminate manpower and to reduce travel costs associated with traditional regular maintenance methods
- If you want to have only one partner for the system control
- If you want to avoid consequential damages

For the application in the cathodic protection technique

- Recording of measurements (current, voltage, potential)
- Monitoring of analog limiting values (e.g. potential)
- Logging and storage of events (status signals and fault signals)
- Digital and analog transmission of measured values to the central station
- Visualization of status and measured values online on monitor
- Online parameterization of cathodic protection stations
- Automatic and manual output of operating journal, routine fault signals, logging and diagrams on monitor and printer

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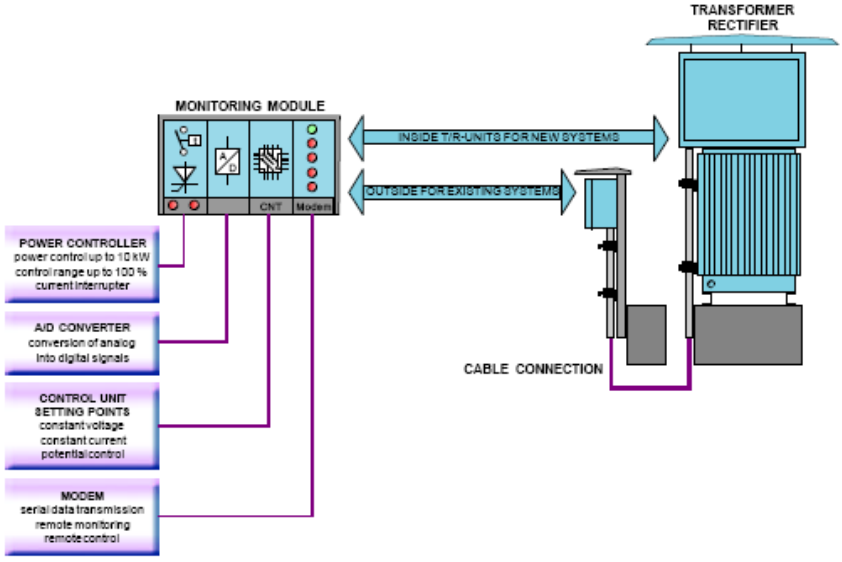
The Monitoring and Control essentially consists of two main components:

- A control and monitoring unit at or inside the transformer rectifier on site
- An interactive system comprising of two products: the Management Software and the Control and Interface Unit as central station which can monitor and control several transformer rectifiers domestic located or worldwide independent from borders or distances

The connection between the two main components is made depending upon availability by direct wiring, radio relay link modem, dial line modem, GSM modem (mobile phone), process field bus (profibus, interbus, canbus, ...), satellite connection or a combination of these medias.

Application of Monitoring Module



- ✓ For new cathodic protection systems, the monitoring module will be an integrated component of the transformer rectifier.
- ✓ For existing cathodic protection systems, the monitoring module will be installed outside the transformer rectifier.

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Central Station

The software is installed on a personal computer with operating system Windows® 98, ME, NT4.0 or 2000 and communicates with the control monitoring modules at the remote sites using modems or interfaces depending on the availability of the different data transfer or telecommunication networks.

The system allows complete monitoring and control of all cathodic protection stations equipped with the required components.

Just one computer and installed software allows monitoring and control of a large number of different sites.

Connection is permitted only when the correct password is inserted, thus guarding against unauthorized access.

All relevant data can be stored in the memory for all sites & stations and it is also possible to export or print them when required.

Local Monitor Module

The local monitor module consists of:

- Microcontroller
- Potential-free analog inputs (four)
- Serial interface for GSM/mobile phone or telephone
- Modem
- Serial interface RS232, a portable laptop may be used locally to program and collect data from the monitor module
- LCD display control unit with keypad (optional)
- Current interrupter relay
- Controlling of interrupter by DCF77 or GPS (optional)
- Controller for thyristor unit
- Data logger
- Battery pack for all internal settings
- Enclosure for outside installation (existing systems)

Housing	Aluminium alloy
Color	Grey
Protection classification	IP65 DIN 40050
Temperature range	-40°C up to +100°C

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Remote Monitoring & Control

Features

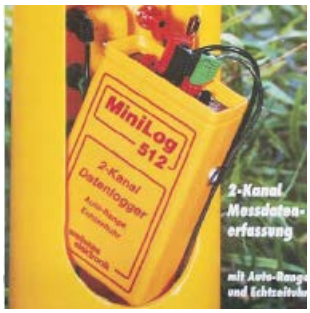
Setting options

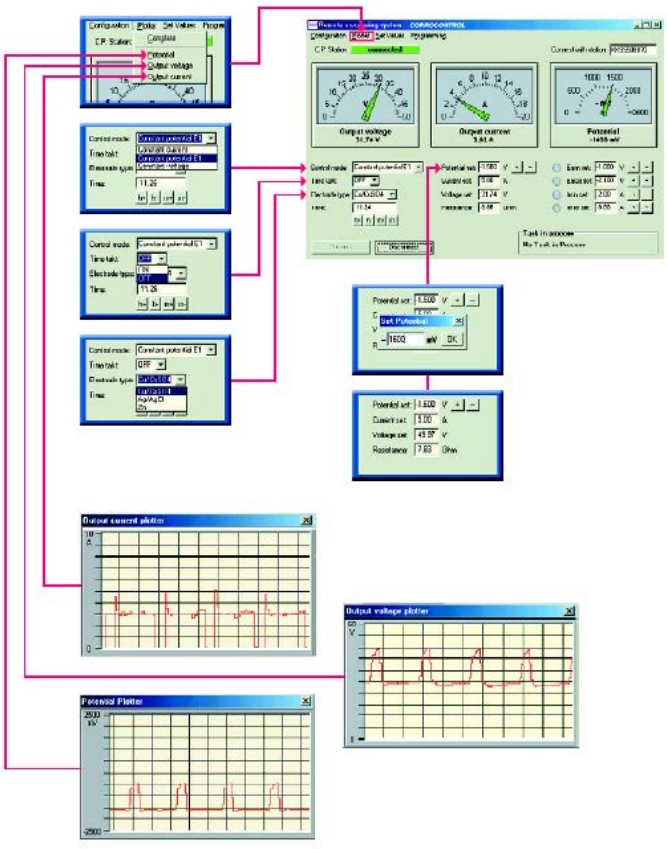
- Control mode : Constant potential
  Constant current
  Constant voltage
- Reference electrodes : $Cu/CuSO_4$
  $Zn/ZnSO_4$
  Ag/AgCl
  MnO_2
- Alarm values : Potential min/max
  Current min/max
  Voltage min/max
- Switch off mode : 4 sec. on / 2 sec. off
  12 sec. on / 3 sec. off
  27 sec. on / 3 sec. off

Data logging

- Potential
- Output current
- Output voltage

The Monitoring and Control applied for cathodic protection of pipelines, production well casings, and industrial plant areas etc. monitor display and sub-menu control





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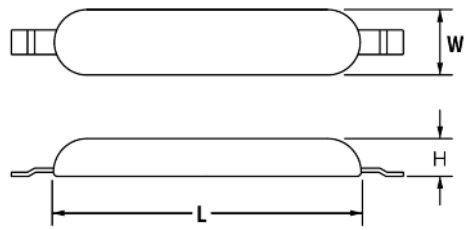
Aluminum Anodes

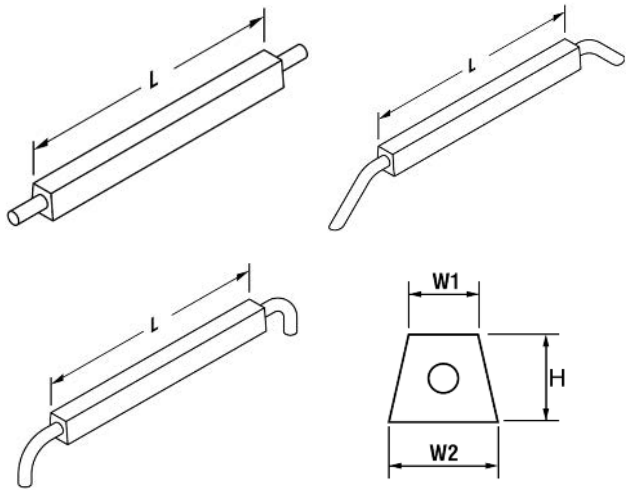
Aluminum anodes offered by SDP comply with Germanischer Lloyds internationally accepted institute, having Indium activated chemical composition in accordance to DNV RP B401 and designed for optimum performance under a variety of environmental conditions and temperature ranges.

Available Sizes Aluminum anodes are available in a variety of sizes, weights and configurations. Depending on the application one of these available anode configurations should provide a reliable solution. However, if special applications are encountered, custom fabricated anodes can be made to suit your needs. Aome of most common size & shapes are as below:

Aluminium Hull Anode		
Dimension Range	Length	5 to 50 cm
	Height	5 to 25 cm
	Width	5 to 40 cm
Weight Range		0.5 to 35kg



Aluminium Platform Stand-off Anode			
Dimension Range	Length (L) cm		500 to 2500
	Height (D) cm		100 to 250
	Width cm	W1	100 to 350
		W2	120 to 370
Weight Range kg			50 to 450



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Anode core – Each anode is typically cast with a steel core suited for the application or installation of the anode. Core types include flat bars, solid rods, pipe cores, threaded rods, eyebolts and other customized cores.

Anode life – As with any other anodes, anode life depends on the current output of the anode. The more current output provided by the anode, the shorter the anode's life. Therefore, it is important to consider a number of factors when selecting the type and quality of anodes. These factors include electrolyte resistivity, structure surface area, coating integrity, temperature, and design life.

Element	Content wt%
Fe	0.15 max
Si	0.10 max
Cu	0.002 max
Zn	2.5 ~ 5.0
In	0.015 ~ 0.025
Others	-
Al	Remainder
Max. Anode capacity	2800 Ah/kg
OCP (V vsCu/$CuSO_4$)	-1.15

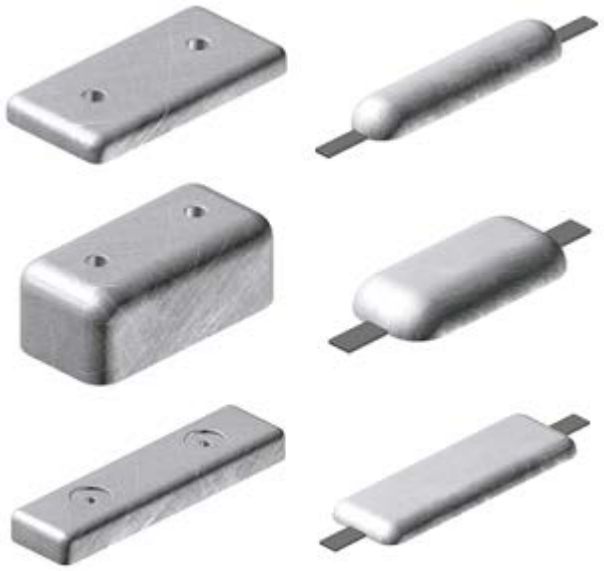
Bracelet Anodes

SDP manufactures a wide range of bracelet style and curved anode segments for fitting to different types of pipe sections and flanges. The design of the bracelet is often varied to suit the mode of fitting (topside or subsea/retrofit) or the type of pipe (rigid or flexible). The bracelet can also be bolted and welded.

