

INDIUM CORPORATION OF AMERICA, EUROPE and ASIA

www.indium.com askus@indium.com **1-800-4-INDIUM**

INDALLOY SPECIALTY ALLOYS

Typical in-house specifications for alloy percent unless otherwise specified by customer:

- Elements <1% (as dopants not as impurities) ±50% off of nominal value
- Elements 1% to <2%: ±0.25% off of nominal value
- Elements 2% to <10%: ±0.5% off of nominal value
- Elements >10%: ±1.0% off of nominal value (Bismuth containing alloys, major constituent ±1.5%)

MECHANICAL PROPERTIES

Indalloy Number	TEMP (Temperature critical alloy: ±2°C of solidus. Non-temperature critical alloy ±3°C)		Elemental Composition (% by Mass)							TEMP		Density	Electrical Conductivity (1.72μohms-cm)	Thermal Conductivity @ 85°C	Thermal Coefficient Expansion @ 20°C	Tensile Strength	Shear Strength	Young's Modulus	Elongation	Brinell Hardness	Latent Heat of Fusion	Specific Heat SOLID	LIQUID				
	Liquidus	Solidus								Liquidus	Solidus																
	°C	°C								°F	°F																
46L	8	7	61.0 Ga	25.0 In	13.0 Sn	1.0 Zn						46	44	0.2348	6.50												
51	11 E	11	62.5 Ga	21.5 In	16.0 Sn						51	51	0.2348	6.50													
60	16 E	16	75.5 Ga	24.5 In						60	60	0.2294	6.35														
77	25	16	95.0 Ga	5.0 In						77	60	0.2222	6.15														
14	30 MP		100.0 Ga						86		0.2133	5.90															
15	43	38	42.9 Bi	21.7 Pb	18.3 In	8.0 Sn	5.1 Cd	4.0 Hg						109	100	0.3353	9.28										
117	47 E	47	44.7 Bi	22.6 Pb	19.1 In	8.3 Sn	5.3 Cd						117	117	0.3310	9.16	4.5	.15	25	5400		37.5 note 4	16.5 note1	36.8	0.163	0.197	
16	52	47	44.7 Bi	22.6 Pb	16.1 In	11.3 Sn	5.3 Cd						126	117	0.3310	9.16											
17	56	54	49.1 Bi	20.9 In	17.9 Pb	11.6 Sn	0.5 Cd						133	129	0.3255	9.01											
136	58 E	58	49.0 Bi	21.0 In	18.0 Pb	12.0 Sn						136	136	0.3255	9.01	2.43	.10	23	6300		20 note 4	16.5 note1	28.9	0.167	0.201		
19	60 E	60	51.0 In	32.5 Bi	16.5 Sn						140	140	0.2847	7.88	3.3		22	4850		11							
18	62 E	62	61.7 In	30.8 Bi	7.5 Cd						143	143	0.2898	8.02													
140	65	57	47.5 Bi	25.4 Pb	12.6 Sn	9.5 Cd	5.0 In						149	135	0.3422	9.47	3.5	.15		3725		77.5 note 4	14 note 1	36	0.159	0.188	
