



MEIER **SOLAR** SOLUTIONS

Dear Customers and Partners,

Since its foundation in 1999, Meier Solar Solutions GmbH has established itself as the global market leader for laminators used in the encapsulation of solar modules. This is largely as a result of innovative entrepreneurship.

The success is in part based on ongoing research and development work. Indeed, only companies that are ahead of their time and constantly set high quality standards can compete in the rapidly growing photovoltaic sector.

Nevertheless, growth alone is not our maxim. Conscious decisions relating to employees and resources – from environmental protection to personnel policies – form an essential part of our corporate culture. After all, we believe that a holistic approach will ultimately have a positive effect on the quality of our products.

Against this background, we look forward to entering into a cooperative partnership with you to jointly capitalise on the opportunities of this future market.

Best wishes,



Florian von Gropper, CEO

OPPORTUNITIES AND RESPONSIBILITIES OF A GLOBAL MARKET LEADER



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PHILOSOPHY

GERMANY

SUSTAINABLE TECHNOLOGY

EDUCATION, KNOWLEDGE AND RESEARCH

ACTIVELY ENGAGING WITH SOCIAL ISSUES

Is it possible for us to manufacture goods in Germany and nonetheless remain highly profitable? Can we grow rapidly while, at the same time, nurturing a shared basis of trust with our employees and partners? Can we actively exchange and pass on our knowledge without compromising our competitive position in the process? Yes, we can!

As a global company, we have the opportunity to make a contribution to a society that is better prepared for the future, to be a role model, to protect places of study and jobs in Germany and to promote sustainable and resource-saving business.

For this reason, we consistently foster innovation in sustainable technologies and services. We support measures for improving environmental and work conditions – not only within our company but also in relation to our contractual partners and suppliers.

For example, being a member of the registered association, Solarvalley Sachsen-Anhalt e.V., we systematically support application, education, scholarship and research in photovoltaics. And one of our corporate goals is to drive forward the urgently needed integration at a global level by exchanging knowledge as free as possible from any barriers.

MEIER SOLAR SOLUTIONS

Working in highly qualified teams, we develop innovations for the world market and construct and manufacture highly efficient encapsulation systems for solar modules.

At our plants in Bocholt and Rossla we currently employ about 140 staff in the fields of research & development, construction, customer support, electrical engineering, mechanical engineering, production, automation, software, sales and administration.

Customer service is always at the top of our list of priorities – from the project phase to order processing and commissioning down to training sessions and technical support, we ensure that our customers benefit from optimal working processes with our laminators.

BOCHOLT



ROSSLA



PRODUCTION AND SERVICE “MADE IN GERMANY”

With more than 260 systems for encapsulating thin-film and crystalline modules, we have the largest base of laminators installed in production worldwide. And precisely because we exclusively manufacture our products at our plants in Bocholt and Rossla, our technologies and innovations are sought after all over the world. Indeed, it is only here that we can offer our international customers top-class products and process quality while consistently dovetailing research and development with production and sales.

Nevertheless, to ensure that we are internationally represented with our “made in Germany” products and to offer our customers the best possible service, we are continually extending our global representative offices.

In addition to our main offices in Germany, our **SALES & SERVICE OFFICES** are also located in:

- CHINA
- INDIA
- ITALY
- CANADA
- SINGAPORE
- SPAIN
- SOUTH KOREA
- TAIWAN
- CZECH REPUBLIC
- USA
- ...

