TEST REPORT
IEC 61109
Insulators for overhead lines – Composite suspension and tension insulators for a.c. systems with a nominal voltage greater than 1 000 V – Definitions, test methods and acceptance criteria

Report Number.....:	HUAX230807024KR
Prepared by (Engineer) .....:	Kevin su
Reviewed By (Supervisor) .....:	Amy jiang
Date of issue.....:	2023-08-11
Total number of pages.....:	14 pages

Shenzhen Huaxiang Testing Co., Ltd. IMPARTIAL Product Safety * Approved *

Name of Testing Laboratory preparing the Report.....:	Shenzhen Huaxiang Testing Co., Ltd.
Applicant's name.....:	Zhejiang Qinjin Power Equipment Co., Ltd.
Address.....:	Industrial function Industrial Park, Chengdong Street, Yueqing , Zhejiang, China
Test specification:	
Standard.....:	IEC 61109:2008
Test procedure.....:	Type test
Non-standard test method.....:	N/A
Test Report Form No.....:	IEC 61109_A
Test Report Form(s) Originator.....:	Huaxiang
Master TRF.....:	Dated 2022-04-14

General disclaimer:

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing Huaxiang Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the Huaxiang, responsible for this Test Report.

Test item description.....:	COMPOSITE INSULATOR
Trade Mark.....:	CONWEE
Manufacturer.....:	Same as applicant **Model/**
Type reference.....:	FXB-24/70YB
Ratings.....:	24KV Bending 70KN

Digitally signed by Bolgarin Mihail
Date: 2025.02.03 19:05:58 EET
Reason: MoldSign Signature
Location: Moldova
MOLDOVA EUROPEANĂ

Summary of testing:	
Tests performed (name of test and test clause): The submitted samples were found to comply with the requirements of: IEC 61109:2008	**Testing location:** 201, Building A10, Fuhai Information Port, Fuhai Street, Bao'an District, Shenzhen City
Summary of compliance with National Differences (List of countries addressed): N/A	
Copy of marking plate: N/A	

Possible test case verdicts:	
- test case does not apply to the test object.... :	N/A
- test object does meet the requirement..... :	P (Pass)
- test object does not meet the requirement.... :	F (Fail)
Testing:	
Date of receipt of test item..... :	2023-08-07
Date (s) of performance of tests.....:	2023-08-07 to 2023-08-11
General remarks:	
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. **Throughout this report a ☐ comma / ☒ point is used as the decimal separator.**	
Name and address of factory (ies).....:	Same as applicant
General product information and other remarks:	
1. This apparatus is COMPOSITE PIN INSULATOR, Voltage 2 4 KV, Tensile 70KN.	

IEC 61109			
Clause	Requirement + Test	Result - Remark	Verdict
4	**IDENTIFICATION**		P
	In addition to the requirements of IEC 62217, each insulator shall be marked with the SML.		P
	It is recommended that each insulator be marked or labelled by the manufacturer to show that it has passed the routine mechanical test.		P
5	**Environmental conditions**		P
	The normal environmental conditions to which insulators are submitted in service are defined in IEC 62217.		P
6	**Transport, storage and installation**		P
	In addition to the requirements of IEC 62217, information on handling of composite insulators can be found in CIGRE Technical Brochure 184 [7]. During installation, or when used in non- standard configurations, composite suspension insulators may be submitted to high torsion, compression or bending loads for which they are not designed. Annex C gives guidance on catering for such loads.		P
7	**Hybrid insulators**		P
	As stated in Clause 1, this standard can be applied in part to hybrid composite insulators where the core is made of a homogeneous material (porcelain, resin). In general, the load-time mechanical tests and tests for core material are not applicable to porcelain cores. For such insulators, the purchaser and the manufacturer shall agree on the selection of tests to be used from this standard and from IEC 60383-1		P
8	**Tolerances**		P
	Unless otherwise agreed, a tolerance of $\pm$ (0,04 $\times$ d + 1 ,5) mm when d $\leqslant$ 300 mm, $\pm$ (0,025 × d + 6) mm when d > 300 mm with a maximum tolerance of ± 50 mm, shall be allowed on all dimensions for which specific tolerances are not requested or given on the insulator drawing (d being the dimension in millimetres).		P
	The measurement of creepage distances shall be related to the design dimensions and tolerances as determined from the insulator drawing, even if this dimension is greater than the value originally specified. When a minimum creepage is specified, the negative tolerance is also limited by this value.		P
	In the case of insulators with creepage distance exceeding 3 m, it is allowed to measure a short section around 1 m long of the insulator and to extrapolate.		P

