REKOSER

Solar Modules

CERTIFICATIONS DOCUMENT

Certifications

Whitewall Energy presents the following certificates::

- CE Declaration of Conformity
- TUV

CE DECLARATION OF CONFORMITY

COMPANY :	Whitewall Energy and Renewable Solutions SL
ADDRESS :	Av. Jacobo Camarero s/n nave 4 18220 Albolote, Granada Spain

Declares that the following products:

PRODUCT TYPE :	Photovoltaic Modules
BRAND :	Rekoser
MODELS :	RSPM Series RSPP Series

Are in conformity with the requirements of the follwing directives of the European Union:

LVD 2014/35/EU Low Voltage
EMC 2015/30/EU Electromagnetic Compatibility (as amended)

Standards to which conformity is declared:

LVD: EN 61730-1:2007+ A1:2012+A2:2013+A11:2014
EN 61730-2:2007+ A1:2012

EMC: EN 61326-1:2013
EN 61000-6-1:2007
EN 61000-6-3:2007/A1:2011/AC:2012

CE

José González
Chief Executive
January 07 2015

whitewall

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Test report
No. TRHZP1103046/01

about the test of a technical equipment

Company: Whitewall Energy and Renewable Solutions S.L
Brand: Rekoser

Applicant: **Shenzhen Shine Solar Co., Ltd**
8th Floor，Buliding A,DongFangYaYuan,
ChenTian Communities,XiXiang Bao'an District,
Shenzhen 518109 P.R.China

Order No.: **QT-HZP1103046**

This report contains 3 text pages

Designed: 20 may. 2012 by: Roger Zhao

Reviewed: 24. 05. 2012 by: Shanne Wei

Company: Whitewall Energy and Renewable Solutions S.L
Brand: Rekoser

Applicant:

Shenzhen Shine Solar Co., Ltd

8th Floor， Buliding A,DongFangYaYuan,
ChenTian Communities,XiXiang Bao'an District,
Shenzhen 518109 P.R.China

Reference/Equipment:

Poly-crystalline Solar Cell Module

156x156:
72cells: SN***P-24(***=255-305 increment of 5)
60cells: SN***P-20(***=210-255 increment of 5)
54cells: SN***P-18(***=190-230 increment of 5)
48cells: SN***P-16(***=170-205 increment of 5)
36cells：
156x156: SN***P-12(***=120-150 increment of 5)
156x119: SN***P-12(***=95-115 increment of 5)
156x93.7: SN***P-12-1(***=75-90 increment of 5)
156x76.1: SN***P-12-2(***=60-75 increment of 5)
156x59.5: SN***P-12(***=50-55 increment of 5)
156x46.8: SN***P-12-3(***=40-45 increment of 5)
156x43.2: SN***P-12-4(***=35-40 increment of 5)
156x35.6: SN***P-12-5(***=30-35 increment of 5)
156x29.5: SN***P-12(***=25)
156x24.0: SN***P-12(***=20)
156x17.5: SN***P-12(***=15)
78x24.0: SN***P-12(***=10)
78x11.7: SN***P-12(***=5)

Mono-crystalline Solar Cell Module

156x156:
72cells: SN***M-24(***=255-305 increment of 5)
60cells: SN***M-20(***=210-255 increment of 5)
54cells: SN***M-18(***=190-230 increment of 5)
48cells: SN***M-16(***=170-205 increment of 5)
125x125:
96cells: SN***M-32(***=215-260 increment of 5)
72cells: SN***M-24(***=160-195 increment of 5)
60cells: SN***M-20(***=135-165 increment of 5)
54cells: SN***M-18(***=120-145 increment of 5)
48cells: SN***M-16(***=110-130 increment of 5)
36cells:
156x156: SN***M-12(***=125-150 increment of 5)
156x119: SN***M-12-1(***=95-115 increment of 5)
125x125: SN***M-12-2(***=80-95 increment of 5)
125x101: SN***M-12-3(***=65-80 increment of 5)
125x86.8: SN***M-12-4(***=55-65 increment of 5)
125x72: SN***M-12-5(***=45-55 increment of 5)
125x59.9: SN***M-12-6(***=40-45 increment of 5)
125x49.7: SN***M-12(***=35)
125x43.2: SN***M-12(***=30)
125x35.4: SN***M-12(***=25)
125x28.3: SN***M-12(***=20)
125x20.6: SN***M-12(***=15)
125x14.2: SN***M-12(***=10)
62.5x14.2: SN***M-12(***=5)

Rating:

Maximun System Voltage	DC 1000V
Application Class	Class A
Safety class	II

Date of receipt: 13.01.2012

Type of examination: Conformity testing with TÜV mark

Test regulations:

IEC/EN 61215: 2005
IEC 61730-1:2004/EN 61730-1:2007
IEC 61730-2:2004/EN 61730-2:2007

Testing period: 16.01.2012- 11.04.2012

Test location:

CCIC Southern Electronic Product Testing(Shenzhen) Co.,Ltd
Electronic Testing Building, Shahe Road, Xili, Nanshan District,
Shenzhen 518055, P.R. China

Applicant	**Shenzhen Shine Solar Co., Ltd** 8th Floor， Buliding A,DongFangYaYuan, ChenTian Communities,XiXiang Bao'an District, Shenzhen 518109 P.R.China
Manufacturer	**Shenzhen Shine Solar Co., Ltd** 8th Floor， Buliding A,DongFangYaYuan, ChenTian Communities,XiXiang Bao'an District, Shenzhen 518109 P.R.China
Date of Application	05.01.2012
Product	Crystalline Silicon PV Module
Model No.	**Poly-crystalline Solar Cell Module** 156x156: 72cells: SN***P-24(***=255-305 increment of 5) 60cells: SN***P-20(***=210-255 increment of 5) 54cells: SN***P-18(***=190-230 increment of 5) 48cells: SN***P-16(***=170-205 increment of 5) 36cells： 156x156: SN***P-12(***=120-150 increment of 5) 156x119: SN***P-12(***=95-115 increment of 5) 156x93.7: SN***P-12-1(***=75-90 increment of 5) 156x76.1: SN***P-12-2(***=60-75 increment of 5) 156x59.5: SN***P-12(***=50-55 increment of 5) 156x46.8: SN***P-12-3(***=40-45 increment of 5) 156x43.2: SN***P-12-4(***=35-40 increment of 5) 156x35.6: SN***P-12-5(***=30-35 increment of 5) 156x29.5: SN***P-12(***=25) 156x24.0: SN***P-12(***=20) 156x17.5: SN***P-12(***=15) 78x24.0: SN***P-12(***=10) 78x11.7: SN***P-12(***=5) **Mono-crystalline Solar Cell Module** 156x156: 72cells: SN***M-24(***=255-305 increment of 5) 60cells: SN***M-20(***=210-255 increment of 5) 54cells: SN***M-18(***=190-230 increment of 5) 48cells: SN***M-16(***=170-205 increment of 5) 125x125: 96cells: SN***M-32(***=215-260 increment of 5) 72cells: SN***M-24(***=160-195 increment of 5) 60cells: SN***M-20(***=135-165 increment of 5) 54cells: SN***M-18(***=120-145 increment of 5) 48cells: SN***M-16(***=110-130 increment of 5) 36cells: 156x156: SN***M-12(***=125-150 increment of 5) 156x119: SN***M-12-1(***=95-115 increment of 5) 125x125: SN***M-12-2(***=80-95 increment of 5) 125x101: SN***M-12-3(***=65-80 increment of 5) 125x86.8: SN***M-12-4(***=55-65 increment of 5) 125x72: SN***M-12-5(***=45-55 increment of 5) 125x59.9: SN***M-12-6(***=40-45 increment of 5) 125x49.7: SN***M-12(***=35) 125x43.2: SN***M-12(***=30) 125x35.4: SN***M-12(***=25) 125x28.3: SN***M-12(***=20) 125x20.6: SN***M-12(***=15) 125x14.2: SN***M-12(***=10) 62.5x14.2: SN***M-12(***=5)
General Information • Maximum System Voltage • Application Class • Electrical Protection Class	 DC 1000V Class A Class II
Type of examination	Conformity testing with TÜV mark
Testing Period	16.01.2012- 11.04.2012
Testing Laboratory	**CCIC Southern Electronic Product Testing(Shenzhen) Co.,Ltd** Electronic Testing Building, Shahe Road, Xili, Nanshan District, Shenzhen 518055, P.R. China

Test results listed in this test report refer exclusively to the mentioned test sample.
Partly copying is not permitted without explicit agreement of the owner.
The submitted test samples as described in the reports hereunder are in compliance with the requirements IEC 61215: 2005 "Crystalline Silicon Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type Approval"

Approved by

Annex (No. of pages):	Annex 1 to TRGZP100411/01 (IEC 61215 report, 36 Pages) Annex 2 to TRGZP100411/01 (IEC 61730-1 report, 18 Pages) Annex 3 to TRGZP100411/01 (IEC 61730-2 report, 23Pages) Annex 4 to TRGZP100411/01 (CDF, 4Pages) Annex 5 to TRGZP100411/01 (Equipment list, 1Page) Annex 6 to TRGZP100411/01 (Photos, 4Pages)
Test results:	The referenced units are in compliance with the above requirements.

Copy of marking plate

SHINE

PHOTOVOLTAIC MODULE
MODEL TYPE:SN280P24-72

MAXIMUM POWER	Pmax	280	±3%	W
SHORT CIRCUIT CURRENT	Isc	8.29		A
OPEN CIRCUIT VOLTAGE	Voc	43.20		V
MAXIMUM POWER CURRENT	Imp	7.78		A
MAXIMUM POWER VOLTAGE	Vmp	36.00		V
MAX. SYSTEM VOLTAGE		1000		V
FUSE RATING		15		A
MODULE DIMENSION		1950×992×40mm		
MODULE APPLICATION:		CLASS A		

*All technical data at standard test conditions:
AM 1.5,1000W/m2 IRRADIANCE, 25℃ CELL TEMPERATURE

WARNING ELECTRICAL HAZARD SOLAR MODULES CAN PRODUCE HIGH VOLTAGES WHEN EXPOSED TO SUNLIGHT. COVER MODULES WHEN CONNECTING WIRING,READ,UNDERSTAND AND FOLLOW ALL SAFETY PRECAUTIONS DESCRIBED IN MODULE INSTALLATION MANUAL, REMOVAL OF TERMINAL BLOCK VOIDS WARRANTY.

DATE OF MANUFACTURE: APIRL,2012
MANUFACTURER:
MADE IN CHINA

SHINE

PHOTOVOLTAIC MODULE
MODEL TYPE:SN290M24-72

MAXIMUM POWER	Pmax	290	±3%	W
SHORT CIRCUIT CURRENT	Isc	8.42		A
OPEN CIRCUIT VOLTAGE	Voc	43.20		V
MAXIMUM POWER CURRENT	Imp	8.05		A
MAXIMUM POWER VOLTAGE	Vmp	36.00		V
MAX. SYSTEM VOLTAGE		1000		V
FUSE RATING		15		A
MODULE DIMENSION		1580×808×40mm		
MODULE APPLICATION:		CLASS A		

*All technical data at standard test conditions:
AM 1.5,1000W/m2 IRRADIANCE, 25℃ CELL TEMPERATURE

WARNING ELECTRICAL HAZARD SOLAR MODULES CAN PRODUCE HIGH VOLTAGES WHEN EXPOSED TO SUNLIGHT. COVER MODULES WHEN CONNECTING WIRING,READ,UNDERSTAND AND FOLLOW ALL SAFETY PRECAUTIONS DESCRIBED IN MODULE INSTALLATION MANUAL, REMOVAL OF TERMINAL BLOCK VOIDS WARRANTY.

DATE OF MANUFACTURE: APIRL,2012
MANUFACTURER:
MADE IN CHINA

Summary of testing:

The model SN280P24-72 and SN290M24-72 were selected as the representative test model had been carried out all the test clauses.

All of the required tests of the IEC/ EN 61215:2005 standard were passed according to the pass criteria. It is therefore declared, that the photovoltaic modules of the aforementioned types fulfil the requirements of the standard IEC/ EN 61215:2005 and it is recommended that certification should be granted.

GENERAL INFORMATION	
Test item particulars:	
Accessories and detachable parts included in the evaluation:	Mounting device
Options included ....:	N/A
Abbreviations used in the report:	
HF – Humidity Freeze	TC – Temperature Cycling
DH – Damp Heat	Vmpp – Maximum power voltage
Imp – Maximum power current	Voc – Open circuit voltage
Isc - Short circuit current	FF – Fill factor
Pmp – Maximum power	α – Current temperature coefficient
NOCT – Nominal Operating Cell Temperature	β – Voltage temperature coefficient
STC – Standard Test Conditions	γ– power temperature coefficient
Possible test case verdicts: - test case does not apply to the test object ....:	Not Apply (N/A)
- test object does meet the requirement................................:	Pass(P)
- test object does not meet the requirement..........................:	Fail(F)

General remarks:

The test verdicts presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.
"(see Enclosure #)" refers to additional information appended to the report.
"(see appended table)" refers to a table appended to the report.

Throughout this report a point is used as the decimal separator.

Detailed product information are to be found in the CDF (constructional data form).

Description of module construction(The representative test model SN280P24-72&SN290M24-72): (Manufacturer and part numbers, unless otherwise specified)

☐ Random sampling from production
☒ Prototype submitted by client

☒ New module type
☐ Modifications (if yes, please choose the applicable modification according to the Retesting Guideline)

- ☒ Change in cell technology
- ☐ Modification to encapsulation system
- ☐ Modification to superstrate
- ☐ Increase in module Area
- ☐ Modification to backsheet/ substrate
- ☐ Modification to frame and/ or mounting structure
- ☐ Modification to junction box/ electrical termination
- ☐ Change in cell interconnect materials or technique
- ☐ Change in electrical circuit of an identical package
- ☐ Higher or lower power output (by 10%) in the identical package including Area and using the identical cell process
- ☐ Qualification of a frameless module after the design has received certification as a framed module
- ☐ Change in bypass diode or number of diodes

Description of similarity (differences) between the applied model and the previously tested model:

- Based on basic project, extend to 6" & 5"mono solar cell.

Module group assignment:

Module type: SN280P24-72

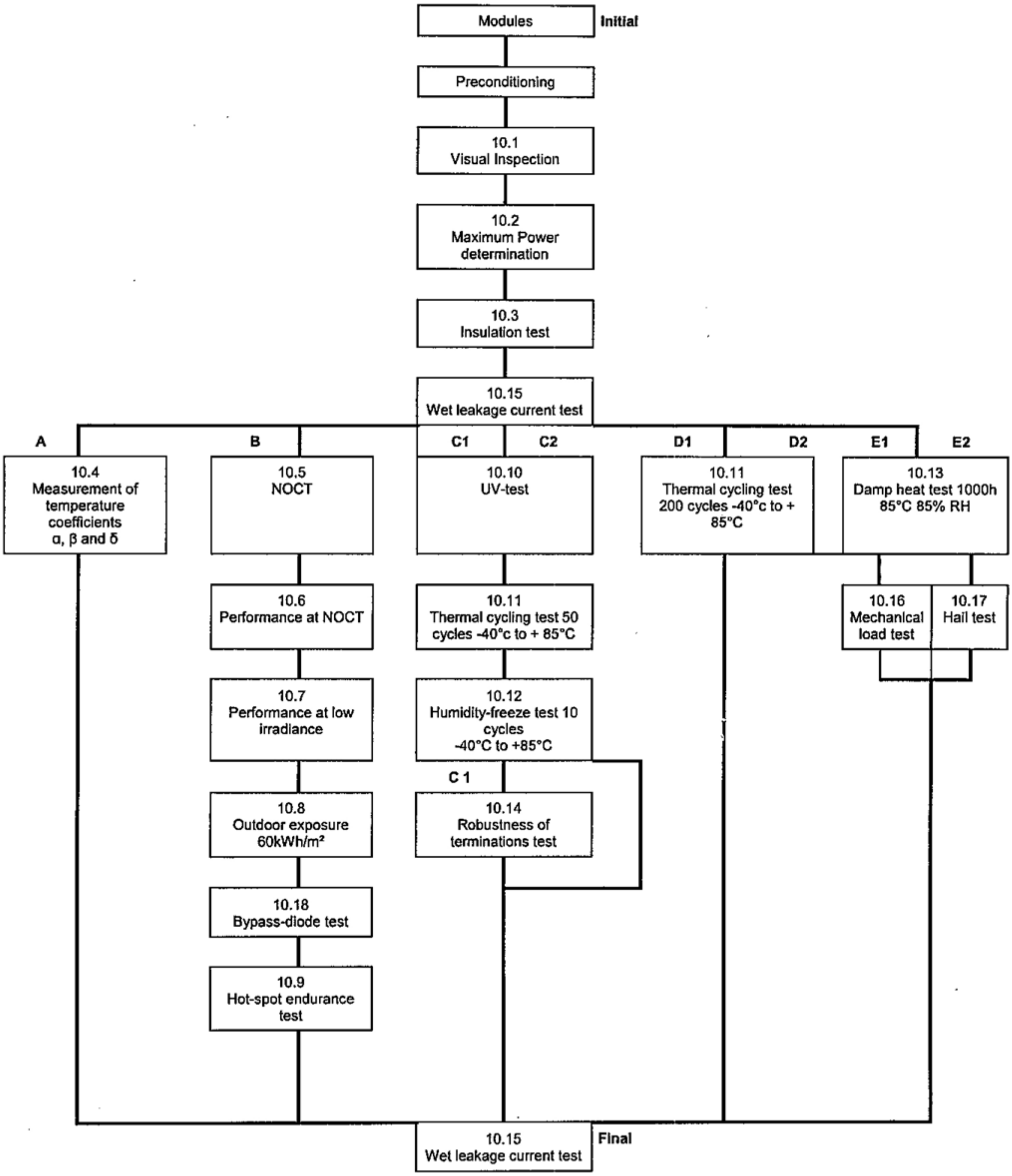
Sample #	Sample Group ID	Model	Sample S/N
1	A	SN280P24-72	SN-P280W00008
2	B	SN280P24-72	SN-P280W00010
3	C1	SN280P24-72	SN-P280W00011
4	C2	SN280P24-72	SN-P280W00009
5	D1	SN280P24-72	SN-P280W00007
6	D2, IV[3]	SN280P24-72	SN-P280W00003
7	E1	SN280P24-72	SN-P280W00004
8	E2	SN280P24-72	SN-P280W00002
9	B	SN280P24-72	SN-P280W00006
10	B	SN280P24-72	SN-P280W00001
11	TT[1], BO[2]	SN280P24-72	SN-P280W00005

12	MB[4]	SN280P24-72	SN-P280W00012
Module type: SN290M24-72			
13	A	SN290M24-72	110510XT992
14	B	SN290M24-72	110510XT888
15	D1	SN290M24-72	110510XT990
16	D2	SN290M24-72	110510XT919
17	E1	SN290M24-72	110510XT912
18	E2	SN290M24-72	110510XT864
19	TT[1], RC[2]	SN290M24-72	110510XT981
Supplementary information: Area of module: 1.94[m²]			

Remark:

1. TT: MST21 Temperature test of IEC/EN 61730-2.
2. RC: MST26 Reverse current overload test of IEC/EN 61730-2.
3. IV: MST14 Impulse voltage test of IEC/EN 61730-2.
4. MB: MST32 Module breakage test of IEC/EN 61730-2.

10	**TEST PROCEDURES** Note: Deviations from test sequence are possible but must be documented.



