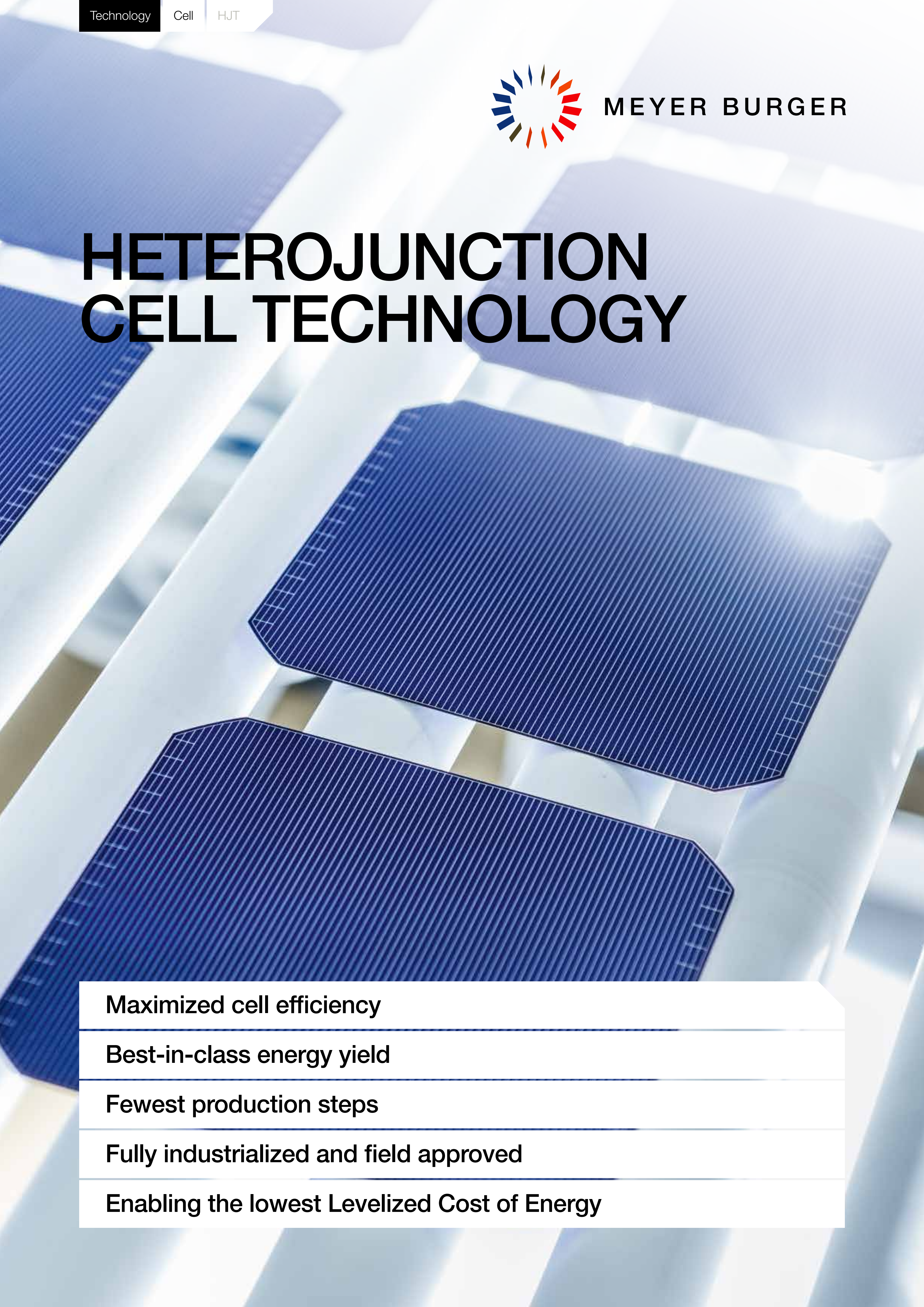
MEYER BURGER



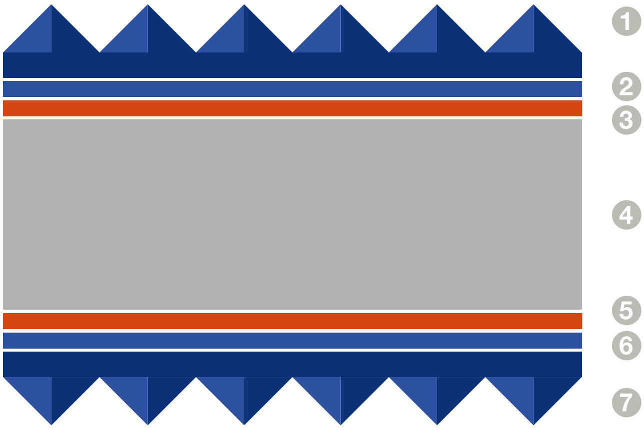
HETEROJUNCTION CELL TECHNOLOGY

- Maximized cell efficiency
- Best-in-class energy yield
- Fewest production steps
- Fully industrialized and field approved
- Enabling the lowest Levelized Cost of Energy

