

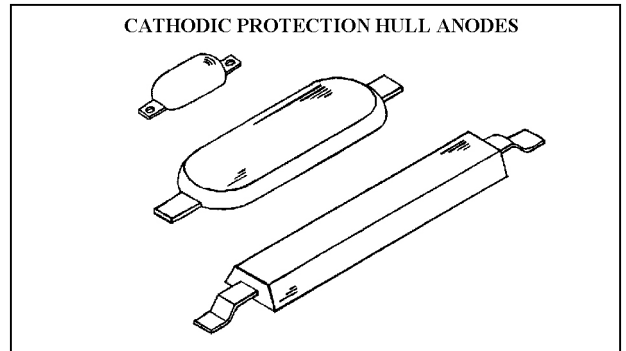
SHIPS' CATHODIC PROTECTION SYSTEM ZINC & ALUMINIUM HULL & TANK ANODES

Corrosion causes frictional drag on the ship's hull which in turn leads to higher operating cost. A high quality coating provides a smooth hull and together with a well-engineered cathodic protection system, helps to ensure that the surface is maintained in good condition.

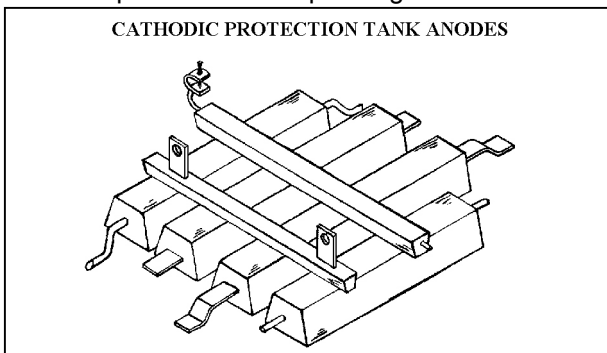
Sacrificial anode systems are commonly used for external hull cathodic protection as they are virtually maintenance free.

Anodes for the external hull are designed to protect local areas and are evenly spread to ensure a good distribution of current.

Anodes located in the stern area are normally spaced closer together because turbulence in this area increases oxygen content in the water making it more corrosive and hence a higher current density is required to provide cathodic protection.



Cathodic protection of ships' cargo and ballast tanks is effected using sacrificial anodes. Zinc and/or aluminium anodes are used and the material selection depends on the compatibility of the alloy with the service of the tank.



Aluminium anodes are acceptable in cargo/ballast tanks provided they are not located at a height (in metres) greater than $'27/W'$ where W is the total mass of anode and core (in kg).

Zinc presents no spark hazard and thus zinc anodes are commonly used throughout. Magnesium anodes present a spark hazard and are not allowed, except as ribbon for de-scaling.

SUNWARM aluminium anodes as well as zinc anodes conforming to US Military Specification 18001K.

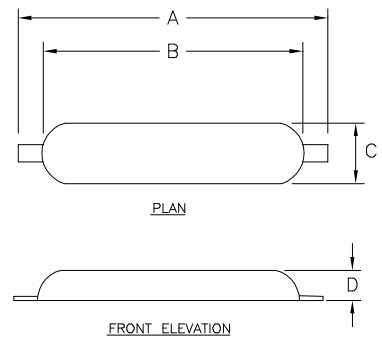


CHEMICAL COMPOSITION (%)	ALUMINIUM	ZINC US MIL SPECS 18001K
Iron (Fe)	0.13 max	0.005 max
Silicon (Si)	0.20 max	–
Copper (Cu)	0.006 max	0.005 max
Cadmium (Cd)	–	0.025 - 0.070
Indium (In)	0.01 - 0.02	–
Lead (Pb)	–	0.006 max
Aluminium (Al)	Remainder	0.10 - 0.50
Zinc (Zn)	2.00 - 6.00	Remainder
Others	0.02 max (each)	0.10 max (total)

MARINE ANODES

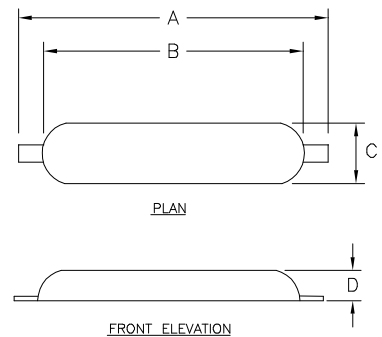
Aluminium Hull Anodes

Type	A	B	C	D	Gross Wt
W131	340	200	95	30	1.4
W130	350	270	150	30	3.2
W111	530	395	150	30	5.2
W114	650	550	127	50	9.8
W117	650	550	130	65	11.6
W119	650	550	130	75	14.1
W118	650	550	130	96	18.0
W124	1015	915	130	50	16.0
W126	1015	915	130	75	24.0
W128	1015	920	130	104	33.0