IEC 61109			
Clause	Requirement + Test	Result - Remark	Verdict
9	**Classification of tests**		P
9.1	Design tests		N/A
	These tests are intended to verify the suitability of the design, materials and method of manufacture (technology). A composite suspension insulator design is defined by the following elements:		N/A
	- materials of the core, housing and their manufacturing method;		N/A
	- material of the end fittings, their design and method of attachment (excluding the coupling);		N/A
	- layer thickness of the housing over the core (including a sheath where used);		N/A
	- diameter of the core.		N/A
	When changes in the design occur, re-qualification shall be carried out in accordance with Table 1 .		N/A
	When a composite suspension insulator is submitted to the design tests, it becomes a parent insulator for a given design and the results shall be considered valid for that design only. This tested parent insulator defines a particular design of insulators which have all the following characteristics:		N/A
	a) same materials for the core and housing and same manufacturing method;		N/A
	b) same material of the fittings, the same connection zone design, and the same housing-to-fitting interface geometry;		N/A
	c) same or greater minimum layer thickness of the housing over the core (including a sheath where used);		N/A
	d) same or smaller stress under mechanical loads;		N/A
	e) same or greater diameter of the core;		N/A
	f) equivalent housing profile parameters, see Note (a) in Table 1 .		N/A
9.2	Type tests		P
	The type tests are intended to verify the main characteristics of a composite insulator, which depend mainly on its shape and size. They also confirm the mechanical characteristics of the assembled core (see Clause A.4). They are made on insulators whose class has satisfied the design tests, more details are given in Clause 1 1 .		P
9.3	Sample tests		N/A
	The sample tests are for the purpose of verifying other characteristics of composite insulators, including those which depend on the quality of manufacture and on the materials used. They are		N/A

IEC 61109			
Clause	Requirement + Test	Result - Remark	Verdict
	made on insulators taken at random from lots offered for acceptance.		
9.4	Routine tests		N/A
	The aim of these tests is to eliminate composite insulators with manufacturing defects. They are made on every composite insulator offered for acceptance.		N/A
10	**Design tests**		N/A
10.1	General		N/A
	These tests consist of the tests prescribed in IEC 62217 as listed in Table 2 below and a specific assembled core load-time test. The design tests are performed only once and the results are recorded in a test report. Each part can be performed independently on new test specimens, where appropriate. The composite insulator of a particular design shall be qualified only when all insulators or test specimens pass the design tests.		N/A
10.2	Test specimens for IEC 62217		N/A
10.2.1	Tests on interfaces and connections of end fittings		N/A
	Three insulators assembled on the production line shall be tested. The insulation length (metal to metal spacing) shall be not less than 800 mm. Both end fittings shall be the same as on standard production insulators. The end fittings shall be assembled so that the insulating part from the fitting to the closest shed shall be identical to that of the production line insulator. If spacers, joining rings or other features are used in the insulator design (notably for longer insulators), the sample shall include any such devices in a typical position.		N/A
10.2.2	Tracking and erosion test		N/A
	If spacers, joining rings or other features are used in the insulator design (notably for longer insulators), the samples for this test shall include any such devices in a typical position.		N/A
	IEC 6221 7 specifies that the creepage distance of the sample shall be between 500 mm and 800 mm. If the inclusion of spacers or joints, as mentioned above, requires a longer creepage distance, the design tests may be performed on insulators of lengths as close to 800 mm as possible. If the manufacturer only has facilities to produce insulators with creepage shorter than 500 mm, the design tests may be performed on insulators of those lengths he has available, but the results are only valid for up to the tested lengths.		N/A
10.2.3	Tests on core material		N/A
	The specimens shall be as specified in IEC 6221 7. However, if the housing material is not bonded to		N/A