STACOLAM/ICOLAM

**MORE THAN 260 LAMINATORS
INSTALLED WORLDWIDE**

THIN-FILM & CRYSTALLINE MODULES

QUALITY & INNOVATION

MADE IN GERMANY



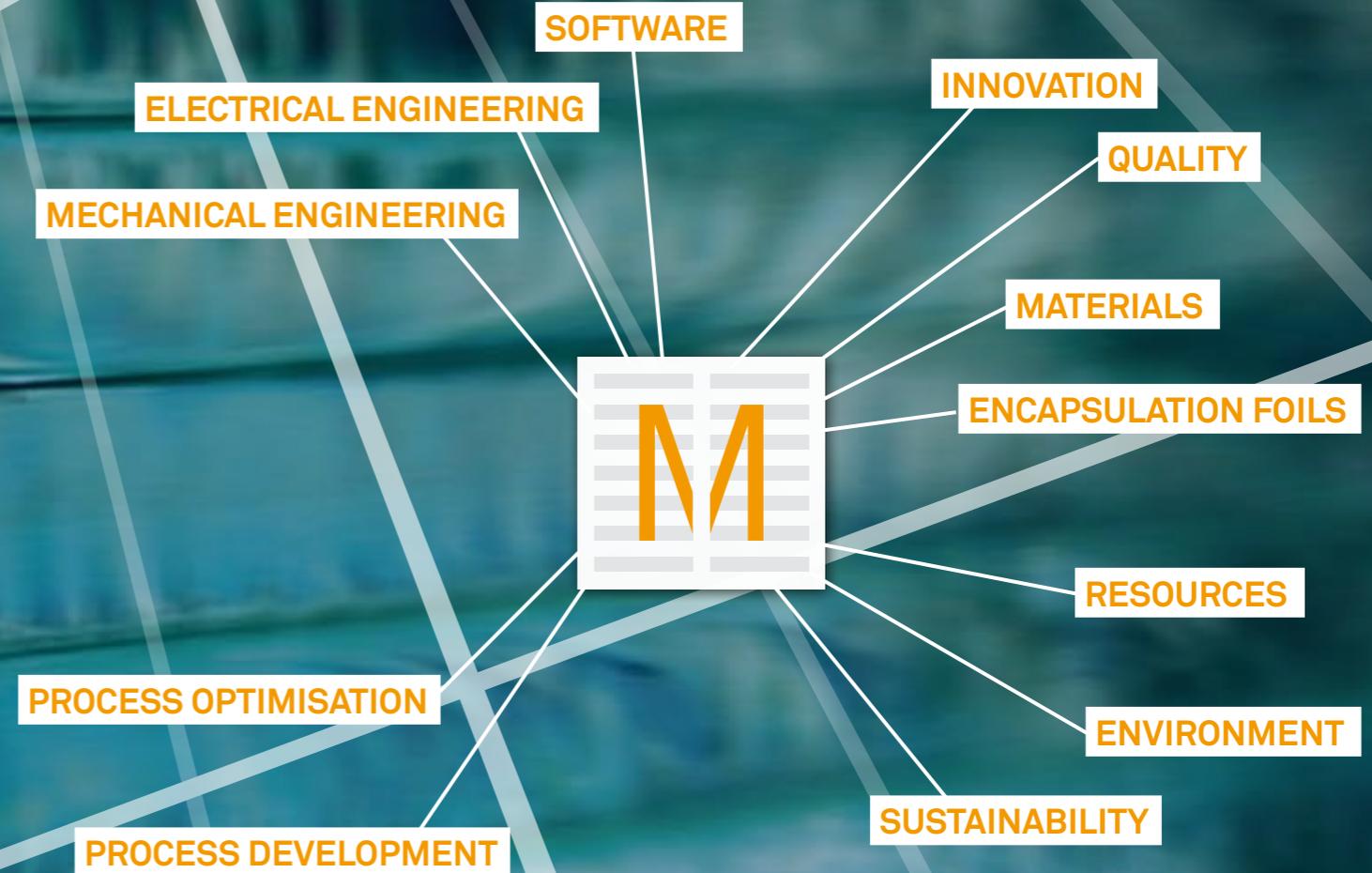
LIVING AND FOSTERING A SPIRIT OF INNOVATION

You can promote customer loyalty by providing excellent services, fair prices and outstanding quality – but there is one thing that a technology company should never neglect: developing truly innovative products. For Meier Solar Solutions, innovation is the matrix for a persistently high demand which allows us continued growth internationally.

In terms of all relevant mechanical, electrical and software-related fields, our research and development know-how is state-of-the-art. Especially in the fields of process development and optimisation, we continually strive to meet to perfection customer-specific requirements with regard to different foils, coatings, and formulas. Notably in processing PVB as well as all other common thermoplastics (TPO, TPSE) as well as EVA NC, EVA FC and EVA UFC, we set new standards with our laminators!

In addition, in our capacity as promoter and development partner we are in close contact with strategic suppliers and customers as well as with leading institutes, universities and research establishments, such as the Fraunhofer Centre for Silicon Photovoltaics.

RESEARCH & DEVELOPMENT





THE LAMINATING PROCESS

01

Firstly, the solar modules are fed into the laminator.

