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TEST REPORT 12206/B/23

ACCREDITED TESTING LABORATORY EGU HV Laboratory No. 1029 CZECH REPUBLIC

CUSTOMER	Jiangsu Shemar Electric Co., Ltd. No. 66 Haiwei Road 226 017 Nantong, Jiangsu China
TEST OBJECT	138 kV Composite line insulator
TYPE SPECIFICATION	138 kV / 111 kN
SHEMAR IDENTIFICATION No.	n/a
TEST STANDARDS	ANSI C29.12-2020, ANSI C29.11-2020
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TEST REPORT 12206/B/23

TEST OBJECT	138 kV Composite line insulator
TYPE SPECIFICATION	138 kV / 111 kN
DRAWING No.	23SM510304
MANUFACTURER	Jiangsu Shemar Electric Co., Ltd. No. 66 Haiwei Road 226 017 Nantong, Jiangsu, China
DATE OF DELIVERY	2023-05-19
DATE OF TESTS	From 2023-06-01 till 2023-08-18
ORDER No.	4530505010
TESTS WITNESSED BY	n/a
ANNEX	TestPolymer EU, test report No. 59/2022/EN

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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

Title	Drawing No.	See
138 kV Composite line insulator	23SM510304	Figure 1

2 TEST SUMMARY

TEST TITLE	TEST STANDARD	RESULT
Tests of interface and connection of fittings	**ANSI C29.12, clause 8.1** **ANSI C29.11, clause 7.1**	**Pass**
Visual inspection and dimensional check	ANSI C29.11, clause 7.1.1.1	Pass
Sudden load release test	ANSI C29.11, clause 7.1.3	Pass
Thermal mechanical test	ANSI C29.11, clause 7.1.4.1	Pass
Water penetration test	ANSI C29.11, clause 7.1.5	Pass
Linearly rising front chopped impulse voltage test	ANSI C29.11, clause 7.1.6.2	Pass
Low-frequency dry flashover test	ANSI C29.11, clause 7.1.6.3	Pass
Core time-load test	**ANSI C29.12, clause 8.2** **ANSI C29.11, clause 7.2**	**Pass**
Visual inspection and dimensional check	ANSI C29.11, clause 7.2.1.1	Pass
Determination of the average failing load of the core	ANSI C29.11, clause 7.2.1.2	Pass
Core time – load test	ANSI C29.11, clause 7.2.1.3	Pass
Flammability test [1)]	**ANSI C29.12, clause 8.5** **ANSI C29.11, clause 7.5**	**Pass**
Core material test	**ANSI C29.12, clause 8.4**	**Pass**
Water diffusion test	ANSI C29.12, clause 8.4.2 ANSI C29.11, clause 7.4.2	Pass
Dye penetration test	ANSI C29.12, clause 8.4.1 ANSI C29.11, clause 7.4.1	Pass

Explanatory notes for tests and standards:
[1)] The test was done in an external accredited laboratory

3 LIST OF SYMBOLS

Symbol	Description
k_d	Air density correction factor
k_h	Humidity correction factor
U_{pk}	The maximum voltage of impulse wave
T_0	Temperature of the shank before the dry power frequency withstand test
T_{30}	Temperature of the shank after the dry power frequency withstand test
T_1	Front time of impulse wave
SR	Steepness of impulse wave

4 TESTS PERFORMED

4.1 TESTS ON INTERFACES AND CONNECTIONS OF END FITTINGS

Tests were carried out according to ANSI C29.12, clause 8.1 and ANSI C29.11 clause 7.1.

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

Insulator No. 18, serial No. 2305096013

Insulator No. 19, serial No. 2305096008

Insulator No. 20, serial No. 2305096026

Insulator No. 21 Ref, serial No. 2305096033

4.1.1 Test specimens

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

Testing and measuring equipment:

- slide gauge 150 mm, Kinex CZ, serial No. KN2038
- tape measure 5 m, Assist, PM-291

Table 2 Test specimens

Sample No.	Type	Visual/dimensional check
18, 19, 20 – test samples 21Ref – reference sample	138 kV Composite line insulator	Pass

Evaluation:

Insulators were without damage and dimensions conform with the drawing.

4.1.2 Sudden load release

Tests were carried out according to ANSI C29.11, clause 7.1.3. This test was performed on insulators No. 18, 19 and 20 at temperatures of -20 °C to -25 °C. Each of tested insulators was subjected to five sudden load releases from a tensile load of 30% SML.

4.1.3 Thermal-mechanical test

Tests were carried out according to ANSI C29.11, clause 7.1.4.1.

Three insulators No. 18, 19 and 20 were subjected to a mechanical load of 5 % SML before and after thermal-mechanical pre-stress for the duration one minute, the reference total length was measured. Measured values are shown in Table 4.

Three insulators No. 18, 19 and 20 were subjected to a mechanical tensile load of 100% of RTL. Each insulator was subject to four 24-hours thermal cycles. Each 24-hour cycle started with one cooling period of -35 °C ± 5 °C, followed by one heating period of +50 °C ± 5°C.

Records of measured temperatures and mechanical load during the thermal-mechanical testing are given in Figure 3, Figure 4, Figure 5 and Figure 6. The test arrangement during the thermal-mechanical test on the insulator is shown in Figure 11.

4.1.4 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 0,1% by weight of NaCl. 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 (see Figure 12).

Testing and measuring equipment:

- loading measuring system Format 1, type EGU – 2V, Z201128288
- thermal mechanical chamber Horkan Klima, invertory No. 1089
- thermal mechanical chamber LaborTech, type Creep test 6.500.C3, serial No. ZA/2018/51
- digital thermometer – datalogger, Comet, serial No. 19270819
- digital thermometer – datalogger, Comet, serial No. 18931701
- conductivity meter, WTW, type Cond 3310, serial No. 12240282
- heating water vessel AKV2, No. 2420
- slide gauge 1 500 mm, Filetta, serial No. G10066

Table 3 Results of pre-stressing tests

Date	Test	Test parameters	Result
2023-06-27	Sudden load release	Tensile load: 33,3 kN (30% SML) Temperature: cold cycle from -20 °C to -25 °C	pass
2023-06-27 to 2023-07-01	Thermal-mechanical test	Tensile load: 56 kN (100% RTL) Temperature: cold cycle -35 °C ±5 °C hot cycle +50 °C ±5 °C	pass
2023-08-15 to 2023-08-17	Water penetration test	Duration: 42 hours	pass

Table 4 Measured samples length before and after thermal-mechanical test

Sample No.	18	19	20
Reference length before test (mm)	1371,5	1372,8	1371,1
Length after test (mm)	1371,5	1372,9	1371,1
The length increase shall be equal or less than 2 mm			

Evaluation:

No cracks and no signs of crumbling or dissolving were observed on test samples.

4.1.5 Verification Tests

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

4.1.5.1 Visual examination

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

Table 5 Results of visual examination

Date	Sample No.	Result
2023-08-18	18, 19, 20	No cracks found

Evaluation:

No cracks were observed on test samples.

4.1.5.2 Linearly rising front chopped impulse voltage test

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

The test voltage - an impulse with a steepness of at least 1000 kV/µs - was applied 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)
- electrode made of a copper strip 20 mm wide and an electrode 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 13. Representative example of the wave shape of the test impulse is given in Figure 2.

Testing and measuring equipment:

– impulse generator TuR Dresden 750 kV, 30 kJ
– divider Haefely R800, serial No. 554333
– measuring system Haefely Trench, type HiAS 743, serial No. 175247
– measuring system for atmospheric condition Comet, serial No. 19910190
– tape measure 7,5 m, Assist, PM-292

Table 6 Linearly rising front chopped impulse voltage test conditions

Date	Pressure (inHg)	Temperature (°F)	Rel. humidity (%)
2023-08-18	29,18	84,2	39,2

Table 7 Results of the linearly rising front chopped impulse voltage test

Sample No.	No. of impulses		Result
	+ polarity	- polarity	
18 (upper section)	25	25	No puncture
18 (middle section)	25	25	No puncture
18 (bottom section)	25	25	No puncture
19 (upper section)	25	25	No puncture
19 (middle section)	25	25	No puncture
19 (bottom section)	25	25	No puncture
20 (upper section)	25	25	No puncture
20 (middle section)	25	25	No puncture
20 (bottom section)	25	25	No puncture

Evaluation:

No puncture of any part of the insulator occurred.

4.1.5.3 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).

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 (at five locations distributed approximately evenly along the length of the insulators) of each sample was measured again and compared to ambient temperature.

The test arrangement and the flashover on the insulator are shown in Figure 14.

Testing and measuring equipment:

- resonant AC source Evergreen, MSR600-1200, serial No. 2001042-EGU
- capacitive divider Evergreen, HCC600-2, serial No. 200104-EGU
- universal voltmeter Haefely DMI 551, serial No. 188856
- digital stop-watch Fastime, PM-251
- measuring system for atmospheric condition Comet, serial No. 14900363
- digital thermometer Fluke 54 IIB, serial No. 41070290WS + touch probe 80PK-27
- tape measure 7,5 m, Assist, PM-292

Table 8 Low-frequency dry flashover voltage test conditions

Date	Pressure (inHg)	Temperature (°F)	Rel. humidity (%)	Arc. distance (m)
2023-03-13	29,15	80,1	57,4	1,32

Table 9 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
21Ref	496; 498; 496; 501; 500	498	514	0,969	1,000
18	490; 500; 496; 498; 496	496	512	0,969	1,000
19	480; 485; 499; 491; 497	491	507	0,969	1,000
20	497; 496; 498; 498; 497	497	513	0,969	1,000
90 % of reference flashover voltage (corrected to std. atm. conditions): 0,9 x 514 kV = 463 kV					

Table 10 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)		
21Ref	398	26,9; 26,9; 27,0; 26,9; 26,9	27,7; 27,7; 27,8; 27,9; 27,8	< 10	Pass
18	398	27,0; 27,0; 26,9; 26,6; 26,6	27,9; 27,9; 27,7; 27,9; 28,0	< 10	Pass
19	398	27,1; 27,0; 26,9; 26,7; 26,6	28,3; 28,3; 27,9; 27,9; 27,8	< 10	Pass
20	398	27,1; 27,0; 27,0; 26,8; 26,9	28,5; 28,5; 27,9; 27,8; 27,9	< 10	Pass
80 % of reference flashover voltage 0,8 x 514 kV = 411 kV (corrected to std. atm. conditions) i.e. 398 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 was not more than 20 °C above the ambient temperature.

Statement of conformity:

138 kV Composite line insulator, type 138 kV / 111 kN, drawing No. 23SM510304 passed the tests according to requirements given in ANSI C29.12, clause 8.1 and ANSI C29.11, clause 7.1.

4.2 CORE TIME-LOAD TESTS

Tests were carried out according to ANSI C29.12, clause 8.2 and ANSI C29.11, clause 7.2.

4.2.1 Test specimens

The tests were performed on six insulator samples:

Insulator No. 6, serial No. 2305096038

Insulator No. 7, serial No. 2305096004

Insulator No. 8, serial No. 2305096015

Insulator No. 9, serial No. 2305096027

Insulator No. 10, serial No. 2305096042

Insulator No. 11, serial No. 2305096024

The insulators were examined visually, and their dimensions were checked against the manufacturer's drawing (see Figure 1) according to ANSI C29.11, clause 7.2.1.1.

Testing and measuring equipment:

- slide gauge 150 mm, Kinex CZ, serial No. KN2038
- tape measure 5 m, Assist, PM-291

Table 11 Test specimens

Sample No.	Type	Visual/dimensional check
6, 7, 8, 9, 10, 11	138 kV Composite line insulator	Pass

Evaluation:

Insulators were without damage and dimensions conform with the drawing.

4.2.2 Determination of the average failing load of the core

Test was carried out according to ANSI C29.11, clause 7.2.1.2. Three insulators No. 6, 7 and 8 were subjected to tensile load applied between couplings. The tensile load was increased rapidly but smoothly from zero to approximately 75 % of expected mechanical failing load and then gradually increased in a time between 30 s to 90 s until breakage of the core or complete pull-out occurs (see Figure 15, Figure 16, Figure 17 and Figure 18). The average of the three failing loads was calculated.

Records of measured mechanical loading during the mechanical failing tests are given in Figure 7, Figure 8 and Figure 9.

Testing and measuring equipment:

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

Table 12 Results of the determination of the failing load

Test date: 2023-06-12		
Sample No.	**Type of failure**	**Failing load**
6	Pull out of the core from the end fitting	168,5 kN
7	Pull out of the core from the end fitting	146,8 kN
8	Pull out of the core from the end fitting	162,2 kN
	Average of the failing load M_{AV}	159,2 kN
	60 % of M_{AV}	**95,5 kN**

4.2.3 Core time-load test

Test was carried out according to ANSI C29.11, clause 7.2.1.3. Three insulators No. 9, 10 and 11 were subjected to a tensile load applied between couplings. The tensile load was increased rapidly but smoothly, from zero up to 60 % of the average failing load and then maintained at this value for 96 hours.

Record of mechanical loading applied during mechanical 96 hours tests are given in Figure 10.

Test samples during the mechanical 96 hours load test are shown in Figure 19.

Testing and measuring equipment:

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

Table 13 Results of the core time-load test

Test date: from 2023-06-12 to 2023-06-16		
Sample No.	**Tensile load**	**Test result**
9	95,5 kN / 96 hours	No failure occurred during the 96 hours withstand load test
10	95,5 kN / 96 hours	No failure occurred during the 96 hours withstand load test
11	95,5 kN / 96 hours	No failure occurred during the 96 hours withstand load test

Evaluation:

No failure (breakage or complete pull-out of the core or fracture of the metal fittings) occurred during the 96 hours withstand load test.

Statement of conformity:

138 kV Composite line insulator, type 138 kV / 111 kN, drawing No. 23SM510304 passed the test according to requirements given in ANSI C29.12, clause 8.2 and ANSI C29.11, clause 7.2.

4.3 FLAMMABILITY TEST [1)]

Table 14 Specification of the silicone material

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

NOTE: The specification of silicone material was provided by customer

The test was performed according to ANSI C29.12, clause 8.5 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 TestPolymer EU, test report No. 59/2022/EN.

Evaluation:

Samples fulfil requirements for horizontal and vertical burning classification HB, V-0, V-1, and V-2.

Statement of conformity:

The specimens of HTV silicone material, passed the test according to requirements given in ANSI C29.12, clause 8.5 and ANSI C29.11, clause 7.5.

4.4 CORE MATERIAL TEST

4.4.1 Dye penetration test

The test was carried out according to ANSI C29.12, clause 8.4.1 and ANSI C29.11, clause 7.4.1.

Ten test specimens of 10 mm ± 0,5 mm in length were cut from 138 kV Composite line insulator.

The test specimens were placed (with fibers in vertical position) on a layer of glass balls (diameter 2 mm) in a glass vessel. A dye (1 % methyl alcohol solution of astrazon) was poured into the vessel, with its level was 2,5 mm above the glass balls. The time taken for the dye to rise (by capillary action) through the specimens was measured. Photo of test specimens after the dye penetration test is in Figure 20.

Testing and measuring equipment:

- digital stop-watch Kalenji PM-260
- slide gauge 150 mm, Kinex CZ, serial No. KN2038

Table 15 Results of the dye penetration test

Date	Duration (min)	Result
2023-06-01	15	No dye penetration

Evaluation:

There were no traces of dye penetration through the insulator core after 15 minutes.

