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Test Report No. 492010572.001

Qualification of Connectors for
Photovoltaic Systems according to EN 50521

Applicant: **Ningbo Jinghua New Energy Technology Co., Ltd.**
Mushan Town,
Yuyao City, Zhejiang Province, 315456, P.R. China

File No.: GZV03034/15-01

Designed: *May, 04. 2015* by: *Gang Gan*

Reviewed: *May. 05. 2015* by: *Arper Hay*

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Test Report



File No.: GZV03034/15-01

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Applicant	Ningbo Jinghua New Energy Technical Co., Ltd. Mushan Town, Yuyao City, Zhejiang Province, 315456, P.R. China
Manufacturer	Ningbo Jinghua New Energy Technical Co., Ltd. Mushan Town, Yuyao City, Zhejiang Province, 315456, P.R. China
Order No.	QT-GZV03034/15
Date of Application	03/30/2015
Product	MC4 Connectors for photovoltaic systems
Model type(s)	LQ-1, LQ-2
General Information	
• Rated Voltage	1500V DC
• Rated Current	30A
• IP Degree of Protection	IP67
• Application Class	Class A
• Safety Class	Class II
Type of examination	Conformity testing with TÜV mark
Testing Period	04/16/2015 - 04/23/2015
Testing Laboratory	National Center of Supervision & Inspection on Solar Photovoltaic Products Quality Suite A-10F, No. 5 Xinhua Road, Wuxi New District Wuxi City, Jiangsu Province, 214028, 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:
EN 50521:2008+A1:2012 "Connectors for photovoltaic systems".

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History of certification	
File no.:	N/A
Certificate no.:	R50089203 0001, R50089203 0002, R50089203 0003, R50089203 0004
Date of issue.....:	09/04/2007, 05/21/2010, 07/07/2010, 04/15/2011
Report no.:	15018383 001, 15018383 002, 15018383 004, 5018383 005, 5018383 009
Type designation(s) :	LQ-1, LQ-2
Description:.....:	N/A
Supplementary information: Basic certificates issued by TÜV Rheinland.	

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Summary of testing

According to the enquiry of the applicant, based on certificate no. R 50089203 issued by TÜV Rheinland, upgrade standard to EN 50521:2008+A1:2012. Meanwhile, making the following changes:

1. Certificate holder name was changed from Ningbo Jinghua Optical Co., Ltd. to Ningbo Jinghua New Energy Technical Co., Ltd. Please see Annex 2 for details.
2. LQ-1:
 - Update rated input voltage to 1500V;
 - Update rated input current to 30A;
 - Extend to a new PV cable type with PV1-F 1x4.0mm² manufactured by Wuxi Vlead Optoelectronic Technology Co., Ltd.
3. LQ-2:
 - Update rated input voltage to 1500V;
 - Extend to a new PV cable type with PV1-F 1x4.0mm² manufactured by Wuxi Vlead Optoelectronic Technology Co., Ltd.

Model types LQ-1 and LQ-2 were selected as representative test samples and conducted with all the related tests.

All tests were successfully completed. Therefore, from the result of testing and factory inspection, it is recommended that certification should be granted.

Detailed product information are to be found in the CDF (constructional data form) in Annex 1 of this report.

Test Report



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General remarks

Test item particulars:	
Accessories and detachable parts included in the evaluation	PV cables
Options included	N/A
Abbreviations used in the report:	
DH - Damp Heat	TC - Temperature Cycling
Possible test case verdicts:	
Test case does not apply to the test object	Not Applicable (N/A)
Test object does meet the requirement.....	Pass (P)
Test object does not meet the requirement.....	Fail (F)
Other remarks:	
The test verdicts presented in this report relate only to the object tested. This report shall not be reproduced, except in full, with the written approval of the issuing testing laboratory. “(see Annex #)” refers to additional information appended to the report. “(see Table #)” refers to a table appended to the report. Throughout this report, a point is used as the decimal separator.	

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General product information

Model type: LQ-1

Rated voltage [V]	1500
Rated impulse voltage [V].....	16000
Rated insulation voltage [V].....	8000
Rated current [A]	30
Application Class	Class A
Safety class in accordance with IEC 61140	Class II
Ambient temperature [°C]	-40 to +85
Upper temperature limited [°C].....	+100
Pollution degree.....	2
Over voltage category	III
IP degree of protection	IP67
Wire cross section area	1 x 4.0mm ²
Cable	PV 1-F 1 x 4.0mm ² by Wuxi Vlead Optoelectronic Technology Co., Ltd.