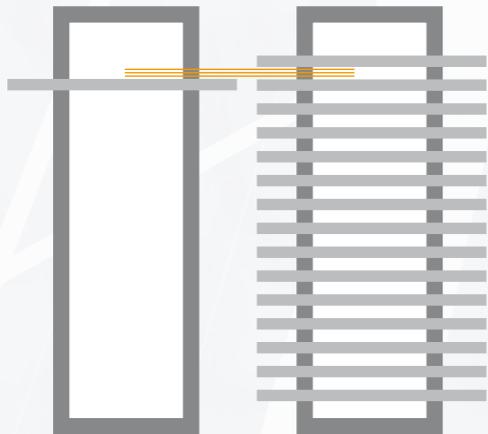
02

When the modules are in position, the lid of the laminating chamber closes and the air under the membrane in the laminator is evacuated. At the same time, a heating plate brings the solar module to the optimum temperature. As the foil starts to crosslink, the space above the membrane, which up until then had also been evacuated, is flooded with air. Due to the pressure difference the membrane presses the module together. In so doing, the pressing times vary according to the module structure and the type of foil material used. Finally, the lid space that has been filled with air is evacuated again.

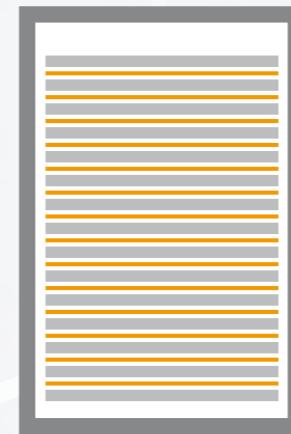
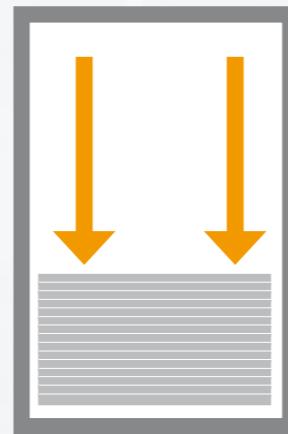
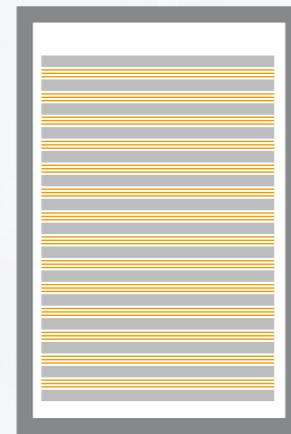
03

After venting the laminating chamber and opening the lid the finished module is guided out and then handed over to the removal station. There the modules can be removed manually or collected by the downstream system.

01



02



03



INNOVATIVE “SOLAR SOLUTIONS“ IN USE

Here we take the opportunity to introduce the most important examples of our solution-based research and development to you, in order to give you an insight into the innovative power of Meier Solar Solutions.