IEC 61109			
Clause	Requirement + Test	Result - Remark	Verdict
	the core, then it shall be removed and the remaining core thoroughly cleaned to remove any traces of sealing material before cutting and testing.		
10.3	Product specific pre-stressing for IEC 62217		N/A
	The tests shall be carried out on the three specimens in the sequence as indicated below.		N/A
10.3.1	Sudden load release		N/A
	With the insulator at –20 °C to –25 °C, every test specimen is subjected to five sudden load releases from a tensile load amounting to 30 % of the SML.		N/A
10.3.2	Thermal-mechanical pre-stress		N/A
	Before commencing the test, the specimens shall be loaded at the ambient temperature by at least 5 % of the SML for 1 min, during which the length of the specimens shall be measured to an accuracy of 0,5 mm. This length shall be considered to be the reference length.		N/A
	The specimens are then submitted to temperature cycles under a continuous mechanical load as described in Figure 1 , the 24 h temperature cycle being perfomed four times. Each 24 h cycle has two temperature levels with a duration of at least 8 h, one at (+50 ± 5) °C, the other at (–35 ± 5) °C. The cold period shall be at a temperature at least 85 K below the value actually applied in the hot period. The pre-stressing can be conducted in air or any other suitable medium.		N/A
	The applied mechanical load shall be equal to the RTL (at least 50 % of the SML) of the specimen. The specimen shall be loaded at ambient temperature before beginning the first thermal cycle.		N/A
	The cycles may be interrupted for maintenance of the test equipment for a total duration of 2 h. The starting point after any interruption shall be the beginning of the interrupted cycle.		N/A
	After the test, the length shall again be measured in a similar manner at the same load and at the original specimen temperature (this is done in order to provide some additional information about the relative movement of the metal fittings).		N/A
10.4	Assembled core load-time tests		N/A
10.4.1	Test specimens		N/A
	Six insulators made on the production line shall be tested. The insulation length (metal to metal spacing) shall be not less than 800 mm. Both end fittings shall be identical in all aspects to those used on production line insulators, except that they may be modified beyond the end of the connection zone in order to avoid failure of the couplings.		N/A

IEC 61109			
Clause	Requirement + Test	Result - Remark	Verdict
	The six insulators shall be examined visually and a check made that their dimensions conform with the drawing.		N/A
10.4.2	Mechanical load test		N/A
	This test is performed in two parts at ambient temperature.		N/A
10.4.2.1	Determination of the average failing load of the core of the assembled insulator M_{AV}		N/A
	Three of the specimens shall be subjected to a tensile load. The tensile load shall be increased rapidly but smoothly from zero to approximately 75 % of the expected mechanical failing load and shall then be gradually increased in a time between 30 s and 90 s until breakage of the core or complete pull-out occurs. The average of the three failing loads M_{AV} shall be calculated.		N/A
10.4.2.2	Verification of the 96 h withstand load		N/A
	Three specimens shall be subjected to a tensile load. The tensile load shall be increased rapidly but smoothly from zero up to 60 % of M_{AV} , as calculated in 1 0.4.2.1 and then maintained at this value for 96 h without failure (breakage or complete pull-out). If for any reason the load application is interrupted, then the test shall be restarted on a new specimen.		N/A
11	**Type tests**		P
	An insulator type is electrically defined by the arcing distance, creepage distance, shed inclination, shed diameter and shed spacing.		P
	The electrical type tests shall be performed only once on insulators satisfying the conditions above and shall be performed with arcing or field control devices (which are generally necessary on composite insulators at transmission voltages) if they are an integral part of the insulator type.		P
	Furthermore, Table 1 outlines the insulator design characteristics that, when changed, also require a repeat of the electrical type tests.		P
	An insulator type is mechanically defined principally by a maximum SML for the given core diameter, method of attachment and coupling design.		P
	The mechanical type tests shall be performed only once on insulators satisfying the criteria for each type.		P
	Furthermore, Table 1 indicates additional insulator design characteristics that, when changed, require a repeat of the mechanical type tests.		P
11.1	Electrical tests		P
	The electrical tests in Table 3 shall be performed		P

IEC 61109			
Clause	Requirement + Test	Result - Remark	Verdict
	according to IEC 60383-2 to confirm the specified values. Interpolation of electrical test results may be used for insulators of intermediate length, provided that the factor between the arcing distances of the insulators whose results form the end points of the interpolation range is less than or equal to 1 ,5. Extrapolation is not allowed.		
11.2	Damage limit proof test and test of the tightness of the interface between end fittings and insulator housing		P
11.2.1	Test specimens		P
	Four insulators taken from the production line shall be tested. In the case of long insulators, specimens may be manufactured, assembled on the production line, with an insulation length (metal to metal spacing) not less than 800 mm. Both end fittings shall be the same as on standard production insulators. The fittings shall be assembled such that the insulating part from the fitting to the closest shed is identical to that of the production line insulator. The insulators shall be examined visually and checked to see that the dimensions conform with the drawing; they shall then be subjected to the mechanical routine test according to 1 3.1 .		P
11.2.2	Performance of the test		P
	a) The four specimens are subjected to a tensile load applied between the couplings at ambient temperature. The tensile load shall be increased rapidly but smoothly from zero up to 70 % of the SML and then maintained at this value for 96 h.		P
	b) Both ends of one of the four specimens shall, at the end of the 96 h test, be subjected to crack indication by dye penetration, in accordance with ISO 3452, on the housing in the zone embracing the complete length of the interface between the housing and metal fitting and including an additional area, sufficiently extended, beyond the end of the metal part. The indication shall be performed in the following way: - the surface shall be properly pre-cleaned with the cleaner; - the penetrant shall be applied on the cleaned surface and left to act for 20 min; - the surface shall be cleaned of the excess penetrant and dried; - the developer shall be applied, if necessary; - the surface shall be inspected. Some housing materials may be penetrated by the penetrant. In such cases, evidence shall be provided to validate the interpretation of the results.		P

