

POWER ENHANCING & SPECIAL INTERCONNECT SOLUTIONS



Reliable. Durable. Innovative.

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ULBRICH SPECIALTY WIRE PRODUCTS

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Solar Technologies



LCR™

Light Capturing Ribbon

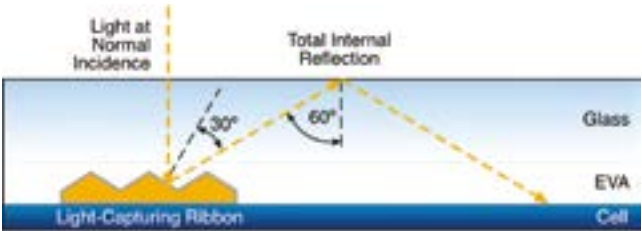
LCR™ is a high efficiency grooved solar cell interconnect wire that replaces traditional flat ribbon used to connect solar cells together within a module. It was developed to increase the efficiency of a solar module by reflecting more light back onto the surface of the cell. This innovative grooved interconnect wire steers the reflected light back to the glass/air interface allowing total internal reflection back onto the cell surface. Up to 80% of the incoming light that strikes the LCR™ ribbon is recovered significantly higher than the 5% recovery of traditional solar cell tabbing and interconnect wire.

BENEFITS

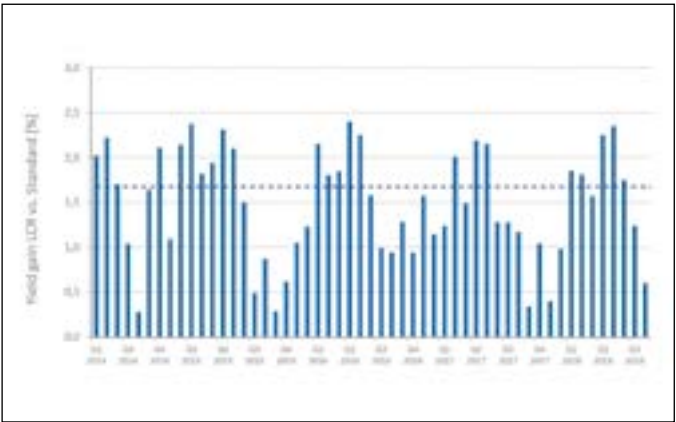
- Up to 3% increase in solar module power output
- Silver plated for maximum reflectivity and conductivity
- Engineered lower yield strength copper wire to prevent cell damage during stringing process
- Now also available in Aluminum
- Compatible with current manufacturing processes with minimal retooling
- Application Engineers design LCR products to satisfy each clients’ unique needs and specifications
- Improved Aesthetics – uniformly dark cells for improved appearance
- Low Coefficient of thermal expansion (low yield) for minimal internal stress (day/night effect) prevents cell breakage during extreme temperature changes and variations.
- Applicable for Heterojunction Cell Technology
- Designed to use with conductive adhesive solutions
- Lead free / RoHS compliant

Light Capturing Ribbon Specification	
Base material	CDA 110 / ETP-1 CDA 101 / CDA 102 / OF-1 Copper
Dimension	Width: 0.600-1.500 Thickness Equivalent: 0.100-0.225 mm
Reflectivity	= > 65%
Coating alloy	Ag100
Mechanical Properties	$R_m: < 270 \text{ [N/mm}^2\text{]}$
	$R_{p0.2}: 90-120\text{[N/mm}^2\text{]}$
	$A = > 20 \text{ [%]}$
Spool	10S
	H20
	K125
Customized specifications available upon request	

INTERNAL REFLECTION



Schematic drawing of light hitting the Light-Capturing Ribbon, being reflected back onto the cell.



Yield increase trough LCR™ in long time field test. (Ref.: W. Muehleisen et al.: EPJ Photovoltaics 7, 70701, 2016)

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MTW

Multi Tabbing Wire

Multi-Tabbing Wire is the newest development for the multiple Bus-bar technology. Over the years, UST has leveraged experiences in product development, manufacturing and marketing competences to engineer a solder coated copper round wire for cell interconnection.

