

EGU-HV Laboratory a. s. EGU HV LABORATORY, Podnikatelská 267, 190 11 Praha 9 - Běchovice





TESTING

UV Lab



EGU HV LABORATORY

Accredited testing laboratory No.: 1029 Accredited by Czech Accreditation Institute according to ČSN EN ISO/IEC 17025:2018

TEST REPORT No.: 11788/J/21

CUSTOMER:	226 017 Nantong, Jiangsu
CUSTOMER:	66 Haiwei Road 226 017 Nantong, Jiangsu China
	Jiangsu Shemar Electric Co., Lto

TYPE SPECIFICATION: SML 222 kN

TEST STANDARDS:

CSA C411.4-16, CSA C411.1-16, IEC 60383-1 Ed.4:1993, NEMA 107:2016

Michal Novotný **Test engineer**

Marek Brosch Head of EGU HV LABORATORY

Jan Lachman, Ph.D. **Director of**

EGU - HV Laboratory a. s.

Test report is confidential and must not be circulated or transferred to any third party without written approval of the customer. Test results relate only to the tests given in presented report and do not substitute any other documents. The report shall not be reproduced except in full without written approval of the testing laboratory. EGU HV Laboratory doesn't perform sampling as test objects and relevant data are supplied to EGU HV Laboratory by a customer. All tests were performed by EGU HV Laboratory at its registered office address if not specified else in this test report. The results apply to the sample as received. EGU HV Laboratory doesn't accept any kind of information provided by a customer that could affect validity of test results.

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TEST REPORT	No.: 11788/J/21	
TEST OBJECT:	230 kV Composite insulator	
TYPE SPECIFICATION:	SML 222 kN	
DRAWING No.:	21SM510758 Rev. B	
MANUFACTURER:	Jiangsu Shemar Electric Co., Ltd.	
DATE OF DELIVERY:	2021-12-09	
DATE OF TESTS:	From 2022-02-28 till 2022-03-24	
ORDER No.:	Contract 23/21	
TESTS WITNESSED BY:	N/A	



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1 TEST SUMMARY

Test title	Test standards	Test result
Corona test	CSA C411.4-16, clause 6.4.4	Passed
Critical impulse flashover test	CSA C411.4-16, clause 6.2 CSA C411.1-16, clause 6.5.1 to 6.5.3	Passed
Wet power frequency voltage flashover test	CSA C411.4-16, clause 6.3 CSA C411.1-16, clause 6.4	No criteria



2 TESTS PERFORMED

2.1 Corona test

2.1.1 Test procedure

Date of test: 2022-02-28

The test was carried out according to CSA C411.4-16, clause 6.4.4 and customer requirements. The test was performed on one composite insulator assembly, including grading rings, serial No. 2111161514.

After the test room was thoroughly darkened the voltage above corona point was applied and held for 5 minutes. The voltage was then reduced until corona disappeared from the test object to measure the corona extinction voltage. This procedure was three (3) times repeated. Field glasses were used for the observation of the corona. Measured extinction voltages are shown in Table 2.

The test arrangement was set up according to CSA C411.4-16, clause 6.4.2.2 (see Figure 2). The bundle of double conductors with spacing 457 mm was simulated using an aluminium tube of 14 m length and 30 mm diameter. Both ends of the tubes were terminated with corona shield-ing spheres (screening electrode) with a diameter of 300 mm. Bundle of conductors was at a height of 4,6 m above the ground.

The exact line configuration (conductor surface voltage gradient E₂) was not known in time of the test. The client specified test voltage (minimum corona extinction voltage) as 120% of maximum design phase-to ground service voltage i.e. $V_T = 1.2 \times 242/\sqrt{3} = 168 \text{ kV}.$

The test object at the specified test voltage is shown in Figure 4. The corona discharges are shown in Figure 5.

Radio interference voltage RIV was measured according to NEMA 107. RIV (expressed in decibels relative to 1 μ V across 150 Ω) was measured at the frequency of 1,0 MHz in compliance with the circuit diagram in Figure 3-3a of NEMA 107, Section 3.

The circuit RIV factor was 0,42.

Measured RIV values are shown in Table 1.

Testing and measuring equipment:

coupling capacitance, 1 000 pF, 800 kV, serial No. 11100108.10.1 measuring impedance Power Diagnostix, NEMA 150 Ω , type CIT4M/V8µ0/RIV, serial No. 12533 test transformer TuR Dresden 5,7/1 200 kV, 1 500 kVA inductive regulator ČKD Praha 6/0 - 3 kV, 50 kVA capacitive divider TuR Dresden 1 200 kV, 150 pF, type WMC 160/1200, serial No. 884470 universal voltmeter Haefely Trench, type DMI 551, serial No. 150505 RIV meter - measuring receiver Power Diagnostix, type RIV meter, serial No. 035 calibrator Power Diagnostix, type CAL3B, serial No. 3014 measuring system for atmospheric condition COMET, serial No. 10910247 digital stop-watch Kalenji, PM-259 field glasses Nikon Action EX 7x50, serial.No. 320695 measuring telescopic stick 5m, type BMI, serial No. 102



2.1.2 Test results

Table 1	Test results	of the RIV	test
---------	--------------	------------	------

U _m (kV)		242	
Atm. conditions p (kPa) t (°C) RH (%)	100,4 15,8 32,0		
Test voltage (kV)	RIV ↓ (μV)	RIV ↑ (μV)	RIV↓ (μV)
253	22 387	22 387	22 387
236	22 387	22 387	22 387
219	22 387	19 953	22 387
202	19 953	19 953	19 953
185	355	398	355
168	22	22	22
151	22	22	22
134	22	22	22
117	22	22	22
0	22	22	22



Um (kV)	242
Atm. conditions	
p (kPa)	100,4
t (°C)	15,8
RH (%)	32,0
Measurement No.	Ue (kV)
1	186
2	187
3	186
Average value	186
Location of corona	Corona ring
С	riteria: U _e > 168 kV

Table 2Test results of the corona test

Evaluation:

Measured corona extinction voltages U_e were greater than the specified minimum corona extinction voltage of 168 kV.

