MOLDELECTRICA	SPECIFICAŢIA TEHNICĂ DESCĂRCĂTOARE CU REZISTENŢA VARIABILĂ PE BAZA DE OXIZI METALICI	Digitally signed by Nguyen Huu thuy Date: 2026.07.13 15:16:00 EEST Reason: MoldSign Signature Location: Moldova MOLDOVA EUROPEANĂ

FIŞA TEHNICĂ DESCARCATOARE CU OXIZI METALICI 35 kV				
Nr crt.	Caracteristica	U.M	Date tehnice solicitate	Date tehnice garantate (oferta furnizorului)
PRODUCĂTOR - NANYANG JINNIU ELECTRIC CO., LTD				
TIP - YH10W-51				
ŢARA DE ORIGINE - South of Zhongyuan road Tongbai Nanyang city, Henan province of China 474750				
CANTITATEA SPRE ACHIZIŢIE		un	6	6
1	CONDIŢII IMPUSE DE SISTEMUL ENERGETIC			
1.1	Tensiunea nominală a sistemului	kV	35	35
1.2	Tensiunea cea mai ridicată a rețelei	kV	40,5	40,5
1.3	Frecvența nominală	Hz	50	50
1.4	Modul de conectare a neutrului rețelei		izolat	Insulated
1.5	Durata defectelor cu pământul	ore	minimum 2	minimum 2
1.6	Curentul de scurtcircuit a rețelei la locul de montaj	kA	20	20
1.7	Valoarea şi durata maxima a supratensiunilor temporare 0,82-0,8 din tensiunea maximă intre faze timp	s	1-10	1-10
2	CONDIŢII CLIMATERICE ŞI DE MEDIU			
2.1	Temperatura mediului ambiant	ºC	–40 / +40	–40 / +40
2.2	Radiația solară maxima	kW/m²	1,1	1,1
2.3	Locul de montaj		exterior	exterior
2.4	Altitudine	m	≤1000	≤1000
2.5	Umiditatea relativă a aerului	%	100	100

2.6	Grosimea stratului de gheață	mm	24	24
2.7	Clasa seismică conform MSK 64		8	8
3	CARACTERISTICI ELECTRICE			
3.1	Tensiunea nominală (Ur)	kV	≥ 50	51
3.2	Tensiunea de funcționare continuă (Uc)	kV	≥ 40	40,5
3.3	Stabilitatea la supratensiuni temporare			
	la 1 secundă	kV	≥ 1,31 Uc	≥ 1,31 Uc
	la 10 secunde	kV	≥ 1,25 Uc	≥ 1,25 Uc
3.4	Curentul nominal de descărcare (unda 8/20uș)	kA	≥10	≥10
3.5	Curentul de mare amplitudine (unda 4/10 uș)	kA	≥100	≥100
3.6	Clasa de descărcare		DH	SM*
3.7	Curent rectangular, unda 2000μs	Amax	≥700	≥700
3.8	Clasa limitatorului de presiune	kA	≥20	≥20
3.9	Tensiunea reziduală la impuls de trăsnet 8/20uș la 10 kA	kV	≤136	≤136
3.10	Tensiunea reziduală la impuls de comutație 30/60 uș la 500A	kV	≤108	≤108
3.11	Nivelul descărcărilor parțiale la 1,05 Un	pC	≤10	≤10
4	CONDIȚII CONSTRUCTIVE SOLICITATE			
4.1	Tipul constructiv		cu ZnO fără eclatoare	With ZnO without spark plugs
4.2	Protecţia anticorozivă părţilor metalice		Da	Yes
4.3	Carcasă cu izolaţie din cauciuc siliconic		Da	Yes
4.4	Linia de fugă specifică	cm/kV	≥2,25	≥2,25
4.5	Momentul minim de rupere continuu	Nm	≥250	≥250
4.6	Momentul minim de rupere temporar	Nm	≥250	≥250
4.7	Tipul racordului		flexibil	Flexible

4.8	Cleme de racordare la circuit incluse		Da	Yes
4.9	Fixarea pe suport		legat la pământ	Grounded
5	ÎNCERCĂRI			
5.1	Încercări de tip conform IEC 60099 şi capitolul 5 al ST		Da	Yes
5.2	Încercări individuale conform IEC 60099 şi capitolul 5 al ST		Da	Yes
5.3	Încercări de tip şi individuale vor fi efectuate în laboratoare certificate conform ISO/IEC 17025		Da	Yes
6	CONDIŢII DE ASIGURARE A CALITĂŢII ŞI PROTECŢIA MEDIULUI			
6.1	Condiţii de asigurare conform ISO 9001		Da	Yes
7	CONDIŢII DE FIABILITATE			
7.1	Durata minimă de viaţa garantată	ani	30	30
7.2	Disponibilitatea minimă	%	99,95	99,95

* – parametrul curentului rectangular, unda 2000 µs, este de 400A pentru clasa DH, din aceste considerente s-a oferit clasa SM care corespunde parametrilor tehnici necesari în concurs.

MOLDELECTRICA	SPECIFICAŢIA TEHNICĂ DESCĂRCĂTOARE CU REZISTENŢA VARIABILĂ PE BAZA DE OXIZI METALICI	

FIŞA TEHNICĂ DESCARCATOARE CU OXIZI METALICI 10 kV				
Nr crt.	Caracteristica	U.M	Date tehnice solicitate	Date tehnice garantate (oferta furnizor)
PRODUCĂTOR - NANYANG JINNIU ELECTRIC CO., LTD				
TIP - YH10W-15				
ŢARA DE ORIGINE - South of Zhongyuan road Tongbai Nanyang city, Henan province of China 474750				
CANTITATEA SPRE ACHIZIŢIE		un	108	108
1	CONDIŢII IMPUSE DE SISTEMUL ENERGETIC			
1.1	Tensiunea nominală a sistemului	kV	10	10
1.2	Tensiunea cea mai ridicată a reţelei	kV	12	12
1.3	Frecvenţa nominală	Hz	50	50
1.4	Modul de conectare a neutrului reţelei		izolat	insulated
1.5	Durata defectelor cu pământul	ore	minimum 2	minimum 2
1.6	Curentul de scurtcircuit a reţelei la locul de montaj	kA	20	20
1.7	Valoarea şi durata maxima a supratensiunilor temporare 0,82-0,8 din tensiunea maximă intre faze timp	s	1 - 10	1 - 10
2	CONDIŢII CLIMATERICE ŞI DE MEDIU			
2.1	Temperatura mediului ambiant	ºC	–40 / +40	–40 / +40
2.2	Radiaţia solară maxima	kW/m²	1,1	1,1
2.3	Locul de montaj		exterior	exterior
2.4	Altitudine	m	≤1000	≤1000
2.5	Umiditatea relativă a aerului	%	100	100
2.6	Grosimea stratului de gheaţă	mm	24	24
2.7	Clasa seismică conform MSK 64		8	8
3	CARACTERISTICI ELECTRICE			
3.1	Tensiunea nominală (Ur)	kV	≥ 15	15
3.2	Tensiunea de funcţionare continuă (Uc)	kV	≥ 12	12
3.3	Stabilitatea la supratensiuni temporare			
	la 1 secundă	kV	≥ 1,31 Uc	≥1,31 Uc
	la 10 secunde	kV	≥ 1,25 Uc	≥1,25 Uc
3.4	Curentul de mare amplitudine (unda 8/10 us)	kA	≥10	≥10
3.5	Curentul nominal de descărcare (unda 4/20us)	kA	≥100	≥100
3.6	Clasa de descărcare		DH	SM*
3.7	Curent rectangular, unda 2000 µs	Amax	≥700	≥700

FIŞA TEHNICĂ DESCARCATOARE CU OXIZI METALICI 10 kV				
Nr crt.	Caracteristica	U.M	Date tehnice solicitate	Date tehnice garantate (oferta furnizor)
3.8	Clasa limitatorului de presiune	kA	≥20	≥20
3.9	Tensiunea reziduală la impuls de trăsnet 8/20uș la 10 kA	kV	≤ 40	≤ 40
3.10	Tensiunea reziduală la impuls de comutaţie 30/60 uș la 500A	kV	≤32	≤32
3.11	Nivelul descărcărilor parţiale la 1,05 Un	pC	≤10	≤10
4	CONDIŢII CONSTRUCTIVE SOLICITATE			
4.1	Tipul constructiv		cu ZnO fără eclatoare	With ZnO without spark plugs
4.2	Protecţia anticorozivă părţilor metalice		Da	Yes
4.3	Carcasă cu izolaţie din cauciuc siliconic		Da	Yes
4.4	Linia de fugă specifică	cm/kV	≥2,25	≥2,25
4.5	Momentul minim de rupere continuu	Nm	≥250	≥250
4.6	Momentul minim de rupere temporar	Nm	≥250	≥250
4.7	Tipul racordului		flexibil	flexible
4.8	Cleme de racordare la circuit incluse		Da	Yes
4.9	Fixarea pe suport		legat la pământ	Grounded
5	ÎNCERCĂRI			
5.1	Încercări de tip conform IEC 60099 şi capitolul 5 al ST		Da	Yes
5.2	Încercări individuale conform IEC 60099 şi capitolul 5 al ST		Da	Yes
5.3	Încercări de tip şi individuale vor fi efectuate în laboratoare certificate conform ISO/IEC 17025		Da	Yes
6	CONDIŢII DE ASIGURARE A CALITĂŢII ŞI PROTECŢIA MEDIULUI			
6.1	Condiţii de asigurare a calităţii conform ISO 9001		Da	Yes
7	CONDIŢII DE FIABILITATE			
7.1	Durata minimă de viaţa garantată	ani	30	30
7.2	Disponibilitate minimă	%	99,95	99,95

* – parametrul curentului rectangular, unda 2000 μs, este de 400A pentru clasa DH, din aceste considerente s-a oferit clasa SM care corespunde parametrilor tehnici necesari în concurs.
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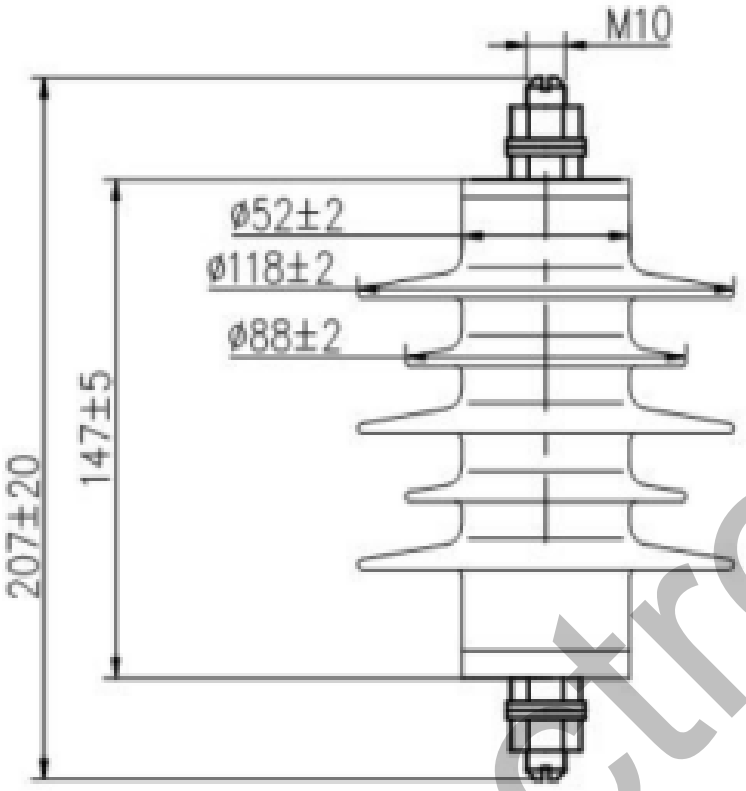
Installation diagram - example of instruction

金牛电气
JINNIU ELECTRIC

YH10W-9

Metal Oxide Surge Arrester



This product is qualified according to the IEC60099-4 Standard delivery inspection.

Inspector: 006

Date: 2025.09

Product Qualified Certificate

Surge arrester

The zinc oxide surge arrester intended for the protection of distribution networks against overvoltage caused by atmospheric discharges due to lightning, and particularly suitable for areas with high pollution.

Reference standards:

Testing item (According to IEC60099-4 Standard)		Required value
A.C. reference voltage at rated frequency 50/60Hz (kV)		≥9
D.C1mA reference voltage (kV)		≥12.7
Leakage current at 0.75 time of D.C.U 1mA (μA)		≤50
Internal partial discharge test （pC）		≤10
Residual voltage at nominal discharge current (kV)		≤27
Continuous operating current at 7.2kV continuous operating voltage (μA)	Ixrms	≤600
	I_{rp}	≤150
4/10μs high current impulse withstand (kA)		100
2ms long duration current impulse withstand 2ms (A)		400
Seal leak rate test		Conformity
Appearance		Intact

Technology:

Zinc oxide surge arrester without spark gap.

•The active part is a stack of non-linear zinc oxide resistors (varistors), developed and manufactured in our factories. Varistors have the ability to instantly switch from an insulating state to a conductive state in the event of an over voltage,

•The composite structure in fiberglass impregnated with epoxy resin ensures the mechanical strength of the stack,

•The outer silicone elastomer shell provides dielectric strength.

Operation conditions:

1. Ambient temperature:-40℃~+60℃
2. Altitude above sea level not over 3000m;
3. Rated frequency for A.C. system : 50/60Hz;
4. The long duration power-frequency voltage of the arrester is not over its continuous operating voltage;
5.The maximum wind velocity not over 45m/s;
6. It is not suitable for dirty areas above IV grade.

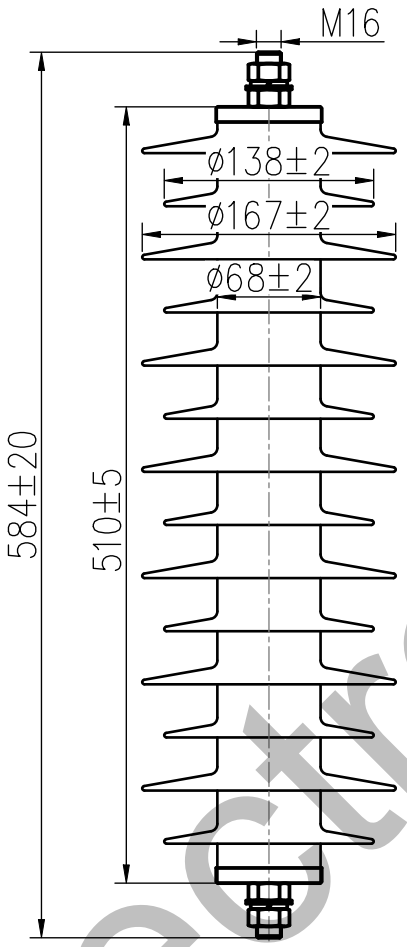
Installation:

1. It can be installed vertically or hung up in electrified wire netting. When it is vertically installed, you should fix the arrester on the bracket by grounding bolt, and ground the arrester by grounding wire reliably.

2. Do not make use of the arrester as a sustaining insulator, and connect the high-voltage terminal to electrified wire netting by soft wire.

3. Install the arrester closely possibly to the equipment, so that reduce the effect resulted by distance.

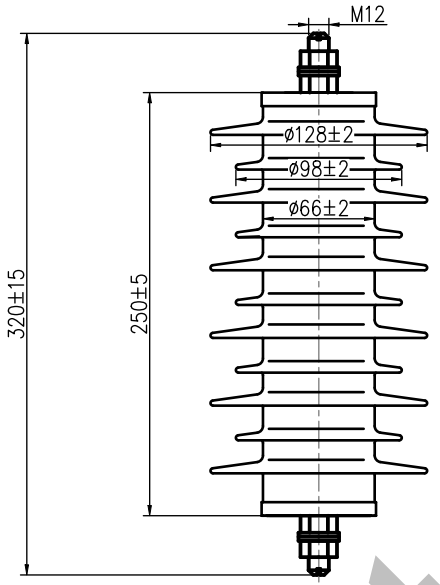
4. Inspect the d.c. reference voltage U1mA and leakage current value under 0.75 times of d.c. reference voltage annually, and the value should meet the stipulation of this product.



Technical specification

1.Continuous operating voltage Uc 40.5 kV
2. Rated voltage Ur 51 kV
3.Residual voltage Ures ≤136 kV
4.Creepage distance 1400mm
5.Nominal discharge current In 10 kA
6. High impulse current 100 kA
7. SM CLASS

备注Remark：			金属氧化物避雷器 Metal Oxide Lightning Arrester YH10W-51	南阳金牛电气有限公司 NANYANG JINNIU ELECTRIC CO.,LTD
	签名Signature	日期Date		单位unit：mm
设计Design	Xiang Xin	13·07·2026	外形图Outline Drawing	1
审核Check	Zhang Yu	13·07·2026		
批准Approve	Jade	13·07·2026		



Technical specification

1.Continuous operating voltage Uc 12kV

2. Rated voltage Ur 15kV

3.Residual voltage Ures(10kA) ≤40 kV

4.Creepage distance 700mm

5.Nominal discharge current In 10 kA

6.High impulse current 100 kA

7.SM class

备注Remark: D52			金属氧化物避雷器 Metal Oxide Lightning Arrester YH10W-15	南阳金牛电气有限公司 NANYANG JINNIU ELECTRIC CO.,LTD
	签名Signature	日期Date		单位unit：mm
设计Design	Xiang Xin	13·07·2026	外形图Outline Drawing	1
审核Check	Zhang Yu	13·07·2026		
批准Approve	Jade	13·07·2026		

ASTA TYPE TEST CERTIFICATE OF COMPLETE TYPE TESTS

Project No: SHA877544 **Certificate No:** ASTA-TYPE-0002761

Applicant: Nanyang Jinniu Electric Co., Ltd
South section of Zhongyuan Road, Tongbai county, Nanyang city, Henan, China

Apparatus: Nominal discharge current (I_n) 10 kA, rated short-circuit current (I_s) 50 kA, YH10W series metal-oxide polymer-housed single-column surge arresters without gaps and disconnector for a.c. system and outdoor use, station medium (SM) class with rated voltage (U_r) from 60 kV to 240 kV.

Manufactured By: Nanyang Jinniu Electric Co., Ltd
South section of Zhongyuan Road, Tongbai county, Nanyang city, Henan, China

Test Report No: CEPRI-EETC02-2023-0185 & 230364B

Designation: YH10W-60, YH10W-66, YH10W-72, YH10W-78, YH10W-84, YH10W-90, YH10W-96, YH10W-102, YH10W-108, YH10W-114, YH10W-120, YH10W-132, YH10W-138, YH10W-144, YH10W-156, YH10W-168, YH10W-180, YH10W-192, YH10W-204, YH10W-216, YH10W-228, YH10W-240

The apparatus which is representative of the designation, supplied drawings and photographs has been evaluated in accordance with:

IEC 60099-4:2014 Clauses 10.8.2, 10.8.3, 10.8.4, 10.8.5, 10.8.6, 10.8.7, 10.8.8, 10.8.10, 10.8.11, 10.8.14, 10.8.15, 10.8.17, Annex B
and the STL Guide to IEC 60099-4 Issue 3.0 25th June 2019, where applicable.

The results are shown in the record of tests attached hereto. The values obtained and the general performance is considered to comply with the above Standard(s) and to justify the ratings assigned by the manufacturer as stated on the ratings page(s) of this Certificate. This Certificate applies only to the apparatus tested. Responsibility for conformity of any apparatus having the same or other designations rests with the Manufacturer.

UKAS PRODUCT CERTIFICATION
0010

Yonghui Q — Certification Engineer

Certification Officer

15 May 2024 — Date

Conditions of use:

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Project No: SHA877544 **Certificate No:** ASTA-TYPE-0002761

Verification of

Nominal discharge current (I_n) 10 kA, rated short-circuit current (I_s) 50 kA, YH10W series metal-oxide polymer-housed single-column surge arresters without gaps and disconnector for a.c. system and outdoor use, station medium (SM) class with rated voltage (U_r) from 60 kV to 240 kV.

RATINGS AND CHARACTERITICS ASSIGNED BY THE MANUFACTURER AND PROVED BY TESTS:

Arrester classification	: SM, Station Medium
Design type	: B
Rated frequency, f_r	: 50 Hz
Nominal discharge current, I_n	: 10 kA
Rated short-circuit current, I_s	: 50 kA, 0.2 s
Reduced short-circuit current	: 25 kA, 0.2 s
Reduced short-circuit current	: 12 kA, 0.2 s
Low short-circuit current	: 600±200 A, 1 s
Repetitive charge transfer rating, Q_{rs}	: 2.0 C
Thermal energy rating, W_{th}	: 8 kJ/kV
Specified long-term load, SLL	: 1.4 kN.m
Specified short-term load, SSL	: 3.5 kN.m
Specified torsional load	: 50 N.m

Respectively Type	YH10W-60	YH10W-66	YH10W-72	YH10W-78	YH10W-84
Rated voltage U_r (kV r.m.s.)	60	66	72	78	84
Continuous operating voltage U_c (kV r.m.s.)	48.0	52.8	58.0	62.4	67.2
Rated short-duration power-frequency voltage U_d (kV r.m.s.) (wet)	140		170		
Rated lightning impulse voltage U_p (kV peak)	325		395		
Dry arcing distance (mm)	700		769		
Reference voltage at reference current 1 mA (kV r.m.s.)	60~63	66~69	72~75	78~81	84~87
Max residual voltage for steep current impulse STIPL (kV peak) at I_n	175.0	193.0	213.0	227.0	245.0
Max residual voltage for lighting current impulse LIPL (kV peak) at 0.5, 1, 2 times of I_n	150.0	165.0	180.0	195.0	210.0
	156.0	172.0	187.0	203.0	221.0
	175.0	192.0	210.0	228.0	248.0
Max residual voltage for switching current impulse SIPL (kV peak) at 1.0 kA	133.0	147.0	159.0	173.0	188.0
Quantity of MOR	17	19	21	22	24

Project No: SHA877544 **Certificate No:** ASTA-TYPE-0002761

RATINGS AND CHARACTERITICS ASSIGNED BY THE MANUFACTURER AND PROVED BY TESTS:

Respectively Type	YH10W-90	YH10W-96	YH10W-102	YH10W-108
Rated voltage U_r (kV r.m.s.)	90	96	102	108
Continuous operating voltage U_c (kV r.m.s.)	72.5	75.0	79.6	84.0
Rated short-duration power-frequency voltage U_d (kV r.m.s.) (wet)	288			
Rated lightning impulse voltage U_p (kV peak)	550			
Dry arcing distance (mm)	1190			
Reference voltage at reference current 1 mA (kV r.m.s.)	90~93	96~99	102~105	108~111
Max residual voltage for steep current impulse STIPL (kV peak) at I_n	266.0	280.0	297.0	315.0
Max residual voltage for lighting current impulse LIPL (kV peak) at 0.5, 1, 2 times of I_n	225.0	240.0	255.0	270.0
	235.0	250.0	266.0	281.0
	262.0	280.0	296.0	315.0
Max residual voltage for switching current impulse SIPL (kV peak) at 1.0 kA	201.0	213.0	226.0	239.0
Quantity of MOR	26	27	29	31

Respectively Type	YH10W-114	YH10W-120	YH10W-132	YH10W-138
Rated voltage U_r (kV r.m.s.)	114	120	132	138
Continuous operating voltage U_c (kV r.m.s.)	91.2	96.0	105.6	110.4
Rated short-duration power-frequency voltage U_d (kV r.m.s.) (wet)	305			
Rated lightning impulse voltage U_p (kV peak)	560			
Dry arcing distance (mm)	1260			
Reference voltage at reference current 1 mA (kV r.m.s.)	114~117	120~123	132~136	138~141
Max residual voltage for steep current impulse STIPL (kV peak) at I_n	335.0	355.0	386.0	405.0
Max residual voltage for lighting current impulse LIPL (kV peak) at 0.5, 1, 2 times of I_n	285.0	300.0	330.0	345.0
	296.0	312.0	344.0	359.0
	330.0	350.0	385.0	400.0
Max residual voltage for switching current impulse SIPL (kV peak) at 1.0 kA	252.0	266.0	293.0	306.0
Quantity of MOR	33	35	38	40

Project No: SHA877544 **Certificate No:** ASTA-TYPE-0002761

RATINGS AND CHARACTERITICS ASSIGNED BY THE MANUFACTURER AND PROVED BY TESTS:

Respectively Type	YH10W-144	YH10W-156	YH10W-168
Rated voltage U_r (kV r.m.s.)	144	156	168
Continuous operating voltage U_c (kV r.m.s.)	115.2	124.8	134.4
Rated short-duration power-frequency voltage U_d (kV r.m.s.) (wet)	340		
Rated lightning impulse voltage U_p (kV peak)	790		
Dry arcing distance (mm)	1538		
Reference voltage at reference current 1 mA (kV r.m.s.)	144~147	156~159	168~171
Max residual voltage for steep current impulse STIPL (kV peak) at I_n	426.0	465.0	490.0
Max residual voltage for lighting current impulse LIPL (kV peak) at 0.5, 1, 2 times of I_n	360.0	390.0	425.0
	374.0	406.0	442.0
	420.0	455.0	495.0
Max residual voltage for switching current impulse SIPL (kV peak) at 1.0 kA	318.0	346.0	376.0
Quantity of MOR	42	46	48

Respectively Type	YH10W-180	YH10W-192	YH10W-204	YH10W-216
Rated voltage U_r (kV r.m.s.)	180	192	204	216
Continuous operating voltage U_c (kV r.m.s.)	144.0	150.0	159.0	168.5
Rated short-duration power-frequency voltage U_d (kV r.m.s.) (wet)	500			
Rated lightning impulse voltage U_p (kV peak)	1055			
Dry arcing distance (mm)	2062			
Reference voltage at reference current 1 mA (kV r.m.s.)	180~183	192~195	204~207	216~219
Max residual voltage for steep current impulse STIPL (kV peak) at I_n	532.0	561.0	600.0	642.0
Max residual voltage for lighting current impulse LIPL (kV peak) at 0.5, 1, 2 times of I_n	450.0	480.0	510.0	540.0
	470.0	500.0	532.0	562.0
	525.0	560.0	595.0	630.0
Max residual voltage for switching current impulse SIPL (kV peak) at 1.0 kA	400.0	426.0	452.0	478.0
Quantity of MOR	52	55	59	63

Project No: SHA877544 **Certificate No:** ASTA-TYPE-0002761

RATINGS AND CHARACTERITICS ASSIGNED BY THE MANUFACTURER AND PROVED BY TESTS:

Respectively Type	YH10W-228	YH10W-240
Rated voltage U_r (kV r.m.s.)	228	240
Continuous operating voltage U_c (kV r.m.s.)	182.4	192.0
Rated short-duration power-frequency voltage U_d (kV r.m.s.) (wet)	540	
Rated lightning impulse voltage U_p (kV peak)	1120	
Dry arcing distance (mm)	2206	
Reference voltage at reference current 1 mA (kV r.m.s.)	228~231	240~243
Max residual voltage for steep current impulse STIPL (kV peak) at I_n	670.0	710.0
Max residual voltage for lighting current impulse LIPL (kV peak) at 0.5, 1, 2 times of I_n	570.0	600.0
	592.0	624.0
	660.0	700.0
Max residual voltage for switching current impulse SIPL (kV peak) at 1.0 kA	504.0	531.0
Quantity of MOR	66	70

Project No: SHA877544 **Certificate No:** ASTA-TYPE-0002761

Certificate contents:

The following documents are attached to and form part of this certificate:

Documents:	Number of pages:
Test report no: CEPRI-EETC02-2023-0185 & 230364B, dated 6 May 2024	82
Drawings	9

Certificate Revision Amendment Table:

Certificate Number	Issue Date	Amendment
ASTA-TYPE-0002761	15 May 2024	Initial Issue

Record of Proving Tests

ASTA

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

APPARATUS TESTED:	Nominal discharge current (I_n) 10 kA, rated short-circuit current (I_s) 50 kA, YH10W series metal-oxide polymer-housed single-column surge arresters without gaps and disconnector for a.c. system and outdoor use, station medium (SM) class with rated voltage (U_r) from 60 kV to 240 kV.
STANDARD:	IEC 60099-4:2014 Clauses 10.8.2, 10.8.3, 10.8.4, 10.8.5, 10.8.6, 10.8.7, 10.8.8, 10.8.10, 10.8.11, 10.8.14, 10.8.15, 10.8.17, Annex B and the STL Guide to IEC 60099-4 Issue 3.0 25th June 2019, where applicable.
MANUFACTURER:	Nanyang Jinniu Electric Co., Ltd South section of Zhongyuan Road, Tongbai county, Nanyang city, Henan, China
TESTING LABORATORY:	POWER INDUSTRY QUALITY INSPECTION AND TEST CENTER FOR ELECTRIC EQUIPMENT China Electric Power Research Institute No.143, Luoyu Road, Hongshan District, Wuhan, Hubei Province. P. R. China and Xi'an High voltage Apparatus Research Institute Co., Ltd (XIHARI) No. 18, North of No. 2 West Ring Road, Xi'an Shaanxi, P. R. China
APPROVED BY:	Goro Zhang, ASTA Observer
ISSUE DATE:	6 May 2024

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

CONTENTS:

List of oscillograms (arranged in the order of publication within the certificate):
Oscillograms for lightning impulse voltage tests: 401+001 and 401+015, 401-001 and 401-015; 402+001 and 402+015, 402-001 and 402-015; 403+001 and 403+015, 403-001 and 403-015.
Oscillograms for steep current impulse residual voltage tests: 314-STI-I, 314-STI-U, 315-STI-I, 315-STI-U, 316-STI-I, 316-STI-U
Oscillograms for lighting current impulse residual voltage tests: 314-LI-10-I, 314-LI-10-U, 315-LI-10-I, 315-LI-10-U, 316-LI-10-I, 316-LI-10-U.
Oscillograms for switching current impulse residual voltage tests: 314-SI-I, 314-SI-U, 315-SI-I, 315-SI-U, 316-SI-I, 316-SI-U.
Oscillograms for Test to verify long term stability under continuous operating voltage： 311, 312, 312.
Oscillograms for test to verify the repetitive charge transfer rating Q_{rs}: 301-20, 302-20, 303-20, 304-20, 305-20, 306-20, 207-20, 308-20, 309-20, 310-20.
Oscillograms for operating duty test: 201.
Oscillograms for power-frequency voltage-versus-time test: 204, 205, 206, 207, 208, 209.
Oscillograms for short-circuit test: SC01-N240598-001; SC02-N240596-001; SC03-240308-004; SC04-240307-001.
Oscillograms for test to verify the dielectric withstand of internal components: 211-01, 211-02, 211-03.

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

CONTENTS: ***(continued)***

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

CONTENTS: ***(continued)***

The drawings were supplied by the manufacturer and the manufacturer guaranteed that the apparatus submitted for tests was manufactured in accordance with the drawings. The ASTA Observer verified that the drawings adequately represented the apparatus tested. The manufacturer was responsible for the correctness of the drawings and the technical data presented.

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

DESCRIPTION OF APPARATUS TESTED

Nominal discharge current (I_n) 10 kA, rated short-circuit current (I_s) 50 kA, YH10W series metal-oxide polymer-housed single-column surge arresters without gaps and disconnector for a.c. system and outdoor use, station medium (SM) class with rated voltage (U_r) from 60 kV to 240 kV.

