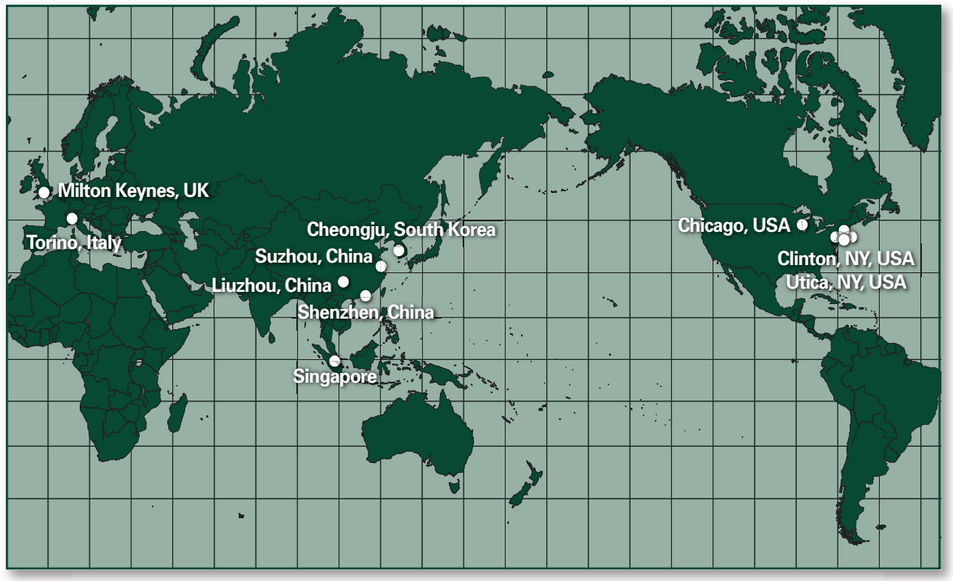
Locations Worldwide



- **Electronics Assembly Materials**
- **Semiconductor Assembly Materials**
- **Metals & Specialty Chemicals**
- **Metal Thermal Interface Materials**
- **Solar Assembly Materials**
- **Engineered Solders & Alloys**

We develop, manufacture, and market soft solders, electronic assembly and packaging materials, indium alloys, and inorganic compounds.

Our Goal

Increase our customers' productivity and profits through premium design, application, and service using advanced materials.

Our basis for success:

- *Excellent product quality and performance*
- *Technical and customer service*
- *Cutting-edge material research and development*
- *Extensive product range*
- *Lowest cost of ownership*

Form No. 97582 (A4) R7

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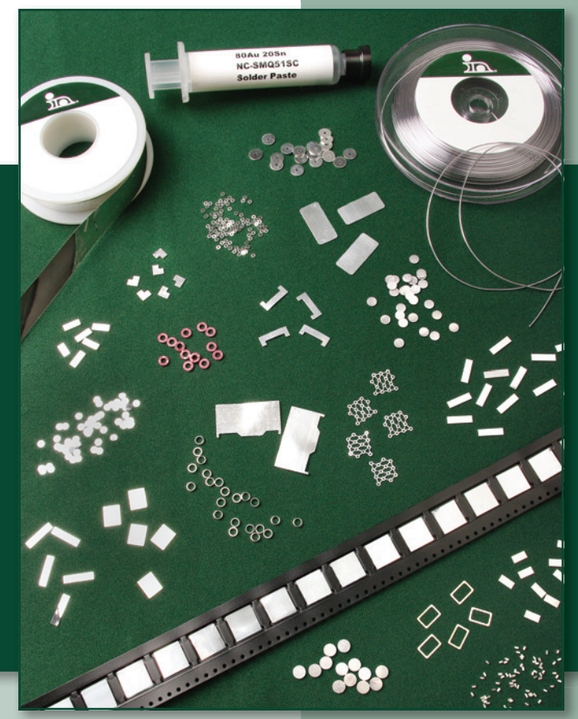
ISO 9001 REGISTERED

INDIUM CORPORATION®

Specialty Solders & Alloys

Technical Information



Contains key technical data for our most popular alloys.