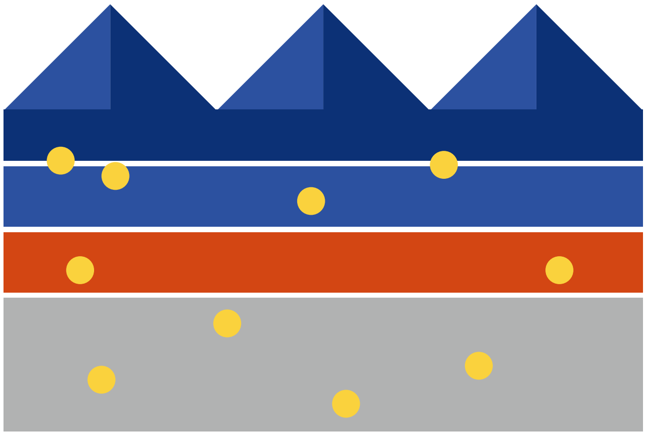
Heterojunction – cutting-edge technology for solar cells

Meyer Burger has long been an industry leader in ensuring ever-increasing highest efficiencies in the industrial production of solar cells. Heterojunction cell technology combines the benefits of crystalline silicon solar cells with those of thin film technologies. As a result, solar cells achieve the highest efficiencies while production costs are lowered. Further cost advantages can be achieved by adopting the comparatively simple low-temperature manufacturing concept, which consists of only six production steps, thus saving energy and making the process economically attractive for manufacturers.

Simple structure – excellent passivation
The thin intrinsic a-Si:H layers deposited between the c-Si wafer and the doped layers are vital to achieving maximum performance from the cell structure. That results in reduced interface state density and decreased surface recombination losses, and lowers the emitter saturation currents. Another key technological advantage is the excellent surface passivation of a-Si:H, which ensures high open-circuit voltages and high cell efficiencies.



