CerAnode™ Technologies International

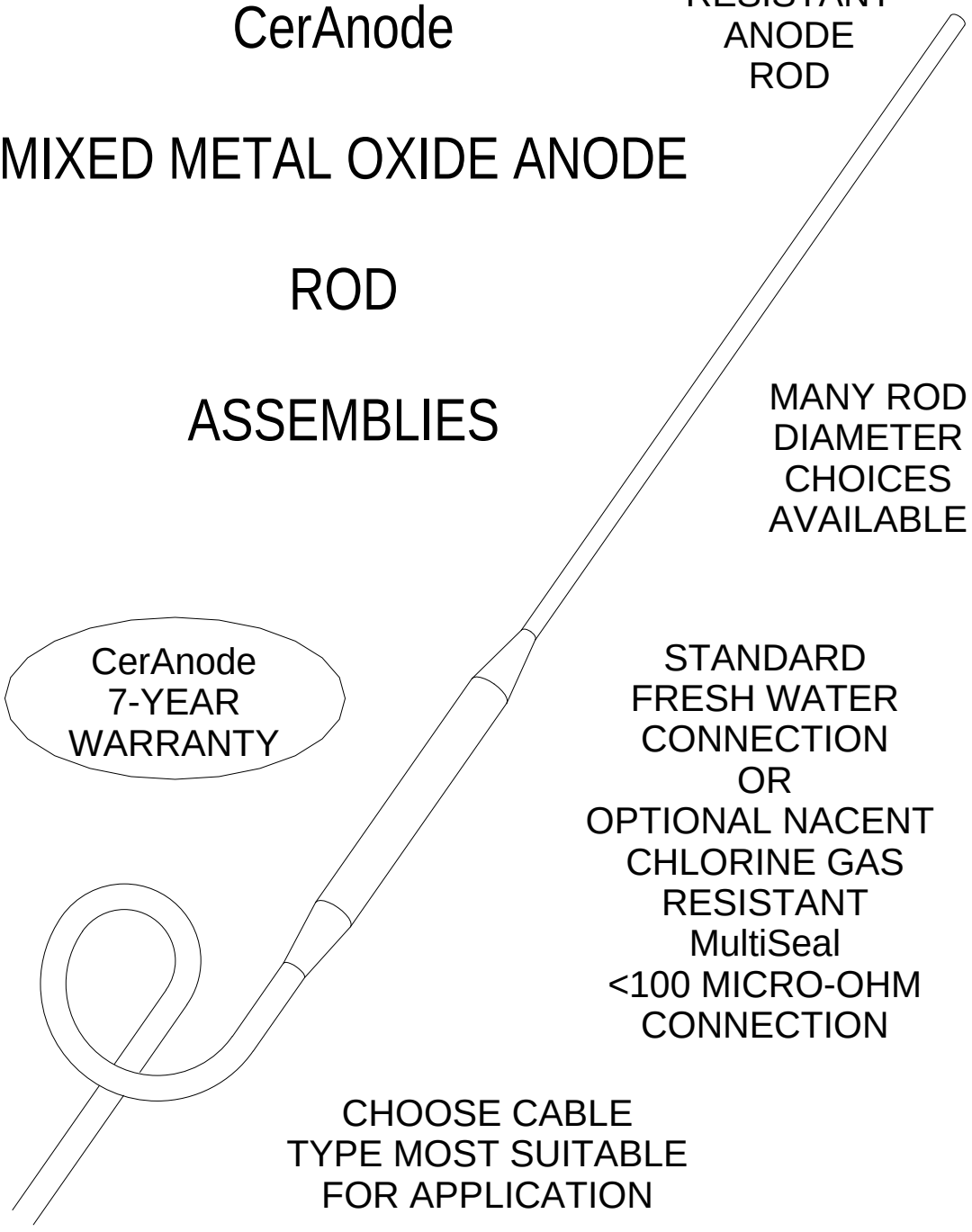
Division of APS-Materials, Inc. ----------

CerAnode

ABRASION RESISTANT ANODE ROD

MIXED METAL OXIDE ANODE ROD ASSEMBLIES

MANY ROD DIAMETER CHOICES AVAILABLE



CerAnode 7-YEAR WARRANTY

STANDARD FRESH WATER CONNECTION OR OPTIONAL NACENT CHLORINE GAS RESISTANT MultiSeal <100 MICRO-OHM CONNECTION

CHOOSE CABLE TYPE MOST SUITABLE FOR APPLICATION

CERANODE RODS & ROD ASSEMBLIES

CerAnode-Rod-Assemblies (CRA) are high quality mixed metal oxide anodes manufactured with special factory connections. They are extremely rugged and powerful making them an ideal choice for a variety of cathodic protection applications.

