Autoritarea Contractantă: *SA "RED-Nord"* Moldova, 3100, m. Bălţi, str. Ştefan cel Mare, 180 „A”
Numărul procedurii de achiziţie: **ID 21559742 din 2 febr 2026, 44100000-1**
Denumirea licitaţiei: **Achizitia Izolatoare 10, 0.4 kV**

Anexa nr. 10

OFERTA TEHNICĂ

Nr	Denumirea	**Referinţa producătorului	Cantitatea		Term. de livrare
3	Izolatoare de susţinere din polimer	**20kV COMPOSITE INSULATOR FXBW-20/70-450 (WA25003-1)**	un.	5305	**45** zile calendaristice din momentul semnarii contractului. Termenul livrarii complete a bunului nu va depasi **150 zile**

****Producator Izolatoare de susţinere din polimer Lot 3: CYG INSULATOR CO.,LTD China**

1. **Livrarea:** SRL Electrocon va efectua livrarea in conditiile DDP Bălti, **depozit Central SA "RED-Nord"- or. Bălţi, str. Ştefan cel Mare, 180 „A”,** conform INCOTERMS 2010 si a cerinţelor stabilite de catre Organizator. **SRL Electrocon** suporta toate cheltuielile si riscurile legate de aducerea marfii in acest loc, inclusiv a taxelor vamale, a altor taxe si speze oficiale care se platesc la import, precum si a costurilor si riscurilor de indeplinire a formalitatilor vamale.);
2. **Descarcarea materialelor**: - va fi efectuata de catre **SA "RED-Nord"**, depozit Central - **or. Bălţi, str. Ştefan cel Mare, 180 „A”;**
3. **Cerinte de ambalare: -** materialele vor fi ambalate conform cerinţelor şi normelor ce asigură integritatea mărfii şi transportarea în siguranţă a acesteia.
4. **Termenul de îndeplinire a contractului:** 45-150 zile;
5. **Eliberarea mărfii: -** se va face în MDL, la cursul oficial al BNM în ziua perfectării documentelor fiscale;
6. **Termenul de achitare** – 30 zile din momentul primirii bunurilor.

Data: 18 februarie 2026
SRL „ELECTROCON” _____
(semnatura şi ştampila)

Digitally signed by Nguyen Huu thuy
Date: 2026.02.18 11:43:29 EET
Reason: MoldSign Signature
Location: Moldova
MOLDOVA EUROPEANĂ

Autoritarea Contractantă: *SA "RED-Nord"* Moldova, 3100, m. Bălţi, str. Ştefan cel Mare, 180 „A”
Numărul procedurii de achiziţie: ID 21559742 din 2 febr 2026, 44100000-1
Denumirea licitaţiei: Achizitia Izolatoare 10, 0.4 kV

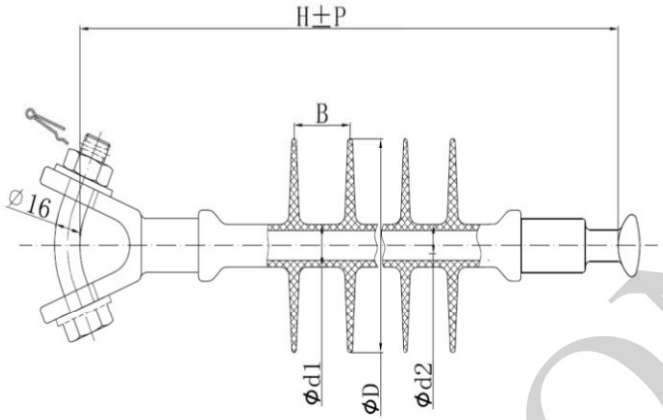
FIŞA TEHNICĂ A OFERTEI Технические характеристики заказа			
Producător Производитель	**CYG INSULATOR CO.,LTD China**		
- **Centrul de Producere/Adresa:** Центр производства/Адрес:	Dongcheng District, Dongguan City, China, PC:523111		
- **Denumirea articolului** (conform catalogului producătorului) Наименование продукта (согласно каталогу производителя)	**20kV COMPOSITE INSULATOR** **FXBW-20/70-450 (WA25003-1)**		
- **Denumirea RN:** Наименование:	**Izolatoare de susținere din polimer**		
Caracteristici generale Общие характеристики	**u.m.** и. е.	**Solicitate** Заказанные	**Ofertate** Представленные
- Standard Стандарт	-	IEC 61109	IEC 61109
- Masa Масса	kg кг	De indicat Указать	2
- Materialul stratului de protecție (anvelopei) Материал защитной оболочки	-	Кремнийорганическая резина+добавка+заполнение	Cauciuc siliconic
- Procentajul (conținutul) de polimer siliconic Процент (содержание) силиконового полимера	%	≥ 35	≥ 35
- Materialul tijei (miezului) Материал стержня	-	Fibră de sticlă ECR + rășină epoxidică ECR стекловолокно +эпоксидная смола	Fibră de sticlă ECR + rășină epoxidică
- Materialul asamblărilor de capăt (armăturilor) Материал оконцевателей (арматуры	-		Oțel zincat la cald
- Tipul asamblărilor de capăt (armăturilor) Тип оконцевателей (арматуры)	-		Y16B16 Y-clevis - Pin Ball
- Zona de poluare Степень загрязнения изоляции	-		III
- Temperatură, ºC min/max Температура, ºC мин/макс			-40 / +40
- Înălțimea de asupra mării, m Высота над уровнем моря, м			< 1000
Caracteristici dimensionale Основные размеры	**u.m.** и. е.	**Solicitate** Заказанные	**Ofertate** Представленные
- Lungimea (cota A pe plan) Длина (значение А на чертеже)	mm мм	≤ 460	450±10
- Distanța de conturnare Длина пути утечки	mm мм	≥ 600	600
- Izolatorul corespunde schiței prezentate în Anexa Изолятор соответствует представленному эскизу в Приложении 2		Da Да	DA
Caracteristici electrice Электрические характеристики	**u.m.** и. е.	**Solicitate** Заказанные	**Ofertate** Представленные
- Tensiunea nominală Номинальное напряжение	kV кВ	20	20
- Tensiunea suportată la impuls de trăsnet 50% Выдерживаемое напряжение грозового импульса 50 %	kV кВ	85	85
- Tensiunea suportată la frecvență industrială sub ploaie 50% Выдерживаемое напряжение 50% промышленной частоты под дождём	kV кВ	35	35
Caracteristici mecanice Механические характеристики	**u.m.** и. е	**Solicitate** Заказанные	**Ofertate** Представленные
- Sarcina mecanică specificată la întindere Механическая разрушающая сила при растяжении	kN кН	70	70
Certificări Сертификаты		**Solicitate** Заказанные	**Ofertate** Представленные
- A sistemului de calitate Система качества	-	ISO 9001	ISO 9001
- Medio-ambientale Окружающая среда	-	ISO 14001	ISO 14001
Garanție Гарантия			
- Termenul de exploatare pe garanție Гарантийный срок эксплуатации	luni месяцы	≥ 24	24 luni

Insulator Marking

CYG

SML 70kN

month year



Guaranteed Technical Paticular

Dimensions Data

-Section Length(H±P)	450±10mm
-Shed Diameter(D)	109mm
-Shed Spacing(B)	40mm
-Housing Diameter(d1)	23mm
-Core Diameter(d2)	16mm
- Ball Coupling size:	16(IEC 60120)
-Y Clevis Coupling Size	16(IEC 61466-1)
-Min arc Distance	300mm
-Min Creepage Distance	600mm

Material Data

-Housing and Sheds:Injection Moulded HTV Silicon Rubber(Grey)
-Core Rod：Glass fiber reinforced&Exopy Resin ECR Rod
-End Fitting:Steel-Hot Dip Gal.
Standard:IEC61109 etc.

Electrical Data

-Rated Voltage	20kV
- Dry Lighting Impulse Withstand Voltage	⩾80kV
-Wet Power Frequency Withstang Voltage	⩾35kV

Mechanical Data

-Specified Tensile Load	70kN
-Specified Routine Load(RTL)	35kN

CYG CYG INSULATOR CO.,LTD

Composite Insulator

DRN.BY	ZHANG WEIAN	2025.01.23	Drawing No.WA26003-1		Rev:1
PRO.BY	HE ZIJIAN	2025.01.23	Model:FXBW-20/70-450		
APP.BY	XU WENRONG	2025.01.23	Scale:NTS	Unit: mm	Wt:2kg

CYG 长园高能电气股份有限公司
CYG INSULATOR CO.,LTD

Niushan Foreign Economy Industrial Park, Dongcheng District, Dongguan City, China, PC:523111 TEL:+86 769 22291876 Fax: +86 769 22291877769 22291877

February 3, 2026

Guarantee Certificate of Quality

Supplier: **CYG INSULATOR CO. LTD.,**
NIUSHAN FOREIGN ECONOMY,
TRADE INDUSTRIAL PARK, DONGCHENG DISTRICT,
DONGGUAN CITY, PC:523111 CHINA

Description of Goods:

1. 20kV COMPOSITE INSULATOR FXBW-20/70-450 (WA25003-1)
2. 20kV POST INSULATOR FZSW-20/10-300 (WA25003-2)

We, CYG Insulator Co. Ltd., hereby guarantee that the materials are new, unused and in accordance with the Technical Specifications of Client and free from defects in materials and workmanship. We guarantee the materials supplied for satisfactory performance in accordance with the Contract.

Thanking you.

For: CYG Insulator Co., Ltd.

CYG INSULATOR CO., LTD 长园高能电气股份有限公司

Jason

IQNET

Building trust together.

Certificate

CQM has issued an IQNET recognized certificate that the organization:

CYG INSULATOR CO.,LTD.

Certification Add.:No.2, Jinghui Road, Niushan Foreign Trade Economy Industrial Park, Dongcheng District, Dongguan City, Guangdong, P.R.China

for the following scope:

R & D, production of composite insulators and composite material insulation products for electrical equipment

has implemented and maintains a

Quality Management System

which fulfils the requirements of the following standard:

ISO 9001:2015

Issued on:2023-05-11
Expires on: 2026-05-23

This attestation is directly linked to the IQNet Partner's original certificate and shall not be used as a stand-alone document

Registration Number: CN-00223Q22398R5M

Alex Stoichitoiu
President of IQNET

Ji XiaoDong
President of CQM

CQM China Quality Mark

This attestation is directly linked to the IQNET Member's original certificate and shall not be used as a stand-alone document.

IQNET Members*:
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* The list of IQNET Members is valid at the time of issue of this certificate. Updated information is available under www.iqnet-certification.com

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Certificate

CQM has issued an IQNET recognized certificate that the organization:

CYG INSULATOR CO.,LTD.

Certification Add.:No.2, Jinghui Road, Niushan Foreign Trade Economy Industrial Park, Dongcheng District, Dongguan City, Guangdong, P.R.China

for the following scope:

R & D, production of composite insulators and composite material insulation products for electrical equipment and relevant management activities

has implemented and maintains a

Environmental Management System

which fulfils the requirements of the following standard:

ISO 14001:2015

Issued on:2023-05-11
Expires on: 2026-05-23

This attestation is directly linked to the IQNet Partner's original certificate and shall not be used as a stand-alone document

Registration Number: CN-00223E31586R5M

Alex Stoichitoiu
President of IQNET

Ji XiaoDong
President of CQM

CQM China Quality Mark

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Certificate

CQM has issued an IQNET recognized certificate that the organization:

CYG INSULATOR CO.,LTD.

Certification Add.:No.2, Jinghui Road, Niushan Foreign Trade Economy Industrial Park, Dongcheng District, Dongguan City, Guangdong, P.R.China

for the following scope:

R & D, production of composite insulators and composite material insulation products for electrical equipment and relevant management activities

has implemented and maintains a

Occupational Health and Safety Management System

which fulfils the requirements of the following standard:

ISO 45001:2018

Issued on:2023-05-11
Expires on: 2026-05-23

This attestation is directly linked to the IQNet Partner's original certificate and shall not be used as a stand-alone document

Registration Number: CN-00223S21480R5M

Alex Stoichitoiu
President of IQNET

Ji XiaoDong
President of CQM

CQM
China Quality Mark

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AENOR Spain **AFNOR Certification** France **APCER** Portugal **CCC** Cyprus **CISQ** Italy **CQC** China **CQM** China **CQS** Czech Republic **Cro Cert** Croatia **DQS Holding GmbH** Germany **EAGLE Certification Group** USA **FCAV** Brazil **FONDONORMA** Venezuela **ICONTEC** Colombia **ICS** Bosnia and Herzegovina **Inspecta Sertifiointi Oy** Finland **INTECO** Costa Rica **IRAM** Argentina **JQA** Japan **KFQ** Korea **LSQA** Uruguay **MIRTEC** Greece **MSZT** Hungary **Nemko AS** Norway **NSAI** Ireland **NYCE-SIGE** México **PCBC** Poland **Quality Austria** Austria **SII** Israel **SIQ** Slovenia **SIRIM QAS International** Malaysia **SQS** Switzerland **SRAC** Romania **TSE** Türkiye **YUQS** Serbia

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China Quality Mark

Environmental Management System Certificate

Certificate Number:00223E31586R5M

CQM hereby certifies that

CYG INSULATOR CO.,LTD.

Unified Social Credit Identifier: 914419002818426765

Domicile:No.2, Jinghui Road, Niushan Foreign Trade Economy Industrial Park, Dongcheng District, Dongguan City, Guangdong, P.R.China

Certification Add.:No.2, Jinghui Road, Niushan Foreign Trade Economy Industrial Park, Dongcheng District, Dongguan City, Guangdong, P.R.China

the management system conform to

GB/T 24001-2016/ISO 14001:2015

This certificate is valid to the following scope:

R & D, production of composite insulators and composite material insulation products for electrical equipment and relevant management activities

(The information of this certificate can be inquired on www.cnca.gov.cn or website of CQM. The continual validity of the certificate can be checked by Certificate Confirmation of surveillance.)

Issued on: 2023-05-11

Expires on: 2026-05-23

签发人：

中国认可
国际互认
管理体系
MANAGEMENT SYSTEM
CNAS C002-M

Member of IQNET

方圆标志认证集团
China Quality Mark Certification Group

CHINA QUALITY MARK

北京市海淀区增光路33号 010-88411888 http://www.cqm.com.cn
Address: No.33, Zengguang Road, Haidian District, Beijing, P.R. China

AA 0018715

CQM
China Quality Mark

Quality Management System Certificate

Certificate Number:00223Q22398R5M

CQM hereby certifies that

CYG INSULATOR CO.,LTD.

Unified Social Credit Identifier: 914419002818426765

Domicile:No.2, Jinghui Road, Niushan Foreign Trade Economy Industrial Park, Dongcheng District, Dongguan City, Guangdong, P.R.China

Certification Add.:No.2, Jinghui Road, Niushan Foreign Trade Economy Industrial Park, Dongcheng District, Dongguan City, Guangdong, P.R.China

the management system conform to

GB/T 19001-2016/ISO 9001:2015

This certificate is valid to the following scope:

R & D, production of composite insulators and composite material insulation products for electrical equipment

(The information of this certificate can be inquired on www.cnca.gov.cn or website of CQM. The continual validity of the certificate can be checked by Certificate Confirmation of surveillance.)

Issued on: 2023-05-11
Expires on: 2026-05-23

签发人：

中国认可
国际互认
管理体系
MANAGEMENT SYSTEM
CNAS C002-M

Member of IQNET

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CHINA QUALITY MARK

北京市海淀区增光路33号 010-88411888 http://www.cqm.com.cn
Address: No.33, Zengguang Road, Haidian District, Beijing, P.R. China

AA 0018717

China Quality Mark

Occupational Health and Safety Management System Certificate

Certificate Number:00223S21480R5M

CQM hereby certifies that

CYG INSULATOR CO.,LTD.

Unified Social Credit Identifier: 914419002818426765

Domicile:No.2, Jinghui Road, Niushan Foreign Trade Economy Industrial Park, Dongcheng District, Dongguan City, Guangdong, P.R.China

Certification Add.:No.2, Jinghui Road, Niushan Foreign Trade Economy Industrial Park, Dongcheng District, Dongguan City, Guangdong, P.R.China

the management system conform to

GB/T 45001-2020/ISO 45001:2018

This certificate is valid to the following scope:

R & D, production of composite insulators and composite material insulation products for electrical equipment and relevant management activities

（The information of this certificate can be inquired on www.cnca.gov.cn or website of CQM. The continual validity of the certificate can be checked by Certificate Confirmation of surveillance.）

Issued on: 2023-05-11

Expires on: 2026-05-23

签发人：

中国认可
国际互认
管理体系
MANAGEMENT SYSTEM
CNAS C002-M

Member of IQNET

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China Quality Mark Certification Group

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北京市海淀区增光路33号 010-88411888 http://www.cqm.com.cn
Address: No.33, Zengguang Road, Haidian District, Beijing, P.R. China

AA 0018719

EA MLA Signatory
Český institut pro akreditaci, o.p.s.
Olšanská 54/3, 130 00 Praha 3

issues

according to section 16 of Act No. 22/1997 Coll., on technical requirements for products, as amended

CERTIFICATE OF ACCREDITATION

No. **530/2023**

EGU - HV Laboratory a.s.
with registered office Podnikatelská 267, 190 11 Praha 9 - Běchovice,
Company Registration No. 25634330

for the Testing Laboratory No. **1029**
EGU HV LABORATORY

Scope of accreditation:

High-voltage tests, measurement of radio-frequency interference, voltage and dielectric tests of electric objects and equipment and mechanical tests of insulators to the extent as specified in the appendix to this Certificate.

This Certificate of Accreditation is a proof of Accreditation issued on the basis of assessment of fulfillment of the accreditation criteria in accordance with

ČSN EN ISO/IEC 17025:2018

In its activities performed within the scope and for the period of validity of this Certificate, the Conformity Assessment Body is entitled to refer to this Certificate, provided that the accreditation is not suspended and the Accredited Body meets the specified accreditation requirements in accordance with the relevant regulations applicable to the activity of an accredited Conformity Assessment Body.

This Certificate of Accreditation replaces, to the full extent, Certificate No.: 309/2022 of 22. 6. 2022, or any administrative acts building upon it.

The Certificate of Accreditation is valid until: **12. 3. 2026**

Prague: 12. 10. 2023

Český institut pro akreditaci, o.p.s.
NÁRODNÍ AKREDITAČNÍ ORGÁN
-3-

Jan Velíšek
Director of the Department
of Testing and Calibration Laboratories
Czech Accreditation Institute

The Appendix is an integral part of
Certificate of Accreditation No.: 530/2023 of 12/10/2023

Accredited entity according to ČSN EN ISO/IEC 17025:2018:

EGU - HV Laboratory a.s.
CAB number 1029, EGU HV LABORATORY
Podnikatelská 267, 190 11 Praha 9 - Běchovice

The laboratory applies a flexible approach to the scope of accreditation.
The current list of activities carried out within the flexible scope is publicly available on the laboratory's website https://www.eguhv.com/testing-rd/#testing in the form „List of activities within the flexible scope of accreditation".
The laboratory provides opinions and interprets test results.

Tests:

Ordinal number[1]	Test procedure / method name	Test procedure / method identification [2]	Subject of the test	Degrees of freedom[3]
1	**DC voltage tests**			
1.1	DC voltage tests	IEC 60060-1 ed. 3, cl. 5; ČSN EN 60060-1, cl. 5; IEEE 4-2013, cl. 7	Equipment with highest voltage for equipment above 1 kV	A, D
1.2	DC voltage tests	IEEE Std 386-2016, cl. 7.5.2	Separable insulated connectors for voltage systems over 600 V	A, D
1.3	DC voltage tests	IEC 60077-1 ed. 2.0, cl. 9.3.3; ČSN EN 60077-1 ed. 2, cl. 9.3.3; IEC 60077-2 ed. 2.0, cl. 9.3.3; ČSN EN 60077-2 ed. 2, cl. 9.3.3; EN 50124-1, cl. 7.5; ČSN EN 50124-1, ed. 2, cl. 7.5	Railway equipment	A, D
1.4	DC voltage tests	IEC 61442 ed. 2.0, cl. 5; ČSN EN 61442, cl. 5; IEC 60502-4; ČSN 34 7006; HD 629.1 S3, cl. 7; ČSN 34 7006, cl. 7; HD 629.2 S2, cl. 7; ČSN 34 7007 ed. 2, cl. 7;	Cable accessories	A, D
1.5	DC voltage tests	IEC 62497-1 ed. 1.1, cl. 7.5	Switchgear and controlgear	A, D
1.6	DC voltage tests	IEC 62848-1 ed. 1.0, cl. 6.2.5	Railway applications - DC surge arresters	A, D
1.7	DC voltage tests	ČSN EN 60358-1, cl. 9.2.3, 10.2.1.2, 10.4	Coupling capacitors and capacitive dividers	A, D
1.8	DC voltage tests	ČSN IEC 60840, Annex H.3.2.2, H.3.2.3, H.4.1	Power cables from 30 kV to 150 kV	A, D

Accredited entity according to ČSN EN ISO/IEC 17025:2018:

EGU - HV Laboratory a.s.
CAB number 1029, EGU HV LABORATORY
Podnikatelská 267, 190 11 Praha 9 - Běchovice

Ordinal number[1]	Test procedure / method name	Test procedure / method identification [2]	Subject of the test	Degrees of freedom[3]
1.9	DC voltage tests	IEC 62067 ed. 3.0, Annex H.3.3.2, H.3.3.3	Power cables from 150 kV to 500 kV	A, D
2	**AC voltage tests**			
2.1	AC voltage tests	IEC 60060-1 ed. 3, cl. 6; ČSN EN 60060-1, cl. 6; IEEE 4-2013, cl. 6	Equipment with highest voltage for equipment above 1 kV	A, D
2.2	AC voltage tests	IEEE Std 386-2016, cl. 7.5.1	Separable insulated connectors for voltage systems over 600 V	A, D
2.3	AC voltage tests	IEC 60076-3 ed. 3.0, cl. 10, 11, 12; ČSN EN 60076-3 ed. 2, cl. 10, 11, 12	Power transformers	A, D
2.4	AC voltage tests	IEC 60077-1 ed. 2.0, cl. 9.3.3; ČSN EN 60077-1 ed. 2, cl. 9.3.3; IEC 60077-2 ed. 2, cl. 9.3.3; ČSN EN 60077-2 ed. 2, cl. 9.3.3; IEC 61992-3 ed. 2, cl. 8.3.3; EN 50124-1, cl. 7.4; ČSN EN 50124-1 ed. 2, cl. 7.4; ČSN EN 50345 ed. 2, cl. 6.2.3, 6.3.3	Railway equipment	A, D
2.5	AC voltage tests	IEC 62848-1 ed. 1.0, cl. 6.2.4	Railway applications – DC metal-oxide surge arresters	A, D
2.6	AC voltage tests	ČSN EN 50123-1 ed. 2, cl. 7.5.2	Railway applications - DC switchgear	A, D
2.7	AC voltage tests	IEC 60099-4 ed. 3, cl. 8.2, 11.8.2; ČSN EN 60099-4 ed. 3, cl. 8.2, 11.8.2; ČSN EN IEC 60099-8 ed. 2, cl. 8.2.3.3; ČSN EN 60099-9, cl. 9.2; IEEE Std. C62.11, cl. 8.1	Metal-oxide surge arresters	A, D
2.8	AC voltage tests	EN 3-7, cl. 9, Annex C; ČSN EN 3-7, cl. 9, Annex C	Portable extinguishers	A, D

Accredited entity according to ČSN EN ISO/IEC 17025:2018:

EGU - HV Laboratory a.s.
CAB number 1029, EGU HV LABORATORY
Podnikatelská 267, 190 11 Praha 9 - Běchovice

Ordinal number[1]	Test procedure / method name	Test procedure / method identification [2]	Subject of the test	Degrees of freedom[3]
2.9	AC voltage tests	IEC 60137 ed. 7.0, cl. 8.2, 8.3, 9.4, 9.6; ČSN EN 60137 ed. 4, cl. 8.2, 8.3, 9.4, 9.6; IEEE Std. C57.19.01, tab. 1, A.1; IEEE Std. C57.19.00, cl. 7.2, 7.4	Bushings	A, D
2.10	AC voltage tests	IEC 60168, ed. 4.2, cl. 4, 4.7, 4.8; ČSN EN 60168, cl. 4, 4.7, 4.8; AS 4398.2-2005, cl. 4, 4.7, 4.8; CAN/CSA C156.1-18, cl. 9.2.3	Station post insulators	A, D
2.11	AC voltage tests	IEC 60076-3 ed. 3.0, cl. 10, 11, 12; ČSN EN 60076-3 ed. 2, cl. 10, 11, 12; IEC 60076-6 ed. 1.0, cl. 11.8.8; ČSN IEC 60076-6, cl. 11.8.8	Reactors	A, D
2.12	AC voltage tests	IEC 60358-1 ed. 1.0, cl. 9.2.3, 9.2.5, 10.2.1.1 ČSN EN 60358-1, cl. 9.2.3, 9.2.5, 10.2.1.1	Coupling capacitors and capacitive dividers	A, D
2.13	AC voltage tests	IEC 60358-1 ed. 1.0, cl. 9.2.3, 9.2.5, 10.2.1.1 ČSN EN 60358-1, cl. 9.2.3, 9.2.5, 10.2.1.1	Ceramic or glass insulators	A, D
2.14	AC voltage tests	IEC 60383-1 ed. 5.0, cl. 13; ČSN IEC 60383-1 ed. 4, cl. 4, 14; ANSI C29.3, cl. 8.2.1, 8.2.2; AS/NZS 2947.1, cl. 14; AS 3609-2005, cl. 2.2, 4.2	Insulator strings and insulator sets	A, D
2.15	AC voltage tests	IEC 60383-2 ed. 1, cl. 2, 10; ČSN EN 60383-2, cl. 2, 10;	Post insulators of organic materials	A, D

The Appendix is an integral part of
Certificate of Accreditation No.: 530/2023 of 12/10/2023

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Ordinal number[1]	Test procedure / method name	Test procedure / method identification [2]	Subject of the test	Degrees of freedom[3]
2.16	AC voltage tests	IEC 62271-103 ed. 2.0, cl. 7.2; IEC 62271-104, ed. 3.0, cl. 7.2; ČSN EN 62271-1 ed. 2, cl. 7.2, Annex E, F; ČSN EN 62271-103, cl. 7.2; ČSN EN 62271-104 ed. 3, cl. 7.2; IEEE Std C37.30.1-2022, cl. 8.1.1	Switchgear and controlgear	A, D
2.17	AC voltage tests	IEC 61057 ed. 2.0, cl. 6.6, 6.7; ČSN EN 61057 ed. 2, cl. 6	Insulating working platforms	A, D
2.18	AC voltage tests	IEC 61109 ed. 2.0, cl. 11, 11.1, tab. 3; ČSN EN 61109, cl. 11, 11.1, tab. 3; NTC 5651, cl. 8.1.2	Composite insulators	A, D
2.19	AC voltage tests	IEC 61869-1 ed. 2.0, cl. 7.2.4, 7.3.1, 7.3.3, 7.3.4; ČSN EN 61869-1, cl. 7.2.4, 7.3.1, 7.3.3, 7.3.4; IEC 61869-2 ed. 1.0, cl. 7.2.4, 7.3.1, 7.3.3, 7.3.4; ČSN EN 61869-2, cl. 7.2.4, 7.3.1, 7.3.3, 7.3.4	Instrument transformers	A, D
2.20	AC voltage tests	IEC 61869-3 ed. 1.0, cl. 7.3.1; ČSN EN 61869-3, cl. 7.3.1	Instrument transformers - inductive voltage transformers	A, D
2.21	AC voltage tests	IEC 61869-4 ed. 1.0, cl. 7.3.1	Instrument transformers - combined transformers	A, D
2.22	AC voltage tests	IEC 61869-5 ed. 1.0, cl. 7.2.4, 7.3.1; ČSN EN 61869-5, cl. 7.2.4, 7.3.1	Instrument transformers - capacitor voltage transformers	A, D
2.23	AC voltage tests	IEC 61952 ed. 2.0, cl. 11, tab. 3; ČSN EN 61952 ed. 2, cl. 11, tab. 3; CSA C411.6-16, cl. 6.2	Composite line post insulators for overhead lines	A, D

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Ordinal number[1]	Test procedure / method name	Test procedure / method identification [2]	Subject of the test	Degrees of freedom[3]
2.24	AC voltage tests	IEC 62231 ed. 1, cl. 9.2.2; ČSN EN 62231, cl. 9.2.2; ANSI C29.19, cl. 8.1; CAN/CSA C156.2-18, cl. 6.2	Composite station post insulators	A, D
2.25	AC voltage tests	IEC 62271-100 ed. 3.0, cl. 6.2, 7.1, 7.2; ČSN EN 62271-100 ed. 3, cl. 6.2, 7.1, 7.2	High-voltage alternating-current circuit breakers	A, D
2.26	AC voltage tests	IEC 62271-102 ed. 2.0, cl. 7.2, 8.1, 8.2; ČSN EN 62271-102 ed. 2, cl. 6.2, 7.1, 7.2; IEC 62497-1 ed. 1.1, cl. 7.4	Disconnectors and earthing switches	A, D
2.27	AC voltage tests	IEC 62271-105 ed. 3, cl. 6.2; ČSN EN 62271-105 ed. 2, cl. 6.2; IEEE Std. C37.42, cl. 6.1;	Alternating current switch-fuse combinations	A, D
2.28	AC voltage tests	IEEE C37.41, cl. 8.2, 8.3	Fuses and accessories over 1 kV	A, D
2.29	AC voltage tests	IEC 62271-200 ed. 3, cl. 6.2, 7.1; ČSN EN 62271-200 ed. 3, cl. 6.2, 7.1	Metal-enclosed switchgear and controlgear	A, D
2.30	AC voltage tests	IEC 62271-203 ed. 3, cl. 6.2, 7.1; ČSN EN 62271-203 ed. 3, cl. 6.2, 7.1	Gas-insulated metal-enclosed switchgear	A, D
2.31	AC voltage tests	IEC 62772 ed. 1.0, cl. 9.4	Composite hollow core station post insulators	A, D
2.32	AC voltage tests	ANSI C29.1, cl. 4.2, 4.3, 4.4, 4.5	Insulators	A, D
2.33	AC voltage tests	ANSI C29.2A, cl. 8.2.3, 8.2.4; ANSI C29.2B, cl. 8.2.1, 8.2.2	Suspension type insulators - porcelain or glass	A, D
2.34	AC voltage tests	ANSI C29.4, cl. 8.2.1, 8.2.2	Porcelain insulators	A, D
2.35	AC voltage tests	ANSI C29.5, cl. 8.2.1, 8.2.2; ANSI C29.6, cl. 8.2.1, 8.2.2; ANSI C29.7, cl. 8.2.1, 8.2.2	Porcelain insulators (pin type & line-post type)	A, D
2.36	AC voltage tests	ANSI C29.9, cl. 8.2.1	Ceramic insulators - apparatus and post-type	A, D

