

## Master Solder Alloy Properties Table

Indalloy #	Temp Liquidus °C	Temp Solidus °C	Indalloy Specialty Alloys	TEMP Liquidus °F	TEMP Solidus °F	Mechanical Properties							Specialty Alloy Properties
						Density LB/CU. IN.	Mass Density (GM/CM3)	Electrical Conductivity % of IACS	Thermal Conductivity W/Cm °C (@85°C)	Thermal Coefficient Expansion Micro IN/IN PPM/°C (@20°C)	Tensile Strength PSI	Shear Bond Holding Strength PSI	
46L	8	7	61Ga 25In 13Sn 1Zn	46	44	.2348	6.5	--	--	--	--	--	Alloy liquid @rm.temp, wets glass and quartz. Mercury replacement.
51	11E	11	62.5Ga 21.5In 16Sn	51	51	.2348	6.50	--	--	--	--	--	Alloy liquid @rm.temp, wets glass and quartz. Mercury replacement.
60	16E	16	75.5Ga 24.5In	60	60	.2294	6.35	--	--	--	--	--	Alloy liquid @rm.temp, wets glass and quartz. Mercury replacement.
117	47E	47	44.7Bi 22.6Pb 19.1In 8.3Sn 5.3Cd	117	117	.3310	9.16	4.50	.15	25	5400	--	General purpose fusible alloy.
136	58E	58	49Bi 21In 18Pb 12Sn	136	136	.3255	9.01	2.43	.10	23	6300	--	General purpose fusible alloy. Wettability not outstanding. For use as solder.
19	60E	60	51In 32.5Bi 16.5Sn	140	140	.2847	7.88	3.30	--	22	4850	--	Environmentally safe fusible alloy. Contains no lead or cadmium.
158	70E	70	50Bi 26.7Pb 13.3Sn 10Cd	158	158	.3461	9.58	4.00	.18	22	5990	300	Lowest melting point solder.
162	72E	72	66.3In 33.7Bi	162	162	.2887	7.99	--	--	--	--	--	Environmentally safe fusible alloy. Contains no lead or cadmium.
174	79E	79	57Bi 26In 17Sn	174	174	.3086	8.54	--	--	--	--	--	Environmentally safe fusible alloy. Contains no lead or cadmium.
8	93E	93	44In 42Sn 14Cd	199	199	.2695	7.46	--	.36	24	2632	--	General purpose fusible alloy.

42	96E	96	46Bi 34Sn 20Pb	205	205	.3248	8.99	--	--	--	--	--	Bismuth added to achieve a low melting point. Fair wettability.
224	108E	108	52.2In 46Sn 1.8Zn	226	226	.2627	7.27	--	--	--	--	--	Pb free solder, high dross due to Zn.
1E	118E	118	52In 48Sn	244	244	.2637	7.30	11.70	.34	20	1720	1630	Indium-tin eutectic with sharp melting point. Has good wettability on glass, quartz and many ceramics. Has good low temperature malleability and therefore compensates for some difference in coefficient of expansion when dissimilar materials are soldered.
255	124E	124	55.5Bi 44.5Pb	255	255	.3772	10.44	4.00	.04	--	6400	--	General purpose fusible alloy.
281	138E	138	58Bi 42Sn	281	281	.3093	8.56	4.50	.19	15	8000	500	Good low melting point solder for electronics assembly of for applications where Cd and Pb are to be avoided, and for thermo-electric applications. Shear rate sensitive.
290	143E	143	97In 3Ag	290	290	.2666	7.38	23.00	.73	22	800	--	Indium with silver added to improve strength. Has the wettability and low-temperature malleability of indium. Particularly useful for cryogenic applications.
181	145E	145	51.2Sn 30.6Pb 18.2Cd	293	293	.3053	8.45	--	.35	24	6263	--	Good general purpose solder in the medium temperature range. Maintains its creep strength well. Not applicable against gold.
2	154	149	80In 15Pb 5Ag	309	300	.2836	7.85	13.00	.43	28	2550	2150	Especially useful for soldering against gold, as leaching is minimized. Good thermal fatigue properties. Compatible with Indalloy numbers 204, 205, 206, 7, 10 and 150 in step-soldering applications.
4	157MP	--	100In	314		.2641	7.31	24.00	.86	29	273	890	Soft, ductile metal has good wettability on many surfaces including ceramics, glass and quartz. Deforms indefinitely under load and has no tendency to become brittle, making it valuable for cryogenic applications.
97	163	144	43Pb 43Sn 14Bi	325	291	.3248	8.99	--	--	--	--	--	Good general purpose step soldering alloy.