147	65	61	48.0 Bi	25.6 Pb	12.8 Sn	9.6 Cd	4.0 In						149	142	0.3432	9.50											
21	69	58	49.0 Bi	18.0 Pb	18.0 In	15.0 Sn						156	136	0.3252	9.00												
158	70 E	70	50.0 Bi	26.7 Pb	13.3 Sn	10.0 Cd						158	158	0.3461	9.58	4	.18	22	5990	300	120 note 4	14.5 note 1	39.8	0.146	0.184		
162	72 E	72	66.3 In	33.7 Bi						162	162	0.2887	7.99														
22	73	70	50.5 Bi	27.8 Pb	12.4 Sn	9.3 Cd						163	158	0.3494	9.67												
23	73	70	50.0 Bi	25.0 Pb	12.5 Sn	12.5 Cd						163	158	0.3468	9.60	3.1			4550		30	25					
24	73	70	50.0 Bi	25.0 Pb	12.5 Sn	12.5 Cd	Dopant: 0.05 Ag					163	158	0.3465	9.59												
25	78 E	78	48.5 Bi	41.5 In	10.0 Cd						172	172	0.3067	8.49													
26	78	70	50.0 Bi	34.5 Pb	9.3 Sn	6.2 Cd						172	158	0.3573	9.89												
174	79 E	79	57.0 Bi	26.0 In	17.0 Sn						174	174	0.3086	8.54													
27	81 E	81	54.0 Bi	29.7 In	16.3 Sn						178	178	0.3060	8.47													
28	82	77	50.0 Bi	39.0 Pb	8.0 Cd	3.0 Sn						180	171	0.3660	10.13												
29	85	81	50.3 Bi	39.2 Pb	8.0 Cd	1.5 In	1.0 Sn						185	178	0.3667	10.15											
160-190	88	71	42.5 Bi	37.7 Pb	11.3 Sn	8.5 Cd						190	160	0.3544	9.81	4.3			5400	300	135 note 4	15 note 1	34.3	0.146			
31	89	80	50.3 Bi	39.2 Pb	8.0 Cd	1.5 Sn	1.0 In						192	176	0.3667	10.15											
32	89	80	50.9 Bi	31.1 Pb	15.0 Sn	2.0 In	1.0 Cd						192	176	0.3479	9.63											
33	91	87	51.1 Bi	39.8 Pb	8.1 Cd	1.0 In						196	189	0.3689	10.21												
34	92	83	52.0 Bi	31.7 Pb	15.3 Sn	1.0 Cd						198	181	0.3505	9.70												
197	92 E	92	51.6 Bi	40.2 Pb	8.2 Cd						198	198	0.3703	10.25													
35	93	73	50.0 Bi	39.0 Pb	7.0 Cd	4.0 Sn						199	163	0.3653	10.11												
36	93	87	51.4 Bi	31.4 Pb	15.2 Sn	2.0 In						199	189	0.3483	9.64												
8	93 E	93	44.0 In	42.0 Sn	14.0 Cd						199	199	0.2695	7.46		.36	24	2632			4.8 note 2						
37	94	90	52.0 Bi	31.7 Pb	15.3 Sn	1.0 In						201	194	0.3505	9.70												
38	95 E	95	52.5 Bi	32.0 Pb	15.5 Sn						203	203	0.3508	9.71													
257	96	95	52.0 Bi	32.0 Pb	16.0 Sn						204	203	0.3501	9.69													
