

## Technical Report No.: 61.410.22.006.01

Date: 2022-08-22

Client: Win Win Precision Technology Co., Ltd. (001256)  
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Factory: 105758

Test subject: Product:  
Mono-crystalline Silicon Photovoltaic (PV) Module(s)

WST-xxxMGX-P2, xxx = 380~415 in step of 5 (for 108 cells);  
WST-xxxMGX-P1, xxx = 380~415 in step of 5 (for 108 cells);  
WST-xxxMGX-P3, xxx = 380~415 in step of 5 (for 108 cells).  
xxx is standing for rated output power at STC.

Test specification: IEC 61215-2:2016 MQT 17 (Hail impact test)

Purpose of examination: • Test according to the test specification

Test result: The test results show that the presented product is in compliance with the specified requirements.

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## 1. Description of the test subject

### 1.1 Picture(s)

Please refer to 4.9 Photos of module samples.

### 1.2 Function

Manufacturer's specification for intended use:  
Use sunlight to generate electricity through PV modules with maximum system voltage of 1500V DC.

### 1.3 Consideration of the foreseeable use

- Not applicable
- Covered through the applied standard
- Covered by the following comment
- Covered by attached risk analysis

### 1.4 Technical Data (test sample)

Model	: WST-410MGX-P1
Rated Voltage	: 1500 Vdc
Rated Power	: 410W
Safety Class	: Class II
Pollution Degree	: 1
Module Fire Performance	: Type 4 according to UL 1703
Fire Safety Class	: Class C according to UL 790
Protection Against Moisture	: Yes
Construction	: Framed
Supply connection	: Junction box, Cable and Connectors
Module dimension	: 1726 x 1135 x 35 [mm]
Weight	: 21.5KG



## **Product Electrical Ratings:**

Type or model number	<b>WST-410MGX-P1</b>
Voc [V] /Tolerance $\pm 10\%$	37.32
Isc [A] /Tolerance $\pm 10\%$	13.93
Vmp [V]	30.93
Imp [A]	13.26
Pmp [W] /Tolerance $\pm 3\%$	410
Maximum system voltage [V]	1500
Maximum Over-Current Protection Rating [A]	25

### List of test samples:

Sample No.	Type / model	Sample S/N	Remark
1	WST-410MGX-P1	W222FBF232714734	Hail impact test

### Copy of marking plate (representative):

		<h2>WST-410MGX-P1</h2>  <p>Serial No.: W218BAJ21370007</p>
<p> <b>Maximum power (Pmax)</b> 410 W  <b>Power tolerance</b> -0/+5 W  <b>Open circuit voltage (Voc)</b> 37.32 V  <b>Short circuit current (Isc)</b> 13.93 A  <b>Maximum power voltage (Vmp)</b> 30.93 V  <b>Maximum power current (Imp)</b> 13.26 A  <b>Maximum system voltage IEC/UL</b> 1500 V  <b>Maximum series fuse</b> 25 A  <b>Maximum load (Positive/Negative)</b> 5400/2400 Pa  <b>Safety factor</b> 1.5                      All electrical data at Standard Test Condition (STC):                      1000 W/m<sup>2</sup> irradiance, AM 1.5 spectrum, cell                      temperature 25°C. Power measurement tolerance: ±3%.                      Tolerance of Voc/Isc data: ±10%.  <b>Module Fire Performance</b> Type 4  <b>Application Class A</b> Class II (IEC 61140)                      System fire class rating: see installation instructions for                      installation requirements to achieve a specified system                      fire class rating with this product. For field connections,                      use minimum No. 12 AWG copper wires insulated for a                      minimum 90°C.                 </p>	<p><b>CONNECTOR MATING</b> SEE MODULE INSTALLATION INSTRUCTIONS FOR APPROPRIATE MATING CONNECTORS.</p> <p style="text-align: center;">CE</p> <p style="text-align: center;">                       Tested to IEC 61215-2:2016 and IEC 61730-1:2016                 </p>	
<p>  <b>WARNING - ELECTRIC HAZARD</b>  <b>AVERTISSEMENT - RISQUE ÉLECTRIQUE</b>                      This unit produces electricity if exposed to light.                      DO NOT disconnect under load.                       Cette unité produit de l'électricité si elle est exposée à la lumière.                      NE PAS se déconnecter sous charge.                 </p>	<p>                     Production Facility(ies): 105758   </p>	
<p>Win Win Precision Technology Co., Ltd. <a href="http://www.winaico.com">www.winaico.com</a>                      4F., No.180, Sec. 2, Gongdao 5th Rd., Hsinchu City 30070, Taiwan</p>		

