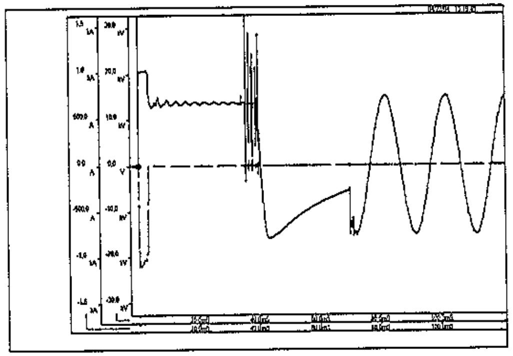
Switching surge operating duty test
Section No.9., rated 10.83 kVrms

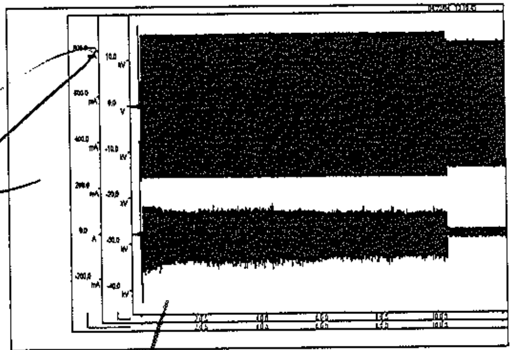


Second long duration current impulse followed by TOV

Time scale: 20.0 ms/div

Voltage scale: 10.0 kV/div

Current scale: 500.0 A/div



Temporary overvoltage (TOV) during 10 sec followed by 0.87 x rated voltage.

Time scale: 2.0 sec/div

Voltage scale: 10.0 kV/div (10.96 kVrms, 9.66 kVrms)

Current scale: 200.0 mA/div

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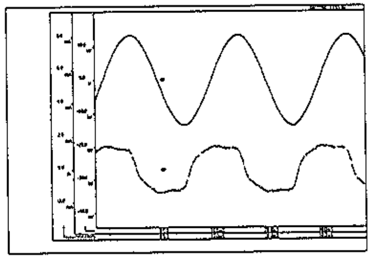
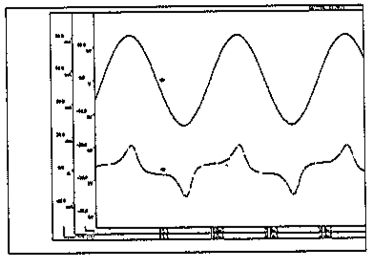
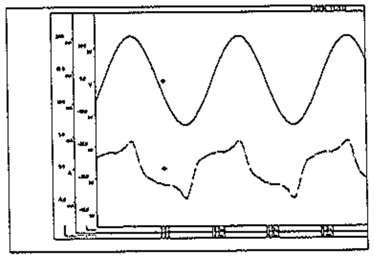
Switching surge operating duty test
Leakage current measurements
Power frequency voltage 9.66 kVrms
Section No.9., rated 10.83 kVrms
Time scale : 10.0 ms/div
Voltage scale: 10.0 kV/div



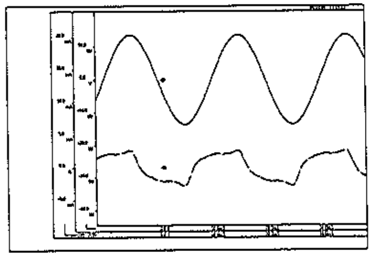
Current scale: 2.0 mA/div
Before 1st discharge at 61.2 °C.



Current scale: 10.0 mA/div
Immediately after 2nd discharge.



Current scale: 5.0 mA/div
10 min after 2nd discharge.



Current scale: 2.0 mA/div
30 min after 2nd discharge.

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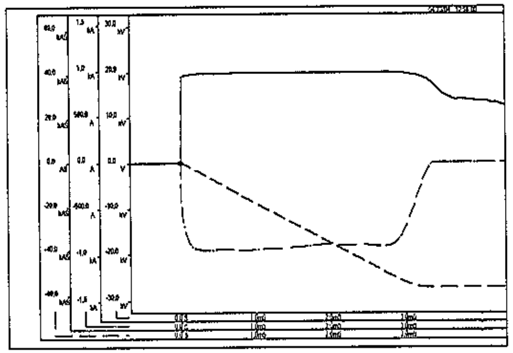
Switching surge operating duty test
Additional long duration current impulse
3rd application
Time scale : 1000.0 µs/div
Voltage scale: 10.0 kV/div
Current scale: 500.0 A/div
Energy scale : 20.0 kJ/div



Section No.7.
rated 10.83 kVrms

Voltage: 20.03 kV

Current: 917.8 A

Energy : 55.93 kJ

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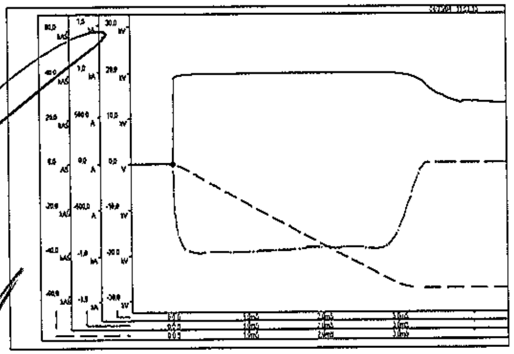

Section No.8
rated 10.83 kVrms

Voltage: 19.98 kV

Current: 928.1 kA

Energy : 56.52 kJ

000245

ВЯРНО С
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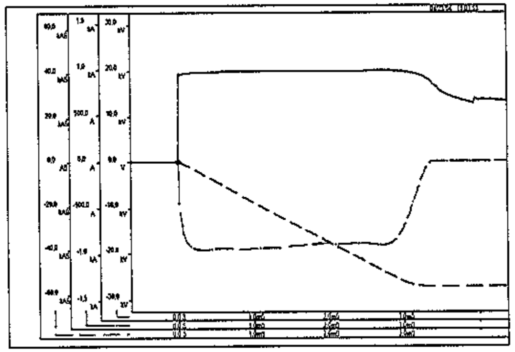
Switching surge operating duty test
Additional long duration current impulse
3rd application
Time scale : 1000.0 µs/div
Voltage scale: 10.0 kV/div
Current scale: 500.0 A/div
Energy scale : 20.0 kJ/div



Section No.9.
rated 10.83

Voltage: 20.05 kV

Current: 919.4 A

Energy : 56.00 kJ

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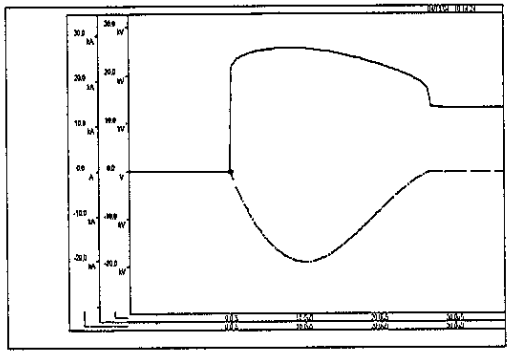
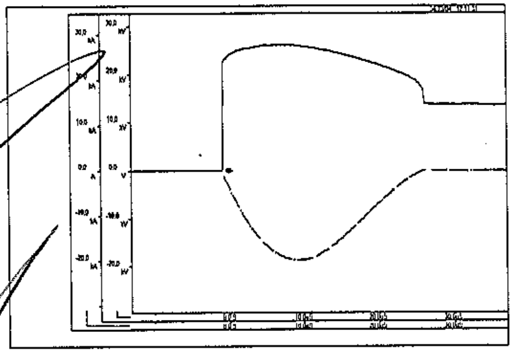
Residual voltage test at 10 kA, 8/20 µs
Section rated 10.83 kVrms
Section No. 7
Time scale: 10.0 µs/div



1st application

Voltage: 10.0 kV/div
(25.64 kV)

Current: 10.0 kA/div
(20.22 kA)



2nd application

Voltage: 10.0 kV/div
(25.95 kV)

Current: 10.0 kA/div
(19.81 kA)

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ВЯРНО С ОРИГИНАЛА

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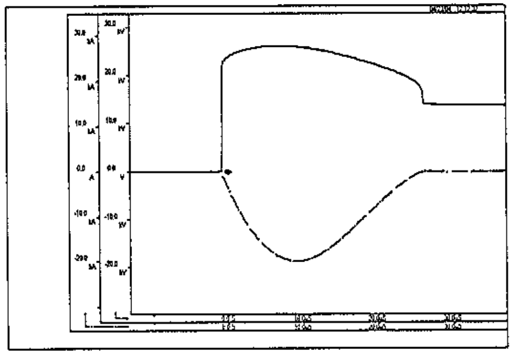
Residual voltage test at 10 kA, 8/20 µs
Section rated 10.83 kVrms
Section No. 7
Time scale: 5.0 µs/div



3rd application

Voltage: 10.0 kV/div
(25.98 kV)

Current: 10.0 kA/div
(19.93 kA)

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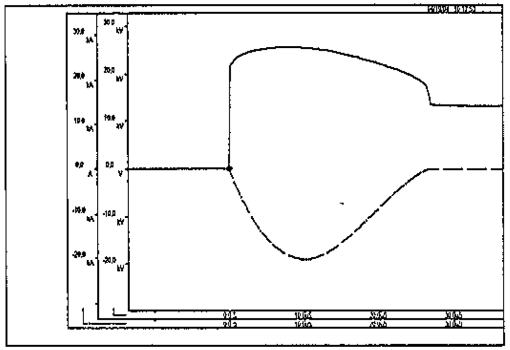
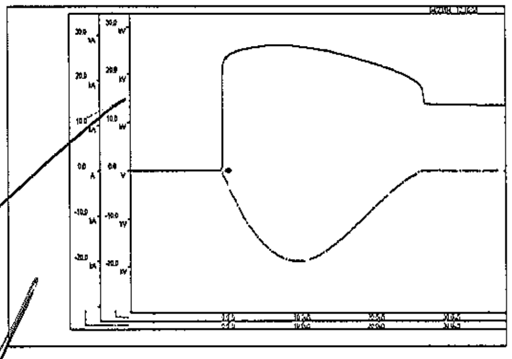
Residual voltage test at 10 kA 8/20 μs
Section rated 10.83 kVrms
Section No. 8
Time scale: 10.0 μs/div



1st application

Voltage: 10.0 kV/div
(25.60 kV)

Current: 10.0 kA/div
(20.22 kA)



2nd application

Voltage: 10.0 kV/div
(25.92 kV)

Current: 10.0 kA/div
(19.94 kA)

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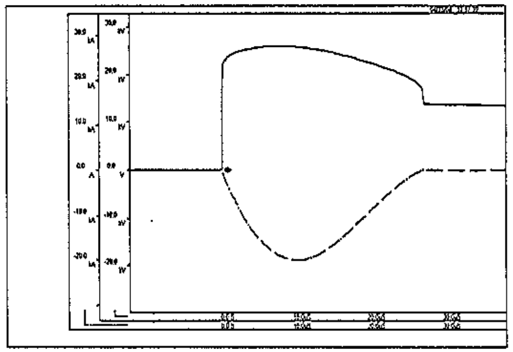
Residual voltage test at 10 kA 8/20 μs
Section rated 10.83 kVrms
Section No. 8
Time scale: 10.0 μs/div



3rd application

Voltage: 10.0 kV/div
(25.95 kV)

Current: 10.0 kA/div
(20.06 kA)

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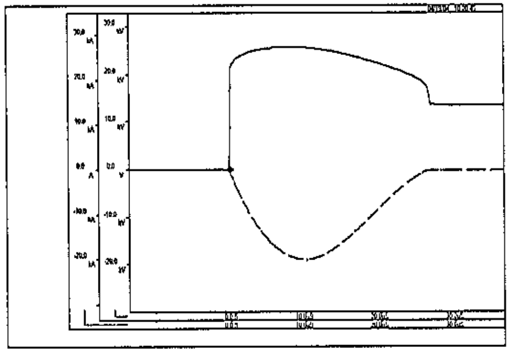
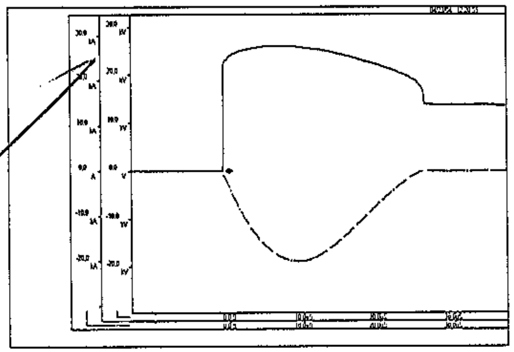
Residual voltage test at 10 kA 8/20 µs
Section rated 10.83 kVrms
Section No. 9
Time scale: 10.0 µs/div



1st application

Voltage: 10.0 kV/div
(25.67 kV)

Current: 10.0 kA/div
(20.15 kA)



2nd application

Voltage: 10.0 kV/div
(25.95 kV)

Current: 10.0 kA/div
(20.01 kA)

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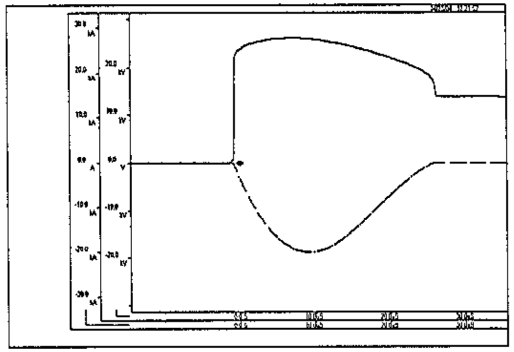
Residual voltage test at 8/20 µs
Section rated 10.83 kVrms
Section No. 9
Time scale: 10.0 µs/div



3rd application

Voltage: 10.0 kV/div
(25.97 kV)

Current: 10.0 kA/div
(19.97 kA)

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ВЯРНО С ОРИГИНАЛА
"КРАСИН" ООД СМОЛЯН

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ENCLOSURE

TEST CIRCUIT - INSTRUMENT SPECIFICATION

The main test report contains only a very short description of test circuits and measuring instruments.

However, a detailed specification of different test circuits, designated 1-9, is found in this enclosure. For each circuit the main components are shown by a sketch in which also all instruments for measuring of voltages, currents and temperatures could be identified. In a belonging "Equipment and Instrument Table" all important data concerning the used instruments as type identification, accuracy and calibration intervals are listed.

Notel All test circuits in the enclosure can not necessary be referred to the test report. This inclosure is used as a basic document for all test reports on surge arresters, and therefore contains a summary of all frequently used test circuits.

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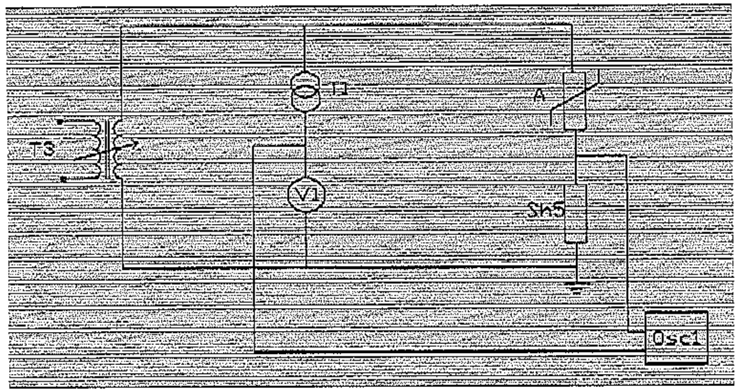
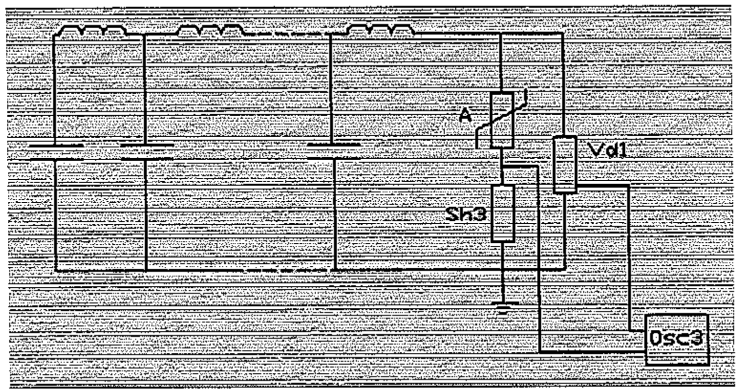
No 1 Principal design of circuit for reference voltage test (AC).



No 2 Principal design of circuit for reference voltage (DC) measuring.



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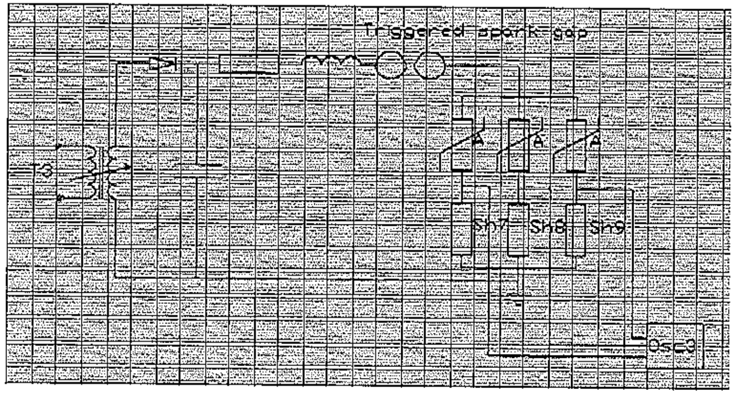
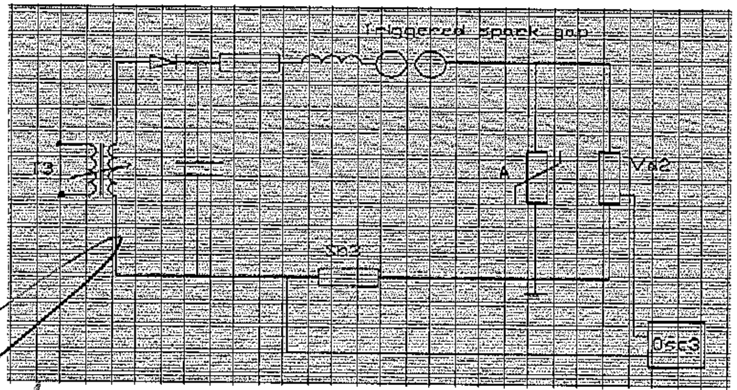
No 3 Principal design of circuit for current sharing test



No 4 Test circuit for residual-voltage test (discharge-voltage time characteristic). All tests including energy withstand and/or residual-voltage (discharge-voltage) tests with a current front time less than or equal to 1 ms and approximately sinusoidal wave shape.



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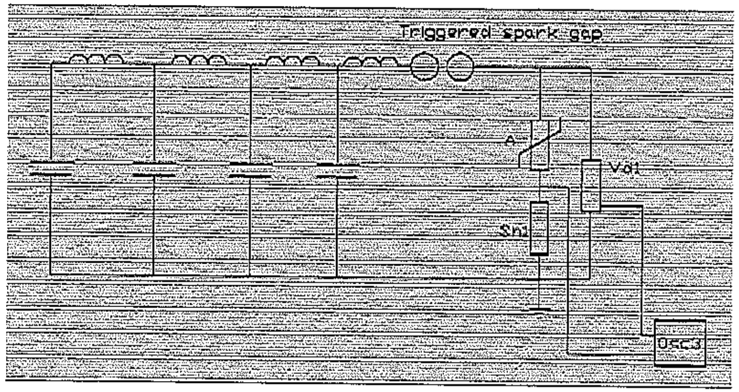
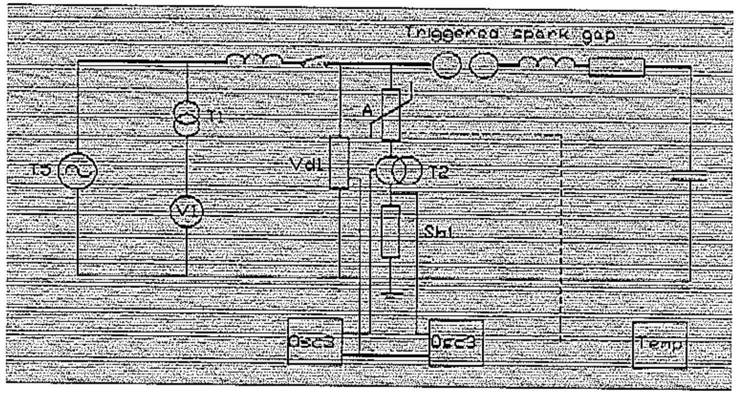
No 5 Test circuit for transmission line discharge test. (All tests including approximately rectangular current impulses.)



No 6 Test circuit for nominal current operating duty test 5, 10, 15 or 20 kA wave shape 8/20 µs. (Applications of an impulse current with the test section energized at power frequency voltage. Alternatives with power frequency voltage applied a short period of time after the impulses or impulse applications without any power frequency voltage are also covered by the test circuit.)



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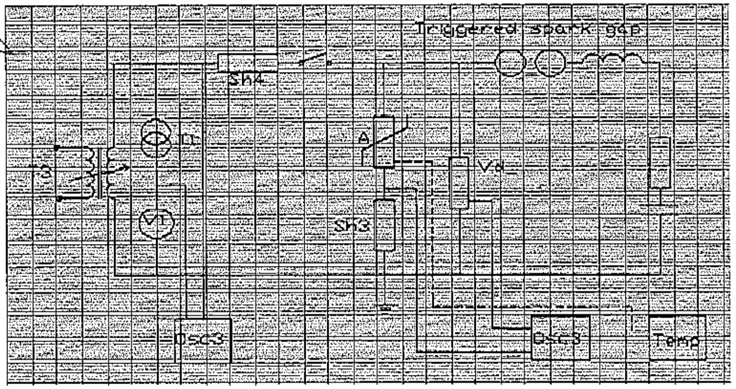
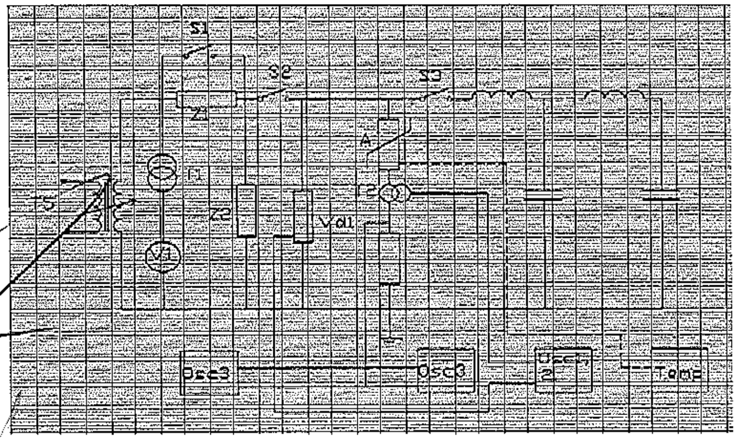
No 7 Test circuit for high current operating duty tests.
(Application of a lightning impulse or switching impulse current.)
Impulse current waveshape is approximately sinusoidal with an energy content higher than in tests according to fig. 6. Voltage is applied a short period of time after the impulse or during and after the impulse.