SDP bracelet anodes are designed for use on all types of pipelines in fresh, brackish, and saltwater environments having specific tolerance fit to the pipe and precise net weight requirements in order to meet cathodic protection design. There are also many specific pipe sizes and factors to consider (ID, OD, length…) than in selecting offshore frame or rig anodes. Bracelet examples here are for Aluminium based anodes but they can be cast in Zinc or Iron alloys.

Tapered Bolted Welded

Zinc Anodes



Zinc anodes are an effective and economical corrosion fighter. They are frequently used in seawater or saline mud, to protect ship hulls, ballast tanks, bulkheads, piers, pilings and heat exchangers. In addition, zinc anodes are also used underground to protect buried steel structures.

SDP provides a full line of zinc anodes, for all applications, manufactured to your exacting project specifications. Our careful attention during the alloying process assures you of a complete line of zinc anodes that provide maximum protection to your structure.

SDP provides a complete line of zinc anodes for these applications:

- Ballast Tank Anodes
- Hull Anodes
- Condenser Anodes
- Heat Exchanger Pencil Anode

Zinc Pencil Anode

Element	Content wt%	
	I	II
Al	0.1 - 0.5	0.005 max
Cd	0.02 - 0.07	0.003 max
Fe	0.005 max	0.0014 max
Pb	0.006 max	0.003 max
Cu	0.005 max	0.002 max
Zinc	Remainder	Remainder
OCP (V vs Ag/AgCl)	- 1.05	- 1.10
Max. Current Capacity	780 Ah/kg	730 Ah/kg

Zinc alloy anodes can be produced in a wide weight range of half to 300 kilograms and shape range of cylindrical to square & pencil forms. They can also be used in applications where spark hazards need to be avoided as in storage tanks containing flammable hazards. Ainc anodes are either mounted directly to the metal being protected or connected with a wire to perform cathodic protection.

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Sacrificial Anodes

Magnesium Anodes

Magnesium anodes are employed in many sacrificial anode systems, due to their light weight and high output ratings. They are an economical choice for underwater or underground applications, especially in environments with high electrical resistance.

SDP's magnesium anodes come in a full array of shapes and sizes to fit any cathodic protection application. The underground anodes may be ordered bare or packaged, depending on your project specifications. SDP's magnesium anodes are available for the following applications:

- Condensers
- Heat exchangers
- Ship hulls
- Soil
- Piers
- Pilings

SDP's Magnesium anodes are available in high potential and 3 standard grades with the chemical composition as following:

Chemical Composition

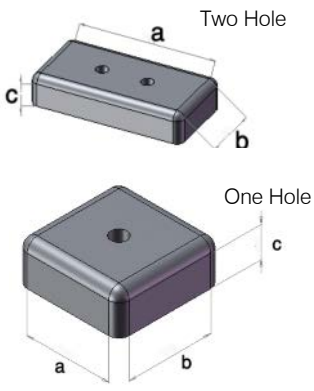
Element	Content wt%			
	High Potential	Grade I	Grade II	Grade II
Al	0.01	5.3-6.7	5.3 - 6.7	5.0 - 7.0
Mn	0.5-1.3	0.15 -0.7	0.15 – 0.7	0.15 – 0.7
Zn	-	2.5 - 3.5	2-5 - 3.5	2.0 - 4.0
Si	0.05	0.10	0.30	0.30
Cu	0.02	0.02	0.05	0.10
Ni	0.001	0.002	0.003	0.003
Fe	0.03	0.003	0.003	0.003
Other total	0.30	0.30	0.30	0.30
Mg	Reminder	Remainder	Remainder	Remainder

Electrochemical Properties

Type	High Potential	Standard Grade I
OCP (V vs. Ag/AgCl)	-1.75	-1.55
Max Current Capacity	1100 Ah/Kg	1100 Ah/Kg

Block Type Magnesium Anodes

Type	Dimensions		
	a	b	c
Two Holes	300	150	40,30,25,20
	250	150	40
	200,130	100	40,30,20
	150	75,70	40,30,20
One Hole	150	150	40,30
	100	100,60	40,30,20
	75	70	40
	75	70	30



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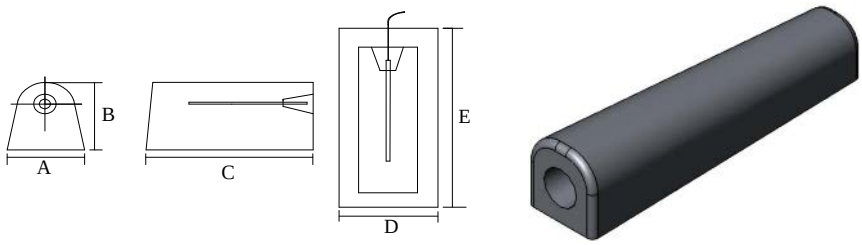
Pre-packaged Magnesium Anodes

Magnesium anodes for buried pipelines, casings, tanks and similar structures are supplied packaged in a cotton bag containing a rapid wetting, moisture retaining backfill.
The backfill powder reduces the soil resistivity surrounding the anodes and improves the anode performance.
The pre-packaged magnesium anodes are available in two grades, standard and High-potential, which is used primarily in high resistivity soils. Anodes are supplied different length of insulated copper cable on request.

Standard backfill composition:	
Powdered Gypsum	: 75%
Granular Bentonite	: 20%
Sodium Sulphate	: 5%

Standard Dimension

Anode Type	Bare Weight lb	Packaged Weight, lb	Bare			Packaged	
			A	B	C	D	E
SDP.1.1.Mg.1	1	5	1-3/4"	1-3/4"	8"	3 1/4"	10"
SDP.1.2.Mg.3	3	9	3-1/2"	3-1/2"	5-1/4"	5 1/2"	10"
SDP.1.3.Mg.5	5	14	3-1/2"	3-1/2"	9-1/4"	5 1/2"	14"
SDP.1.4.Mg.9	9	35	2-3/4"	2-3/4"	26-1/4"	6"	31"
SDP.1.8.Mg.17	17	60	2-3/4"	2-3/4"	50-1/4"	6"	55"
SDP.1.9.Mg.20	20	72	2-3/4"	2-3/4"	56-3/4"	5-1/2"	66"
SDP.1.10.Mg.24	24	60	4-3/4"	4-3/4"	23-1/2"	7"	30"
SDP.1.11.Mg.32	32	90	3-3/4"	4"	47"	6-1/2"	53"
SDP.1.13.Mg.40	40	105	3-3/4"	4"	56-1/2"	6-1/2"	66"
SDP.1.14.Mg.48	48	98	5-1/2"	5-3/4"	30-1/4"	8"	38"
SDP.1.15.Mg.60	60	125	4-3/4"	4-3/4"	57-1/2"	7"	64"



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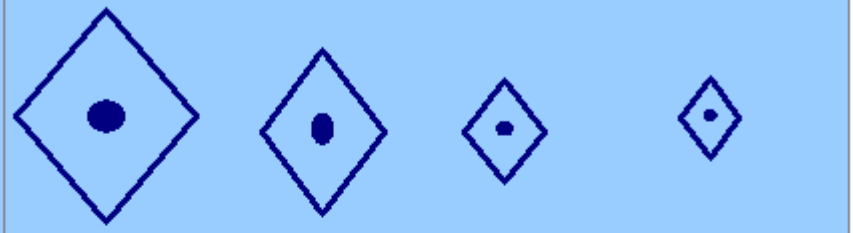
Sacrificial Anodes

Ribbon Sacrificial Anodes

A sacrificial anode shapes having the maximum surface area to mass ratio, therefore providing a high current output.
Ribbon anodes are particularly suitable for high resistivity environments. Anodes of magnesium, zinc and aluminum are available to suit many cathodic protection requirements.

The extruded ribbon anode has advantages like:

- low resistance to earth per unit weight of anode installed
- Efficient current distribution & low current requirement along pipeline
- Fewer electrical connection
- Easy mechanical installationcan

Zinc				
Code	**Super**	**Plus**	**Standard**	**Small**
Section	1" x 1-1/4 "	5/8" x 7/8 "	1/2" x 9/16 "	11/32" x 15/32 "
Core diameter	0.185"	0.135"	0.130"	0.115"
Weight	3.57 kg/m	1.79 kg/m	0.89 kg/m	0.37 kg/m
Coil length	Approx. 30 m	Approx. 60 m	Approx. 150 m	Approx. 300 m

Magnesium		
Code	**3.4 MR**	**2.8 MR**
Section	1" x 1-1/4 "	5/8" x 7/8 "
Core diameter	0.185"	0.135"
Weight	3.57 kg/m	1.79 kg/m
Coil length	Approx. 30 m	Approx. 60 m

All dimensions and weight are nominal. Longer coil lengths are available on request.

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Mixed Metal Oxide Titanium Anodes

Introduction

This material consists of a high purity titanium substrate with an applied coating consisting of a mixture serves as a support for oxide coating. Titanium forms thin, self-healing, adherent oxide which is acid resistant and resist the passage of anodic current. Comparing with conventional impressed current anodes, the anodes are small, lightweight, with extreme low consumption rate (less than 1.0 mg/A.yr) & high current capacity.

Application

MMO titanium anodes perform well in all types of environment including areas with extremely low pH level (under 1), and high chloride concentrations. Their unique configuration makes the anodes ideal for use in a wide variety such as cathodic protection system for buried structures, pipeline, ship, jetties & wharf and steel in concrete.

Anode Life	Maximum Current Density	Electrolyte
20 years	50 A/m^2	Carbonaceous Backfill
20 years	100 A/m^2	Calcined Petroleum Coke
20 years	100 A/m^2	Fresh Water
20 years	300 A/m^2	Brackish Water
20 years	600 A/m^2	Sea Water

MMO anodes are available in different shapes like Rod, Tubular, Plate, Disc and Mesh anodes.

Tubular MMO Titanium Anode

The anodes are made using tubular titanium substrates, which are coated with a mixed metal oxide catalyst. The tubular configuration provides a larger surface area, which in turn permits greater current output and lower anode-to-earth resistance. The tubular style also means lead wire connections can be made in the center of the anode. The most common

Tubular MMO anodes specifications

Diameter	Length	Rated Current Output (A)	
		Soil	Sea Water
16	500	2.5	15
25	500	4	20
25	1000	8	40
25	1200	10	50
32	1200	12	60

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Impressed Current Anodes

Canister MMO Titanium Anodes

MMO anodes are available prepackaged in galvanized steel tubes for easy installation where conventional hole loading methods would not be practical. The canisters include coke breeze backfill, an anode centering device, end plugs, and a lifting bail. The top plug can be recessed to allow the wire to be coiled in the can for protection against shipping damage.

Canister Dimensions

Diameter (mm)	100~500
Length (mm)	500~3000

Coke Backfill

Minimum carbon Con.	98 wt%
Maximum Resistivity	10 Ohm.cm
Density	800 kg/m^3
Max. Particle Size (dia.)	90% 0.1-5.0 mm

String MMO Titanium Anode

The tubular anode can be supplied in strings for use in deep wells to protect underground pipelines or other steel structures like offshore platforms. The string MMO anode is comprised of electrical cable threaded through one or more tubular anodes. Electrical connection between the anode and cable is via a crimping process. The crimp connection seals the anode around the cable at both ends.