IEC61215			
Clause	Requirement + Test	Result - Remark	Verdict

4	**MARKING**		
	Name, monogram or symbol of manufacturer...... :	Printed on nameplate	P
	Type or model number .... :	Printed on nameplate	P
	Serial number.. :	Attached separately beside the string connectors	P
	Polarity of terminals or leads .... :	Marked with color	P
	Maximum system voltage..................................... :	1000VDC	P
	The date and place of manufacture .... :	Traceable from serial number	P

Module type: SN280P24-72

	Initial examination	All modules	
10	Preconditioning ....:	Performed by manufacturer	P
10.1	Visual inspection ....:	See table 10.1	P
10.2	Maximum power determination............................:	See table 10.2	P
10.3	Insulation test ....:	See table 10.3	P
10.15	Wet leakage current test ....:	See table 10.15	P

Group A	Control Module	Sample Group ID A	
10.4	Measurement of temperature coefficients............ :	See table 10.4 B	—

Group B	3 Modules		
10.5	Measurement of Nominal Operating Cell Temperature [NOCT, °C] ....:	See table 10.5 B	—
10.6	Performance at STC and NOCT ....:	See table 10.6 B	—
10.7	Performance at low irradiance ....:	See table 10.7 B	—
10.8	Outdoor exposure test...	See table 10.8 B	P
10.18	Bypass diode thermal test....................................	See table 10.18 B	P
	Maximum allowed junction temperature ....:	200°C	—
	Measured junction temperature ....:	See table 10.18 B	P
10.9	Hot spot endurance test ....:	See table 10.9 B	P

Group C	2 Modules	Sample Group ID C1, C2	
10.10	UV test ....:	15.22 kWh/m²	P
	Final measurements	See table 10.10 C	P
10.11	Thermal cycling test (50 cycles) .... :	50 cycles	P
	Final measurements	See table 10.11 C	P

IEC61215			
Clause	Requirement + Test	Result - Remark	Verdict

10.12	Humidity freeze (10 cycles) ....:	10 cycles	P
	Final measurements	See table 10.12 C	P

Group C1	1 Module	Sample Group ID C1	
10.14	Robustness of terminations test ....:	See table 10.14 C1	P
	Final measurements	See table 10.14 C1	P

Group D	2 Modules	Sample Group ID D1, D2	
10.11	Thermal cycling test (200 cycles) ....:	200 cycles	P
	Final measurements	See table 10.11 D	P

Group E	2 Modules	Sample Group ID E1, E2	
10.13	Damp heat test...:	See table 10.13 E	P
	Final measurements	See table 10.13 E	P

Group E1	1 Module	Sample Group ID E1	
10.16	Mechanical load test	2400Pa	P
10.16.4	-No open-circuits or ground faults detected	Yes	P
	Final measurements	See table 10.16 E1	P

Group E2	1 Module	Sample Group ID E2	
10.17	Hail test	See table 10.17 E2	P
	Number of points impacted	11 points	P
	Final measurements	See table 10.17 E2	P

	Final measurement	All modules	
10.15	Wet leakage current test	See table 10.15 F	P

Module type: SN290M24-72

	Initial examination	All modules	—
10	Preconditioning	Performed by manufacturer	P
10.1	Visual inspection	See table 10.1 Int.	P
10.2	Maximum power determination	See table 10.2 Int.	P
10.3	Insulation test	See table 10.3 Int.	P
10.15	Wet leakage current test	See table 10.15 Int.	P

IEC61215			
Clause	Requirement + Test	Result - Remark	Verdict

Group A	Control Module	Sample Group ID A	—
10.4	Measurement of temperature coefficients	See table 10.4 B	—
10.7	Performance at low irradiance	See table 10.7 B	—

Group B1	1 Module	Sample Group ID B	—
10.9	Hot spot endurance test	See table 10.9 B	P

Group D	2 Modules	Sample Group ID D1, D2	—
10.11	Thermal cycling test (200 cycles)	200 cycles	P
	Final measurements	See table 10.11 D	P

Group E1,E2	2 Module	Sample Group ID E1,E2	—
10.13	Damp heat test	1000h	P
	Final measurements	See table 10.13 E	P

Group E1	1 Module	Sample Group ID E2	—
10.16	Mechanical load test	2400Pa	P
10.16.4	-No open-circuits or ground faults detected	Yes	P
	Final measurements	See table 10.16 E2	P

	Final measurement	All modules	P
10.15	Wet leakage current test	See table 10.15 F	P

IEC61215			
Clause	Requirement + Test	Result - Remark	Verdict

Main test model test results description:
Module type: SN280P24-72

10.1 Initial	**TABLE: Visual inspection (Initial)**	—
Test Date [MM/DD/YYYY]........................:	01/16/2012	—
Sample #	Nature and position of initial findings – comments or attach photos	—
1#	No visual defects	P
2#	No visual defects	P
3#	No visual defects	P
4#	No visual defects	P
5#	No visual defects	P
6#	No visual defects	P
7#	No visual defects	P
8#	No visual defects	P
9#	No visual defects	P
10#	No visual defects	P
11#	No visual defects	P
Supplementary information: N/A.		

10.2 Initial	**TABLE: Maximum power determination (initial)**					—
Test Date [MM/DD/YYYY]........................:	01/16/2012					—
Module temperature [°C] ....:	Corrected to 25					—
Irradiance [W/m^2).......................................:	Corrected to 1000					—
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmax [W]	FF [%]
1#	44.73	34.76	8.58	8.09	281.2	73.3
2#	44.62	34.56	8.57	8.08	279.1	73.0
3#	44.74	34.81	8.57	8.07	281.0	73.3
4#	44.71	34.99	8.56	7.97	278.7	72.9
5#	44.57	34.71	8.62	8.07	280.0	72.9
6#	44.70	34.85	8.61	8.10	282.2	73.4
7#	44.55	34.96	8.66	8.03	280.5	72.7
8#	44.70	34.84	8.64	8.07	281.1	72.8
9#	44.62	34.56	8.57	8.08	279.1	73.0
10#	44.61	34.46	8.59	8.13	280.2	73.1
11#	44.79	34.41	8.57	8.11	279.1	72.7
Supplementary information: N/A						

IEC61215			
Clause	Requirement + Test	Result - Remark	Verdict

10.3 Initial	Table: Insulation test (initial)			—
Test Date [MM/DD/YYYY]........................:			01/16/2012	—
Test Voltage applied [V] ....:			3000V/1min and 1000V/2min	—
Sample #	Measured	Required	Dielectric breakdown	Result
	MΩ	MΩ	Yes (description) / No	
1#	>9999	20.6	No	P
2#	>9999	20.6	No	P
3#	>9999	20.6	No	P
4#	>9999	20.6	No	P
5#	>9999	20.6	No	P
6#	>9999	20.6	No	P
7#	>9999	20.6	No	P
8#	>9999	20.6	No	P
9#	>9999	20.6	No	P
10#	>9999	20.6	No	P
11#	>9999	20.6	No	P
Min. requirement acc. to the standard is 40MΩ. m²				
Supplementary information: Area of module: 1.94 [m²]				

10.15 Initial	TABLE: Wet leakage current test (Initial)			—
Test Date [MM/DD/YYYY].................................:		01/16/2012		—
Test Voltage applied [V] ....:		1000V/2min.		—
Solution resistivity [Ω cm] ....:		1825	< 3,500 Ω cm	—
Solution temperature [°C] .... :		23.0	22±3 °C	—
Sample #	Measured [MΩ]	Limit [MΩ]		Result
1#	3678	20.6		P
2#	3597	20.6		P
3#	4504	20.6		P
4#	3930	20.6		P
5#	5025	20.6		P
6#	4515	20.6		P
7#	4225	20.6		P
8#	5022	20.6		P

IEC61215			
Clause	Requirement + Test	Result - Remark	Verdict

9#	3977	20.6	P
10#	3816	20.6	P
11#	3853	20.6	P
Min. requirement acc. to the standard is 40MΩ. m²			
Supplementary information: Area of module: 1.94 [m²]			

Module type: SN290M24-72

10.1 Initial	TABLE: Visual inspection (Initial)	—
Test Date [MM/DD/YYYY]........................:	01/16/2012	—
Sample #	Nature and position of initial findings – comments or attach photos	—
13#	No visual defects	P
14#	No visual defects	P
15#	No visual defects	P
16#	No visual defects	P
17#	No visual defects	P
18#	No visual defects	P
19#	No visual defects	P
Supplementary information: N/A.		

10.2 Initial	TABLE: Maximum power determination (initial)					—
Test Date [MM/DD/YYYY]........................:		01/16/2012				—
Module temperature [°C] ....:		Corrected to 25				—
Irradiance [W/m²].....................................:		Corrected to 1000				—
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmax [W]	FF [%]
13#	44.91	34.61	8.90	8.34	288.6	72.2
14#	44.86	34.95	8.89	8.31	290.4	72.8
15#	44.89	35.02	8.92	8.28	289.8	72.3
16#	44.95	34.62	8.88	8.36	289.4	72.5
17#	44.76	34.76	8.82	8.27	287.6	72.8
18#	44.90	35.30	8.88	8.23	290.4	72.9
19#	44.82	35.00	8.87	8.29	290.2	73.0
Supplementary information: N/A.						

IEC61215			
Clause	Requirement + Test	Result - Remark	Verdict

10.3 Initial	Table: Insulation test (initial)			—
Test Date [MM/DD/YYYY]........................:		01/16/2012		—
Test Voltage applied [V] ....:		3000V/1min and 1000V/2min		—
Sample #	Measured	Required	Dielectric breakdown	Result
	MΩ	MΩ	Yes (description) / No	
13#	>9999	20.6	No	P
14#	>9999	20.6	No	P
15#	>9999	20.6	No	P
16#	>9999	20.6	No	P
17#	>9999	20.6	No	P
18#	>9999	20.6	No	P
19#	>9999	20.6	No	P
Min. requirement acc. to the standard is 40MΩ. m²				
Supplementary information: Area of module: 1.94 [m²]				

10.15 Initial	TABLE: Wet leakage current test (Initial)			—
Test Date [MM/DD/YYYY]...................................:		01/16/2012		—
Test Voltage applied [V] ....:		1000V/2min.		—
Solution resistivity [Ω cm] ....:		1700	< 3,500 Ω cm	—
Solution temperature [°C] ....:		23.0	22±3 °C	—
Sample #	Measured [MΩ]	Limit [MΩ]		Result
13#	2456	20.6		P
14#	2697	20.6		P
15#	2397	20.6		P
16#	2494	20.6		P
17#	2163	20.6		P
18#	2544	20.6		P
19#	2613	20.6		P
Min. requirement acc. to the standard is 40MΩ. m²				
Supplementary information: Area of module: 1.94[m²]				

IEC61215			
Clause	Requirement + Test	Result - Remark	Verdict

Module type: SN280P24-72

10.4 B	**TABLE: Measurement of temperature coefficients**		—
Test Date [MM/DD/YYYY]:		01/16/2012	—
Ambient air temperature [°C] high/low:		N/A	—
Irradiance [W/m^2]high/low:		1000±50	—
Module temperature [°C] high/low:		63.5/25.2	—
Sample #	**Parameter**	**Calculated Value**	—
1#	α [%/°C):	0.061	—
	β [%/°C):	-0.423	—
	δ [%/°C):	-0.432	—
Supplementary information: N/A.			

Module type: SN290M24-72

10.4 B	TABLE: Measurement of temperature coefficients		—
Test Date [MM/DD/YYYY]:		01/16/2012	—
Ambient air temperature [°C] high/low:		N/A	—
Irradiance [W/m^2]high/low:		1000±50	—
Module temperature [°C] high/low:		65.3/25.4	—
Sample #	**Parameter**	**Calculated Value**	—
13#	α [%/°C):	0.061	—
	β [%/°C):	-0.35	—
	δ [%/°C):	-0.41	—
Supplementary information: N/A.			

IEC61215			
Clause	Requirement + Test	Result - Remark	Verdict

Module type: SN280P24-72

10.5 B	TABLE: Measurement of Nominal Operating Cell Temperature [NOCT, °C]			—
Test Date [MM/DD/YYYY] .... :	03/02/2012	03/03/2012	03/04/2012	—
Wind velocity [m/s]high/low................ :	0.53/0.09	0.52/0.12	0.60/0.24	—
Ambient temperature [°C] high/low...... :	25.9/20.2	25.4/20.7	25.2/20.8	—
Irradiance [W/m^2]high/low .... :	924/456	951/413	932/441	—
Module temperature [°C] high/low....... :	49.8/40.3	50.3/40.1	50.6/40.2	—
Wind velocity [m/s](average).............. :	0.20	0.21	0.20	
Ambient temperature [°C] (average) ... :	22.8	22.2	23.0	
NOCT correction factor [°C] .... :	0	0	0	—
Calculated NOCT [°C] .... :	46.2	46.4	46.3	—
Sample #	**Average NOCT [°C]**			—
9#	46.3			—
Supplementary information: N/A..				

Module type: SN280P24-72

10.6 B	TABLE: Performance at STC and NOCT						—
Test Date [MM/DD/YYYY].......................................:			01/16/2012(STC) / 03/06/2012(NOCT)				—
Wind velocity [m/s]high/low.......................................:			N/A				—
Test method.. :			☒ indoor ☐ outdoor				—
Ambient air temperature [°C] high/low .... :			25				—
Irradiance [W/m^2]high/low.. :			1000(STC)/800(NOCT)				—
Module temperature [°C] high/low............................... :			25(STC) /46.4(NOCT)				—
Condition	Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmax [W]	FF [%]
STC	9	44.88	34.60	8.59	8.12	281.0	72.9
NOCT	9	42.83	32.42	7.60	7.24	234.7	72.1
Supplementary information: N/A.							

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Clause	Requirement + Test	Result - Remark	Verdict

Module type: SN290M24-72

10.6 B	TABLE: Performance at STC and NOCT						—
Test Date [MM/DD/YYYY]..........:		01/16/2012					—
Wind velocity [m/s]high/low..........:		N/A					—
Test method..........:		☒ indoor ☐ outdoor					—
Ambient air temperature [°C] high/low..........:		25					—
Irradiance [W/m^2]high/low..........:		1000(STC)					—
Module temperature [°C] high/low..........:		25(STC)					—
Condition	Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmax [W]	FF [%]
STC	13#	44.95	34.60	8.88	8.36	289.3	72.5
NOCT	/	/	/	/	/	/	/
Supplementary information: N/A.							

Module type: SN280P24-72

10.7 B	TABLE: Performance at low irradiance					—
Test Date [MM/DD/YYYY]..........:		03/06/2012				—
Ambient air temperature [°C]..........:		25				—
Irradiance [W/m^2](200 W/m^2)..........:		200				—
Module temperature [°C]..........:		25				—
Test method..........:		☐ Data corrected to a 25°C cell temperature and 200 W/m^2 irradiance ☒ Directly measured				—
Data corrected to a 25°C cell temperature and 200 W/m^2 irradiance						
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmax [W]	FF [%]
9#	41.59	32.83	1.81	1.51	49.7	66.0
Supplementary information: N/A.						

IEC61215			
Clause	Requirement + Test	Result - Remark	Verdict

Module type: SN290M24-72

10.7 B	TABLE: Performance at low irradiance						—
Test Date [MM/DD/YYYY]...:			03/06/2012				—
Ambient air temperature [°C]...:			25				—
Irradiance [W/m²](200 W/m²)...:			200				—
Module temperature [°C] ...:			25				—
Test method ...:			☐ Data corrected to a 25°C cell temperature and 200 W/m² irradiance ☒ Directly measured				—
Data corrected to a 25°C cell temperature and 200 W/m² irradiance							
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmax [W]	FF [%]	
13#	42.78	33.67	1.87	1.56	52.5	65.7	
Supplementary information: N/A.							

Module type: SN280P24-72

10.8 B	**TABLE: Outdoor exposure test**						—
Test Date [MM/DD/YYYY] start/end ...:			01/16/2012 to 02/20/2012				—
Total irradiation dosage [kWh/m²] ...:			60.12				—
Supplementary information: N/A.							
(10.1 Visual inspection after outdoor exposure test)							P
Test Date [MM/DD/YYYY] ...:			02/20/2012				—
Sample #	Nature and position of initial findings – comments or attach photos						—
2#	No visual defects						P
Supplementary information: N/A.							
(10.2 Maximum power determination after outdoor exposure test)							P
Test Date [MM/DD/YYYY] ...:			02/20/2012				—
Module temperature [°C]...:			Corrected to 25				—
Irradiance [W/m²) ...:			Corrected to 1000				—
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmax [W]	FF [%]	
2#	44.66	34.97	8.56	7.97	278.9	73.0	
Pmax degradation after this test [%] ≤ 5% ...:			-0.07				P
(10.3 Insulation test after outdoor exposure test)							P
Test Date [MM/DD/YYYY] ...:			02/20/2012				—
Test Voltage applied [V] ...:			3000V/1min and 1000V/2min				—

IEC61215			
Clause	Requirement + Test	Result - Remark	Verdict

Sample #	Measured	Required	Dielectric breakdown	Result
	MΩ	MΩ	Yes (description) / No	
2#	>9999	20.6	No	P
Supplementary information: N/A.				

Module type: SN280P24-72

10.18 B	TABLE: Bypass diode thermal test				—
Test Date [MM/DD/YYYY] start/end ....:	03/08/2012				—
Module temperature [°C]............................ :	75.6				—
Number of diodes in junction box .... :	6				—
Diode manufacturer.................................... :	PANJIT INTERNATIONAL INC				—
Diode type designation .... :	Schottky,10SQ050				—
Max. permissible junction temperature Tj_{max} [°C] (according to diode datasheet) .... :	200				—
	Diode 1	Diode 2	Diode 3	Diode 4	Result
Current flow applied [A] .... :	8.6	8.6	8.6	8.6	P
Max. diode surface temperature [°C] [a]....... :	112.4	112.7	104.4	111.5	P
Voltage drop [V] .... :	0.309	0.307	0.315	0.309	P
Power dissipation [W] .... :	2.657	2.640	2.709	2.657	P
Thermal resistance junction to leads (RTHJL)/to case (RTHJC) [K/W] (according to datasheet) :	3.0	3.0	3.0	3.0	P
Calculated max. junction temperature Tj_{calc} [°C] [a] .... :	115.1	115.3	107.1	114.2	P
Tj_{calc} < Tj_{max} (test passed)? yes/no............ :	yes	yes	yes	Yes	P
Current flow (1.25 * Isc) [A]....................... :	10.7	10.7	10.7	10.7	P
Max. diode surface temperature [°C] [a] :	120.0	119.6	111.6	120.7	P
	Diode 5	Diode 6	\	\	Result
Current flow applied [A] .... :	8.6	8.6	\	\	P
Max. diode surface temperature [°C] [a]....... :	109.9	102.4	\	\	P
Voltage drop [V] .... :	0.307	0.315	\	\	P
Power dissipation [W] .... :	2.640	2.709	\	\	P
Thermal resistance junction to leads (RTHJL)/to case (RTHJC) [K/W] (according to datasheet) :	3.0	3.0	\	\	P
Calculated max. junction temperature Tj_{calc} [°C] [a] .... :	112.5	105.1	\	\	P
Tj_{calc} < Tj_{max} (test passed)? yes/no............ :	yes	yes	\	\	P
Current flow (1.25 * Isc) [A]....................... :	10.7	10.7	\	\	P
Max. diode surface temperature [°C] [a]....... :	117.4	108.3	\	\	P

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Clause	Requirement + Test	Result - Remark	Verdict

Remarks: [a] measured at diode case						
(10.1 Visual inspection after bypass diode thermal test)						P
Test Date [MM/DD/YYYY] ....:		03/08/2012				—
Sample #	Nature and position of initial findings – comments or attach photos					—
10#	No visual defects					P
Supplementary information: N/A.						
(10.2 Maximum power determination after bypass diode thermal test)						P
Test Date [MM/DD/YYYY] ....:		03/08/2012				—
Module temperature [°C]...............................:		Corrected to 25				—
Irradiance [W/m²) ....:		Corrected to 1000				—
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmax [W]	FF [%]
10#	44.53	34.41	8.62	8.14	280.1	73.0
Pmax degradation after this test [%] ≤ 5% ....:		-0.03				P
Supplementary information: N/A.						

(10.3 Insulation test after bypass diode thermal test)				P
Test Date [MM/DD/YYYY] ....:		03/08/2012		—
Test Voltage applied [V] ....:		3000V/1min and 1000V/2min		—
Sample #	Measured	Required	Dielectric breakdown	Result
	MΩ	MΩ	Yes (description) / No	
10#	>9999	20.6	No	P
Supplementary information: N/A.				

Module type: SN280P24-72

10.9 B	**TABLE: Hot-spot endurance test**		—
Test Date [MM/DD/YYYY] start/end ....:		03/10/2012	—
Cell interconnection circuit ....:		☒ S ☐ SP ☐ SPS	—
Module temperature at thermal equilibrium [°C] :		47.0	—
Measurement at 1. worst case cell			P
Maximum measured cell temperature [°C] :		93.45	—
Shading rate [%]..:		13.2	—
Measurement at 2. worst case cell			P
Maximum measured cell temperature [°C] :		99.23	—
Shading rate [%]..:		12.7	—

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Clause	Requirement + Test	Result - Remark	Verdict

Measurement at 3. worst case cell						P
Maximum measured cell temperature [°C] :			89.75			—
Shading rate [%]..:			13.6			—
Supplementary information: The Hot-spot endurance test is performed acc. to a draft for IEC 61215 ed.3						
(10.1 Visual inspection after hot-spot endurance test)						P
Test Date [MM/DD/YYYY] ....:			03/10/2012			—
Sample #	Nature and position of initial findings – comments or attach photos					—
10#	No visual defects					P
Supplementary information: N/A.						
(10.2 Maximum power determination after hot-spot endurance test)						P
Test Date [MM/DD/YYYY] ....:			03/10/2012			—
Module temperature [°C]..............................:			Corrected to 25			—
Irradiance [W/m^2) ....:			Corrected to 1000			—
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmax [W]	FF [%]
10#	44.90	34.65	8.64	8.08	280.0	72.2
Pmax degradation after this test [%] ≤ 5% ....:			-0.03			P
Supplementary information: N/A.						
(10.3 Insulation test after hot-spot endurance test)						P
Test Date [MM/DD/YYYY] ....:			03/10/2012			—
Test Voltage applied [V] ....:			3000V/1min and 1000V/2min			—
Sample #	Measured	Required	Dielectric breakdown			Result
	MΩ	MΩ	Yes (description) / No			
10#	>9999	20.6	No			P
Supplementary information: N/A.						

