EGU HV Laboratory a.s.
E G U - H V Laboratory a. s.
EGU HV LABORATORY, Podnikatelská 267, 190 11 Praha 9 - Běchovice

EGU HV LABORATORY

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

L 1029

TEST REPORT No.: 11788/R/21

CUSTOMER:	Jiangsu Shemar Electric Co., Ltd. 66 Haiwei Road 226 017 Nantong, Jiangsu China
TEST OBJECT:	500 kV Composite insulator
TYPE SPECIFICATION:	SML 222 kN
TEST STANDARDS:	ANSI C29.12-2020, ANSI C29.11-2020, NEMA 107:2016, IEEE Std 4:2013

Michal Novotný **Test engineer**	Marek Brosch **Head of EGU HV LABORATORY**	Jan Lachman, Ph.D. **Director of EGU - HV Laboratory a. s.**

TEST REPORT No.: 11788/R/21

TEST OBJECT:	500 kV Composite insulator
TYPE SPECIFICATION:	SML 222 kN
DRAWING No.:	21SM510760 Rev. A
MANUFACTURER:	Jiangsu Shemar Electric Co., Ltd.
DATE OF DELIVERY:	2021-12-09
DATE OF TESTS:	From 2022-02-28 till 2022-03-13
ORDER No.:	Contract 23/21
TESTS WITNESSED BY:	N/A

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1 TEST SUMMARY

Test title	Test standards	Test result
Radio-Influence Voltage (RIV)	ANSI C29.12, clause 9.4	Passed
Critical Impulse Flashover Tests – Positive and Negative	ANSI C29.12, clause 9.3	Passed
Low-Frequency Wet Flashover test	ANSI C29.12, clause 9.2	Passed
Low-Frequency Dry Withstand test	ANSI C29.11, clause 8.2.3	No criteria

2 TESTS PERFORMED

2.1 Radio-Influence Voltage (RIV)

2.1.1 Test procedure

Date of test: 2022-02-28

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 performed on one composite insulator assembly, including grading ring, serial No. 2111161522.

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.

The circuit RIV factor was 0,42.

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 2). The bundle of triple conductors with spacing 457 mm was simulated using an aluminium tube of 14 m length and 30 mm diameter. Both ends of the tubes were terminated with corona shielding spheres (screening electrode) with a diameter of 300 mm. Bundle of conductors was at a height of 5,4 m above the ground.

Testing and measuring equipment:

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

2.1.2 Test results

Table 1 Test results of the RIV test

Rated voltage (kV)	**500**		
Atm. conditions b (in Hg) t (°F) RH (%)	 29,65 60,6 30,2		
Test voltage (kV)	**RIV ↓ (µV)**	**RIV ↑ (µV)**	**RIV ↓ (µV)**
463	316 228	316 228	316 228
431	223 872	223 872	199 526
398	19 953	11 220	22 387
365	100	100	100
332	**45**	**45**	**45**
299	32	32	32
266	22	22	22
233	22	22	22
200	22	22	22
167	22	22	22
|	|	|	|
0	22	22	22

Evaluation:

Measured RIV at 332 kV (115 % of nominal line–to–ground voltage, 1,15 × 500/√3 =332 kV) is lower than the specified value of 100 µV.

Statement of conformity:

500 kV Composite insulator, SML 222 kN, drawing No. 21SM510760 Rev. A, passed the test according to requirements given in ANSI C29.12, clause 9.4.

2.2 Critical Impulse Flashover Tests-Positive and Negative

2.2.1 Test procedure

Date of test: 2022-03-02

The test was carried out according to ANSI C29.12, clause 9.3 and ANSI C29.11, clause 8.2.6.

The test was performed on one composite insulator assembly, including grading ring, serial No. 2111161523.

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 representative wave shape of the lightning impulse 1,2/50 µs is given Graph 1.

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

Testing and measuring devices:

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

2.2.2 Test results

Table 2 Test results of the critical impulse flashover test – positive and negative

Impulse polarity	+	–
Atm. conditions:		
barometric pressure (in Hg)	29,32	29,32
temperature of air (°F)	59,5	59,5
relative humidity (%)	28,8	28,8
Correction factors:		
air density correction factor K_d	1,013	1,013
humidity correction factor K_h	1,115	1,098
Critical impulse flashover voltage (kV)	**2 483**	**2 720**
Measured arcing distance: 4 100 mm		
Drawing specified critical impulse flashover voltage: 2 065 kV		

Evaluation:

Critical impulse flashover value of positive and negative polarity was equal to or exceed 92% of the rated critical impulse flashover voltage specified by drawing 2 065 kV, i.e. 1 900 kV.

Statement of conformity:

500 kV Composite insulator, SML 222 kN, drawing No. 21SM510760 Rev. A, passed the test according to requirements given in ANSI C29.12, clause 9.3.

2.3 Low-Frequency Wet Flashover Test

2.3.1 Test procedure

Date of test: 2022-03-13

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

The test was performed on one composite insulator assembly, including grading ring, serial No. 2111161522.

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 in compliance with ANSI C29.11, clause 8.2.2.1 and 8.1 (see Figure 5).

Testing and measuring equipment:

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

2.3.2 Test results

Table 3 Test results of the low-frequency wet flashover test

Atm. conditions:	
barometric pressure (in Hg)	29,15
temperature of air (°F)	59,0
relative humidity (%)	55,3
Rain parameters:	
r. i. (mm/min)	5,0
conductivity (µS/cm)	189
Correction factors:	
humidity correction factor K_h	1,000
air density correction factor K_d	1,008
Flashover voltage	**889 kV**
Measured arcing distance: 4 100 mm	
Drawing specified low-frequency wet flashover voltage: 980 kV	

Evaluation:

Low-frequency wet flashover value was equal to or exceed 90% of the rated wet flashover value specified by drawing 980 kV, i.e. 882 kV.

Statement of conformity:

500 kV Composite insulator, SML 222 kN, drawing No. 21SM510760 Rev. A, passed the test according to requirements given in ANSI C29.12, clause 9.2.

2.4 Low-Frequency Voltage Dry Withstand Test

2.4.1 Test procedure

Date of test: 2022-03-04

The test was carried out according to ANSI C29.11, clause 8.2.3.

The low-frequency dry flashover test according to ANSI C29.12, clause 9.1 was not performed. The maximum voltage of the laboratory transformer is 1 200 kV, no flashover occurred at this test voltage.

The maximum low-frequency dry withstand voltage was measured. The test voltage was applied to the insulator for one minute (60 seconds).

The test was performed on one composite insulator assembly, including grading ring, serial No. 2111161520.

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 in compliance with ANSI C29.11, clause 8.2.1.2 and 8.1 (see Figure 6).

Testing and measuring equipment:

synchronous generator BEZ Bratislava 6 kV, 1 300 kVA
test transformer TuR Dresden 5,7/1200 kV, 1500 kVA, serial No. 884469
capacitive divider TuR Dresden 1200 kV, 150 pF, type WMC 160/1200, serial No. 884470
universal voltmeter Haefely Trench, type DMI 551, serial No. 150505
measuring system for atmospheric conditions Comet, serial No. 10910247
tape measure 5 m, CXS, PM-241
digital stop-watch Kalenji PM-259

2.4.2 Test results

Table 4 Test results of the low-frequency dry withstand test

Atm. conditions:	
barometric pressure (in Hg)	29,21
temperature of air (°F)	59,2
relative humidity (%)	51,1
Correction factors:	
humidity correction factor K_h	1,106
air density correction factor K_d	1,010
One minute maximum withstand voltage	**1 205 kV / 60 s no flashover**
Flashover voltage	**> 1 205**
Measured arcing distance: 4 100 mm	
Drawing specified low-frequency dry flashover voltage: 1 260 kV	

Evaluation:

Low-frequency dry flashover value was equal to or exceed 95% of the rated dry flashover value specified by drawing 1 260 kV, i.e. 1 197 kV.

3 LIST OF SYMBOLS

RIV	radio influence voltage (µV)
b	barometric pressure (in Hg)
t	temperature of air (°F)
RH	relative humidity (%)
K_h	humidity correction factor
K_d	air density correction factor
U_{pk}	maximum voltage of recorded curve (kV)
T_1	front time of recorded curve (µs)
T_2	time to half-value of recorded curve (µs)
r.i.	average value of measured rainfall intensity – vertical component (mm/min)
conductivity	water conductivity (µS/cm)

4 UNCERTAINTY OF MEASUREMENTS

QUANTITY	UNCERTAINTY (k=2)	
Lightning impulse voltage	U_{pk} T_1 T_2	2,4 % 6,5 % 4,2 %
Radio interference voltage	1,0 dB	
Power-frequency voltage	1,7 %	
Barometric pressure	0,5 %	
Temperature of air	4,0 %	
Relative humidity	6,3 %	
Time	0,7 %	
Telescopic stick	0,8 %	
Length (tape measure)	1,6 %	
Rainfall intensity	10 %	
Conductivity	5,0 %	

