



TEST REPORT

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Report Issue Date: 2025.02.10

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Test Report No. : 6215618.50QS

Project no. : 6215618

Client : Tongwei Co., Ltd.
No. 588, Middle Section Tianfu Avenue, High-Tech Zone, Chengdu, China
(Sichuan) Pilot Free Trade Zone

Date sample received : 2025.01.14/2025.01.23

Product : Photovoltaic (PV) modules

Product description : Please refer to next page(s).

Model. : TWMNH-48HE
TWMNH-48HW

Reference Model not tested : TWMNH-54HCxxx (xxx=475-515, in increment of 5)
TWMNH-48HExxx (xxx=425-465, in increment of 5)
TWMNH-48HWxxx (xxx=425-465, in increment of 5)

Test Requested : Test of RoHS conformity (2011/65/EU) and its subsequent amendments directive (EU) 2015/863.

Test Method : Please refer to next page(s).

Result : Please refer to next page(s).

Conclusion : Requirement passed.

Testing Period : 2025.01.14—2025.01.21
2025.01.23—2025.01.26

Signed for and on behalf of

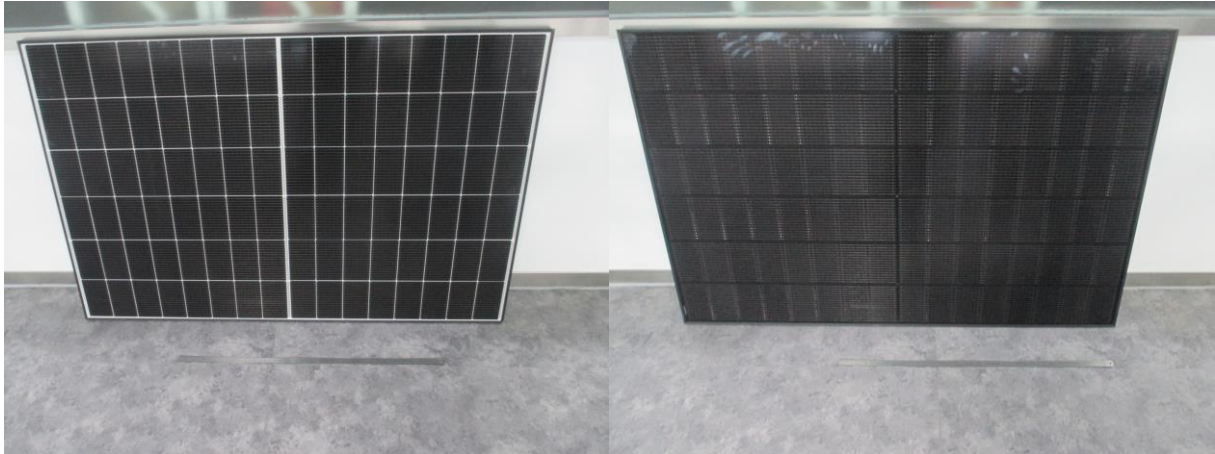
DEKRA Testing and Certification (Shanghai) Ltd



Chen Jiajun(陈佳骏)
Project Manager

Sheng Jinghuan(盛景焕)
Test Engineer

Picture of the product



TEST RESULTS

sample-no.	sample designation	Pb (%)	Cd (%)	Hg (%)	Cr VI (%)	PBB (%)	PBDE (%)	DEHP* (%)	BBP* (%)	DBP* (%)	DIBP* (%)
001	transparent glass	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	N/A	N/A	N/A	N/A
002	silvery metal(solder)	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A	N/A
003	white plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
004	white plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
005	dark blue glass	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	N/A	N/A	N/A	N/A
006	silvery metal(solder)	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A	N/A
007	black metal	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A	N/A
008	silvery sticker with black	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
009	black sticker with white	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
010	white glue	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
011	black plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
012	black plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
013	black plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
014	black plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
015	black plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
016	black plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
017	grey rubber	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
018	black plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
019	silvery metal	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A	N/A
020	silvery metal	< 0.1	< 0.01	< 0.1	< 0.1 ¹⁾	N/A	N/A	N/A	N/A	N/A	N/A
021	silvery metal	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A	N/A
022	black plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
023	diode	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1 ²⁾	< 0.1 ²⁾	N/A	N/A	N/A	N/A
024	coppery metal	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A	N/A
025	silvery metal	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A	N/A
026	silvery metal	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A	N/A
027	silvery metal(solder)	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A	N/A
028	transparent glass	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	N/A	N/A	N/A	N/A
029	dark blue glass	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	N/A	N/A	N/A	N/A
030	white plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
031	translucent plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
032	black sticker with white	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
033	silvery sticker with black	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
034	black metal	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A	N/A

