TEST REPORT
IEC 61730
TUV SUD Test Report for Photovoltaic (PV) modules safety qualification – Part 1: Requirements for construction and Part 2: Requirements for testing

Report No.: Date of issue: Project handler:	704062316712-00 part 2 of 2 April 11, 2024 Rongwei Jing
Testing laboratory: Address: Testing location:	TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch No. 151 Heng Tong Road, Shanghai 200070, P. R. China Yangzhou Opto-Electrical Products Testing Institute No. 10 West Kaifa Road, Yangzhou, 225009 Jiangsu, P. R. China
Client: Client number: Address:	Q-SUN Anhui Co., Ltd. 104991 West of Jingliu Road, North of Weisan Road, 239300 Tianchang City, Anhui Province, PEOPLE'S REPUBLIC OF CHINA
Standard:	This TUV SUD test report form is based on the following requirements: IEC 61730-2:2023 in conjunction with IEC 61730-1:2023
TRF number and revision*:*	TRF IEC 61730:2023 Rev.0:2023
Copyright blank test report:	
General disclaimer:	This test report is based on the content of the standard (see above). The test report considered selected clauses of the a.m. standard(s) and experience gained with product testing. It was prepared by TUV SUD Product Service. TUV SUD Group takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context. This report is the result of a single examination of the object in question and is not generally applicable evaluation of the quality of other products in regular production.
Scheme:	☒ TUV Mark ☐ without certification ☐ AoC/CoC for EU-Directive / EU-Regulation: ☐ GS Mark ☐ NRTL Mark ☐ other:
Non-standard test method: National deviations:	☒ No ☐ Yes, see details under *Summary of testing* N/A
Number of pages *(Report)*:	153

Compiled by: (+ signature)	Rongwei Jing	Approved by: (+ signature)	Guangxia Fu

Test sample: Trademark:	Photovoltaic (PV) Module(s) QSUN solar
Model/Type reference:	QN-685HT-01, QN-595HT-02, QN-580HT-05, QN-560HT-06, QN-615HT-06 (representative testing models)
Rating(s):	refer to page 3~18
Manufacturer: Manufacturer number: Address:	Q-SUN Anhui Co., Ltd. 104991 West of Jingliu Road, North of Weisan Road, 239300 Tianchang City, Anhui Province, PEOPLE'S REPUBLIC OF CHINA

Name and address of factory(ies)

1. Q-SUN Anhui Co., Ltd.
West of Jingliu Road, North of Weisan Road, 239300 Tianchang City, Anhui Province, PEOPLE'S REPUBLIC OF CHINA
Factory No.: 104991

2. Q-SUN Jiangsu Co., Ltd.
Fengfu No. 4 Road, Precision Manufacting Industrial Park, 224200 DongTai City, Jiangsu Province, PEOPLE'S REPUBLIC OF CHINA
Factory No.: 118795

Order description:	☒ Complete test according to TRF
	☐ Partial test according to manufacturer's specifications
	☐ Preliminary test
	☐ Spot check
	☐ Others:
Date of order:	November 20, 2023
Date of receipt of test item:	December 14, 2023
Date(s) of performance of test:	December 15, 2023 to April 03, 2024

Test item particulars:
See below for details

Product Electrical Ratings:

Monofacial Module：

Module type	-			
Voc [V] /Tolerance	-			

Vmp [V]	-			
Imp [Adc]	-			
Isc [Adc] /Tolerance	-			
Pmp [W] /Tolerance	-			
Maximum system voltage [V]	-			
Maximum Over-Current Protection Rating [A]	-			
Remarks:				

Bifacial Module：

	Module type	QN-670HT-01	QN-675HT-01	QN-680HT-01	QN-685HT-01
STC condition	P_{max} [W] /Tolerance	670±3%	675±3%	680±3%	685±3%
	V_{oc} [V] /Tolerance	46.96±3%	47.16±3%	47.35±3%	47.55±3%
	I_{sc} [Adc] /Tolerance	18.06±3%	18.12±3%	18.18±3%	18.24±3%
	V_{mp} [V]	39.39	39.57	39.74	39.92
	I_{mp} [Adc]	17.01	17.06	17.11	17.16
BNPI condition	P_{max} [W] /Tolerance	739±3%	744±3%	750±3%	755±3%
	V_{oc} [V] /Tolerance	46.96±3%	47.16±3%	47.35±3%	47.55±3%
	I_{sc} [Adc] /Tolerance	19.92±3%	19.98±3%	20.04±3%	20.11±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	22.18±3%	22.25±3%	22.32±3%	22.39±3%

	Module type	QN-690HT-01	QN-695HT-01	QN-700HT-01	QN-705HT-01
STC condition	P_{max} [W] /Tolerance	690±3%	695±3%	700±3%	705±3%
	V_{oc} [V] /Tolerance	47.74±3%	47.94±3%	48.13±3%	48.32±3%
	I_{sc} [Adc] /Tolerance	18.29±3%	18.35±3%	18.41±3%	18.47±3%
	V_{mp} [V]	40.09	40.27	40.44	40.61
	I_{mp} [Adc]	17.21	17.26	17.31	17.36

BNPI condition	P_{max} [W] /Tolerance	761±3%	766±3%	772±3%	777±3%
	V_{oc} [V] /Tolerance	47.74±3%	47.94±3%	48.13±3%	48.32±3%
	I_{sc} [Adc] /Tolerance	20.17±3%	20.23±3%	20.30±3%	20.36±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	22.46±3%	22.54±3%	22.61±3%	22.68±3%

	Module type	QN-710HT-01	QN-610HT-01	QN-615HT-01	QN-620HT-01
STC condition	P_{max} [W] /Tolerance	710±3%	610±3%	615±3%	620±3%
	V_{oc} [V] /Tolerance	48.51±3%	42.91±3%	43.12±3%	43.32±3%
	I_{sc} [Adc] /Tolerance	18.52±3%	18.0 ± 3%	18.06±3%	18.11±3%
	V_{mp} [V]	40.78	35.8	35.99	36.17
	I_{mp} [Adc]	17.41	17.04	17.09	17.14
BNPI condition	P_{max} [W] /Tolerance	783±3%	673±3%	678±3%	684±3%
	V_{oc} [V] /Tolerance	48.51±3%	42.91±3%	43.12±3%	43.32±3%
	I_{sc} [Adc] /Tolerance	20.43±3%	19.84±3%	19.91±3%	19.97±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	22.75±3%	22.10±3%	22.17±3%	22.24±3%

	Module type	QN-625HT-01	QN-630HT-01	QN-635HT-01	QN-640HT-01
STC condition	P_{max} [W] /Tolerance	625±3%	630±3%	635±3%	640±3%
	V_{oc} [V] /Tolerance	43.54±3%	43.74±3%	43.96±3%	44.16±3%
	I_{sc} [Adc] /Tolerance	18.17±3%	18.23±3%	18.29±3%	18.34±3%
	V_{mp} [V]	36.36	36.54	36.73	36.91
	I_{mp} [Adc]	17.19	17.24	17.29	17.34
BNPI condition	P_{max} [W] /Tolerance	689±3%	695±3%	700±3%	706±3%
	V_{oc} [V] /Tolerance	43.54±3%	43.74±3%	43.96±3%	44.16±3%
	I_{sc} [Adc] /Tolerance	20.04±3%	20.10±3%	20.16±3%	20.23±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	22.31±3%	22.39±3%	22.46±3%	22.53±3%

	Module type	QN-645HT-01	QN-585HT-02	QN-590HT-02	QN-595HT-02
STC condition	P_{max} [W] /Tolerance	645±3%	585±3%	590±3%	595±3%
	V_{oc} [V] /Tolerance	44.37±3%	46.76±3%	46.98±3%	47.20±3%
	I_{sc} [Adc] /Tolerance	18.40±3%	15.84±3%	15.90±3%	15.95±3%
	V_{mp} [V]	37.09	39.21	39.41	39.61
	I_{mp} [Adc]	17.39	14.92	14.97	15.02
BNPI condition	P_{max} [W] /Tolerance	711±3%	645±3%	650±3%	656±3%
	V_{oc} [V] /Tolerance	44.37±3%	46.76±3%	46.98±3%	47.20±3%
	I_{sc} [Adc] /Tolerance	20.29±3%	17.46±3%	17.53±3%	17.59±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	22.60±3%	19.45±3%	19.52±3%	19.59±3%

	Module type	QN-600HT-02	QN-605HT-02	QN-610HT-02	QN-615HT-02
STC condition	P_{max} [W] /Tolerance	600±3%	605±3%	610±3%	615±3%
	V_{oc} [V] /Tolerance	47.43±3%	47.65±3%	47.88±3%	48.10±3%
	I_{sc} [Adc] /Tolerance	16.01±3%	16.07±3%	16.13±3%	16.19±3%
	V_{mp} [V]	39.81	40.01	40.21	40.41
	I_{mp} [Adc]	15.07	15.12	15.17	15.22
BNPI condition	P_{max} [W] /Tolerance	661±3%	667±3%	673±3%	678±3%
	V_{oc} [V] /Tolerance	47.43±3%	47.65±3%	47.88±3%	48.10±3%
	I_{sc} [Adc] /Tolerance	17.65±3%	17.72±3%	17.78±3%	17.85±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	19.66±3%	19.73±3%	19.80±3%	19.88±3%

	Module type	QN-620HT-02	QN-535HT-02	QN-540HT-02	QN-545HT-02
STC condition	P_{max} [W] /Tolerance	620±3%	535±3%	540±3%	545±3%
	V_{oc} [V] /Tolerance	48.32±3%	42.89±3%	43.13±3%	43.37±3%
	I_{sc} [Adc] /Tolerance	16.24±3%	15.79±3%	15.85±3%	15.91±3%
	V_{mp} [V]	40.6	35.79	36	36.21

	I_{mp} [Adc]	15.27	14.95	15	15.05
BNPI condition	P_{max} [W] /Tolerance	684±3%	590±3%	595±3%	601±3%
	V_{oc} [V] /Tolerance	48.32±3%	42.89±3%	43.13±3%	43.37±3%
	I_{sc} [Adc] /Tolerance	17.91±3%	17.41±3%	17.47±3%	17.54±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	19.95±3%	19.39±3%	19.46±3%	19.53±3%

	Module type	QN-550HT-02	QN-555HT-02	QN-560HT-02	QN-565HT-02
STC condition	P_{max} [W] /Tolerance	550±3%	555±3%	560±3%	565±3%
	V_{oc} [V] /Tolerance	43.61±3%	43.85±3%	44.08±3%	44.32±3%
	I_{sc} [Adc] /Tolerance	15.96±3%	16.02±3%	16.08±3%	16.14±3%
	V_{mp} [V]	36.42	36.63	36.84	37.05
	I_{mp} [Adc]	15.1	15.15	15.20	15.25
BNPI condition	P_{max} [W] /Tolerance	606±3%	612±3%	617±3%	623±3%
	V_{oc} [V] /Tolerance	43.61±3%	43.85±3%	44.08±3%	44.32±3%
	I_{sc} [Adc] /Tolerance	17.60±3%	17.66±3%	17.73±3%	17.79±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	19.60±3%	19.67±3%	19.75±3%	19.82±3%

	Module type	QN-480HT-02	QN-485HT-02	QN-490HT-02	QN-495HT-02
STC condition	P_{max} [W] /Tolerance	480±3%	485±3%	490±3%	495±3%
	V_{oc} [V] /Tolerance	38.74±3%	39.01±3%	39.26±3%	39.51±3%
	I_{sc} [Adc] /Tolerance	15.68±3%	15.74±3%	15.80±3%	15.86±3%
	V_{mp} [V]	32.15	32.38	32.6	32.82
	I_{mp} [Adc]	14.93	14.98	15.03	15.08
BNPI condition	P_{max} [W] /Tolerance	529±3%	535±3%	540±3%	546±3%
	V_{oc} [V] /Tolerance	38.74±3%	39.01±3%	39.26±3%	39.51±3%
	I_{sc} [Adc] /Tolerance	17.29±3%	17.36±3%	17.42±3%	17.48±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	19.26±3%	19.33±3%	19.40±3%	19.47±3%

	Module type	QN-500HT-02	QN-505HT-02	QN-425HT-02	QN-430HT-02
STC condition	P_{max} [W] /Tolerance	500±3%	505±3%	425±3%	430±3%
	V_{oc} [V] /Tolerance	39.77±3%	40.02±3%	34.65±3%	34.93±3%
	I_{sc} [Adc] /Tolerance	15.91±3%	15.97±3%	15.53±3%	15.58±3%
	V_{mp} [V]	33.05	33.27	28.6	28.84
	I_{mp} [Adc]	15.13	15.18	14.86	14.91
BNPI condition	P_{max} [W] /Tolerance	551±3%	557±3%	469±3%	474±3%
	V_{oc} [V] /Tolerance	39.77±3%	40.02±3%	34.65±3%	34.93±3%
	I_{sc} [Adc] /Tolerance	17.55±3%	17.61±3%	17.12±3%	17.18±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	19.54±3%	19.61±3%	19.07±3%	19.14±3%

	Module type	QN-435HT-02	QN-440HT-02	QN-445HT-02	QN-450HT-02
STC condition	P_{max} [W] /Tolerance	435±3%	440±3%	445±3%	450±3%
	V_{oc} [V] /Tolerance	35.20±3%	35.47±3%	35.75±3%	36.02±3%
	I_{sc} [Adc] /Tolerance	15.64±3%	15.70±3%	15.76±3%	15.82±3%
	V_{mp} [V]	29.08	29.31	29.55	29.78
	I_{mp} [Adc]	14.96	15.01	15.06	15.11
BNPI condition	P_{max} [W] /Tolerance	480±3%	485±3%	491±3%	496±3%
	V_{oc} [V] /Tolerance	35.20±3%	35.47±3%	35.75±3%	36.02±3%
	I_{sc} [Adc] /Tolerance	17.25±3%	17.31±3%	17.38±3%	17.44±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	19.21±3%	19.28±3%	19.35±3%	19.42±3%

	Module type	QN-605HT-03	QN-610HT-03	QN-615HT-03	QN-620HT-03
STC condition	P_{max} [W] /Tolerance	605±3%	610±3%	615±3%	620±3%
	V_{oc} [V] /Tolerance	50.76±3%	50.98±3%	51.21±3%	48.32±3%
	I_{sc} [Adc] /Tolerance	15.09±3%	15.15±3%	15.21±3%	16.24±3%
	V_{mp} [V]	42.79	42.99	43.19	40.6

	I_{mp} [Adc]	14.14	14.19	14.24	15.27
BNPI condition	P_{max} [W] /Tolerance	667±3%	673±3%	678±3%	683.57±3%
	V_{oc} [V] /Tolerance	50.76±3%	50.98±3%	51.21±3%	48.32±3%
	I_{sc} [Adc] /Tolerance	16.64±3%	16.70±3%	16.77±3%	17.91±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	18.53±3%	18.60±3%	18.67±3%	19.95±3%

	Module type	QN-625HT-03	QN-630HT-03	QN-635HT-03	QN-640HT-03
STC condition	P_{max} [W] /Tolerance	625±3%	630±3%	635±3%	640±3%
	V_{oc} [V] /Tolerance	51.63±3%	51.85±3%	52.07±3%	52.29±3%
	I_{sc} [Adc] /Tolerance	15.32±3%	15.38±3%	15.44±3%	15.49±3%
	V_{mp} [V]	43.58	43.78	43.97	44.17
	I_{mp} [Adc]	14.34	14.39	14.44	14.49
BNPI condition	P_{max} [W] /Tolerance	689±3%	695±3%	700±3%	706±3%
	V_{oc} [V] /Tolerance	51.63±3%	51.85±3%	52.07±3%	52.29±3%
	I_{sc} [Adc] /Tolerance	16.89±3%	16.96±3%	17.02±3%	17.08±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	18.81±3%	18.89±3%	18.96±3%	19.03±3%

	Module type	QN-555HT-03	QN-560HT-03	QN-565HT-03	QN-570HT-03
STC condition	P_{max} [W] /Tolerance	555±3%	560±3%	565±3%	570±3%
	V_{oc} [V] /Tolerance	46.71±3%	46.95±3%	47.18±3%	47.42±3%
	I_{sc} [Adc] /Tolerance	15.04±3%	15.10±3%	15.16±3%	15.21±3%
	V_{mp} [V]	39.17	39.38	39.59	39.8
	I_{mp} [Adc]	14.17	14.22	14.27	14.32
BNPI condition	P_{max} [W] /Tolerance	612±3%	617±3%	623±3%	628±3%
	V_{oc} [V] /Tolerance	46.71±3%	46.95±3%	47.18±3%	47.42±3%
	I_{sc} [Adc] /Tolerance	16.58±3%	16.65±3%	16.71±3%	16.78±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	18.47±3%	18.54±3%	18.61±3%	18.68±3%

	Module type	QN-575HT-03	QN-580HT-03	QN-585HT-03	QN-505HT-03
STC condition	P_{max} [W] /Tolerance	575±3%	580±3%	585±3%	505±3%
	V_{oc} [V] /Tolerance	47.65±3%	47.89±3%	48.12±3%	42.78±3%
	I_{sc} [Adc] /Tolerance	15.27±3%	15.33±3%	15.39±3%	14.94±3%
	V_{mp} [V]	40.01	40.22	40.43	35.69
	I_{mp} [Adc]	14.37	14.42	14.47	14.15
BNPI condition	P_{max} [W] /Tolerance	634±3%	639±3%	645±3%	557±3%
	V_{oc} [V] /Tolerance	47.65±3%	47.89±3%	48.12±3%	42.78±3%
	I_{sc} [Adc] /Tolerance	16.84±3%	16.90±3%	16.97±3%	16.48±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	18.75±3%	18.83±3%	18.90±3%	18.35±3%

	Module type	QN-510HT-03	QN-515HT-03	QN-520HT-03	QN-525HT-03
STC condition	P_{max} [W] /Tolerance	510±3%	515±3%	520±3%	525±3%
	V_{oc} [V] /Tolerance	43.04±3%	43.29±3%	43.54±3%	43.80±3%
	I_{sc} [Adc] /Tolerance	15.00±3%	15.06±3%	15.12±3%	15.17±3%
	V_{mp} [V]	35.92	36.14	36.36	36.59
	I_{mp} [Adc]	14.2	14.25	14.3	14.35
BNPI condition	P_{max} [W] /Tolerance	562±3%	568±3%	573±3%	579±3%
	V_{oc} [V] /Tolerance	43.04±3%	43.29±3%	43.54±3%	43.80±3%
	I_{sc} [Adc] /Tolerance	16.54±3%	16.60±3%	16.67±3%	16.73±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	18.42±3%	18.49±3%	18.56±3%	18.63±3%

	Module type	QN-530HT-03	QN-455HT-03	QN-460HT-03	QN-465HT-03
STC condition	P_{max} [W] /Tolerance	530±3%	455±3%	460±3%	465±3%
	V_{oc} [V] /Tolerance	44.05±3%	38.67±3%	38.95±3%	39.21±3%
	I_{sc} [Adc] /Tolerance	15.23±3%	14.89±3%	14.95±3%	15.01±3%
	V_{mp} [V]	36.81	32.09	32.33	32.56

	I_{mp} [Adc]	14.4	14.18	14.23	14.28
BNPI condition	P_{max} [W] /Tolerance	584±3%	502±3%	507±3%	513±3%
	V_{oc} [V] /Tolerance	44.05±3%	38.67±3%	38.95±3%	39.21±3%
	I_{sc} [Adc] /Tolerance	16.79±3%	16.42±3%	16.49±3%	16.55±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	18.70±3%	18.29±3%	18.36±3%	18.43±3%

	Module type	QN-470HT-03	QN-475HT-03	QN-480HT-03	QN-585HT-04
STC condition	P_{max} [W] /Tolerance	470±3%	475±3%	480±3%	585±3%
	V_{oc} [V] /Tolerance	39.49±3%	39.75±3%	40.01±3%	50.80±3%
	I_{sc} [Adc] /Tolerance	15.07±3%	15.13±3%	15.18±3%	14.58±3%
	V_{mp} [V]	32.80	33.03	33.26	42.83
	I_{mp} [Adc]	14.33	14.38	14.43	13.66
BNPI condition	P_{max} [W] /Tolerance	518±3%	524±3%	529±3%	645±3%
	V_{oc} [V] /Tolerance	39.49±3%	39.75±3%	40.01±3%	50.80±3%
	I_{sc} [Adc] /Tolerance	16.61±3%	16.68±3%	16.74±3%	16.07±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	18.50±3%	18.57±3%	18.65±3%	17.90±3%

	Module type	QN-590HT-04	QN-595HT-04	QN-600HT-04	QN-605HT-04
STC condition	P_{max} [W] /Tolerance	590±3%	595±3%	600±3%	605±3%
	V_{oc} [V] /Tolerance	51.02±3%	51.26±3%	51.49±3%	51.71±3%
	I_{sc} [Adc] /Tolerance	14.64±3%	14.69±3%	14.75±3%	14.81±3%
	V_{mp} [V]	43.03	43.24	43.45	43.65
	I_{mp} [Adc]	13.71	13.76	13.81	13.86
BNPI condition	P_{max} [W] /Tolerance	650±3%	656±3%	662±3%	667±3%
	V_{oc} [V] /Tolerance	51.02±3%	51.26±3%	51.49±3%	51.71±3%
	I_{sc} [Adc] /Tolerance	16.14±3%	16.20±3%	16.27±3%	16.33±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	17.97±3%	18.04±3%	18.12±3%	18.19±3%

	Module type	QN-610HT-04	QN-615HT-04	QN-535HT-04	QN-540 HT-04
STC condition	P_{max} [W] /Tolerance	610±3%	615±3%	535±3%	540±3%
	V_{oc} [V] /Tolerance	51.93±3%	52.15±3%	46.77±3%	47.02±3%
	I_{sc} [Adc] /Tolerance	14.87±3%	14.93±3%	14.48±3%	14.54±3%
	V_{mp} [V]	43.85	44.05	39.22	39.44
	I_{mp} [Adc]	13.91	13.96	13.64	13.69
BNPI condition	P_{max} [W] /Tolerance	673±3%	678±3%	590±3%	595±3%
	V_{oc} [V] /Tolerance	51.93±3%	52.15±3%	46.77±3%	47.02±3%
	I_{sc} [Adc] /Tolerance	16.39±3%	16.46±3%	15.97±3%	16.03±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	18.26±3%	18.33±3%	17.78±3%	17.85±3%

	Module type	QN-545HT-04	QN-550HT-04	QN-555HT-04	QN-560HT-04
STC condition	P_{max} [W] /Tolerance	545±3%	550±3%	555±3%	560±3%
	V_{oc} [V] /Tolerance	47.27±3%	47.51±3%	47.75±3%	48.00±3%
	I_{sc} [Adc] /Tolerance	14.60±3%	14.65±3%	14.71±3%	14.77±3%
	V_{mp} [V]	39.67	39.88	40.10	40.32
	I_{mp} [Adc]	13.74	13.79	13.84	13.89
BNPI condition	P_{max} [W] /Tolerance	601±3%	606±3%	612±3%	618±3%
	V_{oc} [V] /Tolerance	47.27±3%	47.51±3%	47.75±3%	48.00±3%
	I_{sc} [Adc] /Tolerance	16.09±3%	16.16±3%	16.22±3%	16.28±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	17.92±3%	17.99±3%	18.07±3%	18.14±3%

	Module type	QN-440HT-04	QN-445HT-04	QN-450HT-04	QN-455HT-04
STC condition	P_{max} [W] /Tolerance	440±3%	445±3%	450±3%	455±3%
	V_{oc} [V] /Tolerance	38.83±3%	39.12±3%	39.41±3%	39.68±3%
	I_{sc} [Adc] /Tolerance	14.34±3%	14.40±3%	14.46±3%	14.51±3%
	V_{mp} [V]	32.23	32.48	32.73	32.97

	I_{mp} [Adc]	13.65	13.70	13.75	13.80
BNPI condition	P_{max} [W] /Tolerance	485±3%	491±3%	496±3%	502±3%
	V_{oc} [V] /Tolerance	38.83±3%	39.12±3%	39.41±3%	39.68±3%
	I_{sc} [Adc] /Tolerance	15.81±3%	15.88±3%	15.94±3%	16.00±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	17.61±3%	17.68±3%	17.75±3%	17.82±3%

	Module type	QN-460HT-04	QN-565HT-05	QN-570HT-05	QN-575HT-05
STC condition	P_{max} [W] /Tolerance	460±3%	565±3%	570±3%	575±3%
	V_{oc} [V] /Tolerance	39.96±3%	50.59±3%	50.83±3%	51.07±3%
	I_{sc} [Adc] /Tolerance	14.57±3%	14.14±3%	14.19±3%	14.25±3%
	V_{mp} [V]	33.21	42.64	42.86	43.07
	I_{mp} [Adc]	13.85	13.25	13.30	13.35
BNPI condition	P_{max} [W] /Tolerance	507±3%	623±3%	629±3%	634±3%
	V_{oc} [V] /Tolerance	39.96±3%	50.59±3%	50.83±3%	51.07±3%
	I_{sc} [Adc] /Tolerance	16.07±3%	15.59±3%	15.65±3%	15.71±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	17.89±3%	17.36±3%	17.43±3%	17.50±3%

	Module type	QN-580HT-05	QN-585HT-05	QN-590HT-05	QN-595HT-05
STC condition	P_{max} [W] /Tolerance	580±3%	585±3%	590±3%	595±3%
	V_{oc} [V] /Tolerance	51.30±3%	51.53±3%	51.77±3%	52.00±3%
	I_{sc} [Adc] /Tolerance	14.31±3%	14.37±3%	14.43±3%	14.48±3%
	V_{mp} [V]	43.28	43.49	43.70	43.91
	I_{mp} [Adc]	13.40	13.45	13.50	13.55
BNPI condition	P_{max} [W] /Tolerance	639±3%	645±3%	650±3%	656±3%
	V_{oc} [V] /Tolerance	51.30±3%	51.53±3%	51.77±3%	52.00±3%
	I_{sc} [Adc] /Tolerance	15.78±3%	15.84±3%	15.91±3%	15.97±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	17.57±3%	17.64±3%	17.72±3%	17.79±3%

	Module type	QN-600HT-05	QN-520HT-05	QN-525HT-05	QN-530HT-05
STC condition	P_{max} [W] /Tolerance	600±3%	520±3%	525±3%	530±3%
	V_{oc} [V] /Tolerance	52.23±3%	46.70±3%	46.95±3%	47.21±3%
	I_{sc} [Adc] /Tolerance	14.54±3%	14.10±3%	14.15±3%	14.21±3%
	V_{mp} [V]	44.12	39.16	39.38	39.61
	I_{mp} [Adc]	13.60	13.28	13.33	13.38
BNPI condition	P_{max} [W] /Tolerance	662±3%	573±3%	579±3%	584±3%
	V_{oc} [V] /Tolerance	52.23±3%	46.70±3%	46.95±3%	47.21±3%
	I_{sc} [Adc] /Tolerance	16.03±3%	15.54±3%	15.61±3%	15.67±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	17.86±3%	17.31±3%	17.38±3%	17.45±3%

	Module type	QN-535HT-05	QN-540HT-05	QN-545HT-05	QN-550HT-05
STC condition	P_{max} [W] /Tolerance	535±3%	540±3%	545±3%	550±3%
	V_{oc} [V] /Tolerance	47.46±3%	47.71±3%	47.96±3%	48.20±3%
	I_{sc} [Adc] /Tolerance	14.27±3%	14.33±3%	14.39±3%	14.44±3%
	V_{mp} [V]	39.84	40.06	40.28	40.50
	I_{mp} [Adc]	13.43	13.48	13.53	13.58
BNPI condition	P_{max} [W] /Tolerance	590±3%	595±3%	601±3%	606±3%
	V_{oc} [V] /Tolerance	47.46±3%	47.71±3%	47.96±3%	48.20±3%
	I_{sc} [Adc] /Tolerance	15.73±3%	15.80±3%	15.86±3%	15.93±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	17.52±3%	17.59±3%	17.67±3%	17.74±3%

	Module type	QN-470HT-05	QN-475HT-05	QN-480HT-05	QN-485HT-05
STC condition	P_{max} [W] /Tolerance	470±3%	475±3%	480±3%	485±3%
	V_{oc} [V] /Tolerance	42.50±3%	42.78±3%	43.05±3%	43.31±3%
	I_{sc} [Adc] /Tolerance	14.00±3%	14.06±3%	14.11±3%	14.17±3%
	V_{mp} [V]	35.44	35.69	35.93	36.16

	I_{mp} [Adc]	13.26	13.31	13.36	13.41
BNPI condition	P_{max} [W] /Tolerance	518±3%	524±3%	529±3%	535±3%
	V_{oc} [V] /Tolerance	42.50±3%	42.78±3%	43.05±3%	43.31±3%
	I_{sc} [Adc] /Tolerance	15.43±3%	15.50±3%	15.56±3%	15.63±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	17.19±3%	17.26±3%	17.33±3%	17.40±3%

	Module type	QN-490HT-05	QN-495HT-05	QN-500HT-05	QN-425HT-05
STC condition	P_{max} [W] /Tolerance	490±3%	495±3%	500±3%	425±3%
	V_{oc} [V] /Tolerance	43.59±3%	43.86±3%	44.12±3%	38.54±3%
	I_{sc} [Adc] /Tolerance	14.23±3%	14.29±3%	14.34±3%	13.96±3%
	V_{mp} [V]	36.40	36.64	36.87	31.98
	I_{mp} [Adc]	13.46	13.51	13.56	13.29
BNPI condition	P_{max} [W] /Tolerance	540±3%	546±3%	551±3%	469±3%
	V_{oc} [V] /Tolerance	43.59±3%	43.86±3%	44.12±3%	38.54±3%
	I_{sc} [Adc] /Tolerance	15.69±3%	15.75±3%	15.82±3%	15.39±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	17.47±3%	17.54±3%	17.62±3%	17.14±3%

	Module type	QN-430HT-05	QN-435HT-05	QN-440HT-05	QN-445HT-05
STC condition	P_{max} [W] /Tolerance	430±3%	435±3%	440±3%	445±3%
	V_{oc} [V] /Tolerance	38.83±3%	39.13±3%	39.42±3%	39.70±3%
	I_{sc} [Adc] /Tolerance	14.01±3%	14.07±3%	14.13±3%	14.19±3%
	V_{mp} [V]	32.23	32.49	32.74	32.99
	I_{mp} [Adc]	13.34	13.39	13.44	13.49
BNPI condition	P_{max} [W] /Tolerance	474±3%	480±3%	485±3%	491±3%
	V_{oc} [V] /Tolerance	38.83±3%	39.13±3%	39.42±3%	39.70±3%
	I_{sc} [Adc] /Tolerance	15.45±3%	15.52±3%	15.58±3%	15.64±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	17.21±3%	17.28±3%	17.35±3%	17.42±3%

	Module type	QN-450HT-05	QN-600HT-06	QN-605HT-06	QN-610HT-06
STC condition	P_{max} [W] /Tolerance	450±3%	600±3%	605±3%	610±3%
	V_{oc} [V] /Tolerance	39.98±3%	54.71±3%	54.93±3%	55.16±3%
	I_{sc} [Adc] /Tolerance	14.25±3%	13.88±3%	13.94±3%	14.00±3%
	V_{mp} [V]	33.23	46.37	46.57	46.78
	I_{mp} [Adc]	13.54	12.94	12.99	13.04
BNPI condition	P_{max} [W] /Tolerance	496±3%	662±3%	667±3%	673±3%
	V_{oc} [V] /Tolerance	39.98±3%	54.71±3%	54.93±3%	55.16±3%
	I_{sc} [Adc] /Tolerance	15.71±3%	15.31±3%	15.37±3%	15.43±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	17.49±3%	17.05±3%	17.12±3%	17.19±3%

	Module type	QN-615HT-06	QN-620HT-06	QN-625HT-06	QN-630HT-06
STC condition	P_{max} [W] /Tolerance	615±3%	620±3%	625±3%	630±3%
	V_{oc} [V] /Tolerance	55.38±3%	55.60±3%	55.82±3%	56.04±3%
	I_{sc} [Adc] /Tolerance	14.06±3%	14.11±3%	14.17±3%	14.23±3%
	V_{mp} [V]	46.98	47.18	47.38	47.58
	I_{mp} [Adc]	13.09	13.14	13.19	13.24
BNPI condition	P_{max} [W] /Tolerance	678±3%	684±3%	689±3%	695±3%
	V_{oc} [V] /Tolerance	55.38±3%	55.60±3%	55.82±3%	56.04±3%
	I_{sc} [Adc] /Tolerance	15.50±3%	15.56±3%	15.63±3%	15.69±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	17.26±3%	17.33±3%	17.40±3%	17.47±3%

	Module type	QN-635HT-06	QN-555HT-06	QN-560HT-06	QN-565HT-06
STC condition	P_{max} [W] /Tolerance	635±3%	555±3%	560±3%	565±3%
	V_{oc} [V] /Tolerance	56.26±3%	51.01±3%	51.26±3%	51.32±3%
	I_{sc} [Adc] /Tolerance	14.29±3%	13.77±3%	13.83±3%	13.94±3%
	V_{mp} [V]	47.78	43.02	43.24	43.30

	I_{mp} [Adc]	13.29	12.90	12.95	13.05
BNPI condition	P_{max} [W] /Tolerance	700±3%	612±3%	617±3%	623±3%
	V_{oc} [V] /Tolerance	56.26±3%	51.01±3%	51.26±3%	51.32±3%
	I_{sc} [Adc] /Tolerance	15.75±3%	15.18±3%	15.25±3%	15.37±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	17.54±3%	16.91±3%	16.98±3%	17.11±3%

	Module type	QN-570HT-06	QN-575HT-06	QN-580HT-06	QN-585HT-06
STC condition	P_{max} [W] /Tolerance	570±3%	575±3%	580±3%	585±3%
	V_{oc} [V] /Tolerance	51.55±3%	51.80±3%	52.03±3%	52.26±3%
	I_{sc} [Adc] /Tolerance	13.99±3%	14.05±3%	14.11±3%	14.17±3%
	V_{mp} [V]	43.51	43.73	43.94	44.15
	I_{mp} [Adc]	13.10	13.15	13.20	13.25
BNPI condition	P_{max} [W] /Tolerance	628±3%	634±3%	640±3%	645±3%
	V_{oc} [V] /Tolerance	51.55±3%	51.80±3%	52.03±3%	52.26±3%
	I_{sc} [Adc] /Tolerance	15.43±3%	15.49±3%	15.56±3%	15.62±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	17.19±3%	17.26±3%	17.33±3%	17.40±3%

	Module type	QN-510HT-06	QN-515HT-06	QN-520HT-06	QN-525HT-06
STC condition	P_{max} [W] /Tolerance	510±3%	515±3%	520±3%	525±3%
	V_{oc} [V] /Tolerance	47.01±3%	47.28±3%	47.54±3%	47.80±3%
	I_{sc} [Adc] /Tolerance	13.73±3%	13.79±3%	13.85±3%	13.90±3%
	V_{mp} [V]	39.44	39.68	39.91	40.14
	I_{mp} [Adc]	12.93	12.98	13.03	13.08
BNPI condition	P_{max} [W] /Tolerance	562±3%	568±3%	573±3%	579±3%
	V_{oc} [V] /Tolerance	47.01±3%	47.28±3%	47.54±3%	47.80±3%
	I_{sc} [Adc] /Tolerance	15.14±3%	15.20±3%	15.27±3%	15.33±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	16.86±3%	16.93±3%	17.00±3%	17.07±3%

	Module type	QN-530HT-06	QN-535HT-06	QN-465HT-06	QN-470HT-06
STC condition	P_{max} [W] /Tolerance	530±3%	535±3%	465±3%	470±3%
	V_{oc} [V] /Tolerance	48.06±3%	48.30±3%	43.09±3%	43.37±3%
	I_{sc} [Adc] /Tolerance	13.96±3%	14.02±3%	13.66±3%	13.72±3%
	V_{mp} [V]	40.37	40.59	35.96	36.21
	I_{mp} [Adc]	13.13	13.18	12.93	12.98
BNPI condition	P_{max} [W] /Tolerance	584±3%	590±3%	513±3%	518±3%
	V_{oc} [V] /Tolerance	48.06±3%	48.30±3%	43.09±3%	43.37±3%
	I_{sc} [Adc] /Tolerance	15.39±3%	15.46±3%	15.06±3%	15.12±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	17.15±3%	17.22±3%	16.77±3%	16.85±3%

	Module type	QN-475HT-06	QN-480HT-06	QN-485HT-06	QN-415HT-06
STC condition	P_{max} [W] /Tolerance	475±3%	480±3%	485±3%	415±3%
	V_{oc} [V] /Tolerance	43.64±3%	43.93±3%	44.20±3%	38.80±3%
	I_{sc} [Adc] /Tolerance	13.78±3%	13.83±3%	13.89±3%	13.54±3%
	V_{mp} [V]	36.45	36.70	36.94	32.20
	I_{mp} [Adc]	13.03	13.08	13.13	12.89
BNPI condition	P_{max} [W] /Tolerance	524±3%	529±3%	535±3%	458±3%
	V_{oc} [V] /Tolerance	43.64±3%	43.93±3%	44.20±3%	38.80±3%
	I_{sc} [Adc] /Tolerance	15.19±3%	15.25±3%	15.32±3%	14.93±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	16.92±3%	16.99±3%	17.06±3%	16.63±3%

	Module type	QN-420HT-06	QN-425HT-06	QN-430HT-06	QN-435HT-06
STC condition	P_{max} [W] /Tolerance	420±3%	425±3%	430±3%	435±3%
	V_{oc} [V] /Tolerance	39.10±3%	39.40±3%	39.69±3%	39.98±3%
	I_{sc} [Adc] /Tolerance	13.60±3%	13.66±3%	13.71±3%	13.77±3%
	V_{mp} [V]	32.46	32.72	32.98	33.23

	I_{mp} [Adc]	12.94	12.99	13.04	13.09
BNPI condition	P_{max} [W] /Tolerance	463±3%	469±3%	474±3%	480±3%
	V_{oc} [V] /Tolerance	39.10±3%	39.40±3%	39.69±3%	39.98±3%
	I_{sc} [Adc] /Tolerance	14.99±3%	15.06±3%	15.12±3%	15.19±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	16.70±3%	16.77±3%	16.84±3%	16.91±3%

	Module type	QN-440HT-06	QN-370HT-06	QN-375HT-06	QN-380HT-06
STC condition	P_{max} [W] /Tolerance	440±3%	370±3%	375±3%	380±3%
	V_{oc} [V] /Tolerance	40.28±3%	34.69±3%	35.01±3%	35.33±3%
	I_{sc} [Adc] /Tolerance	13.83±3%	13.50±3%	13.56±3%	13.62±3%
	V_{mp} [V]	33.49	28.64	28.91	29.19
	I_{mp} [Adc]	13.14	12.92	12.97	13.02
BNPI condition	P_{max} [W] /Tolerance	485±3%	408±3%	413±3%	419±3%
	V_{oc} [V] /Tolerance	40.28±3%	34.69±3%	35.01±3%	35.33±3%
	I_{sc} [Adc] /Tolerance	15.25±3%	14.89±3%	14.95±3%	15.01±3%
aBSI(BSI)	I_{sc} [Adc] /Tolerance	16.98±3%	16.58±3%	16.65±3%	16.72±3%

	Module type	QN-385HT-06	QN-390HT-06	-	
STC condition	P_{max} [W] /Tolerance	385±3%	390±3%	-	
	V_{oc} [V] /Tolerance	35.64±3%	35.96±3%	-	
	I_{sc} [Adc] /Tolerance	13.67±3%	13.73±3%	-	
	V_{mp} [V]	29.46	29.73	-	
	I_{mp} [Adc]	13.07	13.12	-	
BNPI condition	P_{max} [W] /Tolerance	425±3%	430±3%	-	
	V_{oc} [V] /Tolerance	35.64±3%	35.96±3%	-	
	I_{sc} [Adc] /Tolerance	15.08±3%	15.14±3%	-	
aBSI(BSI)	I_{sc} [Adc] /Tolerance	16.79±3%	16.86±3%	-	

Product Safety Ratings

Maximum systems voltage (Vsys) ..... :	1500	V
Maximum over-current protection rating ..... :	35/30	A
Class in accordance with IEC 61140 ..... :	See clause 5.1	
Fire safety class ..... :	See clause 5.5	
The modules are intended for a maximum operating altitude [meters above sea level] of ..... :	≤ 2000	m
Recommended maximum series/parallel module configurations ..... :	Refer to manual document	

Attachments:

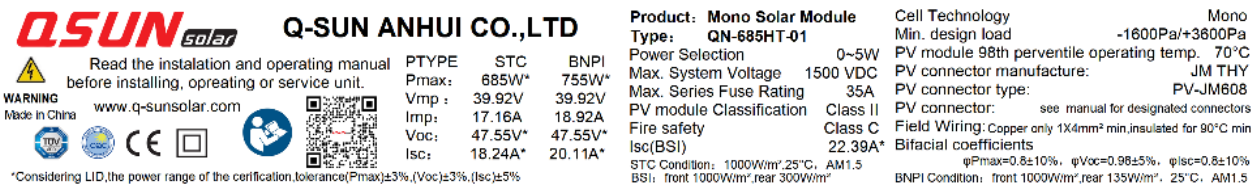
Annex 1: PRODUCT DESCRIPTION SHEET (MANUFACTURERS AND TYPE REFERENCES)

Annex 2: Constructure Details

Annex 3: List of test equipment used

If additional information is necessary, please provide

Copy of marking plate:



Pictures of the product:

Refer to Attachment 1 of TRF 704062316712-00

General product information:

Modifications:

☒ Initial module design qualification

☐ Extension of module design qualification

☐ Original test report ref. no. .....:

Model differences and modification:

☐ Test programs for crystalline silicon PV modules

- ☐ 4.2.1 Modification to frontsheet
- ☐ 4.2.2 Modification to encapsulation system
- ☐ 4.2.3 Modification to cell technology
- ☐ 4.2.4 Modification to cell and string interconnect material or technique
- ☐ 4.2.5 Modification to backsheet
- ☐ 4.2.6 Modification to electrical termination
- ☐ 4.2.7 Modification to bypass diode
- ☐ 4.2.8 Modification to electrical circuitry
- ☐ 4.2.9 Modification to edge sealing
- ☐ 4.2.10 Modification to frame and/or mounting structure
- ☐ 4.2.11 Change in PV module size
- ☐ 4.2.12 Higher or lower output power (by 10 % or more) with the identical design and size and using the identical cell process
- ☐ 4.2.13 Increase of over-current protection rating
- ☐ 4.2.14 Increase of system voltage
- ☐ 4.2.15 Change in cell fixing tape

☐ Test programs for thin-film PV modules

- ☐ 4.3.1 Modification to frontsheet
- ☐ 4.3.2 Modification to encapsulation system
- ☐ 4.3.3 Modification to front contact (e. g.TCO)
- ☐ 4.3.4 Modification to cell technology
- ☐ 4.3.5 Modification to cell layout
- ☐ 4.3.6 Modification to back contact
- ☐ 4.3.7 Modification to edge deletion
- ☐ 4.3.8 Modification to interconnect material or technique
- ☐ 4.3.9 Modification to backsheet
- ☐ 4.3.10 Modification to electrical termination
- ☐ 4.3.11 Modification to bypass diode
- ☐ 4.3.12 Modification to edge sealing
- ☐ 4.3.13 Modification to frame and/or mounting structure
- ☐ 4.3.14 Change in PV module size
- ☐ 4.3.15 Higher or lower output power (by 10 % or more) with the identical design and size
- ☐ 4.3.16 Increase of over-current protection rating
- ☐ 4.3.17 Increase of system voltage

NOTE: The clause references for modifications are excerpted from IEC TS 62915

Summary of testing:

1. Full tests according to IEC 61730-2:2023 were conducted on representative model QN-685HT-01 with material combination 1 (samples M1-x).
Below model types were included:
132 cells (210x105mm, N type) modules:
QN-xxxHT-01, xxx = 670 to 710 in steps of 5
120 cells (210x105mm, N type) modules:
QN-xxxHT-01, xxx = 610 to 645 in steps of 5
All models in each family bin are identical in structure, except for different output power,
Below material components & combinations were verified (refer to Annex 1: Product Description Sheet for details).

