

# OPTICAL DISC AND SOLAR SMART SOLUTIONS TO DRIVE THE FUTURE





## **SUCCESSFUL WITH OPTICAL DISC – A NEWCOMER QUICKLY BECOMES GLOBAL MARKET LEADER**

The history of SINGULUS TECHNOLOGIES started on June 14, 1995 as a buy-out from the Leybold AG in Hanau. The objective of the company was a metalizer for the coating of Compact Discs. Upon its foundation SINGULUS had already planned the entry into the system activities and soon began to develop complete inline production lines for Compact Discs. When SINGULUS presented the CD production line SKYLINE in April 1996 at a trade fair, the company held the number 15 supplier in the market.

With the DVD an entirely new era began in 1996: The first versions of this new optical disc were presented in Japan. At the beginning an inline production process appeared unfeasible to the Japanese developers. However, SINGULUS' experts made this possible after one year of development efforts: the world's first inline production line for DVD named SPACELINE was presented at a professional fair in the US in 1997 and later commissioned for a customer. A success story began.

Since 1996, 5,000 metalizers, nearly 3,000 CD production systems and more than 1,500 SPACELINE systems for the DVD production have been delivered to customers around the world. Since 2008 SINGULUS has been intending to repeat this success in the realms of the third format generation Blu-ray. Today the company is the undisputed market leader for CD, DVD and Blu-ray Disc production lines.



## **THE SECOND PILLAR SOLAR – ON ITS WAY TO ANOTHER SUCCESS STORY**

With the acquisition of the company STANGL Semiconductor Equipment AG in 2007, the foundation was laid to establish the company in the growing photovoltaics market. In the meantime, numerous new products were developed and made marketable at SINGULUS and STANGL. Since 2010 SINGULUS pursues a substantial expansion strategy in the Solar segment. In the future the product range will not be limited to individual machines and plants: SINGULUS together with STANGL will increasingly advance towards a supplier of complete systems with process know-how.

## **BLU-RAY –** WITH A QUANTUM LEAP INTO THE FUTURE

The new Blu-ray format established itself as a standard for movies in high-definition quality. The demand for the new format of the third generation continues to grow globally. For 2010 the market research institute Futuresource projects a growth rate of 60 %. The Blu-ray Disc offers users so far unheard of possibilities: BD-Live provides direct online access with many features: interactive raffles, access to specialized movie databases, chats, exclusive interviews or Facebook profiles, amongst others. The latest technologic developments pave the way for the Blu-ray format. The 3-D movie technology with HD resolution will revolutionize the media world. Movies in 3-D format require 75 to 100 Gbyte storage capacity and can only be saved on Blu-ray Discs. Blu-ray is the format of the future and will therefore repeat the success of the DVD.



## **SOLAR –** SUCCESS WITH INNOVATIVE TECHNOLOGIES

Step by step solar energy emancipates from governmental support programs and quickly moves towards net parity. Net parity for small PV plants is expected to be realized in 2 to 4 years at the latest. The growth rates of 40-50% of the photovoltaics industry in the next couple of years provide SINGULUS a solid market platform for new, innovative plant concepts. With the innovative vacuum coating systems, the wet-chemical inline cell cleaning and etching equipment and patented new processes for the production of thin-film solar cells SINGULUS rigorously progresses the expansion in the solar market. The first successes in 2010 prove us right: SINGULUS is on its way to move more and more towards a “Solar Company” - with a strong Optical Disc pillar.





## OPTICAL DISC SET FOR THE FUTURE WITH BLU-RAY

SINGULUS TECHNOLOGIES is the global market leader for optical disc production lines for CDs, DVDs and Blu-ray Discs and the only provider to offer an entire product range for the complete value chain: mastering, molding and replication.

Within one year of the market introduction in 1997 SINGULUS had already achieved a market share of 70 % with its DVD production line SPACELINE. With the new format generation Blu-ray this success should be repeated. Aside from the format developer SONY there is no other company with such extensive know-how for inline mastering and the inline production of Blu-ray Discs.