Statement of conformity:

Specimens of rod diameter 18 mm from 138 kV Composite line insulator, drawing No. 23SM510304 passed the test according to requirements given in ANSI C29.12, clause 8.4.1 and ANSI C29.11, clause 7.4.1.

4.4.2 Water diffusion test

The test was carried out according to ANSI C29.12, clause 8.4.2 and ANSI C29.11, clause 7.4.2.

Six test specimens of 30 mm ± 0,5 mm in length were cut from 138 kV Composite line insulator.

The surfaces of the samples were cleaned with isopropyl-alcohol and filter-paper immediately before the boiling. The samples were boiled in a glass container for 100 hours in de-ionized water with 0,1 % by weight of NaCl.

After boiling, the samples were removed from the glass container and placed in another glass container filled with tap water at ambient temperature for 15 minutes. The voltage test was carried out within the next three hours.

Immediately before the voltage test the samples were removed from the glass container and their surfaces dried with filter paper. Each specimen was placed between the test electrodes. The test voltage was increased at rate of approximately 1 kV/sec up to 12 kV, kept at this level for one minute and then decreased to zero (see Figure 22).

Testing and measuring equipment:

- slide gauge 150 mm, Kinex, serial no. KN2038
- voltage source HVI 30kV, type HPA-305FC1, serial No. 006 + analog panel meters model 553
- multimeter UNIT UT71D, serial No. 1100420241
- digital stop-watch Kalenji PM-259
- weight Sartorius, type S210P, serial No. 39010002
- measuring cylinder 1000 ml, identification No. PM-243/ČMI19
- heating water vessel, type LTHS 4000, serial No. 18102

Test date: from 2023-06-01 till 2023-06-05

Table 16 Results of the water diffusion test

Sample No.	Test voltage (KV)	Leakage current (μA)	Duration (sec)	Result
1	12	17,6	60	pass
2	12	18,3	60	pass
3	12	16,7	60	pass
4	12	17,2	60	pass
5	12	17,6	60	pass
6	12	16,4	60	pass
Max. allowed leakage current ≤ 1000 μA				

Evaluation:

No puncture or external flashover occurred. The leakage current did not exceed maximum allowable current of 1 mA (r.m.s.).

Statement of conformity:

Samples of rod diameter 18 mm from 138 kV Composite line insulator, drawing No. 23SM510304 passed the test according to requirements given in ANSI C29.12, clause 8.4.2 and ANSI C29.11, clause 7.4.2.

5 UNCERTAINTY OF MEASUREMENTS

Quantity		Uncertainty (k = 2)
Steep-front impulse voltage	U_{pk}	2,2 %
	T_1	6,5 %
Power-frequency current (Unit UT71D)		1,8 %
Power-frequency voltage (analog panel meters model 553)		0,3 kV
Power-frequency voltage (HCC600-2)		1,2 %
Mechanical load (LabTest 5.600SP1)		1,0 %
Mechanical load (Creep test 6.500.C3)		1,0 %
Mechanical load (Format 1)		1,3 %
Temperature (Fluke 54 IIB)		7,5 %
Temperature (datalogger Comet)		3,0 %
Weight (Sartorius)		0,5 %
Atmospheric pressure		0,5 %
Air temperature		4,0 %
Relative humidity		6,3 %
Time		0,7 %
Conductivity (0,1 μS/cm –1 000 mS/cm)		5,0 %
Slide gauge 150 mm		0,4 %
Slide gauge 1 500 mm		0,8 %
Measuring cylinder 1 000 ml		10,0 ml
Length – tape measure (10–5 000 mm)		1,6 %
Length – tape measure (10–7 500 mm)		1,6 %

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: PASS – results are within limits or meet a given specification, FAIL – 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

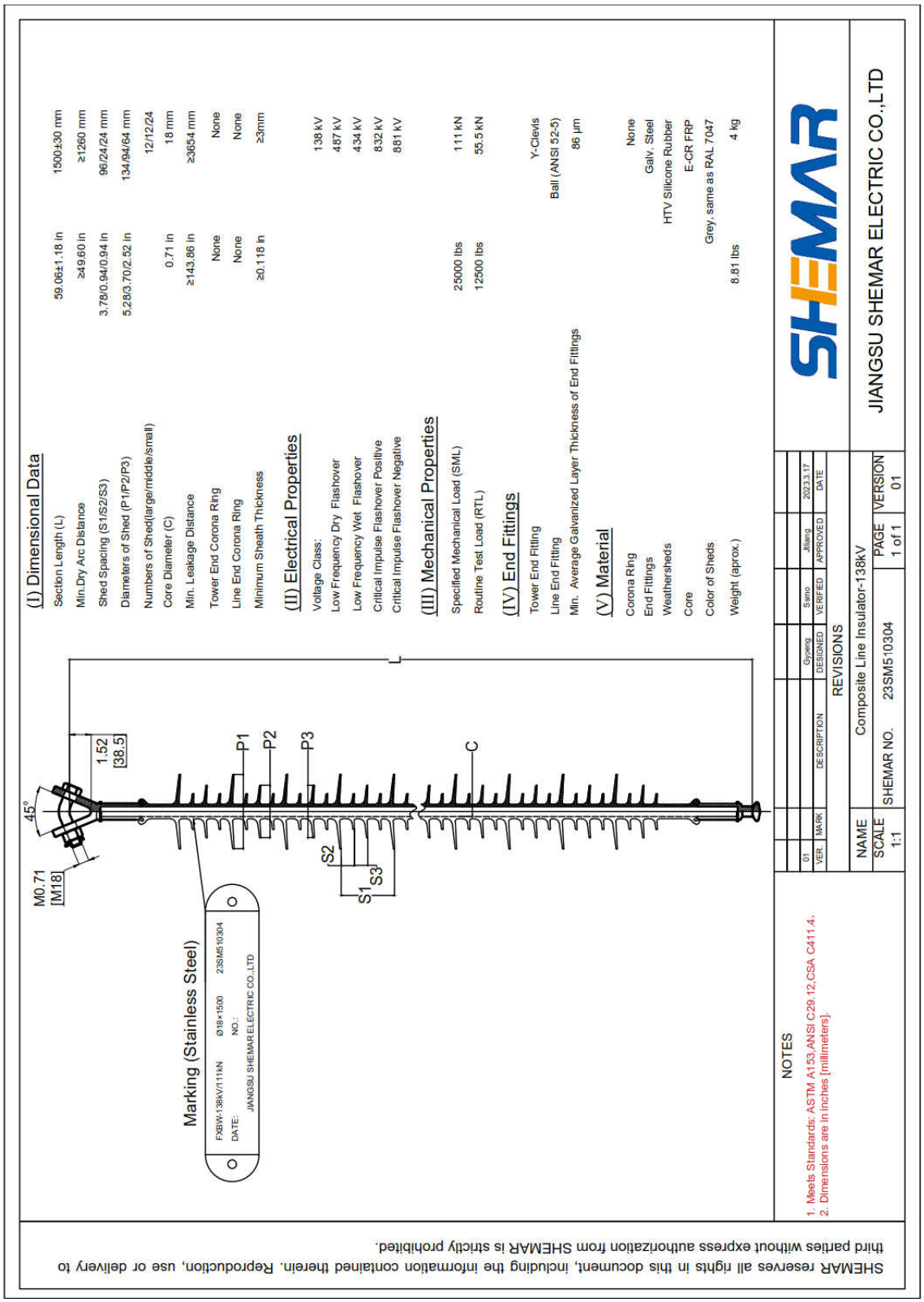

Figure 1 138 kV Composite line insulator, type 138 kV / 111 kN, drawing No. 23SM510304

7 GRAPHS AND RECORDS

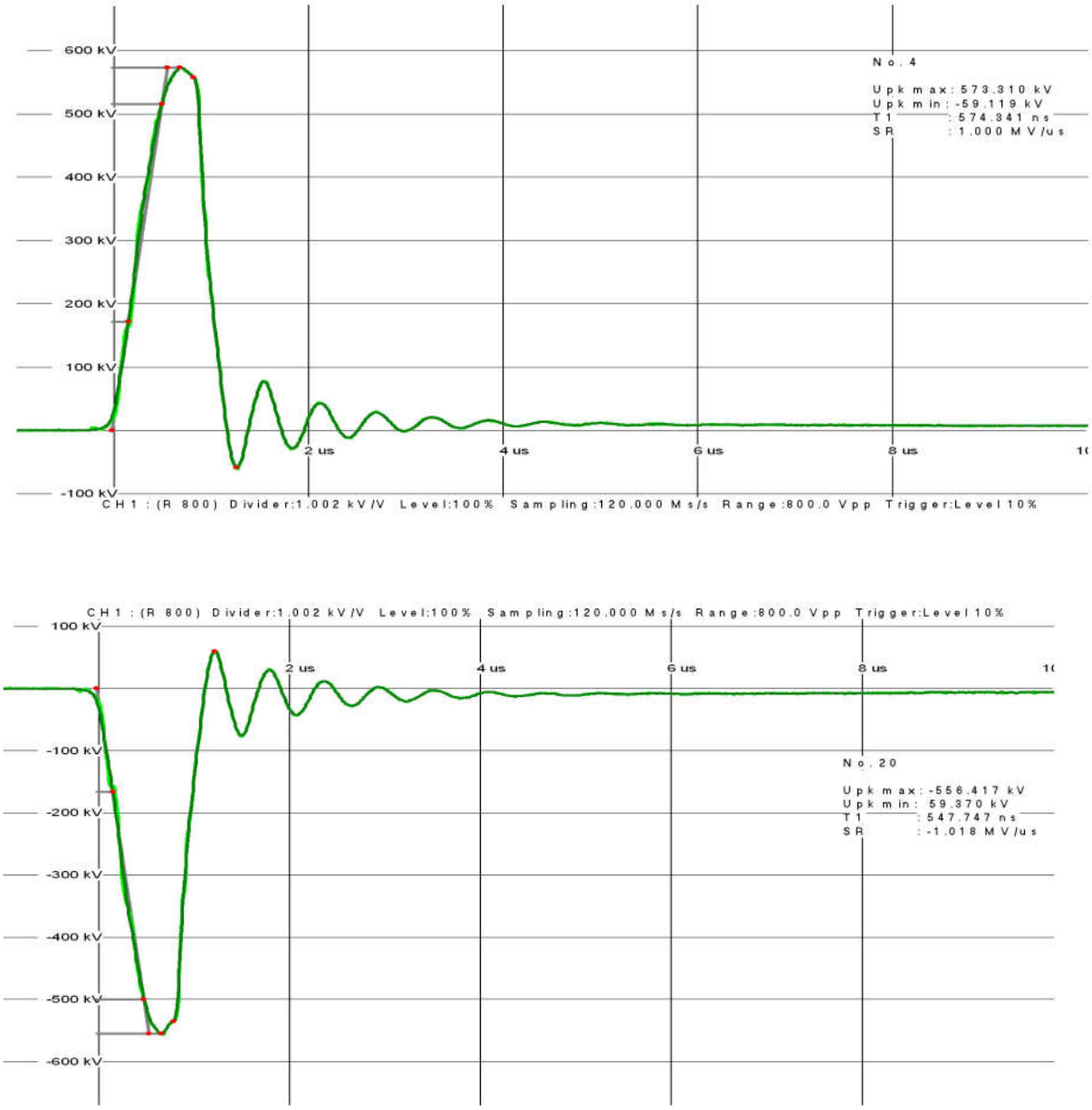

Figure 2 Representative wave shape of the linearly front chopped impulse

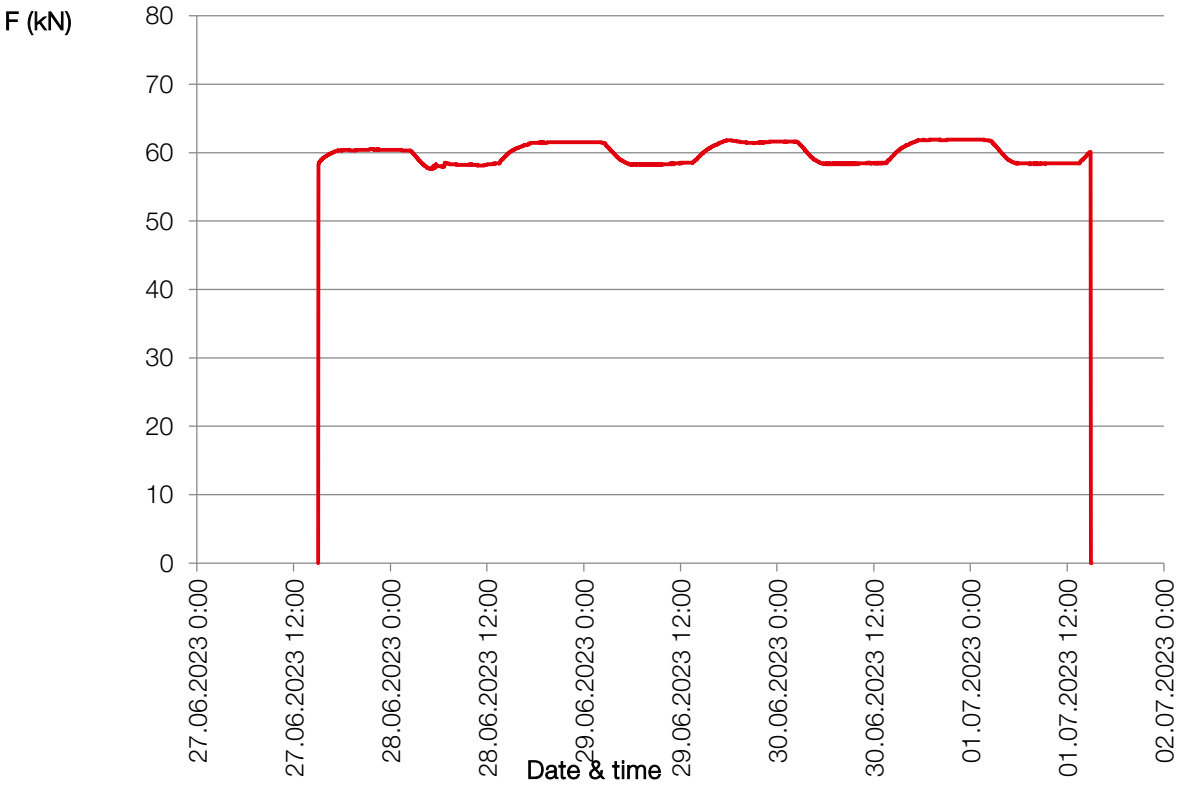

Figure 3 Record of tensile load during thermal-mechanical cycles, test samples No. 3