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

5 PRODUCT DRAWING

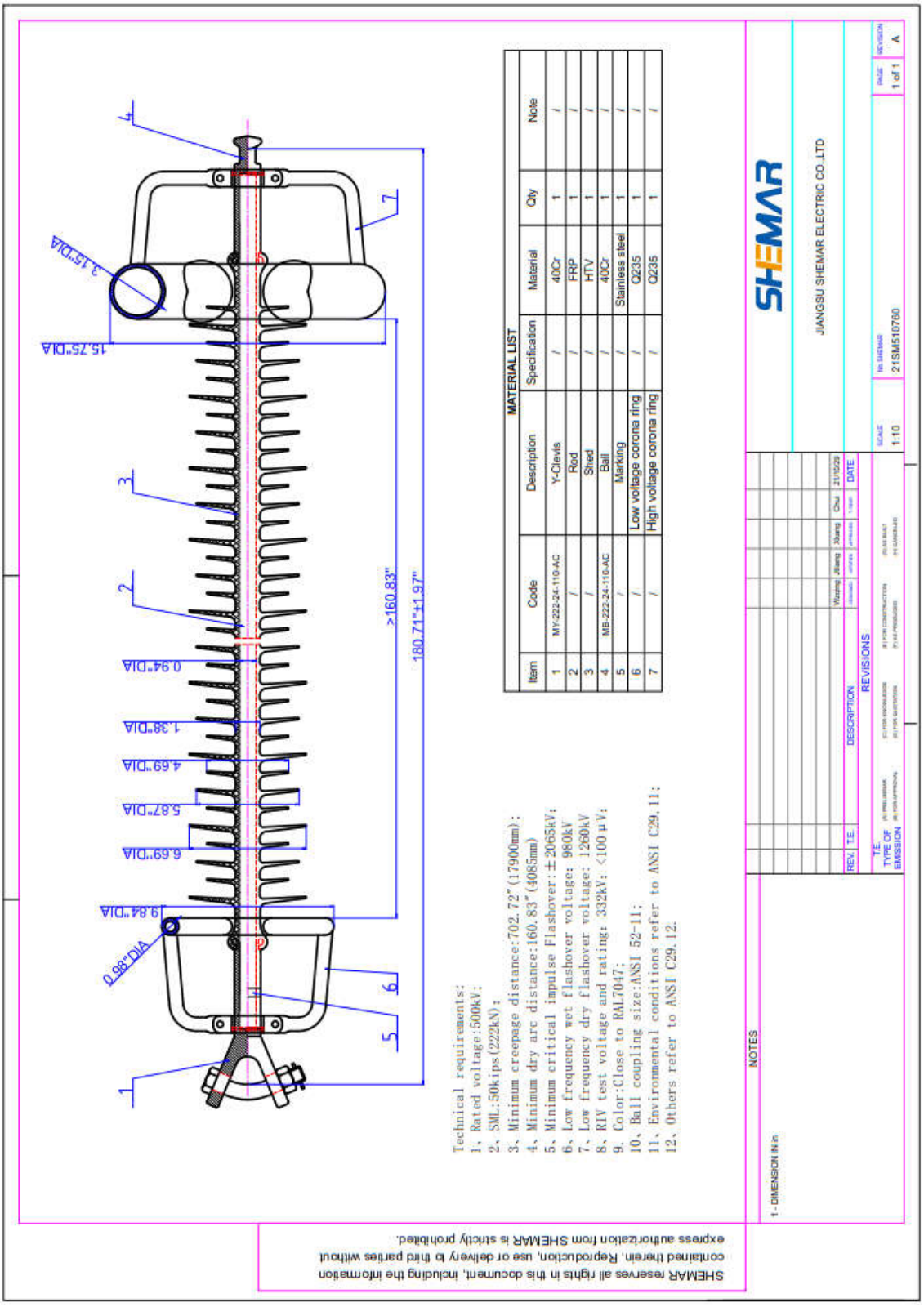


Figure 1
500 kV Composite insulator, SML 222 kN, drawing No. 21SM510760 Rev. A

6 TEST SETUP PHOTOS

Figure 2
Test arrangement for RIV and corona tests

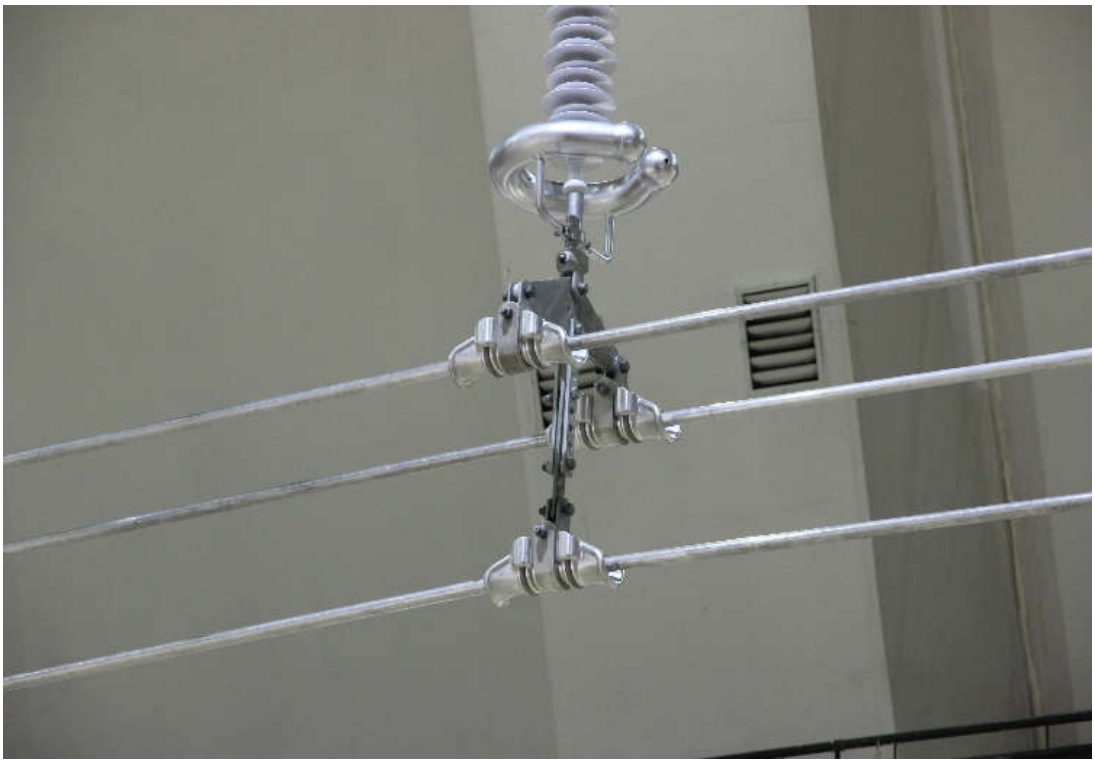


Figure 3
Test arrangement for RIV and corona tests

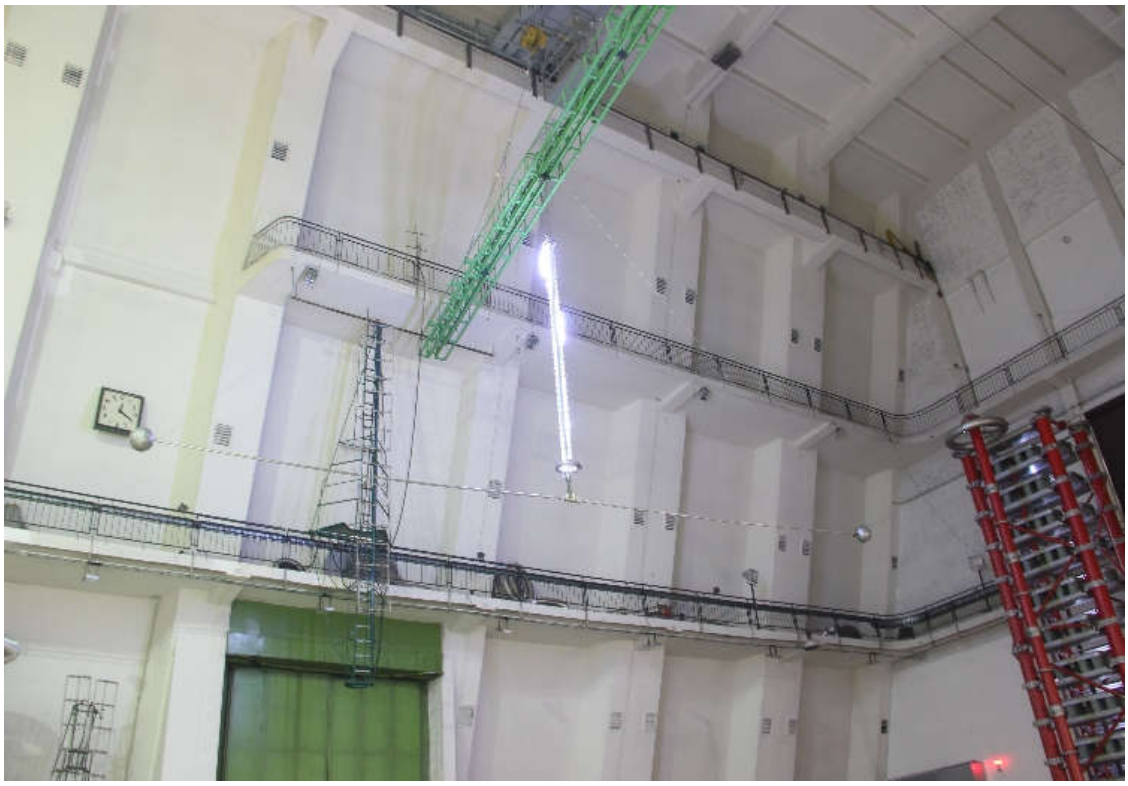


Figure 4
Test arrangement and flashover under the critical impulse flashover test

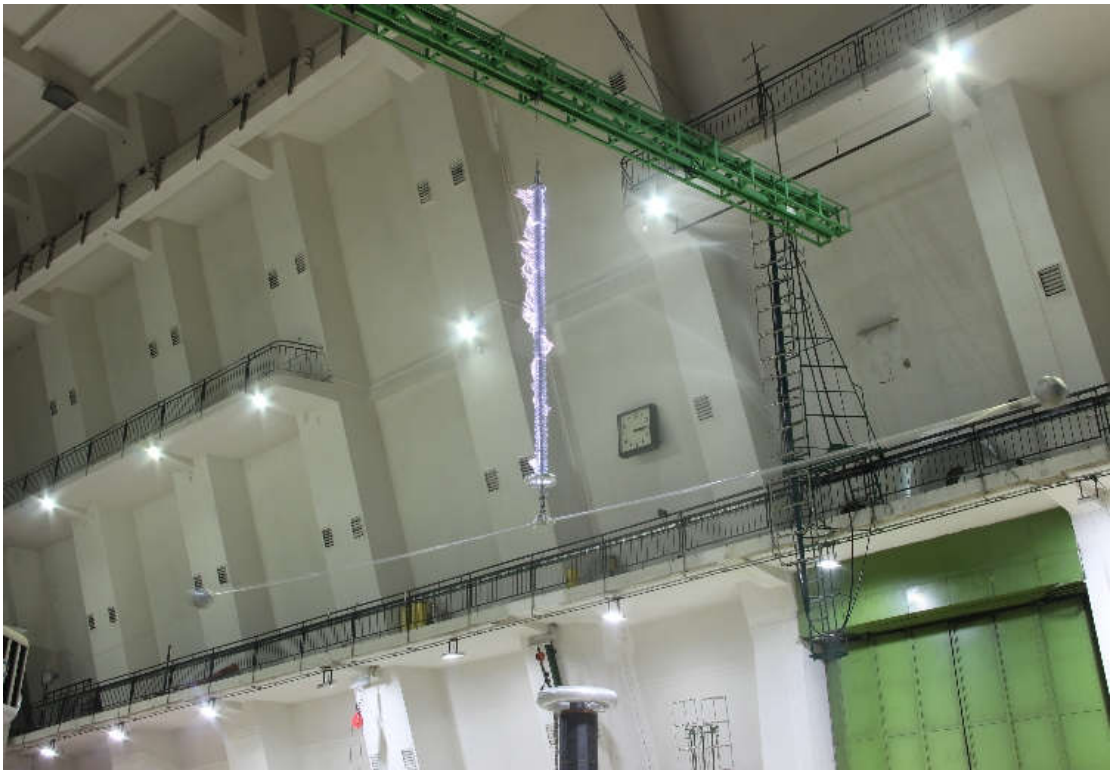
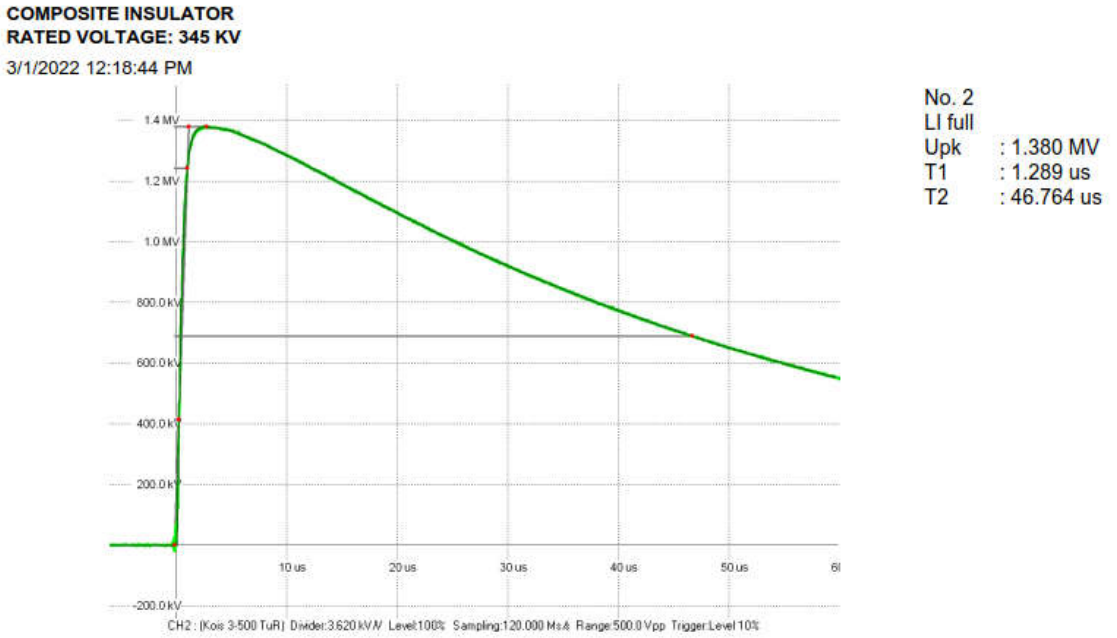
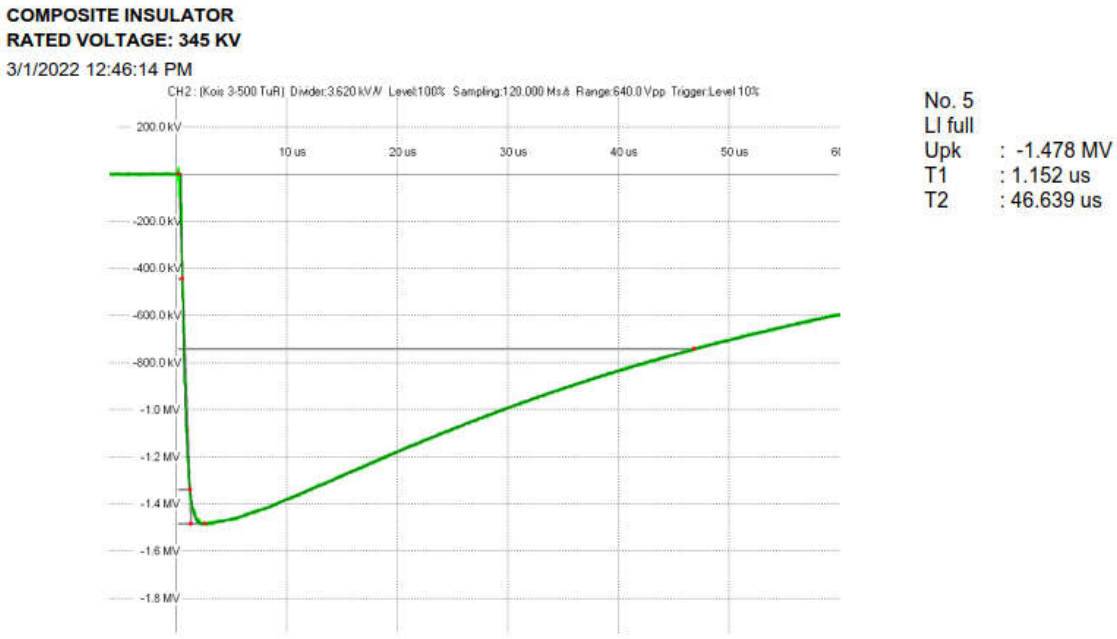


Figure 5
Test arrangement and flashover under the low-frequency wet flashover test

Figure 6
Test arrangement under the low-frequency dry withstand test

7 GRAPHS





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

- end of test report -

Testpolymer EU s.r.o.