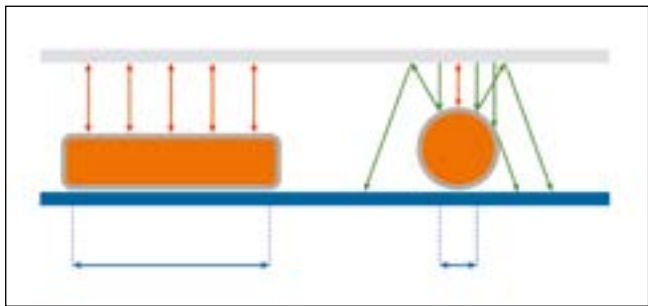
Ulbrich's Multi-Tabbing Wire offers the same high quality and product performance standards you are familiar with from all our other products we supply to the PV Industry. Multi-Tabbing Wire is available in all common copper grades including high-purity oxygen-free copper.

There are no limitations regarding the available dimension you need to build the best performance modules. We have developed a solder coating process to achieve concentric coating layers to guarantee consistent soldering results in the stringing process. The options of solder materials have been expanded to include bismuth and indium alloys, in addition to our standard SnPb alloys.

BENEFITS

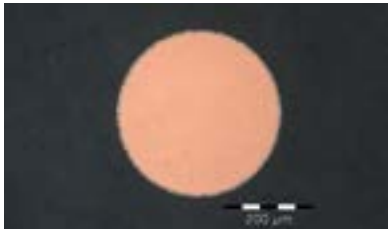
- Concentric solder coated round wire for high efficiency solar cell modules
- Available in lead or lead free solder materials including special low melting temperature materials
- Engineered to your unique dimension, surface coating and physical property requirements
- Manufactured with state of the art processes to ensure consistent product properties
- Precision wound and packaged for safe transportation and stringer processing
- Flexible concerning cell bond options regardless of the heat source
- Manufactured according to ISO certified processes

INTERNAL REFLECTION / SHADOWING LOSS



Reduced shadowing due to small dimension of round wire.

Multi Tabbing Wire Specification		
Base material	CDA 110 / ETP-1 CDA 101 / CDA 102 / OF-1 copper	
Dimension	Ø 0.200 - 0.500 ± 0.005 [mm]	
Coating alloy	Sn60Pb40	Sn62Pb36Ag2
	Sn100	Sn96.5Ag3.0Cu0.5
	Bi58Sn42	In52Sn48
Coating thickness	2.0 – 5.0 [µm]	
	10.0 – 20.0 [µm]	
Mechanical Properties	R _m : < 270 [N/mm²]	
	R _{p0.2} : 100-160[N/mm²]	
	A = > 20 [%]	
Spool	10S	
	H20	
	K125	
Customized specifications available upon request		



MTW before and after soldering

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SCR™

Selectively Coated Ribbon



NEW

Patent Pending

Selectively Coated Ribbon



Upgrade your Modules!

- Enhanced internal reflection
- Power gain at every angle of incidence
- Increased module power
- Plug and play process integration

Heraeus' and Ulbrich's newly developed cell-connecting ribbon – SCR™ – for PV applications – increases module power easily. Its unique design enables a plug and play process integration. SCR™ can be used with all standard soldering and stringing technologies including contact, infrared, inductive and manual soldering. SCR™ has proven its reliability in long-term climate chamber tests. Manufactured and distributed by Ulbrich, this ribbon meets the highest standards with its outstanding quality and precision.

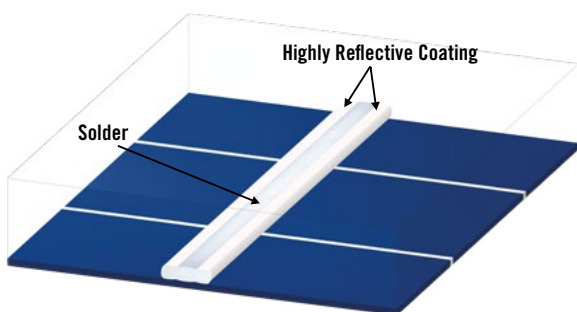


Solar Technologies
Official Manufacturer & Distributor

SCR™

SCR™ stands for Selectively Coated Ribbon. In a continuous and fully automated process, a highly reflective coating is applied onto the flat rolled ribbon. This coating supports internal reflection in the solar module and increases its power output.

