

## PRODUCT DATA SHEET

# Solder Ribbon and Foil

### Introduction

High-quality **Solder Ribbon and Foil** manufactured by Indium Corporation is available in many standard alloys and sizes. Material can also be custom made to your unique material and dimensional requirements.

**Solder Ribbon** is supplied in continuous lengths and is packaged on spools. **Solder Foil** is supplied in sheet form.

### Ribbon Dimensions

Whether you are looking for large quantities of **Solder Ribbon** in specific widths and thicknesses for automatic die bonding, or a few feet to do testing, Indium Corporation can accommodate your needs.

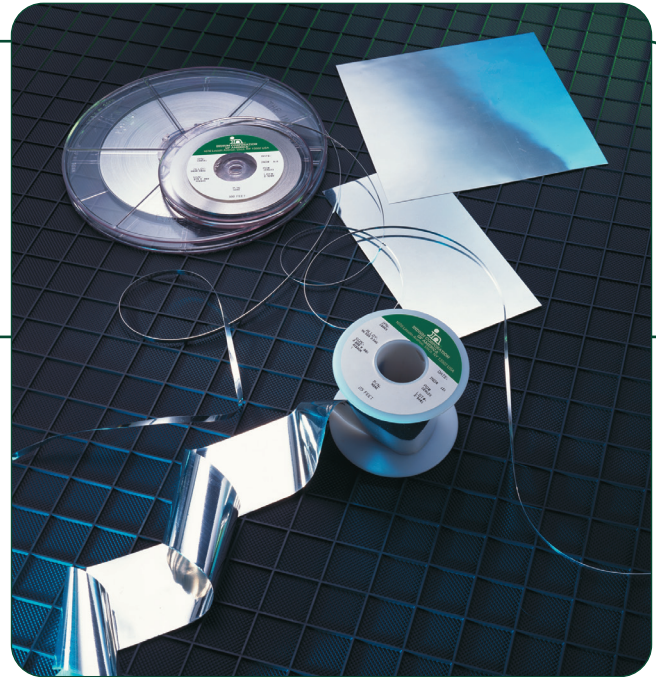
Our capabilities allow us to manufacture widths as small as .020" (.5mm) and up to 2.25" (57.15mm). Thicknesses range from .001" (.025mm) up to as thick as your application requires. All dimensions are dependent on the properties of the metals involved.

We can work with you on your specific dimensional requirements. Our typical tolerances are:

Width	
Up to .099" (2.5mm)	±.010" (.254mm)
.100" to .999" (2.54 to 25.37mm)	±.025" (.635mm)
Over 1.00" (25.4mm)	±.040" (1.01mm)
Thickness	
Up to .001" (.025mm)	±.0002" (.005mm)
.001" (.025mm) to .002" (.050mm)	±.0003" (.0076mm)
>.002" (.050mm) to .010" (.254mm)	±.0005" (.0127mm)
>.010" (.254mm) to .020" (.508mm)	±.0010" (.0254mm)
>.020" (.508mm) to .050" (1.27mm)	±.0025" (.0635mm)
>.050" (1.27mm)	±5%

### Shelf Life

The shelf life of solder preforms is dependent on the alloy composition. Pb-free alloys, and alloys with lead content of <50%, have a shelf life of 1 year from the date of manufacture (DOM). Alloys with lead content ≥50% have a shelf life of 6 months from the DOM.



### Foil Dimensions

Our foil dimensions are shown in our chart. Lead times are short and only a few days from order receipt.

### Available Materials

Whether you require pure metal such as indium, tin, gold, lead, etc., or an alloy, we can accommodate your needs. Indium Corporation has over 200 standard pure metals and alloys available, or we can design an alloy just for you. In addition, our standard alloy list includes a large selection of lead-free alloys.

Several of our more popular alloys are listed on the back of this data sheet. If you need a full listing of our standard alloys, please call us and request our *Solder Alloy Directory*.

From One Engineer To Another®



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### Indium Foil in Bulk

We also provide 99.99% pure **Indium Foil** in coil form on 6 inch diameter cardboard cores. This material is in a bulk form with an unprocessed edge, which means it is not slit. It is available in short lead times.

Bulk **Indium Ribbon** can be used for many applications, but usually the end result is getting closer to the best solution in the form of a preform or engineered material.

	IPN Detail and Tolerances
FOILIN-31879-C001	2.000+/-0.5 X 0.006+/-0.002
FOILIN-31897-C001	4.000+/-0.5 X 0.004+/-0.001
FOILIN-31894-C001	4.000+/-0.5 X 0.006+/-0.002
FOILIN-31880-C001	4.000+/-0.5 X 0.008+/-0.002
FOILIN-31881-C001	4.000+/-0.5 X 0.010+/-0.002
FOILIN-31882-C001	4.000+/-0.5 X 0.020+/-0.002
FOILIN-31898-C001	6.000+/-0.5 X 0.004+/-0.001
FOILIN-31896-C001	6.000+/-0.5 X 0.006+/-0.002
FOILIN-31886-C001	6.000+/-0.5 X 0.008+/-0.002
FOILIN-31888-C001	6.000+/-0.5 X 0.010+/-0.002
FOILIN-31889-C001	6.000+/-0.5 X 0.020+/-0.002
FOILIN-31890-C001	8.000+/-0.5 X 0.006+/-0.002
FOILIN-31891-C001	8.000+/-0.5 X 0.008+/-0.002
FOILIN-31878-C001	8.000+/-0.5 X 0.010+/-0.002
FOILIN-31892-C001	8.000+/-0.5 X 0.020+/-0.002