Statement of conformity:

230 kV Composite insulator, SML 222 kN, drawing No. 21SM510758 Rev. B, passed the test according to requirements given in CSA C411.4-16, clause 6.4.4.



2.2 Critical impulse flashover test

2.2.1 Test procedure

Date of test: 2022-03-01 and 2022-03-24

The test was carried out according to CSA C411.4-16, clause 6.2 and CSA C411.1, clause 6.5.1 to 6.5.3.

The tests were performed on three insulators:

No. 1, serial No. 2111161514, No. 2, serial No. 2111161511, No. 3, serial No. 2111161513.

The critical impulse voltages of both polarities were determined by the up and down method with 30 impulses according to CSA C411.1-16, clause 6.5.3.

All measured voltages were corrected to the standard reference atmospheric conditions according to CSA C411.1-16, clause 6.2.5 and 6.2.6.

The representative wave shape of the lightning impulse $1,2/50 \ \mu s$ is given Graph 1.

The test arrangement was set up in compliance with IEC 60383-1, clause 34 (see Figure 6).

Testing and measuring devices:

impulse generator TuR 3,0 MV, serial No. 1543 capacitive divider TuR Dresden, type KOIS-3-500, serial No. 32373 measuring system DiAS 733, serial No. 173990 tape measure 5 m, CXS, PM-241 measuring system for atmospheric condition COMET, serial No. 10910247



2.2.2 Test results

Test sample No.	1	_	2		3	
Impulse polarity	+	-	+	-	+	-
Atm. conditions:						
air pressure (kPa)	99,6	100,5	99,6	100,5	99,6	100,5
air temperature (°C)	16,1	15,3	16,1	15,3	16,1	15,3
relative humidity (%)	34,0	31,6	34,0	31,6	34,0	31,6
Correction factors:						
air density correction factor k ₁	0,996	1,008	0,996	1,008	0,996	1,008
humidity correction factor k ₂	0,943	0,947	0,942	0,948	0,942	0,948
atmospheric correction factor Kt	0,940	0,955	0,939	0,956	0,938	0,956
Critical impulse flashover voltage (kV)	1 099	1 145	1 092	1 149	1 088	1 150
Polarity	+ -					
Average critical impulse flashover value of the three insulators (kV)	1 093 1 148					
Measured arcing distance: 1 770 mm						
Drawing specified critical impulse flashover voltage: 1 135 kV						
CSA C41116, Table 2 specified critical impulse flashover voltage: 1 135 kV						

 Table 3
 Test results of the critical impulse flashover test

Evaluation:

The average critical impulse flashover value of the three insulators was equal to or exceed 95% of the rated critical impulse flashover value specified by CSA C411.4-16, Table 2 and drawing 1 135 kV, i.e. 1 078 kV.

Statement of conformity:

230 kV Composite insulator, SML 222 kN, drawing No. 21SM510758 Rev. B, passed the test according to requirements given in CSA C411.4-16, clause 6.2. and client requirements.



2.3 Wet power frequency voltage flashover test

2.3.1 Test procedure

Date of test: 2022-03-04

The test was carried out according to CSA C411.4-16, clause 6.3 and CSA C411.1-16, clause 6.4.

The tests were performed on three insulators:

No. 1, serial No. 2111161514, No. 2, serial No. 2111161511, No. 3, serial No. 2111161513.

Characteristics of the artificial rain and precipitation method was in accordance with the CSA C411.1-16, clause 6.4.3.

The wet power-frequency flashover voltage test was performed according to CSA C411.1-16, clause 6.4.4. The flashover voltage was obtained by increasing the voltage continuously from zero up to flashover. The average of five flashovers was calculated.

All measured voltages were corrected to the standard reference atmospheric conditions according to CSA C411.1-16, clause 6.2.5 and 6.2.6.

The test arrangement was set up in compliance with IEC 60383-1, clause 34 (see Figure 7).

Testing and measuring equipment:

synchronous generator BEZ Bratislava 6 kV, 1 300 kVA, 50 Hz test transformer TuR Dresden 5,7/1200 kV, 1500 kVA, serial No. 884469 capacitive divider TuR Dresden 1200 kV, 150 pF, type WMC 160/1200, serial No. 884470 universal voltmeter Haefely Trench, type DMI 551, serial No. 150505 measuring system for atmospheric conditions Comet, serial No. 10910247 tape measure 5 m, CXS, PM-241 digital stop-watch Kalenji PM-259 conductivity meter WTW Cond 3310, serial No. 10410891 plastic measuring cylinder 50ml, identification No. 1/153/14 & 2/153/14



2.3.2 Test results

Test sample No.	1	2	3
Atm. conditions:			
air pressure (kPa)	98,8	98,8	98,8
air temperature (°C)	15,6	15,6	15,6
relative humidity (%)	43,6	43,6	43,6
Rain parameters:			
vertical (mm/min)	1,4	1,4	1,4
horizontal (mm/min)	1,0	1,0	1,0
Conductivity (µS/cm)	100	100	100
Correction factors:			
air density correction factor k ₁	0,990	0,990	0,990
humidity correction factor k ₂	1,000	1,000	1,000
atmospheric correction factor K _t	0,990	0,990	0,990
Flashover voltage	631 kV	624 kV	623 kV
The average wet flashover voltage of the three insulators		626 kV	
Measu	ured arcing distance	: 1 770 mm	
Drawing specified w	et power frequency	flashover voltage: 610) kV

Table 4Test results of the wet power frequency flashover voltage test



3 LIST OF SYMBOLS

RIV	radio interference voltage (µV)
Vt	test voltage specified by client (kV)
Um	maximum design phase-to-phase service voltage
Ue	extinction corona voltage (kV), corresponding to actual atmosphere
р	air pressure (kPa)
t	air temperature (°C)
RH	relative humidity (%)
k 1	air density correction factor
k ₂	humidity correction factor
Kt	atmospheric correction factor
Upk	maximum voltage of recorded curve (kV)
T 1	front time of recorded curve (µs)
T ₂	time to half-value of recorded curve (μ s)
vertical c.	average value of rainfall intensity - vertical component (mm/min)
horizontal c.	average value of rainfall intensity – horizontal component (mm/min)
conductivity	water conductivity (µS/cm)



