

TEST REPORT

24kV/70kN

COMPOSITE SUSPENION INSULATOR

Manufacturer: ZHEJIANG HAIVO ELECTRICAL CO., LTD

Product model: FXB-24kV/70kN

Drawing: 1HZ.046.0507

Batch number: 2023120015

Production quantity: 2200 pcs

Address: Chongshi Industrial Zone, Panshi, Yueqing, Wenzhou, Zhejiang, China
325603

1. **CUSTOMER: Premier Energy Distribution – POLEV Business**

2. **PROJECT: IZOLATOR POLIMERIC CS-70-20-III_Y16, B16 (772704)**

3. **SAMPLE**

1) Name: 24kV/70kN Composite suspension Insulator

2) Color: Grey

3) Quantity used in Testing:

(Sample Size : E1 =8 Nos, E2 =4 Nos as per IEC61109 :2008)

4. **NORMATIVE DOCUMENTS**

IEC 61109:2008, SP.538.DE, 1st edition (customer specification)

5. **TEST PERFORMED**

Acceptance Factory Tests for 24kV/70kN Composite suspension Insulator

6. **TEST DATE: 28th May,2024**

7. **CONCLUSION**

All test results conform to the requirements of standard IEC 61109:2008 and the technical requirements of product drawings.



I. Routine Test

Mechanical Routine Test and Visual Examination

The following routine tests were carried out as shown in table 1.

Table 1: The results of Routine Test

Routine Tests Item	Standard Value or Standard	Verified Value
Verification of Identification Mark	1. Name of manufacturer or trademark	HAIVOL
	2. month and year of manufacturing	03/2024
	3. production batch number	2023120015
	4. products model	FXB-24kV/70kN
	5. Pollution category	III
	6. Standard	IEC61109
	7. Country of manufacturing	Made in China
Visual Examination	IEC 61109:2008	Passed
Conclusion	Meet the requirements	

II. Sample Tests Records

Type: FXB-24KV/70KN

Rod Diameter: $\Phi 16\text{mm}$

1.Verification of Dimension and Marking

The test was carried out according to clause 12.2 of IEC 61109, *Verification of dimensions (E1 + E2)*

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 of IEC 61109 shall be used.

Tolerances:

Unless otherwise agreed, a tolerance of

$\pm (0,04 \times d + 1,5) \text{ mm}$ when $d \leq 300 \text{ mm}$,

$\pm (0,025 \times d + 6) \text{ mm}$ when $d > 300 \text{ mm}$ with a maximum tolerance of $\pm 50 \text{ mm}$,

shall be allowed on all dimensions for which specific tolerances are not requested or given on the insulator drawing (d being the dimension in millimeters).

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.

Samples Nos. 1 to 5 were verified as the dimensions given in the relevant drawing approved by the client and the results are as shown in the table 2:

Table 2: The results of verification of dimension unit: mm

Sample No.	Section Length	Dry Arc Distance	Dia Of Housing	Creepage Distance	rod diameter over insulation	Metal fitting dimensions			Marking
						Top Fitting	Bottom Fitting		
E1-1	457.0	296	98.08	701	23.06	38.14	16.54	32.48	✓
E1-2	455.4	296	97.88	698	23.04	37.26	16.53	32.58	✓
E1-3	457.0	297	98.02	695	23.16	38.50	16.51	32.49	✓
E1-4	455.9	297	98.02	692	23.15	38.32	16.50	32.35	✓
E1-5	456.4	296	98.08	696	23.09	37.78	16.54	32.69	✓
E1-6	457.2	296	98.12	697	23.06	37.82	16.48	32.52	✓
E1-7	456.8	297	97.96	698	23.12	37.76	16.52	32.44	✓
E1-8	455.9	296	97.92	702	23.07	38.13	16.51	32.53	✓
E2-1	456.7	297	98.03	701	23.02	38.24	16.52	32.59	✓

E2-2	457.4	296	98.01	696	23.11	38.08	16.47	32.52	✓
E2-3	456.3	297	98.02	699	23.03	38.23	16.60	32.50	✓
E2-4	456.8	297	98.06	700	23.08	38.41	16.52	32.51	✓
Standard Value	458±15mm	295mm	98mm	660mm	23mm	20mm	17 ⁰ _{-1.2}	33mm	 FXB-24kV/70kN III IEC 61109 03/2024 2023120015 Fabricat in China
Conclusion	Meet the requirements								

2. Galvanizing Test

The test was carried out according to clause 12.5 of IEC 61109, *Galvanizing test (E2)*.

This test shall be performed on all galvanized parts in accordance with IEC 60383-1.

Samples Nos. 1 to 2 were subjected to the test according to IEC 60383-1 and the test results are as shown in the table 3:

Table 3: The results of galvanizing test

Unit: μm

Sample No.		Individual					Individual Average	All Average
		1	2	3	4	5		
E2-1	Top Fitting	141	106	119	132	149	129.4	125.6
	Bottom Fitting	92	136	97	149	135	121.8	
E2-2	Top Fitting	129	128	127	123	114	124.2	122.4
	Bottom Fitting	125	115	126	91	146	120.6	
E2-3	Top Fitting	99	109	100	106	102	103.2	111.3
	Bottom Fitting	103	130	106	109	149	119.4	
E2-4	Top Fitting	146	158	118	112	122	131.2	121.5
	Bottom Fitting	113	112	109	97	128	111.8	

Standard Value Conclusion	86	86	86	86	86	86	86
	Meet the requirements	Meet the requirements	Meet the requirements	Meet the requirements	Meet the requirements	Meet the requirements	Meet the requirements

3.Verification of the Specified Mechanical Load

The test was carried out according to clause 12.4 of IEC 61109. **Verification of tightness of the interface between end fittings and insulator housing (E2) and of the specified mechanical load, SML (E1)**

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 100 % of the SML is reached in less than 90 s, the load (100 % 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).