SOLAR SOLUTION 01: (HIGH)STACKING

SOLAR SOLUTION 02: QUICK CLAMPING SYSTEM

SOLAR SOLUTION 03: VACUUM TECHNOLOGY

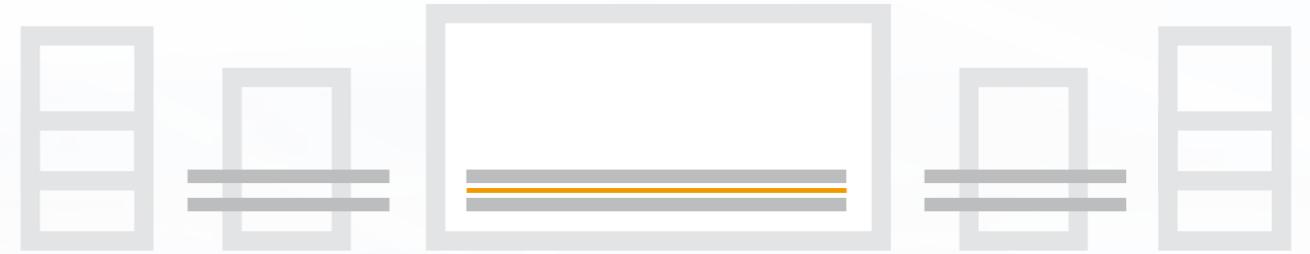
SOLAR SOLUTION 04: TRANSPORT PRECISION

SOLAR SOLUTION 05: PIN LIFTING

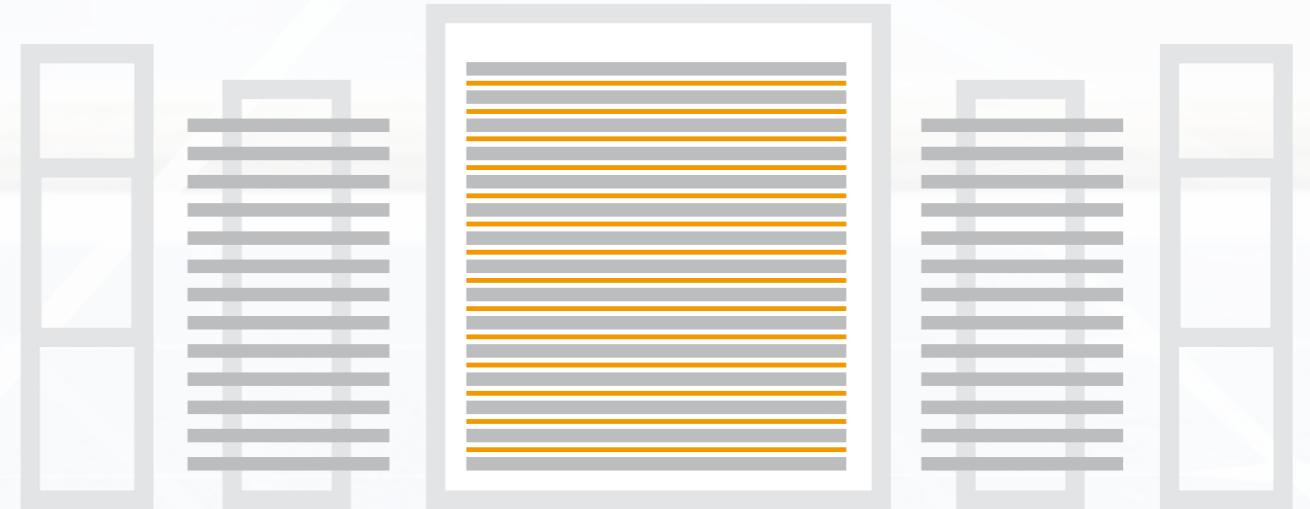
SOLAR SOLUTION 06: TEMPERATURE HOMOGENEITY

SOLAR SOLUTION 07: PROCESS OPTIMISATION

VACUUMLAMINATOR



STACKLAMINATOR





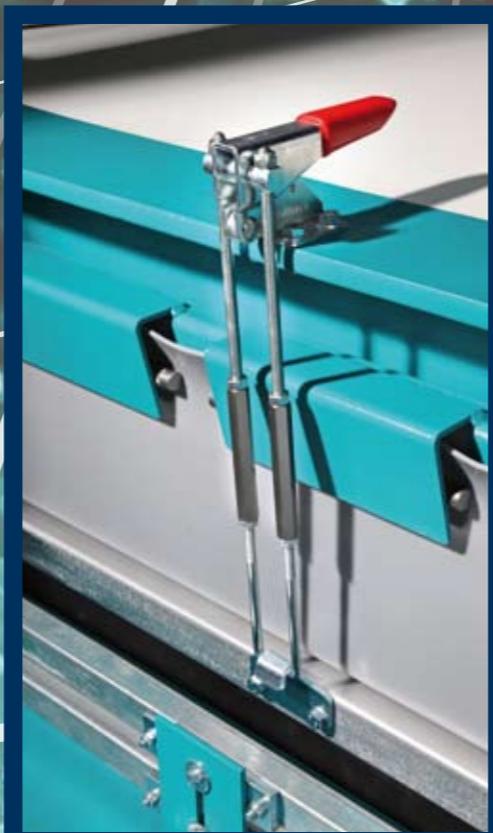
01: (HIGH)STACKING

(High)stacking is an innovative machine from Meier Solar Solutions. It offers huge advantages in the lamination process in respect of space required, speed, capacity utilisation and volume. At the present time it is possible to encapsulate up to 15 levels of solar modules.