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

L 1595

Bohuslavice 123
798 56 Bohuslavice
IČO 29211506
DIČ CZ29211506

laboratory manager : Eva Kovářová
tel.: + 420 582 383 680

kovarova@testpolymer.cz
www.testpolymer.cz

Test report No. 59/2022/EN

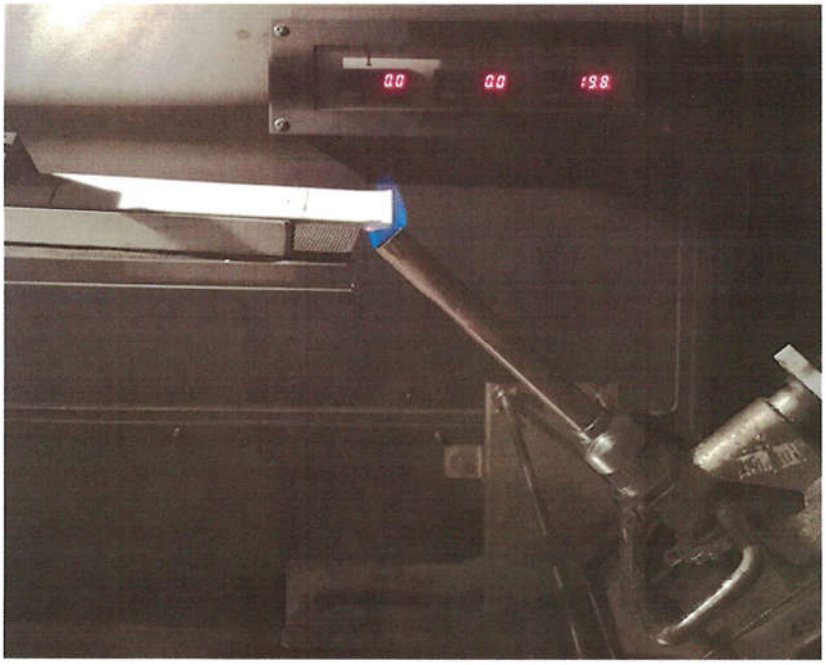
Customer:	**EGU - HV Laboratory a.s., Podnikatelská 267, 190 11 Praha 9, Běchovice**
	Company ID: 25634330, Tax ID: CZ25634330
Customer´s order:	**6/11788/2022**
Application form:	**2200223**
Tested material:	**HTV silicone material**
Detailed description:	**Manufacturer: Jiangsu Shemar Electric Co., 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		

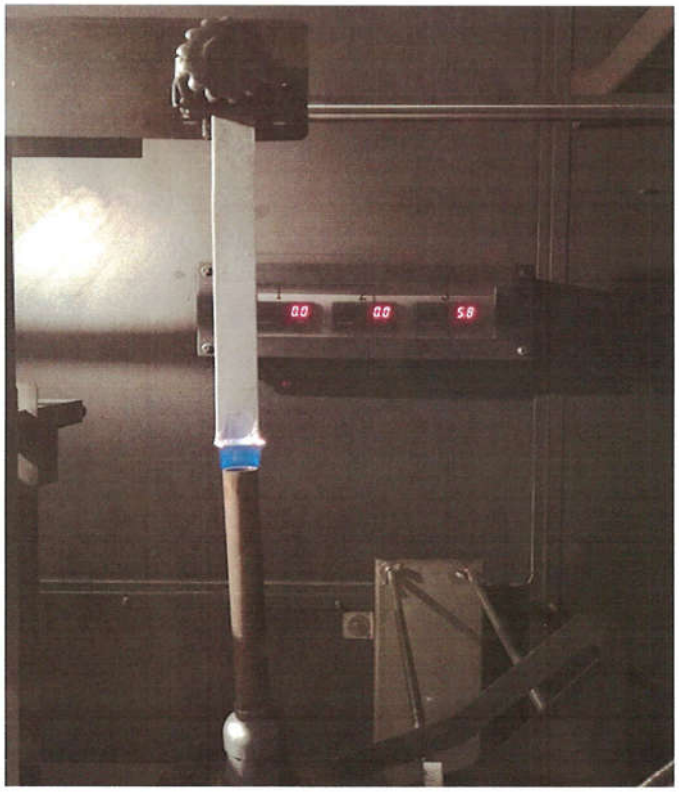
Statement of conformity to specifications - classification	Measured results (burning rate, damaged length) on tested three samples meet all requirements for classification **HB** according to article 8.4 ČSN EN 60695-11-10 ed.2 This statement of conformity to specifications is given in the sense of the 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 375/005

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: **Exposure to laboratory light – Xenon - arc lamps -** *ČSN EN ISO 4892-2* 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 0065
Date of the test	January 7, 2022– February 22, 2022
Tested by	Gabriela Štěpánková
The report made by	Gabriela Štěpánková, Ondřej Janča

This report contains 6 pages and 1 annex.

Digitálně podepsal Ing. Vladimír Špaček, CSc.

In Pardubice on March 29, 2022

Dr. Vladimír Špaček
Head of testing laboratory

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Page/Total pages: 2/6
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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 0065**

[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 and submitted to the test without any treatment of surface protection or heat storage.

Test No. 35: Exposure to laboratory light – Xenon - arc lamps

Testing device: Q-SUN Xe-3HS (Q-Lab, GB), Xenon lamps with irradiation energy 0,51 W/m^2/nm at 340 nm (60 W/m^2/nm for TUV). Filtres used – Q-Daylight. Used IBP placed horizontally at the site of sample exposure was fasten by anticorrosion screw. Irradiation intensity was calibrated by radiometer with zone detector of 340 nm (or TUV).
Description of exposure cycle:
Exposure cycle A1: 102 min of irradiance phase with BP temperature (65 ± 3) °C, chamber temperature (38 ± 3) °C with RH (50 ± 10) %. Spray phase (front spraying) of 18 min. (according to the requirements of article 9. 3. 2 of IEC 62217 (2012) - cycle 1 with 8 hours dark period). Both phases with irradiation energy 0,51 W/m^2/nm at 340 nm (60 W/m^2/nm for TUV). Pause: 4.2. – 8.2.2022. The test samples were putted in testing area and the position of samples during the test was not changed.

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 0,8mm

TEST REPORT T 375/005
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 0065**

[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°.

SYNPO, akciová společnost, S. K. Neumanna 1316, 532 07 Pardubice – Zelené Předměstí, 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 375/005

Annexes: 1

VISUAL EVALUATION OF SURFACE DEFFECTS ACCORDING TO ČSN EN ISO 4628 DURING THE EXPOSURE AFTER XENON TEST ACCORDING TO ČSN EN ISO 4892-2

(January 7, 2022 – February 22, 2022)

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 0065/1	**0, no visual changes**	**0 (S0)**	**0 (S0)**
	22 0065/2	**0, no visual changes**	**0 (S0)**	**0 (S0)**
	22 0065/3	**0, no visual changes**	**0 (S0)**	**0 (S0)**
500 hours				
HTV	22 0065/1	**0, no visual changes**	**0 (S0)**	**0 (S0)**
	22 0065/2	**0, no visual changes**	**0 (S0)**	**0 (S0)**
	22 0065/3	**0, no visual changes**	**0 (S0)**	**0 (S0)**
750 hours				
HTV	22 0065/1	**0, no visual changes**	**0 (S0)**	**0 (S0)**
	22 0065/2	**0, no visual changes**	**0 (S0)**	**0 (S0)**
	22 0065/3	**0, no visual changes**	**0 (S0)**	**0 (S0)**
1000 hours				
HTV	22 0065/1	**0, no visual changes**	**0 (S0)**	**0 (S0)**
	22 0065/2	**0, no visual changes**	**0 (S0)**	**0 (S0)**
	22 0065/3	**0, no visual changes**	**0 (S0)**	**0 (S0)**

SYNPO, akciová společnost, S. K. Neumanna 1316, 532 07 Pardubice – Zelené Předměstí, 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 375/005

Annexes: 1

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

(January 7, 2022 – February 22, 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 0065/1	**0,70**	0,76	0,65	**5,00**	5,42	4,56
	22 0065/2	**0,72**	0,77	0,68	**5,35**	6,18	4,89
	22 0065/3	**0,71**	0,75	0,66	**5,20**	5,71	4,55
250 hours							
HTV	22 0065/1	**0,70**	0,77	0,65	**5,03**	5,47	4,57
	22 0065/2	**0,74**	0,77	0,70	**5,61**	6,23	5,04
	22 0065/3	**0,73**	0,79	0,70	**5,36**	5,78	5,04
500 hours							
HTV	22 0065/1	**0,73**	0,77	0,70	**5,26**	5,50	4,93
	22 0065/2	**0,76**	0,79	0,74	**5,35**	5,82	4,98
	22 0065/3	**0,77**	0,80	0,75	**5,34**	5,96	4,98
750 hours							
HTV	22 0065/1	**0,76**	0,80	0,74	**5,54**	6,15	5,23
	22 0065/2	**0,77**	0,79	0,75	**5,35**	5,63	5,11
	22 0065/3	**0,77**	0,80	0,74	**5,62**	5,96	5,32
1000 hours							
HTV	22 0065/1	**0,76**	0,78	0,74	**5,75**	6,20	5,11
	22 0065/2	**0,77**	0,80	0,74	**5,85**	6,23	5,36
	22 0065/3	**0,79**	0,82	0,75	**6,01**	6,56	5,59

TEST REPORT T 375/005
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 0065**

[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 cracks or raised parts result according to IEC 62217 (2012), clause 9.3.2	**Fulfillment of parameters**
HTV	ČSN EN ISO 4892 - 2	no cracks or raised parts	**Yes**

- End-

SYNPO, akciová společnost, S. K. Neumanna 1316, 532 07 Pardubice – Zelené Předměstí, 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 375/005
Annexes: 1/1

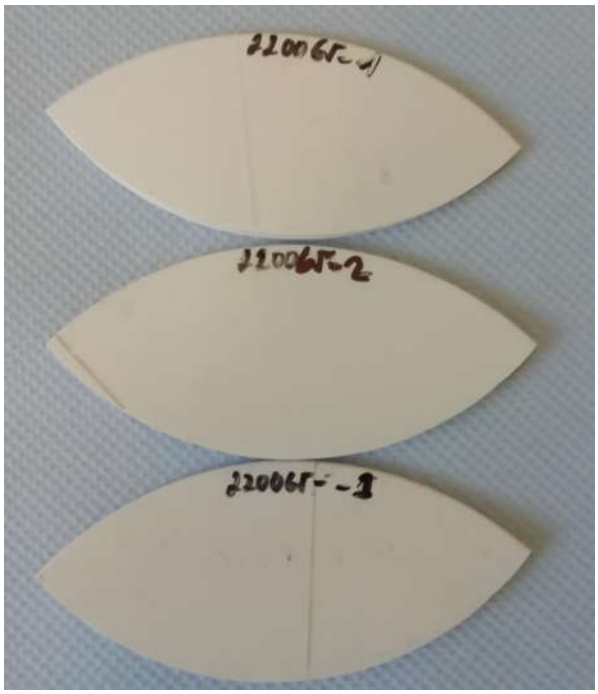
DESCRRIPTION OF THE TEST ITEM

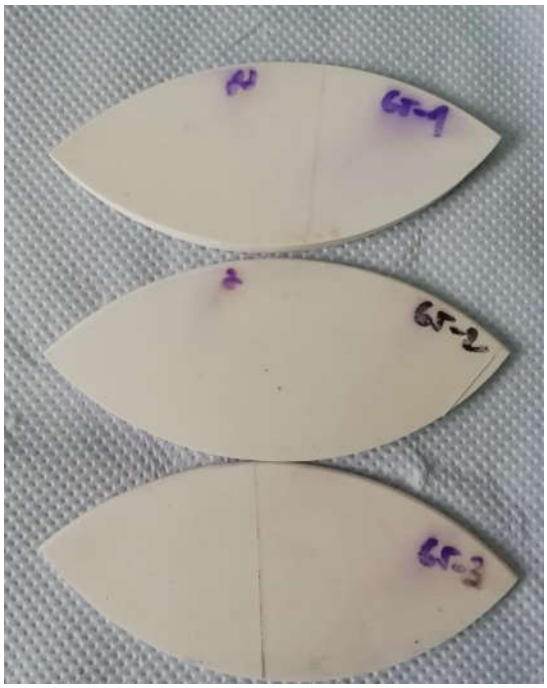
Test item:	**Manufacturer: Jiangsu Shemar Electric Co., Ltd.** **Address : No. 66, Haiwei Road, Sutong Science and Technology Industrial Park, Nantong City, Jiangsu 226017, China** **Type : HTV**
Data delivered by the customer[1] :	-
Internal lab number:	**22 0065**