No 8 Test circuit for transmission line discharge tests followed by power frequency voltage. (All tests including approximately rectangular current impulse followed by power frequency voltage.)



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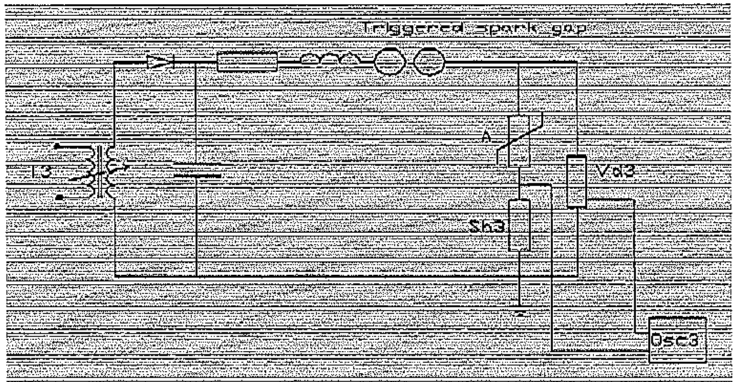
No 9 Test circuit for residual voltage tests on complete arresters or arrester units. Test circuit is also used for checking of current sharing between complete arresters or arrester unit.



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ВЯРНО С
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LIST OF INSTRUMENTS AND EQUIPMENT

Equipment or Instrument	Range of uses	Manufacturer	Type Identification	Ratio	Accuracy	Calibration interval times per year	Notes / Model
A	Test object	ABB	ZnO				Arrester or prorated section
Vd_1	Voltage div.	"	Resistive/Capacit., AKBP 1.	1:1000	± 0.3%	2	Resistance 5.6 M ohm
Vd_2	"	"	Resistive, AKBP 2.	1:96.00	DC ± 0.2%	2	" 3.5 k ohm
Vd_3	"	"	Resistive, E-A553	1:200,4	DC ± 0.01%	2	" 100.2 k ohm
Vd_4	"	"	Resistive, E-E312	1:200	DC ± 0.2%	2	" 7.5 k ohm
"	"	"	"	1:1000	"	2	" "
"	"	"	"	1:5000	"	2	" "
"	"	"	"	1:10000	"	2	" "
M_1	Multimeter	Hewlet Packard	ZE-F587		0.1%	2	Digital multimeter
M_2	Multimeter	Hewlet Packard	ZE-F794		0.1%	2	Digital multimeter
W_1	Wattmeter	Ohio Brass	ZE-A321			2	Little Joule
W_2	AC/DC-Power Analyzer	Norma	ZE-D364			2	D 5135
Osc 1	Storage osc.	Tektronix	E-C167		± 2%	1	7623A
Osc 2	Transient r.	Nicolet	E-A410		± 0.2 %	1	4094
Osc 3	"	Nicolet	E-E605		± 0.2%	1	490
Osc 4	"	Nicolet	E-F810		± 0.2%	1	Pro30
Osc 5	"	Nicolet	E-J461		± 0.2%	1	Pro90
Osc 6	Storage osc.	Tektronix	E-A954		± 2%	1	2430
Temp 1	Thermometer	Testoterm	ZM-A656		± 0.6%	1	D 700 Utilizing thermocouples
Temp 2	Recorder	TOA	ZE-C003		± 0.5	1	EPR type Cromel-Alumel
T_1	Voltage transf.	ABB	EMFC, AKBP 3.	1:1000	Class 1.0	Test Report 83-12-05	Ratio error 0.14%
T_2	Current transf.	"	TXL			1	Arrester leakage current meter
T_3	Power transf	"	EOMA 441	1:150			5 kA
T_4	Power transf.	"	TMZ				5 MVA
T_5	Power generator	"	G 1513				short-circuit gen. 2400 A at 12 kV

HVP/AK 04-22
Enclosure 1:7

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LIST OF INSTRUMENTS AND EQUIPMENT

Equipment or Instrument	Range of uses	Manufacturer	Type Identification	Ratio	Accuracy	Calibration interval times per year	Notes / Model
Datalogger	Thermometer	Intab	M-C163			1	AAC-2
Temp 3	"	Testotherm	M-A506			1	D700N
Temp 4	"	"	M-A175			1	D700
Temp 5	"	"	M-C011			1	D700
Temp 6	"	ASEA	M-B722			1	Fiber 1010
Temp 7	"	"	M-B723			1	Fiber 1010
F1	Filter	Kron-Hite	E-C711		± 5 %	1	
P1	Power supply	Delta Elektronika	E-G135			1	SM 3004-D
M1	Multimeter	Fluke	E-A322		± 0.1 %	1	8020A
CM	C-meter	Doric	E-D084			1	130A

HVP/AK 04-22
Enclosure 1:8

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ВЯРНО С ОРИГИНАЛА

"МРАСИН" СМОЛЯН ООД

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LIST OF INSTRUMENTS AND EQUIPMENT

Equipment or Instrument	Range of uses	Manufacturer	Type	Ratio	Accuracy	Calibration Interval times per year	Notes Model
Sh_1	Coax shunt	ABB	ZE-A117		± 0.5%	1	0.020 ohm
Sh_2	"	"	ZE-A118		± 0.5%	1	0.020 ohm
Sh_3	"	"	ZE-A115		± 0.5%	1	0.005 ohm
Sh_4	Optical shunt	"			± 1%	In connection with test	10 k ohm
Sh_5	Shunt	"			± 0.5%	2	1 k ohm
Sh_6	"	"			± 0.5%	In connection with test	10 k ohm
Sh_7	Coax. shunt	Haefy	ZE-B251		± 0.5%	1	0.00532 ohm
Sh_8	"	"	ZE-C115		± 0.5%	1	0.0050 ohm
Sh_9	"	"	ZE-C112		± 0.5%	1	0.0050 ohm
Sh_{10}	"	"	ZE-B250		± 0.5%	1	0.0256 ohm
Sh_{11}	Coax. shunt	ABB	ZE-A487		± 0.5%	1	0.0050 ohm
Sh_{12}	"	"	ZE-A119		± 0.5%	1	0.0050 ohm
Sh_{13}	"	"	ZE-A120		± 0.5%	1	0.0050 ohm
Sh_{14}	"	"	ZE-A121		± 0.5%	1	0.0050 ohm
Sh_{15}	"	"	ZE-A116		± 0.5%	1	0.020 ohm
Sh_{15}	"	"	ZE-D225		± 0.5%	1	0.020 ohm
Sh_{17}	"	"	ZE-C646		± 0.5%	1	0.020 ohm
Sh_{18}	"	"	ZE-C809		± 0.5%	1	0.020 ohm

NOTE! Values for voltage dividers and shunts are nominal values.

HVP/AK 04-22
Enclosure 1:9

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LIST OF INSTRUMENTS AND EQUIPMENT

Equipment or Instrument	Range of uses	Manufacturer	Type	Ratio	Accuracy	Calibration Interval times per year	Notes Model
Sh_{19}	Coax shunt	ABB	ZE-C807		± 0.5%	1	0.020 ohm
Sh_{20}	"	"	ZE-C808		± 0.5%	1	0.020 ohm
Sh_{21}	"	"	ZE-D895		± 0.5%	1	0.002 ohm
Sh_{22}	"	"	ZE-D402		± 0.5%	1	0.003 ohm
Sh_{23}	"	"	ZE-F045		± 0.5%	1	1000 ohm
Sh_{24}	"	"	ZE-F043		± 0.5%	1	100 ohm
Sh_{25}	"	"	ZE-F044		± 0.5%	1	10 ohm

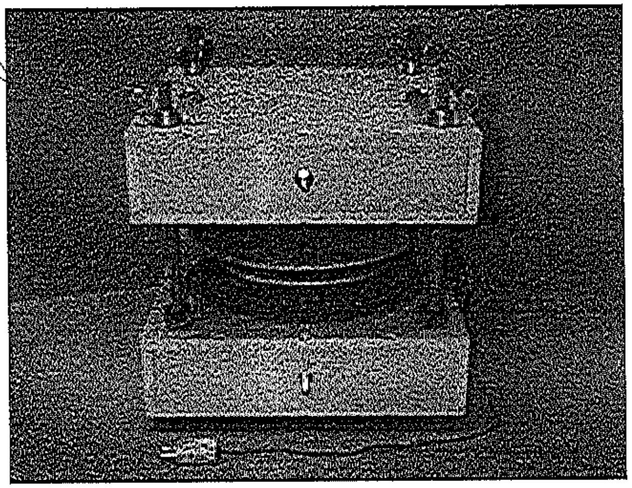
NOTE! Values for voltage dividers and shunts are nominal values.

HVP/AK 04-22
Enclosure 1:10

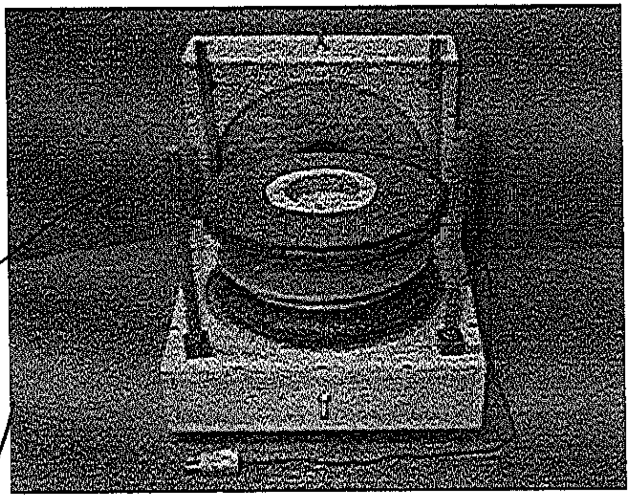
ВЯРНО С ОРИГИНАЛА

"КРАСИН" СМОЛЯН ООД

Test section used for operating duty test



Complete prorated test section



Bottom cover, insulator and the two ZnO- blocks (top cover removed).

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Type tests on PEXLIM P surge arresters

Test object	Three ABB PEXLIM P varistors rated voltage 6.37 to 6.38 kV_{rms}.
Standard	IEC standard 60099-4, Edition 1.2, 2001-12
Test performed	Accelerated ageing test in open air at 0.98 times the rated voltage during 1053 hours.
Tests completed	2004-08-04
Tests performed at	ABB Power Technologies AB - Surge Arrester Laboratory
Witnessing	The tests were witnessed by SATS Inspector Mr. Minoo Mobedjina.

SATS Certification
Minoo Mobedjina
Inspector

на основание чл. 2 от ЗЗЛД

15/9-2004

на основание чл. 2 от ЗЗЛД

Tests reported by : Kent Riik

Report approved by : Lennart Stenström

на основание чл. 2 от ЗЗЛД

Report consists of : 10 pages

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We hereby certify that the objects specified above have successfully passed the test herein reported, thereby verifying guaranteed data.

Ludvika 2004-08-27

ABB Power Technologies AB
High Voltage Products/Surge Arresters
Quality Department

ABB Power Technologies AB
QA
QUALITY

на основание чл. 2 от ЗЗЛД

Kurt Jansson

ВЯРНО С ОРИГИНАЛА

СМОЛЯН

CONTENTS

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ВЯРНО С ОРИГИНАЛА

"КРАСИН" СМОЛЯН ООД

1 SUMMARY

Accelerated ageing tests have been performed on ABB's PEXLIM P type ZnO varistors in accordance with the IEC standard 60099-4, Edition 1.2, 2001-12.

The IEC standard requires testing during 1000 hours at an elevated temperature of 115 °C with the test samples in the surrounding medium of the arrester. The power losses after 1 to 2 hours, P_{1ct}, (starting value) shall be compared with the power losses after 1000 hours, P_{2ct}, and the minium power losses, P_{3ct}, during the 1000 hours test. If the power losses after 1000 hours are less than or equal to the starting value and less than or equal to 1.1 * P_{3ct}, the operating duty tests specified in the proposed standard shall be performed on new varistor blocks without the use of correction factors to be applied to power frequency test voltages. If $P_{2ct} > P_{1ct}$ and $P_{2ct} \leq 1.1 * P_{3ct}$ correction factors are used to obtain the same increase in power losses on new varistor blocks as measured on blocks subjected to the accelerated ageing test. Finally, if $P_{2ct} > 1.1 * P_{3ct}$ aged samples shall be used in the operating duty test.

ABB PEXLIM P surge arresters are equipped with a polymeric housing comprising glass-fiber reinforced plastic and silicon rubber. The rubber is bonded to the varistor surface by vulcanization. The arresters are used in open air, therefore, the tests were performed on sections (including the polymeric housing) in open air. The arrester were pretensioned to a total force of 40 kN before the test. A drawing of the used test section is shown in Enclosure 5.

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2 ACCELERATED AGEING TEST PROCEDURE

2.1 General

The reference current for the ABB PEXLIM P surge arrester is defined at a peak value of 3 mA of the resistive component of the power frequency current. The reference voltage (U_{ref}) is the peak value of power frequency voltage divided by $\sqrt{2}$ measured at the reference current. The resistive current may be slightly asymmetrical in this current region. The reference voltage, therefore, always is defined as the minimum voltage measured at the reference current independent of polarity. The reference voltage (U_{ref}) measured at 23 ± 5 °C is checked on all complete assembled arrester units and must be equal to or higher than the rated voltage, (U_r).

Furthermore, the reference voltage measurement is used to determine test stresses on prorated test sections. The rated voltage of a prorated test section is determined as $U_r = U_{ref}$ in order to ensure that the prorated test section is exposed to higher or equal stresses than any complete surge arrester or surge arrester unit.

2.2 Test objects

Three prorated sections each comprising a polymeric housing and a single PEXLIM P varistor were tested.

The dimensions of the varistors were D=73.8 mm and H=42.5 mm.

Drawing for the varistor type is 5681 018-601.

The reference voltages, measured at a resistive peak current of 3 mA, and corresponding rated voltages are given in Table 1.

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2.3 Test procedure

Prior to the accelerated ageing test, the reference voltage for each varistor was measured.

The test voltage for each of the three varistors was set individually to 0.98 times the measured reference voltage.

Varistor No.	U_{ref} (kV_{rms})	U_r (kV_{rms})	Test voltage (kV_{rms})
1	6.37	6.37	6.25
2	6.38	6.38	6.25
3	6.37	6.37	6.24

Table 1.

The factor 0.98 was chosen in order to take into account maximum possible local voltage stress due to non-linear voltage distribution occuring in any PEXLIM P arrester.

The test-cycle was supervised by a data acquisition system connected to a computer. The system measured each test object individually with respect to test time, temperature, voltage, current, and power losses.

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2.4 Results

The power losses during the accelerated ageing test are shown in Enclosure 1 as the ratio of the measured power losses to the starting value. The starting value is defined as the power losses measured 1 hour after the voltage application.

Complete a.c. characteristics (resistive leakage current vs. voltage) at room temperature and 120°C, both before and after the ageing test, are shown in Enclosures 2 to 4. For PEXLIM P arresters U_C (Continuous Operating Voltage) is less than or equal to 0.8 x U_r.

Thus, as can be seen from the Diagrams, the characteristics are improved after the tests.

The measured test voltage for each varistor is shown in Enclosure 1 as % of nominal test voltage. The temperature deviation for each varistor is shown in the same Enclosure as the difference between nominal temperature and measured temperature in °C.

Varistor No.	P_{1ct} [W]	P_{2ct} [W]	P_{3ct} [W]	P_{2ct} / P_{1ct}	P_{2ct} / P_{3ct}
1	15.467	7.563	7.020	0.489	1.077
2	12.015	6.640	6.265	0.563	1.060
3	10.935	7.152	6.691	0.654	1.069

Table 2.

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"КРАСИН" СМОЛЯН ООД

2.5 Conclusion

Power losses at start of the test, P_{1ct}, and after 1053 hours, P_{2ct}, as well the minimum value during the test, P_{3ct}, are shown in Table 2. The power losses after 1053 hours' testing (P_{2ct}) are less than the power losses measured after 1 hour (P_{1ct}). In addition (P_{2ct}) is less than 1.1 times the minimum power losses (P_{3ct}).

Hence, new PEXLIM P varistors shall be used in all type (design) tests without applying any correction factors.

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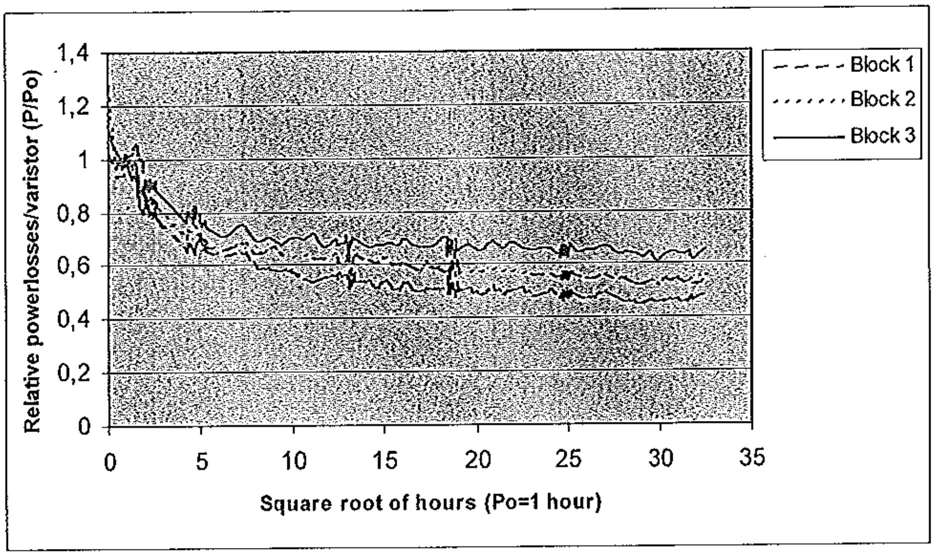

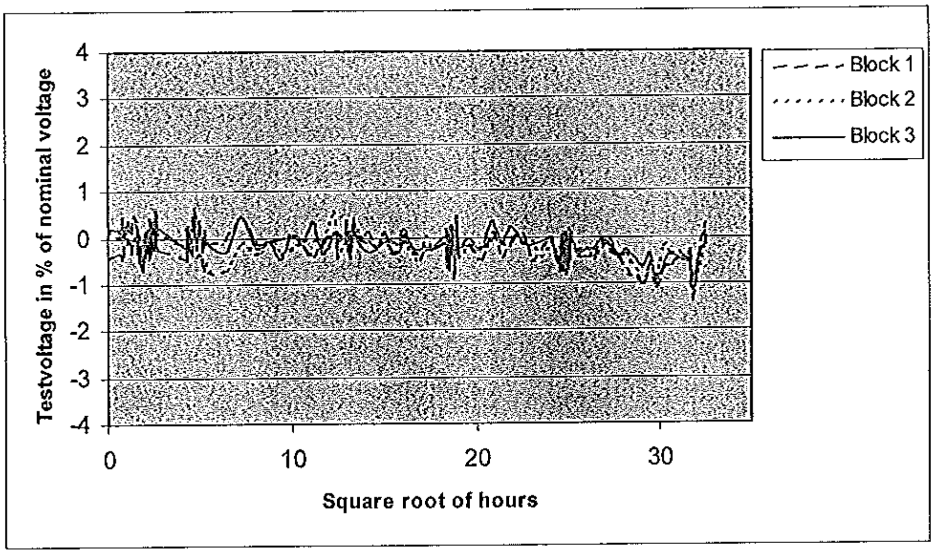

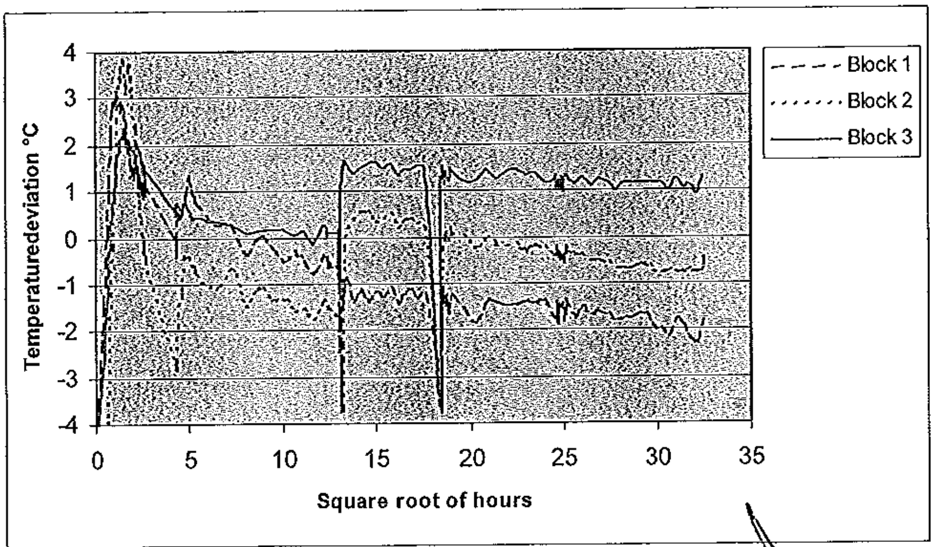

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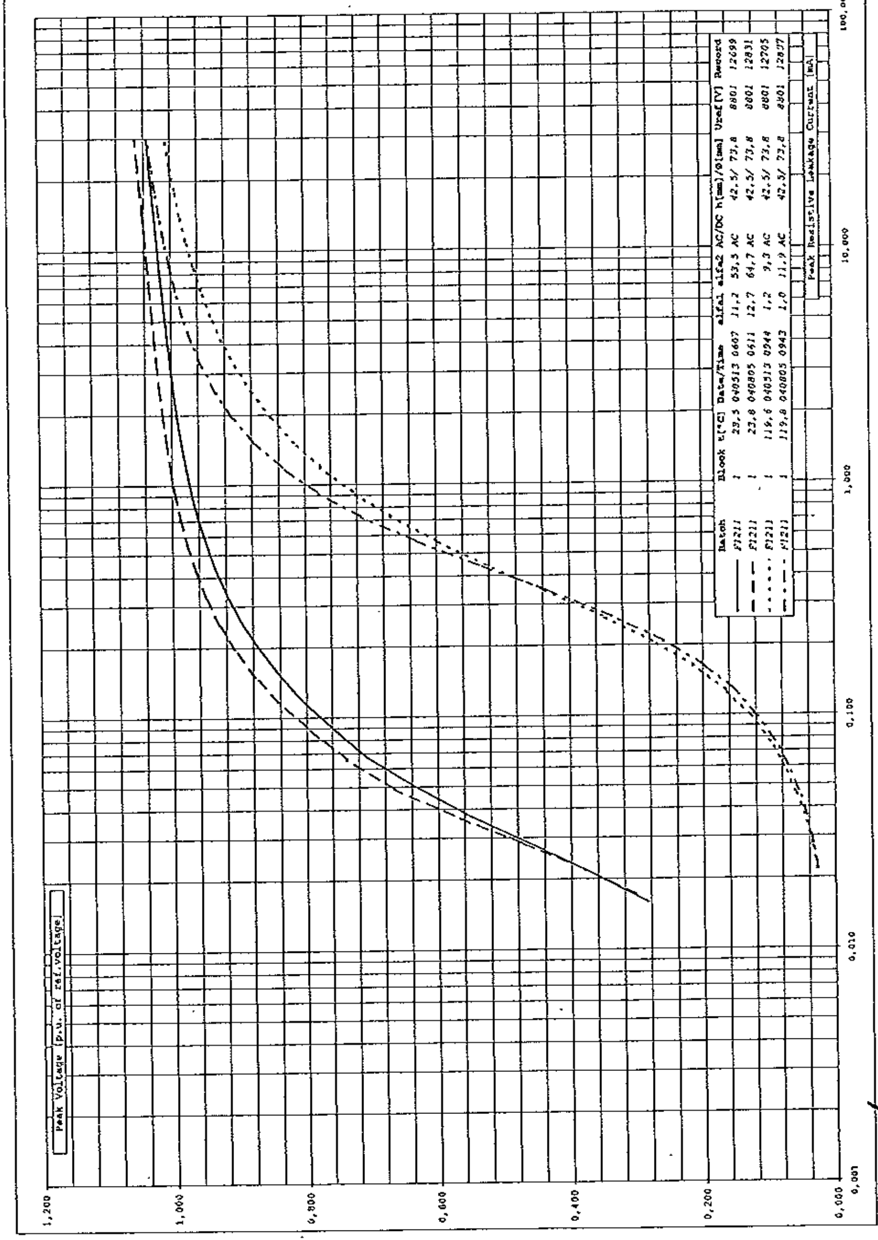
ВЯРНО С ОРИГИНАЛА
"ГРАСИН" СМОЛЯН ООД