YH10W series polymer-housed arrester ratings assigned by the manufacturer:

Arrester classification	: SM, Station Medium
Design type	: B
Rated frequency, f_r	: 50 Hz
Nominal discharge current, I_n	: 10 kA
Rated short-circuit current, I_s	: 50 kA, 0.2 s
Reduced short-circuit current	: 25 kA, 0.2 s
Reduced short-circuit current	: 12 kA, 0.2 s
Low short-circuit current	: 600±200 A, 1 s
Repetitive charge transfer rating, Q_{rs}	: 2.0 C
Thermal energy rating W_{th}	: 8 kJ/kV
Specified long-term load, SLL	: 1.4 kN.m
Specified short-term load, SSL	: 3.5 kN.m
Specified terminal torque	: 50 N.m
Power-frequency voltage-versus-time test (with prior duty)	: 1.20U_r, 0.1 s
	: 1.12U_r, 10 s
	: 1.00U_r, 100 s
	: 0.904U_r, 3600 s
Power-frequency voltage-versus-time test (without prior duty)	: 1.20U_r, 1 s
	: 1.12U_r, 100 s

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

DESCRIPTION OF APPARATUS TESTED *(continued)*

Respectively Type	YH10W-60	YH10W-66	YH10W-72	YH10W-78	YH10W-84
Rated voltage U_r (kV r.m.s.)	60	66	72	78	84
Continuous operating voltage U_c (kV r.m.s.)	48.0	52.8	58.0	62.4	67.2
Rated short-duration power-frequency voltage U_d (kV r.m.s.) (wet)	140			170	
Rated lightning impulse voltage U_p (kV peak)	325			395	
Dry arcing distance (mm)	700			769	
Reference voltage at reference current 1 mA (kV r.m.s.)	60~63	66~69	72~75	78~81	84~87
Max residual voltage for steep current impulse STIPL (kV peak) at I_n	175.0	193.0	213.0	227.0	245.0
Max residual voltage for lighting current impulse LIPL (kV peak) at 0.5, 1, 2 times of I_n	150.0	165.0	180.0	195.0	210.0
	156.0	172.0	187.0	203.0	221.0
	175.0	192.0	210.0	228.0	248.0
Max residual voltage for switching current impulse SIPL (kV peak) at 1.0 kA	133.0	147.0	159.0	173.0	188.0
Quantity of MOR	17	19	21	22	24

Respectively Type	YH10W-90	YH10W-96	YH10W-102	YH10W-108
Rated voltage U_r (kV r.m.s.)	90	96	102	108
Continuous operating voltage U_c (kV r.m.s.)	72.5	75.0	79.6	84.0
Rated short-duration power-frequency voltage U_d (kV r.m.s.) (wet)	288			
Rated lightning impulse voltage U_p (kV peak)	550			
Dry arcing distance (mm)	1190			
Reference voltage at reference current 1 mA (kV r.m.s.)	90~93	96~99	102~105	108~111
Max residual voltage for steep current impulse STIPL (kV peak) at I_n	266.0	280.0	297.0	315.0
Max residual voltage for lighting current impulse LIPL (kV peak) at 0.5, 1, 2 times of I_n	225.0	240.0	255.0	270.0
	235.0	250.0	266.0	281.0
	262.0	280.0	296.0	315.0
Max residual voltage for switching current impulse SIPL (kV peak) at 1.0 kA	201.0	213.0	226.0	239.0
Quantity of MOR	26	27	29	31

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

DESCRIPTION OF APPARATUS TESTED *(continued)*

Respectively Type	YH10W-114	YH10W-120	YH10W-132	YH10W-138
Rated voltage U_r (kV r.m.s.)	114	120	132	138
Continuous operating voltage U_c (kV r.m.s.)	91.2	96.0	105.6	110.4
Rated short-duration power-frequency voltage U_d (kV r.m.s.) (wet)	305			
Rated lightning impulse voltage U_p (kV peak)	560			
Dry arcing distance (mm)	1260			
Reference voltage at reference current 1 mA (kV r.m.s.)	114~117	120~123	132~136	138~141
Max residual voltage for steep current impulse STIPL (kV peak) at I_n	335.0	355.0	386.0	405.0
Max residual voltage for lighting current impulse LIPL (kV peak) at 0.5, 1, 2 times of I_n	285.0	300.0	330.0	345.0
	296.0	312.0	344.0	359.0
	330.0	350.0	385.0	400.0
Max residual voltage for switching current impulse SIPL (kV peak) at 1.0 kA	252.0	266.0	293.0	306.0
Quantity of MOR	33	35	38	40

Respectively Type	YH10W-144	YH10W-156	YH10W-168
Rated voltage U_r (kV r.m.s.)	144	156	168
Continuous operating voltage U_c (kV r.m.s.)	115.2	124.8	134.4
Rated short-duration power-frequency voltage U_d (kV r.m.s.) (wet)	340		
Rated lightning impulse voltage U_p (kV peak)	790		
Dry arcing distance (mm)	1538		
Reference voltage at reference current 1 mA (kV r.m.s.)	144~147	156~159	168~171
Max residual voltage for steep current impulse STIPL (kV peak) at I_n	426.0	465.0	490.0
Max residual voltage for lighting current impulse LIPL (kV peak) at 0.5, 1, 2 times of I_n	360.0	390.0	425.0
	374.0	406.0	442.0
	420.0	455.0	495.0
Max residual voltage for switching current impulse SIPL (kV peak) at 1.0 kA	318.0	346.0	376.0
Quantity of MOR	42	46	48

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

DESCRIPTION OF APPARATUS TESTED *(continued)*

Respectively Type	YH10W-180	YH10W-192	YH10W-204	YH10W-216
Rated voltage U_r (kV r.m.s.)	180	192	204	216
Continuous operating voltage U_c (kV r.m.s.)	144.0	150.0	159.0	168.5
Rated short-duration power-frequency voltage U_d (kV r.m.s.) (wet)	500			
Rated lightning impulse voltage U_p (kV peak)	1055			
Dry arcing distance (mm)	2062			
Reference voltage at reference current 1 mA (kV r.m.s.)	180~183	192~195	204~207	216~219
Max residual voltage for steep current impulse STIPL (kV peak) at I_n	532.0	561.0	600.0	642.0
Max residual voltage for lighting current impulse LIPL (kV peak) at 0.5, 1, 2 times of I_n	450.0	480.0	510.0	540.0
	470.0	500.0	532.0	562.0
	525.0	560.0	595.0	630.0
Max residual voltage for switching current impulse SIPL (kV peak) at 1.0 kA	400.0	426.0	452.0	478.0
Quantity of MOR	52	55	59	63

Respectively Type	YH10W-228	YH10W-240
Rated voltage U_r (kV r.m.s.)	228	240
Continuous operating voltage U_c (kV r.m.s.)	182.4	192.0
Rated short-duration power-frequency voltage U_d (kV r.m.s.) (wet)	540	
Rated lightning impulse voltage U_p (kV peak)	1120	
Dry arcing distance (mm)	2206	
Reference voltage at reference current 1 mA (kV r.m.s.)	228~231	240~243
Max residual voltage for steep current impulse STIPL (kV peak) at I_n	670.0	710.0
Max residual voltage for lighting current impulse LIPL (kV peak) at 0.5, 1, 2 times of I_n	570.0	600.0
	592.0	624.0
	660.0	700.0
Max residual voltage for switching current impulse SIPL (kV peak) at 1.0 kA	504.0	531.0
Quantity of MOR	66	70

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

DESCRIPTION OF APPARATUS TESTED *(continued)*

MOR information:

Type	: JNDQ5.0kV, JNDQ5.1kV (230706181)
Size	: Ø52 mm * 24 mm
Reference voltage	: 3.64±0.4 kV r.m.s. a.c.
Manufacturer	: Nanyang Jinniu Electric Co., Ltd

Record of Proving Tests

ASTA

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

APPLICANT:

Nanyang Jinniu Electric Co., Ltd
South section of Zhongyuan Road, Tongbai county, Nanyang city, Henan, China

DATE OF RECEIPT OF APPARATUS:

20 October 2023

CUSTOMER ORDER NUMBER:

QNS230707002

MANUFACTURER:

Nanyang Jinniu Electric Co., Ltd
South section of Zhongyuan Road, Tongbai county, Nanyang city, Henan, China

WITNESSES OF THE TESTS:

Name		**Organization**
Mr. Goro Zhang	-	ASTA Observer, Intertek
Mr. Yu Zhang	-	Nanyang Jinniu Electric Co., Ltd

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

LABORATORY

The apparatus was tested at:

1. Xi'an High voltage Apparatus Research Institute Co., Ltd (XIHARI)

   No. 18, North of No. 2 West Ring Road, Xi'an Shaanxi, P. R. China, 710077

The laboratory accreditation details are:

This Laboratory is recognized by Intertek ASTA for Conformity Assessment to ISO / IEC 17025:2017 and Regulations for ASTA Recognized Laboratories, Recognition No. 2020-RTL-L2-331

2. POWER INDUSTRY QUALITY INSPECTION AND TEST CENTER FOR ELECTRIC EQUIPMENT
   China Electric Power Research Institute

   No.143, Luoyu Road, Hongshan District, Wuhan, Hubei Province, P. R. China

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

SCHEDULE OF TESTS

Tests in accordance with

IEC 60099-4:2014, Clauses 10.8.2, 10.8.3, 10.8.4, 10.8.5, 10.8.6, 10.8.7, 10.8.8, 10.8.10, 10.8.11, 10.8.14, 10.8.15, 10.8.17, Annex B and the STL Guide to IEC 60099-4: Issue 3.0, 25th June 2019, where applicable.

Test no.	Characteristic verified	Clause	Sample no.	Page no.
1	Insulation withstand tests	10.8.2	401, 402, 403	14 to 15
2	Residual voltage tests	10.8.3	314, 315, 316	16 to 19
3	Test to verify long term stability under continuous operating voltage	10.8.4	311~313	20 to 21
4	Test to verify the repetitive charge transfer rating, Q_{rs}	10.8.5	301~ 310	22 to 23
5	Heat dissipation behaviour of test sample	10.8.6 Annex B	008, 210	24 to 28
6	Operating duty test	10.8.7	201, 202, 203	29 to 30
7	Power-frequency voltage-versus-time test	10.8.8	204~209	31 to 33
* 8	Short-circuit tests	10.8.10	SC01, SC02, SC03, SC04	34 to 36
9	Test of the bending moment	10.8.11	001, 002, 003	37 to 41
10	Radio interference voltage (RIV) test	10.8.14	005, 006, 007	42 to 43
11	Test to verify the dielectric withstand of internal components	10.8.15	211	44
12	Weather ageing test	10.8.17	004 501, 502, 503	45 to 46

* Note: Short-circuit tests were performed in Xi'an High voltage Apparatus Research Institute Co., Ltd (XIHARI).

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

SCHEDULE OF TESTS *(continued)*

Description of the test samples:

The choices and preparation of the test samples below following the requirement of IEC 60099-4: 2014, Clause 7.3.

Sample no.	Description	Photograph no.
401, 402, 403	These test samples were complete arrester without MOR. 401 was YH10W-240 as representative from YH10W-180 to YH10W-240 for insulation withstand tests. 402 was YH10W-168 as representative from YH10W-144 to YH10W-168 for insulation withstand tests. 403 was YH10W-138 as representative from YH10W-60 to YH10W-138 for insulation withstand tests.	P001
001 ~ 003	These test samples were YH10W-138 as representative of this series arresters for the bending moment test.	P002
004	These test sample was YH10W-60 as representative of this series arresters for the weather ageing test.	
005	These test sample was YH10W-138 as representative of this series arresters for the RIV test.	
006	These test sample was YH10W-168 as representative of this series arresters for the bending moment test and RIV test.	P003
007	These test sample was YH10W-240 as representative of this series arresters for the RIV test.	P004
008	These test sample was YH10W-138 as representative of this series arresters for heat dissipation behaviour verification test.	P002
SC01, SC02, SC03, SC04	These test samples were YH10W-138 as representative of this series arresters for short-circuit tests.	P005
301 ~ 316	Single metal-oxide resistor.	P006
201~210	Thermally prorated section.	P007
211	Dielectrically prorated section.	P008
501, 502, 503	Shed and housing material specimens.	P009

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 1: IEC 60099-4 Clause 10.8.2 Insulation withstand tests

Subclause 10.8.2 is same as subclause 8.2 without modification

Clause 8.2.6 Lighting impulse voltage test

Test conditions:

1. Test samples 401,402 and 403 as new condition, 401 was the longest arrester housing for two unit arrester, and 403 was the longest arrester housing for single unit arrester, meanwhile 403 was the highest specific voltage stress in this series arrester, 402 was the longest arrester housing for two unit arrester without shielding ring.
2. Ambient conditions: 6.5 °C, 30% RH, 104.1 kPa.
3. The atmospheric correction factor K_t=0.980 for 401, 402 and 0.981 for 403 was used by calculation, the corrected value of the applied voltage of 401 was 1098 kV peak (0.980*1120 = 1098); the corrected value of the applied voltage of 402 was 775 kV peak (0.980*790 = 775); the corrected value of the applied voltage of 403 was 550 kV peak (0.981*560 = 550).
4. A standard lightning impulse voltage dry test was performed according to clause 7.3.1.2 Procedure B of IEC 60060-1:2010.

Test results:

Test sample no.	Voltage applied to	Earth connected to	Applied voltage (kV peak)	Number of tests	Number of disruptive discharges	Result
401	top terminal	earthing terminal	+1098/-1098	15/15	0/0	Withstood
402	top terminal	earthing terminal	+775/-775	15/15	0/0	Withstood
403	top terminal	earthing terminal	+550/-550	15/15	0/0	Withstood

Note: the applied test voltage specified by the manufacturer was higher than the requirement of IEC 60099-4:2014.

Result:

There were no disruptive discharges during the tests. The requirements of the standard were verified.

All oscillograms were recorded and two oscillograms for each polarity of each sample were published, the published oscillogram nos.:

401+001 and 401+015, 401-001 and 401-015;

402+001 and 402+015, 402-001 and 402-015;

403+001 and 402+015, 403-001 and 403-015.

Photograph no.: P010

Test circuit: Figure 1

Date of tests: 23 January 2024

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 1: IEC 60099-4 Clause 10.8.2 Insulation withstand tests *(continued)*

Subclause 10.8.2 is same as subclause 8.2 without modification

Clause 8.2.8 Power-frequency voltage test

Test conditions:

1. Test samples 401, 402 and 403 as after previous tests.
2. Ambient conditions: 10 °C, 40% RH, 104.1 kPa.
3. The atmospheric correction factor K_t=1.013 for 401, K_t=1.010 for 402 and 1.012 for 403 was used by calculation, the corrected value of the applied voltage of 401 was 547 kV (1.013 * 540=547), the corrected value of the applied voltage of 402 was 344 kV (1.010 * 340=344), the corrected value of the applied voltage of 403 was 309 kV (1.012 * 305=309).
4. The test was done in wet condition as the procedure given in IEC 60060-1: 2010, Clause 4.4, the average precipitation rate of vertical component was 1.5 mm/min, the average precipitation rate of horizontal component was 1.8 mm/min, temperature of water was 11°C, conductivity of water was 100.6 μS/cm.

Test results:

Test sample no.	Voltage applied to	Earth connected to	Applied voltage (kV r.m.s.)	Applied voltage frequency (Hz)	Duration (s)	Result
401	top terminal	earthing terminal	547	50	60	Withstood
402	top terminal	earthing terminal	344	50	60	Withstood
403	top terminal	earthing terminal	309	50	60	Withstood

Note: the applied test voltage specified by the manufacturer was higher than the requirement of IEC 60099-4:2014.

Result:

There were no disruptive discharges during the tests. The requirements of the standard were verified.

Photograph no.: P011

Test circuit: Figure 2

Date of tests: 26 January 2024

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 2: IEC 60099-4 Clause 10.8.3 Residual voltage tests

Subclause 10.8.3 is same as subclause 8.3 without modification

Test conditions:

1. Three test samples 314, 315 and 316 as new condition.
2. Three current generators equipped with computer assisted current and residual voltage measuring systems were used for the residual voltage tests.

Clause 8.3.2 Steep current impulse residual voltage test

Test results:

10kA Steep current impulse (1/5 μs) residual voltage test

Test samples no.	Applied Peak current value (kA,10 ± 5%)	Residual voltage of resistor samples (kV, peak)	Residual voltage of metal block (kV, peak)
314	10.04	10.17	0.478
315	10.04	10.23	
316	10.04	10.11	

1. The waveforms of the applied steep current impulse were within: 1±0.1/<20 μs.
2. Maximum residual voltage of resistor samples after correction: 10.23 kV- 0.478 kV= 9.75 kV.
3. Published oscillogram nos.: 314-STI-I, 314-STI-U, 315-STI-I, 315-STI-U, 316-STI-I, 316-STI-U.
4. The divider ratio was 59.8.
5. Photograph no.: P012
6. Test circuit: Figure 3

Steep current impulse residual voltage converted to full arrester:

Type	Arrester height H (m)	Quantity of MOR	Inductive voltage drop U_L (kV)	Steep current impulse residual voltage (kV, peak)		Specification (kV, peak)
				Full arrester excluding inductive contribution	Full arrester including inductive contribution	
YH10W-60	0.735	17	7.35	165.8	173.1	175.0
YH10W-66		19	7.35	185.3	192.6	193.0
YH10W-72	0.805	21	8.05	204.8	212.8	213.0
YH10W-78		22	8.05	214.5	222.6	227.0
YH10W-84		24	8.05	234.0	242.1	245.0
YH10W-90	1.225	26	12.25	253.6	265.8	266.0
YH10W-96		27	12.25	263.3	275.6	280.0
YH10W-102		29	12.25	282.8	295.1	297.0
YH10W-108		31	12.25	302.3	314.6	315.0
YH10W-114	1.295	33	12.95	321.8	334.8	335.0
YH10W-120		35	12.95	341.3	354.3	355.0
YH10W-132		38	12.95	370.6	383.5	386.0
YH10W-138		40	12.95	390.1	403.0	405.0

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 2: IEC 60099-4 Clause 10.8.3 Residual voltage tests *(continued)*

Clause 8.3.2 Steep current impulse residual voltage test (continued)

Type	Arrester height H (m)	Quantity of MOR	Inductive voltage drop U_L (kV)	Steep current impulse residual voltage (kV, peak)		Specification (kV, peak)
				Full arrester excluding inductive contribution	Full arrester including inductive contribution	
YH10W-144	1.61	42	16.1	409.6	425.7	426.0
YH10W-156		46	16.1	448.6	464.7	465.0
YH10W-168		48	16.1	468.1	484.2	490.0
YH10W-180	2.45	52	24.5	507.1	531.6	532.0
YH10W-192		55	24.5	536.4	560.9	561.0
YH10W-204		59	24.5	575.4	599.9	600.0
YH10W-216		63	24.5	614.4	638.9	642.0
YH10W-228	2.59	66	25.9	643.6	669.5	670.0
YH10W-240		70	25.9	682.6	708.5	710.0

Clause 8.3.3 Lightning impulse residual voltage test

Test results:

5 kA, 10 kA, 20 kA Lightning current impulse (8/20 μs) residual voltage test

Test sample no.	Applied peak current value (kA, 5 ± 5%, 10 ± 5%, 20 ± 5%)	Lightning current impulse residual voltage (kV, peak)
314	5.08	8.19
	10.08	8.73
	20.08	9.43
315	4.96	8.19
	10.00	8.09
	20.16	9.51
316	5.04	8.15
	10.08	8.73
	20.16	9.43

1. The maximum measured value of test samples was utilized to calculate the full arrester residual voltage.
2. Published oscillogram nos.: 314-LI-10-I, 314-LI-10-U, 315-LI-10-I, 315-LI-10-U, 316-LI-10-I, 316-LI-10-U.
3. The divider ratio was 206.8.
4. Photograph no.: P013.
5. Test circuit: Figure 3

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 2: IEC 60099-4 Clause 10.8.3 Residual voltage tests *(continued)*

Clause 8.3.3 Lightning impulse residual voltage test *(continued)*

Verification lightning current impulse residual voltage for full arrester:

Type	Quantity of MOR	Lightning current impulse residual voltage of full arrester (kV, peak)			Specification (kV, peak)		
		5 kA	10 kA	20 kA	5 kA	10 kA	20 kA
YH10W-60	17	139.2	148.4	161.7	150.0	156.0	175.0
YH10W-66	19	155.6	165.9	180.7	165.0	172.0	192.0
YH10W-72	21	172.0	183.3	199.7	180.0	187.0	210.0
YH10W-78	22	180.2	192.1	209.2	195.0	203.0	228.0
YH10W-84	24	196.6	209.5	228.2	210.0	221.0	248.0
YH10W-90	26	212.9	227.0	247.3	225.0	235.0	262.0
YH10W-96	27	221.1	235.7	256.8	240.0	250.0	280.0
YH10W-102	29	237.5	253.2	275.8	255.0	266.0	296.0
YH10W-108	31	253.9	270.6	294.8	270.0	281.0	315.0
YH10W-114	33	270.3	288.1	313.8	285.0	296.0	330.0
YH10W-120	35	286.7	305.6	332.9	300.0	312.0	350.0
YH10W-132	38	311.2	331.7	361.4	330.0	344.0	385.0
YH10W-138	40	327.6	349.2	380.4	345.0	359.0	400.0
YH10W-144	42	344.0	366.7	399.4	360.0	374.0	420.0
YH10W-156	46	376.7	401.6	437.5	390.0	406.0	455.0
YH10W-168	48	393.1	419.0	456.5	425.0	442.0	495.0
YH10W-180	52	425.9	454.0	494.5	450.0	470.0	525.0
YH10W-192	55	450.5	480.2	523.1	480.0	500.0	560.0
YH10W-204	59	483.2	515.1	561.1	510.0	532.0	595.0
YH10W-216	63	516.0	550.0	599.1	540.0	562.0	630.0
YH10W-228	66	540.5	576.2	627.7	570.0	592.0	660.0
YH10W-240	70	573.3	611.1	665.7	600.0	624.0	700.0

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 2: IEC 60099-4 Clause 10.8.3 Residual voltage tests *(continued)*

Clause 8.3.4 Switching impulse residual voltage test

Test results:

1000 A Switching current impulse (48/101 us) residual voltage test

Test sample no.	Applied peak current value (A, 1000 ± 5%)	Switching current impulse residual voltage (kV, peak value)
314	1016	7.24
315	1016	7.28
316	1024	7.20

1. The maximum measured value of test sample was utilized to calculate the full arrester residual voltage.
2. Published oscillogram nos.: 314-SI-I, 314-SI-U, 315-SI-I, 315-SI-U, 316-SI-I, 316-SI-U.
3. The divider ratio was 206.8.
4. Photograph no.: P014
5. Test circuit: Figure 3

Verification switching current impulse residual voltage for full arrester:

Type	Quantity of MOR	Switching current impulse residual voltage of full arrester (kV, peak)	Specification (kV, peak)
YH10W-60	17	123.8	133.0
YH10W-66	19	138.3	147.0
YH10W-72	21	152.9	159.0
YH10W-78	22	160.2	173.0
YH10W-84	24	174.7	188.0
YH10W-90	26	189.3	201.0
YH10W-96	27	196.6	213.0
YH10W-102	29	211.1	226.0
YH10W-108	31	225.7	239.0
YH10W-114	33	240.2	252.0
YH10W-120	35	254.8	266.0
YH10W-132	38	276.6	293.0
YH10W-138	40	291.2	306.0
YH10W-144	42	305.8	318.0
YH10W-156	46	334.9	346.0
YH10W-168	48	349.4	376.0
YH10W-180	52	378.6	400.0
YH10W-192	55	400.4	426.0
YH10W-204	59	429.5	452.0
YH10W-216	63	458.6	478.0
YH10W-228	66	480.5	504.0
YH10W-240	70	509.6	531.0

Result:

All test results of the residual voltage tests fulfilled the specification of manufacturer.

Date of tests: 20 November 2023

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 3: IEC 60099-4 Clause 10.8.4 Test to verify long term stability under continuous operating voltage

Subclause 10.8.4 is same as subclause 8.4 without modification

Test conditions:

1. Three test samples 311, 312 and 313 as new condition.
2. A corrected maximum continuous operating voltage U_{ct} supplied by the manufacturer was applied for this test. The corrected U_{ct} during this test also considered the worst stress of the resistors at the different rated voltage arrester design which share the same resistors.
3. The test was performed in an air temperature-controlled oven.
4. The three test samples were heated to 115 °C ± 2 K and the power losses of the test samples were measured at the corrected maximum continuous operating voltage of U_{ct} as the requirements of the standard. The samples were maintained at this voltage for 1000 h and during which the oven temperature was controlled to keep the surface temperature of the test samples at 115 °C ± 2 K.

Test results:

Test cumulative time (h)	311			312			313		
	Test temperature (℃)	Power loss (W)	Test status	Test temperature (℃)	Power loss (W)	Test status	Test temperature (℃)	Power loss (W)	Test status
3	113.2	1.524	Normal	114.3	1.421	Normal	114.3	1.345	Normal
99	113.6	1.207	Normal	114.8	1.052	Normal	114.8	1.012	Normal
195	113.5	1.145	Normal	114.7	0.985	Normal	114.8	0.955	Normal
243	113.6	1.123	Normal	114.8	0.965	Normal	114.8	0.929	Normal
291	113.5	1.130	Normal	114.8	0.964	Normal	114.8	0.929	Normal
363	113.5	1.125	Normal	114.8	0.955	Normal	114.8	0.916	Normal
411	113.8	1.107	Normal	115.0	0.931	Normal	115.1	0.906	Normal
483	113.8	1.099	Normal	115.0	0.924	Normal	115.2	0.899	Normal
555	113.8	1.084	Normal	115.0	0.916	Normal	115.1	0.890	Normal
603	113.8	1.082	Normal	115.1	0.910	Normal	115.1	0.886	Normal
699	113.9	1.089	Normal	115.0	0.907	Normal	115.2	0.884	Normal
747	113.9	1.096	Normal	115.1	0.901	Normal	115.2	0.880	Normal
819	113.9	1.101	Normal	115.1	0.890	Normal	115.2	0.863	Normal
915	113.9	1.096	Normal	115.0	0.883	Normal	115.2	0.856	Normal
963	113.9	1.097	Normal	115.1	0.880	Normal	115.2	0.853	Normal
987	113.9	1.091	Normal	115.1	0.877	Normal	115.1	0.848	Normal
1011	113.9	1.088	Normal	115.1	0.877	Normal	115.1	0.846	Normal

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 3: IEC 60099-4 Clause 10.8.4 Test to verify long term stability under continuous operating voltage *(continued)*

Test results:

Test samples	U_c (kV r.m.s., 50Hz)	U_{ct} (kV r.m.s., 50Hz)	P_{start} (W)	P_{end} (W)	P_{min} (W)
311	2.82	3.24	1.524	1.088	1.082
312	2.82	3.24	1.421	0.877	0.877
313	2.82	3.24	1.345	0.846	0.846

1. U_c=2.82 kV was a maximum value from the Y10W series arrester.
2. U_{ct}=3.24 kV was taken from U_c above and consider a maximum factor of voltage distribution along the height of the arrester K_{CT}=1.15 by customer provided.
3. Published oscillogram nos.: 311, 312, 313.

Result:

1. Any increase of power losses from P_{min} did not exceed 1.3 times P_{min} during the remaining test period.
2. All measurements of power losses throughout the ageing period, including the final measurement of P_{end} did not exceed 1.1 times P_{start}.
3. All three test samples complied with the criteria of the standard and passed this test.

Photograph no.: P015

Date of tests: 23 November 2023 to 4 January 2024

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 4: IEC 60099-4 Clause 10.8.5 Test to verify the repetitive charge transfer rating of Q_{rs}

Subclause 10.8.5 is same as subclause 8.5 without modification

Test conditions:

1. Ten test samples 301~310 as new condition.
2. Before and after the test, a residual voltage test at nominal discharge current and a reference voltage test at specified reference current were conducted.
3. Each test sample was subjected to twenty current impulses divided in ten groups, each group including two impulses, the time between impulses within a group was between 50 s and 60 s, the time between groups was sufficient enough for the test samples cooling to ambient temperature.
4. The wave shape and duration of the current impulses was a rectangular impulse of 2ms~4ms virtual total duration.
5. The charge content of each impulse was 1.1 times the claimed repetitive charge transfer rating of Q_{rs}.

Test results:

Test sample no.		301	302	303	304	305
Reference voltage test @ 1 mA a.c. current before test (kV r.m.s.)		3.65	3.60	3.64	3.62	3.67
Residual voltage @ 10 kA, 8/20 μs before test (kV peak)		8.69	8.64	8.69	8.77	8.73
Tested repetitive charge transfer rating Q_{rs}=1.1*2.0 C	No.1	2.220	2.268	2.273	2.282	2.259
	No.2	2.237	2.261	2.251	2.263	2.241
	No.3	2.256	2.265	2.239	2.247	2.232
	No.4	2.233	2.253	2.226	2.232	2.215
	No.5	2.220	2.274	2.273	2.263	2.262
	No.6	2.215	2.247	2.236	2.253	2.222
	No.7	2.252	2.268	2.262	2.271	2.247
	No.8	2.233	2.242	2.246	2.237	2.235
	No.9	2.254	2.231	2.210	2.241	2.230
	No.10	2.192	2.215	2.199	2.226	2.207
	No.11	2.223	2.256	2.250	2.256	2.243
	No.12	2.214	2.251	2.245	2.245	2.220
	No.13	2.261	2.271	2.239	2.255	2.254
	No.14	2.233	2.244	2.246	2.244	2.226
	No.15	2.238	2.266	2.252	2.267	2.248
	No.16	2.225	2.258	2.241	2.229	2.227
	No.17	2.270	2.260	2.246	2.249	2.249
	No.18	2.225	2.240	2.241	2.229	2.230
	No.19	2.240	2.258	2.242	2.257	2.233
	No.20	2.199	2.257	2.238	2.226	2.199
Reference voltage test @ 1 mA a.c. current after test (kV r.m.s.)		3.65	3.58	3.63	3.63	3.67
Reference voltage change (%)		+0.0	-0.56	-0.28	+0.28	+0.0
Residual voltage @ 10 kA, 8/20 μs after test (kV peak)		8.73	8.69	8.69	8.69	8.77
Residual voltage change (%)		+0.46	+0.58	+0.0	-0.91	+0.46

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 4: IEC 60099-4 Clause 10.8.5 Test to verify the repetitive charge transfer rating of Q_{rs} *(continued)*

Test results: ***(continued)***

Test samples		306	307	308	309	310
Reference voltage test @ 1 mA a.c. current before test (kV r.m.s.)		3.65	3.67	3.66	3.64	3.66
Residual voltage @ 10 kA, 8/20 μs before test (kV peak)		8.72	8.69	8.72	8.72	8.72
Tested repetitive charge transfer rating Q_{rs}=1.1*2.0 C	No.1	2.255	2.262	2.271	2.286	2.262
	No.2	2.250	2.245	2.233	2.256	2.249
	No.3	2.232	2.231	2.236	2.240	2.245
	No.4	2.228	2.213	2.224	2.240	2.225
	No.5	2.244	2.240	2.241	2.260	2.245
	No.6	2.236	2.232	2.205	2.223	2.230
	No.7	2.258	2.251	2.240	2.259	2.248
	No.8	2.224	2.231	2.230	2.238	2.228
	No.9	2.213	2.218	2.214	2.210	2.199
	No.10	2.212	2.208	2.219	2.211	2.218
	No.11	2.255	2.251	2.232	2.269	2.241
	No.12	2.225	2.213	2.223	2.231	2.232
	No.13	2.243	2.230	2.251	2.249	2.256
	No.14	2.225	2.197	2.237	2.237	2.232
	No.15	2.249	2.246	2.253	2.261	2.240
	No.16	2.242	2.233	2.234	2.232	2.228
	No.17	2.251	2.246	2.236	2.263	2.248
	No.18	2.225	2.232	2.230	2.234	2.220
	No.19	2.235	2.226	2.232	2.250	2.229
	No.20	2.192	2.225	2.222	2.225	2.237
Reference voltage test @ 1 mA a.c. current after test (kV r.m.s.)		3.65	3.67	3.67	3.63	3.65
Reference voltage change (%)		+0.0	+0.0	+0.27	-0.27	-0.27
Residual voltage @ 10 kA, 8/20 μs after test (kV peak)		8.73	8.72	8.72	8.69	8.72
Residual voltage change (%)		+0.11	+0.35	+0.0	-0.34	+0.0

Result:

1. All ten test samples passed the first test sequence and no puncture, flashover or cracking happened during the tests.
2. The changes of the residual voltage at nominal discharge current before and after the tests were within ±5%. The changes of the reference voltage before and after the tests were within ±5%.
3. An additional 10.61 kA, 8/20 μs current impulse was applied to every test sample after the first test sequence and every test sample passed this additional test without mechanical damage.
4. All ten test samples complied with the criteria of the standard and passed this test.

Note: Oscillograms for the 20th test of every test sample were published, refer to page 2.

