Meyer Burger drives technology and productivity in PV

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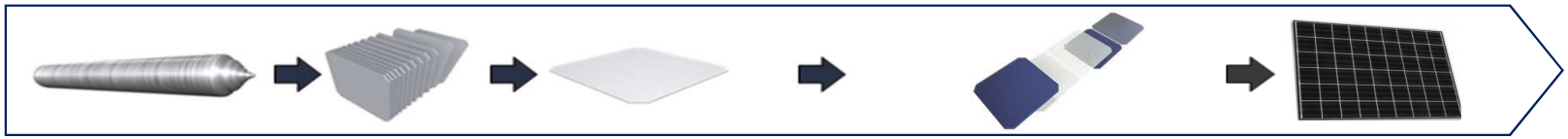
Wafer
Ingot to Wafer

Cell
Wafer to Cell

Module
Cell to Module



Diamond Wire Saw

DW 288 Series 3
& DW 291

Wafer Inspection

WIS-08

Cell Coating

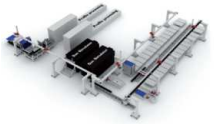
SiNA®

MAiA®

Module Line

SWCT™

Module Testing



High^{LIGHT} & MIS

Industry Standards

	DW 288	Wafer Inspection	SiNA®	MAiA ®	SWCT	Module Testing
# Equipment	> 400	> 850	> 530	> 270	> 10	> 100
Installed Capacity	> 15 GW	> 70 GW	> 40 GW	> 30 GW	> 500 MW	> 20 GW

Visit our booth A2.260 for more information!

Heterojunction (HJT) cell technology

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PERT/PERL in mass production

- High number of process steps
- Double diffusion affecting yield and efficiency distribution

HJT benefits

- Less footprint and manpower due to few process steps
- Efficiency potential up to 25%
- Suited for «thin wafers» due to
  - VOC increase for thin wafer
  - Symmetric front and backside
  - Low temperature process
- Bifacial cell with highest backside efficiency
- Low temperature coefficient
- Lowest Levelized Cost of Electricity

PERT/ PERL process

Boron diffusion
BSG etch
Texture
Phosphor diffusion
Edge isolation
PSG etch
Antireflection coating
Backside passivation
Laser opening
Print rear side
Print front side
Firing
Test & sort

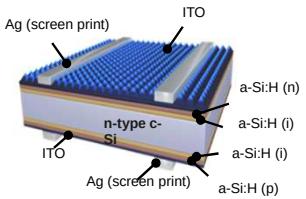
11–13 steps

n-HJT

TEX
a-Si(i)/a-Si(n) FS
a-Si(i)/a-Si(p) RS
TCO FS/RS
Print FS
Print RS
Curing
Test/Sort

8 steps

Demo Line HJT cell process available at MB (Germany)



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SWCT™ Module Technology

SWCT™ = SmartWire Connection Technology

- Innovative and patented foil-wire electrode concept
- Compatible with HJT, PERC, PERT, thin wafer and bifacial cells
- Suitable for fine line printing, plating, passivated contacts and inkjet-printed contacts

SWCT benefits

- Less shading
- Less resistivity losses

} Power increase

- Cell paste usage reduction (up to 70%)
- Better resistance for micro cracks
- Low temperature and low thermal stress interconnection technology
- No alignment needed (≠ MBB)
- Aesthetically attractive
- Lead free cell connection technology

Meas. at	P_{max} [W]	V_{mp} [V]	I_{mp} [A]	V_{oc} [V]	I_{sc} [A]	FF [%]
MB	**412**	44.7	9.2	53.0	9.8	79.7%
CEA	**413**	45.6	9.1	53.8	9.6	80.2%

Average cell η: 23.4%

Test results for SWCT™ glass/glass module with HJT cells

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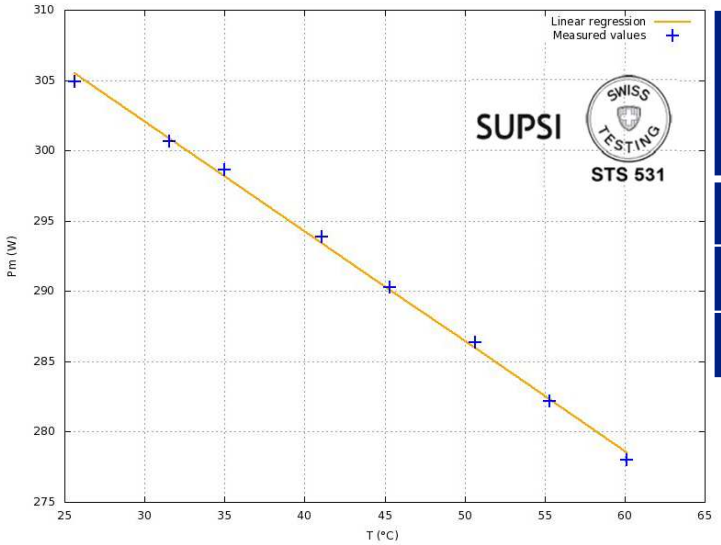
Low Temperature Coefficient



High Bifaciality

based on IEC 60904 Standard *

	Pmax [W]	Voc [V]	Isc [A]	FF [%]	Irradiance [W/m2] black background
Front Side	313	44.4	8,9	78,8	1000
Rear Side	290,7	44,3	8,2	79,8	1000
FS + 20% Albedo	**370,6**				1184