035	black glue	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
036	black plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
037	black plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
038	black plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
039	black plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
040	grey rubber	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
041	black plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
042	black plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
043	black plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
044	silvery metal	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A
045	silvery metal	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A
046	silvery metal	< 0.1	< 0.01	< 0.1	< 0.1 ¹⁾	N/A	N/A	N/A	N/A	N/A
047	black plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
048	silvery metal(solder)	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A
049	diode	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1 ²⁾	< 0.1 ²⁾	N/A	N/A	N/A
050	silvery metal	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A
051	silvery metal	< 0.1 ³⁾	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A
052	coppery metal	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A

1) The analysis by X-ray fluorescence spectrometry showed a detection for Cr. The verification and quantification of Cr (VI) was performed by photometric analysis.

2) The analysis by X-ray fluorescence spectrometry showed a detection for Br. The verification and quantification of PBB/PBDE was performed by GC-MS.

3) The analysis by X-ray fluorescence spectrometry showed a detection for Pb. The verification and quantification of Pb was performed by ICP-OES.

N/A: Not applicable

*=With reference to IEC62321-8:2017, Analysis was performed by GC-MS.

Description of the analysis procedure (brief version):

Test of RoHS conformity

The measurements are performed according to IEC 62321-3-1 : 2013, "Electrotechnical products - Determination of levels of six regulated substances".

The product is divided in single material samples. The materials are analysed on different parameters of the RoHS-directive to assure that the complete product is RoHS-conform or not. At first a XRF (X-ray fluorescence spectrometry) screening is performed. For every sample following statements can be made.

Table: Screening limits in mg/kg for regulated elements in various matrices

Element	Polymers	Metals	Composite Material
Cd	$BL \leq (70-3\sigma) < X < (130+3\sigma) \leq OL$	$BL \leq (70-3\sigma) < X < (130+3\sigma) \leq OL$	$LOD < X < (150+3\sigma) \leq OL$
Pb	$BL \leq (700-3\sigma) < X < (1300+3\sigma) \leq OL$	$BL \leq (700-3\sigma) < X < (1300+3\sigma) \leq OL$	$BL \leq (500-3\sigma) < X < (1500+3\sigma) \leq OL$
Hg	$BL \leq (700-3\sigma) < X < (1300+3\sigma) \leq OL$	$BL \leq (700-3\sigma) < X < (1300+3\sigma) \leq OL$	$BL \leq (500-3\sigma) < X < (1500+3\sigma) \leq OL$
Br	$BL \leq (300-3\sigma) < X$		$BL \leq (250-3\sigma) < X$
Cr	$BL \leq (700-3\sigma) < X$	$BL \leq (700-3\sigma) < X$	$BL \leq (500-3\sigma) < X$

Below limit (**BL**): the tested material complies to the RoHS directive.

Inconclusive (**X**): If the level of the measurement is around the maximum allowed, or if the level for Chrome or Bromine is too high, other more accurate methods are needed to determine the exact level or the composition of Chrome and Bromine.

Over limit (**OL**): If the level of lead, mercury or cadmium is well above the maximum allowed levels (the XRF uncertainty is taken into account), the tested material does not comply with the RoHS directive.

In case of **inconclusive** XRF results, following analysis procedures are applied:

In order to examine the material samples for the heavy metals cadmium, lead and mercury they are digested in acid and the solutions are used to carry out the analysis for the heavy metals by ICP-OES or atomic-absorption spectroscopy.