Advantages

- Fewer anodes required with higher current density
- Current output is easily adjusted
- Ease of installation reduces cost of cathodic protection system
- Greater savings in deep water installations
- Ability to be installed parallel to transmission pipelines

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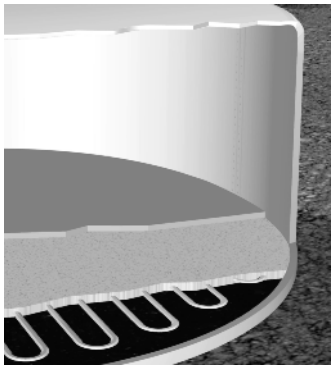
Ribbon MMO Titanium Anodes

Mixed metal oxide ribbon anodes are designed for use on both newly constructed & existing above ground storage tanks.

Advantages



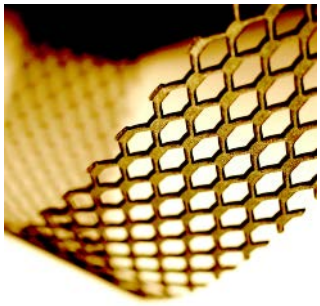
- Adjustable to achieve various design life requirements by varying spaces between strips
- Ability to place under all areas of the tank (because it can be easily cut)
- Availability of multiple paths for current flow (electrically continuous strips)

They can be applied in sands with various levels of moisture and salt contents without carbon backfill. which can also be utilized in concrete bridges, decks and piers as well as in evolution O_2, Cl_2 or a combination of both.

Dimension		Standard Coil Length	Standard Coil Weight	Surface Area
Width	Thickness			
6.35mm	0.635mm	76.22 m	1.12 kgs	0.014m^2 per m

Mixed Metal Oxide Expanded Mesh Anode

The anode is composed of an expanded titanium mesh strip coated with a mixed metal oxide catalyst. Flexibility & light weight make it the most installer friendly material available. The



strips are shipped flat, and can be easily attached to a reinforced concrete structure with plastic anchor pins. They can be packaged in a spiral wound, galvanized steel canister or a fabric sleeve filled with petroleum coke backfill.

Dimension (mm)			Standard Coil length	Current Output
Width	Thickness	Length		
32.5	1.3	1250	76 m	5 amps.
20	1.3	1000	76 m	2 amps.

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Wire MMO Titanium Anodes

The anodes are composed of a copper core which is surrounded by a titanium metallurgically bond coating. The titanium is inherently resilient and stable, allowing the wire anode to be extremely flexible.
Wire anodes are designed suitable for many applications requiring long slender anode material. Linear anodes are for installing in a trench parallel to the pipe to optimize curent distribution and minimize operating costs. Also suitable for installation inside pipe for internal protection. Anodes are available in two (1.5mm dia and 3.0 mm dia) standard sizes, and current ratings.

Titanium Conductor Bar

Titanium conductor bars are used along with MMO ribbon and mesh anodes for cathodic protection of above ground storage tank bottoms and concrete structures. The conductor bar is welded to the MMO to lower anode resistance.

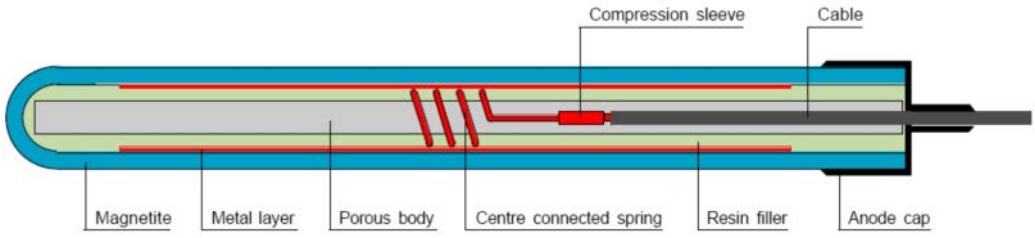
Standard Dimensions

- Width: 0.50” (12.7mm)
- Thickness: 0.035” (0.9mm)
- Coil Length: 250 ft (76.22m)
- Coil Weight: 8.5 lbs (3.8 kgs)

Titanium Conductor Bar

Magnetite Anode

Magnetite anode is an alloy of magnetite & other minerals, which is resistant to corrosion even at high temperatures. The magnetite anode is casted in hollow cylindrical forms to minimise weight and to facilitate cable to anode connections at the centre of the anode. This centre cable to anode connection allows for a uniform current dissipation at the anode surface.



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High Silicon Chromium Cast Iron Anodes

For over Four decades High Silicon Cast Iron Anodes have been used successfully in the cathodic protection industry and is one of the most reliable protection materials available. The consumption rate of High Silicon Chrome Cast Iron anodes has been found to be between 0.2 and 1.2 pounds per ampere-year. A generally accepted design guideline for anodes buried in coke breeze is 0.7 pounds per amp-year. These anodes are available in a number of different styles including solid rod anodes, center connected tubular anodes, and other specialty configurations.

SDP's High Silicon Chromium Iron anode is a solid, non-porous Impressed Current Anode. This anode alloy consists of matrix of Silico-Ferrite in which the majority of carbon is in the form of graphite flakes at grain boundaries. Adding chromium results in eliminating graphite.
These anodes are available in a number of different styles including solid rod anodes, center connected tubular anodes, and other specialty configurations.

Solid Anodes

Typically used for shallow applications, solid high silicon cast iron anodes are low cost solutions to your cathodic protection needs. To compensate for end-effect, which causes increased consumption at the longitudinal ends of an anode, SDP solid cast iron anodes are back beveled with more material near the connection. A choice between epoxy encapsulated, epoxy cap, or heat-shrink cap connection sealants is also offered. Regardless of which sealant is chosen, the wire-to-anode connection resistance will be less than or equal to 0.004 ohms.

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Impressed Current Anodes

3" × 60"

Dimensions and Weight

Total length -A-	mm	1520
Diameter -B-	mm	76
Diameter -C-	mm	101
Surface Area	m^2	0.38
Total Weight	kg	49.1

Chemical Composition

Element	Composition wt%
Si	14.20 – 14.75
Mn	Max 1.5
C	0.70 –1.10
Cr	3.25 – 5.00
Mo	Max 0.20
Cu	Max 0.50
Fe	Balance.

Physical Characteristics

Density	7.0 -7.05	g/cm^3
Compressive Strength	650	Mpa
Brinell Hardness	500	-
Electrical Resistivity	72	$\mu\ \Omega$. cm

2" × 60"

Dimensions and Weight

Total length -A-	mm	1520
Diameter -B-	mm	50
Diameter -C-	mm	76
Surface Area	m^2	0.25
Total Weight	kg	22.7

Chemical Composition

Element	Composition wt%
Si	14.20 – 14.75
Mn	Max 1.5
C	0.70 –1.10
Cr	3.25 – 5.00
Mo	Max 0.20
Cu	Max 0.50
Fe	Balance.

Physical Characteristics

Density	7.0 -7.05	g/cm^3
Compressive Strength	650	Mpa
Brinell Hardness	500	-
Electrical Resistivity	72	$\mu\ \Omega$. cm

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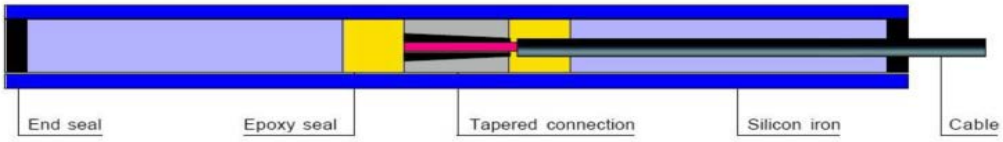
Tubular Anodes

Center Connected Tubular anodes are typically used for Deep Anode groundbed applications, Tubular high silicon cast iron anodes are one of the best solutions to your cathodic protection needs. These anode can also be utilized in variety of electrolytes, from soil and fresh water to brackish and salt water environments. it is suitable for use in deep and conventional ground bed applications.

Nominal Weight & Dimension of Tubular Anodes

Type	Specification (mm)	Surface (m^2)	Weight (kg)
TA1	67×1067	0.22	14.1
TA2	56×2133	0.37	20.9
TA3	67×2133	0.46	28.6
TA4	95×2133	0.64	38.6
TA5	121×2133	0.81	49.9



Composition (ASTM A518 Grade 3)

Element	Composition wt%
Si	14.20 – 14.75
Mn	Max 1.5
C	0.70 –1.10
Cr	3.25 – 5.00
Mo	Max 0.20
Cu	Max 0.50
Fe	Balance.

Physical Characteristics

Density	7.0 -7.05	g/cm^3
Compressive Strength	650	Mpa
Brinell Hardness	500	-
Electrical Resistivity	72	$\mu\,\Omega$. cm

TÜV CERT
DIN ISO 9001:2001

Impressed Current Anodes

Canisters High Silicon Cast Iron Anodes

The prepacked anodes are used in area with high water table or where it is difficult to install loose coke backfill which is normally provided around anodes to:

- Reduce the resistance of anode
- Extend the life of anode
- Improve the contact between anode and surrounding soil

Canisters are pre-packed anodes. For convenience and easier installation, anodes are installed in a spirally wound 0.65 mm thick galvanized steel canister. The canister is packed firmly with metallurgical coke or calcined petroleum coke to ensure even current transfer from the anode.

Unless proper care is taken to ensure good contact between canister and native soil, abnormally high resistance will occur in cases where prepacked anodes are installed to reduce the resistance of anode bed in hard and rocky grounds.

The galvanized steel canisters are biodegradable and will corrode in service and used as transit package only. It should be stored in a dry place before installation to avoid corrosion and perforation.

Standard Container	Diameter (mm)	Length (mm)	Total Weight (kg)
CAN 18/16	160	1800	50
CAN 20/20	200	2000	85
CAN 20/30	300	2000	110

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Metallurgical Coke and Calcined Petroleum Coke

NACE RP-05-72 stated "conductive backfill should be used to lower the total resistance of the ground bed, to improve current distribution, to prolong anode life and to provide a permeable medium for migration of gases…

Resistivity, Particle size, specific weight and chemical analysis are factors to be considered for backfill. Metallurgical coke and calcined petroleum coke are the two types used in cathodic protection.

Metallurgical Coke of high quality that gives optimum performance at a low cost is available in various size ranges.

Fixed Carbon	86 – 89 %
Moisture	0.6 – 1.0 %
Ash	10 -12 %
Volatiles	1.4 – 1.8 %
Grading: 0-1mm; 1-5 mm; 2-7 mm; 3-10 mm	
Resistivity: 50 Ohm.cm	
Bulk density: approx. 700 kg/m^3	

Calcined Petroleum Coke has been developed to meet all basic requirements for earth contact backfill. The carbon content, very high in calcined coke assures a low consumption rate of the backfill material and therefore a longer system life.
The low Resistivity of calcined coke and the small particle size allow the best possible contact between the anode and the surrounding soil.
Other advantages are, high specific gravity, round particle shape with high compression strength, wide range of particle sizes, various grades for loose and vibration fill and for pumping in deepwell application with enhanced wetting and lubricating properties.

Fixed Carbon	98 – 99 %
Moisture	0.1 – 0.5 %
Ash	0.1 – 0.8 %
Volatiles	0.6 – 0.8 %
Grading: 0.1 mm up to 5 mm	
Resistivity: 10 Ohm.cm	
Bulk density: approx. 800-900 kg/m^3	

Handling

Conventional handling of impressed current backfills can be both time consuming and tiring for the installation operator. Deep well ground beds often require hundreds of sacks of backfill to be man handled into mixing tanks. Similarly shallow beds may require that the backfill is manually handled and spread along the ground bed trench.

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Impressed Current Anodes

U PVC - Casing

The installation of an open hole deep groundbed with replaceable anode chains allows an economical design up to 300 m depth and requires the presence of a static water level.

