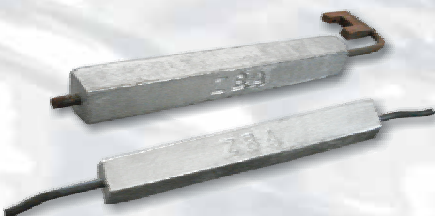




VASSILIOS ZYMARIS



Marine Sacrificial Anodes



COMPANY PROFILE

ZBA-Cathodic Protection Services- specialises in the design and manufacture of sacrificial anodes (Zinc, Aluminium Magnesium) for shipping , offshore, and industrial applications. The company has one of the largest sacrificial anode foundries in the Mediterranean area. Our facilities are equipped with 3 Gaz induction furnaces with a total capacity to produce 8 Tons of Zinc and 4 Tons of Aluminium per day. We are also have our own fully equipped tool room where all molds for the casting are made. ZBA has designed, manufactured & supplied in excess of 10.000 Tons of sacrificial Zinc & Aluminium Alloy anodes for various applications in Marine & Offshore Sectors.

QUALITY ASSURANCE

To ensure the production of uniformly high quality products, ZBA is certified to the requirements of ISO 9001 by BV Quality Assurance.

The ZBA Management System covers every stage of the production process-from design,to manufacture,right through to delivery.The key objective of the ZBA management system is to continually improve.This is achived by reviewing and refining all processes critical to producing high quality products.

LABORATORY SERVICES

Our own in house quality program and laboratory facilities guarantees top quality products.

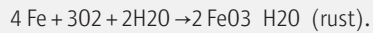
To ensure anode purity all raw materials undergo thorough inspection and every alloy batch is spectrografically tested prior to anode casting.Anodes can only be cast if the spectrographic analysis is within specification.On request ZBA can provide certificate of Chemical Analysis.

Customer may also arrange inspections by recognized quality assurance agencies such as BV,DNV,ABS.

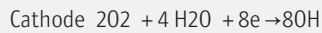
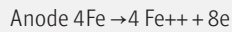


MARINE CORROSION AND CATHODIC PROTECTION

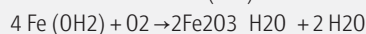
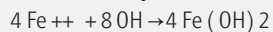
Today much of our infrastructure built upon steel components is seriously threatened by a destructive and persistent enemy: Corrosion. This undesirable process is initiated by the formation of corrosion cell which has three essential components: an anode and a cathode coupled in an electrically conductive solution (electrolyte). The corrosion of bare steel occurs by an electrolytic mechanism requiring the presence of water and oxygen. The overall reaction may be expressed as:



This is the result of two separate reactions, one taking place at anodic areas and producing electrons, another at cathodic areas and consuming electrons.



The ferrous and hydroxyl ions produced by these reactions then react to form ferrous hydroxide, which in the presence of oxygen is oxidized to hydrated ferric oxide, or rust.



Accordingly in the rusting of iron there is a flow of electrons in the metal from the anodic to the cathodic areas and a corresponding corrosion current in the electrolyte carried by the movement of ions in solution. It has been demonstrated that the amount of current that is flowing is equivalent to the amount of metal corroded, in accordance with Faraday's law. Corrosion always develops at the anode where current leaves the metal and enters the electrolyte, whilst a protective effect occurs at the cathode. Thus if the whole metal made sufficiently cathodic, corrosion will not occur.

This is the basic principle of cathodic protection – the practice of using electrochemical reactions to prevent the corrosion of steel structures. The essential factor in cathodic protection is to ensure that the unwanted anodic reactions are suppressed by the application of an opposing current.

This opposing current can be achieved by either of two techniques:

1. Sacrificial Anodes – By corroding away a more reactive metal.

Anodes based on alloys of Zinc, Aluminum and occasionally Magnesium are attached to the structure and corrode in preference to the protected metal. Consequently these anodes require renewal at routine intervals.

2. Impressed Current – A protective current is impressed on the structure through semi-inert anodes.

ZINC ANODE COMPOSITION

ASTM-B-418 TYPE I A-18001 J

Fe 0.005% Max.

Pb 0.006% Max.

Cu 0.005% Max.

Al 0.1 - 0.5%

Cd 0.025 - 0.07%

Zn Remainder

ELECTROCHEMICAL PROPERTIES

Electromechanical capacity : 780 Ampere hours per kg

Solution Potential : -1.05 volts against Ag / AgCl

Current Efficiency : 95 per cent of theoretical pure zinc

ALUMINIUM ANODE COMPOSITION

MIL-A-24779 (SH)

Zn 4.0 - 6.50%

In 0.01 - 0.03%

Si 0.15% Max

Cu 0.006% Max.

