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LAB N° 0951

# TEST REPORT

**Nr AR 15 TEST 026**

**15/0059**

**Cat. 0**

**IEC 61730-1: 2004 + A1: 2011**

**PV Module Safety Qualification - Part 1: Requirements for construction**

Issued to:

**DUSOL INDUSTRIES LLC**

**P O BOX 381057**

**Dubai**

**United Arab Emirates**

Sample/s description:

**Tested PV module type: DS72300W**

**Included Extended Types**

- see Annex 2 -

Test result: **PASS**

Annexes: 2

The test results indicated in this paper are exclusively referred to the described sample/s and in the specified conditions of measure. Any other extension of the results to other sample/s or other conditions of measure are to be considered outside to the scope of this document.

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**ALBARUBENS Srl**

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Issue date:  
08<sup>th</sup> April 2015

**Head of the Laboratory**

Eng. Giuseppe Terzaghi

Test Report No. : AR15TEST026  
 Test performed by : N/A  
 Written by : Dr. Nicoletta De Luca  
 Verified by : Eng. Giuseppe Terzaghi  
 Approved by : Eng. Giuseppe Terzaghi  
 Issued date [YYYY/MM/DD] : 2015/04/08

Summary of testing:

<b>Tests performed (name of test and test clause):</b>	<b>Testing location:</b>
MST 13 Ground continuity test	Albarubens srl
MST 21 Temperature test	via Consorziata Saronnino, 70/20-22
MST 32 Module breakage test	21040 Origgio (VA) – Italy
MST 11 Accessibility test	
10.5 Wet leakage current test	
10.14 Robustness of termination test	
*See AR14TEST091	

Summary of compliance with National Differences: N/A

Copy of marking plate:



Figure 1: type label on the backsheet



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Picture of sample:



Figure 2: Front view of test sample



Figure 3: Rear view of the test sample



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Figure 4: Detail view of closed J-box



Figure 5: Detail view of cables, connections and Polarity mark on the cable

<b>GENERAL INFORMATIONS</b>	
<b>Test item particulars:</b>	
Accessories and detachable parts included in the evaluation:	None
Other options included:	None
<b>Possible test case verdicts:</b>	
- test case does not apply to the test object .....	N/A
- test object does meet the requirement.....	Pass (P)
- test object does not meet the requirement .....	Fail (F)
<b>Testing:</b>	
Date of receipt of test item [YYYY/MM/DD] .....	N/A
Date (s) of performance of tests [YYYY/MM/DD] .....	N/A - see tests details on AR14TEST091 issued by Albarubens Srl
<b>General remarks:</b>	
<p>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.            Any additional text/description/comment, reported in "Supplementary information **", refers to opinions and interpretations, not accredited by ACCREDIA.            "(see remark #)" refers to a remark appended to the report.            "(see Annex #)" refers to an annex appended to the report.            "(see appended table)" refers to a table in the Test Report.            "(*)" refers to not accredited by ACCREDIA.</p> <p>This Test Report is intended for the investigation of PV module in accordance with IEC 61730-1. It can only be used together with IEC 61730-2 Test Report.</p>	
<b>General product information:</b>	
<u>PV module type reference</u>	: DS72300W
<u>Product Electrical Ratings at STC</u>	
Nominal maximum power (Pmax)	:.300W
Nominal open circuit voltage at (Voc)	:.45.3V
Nominal short circuit current at (Isc)	:. 8.94A
Nominal maximum power voltage (Vmp)	:. 36.5V
Nominal maximum power current (Imp)	:. 8.21A
<u>Product Safety Ratings</u>	
Maximum system voltage	:.1000V
Maximum over-current protection rating	:.30A
Safety application class	:.A
Safety class in accordance with IEC 61140	:.N/A
Fire safety class	:.II
Recommended maximum series/parallel module configurations	: N/A