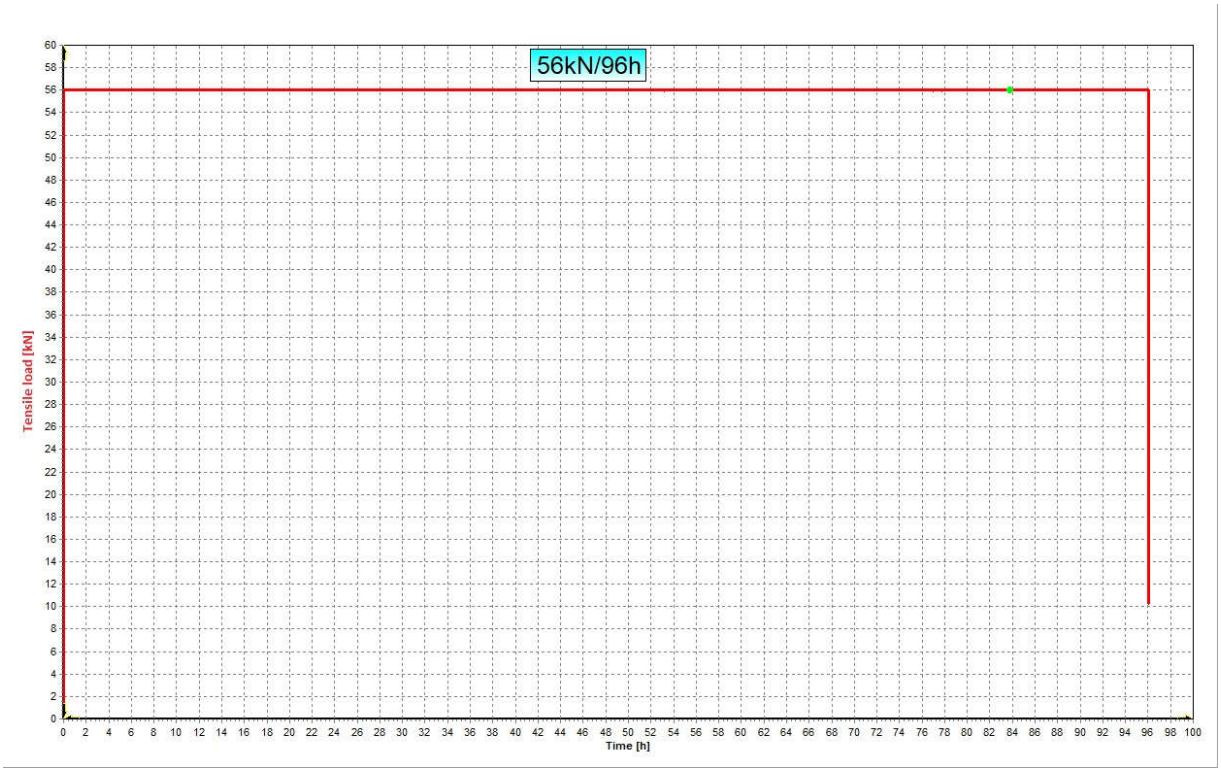

Figure 4 Record of tensile load during thermal-mechanical cycles, test samples No. 1 and 2

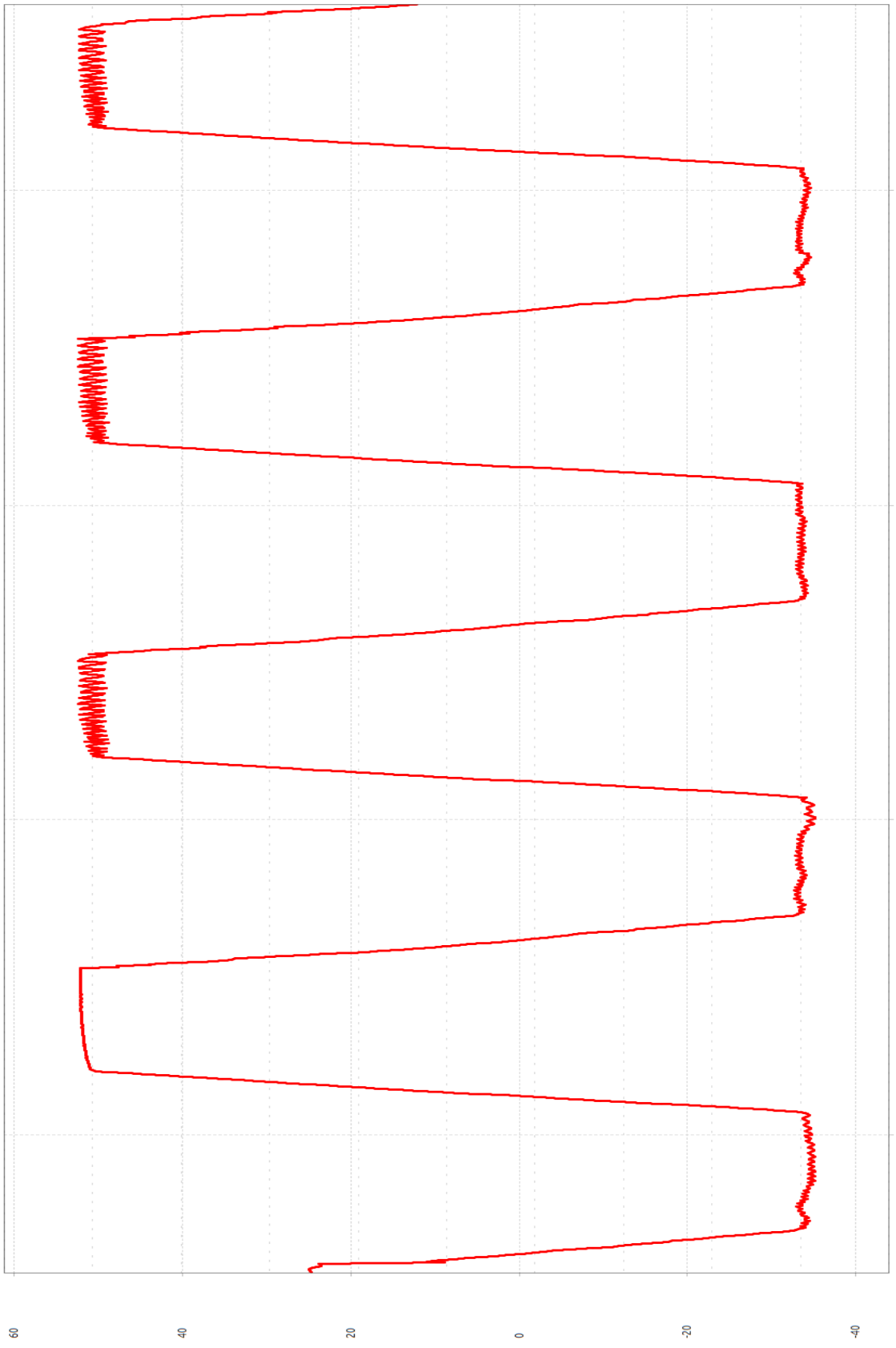

Figure 5 Record of temperature during thermal-mechanical cycles, test sample No. 3

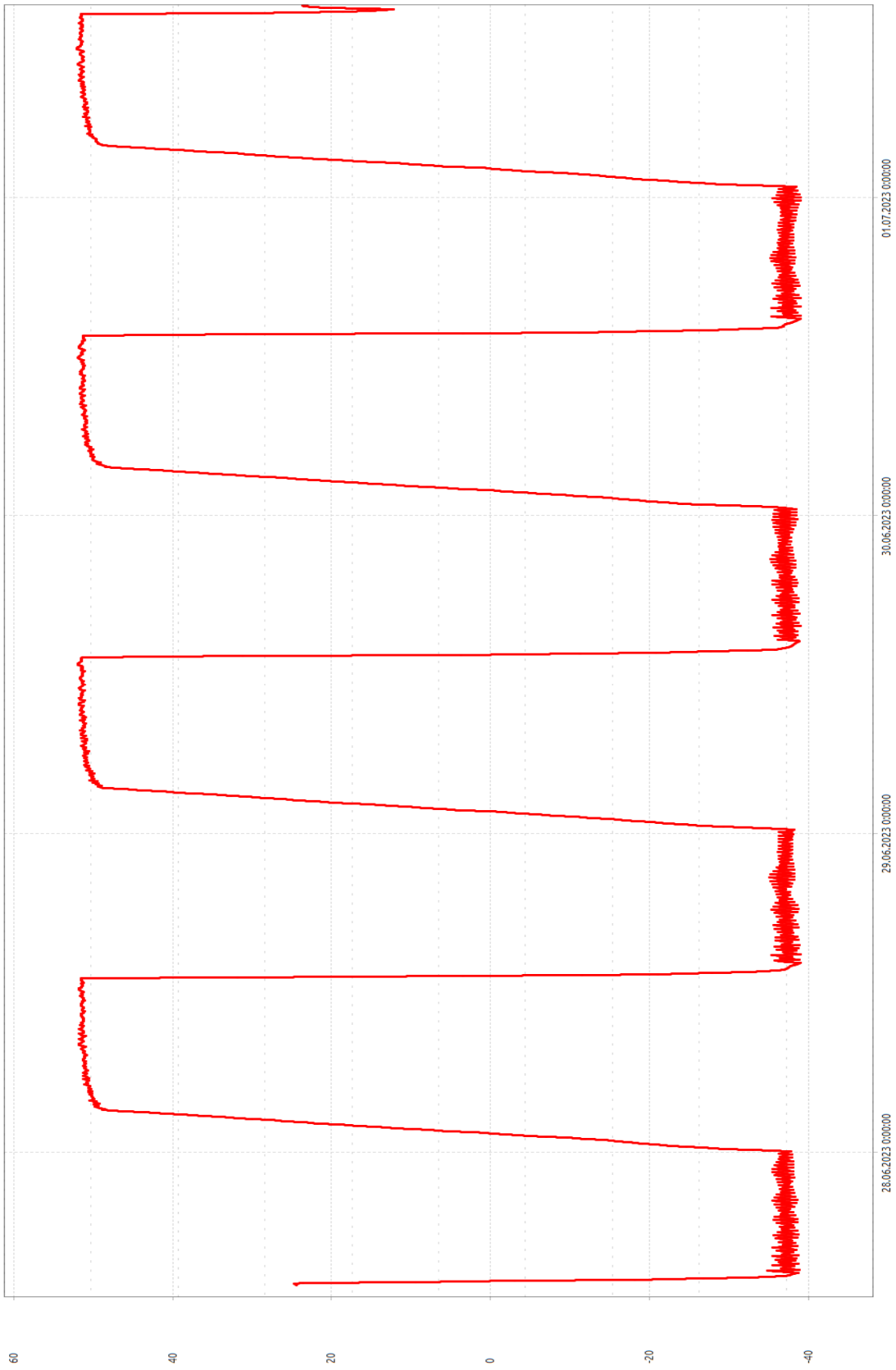

Figure 6 Record of temperature during thermal-mechanical cycles, test samples No. 1 and 2