Fe 0.12% Max.

Ti 0.04% Max

Aluminum Remainder

ELECTROCHEMICAL PROPERTIES

Electromechanical capacity : 2680 Ampere hours per kg

Solution Potential : -1.10 volts against Ag / AgCl

Current Efficiency : 90 per cent of theoretical pure AL.

- Anodes in this series contain a single , cast in steel mounting strap.
- Hull anodes can be welded or bolted by specially made holes on straps.

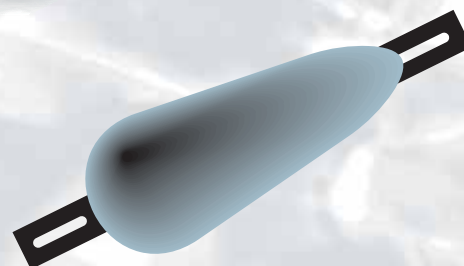
ZINC ALLOY CAST - BOLT ON / WELD ON

PRODUCT CODE	ANODE DIMENSIONS			STRAP DIMENSIONS			HOLE L x w mm	HOLE CENTRE mm	APPROX. WEIGHT KG
	LENGTH mm	WIDTH mm	THICKNESS mm	L mm	W mm	T mm			
Z-05 B	110	35	20	205	16	4	30 x 7	155	0.50
Z-10 B	110	70	30	205	25	4	30 x 7	155	1.00
Z-20 B	190	65	25	290	25	6	40 x 13	220	2.00
Z-20 B A	150	80	40	270	30	4	20 x 10	200	2.00
Z-25 B	150	100	35	290	25	6	40 x 13	220	2.50
Z-30 B	150	100	40	290	25	6	40 x 13	220	3.00
Z-35 B	210	95	30	335	25	6	40 x 13	270	3.50
Z-50 B	290	90	40	455	35	6	60 x 12	365	5.00
Z-70 B	290	120	30	455	35	6	60 x 12	365	7.00
Z-80 B	290	120	30	460	50	6	60 x 12	405	8.00
Z-100 B	330	140	30	505	50	6	60 x 12	405	10.0
Z-100 B	270	150	40	460	50	6	60 x 12	-	10.0
Z-110 B	380	145	40	570	50	6	60 x 12	470	11.0
Z-130 B	580	110	35	750	50	6	60 x 12	600	13.0
Z-160 B	580	110	40	750	50	6	60 x 12	600	16.0
Z-200	770	115	40	1000	50	6	-	-	20.0
Z-240	770	115	45	1000	50	6	-	-	24.0
Z-280	900	125	55	1100	50	6	-	-	28.0
Z-300	900	125	60	1100	50	6	-	-	30.0



ALUMINIUM ALLOY CAST- BOLT ON / WELD ON

PRODUCT CODE	ANODE DIMENSIONS			STRAP DIMENSIONS			HOLE L x w mm	HOLE CENTRE mm	APPROX. WEIGHT KG
	LENGTH mm	WIDTH mm	THICKNESS mm	L mm	W mm	T mm			
AL-05 B	110	70	30	205	25	4	30 x 7	155	0.500
AL-10 B	190	65	25	290	25	6	40 x 13	220	1.00
AL-15 B	150	100	40	290	25	6	40 x 13	220	1.50
AL-20 B	210	95	30	335	25	6	40 x 13	270	2.00
AL-30 B	290	90	40	455	35	6	60 x 12	365	3.00
AL-40 B	290	120	30	460	50	6	60 x 12	405	4.00
AL-50 B	330	140	30	505	50	6	60 x 12	405	5.00
AL-50 B A	270	150	40	460	50	6	60 x 12	-	5.00
AL-60 B	380	145	40	570	50	6	60 x 12	470	6.0
AL-80 B	580	110	40	750	50	6	60 x 12	600	8.0
AL-100	500	130	50	720	50	6	-	-	10
AL-120	770	115	45	1000	50	6	-	-	12
AL-150	700	130	65	1000	50	6	-	-	15
AL-180	900	125	55	1100	50	6	-	-	18
AL-200	900	125	60	1100	50	6	-	-	20