Scope of Module Safety Qualification Testing

<input type="checkbox"/>	Initial Module Safety Qualification
<input checked="" type="checkbox"/>	Extension of Module Safety Qualification
Original Test Report Ref. No..... : AR14TEST091	
<input type="checkbox"/>	Change in cell technology
<input type="checkbox"/>	Modification to junction box/el. termination
<input type="checkbox"/>	Modification to encapsulation system
<input type="checkbox"/>	Change in cell interconnect materials/ technique
<input type="checkbox"/>	Modification to superstrate
<input type="checkbox"/>	Change in el. circuit of an identical package
<input type="checkbox"/>	Increase in module size
<input type="checkbox"/>	Higher or lower output by 10%
<input type="checkbox"/>	Modification to backsheet/substrate
<input type="checkbox"/>	Removal of frame
<input type="checkbox"/>	Modification to frame/mounting structure
<input type="checkbox"/>	Qualification of a frameless module after the design has received certification as a framed module

**Note (1)** Use the “General product information” field to give any information on model differences within a product type family covered by the test report.

**Note (2)** Use the “General product information” field to describe the range of electrical and safety ratings, if the TRF covers a type family of modules.

**Note (3)** Use Annex 1 to list the used materials and components of the module (manufacturer, type reference)

IEC 61730-1 + A1			
Clause	Requirement + Test	Result - Remark	Verdict
<b>3</b>	<b>APPLICATION CLASSES</b>		—
	The module has been evaluated for the following Application Class (Class A, B, C) .....	none	A
<b>4</b>	<b>CONSTRUCTION REQUIREMENTS</b>		—
<b>4.1</b>	<b>General requirements</b>		—
4.1.1	It is stated that the module is able to operate under environmental condition type AB8 according to IEC 60364-5-51.	Modules tested by environmental tests according to IEC 61215	P
4.1.2	The module/s is/are completely assembled when shipped from the factory.	Modules are completely assembled	P
	The module is provided in subassemblies.		
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.	Modules are completely assembled	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 is made such a way that it can be used as stand alone system or with other modules without any alteration	P
4.1.5	The construction of the module is such that ground continuity is not interrupted by installation.	A separate hole is used for ground connection	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.	Method not used	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
Supplementary information*: none			
<b>4.2</b>	<b>Metal parts</b>		—
	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.	- frame composed by anodized aluminum - metallic parts into the junction box are protected by the junction box itself that is IP 65	P
	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 a metal	P

	Simple sheared or cut edges and punched holes are not required to be additionally protected.		P
Supplementary information*: none			
<b>5</b>	<b>POLYMERIC MATERIALS</b>		—
<b>5.1</b>	<b>General</b>		—
	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.	All concerned polymeric materials passed the IEC 61730-2 MST 21 temperature test (see test details on AR14TEST091 issued by Albarubens Srl)	P
<b>5.2</b>	<b>Polymers serving as an enclosure for live parts</b>		
	Information is provided that polymers serving as an enclosure for live parts comply with:	All polymers materials passed the IEC 61730-2 MST 21 temperature test (see test details on AR14TEST091 issued by Albarubens Srl) <u>Junction Box</u> already certified according to EN 50548:2011 + A1 on cert. B150188393006 issued on 2015-01-14 by TÜV Sud and on cert R50277847 0001 issued on 2014/04/01 by TÜV Rheinland	—
	a) 5-V flammability rating (IEC 60695-1-1)	see above	P
	b) 5-V flammability rating, after water immersion and exposure of the end-product (IEC 60695-1-1)	see above	P
	c) Ultraviolet radiation resistance (ANSI/UL 746C)	not exposed to direct sunlight	N/A
	d) Minimum hot wire ignition rating of 30 (IEC 60695-1-1)	see above	P