## 2. Order

### 2.1 Date of Purchase Order, Customer's Reference

2022-03-01, Order No.: 718858229

### 2.2 Receipt of Test Sample, Condition, Location

Telecom Technology Center Communication and Photovoltaic Laboratory - Telecom  
Technology Center  
No.3, Luke 1'st Rd., Lujhu, Kaohsiung city, Taiwan CHINESE TAIPEI

### 2.3 Date of Testing

2022-05-20 ~ 2022-07-11

### 2.4 Location of Testing

Telecom Technology Center Communication and Photovoltaic Laboratory - Telecom  
Technology Center  
No.3, Luke 1'st Rd., Lujhu, Kaohsiung city, Taiwan CHINESE TAIPEI

### 2.5 Points of Non-Compliance or Exceptions of the Test Procedure

N/A

3. Test Results

3.1 Positive Test Results

<b>TABLE 01: MQT 01 ini: Initial Visual inspection</b>		P
Test Date [YYYY-MM-DD].....:	2022-05-20	—
Sample #	Nature and position of initial findings – comments or attach photos	—
1	No major defects	P
Supplementary information: N/A		

<b>TABLE 02: MQT 19.1 ini: Initial stabilization</b>		P				
<b>TABLE 02.1: MQT 06.1 ini: Performance at STC before initial stabilization</b>						
Test Date [YYYY-MM-DD]..... :	2022-05-20	—				
Test method..... :	<input checked="" type="checkbox"/> Simulator <input type="checkbox"/> Natural sunlight	—				
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]
1	14.06	37.67	13.40	30.75	412.11	77.81
Supplementary information: N/A						

<b>TABLE 02.2: MQT 19.1 ini: Initial Stabilization procedure</b>							
Light exposure method.....:	<input type="checkbox"/> Simulator <input checked="" type="checkbox"/> Natural sunlight						
Abbreviation: Regarding light source “S” for Solar simulator and “N” for Natural sunlight							
Stabilization criterion x per IEC 61215-1-x .....	1						
Sample #	1	Test Date (YYYY-MM-DD) start/end .....	2022-05-20 ~ 2022-05-25				
Test cycle	Integrated irradiation (kWh/m <sup>2</sup> )	Irradiance (W/m <sup>2</sup> )	Module temperature (°C)	Resistive load	P <sub>max</sub> (W) at the end of cycle	P <sub>max</sub> – P <sub>min</sub> / P <sub>average</sub> (%)	Stable (Yes/No)
Initial	—	—	—	—	412.11	—	—
1	5	>500	N/A	2.29	412.36	—	—
2	5	>500	N/A	2.29	412.39	0.07	Yes
3							
4						—	—
Supplementary information: From three consecutive power measurements, stabilization occurs when (P <sub>max</sub> -P <sub>min</sub> )/P <sub>average</sub> x 100% < 1%							
<input type="checkbox"/> Other stabilization procedures							
Sample #	Test Date (YYYY-MM-DD) start/end						



N/A	N/A
Test method description:	
Supplementary information: N/A	

TABLE 03: MQT 06.1 ini: Performance at STC after initial stabilization										P
Test Date [YYYY-MM-DD]..... :					2022-05-25					—
Pmax(lab) lower limit (W) .....					See table below: Pmax [W] – Min calc.					—
$\bar{P}_{max}(Lab)$ lower limit (W) .....					$\geq 401.18$					—
Voc(lab) upper limit (V) .....					See table below: Voc [V] Max. calc.					—
Isc (lab) upper limit (A) .....					See table below: Isc [A] Max. calc.					—
Test method..... :					<input checked="" type="checkbox"/> Simulator <input type="checkbox"/> Natural sunlight					—
Sample #	Isc [A]		Voc [V]		Imp [A]	Vmp [V]	Pmax [W]		FF [%]	Result
	Meas.	Max. calc.	Meas.	Max. calc.			Meas.	Min. calc.		
1	14.07	15.05	37.46	40.56	13.41	30.77	412.39	389.14	78.25	P
Supplementary information:										
Type of Solar simulator: Steady state, Class AAA										
The limit values are calculated considering manufacturer's tolerances <i>t</i> of rated nameplate values and laboratory measurement uncertainties <i>m</i> .										