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Ordinal number[1]	Test procedure / method name	Test procedure / method identification [2]	Subject of the test	Degrees of freedom[3]
2.37	AC voltage tests	ANSI C29.11, cl. 8.1, 8.2.1, 8.2.2, 8.2.3, 8.2.4	Composite suspension insulators for overhead lines	A, D
2.38	AC voltage tests	ANSI C29.13, cl. 9.1, 9.2	Composite insulators of distribution deadend type	A, D
2.39	AC voltage tests	ANSI C.29.17, cl. 8.1, 8.2 ANSI C29.18, cl. 9.1,9.2	Composite line post insulators	A, D
2.40	AC voltage tests	CSA C411.1, cl. 6.3, 6.4	Suspension insulators	A, D
2.41	AC voltage tests	ANSI C.29.12, cl. 9.1, 9.2; CSA C411.4-16, cl. 6.3; CSA C411.5-16, cl. 6.2	Composite suspension insulators	A, D
2.42	AC voltage tests	IEC 61442 ed. 2.0, cl. 4; ČSN EN 61442, cl. 4; IEC 60502-4; ČSN 34 7006 HD 629.1 S3, cl. 7; ČSN 34 7006 ed. 3, cl. 7; HD 629.2 S2, cl. 7; ČSN 34 7007 ed. 2, cl. 7	Cable accessories	A, D
2.43	AC voltage tests	IEC 62271-103 ed. 2.0, cl. 6.2; ČSN EN 62271-103, cl. 6.2	Switches	A, D
2.44	AC voltage tests	ČSN EN IEC 62271-213 ed. 1.0, cl. 7.3.3, 7.3.4, 7.4, 7.5, 7.6, 7.7 ČSN EN IEC 62271-215 ed. 1.0, cl. 7.4.3, 7.4.4, 7.5	Voltage detecting systems (VDS)	A, D
2.45	AC voltage tests	ČSN IEC 60502-2, ed. 3.0, cl. 16.4, 18.2.9; ČSN IEC 60502-1 ed. 3.0, cl. 17.4; NEN-HD 620 S3, cl. 3.3; HD 605-S3, cl. 3.2.1, 3.2.5	Power cables from 1 kV up to 30 kV	A, D
2.46	AC voltage tests	ČSN IEC 60840, cl. 9.3, 12.4.7, 15.4.2 d)	Power cables from 30 kV up to 150 kV	A, D
2.47	AC voltage tests	IEC 62067 ed. 3.0, cl. 9.3, 12.4.7.2	Power cables from 150 kV up to 500 kV	A, D

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Ordinal number[1]	Test procedure / method name	Test procedure / method identification [2]	Subject of the test	Degrees of freedom[3]
3	**Tests with lightning impulse voltage**			
3.1	Tests with lightning impulse voltage	IEC 60060-1 ed. 3, cl. 7; ČSN EN 60060-1, cl. 7; IEEE 4-2013, cl. 8	Equipment with highest voltage for equipment above 1 kV	A, D
3.2	Tests with lightning impulse voltage	IEEE Std 386-2016, cl. 7.5.3	Separable insulated connectors for voltage systems over 600 V	A, D
3.3	Tests with lightning impulse voltage	IEC 60076-3 ed. 3.0, cl. 13; ČSN EN 60076-3 ed. 2, cl. 13; IEC 60076-4 ed. 1, cl. 7, 9.1; ČSN EN 60076-4, cl. 7, 9.1	Power transformers	A, D
3.4	Tests with lightning impulse voltage	IEC 60077-1 ed. 2.0, cl. 9.3.3; ČSN EN 60077-1 ed. 2, cl. 9.3.3; IEC 60077-2 ed. 2, cl. 9.3.3; ČSN EN 60077-2 ed. 2, cl. 9.3.3; IEC 61992-3 ed. 2, cl. 8.3.3; EN 50124-1, cl. 7.3; ČSN EN 50124-1 ed. 2, cl. 7.3; ČSN EN 50345 ed. 2, cl. 6.3.2	Railway equipment	A, D
3.5	Tests with lightning impulse voltage	IEC 60099-4 ed. 3.0, cl. 8.2, 11.8.2 ČSN EN 60099-4 ed. 3, cl. 8.2, 11.8.2; ČSN EN IEC 60099-8 ED.2, cl. 8.2.2, 8.4, cl. 10.5.3; ČSN EN 60099-9, cl. 9.2; IEEE Std. C62.11, cl. 8.1	Metal-oxide surge arresters	A, D
3.6	Tests with lightning impulse voltage	IEC 60137 ed. 7, cl. 8.4, 9.3; ČSN EN 60137 ed. 4, cl. 8.4, 9.3; IEEE Std. C57.19.01, tab. 1, A.1; IEEE Std. C57.19.00, cl. 7.2	Bushings	A, D

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Ordinal number[1]	Test procedure / method name	Test procedure / method identification [2]	Subject of the test	Degrees of freedom[3]
3.7	Tests with lightning impulse voltage	IEC 60168 ed. 4.2, cl. 4, 4.5; ČSN EN 60168, cl. 4, 4.5; AS 4398.2-2005, cl. 4, 4.5; CAN/CSA C156.1-18, cl. 9.2.2	Station post insulators	A, D
3.8	Tests with lightning impulse voltage	IEC 60076-3 ed. 3.0, cl. 13; ČSN EN 60076-3 ed. 2, cl. 13; IEC 60076-4 ed. 1.0, cl. 7, 9.1; IEC 60076-6 ed. 1, cl. 11.8.8; ČSN EN 60076-4, cl. 7, 9.1; ČSN EN 60076-6, cl. 11.8.8	Reactors	A, D
3.9	Tests with lightning impulse voltage	ČSN EN 60358-1, cl. 10.1	Coupling capacitors and capacitive dividers	A, D
3.10	Tests with lightning impulse voltage	IEC 60383-1 ed. 5, cl. 12; ČSN IEC 60383-1 ed. 4, cl. 4, 13; AS/NZS 2947.1, cl. 13	Ceramic or glass insulators	A, D
3.11	Tests with lightning impulse voltage	IEC 60383-2 ed. 1, cl. 2, 9; ČSN EN 60383-2, cl. 2, 9;	Insulator strings and insulator sets	A, D
3.12	Tests with lightning impulse voltage	IEC 60660 ed. 2, cl. 2, 2.4, 3.3; ČSN EN 60660, cl. 2, 2.4, 3.3	Post insulators of organic materials	A, D
3.13	Tests with lightning impulse voltage	IEC 62271-103 ed. 2.0, cl. 7.2; IEC 62271-104 ed. 3.0, cl. 7.2; ČSN EN 62271-1 ed. 2, cl. 7.2, Annex E, F; ČSN EN 62271-103, cl. 7.2; ČSN EN 62271-104 ed. 3, cl. 7.2; IEEE Std C37.30.1-2022, cl. 8.1.2	Switchgear and controlgear	A, D
3.14	Tests with lightning impulse voltage	IEC 61109 ed. 2.0, cl. 11, 11.1, tab. 3; ČSN EN 61109, cl. 11, 11.1, tab. 3; NTC 5651, cl. 8.1.1	Composite insulators	A, D
3.15	Tests with lightning impulse voltage	ČSN EN IEC 62271-213 ed. 1.0, cl. 7.3.2 ČSN EN IEC 62271-215 ed. 1.0, cl. 7.4.2	Voltage detecting systems (VDS)	A, D

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Ordinal number[1]	Test procedure / method name	Test procedure / method identification [2]	Subject of the test	Degrees of freedom[3]
3.16	Tests with lightning impulse voltage	IEC 61869-1 ed. 2.0, cl. 7.2.3, 7.4.1, 7.4.2; ČSN EN 61869-1, cl. 7.2.3, 7.4.1, 7.4.2; IEC 61869-2 ed. 2.0, cl. 7.2.3, 7.4.1, 7.4.2; ČSN EN 61869-2, cl. 7.2.3, 7.4.1, 7.4.2	Instrument transformers	A, D
3.17	Tests with lightning impulse voltage	IEC 61869-3 ed. 1.0, cl. 7.2.3, 7.2.3.2; ČSN EN 61869-3, cl. 7.2.3, 7.2.3.2	Instrument transformers - inductive voltage transformers	A, D
3.18	Tests with lightning impulse voltage	IEC 61869-4 ed. 1.0, cl. 7.2.3	Instrument transformers - combined transformers	A, D
3.19	Tests with lightning impulse voltage	IEC 61869-5 ed. 1.0, cl. 7.2.3, 7.4.1; ČSN EN 61869-5, cl. 7.2.3, 7.4.1	Instrument transformers - capacitor voltage transformers	A, D
3.20	Tests with lightning impulse voltage	IEC 61952 ed. 2.0, cl. 11, tab. 3; ČSN EN 61952 ed. 2, cl. 11, tab. 3; ANSI C29.17, cl. 8.3; ANSI C29.18, cl. 9.3; CSA C411.6-16, cl. 6.3	Composite line post insulators for overhead lines	A, D
3.21	Tests with lightning impulse voltage	IEC 62231 ed. 1, cl. 9.2.1; ČSN EN 62231, cl. 9.2.1; ANSI C29.19, cl. 8.2, 8.3; CAN/CSA C156.2-18, cl. 6.3	Composite station post insulators	A, D
3.22	Tests with lightning impulse voltage	IEC 62271-100 ed. 3, cl. 6.2; ČSN EN IEC 62271-100 ed. 3, cl. 6.2	High-voltage alternating-current circuit breakers	A, D
3.23	Tests with lightning impulse voltage	IEC 62271-102 ed. 2.0, cl. 7.2; ČSN EN 62271-102 ed. 2, cl. 6.2; IEC 62497-1 ed. 1.1, cl. 7.3	Disconnectors and earthing switches	A, D
3.24	Tests with lightning impulse voltage	IEC 62271-105 ed. 3.0, cl. 6.2; ČSN EN 62271-105 ed. 2, cl. 6.2; IEEE Std. C37.42, cl. 6.1	Alternating current switch-fuse combinations	A, D

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Ordinal number[1]	Test procedure / method name	Test procedure / method identification [2]	Subject of the test	Degrees of freedom[3]
3.25	Tests with lightning impulse voltage	IEEE C37.41, cl. 8.5	Fuses and accessories over 1 kV	A, D
3.26	Tests with lightning impulse voltage	IEC 62271-200 ed. 3.0, cl. 6.2; ČSN EN 62271-200 ed. 3, cl. 6.2	Metal-enclosed switchgear and controlgear	A, D
3.27	Tests with lightning impulse voltage	IEC 62271-203 ed. 3.0, cl. 6.2, 7.1; ČSN EN 62271-203 ed. 3, cl. 6.2, 7.1	Gas-insulated metal-enclosed switchgear	A, D
3.28	Tests with lightning impulse voltage	IEC 62772 ed.1.0, cl. 9.4	Composite hollow core station post insulators	A, D
3.29	Tests with lightning impulse voltage	ANSI C29.1, cl. 4.7, 4.8	Insulators	A, D
3.30	Tests with lightning impulse voltage	ANSI C29.2A, cl. 8.2.5; ANSI C29.2B, cl. 8.2.3	Suspension type insulators - porcelain or glass	A, D
3.31	Tests with lightning impulse voltage	ANSI C29.5, cl. 8.2.3; ANSI C29.6, cl. 8.2.3; ANSI C29.7, cl. 8.2.3	Porcelain insulators (pin type & line-post type)	A, D
3.32	Tests with lightning impulse voltage	ANSI C29.9, cl. 8.2.2, 8.2.3	Ceramic insulators - apparatus and post-type	A, D
3.33	Tests with lightning impulse voltage	ANSI C29.11, cl. 8.1, 8.2.6, 8.2.7	Composite suspension insulators for overhead lines	A, D
3.34	Tests with lightning impulse voltage	ANSI C29.13, cl. 9.3	Composite insulators of distribution deadend type	A, D
3.35	Tests with lightning impulse voltage	CSA C411.1, cl. 6.5	Suspension insulators	A, D
3.36	Tests with lightning impulse voltage	ANSI C29.12, cl. 9.3; CSA C411.4-16, cl. 6.2; CSA C411.5-16, cl. 6.3	Composite suspension insulators	A, D
3.37	Tests with lightning impulse voltage	IEC 61442 ed. 2.0, cl. 6; ČSN EN 61442, cl. 6; IEC 60502-4; ČSN 34 7006 HD 629.1 S3, cl. 7; ČSN 34 7006 ed. 2, cl. 7; HD 629.2 S2, cl. 7; ČSN 34 7007 ed. 2, cl. 7	Cable accessories	A, D
3.38	Tests with lightning impulse voltage	ČSN EN 50123-1 ed. 2, cl. 7.5.1	Railway applications - DC switchgear	A, D

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Ordinal number[1]	Test procedure / method name	Test procedure / method identification [2]	Subject of the test	Degrees of freedom[3]
3.39	Tests with lightning impulse voltage	IEC 62271-103 ed. 2.0, cl. 6.2; ČSN EN 62271-103, cl. 6.2	Switches	A, D
3.40	Tests with lightning impulse voltage	ČSN IEC 60230, cl. 10	Cables and accessories	A, D
3.41	Tests with lightning impulse voltage	ČSN IEC 60502-2, cl. 18.2.8; ČSN IEC 60502-1, cl. 17.5; NEN-HD 620 S3, cl. 3.3; HD 605-S3, cl. 3.2.4	Power cables from 1 kV up to 30 kV	A, D
3.42	Tests with lightning impulse voltage	ČSN IEC 60840, cl. 12.4.7, 15.4.2 d), Annex H.3.2.4, H.3.2.5, H.4.2	Power cables from 30 kV up to 150 kV	A, D
3.43	Tests with lightning impulse voltage	IEC 62067 ed. 3.0, cl. 12.4.7.2, Annex H.3.3.4, H.3.3.5	Power cables from 150 kV up to 500 kV	A, D
4	**Tests with switching impulse voltage**			
4.1	Tests with switching impulse voltage	IEC 60060-1 ed. 3, cl. 8; ČSN EN 60060-1, cl. 8; IEEE 4-2013, cl. 8	Equipment with highest voltage for equipment above 1 kV	A, D
4.2	Tests with switching impulse voltage	IEC 61869-2 ed. 1.0, cl. 7.2.3, 7.2.4; ČSN EN 61869-2, cl. 7.2.3, 7.2.4	Instrument transformers	A, D
4.3	Tests with switching impulse voltage	IEC 60076-3 ed. 3.0, cl. 14; ČSN EN 60076-3 ed. 2, cl. 14; IEC 60076-4 ed.1, cl. 8, 9.2; ČSN EN 60076-4, cl.8, 9.2	Power transformers	A, D
4.4	Tests with switching impulse voltage	IEC 60099-4 ed. 3.0, cl. 8.2, 11.8.2; ČSN EN 60099-4 ed. 3, cl. 8.2, 11.8.2; ČSN EN IEC 60099-8 ed. 2, cl. 8.2.3.2; ČSN EN 60099-9, cl. 9.2; IEEE Std. C62.11, cl. 8.1	Metal-oxide surge arresters	A, D
4.5	Tests with switching impulse voltage	IEC 60137 ed. 7.0, cl. 8.5; ČSN EN 60137 ed. 4, cl. 8.5; IEEE Std. C57.19.01, tab. 1, A.1; IEEE Std. C57.19.00, cl. 7.2	Bushings	A, D

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Ordinal number[1]	Test procedure / method name	Test procedure / method identification [2]	Subject of the test	Degrees of freedom[3]
4.6	Tests with switching impulse voltage	IEC 60168 ed. 4.2, cl. 4, 4.6; ČSN EN 60168, cl. 4, 4.6; AS 4398.2-2005, cl. 4, 4.6	Station post insulators	A, D
4.7	Tests with switching impulse voltage	ČSN EN 60358-1, cl. 10.2.2	Coupling capacitors and capacitive dividers	A, D
4.8	Tests with switching impulse voltage	IEC 60383-2 ed. 1, cl. 11; ČSN EN 60383-2, cl. 2, 11;	Insulator strings and insulator sets	A, D
4.9	Tests with switching impulse voltage	IEC 62772 ed. 1.0, cl. 9.5	Composite hollow core station post insulators	A, D
4.10	Tests with switching impulse voltage	IEC 62271-104 ed. 3, cl. 7.2; ČSN EN 62271-1 ed. 2, cl. 7.2, Annex E, F; ČSN EN 62271-104 ed. 3, cl. 7.2; IEEE Std C37.30.1-2022, cl. 8.1.4	Switchgear and controlgear	A, D
4.11	Tests with switching impulse voltage	IEC 61057 ed. 2.0, cl. 6.6, 6.7; ČSN EN 61057, ed. 2, cl. 6	Insulating working platforms	A, D
4.12	Tests with switching impulse voltage	IEC 61109 ed. 2.0, cl. 11, 11.1, tab. 3; ČSN EN 61109, cl. 11, 11.1, tab. 3;	Composite insulators	A, D
4.13	Tests with switching impulse voltage	IEC 61869-1 ed. 2.0, cl. 7.2.3, 7.2.4; ČSN EN 61869-1, cl. 7.2.3, 7.2.4	Instrument transformers	A, D
4.14	Tests with switching impulse voltage	IEC 61869-3 ed. 1.0, cl. 7.2.3.3; ČSN EN 61869-3, cl. 7.2.3.3	Instrument transformers - inductive voltage transformers	A, D
4.15	Tests with switching impulse voltage	IEC 61869-4 ed. 1.0, cl. 7.2.3	Instrument transformers - combined transformers	A, D
4.16	Tests with switching impulse voltage	IEC 61869-5 ed. 1.0, cl. 7.2.3, 7.2.4; ČSN EN 61869-5, cl. 7.2.3, 7.2.4	Instrument transformers - capacitor voltage transformers	A, D
4.17	Tests with switching impulse voltage	IEC 61952 ed. 2, cl. 11, tab. 3; ČSN EN 61952 ed. 2, cl. 11, tab. 3;	Composite line post insulators for overhead lines	A, D

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4.18	Tests with switching impulse voltage	IEC 62271-100 ed. 3.0, cl. 6.2; ČSN EN IEC 62271-100 ed. 3, cl. 6.2	High-voltage alternating-current circuit breakers	A, D
4.19	Tests with switching impulse voltage	IEC 62271-102 ed. 2.0, cl. 7.2; ČSN EN IEC 62271-102 ed. 2, cl. 6.2	Disconnectors and earthing switches	A, D
4.20	Tests with switching impulse voltage	IEC 62271-103 ed. 2.0, cl. 7.2; ČSN EN 62271-103, cl. 7.2	Switches and disconnectors Switches	A, D
4.21	Tests with switching impulse voltage	IEC 62271-105 ed. 3.0, cl. 6.2; ČSN EN 62271-105 ed. 2, cl. 6.2	Switch with fuses	A, D
4.22	Tests with switching impulse voltage	IEC 62271-200 ed. 3.0, cl. 6.2; ČSN EN 62271-200 ed. 3, cl. 6.2	Metal-enclosed switchgear and controlgear	A, D
4.23	Tests with switching impulse voltage	IEC 62271-203 ed. 3.0, cl. 6.2; ČSN EN 62271-203 ed. 3, cl. 6.2	Gas-insulated metal-enclosed switchgear	A, D
4.24	Tests with switching impulse voltage	ANSI C29.11, cl. 8.1, 8.2.5	Composite suspension insulators for overhead lines	A, D
4.25	Tests with switching impulse voltage	ČSN IEC 60230 ed. 2, cl. 10	Cables and accessories	A, D
4.26	Tests with switching impulse voltage	IEC 62067 ed. 3.0, cl. 12.4.7.1	Power cables from 150 kV up to 500 kV	A, D
5	**Combined and composite high voltage tests**			
5.1	Combined and composite high voltage tests	IEC 60060-1 ed. 3, cl. 9; ČSN EN 60060-1, cl. 9; IEEE 4-2013, cl. 10	Equipment with highest voltage for equipment above 1 kV	A, D
5.2	Combined and composite high voltage tests	IEEE Std C37.30.1-2022, cl. 8.1.3	Switchgear and controlgear	A, D
6	**Dielectric artificial pollution tests**			
6.1	Dielectric artificial pollution tests	IEC 60507 ed. 3.0; ČSN EN 60507	Insulators	A, D
6.2	Dielectric artificial pollution tests	IEC/TS 60815-1 ed. 1.0, Annex C	Insulators for overhead lines	A, D
6.3	Dielectric artificial pollution tests	ČSN EN IEC 62271-213 ed. 1.0, cl. 7.3.5	Voltage detecting systems (VDS)	A, D

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6.4	Dielectric artificial pollution tests	IEC 62271-103 ed. 2.0, cl. 7.2.9; ČSN EN 62271-103, cl. 7.2.9	Switches	A, D
6.5	Dielectric artificial pollution tests	IEC 60099-4 ed. 3.0, cl. 10.8.17.2; ČSN EN 60099-4 ed. 3, cl. 10.8.17.2; IEEE C62.11, cl. 8.7	Metal-oxide surge arresters	A, D
6.6	Dielectric artificial pollution tests	IEC 61109 ed. 2.0, cl. 10.1, 10.2.2; ČSN EN 61109, cl. 10.1, 10.2.2;	Composite insulators	A, D
6.7	Dielectric artificial pollution tests	IEC 61442 ed. 2.0, cl. 13; ČSN EN 61442, cl. 13; IEC 60502-4 ČSN 34 7006	Cable accessories	A, D
6.8	Dielectric artificial pollution tests	IEC 61462 ed. 1, čl 7.3.3; ČSN EN 61462, čl 7.3.3	Composite hollow insulators	A, D
6.9	Dielectric artificial pollution tests	IEC 61952 ed. 2.0, cl. 10.1, 10.2.2; ČSN EN 61952 ed. 2, cl. 10.1, 10.2.2; CSA C411.6-16, cl. 5.7, method 2	Composite line post insulators for overhead lines	A, D
6.10	Dielectric artificial pollution tests	IEC 62217 ed. 2.0, cl. 9.3.3; ČSN EN 62217 ed. 2, cl. 9.3.3	Polymeric insulators for indoor and outdoor use	A, D
6.11	Dielectric artificial pollution tests	IEC 62772 ed. 1.0, cl. 8.4	Composite hollow core station post insulators	A, D
6.12	Dielectric artificial pollution tests	IEC 62231 ed. 1, cl. 8.4; ČSN EN 62231, cl. 8.4; ANSI C29.19, cl. 7.3; CAN/CSA C156.2-18, cl. 5.7	Composite station post insulators	A, D
6.13	Dielectric artificial pollution tests	ČSN EN 50345 ed. 2, cl. 6.2.4	Railway equipment	A, D
6.14	Dielectric artificial pollution tests	ANSI C29.11, cl. 7.3	Composite suspension insulators for overhead lines	A, D
6.15	Dielectric artificial pollution tests	ANSI C29.13, cl. 8.6	Composite insulators of distribution deadend type	A, D

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6.16	Dielectric artificial pollution tests	ANSI C29.17, cl. 7.3	Composite line post insulators	A, D
6.17	Dielectric artificial pollution tests	IEC/TR 62730 ed. 1.0, cl. 7.1	Polymeric insulators for indoor and outdoor use	A, D
6.18	Dielectric artificial pollution tests	ANSI C29.18, cl. 8.6, method 2	Composite line post insulators	A, D
6.19	Dielectric artificial pollution tests	ANSI C29.12, cl. 8.3; CSA C411.4-16, cl. 5.5, method 2; CSA C411.5-16, cl. 5.7	Composite suspension insulators	A, D
6.20	Dielectric artificial pollution tests	IEEE C37.41, cl. 18.2.3	Fuses and accessories over 1 kV	A, D
7	**Measurement of reference voltage**			
7.1	Measurement of reference voltage	IEC 60099-4 ed. 3.0, cl. 7.2; ČSN EN 60099-4 ed. 3, cl. 7.2	Metal-oxide surge arresters	A,D
8	**Measurement of partial discharges and loss factor**			
8.1	Measurement of partial discharges and loss factor	IEC 60270 ed. 3.1; ČSN EN 60270	Electrical equipment, components and systems tested with AC voltage	A, D
8.2	Measurement of partial discharges and loss factor	IEEE Std 386-2016, cl. 7.4	Separable insulated connectors for voltage systems over 600 V	A, D
8.3	Measurement of partial discharges and loss factor	IEC 60076-3 ed. 3.0, Annex A; ČSN EN 60076-3 ed. 2, Annex A	Power transformers	A, D
8.4	Measurement of partial discharges and loss factor	IEC 60099-4 ed. 3.0, cl. 9.1 c), d), 12.8.17; ČSN EN 60099-4 ed. 3, cl. 9.1 c), d), 12.8.17	Metal-oxide surge arresters	A, D
8.5	Measurement of partial discharges and loss factor	NTC 5651, cl. 8.1.3	Composite insulators	A, D
8.6	Measurement of partial discharges and loss factor	IEC 60137 ed. 7.0, cl. 8.3, 9.2, 9.5; ČSN EN 60137 ed. 4, cl. 8.3, 9.2, 9.5; IEC 60137 ed. 7.0, cl. 8.6; IEEE Std. C57.19.01, tab. 5, 6; IEEE Std. C57.19.00, cl. 7.2, 7.4	Bushings	A, D

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Ordinal number[1]	Test procedure / method name	Test procedure / method identification [2]	Subject of the test	Degrees of freedom[3]
8.7	Measurement of partial discharges and loss factor	ČSN EN 60358-1 ed. 1.0, cl. 9.2.2, 9.2.4	Coupling capacitors and capacitive dividers	A, D
8.8	Measurement of partial discharges and loss factor	IEC 60660 ed. 2, cl. 3.5, 5.4; ČSN EN 60660, cl. 3.5, 5.4	Post insulators of organic materials	A, D
8.9	Measurement of partial discharges and loss factor	IEC 61869-1 ed. 2.0, cl. 7.3.2, 7.4.3; ČSN EN 61869-1, cl. 7.3.2, 7.4.3; IEC 61869-2 ed. 1.0, cl. 7.3.2, 7.4.3; ČSN EN 61869-2, cl. 7.3.2, 7.4.3	Instrument transformers	A, D
8.10	Measurement of partial discharges and loss factor	IEC 61869-3 ed. 1, cl. 7.3.2, 7.4.3; ČSN EN 61869-3, cl. 7.3.2, 7.4.3	Instrument transformers - inductive voltage transformers	A, D
8.11	Measurement of partial discharges and loss factor	IEC 61869-5 ed. 1.0, cl. 7.3.2, 7.2.501; ČSN EN 61869-5, cl. 7.3.2, 7.2.501	Instrument transformers - capacitor voltage transformers	A, D
8.12	Measurement of partial discharges and loss factor	IEC 62271-200 ed. 3.0, cl. 6.2.9, 7.101; ČSN EN 62271-200 ed. 3, cl. 6.2.9, 7.101; IEC 62271-203 ed. 3.0, cl. 6.2.9, 7.1.102; ČSN EN 62271-203 ed. 3, cl. 6.2.9, 7.1.102	Gas-insulated metal-enclosed switchgear	A, D
8.13	Measurement of partial discharges and loss factor	IEC 61442 ed. 2.0, cl. 7; ČSN EN 61442, cl. 7; IEC 60502-4; ČSN 34 7006 HD 629.1 S3, cl. 7; ČSN 34 7006 ed. 2, cl. 7; HD 629.2 S2, cl. 7; ČSN 34 7007 ed. 2, cl. 7	Cable accessories	A, D
8.14	Measurement of partial discharges and loss factor	ČSN IEC 60502-2, cl. 16.3, 18.2.5, 18.2.6; NEN-HD 620 S3, cl. 3.3; HD 605 S3, cl. 3.10, 3.11	Power cables from 1 kV up to 30 kV	A, D

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Ordinal number[1]	Test procedure / method name	Test procedure / method identification [2]	Subject of the test	Degrees of freedom[3]
8.15	Measurement of partial discharges and loss factor	ČSN IEC 60840, cl. 9.2, 12.4.4, 12.4.5, 15.4.2 a), 15.4.2 c)	Power cables from 30 kV up to 150 kV	A, D
8.16	Measurement of partial discharges and loss factor	IEC 62067 ed. 3.0, cl. 9.2, 12.4.4, 12.4.5	Power cables from 150 kV up to 500 kV	A, D
9	**Electromagnetic interference measurement**			
9.1	Electromagnetic interference measurement	TR CISPR 18-2 ed. 3.0, cl. 4.5	Overhead power lines and high-voltage equipment	A, D
9.2	Electromagnetic interference measurement	IEC 60099-4 ed. 3.0, cl. 8.14; ČSN EN 60099-4 ed. 3, cl. 8.14; IEEE Std. C62.11, cl. 8.10; ČSN EN IEC 60099-8 ed. 2, cl. 10.4; IEC 60099-9 ed.1.0, cl. 9.9	Metal-oxide surge arresters	A, D
9.3	Electromagnetic interference measurement	IEC 60137 ed. 7.0, cl. 8.7; ČSN EN 60137 ed. 4, cl. 8.7; IEEE Std. C57.19.01, tab. 5; IEEE Std. C57.19.00, cl. 7.2, 7.4	Bushings	A, D
9.4	Electromagnetic interference measurement	ČSN EN 60358-1 ed.1, cl. 10.3	Coupling capacitors and capacitive dividers	A, D
9.5	Electromagnetic interference measurement	IEC 60437 ed. 2; ČSN EN 60437	Insulators	A, D
9.6	Electromagnetic interference measurement	IEC 61284 ed. 2, cl. 14; ČSN EN 61284, cl. 14	Fittings for overhead lines	A, D
9.7	Electromagnetic interference measurement	IEC 61854 ed. 2, cl. 7.7; ČSN EN IEC 61854 ed.2, cl. 7.7	Spacers	A, D
9.8	Electromagnetic interference measurement	IEC 61869-1 ed. 2.0, cl. 7.2.5, 7.2.5.1; ČSN EN 61869-1, cl. 7.2.5, 7.2.5.1; IEC 61869-2 ed. 1.0, cl. 7.2.5, 7.2.5.1; ČSN EN 61869-2, cl. 7.2.5, 7.2.5.1	Instrument transformers	A, D

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9.9	Electromagnetic interference measurement	IEC 61869-5 ed. 1.0, cl. 7.2.5, 7.2.5.1; ČSN EN 61869-5, cl. 7.2.5, 7.2.5.1	Instrument transformers - capacitor voltage transformers	A, D
9.10	Electromagnetic interference measurement	ČSN EN IEC 61897 ed. 2, cl. 7.10	Vibration dampers	A, D
9.11	Electromagnetic interference measurement	ČSN EN 62271-1 ed. 2, cl. 7.3, 7.9.1.1; IEC 62271-104 ed. 3.0, cl. 7.3; ČSN EN IEC 62271-104 ed. 3, cl. 7.3; IEEE Std C37.30.1-2022, cl. 8.7, 8.8	Switchgear and controlgear	A, D
9.12	Electromagnetic interference measurement	IEC 62271-100 ed. 3.0, cl. 6.3; ČSN EN IEC 62271-100 ed. 3, cl. 6.3	High-voltage alternating-current circuit breakers	A, D
9.13	Electromagnetic interference measurement	IEC 62271-102 ed. 2.0, cl. 7.3; ČSN EN 62271-102 ed. 2, cl. 6.3	Disconnectors and earthing switches	A, D
9.14	Electromagnetic interference measurement	IEC 62271-105 ed. 3.0, cl. 6.3; ČSN EN 62271-105 ed. 2, cl. 6.3; IEEE Std. C37.42, cl. 6.4	Alternating current switch-fuse combinations	A, D
9.15	Electromagnetic interference measurement	IEEE C37.41, cl. 10	Fuses and accessories over 1 kV	A, D
9.16	Electromagnetic interference measurement	ANSI C29.1, cl. 4.9	Insulators	A, D
9.17	Electromagnetic interference measurement	ANSI C29.2A, cl. 8.2.6; ANSI C29.2B, cl. 8.2.4	Suspension type insulators - porcelain or glass	A, D
9.18	Electromagnetic interference measurement	ANSI C29.5, cl. 8.2.4; ANSI C29.6, cl. 8.2.4; ANSI C29.7, cl. 8.2.4	Porcelain insulators (pin type & line-post type)	A, D
9.19	Electromagnetic interference measurement	CAN/CSA C156.1-18, cl. 9.2.5	Station post insulators	A, D
9.20	Electromagnetic interference measurement	ANSI C29.9, cl. 8.2.4	Ceramic insulators - apparatus and post-type	A, D
9.21	Electromagnetic interference measurement	ANSI C29.11, cl. 8.2.8	Composite suspension insulators for overhead lines	A, D

