

ANLAGE zum Prüfbericht-Nr.: CN24GCU7 001
APPENDIX to Test Report No.:

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Annex 1: Constructional Data Form (CDF)




Customers reference
no.: 2496578

TÜV Rheinland report no.:
CN24GCU7 001
TÜV Rheinland project no.:
244554199

Certificate: N/A
File: N/A

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Constructional Data Form for Photovoltaic Modules

| | | | | |
|--|--|---|---|---|
| License Holder..... (full address) | Sany Silicon Energy (Zhuzhou) Co., Ltd. Room 518-50, Building 1, Longxin International, No.255, Tongxia Road, Tongtangwan Street, Shifeng District, Zhuzhou City, Hunan Province, P.R. China | | | |
| Production Factory (full address) | Sany Silicon Energy (Zhuzhou) Co., Ltd. Sany Energy Equipment Industrial Park, No.320 Qingshui Road, Shifeng District, Zhuzhou City, Hunan Province 412005 P.R. China | | | |
| Type of Product..... | Photovoltaic (PV) Modules | | | |
| Trademark..... |  | | | |
| | Glass-glass module | | | |
| | With ½ cut of 182 mono c-Si cell (156pcs): | With ½ cut of 182 mono c-Si cell (144pcs): | With ½ cut of 182 mono c-Si cell (120pcs): | With ½ cut of 182 mono c-Si cell (108pcs): |
| Type Name or Model No. | SYMNI56TBDxxx xxx=power in Wp | SYMNI44TBDxxx xxx=power in Wp | SYMNI20TBDxxx xxx=power in Wp | SYMNI08TBDxxx xxx=power in Wp |
| Maximum System Voltage [VDC] | 1500 | 1500 | 1500 | 1500 |
| Rated Maximum Power [W] .. | 615, 620, 625, 630, 635 | 555, 560, 565, 570, 575, 580, 585 | 455, 460, 465, 470, 475, 480, 485 | 415, 420, 425, 430, 435, 440 |
| Tolerance of Rating Pmax / Voc / Isc [%]..... | ±3 / ±3 / ±3 | ±3 / ±3 / ±3 | ±3 / ±3 / ±3 | ±3 / ±3 / ±3 |
| Rated Open Circuit Voltage [V]..... | 55.53, 55.67, 55.81, 55.95, 56.09 | 50.98, 51.12, 51.26, 51.40, 51.54, 51.68, 51.82 | 42.27, 42.41, 42.55, 42.69, 42.83, 42.97, 43.11 | 37.94, 38.14, 38.34, 38.54, 38.74, 38.94 |
| Rated Short Circuit Current [A]..... | 13.72, 13.78, 13.84, 13.90, 13.96 | 13.60, 13.66, 13.72, 13.78, 13.84, 13.90, 13.96 | 13.54, 13.60, 13.66, 13.72, 13.78, 13.84, 13.90 | 13.60, 13.66, 13.72, 13.78, 13.84, 13.90 |
| Over-current protection rating[A]: | 30 | 30 | 30 | 30 |
| Classification (IEC 61730)..... | Class II | Class II | Class II | Class II |
| Fire rating (According to UL 790)..... | Class A | Class A | Class A | Class A |
| Pollution degree | I | I | I | I |
| Dimensions (l x w x h) [mm].. | 2465x1134x30 | 2278x1134x30 | 1903*1134*30 | 1722*1134*30 |
| Module area [m²]..... | 2.80 | 2.58 | 2.16 | 1.95 |
| Min- creepage distance [mm]: | 12.3±1 | 12.3±1 | 12.3±1 | 12.3±1 |
| Number of solar cells | 156 | 144 | 120 | 108 |

Shanghai, 2024-03-24



TÜV Rheinland Group

Zhuzhou

(City)

2024-03-24

(Date)



(Stamp and/or signature of applicant)