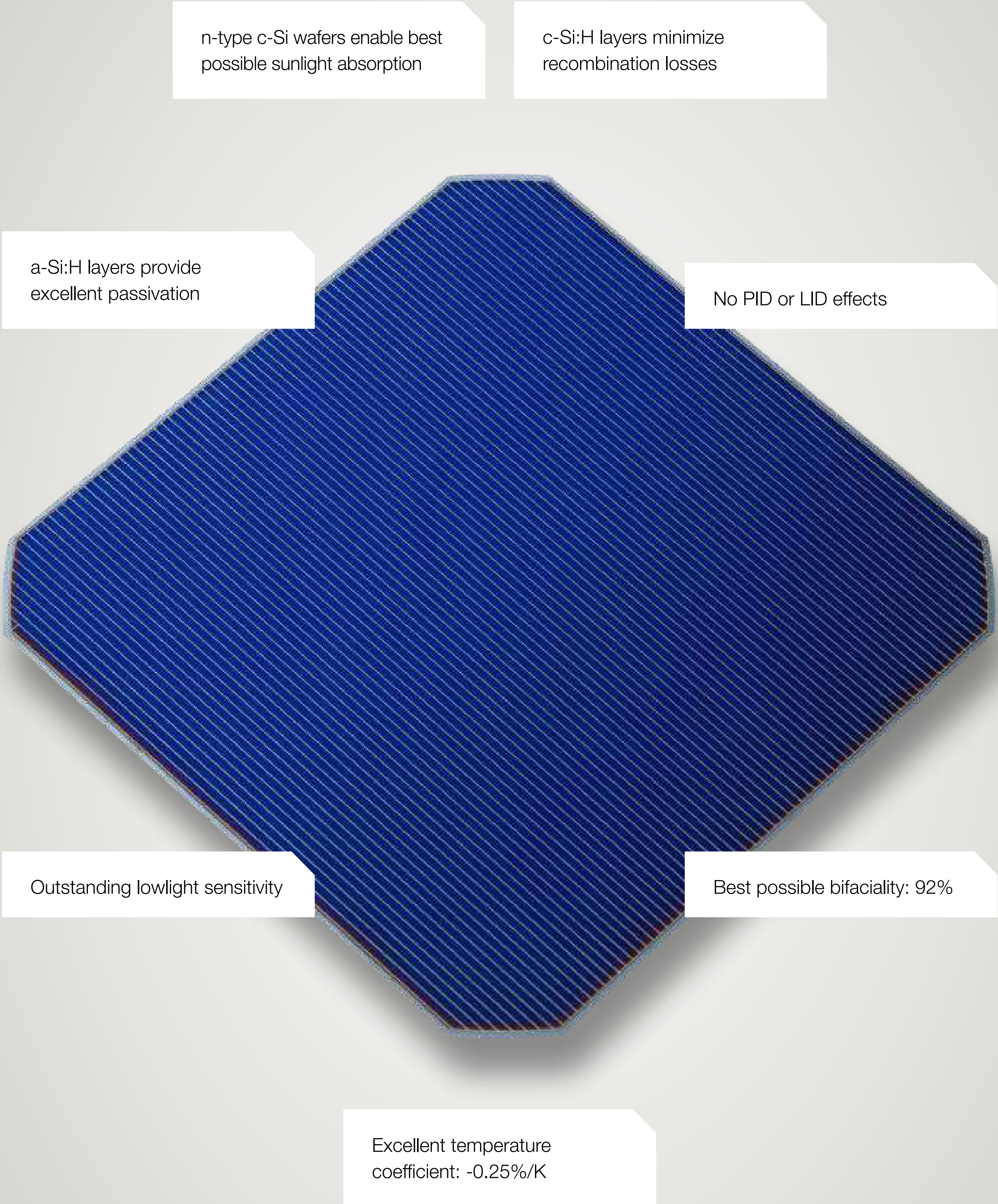
1. Transparent conductive oxide
2. N-doped amorphous silicon
3. Intrinsic amorphous silicon
4. N-type silicon wafer
5. Intrinsic amorphous silicon
6. P-doped amorphous silicon
7. Transparent conductive oxide

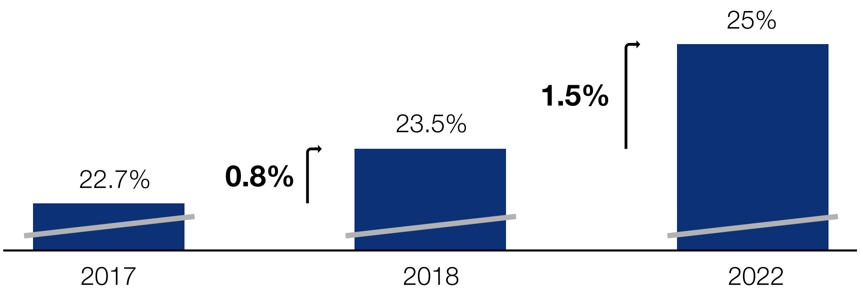


The amorphous layer decreases the surface recombination loss.
High cell efficiency is the result.

Record-breaking module

Especially in the PV industry, innovations from Meyer Burger are redefining the state-of-the-art. In May 2018, in cooperation with Meyer Burger, the renowned research institute CEA INES (Alternative Energies and Atomic Energy Commission) produced a new heterojunction (HJT) module comprising 72 solar cells that reached a record module performance of 410 watts. It integrated HJT cells which had been manufactured on the industrial 2,400 wph cell production equipment from Meyer Burger within CEA INES›s pilot line and connected in Thun using Meyer Burger›s SmartWire Connection Technology (SWCT™).


n-type c-Si wafers enable best possible sunlight absorption
c-Si:H layers minimize recombination losses
a-Si:H layers provide excellent passivation
No PID or LID effects
Outstanding lowlight sensitivity
Best possible bifaciality: 92%
Excellent temperature coefficient: -0.25%/K



Unrivalled cell efficiency

Heterojunction is the only commercially available c-Si technology that delivers over 24% cell-level production efficiencies today and possibly 25% in the next three to four years. The technology combines the advantages of crystalline silicon (c-Si) solar cells with the good absorption of sunlight and the superior passivation characteristics of amorphous silicon (a-Si) known from thin film technologies. The thin intrinsic a-Si:H layers deposited between the n-type c-Si wafer and the doped layers are vital to achieving maximum performance from the cell structure. That results in reduced interface state density and decreased surface recombination losses.

