



Testing laboratory No. 1029

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to ČSN EN ISO/IEC 17025:2018

TEST REPORT 12591/D/24

CUSTOMER	Jiangsu Shemar Electric Co., Ltd. No.66, Haiwei Road, Sutong science and Technology Industrial Park, 226 017 Nantong City, Jiangsu Province China	A circular blue stamp with the text 'ACCREDITED TESTING LABORATORY' around the top edge, 'EGU HV Laboratory' in the center, and 'No. 1029 CZECH REPUBLIC' around the bottom edge.
TEST OBJECT	Station post insulator	
TYPE SPECIFICATION	TR-288	
TEST STANDARDS	ANSI C29.19-2020, ANSI C29.11-2020	
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INDEPENDENT TESTING

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TEST REPORT 12591/D/24

TEST OBJECT	Station post insulator
TYPE SPECIFICATION	TR-288
DRAWING No.	24SM280706-TR288
MANUFACTURER	Jiangsu Shemar Electric Co., Ltd. No.66, Haiwei Road, Sutong science and Technology Industrial Park, 226 017 Nantong City, Jiangsu Province China
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1 TEST OBJECT IDENTIFICATION

The results presented in this test report apply only to test objects subjected to the testing. Responsibility for conformity of any objects having the same designation as the test object fully rests with the Manufacturer.

EGU HV LABORATORY is not responsible for the sampling. Samples are provided by a customer. Test results apply only to tested samples as received.

A customer guarantees a test object being made according to submitted product drawings and documents, see Table 1.

EGU HV LABORATORY confirms product drawings submitted by a customer fully represent in technical aspects (shape, dimensions etc.) a given test object and markings/nameplates on a test object conform with drawings.

Table 1 Drawings/documents submitted, and included in this test report

Document No.	Title	See
24SM280706-TR288	Station post insulator type TR-288	Figure 1
24SM281108	Station post insulator type TR-288 (sample for tracking and erosion test)	Figure 2

2 TEST SUMMARY

Test title	Test standard	Result
Tests of interface and connection of fittings	ANSI C29.19, clause 7.1 ANSI C29.11, clause 7.1	Passed
Visual inspection and dimensional check	ANSI C29.11, clause 7.1.1.2	Passed
Thermal mechanical test	ANSI C29.11, clause 7.1.4.2	Passed
Water penetration test	ANSI C29.11, clause 7.1.5	Passed
Linearly rising front chopped impulse voltage test	ANSI C29.11, clause 7.1.6.2	Passed
Low-frequency dry flashover test	ANSI C29.11, clause 7.1.6.3	Passed
Assembled core load test: Cantilever breaking load test	ANSI C29.19, clause 7.2.1 ANSI C29.11, clause 8.3.1.3.2	Passed
Assembled core load test: Core Time-Load Test	ANSI C29.19, clause 7.2.2 ANSI C29.11, clause 7.2.2	Passed
Assembled core load test: Tensile load test	ANSI C29.19, clause 7.2.3 ANSI C29.11, clause 9.4.3	Passed
Assembled core load test: Torsion load test ¹⁾	ANSI C29.19, clause 7.2.3 ANSI C29.11, clause 9.4.3	Passed
Assembled core load test: Compression load test ¹⁾	ANSI C29.19, clause 7.2.3 ANSI C29.11, clause 9.4.3	Passed
Housing tracking and erosion test	ANSI C29.19, clause 7.3 ANSI C29.11, clause 7.3	Passed
Aging or weathering test ¹⁾	ANSI C29.19, clause 7.4	Passed
Core material test: Dye Penetration Test (qualified from transmission line post insulator 115 kV / 250-41 see test report 12223/B/23)	ANSI C29.19, clause 7.5.1 ANSI C29.11, clause 7.4.1	Passed
Core material test: Water Diffusion Test (qualified from transmission line post insulator 115 kV / 250-41 see test report 12223/B/23)	ANSI C29.19, clause 7.5.2 ANSI C29.11, clause 7.4.2	Passed
Flammability test ¹⁾	ANSI C29.19, clause 7.6 ANSI C29.11, clause 7.5	Passed

Explanatory notes for tests and standards:

¹⁾ The test was done in an external accredited laboratory

3 LIST OF SYMBOLS

Symbol	Description
T_0	Temperature of the shank before the dry power frequency withstand test (°C)
T_{30}	Temperature of the shank after the dry power frequency withstand test (°C)
U_{pk}	Maximum voltage of impulse wave (kV)
T_1	Front time of impulse wave (μs)
SR	Steep rate of impulse wave (MV/ μs)
k_d	Air density correction factor
k_h	Humidity correction factor

4 TESTS PERFORMED

4.1 TESTS ON INTERFACES AND CONNECTIONS OF END FITTINGS

Tests were carried out according to ANSI C29.19, clause 7.1 and ANSI C29.11 clause 7.1.

The tests were performed on three insulator samples and on reference insulator sample.

4.1.1 Test specimens

Tests were carried out according to ANSI C29.19, clause 7.1.1.

The insulators were examined visually, and their dimensions were checked against the manufacturer's drawing (see Figure 1).

Testing and measuring equipment:

- slide gauge 300 mm, Kinex CZ, serial No. 2441/05
- tape measure 5 m, Assist, PM-291

Table 2 Test specimens

Sample No.	Type	Visual/dimensional check
1, 2, 3 – test samples Ref – reference sample	TR-288	Passed

Evaluation:

Insulators were without damage and dimensions conform with the drawing.

Testing and measuring equipment:

- thermal-mechanical chamber Horkan Klima, inventory No. 2237
- loading measuring system Format 1, type EGU – 1H, Z201128287
- digital thermometer – datalogger, Comet, serial No. 18931701
- conductivity meter, WTW, type Cond 3110, serial No. 12240282
- heating water vessel AKV2, No. 2420

4.1.2 Thermal-mechanical test

Tests were carried out according to ANSI C29.11, clause 7.1.4.2.2.

Three insulators No. 1, 2 and 3 were subjected to a mechanical load in two opposite directions and to two 24-hours thermal cycles. The load applied to the insulators corresponded to the 50% of SCL. Each 24-hour cycle started with one heating period of $+50\text{ °C} \pm 5\text{ °C}$, followed by one cooling period of $-35\text{ °C} \pm 5\text{ °C}$.

Records of measured temperatures and mechanical load during the thermal-mechanical testing are given in Figure 4 and Figure 5.

Evaluation:

The test samples passed thermal mechanical test.

4.1.3 Water penetration test

Test was carried out according to ANSI C29.11, clause 7.1.5.

Three tested insulators were immersed for 42 hours boiling in water with conductivity 1 650 $\mu\text{S}/\text{cm}$ at 20 °C to 25 °C. At the end of boiling, the insulators remained immersed until the water cooled to approx. 50 °C and maintained at this temperature until the verification tests started.

Table 3 Results of pre-stressing tests

Date	Test	Bending load (kN)	Duration (h)	Result
2024-09-26 to 2024-10-11	Thermal-mechanical pre-stress	6,5	48	Passed
2024-10-15 to 2024-10-17	Water penetration test	n/a	42	Passed
SCL: 13 kN				

Evaluation:

The test samples passed pre-stressing tests.

4.1.4 Verification Tests

Test were carried out according to ANSI C29.11, clause 7.1.6.

4.1.4.1 Visual Test

Insulators were inspected visually according to ANSI C29.11, clause 7.1.6.1.

Table 4 Results of visual examination

Date	Sample No.	Result
2024-10-18	1, 2, 3	Passed

Evaluation:

No cracks were observed on test samples.

4.1.4.2 Linearly Rising Front Chopped Impulse Voltage Test

Test was carried out according to ANSI C29.11, clause 7.1.6.2.

Because length between the fittings was more than 500 m the test voltage - an impulse with a steepness of at least 1000 kV/ μs - was applied as follows between:

- the original upper metal fitting and an electrode made of a copper strip 20 mm wide and less than 1 mm thick (upper section)
- the two electrodes made of a copper strip 20 mm wide and less than 1 mm thick (middle section)
- electrode made of a copper strip 20 mm wide and less than 1 mm thick and an original bottom metal fitting (bottom section).

Each sample was stressed individually with 25 impulses of positive and 25 impulses of negative polarity.

The test arrangement and the flashover on the insulator are shown in Figure 9. Representative example of the wave shape of the test impulse is given in Figure 3.

Testing and measuring equipment:

- impulse generator TuR Dresden 750 kV, 30 kJ, serial No. 862512
- divider passoni villa, type 700kV, serial No. 11635
- measuring system Haefely Trench, type HiAS 743, serial No. 175247
- measuring system for atmospheric condition Comet, serial No. 14900363
- tape measure 5 m, Assist, PM-291

Table 5 Linearly rising front chopped impulse voltage test conditions

Date	Pressure (inHg)	Temperature (°F)	Rel. humidity (%)
2024-10-18	29,09	61,3	55,8

Table 6 Results of the linearly rising front chopped impulse voltage test

Sample No.	No. of impulses		Result
	+ polarity	- polarity	
1 (upper section)	25	25	Passed
1 (middle section)	25	25	Passed
1 (bottom section)	25	25	Passed
2 (upper section)	25	25	Passed
2 (middle section)	25	25	Passed
2 (bottom section)	25	25	Passed
3 (upper section)	25	25	Passed
3 (middle section)	25	25	Passed
3 (bottom section)	25	25	Passed

Evaluation:

No puncture of any part of the insulator occurred.

4.1.4.3 Low-Frequency Dry Flashover Voltage test

Test was carried out according to ANSI C29.11, clause 7.1.6.3.

The flashover voltage sample was determined by averaging of five consecutive flashovers on each insulator. The value was corrected to normal standard atmospheric conditions in accordance with ANSI C29.11, clause 8.2.1.5. The flashover voltage was obtained by increasing the voltage linearly from zero within one minute.

The flashover voltage of each sample shall be greater than or equal to 90 % of flashover voltage of the reference sample (reference flashover voltage).

The flashover voltage of each sample shall be greater than or equal to 90 % of flashover voltage of the reference sample (reference flashover voltage). Then the samples were subjected for 30 minutes to 80 % of the reference flashover voltage (corrected to actual test conditions). Immediately after the test the temperature of the shank T_{30} (at five places) of each sample was measured again and compared to reference temperature T_0 .

The test arrangement and the flashover on the insulator are shown in Figure 10.

Testing and measuring equipment:

- synchronous generator BEZ Bratislava 6 kV, 1 300 kVA, 50 Hz, serial No. BRA20980
- test transformer TuR Dresden 5,7/1200 kV, 1440 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
- digital stop-watch Kalenji, PM-300
- measuring system for atmospheric condition Comet, serial No. 14900363
- digital thermometer Fluke 54 IIB, serial No. 41070290WS + touch probe 80PK-27
- tape measure 5 m, Assist, PM-291

Table 7 Low-frequency dry flashover voltage test conditions

Date	Pressure (inHg)	Temperature (°F)	Rel. humidity (%)	Arc. distance (m)
2024-10-18	29,09	62,4	53,4	1,23

Table 8 Results of the low-frequency dry flashover voltage test

Sample No.	Measured flashovers (kV)	Average flashover (kV)		Atm. correction factors	
	Individual	Measured	Corrected	k_d	k_h
4 Ref	466; 469; 449; 459; 458	460	516	0,999	1,121
1	450; 459; 457; 471; 469	461	517	0,999	1,121
2	473; 465; 463; 451; 463	463	520	0,999	1,121
3	451; 464; 465; 462; 466	462	518	0,999	1,121
90 % of reference flashover voltage (corrected to std. atm. conditions): $0,9 \times 516 \text{ kV} = 464 \text{ kV}$					

Table 9 Results of the low-frequency dry withstand voltage test

Sample No.	Test voltage (kV)	Temperature of the shank		Temperature rise (°C)	Result
		T_0 (°C)	T_{30} (°C)		
4 Ref	368	17,7; 17,7; 17,7; 17,7; 17,7	17,7; 17,7; 17,7; 17,7; 17,8	< 10	Passed
1	368	17,6; 17,6; 17,6; 17,7; 17,7	17,7; 17,7; 17,6; 17,7; 17,7	< 10	Passed
2	368	18,1; 18,1; 18,0; 18,0; 18,0	18,1; 18,1; 18,1; 18,1; 18,1	< 10	Passed
3	368	17,8; 17,7; 17,8; 17,8; 17,8	17,8; 17,8; 17,8; 17,8; 17,8	< 10	Passed
80 % of reference flashover voltage $0,8 \times 297 \text{ kV} = 238 \text{ kV}$ (corrected to std. atm. conditions) i.e. 214 kV (corrected to actual test conditions)					

Evaluation:

Flashover voltages of test samples exceed 90 % of reference flashover voltage.

No puncture of any part of the insulator occurred.

The temperature rise of the insulator shank (measured immediately after the test) was not more than 10 °C above the ambient temperature.

Statement of conformity:

Station post insulator, type TR-288, drawing No. 24SM280706-TR288 passed the tests according to requirements given in ANSI C29.19, clause 7.1 and ANSI C29.11, clause 7.1.

4.2 ASSEMBLED CORE LOAD TIME TESTS

4.2.1 Cantilever breaking load test

Test was carried out according to ANSI C29.19, clause 7.2.1 and ANSI C29.11, clause 8.3.1.3.2.

4.2.1.1 Test specimens

Test was carried out according to ANSI C29.19, clause 7.2.1. The three insulators were examined visually.

Testing and measuring equipment:

- slide gauge 300 mm, Kinex CZ, serial No. 2441/05
- tape measure 5 m, Assist, PM-291

Table 10 Results of the visual examination

Sample No.	Type	Visual/dimensional check
1, 2, 3	TR-288	Passed

Evaluation:

Insulators were without damage and dimensions conform with the drawing.

4.2.1.2 Test procedure

Three insulators were subjected to the cantilever load. The load was applied to the insulators in line with the axis of the core of the insulator. The load was increased quickly but smoothly (40 % of SCL per minute) from zero until the breakage of either the core or the metal fitting occurs.

The records of the cantilever load are given in the Figure 6.

Test arrangement during and after cantilever breaking load test is given in the Figure 13 and Figure 14.

Testing and measuring equipment:

- loading machine LabTest, type 6.100.1.30.1.1, serial No. ZA/2024/019

4.2.1.3 Test results

Table 11 Results of the cantilever breaking load test

Date of test: 2024-11-11			
Test sample No.	SCL (kN)	Cantilever failing load (kN)	Type of failure
1	13,0	14,1	Failure of the core rod
2	13,0	13,6	Failure of the core rod
3	13,0	14,1	Failure of the core rod

Evaluation:

The three failing load values are greater than the SCL 13 kN.

Statement of conformity:

Station post insulator, type TR-288, drawing No. 24SM280706-TR288 passed the test according to requirements given in ANSI C29.19, clause 7.2.1 and ANSI C29.11, clause 8.3.1.3.2.

4.2.2 Core Time-Load Test

Tests were carried out according to ANSI C29.19, clause 7.2.2 and ANSI C29.11, clause 7.2.2.

4.2.2.1 Test specimens

Test was carried out according to ANSI C29.11, clause 7.2.2.1. The three insulators were examined visually.