<b>5.3</b>	<b>Polymers serving to support live parts</b>		—
	Information is provided that polymers serving to support live parts comply with:	<p><u>Junction Box</u> already certified according to EN 50548:2011 + A1 on cert. B150188393006 issued on 2015-01-14 by TÜV Sud and on cert R50277847 0001 issued on 2014/04/01 by TÜV Rheinland</p> <p><u>Cables</u> already certified according to 2 PfG 1169/08.2007 on cert. 15028370001 issued on 2009/09/22 by TÜV Rheinland</p> <p><u>Connectors</u> already certified according to EN 50521:2008 on cert. R 50111137 issued on 2010-08-06 by TÜV Rheinland</p>	—
	a) Flammability classification and high-current arc ignition rating (IEC 60695-1-1) as given in Table 1 of IEC 61730-1	see above	P
	b) Comparative Tracking Index (CTI) $\geq$ 250 V	see above	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.	see above	P
	Maximum system operating voltage rating (V):	1000V	—
	d) Ultraviolet radiation resistance (ANSI/UL 746C)	after installation not exposed	N/A
<b>5.4</b>	<b>Polymers serving as an outer surface</b>		—
	Information is provided that polymeric substrates or superstrates used in the module have:	<p>Polymeric material Isovoltalcosolar AAA 3554 already certified according to 2 PfG 1793/10.10 on cert. R60037668 issued on 2011/02/09 by TÜV Rheinland and also according ASTM E 162b:2008 on test report 09/0899e-1 issued on 2010/07/01 by CurrentaGmbH&amp;Co.OHG</p> <p>see also MST15 test details on AR14TEST091 issued by Albarubens Srl</p>	—
5.4.1	a) A thermal index, both electrical and mechanical, as determined in accordance with IEC 60216 of at least 90°C.	RTI $\geq$ 130°C	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.	Backsheet passed the IEC 61730-2 MST 21 temperature test (see test details on AR14TEST091 issued by Albarubens Srl)	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 m <sup>2</sup> or a single dimension larger than 2 m, has a maximum flame spread index of 100 as determined under ASTM E162-1990.	For Fire test see Test Report n.1700.0CI0262_14_rev.1 issued on 2015/01/23 by LAPI S.p.a.	P
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.	Not exposed to direct sunlight	N/A
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.	Polymeric material Isovolta Icosolar AAA 3554 already certified according to 2 PfG 1793/10.10 on cert. R60037668 issued on 2011/02/09 by TÜV Rheinland and also according ASTM E 162b:2008 on test report 09/0899e-1 issued on 2010/07/01 by CurrentaGmbH&Co.OHG see also MST15 test details on AR14TEST091 issued by Albarubens Srl	P
<b>5.5</b>	<b>Polymers serving as barriers</b>		—
	Insulation barriers are of adequate thickness and of a material appropriate for the application, as defined by IEC 61140	EVA encapsulation, front glass, cables, junction box, connectors and backsheet foil provide an acceptable insulation	P
	Barriers or liners are held in place and are not adversely affected	EVA encapsulation, front glass, cables, junction box, connectors and backsheet foil provide an acceptable insulation	P
<b>5.6</b>	<b>Polymers serving as structural glazing materials</b>		—
	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.	IEC 61730-2 MST 32 Module breakage test passed (see test details on AR14TEST091 issued by Albarubens Srl)	P
Supplementary information*: none			
<b>6</b>	<b>INTERNAL WIRING AND CURRENT-CARRYING PARTS</b>		—

	Any current-carrying part and wiring has the mechanical strength and current-carrying capacity necessary for its application.	Cables already certified according to 2 PfG 1169/08.2007 on cert. 15028370001 issued on 2009/09/22 by TÜV Rheinland	P
<b>6.1</b>	<b>Internal wiring</b>		—
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.	see above	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.	see above	P
<b>6.2</b>	<b>Splices</b>		—
	Splices are insulated equivalent to that required for the wiring involved.	no splices are present	N/A
<b>6.3</b>	<b>Mechanical securement</b>		—
6.3.1	Joints or connections are mechanically secure and provide electrical contact without strain on connections and terminals.	connections between cells metallization and interconnection are mechanically secure as held by encapsulation system	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*: none			
<b>7</b>	<b>CONNECTIONS</b>		—
<b>7.1</b>	<b>Field connections – general requirements</b>		—
7.1.1	The module is provided with wiring terminals, connectors, or leads to accommodate current-carrying conductors of the load circuit.	connectors and cables are rated up to 20A, junction box up to 15A	P
7.1.2	Field connections are rated for exposure to direct sunlight as defined in Clause 5 of IEC 61730-1.	Cables already certified according to 2 PfG 1169/08.2007 on cert. 15028370001 issued on 2009/09/22 by TÜV Rheinland Connectors already certified according to EN 50521:2008 on cert. R 50111137 issued on 2010-08-06 by TÜV Rheinland	P
	Field connections are exposed to the degrading effects of direct sunlight.	after installation not exposed to direct sunlight	N/A
<b>7.2</b>	<b>Field wiring terminals</b>		—