4 UNCERTAINTY OF MEASUREMENTS

QUANTITY	UNCERTAINTY (k=2)	
	U _{pk}	2,4 %
Lightning impulse voltage	T_1	6,5 %
	T ₂	4,2 %
Radio interference voltage	1,	0 dB
Power-frequency voltage	1	,7 %
Air pressure	0,5 %	
Temperature	4,0 %	
Relative humidity	6,3 %	
Time	0,7 %	
Telescopic stick	0,8 %	
Length (tape measure)	1,6 %	
Rainfall intensity	10 %	
Conductivity	5,0 %	

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k = 2, which for a Normal (Gaussian) distribution corresponds to a coverage probability of approximately 95 %. Details related to the statement of conformity when applied are given in a price quotation submitted to a customer before the testing and on the website of the laboratory.



5 PRODUCT DRAWING



Figure 1 230 kV Composite insulator, SML 222 kN, drawing No. 21SM510758 Rev. B



6 TEST SETUP PHOTOS



Figure 2 Test arrangement for RIV and corona tests



Figure 3 Test arrangement for RIV and corona tests

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Figure 4 Test object at the test voltage of 168 kV – no positive corona



Figure 5 Test object at the test voltage of 253 kV

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Figure 6 Test arrangement and flashover under the critical impulse flashover test



Figure 7 Test arrangement and flashover under the wet power frequency voltage flashover test



7 GRAPHS



Graph 1 Representative wave shape of the lightning impulse 1,2/50 μs

- end of test report -

Testpolymer EU 17025-F-05_15





Testing laboratory No. 1595 accredited by ČIA according to ČSN EN ISO/IEC 17025: 2018



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laboratory manager : Eva Kovářová tel.: + 420 582 383 680 kovarova@testpolymer.cz www.testpolymer.cz

Test report No. 59/2022/EN

Customor	EGU - HV Laboratory a.s., Podnikatelská 267, 190 11 Praha 9, Běchovice	
customer.	Company ID: 25634330, Tax ID: CZ25634330	
Customer's order:	6/11788/2022	
Application form:	2200223	
Tested material:	HTV silicone material	
Detailed description:	Manufacturer: Jiangsu Shemar Electric Co., Ltd.	
Form of material:	test specimens - sampled and delivered by customer	
Preparation of samples:	test specimens supplied by customer	
Date of receipt of the sample:	10.1.2022	

Tests	Test specifications		
Fine base of basting the viscouted and constitut flames to sta	UL 94: 2013 revision 05/2021		
Fire nazard testing - nonzontal and vertical name tests	ČSN EN 60695-11-10 ed.2: 2014		

These tests were performed in accordance with the standard ČSN EN 62217 ed.2: 2013, article 9.3.4.

Test No. 15Fire hazard testing - Horizontal and vertical flame tests - methodA - horizontal burning test

Photo of the position of the test specimen during the test:



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				00/		1
	Test re	port No	o. 59/20	022/EN		
Test standard:	ČSN EN 6069	95-11-10 ed	. 2: 2014			
Test equipment:	Chamber At	Chamber Atlas HVUL2				
Ignition course:	Burner with	an inner dia	ameter 9.5 m	m		
ignition source.	The gas used	d: Methane	2.5			
	Blue flame h	Blue flame height 20 mm, the exposure time 30s				
Test conditions:	No forced ve	entilation w	as used durir	ng the test		
	Temperatur	e:	22,0 - 23,0°	C	Humidity:	48,0 - 49,0%
Description of the sample (sample type, the color, the location in the product, the number of samples tested):	Test specim	Test specimens of grey color 125x13x3mm, 3 pieces				
Conditioning of samples:	48 hours at	23±2°C and	50±5% relati	ive humidity		
Conditioning of cotton indicator:	24 hours in	desiccator 2	23±2°C			
Deviations from the standard:	no					
Test progress:	After removing the ignition flame, the test specimens do not burn. The flame did not exceed the 25 mm mark. A support fixture was used during the test due to the bending of the test specimens.					
Test specimen No.1	burning stopped before 25 mm					
Test specimen No.2	burning stopped before 25 mm					
Test specimen No.3	burning stopped before 25 mm					
No. of test specimen	Damaged length L (mm)	Burning time t (s)	Linear burn rate (mm/min)	Linear burn va (mm	rate average Ilue /min)	Sample standard deviation (mm/min)
1	0	0	0			
2	0	0	0		0	0
3	0	0	0			
Statement of conformity to specification	 A to to tion Measured results (burning rate, damaged length) on tested three samples meet all requirements for classification HB according to article 8.4 ČSN EN 60695-11-10 ed.2 This statement of conformity to specifications is given in the sense of the shared risk decision rule; without including measurement uncertainty. 					
Tested and evaluated by:	Ing. Lukáš N	avrátil		Date:	13.1.2022	

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Test report No. 59/2022/EN				
Test No. 15	Fire hazard testing - horizontal and ver B - vertical burning test	rtical flame tests - method		
Photo of the position of the test spe	ecimen during the test:			
Test standard:	ČSN EN 60695-11-10 ed. 2: 2014			
Test equipment:	Chamber Atlas HVUL2			
	Burner with an inner diameter 9.5 mm			
Ignition source:	The gas used: Methane 2.5			
	Blue flame height 20 mm, the exposure time 2 x 10s			
Test conditions:	No forced ventilation was used during the test			
	Temperature: 22.0 - 23.0°C	Humidity: 48.0 - 49.0%		
Description of the sample (sample type, the color, the location in the product, the number of samples tested):	Test specimens of grey color 125x13x3mm, 10 pic	eces		
Conditioning of samples:	5 pieces - 48 hours in the climate chamber at 23±2 5 pieces -168 ±2 hours in the hot air oven at 70±2 hours at room temperature	2°C and 50±5% relative humidity; °C and cooled in desiccator min. 4		
Conditioning of cotton indicator:	24 hours in desiccator 23±2°C			
Deviations from the standard:	Not detected			
Test progress:	The test specimens do not burn after the first or a flame. The material does not drip or ignite absorb	fter the second application of the ent cotton.		