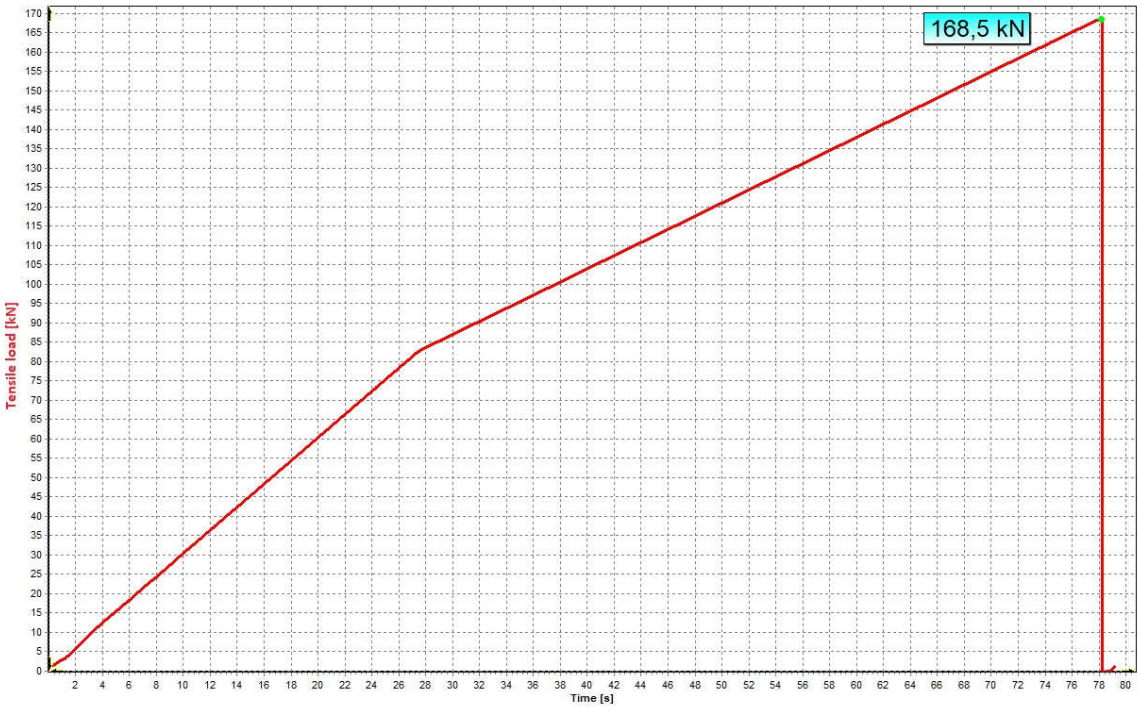

Figure 7 Record of mechanical failing test, test sample No. 6

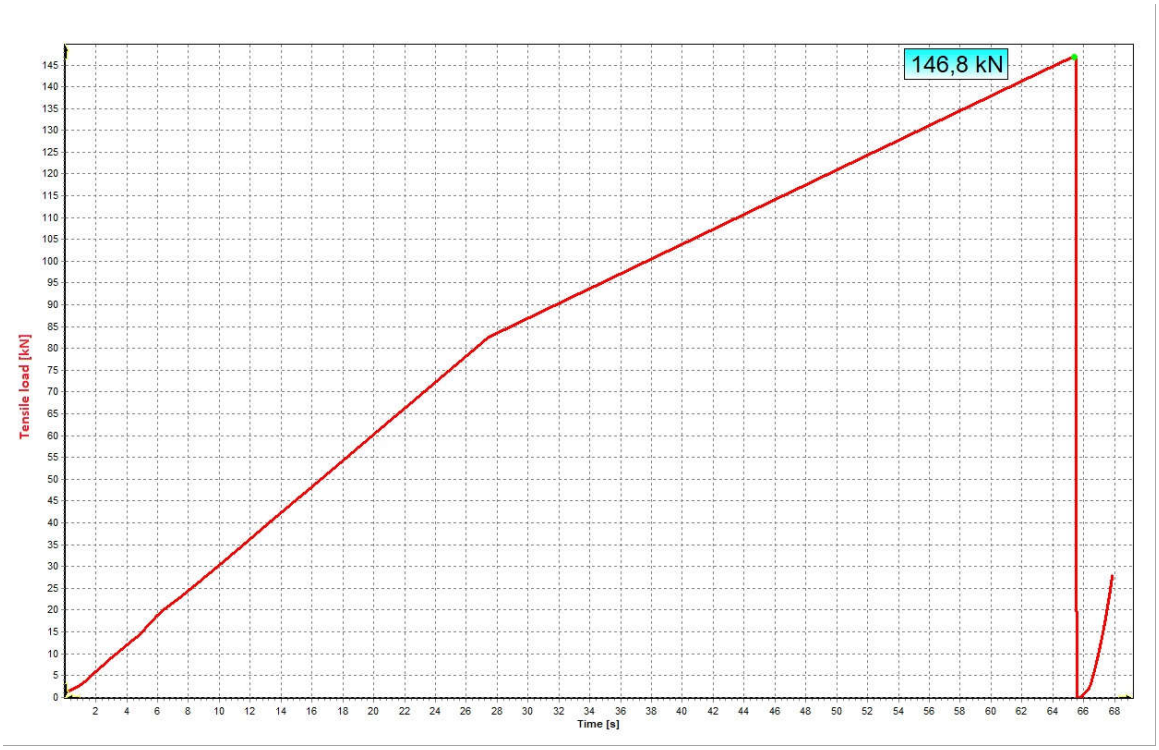

Figure 8 Record of mechanical failing test, test sample No. 7

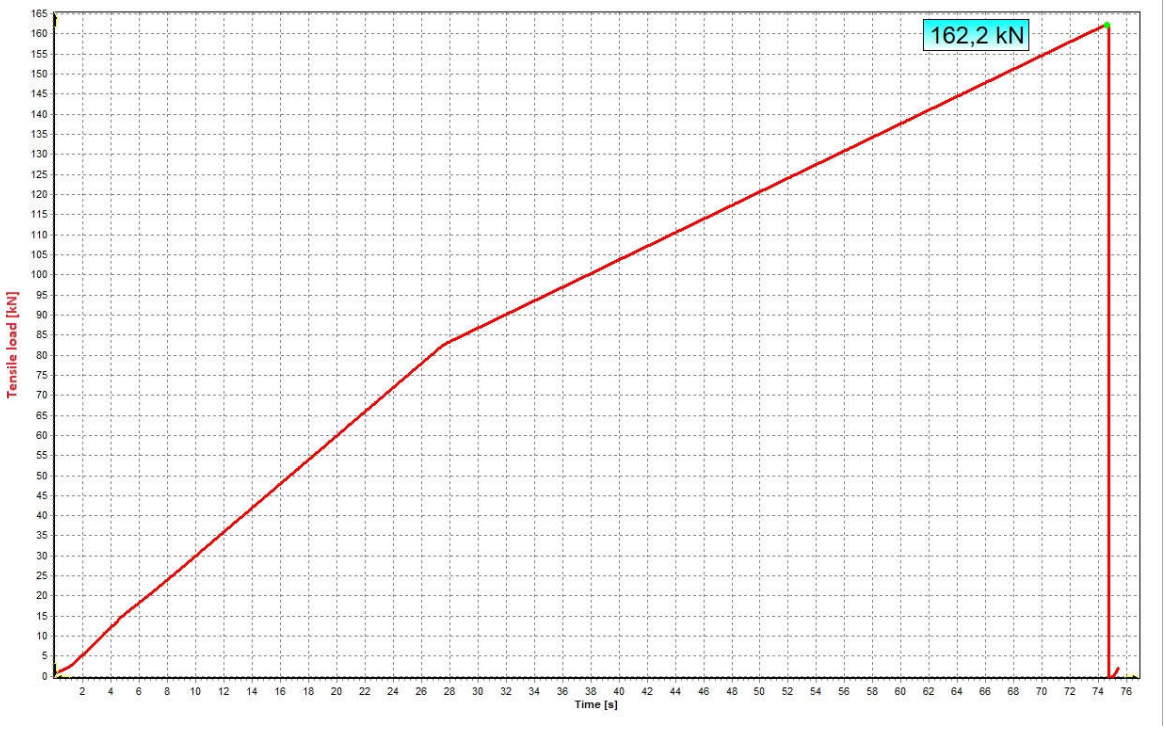

Figure 9 Record of mechanical failing test, test sample No. 8

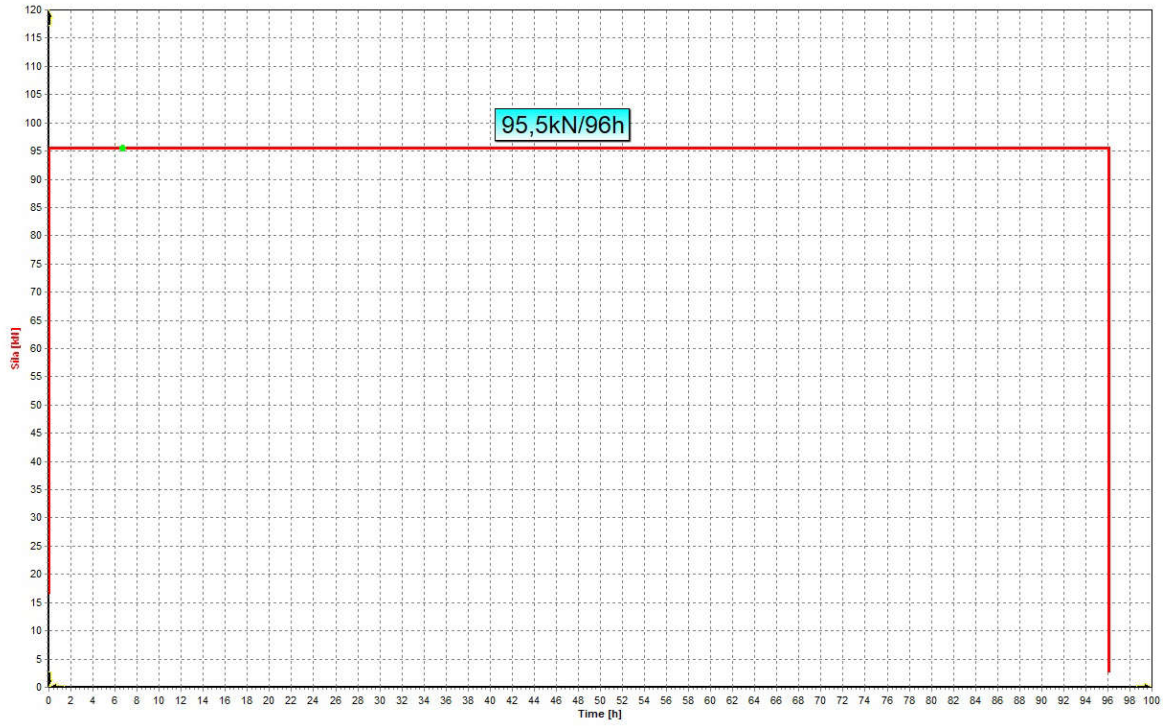

Figure 10 Record of mechanical withstand load test, test samples No. 9, 10 and 11

8 TEST OBJECT AND TEST SETUP PHOTOS

Figure 11 Test samples during thermal mechanical test

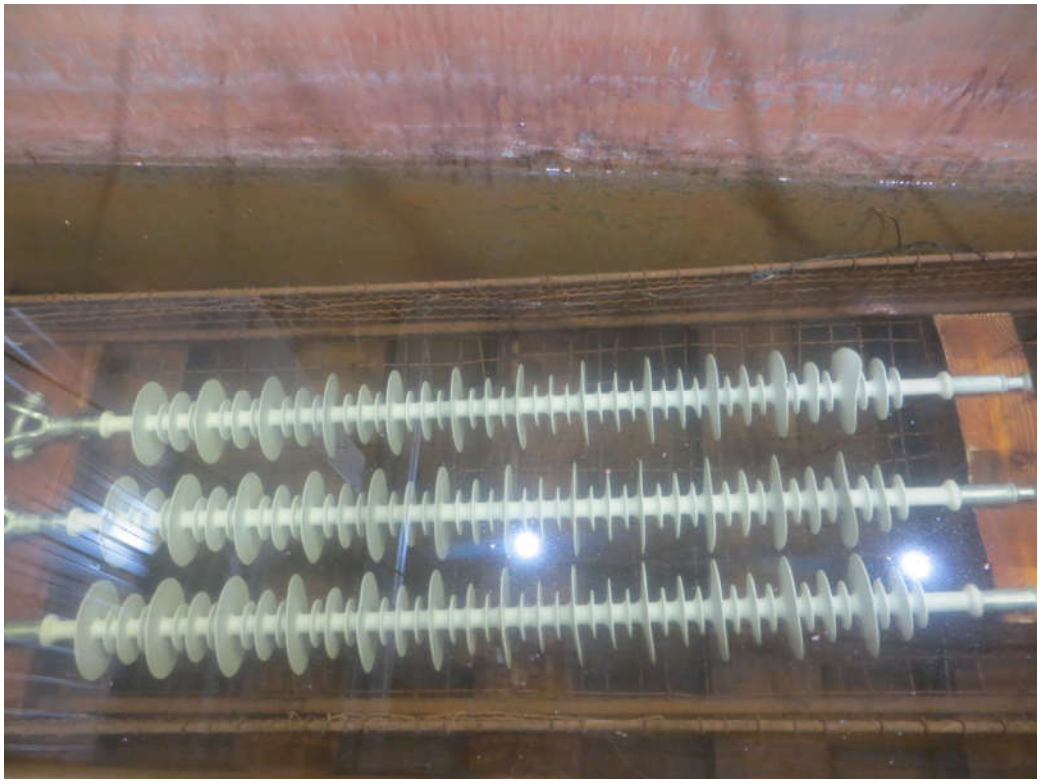

Figure 12 Test samples during water penetration test

Figure 13 Test sample during the linearly rising front chopped impulse voltage test

