

Purpose

To list the elements required to make our main anode alloys

References

Australian Standard AS2239 (2003)

A1 (AS2239-2003)

Kg's 23.5	Ingots Each	Zinc Kg's	Indium Grams	Cadmium Grams
23.5	1	0.6	5.0	2.0
47.0	2	1.2	10.1	4.0
70.5	3	1.8	15.1	6.0
94.0	4	2.4	20.1	8.0
117.5	5	3.0	25.2	10.0
141.0	6	3.6	30.2	12.0
164.5	7	4.2	35.3	14.0
188.0	8	4.8	40.3	16.0
211.5	9	5.4	45.3	18.0
235.0	10	6.0	50.4	20.0
258.5	11	6.6	55.4	22.0
282.0	12	7.2	60.4	24.0
305.5	13	7.8	65.5	26.0
329.0	14	8.4	70.5	28.0
352.5	15	9.0	75.5	30.0
376.0	16	9.6	80.6	32.0
399.5	17	10.2	85.6	34.0
423.0	18	10.8	90.6	36.0
446.5	19	11.4	95.7	38.0
470.0	20	12.0	100.7	40.0
493.5	21	12.6	105.8	41.9
517.0	22	13.2	110.8	43.9
540.5	23	13.8	115.8	45.9
564.0	24	14.4	120.9	47.9
587.5	25	15.0	125.9	49.9
611.0	26	15.6	130.9	51.9

Trimming and/or Diluting A1

Erbo Furnace – 560 kg

Zinc: 600 grams will lower/raise 0.1%
Indium: 5.7 grams will lower/raise 0.001% (10ppm)
Cadmium: 5.6 grams will lower/raise 0.001% (10ppm)

Induction Furnace – 400 kg

Zinc: 400 grams will lower/raise 0.1%
Indium: 4 grams will lower/raise 0.001% (10ppm)
Cadmium: 4 grams will lower/raise 0.001% (10ppm)

Induction Furnace – 450 kg

Zinc: 470 grams will lower/raise 0.1%
Indium: 4.5 grams will lower/raise 0.001% (10ppm)
Cadmium: 4.5 grams will lower/raise 0.001% (10ppm)

Induction Furnace – 500 kg

Zinc: 520 grams will lower/raise 0.1%
Indium: 5 grams will lower/raise 0.001% (10ppm)
Cadmium: 5 grams will lower/raise 0.001% (10ppm)

Obtain additions for any specific back-charge – then adjust those additions using the information above to “trim up” or “dilute down” the entire furnace weight.

A2 (AS2239-2003)

Kg's 23.5	Ingots Each	Al/Ti Rod Grams	Zinc Kg's	Indium Grams	Mag Pugs Each
23.5	1	150	1.0	7.1	1
47.0	2	300	2.0	14.1	2
70.5	3	450	3.0	21.2	4
94.0	4	600	4.0	28.2	5
117.5	5	750	4.9	35.3	6
141.0	6	900	5.9	42.3	7
164.5	7	1050	6.9	49.4	9
188.0	8	1200	7.9	56.4	10
211.5	9	1350	8.9	63.5	11
235.0	10	1500	9.9	70.5	12
258.5	11	1650	10.9	77.6	14
282.0	12	1800	11.9	84.6	15
305.5	13	1950	12.9	91.7	16
329.0	14	2100	13.9	98.7	17
352.5	15	2250	14.8	105.8	19
376.0	16	2400	15.8	112.8	20
399.5	17	2550	16.8	119.9	21
423.0	18	2700	17.8	126.9	22
446.5	19	2850	18.8	134.0	24
470.0	20	3000	19.8	141.0	25
493.5	21	3150	20.8	172.7	26
517.0	22	3300	21.8	181.0	27
540.5	23	3450	22.8	189.2	28
564.0	24	3600	23.7	197.4	30
587.5	25	3750	24.7	205.6	31
611.0	26	3900	25.7	213.9	32

Procedure: Alloy Additions

A2 is best made in the Induction Furnace. From time to time it can/has been made in the Erbo Furnace.

Note the Aluminium-Titanium Master Alloy requires practice, for both Induction and Erbo Furnaces.

Initial (Start Up) Charge: Add the Al-Titanium Master Alloy straight after (into the liquid) the first pack of ingots has melted.

When “Back-charging” add the Al-Titanium Master Alloy straight after tapping (or bale out casting) before any of the Aluminium ingots.

Calculated additions should land you “about 0.032% Titanium”. Each Rod of TiBor 5:1 (10mm dia x 500mm long) weights 100grams, 1.5 rods per ingot will maintain 0.032% Ti.

Induction Furnace – Zinc, Indium and Magnesium Additions

Add Zinc and Indium as normally done, when the entire charge is melted.

Allow some freeboard for the Magnesium addition! It will add substantial volume. (This is done by reducing the initial charge weight) 1-2 Ingots. Add the Magnesium to the furnace LAST, according to standard practice.

Pugs have been calculated using 300 gram size. Addition is aimed at 1.5% Magnesium.

Erbo Furnace – Zinc, Indium and Magnesium Additions

Leave 2 or 3 ingots out of the initial Charge or Back Charge. These will be used to counteract the superheat- over-run.

Add the Zinc and Indium, then add the Magnesium. The Magnesium will need to be manually “rabbled” in.