Photograph no.: P016

Test circuit: Figure 4 and Figure 5

Date of tests: 20 to 23 November 2023

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 5: IEC 60099-4 Clause 10.8.6 & Annex B Heat dissipation behaviour of test sample

Test conditions:

1. A complete arrester of test sample 008 and a thermally prorated section of test sample 210 were used for this test.
2. The test on complete arrester and thermally prorated section were all in a still air ambient temperature of 20 °C ± 15 K and the ambient temperature remained within ±3 K during the test. The ambient temperature during the test for thermally prorated section was within ±10 K of the ambient temperature during the test on the complete arrester and remain ±3 K during the test.
3. Temperature measuring equipment using calibrated temperature sensors with optical fibre cable for test data transmission were used for measuring the resistor column surface temperature of the full assembly arrester. The sensor located between 1/2 and 1/3 of the length of the resistor column from the top of the arrester. For the surface temperature measuring of the thermally prorated section the sensor was in the bottom surface of the test sample. The ambient temperature of the test lab was recorded using the other temperature sensor during the tests.
4. A power-frequency voltage of 50 Hz was used for heating every test sample to at least 140 °C within an hour. After that the voltage supply was disconnected from the test sample and the cooling time curve of every test sample with the record period not less than 2 hours was recorded for every minute.

Test results:

Measuring point during cooling period (second)	Complete arrester, 008 (T_A=16 ˚C)		Thermally prorated section unit, 210 (T_A=17 ˚C)	
	Measured resistor temperature during cooling period (˚C)	Relative over-temperature T_{rel}	Measured resistor temperature during cooling period (˚C)	Relative over-temperature T_{rel}
0 (T_0)	152.46	1.00	142.96	1.00
63	151.85	1.00	141.81	0.99
126	150.12	0.98	141.00	0.98
189	148.59	0.97	140.08	0.98
252	147.24	0.96	139.34	0.97
315	145.65	0.95	138.47	0.96
378	144.21	0.94	137.59	0.96
441	142.88	0.93	136.87	0.95
504	141.42	0.92	136.16	0.95
567	139.97	0.91	135.45	0.94
630	138.76	0.90	134.82	0.94
693	137.42	0.89	134.12	0.93
756	136.27	0.88	133.42	0.92
819	135.03	0.87	132.69	0.92
882	133.79	0.86	132.02	0.91
945	132.59	0.85	131.42	0.91
1008	131.43	0.85	130.91	0.90
1071	129.98	0.84	130.37	0.90
1134	128.77	0.83	129.66	0.89
1197	127.85	0.82	129.18	0.89
1260	126.76	0.81	128.68	0.89
1323	125.62	0.80	128.06	0.88

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 5: IEC 60099-4 Clause 10.8.6 & Annex B Heat dissipation behaviour of test sample *(continued)*

Test results:

Measuring point during cooling period (second)	Complete arrester, 008 (T_A=16 ˚C)		Thermally prorated section unit, 210 (T_A=17 ˚C)	
	Measured resistor temperature during cooling period (˚C)	Relative over-temperature T_{rel}	Measured resistor temperature during cooling period (˚C)	Relative over-temperature T_{rel}
1386	124.49	0.80	127.61	0.88
1449	123.35	0.79	127.20	0.87
1512	122.37	0.78	126.72	0.87
1575	121.29	0.77	126.33	0.87
1638	120.33	0.76	125.75	0.86
1701	119.36	0.76	125.22	0.86
1764	118.53	0.75	124.88	0.86
1827	117.65	0.74	124.40	0.85
1890	116.57	0.74	124.03	0.85
1953	115.58	0.73	123.67	0.85
2016	114.82	0.72	123.02	0.84
2079	114.05	0.72	122.81	0.84
2142	112.89	0.71	122.45	0.84
2205	111.85	0.70	121.85	0.83
2268	110.99	0.70	121.38	0.83
2331	110.29	0.69	121.19	0.83
2394	109.57	0.69	120.62	0.82
2457	108.43	0.68	120.26	0.82
2520	107.65	0.67	119.94	0.82
2583	106.66	0.66	119.35	0.81
2646	105.93	0.66	118.89	0.81
2709	104.78	0.65	118.49	0.81
2772	103.90	0.64	118.22	0.80
2835	102.44	0.63	117.65	0.80
2898	101.58	0.63	117.44	0.80
2961	100.70	0.62	117.00	0.79
3024	99.87	0.61	116.66	0.79
3087	98.98	0.61	116.27	0.79
3150	98.30	0.60	115.96	0.79
3213	97.29	0.60	115.66	0.78
3276	96.61	0.59	115.20	0.78
3339	95.79	0.58	114.92	0.78
3402	94.92	0.58	114.53	0.77
3465	94.35	0.57	114.19	0.77
3528	93.45	0.57	113.79	0.77
3591	92.48	0.56	113.60	0.77
3654	92.10	0.56	113.21	0.76
3717	91.05	0.55	112.89	0.76
3780	90.28	0.54	112.53	0.76
3843	89.42	0.54	112.31	0.76
3906	88.71	0.53	112.01	0.75

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 5: IEC 60099-4 Clause 10.8.6 & Annex B Heat dissipation behaviour of test sample *(continued)*

Test results:

Measuring point during cooling period (second)	Complete arrester, 008 (T_A=16 ˚C)		Thermally prorated section unit, 210 (T_A=17 ˚C)	
	Measured resistor temperature during cooling period (˚C)	Relative over-temperature T_{rel}	Measured resistor temperature during cooling period (˚C)	Relative over-temperature T_{rel}
3969	87.84	0.53	111.57	0.75
4032	87.19	0.52	111.39	0.75
4095	86.35	0.52	111.07	0.75
4158	85.76	0.51	110.76	0.74
4221	85.16	0.51	110.45	0.74
4284	84.28	0.50	110.19	0.74
4347	83.71	0.50	109.93	0.74
4410	83.12	0.49	109.71	0.74
4473	82.46	0.49	109.30	0.73
4536	81.73	0.48	109.01	0.73
4599	81.06	0.48	108.67	0.73
4662	80.43	0.47	108.49	0.73
4725	79.92	0.47	108.15	0.72
4788	79.11	0.46	107.85	0.72
4851	78.52	0.46	107.66	0.72
4914	77.91	0.45	107.40	0.72
4977	77.31	0.45	106.98	0.71
5040	76.83	0.45	106.87	0.71
5103	76.23	0.44	106.62	0.71
5166	75.60	0.44	106.24	0.71
5229	74.96	0.43	105.99	0.71
5292	74.43	0.43	105.68	0.70
5355	73.90	0.42	105.53	0.70
5418	73.16	0.42	105.07	0.70
5481	72.67	0.42	104.86	0.70
5544	72.16	0.41	104.60	0.70
5607	71.50	0.41	104.27	0.69
5670	71.19	0.40	104.09	0.69
5733	70.57	0.40	103.80	0.69
5796	70.12	0.40	103.45	0.69
5859	69.51	0.39	103.28	0.68
5922	69.17	0.39	103.09	0.68
5985	68.74	0.39	102.78	0.68
6048	68.19	0.38	102.63	0.68
6111	67.81	0.38	102.18	0.68
6174	67.36	0.38	101.94	0.67
6237	66.75	0.37	101.93	0.67
6300	66.34	0.37	101.53	0.67
6363	65.94	0.37	101.23	0.67
6426	65.41	0.36	101.05	0.67
6489	64.85	0.36	100.87	0.67

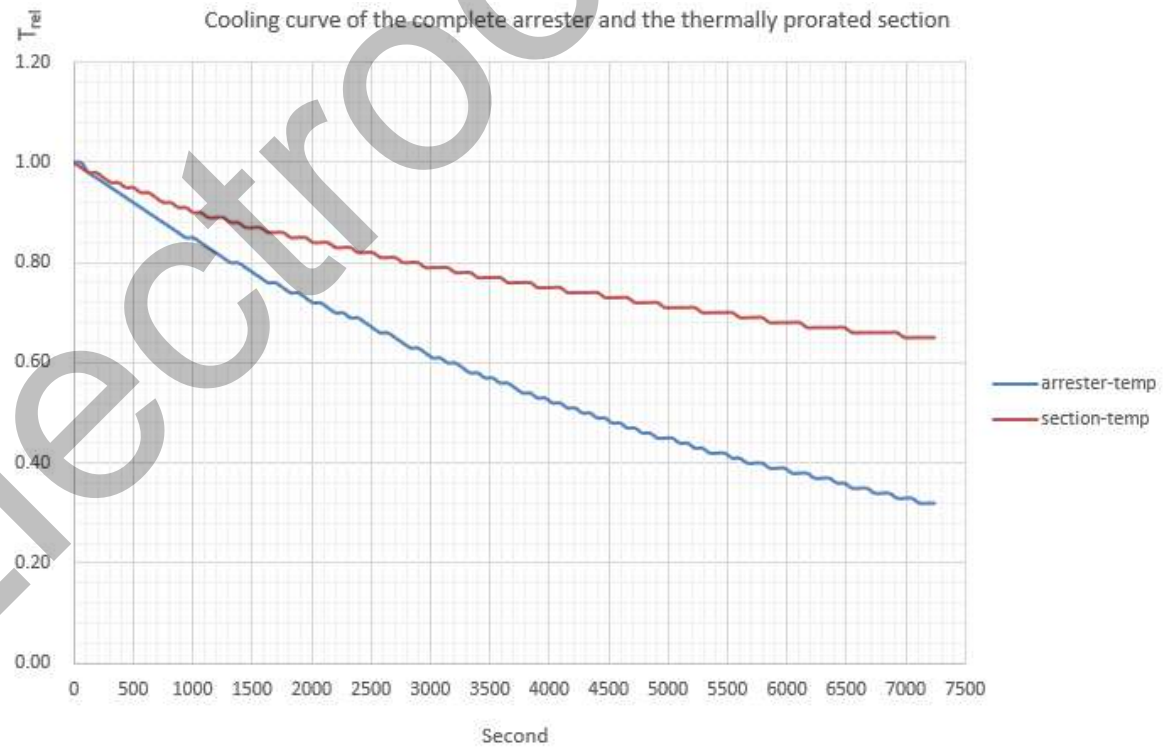
Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 5: IEC 60099-4 Clause 10.8.6 & Annex B Heat dissipation behaviour of test sample *(continued)*

Test results:

Measuring point during cooling period (second)	Complete arrester, 008 (T_A=16 ˚C)		Thermally prorated section, 210 (T_A=17 ˚C)	
	Measured resistor temperature during cooling period (˚C)	Relative over-temperature T_{rel}	Measured resistor temperature during cooling period (˚C)	Relative over-temperature T_{rel}
6552	64.34	0.35	100.69	0.66
6615	64.04	0.35	100.51	0.66
6678	63.52	0.35	100.34	0.66
6741	62.92	0.34	100.17	0.66
6804	62.54	0.34	100.00	0.66
6867	62.12	0.34	99.83	0.66
6930	61.71	0.33	99.66	0.66
6993	61.07	0.33	99.50	0.65
7056	60.73	0.33	99.34	0.65
7119	60.30	0.32	99.18	0.65
7182	59.78	0.32	99.02	0.65
7245	59.48	0.32	98.87	0.65

Cooling curves displaying the relative overtemperature of the complete arrester and of the thermally prorated section plotted as follows:



Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 5: IEC 60099-4 Clause 10.8.6 & Annex B Heat dissipation behaviour of test sample *(continued)*

Result:

The oscillogram showed, at any time, the measured cooling curve of the thermally prorated section did not fall below the measured cooling curve of the complete arrester, the compensation temperature (ΔT) calculated by:

$\Delta T = K*(T_0-T_A)_{max} = 0.01 * 136.5 = 1.4 \approx 2$ (˚C)

Where, T_0 is the maximum heating temperature.

T_A is the average ambient temperature during the test.

K is the max value of ($T_{rel\_arrester} - T_{rel\_section}$)

Conclusion:

The preheating temperature of sample for operating duty test and power-frequency voltage-versus-time test should be 62 ˚C.

Photograph nos.: P017 and P018

Date of tests: 22 and 24 November 2023

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 6: IEC 60099-4 Clause 10.8.7 Operating duty test

Test conditions:

1. Three test samples 201, 202 and 203 as new condition.
2. Before and after the tests, the residual voltage tests at nominal discharge current were conducted.
3. The applied voltage and their measuring system complied with the requirements of the standard.

Test results:

Test sample no.		201	202	203
Residual voltage @ 10 kA, 8/20 μs before test (kV peak)		8.64	8.64	8.64
Reference voltage of the resistor blocks at 1 mA reference current (kV r.m.s.)		3.59	3.57	3.63
Determinate U_r of the resistor blocks (kV r.m.s.) by manufacturer		3.59	3.57	3.63
Determinate U_c of the resistor blocks (kV r.m.s.) by manufacturer		2.87	2.86	2.90
Specified thermal energy rating W_{th} (kJ/kV)		8	8	8
Two times 100 kA±10%, 4/10μs high current impulses withstand test	1st (kA)	104.0	104.4	104.0
	2nd (kA)	104.0	104.0	104.0
Determinate and preheating start temperature: ϑ_{start}		62 ˚C		
Injected thermal energy in 3 minutes (>= 8 kJ/kV)	1st (kJ)	14.64	14.67	14.50
	2nd (kJ)	14.44	14.28	15.21
	Σ (kJ)	29.08	28.95	29.71
	W_{th} (kJ/kV) in fact	8.10	8.11	8.18
Apply voltage within 100 ms after the last injection of energy (ms)		94.0	95.0	90.4
Applied U_r of the resistor blocks (kV r.m.s.)		3.59	3.57	3.63
Durations (second)		10	10	10
Applied U_c of the resistor blocks (kV r.m.s.)		2.87	2.86	2.90
Durations (minutes)		30	30	30
Power dissipation at U_c (W)	1st second	54.70	52.19	59.08
	5th min	5.62	5.45	6.36
	10th min	4.69	4.63	5.02
	15th min	4.12	4.31	4.39
	20th min	3.85	3.90	4.06
	25th min	3.71	3.70	3.66
	30th min	3.61	3.56	3.47
Sample cooled to		Cooled to ambient 20 ˚C±15 ˚C		
Residual voltage @ 10 kA, 8/20 μs after test (kV peak)		8.73	8.73	8.85
Change of the residual voltage (%)		+1.04	+1.04	+2.43
Visual inspection of the test sample		No physical damage		

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 6: IEC 60099-4 Clause 10.8.7 Operating duty test *(continued)*

Result:

1. The thermal recovery of all test samples had been demonstrated.
2. All test samples had no physical damage during and after the tests.
3. The changes of the residual voltage of all test samples at nominal discharge current before and after the tests were within ±5 %.
4. The test samples passed the operating duty tests.

Oscillogram no.: 201

Photograph no.: P019

Test circuit: Figure 6

Date of tests: 28 and 29 January 2024

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 7: IEC 60099-4 Clause 10.8.8 Power-frequency voltage-versus-time test

Test conditions:

1. Six test samples 204~209 as new condition.
2. Before and after the tests, the residual voltage tests at nominal discharge current were conducted.
3. The applied voltage and their measuring system complied with the requirements of the standard.

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 7: IEC 60099-4 Clause 10.8.8 Power-frequency voltage-versus-time test *(continued)*

Test results of "with prior duty":

Test sample no.		204	205	206	207
Residual voltage @ 10 kA, 8/20 μs before test (kV peak)		8.64	8.64	8.72	8.69
U_{ref} of the resistor blocks at 1 mA reference current (kV r.m.s.)		3.58	3.57	3.65	3.63
Determinate U_r of the resistor blocks (kV r.m.s.) by manufacturer		3.58	3.57	3.65	3.63
Determinate U_c of the resistor blocks (kV r.m.s.) by manufacturer		2.86	2.86	2.92	2.90
Specified thermal energy rating W_{th} (kJ/kV)		8	8	8	8
Determinate and preheating start temperature: ϑ_{start}		62 ˚C			
Injected thermal energy in 3 minutes (>= 8 kJ/kV)	1st (kJ)	14.92	14.71	14.59	14.43
	2nd (kJ)	15.05	14.68	20.21	15.05
	Σ (kJ)	29.97	29.39	34.80	29.48
	W_{th} (kJ/kV) in fact	8.37	8.23	9.53	8.12
Apply voltage within 100 ms after the last injection of energy (ms)		94.0	92.0	96.0	92.0
Overvoltage published by the manufacturer		1.20*U_r	1.12*U_r	1.00*U_r	0.904*U_r
Overvoltage verified by the tests		1.20*U_r	1.12*U_r	1.00*U_r	0.904*U_r
Applied U_r of the resistor blocks (kV r.m.s.)		4.30	4.00	3.65	3.28
Overvoltage duration required by the standard (s)		0.1	10	100	3600
Overvoltage duration verified by the tests (s)		0.1	10	100	3600
Applied U_c of the resistor blocks (kV r.m.s.)		2.86	2.86	2.92	2.90
Durations (min)		30	30	30	30
Power dissipation at U_c (W)	1st second	117.0	107.5	9.59	5.69
	5th min	4.44	5.17	4.42	3.15
	10th min	3.82	4.05	3.88	3.08
	15th min	3.61	3.74	3.75	3.05
	20th min	3.38	3.41	3.72	3.00
	25th min	3.20	3.29	3.54	2.95
	30th min	3.14	3.06	3.22	2.86
Sample cooled to		Cooled to ambient 20 ˚C±15 ˚C			
Residual voltage @ 10 kA, 8/20 μs after test (kV peak)		8.72	8.72	8.81	8.81
Change of the residual voltage (%)		+0.93	+0.93	+1.03	+1.38
Visual inspection of the test sample		No physical damage			

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 7: IEC 60099-4 Clause 10.8.8 Power-frequency voltage-versus-time test *(continued))*

Test results of "without prior duty":

Test sample no.		208	209
Residual voltage @ 10 kA, 8/20 μs before test (kV peak)		8.60	8.60
U_{ref} of the resistor blocks at 1 mA reference current (kV r.m.s.)		3.61	3.58
Determinate U_r of the resistor blocks (kV r.m.s.) by manufacturer		3.61	3.58
Determinate U_c of the resistor blocks (kV r.m.s.) by manufacturer		2.89	2.86
Determinate and preheating start temperature: ϑ_{start}		62 ˚C	
Overvoltage published by the manufacturer		1.20*U_r	1.10*U_r
Overvoltage verified by the tests		1.20*U_r	1.10*U_r
Applied U_r of the resistor blocks (kV r.m.s.)		4.33	3.94
Overvoltage duration required by the standard		1s	100s
Overvoltage duration verified by the tests		1s	100s
Applied U_c of the resistor blocks (kV r.m.s.)		2.89	2.86
Durations (min)		30	30
Power dissipation at U_c (W)	1st second	4.09	3.14
	5th min	3.30	2.26
	10th min	3.01	2.24
	15th min	2.93	2.18
	20th min	2.91	2.18
	25th min	2.85	2.14
	30th min	2.83	2.13
Sample cooled to		Cooled to ambient 20 ˚C±15 ˚C	
Residual voltage @ 10 kA, 8/20 μs after test (kV peak)		8.69	8.69
Change of the residual voltage (%)		+1.05	+1.05
Visual inspection of the test sample		No physical damage	

Result:

1. The thermal recovery of all test samples was demonstrated.
2. All test samples did not have physical damage during and after the tests.
3. The changes of the residual voltage of all test samples at nominal discharge current before and after the tests were within ±5 %.
4. The test samples passed the power-frequency voltage-versus-time tests.

Oscillogram nos.: 204, 205, 206, 207, 208, 209

Photograph no.: P020

Test circuit: Figure 6

Date of tests: 28 and 29 January 2024

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 8: IEC 60099-4 Clause 10.8.10 short-circuit tests

Test conditions:

1. Four test samples SC01, SC02, SC03 and SC04 as new condition.
2. The test voltage was less than 77% of rated voltage per clause 10.8.10.4.3 of IEC 60099-4:2014 for the rated short-circuit current test and the reduced short-circuit current test, the test voltage frequency was 50 Hz.
3. Short-circuit test circuit was met requirements of IEC standard, a surrounding circular enclosure was made of non-metallic material and was positioned symmetrically with respect to the axis of the test sample, the height of the enclosure was 40 cm and its diameter was calculated by formula $D=1.2*(2*H+D_{arr})$, (H is the height of tested arrester unit; D_{arr} is the diameter of tested arrester unit).
4. Pre-failure test of voltage source method was used before short-circuit test, a voltage exceeding 1.15 times U_c was applied to test sample, it was caused the arrester to fail within (5 ± 3) min, then carried out short-circuit test within 15 min.
5. For the rated short-circuit current test, reduced short-circuit current test and low-current short-circuit test of “Design B” arrester, the peak value of the first half-cycle of the actual arrester test current shall be at least √2 times the r.m.s. value of the short circuit current.

Test results:

a) Rated short-circuit current test (I_s=50 kA r.m.s.)

Test sample no.	SC01
Applied voltage for pre-failure (kV)	143.8
Current when pre-failure (A)	< 30
Test duration (min)	3.56
Photograph no. before test	P021
Test voltage applied (kV r.m.s.)	18.6
Peak value of the first half-cycle current (kA)	98.7
Symmetrical current (kA r.m.s.)	50.8
Test duration (s)	0.23
Photograph no. after test	P022
Oscillogram no.	SC01-N240598-001

Result:

1. No violent shattering of structural parts of the sample.
2. No flames in or out of the enclosure after the tests.
3. The measured short-circuit current was verified to meet the requirement of standard.

Test circuit: Figure 8

Date of tests: 29 April 2024

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 8: IEC 60099-4 Clause 10.8.10 short-circuit tests *(continued)*

Test results:

b) Reduced short-circuit current test (25 kA r.m.s.)

Test sample no.	SC02
Applied voltage for pre-failure (kV)	144.2
Current when pre-failure (A)	< 30
Test duration (min)	3.56
Photograph no. before test	P023
Test voltage applied (kV r.m.s.)	18.5
Peak value of the first half-cycle current (kA)	58.0
Symmetrical current (kA r.m.s.)	25.3
Test duration (s)	0.203
Photograph no. after test	P024
Oscillogram no.	SC02-N240596-001

Result:

1. No violent shattering of structural parts of the sample.
2. No flames in or out of the enclosure after the tests.
3. The measured short-circuit current was verified to meet the requirement of standard.

Test circuit: Figure 8

Date of tests: 29 April 2024

c) Reduced short-circuit current test (12 kA r.m.s.)

Test sample no.	SC03
Applied voltage for pre-failure (kV)	142.6
Current when pre-failure (A)	< 30
Test duration (min)	3.82
Photograph no. before test	P025
Test voltage applied (kV r.m.s.)	10.5
Peak value of the first half-cycle current (kA)	33.4
Symmetrical current (kA r.m.s.)	12.9
Test duration (s)	0.213
Photograph no. after test	P026
Oscillogram no.	SC03-240057-001

Result:

1. No violent shattering of structural parts of the sample.
2. No flames in or out of the enclosure after the tests.
3. The measured short-circuit current was verified to meet the requirement of standard.

Test circuit: Figure 7

Date of tests: 7 March 2024

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 8: IEC 60099-4 Clause 10.8.10 short-circuit tests *(continued)*

Test results:

d) Low-current short-circuit test (600±200 A r.m.s.)

Test sample no.	SC04
Applied voltage for pre-failure (kV)	146.1
Current when pre-failure (A)	< 30
Test duration (min)	3.45
Photograph no. before test	P027
Test voltage applied (kV r.m.s.)	140.4
Peak value of the first half-cycle current (kA)	1.06
Symmetrical current (A r.m.s.)	682
Test duration (s)	1.036
Photograph no. after test	P028
Oscillogram no.	SC04-240307-001

Result:

1. No violent shattering of structural parts of the sample.
2. No flames in or out of the enclosure after the tests.
3. The measured short-circuit current was verified to meet the requirement of standard.

Test circuit: Figure 8

Date of tests: 7 March 2024

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 9: IEC 60099-4 Clause 10.8.11 Test of the bending moment

Test conditions:

1. Three test samples 001, 002 and 003 as new condition.
2. Test procedure: arresters for U_s > 52 kV.
3. The test consisted of three steps:
   Step 1:
   1000 cycle bending moment on three samples to applied load from zero to long-term load (SLL) in one direction, followed by loading to SLL in the opposite direction, then returning to zero load with a frequency in the range 0.01 Hz ~ 0.5 Hz, the maximum deflection during the test and any residual deflection was recorded, the residual deflection was measured in the interval 1 min to 10 min after the load released.

   Step 2.1:
   Short-term load (SSL) test on 001 and 003, the load was increased smoothly to specified SSL within 30 s to 90 s, maintained for 60 s to 90 s in the end, then released smoothly, the maximum deflection during the test and any residual deflection was recorded, the residual deflection was measured in the interval 1 min to 10 min after the load released.

   Step 2.2:
   Mechanical / thermal preconditioning on 002, the terminal torque was applied to this sample for a duration of 30 s, then the SLL was applied in four directions and the thermal variations was consisted of two 48 h cycles of heating and cooling as described in Figure 11 of IEC 60099-4: 2014, the direction of SLL changed every 24 h, at any temperature in the transition from hot to cold, or from cold to hot, as defined in Figure 12 of IEC 60099-4: 2014, the temperature of the hot and cold periods was maintained for at least 16 h.

   Step 3:
   After the above-mentioned test, all three samples were subjected to a water immersion test.
4. Specified long-term load (SLL) was 1.4 kN.m , specified short-term load (SSL) was 3.5 kN.m, specified terminal torque was 50 N.m.
5. Evaluation criterion:
   - After step 2, no visible damage; the slop of the force-deflection curve remains positive up to the SSL value except for dips not exceeding 5 % of SSL magnitude, maximum deflection and any remaining permanent deflection was reported.
   - After step 3, the change rate of power loss should not exceed 20% or increase value was not more than 20 mW/kV, the internal partial discharge should not exceed 10 pC at 1.05 times U_c; the change rate of residual voltage should not exceed 5%, the change rate of residual voltage between two successive impulses at normal discharge current should not exceed 2%, the change rate of reference voltage should not exceed 2%.

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 9: IEC 60099-4 Clause 10.8.11 Test of the bending moment *(continued)*

Test procedure and results:

Test sample no.		001	003
Before test	Continuous operating voltage U_c (kV r.m.s.)	110.4	110.4
	Watt loss at U_c (W)	6.85	7.37
	Ambient temperature (˚C) at 20 November	16	16
	Partial discharge at 1.05*U_c (pC)	2.2	1.9
	Reference voltage at reference current 1mA (kV r.m.s.)	123.9	124.1
	1st: Residual voltage at nominal discharge current	9.94 kA, 302.3 kV peak	9.94 kA, 299.4 kV peak
Step 1: 1000 cycles of bending moment test in SLL load	Number of cycles	1000	1000
	Frequency for cyclic motion (Hz)	0.011	0.011
	Height from the actual load to the horizontal mounting base (mm)	1325	1325
	Actual load for test (kN)	1.06	1.06
	Maximum deflection (mm)	84.44	97.24
	Residual deflection after load release (mm)	5	16
	Visual inspection	No visible mechanical damage	No visible mechanical damage
	Photograph no.	P029	
Step 2: Bending moment test in SSL load	Actual load for test (kN)	2.65	2.65
	Height of the actual load (m)	1.325	1.325
	Converted to moment of force (kN.m)	3.51	3.51
	Force maintaining time before load release (s)	63	63
	Housing height (mm)	1325	1325
	Maximum deflection (mm)	168.03	158.81
	Residual deflection after load release (mm)	19	11
	Force-deflection curve	No dips in curve when force positive up to SSL	No dips in curve when force positive up to SSL
	Visual inspection	No visible damage	No visible damage
	Photograph no.	P030	

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 9: IEC 60099-4 Clause 10.8.11 Test of the bending moment *(continued)*

Test procedure and results:

Step 3: Water immersion test	Boiling deionized water 1 kg/m^3 of NaCl for 42 h;	Time: 2023-11-25 15:00~2023-11-27 09:00, then removed the sample and placed under ambient temperature for cooling dry 5 h, then carried out the verification test within 3 h.	
	Preparing evaluation tests		
	Photograph no.	P031	
After test	Watt loss at U_c (W), change rate (%) and increase value (mW/kV)	7.75, +13.14 9.38 mW/kV	7.65, +3.80 2.92 mW/kV
	Ambient temperature (˚C) on 27 November	14.5	14.5
	Partial discharge at 1.05*U_c (pC)	0.1	0.1
	2nd: Residual voltage at nominal discharge current and change rate (%)	309.4 kV peak, +2.35	311.6 kV peak, +4.07
	Reference voltage at reference current 1mA (kV r.m.s.) and change rate (%)	123.6, -0.24	123.8, -0.24
	3rd: Residual voltage at nominal discharge current	10.10 kA, 306.9 kV peak	10.32 kA, 305.1 kV peak
	4th: Residual voltage at nominal discharge current and change rate (%)	10.16 kA, 307.01kV peak, +0.03	10.22 kA, 305.1kVpeak, 0
	Reference voltage at reference current 1mA (kV r.m.s.) and change rate (%)	123.3, -0.24	123.5, -0.24
	Visual inspection	No visible damage	
Date of tests		20 to 28 November 2023	

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 9: IEC 60099-4 Clause 10.8.11 Test of the bending moment *(continued)*

Test procedure and results:

Test sample no.		002
Before test	Continuous operating voltage U_c (kV r.m.s.)	110.4
	Watt loss at U_c (W)	7.44
	Ambient temperature (˚C) on 20 November 2023	16
	Partial discharge at 1.05*U_c (pC)	1.9
	Reference voltage at reference current 1mA (kV r.m.s.)	124.1
	1st: Residual voltage at nominal discharge current	9.72 kA, 305.0 kV peak
Step 1: 1000 cycles of bending moment test in SLL load	Number of cycles	1000
	Frequency for cyclic motion (Hz)	0.011
	Height from the actual load to the horizontal mounting base (mm)	1325
	Actual load for test (kN)	1.06
	Maximum deflection (mm)	94.90
	Residual deflection after load release (mm)	13
	Visual inspection	No visible mechanical damage
Step 2: Mechanical/ thermal preconditioning	Applied terminal torque	50 N.m for a duration of 30 s
	Applied SLL and thermal variations	Figure 11 & 12 as described in standard of IEC 60099-4: 2014
	Height of the actual load (m)	1.325
	Actual load for test (kN)	1.06
	Converted to moment of force (kN.m)	1.40
	Temperature and duration (maintained time more than 16 h at high temperature +60˚C, +45˚C and low temperature -25˚C, -40˚C)	Time: 2023-11-21 10:00 to 2023-11-22 10:00 Temperature: +60 ˚C, load angle: 0˚
		Time: 2022-11-22 10:00 to 2022-11-23 10:00 Temperature: -25 ˚C, load angle: 180˚
		Time: 2022-11-23 10:00 to 2022-11-24 10:00 Temperature: +45 ˚C, load angle: 90˚
		Time: 2021-11-25 10:00 to 2022-11-25 10:00 Temperature: -40 ˚C, load angle: 270˚
	Visual inspection	No visible mechanical damage
	Photograph no.	P032

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 9: IEC 60099-4 Clause 10.8.11 Test of the bending moment *(continued)*

Test procedure and results:

Step 3: Water immersion test	Boiling deionized water 1 kg/m^3 of NaCl for 42 h	Time: 2023-11-25 15:00~2023-11-27 09:00, then removed the sample and placed under ambient temperature for cooling dry 5 h, then carried out the verification test within 3 h.
	Preparing evaluation tests	
	Photograph no.	P031
After test	Watt loss at U_c (W) and change rate (%), increase value (mW/kV)	6.39, -14.11, -10.94
	Ambient temperature (˚C) on 27 November 2023	14.5
	Partial discharge at 1.05*U_c (pC)	1.7
	2nd: Residual voltage at nominal discharge current and change rate (%)	10.21 kA, 306.3 kV peak, +0.43
	Reference voltage at reference current 1 mA (kV r.m.s.) and change rate (%)	123.7, -0.32
	3rd: Residual voltage at nominal discharge current	9.93 kA, 311.3 kV peak
	4th: Residual voltage at nominal discharge current and change rate (%)	9.90 kA, 310.9 kV peak, -0.13
	Reference voltage at reference current 1mA (kV r.m.s.) and change rate (%)	122.6, -089
	Visual inspection	No visible damage
Date of tests		20 to 28 November 2023

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 10: IEC 60099-4 Clause 10.8.14 Radio interference voltage (RIV) test

Subclause 10.8.14 is same as subclause 8.14 without modification

Test conditions:

1. Three test samples 005, 006 and 007 as in a clean and dry condition.
2. The test voltage was applied between the top terminal and the bottom earthing terminal.
3. The radio influence voltage was measured at a frequency of 1 MHz.
4. The measuring circuit for the radio interference voltage test was complied with CISPR/TR 18-2.
5. Ambient conditions: 6.5 °C, 30% RH.