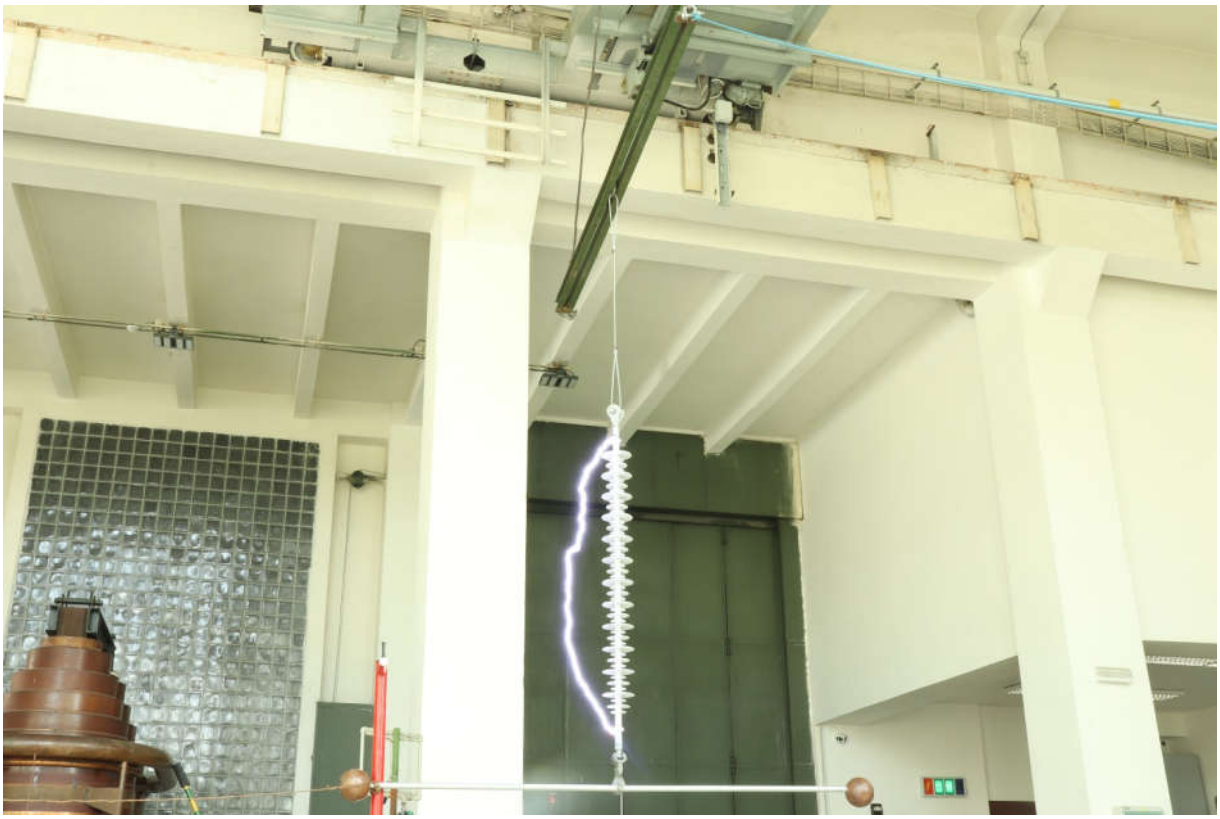

Figure 14 Test sample during the low-frequency dry flashover voltage test

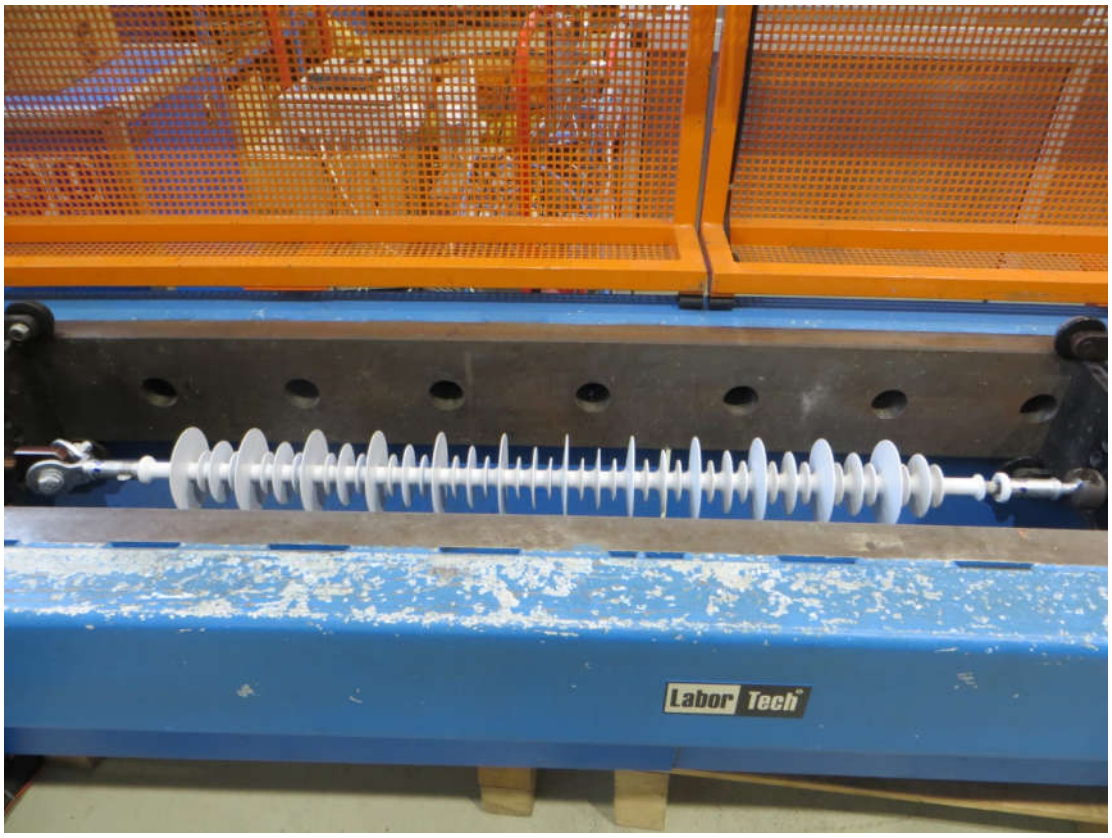

Figure 15 Mechanical failing load test, test sample No. 6

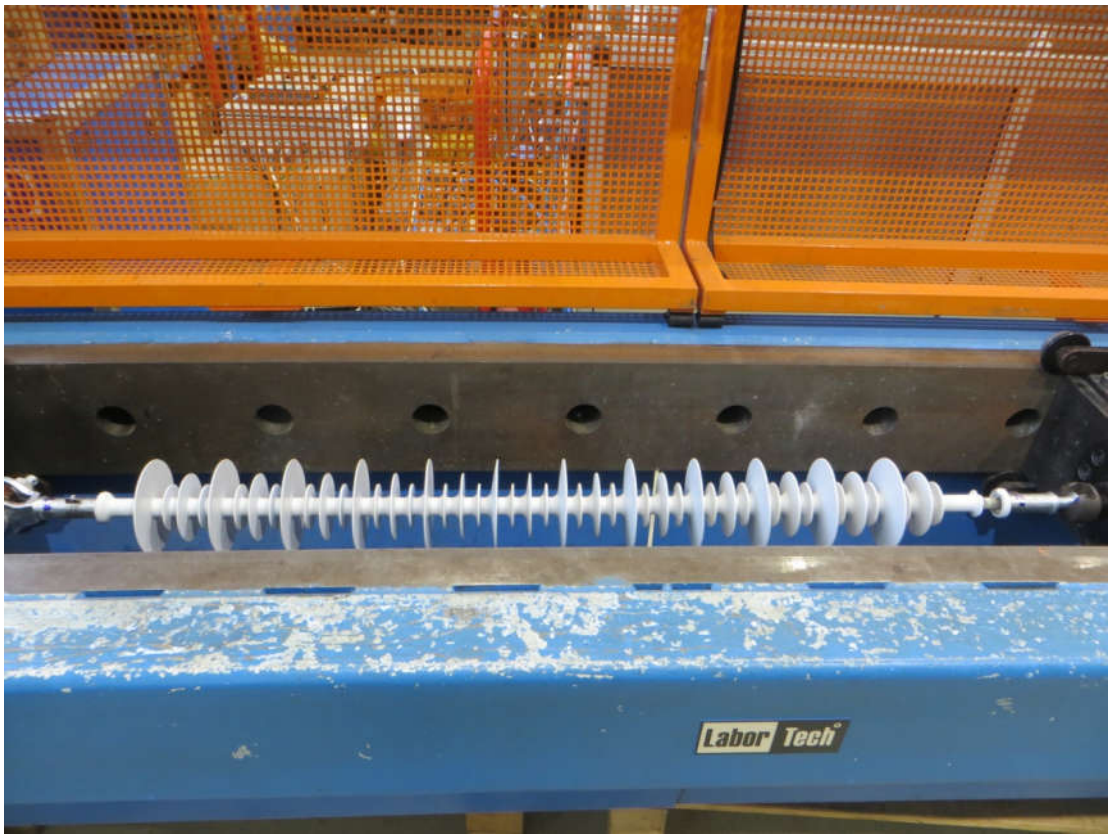

Figure 16 Mechanical failing load test, test sample No. 7

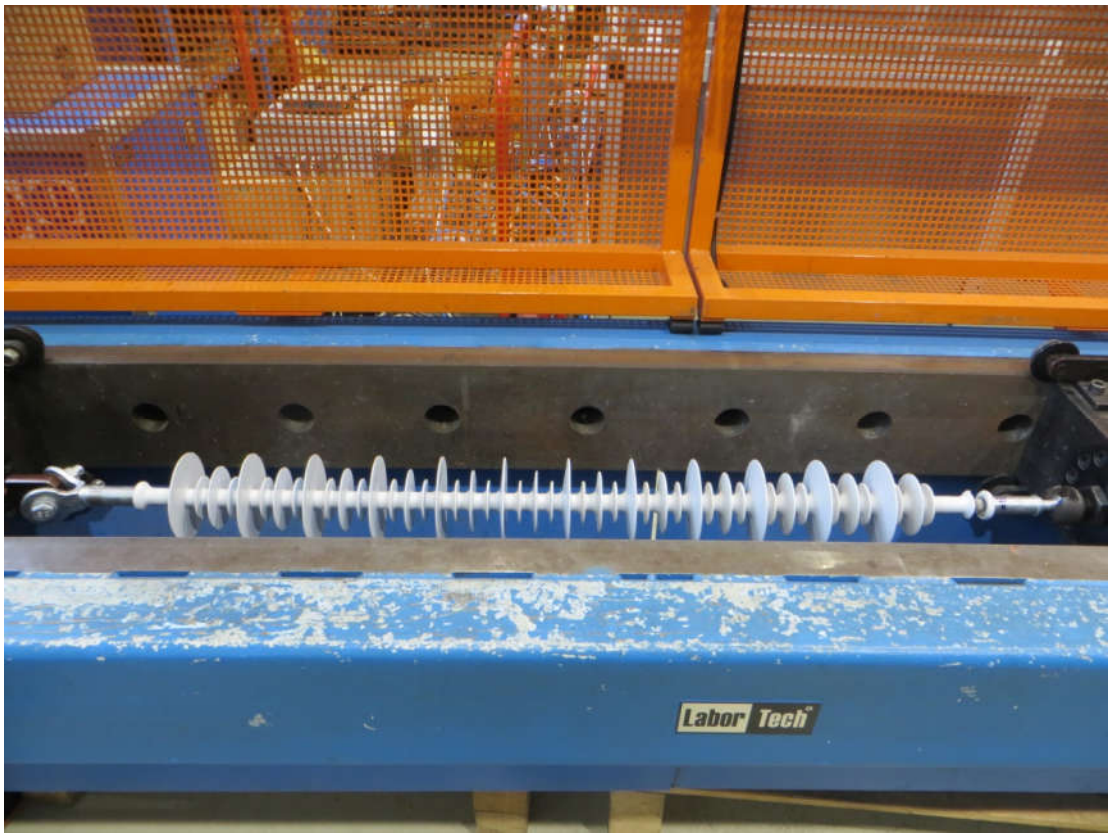

Figure 17 Mechanical failing load test, test sample No. 8

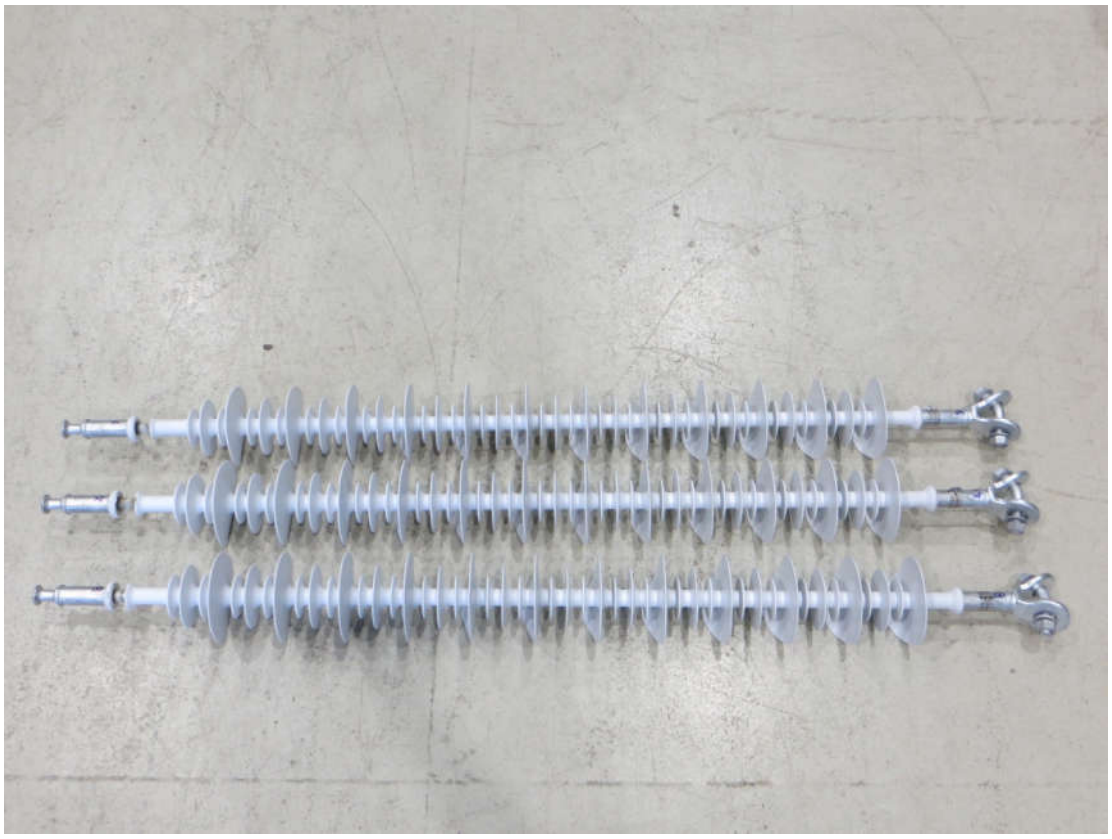

Figure 18 Test samples No. 6, 7 and 8 after mechanical failing load test

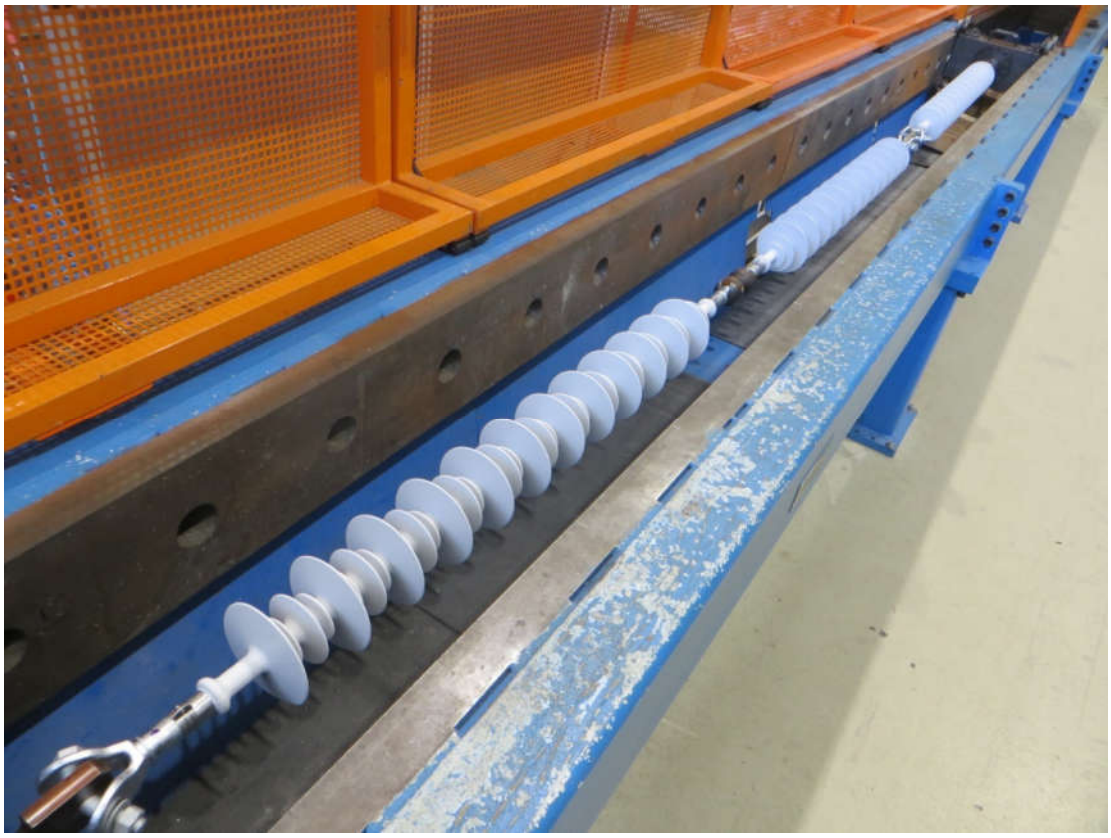

Figure 19 Withstand tensile load test, test samples No. 9, 10 and 11

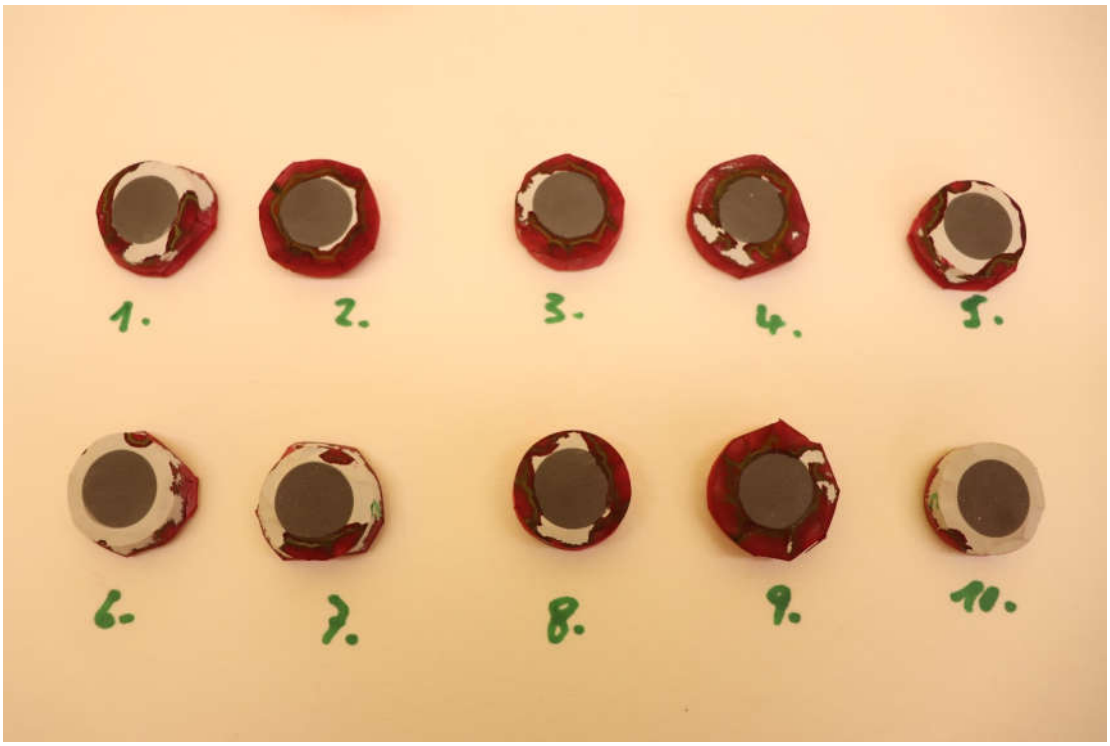

Figure 20 Test specimens after dye penetration test

Figure 21 Test specimens, water diffusion test

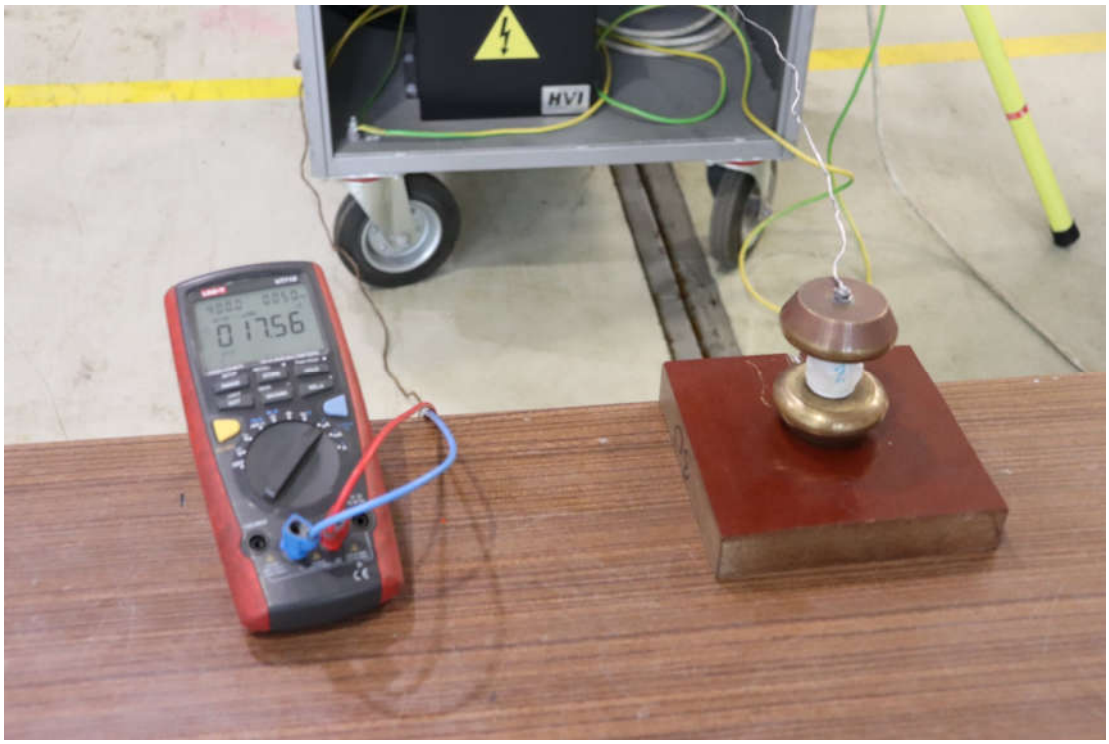

Figure 22 Test specimens during the voltage test (water diffusion test)

– end of the test report –

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TEST REPORT 12206/A/23

ACCREDITED TESTING LABORATORY EGU HV Laboratory No. 1029 CZECH REPUBLIC

CUSTOMER	Jiangsu Shemar Electric Co., Ltd. No. 66 Haiwei Road 226 017 Nantong, Jiangsu China
TEST OBJECT	138 kV Composite line insulator
TYPE SPECIFICATION	138 kV / 111 kN
SHEMAR IDENTIFICATION No.	n/a
TEST STANDARDS	ANSI C29.12-2020, ANSI C29.11-2020, NEMA 107:2016, IEEE Std 4:2013
NUMBER OF COPY	1
NUMBER OF PAGES	19
DATE OF ISSUE	2023-11-09

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TEST REPORT 12206/A/23

TEST OBJECT	138 kV Composite line insulator
TYPE SPECIFICATION	138 kV / 111 kN
DRAWING No.	23SM510304
MANUFACTURER	Jiangsu Shemar Electric Co., Ltd. No. 66 Haiwei Road 226 017 Nantong, Jiangsu, China
DATE OF DELIVERY	2023-05-19
DATE OF TESTS	From 2023-06-19 to 2023-07-31
ORDER No.	4530505010
TESTS WITNESSED BY	N/A
ANNEX	N/A

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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

Title	Drawing No.	See
138 kV Composite line insulator	23SM510304	Figure 1

2 TEST SUMMARY

Test title	Test standard	Result
Radio – influence voltage	ANSI C29.12, clause 9.4	Pass
Critical impulse flashover tests – positive and negative	ANSI C29.12, clause 9.3	Pass
Low - frequency wet flashover test	ANSI C29.12, clause 9.2	Pass
Low - frequency dry flashover test	ANSI C29.12, clause 9.1	Pass

3 LIST OF SYMBOLS

Symbol	Description
RIV	Radio influence voltage (μV)
U_p	The maximum voltage of impulse wave (kV)
T_1	Front time of impulse wave (μs)
T_2	Time to half-value of impulse wave (μs)

4 TESTS PERFORMED

4.1 RADIO – INFLUENCE VOLTAGE TEST

4.1.1 Test procedure

The test was carried out according to ANSI C29.12, clause 9.4, ANSI C29.11, clause 8.2.8 and customer requirements.

The test was carried out on one insulator No. 12, serial No. 2305096037.

Radio influence voltage RIV was measured according to NEMA 107. RIV (expressed in decibels relative to 1 μV 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.

Measured RIV values are shown in Table 1.

The test arrangement was set up according to ANSI C29.11, clause 8.2.8.1 and customer requirements (see Figure 3). The single conductor was simulated by tube with a diameter 30 mm. Length of the tube was 8 m. Both ends of the tube were terminated with corona shielding spheres (screening electrode) with a diameter of 300 mm. Conductor was at a height of 4,0 m above the ground.

Testing and measuring equipment:

- 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, type DMI 551, serial No. 150505
- coupling capacitance, 1 000 pF, 800 kV, serial No. 11100108.10.1
- measuring receiver Power Diagnostix, type RIV meter, serial No. 035
- calibrator Power Diagnostix, type CAL3B, serial No. 3014
- impedance Power Diagnostix, type CIT4M/V8μ0/RIV, serial No. 12533
- measuring system for atmospheric condition COMET, serial No. 10910247
- measuring telescopic stick 5 m, type BMI, serial No. 102

4.1.2 Test results

Table 2 Results of the radio – influence voltage test

Date of the test: 2023-07-31			
Atm. conditions			
pressure (inHg)			29,06
temperature (°F)			73,8
rel. humidity (%)			49,7
Test voltage (kV)	**Radio - influence voltage (µV)**		
	1st run ↓	**2nd run ↑**	**3rd run ↓**
162	22 387	15 849	19 953
147	251	316	251
134	71	71	71
122	56	56	56
111	32	32	32
101	10	10	10
92	**10**	**10**	**10**
83	10	10	10
74	10	10	10
65	10	10	10
|	|	|	|
0	–	–	10
Measuring frequency:	1,0 MHz	Circuit correction factor:	0,42
Criteria: RIV at 92 kV ≤ 100 µV (115 % of nominal line – to – ground voltage, 1,15 × 138/√3 =92 kV) maximum voltage for equipment U_m = 138 kV			

Evaluation:

Measured RIV at 92 kV (115 % of nominal line – to – ground voltage, 1,15 × 138/√3 =92 kV) is lower than the specified value of 100 µV.

Statement of conformity:

138 kV Composite line insulator, type 138 kV / 111 kN, drawing No. 23SM510304, passed the test according to requirements given in ANSI C29.12, clause 9.4.

4.2 CRITICAL IMPULSE FLASHOVER TESTS – POSITIVE AND NEGATIVE

4.2.1 Test procedure

The tests were carried out according to ANSI C29.12, clause 9.3 and ANSI C29.11, clause 8.2.6.

The test was carried out on one insulator No. 12, serial No. 2305096037.

The critical impulse voltage of positive and negative polarity was determined by the up and down method with 30 impulses according to ANSI C29.11, clause 8.2.6.4 and IEEE Std 4, clause 8.

All measured voltages were corrected to the standard reference atmospheric conditions according to ANSI C29.11, clause 8.2.6.6.

The wave shape of lightning-impulse 1,2/50 µs is given in Figure 2.

The test arrangement was set up according to ANSI C29.11, clause 8.2.6.2 and 8.1 (see Figure 4).

Testing and measuring equipment:

- impulse generator HighVolt IGL 180/1800G, serial No. IGG2295141
- capacitive/resistive divider, type MCR 0,4/2000-1000/1000 H391-41, serial No. MCR2295141/103732
- measuring system High Volt, type HiRES S4D, serial No. HIGG2295141
- measuring system for atmospheric condition COMET, serial No. 14900363
- tape measure, type 7,5 m, Assist, PM-241

4.2.2 Test results

Table 3 Results of the critical impulse flashover tests – positive and negative

Date of the test: 2023-06-19		
Atm. Conditions		
pressure (inHg)		29,09
temperature (°F)		72,7
rel. humidity (%)		52,8
Impulse polarity	**+**	**-**
Correction factors		
k_d air density correction	0,980	0,980
k_h humidity correction	1,042	1,035
min arcing distance (m)	1,32	1,32
Critical impulse flashover voltage	**831**	**880**
Critical impulse flashover voltage, positive polarity: 832 kV		
Critical impulse flashover voltage, negative polarity: 881 kV		

Evaluation:

Critical impulse flashover value of positive polarity was equal to or exceed 92% of the rated critical impulse flashover voltage specified by drawing 832 kV, i.e. 765 kV.

Critical impulse flashover value of negative polarity was equal to or exceed 92% of the rated critical impulse flashover voltage specified by drawing 881 kV, i.e. 811 kV.

Statement of conformity:

138 kV Composite line insulator, type 138 kV / 111 kN, drawing No. 23SM510304, passed the test according to requirements given in ANSI C29.12, clause 9.3.

4.3 LOW - FREQUENCY WET FLASHOVER TEST

4.3.1 Test procedure

The test was carried out according to ANSI C29.12, clause 9.2 and ANSI C29.11, clause 8.2.2.

The test was carried out on one insulator No. 12, serial No. 2305096037.

Characteristics of the artificial rain and precipitation method was in accordance with the ANSI C29.11, clause 8.2.2.2.

The low-frequency wet flashover test was performed according to ANSI C29.11, clause 8.2.2.4 and 8.2.2.5. 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 ANSI C29.11, clause 8.2.2.6.

The test arrangement was set up according to ANSI C29.11, clause 8.2.2.1 and 8.1.1 (see Figure 5)

Testing and measuring equipment:

- resonant AC source Evergreen, MSR600-1200, serial No. 2001042-EGU
- capacitive divider Evergreen, HCC600-2, serial No. 200104-EGU
- universal voltmeter Haefely DMI 551, serial No. 188856
- measuring system for atmospheric conditions Comet, serial No. 14900363
- tape measure, type 7,5 m, Assist, PM-292
- digital stopwatch Kalenji PM-259
- conductivity meter WTW Cond 3310, serial No. 12240282
- plastic measuring cylinder 50ml, identification No. 1/153/14 & 2/153/14

4.3.2 Test results

Table 4 Results of low - frequency wet flashover test

Date of the test: 2023-06-20	
Atm. conditions	
pressure (inHg)	29,09
temperature (°F)	74,1
rel. humidity (%)	66,2
Rain parameters	.
vertical components (mm/min)	4,8
water conductivity (µS/cm)	54
Correction factors for	
k_d air density correction	0,978
k_h humidity correction	1,000
min arcing distance (m)	1,32
Wet flashover voltage (kV)	**457**
Low - frequency wet flashover voltage: 434 kV	

Evaluation:

Low-frequency wet flashover value was equal to or exceed 90% of the rated wet flashover value specified by drawing 434 kV, i.e. 391 kV.

Statement of conformity:

138 kV Composite line insulator, type 138 kV / 111 kN, drawing No. 23SM510304, passed the test according to requirements given in ANSI C29.12, clause 9.2.

4.4 LOW - FREQUENCY DRY FLASHOVER TEST

4.4.1 Test procedure

The test was carried out according to ANSI C29.12, clause 9.1 and ANSI C29.11, clause 8.2.1.

The test was carried out on one insulator No. 12, serial No. 2305096037.

The low-frequency dry flashover test was performed according to ANSI C29.11, clause 8.2.1.3 and 8.2.1.4. 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 ANSI C29.11, clause 8.2.1.5.

The test arrangement was set up according to ANSI C29.11, clause 8.2.1.2 and 8.1.1 (see Figure 6).

Testing and measuring equipment:

- resonant AC source Evergreen, MSR600-1200, serial No. 2001042-EGU
- capacitive divider Evergreen, HCC600-2, serial No. 200104-EGU
- universal voltmeter Haefely DMI 551, serial No. 188856
- measuring system for atmospheric conditions Comet, serial No. 14900363
- tape measure, type 7,5 m, Assist, PM-292
- digital stopwatch Kalenji PM-259

4.4.2 Test results

Table 5 Results of low - frequency dry flashover test

Date of the test: 2023-06-20	
Atm. Conditions	
pressure (inHg)	29,09
temperature (°F)	72,3
rel. humidity (%)	56,6
Correction factors for	
k_d air density correction	0,981
k_h humidity correction	1,043
min arcing distance (m)	1,32
Dry flashover voltage (kV)	**527**
Low - frequency dry flashover voltage: 487 kV	

Evaluation:

Low-frequency wet flashover value was equal to or exceed 95% of the rated wet flashover value specified by drawing 487 kV, i.e. 463 kV.

Statement of conformity:

138 kV Composite line insulator, type 138 kV / 111 kN, drawing No. 23SM510304, passed the test according to ANSI C29.12, clause 9.1.

5 UNCERTAINTY OF MEASUREMENTS

Quantity		Uncertainty (k = 2)
Lightning impulse voltage	U_{pk}	1,7 %
	T_1	8,0 %
	T_2	3,1 %
Power-frequency voltage (HCC600-2)		1,2 %
Power-frequency voltage (WMC 160/1200)		1,7 %
Radio influence voltage		1,0 dB
Temperature		4,0 %
Air pressure		0,5 %
Relative humidity		6,3 %
Time		0,7 %
Rainfall intensity		10,0 %
Conductivity		5,0 %
Length (tape measure 7,5m)		1,6 %
Length (telescopic stick 8 m)		0,8 %

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: PASS – results are within limits or meet a given specification, FAIL – results are out of limits or fail a given specification. Calculated uncertainty of measurements is only informative with regards to the statement of conformity application.