Superstrate	Dongli 2.0mm Heat strengthened AR-coated glass
Encapsulant	JCC-305T / JCC-105P-T
Solar Cell	CZJT-210M-18D1
Interconnector	Tianwei φ 0.26mm round wire ribbon, 0.3x4 & 0.35x6mm string connector
Flux	FD-309
Substrate	Dongli 2.0mm Heat strengthened glass with white glaze
Junction box	JM37xy
Potting material	FS-8206A
Frame	Frame 6005-T6 Anodized aluminum alloy, 35mm height
Adhesive	FS-996
Fixing tape	T5065
Label	AVERY PET

2. Based on TÜV SÜD certificate Z2 104991 0004 Rev. 04, updated the testing standards from 'IEC 61730-1:2016, IEC 61730-2:2016' to 'IEC 61730-1:2023, IEC 61730-2:2023' for modules with TOPCon cells 182M 247 16BB 10SEG NFJ-TBNU & 182R MBB NFH-TBNU,
3. Redefined the module model names as below:
144 cells (182x93.4 mm, N type) modules:
QN-xxxHT-05, xxx = 565 to 600 in steps of 5
132 cells (182x93.4 mm, N type) modules:
QN-xxxHT-05, xxx = 520 to 550 in steps of 5
120 cells (182x93.4 mm, N type) modules:
QN-xxxHT-05, xxx = 470 to 500 in steps of 5
108 cells (182x93.4 mm, N type) modules:
QN-xxxHT-05, xxx = 425 to 450 in steps of 5
144 cells (182x91, N type) modules:
QN-xxxHT-06, xxx = 555 to 585 in steps of 5
132 cells (182x91, N type) modules:
QN-xxxHT-06, xxx = 510 to 535 in steps of 5
120 cells (182x91, N type) modules:
QN-xxxHT-06, xxx = 465 to 485 in steps of 5
108 cells (182x91, N type) modules:
QN-xxxHT-06, xxx = 415 to 440 in steps of 5
96 cells (182x91, N type) modules:
QN-xxxHT-06, xxx = 370 to 390 in steps of 5

Following gap tests were conducted on representative models QN-580HT-05 & QN-560HT-06 with material combination 2 (samples M2-x) for above modifications 2~3:
Reverse current overload test (MST 26)
4. Included below similar model types:
156 cells (182x91, N type) modules:
QN-xxxHT-06, xxx = 600 to 635 in steps of 5
Following tests were conducted on representative model QN-615HT-06 with material combination 3 (samples M3-x) according to retest guideline 4.2.7, 4.2.8 of IEC TS 62915 Edition 2.0 for above modification 4:
Reverse current overload test (MST 26)
5. Added alternative TOPCon Cells JACMKTB-D, JACMLTB-D & JACMHTB-D with different cut sizes,
6. Included below model types:
132 cells (182x105mm, N type) modules:
QN-xxxHT-02, xxx = 585 to 620 in steps of 5
120 cells (182x105mm, N type) modules:
QN-xxxHT-02, xxx = 535 to 565 in steps of 5
108 cells (182x105mm, N type) modules:
QN-xxxHT-02, xxx = 480 to 505 in steps of 5
96 cells (182x105mm, N type) modules:
QN-xxxHT-02, xxx = 425 to 450 in steps of 5
144 cells (182x99.5mm, N type) modules:
QN-xxxHT-03, xxx = 605 to 640 in steps of 5
132 cells (182x99.5mm, N type) modules:
QN-xxxHT-03, xxx = 555 to 585 in steps of 5
120 cells (182x99.5mm, N type) modules:
QN-xxxHT-03, xxx = 505 to 530 in steps of 5
108 cells (182x99.5mm, N type) modules:
QN-xxxHT-03, xxx = 455 to 480 in steps of 5
144 cells (182x95.8mm, N type) modules:
QN-xxxHT-04, xxx = 585 to 615 in steps of 5
132 cells (182x95.8mm, N type) modules:
QN-xxxHT-04, xxx = 535 to 560 in steps of 5
108 cells (182x95.8mm, N type) modules:
QN-xxxHT-04, xxx = 440 to 460 in steps of 5
7. Added following alternative manufacturer for Cell interconnector & String connector: JingLan Advanced Material Co., Ltd.,
8. Added below material combination:
Cell JACMKTB-D, JACMLTB-D, JACMHTB-D + Encapsulant S102 / S101 + Substrate black glaze glass + Adhesive HT906Z + J-box JM07w,
Following tests were conducted on representative model QN-595HT-02 with material combination 4 (samples M4-x) according to retest guideline 4.2.3, 4.2.4, 4.2.8 of IEC TS 62915 Edition 2.0 for above modifications 5~8:
Reverse current overload test (MST 26)

9. Added below alternative Electrical terminations:

a) J-box: PV-GZX306 and related Potting material, bypass diodes, Cables, Connectors,

b) J-box: 3Qxy and related Potting material, bypass diodes, Cables, Connectors,

c) J-box: OSTA-03 and related Potting material, bypass diodes, Cables, Connectors,

Verification tests were performed on component level in TÜV SÜD reports 704071614003-14, 704071902004-05 & 04071914601-06, so no test was considered to be necessary in this report.

10. Added below alternative manufacturers for Cell interconnector & String connector with same material:

a) Jiangsu Lanxin New Energy Techonology CO., Ltd.

b) Jiangsu Zhongdao new material science and Technology Co., Ltd.

No test was considered to be necessary in this report.
Construction check was conducted according to IEC 61730-1:2023.

Possible test case verdicts:

test case does not apply to the test object:	N/A (not applicable / not included in the order)
test object does meet the requirement:	P (Pass)
test object does not meet the requirement:	F (Fail)

General remarks:

"(see remark #)" refers to a remark appended to the report.
"(see appended table)" refers to a table appended to the report.
Throughout this report **a comma** is used as the decimal separator.
The test results presented in this report relate only to the object tested.

IEC 61730-1: Part 1: Requirements for construction			
Clause	Requirement + Test	Result - Remark	Verdict

7 SAMPLING			
	☐ The modules tested (modules and laminate) were taken at random from a production batch and subjected to manufacturer's normal quality control and inspection for safety testing		N/A
	☒ The modules tested (modules and laminate) were prototypes of a new design and not taken from a production batch.		P
	☒ Preconditioning of test samples was performed within IEC 61215 performance testing		P
	☐ Preconditioning of test samples was performed separately from IEC 61215 performance testing		N/A
Supplementary information: N/A			

Module group assignment:

Sample #	Sample Group ID	Type/model	Sample S/N	Remark
Material combination 1:				
M1-10 (GDP240092-1)	Control	QN-685HT-01	26231193220542	Control module
M1-13 (GDP240092-2)	F	QN-685HT-01	26231193220850	BT, HS, RC
M1-4 (GDP240092-3)	C	QN-685HT-01	26231193220795	UV sequence
M1-8 (GDP240092-5)	E	QN-685HT-01	26231193220849	TC200 Sequence
M1-6 (GDP240092-7)	D	QN-685HT-01	26231193220821	DH Sequence
M1 (GDP240092-16)	A	QN-685HT-01	26231193220533	Materials creep test
M1-2 (GDP240092-13)	B	QN-685HT-01	26231193220768	Sequence B
M1-3 (GDP240092-15)	B1	QN-685HT-01	26231193220858	Sequence B1
M1-14 (GDP240092-14)	G	QN-685HT-01	26231193220840	Impulse voltage
M15 (GDP240092-18)	Module-Break	QN-685HT-01	26231193220649	MB

IEC 61730-1: Part 1: Requirements for construction			
Clause	Requirement + Test	Result - Remark	Verdict

M1-16 (GDP240092-17)	Ignitability	QN-685HT-01	26231193220828	Ignitability
M1-22 (GDP240092-19)	Fire test	QN-685HT-01	26231193220856	Fire test
M1-23 (GDP240092-21)	Fire test	QN-685HT-01	26231193220086	Fire test
Material combination 2:				
M2-11 (GDP240090-1)	Control	QN-580HT-05	26231193223792	Control module
M2-13 (GDP240090-2)	F	QN-580HT-05	26231193223793	RC
Material combination 3:				
M3-10 (GDP240390-1)	Control	QN-615HT-06	26231293246161	Control module
M3-13 (GDP240390-2)	F	QN-615HT-06	26231293246116	RC
Material combination 4:				
M4-10 (GDP240200-1)	Control	QN-595HT-02	26231193209190	Control module
M4-13 (GDP240200-2)	F	QN-595HT-02	26231193209305	RC
Remarks: N/A				

Note (1) Use the “General product information” field to give any information on model differences within a product type family covered by the test report and describe the range of electrical and safety ratings, if the TRF covers a type family of modules.

Note (2) Use Annex 2 to list the used materials and components of the module (manufacturer/supplier and type reference)

Note (3) The module numbers/identifiers are set in accordance to IEC 62915 Photovoltaic (PV) modules – Retesting for type approval, design and safety qualification, Annex A3 of IEC 62915

IEC 61730-1: Part 1: Requirements for construction			
Clause	Requirement + Test	Result - Remark	Verdict

IEC 61730 Part 1: Requirements for construction

5 Classification, applications and intended use			
5.1 General			
	The module has been evaluated for the following Class (IEC 61140)……:	☐ Class 0 ☒ Class II ☐ Class III	—
5.5 Intended use			
	PV modules are installed in the following special applications:		—
	Building attached PV (BAPV)	☐ yes ☒ no	—
	Building integrated PV (BIPV)	☐ yes ☒ no	—
	Applications in areas where snow and / or wind load exceeding loads as tested in IEC 61730-2 are expected	☐ yes ☒ no	—
	Module-applied electronics	☐ yes ☒ no	—
	Areas with high salt exposure	☐ yes ☒ no	—
	other (please specify)	☐ yes, as follows: ☒ no	—
6 Requirements for design and construction			
6.1 General			—
	98th percentile module operating temperature	☒ 70 °C or less ☐ in excess of 70 °C (extended testing according to IEC TS 63126)	P
	PV module suitable for operation in unprotected outdoor locations, i.e. exposed to direct and indirect (albedo) solar radiation and up to 100 % relative humidity as well as to rain.		P
	Product shipped from the factory as	☒ completely assembled ☐ subassemblies	—
	The provided assemblies of the product do not involve any action that is likely to affect compliance with the requirements of the IEC 61730 series.		N/A

IEC 61730-1: Part 1: Requirements for construction			
Clause	Requirement + Test	Result - Remark	Verdict
	Incorporation of a PV module into the final assembly does not require any alteration of the PV module from its originally evaluated form.		N/A
	Equipotential bonding continuity is not interrupted by installation		P
	Any adjustable or movable structural part are provided with a locking device		N/A
	PV modules have no accessible burrs, sharp edges or sharp points	See Table 45	P
	Parts are prevented from loosening or turning	See Table 47 and 48	P
5.2 Marking and documentation			
5.2.1	Instructions related to safety are in an official language of the country where the equipment is to be installed.	In English	P
5.2.2 Marking			
5.2.2.1 General			
	Each PV module includes the following clear and indelible markings:		—
	a) Name, registered trade name, or registered trade mark of manufacturer	Trade mark: QSUN solar (logo)	P
	b) Type or model number designation	Marked on label	P
	c) Serial number	Provided under superstrate near the top rail of frame	P
	d) Date and place of manufacture; alternatively serial number assuring traceability of date and place of manufacture	serial number allowing to trace the date and place of manufacture	P
	e) "Maximum system voltage" or "Vsys"	1500V DC	P
	f) Class of protection against electrical shock, in accordance with Clause 5 of IEC 61730-1:2023	Class II	P
	g) "Voltage at open-circuit" or "V_{OC}" including manufacturing tolerances. For bifacial modules, open-circuit voltage at STC, BNPI as defined in IEC 61215-1	Marked on label	P
	h) "Current at short-circuit" or "I_{SC}" including manufacturing tolerances. For bifacial modules, short-circuit current at STC, BNPI as defined in IEC 61215-1 and aBSI/BSI	Marked on label	P

IEC 61730-1: Part 1: Requirements for construction			
Clause	Requirement + Test	Result - Remark	Verdict
	i) "PV module maximum power" or "Pmax" including manufacturing tolerances as defined in IEC 61215-1. For bifacial modules, Pmax at STC, BNPI as defined in IEC 61215-1	Marked on label	P
	j) For bifacial modules, a clear indication of the front side, or both are designed for prolonged exposure to direct sunlight		P
	k) For flexible modules, the minimum radius of curvature		N/A
	l) Positive ("+" or downward) and negative ("−" or upward) design load ratings in pascal (Pa) excluding the test load safety factor		P
	m) “Maximum overcurrent protection rating”	See Table 34	P
	n) a module temperature rating of	☒ 70 °C, ☐ 80 °C (tested according to IEC TS 63126 Level 1) ☐ 90 °C (tested according to IEC TS 63126 Level 2)	P
	o) connector manufacturer and model used; refer to manual for designated mating connectors		P
	A paper copy of the documentation required in 6.2.3 is not included with the module		—
	p) A link to documentation that required in 6.2.3 after either the statement "Safety information" or the symbol ISO 7010-M002:2011-05, Refer to instruction manual/booklet: 	☐ Website ☒QR code	P
	International symbols are used where applicable.		P
	PV connectors or wiring are marked in accordance to IEC 62852 with a symbol „Do not disconnect under load”.		P
	Symbol or warning notice are imprinted or labelled close to connector		P
	PV connectors are clearly marked indicating the terminal polarity.		P

IEC 61730-1: Part 1: Requirements for construction			
Clause	Requirement + Test	Result - Remark	Verdict
	For Class II and Class 0 PV modules, the  (IEC 60417-6042: Caution, risk of electric shock) symbol is applied near the PV module electrical connection means.		P
	PV modules are marked to indicate the class	☒ class II:  ☐ class III:  ☐ class 0: no symbol	P
	PV modules provided with a functional earth connection (see section 6.2.2.2.2)	—	N/A
	PV modules with terminals for field wiring rated only for use with copper wire are marked, at or adjacent to the terminals, with the statement "Use copper wire only", "Cu only", or the equivalent.		N/A
	PV modules with terminals for field wiring rated only for use with a different specific wiring material are marked with a similar statement referring to the rated material.		N/A
6.2.2.2 Symbols			
6.2.2.2.1 Equipotential bonding			
	Bonding conductor for equipotential bonding is identified with:	☒  ; ☐ 	P
	No other terminal or location is identified in this manner		P
6.2.2.2.2 Functional earthing			
	Field installed functional earthing conductor is identified with the symbol:		N/A
6.2.3 Documentation			
6.2.3.1 Gneral			
	Documentation concerning electrical and mechanical installation provided.		P
	Documentation is supplied in one of the official languages of the country where the PV modules will be installed		P
	International symbols is used where applicable		P
	Product shipped in subassemblies		—
	Assembly instructions is provided		P

IEC 61730-1: Part 1: Requirements for construction			
Clause	Requirement + Test	Result - Remark	Verdict

	The following information shall be included in the documentation:		—
	– all information as required by 6.2.2.1 with exception of c) and d)		P
	– recommended maximum series/parallel module configurations		P
	– temperature coefficient for open-circuit voltage		P
	– temperature coefficient for maximum power		P
	– temperature coefficient for short-circuit current		P
6.2.3.2 Suitable environmental and mounting conditions			
	The documentation shall state the environmental and mounting conditions for which the module has been qualified, which by default always include:		P
	The maximum rated altitude the PV module is designed for; de-ratings may be applied		P
	A statement indicating the negative (upward) and positive (downward) design load ratings for each mechanical means. Safety factor γm may also be noted.		P
	For bifacial modules, designation of front side for exposures or both sides are intended for use with prolonged exposure to direct sunlight		P
	A temperature range from environmental temperature of −40 °C to 98th percentile module operating temperature of	☒70 °C ☐80 °C (tested to Level 1 conditions in IEC TS 63126) ☐90 °C (tested to Level 2 conditions in IEC TS 63126)	P
	Guidance on geographic areas, mounting conditions and system design and installation factors where the anticipated 98th percentile module operating temperature will be greater than 70 °C.		P

IEC 61730-1: Part 1: Requirements for construction			
Clause	Requirement + Test	Result - Remark	Verdict
	The following or equivalent statements shall be included: "A photovoltaic module is likely to experience conditions that produce higher current and/or voltage than reported at standard test conditions. Factors to consider include module temperature and front side irradiance (and, for bifacial modules, ground or roof albedo, row spacing, and installation height). Accordingly, the values of V_{OC} and I_{SC} (or for bifacial modules, I_{SC}-aBSI) marked on this PV module should be multiplied by a factor of 1,25 when determining voltage and current ratings for components connected to the PV output." "The safety factor of 1,25 given for the minimum voltage rating of the components in the example statement above may be modified during the design of a system according to the minimum temperature of the location of the installation and the temperature coefficient for V_{OC}. The safety factor of 1,25 given for conductor current ratings values for I_{SC} (or for bifacial modules, I_{SC}-aBSI) may be adjusted based on the maximum values of irradiance incident on the front side of the module (and the rear side for bifacial modules). To this purpose, a full simulation for the specific location and module orientation (and for bifacial modules, ground albedo, row spacing and installation height) is required. Further guidance for the choice of a safety factor other than 1,25 is given in IEC 62548."		P
	A statement concerning artificially concentrated sunlight		P
	The documentation should report if the PV modules were evaluated according to the following standards, including which specific testing sequences were used		—
	– IEC 61701, include test method used		P
	– IEC 62716, include test sequence 1 or 2		N/A
	– IEC 62109-3, Include MIE Type A or B		N/A
	– IEC TS 63126, Include temperature Level 1 or 2		N/A
6.2.3.3 Mounting			
	Documentation shall include adequate information and instructions for each mounting method as listed in the manufacturer's mounting instructions, additionally:		P
	– A statement indicating the minimum mechanical means for securing the PV module		P

IEC 61730-1: Part 1: Requirements for construction			
Clause	Requirement + Test	Result - Remark	Verdict
	– limitations to the mounting situation (e.g. slope, orientation, mounting means, cooling, specific spacing and any other condition that can influence the safety of the PV module installation)		P
	If adhesives are used for mounting: – The type of adhesive and the allowable substrates		N/A
	If adhesives are specified for use in the field to provide mechanical securement to specific roof coverings or mounting systems: – the manufacturer and unique part number of adhesives – the required surface preparation – adhesive application process and curing conditions		N/A
6.2.3.4 Connectors/wiring			
	Documentation shall include a detailed description of the following information related to the connectors and wiring method:		P
	– Minimum cable diameters for PV modules intended for field wiring which complies with	☒ IEC 62930, type131 or 133 ☒ EN 50618	P
	– Limitations on wiring methods and wire management that apply to the junction box for the PV module		P
	– A statement that wiring to interconnect modules shall be rated for the application.		P
	– Type of terminals for field wiring		N/A
	– Specific PV connector model / types and manufacturer to which the PV module connectors can be mated		P
	– The bonding method(s), if applicable, is specified including all provided or specified hardware		P
	– The type and ratings of bypass diode to be used (if applicable)		P
6.2.3.5 Fire ratings			
	The documentation shall include:		P

IEC 61730-1: Part 1: Requirements for construction			
Clause	Requirement + Test	Result - Remark	Verdict
	– A statement indicating	☒ fire rating(s) and applied standards ☐ statement regarding resistance to external fire sources not evaluated	P
	– Limitations regarding fire ratings (e.g. installation slope, sub structure or other applicable installation information)		P
6.3 Electrical components and insulation			
6.3.2 Internal wiring			
	Internal wiring has sufficient current carrying capacity for the relevant application.	See Table 34	P
6.3.3 External wiring and cables			
	External wires and cables fulfil the requirements of	☒ EN 50618 ☒ IEC 62930 type 131 or 133	P
6.3.4 Module overcurrent protection rating			
	Nominal fuse ratings (In) shall be equal to or larger than 1,4 times I_{SC} and for bifacial PV modules shall be equal to or larger than 1,4 times I_{SC}-aBSI		P
6.3.5 Connectors			
	External DC connectors fulfil the requirements of IEC 62852.		P
6.3.6 Junction boxes for PV modules			
	Junction boxes for PV modules fulfil the requirements of IEC 62790.		P
6.3.7 Frontsheets and backsheets			
	Frontsheet:		P
	Material Frontsheet:	☒ Glass ☐ Polymeric material ☐ Others.	—
	Polymeric frontsheets fulfil the requirements of IEC 62788-2-1		N/A
	Frontsheet of:	☐ Monoficial module ☒ Designated front side for bifacial module ☐ Designated both sides are intended for use with prolonged exposure to direct sunlight for bifacial module	—

IEC 61730-1: Part 1: Requirements for construction			
Clause	Requirement + Test	Result - Remark	Verdict
	Adhesion to encapsulant or glass is appropriate	Compliance is checked by test sequences of IEC 61730-2 listed in this report.	P
	Backsheet:		—
	Material Backsheet:	☒ Glass ☐ Polymeric material ☐ Others.	—
	Polymeric backsheets fulfil the requirements of IEC 62788-2-1		N/A
	UV cut-off for the combination of the encapsulant and glass in the module is the same or lower than which is found in IEC 62788-2-1 for backsheet qualification		N/A
	Adhesion to encapsulant or glass is appropriate	Compliance is checked by test sequences of IEC 61730-2 listed in this report.	P
6.3.8 Insulation barriers			
	Polymeric insulation barrier meets the relevant requirements of 6.5.2	See 6.5.2	P
	Barrier held in place while keeping its required electrical and mechanical properties		P
	Removal of barrier only possible by using a tool		P
6.3.9 Electrical connections			
6.3.9.1 General			
	Terminations are so designed, that the contact pressure is not transmitted through insulating material except ceramic, mica or other adequate material. Compliance checked by MST 01		P
	Measures are taken to prevent connections becoming loose, e.g. by using a washer.	See Table 11 and Table 48	P
	End of a stranded conductor is not consolidated by soft soldering.		P
	Measures are taken to prevent contact stress impairing electrical conductivity.		P
6.3.9.2 Terminals for external cables and PV connector ribbons			
	Terminals for electrical connections are suitable for the type and range of conductor cross-sectional areas and meet the relevant requirements of IEC 62790 and RTE, RTI, and TI requirements of 6.5.2.2.3.	See 6.5.2.2.3	N/A

IEC 61730-1: Part 1: Requirements for construction			
Clause	Requirement + Test	Result - Remark	Verdict
	Insulated terminals are designed such that a reduction of clearances and creepage distances by displacement is prevented.		N/A
6.3.9.3 Splices and connections inside a PV module			
	Splices and connections are mechanically secured and provide electrical continuity.		P
	Electrical connections are soldered, welded, conductively adhered, crimped, or otherwise securely connected.		P
	A soldered or conductively adhered joint is additionally mechanically secured.		P
6.3. Encapsulants			
	Thermal properties are sufficient for intended application.		P
	The insulation properties according to 6.5.2.2 are met, if applicable.	See 6.5.2.2	P
6.3.11 Bypass diodes			
	Bypass diodes are rated to withstand the current and voltage for their intended use.	See Table 31 and Table 46	P
6.4 Mechanical and electromechanical connections			
6.4.1 General			
	Type of connection:	☒ Connection within frame ☐ Mounting interfaces via adhesive ☒ frame to clamp a mounting system ☒ Equipotential bonding ☒ Attachment of junction box ☒ mechanical connections within the laminate:	P
	Mechanical connections are durable to withstand the thermal, mechanical, and environmental stresses occurring in the application.	See Table 38, Table 13 and Table 11	P
	Removable parts are only detachable with the aid of tools.		P
	Lids attached without screws have one or several detectable facilities for enabling tools.		P
	No contact of tools with the live parts when the lid is removed.		P

IEC 61730-1: Part 1: Requirements for construction			
Clause	Requirement + Test	Result - Remark	Verdict
	No friction between surfaces as the sole means to inhibit the turning or loosening of a part, unless provisions to prevent unintended movement or rotation of the component is given.		P
6.4.2 Screw connections			
	Screws and mechanical connections withstand the mechanical stresses occurring in normal use.		P
	Screws are not made of a material which is soft or liable to creep.		P
	Screws used to provide mechanical stability and continuity for equipotential bonding withstand the mechanical stresses occurring in normal use.		P
	At least one screw per electrical- mechanical connection ensures the electrical connection between the metallic components		P
	Screws used for mechanical and electrical connections with a nominal diameter of less than 3 mm are screwed into metal.		P
	For screws used for mechanical and electrical connections two full threads are engaged into the metal.		P
	Screwed and other fixed connections are in such a way that they do not come loose through torsion, bending stresses, vibration, etc.		P
6.4.3 Rivets			
	Rivets which serve as electrical as well as mechanical connections are locked against loosening.		N/A
6.4.4 Thread-cutting screws			
	Thread-cutting and self-tapping screws are not used for interconnection of current-carrying parts made of a material which is soft or liable to creep.		N/A
	No thread-forming or thread-cutting (self-tapping) screws (sheet metal screws) are used for the connection of current-carrying parts.		N/A
	Thread-cutting (self-tapping) screws not be used if they are likely to be operated by the user or installer.		N/A
	Thread-cutting and thread-forming screws, used to provide continuity for equipotential bonding, are such that it is not necessary to disturb the connection in normal use.		N/A

IEC 61730-1: Part 1: Requirements for construction			
Clause	Requirement + Test	Result - Remark	Verdict
	For equipotential bonding one screw is permitted if two full threads engage the metal		N/A
6.4.5 Form/press / tight fit			
	Form/press/tight fits of metallic components which are not separately equipotential bonded are electrically connected.		P
	Requirements of MST 32 and MST 34 are met, continuity of equipotential bonding (MST 13) is provided before and after the MST 32 and MST 34 tests	See Table 38, Table 39 and Table 11	P
6.4.6 Connections by adhesives			
	Connections by adhesive for mounting means are sufficient.	See Table 38, Table 39 and Table 11	P
	Fixing of junction box by adhesive is sufficient.	See Table 27, and Table 10	P
	Adhesion of a polymer relied upon for insulation to another insulating layer is appropriate for the application.	Verified according to IEC61730-2 tests	N/A
	Connection by adhesive which is considered as cemented joint fulfils the requirements of 6.6.4.3		P
6.4.7 Other connections			
	Other connections such as, welded or soldered, as well as Materials and processes for creating the connections are appropriate for the application and for the intended use.	See Table 6 and Table 43	P
	Other connections which are relied upon for equipotential bonding fulfil the requirements of (MST 13).	See Table 11	P
6.5 Materials			
6.5.2 Polymeric materials			
6.5.2.1 General			
	Polymeric materials are able to durably and safely withstand the electrical, mechanical, thermal, environmental, and corrosive stresses occurring in the application.	Test results see subsequent sections	P
	Polymeric materials are resistant to electrical and mechanical property degradation.	Test results see subsequent sections	P
6.5.2.2 Polymeric materials used as electrical insulation			
6.5.2.2.1 General			

IEC 61730-1: Part 1: Requirements for construction			
Clause	Requirement + Test	Result - Remark	Verdict
	Material relied upon for insulation in thin layers shall be appropriate for the application according to 6.6.4.2	See 6.6.4.2	N/A
	A material which serves as functional insulation shall be appropriate according to 6.6.4.4	See 6.6.4.4	P
6.5.2.2.2 Endurance to electrical stress			
	Materials relied upon for insulation (RUI) shall have sufficient breakdown strength and shall comply with 6.6.4.2	See 6.6.4.2	N/A
	Materials used as electrical insulation are in compliance with the insulation coordination requirements	See 6.6.3	P
6.5.2.2.3 Endurance to thermal stress			
	Materials used as relied upon insulation have a mechanical and electrical relative thermal endurance, relative thermal index or temperature index (RTE/RTI or TI) appropriate for the application, at least 90 °C.	☐ TI: ☐ RTE: ☐ RTI:	N/A
6.5.2.2.4 Endurance to environmental stress			
	Endurance to environmental stresses, including heat, moisture, and UV radiation at module level	Compliance is checked by test sequences of IEC 61730-2 listed in this report.	P
6.5.2.3 Flammability			
	External polymeric parts of the PV module meet the following requirements:		P
	- flammability class minimum V-1 for all external polymeric parts with the exception of insulation in thin layers		P
	- ignitability test in final application	See Table 37	P
	- Polymeric parts which are not components of the laminate fulfil the requirements of ignitability test	See Table 37	P
6.5.2.4 Rigid polymeric materials used for mechanical functions			
	Mechanical strength at lower temperatures, IEC 62790:2020, 5.3.8 followed by MST 01		P
	Weather resistance test, IEC 62790:2020, 5.3.11 followed by MST 01		P
	Flammability class, IEC 60695-11-10 (minimum V-1)		P
	Ball pressure test, IEC 60695-10-2 (90 °C, < 2 mm diameter).		P

IEC 61730-1: Part 1: Requirements for construction			
Clause	Requirement + Test	Result - Remark	Verdict
	RTI/RTE/TI (≥ 90 ° C), IEC 60216-5 (mechanical parts only), IEC 60216-6 (mechanical parts only), UL 746B (mechanical only with impact).		P
6.5.3 Metallic materials			
6.5.3.1 General			
	Metallic components is designed to withstand a minimum corrosion atmospheric category level C2 as specified in Table B.1 in ISO 9224:2012, Annex B		P
	Metal parts are not in contact to metal parts having a difference of their electrochemical potentials of more than 600 mV.		P
	Iron or mild steel are plated, painted, or enamelled for protection against corrosion.	No Iron or mild steel parts	N/A
	Corrosion protection is at least equivalent to a zinc coating of 0.015 mm thickness	See Table 6	P
6.5.3.2 Current carrying parts			
	Current-carrying parts have sufficient mechanical strength and electrical conductivity.	See Table 34 See Table 11	P
	Environmental conditions can cause corrosion:		P
	The coating for protective coated metal is capable of preventing corrosion according to either one of the listed standards.	☐ ISO 1456 ☐ ISO 1461 ☐ ISO 2081 ☐ ISO 2093	N/A
	Coated metal not used if the current-carrying parts are stressed by abrasion.		N/A
6.4 Adhesives			
	Adhesives are appropriate for the application.	See Tables 40, Table 39, Table 27, Table 29, Table 12, and Table 10	P
	Adhesive as part of the relied upon electrical insulation meets the requirements of 6.5.2.2.3	See 6.5.2.2.3	N/A
6.6 Protection against electric shock			
6.6.1 General			
	Adequate protection against contact with hazardous live parts provided		P
	Specimens pose no risk of electric shock.		P

IEC 61730-1: Part 1: Requirements for construction			
Clause	Requirement + Test	Result - Remark	Verdict

6.6.2 Protection against accessibility to hazardous live parts			
6.6.2.1 General			
	Class of module	See safety ratings	—
	For class 0 and Class II modules adequate protection against accessibility to hazardous live parts (> 35 V DC) provided.	See Table 12	P
Table 2 of 6.6.3	For Class 0 PV modules, accessible metal parts and accessible surfaces as well as live parts of different potential of the same circuit are separated by at least basic insulation.		N/A
	For Class II PV modules construction provide separation between accessible parts or accessible surfaces and hazardous live parts by double or reinforced insulation.		P
Table 2 of 6.6.3	For Class II PV modules, live parts of different potential of the same circuit are separated by double or reinforced insulation.		P
	For Class III PV modules separation between accessible parts or accessible surfaces and hazardous live parts by functional insulation.		N/A
Table 2 of 6.6.3	In Class III PV modules live parts of different polarity are separated by at least functional insulation.		N/A
	Materials used for realizing protection against accessibility of hazardous live parts by means of enclosure, insulation barrier or relied upon insulation comply with the requirements of 5.5.2 due to their application.		P
6.6.2.2 Protection by means of enclosures and insulation barriers			
	Enclosures or insulation barriers are so designed that, after mounting, the live parts are not accessible (even after possible deformation)		P
	Degree of protection of the housing is not impaired by any possible deformation.		P
	Parts of enclosures and insulation barriers that provide protection are not removable without the use of a tool.		P
	Lids which are attached without screws have one or several detectable features, e.g. recesses,		P
	Tool to open the lid do not come into contact with the live parts if lid is removed correctly.		P

IEC 61730-1: Part 1: Requirements for construction			
Clause	Requirement + Test	Result - Remark	Verdict
	Insulation barriers are held in place and are not affected by influences expected during normal operation. Electrical and mechanical properties don't fall below the minimum acceptable values for the application.		P
	Parts are prevented from loosening or turning.		P
6.6.2.3 Protection by means of insulation of live parts			
	Insulation materials providing the sole insulation between a live part and an accessible metal part, or between uninsulated live parts not of the same potential, are of adequate thickness and of a material appropriate for the application.		P
	Requirements of Table 2	see 6.6.2.1 of this report	—
6.6.3 Insulation coordination			
6.6.3.1	Components comply with the requirements for their relevant standards	See Annex 1	P
6.6.3.2 Influencing factors			
6.6.3.2.1	Pollution degree	See Table 1, Table 2, Table 3	—
6.6.3.2.2	Material group	See Table 1, Table 2, Table 3	—
6.6.3.3	Clearance	See Table 1, Table 2, Table 3, Table 4	P
6.6.3.4.	Creepage distance	See Table 1, Table 2, Table 3	P
6.6.4 Distance through functional and relied upon insulation			
6.6.4.2 Thin layers – relied upon insulation			
	The RUI layers contributing to the DTI fulfil the following requirements at every location as applicable to each of the listed cases:		N/A
	Relied upon insulation in thin layers is applied at	☐ Backsheet ☐ Front sheet ☐ insulation within laminate ☐ others	—
	Informative parameter evaluated according to IEC 62788-2-1 are presented		N/A
	Construction of Insulation in thin layers complies with requirements concerning RTE/TI/RTI		N/A
	Initial construction of Insulation in thin layers complies with requirements concerning thickness under consideration of figure 4 as described in table 3 or 4:		N/A
	Minimum thickness according to lines 4) of Table 3 not less than:		N/A

IEC 61730-1: Part 1: Requirements for construction			
Clause	Requirement + Test	Result - Remark	Verdict
	the sum of the individual thicknesses of all RUI according to lines 4) of Table 3 not less than:		N/A
	Insulation in thin layers provide sufficient dielectric strength:		—
	Test voltage for single-layer sheet and for entire multi-layer sheet providing relied upon insulation (2000V + 4 times system voltage)…….:		N/A
	Test voltage at least two layers of a multi-layer providing relied upon insulation (1000V + 2 times system voltage)…….:		N/A
	Single-layer sheet as well as entire multi-layer sheet in final application comply with following:		—
	- insulation thickness test (MST 04)	See Table 49	N/A
	- the insulation test (MST 16) after cut susceptibility test (MST 12)	See Table 41	N/A
6.6.4.3 Cemented joints			
	Cemented joints were considered as	☐ Edge seal ☒ Interface between Junction Box and mounting surface ☐ others	—
	Distances along cemented joints comply with the minimum distances as required in table 3 or table 4:		P
	System voltage…….:	See safety ratings	—
	Distance along cemented joints req./meas. (mm):	3.5 / 7.4	P
	A distance can be considered as cemented joint if following requirements are met:		—
	- Neither cracks nor voids in the insulating compounds have been occurred which either by themselves or in combination reduces the distances through the cemented joint below the required values.		N/A
	- No breakdown at MST 16 (initial and final test) with a 1,35 times higher tests voltage:		P
	Test voltage (V):	10800	—
	No breakdown at MST 17 (initial and final test) with a 1,35 times higher tests voltage:		P
	Test voltage (V):	2025	—
	The electrically insulating adhesive/sealant have a volume resistivity:		—
	- of greater than 50×10^6 Ω cm (dry)		N/A

IEC 61730-1: Part 1: Requirements for construction			
Clause	Requirement + Test	Result - Remark	Verdict
	- and greater than 10 × 10^6 Ω cm (wet).		N/A
	☐ rigid / rigid: lap shear test MST 36 ☐ rigid / flexible: Peel test MST 35	See Table 40 and Table 39	N/A
	Supplement information: Above mentioned tests have to be performed for each cemented joint. Also the materials and their properties have to be listed in annex 1		
6.6.4.4 Distance through functional insulation			
	Minimum distance	See Table 1, Table 2, Table 3	P

IEC 61730-1: Part 1: Requirements for construction			
Clause	Requirement + Test	Result - Remark	Verdict

6.6.3: Clearance, creepage distances and distances through solid insulation

Table 1: Design evaluation

Clearances and creepage distances

Clearance (cl) and creepage distance (cr) between:	Line of table 3or 4	Type of insulation	Pollution degree	CTI Material group	Relevant voltage	Clearance cl (mm)		Creepage cr (mm)	
						Required	Design[a]	Required	Design[a]
Between cell and outer accessible surfaces	1	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2	☒ I ☐ II ☐ IIIa	1500V DC	19.4	10.5~ 12.5	10.4	10.5~ 12.5
Between busbar and outer accessible surfaces	1	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2	☒ I ☐ II ☐ IIIa	1500V DC	19.4	10.5~ 12.5	10.4	10.5~ 12.5
Between junction box ribbon and outer accessible surfaces	1	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2	☒ I ☐ II ☐ IIIa	1500V DC	19.4	≥11.7	10.4	≥11.7
Between any other current carrying part and outer accessible surfaces	1	☐ Functional ☐ Basic ☐ Suppl. ☐ Reinforced	☐ 1 ☐ 2	☐ I ☐ II ☐ IIIa	N/A	N/A	N/A	N/A	N/A
Between cells	2	☒ Functional ☐ Basic ☐ Suppl. ☐ Reinforced	☒ 1 ☐ 2	☒ I ☐ II ☐ IIIa	~0.7 V DC	N/A	0.45~ 1.45	N/A	0.45~ 1.45
Between cell strings	2	☒ Functional ☐ Basic ☐ Suppl. ☐ Reinforced	☒ 1 ☐ 2	☒ I ☐ II ☐ IIIa	<35V DC	0.1	2.0~3.0	0.2	2.0~3.0
Between other highest potential difference within the module	2	☒ Functional ☐ Basic ☐ Suppl. ☐ Reinforced	☒ 1 ☐ 2	☒ I ☐ II ☐ IIIa	<35V DC	0.1	≥3.0	0.2	≥3.0
Distances through materials									

IEC 61730-1: Part 1: Requirements for construction			
Clause	Requirement + Test	Result - Remark	Verdict

DTFI-Distance between parts of different potential within a PV module(one encapsulant see IEC 61370-1:2023 Figure C.3:	Line of table 3 or 4	Type of insulation	Relevant voltage	Required (mm)	Design[a] (mm)
Between busbars	3	☐ no additional test ☐ with additional tests in 6.6.4.4	N/A	N/A	N/A
Between cell strings	3	☐ no additional test ☐ with additional tests in 6.6.4.4	N/A	N/A	N/A
Between other highest potential difference within the module	3	☐ no additional test ☐ with additional tests in 6.6.4.4	N/A	N/A	N/A

Insulation in thin layers (DTI)	Line of table 3 or 4	Relevant voltage	Required (mm)	Design./ sample # (mm)
	4	N/A	N/A	N/A
Cemented joints	Line of table 3 or 4	Relevant voltage	Required (mm)	Design/ sample # (mm)
	5	1500V DC	3.5	7.4

Supplementary information see photographs/drawings/illustrations on annex 2

[a] #. List relevant position and test voltage for each clearence which is verified by impulse voltage test according to IEC 60664-1.