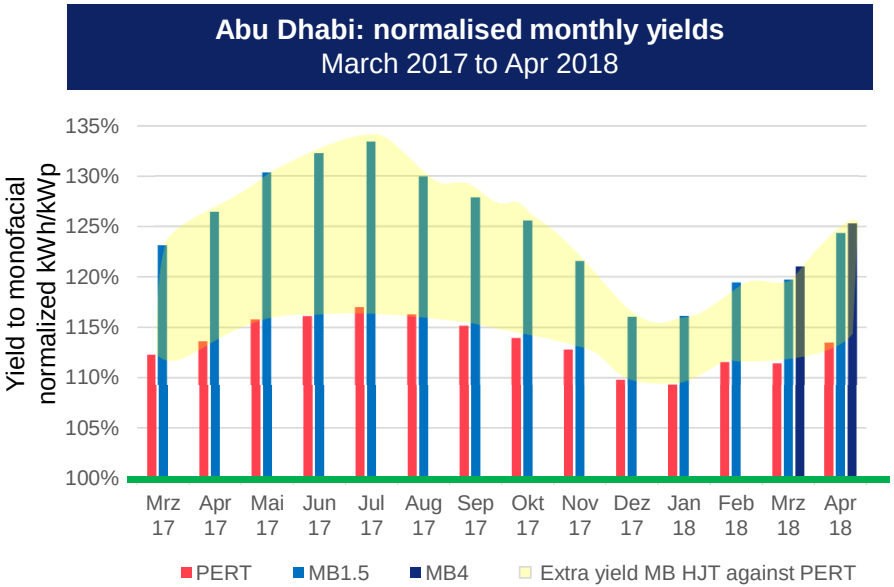
$$Bif\ I_{SC} = \frac{I_{SC\_rear}}{I_{SC\_front}} = \quad 92{,}1\%$$

TÜVRheinland® Precisely Right.

$$Bif\ P_{max} = \frac{P_{\max\_rear}}{P_{\max\_front}} = \ 92{,}8\%$$

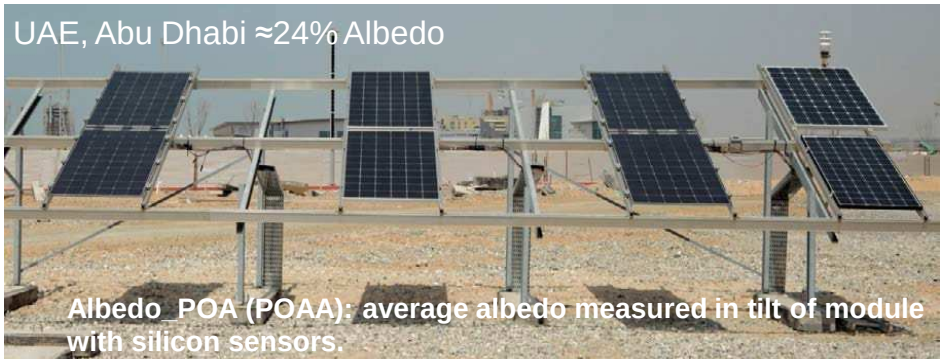
- **Excellent Temperature Coefficient** for Meyer Burger's HJT glass/glass module certified by SUPSI with only **-0,25%/K at** module level
- High bifaciality of 92,0% was measured at module level based on SUPSI calibration

Test sites: Energy yield harvesting
UAE: Abu Dhabi



25%- 30% higher energy yield of MB HJT against p-PERC

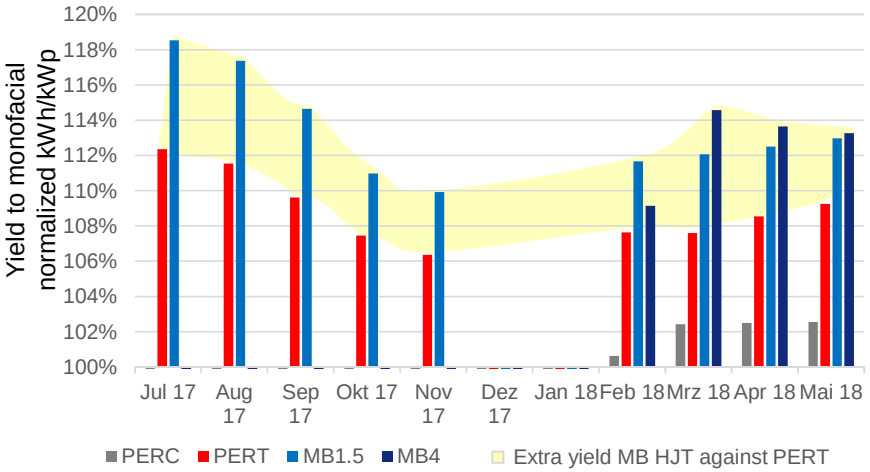
Monofacial p-PERC reference



Proven increased energy yield with bifacial cell / module technologies

Test site: Energy yield harvesting China: Yinchuan

Yinchuan: normalised monthly yields to monofacial
July 2017 to May 2018



Summary:

- Mixed hot and clod temperatures
- New types of modules since Feb 2018
- Site suffered power outage Dec./Jan.
- Bifacial PERT ca. 10% over monofacial
- Bifacial MB ca. 15% over monofacial

All figures are referenced to kWh/kWp and to monofacial Al-BSF technology

Proven increased energy yield with bifacial cell / module technologies