Best-in-class energy yield

The Meyer Burger HJT modules technology deliver an outstanding energy yield under module operating conditions. That provides a significant competitive advantage for cell and module manufacturers, as well as for end customers.

Cell efficiency of more than 24%
Very low-temperature coefficient of 0.25/K
Excellent lowlight sensitivity
No LID and PID effects

Best-in-class energy yield

Consistent performance for the long term without LID and PID effects

LID (light-induced degradation) is caused by boron/oxygen complexes, which are only possible with B-doped p-type silicon. HJT technology, based on n-type silicon, is immune to this effect which can result in efficiency losses of 3%. PID (potential-induced degradation) is caused by ions migrating from the glass to the cell surface. There, the ions with their electrical field interfere with the emitter. HJT cells have an extremely conductive TCO (transparent conductive oxides) coating on both sides which electrically protects the cell like a Faraday cage. This prevents the efficiency loss of 2% which would otherwise be incurred.

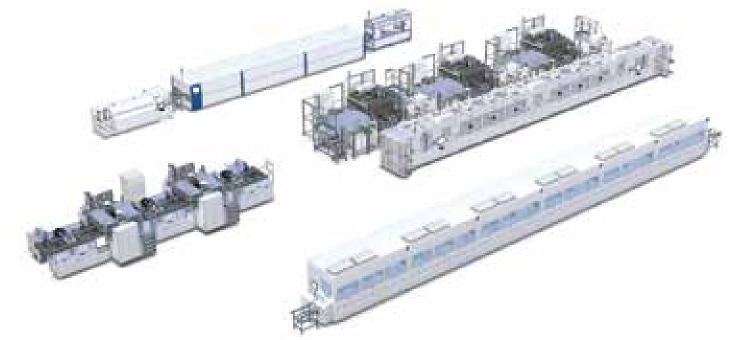
Outstanding temperature coefficient (TC)

In a sun belt (normal operating cell temperature) of 60°C, the increase in efficiency is 8%. This is attributable to the outstanding temperature coefficient (TKMPP) of –0.25%/°K of HJT cells compared to –0.43%/°K of standard cells.

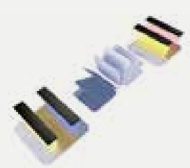
Outstanding behavior under low light conditions

The amorphous silicon deposited on the HJT cells enables a good luminous efficacy, significantly above that of crystalline silicon cells, even with diffuse light

Manufacturing Heterojunction Cells

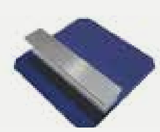


Texturing
For high-efficiency HJT cells, damage from cutting has to be completely removed and a special texture created by wet chemical processes. The wafers are also put through a special cleaning process.

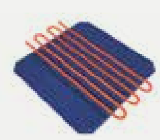


PECVD coating (a:Si:H layers)
The surface of the cell is passivated to prevent energy loss within the cell. The intrinsic and amorphous silicon layers are separated without cross-contamination, thus achieving passivation with high longevity.
Meyer Burger equipment: HELiA $_{pecvd}$

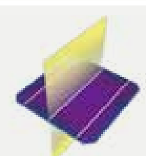
PVD coating (TCO layers)
A sputtering process is used to apply a TCO (transparent conductive oxide) layer to the front and back of wafers which serves as an antireflection layer.
Meyer Burger equipment: HELiA $_{pvd}$



Printing (contacts)
Screen printing is used to print the thin contact lines (fingers) on the front and back of wafers with silver paste.



Curing
Curing is a simple thermal process at temperatures of <250°C in order to outgas the solvents within the low-temperature paste.
Meyer Burger equipment: CALiPSO



Testing & sorting
Meyer Burger offers leading measurement procedures for the precise testing of high capacitance HJT cells which require a measurement speed of 400–600 ms.

Specifications

Application

types	sizes	format
n-type mono	M2, M4	Full pseudo square ½ cells

Coating equipment

HELiA $_{PECVD}$
Front side: a-Si:H (i) / a-Si:H (n)
a-Si:H (i) / a-Si:H (p)

HELiA $_{PVD}$
Front: TCO
Back: TCO

Worldwide presence

Service

Meyer Burger, with its service centers near you, offers first-class service that only the original manufacturer can deliver. We take responsibility for the availability and productivity of your equipment today and tomorrow.

With a complete range of services, we support you from commissioning through production support and maintenance to life-prolonging system upgrades. All works are carried out by qualified technicians and with original service parts only – at your site or in our local service center.

Wherever you need it, our service is available in time, and of top quality.

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