The advantages compared to closed hole groundbeds are as follows:

• Trouble-free unlimited life compared to erratic and short (5 years) life time of closed hole groundbeds.

• Possibility of anode replacement, inspection, repair and replacement of chain components.

The unlimited lifetime of replaceable groundbeds is ensured by stable non-conductive, corrosion resistant casings.

Casing

The specified casing is selected by considering the external pressure loading which is caused by geological formation, the depth of groundbed, the ratio of borehole diameter to casing diameter and the position of dynamic water level.

Perforated casings are provided with slots which run perpendicular to pipe axis, thus resulting in a minor decrease of collapse resistance as compared with pipes having longitudinal slots.

The perforated (open) area covers minimum 20 % surface of the casing around anodes.

Dimension

Nominal Diameter ND (mm)	Outer Diameter (mm)	Wall Thickness (mm)	Inner Diameter (mm)	Outer Diameter Over Socket (mm)	Weight (kg/m)	Thread Type
150	165	7.5	150	174	5.5	T
175	195	8.5	178	203	7.4	T
175	195	11.5	163	213	9.8	T
200	225	10.5	205	239	10.0	T
200	225	13.0	188	249	12.8	T

Installation Equipment / Accessories

1. **Hoisting devices** for lifting and lowering of the pipe string
2. **Sump pipes** for silt deposit
3. **Centralizers** for centralization of casing in the borehole during installation
4. **Wooden plugs** for fastening to the bottom end of casing or sump pipe
5. **Wooden clamps** faced with leather for holding the casing on the ground level

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TCS Series of Manual CP Rectifier (O63 Model, Oil-Cooled)

SDP's 63 Step Manual Controlled Cathodic Protection TR Units (Oil-Cooled) are specially designed for safe and long term operation in environments such as desert and tropical locations.

The transformer rectifier components are housed in steel enclosures divided into two main sections, namely oil tank and control cabinet.

The transformer rectifier is supplied complete with bolted type base frame and fixing bolts for plinth mounting. The outdoor control cabinets are normally provided with sunshade.

Standard Features of the 63 Step Manual Controlled Rectifiers

1) Manual voltage control over the 63 steps of nominal rated voltage automatic

2) Coarse, medium and fine adjustment by 3 X 4 step tap changer switches, rated to operate while system is energized, even on full load condition.

3) Compact design and easy to use and installation.

4) Minimum maintenance requirements and long operation time.

5) Weather proof construction and corrosion resistive finish by hot dip galvanized.

6) Ac input voltage, DC output voltage and current monitoring by moving coil analogical meters.

7) Over voltage and current protection for both of AC and DC sides.

8) Surge protection on D.C. side, lighting protection on Ac side.

9) Cooling by natural convention of transformer oil.

10) Suitable for either 3 wire or 4 wire connection for 3 Phase 380/440 Volt 50 and/or 60 Hz systems.

TÜV CERT
DIN ISO 9001:2001

CTR Series of SCR Controlled CP Rectifier

(Oil-Cooled and Air-Cooled)

SDP's SCR Controlled Cathodic Protection TR Units are specially designed for safe and long term operation in environments such as desert and tropical locations.

The transformer rectifier components are housed in steel enclosures divided into two main sections, namely oil tank and control cabinet.

The transformer rectifier is supplied complete with bolted type base frame and fixing bolts for plinth mounting. The outdoor control cabinets are normally provided with sunshade.

Transformer Rectifiers

Features of the SCR Controlled Conventional Rectifiers

1) Automatic constant voltage with current limitation and constant current with voltage limitation.

2) Stepless control over the full range of nominal output ratings.

3) Precision control with phase angle control of power SCR unit.

4) 2 units of external one turn potentiometer only for setting output voltage and output current.

5) Cooling by natural convention of air or oil.

6) Intelligent anode current limiting preventing over current protection.

7) Suitable to be supplied by 3 Phase 3 wire and/or 4 wire 50/60 Hz.

8) Surge protection on D.C. side, lighting protection on Ac side.

* Modular multi channel DC output structure built-in a single enclosure

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VTR Series of Manual Controlled CP Rectifier (AMV Model, Air-Cooled)

SDP's Variac Controlled Manual cathodic protection transformer rectifier units are specially designed for safe and long term operation in environments such as deserts, tropical and coastal locations.

The Air-Cooled Variac Controlled Transformer rectifier components installed on a rigid chase are housed in steel cabinet and caring out the following specifications.

Features of the Variac Controlled Rectifiers

1) Step less control of DC output voltage.

2) Compact and easy to use and installation.

3) Minimum maintenance requirements and long operation time.

4) Weather proof construction and corrosion resistive finish with UV protection.

5) Ac input voltage, DC output voltage and current monitoring by moving coil analogical meters.

6) Over voltage and current protection for both of AC and DC sides.

7) Surge protection on DC side, lighting protection on AC side.

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DIN ISO 9001:2001

Transformer Rectifiers

RRU Series of Automatic CP Rectifier

(Oil-Cooled and Air-Cooled)

Digital technology ensures superb reliability and provides flexibility to meet the requirements of today's different fields of industry in the most efficient and cost effective manner.

Embedding of intelligent control systems based on the digital and micro-processor technology enables the functions of Impressed Current Cathodic Protection systems to be monitored and controlled remotely across of the SCADA (Supervisory Control and Data Acquisition) systems. SDP Co. has the pleasure of producing these kinds of intelligent and smart rectifiers in case of both standard and custom design in the various capacities.

Features of the SCADA Based Rectifiers

1) Full Micro-processor based control, Intuitive control with LCD display and SCADA system.

2) Automatic operation (Referring Actual Potential of Cathode) with manual over-ride (Constant Current or Constant Voltage) facilities.

3) Precision control with phase angle control of power SCR unit.

4) Fully adjustable settings with operator interface and remote SCADA system over full ranges of reference electrode potential or output voltages and currents.

5) Direct RTU connectivity via 4-20 mA signal converters.

6) Intelligent Anode current limiting preventing over current protection.

7) Internal maintenance and diagnostics

8) Surge Protection on D.C. side, lighting protection on Ac side.

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Solar Systems

Solar Power Units

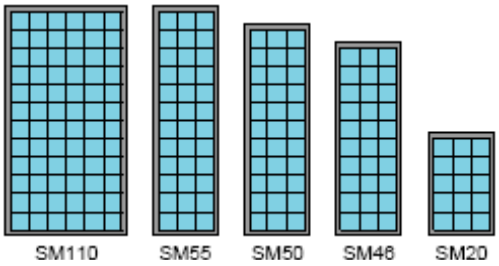
When Is It Applied?

While it is not profitable to use electricity network for supplying electricity for Cathodict protection system because of the cost of elactricity transfer; SDP's Solar system can provide electricity at fair price .

The Components

The main components which make up a Photovoltaic power generator for application in cathodic protection systems are the solar array, the battery charge controller, the battery storage and the output regulator. The entire system is modular and can be adapted to specific requirements of customers.

Solar Modules



Five high efficiency single-crystal solar modules provide the highest light to energy conversion efficiency.

Cells are textured and have antireflection coating.

Multiple Redundant Contacts provide a high degree of fault tolerance and circuit reliabitility. Circuit is laminated between layers of ethylene vinyl acetate (EVA) for moisture resistance, UV stability and electrical isolation.

Low Iron Tempered Glass Front for strength and superior light transmission.

Rugged Anodized Aluminum frame is designed for exceptional strength.

Side Rails with multiple mounting holes for easy installation.

Tough, multi-layered polymer back-sheet is used for environmental protection, resistance to abrasion, tears and punctures.

Module type		SM110	SM55	SM50	SM45	SM20
Electrical parameters	V	12	12	12	12	12
Max. power rating P_{max}	(WP)	110	55	50	46	20
Min. Power rating P_{min}	(WP)	100	50	45	41	18
Rated current IMMP	(A)	6.3	3.15	3.15	3.15	1.38
Rated voltage UMPP	(V)	17.5	17.5	15.9	14.6	14.5
Short circuit current ISC	(A)	6.9	3.45	3.35	3.35	1.6
Open circuit voltage UOC	(V)	21.7	21.7	19.8	18.0	18.0

Physical parameters		SM110	SM55	SM50	SM45	SM20
Length	mm	1316	1293	1219	1083	567
Width	mm	660	329	329	329	329
Depth	mm	40	34	34	34	35
Weight	kg	11.5	5.5	5.2	4.6	2.5

The modules are tested in accordance with related standards

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Compensating Current Limitation Unit

On long distance pipeline routes several pipelines are often running parallel in one pipeline corridor which is cathodically protected by one common CP-unit having individual cathode cable connections for every pipeline.

Depending on the age and quality of pipeline coating the current demand of the various pipelines differs in a wide range, which can results in an extremely high potential difference at the drain point.

This can not only lead to "Under Protection" for poor coated pipelines and "Over Protection" for well coated pipelines but also result in the circulation of uncontrolled currents between the pipelines and thereby make the cathodic protection system insufficient and can cause corrosion.

The compensating current limitation unit which facilitates the adjustment of current in each pipeline circuit, prevents the flow of uncontrolled circulating currents between pipelines and uniform potential levels, can be provided in the transformer rectifier or supplied separately depending on site conditions and purchaser's specification.

Description

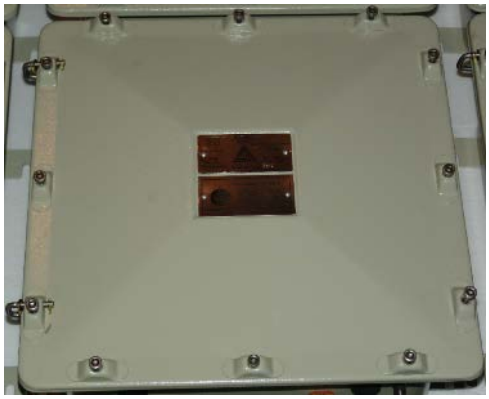
The unit mainly consists of several current paths depending on the number of pipelines to be connected.

Each current path may consist of :

- Blocking Diode to prevent the flow of current between pipelines
- Variable Resistor to adjust the magnitude of current for each pipeline
- Surge Protection Cascade to protect the components against over voltage
- Shunts & Meters for the total and individual current measurements
- Terminals for cable connections

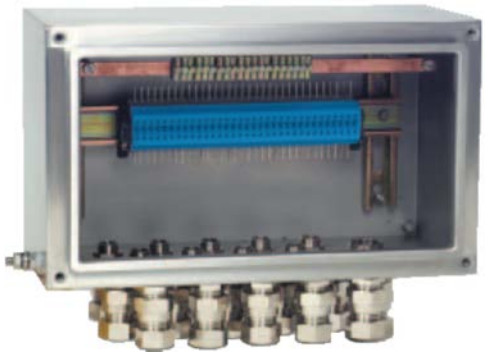
The enclosure for the unit can be made of sheet steel, stainless steel, cast aluminium or non metallic such as glass fibre reinforced polyester with weather proof protection up to IP 66 and suitable for pole, wall or plinth mounting.

Anode and Cathode Junction Box



Junction Boxes are used for terminating the anode and cathode cables and for connecting them with main positive and negative cables coming from the DC source unit.
Junction Boxes can be provided with a shunt to measure the output current of each anode and cathode or group of them and also with a variable resistor for adjusting individual output current of each circuit.
The tailor made junction boxes are provided with necessary components such as:

- variable resistors according to required ratings
- shunts according to required ratings and standards
- cable terminations for cable lugs or screw clamp connections
- cable glands or conduits for cable entries
- blocking diodes to prevent the flow of currents in reverse direction



Enclosures

Enclosures in steel, aluminum, polyester or stainless steel as outdoor weatherproof design to IP66 and different EX-versions are available.
In addition, various types of enclosures can be supplied workshop-built and tested to fulfill the required standards, layouts and site conditions.