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Constructional Data Form for Photovoltaic Modules

| | | | | |
|--|---|---|---|-----|
| Cells per bypass diode | 52 | 48 | 40 | 36 |
| Serial/parallel connection of cells | SPS | SPS | SPS | SPS |
| | With ½ cut of 182 mono c-Si cell (144pcs): | With ½ cut of 182 mono c-Si cell (120pcs): | With ½ cut of 182 mono c-Si cell (108pcs): | - |
| Type Name or Model No.: | SYMN144R01TBDxxx xxx=power in Wp | SYMN120R01TBDxxx xxx=power in Wp | SYMN108R01TBDxxx xxx=power in Wp | - |
| Maximum System Voltage [VDC] | 1500 | 1500 | 1500 | - |
| Rated Maximum Power [W] ...: | 590, 595, 600, 605, 610, 615, 620 | 490, 495, 500, 505, 510, 515, 520 | 440, 445, 450, 455, 460, 465, 470 | - |
| Tolerance of Rating Pmax / Voc / Isc [%] | ±3 / ±3 / ±3 | ±3 / ±3 / ±3 | ±3 / ±3 / ±3 | - |
| Rated Open Circuit Voltage [V] | 51.20, 51.34, 51.48, 51.62, 51.76, 51.90, 52.04 | 42.62, 42.76, 42.90, 43.04, 43.18, 43.32, 43.46 | 38.33, 38.47, 38.61, 38.75, 38.89, 39.03, 39.17 | - |
| Rated Short Circuit Current [A] | 14.44, 14.50, 14.56, 14.62, 14.68, 14.74, 14.80 | 14.44, 14.50, 14.56, 14.62, 14.68, 14.74, 14.80 | 14.44, 14.50, 14.56, 14.62, 14.68, 14.74, 14.80 | - |
| Over-current protection rating[A]: | 30 | 30 | 30 | - |
| Classification (IEC 61730) | Class II | Class II | Class II | - |
| Fire rating (According to UL 790) | Class A | Class A | Class A | - |
| Pollution degree | I | I | I | - |
| Dimensions (l x w x h) [mm] ...: | 2382x1134x30 | 1994x1134x30 | 1800x1134x30 | - |
| Module area [m²] | 2.70 | 2.20 | 2.04 | - |
| Min- creepage distance [mm]: | 12.3±1 | 12.3±1 | 12.3±1 | - |
| Number of solar cells | 144 | 120 | 108 | - |
| Cells per bypass diode | 48 | 40 | 36 | - |
| Serial/parallel connection of cells | SPS | SPS | SPS | - |

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Constructional Data Form for Photovoltaic Modules

Copy of marking plate:

| | | | | | | |
|---|---|---|--|---|---|--|
|      | PV MODULE Sany Silicon Energy (Zhuzhou) Co., LTD Sany Energy Equipment Industrial Park, No.320 Qingshui Road, Shifeng District, Zhuzhou City, Hunan Province 412005 China www.sanygroup.com/ | SYM144TBD555 Max. power (Pmax) Max. power tolerance Voltage at max. power(Vmp) Current at max. power(Imp) Open-circuit voltage(Voc) Short-circuit current(Isc) Maximum system voltage | 555W ±3% 41.84V 13.29A 60.47V±3% 14.07A±3% 1500VDC | bifaciality Series Fuse Rating operating temperature range protect rage module vprotectight module size STC | 80±5% 30A 40°C ~ +85°C II 32.0(kg) 2278×1134×30(mm) 1000W/m², AM1.5, 25°C |  warning Only the professionals can install and maintain the components Be careful of the dangerous high DC voltage when connecting the components Never damage or scratch the back of the assembly |
| | PV MODULE Sany Silicon Energy (Zhuzhou) Co., LTD Sany Energy Equipment Industrial Park, No.329 Qingshui Road, Shifeng District, Zhuzhou City, Hunan Province 412005 China www.sanygroup.com/ | SYM156TBD635 Max. power (Pmax) Max. power tolerance Voltage at max. power(Vmp) Current at max. power(Imp) Open-circuit voltage(Voc) Short-circuit current(Isc) Maximum system voltage | 635W ±3% 47.47V 13.38A 56.09V±3% 13.96A±3% 1500VDC | bifaciality Series Fuse Rating operating temperature range protect rage module vprotectight module size STC | 80±5% 30A 40°C ~ +85°C II 34.3(kg) 2465×1134×30(mm) 1000W/m², AM1.5, 25°C |  warning Only the professionals can install and maintain the components Be careful of the dangerous high DC voltage when connecting the components Never damage or scratch the back of the assembly |

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 (City) (Date)


