



# TEST REPORT

**DEKRA Testing and Certification (Shanghai) Ltd**

No.1050 Xingxian Road,jiading District,

Shanghai, 201815

Tel.: +86 21 6181 1500

Fax: +86 21 6181 1515

Contact

Mr. Halo Sheng

E-Mail: Halo.Sheng@dekra.com

Report Issue Date: 2024.10.17

Page 1 of 8

**Test Report No. : 6203436.50QS**

**Project no. : 6203436**

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

Date sample received : 2024.09.19/2024.09.29

Product : Photovoltaic (PV) modules

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

Model. : TWMHF-66HD725  
TWMNF-66HS720  
TWMNF-66HB720

Reference Model not tested : TWMNH-66HSxxx (xxx = 585-635)  
TWMNH-66HBxxx (xxx = 585-635)  
TWMNH-60HSxxx (xxx = 530-575)  
TWMNH-60HBxxx (xxx = 530-575)  
TWMNH-54HSxxx (xxx = 480-520)  
TWMNH-54HBxxx (xxx = 480-520)  
TWMNH-48HSxxx (xxx = 425-460)  
TWMNH-48HBxxx (xxx = 425-460)  
TWMNF-66HDxxx (xxx = 665-725)  
TWMNF-60HDxxx (xxx = 605-660)  
TWMNF-54HDxxx (xxx = 545-590)  
TWMNF-55HDxxx (xxx = 530-570)  
TWMNF-50HDxxx (xxx = 480-515)  
TWMHF-66HDxxx (xxx = 670-740)  
TWMHF-60HDxxx (xxx = 605-670)  
TWMNF-66HSxxx (xxx = 650-730)  
TWMNF-66HBxxx (xxx = 650-730)  
TWMNF-60HSxxx (xxx = 590-660)  
TWMNF-60HBxxx (xxx = 590-660)  
TWMNF-54HSxxx (xxx = 530-595)  
TWMNF-54HBxxx (xxx = 530-595)

TWMNF-55HSxxx (xxx = 540-580)  
TWMNF-55HBxxx (xxx = 540-580)  
TWMNF-50HSxxx (xxx = 490-530)  
TWMNF-50HBxxx (xxx = 490-530)

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 : 2019.09.19—2024.09.27  
2024.09.29—2024.10.12

Signed for and on behalf of

**DEKRA Testing and Certification (Shanghai) Ltd**



Liu Nan (刘楠)

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	silvery plastic (label)	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
002	silvery metal	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A	N/A
003	black plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
004	black plastic (seal ring)	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
005	silvery metal	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A	N/A
006	silvery metal	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A	N/A
007	silvery metal	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A	N/A
008	black plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
009	black plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
010	black plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
011	diode	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	N/A	N/A	N/A	N/A
012	silvery metal	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A	N/A
013	silvery metal	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A	N/A
014	white glue	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
015	silvery metal (solder)	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A	N/A
016	silvery metal (solder)	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A	N/A
017	black plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
018	transparent glue with cell	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
019	transparent glass	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A	N/A
020	black plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
021	white plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
022	white plastic with black print	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
023	silvery plastic (label)	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
024	silvery metal	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A	N/A
025	black plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
026	white plastic (seal ring)	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
027	silvery metal	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A	N/A
028	silvery metal	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A	N/A
029	silvery metal	< 0.1	< 0.01	< 0.1	< 0.1 <sup>1)</sup>	N/A	N/A	N/A	N/A	N/A	N/A
030	black plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
031	black plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
032	black plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
033	black plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

034	white glue	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
035	black plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
036	silvery metal	1.99 <sup>2)a</sup>	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A	N/A
037	silvery metal	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A	N/A
038	diode	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	N/A	N/A	N/A	N/A
039	silvery metal (solder)	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A	N/A
040	silvery metal (solder)	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A	N/A
041	transparent glue with cell	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
042	transparent glass	< 0.1	< 0.01	< 0.1	< 0.1	N/A	N/A	N/A	N/A	N/A	N/A
043	white plastic	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
044	white plastic with black print	< 0.1	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

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 Pb. The verification and quantification of Pb was performed by ICP-OES.

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

a) The annex to directive 2011/65/EU (exemptions of RoHS-directive) contains following point:

“6(c) Copper alloy containing up to 4 % lead by weight.”

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.