CerAnode also manufactures a titanium tubular anode product. It is available in both single or string configuration. Request the CPR Brochure from CerAnode

1) HIGH POWERED ACTIVATED TITANIUM ANODE ROD. CerAnode's very thin anode coating is exceptionally durable in combination with its solid ductile commercially pure titanium substrate. Unlike other similar MMO products on the market it is even scratch resistant. Prove it yourself. You can sharpen your knife on this durable ceramic coating. It is ideal where installation processes could possibly have an abrasive effect on the anode removing some of the precious metal oxide. The CerAnode, however, will remain unaffected providing its full life. It is a special arc-plasma spray processed sintered mixed metal oxide ceramic. It consists primarily of precious metal and refractory metal oxides in sufficient quantities and ratios to provide a life expectancy beyond its cataloged value. This provides the conservatism in anode design needed to assure a long life even in harsh environments. Its Iridium-tantalum-titanium based MMO has an ultra low electro-catalytic wear rate resulting in true dimensional stability. This anode will support the evolution of both oxygen and chlorine making it the choice for fresh water, seawater, mud, brackish water and coke environments. CerAnode's unique cable-to-anode connection results in a very high quality, high reliability anode assembly. The rods are also available without cable attachment.

2) STANDARD OR SPECIAL LEAD WIRE CABLE. The CRA uses standard or special user selected cable choices, many of which have been industry standards for many decades with proven track records. The cable choices have withstood the test of time. A wide choice of cables is available in order to provide the most economical anode assembly for the application. HMWPE is an economical choice but fluoropolymers such as Kynar®/HMWPE, or Halar®/HMWPE are available for more demanding applications where chlorides, oil or other harsh environments are involved. Cable choices such as EPR/CSPE (ethylene propylene rubber/chlorosulphonated polyethylene = Hypalon®) are available when suitable for the application. It is important that the appropriate cable be engineered for the environment. Since free chlorine gas is generated at the anode in a chloride environment, a fluoropolymer insulated cable should be used if this gas will contact the cable. Chlorine gas is very aggressive. Oxygen is generated in a fresh water environment.

3) MOISTURE PROOF CORROSION RESISTANT CONNECTION. The CerAnode MultiSeal™, consisting of 3 distinct seals assures a moisture proof electrical connection. The "CXP" & "CXF" options provide excellent resistance against acids and oil. Choose "CXF" for resistance to nascent chlorine gas, an absolute necessity in chloride environments. The MultiSeal™ also provides "water block" integrity so that the CP cable jacket cannot act as a siphon from the groundbed to the terminal box. In addition, the MultiSeal™ maintains the moisture proof seal if the cable should accidentally be stretched at the connection area.

4) ULTRA LOW ELECTRICAL CONNECTION RESISTANCE. The special APSconnect™ arc-plasma spray processing and the SWGconnect™ has resulted in an ultra low resistance electrical connection. The electrical

connection resistance is so low that it is equivalent to the theoretical resistance of the copper cable. No cable-to-titanium connection interface resistance is detectable when measured with a 4-wire Kelvin type resistance bridge capable of resolving $5x10^{-5}$ ohms.

5) MECHANICAL STRENGTH. The cable-to-anode connection is either swaged by a 200 ton circumferential precision connector adapter called SWGconnect™ or soldered by means of a arc-plasma sprayed copper-to-valve metal soldering process called APSconnect™. Either process results in high tensile strength such that the cable breaks before the connection is disturbed.

6) PERFORATED PIPE PROTECTIVE HOUSING OPTION. For applications where protection of the anode element or electronic isolation from surrounding structures is desired, CerAnode offers the CRA mounted in a perforated pipe housing. The CRA element is centralized and anchored in a perforated PVC or FRP pipe as specified. It is essentially transparent to the current. Materials are chosen to be compatible with the electrolyte environment as requested.