6 PRODUCT DRAWING

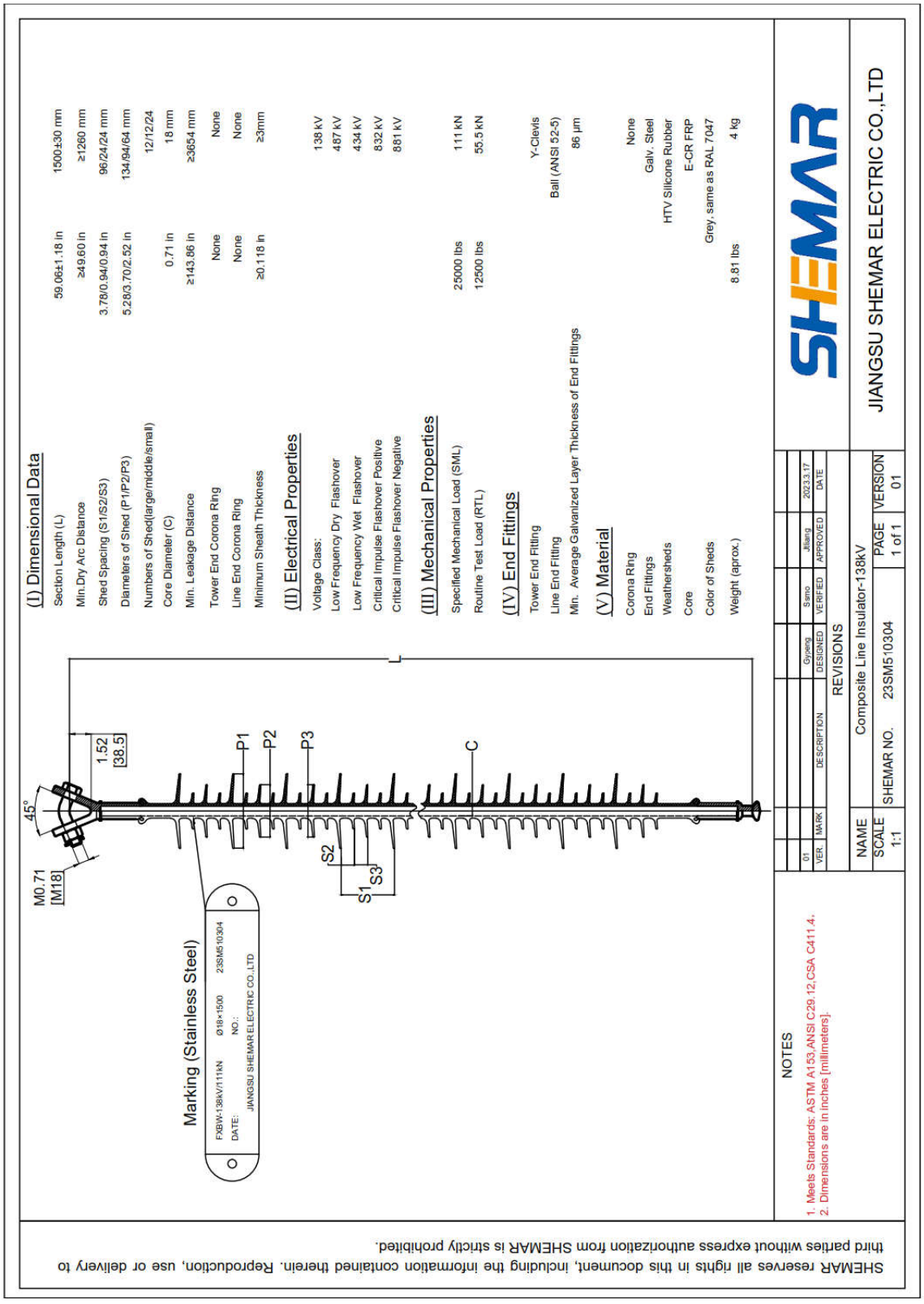

Figure 1 138 kV Composite line insulator, type 138 kV / 111 kN, drawing No. 23SM510304

7 GRAPHS AND RECORDS

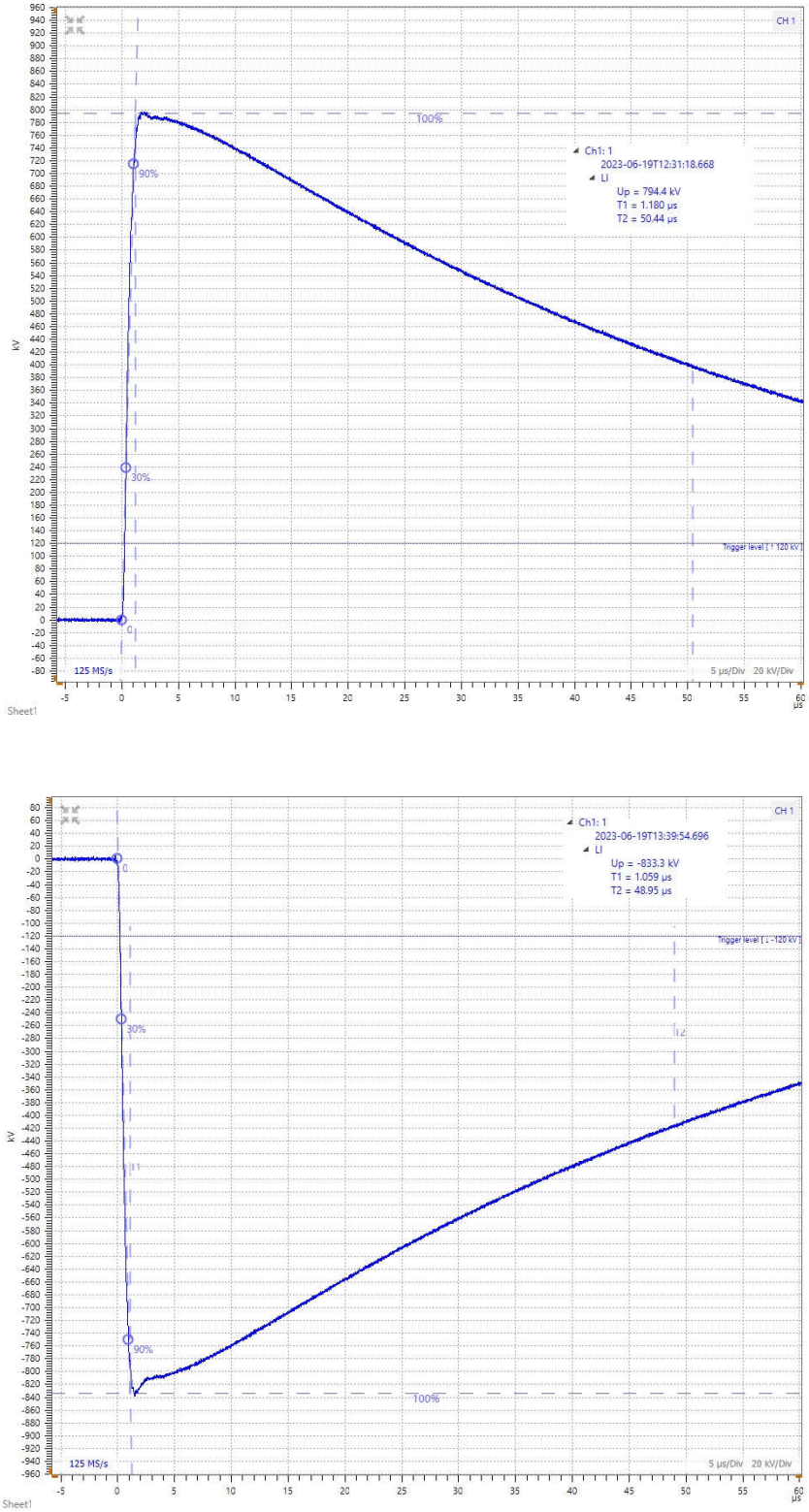

Figure 2 Record of the lightning impulse voltage 1,2/50 µs

8 TEST OBJECT AND TEST SETUP PHOTOS

Figure 3 Test arrangement under the radio – influence voltage test

Figure 4 Test arrangement and flashover under the critical impulse flashover test

Figure 5 Test arrangement and flashover under the low-frequency wet flashover test

Figure 6 Test arrangement and flashover under the low-frequency dry flashover test

– end of the test report –

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TEST REPORT 12206/E/23

ACCREDITED TESTING LABORATORY EGU HV Laboratory No. 1029 CZECH REPUBLIC

CUSTOMER	Jiangsu Shemar Electric Co., Ltd. No. 66 Haiwei Road 226 017 Nantong, Jiangsu China
TEST OBJECT	138 kV Composite line insulator
TYPE SPECIFICATION	138 kV / 111 kN
SHEMAR IDENTIFICATION No.	n/a
TEST STANDARDS	ANSI C29.12-2020, ANSI C29.11-2020
NUMBER OF COPY	1
NUMBER OF PAGES	12
DATE OF ISSUE	2024-01-18

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TEST REPORT 12206/E/23

TEST OBJECT	138 kV Composite line insulator
TYPE SPECIFICATION	138 kV / 111 kN
DRAWING No.	23SM510304
MANUFACTURER	Jiangsu Shemar Electric Co., Ltd. No. 66 Haiwei Road 226 017 Nantong, Jiangsu, China
DATE OF DELIVERY	2023-05-19
DATE OF TESTS	From 2023-11-29 till 2024-01-10
ORDER No.	4530505010
TESTS WITNESSED BY	n/a
ANNEX	n/a

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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

Title	Drawing No.	See
138 kV Composite line insulator	23SM510304	Figure 1

2 TEST SUMMARY

TEST TITLE	TEST STANDARD	RESULT
Housing tracking end erosion test	ANSI C29.12, clause 8.3 ANSI C29.11, clause 7.3	Pass

3 TESTS PERFORMED

3.1 HOUSING TRACKING AND EROSION TESTS

Table 2 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

3.1.1 Test procedure

Test was carried out according to ANSI C29.12, clause 8.3 and ANSI C29.11, clause 7.3. Two samples with reduced length of 138 kV Composite line insulator, drawing No. 23SM510304 were subjected to a salt fog test in accordance with ANSI C29.11, clause 7.3.

A record of a test voltage during the tracking and erosion test is shown Figure 2. Photographs of test samples before and after finishing of the test are given in Figure 3, Figure 4 and Figure 5.

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 m^3. 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 mm^2 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 mm^2 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 Třebíč, serial No. 6022
- measuring voltage transformer, ABB TDC7, serial No. VLT52111022698
- measuring PC, Dewe-rack+USB converter type 6341, serial No. 52150637/1890C82
- tape measure 5 m, Assist, PM-291
- slide gauge 150 mm, Kinex, serial No. KN2038
- conductivity meter, WTW Cond 3310, serial No. 12240282
- measuring cylinder 250 ml, identification No. PM-256
- digital stop-watch Olympia, PM-172
- measuring system for atmospheric condition Comet, serial No. 10910247

Table 3 Results of housing tracking and erosion test

Sample information:			
Sample No. 1	vertical position		
Sample No. 2	horizontal position		
Creepage distance (mm)	510		
Arcing distance (mm)	294		
Shank diameter (mm)	26		
Test parameters:			
Test voltage (kV)	14,8 (510/34,6)		
Beginning of the test	2023-11-29	Initial salinity (kg/m^3)	8 ± 0,4
End of the test	2024-01-10	Final salinity (kg/m^3)	8 ± 0,4
Total duration (hours)	1008		
Average precipitation (ml/hour)	1,72		
No. of flashovers	0		
Visual inspection after 1000h salt fog test:			
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		

Evaluation:

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

Statement of conformity:

138 kV Composite line insulator, type 138 kV / 111 kN, drawing No. 23SM510304 passed the tests according to requirements given in ANSI C29.12, clause 8.3 and ANSI C29.11, clause 7.3.

4 UNCERTAINTY OF MEASUREMENTS

Quantity	Uncertainty (k = 2)
Power-frequency voltage	1,0 %
Time	0,7 %
Air temperature	4,0 %
Conductivity (0,1 μS/cm –1 000 mS/cm)	5,0 %
Slide gauge 150 mm	0,4 %
Measuring cylinder 250 ml	1,0 ml
Length – tape measure (10–5 000 mm)	1,6 %

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: PASS – results are within limits or meet a given specification, FAIL – 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.

5 PRODUCT DRAWING

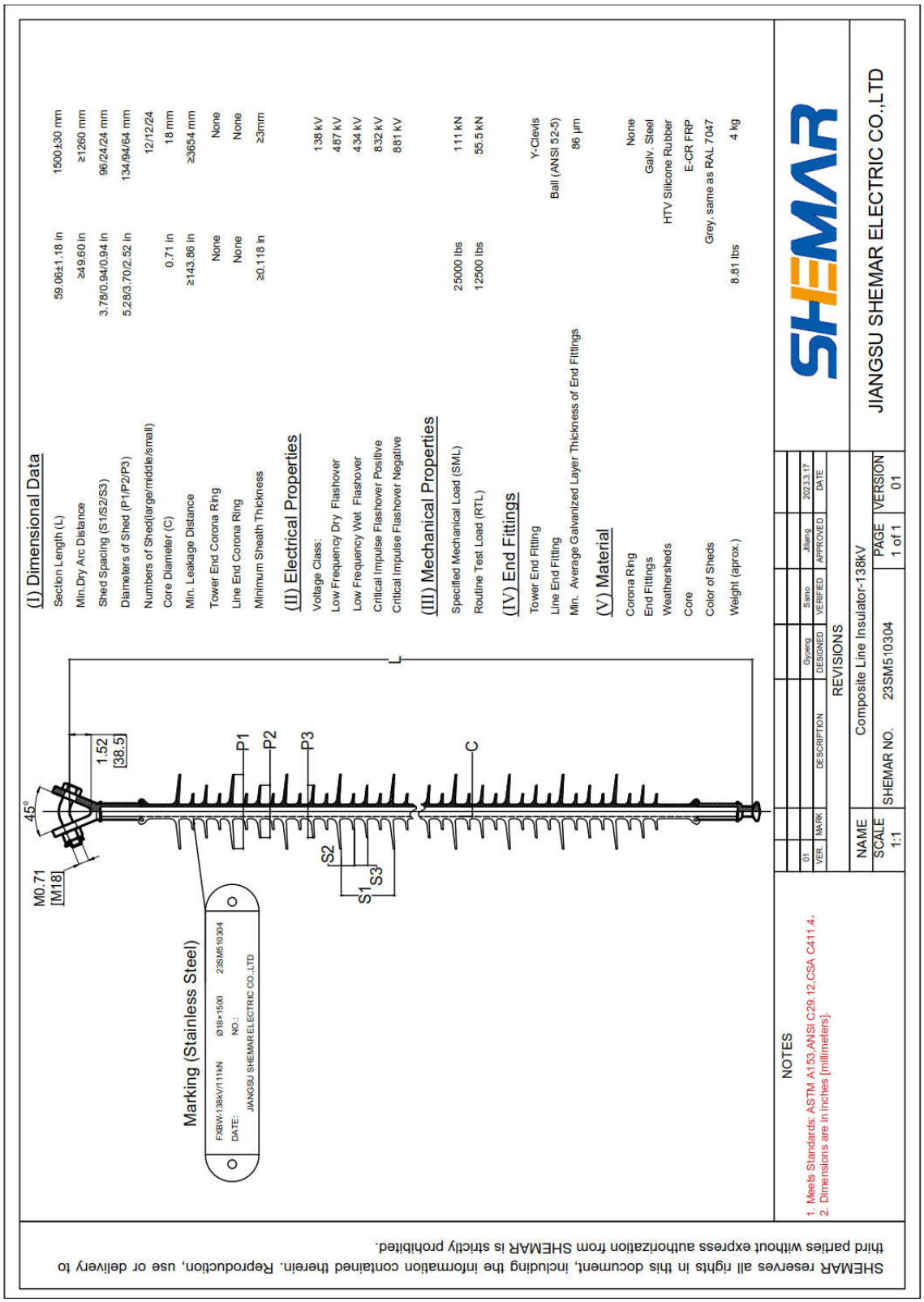

Figure 1 138 kV Composite line insulator, type 138 kV / 111 kN, drawing No. 23SM510304