ABB AC/DC Test on ZnO Varistors	AC-CHARACTERISTICS AT 20 AND 120 °C. BEFORE AND AFTER ACCELERATED AGEING TEST ON P 6 kV VARISTORS. NO. 1.	Date 04-08-24 HVP/AK 04-28 Enclosure 2



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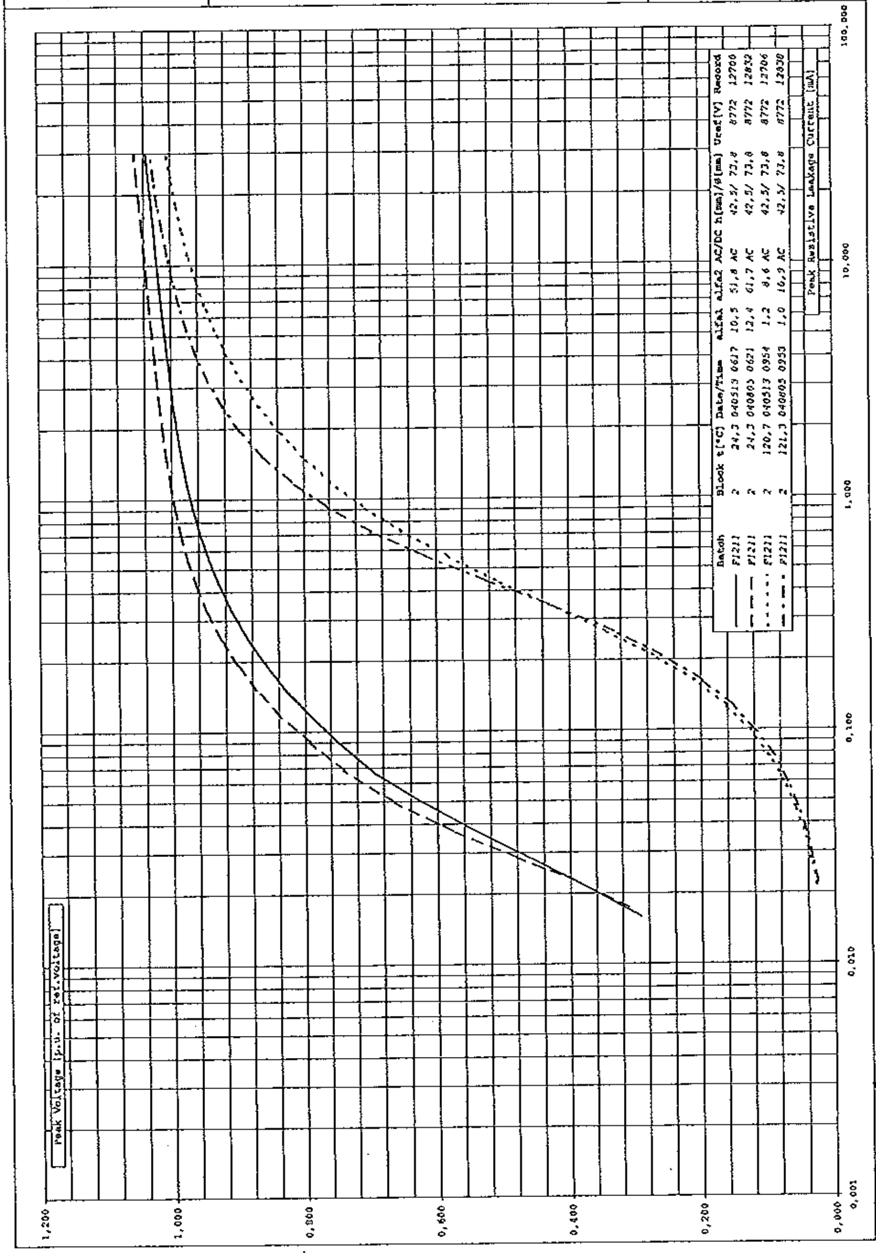
КРАСИН СМОЛЯН ООД

ABB AC/DC Test on ZnO Varistors	AC-CHARACTERISTICS AT 20 AND 120 °C. BEFORE AND AFTER ACCELERATED AGEING TEST ON P 6 kV VARISTORS. NO. 2.	Date 04-08-24 HVP/AK 04-28 Enclosure 3



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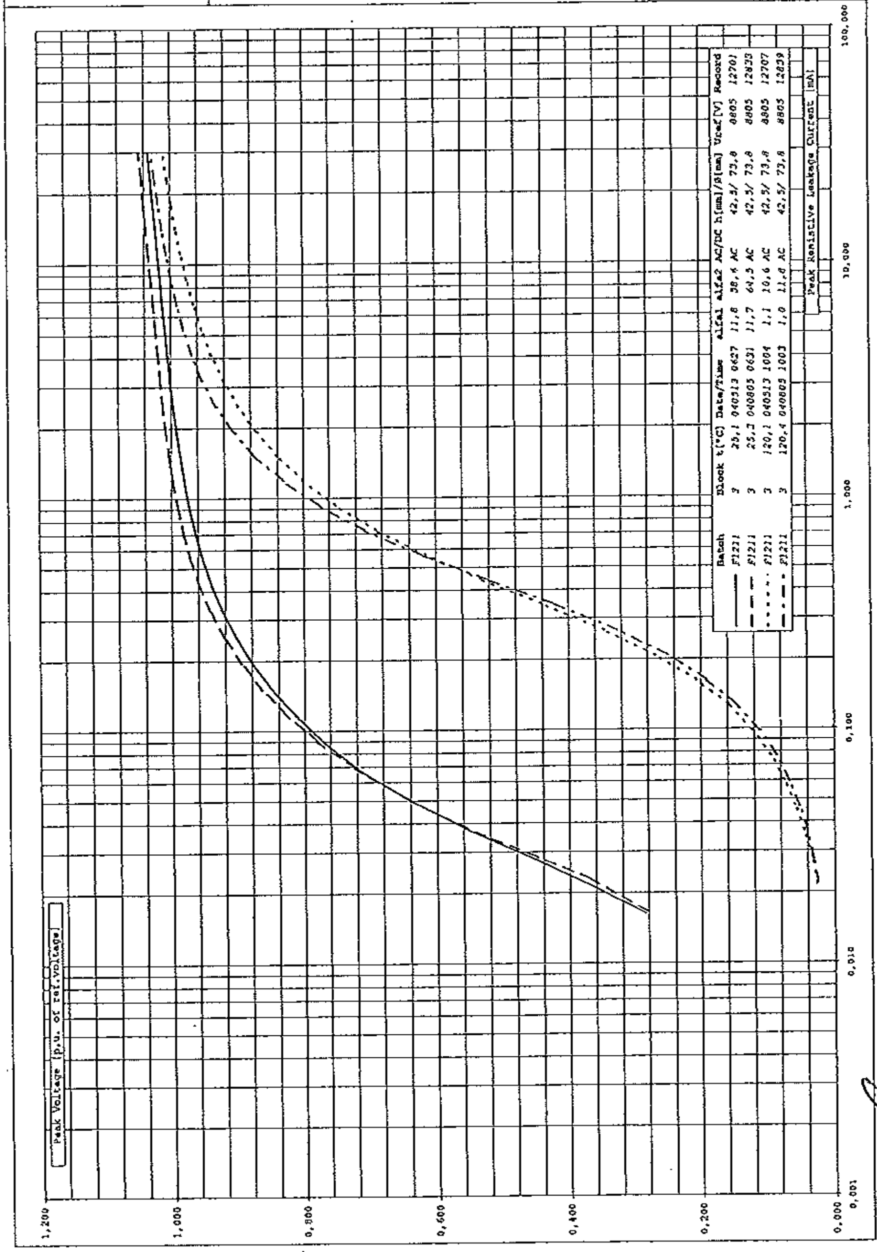
ВЯРНО С ОРИГИНАЛА

"КРАСИН" СМОЛЯН ООД

ABB AC/DC Test on ZnO Varistors	AC-CHARACTERISTICS AT 20 AND 120 °C. BEFORE AND AFTER ACCELERATED AGEING TEST ON P 6 kV VARISTORS. NO. 3.	Date 04-08-24 HVP/AK 04-28 Enclosure 4



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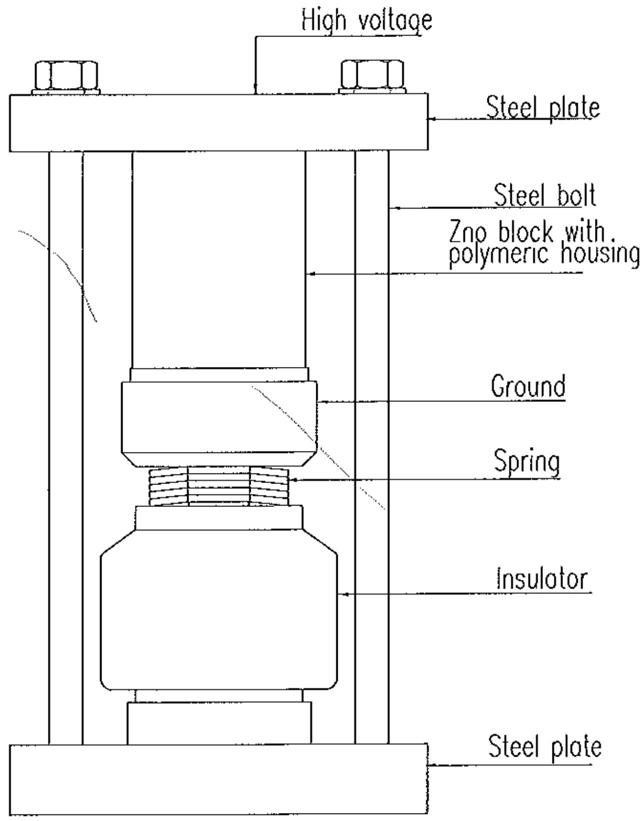

Test section

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ВЯРНО С
ОРИГИНАЛА

"КРАСИН"
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ООД

LAK 5873
PTPH/HV/AKB

Обобщение на типовите изпитания на вентилен отвод PEXLIM P-X

Металоокисен ограничител на пренапрежения със силиковова външна обвивка.

Извършени типови изпитания	Стандарт	Доклад No.	Издание	Бележка/проверка
Електрически тестове				
Изпитване на външна изолация	IEC 60060-1,ANSI Std 4	HVP/AK 02-03	2002-01-08	Всички размери модули (36, 72 and 120kV)
Изпитване на ускорено стареене	IEC 60099-4	HVP/AK 04-28	2004-08-27	Дългосрочна устойчивост при стрес с
Изпитване на ускорено стареене	ANSI/IEEE C62.11	HVP/AK 04-29	2004-08-27	най-високо напрежение (0.98*Uref)
Изпитване на остатъчно напрежение	IEC 60099-4	HVP/AK 04-22	2004-06-11	Защитните нива
Издръжливост на продължителен токов импулс	IEC 60099-4	HVP/AK 04-22	2004-06-11	Възможност за покриване на клас 4
Изпитване за експлоатационни характеристики	IEC 60099-4	HVP/AK 04-22	2004-06-11	Устойчивост на импулс и термична устойчивост
Изпитване на ток на късо съединение				
Тест на к.с. с голям ток (65kA)	IEC 60099-4,Amendment 2	HVP/AK 02-02	2002-01-08	Метод за свръхнапрежение
Тест на к.с. с малък ток (600A)	IEC 60099-4,Amendment 2	HVP/AK 02-02	2002-01-08	Метод за свръхнапрежение
Изпитвания за стареене под въздействие на околната среда				
Тест стареене от времето (1000 h солена мъгла)	IEC 60099-4,Amendment 2	SATS 02-S01	2002-01-21	Тест на120 kV модул
Тест за проникване на влага	IEC 60099-4,Amendment 2	HVP/AK 01-06	2001-12-20	Тест на 120 kV модул
Проверка на нискотемпературните характеристики		HVP/AK 02-01	2002-01-07	Тест на 120 kV модул при 2500Nm -50°C
Механични изпиания				
Изпитване на издържливост на огъване		HVP/AK 01-09	2001-12-10	Проверява максимално използваемото огъване
Изпитване на разрушаване при огъване		HVP/AK 01-07	2001-12-10	при момент от ≥ 2500 Nm

Технически данни	Документ No.	Издание
Защитни характеристики	LAK 5882	2003-04-09
Характеристики кратковременно пренапрежение (TOV)	LAK 5881	2002-01-08

ABB Силови Технологии AB

С настоящото удостоверяваме, че горните тестовете, проверяват гарантираните данни за вентилен отвод тип PEXLIM P-X

Людвика 2002-01-25
ABB Продукти Силови Технологии
[redacted] Напрежение/
[redacted] дел Качество

на основание чл. 2 от ЗЗЛД

ABB Power Technologies AB QA QUALITY

ABB

2002-01-25
Рев. 2 (Дата на ревизията 2005-12-16)

ВЯРНО С ОРИГИНАЛА

„СИН" ООД СМОЛЯН

000265

SATS Certification

Scandinavian Association for Testing of Electric Power Equipment
c/o – SINTEF Energy Research, Sem Saelandsv. 11, NO – 7465 Trondheim, Norway
Telephone: + 47 73 59 72 00 Telefax: + 47 73 59 72 50 E-mail: SATS@energy.sintef.no

Report of Performance No.: 02-S01

Title: Salt fog test 1000 hours on one surge arrester type PEXLIM P120-XH145

Trondheim 2002-01-21

Place and date

SATS Certification: Rolf Hegerberg

Copyright: SATS

RoP 02-S01

ВЯРНО С ОРИГИНАЛА

КРАСИ СМОЛЯН ООД

000266

REPORT OF PERFORMANCE No. 02-S01

Client	ABB Power Technology Products AB S-771 80 Ludvika, Sweden
Test object	One surge arrester of composite material
Designation	PEXLIM P120-XH145, Product number P3620
Manufacturer	ABB Power Technology Products AB S-771 80 Ludvika, Sweden
Ratings assigned by the manufacturer	Rated voltage 120 kV Maximum continuous operating voltage, U_c 96 kV Creepage distance 3625 mm
Tests performed	1000 hours salt fog test at 98 kV AC, 50Hz
Standards	IEC 60099-4,,Amendment 2, October 2001
Testing station	STRI AB, Ludvika Sweden. The laboratory is accredited (no: 1534) by SWEDAC
Date of tests	November 8 – December 21, 2001
Test results	The test object fulfilled the requirements in accordance with the standard.
The documents forming this report	Title page and 7 numbered pages

на основание чл. 2 от ЗЗЛД

Ludvika 2002-01-15
Place and Date

Laboratory Manager: Lars-Olof Gunnarsson

SATS Inspector: Göran Olsson

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ВЯРНО С ОРИГИНАЛА

КРАСИН СМОЛЯН ООД

CONTENTS

The tests were witnessed by mr Göran Olsson, representing SATS Certification, Norway

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ВЯРНО С ОРИГИНАЛА

"КРАСИН" СМОЛЯН ООД

LIST OF DRAWING NUMBERS OF THE TEST OBJECT

The manufacturer guarantees that the equipment submitted for tests is manufactured in accordance with the following drawing:

Description	Type	Drawing	Revision
Dimension Drawing	Assembly drawing	LAK 5862	0

на основание чл. 2 от ЗЗЛД

Manufacturers Representative

Lennart Stenström

ABB Power Technology Products AB,
Department AK

The dimension drawing is included in this report.

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ВЯРНО С ОРИГИНАЛА

"КРАСИН" СМОЛЯН ООД

1. TEST OBJECT

Product description	Surge arrester of composite material
Designation	PEXLIM P120-XH145
Product number	P3620

2. TESTS

1000h salt fog test with 98 kV AC, 50Hz with routine test before and after the salt fog test

2.1 Test conditions

Test chamber:	3 x 3 x 5 (m) (W x L x H)
Test voltage:	98 kV AC
Test duration:	1020 hours
Salinity:	4 and 5 kg/m^3
Flow rate salt fog:	4 l/h
Nozzles salt fog:	4 pcs type acc. to IEC 60507
Temperature:	16 - 21°C
Number of test objects in the chamber:	4

2.2 Test procedure

The NaCl content of the water was 5 kg/m^3 from the start. According to IEC 60099-4, Amendment 2, the salt content was reduced when the second flashover occurred. The routine tests were carried out by ABB Power Technology Products AB, Surge Arresters. The routine tests before and after the salt fog test were witnessed by a SATS Inspector.

2.3 Water flow rate

As the chamber is large, the concentration of salt fog in the vertical direction in uneven. For the actual test the water flow rate was chosen in such a way that the condensation rate at the test object was about 1.5 - 2.0 ml/h on 80 cm^2 in accordance with IEC 60068-2-11.
This condensation rate also corresponds to a flow rate of 0.4 l/m^3 per hour in a chamber with a volume of about 10 m^3.

2.4 Test results

The first flashover occurred after 690 hours. The second flashover occurred after 734 hours and the salinity was then reduced to 4 kg/m^3.