39	96 E	96	52.0 Bi	30.0 Pb	18.0 Sn						205	205	0.3468	9.60	2.3	.13	24	5060	3800	2.08	148.6	15.5 note 1	34.7	0.151	0.167		
42	96 E	96	46.0 Bi	34.0 Sn	20.0 Pb						205	205	0.3248	8.99													
40	99	93	50.0 Bi	31.0 Pb	19.0 Sn						210	199	0.3461	9.58													
41	100 E	100	50.0 Bi	28.0 Pb	22.0 Sn						212	212	0.3411	9.44													
43	102	70	40.5 Bi	27.8 Pb	22.4 Sn	9.3 Cd						216	158	0.3367	9.32												
45	103	102	54.0 Bi	26.0 Sn	20.0 Cd						217	216	0.3172	8.78													
46	104	95	56.0 Bi	22.0 Pb	22.0 Sn						219	203	0.3385	9.37													
57	104	95	50.0 Bi	30.0 Pb	20.0 Sn						219	203	0.3443	9.53													
47	105	70	35.3 Bi	35.1 Pb	20.1 Sn	9.5 Cd						221	158	0.3425	9.48												
48	105	98	52.2 Bi	37.8 Pb	10.0 Sn						221	208	0.3602	9.97													
49	107	96	45.0 Bi	35.0 Pb	20.0 Sn						225	205	0.3468	9.60													
50	108	95	46.0 Bi	34.0 Pb	20.0 Sn						226	203	0.3465	9.59													
52	108	102	54.5 Bi	39.5 Pb	6.0 Sn						226	216	0.3664	10.14													
224	108 E	108	52.2 In	46.0 Sn	1.8 Zn						226	226	0.2627	7.27													
53	109 E	109	67.0 Bi	33.0 In						228	228	0.3183	8.81														
54	112	98	51.6 Bi	41.4 Pb	7.0 Sn						234	208	0.3660	10.13													
55	113	72	40.0 Bi	33.4 Pb	13.3 Sn	13.3 Cd						235	162	0.3479	9.63												
56	113	104	54.4 Bi	43.6 Pb	1.0 Sn	1.0 Cd						235	219	0.3750	10.38												
44	115	95	50.0 Bi	25.0 Pb	25.0 Sn						239	203	0.3367	9.32													
58	117	103	53.0 Bi	42.5 Pb	4.5 Sn						243	217	0.3700	10.24													
59	118	75	38.2 Bi	31.7 Sn	26.4 Pb	2.6 Cd	1.1 Sb	Dopant: 0.06 Cu					244	167	0.3273	9.06											
1E	118 E	118	52.0 In	48.0 Sn						244	244	0.2637	7.30	11.7	.34	20	1720	1630		83	4.5 note 2						
61	119	108	53.7 Bi	43.1 Pb	3.2 Sn						246	226	0.3721	10.30													
62	120	117	55.0 Bi	44.0 Pb	1.0 Sn						248	243	0.3754	10.39													
63	121	92	56.8 Bi	41.2 Pb	2.0 Cd						250	198	0.3743	10.36													
64	121	120	55.0 Bi	44.0 Pb	1.0 In						250	248	0.3754	10.39													
65	123	70	46.0 Pb	30.7 Bi	18.2 Sn	5.1 Cd						253	158	0.3519	9.74												