9	167	154	70Sn 18Pb 12In	333	309	.2815	7.79	12.20	.45	24	5320	4190	General purpose solder in 160°C range with good physical properties.
204	175	165	70In 30Pb	347	329	.2959	8.19	8.80	.38	28	3450	--	Indalloys #7, #10, #150, #204, #205 and #206 comprise a group of lead-indium solders designed to cover the temperature range of 165°C-275°C. All have the minimum gold-leaching characteristics of lead-indium as well as good thermal fatigue properties.
Sn62	179E	179	62Sn 36Pb 2Ag	354	354	.3039	8.41	11.90	.50	27	7000	7540	Good general purpose solder. Can be used on silver bearing surfaces to reduce scavenging.
205	181	173	60In 40Pb	358	343	.3078	8.52	7.00	.29	27	4150	--	See Indalloy #204 above.
106 (Sn63)	183E	183	63Sn 37Pb	361	361	.3035	8.40	11.50	.50	25	7500	6200	Standard eutectic tin-lead solder with wide application. Not recommended against silver and/or gold.
231	186	174	86.5Sn 5.5Zn 4.5In 3.5Bi	367	345	.2659	7.36	--	--	--	--	--	Pb free solder. High dross.
227	187	175	77.2Sn 20In 2.8Ag	369	347	.2619	7.25	9.80	.54	28	6800	4800	Pb free solder can be used as a replacement for 63Sn 37Pb, 62Sn 36Pb 2Ag and 60Sn 40Pb in that it has similar physical and mechanical properties.
201	199E	199	91Sn 9Zn	390	390	.2627	7.27	15.00	.61	--	7940	--	Recommended for soldering to aluminum. Use flux #3.
7	210	184	50In 50Pb	410	363	.3201	8.86	6.00	.22	27	4670	2680	See Indalloy #204 above.
232	217E	217	93.6Sn 4.7Ag 1.7Cu	423	423	.2684	7.43	--	--	--	--	--	Patented Pb free solder.
121	221E	221	96.5Sn 3.5Ag	430	430	.2659	7.36	16.00	.33	30	5620	--	Standard tin-silver eutectic solder with wide application when lead-based solders do not meet temperature, strength or safety requirements. Not recommended against gold-plated surfaces. Excellent for step soldering with #42, #106, #165 and #171.
206	231	197	60Pb 40In  90Sn	448	387	.3360	9.30	5.20	.19	26	5000		See Indalloy #204 above.  Lower temp eutectic, in the Au Sn

238	217E	217	10Au	450	450	.2811	7.78	--	--	--	--	--	system.
209	233MP	--	65Sn 25Ag 10Sb	451	--	2818	7.80	--	--	36	17000	--	Low temperature die attach alloy. Has very high tensile strength.
3	237	143	90In 10Ag	459	289	.2724	7.54	22.10	.67	15	1650	1600	Indium with silver added to improve strength. Has the wettability and low-temperature malleability of indium.
133	240	235	95Sn 5Sb	464	455	.2619	7.25	11.90	.28	31	5900	6000	Higher tensile strength solder than #121. Particular application is joining copper tubing in refrigeration and potable water systems. Has good wettability with good long time sheer strength at 100°C.
236	247	237	83Pb 10Sb 5Sn 2Ag	477	459	.3739	10.35	--	--	--	--	--	Intermediate temp solder. Creep resistant.
233	255	245	85Pb 10Sb 5Sn	491	473	.3743	10.36	6.00	--	--	5570	--	Intermediate temp solder. Creep resistant.
10	260	240	75Pb 25In	500	464	.3602	9.97	4.60	.18	26	5450	3520	See Indalloy #204 above.
150	275	260	81Pb 19In	527	500	.3711	10.27	4.50	.17	27	5550	--	See Indalloy #204 above. Lowest In containing for good wettability.
182	280E	280	80Au 20Sn	536	536	.5242	14.51	--	.57	16	40000	40000	Eutectic die attach and package sealing.
151	296	287	92.5Pb 5Sn 2.5Ag	565	549	.3982	11.02	8.60	--	29	4210	2240	Similar to Indalloy #165.
228	299	267	88Pb 10Sn 2Ag	570	513	.3884	10.75	8.50	.27	29	3260	--	High temp solder.
159	302	275	90Pb 10Sn	576	527	.3884	10.75	8.90	.25	29	4400	2400	High temp solder for BGA applications.
237	304MP	--	93Pb 3Sn 2In 2Ag	579	--	.4000	11.07	--	--	--	--	--	High temp solder.
165	309E	309	97.5Pb 1.5Ag 1Sn	588	588	.4075	11.28	6.00	.23	30	4420	--	Standard lead-silver-tin eutectic solder with wide application in semiconductor assembly.
164	310	300	92.5Pb 5In 2.5Ag	590	572	.3982	11.02	5.50	.25	25	4560	2830	This alloy is very useful in the 300° C range. It has particularly good thermal fatigue properties as well as the minimal gold leaching properties of indium-lead alloys.

171	312	308	95Pb 5Sn	594	586	.3996	11.06	8.80	.23	30	4000	2100	Often used in reducing atmospheres. Wide application in soldering.
239	313E	313	91Pb 4Sn 4Ag 1In	595	595	.3992	11.05	--	--	--	--	--	High temp solder.
183	356E	356	88Au 12Ge	673	673	.5300	14.67	--	.44	13	26835	26825	Eutectic die attach.
178	485	451	82Au 18In	905	844	.5383	14.90	--	--	--	--	--	Stiff alloy. Limited fabrications available.