

CERTIFICATE

TÜV NORD CERT GmbH
herewith declares that

Emrys Solar GmbH
Sontraer Str. 9
60386
Frankfurt am Main

is authorized to provide the product mentioned below with the mark as illustrated:

Description of product (details see Annex 2):

Crystalline Silicon Terrestrial Photovoltaic (PV) Modules




Valid from: 2023-07-24

Valid until: 2027-07-03

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|-------------------------------|---|
| Certification program: | P12-VA-01 Rev. 17 09.20 |
| Certification fundamental(s): | IEC / EN 61215-1:2016; IEC / EN 61215-1-1:2016; IEC 61215-2:2016 / EN 61215-2:2017 + AC:2017 + AC:2018; IEC 61730-1:2016 / EN IEC 61730-1:2018 + AC:2018; IEC 61730-2:2016 / EN IEC 61730-2:2018 + AC:2018. |
| Registered No.: | 44 780 23 406749 - 223 |
| Test Report No.: | 492012579.001 |
| File No.: | PVP06169/23P-01 |




TÜV NORD CERT GmbH
Certification Body
Consumer Products

Essen, 2023-07-24

Description of product(s):

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|-------------------------------------|---|
| Module types: | Double Glass PV Modules with Half-cut 182mm Mono-crystalline Silicon Solar Cells: 144 cells: ESxxxM72-S2-BF (xxx=530-550, in steps of 5) 132 cells: ESxxxM66-S2-BF (xxx=485-505, in steps of 5) 120 cells: ESxxxM60-S2-BF (xxx=440-455, in steps of 5) 108 cells: ESxxxM54-S2-BF (xxx=400-410, in steps of 5) Remark: xxx indicates output power from the front side only |
| Maximum system voltage: | 1500V |
| Fuse rating: | 30A |
| Electrical protection class: | Class II |
| Pollution degree: | 1 |
| Material group: | I |
| Design load (positive / negative): | 3600Pa / 1600Pa |
| Safety factors: | 1.5 |
| Fire safety class: | Class C according to ANSI/UL 1703-2018 (as per ANSI/UL 790-2018) |
| Bifaciality coefficient (ϕ): | 70% \pm 5% |

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| Module types: | Double Glass PV Modules with Half-cut 210mm Mono-crystalline Silicon Solar Cells: 132 cells: ESxxxM66-S3-BF (xxx=650-670, in steps of 5) 120 cells: ESxxxM60-S3-BF (xxx=590-610, in steps of 5) 108 cells: ESxxxM54-S3-BF (xxx=530-545, in steps of 5) 96 cells: ESxxxM48-S3-BF (xxx=475-490, in steps of 5) 84 cells: ESxxxM42-S3-BF (xxx=415-425, in steps of 5) Remark: xxx indicates output power from the front side only |
| Maximum system voltage: | 1500V |
| Fuse rating: | 35A |
| Electrical protection class: | Class II |
| Pollution degree: | 1 |
| Material group: | I |
| Design load (positive / negative): | 3600Pa / 1600Pa |
| Safety factors: | 1.5 |
| Fire safety class: | Class C according to ANSI/UL 1703-2018 (as per ANSI/UL 790-2018) |
| Bifaciality coefficient (ϕ): | 70% \pm 5% |

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| Module types: | Double Glass PV Modules with Half-cut 210mm TOPCon Monocrystalline Silicon Solar Cells: 132 cells: ESxxxM66-NT3-BF (xxx=660-690, in steps of 5) 120 cells: ESxxxM60-NT3-BF (xxx=600-625, in steps of 5) Remark: xxx indicates output power from the front side only |
| Maximum system voltage: | 1500V |
| Fuse rating: | 35A |
| Electrical protection class: | Class II |
| Pollution degree: | 1 |
| Material group: | I |
| Design load (positive / negative): | 3600Pa / 1600Pa |
| Safety factors: | 1.5 |
| Fire safety class: | Class C according to ANSI/UL 1703-2018 (as per ANSI/UL 790-2018) |
| Bifaciality coefficient (ϕ): | 70% \pm 5% |

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| Module types: | Double Glass PV Modules with Half-cut 182mm TOPCon Monocrystalline Silicon Solar Cells: 156 cells: ESxxxM78-NT2-BF (xxx=580-615, in steps of 5) 144 cells: ESxxxM72-NT2-BF (xxx=535-590, in steps of 5) 132 cells: ESxxxM66-NT2-BF (xxx=490-540, in steps of 5) 120 cells: ESxxxM60-NT2-BF (xxx=445-490, in steps of 5) 108 cells: ESxxxM54-NT2-BF (xxx=400-440, in steps of 5) Remark: xxx indicates output power from the front side only |
| Maximum system voltage: | 1500V |
| Fuse rating: | 30A |
| Electrical protection class: | Class II |
| Pollution degree: | 1 |
| Material group: | I |
| Design load (positive / negative): | 3600Pa / 1600Pa |
| Safety factors: | 1.5 |
| Fire safety class: | Class C according to ANSI/UL 1703-2018 (as per ANSI/UL 790-2018) |
| Bifaciality coefficient (ϕ): | 70% \pm 5% |



