

solcos

**Technical
Information
Vfeb2010**

Solder Plated Flat Copper Wire

Technical Characteristics

Product.	Electrolytic Flat copper wire of high purity 99.99%, smooth, brilliant, cleaning. Out of scales and strokes, plated by dipping with tin and lead with different chemicals compositions. You can choice ETP Copper (C110) or Oxygen Free Copper (C102)
First uses.	Solar cells, contacts, electronic circuits repairs kit.
Manufacturing's rules.	Particular customer's specification or this technical data sheet.
Temper	Soft. / Hard / ½ Hard (see technical parameters in apendix XXX regarding Tensile and Yield Strngth)
Packing	To see enclosed pictures with models

Bare Copper Flat Wire Tolerances	SOLCOND	UHP SOLCOND
Thickness: +/- 10% of the nominal thickness		+/- 0.005 mm.
Width:		
From 1.00 mm. to 3.00 mm.	+/- 0.10 mm.	+/- 0.03 mm.
From 3.01 mm. To 5.00 mm.	+/- 0.20 mm.	+/- 0.05 mm.
From 5.01 mm. To 6.00 mm.	+/- 0.25 mm.	+/- 0.07 mm.
Camber: max 12,7 mm in 914 mm. (regular 3-6 mm in 1000 mm)		(see additional information)

Manufacturing's magnitudes.	Min Thickness: 0.04 mm. Max Thickness: 0.60 mm.
	Min Width: 1.00 mm. Max Width: 6.00 mm.
	We can produce other dimensions only under consult.

Thickness Plated	Regular 10-15 microns per side Regular 15-25 mic per side (Recommended for Komax, Somont, P Energy, Team Technic machines) Regular 25-30 mic per side (Recommended for NPC machines) Regular 16-22 microns per side Regular 30-50 microns per side
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Plated Chemical Composition	Regular Sn (tin) 60% / Pb (lead) 40% Sn (tin) 96.5% / Ag (silver) 3.5% Sn (tin) 62 % / Pb (lead) 36% / Ag (silver) 2% --(LOWER FUSION POINT) Sn (tin) 63% / Pb (lead) 37% Only Sn 100% (Copper up to 1.50% / other requirement) Others. Sn 70/ Pb 30 – Sn 80/ Pb 20 – Sn 50/ Pb 50 - Only Sn Only Sn (Copper <1.50%) We can produce other chemical mix only under consult.
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Normal period of delivery.	21 days depending on the available production and the measures apply for.
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Comparison of UHP SOLCOND with regulars pv ribbons

PV RIBBON for solar cells interconnection

Actually the regular pv ribbon produced in the market follow the next properties

Tolerances =mm.=	Regular PV RIBBON offered in the market	UHP SOLCOND
Widht	Min ± 0.07 Max ± 0.10	± 0.03 mm.
Thickness	Min ± 0.01 Max ± 0.02	± 0.005 mm.

With the new UHP SOLCOND the module maker can reduce the dimension of the Photovoltaic ribbon requested due to that, the less tolerances offered for the new SOLCOND allow to reduce the difference between the minimum cross section to the maximum cross section.

Example

Regular Photovoltaic Ribbon **Ultra High Precision SOLCOND**

Size 0.15 x 2.00 mm.	Minimum NOMINAL cross section	
Minimum thickness	0.135 mm.	0.145 mm.
Minimum width	1.90 mm.	1.97 mm.
MINIMUM NOMINAL CROSSSS SECTION	0.2565 mm ²	0.2856 mm²
	Maximum NOMINAL cross section	
Maximum thickness	0.165 mm.	0.155 mm.
Maximum width	2.10 mm.	2.03 mm.
MAXIMUM NOMINAL CROSSSS SECTION	0.3465 mm ²	0.3146 mm²
DIFFERENCE BETWEEN MIN to MAX	35.08%	10.15%

In the same dimension the difference between min to max cross section offered for the regulars pv ribbon of the market is 35.08% against **10.15% Offered by UHP SOLCOND**

Following on this calculation we could think that if the min cross section offered by the regulars Photovoltaic ribbons of the worldwide market is 0.2565 mm².