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		17025	5-F-05_15				
	Test re	eport No	o. 59/20)22/EN			
No. of test specimen:	Afterflame time after the first flame application t ₁ (s)	Afterflame time after the second flame application t ₂ (s)	Afterflame plus afterglow time after the second flame application t ₂ +t ₃ (s)	Afterflame up to the holding clamp: YES - NO	Flaming particles or drops: YES - NO	Cotton indicator ignited by flaming particles or drops: YES - NO	
	Specimens c	onditioned in clin	nate chamber				
1	0	0	0	NO	NO	NO	
2	0	0	0	NO	NO	NO	
3	0	0	0	NO	NO	NO	
4	0	0	0	NO	NO	NO	
5	0	0	0	NO	NO	NO	
· · · · · · · · · · · · · · · · · · ·	Specimen	s conditioned in h	not air oven				
1	0	0	0	NO	NO	NO	
2	0	0	0	NO	NO	NO	
3	0	0	0	NO	NO	NO	
4	0	0	0	NO	NO	NO	
5	0	0	0	NO	NO	NO	
Statement of conformity to specification	The measu indicators This statem	on the ten c) on the ten V-0 acco nent of confo decision ru	burning and samples tes ording to arti ormity to spe ile; without i	afterglow ti ted meet all icle 9.4 ČSN cifications is ncluding me	mes and the the requirer EN 60695-11 given in the asurement u	condition of ments for clas -10 ed. 2. sense of the uncertainty.	the cotton ssification shared risk
Tested and evaluated by:	Ing. Lukáš N	lavrátil		Date:	13.1.2022,	18.1.2022	

Declaration:

Test results relates only to the test subject and refer to the sample as received

Laboratory is not responsible for sampling and specimen preparations done by customer.

Without the written consent of the Head of Laboratory, the protocol cannot be reproduced other than the entire. All results are metrologically traceable.

Test report was created by:

Jana Trbušková Chief laboratory technician

Test report was approved by:

In Bohuslavice:

19.1.2022

Eva Kovářová Laboratory manager TKUS

č. 1595

End of test report



KEMA TEST REPORT

Object	Composite insulator unit with grading rin	gs
Туре	FXBW-230kV/222kN	Serial No
	230 kV - 20 kA - 50 Hz	
Client	Jiangsu Shemar Electric Co., Ltd., No. 66 Haiwei Road, Sutong Science and Jiangsu 226017, People's Republic of Chi	Technology Industrial Park, Nantong City, na
Manufacturer	Insulator units: Jiangsu Shemar Electric Co., Ltd., No. 99 Yishou Road (South), Rugao, Jiang People's Republic of China ^{*)}	ısu 226553,
	Protective fittings: Jiangsu Shemar Electric Co., Ltd., No. 99 Yishou Road (South), Rugao, Jiang People's Republic of China ^{*)}	su 226553,
Tested by	Zkušebnictví, a.s KEMA Labs Podnikatelská 547, Prague 9, the Czech R	Republic
Date of tests	7 March 2022	
Test specification	The tests have been carried out in accord chapter 3 'Tests carried out'.	dance with the client's instructions, see
	· 1927 ·	E .
	CY FUX	8-

This report applies only to the object tested. The responsibility for conformity of any object having the same type references as that tested rests with the manufacturer. *) as declared by the manufacturer

This report consists of 42 pages in total.

Zkušebnictví, a.s.

5052-22

Robert Jech Operational Manager

Prague, 25 March 2022



INFORMATION SHEET

1

4

KEMA Type Test Certificate

A KEMA Type Test Certificate contains a record of a series of (type) tests carried out in accordance with a recognized standard. The object tested has fulfilled the requirements of this standard and the relevant ratings assigned by the manufacturer are endorsed by KEMA Labs. In addition, the object's technical drawings have been verified and the condition of the object after the tests is assessed and recorded. The Certificate contains the essential drawings and a description of the object tested. A KEMA Type Test Certificate signifies that the object meets all the requirements of the named subclauses of the standard. It can be identified by gold-embossed lettering on the cover and a gold seal on its front sheet. The Certificate is applicable to the object tested only. KEMA Labs is responsible for the validity and the contents of the Certificate. The responsibility for conformity of any object having the same type references as the one tested rests with the manufacturer.

Detailed rules on types of certification are given in KEMA Labs' Certification procedure applicable to KEMA Labs.

2 KEMA Report of Performance

A KEMA Report of Performance is issued when an object has successfully completed and passed a subset (but not all) of test programmes in accordance with a recognized standard. In addition, the object's technical drawings have been verified and the condition of the object after the tests is assessed and recorded. The report is applicable to the object tested only. A KEMA Report of Performance signifies that the object meets the requirements of the named subclauses of the standard. It can be identified by silver-embossed lettering on the cover and a silver seal on its front sheet.

The sentence on the front sheet of a KEMA Report of Performance will state that the tests have been carried out in accordance with The object has complied with the relevant requirements.

3 KEMA Test Report

A KEMA Test Report is issued in all other cases. Reasons for issuing a KEMA Test Report could be:

- Tests were performed according to the client's instructions.
- Tests were performed only partially according to the standard.
- No technical drawings were submitted for verification and/or no assessment of the condition of the object after the tests was performed.
- The object failed one or more of the performed tests.

The KEMA Test Report can be identified by the grey-embossed lettering on the cover and grey seal on its front sheet.

In case the number of tests, the test procedure and the test parameters are based on a recognized standard and related to the ratings assigned by the manufacturer, the following sentence will appear on the front sheet. The tests have been carried out in accordance with the client's instructions. Test procedure and test parameters were based on If the object does not pass the tests such behaviour will be mentioned on the front sheet. Verification of the drawings (if submitted) and assessment of the condition after the tests is only done on client's request.

When the tests, test procedure and/or test parameters are not in accordance with a recognized standard, the front sheet will state the tests have been carried out in accordance with client's instructions.