Pugs have been calculated using 300 gram size. Addition is aimed at 1.5% Magnesium.

Zinc is calculated to aim at 4.0%. Indium is calculated to aim at 0.030 – 0.035%.

Issued by: BL	Last reviewed: 23SEP25	NOTE: This document is no longer current once it is printed. The version on the server is the most current version.	Page 4
---------------	------------------------	--	--------

A6 (AS2239-2003)

Kg's 23.5	Ingots Each	Zinc Kg's	Indium Grams	Silicon Grams
23.5	1	1.0	3.6	140
47.0	2	2.0	7.2	280
70.5	3	3.0	10.8	420
94.0	4	4.0	14.4	560
117.5	5	5.0	18.0	700
141.0	6	6.0	21.6	840
164.5	7	7.0	25.2	980
188.0	8	8.0	28.8	1120
211.5	9	9.0	32.4	1260
235.0	10	10.0	36.0	1400
258.5	11	11.0	39.6	1540
282.0	12	12.0	43.2	1680
305.5	13	13.0	46.8	1820
329.0	14	14.0	50.4	1960
352.5	15	15.0	54.0	2100
376.0	16	16.0	57.6	2240
399.5	17	17.0	61.1	2380
423.0	18	18.0	64.7	2520
446.5	19	19.0	68.3	2660
470.0	20	20.0	71.9	2800
493.5	21	21.0	75.5	2940
517.0	22	22.0	79.1	3080
540.5	23	23.0	82.7	3220
564.0	24	24.0	86.3	3360
587.5	25	25.0	89.9	3500
611.0	26	26.0	93.5	3640

Trimming and/or Diluting A6

Erbo Furnace – 560 kg

Zinc: 600 grams will lower/raise 0.1%
Indium: 5.7 grams will lower/raise 0.001% (10ppm)
Cadmium: 3 stripes will lower/raise 0.01%

Induction Furnace – 400 kg

Zinc: 400 grams will lower/raise 0.1%
Indium: 4 grams will lower/raise 0.001% (10ppm)
Cadmium: 2+ stripes will lower/raise 0.01%

Induction Furnace – 450 kg

Zinc: 470 grams will lower/raise 0.1%
Indium: 4.5 grams will lower/raise 0.001% (10ppm)
Cadmium: 2+ stripes will lower/raise 0.01%

Induction Furnace – 500 kg

Zinc: 520 grams will lower/raise 0.1%
Indium: 5 grams will lower/raise 0.001% (10ppm)
Cadmium: 3 stripes will lower/raise 0.01%

Obtain additions for any specific back-charge – then adjust those additions using the information above to “trim up” or “dilute down” the entire furnace weight.

Making Z1 Master Alloy (AS2239-2003)

The Z1 Master Alloy composition is 17.5% Aluminium, 2.9% Cadmium and 79.6% Zinc.

The Master Alloy is added to SHG Zinc ingot to make Z1 Zinc anodes.

Use the “Blue” Gas Fired Aluminium Bale Out Furnace. Use the “Zinc Base Crucible” for that furnace. This is a Zinc base (Master Alloy), but the Aluminium must be melted first.

1. Charge **2 + ½ Ingots of PO 610 Aluminium ingot** = 58 to 60kg Aluminium. They are to be melted down to obtain an “Aluminium Bath”.
2. **Add 10 Slabs of SHG Zinc ingot to the liquid Aluminium.** Add a few at a time.
3. It takes some time for the two liquids to “pair up” at this concentration. Once you are satisfied that the Zn/Al is melted and stirred – and in solution **add 10kg of Cadmium.** Use adequate stirring to “homogenise” the melt. Avoid removing dross as this is Aluminium, “still reducing into the Zinc”.
4. Cast using the slug conveyor, filling each cavity to the top.
5. Separate each batch of master alloy into clean drums and clearly label with casting date. The first melt of Z1 using a new batch of mater alloy must be immediately checked using the OES to ensure correct chemistry.

Making Z1 Alloy Using SHG Zinc Ingot + Z1 Master Alloy

Melt SHG Zinc ingot in either the Zinc Bale Out 1 or Zinc Bale Out 2 furnaces, and add 1 master alloy slug per SHG ingot. If a predetermined quantity of SHG is to be melted, add the master alloy as early as possible to aid in melting and homogeneity. Check the weight of the master alloy addition against the table below to ensure no under/overweight slugs.

Ingots	Ingot Weight (Kg)	Master Alloy Minimum Weight (g)	Master Alloy Target Weight (g)	Master Alloy Maximum Weight (g)
1	25	362	402	442
2	50	724	804	884
3	75	1085	1206	1327
4	100	1447	1608	1769
5	125	1809	2010	2211
6	150	2171	2412	2653
7	175	2533	2814	3095
8	200	2894	3216	3538
9	225	3256	3618	3980
10	250	3618	4020	4422
11	275	3980	4422	4864
12	300	4342	4824	5306
13	325	4703	5226	5749
14	350	5065	5628	6191
15	375	5427	6030	6633
16	400	5789	6432	7075
17	425	6151	6834	7517
18	450	6512	7236	7960
19	475	6874	7638	8402
20	500	7236	8040	8844

Note: Laminated Copy located in Lab

END OF DOCUMENT