TABLE 04: MQT 03 ini: Initial Insulation test					P
Test Date [YYYY-MM-DD]..... :				2022-05-25	—
Test Voltage applied [V] .....				8000/1500	—
Size of module [m <sup>2</sup> ] .....				1.96	—
Required Resistance [MΩ] .....				20.41	—
Sample #	Measured		Dielectric breakdown		Result
	MΩ		Yes (description)	No	
1	8600			X	P
Supplementary information:					
Size of module [m <sup>2</sup> ] = 1.96m <sup>2</sup>					
Required Resistance = 40 MΩ* m <sup>2</sup> /1.96 m <sup>2</sup> = 20.41MΩ					



TABLE 05: MQT 15 ini: Initial Wet leakage current test				P
Test Date [YYYY-MM-DD].....:		2022-05-25		—
Test Voltage applied [V].....:		1500		—
Solution temperature [°C] .....		22 ± 2		—
Size of module [m²] .....		1.96		—
Required Resistance [MΩ] .....		20.41		—
Sample #	Measured [MΩ]	Required Resistance [MΩ]	Result	
1	7700	20.41	P	
Supplementary information: Size of module [m²] = 1.96m² Required Resistance = 40 MΩ* m² /1.96 m² = 20.41MΩ				

TABLE 06: MQT 17 - Hail impact test								P
Test Date [YYYY-MM-DD]..... :		2022-06-24 ~ 2022-07-08						—
Sample #		1						—
Ice ball size [mm] .....	1	2	3	4	5	6	—	
	35.1	35.1	35.0	35.1	35.0	35.0		
	7	8	9	10	11			
	34.9	35.1	35.0	35.0	35.1			
Ice ball weight [g] .....	1	2	3	4	5	6	—	
	20.8	20.8	20.7	20.8	20.7	20.7		
	7	8	9	10	11			
	20.6	20.8	20.7	20.7	20.8			
Ice ball velocity [m/s]..... :	1	2	3	4	5	6	—	
	27.9	27.5	27.2	27.7	27.6	27.5		
	7	8	9	10	11			
	27.2	28.0	27.5	27.6	27.9			
Number of impact locations .....		11 points						—
Supplementary information:								



Shot No.	Location
1	Any corner of the module window, not more than one radius from the module edge.
2	Any edge of the module, not more than one radius of ice-ball from the module edge.
3, 4	Over edges of the circuit (e.g. individual cells).
5, 6	Over the circuit near interconnects (i.e. cell interconnects and bus ribbons).
7, 8	On the module window, not more than half diameter of ice ball from one of the points at which the module is mounted to the supporting structure.
9, 10	On the module window, at points farthest from the points selected above.
11	Any points which may prove especially vulnerable to hail impact like over the junction box.