Samples No. 1 to 3 were subjected to the test according to clause 12.4 of IEC61109. A tensile load applied for the samples was increased rapidly but smoothly from zero to 75% of the SML, and then gradually increased to 100% SML value within 90s. No failure occurred; the mechanical load-time test passed successfully. After this test, the tensile load should be increased until the failing load was reached. The results are as shown in the table 4 as follows:

Table 4: The results of the specified mechanical load for 1min

Sample No	Specified mechanical Load, (kN)	Withstand Time, (min)	Failing Load, (kN)	Failing Type
E1-1	70	90S	71.4	/
E1-2	70	90S	72.1	/
E1-3	70	90S	72.1	/
E1-4	70	90S	70.8	/
E1-5	70	90S	72.3	/
E1-6	70	90S	72.1	/
E1-7	70	90S	71.6	

E1-8	70	90S	71.2	/
Standard Value	70			
Conclusion	Meet the requirements			

4.Verification of the Tightness of the Interface between end Fittings Insulator Housing

The test was carried out according to clause 12.4 of IEC61109:2008, **Verification of tightness of the interface between end fittings and insulator housing (E2)** 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;
- 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.

Sample No. 2 was 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. Evaluation of the test according to IEC61109 Amendment1. The test results are as shown in the table 5:

Table 5: The results of verification of tightness of the interface

Sample No.	Time of the penetrant acting, (min)	Tensile load, (kN)	Withstand time of the tensile load, (min)	Result
E2-1	5	49.7	15	no dye penetration
E2-2	5	51.0	15	no dye penetration
E2-3	5	49.5	15	no dye penetration
E2-4	5	49.6	15	no dye penetration
Conclusion	Meet the requirements			

III. Additional test

1. Dye penetration test

The test was carried out according to clause 9.4.1.1 Procedure of IEC 61109

Ten samples shall be cut from a production line insulator making the cut approximately 90° to the long axis of the insulator with a diamond-coated circular saw blade under running cold water. The length of the samples h shall be 10 mm ± 0,5 mm. The cut surfaces shall be smoothed by means of fine abrasive cloth (grain size 180). The cut ends shall be clean and parallel.

The specimens shall be placed (long axis of the insulator vertical) on a layer of steel or glass balls of same diameter (1 mm to 2 mm) in a vessel or tray. A solution of 1 % (by weight) of Astrazon BR 200¹ in methanol shall be poured into the vessel, its level being 2 mm or 3 mm higher than the level of the balls. The specimens shall be observed for 15 minutes.

Table 6: Porosity

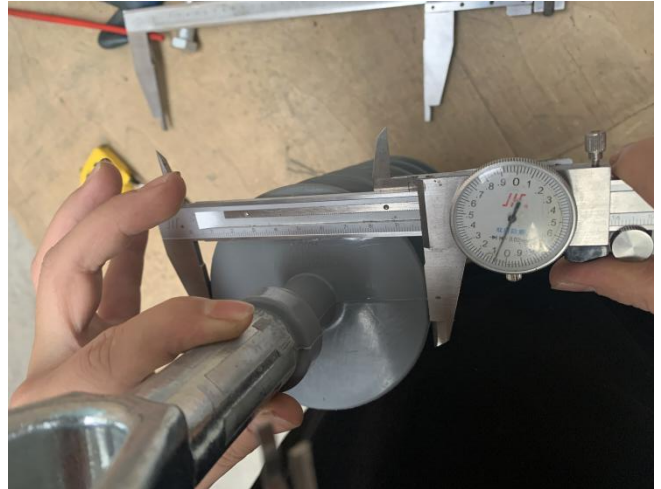
Sample No.	Time of the penetrant acting, (min)	Permeation or not	Result
1	15	not	no dye rose through the samples
2	15	not	no dye rose through the samples
3	15	not	no dye rose through the samples
Conclusion	Meet the requirements		

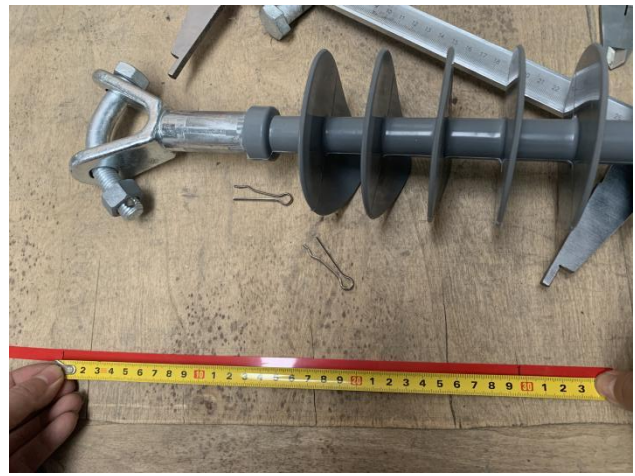
IV. Measuring devices used for the tests

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Annex A: The photos of the tests carried out

A1. Verification of Dimension and Marking





A2. Galvanizing Test







A3. Verification of the Specified Mechanical Load





A4. Verification of the Tightness of the Interface between end Fittings Insulator Housing





A5. Dye penetration test