Test results:

Test voltage (kV, r.m.s.)	Duration (min)	Applied voltage (kV, r.m.s.)			Measured RIV level (μV, r.m.s.)			Limit of the manufacturer (μV, r.m.s.)
		005	006	007	005	006	007	
1.15*U_c	/	127.0	154.6	220.8	214	151	240	500
1.05*U_c	5	115.9	141.1	201.6	191	240	191	500
1.0*U_c	/	110.4	134.4	192.0	191	190	191	500
0.9*U_c	/	99.4	121.0	172.8	180	151	180	500
0.8*U_c	/	88.3	107.5	153.6	170	151	180	500
0.7*U_c	/	77.3	94.1	134.4	170	151	151	500
0.6*U_c	/	66.2	80.6	115.2	170	151	151	500
0.5*U_c	/	55.2	67.2	96.0	151	120	135	500
0.6*U_c	/	66.2	80.6	115.2	170	151	151	500
0.7*U_c	/	77.3	94.1	134.4	170	151	151	500
0.8*U_c	/	88.3	107.5	153.6	170	151	170	500
0.9*U_c	/	99.4	121.0	172.8	190	170	170	500
1.0*U_c	/	110.4	134.4	192.0	190	170	180	500
1.05*U_c	5	115.9	141.1	201.6	180	191	206	500
1.0*U_c	/	110.4	134.4	192.0	170	152	179	500
0.9*U_c	/	99.4	121.0	172.8	169	152	179	500
0.8*U_c	/	88.3	107.5	153.6	169	150	170	500
0.7*U_c	/	77.3	94.1	134.4	169	150	170	500
0.6*U_c	/	66.2	80.6	115.2	169	150	140	500
0.5*U_c	/	55.2	67.2	96.0	152	130	135	500

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 10: IEC 60099-4 Clause 10.8.14 Radio interference voltage (RIV) test *(continued)*

Result:

The measured RIV levels were within the limit required by the standard and the manufacturer.

Photograph nos.: P033, P034 and P035

Test circuit: Figure 9

Date of tests: 23 January 2024

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 11: IEC 60099-4 Clause 10.8.15 Test to verify the dielectric withstand of internal components

Subclause 10.8.15 is same as subclause 8.15 without modification

Test conditions:

1. One test sample 211 as new condition.
1. The test sample was heated in an oven for a time sufficient to obtain thermal equilibrium to 60℃, the test was performed within 10 minutes after removing from the oven, a high-current impulse with amplitude according to table 4 of IEC 60099-4: 2014 was used for this test.

Test results:

Test sample no..		211
Residual voltage @ 10 kA, 8/20 μs, before test (kV, peak)		8.81
Preheated sample to temperature of (℃)		60±3
One 4/10 μs, 100 kA high-current impulse (kA, peak)		100.8
Sample cooled to		Cooled to ambient 20 ˚C±15 ˚C
Residual voltage @ 10 kA, 8/20 μs, after sample cooled to ambient temperature (kV, peak)		8.85
Change of the residual voltage (%)		+0.45
Visual inspection		No puncture, flashover, cracking and other significant damage
Evaluation test	Two 8/20 current impulse check, Test current was 10.61 kA (kA, peak)	10.72
		10.64
	Oscillograms check	No breakdown

Result:

1. No dielectric breakdown during the tests.
2. No physical damage during and after the tests.
3. The changes of the residual voltage of test sample at nominal discharge current before and after the tests were within ±5 %.
4. The test sample passed the test to verify the dielectric withstand of internal components.

Oscillogram no.: 211-01, 211-02, 211-03

Photograph no.: P036

Test circuit: Figure 10

Date of tests: 23 November 2023

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 11: IEC 60099-4 Clause 10.8.17 weather ageing test

This test has two parts: salt fog test and ultra-violet (UV) light test.

Part one: salt fog test

Test conditions:

1. Sample 004 was used as a complete arrester of YH10W-60 as representative of this series arresters recommended by customer, its rated voltage was 60 kV, continuous operating voltage was 48 kV, creepage distance was 2210 mm.
2. The test sample was in a clean condition before starting test and mounted vertically, there was enough clearance between the roof of the chamber and test sample and from the walls to avoid electrical field disturbance.
3. The test voltage was applied between the top terminal and the bottom earthing terminal, the fog filled the chamber and was not directly sprayed onto the test sample.
4. After test, the reference voltage measured was not decreased by more than 5%, the partial discharge level was not exceeded 10 pC.
5. Temperature in test chamber: 21~25 °C, water flow rate: 0.4 l/h/m^3, Size of droplets: 5~10 μm, NaCl content of water: 3.0 kg/m^3.

Test results:

Test sample no.		004
Before test	Reference voltage at reference current 1 mA (kV r.m.s.)	62.1
	Partial discharge at 1.05*U_c (pC)	2.2
salt fog test	Applied voltage (kV r.m.s.)	48.0
	Duration for applied voltage (h)	1000 Begin time: 2023-11-30 10:00 am End time: 2024-1-11 10:00 am
	Power supply interruption times	0
	Flashover times	0
	Salt fog interruption times	0
	Photograph no.	P037
After test	Reference voltage at reference current 1 mA (kV r.m.s.)	63.0
	Change rate of reference voltage compared to before test (%)	+1.43
	Partial discharge at 1.05*U_c (pC)	0.1
Visual inspection		No tracking occurred in the surface of test sample. No erosion occurred through the entire thickness of the external coating up to the next layer of material. No punctured in the sheds and housing.
Date of tests		20 November 2023 to 28 January 2024

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

Test no. 11: IEC 60099-4 Clause 10.8.17 weather ageing test *(continued)*

Part two: UV light test

Test conditions:

1. Three test specimens 501, 502, 503 was used.
2. The insulator housing material specimens were subjected to a 1000 h UV light test using Fluorescent UV methods according to ISO 4892-1 and ISO 4892-3, using type I fluorescent UV lamp, exposure method 1.
3. Temperature in test chamber: 60˚C for 8 h UV light, 50˚C for 4 h condensation, irradiance: 0.76 W/m^2, circular 1000 hours.
4. After test, the roughness, R_z as defined in ISO 4287, shall not exceed 0.1 mm.

Test results:

Test sample no.		501	502	503
UV light test		Time duration: 1000 h Begin time: 2023.11.30 10:30 am; End time: 2024 01.11 10:30 am		
Roughness R_z (μm)	Frontage side	3.774	4.351	5.058
	Reverse side	4.683	4.574	5.186

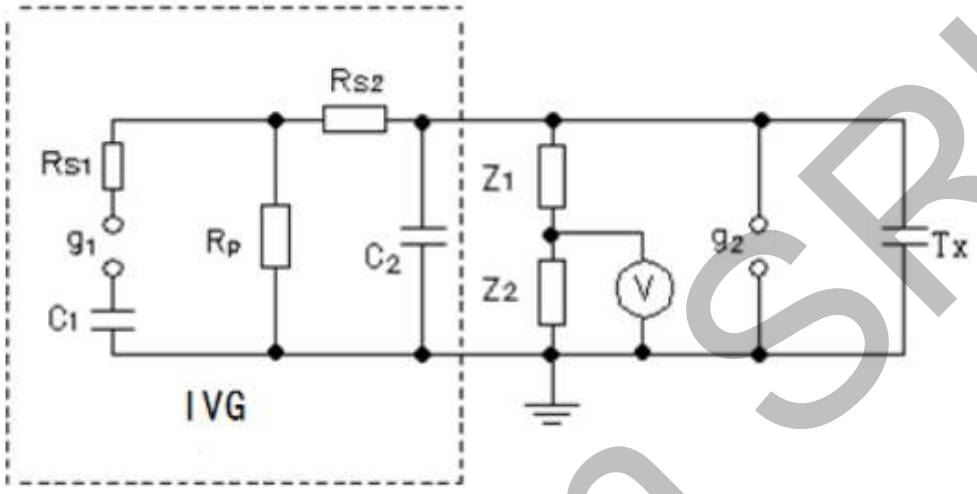
Result:

No visible cracks and raised areas in the surface of test specimens, the samples passed the test.

Photograph no.: P038

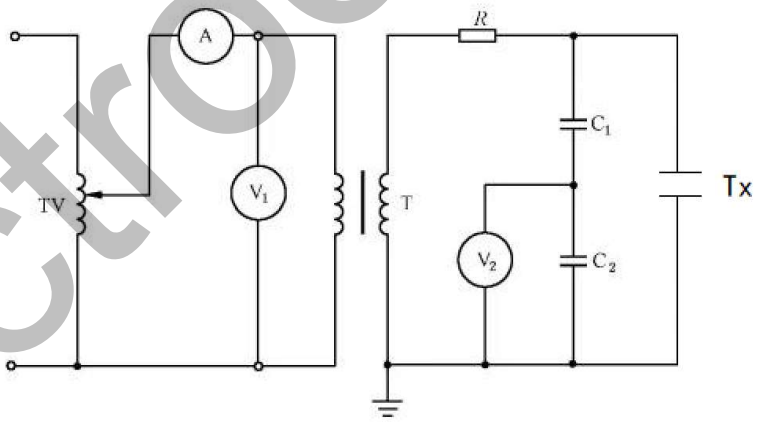
Date of tests: 20 November 2023 to 11 January 2024

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B



Rep.	Designation	Rep.	Designation
IVG	Impulse voltage generator	Z1, Z2, V	Impulse voltage measurement system
g2	Chopped impulse device	Tx	Test object

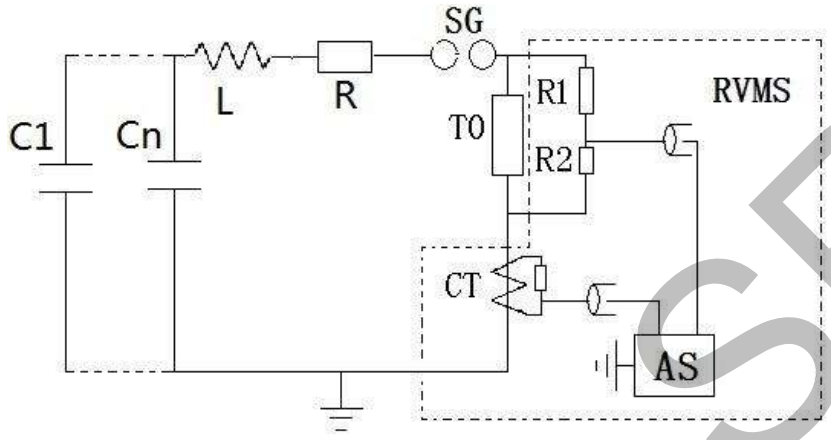
Figure 1- Test circuit for lightning impulse voltage withstand tests



Rep.	Designation	Rep.	Designation
TV	Regulators	T	Testing Transformer
V1, V2	Voltmeter	Tx	Test object
R	Protect resistor	A	Ammeter
C1, C2	High voltage capacitor / Low voltage capacitor for voltage divider		

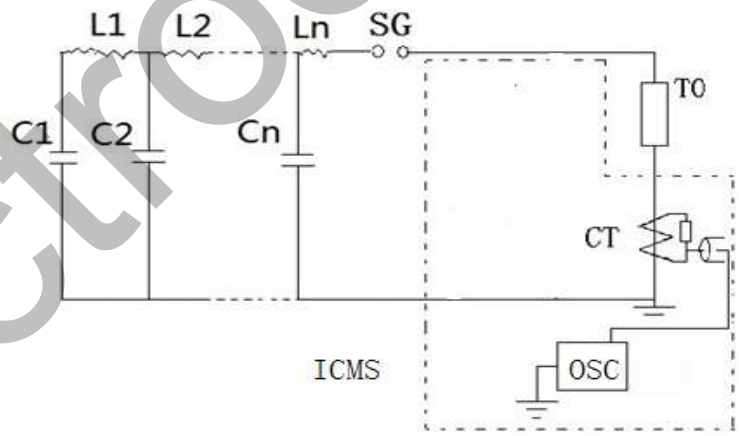
Figure 2 - Test circuit for power-frequency voltage withstand tests

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B



Rep.	Designation	Rep.	Designation
C1~Cn	Parallel capacitor	L	Circuit inductor
CT	Current transformer	R	Circuit resistor
SG	Sphere gap	R1/R2	H.V./L.V. arm resistance
AS	Acquisition device	TO	Test object
RVMS	Residual voltage measuring system		

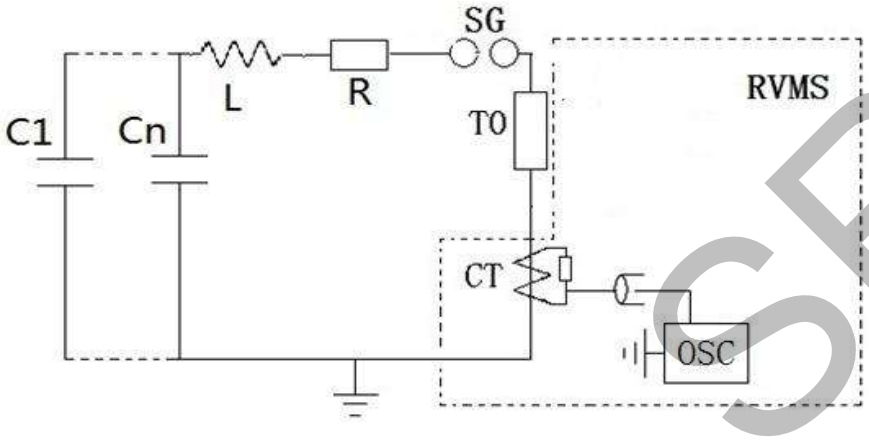
Figure 3 - Test circuit of residual voltage test



Rep.	Designation	Rep.	Designation
C1~Cn	Capacitors of impulse current generator	L1~Ln	Inductors of impulse current generator
SG	Sphere gap	CT	Current transformer
OSC	Oscilloscope	TO	Test object
ICMS	Long-duration current impulse measurement system		

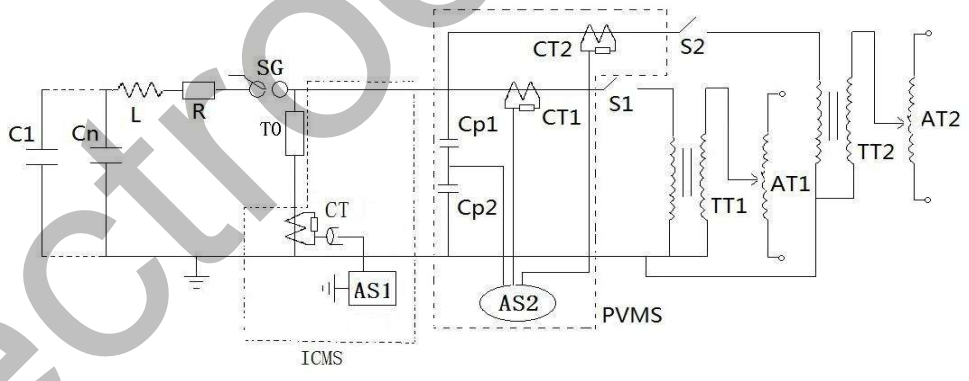
Figure 4 - Test circuit of verify the repetitive charge transfer rating, Q_{rs} test

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B



Rep.	Designation	Rep.	Designation
C1~Cn	Parallel capacitor	TO	Test object
L	Circuit inductor	R	Circuit resistor
SG	Sphere gap	CT	Current transformer
OSC	Oscilloscope	RVMS	Impulse current measuring system

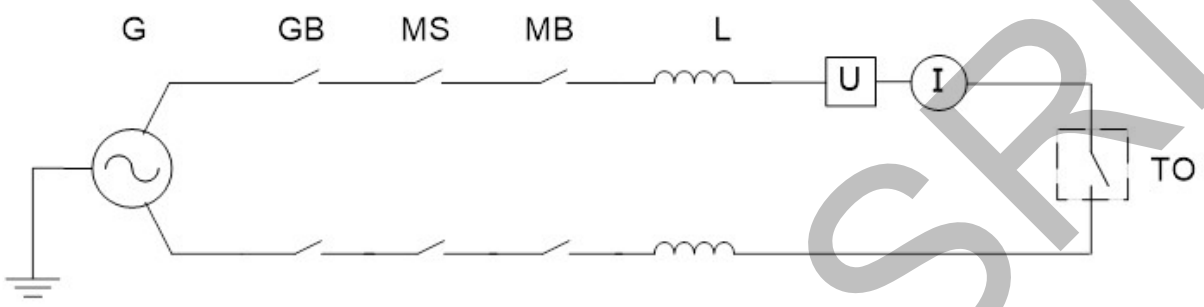
Figure 5 - Test circuit of verify the repetitive charge transfer rating for current impulse test



Rep.	Designation	Rep.	Designation
AT1	Regulators 1	TT1	Testing transformer 1
AT2	Regulators 2	TT2	Testing transformer 2
C1~Cn	Parallel capacitor	TO	Test object
L	Circuit inductor	R	Circuit resistor
Cp1/Cp2	H.V/ L.V arm capacitance	CT, CT1, CT2	Current transformer
AS1, AS2	Acquisition device	S1, S2	Gang switch
SG	Sphere gap		
ICMS	Impulse Current measuring system		
PVMS	Power frequency voltage measuring system		

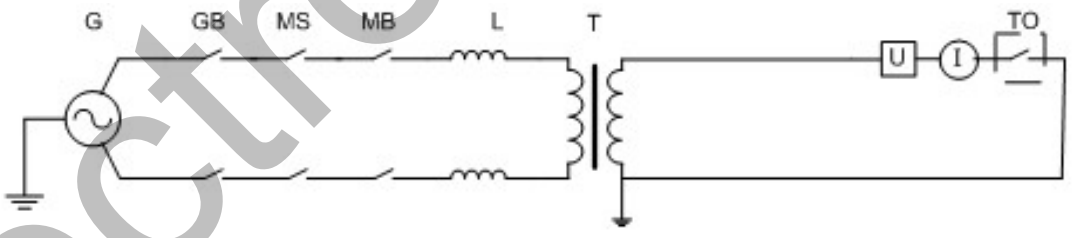
Figure 6 - Test circuit of operating duty and power-frequency voltage-versus-time test

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B



Rep.	Designation	Rep.	Designation
G	Generator	L	Reactor
GB	Generator breaker	MB	Master breaker
MS	Making switch	I	Current measurement
U	Voltage measurement	TO	Test object

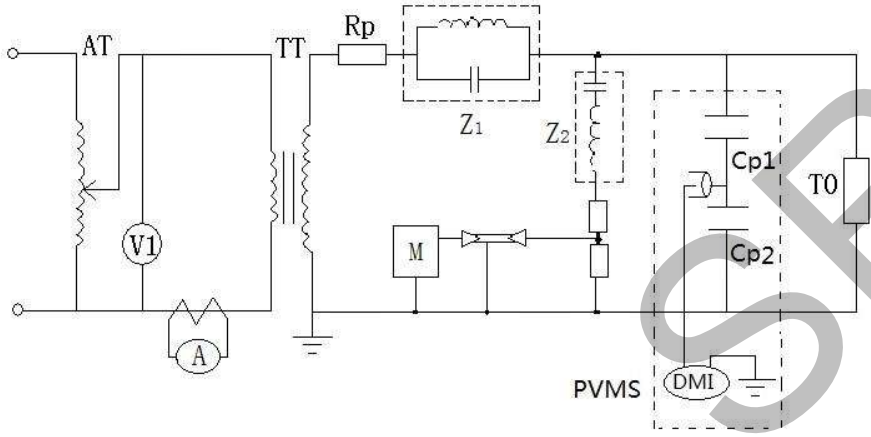
Figure 7 - Test circuit of short-circuit tests



Rep.	Designation	Rep.	Designation
G	Generator	L	Reactor
GB	Generator breaker	MB	Master breaker
MS	Making switch	I	Current measurement
U	Voltage measurement	TO	Test object
T	Transformer		

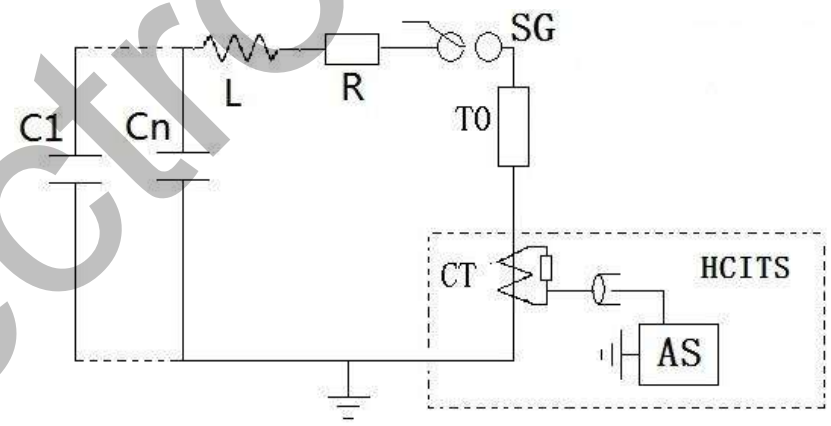
Figure 8 - Test circuit of short-circuit tests

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B



Rep.	Designation	Rep.	Designation
TT	Testing transformer	TO	Test object
AT	Regulators	Rp	Protection resistance
V1	Voltmeter	A	Ammeter
Cp1/Cp2	H.V/ L.V arm capacitance	DMI	Digital measuring instrument
Z1	Blocking impedance	Z2	Coupling impedance
M	RIV measuring device		
PVMS	Power frequency voltage measuring system		

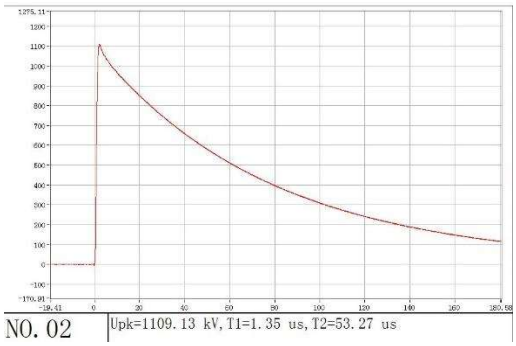
Figure 9 - Test circuit of radio interference voltage (RIV) test



Rep.	Designation	Rep.	Designation
C1~Cn	Parallel capacitor	TO	Test object
L	The wave inductor	R	The wave resistor
SG	Sphere gap	CT	Current transformer
AS	Acquisition device	HCITS	High Current Impulse test system

Figure 10 - Test circuit to verify the dielectric withstand of internal components (high-current impulse)

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B



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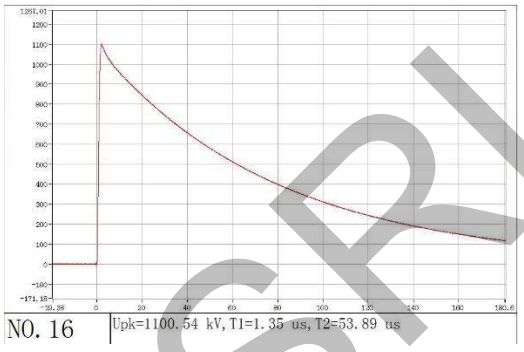

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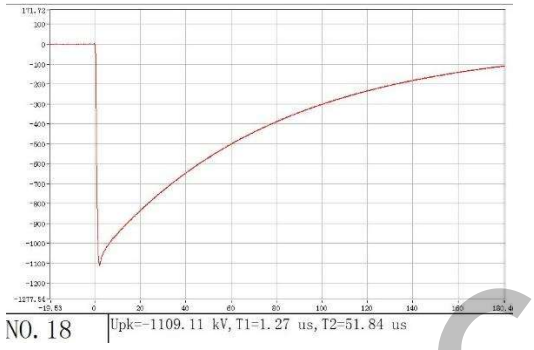

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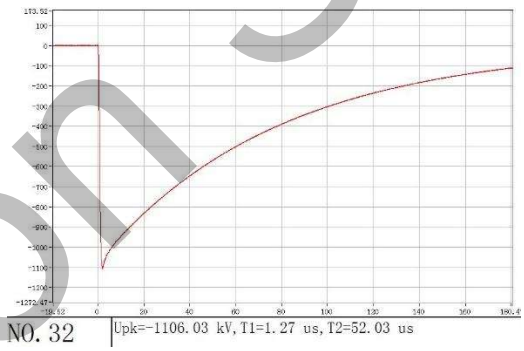

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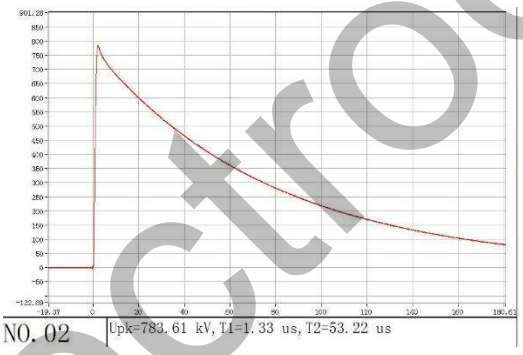

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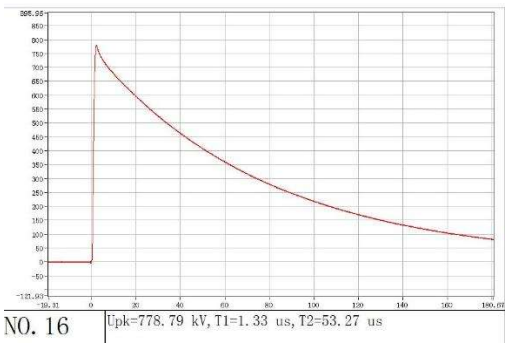

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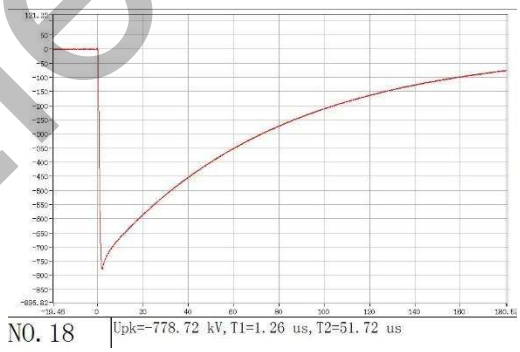

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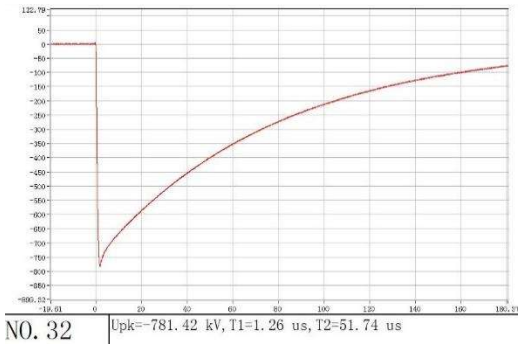

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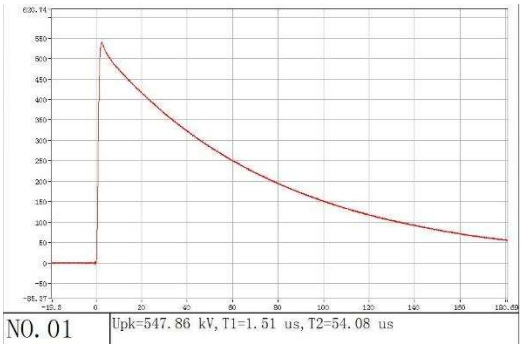

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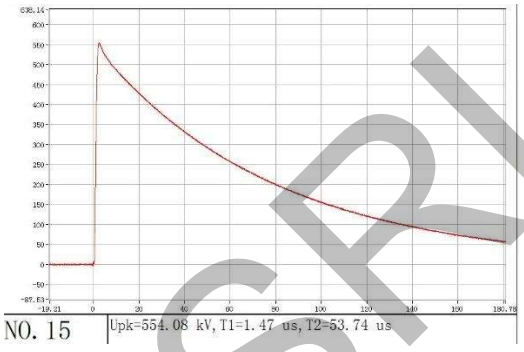

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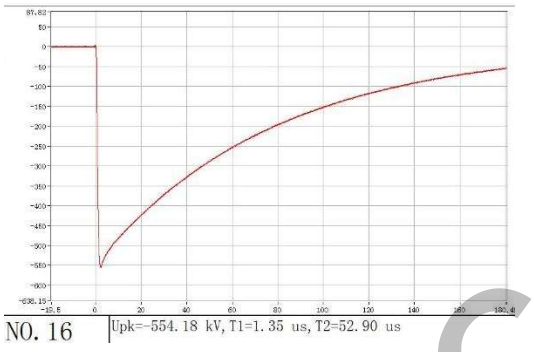

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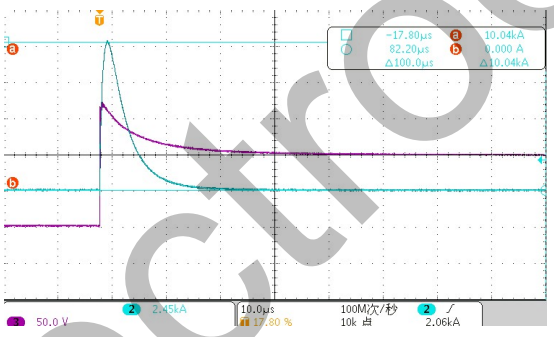

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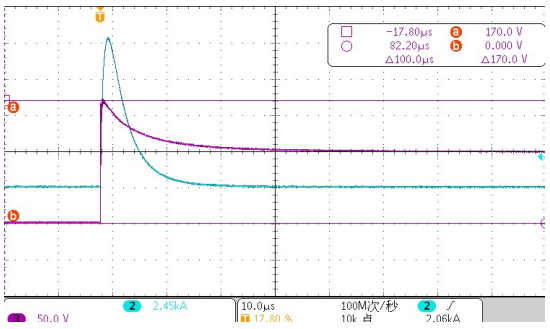

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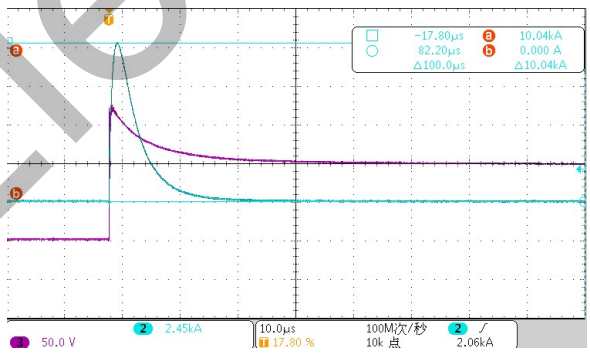

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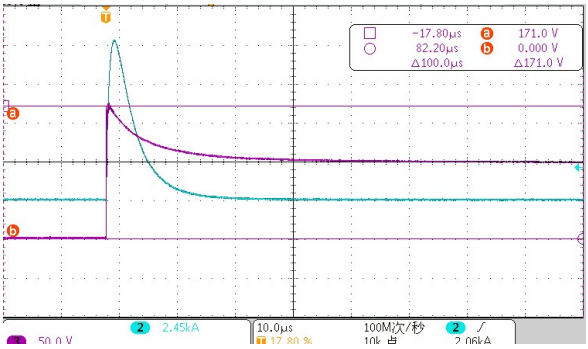

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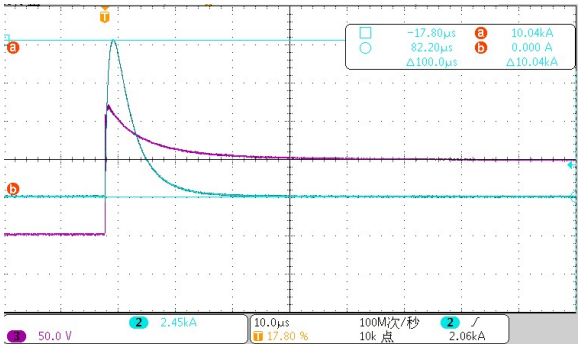