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Constructional Data Form for Photovoltaic Modules

| List of Critical Components (add lines for multiple material sources) | | | | | |
|---|--|--|---|-----------------------------|---------------------------------|
| Object | Manufacturer / trademark | Type / model | Technical data / ratings | Standard (if applicable) | Certificates (if applicable) |
| Front cover 1 | CSG HOLDING CO., LTD. | Semi-tempered AR coated glass | Thickness = 2.0mm±0.2mm | — | — |
| Front cover 2 | Hunan Kibing Solar Technology Co., Ltd. | Semi-tempered AR coated glass | Thickness = 2.0mm±0.2mm | — | — |
| Rear cover 1 | CSG HOLDING CO., LTD. | Semi-Tempered back glass | Thickness = 2.0mm±0.2mm | — | — |
| Rear cover 3 | Hunan Kibing Solar Technology Co., Ltd. | Semi-Tempered back glass | Thickness = 2.0mm±0.2mm | — | — |
| Encapsulation material 1 | HANGZHOU FIRST APPLIED MATERIAL CO., LTD | EP304 (near glass) | Thickness = 0.5mm±10% gram weight: 400g/m²±10% | — | — |
| | | F406PS (near back glass) | Thickness = 0.5mm±10% gram weight: 400g/m²±10% | | |
| Encapsulation material 2 | CHANGZHOU BETTERIAL FILM TECHNOLOGIES CO., LTD | B602M (near glass) | Thickness = 0.5mm±10% gram weight: 400g/m²±10% | — | — |
| | | B601HP (near back glass) | Thickness = 0.5mm±10% gram weight: 400g/m²±10% | | |
| Solar cell 1 | Sany Silicon Energy (Zhuzhou) Co., Ltd. | SYCN182T16 (combined with Encapsulation material 1, 2) | N type mono c-Si cell with 16 dotted busbars 182mm×91mm±0.25mm Thickness=130µm±15µm | — | — |
| Solar cell 2 | Sany Silicon Energy (Zhuzhou) Co., Ltd. | SYCN18AT16 (combined with Encapsulation material 1, 2) | N type mono c-Si cell with 16 dotted busbars 182.2mm×95.8mm±0.25mm Thickness=130µm±15µm | — | — |
| Cell connectors 1 | Changzhou Sheng Yue metal new material Co., Ltd. | Sn60Pb40 | Ø= 0.26±0.01mm | — | — |
| Cell connectors 2 | Suzhou YourBest New-type Materials Co., Ltd. | Sn60Pb40 | Ø= 0.26±0.01mm | — | — |
| String connectors 1 | Changzhou Sheng Yue metal new material Co., Ltd. | Sn60Pb40 | T(mm) x L(mm): 0.3±0.01mm x 6.0±0.05mm 0.3±0.01mm x 4.0±0.05mm | — | — |

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| List of Critical Components (add lines for multiple material sources) | | | | | |
|---|--|---|--|-----------------------------|---------------------------------|
| Object | Manufacturer / trademark | Type / model | Technical data / ratings | Standard (if applicable) | Certificates (if applicable) |
| String connectors 2 | Suzhou YourBest New- type Materials Co., Ltd. | Sn60Pb40 | T(mm) x L(mm): 0.3±0.01mm x 6.0±0.05mm 0.3±0.01mm x 4.0±0.05mm | — | — |
| Frame parts 2 | Jiangsu Jiachen Aluminium Technology Co., Ltd | Anodized Aluminium Alloy 6005-T6 (Silver) | H(mm) x W(mm): 1. 30x33mm (long frame) 30x18mm (short frame) 2. 30x30mm (long frame) 30x15mm (short frame) | — | — |
| Frame parts 3 | CHANGSHU DONGNENG SOLAR TECHNOLOGY CO., LTD | Anodized Aluminium Alloy 6005-T6 (Silver) | H(mm) x W(mm): 1. 30x33mm (long frame) 30x18mm (short frame) 2. 30x30mm (long frame) 30x15mm (short frame) | — | — |
| Adhesive (frame) 1 | H.B.Fuller (Suzhou) Advanced Material Co., Ltd. | 1527 | Color: White | — | — |
| Adhesive (frame) 2 | Shanghai Huitian New Material Co., Ltd. | HT906Z | Color: White | — | — |
| Fluxing agent 1 | Zhuhai Changxian New Materials Technology Co., Ltd | CX700 | — | — | — |
| Fluxing agent 2 | ASAHI SOLDER TECHNOLOGY(WUXI) CO., LTD | SF180 | — | — | — |
| Fixing tape 1 | SuZhou Rongzhi Electronic Technology Co., Ltd | D60F6-2 | Thickness= 100µm±40µm | — | — |
| Fixing tape 2 | Guangdong Sunrui New Material Co., Ltd. | HZ UV-100 | Thickness= 100µm±40µm | — | — |
| Insulation tape | — | — | — | — | — |
| (Optional) Accessories | — | — | — | — | — |

