

“Exclusive Use of the ZSW's New CIGS World Record Offers Manz Further Considerable Opportunities to Significantly Cut Production Costs”

- **Efficiency of 20.8 percent: highest efficiency ever achieved using thin-film technology, even above laboratory efficiency levels achieved with polycrystalline solar cells**
- **Manz holds the exclusive right to utilize the world record technology, which will allow the company to rapidly implement it in production technology for mass production**
- **Sustained increase in solar power's competitive position through significant cost reductions**

Reutlingen, 28 October 2013. The Baden-Württemberg Center for Solar Energy and Hydrogen Research (ZSW) has presented a CIGS thin-film solar cell with an efficiency level of 20.8 percent. This world record was officially confirmed by the Fraunhofer Institute for Solar Energy Systems ISE in Freiburg. The record-holding cell was manufactured using the co-evaporation method, a technology that was developed further and patented jointly by Manz and the ZSW.

With this new CIGS thin-film cell, the ZSW exceeded the efficiency of today's widely-used polycrystalline solar cells for the first time and compensates the only remaining disadvantage of the vastly cost-efficient thin-film technology. This success, which impressively confirms the the future potential of CIGS, is the result of intensive joint research conducted by the ZSW and Manz. The stated goal of their partnership is to cut the cost of solar power even more rapidly, and with this outstanding result, the two partners have moved a large step closer to this goal.

Three questions about the 20.8-percent world record for Dieter Manz, founder and CEO of Manz AG:

1. **What does the ZSW's new world record mean for the solar industry and for Manz? Can this milestone trigger a new wave of investments?**

The new world record is an extremely important step, both for our company and the industry as a whole. In this way the only remaining disadvantage of thin-film modules compared to polycrystalline solar cells has been eliminated, the marked share of the cost-efficient CIGS thin-film technology will thus increase significantly. Our company holds the exclusive usage rights to this world record technology, and will now transition it from the laboratory into mass production. With a record module efficiency of 14.6% we have already caught up with polycrystalline technology last year; the research result of the world record cell will help us speeding up the increase of efficiency on production size modules. This is exactly why Manz has the CIGS innovation line in Schwäbisch-Hall, where we produce modules on a large scale and transfer knowledge gained in the lab to mass production. Customers of our CIGSfab, the fully-integrated, turnkey production line for CIGS thin-film solar panels will see the greatest benefit from this achievement – we are going to offer them exclusive access to the world's leading world-record technology. As such, we can guarantee them maximum security for their investment in the field of photovoltaics. I firmly believe that there is currently no other way in world to enter the PV market that is anywhere near as safe and profitable as our model. As a result, the odds of us selling a Manz CIGSfab have never been better.

The signal we are sending to the industry is clear: using a CIGSfab, manufacturers can produce panels far below the current standard costs. Thus grid parity in countless areas of the world can be achieved. A year ago, we announced that our technology has the potential to usher in a new era in the solar industry. And now we have the proof: CIGS thin-film is more efficient than polycrystalline. I am greatly pleased that we played a major role in achieving this.

2. Which effect will the CIGS world-record have on the further development of the photovoltaic industry?

The basic conditions are going to change in favor of CIGS thin-film technology. CIGS production costs are considerably more favorable already today and on top of that, the technology has the greatest potential for further efficiency increases. Production lines can be scaled as desired and thanks to the comparatively low initial investment; they are perfect for manufacturing panels locally in the large growth markets of PV with local content requirements. These markets are characterized by an energy demand that is constantly increasing which cannot be covered by fossil fuels. In order to meet this trend

head on, as well as develop new industry sectors and create qualified jobs, many countries are taking serious efforts to establish local production capacities. CIGS thin-film technology and the Manz CIGSfab are both perfect for this purpose. Thanks to the high level of integration compared to crystalline production, the production process is much more simple, considerably more affordable and can thus be realized much faster. In addition, the lion's share of the materials needed, can be sourced locally which additionally strengthens the local economy. CIGS is simply the best solution for companies that want to produce solar panels locally.

3. Solar power is still considered too expensive. Rightly so?

Not at all. In many parts of the world, solar power can already compete with power generated by large-scale power plants. This means costs are now at a level similar to fossil fuels. Talking about the generation of peak load, solar power has been the cheaper alternative for many years already compared to diesel generators or infrequent running gas-fired power plants. As a result, markets in sunny growth regions of the world have the opportunity to cover an increasing share of their local demand for electricity with solar power.

And this trend has just begun! At Manz we have a roadmap for our solar business that plans to offer customers of our CIGSfab panel efficiency increases up to 16% and more within the coming four years. Like this, power generation with CIGS thin-film modules becomes competitive and cost-efficient almost everywhere on the world.



Dieter Manz (right) with Dr. Kay Orgassa, head of CIGS development, next to a CIGS thin-film solar panel.

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Manz AG – Passion for Efficiency

Manz AG, headquartered in Reutlingen, Germany, is one of the world's leading high-tech engineering firms. Founded in 1987, in recent years the company has grown from an automation specialist into a supplier of integrated production lines. Manz has expertise in six fields of technology: automation, laser processes, vacuum coating, screen printing, metrology, and wet-chemical processes. These technologies are used and developed in three strategic business areas: Display, Solar, and Battery.

The corporate group led by founder Dieter Manz has been listed on the stock exchange in Germany since 2006, and currently develops and manufactures its products in Germany, China, Taiwan, Slovakia, and Hungary. Manz also has sales and service offices in the United States, South Korea, and India. At the beginning of 2013, Manz AG employed approximately 1,850 people, 900 of whom work in Asia. With its slogan, "Passion for Efficiency," Manz's engineers are making a promise to offer its customers – all companies active in important future markets – increasingly efficient production equipment. As an engineering firm, the company plays a significant role in reducing the cost of manufacturing end products, making these products available to large groups of buyers worldwide.

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