[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 ČSN EN ISO 4892-2

1 **2**





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

KEMA TEST REPORT

5051-22

Object	Composite insulator unit with grading rings
Type	FXBW-500kV/222kN **Serial No.** -
	500 kV - 20 kA - 50 Hz
Client	Jiangsu Shemar Electric Co., Ltd., No. 66 Haiwei Road, Sutong Science and Technology Industrial Park, Nantong City, Jiangsu 226017, People's Republic of China
Manufacturer	Insulator units: Jiangsu Shemar Electric Co., Ltd., No. 99 Yishou Road (South), Rugao, Jiangsu 226553, People's Republic of China *) Protective fittings: Jiangsu Shemar Electric Co., Ltd., No. 99 Yishou Road (South), Rugao, Jiangsu 226553, People's Republic of China *)
Tested by	Zkušebnictví, a.s. - KEMA Labs Podnikatelská 547, Prague 9, the Czech Republic
Date of tests	4 and 7 March 2022
Test specification	The tests have been carried out in accordance with the client's instructions, see chapter 3 'Tests carried out'.

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

This report consists of 45 pages in total.

Zkušebnictví, a.s.

Robert Jech
Operational Manager

Prague, 25 March 2022

INFORMATION SHEET

1 KEMA Type Test Certificate

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

2 KEMA Report of Performance

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

3 KEMA Test Report

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

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

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

4 Official and uncontrolled test documents

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

REVISION OVERVIEW

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

TABLE OF CONTENTS

1 IDENTIFICATION OF THE OBJECT TESTED

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

1.1 Ratings/characteristics of the object tested

Voltage	500 kV
Short-circuit current of the system	20 kA
Frequency	50 Hz
Specified minimum mechanical (failing) load (SFL / SML) – insulator units	222 kN
Year of manufacture of insulator units	2021
Year of manufacture of fittings	2021
Type of insulator unit	FXBW-500kV/222kN
Number of insulator units in one branch	1
Length of the insulator unit	4590±50 mm

1.2 Description of the object tested

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

1.3 List of drawings

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

The following drawings and/or documents have been included in this report:

Drawing no./document no.	Revision
21SM510760	04

On request of the manufacturer the following drawings and/or documents have been included in this report.
KEMA Labs has not verified these drawings and/or documents.

Drawing no./document no.	Revision
Specification for Non-Ceramic Suspension and Dead End Insulators (TLMS-028), Pages 1, 10 of 11	3

The following drawings and/or documents are only listed for reference.
KEMA Labs has not verified these drawings and/or documents.

Drawing no./document no.	Revision
Specification for Non-Ceramic Suspension and Dead End Insulators (TLMS-028)	3

2 GENERAL INFORMATION

2.1 The tests were witnessed by

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

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

2.2 The tests were carried out under responsibility of

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

2.3 Subcontracting

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

- mechanical failing load test.

2.4 Accuracy of measurement

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

The guaranteed uncertainty in the figures mentioned, taking into account the total measuring system, is less than 5%, unless mentioned otherwise.
The reported expanded uncertainties of measurements are stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a probability of approximately 95 %. Determination is based on ENV 13005(GUM).

2.5 Notes

The results apply to the sample as received.

The tests were recorded on a high-speed video.

3 TESTS CARRIED OUT

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

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

4 LEGEND

Phase indications

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

Explanation of the letter symbols and abbreviations on the oscillograms

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

5 SUMMARY OF TESTS

Checking of the test current							
Test no.		220304 1005	-	-	-	-	-
Time interval between tests	min	-	-	-	-	-	-
Phase	-	R, T	-	-	-	-	-
Applied voltage, phase-to-ground	kV_{RMS}	20,0	-	-	-	-	-
Current	kA_{peak}	31,2	-	-	-	-	-
Current, a.c. component, beginning	kA_{RMS}	20,4	-	-	-	-	-
Current, a.c. component, middle	kA_{RMS}	20,6	-	-	-	-	-
Current, a.c. component, end	kA_{RMS}	20,8	-	-	-	-	-
Current, a.c. component, average	kA_{RMS}	20,6	-	-	-	-	-
Duration	s	0,243	-	-	-	-	-
Ratio of Ixt	-	-	-	-	-	-	-

Observations	
220304-1005	-
-	-
-	-
-	-
-	-
-	-

Power arc test							
Test no.		220304 1006	220304 1007	220304 1008	220304 1009	220304 1010	-
Time interval between tests	min	-	22:25	22:31	21:21	20:49	-
Phase	-	R, T	R, T	R, T	R, T	R, T	-
Applied voltage, phase-to-ground	kV_{RMS}	20,5	21,0	21,0	21,0	21,0	-
Current	kA_{peak}	27,4	29,2	29,3	28,6	28,9	-
Current, a.c. component, beginning	kA_{RMS}	19,5	19,7	19,5	20,2	20,4	-
Current, a.c. component, middle	kA_{RMS}	19,7	20,0	20,4	20,6	20,7	-
Current, a.c. component, end	kA_{RMS}	19,5	20,1	20,4	20,7	20,7	-
Current, a.c. component, average	kA_{RMS}	19,4	19,9	20,0	20,3	20,5	-
Duration	s	0,256	0,257	0,257	0,256	0,256	-
Ratio of Ixt	-	0,99	1,02	1,03	1,04	1,05	-

Observations	
220304-1006	No fault.
220304-1007	No fault.
220304-1008	No fault.
220304-1009	No fault.
220304-1010	No fault.
-	-

Mechanical failing load test							
Sample		1S	-	-	-	-	-
70% of SFL/SML	kN	155,4	-	-	-	-	-
Maximum tensile load (uncertainty U=1,0%)	kN	313	-	-	-	-	-
Failing load (uncertainty U=1,0%)	kN	313	-	-	-	-	-
Time of holding (uncertainty U=0,7%)	s	60	-	-	-	-	-

Observation	
1S	Insulator unit 1S – no breakage up to 60 s.
-	-
-	-
-	-
-	-
-	-

6 CHECKING OF THE TEST CURRENT

Standard and date

Standard	Client's instructions
Test date	4 March 2022

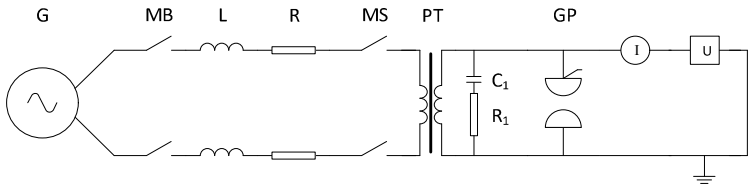
Serial No.

-

6.1 Condition before test

-

6.2 Test circuit S01



G	= Generator	L	= Reactor	C_1	= Protective Capacitors	U	= Voltage Measurement to earth
MB	= Master Breaker	R	= Resistor	R_1	= Protective Resistors	I	= Current Measurement
MS	= Make Switch			GP	= Protective Spark Gap		
PT	= Power Transformer						

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

Load	
Short-circuit point	earthed

Remarks: -

6.3 Test results and oscillograms

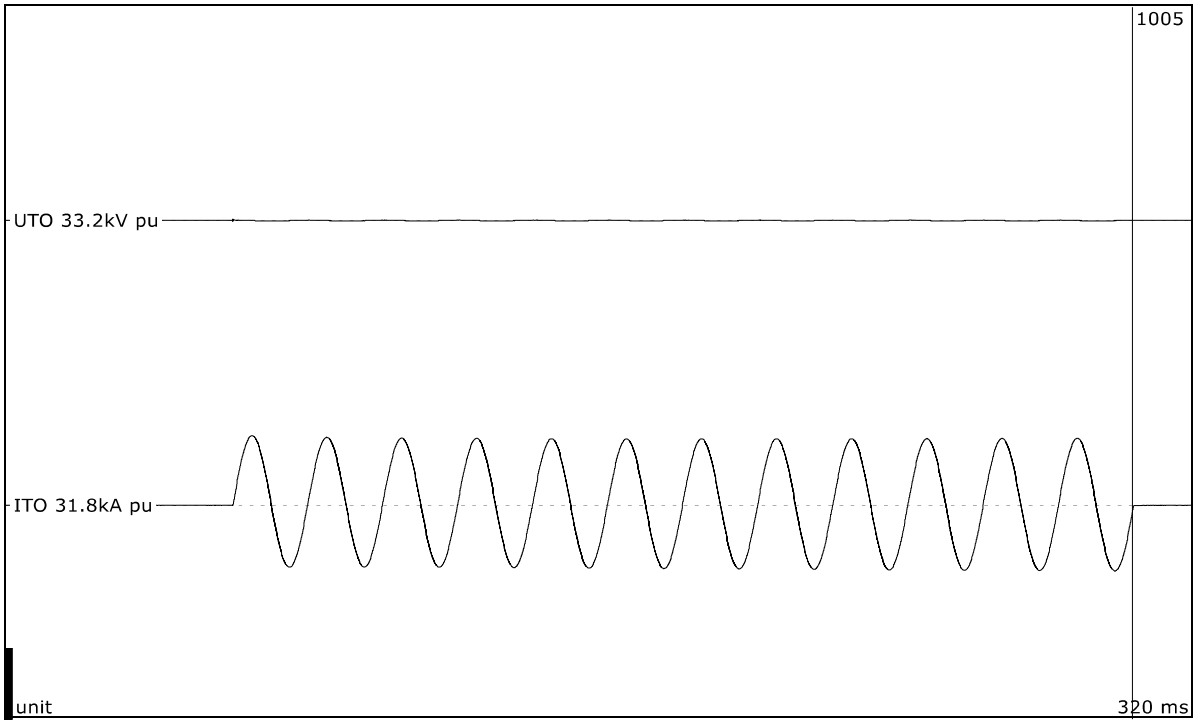
Overview of test numbers

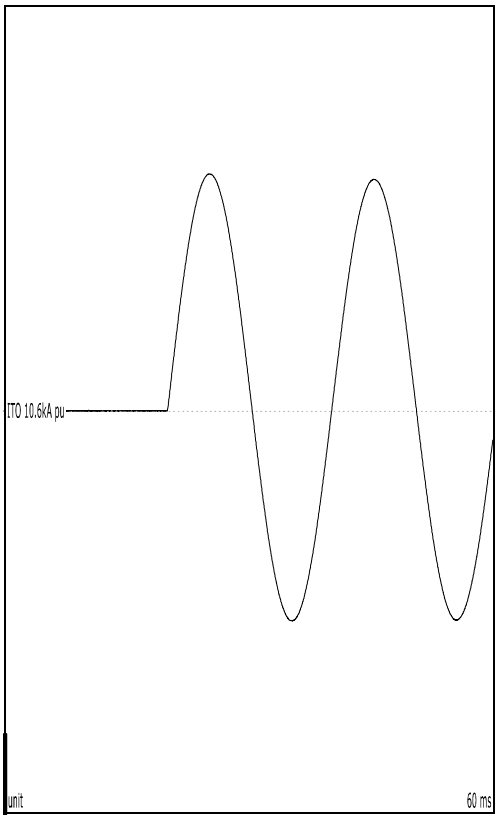
220304-1005

Remarks

Test number	Specified arc current	Specified arc time
220304-1005	20 kA	0,25 s

Checking of the test current





Test number: **220304-1005**

Time interval between tests	min	-
Phase		**R, T**
Applied voltage, phase-to-ground	kV_{RMS}	20,0
Current	kA_{peak}	31,2
Current, a.c. component, beginning	kA_{RMS}	20,4
Current, a.c. component, middle	kA_{RMS}	20,6
Current, a.c. component, end	kA_{RMS}	20,8
Current, a.c. component, average	kA_{RMS}	20,6
Duration	s	0,243
Ratio of Ixt		-

Observations: -

7 POWER ARC TEST

Standard and date

Standard	Client's instructions
Test date	4 March 2022

Serial No.