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| Junction box set 1 | | | | | |
|------------------------|--|--|---|---------------------------------------|------------|
| Junction box 1 | Suzhou Xtong Photovoltaic Technologies Co., Ltd. | PV-XT1609Nxyz (x=4; y=3; z=1 or 2) | Rated. Voltage = 1500V Rated. Current = 25A Reverse current: 40A IP68 | IEC 62790: 2020 EN IEC 62790: 2020 | R 50524457 |
| Cable | Suzhou Xtong Photovoltaic Technologies Co., Ltd. | 62930 IEC 131 1 x 2,5mm ² / 1 x 4,0mm ² / 1 x 6,0mm ² HALOGEN FREE LOW SMOKE | Max. Voltage = 1500VDC | IEC 62930 | R 50453577 |
| Connector | Suzhou Xtong Photovoltaic Technologies Co., Ltd. | PV-XT101.2 | Rated. Voltage = 1500V Rated. Current = 41A | IEC 62852:2014 | R 50568733 |
| Bypass diode | Suzhou Xtong Photovoltaic Technologies Co., Ltd. | XT4050M-B | Tj max = 200°C | — | — |
| Adhesive | H.B.Fuller (Suzhou) Advanced Material Co., Ltd. | 1527 | Color: White | — | — |
| Potting (junction box) | H.B.Fuller (Suzhou) Advanced Material Co., Ltd. | 1533 | Color: White | — | — |
| Junction box set 2 | | | | | |
| Junction box 2 | QC Solar (Suzhou) Corporation | 3Qxy (x=1 or 2 or 3 or 4; y=1 or 2 or 3 or 4) | Rated voltage = 1500VDC Rated current = 20A (x=1; y=1 or 2 or 3 or 4) Rated current = 22A (x=2; y=1 or 2 or 3) Rated current = 25A (x=3; y=1 or 2 or 3 or 4) Rated current = 30A (x=4; y=1 or 2 or 3 or 4) Reverse current = 40A IP68 | IEC 62790: 2020 EN IEC 62790: 2020 | R 50510013 |
| Cable | QC Solar (Suzhou) Corporation | 62930 IEC 131 1 x 2,5mm ² / 1 x 4,0mm ² / 1 x 6,0mm ² / 1 x 10,0mm ² HALOGEN FREE LOW SMOKE | Max. Voltage = 1500VDC | IEC 62930 | R 50447239 |

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| | | | | | |
|---------------------------|--|------------|--|--------------------|------------|
| Connector | QC Solar (Suzhou) Corporation | QC4.10-cds | Max. Voltage = 1500VDC Max. Current = 41A | IEC 62852: 2014 | R 50505605 |
| Bypass diode | QC Solar (Suzhou) Corporation | QCM4045 | Tj max =200 °C; | — | — |
| Adhesive | Shanghai Huitian New Material Co., Ltd. | HT906Z | Color: White | — | — |
| Potting (junction box) | Shanghai Huitian New Material Co., Ltd. | 5299W-S | Color: White | — | — |

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Annex 2: Photos Documentation
Module type: SYMN156TBD625 (BOM1)

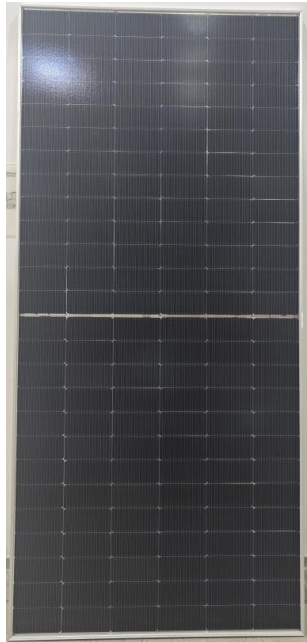


Fig. 1: front view of test sample



Fig. 2: rear view of test sample

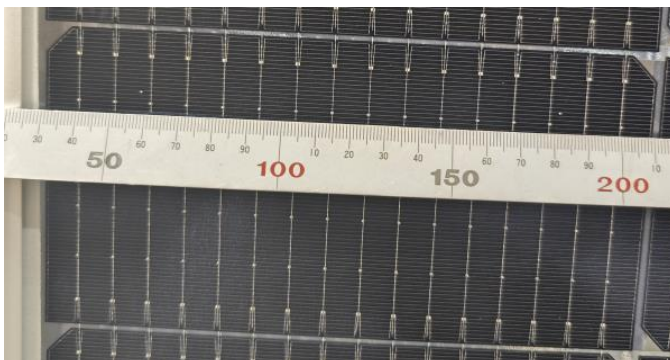


Fig. 3: view of solar cell



Fig. 4: view of type label

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Fig. 5: view of closed junction box