Testing and measuring equipment:

- slide gauge 300 mm, Kinex CZ, serial No. 2441/05
- tape measure 5 m, Assist, PM-291

Table 12 Results of the visual examination

Sample No.	Type	Visual/dimensional check
1, 2, 3	TR-288	Passed

Evaluation:

Insulators were without damage and dimensions conform with the drawing.

4.2.2.2 Test procedure

Three insulators were subjected to cantilever load of RCL (50 % of SCL) at a temperature $20^{\circ}\text{C} \pm 10\text{ K}$. This load was maintained for 96 hours (see Figure 11).

The base end fittings of insulators No. 1, 2 and 3 were cut at 90° to the axis of the core and about 50 mm from the end metal fittings. The metal end fittings and the core were cut longitudinally into two halves in the plane of the previously applied cantilever load.

The longitudinal cut sections of each insulator were subjected to dye penetration test. After the dye penetration test the specimens were inspected. Samples are shown in Figure 12.

Testing and measuring equipment:

- loading measuring system Dini Argeo, type MCWNT1RF, serial No. 0100071048, 0100075094, 0100083839
- bending machine, serial No. EGU/ZD/04
- measuring system for atmospheric condition Comet, serial No. 14900363

4.2.2.3 Test results

Table 13 Results of the core time-load test

Test date: from 2024-09-26 till 2024-09-30			
Sample No.	SCL (kN)	Cantilever load 50 % SCL	Test result
1	13,0	6,5 kN / 96 h	Passed
2	13,0	6,5 kN / 96 h	Passed
3	13,0	6,5 kN / 96 h	Passed

Table 14 Results of the dye penetration test after core time-load test

Test date: 2024-10-15			
Sample No.	Test result		
1	Bottom end fitting	Passed	
2	Bottom end fitting	Passed	
3	Bottom end fitting	Passed	

Evaluation:

No break, no cracks or permanent deformation was observed after the 96 hours cantilever load test on insulators No. 1, 2 and 3.

No cracks or delamination in the fiberglass rod were indicated by the dye penetration test on insulators No. 1, 2 and 3.

Statement of conformity:

Station post insulator, type TR-288, drawing No. 24SM280706-TR288 passed the test according to requirements given in ANSI C29.19, clause 7.2.2 and ANSI C29.11, clause 7.2.2.

4.2.3 Tensile load test

Tests were carried out according to ANSI C29.19, clause 7.2.3 and ANSI C29.11, clause 9.4.3

4.2.3.1 Test specimens

Test was carried out according to ANSI C29.19, clause 7.2.3.1. The three insulators were examined visually.

Testing and measuring equipment:

- slide gauge 300 mm, Kinex CZ, serial No. 2441/05
- tape measure 5 m, Assist, PM-291

Table 15 Results of the visual examination

Sample No.	Type	Visual/dimensional check
1, 2, 3	TR-288	Passed

Evaluation:

Insulators were without damage and dimensions conform with the drawing.

4.2.3.2 Test procedure

Three insulators were subjected to tensile load applied between couplings. The tensile load was increased rapidly but smoothly from zero approximately to 75 % of STL, then gradually increased in a time of 30 s to 100 % of STL and sustained for the 60 s. Then the load was increased up to the failure of the insulator (see Figure 15 and Figure 16). Records of mechanical loading during the failing load test are given in Figure 7.

Testing and measuring equipment:

- hydraulic loading machine LabTest 5.600SP1, serial No. 15/12

4.2.3.3 Test results

Table 16 Results of the tensile load test

Test date:	2024-03-15			
Sample No.	STL test	Failing load (kN)		Type of failure
1	121 kN / 60 s	361,3	Pull out of the core from the end fitting	
2	121 kN / 60 s	356,5	Pull out of the core from the end fitting	
3	121 kN / 60 s	347,9	Pull out of the core from the end fitting	
Specified tensile load (STL): 121 kN				

Evaluation:

No pull-out of the core from the end fitting and no breakage of the end fitting occurred during one-minute tensile load test at STL load.

Statement of conformity:

Station post insulator, type TR-288, drawing No. 24SM280706-TR288 passed the test according to requirements given in ANSI C29.19, clause 7.2.3.

4.2.4 Torsion test ¹⁾

4.2.4.1 Test procedure

Test was carried out according to ANSI C29.19, clause 7.2.4 and ANSI C29.11, clause 8.3.1.3.3 on three insulators.

The insulators were examined visually and their dimensions were checked against the manufacturer's drawing (see Figure 1).

The torsion load was applied to the insulator with the axis of the core of the insulator. No bending moment was applied. Then the insulators were gradually loaded until to breakage of the insulator or slip of the end fitting.

The test was performed by accredited test laboratory Klokner Institute as per attached annex test report No. 900/24/AL.

4.2.4.2 Test results

Table 17 Results of the torsional test

Test date: 2024-11-06		
Sample No.	Failing moment (kNm)	Type of failure
1	4,12	Breakage of core inside of flange
2	4,12	Breakage of core inside of flange
3	3,88	Breakage of core inside of flange
Specified torsion load (SToL): 2,5 kN		

Statement of conformity:

Station post insulator, type TR-288, drawing No. 24SM280706-TR288 passed the test according to requirements given in ANSI C29.19, clause 7.2.4 and ANSI C29.11, clause 8.3.1.3.3.

4.2.5 Compression load test ¹⁾

4.2.5.1 Test procedure

Test was carried out according to ANSI C29.19, clause 7.2.5 and ANSI C29.11, clause 8.3.2 on one insulator sample.

The insulators were examined visually and their dimensions were checked against the manufacturer's drawing (see Figure 1).

The load was increased rapidly but smoothly from zero to 75 % of SCoL and then gradually increased in a time between 30 s and 90 s until 100 % of SCoL was reached, after that the compression load was removed.

The insulator was cut at 90° to the axis of the core and the longitudinal cut sections of the insulator were subjected to dye penetration test. After the dye penetration test the specimens were inspected.

The test was performed by accredited test laboratory Klokner Institute as per attached annex test report No. 900/24/AL.

4.2.5.2 Test results

Table 18 Results of the compression load test

Test date: 2024-11-06			
Sample No.	One minute withstand test	Change of the sample's length (mm)	Type of failure
11	333,6 kN / 60 s	0,2	No failure, no cracks were observed after dye penetration test

Evaluation:

No visual damage of the insulator was observed during the withstand test.

Statement of conformity:

Station post insulator, type TR-288, drawing No. 24SM280706-TR288 passed the test according to requirements given in ANSI C29.19, clause 7.2.5 and ANSI C29.11, clause 8.3.2.

4.3 HOUSING TRACKING AND EROSION TEST

Table 19 Specification of the silicone material

Manufacturer	Jiangsu Shemar Electric Co., Ltd.
Address	No. 66 Haiwei Road 226 017 Nantong, Jiangsu China
Type	HTV Silicone rubber
Color	Gray
Batch number	N/A

NOTE: The specification of silicone material was provided by customer

4.3.1 Tracking and erosion test – 1000h salt fog test

Test was carried out according to ANSI C29.19, clause 7.3 and ANSI C29.11, clause 7.3. Two samples of station post insulator drawing No. 24SM281109 (see Figure 2) were subjected to a salt fog test in accordance with ANSI C29.11, clause 7.3.1.

A record of the test voltage during the tracking and erosion test is shown in Figure 8. Photographs of test samples after finishing of the test are given in Figure 17, Figure 18 and Figure 19.

Test specimens: Test samples shall fulfill requirements of ANSI C29.11, clause 7.3.1. Samples are cleaned with de-ionized water before starting the test. There is a clearance of at least 400 mm between parallel test specimens and between test specimens and the roof, the walls and the floor.

Test chamber: Test is performed in a moisture-sealed corrosion-proof chamber not exceeding 15 m³. according to ANSI C29.11, clause 7.3.2.

Sample mounting: Test specimens were cleaned with de-ionized water before starting the test. One test specimen was tested mounted horizontally and the second test specimen was mounted vertically. There was a clearance of at least 200 mm between the roof of the chamber and a test specimen a clearance of at least 100 mm between the side walls of the chamber and a test specimen and at least 400 mm between parallel test specimens.

Fog calibration: The fog calibration is according to ANSI C29.11, clause 7.3.2.2. Before commencing the test two collecting receptacles with a collection area of 7085 mm² and a height of 100 mm were placed close to the position of the ends of the test objects. They collected between 1,5 ml and 2,0 ml of precipitation per hour (corrected to 8000 mm² collecting area) averaged over a minimum period of 16 hours. The flow rate was checked at least every 100 hours. Interruption times are not to be counted as test time.

Test voltage: Test voltage (in kV) is determined by dividing creepage distance of samples (in mm) by 34,6, according to ANSI C29.11, clause 7.3.3.3.1. The protection level of the tripping device is set at 1 A (r.m.s.).

Test conditions: Test conditions are according to ANSI C29.11, clause 7.3.3. Ambient temperature within the duration of the 1000h test is 20 °C ±5 K. Weekly interruptions of the test for inspection purposes shall not exceed 1 h. The interruptions are not counted in test duration.

The initial salinity of the water is calculated according to ANSI C29.11, table 2. If more than one flashover occurs the salinity is halved, and test continues. Numbers of flashovers and trip outs, when occurred, are recorded.

Testing and measuring equipment:

- test transformer Hipotronics, serial No. CW14-5165
- measuring voltage transformer ABB, type TDC 7, serial No. VLT52111022699
- measuring PC, Dewe-rack+USB converter type 6341, serial No. 5202020046/1AD3392
- tape measure 5 m, Assist, PM-291
- slide gauge 300 mm, Kinex, serial No. 2441/05
- conductivity meter, WTW Cond 3310, serial No. 12240282
- measuring cylinder 250 ml, identification No. PM-177
- digital stop-watch Olympia, PM-172
- comet serial No. 10910247

4.3.2 Test results

Table 20 Results of tracking and erosion test – 1000h salt fog test

Sample information:			
Sample No. 1	vertical position (serial No. 2411216611)		
Sample No. 2	horizontal position (serial No. 2411216610)		
Creepage distance (mm)	500		
Arcing distance (mm)	200		
Shank diameter (mm)	74		
Test parameters:			
Test voltage (kV)	14,5	(500/34,6)	
Beginning of the test	2024-11-29	Initial salinity (kg/m³)	4 ± 0,2
End of the test	2025-01-10	Final salinity (kg/m³)	4 ± 0,2
Total duration (hours)	1015		
Average precipitation (ml/hour)	1,79		
No. of flashovers	0		
Visual inspection after 1000h salt fog test:			
Sample No. 1	Passed		
Sample No. 2	Passed		

Evaluation:

Sample No. 1 - No tracking, no erosion, no puncture of shed, housing or interface occurred.

Sample No. 2 - No tracking, no erosion, no puncture of shed, housing or interface occurred.

Statement of conformity:

Station post insulator, type TR-288 (short sample for tracking and erosion test), drawing No. 24SM281108 passed test according to requirements given in ANSI C29.19, clause 7.3 and ANSI C29.11, clause 7.3.

4.4 ACCELERATED WEATHERING TEST ¹⁾

The test was performed according to ANSI C29.19, clause 7.4 and ASTM D2565.

The test was performed by accredited test laboratory SYNPO a.s., test report No. T 385/007.

Table 21 Silicone material specification

Type	HTV Silicone material
Manufacturer	Jiangsu Shemar Electric Co., Ltd.
Address	No. 66, Haiwei Road, Sutong Science and technology Industrial Park, Nantong City, Jiangsu 226017, China
Color	Gray
Batch number	N/A

NOTE: The specification of silicone material was provided by customer

Evaluation:

No surface degradations such cracks and raised areas occurred after the test.

Statement of conformity:

The HTV silicone material passed the test according to requirements given in ANSI C29.19, clause 7.4 and ASTM D2565.

4.5 FLAMMABILITY TEST ¹⁾

The test was performed according to ANSI C29.19, clause 7.6 and ANSI C29.11, clause 7.5. The samples of silicone material of required dimensions were provided by the customer.

The test was performed by accredited test laboratory SYNPO, test report No. T 391/2/1.

Table 22 Silicone material specification

Type	HTV Silicone material
Manufacturer	Jiangsu Shemar Electric Co., Ltd.
Address	No. 66, Haiwei Road, Sutong Science and technology Industrial Park, Nantong City, Jiangsu 226017, China
Color	Gray
Batch number	N/A

NOTE: The specification of silicone material was provided by customer

Evaluation:

The HTV silicone material passed specification V0 and HB.

Statement of conformity:

The HTV silicone material passed the test according to requirements given in ANSI C29.19, clause 7.6.

5 UNCERTAINTY OF MEASUREMENTS

Quantity	Uncertainty (k = 2)	
Lightning impulse voltage	U _t	2,2 %
	T ₁	6,5 %
	T ₂	4,2 %
Power-frequency voltage		1,7 %
Radio interference voltage		1,0 dB
Length (tape measure 5 m)		1,6 %
Temperature		4,0 %
Air pressure		0,5 %
Relative humidity		6,3 %
Time		0,7 %
Conductivity		5,0 %
Rainfall intensity		10,0 %

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%.

EGU - HV Laboratory applies a binary decision rule to the statement of conformity which reports two statements: PASSED – results are within limits or meet a given specification, FAILED – results are out of limits or fail a given specification. Calculated uncertainty of measurements are only informative with regards to the statement of conformity application.