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.	<u>Junction Box</u> already certified according to EN 50548:2011 + A1 on cert. B150188393006 issued on 2015-01-14 by TÜV Sud and on cert R50277847 0001 issued on 2014/04/01 by TÜV Rheinland	P
7.2.2	Wiring terminals integral to the construction of the terminal enclosure comply with the following requirements:	<u>Junction Box</u> already certified according to EN 50548:2011 + A1 on cert. B150188393006 issued on 2015-01-14 by TÜV Sud and on cert R50277847 0001 issued on 2014/04/01 by TÜV Rheinland	P
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)	no screws	N/A
	The screws and nuts used for field wiring do not serve to fix any other component.	no screws	N/A
7.2.2.2	b) Terminal screws have a minimum nominal thread diameter as shown in Table 2 of IEC 61730-1.	no screws	N/A
	Stud terminals are provided with nuts and washers.	no screws	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.	no such a terminal	N/A
	Terminals are designed or located that the conductor cannot slip out when the clamping screws or nuts are tightened.	no such a terminal	N/A
	Terminals are fixed suitably when the means of clamping the conductor is tightened or loosened:	no such a terminal	N/A
	- The terminal itself does not work loose,	no such a terminal	N/A
	- Internal wiring is not subjected to stress,	no such a terminal	N/A
	- Creepage distances and clearances are not reduced below the values specified in clause 9 of IEC 61730-1.	verified by calliper measurement	P
<b>7.3</b>	<b>Connectors</b>		—
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.	<u>Connectors</u> already certified according to EN 50521:2008 on cert. R 50111137 issued on 2010-08-06 by TÜV Rheinland	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.	see above	P

7.3.2	The connector has been appropriately evaluated for disconnect overload performance.	“do not disconnect under load” written on the tag attached the cable	P
7.3.3	Connectors intended for exposure to the outdoor environment are enclosed by material which complies with the following:	Connectors already certified according to EN 50521:2008 on cert. R 50111137 issued on 2010-08-06 by TÜV Rheinland	P
	a) UV resistance in accordance with the requirements of Clause 5.	not exposed to direct sunlight after installation	N/A
	b) Resistance to inclusion of water acc. to IEC 60529 (equivalent to IP55)	see above	P
	c) Steel ball impact test acc. to IEC 61721	see above	P
	d) Accessibility Test MST 11 of IEC 61730-2	IEC 61730-2 MST 11 accessibility test passed (see test details on AR14TEST091 issued by Albarubens Srl)	P
7.3.4	Separable multi-pole connectors are polarised.	1 connector is male type and other is female type. They are different marked and	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.	connection between male/male or female/female 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.	IEC 61730-2 MST 11 accessibility test passed (see test details on AR14TEST091 issued by Albarubens Srl)	P
<b>7.4</b>	<b>Output lead or cables</b>		—
	Leads extending from the module are rated for the appropriate system voltage, ampacity, wet locations, temperature and sunlight resistance.	Cables already certified according to 2 PfG 1169/08.2007 on cert. 15028370001 issued on 2009/09/22 by TÜV Rheinland	P
Supplementary information*: none			
<b>8</b>	<b>BONDING AND GROUNDING</b>		—
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 than 10 cm <sup>2</sup> accessible after installation, then the module has provisions for grounding.	There is a grounding point marked on the frame	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).	verified by insulation tests of IEC 61730-2	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. <i>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.</i>	IEC 61730-2 MST 13 ground continuity test passed (see test details on AR14TEST091 issued by Albarubens Srl)	P
8.4	Routine maintenance of the module does not involve breaking or disturbing the bonding path.	Bonding position is not broken or disturbed during routine maintenance	P
	A bolt, screw, or other part used for bonding purposes is not intended for securing the complete device.	see above	P
8.5	Bonding is by a positive means, such as clamping, riveting, bolted or screwed connections, or welding, soldering or brazing.	IEC 61730-2 MST 13 ground continuity test passed (see test details on AR14TEST091 issued by Albarubens Srl)	P
	The bonding connection penetrates all nonconductive coatings, such as paint, anodised coatings or vitreous enamel.	see above	P
8.6	All joints in the bonding path are mechanically secure.	mechanically secure without soldering	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.	method not used	N/A
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.	the size of grounding bolt is appropriate according to the Table 2 of IEC 61730-1	P
8.9	Ferrous metal parts in the grounding path are protected against corrosion by metallic or non-metallic coatings.	no ferrous parts contained	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 such a metal part	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.	There is the appropriate symbol	P
	No other terminal or location is identified in this manner.	—	P
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.	There is the appropriate symbol next to the hole	P
Supplementary information*: none			