Hexavalent chromium is checked by extracting the sample with water at 100 °C (determination of Cr VI in colorless and colored chromate coating on metals) respectively with alkaline extraction at 90-95 °C (determination of Cr VI in polymers and electronic components) followed by photometric analysis.

In the case of metallic components with a surface coating containing hexavalent Chromium (passivation) the concentration is expressed in mg of Chromium VI per component. In order to obtain further information about the concentration on the surface coating it is necessary to know the weight per unit area of the coating and the surface area of the component. Information about surface coatings is to be provided by the client.

The examination for bromine-based flame retardant products is carried out by gas chromatography-mass spectrometry after extraction by solvents; this involves the individual analysis and quantification of the substances specified in the RoHS. The current valid regulations relating to exceptions in respect of the analysed substances are to be taken into account by the client.

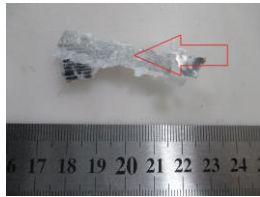
The following Polybrominated Biphenyls (PBBs) and Polybrominated Diphenyl Ethers (PBDEs) are analyzed:

2-Bromobiphenyl PBB2, Dibromobiphenyl PBB15, Tribromobiphenyl PBB30, Tetrabromobiphenyl PBB52, Pentabromobiphenyl PBB103, Hexabromobiphenyl PBB153, Heptabromobiphenyl PBB250, Octabromobiphenyl PBB250, Nonabromobiphenyl PBB250, Decabromobiphenyl PBB209, Bromodiphenylether BDE2, Dibromodiphenylether BDE15, Tribromodiphenylether BDE30, Tetrabromodiphenylether BDE62, Pentabromodiphenylether BDE99, Hexabromodiphenylether BDE153, Heptabromodiphenylether BDE183, Octabromodiphenylether BDE203, Nonabromodiphenylether BDE206, Decabromodiphenylether BDE209.

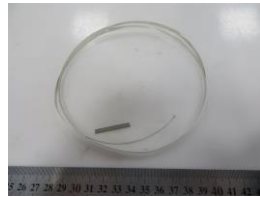
Limits according to RoHS (2011/65/EU) and its subsequent amendments directive (EU) 2015/863 / Test methods (additional chemical analysis):

Parameter	Limits according to RoHS	Test method
Cadmium	0,01 % (100 mg/kg or 0,1 g/kg)	IEC62321-5:2013
Lead	0,1 % (1000 mg/kg or 1 g/kg)	IEC62321-5:2013
Hexavalent Chromium	0,1 % (1000 mg/kg or 1 g/kg)	Metal: IEC62321-7-1:2015 Non-metal: IEC62321-7-2:2017
Mercury	0,1 % (1000 mg/kg or 1 g/kg)	IEC62321-4:2013/AMD1:2017
PBB and PBDE	0,1 % (1000 mg/kg or 1 g/kg)	IEC62321-6:2015
DEHP	0,1 % (1000 mg/kg or 1 g/kg)	IEC62321-8:2017
BBP	0,1 % (1000 mg/kg or 1 g/kg)	IEC62321-8:2017
DBP	0,1 % (1000 mg/kg or 1 g/kg)	IEC62321-8:2017
DIBP	0,1 % (1000 mg/kg or 1 g/kg)	IEC62321-8:2017