Official and uncontrolled test documents

The official test documents of KEMA Labs are issued in bound form. Uncontrolled copies may be provided as a digital file for convenience of reproduction by the client. The copyright has to be respected at all times.



REVISION OVERVIEW

Rev. No	Date of issue	Reason for issue
0	25 March 2022	First issue



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5052-22

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1 IDENTIFICATION OF THE OBJECT TESTED

All data mentioned in this chapter are provided by a client.

1.1 Ratings/characteristics of the object tested

Voltage	230 kV
Short-circuit current of the system	20 kA
Frequency	50 Hz
Specified minimum mechanical (failing) load (SFL / SML) –	222 FN
insulator units	
Year of manufacture of insulator units	2021
Year of manufacture of fittings	2021
Type of insulator unit	FXBW-230kV/222kN
Number of insulator units in one branch	1
Length of the insulator unit	2200±30 mm

1.2 Description of the object tested

Composite insulator unit 222 kN with grading rings (protective fittings).

1.3 List of drawings

The manufacturer has guaranteed that the test object submitted for tests has been manufactured in accordance with the following drawings and/or documents. KEMA Labs has verified that these drawings and/or documents adequately represent the test object. The manufacturer is responsible for the correctness of these drawings and/or documents and the technical data presented.

The following drawings and/or documents have been included in this report:Drawing no./document no.Revision21SM51075803

On request of the manufacturer the following drawings and/or documents have been included in this report.

KEMA Labs has not verified these drawings and/or documents.	
Drawing no./document no.	Revision
Specification for Non-Ceramic Suspension and Dead End	3
Insulators (TLMS-028), Pages 1, 10 of 11	
The following drawings and/or documents are only listed for ref	oronco

The following drawings and/or documents are only listed for rele	sience.
KEMA Labs has not verified these drawings and/or documents.	
Drawing no./document no.	Revision
Specification for Non-Ceramic Suspension and Dead End	3
Insulators (TLMS-028)	



2 GENERAL INFORMATION

2.1 The tests were witnessed by

The tests were carried out without a representative of the client present at the KEMA Labs premises. These tests were witnessed by means of remote witnessing. According to the client, the following persons witnessed the tests:

Name	Company
Usama Ahmed	Shemar Power,
	Toronto, Canada
Gavin	Jiangsu Shemar Electric Co., Ltd.,
	Rugao, People's Republic of China

2.2 The tests were carried out under responsibility of

Name	Company
Jan Štangler	Zkušebnictví, a.s KEMA Labs
	Prague, the Czech Republic

2.3 Subcontracting

The following tests were subcontracted to EGU – HV Laboratory a.s., Prague, the Czech Republic:

• mechanical failing load test.

2.4 Accuracy of measurement

The decision rule in conformity assessment is based on the 'simple acceptance method' according to ILAC-G8:09/2019.

The guaranteed uncertainty in the figures mentioned, taking into account the total measuring system, is less than 5%, unless mentioned otherwise.

The reported expanded uncertainties of measurements are stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a probability of approximately 95 %. Determination is based on ENV 13005(GUM).

2.5 Notes

The results apply to the sample as received.

The tests were recorded on a high-speed video.



3 TESTS CARRIED OUT

The tests have been carried out in accordance with the client's instructions as specified below.

Tests carried out	Client's instructions	Remarks (if any)
Power arc test 20 kA / 0,25 s + 0,25 s + 0,25 s + 0,25 s + 0,25 s, test circuit D	IEC 61467:2008, subclause 8 and 10 and Specification for Non-Ceramic Suspension and Dead End Insulators (TLMS-028) Revision 3, issued May 16, 2013, chapter V.A. Grading Ring Testing	Test object is not "short string" as defined in IEC 61467:2008; Protection fittings included; Different current level, duration and number of tests on one insulator unit from IEC 61467:2008



4 LEGEND

Phase indications

If more than one phase is recorded on oscillogram, the phases are indicated by the digits 1, 2 and 3. These phases 1, 2 and 3 correspond to the phase values in the columns of the accompanying table, respectively from left to right.

Explanation of the letter symbols and abbreviations on the oscillograms

- pu Per unit (the reference length of one unit is represented by the black bar on the oscillogram)
- ITO Current through test object
- UTO Voltage across test object



5 SUMMARY OF TESTS

Checking of the test current							
Test no.		220307 1004	-	-	-	-	-
Time interval between tests	min	-	-	-	-	-	-
Phase	-	R <i>,</i> T	-	-	-	-	-
Applied voltage, phase-to-ground	kV _{RMS}	20,0	-	-	-	-	-
Current	kA _{peak}	31,5	-	-	-	-	-
Current, a.c. component, beginning	kA _{RMS}	20,3	-	-	-	-	-
Current, a.c. component, middle	kA _{RMS}	20,6	-	-	-	-	-
Current, a.c. component, end	kA _{RMS}	20,7	-	-	-	-	-
Current, a.c. component, average	kA _{RMS}	20,5	-	-	-	-	-
Duration	S	0,253	-	-	-	-	-
Ratio of Ixt	-	-	-	-	-	-	-

Observations	
220307-1004	-
-	-
-	-
-	-
-	-
-	-



Power arc test							
Test no.		220307 1005	220307 1006	220307 1007	220307 1008	220307 1009	-
Time interval between tests	min	-	26:18	21:21	22:15	20:54	-
Phase	-	R, T	R, T	R, T	R, T	R <i>,</i> T	-
Applied voltage, phase-to-ground	kV _{RMS}	20,5	20,5	20,5	20,5	20,5	-
Current	kA _{peak}	30,5	31,4	32,3	-29,9	-30,4	-
Current, a.c. component, beginning	kA _{RMS}	20,2	19,8	20,2	20,1	20,1	-
Current, a.c. component, middle	kA _{RMS}	20,3	20,1	20,3	20,4	20,4	-
Current, a.c. component, end	kA _{RMS}	20,6	20,3	20,5	20,6	20,6	-
Current, a.c. component, average	kA _{RMS}	20,3	20,1	20,3	20,3	20,3	-
Duration	s	0,255	0,255	0,255	0,254	0,254	-
Ratio of Ixt	-	1,04	1,03	1,04	1,03	1,03	-