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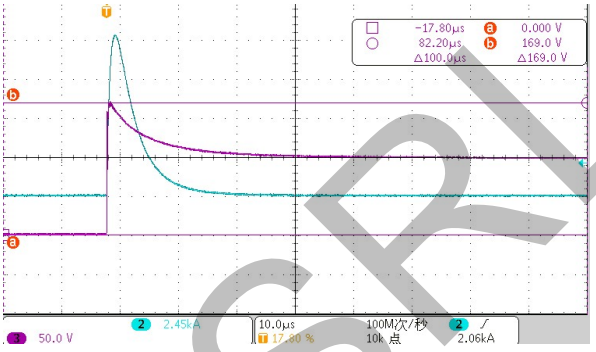

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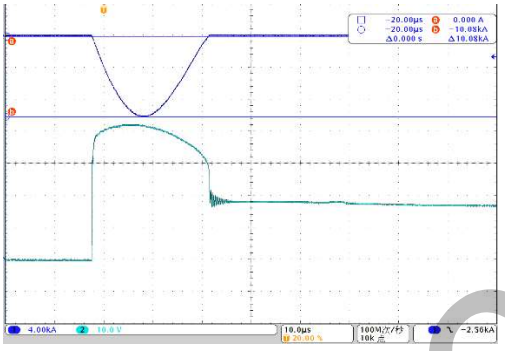

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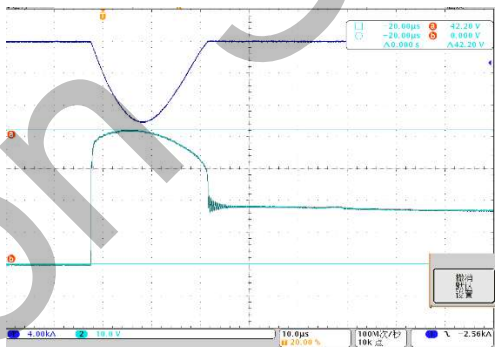

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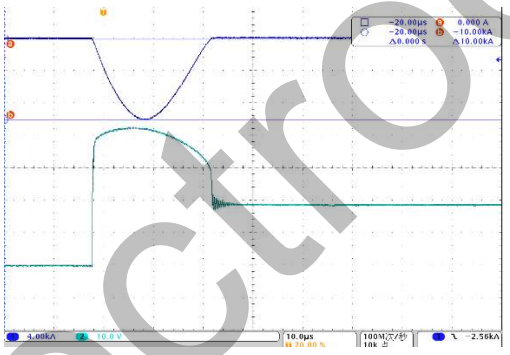

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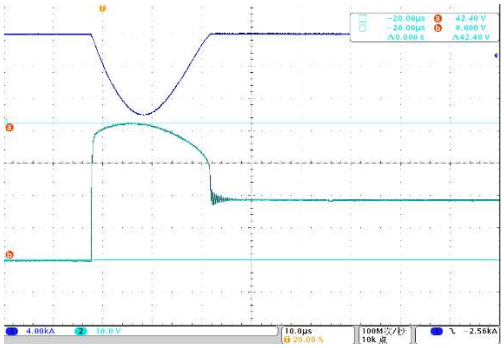

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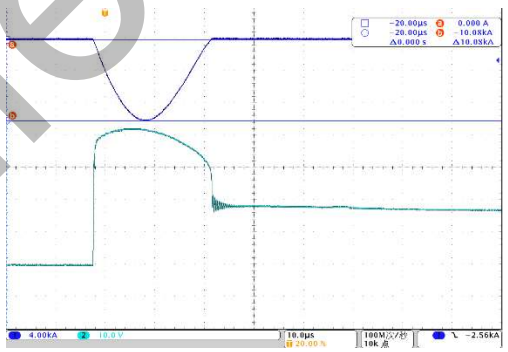

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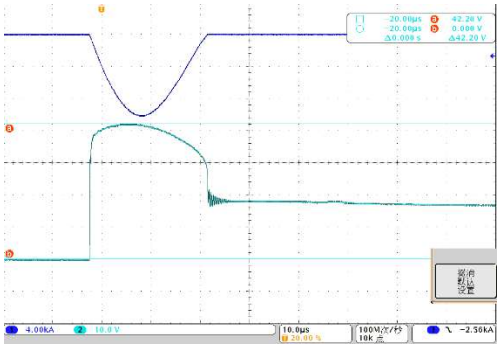

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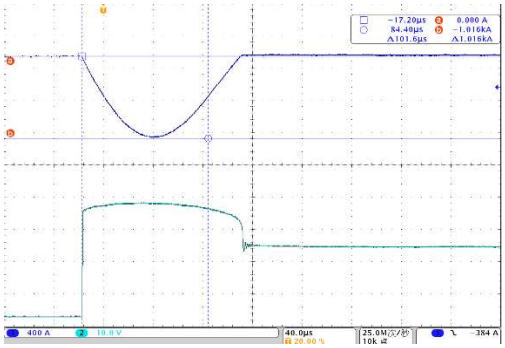

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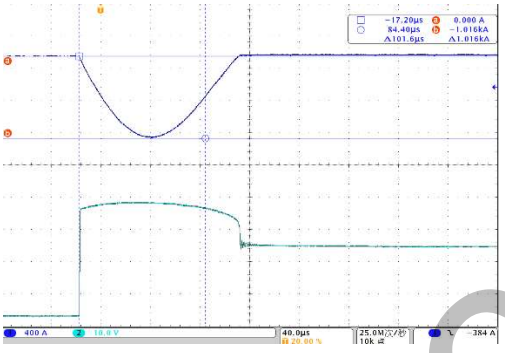

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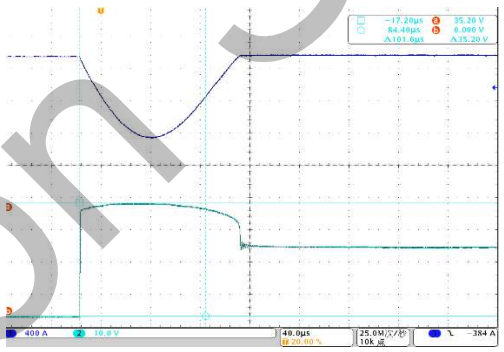

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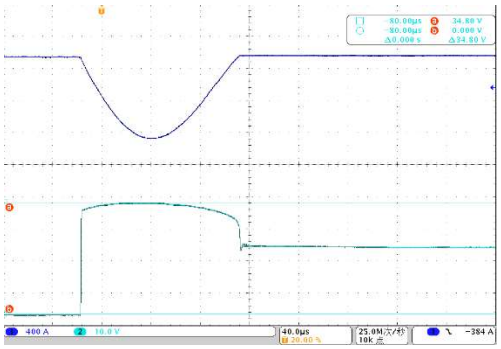

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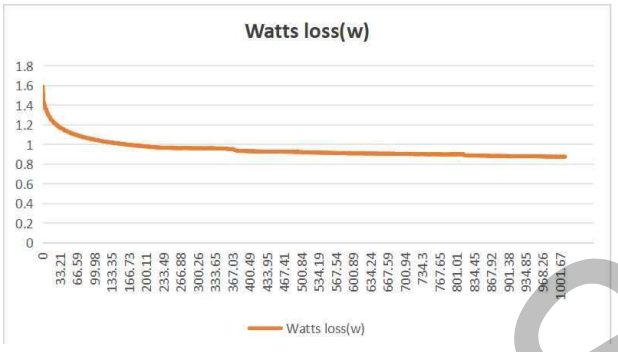
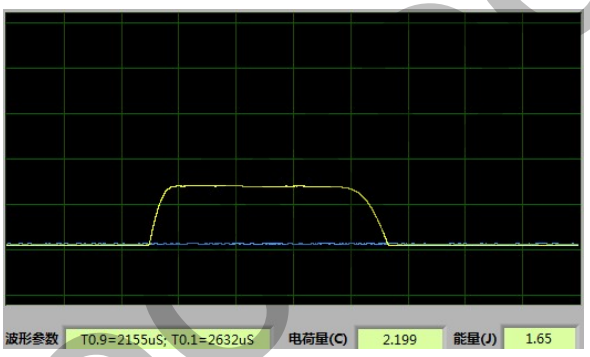
311

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

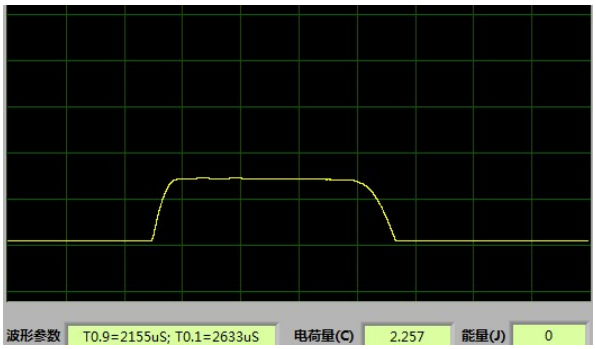


312

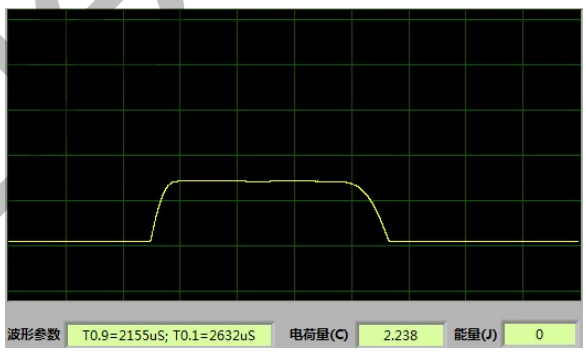
313



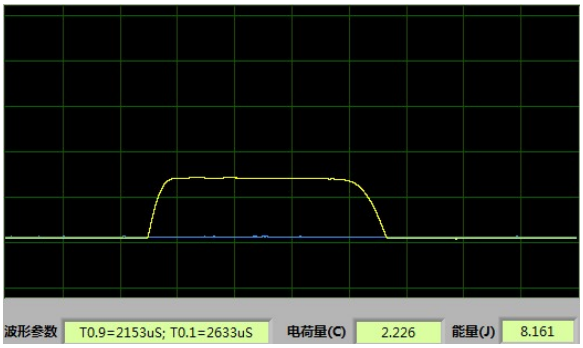
301-20



302-20

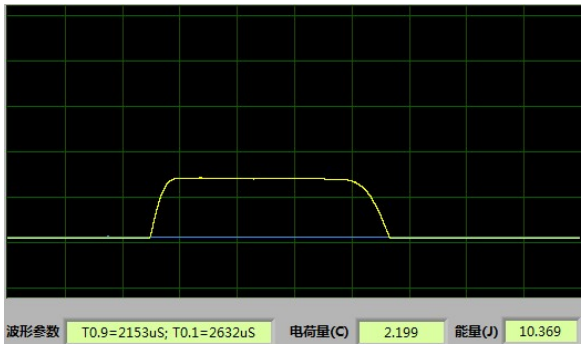


303-20

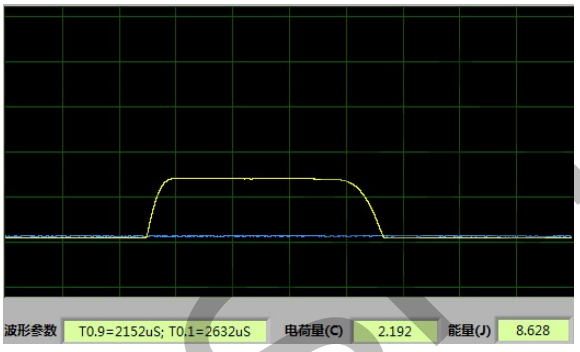


304-20

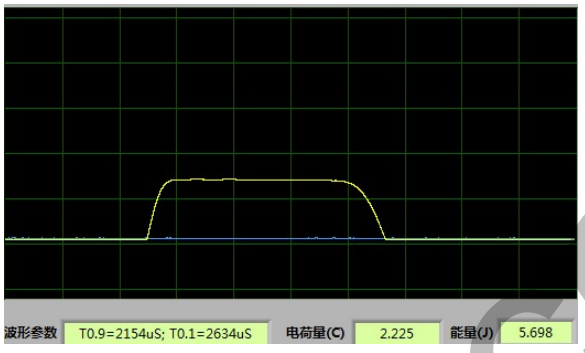
Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B



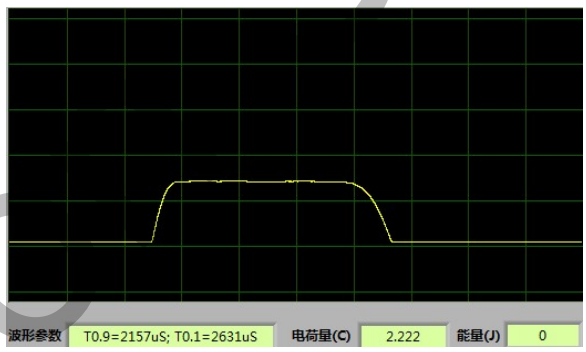
305-20



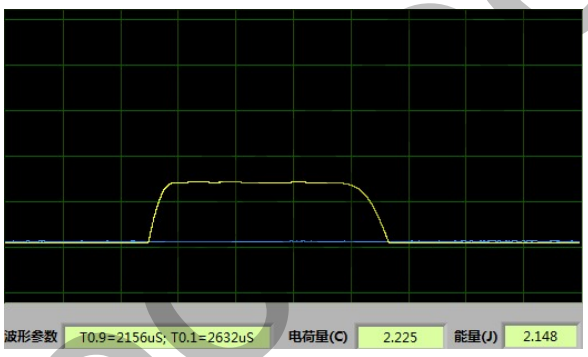
306-20



307-20



308-20



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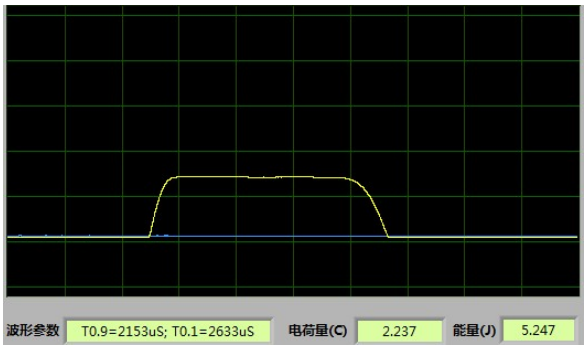
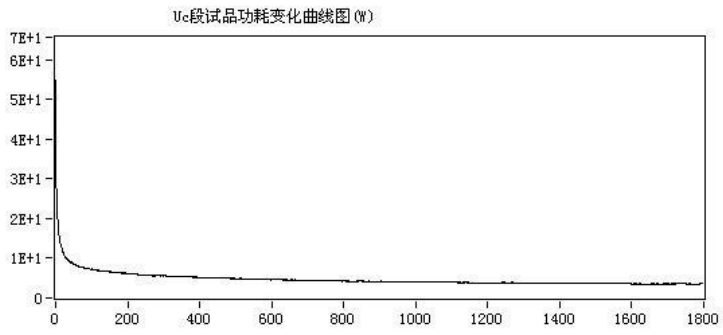
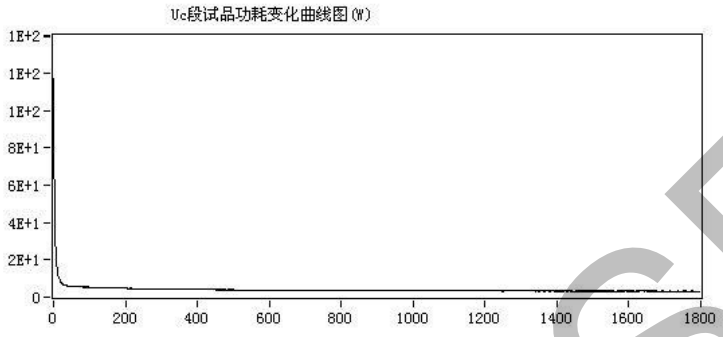


310-20

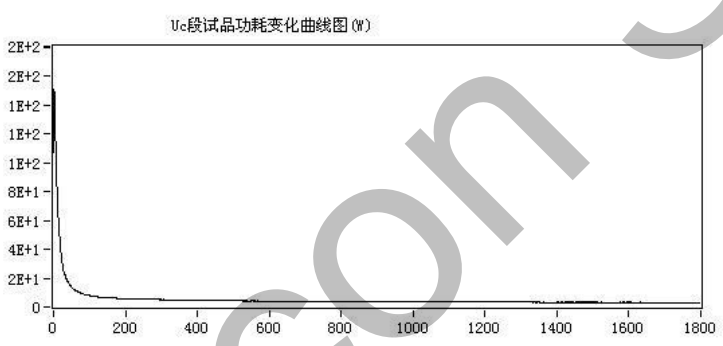


201

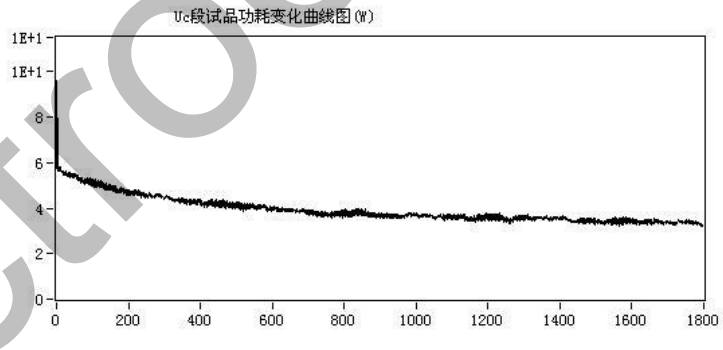
Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B



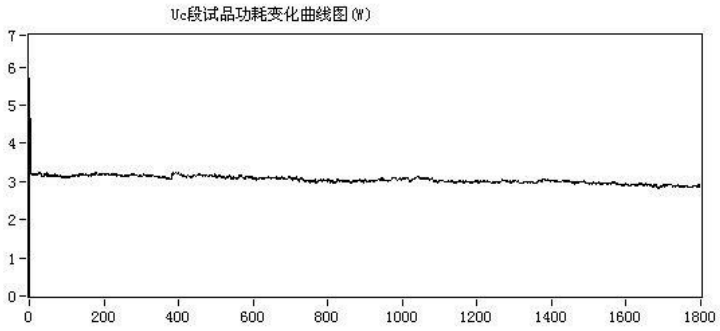
204



205

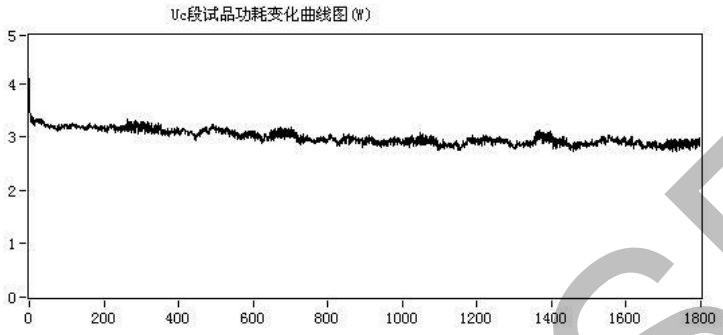


206

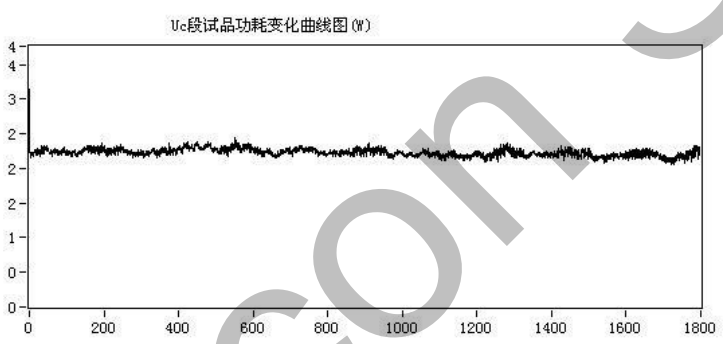


207

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B



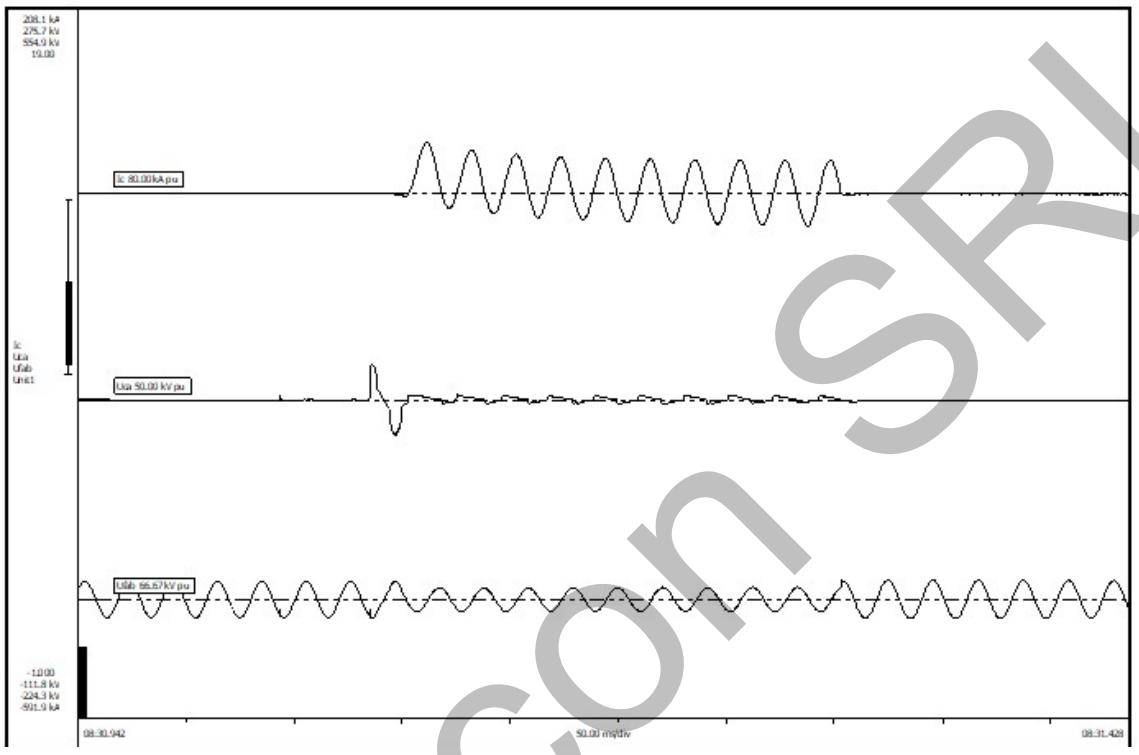
208



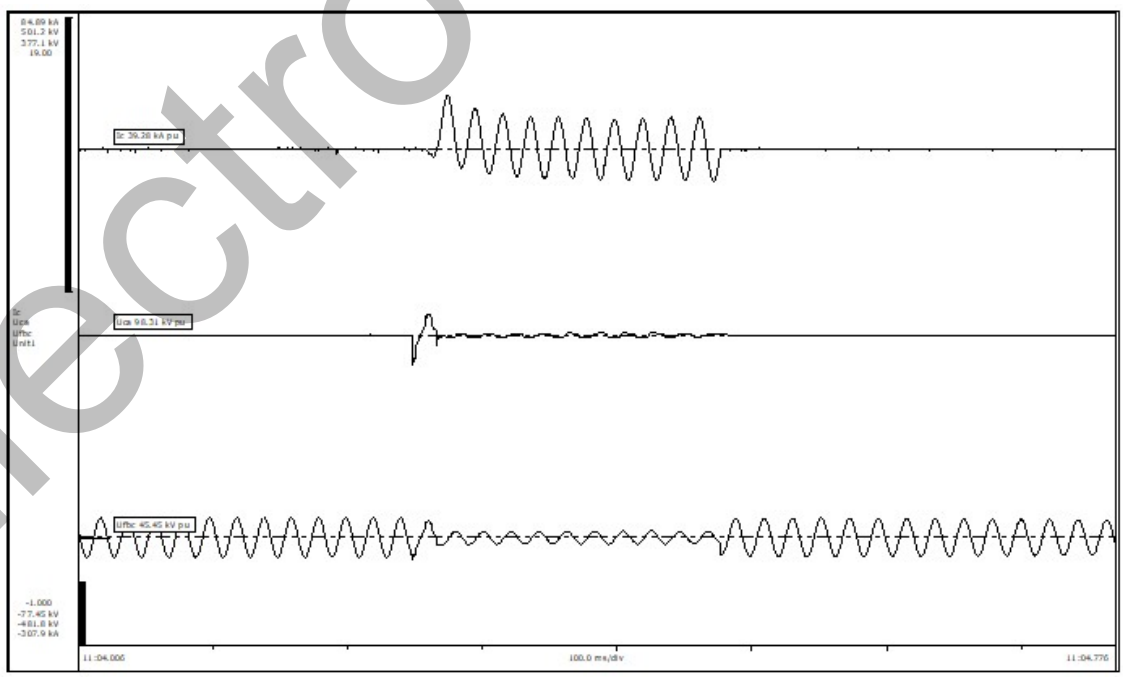
209

SC01-N240598-001

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

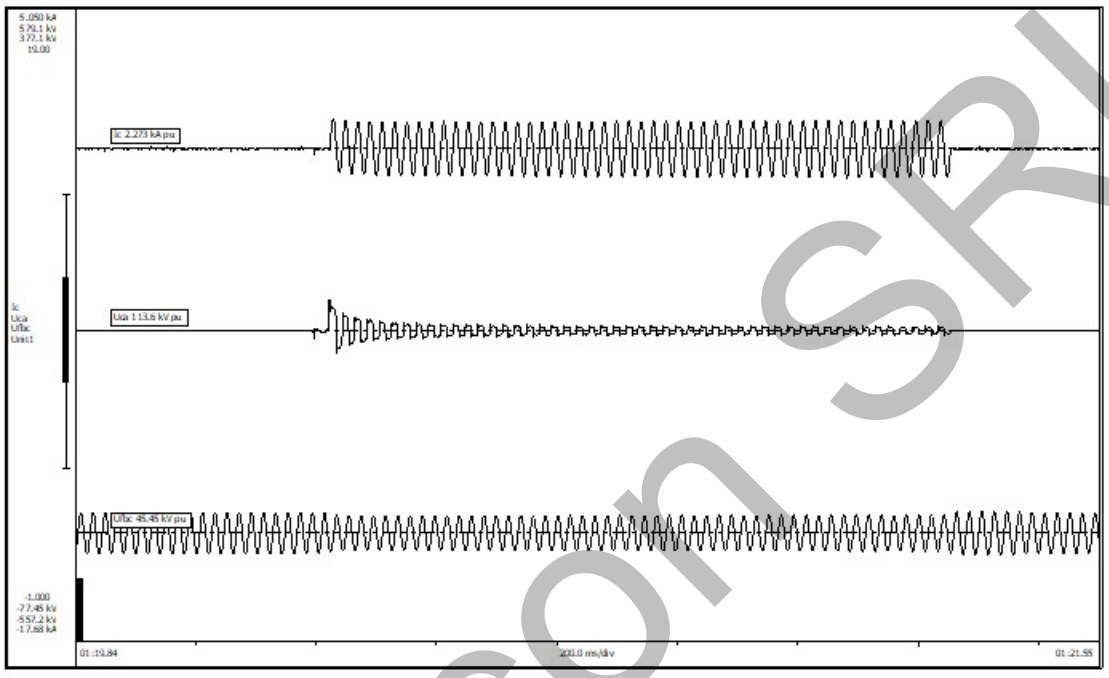


SC02-N240596-001



SC03-240308-004

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B



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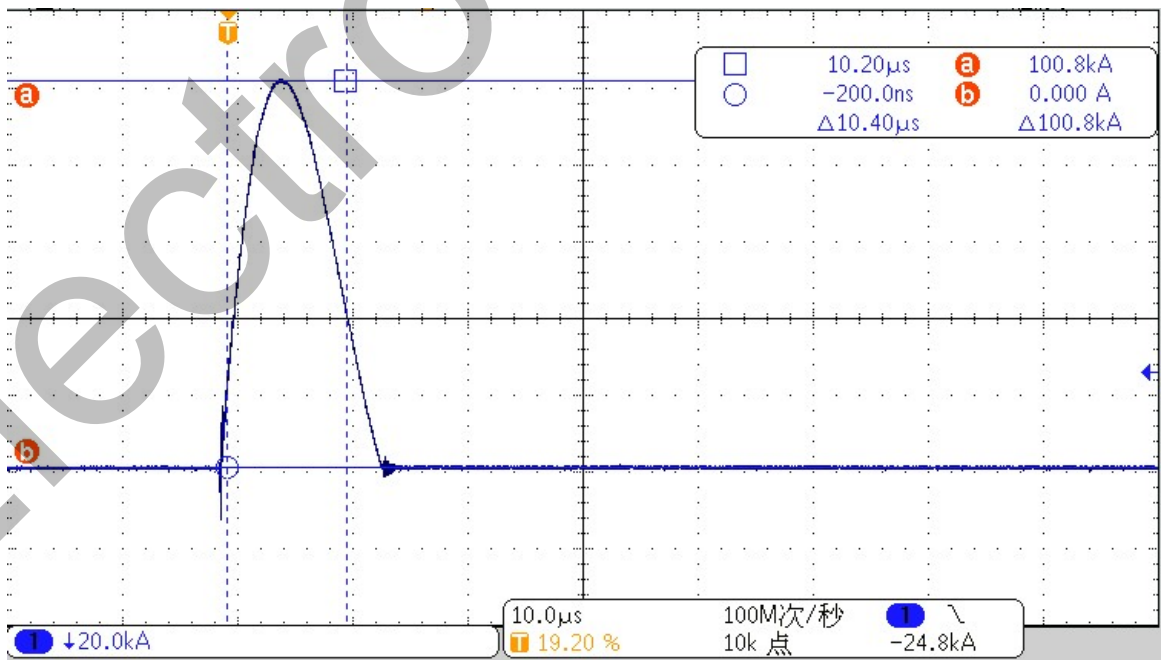
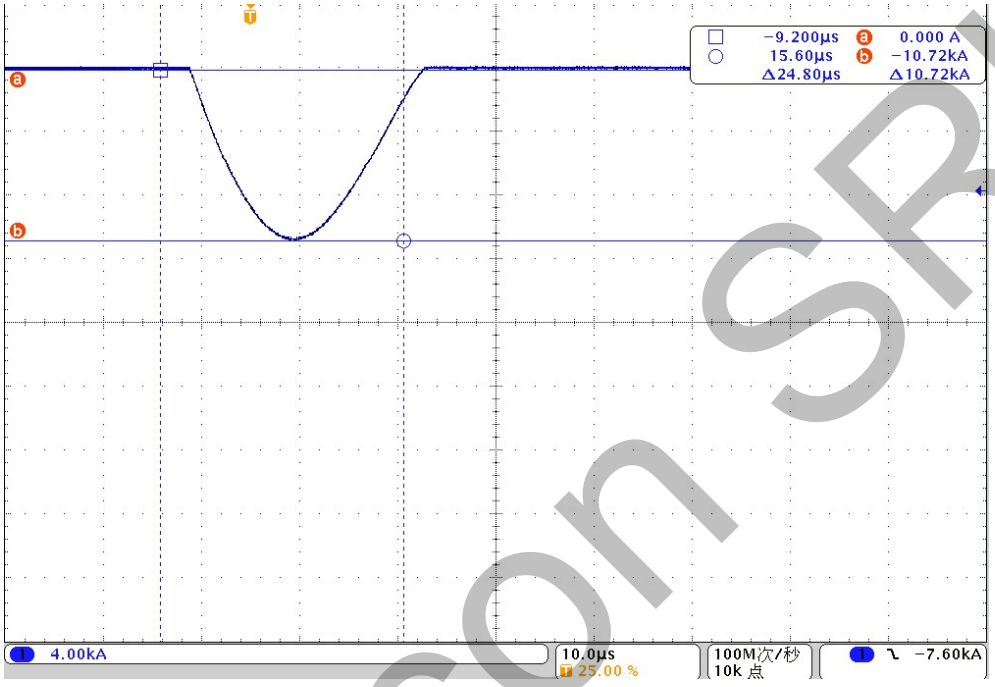
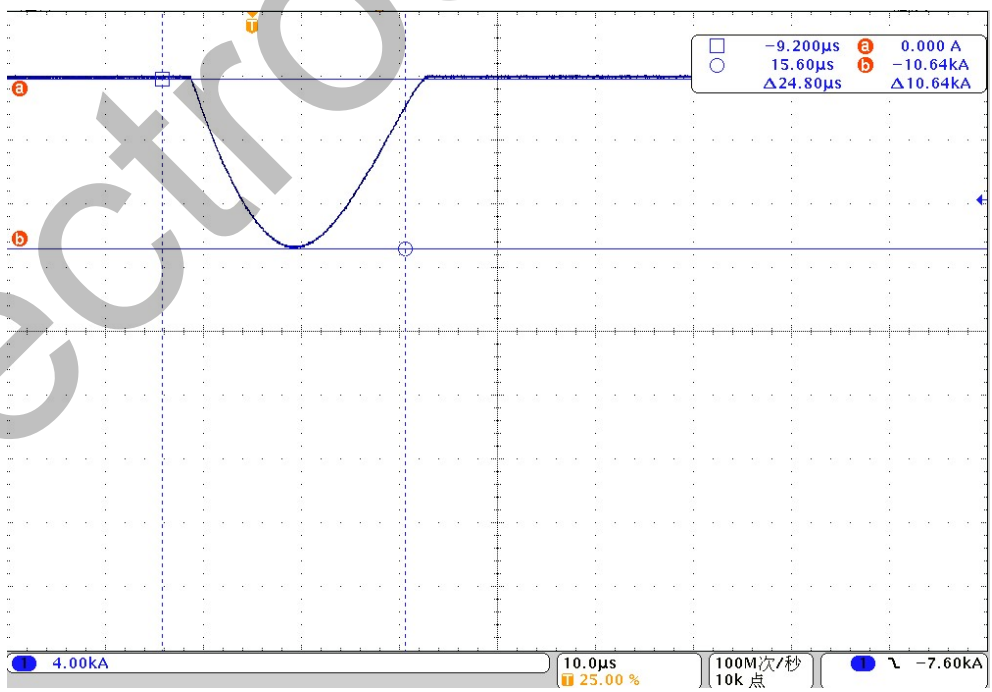