-

7.1 Condition before test

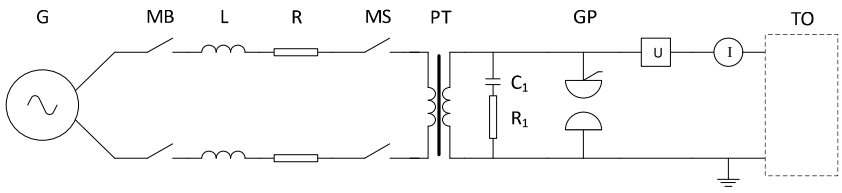
Insulator unit new.
Test circuit D of IEC 61467, specified arc current In = Isys.
Unbalanced supply circuit.
Unbalanced return circuit.
Return circuit earthed.

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

Arc initiation by means of four twisted together fusible copper wires with a total cross-section of 2 mm^2.

For test arrangement see page 18.

7.2 Test circuit S02



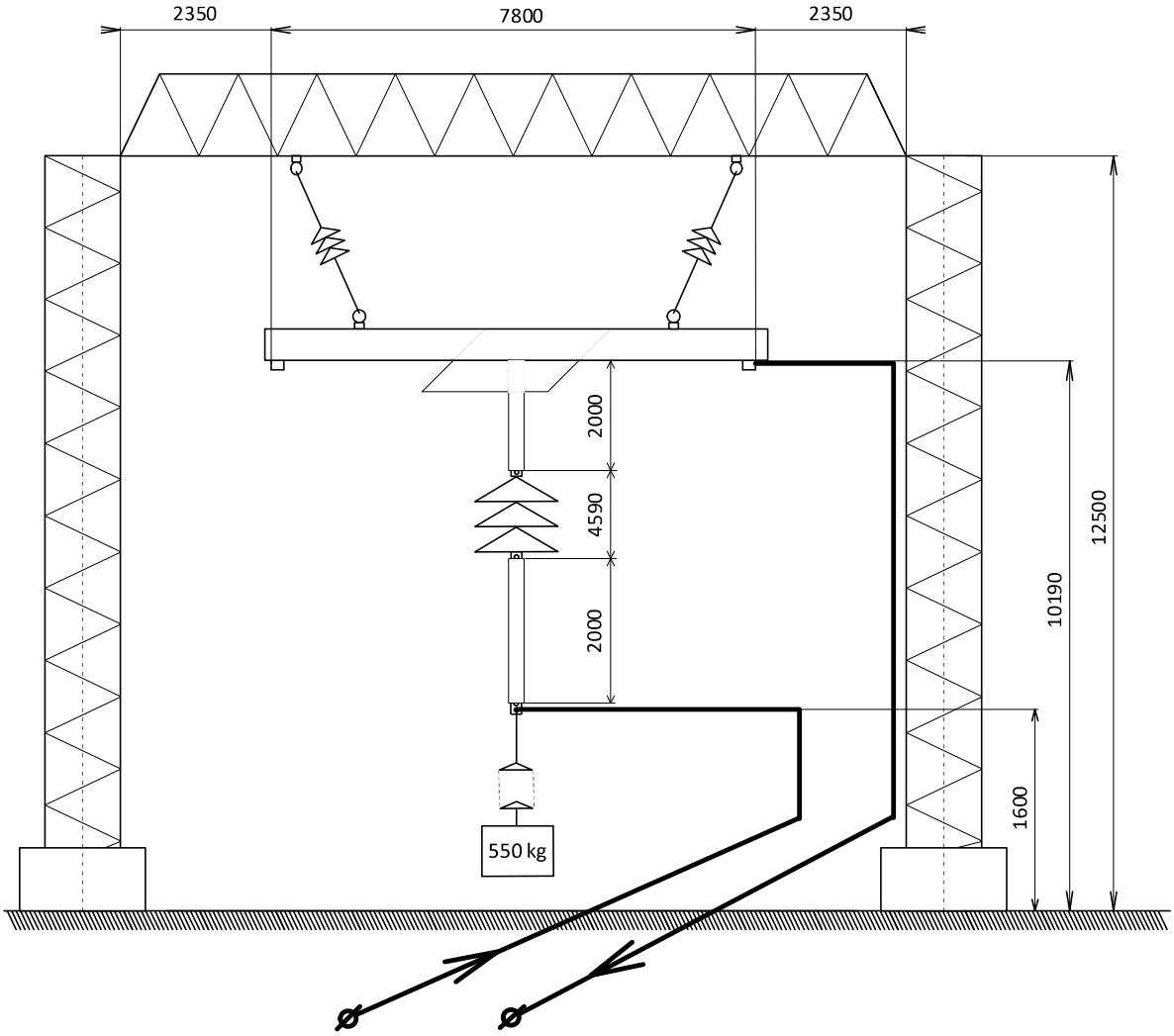
G	= Generator	TO	= Test Object	C_1	= Protective Capacitors	U	= Voltage Measurement to earth
MB	= Master Breaker	L	= Reactor	R_1	= Protective Resistors	I	= Current Measurement
MS	= Make Switch	R	= Resistor	GP	= Protective Spark Gap		
PT	= Power Transformer						

Supply		
Power	MVA	420,00
Frequency	Hz	50
Phase(s)		1
Voltage	kV	21,0
Current	kA	20
Impedance	Ω	1,050
Power factor		< 0,1
Neutral		not earthed

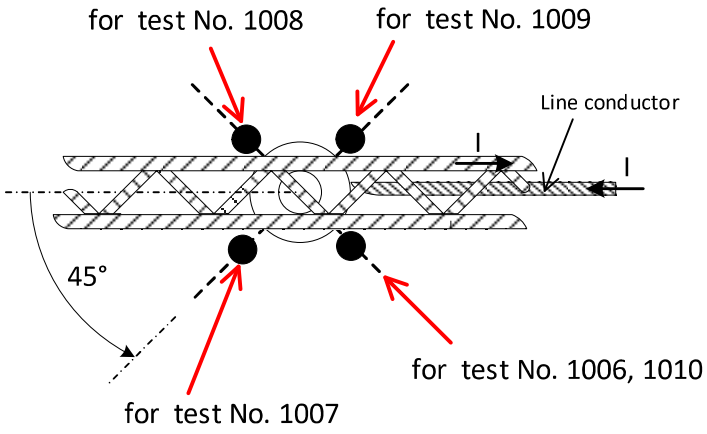
Load	
Short-circuit point	earthed

Remarks: -

7.3 Test arrangement



Position of the fusible wire, top view:



7.4 Photographs before test

7.5 Test results and oscillograms

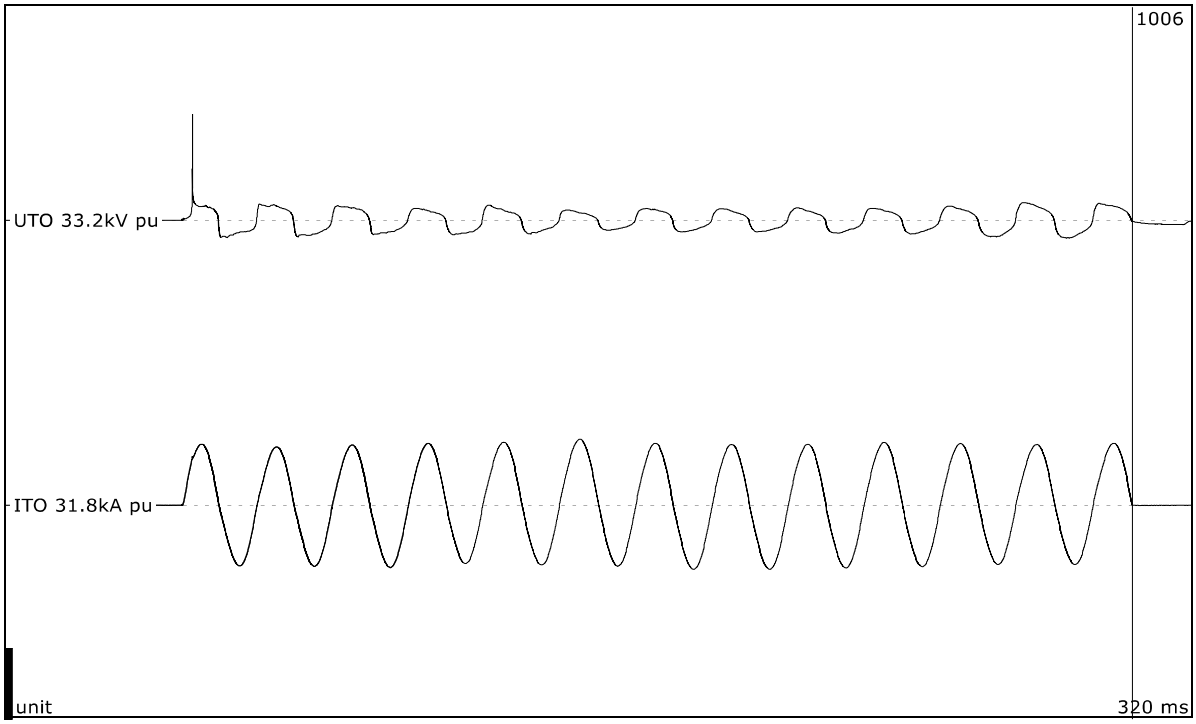
Overview of test numbers

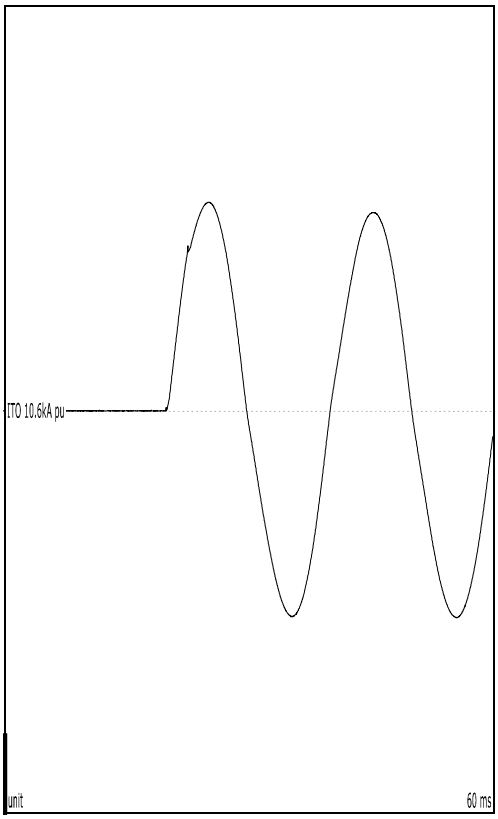
220304-1006
220304-1007
220304-1008
220304-1009
220304-1010

Remarks

Test number	Specified arc current	Specified arc time
220304-1006	20 kA	0,25 s
220304-1007	20 kA	0,25 s
220304-1008	20 kA	0,25 s
220304-1009	20 kA	0,25 s
220304-1010	20 kA	0,25 s