Accessories

Hot dip galvanized steel frames for fixing on foundations or supports for wall mounting with conduits etc. can also be supplied on request.

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Test Stations & Markers

Permanent Test Stations are Provided at selected locations along the protected structure to check, monitor and control the performance of Cathodic protections.

Various types and shapes of test posts meeting BS, NACE and IPS standards are available in SDP works.

Special production according to different requirement for Cathodic protection projects to meet client specifications is also possible.

Boxes

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Cables

Our range covers the most common only used cables, with copper or Aluminum conductors and combination of PVC, XLPE, PE, HMWPE and PVDF insulation, depending on Cathodic protection application type and chloride contents of environment. The cables are supplied from manufactures which produce their goods in accordance with standards live IEC, BS, VDE, JIS control, testing & inspection to check every critical property such as DC resistance, insulation resistance, voltage test, attenuation, impedance capacitance for (R.F and voice cables) and physical characteristics.

Low voltage power cables With PVC or XLPE insulation Rated Voltage 0.6/1 kV	
Medium voltage power cables With PVC or XLPE insulation Rated voltage 3.6/6 kV up to 12/20 kV	
Instrument Cables	
PVC insulated, non sheated general purpose cable single core 450/750 V, rigid conductors	
PVC insulated, non sheated general purpose cable single core 450/750 V, flexible conductors	
PVC insulated, PVC sheated light cable twin,3 core,4 core and Five core 300/500V	
PVC insulated, PVC sheated, single core, Flat Twin and 3 core, 300-500 V	
PVC insulated, PVC sheated light cord parallel twin, circular twin, 3 core, 4 core 300/500 V	
PVC insulated, PVC sheated, screened, ordinary cord, circular twin, 3 core, 4 core 300/500 V	
PVC insulated, PVC sheated Equipment cables	
PVC insulated, PVC sheated, screened, multi pair, Equipment cables	

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DIN ISO 9001:2001

Cathodic Protection Cable
Kynar

Where improved corrosion resistance is required as in many deep well applications, dual jacketed Kynar/HMWPE cable is recommended. Historically, anode cable is the most cause of failures is deep well anode systems. As cathodic protection anodes discharge current, high levels of chlorine gas can be generated. Chlorine gas is detrimental HMWPE insulation and the deterioration of the insulation will lead to failure of copper cable and loss of the anode in cathodic protection circuit.

With the dual insulated cable, the outer insulation jacket consists of standard HMWPE, which provides excellence physical properties such as abrasion resistance. The inner jacket consists of a homogenous wall of natural PVDF flouropolymer (Kynar), which provides excellence resistance to chlorine attack. Kynar is also resistant to many other detrimental chemicals such as hydrochloric and sulfuric acid as well as petroleum hydrocarbons.

• Application:

A direct earth burial, DC lead, cathodic protection cable for use in deep anode groundbed installations, designed to withstand corrosive gases.

• Standards:

1. Conductor

Stranded bare copper conductor conforms to ASTM Specification B-8.

2. Insulation

A homogeneous wall of natural PVDF fluoropolymer (Kynar) shall be extruded over the conductor.

3. Jacket

Insulation is high molecular weight polyethylene conforming to ASTM-D-1248, Type 1, Class A, Category 5, Grades E4 and E5. Tensile Strengths JI, J3. Available with high density polyethylene (Types II, III, IV) Class B and C (all colors). Surface printed. Custom printing available.

• Size and dimensions

Size	No. of Strands	Circular Mils	AWG Diameter Inches	Kynar Thickness Inches	HMWPE Thickness Inches	Nominal Diameter Inches	Weight Lbs per 1000 ft	DC Ohms per Mft at 20°C
#8	7	16,510	0.146	0.020	0.065	0.316	83	0.640
#6	7	26,240	0.184	0.020	0.065	0.354	120	0.403
#4	7	41,740	0.232	0.020	0.065	0.402	177	0.254
#2	7	66,360	0.283	0.020	0.065	0.462	260	0.159

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Splicing Kits

Splicing Kits are universally suitable to connect low voltage plastic insulated cables or conductors insulated with PVC, PE, VPE and EPR (e.g. N(A)YY, NYM, TT) with or without concentric conductor. They are suitable for compression connectors on Aluminum and Copper conductors.
Splicing kits could be applied in indoor, outdoor, underground, water cable trays.

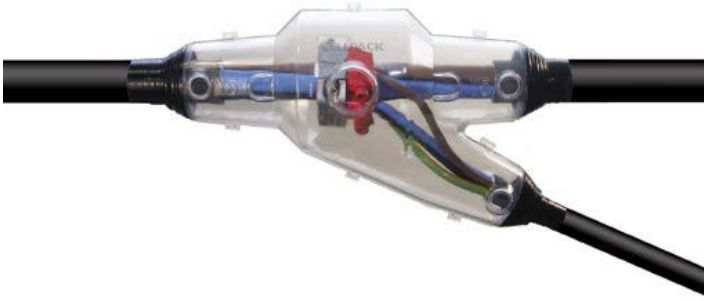
Cast-resin Branch Joint T-Shape

Features

- Large insertion opening for easy
- High electrical insulation values
- Watertight both longitudinally and transversely
- High mechanical strength
- Resistant to UV-radiation, alkaline earths and chemical agents
- Compact size
- Standard resin storable for up to 40 months
- High quality, transparent, shockproof plastic moulds
- Visible splice position before casting
- Extremely simple and fast fitting, saves time and costs
- Immediately operational

They may be supplied in straight-through, branch and cast-resin joint types.

Cast-Resin Branch Joint
Y Shape



Cast-Resin Straight-Through Joint
M Shape

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Handy Cap & Tape Coating

SDP also supplies Royston Handy Caps (with or without primer) for use in pipeline or tank corrosion protection.

Handy Cap is a prefabricated assembly designed to provide anode and test lead wire welds on metal pipe and tanks. Using Handy Cap IP due to integration of a primer makes field application of it easier and more economical.

Advantages of Handy Cap IP

- No separate liquid primer required.
- Ideal for keyhole applications.
- Dome and tunnel provide easy access.
- Elastomeric compound encases weld profile.

No further protection is required when the Handy Cap IP covers the entire exposed metal area. Uncovered areas should be protected with primer-less Tapecoat or Royston tapes.

Easy Field-Applied Corrosion Protection

Tapecoat Gray Adhesive bonds the tough outer shell of the Handy Cap IP to the bare metal weld area and surrounding plant applied coating. Innovative Tapecoat Gray incorporates an integrated primer in its adhesive and provides exceptional bonding without the costly application of liquid primer. A protective compound within the dome molds itself over the irregular welded profile and encases the exothermic connection.

Handy Cap XL IP is a 5" x 5" larger tape coat which has advantage of conforming weld tape to small diameters

Our other pipe coating products include of Patch/Repair and Joint Wrap Tape, Primer, Mastic and Polyken joint coating tapes.

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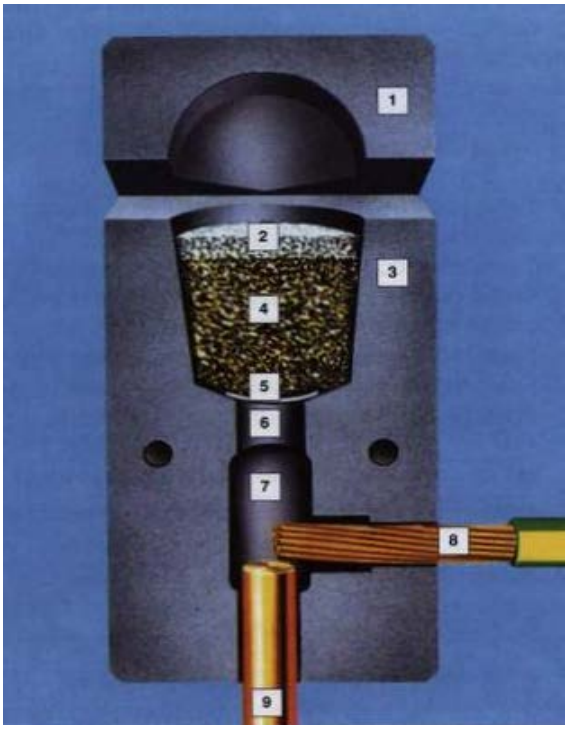
Welding
The exothermic welding process

The exothermic welding process is a simple and safe method which does not require an external source of large heat or electric power for making copper to copper, copper to steel or steel to steel connections for the conduction of electricity.



A semi permanent graphite mould is used for making connections by exothermic process. The mould is placed over the conductors to be joined. The weld powder is poured into the mould cavity after placing the thin metal disc to block the downward passage of the powder .The top lid is closed and a spark is produced by a flint gun to ignite the powder inside the mould.

The ignition of weld powder causes high temperature exothermic reactions and the formation of aluminum oxide slag and molten copper. The molten copper melts the thin disc blocking its downward passage and flows through onto the conductors to be joined. A fusion weld is formed between the conductors in this process

.

The majority of exothermic welding connections have at least twice the cross sectional area of the welded conductors and equivalent or greater current carrying capacity. Since the connection is fusion of virtually pure copper it can withstand high current surges and does not loose or corrode at the point of weld.

The selection guide shows the typical materials necessary for cathodic protection connections. Further information and advice on mould, clamp and powder size for any particular application, can be provided on request

1. Lid
2. Starting power
3. Graphite mould
4. Weld metal powder
5. Steel disc
6. Tap hole
7. Weld cavity
8. Conductor
9. Earth rod

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Thermit Welding
The exothermic welding equipment

Very little time or skill is necessary for making reliable connections by using exothermic welding process. Being light, portable and requiring no outside power source, this method is ideal for making cable to pipe/structure connections in CP works.

Weld powder

Weld powder, a mixture of copper oxide and aluminum, packed in plastic tubes. Each tube contains a measured quantity of weld-metal powder, together with the correct amount of silver-colored starting powder. The powder supplied is sufficient to make the appropriate joint. Four types of weld powder are available, each suited for connecting different materials:

- For copper to copper and copper to steel (except rails)
- For copper to cast iron
- For copper to steel pipe
- For copper to rail and steel to rail

Graphite mould

The graphite mould comprises a crucible, a tap hole and a weld cavity. The exothermic reaction takes place in the crucible; the molten copper is directed by the tap pole into the weld cavity, which is designed to allow easy removal of the mould from the finished joint.
This design prolongs the mould s life to allow approximately 75 joints, on an average, depending upon the level of care in use.

Mould holder

In most cases the graphite mould is split so it can be clamped around the conductors to be joined. The mould holder can secure different types of moulds and should be ordered separately according to the type and size of joint required.

Standard tool kit

The tool kit comprises:

- ✓ File card brush for cleaning conductors
- ✓ Flint gun for starting the reaction
- ✓ Mould scraper for removing slag left in the crucible after a joint has been made
- ✓ Mould brush for final cleaning of the crucible, tab hole and weld cavity after making the joint

Cable cleaner

Designed for cleaning circular conductors, i.e. rods and cables.

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Pin Brazing

Pin Brazing is used to ensure a safe electrical connection to different types of steel structure. It is primarily designed for the occasional user who needs a simple, rugged and low cost machine. This method is well suited for joints between pipes, connection to measuring cables, installation of sacrificial anodes, test posts and many other applications.