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9.22	Electromagnetic interference measurement	ANSI C29.13, cl. 9.4	Composite insulators of distribution deadend type	A, D
9.23	Electromagnetic interference measurement	ANSI C29.17, cl. 8.4; ANSI C29.18, cl. 9.4; CSA C411.6-16, cl. 6.4	Composite line post insulators	A, D
9.24	Electromagnetic interference measurement	ANSI C29.19, cl. 8.4; CAN/CSA C156.2-18, cl. 6.4	Composite station post insulator	A, D
9.25	Electromagnetic interference measurement	CSA C411.1-16, cl. 6.7	Suspension insulators	A, D
9.26	Electromagnetic interference measurement	ANSI C29.12, cl. 9.4; CSA C411.4-16, cl. 6.4; CSA C411.5-16, cl. 6.4	Composite suspension insulators	A, D
9.27	Electromagnetic interference measurement	NEMA No. 107	High-voltage equipment	A, D
9.28	Electromagnetic interference measurement	ANSI/NEMA CC 1-2018, cl. 3.3	Electric power connection for substations	A, D
10	**Impulse voltage puncture test and alternating voltage test**			
10.1	Impulse voltage puncture test and alternating voltage test	IEC 61211 ed. 2, cl. 5; ČSN EN 61211, cl. 5; IEC 60383-1 ed. 5.0, cl. 15.1; ANSI C29.1, cl. 4.11; ANSI C29.2B, cl. 8.3.5; ANSI C29.5, cl. 8.3.5	Insulators	A, D
10.2	Impulse voltage puncture test and alternating voltage test	ČSN EN 60168, cl. 4.9; CAN/CSA C156.1-18, cl. 9.3.7	Station post insulators	A, D
10.3	Impulse voltage puncture test and alternating voltage test	CSA C411.1-16, cl. 6.6	Suspension insulators	A, D
10.4	Impulse voltage puncture test and alternating voltage test	ČSN EN IEC 60099-8 ed.2, cl. 10.5.2	Metal-oxide surge arresters	A, D
11	**Dielectric tests of protective and working equipment**			
11.1	Dielectric tests of protective and working equipment	PNE 35 9700 ed. 5, cl. 4, 5	Dielectric protective and working tools	A, D
11.2	Dielectric tests of protective and working equipment	PNE 35 9700 ed. 5, cl. 4, 5; ČSN 35 9701	Handling rods, fuse tongs, salvage hooks	A, D

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11.3	Dielectric tests of protective and working equipment	IEC 61243-1 ed. 3, cl. 6, 7; ČSN EN IEC 61243-1 ed. 2, cl. 6, 7; IEC 61243-2 ed.1.2, cl. 5; ČSN EN 61243-2, cl. 5	Voltage detectors	A, D
11.4	Dielectric tests of protective and working equipment	ČSN EN IEC 62271-213 ed. 1.0, cl. 7.3.2, 7.3.3, 7.3.4, 7.4, 7.5, 7.6, 7.7, 7.11, 7.13 ČSN EN IEC 62271-215 ed. 1.0, cl. 7.4.2, 7.4.3, 7.4.4, 7.5, 7.9, 7.10, 7.12	Voltage detecting systems (VDS)	A, D
11.5	Dielectric tests of protective and working equipment	IEC 60832-1 ed. 1.0, cl. 5.7; ČSN EN 60832-1, cl. 5.7	Insulating poles and heads	A, D
11.6	Dielectric tests of protective and working equipment	IEC 60855-1 ed. 2.0, cl. 5.4; ČSN EN 60855-1, cl. 5.4	Foam-filled insulating tubes and solid bars	A, D
11.7	Dielectric tests of protective and working equipment	IEC 61229 ed. 1.2, cl. 6.4; ČSN EN 61229, cl. 6.4	Fixed protective covers	A, D
11.8	Dielectric tests of protective and working equipment	IEC 61235 ed. 1, cl. 9; ČSN EN 61235, cl. 9	Insulating hollow tubes	A, D
11.9	Dielectric tests of protective and working equipment	IEC 61478 ed. 1, cl. 6.5; ČSN EN 61478, cl. 6.5	Insulating ladders	A, D
11.10	Dielectric tests of protective and working equipment	IEC 61479 ed. 1, cl. 7.4; ČSN EN 61479, cl. 7.4	Flexible conductor covers	A, D
11.11	Dielectric tests of protective and working equipment	ČSN EN 62193, cl. 5, 6	Telescopic sticks	A, D
12	**Design tests of interface and connection of end fittings**			
12.1	Design tests of interface and connection of end fittings	IEC 60099-4 ed. 3.0, cl. 10.8.11.3.2; ČSN EN 60099-4 ed. 3, cl. 10.8.11.3.2	Overvoltage limiters	A, D
12.2	Design tests of interface and connection of end fittings	IEC 60660 ed. 2, cl. 3.10; ČSN EN 60660, cl. 3.10	Post insulators of organic material	A, D

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12.3	Design tests of interface and connection of end fittings	IEC 61109 ed. 2.0, cl. 10.1, 10.2.1, 10.3.1, 10.3.2; ČSN EN 61109, cl. 10.1, 10.2.1, 10.3.1, 10.3.2; NTC 5651, cl. 8.3.2	Composite insulators	A, D
12.4	Design tests of interface and connection of end fittings	IEC 61462 ed. 1, cl. 7.2, 9.5; ČSN EN 61462, cl. 7.2, 9.5; IEC 62772 ed.1.0, cl. 8.2	Composite hollow insulators and station post hollow insulators	A, D
12.5	Design tests of interface and connection of end fittings	IEC 61952 ed. 2.0, cl. 10.1, 10.2.1, 10.3.1; ČSN EN 61952 ed. 2, cl. 10.1, 10.2.1, 10.3.1; CSA C411.6-16, cl. 5.2	Composite line post insulators for overhead lines	A, D
12.6	Design tests of interface and connection of end fittings	IEC 62217 ed. 2.0, cl. 9.2; ČSN EN 62217 ed. 2, cl. 9.2	Polymeric insulators for indoor and outdoor use	A, D
12.7	Design tests of interface and connection of end fittings	IEC 62231 ed. 1, cl. 8.2; ČSN EN 62231, cl. 8.2; ANSI C29.19, cl. 7.1; CAN/CSA C156.2-18, cl. 5.2	Composite station post insulators	A, D
12.8	Design tests of interface and connection of end fittings	ANSI C29.11, cl. 7.1	Composite suspension insulators for overhead lines	A, D
12.9	Design tests of interface and connection of end fittings	ANSI C29.17, cl. 7.1; ANSI C29.18, cl. 8.1	Composite line post insulators	A, D
12.10	Design tests of interface and connection of end fittings	CSA C411.4-16, cl. 5.3; CSA C411.5-16, cl. 5.2; ANSI C29.12, cl. 8.1	Composite suspension insulators	A, D
13	**Test for the core material (dye penetration test and water diffusion test)**			
13.1	Test for the core material (dye penetration test and water diffusion test)	IEC 61109 ed. 2.0, cl. 10.1, 10.2.3; ČSN EN 61109, cl. 10.1, 10.2.3;	Composite insulators	A, D
13.2	Test for the core material (dye penetration test and water diffusion test)	IEC 60383-1 ed. 5, cl. 25; IEC 60168 ed. 4.2, cl. 5.6; CAN/CSA C156.1-18, cl. 9.3.8	Ceramic or glass insulators	A, D

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13.3	Test for the core material (dye penetration test and water diffusion test)	IEC 61952 ed. 2.0, cl. 10.1, 10.2.3; ČSN EN 61952 ed. 2, cl. 10.1, 10.2.3; CSA C411.6-16, cl. 5.4, 5.5	Composite line post insulators for overhead lines	A, D
13.4	Test for the core material (dye penetration test and water diffusion test)	CSA C310-21, cl. 7.2	Switch with fuses	A, D
13.5	Test for the core material (dye penetration test and water diffusion test)	IEC 61462 ed. 1, cl. 7.4; ČSN EN 61462, cl. 7.4; IEC 62772 ed. 1.0, cl. 8.5	Composite hollow insulators and station post hollow insulators	A, D
13.6	Test for the core material (dye penetration test and water diffusion test)	IEC 62217 ed. 2.0, cl. 9.4; ČSN EN 62217 ed. 2, cl. 9.4	Polymeric insulators for indoor and outdoor use	A, D
13.7	Test for the core material (dye penetration test and water diffusion test)	ANSI C29.1, cl. 5.4; ANSI C29.2B, cl. 8.3.2; ANSI C29.9, cl. 8.3.2; ANSI C29.5, cl. 8.3.3; ANSI C29.7, cl. 8.3.2	Glass and porcelain insulators	A, D
13.8	Test for the core material (dye penetration test and water diffusion test)	ČSN EN 62155, cl. 7.4	Glass and porcelain hollow insulators	A, D
13.9	Test for the core material (dye penetration test and water diffusion test)	ANSI C29.11, cl. 7.4	Composite suspension insulators for overhead lines	A, D
13.10	Test for the core material (dye penetration test and water diffusion test)	ANSI C29.13, cl. 8.3, 8.4; ANSI C29.13, cl. 8.5.3.1	Composite insulators of distribution deadend type	A, D
13.11	Test for the core material (dye penetration test and water diffusion test)	ANSI C29.17, cl. 7.5; ANSI C29.18, cl. 8.3, 8.4; ANSI C29.18, cl. 8.5.3.1	Composite line post insulators	A, D
13.12	Test for the core material (dye penetration test and water diffusion test)	ANSI C29.19, cl. 7.5; CAN/CSA C156.2-18, cl. 5.4, 5.5, 5.6.3.2	Composite station post insulators	A, D
13.13	Test for the core material (dye penetration test and water diffusion test)	CSA C411.4-16, cl. 5.2; CSA C411.5-16, cl. 5.4, 5.5, 5.6.3.2; CSA C411.5-16, cl. 6.2; CSA C411.6-16, cl. 5.6.3.2; ANSI C29.12, cl. 8.4	Composite suspension insulators	A, D

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Ordinal number[1]	Test procedure / method name	Test procedure / method identification [2]	Subject of the test	Degrees of freedom[3]
13.14	Test for the core material (dye penetration test and water diffusion test)	IEEE C37.41, cl. 18.3	Fuses and accessories over 1 kV	A, D
14	**Mechanical force tests (tension, bending, impact)**			
14.1	Mechanical force tests (tension, bending, impact)	IEC 60137 ed. 7.0, cl. 8.10; ČSN EN 60137 ed. 4, cl. 8.10; IEEE C57.19.00, cl. 7.2.2	Bushings	A, D
14.2	Mechanical force tests (tension, bending, impact)	IEC 60168 ed. 4.2, cl. 5.2.1, 5.2.2, 5.2.3, 5.2.4, 5.2.6; 5.2.7 ČSN EN 60168 cl. 5.2.1, 5.2.2, 5.2.3, 5.2.4, 5.2.6, 5.2.7 AS 4398.2-2005, cl. 5.2.1, 5.2.2, 5.2.3, 5.2.4, 5.2.6; 5.2.7 CAN/CSA C156.1-18, cl. 9.2.4.5, 9.2.4.7	Station post insulators	A, D
14.3	Mechanical force tests (tension, bending, impact)	IEC 60383-1 ed. 5.0, cl. 18, 19; ČSN IEC 383-1 ed. 4, cl. 18, 19; AS/NZS 2947.1-99, cl. 5; IEC TR 60797 ed. 1, cl. 4; AS 3608-2005, cl. 2.2, 2.3, 3.2.3, 4.2; AS 3609-2005, cl. 2.3, 3.2.3, 4.3	Ceramic or glass insulators	A, D
14.4	Mechanical force tests (tension, bending, impact)	IEC 60660 ed. 2, cl. 3.7, 3.8, 3.9, 5.3; ČSN EN 60660, cl. 3.7, 3.8, 3.9, 5.3	Post insulators of organic materials	A, D
14.5	Mechanical force tests (tension, bending, impact)	IEC 61109 ed. 2.0, cl. 13; ČSN EN 61109, cl. 13; NTC 5651, cl. 19	Composite insulators	A, D
14.6	Mechanical force tests (tension, bending, impact)	ČSN EN IEC 62271-213 ed. 1.0, cl. 7.19 ČSN EN IEC 62271-215 ed. 1.0, cl. 7.17	Voltage detecting systems (VDS)	A, D
14.7	Mechanical force tests (tension, bending, impact)	IEC 61284 ed. 2, cl. 11; ČSN EN 61284, cl. 11	Fittings for overhead lines	A, D

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Ordinal number[1]	Test procedure / method name	Test procedure / method identification [2]	Subject of the test	Degrees of freedom[3]
14.8	Mechanical force tests (tension, bending, impact)	IEC 61462 ed. 1, cl. 10.4; ČSN EN 61462, cl. 10.4; IEC 62772 ed.1.0, cl. 8.3.1, 8.3.3	Composite hollow insulators Composite hollow core station post insulators	A, D
14.9	Mechanical force tests (tension, bending, impact)	IEC 61952 ed. 2.0, cl. 11.2, 12.4, 13; ČSN EN 61952 ed. 2, cl. 11.2, 12.4, 13; CSA C411.6-16, cl. 5.8, 5.9	Composite line post insulators for overhead lines	A, D
14.10	Mechanical force tests (tension, bending, impact)	IEC 62155 ed. 1, cl. 7, 7.2, 8.3; ČSN EN 62155, cl. 7, 7.2, 8.3	Ceramic or glass hollow insulators	A, D
14.11	Mechanical force tests (tension, bending, impact)	IEC 62231 ed. 1, cl. 9.3, 10.4; ČSN EN 62231, cl. 9.3, 10.4; ANSI C29.19, cl. 7.2.1, 7.2.3, 7.2.5, 9.4, 9.5, 10.1; CAN/CSA C156.2-18, cl. 5.8, 5.9	Composite station post insulators	A, D
14.12	Mechanical force tests (tension, bending, impact)	ČSN EN 60099-4 ed. 3, cl. 8.11.6	Metal-oxide surge arrester	A, D
14.13	Mechanical force tests (tension, bending, impact)	CSA C411.1-16, cl. 6.9, 7.6, 8.4	Suspension insulators	A, D
14.14	Mechanical force tests (tension, bending, impact)	ANSI C29.12, cl. 10.3, 11.1; CSA C411.4-16, cl. 5.6, 7.5; CSA C411.5-16, cl. 5.8	Composite suspension insulators	A, D
14.15	Mechanical force tests (tension, bending, impact)	ANSI C29.1, cl. 5.1, 5.2, 5.3, 7.2	Insulators	A, D
14.16	Mechanical force tests (tension, bending, impact)	ANSI C29.2A, cl. 8.2.9, 8.3.4, 8.4.3; ANSI C29.2B, cl. 8.2.7, 8.3.4, 8.4.3	Suspension type insulators - porcelain or glass	A, D
14.17	Mechanical force tests (tension, bending, impact)	ANSI C29.1, cl. 5.1.2.2; ANSI C29.2B, cl. 8.2.8	Suspension insulators - ceramic and glass	A, D
14.18	Mechanical force tests (tension, bending, impact)	ANSI C29.4, cl. 8.3.4	Porcelain insulators	A, D
14.19	Mechanical force tests (tension, bending, impact)	ANSI C29.5, cl. 8.2.5; ANSI C29.6, cl. 8.3.3; ANSI C29.7, cl. 8.3.4	Porcelain insulators (pin type)	A, D

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Ordinal number[1]	Test procedure / method name	Test procedure / method identification [2]	Subject of the test	Degrees of freedom[3]
14.20	Mechanical force tests (tension, bending, impact)	ANSI C29.9, cl. 8.2.6, 8.3.4, 8.3.5	Ceramic insulators - apparatus and post-type	A, D
14.21	Mechanical force tests (tension, bending, impact)	ANSI C29.11, cl. 8.3.1.2, 8.3.1.3, 8.3.1.3.1, 8.3.1.3.2, 8.3.2, 9.4, 9.5, 10.1	Composite suspension insulators for overhead lines	A, D
14.22	Mechanical force tests (tension, bending, impact)	ANSI C29.13, cl. 8.7, 10.3, 11.1	Composite insulators of distribution deadend type	A, D
14.23	Mechanical force tests (tension, bending, impact)	ANSI C29.17, cl. 9.4, 9.5, 10; ANSI C29.18, cl. 8.7,10.3	Composite line post insulators	A, D
14.24	Mechanical force tests (tension, bending, impact)	ANSI/NEMA CC 1-2018, cl. 3.2	Electric power connection for substations	A, D
14.25	Mechanical force tests (tension, bending, impact)	ČSN IEC 60502-2, cl. 18.2.4; NEN-HD 620 S3, cl. 3.3; HD 605-S3, cl. 2.4.1.7	Power cables from 1 kV up to 30 kV	A, D
14.26	Mechanical force tests (tension, bending, impact)	ČSN IEC 60840, cl. 12.4.3	Power cables from 30 kV up to 150 kV	A, D
14.27	Mechanical force tests (tension, bending, impact)	IEC 62067 ed. 3.0, cl. 12.4.3	Power cables from 150 kV up to 500 kV	A, D
15	**Assembled core load-time tests**			
15.1	Assembled core load-time tests	IEC 61109 ed. 2.0, cl. 10.4, 11.2, 12.4; ČSN EN 61109, cl. 10.4, 11.2, 12.4;	Composite insulators	A, D
15.2	Assembled core load-time tests	IEC 61952 ed. 2.0, cl. 10.4; ČSN EN 61952 ed. 2, cl. 10.4; ANSI C29.17, cl. 7.2; ANSI C29.18, cl. 8.5.3.1; IEC/TR 62039 ed. 2, cl. 4.8	Composite line post insulators for overhead lines	A, D
15.3	Assembled core load-time tests	IEC 62231 ed. 1, cl. 8.3; ČSN EN 62231, cl. 8.3; ANSI C29.19, cl. 7.2.2	Composite station post insulators	A, D
15.4	Assembled core load-time tests	ANSI C29.11, cl. 7.2	Composite suspension insulators for overhead lines	A, D
15.5	Assembled core load-time tests	CSA C411.4-16, cl. 5.8, 5.9; ANSI C29.12, cl. 8.2	Composite suspension insulators	A, D

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Ordinal number[1]	Test procedure / method name	Test procedure / method identification [2]	Subject of the test	Degrees of freedom[3]
16	**Thermal - mechanical tests**			
16.1	Thermal - mechanical tests	IEC 60099-4 ed. 3.0, cl. 10.8.11.3.1.2; ČSN EN 60099-4 ed. 3, cl. 10.8.11.3.1.2	Overvoltage limiters	A, D
16.2	Thermal - mechanical tests	IEC 60383-1 ed. 5.0, cl. 20; ČSN IEC 383-1 ed.4, cl. 20; AS/NZS 2947.1-99, cl. 20	Ceramic or glass insulators	A, D
16.3	Thermal - mechanical tests	IEC 60660 ed. 2, cl. 3.13; ČSN EN 60660, cl. 3.13	Post insulators of organic materials	A, D
16.4	Thermal - mechanical tests	IEC 61109 ed. 2.0, cl. 10.3.2; ČSN EN 61109, cl. 10.3.2	Composite insulators	A, D
16.5	Thermal - mechanical tests	IEC 61952 ed. 2.0, cl. 10.3.1; ČSN EN 61952 ed. 2, cl. 10.3.1; CSA C411.6-16, cl. 5.10	Composite line post insulators for overhead lines	A, D
16.6	Thermal - mechanical tests	IEC 62231 ed. 1, cl. 8.2.4; ČSN EN 62231, cl. 8.2.4; CAN/CSA C156.2-18, cl. 5.12	Composite station post insulators	A, D
16.7	Thermal - mechanical tests	CSA C411.1-16, cl. 6.10	Suspension insulators	A, D
16.8	Thermal - mechanical tests	CSA C411.4-16, cl. 5.7; CSA C411.5-16, cl. 5.10	Composite suspension insulators	A, D
16.9	Thermal - mechanical tests	ANSI C29.2A, cl. 8.2.7; ANSI C29.2B, cl. 8.2.5	Suspension type insulators - porcelain or glass	A, D
16.10	Thermal - mechanical tests	ANSI C29.11, cl. 7.1.4	Composite suspension insulators for overhead lines	A, D
16.11	Thermal - mechanical tests	ANSI C29.13, cl. 8.9	Composite insulators of distribution deadend type	A, D
16.12	Thermal - mechanical tests	ANSI C29.18, cl. 8.8	Composite line post insulators	A, D
17	**Temperature cycle tests**			
17.1	Temperature cycle tests	IEC 60168 ed. 4.2, cl. 5.4, 5.5; ČSN EN 60168, cl. 5.4, 5.5; AS 4398.2-2005, cl. 5.4, 5.5; CAN/CSA C156.1-18, cl. 9.3.4	Station post insulators	A, D

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Ordinal number[1]	Test procedure / method name	Test procedure / method identification [2]	Subject of the test	Degrees of freedom[3]
17.2	Temperature cycle tests	IEC 60383-1 ed. 5.0, cl. 24, 25; ČSN IEC 383-1ed.4, cl. 23, 24; AS/NZS 2947.1, cl. 23, 24	Ceramic or glass insulators	A, D
17.3	Temperature cycle tests	NTC 5651, cl. 18	Composite insulators	A, D
17.4	Temperature cycle tests	IEC 62155 ed. 1, cl. 7, 7.3; ČSN EN 62155, cl. 7, 7.3	Ceramic or glass hollow insulators	A, D
17.5	Temperature cycle tests	CSA C411.1-16, cl. 7.5, 8.3	Suspension insulators	A, D
17.6	Temperature cycle tests	ANSI C29.1, cl. 5.5	Insulators	A, D
17.7	Temperature cycle tests	ANSI C29.2A, cl. 8.2.8; ANSI C29.2B, cl. 8.2.6	Suspension type insulators - porcelain or glass	A, D
17.8	Temperature cycle tests	ANSI C29.5, cl. 8.2.6; ANSI C29.6, cl. 8.2.5; ANSI C29.7, cl. 8.2.5	Porcelain insulators (pin type)	A, D
17.9	Temperature cycle tests	ANSI C29.9, cl. 8.2.5	Ceramic insulators - apparatus and post-type	A, D
17.10	Temperature cycle tests	ČSN IEC 60840, Annex H.3.1	Power cables from 30 kV to 150 kV	A, D
17.11	Temperature cycle tests	IEC 62067 ed. 3.0, Annex H.3.2	Power cables from 150 kV to 500 kV	A, D
18	**Verification of dimensions, displacement, contact angle and locking systems**			
18.1	Verification of dimensions, displacement, contact angle and locking systems	IEC 60137 ed. 7.0, cl. 8.14, 9.11; ČSN EN 60137 ed. 4, cl. 8.14	Bushings	A, D
18.2	Verification of dimensions, displacement, contact angle and locking systems	IEC 60168 ed. 4.2, cl. 5.1; ČSN EN 60168 cl. 5.1; AS 4398.2-2005, cl. 5.1, 5.3; CAN/CSA C156.1-18, cl. 9.3.2	Station post insulators	A, D
18.3	Verification of dimensions, displacement, contact angle and locking systems	IEC 60120 ed. 4, cl. 9, 10; ČSN EN IEC 60120, cl. 9, 10	Dimensions of ball and socket coupling of string insulator units	A, D

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Ordinal number[1]	Test procedure / method name	Test procedure / method identification [2]	Subject of the test	Degrees of freedom[3]
18.4	Verification of dimensions, displacement, contact angle and locking systems	IEC 60383-1 ed. 5.0, cl. 17, 22, 23; ČSN IEC 383-1 ed. 4, cl. 17, 21, 22; AS/NZS 2947.1-99, cl. 17, 21, 22; AS 3608-2005, cl. 2.1, 3.2.2, 4.1; AS 3609-2005, cl. 2.1, 3.2.2, 4.1	Ceramic or glass insulators	A, D
18.5	Verification of dimensions, displacement, contact angle and locking systems	IEC 60660 ed. 2, cl. 4.2, Annex A; ČSN EN 60660, cl. 4.2, Annex A	Post insulators of organic materials	A, D
18.6	Verification of dimensions, displacement, contact angle and locking systems	IEC 61109 ed. 2.0, cl. 12.2, 12.3, 8; ČSN EN 61109, cl. 12.2, 12.3, 8; IEC 62217 ed. 2, cl. 8; ČSN EN 62217 ed. 2, cl. 8; NTC 5651, cl. 17	Composite insulators	A, D
18.7	Verification of dimensions, displacement, contact angle and locking systems	IEC 61284 ed. 2, cl. 7, 8; ČSN EN 61284, cl. 7, 8	Fittings for overhead lines	A, D
18.8	Verification of dimensions, displacement, contact angle and locking systems	IEC 61462 ed. 1, cl. 9.3; ČSN EN 61462, cl. 9.3	Composite hollow insulators	A, D
18.9	Verification of dimensions, displacement, contact angle and locking systems	IEC 61952 ed. 2, cl. 12.2, 8; ČSN EN 61952 ed. 2, cl. 12.2, 12.3, 8;	Composite line post insulators for overhead lines	A, D
18.10	Verification of dimensions, displacement, contact angle and locking systems	IEC TR 62039 ed. 2.0, cl. 4.12.2.3, 4.12.2.4;	Polymeric materials	A, D
18.11	Verification of dimensions, displacement, contact angle and locking systems	IEC 62155 ed. 1, cl. 7.1; ČSN EN 62155, cl. 7.1	Ceramic or glass hollow insulators	A, D
18.12	Verification of dimensions, displacement, contact angle and locking systems	IEC 62231 ed. 1, cl. 9.1; ČSN EN 62231, cl. 9.1; ANSI C29.19, cl. 9.2	Composite station post insulators	A, D

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Ordinal number[1]	Test procedure / method name	Test procedure / method identification [2]	Subject of the test	Degrees of freedom[3]
18.13	Verification of dimensions, displacement, contact angle and locking systems	ANSI C29.2A, cl. 8.3.1; ANSI C29.2B, cl. 8.3.1	Suspension type insulators - porcelain or glass	A, D
18.14	Verification of dimensions, displacement, contact angle and locking systems	IEC 60383-1 ed. 5.0, cl. 17, 22, 23; ČSN IEC 383-1 ed. 4, cl. 17, 21, 22; AS/NZS 2947.1-99, cl. 17, 21, 22; AS 3608-2005, cl. 2.1, 3.2.2, 4.1; AS 3609-2005, cl. 2.1, 3.2.2, 4.1	Porcelain insulators	A, D
18.15	Verification of dimensions, displacement, contact angle and locking systems	IEC 60660 ed. 2, cl. 4.2, Annex A; ČSN EN 60660, cl. 4.2, Annex A	Ceramic insulators - apparatus and post-type	A, D
18.16	Verification of dimensions, displacement, contact angle and locking systems	IEC 61109 ed. 2.0, cl. 12.2, 12.3, 8; ČSN EN 61109, cl. 12.2, 12.3, 8; IEC 62217 ed. 2, cl. 8; ČSN EN 62217 ed. 2, cl. 8; NTC 5651, cl. 17	Composite suspension insulators for overhead lines	A, D
18.17	Verification of dimensions, displacement, contact angle and locking systems	IEC 61284 ed. 2, cl. 7, 8; ČSN EN 61284, cl. 7, 8	Composite suspension insulators	A, D
18.18	Verification of dimensions, displacement, contact angle and locking systems	IEC 61462 ed. 1, cl. 9.3; ČSN EN 61462, cl. 9.3	Composite insulators of distribution deadend type	A, D
18.19	Verification of dimensions, displacement, contact angle and locking systems	IEC 61952 ed. 2, cl. 12.2, 8; ČSN EN 61952 ed. 2, cl. 12.2, 12.3, 8;	Composite line post insulators	A, D
18.20	Verification of dimensions, displacement, contact angle and locking systems	IEC TR 62039 ed. 2.0, cl. 4.12.2.3, 4.12.2.4;	Railway equipment	A, D
18.21	Verification of dimensions, displacement, contact angle and locking systems	IEC 62155 ed. 1, cl. 7.1; ČSN EN 62155, cl. 7.1	Electric and optical fibre cables	A, D

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18.22	Verification of dimensions, displacement, contact angle and locking systems	IEC 62231 ed. 1, cl. 9.1; ČSN EN 62231, cl. 9.1; ANSI C29.19, cl. 9.2	Power cables from 30 kV up to 150 kV	A, D
18.23	Verification of dimensions, displacement, contact angle and locking systems	ANSI C29.2A, cl. 8.3.1; ANSI C29.2B, cl. 8.3.1	Power cables from 150 kV up to 500 kV	A, D
19	**Hardness test of shed and housing material (Shore)**			
19.1	Hardness test of shed and housing material (Shore)	IEC 61462 ed. 1, cl. 7.3.1; ČSN EN 61462, cl. 7.3.1	Composite hollow insulators	A, D
19.2	Hardness test of shed and housing material (Shore)	IEC 62217 ed. 2, cl. 9.3.1; ČSN EN 62217 ed. 2, cl. 9.3.1	Polymeric insulators for indoor and outdoor use	A, D
19.3	Hardness test of shed and housing material (Shore)	IEC 62231 ed. 1, cl. 8.4; ČSN EN 62231, cl. 8.4	Composite station post insulators	A, D
19.4	Hardness test of shed and housing material (Shore)	ANSI C29.13, cl. 8.1	Composite insulators of distribution deadend type	A, D
20	**Determination of the coating mass by the magnetic test method**			
20.1	Determination of the coating mass by the magnetic test method	IEC 60383-1 ed. 5.0, cl. 27.1.2; ČSN IEC 383-1 ed. 4, cl. 26.1.2; ANSI C29.2B, cl. 8.3.3; ANSI C29.7, cl. 8.3.3	Ceramic or glass insulators	A, D
20.2	Determination of the coating mass by the magnetic test method	IEC 60168 ed. 4.2, cl. 5.7.1.2; ČSN EN 60168 cl. 5.7.1.2	Station post insulators	A, D
20.3	Determination of the coating mass by the magnetic test method	IEC 61109 ed. 2.0, cl. 12.5; ČSN EN 61109, cl. 12.5	Composite insulators	A, D
20.4	Determination of the coating mass by the magnetic test method	IEC 61284 ed. 2, chap. 9 ČSN EN 61284, chap. 9	Fittings for overhead lines	A, D
20.5	Determination of the coating mass by the magnetic test method	ANSI C29.11, cl. 9.6; ANSI C29.13, cl. 10.2; ANSI C29.17, cl. 9.3; ANSI C29.19, cl. 9.3; IEC 62231 ed.1, cl. 10.3	Composite insulators	A, D