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|--------------------------------------|----------------|----------------|----------------|----------------|
| Module types: | ES530M72-S2-BF | ES535M72-S2-BF | ES540M72-S2-BF | ES545M72-S2-BF |
| Rated Pmpp at STC (Front side only): | 530W | 535W | 540W | 545W |
| Rated Pmpp power with albedo 13.5%: | 580W | 585W | 590W | 595W |

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|--------------------------------------|----------------|----------------|----------------|----------------|
| Module types: | ES550M72-S2-BF | ES485M66-S2-BF | ES490M66-S2-BF | ES495M66-S2-BF |
| Rated Pmpp at STC (Front side only): | 550W | 485W | 490W | 495W |
| Rated Pmpp power with albedo 13.5%: | 600W | 530W | 535W | 540W |

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| Module types: | ES500M66-S2-BF | ES505M66-S2-BF | ES440M60-S2-BF | ES445M60-S2-BF |
| Rated Pmpp at STC (Front side only): | 500W | 505W | 440W | 445W |
| Rated Pmpp power with albedo 13.5%: | 545W | 550W | 480W | 485W |

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| Module types: | ES450M60-S2-BF | ES455M60-S2-BF | ES400M54-S2-BF | ES405M54-S2-BF |
| Rated Pmpp at STC (Front side only): | 450W | 455W | 400W | 405W |
| Rated Pmpp power with albedo 13.5%: | 490W | 495W | 435W | 440W |

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| Module types: | ES410M54-S2-BF | ES650M66-S3-BF | ES655M66-S3-BF | ES660M66-S3-BF |
| Rated Pmpp at STC (Front side only): | 410W | 650W | 655W | 660W |
| Rated Pmpp power with albedo 13.5%: | 445W | 710W | 715W | 720W |



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| Module types: | ES665M66-S3-BF | ES670M66-S3-BF | ES590M60-S3-BF | ES595M60-S3-BF |
| Rated Pmpp at STC (Front side only): | 665W | 670W | 590W | 595W |
| Rated Pmpp power with albedo 13.5%: | 725W | 730W | 645W | 650W |

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| Module types: | ES600M60-S3-BF | ES605M60-S3-BF | ES610M60-S3-BF | ES530M54-S3-BF |
| Rated Pmpp at STC (Front side only): | 600W | 605W | 610W | 530W |
| Rated Pmpp power with albedo 13.5%: | 655W | 660W | 665W | 580W |

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| Module types: | ES535M54-S3-BF | ES540M54-S3-BF | ES545M54-S3-BF | ES475M48-S3-BF |
| Rated Pmpp at STC (Front side only): | 535W | 540W | 545W | 475W |
| Rated Pmpp power with albedo 13.5%: | 585W | 590W | 595W | 520W |

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| Module types: | ES480M48-S3-BF | ES485M48-S3-BF | ES490M48-S3-BF | ES415M42-S3-BF |
| Rated Pmpp at STC (Front side only): | 480W | 485W | 490W | 415W |
| Rated Pmpp power with albedo 13.5%: | 525W | 530W | 535W | 455W |

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| Module types: | ES420M42-S3-BF | ES425M42-S3-BF |
| Rated Pmpp at STC (Front side only): | 420W | 425W |
| Rated Pmpp power with albedo 13.5%: | 460W | 465W |



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| Module types: | ES660M66-NT3-BF | ES665M66-NT3-BF | ES670M66-NT3-BF | ES675M66-NT3-BF |
| Rated P _{mp} at STC (Front side only): | 660W | 665W | 670W | 675W |
| Rated P _{mp} power with albedo 13.5%: | 735W | 740W | 745W | 750W |

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| Module types: | ES680M66-NT3-BF | ES685M66-NT3-BF | ES690M66-NT3-BF | ES600M60-NT3-BF |
| Rated P _{mp} at STC (Front side only): | 680W | 685W | 690W | 600W |
| Rated P _{mp} power with albedo 13.5%: | 755W | 760W | 765W | 670W |

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| Module types: | ES605M60-NT3-BF | ES610M60-NT3-BF | ES615M60-NT3-BF | ES620M60-NT3-BF |
| Rated P _{mp} at STC (Front side only): | 605W | 610W | 615W | 620W |
| Rated P _{mp} power with albedo 13.5%: | 675W | 680W | 685W | 690W |

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| Module types: | ES625M60-NT3-BF | ES580M78-NT2-BF | ES585M78-NT2-BF | ES590M78-NT2-BF |
| Rated P _{mp} at STC (Front side only): | 625W | 580 | 585 | 590 |
| Rated P _{mp} power with albedo 13.5%: | 695W | 645 | 650 | 655 |