IEC 61730-1: Part 1: Requirements for construction			
Clause	Requirement + Test	Result - Remark	Verdict

6.6.3.4: Clearance, creepage distances and distances through solid insulation

Table 2：Measured Initial

Sample #: laminate M1-14

MST 57 Clearances and creepage distances

Clearance (cl) and creepage distance (cr) between:	Line of table 3or 4	Type of insulation	Pollution degree	CTI Material group	Relevant voltage	Clearance cl (mm)		Creepage cr (mm)	
						Required	Meas.[a]	Required	Meas[a]
Between cell and outer accessible surfaces	1	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2	☒ I ☐ II ☐ IIIa	1500V DC	19.4	11.5	10.4	11.5
Between busbar and outer accessible surfaces	1	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2	☒ I ☐ II ☐ IIIa	1500V DC	19.4	11.5	10.4	11.5
Between junction box ribbon and outer accessible surfaces	1	☐ Functional ☐ Basic ☐ Suppl. ☐ Reinforced	☐ 1 ☐ 2	☐ I ☐ II ☐ IIIa	N/A	N/A	N/A	N/A	N/A
Between any other current carrying part and outer accessible surfaces	1	☐ Functional ☐ Basic ☐ Suppl. ☐ Reinforced	☐ 1 ☐ 2	☐ I ☐ II ☐ IIIa	N/A	N/A	N/A	N/A	N/A
Between cells	2	☒ Functional ☐ Basic ☐ Suppl. ☐ Reinforced	☒ 1 ☐ 2	☒ I ☐ II ☐ IIIa	~0.7 V DC	N/A	1.0	N/A	1.0
Between cell strings	2	☒ Functional ☐ Basic ☐ Suppl. ☐ Reinforced	☒ 1 ☐ 2	☒ I ☐ II ☐ IIIa	<35V DC	0.1	2.2	0.2	2.2

IEC 61730-1: Part 1: Requirements for construction			
Clause	Requirement + Test	Result - Remark	Verdict

Between other highest potential difference within the module	2	☒ Functional ☐ Basic ☐ Suppl. ☐ Reinforced	☒ 1 ☐ 2	☒ I ☐ II ☐ IIIa	<35V DC	0.1	≥3.0	0.2	≥3.0

Distances through materials

Distance between parts of different potential within a PV module (DTFI):	Line of table 3 or 4	Type of insulation	Relevant voltage	Required (mm)	Meas.[a] (mm)
Between busbars	3	☐ no additional test ☐ with additional tests in 6.6.4.4	N/A	N/A	N/A
Between cell strings	3	☐ no additional test ☐ with additional tests in 6.6.4.4	N/A	N/A	N/A
Between other highest potential difference within the module	3	☐ no additional test ☐ with additional tests in 6.6.4.4	N/A	N/A	N/A

Insulation in thin layers (DTI)	Line of table 3 or 4	Relevant voltage	Required (mm)	Meas./ sample # (mm)
	4	N/A	N/A	N/A
Cemented joints	Line of table 3 or 4	Relevant voltage	Required (mm)	Meas./ sample # (mm)
	5	1500V DC	3.5	7.4 / component sample in IEC 62790 testing reort 704072242901-00

Supplementary information see photographs/drawings/illustrations on annex 2

[a] Report the smallest measured distance and sample #. List relevant position and test voltage for each clearence which is verified by impulse voltage test according to IEC 60664-1.

IEC 61730-1: Part 1: Requirements for construction			
Clause	Requirement + Test	Result - Remark	Verdict

6.6.3.4: Clearance, creepage distances and distances through solid insulation

Table 3: Measured Final

Sample #: laminate M1-14

MST 57 Clearances and creepage distances

Clearance (cl) and creepage distance (cr) between:	Line of table 3or 4	Type of insulation	Pollution degree	CTI Material group	Relevant voltage	Clearance cl (mm)		Creepage cr (mm)	
						Required	Meas.[a]	Required	Meas[a]
Between cell and outer accessible surfaces	1	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2	☒ I ☐ II ☐ IIIa	1500V DC	19.4	11.5	10.4	11.5
Between busbar and outer accessible surfaces	1	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	☒ 1 ☐ 2	☒ I ☐ II ☐ IIIa	1500V DC	19.4	11.5	10.4	11.5
Between junction box ribbon and outer accessible surfaces	1	☐ Functional ☐ Basic ☐ Suppl. ☐ Reinforced	☐ 1 ☐ 2	☐ I ☐ II ☐ IIIa	N/A	N/A	N/A	N/A	N/A
Between any other current carrying part and outer accessible surfaces	1	☐ Functional ☐ Basic ☐ Suppl. ☐ Reinforced	☐ 1 ☐ 2	☐ I ☐ II ☐ IIIa	N/A	N/A	N/A	N/A	N/A
Between cells	2	☒ Functional ☐ Basic ☐ Suppl. ☐ Reinforced	☒ 1 ☐ 2	☒ I ☐ II ☐ IIIa	~0.7 V DC	N/A	1.0	N/A	1.0
Between cell strings	2	☒ Functional ☐ Basic ☐ Suppl. ☐ Reinforced	☒ 1 ☐ 2	☒ I ☐ II ☐ IIIa	<35V DC	0.1	2.2	0.2	2.2

IEC 61730-1: Part 1: Requirements for construction			
Clause	Requirement + Test	Result - Remark	Verdict

Between other highest potential difference within the module	2	☒ Functional ☐ Basic ☐ Suppl. ☐ Reinforced	☒ 1 ☐ 2	☒ I ☐ II ☐ IIIa	<35V DC	0.1	≥3.0	0.2	≥3.0

Distances through materials

Distance between parts of different potential within a PV module (DTFI):	Line of table 3 or 4	Type of insulation	Relevant voltage	Required (mm)	Meas.[a] (mm)
Between busbars	3	☐ no additional test ☐ with additional tests in 6.6.4.4	N/A	N/A	N/A
Between cell strings	3	☐ no additional test ☐ with additional tests in 6.6.4.4	N/A	N/A	N/A
Between other highest potential difference within the module	3	☐ no additional test ☐ with additional tests in 6.6.4.4	N/A	N/A	N/A

Insulation in thin layers (DTI)	Line of table 3 or 4	Relevant voltage	Required (mm)	Meas./ sample # (mm)
	4	N/A	N/A	N/A

Cemented joints	Line of table 3 or 4	Relevant voltage	Required (mm)	Meas./ sample # (mm)
	5	1500V DC	3.5	7.4 / component sample in IEC 62790 testing reort 704072242901-00

Supplementary information see photographs/drawings/illustrations on annex 2

[a] Report the smallest measured distance and sample #. List relevant position and test voltage for each clearence which is verified by impulse voltage test according to IEC 60664-1.

IEC 61730-1: Part 1: Requirements for construction			
Clause	Requirement + Test	Result - Remark	Verdict

Table 4: 6.6.3.4 - Clearance evaluated by Impulse voltage test

Test Date (YYYY-MM-DD).....	2024-02-24 for M1-14

Results

☒ No evidence of dielectric breakdown or surface tracking observed — P

Supplementary information:

Clearance (cl) at/of/between: Sample#	Line of table 3or 4	Type of insulation	Working voltage	Impulse voltage	Measured			Verdict
					Voltage Peak kV	T_1 µs	T_2 µs	--
Between cell and outer accessible surfaces :	1	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	1500	20000	20	1.17 1.17 1.17 1.17 1.17 1.17	50.6 49.7 50.3 50.9 49.8 51.1	P
Between busbar and outer accessible surfaces :	1	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	1500	20000	20	1.17 1.17 1.17 1.17 1.17 1.17	50.6 49.7 50.3 50.9 49.8 51.1	P
Between junction box ribbon and outer accessible surfaces:	1	☐ Functional ☐ Basic ☐ Suppl. ☒ Reinforced	1500	20000	20	1.17 1.17 1.17 1.17 1.17 1.17	50.6 49.7 50.3 50.9 49.8 51.1	P
Between any other current carrying part and outer accessible surfaces:		☐ Functional ☐ Basic ☐ Suppl. ☐ Reinforced	N/A	N/A	N/A	N/A	N/A	N/A

Supplementary information:N/A

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

IEC 61730 Part 2: Requirements for testing

8 Testing
Test sequences see IEC 61730-2 Deviations from test sequence are possible but must be documented.

10 TEST PROCEDURES			
10.1 General: Safety qualification testing included the following Module Safety Tests (MST) of IEC 61730-2			
1.1.1 Initial Testing			
10.2	MST 01 – Visual inspection ..... :	See appended Table 6	P
10.3	MST 02 - Performance at STC ..... :	See appended Table 7	P
10.4	MST 03 – Maximum power determination..... :	See appended Table 8	P
10.13	MST 16 – Insulation test..... :	See appended Table 9	P
10.14	MST 17 – Wet leakage current test..... :	See appended Table 10	P
10.11	MST 13 – Continuity test of equipotential bonding:	See appended Table 11	P
10.9	MST 11 – Accessibility test..... :	See appended Table 12	P
Sequence A			
10.26	MST 37 – Materials creep test..... :	See appended Table 13	P
10.11	MST 13 – Continuity test of equipotential bonding:	See appended Table 11	P
10.9	MST 11 – Accessibility test..... :	See appended Table 12	P
Sequence B			
10.30	MST 53 – Damp heat test 200h..... :	See appended Table 14	P
10.31	MST 54 – UV test 60kWh/m² ..... :	See appended Table 15	P
10.29	MST 52 – Humidity freeze test ..... :	See appended Table 16	P
10.31	MST 54 – UV test 60kWh/m² ..... :	See appended Table 17	P
10.29	MST 52 – Humidity freeze test ..... :	See appended Table 18	P
Sequence B1			
10.32	MST 55 – Cold conditioning ..... :	See appended Table 19	P
10.33	MST 56 – Dry heat conditioning ..... :	See appended Table 20	P
10.29	MST 52 – Humidity freeze test ..... :	See appended Table 21	P
10.32	MST 55 – Cold conditioning ..... :	See appended Table 22	P
10.29	MST 52 – Humidity freeze test ..... :	See appended Table 23	P

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict
Sequence C			
10.31	MST 54 – UV test 15kWh/m²..... :	See appended Table 24 Or refer to report No. 704062316712-00 part 1 of 2	P
10.28	MST 51 – Thermal cycling 50 test..... :	See appended Table 25 Or refer to report No. 704062316712-00 part 1 of 2	P
10.29	MST 52 – Humidity freeze test ..... :	See appended Table 26 Or refer to report No. 704062316712-00 part 1 of 2	P
10.27	MST 42 – Robustness of terminations test ..... :	See appended Table 27 Or refer to report No. 704062316712-00 part 1 of 2	P
Sequence D			
10.30	MST 53 – Damp heat test..... :	See appended Table 28 Or refer to report No. 704062316712-00 part 1 of 2	P
10.23	MST 34 – Static mechanical load test ..... :	See appended Table 29 Or refer to report No. 704062316712-00 part 1 of 2	P
Sequence E			
10.28	MST 51 – Thermal cycling 200 test..... :	See appended Table 30 Or refer to report No. 704062316712-00 part 1 of 2	P
Sequence F			
10.19	MST 25 – Bypass diode thermal test ..... :	See appended Table 31	P
10.16	MST 22 – Hot-spot endurance Test ..... :	See appended Table 33	P
10.20	MST 26 – Reverse current overload test..... :	See appended Table 34	P
Sequence G			
10.12	MST 14 – Impulse voltage test..... :	See appended Table 35	P
Other tests			
10.17	MST 23 – Fire Test..... :	See appended Table 36	P
10.18	MST 24 – Ignitability test ..... :	See appended Table 37	P
10.21	MST 32 – Module breakage test ..... :	See appended Table 38	P
10.24	MST 35 – Peel test..... :	See appended Table 39	N/A

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

10.25	MST 36 – Lap shear strength test .....:	See appended Table 40	N/A
Final Testing			
10.10	MST 12 – Cut susceptibility test .....:	See appended Table 41	N/A
10.11	MST 13 – Continuity test of equipotential bonding:	See appended Table 11	P
10.9	MST 11 – Accessibility test.....:	See appended Table 12	P
10.4	MST 03 – Maximum power determination.....:	See appended Table 42	P
10.1	MST 01 – Visual inspection .....:	See appended Table 43	P
10.6	MST 05 – Durability of markings .....:	See appended Table 44	P
10.7	MST 06 – Sharp edge test.....:	See appended Table 45	P
10.8	MST 07 – Bypass diode functionality test .....:	See appended Table 46	P
10.22	MST 33a – General screw connections test.....:	See appended Table 47	N/A
10.22	MST 33b – Locking Screw connections test .....:	See appended Table 48	N/A
10.5	MST 04 – Insulation thickness test.....:	See appended Table 49	N/A
Supplementary information: N/A			

Table 5: Placeholder section previous overview of MST items for each test sample
--

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Table 6: MST 01 - Initial Visual inspection			
Test Date (YYYY-MM-DD)....:		2023-12-15 for M1-x, M4-x 2023-12-05 for M2-x 2024-03-05 for M3-x	—
M1-10	Findings....:	☐ Yes....☒ No	P
	Nature and position of findings – comments or attach photos	No major visual defects found	—
M1-13	Findings....:	☐ Yes....☒ No	P
	Nature and position of findings – comments or attach photos	No major visual defects found	—
M1-4	Findings....:	☐ Yes....☒ No	P
	Nature and position of findings – comments or attach photos	No major visual defects found	—
M1-8	Findings....:	☐ Yes....☒ No	P
	Nature and position of findings – comments or attach photos	No major visual defects found	—
M1-6	Findings....:	☐ Yes....☒ No	P
	Nature and position of findings – comments or attach photos	No major visual defects found	—
M1-1	Findings....:	☐ Yes....☒ No	P
	Nature and position of findings – comments or attach photos	No major visual defects found	—
M1-2	Findings....:	☐ Yes....☒ No	P
	Nature and position of findings – comments or attach photos	No major visual defects found	—
M1-3	Findings....:	☐ Yes....☒ No	P
	Nature and position of findings – comments or attach photos	No major visual defects found	—
M1-14	Findings....:	☐ Yes....☒ No	P
	Nature and position of findings – comments or attach photos	No major visual defects found	—
M1-15	Findings....:	☐ Yes....☒ No	P
	Nature and position of findings – comments or attach photos	No major visual defects found	—
M1-16	Findings....:	☐ Yes....☒ No	

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict
	Nature and position of findings – comments or attach photos	No major visual defects found	—
M1-22	Findings .....:	☐ Yes .....☒ No	
	Nature and position of findings – comments or attach photos	No major visual defects found	—
M1-23	Findings .....:	☐ Yes .....☒ No	
	Nature and position of findings – comments or attach photos	No major visual defects found	—
M2-11	Findings .....:	☐ Yes .....☒ No	
	Nature and position of findings – comments or attach photos	No major visual defects found	—
M2-13	Findings .....:	☐ Yes .....☒ No	
	Nature and position of findings – comments or attach photos	No major visual defects found	—
M3-10	Findings .....:	☐ Yes .....☒ No	
	Nature and position of findings – comments or attach photos	No major visual defects found	—
M3-13	Findings .....:	☐ Yes .....☒ No	
	Nature and position of findings – comments or attach photos	No major visual defects found	—
M4-10	Findings .....:	☐ Yes .....☒ No	
	Nature and position of findings – comments or attach photos	No major visual defects found	—
M4-13	Findings .....:	☐ Yes .....☒ No	
	Nature and position of findings – comments or attach photos	No major visual defects found	—

TABLE 8.1: MST 02 Performance at STC		
TABLE 8.1: MST 02 Performance at STC (Front side)		
Sample .....:	M1-10	—
Test Date [YYYY-MM-DD].....:	2023-12-17	—
Irradiance (W/M1-2) .....:	1000	—
Module temperature (°C) .....:	25	—
Test method.....:	☒ Simulator ☐ Natural sunlight	—
Rated Isc including manufacturing tolerances .....:	18.24±3%	—
Rated Voc including manufacturing tolerances....:	47.55±3%	—

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmp [W]	FF [%]	Result
18.230	47.479	17.093	40.099	685.412	79.19	P
Supplementary information: N/A						

Sample .....:	M2-10	—
Test Date [YYYY-MM-DD].....:	2023-12-07	—
Irradiance (W/M1-2) .....:	1000	—
Module temperature (°C) .....:	25	—
Test method.....:	☒ Simulator ☐ Natural sunlight	—
Rated Isc including manufacturing tolerances .....:	14.31±3%	—
Rated Voc including manufacturing tolerances....:	51.30±3%	—

Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmp [W]	FF [%]	Result
14.223	51.621	13.528	42.925	580.689	79.09	P
Supplementary information: N/A						

Sample .....:	M3-10	—
Test Date [YYYY-MM-DD].....:	2024-03-07	—
Irradiance (W/M1-2) .....:	1000	—
Module temperature (°C) .....:	25	—
Test method.....:	☒ Simulator ☐ Natural sunlight	—
Rated Isc including manufacturing tolerances .....:	14.06±3%	—
Rated Voc including manufacturing tolerances....:	55.38±3%	—

Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmp [W]	FF [%]	Result
13.632	56.159	12.947	47.668	617.158	80.62	P
Supplementary information: N/A						

Sample .....:	M4-10	—
Test Date [YYYY-MM-DD].....:	2023-12-17	—
Irradiance (W/M1-2) .....:	1000	—
Module temperature (°C) .....:	25	—
Test method.....:	☒ Simulator ☐ Natural sunlight	—
Rated Isc including manufacturing tolerances .....:	15.95±3%	—
Rated Voc including manufacturing tolerances....:	47.20±3%	—

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmp [W]	FF [%]	Result
15.507	47.692	14.724	40.219	592.185	80.07	P
Supplementary information: N/A						

TABLE 8.2: MST 03 Performance at STC on (Back side)							
Test Date [YYYY-MM-DD].....:	2023-12-17 for M1-10, M4-10 2023-12-07 for M2-10 2024-03-07 for M3-10						—
Irradiance (W/m2) .....:	1000						—
Module temperature (°C) .....:	25						—
Test method.....:	☒ Simulator ☐ Natural sunlight						—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmp [W]	FF [%]	Result
M1-10	14.590	47.112	13.059	40.898	534.087	77.70	P
M2-11	11.306	51.025	10.227	45.132	461.565	80.01	P
M3-10	10.637	55.745	9.624	48.373	465.542	78.51	P
M4-10	12.542	47.259	10.977	40.904	449.003	75.75	P

TABLE 8.3: MQT 06.1 ini: Performance at BNPI (front side irradiance 1 000 W/m², back side irradiance 135 W/m², 25 °C, AM 1.5) before initial stabilization							
Test Date [YYYY-MM-DD].....:	2023-12-17 for M1-10, M4-10 2023-12-07 for M2-10 2024-03-07 for M3-10						—
Irradiance (W/m2) .....:	BNPI						—
Module temperature (°C) .....:	25						—
Test method.....:	☒ Simulator ☐ Natural sunlight						—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmp [W]	FF [%]	Result
M1-10	20.101	47.652	18.927	40.096	758.897	79.23	P
M2-11	15.626	51.477	14.890	42.927	639.183	79.46	P
M3-10	15.032	56.352	14.245	47.676	679.145	80.17	P
M4-10	17.077	47.866	16.188	40.221	651.098	79.65	P

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

TABLE 8: MST 03 Maximum power determination							P
Test Date [YYYY-MM-DD] ..... :	2023-12-17 for M1-x, M4-x 2023-12-07 for M2-x 2024-03-07 for M3-x						—
Irradiance (W/M1-2) ..... :	1000						—
Module temperature (°C) ..... :	25						—
Test method ..... :	☒ Simulator ☐ Natural sunlight						—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmp [W]	FF [%]	Result
M1-13	17.978	47.517	17.026	40.263	685.518	80.25	P
M1-4	18.067	47.550	17.038	40.243	685.660	79.81	P
M1-8	18.040	47.424	17.125	39.958	684.281	79.98	P
M1-6	18.014	47.474	17.057	40.111	684.173	80.00	P
M1-1	18.012	47.405	17.088	40.223	687.331	80.50	P
M1-2	18.034	47.417	17.063	40.274	687.195	80.36	P
M1-3	18.035	47.398	17.066	40.281	687.436	80.42	P
M1-14	18.045	47.493	17.135	40.342	691.260	80.66	P
M2-13	14.236	51.603	13.547	42.923	581.478	79.15	P
M3-13	13.632	55.960	13.001	47.515	617.743	80.98	P
M4-13	15.664	47.741	14.727	40.299	593.483	79.36	P
Supplementary information:							

Table 9: MST 16 - Initial Insulation test					
Test Date (YYYY-MM-DD) .....:	2023-12-17 for M1-x, M4-x 2024-01-15 for M2-x 2024-03-07 for M3-x				—
Test Voltage applied (V, DC) .....:	8000/1500				—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
M1-10	>10000	12.88	No dielectric breakdown	x	P
M1-13	>10000	12.88	No dielectric breakdown	x	P
M1-4	>10000	12.88	No dielectric breakdown	x	P
M1-8	>10000	12.88	No dielectric breakdown	x	P

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

M1-6	>10000	12.88	No dielectric breakdown	x	P
M1-1	>10000	12.88	No dielectric breakdown	x	P
M1-2	>10000	12.88	No dielectric breakdown	x	P
M1-3	>10000	12.88	No dielectric breakdown	x	P
M1-14	>10000	12.88	No dielectric breakdown	x	P
M2-10	>2000	14.80	No dielectric breakdown	x	P
M2-13	>2000	14.80	No dielectric breakdown	x	P
M3-10	>10000	14.31	No dielectric breakdown	x	P
M3-13	>10000	14.31	No dielectric breakdown	x	P
M4-10	>10000	14.80	No dielectric breakdown	x	P
M4-13	>10000	14.80	No dielectric breakdown	x	P
Supplementary information: Size of module [m²] 3.11 for M1-x, 2.70 for M2-x & M4-x, 2.80 for M3-x, the maximum measuring limit of the equipment is 10000MΩ.					

Table 10: MST 17 - Initial Wet leakage current test			
Test Date (YYYY-MM-DD) .....:	2023-12-17 for M1-x, M4-x 2024-01-15 for M2-x 2024-03-07 for M3-x		—
Test Voltage applied (V, dc) .....:	1500		—
Solution resistivity (Ω cm) .....:	2795 for M1-x, M4-x 2848 for M2-x 2893 for M3-x		—
Solution temperature (°C)..... :	22.2 for M1-x, M4-x 21.8 for M2-x 23.1 for M3-x		—
Sample #	Measured (MΩ)	Required (MΩ)	Result
M1-10	>10000	12.88	P
M1-13	>10000	12.88	P
M1-4	>10000	12.88	P
M1-8	>10000	12.88	P
M1-6	>10000	12.88	P
M1-1	>10000	12.88	P
M1-2	>10000	12.88	P
M1-3	>10000	12.88	P

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

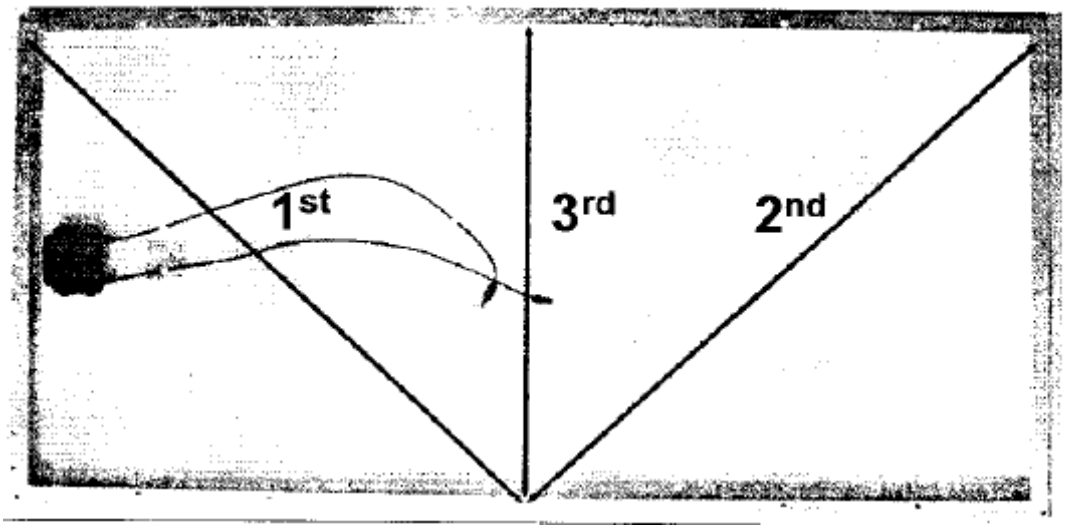
M1-14	>10000	12.88	P
M2-10	5219	14.80	P
M2-13	5577	14.80	P
M3-10	>10000	14.31	P
M3-13	>10000	14.31	P
M4-10	>10000	14.80	P
M4-13	>10000	14.80	P
Supplementary information: Size of module [m²] 3.11 for M1-x, 2.70 for M2-x & M4-x, 2.80 for M3-x, the maximum measuring limit of the equipment is 10000MΩ.			

Table 11: MST 13 - Continuity test of equipotential bonding				
Test Date Initial examination (YYYY-MM-DD) ..... :	2024-01-25 for M1-15 2023-12-17 for others			—
Test Date Final examination (YYYY-MM-DD) ..... :	2024-01-25 for M1-1, M1-15 2024-03-26 for others			—
Maximum over-current protection rating (A) ..... :	35			—
Current applied (A) ..... :	87.5			—
Location of designated grounding point ..... :	Indicate in supplementary information			—
Location of second contacting point ..... :	Indicate in supplementary information			—
Sample #	Position in test sequence:	Voltage [V]	Resistance [Ω]	
M1-4	Initial examination	0.2625 / 0.2625 / 0.4375	0.003 / 0.003 / 0.005	P
	Preconditioning: MST 54, MST 51, MST 52, MST 42, ~~MST 12~~			—
	Final examination	0.2625 / 0.4375 / 0.2625	0.003 / 0.005 / 0.003	P
M1-8	Initial examination	0.6125 / 0.4375 / 0.4375	0.007 / 0.005 / 0.005	P
	Preconditioning: MST 51, ~~MST 12~~			—
	Final examination	0.6125 / 0.6125 / 0.350	0.007 / 0.007 / 0.004	P
M1-6	Initial examination	0.2625 / 0.525 / 0.2625	0.003 / 0.006 / 0.003	P
	Preconditioning: MST 53, MST 34, ~~MST 12~~			—
	Final examination	0.525 / 0.6125 / 0.525	0.006 / 0.007 / 0.006	P

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

M1-1	Initial examination	0.350 / 0.6125 / 0.4375	0.004 / 0.007 / 0.005	P
	Preconditioning: MST 37			—
	Final examination	0.350 / 0.4375 / 0.350	0.004 / 0.005 / 0.004	P
M1-2	Initial examination	0.525 / 0.6125 / 0.350	0.006 / 0.007 / 0.004	P
	Preconditioning: MST 53, MST 54, MST 52, MST 54, MST 52, ~~MST 12~~			—
	Final examination	0.350 / 0.4375 / 0.6125	0.004 / 0.005 / 0.007	P
M1-3	Initial examination	0.4375 / 0.350 / 0.4375	0.005 / 0.004 / 0.005	P
	Preconditioning: MST 55, MST 56, MST 52, MST 55, MST 52, ~~MST12~~			—
	Final examination	0.2625 / 0.6125 / 0.4375	0.003 / 0.007 / 0.005	P
M1-15	Initial examination	0.4375 / 0.350 / 0.350	0.005 / 0.004 / 0.004	P
	Preconditioning: MST 32			—
	Final examination	0.6125 / 0.350 / 0.2625	0.007 / 0.004 / 0.003	P

Supplementary information:



IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Table 12: MST 11 - Accessibility test			
Test Date **Initial** examination (YYYY-MM-DD) .:		2023-12-17	—
Test Date **Final** examination (YYYY-MM-DD) ..:		2024-01-25 for M1-1 2024-03-26 for others	—
Sample #	Position in test sequence:		
M1-4	Initial examination, access?	☐ Yes ☒ No	P
	Preconditioning: MST 54, MST 51, MST 52, MST 42, ~~MST 12~~, MST 13		—
	Final examination, access?	☐ Yes ☒ No	P
M1-8	Initial examination, access?	☐ Yes ☒ No	P
	Preconditioning: MST 51, ~~MST 12~~, MST 13		—
	Final examination, access?	☐ Yes ☒ No	P
M1-6	Initial examination, access?	☐ Yes ☒ No	P
	Preconditioning: MST 53, MST 34, ~~MST 12~~, MST 13		—
	Final examination, access?	☐ Yes ☒ No	P
M1-1	Initial examination, access?	☐ Yes ☒ No	P
	Preconditioning: MST 37, MST 13		—
	Final examination, access?	☐ Yes ☒ No	P
M1-2	Initial examination, access?	☐ Yes ☒ No	P
	Preconditioning: MST 53, MST 54, MST 52, MST 54, MST 52, ~~MST 12~~, MST 13		—
	Final examination, access?	☐ Yes ☒ No	P
M1-3	Initial examination, access?	☐ Yes ☒ No	P
	Preconditioning: MST 55, MST 56, MST 52, MST 55, MST 52, ~~MST12~~		—
	Final examination, access?	☐ Yes ☒ No	P
Supplementary information: N/A			

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

SEQUENCE A				
Sample #	M1-1			—
Table 13: MST 37 - Materials creep test				
Test Date (YYYY-MM-DD) start/end .....:	2024-01-16 / 2024-01-25			—
Duration [h] .....:	200			—
Applied temperature [°C] .....:	105±5			—
MST 01: Visual inspection after materials creep test				—
Test Date (YYYY-MM-DD) .....:	2024-01-25			—
Findings .....:	☐ Yes ..... ☒ No			P
Nature and position of findings – comments or attach photos	No major visual defects found			—
Supplementary information: For clearance and creepage distances see table XYZ				
MST 16: Insulation test after materials creep test				—
Test Date (YYYY-MM-DD) .....:	2024-01-25			—
Test Voltage applied (V, dc) .....:	8000/1500			—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
>10000	12.88	No dielectric breakdown	x	P
MST 17: Wet leakage current test after materials creep test				—
Test Date (YYYY-MM-DD) .....:	2024-01-25			—
Test Voltage applied (V, dc) .....:	1500			—
Solution resistivity (Ω cm) .....:	< 3500 Ω cm at 22 ± 2°C			—
Solution temperature (°C) .....:	22.2			—
Measured(MΩ)	Required (MΩ)			Result
>10000	12.88			P
Supplementary information: Size of module [m²] 3.11, the maximum measuring limit of the equipment is 10000 MΩ.				

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

SEQUENCE B					
Sample #	M1-2				—
Table 14: MST 53 - Damp heat test					
Test Date (YYYY-MM-DD) start/end .....:	2023-12-24 / 2024-01-02				—
Duration [h] .....:	200				—
MST 01: Visual inspection after Damp heat test					—
Test Date (YYYY-MM-DD) .....:	2024-01-02				—
Sample #	Findings	Nature and position of findings – comments or attach photos			—
M1-2	☐ Yes ☒ No	No major visual defects found			P
MST 16: Insulation test after Damp heat test					—
Test Date (YYYY-MM-DD) .....:	2024-01-02				—
Test Voltage applied (V, DC) .....:	8000/1500				—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
M1-2	>10000	12.88	No dielectric breakdown	x	P
Supplementary information: Size of module [m²] 3.11, the maximum measuring limit of the equipment is 10000MΩ.					

Table 15: MST 54 - UV test		
UV test (frontside)		
Sample # .....:	M1-2	—
Test Date (YYYY-MM-DD) start/end .....:	2024-01-13 / 2024-02-01	—
Module temperature [°C] .....:	60±5	—
Irradiation total [kWh/ m²] .....:	60	—
Open circuits .....:	☐ Yes ☒ No	P
UV test (backside)		
Sample # .....:	M1-2	—
Test Date (YYYY-MM-DD) start/end .....:	2024-02-24 / 2024-03-14	—
Module temperature [°C] .....:	60±5	—
Irradiation total [kWh/ m²] .....:	60	—
Open circuits .....:	☐ Yes ☒ No	P

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

MST 01: Visual inspection after UV test					—
Test Date (YYYY-MM-DD) .....:		2024-02-01 (after frontside UV test) 2024-03-14 (after backside UV test)			—
Sample#		Findings		Nature and position of findings – comments or attach photos	—
M1-2		☐ Yes ☒ No		No major visual defects found	P
M1-2		☐ Yes ☒ No		No major visual defects found	P
MST 16: Insulation test after UV test					—
Test Date (YYYY-MM-DD) .....:		2024-02-01 (after frontside UV test) 2024-03-14 (after backside UV test)			—
Test Voltage applied (V, DC) .....:		8000/1500			—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
M1-2	>10000	12.88	No dielectric breakdown	x	P
M1-2	>10000	12.88	No dielectric breakdown	x	P
Supplementary information: Size of module [m²] 3.11, the maximum measuring limit of the equipment is 10000MΩ.					

Table 16: MST 52 -Humidity freeze test			
Test Date (YYYY-MM-DD) start/end .....:		2024-02-14 / 2024-02-24 (after frontside UV test) 2024-03-14 / 2024-03-24 (after backside UV test)	—
Total cycles (10) .....:		10	—
Sample#		Open circuits :	—
M1-2		☐ Yes ☒ No	P
MST 01: Visual inspection after Humidity freeze test			—
Test Date (YYYY-MM-DD) .....:		2024-02-24 (after frontside UV & HF test) 2024-03-24 (after backside UV & HF test)	—
Sample#	Findings	Nature and position of findings – comments or attach photos	—
M1-2	☐ Yes ☒ No	No major visual defects found	P
M1-2	☐ Yes ☒ No	No major visual defects found	P
MST 16: Insulation test after Humidity freeze test			—
Test Date (YYYY-MM-DD) .....:		2024-02-24 (after frontside UV & HF test) 2024-03-24 (after backside UV & HF test)	—
Test Voltage applied (V, DC) .....:		8000/1500	—

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
M1-2	>10000	12.88	No dielectric breakdown	x	P
M1-2	>10000	12.88	No dielectric breakdown	x	P
Supplementary information: Size of module [m²] 3.11, the maximum measuring limit of the equipment is 10000MΩ.					

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

SEQUENCE B1				
Sample #	M1-3			—
Table 19: MST 55 - Cold conditioning				
Test Date (YYYY-MM-DD) start/end .....:		2024-01-16 / 2024-01-18		—
Temperature [°C] Duration [h] .....:		-40±3 / 48		—
MST 01: Visual inspection after Cold conditioning				—
Test Date (YYYY-MM-DD) .....:		2024-01-18		—
Findings .....:		☐ Yes ..... ☒ No		P
Nature and position of findings – comments or attach photos		No major visual defects found		—
MST 16: Insulation test after Cold conditioning				—
Test Date (YYYY-MM-DD) .....:		2024-01-18		—
Test Voltage applied (V, DC) .....:		8000/1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
>10000	12.88	No dielectric breakdown	x	P
Supplementary information: Size of module [m²] 3.11, the maximum measuring limit of the equipment is 10000MΩ.				

Table 20: MST 56 - Dry heat conditioning				
Test Date (YYYY-MM-DD) start/end .....:		2024-01-18 / 2024-01-27		—
Temperature [°C] Duration [h] .....:		105 / 200		—
MST 01: Visual inspection after Dry heat conditioning				—
Test Date (YYYY-MM-DD) .....:		2024-01-27		—
Findings .....:		☐ Yes ..... ☒ No		P
Nature and position of findings – comments or attach photos		No major visual defects found		—
MST 16: Insulation test after Dry heat conditioning				—
Test Date (YYYY-MM-DD) .....:		2024-01-27		—
Test Voltage applied (V, DC) .....:				—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
>10000	12.88	No dielectric breakdown	x	P

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Supplementary information: Size of module [m²] 3.11, the maximum measuring limit of the equipment is 10000MΩ.

Table 21: MST 52 - Humidity freeze test				
Test Date (YYYY-MM-DD) start/end .....:		2024-01-28 / 2024-02-07		—
Total cycles (10) .....:		10		—
Open circuits.....:		☐ Yes ☒ No		
MST 01: Visual inspection after Humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2024-02-07		—
Findings .....:		☐ Yes ..... ☒ No		P
Nature and position of findings – comments or attach photos		No major visual defects found		—
MST 16: Insulation test after Humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2024-02-07		—
Test Voltage applied (V, DC) .....:		8000/1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
>10000	12.88	No dielectric breakdown	x	P
Supplementary information: Size of module [m²] 3.11, the maximum measuring limit of the equipment is 10000MΩ.				

Table 22: MST 55 - Cold conditioning				
Test Date (YYYY-MM-DD) start/end .....:		2024-02-09 / 2024-02-11		—
Temperature [°C] / Duration [h] .....:		-40±3 / 48		—
MST 01: Visual inspection after Cold conditioning				—
Test Date (YYYY-MM-DD) .....:		2024-02-11		—
Findings .....:		☐ Yes ..... ☒ No		P
Nature and position of findings – comments or attach photos		No major visual defects found		—
MST 16: Insulation test after Cold conditioning				—
Test Date (YYYY-MM-DD) .....:		2024-02-11		—
Test Voltage applied (V, DC) .....:		8000/1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
>10000	12.88	No dielectric breakdown	x	P

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Supplementary information: Size of module [m²] 3.11, the maximum measuring limit of the equipment is 10000MΩ.

Table 23: MST 52 - Humidity freeze test				
Test Date (YYYY-MM-DD) start/end .....:		2024-02-12 / 2024-02-22		—
Total cycles (10) .....:		10		—
Open circuits .....:		☐ Yes ☒ No		P
MST 01: Visual inspection after Humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2024-02-22		—
Findings .....:		☐ Yes ..... ☒ No		P
Nature and position of findings – comments or attach photos		No major visual defects found		—
MST 16: Insulation test after Humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2024-02-22		—
Test Voltage applied (V, DC) .....:		8000/1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
>10000	12.88	No dielectric breakdown	x	P
MST 17: Wet leakage current test after humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2024-02-22		—
Test Voltage applied (V, dc) .....:		1500		—
Solution resistivity (Ω cm) .....:		2795		—
Solution temperature (°C) .....:		22.1		—
Measured (MΩ)		Required (MΩ)		Result
>10000		12.88		P
Supplementary information: Size of module [m²] 3.11, the maximum measuring limit of the equipment is 10000MΩ.				

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

SEQUENCE C				
Sample #	M1-4			—
Table 24: MST 54 - UV test				
Test Date (YYYY-MM-DD) start/end .....:		2023-12-28 / 2024-01-02 (for front side) 2024-01-02 / 2024-01-07 (for rear side)		—
Module temperature [°C] .....:		60±5		—
Irradiation total [kWh/ m²] .....:		15		—
Open circuits .....:		☐ Yes ☒ No		P
MST 01: Visual inspection after UV test				—
Test Date (YYYY-MM-DD) .....:		2024-01-07		—
Findings .....:		☐ Yes ..... ☒ No		P
Nature and position of findings – comments or attach photos		No major visual defects found		—
MST 16: Insulation test after UV test				—
Test Date (YYYY-MM-DD) .....:		2024-01-07		—
Test Voltage applied (V, DC) .....:		8000/1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
>10000	12.88	No dielectric breakdown	x	P
Supplementary information: Size of module [m²] 3.11, the maximum measuring limit of the equipment is 10000MΩ.				

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Table 25: MST 51 - Thermal cycling test				
Test Date (YYYY-MM-DD) start/end .....:	2024-01-25 / 2024-02-04			—
Total cycles (50) .....:	50			—
Applied current (A) .....:	20.96 for the heat up cycle from -40 °C to 80 °C 0.05 for other stages			—
Limiting voltage (V) .....:	N/A			—
Open circuits .....:	☐ Yes ☒ No			P
MST 01: Visual inspection after Thermal cycling test				—
Test Date (YYYY-MM-DD) .....:	2024-02-04			—
Findings .....:	☐ Yes ..... ☒ No			P
Nature and position of findings – comments or attach photos	No major visual defects found			—
MST 16: Insulation test after Thermal cycling test				—
Test Date (YYYY-MM-DD) .....:	2024-02-04			—
Test Voltage applied (V, DC) .....:	8000/1500			—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
>10000	12.88	No dielectric breakdown	x	P
Supplementary information: Size of module [m²] 3.11, the maximum measuring limit of the equipment is 10000MΩ.				

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Table 26: MST 52 - Humidity freeze test				
Test Date (YYYY-MM-DD) start/end .....:		2024-02-08 / 2024-02-18		—
Total cycles (10) .....:		10		—
Open circuits .....:		☐ Yes ☒ No		P
MST 01: Visual inspection after Humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2024-02-18		—
Findings .....:		☐ Yes ..... ☒ No		P
Nature and position of findings – comments or attach photos		No major visual defects found		—
MST 16: Insulation test after Humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2024-02-18		—
Test Voltage applied (V, DC) .....:		8000/1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
>10000	12.88	No dielectric breakdown	x	P
MST 17: Wet leakage current test after humidity freeze test				—
Test Date (YYYY-MM-DD) .....:		2024-02-18		—
Test Voltage applied (V, dc) .....:		1500		—
Solution resistivity (Ω cm) .....:		2874		—
Solution temperature (°C) .....:		21.7		—
Measured (MΩ)		Required (MΩ)		Result
>10000		12.88		P
Supplementary information: Size of module [m²] 3.11, the maximum measuring limit of the equipment is 10000MΩ.				