211-1

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

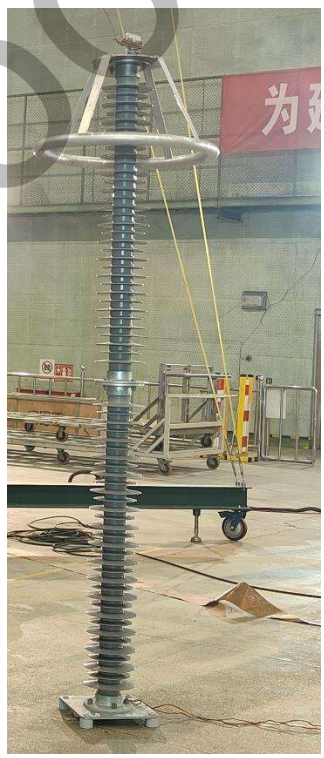


211-2



211-3

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B



P001

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

P002

P003

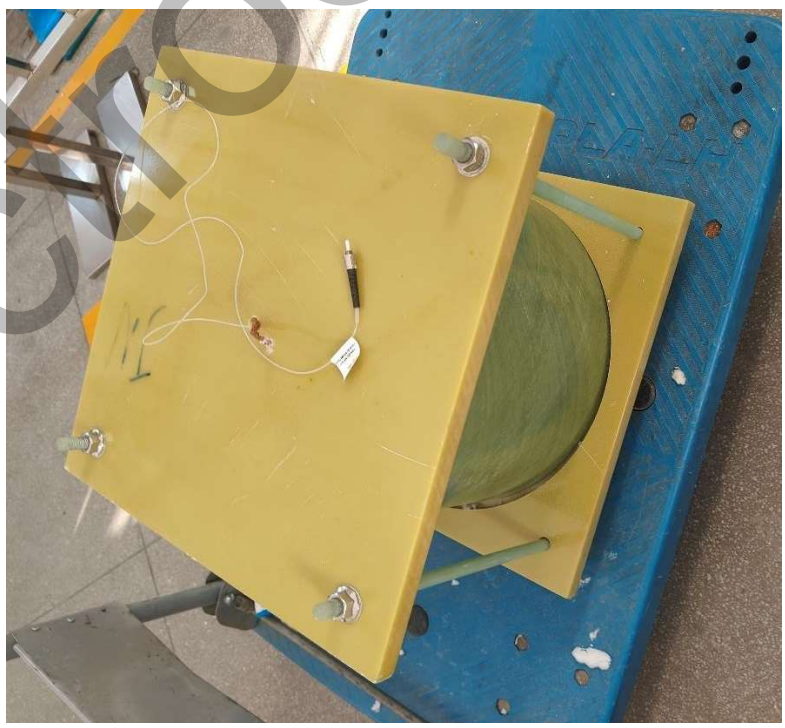
Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

P004

P005

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

P006



P007

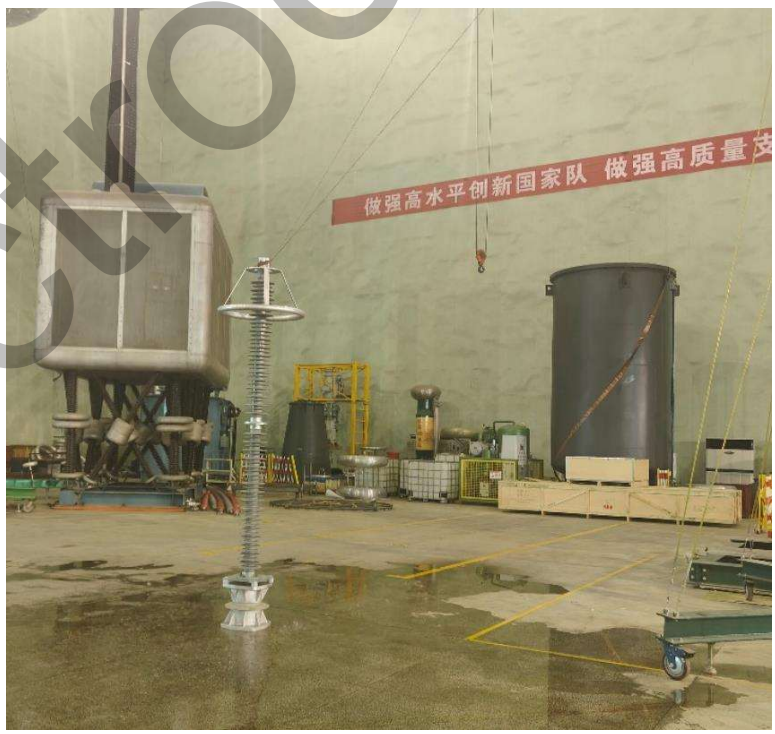
Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

P008

P009

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

P010



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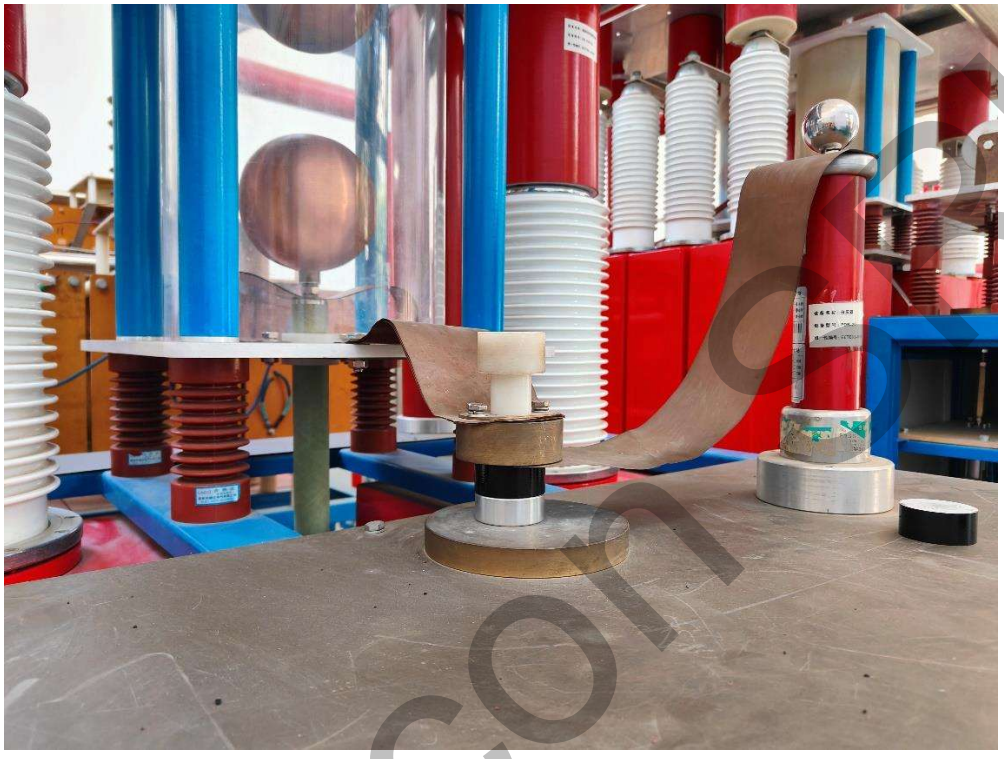
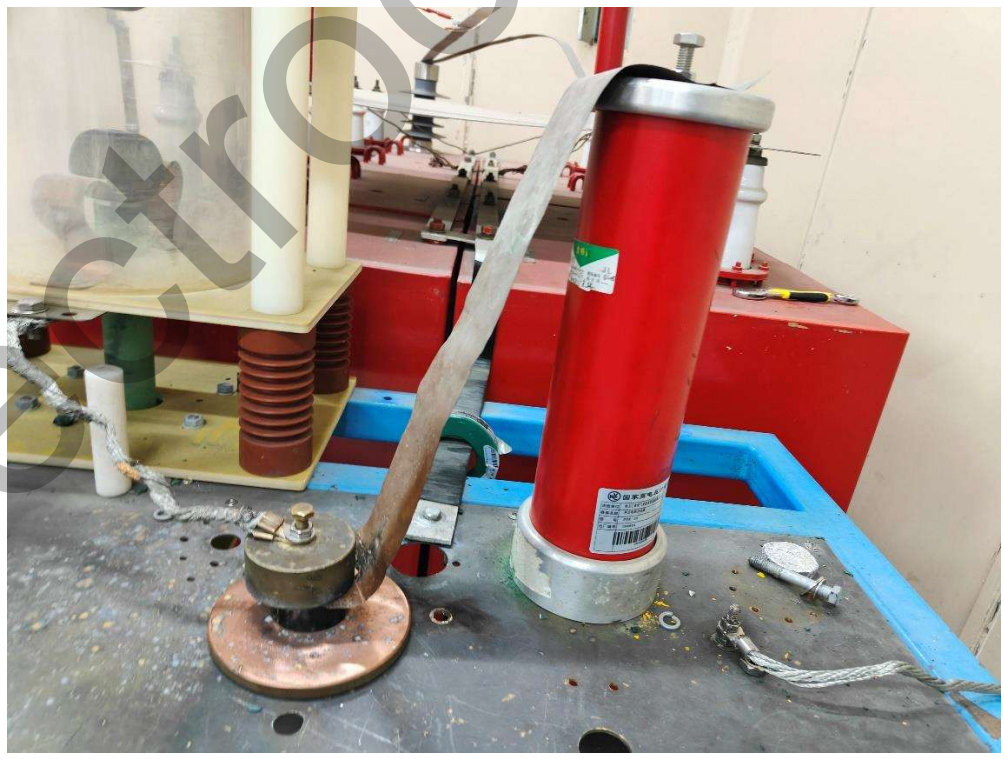


P012



P013

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

P014

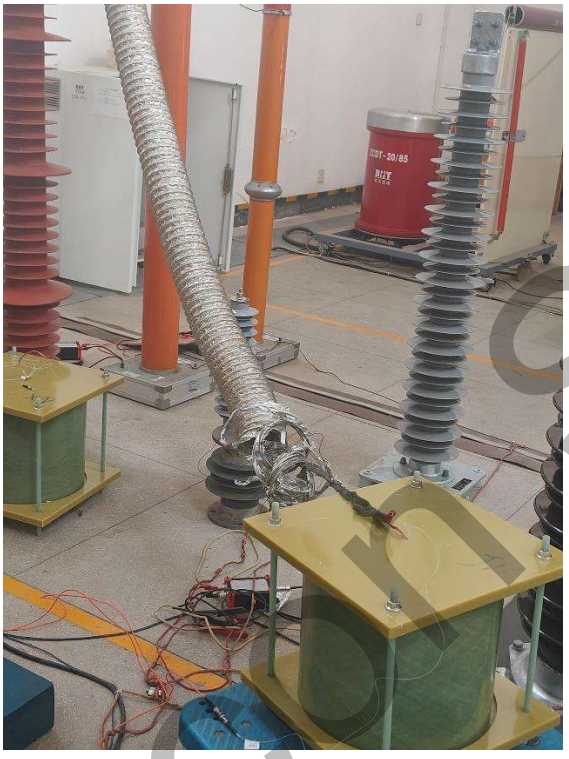
P015

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

P016

P017

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

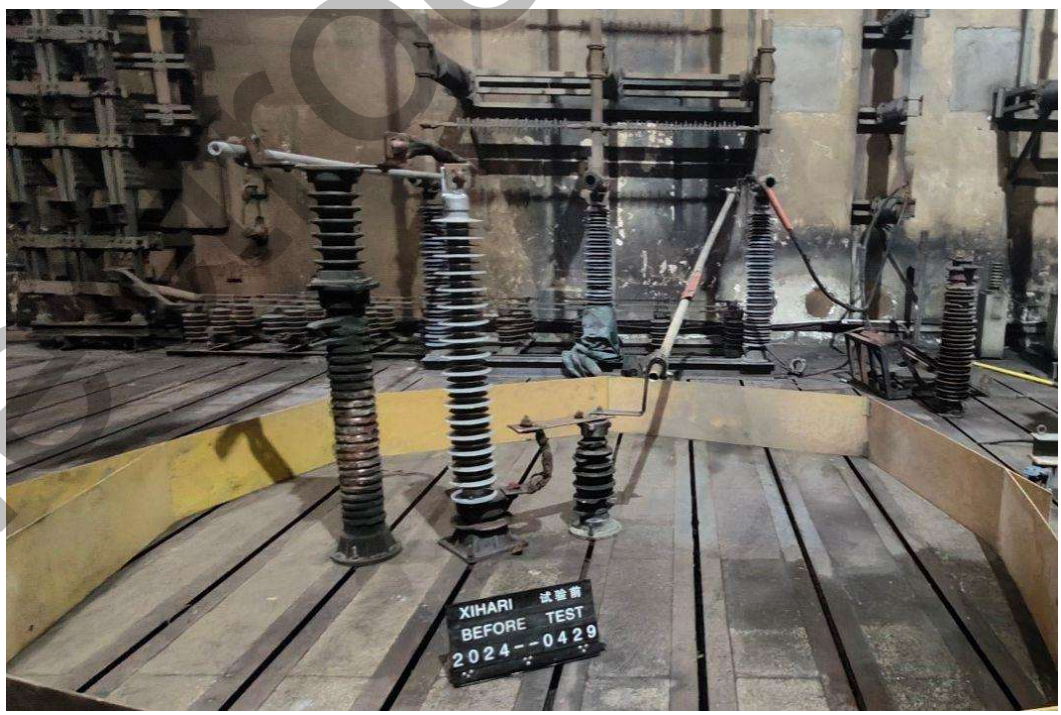


P018

P019

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

P020



P021

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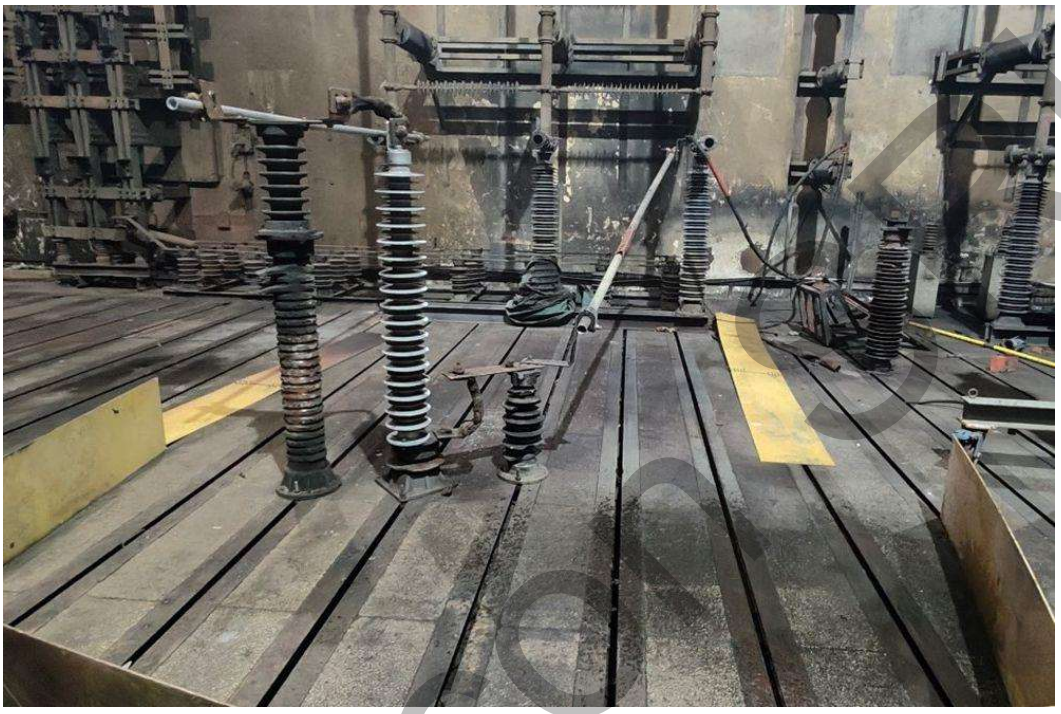
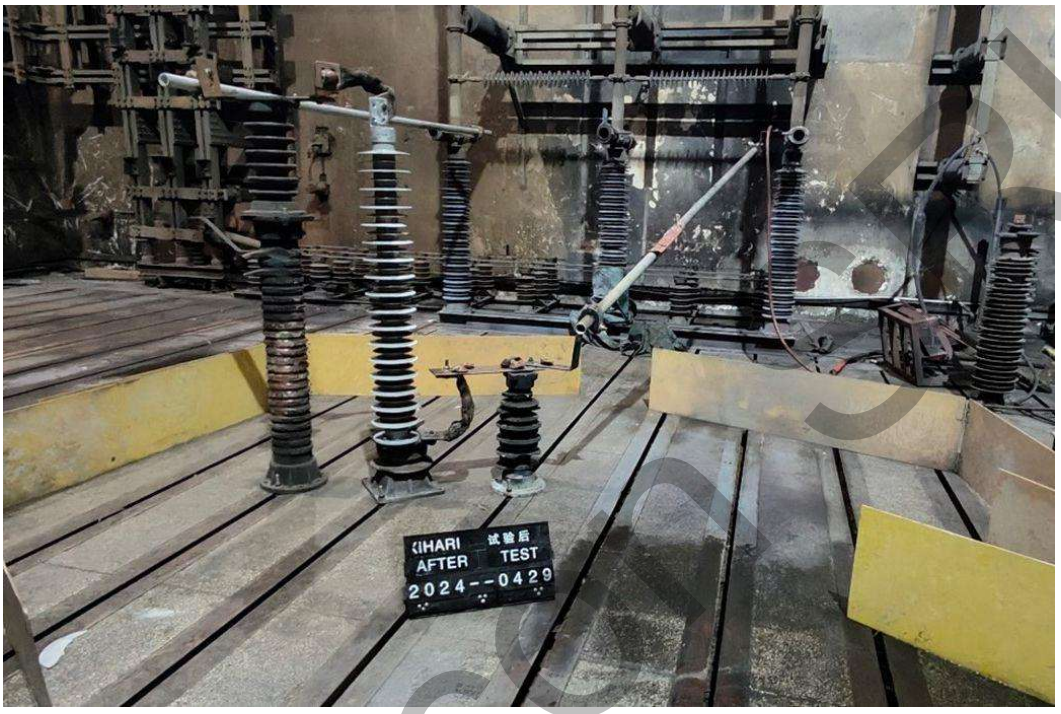


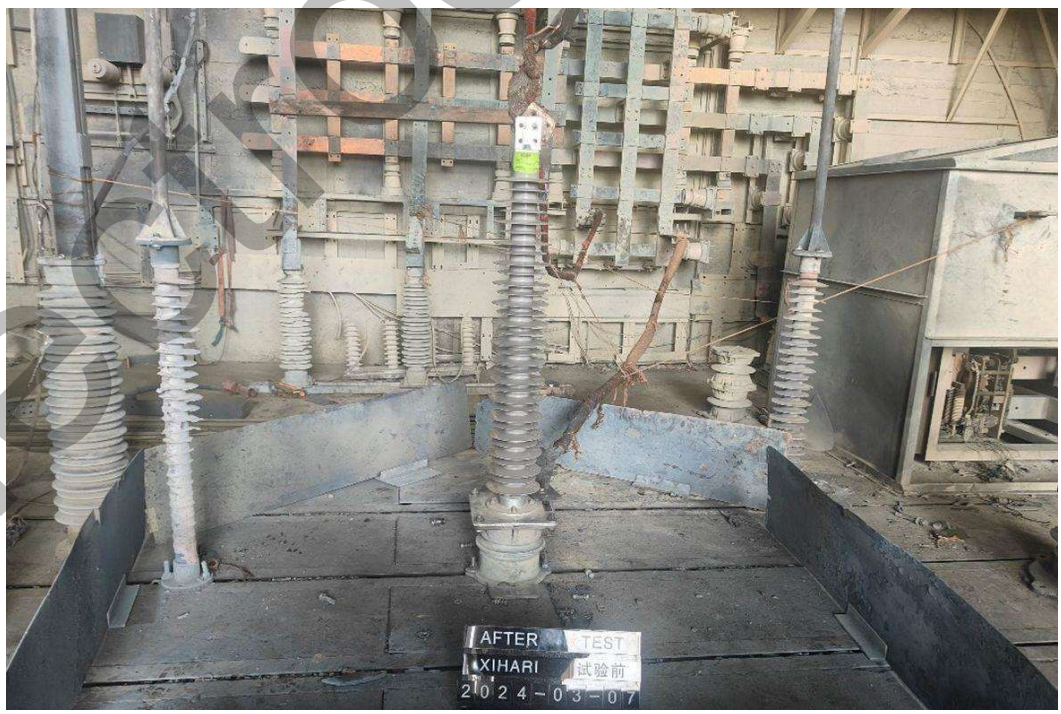
P022

P023

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

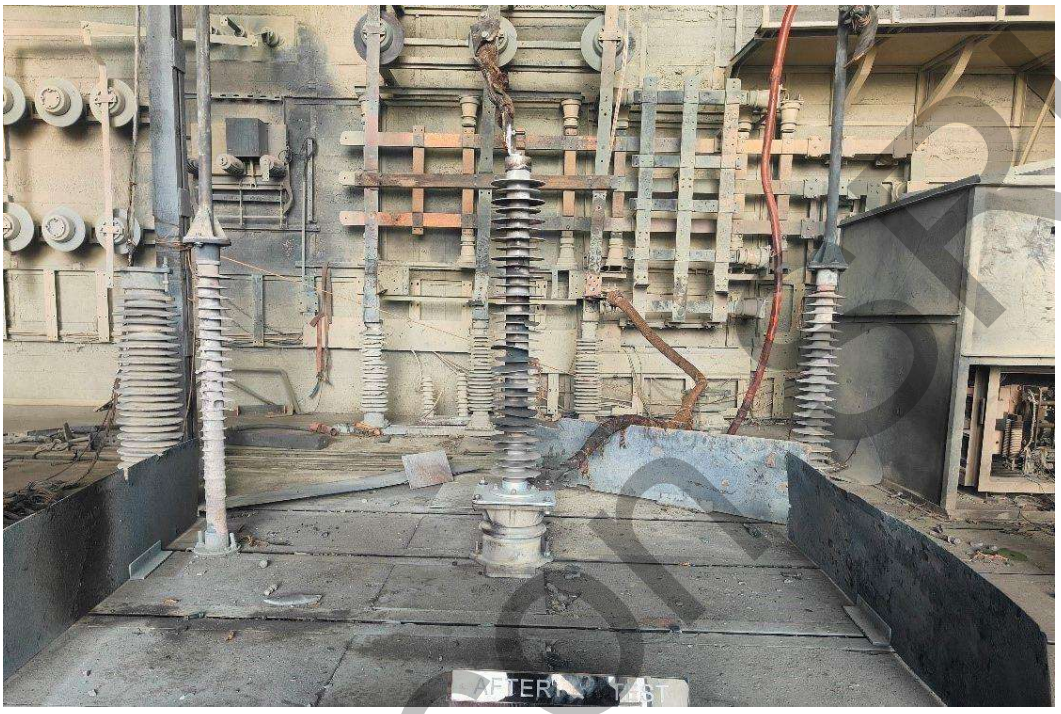


P024



P025

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B



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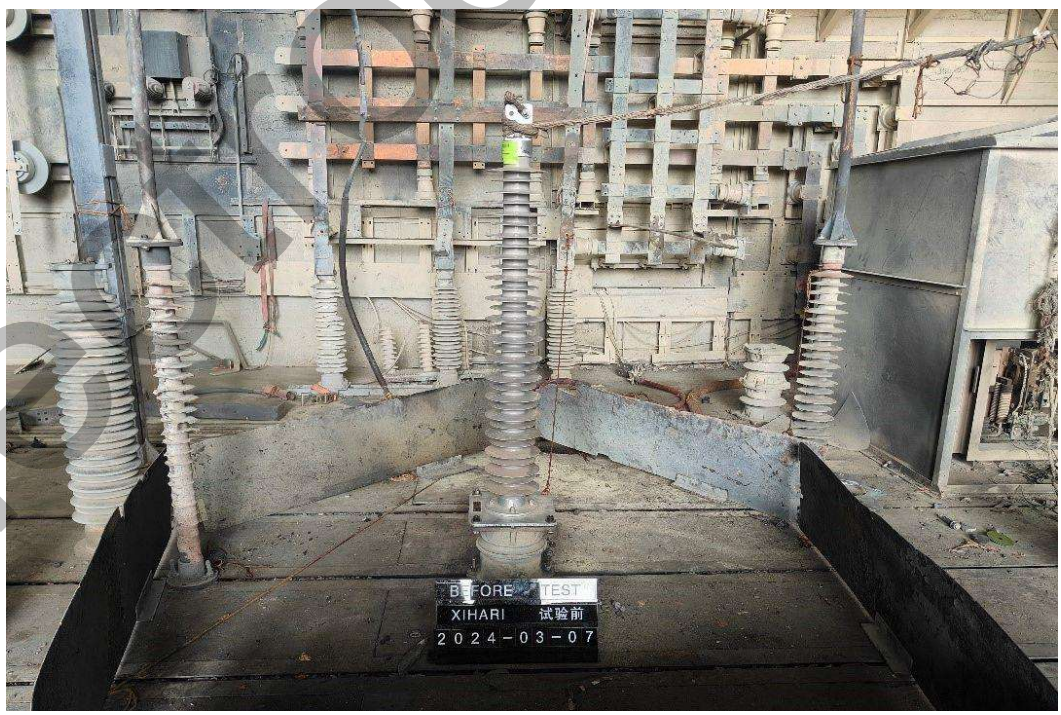

P027

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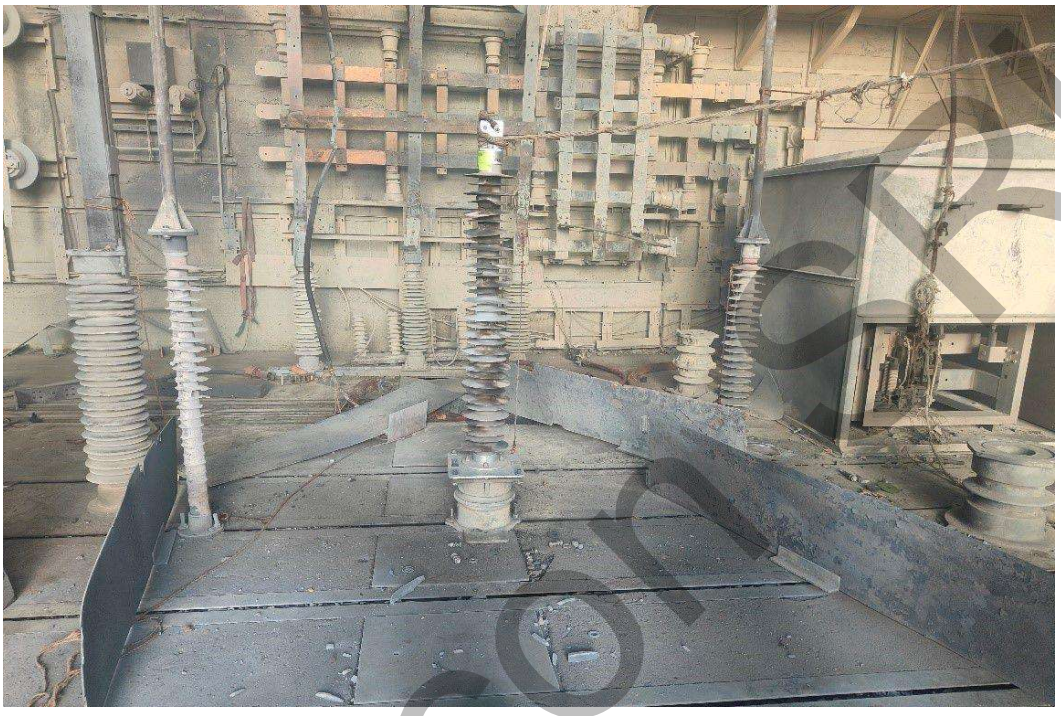
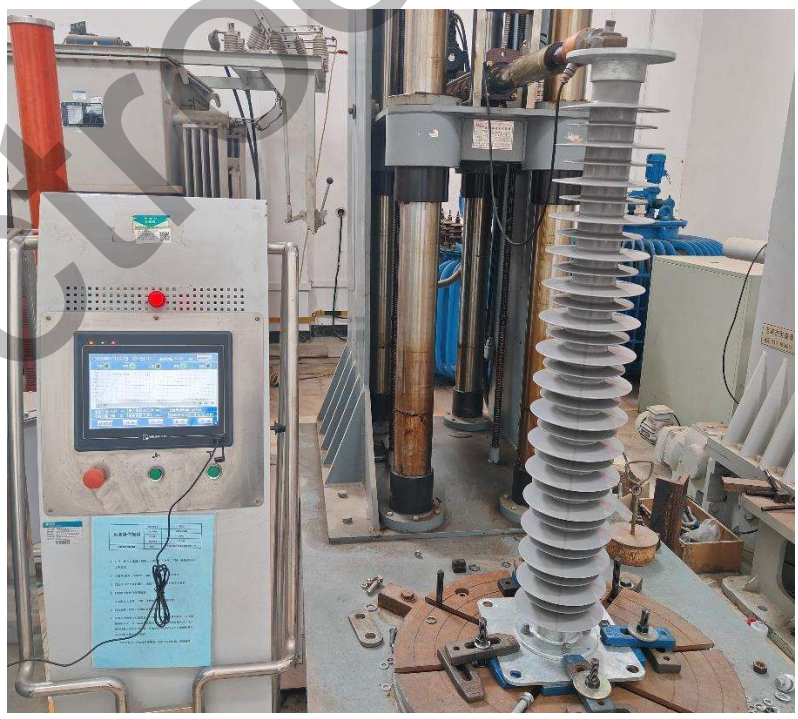


P028



P029

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

P030

P031

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

P032

P033

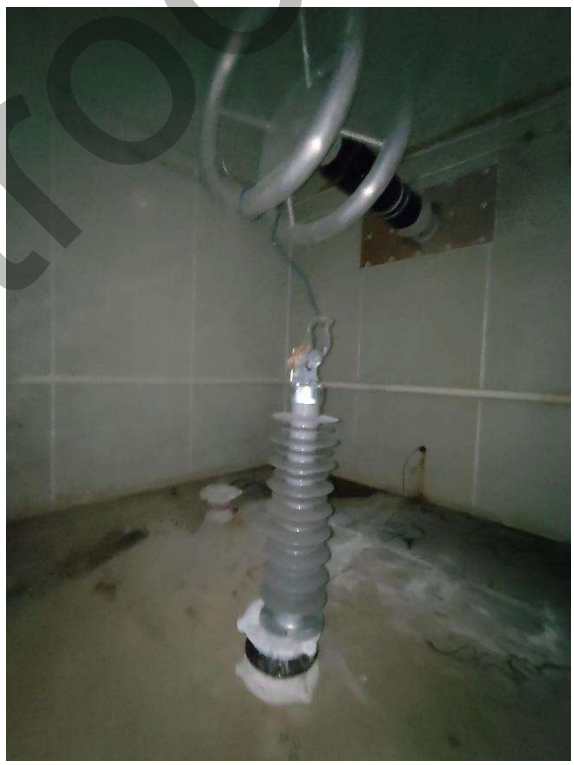
Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

P034

P035

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

P036



P037

Laboratory Ref. No: CEPRI-EETC02-2023-0185 & 230364B

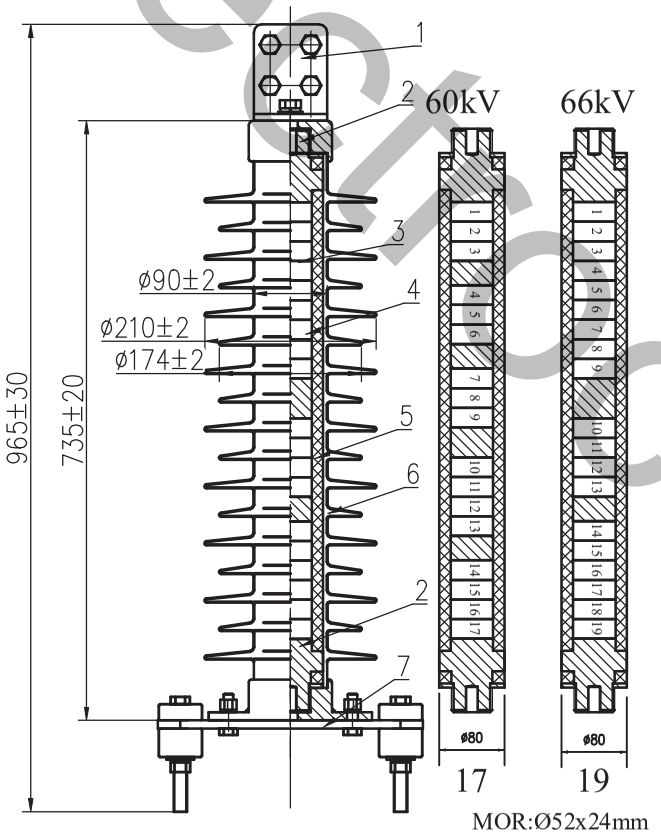
P038

----------End of report----------

I (Yu Zhang),of(Nanyang Jinniu Electric Co., Ltd) certify that this drawing is a true representation of the apparatus tested.