Module type: SN290M24-72

10.9 B	TABLE: Hot-spot endurance test		—
Test Date [MM/DD/YYYY] start/end ....:		03/11/2012	—
Cell interconnection circuit ....:		☒ S ☐ SP ☐ SPS	—
Module temperature at thermal equilibrium [°C] :		46.4	—
Measurement at 1. worst case cell			P
Maximum measured cell temperature [°C] :		100.72	—
Shading rate [%]..:		13.1	—

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Clause	Requirement + Test	Result - Remark	Verdict

Measurement at 2. worst case cell		P
Maximum measured cell temperature [°C] :	111.15	—
Shading rate [%]..:	12.7	—
Measurement at 3. worst case cell		P
Maximum measured cell temperature [°C] :	95.81	—
Shading rate [%]..:	14.8	—
Supplementary information: The Hot-spot endurance test is performed acc. to a draft for IEC 61215 ed.3		
(10.1 Visual inspection after hot-spot endurance test)		P
Test Date [MM/DD/YYYY] ....:	03/11/2012	—

Sample #	Nature and position of initial findings – comments or attach photos	—
14#	No visual defects	P
Supplementary information: N/A.		

(10.2 Maximum power determination after hot-spot endurance test)		P
Test Date [MM/DD/YYYY] ....:	03/11/2012	—
Module temperature [°C]...............................:	Corrected to 25	—
Irradiance [W/m^2) ....:	Corrected to 1000	—

Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmax [W]	FF [%]
14#	44.75	34.72	8.87	8.30	288.2	72.6

Pmax degradation after this test [%] ≤ 5% ....:	-0.76	P
Supplementary information: N/A.		
(10.3 Insulation test after hot-spot endurance test)		**P**
Test Date [MM/DD/YYYY] ....:	03/11/2012	—
Test Voltage applied [V] ....:	3000V/1min and 1000V/2min	—

Sample #	Measured	Required	Dielectric breakdown	Result
	MΩ	MΩ	Yes (description) / No	
14#	>9999	20.6	No	P
Supplementary information: N/A.				

Module type: SN280P24-72

10.10 C	TABLE: UV preconditioning test	—
Test Date [MM/DD/YYYY] start/end ....:	01/18/2012 to 01/25/2012	—
Module temperature [°C] ....:	55	P
UV irradiation dose (280-400nm) [kWh/ m²] ...:	15.22	P

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Clause	Requirement + Test	Result - Remark	Verdict

Ratio of UV-B irradiation(280-320nm) [%].......:	5.6%	P
Sample #	Open circuits (yes/no)	—
3#	No	P
4#	No	P
Supplementary information: N/A.		
(10.1 Visual inspection after UV preconditioning test)		P
Test Date [MM/DD/YYYY] ....:	01/25/2012	—
Sample #		—
3#	No visual defects	P
4#	No visual defects	P
Supplementary information: N/A.		
(10.2 Maximum power determination after UV preconditioning test)		—
Test Date [MM/DD/YYYY] ....:	01/25/2012	—
Module temperature [°C]...............................:	Corrected to 25	—
Irradiance [W/m^2) ....:	Corrected to 1000	—

Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmax [W]	FF [%]
3#	44.73	35.18	8.58	7.96	279.9	73.0
4#	44.73	34.63	8.56	8.07	279.6	73.0

Pmax degradation after this test [%] ≤ 5% ....:	#3:-0.39	#4:+0.32	P
Supplementary information: N/A.			
(10.3 Insulation test after UV preconditioning test)			P
Test Date [MM/DD/YYYY] ....:	01/25/2012		—
Test Voltage applied [V] ....:	3000V/1min and 1000V/2min		—

Sample #	Measured	Required	Dielectric breakdown	Result
	MΩ	MΩ	Yes (description) / No	
3#	>9999	20.6	No	P
4#	>9999	20.6	No	P
Supplementary information: N/A.				

Module type: SN280P24-72

10.11 C	TABLE: Thermal cycling 50 test	P
Test Date [MM/DD/YYYY] start/end ....:	01/25/2012 to 01/31/2012	—
Total cycles (50) ....:	50	—
Sample #	Open circuits (yes/no)	—

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Clause	Requirement + Test	Result - Remark	Verdict

3#	No						P
4#	No						P
Supplementary information: N/A.							
(10.1 Visual inspection after thermal cycling 50 test)							P
Test Date [MM/DD/YYYY] ....:			01/31/2012				—
Sample #	Nature and position of initial findings – comments or attach photos						—
3#	No visual defects						P
4#	No visual defects						P
Supplementary information: N/A.							
(10.2 Maximum power determination after thermal cycling 50 test)							P
Test Date [MM/DD/YYYY] ....:			01/31/2012				—
Module temperature [°C]..............................:			Corrected to 25				—
Irradiance [W/m^2) ....:			Corrected to 1000				—
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmax [W]	FF [%]	
3#	44.64	34.64	8.57	8.08	279.0	73.0	
4#	44.67	34.96	8.57	7.98	278.9	72.8	
Pmax degradation after this test [%] ≤ 5% ....:			#3:-0.32	#4:-0.25			P
Supplementary information: N/A.							
(10.3 Insulation test after thermal cycling 50 test)							P
Test Date [MM/DD/YYYY] ....:			01/31/2012				—
Test Voltage applied [V] ....:			3000V/1min and 1000V/2min				—
Sample #	Measured MΩ	Required MΩ	Dielectric breakdown Yes (description) / No				Result
3#	>9999	20.6	No				P
4#	>9999	20.6	No				P
Supplementary information: N/A.							

Module type: SN280P24-72

10.12 C	**TABLE: Humidity freeze 10 test**		—
Test Date [MM/DD/YYYY] start/end ....:		01/31/2012 to 02/10/2012	—
Total cycles (10) ....:		10	—
Sample #	Open circuits (yes/no)		—
3#	No		P
4#	No		P

IEC61215			
Clause	Requirement + Test	Result - Remark	Verdict

Supplementary information: N/A.						
(10.1 Visual inspection after humidity freeze 10 test)						P
Test Date [MM/DD/YYYY] ....:		02/10/2012				—
Sample #	Nature and position of initial findings – comments or attach photos					—
3#	No visual defects					P
4#	No visual defects					P
Supplementary information: N/A.						
(10.2 Maximum power determination after humidity freeze 10 test)						P
Test Date [MM/DD/YYYY] ....:		02/10/2012				—
Module temperature [°C]...............................:		Corrected to 25				—
Irradiance [W/m^2) ....:		Corrected to 1000				—
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmax [W]	FF [%]
3#	44.78	34.90	8.56	8.02	279.8	73.0
4#	44.85	35.03	8.57	7.98	279.6	72.7
Pmax degradation after this test [%] ≤ 5% ....:			#3:+0.29	#4:+0.25		P
Supplementary information: N/A.						

(10.3 Insulation test after humidity freeze 10 test)				P
Test Date [MM/DD/YYYY] ....:			02/10/2012	—
Test Voltage applied [V] ....:			3000V/1min and 1000V/2min	—
Sample #	Measured	Required	Dielectric breakdown	Result
	MΩ	MΩ	Yes (description) / No	
3#	>9999	20.6	No	P
4#	>9999	20.6	No	P
Supplementary information: N/A.				

Module type: SN280P24-72

10.14 C2	**TABLE: Robustness of terminations test**	—
Test Date [MM/DD/YYYY] start/end .. :	02/15/2012	—
Types of terminations	☒Type A: wire of flying lead ☐Type B: tags. threaded stubs. screws. etc. ☐Type C: connector	—
Applied force in all directions [N] .... :	40	—
Sample #	Open circuits (yes/no)	—
3#	No	P
Supplementary information: N/A.		

IEC61215			
Clause	Requirement + Test	Result - Remark	Verdict

(10.1 Visual inspection after robustness of terminations test)							P
Test Date [MM/DD/YYYY] ....:		02/15/2012					—
Sample #	Nature and position of initial findings – comments or attach photos						—
3#	No visual defects						P
Supplementary information: N/A.							
(10.2 Maximum power determination after robustness of terminations test)							P
Test Date [MM/DD/YYYY] ....:		02/15/2012					—
Module temperature [°C]...............................:		Corrected to 25					—
Irradiance [W/m^2) ....:		Corrected to 1000					—
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmax [W]	FF [%]	
3#	44.76	34.98	8.60	7.98	279.1	72.5	
Pmax degradation after this test [%] ≤ 5% ....:			#3:-0.29				P
Supplementary information: N/A.							
(10.3 Insulation test after robustness of terminations test)							P
Test Date [MM/DD/YYYY] ....:		02/15/2012					—
Test Voltage applied [V] ....:		3000V/1min and 1000V/2min					—
Sample #	Measured	Required	Dielectric breakdown				Result
	MΩ	MΩ	Yes (description) / No				
3#	>9999	20.6	No				P
Supplementary information: N/A.							

Module type: SN280P24-72

10.11 D	**TABLE: Thermal cycling 200 test**		—
Test Date [MM/DD/YYYY] start/end ....:		01/18/2012 to 03/06/2012	—
Total cycles (200)		200	—
Applied current [A]		8.0	—
Sample #	Open circuits (yes/no)		—
5#	No		P
6#	No		P
Supplementary information: N/A.			
(10.1 Visual inspection after thermal cycling 200 test)			P
Test Date [MM/DD/YYYY] ....:		03/06/2012	—
Sample #	Nature and position of initial findings – comments or attach photos		—
5#	No visual defects		P

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Clause	Requirement + Test	Result - Remark	Verdict

6#	No visual defects					P
Supplementary information: N/A.						
(10.2 Maximum power determination after thermal cycling 200 test)						P
Test Date [MM/DD/YYYY] ....:		03/06/2012				—
Module temperature [°C]..............................:		Corrected to 25				—
Irradiance [W/m^2) ....:		Corrected to 1000				—
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmax [W]	FF [%]
5#	44.54	34.25	8.64	7.97	272.9	70.9
6#	44.72	34.85	8.62	8.04	280.3	72.7
Pmax degradation after this test [%] ≤ 5% ....:			5#:-2.54	6#:-0.67		P
Supplementary information: N/A.						

(10.3 Insulation test after thermal cycling 200 test)				P
Test Date [MM/DD/YYYY] ....:			03/06/2012	—
Test Voltage applied [V]..........................:			3000V/1min and 1000V/2min	—
Sample #	Measured	Required	Dielectric breakdown	Result
	MΩ	MΩ	Yes (description) / No	
5#	>9999	20.6	No	P
6#	>9999	20.6	No	P
Supplementary information: N/A.				

Module type: SN290M24-72

10.11 D	TABLE: Thermal cycling 200 test		—
Test Date [MM/DD/YYYY] start/end ....:		01/18/2012 to 03/06/2012	—
Total cycles (200)		200	—
Applied current [A]		8.2	—
Sample #	Open circuits (yes/no)		—
17#	No		P
18#	No		P
Supplementary information: N/A.			
(10.1 Visual inspection after thermal cycling 200 test)			P
Test Date [MM/DD/YYYY] ....:		03/06/2012	—
Sample #	Nature and position of initial findings – comments or attach photos		—
17#	No visual defects		P
18#	No visual defects		P

IEC61215			
Clause	Requirement + Test	Result - Remark	Verdict

Supplementary information: N/A.						
(10.2 Maximum power determination after thermal cycling 200 test)						P
Test Date [MM/DD/YYYY] ....:		03/06/2012				—
Module temperature [°C]..............................:		Corrected to 25				—
Irradiance [W/m^2) ....:		Corrected to 1000				—
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmax [W]	FF [%]
17#	44.81	34.31	8.83	8.40	288.2	72.8
18#	45.07	34.88	8.81	8.31	289.9	73.0
Pmax degradation after this test [%] ≤ 5% ....:			5#:-0.21		6#:+0.17	P
Supplementary information: N/A.						

(10.3 Insulation test after thermal cycling 200 test)				P
Test Date [MM/DD/YYYY] ....:			03/06/2012	—
Test Voltage applied [V]..........................:			3000V/1min and 1000V/2min	—
Sample #	Measured	Required	Dielectric breakdown	Result
	MΩ	MΩ	Yes (description) / No	
17#	>9999	20.6	No	P
18#	>9999	20.6	No	P
Supplementary information: N/A.				

Module type: SN280P24-72

10.13 E	**TABLE: Damp heat 1000 test**	—
Test Date [MM/DD/YYYY] start/end ....:	01/18/2012 to 03/07/2012	—
Total hours (1000)	1000h	—
Sample #	Open circuits (yes/no)	—
7#	No	P
8#	No	P
Supplementary information: N/A.		
(10.1 Visual inspection after damp heat 1000 test)		P
Test Date [MM/DD/YYYY] ....:	03/07/2012	—
Sample #	Nature and position of initial findings – comments or attach photos	—
7#	No visual defects	P
8#	No visual defects	P
Supplementary information: N/A.		

IEC61215			
Clause	Requirement + Test	Result - Remark	Verdict

(10.3 Insulation test after damp heat 1000 test)					P
Test Date [MM/DD/YYYY] ....:			03/07/2012		—
Test Voltage applied [V] ....:			3000V/1min and 1000V/2min		—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description) / No		
7#	>9999	20.6	No		P
8#	>9999	20.6	No		P
(10.15 Wet leakage current test after damp heat 1000 test)					P
Test Date [MM/DD/YYYY] ....:			03/07/2012		—
Test Voltage applied [V]................................ :			1000V/2min		—
Solution resistivity [Ω cm]...............................:			1730	< 3,500 Ω cm	P
Solution temperature [°C] .... :			22.0	22±3°C	P
Sample #	Measured [MΩ]		Limit [MΩ]		Result
7#	3278		20.6		P
8#	2636		20.6		P
Supplementary information: N/A.					

(10.2 Maximum power determination after damp heat 1000 test)						P
Test Date [MM/DD/YYYY] ....:			03/07/2012			—
Module temperature [°C]..............................:			Corrected to 25			—
Irradiance [W/m^2) ....:			Corrected to 1000			—
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmax [W]	FF [%]
7#	44.54	34.88	8.75	8.08	282.0	72.4
8#	44.39	34.71	8.72	8.06	279.7	72.2
Pmax degradation after this test [%] ≤ 5% ....:			#7:+0.53	#8:-0.50		P
Supplementary information: N/A.						

Module type: SN290M24-72

10.13 E	**TABLE: Damp heat 1000 test**	—
Test Date [MM/DD/YYYY] start/end ....:	01/18/2012 to 03/07/2012	—
Total hours (1000)	1000h	—
Sample #	Open circuits (yes/no)	—
15#	No	P
16#	No	P
Supplementary information: N/A.		

IEC61215			
Clause	Requirement + Test	Result - Remark	Verdict

(10.1 Visual inspection after damp heat 1000 test)		P
Test Date [MM/DD/YYYY] ....:	03/07/2012	—
Sample #	Nature and position of initial findings – comments or attach photos	—
15#	No visual defects	P
16#	No visual defects	P
Supplementary information: N/A.		

(10.3 Insulation test after damp heat 1000 test)				P
Test Date [MM/DD/YYYY] ....:			03/07/2012	—
Test Voltage applied [V] ....:			3000V/1min and 1000V/2min	—
Sample #	Measured	Required	Dielectric breakdown	Result
	MΩ	MΩ	Yes (description) / No	
15#	>9999	20.6	No	P
16#	>9999	20.6	No	P

(10.15 Wet leakage current test after damp heat 1000 test)			P
Test Date [MM/DD/YYYY] ....:	03/07/2012		—
Test Voltage applied [V]...............................:	1000V/2min		—
Solution resistivity [Ω cm]...............................:	1730	< 3,500 Ω cm	P
Solution temperature [°C] ....:	22.0	22±3°C	P
Sample #	Measured [MΩ]	Limit [MΩ]	Result
15#	1906	20.6	P
16#	1814	20.6	P
Supplementary information: N/A.			

(10.2 Maximum power determination after damp heat 1000 test)						P
Test Date [MM/DD/YYYY] ....:			03/07/2012			—
Module temperature [°C]..............................:			Corrected to 25			—
Irradiance [W/m^2) ....:			Corrected to 1000			—
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmax [W]	FF [%]
15#	44.89	34.73	8.90	8.31	288.6	72.2
16#	44.91	34.70	8.88	8.29	287.7	72.1
Pmax degradation after this test [%] ≤ 5% ....:			#5:-0.41		#6:-0.59	P
Supplementary information: N/A.						

IEC61215			
Clause	Requirement + Test	Result - Remark	Verdict

Module type: SN280P24-72

10.16 E1	**TABLE: Mechanical load test**						—
Sample #		7					—
Test Date [MM/DD/YYYY]		03/10/2012					—
Mounting method		Standard mounting		Standard mounting			P
Load applied to		front side		back side			—
Mechanical load [Pa]		2400		2400			—
First cycle time (start/end)		1h		1h			—
Intermittent open-circuit (yes/no)		No		No			P
Second cycle time (start/end)		1h		1h			—
Intermittent open-circuit (yes/no)		No		No			P
Third cycle time (start/end)		1h		1h			—
Intermittent open-circuit (yes/no)		No		No			P
Supplementary information: N/A.							
(10.1 Visual inspection after mechanical load test)							P
Test Date [MM/DD/YYYY] ....:		03/10/2012					—
Sample #	Nature and position of initial findings – comments or attach photos						—
7	No visual defects						P
Supplementary information: N/A.							
(10.2 Maximum power determination after mechanical load test)							P
Test Date [MM/DD/YYYY] ....:		03/10/2012					—
Module temperature [°C].............................:		Corrected to 25					—
Irradiance [W/m^2) ....:		Corrected to 1000					—
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmax [W]		FF [%]
7	44.42	34.53	8.65	7.96	274.9		71.5
Pmax degradation after this test [%] ≤ 5% ....:			-2.52				P
Supplementary information: N/A.							
(10.3 Insulation test after mechanical load test)							P
Test Date [MM/DD/YYYY] ....:		03/10/2012					—
Test Voltage applied [V] ....:		3000V/1min and 1000V/2min					—
Sample #	Measured	Required	Dielectric breakdown				Result
	MΩ	MΩ	Yes (description) / No				
7	6524	20.6	No				P
Supplementary information: N/A.							

IEC61215			
Clause	Requirement + Test	Result - Remark	Verdict

Module type: SN290M24-72

10.16 E1	TABLE: Mechanical load test		—
Sample #	15#		—
Test Date [MM/DD/YYYY]	03/13/2012		—
Mounting method	Standard mounting	Standard mounting	P
Load applied to	front side	back side	—
Mechanical load [Pa]	2400	2400	—
First cycle time (start/end)	1h	1h	—
Intermittent open-circuit (yes/no)	No	No	P
Second cycle time (start/end)	1h	1h	—
Intermittent open-circuit (yes/no)	No	No	P
Third cycle time (start/end)	1h	1h	—
Intermittent open-circuit (yes/no)	No	No	P
Supplementary information: N/A.			

(10.1 Visual inspection after mechanical load test)		P
Test Date [MM/DD/YYYY] ....:	03/13/2012	—
Sample #	Nature and position of initial findings – comments or attach photos	—
15#	No visual defects	P
Supplementary information: N/A.		

(10.2 Maximum power determination after mechanical load test)						P
Test Date [MM/DD/YYYY] ....:			03/13/2012			—
Module temperature [°C]..............................:			Corrected to 25			—
Irradiance [W/m^2) ....:			Corrected to 1000			—
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmax [W]	FF [%]
15#	44.72	34.53	8.80	8.24	284.5	72.3
Pmax degradation after this test [%] ≤ 5% ....:			-1.42			P
Supplementary information: N/A.						

(10.3 Insulation test after mechanical load test)				P
Test Date [MM/DD/YYYY] ....:			03/13/2012	—
Test Voltage applied [V] ....:			3000V/1min and 1000V/2min	—
Sample #	Measured	Required	Dielectric breakdown	Result
	MΩ	MΩ	Yes (description) / No	
15#	>9999	20.6	No	P
Supplementary information: N/A.				

IEC61215			
Clause	Requirement + Test	Result - Remark	Verdict

Module type: SN280P24-72

10.17 E2	TABLE: Hail impact test	—
Test Date [MM/DD/YYYY] ....:	03/12/2012	—
Ice ball Area [mm]	Diameter 25mm	—
Ice ball weight [g]	7.53±5%	—
Ice ball velocity [m/s]......................................	23.0±5%	—
Number of impact locations	11	P
Sample #	Open circuits (yes/no)	—
8#	No	P
Supplementary information: (impact location descriptions)		
(10.1 Visual inspection after hail impact test)		P
Test Date [MM/DD/YYYY] ....:	03/12/2012	—
Sample #	Nature and position of initial findings – comments or attach photos	—
8#	No visual defects	P
Supplementary information: N/A.		
(10.2 Maximum power determination after hail impact test)		P
Test Date [MM/DD/YYYY] ....:	03/12/2012	—
Module temperature [°C]...............................:	Corrected to 25	—
Irradiance [W/m^2) ....:	Corrected to 1000	—

Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmax [W]	FF [%]
8#	44.32	34.62	8.68	8.04	278.3	72.3

Pmax degradation after this test [%] ≤ 5% ....:	-0.50	P
Supplementary information: N/A.		
(10.3 Insulation test after hail impact test)		P
Test Date [MM/DD/YYYY] ....:	03/12/2012	—
Test Voltage applied [V] ....:	3000V/1min and 1000V/2min	—

Sample #	Measured	Required	Dielectric breakdown	Result
	MΩ	MΩ	Yes (description) / No	
8#	>9999	20.6	No	P
Supplementary information: N/A.				