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Table 27: MST 42 - Robustness of terminations test				
Test Date (YYYY-MM-DD) .....:	2024-02-18			—
MQT 14.1: Retention of junction box on mounting surface				
Supplementary information: the force used in the retention of junction box on mounting surface was increased from 40 N to 156 N.				
MST 01: Visual inspection after retention of junction box on mounting surface				
Test Date (YYYY-MM-DD) .....:	2024-02-18			—
Findings .....:	☐ Yes ..... ☒ No			P
Nature and position of findings – comments or attach photos	No major visual defects found			—
MST 16: Insulation test after retention of junction box on mounting surface				
Test Date (YYYY-MM-DD) .....:	2024-02-18			—
Test Voltage applied (V, DC) .....:	10800/2025			—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
>10000	12.88	No dielectric breakdown	x	P
Supplementary information: Size of module [m²] 3.11, the maximum resistance measurement range is 10000MΩ.				
MST 17: Wet leakage current test after retention of junction box on mounting surface				
Test Date (YYYY-MM-DD) .....:	2024-02-18			—
Test Voltage applied [V] .....:	2025			—
Solution resistivity (Ω cm) .....:	2837			—
Solution temperature (°C) .....:	22.1			—
Measured [MΩ]	Required [MΩ]			Result
>10000	12.88			P
Supplementary information: Size of module [m²] 3.11, the maximum measuring limit of the equipment is 10000MΩ.				

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

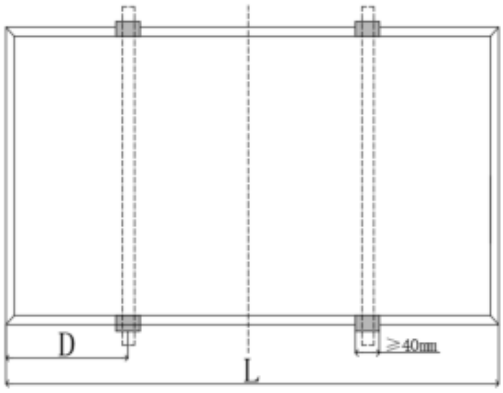
SEQUENCE D				
Sample #	M1-6			—
Table 28: MST 53 - Damp heat test				
Test Date (YYYY-MM-DD) start/end .....:	2024-01-16 / 2024-02-27			—
Total hours (1000) .....:	1000			—
MST 01: Visual inspection after damp heat test				—
Test Date (YYYY-MM-DD) .....:	2024-02-27			—
Findings .....:	☐ Yes ..... ☒ No			P
Nature and position of findings – comments or attach photos	No major visual defects found			—
MST 16: Insulation test after damp heat test				—
Test Date (YYYY-MM-DD) .....:	2024-02-27			—
Test Voltage applied (V, DC) .....:	8000/1500			—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
>10000	12.88	No dielectric breakdown	x	P
MST 17: Wet leakage current test after damp heat test				—
Test Date (YYYY-MM-DD) .....:	2024-02-27			—
Test Voltage applied (V, dc) .....:	1500			—
Solution resistivity (Ω cm) .....:	2884			—
Solution temperature (°C) .....:	22.1			—
Measured (MΩ)	Required (MΩ)			Result
>10000	12.88			P
Supplementary information: Size of module [m²] 3.11, the maximum measuring limit of the equipment is 10000MΩ.				
Table 27: MST 42 - Robustness of terminations test				
Test Date (YYYY-MM-DD) .....:	2024-02-27			—
If cemented joint at Junction box				
MQT 14.1: Retention of junction box on mounting surface				
Supplementary information: N/A				
MST 01: Visual inspection after retention of junction box on mounting surface				
Test Date (YYYY-MM-DD) .....:	2024-02-27			—
Findings .....:	☐ Yes .....☒ No			P

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Nature and position of findings – comments or attach photos		No major visual defects found		—
MST 16: Insulation test after retention of junction box on mounting surface				
Test Date (YYYY-MM-DD) .....:		2024-02-27		—
Test Voltage applied (V, DC) .....:		10800/2025		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
>10000	12.88	No dielectric breakdown	x	P
Supplementary information: Size of module [m²] 3.11, the maximum resistance measurement range is 10000MΩ.				
MST 17: Wet leakage current test after retention of junction box on mounting surface				
Test Date (YYYY-MM-DD) .....:		2024-02-27		—
Test Voltage applied [V] .....:		2025		—
Solution resistivity (Ω cm) .....:		< 3500 Ω cm at 22 ± 2°C		—
Solution temperature (°C) .....:		22.1		—
Measured [MΩ]		Required [MΩ]		Result
>10000		12.88		P
Supplementary information: the maximum resistance measurement range is 10000MΩ.				

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Table 29: MST 34 - Static mechanical load test (M1-6)			
Test Date (YYYY-MM-DD) .....:	2024-03-05		—
Mounting method .....:	Installed by 4 clamps on long side frame		—
Design Load [Pa] / Safety factor γm.....:	3600, 1600 / 1.5		—
Load applied to.....:	front side	back side	—
Mechanical load [Pa].....:	5400	2400	—
First cycle time (start/end) .....:	9:13 / 10:13	10:18 / 11:18	—
Intermittent open-circuit (yes/no) .....:	No	No	P
Second cycle time (start/end) .....:	11:23 / 12:23	12:28 / 13:28	—
Intermittent open-circuit (yes/no) .....:	No	No	P
Third cycle time (start/end) .....:	13:38 / 14:38	15:48 / 16:48	—
Intermittent open-circuit (yes/no) .....:	No	No	P
Supplementary information:			



D=1/4L

MST 01: Visual inspection after Static mechanical load test		—
Test Date (YYYY-MM-DD) .....:	2024-03-05	—
Findings .....:	☐ Yes ..... ☒ No	P
Nature and position of findings – comments or attach photos	No major visual defects found	—

MST 16: Insulation test after Static mechanical load test				—
Test Date (YYYY-MM-DD) .....:		2024-03-05		—
Test Voltage applied (V, DC) .....:		8000/1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

>10000	12.88	No dielectric breakdown	x	P
MST 17: Wet leakage current test after Static mechanical load test				—
Test Date (YYYY-MM-DD) .....:		2024-03-05		—
Test Voltage applied (V, dc) .....:		1500		—
Solution resistivity (Ω cm) .....:		2791		—
Solution temperature (°C).....:		21.9		—
Measured (MΩ)		Required (MΩ)		Result
>10000		12.88		P
Supplementary information: Size of module [m²] 3.11, the maximum measuring limit of the equipment is 10000MΩ.				

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

SEQUENCE E				
Sample #	M1-8			—
Table 30: MST 51 - Thermal cycling test				
Test Date (YYYY-MM-DD) start/end .....:	2024-01-15 / 2024-02-18			—
Total cycles (200) .....:	200			—
Applied current (A) .....:	20.92 for the heat up cycle from –40 °C to 80 °C 0.05 for other stages			—
Limiting voltage (V) .....:	N/A			—
Open circuits .....:	☐ Yes ☒ No			P
MST 01: Visual inspection after Thermal cycling test				—
Test Date (YYYY-MM-DD) .....:	2024-02-18			—
Findings .....:	☐ Yes ..... ☒ No			P
Nature and position of findings – comments or attach photos	No major visual defects found			—
MST 16: Insulation test after Thermal cycling test				—
Test Date (YYYY-MM-DD) .....:	2024-02-18			—
Test Voltage applied (V, DC) .....:	10800/2025			—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
>10000	12.88	No dielectric breakdown	x	P
MST 17: Wet leakage current test after Thermal cycling test				—
Test Date (YYYY-MM-DD) .....:	2024-02-18			—
Test Voltage applied (V, dc) .....:	2025			—
Solution resistivity (Ω cm) .....:	2935			—
Solution temperature (°C) .....:	22.1			—
Measured (MΩ)	Required (MΩ)			Result
>10000	12.88			P
Supplementary information: Size of module [m²] 3.11, the maximum measuring limit of the equipment is 10000MΩ.				

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

SEQUENCE F						
Sample #	M1-13					—
Table 31: MST 25 - Bypass diode thermal test						
Test Date [YYYY-MM-DD] start/end .....:	2024-01-16 / 2024-01-16					—
Module temperature [°C].....:	75 ± 5					—
Number of diodes in junction box .....:	3					—
Diode manufacturer .....:	Hangzhou Silan Microelectronics Co., Ltd.					—
Diode type designation .....:	MK5050					—
Max. permissible junction temperature Tjmax [°C] (according to diode datasheet).....:	200					—
Step 1, Determination of *VD* versus *TJ* characteristic						—
Ambient temperature of the junction box [°C] ....:	30 ± 2	50 ± 2	70 ± 2	90 ± 2	110 ± 2	
Pulsed current .....:	22.36	22.36	22.36	22.36	—	
Voltage drop [V] .....:	0.45 0.45 0.45	0.43 0.43 0.43	0.41 0.41 0.41	0.39 0.39 0.39	—	
VD versus TJ characteristic.....:	T_J = -995.0* V_D + 478.150 T_J = -991.50* V_D + 476.805 T_J = -990.0* V_D + 476.30					
Max. permissible junction temperature Tj_{max} [°C] (according to diode datasheet) .....:	200					—
Step 2, Bypass diode thermal test						—
	Diode 1	Diode 2	Diode 3			Result
Current flow applied [A].....:	22.36	22.36	22.36			—
Max. diode surface temperature allowed Tjmax [°C],.....:	N/A	N/A	N/A			—
Voltage drop [V] after 1h.....:	0.35	0.35	0.35			—
Calculated max. junction temperature Tjcalc [°C] .....:	129.9	129.8	129.8			—
Tjcalc < Tjmax (test passed)? yes/no.....:	yes	yes	yes			P
Current flow (1.25 * Isc) [A].....:	27.95	27.95	27.95			—
Bypass diode remain(s) functional (yes/no).....:	yes	yes	yes			P
Remarks: See Table 46 for the test details of bypass diode functionality test						
MST 01: Visual inspection after Bypass diode thermal test						P
Test Date [YYYY-MM-DD].....:	2024-01-16					—

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Findings .....:		☐ Yes .....☒ No		P
Nature and position of findings – comments or attach photos		No major visual defects found		—
MST 16: Insulation test after Bypass diode thermal test				—
Test Date (YYYY-MM-DD) .....:		2024-01-16		—
Test Voltage applied (V, DC).....:		8000/1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
>10000	12.88	No dielectric breakdown	x	P
MST 17: Wet leakage current test after Bypass diode thermal test				—
Test Date [YYYY-MM-DD]:.....		2024-01-16		—
Test Voltage applied [V]:.....		1500		—
Solution resistivity [Ω cm) .....:		< 3500 Ω cm at 22 ± 2°C		—
Solution temperature [°C] .....:		22.2		—
Measured [MΩ]		Required [MΩ]		Result
>10000		12.88		P
Supplementary information: Size of module [m²] 3.11, the maximum measuring limit of the equipment is 10000MΩ.				

Table 32: Placeholder section, formerly Temperature test MST 21
—

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Table 33: MST 22 - Hot-spot endurance test						
Test Date (YYYY-MM-DD) start/end .....:	2024-02-04 / 2024-02-04					—
Cell interconnection circuit .....:	☐ S ☒ SP ☐ PS					—
Irradiance during each cycle……. .....:	1251					—
Module temperature at thermal equilibrium in each cycle [°C] .....:	51.3 / 53.6 / 52.6 / 51.6 / 50.3 / 52.1 / 54.0					—
Determination of worst case cell						—
Maximum measured cell temperature in each cycle [°C] .....:	161.3 / 155.7 / 165.1 / 143.6 / 151.2 / 153.2 / 154.1					—
Shading rate [%] or number of cells shaded .....:	10 / 10 / 15 / 10 / 10 / 10 / 10					—
Test hours for each cycle.....:	1h					—
MST 01: Visual inspection after hot-spot endurance test						—
Test Date (YYYY-MM-DD) .....:	2024-02-05					—
Findings .....:	☐ Yes .....☒ No					P
Nature and position of findings – comments or attach photos	No major visual defects found					—
MST 02: Maximum power determination after hot-spot endurance test						—
Test Date [YYYY-MM-DD].....:	2024-02-05					—
Module temperature [°C].....:	25					—
Irradiance [W/m²].....:	1000					—
Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmp [W]		FF [%]
17.985	47.506	16.981	39.984	678.968		79.47
MST 16: Insulation test after hot-spot endurance test						—
Test Date (YYYY-MM-DD) .....:	2024-02-05					—
Test Voltage applied [V] .....:	8000/1500					—
Measured	Required	Dielectric breakdown				Result
MΩ	MΩ	Yes (description)			No	
>10000	12.88	No dielectric breakdown			x	P
MST 17: Wet leakage current test after hot-spot endurance test						—
Test Date (YYYY-MM-DD) .....:	2024-02-05					—
Test Voltage applied [V] .....:	1500					—
Solution resistivity [Ω cm) .....:	< 3500 Ω cm at 22 ± 2°C					—
Solution temperature [°C] .....:	21.5					—

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Measured [MΩ]	Required [MΩ]	Result
>10000	12.88	P
Supplementary information: Size of module [m²] 3.11, the maximum measuring limit of the equipment is 10000MΩ.		

Table 34: MST 26 - Reverse current overload test			
Test Date (YYYY-MM-DD) ..... :	2024-02-20		—
Module over-current protection rating (A) .....:	35		—
Test current (A) .....:	47.25		—
Range of applied voltage (V) .....:	55.2~51.1		—
Test duration .....:	2 hours		—
Recorded hottest point temperature.....:	86.1 °C		
Observations			Result
☒ No flaming of the module			P
☒ No flaming of the tissue paper			
☒ MST 17 requirements fulfilled (see appended Table MST17)			
☒ Max. measured external module surface temperature not exceed 170 °C			
MST 01: Visual inspection after Reverse current overload test			—
Test Date (YYYY-MM-DD) .....:	2024-02-20		—
Findings .....:	☐ Yes .....☒ No		P
Nature and position of findings – comments or attach photos	No major visual defects found		—
MST 16: Insulation test after Reverse current overload test			—
Test Date (YYYY-MM-DD) .....:	2024-02-20		—
Test Voltage applied (V, DC) .....:	8000/1500		—
Measured	Required	Dielectric breakdown	Result
MΩ	MΩ	Yes (description) / No	
>10000	12.88	No dielectric breakdown / x	P
MST 17: Wet leakage current test after Reverse current overload test			—
Test Date (YYYY-MM-DD) .....:	2024-02-20		—
Test Voltage applied (V, dc) .....:	1500		—
Solution resistivity (Ω cm) .....:	< 3500 Ω cm at 22 ± 2°C		—
Solution temperature (°C) .....:	21.3		—
Measured (MΩ)	Required (MΩ)		Result

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

>10000	12.88	P
Supplementary information: Size of module [m²] 3.11, the maximum measuring limit of the equipment is 10000MΩ.		

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

SEQUENCE F						
Sample #	M2-13					—
Table 31: MST 25 - Bypass diode thermal test						
Test Date [YYYY-MM-DD] start/end .....:						—
Module temperature [°C].....:						—
Number of diodes in junction box .....:						—
Diode manufacturer .....:						—
Diode type designation .....:						—
Max. permissible junction temperature Tjmax [°C] (according to diode datasheet).....:						—
Step 1, Determination of *VD* versus *TJ* characteristic						—
Ambient temperature of the junction box [°C] ....:	30 ± 2	50 ± 2	70 ± 2	90 ± 2	110 ± 2	
Pulsed current .....:						—
Voltage drop [V] .....:						—
VD versus TJ characteristic.....:	—					
Max. permissible junction temperature Tj_{max} [°C] (according to diode datasheet) ..... :						—
Step 2, Bypass diode thermal test						—
	Diode 1	Diode 2	Diode 3			Result
Current flow applied [A].....:						—
Max. diode surface temperature allowed Tjmax [°C],.....:						—
Voltage drop [V] after 1h.....:						—
Calculated max. junction temperature Tjcalc [°C] .....:						—
Tjcalc < Tjmax (test passed)? yes/no.....:						—
Current flow (1.25 * Isc) [A].....:						—
Bypass diode remain(s) functional (yes/no).....:						—
Remarks: See Table 46 for the test details of bypass diode functionality test						
MST 01: Visual inspection after Bypass diode thermal test						—
Test Date [YYYY-MM-DD].....:						—
Findings .....:	☐ Yes .....☐ No					—
Nature and position of findings – comments or attach photos						—

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

MST 16: Insulation test after Bypass diode thermal test				—
Test Date (YYYY-MM-DD) .....:				—
Test Voltage applied (V, DC).....:				—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
				—
MST 17: Wet leakage current test after Bypass diode thermal test				—
Test Date [YYYY-MM-DD]:.....				—
Test Voltage applied [V]:.....				—
Solution resistivity [Ω cm) .....:		< 3500 Ω cm at 22 ± 2°C		—
Solution temperature [°C] .....:				—
Measured [MΩ]		Required [MΩ]		Result
				—
Supplementary information: Size of module [m²]				

Table 32: Placeholder section, formerly Temperature test MST 21
—

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Table 33: MST 22 - Hot-spot endurance test						
Test Date (YYYY-MM-DD) start/end .....:	2023-12-12 / 2023-12-12					—
Cell interconnection circuit .....:	☐ S ☒ SP ☐ PS					—
Irradiance during each cycle……..…..:	1238					—
Module temperature at thermal equilibrium in each cycle [°C] .....:	52.3 / 51.8 / 52.7 / 55.2 / 50.8 / 51.4 / 51.9					—
Determination of worst case cell						—
Maximum measured cell temperature in each cycle [°C] .....:	160.6 / 154.5 / 162.1 / 141.6 / 157.4 / 149.3 / 151.2					—
Shading rate [%] or number of cells shaded .....:	10 / 10 / 15 / 10 / 10 / 5 / 10					—
Test hours for each cycle.....:	1h					—
MST 01: Visual inspection after hot-spot endurance test						—
Test Date (YYYY-MM-DD) .....:	2023-12-13					—
Findings .....:	☐ Yes .....☒ No					P
Nature and position of findings – comments or attach photos	No major visual defects found					—
MST 02: Maximum power determination after hot-spot endurance test						—
Test Date [YYYY-MM-DD].....:	2023-12-13					—
Module temperature [°C].....:	25					—
Irradiance [W/m²].....:	1000					—
Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmp [W]		FF [%]
14.226	51.619	13.521	42.719	577.604		78.66
MST 16: Insulation test after hot-spot endurance test						—
Test Date (YYYY-MM-DD) .....:	2023-12-13					—
Test Voltage applied [V] .....:	8000/1500					—
Measured	Required	Dielectric breakdown				Result
MΩ	MΩ	Yes (description)			No	
>10000	14.80	No dielectric breakdown			x	P
MST 17: Wet leakage current test after hot-spot endurance test						—
Test Date (YYYY-MM-DD) .....:	2023-12-13					—
Test Voltage applied [V] .....:	1500					—
Solution resistivity [Ω cm) .....:	< 3500 Ω cm at 22 ± 2°C					—
Solution temperature [°C] .....:	21.9					—

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Measured [MΩ]	Required [MΩ]	Result
5582	14.80	P
Supplementary information: Size of module [m²] 2.70, the maximum measuring limit of the equipment is 10000MΩ.		

Table 34: MST 26 - Reverse current overload test				
Test Date (YYYY-MM-DD) ..... :		2023-12-15		—
Module over-current protection rating (A) .....:		30		—
Test current (A) .....:		40.5		—
Range of applied voltage (V) .....:		58.98~52.44		—
Test duration .....:		2 hours		—
Recorded hottest point temperature.....:		83.1 °C		
Observations				Result
☒ No flaming of the module				P
☒ No flaming of the tissue paper				
☒ MST 17 requirements fulfilled (see appended Table MST17)				
☒ Max. measured external module surface temperature not exceed 170 °C				
MST 01: Visual inspection after Reverse current overload test				—
Test Date (YYYY-MM-DD) .....:		2023-12-15		—
Findings .....:		☐ Yes .....☒ No		P
Nature and position of findings – comments or attach photos		No major visual defects found		—
MST 16: Insulation test after Reverse current overload test				—
Test Date (YYYY-MM-DD) .....:		2023-12-15		—
Test Voltage applied (V, DC) .....:		8000/1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
7975	14.80	No dielectric breakdown	x	P
MST 17: Wet leakage current test after Reverse current overload test				—
Test Date (YYYY-MM-DD) .....:		2023-12-15		—
Test Voltage applied (V, dc) .....:		1500		—
Solution resistivity (Ω cm) .....:		< 3500 Ω cm at 22 ± 2°C		—
Solution temperature (°C) .....:		22.4		—
Measured (MΩ)		Required (MΩ)		Result

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict
5372	14.80		P
Supplementary information: Size of module [m²] 2.70, the maximum measuring limit of the equipment is 10000MΩ.			

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

SEQUENCE F						
Sample #	M3-13					—
Table 31: MST 25 - Bypass diode thermal test						
Test Date [YYYY-MM-DD] start/end .....:	2024-03-15 / 2024-03-15					—
Module temperature [°C].....:	75 ± 5					—
Number of diodes in junction box .....:	3					—
Diode manufacturer .....:	Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd					—
Diode type designation .....:	THY4050					—
Max. permissible junction temperature Tjmax [°C] (according to diode datasheet).....:	200					—
Step 1, Determination of *VD* versus *TJ* characteristic						—
Ambient temperature of the junction box [°C] ....:	30 ± 2	50 ± 2	70 ± 2	90 ± 2	110 ± 2	
Pulsed current .....:	16.78	16.78	16.78	16.78	—	
Voltage drop [V] .....:	30.4 30.6 30.8	50.3 50.5 50.6	70.2 70.3 70.4	90.1 90.1 90.2	—	
VD versus TJ characteristic.....:	T_J = -995.0* V_D + 468.20 T_J = -991.50* V_D + 466.89 T_J = -990.0* V_D + 466.40					
Max. permissible junction temperature Tj_{max} [°C] (according to diode datasheet) .....:	200					—
Step 2, Bypass diode thermal test						—
	Diode 1	Diode 2	Diode 3			Result
Current flow applied [A].....:	16.78	16.78	16.78			—
Max. diode surface temperature allowed Tjmax [°C],.....:	N/A	N/A	N/A			—
Voltage drop [V] after 1h.....:	0.33	0.33	0.33			—
Calculated max. junction temperature Tjcalc [°C] .....:	139.9	139.7	139.7			—
Tjcalc < Tjmax (test passed)? yes/no.....:	yes	yes	yes			P
Current flow (1.25 * Isc) [A].....:	20.98	20.98	20.98			—
Bypass diode remain(s) functional (yes/no).....:	yes	yes	yes			P
Remarks: See Table 46 for the test details of bypass diode functionality test						
MST 01: Visual inspection after Bypass diode thermal test						P
Test Date [YYYY-MM-DD].....:	2024-03-15					—

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Findings .....:		☐ Yes .....☒ No		P
Nature and position of findings – comments or attach photos		No major visual defects found		—
MST 16: Insulation test after Bypass diode thermal test				—
Test Date (YYYY-MM-DD) .....:		2024-03-15		—
Test Voltage applied (V, DC).....:		8000/1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
>10000	14.31	No dielectric breakdown	x	P
MST 17: Wet leakage current test after Bypass diode thermal test				—
Test Date [YYYY-MM-DD]:.....		2024-03-15		—
Test Voltage applied [V]:.....		1500		—
Solution resistivity [Ω cm) .....:		< 3500 Ω cm at 22 ± 2°C		—
Solution temperature [°C] .....:		21.5		—
Measured [MΩ]		Required [MΩ]		Result
>10000		14.31		P
Supplementary information: Size of module [m²] 2.80, the maximum measuring limit of the equipment is 10000MΩ.				

Table 32: Placeholder section, formerly Temperature test MST 21
—

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Table 33: MST 22 - Hot-spot endurance test						
Test Date (YYYY-MM-DD) start/end .....:	2024-03-26 / 2024-03-26					—
Cell interconnection circuit .....:	☐ S ☒ SP ☐ PS					—
Irradiance during each cycle……..…..:	1251					—
Module temperature at thermal equilibrium in each cycle [°C] .....:	51.5 / 53.3 / 55.2 / 52.8 / 51.7 / 54.4 / 56.2					—
Determination of worst case cell						—
Maximum measured cell temperature in each cycle [°C] .....:	167.3 / 162.1 / 165.4 / 143.5 / 151.6 / 153.8 / 155.3					—
Shading rate [%] or number of cells shaded .....:	15 / 10 / 10 / 5 / 10 / 10 / 10					—
Test hours for each cycle.....:	1h					—
MST 01: Visual inspection after hot-spot endurance test						—
Test Date (YYYY-MM-DD) .....:	2024-03-26					—
Findings .....:	☐ Yes.....☒ No					P
Nature and position of findings – comments or attach photos	No major visual defects found					—
MST 02: Maximum power determination after hot-spot endurance test						—
Test Date [YYYY-MM-DD].....:	2024-03-26					—
Module temperature [°C].....:	25					—
Irradiance [W/m²].....:	1000					—
Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmp [W]		FF [%]
13.640	55.933	12.991	47.147	612.487		80.28
MST 16: Insulation test after hot-spot endurance test						—
Test Date (YYYY-MM-DD) .....:	2024-03-26					—
Test Voltage applied [V] .....:	8000/1500					—
Measured	Required	Dielectric breakdown				Result
MΩ	MΩ	Yes (description)			No	
>10000	14.31	No dielectric breakdown			x	P
MST 17: Wet leakage current test after hot-spot endurance test						—
Test Date (YYYY-MM-DD) .....:	2024-03-26					—
Test Voltage applied [V] .....:	1500					—
Solution resistivity [Ω cm) .....:	< 3500 Ω cm at 22 ± 2°C					—
Solution temperature [°C] .....:	23.1					—

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Measured [MΩ]	Required [MΩ]	Result
>10000	14.31	P
Supplementary information: Size of module [m²] 2.80, the maximum measuring limit of the equipment is 10000MΩ.		

Table 34: MST 26 - Reverse current overload test			
Test Date (YYYY-MM-DD) ..... :	2024-04-01		—
Module over-current protection rating (A) .....:	30		—
Test current (A) .....:	40.5		—
Range of applied voltage (V) .....:	62.87~56.26		—
Test duration .....:	2 hours		—
Recorded hottest point temperature.....:	83.2 °C		
Observations			Result
☒ No flaming of the module			P
☒ No flaming of the tissue paper			
☒ MST 17 requirements fulfilled (see appended Table MST17)			
☒ Max. measured external module surface temperature not exceed 170 °C			
MST 01: Visual inspection after Reverse current overload test			—
Test Date (YYYY-MM-DD) .....:	2024-04-01		—
Findings .....:	☐ Yes .....☒ No		P
Nature and position of findings – comments or attach photos	No major visual defects found		—
MST 16: Insulation test after Reverse current overload test			—
Test Date (YYYY-MM-DD) .....:	2024-04-01		—
Test Voltage applied (V, DC) .....:	8000/1500		—
Measured	Required	Dielectric breakdown	Result
MΩ	MΩ	Yes (description) / No	
>10000	14.31	No dielectric breakdown / x	P
MST 17: Wet leakage current test after Reverse current overload test			—
Test Date (YYYY-MM-DD) .....:	2024-04-01		—
Test Voltage applied (V, dc) .....:	1500		—
Solution resistivity (Ω cm) .....:	< 3500 Ω cm at 22 ± 2°C		—
Solution temperature (°C) .....:	23.1		—
Measured (MΩ)	Required (MΩ)		Result

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

>10000	14.31	P
Supplementary information: Size of module [m²] 2.80, the maximum measuring limit of the equipment is 10000MΩ.		

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

SEQUENCE F						
Sample #	M4-13					—
Table 31: MST 25 - Bypass diode thermal test						
Test Date [YYYY-MM-DD] start/end .....:						—
Module temperature [°C].....:						—
Number of diodes in junction box .....:						—
Diode manufacturer .....:						—
Diode type designation .....:						—
Max. permissible junction temperature Tjmax [°C] (according to diode datasheet).....:						—
Step 1, Determination of *VD* versus *TJ* characteristic						—
Ambient temperature of the junction box [°C] ....:	30 ± 2	50 ± 2	70 ± 2	90 ± 2	110 ± 2	
Pulsed current .....:						—
Voltage drop [V] .....:						—
VD versus TJ characteristic.....:	—					
Max. permissible junction temperature Tj_{max} [°C] (according to diode datasheet) ..... :						—
Step 2, Bypass diode thermal test						—
	Diode 1	Diode 2	Diode 3			Result
Current flow applied [A].....:						—
Max. diode surface temperature allowed Tjmax [°C],.....:						—
Voltage drop [V] after 1h.....:						—
Calculated max. junction temperature Tjcalc [°C] .....:						—
Tjcalc < Tjmax (test passed)? yes/no.....:						—
Current flow (1.25 * Isc) [A].....:						—
Bypass diode remain(s) functional (yes/no).....:						—
Remarks: See Table 46 for the test details of bypass diode functionality test						
MST 01: Visual inspection after Bypass diode thermal test						—
Test Date [YYYY-MM-DD].....:						—
Findings .....:	☐ Yes .....☐ No					—
Nature and position of findings – comments or attach photos						—

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

MST 16: Insulation test after Bypass diode thermal test				—
Test Date (YYYY-MM-DD) .....:				—
Test Voltage applied (V, DC).....:				—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
				—
MST 17: Wet leakage current test after Bypass diode thermal test				—
Test Date [YYYY-MM-DD]:.....				—
Test Voltage applied [V]:.....				—
Solution resistivity [Ω cm) .....:		< 3500 Ω cm at 22 ± 2°C		—
Solution temperature [°C] .....:				—
Measured [MΩ]		Required [MΩ]		Result
				—
Supplementary information: Size of module [m²]				

Table 32: Placeholder section, formerly Temperature test MST 21
—

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Table 33: MST 22 - Hot-spot endurance test						
Test Date (YYYY-MM-DD) start/end .....:	2024-02-06 / 2024-02-06					—
Cell interconnection circuit .....:	☐ S ☒ SP ☐ PS					—
Irradiance during each cycle……..…..:	1248					—
Module temperature at thermal equilibrium in each cycle [°C] .....:	52.1 / 54.2 / 51.1 / 51.8 / 50.7 / 52.6 / 54.5					—
Determination of worst case cell						—
Maximum measured cell temperature in each cycle [°C] .....:	162.7 / 157.1 / 171.3 / 147.4 / 150.2 / 152.8 / 153.9					—
Shading rate [%] or number of cells shaded .....:	10 / 10 / 15 / 10 / 10 / 10 / 10					—
Test hours for each cycle.....:	1h					—
MST 01: Visual inspection after hot-spot endurance test						—
Test Date (YYYY-MM-DD) .....:	2024-02-07					—
Findings .....:	☐ Yes .....☒ No					P
Nature and position of findings – comments or attach photos	No major visual defects found					—
MST 02: Maximum power determination after hot-spot endurance test						—
Test Date [YYYY-MM-DD].....:	2024-02-07					—
Module temperature [°C].....:	25					—
Irradiance [W/m²].....:	1000					—
Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmp [W]		FF [%]
15.669	47.756	14.694	40.186	590.493		78.91
MST 16: Insulation test after hot-spot endurance test						—
Test Date (YYYY-MM-DD) .....:	2024-02-07					—
Test Voltage applied [V] .....:	8000/1500					—
Measured	Required	Dielectric breakdown				Result
MΩ	MΩ	Yes (description)			No	
>10000	14.80	No dielectric breakdown			x	P
MST 17: Wet leakage current test after hot-spot endurance test						—
Test Date (YYYY-MM-DD) .....:	2024-02-07					—
Test Voltage applied [V] .....:	1500					—
Solution resistivity [Ω cm) .....:	< 3500 Ω cm at 22 ± 2°C					—
Solution temperature [°C] .....:	21.8					—

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Measured [MΩ]	Required [MΩ]	Result
>10000	14.80	P
Supplementary information: Size of module [m²] 2.70, the maximum measuring limit of the equipment is 10000MΩ.		

Table 34: MST 26 - Reverse current overload test			
Test Date (YYYY-MM-DD) ..... :	2024-02-25		—
Module over-current protection rating (A) .....:	30		—
Test current (A) .....:	40.5		—
Range of applied voltage (V) .....:	56.3~52.2		—
Test duration .....:	2 hours		—
Recorded hottest point temperature.....:	82.7 °C		
Observations			Result
☒ No flaming of the module			P
☒ No flaming of the tissue paper			
☒ MST 17 requirements fulfilled (see appended Table MST17)			
☒ Max. measured external module surface temperature not exceed 170 °C			
MST 01: Visual inspection after Reverse current overload test			—
Test Date (YYYY-MM-DD) .....:	2024-02-25		—
Findings .....:	☐ Yes .....☒ No		P
Nature and position of findings – comments or attach photos	No major visual defects found		—
MST 16: Insulation test after Reverse current overload test			—
Test Date (YYYY-MM-DD) .....:	2024-02-25		—
Test Voltage applied (V, DC) .....:	8000/1500		—
Measured	Required	Dielectric breakdown	Result
MΩ	MΩ	Yes (description) / No	
>10000	14.80	No dielectric breakdown / x	P
MST 17: Wet leakage current test after Reverse current overload test			—
Test Date (YYYY-MM-DD) .....:	2024-02-25		—
Test Voltage applied (V, dc) .....:	1500		—
Solution resistivity (Ω cm) .....:	< 3500 Ω cm at 22 ± 2°C		—
Solution temperature (°C) .....:	21.8		—
Measured (MΩ)	Required (MΩ)		Result

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

>10000	14.80	P
Supplementary information: Size of module [m²] 2.70, the maximum measuring limit of the equipment is 10000MΩ.		

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

SEQUENCE G				
Table 35: MST 14 - Impulse voltage test				
Sample #	M1-14			
Test Date (YYYY-MM-DD)..... :		2024-02-24		—
Maximum system voltage (V) ..... :		1500		—
Required Impulse voltage (V) ..... :		20000		—
Measured Impulse voltage (V)..... :		20000		P
T_1 (µs) ..... :		1.17 / 1.17 / 1.17 / 1.17 / 1.17 / 1.17		P
T_2 (µs) ..... :		50.6 / 49.7 / 50.3 / 50.9 / 49.8 / 51.1		P
Thickness of conductive foil (mm) ..... :		0.065		—
Results				
☒ No evidence of dielectric breakdown or surface tracking observed ☒ No evidence of major visual defects (see table MST 01 below)				P
MST 01: Visual inspection after Impulse voltage test				—
Test Date (YYYY-MM-DD) ..... :		2024-02-24		—
Findings ..... :		☐ Yes ..... ☒ No		P
Nature and position of findings – comments or attach photos		No major visual defects found		—
MST 16: Insulation test after Impulse voltage test				—
Test Date (YYYY-MM-DD) ..... :		2024-02-24		—
Test Voltage applied (V, DC) ..... :		8000/1500		—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
>10000	12.88	No dielectric breakdown	x	P
Sample #:				—
Test Date (YYYY-MM-DD)..... :				—
Maximum system voltage (V) ..... :				—
Required Impulse voltage (V) ..... :				—
Measured Impulse voltage (V)..... :				—
T_1 (µs) ..... :				—
T_2 (µs) ..... :				—
Thickness of conductive foil (mm) ..... :				—

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Results				
☐ No evidence of dielectric breakdown or surface tracking observed ☐ No evidence of major visual defects (see table MST 01 below)				—
MST 01: Visual inspection after Impulse voltage test				—
Test Date (YYYY-MM-DD) .....:				—
Findings .....:		☐ Yes ..... ☐ No		—
Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after Impulse voltage test				—
Test Date (YYYY-MM-DD) .....:				—
Test Voltage applied (V, DC) .....:				—
Measured	Required	Dielectric breakdown		Result
MΩ	MΩ	Yes (description)	No	
				—
Supplementary information: Size of module [m²] 3.11, the maximum measuring limit of the equipment is 10000MΩ.				

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

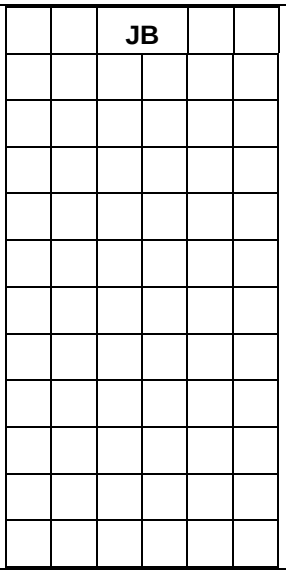
OTHER TESTS		
Sample #:	M1-22, M1-23	—
Table 36: MST 23 - Fire test		
Test Date (YYYY-MM-DD)..... :	2024-01-17	—
Module fire resistance class (A, B, C) .....:	C	—
No. of modules provided to create the test assembly .....:	2	—
☒ The module complies with the requirements for the fire resistance class		P
Supplementary information: Sample # M1-23 was used for Class C burning brand test, sample # M1-22 was used for Class A spread-of-flame test.		