IEC 61109			
Clause	Requirement + Test	Result - Remark	Verdict
	After the penetration test the specimen shall be inspected. If any cracks are visible, the housing and, if necessary, the metal fittings and the core shall be cut perpendicular to the crack in the middle of the widest of the indicated cracks, into two halves. The surface of the two halves shall then be investigated to measure the depth of the cracks.		
	c) The three remaining specimens are then again subjected to a tensile load applied between the couplings at ambient temperature. The tensile load shall be increased rapidly but smoothly from zero to approximately 75 % of the SMS and then gradually increased in a time between 30 s to 90 s to the SMS. If 1 00 % of the SML is reached in less than 90 s, the load (1 00 % of SML) shall be maintained for the remainder of the 90 s (this test is considered to be equivalent to a 1 min 1 00 % withstand test at SML). In order to obtain more information from the test, unless special reasons apply (for instance the maximum tensile load of the test machine), the load may be increased until the failing load is reached and its value recorded.		P
11.2.3	Evaluation of the test		P
	The test is passed if		P
	- no failure (breakage or complete pull-out of the core, or fracture of the metal fitting) occurs either during the 96 h test at 70 % of the SML (1 1 .2.2 a)) or during the 1 min 1 00 % withstand test at SML (1 1 .2.2 c)),		P
	- no cracks are indicated by the dye penetration method described in 1 1 .2.2.2 b),		P
	- the investigation of the halves described in 1 1 .2.2.2 b) shows clearly that the cracks do not reach the core.		P
12	**Sample tests**		N/A
12.1	General rules		N/A
	For the sample tests, two samples are used, E1 and E2. The sizes of these samples are indicated in Table 4 below. If more than 1 0 000 insulators are concerned, they shall be divided into an optimum number of lots comprising between 2 000 and 1 0 000 insulators. The results of the tests shall be evaluated separately for each lot.		N/A
	The insulators shall be selected from the lot at random. The purchaser has the right to make the selection. The samples shall be subjected to the applicable sampling tests.		N/A
	The sampling tests are as follows:		N/A
	a) verification of dimensions …… (E1 + E2)		N/A

IEC 61109			
Clause	Requirement + Test	Result - Remark	Verdict
	b) verification of the locking system …… (E2)		N/A
	c) verification of the tightness of the interface between end fittings and insulator housing …… (E2)		N/A
	d) verification of the specified mechanical load, SML …… (E1)		N/A
	e) galvanizing test …… (E2)		N/A
	In the event of a failure of the sample to satisfy a test, the re-testing procedure shall be applied as prescribed in 12.6.		N/A
	Insulators of sample E2 only can be used in service and only if the galvanizing test is performed with the magnetic method.		N/A
12.2	Verification of dimensions (E1 + E2)		N/A
	The dimensions given in the drawings shall be verified. The tolerances given in the drawings are valid. If no tolerances are given in the drawings the values mentioned in Clause 8 shall be used.		N/A
12.3	Verification of the end fittings (E2)		N/A
	The dimensions and gauges for end fittings are given in IEC 61 466-1. The appropriate verification shall be made for the types of fitting used including, if applicable, verification of the locking system in accordance with IEC 60383-1 .		N/A
12.4	Verification of tightness of the interface between end fittings and insulator housing (E2) and of the specified mechanical load, SML (E1)		N/A
	a) One insulator, selected randomly from the sample E2, shall be subjected to crack indication by dye penetration, in accordance with ISO 3452, on the housing in the zone embracing the complete length of the interface between the housing and metal fitting and including an additional area, sufficiently extended, beyond the end of the metal part. The indication shall be performed in the following way: – the surface shall be properly pre-cleaned with the cleaner; – the penetrant, which shall act during 20 min, shall be applied on the cleaned surface; – within 5 min after the application of the penetrant, the insulator shall be subjected, at the ambient temperature, to a tensile load of 70 % of the SML, applied between the metal fittings; the tensile load shall be increased rapidly but smoothly from zero up to 70 % of the SML, and then maintained at this value for 1 min;		N/A