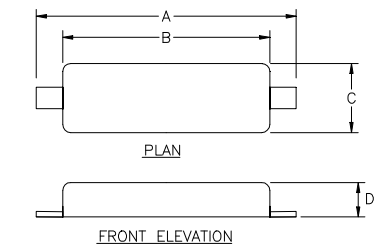
Zinc Hull Anodes

Type	A	B	C	D	Gross Wt
Z41	425	305	75	38	4.5
Z50	425	305	75	40	5.0
Z64	425	305	90	45	6.8
Z81	425	305	152	32	8.5
Z93	425	305	152	35	9.7
Z100	425	305	152	38	10.0
Z140	625	456	102	53	15.0



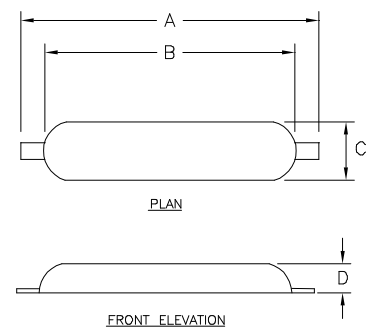
Zinc Hull Anodes

Type	A	B	C	D	Gross Wt
Z170	750	585	134	37	18.3
Z250	750	585	142	53	26.3
Z350	750	585	149	69	36.3



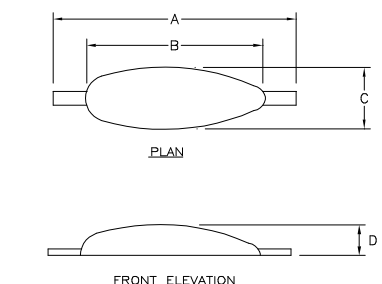
Zinc Hull Anodes

Type	A	B	C	D	Gross Wt
W6Z	370	270	150	32	7.1
W11Z	530	400	150	32	12.0
W14Z	650	550	130	50	22.5
W17Z	650	550	130	65	27.0
W19Z	650	550	130	75	34.7
W18Z	650	550	130	96	44.9
W24Z	1015	915	130	50	36.5



Zinc Hull Anodes

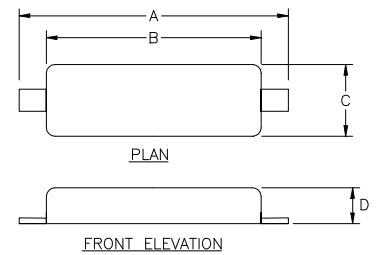
Type	A	B	C	D	Gross Wt
WP2	300	220	75	38	2.6
WP5	370	290	100	50	5.0
W10Z	370	280	150	75	10.7



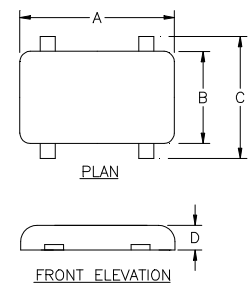
MARINE ANODES

Welded Hull Anode

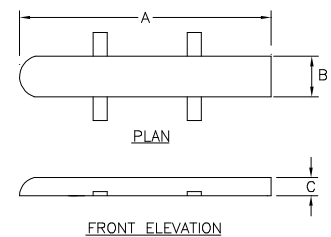
Type					Zinc	Aluminium
	A	B	C	D	Gross Wt	Gross Wt
S2	238	150	75	25	1.7	0.7
S3	350	200	100	20	3.0	1.4
S4	350	200	100	30	4.2	1.7
S4E	350	200	100	40	6.3	2.7



Type					Zinc	Aluminium
	A	B	C	D	Gross Wt	Gross Wt
S6	300	150	270	20	6.5	3.0
S8	300	150	270	25	8.0	3.5
S9	300	150	270	30	9.5	4.1
S9E	300	150	270	40	12.0	5.0
S9F	300	150	270	50	14.6	6.0

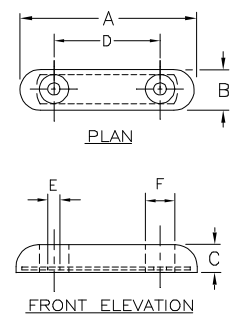


Type				Zinc	Aluminium
	A	B	C	Gross Wt	Gross Wt
S18	800	75	50	19.0	7.5



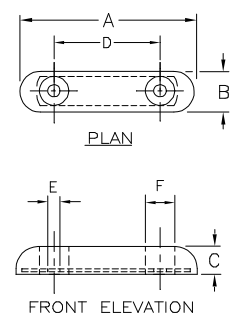
Aluminium Bolted Hull Anodes

Type	A	B	C	D	E ø	F ø	Gross Wt
A36B	305	76	36	205	19	50	1.9
A45B	305	80	38	205	17	50	2.0
A84B	300	150	30	200	18	32	3.6
A114B	456	102	53	230	23	60	5.0
RF80	540	130	53	340	26	60	8.0
MF93	400	150	60	180	26	60	9.3
RF96	540	140	64	340	26	60	9.6
RF118	460	200	64	260	26	60	11.8
RF155	540	200	65	340	26	60	15.4