Observations	
220307-1005	No fault.
220307-1006	No fault.
220307-1007	No fault.
220307-1008	No fault.
220307-1009	No fault.
-	-



Mechanical failing load test							
Sample		25	-	-	-	-	-
70% of SFL/SML	kN	155,4	-	-	-	-	-
Maximum tensile load (uncertainty U=1,0%)	kN	322,3	-	-	-	-	-
Failing load (uncertainty U=1,0%)	kN	322,3	-	-	-	-	-
Time of holding (uncertainty U=0,7%)	s	60	-	-	-	-	-

Observation	
25	Insulator unit 2S – no breakage up to 60 s.
-	-
-	-
-	-
-	-
-	-



6 CHECKING OF THE TEST CURRENT

Standard and date

Standard	Client's instructions
Test date	7 March 2022

Serial No.

-

-

6.1 Condition before test



6.2 Test circuit S01



PT = Power Transformer

Supply		
Power	MVA	400,00
Frequency	Hz	50
Phase(s)		1
Voltage	kV	20
Current	kA	20
Impedance	Ω	1,000
Power factor		< 0,1
Neutral		not earthed

	Load	
	Short-circuit point	earthed
-		



6.3 Test results and oscillograms

Overview of test numbers

220307-1004

Remarks

Test number	Specified arc current	Specified arc time
220307-1004	20 kA	0,25 s



Checking of the test current

Test number:

Phase

Current

Duration

Ratio of Ixt

Observations:

-

Time interval between tests





Rev. 0



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7 POWER ARC TEST

Standard and date

Standard	Client's instructions
Test date	7 March 2022

Serial No.

-

7.1 Condition before test

Insulator unit new. Test circuit D of IEC 61467, specified arc current In = Isys. Unbalanced supply circuit. Unbalanced return circuit. Return circuit earthed.

A load of more than 5 kN was applied to the test object.

Arc initiation by means of two twisted together fusible copper wires with a total cross-section of 1 mm².

For test arrangement see page 18.



7.2 **Test circuit S02**



- MB = Master Breaker
- L = Reactor = Resistor

R

- R1 = Protective Resistors
 - GP = Protective Spark Gap

I.

= Current Measurement

MS = Make Switch PT = Power Transformer

Supply			Load
Power	MVA	410,00	Short-ci
Frequency	Hz	50	
Phase(s)		1	
Voltage	kV	20,5	
Current	kA	20	
Impedance	Ω	1,025	
Power factor		< 0,1	
Neutral		not earthed	

	Load	
	Short-circuit point	earthed
-		



7.3 Test arrangement





7.4 Photographs before test









7.5 Test results and oscillograms

Overview of test numbers

220307-1005 220307-1006 220307-1007 220307-1008 220307-1009

Remarks

Test number	Specified arc current	Specified arc time
220307-1005	20 kA	0,25 s
220307-1006	20 kA	0,25 s
220307-1007	20 kA	0,25 s
220307-1008	20 kA	0,25 s
220307-1009	20 kA	0,25 s



-22-







Test number:

Phase

Current

Duration

Ratio of Ixt

Observations:







Phase

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5052-22





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-25-







-26-







7.6 Condition/inspection after test

Visual examination:

Insulating components:

No housing damage, no exposure of the fiberglass core. Discoloration and burning of the surface.

Metallic insulator components: Partial melting and arc puddling; galvanized coating damaged; burning on the surface.

Corona rings and other protective metallic parts: Partial metallic evaporation of the grading rings (see pages 30 – 33).



7.7 Photographs after test

























8 MECHANICAL FAILING LOAD TEST

Standard and date

Standard	Client's instructions
Test date	7 March 2022

Serial No.

-

8.1 Condition before test

Insulator unit in same condition.

Insulator unit (2S) under test.

Mechanical load rapidly but smoothly increased to 70% of SFL/SML, held for 60 s (end of mechanical failing load test) and then raised up to the breaking.



8.2 Photographs before tests





8.3 Test results and oscillograms

Mechanical failing load test



Sample 2S		
70% of SFL/SML	kN	155,4
Maximum tensile load (uncertainty U=1,0%)	kN	322,3
Failing load (uncertainty U=1,0%)	kN	322,3
Time of holding (uncertainty U=0,7%)	s	60

Observation: Insulator unit 2S – no breakage up to 60 s.



8.4 Condition/inspection after tests

Insulator unit (2S) reached the end of mechanical failing load test.

Criteria (IEC 61467:2008, Table 4):

Insulator separation during the test	Not permitted	Fulfilled
Burning, breaking of sheds or ribs, glaze removal, melting of galvanized surfaces	Permitted	Fulfilled
Exposure of the fiberglass core (composite insulators only)	Not permitted	Fulfilled
Dry power frequency flashover to check for puncture (class B only)	All units shall be tested and external flashover shall occur.	Not Applicable
Mechanical failing load test	The failing load on all selected units shall be at least 70 % of SFL or SML.	Fulfilled
Tests on fittings and conductors	By agreement	Not Applicable

Criteria (TLMS-028) included in chapter 7.6 and table above.



8.5 Photographs after tests









9 DRAWINGS





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File: Http://Transmissionsp/TLPE/TLPE_Standards/Standardsdocsinprogress/TLMS-028 Rev.3 - Specification For Non-Ceramic Suspension And Dead End Insulators.Doc

Specification for Non-Ceramic Suspension and Dead End Insulators

Document #: TLMS-028 Revision 3

Effective Date: May 16, 2013 Supersedes TLES-028 Revision 2

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Specific	ation for Non-Ceramic Su	spension and Dead End Ins	ulators	
AEP AMERICAN"	Responsible Engineer:	Copyright 2013	Pay 3	TLMS-028
POWER	Eric Engdahl	American Electric Power	1100.5	Page 1 of 11

V. Testing Requirements

KEMA Labs

A. Grading Ring Testing

- 1. The Vendor shall provide test results that any supplied grading rings are able to withstand 5 separate electric arcs of 20 kA applied for a period of 0.25 seconds.
- 2. The polymer housing is not to be damaged by power arcs to the grading rings.
- 3. The grading rings shall maintain their shape after the five (5) test electric arcs and any metal loss shall not significantly impact the E-stress grading function of the grading rings.
- 4. Any loss of grading ring metal during these tests will be recorded.
- 5. Loss of galvanization, if present, shall be recorded but loss of galvanization during this test is not considered failure.
- 6. Grading rings are required on all NCI's designed for 138kV and higher voltage lines.