The Pin Brazing unit:

1) Brazing Gun
2) Battery Unit
3) Battery
4) Battery Charger
5) Earth Device

Special Benefits:

- Minimum thermal effect on the steel, because of low melting of solder & short heating time.
- Applying this method under wind, rain and cold conditions.
- Being safe for Pin Brazing operators.
- Easy to use because of the automated nature of the
- Fast installation and performance.
- Versatile by portable nature of the equipment.

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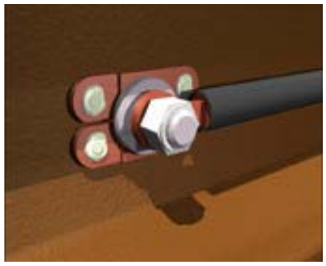
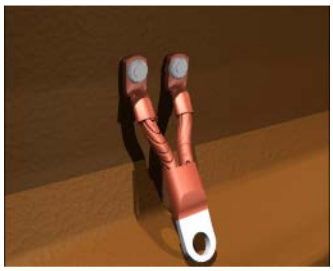
Applications:

Earthing

Studs



T-Connectors



Y-Connectors

Accessories:

Cable lugs for pinbrazing
Cable lugs for pinbrazing and pinbraze to cable
Fixing clamps
Press tools

Cable lugs for pin brazing

Direct
Brazing Pins

Threaded Pins

Ferrules

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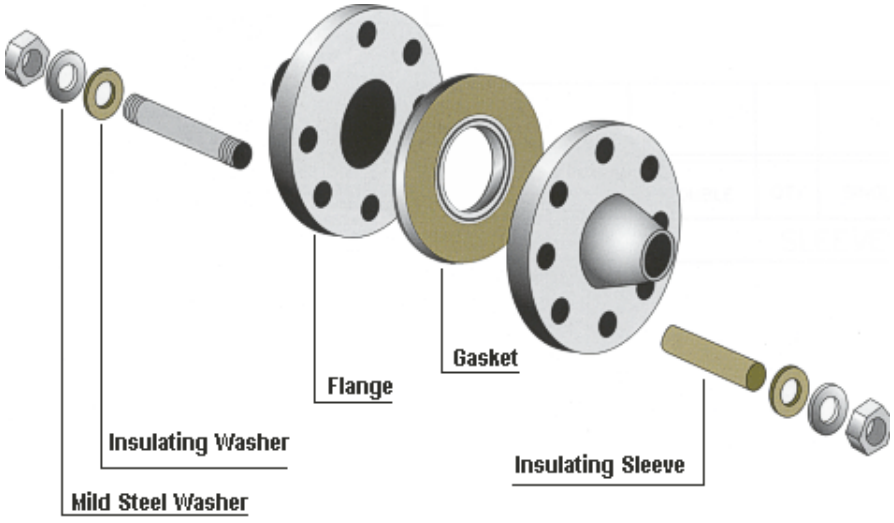
Flange Insulation

In order to maintain the full integrity of a pipeline cathodic protection system, a pre-requisite is that the pipeline is electrically isolated from other structures. One of the main reasons for this is to prevent current drainage. In the case of pipelines, well casings and similar construction, insulation can be performed by installing Insulating Flange Kits or Insulating Joints.

When using Insulating Flange Kits, the material recommended is a neoprene coated phenolic either as a full face or ring joint, used in conjunction with insulating bolt sleeves which can be supplied in sufficient thinness to permit the use of standard bolts provided that there is a clearance of 3 millimeters between bolt diameter and bolt hole. Tufnol or similar material washers are also used to isolate the bolt and nut head from the flange although in practice it is only necessary to isolate on one side. It is important that the gasket material used should have a high electrical resistance in conjunction with rigidity but at the same time permit sufficient compression by tightening up to overcome any problems of leaking joints. It is particularly necessary to over-wrap the whole joint, immediately after making, in order to prevent dirt and moisture ingress between the flange end faces or between the heads of the nuts and bolts and the pipe itself. Wherever possible this type of connection should be pre-assembled in a works and checked for insulation prior to insertion on site.



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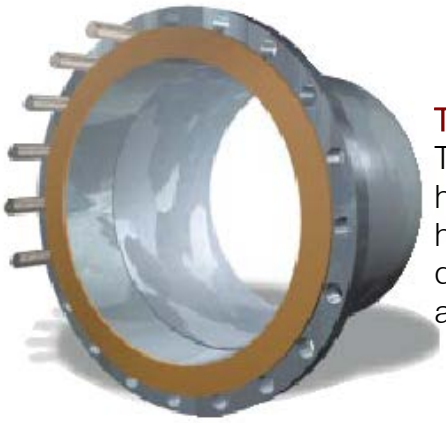
Type “E” Gaskets

Type “E” Gaskets extend to the outside diameter of the flange.
They feature precision located bolt holes, to automatically center the gasket, and offer maximum protection against foreign material “shorting-out” the flange.



Type “F” Gaskets

Type "F" gaskets are made without bolt holes, to fit tightly inside the overall bolt hold circle of the flange faces. The outside diameter of the gasket fits tightly in place, assuring a well centered position.

Further Protection

To prevent short circuit in flanges caused by the ingress of conductive matter between the flanges faces, it is recommended that self adhesive PVC tape be wrapped around the outside of the flange for both types specially for F type of flange insulating gaskets.

Standard Flange Insulation Kit

Unless otherwise specified shall consist of the following:

- Gasket
- Insulating Sleeve
- Insulating Washers
- Mild steel Washers

Faced Phenolic Gaskets

Neoprene faced phenolic gaskets have long been used as a standard insulating gasket in the gas and oil industries because the soft neoprene rubber provides good sealing qualities. In these gaskets, neoprene sheets are factory bonded to both sides of a laminated phenolic sheet to give good sealing qualities and high electrical resistance. The temperature limitation of these gaskets is approximately + 90°C (1940P)

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Monolithic Insulating Joints

Monolithic Insulating Joints are used for electrically isolating of cathodic protected pipeline sections from unprotected pipelines or other metallic structures.

Monolithic Insulating Joints are maintenance free, boltless, rigid pipeline components, factory-welded and ready for installation at site. They are suitable either above or underground installation without the need for special precautions.

Monolithic Insulating Joint:

Eliminates short circuits, bolts, sleeves and washers – the major source of short circuits in most isolation assemblies – are eliminated with isolation fitting.

Eliminates Field Assembly, isolation fitting is completely factory assembled and tested. There are no flanges, gaskets, nuts, bolts, sleeves or washers to handle and consequently no fluid leaks due to improper field assembly.

Less Expensive
Purchase the isolation fitting for less than the cost of the component parts of insulated flange assemblies in most pipe sizes. Install the isolation fitting for less than the labor costs of installing an insulated flange assembly.

Please provide the following information on any request for quotation:

- nominal pipe size
- pipe wall thickness
- pipe grade
- design rating or pipeline pressure

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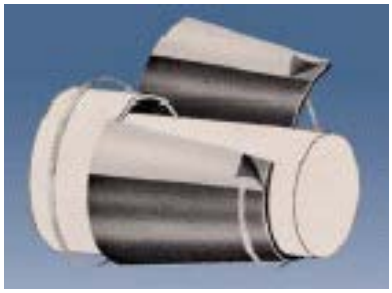
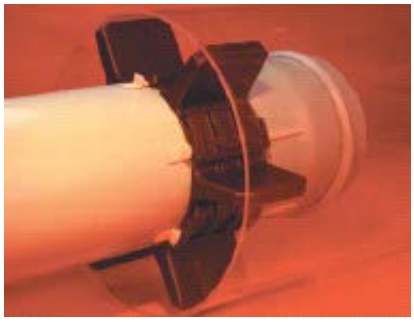
Pipe/Sleeve End Seals and Insulators

Model 'C' are fabricated casing seals made from neoprene which can be supplied to suit any carrier casing combination e.g. 8" carrier 16" casing



Model 'W' is wrapping around casing seals, made from neoprene. They can be installed after both the carrier and casing are completed. They can be supplied for any carrier casing combination.
All casing seals are supplied with worm driven steel bands.

Plastic Insulators are manufactured from high density polyethylene and are suitable for a maximum working temperature of 180 °F. They are made for every pipe size. Between 1" and 12" they are made in two pieces. From 14" the insulators are of multi segment pattern, one segment being required for each 4" (100mm) of pipe diameter and one 1/2 segment for the excess 2", where this occurs.



Up to 12" Insulators are available with skid heights of either 24 or 34 mm. From 14" skid heights of 24mm, 34mm or 48mm can be provided.
All insulators are supplied with necessary fixing screw and nuts.

Steel Insulators are fabricated from 14 gauge (0.074") steel. Where skid risers are fitted these are made from 12 gauges steel. All Steel work PVC coated by fluidized bed method to thickness of approximately 15 mils (0.15").
Skids can either be molded polyethylene, 30% glass reinforced resin, or fabric based phenolic laminate. Each skid is fixed to steel band of the insulator by two welded studs.
The necessary steel studs and nuts for fixing the insulators should be fixed 12" from the end of the casing and the second insulator should not be more than 4' from the first insulator after which the spacing on plastic insulators should not exceed 8'(2400 m) and on steel insulators should not exceed 12' (3000 m)

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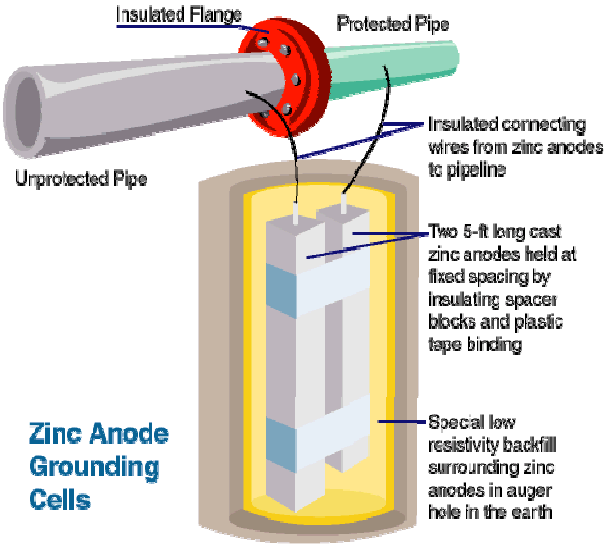
Zinc Earthing Cell

The importance of control of stray current is becoming more apparent as the pipeline network is globally expanded. Sources from which these stray currents emanate can be put down to a variety of reasons, from both an AC and DC basis. Super grid electricity transmission system is of particular concern. Increasingly zinc grounding cells are used as earthing material on sights where corrosion has occurred or 'is' induced.

Zinc grounding cells provide a low resistance across an insulating joint without introducing excessive loss of cathodic protection current by developing a polarization potential across the cell of several tenths of a volt that has the effect of greatly reducing flow of cathodic protection current through the cell.



These cells consist of two zinc rods, with insulation material to separate them, in a conductive backfill material, packaged in a bag. The insulation or separator leaves the zinc rods reasonably close together without touching. The backfill material, such as bentonite, promotes conduction and contact with the surrounding earth, as the package is buried near the points it is connected to.