Fig. 6: view of cables

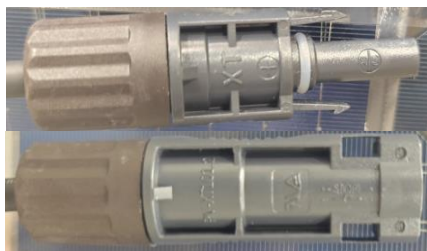


Fig. 7: view of connections

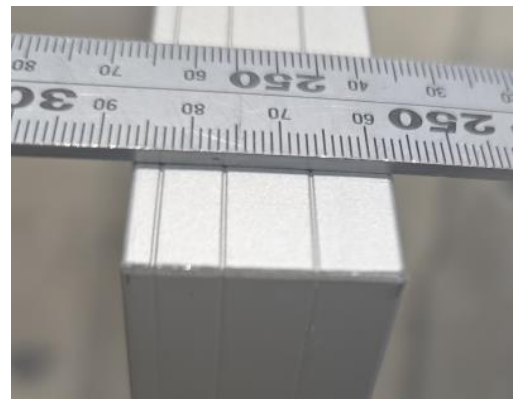


Fig. 8: view of frame corner

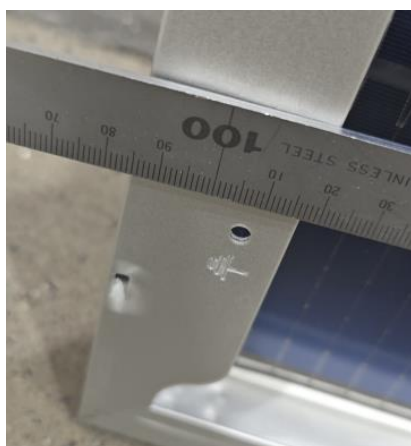


Fig. 9: view of grounding mark

Module type: SYMN156TBD620 (BOM2)



Fig. 10: front view of test sample



Fig. 11: rear view of test sample

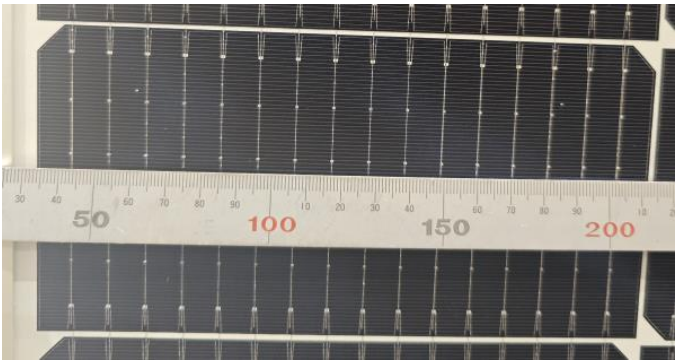


Fig. 12: view of solar cell



Fig. 13: view of type label

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Fig. 14: view of closed junction box



Fig. 15: view of cables



Fig. 16: view of connections



Fig. 17: view of frame corner

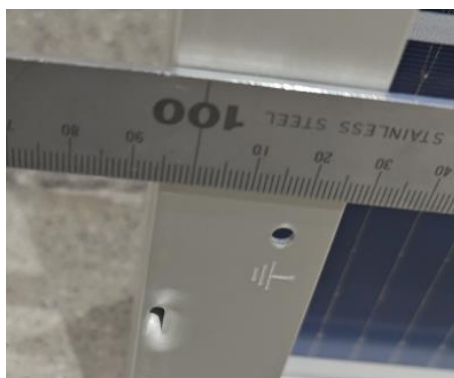


Fig. 18: view of grounding mark

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Annex 3: EL images

Model type: SYMN156TBD625 (BOM1)