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21	**Tightness test of oil, gas and water leakage**			
21.1	Oil, gas and water leak test	IEC 60137 ed. 7, cl. 8.11; ČSN EN 60137 ed. 4, cl. 8.11; ČSN EN 61462, cl. 7.2.5.4	Bushings Hollow core insulators	A, D
21.2	Oil, gas and water leak test	ČSN IEC 60840, Annex E, F	Power cables from 30 kV to 150 kV	A, D
21.3	Oil, gas and water leak test	IEC 62067 ed. 3.0, Annex E, F	Power cables from 150 kV to 500 kV	A, D
22	**Temperature-rise test**			
22.1	Temperature-rise test	IEC 60137 ed. 7, cl. 8.8, 8.9; ČSN IEC 60137 ed. 4, cl. 8.8, 8.9; IEEE C57.19.00, cl. 7.2.3	Bushings	A, D
22.2	Temperature-rise test	ČSN EN 62271-1 ed.2, cl. 7.5; ČSN EN IEC 62271-102 ed.2, cl. 7.5; ČSN EN 62271-103, cl. 7.5; ČSN EN IEC 62271-104 ed.3, cl. 7.5	Switchgear and controlgear	A, D
23	**Measurement of electrical resistance, resistivity and magnetic losses**			
23.1	Measurement of electrical resistance, resistivity and magnetic losses	ČSN EN 60358-1, cl. 9.2.6	Coupling capacitors and capacitive dividers	A, D
23.2	Measurement of electrical resistance, resistivity and magnetic losses	ČSN IEC 60502-2, cl. 16.2, 18.2.10; IEC 60228 ed.3.0; ČSN IEC 60502-1, cl. 17.2, 17.3	Power cables from 1 kV up to 30 kV	A, D
23.3	Measurement of electrical resistance, resistivity and magnetic losses	IEC 60840 ed. 5.1, cl. 12.4.9 ČSN IEC 60840, cl. 12.4.9	Power cables from 30 kV up to 150 kV	A, D
23.4	Measurement of electrical resistance, resistivity and magnetic losses	IEC 62067 ed. 3.0, cl. 12.4.9 IEC 62067 ed. 3.0, cl. 12.4.9	Power cables from 150 kV up to 500 kV	A, D
23.5	Measurement of electrical resistance, resistivity and magnetic losses	IEC 61284 ed. 2, cl. 12 ČSN EN 61284, cl. 12	Fittings for overhead lines	A, D

Accredited entity according to ČSN EN ISO/IEC 17025:2018:

EGU - HV Laboratory a.s.
CAB number 1029, EGU HV LABORATORY
Podnikatelská 267, 190 11 Praha 9 - Běchovice

Ordinal number[1]	Test procedure / method name	Test procedure / method identification [2]	Subject of the test	Degrees of freedom[3]
23.6	Measurement of electrical resistance, resistivity and magnetic losses	ČSN EN 62271-1 ed. 2, cl. 7.4; ČSN EN IEC 62271-102 ed. 2, cl. 7.4; ČSN EN 62271-103, cl. 7.4; ČSN EN IEC 62271-104 ed. 3, cl. 7.4	Switchgear and controlgear	A, D
24	**Temperature cycle tests**			
24.1	Temperature cycle tests	ČSN IEC 60502-2, cl. 18.2.7; NEN-HD 620 S3, cl. 3.3; HD 605-S3, cl. 3.8	Power cables from 1 kV to 30 kV	A, D
24.2	Temperature cycle tests	IEC 60840 ed. 5.0, cl. 12.4.6, 15.4.2 b) ČSN IEC 60840, cl. 12.4.6, 15.4.2 b)	Power cables from 30 kV to 150 kV	A, D
24.3	Temperature cycle tests	IEC 62067 ed. 3.0, cl. 12.4.6	Power cables from 150 kV to 500 kV	A, D
24.4	Temperature cycle tests	IEC 61284, cl. 13.5.2 ČSN EN 61284, cl. 13.5.2	Fittings for overhead lines	A, D
24.5	Temperature cycle tests	ČSN EN 61442, cl. 8, 9; IEC 60502-4 ed. 3.0; ČSN 34 7006 ed. 3	Accessories for power cables	A, D
25	**Electric and magnetic field measurement (1 Hz to 100 kHz)**			
25.1*	Electric and magnetic field measurement (1 Hz to 100 kHz)	IEC 62110 ed. 1.0 ČSN EN 62110; ČSN EN 50413	Environment with installed equipment for the generation, transmission and distribution of electricity	A, D
26	**Assessment of non-ionising radiation values (1 Hz to 100 kHz) by calculation**			
26.1*	Assessment of non-ionising radiation values (1 Hz to 100 kHz) by calculation	IP5 (Gov. Decree No. 291/2015 Coll.; MoH CR Bulletin No. 8/2017)	Environment with installed equipment for the generation, transmission and distribution of electricity	A, D
27	**Impulse current tests**			
27.1	Impulse current tests	IEC 60099-4 ed. 3, cl. 9.1 b), 8.3 ČSN EN 60099-4 ed. 3, cl. 9.1 b), 8.3	Surge arresters	A, D

Accredited entity according to ČSN EN ISO/IEC 17025:2018:

EGU - HV Laboratory a.s.
CAB number 1029, EGU HV LABORATORY
Podnikatelská 267, 190 11 Praha 9 - Běchovice

1 asterisk at the ordinal number identifies the tests, which the laboratory is qualified to carry out outside the permanent laboratory premises

2 if the document identifying the test procedure is dated, only these specific procedures are used. If the document identifying the test procedure is not dated, the latest edition of the specified procedure is used (including any changes)

3 degrees of freedom: A – Flexibility concerning materials/products (subject of the test), B – Flexibility concerning components/parameters/characteristics, C – Flexibility concerning the performance of the method, D – Flexibility concerning the method

The laboratory can modify the test procedures with the specified degree(s) of freedom in the scope of accreditation while maintaining the principle of measurement. If no degree of freedom is specified, the laboratory cannot apply a flexible approach to the scope of accreditation for the test.

Explanations and abbreviations:

ANSI	- American National Standards Institute
AS	- Australian Standard
CAN/CSA	- Canadian Standard
IEEE	- Standard published by an international non-profit professional organization
IP	- Internal Testing Procedure
NEMA	- National Electrical Manufacturers Association
NTC	- Colombian Standard
HD	- Harmonized Document
GR No. 291/2015 Coll.	- on health protection against non-ionising radiation
PNE	- Branch standard
MoH CR Bulletin No. 8/2017 -	Guideline for the procedure pursuant to Sections 35 and 36 of Act No. 258/2000 Coll., on the protection of public health and on the amendment of certain related acts, as amended, and Government Decree No. 291/2015 coll., on the protection of health against non-ionizing radiation

Český institut pro akreditaci, o.p.s.
NÁRODNÍ AKREDITAČNÍ ORGÁN
-3-

CYG 长园高能电气股份有限公司
CYG INSULATOR CO.,LTD
Niushan Foreign Economy Trade industrial Park, Dongcheng District,Dongguan City,China, PC:523111 Phone:+86 769 22291876 Fax:+86 769 22291877

1. Facility of Type Testing			
S/N	Items	Description	Test item
1.1	Tensile load testing machine	Tensile Load:0-300KN	Mechanical Tension Load Test
		Tensile Load:0-300KN	
		Tensile Load:0-300KN	
		Tensile Load:0-1000KN	
		Tensile Load:0-2000KN	
		Tensile Load:0-2000KN	
		Tensile Load:0-3000KN	
1.2	Bending and Twisting machine	Bending load:20kN*5000mm	Bending /twisting
		Bending load:50kN*5000mm	
1.3	Torsion Wrench	200N	Torsion Test
		560N	
1.4	1500kV power-frequency voltage Transformer & Testing Device	1500KV/500mA	Power-frequency
1.5	3600kV impulse/600kV steep wave generator	3600KV	Impulse and Steep wave
1.6	Rainy Device	Wet Condition	Wet electrical test
2. Facility of Acceptable Test			
2.10	Tape	Verification of Dimension of end fittings	
	micrometer		
	Coupling Gauge		
2.20	Locking Device Tester	0-500N	Locking Device Test
2.30	Zinc coating Thickness Tester	Galvanizing Test	
2.40	Mechanical Facility	same as item 1.1	same as item 1.1
3. Facility of Design Test			
3.1	Water Immersion Device	Boiling Tank	Interface & Connection of end fitting and Sheds
	Thermal Mechanical Test Device	'-35°to 50°	
	1500kV power-frequency voltage Transformer & Testing Device	1500KV power frequency	
	3600kV impulse/600kV steep wave generator	3600 impulse	
3.2	Rubber hardometer	Dial plate：0-100	Harderness Test for silicone rubber
	Horizontal vertical combustion test instrument	/	Flammability Test for silicone rubber
	UV Weathering test instrument	/	Accelerated weathering test
	Tracking Wheel Testing Device		1000h tracking and erison Tests
3.3	Boling Device	Boiling the core rod and bonding core	Water diffusion Test
	Core Rod Device	Core Dye Penetration	Dye Penetration Test
	High voltage bridge	Capacitance:4-2*104PF	Dielectric property test
	Conductivity measuring	Measuring range:	Conductivity
	instrument	0-10^5us/cm	measuring
3.4	High Pressure Washing Testing Device	High Pressure Washing Test(6Mpa)	
3.5	High frequency voltage generator	120KV 50-400Hz	Hydrophobicity Recovery test
4. Facility of Raw material Inspection			
4.1	300kV Power frequency withstand transformer	300kV	Power frequency withstand test

4.2	Core-rod inspecting device	lighting Inspect	Core rod defect inspect
4.3	Zinc coating pachometer	Measuring range: 0-400um	Zinc coating thickness measuring
4.4	Ultrasoni Crack Detector	Working frequency: 0.5-20MHz	Metal fitting crack and defect detector
4.5	Electronic analyse balance	0-190g, precisioon:0.0001g	Raw materail analyse
4.6	Acidity indicator	/	Raw materail analyse
4.7	Viscosity indicator	/	Raw materail analyse
4.8	Refractometer	/	Raw materail analyse
4.9	Metallographic microscope Metallographic Cutting Device Metallographic Polishing Device	Metal fitting Structure analyse	
4.10	Brinell & Rockwell & Vickers Hardness Tester	Metal Fitting Hardness Test	
4.11	Element Analysis	Metal Fitting Elements Analysis	
4.12	Vulcanization testing device	Silicone Rubber Vulcanizatin Test	
4.13	Plastic and rubber tensile load testing machine	Max Tensile Load:3000N	Mixed rubber physical property test
4.14	Shore durometer(A)	Hardness test for Silicone rubber	
4.15	Rubber pachometer	Rubber thickness	
4.16	Laser Diameter Testor	Core Diemeter	
4.17	Rubber pachometer	Measuring range: 0-10mm Precision;0.01mm	thickness measuring for mixed rubber
4.18	Megohmmeter	Resistnace Measuring range: $1*10^{6}$-$1*10^{17}\Omega$	Insulating resistance measuring
4.19	Plastic and rubber tensile load testing machine	Max Tensile Load: 3000N	Mixed rubber physical property test
4.20	100kV ac and dc testing transformer	Max test voltage: ac 100kV/dc 140 kV	Puncture field intensity test
4.21	AC/DC Tracking & Erosion Device	Rubber Tracking & Erosion	
4.22	Synthetic insulating material testing device	Max test voltage: ac and dc 12 kV	Tracking test and Core rod test
4.23	Salt-Fog test machine	Salt-Fog test	

Signed:

Name Zhang Fan

Titel Vice Director

Duly authorized on behalf of: CYG INSULATOR CO LTD.

CYG INSULATOR CO., LTD

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

HIGH VOLTAGE TESTING LABORATORY

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

L 1029

TEST REPORT No.: 11320/B/20

CUSTOMER:	CYG Insulator Co., Ltd. Jinghui Road No.2, Niushan Foregin Economy Industrial Park Dongcheng District, Dongguan City 523128 China
TEST OBJECT:	Composite suspension insulator 36 kV / 70 kN
MODEL:	CS 70 EB 170/900-555
TEST STANDARDS:	IEC 60060-1 Ed.3:2010, IEC 61109 Ed.2.0:2008, IEC 62217 Ed.2:2012, IEC TR 62039 Ed.1:2007

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

Copies: 1+1 Pages: 34 Date: 2020-03-02

TEST REPORT No.: 11320/B/20

TEST OBJECT:	Composite suspension insulator 36 kV / 70 kN
DRAWING No.:	GN190015 Rev. 5
MODEL:	CS 70 EB 170/900-555
MANUFACTURER:	CYG Insulator Co., Ltd. Jinghui Road No.2, Niushan Foregin Economy Industrial Park Dongcheng District, Dongguan City 523128 China
DATE OF DELIVERY:	2020-01-08
DATE OF TESTS:	From 2020-01-09 till 2020-02-24
ORDER No.:	Contract No. 001/20
TESTS WITNESSED BY:	N/A

TABLE OF CONTENTS

1 TEST SUMMARY

Test title	Test standard	Test result
Tests on interfaces and connection of end fittings	IEC 61109, clause 10.2.1, 10.3 IEC 62217, clause 9.2	Passed
Assembled core load time test	IEC 61109, clause 10.4	Passed
Test on shed and housing material: hardness test	IEC 62217, clause 9.3.1	Passed
Test on shed and housing material: tracking and erosion test – 1000h salt fog test	IEC 62217, clause 9.3.3	Passed
Test on shed and housing material: flammability test[1)] (see EZU test report 020110-01/01)	IEC 62217, clause 9.3.4	Passed
Test on shed and housing material: accelerated weathering test 1000h [1)] (see SYNPO test report T350/047)	IEC 62217, clause 9.3.2	Passed
Test on core material: Dye penetration test	IEC 62217, clause 9.4.1	Passed
Test on core material: Water diffusion test	IEC 62217, clause 9.4.2	Passed
Test on resistance to chemical attack	IEC TR 62039, clause3.8	Passed

Note:
[1)] The test was done in external accredited laboratory

2 TESTS PERFORMED

2.1 Tests on interfaces and connections of end fittings

Test was carried out according to IEC 61109, clause 10.2 and IEC 62217, clause 9.2. The test was performed on insulators samples No.: 1, 2, 3 and 4 REF.

2.1.1 Visual inspection and dimensional check

The test was performed on insulators samples No.: 1, 2, 3 and 4 REF. 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, serial No. 393/10

Insulators were without damage and dimensions conform with a drawing.

2.1.2 Pre-stressing

Tests were carried out according to IEC 61109, clause 10.3, and IEC 62217 clause 9.2. The tests were performed on insulator samples No. 1, 2 and 3.

2.1.2.1 Sudden load release

Test dates: 2020-01-09

Tests were carried out according to IEC 61109, clause 10.3.1

This test was performed on insulators No. 1, 2 and 3 at temperatures of –20 °C to –25 °C. Each of tested insulators was subjected to five sudden load releases from a tensile load of 21 kN (30 % of SML 70 kN).

Testing and measuring equipment:
loading measuring system Format 1, type EGU – 1V, Z201128287
digital thermometer - datalogger, Comet system U0141M, serial No. 19270819
Thermal mechanical chamber Horkan Klima, inventory No. 2237

2.1.2.2 Thermal-mechanical pre-stress

Testing date: from 2020-01-09 till 2020-01-13

Tests were carried out according to IEC 61109, clause 10.3.2

Three insulators No. 1, 2 and 3 were subjected to a mechanical load of 3,5 kN (5 % of SML 70 kN) for the duration one minute, the reference total length was measured. Measured values are show in Table 1.

Three insulators No. 1, 2 and 3 were subjected to a mechanical load of 35 kN (50 % of SML). Each insulator was subjected to four 24-hour cycles 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 tension during the thermal-mechanical testing on test sample No. 1 are given in Graphs 2 and 3. The test arrangement during the thermal-mechanical test on the insulator is shown in Figure 2.

Testing and measuring equipment:
loading measuring system Format 1, type EGU – 1V, Z201128287
digital thermometer - datalogger, Comet system U0141M, serial No. 19270819
Thermal mechanical chamber Horkan Klima, inventory No. 2237
tape measure 5 m, CXS, PM-241

Table 1

Insulator No.	1	2	3
Total length before test (mm)	451	454	453
Total length after test (mm)	452	455	453

2.1.2.3 Water immersion test

Testing date: from 2020-01-14 till 2020-01-16

Test was carried out according to IEC 62217, clause 9.2.6.

Three tested insulators No. 1, 2 and 3 were immersed for 42 hours boiling in tap water adjusted to a conductivity of 1750 µS/cm ± 80 µS/cm at 20°C.

At the end of boiling, the insulators remained immersed until the water cooled to approx. 50 °C and maintained at this temperature until the verification tests started.

Testing and measuring equipment:
conductivity meter, WTW, type Cond 3310, serial No. 12240282
heating water vessel AKV2, No. 2420

2.1.3 Verification tests

Testing date: 2020-01-17

Tests were carried out according to IEC 62217, clause 9.2.7.

2.1.3.1 Visual examination

Insulators were inspected visually.

Test results
No cracks were observed.

2.1.3.2 Steep-front impulse voltage test

Test was carried out according to IEC 62217, clause 9.2.7.3.

Atmospheric conditions:

air pressure	99,1 kPa
air temperature	19,1 °C
relative humidity	34,1 %

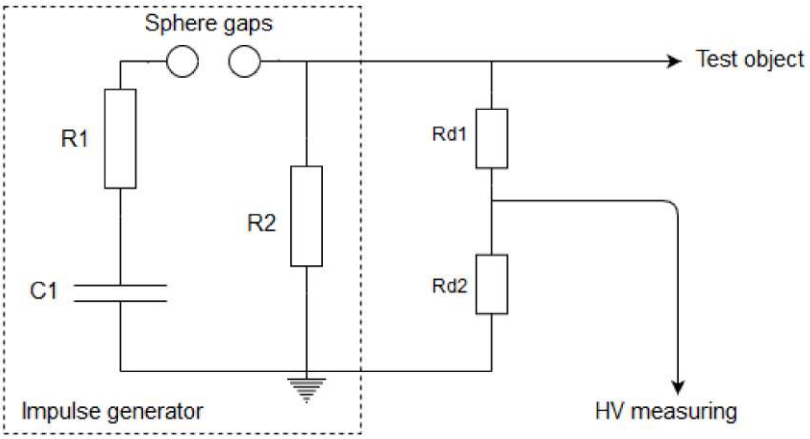
Insulators No. 1, 2, 3 were tested. The test voltage - an impulse with a steepness of at least 1000 kV/µs - was applied between the original upper and bottom metal fitting.

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 3.

The wave shape of the test impulse is given in Graph 1.

Testing and measuring equipment:



impulse generator TuR Dresden 750 kV, 30 kJ
R_{d1}/R_{d2} - divider Passoni Villa 700 kV, serial No. 11635
measuring system Haefely Trench, type HiAS 743, serial No. 175247
measuring system for atmospheric conditions Comet, serial No. 10910247
tape measure 5 m, CXS, PM-241

Test results
No punctures of the sheds or the core were recorded.

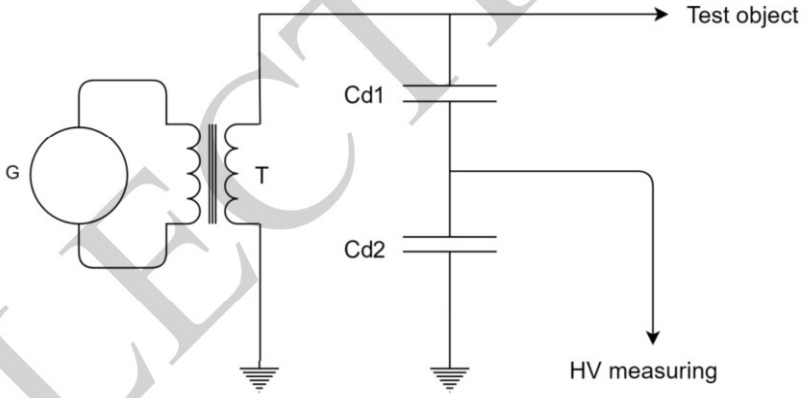
2.1.3.3 Dry power frequency voltage test

Test was carried out according to IEC 62217, clause 9.2.7.4.

Atmospheric conditions:

air pressure	99,0 kPa
air temperature	19,0 °C
relative humidity	33,2 %

Testing and measuring equipment:



G – synchronous generator BEZ Bratislava 6 kV, 1 300 kVA, 50 Hz
T – test transformer Fischer Köln 250 kV, serial No. P38879
Cd1/Cd2 – capacitive divider LK-250, serial No. 001-12
universal voltmeter Siemens MU 17, serial No. 929218
digital stop-watch Olympia, PM-172
measuring system for atmospheric conditions COMET, serial No. 10910247
digital thermometer Fluke 52 IIB, serial No. 41070290WS + probe 80PK-27
tape measure, CXS 5 m, PM-241

This test consisted of the following two tests:

a) Dry power frequency flashover test

Samples No. 1, 2, 3 and No. 4 REF (as a reference sample) were tested. The average of five flashover voltages on each insulator was corrected to normal standard atmospheric conditions in accordance with IEC 60060-l, clause 4.3. The flashover voltage was obtained by increasing the voltage linearly from zero within one minute.

The test arrangement and the flashover of the insulator are shown in Figure 4.

The value of reference flashover voltage was obtained from insulator No. 4 REF.

The average value of the flashover voltages of insulators No. 1, 2 and 3 shall be greater than or equal to 90 % of flashover voltage of the reference insulator No. 4 REF.

Table 2

Insulator No.	**Uncorrected flashovers values (kV)**					**Uncorrected flashover average (kV)**	**Correction factors**	**Corrected flashover voltage (kV)**
4 REF	175	170	171	168	172	171	$k_1 = 0{,}981$ $k_2 = 0{,}938$ $K_t = 0{,}920$	186
90 % of reference flashover voltage = 167 kV (corrected to reference conditions)								
80 % of reference flashover voltage = 137 kV								

Table 3

Insulator No.	**Uncorrected flashovers values (kV)**					**Uncorrected flashover average (kV)**	**Correction factors**	**Corrected flashover average (kV)**
1	171	172	167	169	169	170	$k_1 = 0{,}981$ $k_2 = 0{,}937$ $K_t = 0{,}919$	185
2	170	171	170	167	170	170	$k_1 = 0{,}981$ $k_2 = 0{,}937$ $K_t = 0{,}919$	185
3	168	166	166	167	170	167	$k_1 = 0{,}981$ $k_2 = 0{,}934$ $K_t = 0{,}916$	182

Test result

Average corrected flashover voltage values of insulators No. 1, 2, 3 exceed 90 % of the reference flashover voltage.

b) Dry power frequency withstand test

Each of tested insulators No. 1, 2, 3 and No. 4 REF were individually subjected for 30 minutes to 80 % of the average reference flashover voltage. The requirement is that during this test no puncture of the insulator shall occur and the temperature rise ΔT of the shank measured immediately after the test shall be not more than 10 K (see Table 4). The temperature was measured by digital thermometer Fluke 52 IIB at three points of each tested insulator (bottom, middle, upper).

Table 4

Insulator No.	Test voltage (kV)	Result	ΔT (K)
1	137	passed	<10
2	137	passed	<10
3	137	passed	<10
4 REF	137	passed	<10

Conclusion:

No puncture was recorded during the dry power frequency withstand test on all of tested insulators and the increase in temperature of the insulator shank was under 10 K.

Composite suspension insulator 36 kV / 70 kN, model CS 70 EB 170/900-555, drawing No. GN190015 Rev. 5, passed the Tests on interfaces and connections of end fittings according to IEC 61109, clause 10.2.1, clause 10.3 & IEC 62217, clause 9.2

2.2 Assembled core load time tests

Test date: from 2020-01-09 till 2020-01-20

2.2.1 Test specimens

The test was performed on insulators samples No. 1, 2, 3, 4, 5 and 6. 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
slide gauge 500 mm, Shan Brand, serial No. 884087
tape measure CXS 5 m, PM-241

Insulators were without damage and dimensions conform with drawing.

2.2.2 Determination of the average failing load of the core of the assembled insulator M_{AV}

Test date: 2020-01-09

Test was carried out according to IEC 61109, clause 10.4.2.1. Three insulators No. 1, 2 and 3 were subjected to tensile load applied between couplings. The tensile load was increased rapidly but smoothly from zero to approximately 53 kN (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 5, 6 and 7). The average of the three failing loads M_{AV} was calculated.

Records of measured mechanical loading during the mechanical failing load test are given in Graph 4, 5 and 6.

Testing and measuring equipment:
hydraulic loading machine LabTest 5.600SP1, serial No. 15/12

Table 5

Insulator No.	Insulator failing load (kN)	Type of failure
1	90,4	Pull out of the core from the end fitting
2	92,8	Pull out of the core from the end fitting
3	97,0	Pull out of the core from the end fitting
Average of the failing load M_{AV}	93,4	

2.2.3 Verification of the 96 hours withstand load

Test date: from 2020-01-16 till 2020-01-20

Test was carried out according to IEC 61109, clause 10.4.2.2. Three insulators No. 4, 5 and 6 were subjected to a tensile load applied between couplings. The tensile load was increased rapidly but smoothly, from zero up to 56,0 kN (60 % of M_{AV} = 93,4 kN) and then maintained at this value for 96 hours (see Figure 8).

Record of mechanical loading applied during mechanical 96 hours tests are given in Graph 7.

Testing and measuring equipment:
hydraulic loading machine LabTest 5.600SP1, serial No. 15/12

Conclusion:

Composite suspension insulator 36 kV / 70 kN, model CS 70 EB 170/900-555, drawing No. GN190015 Rev. 5, passed the damage limit proof test and test of tightness of the interface between end fittings and insulator housing according to IEC 61109, clause 11.2.

2.3 Test on shed and housing material

Specification of silicone material

Manufacturer: CYG Insulator Co., Ltd.
Address: Jinghui Road No.2,Niushan Foreign Economy Industrial Park, Dongcheng District, Dongguan City, 523128 ,China
Color: Gray
Type: HTV Silicone rubber
Material number: GN-100

2.3.1 Hardness test

2.3.1.1 Test procedure

Test date: from 2020-01-20 till 2020-01-22
Test was carried out according to IEC 62217, clause 9.3.1.

Determination of hardness after boiling of test samples

The hardness of two samples was measured with a Shore A durometer. Measured values were recorded.

Water immersion test

The two tested samples No. #1, #2 were immersed for 42 hours in boiling deionized water with 0,1 % by weight of NaClause At the end of boiling, the test samples remained immersed and cooled to ambient temperature until the verification tests started.

Determination of hardness after boiling of test samples

The hardness of two samples was measured with shore A durometer (see Figure 16). Measured values were recorded. The measured values of hardness are given in Table 6.

Testing and measuring equipment:
durometer Shore A, serial No. 45609010
weight Sartorius A210P, serial No. 350010002
measuring cylinder 1000 ml, identification No. 2/044/11
Digital thermometer Fluke 52IIB, serial No. 41070290WS + probe type 80 PK-27
Heating water vessel, type LTHS 4000

2.3.1.2 Test results

Table 6

Sample No.	**Before water immersion test**	**Average value**
1	80,0; 80,5; 79,8; 79,0; 80,4	79,9
2	79,1; 79,6; 80,1; 78,5; 79,5	79,4

Sample No.	**After water immersion test**	**Average value**
1	79,0; 79,4; 76,9; 80,2; 79,0	78,9
2	77,9; 80,5; 79,0; 80,4; 79,5	79,5

Conslusion:

No marked changes of hardness of test samples were recorded. The hardness of each specimen was not change from the pre-boiled value by more than ±20%.

Test specimens of silicone material, passed the hardness test according to IEC 62217, clause 9.3.1.

2.3.2 Accelerated weathering test [1)]

The test was done in external accredited laboratory SYNPO.

Specification of silicone material

Manufacturer: CYG Insulator Co., Ltd.
Address: Jinghui Road No.2,Niushan Foreign Economy Industrial Park, Dongcheng District, Dongguan City, 523128 ,China
Color: Gray
Type: HTV Silicone rubber
Material number: GN-100

Conslusion:

The test was performed according IEC 62217, clause 9.3.2. Silicone material passed the accelerated weathering test according to IEC 62217, clause 9.3.2 based on the test report No. T350/047 from SYNPO.

2.3.3 Flammability test [1)]

The test was done in external accredited laboratory EZU.

Manufacturer: CYG Insulator Co., Ltd.
Address: Jinghui Road No.2,Niushan Foreign Economy Industrial Park, Dongcheng District, Dongguan City, 523128 ,China
Color: Gray
Type: HTV Silicone rubber
Material number: GN-100

Conslusion:

The test was performed according IEC 62217, clause 9.3.4 and IEC 60695-11-10. Silicone material passed the flammability test according to IEC 62217, clause 9.3.4 based on the test report No. 020110-01/01 from EZU.

2.3.4 Tracking and erosion test – 1000h salt fog test

Test was carried out according to IEC 62217, clause 9.3.3.

2.3.4.1 Test procedure

Two samples of composite insulators were subjected to a salt fog test in accordance with IEC 62217, clause 9.3.3. The test was performed on shorter test samples with creepage distance between 500 mm and 800 mm according IEC 62217 clause 9.3.3.5.

Sample No.:	Test position
1.	Vertical
2.	Horizontal

Creepage distance of test samples: 560 mm
Test voltage: 16,2 kV
Starting salinity: 8 ± 0,4 kg/m^3
Finish salinity: 8 ± 0,4 kg/m^3
Temperature: 20° C ±5 K

Test specimens

Test specimens were cleaned with de-ionized water before starting the test. There was 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

The test chamber was prepared according to IEC 62217, clause 9.3.3.2.
Test was performed in a moisture-sealed corrosion-proof chamber not exceeding 15 m^3.

Fog generation

The fog generation was done according to IEC 62217, clause 9.3.3.3.

Fog calibration

The fog calibration was done according to IEC 62217, clause 9.3.3.4.
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.

Test voltage

Test voltage was adjusted according to IEC 62217, clause 9.3.3.6 (see Graph 8).
The test circuit when loaded with a continuous resistive current of 250 mA (r.m.s.) during 1 sec on the high voltage side shall experience a maximum voltage drop of 5 %.
The protection level of the tripping device was set at 1 A (r.m.s.).

Test conditions

Test conditions was adjusted according to IEC 62217, clause 9.3.3.7.
Duration of the test: 1010 hours.
Weekly interruptions of the test for inspection purposes did not exceed 1 h.
Numbers of flashovers and trip outs, when occurred, were recorded.