6 PRODUCT DRAWING

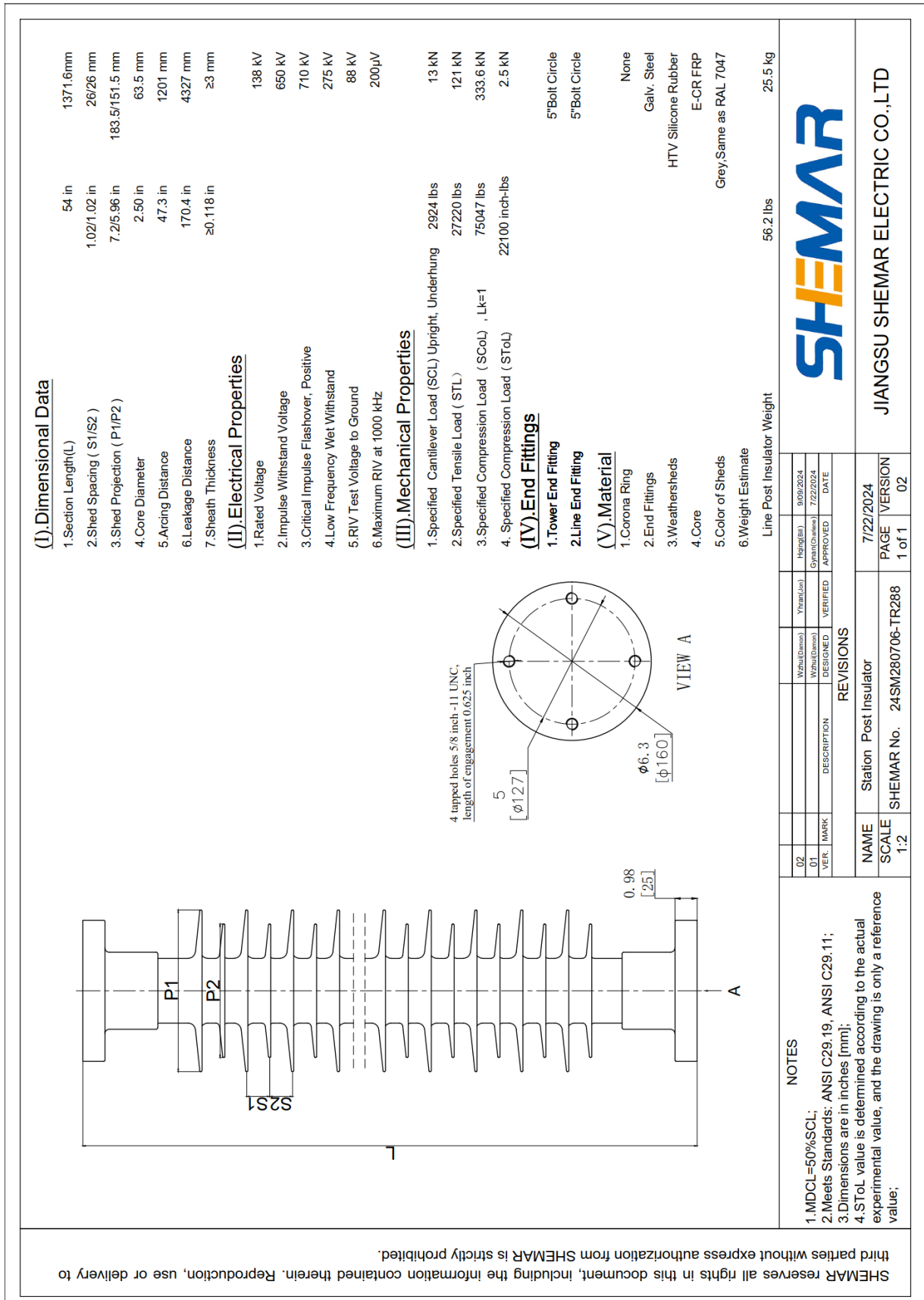


Figure 1 Station post insulator type TR-288, drawing No. 24SM280706-TR288

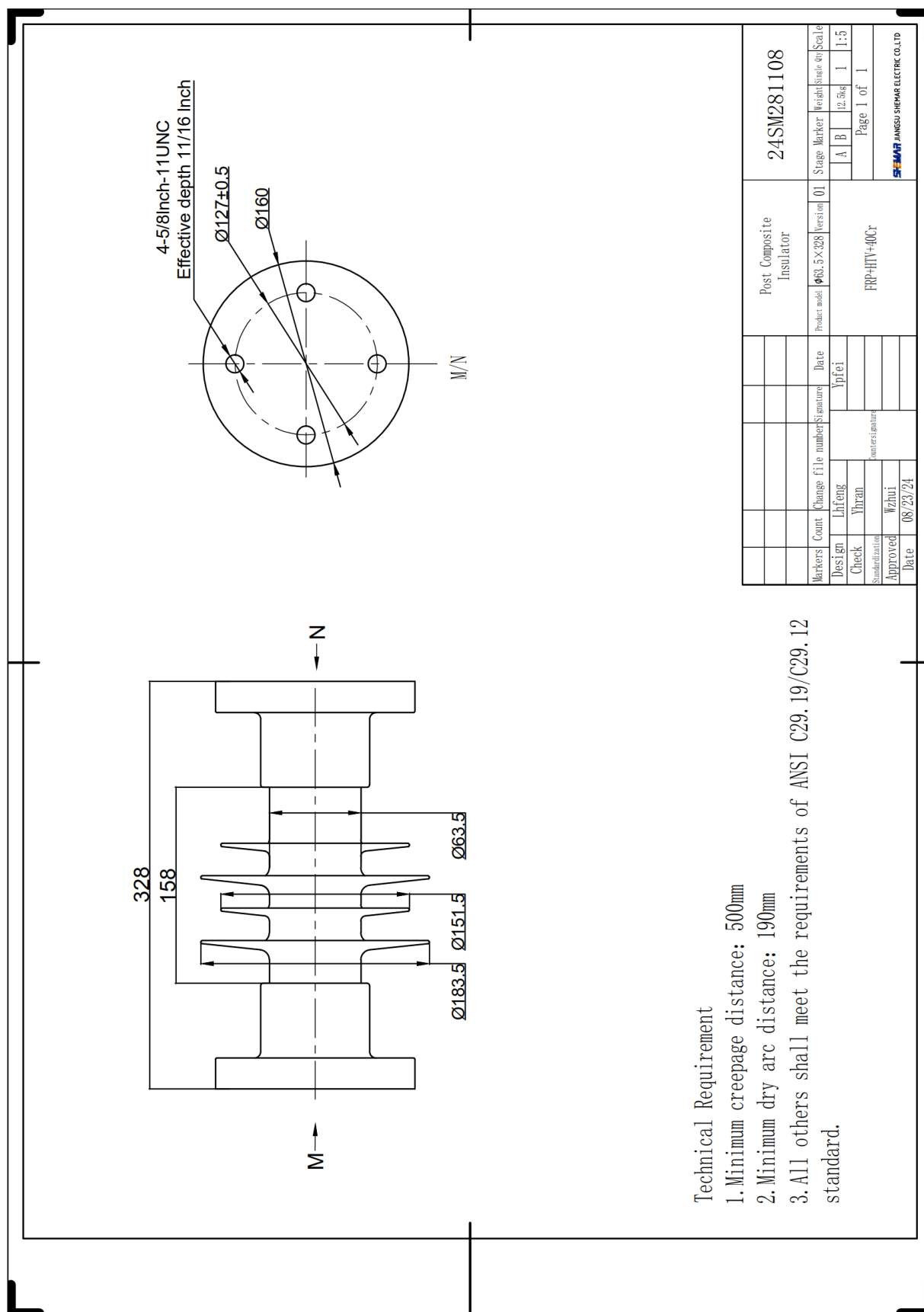


Figure 2 Station post insulator type TR-288 (short sample) drawing No. 24SM281108

7 GRAPHS AND RECORDS

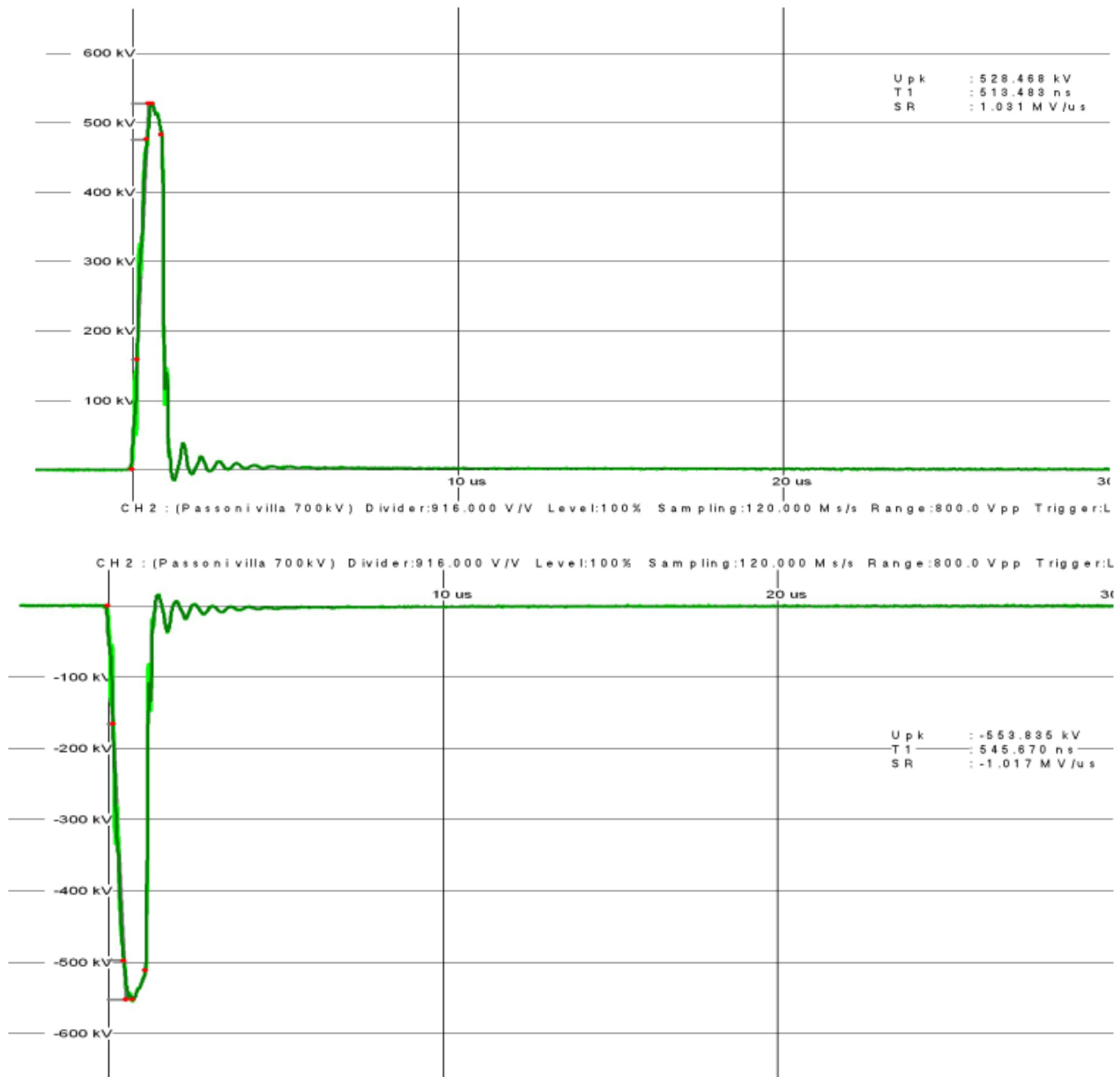


Figure 3 Representative wave shape of the linearly front chopped impulse

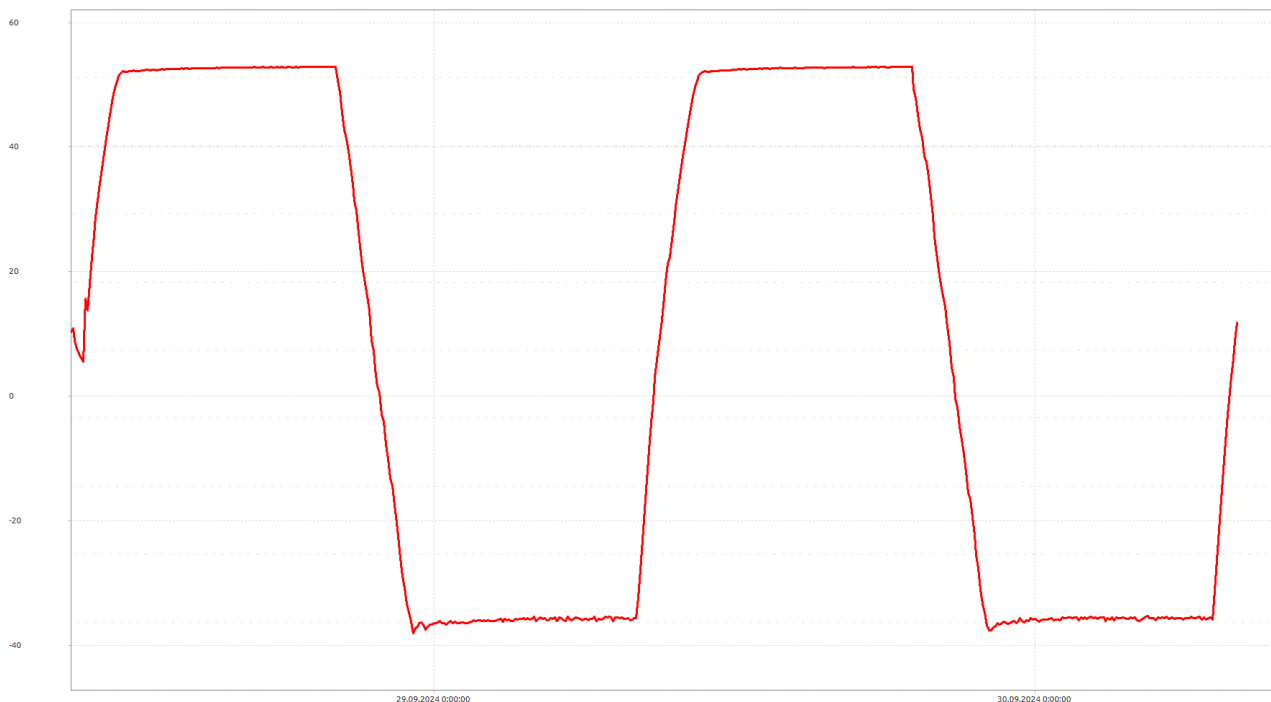


Figure 4 Representative record of temperature during Thermal-mechanical test

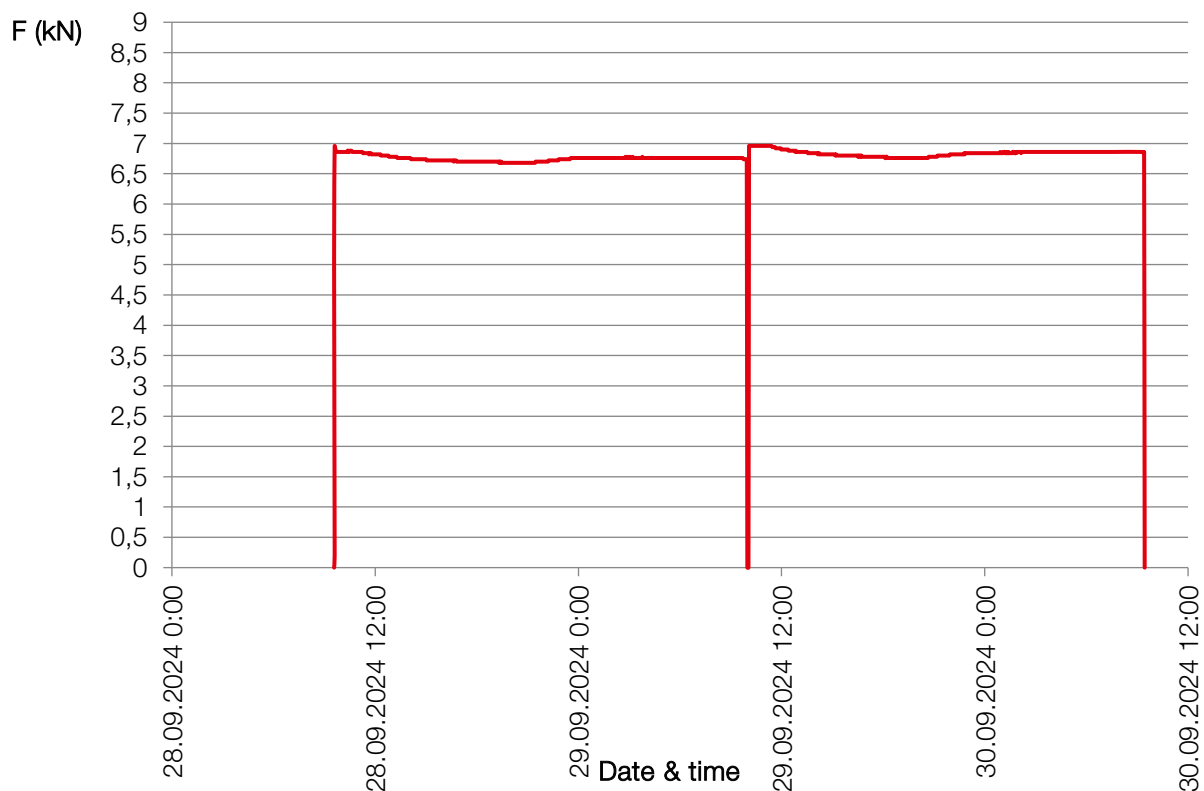


Figure 5 Representative record of the bending load during Thermal-mechanical test