<b>9</b>	<b>Creepage and Clearance distances</b>		—
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.	distances verified by calliper in accordance to the Tables 3 and 4 of IEC 61730-1.	P
	Minimum measured creepage and clearance distances between field wiring terminals (mm) .... :	No field wiring connections	—
	Minimum Measured clearance distances between internal current carrying parts and accessible points (mm) .....	between cells and module edge: 20+/-1mm between connection ribbon and module edge: 10+/-1mm	—
9.2	Creepage and clearance distances at field wiring terminals have been judged on module open-circuit voltage ( $V_{oc}$ ).	no such terminals	N/A
	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.	see above	N/A
9.3	The spacings at a field-wiring terminal have been measured with and without wire connected to the terminal.	conductors are already installed on the junction box	N/A
	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.	see above 9.3	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*: none			
<b>10</b>	<b>FIELD WIRING COMPARTMENTS WITH COVERS</b>		—
<b>10.1</b>	<b>General</b>		—
	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 present	P
<b>10.2</b>	<b>Wall thickness</b>		
	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.	<u>Junction Box</u> already certified according to EN 50548:2011 + A1 on cert. B150188393006 issued on 2015-01-14 by TÜV Sud and on cert R50277847 0001 issued on 2014/04/01 by TÜV Rheinland	P





<b>10.3</b>	<b>Internal volume</b>		—
	The internal volume for each intended conductor complies with the requirements of Table 6 of IEC 61730-1.	see above 10.2	P
	In the space comprising the minimum required volume, no enclosure dimension is less than 20 mm.	see above 10.2	P
<b>10.4</b>	<b>Openings</b>		—
	All openings are provided with appropriate coverings, whose functions comply with the requirements of:	—	P
	- Subclause 5.2.1 of IEC 61730-1	—	P
	- Wet leakage Current test of Subclause 10.15 of IEC 61646 or 10.15 of IEC 61215 Ed. 2.	IEC 61730-2 MST 17 wet leakage test (see test details on AR14TEST091 issued by Albarubens Srl).	P
	- Accessibility test MST 11 of IEC 61730-2	IEC 61730-2 MST 11 accessibility test (see test details on AR14TEST091 issued by Albarubens Srl).	P
	Coverings can only be removed by the use of a tool	Covering may be only removed by the use of a tool	P
<b>10.5</b>	<b>Gaskets and seals</b>		—
	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 IEC 61730-2 climatic tests or components test for junction box, cables and connectors	P
<b>10.6</b>	<b>Strain relief</b>		—
	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. <i>Note: Mechanical securement means which comply with Subclause 10.14 (Robustness of Terminations Test) of IEC 61215 meet this requirement.</i>	IEC 61215 §10.14 Robustness of terminations test (see test details on AR14TEST091 issued by Albarubens Srl).	P
<b>10.7</b>	<b>Sharp edges</b>		—
10.7.1	The enclosure is smooth and free from sharp edges, burrs, or the like that may damage insulation or conductors.	the enclosure is smooth and free of any conditions that might damage insulation or conductors	P
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 openings nor knockouts	N/A