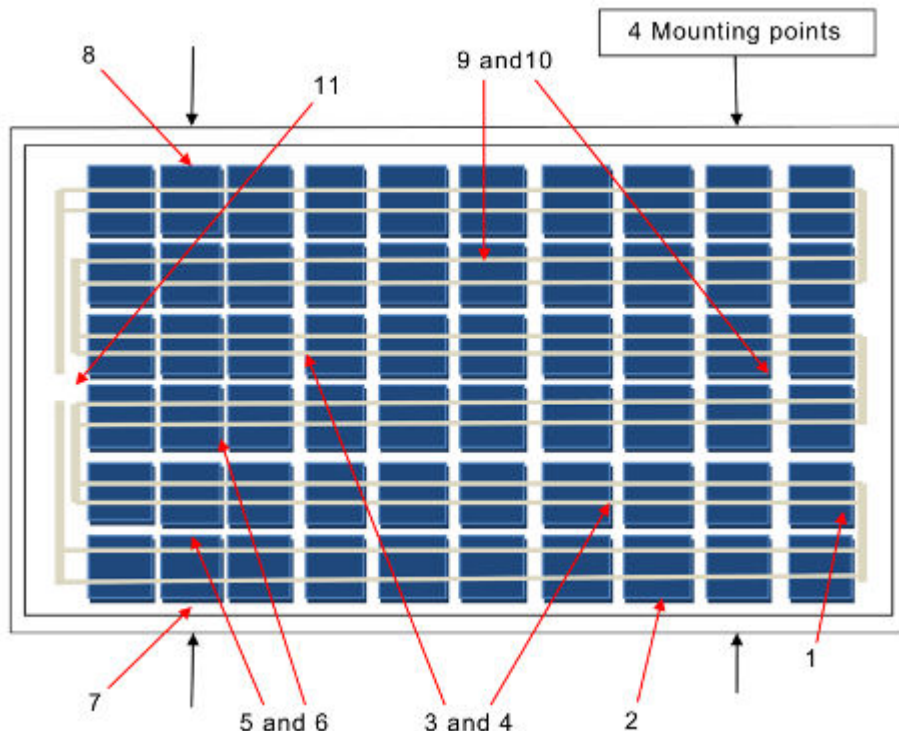


TABLE 07: MQT 01 - Visual inspection after hail impact test		P
Test Date [YYYY-MM-DD].....:	2022-07-08	—
Sample #	Nature and position of initial findings – comments or attach photos	—
1	No changes	P
Supplementary information: N/A		

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TABLE 08: MQT 06.1: Final Performance at STC									P
Test Date [YYYY-MM-DD]..... :					2022-07-11				—
Test method..... :					<input checked="" type="checkbox"/> Simulator <input type="checkbox"/> Natural sunlight				—
Sample #	Isc [A]	Voc [V]	Imp [A]	Vmp [V]	Pmax [W]	FF [%]	Pmax [W] (Lab_GateNo.1)	Power Degradation [%]	Result
1	14.09	37.42	13.37	30.80	411.63	78.06	412.39	-0.18	P
Supplementary information: Type of Solar simulator: Steady state, Class AAA									

TABLE 09: MQT 03 fin: Final Insulation test						P
Test Date [YYYY-MM-DD]..... :					2022-07-11	—
Test Voltage applied [V] .....					8000/1500	—
Size of module [m²] .....					1.96	—
Required Resistance [MΩ] .....					20.41	—
Sample #	Required	Measured	Dielectric breakdown			Result
	MΩ	MΩ	Yes (description)	No		
1	7500	20.41		X	P	
Supplementary information: Size of module [m²] = 1.96m² Required Resistance = 40 MΩ* m² /1.96 m² = 20.41MΩ						

TABLE 10: MQT 15 fin: Final Wet leakage current test				P
Test Date [YYYY-MM-DD]..... :			2022-07-11	—
Test Voltage applied [V]..... :			1500	—
Solution temperature [°C] .....			22 ± 2	—
Size of module [m²] .....			1.96	—
Required Resistance [MΩ] .....			20.41	—
Sample #	Measured [MΩ]	Limit [MΩ]		Result
1	6700	20.41		P
Supplementary information: Size of module [m²] = 1.96m² Required Resistance = 40 MΩ* m² /1.96 m² = 20.41MΩ				

## Technical Report



### 5. Documentation

N/A

### 6. Summary

#### Extension and modification remarks:

1. The test specification (test report no. 61.410.22.006.01) is met for WST-xxxMGX-P1 (108 cells) as full-sized representative sample. Other product series constructed with each encapsulation material used and any component forming an outer surface of the module as same as tested sample are consider meeting the test specification as well, the list of model type as below:
  - a. WST-xxxMGX-P2, xxx = 380~415 in step of 5 (for 108 cells)
  - b. WST-xxxMGX-P1, xxx = 380~415 in step of 5 (for 108 cells)
  - c. WST-xxxMGX-P3, xxx = 380~415 in step of 5 (for 108 cells)

The test specification(s) is (are) met  
**TÜV SÜD Asia Ltd. Taiwan Branch**  
**TÜV SÜD Group**

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Technical Report checked:   
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