Power arc test



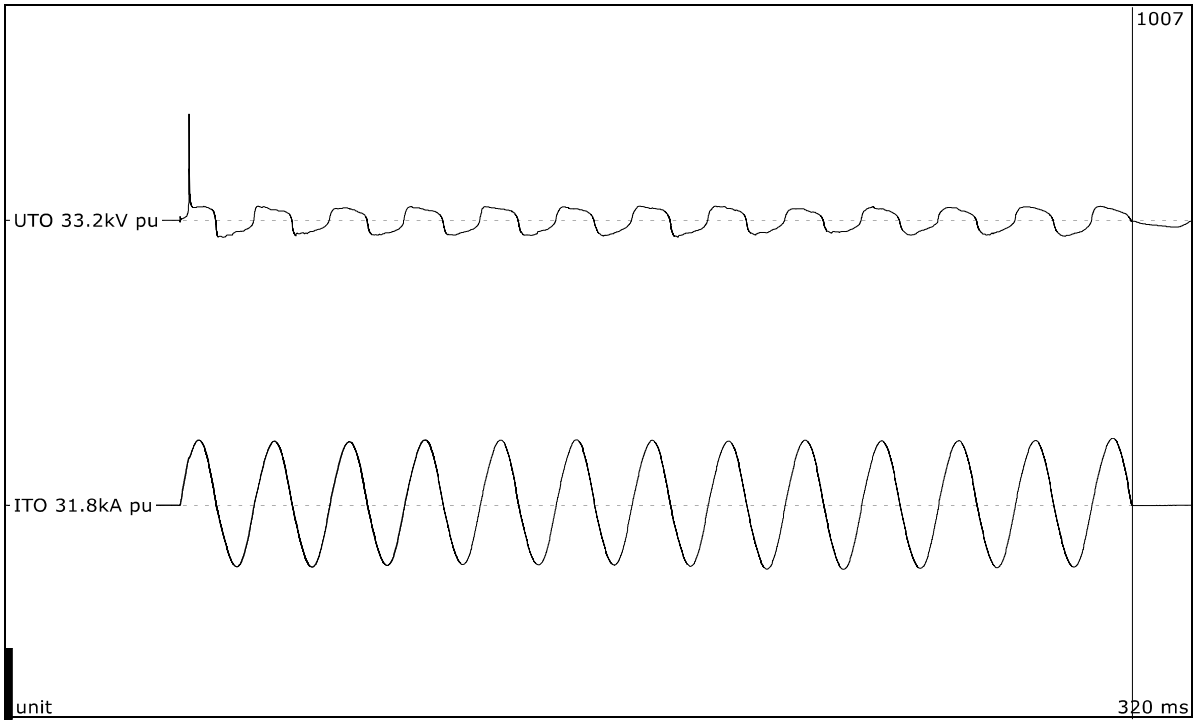


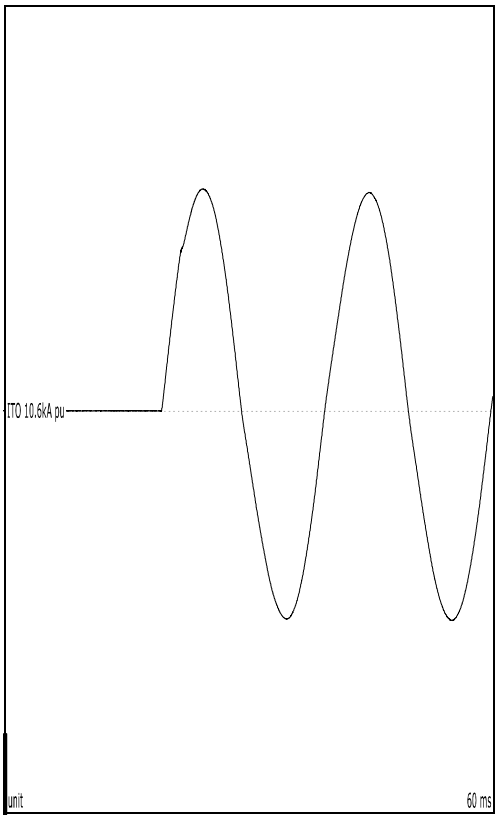
Test number: **220304-1006**

Time interval between tests	min	-
Phase		**R, T**
Applied voltage, phase-to-ground	kV_{RMS}	20,5
Current	kA_{peak}	27,4
Current, a.c. component, beginning	kA_{RMS}	19,5
Current, a.c. component, middle	kA_{RMS}	19,7
Current, a.c. component, end	kA_{RMS}	19,5
Current, a.c. component, average	kA_{RMS}	19,4
Duration	s	0,256
Ratio of Ixt		0,99

Observations: No fault.

Power arc test



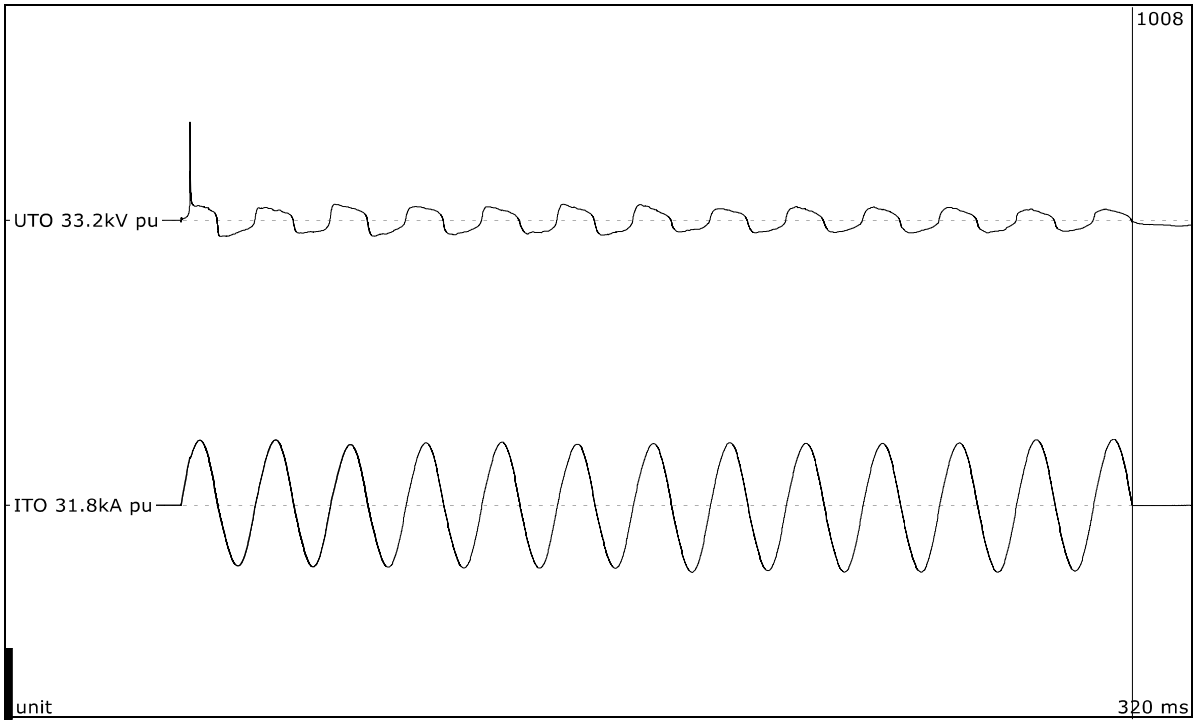


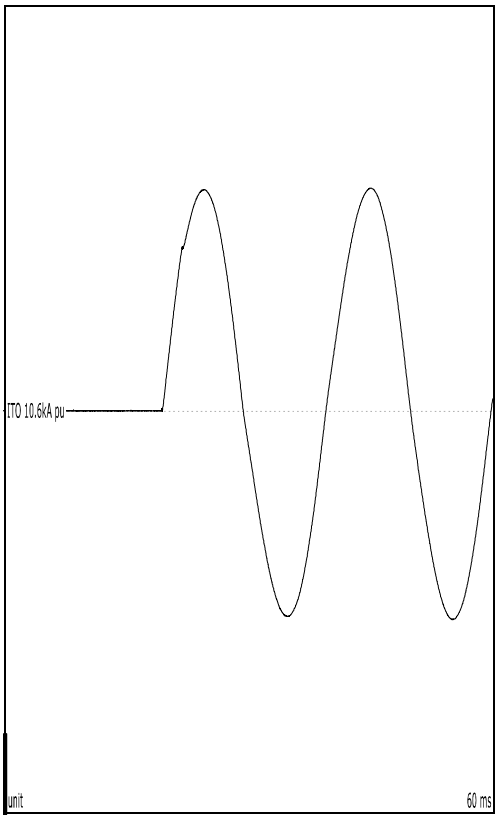
Test number: **220304-1007**

Time interval between tests	min	22:25
Phase		**R, T**
Applied voltage, phase-to-ground	kV_{RMS}	21,0
Current	kA_{peak}	29,2
Current, a.c. component, beginning	kA_{RMS}	19,7
Current, a.c. component, middle	kA_{RMS}	20,0
Current, a.c. component, end	kA_{RMS}	20,1
Current, a.c. component, average	kA_{RMS}	19,9
Duration	s	0,257
Ratio of Ixt		1,02

Observations: No fault.

Power arc test



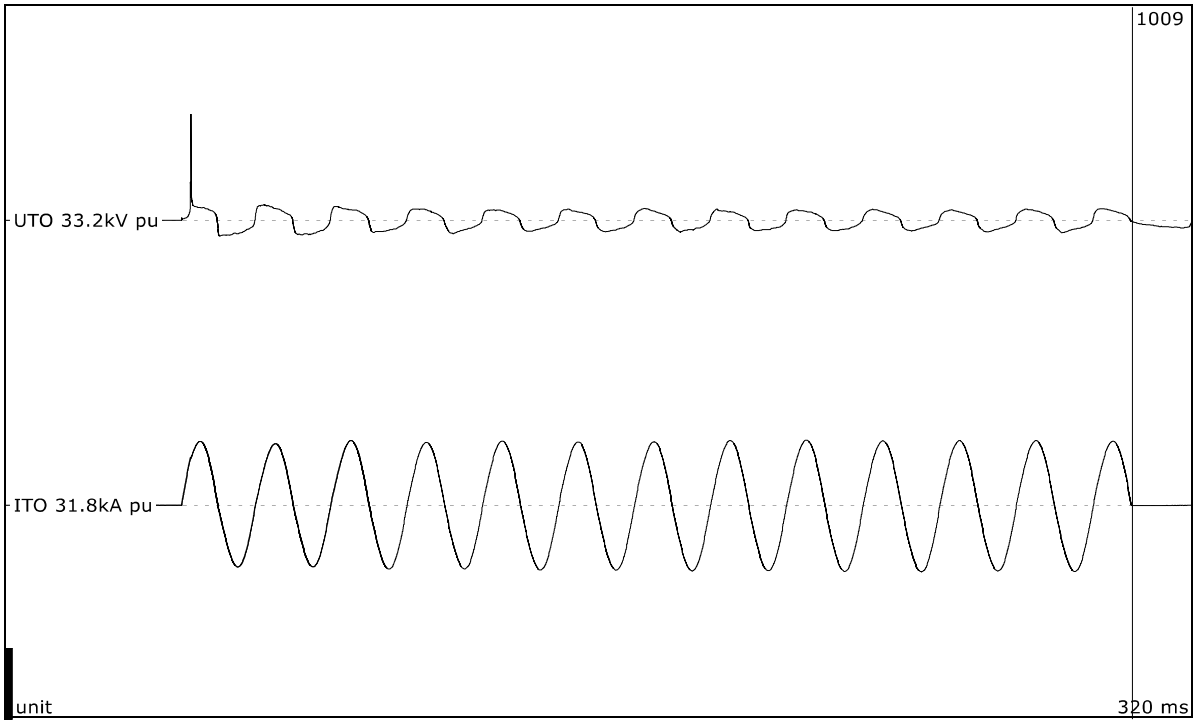


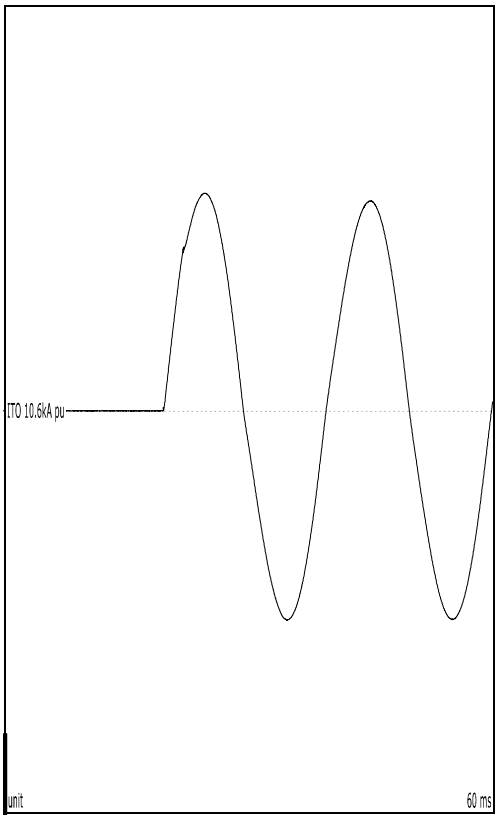
Test number: **220304-1008**

Time interval between tests	min	22:31
Phase		**R, T**
Applied voltage, phase-to-ground	kV_{RMS}	21,0
Current	kA_{peak}	29,3
Current, a.c. component, beginning	kA_{RMS}	19,5
Current, a.c. component, middle	kA_{RMS}	20,4
Current, a.c. component, end	kA_{RMS}	20,4
Current, a.c. component, average	kA_{RMS}	20,0
Duration	s	0,257
Ratio of Ixt		1,03

Observations: No fault.