The first Blu-ray production systems BLULINE were already delivered to major international customers in 2005. At the beginning of 2008 SINGULUS presented the BLULINE II for dual layer Blu-ray with 50 Gbyte storage capacity. Today, customers around the world are operating with more than 70 Blu-ray production lines supplied by SINGULUS.



## BLU-RAY



At the Consumer Electronics Show (CES) 2010 in Las Vegas Blu-ray 3-D players and 3-D TVs were presented. After the introduction of high-definition television consumers can thus look forward to the next innovation.



The Blu-ray Disc with a capacity of 50 Gbyte is the only inexpensive storage medium for the sale of 3-D movies in high-definition quality (HD – High Definition).



**BLULINE II – "THE 3<sup>RD</sup> DIMENSION"**  
PRODUCTION EQUIPMENT FOR SINGLE LAYER  
AND DUAL LAYER BLU-RAY DISC



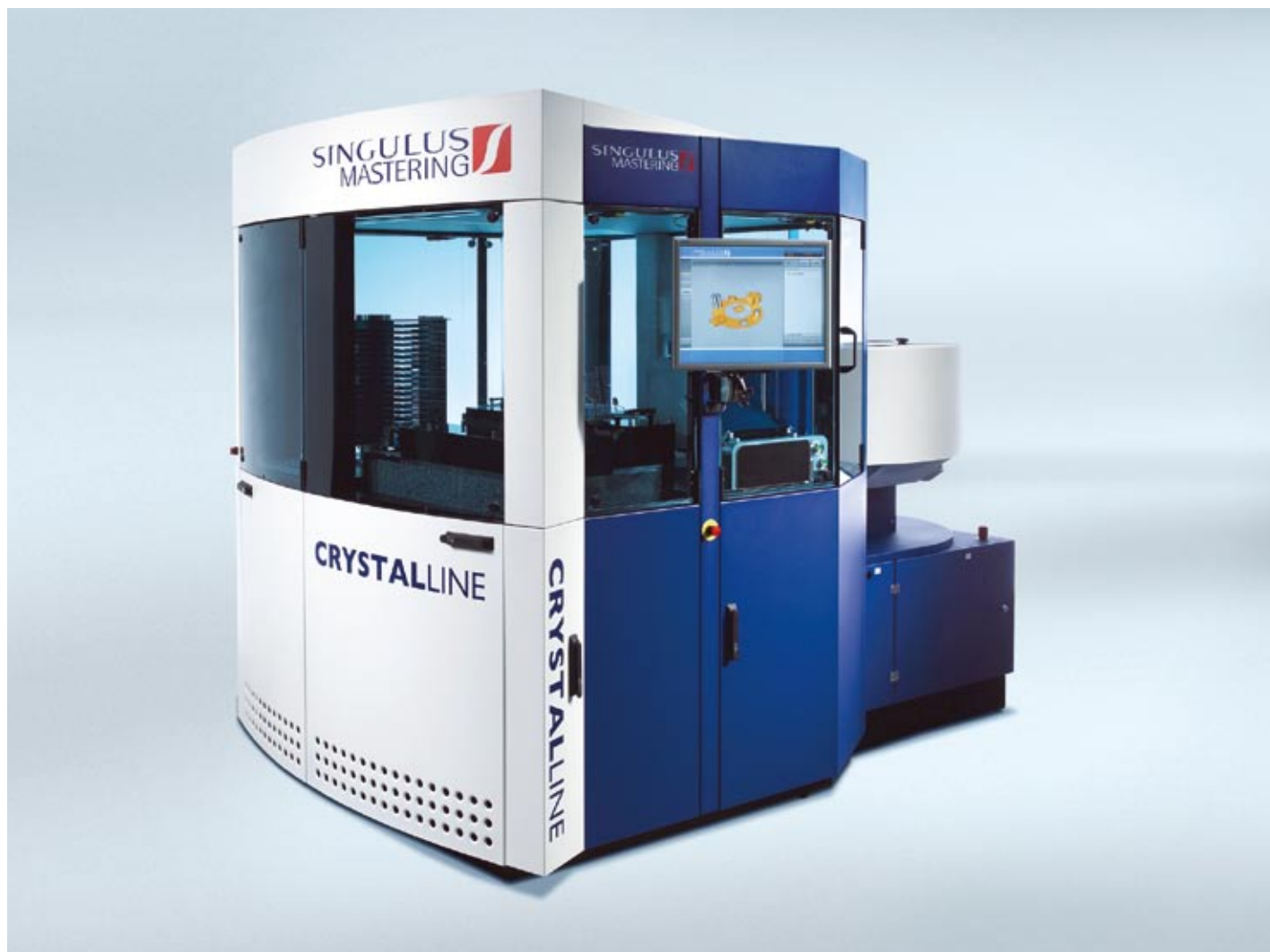
With the BLULINE II SINGULUS once again succeeded in setting a benchmark for reliability and production levels of Blu-ray Disc manufacturing. With a cycle time of less than 4 seconds this machine sets highest standards and is almost unrivaled in the world.