We could say that if we decrease the thickness of the ribbon with UHP SOLCOND we could get the same result as follow

Min cross section of the regular PV ribbon for 2.00x0.15 mm is = 0.2565 mm²

If UHP SOLCOND warranty min widht in 1.97 mm. The NEW thickness for the ribbon will be **0.13 mm. Instead of 0.15 mm.**

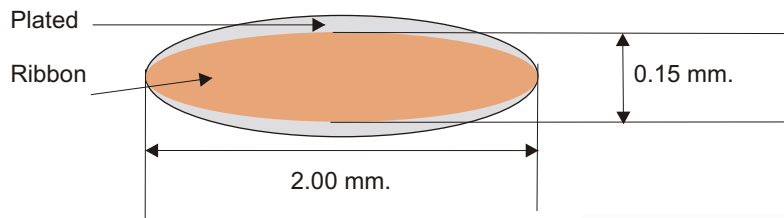
If we reduce the thickness to 0.13 mm. We could say that the force of the ribbon over the solar cells will be less with 0.13 mm than 0.15 mm., Ofcourse it will bring better results on the soldering and lamination process with thinner solar cells.

THE MOST IMPORTANT IMPROVEMENT

So far the big improvement in the precision that ULTRA HIGH PRECISION SOLCOND OFFER in the market nowadays there is other important point that the new ribbon offer in comparison with the present ribbons offered in the market

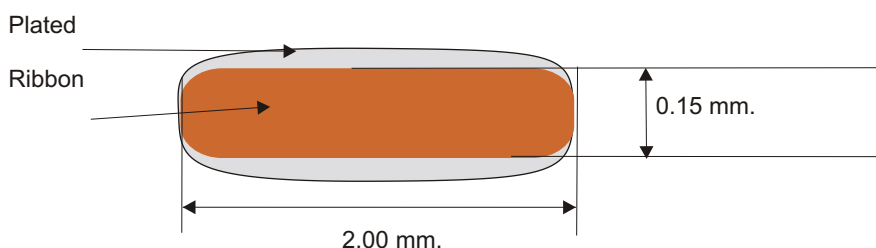
Perfectly flat ribbon

If you place a piece of ribbon in the microscope you will see that all the ribbons offered in the market produced by rolling process have the following shape

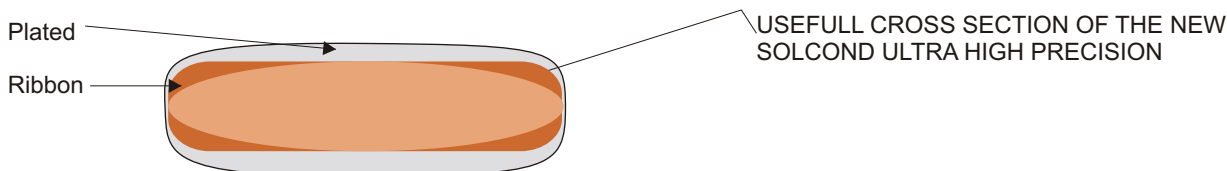


The ribbons offered in the market show an oval shape instead of a perfectly flat shape. This shape produce that the before calculation that we made for the cross section be not really right, because we calculate the cross section like a rectangle Width x Thickness

In the **NEW ULTRA HIGH PRECISION SOLCOND** has a rectangle shape offering more cross section in the same dimension.



As a result the new ULTRA HIGH PRECISION SOLCOND has **bigger cross section in the same dimension** due to the corners in the shape offer around 8 to 10% more copper.



In conclusion and coming back to the previous calculation we can say that the original cross section made in the previous calculation (page before) was wrong and it should be 8% smaller. Therefore

Previous calculation of Min cross section : $0.2565 \text{ mm}^2 - 8\% = 0.2359 \text{ mm}^2$ EFECTIVE CROSS SECTION

THE NEW POSSIBLE THICKNESS FOR YOUR RIBBON COULD BE: 0.1197 mm.

The values showed in the present technical datasheet, must be validated for each module manufacture according their own module production process.

Regular Sizes

CREATIV produces special ribbon sizes according client's needs, however there are several options according most popular market requirements.

