

# TECHNICAL INFOSHEET

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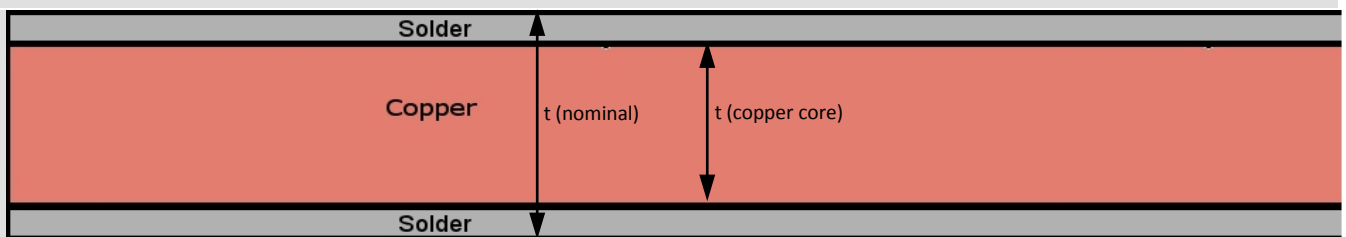
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## Thin Film Ribbon

Solder coated ribbon is a composite material consisting of a copper conductor with tin solder on both sides. Material is produced by roll-cladding.

### composition of material:



Schematic cross-section of solar ribbon

<b>copper core layer</b> 80 or 74 % of nominal thickness	ETP-Cu acc. to DIN EN 1976; 99.9% Cu incl. Ag; approximately
<b>top and bottom solder layer</b> 10 or 13 % of nominal thickness	Sn-solder alloy; different types or layer ratio available on request: <ul style="list-style-type: none"> <li>- Sn96.8% with anti-oxidants</li> <li>- SnAg3Cu0,5</li> <li>- SnAg3,5</li> <li>- Sn62Pb36Ag2</li> <li>- Sn60Pb39,1Sb0,9</li> </ul>
<b>layer ratio (Solder)</b>	3,3% / 4% / 10% / 13% in thickness percentage
<b>application</b>	Interconnecting ribbon for thin film modules

### physical

#### properties

(design values only, will not be certified)

density depending on solder alloy and layer ratio; "mixed" density of solder and copper	metric units				
	Solder	SnAg3Cu0,5	SnAg3,5	SnPb36Ag2	SnPb39,1Sb0,9
	13%	8,517 g/cm <sup>3</sup>	8,519 g/cm <sup>3</sup>	8,888 g/cm <sup>3</sup>	8,903g/cm <sup>3</sup>
	10%	8,610 g/cm <sup>3</sup>	8,612 g/cm <sup>3</sup>	8,895 g/cm <sup>3</sup>	8,907 g/cm <sup>3</sup>
	4%	8,797 g/cm <sup>3</sup>	8,910 g/cm <sup>3</sup>	8,796 g/cm <sup>3</sup>	8,915 g/cm <sup>3</sup>

electrical conductivity of copper core	100 % IACS
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<b>mechanical properties</b>	Yield strength Rp0,2 [MPa]	Tensile strength Rm [MPa]	Elongation A [%]
	Max. 115	200-250	Min. 15
<b>dimensional properties</b>	Camber according to DIN EN 1652 or on agreement		
<b>solder quality</b>	Oven annealed		
<b>recommendations for processing</b>	- Do not remove protective wrapping until use		
<b>manufacturing program of strip</b>	thickness of strip [mm]	0.1 – 0.5 mm ( <i>nominal value including solder</i> )	
	width of strip [mm]	1.0 – 10.0 mm	
	thickness tolerance	±10 % on total thickness; thickness of each layer as determined by volume ratio shall not deviate by more than +/-10% from nominal	
	width tolerance	+/- 0.05 mm	
	preferred spool types [mm]	HKV 200; HKV 160; HKV 125 <i>Side shields 50/95 with outer diameter 250 mm others on request</i>	
	slitting edges	Edges remain untinned due to slitting process	

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