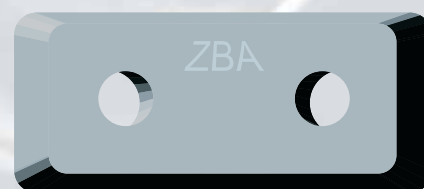
ZINC CAST PLATE - BOLT ON

PRODUCT CODE	ANODE LENGTH mm	ANODE WIDTH mm	ANODE THICKNESS mm	HOLE L x W mm	HOLE CENTRES mm	GROOVE x DEPTH mm	APPROX. WEIGHT KG
ZCP-75 B	150	75	20	21 x 17	75	30 x 18	1.2
ZCP-110 B 2	200	100	20	21 x 17	110	40 x 20	2.4
ZCP-110 B 3	200	100	30	21 x 17	110	40 x 28	3.4
ZCP-160 B 2	300	150	20	50 x 17	160	50 x 15	5.6
ZCP-160 B 3	300	150	30	50 x 17	160	50 x 25	8.5
ZCP-160 B 4	300	150	40	50 x 17	160	50 x 35	12.2
ZCP-160 B 5	300	150	50	50 x 17	160	50 x 45	16
ZCP-160 B 6	300	200	50	50 x 17	160	50 x 45	20.4



ALUMINIUM CAST PLATE - BOLT ON

PRODUCT CODE	ANODE LENGTH mm	ANODE WIDTH mm	ANODE THICKNESS mm	HOLE L x W mm	HOLE CENTRES mm	GROOVE x DEPTH mm	APPROX. WEIGHT KG
ACP-75 B	150	75	20	21 x 17	75	30 x 18	0.5
ACP-110 B 2	200	100	20	21 x 17	110	40 x 18	1.0
ACP-110 B 3	200	100	30	21 x 17	110	40 x 28	1.5
ACP-160 B 3	300	150	30	50 x 17	160	50 x 25	3.1
ACP-160 B 4	300	150	40	50 x 17	160	50 x 35	4.5
ACP-160 B 5	300	150	50	50 x 17	160	50 x 45	6.2
ACP-160 B 6	300	200	50	50 x 17	160	50 x 45	8.5
ACP-180 B	380	170	50	50 x 17	180	50 x 45	9.1
ACP-260 B	540	200	40	50 x 17	260	50 x 35	12
ACP-300 B	540	130	50	50 x 17	300	50 x 45	10
ACP-340 B	540	200	50	50 x 17	340	50 x 45	15.3



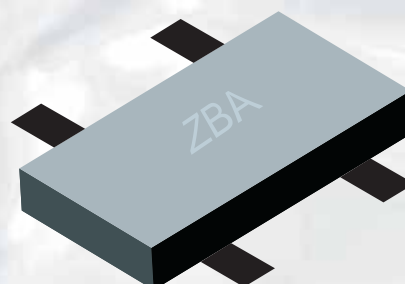
ZINC ALLOY CAST - MILITARY ANODES

-These anodes contain two cast-in galvanized steel mounting straps or two cast-in cored holes on 150 mm centres.

PRODUCT CODE	ANODE DIMENSIONS			STRAP DIMENSIONS			APPROX. WEIGHT KG
	LENGTH mm	WIDTH mm	THICKNESS mm	L mm	W mm	T mm	
Z-100 M	300	150	30	290	25	6	10.0
Z-120 M	300	150	35	290	25	6	12.0

ALUMINIUM ALLOY CAST - MILITARY ANODES

PRODUCT CODE	ANODE DIMENSIONS			STRAP DIMENSIONS			APPROX. WEIGHT KG
	LENGTH mm	WIDTH mm	THICKNESS mm	L mm	W mm	T mm	
AL-35 M	300	150	30	290	25	6	3.5
AL-42 M	300	150	35	290	25	6	4.2



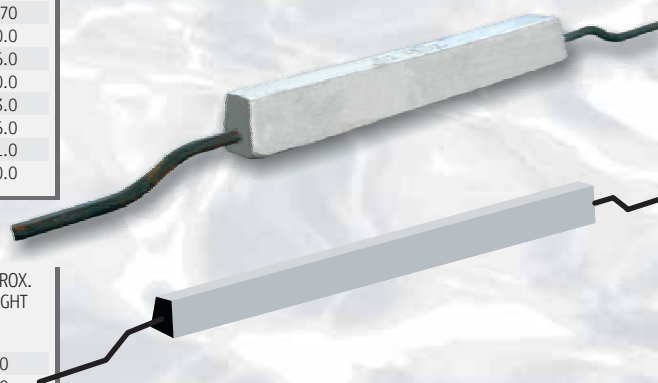
-These anodes are recommended for the protection of ballast tanks in bulk carriers, cargo vessels and bottom protection in tankers.