Model type: LQ-2

Rated voltage [V]	1500
Rated impulse voltage [V].....	16000
Rated insulation voltage [V].....	8000
Rated current [A]	30
Application Class	Class A
Safety class in accordance with IEC 61140	Class II
Ambient temperature [°C]	-40 to +85
Upper temperature limited [°C].....	+100
Pollution degree.....	2
Over voltage category	III
IP degree of protection	IP67
Wire cross section area	1 x 4.0mm ²
Cable	PV 1-F 1 x 4.0mm ² by Wuxi Vlead Optoelectronic Technology Co., Ltd.

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Testing procedure

Model type: LQ-1

☐	Random sampling from production
☒	Prototype submitted by client
☐	New type
☒	Modifications (if yes, please choose the applicable modification according to the Retesting Guideline)
☐	Modification to enclosure material
☐	Modification to enclosure design
☐	Modification to electrical connections and terminations
☒	Modification to rated input current
☒	Modification to rated input voltage
☐	Modification to cord anchorage
☒	Modification to PV cable
☐	Modification to lid gasket/sealing
☐	Others
☐	Others
Description of similarity (differences) between the applied model and the previously tested model:	
- Update rated input voltage to 1500V; - Update rated input current to 30A; - Extend to two new PV cable types with PV1-F 1x4.0mm² manufactured by Wuxi Vlead Optoelectronic Technology Co., Ltd.	

Model type: LQ-2

☐	Random sampling from production
☒	Prototype submitted by client
☐	New type
☒	Modifications (if yes, please choose the applicable modification according to the Retesting Guideline)
☐	Modification to enclosure material
☐	Modification to enclosure design
☐	Modification to electrical connections and terminations
☐	Modification to rated input current
☒	Modification to rated input voltage
☐	Modification to cord anchorage
☒	Modification to PV cable
☐	Modification to lid gasket/sealing
☐	Others
☐	Others
Description of similarity (differences) between the applied model and the previously tested model:	
- Update rated input voltage to 1500V; - Extend to a new PV cable type with PV1-F 1x4.0mm² manufactured by Wuxi Vlead Optoelectronic Technology Co., Ltd.	

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EN 50521			
Clause	Requirement + Test	Result - Remark	Verdict

Test results of EN 50521

Model type: LQ-1

Group C Thermal test			-
C1	Initial measurement	-	-
-	Test according to 2b of EN 60512, contact resistance test.	Test current: 1A Contact resistance: 0.823mΩ	-
C2	Temperature rise test	-	-
-	5.13 of EN 50521, test according to 6.3.4 of EN 50521. The upper specified temperature shall not be exceeded.	Test current: 30A Temperature: 88.2°C<100°C	P
C3	Dry heat	-	-
-	1a of EN 60512, test according to 11i of EN 50521. The upper specified temperature shall not be exceeded. No damage likely to impair function after test.	N/A	N/A
C4	Final measurement	-	-
-	Test according to 2b of EN 60512, contact resistance test. Deviation of the contact resistance shall be no more than 50% of the reference value or 5mΩ. The higher value is permissible.	Test current: 1A Contact resistance: 0.966mΩ Deviation: 0.143mΩ	P
Supplementary information: N/A			-

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EN 50521			
Clause	Requirement + Test	Result - Remark	Verdict
Group D Climate test			-
D1	Initial measurement	-	-
-	Test according to 2b of EN 60512, contact resistance test.	Test current: 1A Contact resistance: 0.762mΩ	-
D2	Thermal cycle test	-	-
	1a of EN 60512, test according to 6.3.11 of EN 50521, 200 cycles. Visual examination after test.	N/A	N/A
D3	Damp heat	-	-
-	1a of EN 60512, test according to 6.3.12 of EN 50521, 1000 hours. Visual examination after test.	N/A	N/A
D4	Dielectric strength	-	-
-	5.18.1.1 of EN 50521, test according to 6.3.8 a) of EN 50521, impulse withstand test. There shall be no breakdown or flashover.	Test voltage: 16000V No breakdown or flash over	P
-	5.18.2 of EN 50521, test according to 6.3.8 b) of EN 50521. There shall be no breakdown or flashover.	Test voltage: 8000V at 50Hz No breakdown or flashover.	P
D5	Corrosion test	-	-
-	5.21.1 of EN 50521, test according to 6.3.9 of EN 50521, test 1 or test 2. Metal parts shall be so designed that corrosion shall not impair safety with regard to electrical and mechanical characteristics.	N/A	N/A
D6	Final measurement	-	-
-	Test according to 2b of EN 60512, contact resistance test. Deviation of the contact resistance shall be no more than 50% of the reference value or 5mΩ. The higher value is permissible.	Test current: 1A Contact resistance: 0.889mΩ Deviation: 0.127mΩ	P
Supplementary information: N/A			-