The developers and engineers at SINGULUS have thus set a standard for the manufacturing of 50 Gbyte Blu-ray Discs - a machine technology that is also applicable for discs with higher capacity of 75 to 100 Gbyte.

The BLULINE II - 3<sup>rd</sup> Dimension is technologically designed for the upcoming high-definition 3-D movies on Blu-ray.



**CRYSTALLINE –**  
MASTERING SYSTEM FOR SINGLE  
AND DUAL LAYER BLU-RAY DISC



In the realms of mastering technology SINGULUS is also the only company next to SONY to be able to offer production technology for manufacturing.

In April 2009 the first Blu-ray disc masters according to the demanding specifications of the dual layer technology were produced. The mastering system CRYSTALLINE was certified for the dual layer Blu-ray Disc in 2009.

Since then additional systems for the manufacturing of single and dual layer Blu-ray Discs are being employed by customers.

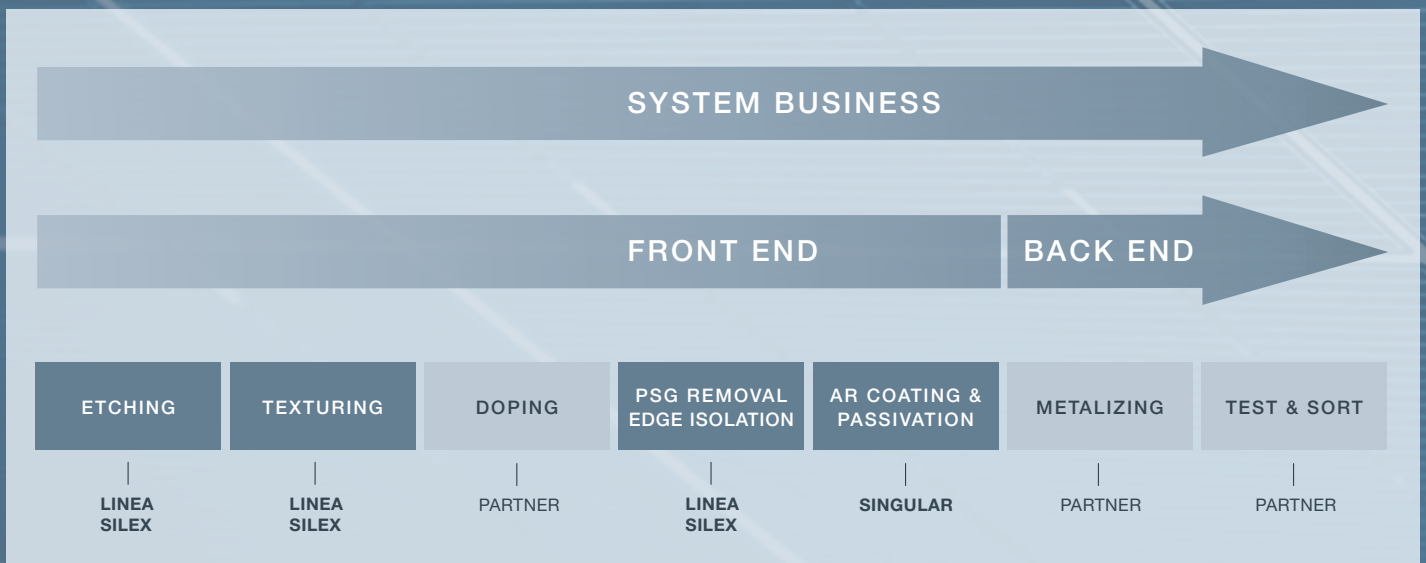


## SILICON SOLAR TECHNOLOGY

In the area of silicon solar technology SINGULUS TECHNOLOGIES delivered the first SINGULAR inline coating machine for anti-reflective coating of silicon solar cells in November 2009. STANGL's newly developed inline cleaning system LINEA with the corresponding fully-automated wafer handling system was installed at the identical customer at the same time.

The company's goal with respect to the silicon solar technology is to position itself at the forefront with the launch of new production technologies. In the future SINGULUS will not only supply individual machines and equipment for the silicon solar technology but will also actively market so-called front end systems and complete production systems for the whole cell production with process know-how in the solar market. For this SINGULUS and STANGL already possess the necessary basic expertise for wet-chemical and AR-coating processes. This enhancement of the business model from single machines towards systems was also successful in the Optical Disc market some years ago.

### SINGULUS SYSTEM BUSINESS: FROM WAFER TO SI-SOLAR CELLS





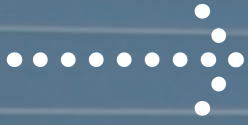