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	Liquidus	Solidus	% In	% Sn	% Pb	% Bi	Liquidus	Solidus											lb/in ³	gm/cm ³	PSI	PSI
	°C	°C					°F	°F			PPM/°C											
253	123 E	123	74.0 In	26.0 Cd			253	253	0.2753	7.62												
255	124 E	124	55.5 Bi	44.5 Pb			255	255	0.3772	10.44	4	.04		6400								
1	125	118	50.0 In	50.0 Sn			257	244	0.2637	7.30	11.7	.34	20	1720	1630		37.5	15	20.9	0.126	0.155	
13	125 MP		70.0 In	15.0 Sn	9.6 Pb	5.4 Cd	257		0.2757	7.63		.39	27	1476	2000		83	4	4.5 note 2			
67	126	124	58.0 Bi	42.0 Pb			259	255	0.3758	10.40												
68	127	93	38.0 Pb	37.0 Bi	25.0 Sn		261	199	0.3425	9.48												
69	129	95	51.6 Bi	37.4 Sn	6.0 In	5.0 Pb	264	203	0.3100	8.58												
70	130	121	40.0 In	40.0 Sn	20.0 Pb		266	250	0.2840	7.86												
71	131	118	52.0 Sn	48.0 In			268	244	0.2637	7.30												
72	133	96	34.0 Pb	34.0 Sn	32.0 Bi		271	205	0.3306	9.15												
73	133	128	56.8 Bi	41.2 Sn	2.0 Pb		271	262	0.3107	8.60												
74	135	96	38.4 Bi	30.8 Pb	30.8 Sn		275	205	0.3328	9.21												
75	135 E	135	57.4 Bi	41.6 Sn	1.0 Pb		275	275	0.3100	8.58												
76	136	95	36.0 Bi	32.0 Pb	31.0 Sn	1.0 Ag	277	203	0.3331	9.22												
78	136	95	36.7 Bi	31.8 Pb	31.5 Sn	Dopant: 0.25 Cd and 0.05 Ag	277	203	0.3324	9.20												
79	136	121	55.1 Bi	39.9 Sn	5.0 Pb		277	250	0.3132	8.67												
80	137	95	36.4 Bi	31.8 Pb	31.8 Sn		279	203	0.3320	9.19												
81	137	96	43.0 Pb	28.5 Bi	28.5 Sn		279	205	0.3407	9.43												
281	138 E	138	58.0 Bi	42.0 Sn			281	281	0.3093	8.56	4.5	.19	15	8000	500		55 note 4	23 note 1	44.8	0.167	0.201	
83	139	96	38.4 Pb	30.8 Bi	30.8 Sn		282	205	0.3360	9.30												
84	139	132	45.0 Sn	32.0 Pb	18.0 Cd	5.0 Bi	282	270	0.3118	8.63												
282	140	139	57.0 Bi	42.0 Sn	1.0 Ag		284	262	0.3098	8.57												
85	143	96	33.4 Bi	33.3 Pb	33.3 Sn		289	205	0.3310	9.16												
290	143 E	143	97.0 In	3.0 Ag			290	290	0.2666	7.38	23	.73	22	800				2				
86	144 E	144	60.0 Bi	40.0 Cd			291	291	0.3364	9.31												
87	145	118	58.0 Sn	42.0 In			293	244	0.2637	7.30												
181	145 E	145	51.2 Sn	30.6 Pb	18.2 Cd		293	293	0.3053	8.45		.35	24	6263								
203	150	125	95.0 In	5.0 Bi			302	257	0.2675	7.40												
88	150 MP		99.3 In	0.7 Ga			302		0.2641	7.31												
225	151	143	90.0 In	10.0 Sn			304	289	0.2641	7.31												
89	152	120	42.0 Pb	37.0 Sn	21.0 Bi		306	248	0.3310	9.16												
230	152	140	54.0 Sn	26.0 Pb	20.0 In	Dopant: 0.12 - 0.16 Cu	306	284	0.2912	8.06												
90	152 MP		99.4 In	0.6 Ga			306		0.2641	7.31												
91	153 MP		99.6 In	0.4 Ga			307		0.2641	7.31												
2	154	149	80.0 In	15.0 Pb	5.0 Ag		309	300	0.2836	7.85	13	.43	28	2550	2150		58	5.2 note 2				
92	154 MP		99.5 In	0.5 Ga			309		0.2641	7.31												
4	157 MP		100.0 In				314		0.2641	7.31	24	.86	29	273	890	1.57	22 to 41	0.9	28.47	0.243		
93	160	122	54.5 Pb	45.5 Bi			320	252	0.3826	10.59												