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EN 50521			
Clause	Requirement + Test	Result - Remark	Verdict

Model type: LQ-2

Group D Climate test			-
D1	Initial measurement	-	-
-	Test according to 2b of EN 60512, contact resistance test.	Test current: 1A Contact resistance: 0.841mΩ	-
D2	Thermal cycle test	-	-
	1a of EN 60512, test according to 6.3.11 of EN 50521, 200 cycles. Visual examination after test.	N/A	N/A
D3	Damp heat	-	-
-	1a of EN 60512, test according to 6.3.12 of EN 50521, 1000 hours. Visual examination after test.	N/A	N/A
D4	Dielectric strength	-	-
-	5.18.1.1 of EN 50521, test according to 6.3.8 a) of EN 50521, impulse withstand test. There shall be no breakdown or flashover.	Test voltage: 16000V No breakdown or flash over	P
-	5.18.2 of EN 50521, test according to 6.3.8 b) of EN 50521. There shall be no breakdown or flashover.	Test voltage: 8000V at 50Hz No breakdown or flashover.	P
D5	Corrosion test	-	-
-	5.21.1 of EN 50521, test according to 6.3.9 of EN 50521, test 1 or test 2. Metal parts shall be so designed that corrosion shall not impair safety with regard to electrical and mechanical characteristics.	N/A	N/A
D6	Final measurement	-	-
-	Test according to 2b of EN 60512, contact resistance test. Deviation of the contact resistance shall be no more than 50% of the reference value or 5mΩ. The higher value is permissible.	Test current: 1A Contact resistance: 0.972mΩ Deviation: 0.132mΩ	P
Supplementary information: N/A			-

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Annex 1: Constructional Data Form (CDF)



File No.: GZV03034/15-01

Attached to Test Report No.: 492010572.001

CDF (Constructional Data Form) for Electrical Products

Applicant.....	Ningbo Jinghua New Energy Technical Co., Ltd. Mushan Town, Yuyao City, Zhejiang Province, 315456, P.R. China
Manufacturer	Ningbo Jinghua New Energy Technical Co., Ltd. Mushan Town, Yuyao City, Zhejiang Province, 315456, P.R. China
Product	Connectors for photovoltaic systems
Type designation(s)	LQ-1, LQ-2

Ratings:

Rated voltage	1500V DC
Rated impulse voltage	16000V DC
Rated insulation voltage	8000V DC
Rated current	30A
Existence of an enclosure	Enclosed connector
Design of the connector	Free connector for LQ-1 Fixed connector for LQ-2
Type of conductor	Flexible
Number of poles	1
Application class	Class A
Safety class	Class II
Pollution degree	2
Over voltage category	III
Ambient temperature	-40°C to +85°C
RTI housing material	100°C
Termination and connection	Crimped-type terminals for external flexible PV Cable
Cable diameter	6.1mm
Wire cross section area	1 x 4.0mm ²
IP degree of protection	IP67
Rewireable?	No

Confirmation of the applicant

(Place and date)

Confirmation of TÜV NORD CERT

Shanghai, May 4, 2015 (Place and date)

(Applicant's legally authorized signature and stamp)

(Signature of authorized TÜV NORD CERT engineer)

PV-F-011 CDF

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List of critical materials and components:

Object	Manufacturer	Type	Technical Data	Remark
Insulation material of connector body	PAIGEL-HULS LTD	PA12 1988HB	V-0	Tested with connectors
Screw cap for connector body	PAIGEL-HULS LTD	PA12 1988HB	V-0	Tested with connectors
Current carrying part	Ningbo Xingye Electric and Copper Co., Ltd.	H62	Material: Copper T2 Tin-plated	Tested with connectors
Clamp device for PV cable	Ningbo Xingye Electric and Copper Co., Ltd.	H62	Material: Copper T2 Tin-plated	Tested with connectors
Cable	Wuxi Vlead Optoelectronic Technology Co., Ltd	PV1-F 1x4.0mm ²	Rated voltage = 1800VDC	Tested with connectors Certificate no. R 50264912
Anchorage for PV cable	NILIT PLASTICS EUROPE GMBH&CO KG	A 63 V2	Material: polyamide 66 RTI: 125°C Flammability Class: V-2 (EN60695-11-10)	Tested with connectors UL approval: E86034
Sealing gasket for PV cable	Cixi City Hongye Silicon Rubber Factory	Silicon rubber	Material: Silicon rubber Diameter (inside) = 6.2mm Diameter (outside) = 14.1mm Length = 12.3mm	Tested with connectors
Others (spring, screw, etc.)	N/A	N/A	N/A	N/A

----- End of CDF -----

Confirmation of the applicant

(Place and date)