Routine tests	Ref. Voltage	Internal Corona	
	kV rms	kV rms	pC
Before salt fog test	124.4	108.0	<5
After salt fog test	125.5	108.0	<5

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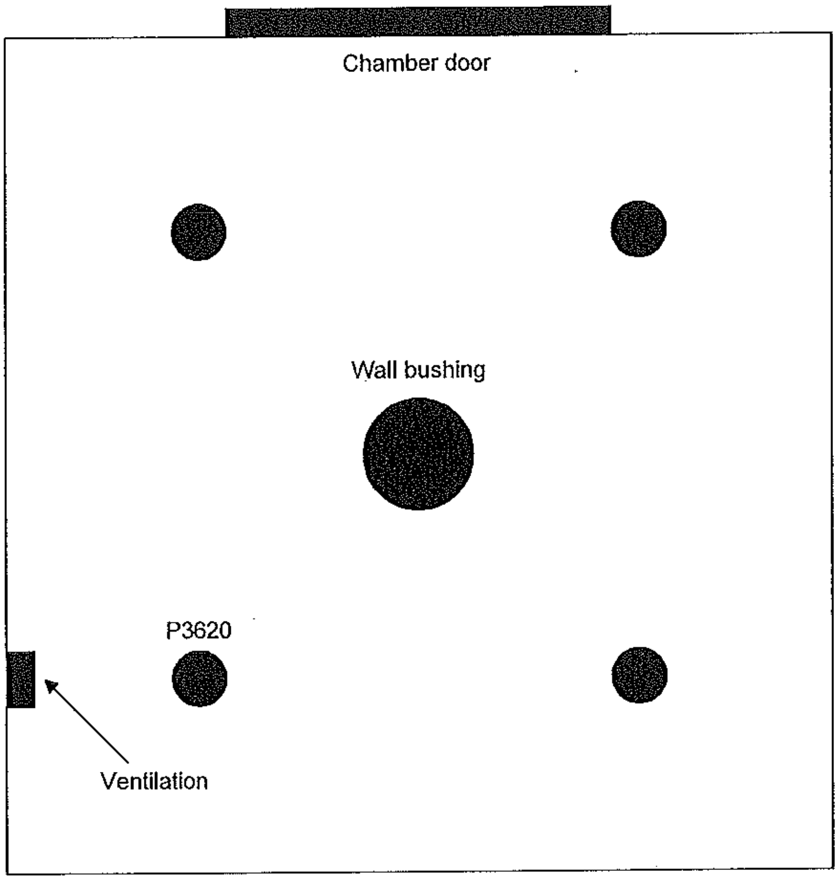
ВЯРНО С ОРИГИНАЛА

„КРАСИН" СМОЛЯН ООД

3. Test set-up in chamber



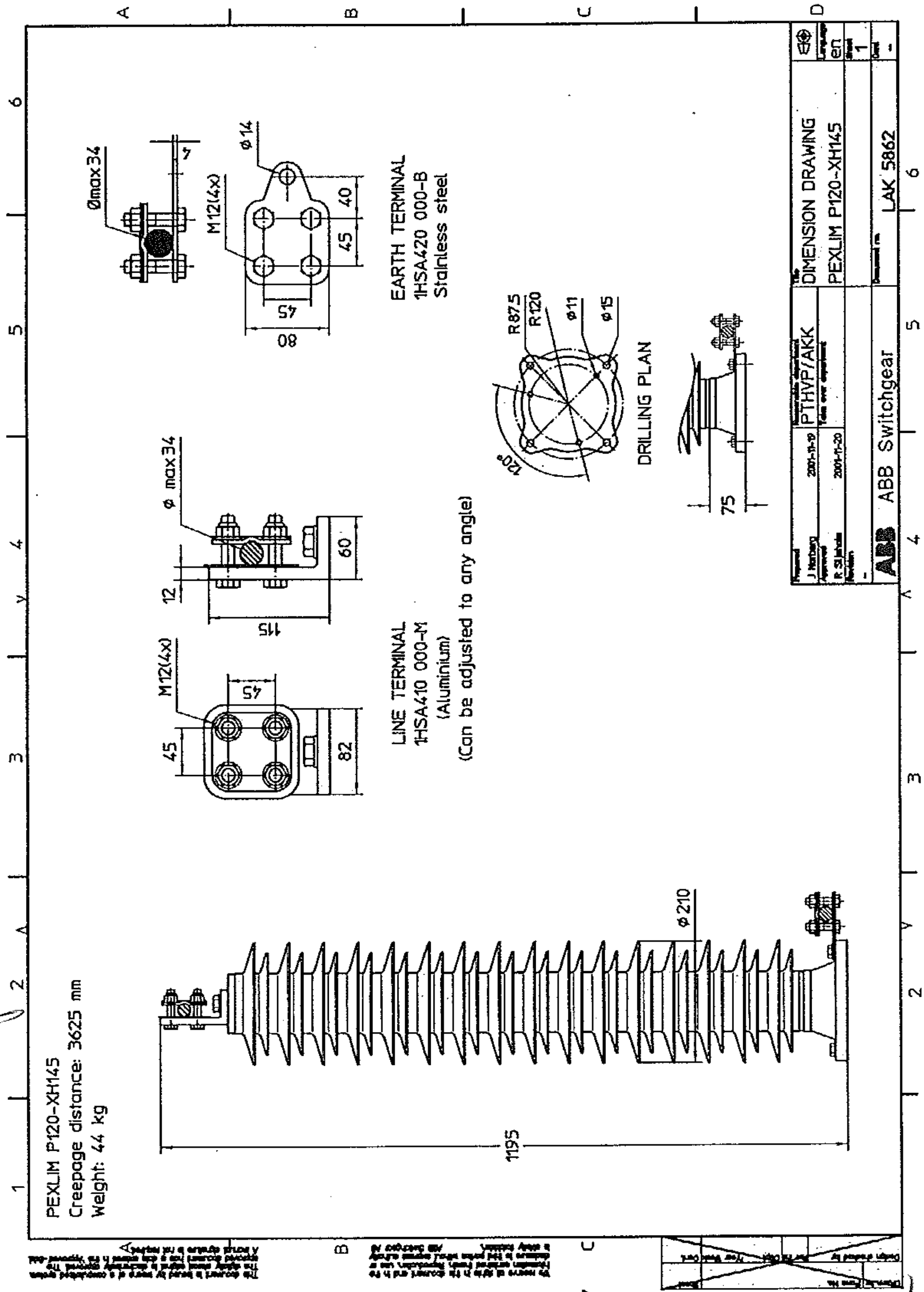
4. Conclusions

The test object P3620 fulfilled the requirements in accordance with IEC 60099-4, Amendment 2.

The reference voltage had not decreased after the salt fog test
Partial discharge level <5 pC both before and after the salt fog test.
Two over-current trip-outs caused by test object P3620 occurred, at the salinity of 5 kg/m^3.
No erosion exceeding the thickness of external coating.
No puncture of sheds was observed.
No tracking was found on external coating.

ВЯРНО С ОРИГИНАЛА
"КРАСИН" СМОЛЯН ООД

5. Dimension drawing of the test object



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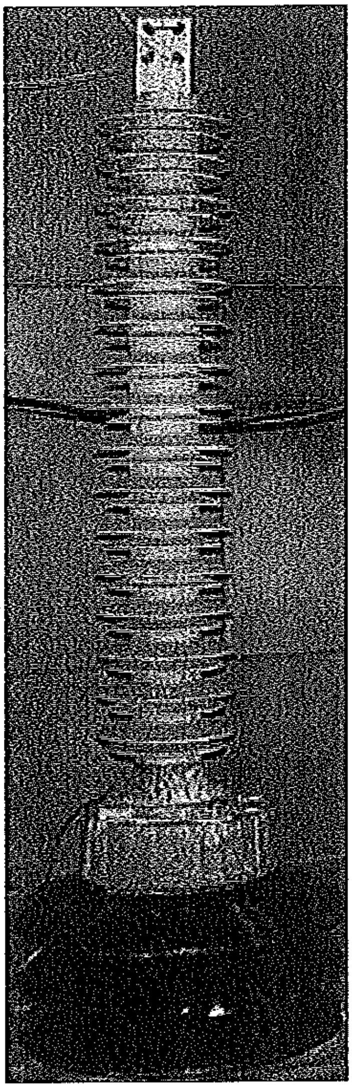
ВЯРНО С ОРИГИНАЛА

"КРАСИН" СМОЛЯН ООД

6. Photograph of the test object after the test



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ВЯРНО С ОРИГИНАЛА

"КРАСИН" СМОЛЯН ООД

Summary of type tests and documentation for arrester type PEXLIM P-X

Zinc oxide surge arrester with HTV silicone rubber housing.

Type tests performed	Standard	Report No.	Issued	Note/verification
Electrical tests				
External insulation test	IEC 60060-1,ANSI Std 4	HVP/AK 02-03	2002-01-08	All module sizes (36, 72 and 120kV)
Accelerated ageing test	IEC 60099-4	HVP/AK 04-28	2004-08-27	The long term stability at highest
Accelerated ageing test	ANSI/IEEE C62.11	HVP/AK 04-29	2004-08-27	voltage stress (0.98*Uref)
Residual voltage test	IEC 60099-4	HVP/AK 04-22	2004-06-11	The protection levels
Long duration current impulse withstand test	IEC 60099-4	HVP/AK 04-22	2004-06-11	Class 4 capability
Operating duty test	IEC 60099-4	HVP/AK 04-22	2004-06-11	The impulse strength and thermal stability
Short-circuit current tests				
High-current short-circuit test (65kA)	IEC 60099-4,Amendment 2	HVP/AK 02-02	2002-01-08	Overvoltage method
Low-current short-circuit test (600A)	IEC 60099-4,Amendment 2	HVP/AK 02-02	2002-01-08	Overvoltage method
Environmental ageing tests				
Weather ageing test (1000 h salt fog)	IEC 60099-4,Amendment 2	SATS 02-S01	2002-01-21	Test on 120 kV module
Moisture ingress test	IEC 60099-4,Amendment 2	HVP/AK 01-06	2001-12-20	Test on 120 kV module
Verification of low temperature performance		HVP/AK 02-01	2002-01-07	Test on 120 kV module at 2500 Nm -50°C
Mechanical tests				
Bending strength test		HVP/AK 01-09	2001-12-10	Verifies a maximum usable bending
Bending fatigue test		HVP/AK 01-07	2001-12-10	moment of ≥ 2500 Nm

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Data sheets	Document No.	Issued
Protective characteristics	LAK 5882	2003-04-09
Temporary overvoltage (TOV) characteristics	LAK 5881	2002-01-08

ABB Power Technologies AB

на основание чл. 2 от ЗЗЛД

e tests listed above verify guaranteed data for PEXLIM P-X arresters

y Products AB
/Surge Arresters

ABB Power Technologies AB QA QUALITY

Kurt Jansson

2002-01-25
Rev 2 (Revision date 2005-12-16)

ВЯРНО С ОРИГИНАЛА

"КРАСИН" СМОЛЯН ООД

Test Report: HVP/AK 02-03
rev 1

Type tests on PEXLIM P Surge Arresters

Test objects:	Surge arrester modules rated 36, 72 and 120 kV with the ZnO blocks replaced by insulating material
Standards:	IEC 60099-4, first edition 1991-11 IEC 60060-1, second edition 1989-11 ANSI/IEEE Std C62.11-1993 ANSI/IEEE Std 4-1978
Tests performed:	Insulation withstand tests
Test report:	Q 99-281
Validation:	The test objects initially represented arrester modules used for arrester type PEXLIM Q. However, the physical dimensions for the modules used for arrester type PEXLIM P-X are identical. The test results, therefore, also are valid for arresters of type PEXLIM P-X.
Tests completed:	1999-10-21
Tests performed at:	ABB Transformers AB/High Voltage Laboratory
Report consists of:	37 pages (Report Q 99-281, 36 pages)

We hereby certify that the objects specified above have successfully passed the test herein reported, thereby verifying guaranteed data.

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Ludvika 2002-01-08

ABB Power Technology Products AB
High Voltage Products/Surge Arresters
Quality Department

на основание чл. 2 от ЗЗЛД

ABB Power Technology Products AB QA QUALITY

Kurt Jansson

ВЯРНО С ОРИГИНАЛА

"ЧАСИН" СМОЛЯН ООД

Type tests on PEXLIM P surge arresters

Test object	Three ABB PEXLIM P varistors rated voltage 6.37 to 6.38 kVrms
Standard	IEC standard 60099-4, Edition 1.2, 2001-12
Test performed	Accelerated ageing test in open air at 0.98 times the rated voltage during 1053 hours.
Tests completed	2004-08-04
Tests performed at	ABB Power Technologies AB - Surge Arrester Laboratory
Witnessing	The tests were witnessed by SATS Inspector Mr. Minoo Mobedjina.

SATS Certification
Minoo Mobedjina
Inspector
Sign: utM:
13/9-2004

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Tests reported by : Kent Riik

Report approved by : Lennart Stenstrom

Report consists of : 10 pages

We hereby certify that the objects specified above have successfully passed the test herein reported, thereby verifying guaranteed data.

Ludvika 2004-08-27

ABB Power Technologies AB
High Voltage Products/Surge Arresters
Quality Department

на основание чл. 2 от ЗЗЛД

Kurt Jansson

ABB Power Technologies AB QA QUALITY

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9.9.1.1.

"КРАСИН" СМОЛЯН ООД

ВЯРНО С ОРИГИНАЛА

Type tests on PEXLIM P surge arresters

Test object	: Three ABB PEXLIM P varistors Duty-Cycle voltage rating 6.37 to 6.38 kVrms
Standard	: ANSI/IEEE C62.11-1999
Test performed	: Accelerated ageing test in open air at 0.98 times the duty-cycle voltage rating during 1053 hours.
Tests completed	: 2004-08-04
Tests performed at	: ABB Power Technologies AB - Surge Arrester Laboratory
Witnessing	: The tests were witnessed by SATS Inspector Mr. Minoa Mobedjina.

SATS Certification
Minoo Mobedjina
на основание чл. 2 от ЗЗЛД

About SATS	: SATS "Scandinavian Association for Testing of Electric Power Equipment" is a member of Short circuit Liaison (STL) and a member of EOTC, European Electric Sector Committee ELSECOM, Agreement Group No. 0007.
Tests reported by	Kent Riik
Report approved by	: Lennart Stenstrom
Report consists of	: 10 pages

We hereby certify that the objects specified above have successfully passed the test herein reported, thereby verifying guaranteed data.

Ludvika 2004-08-27

ABB Power Technologies AB
High Voltage Products/Surge Arresters
Quality Department

на основание чл. 2 от ЗЗЛД

Kurt Jansson

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ВЯРНО С ОРИГИНАЛА

„КРАСИН" СМОЛЯН ООД

Type tests on PEXLIM P-X surge arresters.

Test objects	Prorated arrester sections acc. to IEC, rated voltage 6.29 to 10.85 kV
Standard	IEC 60099-4, Edition 1.2, 2001-12
Test performed	Residual voltage test Long duration current impulse withstand test, class 4 Operating duty test, nominal current 20 kA
Tests completed	2004-04-23
Tests performed at	ABB Power Technologies AB -Surge Arrester Laboratory
Tests reported by	Jan-Erik Almen J'1!i2-
Report approved by	: Lennart Stenstrom
Report consists of	: 69 pages
Witnessing	:The tests werES'l <i"Bficr Bri"s ector Mr Minoa Mobedjina.

Minoo Mobediina

на основание чл. 2 от ЗЗЛД

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About SATS	:SATS "Scandinavian Associajbn for Testing of Electric Power Equipment" is a member of Short circuit Liaison (STL) and a member of EOTC, European Electric Sector Committee ELSECOM, Agreement Group No. 0007

We hereby certify that the objects specified above have successfully passed the test herein reported, thereby verifying guaranteed data.

Ludvika 2004-06-11
ABB Power Technologies AB
High Voltage Products/Surge Arresters
Quality Department

на основание чл. 2 от ЗЗЛД

Kurt Jansson

ABB Power Technologies AB QA QUALITY

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Type tests on PEXLIM P Surge Arresters

Test objects: Surge arresters of type PEXLIM P120-XH145 with rated voltage 120 kV.

Standards: IEC 60099-4, Amendment 2 (Annex O) of October 2001 (Same requirements as per earlier IEC document 37/231/CDV)

Tests performed: Pressure relief tests

Current	Report
65 kA	KEMA 566-01 *
25 kA	KEMA 566-01
12 kA	KEMA 566-01
600 A	KEMA 566-01

*) First current peak ≥ 2.5 times 65 kA

Validation: The test objects represent the longest electrical and mechanical sections used for PEXLIM P-X surge arresters. The tests therefore verify the performance of all arresters of type PEXLIM P-X.

Tests completed: 2001-11-22

Tests performed at: KEMA Arnhem - High Power Laboratory

Report consists of: 46 pages (KEMA 566-01, 45 pages)

We hereby certify that the objects specified above have successfully passed the test herein reported, thereby verifying guaranteed data.

Ludvika 2002-01-08

ABB Power Technology Products AB
High Voltage Products/Surge Arresters
Quality Department

на основание чл. 2 от ЗЗЛД

Kurt Jansson

ABB Power Technology Products AB Quality QA

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SATS Certification

Scandinavian Association for Testing of Electric Power Equipment
c/o-SINTEF Energy Research, Sem Saelandsv. 11, NO-7465 Trondheim, Norway
Telephone: +47 73 59 72 00 Telefax: +47 73 59 72 50 E-mail: SATS@energy.sintef.no

Report of Performance No.: 02-801

Title: Salt fog test 1000 hours on one surge arrester type PEXLIM P120-XH145

Trondheim 2002-01-21

P на основание чл. 2 от ЗЗЛД

SATS Certification: Rolf Hegerberg

Copyright: SATS

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ВЯРНО С ОРИГИНАЛА

"КРАСИН" СМОЛЯН ООД

ABB Power Technology Products	Rapport Report	R HVP/AK 01-06 rev1

Författare - Author

на основание чл. 2 от ЗЗЛД

Lennart Stenström

Godkännare - Approved by

Gunnar Persson

на основание чл. 2 от ЗЗЛД

Uppdragsgivare - Requested by

Titel - Title

Moisture ingress test on surge arrester PEXLIM P120-XH145

Från - From	Datum - Date	Reg.	Sida - Page
PTHVP/AKB	2001-12-20		1(3)

☐ Utredning teoretisk undersökning - Analysis, theoretical investigation

Ordernr - Ref. No.

☒ Provning, experim. under-sökning - Test experimental investigation

Debiteras ordernr - Debit Order

Pkl/Akl

☐ Delrapport Partial report

☒ Slutrapport Final report

Antal textsidor - No. of text pages
3

Provning/undersökning avslutad
Test/investigation finished
01-11-19

Antal bilagesidor - No. of supplem. pages
4

Sammanfattning - Summary

TEST METHOD

Moisture ingress test in accordance with IEC 60099-4, Amendment 2 of 2001-10, Clause 9.7.9 (Same requirements as per earlier IEC Committee Draft for Vote 37/231/CDV, Clause 9.7.8)

TEST OBJECT

Surge arresters PEXLIM P120-XH145 according to dimension drawing 1HSA303 000-CA (enclosed)

TEST PROCEDURE

Initial measurements of power losses, residual voltage and partial discharge level according to Clause 9.7.9.1 as well as check of reference voltage.

Preconditioning according to Clause 9.7.9.2

Water immersion according to Clause 9.7.9.3

Verification tests including visual inspection, measurements of power losses, residual voltage and partial discharges according to Clause 9.7.9.4 as well as check of reference voltage.

TEST RESULT

The surge arresters passed the test successfully.

Ludvika 2001-12-20

ABB Power Technology Products AB
High Voltage Products/Surge Arresters
Quality Department

на основание чл. 2 от ЗЗЛД

Kurt Jansson

ABB Power Technology Products AB QA QUALITY

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РАСИН СМОЛЯН ООД

ABB Power Technology Products AB

на основание чл. 2 от ЗЗЛД

Rapport
Report

Författare - Author	Från - From	Datum - Date	R HVP/AK 02-01
Roger Siljeholm	HVP/AK	2002-01-07	Reg. / Sida - Page: 1

Författare - Author
Roger Siljeholm

Godkännare - Approved by
Lennart Stenstrom

Uppdragsgivare - Requested by
Gunnar Persson

Titel - Title
Test of low temperature performance at -50°C for surge arresters on type PEXLIM P120-XH145.

- [ ] Utredning teoretisk undersökning - Analysis, theoretical investigation
- [ ] Provning, experim. undersökning - Test experimental investigation
- [ ] Delrapport Partial report
- [x] Slutrapport Final report

Provning/undersökning avslutad
Test/invetigation finished

Ordernr - Ref. No.

Debiteras ordernr - Debit Order No.

Pkl/Akl

Antal textsidor - No. of text pages: 1

Antal bilagesidor - No. of supplem. pages: 4

PURPOSE

The purpose was to verify the low temperature performance of the arrester type PEXLIM P-X.

TEST OBJECT

One arrester of type PEXLIM P120-XH145 with rated voltage 120 kV, serial number P-X30. The arresters comprise the longest mechanical sections used for the arrester type PEXLIM P-X.

TEST PERFORMED

The modules were placed in a bending fixture and loaded with a bending moment of 2500 Nm while the ambient temperature was cycled from +20° C to –50° C. (See enclosed test report SPL 01-239)

RESULT

The test objects withstood the test without any damage. (See report SPL 01-239.)
Before and after the mechanical test the modules were electrically routine tested, result as per Table 1. No significant changes in the electrical characteristics were observed.

Arrester	Reference Voltage (Uref) at 3 mA resistive current		Partial discharge level at 0.9*Uref		Power losses at 0.8*Uref	
	Before test kV	After test kV	Before test pC	After test pC	Before test W	After test W
P-X30	128.9	128.4	<5	<5	4.3	4.1

Table 1. Electrical routine tests.

Ludvika 2002-01-07

ABB Power Technology Products AB
High Voltage Products/Surge Arresters
Quality Department

на основание чл. 2 от ЗЗЛД

Kurt Jansson

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ВЯРНО С ОРИГИНАЛА

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ABB Power T[redacted] на основание чл. 2 от ЗЗЛД

Författare - Author
Roger Siljeholm[redacted]
Godkännare - Approved by
Lennart Stenstr[redacted]
Uppdragsgivare - Requested [redacted]
Gunnar Persso[redacted]

Titel - Title
Bending strength test on surge arrester type
PEXLIM P120-XH145

Rapport
Report

Från - From: HVP/AK
Datum - Date: 2001-12-10

R HVP/AK 01-09
Reg.
Sida - Page: 1

Ordernr - Ref. No.

Debiteras ordernr - Debit Order No.

Pkt/Akt

- [ ] Utredning teoretisk undersökning - Analysis, theoretical investigation
- [ ] Provning, experim. undersökning - Test experimental investigation
- [ ] Delrapport Partial report
- [x] Slutrapport Final report

Provning/undersökning avslutad
Test/invetigation finished

Antal textsidor - No. of text pages: 1

Antal bilagesidor - No. of supplem. pages: 5

PURPOSE
The purpose was to verify a bending strength of 4000 Nm of the arrester type PEXLIM P-X.

TEST OBJECT
Two arresters of type PEXLIM P120-XH145 with rated voltage 120 kV, serial numbers P-X28 and P-X29 were tested. The arresters comprise the longest mechanical sections used for the arrester type PEXLIM P-X.

TEST PERFORMED
The arresters were loaded until failure with rate of 2500 Nm/min. The deflection was measured during the test. See report SPL 01-220.

RESULT
The two arresters failed at 6020 Nm and 5870 Nm respectively. See report SPL 01-220.

Ludvika 2001-12-10

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High Voltage Products/Surge Arresters
Quality Department

на основание чл. 2 от ЗЗЛД [redacted]

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QUALITY

Kurt Jansson

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„КРАСИН" СМОЛЯН ООД

ABB

ABB Power T на основание чл. 2 от ЗЗЛД B

Författare - Author
Roger Siljeholn
Godkännare - Approved by
Lennart Stenstr
Uppdragsgivare - Requeste
Gunnar Persso

Titel - Title
Bending fatigue test on surge arrester type
PEXLIM P120-XH145

Rapport
Report

Från - From
HVP/AK

Datum - Date
2001-12-10

R HVP/AK 01-07
Reg.