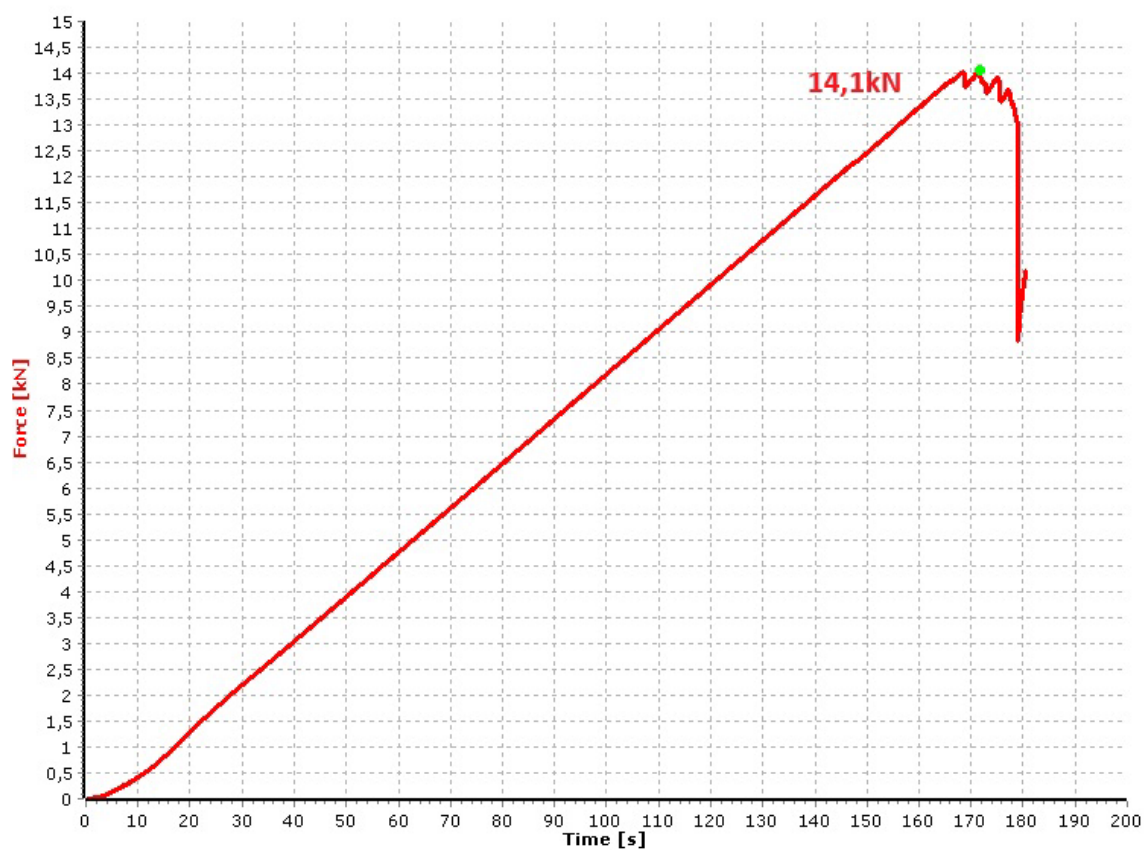


Figure 6 Representative record of the load during cantilever failing load test

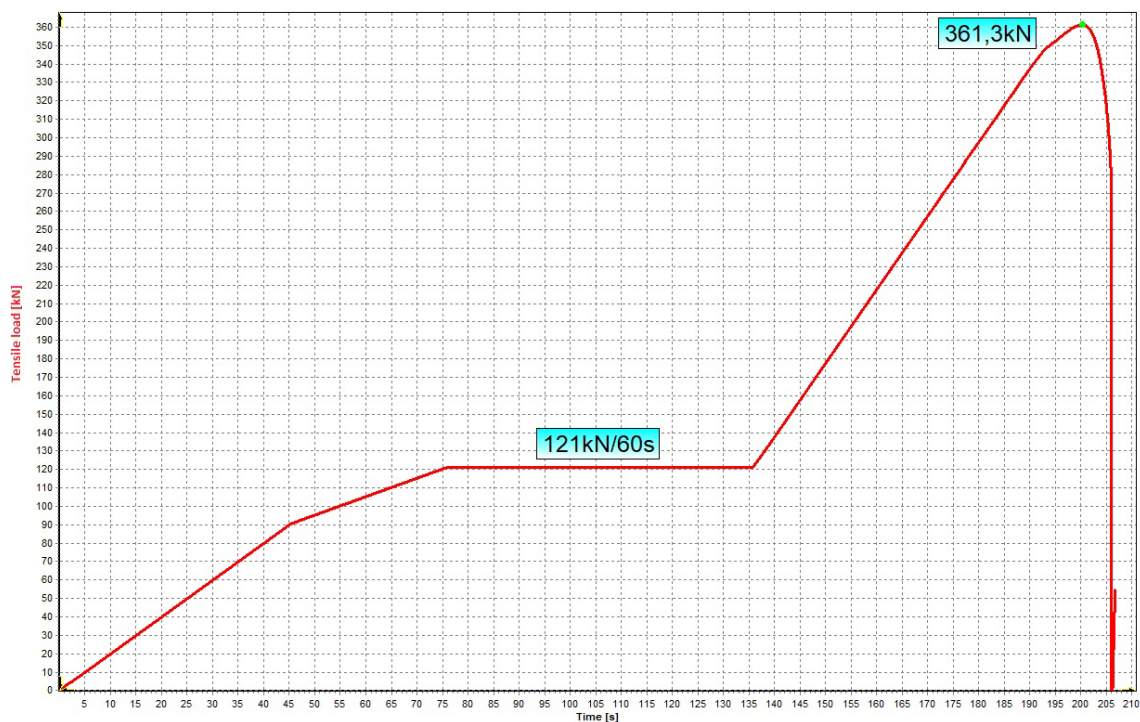


Figure 7 Representative record of the load during tensile load test

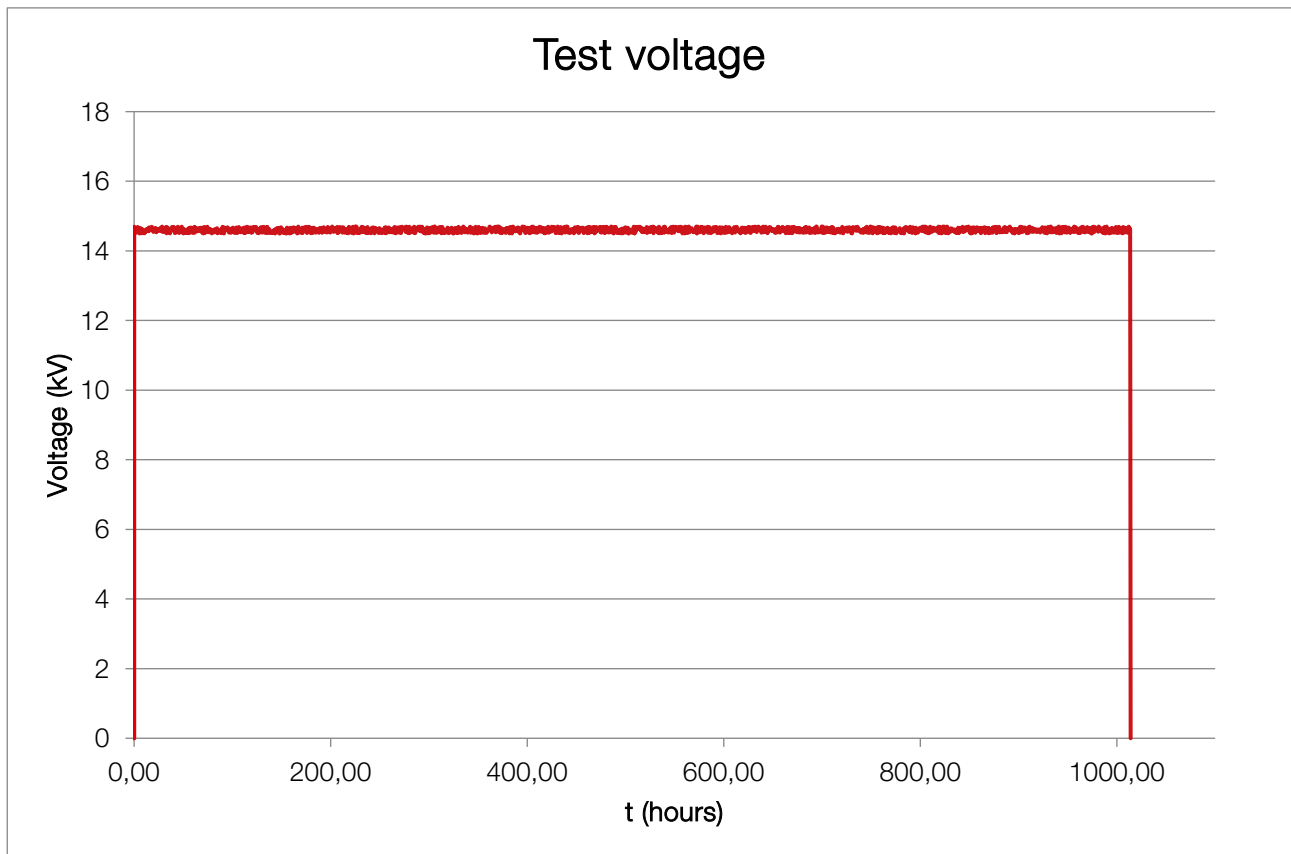


Figure 8 Record of the test voltage during the 1000 hour salt fog test

8 TEST OBJECT AND TEST SETUP PHOTOS

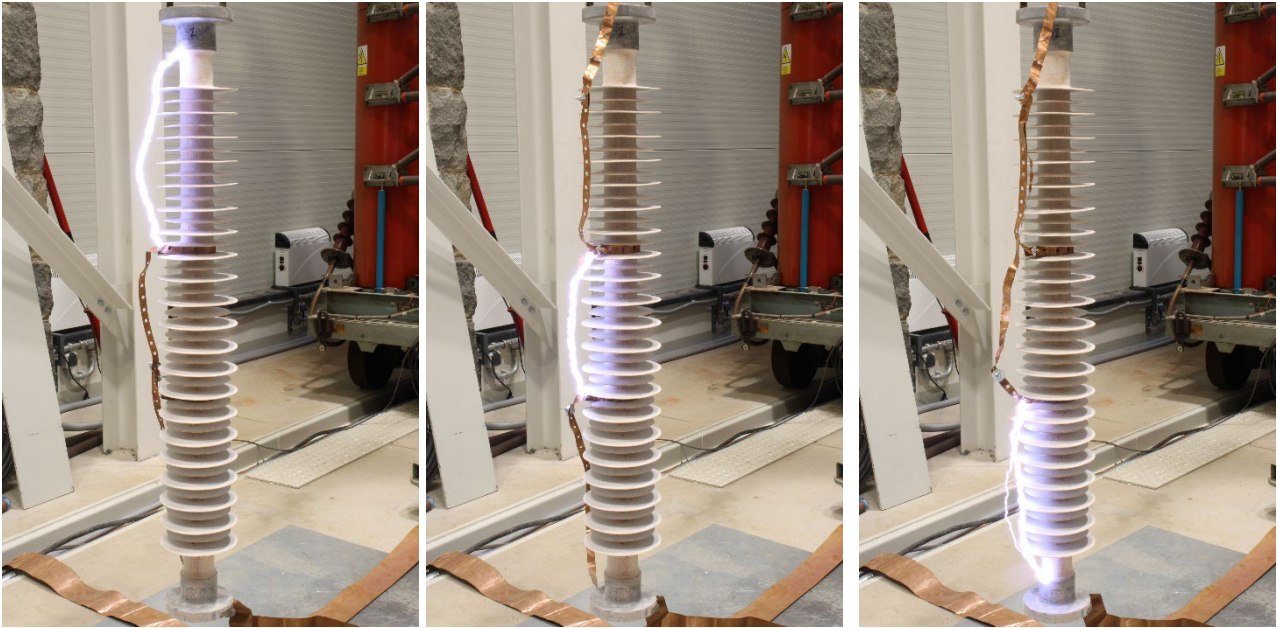


Figure 9 The test sample during the linearly rising front chopped impulse voltage test