Sample #:	M1-16	—
Table 37: MST 24 - Ignitability test		
Test Date (YYYY-MM-DD) .....:	2024-01-25	—
Flame application point.....:		—
Surface exposure.....:	☒ Yes ☐ No	—
Backsheet foil exposure.....:	☐ Yes ☒ No	—
Frame adhesive exposure .....:	☐ Yes ☒ No	—
Edge exposure .....:	☐ Yes ☒ No	—
Junction box adhesive exposure .....:	☒ Yes ☐ No	—
Type label exposure.....:	☒ Yes ☐ No	—
Backrail adhesive exposure.....:	☐ Yes ☒ No	—
Ignition occurs .....:	☐ Yes ☒ No	—
Flame spread less as 150 mm	☒ Yes ☐ No	P
Length of destroyed area.....:	No ignition	P
Supplementary information: N/A		

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Sample #:	M1-15		—
Table 38: MST 32 - Module breakage test			
Test Date (YYYY-MM-DD)..... :	2024-01-25		—
Weight of impactor (kg)..... :	45.5		—
Thickness of sample (mm) ..... :	35		—
Mounting technique used..... :	Installed by 4 clamps on long side frame, (refer to MST 34 for details)		—
Module breakage ..... :	☒	No breakage	P
	☒	No separation from frame or mounting structure	P
	☐	Breakage occurred, no shear or opening large enough for a 76 mm diameter sphere to pass freely developed	N/A
	☐	Breakage occurred, no particles larger than 65 cm² ejected from sample	N/A
	☒	Continuity of equipotential bonding provided, see table 10.11	P
Nature and position of findings – comments or attach photos			Result
No major visual defects found			P
Supplementary information: N/A			

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Sample #:		—
Table 39: MST 35 - Peel test (only for cemented joints)		
Test Date (YYYY-MM-DD)..... :		—
Location	☐ Flexible Frontsheet ☐ Flexible Backsheet ☐ Rigid Frontsheet ☐ Rigid Backsheet ☐ Other areas	—
Width of cemented joint	☐ ≤ 10 mm ☐ > 10mm	—
Description of area		—
Arithmetic mean M1 of adhesion force of unconditioned samples [N]		—
Arithmetic mean M1-2 of adhesion force of samples conditioned with sequence B [N]		—
Loss of adhesion force: $0.5 < \frac{?_1^n M2}{?_1^n M1}$		
Supplementary information:		

Sample #:		—
Table 40: MST 36 - Lap shear strength test (only for cemented joints)		
Test Date (YYYY-MM-DD)..... :		—

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Preconditioning:		
MST 53 Test Date (YYYY-MM-DD) start/end....:		—
MST 54 Test Date (YYYY-MM-DD) start/end....:		—
MST 52 Test Date (YYYY-MM-DD) start/end....:		—
MST 54 Test Date (YYYY-MM-DD) start/end....:		—
MST 52 Test Date (YYYY-MM-DD) start/end....:		—
Arithmetic mean M1 of adhesion force of unconditioned samples [N]		—
Arithmetic mean M1-2 of adhesion force of samples conditioned with sequence B [N]		—
Loss of adhesion force: $0.5 < \frac{?_1^n M2}{?_1^n M1}$		—
Supplementary information:		

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Table 41: MST 12 - Cut susceptibility test					
Test Date (YYYY-MM-DD) .....:					—
Applied force (N) .....:					—
MST 01 Visual inspection after cut test					—
Test Date (YYYY-MM-DD) .....:					—
	Findings.....:	☐ Yes.....☐ No			—
	Nature and position of findings – comments or attach photos				—
	Findings.....:	☐ Yes.....☐ No			—
	Nature and position of findings – comments or attach photos				—
	Findings.....:	☐ Yes.....☐ No			—
	Nature and position of findings – comments or attach photos				—
	Findings.....:	☐ Yes.....☐ No			—
	Nature and position of findings – comments or attach photos				—
MST 16: Insulation test after cut test					—
Test Date (YYYY-MM-DD) .....:					—
Test Voltage applied (V, DC) .....:					—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
					—
					—
					—
					—
					—
					—

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

MST 17: Wet leakage current test after cut test			—
Test Date (YYYY-MM-DD) .....:			—
Test Voltage applied (V, dc) .....:			—
Solution resistivity (Ω cm) .....:		< 3500 Ω cm at 22 ± 2°C	—
Solution temperature (°C) .....:			—
Sample #	Measured (MΩ)	Required (MΩ)	Result
			—
			—
			—
			—
			—
			—
Supplementary information: Size of module [m²]			

Table 42: MST 03 - Maximum power determination final						
Test Date (YYYY-MM-DD) .....:			2024-03-28 for M1-x, M4-x 2023-12-18 for M2-x 2024-04-03 for M3-x			—
Module temperature (°C) .....:			25			—
Irradiance (W/m²) .....:			1000			—
Sample #	Isc (A)	Voc (V)	Imp (A)	Vmp (V)	Pmp (W)	FF (%)
M1-10	18.228	47.486	17.092	40.098	685.355	79.18
M1-13	17.987	47.507	16.992	39.803	676.333	79.15
M1-4	18.063	47.531	16.958	39.173	664.296	77.37
M1-8	18.038	47.438	17.092	39.328	672.194	78.56
M1-6	18.008	47.407	16.988	39.271	667.136	78.15
M1-2	18.047	47.348	17.069	39.404	672.587	78.71
M1-3	18.042	47.400	17.055	39.398	671.933	78.57
M2-11	14.215	51.628	13.526	42.921	580.549	79.11
M2-13	14.226	51.619	13.521	42.719	577.604	78.66
M3-10	13.623	56.151	12.951	47.669	617.361	80.71
M3-13	13.637	55.924	13.010	46.969	611.067	80.13
M4-10	15.504	47.684	14.719	40.218	591.969	80.07

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

M4-13	15.663	47.737	14.720	39.996	588.741	78.74
Supplementary information: N/A						

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Table 43: MST 01 - Final Visual inspection			
Test Date (YYYY-MM-DD) .....:		2024-03-28 for M1-x, M4-x 2023-12-18 for M2-x 2024-04-03 for M3-x	—
Sample # M1-10	Findings .....:	☐ Yes .....☒ No	P
	Nature and position of findings – comments or attach photos	No major visual defects found	—
Sample # M1-13	Findings .....:	☐ Yes .....☒ No	P
	Nature and position of findings – comments or attach photos	No major visual defects found	—
Sample # M1-4	Findings .....:	☐ Yes .....☒ No	P
	Nature and position of findings – comments or attach photos	No major visual defects found	—
Sample # M1-8	Findings .....:	☐ Yes .....☒ No	P
	Nature and position of findings – comments or attach photos	No major visual defects found	—
Sample # M1-6	Findings .....:	☐ Yes .....☒ No	P
	Nature and position of findings – comments or attach photos	No major visual defects found	—
Sample # M1-2	Findings .....:	☐ Yes .....☒ No	P
	Nature and position of findings – comments or attach photos	No major visual defects found	—
Sample # M1-3	Findings .....:	☐ Yes .....☒ No	P
	Nature and position of findings – comments or attach photos	No major visual defects found	—
Sample # M2-11	Findings .....:	☐ Yes .....☒ No	P
	Nature and position of findings – comments or attach photos	No major visual defects found	—
Sample # M2-13	Findings .....:	☐ Yes .....☒ No	P
	Nature and position of findings – comments or attach photos	No major visual defects found	—
Sample # M3-10	Findings .....:	☐ Yes .....☒ No	P
	Nature and position of findings – comments or attach photos	No major visual defects found	—
	Findings .....:	☐ Yes .....☒ No	P

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict
Sample # M3-13	Nature and position of findings – comments or attach photos	No major visual defects found	—
Sample # M4-10	Findings.....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No major visual defects found	—
Sample # M4-13	Findings.....:	☐ Yes.....☒ No	P
	Nature and position of findings – comments or attach photos	No major visual defects found	—
Supplementary information: N/A			

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Table 44: MST 05 - Durability of markings									
Test Date (YYYY-MM-DD) .....:			2024-03-28						—
Sample #	Markings legible			Not easily removable			No curling		Result
M1-10	☒ Yes	☐ No		☒ Yes	☐ No		☒ Yes	☐ No	P
M1-13	☒ Yes	☐ No		☒ Yes	☐ No		☒ Yes	☐ No	P
M1-4	☒ Yes	☐ No		☒ Yes	☐ No		☒ Yes	☐ No	P
M1-8	☒ Yes	☐ No		☒ Yes	☐ No		☒ Yes	☐ No	P
M1-6	☒ Yes	☐ No		☒ Yes	☐ No		☒ Yes	☐ No	P
M1-2	☒ Yes	☐ No		☒ Yes	☐ No		☒ Yes	☐ No	P
M1-3	☒ Yes	☐ No		☒ Yes	☐ No		☒ Yes	☐ No	P
Supplementary information: N/A									

1.2 Table 45: MST 06 - Sharp edge test				
Test Date (YYYY-MM-DD) .....:	2024-03-28			—
Sample #	Accessible surfaces free of sharp edges, burrs etc.			Result
M1-10	☒ Yes	☐ No		P
M1-13	☒ Yes	☐ No		P
M1-4	☒ Yes	☐ No		P
M1-8	☒ Yes	☐ No		P
M1-6	☒ Yes	☐ No		P
M1-2	☒ Yes	☐ No		P
M1-3	☒ Yes	☐ No		P
Supplementary information: N/A				

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Table 46: MST 07 - Bypass diode functionality test							
Test Date (YYYY-MM-DD) .....:	2024-03-28 for M1-x, M4-x 2023-12-18 for M2-x 2024-04-03 for M3-x						—
☐ **Method A**							—
Ambient temperature [°C] .....:							—
Current flow applied [A].....:							—
Sample #	VFM		VFMrated	VFM = (N × VFMrated) ± 10 %			Result
				☐ Yes	☐ No		—
				☐ Yes	☐ No		—
				☐ Yes	☐ No		—
				☐ Yes	☐ No		—
				☐ Yes	☐ No		—
☒ **Method B**							—
Sample #	IV curve after shading						Result
	Diode 1 working properly		Diode 2 working properly		Diode 3 working properly		
M1-10	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes	☐ No	P
M1-13	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes	☐ No	P
M1-4	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes	☐ No	P
M1-8	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes	☐ No	P
M1-6	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes	☐ No	P
M1-2	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes	☐ No	P
M1-3	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes	☐ No	P
M2-11	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes	☐ No	P
M2-13	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes	☐ No	P
M3-10	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes	☐ No	P
M3-13	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes	☐ No	P
M4-10	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes	☐ No	P
M4-13	☒ Yes	☐ No	☒ Yes	☐ No	☒ Yes	☐ No	P
Supplementary information: N/A							

IEC 61730-2: Part 2: Requirements for testing			
Clause	Requirement + Test	Result - Remark	Verdict

Table 47: MST 33a - Test for general screw connections			
Test Date (YYYY-MM-DD) ..... :			—
Sample #	Thread diameter [mm]	Torque [Nm]	Result
			—
			—
			—
			—
			—
Supplementary information:			

Table 48: MST 33b - Test for locking screws			
Test Date (YYYY-MM-DD) ..... :			—
Sample #	Thread diameter [mm]	Torque [Nm]	Result
			—
			—
			—
			—
			—
Supplementary information:			

Sample #		—
Table 49: MST 04 - Insulation thickness test		
Test Date (YYYY-MM-DD) ..... :		—
Max. System voltage..... :		—
Thickness of insulation acc. datasheet ..... :		—
Required thickness of insulation..... :		—
Measurement uncertainty ..... :		—
Location	Measured thickness (including uncertainty)	Result
Solder connections		—
Edges of frameless PV modules		—
Laminator membrane indents		—
Supplementary information:		

Annex 1-1: PRODUCT DESCRIPTION SHEET (MANUFACTURERS AND TYPE REFERENCES)

A1.1	MODULE TYPE/S
	QN-685HT-01

A1.2	MODULE DESIGN	
	Module dimensions (L x W x H) [mm] ..... :	2384 x 1303 x 35
	Weights ..... :	38.0 ±3% Kg (approx.)
	Front/Rear cover bonding classification ..... :	☐ rigid/flexible ☒ rigid/rigid ☐ flexible/flexible

A1.3	SOLAR CELL	
	Cell type reference ..... :	**CHUZHOU JIETAI NEW ENERGY TECHNOLOGY CO., LTD** Cell type: CZJT-210M-18D1, N type mono crystalline silicon, 18 busbars
	Cell dimensions L x W (± %) [mm] ..... :	210 ±0.5 x 105 ±0.5 x 0.13 ±0.013
	Cell thickness [µm] ..... :	130 ± 13
	Cell area [cm²] ..... :	220.48

A1.4	IDENTIFICATION OF MATERIALS	
	Front cover ..... :	**Nantong Dongli New Energy Technology Co., Ltd.** Type: Heat strengthened AR-coated glass, patterned solar glass, Thickness: 2.0 mm
	Rear cover ..... :	**Nantong Dongli New Energy Technology Co., Ltd.** Type: Heat strengthened glass with white glaze, patterned solar glass, Thickness: 2.0 mm
	Encapsulation material front side ..... :	**Kunshan Tianyang New Materials Co., Ltd.** Type: JCC-305T, material: EVA/POE/EVA, Thickness: 0.6±0.1 mm
	Encapsulation material back side..... :	**Kunshan Tianyang New Materials Co., Ltd.** Type: JCC-105P-T, material: EVA, Thickness: 0.6±0.1 mm

	Frame parts ..... :	**Frame (Jiangsu) PV Materials Manufacturing Co., Ltd** Anodized aluminum alloy, 6005-T6, silver colour, assembled by key corners
	Mounting parts..... :	N/A
	Adhesive for frame ..... :	**Jiangxi Fenfa Technology Co Ltd** Type: FS-996, Rated HB at min. 3.0 mm thick, RTI=105, HWI=2, HAI=0 UL certified, No. E518743
	Edge sealing..... :	N/A
	Internal wiring ..... :	N/A
	Cell connector ..... :	**Tianwei Technology Dongtai Co., Ltd** Cross section: Φ0.26 mm, round wire ribbon, Material: Base Cu (≥99.95%), coating: Sn(60±3)%Pb(40±3)%, coating thickness 0.018 (-0.005, +0.01) mm at each side.
	String connector ..... :	**Tianwei Technology Dongtai Co., Ltd** Cross section: 0.3 × 4 & 0.35 × 6 mm, Material: Base Cu (≥99.97%), coating Sn63%Pb37%, coating thickness 0.025±0.0025mm at each side.
	Soldering material ..... :	Sn(60±3)%Pb(40±3)%
	Fluxing agent..... :	**Anhui Costar Technology Co., Ltd.** Type: FD-309, no clean halogen free liquid flux.
	Junction box ..... :	**Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd** Type: JM37xy (x=A, y=C), DC 1500 V, 30A, IP 68(1m, 1h), -40 °C to 85 °C, TÜV SÜD certified, No. B 097074 0006 Rev. 01
	Cable ..... :	**Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd** Type: H1Z2Z2-K 1×4mm^2, 1500V DC, -40 °C to 90 °C, TÜV Rheinland certified, No. R 50334928
	Connector..... :	**Stäubli Electrical Connectors AG** Type: PV-KST4-EVO2A/xy, PV-KBT4-EVO2A/xy, 1500VDC,45A (4mm^2), IP68(1m, 1h), -40°C to 85°C TÜV Rheinland certified, No. R 60127169

	Bypass diode ..... :	**Hangzhou Silan Microelectronics Co., Ltd.** Type: MK5050, Max. peak reverse voltage 50 V, Max. average forward current 50 A, Max. junction temperature 200 °C.
	Potting material ..... :	**Jiangxi Fenfa Technology Co Ltd** Type: FS-8206A, white colour, Rated V-1 at min. 6.0 mm thick, RTI=105, HWI=1, HAI=0 UL certified, No. E518743
	Adhesive for junction box ..... :	**Jiangxi Fenfa Technology Co Ltd** Type: FS-996, Rated HB at min. 3.0 mm thick, RTI=105, HWI=2, HAI=0 UL certified, No. E518743
	Additional material (e. g. fixing tape, insulation tape) ..... :	1) Fixing tape: **Suzhou temosun PV Material Co., Ltd.** Type: T5065 2) Marking label: **Suzhou ZhengAo Packing Material Limited Company** Type: AVERY PET

A1.5	**MODULE DESIGN - MINIMUM DISTANCES**	
	Between cells ..... :	Refer to Table 1
	Between cell and accessible surfaces ..... :	Refer to Table 1
	Between any current carrying part and accessible surfaces ..... :	Refer to Table 1

A1.6	**MODULE DESIGN - ELECTRICAL CONFIGURATION**	
	Total number of cells ..... :	132
	Serial-parallel connection of cells ..... :	SPS
	Cells per bypass diode ..... :	44
	No. of bypass diodes ..... :	3

Remark: for tested sample group M1-x

Annex 1-2: PRODUCT DESCRIPTION SHEET (MANUFACTURERS AND TYPE REFERENCES)

A1.1	MODULE TYPE/S
	QN-580HT-05

A1.2	MODULE DESIGN	
	Module dimensions (L x W x H) [mm] ..... :	2384 x 1134 x 30
	Weights ..... :	32.5 ±3% Kg (approx.)
	Front/Rear cover bonding classification ..... :	☐ rigid/flexible ☒ rigid/rigid ☐ flexible/flexible

A1.3	SOLAR CELL	
	Cell type reference ..... :	**Jinko Solar Co., Ltd.** Cell type: 182R MBB NFH-TBNU, N type mono crystalline silicon, 16 busbars
	Cell dimensions L x W (± %) [mm] ..... :	182 ±0.5 x 93.4 ±0.5 x 0.16 ±0.016
	Cell thickness [µm] ..... :	160 ± 16
	Cell area [cm²] ..... :	167.0

A1.4	IDENTIFICATION OF MATERIALS	
	Front cover ..... :	**Flat Solar Glass Group Co., Ltd.** Type: AR Coated Heat strengthened glass, patterned solar glass, Thickness: 2.0 mm
	Rear cover ..... :	**Flat Solar Glass Group Co., Ltd.** Type: Heat strengthened glass with white glaze, patterned solar glass, Thickness: 2.0 mm
	Encapsulation material front side ..... :	**Jiangsu Lushan New Materials Co., Ltd.** Type: S102, material: EVA/POE/EVA thickness: 0.6±0.1mm
	Encapsulation material back side..... :	**Jiangsu Lushan New Materials Co., Ltd.** Type: S101, material: EVA/POE/EVA thickness: 0.6±0.1mm
	Frame parts ..... :	**Jiangsu Chengqing New Energy Co., Ltd.** Anodized aluminum alloy, 6005-T6, black colour, assembled by key corners
	Mounting parts..... :	N/A

	Adhesive for frame ..... :	**Guangzhou Jointas Chemical Co., Ltd.** Type: 179, Rated HB at min. 1.5 mm thick, RTI=105 UL certified, No. E521359
	Edge sealing..... :	N/A
	Internal wiring ..... :	N/A
	Cell connector ..... :	**Suzhou Boneed Photovoltaic Technology Co., Ltd.** Cross section: φ 0.26 (-0.01, +0.02) mm, round wire ribbon, Material: Base Cu (≥99.95%), coating: Sn(60±3)%Pb(40±3)%, coating thickness 0.018 (-0.005, +0.01) mm at each side.
	String connector ..... :	**Suzhou Boneed Photovoltaic Technology Co., Ltd.** Cross section: 0.3±0.015 × 4±0.05 & 0.35±0.015 × 6±0.05 mm, Material: Base Cu (≥99.95%), coating Sn60%Pb40%, coating thickness 0.023(-0.005, + 0.01)mm at each side.
	Soldering material ..... :	Sn(60±3)%Pb(40±3)%
	Fluxing agent..... :	**Shenzhen Vital New Material Company Limited** Type: WTO-PV107, no clean halogen free liquid flux.
	Junction box ..... :	**Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd** Type: JM07w, Rated DC 1500 V, 25A, IP 68 (1m, 1h), -40 °C to 85 °C, TÜV SÜD certified, No. B 097074 0004 Rev. 02
	Cable ..... :	**Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd** Type: 62930 IEC 131 1×4mm^2, 1500V DC, -40 °C to 90 °C, TÜV Rheinland certified, No. R 50507377
	Connector..... :	**Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd** Type: HQC4, Rated DC 1500V, 30A, IP68 (1m, 1h), -40°C to 85°C TÜV SÜD certified, No. B 097074 0005 Rev. 01

	Bypass diode ..... :	**Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd** Type: THY4050, Schottky, Max. peak reverse voltage 50 V, Max. average forward current 40 A, Max. junction temperature 200 °C.
	Potting material ..... :	**Guangzhou Jointas Chemical Co., Ltd.** Type: 162, Rated V-0 at min. 3.0 mm thick, RTI=105 UL certified, No. E521359
	Adhesive for junction box ..... :	**Guangzhou Jointas Chemical Co., Ltd.** Type: 179, Rated HB at min. 1.5 mm thick, RTI=105 UL certified, No. E521359
	Additional material (e. g. fixing tape, insulation tape) ..... :	1) Fixing tape: **Suzhou temosun PV Material Co., Ltd.** Type: T5065, TEMOSUN Adhesive tapes, transparency, 0.06±0.02mm thick. 2) Marking label: **Suzhou ZhengAo Packing Material Limited Company** Type: AVERY PET

A1.5	**MODULE DESIGN - MINIMUM DISTANCES**	
	Between cells ..... :	2.0 mm
	Between cell and accessible surfaces ..... :	10.5 mm
	Between any current carrying part and accessible surfaces ..... :	10.5 mm

A1.6	**MODULE DESIGN - ELECTRICAL CONFIGURATION**	
	Total number of cells ..... :	144
	Serial-parallel connection of cells ..... :	SPS
	Cells per bypass diode ..... :	48
	No. of bypass diodes ..... :	3

Remark: for tested sample group M2-x

Annex 1-3: PRODUCT DESCRIPTION SHEET (MANUFACTURERS AND TYPE REFERENCES)

A1.1	MODULE TYPE/S
	QN-615HT-06

A1.2	MODULE DESIGN	
	Module dimensions (L x W x H) [mm] ..... :	2465 x 1134 x 30
	Weights ..... :	33.7 ±3% Kg (approx.)
	Front/Rear cover bonding classification ..... :	☐ rigid/flexible ☒ rigid/rigid ☐ flexible/flexible

A1.3	SOLAR CELL	
	Cell type reference ..... :	**Jinko Solar Co., Ltd.** Cell type: 182M 247 16BB 10SEG NFJ-TBNU, N type mono crystalline silicon, 16 busbars
	Cell dimensions L x W (± %) [mm] ..... :	182 ±0.5 x 91 ±0.5 x 0.16 ±0.016
	Cell thickness [µm] ..... :	160 ± 16
	Cell area [cm²] ..... :	165.6

A1.4	IDENTIFICATION OF MATERIALS	
	Front cover ..... :	**Flat Solar Glass Group Co., Ltd.** Type: AR Coated Heat strengthened glass, patterned solar glass, Thickness: 2.0 mm
	Rear cover ..... :	**Flat Solar Glass Group Co., Ltd.** Type: Heat strengthened glass with white glaze, patterned solar glass, Thickness: 2.0 mm
	Encapsulation material front side ..... :	**Jiangsu Lushan New Materials Co., Ltd.** Type: S102, material: EVA/POE/EVA thickness: 0.6±0.1mm
	Encapsulation material back side..... :	**Jiangsu Lushan New Materials Co., Ltd.** Type: S101, material: EVA/POE/EVA thickness: 0.6±0.1mm
	Frame parts ..... :	**Jiangsu Chengqing New Energy Co., Ltd.** Anodized aluminum alloy, 6005-T6, silvery colour, assembled by key corners
	Mounting parts..... :	N/A

	Adhesive for frame ..... :	**Shanghai Huitian New Material Co., Ltd.** Type: HT906Z, Rated V-0 at min. 3.0 mm thick, RTI=105, CTI=0 UL certified, No. E248611
	Edge sealing..... :	N/A
	Internal wiring ..... :	N/A
	Cell connector ..... :	**Suzhou Boneed Photovoltaic Technology Co., Ltd.** Cross section: φ 0.26 (-0.01, +0.02) mm, round wire ribbon, Material: Base Cu (≥99.95%), coating: Sn(60±3)%Pb(40±3)%, coating thickness 0.018 (-0.005, +0.01) mm at each side.
	String connector ..... :	**Suzhou Boneed Photovoltaic Technology Co., Ltd.** Cross section: 0.3±0.015 × 4±0.05 & 0.35±0.015 × 6±0.05 mm, Material: Base Cu (≥99.95%), coating Sn60%Pb40%, coating thickness 0.023(-0.005, + 0.01)mm at each side.
	Soldering material ..... :	Sn(60±3)%Pb(40±3)%
	Fluxing agent..... :	**Shenzhen Vital New Material Company Limited** Type: WTO-PV107, no clean halogen free liquid flux.
	Junction box ..... :	**Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd** Type: JM07w, Rated DC 1500 V, 25A, IP 68 (1m, 1h), -40 °C to 85 °C, TÜV SÜD certified, No. B 097074 0004 Rev. 02
	Cable ..... :	**Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd** Type: 62930 IEC 131 1×4mm^2, 1500V DC, -40 °C to 90 °C, TÜV Rheinland certified, No. R 50507377
	Connector..... :	**Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd** Type: HQC4, Rated DC 1500V, 30A, IP68 (1m, 1h), -40°C to 85°C TÜV SÜD certified, No. B 097074 0005 Rev. 01

	Bypass diode ..... :	**Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd** Type: THY4050, Schottky, Max. peak reverse voltage 50 V, Max. average forward current 40 A, Max. junction temperature 200 °C.
	Potting material ..... :	**Shanghai Huitian New Material Co., Ltd.** Type: 5299W-S, Rated V-0 at min. 3.0 mm thick, RTI=105, CTI=0 UL certified, No. E248611
	Adhesive for junction box ..... :	**Shanghai Huitian New Material Co., Ltd.** Type: HT906Z, Rated V-0 at min. 3.0 mm thick, RTI=105, CTI=0 UL certified, No. E248611
	Additional material (e. g. fixing tape, insulation tape) ..... :	1) Fixing tape: **Suzhou temosun PV Material Co., Ltd.** Type: T5065, TEMOSUN Adhesive tapes, transparency, 0.06±0.02mm thick. 2) Marking label: **Suzhou ZhengAo Packing Material Limited Company** Type: AVERY PET

A1.5	**MODULE DESIGN - MINIMUM DISTANCES**	
	Between cells ..... :	0.7 mm
	Between cell and accessible surfaces ..... :	10.5 mm
	Between any current carrying part and accessible surfaces ..... :	10.5 mm

A1.6	**MODULE DESIGN - ELECTRICAL CONFIGURATION**	
	Total number of cells ..... :	156
	Serial-parallel connection of cells ..... :	SPS
	Cells per bypass diode ..... :	52
	No. of bypass diodes ..... :	3

Remark: for tested sample group M3-x

Annex 1-4: PRODUCT DESCRIPTION SHEET (MANUFACTURERS AND TYPE REFERENCES)

A1.1	MODULE TYPE/S
	QN-595HT-02

A1.2	MODULE DESIGN	
	Module dimensions (L x W x H) [mm] ..... :	2382 x 1134 x 30
	Weights ..... :	32.5 ±3% Kg (approx.)
	Front/Rear cover bonding classification ..... :	☐ rigid/flexible ☒ rigid/rigid ☐ flexible/flexible

A1.3	SOLAR CELL	
	Cell type reference ..... :	**JA Solar Technology Co., Ltd.** Cell type: JACMKTB-D, N type mono crystalline silicon, 16 busbars
	Cell dimensions L x W (± %) [mm] ..... :	182 ±1.5 x 105 ±1.5 x 0.13 ±0.013
	Cell thickness [µm] ..... :	130 ± 13
	Cell area [cm²] ..... :	191.1681

A1.4	IDENTIFICATION OF MATERIALS	
	Front cover ..... :	**China National Building Materials (HEFEI) New Energy Resources Co., LTD.** Type: Heat strengthened AR-coated glass, patterned solar glass, Thickness: 2.0 mm
	Rear cover ..... :	**China National Building Materials (HEFEI) New Energy Resources Co., LTD.** Type: Heat strengthened glass with black glaze, patterned solar glass, Thickness: 2.0 mm
	Encapsulation material front side ..... :	**Jiangsu Lushan New Materials Co., Ltd.** Type: S102, material: EVA/POE/EVA thickness: 0.6±0.1mm
	Encapsulation material back side..... :	**Jiangsu Lushan New Materials Co., Ltd.** Type: S101, material: EVA/POE/EVA thickness: 0.6±0.1mm

	Frame parts ..... :	**Frame (Jiangsu) PV Materials Manufacturing Co., Ltd** Anodized aluminum alloy, 6005-T6, black colour, assembled by key corners
	Mounting parts..... :	N/A
	Adhesive for frame ..... :	**Shanghai Huitian New Material Co., Ltd.** Type: HT906Z, Rated V-0 at min. 3.0 mm thick, RTI=105, CTI=0 UL certified, No. E248611
	Edge sealing..... :	N/A
	Internal wiring ..... :	N/A
	Cell connector ..... :	**JingLan Advanced Material Co., Ltd.** Cross section: φ 0.26 (-0.01, +0.02) mm, round wire ribbon, Material: Base Cu (≥99.95%), coating: Sn(60±3)%Pb(40±3)%, coating thickness 0.018 (-0.005, +0.01) mm at each side.
	String connector ..... :	**JingLan Advanced Material Co., Ltd.** Cross section: 0.3±0.015 × 4±0.05 & 0.35±0.015 × 6±0.05 mm, Material: Base Cu (≥99.95%), coating Sn60%Pb40%, coating thickness 0.023(-0.005, + 0.01)mm at each side.
	Soldering material ..... :	Sn(60±3)%Pb(40±3)%
	Fluxing agent..... :	**Shenzhen Vital New Material Company Limited** Type: WTO-PV107, no clean halogen free liquid flux.
	Junction box ..... :	**Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd** Type: JM07w, Rated DC 1500 V, 25A, IP 68 (1m, 1h), -40 °C to 85 °C, TÜV SÜD certified, No. B 097074 0004 Rev. 02
	Cable ..... :	**Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd** Type: 62930 IEC 131 1×4mm^2, 1500V DC, -40 °C to 90 °C, TÜV Rheinland certified, No. R 50507377
	Connector..... :	**Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd** Type: HQC4, Rated DC 1500V, 30A, IP68 (1m, 1h), -40°C to 85°C TÜV SÜD certified, No. B 097074 0005 Rev. 01

	Bypass diode ..... :	**Zhejiang Jiaming Tianheyuan Photovoltaics Technology Co. Ltd** Type: THY4050, Schottky, Max. peak reverse voltage 50 V, Max. average forward current 40 A, Max. junction temperature 200 °C.
	Potting material ..... :	**Shanghai Huitian New Material Co., Ltd.** Type: 5299W-S, Rated V-0 at min. 3.0 mm thick, RTI=105, CTI=0 UL certified, No. E248611
	Adhesive for junction box ..... :	**Shanghai Huitian New Material Co., Ltd.** Type: HT906Z, Rated V-0 at min. 3.0 mm thick, RTI=105, CTI=0 UL certified, No. E248611
	Additional material (e. g. fixing tape, insulation tape) ..... :	1) Fixing tape: **Suzhou temosun PV Material Co., Ltd.** Type: T5065, TEMOSUN Adhesive tapes, transparency, 0.06±0.02mm thick. 2) Marking label: **Suzhou ZhengAo Packing Material Limited Company** Type: AVERY PET

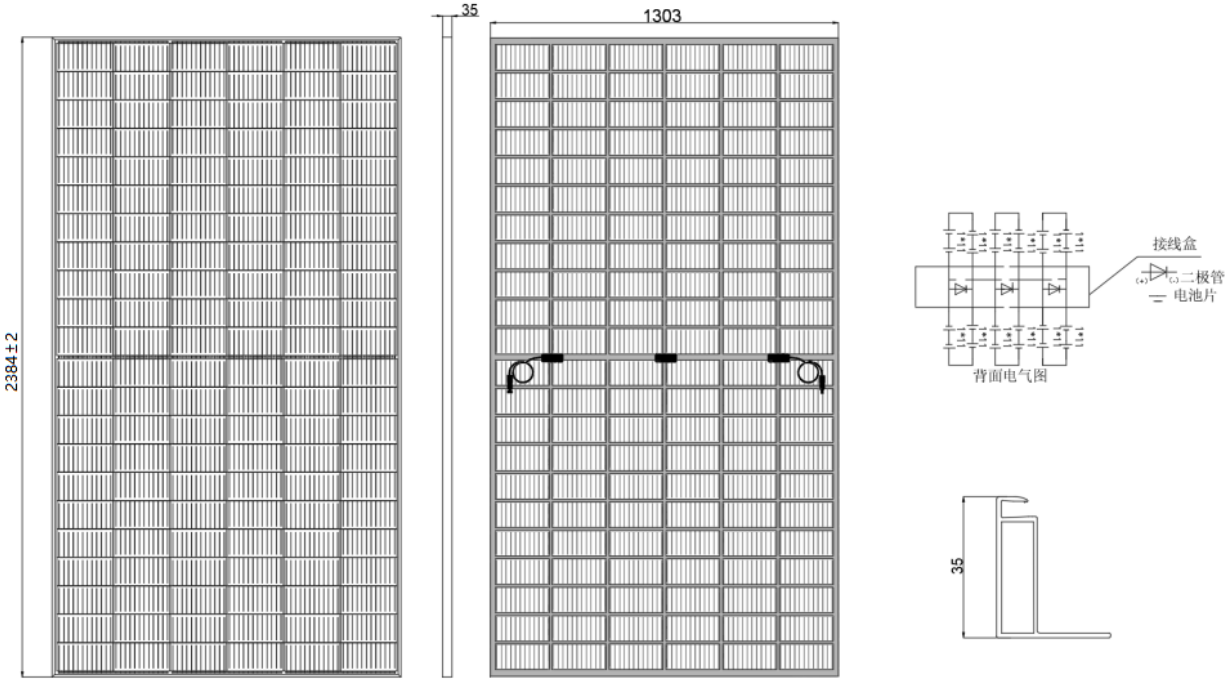
A1.5	**MODULE DESIGN - MINIMUM DISTANCES**	
	Between cells ..... :	0.65 mm
	Between cell and accessible surfaces ..... :	10.5 mm
	Between any current carrying part and accessible surfaces ..... :	10.5 mm

A1.6	**MODULE DESIGN - ELECTRICAL CONFIGURATION**	
	Total number of cells ..... :	132
	Serial-parallel connection of cells ..... :	SPS
	Cells per bypass diode ..... :	44
	No. of bypass diodes ..... :	3

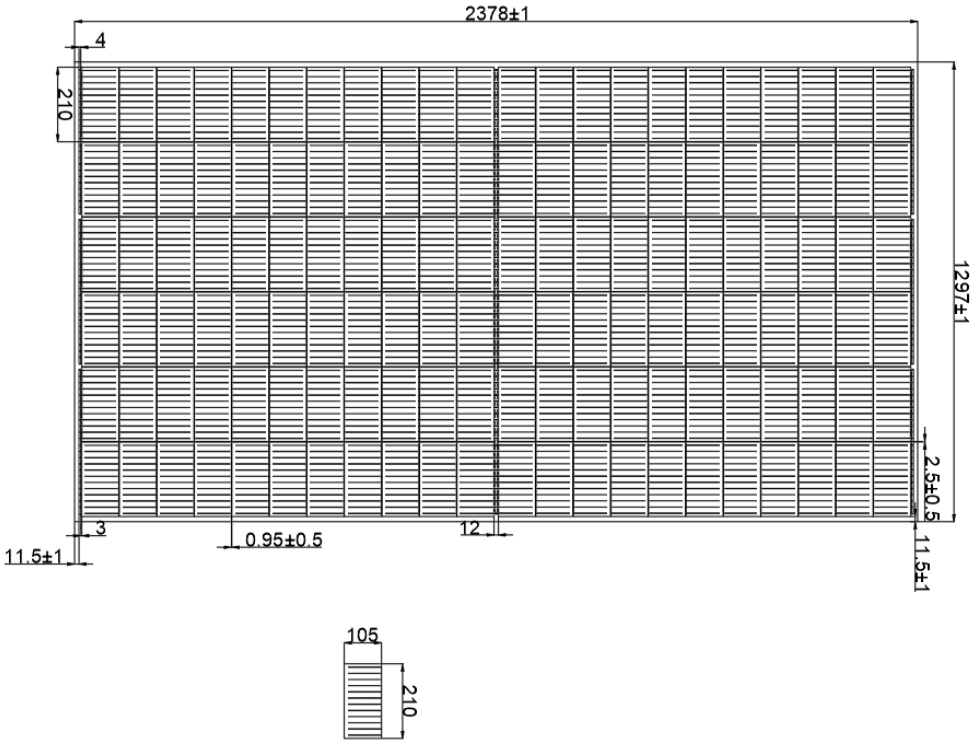
Remark: for tested sample group M4-x

Annex 2: Constructure Details

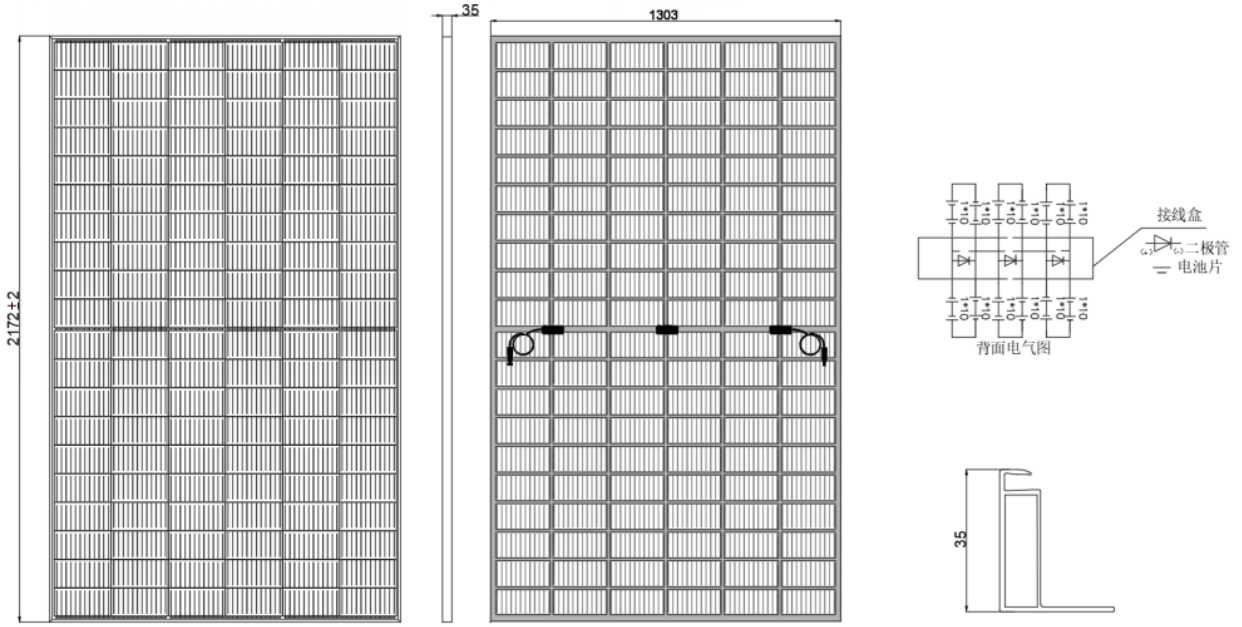
QN-xxxHT-01 series (144 cells module)



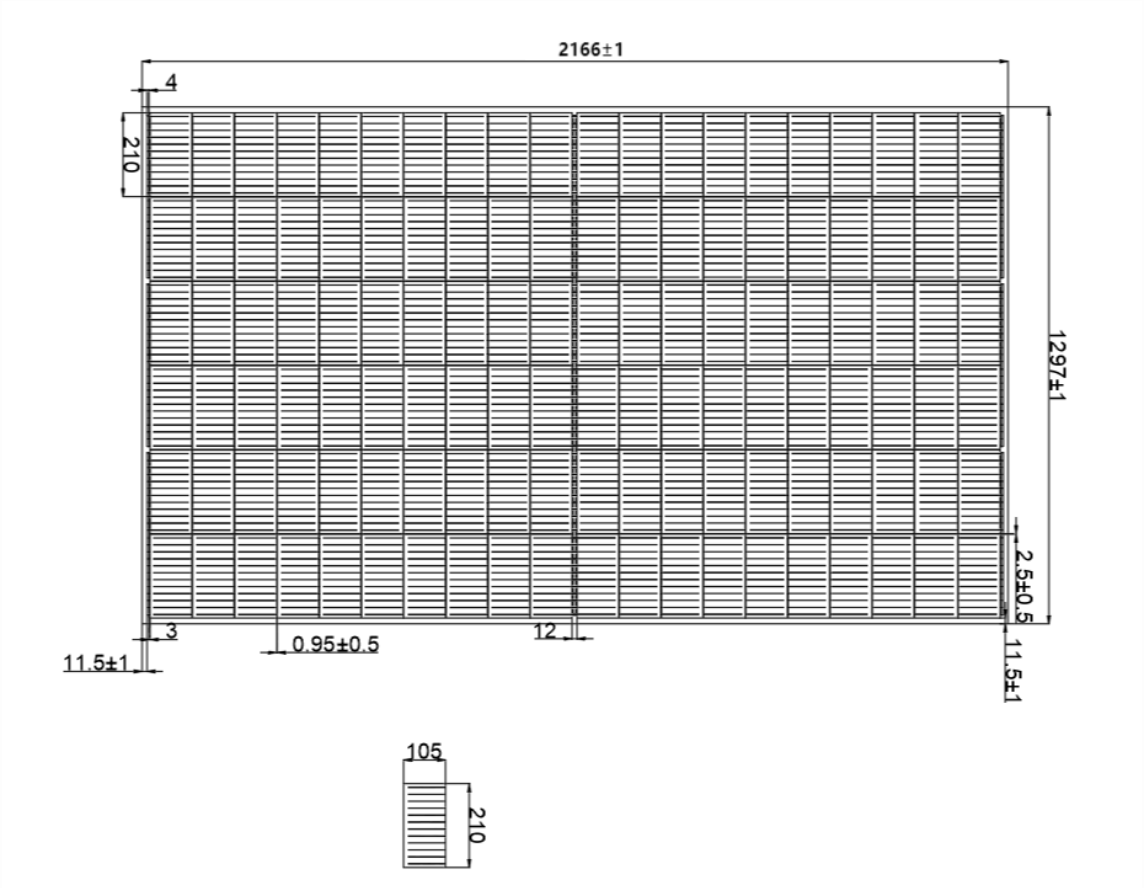
Cell and conductor layout on the laminate



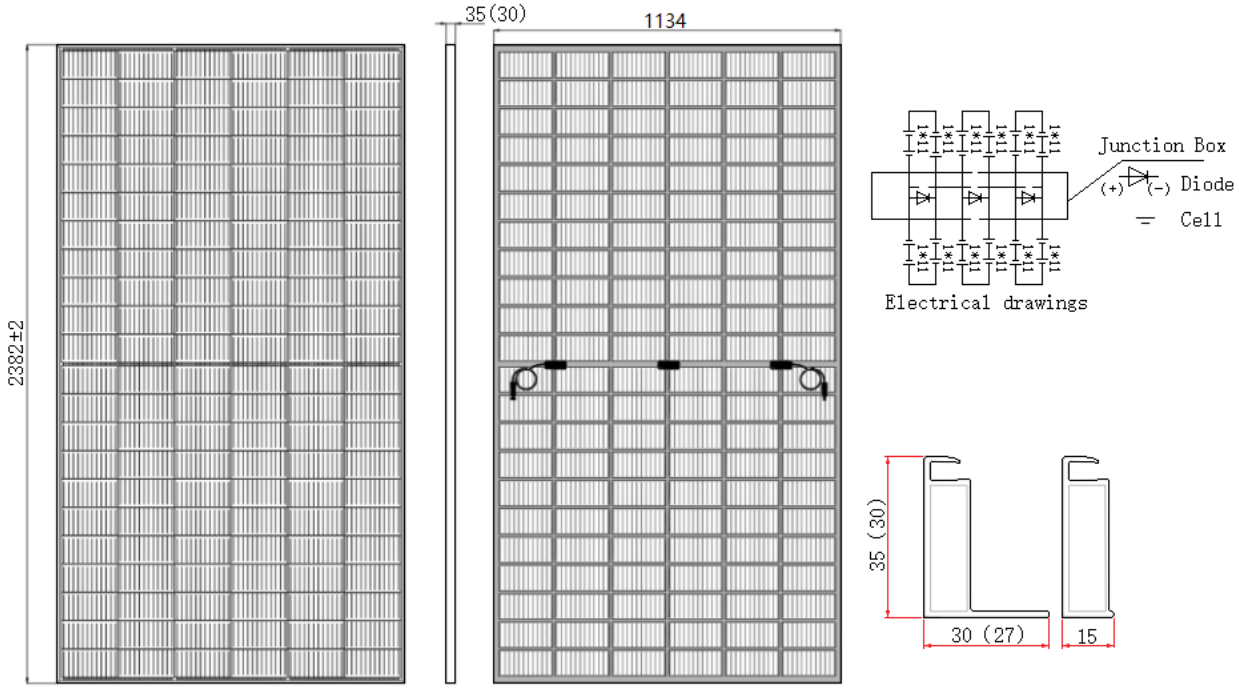
QN-xxxHT-01 series (132 cells module)