7) ANODE SPECIFICATIONS[1]. The table below shows Rod 20 year Ampere Ratings per linear foot in various electrolytes. Anode specifications may change without notice. Consult CerAnode for custom sizes & coatings. Maximum standard length = 10 feet.

AMPERE RATING PER FOOT FOR 20 YEARS

SIZE*	TYPE	CURRENT	FRESH[2] ,BRACK & COKE[4]	SEA[3]	METALLIC OHMS/FT.	PART #
1/4"	STI	LOW	0.200	0.500	0.0054	CRA-STI-250L
1/4"	STI	REG	0.400	1.000	0.0054	CRA-STI-250R
1/4"	STI	HIGH	0.800	2.000	0.0054	CRA-STI-250H
3/8	STI	LOW	0.300	0.750	0.0024	CRA-STI-375L
3/8	STI	REG	0.600	1.500	0.0024	CRA-STI-375R
3/8	STI	HIGH	1.200	3.000	0.0024	CRA-STI-375H
1/2	STI	LOW	0.400	1.000	0.00135	CRA-STI-500L
1/2	STI	REG	0.800	2.000	0.00135	CRA-STI-500R
1/2	STI	HIGH	1.600	4.000	0.00135	CRA-STI-500H

(* For larger diameters we suggest the CerAnode CPR -- see the CPR catalog brochure.)

NOTES: "STI" = Solid Titanium, "CNC" = Copper/Niobium/Ceramic (Cu core with Nb interface).

1 For voltage attenuation of <10% at the rod end opposite from the connection, the ratio of ROD METALLIC RESISTANCE to ANODE-ELECTROLYTIC RESISTANCE must be <0.22.

2 Total Immersion in water. Reduce current 50% for operation below 5 degrees C. Electrolyte impurities may also affect rating.

3 Total Immersion in water. Reduce current 50% for operation below 10 degrees C. Electrolyte impurities may also affect rating.

4 Loresco[R] DW-1, SC-2, SC-3 or equal is recommended.

5 For special sizes and diameters consult CerAnode.

How to Specify CerAnode Rod Anode Assemblies

(for rods only see part numbers in previous table)

Typical part number = CRA-4FT-STI-250H-100FT-8AWG-HMWPE-PS-CXF-3FT/XF

CRA[1]	= Product Designator for CerAnode Rod Anode Assembly
4FT	= Rod Length is 4 feet
STI[1]	= Solid Titanium Substrate
250H[1]	= 0.250" Diameter High Current Anode Rod
100FT	= Cable is 100 Feet Long
8 AWG	= Cable Size is 8 awg
HMWPE[2]	= Cable Insulation is High Molecular Weight Polyethylene
SWG[3]	= SWGconnect[tm] for ultra-low resistance swage connection (standard)
PS[3]	= APSconnect[tm] for plasma spray connection
CXP[4]	= Cable connection is Cross Linked Polyolefin-Oil Resistant
3FT/XF[2]	= 3 Feet Fluoropolymer Cable Shield starting inside the connection.
PERFP	= Perforated Pipe Followed by Material (FRP or PVC) & Schedule Size

Notes:

1 See last column of table on previous page for individual rod designators and rod current rating.

2 Cable Insulation Type. Many insulation types are available. The most common types are HMWPE (high molecular weight polyethylene), Kynar[R] or Halar[R] with a top layer of HMWPE, EPR/CSPE (ethylene propylene rubber/chlorosulfunated polyethylene) or other customer designated insulation. It is important to specify a fluoropolymer insulation layer (Halar of Kynar) cable insulation where chlorides may be present. It is possible to use the "CXF" connection option with HMWPE cable in some chloride applications, if a Fluoropolymer shield is specified for some distance up the cable.

3 The “SWG” for SWGconnect[tm] is a very special swage connection and the "PS" for APSconnect[tm], is a very special plasma spray solder connection. Both are of the highest quality and provide Ultra Low Electrical Resistance and Very High Mechanical Strength. The SWG connection is used for all connections except for special anode sizes.

4 Connection Insulation Type: Specify "CXP” for RUGGED X-Linked Polyolefin Encapsulation providing general chemical and oil resistance, or "CXF" X-Linked Fluoropolymer Encapsulation for CHLORINE GAS, Oil and General Chemical resistance. It is important to specify the CXF option for all applications where chlorides may be present.

WHEN IN DOUBT ABOUT SPECIFICATIONS, CONSULT ***CerAnode***.