Power arc test



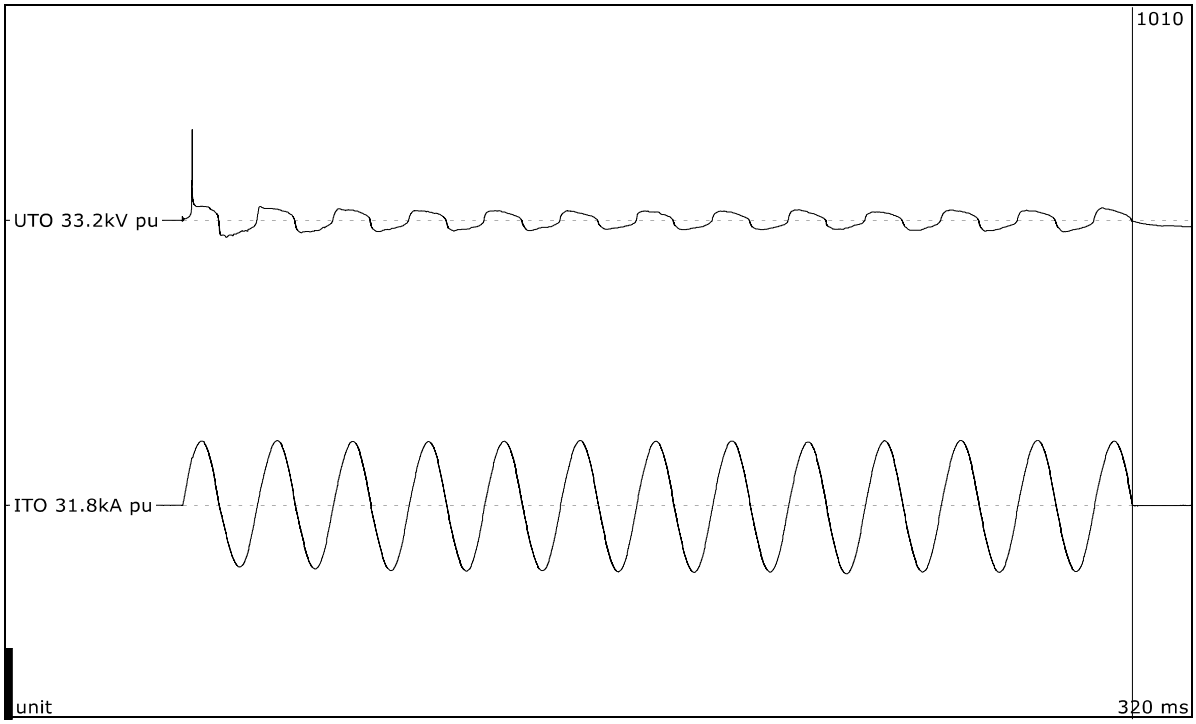


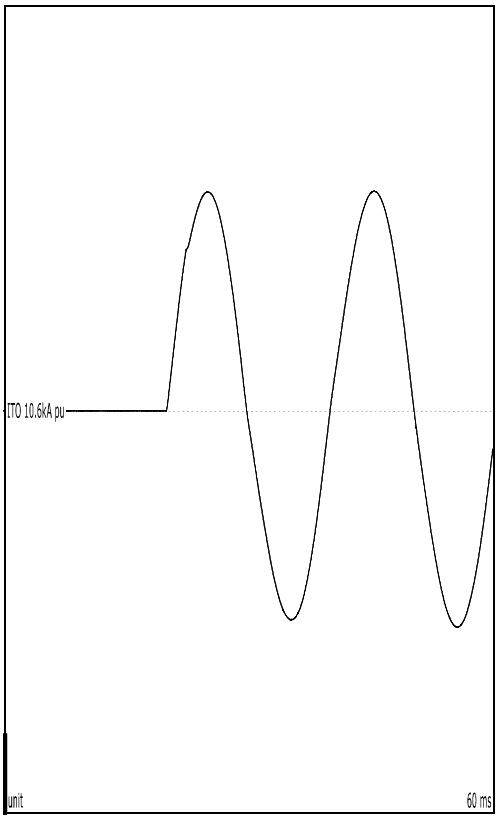
Test number: **220304-1009**

Time interval between tests	min	21:21
Phase		**R, T**
Applied voltage, phase-to-ground	kV_{RMS}	21,0
Current	kA_{peak}	28,6
Current, a.c. component, beginning	kA_{RMS}	20,2
Current, a.c. component, middle	kA_{RMS}	20,6
Current, a.c. component, end	kA_{RMS}	20,7
Current, a.c. component, average	kA_{RMS}	20,3
Duration	s	0,256
Ratio of Ixt		1,04

Observations: No fault.

Power arc test





Test number: **220304-1010**

Time interval between tests	min	20:49
Phase		**R, T**
Applied voltage, phase-to-ground	kV_{RMS}	21,0
Current	kA_{peak}	28,9
Current, a.c. component, beginning	kA_{RMS}	20,4
Current, a.c. component, middle	kA_{RMS}	20,7
Current, a.c. component, end	kA_{RMS}	20,7
Current, a.c. component, average	kA_{RMS}	20,5
Duration	s	0,256
Ratio of Ixt		1,05

Observations: No fault.

7.6 Condition/inspection after test

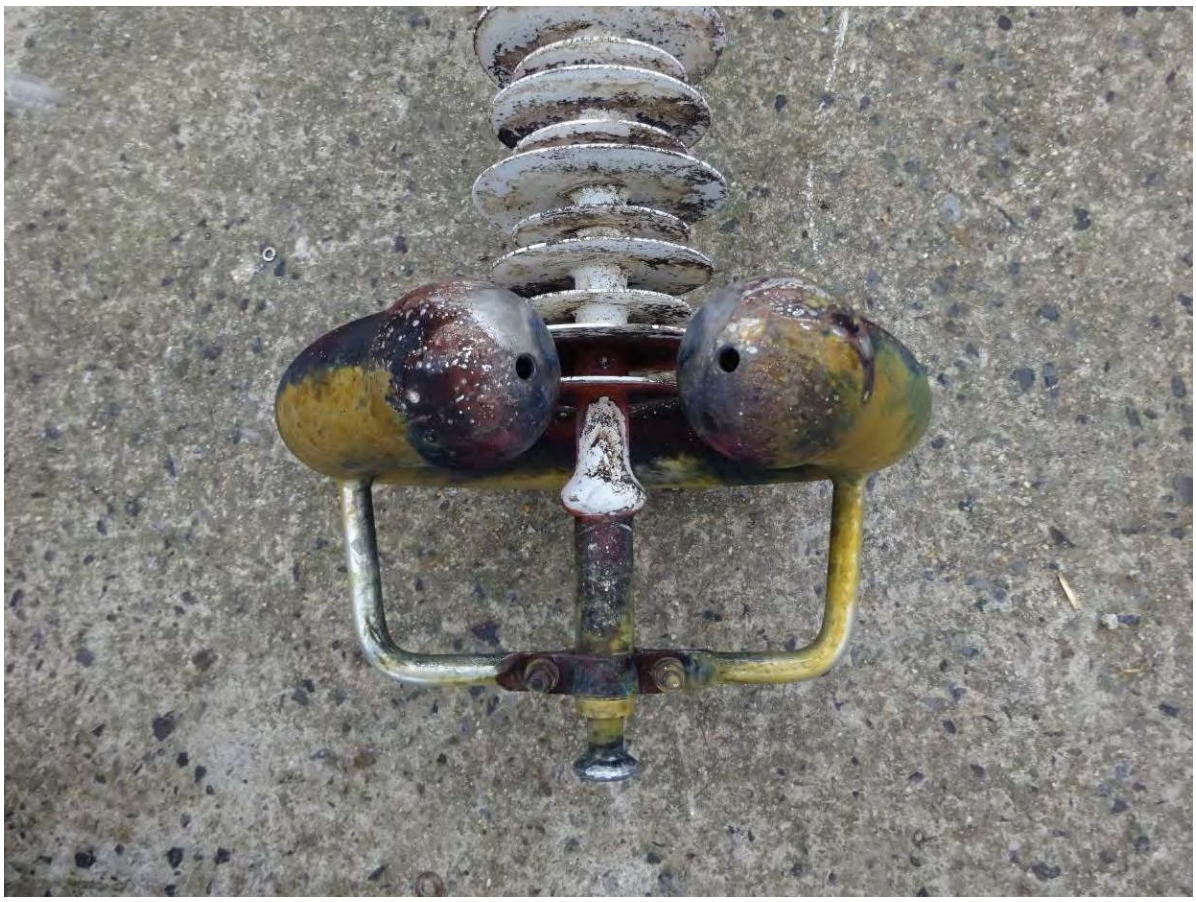
Visual examination:

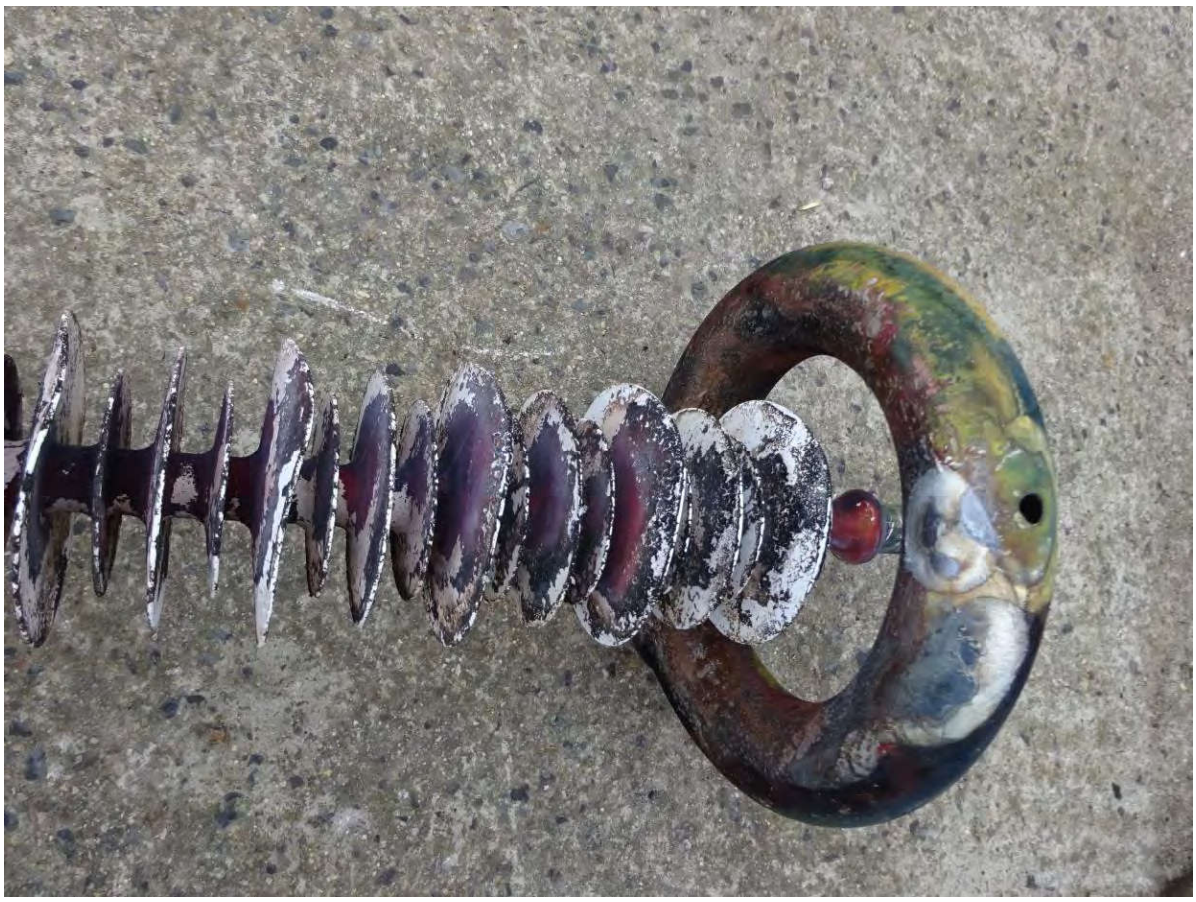
Insulating components:
No housing damage, no exposure of the fiberglass core. Discoloration and burning of the surface.

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

Corona rings and other protective metallic parts:
Partial metallic evaporation of the grading rings (see pages 33 – 36).

7.7 Photographs after test





8 MECHANICAL FAILING LOAD TEST

Standard and date

Standard	Client's instructions
Test date	7 March 2022

Serial No.