Mentioned sizes are in according with bare sizes

PV RIBBON for solar cells interconnection (Other sizes under request)

Thickness Mm.	Width mm.	Square Section mm2.	Thickness inches	Width inches	Square Section inches2
0.076	1.780	0.135	0.030	0.701	0.0210
0.076	2.030	0.154	0.030	0.799	0.0239
0.100	2.000	0.200	0.039	0.787	0.0310
0.100	2.540	0.254	0.039	1.000	0.0394
0.100	3.000	0.300	0.039	1.181	0.0465
0.127	2.030	0.258	0.050	0.799	0.0400
0.127	2.540	0.323	0.050	1.000	0.0500
0.150	2.030	0.305	0.059	0.799	0.0472
0.150	2.300	0.345	0.059	0.906	0.0535
0.150	2.540	0.381	0.059	1.000	0.0591
0.180	2.540	0.457	0.071	1.000	0.0709
0.200	2.000	0.400	0.079	0.787	0.0620
0.200	2.500	0.500	0.079	0.984	0.0775

PV RIBBON for solar tab interconnection (Other sizes under request)

Thickness mm.	Width mm.	Square Section mm2.	Thickness inches	Width inches	Square Section inches2
0.150	5.000	0.750	0.059	1.969	0.1163
0.200	5.080	1.016	0.079	2.000	0.1575
0.200	4.000	0.800	0.079	1.575	0.1240
0.250	5.080	1.270	0.098	2.000	0.1969
0.300	5.080	1.524	0.118	2.000	0.2362
0.350	5.080	1.778	0.138	2.000	0.2756
0.380	5.080	1.930	0.150	2.000	0.2992
0.500	5.000	2.500	0.197	1.969	0.3875

Ultra High Precision **SOLCOND UHP** (Other sizes under request)

Thickness mm.	Width mm.	Square Section mm2.	Thickness inches	Width inches	Square Section inches2
0.100	2.00	0.200	0.059	1.969	0.1163
0.120	2.00	0,240	0.079	2.000	0.1575
0.130	2.30	0.299	0.079	1.575	0.1240
0.150	2.30	0.345	0.098	2.000	0.1969
0.150	2.00	0.300	0.118	2.000	0.2362
0.150	1.50	0.225	0.138	2.000	0.2756
0.150	2.50	0.375	0.150	2.000	0.2992
0.200	5.000	1.000	0.197	1.969	0.3875

Camber Measuring

CREATIV SOLCOND PV RIBBON is 100% controled in our production side. 100% of the spools are checked in order to warranty To the customer our high quality products..

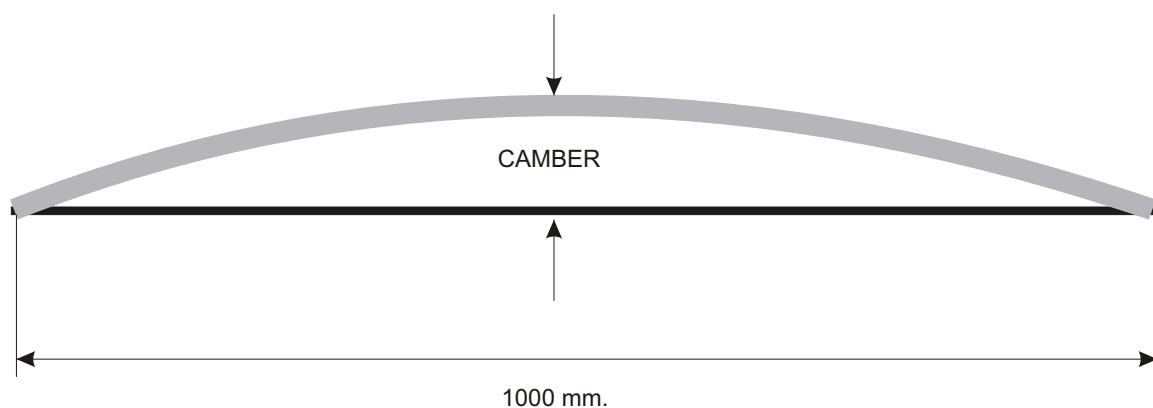
The camber is the curvature of the ribbon in 1 meter and is measured according the bellow drawing.