Testing and measuring equipment:

test transformer Tebíč, serial No. 6022
measuring voltage transformer ABB, typ TDC 7, 35/0,1 kV, serial No. VLT52111022698
measuring PC, Dewe-rack+USB converter type 6341, serial No. 52150637/1890C82
tape measure 5 m, CXS, PM-241
slide gauge 150 mm, Kinex, serial No. KN2038
conductivity meter, WTW Cond 3110, serial No. 11060082
measuring cylinder 250 ml, identification No. 1/044/11
digital stop-watch Olympia, PM-172

2.3.4.2 Test result

Summary of the test:

Measured creepage distance: 560 mm

Arcing distance: 265 mm

Test voltage: 26,2 kV

Beginning of the test: 2020-01-13

End of the test: 2020-02-24

Starting salinity: 8 ± 0,4 kg/m^3

Finishing salinity: 8 ± 0,4 kg/m^3

Test duration:: 1010 hours

Temperature: 20 °C ±5 K

The average collect of precipitation was 1,8 ml/hour.

A record of a test voltage during the tracking and erosion test is given in Graph 8. Photographs of test samples before and after finishing of the test are given in Figures 9, 10 and 11.

Table 7

Sample No.	Test position	Number of flashovers	Visual examination
#2	horizontal	0	no tracking occurs, no erosion, no puncture of shed, housing or interface occurred
#1	vertical	0	no tracking occurs, no erosion, no puncture of shed, housing or interface occurred

Conclusion:

Composite suspension insulator 36 kV / 70 kN, model CS 70 EB 170/900-555, drawing No. GN190015 Rev. 5, passed the tracking and erosion test according to IEC 62217, clause 9.3.3.

2.4 Test on core material

2.4.1 Dye penetration test

Test date: 2020-01-10

The test was carried out according IEC 62217, clause 9.4.1.

Test specimens

Ten test specimens of 10 mm in length were cut from rod from insulator delivered by customer.

Test procedure

The test specimens were placed (with fibres 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 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 specimen after the dye penetration test is in Figure 12.

Testing and measuring equipment:

digital stop-watch Olympia PM-172
slide gauge 150 mm, Kinex CZ, serial No. KN2038

Conclusion:

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

Specimens of rod diameter 16 mm passed dye penetration test according to IEC 62217, clause 9.4.1.

2.4.2 Water diffusion test

Test date: from 2020-01-13 till 2020-01-17

The test was carried out according to IEC 62217, clause 9.4.2.

Test specimens

Six test specimens of 30 mm in length were cut from rod from insulator delivered by customer.

Pre-stressing

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

After boiling, the specimens 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 described in the following clause was carried out within the next three hours.

Voltage test

Immediately before the voltage test the specimens 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 13).

Testing and measuring equipment:

slide gauge 150 mm, Kinex, serial no. KN2038
voltage source VEB Dresden 3 kVA, 50kV, type WPF 3/50, serial No. 854409
measuring transformer TuR Dresden, type UZGT 30, serial No. 02022
multimeter Kyoritsu 1052, serial No. 8077645
Multimeter UT60E, serial No. 1100559236 + shunt PM-160
digital stop-watch Olympia PM-172
weight Sartorius, type S210P, serial No. 39010002
measuring cylinder 1000 ml, identification No. 2/044/11
heating water vessel, type LTHS 4000, serial No. 18102

Test results

Table 8

Specimen No.	Testing voltage (kV)	Leakage current (µA)	Test duration (sec)	Result
1	12,0	12,1	60	passed
2	12,0	10,4	60	passed
3	12,0	9,9	60	passed
4	12,0	9,7	60	passed
5	12,0	10,6	60	passed
6	12,0	10,4	60	passed

Conclusion:

During this test no puncture or external flashover were observed. The leakage current did not exceed maximum allowable current of 1 mA (r.m.s.).

Specimens of rod diameter 16 mm passed water diffusion test according to IEC 62217, clause 9.4.2.

2.5 Resistance to chemical attack

2.5.1 Test procedure and test results

Date of test: from 2020-01-10 till 2020-01-14

Test was carried out according to IEC TR 62039, clause 3.8.

The size of acid container was adapted in such a way that the FRP core is surrounded of liquid thickness not less than 10 mm and directly on contact with FRP core with a length not less than 40 mm.

A core sample (diameter 16 mm) was subject to a tensile load applied between the metal fittings. The tensile load was increased rapidly but smoothly from zero to load corresponding to 340 MPa, i.e. 68,4 kN for 96 hours (see Graph 9 and Figures 14 and 15).

Immediately after the load application, nitric acid of a concentration of 1 mol/l nitric acid HNO_3 was poured into acid container.

Testing and measuring equipment:

hydraulic loading machine LabTest 5.600SP1, serial No. 15/12
Measuring cylinder 1000 ml, i.No. 2/044/11
slide gauge 150 mm, Kinex, serial No. KN2038

Conclusion:

No visual deterioration of the core recorded on tested insulator unit.

No failure of the "brittle fracture" type on tested insulator unit.

Composite suspension insulator 36 kV / 70 kN, model CS 70 EB 170/900-555, drawing No. GN190015 Rev. 5, passed the resistance to chemical attack according to IEC TR 62039, clause 3.8.

3 UNCERTAINTY OF MEASUREMENTS

QUANTITY	UNCERTAINTY (k=2)	
Steep-front impulse voltage	U_m T_1	2,0 % 5,9 %
Power-frequency voltage	1,5 %	
Power-frequency current	1,3 %	
Power-frequency (salt fog test)	1,0 %	
Power-frequency voltage (Kyoritsu 1052)	0,9 %	
Mechanical load (LabTest 5.600SP1)	1,0 %	
Mechanical load (thermal-mechanical test)	1,3 %	
Temperature (Fluke 52II)	7,5 %	
Temperature (Comet S0141)	3,0 %	
Weight (Sartorius)	0,9 %	
Atmospheric pressure	0,5 %	
Air temperature	4,0 %	
Relative humidity	6,3 %	
Time	0,7 %	
Conductivity (0,1 µS/cm – 1000 mS/cm)	1,0 %	
Slide gauge 150 mm	0,4 %	
Slide gauge 500 mm	0,8 %	
Measuring cylinder 1000 ml	3,0%	
Measuring cylinder 250 ml	3,0%	
Length – tape measure (10 – 5000 mm)	1,6 %	
Hardness (Shore A)	2,6 %	

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 %.

4 PRODUCT DRAWING

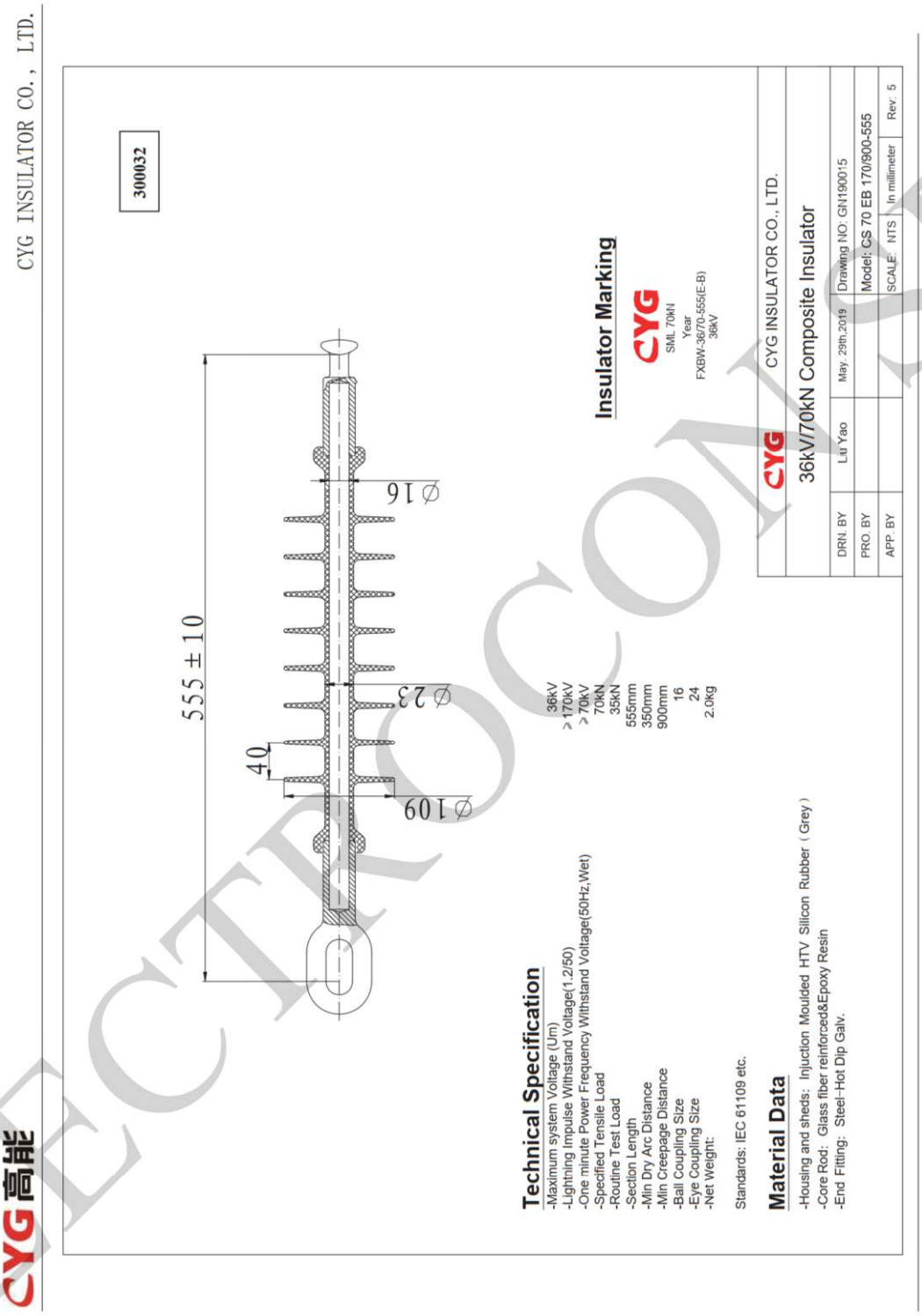
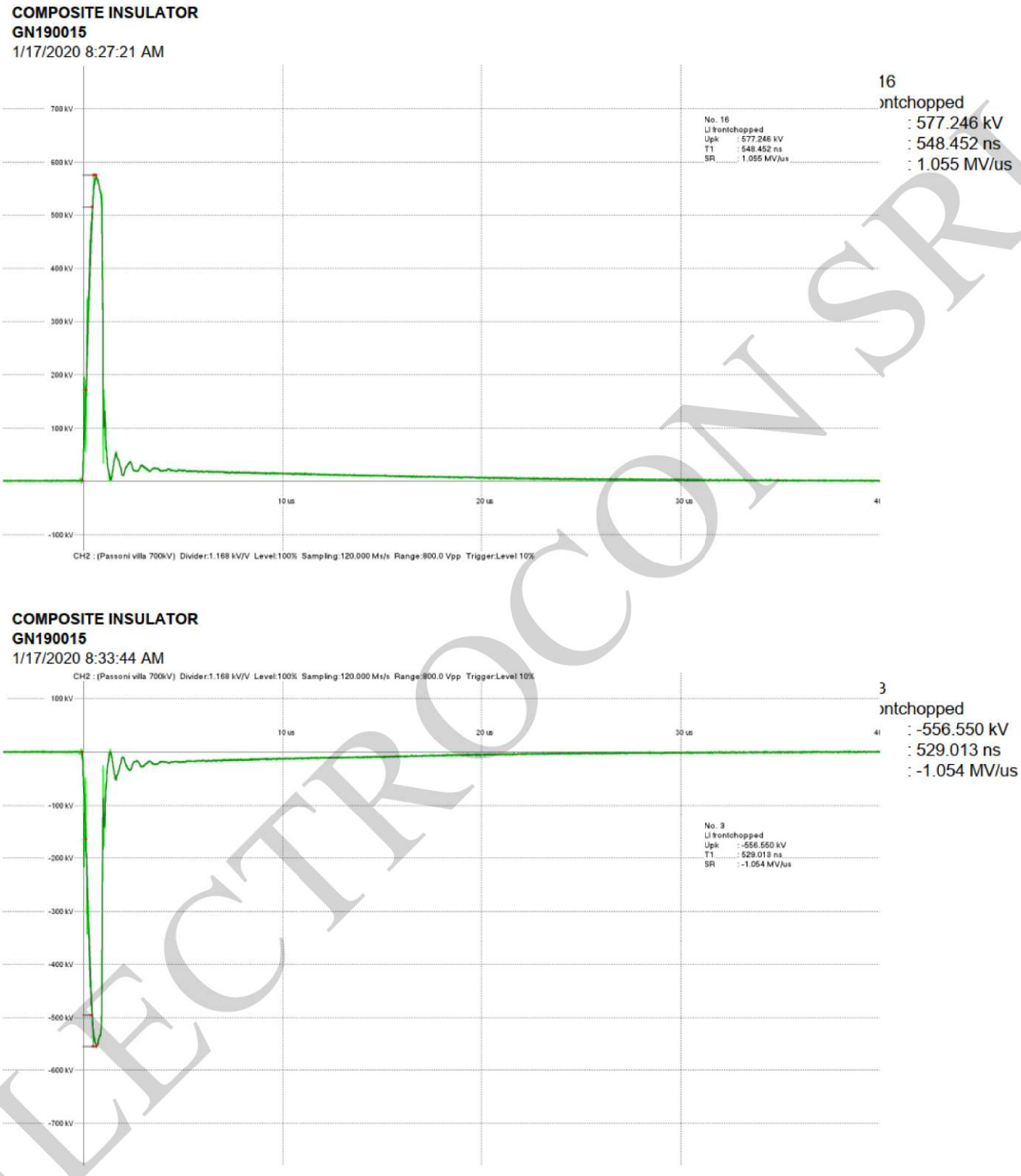
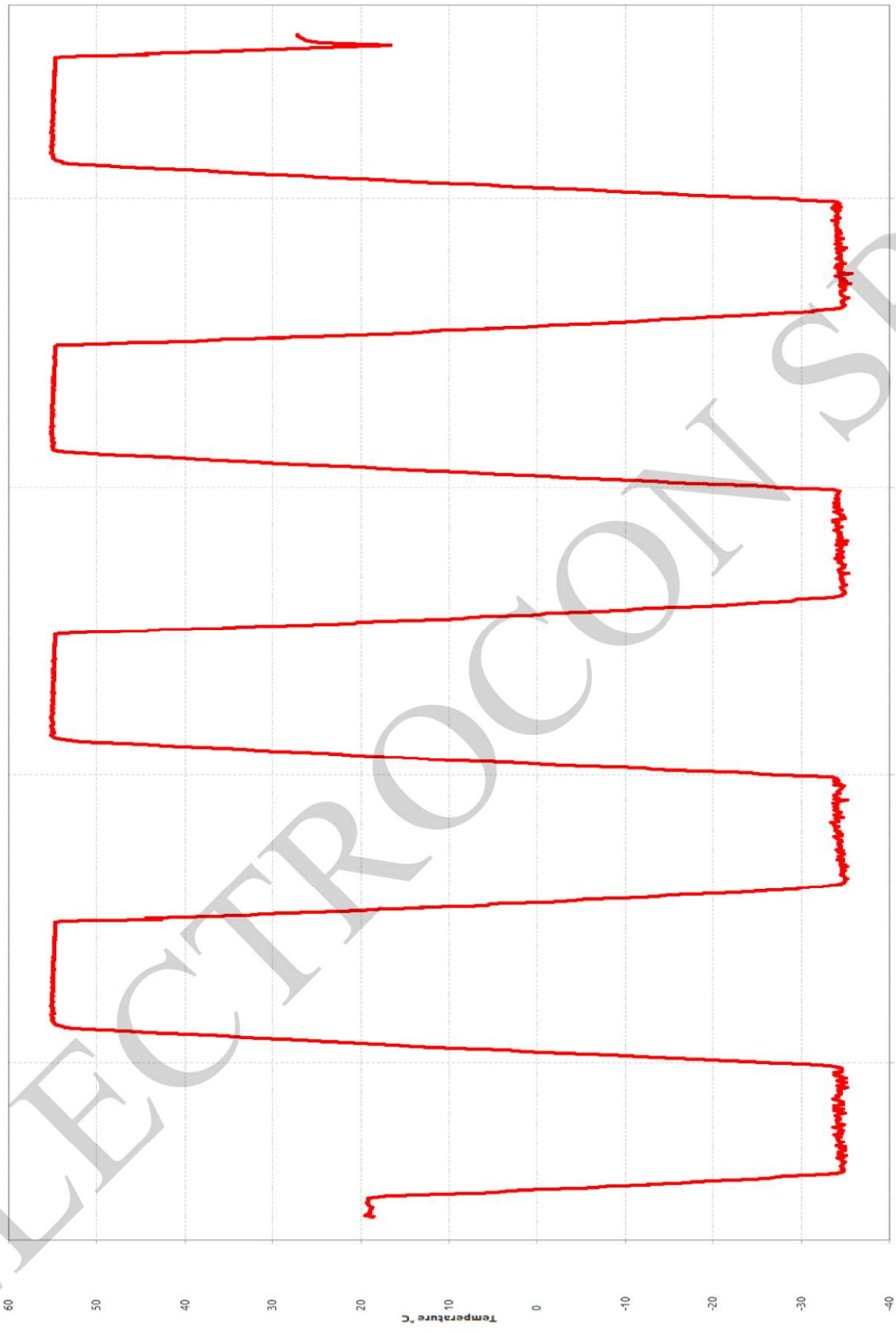


Figure 1
Composite suspension insulator 36 kV / 70 kN, model CS 70 EB 170/900-555, drawing No. GN190015 Rev. 5

5 GRAPHS AND RECORDS

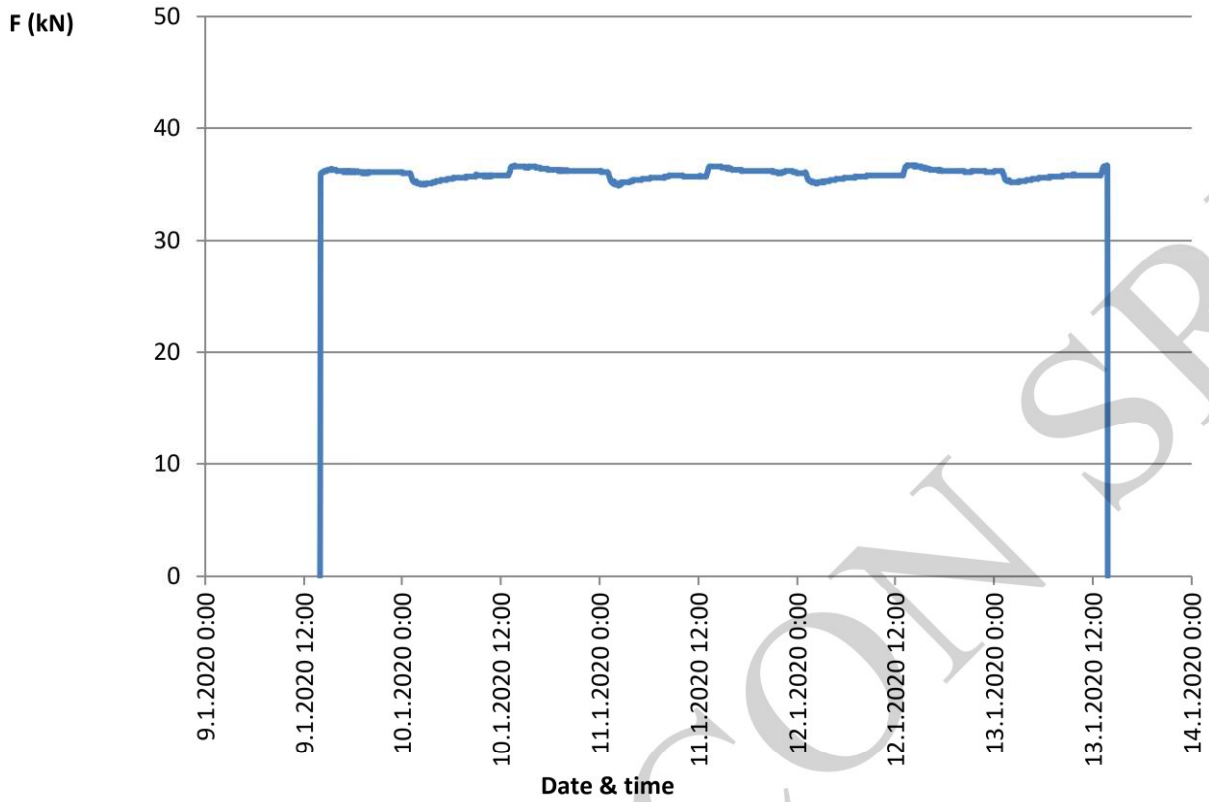


Graph 1
The wave shape of steep front impulse



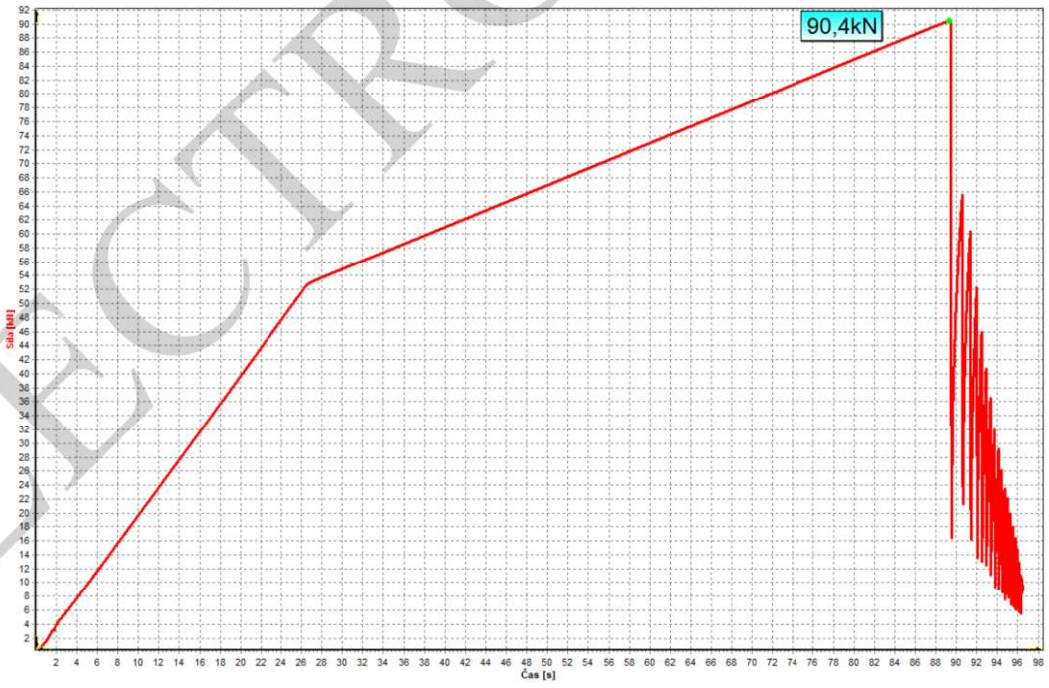
Graph 2

Composite suspension insulator 36 kV / 70 kN, model CS 70 EB 170/900-555, drawing No. GN190015 REV. 5, record of temperature during thermal-mechanical cycles



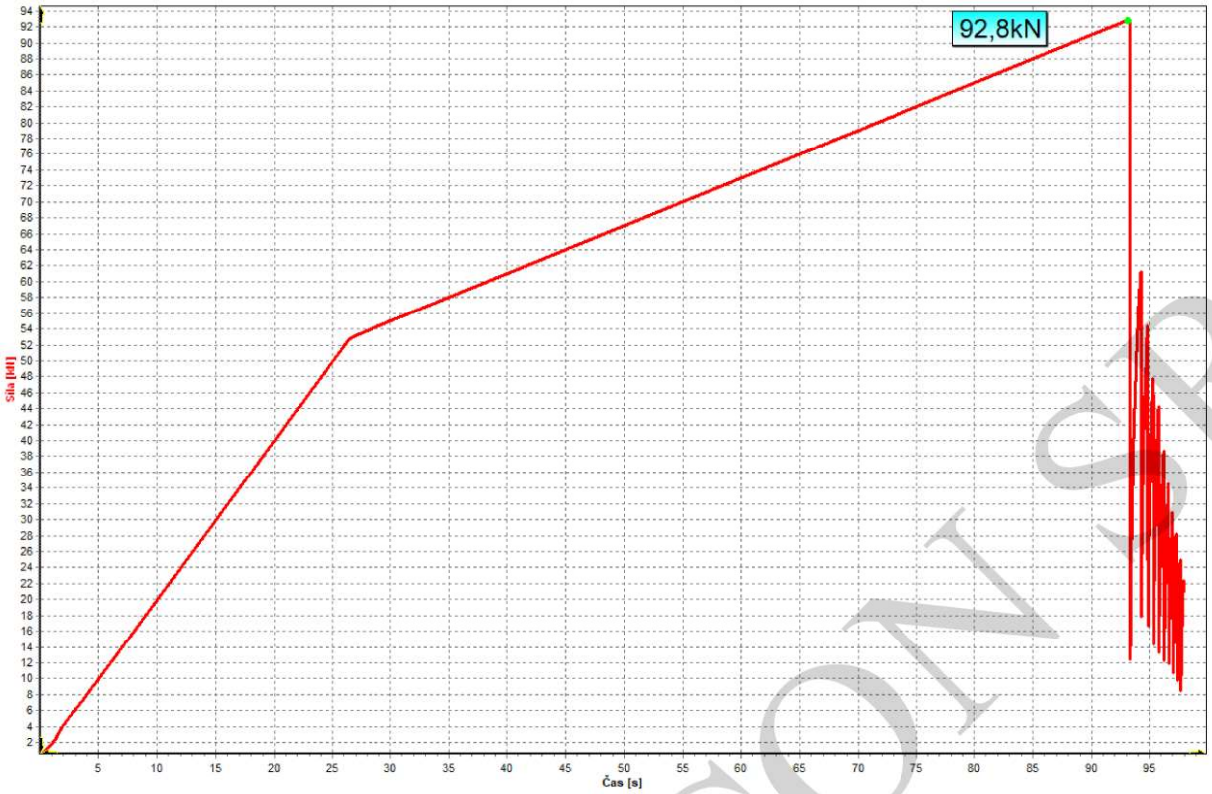
Graph 3

Composite suspension insulator 36 kV / 70 kN, model CS 70 EB 170/900-555, drawing No. GN190015 Rev. 5, record of tension during thermal-mechanical cycles

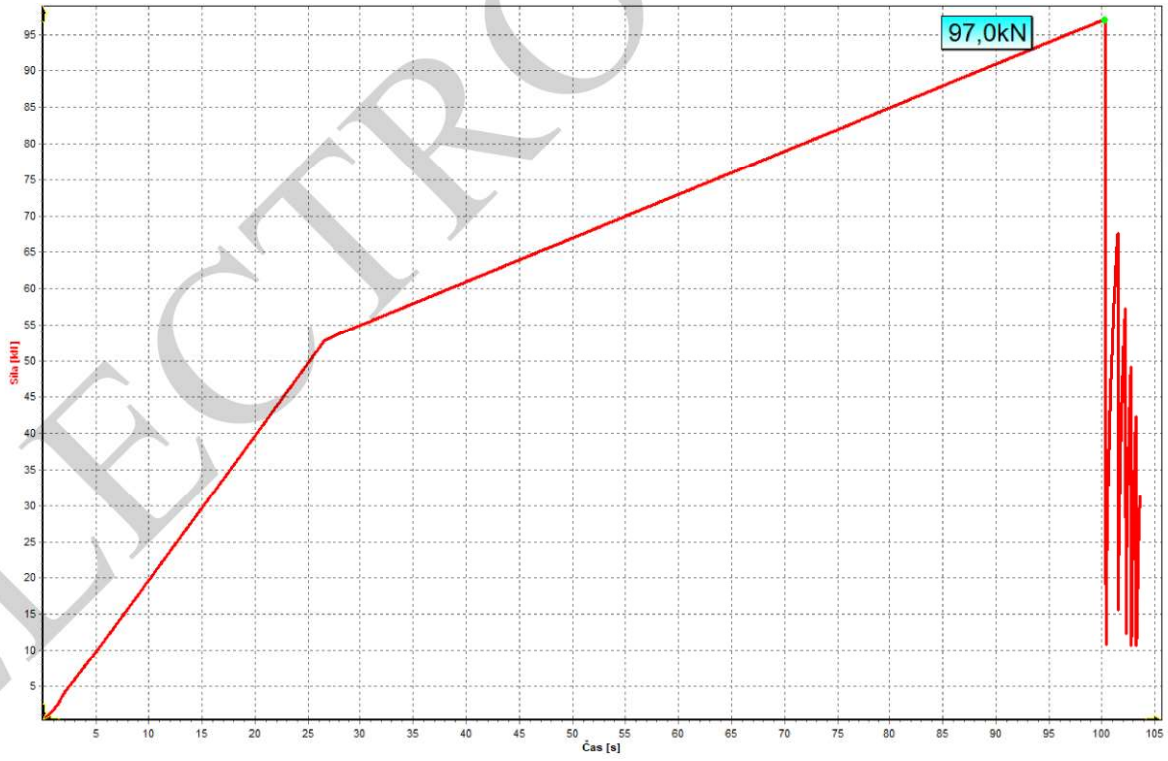


Graph 4

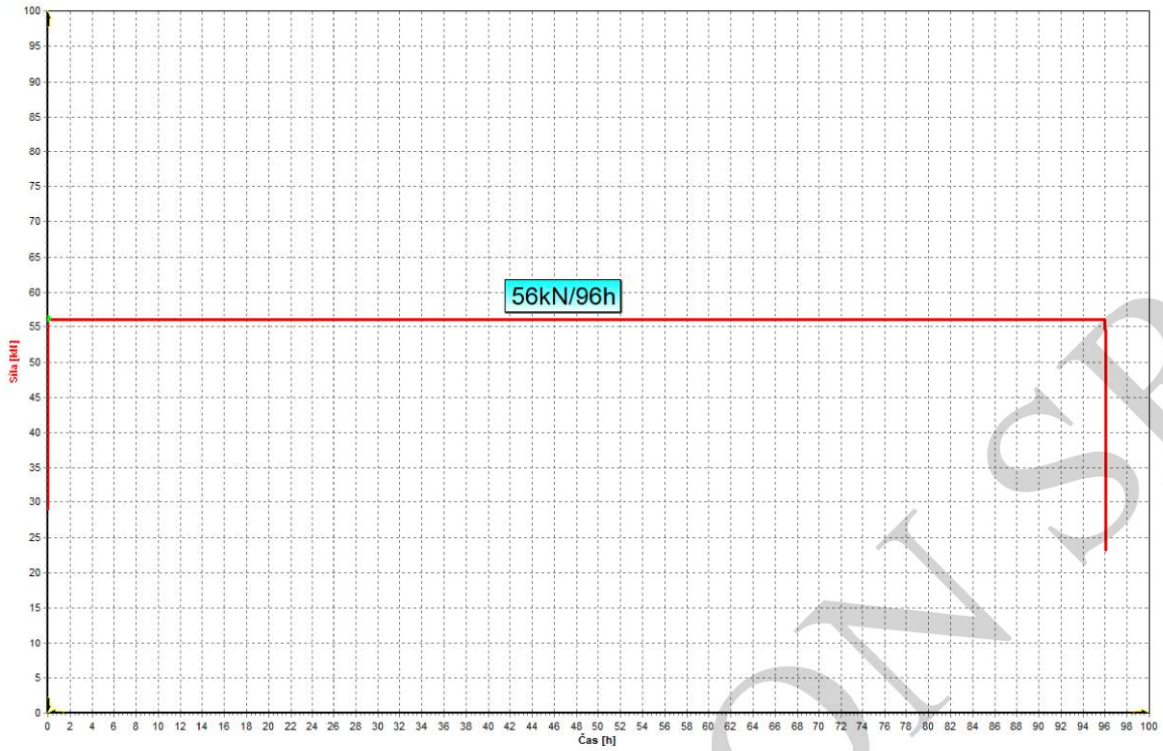
Composite suspension insulator 36 kV / 70 kN, model CS 70 EB 170/900-555, drawing No. GN190015 Rev. 5, record of mechanical loading test, test sample No. 1