Alloys ranging in temperature from 8°-363°C.

- Arrays
- Custom Shapes
- Flux
- Frame
- Ingot
- Liquid TIM
- Metal Gaskets/Seals
- Metal TIM
- Polymers/Underfills
- Paste
- Powder
- Ribbon
- Solar Foil & Ribbon
- Solar Materials
- Solder Spheres
- Split Rings
- Squares
- Wire

INDIUM CORPORATION®

Guide to Indalloy® Specialty Solders & Alloys

INDIUM CORPORATION®

Indalloy® Number	Temperature °C (°F) Liquidus	Solidus	Elemental Composition (% By Mass)	Density lb/in^3	Density gm/cm^3	Electrical Conductivity (1.72 μohms-cm) % of IACS	Thermal Conductivity @ 85°C W/cm-° C	Coefficient of Thermal Expansion @ 20°C PPM/° C	Tensile Strength PSI	Shear Strength PSI	SPECIALTY ALLOY PROPERTIES
46L	8 (46)	7 (45)	61.0Ga/25.0In/13.0Sn/1.0Zn	0.2348	6.50						Alloy liquid at room temperature, wets glass and quartz. Possible mercury replacement.
51E	11 (52) E		66.5Ga/20.5In/13.0Sn	0.2348	6.50						Alloy liquid at room temperature, wets glass and quartz. Possible mercury replacement.
60	16 (60) E		75.5Ga/24.5In	0.2294	6.35						Alloy liquid at room temperature, wets glass and quartz. Possible mercury replacement.
117	47 (117) E		44.7Bi/22.6Pb/19.1In/8.3Sn/ 5.3Cd	0.3310	9.16	4.5	0.15	25	5400		General purpose fusible alloy.
136	58 (136) E		49.0Bi/21.0In/18.0Pb/12.0Sn	0.3255 9.01	2.43	0.10	23		6300		General purpose fusible alloy.
19	60 (140) E		51.0In/32.5Bi/16.5Sn	0.2847	7.88	3.3		22	4850		Environmentally safe fusible alloy. Contains no lead or cadmium.
158	70 (158) E		50.0Bi/26.7Pb/13.3Sn/10.0Cd	0.3461	9.58	4.0	0.18	22	5990	300	General purpose fusible alloy.
162	72 (162) E		66.3In/33.7Bi	0.2887	7.99						Environmentally safe fusible alloy. Contains no lead or cadmium.
174	79 (174) E		57.0Bi/26.0In/17.0Sn	0.3086	8.54						Environmentally safe fusible alloy. Contains no lead or cadmium.
42	96 (205) E		46.0Bi/34.0Sn/20.0Pb	0.3248	8.99						Low temperature eutectic solder. Can be used on the same metallization as Sn/Pb based solders. Lowest temperature solder paste.
224	108 (226) E		52.2In/46.0Sn/1.8Zn	0.2627							Pb-free solder. Zinc causes high dross.
1E	118 (244) E		52.0In/48.0Sn	0.2637	7.30	11.7	0.34	20	1720	1630	Fair wettability on glass, quartz, and many ceramics. Good low-temperature malleability. Compensates for some CTE mismatch. Low vapor pressure.
255	124 (255) E		55.5Bi/44.5Pb	0.3772	10.44	4.0	0.04		6400		General purpose fusible alloy.
281	138 (281) E		58.0Bi/42.0Sn	0.3093	8.56	4.5	0.19	15	8000	500	Makes a good low-temperature solder paste for electronics assembly. Can be used where Cd and Pb should be avoided. Also good for thermo-electric applications.
282	140 (284)	139 (282)	57.0Bi/42.0Sn/1.0Ag	0.3098	8.57						More malleable and ductile than #281.
290	143 (290) E		97.0In/3.0Ag	0.2666	7.38	23.0	0.73	22	800		Has nearly the wettability, thermal conductivity, and low-temperature malleability of In. Solders silver, fired glass, and ceramics. Good for thermal interfaces requiring more creep resistance than pure indium.