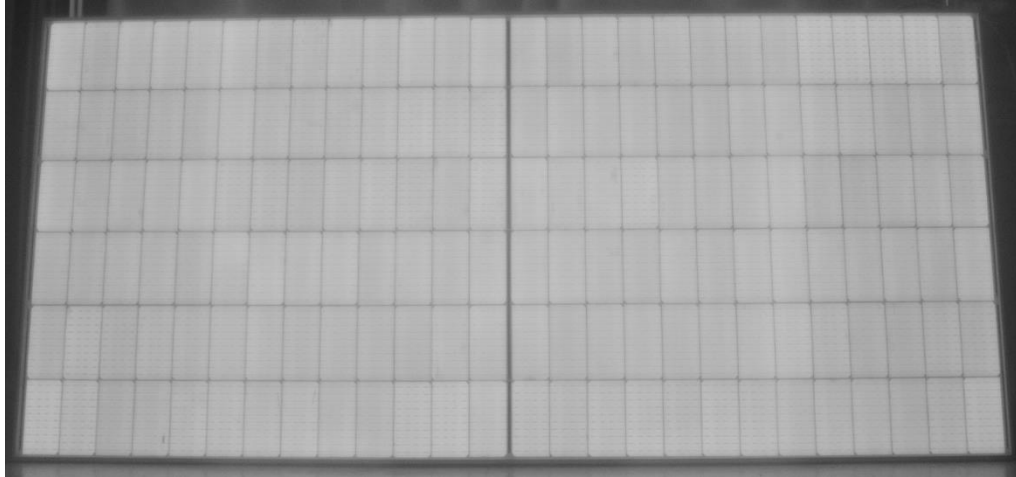


Fig. 19: EL-image of sample 312012090005 (initial)

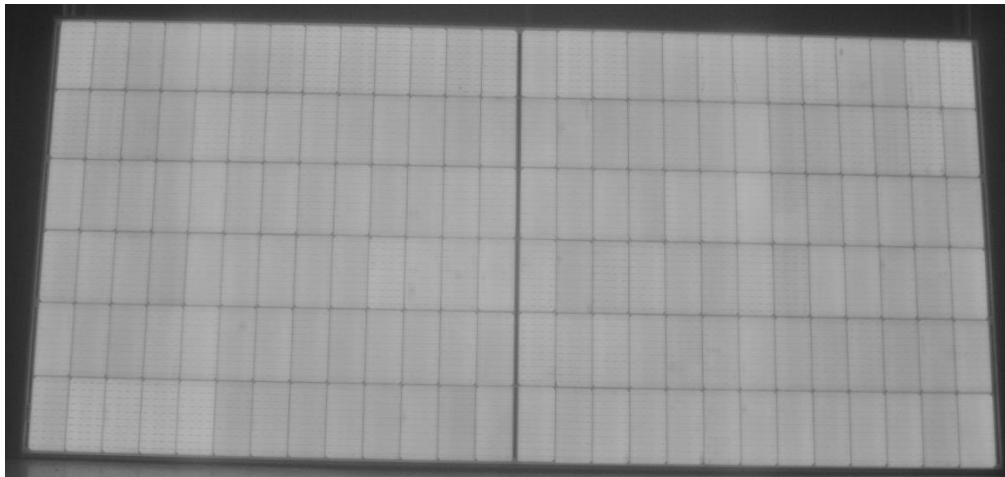


Fig. 20: EL-image of sample 312012090005 (final)

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Model type: SYMN156TBD620 (BOM2)