94	160	145	50.0 Sn	25.0 Cd	25.0 Pb		320	293	0.3020	8.36												
95	162	140	48.0 Sn	36.0 Pb	16.0 Bi		324	284	0.3172	8.78												
97	163	144	43.0 Sn	43.0 Pb	14.0 Bi		325	291	0.3259	9.02			24	6400		3.56	41					
98	167	120	50.0 Sn	40.0 Pb	10.0 Bi		333	248	0.3169	8.77												
9	167	154	70.0 Sn	18.0 Pb	12.0 In		333	309	0.2815	7.79	12.2	.45	24	5320	4190		135.5	12 note 2				
99	170	131	51.5 Pb	27.0 Sn	21.5 Bi		338	268	0.3461	9.58												
281-338	170	138	60.0 Sn	40.0 Bi			338	280	0.2934	8.12	5	.30		7500			35	23.5 note 1	44.4	0.18	0.213	
234	172	166	49.7 Sn	41.8 Pb	8.0 Bi	0.5 Ag	342	331	0.3187	8.82												
101	173	130	50.0 Pb	30.0 Sn	20.0 Bi		343	266	0.3422	9.47												
240	173	160	46.0 Sn	46.0 Pb	8.0 Bi		343	320	0.3241	8.97				6000		5.28	48					
204	175	165	70.0 In	30.0 Pb			347	329	0.2959	8.19	8.8	.38	28	3450								
102	176	146	47.5 Pb	39.9 Sn	12.6 Bi		349	295	0.3299	9.13												
103	177 E	177	67.8 Sn	32.2 Cd			351	351	0.2775	7.68												
104	179 E	179	62.5 Sn	36.1 Pb	1.4 Ag		354	354	0.3039	8.41	11.9	.50	27	7000	7540						0.167	
105	180	96	60.0 Sn	25.5 Bi	14.5 Pb		356	205	0.2981	8.25												
5	181	134	37.5 Pb	37.5 Sn	25.0 In		358	273	0.3042	8.42	7.8	.23	23	5260	4300		101	10.2 note 2				
205	181	173	60.0 In	40.0 Pb			358	343	0.3078	8.52	7	.29	27	4150								
100	182	178	62.6 Sn	37.0 Pb	0.4 Ag		361	352	0.3035	8.40												
106	183 E	183	63.0 Sn	37.0 Pb			361	361	0.3035	8.40	11.5	.50	25	7500	6200	4.35	37	17			0.167	
213	183	183	62.0 Sn	38.0 Pb			362	361	0.3046	8.43							4.35					
107	184	183	65.0 Sn	35.0 Pb			363	361	0.3010	8.33												
231	186	174	86.5 Sn	5.5 Zn	4.5 In	3.5 Bi	367	345	0.2659	7.36												
108	186	183	70.0 Sn	30.0 Pb			367	361	0.2948	8.16	12.5		22	7800	5200	5.08	30	17				
227	187	175	77.2 Sn	20.0 In	2.8 Ag		369	347	0.2619	7.25	9.8	.54	28	6800	4800	5.6	47	17				
226	187	181	83.6 Sn	8.8 In	7.6 Zn		369	358	0.2627	7.27				6600		4	85.5					
137	189	179	61.5 Sn	35.5 Pb	3.0 Ag		372	354	0.3046	8.43												
109	191	183	60.0 Sn	40.0 Pb			376	361	0.3071	8.50	11.5	.49	25	7600	5600	4.35	40	16				
110	192	183	75.0 Sn	25.0 Pb			378	361	0.2890	8.00												
235	195	165	58.0 In	39.0 Pb	3.0 Ag		383	329	0.3104	8.59												
111	197	170	55.5 Pb	40.5 Sn	4.0 Bi		387	338	0.3328	9.21												
112	199	183	80.0 Sn	20.0 Pb			390	361	0.2836	7.85												
201	199 E	199	91.0 Sn	9.0 Zn			390	390	0.2627	7.27	15	.61		7940			32.5	21.5 note 1	71.2	0.239	0.272	
113	200	183	55.0 Sn	45.0 Pb			392	361	0.3136	8.68												
114	205	183	85.0 Sn	15.0 Pb			401	361	0.2782	7.70												
254	205	204	86.9 Sn	10.0 In	3.1 Ag		401	399	0.2663	7.37												
115	210	177	55.0 Pb	44.0 Sn	1.0 Ag		410	351	0.3291	9.11												
7	210	184	50.0 In	50.0 Pb			410	363	0.3201	8.86	6	.22	27	4670	2680		55	9.6 note 2				
116	212	183	50.0 Sn	50.0 Pb			414	361	0.3205	8.87	10.9	.48	23	6000	5200		35	14				