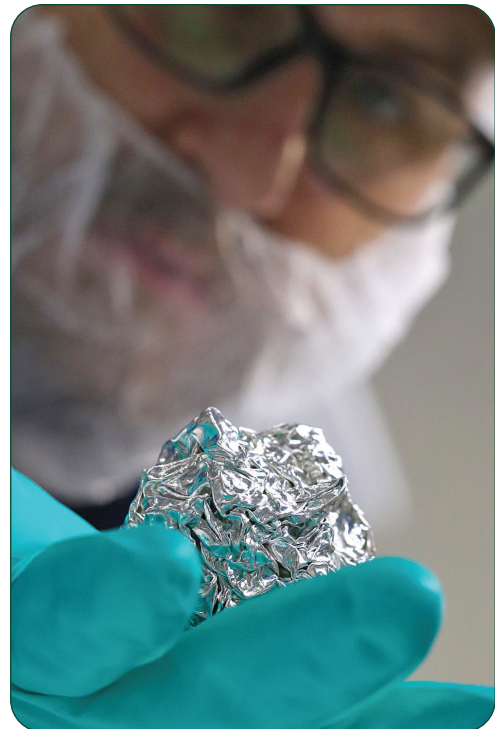
**Indium Foil** can be cut in many ways, either with scissors or even with a cutting wheel, as shown. **Indium Foil** can also easily be hand punched, if you need to have holes.

Handling **Indium Ribbon** in a thin thickness can be tricky. It is a good idea to use gloves and try and support the material when picking it up or moving it to a work station. The material is also so soft that it will scratch very easily. If wrinkles are formed, it is easy to flatten them back out.



### Indium Scrap has Value...

Although it would seem that our goal is to help you come up with a solution using indium, it is also our goal to help you learn and create scrap. Only by creating scrap is there proof that you have attempted to come up with a solution. Have no fear in making scrap with your **Indium Foil**. Simply contact us after you have used your **Indium Foil** and return your scrap to us. We will give you a discount code to order more **Indium Foil**, or work with our world-class tech service department to come up with a better solution for your application.



### Foil on a Coil

Foil on a coil is a value-priced product with the intent to get foil in our customers' hands as quickly as possible for experimentation and use. We guarantee 99.99% purity of elemental alloy composition. We **do not** provide certification of metal analysis or dimensional analysis. This can be provided for a fee, or you may contact us directly and speak to an inside sales representative for a custom defined product; however, commercial lead times and minimum lot charges may apply for custom products. Foil on a coil can also be provided in longer continuous lengths; please inquire directly if this is something you are interested in.

Want to learn more about indium and indium-based materials? Please check out our YouTube videos.

Contact our engineers: [askus@indium.com](mailto:askus@indium.com)

Learn more: [www.indium.com](http://www.indium.com)



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# Solder Ribbon and Foil

### Storage

Store **Solder Ribbon and Foil** in the original container, closed securely, in 55% RH or less at or below normal room temperature (~70°F/21°C). It can also be stored in an inert atmosphere, such as a nitrogen dry box.

### Packaging

We have developed standard packaging for various alloys and ribbon widths. However, if you have specialized needs, such as spool size, quantity per spool, or other requirements, we can meet your unique specifications.

Each order can be shipped with a Certificate of Analysis which includes information on metallic impurities. We can also provide a Certificate of Conformance when **Solder Ribbon and Foil** is made to customer specifications.

### Technical Support

Indium Corporation's internationally experienced engineers provide in-depth technical assistance to our customers. Thoroughly knowledgeable in all facets of Materials Science as it applies to the electronics and semiconductor sectors, Technical Support Engineers provide expert advice in solder properties, alloy compatibility and selection of solder preforms, wire, ribbon, foil, and paste. Indium Corporation's Technical Support Engineers provide rapid response to all technical inquiries.

### Safety Data Sheets

Please refer to the SDS document within the product shipment, or contact our local team to receive a copy.