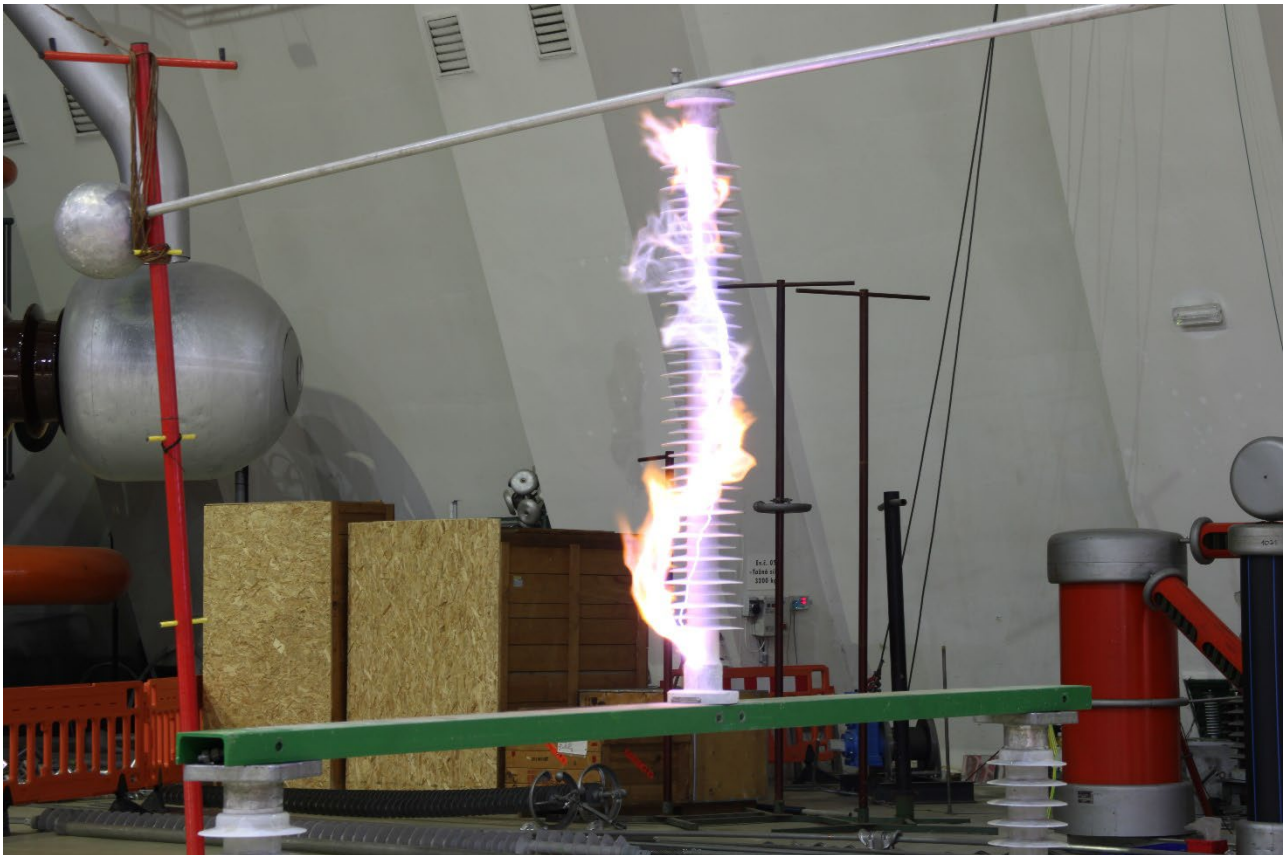


Figure 10 The test sample during the low-frequency dry flashover voltage test

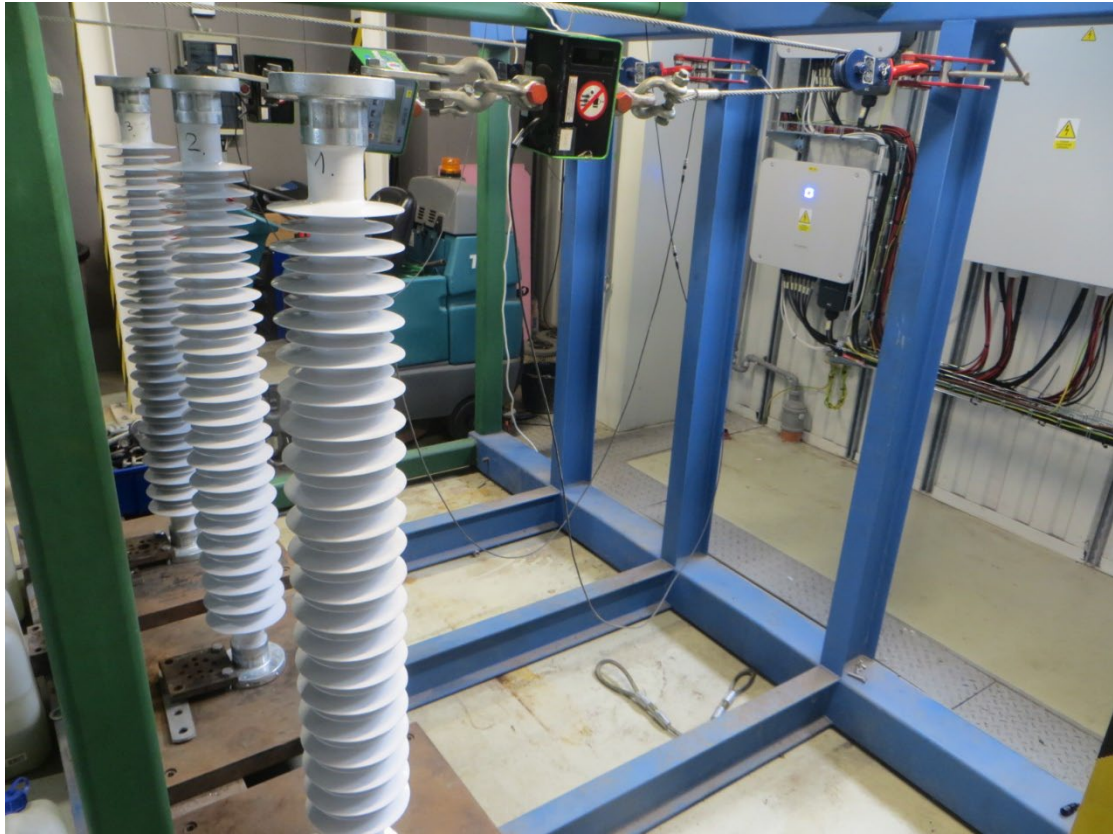


Figure 11 Test samples during core time-load test

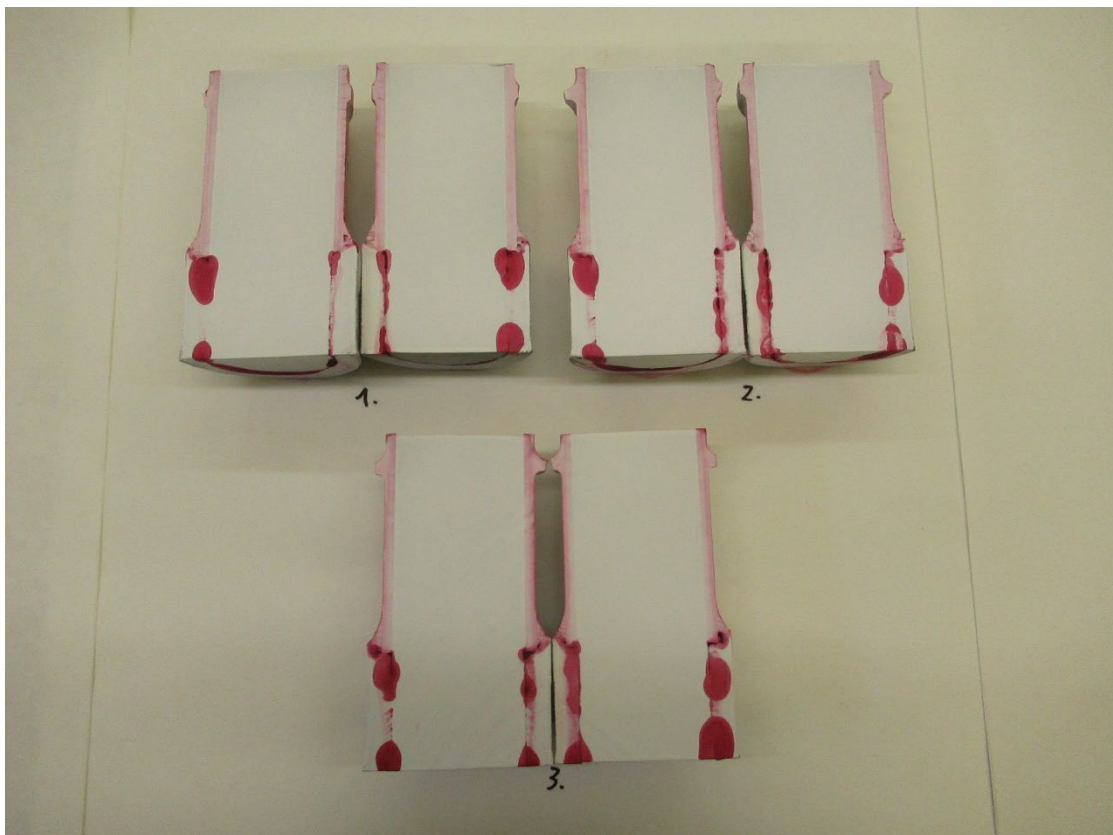


Figure 12 Test samples after dye penetration test (core time-load test)

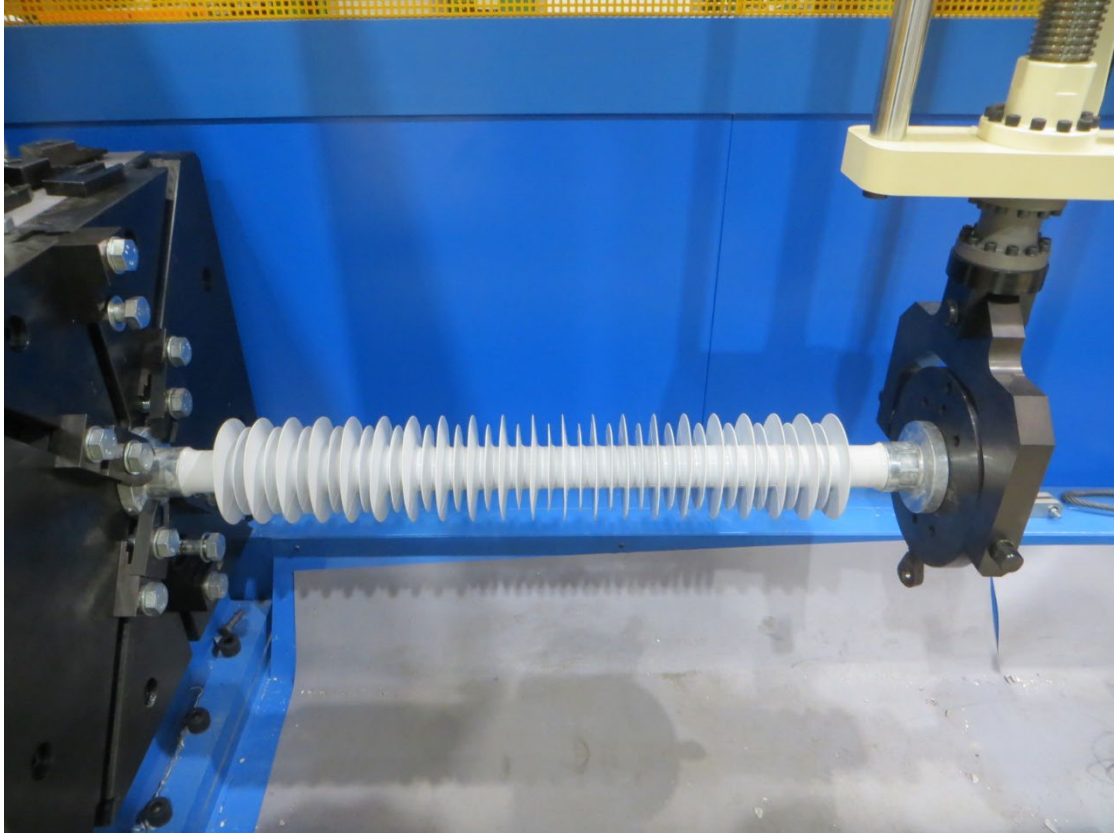


Figure 13 Test sample during cantilever failing load test

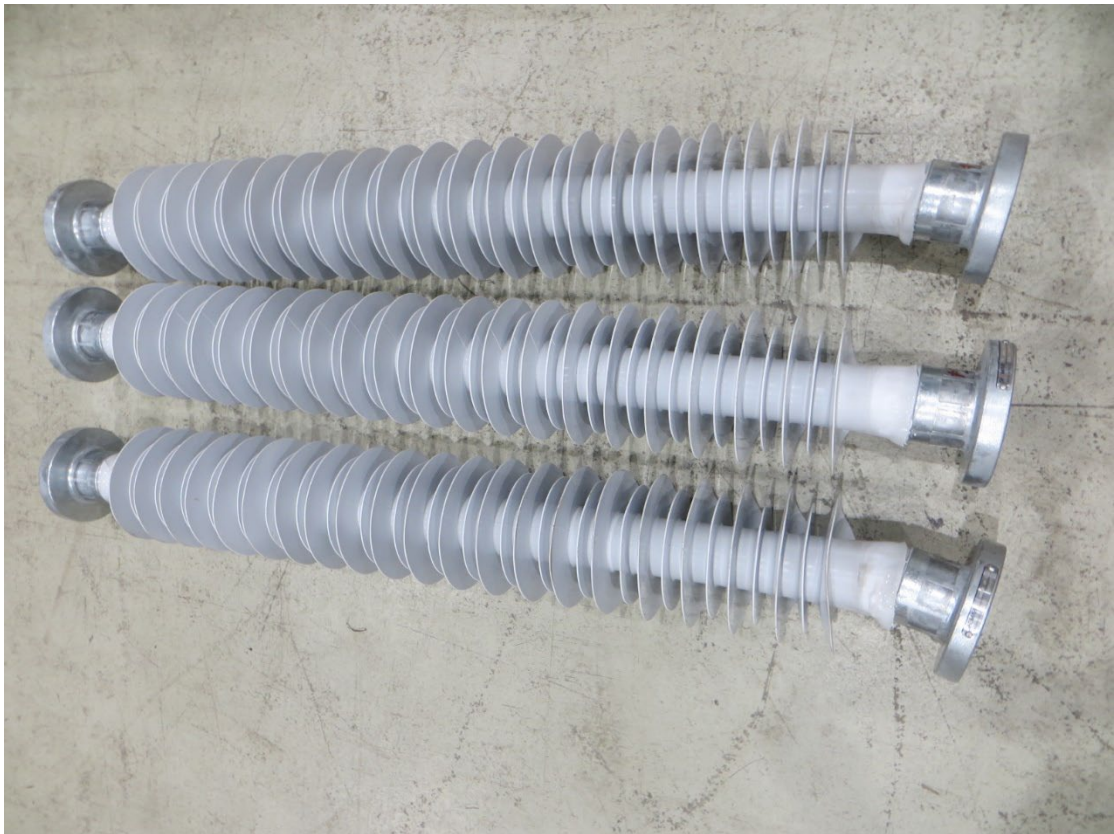


Figure 14 Test samples after cantilever failing load test

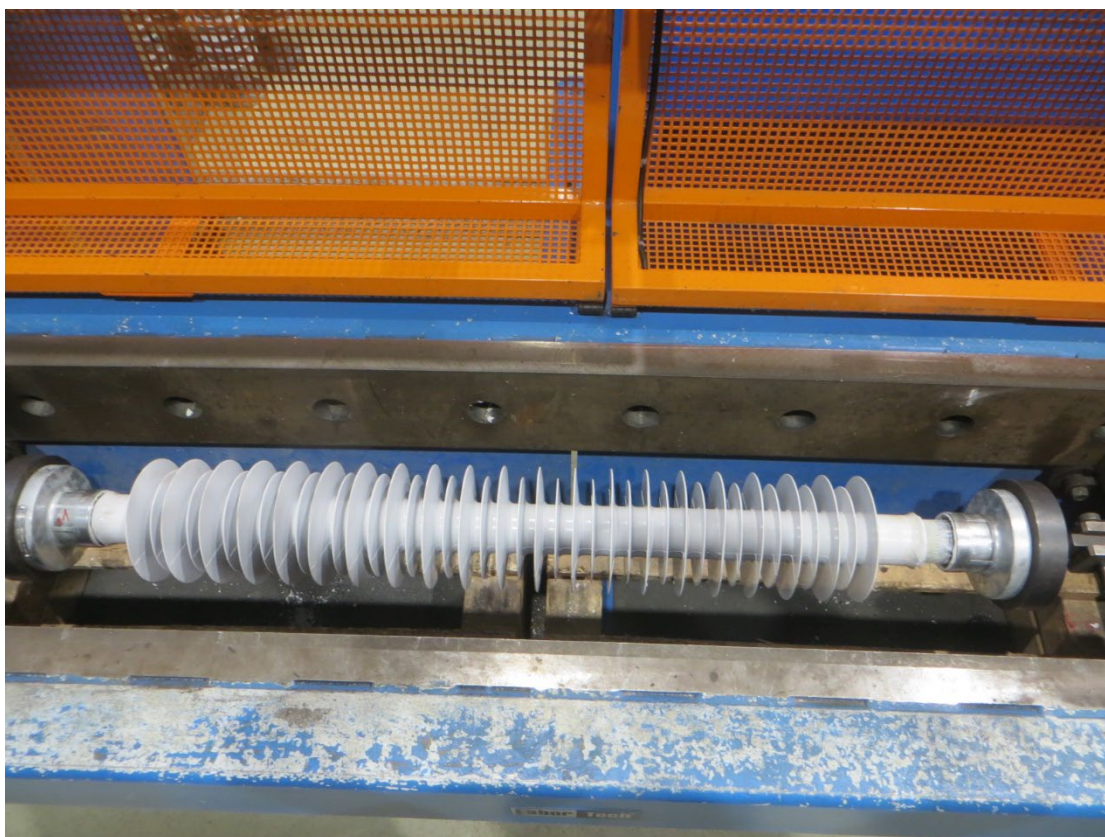


Figure 15 Test sample during tensile load test



Figure 16 Test samples after tensile load test



Figure 17 Test sample in vertical test position, before and after tracking end erosion test – 1000h salt fog test