IEC 61109			
Clause	Requirement + Test	Result - Remark	Verdict
	- the surface shall be cleaned with the excess penetrant removed, and dried; - the developer shall be applied, if necessary; - the surface shall be inspected. Some housing materials may be penetrated by the penetrant. In such cases, evidence shall be provided to validate the interpretation of the results. After the 1 min test at 70 % of the SML, if any cracks occur, the housing and, if necessary, the metal fittings and the core shall be cut perpendicular to the crack in the middle of the widest of the indicated cracks, into two halves. The surface of the two halves shall then be investigated to measure the depth of the cracks.		
	b) The insulators of the sample E1 shall be subjected at ambient temperature to a tensile load, applied between the couplings. The tensile load shall be increased rapidly but smoothly from zero to approximately 75 % of the SML and then gradually increased to the SML in a time between 30 s to 90 s. If 1 00 % of the SML is reached in less than 90 s, the load (1 00 % of the SML) shall be maintained for the remainder of the 90 s (this test is considered to be equivalent to a 1 min withstand test at the SML). In order to obtain more information from the test, unless special reasons apply (for instance the maximum tensile load of the test machine), the load may be increased until the failing load is reached, and its value recorded.		N/A
	The insulators have passed this test if		N/A
	- no failure (breakage or complete pull-out of the core, or fracture of the metal fitting) occurs either during the 1 min 70 % withstand test (a)) or during the 1 min 1 00 % withstand test (b)),		N/A
	- no cracks are indicated after the dye penetration method described in 1 2.4 a),		N/A
	- the investigation of the halves described in 1 2.4 a) shows clearly that the cracks do not reach the core.		N/A
12.5	Galvanizing test (E2)		N/A
	This test shall be performed on all galvanized parts in accordance with IEC 60383-1 .		N/A
12.6	Re-testing procedure		N/A
	If only one insulator or end fitting fails to comply with the sampling tests, re-testing shall be performed using a new sample size equal to twice the quantity originally submitted to the tests.		N/A
	The re-testing shall comprise the test in which		N/A

IEC 61109			
Clause	Requirement + Test	Result - Remark	Verdict
	failure occurred.		
	If two or more insulators or metal parts fail to comply with any of the sampling tests, or if any failure occurs during the re-testing, the complete lot is considered as not complying with this standard and shall be withdrawn by the manufacturer.		N/A
	Provided the cause of the failure can be clearly identified, the manufacturer may sort the lot to eliminate all the insulators with this defect. The sorted lot may then be re-submitted for testing. The number then selected shall be three times the first quantity chosen for tests. If any insulator fails during this re-testing, the complete lot is considered as not complying with this standard and shall be withdrawn by the manufacturer.		N/A
13	**Routine tests**		N/A
13.1	Mechanical routine test		N/A
	Every insulator shall withstand, at ambient temperature, a tensile load at RTL corresponding to $0,5 \times \text{SML} \left(^{+10}_{0}\right)\%$ for at least 1 0 s.		N/A
13.2	Visual examination		N/A
	Each insulator shall be examined. The mounting of the end fittings on the insulating parts shall be in accordance with the drawings. The colour of the insulator shall be approximately as specified in the drawings. The markings shall be in conformance with the requirements of this standard (see Clause 4).		N/A
	The following defects are not permitted:		N/A
	a) superficial defects of an area greater than 25 mm 2 (the total defective area not to exceed 0,2 % of the total insulator surface) or of depth greater than 1 mm;		N/A
	b) cracks at the root of the shed, notably next to the metal fittings;		N/A
	c) separation or lack of bonding at the housing to metal fitting joint (if applicable);		N/A
	d) separation or bonding defects at the shed to sheath interface,		N/A
	e) moulding flashes protruding more than 1 mm above the housing surface.		N/A

Annex A	**Principles of the damage limit, load coordination and testing for composite suspension and tension insulators**	P
A.1	**Introductory remark**	P
A.2	**Load-time behaviour and the damage limit**	
A.3	**Service load coordination**	

IEC 61109			
Clause	Requirement + Test	Result - Remark	Verdict
A.4	**Verification tests**		

Annex B	**Example of two possible devices for sudden release of load**	P
B.1	**Device 1 (Figure B.1)**	P
B.2	**Device 2 (Figure B.2)**	

Annex C	**Guidance on non-standard mechanical stresses and dynamic mechanical loading of composite tension/suspension insulators**	P
C.1	**Introductory remark**	P
C.2	**Torsion loads**	P
C.3	**Compressive (buckling) loads**	P
C.4	**Bending loads**	P
C.5	**Dynamic mechanical loads**	P
C.6	**Limits**	P