B.Routine Testing

The routine tests specified in ANSI C29.12 shall be performed. The Vendor shall provide the results of any or all these tests upon request.

C. Sample Testing

The sample tests specified in ANSI C29.12 shall be performed. The Vendor shall provide the results of any or all these tests upon request.

VI. Drawing Requirements

The Vendor shall provide the design drawing for each insulator requested for proposal. The drawing shall be provided in three-dimensional electronic format (AutoCAD or MicroStation). The drawing shall, at a minimum, include the information listed below. The stated electrical values shall account for the presence of grading rings or other electric field suppression devices shown on the drawings.

- Low-frequency dry flashover value as determined by the Design Tests in ANSI C29.12.
- Low-frequency wet flashover value as determined by the Design Tests in ANSI C29.12.
- Positive and negative critical impulse flashover values as determined by the Design Tests in ANSI C29.12.
- Section length.
- Dry arc distance.
- Leakage distance.
- Specified Mechanical Load and Routine Test Load
- · Shed spacing, diameters, and shapes.
- Sheath minimum and maximum thickness
- Radio-influence voltage as determined according to the Design Tests in ANSI C29.12.

AEP AMERICAN [®] ELECTRIC POWER	Specification for Non-Ceramic Suspension and	Doy 2	TLMS-028
	Dead End Insulators	Nev. 5	Page 10 of 11



SYNPO, akciová společnostS. K. Neumanna 1316532 07 Pardubice - Zelené PředměstíThe Czech Republic

Department of Evaluation and Testing Testing Laboratory No. 1105.2 accredited by CAI according to ČSN EN ISO/IEC 17025:2018

TEST REPORT T 375/006

Name and contact information of the customer	EGU – HV Laboratory a.s. Podnikatelská 267, 190 11 Praha 9 – Běchovice The Czech Republic
Test item(s)	Manufacturer: Jiangsu Shemar Electric Co., Ltd. Address : No. 66, Haiwei Road, Sutong Science and Technology Industrial Park, Nantong City, Jiangsu 226017, China Type : HTV
Test procedure/method	Test No. 35: Standard Practice for Xenon-Arc Exposure of Plastics Intended for Outdoor Applications ASTM D2565-16 (The test was included in the flexible scope of accreditation)Test No. 1 : Determination of the degree of degradation of coatings APP 1 (ČSN EN ISO 4628 - 1, 4, 5)Test No. 33 : Surface roughness measurement (Ra, Rz, Ry, Rq) (ČSN EN ISO 4287, ČSN EN ISO 4288)
Date of receipt of item(s)	January 7, 2022
Internal laboratory number	22 0066
Date of the test	January 7, 2022– February 18, 2022
Tested by	Gabriela Štěpánková
The report made by	Gabriela Štěpánková, Ondřej Janča

This report contains 6 pages and 1 annex.



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Digitálně podepsal Ing. Vladimír Špaček, CSc.

Dr. Vladimír Špaček Head of testing laboratory

In Pardubice on March 29, 2022

The test results relate only to the test item(s) as received.

This test report by itself in no way constitutes or implies product approval by any other body. The test report shall not be reproduced except in full, without written approval of the laboratory.

TEST REPORT T 375/006

Page/Total pages: 2/6 Annexes: 1

DESCRRIPTION OF THE TEST ITEM



Test item:	Manufacturer: Jiangsu Shemar Electric Co., Ltd. Address : No. 66, Haiwei Road, Sutong Science and Technology Industrial Park, Nantong City, Jiangsu 226017, China Type : HTV
Data delivered by the customer ¹ :	-
Internal lab number:	22 0066

¹The laboratory is not responsible for the data delivered by customer.

FURTHER SPECIFICATION OF THE TEST PERFORMANCE

The samples of testing were received from the contractor (3 pieces) and submitted to the test without any treatment of surface protection or heat storage.

Test No. 35: Standard Practice for Xenon-Arc Exposure of Plastics Intended for Outdoor Applications ASTM D2565-16

(The test was included in the flexible scope of accreditation)

Test was performed according to ASTM D2565-16

Testing device: Q-SUN Xe-3HS (Q-Lab Corporation, GB). Cycle number 1^H.

Exposure cycling: regular switching of drying period for 102 minutes at (63 ± 2) °C light followed by 18 minutes of light and front spray.

Light source: Xenon lamps with irradiance energy of $0.35 \text{ W/m}^2/\text{nm}$ at 340 nm. Used UBP placed horizontally at the site of sample exposure was fasten by anticorrosion screw.

The test samples were putted in testing area and the position of samples during the test was not changed – for measurements only.

Test No. 33: Surface roughness measurement

Test was performed according to ČSN EN ISO 4288 - Geometrical product specifications (GPS) - Surface texture: Profile method – Rules and procedures for the assessment of surface texture. Parameters of surface texture were measured according to \check{CSN} EN ISO 4287-Geometrical product specifications (GPS) - Surface texture: Profile method - Terms, definitions and surface texture parameters.

Testing device: SURFTEST SJ-201 (Mitutoyo, Ltd., Japan). Ra - arithmetical mean deviation of the assessed profile (roughness) Rz - maximum height of profile (roughness).

Measurements were performed six times on each sample.

Measurement conditions: basic roughness length 0,8 mm

TEST REPORT T 375/006 Page/Total pages: 3/6 Annexes: 1



DESCRRIPTION OF THE TEST ITEM

Test item:	Manufacturer: Jiangsu Shemar Electric Co., Ltd.		
	Address : No. 66, Haiwei Road, Sutong Science and		
	Technology Industrial Park, Nantong City, Jiangsu 226017,		
	Type : HTV		
Data delivered by the customer ¹ :	-		
Internal lab number:	22 0066		

¹The laboratory is not responsible for the data delivered by customer.