Signature

No.	Description
7	Insulated base
6	Silicone rubber housed
5	Glass fiber winding layer
4	Zinc oxide varistor
3	Aluminum power block
2	Winding electrode
1	Terminal plate



YH10W-60、YH10W-66、

IEC60099-4

Surge arrester performance data | 48Hz-62Hz

No	Item	Data	Unit
1	Arrester class	Station，Design B	
2	Designation	SM	
3	Rated thermal energy W_{th}	≥8	kJ/kV
4	Repetitive charge transfer rating Q_{rs}	≥2	C
5	High current impulse of 4/10μS	100	kA
6	Short-circuit / pressure relief capability	50/0.2、 25/0.2、 12/0.2、 0.6/1	kA/S
7	Specified short-term load(SSL)	3.5	kN.m
8	Rated lightning impulse voltage Up	325	kVp
9	Rated short-duration power-frequency voltage Ud (wet)	140	$kV_{r.m.s}$
10	Dry arcing distance	700	mm
11	Creepage distance	2210	mm

12

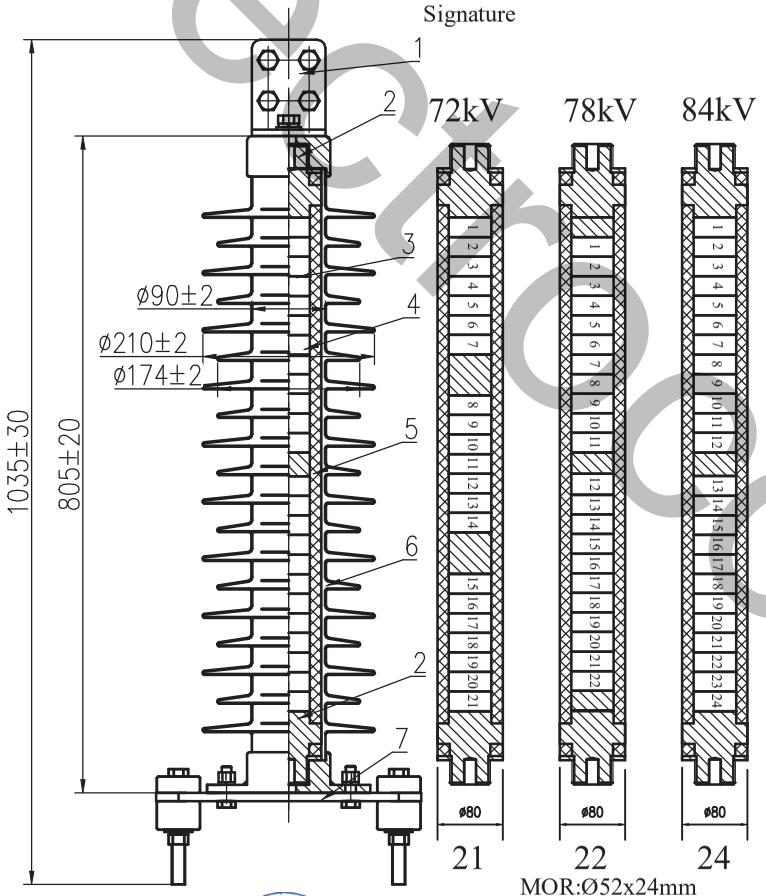
Ur kVrms	Uc kVrms	Uref AC kVrms	Residual Voltage (kVp) 8/20us 5kA	8/20us 10kA	8/20us 20kA	48/101us 1kA	1/5us 10kA
60	48.0	60-63	150.0	156.0	175.0	133.0	175.0
66	52.8	66-69	165.0	172.0	192.0	147.0	193.0

设计 Designed	Po. Xing	2023.10.01	金属氧化物避雷器 Metal Oxide Lightning Arrester			YH10W-(60~66)
审核 Checked	Long. Huang	2023.10.01				
标准化 Standardized	Ke. Huang	2023.10.01	图号 Drawing No	版本 Version	比例 Scale	南阳金牛电气有限公司 NANYANG JINNIU ELECTRIC CO.,LTD
批准 Approved	Yu. Zhang	2023.10.01	JNE-10701	B0	1:5	

I (Yu Zhang),of(Nanyang Jinniu Electric Co., Ltd) certify that this drawing is a true representation of the apparatus tested.

Signature

No.	Description
7	Insulated base
6	Silicone rubber housed
5	Glass fiber winding layer
4	Zinc oxide varistor
3	Aluminum power block
2	Winding electrode
1	Terminal plate



YH10W-72、YH10W-78、YH10W-84、

IEC60099-4

Surge arrester performance data — 48Hz-62Hz

No	Item	Data	Unit
1	Arrester class	Station，Design B	
2	Designation	SM	
3	Rated thermal energy W_{th}	≥8	kJ/kV
4	Repetitive charge transfer rating Q_{rs}	≥2	C
5	High current impulse of 4/10μS	100	kA
6	Short-circuit / pressure relief capability	50/0.2、 25/0.2、 12/0.2、 0.6/1	kA/S
7	Specified short-term load(SSL)	3.5	kN.m
8	Rated lightning impulse voltage Up	395	kVp
9	Rated short-duration power-frequency voltage Ud (wet)	170	$kV_{r.m.s}$
10	Dry arcing distance	769	mm
11	Creepage distance	2460	mm

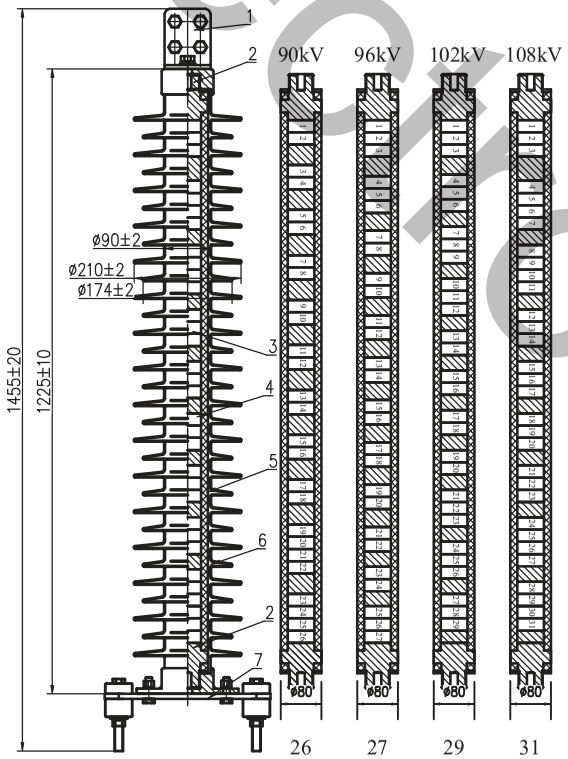
	Ur kVrms	Uc kVrms	Uref AC kVrms	Residual Voltage (kVp) 8/20us 5kA	8/20us 10kA	8/20us 20kA	48/101us 1kA	1/5us 10kA
12	72	58.0	72-75	180.0	187.0	210.0	159.0	213.0
	78	62.4	78-81	195.0	203.0	228.0	173.0	227.0
	84	67.2	84-87	210.0	221.0	248.0	188.0	245.0

设计 Designed	Po. Xing	2023.10.01	金属氧化物避雷器 Metal Oxide Lightning Arrester			YH10W-(72~84)
审核 Checked	Long. Huang	2023.10.01				
标准化 Standardized	Ke. Huang	2023.10.01	图号 Drawing No	版本 Version	比例 Scale	南阳金牛电气有限公司 NANYANG JINNIU ELECTRIC CO.,LTD
批准 Approved	Yu. Zhang	2023.10.01	JNE-10702	B0	1:5	

I (Yu Zhang),of(Nanyang Jinniu Electric Co., Ltd) certify that this drawing is a true representation of the apparatus tested.

Signature

No.	Description
7	Insulated base
6	Silicone rubber housed
5	Glass fiber winding layer
4	Zinc oxide varistor
3	Aluminum power block
2	Winding electrode
1	Terminal plate



MOR:Ø52x24mm

YH10W-90、YH10W-96、YH10W-102、YH10W-108、

IEC60099-4

Surge arrester performance data | 48Hz-62Hz

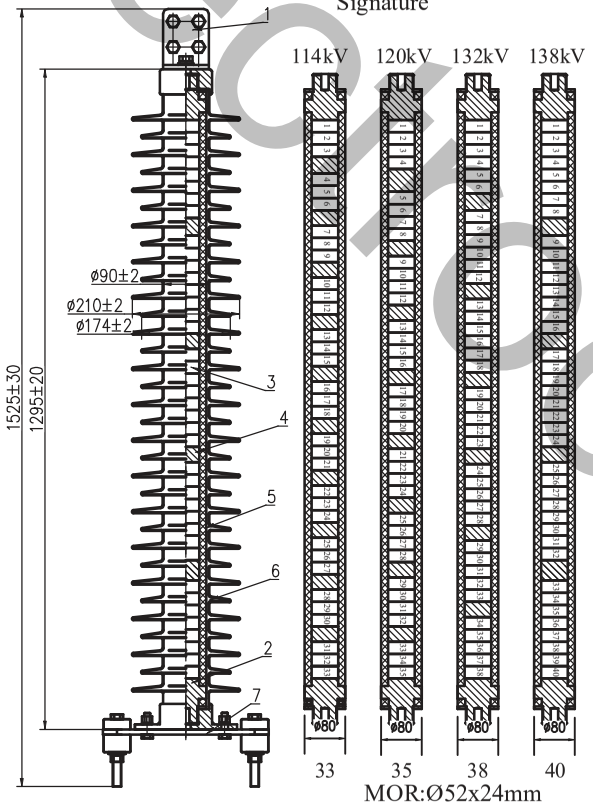
No	Item	Data	Unit
1	Arrester class	Station，Design B	
2	Designation	SM	
3	Rated thermal energy W_{th}	≥8	kJ/kV
4	Repetitive charge transfer rating Q_{rs}	≥2	C
5	High current impulse of 4/10μS	100	kA
6	Short-circuit / pressure relief capability	50/0.2、 25/0.2、 12/0.2、 0.6/1	kA/S
7	Specified short-term load(SSL)	3.5	kN.m
8	Rated lightning impulse voltage Up	550	kVp
9	Rated short-duration power-frequency voltage Ud (wet)	288	$kV_{r.m.s}$
10	Dry arcing distance	1190	mm
11	Creepage distance	3960	mm

	Ur kVrms	Uc kVrms	Uref AC kVrms	Residual Voltage （kVp）				
				8/20us			48/101us	1/5us
				5kA	10kA	20kA	1kA	10kA
12	90	72.5	90-93	225.0	235.0	262.0	201.0	266.0
	96	75.0	96-99	240.0	250.0	280.0	213.0	280.0
	102	79.6	102-105	255.0	266.0	296.0	226.0	297.0
	108	84.0	108-111	270.0	281.0	315.0	239.0	315.0

设计 Designed	Po. Xing	2023.10.01	金属氧化物避雷器 Metal Oxide Lightning Arrester			YH10W-(90~108)
审核 Checked	Long. Huang	2023.10.01				
标准化 Standardized	Ke. Huang	2023.10.01	图号 Drawing No	版本 Version	比例 Scale	南阳金牛电气有限公司 NANYANG JINNIU ELECTRIC CO.,LTD
批准 Approved	Yu. Zhang	2023.10.01	JNE-10703	B0	1:8	

I (Yu Zhang),of(Nanyang Jinniu Electric Co., Ltd) certify that this drawing is a true representation of the apparatus tested.

Signature



No.	Description
7	Insulated base
6	Silicone rubber housed
5	Glass fiber winding layer
4	Zinc oxide varistor
3	Aluminum power block
2	Winding electrode
1	Terminal plate

YH10W-114、YH10W-120、YH10W-132、YH10W-138、

IEC60099-4

Surge arrester performance data — 48Hz-62Hz

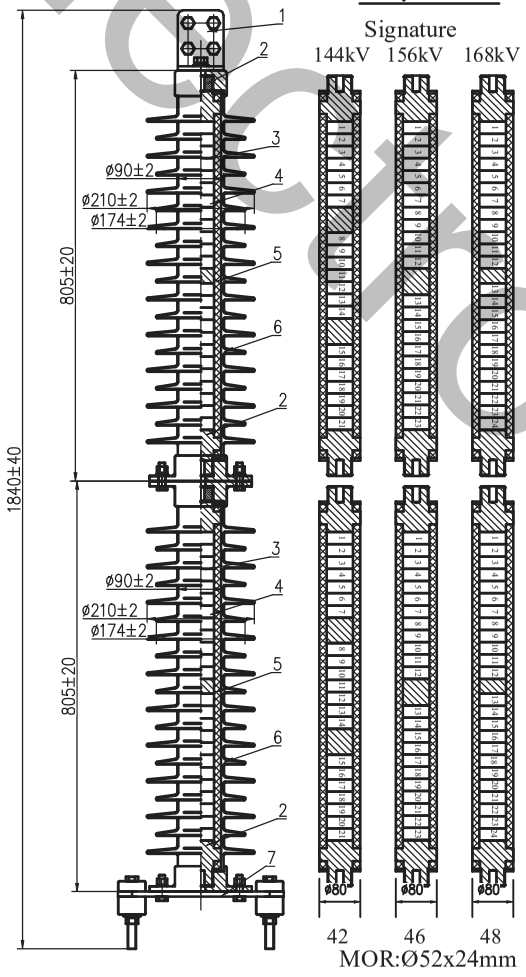
No	Item	Data	Unit
1	Arrester class	Station，Design B	
2	Designation	SM	
3	Rated thermal energy W_{th}	≥8	kJ/kV
4	Repetitive charge transfer rating Q_{rs}	≥2	C
5	High current impulse of 4/10μS	100	kA
6	Short-circuit / pressure relief capability	50/0.2、 25/0.2、 12/0.2、 0.6/1	kA/S
7	Specified short-term load(SSL)	3.5	kN.m
8	Rated lightning impulse voltage Up	560	kVp
9	Rated short-duration power-frequency voltage Ud (wet)	305	$kV_{r.m.s}$
10	Dry arcing distance	1260	mm
11	Creepage distance	4210	mm

	Ur kVrms	Uc kVrms	Uref AC kVrms	Residual Voltage (kVp) 8/20us 5kA	8/20us 10kA	8/20us 20kA	48/101us 1kA	1/5us 10kA
12	114	91.2	114-117	285.0	296.0	330.0	252.0	335.0
	120	96.0	120-123	300.0	312.0	350.0	266.0	355.0
	132	105.6	132-136	330.0	344.0	385.0	293.0	386.0
	138	110.4	138-141	345.0	359.0	400.0	306.0	405.0

设计 Designed	Po. Xing	2023.10.01	金属氧化物避雷器 Metal Oxide Lightning Arrester			YH10W-(114~138)
审 核 Checked	Long. Huang	2023.10.01				
标准化 Standardized	Ke. Huang	2023.10.01	图号 Drawing No	版本 Version	比例 Scale	南阳金牛电气有限公司 NANYANG JINNIU ELECTRIC CO.,LTD
批 准 Approved	Yu. Zhang	2023.10.01	JNE-10704	B0	1:8	

I (Yu Zhang),of(Nanyang Jinniu Electric Co., Ltd) certify that this drawing is a true representation of the apparatus tested.

Signature



No.	Description
7	Insulated base
6	Silicone rubber housed
5	Glass fiber winding layer
4	Zinc oxide varistor
3	Aluminum power block
2	Winding electrode
1	Terminal plate

YH10W-144、YH10W-156、YH10W-168、

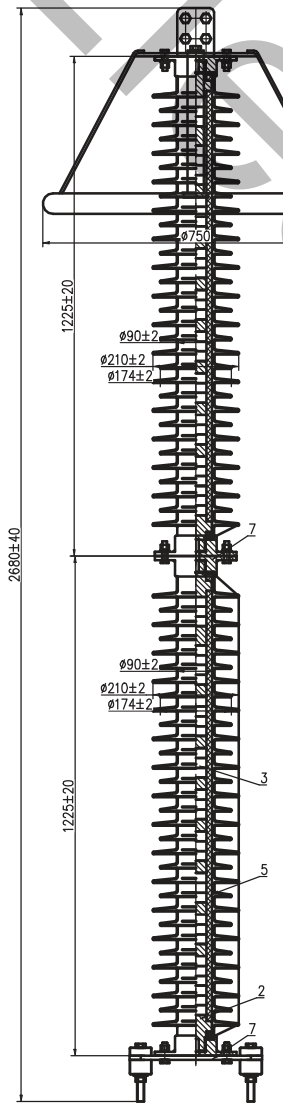
IEC60099-4

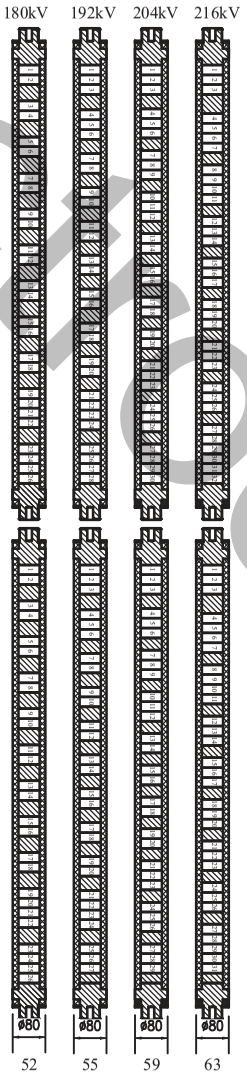
Surge arrester performance data | 48Hz-62Hz

No	Item	Data	Unit
1	Arrester class	Station，Design B	
2	Designation	SM	
3	Rated thermal energy W_{th}	≥8	kJ/kV
4	Repetitive charge transfer rating Q_{rs}	≥2	C
5	High current impulse of 4/10μS	100	kA
6	Short-circuit / pressure relief capability	50/0.2、 25/0.2、 12/0.2、 0.6/1	kA/S
7	Specified short-term load(SSL)	3.5	kN.m
8	Rated lightning impulse voltage Up	790	kVp
9	Rated short-duration power-frequency voltage Ud (wet)	340	$kV_{r.m.s}$
10	Dry arcing distance	1538	mm
11	Creepage distance	4920	mm

	Ur kVrms	Uc kVrms	Uref AC kVrms	Residual Voltage （kVp）				
				8/20us			48/101us	1/5us
				5kA	10kA	20kA	1kA	10kA
12	144	115.2	144-147	360.0	374.0	420.0	318.0	426.0
	156	124.8	156-159	390.0	406.0	455.0	346.0	465.0
	168	134.4	168-171	425.0	442.0	495.0	376.0	490.0

设计 Designed	Po. Xing	2023.10.01	金属氧化物避雷器 Metal Oxide Lightning Arrester			YH10W-(144~168)
审 核 Checked	Long. Huang	2023.10.01				
标准化 Standardized	Ke. Huang	2023.10.01	图号 Drawing No	版本 Version	比例 Scale	南阳金牛电气有限公司 NANYANG JINNIU ELECTRIC CO.,LTD
批 准 Approved	Yu. Zhang	2023.10.01	JNE-10705	B0	1:8	





MOR:Ø52x24mm

I (Yu Zhang),of(Nanyang Jinniu Electric Co., Ltd) certify that this drawing is a true representation of the apparatus tested.

Signature

No.	Description
7	Insulated base
6	Silicone rubber housed
5	Glass fiber winding layer
4	Zinc oxide varistor
3	Aluminum power block
2	Winding electrode
1	Terminal plate

YH10W-180、YH10W-192、YH10W-204、YH10W-216、

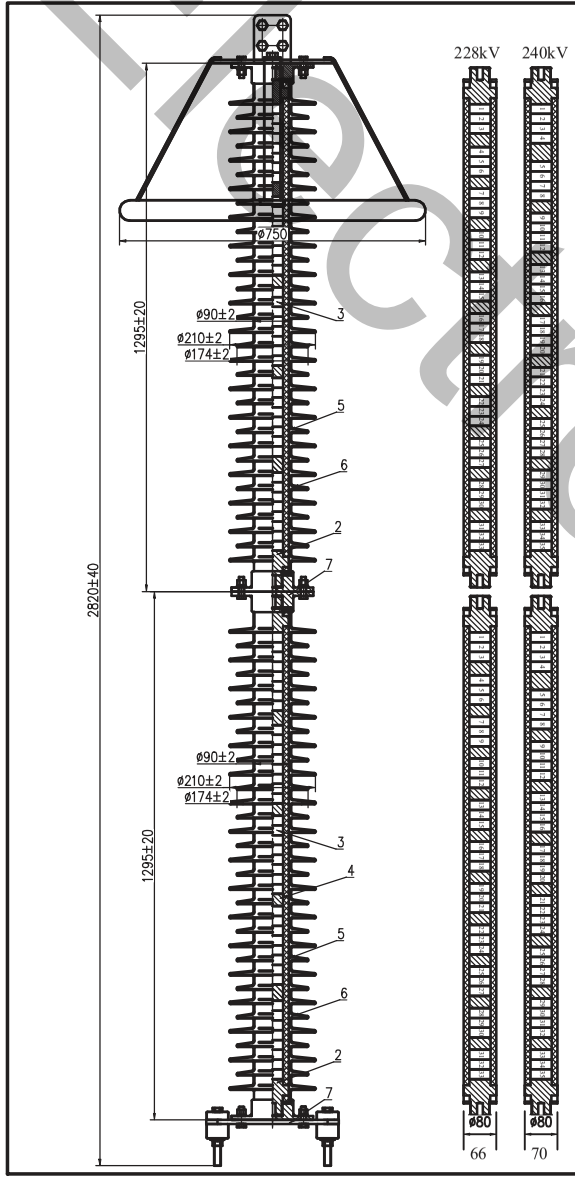
IEC60099-4

Surge arrester performance data — 48Hz-62Hz

No	Item	Data	Unit
1	Arrester class	Station，Design B	
2	Designation	SM	
3	Rated thermal energy W_{th}	≥8	kJ/kV
4	Repetitive charge transfer rating Q_{rs}	≥2	C
5	High current impulse of 4/10μS	100	kA
6	Short-circuit / pressure relief capability	50/0.2、 25/0.2、 12/0.2、 0.6/1	kA/S
7	Specified short-term load(SSL)	3.5	kN.m
8	Rated lightning impulse voltage Up	1055	kVp
9	Rated short-duration power-frequency voltage Ud (wet)	500	$kV_{r.m.s}$
10	Dry arcing distance	2062	mm
11	Creepage distance	7920	mm

	Ur kVrms	Uc kVrms	Uref AC kVrms	Residual Voltage (kVp) 8/20us 5kA	8/20us 10kA	8/20us 20kA	48/101us 1kA	1/5us 10kA
12	180	144.0	180-183	450.0	470.0	525.0	400.0	532.0
	192	150.0	192-195	480.0	500.0	560.0	426.0	561.0
	204	159.0	204-207	510.0	532.0	595.0	452.0	600.0
	216	168.5	216-219	540.0	562.0	630.0	478.0	642.0

设计 Designed	Po. Xing	2023.10.01	金属氧化物避雷器 Metal Oxide Lightning Arrester			YH10W-(180~216)
审核 Checked	Long. Huang	2023.10.01				
标准化 Standardized	Ke. Huang	2023.10.01	图号 Drawing No	版本 Version	比例 Scale	南阳金牛电气有限公司 NANYANG JINNIU ELECTRIC CO.,LTD
批准 Approved	Yu. Zhang	2023.10.01	JNE-10706	B0	1:8	



MOR:Ø52x24mm

I (Yu Zhang),of(Nanyang Jinniu Electric Co., Ltd) certify that this drawing is a true representation of the apparatus tested.

Signature

No.	Description
7	Insulated base
6	Silicone rubber housed
5	Glass fiber winding layer
4	Zinc oxide varistor
3	Aluminum power block
2	Winding electrode
1	Terminal plate

YH10W-228、YH10W-240、

IEC60099-4

Surge arrester performance data — 48Hz-62Hz

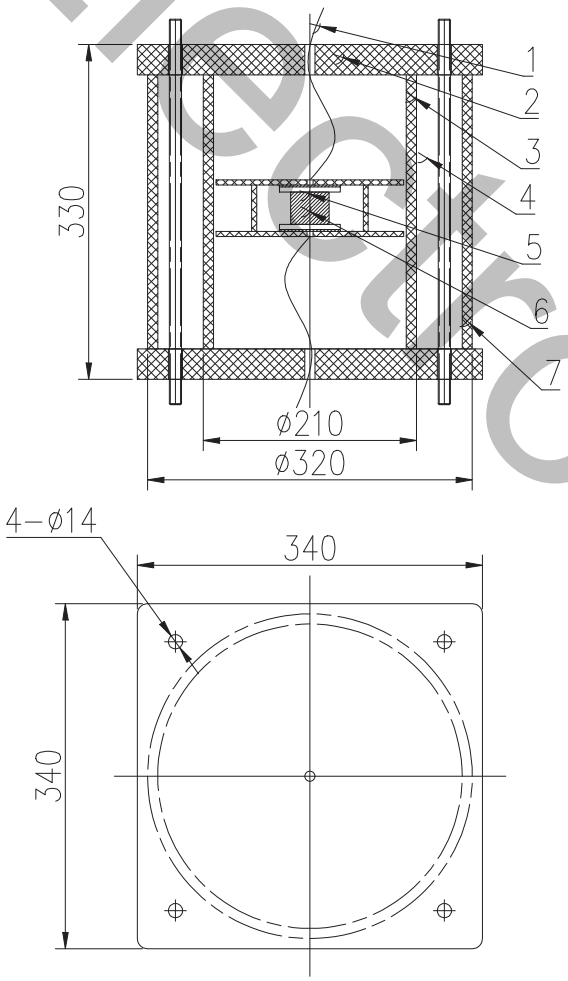
No	Item	Data	Unit
1	Arrester class	Station，Design B	
2	Designation	SM	
3	Rated thermal energy W_{th}	≥8	kJ/kV
4	Repetitive charge transfer rating Q_{rs}	≥2	C
5	High current impulse of 4/10μS	100	kA
6	Short-circuit / pressure relief capability	50/0.2、 25/0.2、 12/0.2、 0.6/1	kA/S
7	Specified short-term load(SSL)	3.5	kN.m
8	Rated lightning impulse voltage Up	1120	kVp
9	Rated short-duration power-frequency voltage Ud (wet)	540	$kV_{r.m.s}$
10	Dry arcing distance	2206	mm
11	Creepage distance	8420	mm

	Ur kVrms	Uc kVrms	Uref AC kVrms	Residual Voltage (kVp) 8/20us 5kA	8/20us 10kA	8/20us 20kA	48/101us 1kA	1/5us 10kA
12	228	182.4	228-231	570.0	592.0	660.0	504.0	670.0
	240	192.0	240-243	600.0	624.0	700.0	531.0	710.0

设计 Designed	Po. Xing	2023.10.01	金属氧化物避雷器 Metal Oxide Lightning Arrester			YH10W-(228~240)
审核 Checked	Long. Huang	2023.10.01				
标准化 Standardized	Ke. Huang	2023.10.01	图号 Drawing No	版本 Version	比例 Scale	南阳金牛电气有限公司 NANYANG JINNIU ELECTRIC CO.,LTD
批准 Approved	Yu. Zhang	2023.10.01	JNE-10707	B0	1:10	

I (Yu Zhang),of(Nanyang Jinniu Electric Co., Ltd) certify that this drawing is a true representation of the apparatus tested.

Signature

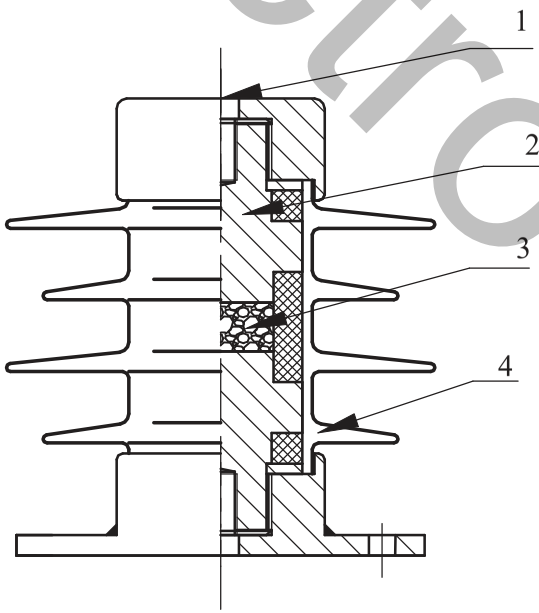


No	Item
1	copper conductor
2	Epoxy plate lid
3	The epoxy tube
4	Insulation cotton
5	Iron spacer
6	zinc oxide varistor D52×24
7	The epoxy tube

设 计 Designed	Po. Xing	2023.10.01	金属氧化物避雷器 Metal Oxide Lightning Arrester			热比例单元 THERMAL-PRORATED SECTION-UNIT
审 核 Checked	Long. Huang	2023.10.01				
标准化 Standardized	Ke. Huang	2023.10.01	图号 Drawing No	版本 Version	比例 Scale	南阳金牛电气有限公司 NANYANG JINNIU ELECTRIC CO.,LTD
批 准 Approved	Yu. Zhang	2023.10.01	JNE-10807	B0	1:8	

I (Yu Zhang),of(Nanyang Jinniu Electric Co., Ltd) certify that this drawing is a true representation of the apparatus tested.