Sida - Page
1

☐ Utredning teoretisk undersökning - Analysis, theoretical investigation

☐ Provning, experim. undersökning - Test experimental investigation

☐ Delrapport
Partial report

☒ Slutrapport
Final report

Provning/undersökning avslutad
Test/invetigation finished

Ordernr - Ref. No.

Debiteras ordernr - Debit Order No.

Pkt/Akt

Antal textsidor - No. of text pages
1

Antal bilagesidor - No. of supplem. pages
4

PURPOSE
The purpose was to verify the bending fatigue strength of the arrester type PEXLIM P-X.

TEST OBJECT
Two arresters of type PEXLIM P120-XH145 with rated voltage 120 kV, serial numbers P-X22 and P-X24 were tested. The arresters comprise the longest mechanical sections used for the arrester type PEXLIM P-X.

TEST PERFORMED
The modules were subjected to a cyclic bending test consisting of 1000 cycles at a bending moment level of 2500 Nm at the frequency 0.3 Hz. See report SPL 01-218.

RESULT
The test objects withstood the test without any damage. See report SPL 01-218.
Before and after the mechanical test the modules were electrically routine tested, result as per Table 1. No significant changes in the electrical characteristics were observed.

Arrester	Reference Voltage (Uref) at 3 mA resistive current		Partial discharge level at 0.9*Uref		Power losses at 0.8*Uref	
	Before test kV	After test kV	Before test pC	After test pC	Before test W	After test W
P-X22	129.5	129.2	<5	<5	4.2	4.0
P-X24	128.9	128.8	<5	<5	4.4	4.2

Table 1. Electrical routine tests.

Ludvika 2001-12-10

ABB Power Technology Products AB
High Voltage Products/Surge Arresters
Quality Department

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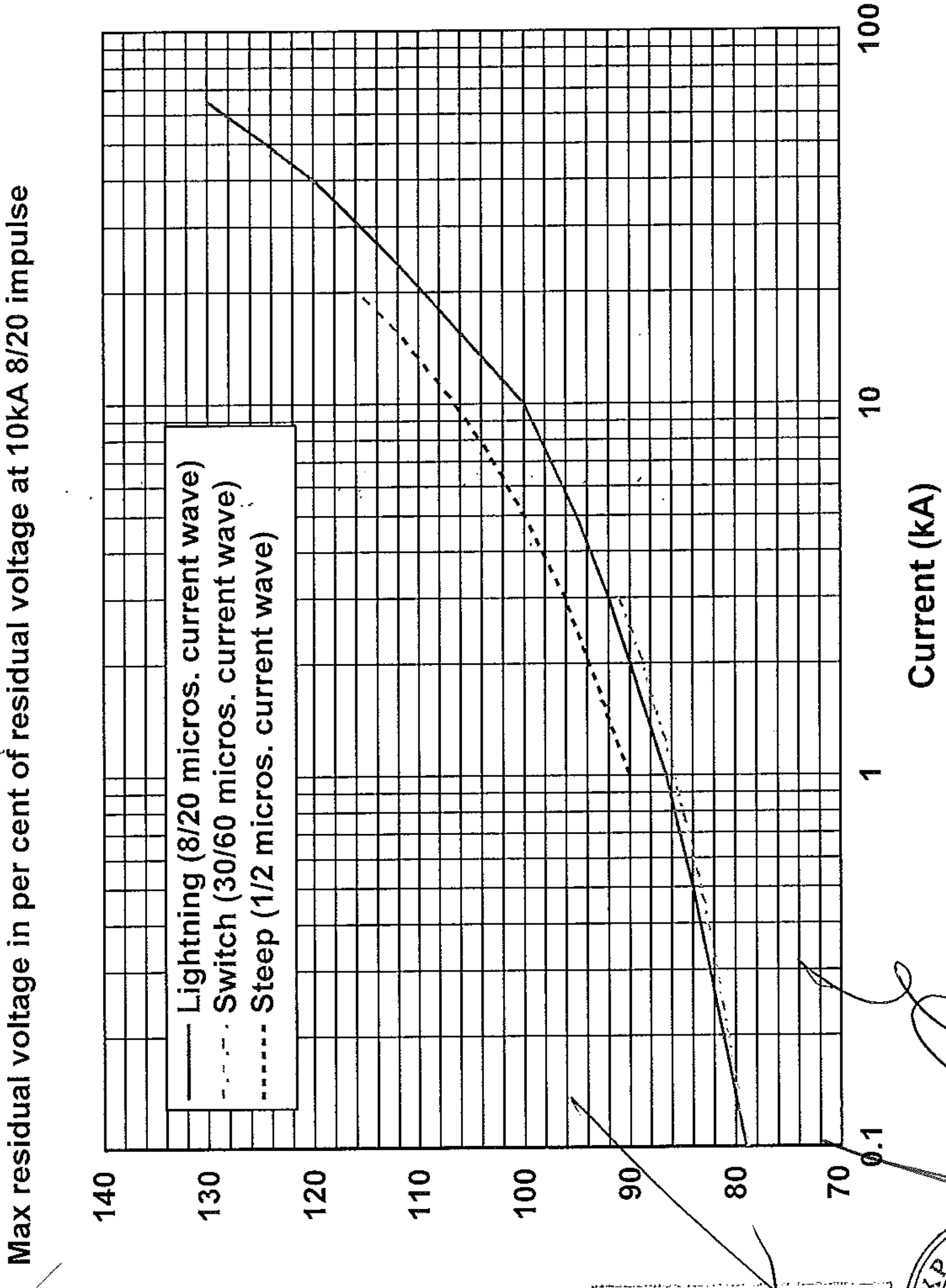
ABB

LAK 5882 Rev 1
PTHVP/AKB 02-01-18

Rev. date 2003-04-09

PROTECTIVE CHARACTERISTICS FOR ARRESTERS TYPE EXLIM & PEXLIM P (external inductive effects neglected)



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ВЯРНО С ОРИГИНАЛА

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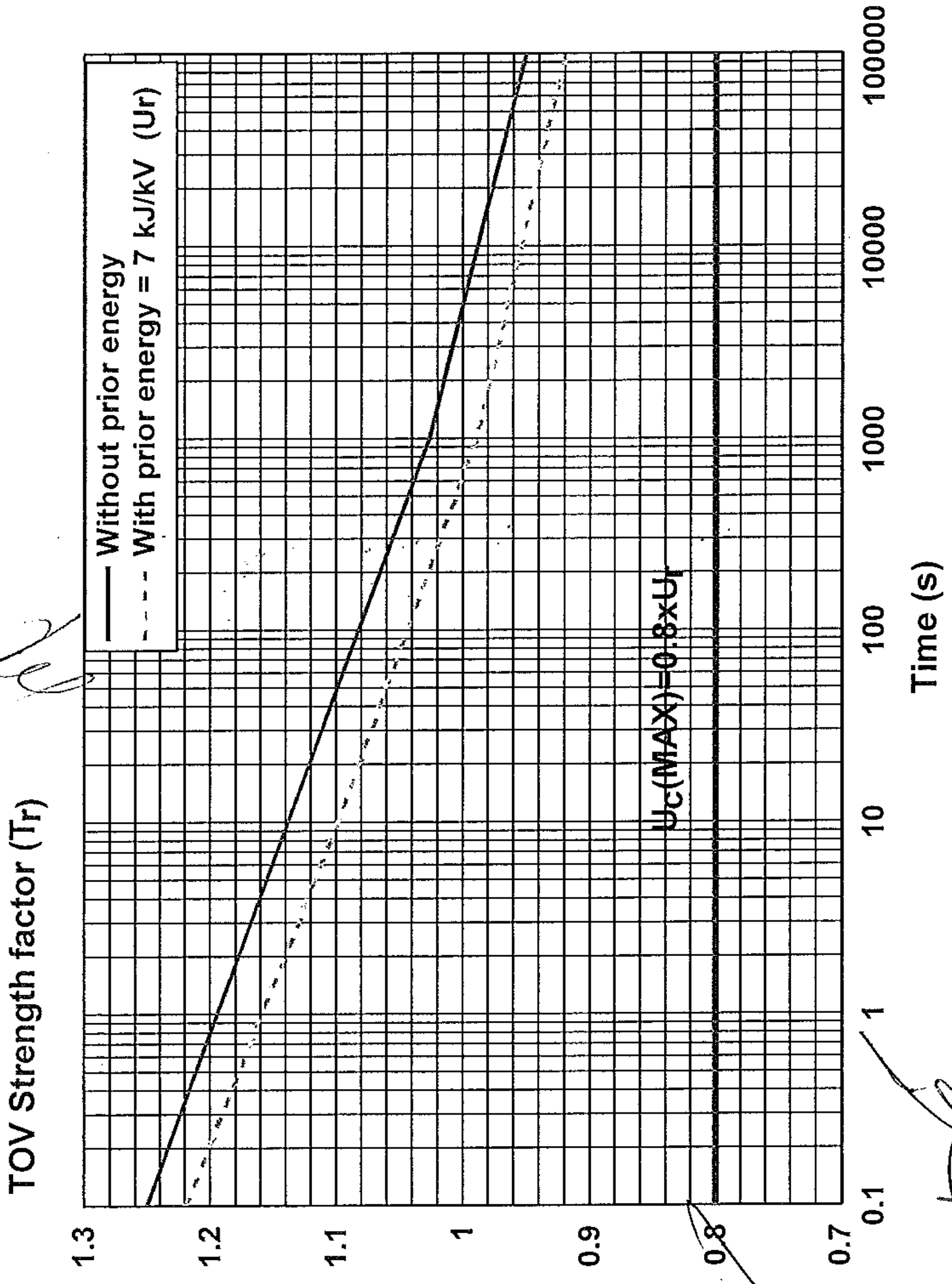
LAK 5881 Rev 0
PTHVP/AKB 02-01-08

TOV capability for arresters type PEXLIM P-X

Expressed in multiples of the rated voltage U_r, (T_r)



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ВЯРНО С ОРИГИНАЛА

"КРАСИН" СМОЛЯН ООД

за участие в открита процедура за възлагане на обществена поръчка с предмет:

„Подмяна на маслонапълнена кабелна електропроводна линия 110 kV „Зенит" от линеен ножов разединител 110 kV на ПС „Хаджи Димитър" до линеен ножов разединител 110 kV в ПС „Подуяне", реф. № PPC 17 – 169

Техническо предложение

Техническа документация

Приложение № 1 към Предложение за изпълнение на поръчката по т.15.1. от Техническото предложение – Заверени копия на документи за Ограничител на пренапрежение (вентилен отвод) за нова КЕЛ 110 kV:

- Приложение № 1.2. към т.15.1.2. от Техническото предложение – Заверено копие на Сертификат/акредитация на независимата изпитвателна лаборатория, провела типовите изпитвания

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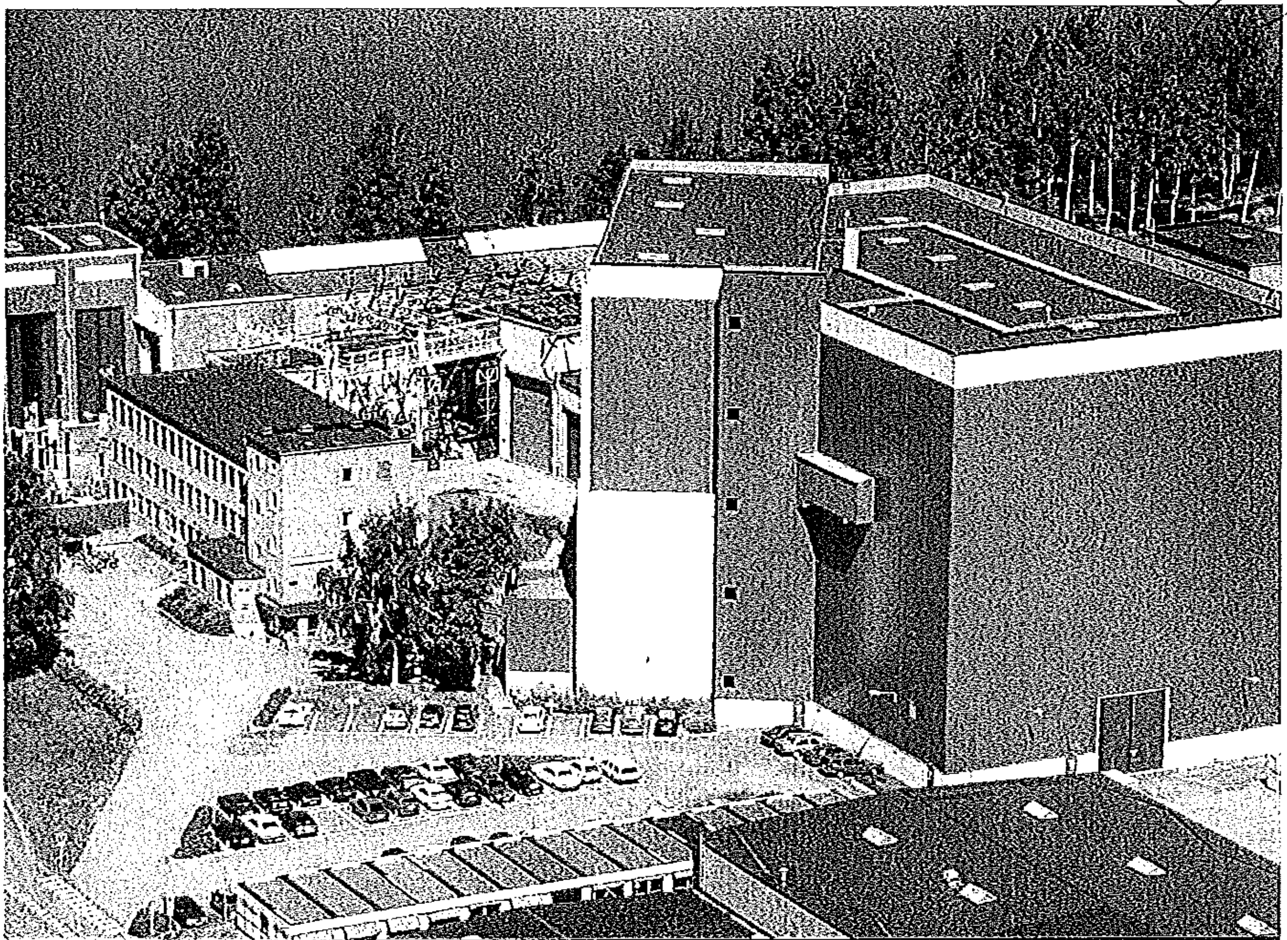

Brochure

High Power Laboratory, Ludvika, Sweden
Testing and third party certification of power transmission and distribution equipment

Power and productivity
for a better world™

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ВЯРНО С
ОРИГИНАЛА

"КРАСИН"
СМОЛЯН
ООД

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Integrity and Independence
– well established and documented

Various kinds of high voltage electrical equipment such as circuit breakers, disconnectors, earthing switches, power transformers, instrument transformers, surge arresters, switchgear cubicles etc; are tested at the High Power Laboratory in accordance with the international or regional standards.

Accreditation

The High Power Laboratory, Ludvika is accredited by SWEDAC (Swedish Government Body) in accordance with ISO/IEC 17025. The quality system, competence of personnel, adequacy of test equipment and calibration of measuring equipment are checked and assessed periodically by SWEDAC for their compliance to ISO/IEC 17025. This assures that the tests are performed correctly and impartially.

Affiliation and International cooperation

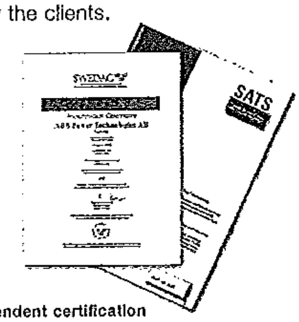
The laboratory is affiliated to SATS, an independent certification body based in Scandinavia and accredited according to EN 45011. SATS Certification issues Reports of Performance/Type Test Certificates for tests performed at the High Power Laboratory, Ludvika, under the supervision of its inspectors.

SATS is a member of STL (Short-circuit Testing Liaison), an international organization of similar testing and certification bodies. STL has framed the guidelines for uniform application of the standards with regard to the test methods, measurement, evaluation and issue of type test reports/certificates.

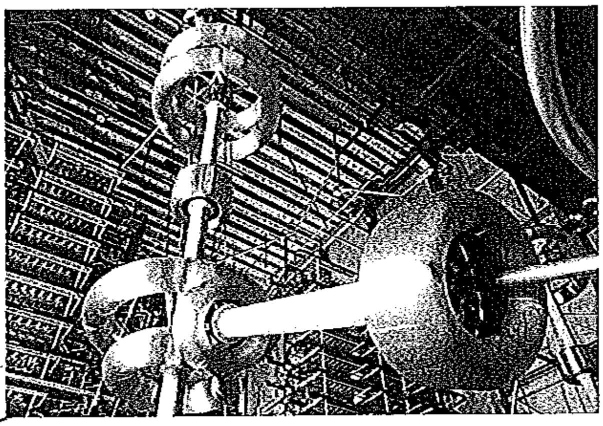
Strengthened by its long experience and reputation, the High Power Laboratory, Ludvika lives up to the trustworthiness and professionalism demanded of it by the clients.

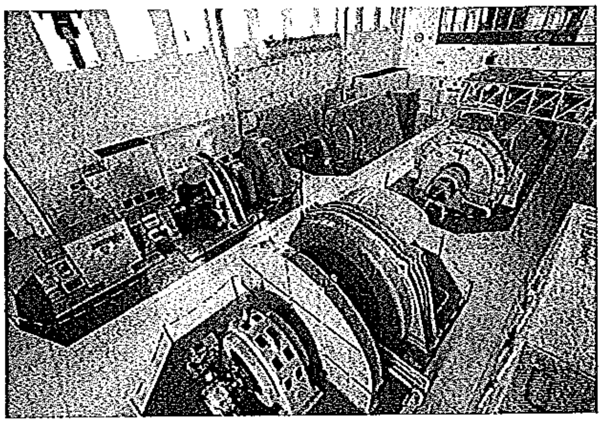
SATS Certification

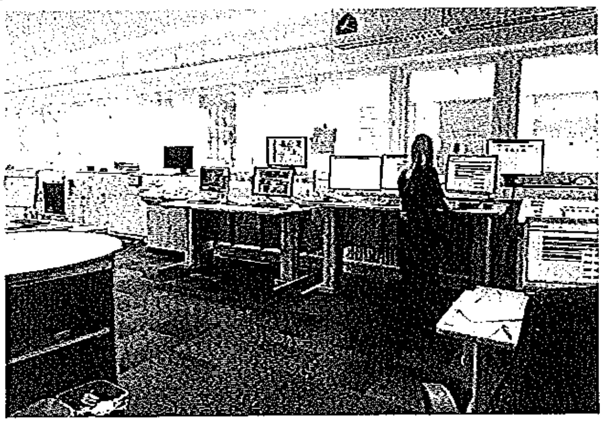
SWEDAC ACKREDITERING
1297
ISO/IEC 17025

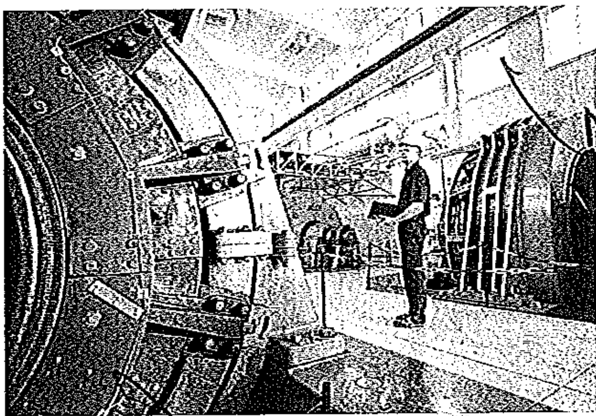


Affiliated to SATS Certification, an independent certification body accredited acc. to EN 45011 and a member of the STLA (Short-circuit Testing Liaison Agreement). Accredited by SWEDAC









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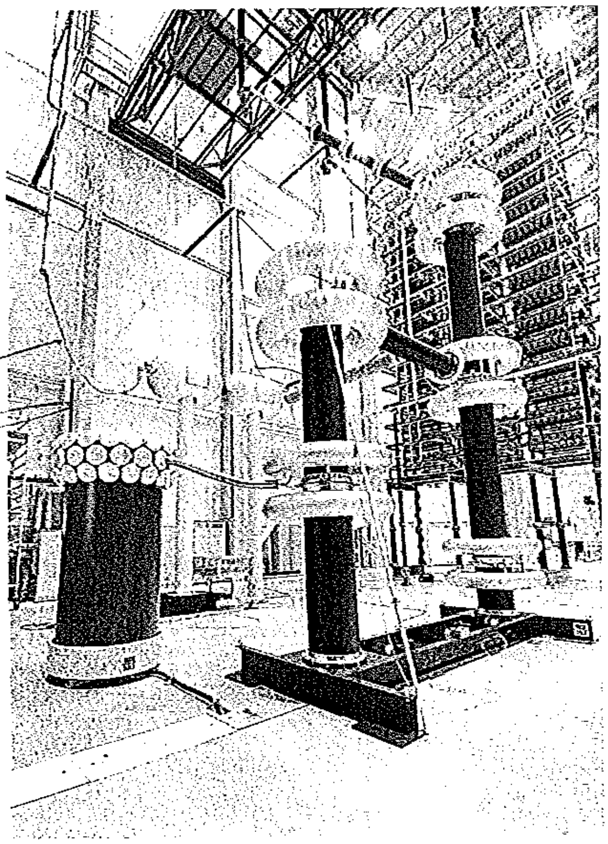
ВЯРНО С ОРИГИНАЛА

„КРАСИН" СМОЛЯН ООД

Latest technology combined with long experience

Short-circuit testing was started in Ludvika 75 years ago in 1933 with the installation of the first short-circuit generator, at that time the largest in the world. The testing technology since then has been developed continuously contributing to the long collective experience in the field. The present test station was established 50 years ago. The test and measuring equipment has been upgraded and modernized since then to meet the demands imposed by the ever increasing capacity of products to be tested and their stringent standards.



High expectations and preparedness
The Laboratory is well geared to meet the requirements of the clients for the development tests which require advanced test and measuring equipment, experienced test engineers with adequate knowledge of the products to be tested in order to support the development process.