APP 1 - Determination of the degree of degradation of coatings

The evaluation of surface failure (defects) was performed according standard ČSN EN ISO 4628 Paints and varnishes – Evaluation of degradation of coatings – Designation of quantity and size of defects, and of intensity of uniform changes in appearance; Part 1: General introduction and designation system; Part 4: Assessment of degree of cracking; Part 5: Assessment of degree of flaking

Lighting used in the evaluation of defect on the surface finish: the fluorescent tube, standard observation: the observation angle 0° / light incidence of angle 45° .

TEST REPORT T 375/006 Page/Total pages: 4/6 Annexes: 1



VISUAL EVALUATION OF SURFACE DEFFECTS ACCORDING TO ČSN EN ISO 4628 DURING THE EXPOSURE AFTER XENON TEST ACCORDING TO ASTM D2565-16 (January 7, 2022 – February 18, 2022)

(The test was included in the flexible scope of accreditation)

(The test was meride	iea in the flent	ete seope of acet cattait	011)		
Sample	Internal	Surface failure	Cracking	Flaking	
		ČSN EN	ČSN EN	ČSN EN	
name	Lau Numbor	ISO 4628-1	ISO 4628-4	ISO 4628-5	
	Number	degree + verbal	degree	degree	
250 hours					
	22 0066/1	0, no visual changes	0 (80)	0 (80)	
HTV	22 0066/2	0, no visual changes	0 (80)	0 (80)	
	22 0066/3	0, no visual changes	0 (S0)	0 (S0)	
500 hours					
нту	22 0066/1	0, no visual changes	0 (S0)	0 (S0)	
	22 0066/2	0, no visual changes	0 (80)	0 (S0)	
	22 0066/3	0, no visual changes	0 (S0)	0 (S0)	
750 hours					
	22 0066/1	0, no visual changes	0 (80)	0 (S0)	
HTV	22 0066/2	0, no visual changes	0 (80)	0 (80)	
	22 0066/3	0, no visual changes	0 (80)	0 (S0)	
1000 hours					
	22 0066/1	0, no visual changes	0 (80)	0 (80)	
HTV	22 0066/2	0, no visual changes	0 (80)	0 (S0)	
	22 0066/3	0, no visual changes	0 (80)	0 (80)	

TEST REPORT T 375/006 Page/Total pages: 5/6

Annexes: 1



MEASUREMENT OF SURFACE ROUGHNESS ACCORDING TO ČSN EN ISO 4287, 4288 (January 7, 2022 – February 18, 2022)

_	(January 7, 2022 - rcoruary)	10, 2022)						
Sample name	Internal	Arithmetical mean deviation of the assessed roughness <u>Ra</u> Measuring range [μm]			Maximum height of profile (roughness) <u>Rz</u>			
	Lab Number				Measuring range [µm]			
		Mean	Max.	Min.	Mean	Max.	Min.	
	Before exposure							
Г		22.00((1	0.67	0.00	0.64		4.00	4.50

	22 0066/1	0,67	0,69	0,64	4,74	4,92	4,53
HTV	22 0066/2	0,66	0,73	0,60	4,99	5,25	4,82
	22 0066/3	0,71	0,75	0,67	5,28	5,64	4,87

250 hours

HTV	22 0066/1	0,67	0,70	0,63	4,84	5,11	4,56
	22 0066/2	0,69	0,75	0,65	5,06	5,47	4,52
	22 0066/3	0,72	0,76	0,65	5,24	5,78	4,25

500 hours

HTV	22 0066/1	0,64	0,67	0,60	5,01	5,36	4,60
	22 0066/2	0,72	0,77	0,60	5,33	6,11	4,70
	22 0066/3	0,76	0,80	0,70	5,65	6,27	4,90

750 hours

нту	22 0066/1	0,67	0,70	0,64	5,18	5,56	4,88
	22 0066/2	0,77	0,80	0,74	5,64	5,96	5,32
	22 0066/3	0,78	0,80	0,75	5,76	6,22	5,29

1000 hours

HTV	22 0066/1	0,74	0,78	0,68	5,81	6,09	5,22
	22 0066/2	0,79	0,81	0,77	5,95	6,22	5,69
	22 0066/3	0,79	0,83	0,76	6,14	6,55	5,78

TEST REPORT T 375/006 Page/Total pages: 6/6 Annexes: 1





Test item:	Manufacturer: Jiangsu Shemar Electric Co., Ltd.
	Address : No. 66, Haiwei Road, Sutong Science and
	Technology Industrial Park, Nantong City, Jiangsu 226017,
	China
	Type : HTV
Data delivered by the customer ¹ :	-
Internal lab number:	22 0066

¹The laboratory is not responsible for the data delivered by customer.

Statement of conformity

The laboratory uses a binary decision rule according to ILAC-G08: 09/2019, article 4.2.1

Test items	Prescribed	Parameter no surface defects such as cracks, crumbling or blisters	Fulfillment of parameters	
	test	result according to CSA C411.416 article 5.4.3		
НТУ	ASTM D2565-16	no cracks, crumbling or blisters	Yes	

-End-

TEST REPORT T 375/006 Annexes: 1/1



DESCRRIPTION OF THE TEST ITEM

Test item:	Manufacturer: Jiangsu Shemar Electric Co., Ltd. Address : No. 66, Haiwei Road, Sutong Science and Technology Industrial Park, Nantong City, Jiangsu 226017, China Type : HTV
Data delivered by the customer ¹ :	-
Internal lab number:	22 0066

¹The laboratory is not responsible for the data delivered by customer.

THE PHOTOS OF TEST SAMPLES AFTER 1000 HOURS OF EXPOSURE UNDER XENON LAMPS ACCORDING TO ASTM D2565-16

(The test was included in the flexible scope of accreditation)



Pic 1 : Exposure after 1000hrs (top face) Pic 2 : Exposure after 1000hrs (lower face)