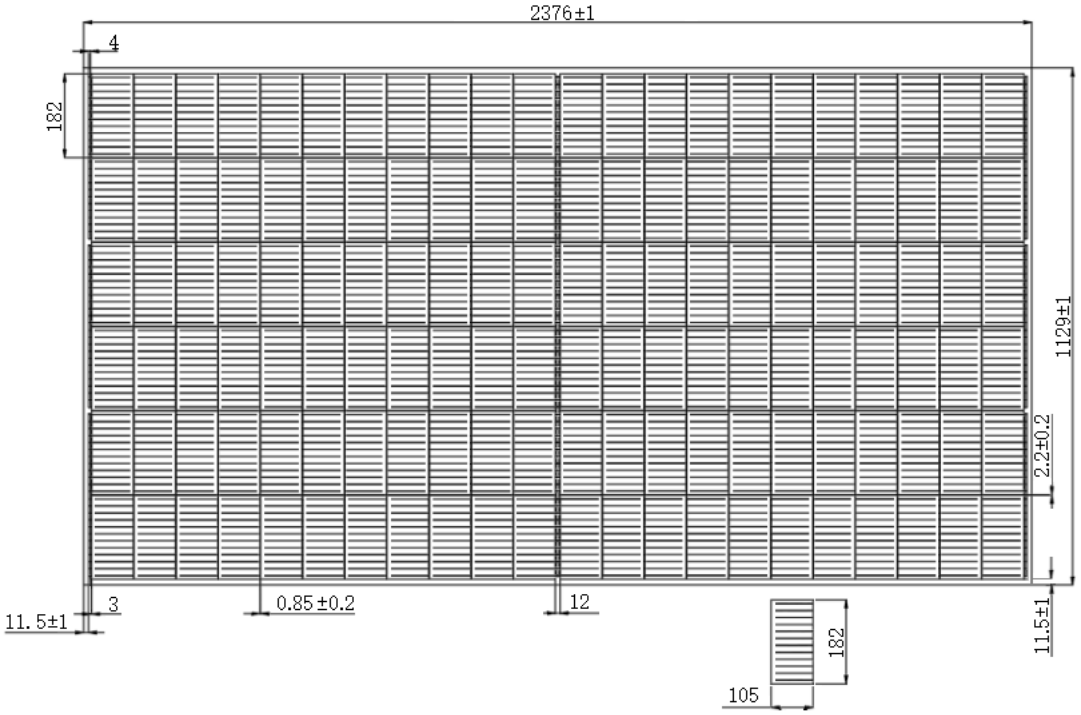
Cell and conductor layout on the laminate



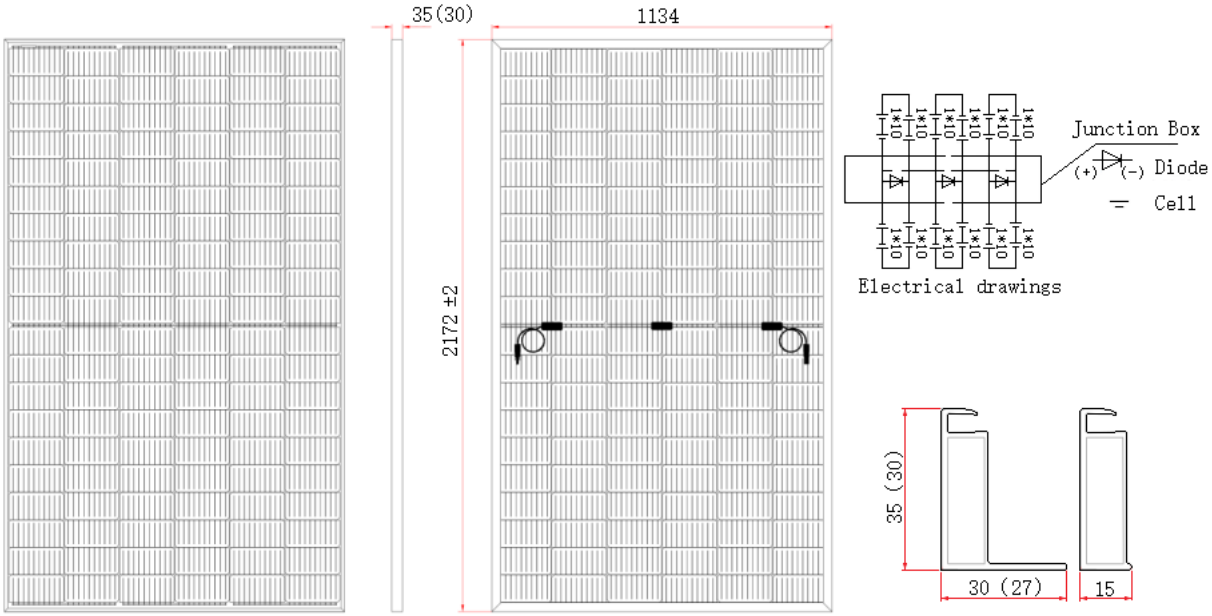
QN-xxxHT-02 series (132 cells module)



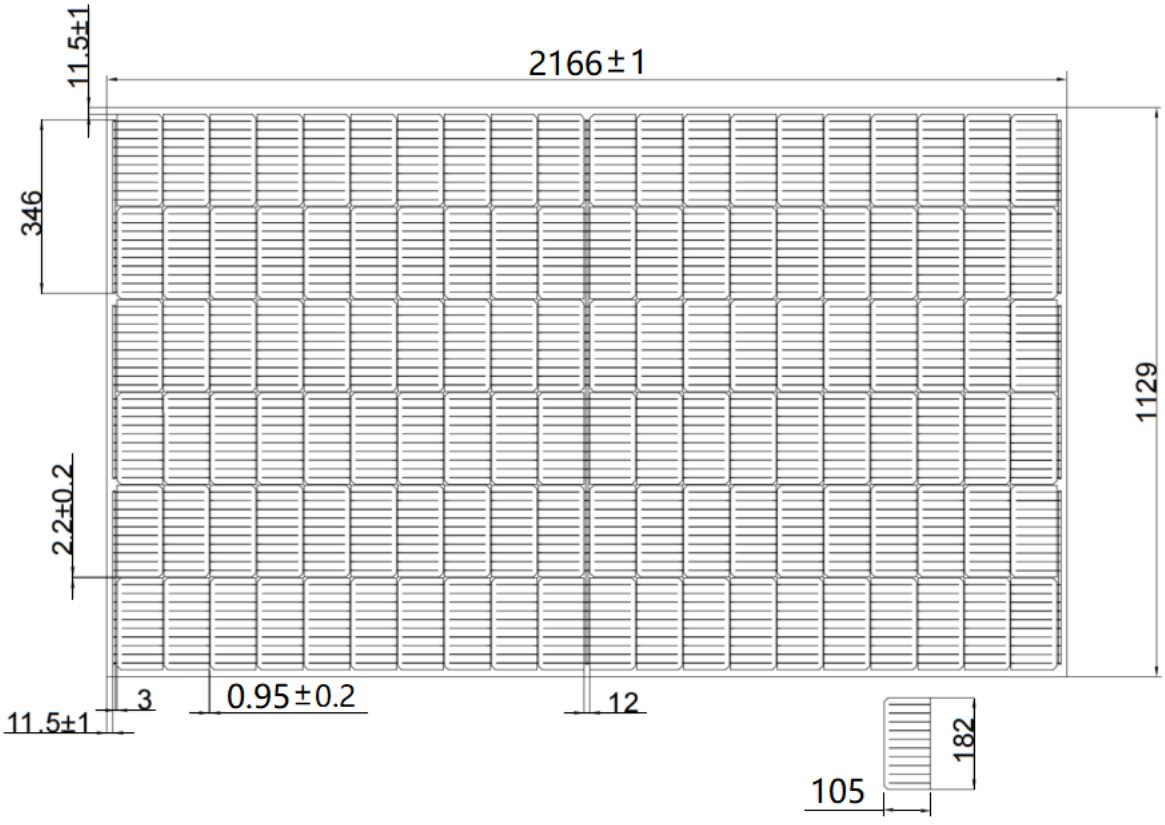
Cell and conductor layout on the laminate



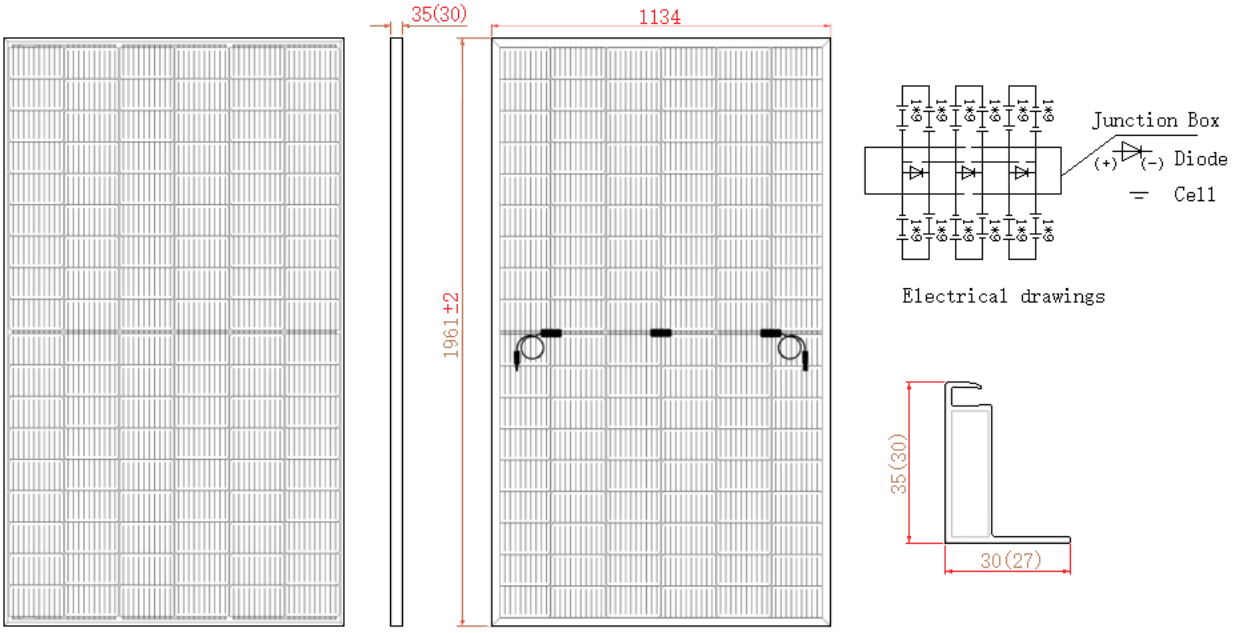
QN-xxxHT-02 series (120 cells module)



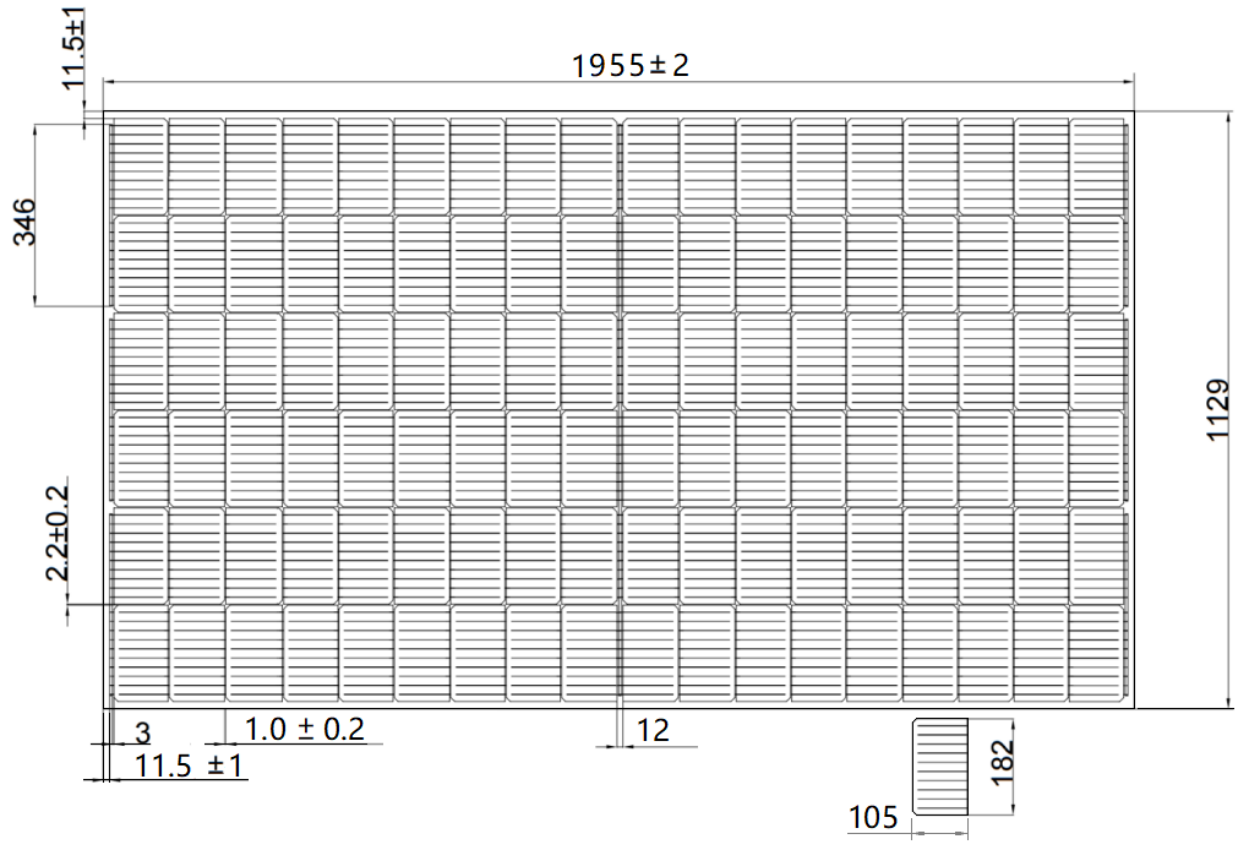
Cell and conductor layout on the laminate



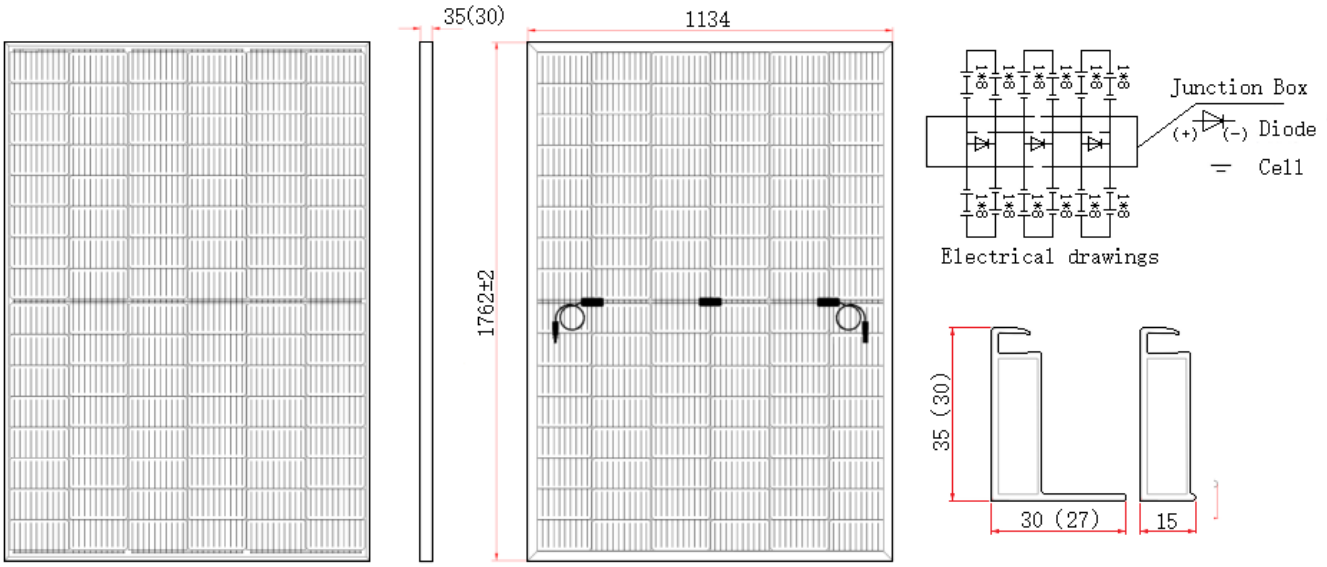
QN-xxxHT-02 series (108 cells module)



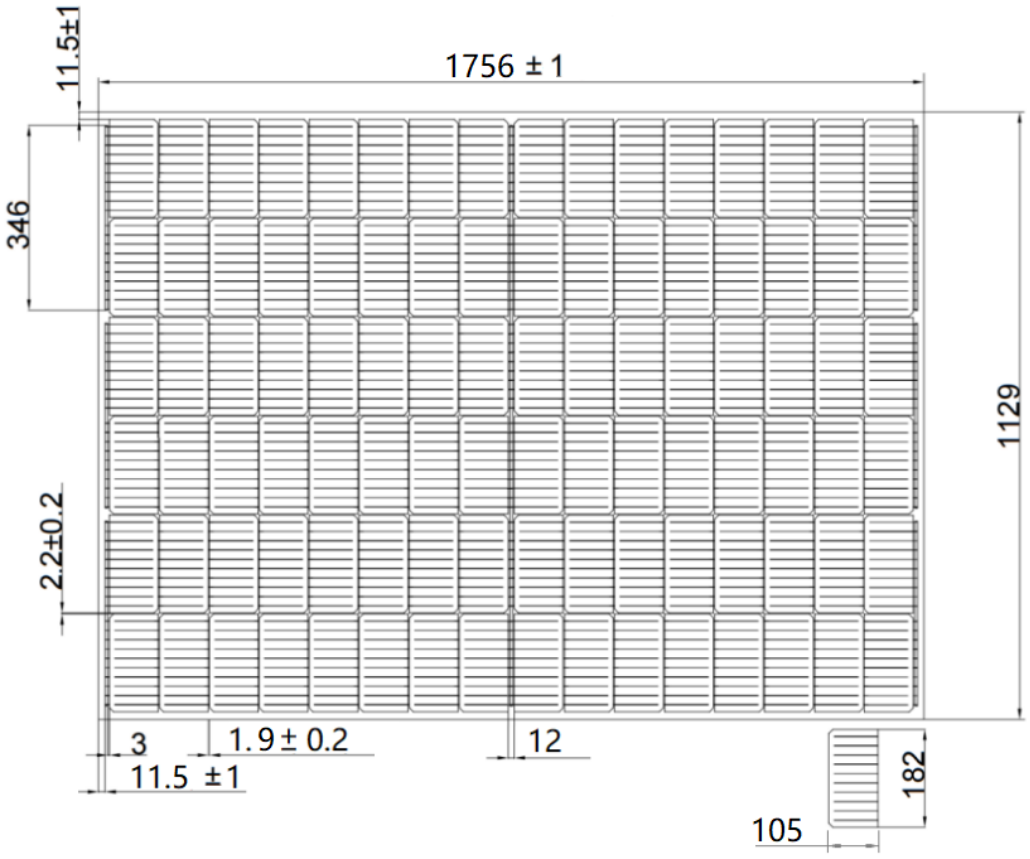
Cell and conductor layout on the laminate



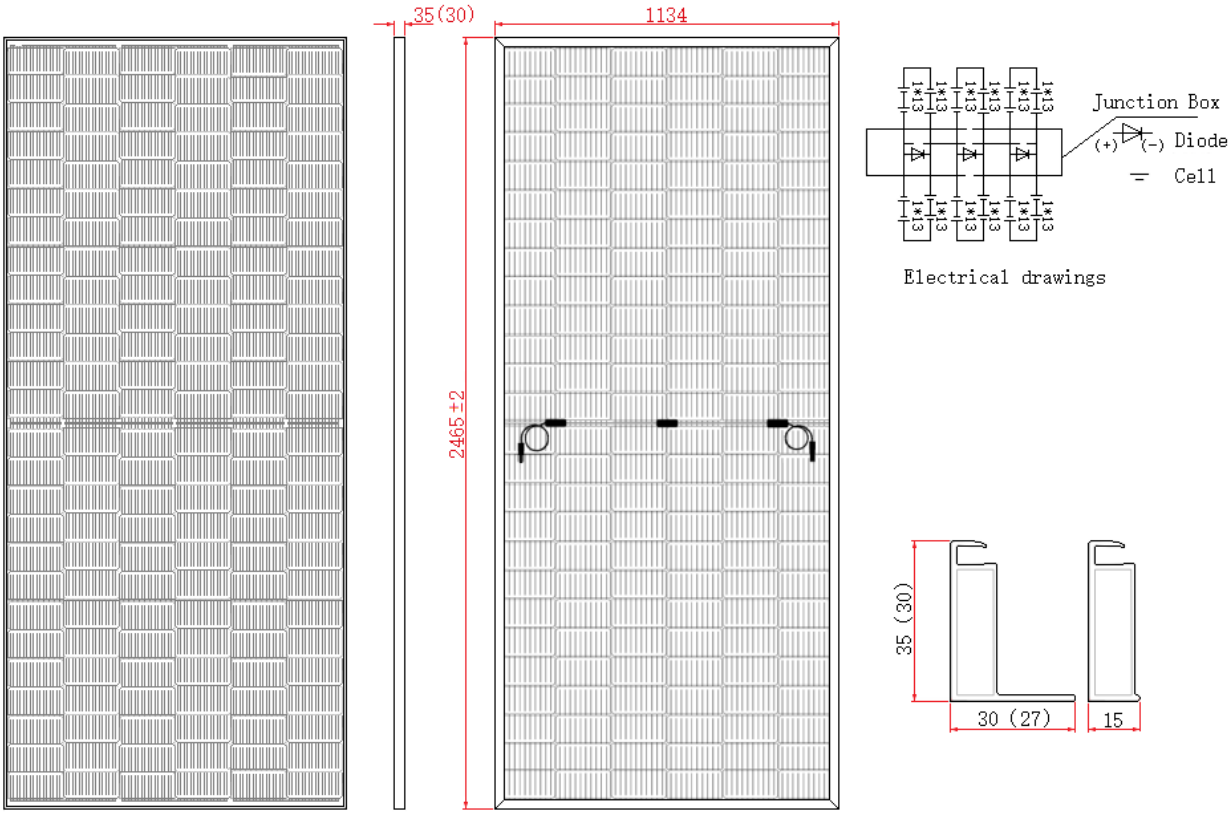
QN-xxxHT-02 series (96 cells module)



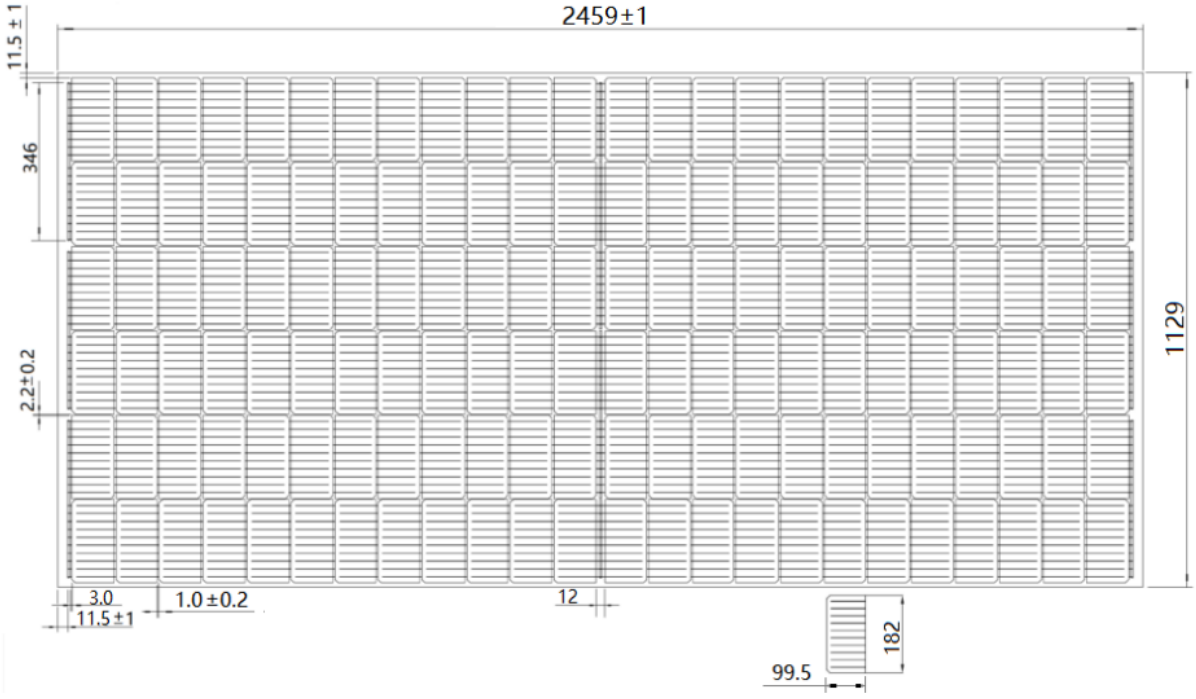
Cell and conductor layout on the laminate



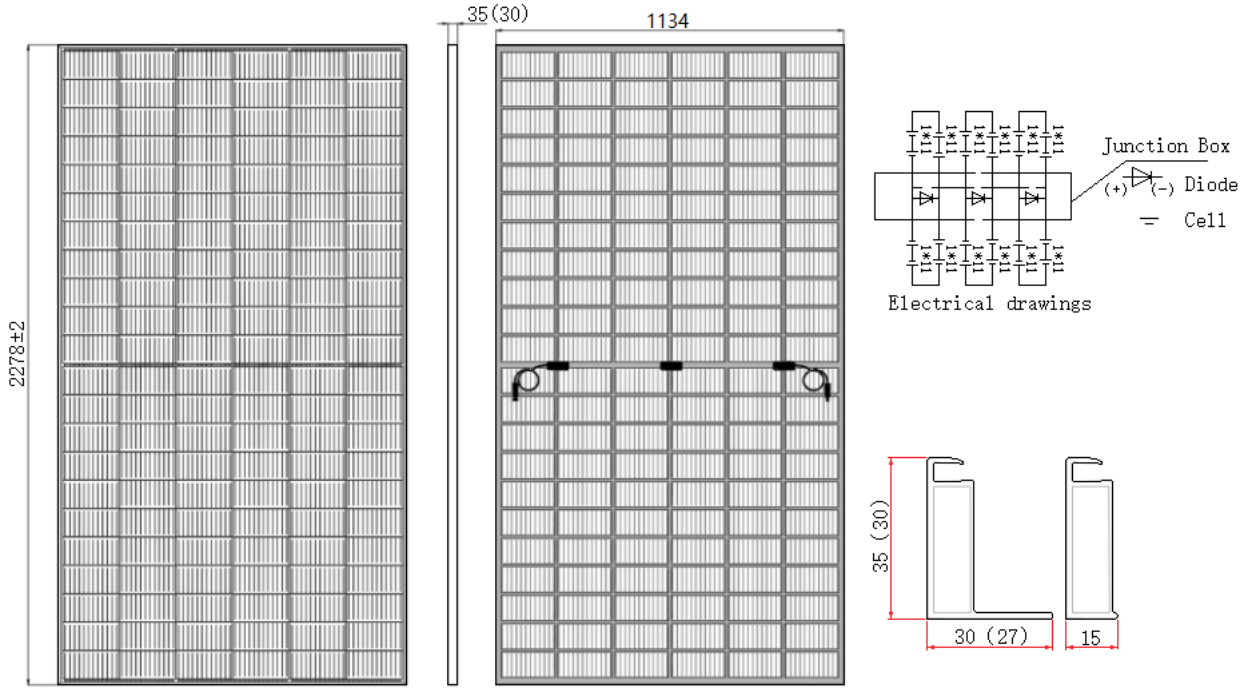
QN-xxxHT-03 series (144 cells module)



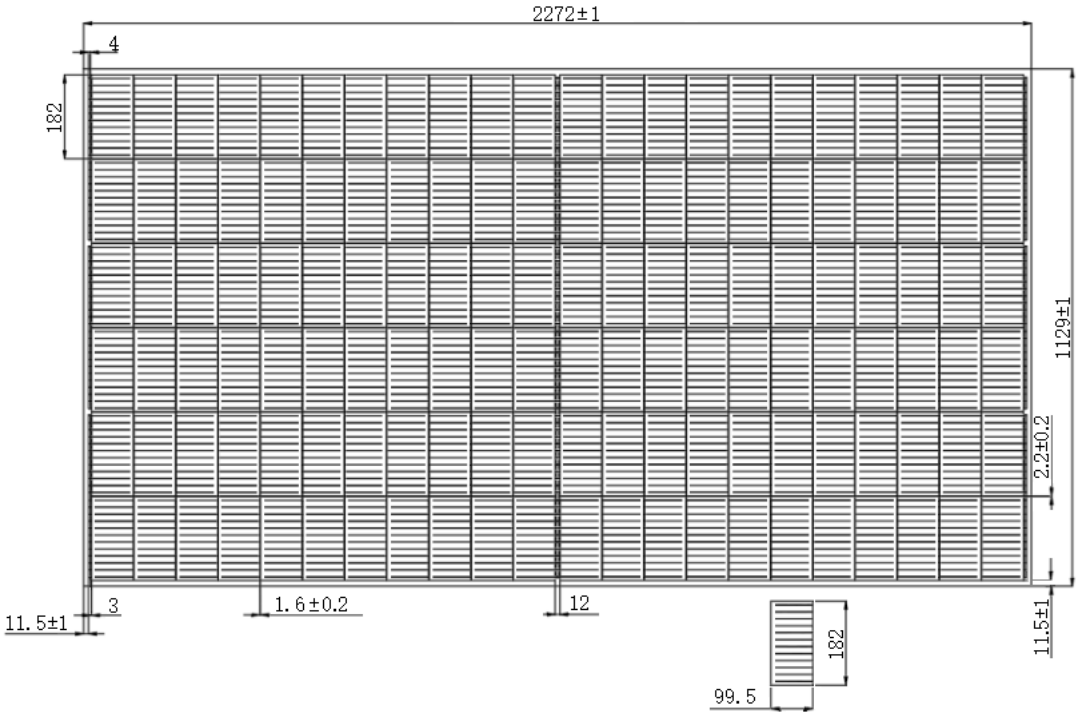
Cell and conductor layout on the laminate



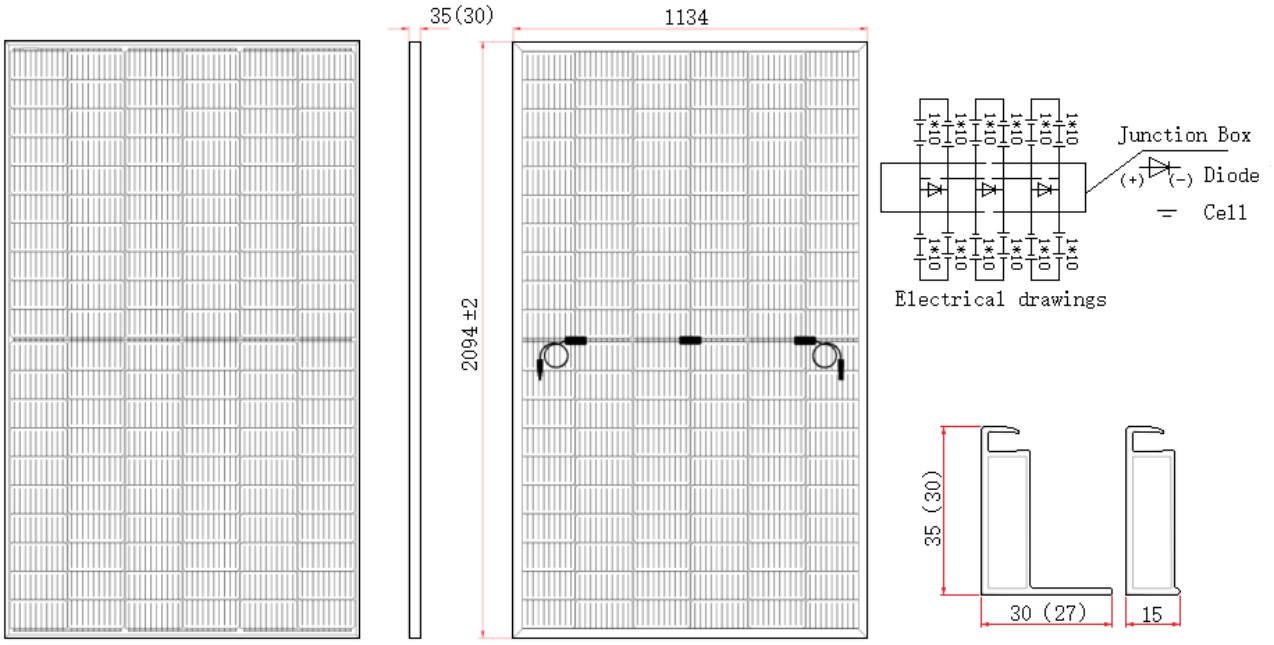
QN-xxxHT-03 series (132 cells module)



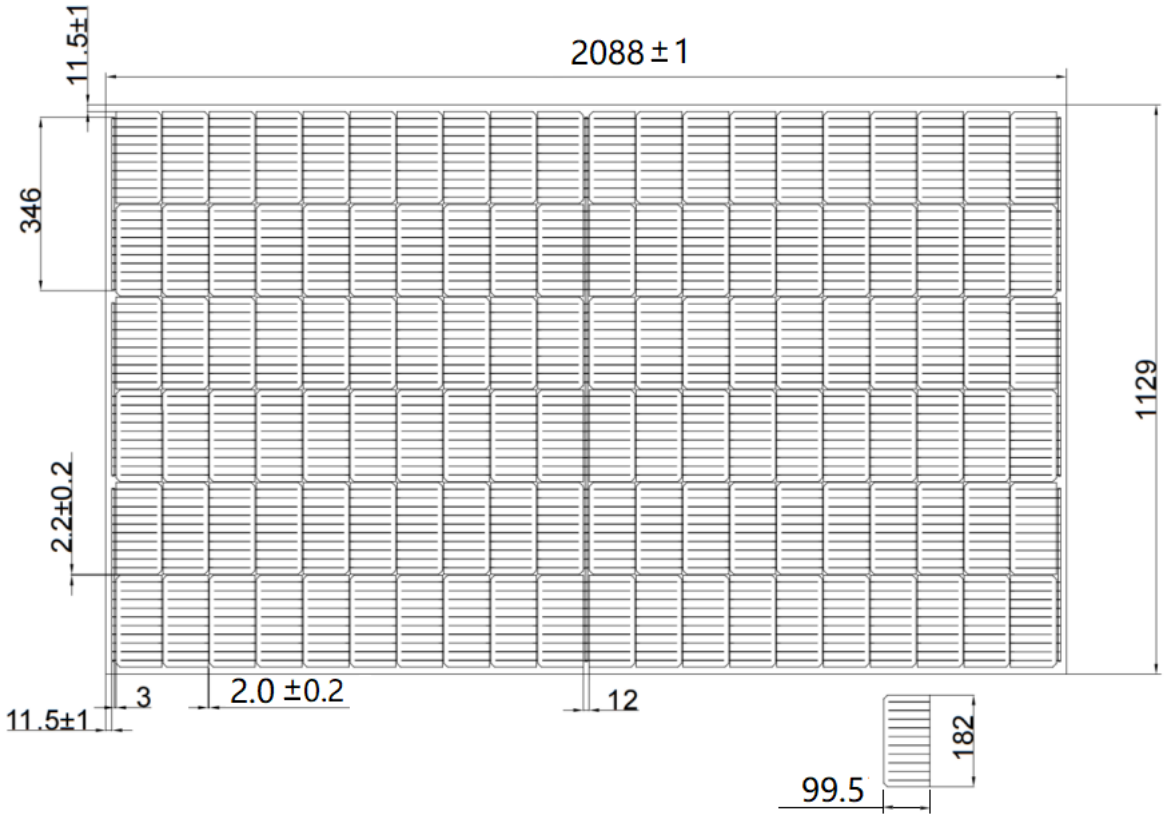
Cell and conductor layout on the laminate



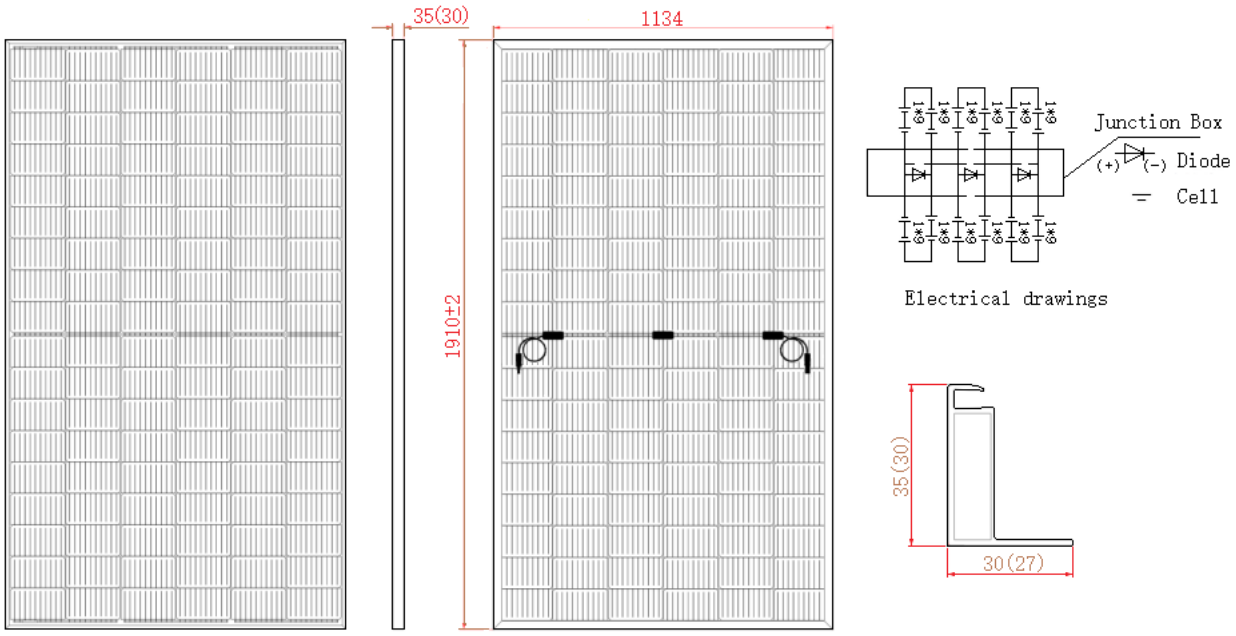
QN-xxxHT-03 series (120 cells module)



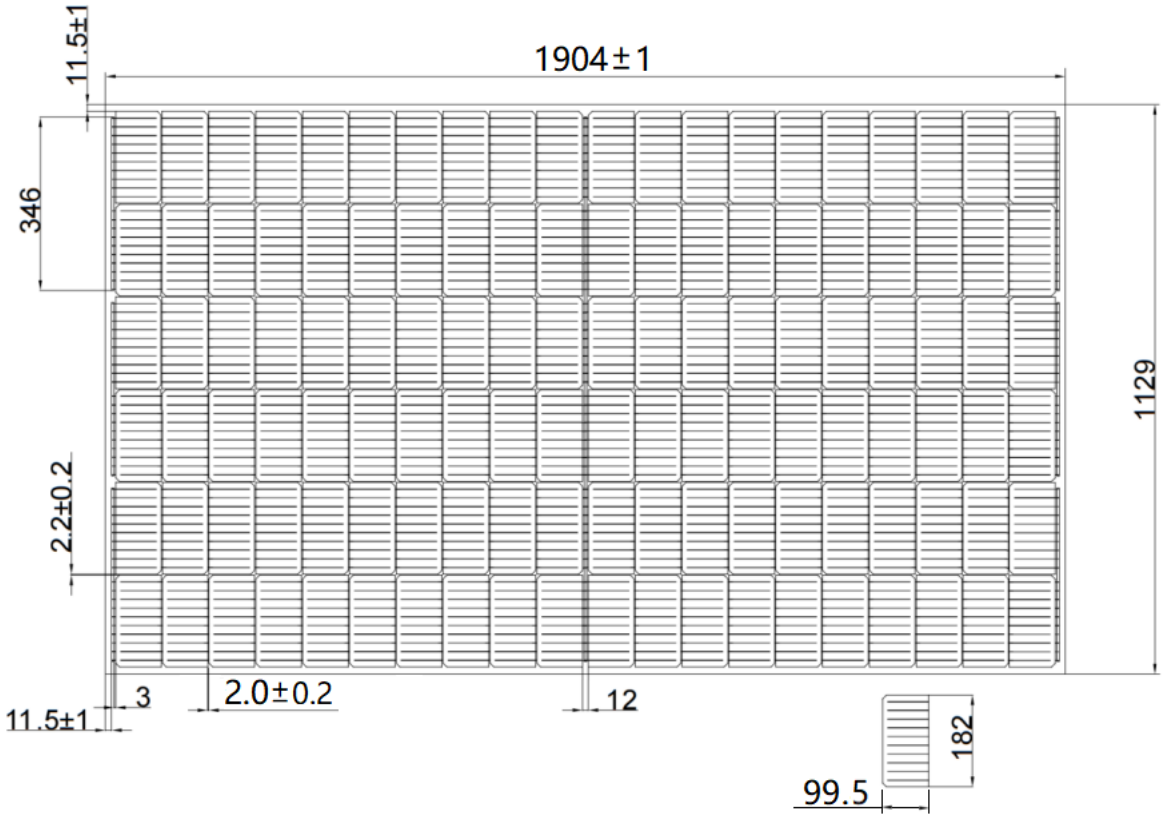
Cell and conductor layout on the laminate