02: QUICK CLAMPING

To date, membrane change was a time-consuming, complicated and cost-intensive procedure. The membrane had to be preheated, in order to pretension it after slackening a number of screws, and several people were required to fit it. This work is no longer necessary thanks to the "Quick Clamping System" patented by Meier Solar Solutions. The quick clamping mechanism developed especially for this reduces the time for the replacement of the torn membrane to less than 20 minutes. Re-tensioning is possible if required, this considerably increases the service life of the membrane.

The patent held by Meier Solar Solutions saves time and money thanks to shorter down-times and can be retrofitted to many laminators.



03: VACUUM TECHNOLOGY

High performance vacuum pumps and an excellent seal on the chamber parts provide a complete vacuum in the laminating chamber. A fan is connected upstream to provide sufficient suction even when the pressure is low.



04: TRANSPORT PRECISION

Glass fibre straps with a PTFE coating are the tried and tested method to minimise any possible sticking when the modules are being transported in the laminator. Any material that does stick is removed by a brush and scraping device. The system can be fitted directly on the lid to protect the membrane from impurities.



05: PIN LIFTING

Gentle heating of the modules is achieved by placing the glass on pins that can be moved in and out using a lifting system. At the same time transverse warping of the glass is restricted to a minimum.



06: TEMPERATURE HOMOGENEITY

A maintenance free heating system with heating conductors in CNC-milled grooves provides homogenous temperature distribution on the whole of the usable surface. The heating plates are divided into several separate control zones. If required, the system can additionally be fitted with a cooling system, in order to enable cooling down in the laminator.



07: PROCESS OPTIMISATION

A smooth production procedure is the core of every manufacturing process. Only someone who can understand the whole of the procedure, when and to what standard of quality the different systems have been manufactured, is in the position to use this experience in an optimum way for the future. It is therefore obvious that together with product development, process optimisation is one of our core subjects.

The result of this research and development work is amongst other things a process control system for our laminators that enables control, inspection and storage of all process data using an industrial PC. All processes can be called up again at a later date. The operation of the plant can also be carried out completely via the system. Access to the computer via the company internal network is also possible, as well as remote maintenance via modem.

LAMINATORS BY MEIER SOLAR SOLUTIONS

AUTOMATIC AND SEMI AUTOMATIC
MACHINES FOR THIN-FILM AND CRYSTALLINE PROCESSES

VACUUMLAMINATOR

ICOLAM

STACKLAMINATOR

STACOLAM



THE ADVANTAGES OF OUR LAMINATORS

- + OPTIMUM BONDING OF THE LAMINATES
- + SECURE PROTECTION AGAINST MECHANICAL AND WEATHER DAMAGE
- + EVEN APPLICATION OF FORCE ON THE LAMINATOR SURFACE
- + VARIABLE CONTACT PRESSURE VIA PRESSURE CONTROL
- + EXACT INSPECTION AND CONTROL OF THE LAMINATING PROCESSES
- + HIGH DEGREE OF TEMPERATURE HOMOGENEITY
- + AUTOMATIC PROCESS CONTROL
- + EASY INTEGRATION IN EXISTING PLANTS
- + OPERATOR FRIENDLY

ICOLAM – VACUUMLAMINATOR

All-inclusive efficiency: fully automatic process control is already part of the basic equipment for the ICOLAM laminating system. The program control allows different combinations to be stored using the PC function, so that they are available to the controller operating system at any time. This means that a specially co-ordinated process flow can be set, saved and called up again at any time at the push of a button.