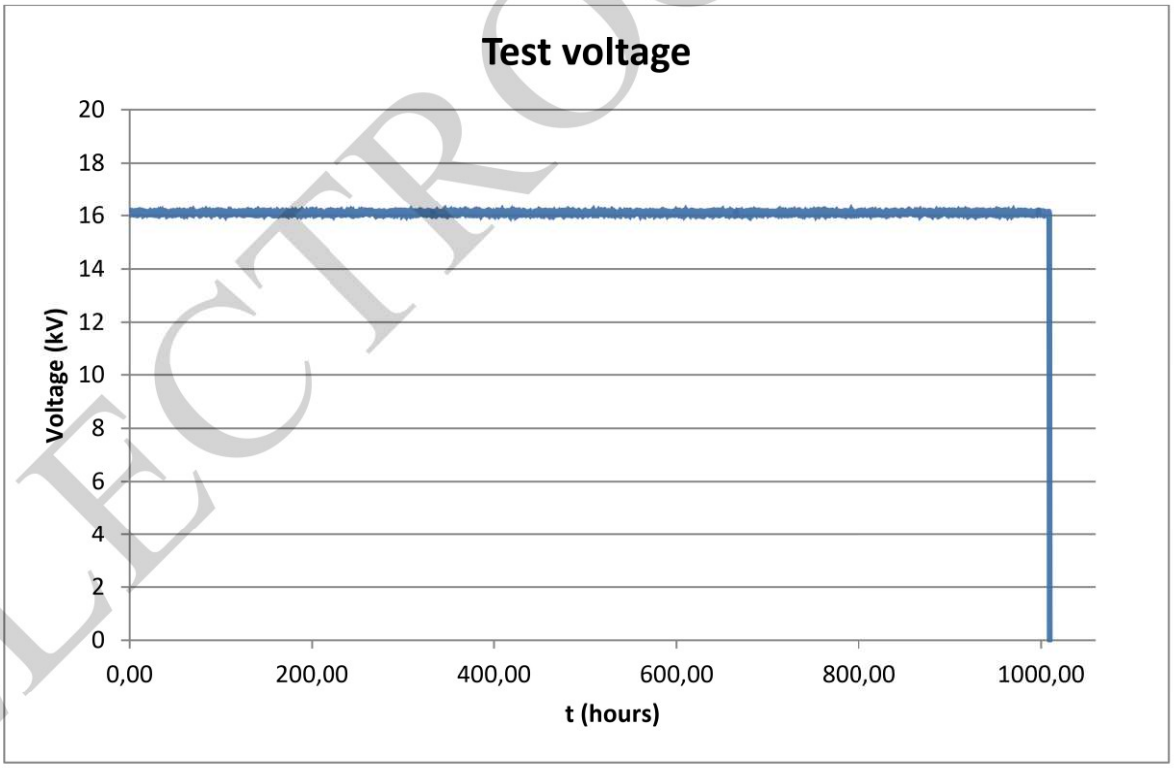
Graph 5
Composite suspension insulator 36 kV / 70 kN, model CS 70 EB 170/900-555, drawing No. GN190015 Rev. 5, record of mechanical loading test, test sample No. 2



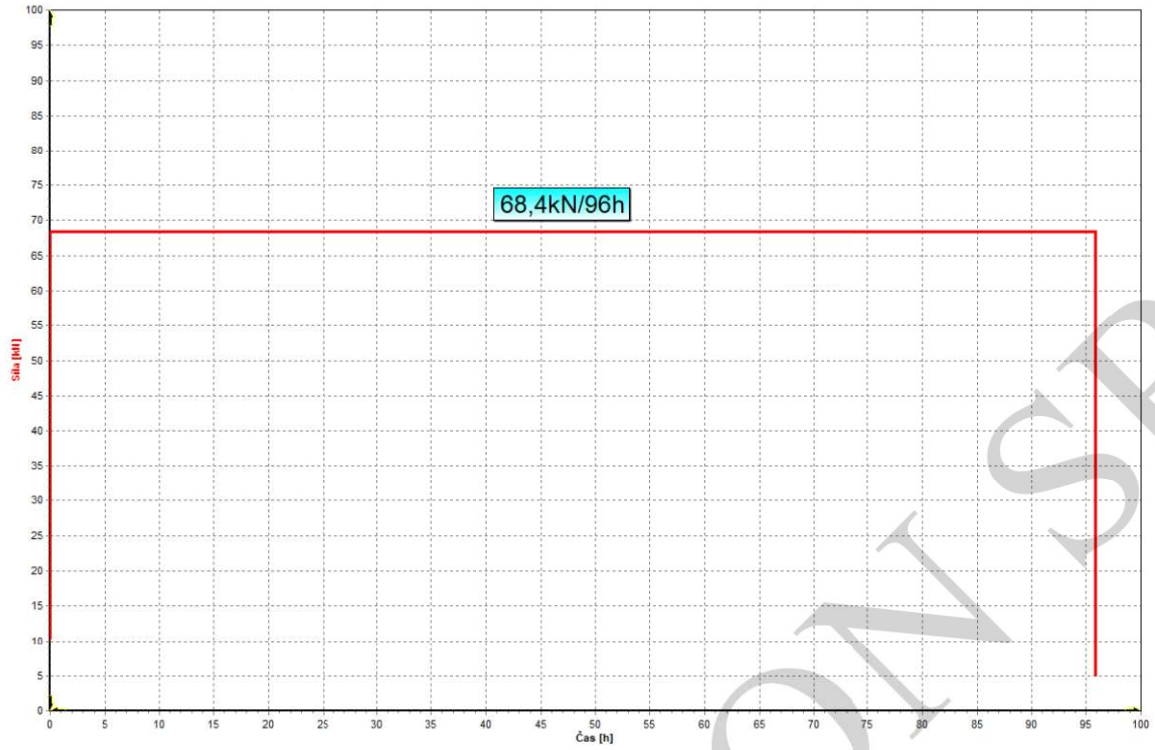
Graph 6
Composite suspension insulator 36 kV / 70 kN, model CS 70 EB 170/900-555, drawing No. GN190015 Rev. 5, record of mechanical loading test, test sample No. 3



Graph 7
Composite suspension insulator 36 kV / 70 kN, model CS 70 EB 170/900-555, drawing No. GN190015 Rev. 5, record of 96h mechanical loading test, test sample No. 4, 5 and 6



Graph 8
Composite suspension insulator 36 kV / 70 kN, model CS 70 EB 170/900-555, drawing No. GN190015 Rev. 5, record of the test voltage during the 1000 hour salt fog test



Graph 9
Composite suspension insulator 36 kV / 70 kN, model CS 70 EB 170/900-555, drawing No. GN190015 Rev. 5, record of mechanical loading test

6 TEST OBJECT AND TEST SETUP PHOTOS

Figure 2
Composite suspension insulator 36 kV / 70 kN, model CS 70 EB 170/900-555, drawing No. GN190015 Rev. 5, during thermal – mechanical test

Figure 3
Composite suspension insulator 36 kV / 70 kN, model CS 70 EB 170/900-555, drawing No. GN190015 Rev. 5, during the steep-front impulse voltage test

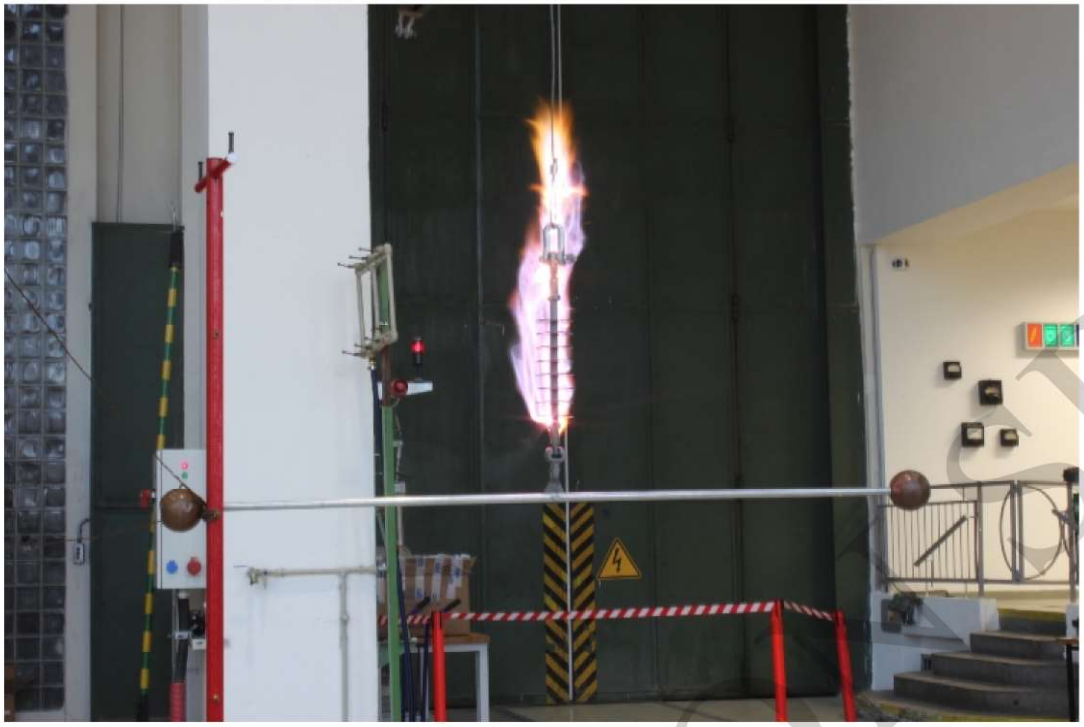


Figure 4
Composite suspension insulator 36 kV / 70 kN, model CS 70 EB 170/900-555, drawing No. GN190015 Rev. 5, during the dry power frequency flashover test

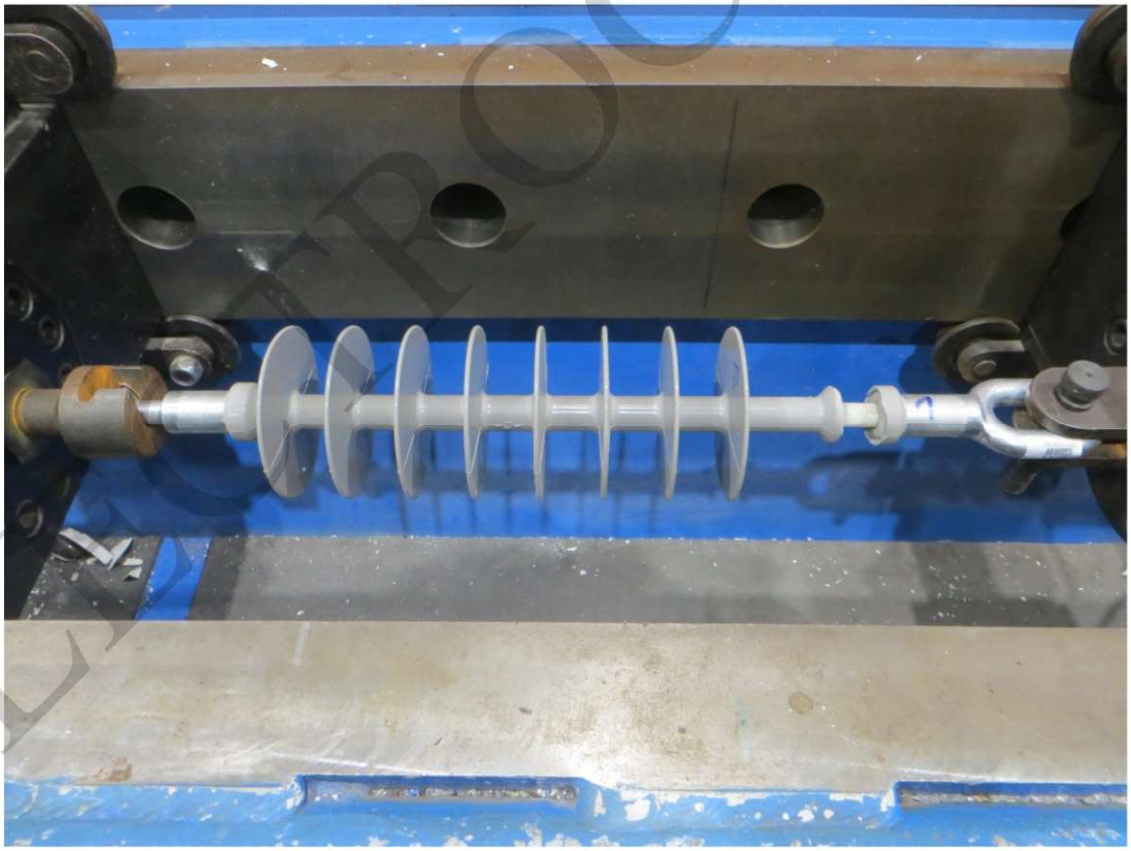


Figure 5
Composite suspension insulator 36 kV / 70 kN, model CS 70 EB 170/900-555, drawing No. GN190015 Rev. 5, after mechanical failing load test, test sample No. 1

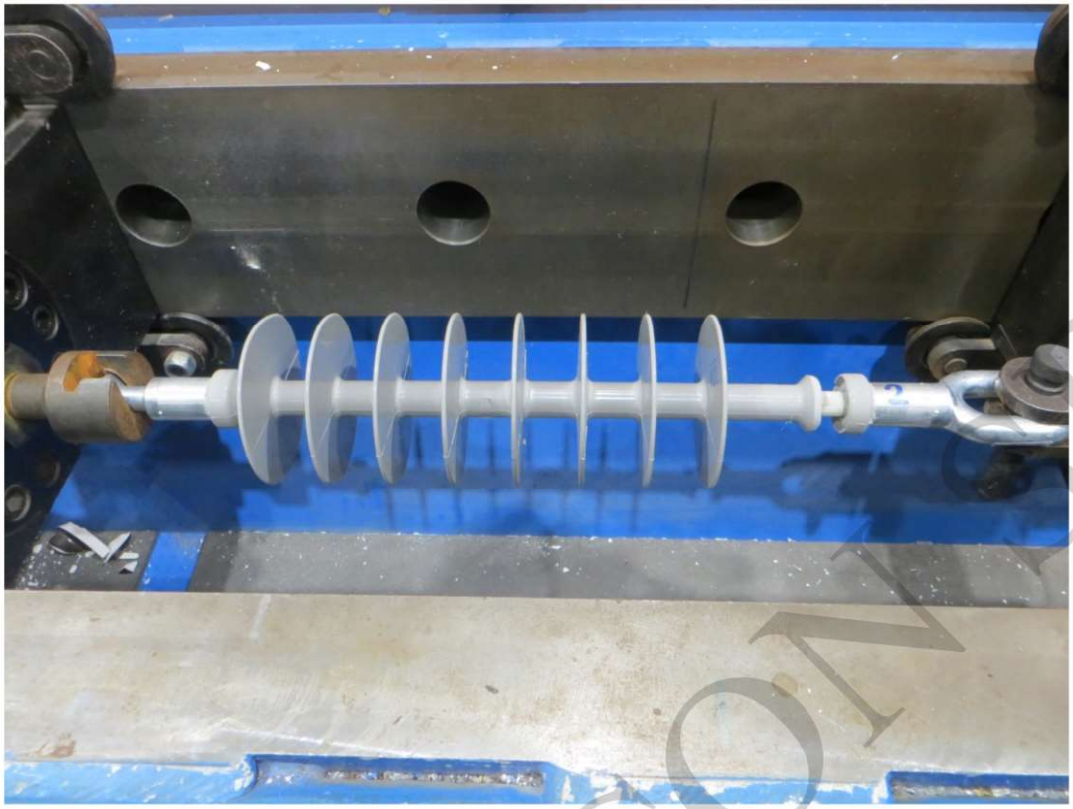


Figure 6
Composite suspension insulator 36 kV / 70 kN, model CS 70 EB 170/900-555, drawing No. GN190015 Rev. 5, after mechanical failing load test, test sample No. 2

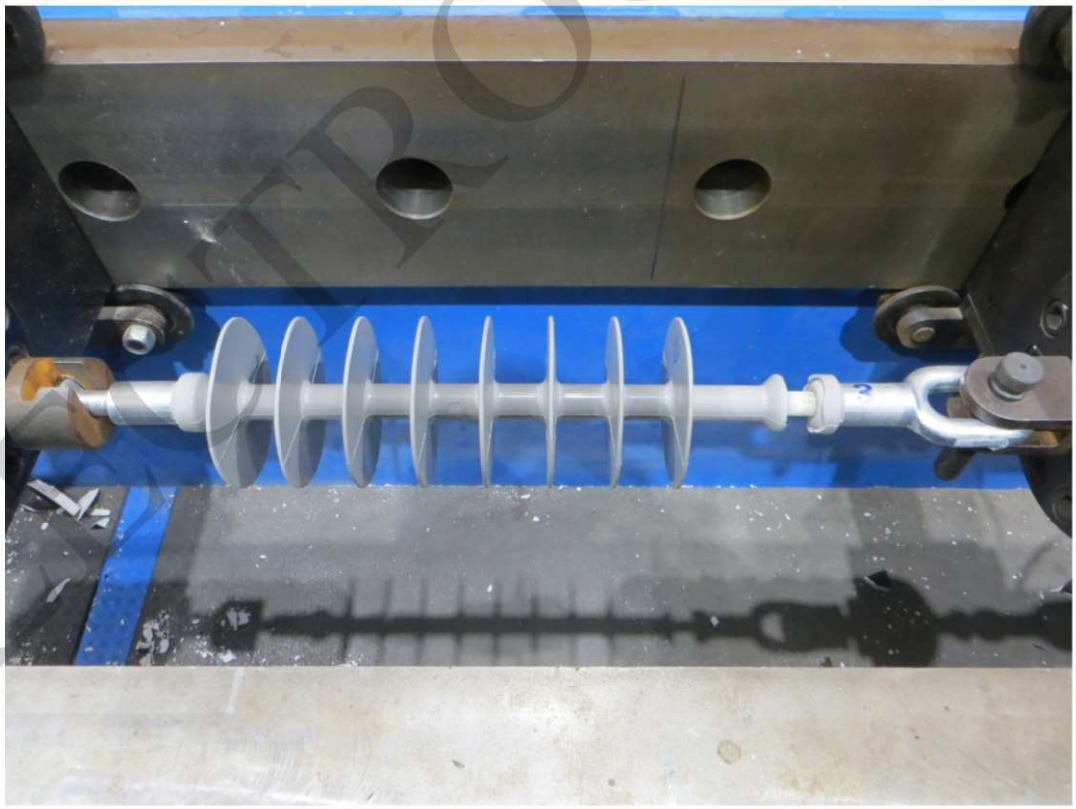


Figure 7
Composite suspension insulator 36 kV / 70 kN, model CS 70 EB 170/900-555, drawing No. GN190015 Rev. 5, after mechanical failing load test, test sample No. 3

Figure 8
Composite suspension insulator 36 kV / 70 kN, model CS 70 EB 170/900-555, drawing No. GN190015 Rev. 5, during verification of the 96 hours mechanical load test, test samples No. 4, 5 and 6

Figure 9
Composite suspension insulator 36 kV / 70 kN, model CS 70 EB 170/900-555, drawing No. GN190015 Rev. 5, vertical position, before and after the tracking and erosion test – 1000 h

Figure 10
Composite suspension insulator 36 kV / 70 kN, model CS 70 EB 170/900-555, drawing No. GN190015 Rev. 5, horizontal position, before the tracking and erosion test – 1000 h

Figure 11
Composite suspension insulator 36 kV / 70 kN, model CS 70 EB 170/900-555, drawing No. GN190015 Rev. 5, horizontal position, after the tracking and erosion test – 1000 h

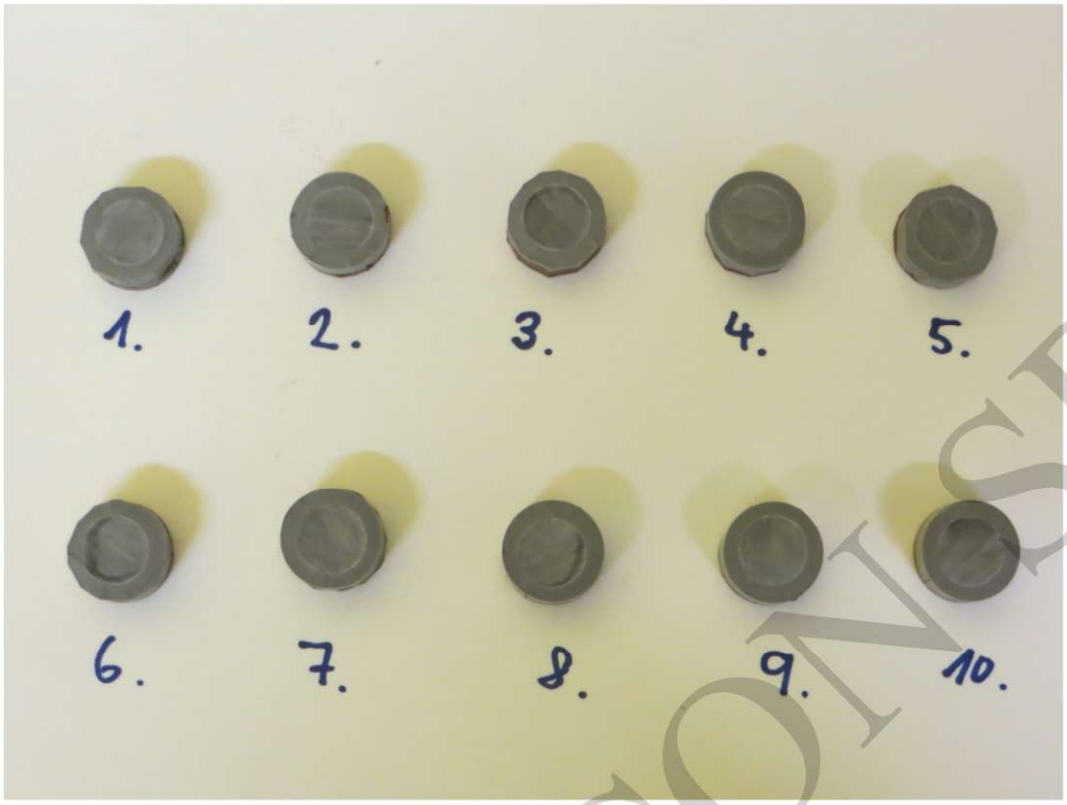


Figure 12
Composite suspension insulator 36 kV / 70 kN, model CS 70 EB 170/900-555, drawing No. GN190015 Rev. 5, after the dye penetration test

Figure 13
Composite suspension insulator 36 kV / 70 kN, model CS 70 EB 170/900-555, drawing No. GN190015 Rev. 5, electrical test (after water diffusion test)

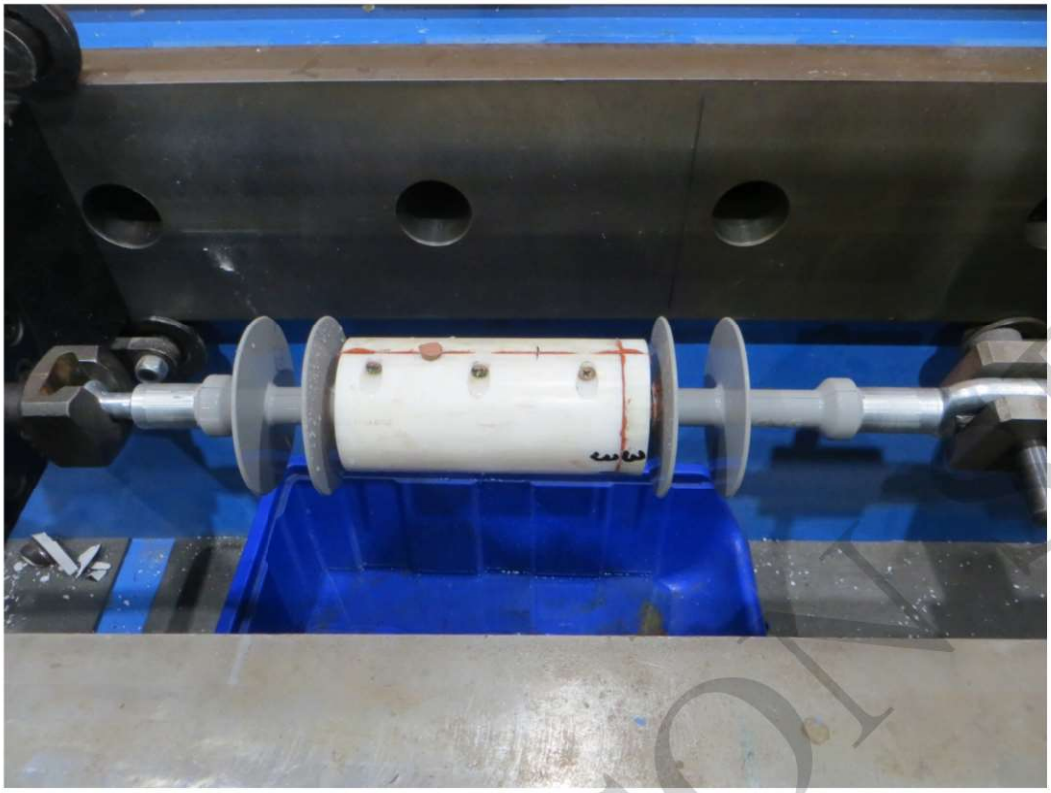


Figure 14
Composite suspension insulator 36 kV / 70 kN, model CS 70 EB 170/900-555, drawing No. GN190015 Rev. 5, test arrangement for the resistance to chemical attack

Figure 15
Composite suspension insulator 36 kV / 70 kN, model CS 70 EB 170/900-555, drawing No. GN190015 Rev. 5, after resistance to chemical attack

Figure 16
Silicone material, hardness test

- end of test report -

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

HIGH VOLTAGE TESTING LABORATORY

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

L 1029

TEST REPORT No.: 11494/A/20

CUSTOMER:	CYG Insulator Co., Ltd. Jinghui Road No.2, Niushan Foregin Economy Industrial Park Dongcheng District, Dongguan City 523128 P. R. China
TEST OBJECT:	Composite suspension insulator 22 kV / 70 kN
TYPE SPECIFICATION:	FXBW-22/70-438 (strain)
TEST STANDARDS:	IEC 60060-1 Ed.3:2010, IEC 61109 Ed.2.0:2008, IEC 60383-2 Ed.1:1993, IEC 60437 Ed.2:1997, CISPR TR 18-2 Ed.3.0:2017, IEC 61284 Ed.2:1997 STRI Guide 92/1[1)], IEC TS 62073 Ed.2.0:2016[1)]

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

TEST REPORT	No.: 11494/A/20
TEST OBJECT:	Composite suspension insulator 22 kV / 70 kN
TYPE SPECIFICATION:	FXBW-22/70-438 (strain)
DRAWING No.:	GN200049, Rev. 1
MANUFACTURER:	CYG Insulator Co., Ltd. Jinghui Road No.2, Niushan Foregin Economy Industrial Park Dongcheng District, Dongguan City 523128 P. R. China
DATE OF DELIVERY:	2020-11-05
DATE OF TESTS:	From 2020-11-05 till 2020-11-24
ORDER No.:	Contract 15/20 Rev.1
TESTS WITNESSED BY:	N/A

TABLE OF CONTENTS

1 TEST SUMMARY

Test title	Test standard	Test result
Radio interference voltage test	IEC 60437, clause 13 IEC 61284, clause 14	Passed
Corona voltage test	IEC 61284, clause 14	Passed
Dry lightning impulse withstand voltage test	IEC 61109, clause 11.1 IEC 60060-1, clause 7.3.1.4	Passed
Wet power frequency withstand voltage test	IEC 61109, clause 11.1 IEC 60060-1, clause 6.3.1	Passed
Damage limit proof test and test of the tightness of the interface between end fittings and insulator housing	IEC 61109, clause 11.2	Passed
Hydrophobicity test – spray method [1)]	STRI Guide 92/1 [1)] IEC TS 62073, clause 3.4 [1)]	Passed

Explanatory notes for tests and standards:

[1)] This standard or test is not subject of EGU-HV Laboratory accreditation.

2 LIST OF SYMBOLS

All measured voltages are corrected for the standard reference atmosphere according to IEC 60060-1, clauses 4.3 and 4.4.2.

All measured data including values of atmospheric conditions are given in the following tables where:

R.I.V.	radio interference voltage (dB/1μV)
$\mathbf{U_e}$	corona extinction voltage (kV), corresponding to the actual atmosphere
$\mathbf{U_{50LI}}$	50% dry lightning impulse flashover voltage (kV), corresponding to the standard reference atmosphere,
$\mathbf{U_{10LI}}$	10% dry lightning impulse flashover voltage (kV), corresponding to the standard reference atmosphere,
$\mathbf{U_F}$	wet power-frequency flashover voltage (kV), corresponding to the standard reference atmosphere,
$\mathbf{U_{MW}}$	maximum wet power-frequency withstand voltage (kV), corresponding to reference atmosphere.

3 TESTS PERFORMED

3.1 Radio interference voltage test

3.1.1 Test procedure

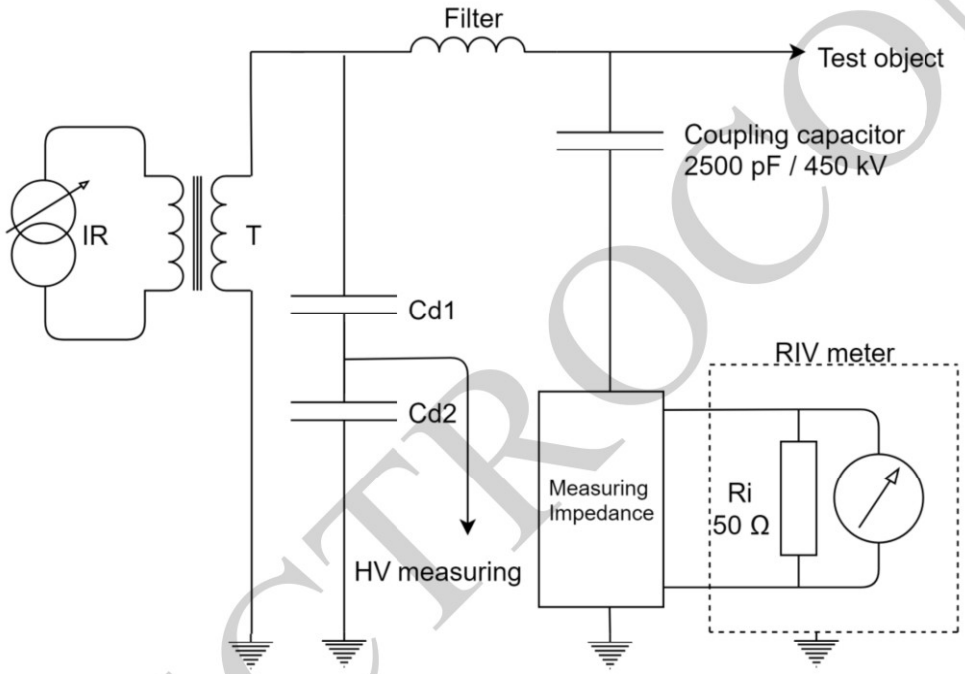
Date of test: 2020-11-24

The radio interference voltage (RIV) test was carried out according to IEC 60437, clause 13 and IEC 61284, clause 14.