IEC61215			
Clause	Requirement + Test	Result - Remark	Verdict

Module type: SN280P24-72

10.2 F	**TABLE: Maximum power determination (final)**							—
Test Date [MM/DD/YYYY]........................:			Refer to each group					—
Module temperature [°C]..........................:			Corrected to 25					—
Irradiance [W/m²].....................................:			Corrected to 1000					—
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmax [W]	FF [%]	Degradation [%]	Limit [%]
1#	44.88	34.60	8.59	8.12	281.0	72.9	-0.07	-8
2#	44.66	34.97	8.56	7.97	278.9	73.0	-0.07	-8
3#	44.78	34.90	8.56	8.02	279.1	73.0	-0.54	-8
4#	44.76	34.98	8.60	7.98	279.6	72.5	+0.25	-8
5#	44.54	34.25	8.64	7.97	272.9	70.9	-2.54	-8
6#	44.72	34.85	8.62	8.04	280.3	72.7	-0.67	-8
7#	44.42	34.53	8.65	7.96	274.9	71.5	-2.00	-8
8#	44.32	34.62	8.68	8.04	278.3	72.3	-1.00	-8
9#	44.60	34.55	8.56	8.07	278.8	73.0	-0.11	-8
10#	44.62	34.47	8.60	8.12	279.9	72.9	-0.11	-8
11#	44.65	34.42	8.56	8.13	279.8	73.2	+0.25	-8
Supplementary information: N/A.								

Module type: SN290M24-72

10.2 F	**TABLE: Maximum power determination (final)**							—
Test Date [MM/DD/YYYY]........................:		Refer to each group						—
Module temperature [°C] ....:		Corrected to 25						—
Irradiance [W/m^2]......................................:		Corrected to 1000						—
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmax [W]]	FF [%]	Degradation [%]	Limit [%]
13#	44.89	34.58	8.88	8.33	288.1	72.3	-0.17	-8
14#	44.75	34.72	8.87	8.30	288.2	72.6	-0.76	-8
15#	44.72	34.53	8.80	8.24	284.5	72.3	-1.83	-8
16#	44.91	34.70	8.88	8.29	287.7	72.1	-0.59	-8
17#	44.81	34.31	8.83	8.40	288.2	72.8	+0.21	-8
18#	45.07	34.88	8.81	8.31	289.9	73.0	-0.17	-8
19#	44.75	34.84	8.82	8.24	287.1	72.7	-1.07	-8
Supplementary information: N/A.								

IEC61215			
Clause	Requirement + Test	Result - Remark	Verdict

Module type: SN280P24-72

10.15 F	**TABLE: Wet leakage current test (final)**			—
Test Date [MM/DD/YYYY] ....:		Refer to each group		—
Test Voltage applied [V] ....:		1000V/2min		—
Solution resistivity [Ω cm] ....:		1745	< 3,500 Ω cm	P
Solution temperature [°C] ....:		23.5	22±3°C	P
Sample #	Measured [MΩ]	Limit [MΩ]		Result
1#	3356	20.6		P
2#	3125	20.6		P
3#	2465	20.6		P
4#	2983	20.6		P
5#	1002	20.6		P
6#	3452	20.6		P
7#	2489	20.6		P
8#	2463	20.6		P
9#	2464	20.6		P
10#	2646	20.6		P
11#	2945	20.6		P
Supplementary information: Area of module :1.94				

IEC61215			
Clause	Requirement + Test	Result - Remark	Verdict

Module type: SN290M24-72

10.15 F	TABLE: Wet leakage current test (final)		—
Test Date [MM/DD/YYYY] ....:		Refer to each group	—
Test Voltage applied [V] ....:		1000V/2min	—
Solution resistivity [Ω cm] ....:		1720 / < 3,500 Ω cm	P
Solution temperature [°C] ....:		23.5 / 22±3°C	P
Sample #	Measured [MΩ]	Limit [MΩ]	Result
13#	2472	20.6	P
14#	2443	20.6	P
15#	2143	20.6	P
16#	2243	20.6	P
17#	1834	20.6	P
18#	1943	20.6	P
19#	2045	20.6	P
Supplementary information: Area of module : 1.94[m²]			

---------------- End of Test report ----------------

Test report

File No.: 2.4-4042/12 TNa/Spri

Annex 2 to TRHZP1103046/01

TÜV NORD

Date:21.01.2012

Applicant	**Shenzhen Shine Solar Co., Ltd** 8th Floor, Buliding A,DongFangYaYuan, ChenTian Communities,XiXiang Bao'an District, Shenzhen 518109 P.R.China
Manufacturer	**Shenzhen Shine Solar Co., Ltd** 8th Floor, Buliding A,DongFangYaYuan, ChenTian Communities,XiXiang Bao'an District, Shenzhen 518109 P.R.China
Date of Application	05.01.2012
Product	Crystalline Silicon PV Module
Model No.	**Poly-crystalline Solar Cell Module** 156x156: 72cells: SN***P-24(***=255-305 increment of 5) 60cells: SN***P-20(***=210-255 increment of 5) 54cells: SN***P-18(***=190-230 increment of 5) 48cells: SN***P-16(***=170-205 increment of 5) 36cells: 156x156: SN***P-12(***=120-150 increment of 5) 156x119: SN***P-12(***=95-115 increment of 5) 156x93.7: SN***P-12-1(***=75-90 increment of 5) 156x76.1: SN***P-12-2(***=60-75 increment of 5) 156x59.5: SN***P-12(***=50-55 increment of 5) 156x46.8: SN***P-12-3(***=40-45 increment of 5) 156x43.2: SN***P-12-4(***=35-40 increment of 5) 156x35.6: SN***P-12-5(***=30-35 increment of 5) 156x29.5: SN***P-12(***=25) 156x24.0: SN***P-12(***=20) 156x17.5: SN***P-12(***=15) 78x24.0: SN***P-12(***=10) 78x11.7: SN***P-12(***=5) **Mono-crystalline Solar Cell Module** 156x156: 72cells: SN***M-24(***=255-305 increment of 5) 60cells: SN***M-20(***=210-255 increment of 5) 54cells: SN***M-18(***=190-230 increment of 5) 48cells: SN***M-16(***=170-205 increment of 5) 125x125: 96cells: SN***M-32(***=215-260 increment of 5) 72cells: SN***M-24(***=160-195 increment of 5) 60cells: SN***M-20(***=135-165 increment of 5) 54cells: SN***M-18(***=120-145 increment of 5) 48cells: SN***M-16(***=110-130 increment of 5) 36cells: 156x156: SN***M-12(***=125-150 increment of 5) 156x119: SN***M-12-1(***=95-115 increment of 5) 125x125: SN***M-12-2(***=80-95 increment of 5) 125x101: SN***M-12-3(***=65-80 increment of 5) 125x86.8: SN***M-12-4(***=55-65 increment of 5) 125x72: SN***M-12-5(***=45-55 increment of 5) 125x59.9: SN***M-12-6(***=40-45 increment of 5) 125x49.7: SN***M-12(***=35) 125x43.2: SN***M-12(***=30) 125x35.4: SN***M-12(***=25) 125x28.3: SN***M-12(***=20) 125x20.6: SN***M-12(***=15) 125x14.2: SN***M-12(***=10) 62.5x14.2: SN***M-12(***=5)
General Information • Maximum System Voltage • Application Class • Electrical Protection Class	 DC 1000V Class A Class II
Type of examination	Conformity testing with TÜV mark
Testing Period	16.01.2012- 11.04.2012
Testing Laboratory	**CCIC Southern Electronic Product Testing(Shenzhen) Co.,Ltd** Electronic Testing Building, Shahe Road, Xili, Nanshan District, Shenzhen 518055, P.R. China

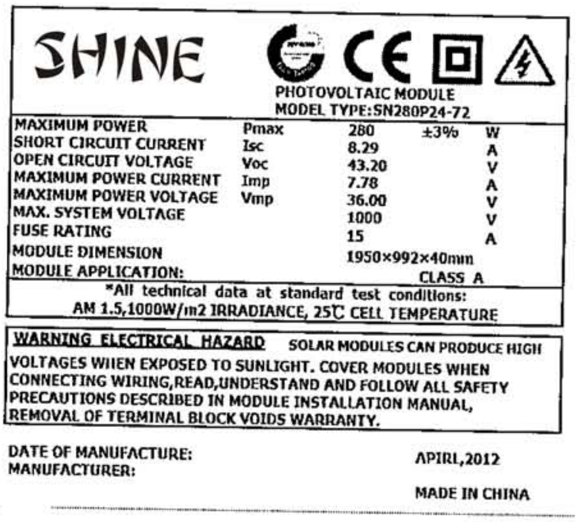
Test results listed in this test report refer exclusively to the mentioned test sample.
Partly copying is not permitted without explicit agreement of the owner.
The submitted test samples as described in the reports hereunder are in compliance with the requirements
IEC 61730-1:2004 "Photovoltaic (PV) module safety qualification. Part 1: Requirements for construction"

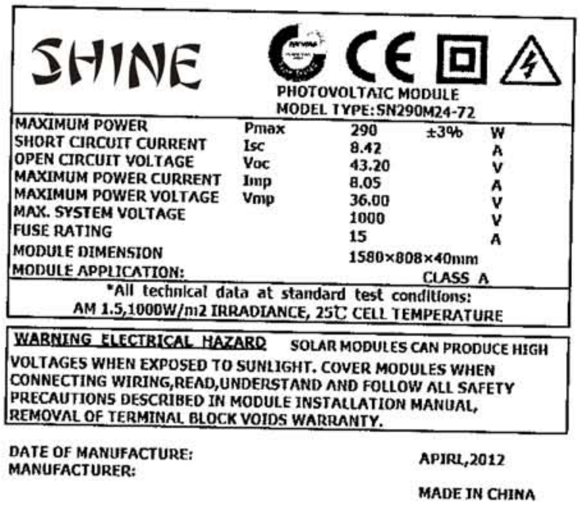
Roger Zhao

Approved by

TRF No. 61730-1A

Copy of marking plate





Summary of testing:

The model SN280P24-72 and SN290M24-72 were selected as the representative test model had been carried out all the test clauses.

All of the required tests of the IEC 61730:2004 standard were passed according to the pass criteria. It is therefore declared, that the photovoltaic modules of the aforementioned types fulfil the requirements of the standard IEC 61730:2004 and it is recommended that certification should be granted.

GENERAL INFORMATION	
Test item particulars:	
Accessories and detachable parts included in the evaluation:	Mounting device
Options included ....:	N/A
Abbreviations used in the report:	
HF – Humidity Freeze	TC – Temperature Cycling
DH – Damp Heat	Vmpp – Maximum power voltage
Imp – Maximum power current	Voc – Open circuit voltage
Isc - Short circuit current	FF – Fill factor
Pmp – Maximum power	α – Current temperature coefficient
NOCT – Nominal Operating Cell Temperature	β – Voltage temperature coefficient
STC – Standard Test Conditions	γ– power temperature coefficient
Possible test case verdicts:	
- test case does not apply to the test object ....:	Not Apply (N/A)
- test object does meet the requirement ....:	Pass(P)
- test object does not meet the requirement ....:	Fail(F)

General remarks:

The test verdicts presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.
"(see Enclosure #)" refers to additional information appended to the report.
"(see appended table)" refers to a table appended to the report.

Throughout this report a point is used as the decimal separator.

Detailed product information are to be found in the CDF (constructional data form).

Test item particulars:

Accessories and detachable parts included in the evaluation .... N/A

Other options included .... N/A

Possible test case verdicts:

- test case does not apply to the test object ....: Not Apply (N/A)
- test object does meet the requirement.......................: Pass(P)
- test object does not meet the requirement.................: Fail(F)

Abbreviations used in the report:

CTI	– Comparative Tracking Index	PD	– Partial Discharge
FF	– Fill factor	STC	– Standard Test Conditions
Ipm	– Maximum power current	RTI	– Relative Thermal Index
Isc	– Short circuit current	Voc	– Open circuit voltage
MST	– Module Safety Test	Vpm	– Maximum power voltage
Pmax	– Maximum power		

General remarks:

This report shall not be reproduced except in full without the written approval of the testing laboratory.
The test results presented in this report relate only to the item(s) tested.
"(see remark #)" refers to a remark appended to the report.
"(see Appendix #)" refers to an annex appended to the report.
"(see appended table)" refers to a table in the Test Report.
Throughout this report a point is used as the decimal separator.
This Test Report Form is intended for the investigation of PV module in accordance with IEC 61730-1. It can only be used together with IEC 61730-2 and IEC 61215 Test Report.

General product information:

Product Safety Ratings

Maximum system voltage...: 1000 V

Maximum over-current protection rating.......................................: 15 A

Safety application class ....: Class A

Safety class in accordance with IEC 61140..................................: Class II

Fire safety class..: Not evaluated

Recommended maximum series/parallel module configurations: Please refer to Manual

IEC 61730-1			
Clause	Requirement + Test	Result - Remark	Verdict

3	**APPLICATION CLASSES**		
	The module has been evaluated for the following Application Class (Class A, B, C).............................:	Class A	P

4	**CONSTRUCTION REQUIREMENTS**		P
4.1	**General requirements**		
4.1.1	It is stated that the module is able to operate under environmental condition type AB8 according to IEC 60364-5-51.	Module was tested according to IEC61215	P
4.1.2	The module/s is/are completely assembled when shipped from the factory.	Module is completely assembled.	P
	The module is provided in subassemblies.	No assembly part is present	P
4.1.3	Incorporation of a module into the final assembly does not require any alteration of the module from its originally evaluated form. If YES, specific details describing necessary modification(s) are provided in the installation instructions.	No assembly part is present	P
4.1.4	If the module must bear a definite relationship to another module, it is constructed to permit incorporation into the final assembly without the need for alteration.	Module can be used either in standalone or with another module without nay alternation	P
4.1.5	The construction of the module is such that ground continuity is not interrupted by installation.	Grounding connection is a separate connection on the frame	P
4.1.6	Parts of the module are prevented from loosening or turning, if such loosening or turning may result in a risk of fire, electric shock, or injury to persons.	No such parts	N/A
4.1.7	Friction between surfaces is not used as the sole means to inhibit the turning or loosening of a part.	No such parts	N/A
4.1.8	Any adjustable or movable structural part is provided with a locking device to reduce the likelihood of unintentional movement.	No moving parts	N/A
4.2	**Metal parts**		
	Metals used in locations that are exposed to moisture shall not be employed alone or in combinations that could result in deterioration, such that the product would not comply with the requirements in this standard.	Only Aluminium is use for the frame. IP Rating of the junction box is 65. No risk for deterioration.	P

IEC 61730-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Iron or mild steel serving as a necessary part of the module but not exposed to the weather are plated, painted, or enamelled for protection against corrosion.	No such metal	N/A
	Simple sheared or cut edges and punched holes are not required to be additionally protected.	No such part	N/A
Supplementary information: N/A.			

5	**POLYMERIC MATERIALS**		P
5.1	**General**		
	Polymeric materials serving as an enclosure for live metal parts .... :	See Subclause 5.2	—
	Polymeric materials serving as support for live metal parts .... :	See Subclause 5.3	—
	Polymeric materials serving as the outer surface for the module .... :	See Subclause 5.4	—
	Polymeric materials serving as barriers................ :	See Subclause 5.5	—
	All polymeric materials have a minimum thermal index (electrical and mechanical, as defined by IEC 60216-5) of 20°C above the maximum measured operating temperature of said material in application, as measured during the Temperature Test MST 21 given in IEC 61730-2.	IEC61730-2, MST21 test was passed.	P
5.2	Polymers serving as an enclosure for live parts		
	Information is provided that polymers serving as an enclosure for live parts comply with:		
	a) 5-V flammability rating (IEC 60695-1-1)	Junction box is certified. (Refer to CDF)	P
	b) 5-V flammability rating, after water immersion and exposure of the end-product (IEC 60695-1-1)	Junction box is certified. (Refer to CDF)	P
	c) Ultraviolet radiation resistance (ANSI/UL 746C)	Junction box is certified. (Refer to CDF)	P
	d) Minimum hot wire ignition rating of 30 (IEC 60695-1-1)	Junction box is certified. (Refer to CDF)	P
5.3	Polymers serving to support live parts		
	Information is provided that polymers serving to support live parts comply with:		—

IEC 61730-1			
Clause	Requirement + Test	Result - Remark	Verdict
	a) Flammability classification and high-current arc ignition rating (IEC 60695-1-1) as given in Table 1 of IEC 61730-1	Junction box is certified. (Refer to CDF)	P
	b) Comparative Tracking Index (CTI) ≥ 250 V	Junction box is certified. (Refer to CDF)	P
	Comparative Tracking Index (IEC 60112) :		—
	c) Inclined plane tracking rating of 1 h, using the time to track method at 2.5 kV (ASTM D2303), if the maximum system operating voltage rating is in the range 600 – 1500 V.	Junction box is certified. (Refer to CDF)	P
	Maximum system operating voltage rating (V):	1000V	—
	d) Ultraviolet radiation resistance (ANSI/UL 746C)	Junction box is certified. (Refer to CDF)	P
5.4	Polymers serving as an outer surface		
	Information is provided that polymeric substrates or superstrates used in the module have:		—
5.4.1	a) A thermal index, both electrical and mechanical, as determined in accordance with IEC 60216 of at least 90°C.	IEC61730-2, MST21 test was passed.	P
	b) A thermal index of at least 20°C above the maximum measured operating temperature of the material as measured during the Temperature Test MST21 of IEC 61730-2.	IEC61730-2, MST21 test was passed.	P
5.4.2	Polymeric materials that serve as the outer enclosure for a module that (1) is intended to be installed in a multi-module or -panel system or (2) have an exposed surface area greater than 1 m² or a single dimension larger than 2 m, has a maximum flame spread index of 100 as determined under ASTM E162-1990.	No such part	N/A
5.4.3	If exposed to direct sunlight in the application, the polymeric material has been evaluated for ultraviolet (UV) radiation resistance as determined in accordance with ANSI/UL 746C.	Backsheet is not directly exposed to sunlight.	P
5.4.4	Polymeric materials intended for use as a superstrate or substrate, without appropriate IEC insulation pre-qualification, comply with the requirements of the Partial Discharge Test MST 15 of IEC 61730-2.	IEC61730-2, MST15 test was passed.	P
5.5	**Polymers serving as barriers**		

IEC 61730-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Insulation barriers are of adequate thickness and of a material appropriate for the application, as defined by IEC 61140	EVA, Glass, Backsheet, Junction Box, Cable, Connector are acceptable insulation	P
	Barriers or liners are held in place and are not adversely affected	No such part	P
5.6	**Polymers serving as structural glazing materials**		
	Polymers serving as structural glazing materials comply with the requirements for safety glazing by material certification (ANSI Z97.1-93) or by testing in accordance with Module Breakage Test MST 32 of IEC 61730-2.	IEC61730-2, MST32 test was passed.	P
Supplementary information: N/A.			

6	**INTERNAL WIRING AND CURRENT-CARRYING PARTS**		
	Any current-carrying part and wiring has the mechanical strength and current-carrying capacity necessary for its application.		—
6.1	**Internal wiring**		
6.1.1	Wiring used within a module has an insulation rating for a minimum of 90°C, with a gauge and voltage rating acceptable for the application as defined by the requirements of IEC 60189-2.	Cable is certified. (Refer to CDF)	P
6.1.2	The wiring of a module is located so that after installation of the module in the intended manner the insulation is not exposed to degrading effects of direct sunlight.	Cable is certified. (Refer to CDF)	P
6.2	**Splices**		
	Splices are insulated equivalent to that required for the wiring involved.	No splice	N/A
6.3	**Mechanical securement**		
6.3.1	Joints or connections are mechanically secure and provide electrical contact without strain on connections and terminals.	Connections are mechanically secure.	P
6.3.2	Uninsulated live parts are secured to its supporting surface so that they are prevented from turning or shifting in position.	No un-insulated parts	N/A
Supplementary information: N/A.			