The camber is a very important factor for the modules maker production since it warranty a good aling of the ribbon over the solar cell in order that it feet in tne cell bus bar.

Despite that some stringer machines have a system to correct the camber before soldering, this system cannot correct high values of camber.

It means that the warranty of the camber dimensions will help to the module maker to improve the module production.

CAMBER MEASURING:

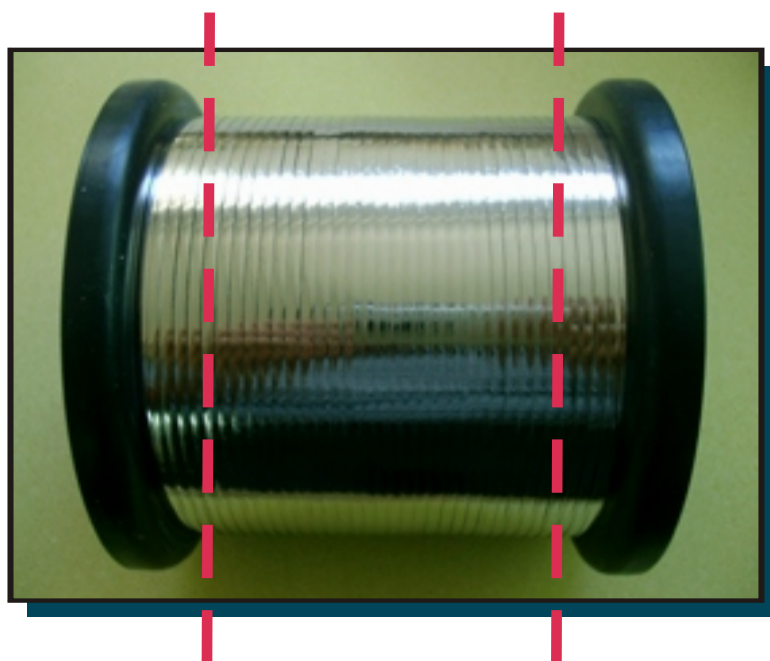


The camber is produced during the spooling time in the ribbon production. We split the camber are in 3 areas (2 sides of the spool + center). Usually the camber is higher in the sides due to the spooling system, When the direction of spooling change the wire copy this Movemete producing the camber.

In the center area the camber can reach. Up to 3 mm.

In the sides area the camber can reach up to 10 mm.

Other specifications can be requested under consult.



TEMPER

CREATIV produces special ribbon **tempers** according client's needs, however there are several options according most popular market requirements. On the other hand, our material has tested in several stringers machines and also hand soldering. The last development was to introduce a more flexible material in order to get less cell breakage on the production process after soldering.

PV RIBBON for solar cells interconnection

Elongation in %	
Annealed	20 to 40 %
Half Hard	15 to 20 %
Hard	5 to 15 %
Spring	Less 5 %

Yield Strength Mpa Rp 0.2	
CPR 0	60-90
CPR 1	91-120
CPR 2	121 a 160

Tensile Strength Mpa	
Soft	150 a 220

Tensile Strength: It is the last tensile strenght of the material, the limit value previous on the material breaks, with sudden release of the elastic energy. The max value of the material will sustain before fracture. This value is calculated by dividing the max load by the original cross section area. The original cross section area is calculated by weight for the specific weight of the raw material. The tensile strength unit measure is Nw/m² or Mpa or Ksi.

Yield Srength. It is as the amount of strain that a material can undergo before moving from elastic deformation into plastic deformation. The specified permanet deformation has been standarized for the Cu in 0.2% offset on the stress-strain curve. The yield strength unit is Mpa or Ksi.

It is commonly used for Power transformers and it is regulated in the BSI 1432 with different grades.