The type tests for certification needs the complete range test circuits and measuring equipment fulfilling the requirements of the standards. The Laboratory is equipped and accredited for a wide range of such certification tests.

At the forefront
A fully automated modern synthetic test facility was established in 1996 replacing the first generation of synthetic test circuit from the sixties. This combined with the two s.c. generators permit testing of high voltage circuit-breakers of voltage ratings up to 800 kV.

Measurement, data collection and analysis system is of the most advanced technology available. With highly reliable and accurate optically isolated measurements, automated calculation and presentation of test data, the Laboratory has been in the forefront of development activities in this area.

The Laboratory has also established test facilities for the operational tests of HVDC and SVC valves, a unique resource, using both direct and synthetic test methods.

High Power.indd 3 000290 ВЯРНО С ОРИГИНАЛА КРАСИАН СМОЛЯН ООД 2010-11-18 08.52

Adequate resources – a basic requirement

The large base of installed equipment is a necessity for performing the requested tests on various products. The laboratory's resources have been augmented over the years in order to meet with the changing requirements.

The laboratory is equipped with two short-circuit generators which together can deliver 4,000 MVA of short-circuit power for direct testing. Together with the synthetic test circuit a short-circuit power of over 75,000 MVA can be realized in the laboratory.

There are nine test cells of different dimensions for testing of various kinds of products. Apart from the high speed measuring system there exist facilities to record the test with high speed digital video camera which can be synchronized with the test oscillogram during playback to give a better understanding of the happenings during test.

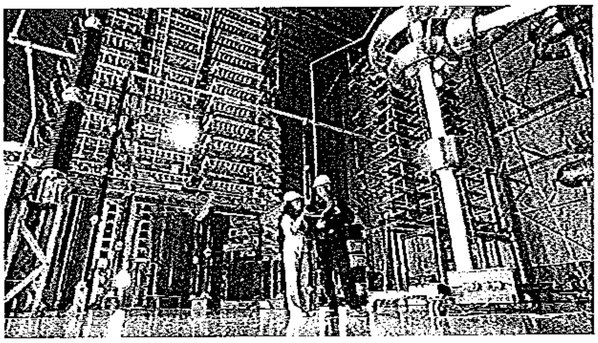
In the High Current Laboratory, which is an integral part of the High Power Laboratory, tests are performed with continuous high currents to check the temperature rise limits of the power equipment under normal operation conditions.

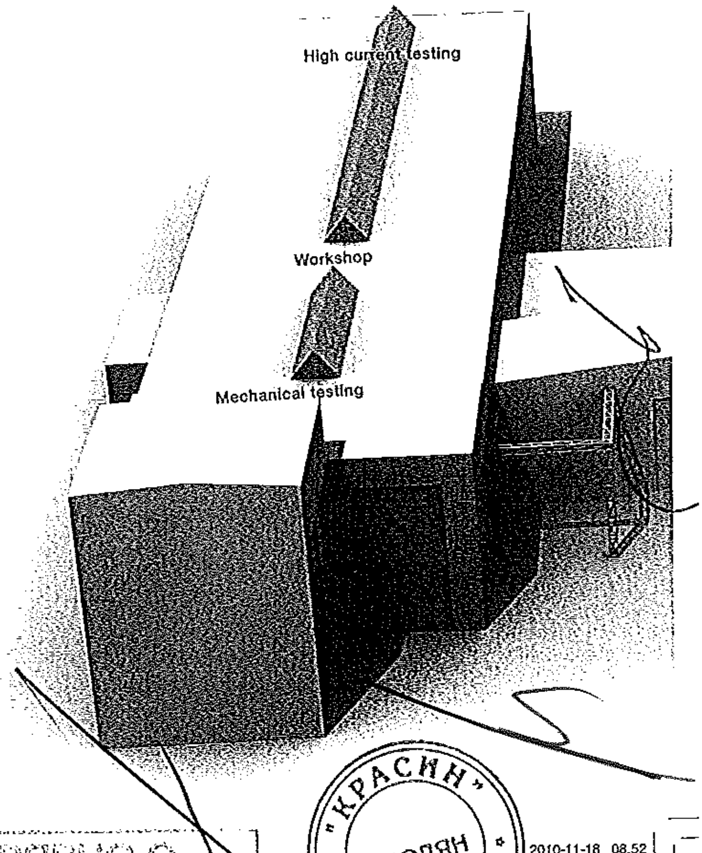
In the Mechanical Test Laboratory, also a part of the High Power Laboratory, tests are performed on switching equipment such as circuit breakers in order to verify their mechanical endurance. Tests are also performed here to verify the mechanical withstand properties of the components and the fully assembled products.

Site overview

The High Power Laboratory is situated on the banks of lake Väsman as a part of the ABB industrial complex in Ludvika. ABB in Ludvika has been a leading center for development and manufacturing of various high voltage transmission equipment for more than 100 years. The laboratory is spread over an area of 15 000 sq. m which includes the high power, high current and mechanical testing with over 20 test bays and a large workshop.

The high voltage laboratory STRI, located next door, completes the type test facilities available in the location.





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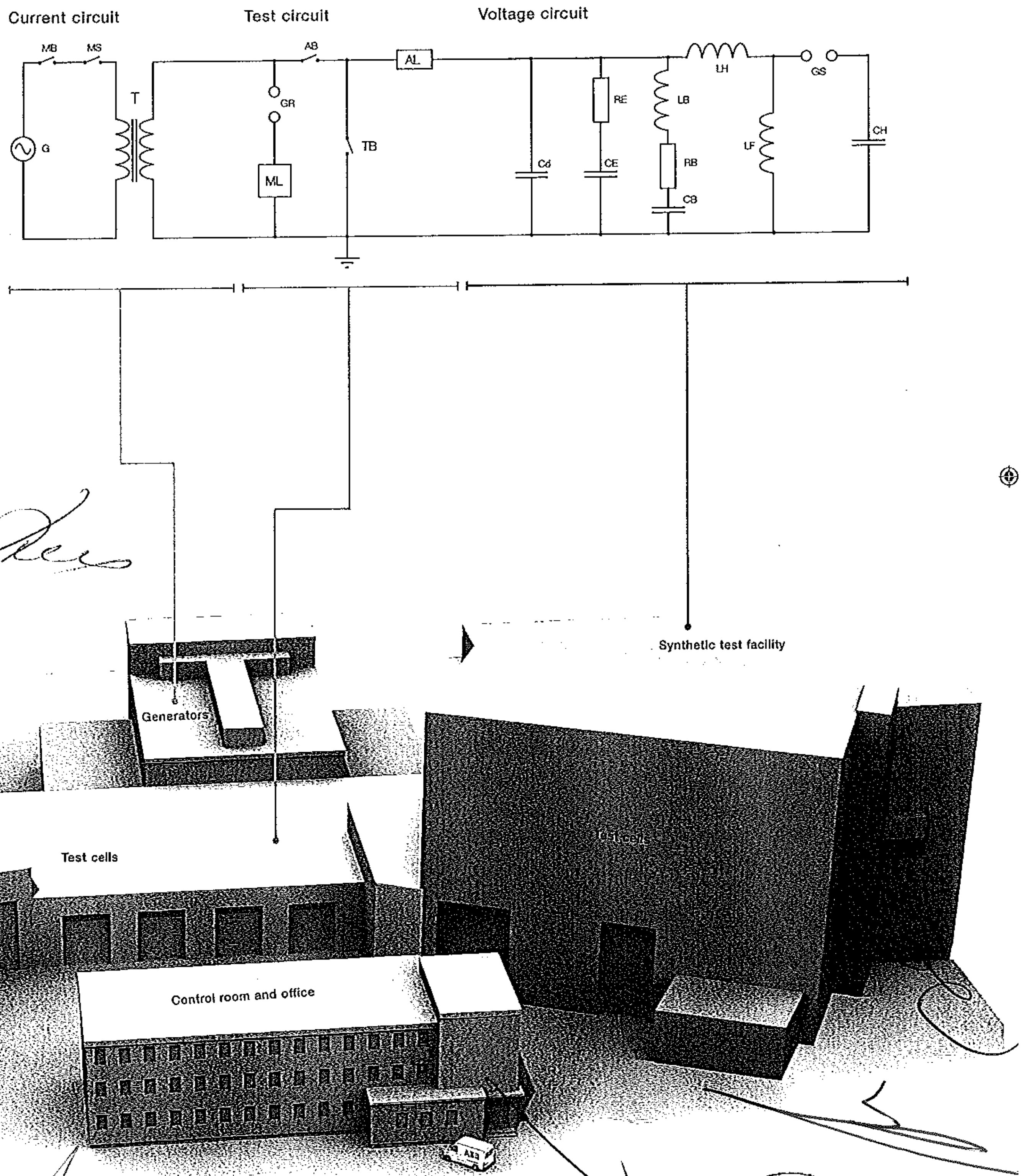
000291
ВЯРНО С ОРИГИНАЛА
"КРАСИН" СМОЛЯН ООД
2010-11-18 08.52

Synthetic test circuit



High Power Laboratory, Ludvika, Sweden 5

ВЯРНО С ОРИГИНАЛА

КРАСИН СМОЛЯН ООД

Test facilities

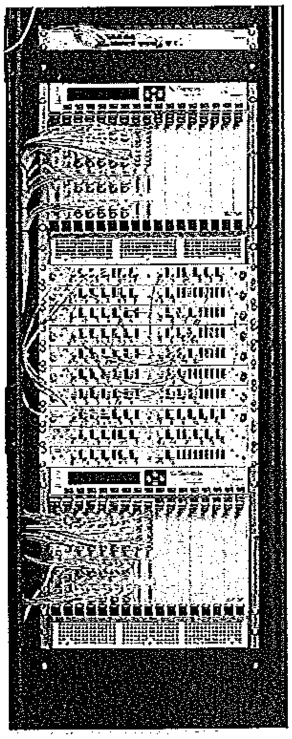
Direct testing	
Max. short-circuit power	4 000 MVA
Max. test voltage – 3 φ	145 kV
Max. test voltage – 1 φ	250 kV
Frequency	16 2/3 – 60 Hz
Max. test current	100 kA rms

Other test facilities	
Temperature-rise test	Up to 25 kA rms
HVDC thyristor valves (direct and synthetic tests)	
Power frequency voltage test	600 kV rms
Mechanical tests	– endurance – snap-back – cantilever – tightness – environmental

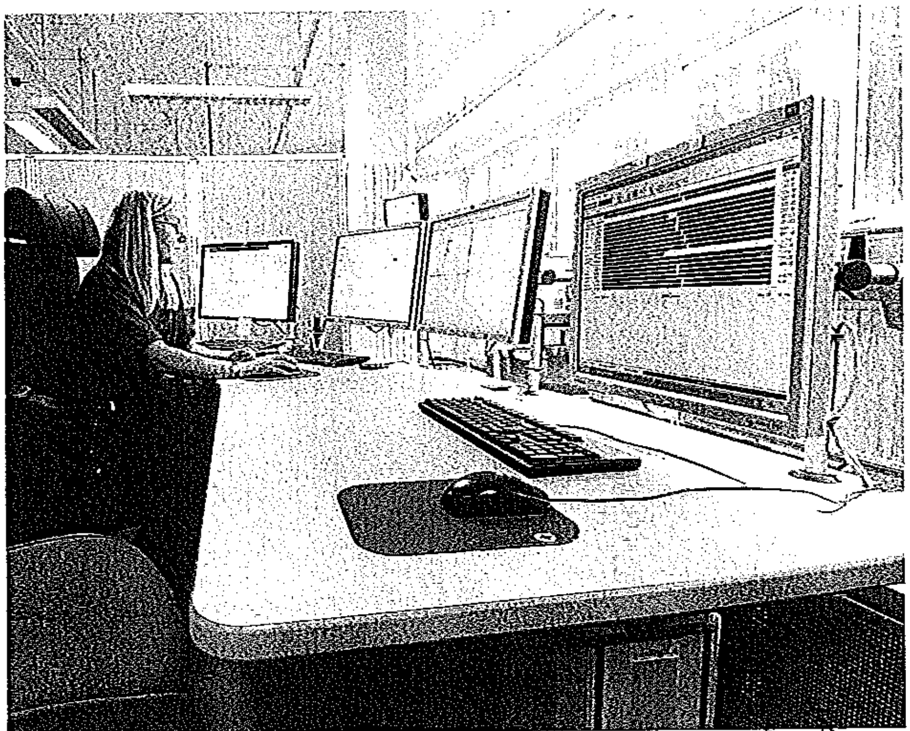
Synthetic testing	
Single-phase test	550 kV, 80 kA
Three-phase test	245 kV, 63 kA
Main capacitor banks	6.7 MJ
Two circuits	± 880 kV d.c.
4-parameter TRV and a.c. recovery voltage	
Short-circuit making tests with time delay less than 5 μs	
Capacitive current switching testsl	

Measurement and control
Fast digital transient recorders with optic-fibre isolated digitizers located in test cells
High speed digital video recording system
Automated data processing system, in accordance with IEC and STL guidelines
Fully-automated control systems for short-circuit generators and synthetic test circuits
High current measurements traceable to the STL reference shunt

New generation measurement system



Optic fiber isolation and high speed recording (100 MSa/s) in all channels



Automatic measurements for quicker evaluation

High Power.indd 6

000293

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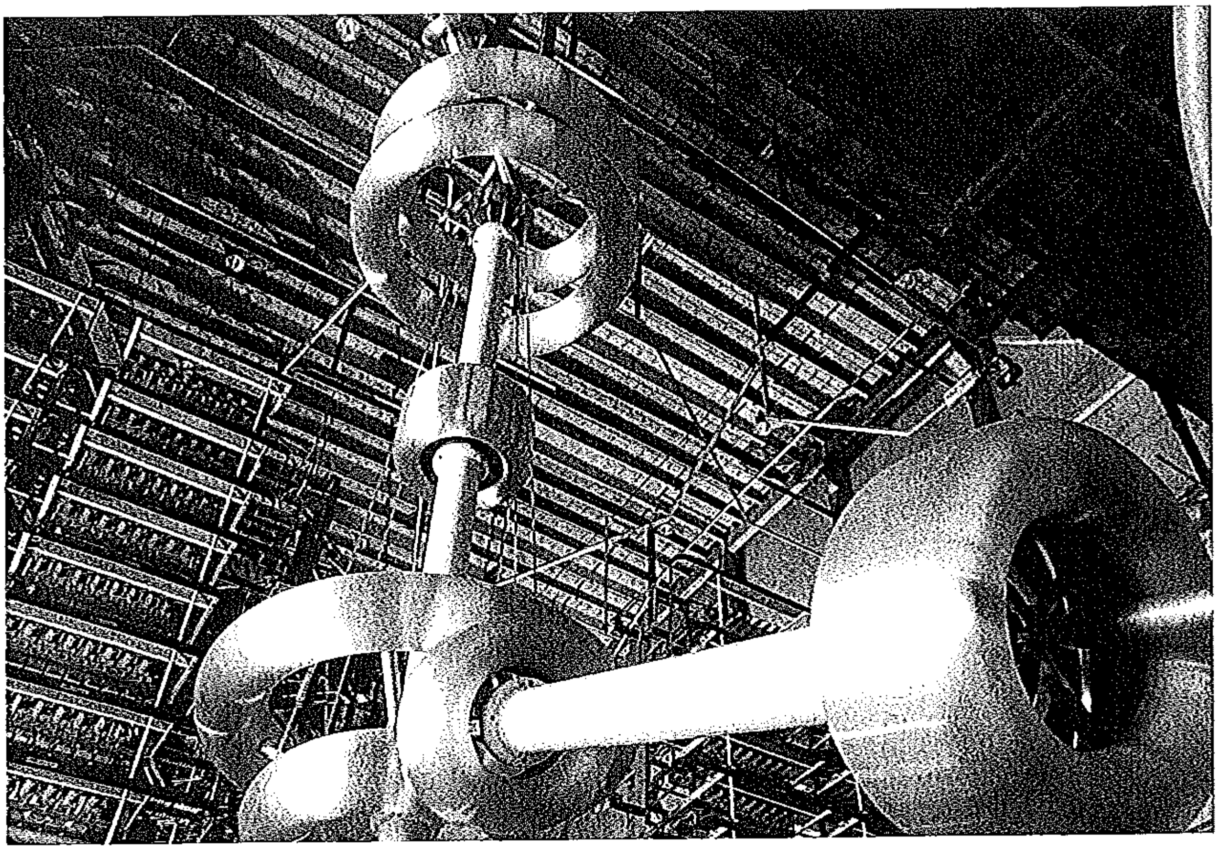
„КРАСИН" СМОЛЯН ООД

2010-11-18 08.53



Feasible tests

Test \ Equipment	MV circuit breakers	HV circuit breakers	Metal enclosed switchgear	Power transformers	Surge arresters	Disconnector & earthing switch	Current transformer	High voltage switches	Switch-fuse units	Voltage transformers	On-load tap changers	Insulators sets	Reactor & line-traps
Short time withstand current	•	•	•	•		•	•	•		•			•
Short-circuit making capacity	•	•				•		•	•				
Short-circuit breaking capacity	•	•							•				
Short-line fault		•											
Out-of-phase	•	•											
Line-charging switching	•	•											
Cable-charging switching	•	•											
Capacitor bank switching	•	•											
Shunt reactor switching		•											
Temperature-rise tests	•	•	•			•	•	•	•	•	•		
Internal-arc tests			•						•				
Bus-transfer current switching						•							
Induced current switching						•							
Pressure-relief					•								
Transient performance							•			•			
Ferro-resonance										•			
Breaking capacity											•		
Service duty tests											•		
Power arc tests												•	
Mechanical endurance	•	•				•		•	•				

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ВЯРНО С ОРИГИНАЛА
СМОЛЯН ООД

Contact us

ABB AB
High Power Laboratory
SE-771 80 LUDVIKA, SWEDEN
Tel: +46 (0)240 78 26 06
Fax: +46 (0)240 78 26 19
E-mail: highpowerlab@se.abb.com
www.abb.com/highvoltage

NOTE! ABB AB is working continuously to improve the products. We therefore reserve the right to change designs, dimensions and data without prior notice.

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Power and productivity
for a better world™

ABB

ВЯРНО С ОРИГИНАЛА

"КРАСИН" СМОЛЯН ООД

SWEDAC

Styrelsen för ackreditering och teknisk kontroll
Swedish Board for Accreditation and Conformity Assessment

ACKREDITERINGSBEVIS

ACCREDITATION CERTIFICATE

STRI Högspänningslaboratorium

har genom beslut den
following the decision on

30 september 1998

ackrediterats som
is accredited as

provningslaboratorium
testing laboratory

och därvid erhållit registreringsnummer
and has been assigned registration number

1534

Styrelsen [redacted] на основание чл. 2 от ЗЗЛД
Swedish Boa[redacted]*nt*

Lars Ettarp
Generaldirektör
Director General

Ackrediterat organ har rätt att använda nedanstående märke.
An accredited body is entitled to use the following logotype.

SWEDAC ACKREDITERING

Ackrediteringens omfattning och villkor framgår av ackrediteringsbeslutet.
The scope and conditions of accreditation are specified in the accreditation decision.

000296

ВЯРНО С ОРИГИНАЛА

"КРАСИН" СМОЛЯН ООД

EV/DI/532067843/<u>ALTERATION OF ARTICLES OF ASSOCIATION</u>
(unofficial translation)

On this third day of May two thousand and four, appeared before me,
Cornelis Everardus Martinus van Steenderen, civil law notary, resident at Rijswijk, South Holland:
Diana Schreur, secretary, for the purposes hereof residing at 2281 AJ Rijswijk, South-Holland, Haagweg 175, born at 's-Gravenhage on November eighteenth nineteen hundred and seventy-two,
acting herein in his capacity of attorney in fact authorised to represent:

1. Daniel Georges Marcel Pierre, living at 77470 Trilport (France), 3 Chemin de Peuplin, born in Trilport (France) on the eleventh day of April nineteen hundred and forty-eight and married;
2. Thomas Georg Facklam, living at 63450 Hanau (Germany), Lallienstrasse 34, born in Steinhein (Germany) on the twenty-second day of January nineteen hundred and fifty-three and married;
3. Jozef Gerardus Victor Marie Leferink, living at 5103 GK Dongen (The Netherlands), Vossendonk 11, born in Roermond (The Netherlands) on the twenty-sixth day of April nineteen hundred and forty-four and married,

acting, when granting the power of the attorney, in their capacity of chairman, vice-chairman and member respectively of the **EUROPEAN CO-OPERATION FOR ACCREDITATION(EA)**, registered offices at Utrecht (The Netherlands), place of business 3511 CJ Utrecht (The Netherlands), Radboudkade 223, registered with the commercial register under number 30166411.

3/. The powers of attorney have been granted in writing; the documents in question will be appended to this deed.

The appearer declared that the General Assembly of the EUROPEAN CO-OPERATION FOR ACCREDITATION (EA) have resolved to amend the Articles of Association in a meeting held in London on the twenty-sixth and twenty-seventh day of November two thousand and three, and that she, acting in her

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„КРАСИН" СМОЛЯН ООД

aforementioned capacity, in pursuance of this resolution, now proceeds to its execution.

./. The appearer, acting as aforementioned, declared to amend the Articles of Association of said company as follows:

1. Paragraph 3 of article 10 is renumbered into 3a;
2. After paragraph 3a a new paragraph numbered 3b is inserted which reads:
   In case of election of persons, the person may be elected by a majority of one half of the votes cast at a meeting at which at least three quarters of the members of the General Assembly is represented.

Furthermore the statement was made that the articles of association after implementation of the alteration shall read:

ARTICLES.

NAME, REGISTERED OFFICE AND DURATION

Article 1

1. The name of the association is **EUROPEAN CO-OPERATION FOR ACCREDITATION (EA).**
   Its registered office is in the municipality of Utrecht, The Netherlands. The Association is governed by the Law of the Netherlands.
2. The association has been established for an indefinite period of time.