IEC 61730-1			
Clause	Requirement + Test	Result - Remark	Verdict
7	**CONNECTIONS**		
7.1	**Field connections – general requirements**		
7.1.1	The module is provided with wiring terminals, connectors, or leads to accommodate current-carrying conductors of the load circuit.	Junction, cable and connector have accommodate rated current.	P
7.1.2	Field connections are rated for exposure to direct sunlight as defined in Clause 5 of IEC 61730-1.	Cable and connector are certified. (Refer to CDF)	P
	Field connections are exposed to the degrading effects of direct sunlight.	Cable and connector are certified. (Refer to CDF)	P
7.2	**Field wiring terminals**		
7.2.1	Field wiring terminal blocks are rated for the appropriate voltage and current for the application and constructed in compliance with IEC 60947-1.	Junction box is certified. (Refer to CDF)	P
7.2.2	Wiring terminals integral to the construction of the terminal enclosure comply with the following requirements:	No such terminal	N/A
7.2.2.1	a) Screws and nuts which clamp external conductors have a thread conforming with ISO 261 or ISO 262 (or comparable standards)	—	N/A
	The screws and nuts used for field wiring do not serve to fix any other component.	—	N/A
7.2.2.2	b) Terminal screws have a minimum nominal thread diameter as shown in Table 2 of IEC 61730-1.	—	N/A
	Stud terminals are provided with nuts and washers.	—	N/A
7.2.2.3	c) Terminals are designed that they clamp the conductor between metal surfaces with sufficient contact pressure and without damage to the conductor.	—	N/A
	Terminals are designed or located that the conductor cannot slip out when the clamping screws or nuts are tightened.	—	N/A
	Terminals are fixed suitably when the means of clamping the conductor is tightened or loosened:	—	N/A
	- The terminal itself does not work loose,	—	N/A
	- Internal wiring is not subjected to stress,	—	N/A

IEC 61730-1			
Clause	Requirement + Test	Result - Remark	Verdict
	- Creepage distances and clearances are not reduced below the values specified in clause 9 of IEC 61730-1.	—	N/A
7.3	**Connectors**		
7.3.1	The connector intended for use in the output circuit of the module is rated for the appropriate voltage and current, as per the requirements of the IEC 60130 series.	Connector is certified. (Refer to CDF)	P
	Connectors comply with the requirements of Clause 5 of IEC 61730-1, with respect to flammability, comparative tracking index and relative thermal index for the support of live parts.	Connector is certified. (Refer to CDF)	P
7.3.2	The connector has been appropriately evaluated for disconnect overload performance.	"Do not disconnect underload" is written on the tag.	P
7.3.3	Connectors intended for exposure to the outdoor environment are enclosed by material which complies with the following:	Connector is certified. (Refer to CDF)	P
	a) UV resistance in accordance with the requirements of Clause 5.	Connector is certified. (Refer to CDF)	P
	b) Resistance to inclusion of water acc. to IEC 60529 (equivalent to IP55)	Connector is certified. (Refer to CDF)	P
	c) Steel ball impact test acc. to IEC 61721	Connector is certified. (Refer to CDF)	P
	d) Accessibility Test MST 11 of IEC 61730-2	Connector is certified. (Refer to CDF)	P
7.3.4	Separable multi-pole connectors are polarised.	Connector is certified. (Refer to CDF)	P
	If two or more separable connectors are provided, they are configured or arranged so that the other will not accept the mating connector for one.	Male connector and female connector are different type. Improper connection is not possible.	P
7.3.5	For a connector incorporating a grounding member, the grounding member is the first to make and the last to break contact with the mating connector.	No grounding member in the connector	N/A
7.3.6	Connectors that can be separated without the use of a tool do not have accessible conductive parts, as determined under the Accessibility Test MST 11 of IEC 61730-2.	No accessible conductive part. IEC61730-2, MST32 test was passed.	P
7.4	**Output lead or cables**		

IEC 61730-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Leads extending from the module are rated for the appropriate system voltage, ampacity, wet locations, temperature and sunlight resistance.	Cable and connector are certified. (Refer to CDF)	P
Supplementary information: N/A.			
8	**BONDING AND GROUNDING**		
8.1	If accessible conductive parts of the module form a perimeter framing or mounting system, or if the module has a conductive surface area of greater that 10 cm² accessible after installation, then the module has provisions for grounding.	Grounding position and the way to grounding are stated in the installation manual.	P
8.2	If the module is rated as safety class II and provided with provisions for functional grounding, the functional grounding is isolated from live parts by reinforced insulation (Subclause 7.3.2.2 of IEC 61140).	IEC61730-2 test was passed.	P
8.3	Each exposed conductive part of the module, that is assessable during normal operation, is bonded together, as verified by Ground Continuity Test MST 13 of IEC 61730-2. *Note: If conductive materials are used only as fasteners for installation and separated from the conductive components of the module by both appropriate insulation and spacings, they are not required to be bonded.*	IEC61730-2, MST13 test was passed.	P
8.4	Routine maintenance of the module does not involve breaking or disturbing the bonding path.	Bonding path is not disturbed by routine maintenance.	P
	A bolt, screw, or other part used for bonding purposes is not intended for securing the complete device.	Written in the installation manual	P
8.5	Bonding is by a positive means, such as clamping, riveting, bolted or screwed connections, or welding, soldering or brazing.	IEC61730-2, MST13 test was passed.	P
	The bonding connection penetrates all nonconductive coatings, such as paint, anodised coatings or vitreous enamel.	IEC61730-2, MST13 test was passed.	P
8.6	All joints in the bonding path are mechanically secure.	Bonding path are mechanically secure.	P
8.7	If the bonding connection depends upon screw threads, two or more screws or two full threads of a single screw engage the metal.	No screw is used.	N/A

IEC 61730-1			
Clause	Requirement + Test	Result - Remark	Verdict
8.8	The diameter of the grounding screw or bolt is sized appropriately to the gauge of the bonding conductor, as per Table 2 of IEC 61730-1.	Grounding hole size is 4mm	P
8.9	Ferrous metal parts in the grounding path are protected against corrosion by metallic or non-metallic coatings.	No ferrous metal part	N/A
8.10	The module has metal-to-metal multiple-bearing pin-type hinges. These are considered to be an acceptable means for bonding.	No hinge	N/A
8.11	A wiring terminal or bonding location is identified with the appropriate symbol (IEC 60417-5019) or has a green-coloured part.	Grounding mark is attached	P
	No other terminal or location is identified in this manner.	—	N/A
8.12	If a marking is used to identify an equipment grounding terminal, it is located on or adjacent to the terminal, or on a wiring diagram affixed to the module or panel near the terminal.	Grounding mark is attached	P
Supplementary information:			

9	**Creepage and Clearance distances**		
9.1	Creepage and clearance distances between uninsulated live parts not of the same potential and between a live part and an accessible metal part, are not less than the values specified in Tables 3 and 4 of IEC 61730-1.		—
	Minimum measured creepage and clearance distances between field wiring terminals (mm).....:	Junction box is certified. (Refer to CDF)	P
	Minimum Measured clearance distances between internal current carrying parts and accessible points (mm)..:	Minimum Measured clearance distances among all these module types is: 15mm from the edge of glass to string connector 17mm from the edge of glass to cell	P
9.2	Creepage and clearance distances at field wiring terminals have been judged on module open-circuit voltage (V_{oc}).		—

IEC 61730-1			
Clause	Requirement + Test	Result - Remark	Verdict
	If additional unmarked terminals exist in the terminal block, or if wiring terminals are marked specifically for grounding, the creepage and clearance distances have been judged on the basis of the maximum system operating voltage.	No such terminal	N/A
9.3	The spacings at a field-wiring terminal have been measured with and without wire connected to the terminal.		—
	If the terminal will properly accommodate it, and if the product was not marked to restrict its use, the wire is one size larger than that required, otherwise, the wire is of the required size.	No the terminal already installed in the junction box.	N/A
9.4	Surfaces separated by a gap of 0,4 mm or less have been considered to be in contact with each other.	No such surface	N/A
Supplementary information: N/A.			

10	**FIELD WIRING COMPARTMENTS WITH COVERS**		
10.1	**General**		
	If the module is designed for the application of a permanently attached wiring system by an installer in the field, it is to be provided with an enclosed wiring compartment	Junction box is certified. (Refer to CDF)	P
10.2	**Wall thickness**		
	If the wiring compartment is intended for the attachment of a field-applied permanent wiring system, the minimum wall thickness for the material complies with Table 5 of IEC 61730-1.	Junction box is certified. (Refer to CDF)	P
10.3	**Internal volume**		
	The internal volume for each intended conductor complies with the requirements of Table 6 of IEC 61730-1.	Junction box is certified. (Refer to CDF)	P
	In the space comprising the minimum required volume, no enclosure dimension is less than 20 mm.	Junction box is certified. (Refer to CDF)	P
10.4	**Openings**		
	All openings are provided with appropriate coverings, whose functions comply with the requirements of:		-

IEC 61730-1			
Clause	Requirement + Test	Result - Remark	Verdict
	- Subclause 5.2.1 of IEC 61730-1	Junction box is certified. (Refer to CDF)	P
	- Wet leakage Current test of Subclause 10.20 of IEC 61646 or 10.17 of IEC 61215 Ed. 2.	10.17 of IEC61215 test was passed.	P
	- Accessibility test MST 11 of IEC 61730-2	MST 11 of IEC61730-2 test was passed.	P
	Coverings can only be removed by the use of a tool	Tool is needed by removal of cover	P
10.5	**Gaskets and seals**		
	Gaskets and seals do not deteriorate beyond limits during accelerated ageing, and are not used where they may be subject to flexing during normal operation.	Gasket and seals did not deteriorate during 61730-2 testing	P
10.6	**Strain relief**		
	Any strain relief is provided so that stress on a lead intended for field connection, or otherwise likely to be handled in the field, including a flexible cord, is not transmitted to the electrical connection inside the module. *Note: Mechanical securement means which comply with Subclause 10.14 (Robustness of Terminations Test) of IEC 61215 meet this requirement.*	10.17 of IEC61730-2 test was passed.	P
10.7	**Sharp edges**		
10.7.1	The enclosure is smooth and free from sharp edges, burrs, or the like that may damage insulation or conductors.	No sharp edge and burr	N/A
10.7.2	The inner edges of conduit openings and knockouts are smooth and free from sharp edges, burrs, or the like that may damage insulation or conductors.	No conduit and knockout	N/A
10.8	**Conduit applications – Metallic**		
10.8.1	Any threaded hole in a metal wiring compartment intended for the connection of rigid metal conduit is reinforced to provide metal not less than 6,4 mm thick.	No conduit	N/A
	Any threaded hole is tapered unless a conduit end stop is provided.	No conduit	N/A

IEC 61730-1			
Clause	Requirement + Test	Result - Remark	Verdict
10.8.2	If threads for the connection of conduit are tapped all the way through a hole in a compartment wall, there are not less than 3.5 nor more than 5 threads in the metal and the construction. was such that a conduit bushing can be attached as intended.	No conduit	N/A
	The construction is such that a conduit bushing can be attached as intended.	No conduit	N/A
10.8.3	If threads for the connection of conduit are not tapped all the way through a hole in a compartment wall, there are not less than 5 full threads in the metal. and there was a smooth, rounded inlet hole for the conductors.	No conduit	N/A
	There are smooth, rounded inlet holes for the conductors.	No conduit	N/A
10.8.4	For a non-threaded opening in a metal wiring compartment intended to accommodate rigid metallic conduit, a flat surface of sufficient area is provided around the opening to accept the bearing surfaces of the bushing and lock washer.	No conduit	N/A
10.8.5	Conduit complies with the Conduit bending test MST 33 of IEC 61730-2.	No conduit	N/A
10.9	**Conduit applications – Non-metallic**		
10.9.1	The thickness of sides, end walls, and bottom of a non-metallic wiring enclosure specified for conduit applications is not less than the values specified in Table 7 of IEC 61730-1.	No conduit	N/A
10.9.2	A non-metallic wiring compartment intended to accommodate non-metallic conduit fulfils the following requirements:	No conduit	N/A
	a) It has one or more unthreaded conduit-connection sockets;	No conduit	N/A
	b) It has one or more threaded or unthreaded openings for a conduit-connection socket, or one or more knockouts that comply with the requirements of Knockout Test MST 44 of IEC 61730-2;	No conduit	N/A
	c) It complies with the Conduit Bending Test MST 33 of IEC 61730-2, if intended for rigid non-metallic conduit.	No conduit	N/A
10.9.3	Sockets for the connection of non-metallic conduit provide a positive end stop for the conduit.	No conduit	N/A

IEC 61730-1			
Clause	Requirement + Test	Result - Remark	Verdict
	The socket diameters, the throat diameter at the entrance to the box, the socket depths, and the wall thickness of the socket are within the limits specified in the applicable conduit system.	No conduit	N/A
10.9.4	A knockout or opening in a non-metallic wiring compartment intended to accommodate rigid non-metallic conduit complies with the dimensional requirements of the applicable conduit system.	No conduit	N/A
Supplementary information: N/A.			

11	**MARKING**		
11.1	The module includes the following clear and indelible markings:		
	– Name, monogram or symbol of manufacturer	Refer to copy of marking plate	P
	– Type or model number	Refer to copy of marking plate	P
	– Serial number	Refer to sticker	P
	– Polarity of terminals or leads	Refer to copy of marking plate	P
	– Maximum system voltage	Refer to copy of marking plate	P
	– Safety class (IEC 61140)	Refer to copy of marking plate	P
	The date and place of manufacture are marked on the module or are traceable from the serial number.	Traceable from serial No.	P
	International symbols are used where applicable.	—	N/A
11.2	The following additional markings are applied to either the module or placed into the instruction and installation data (required documents).		—
	– Voltage at open-circuit	Refer to copy of marking plate	P
	– Current at short-circuit	Refer to copy of marking plate	P
	– Maximum over-current protection rating, as verified by the Reverse Current Overload Test MST 26 of IEC 61730-2	Refer to copy of marking plate	P
	– Recommended maximum series/parallel module configurations	Refer to Installation Manual	P
	– Application class	Refer to copy of marking plate	P
	All electrical data are given relative to Standard Test Conditions (1000W/m^2 @ 25°C)	Refer to copy of marking plate	P

IEC 61730-1			
Clause	Requirement + Test	Result - Remark	Verdict
11.3	Connectors suitable only for field assembly of modules are marked "Do not disconnect under load".	Refer to the picture of connector	P
11.4	For modules with open-circuit voltage in excess of 50 V, and/or modules rated for maximum system voltage in excess of 50 V, a highly visible warning label regarding the shock hazard is applied near the means of connection to the module.	Written in installation manual	P
Supplementary information: N/A.			

12	**REQUIREMENTS FOR SUPPLIED DOCUMENTS**		
12.1	The module or panel is supplied with installation instructions describing the methods of electrical and mechanical installation and the electrical ratings of the module.	Installation manual is provided.	P
	The instructions state the application class under which the module was qualified and any specific limitations required for that application class.	Written in installation manual	P
12.2	When the fire rating is dependent on a specific mounting structure, specific spacing, or specific means of attachment to the roof or structure, details of the specific parameter or parameters are included in the instructions.	Written in installation manual	P
12.3	The electrical installation instructions include a detailed description of the wiring method.		—
	The description of the wiring method includes the following information:		—
	– Grounding method	Written in installation manual.	P
	– Size, type, and temperature rating of the conductors	Written in installation manual.	P
	– Recommended maximum series/parallel module configurations	Written in installation manual.	P
	– Type of over-current protection and diode bypassing to be used	Written in installation manual.	P
	– Minimum cable diameters when the wiring method is cable	Written in installation manual.	P
	– Any limitations on wiring methods that apply to the wiring compartment or box	Written in installation manual.	P
12.4	The mechanical installation instructions for roof mounting include:		

IEC 61730-1			
Clause	Requirement + Test	Result - Remark	Verdict
	– A statement indicating the minimum mechanical means for securing the module or panel to the roof	Written in installation manual	P
	– A statement that the assembly is to be mounted over a fire resistant roof covering rated for the application (only for non-integral modules or panels)	Written in installation manual	P
	– Indication of any slope required for maintaining a fire class rating	Written in installation manual	P
12.5	The installation instructions include a statement advising that artificially concentrated sunlight shall not be directed on the module or panel.	"Sunlight shall not be concentrated on the module or other artificial light sources onto the module," is written in installation manual	P
12.6	Assembly instructions are provided with a product shipped in subassemblies, and are detailed and adequate to the degree required to facilitate total assembly of the product.	No assembly is required.	P
12.7	The installation instructions include the proposed statement given in this Subclause (or equivalent) to allow for increased output of the module resulting from certain conditions of use.	Written installation manual.	P
Supplementary information: N/A.			

--------------- End of Test report -----------------

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Manufacturer	**Shenzhen Shine Solar Co., Ltd** 8th Floor，Buliding A,DongFangYaYuan, ChenTian Communities,XiXiang Bao'an District, Shenzhen 518109 P.R.China
Date of Application	05.01.2012
Product	Crystalline Silicon PV Module
Model No.	**Poly-crystalline Solar Cell Module** 156x156: 72cells: SN***P-24(***=255-305 increment of 5) 60cells: SN***P-20(***=210-255 increment of 5) 54cells: SN***P-18(***=190-230 increment of 5) 48cells: SN***P-16(***=170-205 increment of 5) 36cells： 156x156: SN***P-12(***=120-150 increment of 5) 156x119: SN***P-12(***=95-115 increment of 5) 156x93.7: SN***P-12-1(***=75-90 increment of 5) 156x76.1: SN***P-12-2(***=60-75 increment of 5) 156x59.5: SN***P-12(***=50-55 increment of 5) 156x46.8: SN***P-12-3(***=40-45 increment of 5) 156x43.2: SN***P-12-4(***=35-40 increment of 5) 156x35.6: SN***P-12-5(***=30-35 increment of 5) 156x29.5: SN***P-12(***=25) 156x24.0: SN***P-12(***=20) 156x17.5: SN***P-12(***=15) 78x24.0: SN***P-12(***=10) 78x11.7: SN***P-12(***=5) **Mono-crystalline Solar Cell Module** 156x156: 72cells: SN***M-24(***=255-305 increment of 5) 60cells: SN***M-20(***=210-255 increment of 5) 54cells: SN***M-18(***=190-230 increment of 5) 48cells: SN***M-16(***=170-205 increment of 5) 125x125: 96cells: SN***M-32(***=215-260 increment of 5) 72cells: SN***M-24(***=160-195 increment of 5) 60cells: SN***M-20(***=135-165 increment of 5) 54cells: SN***M-18(***=120-145 increment of 5) 48cells: SN***M-16(***=110-130 increment of 5) 36cells: 156x156: SN***M-12(***=125-150 increment of 5) 156x119: SN***M-12-1(***=95-115 increment of 5) 125x125: SN***M-12-2(***=80-95 increment of 5) 125x101: SN***M-12-3(***=65-80 increment of 5) 125x86.8: SN***M-12-4(***=55-65 increment of 5) 125x72: SN***M-12-5(***=45-55 increment of 5) 125x59.9: SN***M-12-6(***=40-45 increment of 5) 125x49.7: SN***M-12(***=35) 125x43.2: SN***M-12(***=30) 125x35.4: SN***M-12(***=25) 125x28.3: SN***M-12(***=20) 125x20.6: SN***M-12(***=15) 125x14.2: SN***M-12(***=10) 62.5x14.2: SN***M-12(***=5)
General Information • Maximum System Voltage • Application Class • Electrical Protection Class	 DC 1000V Class A Class II
Type of examination	Conformity testing with TÜV mark
Testing Period	18.01.2012- 10.03.2012
Testing Laboratory	**CCIC Southern Electronic Product Testing(Shenzhen) Co.,Ltd** Electronic Testing Building, Shahe Road, Xili, Nanshan District, Shenzhen 518055, P.R. China

Test results listed in this test report refer exclusively to the mentioned test sample.

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The submitted test samples as described in the reports hereunder are in compliance with the requirements IEC61730-2:2004 “Photovoltaic (PV) module safety qualification. Part 2: Requirements for testing”

Roger Liao

Approved by

Copy of marking plate

SHINE

PHOTOVOLTAIC MODULE
MODEL TYPE:SN280P24-72

MAXIMUM POWER	Pmax	280	±3%	W
SHORT CIRCUIT CURRENT	Isc	8.29		A
OPEN CIRCUIT VOLTAGE	Voc	43.20		V
MAXIMUM POWER CURRENT	Imp	7.78		A
MAXIMUM POWER VOLTAGE	Vmp	36.00		V
MAX. SYSTEM VOLTAGE		1000		V
FUSE RATING		15		A
MODULE DIMENSION		1950×992×40mm		
MODULE APPLICATION:			CLASS A	

*All technical data at standard test conditions:
AM 1.5,1000W/m2 IRRADIANCE, 25℃ CELL TEMPERATURE

WARNING ELECTRICAL HAZARD SOLAR MODULES CAN PRODUCE HIGH VOLTAGES WHEN EXPOSED TO SUNLIGHT. COVER MODULES WHEN CONNECTING WIRING,READ,UNDERSTAND AND FOLLOW ALL SAFETY PRECAUTIONS DESCRIBED IN MODULE INSTALLATION MANUAL, REMOVAL OF TERMINAL BLOCK VOIDS WARRANTY.