Fusion Point

Plated Chemical Composition	Solid Temperature	Liquid Temperature	Specific Weight	Traction
10/90	234	325	10.7	3.40
20/80	183	277	10.2	3.80
30/70	183	255	9.70	3.90
40/60	183	234	9.28	4.30
50/50	183	216	8.90	4.77
60/40	183	189	8.52	6.0
63/37	183	183	8.42	6.0
Sn100%	232	232	7.30	1.1
95-A	236	243	7.27	2.8
SAVI Nro. 2	183	215	8.90	5.5
HFP (1)	296	301	11.06	3.6
LFP (2)	145	145	8.54	6.3
LFP 2% Ag. (3)	177	179	8.51	-
Pb 100%	327	327	11.34	1.2

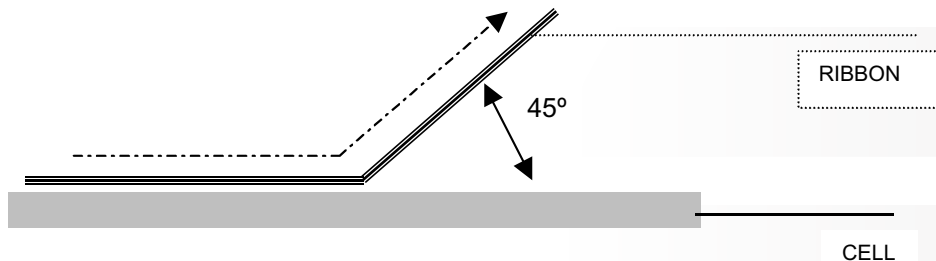
(1) Sn 50% / Pb 50% (2) Sn 60% / Pb 40% (3) Sn 62% / Pb 36% / Ag 2%

Welding Ribbon Test

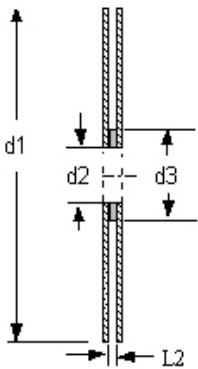
SOLCOND provides excellent welding conditions for your solar cells offering long shelf life after your welding process.
(See following table)

Plated Chemical Composition	Resistance of the welding in Gr. In normal conditions	Resistance of the welding in Gr. After 5 hours over - 165 Degrees
Sn 100%	>800 gr.	>440 gr.
Sn 62% / Pb 36% / Ag 2%	>800 gr.	>440 gr.
96.50 / 3.50	>800 gr.	>440 gr.
100	>800 gr.	>440 gr.

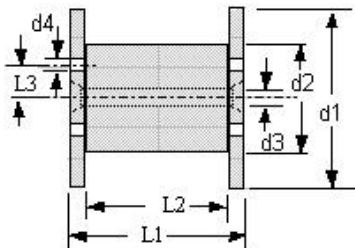
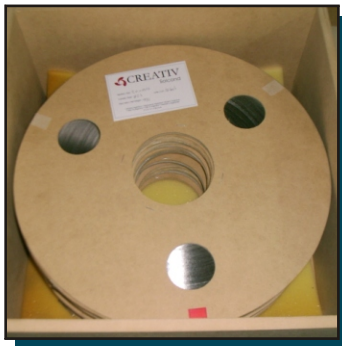
(*) It measures depends of the cell quality



Packaging

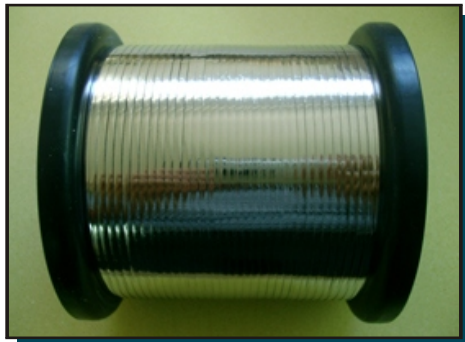


Number	d1 mm	d2 mm	d3 mm	L2 mm	Kg. Capacity for Ribbon Widths				Material	Id. Nr.
					1.5 mm	2.0 mm	2.5 mm	4.0 mm		
15 x 4 A	381.00	101.60	114.30	variable	1.2	1.6	2.0	3.2	Wood	*1
8 x 3/4 C	203.00	19.00	63.50	variable	0.3	0.4	0.5	0.8	Wood	*2
14 x 4 C	356.00	101.60	139.70	variable	1.0	1.3	1.6	2.6	Wood	*3