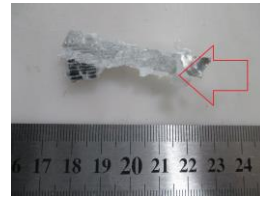
Sample Photos



Test item001



Test item002



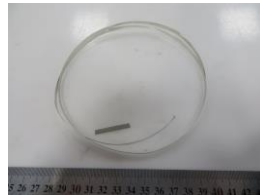
Test item003



Test item004



Test item005



Test item006



Test item007



Test item008



Test item009



Test item010



Test item011



Test item012



Test item013



Test item014



Test item015



Test item016



Test item017



Test item018



Test item019



Test item020



Test item021



Test item022



Test item023



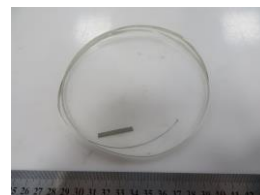
Test item024



Test item025



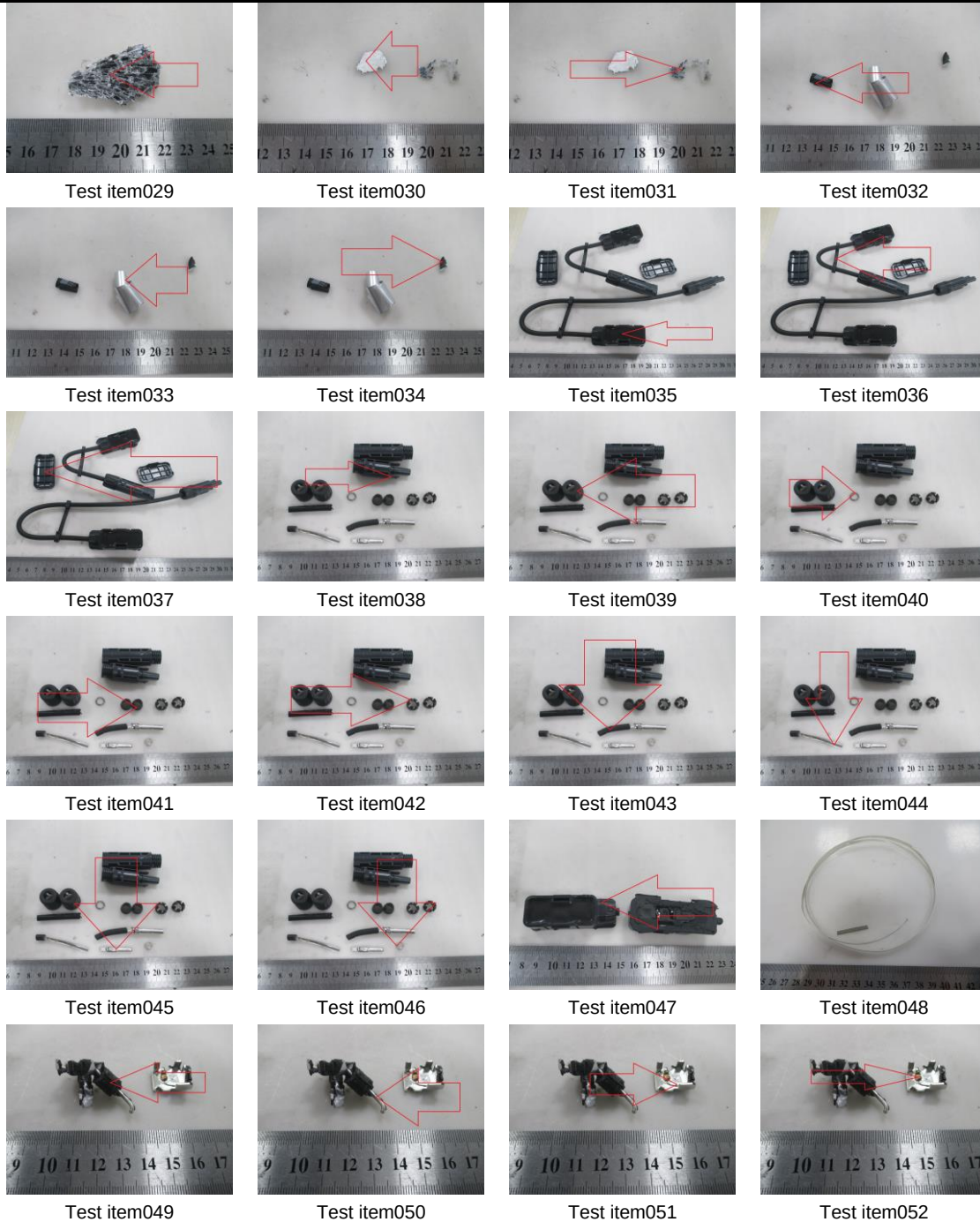
Test item026



Test item027



Test item028



---End of Report---

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