

	<b>DEEP10</b> General Purpose Offshore Alloy	<b>DEEP7</b> Cold Water Alloy
<b>Chemical Composition (% by weight)</b>		
Iron (Fe)	0.10 max	0.07 max
Silicon (Si)	0.10 max	0.10 max
Copper (Cu)	0.006 max	0.003 max
Zinc (Zn)	2.0 -- 6.0	4.75 – 5.75
Indium (In)	0.01 – 0.05	0.015 – 0.025
Titanium (Ti)	0.025 max	0.025 max
Others (each)	0.02 max	0.02 max
Aluminum (Al)	remainder	remainder
<b>Electrochemical</b>		
Open Circuit Potential	(-) 1.08 V vs Ag/AgCl sw.	(-) 1.08 V vs Ag/AgCl sw.
Closed Circuit Potential(1)	(-) 1.05 V vs Ag/AgCl sw,	(-) 1.05 V vs Ag/AgCl sw,
Seawater Capacity @ 25°C	1100 A-Hr/lb. (2420 A-Hr/Kg.)	1100 A-Hr/lb. (2420 A-Hr/Kg.)
Seawater Capacity @ 5°C	Variable (2)	1100 A-Hr/lb. (2420 A-Hr/Kg.)
Seabed Mud Capacity (3)	950 A-Hr/lb (2090 A-hr/Kg.)	950 A-Hr/lb (2090 A-hr/Kg.)
Seabed Mud Capacity @ 5°C	Variable (2)	950 A-Hr/lb (2090 A-hr/Kg.)
<b>Physical</b>		
Alloy Density	0.098 lb/in3 (2.71 gm/cm3)	0.098 lb/in3 (2.71 gm/cm3)
<b>Recommended Applications</b>		
Offshore Structures (Platforms, Pipelines, FPS, FPSO, MODU, SPAR, Subsea Structure, Risers, Wind Turbine, etc)	Any Tropical Ocean < 600 fsw (180 Msw) with mean water temperature higher than 45 F (7C).	Any Ocean, Any Depth, Any Temperature
Inshore Structures (Ports, Harbors, Jetties, Windfarms, Locks, Dams, Bridges, Piers etc.)	Any Body of water < 600 fsw (180 Msw) with mean water temperature higher than 45 F (7C), Chloride < 200 ohm-cm.	Any Body of Water, Any Depth, Any Temperature with Chloride Ion Concentration > 12 ppt. Resistivity < 200 ohm-cm.
Produced Water Vessels & Tanks	Any produced brine < 140 F(60 C)(4)	No Improvement over DEEP 10
Seawater Ballast Tanks	Suitable for most seawater applications (5).	No Improvement over DEEP 10

**Notes**

- 1 Recommended number to use when designing CP systems.
- 2 Activation can be a problem with chemistries at extremes of specification in cold water.
- 3 Recommended number to use when designing CP systems for offshore pipelines using bracelet or sub bottom anode systems.
- 4 Consult a CP Specialist for guidance at elevated temperatures as performance de-rating will be needed.
- 5 Excercise care with variable ballast tanks as dangerous volumes of hydrogen can be generated under certain conditions.

For additional guidance in application of these alloys vist our website and go to "Ask a Corrosion Expert".

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**Deepwater Corrosion Services Inc.**

Sacrificial Anodes for the Offshore Oil and Gas Industry

**DEEPWATER GAUS ANODES****DEEPWATER**

www.stoprust.com

## Overview

Deepwater Gaus anodes are manufactured at our Houston foundry to the highest industry standards. Our induction furnace offers a wide range of advantages in efficiency and quality over the gas furnaces that most Aluminum foundries still use. Gas furnaces are slower and less efficient for achieving precise chemical compositions. Using the high-frequency AC induction method causes faster melting; this reduces the risk of melt contamination, saves energy, and provides a very homogenous casting. For large pipeline bracelets our water cooled molds produce crack and warp-free castings every time.