DATE OF MANUFACTURE: APIRL,2012
MANUFACTURER:
MADE IN CHINA

SHINE

PHOTOVOLTAIC MODULE
MODEL TYPE:SN290M24-72

MAXIMUM POWER	Pmax	290	±3%	W
SHORT CIRCUIT CURRENT	Isc	8.42		A
OPEN CIRCUIT VOLTAGE	Voc	43.20		V
MAXIMUM POWER CURRENT	Imp	8.05		A
MAXIMUM POWER VOLTAGE	Vmp	36.00		V
MAX. SYSTEM VOLTAGE		1000		V
FUSE RATING		15		A
MODULE DIMENSION		1580×808×40mm		
MODULE APPLICATION:			CLASS A	

*All technical data at standard test conditions:
AM 1.5,1000W/m2 IRRADIANCE, 25℃ CELL TEMPERATURE

WARNING ELECTRICAL HAZARD SOLAR MODULES CAN PRODUCE HIGH VOLTAGES WHEN EXPOSED TO SUNLIGHT. COVER MODULES WHEN CONNECTING WIRING,READ,UNDERSTAND AND FOLLOW ALL SAFETY PRECAUTIONS DESCRIBED IN MODULE INSTALLATION MANUAL, REMOVAL OF TERMINAL BLOCK VOIDS WARRANTY.

DATE OF MANUFACTURE: APIRL,2012
MANUFACTURER:
MADE IN CHINA

Summary of testing:

The model SN280P24-72 and SN290M24-72 were selected as the representative test model had been carried out all the test clauses.

All of the required tests of the IEC 61730:2004 standard were passed according to the pass criteria. It is therefore declared, that the photovoltaic modules of the aforementioned types fulfil the requirements of the standard IEC 61730:2004 and it is recommended that certification should be granted.

GENERAL INFORMATION	
Test item particulars:	
Accessories and detachable parts included in the evaluation:	Mounting device
Options included ....:	N/A
Abbreviations used in the report:	
HF – Humidity Freeze	TC – Temperature Cycling
DH – Damp Heat	Vmpp – Maximum power voltage
Imp – Maximum power current	Voc – Open circuit voltage
Isc - Short circuit current	FF – Fill factor
Pmp – Maximum power	α – Current temperature coefficient
NOCT – Nominal Operating Cell Temperature	β – Voltage temperature coefficient
STC – Standard Test Conditions	γ– power temperature coefficient
Possible test case verdicts: - test case does not apply to the test object .... :	Not Apply (N/A)
- test object does meet the requirement .... :	Pass(P)
- test object does not meet the requirement .... :	Fail(F)

General remarks:

The test verdicts presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.
"(see Enclosure #)" refers to additional information appended to the report.
"(see appended table)" refers to a table appended to the report.

Throughout this report a point is used as the decimal separator.

Detailed product information are to be found in the CDF (constructional data form).

Test item particulars:	
Accessories and detachable parts included in the evaluation..	N/A
Mounting system used	N/A
Other options included	N/A
Possible test case verdicts:	
- Test case does not apply to the test object ....:	N/A (Not apply)
- Test object does meet the requirement......................:	P (Pass)
- Test object does not meet the requirement................:	F (Fail)
Abbreviations used in the report:	
CTI – Comparative Tracking Index	PD – Partial Discharge
FF – Fill factor	RTI – Relative Thermal Index
Ipm – Maximum power current	STC – Standard Test Conditions
Isc – Short circuit current	TC –Thermal Cycling
MST – Module Safety Test	Voc – Open circuit voltage
Pmax – Maximum power	Vpm – Maximum power voltage

General remarks:

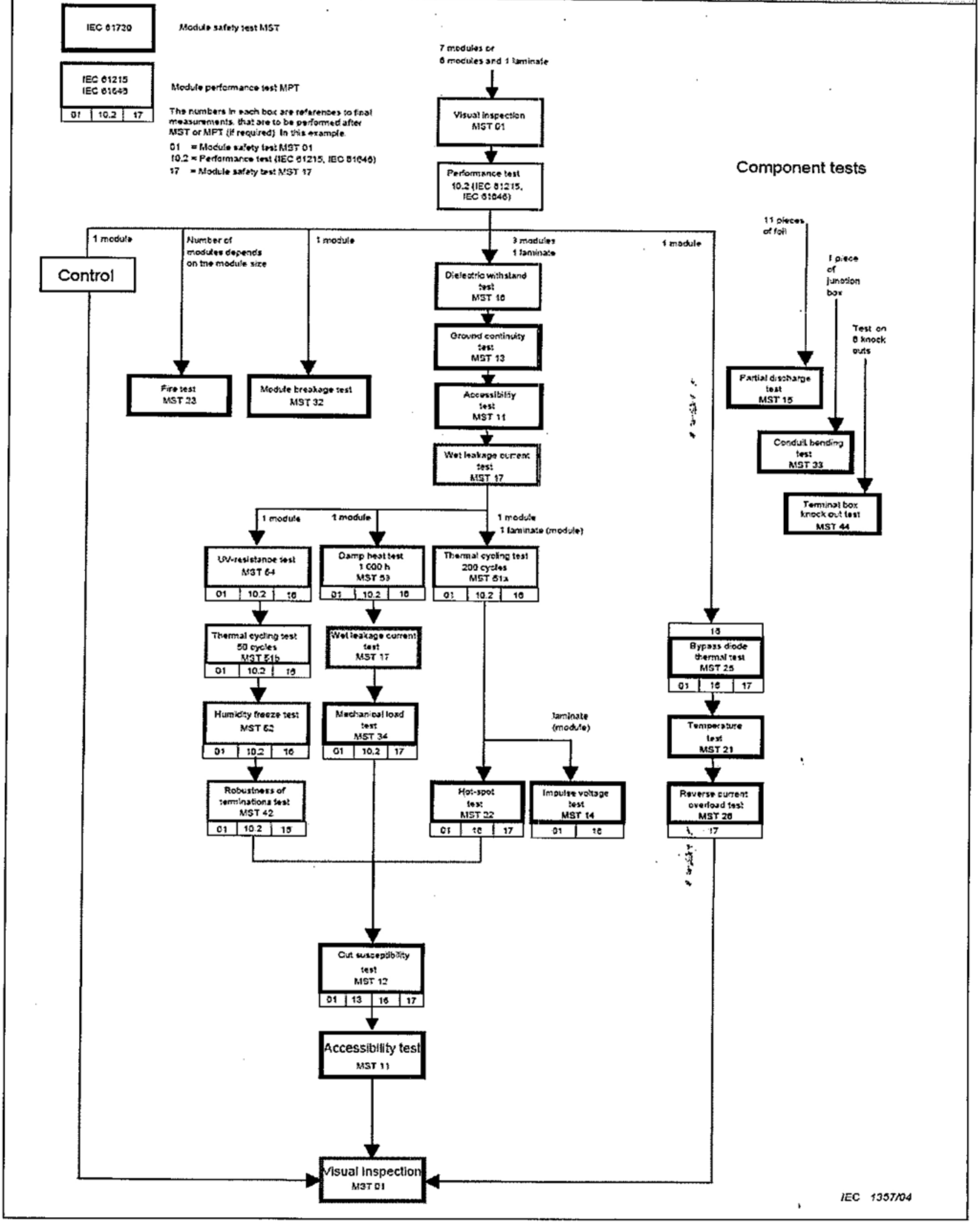
This report shall not be reproduced except in full without the written approval of the testing laboratory.
The test results presented in this report relate only to the item(s) tested.
"(see remark #)" refers to a remark appended to the report.
"(see appedix #)" refers to an annex appended to the report.
"(see appended table)" refers to a table in the Test Report.
Throughout this report a point is used as the decimal separator.
This Test Report Form is intended for the investigation of PV module in accordance with IEC 61730-2. It can only be used together with IEC 61730-1 and IEC 61215 Test Report.

General product information:

<u>Product Safety Ratings</u>

Maximum system voltage ....:	1000 V
Maximum over-current protection rating.......................................:	15 A
Safety application class ....:	Class A
Safety class in accordance with IEC 61140..................................:	Class II
Fire safety class...:	Not evaluated
Recommended maximum series/parallel module configurations:	Please refer to Manual

TEST SEQUENCES FOR MODULE SAFETY TESTING UNDER IEC 61730-2



IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict

3	APPLICATION CLASSES		P
	The module has been evaluated for the following Application Class (Class A, B, C)............................:	Class A	P

REQUIRED TESTS DEPENDING ON THE APPLICATION CLASS			
Application Class			Module Safety Test
A	B	C	
			Preconditioning tests:
X	X	X	MST 51 Thermal cycling (TC50 or TC200)
X	X	X	MST 52 Humidity freeze
X	X	X	MST 53 Damp heat
X	X	X	MST 54 UV resistance
			General inspection test:
X	X	X	MST 01 Visual Inspection
			Electrical shock hazard tests:
X	X	-	MST 11 Accessibility test
X	X	-	MST 12 Cut Susceptibility test
X	X	X	MST 13 Ground Continuity test
X	X*	-	MST 14 Impulse Voltage test
X	X*	-	MST 16 Dielectric Withstand test
X	X	-	MST 17 Wet Leakage Current test
X	X	X	MST 42 Robustness of terminations
			Fire Hazard tests:
X	X	X	MST 21 Temperature test
X	X	X	MST 22 Hot spot test
X**	-	-	MST 23 Fire test
X	X	-	MST 26 Reverse current overload test
			Mechanical stress tests:
X	X	X	MST 32 Module breakage test
X	-	X	MST 34 Mechanical load test
			Component tests:
X	-	-	MST 15 Partial discharge test
X	X	-	MST 33 Conduit bending
X	X	X	MST 44 Terminal box knockout test

Legend:

X	Test required
-	Test not required
*	Different test levels for Application class A and B
**	Minimum Fire Resistance Class C is necessary for building roof-mounted modules.

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict

6	**SAMPLING**		P
	☐ 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 or IEC 61646 performance testing		N/A
	☒ Preconditioning of test samples was performed separately from IEC 61215 or IEC 61646 performance testing		P

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict

List of test samples

SN280P24-72:

Sample #	Sample Group ID	Model	Sample S/N
1	A	SN280P24-72	SN-P280W00008
2	B	SN280P24-72	SN-P280W00010
3	C1	SN280P24-72	SN-P280W00011
4	C2	SN280P24-72	SN-P280W00009
5	D1	SN280P24-72	SN-P280W00007
6	D2, IV[3]	SN280P24-72	SN-P280W00003
7	E1	SN280P24-72	SN-P280W00004
8	E2	SN280P24-72	SN-P280W00002
9	B	SN280P24-72	SN-P280W00006
10	B	SN280P24-72	SN-P280W00001
11	TT[1], RC[2]	SN280P24-72	SN-P280W00005
12	MB[4]	SN280P24-72	SN-P280W00012

SN290M24-72:

Sample #	Sample Group ID	Model	Sample S/N
13	A	SN290M24-72	110510XT992
14	B	SN290M24-72	110510XT888
15	D1	SN290M24-72	110510XT990
16	D2	SN290M24-72	110510XT919
17	E1	SN290M24-72	110510XT912
18	E2	SN290M24-72	110510XT864
19	TT[1], RC[2]	SN290M24-72	110510XT981

Supplementary information: Area of module: 1.94[m^2]

Remark:

1. TT: MST21 Temperature test of IEC/EN 61730-2.
2. RC: MST26 Reverse current overload test of IEC/EN 61730-2.
3. IV: MST14 Impulse voltage test of IEC/EN 61730-2.
4. MB: MST32 Module breakage test of IEC/EN 61730-2.

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict

9	**PASS CRITERIA**		—
	The module under evaluation was judged to have passed all safety qualification test. The test samples met all of the criteria of each individual safety test.	See appended Tables	P
Supplementary information: N/A.			

10	**TEST PROCEDURES**		—
	Safety qualification testing included the following Module Safety Tests (MST) of IEC 61730-2:	—	—
10.1	MST 01 – Visual inspection ....:	See appended Table 10.1	P
10.2	MST 11 – Accessibility test.................................:	See appended Table 10.2	P
10.3	MST 12 – Cut susceptibility test..........................:	See appended Table 10.3	P
10.4	MST 13 – Ground continuity test ....:	See appended Table 10.4	P
10.5	MST 14 – Impulse voltage test	See appended Table 10.5	P
10.6	MST 16 – Dielectric withstand test ....:	See appended Table 10.6	P
10.7	MST 21 – Temperature test.................................:	See appended Table 10.7	P
10.8	MST 23 – Fire test ....:	—	N/A
10.9	MST 26 – Reverse current overload Test............:	See appended Table 10.9	P
10.10	MST 32 – Module breakage test..........................:	See appended Table 10.10	P
Component Tests			
11.1	MST 15 – Partial discharge test...........................:	See appendix	P
11.2	MST 33 – Conduit bending test ....:	—	N/A
11.3	MST 44 – Terminal box knockout test.................:	—	N/A
Supplementary information: N/A.			

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict

Main test model test results description

Module type: SN280P24-72

Overview of MST items for each test sample

MST item	Sample No. 1#	2#	3#	4#	5#	6#	7#	8#	9#	10#	11#	12#		
Control module	X													
MST 01 – Visual inspection	X	X	X	X	X	X	X	X	X	X	X	X		
MST 11 – Accessibility test			X		X		X			X				
MST 12 – Cut susceptibility test			X		X		X			X				
MST 13 – Ground continuity test			X		X		X			X				
MST 14 – Impulse voltage test						X_2								
MST 15 – Partial discharge test														
MST 16 – Dielectric withstand test	X	X	X	X	X	X	X	X	X	X	X			
MST 17 – Wet leakage current test	X	X	X	X	X	X	X	X	X	X	X			
MST 21 – Temperature test											X			
MST 22 – Hot-spot test*										X				
MST 23 – Fire test														
MST 26 – Reverse current overload test											X			
MST 32 – Module breakage test												X		
MST 33 – Conduit bending test														
MST 34 – Mechanical load test*							X_1							
MST 42 – Robustness of terminations test*			X_1											
MST 44 – Terminal box knock out test														
MST 51a – Thermal cycling test (TC200) *					X_1	X_2								
MST 51b – Thermal cycling test (TC50) *			X_1	X_2										
MST 52 – Humidity freeze test*			X_1	X_2										
MST 53 – Damp heat test*							X_1	X_2						
MST 54 – UV preconditioning test*			X_1	X_2										

Legend:

1. Xn Test performed, where n gives the sequence of testing (n =1, 2 etc.)
2. Project with " * ", please see report:

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict

Module type: SN290M24-72

Overview of MST items for each test sample														
MST item	Sample No.													
	13#	14#	15#	16#	17#	18#	19#							
Control module	X													
MST 01 – Visual inspection	X	X	X	X	X	X	X							
MST 11 – Accessibility test														
MST 12 – Cut susceptibility test														
MST 13 – Ground continuity test														
MST 14 – Impulse voltage test														
MST 15 – Partial discharge test														
MST 16 – Dielectric withstand test	X	X	X	X	X	X	X							
MST 17 – Wet leakage current test	X	X	X	X	X	X	X							
MST 21 – Temperature test							X							
MST 22 – Hot-spot test*		X												
MST 23 – Fire test														
MST 26 – Reverse current overload test							X							
MST 32 – Module breakage test														
MST 33 – Conduit bending test														
MST 34 – Mechanical load test*			X_1											
MST 42 – Robustness of terminations test*														
MST 44 – Terminal box knock out test														
MST 51a – Thermal cycling test (TC200) *					X_1	X_2								
MST 51b – Thermal cycling test (TC50) *														
MST 52 – Humidity freeze test*														
MST 53 – Damp heat test*			X_1	X_2										
MST 54 – UV preconditioning test*														

Legend:

1. Xn Test performed, where n gives the sequence of testing (n =1, 2 etc.)
2. Projects with " * ", please see report.

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict

Module type: SN280P24-72

Table 10.1	MST 01 – VISUAL INSPECTION		-
Sample #	Position in test sequence	Nature and position of initial findings Comments or attach photos	-
3#	Initial examination	No visual defects	P
	Preconditioning: MST 54, MST 51b, MST 52	No visual defects	P
	MST 12, Cut susceptibility test	No visual defects	P
	Final examination	No visual defects	P
5#	Initial examination	No visual defects	P
	Preconditioning: MST 51a	No visual defects	P
	MST 12, Cut susceptibility test	No visual defects	P
	Final examination	No visual defects	P
6#	Initial examination	No visual defects	P
	Preconditioning:,MST 51a	No visual defects	P
	MST 14, Impulse voltage test	No visual defects	P
	Final examination	No visual defects	P
7#	Initial examination	No visual defects	P
	Preconditioning: MST 53, MST 34	No visual defects	P
	MST 12, Cut susceptibility test		N/A
	Final examination		N/A
10#	Initial examination	No visual defects	P
	Preconditioning: MST 22, MST 25	No visual defects	P
	MST 12, Cut susceptibility test	No visual defects	P
	Final examination	No visual defects	P
11#	Initial examination	No visual defects	P
	Preconditioning: MST 25	No visual defects	P
	MST 21, Temperature test	No visual defects	P
	MST 26, Reverse current overload test	No visual defects	P
	Final examination	No visual defects	P
12#	Initial examination	No visual defects	P
Supplementary information: N/A..			

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict

Module type: SN290M24-72

MST 01	TABLE: Visual inspection		—
Sample #	Position in test sequence	—	—
19#	Initial examination	No visual defects	P
	MST 21, Temperature test	No visual defects	P
	MST 26, Reverse current overload	No visual defects	P
	Final examination	No visual defects	P
Supplementary information: N/A.			

Module type: SN280P24-72

Table 10.2	MST 11 – ACCESSIBILITY TEST		—
Sample #	Position in test sequence	—	—
3#	Initial examination	>2000 MΩ	P
	Preconditioning: MST 54, MST 51b, MST 52	—	—
	MST 12, Cut susceptibility test	—	—
	Final examination	>2000 MΩ	P
5#	Initial examination	>2000 MΩ	P
	Preconditioning: MST 51a	—	—
	MST 12, Cut susceptibility test	—	—
	Final examination	>2000 MΩ	P
7#	Initial examination	>2000 MΩ	P
	Preconditioning: MST 53, MST 34	—	—
	MST 12, Cut susceptibility test	—	—
	Final examination	>2000 MΩ	P
10#	Initial examination	>2000 MΩ	P
	Preconditioning: MST 22, MST 25	—	—
	MST 12, Cut susceptibility test	—	—
	Final examination	>2000 MΩ	P
Supplementary information: N/A..			

Module type: SN280P24-72

Table 10.3	MST 12 – CUT SUSCEPTIBILITY TEST		P
	Applied force (N)...:	8.9±0.5	—
Sample No.	Pass criteria		—
3#	☒ No visual evidence that the superstrate or substrate have been cut ☒ No exposure of active circuitry of the module ☒ Requirement of MST 13, MST 16, MST 17 are met (see appended Tables 10.4, 10.6, MST17)		P
5#	☒ No visual evidence that the superstrate or substrate have been cut ☒ No exposure of active circuitry of the module ☒ Requirement of MST 13, MST 16, MST 17 are met (see appended Tables 10.4, 10.6, MST17)		P
7#	☒ No visual evidence that the superstrate or substrate have been cut ☒ No exposure of active circuitry of the module ☒ Requirement of MST 13, MST 16, MST 17 are met (see appended Tables 10.4, 10.6, MST17)		P
10#	☒ No visual evidence that the superstrate or substrate have been cut ☒ No exposure of active circuitry of the module ☒ Requirement of MST 13, MST 16, MST 17 are met (see appended Tables 10.4, 10.6, MST17)		P
Supplementary information: N/A			

Module type: SN280P24-72

Table 10.4	MST 13 – GROUND CONTINUITY TEST		—
Maximum over-current protection rating [A] ......:		15	—
Current applied [A]...:		37.5	—
Location of designated grounding point.............:		The centre of long side	—
Location of second contacting point ....:		A: The centre of another longer side B: Adjacent shorter side with greatest distance from the grounding point C: The centre of the other shorter side	—
Sample #	Position in test sequence	Resistance [Ω]	—
3#	Initial examination	A: 0.003 B: 0.002 C: 0.002	P

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict
	Preconditioning: MST 54, MST 51b, MST 52	—	—
	MST 12, Cut susceptibility test	—	—
	Final examination	A: 0.004 B: 0.002 C: 0.003	P
5#	Initial examination	A: 0.003 B: 0.002 C: 0.003	P
	Preconditioning: MST 51a	—	—
	MST 12, Cut susceptibility test	—	—
	Final examination	A: 0.004 B: 0.004 C: 0.003	P
7#	Initial examination	A: 0.003 B: 0.002 C: 0.002	P
	Preconditioning: MST 53, MST 34	—	—
	MST 12, Cut susceptibility test	—	—
	Final examination		N/A
10#	Initial examination	A: 0.003 B: 0.002 C: 0.002	P
	Preconditioning: MST 53, MST 34	—	—
	MST 12, Cut susceptibility test	—	—
	Final examination	A: 0.005 B: 0.004 C: 0.004	P
Supplementary information: N/A.			