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	Liquidus	Solidus	% Pb	% Zn	% Cd	% Ag	% Au	% In	% Sn	% Ni											% Ge	% Si	% Cu
	°C	°C																			J/g	J/g-°C	J/g-°C
229	365	304	94.5	Pb	5.5	Ag						689	579	0.4101	11.35								
176	382 E	382	95.0	Zn	5.0	Al						720	720	0.2385	6.60								
185	395	340	95.0	Cd	5.0	Ag						743	644	0.3154	8.73								
186	424 E	424	55.0	Ge	45.0	Al						795	795	0.1340	3.71								
177	465	451	75.0	Au	25.0	In						869	844	0.4950	13.70								
178	485	451	82.0	Au	18.0	In						905	844	0.5383	14.90								
187	525 E	525	45.0	Ag	38.0	Au	17.0	Ge				977	977	0.3823	10.58								
188	577 E	577	88.3	Al	11.7	Si						1,071	1,071	0.0961	2.66								
189	585	521	86.0	Al	10.0	Si	4.0	Cu				1,085	970	0.0994	2.75								
190	610	577	92.5	Al	7.5	Si						1,130	1,071	0.0968	2.68								
215	620	605	45.0	Ag	24.0	Cd	16.0	Zn	15.0	Cu		1,148	1,121	0.3291	9.11								
191	630	577	95.0	Al	5.0	Si						1,166	1,071	0.0972	2.69								
216	635	625	50.0	Ag	18.0	Cd	16.5	Zn	15.5	Cu		1,175	1,157	0.3320	9.19								
217	650	620	56.0	Ag	22.0	Cu	17.0	Zn	5.0	Sn		1,202	1,148	0.3328	9.21								
192	660 MP		100.0	Al								1,220		0.0976	2.70								
218	690	630	50.0	Ag	16.0	Cd	15.5	Cu	15.5	Zn	3.0	Ni		1,274	1,166	0.3328	9.21						
219	700	605	35.0	Ag	26.0	Cu	21.0	Zn	18.0	Cd		1,292	1,121	0.3208	8.88								
179	705	603	61.0	Ag	24.0	Cu	15.0	In				1,301	1,117	0.3425	9.48								
211	705	640	80.0	Cu	15.0	Ag	5.0	P				1,301	1,184	0.2753	7.62								
212	710	605	30.0	Ag	27.0	Cu	23.0	Zn	20.0	Cd		1,310	1,121	0.3169	8.77								
214	720	600	60.0	Ag	30.0	Cu	10.0	Sn				1,328	1,112	0.3461	9.58								
193	780 E	780	72.0	Ag	28.0	Cu						1,436	1,436	0.3617	10.01								
220	785	775	71.5	Ag	28.0	Cu	0.5	Ni				1,445	1,427	0.3617	10.01								
194	800	370	98.0	Au	2.0	Si						1,472	698	0.6113	16.92								
221	800	690	63.0	Ag	28.5	Cu	6.0	Sn	2.5	Ni		1,472	1,274	0.3508	9.71								
195	890 E	890	80.0	Au	20.0	Cu						1,634	1,634	0.5662	15.67								
196	950 E	950	82.0	Au	18.0	Ni						1,742	1,742	0.5752	15.92								
207	961 MP		100.0	Ag								1,762		0.3794	10.50								
208	985	665	85.0	Cu	8.0	Sn	7.0	Ag				1,805	1,229	0.3205	8.87								
198	1020	1000	50.0	Au	50.0	Ag						1,868	1,832	0.4914	13.60								
199	1030	360	99.40	Au	0.60	Sb						1,886	680	0.6894	19.08								
222	1030	1025	99.0	Au	1.0	Ga						1,886	1,877	0.6818	18.87								
223	1063 MP		99.8	Au	0.2	P						1,945		0.6843	18.94								
200	1064 MP		100.0	Au								1,948		0.6973	19.30	73.4	3.18	14	20000	11.2	39 to 45(Zin)	0.13	
532																							

NOTES

- note 1: Brinell Hardness, 2mm ball, 4kg load
- note 2: Modified Brinell hardness, using 100-kg load, 1/2 min.
- note 3: Depends on specimen preparation.
- note 4: % elongation on 5.65 (sq. root Area) gauge length

Conversions:

Resistivity of IACS / Elec. conductivity %IACS = Resistivity of alloy
 ex: 1.72 x 100 / %IACS = micro ohm - cm