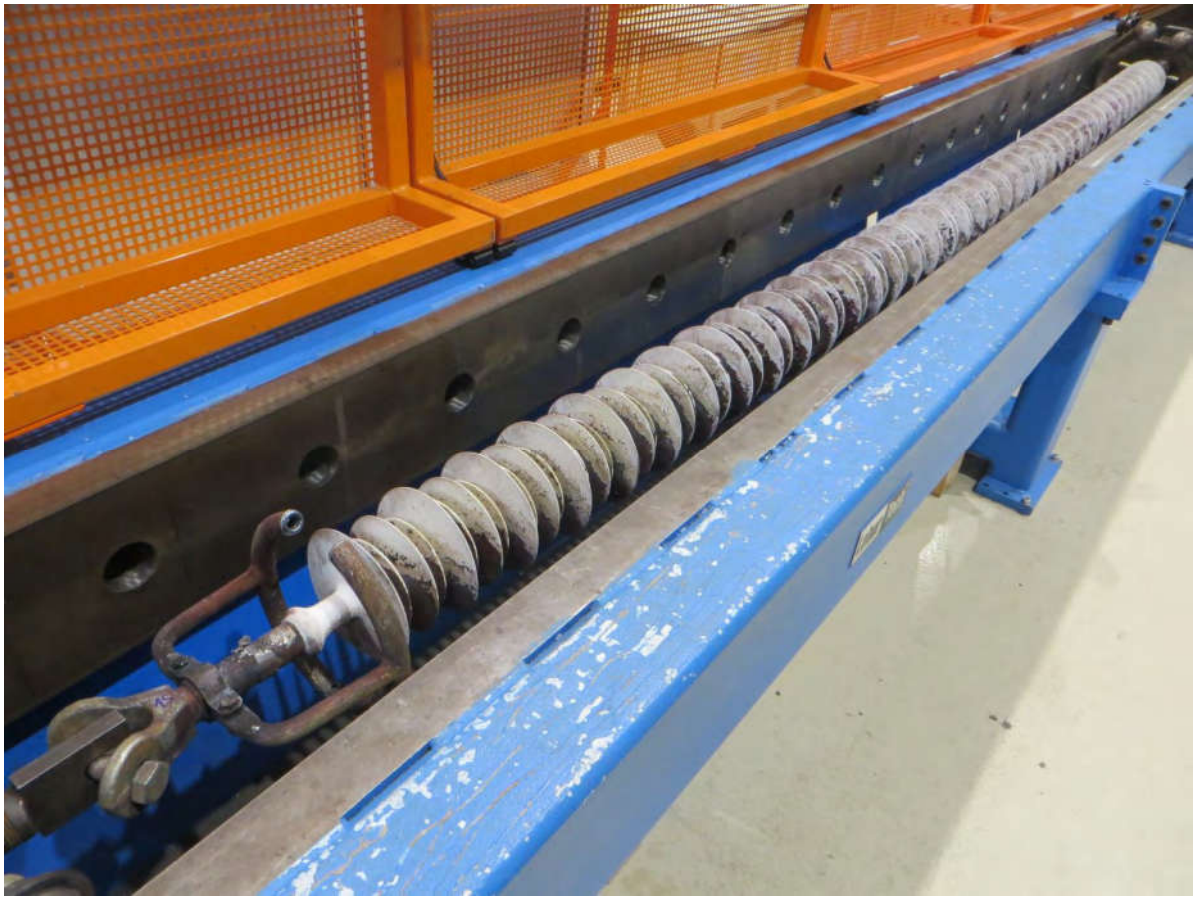
-

8.1 Condition before test

Insulator unit in same condition.

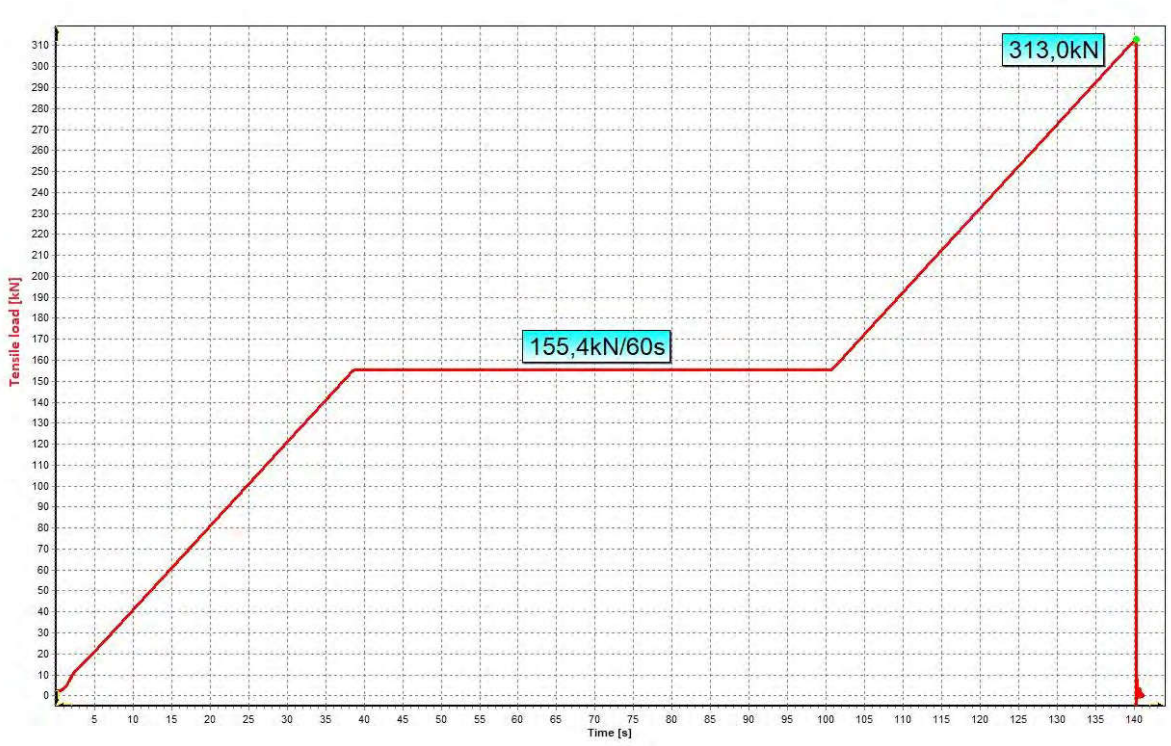
Insulator unit (1S) under test.
Mechanical load rapidly but smoothly increased to 70% of SFL/SML, held for 60 s (end of mechanical failing load test) and then raised up to the breaking.

8.2 Photographs before tests



8.3 Test results and oscillograms

Mechanical failing load test



Sample **1S**

70% of SFL/SML	kN	155,4
Maximum tensile load (uncertainty U=1,0%)	kN	313
Failing load (uncertainty U=1,0%)	kN	313
Time of holding (uncertainty U=0,7%)	s	60

Observation: Insulator unit 1S – no breakage up to 60 s.

8.4 Condition/inspection after tests

Insulator unit (1S) reached the end of mechanical failing load test.

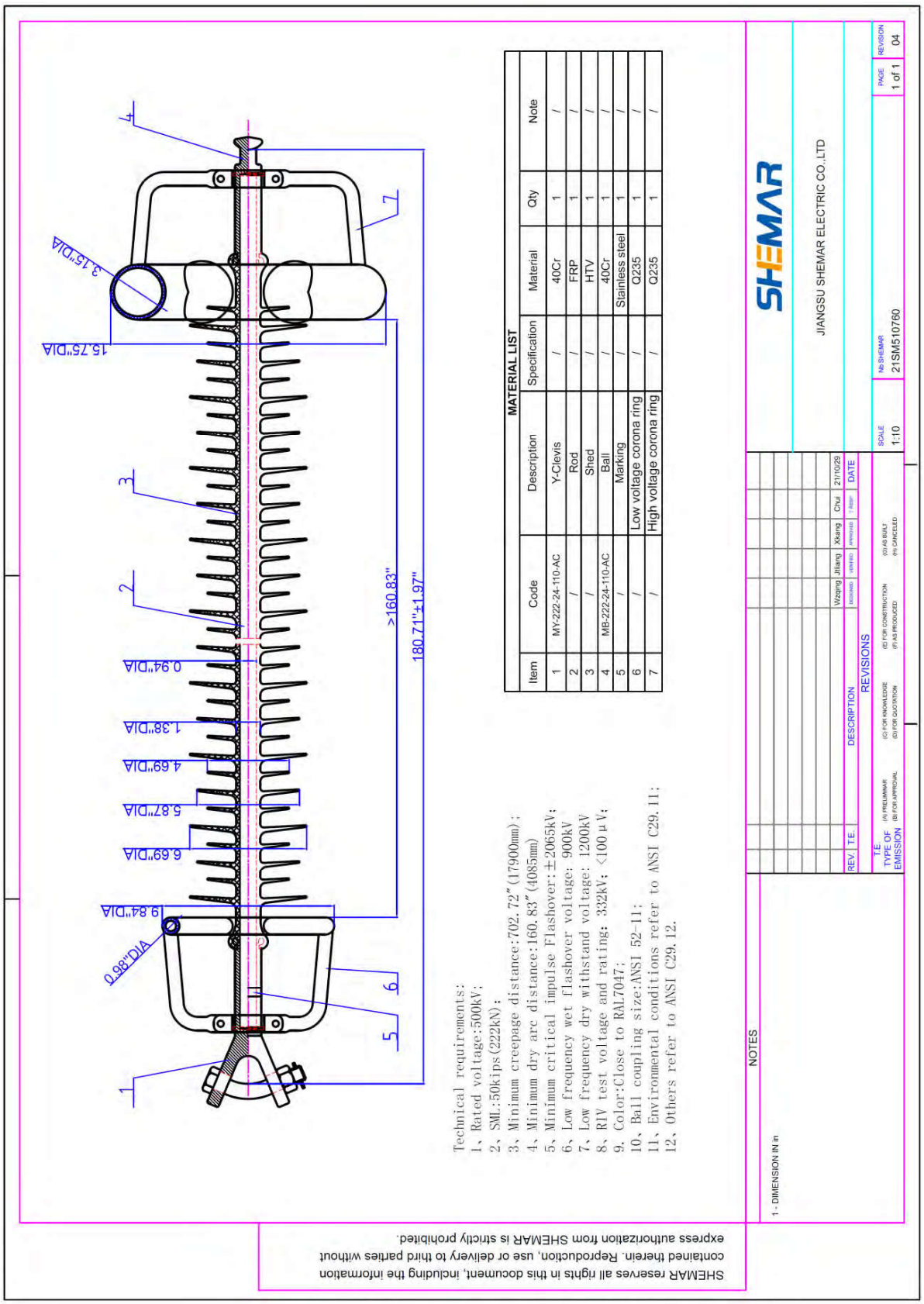
Criteria (IEC 61467:2008, Table 4):

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

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

8.5 Photographs after tests

9 DRAWINGS


MATERIAL LIST
Item | Code | Description | Specification | Material | Qty | Note
1 | MY-222-24-110-AC | Y-Clevis | / | 40Cr | 1 | /
2 | / | Rod | / | FRP | 1 | /
3 | / | Shed | / | HTV | 1 | /
4 | MB-222-24-110-AC | Ball | / | 40Cr | 1 | /
5 | / | Marking | / | Stainless steel | 1 | /
6 | / | Low voltage corona ring | / | Q235 | 1 | /
7 | / | High voltage corona ring | / | Q235 | 1 | /
Technical requirements:
1、Rated voltage:500kV;
2、SML:50kips(222kN);
3、Minimum creepage distance:702.72"(17900mm);
4、Minimum dry arc distance:160.83"(4085mm)
5、Minimum critical impulse Flashover:±2065kV;
6、Low frequency wet flashover voltage: 900kV
7、Low frequency dry withstand voltage: 1200kV
8、RIV test voltage and rating: 332kV; <100μV;
9、Color:Close to RAL7047;
10、Ball coupling size:ANSI 52-11;
11、Environmental conditions refer to ANSI C29.11;
12、Others refer to ANSI C29.12.
>160.83"
180.71"±1.97"
15.75"DIA
3.15"DIA
9.84"DIA
6.69"DIA
5.87"DIA
4.69"DIA
1.38"DIA
0.94"DIA
0.86"DIA
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File: Http://Transmissionsp/TLPE/TLPE_Standards/Standardsdocsinprogress/TLMS-028 Rev.3 - Specification For Non-Ceramic Suspension And Dead End Insulators.Doc

Specification for Non-Ceramic Suspension and Dead End Insulators

Document #: TLMS-028 Revision 3

Effective Date: May 16, 2013

Supersedes TLES-028 Revision 2

V. Testing Requirements

A. Grading Ring Testing

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

B. Routine Testing

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

C. Sample Testing

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

VI. Drawing Requirements

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

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