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict

Module type: SN280P24-72

Table 10.5	MST 14 – IMPULSE VOLTAGE TEST		—
	Maximum system voltage (V) ....:	1000	—
	Impulse voltage (V)...:	8000	—
	Thickness of conductive foil (mm) ....:	0.05	—
Sample No.	Pass criteria		—
6#	☒ No evidence of dielectric breakdown or surface tracking observed ☒ No evidence of major visual defects (See appended table 10.1)		P
Supplementary information: N/A			

Module type: SN280P24-72

TABLE 10.6	MST 16 – DIELECTRIC WITHSTAND TEST			—
Maximum system voltage [V]............................ :		1000		—
Test voltage applied [V] .... :		1 minute of 6000 and 2 minutes of 1000		—
Minimum allowable insulation resistance [MΩ]. :		20.6		—
Sample #	Position in test sequence	Dielectric breakdown?	Resistance [MΩ]	—
3#	Initial test..:	☐	>2000	P
	MST 54, MST 51b, MST 52	Preconditioning		—
	Intermediate test.............................:	☐	>2000	P
	MST 12, Cut susceptibility test	MST		—
	Final examination	☐	>2000	P
5#	Initial test..:	☐	>2000	P
	MST 51a	Preconditioning		—
	Intermediate test.............................:	☐	>2000	P
	MST 12, Cut susceptibility test	MST		—
	Final examination	☐	>2000	P
6#	Initial test..:	☐	>2000	P
	MST 51a	Preconditioning		—
	Intermediate test.............................:	☐	>2000	P
	MST 14, Impulse voltage test	MST		—
	Final examination	☐	>2000	P
7#	Initial test..:	☐	>2000	P

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict

	MST 53, MST 34	Preconditioning		—
	Intermediate test.............................:	☐	>2000	P
	MST 12, Cut susceptibility test	MST		—
	Final examination	☐	>2000	P
10#	Initial test.......................................:	☐	>2000	P
	MST 22	Preconditioning		—
	Intermediate test.............................:	☐	>2000	P
	MST 12, Cut susceptibility test	MST		—
	Final examination	☐	>2000	P
Supplementary information: Minimum requirement according to the standard is 40MΩ·m^2.				

Module type: SN280P24-72

TABLE 10.7	MST 21 – TEMPERATURE TEST			—
Sample #...:	11#			—
Reference solar irradiance [W/m^2]..................:	1000			—
Reference ambient temperature [°C] ....:	40			—
Module open-circuited				
Measuring location	Component temperature T_{OBS}[°C]	Normalised temperature T_{CON}[°C]	Component temperature limit [°C]	—
Module superstrate above the centre cell	86.2	78.8	—	—
Module substrate below the centre cell	90.4	83.0	85	P
Terminal enclosure interior surface	57.1	49.7	85	P
Terminal enclosure interior air space	85.2	77.8	85	P
Field wiring terminals	84.3	76.9	85	P
Insulation of the field wiring leads	56.3	48.9	90	P
External connector bodies	49.4	42.0	85	P
Diode bodies	78.5	71.1	200	P
Frame	56.9	49.5	85	P
Ambient	47.4	40.0	—	—
Module short-circuited				
Measuring location	Component temperature T_{OBS}[°C]	Normalised temperature T_{CON}[°C]	Component temperature limit [°C]	—

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict

Module superstrate above the centre cell	83.4	78.3	—	—
Module substrate below the centre cell	88.1	83.0	85	P
Terminal enclosure interior surface	56.2	51.1	85	P
Terminal enclosure interior air space	83.1	78.0	85	P
Field wiring terminals	64.9	59.8	85	P
Insulation of the field wiring leads	59.0	53.9	90	P
External connector bodies	45.4	40.3	85	P
Diode bodies	78.9	73.8	200	P
Frame	56.3	51.2	85	P
Ambient	45.1	40.0	—	—
Supplementary information: $T_{CON} = T_{OBS} + (40°C - T_{AMB})$ Temperature limits are given in Table 9 of IEC 61730-2 / EN 61730-2.				

Module type: SN290M24-72

Table 10.7	MST 21 – Temperature Test				P
	Sample No. :	7#			—
	Reference solar irradiance [W/m²] :	1000			—
	Reference ambient temperature [°C] :	40			—
Module open-circuited					
Measuring location:		Component temperature T_{OBS} [°C]	Normalised temperature T_{CON} [°C]	Component temperature limit [°C]	—
Module superstrate above the centre cell		75.0	79.5	—	P
Module substrate below the centre cell		78.0	82.5	85	P
Terminal enclosure interior surface		76.5	81.0	85	P
Terminal enclosure interior air space		64.7	69.2	85	P
Field wiring terminals		64.3	68.8	85	P
Insulation of the field wiring leads		49.2	53.7	90	P
External connector bodies		53.0	57.5	85	P
Diode bodies		70.4	74.9	200	P
Frame		55.0	59.5	90	P
Ambient		35.5	40.0	-	P
Module short-circuited					
Measuring location:		Component temperature	Normalised temperature	Component temperature	—

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict

	T_{OBS} [°C]	T_{CON} [°C]	limit [°C]	
Module superstrate above the centre cell	67.5	73.6	—	P
Module substrate below the centre cell	70.2	76.3	85	P
Terminal enclosure interior surface	66.9	73.0	85	P
Terminal enclosure interior air space	54.5	60.6	85	P
Field wiring terminals	55.4	61.5	85	P
Insulation of the field wiring leads	50.4	56.5	90	P
External connector bodies	51.0	57.1	85	P
Diode bodies	75.9	82.0	200	P
Frame	49.3	55.4	90	P
Ambient	33.9	40.0	—	P
Supplementary information: $T_{CON} = T_{OBS} + (40°C - T_{AMB})$ Temperature limits are given in Table 9 of IEC 61730-2.				

Module type: SN280P24-72

TABLE 10.9	MST 26 – REVERSE CURRENT OVERLOAD TEST		—
Maximum over-current protection rating [A]...... :		15	—
Applied current [A]		20.25	—
Applied voltage [V] / high – low......................... :		54.7 to 49.2	—
Test duration [h]... :		2	—
Sample #	Pass criteria		—
11#	☒ No flaming of the module		P
	☒ No flaming or charring of the cheesecloth		P
	☒ No flaming of the tissue paper		P
	☒ MST 17 requirements fulfilled (see appended Table MST 17)		P
Supplementary information: N/A			

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict

Module type: SN290M24-72

MST 26	TABLE: Reverse current overload test		—
Maximum over-current protection rating [A]...... :		15	—
Applied current [A]		20. 25	—
Applied voltage [V] / high – low......................... :		54.3 to 50.5	—
Test duration [h].. :		2 hours	—
Sample #	Pass criteria		—
19#	☒No flaming of the module		P
	☒No flaming or charring of the cheesecloth		P
	☒No flaming of the tissue paper		P
	☒MST 17 requirements fulfilled (see table MST17)		P
Supplementary information: N/A.			

Module type: SN280P24-72

TABLE 10.10	MST 32 – MODULE BREAKAGE TEST		—
Weight of impactor [kg].................................... :		45.5	—
Thickness of sample [mm]................................ :		40	—
Mounting technique used.................................. :		4 M8 checked	—
Module breakage .... :		☐ No breakage	—
		☐ Breakage at 300 mm	—
		☐ Breakage at 450 mm	—
		☒ Breakage at 1220 mm	—
Weight of particles in case of breakage [g]....... :		N/A	—
Sample #	Pass criteria		—
12#	☐ Breakage occurred, but no shear or opening large enough for a 76 mm diameter sphere to pass freely has developed.		P
	☒ Disintegration occurred, but the ten largest crack-free particles selected 5 min subsequent to the test didn't weigh more in grams than 16 times the thickness of the sample in millimetres.		
	☐ Breakage occurred, but no particles larger than 6.5 cm² have been ejected from the sample.		
Supplementary information: N/A			

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict

Module type: SN280P24-72

MST 17	TABLE: Wet leakage current test		—
Maximum system voltage [V]............................:		1000	—
Test voltage applied [V] ....:		1000	—
Module area A (m²) :		1.94	—
Resistivity of wetting agent (Ω·cm) :		<3500	—
Average wetting agent temperature (°C) :		22±3	—
Minimum allowable insulation resistance [MΩ] :		20.6	—
Sample #	Position in test sequence	Resistance [MΩ]	—
3#	MST 54, UV Preconditioning MST 51b, Thermal Cycling (TC50) MST 52, Humidity Freeze MST 12, Cut Susceptibility	2465	P
5#	MST 51a, Thermal Cycling (TC200) MST 12, Cut Susceptibility	1002	P
6#	MST 51a, Thermal Cycling (TC200) MST 14, impulse voltage test	3452	P
7#	MST 53, Damp Heat MST 12, Cut Susceptibility	2489	P
10#	MST 25, Bypass diode thermal test MST 22, Hot spot MST 12, Cut Susceptibility	2636	P
11#	MST 21, Temperature test MST 26, Reverse Current Overload	2945	P
Supplementary information: Minimum requirement according to the standard is 40MΩ·m².			

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict

Module type: SN290M24-72

Table MST17	**MST 17 – Wet leakage current test**			P
	Maximum system voltage [V] ....:		1000	—
	Test voltage applied [V]...................................:		1000	—
	Module area A (m²) :		1.94	—
	Resistivity of wetting agent (Ω·cm) :		<3500	—
	Average wetting agent temperature (°C) :		22±3	—
	Minimum allowable insulation resistance [MΩ] :		20.6	—
Sample No.		Position in test sequence:	Insulation resistance at V_{TEST} (MΩ)	—
19#		MST 21, Temperature test MST 26, Reverse Current Overload	2045	P
Supplementary information: N/A.				

IEC 61730-2			
Clause	Requirement + Test	Result - Remark	Verdict

Appendix: Partial Discharge Test

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Partial Discharge Test

of reverse side foils for photovoltaic (PV) modules

Reference No.:
QT-SHV05007/12

Test report no.	*Date of Issue*	*Revision*
TRSHV05007/12/01	25-04-2012	1.0

General Information:

Manufacturer:	Shenzhen APT Technology Co., Ltd No.68 Minsheng Road, Gongming Street, Guangming New Area, Shenzhen City, Guangdong Province , P.R. China
Products:	Reverse side foils for photovoltaic (PV) modules
Type designation:	ATP300
Layer structure:	FEVE (thickness = 30µm) PET (thickness = 240µm) FEVE (thickness = 30µm)
Standards:	IEC 61730-2:2004 / EN 61730-2:2007 Photovoltaic (PV) module safety qualification – Part 2: Requirements for testing (MST 15) IEC 60664-1 Insulation coordination for electrical equipment within low-voltage systems – Part 1: Principles, requirements and tests
Number of measurements:	11

Test Result:

Extinction voltage U_e:	Min. value U_{emin}(V)	1072
	Max. value U_{emax}(V)	1124
	Mean value U_{emean}(V)	1104
	Standard deviation σ (V)	15,1
	Uemean-σ (V)	1088,9

Calculation of the maximum permissible system voltage U_{sys}:

Formula: $U_{sys} = U_e x1,414 / (1,2 x 1,25)$

where
1,414 calculation of the peak value
1,2 is safety factor of humidity / temperature, etc.
1,25 is safety factor of double or reinforced insulation

Maximum permissible system voltage U_{sys} = 1026 VDC

Responsible by

Roger Miao

Angela Xu

TYPE TESTED TÜV NORD TÜV NORD (HANGZHOU) CO., LTD.

TÜV NORD (Hangzhou) Co., Ltd.
No. 50 JiuHuan Road, Hangzhou City, Zhejiang Province, P.R. China
Phone: +86 (0)571 85386989 Fax: +86 (0)571 85386988

---------------- End of Test report ----------------

Constructional data form (CDF)

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Constructional data form for electrical products

Applicant:	**Shenzhen Shine Solar Co., Ltd** 8th Floor, Buliding A,DongFangYaYuan,ChenTian Communities, XiXiang Bao'an District, Shenzhen 518109 P.R.China
Manufacturing plant:	**Shenzhen Shine Solar Co., Ltd** 8th Floor, Buliding A,DongFangYaYuan,ChenTian Communities, XiXiang Bao'an District, Shenzhen 518109 P.R.China
Product:	Crystalline Silicon PV Module

Type designation:

Poly-crystalline Solar Cell Module

156x156:
72cells: SN***P-24(***=255-305 increment of 5)
60cells: SN***P-20(***=210-255 increment of 5)
54cells: SN***P-18(***=190-230 increment of 5)
48cells: SN***P-16(***=170-205 increment of 5)
36cells:
156x156: SN***P-12(***=120-150 increment of 5)
156x119: SN***P-12(***=95-115 increment of 5)
156x93.7: SN***P-12-1(***=75-90 increment of 5)
156x76.1: SN***P-12-2(***=60-75 increment of 5)
156x59.5: SN***P-12(***=50-55 increment of 5)
156x46.8: SN***P-12-3(***=40-45 increment of 5)
156x43.2: SN***P-12-4(***=35-40 increment of 5)
156x35.6: SN***P-12-5(***=30-35 increment of 5)
156x29.5: SN***P-12(***=25)
156x24.0: SN***P-12(***=20)
156x17.5: SN***P-12(***=15)
78x24.0: SN***P-12(***=10)
78x11.7: SN***P-12(***=5)

Mono-crystalline Solar Cell Module

156x156:
72cells: SN***M-24(***=255-305 increment of 5)
60cells: SN***M-20(***=210-255 increment of 5)
54cells: SN***M-18(***=190-230 increment of 5)
48cells: SN***M-16(***=170-205 increment of 5)
125x125:
96cells: SN***M-32(***=215-260 increment of 5)
72cells: SN***M-24(***=160-195 increment of 5)
60cells: SN***M-20(***=135-165 increment of 5)
54cells: SN***M-18(***=120-145 increment of 5)
48cells: SN***M-16(***=110-130 increment of 5)
36cells:
156x156: SN***M-12(***=125-150 increment of 5)
156x119: SN***M-12-1(***=95-115 increment of 5)
125x125: SN***M-12-2(***=80-95 increment of 5)
125x101: SN***M-12-3(***=65-80 increment of 5)
125x86.8: SN***M-12-4(***=55-65 increment of 5)
125x72: SN***M-12-5(***=45-55 increment of 5)
125x59.9: SN***M-12-6(***=40-45 increment of 5)
125x49.7: SN***M-12(***=35)
125x43.2: SN***M-12(***=30)
125x35.4: SN***M-12(***=25)
125x28.3: SN***M-12(***=20)
125x20.6: SN***M-12(***=15)
125x14.2: SN***M-12(***=10)
62.5x14.2: SN***M-12(***=5)

Applicant's confirmation

(Place and date)

2012.5.22

(Applicant's legally authorized signature and stamp)

Confirmation of TÜV NORD CERT:

Essen, 22-May, 2012

(Signature of authorized TÜV NORD CERT engineer)

File No. *Geschäfts-Nr.*

HZP1103046

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Main test type SN280P24-72 Ratings:

Voc:	44.57V
Isc:	8.62A
Vmp:	34.71V
Imp:	8.07A
Rated power:	280W ± 3%
Operation mode:	Continuously
Maximun system voltage:	DC1000V
Maximun over-current protection rating:	15A
Elect. protection class:	Class A (Safety application class), Class II
IP-Code:	IP65
Mains connection	—
Materials:	a)Enclosure: — b) PCBs: —

Main test type SN290M24-72 Ratings:

Voc:	44.82V
Isc:	8.87A
Vmp:	35.00V
Imp:	8.29A
Rated power:	290W ± 3%
Operation mode:	Continuously
Maximun system voltage:	DC1000V
Maximun over-current protection rating:	15A
Elect. protection class:	Class A (Safety application class), Class II
IP-Code:	IP65
Mains connection	—
Materials:	a)Enclosure: — b) PCBs: —

Applicant's confirmation

2012.5.22

(Place and date)

(Applicant's legally authorized signature and stamp)

Confirmation of TÜV NORD CERT:

Essen, 22.May.2012

(Signature of authorized TÜV NORD CERT engineer)

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List of critical components:

Object/ part NO.	Manufacturer/ trademark	Type/ model	Technical data	Standard	Mark(s) of conformity
SOLAR CELL					
6" Poly cell	Delsolar Co., Ltd	D6RL-1720	Poly-crystalline silicon, Cell (l x m) [mm]:156x156, Cell thickness[μm]: 200±30 Cell area[cm²]:243.36	Acc. IEC/EN 61215, IEC/EN 61730-1/-2	Tested with PV module
6" Mono cell:	J.A Solar Energy Co., Ltd	156S	Mono-crystalline silicon, Cell (l x m) [mm]:156x156, Cell thickness[μm]:200±30, Cell area[cm²]:238.96, Cell diameter [mm]:200	Acc. IEC/EN 61215, IEC/EN 61730-1/-2	Tested with PV module
5" Mono cell:	J.A Solar Energy Co., Ltd	125S	Mono-crystalline silicon, Cell (l x m) [mm]:125x125, Cell thickness[μm]:200±30, Cell area[cm²]:154.85, Cell diemater [mm]:165	Acc. IEC/EN 61215, IEC/EN 61730-1/-2	Tested with PV module

IDENTIFICATION OF MATERIALS					
Front cover	Guangdong Golden Glass Technologies Limited	Low-iron tempered glass,	Thickness= 4.0mm	Acc. IEC/EN 61215, IEC/EN 61730-1/-2	Tested with PV module
Rear cover	Shenzhen APT Technology Co., Ltd	ATP300	Thickness=0.3mm RTI=105°C, Usys=1026V	Acc. IEC/EN 61215, IEC/EN 61730-1/-2, IEC 60664-1	Tested with PV module
Encapsulation material	Guangzhou Lushan Chemical Materials Co., Ltd	E10	Thickness= 0.5mm	Acc. IEC/EN 61215, IEC/EN 61730-1/-2	Tested with PV module
Frame parts	Shenzhen Fengtai Technology Co., Ltd	6063-T5	Aluminum alloy frame, Assembly by rivets Thickness= 40mm	Acc. IEC/EN 61215, IEC/EN 61730-1/-2	Tested with PV module
Internal wiring (interconnect cell-to-cell bus bar)	Shenzhen Huaguangda Technology Co., Ltd	2.0*0.16mm	Alloy: Sn99Ag1	Acc. IEC/EN 61215, IEC/EN 61730-1/-2	Tested with PV module
Internal wiring (for inter-string connection)	Shenzhen Huaguangda Technology Co., Ltd	5*0.2mm	Alloy: Sn99Ag1	Acc. IEC/EN 61215, IEC/EN 61730-1/-2	Tested with PV module

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2012.5.22

(Place and date)

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Confirmation of TÜV NORD CERT:

Essen, Roger Li

22 MAY, 2012

(Signature of authorized TÜV NORD CERT engineer)

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soldering material	Shenzhen Yongsheng Chemical Co.,Ltd	YS-1.0	Alloy:SN99.3CU0.7	Acc. IEC/EN 61215, IEC/EN 61730-1/-2	Tested with PV module
Soldering flux	Shenzhen Yongsheng Chemical Co.,Ltd	YS-501	—	Acc. IEC/EN 61215, IEC/EN 61730-1/-2	Tested with PV module
Potting material (for junction box)	N/A	—	—	—	—

IDENTIFICATION OF COMPONENTS					
Junction box	Shenzhen Hongxinxu Industrial Development C., Ltd	PV-JB001	DC 1000V, IP 65, Class II, -40°C to 85°C	Acc. IEC/EN 61215, IEC/EN 61730-1/-2, DIN V VDE V 0126-5:2008	Tested with PV module+TUV SUD/ B100773868003
Bypass diode	PANJIT	10SQ050	I_F=10A Tj max =200℃	—	—
Cable	DONGGUAN NISTAR TRANSMITTING TECHNOLOGY CO., INC	PV1-F	-40°C to 85°C, 4.0mm²	Acc. IEC/EN 61215, IEC/EN 61730-1/-2, 2 PfG 1169/08.07	Tested with PV module+TUV Rheinland/ R 50159597
Connectors	Shenzhen Hongxinxu Industrial Development C., Ltd	PV-CT001	DC 1000V, 25A	Acc. IEC/EN 61215, IEC/EN 61730-1/-2, EN 50521:2008	Tested with PV module+TUV SUD/B10077386 8005

Please mention only German or EC wide recognized approvals and attach a copy of each certificate

Applicant's confirmation

(Place and date)

(Applicant's legally authorized signature and stamp)

Confirmation of TÜV NORD CERT:

Essen, Roger zhigo

22.May. 2012

(Signature of authorized TÜV NORD CERT engineer)