Number	d1 mm	d2 mm	d3 mm	d4 mm	L1 mm	L2 mm	L3 mm	Capacity kg	Mat.	Notes
Jp5	150	80	20	5	110	90	15	5.0	ABS	1
D125	125	80	16	7	125	100	20	3.0	PS	1
D160	160	100	22	13	160	128	32	6.0	PS	1
SDK300	300	50.5	11	103	91	44.5	15	12.0	PS	1

Notes: 1. Meets ICE 264-2-1 (DIN 46 399)



Material Identification

Labels are important to identify the materials during the process or when they are packed into the boxes at your warehouse. Due to this CREATIV labels identify the product clearly informing Operator N° and N° of spool provide traceability for our quality system. Besides in each wood box you will find the following information. Barcode, provides an internal secure control in order that right quantities be mentioned into right boxes and packing list.

CUSTOMER NAME
PURCHASE ORDER
PRODUCT

WEIGHT IN Kg. And Lb

LENGTH IN meters And Feet

Lot N° and Unit N°.

BARCODE



Cartoon Boxes

In order to maintain in good conditions the materials from our factory to your use, We pack the reels into the wood boxes. The sizes of the boxes are in accordance with the reel dimension. Besides, we protect the material with nylon and cardboard.

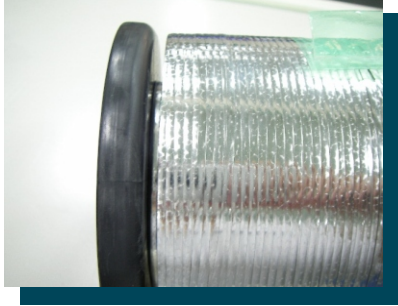
D160 spools - 4 spools per cartoon (up to 28 Kg. Net) -
D125 spools - 10 spools per cartoon (up to 30 Kg. Net)
Jp5 Spools - 6 spools per cartoon (up to 30 Kg. Net)

170 mm. Height x 330 mm. Widht x 330 mm. Length
135 mm. Height x 260 mm. Width x 135 mm. Length
170 mm. Height x 330 mm. Widht x 330 mm. Length



Vacuum Protection

CREATIV protect the ribbons with vacuum system protection in order to prevent the corrosion in longterms and in order to fit ribbon against the spools protection the displacements of the spires into the spool. This protection decrease the possibility to get gaps on the lateral sides of the spools after a shock.



The pictures shows
The problems of the
Hits or shocks on the
Transport WITHOUT
Vacuum protection



Vacuum protected
Spools system

CREATIV provide shock sensor labels in each shipment in order to prevent the shock on the transport. Also preventions labels FRAGILE and handling information are clearly showed



Pallets

The pallets are made according the necessity of the shipment and the boxes are moored with plastics tapes and all is cover with plastics strict bags. The pallets dimensions are according to the quantity shipped.



How to order SOLDCOND PV Ribbon?

If you wish to order us SOLCOND PV Ribbon will be better that you can send your requirement under the following form and including all the following information in order to attend your requirement with out not troubles.

- Quantity (ex. 1300 Kg. you can inform us the quantity in meters)
- Type of base material. (Ex. Cu CDA 110 or Cu CDA 102)
- Type of plated mix. (Ex. Sn 62% / Pb 36% / Ag 2% or Sn 96.50% / Ag 3.50%)
- Sizes of the bare ribbon (Ex. 0.10x2.00 or 0.20x5.00) PLEASE SEE THAT SIZES WILL BE IN ACCORDANCE OF BARE DIMENSION
- Thickness of the plated (Ex. 10-15 mic per side Or 30-50 mic per side) PLEASE SEE THAT SIZES OF THE MENTIONED PLATED WILL IN ACCORDANCE WITH THE PLATED PER SIDE)

Yield strength.

Tensile Strength

Elongation

- Packaging type. (Ex. Reel 15x4 or DIN 160 Spool)

In other words if you wish to order us SOLCOND ribbon of copper ETP 110 0.10x2.00 mm. plated with Sn62/Pb36/Ag2 10-15 mic per side and packed in DIN 160 spools you should order according the following way.

1300 Kg. PV RIBBON CU ETP CDA 110 SOLCOND 62/36/2 0.10x2.00 mm. 10-15 D160