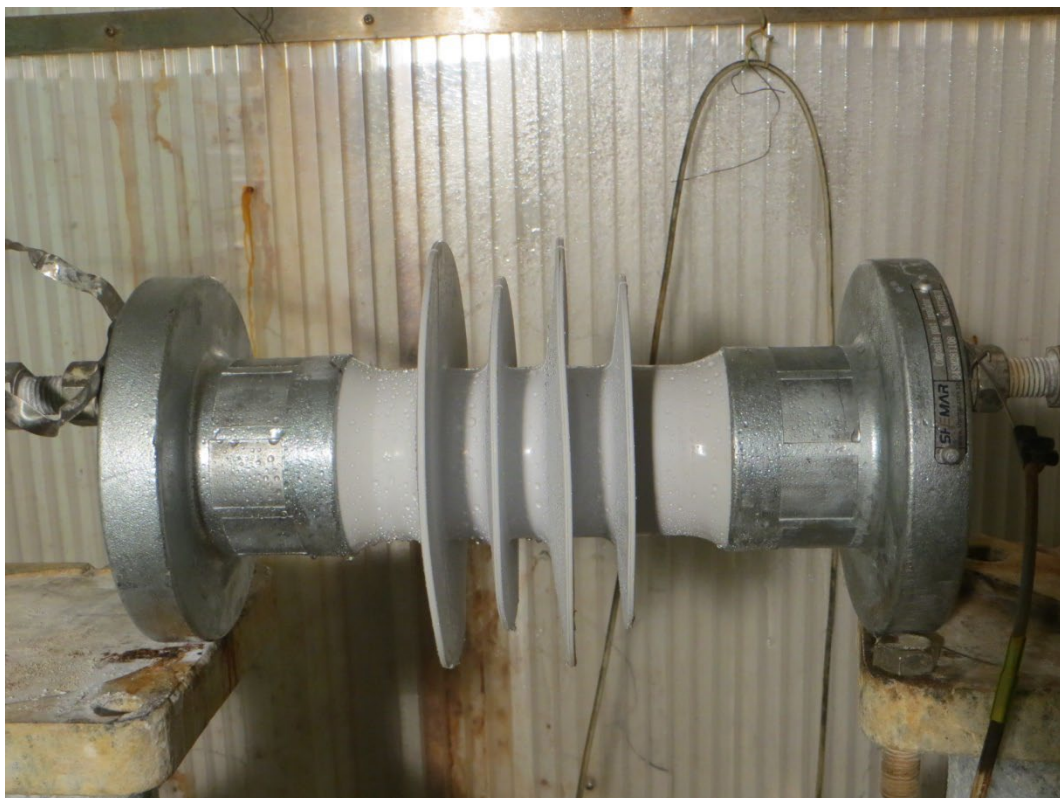


Figure 18 Test sample in horizontal test position, before tracking end erosion test – 1000h salt fog test

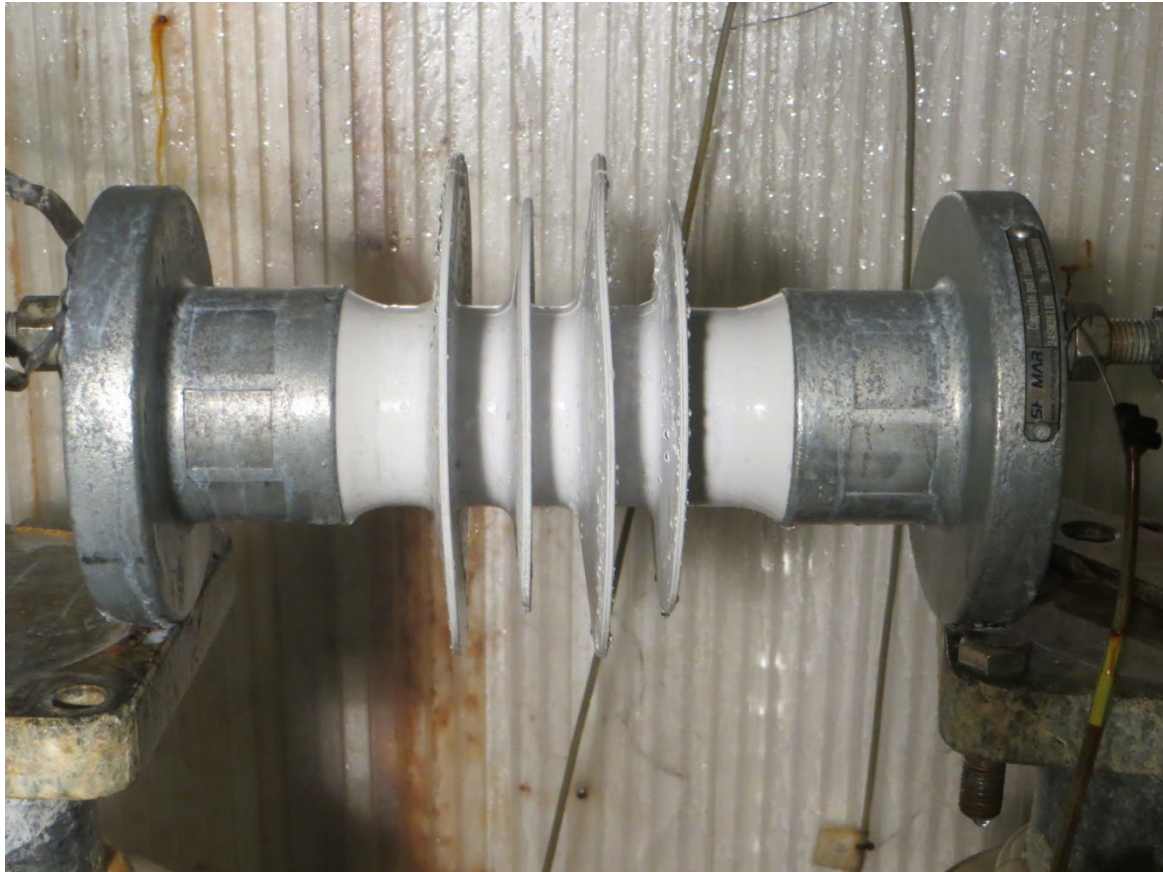


Figure 19 Test sample in horizontal test position, after tracking end erosion test – 1000h salt fog test

– end of the test report –



SYNPO, akciová společnost
S. K. Neumanna 1316
532 07 Pardubice - Zelené Předměstí
Czech Republic

*Department of Evaluation and Testing
Workplace 2: Department of Evaluation of Physical Properties of Materials
Testing Laboratory No. 1105.2 accredited by CAI according to ČSN EN ISO/IEC 17025:2018*

TEST REPORT T 391/2/1

Name and contact information of the customer:	EGU – HV Laboratory a.s. Podnikatelská 267 190 11 Praha 9, Běchovice, Czech Republic
Test item(s):	HTV Silicone Rubber
Test procedure/method:	Test flames – 50 W horizontal and vertical flame test methods ČSN EN 60695-11-10, ed. 2
Date of receipt of item(s):	April 14, 2023
Internal laboratory number:	23 182
Date of the test:	April 14 - 26, 2023
Tested by:	H. Slaná, O. Škola
The report made by:	H. Slaná, O. Škola

This report contains 6 pages and no annexes.

In Pardubice on May 31, 2023

 Digitálně
podepsal Ing.
Edita Matysová,
Ph.D.
.....
Dr. Edita Matysová
Deputy head of testing laboratory

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.

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TEST REPORT T 391/2/1

Page/total pages: 2/6

Number of annexes: 0

DESCRIPTION OF THE TEST ITEM

Test item(s):	HTV Silicone Rubber
Data delivered by customer ¹ :	Manufacturer: Jiangsu Shemar Electric Co., Ltd. Address: No. 66, Haiwei Road, Sutong Scienceand Technology Industrial Park Type: HTV Silicone Rubber Batch number: N/A Standards related to test method according to ČSN EN 60695-11-10, ed.2 – standard IEC 62217, article 9.3.4, standard ANSI C29.18, clause 8.9 and standard ANSI C29.11, article 7.5 and standard CSA C411.6:16, clause 5.11
Internal laboratory number:	23 182
Form of test item:	Delivered in the form of testing pieces.

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

TEST PROCEDURE/METHOD

The horizontal flame test was carried out according to Fire hazard testing - Test flames – 50 W horizontal and vertical flame test methods ČSN EN 60695-11-10 ed.2, article 8.

Preparation of testing pieces was not a part of the test.

Specimens	
Type	rectangular 125x13x3 mm
Thickness	See table of results
Number	3 pcs
Conditioning	120 hours / 23±2 °C / 50±10 % r.h. (3 pcs)
Testing	
Testing machine	TF328 UL94 H&V Flammability Tester
Ignition source	Laboratory burner
The used gas	Methane
Flame application time	30 seconds
Distance of reference marks	25 and 100 mm
Measuring of dimensions	digital micrometre (Mitutoyo)
Another devices	digital stopwatch, steel ruler
Discarded test specimens – reason	-
Deviations from the procedure	-

TEST REPORT T 391/2/1

Page/total pages: 3/6

Number of annexes: 0

TABLE OF RESULTS

Internal laboratory number	Test item				
	HTV Silicone Rubber (Horizontal flame test)				
23 182					
Specimen No.	Thickness	Damaged length L	Burning time t	Linear burning rate	Classification according to ČSN EN 60695-11-10 ed.2, article 8.4
	[mm]	[mm]	[s]	[mm/min.]	
1	2.98	0	0	0	HB @ 3 mm
2	3.03	0	0	0	
3	3.15	0	0	0	

DESCRIPTION OF THE TEST ITEM

Test item(s):	HTV Silicone Rubber
Data delivered by customer ¹ :	Manufacturer: Jiangsu Shemar Electric Co., Ltd. Address: No. 66, Haiwei Road, Sutong Scienceand Technology Industrial Park Type: HTV Silicone Rubber Batch number: N/A Standards related to test method according to ČSN EN 60695-11-10, ed.2 – standard IEC 62217, article 9.3.4, standard ANSI C29.18, clause 8.9 and standard ANSI C29.11, article 7.5 and standard CSA C411.6:16, clause 5.11
Internal laboratory number:	23 182
Form of test item:	Delivered in the form of testing pieces.

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

TEST REPORT T 391/2/1

Page/total pages: 4/6

Number of annexes: 0

TEST PROCEDURE/METHOD

The vertical flame test was carried out according to Fire hazard testing - Test flames – 50 W horizontal and vertical flame test methods ČSN EN 60695-11-10 ed.2, article 9.

Preparation of testing pieces was not a part of the test.

Specimens	
Type	rectangular 125x13x3 mm
Thickness	See table of results
Number	10 pcs
Conditioning	
in “delivery condition” (method A)	120 hours / 23±2 °C / 50±10 % r.h. (5 pcs)
in drying oven (method B)	168 hours / 70 °C - 120 hours in a desiccator (5 pcs)
Testing	
Testing machine	TF328 UL94 H&V Flammability Tester
Ignition source	Laboratory burner
The used gas	Methane
Flame application time	2x 10 seconds
Axis of Bunsen burner tube	angle 45±2° to the horizontal plane
Dry absorbent	pure cotton
Measuring of dimensions	digital micrometre (Mitutoyo)
Another devices	drying oven MEMMERT
	digital stopwatch
	desiccator with silica gel
	steel ruler
Discarded test specimens – reason	-
Deviations from the procedure	-

TABLE OF RESULTS

Internal laboratory number	Test item								
	HTV Silicone Rubber								
	(Vertical flame test – conditioning method A)								
23 182									
Specimen No.	Thickness [mm]	Time [s]					Afterglow / Burning up to the holding clamp	Ignition of dry absorbent by burning particles or drops	Classification according to ČSN EN 60695-11-10 ed.2, article 9.4
		t ₁	t ₂	t ₃	t ₂ +t ₃	Σ(t ₁ +t ₂)			
4	3.09	0	0	0	0	0	No	No	V-0 @ 3 mm
5	3.08	0	0	0	0		No	No	
6	3.16	0	0	0	0		No	No	
7	3.13	0	0	0	0		No	No	
8	3.11	0	0	0	0		No	No	

TEST REPORT T 391/2/1

Page/total pages: 5/6

Number of annexes: 0

TABLE OF RESULTS

Internal laboratory number	Test item								
	HTV Silicone Rubber (Vertical flame test – conditioning method B)								
23 182									
Specimen No.	Thickness [mm]	Time [s]					Afterglow / Burning up to the holding clamp	Ignition of dry absorbent by burning particles or drops	Classification according to ČSN EN 60695-11-10 ed.2, article 9.4
		t ₁	t ₂	t ₃	t ₂ +t ₃	Σ(t ₁ +t ₂)			
9	3.17	0	0	0	0	0	No	No	V-0 @ 3 mm
10	3.18	0	0	0	0		No	No	
11	3.14	0	0	0	0		No	No	
12	3.11	0	0	0	0		No	No	
13	3.08	0	0	0	0		No	No	

Criteria of flammability classification in vertical position acc. to ČSN EN 60695-11-10 ed. 2, article 9.4

- t_1 the afterflame time after the first flame application
 t_2 the afterflame time after the second flame application
 t_3 the afterglow time after the second flame application

TEST REPORT T 391/2/1

Page/total pages: 6/6

Number of annexes: 0

STATEMENT OF CONFORMITY

The laboratory uses a binary decision rule according to ILAC-G8:09/2019, article 4.2.1

Test item(s)	Prescribed test	Parameter ČSN EN 60695-11-10 ed.2 Article 8.4.2, grade HB	Fulfillment parameters
		a) test material does not burn by a flame after the ignition source is removed	
HTV Silicone Rubber	ČSN EN 60695-11-10 ed.2 Method A	The sample „HTV Silicone Rubber“ did not burn after the ignition source was removed	YES

Test item(s)	Prescribed test	Parameter ČSN EN 60695-11-10 ed.2 Article 9.4, grade V-0	Fulfillment parameters
		The afterflame times (t_1 , t_2) for individual specimens are ≤ 10 seconds	
HTV Silicone Rubber	ČSN EN 60695-11-10 ed.2 Method B Conditioning Method A	The sample „HTV Silicone Rubber“ did not burn after the ignition source was removed, the afterflame times (t_1 , t_2) are 0 seconds.	YES
	ČSN EN 60695-11-10 ed.2 Method B Conditioning Method B	The sample „HTV Silicone Rubber“ did not burn after the ignition source was removed, the afterflame times (t_1 , t_2) are 0 seconds.	YES

- End of test report -



SYNPO, akciová společnost
S. K. Neumanna 1316
532 07 Pardubice - Zelené Předměstí
The Czech Republic

*Department of Evaluation and Testing
Workplace 1: Department of Evaluation of Surface Treatments
Testing Laboratory No. 1105.2 accredited by CAI according to ČSN EN ISO/IEC 17025:2018*

**TEST REPORT
T 385/007**

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)	Type: HTV Silicone Manufacturer: Jiangsu Shemar Electric Co., Ltd. Address: No. 66, Haiwei Road, Sutong Science and Technology Industrial Park, Nantong City, Jiangsu226017, China
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)	April 14, 2023
Internal laboratory number	23 0384
Date of the test	April 17 – May 29, 2023
Tested by	Dipl. – Ing. Ondřej Janča
The report made by	Dipl. – Ing. Ondřej Janča, Dr. František Herrmann

This report contains 4 pages and 1 annex.