OBJECTIVES

Article 2

The objectives of the association are:

- to define, harmonise and build consistency in accreditation of e.g calibration, certification, inspection and testing as a service to European trade and industry according to its needs and in line with economic conditions with the aim to further reduce barriers to trade;
- to build up and maintain a multilateral agreement on mutual recognition between the Accreditation Schemes operated by Full Members of EA and to promote the international acceptance of this agreement;
- to promote the establishment of agreements on mutual recognition between accreditation schemes on the international level;
- to promote confidence in the European infrastructure, competence and services in calibration, certification, inspection, testing and other activities covered by EA;

ВЯРНО С ОРИГИНАЛА

"КРАСИН" СМОЛЯН ООД

- to be a resource on technical matters related to the implementation and operation of the European policies in the field of conformity assessment.

CAPITAL

Article 3

The association's capital shall be made up of:

a. contributions from members
b. monies otherwise obtained by the association.

MEMBERS OF THE ASSOCIATION

Article 4

1. The membership shall have two types of members:
   a. FULL MEMBERS are nationally recognised accreditation bodies in a country (economy) being:
      - a member state of the European Economic Area, or
      - a member state of EFTA, or
      - a country which has been formally identified by the EU or EFTA as a candidate country for membership in EU or EFTA,

      and can provide evidence that they are operational and comply with the requirements set out in relevant European Standards and EA application documents.
   b. ASSOCIATE MEMBERS are nationally recognised accreditation bodies in a European country (economy) not being:
      - a member state of the European Economic Area, or
      - a member state of EFTA, or
      - a country which has been formally identified by the EU or EFTA as a candidate country for membership in EU or EFTA,

      and can provide evidence that they are operational and comply with the requirements set out in relevant European Standards and EA application documents.
2. Application for membership should be submitted to the Secretariat. The General Assembly decides whether to accept an applicant or not as a member.
3. Members subscribe for a period of twelve months – the member contribution period – commencing on the first of January the year following the acceptance by EA.

ВЯРНО С ОРИГИНАЛА

"КРАСИН" СМОЛЯН ООД

4. A member shall be obliged to pay annually a contribution. The level of contribution shall be established by the General Assembly not later than first December the year before the membership due has to be paid for.
5. A member shall be entitled to terminate membership of the association at the end of the member contribution period, with due observance of a period of notice of at least two months, by sending written notification to this effect to the Secretariat, on the condition that the member has met all his financial obligations in relation to the association or shall have met them by the end of the member contribution period concerned.
6. The General Assembly may terminate the membership of a member if the latter no longer complies with the requirements under the Articles or the Rules of Procedure as indicated under Article 20, or if the member acts in conflict with the Articles, the rules of procedure, lawfully adopted resolutions or the interests of association.
7. The General Assembly shall notify the member concerned in writing of such a resolution, stating reasons and the date on which membership will be terminated.
8. More detailed rules concerning membership are contained in a separate document.

THE GENERAL ASSEMBLY

Article 5

The General Assembly is the highest decision-making body of the association.

Article 6

The General Assembly shall give instructions in respect of the policy and shall supervise the management and the general course of affairs in the association.

Article 7

1. Each full and associate member of the association appoints a delegation of maximum two persons to represent it in the General Assembly. If there are more than one member from the same country (economy) these members must agree on a delegation of maximum 2 persons to represent them in the General Assembly.
2. Each delegation in the General Assembly, representing full members is entitled to one vote.

ВЯРНО С ОРИГИНАЛА

"КРАСИН" СМОЛЯН ООД

3. Associate members may contribute to the meetings but have no voting rights.
4. The Chairman, Vice Chairman, committee chairmen and further members of the Executive Committee shall be elected from the full members.

REPRESENTATION

Article 8

The Executive Committee, or alternatively the Chairman together with two other members of the Executive Committee, shall be entitled to represent the association at law and otherwise.

Article 9

The Executive Committee shall have the power to authorise the Chairman to represent the association at law and otherwise.

MEETINGS

Article 10

1. The General Assembly shall meet at least once per year and further as often and as many times as the chairman or one tenth of the members shall deem desirable.
2. The Secretary shall convene the meetings, giving written notification, which shall be understood to include a facsimile or e-mail.

3a. Unless otherwise stated in these Articles, valid resolutions may be adopted by a majority of two thirds of the votes cast at a meeting at which at least three quarters of the members of the General Assembly is represented.

3b. In case of election of persons, the person may be elected by a majority of one half of the votes cast at a meeting at which at least three quarters of the members of the General Assembly is represented.

4. More detailed rules concerning the General Assembly and the Executive Committee shall be contained in a set of Rules of Procedures.

Article 11

Resolutions may be adopted by the Committees otherwise than at a meeting. Votes may only be cast by ballot, which shall be understood to include facsimile and e-mail.

THE EXECUTIVE COMMITTEE

Article 12

In furtherance of the objectives of the association, its policy and management shall be implemented by the Executive Committee between the meetings of the General

ВЯРНО С ОРИГИНАЛА

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Assembly.

Article 13

Members of the Executive Committee shall be elected and dismissed by the General Assembly in accordance with Rules of Procedure adopted by the General Assembly, and shall represent the EA full membership in a well balanced manner.

Article 14

The Chairman shall chair the Executive Committee, in his absence the Executive Committee shall be chaired by the Vice Chairman.

Article 15

Following endorsement by the General Assembly, the Executive Committee shall have the authority to enter into agreements to purchase, dispose of or encumber registered property, or to enter into agreements by which the association commits itself as guarantor or joint and several debtor, warrants performance by a third party or undertakes to provide security for a debt of a third party.

ADVISORY BOARD

Article 16

Feedback from all parties concerned in accreditation shall be brought to the association and its members by an independent EA Advisory Board to ensure that the work of the association meets the needs of the market place.

Article 17

The responsibilities, terms of reference and composition of the EA Advisory Board are defined in separate documents.

SECRETARY

Article 18

The General Assembly shall have the power, upon proposal of the Executive Committee, to appoint and to dismiss the Secretary.

Article 19

The responsibilities, tasks and duties of the secretary are defined in a separate document.

RULES OF PROCEDURES

Article 20

The Executive Committee draw up one or more sets of rules and regulations for the implementation of the provisions of the Articles and with regard to matters not dealt

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„КРАСИН" СМОЛЯН ООД

with therein, in particular concerning appeals and complaints. These rules and regulations shall be approved by the General Assembly. The rules and regulations may not be in conflict with the legal provisions and the Articles.

FINANCIAL YEAR, ACCOUNTS & DISCHARGE AND BUDGET

Article 21

1. The financial year of the association shall run from 1 January to 31 December.
2. The Executive Committee shall render to the General Assembly an account of affairs during the preceding financial year no later than in the month of November.
3. An independent registered accountant, proposed by the Executive Committee, and accepted by the General Assembly, shall for its purpose draw up a financial report containing all income and expenditure in the financial year concerned. This financial report shall be submitted to the General Assembly for approval.
4. Approval of the financial report by the General Assembly shall discharge the Executive Committee from liability in respect of their conduct of affairs, during the financial year concerned.
5. The Executive Committee proposes the budget for the next financial year for approval by the General Assembly.
6. The General Assembly may appoint one person from among its members to review the annual financial statements with the purpose of verifying that the financial provision has been spent in accordance with the decisions of the General Assembly.

AMENDMENT OF THE ARTICLES

Article 22

The General Assembly shall be entitled to amend the Articles.

WINDING-UP AND LIQUIDATION

Article 23

1. The Executive Committee shall be entitled, upon decision by the General Assembly, to wind up the association.
2. Liquidation shall be carried out by the Executive Committee.
3. The association shall continue to exist after being wound up if and in so far as this is necessary for the settlement of affairs.
4. During the liquidation the provisions of the Articles shall remain in force as far

ВЯРНО С ОРИГИНАЛА

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as possible and necessary.

5. The General Assembly shall determine how any surplus should be allocated, doing so as far as possible in accordance with the objectives of the association.

CLOSING STATEMENT

This deed, drawn up in one original copy, was executed in Rijswijk, South-Holland, on the date first before written.

After the substance of this deed had been stated and the content thereof had been explained to the person appearing, that person declared to have taken cognizance of this deed and not to require this deed to be read out in full.

Subsequently, after a reading in part in accordance with the law, this deed was signed by the person appearing, who is known to me, and by me, Notary.

ВЯРНО С ОРИГИНАЛА

"КРАСИН" СМОЛЯН ООД

SWEDAC

Styrelsen för ackreditering och teknisk kontroll
Swedish Board for Accreditation and Conformity Assessment

ACKREDITERINGSBEVIS

ACCREDITATION CERTIFICATE

ABB Switchgear AB

High Power Laboratory

har genom beslut den
following the decision on

10 mars 1994

ackrediterats som
is accredited as

provningslaboratorium
testing laboratory

och därvid erhållit registreringsnummer
and has been assigned registration number

1297

Styrelsen för ackreditering och teknisk kontroll
Swedish Board на основание чл. 2 от ЗЗЛД *Assessment*

Generaldirektör
Director General

Ackrediterat organ har rätt att använda nedanstående märke.
An accredited body is entitled to use the following logotype.

SWEDAC ACKREDITERING

Ackrediteringens omfattning och villkor framgår av ackrediteringsbeslutet.
The scope and conditions of accreditation are specified in the accreditation decision.

000305

ВЯРНО С ОРИГИНАЛА

"КРАСИН" СМОЛЯН ООД

SWEDAC
Styrelsen för ackreditering och teknisk kontroll
Swedish Board for Accreditation and Conformity Assessment

Date
2017-12-21

Reference
2017/3070

Industry division
Ann-Louise Skoglund
Direktnr: +46 33 177706
E-post: ann-louise.skoglund@swedac.se

ABB AB
STRI
-
771 32 Ludvika

Decision on accreditation
(2 appendices)

Decision
Swedish Board for Accreditation and Conformity Assessment (Swedac) accredits ABB AB (registration number 556029-7029) as testing laboratory for electric testing and calibration. The scope of accreditation is specified in the "Field of accreditation" on the web page.

ABB AB will use the accreditation number 1297.
The accreditation is valid until further notice.

Flexible scope of accreditation
ABB AB shall always keep an updated list of methods used within its accreditation. For the upcoming assessments you shall provide Swedac a list of changes introduced since the latest assessment.

Flexible scope of accreditation implies that the laboratory within its accreditation, without applying to Swedac, may do changes in all ready accredited methods as follows:

- Introduce new properties, variables, analysis or range of measurement within an existing accredited method
- Introduce new methods within a specified area
- Introduce new products/new test types within an existing accredited method
- Introduce new versions of standard methods

The changes introduced by flexible scope accreditation should not imply new measurement principles, new accreditation or technical areas than those already existing in the accreditation decision.

Additional constraints are as follows: Flexibles scope of accreditation is only valid for testing. The calibration laboratory has fixed scope, and is not included in flexible scope of accreditation.

Applicable provisions
The provisions used in Swedacs accreditation process and which are applicable to activities are set out in the appendix.

Swedac
Tel: +46 771 99 09 00, www.swedac.se
E-mail: registrator@swedac.se
Organisation No: 202100-3815

Head Office
Postal Address: Box 878, SE-501 15 Borås
Visiting Address: Österlånggatan 5
Fax: +46 33 10 13 92

Stockholm Office
Postal Address: Box 15045, SE-167 15 Bromma
Visiting Address: Gustavslundsvägen 151 E, plan 8
Fax: +46 33 10 13 92

000306

ВЯРНО С ОРИГИНАЛА

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Reason for decision
ABB AB has applied for accreditation as testing laboratory. Swedac assesses that the requirements are fulfilled for accreditation for the scope set out in the application and which was reviewed during the assessment.

Information
The scope of accreditation is specified in the "Field of accreditation" on the web page. Application for changed scope, except to the flexible accreditation, must be made to Swedac.

Regular surveillance visit will be performed as described in the applicable regulations on accreditation.

Accredited laboratories pay an annual fee in accordance with Swedac's regulations.

The organization carries out accredited activities in their own premises. Activities outside the laboratory's own premises, so-called field activities, are not included in the accreditation.

This decision has been made by Division Manager Tomas Holm in consultation with the Technical Officer Per Fällström.

Tomas Holm

Appendices
Applicable provisions
Accreditation certificates, Testing and Calibration

Please notice that this is a translation, in case of any discrepancies between the English version and the original Swedish version the latter will prevail.

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„КРАСИН" СМОЛЯН ООД

SWEDAC
Styrelsen för ackreditering och teknisk kontroll
Swedish Board for Accreditation and Conformity Assessment

Date
2017-12-21

Appendixes

Reference
2017/3070

Applicable provisions

EU legislation and national legislation

Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products and repealing Regulation (EEC) No 339/93

Act (SFS 2011:791) concerning Accreditation and Conformity Assessment

Ordinance (2011:811) concerning Accreditation and Conformity Assessment

STAFS 2011:33 Swedac's Regulations and General Guidelines for the Accreditation of Laboratories

STAFS 2015:8 Swedac's Regulations and General Guidelines (STAFS 2015:8) on Accreditation

STAFS 2011:33 includes all requirements in SS-EN ISO/IEC 17025:2005

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ВЯРНО С ОРИГИНАЛА

"КРАСИН" СМОЛЯН ООД

ACCREDITATION CERTIFICATE

SWEDAC · ACKREDITERING

Ackred. nr. 1297
Testing
ISO/IEC 17025

ABB AB
STRI
Registration number 556029-7029

is accredited as a testing laboratory for the scope specified in appendix 2. The applicable terms of the accreditation are specified in appendix 1.

This laboratory is accredited in accordance with the International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system. The accredited laboratory is responsible for the results of performed testing and submitted judgements as well as, where applicable, for the selection and application of work methods within the scope of the granted accreditation.

The accreditation is valid until further notice. The Swedish Board for Accreditation and Conformity Assessment (Swedac) regularly carries out surveillance, and a full reassessment every fourth year, in order to verify that the applicable terms of accreditation, see appendix 1, are continually fulfilled.

This accreditation certificate was issued **2017-12-21** by
Tomas Holm,
Manager of the Industry division

Accreditation was granted in accordance with article 5 (1) or Regulation (EC) No 765/2008 regarding accreditation and market surveillance etc. and the Act (SFS 2011:791) concerning Accreditation and Conformity Assessment. Swedac is the national accreditation body responsible for the assessment of the competence of certification bodies, inspection bodies, laboratories and environmental verifier applying for accreditation. This accreditation has been issued under the EA MLA and is therefore recognised as equivalent to other accreditations issued under the EA MLA within the same accreditation scope.

000309

ВЯРНО С ОРИГИНАЛА

„КРАСИН" СМОЛЯН ООД

ACCREDITATION CERTIFICATE

SWEDAC · ACKREDITERING ·

Ackred. nr. 1297
Calibration
ISO/IEC 17025

ABB AB
STRI
Registration number 556029-7029

is accredited as a calibration laboratory for the scope specified in appendix 2. The applicable terms of the accreditation are specified in appendix 1.

This laboratory is accredited in accordance with the International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system. The accredited laboratory is responsible for the results of performed calibration and submitted judgements as well as, where applicable, for the selection and application of work methods within the scope of the granted accreditation.

The accreditation is valid until further notice. The Swedish Board for Accreditation and Conformity Assessment (Swedac) regularly carries out surveillance, and a full reassessment every fourth year, in order to verify that the applicable terms of accreditation, see appendix 1, are continually fulfilled.

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Tomas Holm,
Manager of the Industry division

Accreditation was granted in accordance with article 5 (1) or Regulation (EC) No 765/2008 regarding accreditation and market surveillance etc. and the Act (SFS 2011:791) concerning Accreditation and Conformity Assessment. Swedac is the national accreditation body responsible for the assessment of the competence of certification bodies, inspection bodies, laboratories and environmental verifier applying for accreditation. This accreditation has been issued under the EA MLA and is therefore recognised as equivalent to other accreditations issued under the EA MLA within the same accreditation scope.

000310

ВЯРНО С ОРИГИНАЛА

„КРАСИН" СМОЛЯН ООД

за участие в открита процедура за възлагане на обществена поръчка с предмет:

„Подмяна на маслонапълнена кабелна електропроводна линия 110 kV „Зенит" от линеен ножов разединител 110 kV на ПС „Хаджи Димитър" до линеен ножов разединител 110 kV в ПС „Подуяне", реф. № PPC 17 – 169

Техническо предложение

Техническа документация

Приложение № 1 към Предложение за изпълнение на поръчката по т.15.1. от Техническото предложение – Заверени копия на документи за Ограничител на пренапрежение (вентилен отвод) за нова КЕЛ 110 kV:

- Приложение № 1.3. към т.15.1.3. от Техническото предложение – Последно издание на части от каталога на производителя

000311

Zinc Oxide Surge Arrester PEXLIM P-X

Protection of switchgear, transformers and other equipment in high voltage systems against atmospheric and switching overvoltages.
- in areas with very high lightning intensity
- where grounding or shielding conditions are poor or incomplete
- for important installations
- where energy requirements are very high (e.g. very long lines, capacitor protection).

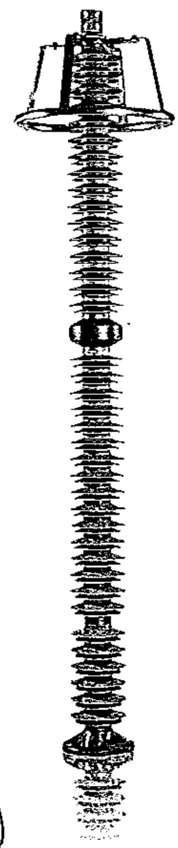
Superior where low weight, reduced clearances, flexible mounting, non-fragility and additional personnel safety is required.

Major component in PEXLINK™ concept for transmission line protection.

i Other data can be ordered on request. Please contact your local sales representative.

Brief performance data

Arrester classification as per IEC 60099-4 Ed 3.0	Station; SH
Arrester classification as per IEEE Std C62.11-2012	Station
System voltages (U_s)	52 - 420 kV
Rated voltages (U_r)	42 - 360 kV
Nominal discharge current (IEC)	20 kA_{peak}
Lightning impulse classifying current (ANSI/IEEE)	10/15 kA_{peak}
Charge, energy and current withstand:	
Repetitive charge transfer rating, Q_{rs} (IEC)	3.2 C
Thermal energy rating, W_{th} (IEC)	11 kJ/kV (U_r)
Single impulse energy capability (2 ms to 4 ms impulse)	7.0 kJ/kV (U_r)
Discharge current withstand strength:	
High current 4/10 μs	100 kA_{peak}
Low current 2000 μs, (based on Q_{rs})	1 600 A_{peak}
Energy class as per IEEE standard (switching surge energy rating)	G
Single-impulse withstand rating as per IEEE standard	3.2 C
Repetitive charge transfer test value - sample tests on all manufactured block batches	4.0 C
Short-circuit/Pressure relief capability	65 $kA_{rms(sym)}$
Mechanical strength:	
Specified long-term load (SLL)	2500 Nm
Specified short-term load (SSL)	4000 Nm
Service conditions:	
Ambient temperature	-50 °C to +45 °C
Design altitude	max. 1000 m
Frequency	15 - 62 Hz
Line discharge class (as per IEC60099-4, Ed. 2.2)	Class 4



Further data according to the IEEE standard can be supplied on request

000312

ВЯРНО С ОРИГИНАЛА

«КРАСИН» СМОЛЯН ООД

PEXLIM P-X

Guaranteed protective data 24 - 145 kV

Max. system voltage	Rated voltage	Max. continuous operating voltage [1]		TOV capability [2]		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_s	U_r	U_c	MCOV	1 s	10 s	1 kA	2 kA	3 kA	5 kA	10 kA	20 kA	40 kA
kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}
24[3]	24	19.2	19.5	26.5	25.2	46.8	48.5	49.7	51.9	54.6	59.8	65.6
36[3]	30	24.0	24.4	33.1	31.5	58.5	60.7	62.2	64.9	68.3	74.8	81.9
	33	26.4	26.7	36.4	34.6	64.4	66.7	68.4	71.4	75.1	82.3	90.1
	36	28.8	29.0	39.7	37.8	70.2	72.8	74.6	77.9	81.9	89.7	98.3
	39	31.2	31.5	43.0	40.9	76.1	78.8	80.8	84.3	88.8	97.2	107
52	42	34	34.0	46.4	44.1	81.9	84.9	87.0	90.8	95.6	105	115
	48	38	39.0	53.0	50.4	93.6	97.0	99.4	104	110	120	132
	51	41	41.3	56.3	53.5	99.5	104	106	111	117	128	140
	54	43	43.0	59.6	56.7	106	110	112	117	123	135	148
	60	48	48.0	66.3	63.0	117	122	125	130	137	150	164
	72	58	58.0	79.5	75.6	141	146	150	156	164	180	197
72	54	43	43.0	59.6	56.7	106	110	112	117	123	135	148
	60	48	48.0	66.3	63.0	117	122	125	130	137	150	164
	63	50	51.0	69.6	66.1	123	128	131	137	144	157	172
	66	53	53.4	72.9	69.3	129	134	137	143	151	165	181
	72	58	58.0	79.5	75.6	141	146	150	156	164	180	197
	75	60	60.7	82.8	78.7	147	152	156	163	171	187	205
	78	62	63.1	86.1	81.9	153	158	162	169	178	195	213
	81	65	65.6	89.5	85.0	158	164	168	176	185	202	222
	84	67	68.0	92.8	88.2	164	170	174	182	192	210	230
100	72	58	58.0	79.5	75.6	141	146	150	156	164	180	197
	75	60	60.7	82.8	78.7	147	152	156	163	171	187	205
	78	62	63.1	86.1	81.9	153	158	162	169	178	195	213
	81	65	65.6	89.5	85.0	158	164	168	176	185	202	222
	84	67	68.0	92.8	88.2	164	170	174	182	192	210	230
123	90	72	72.0	99.4	94.5	176	182	187	195	205	225	246
	96	77	77.0	106	100	188	194	199	208	219	240	263
	102	78	82.6	112	107	199	207	212	221	233	255	279
	108	78	84.0	119	113	211	219	224	234	246	270	295
	114	78	92.3	125	119	223	231	237	247	260	284	312
	120	78	98.0	132	126	234	243	249	260	273	299	328
	129	78	104	142	135	252	261	268	279	294	322	353
	132	78	106	145	138	258	267	274	286	301	329	361
	138	78	111	152	144	270	279	286	299	314	344	377
	144	78	115	159	151	281	291	299	312	328	359	394
	150	78	121	165	157	293	304	311	325	342	374	410

1) The continuous operating voltages U_c (as per IEC) and MCOV (as per IEEE) differ only due to deviations in type test procedures.
U_c has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with U_c higher than or equal to the actual system voltage divided by √3 can be selected.