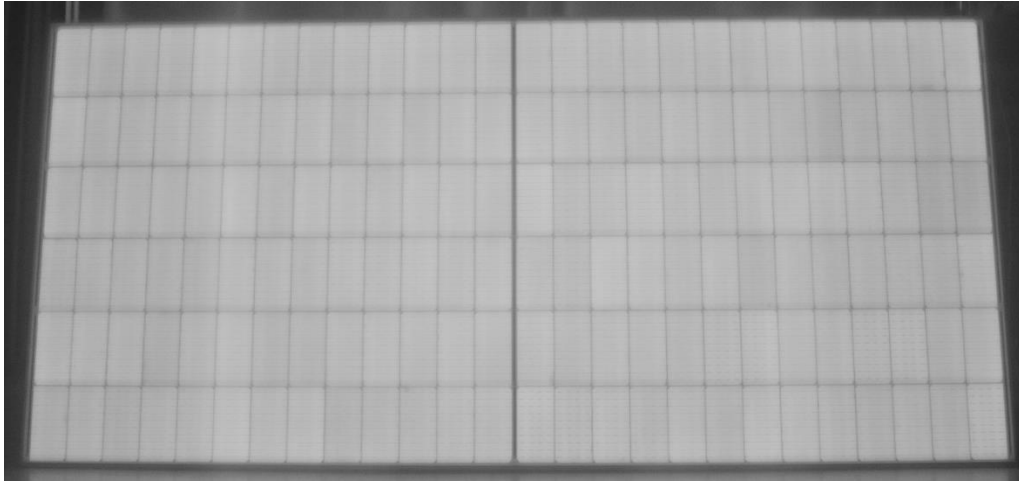


Fig. 21: EL-image of sample 2311012100004 (initial)

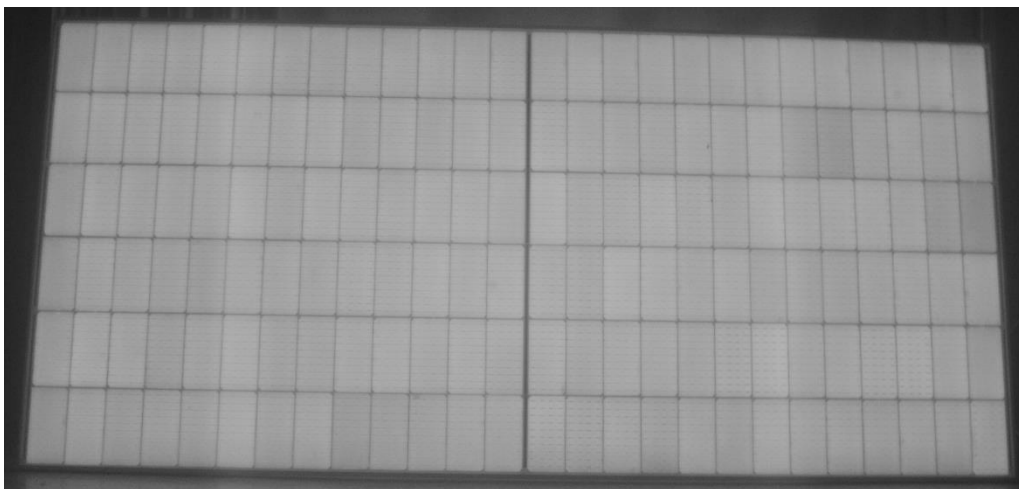


Fig. 22: EL-image of sample 2311012100004 (final)

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Annex 4: IR images

Model type: SYMN156TBD625 (BOM1)

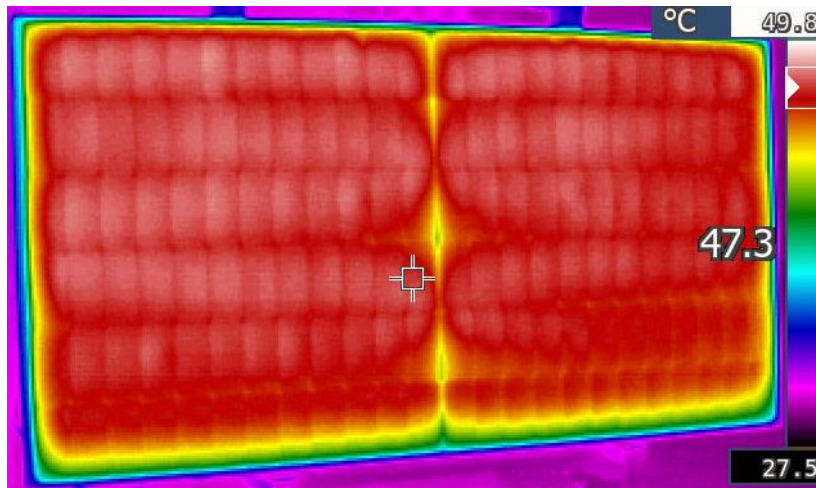


Fig. 23: IR-image of sample 312012090005 (initial)