In Pardubice on May 30, 2023

 Digitálně
podepsal Ing.
Edita Matysová,
Ph.D.

Dr. Edita Matysová
Deputy head of testing laboratory

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TEST REPORT T 385/007

Page/Total pages: 2/4

Annexes: 1

DESCRIPTION OF THE TEST ITEM

Test item ¹ :	Type: HTV Silicone
Data delivered by the customer ¹ :	Manufacturer: Jiangsu Shemar Electric Co., Ltd. Address: No. 66, Haiwei Road, Sutong Science and Technology Industrial Park, Nantong City, Jiangsu226017, China
Internal lab number:	23 0384

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 and submitted to the test without any treatment of surface protection or heat storage. 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 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 W/m²/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.

Testing was performed based on customer request with accordance to standard ANSI C29.18, article 8.2 and CSA C411.6-6, article 5.3.

Test No. 33: Surface roughness measurement

Test was performed according to ČSN EN ISO 4288 (1999) - 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 ČSN 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 0,8mm

TEST REPORT T 385/007

Page/Total pages: 3/4

Annexes: 1

RESULTS OF EVALUATION AFTER 1000 H OF XENON EXPOSURE ACC. TO ASTM D2565-16

(April 17 – May 29, 2023) *(The test was included in the flexible scope of accreditation)*

Sample spec.	Int. Lab. No.	Surface appearance	Cracking	Flaking
		ČSN EN ISO 4628-1	ČSN EN ISO 4628-4	ČSN EN ISO 4628-5
		degree + verbal	degree	degree

1000 hours

HTV Silicone	23 0384/1	0 - no visual changes	0 (S0)	0 (S0)
	23 0384/2		0 (S0)	0 (S0)
	23 0384/3		0 (S0)	0 (S0)

RESULTS OF SURFACE ROUGHNESS ACC. TO ČSN EN ISO 4287, 4288 (1999) AFTER XENON EXPOSURE (April 17 – May 29, 2023)

Sample spec.	Int. Lab. No.	Arithmetical mean deviation of the assessed roughness <u>R_a</u>			Maximum height of profile (roughness) <u>R_z</u>		
		Measuring range [μm]			Measuring range [μm]		
		Mean	Max.	Min.	Mean	Max.	Min.

Before exposure

HTV Silicone	23 0384/1	0,45	0,49	0,41	3,40	3,52	3,23
	23 0384/2	0,46	0,49	0,44	3,55	3,75	3,20
	23 0384/3	0,48	0,51	0,44	3,77	4,28	3,52

1000hours

HTV Silicone	23 0384/1	0,44	0,48	0,41	3,38	3,49	3,23
	23 0384/2	0,45	0,47	0,42	3,53	3,57	3,48
	23 0384/3	0,46	0,49	0,42	3,65	3,99	3,25

SYNPO, akciová společnost, S. K. Neumanna 1316, 532 07 Pardubice - Zelené Předměstí
Evaluation and testing department, Workplace 1: Department of Evaluation of Surface Treatments,
Testing laboratory No. 1105.2 accredited by ČIA according to ČSN EN / IEC 17025: 2018

TEST REPORT T 385/007

Page/Total pages: 4/4

Annexes: 1

Statement of conformity

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

Test items	Prescribed test	Parameter No cracks or raised parts	Fulfillment of parameters
		Result according to ANSI C29.18, article 8.2 and CSA C411.6-6, article 5.3.	
Type: HTV Silicone	ASTM D2565-16	No cracks or crazing of surface	<u>Yes</u>

- End of test report -

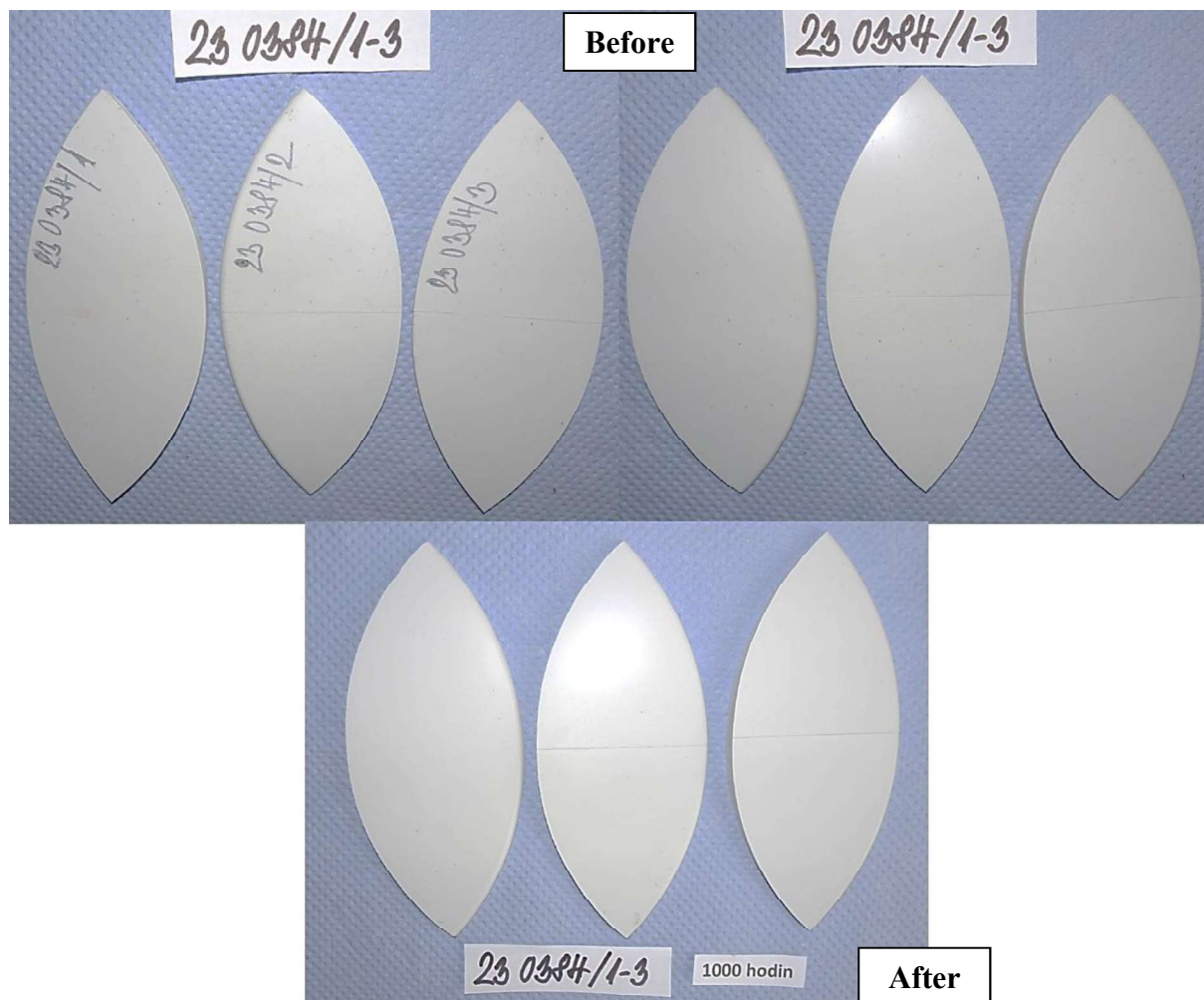
SYNPO, akciová společnost, S. K. Neumanna 1316, 532 07 Pardubice - Zelené Předměstí
Evaluation and testing department, Workplace 1: Department of Evaluation of Surface Treatments,
Testing laboratory No. 1105.2 accredited by ČIA according to ČSN EN / IEC 17025: 2018

TEST REPORT T 385/007

Annexes: 1/1

THE PHOTOS OF TEST SAMPLES XENON EXPOSURE ACC.TO ASTM D2565-16

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





CZECH TECHNICAL UNIVERSITY IN PRAGUE

KLOKNER INSTITUTE

Šolínova 7, 166 08 Prague 6, Czech Republic



Testing laboratory of Klokner Institute
accredited by CAI
according to ČSN EN ISO/IEC 17025:2018

TEST REPORT

Number of report	:	900 / 24 / AL
Order No.	:	24 00 J 438
Date	:	20 th November 2024
Number of pages of Test report	:	9
Customer	:	EGU - HV Laboratory a.s., Podnikatelská 267, Praha 9 – Běchovice
Subject of test	:	Mechanical test of Composite line post insulator Type TR-288
Tested object	:	Outdoor post line insulator
Test standard identification	:	ANSI C29.11-2020 cl. 8.3.1.3.3 and 8.3.2 (A) ANSI C29.19-2020, čl. 7.2.4 and 7.2.5 (N)
Copies / No. of copy	:	2 / 1 2
Responsible engineer	:	Tomáš Jaterka
Test performing and cooperation	:	Michal Křest'an, Msc.
Authorized by Head of laboratory	:	Martin Holeček, MSc.



1. Annotation

The results of mechanical tests of insulators (drawing No. see figure 1). The test was ordered on 5th November by EGU - HV Laboratory a.s., order no. 205/12591/2024.

2. Tested object

Outdoor post insulator.

3. Test standard identification

ANSI C29.11 - 2020 (A)

Clauses	8.3.1.3.3	Torsional Load Test
	8.3.2	Compression Withstand Load Test

ANSI C29.19-2020 (N),

Clauses	7.2.4	Torsional Load Test
	7.2.5	Compression Withstand Load Test

(A) - These tests were performed as accredited test with the reference to the accreditation of testing laboratory No. 1061 accredited by CAI.

(N) - These tests were performed without the reference to the accreditation of the testing laboratory No. 1061 accredited by CAI.

4. Test equipment identification and uncertainty of measurement

The following equipment was used for the tests:

- ◆ Electronic system MTS – FLEXTEST 40.
- ◆ Measurements equipment QUANTUM X, Typ MX840A serial No. 9E5008E4E
- ◆ Loading jack 160 kN
- ◆ Load cell 200 kN No. P 07 003 M
- ◆ WPM DB 6 000 kN No. S 12 013 M
- ◆ Potentiometric sensor 0-25 mm No. P 01 143 M
- ◆ Tape measure No. P 01 010 M
- ◆ Digital Thermometer No. P 10 027 M
- Steel stand KU CTU

5. Sampling

Date of delivery samples : 04/11/2024

Sampling environment : -

The samples were tested as received to the laboratory. The laboratory is not responsible for sampling.

6. Test samples

Lab No. of samples : 3680- 3683/24

Date provided by customer:

Type of insulator : **Composite line post insulator**

Drawing No. : **24SM280706** (see Figure 1)

Manufacturer : **SHEMAR, Jiangsu Shemar Electric Co.,LTD
CHINA**

No. of samples : **Samples No. 1 - 4**

7. Compression Withstand Load Test

Date of test : 6/11/2024
 Type of insulator : **24SM280706**
 Test standard : ANSI C29.11- clause 8.3.2
 Minimum failing load (SCoL) : 333,6 kN
 Increase in load : 0,6 kN/s, smoothly
 Operator : Tomáš Jaterka
 Loading / record system : Hydraulic loading machine WPM DB 6 000 kN,
 time x load diagram is on graph in Appendix 2.
 Temperature : 23 °C

Test procedure :

There was measured and recorded length of insulator before and after compression test. Change of the sample's length after applied load 333,6 kN is in table 1.

Smooth load up to 333,6 kN (100%), gradually increased to the SCoL = 333,6 kN in time between 30 s to 90 s. When it was reached 333,6 kN (100 % of SCoL) holding on this level, sustained for the remainder of the 90 s, afterwards unloading to 0 kN and visual inspection of insulator. Arrangement of the test is on Photo 1. There were performed dye penetration tests according ISO 3452 on the all sample see Photo 2. Result of test is in Table 1.

Table 1: Result of test

Sample No.	Maximum reached load [kN]	Change of the sample's length after applied load 333,6 kN [mm]	Test result
4	333,6	0,2	No failure, No cracks were observed after dye penetration test

**Photo 1** – Characteristic arrangement of the compression test

3 from 9

Test report number 900/24/AL

Dye penetration test on the cut surfaces

Tested samples	:	No. 4
Date of test	:	06/11/2024
Temperature	:	22 °C
Test result	:	<u>No cracks were observed after dye penetration test on insulator No. #4 - insulator passed.</u>

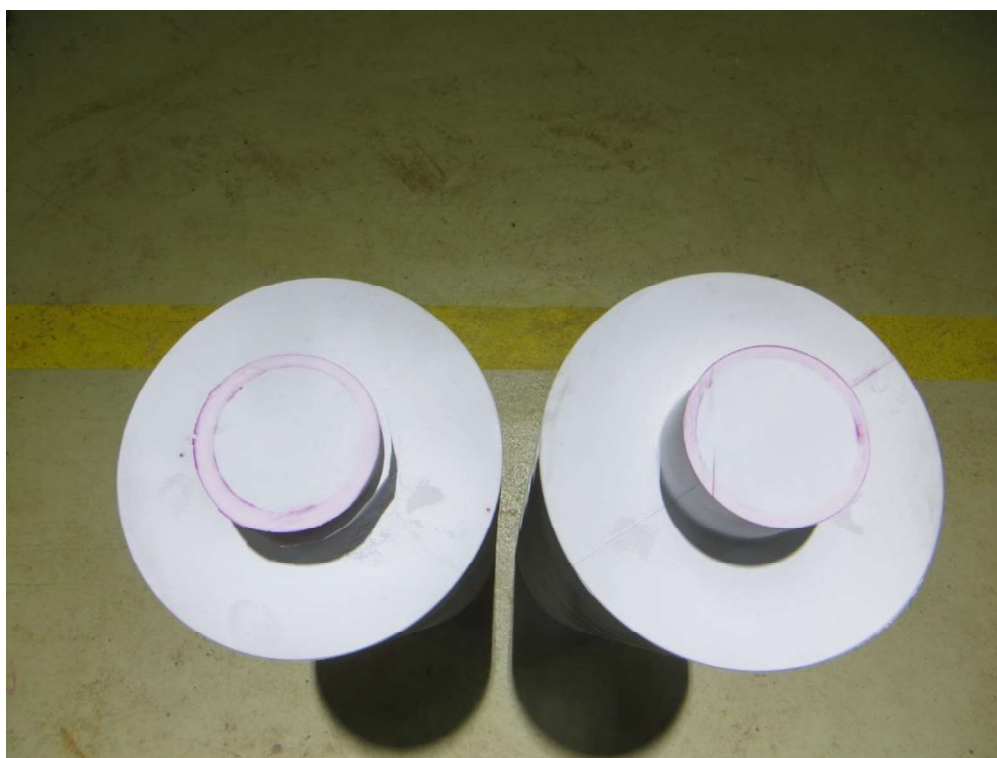


Photo 2: View of sample after the dye penetration test

8. Torsional Load Test

Date of test : 06/11/2024
 Type of insulator : **24SM280706**
 Test Sample No. : 1-3
 Test standard : ANSI C29.11- clause 8.3.1.3.3
 Minimum failing load (MFL) : 2,5 kNm
 Increase in load : 0,07 kNm/s, smoothly
 Operator : Tomáš Jaterka
 Temperature during test : + 22 °C.
 Loading / record system : Hydraulic loading jack was moving with lever that was prepared from a section of steel wheel (diameter 600 mm). This lever was connected with insulator's head. The other end of the insulator was fixed at steel frame. Torsion load was calculated from linear load **F** and diameter of wheel **d**. The load was controlled by electronic system MTS - FLEXTES. This system also scanned and saved data of loading at hard disc of controlling PC.

