

INDIUM CORPORATION OF AMERICA, EUROPE and ASIA

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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% of nominal value
 Elements 1% to <2%: ±0.25% of nominal value
 Elements 2% to <10%: ±0.5% of nominal value
 Elements >10%: ±1.0% 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 Liquidus	TEMP Solidus	Density lb/in ³	Electrical Conductivity (1.72x10 ¹⁰ ohms-cm) % of IACS	Thermal Conductivity @ 85°C W/cm ² -C	Thermal Coefficient Expansion @ 20°C PPM/C	Yield Strength M Pa	Tensile Strength PSI	Shear Strength PSI	Young's Modulus PSI x 10 ⁶	Creep N/mm ²	Elongation %	Brinell Hardness	Wetting Angle °	Latent Heat of Fusion J/g	Specific Heat SOLID J/g-C	LIQUID J/g-C
	Liquidus °C	Solidus °C	%	%	%	%																	
46L	8	11	61.0 Ga	25.0 In	13.0 Sn	1.0 Zn	46	44	0.2348	8.50													
51E	11	11	66.5 Ga	20.5 In	13.0 Sn		52	52	0.2283	6.32													
60	16	16	75.5 Ga	24.5 In			60	60	0.2294	6.35													
51	17	11	62.5 Ga	21.5 In	16.0 Sn		63	51	0.2348	6.50													
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													
19	60 E	60	91.0 In	32.5 Bi	16.5 Sn		140	140	0.2847	7.88	3.3	.19 @ 40.1°C	22		4850				11				
162	72 E	72	66.3 In	33.7 Bi			162	162	0.2887	7.99													
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													
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													
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			
1	125	118	50.0 In	50.0 Sn			257	244	0.2637	7.30	11.7	.34	20		1720	1630			83	4.5 note 2			
71	131	118	52.0 Sn	48.0 In			268	244	0.2637	7.30													
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
282	140	139	57.0 Bi	42.0 Sn	1.0 Ag		284	282	0.3098	8.57													
290	143 E	143	97.0 In	3.0 Ag			290	290	0.2866	7.38	23	.73	22		800				2				
87	145	118	58.0 Sn	42.0 In			293	244	0.2637	7.30													
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													
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													
92	154 MP		98.5 In	0.5 Ga			309		0.2641	7.31													
4	157 MP		100.0 In				314		0.2641	7.31													
281-338	170	138	60.0 Sn	40.0 Bi			338	280	0.2934	8.12	5	.30			7500	890	1.57		22 to 41	0.9	28.47	0.243	
231	186	174	86.5 Sn	5.5 Zn	4.5 In	3.5 Bi	367	345	0.2659	7.36									35	23.5 note 1	44.4	0.18	0.213
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				
201	189 E	199	91.0 Sn	9.0 Zn			380	390	0.2627	7.27	15	.61			7940				32.5	21.5 note 1	71.2	0.239	0.272
254	205	204	86.9 Sn	10.0 In	3.1 Ag		401	399	0.2663	7.37													
249	213	211	91.8 Sn	4.8 Bi	3.4 Ag		415	412	0.2688	7.44													
238	217 E	217	90.0 Sn	10.0 Au			423	423	0.2811	7.78					7280				1.1				
241	220	217	95.5 Sn	3.8 Ag	0.7 Cu		428	423	0.2674	7.40	13.2				6962	3916			13 (note 6)	36.5	15	42 (note 7)	
252	220	217	95.5 Sn	3.9 Ag	0.6 Cu		428	423	0.2674	7.40													
256	220	217	96.5 Sn	3.0 Ag	0.5 Cu		428	423	0.2674	7.40					25.3 (note 5)	7200	2.41			19.3			
121	221 E	221	96.5 Sn	3.5 Ag			430	430	0.2710	7.50	16		.33	30	5800	2700			73	40			