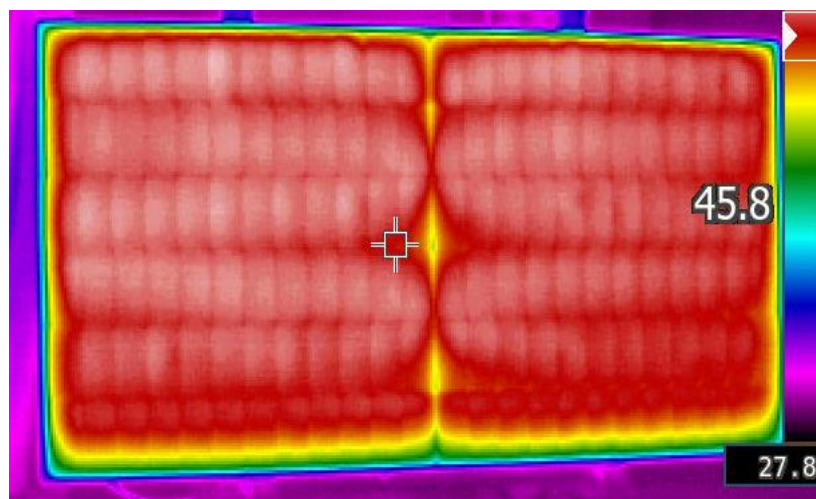


Fig. 24: IR-image of sample 312012090005 (final)

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Model type: SYMN156TBD620 (BOM2)

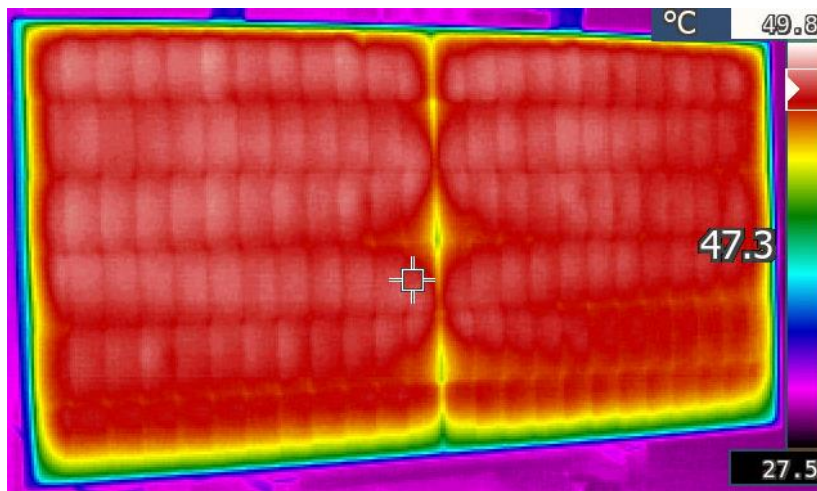


Fig. 25: IR-image of sample 2311012100004 (initial)

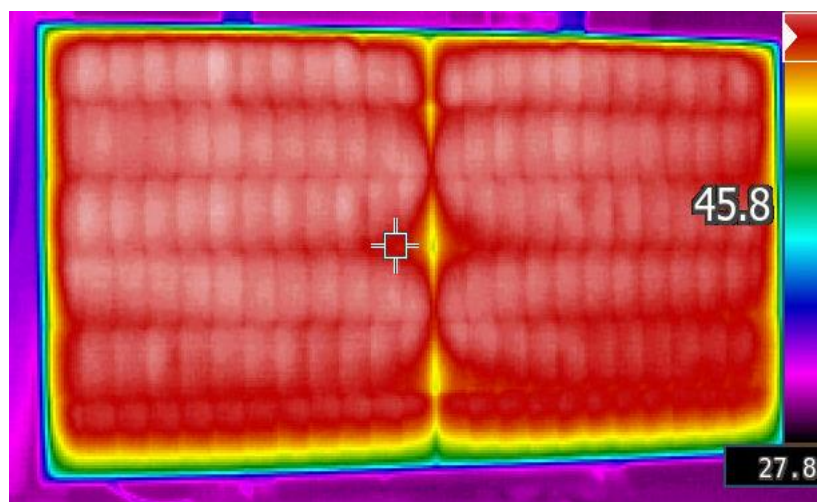


Fig. 26: IR-image of sample 2311012100004 (final)

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Annex 5: Declaration

Statement

To TUV Rheinland (Shanghai) Co., Ltd.:

Below solar cells have identical anti-reflective coating, metallization, crystallization process, cell thickness et. expect for cell dimension as below for details.

Solar cell 1 SYCN182T16 182mmX191mm 16BB
Solar cell 2 SYCN18AT16 182.2mmX95.8mm 16BB



Sany Silicon Energy (Zhuzhou) Co., Ltd.

End of Test Report