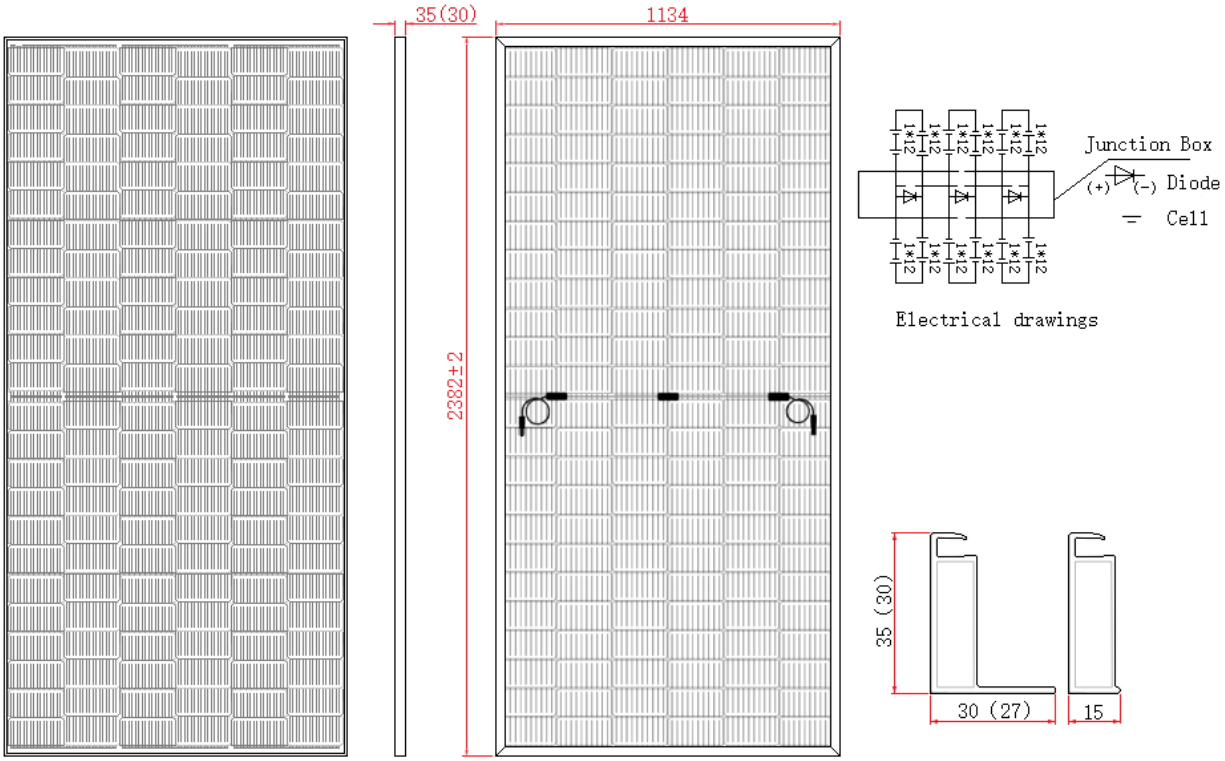
QN-xxxHT-03 series (108 cells module)



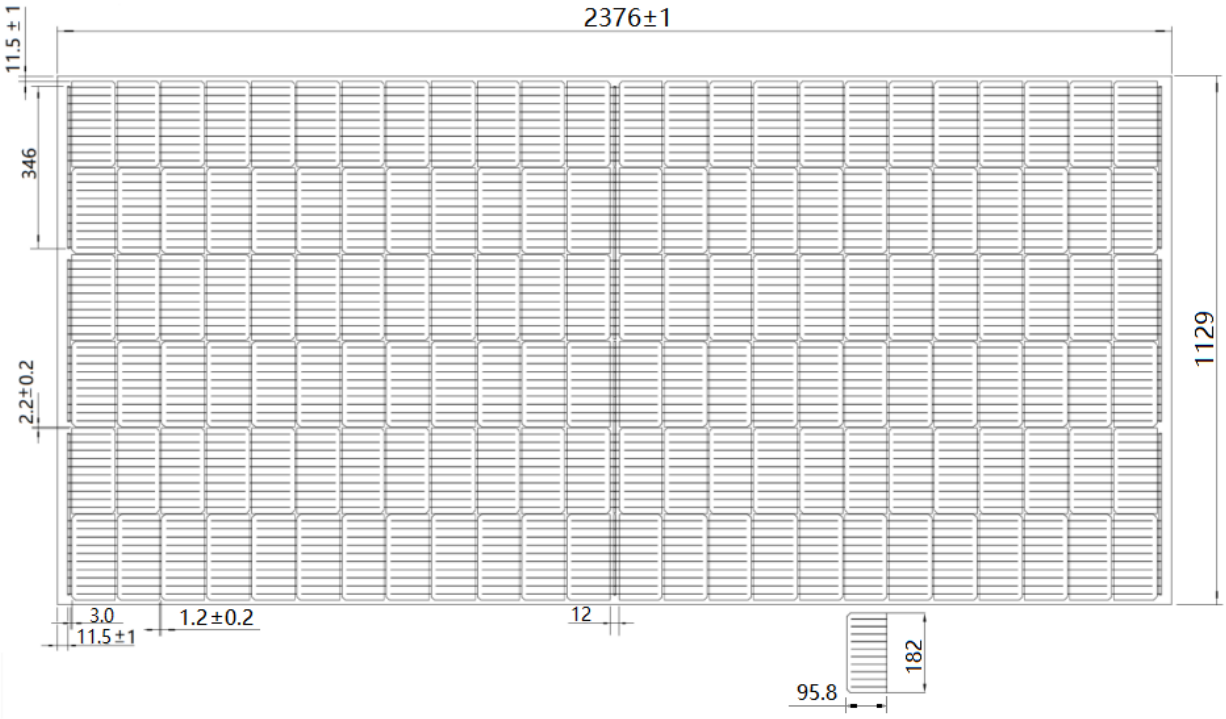
Cell and conductor layout on the laminate



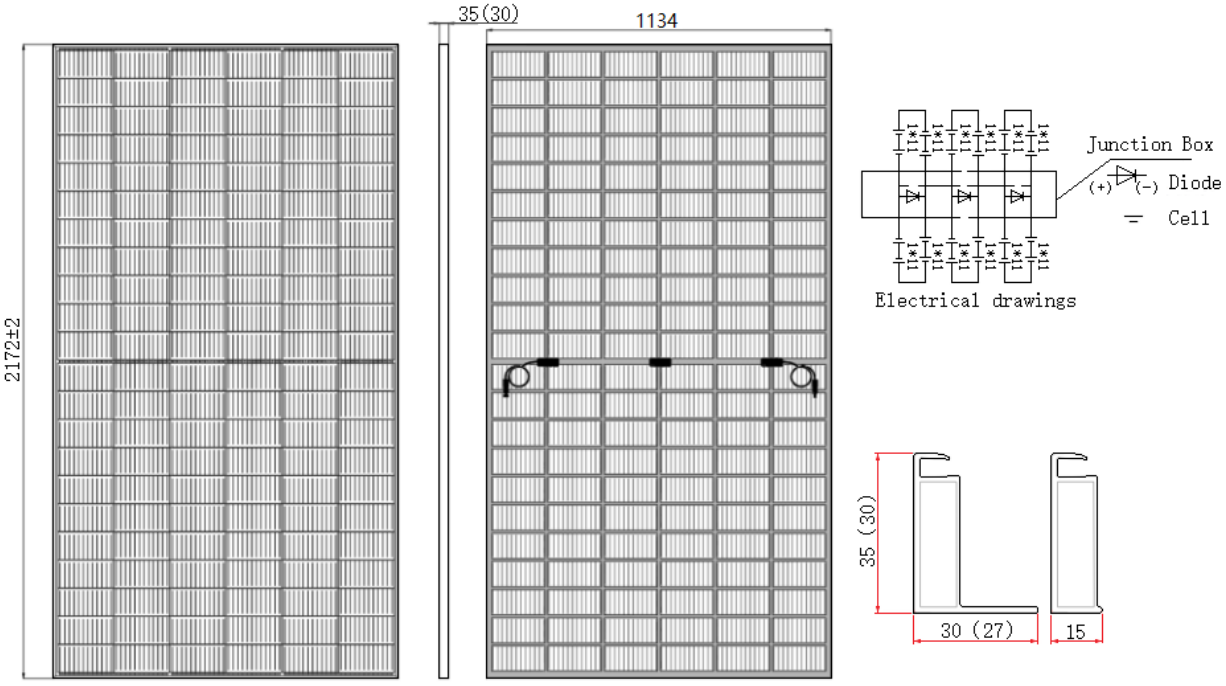
QN-xxxHT-04 series (144 cells module)



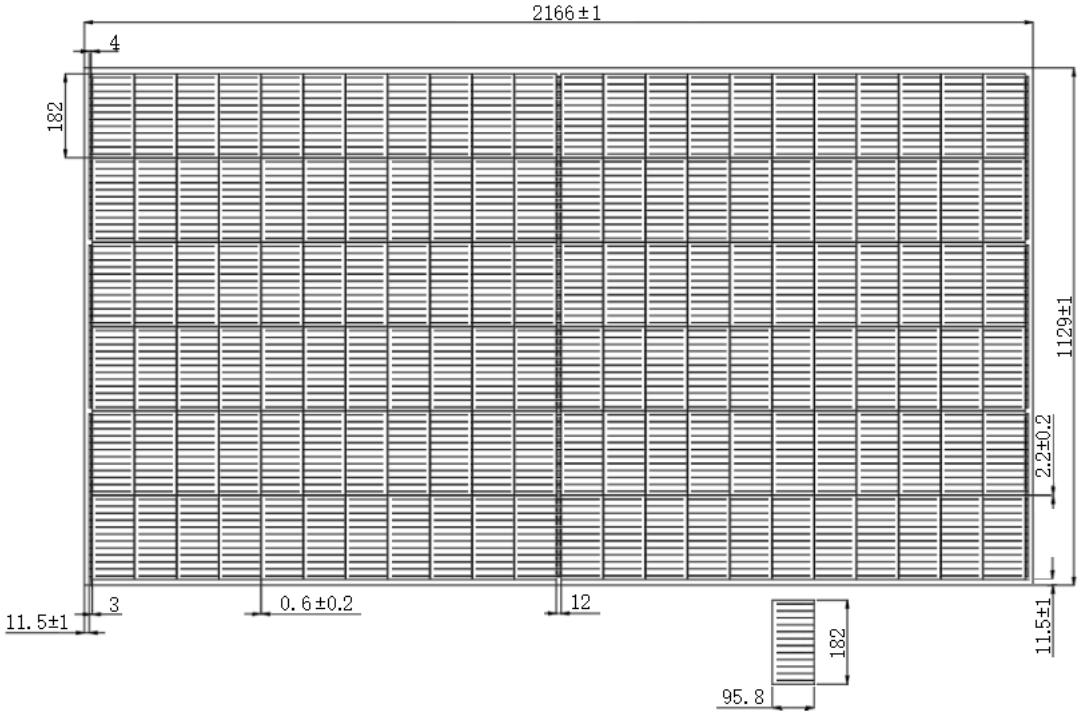
Cell and conductor layout on the laminate



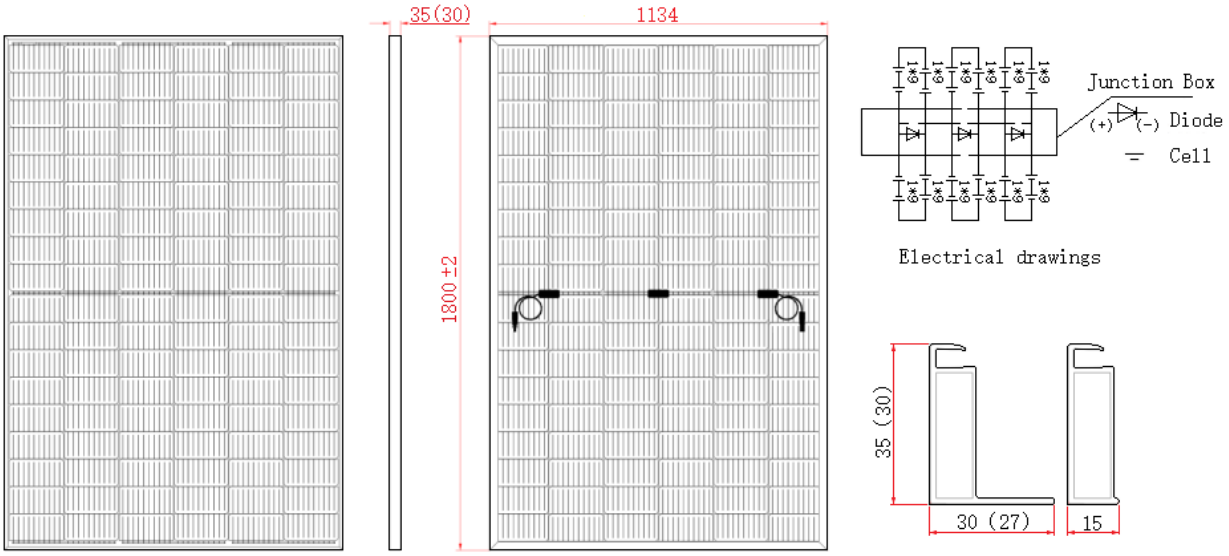
QN-xxxHT-04 series (132 cells module)



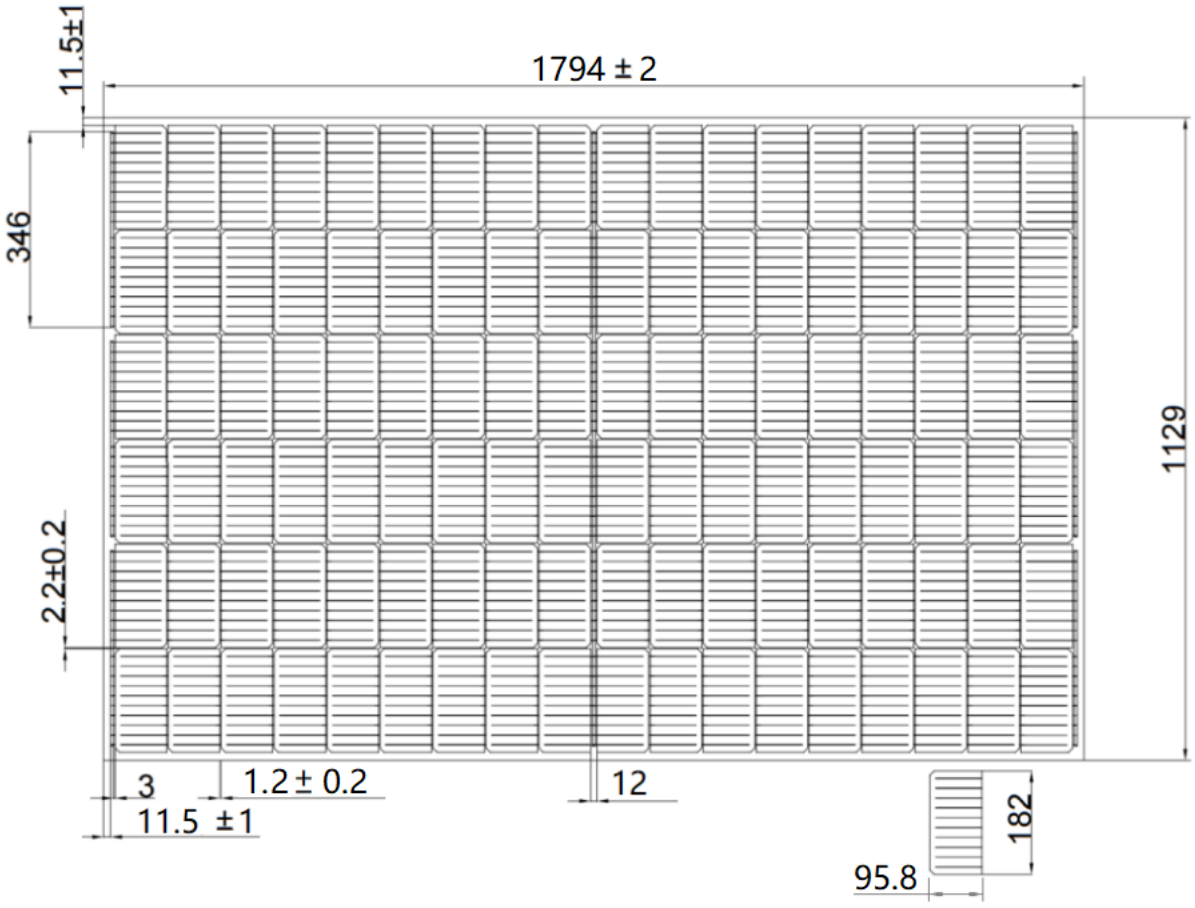
Cell and conductor layout on the laminate



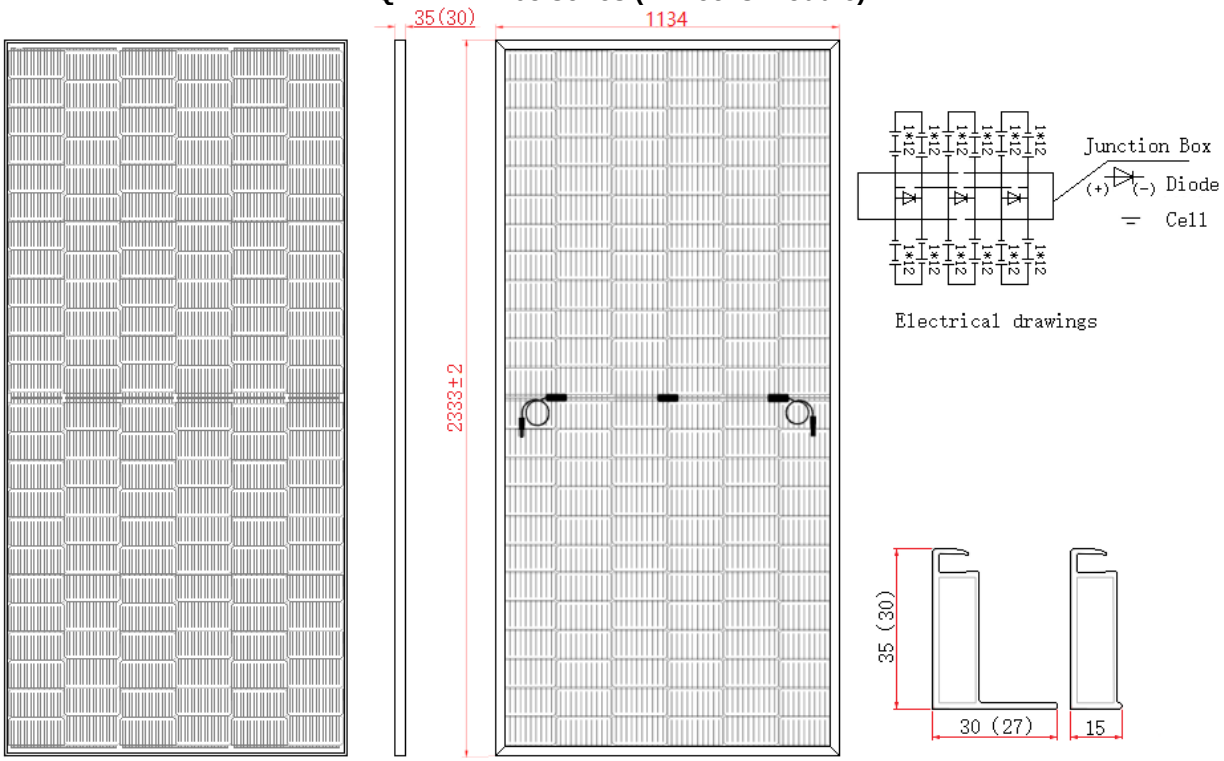
QN-xxxHT-04 series (108 cells module)



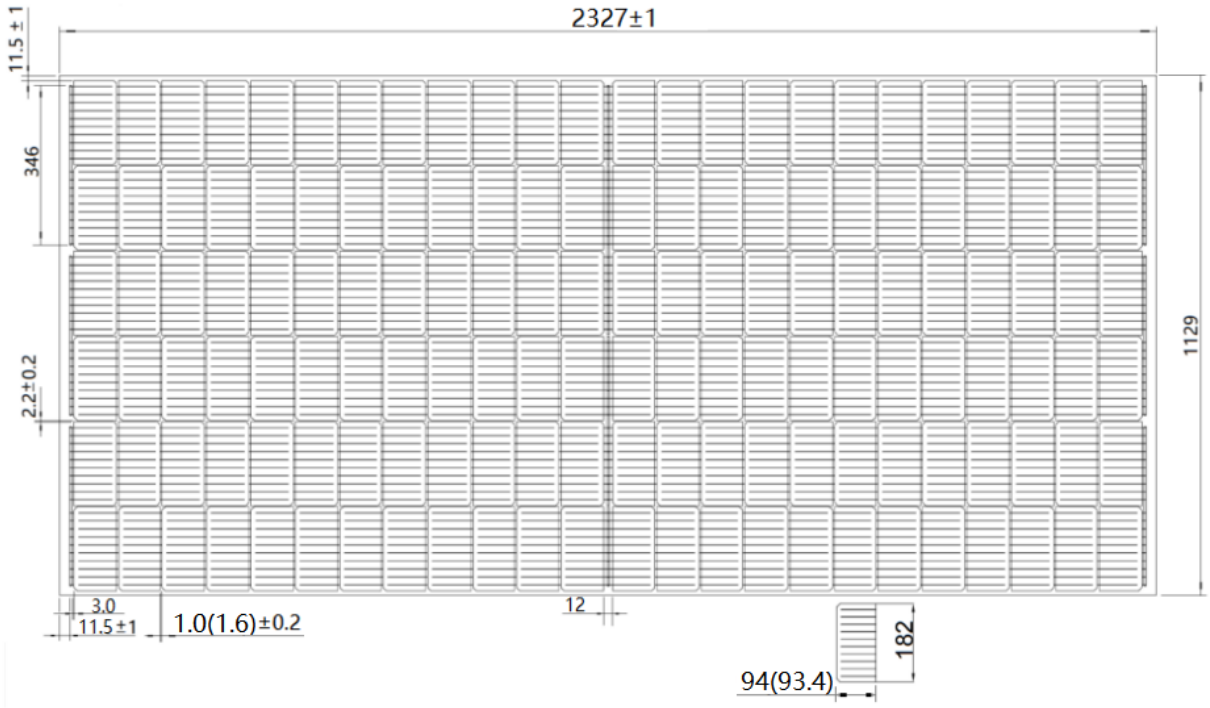
Cell and conductor layout on the laminate



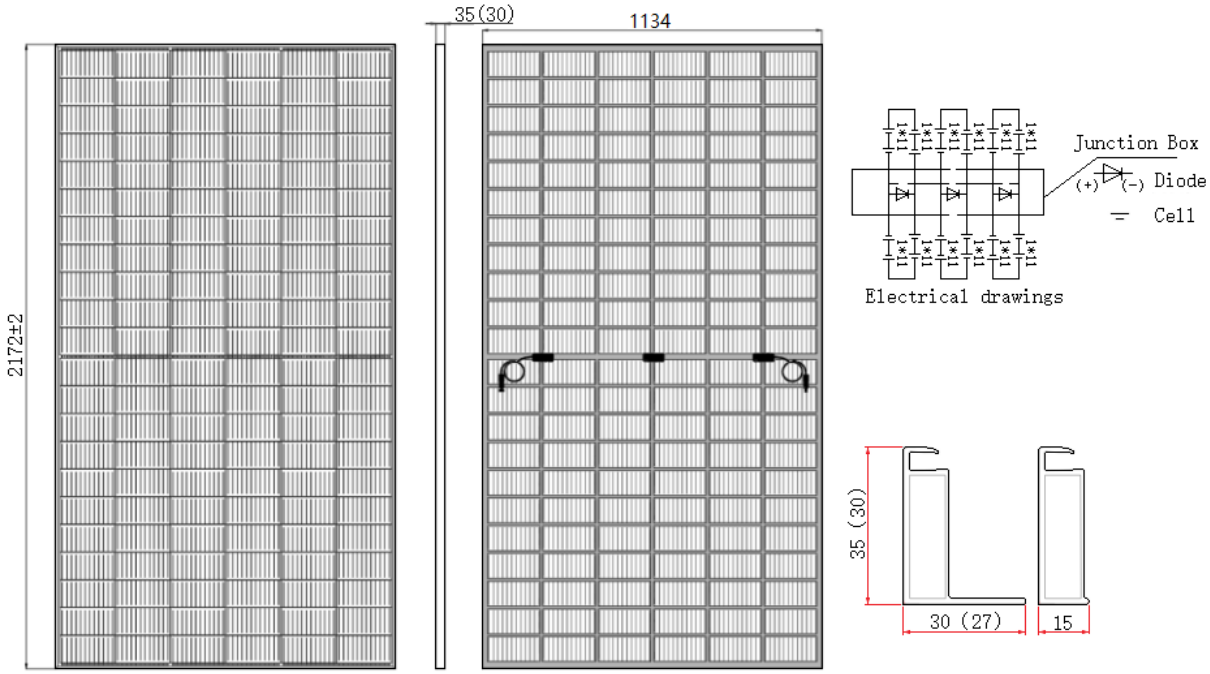
QN-xxxHT-05 series (144 cells module)



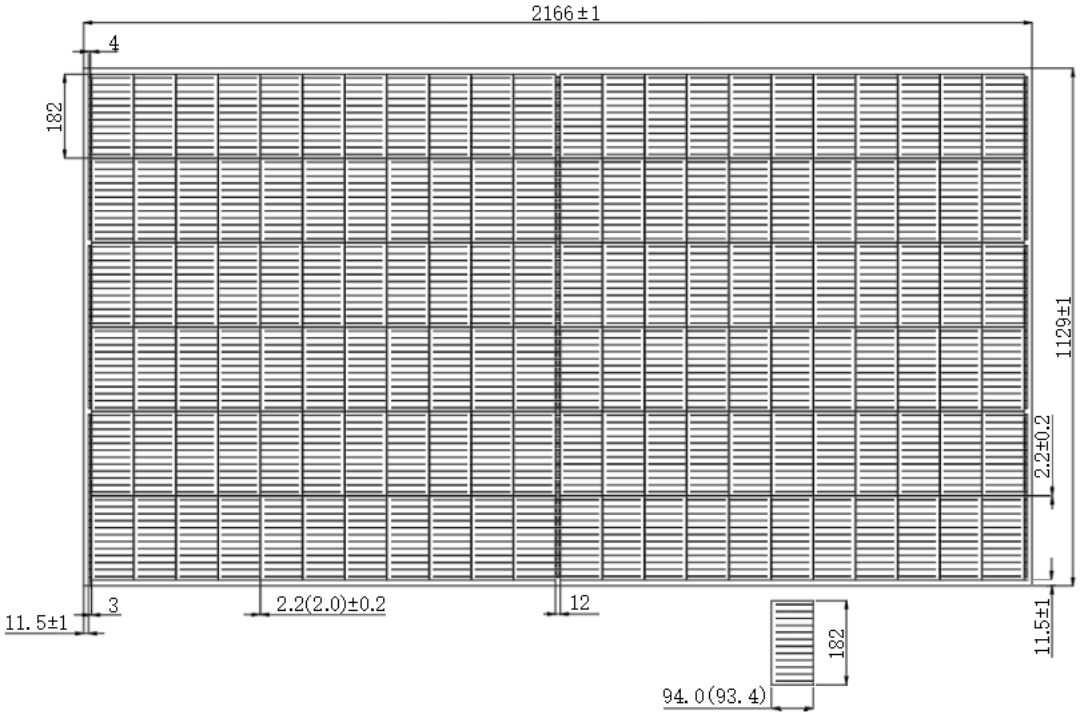
Cell and conductor layout on the laminate



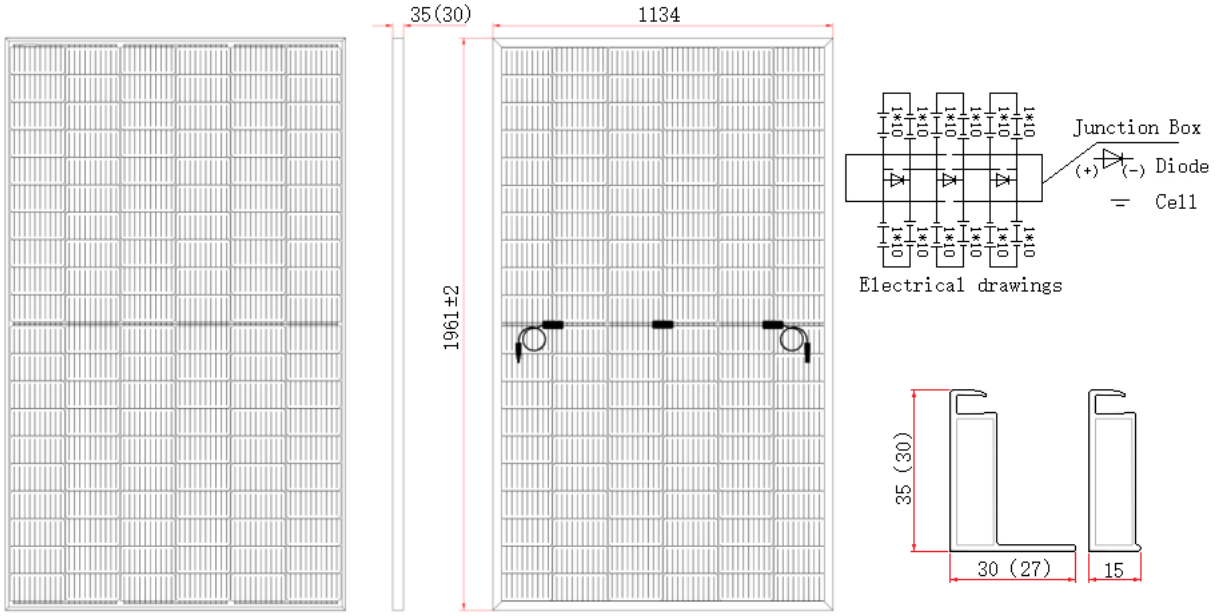
QN-xxxHT-05 series (132 cells module)



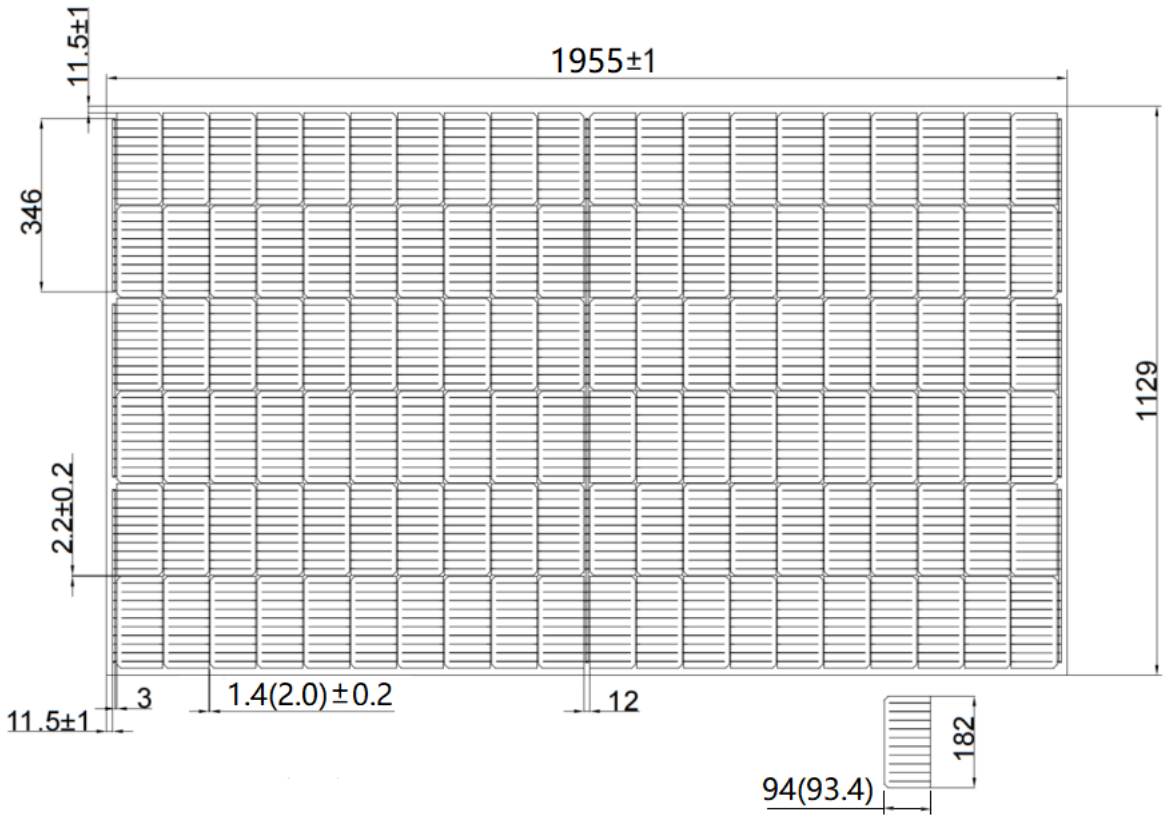
Cell and conductor layout on the laminate



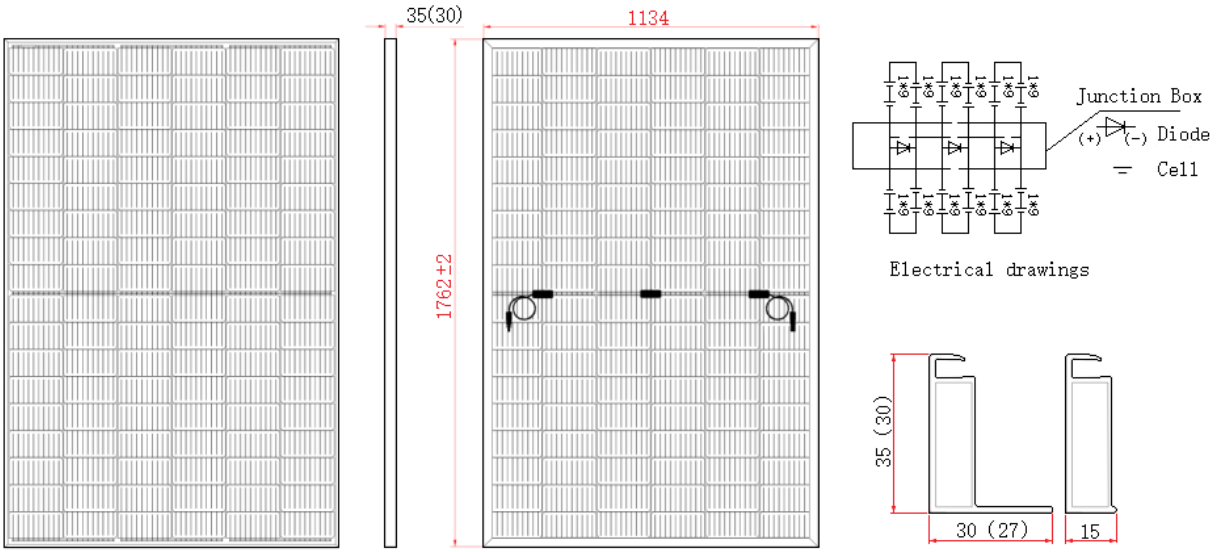
QN-xxxHT-05 series (120 cells module)



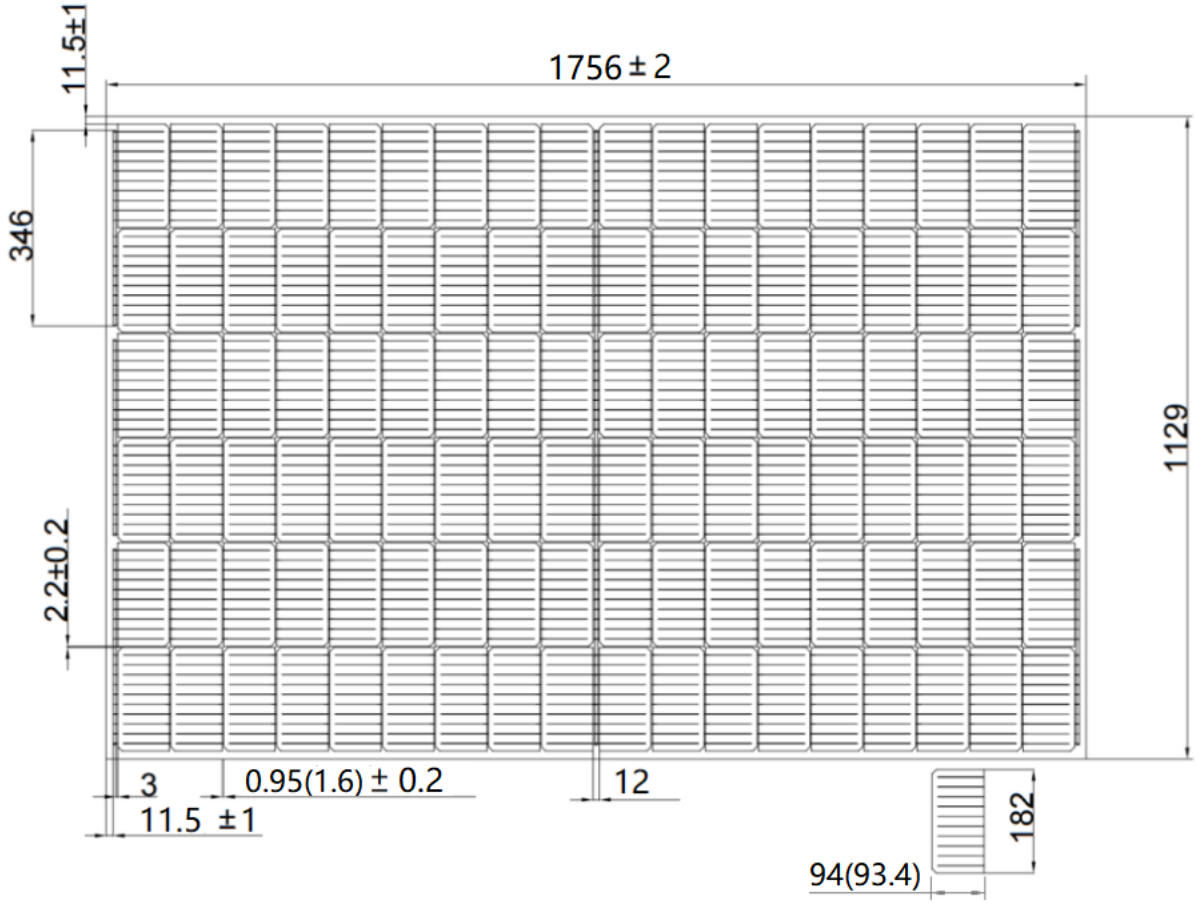
Cell and conductor layout on the laminate



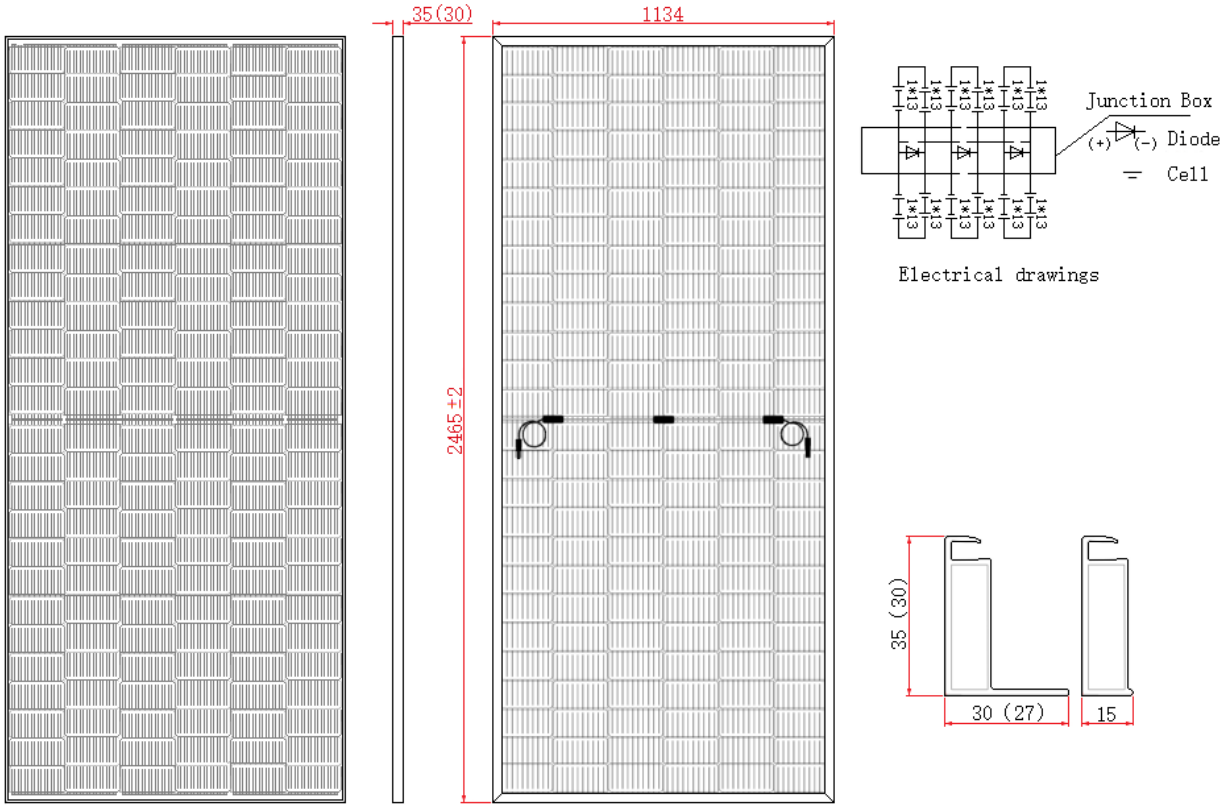
QN-xxxHT-05 series (108 cells module)