EXACT INSPECTION AND CONTROL



TEMPERATURE HOMOGENEITY

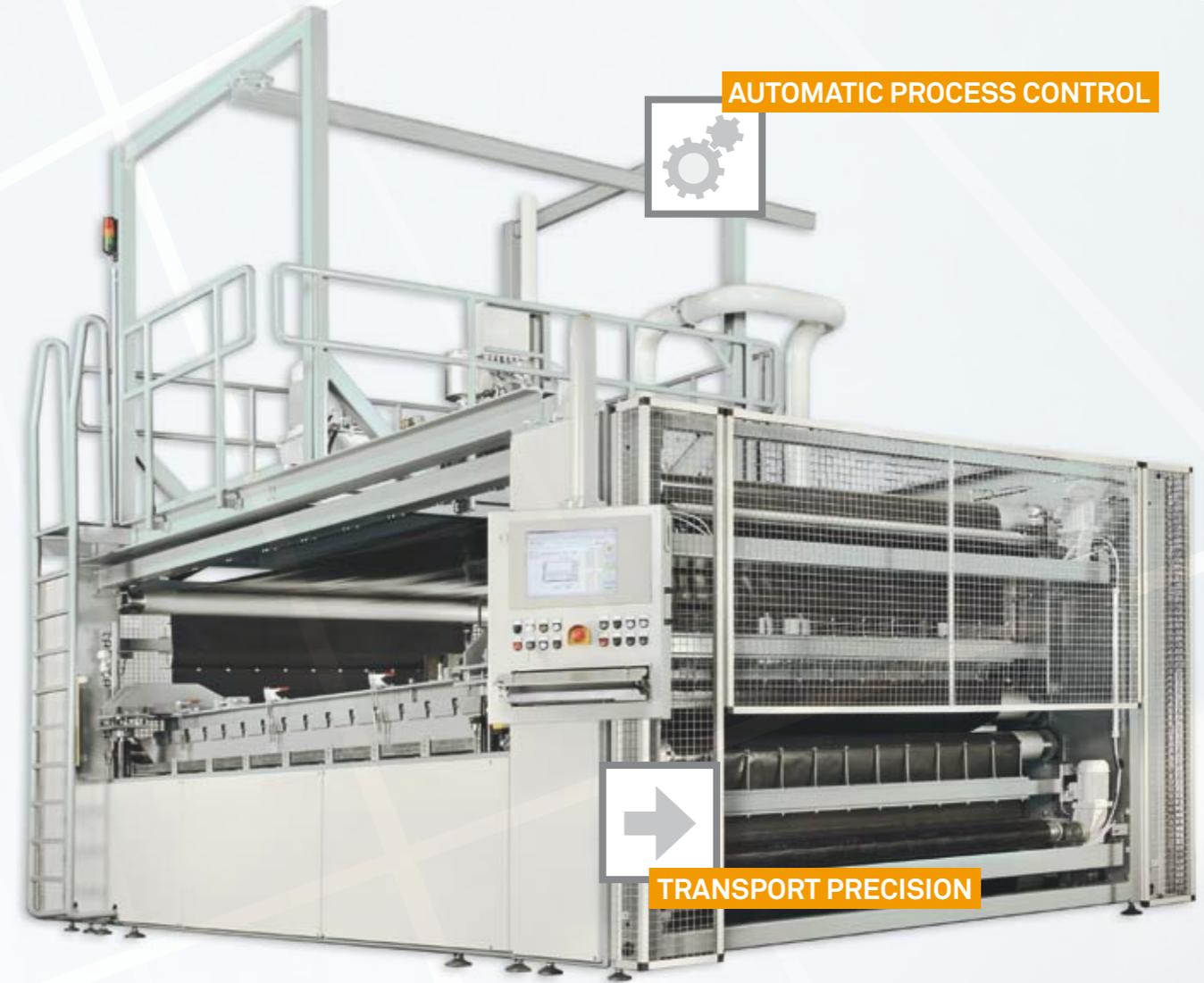
OPERATOR FRIENDLY



AUTOMATIC PROCESS CONTROL



TRANSPORT PRECISION



STACOLAM – THE STACKLAMINATOR

The innovative machine from Meier Solar Solutions – a laminator on 15 levels for thin-film and crystalline processes, which replaces more than four conventional laminators.

The STACOLAM, the world's most efficient stacking laminator enables lamination of a total of 30 modules for the first time and thus achieves an annual capacity of up to 1.2 million modules. The levels laminator STACOLAM gives us, as the only manufacturer worldwide, a technology that offers convincing advantages.

The new stacking laminators STACOLAM 15x23/13 and STACOLAM 15x21/14:

- + 39-48m² lamination area
- + 90-130 modules/hr
- + up to 200 MW/year
- + 25% overall space requirement
- + 25% absolute resistive heat dissipation
- + low maintenance outlay
- + the world's largest laminator



LOWER MAINTENANCE COSTS



LESS HEAT RADIATION



ABSOLUTE FLOOR SPACE 25%



SPECIAL MANUFACTURE TO CUSTOMER SPECIFICATION

MODELS AND DESIGNS TO MEET YOUR REQUIREMENTS

We specialise in machines with fully automatic transport systems. Our laminators are available in different degrees of automation. Whether the laminates are laid on manually in front of the laminator or handed over to the loading device by an upstream system (stringer, lay-up) depends on our customer requirements.