<b>10.8</b>	<b>Conduit applications – Metallic</b>		—
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 metallic conduit application	N/A
	Any threaded hole is tapered unless a conduit end stop is provided.	no metallic conduit application	N/A
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 metallic conduit application	N/A
	The construction is such that a conduit bushing can be attached as intended.	no metallic conduit application	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 metallic conduit application	N/A
	There are smooth, rounded inlet holes for the conductors.	no metallic conduit application	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 metallic conduit application	N/A
10.8.5	Conduit complies with the Conduit bending test MST 33 of IEC 61730-2.	junction box is not intended to be used with conduit	N/A
<b>10.9</b>	<b>Conduit applications – Non-metallic</b>		—
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 non-metallic conduit application	N/A
10.9.2	A non-metallic wiring compartment intended to accommodate non-metallic conduit fulfils the following requirements:	no non-metallic conduit application	N/A
	a) It has one or more unthreaded conduit-connection sockets;	no non-metallic conduit application	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 non-metallic conduit application	N/A
	c) It complies with the Conduit Bending Test MST 33 of IEC 61730-2, if intended for rigid non-metallic conduit.	no non-metallic conduit application	N/A



10.9.3	Sockets for the connection of non-metallic conduit provide a positive end stop for the conduit.	no non-metallic conduit application	N/A
	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 non-metallic conduit application	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 non-metallic conduit application	N/A
Supplementary information*: none			
<b>11</b>	<b>MARKING</b>		—
11.1	The module includes the following clear and indelible markings:	—	—
	– Name, monogram or symbol of manufacturer	refer to label picture on page 2	P
	– Type or model number	refer to label picture on page 2	P
	– Serial number	refer to label picture on page 2	P
	– Polarity of terminals or leads	marked on connectors	P
	– Maximum system voltage	refer to label picture on page 2	P
	– Safety class (IEC 61140)	refer to label picture on page 2	P
	The date and place of manufacture are marked on the module or are traceable from the serial number.	traceable by serial number	P
	International symbols are used where applicable.	refer to label picture on page 2	P
11.2	The following additional markings are applied to either the module or placed into the instruction and installation data (required documents).	—	P
	– Voltage at open-circuit	refer to label picture on page 2	P
	– Current at short-circuit	refer to label picture on page 2	P
	– Maximum over-current protection rating, as verified by the Reverse Current Overload Test MST 26 of IEC 61730-2	30A, refer to label picture on page 2	P
	– Recommended maximum series/parallel module configurations	indicated in the installation manual and computable by $V_{OC}$ and maximum system voltage	P
	– Application class	A, refer to label picture on page 2	P
	All electrical data are given relative to Standard Test Conditions (1000W/m <sup>2</sup> @ 25°C)	refer to label picture on page 2	P
11.3	Connectors suitable only for field assembly of modules are marked “Do not disconnect under load”.	indicated by the tag on the cables next to the connectors	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.	refer to label picture on page 2	P
Supplementary information*: none			
<b>12</b>	<b>REQUIREMENTS FOR SUPPLIED DOCUMENTS</b>		—
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 instructions are provided with the statement of application class	P
	The instructions state the application class under which the module was qualified and any specific limitations required for that application class.	see above	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.	installation instructions are provided with the statement of fire class	P
12.3	The electrical installation instructions include a detailed description of the wiring method.	—	P
	The description of the wiring method includes the following information:	—	—
	– Grounding method	written in installation instructions	P
	– Size, type, and temperature rating of the conductors	written in installation instructions	P
	– Recommended maximum series/parallel module configurations	written in installation instructions computable by $V_{OC}$ and maximum system voltage	P
	– Type of over-current protection and diode bypassing to be used	over-current protection indicated in installation instructions, bypass diode already integrated in the junction box	P
	– Minimum cable diameters when the wiring method is cable	junction box is already supplied with cables and connectors	P
– Any limitations on wiring methods that apply to the wiring compartment or box	written in installation instructions	P	
12.4	The mechanical installation instructions for roof mounting include:	—	—
	– A statement indicating the minimum mechanical means for securing the module or panel to the roof	written in installation instructions	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 instructions	P
	– Indication of any slope required for maintaining a fire class rating	installation instructions are provided with the statement of fire class	P
12.5	The installation instructions include a statement advising that artificially concentrated sunlight shall not be directed on the module or panel.	written in installation instructions	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.	final product is provided as unique and inseparable part	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 in installation instructions	P
Supplementary information*: none			

----- End of Test Report No. AR 15 TEST 026 -----

**List of Annexes**

Annex 1: Product Description Sheet (Manufacturers and type references)