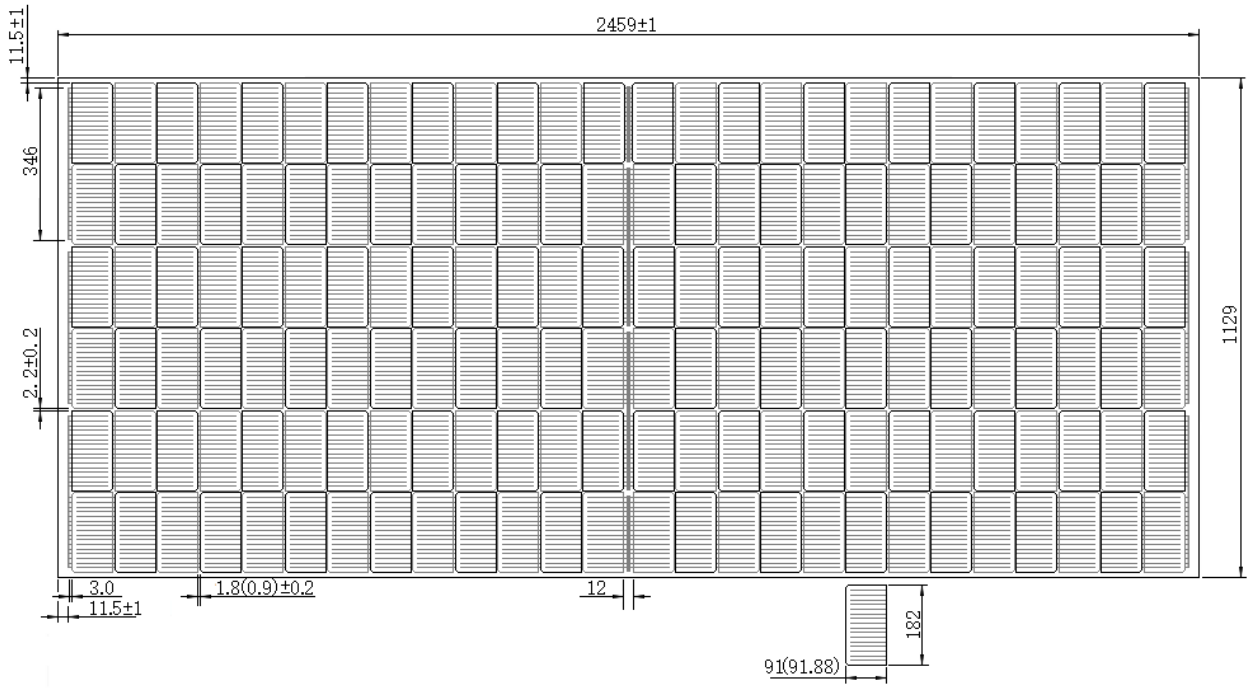
Cell and conductor layout on the laminate



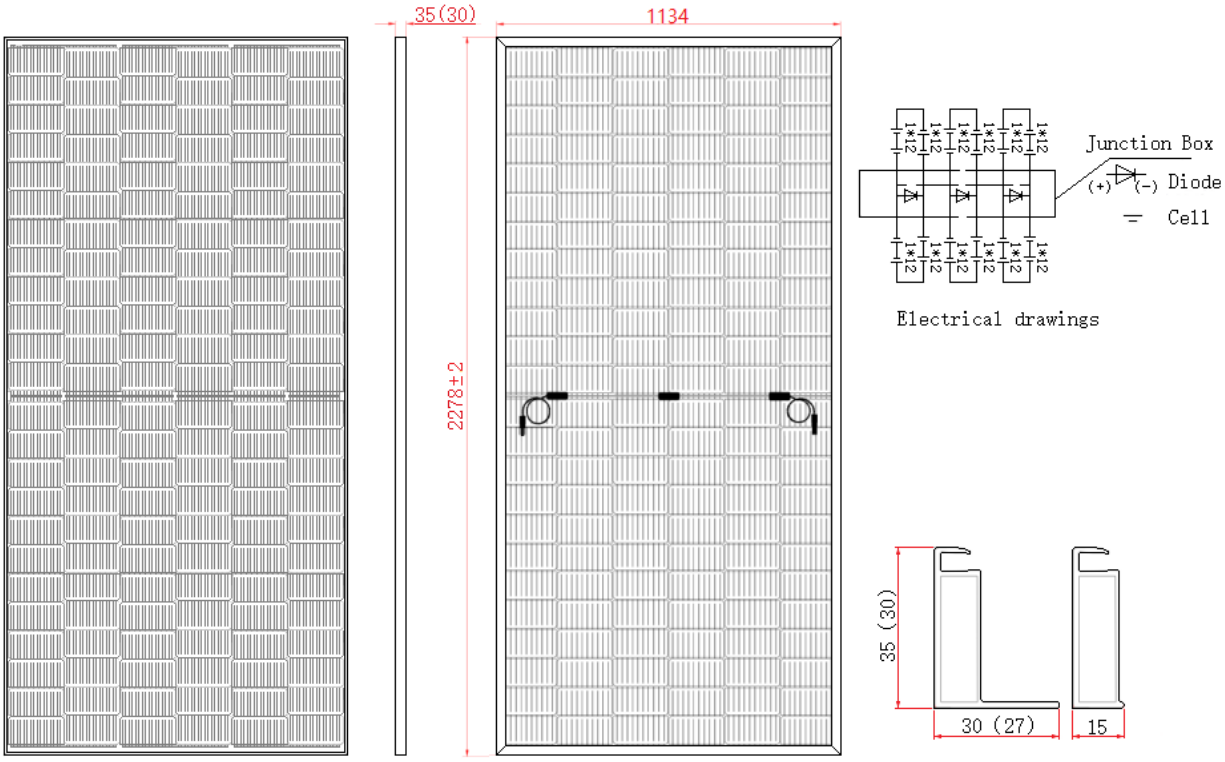
QN-xxxHT-06 series (156 cells module)



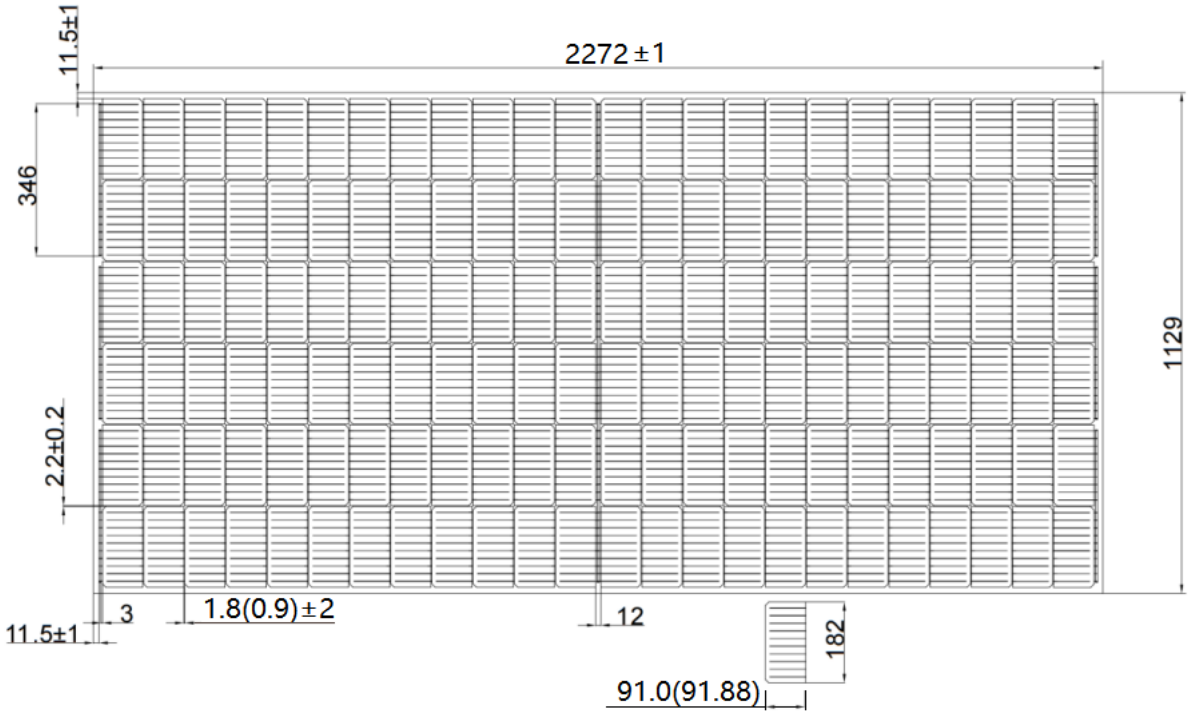
Cell and conductor layout on the laminate



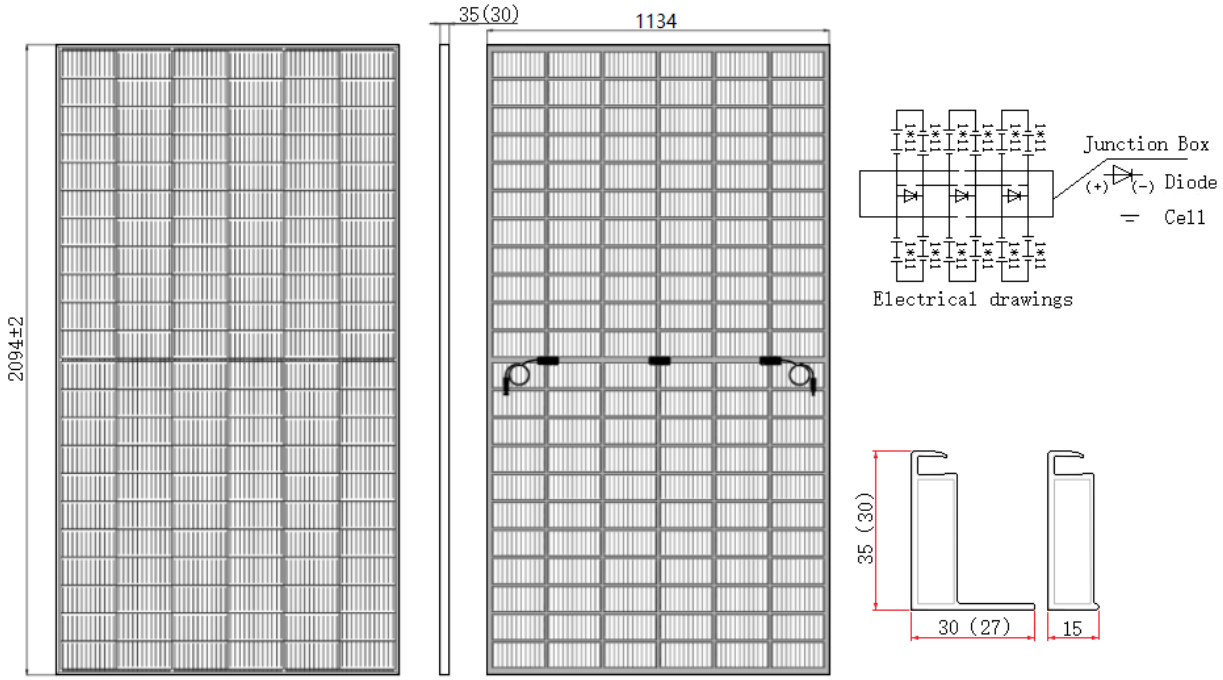
QN-xxxHT-06 series (144 cells module)



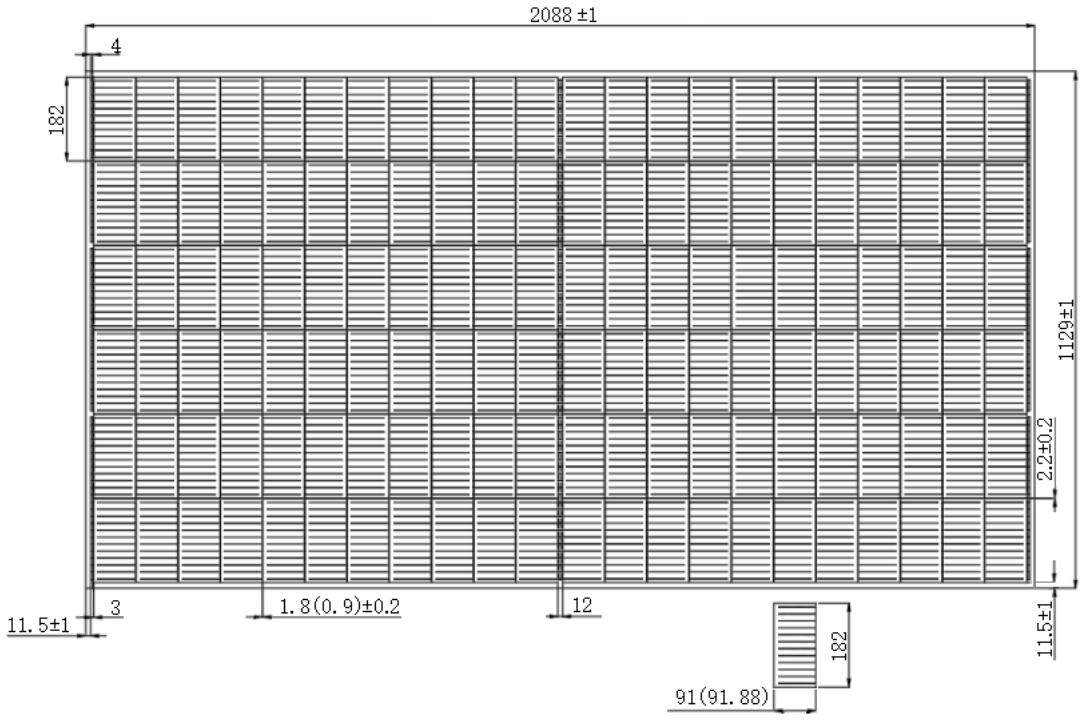
Cell and conductor layout on the laminate



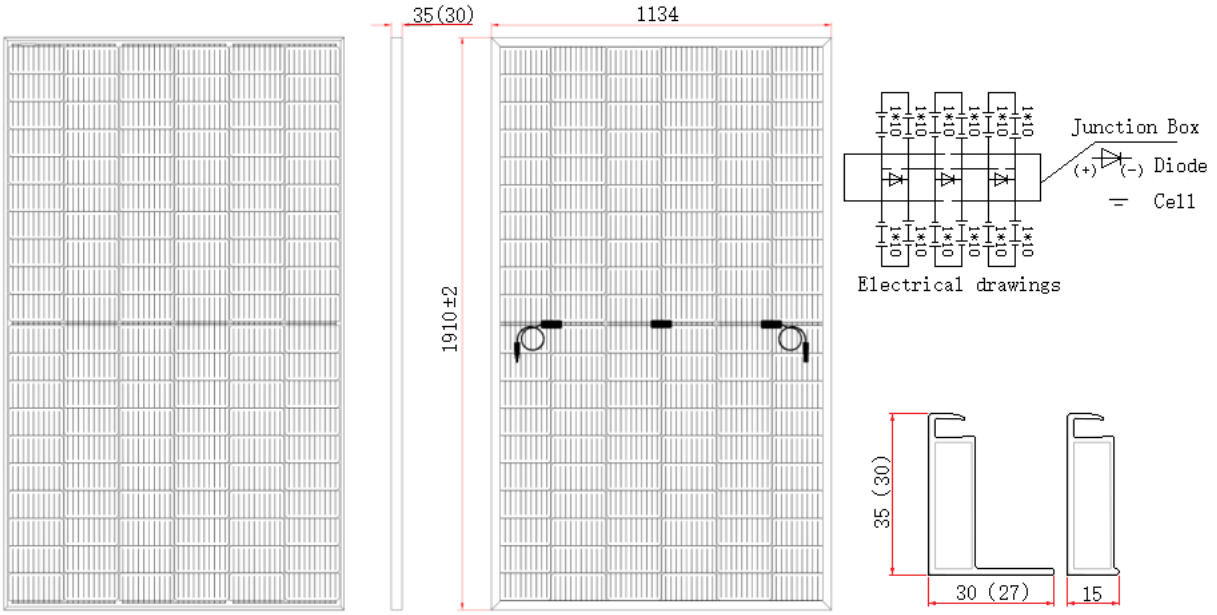
QN-xxxHT-06 series (132 cells module)



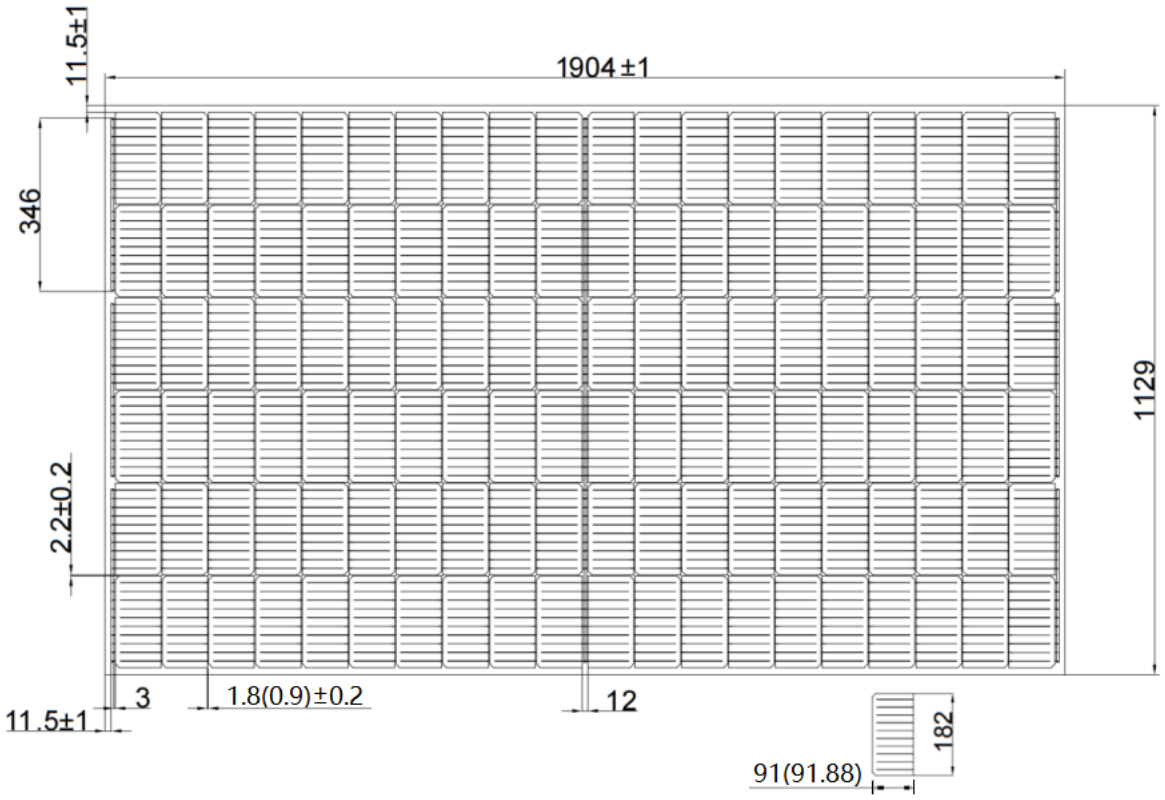
Cell and conductor layout on the laminate



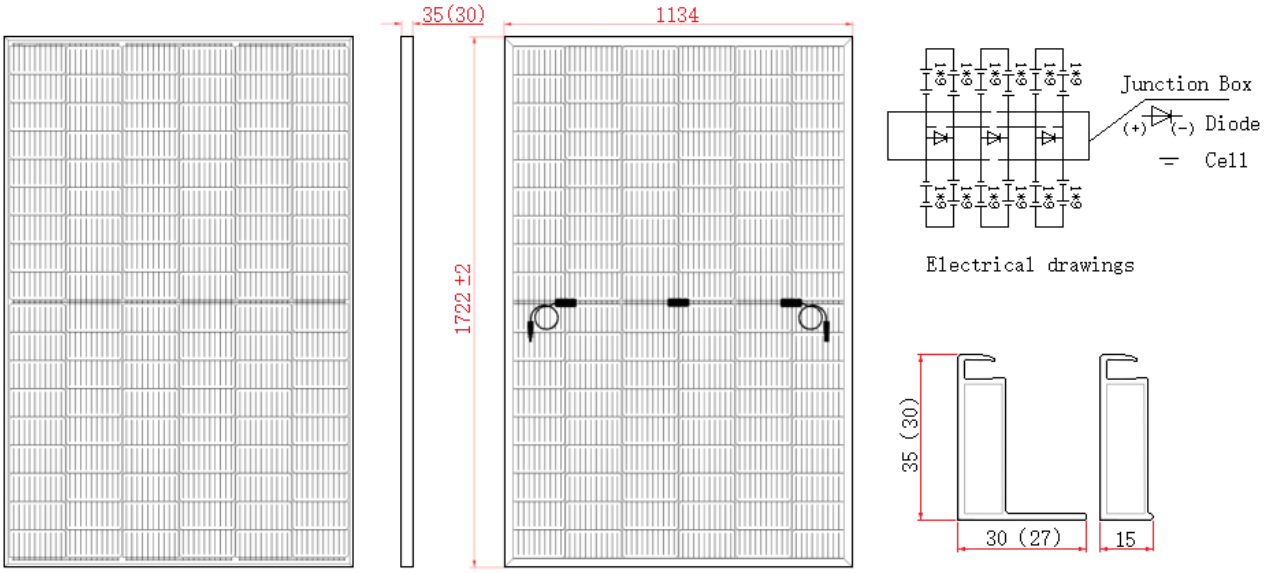
QN-xxxHT-06 series (120 cells module)



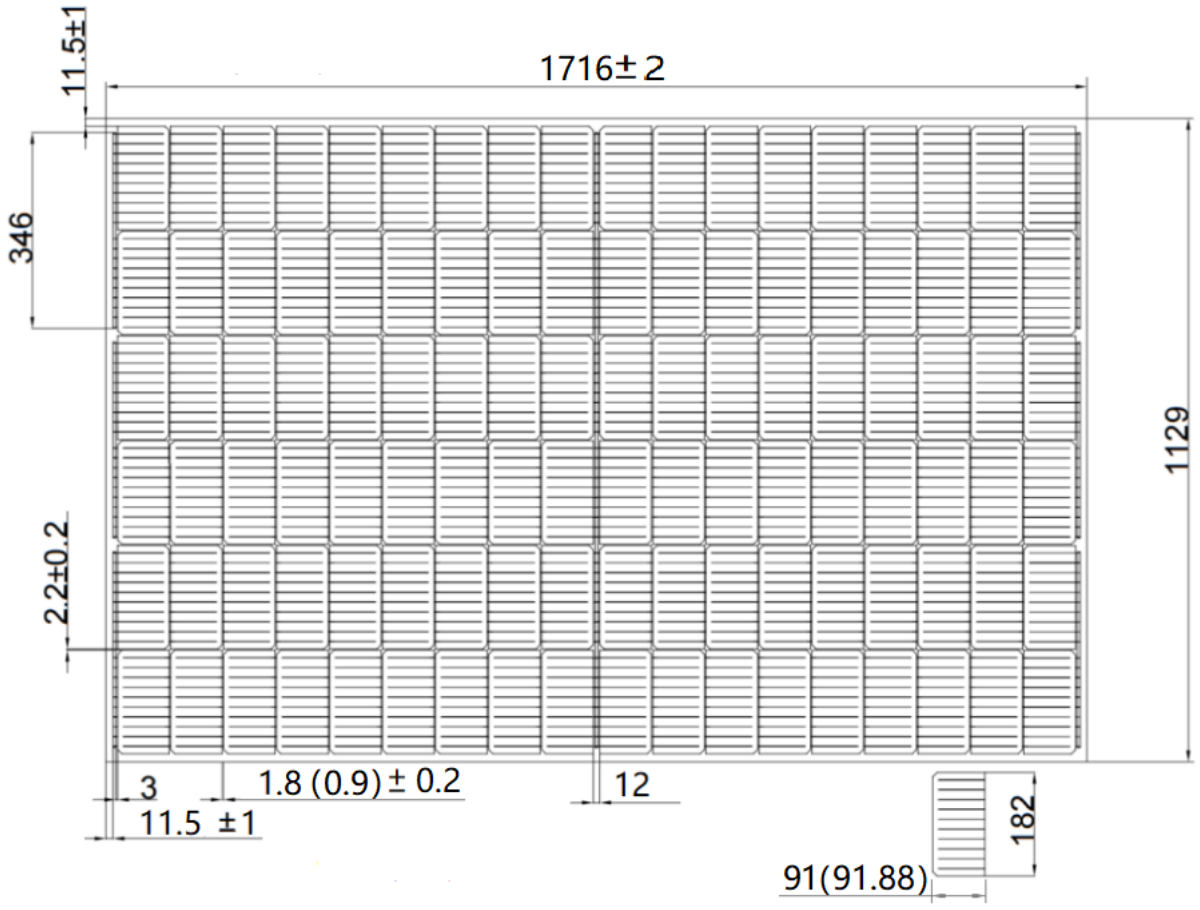
Cell and conductor layout on the laminate



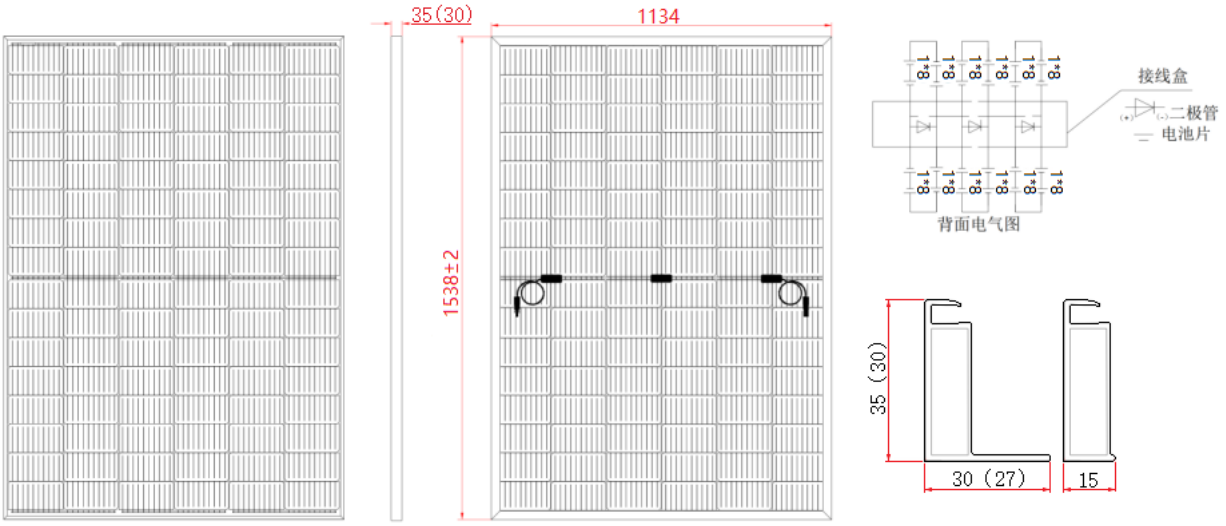
QN-xxxHT-06 series (108 cells module)



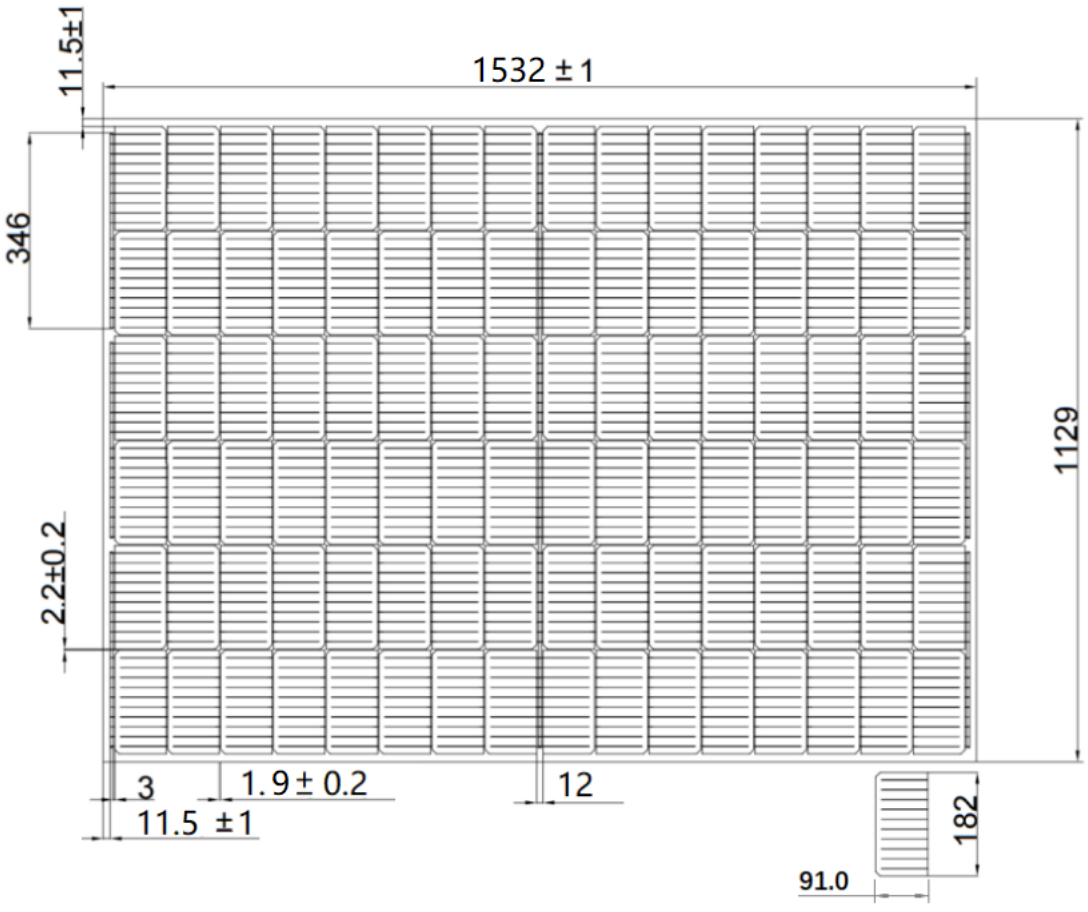
Cell and conductor layout on the laminate



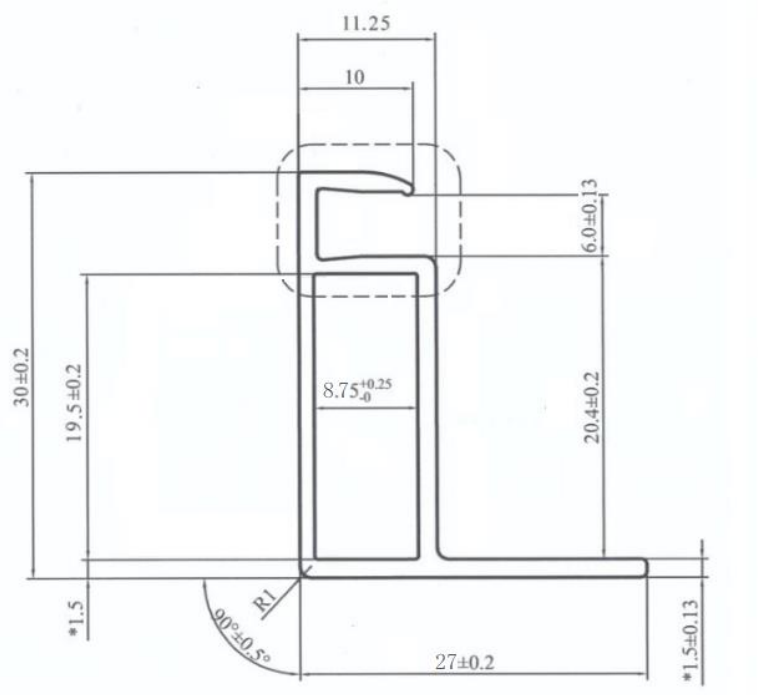
QN-xxxHT-06 series (96 cells module)



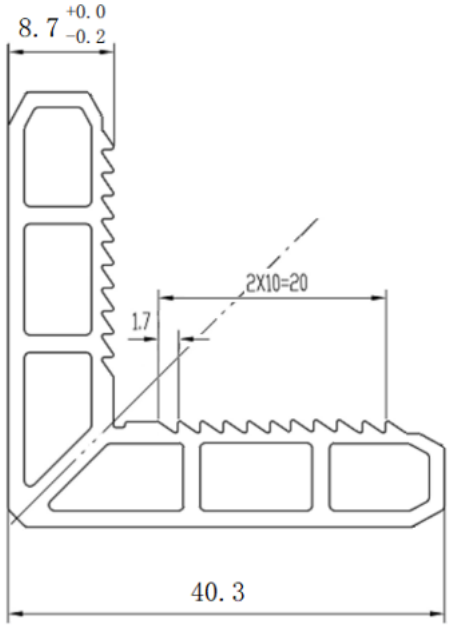
Cell and conductor layout on the laminate



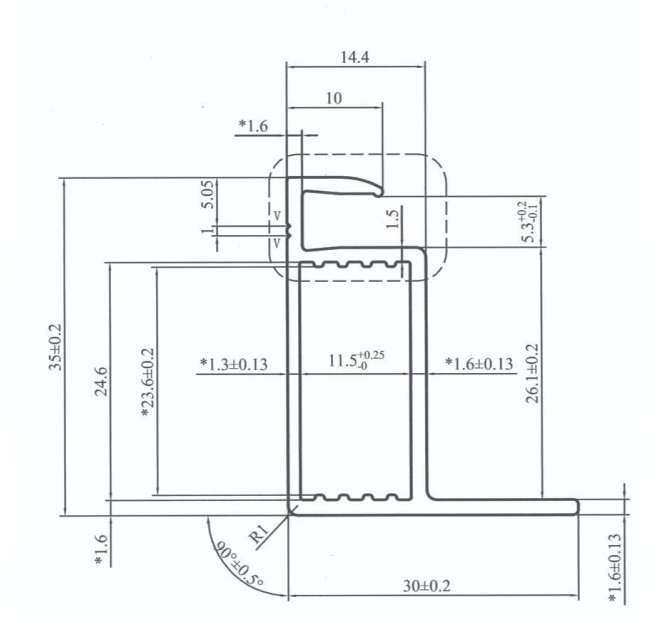
Cross section of 30mm hight frame for 2.0mm double glass module

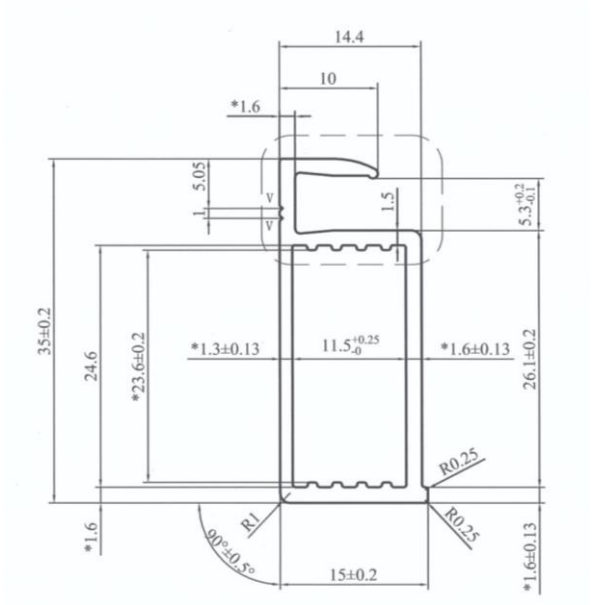


Conner key of 30mm hight frame

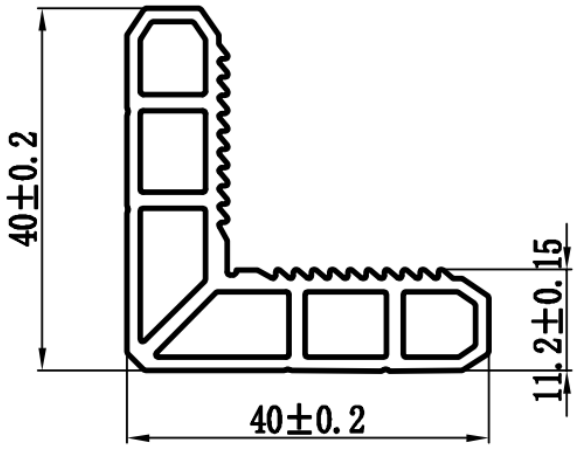


Cross section of 35mm hight frame for 2.0mm double glass module

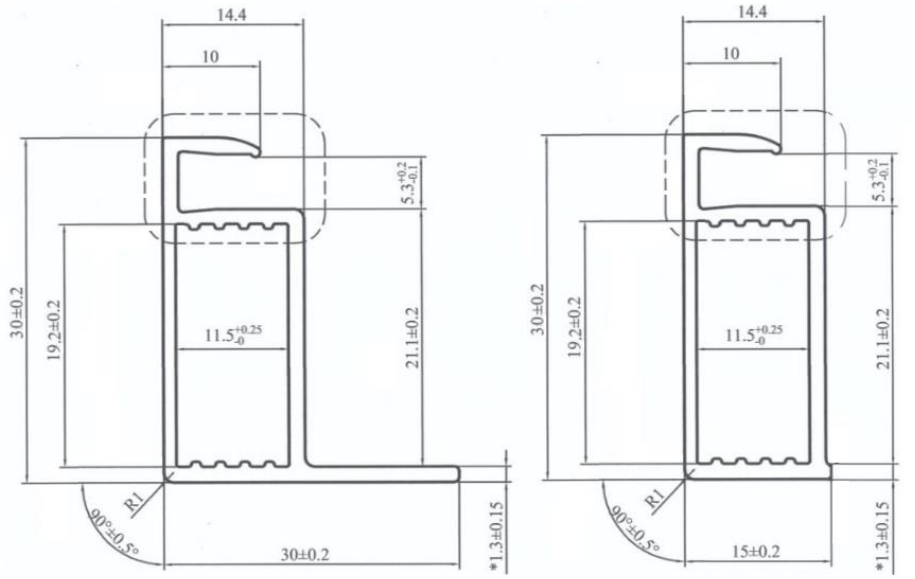




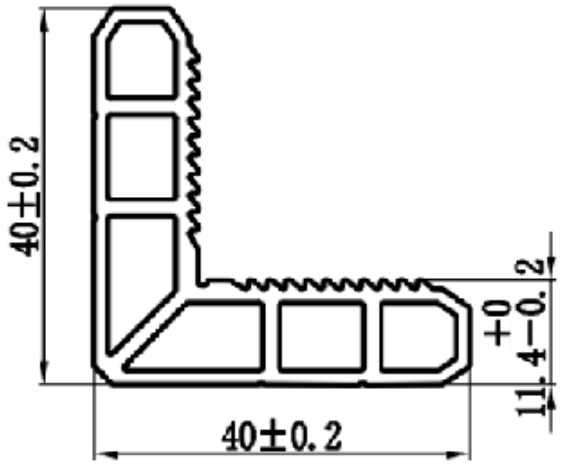
Conner key of 35mm hight frame



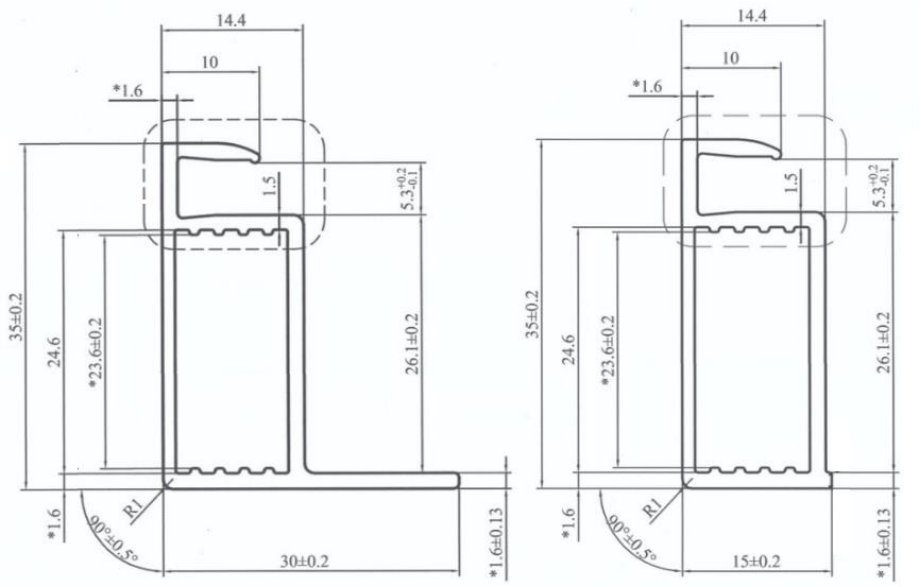
Cross section of 30mm hight frame for 1.6mm double glass module



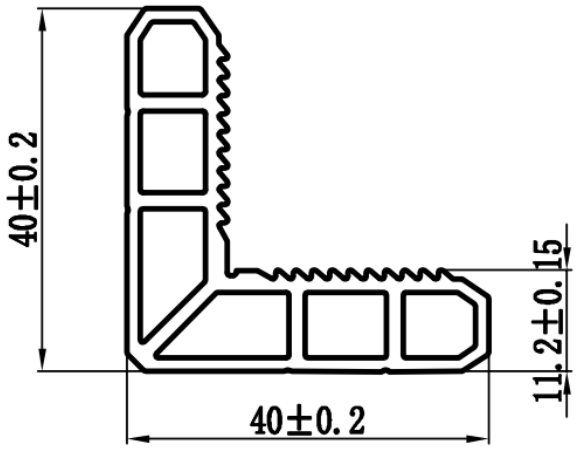
Conner key of 30mm hight frame



Cross section of 35mm hight frame for 1.6mm double glass module



Conner key of 35mm hight frame



Annex 3: List of test equipment used:

A completed list of used test equipment shall be provided in the Test Reports when a Manufacturer Testing Laboratory according to CTF stage 1 or CTF stage 2 procedure has been used.

Note: This page may be removed when CTF stage 1 or CTF stage 2 are not used. See also clause 4.8 in OD 2020 for more details.

Clause	Measurement / testing	Testing / measuring equipment / material used, (Equipment ID)	Range used	Last Calibration date	Calibration due date
N/A	N/A	N/A	N/A	N/A	N/A