2	154 (309)	149 (300)	80.0In/15.0Pb/5.0Ag	0.2836	7.85	13.0	0.43	28	2550	2150	Especially useful for soldering to gold because it minimizes leaching. Good thermal fatigue properties.
4	157 (314) MP		100.0In	0.2641	7.31	24.0	0.86	29	273	890	Soft, ductile metal has good wettability on many surfaces, including glazed ceramics, certain metallic oxides, glass, and quartz. Bonds to non-metallics. Deforms indefinitely under load and has no tendency to become brittle, making it valuable for cryogenic applications. Volume change on freezing -2.5%.
97	163 (325)	144 (291)	43.0Sn/43.0Pb/14.0Bi	0.3259	9.02			24	6400		Good general purpose step soldering alloy.
9	167 (333)	154 (309)	70.0Sn/18.0Pb/12.0In	0.2815	7.79	12.2	0.45	24	5320	4190	General purpose solder with good physical properties.
204	175 (347)	165 (329)	70.0In/30.0Pb	0.2959	8.19	8.8	0.38	28	3450		Minimizes gold leaching characteristics. Good thermal fatigue properties.
Sn62	179 (354) E		62.0Sn/36.0Pb/2.0Ag	0.3039	8.41	11.9	0.50	27	7000	7540	Good general purpose solder. Can be used on sliver bearing surfaces to reduce scavenging.
205	181 (358)	173 (343)	60.0In/40.0Pb	0.3078	8.52	7.0	0.29	27	4150		Minimizes gold leaching characteristics. Good thermal fatigue properties.
Sn63	183 (361) E		63.0Sn/37.0Pb	0.3035	8.40	11.5	0.50	25	7500	6200	Most widely used Sn/Pb electronic solder. Not recommended for soldering to gold thicker than 0.5 microns (20 micro inches).
231	186 (367)	174 (345)	86.5Sn/5.5Zn/4.5In/3.5Bi	0.2659	7.36						Pb-free solder. Zinc causes high dross.
227	187 (369)	175 (347)	77.2Sn/20.0In/2.8Ag	0.2619	7.25	9.8	0.54	28	6800	4800	Can be used as a Pb-free replacement for Sn63, Sn62, Sn60 because it has a similar melting point, as well as, equal, or superior, physical and mechanical properties. Not for use over 100°C due to Sn/In eutectic. U.S. patent #5,256,370; covers 70-92%Sn 1-6%Ag 4-35%In; temperature range Liquidus: 179-213°C; Solidus: 167-212°C.
201	199 (390) E		91.0Sn/9.0Zn	0.2627	7.27	15.0	0.61		7940		Recommended for soldering to aluminum using flux #3.
254	205 (401)	204 (399)	86.9Sn/10.0In/3.1Ag	0.2663	7.37						Lead-free U.S. Patent #5,256,370; covers 70-92%4Sn 1-6%Ag 4- 35%In; temp. range Liq. 179-213°C, Sol. 167-212°C
7	210 (410)	184 (363)	50.0In/50.0Pb	0.3201	8.86	6.0	0.22	27	4670	2680	Minimizes gold leaching characteristics. Good thermal fatigue properties. Very good resistance to alkaline corrosion.
249	213 (415)	211 (412)	91.8Sn/4.8Bi/3.4Ag	0.2688	7.44						Pb-free alloy.
238	217 (423) E		90.0Sn/10.0Au	0.2811	7.78				7280		Lower temperature eutectic in the Au Sn system.
241	220 (428)	217 (423)	95.5Sn/3.8Ag/0.7Cu	0.2674	7.40	13.2			6962	3916	Pb-free alloy, no patent.
256	220 (428)	217 (423)	96.5Sn/3.0Ag/0.5Cu	0.2674	7.40				7200		Pb-free alloy, no patent. Highly recommend alloy.
121	221 (430) E		96.5Sn/3.5Ag	0.2710	7.50	16.0	0.33	30	5800	2700	Pb-free, high-temperature solder. Excellent thermal fatigue properties. Not recommended for soldering to gold thicker than 0.5 microns (20 micro inches).