After the continuous automatic laminating cycle the finished laminates can be removed manually by the removal station or collected by the downstream system (framing, test station). Batch follow-up with continuous documentation of every individual process via our process control system is available as an option.

OPTIONS

We manufacture our modular designed plants in different degrees of automation, specially designed for the requirements of the photovoltaic and glass industry.

Together with our standard models we also supply individual laminators and accessories to meet with your requirements.

- + The following modules are available as an option
- + Pre-heating zone
- + Cooling station/cooling press
- + Special requirements in respect of temperature and/or pressure control
- + Special loading and unloading devices
- + Variable laminating area and moulds for convex modules
- + Self-powered recooling device
- + Separate hardening oven
- + Special sizes

ICOLAM/STACOLAM LAMINATORS – TECHNICAL INFORMATION

MODEL		ICOLAM 10/08	ICOLAM 18/11	ICOLAM 25/15	ICOLAM 28/18
		Laboratory (manual)	Laboratory (manual)	Laboratory (manual/automatic)	Production
Usable surface length	mm	900	1.700	2,400	2,700
Usable surface width	mm	700	1,000	1,400	1,700
Max. power consumption	kW	12	32	72	114
Overall length (with transport unit)	mm	1,430	1.950	9,645	10,545
Overall width	mm	1,690	2,650	3,200	3,500
Overall height	mm	2,300	2,400	2,400	2,400

MODEL		STACOLAM 15 x 20/13	STACOLAM 13 x 23/14*
		Production	Production (thin-film)
Usable surface length	mm	2,000	2,300
Usable surface width	mm	1,300	1,400
Max. power consumption	kW	850	930
Overall length (with transport unit)	mm	13,300	15,000
Overall width	mm	5,300	5,500
Overall height	mm	4,000	4.,500

* 11 x 23/14 and 15 x 23/14 available on request

MODEL		ICOLAM 36/21	ICOLAM 38/24	ICOLAM 42/24	ICOLAM 25/46
		Production	Production	Production	Production
Usable surface length	mm	3,500	3,700	4,100	2,400
Usable surface width	mm	2,000	2,300	2,300	4,500
Max. power consumption	kW	114	130	140	170
Overall length (with transport unit)	mm	13,065	13,665	14,865	10,800
Overall width	mm	3,800	4,100	4,100	6,260
Overall height	mm	2,400	2,400	2,400	2,400



ICOLAM/STACOLAM LAMINATORS – PERFORMANCE OVERVIEW

Basis for calculation	Shifts worked	Days p.a.	Availability in %	Module capacity W
crystalline	3 x 8 h	340	95	200

LAMINATOR	ICOLAM 28/18	ICOLAM 36/21	ICOLAM 38/24	ICOLAM 42/24	STACOLAM 15 x 20/13	STACOLAM 15 x 23/14
Usable m ²	4,59	7,00	8,51	9,43	39,00	48,30
Module size	1,700 x 1,000	1,700 x 1,000	1,700 x 1,000	1,900 x 1,000	1,700 x 1,000	1,400 x 1,000
Number of modules per pass	2	3	4	4	15	30
18 min. process time/MW p.a..	10	15	20	22	78	134*
Cycle time per module (in secs)	540	360	270	270	72	36
15 min. process time/MW p.a.	12	19	25	27	93	173*
Cycle time per module (in secs)	450	300	225	225	60	30
12 min. process time/MW p.a..	15	21	30	30	116	215*
Cycle time per module (in secs)	360	240	180	180	48	24

* Calculated with 185 Watt module performance

Basis for calculation	Shifts worked	Days p.a.	Availability in %	Module capacity W
thin-film	3 x 8 h	340	95	70

LAMINATOR	ICOLAM 42/24	ICOLAM 25/46	STACOLAM 11 x 23/14	STACOLAM 13 x 23/14	STACOLAM 15 x 23/14
Usable m ²	8,51	9,43	35,42	41,86	48,30
Module size	1,300 x 1,100	1,400 x 1,100	1,400 x 1,100	1,400 x 1,100	1,400 x 1,100
Number of modules per pass	6	6	22	26	30
30 min. process time/MW p.a.	7	7	23	28	32
Cycle time per module (in secs)	300	300	82	69	60
25 min. process time/MW p.a.	8	8	28	33	39
Cycle time per module (in secs)	250	250	68	58	50
20 min. process time/MW p.a.	10	10	36	42	49
Cycle time per module (in secs)	200	200	55	46	40