6 GRAPH

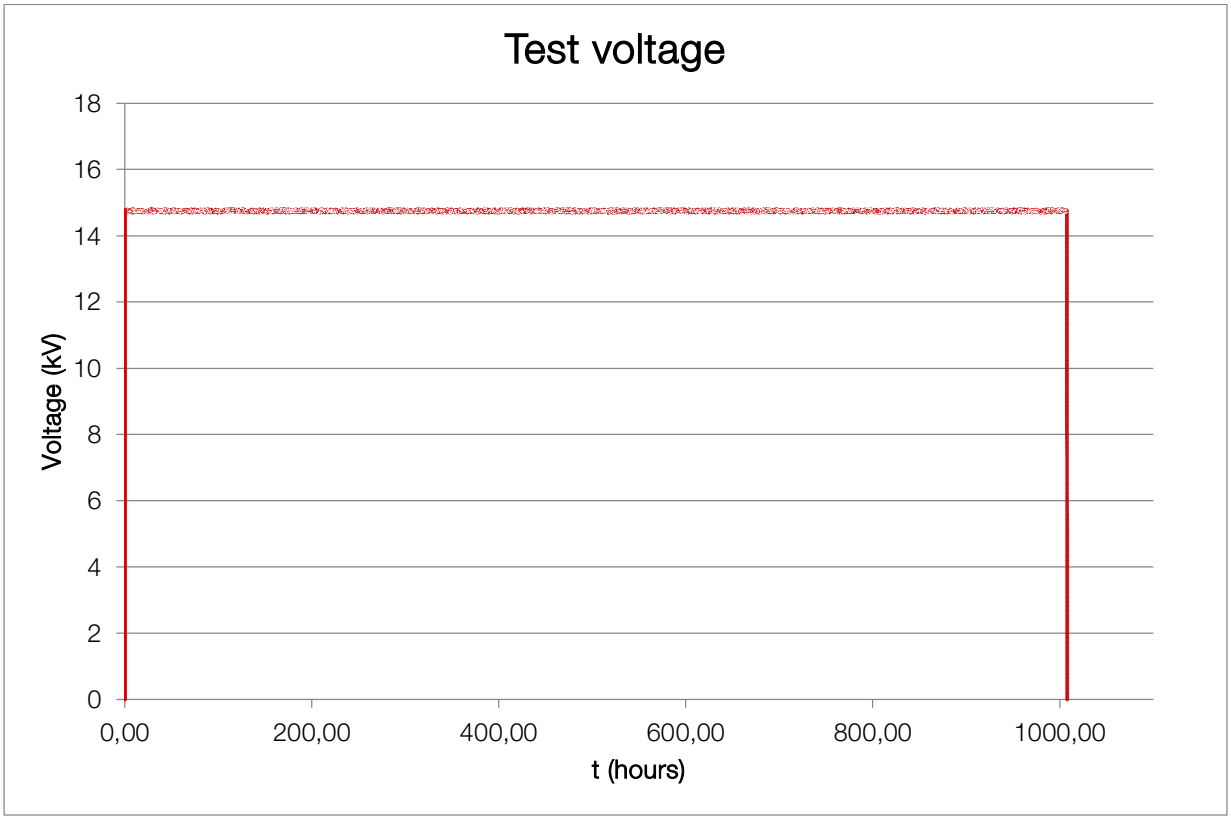

Figure 2 Record of the test voltage during the housing tracking and erosion test

7 TEST OBJECT AND TEST SETUP PHOTOS

Figure 3 Test sample in vertical test position, before and after housing tracking and erosion test

Figure 4 Test sample in horizontal test position, before housing tracking and erosion test

Figure 5 Test sample in horizontal test position, after housing tracking and erosion test

– end of the test report –

Testpolymer EU s.r.o.

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

L 1595

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tel.: + 420 582 383 680

kovarova@testpolymer.cz
www.testpolymer.cz

Test report No. 59/2022/EN

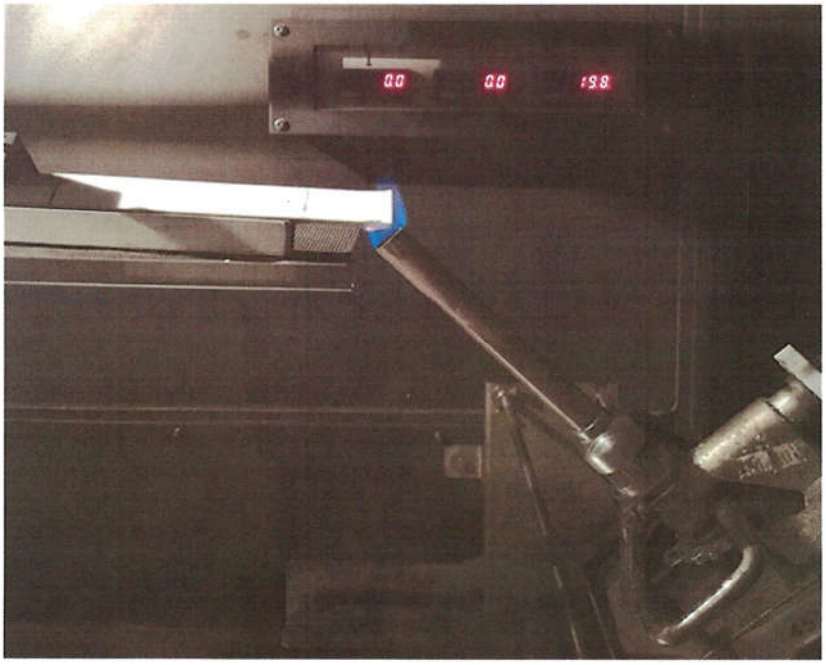
Customer:	**EGU - HV Laboratory a.s., Podnikatelská 267, 190 11 Praha 9, Běchovice**
	Company ID: 25634330, Tax ID: CZ25634330
Customer´s order:	**6/11788/2022**
Application form:	**2200223**
Tested material:	**HTV silicone material**
Detailed description:	**Manufacturer: Jiangsu Shemar Electric Co., 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
Fire hazard testing - horizontal and vertical flame tests	UL 94: 2013 revision 05/2021 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. 15	**Fire hazard testing - Horizontal and vertical flame tests - method A - horizontal burning test**

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



Test report No. 59/2022/EN

Test standard:	ČSN EN 60695-11-10 ed. 2: 2014	
Test equipment:	Chamber Atlas HVUL2	
Ignition source:	Burner with an inner diameter 9.5 mm	
	The gas used: Methane 2.5	
Test conditions:	Blue flame height 20 mm, the exposure time 30s	
	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, 3 pieces	
Conditioning of samples:	48 hours at 23±2°C and 50±5% relative humidity	
Conditioning of cotton indicator:	24 hours in desiccator 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 rate average value (mm/min)**	Sample standard deviation (mm/min)
1	0	0	0	**0**	0
2	0	0	0		
3	0	0	0		

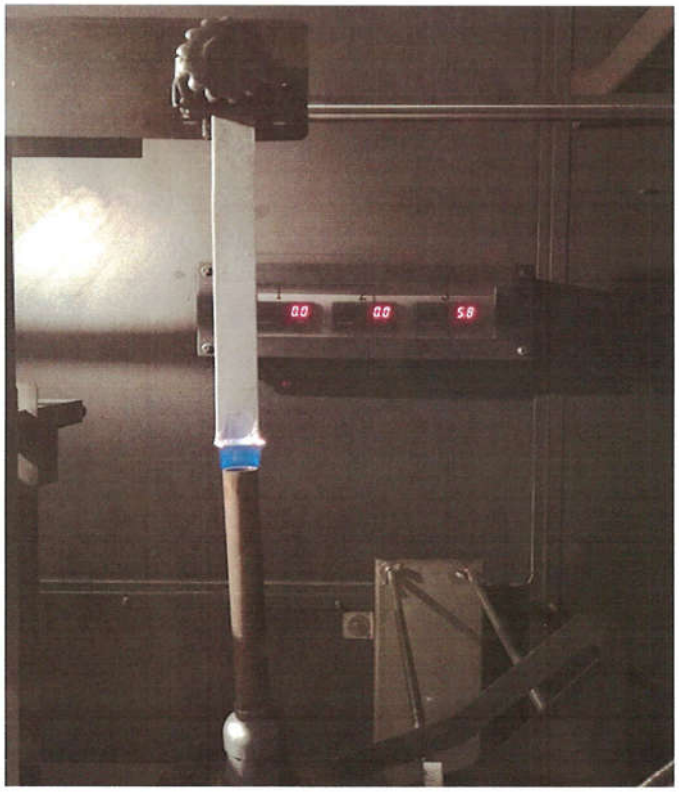
Statement of conformity to specifications - classification	Measured results (burning rate, damaged length) on tested three samples meet all requirements for classification **HB** according to article 8.4 ČSN EN 60695-11-10 ed.2 This statement of conformity to specifications is given in the sense of the shared risk decision rule; without including measurement uncertainty.

Tested and evaluated by:	Ing. Lukáš Navrátil	Date:	13.1.2022

Test report No. 59/2022/EN

Test No. 15	**Fire hazard testing - horizontal and vertical flame tests - method B - vertical burning test**

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



Test standard:	ČSN EN 60695-11-10 ed. 2: 2014	
Test equipment:	Chamber Atlas HVUL2	
Ignition source:	Burner with an inner diameter 9.5 mm	
	The gas used: Methane 2.5	
Test conditions:	Blue flame height 20 mm, the exposure time 2 x 10s	
	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 pieces	
Conditioning of samples:	5 pieces - 48 hours in the climate chamber at 23±2°C and 50±5% relative humidity; 5 pieces -168 ±2 hours in the hot air oven at 70±2°C and cooled in desiccator min. 4 hours at room temperature	
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 after the second application of the flame. The material does not drip or ignite absorbent cotton.	

Test report No. 59/2022/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 conditioned in climate 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
Specimens conditioned in hot 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 specifications - classification	The measured results (burning and afterglow times and the condition of the cotton indicators) on the ten samples tested meet all the requirements for classification **V-0** according to article 9.4 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 Navrátil	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

AKREDITOVANÁ ZKUŠEBNÍ LABORATOŘ Testpolymer EU s.r.o. č. 1595

Test report was approved by:

Eva Kovářová
Laboratory manager

In Bohuslavice: 19.1.2022

End of test report

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

In Pardubice on March 29, 2022

Digitálně podepsal Ing. Vladimír Špaček, CSc.

Dr. Vladimír Špaček
Head of testing 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**

[1]The 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 W/m^2/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 *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 0,8 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, China** **Type : HTV**
Data delivered by the customer[1] :	-
Internal lab number:	**22 0066**

[1]The 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°.

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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

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)

Sample name	Internal Lab Number	Surface failure	Cracking	Flaking
		ČSN EN ISO 4628-1	*ČSN EN ISO 4628-4*	*ČSN EN ISO 4628-5*
		degree + verbal	*degree*	*degree*
250 hours				
HTV	22 0066/1	**0, no visual changes**	**0 (S0)**	**0 (S0)**
	22 0066/2	**0, no visual changes**	**0 (S0)**	**0 (S0)**
	22 0066/3	**0, no visual changes**	**0 (S0)**	**0 (S0)**
500 hours				
HTV	22 0066/1	**0, no visual changes**	**0 (S0)**	**0 (S0)**
	22 0066/2	**0, no visual changes**	**0 (S0)**	**0 (S0)**
	22 0066/3	**0, no visual changes**	**0 (S0)**	**0 (S0)**
750 hours				
HTV	22 0066/1	**0, no visual changes**	**0 (S0)**	**0 (S0)**
	22 0066/2	**0, no visual changes**	**0 (S0)**	**0 (S0)**
	22 0066/3	**0, no visual changes**	**0 (S0)**	**0 (S0)**
1000 hours				
HTV	22 0066/1	**0, no visual changes**	**0 (S0)**	**0 (S0)**
	22 0066/2	**0, no visual changes**	**0 (S0)**	**0 (S0)**
	22 0066/3	**0, no visual changes**	**0 (S0)**	**0 (S0)**

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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

Annexes: 1

MEASUREMENT OF SURFACE ROUGHNESS ACCORDING TO ČSN EN ISO 4287, 4288

(January 7, 2022 – February 18, 2022)

Sample name	Internal Lab Number	Arithmetical mean deviation of the assessed roughness Ra			Maximum height of profile (roughness) Rz		
		Measuring range [µm]			Measuring range [µm]		
		Mean	Max.	Min.	Mean	Max.	Min.
Before exposure							
HTV	22 0066/1	**0,67**	0,69	0,64	**4,74**	4,92	4,53
	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							
HTV	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

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**

[1]The 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 test**	**Parameter** no surface defects such as cracks, crumbling or blisters result according to CSA C411.4.-16 article 5.4.3	**Fulfillment of parameters**
HTV	ASTM D2565-16	no cracks, crumbling or blisters	**Yes**

-End-

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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
Annexes: 1/1

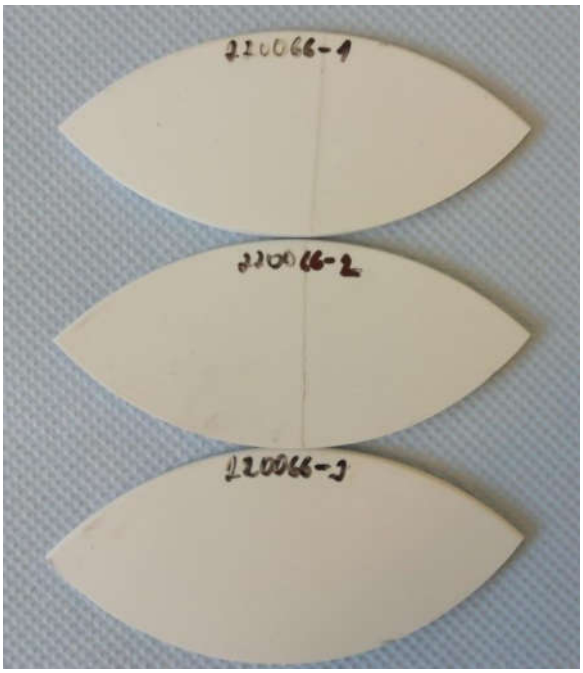
DESCRRIPTION OF THE TEST ITEM

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**

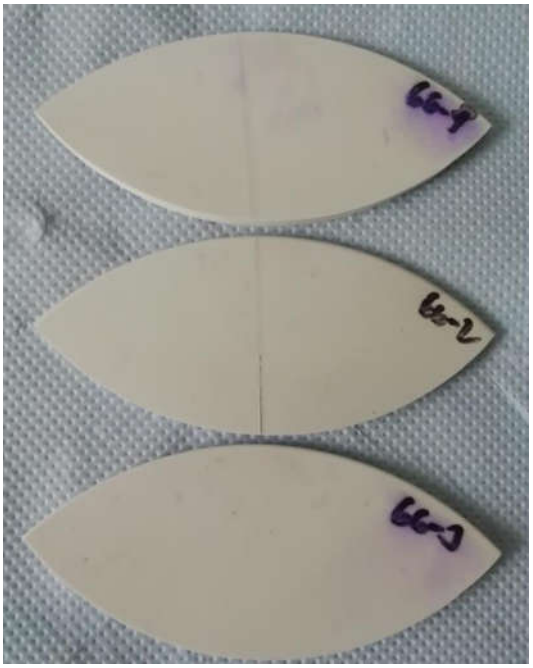
[1]The laboratory is not responsible for the data delivered by customer.

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)

1



2



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