### **SINGULAR** AR COATING PLANT FOR SI-SOLAR WAFER

SINGULAR is a new PECVD coating system for crystalline silicon solar cells, which should satisfy both today's and future requirements of solar cell production processes. The machine offers an innovative inline concept for powerful Si-solar cell production.



### **LINEA** INLINE CLEANING MACHINE FOR SI SOLAR WAFERS

LINEA is a new inline machine for wet-chemical cleaning and etching of crystalline solar wafers. The LINEA system handles 1,500 to 3,000 wafers/hour and accordingly achieves a production capacity of 30 to 60 MW, respectively. LINEA supplements the STANGL portfolio of wet-chemical systems in the solar cell production.



## THIN-FILM SOLAR TECHNOLOGY

Thin-film solar panels offer specific advantages compared to the silicon solar technology. They are excellently suited as architectural design elements. SINGULUS is the market leader for the wet-chemical cleaning applying CIS and CdTe processes. New plant concepts, which employ spray ion layer gas reaction (ILGAR) processes for example, expand the portfolio and value-added chain in the area of thin-film solar technology. The company's target is to position itself at the forefront for the introduction of new technologies with respect to silicon as well as thin-film solar technology. Step by step SINGULUS will progress towards a system supplier in this solar segment as well.

### **SINGULUS offers modern production systems for CIS/CIGS and CdTe thin-film solar panels made of glass and flexible substrates:**

- Glass washing machines
- Wet-chemical systems
- Systems for the manufacturing of cadmium-free buffer layers
- Equipment employing spray ion layer gas reaction (ILGAR) processes
- Selenization ovens
- Diffusion ovens
- TCO etching machines
- TCO coating machines

## VITRUM

INLINE CLEANING AND COATING SYSTEM  
FOR THIN-FILM SOLAR CELLS



Modular inline cleaning and coating machine for thin-film solar cells on glass with cycle times of 60 seconds. The dimensions of the glass substrates can be up to 2.6 meters.

## IMPEDIO

INLINE CLEANING AND COATING SYSTEM  
FOR FLEXIBLE THIN-FILM SOLAR CELLS



The roll-to-roll production equipment of the IMPEDIO type for the wet-chemical coating of thin-film solar cells are applied in the CIS/CIGS technologies.



**SINGULUS** 

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