RIV (expressed in decibels relative to 1 µV across 300 Ω) was measured at the frequency of 1,0 MHz. The test circuit was calibrated according to TR CISPR 18-2, clause 4.5.12. Measured correction factor was 12 dB/µV.

The test arrangement was set up according to IEC 60383-2, clause 12.3 (see Figure 2). The clamp with conductor was provided by EGU HV Laboratory a.s.

Testing and measuring equipment:



Filter – reactance coil (f = 1,0 MHz)
coupling capacitance, 2 500 pF, 450 kV, serial No. 3874
IR - inductive regulator ČKD Praha 6/ 0 - 3 kV, 50 kVA
T – test transformer Fischer Köln 250 kV, serial No. P38879
Cd1/Cd2 – capacitive divider LK-250, serial No. 001-12
universal voltmeter High Volt MU 17, serial No. 929218
RIV meter- measuring receiver Power Diagnostix, type RIV meter, serial No. 035
measuring impedance Power Diagnostix, type CIT4M/V8µ0/RIV, serial No.12533
RIV calibrator Power Diagnostix, type CAL3D, serial No. 2840
digital stop-watch Olympia, type Sport, PM-172
measuring system for atmospheric condition COMET, serial No. 19910190
binocular Nikon, type Action EX, serial No. 320695

3.1.2 Test results

Table 1 Test results of the RIV test

air pressure (kPa) air temperature (°C) relative humidity (%)	99,8 18,9 45,9					
	R.I.V.					
U (kV)	U - decreased		U - increased		U - decreased	
	(dB/1µV)	**(µV)**	**(dB/1µV)**	**(µV)**	**(dB/1µV)**	**(µV)**
100	38	79,4	38	79,4	38	79,4
50	19	9	19	9	19	9
24,6	17	7,1	17	7,1	17	7,1
22,6	17	7,1	17	7,1	17	7,1
20,6	17	7,1	17	7,1	17	7,1
18,6	17	7,1	17	7,1	17	7,1
16,6	17	7,1	17	7,1	17	7,1
14,6	17	7,1	17	7,1	17	7,1
13,3	**17**	**7,1**	**17**	**7,1**	**17**	**7,1**
12,6	17	7,1	17	7,1	17	7,1
0	17	7,1	17	7,1	17	7,1
Specified value: ≤ 250 µV at 13,3 kV at 1,0 MHz						

Conclusion:

The radio interference voltage (R.I.V.) measured at the test voltage of 13,3 kV was lower than the specified value of 250 µV.

Composite suspension insulator, type FXBW-22/70-438 (strain), drawing No. GN200049, Rev.1, passed the radio interference voltage test according to IEC 60437, clause 13 and IEC 61284, clause 14.

3.2 Corona voltage test

3.2.1 Test procedure

Date of test: 2020-11-24

The corona voltage test was carried out according to IEC 61284, clause 14.

After the test room was thoroughly darkened the voltage above corona point was applied and then gradually decreased until streamers disappeared from the test object to measure the positive corona extinction voltage. This procedure was three (3) times repeated. Binocular was used for observation of positive corona.

The test arrangement is shown in Figure 2.

The corona discharges are shown in Figure 3.

The test circuit and the list of testing and measuring devices are given in clause 3.1.1 of this test report. The clamp with conductor was provided by EGU HV Laboratory a.s.

3.2.2 Test results

Table 2 Test results of the corona test

air pressure (kPa) air temperature (°C) relative humidity (%)	99,8 18,9 45,9
Measurement No.	**U_e (kV)**
1 2 3	102 102 100
Average value	**101**
Location of corona	conductor *)
Specified value: positive corona extinction voltage ≥ 13,3 kV	

*) conductor were provided by EGU HV Laboratory a.s.

Conclusion:

Measured corona extinction voltage U_e was higher than the specified minimum corona extinction voltage of 13,3 kV.

Composite suspension insulator, type FXBW-22/70-438 (strain), drawing No. GN200049, Rev.1, passed the corona voltage test according to IEC 61284, clause 14.

3.3 Dry lightning impulse withstand voltage test

3.3.1 Test procedure

Date of test: 2020-11-13

The test was carried out according to IEC 61109, clause 11.1.

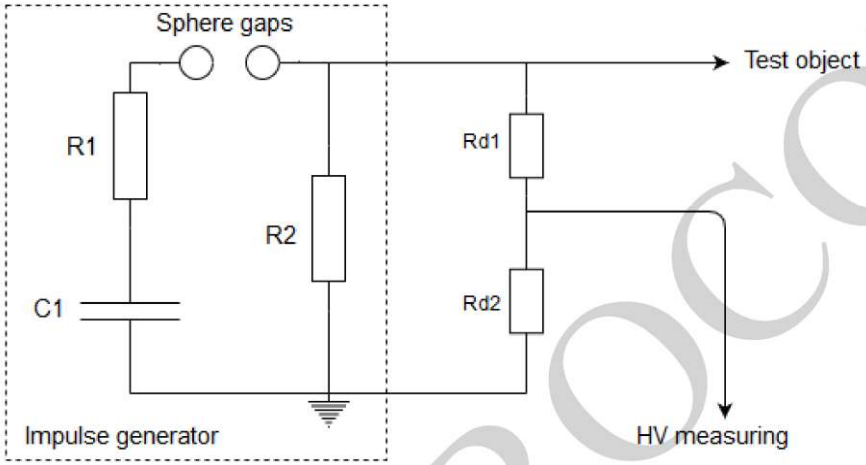
The 50% lightning impulse flashover voltages of both polarities were determined by the up and down method with 30 impulses according to IEC 60060-1, clause 7.3.1.4.

The 10% lightning impulse flashover voltages of both polarities were calculated from the 50% lightning impulse flashover voltages according to IEC 60060-1, clause 7.3.1.4.

The wave shape of lightning impulse voltage 1,2/50 µs is given on Graph 1.

The test arrangement was set up according to IEC 61109, clause 11.1.1 & IEC 60383-2, clause 12.3 (see Figure 4).

Testing and measuring equipment:



impulse generator TuR Dresden 750 kV, 30 kJ, serial No. 862512
Rd1/Rd2 resistance divider TuR Dresden, type SMR 10/770, serial No. 895742
measuring system Haefely, type HiAS 743, serial No. 175247
tape measure 5 m, CXS, PM-241
measuring system for atmospheric condition COMET, serial No. 19910190

3.3.2 Test results

Table 3 Test results of the dry lightning impulse voltage tests

Impulse polarity	+	−
Atm. conditions:		
air pressure (kPa)	99,2	99,2
air temperature (°C)	18,8	18,8
relative humidity (%)	49,4	49,4
Correction factors:		
air density correction factor k_1	0,983	0,983
humidity correction factor k_2	0,983	0,999
atmospheric correction factor K_t	0,966	0,983
Test voltage:		
U_{50LI} (kV)	230	310
U_{10LI} (kV)	**221**	**298**
Measured arcing distance: 330 mm		
Specified dry lightning impulse voltage: 125 kV		

Conclusion:

No damage of composite suspension insulator occurred during the dry lightning impulse voltage test.

The dry lightning impulse withstand voltages (U_{10LI}) of both polarities were higher than the specified dry lightning impulse withstand voltage positive and negative polarity 125 kV.

Composite suspension insulator, type FXBW-22/70-438 (strain), drawing No. GN200049, Rev.1, passed the dry lightning impulse voltage tests according to IEC 61109, clause 11.1 & IEC 60060-1, clause 7.3.1.4.

3.4 Wet power-frequency withstand voltage test

3.4.1 Test procedure

Date of test: 2020-11-13

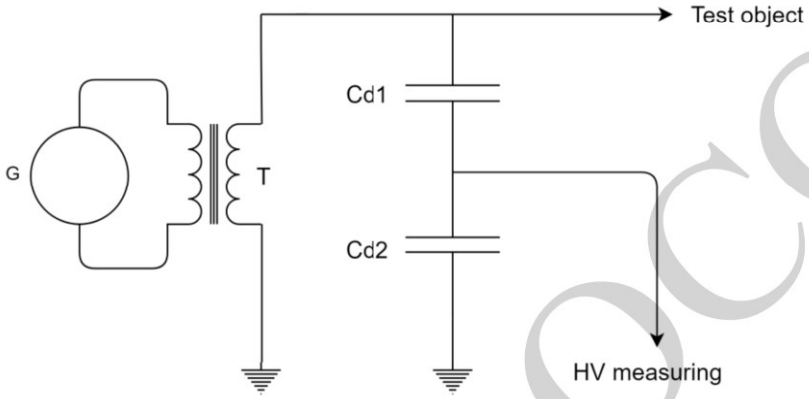
The wet power-frequency withstand voltage test was measured according to IEC 61109, clause 11.1.

The wet power-frequency flashover voltage was measured according to IEC 60060-1, clause 6.3.2. The flashover voltage was obtained by increasing the voltage continuously from zero up to flashover. The average of five flashovers was calculated.

The maximum wet power-frequency withstand test voltage was applied to the test object for 60 seconds. The test was carried out according to IEC 60060-1, clause 6.3.1.

The test arrangement was set up according to IEC 61109, clause 11.1.1 & IEC 60383-2, clause 12.3 (see Figure 5).

Testing and measuring equipment:



G – synchronous generator BEZ Bratislava 6 kV, 1 300 kVA, 50 Hz
T – test transformer Fischer Köln 250 kV, serial No. P38879
Cd1/Cd2 – capacitive divider LK-250, serial No. 001-12
universal voltmeter High Volt MU 17, serial No. 929218
measuring system for atmospheric conditions COMET, serial No. 19910190
tape measure 5 m, CXS, PM-241
digital stopwatch Olympia, PM-172
conductivity meter WTW cond 3310, serial No. 10410891
plastic measuring cylinder 50ml, i. No. 1/153/14 & 2/153/14

3.4.2 Test results

Table 4 Test results of the wet power-frequency withstand voltage tests

Atm. conditions:		
air pressure (kPa)	99,2	
air temperature (°C)	18,6	
relative humidity (%)	55,7	
Rain parameters:		
vertical (mm/min)	1,6	
horizontal (mm/min)	1,2	
Conductivity (µS/cm)	97	
Correction factors:	**U_{MW}**	**U_F**
air density correction factor k_1	0,988	0,984
humidity correction factor k_2	1,000	1,000
atmospheric correction factor K_t	0,988	0,984
Maximum withstand test voltage U_{MW}	**91 kV, 60 s – no flashover**	
Flashover voltage U_F	118 kV	
Measured arcing distance: 330 mm		
Specified wet power frequency withstand voltage: 50 kV		

Conclusion:

No damage of composite suspension insulator during the wet power-frequency withstand voltage test.

Measured maximum wet power-frequency withstand voltage (U_{MW}) was higher than the specified wet power-frequency withstand voltage of 50 kV. No flashover occurred on the insulator during the one minute withstand voltage test with the maximum measured wet power-frequency withstand voltage of 91 kV.

Composite suspension insulator, type FXBW-22/70-438 (strain), drawing No. GN200049, Rev.1, passed the wet power-frequency withstand voltage test according to IEC 61109, clause 11.1 & IEC 60060-1, clause 6.3.1.

3.5 Damage limit proof test and test of the tightness of the interface between end fittings and insulator housing

3.5.1 Test specimens

The test was performed on composite insulators samples No.: 1, 2, 3 and 4. 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, CXS, PM-241

Test results
Insulators were without damage and dimensions conform with the drawing.

3.5.2 Performance of the test

Date of test: from 2020-11-05 till 2020-11-09

Test was carried out according to IEC 61109, clause 11.2.2.

This test was performed on insulators No. 1, 2, 3 and 4 in three parts at the ambient temperature as described in the following three paragraphs.

a) All four specimens were subjected to a tensile load applied between couplings. The tensile load was increased rapidly but smoothly, from zero up to 49 kN (70 % of SML, SML = 70 kN) and then maintained at this value for 96 hours. Test samples during tensile load test are shown in Figure 6.
Record of measured 96 hours mechanical test on test samples No. 1, 2, 3 and 4 is given in Graph 2.

Testing and measuring equipment:
Creep test 6.500.C3, LaborTech, serial No. ZA/2018/51

Date of test: 2020-11-09

b) Both ends of insulator No. 4 were subjected to the dye penetration test for 20 minutes. After the penetration test the specimens were inspected. Test sample after the dye penetration test is shown in Figure 10.

Testing and measuring equipment:
digital stop-watch Olympia PM-172

c) Three composite silicone insulators No. 1, 2, 3 were then again subjected to tensile load applied between couplings. The tensile load was increased rapidly but smoothly from zero to approximately 53 kN (75 % of SML) and then gradually increased in a time between 30 s to 90 s to 70 kN (100 % of SML). Load was sustained for the reminder of the 60 s. After finishing the test according to paragraph c) the tensile load on composite silicone insulator samples No. 1, 2 and 3 were increased up to failing load. Records of mechanical test are in Graphs 3, 4 and 5. Test samples after the mechanical test are shown in Figures 7, 8 and 9.

Testing and measuring equipment:
hydraulic loading machine LabTest 5.600SP1, serial No. 15/12

3.5.3 Test results

Table 5

Test sample No.	One minute withstand test	Composite insulator failing load (kN)	Type of failure
1	70 kN/60 s	102,5	Socket
2	70 kN/60 s	108,9	Pull out of the core from the end fitting
3	70 kN/60 s	113,8	Pull out of the core from the end fitting

Conclusion:

No failure (breakage or complete pull-out of the core or fracture of the metal fittings) occurred during 96 h test on insulators No. 1, 2, 3 and 4.

No failure occurred during 1 min withstand test on insulators No. 1, 2, 3.

No cracks were observed after dye penetration test on insulator No. 4.

Composite suspension insulator, type FXBW-22/70-438 (strain), drawing No. GN200049, Rev.1, passed the damage limit proof test and test of the tightness of the interface between end fittings and insulator housing according to IEC 61109, clause 11.2.

3.6 Hydrophobicity test – spray method [1)]

Test date: 2020-11-24

The test was performed according to IEC 62073, clause 3.4 [1)] and STRI Guide 92/1 [1)].

The test was performed on the three composite suspension insulator model FXBW-22/70-438 (strain).

The surface of the insulator was sprayed from the distance of 30 cm for 30 s.

The insulators No. 1, 2 and 3 after wetting are shown in Figures 11, 12 and 13.

Testing and measuring equipment:

digital stop-watch Olympia PM-172
tape measure 5 m, CXS, PM-241

Test results

The hydrophobicity class (HC) 1 was determined on the insulator to according to IEC 62073 [1)] and STRI Guide 92/1 [1)].

Conclusion:

Composite suspension insulator, type FXBW-22/70-438 (strain), drawing No. GN200049, Rev.1, passed the hydrophobicity test – spray method according to IEC 62073, clause 6 [1)] and STRI Guide 92/1 [1)].

4 UNCERTAINTY OF MEASUREMENTS

QUANTITY	UNCERTAINTY (k=2)	
Lightning impulse voltage	U_m T_1 T_2	1,7 % 5,8 % 4,2 %
Radio interference voltage	1,0 dB	
Power-frequency voltage	1,5 %	
Atmospheric pressure	0,5 %	
Air temperature	4,0 %	
Relative humidity	6,3 %	
Time	0,7 %	
Conductivity (0,1 µS/cm – 1000 mS/cm)	5,0 %	
Length (tape measure 5,0 m)	1,6 %	
Slide gauge 150 mm	0,4 %	
Mechanical load	1,0 %	
Rainfall intensity measuring cylinder 5-50 ml	10,0 %	

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

5 PRODUCT DRAWING

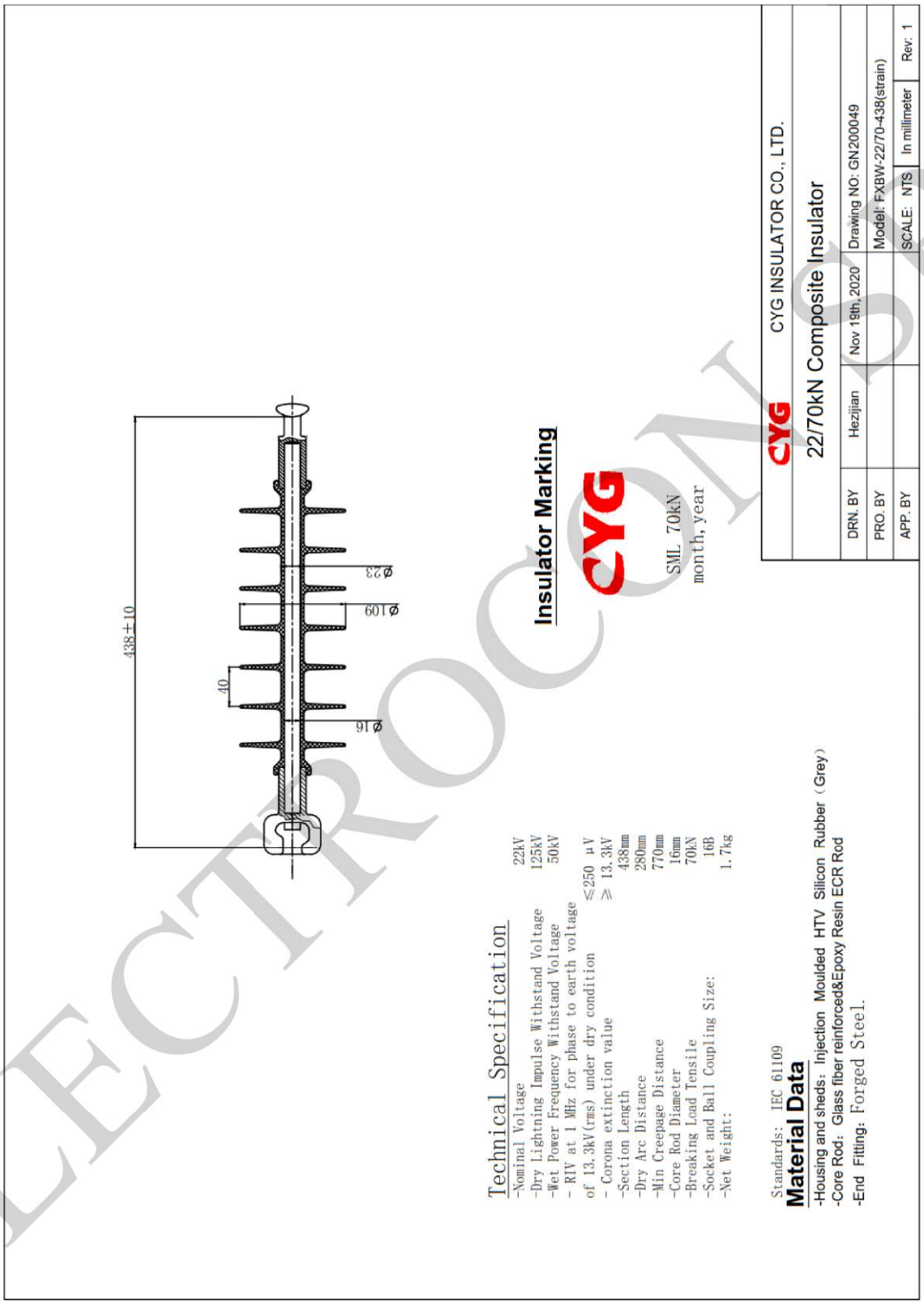
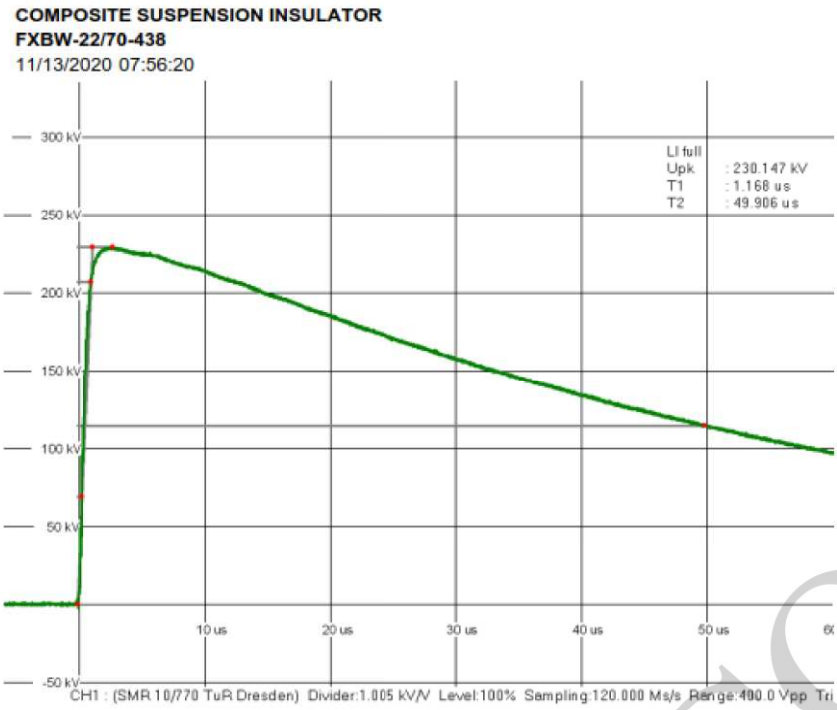


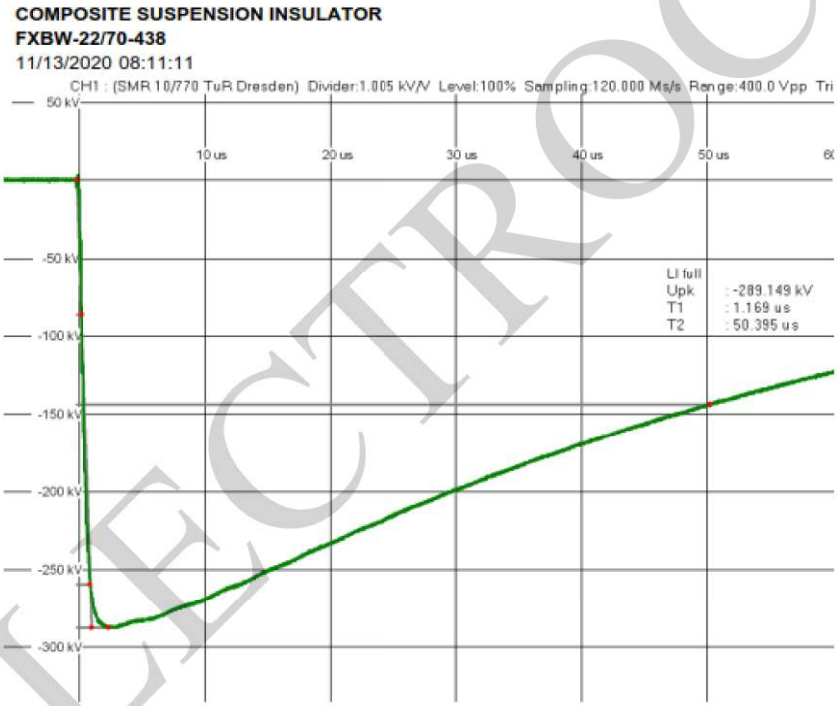
Figure 1

Composite suspension insulator, type FXBW-22/70-438 (strain), drawing No. GN200049, Rev.1

6 GRAPHS AND RECORDS

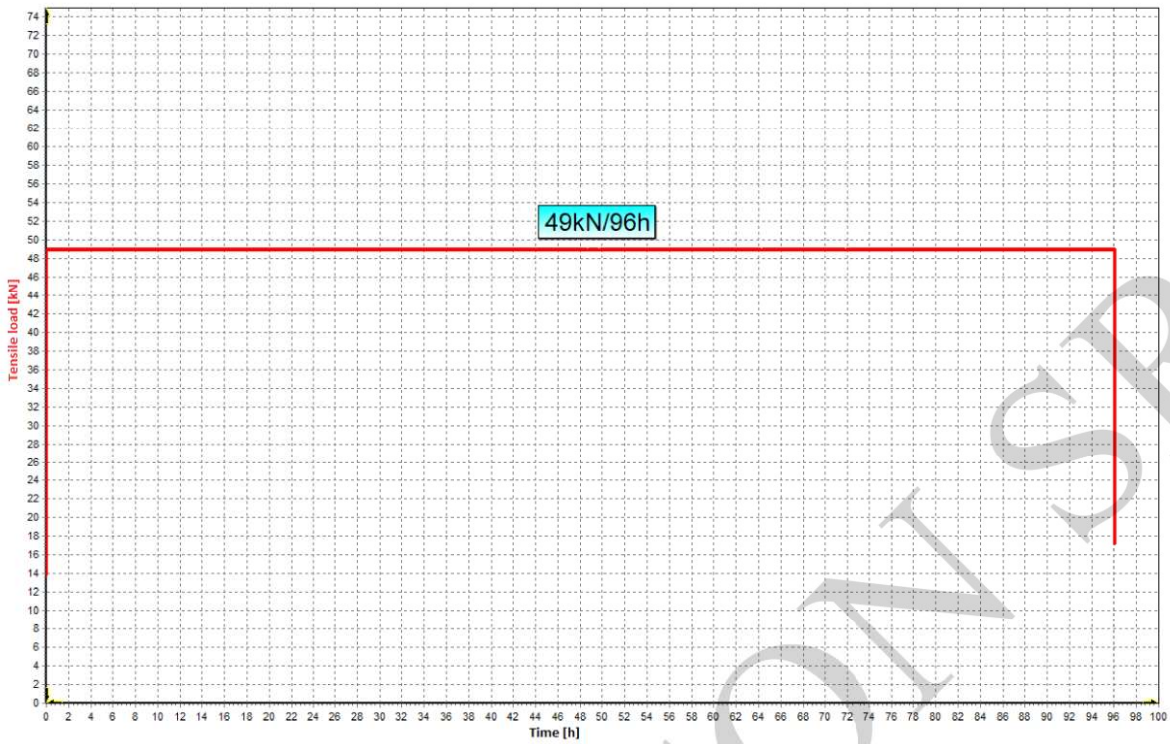


LI full
Upk : 230.147 kV
T1 : 1.168 us
T2 : 49.906 us

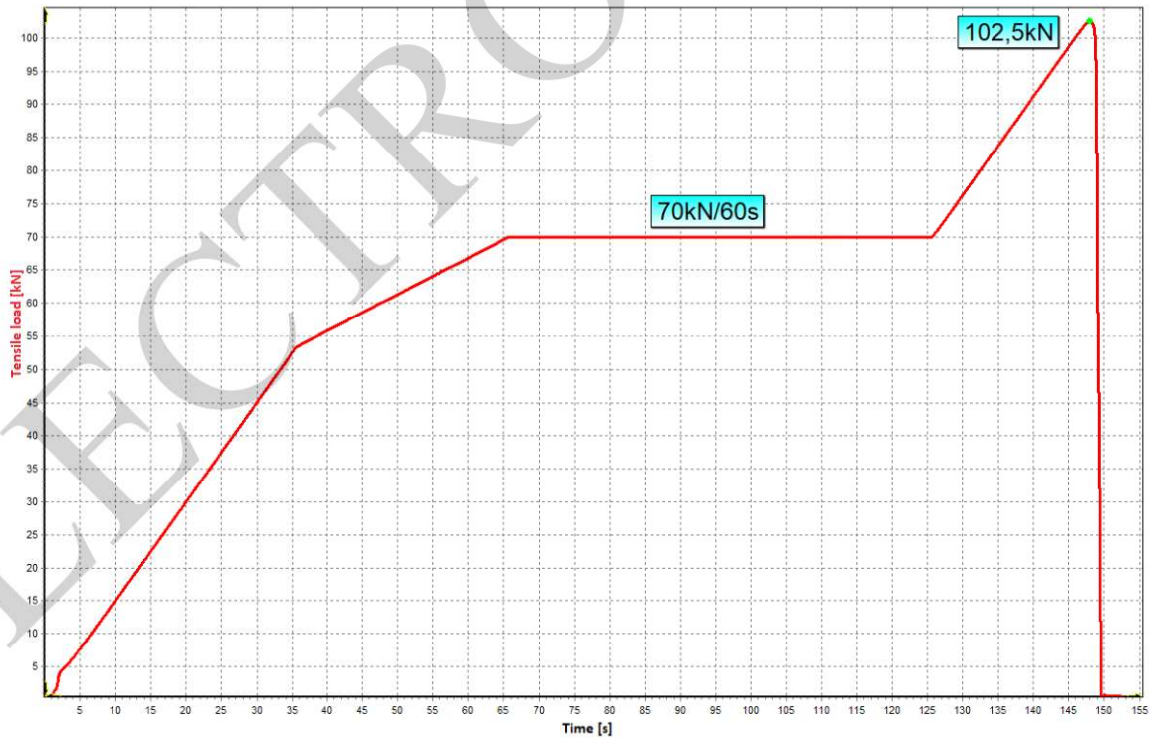


LI full
Upk : -289.149 kV
T1 : 1.169 us
T2 : 50.395 us

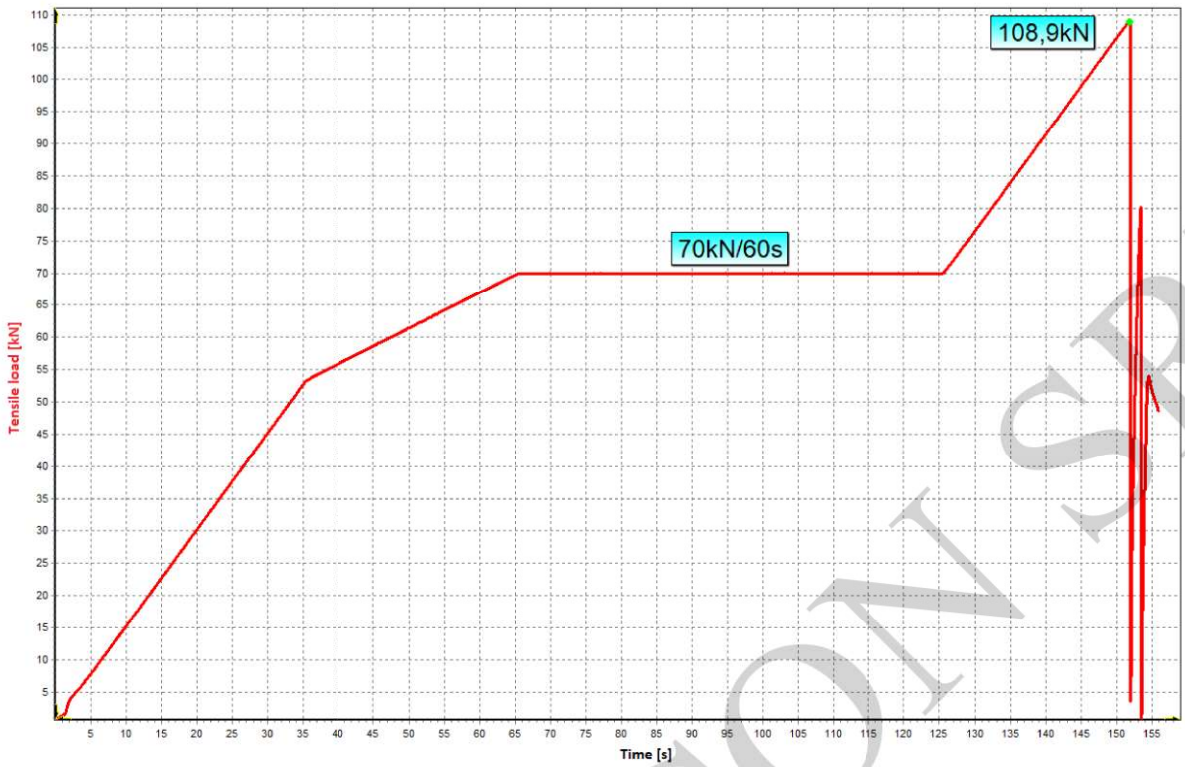
Graph 1
The wave shape of lighting impulse voltage 1,2/50 µs