## Some Physical Properties of Common Solder Ribbon and Foil Alloys

Liquidus (°C/°F)	Solidus (°C/°F)	Indalloy® Number	Composition	Plastic Range (°C/°F)	Mass Density (gm/cm <sup>3</sup> )	Electrical Conductivity (% of Cu)	Thermal Conductivity W/cm <sup>2</sup> °C @ 85°C	Thermal Coefficient of Expansion μ in/in/°C @ 20°C	Tensile Strength (psi)	Bond Holding Strength (Shear) (psi)
118/244	118/244	1E	52In/48Sn	Eutectic	7.30	11.70	0.34	20.0	1,720	1,630
138/281	138/281	281	58Bi/42Sn	Eutectic	8.56	4.5	0.19	15.0	8,000	500
143/290	143/290	290	97In/3Ag	Eutectic	7.38	23.00	0.73	22.0	800	—
154/309	149/300	2	80In/15Pb/5Ag	5/9	7.85	13.00	0.43	28.0	2,550	2,150
157/315	157/315	4	100In	Melting Point	7.31	24.00	0.86	29.0	273	890
167/333	154/309	9	70Sn/18Pb/12In	13/24	7.79	12.20	0.45	24.0	5,320	4,190
175/347	165/329	204	70In/30Pb	10/18	8.19	8.80	0.38	28.0	3,450	—
179/354	179/354	Sn62	62Sn/36Pb/2Ag	Eutectic	8.41	11.90	0.50	27.0	7,000	7,540
181/358	173/343	205	60In/40Pb	8/15	8.52	7.00	0.29	27.0	4,150	—
183/361	183/361	Sn63	63Sn/37Pb	Eutectic	8.40	11.50	0.50	25.0	7,500	6,200
210/410	184/363	7	50In/50Pb	26/47	8.86	6.00	0.22	27.0	4,670	2,680
221/430	221/430	121	96.5Sn/3.5Ag	Eutectic	7.36	16.00	0.33	30.2	5,620	—
232/450	232/450	128	100Sn	Melting Point	7.28	15.60	0.73	24.0	1,900	—
260/500	240/464	10	75Pb/25In	20/36	9.97	4.60	0.18	26.0	5,450	3,520
280/536	280/536	182	80Au/20Sn	Eutectic	14.51	—	0.57	16.0	40,000	40,000
356/673	356/673	183	88Au/12Ge	Eutectic	14.67	—	0.44	13.0	26,825	26,825
1,064/1,948	1,064/1,948	200	100Au	Melting Point	19.30	73.4	3.18	14.0	18,000-20,000	—

All information is for reference only.

Not to be used as incoming product specifications.

Also available: solder preforms, solder wire, solder paste, solder spheres, solder fluxes, solder ingot, and other solder fabrications.

Contact our engineers: [askus@indium.com](mailto:askus@indium.com)

Learn more: [www.indium.com](http://www.indium.com)



# Material Properties of Indium

## Structure

**Crystal structure:**

Face Centered Tetragonal at 25°C

a=0.325nm and c=0.494nm

## Mass Characteristics

**Atomic weight:** 114.818

Temperature	Density
20°C	7.300 g/cc
164	7.026
194	7.001
228	6.974
271	6.939
300	6.916

**Volume change on freezing:** 2.5% contraction

## Thermal Properties

**Melting point:** 156.61°C

**Boiling point:** 2,080°C

**Coefficient of thermal expansion:** linear, 24.8µm/m/K at 20°C

Temperature	Specific Heat
25°C	233 J/kg•K
127	252
156.63 (solid)	264
156.63 (liquid)	257
227	256
327	255
427	254

**Latent heat of fusion:** 28.47kJ/kg

**Latent heat of vaporization:** 959.42kJ/kg

**Thermal conductivity:** 83.7W/mK at 0°C

Temperature	Vapor Pressure
1,215°C	0.1013 kPa
1,421	1.0130
1,693	10.1300
2,080	101.3000

## Magnetic Properties

**Magnetic susceptibility:** Volumetric:  $7.0 \times 10^{-6}$  (mks or SI)

## Electrical Properties

**Super conducting at 3.38K:**

Temperature	Electrical Resistivity
20°C	84 nΩm
154	291
181	301
222	319
280	348

**Electrochemical equivalent:** Valence 3, 396.4µg/°C

**Electrode potential:**  $\text{In}^{\circ} \rightarrow \text{In}^{3+} + 3\text{e}^{-}$ , 0.38V

**Electronegativity:** 1.7

## Nuclear Properties

**Natural isotope distribution:**

Mass Number	Natural Isotope Percentage
113	4.3%
115	95.7

**Thermal neutron cross section:**

**For 2.2km/s neutrons:** absorption,  $190 \pm 10\text{b}$   
scattering,  $2.2 \pm 0.5\text{b}$

**Valences shown:** 3, 2, and 1

**Atomic radius/Goldschmidt:** 0.157 nm

**Atomic number:** 49

**Photoelectric work function:** 4.12 eV

**Electronic structure:**  $\text{Kr}4\text{d}^{10}\text{5s}^2\text{5p}^1$

**First ionization energy:** 133 kcal/gmole

## Mechanical Properties

K	Tensile Strength
295 K	1.6 MPa
76	15.0
4	31.9

**Compressive strength:** 2.14 MPa

**Hardness:** 0.9HB

**Elastic modulus at 20°C:** 12.74 GPa in tension

**Poisson's ratio at 20°C:** 0.4498

**Bulk modulus:** 35.3 GPa

**Tensile modulus:** 10.6 GPa

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All of Indium Corporation's solder paste and preform manufacturing facilities are IATF 16949:2016 certified. Indium Corporation is an ISO 9001:2015 registered company.

Contact our engineers: [askus@indium.com](mailto:askus@indium.com)

Learn more: [www.indium.com](http://www.indium.com)

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