STRAIGHT CORE ARRANGEMENT

-Anodes contain a straight steel core rod for clamping / bolting to a ballast tank structure with "U" bolts or clamps.

ZINC ALLOY

PRODUCT CODE	ANODE DIMENSIONS			CORE DIMENSIONS		APPROX. WEIGHT KG
	LENGTH mm	WIDTH mm	THICKNESS mm	Lc mm	DIA mm	
ZT-67	250	60	50	700	12	6.70
ZT-100	500	60	45	1000	12	10.0
ZT-160	750	60	45	1250	12	16.0
ZT-200	1000	60	45	1500	12	20.0
ZT-230	1000	60	50	1500	12	23.0
ZT-260	1250	60	45	1750	12	26.0
ZT-310	1250	60	55	1750	12	31.0
ZT-400	1250	60	70	1750	12	40.0



ALUMINIUM ALLOY

PRODUCT CODE	ANODE DIMENSIONS			CORE DIMENSIONS		APPROX. WEIGHT KG
	LENGTH mm	WIDTH mm	THICKNESS mm	Lc mm	DIA mm	
AT-50	500	60	45	1000	12	5.0
AT-80	750	60	55	1250	12	8.0
AT-100	1000	60	50	1500	12	10.0
AT-130	1000	60	70	1500	12	13.0
AT-160	1250	60	70	1750	12	16.0

As an option steel core rod can be double cranked for direct welding to structure.

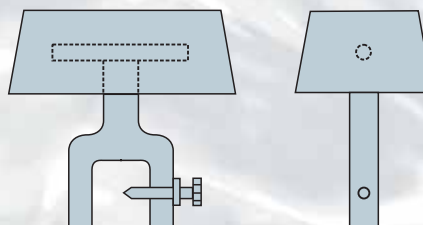
ZINC ALLOY-PITGUARD ANODES

PRODUCT CODE	ANODE DIMENSIONS			APPROX. WEIGHT *
	LENGTH mm	WIDTH mm	THICKNESS mm	
ZTP-65	250	60	50	6.5
ZTP-100	500	60	45	10.0
ZTP-125	500	60	55	12.5
ZTP-160	750	60	45	16.0



ZINC ALLOY – INTEGRAL CENTRE CLAMP

PRODUCT CODE	ANODE DIMENSIONS			APPROX. WEIGHT *
	LENGTH mm	WIDTH mm	THICKNESS mm	
ZTC-65	250	60	50	6.5
ZTC-100	500	60	45	10.0



ALUMINIUM ALLOY-PITGUARD ANODES

PRODUCT CODE	ANODE DIMENSIONS			APPROX. WEIGHT *
	LENGTH mm	WIDTH mm	THICKNESS mm	
ATP-30	250	60	50	3.0
ATP-50	500	60	50	5.0
ATP-70	750	60	50	7.0

ALUMINIUM ALLOY – INTEGRAL CENTRE CLAMP

PRODUCT CODE	ANODE DIMENSIONS			APPROX. WEIGHT *
	LENGTH mm	WIDTH mm	THICKNESS mm	
ATC-30	250	60	50	3.0
ATC-50	500	60	45	5.0

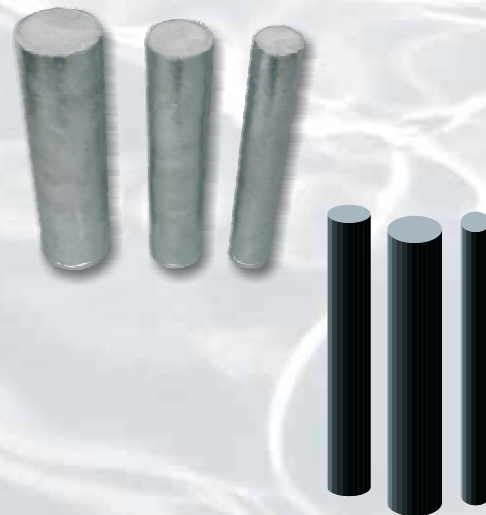
*Weights excluding clamp

ZINC ROD ANODES

- Cast rod anodes protect from corrosion and scaling in hot water applications, marine engines, pumps, heat exchanger
- Cast rod anodes from 30 mm to 200 mm diameter is nominal size with a rougher finish
- Cast rod anodes has maximum length 500 / 600 mm
- Also available 300 mm