Zinc Bolted Hull Anodes

Type	A	B	C	D	E ø	F ø	Gross Wt
Z36B	305	76	36	205	19	50	4.1
Z45B	305	80	38	205	17	50	4.5
Z84B	300	150	30	200	18	32	8.4
Z114B	456	102	53	230	23	60	12.1
20RB	540	130	53	340	26	60	19.7
24RB	540	140	64	340	26	60	23.7
23MB	400	150	60	180	26	60	23.0
30RB	460	200	64	260	26	60	30.8
40RB	540	200	65	340	26	60	40.0

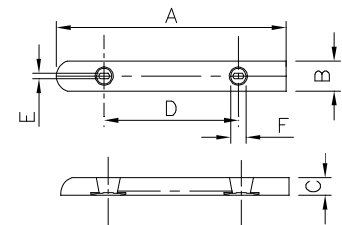
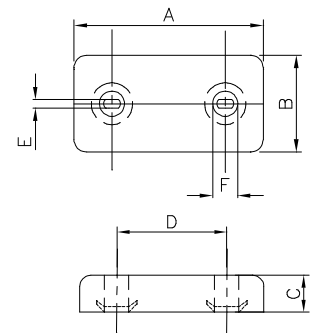


MARINE ANODES

Bolted Hull Anode

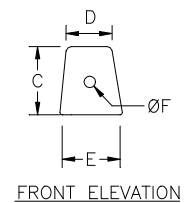
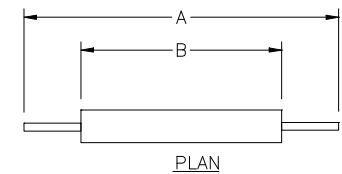
Type							Zinc	Aluminium
	A	B	C	D	E	F	Gross Wt	Gross Wt
B2	150	75	25	75	14	33	1.5	0.7
B3	200	100	20	110	14	38	2.5	1.1
B4	200	100	30	110	14	38	3.6	1.5
B4E	200	100	40	110	14	38	4.2	1.8
B6	300	150	20	160	26	50	5.9	2.7
B8	300	150	25	160	26	50	7.3	2.9
B9	300	150	30	160	26	50	8.3	3.3
B9E	300	150	40	160	26	50	11.0	4.6
B9F	300	150	50	160	26	50	13.8	5.5
B9G	300	150	75	160	26	50	22.0	8.0
B12	300	200	40	160	26	50	15.2	6.0
B12D	300	200	50	160	26	50	18.8	7.4
B12E	300	200	65	160	26	50	26.8	10.7

B18	800	75	50	400	26	50	15.8	6.3
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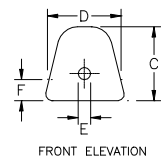
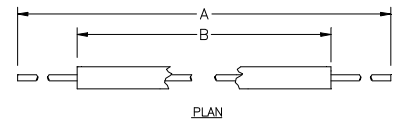
Aluminium Tank Anode

Type	A	B	C	D	E	FØ	Gross Wt
W110	1225	765	50	40	50	14	5.4
W151	1985	1525	75	50	65	14	19.3
W152	1730	1270	75	50	65	14	16.3
W153	1475	1015	75	50	65	14	13.1
W154	1225	765	75	50	65	14	10.0
W155	1070	610	75	50	65	14	8.1
W156	765	305	75	50	65	14	3.8
W191	1985	1525	95	75	85	14	32.9
W192	1720	1260	95	75	85	14	27.2
W193	1465	1005	95	75	85	14	21.7
W194	1210	750	95	75	85	14	16.3
W195	1060	600	95	75	85	14	13.2
W196	765	305	95	75	85	14	6.3



Zinc Tank Anode

Type	A	B	C	D	EØ	F	Gross Wt
WT25Z	1066	610	57	64	14	19	11.3
WT35Z	1066	610	69	77	14	23	15.9
WT45Z	1066	610	79	83	14	25	21.1
WT50Z	1676	1220	57	64	14	19	22.6
WT70Z	1676	1220	69	77	14	23	31.8
WT90Z	1676	1220	79	83	14	25	42.2
WT110Z	1676	1220	91	94	14	32	53.8



Pit-Guard Tank Anode

Type	Material	A	B	C	Nett Wt
AT 2235	Aluminium	200	70	76	2.3
AT 2235/1	Aluminium	400	70	76	4.7
AT 2235/2	Aluminium	356	70	76	4.2
AT 2237	Aluminium	395	76	63	4.5
ZT 2247	Zinc	332	70	76	10.0
ZT 2252	Zinc	342	76	63	10.0