251	225	217	96.2 Sn	2.5 Ag	0.8 Cu	0.6 Sb	437	423	0.2663	7.37													
246	225	217	95.5 Sn	4.0 Ag	0.5 Cu		437	423	0.2674	7.40					7470		2.6			17.3			
260	226	217	98.5 Sn	1.0 Ag	0.5 Cu	Dopant: 0.05 Mn	439	423	0.2645	7.32					5625.0		2.11	15.7					
123	226	221	97.5 Sn	2.5 Ag			439	430	0.2652	7.34													
258	227	215	98.5 Sn	1.0 Ag	0.5 Cu		441	419	0.2645	7.32					5640		2.15			13.4			
243	227 E	227	99.0 Sn	1.0 Cu			441	441	0.2641	7.31													
244	227 E	227	99.3 Sn	0.7 Cu			441	441	0.2641	7.31													
128	232 MP		100.0 Sn				450		0.2630	7.28	15.6	.73	24		1900		6.1					0.222	
209	233 MP		65.0 Sn	25.0 Ag	10.0 Sb		451		0.2818	7.80			36		17000								
129	235 MP		99.0 Sn	1.0 Sb			455		0.2627	7.27													
3	237	143	90.0 In	10.0 Ag			459	289	0.2724	7.54	22.1	.67	15		1650	1600			61	2.7 note 2			
131	238	232	97.0 Sn	3.0 Sb			460	450	0.2623	7.26					1400								
132	240	221	95.0 Sn	5.0 Ag			464	450	0.2670	7.39	12.6		23		8000	3540			30	13.7		0.23	
133	240	235	95.0 Sn	5.0 Sb			464	455	0.2619	7.25	11.9	.28	31		5900	6000			38	13.3			
139	251	134	95.0 Bi	5.0 Sn			484	273	0.3483	9.64													
148	271 MP		100.0 Bi				520		0.3541	9.80													
259	272	250	90.0 Sn	10.0 Sb			522	482	0.2616	7.24	10.7	.49			6103	2336					42.7		
182	280 E	280	80.0 Au	20.0 Sn			536	536	0.5242	14.51			16		40000	40000	8.57		2			0.15	
156	285	221	90.0 Sn	10.0 Ag			563	450	0.2713	7.51													
160	300	227	97.0 Sn	3.0 Cu			572	441	0.2645	7.32													
172	330	231	98.0 Sn	2.0 As			626	448	0.2616	7.24													
173	345	232	99.0 Sn	1.0 Ge			653	450	0.2623	7.26													
183	356 E	356	88.0 Au	12.0 Ge		Dopant: 0.05 Ge	673	673	0.5300	14.67			13		26835	26825	10.55						
261	360	262	89.0 Bi	11.0 Ag			680	504	0.3559	9.85			.09		8000		5.4						
184	363 E	363	96.8 Au	3.2 Si			685	685	0.6564	15.40			.27	12	36975	31900	12.04						
176	382 E	382	95.0 Zn	5.0 Al			720	720	0.2385	6.60													
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			1,074	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													
191	630	577	95.0 Al	5.0 Si			1,166	1,071	0.0972	2.69													
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													
179	705	603	91.0 Ag	24.0 Cu	15.0 In		1,301																

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	Liquidus	Solidus	% Au	% Ag	Liquidus	Solidus														lb/in ³	gm/cm ³
198	1020	1000	50.0	Au	50.0	Ag	1,868	1,832	0.4914	13.80											
222	1030	1025	99.0	Au	1.0	Ga	1,886	1,877	0.6818	18.87											
199	1030	360	99.4	Au	0.6	Sb	1,886	680	0.6894	19.08											
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(2in)			0.13	

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
- note 5: J. Zhao, Y. Miyashita and S.L. Mannan; J. Electr. Mater., Vol. 31, 8 (2002) p. 879
- note 6: Results @ 20°C, Multicore Ecosol (MSL Ref. 733 9/99)
- note 7: Mario F. Arenas, Viola L. Acoff

Conversions:

Resistivity of IACS / Elec. conductivity %IACS = Resistivity of alloy

ex: 1.72 x 100 / %IACS = micro ohm - cm