USABLE SURFACE



MODULE CAPACITY



AVAILABILITY



CYCLE TIME PER MODULE



CUSTOMER SUPPORT

The success of our customers is also our own success. Your goals are our goals. We do not see ourselves merely as developer, manufacturer and supplier but, equally important, as your partner. We are ambitious in driving forward the continual development of our technologies and innovations, providing a full service directly from the source. From the project phase to order processing and commissioning down to customer support: our international representative offices allow us to flexibly react to individual customer requirements at any time.



24/7

24/7 WORLDWIDE PROGRAMME

- + 24 hr customer hotline – standby service
- + Customer-tailored and machine-specific servicing
- + Service engineers on standby, available on site, worldwide
- + Spare parts storage on site and overnight transport to the customer
- + Set-up of worldwide servicing stations
- + Courses / training



24/7

MEIER TECHNICAL ACADEMY

Would you like to test our technology with your products? No problem! Test our laminators individually with your materials or let us help you optimise your processes and process technology. All current and potential partners have access to our Technical Academy in Bocholt / Germany. Our specialists will support you and will be pleased to provide training for your employees.



SERVICE

Our systems are renowned for being maintenance-friendly. The parts are set up so as to make them easily accessible. This means, for example, that changing membranes or servicing the vacuum pumps are unusually straightforward tasks. And of course our technical service is available to you around the clock, just in case.



SERVICE

ASSEMBLY AND TRAINING

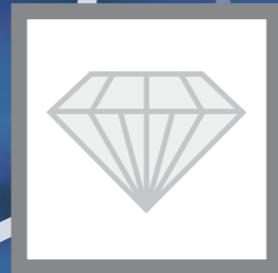
Make use of our offer of providing training for your staff on how to operate and service our laminators correctly. Fully accommodating your needs, we will hold a training session either on site in your facilities or in our own premises. If you would like to commission your system as quickly as possible, you can, in addition, take advantage of our special service, provided by our specialised personnel, of assembling and commissioning your Meier Solar Solutions laminator on site.



QUALITY ASSURANCE

We attribute the great interest in our products first and foremost to the reliability of our machines and the proven longevity of the modules produced with them – a rudimentary element of your and our success. After all, it is possible to maintain and increase our competitiveness internationally on the basis of producing high-quality systems which meet the individual requirements of our customers. Being fully confident in their quality, we guarantee a minimum durability of 20 years on the laminations executed with our machines. It is for this reason that we continue to manufacture our products at our German plants in Bocholt and Rossla; this allows us to continue to consistently provide the “made in Germany” quality much appreciated by our customers.

WORLD PREMIERE:
OUR ICOLAM 36/21 WAS THE FIRST LAMINATOR IN THE WORLD TO BE ACCREDITED BY TÜV, THE GERMAN TECHNICAL CONTROL BOARD!



SAFETY

Whoever operates a Meier Solar Solutions system has every reason to feel safe. All potentially dangerous movements, such as lifting off the lid, are secured. In addition, it goes without saying that our laminators fully comply with EC machine guidelines. CE designation is mandatory.

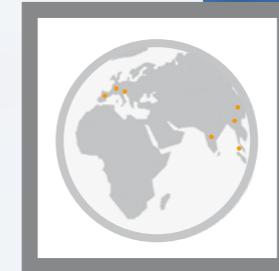


IN THE END WE CALL IT M+

Service, quality, innovation, sustainability and trading based on partnership form an integral part of the corporate culture of Meier Solar Solutions – a benchmark which we are keen to be measured by. For what counts in the end are not grand statements but the actual result. We call it M+.

M+ in a nutshell:

- + products “made in Germany”
- + local presence worldwide
- + fair price policy
- + long-standing experience
- + flexible and fast service
- + highly-qualified staff
- + real all-in-one solutions
- + 100% process control
- + leading in research and development
- + sustainable trading for the benefit of mankind and the environment



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A series of white, overlapping lines of varying thicknesses and orientations, creating a dynamic, geometric pattern in the bottom right corner of the page. The lines appear to be part of a larger, partially visible structure, possibly representing solar panels or a modern architectural design.