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| Module types: | ES595M78-NT2-BF | ES600M78-NT2-BF | ES605M78-NT2-BF | ES610M78-NT2-BF |
| Rated P _{mp} at STC (Front side only): | 595 | 600 | 605 | 610 |
| Rated P _{mp} power with albedo 13.5%: | 660 | 665 | 670 | 675 |



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|--------------------------------------|-----------------|-----------------|-----------------|-----------------|
| Module types: | ES615M78-NT2-BF | ES535M72-NT2-BF | ES540M72-NT2-BF | ES545M72-NT2-BF |
| Rated Pmpp at STC (Front side only): | 615 | 535 | 540 | 545 |
| Rated Pmpp power with albedo 13.5%: | 680 | 595 | 600 | 605 |

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|--------------------------------------|-----------------|-----------------|-----------------|-----------------|
| Module types: | ES550M72-NT2-BF | ES555M72-NT2-BF | ES560M72-NT2-BF | ES565M72-NT2-BF |
| Rated Pmpp at STC (Front side only): | 550 | 555 | 560 | 565 |
| Rated Pmpp power with albedo 13.5%: | 610 | 615 | 620 | 625 |

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| Module types: | ES570M72-NT2-BF | ES575M72-NT2-BF | ES580M72-NT2-BF | ES585M72-NT2-BF |
| Rated Pmpp at STC (Front side only): | 570 | 575 | 580 | 585 |
| Rated Pmpp power with albedo 13.5%: | 630 | 635 | 640 | 645 |

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|--------------------------------------|-----------------|-----------------|-----------------|-----------------|
| Module types: | ES590M72-NT2-BF | ES490M66-NT2-BF | ES495M66-NT2-BF | ES500M66-NT2-BF |
| Rated Pmpp at STC (Front side only): | 590 | 490 | 495 | 500 |
| Rated Pmpp power with albedo 13.5%: | 650 | 545 | 550 | 555 |

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| Module types: | ES505M66-NT2-BF | ES510M66-NT2-BF | ES515M66-NT2-BF | ES520M66-NT2-BF |
| Rated Pmpp at STC (Front side only): | 505 | 510 | 515 | 520 |
| Rated Pmpp power with albedo 13.5%: | 560 | 565 | 570 | 575 |



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| Module types: | ES525M66-NT2-BF | ES530M66-NT2-BF | ES535M66-NT2-BF | ES540M66-NT2-BF |
| Rated Pmpp at STC (Front side only): | 525 | 530 | 535 | 540 |
| Rated Pmpp power with albedo 13.5%: | 580 | 585 | 590 | 595 |

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|--------------------------------------|-----------------|-----------------|-----------------|-----------------|
| Module types: | ES445M60-NT2-BF | ES450M60-NT2-BF | ES455M60-NT2-BF | ES460M60-NT2-BF |
| Rated Pmpp at STC (Front side only): | 445 | 450 | 455 | 460 |
| Rated Pmpp power with albedo 13.5%: | 495 | 500 | 505 | 510 |

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| Module types: | ES465M60-NT2-BF | ES470M60-NT2-BF | ES475M60-NT2-BF | ES480M60-NT2-BF |
| Rated Pmpp at STC (Front side only): | 465 | 470 | 475 | 480 |
| Rated Pmpp power with albedo 13.5%: | 515 | 520 | 525 | 530 |

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|--------------------------------------|-----------------|-----------------|-----------------|-----------------|
| Module types: | ES485M60-NT2-BF | ES490M60-NT2-BF | ES400M54-NT2-BF | ES405M54-NT2-BF |
| Rated Pmpp at STC (Front side only): | 485 | 490 | 400 | 405 |
| Rated Pmpp power with albedo 13.5%: | 535 | 540 | 445 | 450 |

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|--------------------------------------|-----------------|-----------------|-----------------|-----------------|
| Module types: | ES410M54-NT2-BF | ES415M54-NT2-BF | ES420M54-NT2-BF | ES425M54-NT2-BF |
| Rated Pmpp at STC (Front side only): | 410 | 415 | 420 | 425 |
| Rated Pmpp power with albedo 13.5%: | 455 | 460 | 465 | 470 |



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| Module types: | ES430M54-NT2-BF | ES435M54-NT2-BF | ES440M54-NT2-BF |
| Rated P _{mpp} at STC (Front side only): | 430 | 435 | 440 |
| Rated P _{mpp} power with albedo 13.5%: | 475 | 480 | 485 |

Remark:

For detailed product information, please refer to CDF (Constructional Data Form) in Annex 1 of test report.

Bifaciality coefficient (ϕ) = ($I_{sc\text{rear}} / I_{sc\text{front}}$) or ($P_{mpp\text{rear}} / P_{mpp\text{front}}$), whichever is smaller.

The tolerance of bifaciality coefficient (ϕ) is claimed by client.

Rated P_{mpp} power with albedo: comprehensive power of both sides, taken ϕ and albedo into consideration.

The albedo is claimed by client.



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