## Experience

Sr. Antonio Galvan has been in the anode production business since 1978, when he assumed control of the family foundry operation. Sr. Galvan has dedicated his career to the efficient production of sacrificial anodes. With Sr. Galvan's expertise in water-cooled mold design, the Deepwater Gaus foundry will be at the cutting edge on the Gulf Coast, especially for large-diameter pipeline bracelet anode manufacturing.

Deepwater Corrosion Services Inc. is a recognized leader in offshore corrosion control. Since 1986, the company has serviced the international community from its Houston, TX headquarters. Being the technology leader in offshore CP (cathodic protection) life extension has created the need for a dedicated foundry facility.

For many years Deepwater has been praised as one of the top third-party anode quality inspectors. More recently, the company has been selected by Shell Deepwater to develop a foundry quality audit program. During the course of many anode foundry evaluations, Deepwater's personnel have been to most of the world's premier foundry operations, and several second tier facilities. This knowledge makes us confident that the Deepwater Gaus facility's anodes are among the highest quality on the market.

Mr. Dick Baxter is one of the industries recognized experts in anode metallurgy and quality testing. He started his career working for Federated ASARCO in the aluminum foundry business. For the last twenty-one years he has been helping Deepwater establish a technological lead in the offshore CP business.

Mr. Jim Britton (CEO of Deepwater) has been responsible for many innovations in offshore corrosion control. He has specialized in the inspection and testing of anodes, and has been active on NACE committees associated with anode quality. Since 1980, Mr. Britton has visited over twenty anode production facilities worldwide.



## Technology

The use of induction furnaces offers a wide range of advantages both in anode quality and production efficiency, most other aluminum foundries use gas, which is slow and inefficient. Using the high-frequency AC induction method gives faster melting; this reduces melt contamination, saves energy and provides a very homogenous casting.

### Location

With the Deepwater Gaus foundry and Deepwater's technical support services office located less than a mile from one another in the Houston Energy Corridor, both operations are convenient for Gulf Coast fabrication and pipe coating yards, also for Houston-based third party inspectors. We can provide anodes on shorter lead-times, at greatly reduced shipping cost to the customer.

## Anode Alloys

**DEEP10** – Al-In-Zn alloy for use in ambient temperature seawater, produced water or marine (seabed) silts. The chemistry is optimized for a wide range of applications where temperatures are between 7 – 60° C (45 - 140° F), and where Chloride Ion concentration is > 12 ppt. This range covers most of the world's tropical oceans down to ~ 200 M (650 ft.) water depths.

**DEEP7** – Al-In-Zn alloy for use in cold water or marine silt < 7° C (45° F). This alloy is specifically recommended for deep water. The alloy has a controlled chemistry, which maintains the key elements in tighter ranges to guard against non-activation. The alloy is suitable additionally for all applications of DEEP 10. Chemical composition and electrochemical performance data are given (Table 1 reverse of brochure).

### Anode for Offshore Assets

Deepwater Gaus specializes in delivering all of the basic anode types with core configurations to suit a wide range of offshore and marine applications. For standard sizes and specifications, please visit stoprust.com. For custom anodes, please provide us with a drawing and detailed chemical composition specifications. Because we manufacture our own molds we are able to offer competitive prices on custom anode shapes. Our in-house pipe bender can handle pipe up to 4" schedule 80.

The Deepwater Gaus foundry produces all anodes used by Deepwater for both new construction and for our range of proprietary retrofit systems, including RetroPod™, RetroSled™, RetroLink™, and Smart-Mat™.

Basic anode types include: Platform Anodes (1), Pier and Piling Anodes (2), Hull-bolted Anodes (3), Hull-welded Anodes (4), Welded Pipeline Bracelet Anodes (5), Tapered Pipeline Bracelet Anodes (6), Bolted Pipeline Bracelet Anodes (7), Custom Aluminum Anodes (8).