Confirmation of TÜV NORD CERT

Shanghai, May 4, 2015 (Place and date)

(Applicant's legally authorized signature and stamp)

(Signature of authorized TÜV NORD CERT engineer)

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Annex 2: Holder name change declaration

变更声明

兹证明，我公司原先名字为宁波市晶华光学有限公司，后变更为宁波晶华新能源科技有限公司



2015.4.25

变更登记情况

登记情况:

注册号: 330281000205160

企业名称: 宁波晶华新能源科技有限公司

住所(经营场所): 余姚市牟山镇

法定代表人(负责人): 赵初山

企业类型: 其他有限责任公司

注册资本(资金数额): 100.0

万 人民币元 登记机关: 余姚市市场监督管理局

经营起始日期: 1993/05/10

经营截至日期: 0000/00/00

核准日期: 2013/12/12

经营范围: 太阳能组件、太阳能接线盒、太阳能连接器的研发; 光电仪器零部件、塑料制品、五金件、照明器材的制造、加工; 自营和代理货物和技术的进出口, 但国家限定经营或禁止进出口的货物和技术除外。

次数	变更事项	变更前内容	变更后内容	核准时间
5	一般经营项目变更	一般经营项目: 光电仪器及零部件、塑料制品、五金件的制造、加工; 金属材料、化工原料(除化学危险物品)、建筑材料的批发、零售、代购代销; 经营本企业和成员企业生产、科研所需的原辅材料、机械设备、仪器仪表、零配件及相关技术的进口业务。出口各种规格望远镜系列#	一般经营项目: 太阳能组件、太阳能接线盒、太阳能连接器的研发; 光电仪器零部件、塑料制品、五金件的制造、加工; 金属材料、建筑材料的批发、零售; 自营和代理货物和技术的进出口, 但国家限定经营或禁止进出口的货物和技术除外。	2011/08/25
5	名称变更	宁波市晶华光学有限公司	宁波晶华新能源科技有限公司	2011/08/25



打印日期: 2015年01月21日

机读档案仅供参考以原始档案为准

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Annex 3: List of measurement equipment

Equipment	Identification	Next calibration date
Temperature chamber	TT20-03	03/20/2016
Dielectric strength tester	EV20-23	11/01/2015
Impulse voltage tester	EV21-10	11/05/2015
DC power supply	ES20-12	11/05/2015
Hybrid recorder	TT21-13	07/16/2015

Annex 4: Photos

Model type: LQ-1



Overview



Overview



Overview (+)



Overview (+)



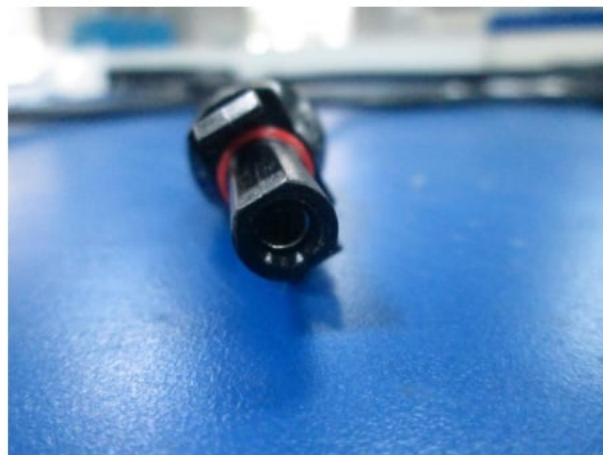
Overview (-)



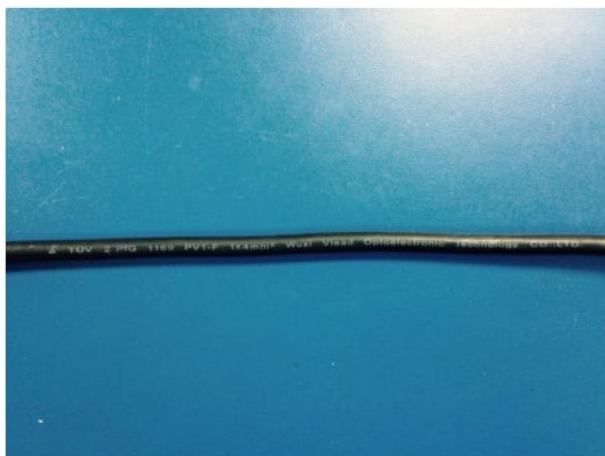
Overview (-)



Cross section (-)



Cross section (+)



Cable (PV1-F 1x4.0mm²)

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Model type: LQ-2



Overview



Overview



Overview (+)



Overview (+)



Overview (-)



Overview (-)

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Cross section (-)



Cross section (+)



Cable (PV1-F 1x4.0mm²)

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