Chemical composition of Zinc Electrode:
Copper Cu 0.005% max
Aluminum Al 0.10 – 0.50%
Iron Fe 0.005% max
Cadmium Cd 0.025% - 0.07%
Lead Pb 0.006% max
Others (total) 0.10% max
Zinc Zn Remainder
Potential Ag/AgCl - 1.05 V
Capacity ampere hours 780 per kg min

Packaged in cotton bag with the following chemical backfill Composition:
Powdered Gypsum 75%
Granulated Bentonite 20%
Sodium Sulphate 5%electrical efficiency and long working life

A wire lead attaches each rod to a point of interest, such as across an insulated flange, or between a pipeline and ground. The concept for protection is that the zinc rods will allow separation of the two structures, and minimize the DC cathodic protection current flow under normal conditions. Under over-voltage conditions, the small separation between the rods and the conductive backfill . will allow current to flow between them, draining the un

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Spark Gap

The isolating spark gaps are used for conductive system parts which cannot be interconnected directly in safe or hazardous zones. They limit the extent of the applied cathodic protection and prevent the loss of protective current to other buried metallic structures in the event of a lightning strike on to any above ground pipe work or connected structure, or an electrical fault causing a voltage surge on the pipe, a flashover across the insulating components to the flange could occur.

SDP provides clients with the wide range of surge arrestors. Our approved type with flexible conductor connection adjusts itself quickly to any application environment. The pre-wired spark gaps include connecting cables with different lengths or could be connected to structure with cable lugs, screws and nuts. The flat or angled connection brackets (IF), which are available as accessories, allow for easy connection of the spark gap at pipeline flanges. Some of them are enclosed by a damp-proof PVC enclosure and can be ideally used for underground installation at insulating couplings.

The low spark-over voltages of the spark gaps are applied in protecting when the separate installation parts had only a low insulation resistance against each other.

The powerful explosion proof isolating spark gaps are supplied with a fail-safe device, which establishes a safe operating state (short circuit) even in case of overloads.

Suppliable Spark Gaps Specifications

Lightning Impulse Current (10/350 µs) I_{imp}	50, 75 &100 KA
Lightning Current Carrying Capability acc. to EN 50164-3	H or N
Nominal Discharge Current (8/20 µs) In	100 kA
100% Lightning Impulse Spark-Over Voltage U_{as} 100	≤ 4KA ≤2.5KV ≤0.95
Power frequency spark-over voltage (50 Hz) U_{aw}	≤2.5KV ≤1.2KV ≤0.07
Operating Temperature Range TU	20 to 80°C or 150°C
Degree of Protection	IP54, IP65, IP67
Enclusure Material	Steel/Plastic Coating, Zinc Die Casting
Material	Stainless Steel

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Polarization Cell

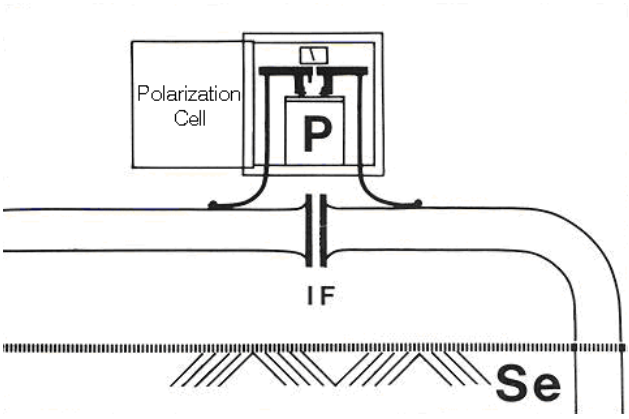
Polarization Cells are designed to protect personnel and equipment from electrical disturbances. They effectively block cathodic protection DC voltages; all other electrical disturbances are freely conducted to ground, such as:

- AC Fault Currents
- Mitigation of Induced AC Voltages
- Lightning

They contain pairs of pure nickel plates immersed in KOH electrolyte. The surfaces of these plates instantly polarize when separated metallic structures are connected to opposite terminals. The polarizing film blocks DC, to contain cathodic protection current, while freely passing AC. Personnel are safely protected from shock hazards during AC faults. Insulating fittings and equipment are protected during electrical disturbances. Separated underground or submerged metallic structures are efficiently protected.

Isolated structures, which must remain effectively grounded to the AC utility network, are designed to meet this requirement in national electrical safety codes.

SDP supplies polarization cell systems up to 100 kA AC fault current capacities, in 5 kA increments. Each cell system is capable of blocking 1.7 volts DC.



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Lightning Protection Systems

Lightning is a fast and instantaneous exchange of electric charges between Earth and cloud. The negative clouds are mainly stormy and are the base of lightning strikes. The lower part of the storm cloud is negatively charged when the cloud moves; it generates on the Earth a charge of equal value and opposite sign. When the accumulation of charge exceeds a critical potential (when the voltage gradient reaches a value of about 10 KV/cm) a channel of electrodes leaves the base of the cloud in the form of a faintly luminescent reject and progresses rapidly toward the earth.

Material Specification

All Products in lightning protection are produced in accordance with BS 6651 standard that ensures a satisfactory life span of at least 30 years to ensure an effective system and a satisfactory long term performance. All fittings need to be mechanically robust and provide good corrosion resistance qualities in widely differing environments aluminum and copper the two metals most commonly used in lightning protection system particularly where they come into contact with each termination networks and down conductors, it has to be conducted to copper at or around the test clamp.
This connection should be positioned at the beginning of the earth termination network.

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Copper Bonded Earth Rods

Copper Bonded Earth Rods or ground rods are the ideal driven earth electrodes; they offer the installer an economical and efficient earth rod grounding system.

Electrolytic copper is uniformly molecularly bonded onto a high tensile steel core to a pure thickness from 25-250 micron, thus ensuring excellent corrosion resistance and eliminating electrolytic action.

The high tensile steel core ensures strength and hardness allowing the use of power hammers for deep driven systems.

Coupling threads are formed by a rolling process to ensure thread strength and to maintain the integrity of the molecularly bonded copper. The universally used thread rolling technique raises the surface of the rod.
Standard: BS 6651 / UL 467.

Dimension Rod Size	Actual Rod Dia	Thread Dia	Ord No.
9.5 x 1200	9.5	Un-Threaded	MZF 9.512
9.5 x 1800	9.5	Un-Threaded	MZF 9.518
14 x 1200	12.0	14	MZF 1412
14 x 1500	12.0	14	MZF 1415
14 x 1800	12.0	14	MZF 1418
14 x 2000	12.0	14	MZF 1420
14 x 2400	12.0	14	MZF 1424
16 x 1200	14.2	5/8”	MZF 1612
16 x 1500	14.2	5/8”	MZF 1615
16 x 1800	14.2	5/8”	MZF 1618
16 x 2400	14.2	5/8”	MZF 1624
16 x 3000	14.2	5/8”	MZF 1630
19 x 1200	17.2	3/4”	MZF 19012
19 x 1500	17.2	3/4”	MZF 1915
19 x 1800	17.2	3/4”	MZF 1918
19 x 2400	17.2	3/4”	MZF 1924
19 x 3000	17.2	3/4”	MZF 1930

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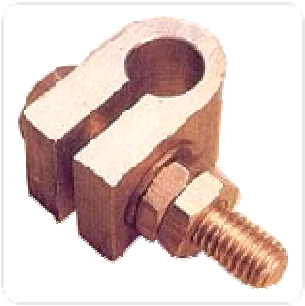
Rod to Cable Clamp (Simple Type)

Manufacture in brass / gunmetal to suit various diameter earth rod and cable.

Standard : BS2874/BS1400

Rod Diameter (mm)	Conductor Size (mm^2)	Ord. No.
9.5	35	CZC 35
16	50	CZC 50
16	70	CZC 70
20	95	CZC 95

Split Connector Clamp

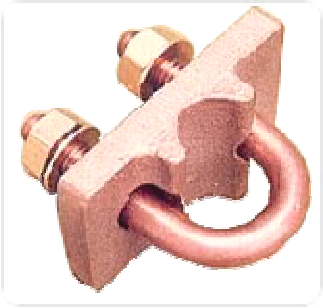


Manufacture in brass /gunmetal, complete with bolt, washer and two locknuts.

Standard : BS2874/BS1400

Rod Diameter (mm)	Rod Type	Ord. No.
9.5	Copper Bonded	CZS 1
16	Solid Copper	CZS 2
16	Copper Bonded *	CZS 3
20	Solid Copper	CZS 4
20	Copper Bonded *	CZS 5

U – Bolt Pipe Clamp



These are manufactured in copper with gunmetal back plates.

Standard : BS2874/BS1400

Rod Diameter (mm)	Ord. No.
16	CZU 16
20	CZU 20
25	CZU 25

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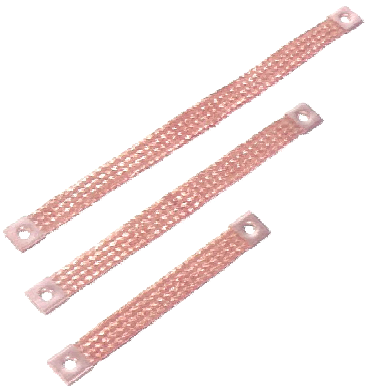
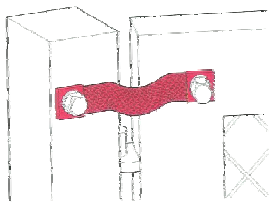
Flexible Copper Earth Bar





High conductivity cooper wire braid manufactured for bonding of doors & movable objects.

Size mm	Bolt hole dia. mm	Order Code
25*3	12	FCBE 253
30*3	12	FCBE 303
40*3	12,14,16	FCBE 403

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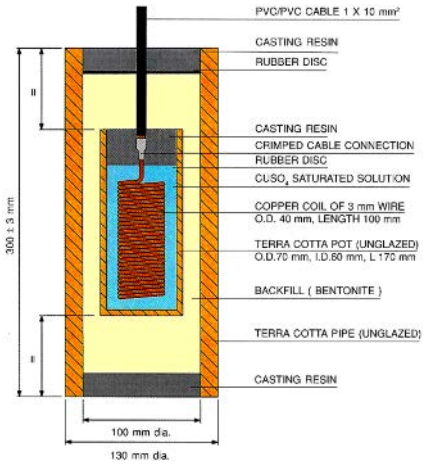
Cu/ $CuSO_4$ Reference Electrode

Various types of Cu/$CuSO_4$ half cells are available in SDP works including both of Stationary (Permanent) and Portable electrodes. All copper sulfate electrodes are shipped include a charge of high-purity copper sulfate crystals.

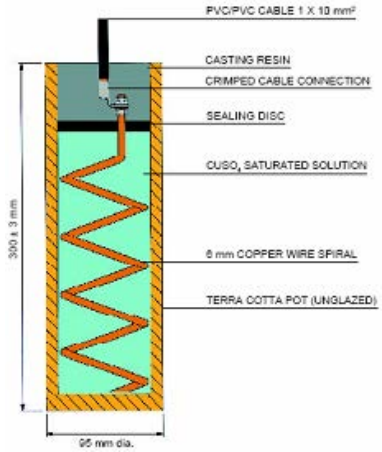
Electrode potential is subject of tests and calibration as well as +320 mV referring to H_2 Potential.

Portable electrodes can be supplied within the following dimensions with a protective cap for the CPT porous plug.

Approx. Diameter : 35 mm
Approx. length : 150mm
Cable Type : #14 Cu/PVC
Dry weight : 0.145kg



Stationary reference electrodes would be used for permanent measurement of Test Posts and/or to generate Soil to structure feedback signal for Potential controlled CP Power sources as well as Automatic Transformer / rectifier units and solar powered CP stations.