Annex 2: Model to be included in the test report

**ANNEX 1: PRODUCT DESCRIPTION SHEET (MANUFACTURERS AND TYPE REFERENCES)**

<b>A1.1</b>	<b>MODULES TYPE/S</b>	
		DS72300W

<b>A1.2</b>	<b>SOLAR CELL</b>	
	Cell type reference.....:	3BB Multi
	Cell dimensions L x W (mm).....:	156 x 156
	Cell thickness ( $\mu\text{m}$ ).....:	200
	Cell area ( $\text{cm}^2$ ).....:	243.36

<b>A1.3</b>	<b>IDENTIFICATION OF MATERIALS</b>	
	Front cover.....:	Glass - Flat solar group
	Rear cover.....:	Icosolar AAA3554/0.35mm - Isovoltaic
	Encapsulant.....:	EVA - STR/Photocap15585HLT
	Frame.....:	Aluminium - Akcome Metals Technology
	Adhesive for frame.....:	Silicon Sealant - Tonsan 1527
	Adhesive for junction box.....:	Silicon Sealant - Tonsan 1527
	Potting material.....:	Tonsan Potting compound for PV junction Box - 1521
	Internal wiring.....:	Sn62Pb36Ag2 between cells : 2mm,+/-0.5mm, between strings: 3mm,+/-0.5mm
	Soldering material.....:	Interconnect Ribbon - Gebauer&Griller
	Other.....:	n.d.

<b>A1.4</b>	<b>IDENTIFICATION OF COMPONENTS</b>	
	Junction box.....:	156B 4t-6d/Ningbo GZX
	Cable.....:	GZX4mm <sup>2</sup> 100cmx2
	Connector.....:	MC4
	Bypass diode.....:	12SQO45S

<b>A1.5</b>	<b>MODULE DESIGN –DIMENSIONS</b>	
	Module dimensions L x W x H (mm)	1955 x 990 x 42

<b>A1.6</b>	<b>MODULE DESIGN - MINIMUM DISTANCES</b>	
	Between cells	2mm, +/-0.5mm
	Between cell and edge of laminate	20mm, +/-1mm
	Between any current carrying part and edge of laminate	10mm, +/-1mm

<b>A1.7</b>	<b>MODULE DESIGN - ELECTRICAL CONFIGURATION</b>	
	Total number of cells	72
	Serial-parallel connection of cells	72 series
	Cells per bypass diode	12
	No. of bypass diodes	6

**Annex 2: The photovoltaic modules with the models**

Tested type	Cell number	Cell size [mm]	Module size [mm]	Cell technology	Rated power [W]
DS72300W	72	(156X156)mm	(1955x990)mm	3BB Multi	300Wp

\* Extended PV module type without need of re-testing (according to IECCE “Retest Guidelines”):

Type *	Cell number	Cell size [mm]	Module size [mm]	Cell technology	Rated power [W]
[DS60250W]	60	(156X156)mm	(1655X990)mm	3BB Multi	250Wp
[DS60260W]	60	(156X156)mm	(1655x990)mm	3BB Multi	260Wp
[DS60270W]	60	(156X156)mm	(1655x990)mm	3BB Multi	270Wp
[DS72310W]	72	(156X156)mm	(1955x990)mm	3BB Multi	310Wp
[DS72320W]	72	(156X156)mm	(1955x990)mm	3BB Multi	320Wp
[DS72225W]	72	(117X156)mm	(1480X990)mm	3BB Multi	225Wp
[DS72200W]	72	(104X156)mm	(1480X990)mm	3BB Multi	200Wp
[DS72175W]	72	(92X156)mm	(1205X990)mm	3BB Multi	175Wp
[DS36150W]	36	(156X156)mm	(1480X670)mm	3BB Multi	150Wp
[DS36125W]	36	(130x156)mm	(1480x670)mm	3BB Multi	125Wp
[DS36100W]	36	(104x156)mm	(1035x670)mm	3BB Multi	100Wp
[DS3675W]	36	(78x156)mm	(785x670)mm	3BB Multi	75Wp
[DS3660W]	36	(64x156)mm	(635x670)mm	3BB Multi	60Wp
[DS3650W]	36	(52x156)mm	(535x670)mm	3BB Multi	50Wp
[DS3640W]	36	(39x156)mm	(535x670)mm	3BB Multi	40Wp