------------------- End of test report -------------------

Test Equipment List

No.	Equipment	Type	Manufacturer	Certification
1	Solar Simulator	PSS8	Berger Lichttechnik GmbH & Go. KG	2012.08.01
		DLSK-SOL5	Beijing Delicacy Laser Optoelectronics Co., LTD	2012.11.13
2	Dielectric Strength Tester	GPI-825	Gwinstek	2012.11.07
3	Voltage-Resistant Tester	CS2671B	Allwin Instrument Science And Technology Co., Ltd.	2012.12.21
4	Grounding Continuity Tester	7316	Extech	2012.05.30
5	DC Milliohmmeter	GOM-801H	Vkan	2013.03.09
6	Irradiance Illuminometer	MS-802	EKO	2013.01.25
7	Data Acquisition Unit	34972A	Agilent	2013.03.02
8	Anemoscope	81000	R. M. Young Company	2013.02.03
9	CCC Steady-State Light Source	SET-IT01	Philips	2012.07.15
10	Chamber	GLW-156WGP/1	Espec China	2013.02.18
				2013.02.18
		ESS-SDJ616	Chongqing Yinhe	2013.02.18
				2013.02.18
		KMHW-6L	Wistron Group	2013.03.11
11	UVA Illuminometer	PMA2110	Solar Light	2012.08.15
12	UVB Illuminometer	PMA2106	Solar Light	2012.08.15
13	Robustness Of Terminations Tester	BT-T012-04	Guangdong Liteng	2012.10.21
14	Hail tester	TCN40A	Kexiang testing equipment	2012.11.25
15	Power supply	WYK-15020K	Yangzhou Huatai Electronics	2013.03.24
16	Cut susceptibility tester	KX-988	Kexiang testing equipment	2012.07.28
17	Impulse Voltage Tester	TSS500M10	EM test	2012.06.09

------------------- End of test report -------------------

RM
Smaysov

Module type: SN280P24-72

Photo 1: Front overview

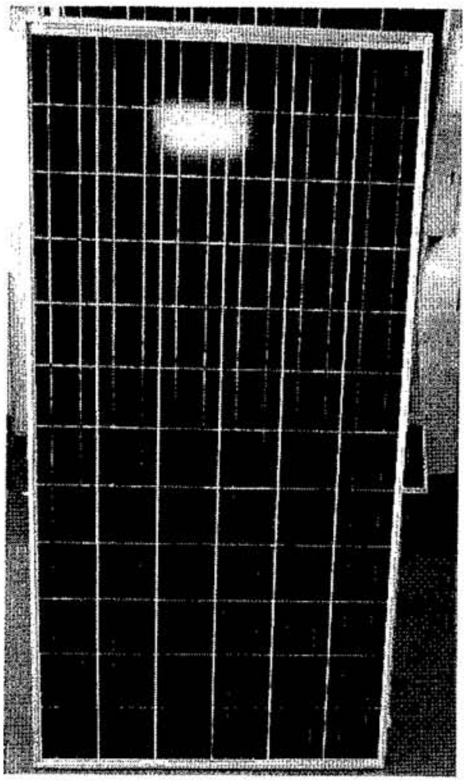

Photo 2: Back overview

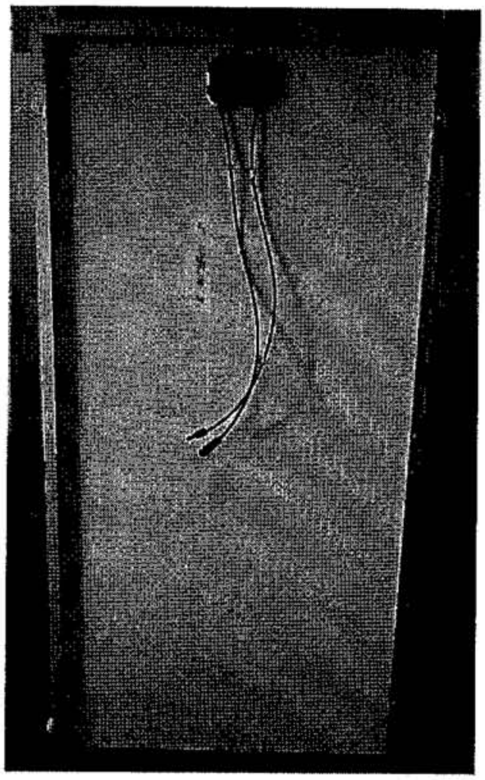

Photo 3: View of label

Photo 4: View of solar cell

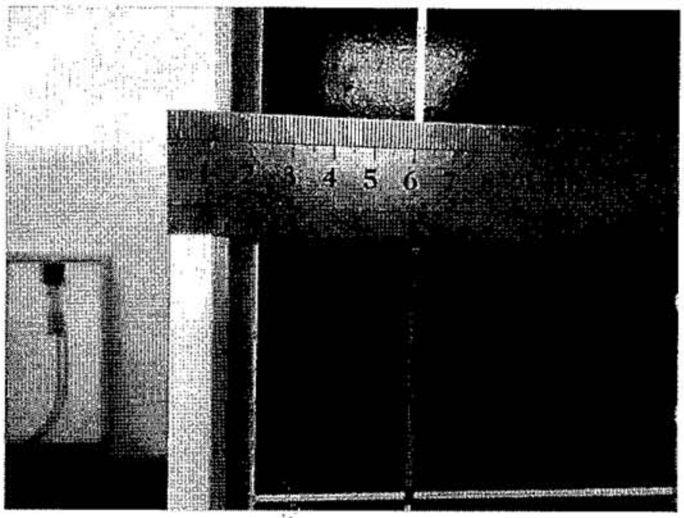

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Photo 5: View of open junction box

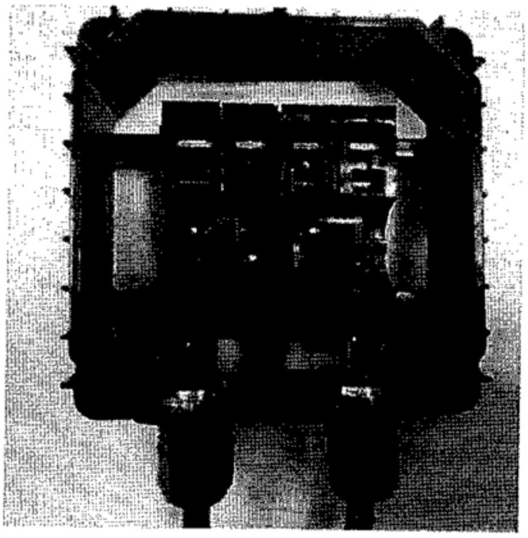


Photo 6: View of closed junction box

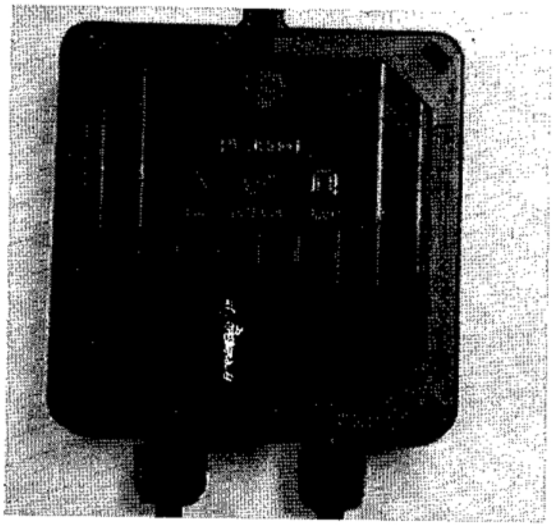


Photo 7: View of connector

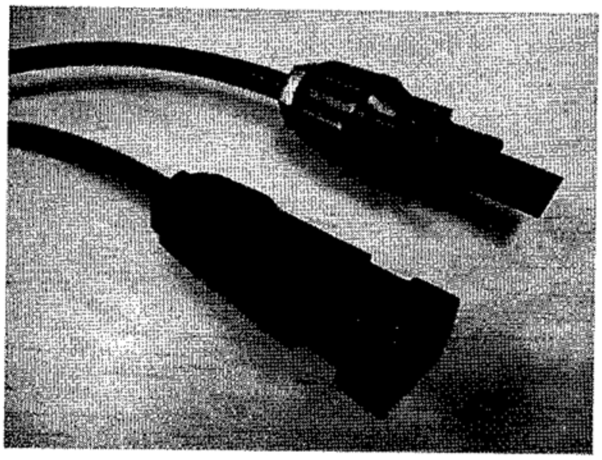


Photo 8: View of cables

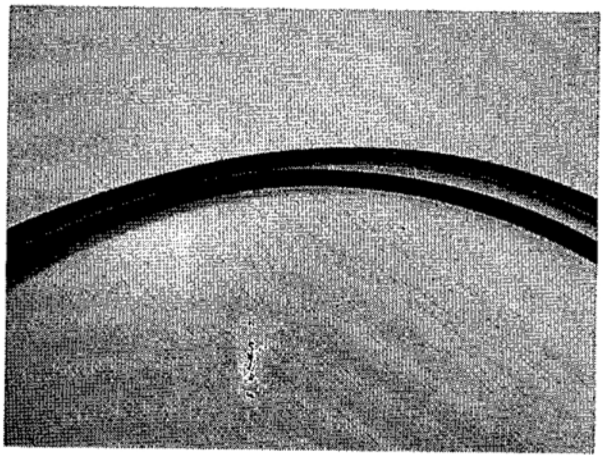


Photo 9: View of frame

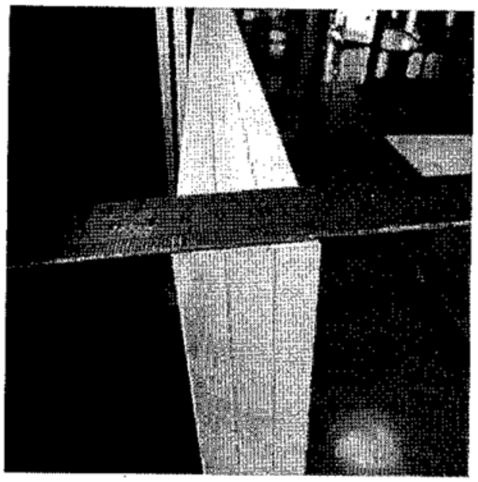
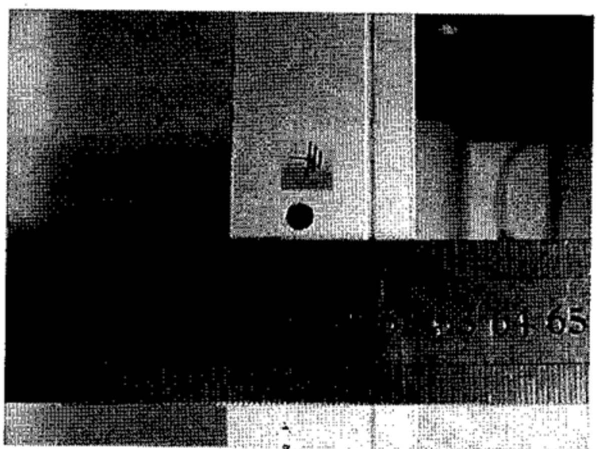


Photo 10: View of grounding hole



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Module type: SN290M24-72

Photo 11: Front overview

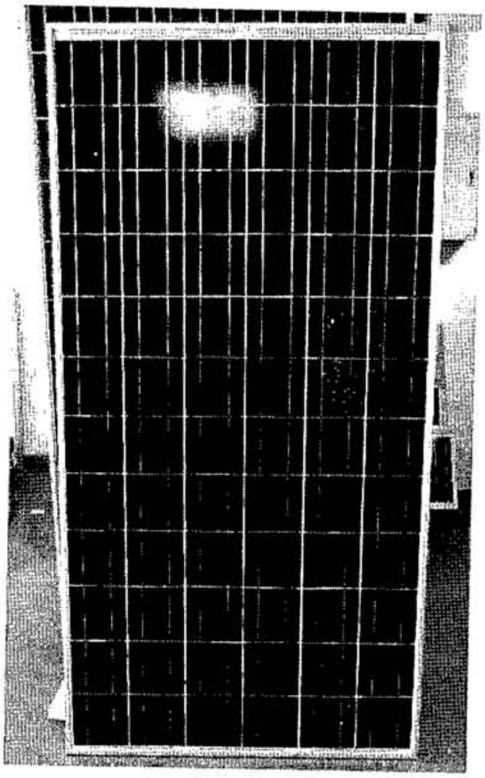

Photo 12: Back overview

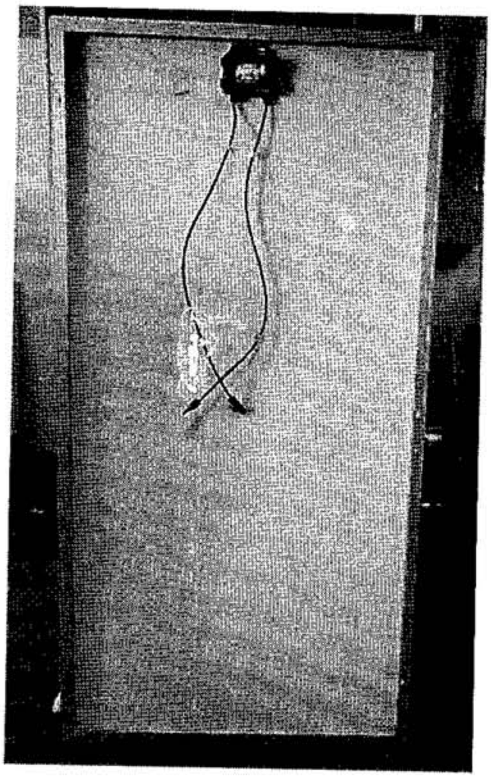

Photo 13: View of label

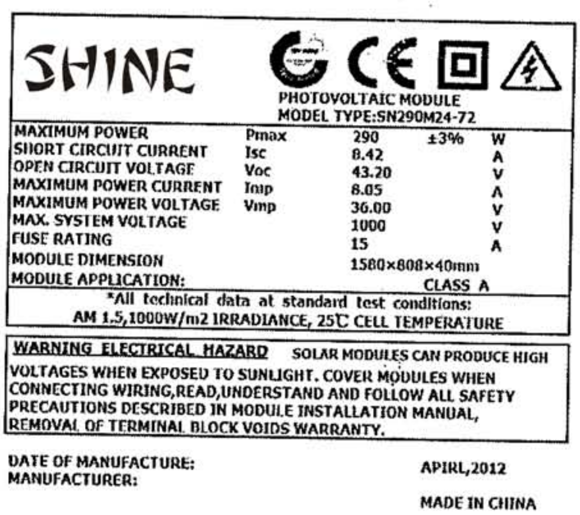

Photo 14: View of solar cell

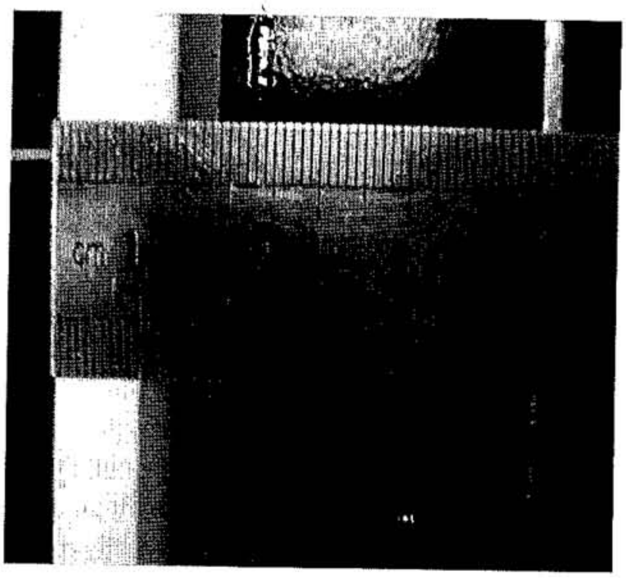

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Photo 15: View of open junction box

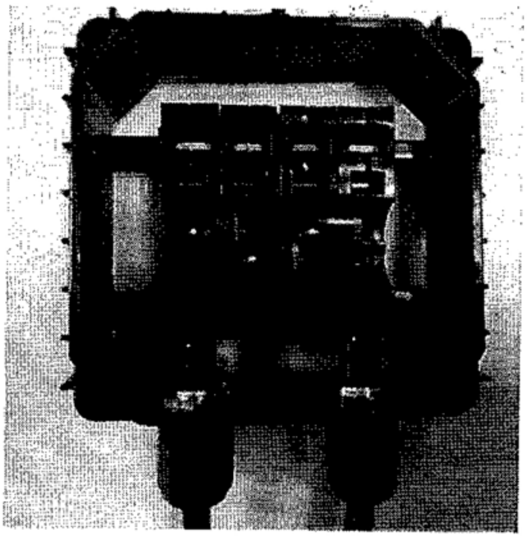


Photo 16: View of closed junction box

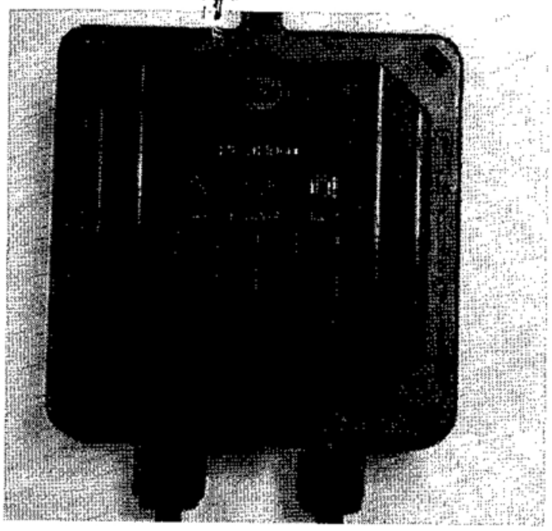


Photo 17: View of connector

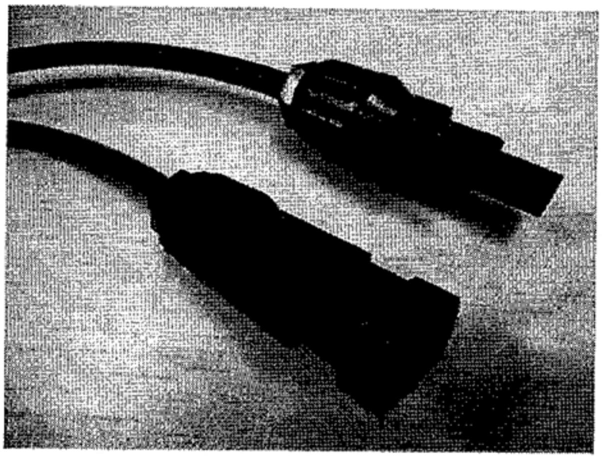


Photo 18: View of cables

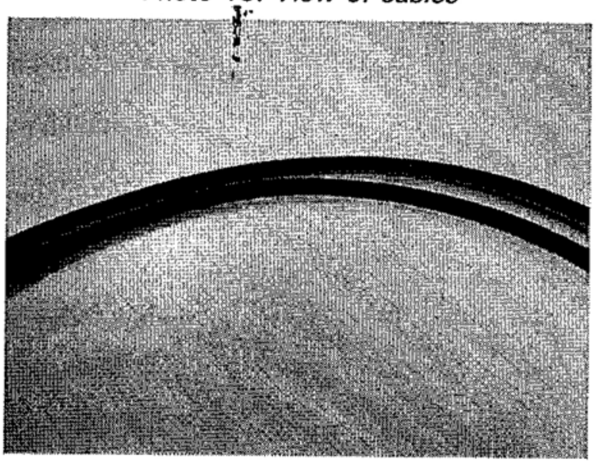


Photo 19: View of frame

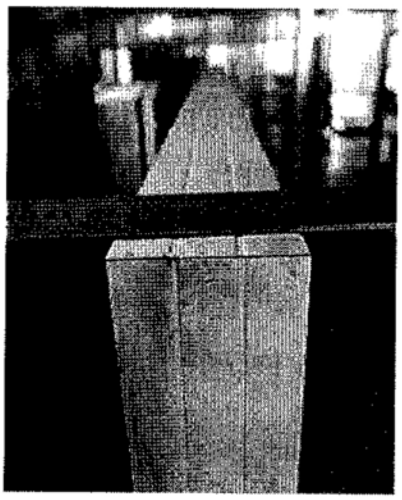
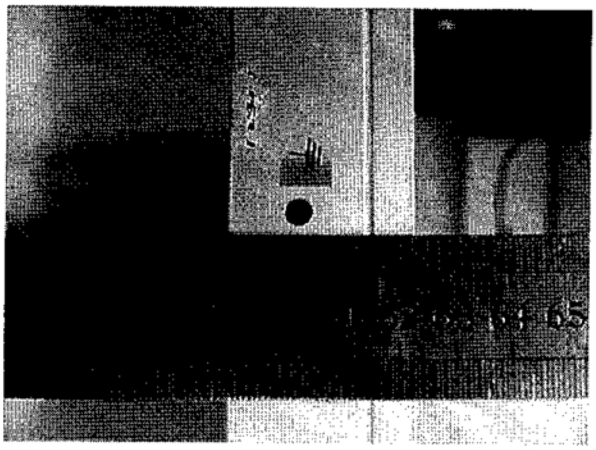


Photo 20: View of grounding hole



------------------ **End of test report** ------------------

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