Test procedure : Smooth load up until breakage, visual inspection.

Graphs from test are shown in Appendix 3. Test arrangement is on Photo 3. Result of test is in table 2.

Table 2: Results of test

Sample No.	Failing load [kNm]	Way of failure
1	4,12	Breakage of core inside of flange
2	4,12	Breakage of core inside of flange
3	3,88	Breakage of core inside of flange

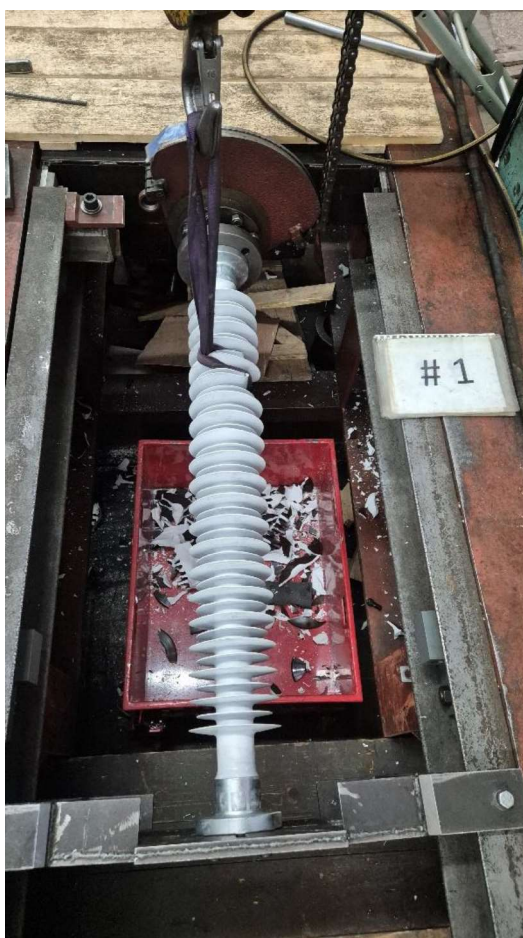


Photo 3 – Characteristic arrangement of the torsional test

**Photo 4 – Samples after the torsional test****Uncertainty of measurement**

Parameter		Uncertainty – coverage factor $k = 2$
Torsion load	Nm	$\pm 2 \%$
Compression load	kN	$\pm 2 \%$
Measured length (compression)	mm	$\pm 0.01 \text{ mm}$

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurements multiplied by the coverage factor $k = 2$, which for a Normal (Gaussian) distribution corresponds to a coverage probability of approximately 95 %.

Figure No. 1

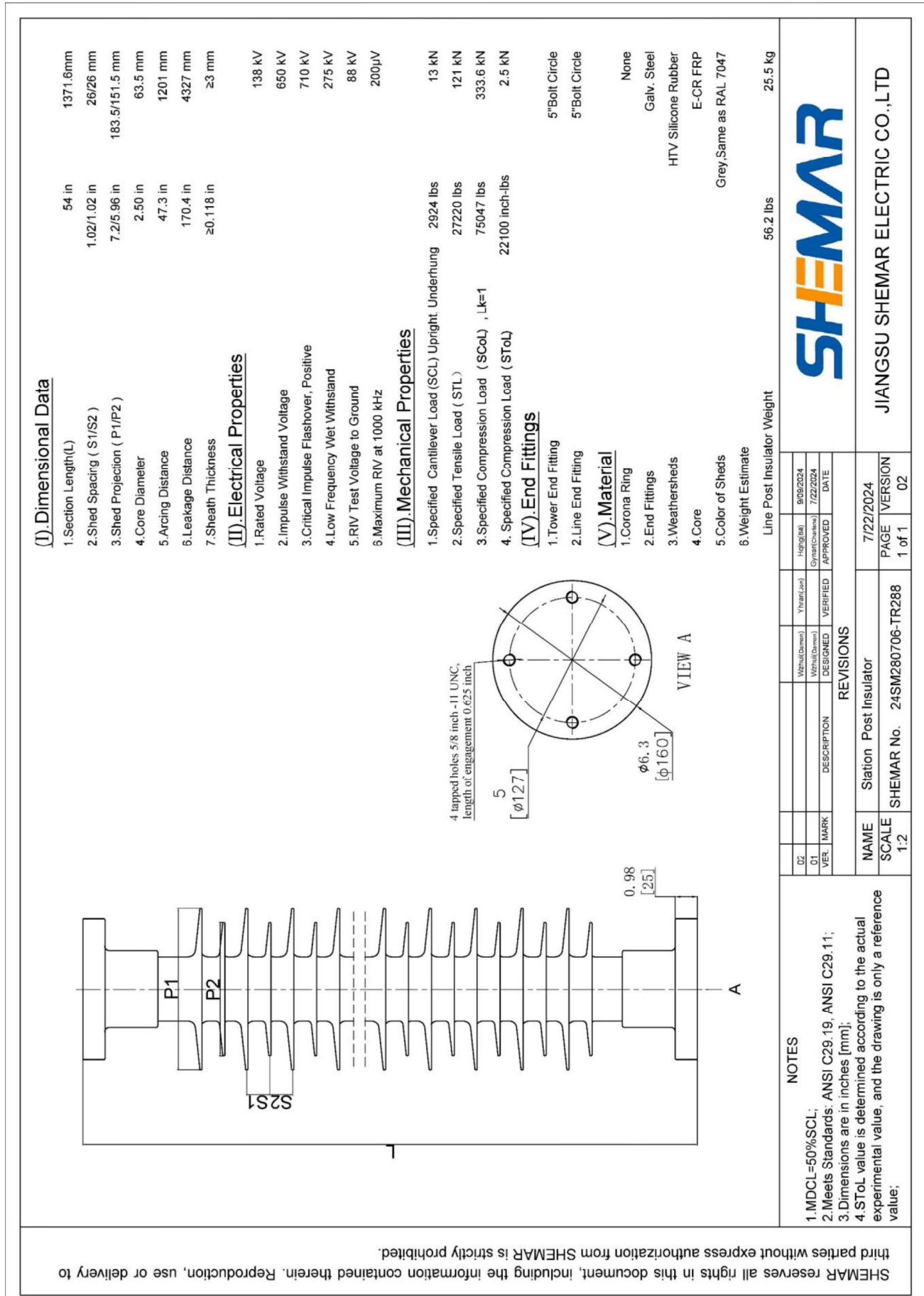


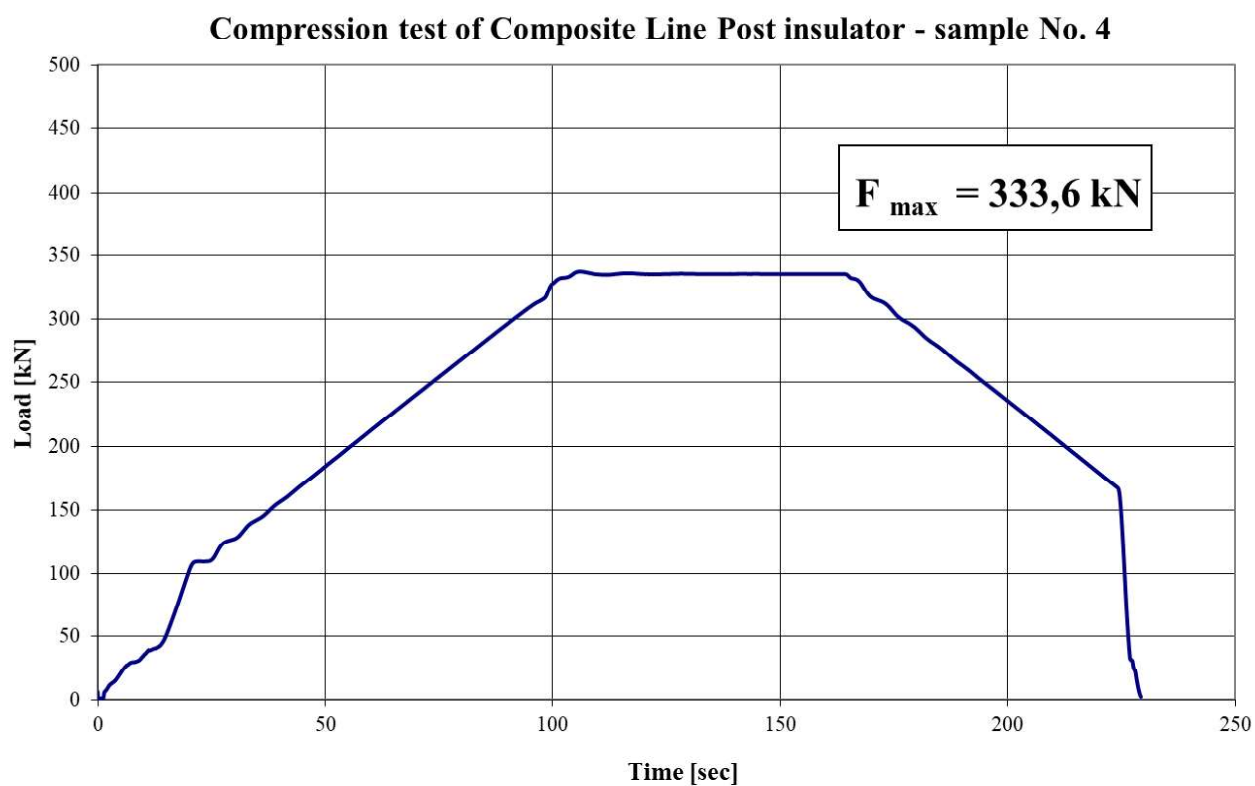
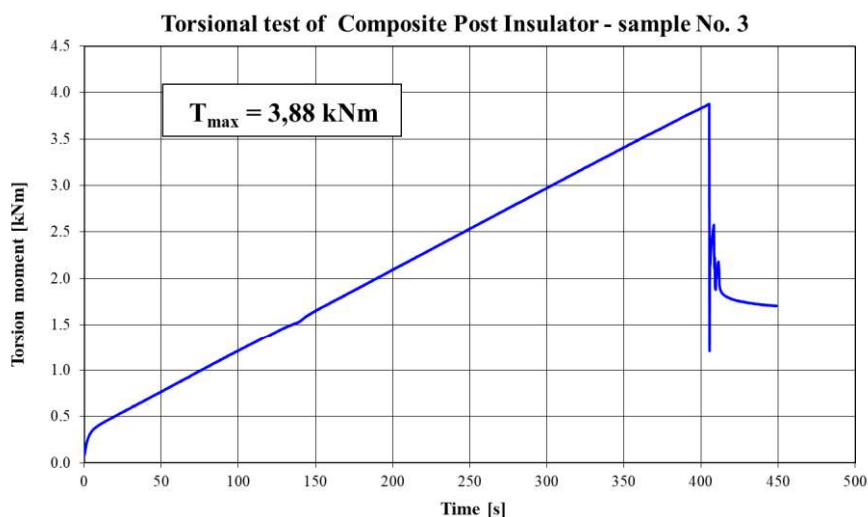
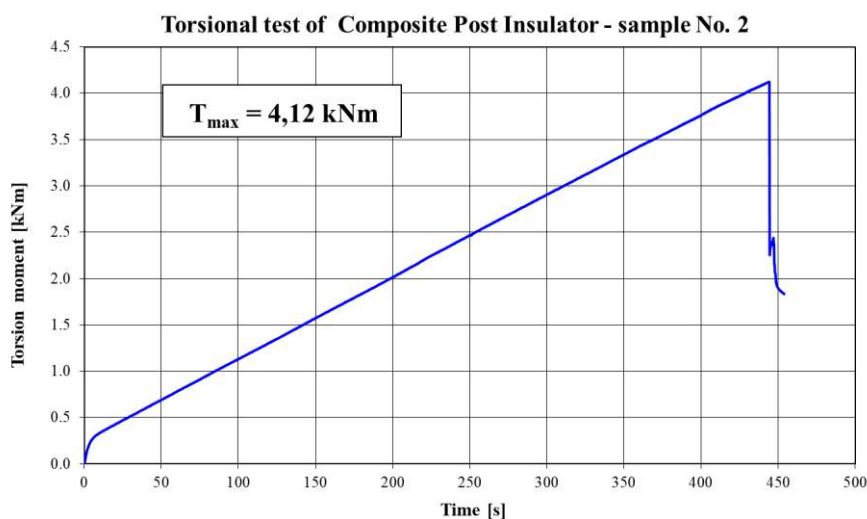
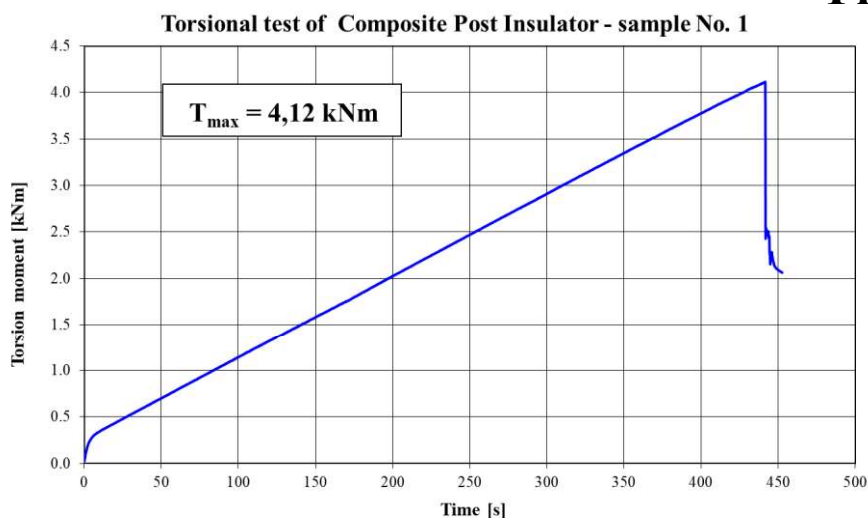
Figure No. 2

Figure No. 3

..... End of Test report

DECLARATION

The test results are related only to the tested objects described in paragraph "Test subject", "Sampling" or "Test specimen". Laboratory declines the responsibility for the test results when their validity may be affected by the information provided by the Customer. The results of this report do not replace other documents (certificates, etc.). This report may be reproduced only in its entirety. Parts of the test report can be reproduced and these parts published or otherwise used only with a written approval of the Accredited laboratory No. 1061 of Klokner Institute CTU in Prague.