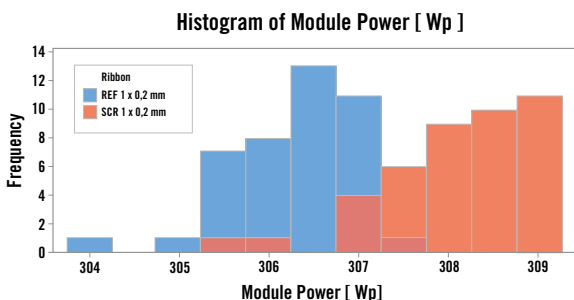
Due to the ribbons precision and unique design, the integration into an existing module manufacturing process is simple and requires no further investment.



POWER GAIN

The reflective white, high-stability coating on the SCR™ leads to higher internal reflection and to higher Short Cut Current (I_{sc}). Statistically proved results show an average power gain of 1.9 Watt per module.*

*External test results. Series of 84 60-cell modules (5BB, Mono, Perc, full cell)



PLUG & PLAY

New products must be competitive and easy to integrate into existing production processes. The compatibility of SCR™ with all standard soldering technologies makes it easy to substitute your current cell interconnectors.

Soldering and Stringing Technologies suitable for SCR™:

- Contact soldering
- Infrared soldering
- Induction soldering
- Manual rework

MECHANICAL PROPERTIES

Optimized mechanical properties of the SCR™ improve the thermo-mechanical stress situation caused by the different thermal expansion coefficients of the copper ribbon and silicon cell. A specially designed heat treatment process, applied before the coating process, guarantees the needed reliability and fatigue resistance for solar cell interconnections.

RELIABILITY

- Thermal cycling test: 600 cycles passed
- Damp heat test: 2000 h passed
- Combined Damp heat and UV: 240 kWh/m² passed

DIMENSIONS

To ensure optimal power-gain in your module, this product will be available in a variety of dimensions.

Ulbrich's Application Engineering Team will assist you in finding the right product specification for your application.

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SPR

Standard PV Ribbon

In reaction to the quick changing and super flexible solar market Ulbrich Solar Technologies established its new Standard Solar product line. With our new standardized solar module connector materials we created the possibility to react quickly to spot market demands and therefore help our customers to capitalize any short-term business opportunities and support their inventory management. Of the shelf materials in the most common specifications delivered within days and within the high Ulbrich Solar Technology quality standards are the foundation of our new Standard Solar Product Line.

Standard Tabbing Ribbon Specification

Base material	Cu
Dimension Copper Core	width: 1,000 +/- 0,070 [mm] thickness: 0,200 +/- 0,005 [mm]
Coating Quality	hot dip tinned
Coating Alloy	Sn60Pb40 acc. EN ISO 9453
Coating thickness	15 - 25 [µm]
Mechanical Properteis	Rm: max. 270 [Mpa] Rp0,2: max. 80 [Mpa] A: min. 25 [%]
Spool	10SB, HKV 160

Standard Bus Ribbon Specification

Base material	Cu
Dimension Copper Core	width: 5,000 +/- 0,080 [mm] thickness: 0,300 +/- 0,010 [mm]
Coating Quality	hot dip tinned
Coating Alloy	Sn60Pb40 acc. EN ISO 9453
Coating thickness	15 - 25 [µm]
Mechanical Properteis	Rm: max. 270 [Mpa] Rp0,2: max. 140 [Mpa] A: min. 15 [%]
Spool	10SB



In nearly three decades Ulbrich Solar Technologies developed a solid foundation and reputation in the international solar community. Hot dipped copper flat ribbon was the first product Ulbrich delivered to the first solar module customers of the modern photovoltaics industry. Hot dipped copper flat ribbon are still a demanding product for modern manufacturing facilities and play a major technological role in modern module manufacturing.

To support the rapidly changing solar business environment the new Ulbrich Standard PV Ribbon product line makes Ulbrich's high quality products available on short notice. A large stock of standard specifications enables our customers to minimize their own inventories and optimizes the reaction time to fast changing market demands. Together with our customers Ulbrich's logistic departments manage and plan their demands just in time.



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