Stationary Reference electrodes are Pre-Packaged with low resistivity none metallic Backfill containing following composition;

- 70% Bentonite
- 10% Vermiculite
- 20% Sodium Sulfate

Package Dimensions varies by application and client requirement

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Ag/AgCl Portable Reference Electrode

GMC Silver – Silver Chloride reference electrodes for use in seawater and brackish water, river mouths, estuaries, sea water and high chloride waters. Three models are available.

Model AG-4 potable reference electrode is designed for standard everyday use in 0-100^{o}C water depths and can be used in salt water and saturated saline water conditions such as offshore platforms, off shore pipelines, seawater docks and boats or ships. The AG-4 features are following:

High impact ABS plastic housing with 50' of RHH-RHW cable. The electrode is pre- weighted. Special silver–silver chloride element allows for calibration and chloridizing repair if needed in field prior to use. Ideal for medium to light potential work. Color coded blue for ease of electrode type determination.

- **Connection Stud:** 1/4"-20 plated brass.
- **Size:** 1" dia. × 8" long ABS plastic high impact blue housing.
- **Stability:** +/-10 millivolts with 3.0 microamp load.
- **Temperature Range:** 0^{o}C to 100^{o}C

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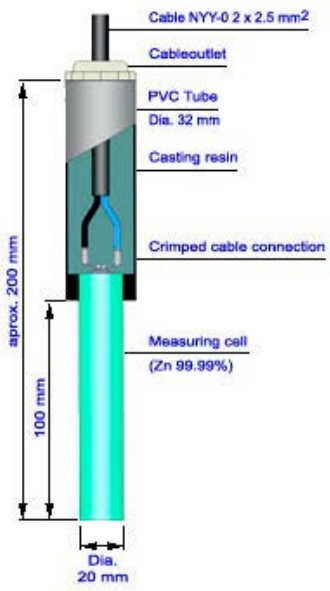
Zinc Reference Electrode

$Zn/ZnSO_4$ Reference electrodes are permanently installed in soil to facilitate the potential measurement of the protected structures. The electrodes shall be installed close to the protected structure.

The reference electode is used inside internally protected steel water boxes, tanks, pipes etc. and is provided with a 1" screw-in thread for permanent fixture by using a weld-in flange. The measuring cell is covered with insulating material so that the only exposed area is the circular base at the bottom. Potential referring to H_2 electrode: - 0.77 V,



Zinc / Zinc Sulfate reference electrode has the longest life compare to any other reference electrodes. These reference electrodes are available with and without backfill for underground and fresh water applications.

The main components of the permanent solid type zinc reference electrode shall be:

- a cylindrical zinc bar (dia. 20mm, Length 100m) of approx. 63cm^2 sensing surface area
- Reference electrode cable connection and cable lead
- Linen bag with non polarizing backfill.

Bag dimensions:

- Approx. 100 mm diameter
- Approx. 300 mm height

The electrodes are designed and manufactured according to purchaser´s requirements for: Operational conditions, temperature and pressure Cable type and length Length of measuring electrode

Portable Zinc reference electrodes are used for tanks & exchangers

Reference Electrodes

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Measuring Equipments

Mobile Data Collection (Multifunction Instrument MODATA)

MODATA, a computer-aided measuring system, has been developed to integrate the function and capability of several instruments used in the field of Cathodic corrosion protection in one instrument only.

MTC Multi Task Converter

Combines 4 separate measuring instruments (AC/DC voltage, current, m-volts, resistance)

Plastic Carrying Case

Allows optional use as a mobile carried-about measuring unit as well as a comfortable measuring data collection system equipped with carrying straps.

DOS Computer

1 MByte memory for program and measuring data provides storage of data up to 5000 test points including all measuring data and identification of sites, alternatively for about of 90km intensive measurements.

Compact and Splash-Water Proof Data Collection Unit

MODATA consists of a small watertight MS-DOS compatible computer with large display and Multi Task Converter integrated in splash-water proof plastic housing specially designed for cathodic protection measurements.

Contrast-Enhanced Display

Back-lit, with 40 characters at 8 lines, provides best legibility even under extreme lighting conditions.

Multi Task Converter integrating 4 Measuring System

Through newly designed MTC, MODATA allows measuring of any relevant values for maintenance and/or intensive measurements without requiring additional instruments.

Watertight Keyboard

Eliminates special protective cover when operated in wet or dusty environments.

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Power Supply

Of Multi Task Converter by rechargeable battery as integral part of plastic housing. Replaceable NiCadsAA type for MS-DOS computer.

Operational Times

Typically 15h for MTC and MS-DOS computer. Remaining power indication allows optimum capacity use.

Data Cartridge

Newly designed data cartridge for data storage of more than 1000 test points or alternatively approx. 20 km of intensive measurements. PC linking without requiring additional data cartridge interface.

Root Data and Last Year's Values for up to 5000 Test Points available on Site

All important measuring test point data such as number, type, details and measuring data are immediately available on site. For comparison purposes last years values may be shown on large display

Charging Facility

By means of 230V AC mains or 12V vehicle battery with galvanic isolation from vehicle ground. Automatic reverting to trickle charge condition after completion of charging cycle.

Quick and Easy-to-Do Collection of Measuring Values even at parallel running Pipelines

Free selection of sequence of test points monitored. When taking measuring values at parallel running pipelines option exists to switch between them by key operation.

Technical Features

Interfaces

Serial interface port for connection of data cartridge or direct data transfer between PC and MODATA.

Bar Code Input

Provided for automatic test point identification on site.

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Specifications

Function 1 (Measuring instrument)

DC Voltage Measurement (3 channels)	
Input impedance	>2 MΩ
Series-mode rejection	at 16.6Hz appx. 60dB (factor 10_3) at 50Hz appx. 100dB (factor 10_5)
Measuring range	±1V - ±10V - ±150V
Resolution	0.1 mV on 1 V range 1 mV on 10 V range 15 mV on 150 V range
The input recording of the 3 DC voltage channels can be selected at the same time, so that the calculation of IR-free potentials is assured by the extrapolation method.	

AC Voltage Measurement (1 channel)	
Measuring range	1 V r.m.s - 10 V r.m.s - 240 V r.m.s
Resolution	0.2 mV on 1 V range
	2 mV on 10 V range
	50 mV on 240 V range
Via channel 1 DC voltage and its AC component can be measured simultaneously. This feature is important for verification of AC voltage influenced potentials.	

Current measurement			
Range	int. Shunt	Resolution	Voltage drop
2 mA	10 Ohm	1 µA	max. 20 mV
20 mA	1 Ohm	10 µA	max. 20 mV
1 A	0.1Ohm	100µA	max. 100mV
The use of external shunts is recommended for the measurement of currents > 0.5 A in order to avoid undesired voltage drops. The measured voltage via the external shunt is automatically converted into current value by the software.			

Micro Voltage Measurement	
Input impedance	1 MΩ
Series-mode rejection	at 16Hz appx. 60dB (factor 10_3) at 50Hz appx. 100dB (factor 10_5)
Measuring range	±100V
Resolution	1 µV

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Function 2

Scope of supply

- MODATA computer
- 4 Mignon NiCd-storage battery (inside MODATA computer)
- MODATA-multifunctional converter with integrated storage battery
- Charging set with 2 outlets for MODATA computer and converter
- Transfer adaptor cable for connection to a stationary PC
- Synchronization cable for external synchronization
- Driver disk with data register and transfer program "HCOM" for data transfer between PC and MODATA
- MODATA user guide handbooks

Options

- Carrying strap, type "Sprint"
- Carrying system, type "Marathon" for class

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WTW Pocket Multi-Parameter Instrument Multi-Line P3

The Professionally Designed System

Handy, easy to use, robust, waterproof and additionally with several measuring parameters. Simultaneous connection of a pH/Redox electrode and conductivity cell allows up to three parameters to be measured at the same time

Multi line P3/LF-SET

Professional case with built-in measuring set, with instrument, electrode, conductivity cell, calibration, maintenance accessories & operating instructions.

Multiline P3	Conductivity measurement
Measuring range/ resolution	1 µS/cm 500 mS/cm in 4 ranges Salinity : 0,0 70.0
Accuracy (± 1 digit)	± 1% ovf value
Temperature compensation	linear and non-linear function for ultra pure and natural waters

Multi line P3	pH measurement
Measuring range/ resolution	pH: -2.00 +16.0 mV: -1250 +1250
Accuracy (± 1 digit)	pH: ±0.01 pH mV: ±1 mV
Temperature compensation	automatic: -5 +99.9 °C manual: -20 +130 °C

Multi line P3	Temperature measurement
Measuring range	-5.0 ... +99.9 °C

Parameter selection:

- pH and Redox potential
- Conductivity & salinity
- Temperature

Advantages

- Handy & complete
- Waterproof
- Easy to use
- GLP-conform

Performance features

- Hose-proof (IP66) and submersible (IP67) display, automatic calibration of all sensors, built-in memory for 120 data sets and serial RS interface
- Impact-resistant antistatic ABS plastic housing
- Insensitive silicone keyboard for simple operation
- Calibration and measurement in GLP mode
- Built-in memory for 120 data-sets each with 3 measured values, date, time, and individual identification number
- Time-controlled measurements over periods of up to 5 days
- Push-button manual store
- Energy-saving operation by low power electronics & automatic switch-off
- Operation for 150-800 hours with rechargeable batteries (period depends on connected sensors)
- Continuous operation with plug-in mains power supply
- EMC interference resistance - e.g. measurements are not influenced by strong transmitters (radio, etc.)

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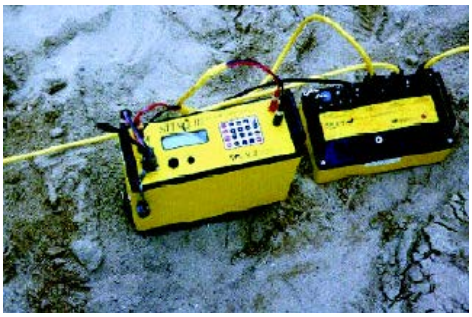
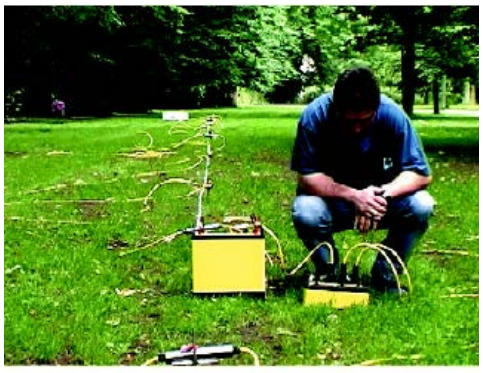
STING R1 Deep Earth Resistivity Meter



The deep earth resistivity meter has been developed for the determination of specific soil resistivity based on experience that most of the commercially available earthing meters fail to provide correct measurable values for soil below 30 m depth.
Correct data on resistivity of soil at greater depths is of special importance for designing of deep anode groundbeds in impressed cathodic protection systems. The STING R1 is a state-of-the-art portable earth resistivity meter with memory storage of readings and user defined measure cycles. It provides the highest accuracy and lowest noise levels in the industry.

Key Benefits

- Field proven rugged construction. Built to last in real conditions
- Large capacity internal memory for storage of measurement results
- The best accuracy and noise performance in the industry
- Easy to use menu driven system
- User programmed measure cycles can be loaded into memory from a PC and later executed in the field
- Directly controls Swift Smart Electrodes, no need



Sting R1 with the Swift control unit, cables and electrode system

The Swift switches are simply attached to stainless steel electrodes in the field using rubber bands. Standard Swift electrode switch, permanently attached to the cable with water-proof sealings.

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SDP

Sepehr Danesh Pooya

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