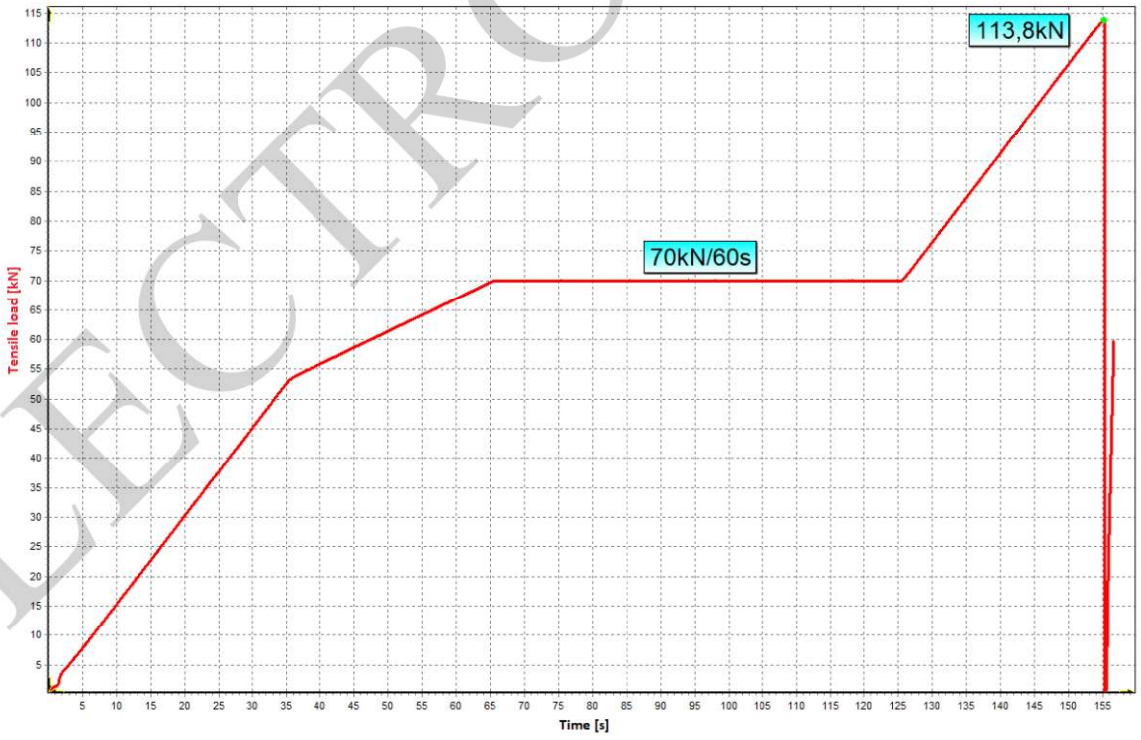
Graph 2
Composite suspension insulator, type FXBW-22/70-438 (strain), drawing No. GN200049, Rev.1, record of 96 hours mechanical loading test, samples No. 1, 2, 3 and 4



Graph 3
Composite suspension insulator, type FXBW-22/70-438 (strain), drawing No. GN200049, Rev.1, record of mechanical loading test, sample No. 1



Graph 4
Composite suspension insulator, type FXBW-22/70-438 (strain), drawing No. GN200049, Rev.1, record of mechanical loading test, sample No. 2



Graph 5
Composite suspension insulator, type FXBW-22/70-438 (strain), drawing No. GN200049, Rev.1, record of mechanical loading test, sample No. 3

7 TEST OBJECT AND TEST SETUP PHOTOS

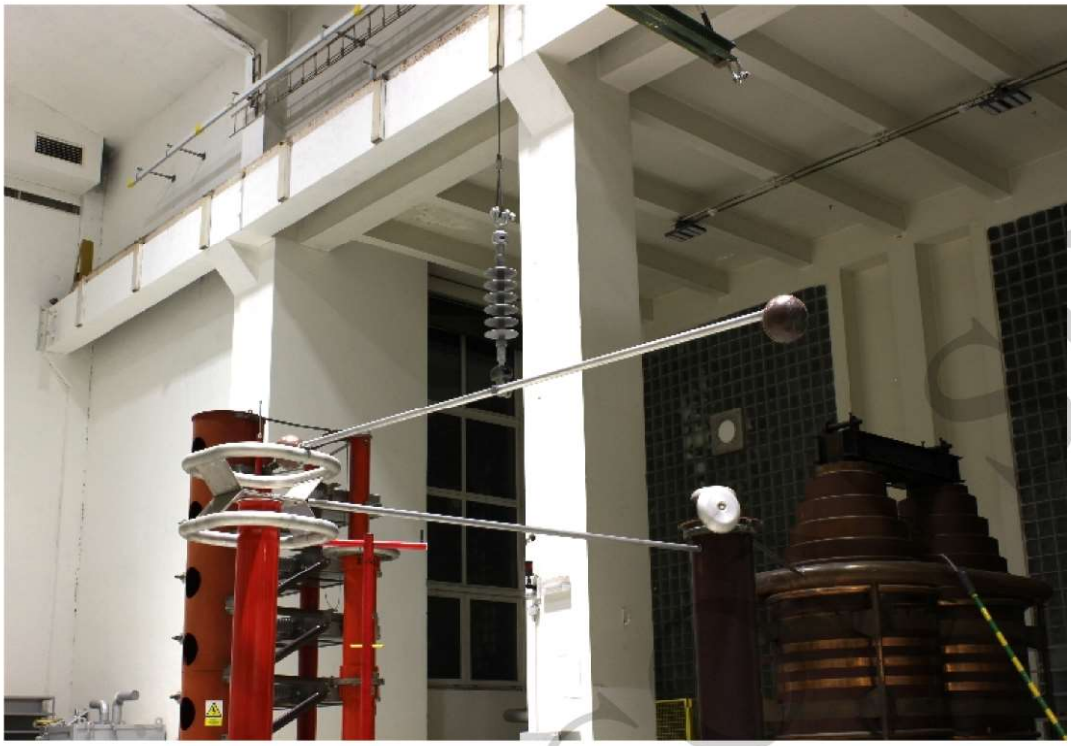


Figure 2
Composite suspension insulator, type FXBW-22/70-438 (strain), drawing No. GN200049, Rev.1, test arrangement for RIV and corona test

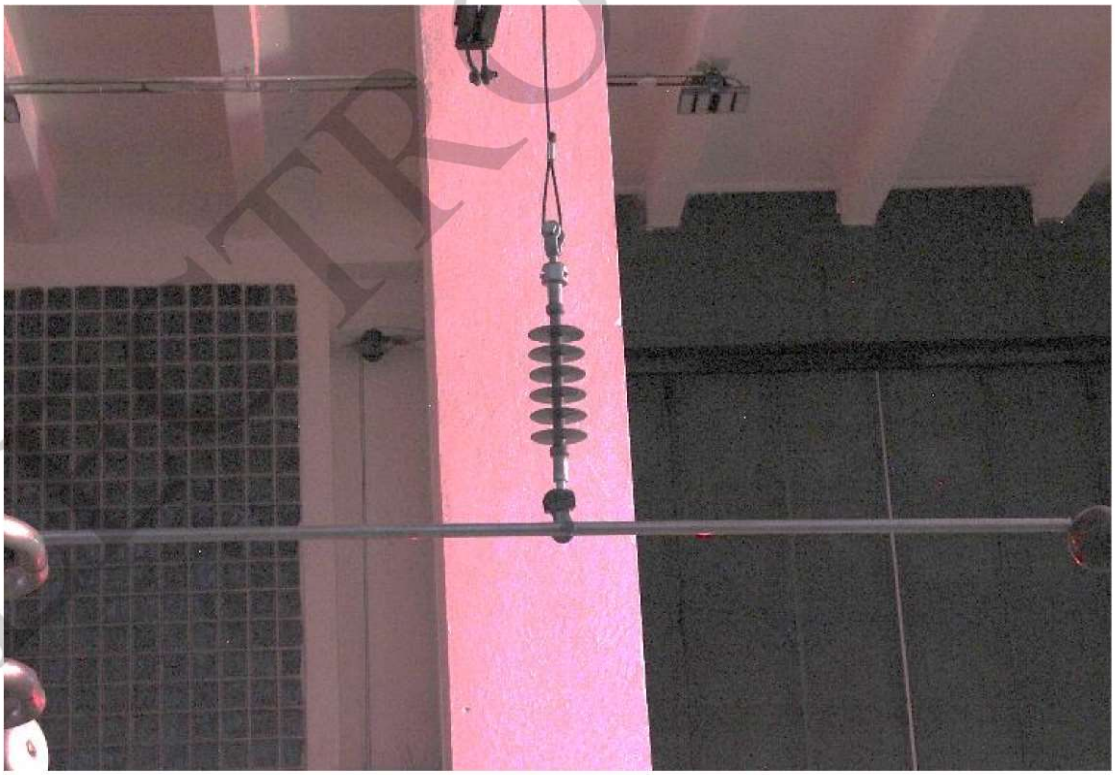


Figure 3
Composite suspension insulator, type FXBW-22/70-438 (strain), drawing No. GN200049, Rev.1, visible corona at test voltage 100 kV

Figure 4
Composite suspension insulator, type FXBW-22/70-438 (strain), drawing No. GN200049, Rev.1, during the dry lightning impulse voltage test

Figure 5
Composite suspension insulator, type FXBW-22/70-438 (strain), drawing No. GN200049, Rev.1, during the wet power frequency withstand voltage test

Figure 6
Composite suspension insulator, type FXBW-22/70-438 (strain), drawing No. GN200049, Rev.1, during verification of the 96 hours mechanical load test, test samples No. 1, 2, 3 and 4

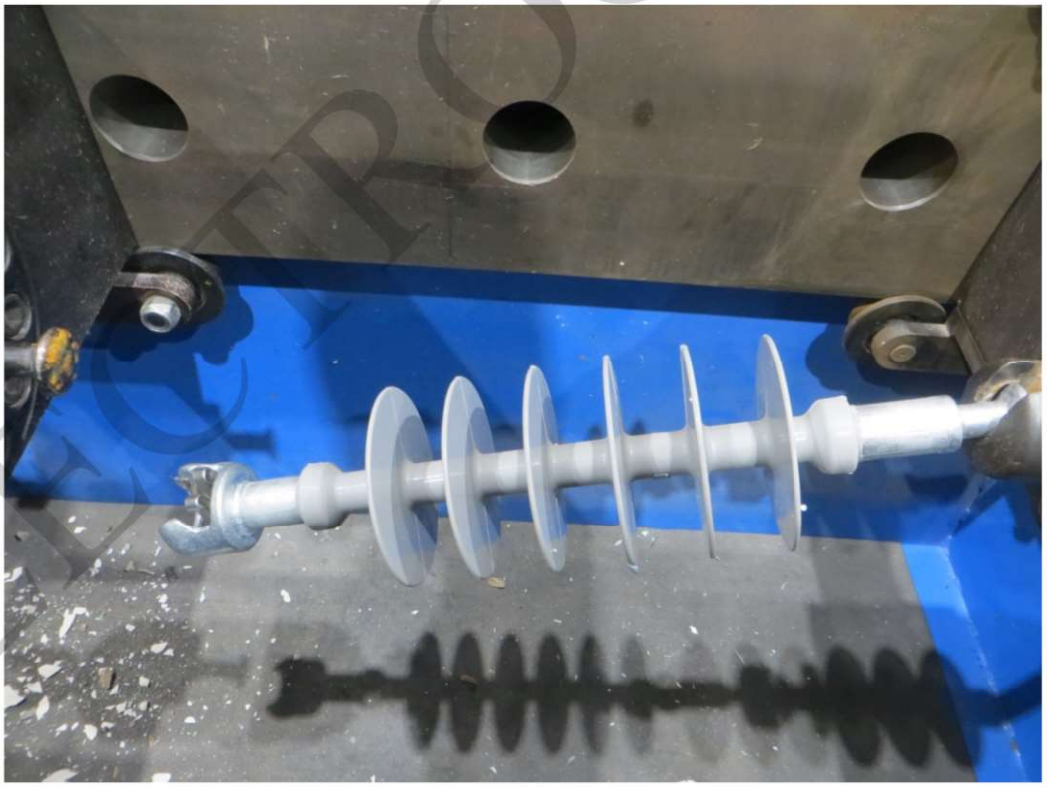


Figure 7
Composite suspension insulator, type FXBW-22/70-438 (strain), drawing No. GN200049, Rev.1, test sample No. 1 after mechanical failing load test

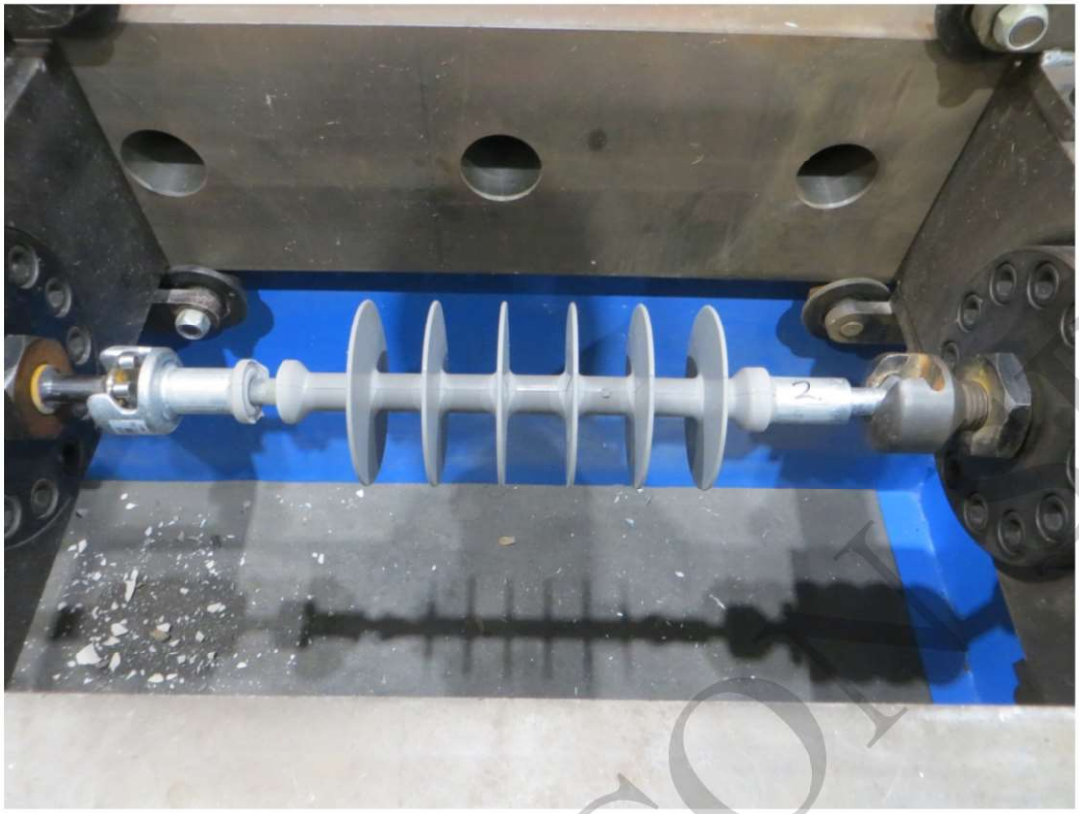


Figure 8
Composite suspension insulator, type FXBW-22/70-438 (strain), drawing No. GN200049, Rev.1, test sample No. 2 after mechanical failing load test

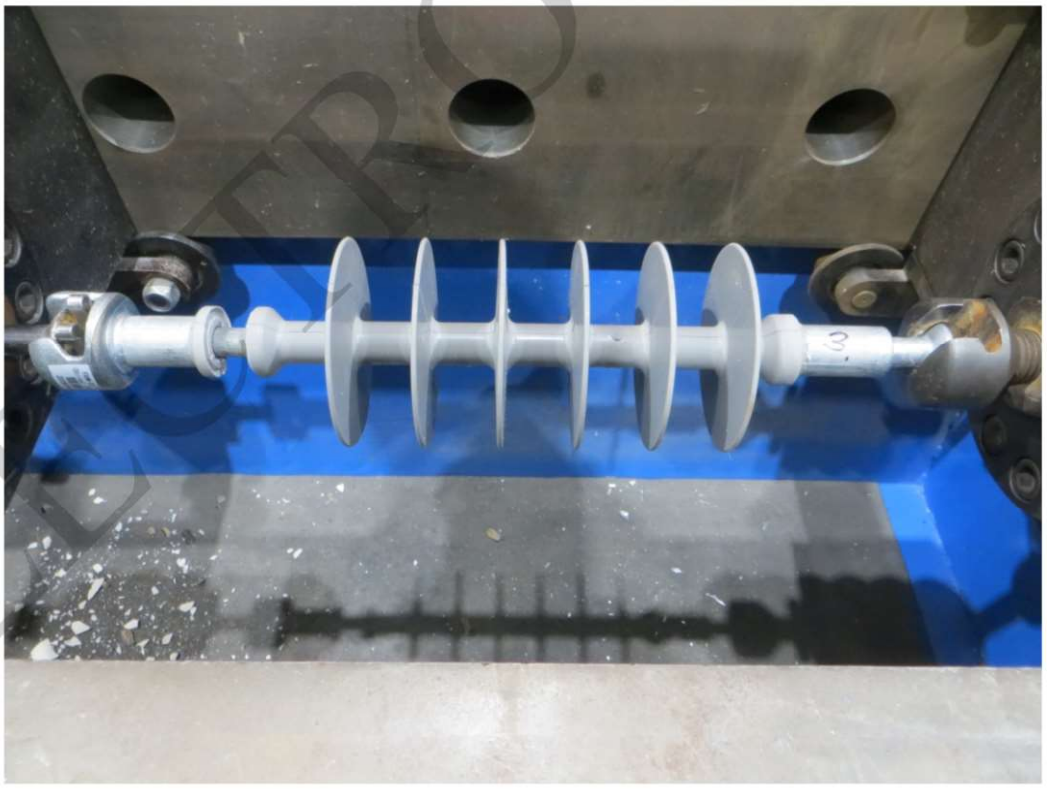


Figure 9
Composite suspension insulator, type FXBW-22/70-438 (strain), drawing No. GN200049, Rev.1, test sample No. 3 after mechanical failing load test

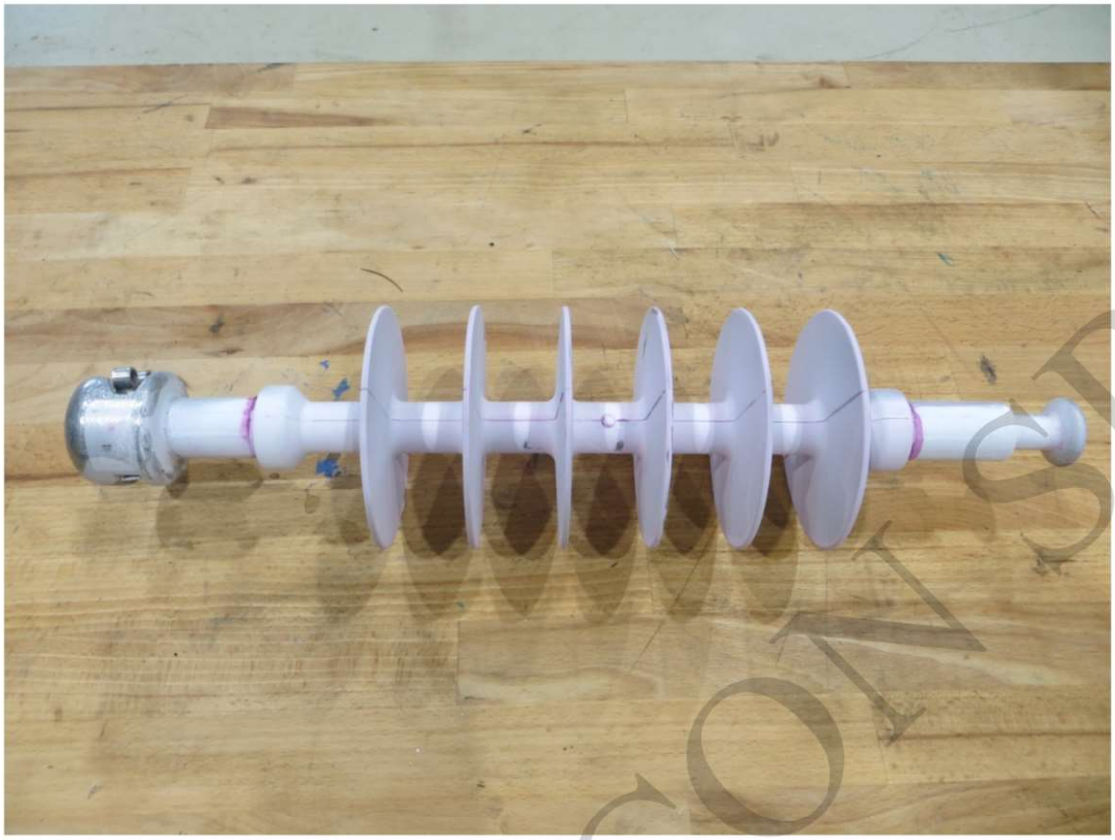


Figure 10
Composite suspension insulator, type FXBW-22/70-438 (strain), drawing No. GN200049, Rev.1, test sample No. 4 after dye penetration test

Figure 11
Composite suspension insulator, type FXBW-22/70-438 (strain), drawing No. GN200049, Rev.1, test sample No. 1 after hydrophobicity test

Figure 12
Composite suspension insulator, type FXBW-22/70-438 (strain), drawing No. GN200049, Rev.1, test sample No. 2 after hydrophobicity test

Figure 13
Composite suspension insulator, type FXBW-22/70-438 (strain), drawing No. GN200049, Rev.1, test sample No. 3 after hydrophobicity test

- end of test report -

中国科学院广州化学研究所分析测试中心
Analyzing and Testing Center of Guangzhou Institute of Chemistry, Chinese Academy of Sciences
广州中科检测技术服务有限公司
Guangzhou CAS Test Technical Services Co., Ltd.

TEST REPORT

正本

Applicant : CYG INSULATOR Co.,Ltd
Address : /

The following merchandise was (were) submitted and identified by the client as:

Name of Sample :	FXBW-765/210-2975
Test Type :	Commission
Analysis No. :	A170223-11
Sample Quantity :	1
Batch No. /Brand/Model :	/
Buyer :	/
Supplier :	/
Sample Received :	2017/02/23
Test Period :	2017/02/23– 2017/03/02
Test Request :	FTIR Analysis
Test Method :	Please refer to next page(s).
Test Result :	Please refer to next page(s).
Test Part Description :	Rubber

Edited by: 谢静仇 **Approved by:**

Checked by: 赖朵杰 **Official Seal:** 检验检测专用章

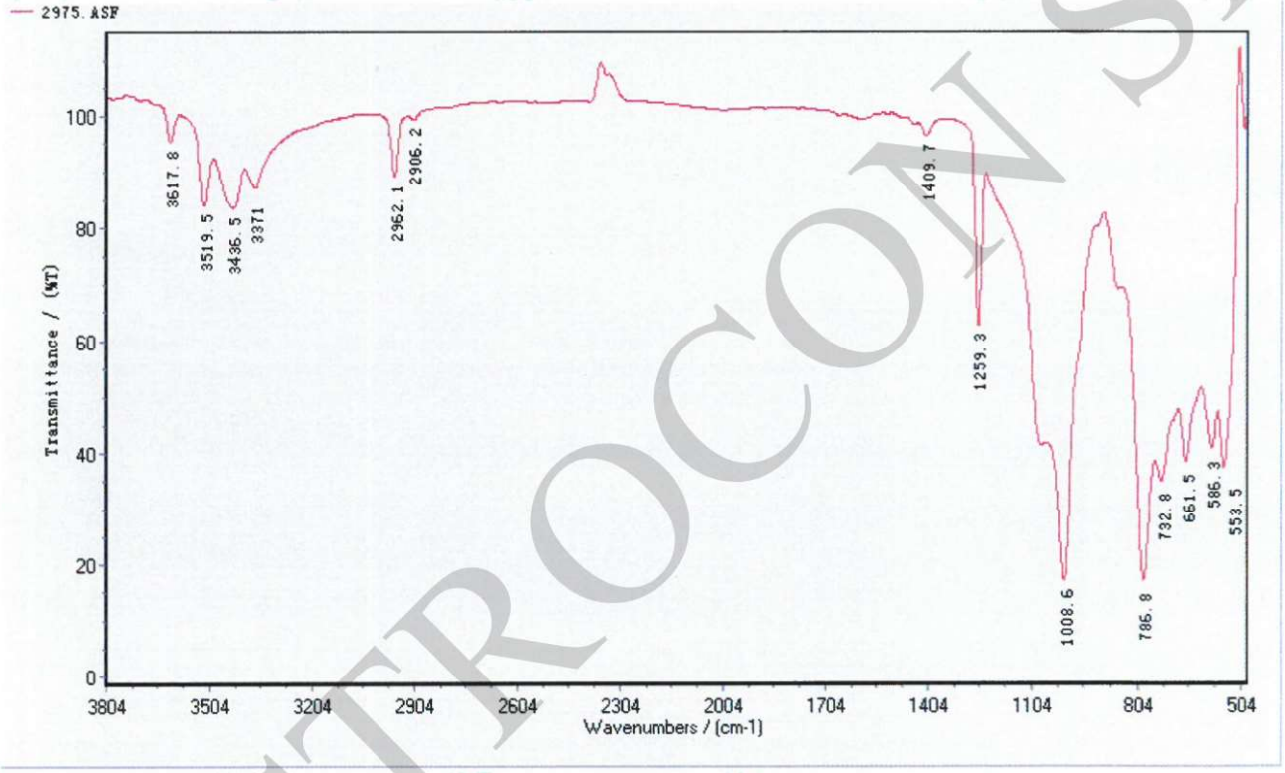
地址：广州市天河区兴科路 368 号 邮编：510650
Add: No. 368 Xingke Road, Tianhe District, Guangzhou, P. R .China. ZIP Code: 510650
电话(Tel)：020-85231290，020-85231823 网址(Website)：http://www.cas-test.org
传真(Fax)：020-85231035 邮箱(E-mail)：atc@gic.ac.cn

中国科学院广州化学研究所分析测试中心
Analyzing and Testing Center of Guangzhou Institute of Chemistry, Chinese Academy of Sciences
广州中科检测技术服务有限公司
Guangzhou CAS Test Technical Services Co., Ltd.

TEST REPORT

TEST RESULTS:

Sample Name	Results
FXBW-765/210-2975	Silicone rubber



SAMPLE PHOTO

******** END OF REPORT ********

Statement

1. All samples and goods are accepted by The Guangzhou CAS Test Technical Services Co., Ltd (the "Company") solely for testing and reporting in accordance with the following terms and conditions. The company provides its services on basis that such terms and conditions constitute express agreement between the company and any person, firm or company requesting its services (the "Client").
2. Test report is invalid if not affixed with authorized stamp of test and paging seal.
3. Test report is invalid without signature of verifier and approver.
4. Test report is invalid if being supplemented, deleted or altered.
5. Without prior written permission of the Company, the test report can not be reproduced in part (except in whole).
6. The result(s) shown in this test report refer only to the sample(s) tested, and do not apply to the same batch, the same size or the same brand of products (except the test sample) or to proving the related methods of making, processing or production of the test samples, the correctness and rationality of processes or process.
7. Objections to the test report must be submitted to the Company within 15 days. Otherwise, it will automatically deem to have accepted this test report.
8. If the sample(s) is(are) submitted by Client for detection, sample source information is provided by the customer and the Company is not responsible for its authenticity.
9. As any report is issued as a result of this application for testing services, the Company will strictly keep confidentiality to the clients. Without the consent of the Clients, the Company will not enter into any discussion or correspondence with any third party concerning the contents of the report, unless required by the relevant government authorities, laws or court orders.
10. The result(s) or conclusion shown in this test report about the description of the characteristics, composition, properties or quality are based on the specific time, specific methods and specific applicable criteria . Using different methods and criteria or under different environmental conditions for testing, it may come to different conclusions.
11. This report is not regarded as any judicial decision.
12. Since the Company's causes lead to modify the contents of the test report, the Company shall reissue the test report and bear the modification cost. The Client shall return the original test report.
    Since the Client's causes lead to modify the contents of the test report, the Client need to submit an application form for report change to the Company. The Client shall bear the modification cost and return the original test report if the Company approves to reissue the test report.
13. The English version of this statement is translated from Chinese one. So with any disagreement between them, the Chinese version shall prevail.

Autoritarea Contractantă: *SA "RED-Nord"* Moldova, 3100, m. Bălţi, str. Ştefan cel Mare, 180 „A”
Numărul procedurii de achiziţie: **ID 21559742 din 2 febr 2026, 44100000-1**
Denumirea licitaţiei: **Achizitia Izolatoare 10/0,4 kV**

SRL„ ELECTROCON ”
MD-2052, mun.Chişinău,
str.Maria Dragan, 19,
IDNO - cod fiscal 1003600025379
tel.: (373 22) 47-03-13
fax: (373 22) 47-04-74
E-mail:elconsm@yandex.ru
www.electrocon.md

„ЭЛЕКТРОКОН”ООО
MD-2052, г. Кишинев,
ул. Мария Драган, 19,
IDNO - cod fiscal 1003600025379
тел.: (373 22) 47-03-13
факс: (373 22) 47-04-74
E-mail:elconsm@yandex.ru
www.electrocon.md

Pentru licitația **Izolatoare 10, 0.4 kV**, ID 21559742 din 2 febr 2026, 44100000-1 vă aducem la cunoștință că **Mostra (ANALOGICĂ)** produsului ofertat **Izolatoare de susținere din polimer** la momentul actual se află la depozitul SA "RED-Nord" Moldova, 3100, m. Bălţi, str. Ştefan cel Mare, 180 „A”.

Data: 18 februarie 2026
SRL „ELECTROCON”

_____ *(semnatura şi ştampila)*