PRODUCT CODE	ANODE DIAMETER (mm)	LENGTH (mm) B	APPROX. WEIGHT (KG)
ZR12-500	12	500	0.40
ZR16-500	16	500	0.72
ZR19-500	19	500	1.00
ZR22-500	22	500	1.50
ZR25-500	25	500	1.70
ZR30-600	30	600	3.00
ZR35-600	35	600	4.10
ZR40-600	40	600	5.40
ZR45-600	45	600	6.60
ZR50-600	50	600	8.50
ZR60-600	60	600	12.2
ZR65-600	65	600	14.7
ZR70-600	70	600	16.6
ZR75-550	75	550	17.0
ZR80-600	80	600	22.0
ZR90-600	90	600	27.5
ZR100-500	100	500	28.5

PRODUCT	ANODE DIAMETER (mm)	LENGTH (mm) B	APPROX. WEIGHT (KG)
ZR30- 300	30	300	1.52
ZR35- 300	35	300	1.96
ZR40- 300	40	300	2.70
ZR45- 300	45	300	3.30
ZR50- 300	50	300	4.25
ZR60- 300	60	300	6.12
ZR65- 300	65	300	7.30
ZR70- 300	70	300	8.30
ZR75- 300	75	300	9.70
ZR80- 300	80	300	10.9
ZR90- 300	90	300	13.8
ZR100-300	100	300	17.0
ZR110- 300	110	300	20.5
ZR120- 300	120	300	24.5
ZR150- 300	150	300	38.2
ZR160- 300	160	300	43.5
ZR170- 300	170	300	49.0
ZR185- 300	185	300	57.5
ZR200- 300	200	300	68.0



-Different dimensions (diameter x length) are also available upon request.

Heat Exchanger & Condenser Anodes

- Heat Exchanger Anodes of different styles.
- Square ,Circular
- Solid / Drilled.
- Specify your desired Thickness / Hole / Thread

STYLE SQUARE

PRODUCT CODE	ANODE LENGTH mm	ANODE WIDTH mm	ANODE THICKNESS mm	APPROX. WEIGHT KG
ZP-1005020	100	50	20	0.750
ZP-10010020	100	100	20	1.440
ZP-1507025	150	70	25	1.900
ZP-15015020	150	150	20	3.240
ZP-20010020	200	100	20	2.900
ZP-20020025	200	200	25	7.200
ZP-25025020	250	250	20	9.000
ZP-2507040	250	70	40	5.100
ZP-30015020	300	150	20	6.400
ZP-30015025	300	150	25	8.100
ZP-10005020	1000	50	20	6.800
ZP-10006025	1000	60	25	10.200
ZP-10007025	1000	70	25	11.900
ZP-8004025	800	40	25	5.440

-Different dimensions (length x width x thickness) are also available upon request

HEAT EXCHANGER - STYLE CIRCULAR

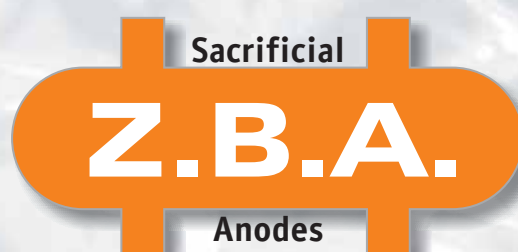
PRODUCT CODE	ANODE DIAMETER	THICKNESS	HOLE	THREAD
ZD-30	30	20	UPON	REQUEST
ZD-40	40	20	<<	<<
ZD-50	50	20	<<	<<
ZD-60	60	20	<<	<<
ZD-70	70	20	<<	<<
ZD-80	80	20	<<	<<
ZD-90	90	20	<<	<<
ZD-100	100	20	<<	<<
ZD-110	110	25	<<	<<
ZD-120	120	25	<<	<<
ZD-130	130	25	<<	<<
ZD-140	140	25	<<	<<
ZD-150	150	25	<<	<<
ZD0160	160	30	<<	<<
ZD-170	170	30	<<	<<
ZD-180	180	30	<<	<<
ZD-190	190	30	<<	<<
ZD-200	200	30	<<	<<
ZD-210	210	30	<<	<<
ZD-220	220	30	<<	<<
ZD-230	230	30	<<	<<
ZD-240	240	30	<<	<<
ZD-250	250	30	<<	<<
ZD-300	300	30	<<	<<



-Different dimensions (diameter x length) are also available upon request.



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