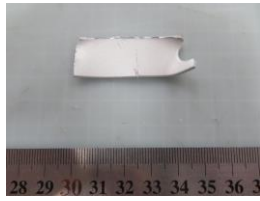
**Limits according to RoHS (2011/65/EU) and its subsequent amendments directive (EU) 2015/863 / Test methods (additional chemical analysis):**

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



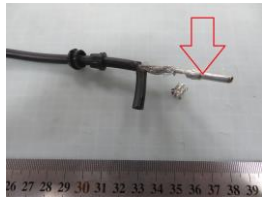
Test item002



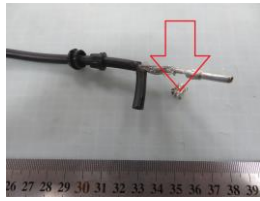
Test item003



Test item004



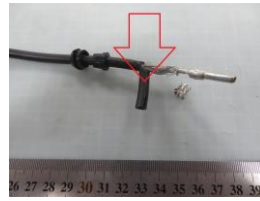
Test item005



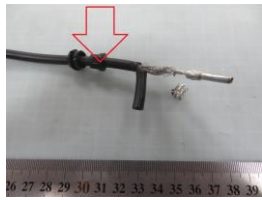
Test item006



Test item007



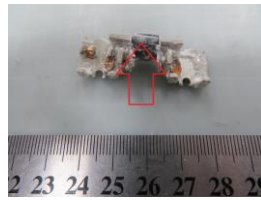
Test item008



Test item009



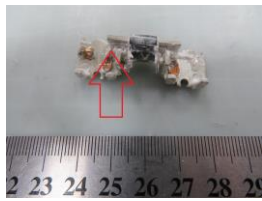
Test item010



Test item011



Test item012



Test item013



Test item014



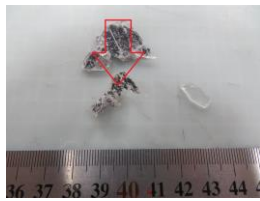
Test item015



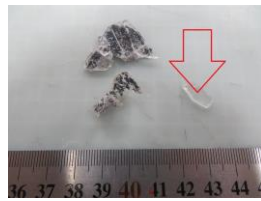
Test item016



Test item017



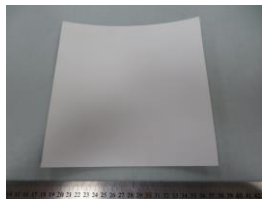
Test item018



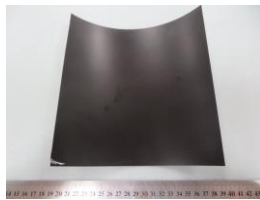
Test item019



Test item020



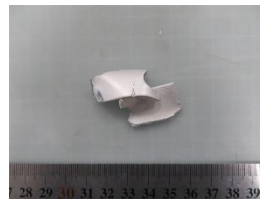
Test item021



Test item022



Test item023



Test item024



Test item025



Test item026



Test item027



Test item028



Test item029



Test item030



Test item031



Test item032



Test item033



Test item034



Test item035



Test item036



Test item037



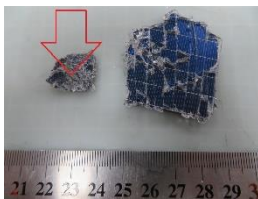
Test item038



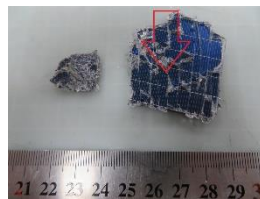
Test item039



Test item040



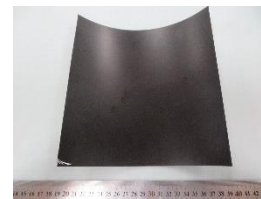
Test item041



Test item042



Test item043



Test item044

---End of Report---

Please note that every statement made in this report is only valid for the samples tested and reported herein. Samples were provided by applicant. Without consent of the testing organization, this report shall not be reproduced except in full and the clients shall not be unauthorized use of test results for improper propaganda. DEKRA declines any responsibility with deviations required by the customer that may affect the validity of result. The information is provided by the customer in this report may affect the validity of the results; the test lab is not responsible for it. The measurement result is considered in conformance with the requirement if it is within the prescribed limit, It is not necessary to calculate the uncertainty associated with the measurement result, unless the specification, standard or customer have special requirements. This report is not used for social proof function in China market.