206	231 (448)	197 (387)	60.0Pb/40.0In	0.3360	9.30	5.2	0.19	26	5000		Minimizes gold leaching characteristics. Good thermal fatigue properties.
209	233 (451) E		65.0Sn/25.0Ag/10.0Sb	0.2818	7.80			36	17000		Pb-free – Good wetting, high performance solder. Melting point is too low for use with Pb-free solders used to attach the devices to the board.
3	237 (459)	143 (289)	90.0In/10.0Ag	0.2724	7.54	22.1	0.67	15	1650	1600	Has nearly the wettability and low-temperature malleability of indium. Solders silver, fired glass, and ceramics. Large plastic range.
133	240 (464)	235 (455)	95.0Sn/5.0Sb	0.2619	7.25	11.9	0.28	31	5900	6000	Pb-free, used in food equipment, potable water systems, and refrigeration tubing. Good wettability and creep resistance.
236	247 (477)	237 (459)	83.0Pb/10.0Sb/5.0Sn/2.0Ag	0.3739	10.35						Intermediate temperature solder. Creep resistant.
233	255 (491)	245 (473)	85.0Pb/10.0Sb/5.0Sn	0.3743	10.36	6.0			5570		Used in step soldering.
10	260 (500)	240 (464)	75.0Pb/25.0In	0.3602	9.97	4.6	0.18	26	5450	3520	Minimizes gold leaching characteristics. Good thermal fatigue properties. Very good resistance to alkaline corrosion
150	275 (527)	260 (500)	81.0Pb/19.0In	0.3711	10.27	4.5	0.17	27	5550		Minimizes gold leaching characteristics. Good thermal fatigue properties. Very good resistance to alkaline corrosion
182	280 (536) E		80.0Au/20.0Sn	0.5242	14.51		0.57	16	40000	40000	Very strong solder with excellent thermal fatigue resistance. Excellent solder to use when soldering to gold. High thermal conductivity.
228	290 (554)	267 (513)	88.0Pb/10.0Sn/2.0Ag	0.3884	10.75	8.5	0.27	29	3260		Not recommended for applications above 120°C due to formation of eutectic.
151	296 (565)	287 (549)	92.5Pb/5.0Sn/2.5Ag	0.3982	11.02	8.6		29	4210	2240	Ag increases the performance without a large decrease in wetting.
159	302 (576)	275 (527)	90.0Pb/10.0Sn	0.3884	10.75	8.9	0.25	29	4400	2400	Easy to use since it wets well, but very low thermal cycling performance.
163	304 (579)	299 (570)	95.5Pb/2.5Ag/2.0Sn	0.4047	11.20						Good for soft solder die-attach. Poor wetting, but good thermal cycle performance due to low tin content.
237	304 (579) MP		93.0Pb/3.0Sn/2.0In/2.0Ag	0.4000	11.07						High temperature solder.
165	309 (588) E		97.5Pb/1.5Ag/1.0Sn	0.4075	11.28	6.0	0.23	30	4420		High temperature solder, frequently used in semiconductor assembly. Often used in reducing atmospheres such as 12% hydrogen. Slightly better corrosion resistance than #101
164	310 (590)	300 (572)	92.5Pb/5.0In/2.5Ag	0.3982	11.02	5.5	0.25	25	4560	2830	Good thermal fatigue. Minimal gold leaching properties of In/Pb alloys. Often used in reducing atmospheres such as 88% nitrogen 12% hydrogen.
171	312 (594)	308 (586)	95.0Pb/5.0Sn	0.3996	11.06	8.8	0.23	30	4000	2100	High temperature Sn/Pb alloy.
239	313 (595) E		91.0Pb/4.0Sn/4.0Ag/1.0In	0.3992	11.05						High temperature solder.
183	356 (673) E		88.0Au/12.0Ge	0.5300	14.67		0.44	13	26835	26825	Die-attach alloy
184	363 (685) E		96.8Au/3.2Si	0.5564	15.40		0.27	12	36975	31900	Die-attach alloy