Signature



No	Item
1	Package cover
2	Electrodes
3	zinc oxide varistor D52×24
4	

设 计 Designed	Po. Xing	2023.10.01	金属氧化物避雷器 Metal Oxide Lightning Arrester			介质比例单元 MEDIUM-PRORATED SECTION-UNIT
审 核 Checked	Long. Huang	2023.10.01				
标准化 Standardized	Ke. Huang	2023.10.01	图号 Drawing No	版本 Version	比例 Scale	南阳金牛电气有限公司 NANYANG JINNIU ELECTRIC CO.,LTD
批 准 Approved	Yu. Zhang	2023.10.01	JNE-10809	B0	1:2	

KEMA Labs

TYPE TEST CERTIFICATE OF COMPLETE TYPE TEST

Certificate No.
C4015507
Revision 0

Test Object Polymer-housed metal-oxide surge arresters

Designation YH10W **Serial No.**

Rated voltage 3 kV to 51 kV; Arrester class Distribution DH; Rated frequency 50/60 Hz

Manufacturer Nanyang Jinniu Electric Co., Ltd Industry park of Tongbay, Nanyang city, Henan province, China 474750

Production Location See manufacturer address above

Client Nanyang Jinniu Electric Co., Ltd Industry park of Tongbay, Nanyang city, Henan province, China 474750

Date(s) of tests From November 14, 2022 to November 29 2024

Tested by CESI S.p.A. ("KEMA Labs"),
Via Rubattino, 54
20134 Milano – Italy

The test object, constructed in accordance with the description, drawings and photographs incorporated in the documents forming part of this Certificate, has been subjected to the series of proving tests in accordance with:

IEC 60099-4 (2014-06), subclause 10.8
This Certificate has been issued following exclusively the STL Guides and Procedures.

The results are shown in the record of proving tests reported in detail in chapter 2 of this document and the oscillograms (if any) attached hereto.
The values obtained and the general performance are considered to comply with the above standard(s) and to justify the ratings assigned by the manufacturer as listed in chapter 1.
This Certificate applies only to the individual object tested. KEMA Labs makes no representations or warranties with respect to any device other than the object tested. It is the responsibility of the applicable device manufacturer to ensure that any other devices or units having the same name and descriptions as the test object are identical.

This certificate comprises 07 Pages in total

Issued by **CESI S.p.A.**

Bertani Alessandro
C4015507 5000 APP
Director,
High Voltage Labs

Milan, January 17, 2025

LAB N° 0030 L

INFORMATION SHEET

The type of documents presented below can be issued by test laboratories which are part of KEMA Labs.
Details of these and all other types of certificates and reports issued by KEMA Labs are given on the website, which can be accessed through the QR code on the front sheet. The title on the front sheet of the document indicates which type of document is under review. All documents comprise a record of the (type) tests carried out. Mandatory requirements for items 1, 2, 3, 4 and 5 are that the object tested is clearly identified and verified by technical description, drawings and/or additional specifications. The condition of the object after testing is assessed and recorded, if applicable.

1 Certificate
A Certificate is issued when the object tested has fulfilled the requirements of (the named (sub)clauses of) a recognized standard. The relevant ratings assigned by the manufacturer are endorsed by KEMA Labs. All relevant test results and observations are given in the records of proving tests (items 3, 4, 5 and 6) which form the basis of a Certificate and are referred to in this Certificate.

2 Calibration Certificate
A Calibration Certificate is issued when a calibration program has been successfully executed. The calibration program refers to an accredited calibration procedure that is according to recognized standards, manufacturer's specifications or validated internal methods.

3 Type Test Report
A Type Test Report is issued for products in the segments of low voltage, railway applications, automotive, metering and protection & substation automation when the object tested has successfully passed the requested type tests (of the named (sub)clauses) in accordance with a recognized standard. The tests required in these (sub)clauses could cover a complete or partial set of type tests.
The sentence on the front sheet of a Type Test Report will state that the tests have been carried out in accordance with ……
The object has complied with the relevant requirements of the standard and justify the relevant ratings assigned by the manufacturer as listed in chapter 1.

4 Design Verification Report
A Design Verification Report is issued when the object tested has successfully passed the requested design verification tests of the named (sub)clauses in accordance with IEC 61439. The tests series required in these (sub)clauses could cover a complete or selected set of design verification tests.
The sentence on the front sheet of a Design Verification Report will state that the tests have been carried out in accordance with IEC 61439. The object has complied with the relevant requirements of the standard and justify the relevant ratings assigned by the manufacturer as listed in chapter 1.

5 Report of Performance or Type Test Report
A Report of Performance or Type Test Report is issued for products in the segments of MV and HV transmission and distribution when the object tested has successfully passed the requested (type) tests of the named (sub)clauses in accordance with a recognized standard. The tests required in these (sub)clauses could cover a complete or partial set of (type) tests.
The sentence on the front sheet of a Report of Performance or Type Test Report will state that the tests have been carried out in accordance with …… The object has complied with the relevant requirements of the standard.
However, a Report of Performance or Type Test Report does not confirm any assigned rating.

6 Test Report
A Test Report is issued in all other cases.

7 Identification of official test documents
The official test documents of KEMA Labs are issued in digital form through .pdf files. Only integral reproduction of this document is permitted without written permission from KEMA Labs. A sealed and bound version of the test document may be available for the convenience of the client and has the status 'for information only'. The copyright must be respected.
Items 1 and 2 are identified by a gold watermark and a gold seal with red ribbon on its front sheet. Items 3, 4 and 5 are identified by a silver watermark and a silver seal with green ribbon on its front sheet. Item 6 is identified by a blue watermark on its front sheet.

8 Disclaimers
No certificate or other report issued by KEMA Labs for the purpose of confirming the performance of a test object in relation to the testing requirements of a national or international standard, or in relation to any other testing specification, shall constitute a warranty as to the adequacy or quality of the design or construction of the test object. No other document issued by KEMA Labs for the purpose of reporting, explaining or describing any engineering or consulting services performed by KEMA Labs shall constitute a warranty as to the adequacy or quality of the design or construction of any apparatus or system that is the subject of the document. Information provided by the client or manufacturer can affect the validity of results. KEMA Labs is not responsible for the consequences in such cases.

REVISION OVERVIEW

The edition with the highest revision number always replaces the earlier issued editions.

Rev.No	Date of issue	Page no. and changes
0	January 17, 2025	First issue

1 IDENTIFICATION OF THE OBJECT

1.1 Ratings/characteristics proven by tests

Polymer-housed metal-oxide surge arresters	
Type / Designation	YH10W
Rated voltage - U_r	3 kV to 51 kV (see details in table at page 5)
Continuous operating voltage - U_c	2,4 kV to 40,8 kV (see details in table at page 5)
Rated frequency	50/60 Hz
Arrester classification	Distribution DH
Nominal discharge current – I_n	10 kA
Repetitive charge transfer rating – Q_{rs}	0,4 C
Thermal CHARGE rating - Q_{th}	1,1 C
Rated short current - Is	31,5 kA
- Design	B
Specified short –term load- SSL	220 Nm
Specified long-term load - SLL	100 Nm
Terminal torque	20 Nm
Power frequency voltage versus time curve with prior duty	
- for 0,1 s	1,200 U_r
- for 1,1 s	1,050 U_r
- for 10,1 s	1,000 U_r
- for 1000 s	0,950 U_r
Power frequency voltage versus time curve without prior duty	
- for 0,1 s	1,220 U_r
- for 1000 s	0,980 U_r
Min. reference voltage at the reference current of 1 mA	3,0 kV to 51,0 kV (see details in table at page
Maximum residual voltage at I_n = 10 kA	8,8 kV to 149,6 kV (see details in table at page 5)

1.2 Description of the object tested

Polymer-housed metal-oxide surge arresters. Here below a list of the size of the tested objects:

Surge arrester type	Rated voltage [kV]	Continuous operating voltage [kV]	Minimum reference voltage at the reference current of 1,0 mA [kV]	Maximum residual voltage at In = 10 kA [kV]	N. of MO resistors fitted: type D36,5x20	Outline drawing (see document C4015547)
YH10W-3	3	2,4	3	8,8	1	C4015547- 1
YH10W-6	6	4,8	6	17,6	2	C4015547- 2
YH10W-9	9	7,2	9	26,4	3	C4015547- 3
YH10W-10	10	8	10	29,3	3	C4015547- 4
YH10W-11	11	8,8	11	32,3	4	C4015547- 5
YH10W-12	12	9,6	12	35,2	4	C4015547- 6
YH10W-15	15	12	15	44	5	C4015547- 7
YH10W-17.5	17,5	14	17,5	51,3	6	C4015547- 8
YH10W-18	18	14,4	18	52,8	6	C4015547- 9
YH10W-21	21	16,8	21	61,6	7	C4015547- 10
YH10W-24	24	19,2	24	70,4	8	C4015547- 11
YH10W-27	27	21,6	27	79,2	9	C4015547- 12
YH10W-30	30	24	30	88	10	C4015547- 13
YH10W-33	33	26,4	33	96,8	11	C4015547- 14
YH10W-36	36	28,8	36	105,6	12	C4015547- 15
YH10W-39	39	31,2	39	114,4	13	C4015547- 16
YH10W-42	42	33,6	42	123,2	14	C4015547- 17
YH10W-45	45	36	45	132	15	C4015547- 18

YH10W-48	48	38,4	48	140,8	16	C4015547- 19
YH10W-51	51	40,8	51	149,6	17	C4015547- 20

1.3 List of drawings

The manufacturer has guaranteed that the object submitted for tests has been manufactured in accordance with the following drawings and/or documents, supplied by them. KEMA Labs has verified that these drawings and/or documents adequately represent the object tested. The manufacturer is responsible for the correctness of these drawings and/or documents and the technical data presented. KEMA Labs makes no representations or warranties regarding the accuracy of the drawings or that the drawings meet any applicable industry standards or legal or regulatory requirements.

The table here below specifies details of the ratings of the surge arresters belonging to the homogeneous series arresters type YH10W as proved by the type tests

The following drawings have been annexed to the relevant reports:

Drawing JNDQ.MO3620 (MO resistor drawing)	C3008047
Drawing JN-DH3.RMX (Long term stability test) section	C3008329
Drawing JN-DH6.49187 (Sections in thermal model) for TOV test	C3008323-2
Drawing JN- DHBL.49187 (Sections in thermal model) for Operating duty test	C3008109-2
Drawing JN- DH51.49427.RMX (Sections in thermal model) 51kV Arrester with thermal sensor	C3008356
Drawing JN-DH51.49427 (Cross sectional) 51 kV Surge arrester drawing	C3008071

2 RECORDS OF PROVING TESTS

This Certificate is issued based on the following records of proving tests, demonstrating the conformity of the apparatus to the standard(s) mentioned on the front sheet. These following documents form an integral part of this Certificate.

Description	**Revision**
FGH TTR H24026	00
CESI TTR C4017166	00
CESI TTR C2016889	00
CESI TTR C2016356	00
CESI TTR C2016357	00
CESI TTR C2017219	00
CESI TTR C2017220	00
CESI TTR C2016984	00
CESI TTR C2017565	00
CESI TTR C2016265	00
CESI TTR C3008043	00
CESI TTR C2016352	00

3 TESTS CARRIED OUT

A brief description of all the tests carried out is given in the tables below.

No. Standard and clause	Description of tests	Reference documents
IEC 60099-4 Sub-clause 10.8.2	Insulation withstand test	C4017166
IEC 60099-4 Sub-clause 10.8.3	Residual voltage tests	C2016889
IEC 60099-4 Sub-clause 10.8.4	Test to verify long term stability under continuous operating voltage	C2016356
IEC 60099-4 Sub-clause 10.8.5	Test to verify the repetitive charge transfer rating, Qrs	C2016357
IEC 60099-4 Sub-clause 10.8.6	Heat dissipation behaviour of test sample	C2017219 C2017220
IEC 60099-4 Sub-clause 10.8.7	Operating duty test	C2016984
IEC 60099-4 Sub-clause 10.8.8	Power frequency voltage-versus-time test	C2017565
IEC 60099-4 Sub-clause 10.8.10	Short circuit test	C2016265
IEC 60099-4 Sub-clause 10.8.11	Test of the bending moment	C2016352
IEC 60099-4 Sub-clause 10.8.17.2	Salt fog test	H24026
IEC 60099-4 Sub-clause 10.8.17.3	UV light test	C3008043

4 ADDITIONAL TYPE TESTS

Not applicable.

5 ADDITIONAL REFERENCES

CESI Report C4015515

The Report C4015515 specifies the criteria, adopted for the selection of the test samples and for the calculation of the test parameters, in such a way that a type test carried out on one test specimen can cover at the same time all the surge arresters of the homogeneous.

END OF DOCUMENT

The laboratories of KEMA Labs are:

- CESI S.p.A., Milan, Italy.
- FGH Engineering & Test GmbH, Mannheim, Germany.
- IPH Institut "Prüffeld für elektrische Hochleistungstechnik" GmbH, Berlin, Germany.
- KEMA B.V., Arnhem, The Netherlands.
- KEMA Labs, Zkušebnictví, a.s., Prague, the Czech Republic.
- KEMA-Powertest, LLC, Chalfont, United States.

CESI

Copy No. 1 Certificate No C3009711

STL Type Test Certificate

of Complete Type Test

Test object	Polymer-housed metal-oxide surge arresters
Designation	YH10W Rated voltage 3 kV to 51 kV; Arrester class Station SL; Rated frequency 50/60 Hz
Manufacturer	Nanyang Jinniu Electric Co., Ltd Industry park of Tongbay, Nanyang city, Henan province, China 474750
Tested for	Nanyang Jinniu Electric Co., Ltd Industry park of Tongbay, Nanyang city, Henan province, China 474750
Date(s) of tests	From June 21 th to March 17 th, 2023
Tested by	CESI S.p.A. Via Rubattino 54 20134 Milano

The test object, constructed in accordance with the description, drawings and photographs incorporated in this document has been subjected to the series of proving tests in accordance with STL Guides and:

IEC 60099-4 (2014-06)
Sub-clauses 10.8

This Type Test Certificate has been issued by CESI following exclusively the STL Guides.
The results are shown in the record of Proving Tests and the oscillograms attached hereto. The values obtained and the general performance are considered to comply with the above Standard(s) and to justify the ratings assigned by the Manufacturer as listed on the ratings page.
The Certificate applies only to the test object. The responsibility for conformity of any equipment having the same designations with that tested rests with the Manufacturer.

This Certificate comprises 11 sheet in total.

July 17, 2023

Date of issue STL Member Laboratory STL Member

ilac-MRA

ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO
LAB N° 0030 L

The laboratory meets the requirements of the Standard ISO/IEC 17025: 2017 "General requirements for the competence of testing and calibration laboratories". The in force status of the accreditation and the list of accredited tests may be checked in the WEB site: www.cesi.it

测思 Centro Elettrotecnico Sperimentale Italiano

STL

The Short-Circuit Testing Liaison (STL) provides a forum for voluntary international collaboration between testing organisations. The basic aim is the harmonised application of IEC and Regional/National Standards to the type testing of electrical high-voltage power equipment.

A list of STL Members and Member Laboratories is available at www.stl-liaison.org.

Certificates

STL as a collaboration does not itself issue Certificates. Each STL Member issuing a STL Type Test Certificate is responsible for the validity and contents of that Certificate. A STL Type Test Certificate is issued by STL Members based on tests performed by an STL Member Laboratory within their accredited scope to ISO/IEC 17025. If the Type Test Certificate is issued under accreditation of ISO/IEC 17065 the name of the issuing body is the one of the Certification Body related to the STL Member.
A detailed description of Certificate documents is available at www.stl-liaison.org.

STL Guides

All STL Members pledge that, when testing for certification to a Standard in respect of which an STL Guide has been issued, they will test only in accordance with the agreed interpretation of the Standard as given in the STL Guide. In addition, the STL Members have agreed to present STL Type Test Certificates in the form given in the STL General Guide. For further information contact your local STL Member.
Detailed information is available at www.stl-liaison.org, or contact the STL Secretariat at the address indicated in the website.

Table of contents

1 RATINGS ASSIGNED BY THE MANUFACTURER AS PROVED BY THE TESTS

Polymer-housed metal-oxide surge arresters	
Manufacturer	Nanyang Jinniu Electric Co., Ltd
Type / Designation	YH10W
Rated voltage - U_r	3 kV to 51 kV (see details in table at page 5)
Continuous operating voltage - U_c	2,4 kV to 40,8 kV (see details in table at page 5)
Rated frequency	50/60 Hz
Arrester classification	Station SL
Nominal discharge current – I_n	10 kA
Repetitive charge transfer rating – Q_{rs}	1,0 C
Thermal energy rating - W_{th}	5 kJ/kV
Rated short current - Is	40 kA
- Design	B
Specified short –term load- SSL	500 Nm
Power frequency voltage versus time curve with prior duty	
- for 0,1 s	1,200 U_r
- for 1,1 s	1,050 U_r
- for 10,1 s	1,000 U_r
- for 1000 s	0,950 U_r
Power frequency voltage versus time curve without prior	
- for 0,1 s	1,220 U_r
- for 1000 s	0,980 U_r
Min. reference voltage at the reference current of 1 mA	3,0 kV to 51,0 kV (see details in table at page 5)
Maximum residual voltage at I_n = 10 kA	8,5 kV to 144,5 kV (see details in table at page 5)

The table here below specifies details of the ratings of the surge arresters belonging to the homogeneous series arresters type YH10W as proved by the type tests

Surge arrester type	Rated voltage [kV]	Continuous operating voltage [kV]	Minimum reference voltage at the reference current of 1,0 mA [kV]	Maximum residual voltage at In = 10 kA [kV]	N. of MO resistors fitted: type D46x20	Outline drawing (see document C3006779)
YH10W-3	3	2,4	3	8,50	1	C3006779-1
YH10W-6	6	4,8	6	17,00	2	C3006779-2
YH10W-9	9	7,2	9	25,50	3	C3006779-3
YH10W-10	10	8	10	28,30	3	C3006779-4
YH10W-12	12	9,6	12	34,00	4	C3006779-5
YH10W-15	15	12	15	42,50	5	C3006779-6
YH10W-18	18	14,4	18	51,00	6	C3006779-7
YH10W-21	21	16,8	21	59,50	7	C3006779-8
YH10W-24	24	19,2	24	68,00	8	C3006779-9
YH10W-27	27	21,6	27	76,50	9	C3006779-10
YH10W-30	30	24	30	85,00	10	C3006779-11
YH10W-33	33	26,4	33	93,50	11	C3006779-12
YH10W-36	36	28,8	36	102,00	12	C3006779-13
YH10W-39	39	31,2	39	110,50	13	C3006779-14
YH10W-42	42	33,6	42	119,00	14	C3006779-15
YH10W-45	45	36	45	127,50	15	C3006779-16
YH10W-48	48	38,4	48	136,00	16	C3006779-17
YH10W-51	51	40,8	51	144,50	17	C3006779-18

2 ADDITIONAL TYPE TESTS

Not applicable.

3 REFERENCE DOCUMENTS

The following reference documents are integral part of this Certificate:

No.	Description	CESI registration
1	Test report	H 23005
2	Test report	C2010193 Rev 1
3	Test report	C2010163
4	Test report	C2010612
5	Test report	C2009921 Rev 1
6	Test report	C2010614 Rev 1
7	Test report	C2009911 Rev 1
8	Test report	C2010145
9	Test report	C2010142
10	Test report	C2010395
11	Test report	C3008043
12	Test report	C2011364 Rev 2
13	Test report	C2011099 Rev 1
14	Report (*)	C3009723
15	Drawing JNDQ.MO4620	C3006774-1
16	Drawing JN-SL6.RMX	C3006774-2
17	Drawing JN-SL3.RMX	C3006774-3
18	Drawing JN-SL6.6090	C3006774-4
19	Drawing JN-SL48.60510	C3006774-5
20	Drawing JN-SL48.60510	C3006774-6
21	Drawing JN-SL51.60550	C3006774-7

(*) The Report C3009723 specifies the criteria, adopted for the selection of the test samples and for the calculation of the test parameters, in such a way that a type test carried out on one test specimen can cover at the same time all the surge arresters of the homogeneous

4 ADDITIONAL REFERENCES

Not applicable.

5 RECORD OF PROVING TESTS

The table below lists all the tests performed and the references to the relevant Test Reports containing the test values.

No. Standard and clause	Description of tests	Reference documents
IEC 60099-4 Sub-clause 10.8.2	Insulation withstand test	C2010142 C2010145 C3009723
IEC 60099-4 Sub-clause 10.8.3	Residual voltage tests	C2010193-1 C3009723
IEC 60099-4 Sub-clause 10.8.4	Test to verify long term stability under continuous operating voltage	C2009911-1 C3009723
IEC 60099-4 Sub-clause 10.8.5	Test to verify the repetitive charge transfer rating, Qrs	C2009921-1 C3009723
IEC 60099-4 Sub-clause 10.8.6	Heat dissipation behaviour of test sample	C2010614-1 C3009723
IEC 60099-4 Sub-clause 10.8.7	Operating duty test	C2010613 C3009723
IEC 60099-4 Sub-clause 10.8.8	Power frequency voltage-versus-time test	C2010612 C3009723
IEC 60099-4 Sub-clause 10.8.10	Short circuit test	C2011364-2 C3009723

IEC 60099-4 Sub-clause 10.8.11	Bending moment	C2010395 C3009723
IEC 60099-4 Sub-clause 10.8.15	Test to verify the dielectric withstand of the internal component	C2011099-1 C3009723
IEC 60099-4 Sub-clause 10.8.17.2	Salt fog	H23005 C3009723
IEC 60099-4 Sub-clause 10.8.17.3	UV light test	C3008043 C3009723

6 IDENTIFICATION OF THE APPARATUS

The Manufacturer guarantees that the tested apparatus is manufactured according to the submitted drawings.

CESI checked that these drawings adequately represent in shape and dimensions the essential details and the main parts of the tested apparatus.

These drawings identified by CESI and numbered

- C3006774 No.1
- C3006774 No.2
- C3006774 No.3
- C3006774 No.4
- C3006774 No.5
- C3006774-No.6
- C2006774 No.7

have been annexed to the relevant test report.

China National Accreditation Service for Conformity Assessment

LABORATORY ACCREDITATION CERTIFICATE

(Registration No. CNAS L21676)

Testing Center of Nanyang Jinniu Electric Co., Ltd.

(Legal Entity: Nanyang Jinniu Electric Co., Ltd.)

1/F., Building 2, South of Zhongyuan Road, Tongbai, Nanyang, Henan, China

is accredited in accordance with ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories(CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence to undertake the service described in the schedule attached to this certificate.

The scope of accreditation is detailed in the attached schedule bearing the same registration number as above. The schedule forms an integral part of this certificate.

Effective Date：2024-10-09

Expiry Date：2030-10-08

Signed on behalf of China National Accreditation Service for Conformity Assessment 张朝华

China National Accreditation Service for Conformity Assessment (CNAS) is authorized by Certification and Accreditation Administration of the People's Republic of China (CNCA) to operate the national accreditation schemes for conformity assessment. CNAS is a signatory of the International Laboratory Accreditation Cooperation Mutual Recognition Arrangement (ILAC MRA) and the Asia Pacific Accreditation Cooperation Mutual Recognition Arrangement (APAC MRA).

The validity of the certificate can be checked on CNAS website at http://www.cnas.org.cn/english/findanaccreditedbody/index.shtml.

金牛电气 JINNIU ELECTRIC

南阳金牛电气有限公司

Nanyang Jinniu Electric Co., Ltd

20 YEARS SUPPLY RECORD

Serial No.	Quality(pcs)	Purchaser	Address	Type of Material	Supply Years	Remark
1	7320000	XIAMEN ABB Power Electronics Co., Ltd.	Shenzhen ,China	Metal Oxide Varistor 42*20	2004-2023	Normal .Still Operating
2	500	Jiangxi Power Grid Co., Ltd	China	Surge Arrester 10kA 51KV	2023.3	Normal .Still Operating
3	455000	CFE	Mexico	Surge Arrester 10kA 3~ 36KV	2018-2023	lormal .Still Operating
4	3568	LLYcon Electrica Brasil	Brazil	Surge Arrester 10kA 12KV	2017-2023	Normal .Still Operating
5	351	CG power	India	Surge Arrester core 10kA 60KV	2009-2023	Normal .Still Operating
6	258000 50000	NGK	Japan	Metal Oxide Varistor 42*20 Surge Arrester10kA 18KV	2016-2022	Normal .Still Operating
7	35020	GS Yuasa Corporation	Japan	Metal Oxide Varistor 35*30 Surge Arrester 10KA 36KV	2009-2022	Normal .Still Operating
8	5000	Raízen Energia S.A.	Brazil	Surge Arrester 10kA 72.5KV	2010-2019	Normal .Still Operating
9	35000	NKT	Germany	Surge Arrester 10kA 36KV	2015-2022	Normal .Still Operating
10	52000	Terrig (Tianjin) Technology Co., Ltd.	Tianjin,China	Surge Arrester 10kA 198KV	2002-2025	Normal .Still Operating
11	89500	Polymer-Apparat Co.,	Russia	Surge Arrester 10kA 15KV	2008-2023	Normal .Still Operating
12	17800	Iberdrola S.A.	Spain	Surge Arrester 10kA 60KV	2009-2022	Normal .Still Operating
13	35800	Elopar Group	Turkey	Surge Arrester 10kA 27KV	2014-2022	Normal .Still Operating
14	27900	Gamesa Corporación Tecnologíca S.A.	Spain	Surge Arrester 10kA 36KV	2017-2024	Normal .Still Operating

金牛电气 JINNIU ELECTRIC

南阳金牛电气有限公司

Nanyang Jinniu Electric Co., Ltd

20 YEARS SUPPLY RECORD

15	2000	Iberdrola S.A.	Spain	Surge Arrester 10kA 115KV	2009-2022	Normal .Still Operating
16	40589	Fuji Electric Co., Ltd.	Japan	Surge Arrester 10kA 36KV	2008-2022	Normal .Still Operating
17	30500	Enel Green Power S.P.A.	Italy	Surge Arrester 10kA 30KV	2016-2024	Normal .Still Operating
18	5682	Zhengzhou Xianghe Group Electrical Equipment Co., Ltd	Zhengzhou ,China	Surge Arrester 10kA 138KV	2005-2024	Normal .Still Operating
19	16358	Xiangyang State Grid Synthetic Insulator Co., Ltd.	Hubei,China	Surge Arrester 10kA 36KV	2018-2024	Normal .Still Operating
20	850000	CHNT Co,.	Zhejiang ,China	Surge Arrester 220v,36kv	2012-2023	Normal .Still Operating
21	810	Zhejiang Power Grid Co., Ltd	Zhejiang ,China	Surge Arrester 10kA 115KV	2017-2024	Normal .Still Operating
22	27600	Zhejiang Zhongneng Electric Co., Ltd.	Zhejiang ,China	Surge Arrester 10kA 15kV,36KV	2017-2024	Normal .Still Operating
23	5355	Shandong Bian Electric Power Technology Co., Ltd	Shandong,China	Surge Arrester 10kA 115KV	2010-2024	Normal .Still Operating
24	200000	Hunan Electric Power Company	Hunan,China	Surge Arrester 10kA 10KV	2018-2021	Normal .Still Operating
25	100000	Meidensha Corporation	Japan	Ring Varistor 57*31*24	2019-2023	Normal .Still Operating
26	7450	CEYLON ELECTRICITY BOARD	Sri lanka	Surge Arrester 10kA 36KV	2018-2022	Normal .Still Operating
27	1200	CEYLON ELECTRICITY BOARD	Sri lanka	Surge Arrester 10kA 12KV	2018-2022	Tender
28	25768	Nanyang Jinguan Electric Co., Ltd.	Nanyang ,China	Surge Arrester 10kA 230KV	2009-2023	Tender
29	80000	Hunan Disaster Prevention Technology Co., Ltd	Hunan,China	Surge Arrester 10kA,15kV	2022	Tender
30	45000	Hunan Disaster Prevention Technology Co., Ltd	Hunan,China	Surge Arrester 10kA 33kV	2023	Tender
31	150	Shandong taikai Transformer Co., Ltd	Shandong,China	Surge Arrester 10kA 230kV	2019-2024	Normal .Still Operating

南阳金牛电气有限公司
Nanyang Jinniu Electric Co., Ltd

20 YEARS SUPPLY RECORD

32	3	Shandong taikai Electrical Co.,Ltd	Shandong,China	Surge Arrester 10kA 400kV	2019-2024	Normal .Still Operating
33	3000	Republic of Yemen	Yemen	Surge Arrester 10kA 36kV	2019	Tender
34	96	Republic of Yemen	Yemen	Surge Arrester 10kA 108kV	2019	Tender
35	48	Republic of Yemen	Yemen	Surge Arrester 10kA 230kV	2019	Tender
36	24	Zhengzhou Xianghe Group Electrical Equipment Co., Ltd	Zhengzhou,China	Surge Arrester 10kA 66kV	2024	Normal .Still Operating
37	19	Dalian Tucheng International Corp.	Dalian,China	Porcelain Surge Arrester 10kA 230kV	2024	Normal .Still Operating
38	90	Henan Dingli equipment Co.,Ltd.	Henan,China	Surge Arrester 10kA 230kV	2022	Normal .Still Operating
39	3	Henan Dingli equipment Co.,Ltd.	Henan,China	Surge Arrester 10kA 420kV	2018-2024	Normal .Still Operating
40	120	Henan Jinguan Ecectric Co.,Ltd.	Henan,China	Surge Arrester 20kA 500kV	2019-2024	Normal .Still Operating
41	18	PT Symphos Electric	Indonesia	Surge Arrester 10kA 216kV	2024	Normal .Still Operating
42	36	DAX ENERGY EQUIPAMENTOS ESISTEMAS LTDA	Brazil	Surge Arrester 10kA 198kV	2023	Tender
43	6	TOP ELECTRO LLC	Ukraine	Surge Arrester 10kA 192kV	2024	Normal .Still Operating

Date:7th,April,2025

Nanyang Jinniu Electric Co.,Ltd

南 阳 金 牛 电 气 有 限 公 司

NANYANG JINNIU ELECTRIC CO., LTD

Certificate of Conformance and Warranty Letter

We, Nanyang Jinniu Electric Co., Ltd, warrants that the product or any part supplied by us are free from defects in the design, engineering, materials and workmanship of the product supplied and are in compliance with the standard IEC 60099-4 .

We warrant that if there is damage to property or personnel due to defects in the design, engineering, materials and workmanship of the product supplied by us during the installation and/or use, we shall be fully liable for any loss or damage thereby suffered by the Purchaser and/or the End User.

Signature and seal：Nucky

Manufacturer：NANYANG JINNIU ELECTRIC CO., LTD

Date：02/02/2026

The Certificate Of Quality Management System

Certificate No.: 3671900079R2M

Nanyang Jinniu Electric Co., Ltd

Registered Address:South section of Zhongyuan Road, Industrial Cluster Area, Tongbai County Zip Code: 474750

Office Address: South section of Zhongyuan Road, Industrial Cluster Area, Tongbai County, Nanyang city, Henan province Zip Code: 474750

Production address: South section of Zhongyuan Road, Industrial Cluster Area, Tongbai County, Nanyang city, Henan province Zip Code: 474750

Uniform social credit code: 9141133068316840XF

According to your organization's application,our company carried out audit and certification in accordance with the requirements for Quality Management System(GB/T19001-2016/ISO9001:2015), it accords with the Requirementsthrough assessment.The scope of the certified QMS is:

Design, development, and production of Metal Oxide Varistors, Metal Oxide surge arresters and surge arrester core

Initial date: Apr 12,2019 Recertification date: Nov 29,2024 The certificate is valid until: Dec 06,2027

First S.A.	Labelling	Second S.A.	Labelling	Third S.A.	Labelling

The certified organization must accept at least one surveillance audit annually and a qualified mark shall be attached onto the certificate, within validity period of the certificate, then the certificate can be maintained valid.
For more details of this certificate, please login CNCA' s website: www.cnca.gov.cn.
For the validity of the certificate,please scan the QR codes ride for accurate information.

MEMBER OF MULTILATERAL RECOGNITION ARRANGEMENT IAF

CNAS 中国认可 国际互认 管理体系 MANAGEMENT SYSTEM CNAS C233-M

CSHY ZHONG BIAO HUA YUAN

证书专用章

ZHONG BIAO HUA YUAN(BEIJING)CERTIFICATION CENTER CO., LTD.
Address: 4th Floor, Building No. 22, 10th District, No. 188 South Sihuan West Road, Fengtai District, Beijing
P.C.:100070 Tel.:010-53393099 Mailbox: cshy03_2018@163.com
Website:http://www.cshychina.com