2) With prior duty equal to the thermal energy rating of 11 kJ/kV (U_r)

3) Arresters for system voltages 36 kV or below can be supplied, on request, when the order also includes arresters for higher system voltages.

Arresters with lower or higher rated voltages may be available on request for special applications.

ВЯРНО С ОРИГИНАЛА

КРАСИН СМОЛЯН ООД

000313

PEXLIM P-X

Guaranteed protective data 145 - 420 kV

Max. system voltage	Rated voltage	Max. continuous operating voltage [1]		TOV capability [2]		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_s	U_r	U_c	MCOV	1 s	10 s	1 kA	2 kA	3 kA	5 kA	10 kA	20 kA	40 kA
kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}
145	108	86	86.0	119	113	211	219	224	234	246	270	295
	120	92	98.0	132	126	234	243	249	260	273	299	328
	132	92	106	145	138	258	267	274	286	301	329	361
	138	92	111	152	144	270	279	286	299	314	344	377
	144	92	115	159	151	281	291	299	312	328	359	394
	150	92	121	165	157	293	304	311	325	342	374	410
	162	92	131	179	170	316	328	336	351	369	404	443
	168	92	131	185	176	328	340	348	364	383	419	459
170	132	106	106	145	138	258	267	274	286	301	329	361
	144	108	115	159	151	281	291	299	312	328	359	394
	150	108	121	165	157	293	304	311	325	342	374	410
	162	108	131	179	170	316	328	336	351	369	404	443
	168	108	131	185	176	328	340	348	364	383	419	459
	180	108	144	198	189	351	364	373	390	410	449	492
	192	108	152	212	201	375	388	398	415	437	479	525
245	180	144	144	198	189	351	364	373	390	410	449	492
	192	154	154	212	201	375	388	398	415	437	479	525
	198	156	160	218	207	387	400	410	428	451	494	541
	210	156	170	232	220	410	425	435	454	478	524	574
	214	156	173	237	225	419	434	445	464	488	535	586
	216	156	175	238	226	422	437	448	467	492	539	590
	219	156	177	241	229	427	443	454	474	499	546	598
	222	156	179	245	233	433	449	460	480	506	554	607
	228	156	180	251	239	445	461	473	493	519	568	623
300	216	173	175	238	226	422	437	448	467	492	539	590
	228	182	182	251	239	445	461	473	493	519	568	623
	240	191	191	265	252	468	485	497	519	546	598	656
	258	191	209	285	270	504	522	535	558	587	643	705
	264	191	212	291	277	515	534	547	571	601	658	721
	276	191	220	304	289	539	558	572	597	628	688	754
362	258	206	209	285	270	504	522	535	558	587	643	705
	264	211	212	291	277	515	534	547	571	601	658	721
	276	221	221	304	289	539	558	572	597	628	688	754
	288	230	230	318	302	562	582	597	623	656	718	787
420	330	264	267	364	346	644	667	684	714	751	823	901
	336	267	272	371	352	656	679	696	727	765	838	918
	342	267	277	377	359	667	691	709	740	779	852	934
	360	267	291	397	378	702	728	746	779	819	897	983

1) The continuous operating voltages U_c (as per IEC) and MCOV (as per IEEE) differ only due to deviations in type test procedures.
U_c has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with U_c higher than or equal to the actual system voltage divided by $\sqrt{3}$ can be selected.

2) With prior duty equal to the thermal energy rating of 11 kJ/kV (U_r)

Arresters with lower or higher rated voltages may be available on request for special applications.

000314

ВЯРНО С ОРИГИНАЛА

„КРАСИН" СМОЛЯН ООД

PEXLIM P-X

Technical data for housings

Max. system voltage	Rated voltage	Housing	Creepage distance	External insulation *)				Dimensions					
U_s	U_r			1.2/50 µs dry	50 Hz wet (60s)	60 Hz wet (10s)	250/2500 µs wet	Mass	A_{max}	B	C	D	Fig.
kV_{rms}	kV_{rms}		mm	kV_{peak}	kV_{rms}	kV_{rms}	kV_{peak}	kg	mm	mm	mm	mm	
24	24	XV024	1363	283	126	126	235	19	481	-	-	-	1
36	30-36	XV036	1363	283	126	126	235	19	481	-	-	-	1
	39	XV036	2270	400	187	187	330	30	736	-	-	-	1
52	42-72	XV052	2270	400	187	187	330	30	736	-	-	-	1
72	54-72	XV072	2270	400	187	187	330	29	736	-	-	-	1
	75-84	XV072	3625	578	293	293	462	44	1080	-	-	-	1
100	75-96	XV100	3625	578	293	293	462	44	1080	-	-	-	1
123	90-120	XH123	3625	578	293	293	462	43	1080	-	-	-	1
	90-144	XV123	4540	800	374	374	660	54	1397	-	-	-	2
	150	XV123	4988	861	419	419	697	55	1486	-	-	-	2
145	108-120	XH145	3625	578	293	293	462	42	1080	-	-	-	1
	108-144	XV145	4540	800	374	374	660	53	1397	-	-	-	2
	150	XV145	4988	861	419	419	697	55	1486	-	-	-	2
	162-168	XV145	5895	978	480	480	792	66	1741	-	-	-	2
170	132-144	XH170	4540	800	374	374	660	53	1400	400	-	160	3
	150	XV170	4988	861	419	419	697	57	1489	400	-	160	3
	132-192	XV170	5895	978	480	480	792	70	1744	400	-	160	3
245	180-192	XM245	5895	978	480	480	792	66	1744	400	-	160	3
	180-228	XH245	7250	1156	586	586	924	83	2088	400	-	160	3
	180-198	XV245	8613	1439	712	712	1159	101	2647	800	-	500	4
	210-228	XV245	8613	1439	712	712	1159	98	2617	600	-	300	4
300	216-276	XH300	8613	1439	712	712	1159	101	2617	800	-	500	4
	216-276	XV300	9520	1556	773	773	1254	110	2872	800	-	500	4
362	258-288	XH362	9520	1556	773	773	1254	118	2872	1200	1000	600	5
	258-288	XV362	11790	1956	960	960	1584	148	3533	1400	1000	700	6
420	330-360	XH420	10875	1734	879	879	1386	131	3216	1400	1000	700	5
Neutral-ground arresters													
52	30-36	XN052	1363	283	126	126	235	19	481	-	-	-	1
72	42-54	XN072	2270	400	187	187	330	29	736	-	-	-	1
100	60	XN100	2270	400	187	187	330	30	736	-	-	-	1
123	72	XN123	2270	400	187	187	330	28	736	-	-	-	1
	75-120	XN123	3625	578	293	293	462	43	1080	-	-	-	1
145	84-120	XN145	3625	578	293	293	462	42	1080	-	-	-	1
170	96-120	XN170	3625	578	293	293	462	42	1080	-	-	-	1
245	108	XN245	3625	578	293	293	462	41	1080	-	-	-	1
	132-144	XN245	4540	800	374	374	660	50	1397	-	-	-	2

*) Sum of withstand voltages for empty units of arrester.

ВЯРНО С ОРИГИНАЛА

"КРАСИН" СМОЛЯН ООД

000315

PEXLIM P-X
Technical data for housings

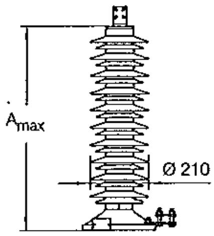


Figure 1

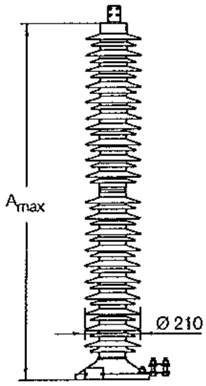


Figure 2

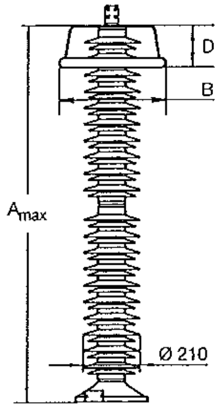


Figure 3

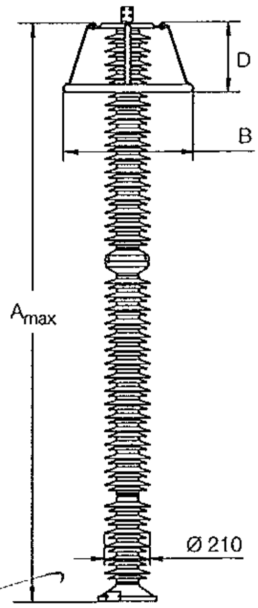


Figure 4

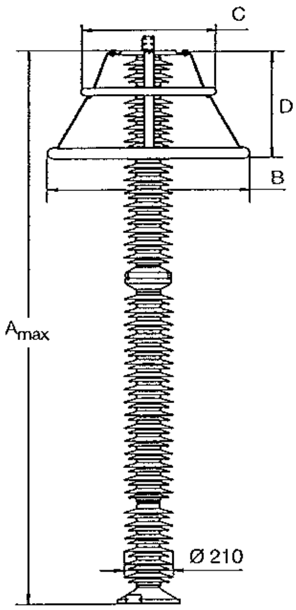


Figure 5

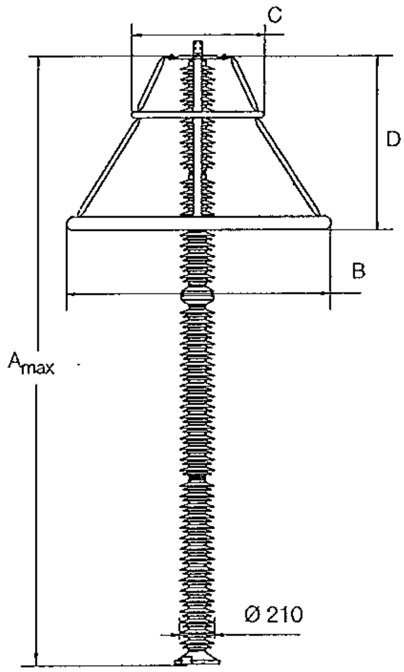


Figure 6

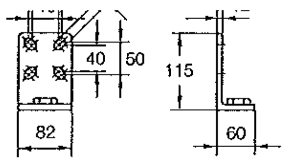
000316

ВЯРНО С ОРИГИНАЛА

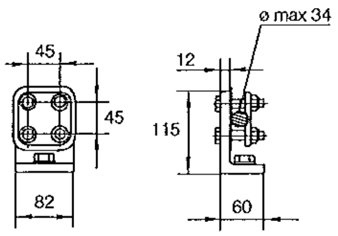
„КРАСИН" СМОЛЯН ООД

PEXLIM P-X
Accessories

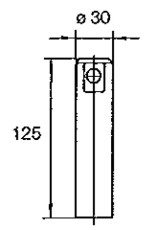
Line terminals



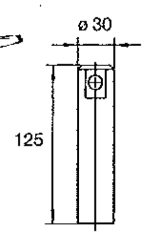
1HSA410 000-L
Aluminium



1HSA410 000-M
Aluminium flag with other items in stainless steel

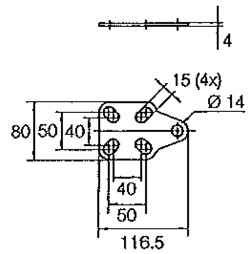


1HSA410 000-N
Aluminium

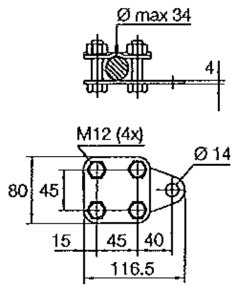


1HSA410 000-P
Stainless steel

Earth terminals

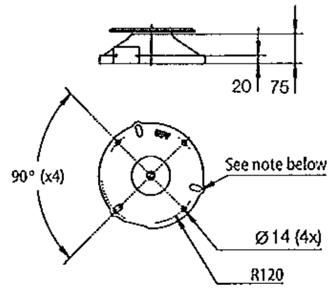


1HSA420 000-A
Stainless steel



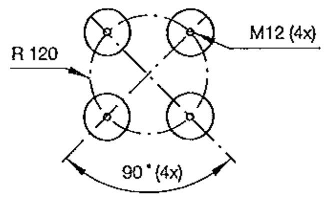
1HSA420 000-B
Stainless steel

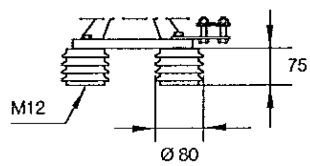
Drilling plans



NOTE! Alternative drilling plan
3 slotted holes (120 °), n14 at R111-127

Without insulating base
Aluminium





Insulating base
1HSA430 000-A
Epoxy resin

M12 bolts for connection to structure are not supplied by ABB. Required threaded grip length is 15-20 mm.

ВЯРНО С ОРИГИНАЛА

КРАСИН СМОЛЯН ООД

000317

PEXLIM P-X
Shipping data

Rated voltage	Housing	Number of arresters per crate					
		One		Three		Six	
U_r		Volume	Gross	Volume	Gross	Volume	Gross
kV_{rms}		m^3	kg	m^3	kg	m^3	kg
24	XV024	0.1	42	0.5	86	0.9	152
30-36	XV036	0.1	42	0.5	86	0.9	152
39	XV036	0.5	52	0.5	116	0.9	212
42-72	XV052	0.5	52	0.5	116	0.9	212
54-72	XV072	0.5	52	0.5	116	0.9	212
75-84	XV072	0.7	71	0.7	163	1.2	301
75-96	XV100	0.7	71	0.7	163	1.2	301
90-120	XH123	0.7	71	0.7	163	1.2	301
90-144	XV123	0.9	87	0.9	201	1.5	372
150	XV123	0.9	87	0.9	201	1.5	372
108-120	XH145	0.7	68	0.7	154	1.2	283
108-144	XV145	0.9	87	0.9	201	1.5	372
150	XV145	0.9	87	0.9	201	1.5	372
162-168	XV145	1.1	98	1.1	239	1.9	443
132-144	XH170	0.9	89	0.9	207	1.5	384
150	XH170	0.9	89	0.9	207	1.5	384
132-192	XV170	1.1	102	1.1	251	1.9	443
192	XM245	1.1	98	1.1	239	1.9	443
180-228	XH245	1.1	115	1.1	290	1.9	545
180-198	XV245	0.9	133	1.5	339	-	-
210-228	XV245	0.9	133	1.5	339	-	-
216-264	XH300	1.0	155	1.7	358	-	-
276	XH300	1.0	155	1.7	358	-	-
216-276	XV300	1.0	163	1.7	382	-	-
258-288	XH362	1.6	207	2.3	435	-	-
258	XV362	2.1	242	2.9	497	-	-
264-288	XV362	2.1	258	2.3	545	-	-
330-360	XH420	2.1	242	2.3	497	-	-
30-36	XN052	0.1	42	0.5	86	0.9	152
42-54	XN072	0.5	52	0.5	116	0.9	212
60	XN100	0.5	52	0.5	116	0.9	212
72	XN123	0.5	52	0.5	116	0.9	212
75-120	XN123	0.7	71	0.7	163	1.2	301
84-120	XN145	0.7	71	0.7	163	1.2	301
96-120	XN170	0.7	71	0.7	163	1.2	301
108-120	XN245	0.7	71	0.7	163	1.2	301
132-144	XN245	0.9	87	0.9	201	1.5	372

Each crate contains a certain number of arrester units and accessories for assembly and erection. A packing list is attached externally on each crate.

Each separate crate is numbered and the numbers of all crates and their contents are listed in the shipping specification. ABB reserves the right to pack arresters in the most effective/economic combination. Alternate or non-standard crates may involve additional charges.

i The table above is to be seen as an approximation and specific data for deliveries may differ from the values given.

000318

ВЯРНО С ОРИГИНАЛА

"КРАСИН" СМОЛЯН ООД

за участие в открита процедура за възлагане на обществена поръчка с предмет:

„Подмяна на маслонапълнена кабелна електропроводна линия 110 kV „Зенит" от линеен ножов разединител 110 kV на ПС „Хаджи Димитър" до линеен ножов разединител 110 kV в ПС „Подуяне", реф. № PPC 17 – 169

Техническо предложение

Техническа документация

Приложение № 1 към Предложение за изпълнение на поръчката по т.15.1. от Техническото предложение – Заверени копия на документи за Ограничител на пренапрежение (вентилен отвод) за нова КЕЛ 110 kV:

- Приложение № 1.4. към т.15.1.4. от Техническото предложение – Други по преценка на участника (*декларации за съответствие и др.)*

000319

ABB

Date
2017-June-14
Dealt with by, telephone
Anders Ahlström, +46 240 7834 56
E-mail
anders.ahlstrom@se.abb.com
Fax
+46 240 78 38 91
Our ref.
17BG365611

CERTIFICATE OF CONFORMITY WITH STANDARDS AND ORIGIN

To Whom it May Concern,

We ABB AB, Ludvika, Sweden, hereby declare under our sole responsibility, that all our surge arresters type PEXLIM P096-XV123 are designed, manufactured and tested in accordance and in compliance with the following standards, directives or other normative documents:
Directive: EMC directive 2004/108/EC
Applied EC IEC 60099-4, Surge arresters – Part 4 – Metal oxide Harmonized surge arresters without gaps for a.c. systems.
ANSI/IEEE C62.11 and the requirements laid down in our proposal for the above mentioned project.
The equipment is manufactured in our factory ABB in Ludvika, Sweden.
The Process of Engineering, Manufacturing and Testing of the mentioned goods will be accomplished according to our Quality and Management Systems as certified by ISO 9001/ISO 14001.
This has been issued for any purpose it may serve.

Yours faithfully,

Anders Ahlström
Area Marketing Manager
ABB AB
High Voltage Products

000320

"КРАСИН" СМОЛЯН ООД

Превод от английски език, извършен от Даниела Кирилова Тодорова:

[Лого – не се чете]

Дата
2017 – Юни -14
Съгласувано от, телефон
Андерс Ахлщтрьом, +46 240 7834 56
И-мейл
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Факс:
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Наш реф.:
17BG365611

ДЕКЛАРАЦИ ЗА СЪОТВЕТСТВИЕ СЪС СТАНДАРТИ И ПРОИЗХОД

На вниманието на всички заинтересовани,

Ние, АББ АЛ, Лудвика, Швеция, с настоящото декларираме, че всички наши вентилни отводи тип PEXLIM PO96-XV123 са проектирани, произведени и тествани, съгласно и в съответствие със следните стандарти, директиви и други нормативни документи:

Директива: ЕМС директива 2004/108/ЕС
Приложим ЕС IEC 60099-4, Вентилни отводи – Част 4 – Металоокисни хармонизирани вентилни отводи без отвори за а.с. системи.

ANSI/IEEE C62.11 и изискванията посочени по-долу в нашето предложение за горепосочения проект.
Оборудването се произвежда в нашата фабрика АББ в Лудвика, Швеция.
Процесът по Инженеринг, Производство и Тестване на посочените стоки ще бъде извършен съгласно нашите Системи за качество и управление, съгласно сертификацията по ISO 9001/ISO 14001.
Настоящото се издава да послужи, където е необходимо.

Искрено Ваш,

[подпис-не се чете]

Андерс Ахлщрьом
Локален Маркет Мениджър
АББ АБ
Високоволтови Продукти

000321 ВЯРНО С ОРИГИНАЛА

„КРАСИН" СМОЛЯН ООД

Data Schedule

Tender ID: Pos:

ABB High Voltage Products

Data schedule: Surge Arresters

DIMENSION DRAWING: 1HSA134-8664

		PEXLIM P-X P096-XV123
1 General data		
Design		ZnO, Gapless
Manufacturer, country		ABB
Applied standards		IEC
Catalogue		1HSM 9543 12-00en
Maximum system voltage (Us)	kVrms	123
Arrester classification as per IEC 60099-4 Ed 3.0		Station; SH
Nominal discharge current	kApeak	20
Rated voltage (Ur)	kVrms	96
Maximum continuous operating voltage (Uc)	kVrms	77
Frequency	Hz	15-62
TOV capability (after thermal energy rating, Wth)		
1 s	kVrms	106
10 s	kVrms	100
2 Charge, energy and current withstand data		
Repetitive charge transfer rating, Qrs	C	3.2
Thermal energy rating, Wth	kJ/kV (Ur)	11
Discharge current withstand strength		
High current, 4/10 µs	kApeak	100
Low current, 2000 µs	Apeak	1600
Single-impulse withstand rating (IEEE), Repetitive charge transfer test value (IEC) - sample tests on all manufactured block batches	C	4
Energy data as per previous IEC standard IEC 60099-4, Ed 2.2		
Line discharge class	Class	4
Energy capability - thermal energy capability (as per IEC 60099-4 Ed 2.2, clause 8.5.5)	kJ/kV (Ur)	11
3 Guaranteed max. protective data		
Maximum residual/discharge voltage		
with current wave 30/60 µs (slow-front/switching)		
0.5 kA	kVpeak	182
1.0 kA	kVpeak	188
2.0 kA	kVpeak	194
with current wave 8/20 µs (fast-front/lightning)		
5.0 kA	kVpeak	208
10 kA	kVpeak	219
20 kA	kVpeak	240
with current wave 1/(2-20) µs (FOW as per IEEE, steep front as per IEC) External inductive effects neglected.		
10 kA	kVpeak	233
4 Technical data for housing		
Short-circuit capability		
High current, 0.2 s	kArms	65
Low current	Arms	600
External insulation		
Requirements as per IEC 60099-4		
LIWL, 1.2/50 µs	kVpeak	312
50 Hz, wet (60 s)	kVrms	146
SIWL, wet (250/2500 µs)	kVpeak	243
Tested values on empty units/modules housings		
LIWL, 1.2/50 µs	kVpeak	800
50 Hz, wet (60 s)	kVrms	374
SIWL, wet (250/2500 µs)	kVpeak	660
Creepage distance (nominal)	mm	4540
	mm/kV (Us)	36.9
Specified long-term load (SLL)	Nm	2500
Specified short-term load (SSL)	Nm	4000
Insulator colour / material		Grey Silicone

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ВЯРНО С ОРИГИНАЛА
"КРАСИН" СМОЛЯН ООД

за участие в открита процедура за възлагане на обществена поръчка с предмет:

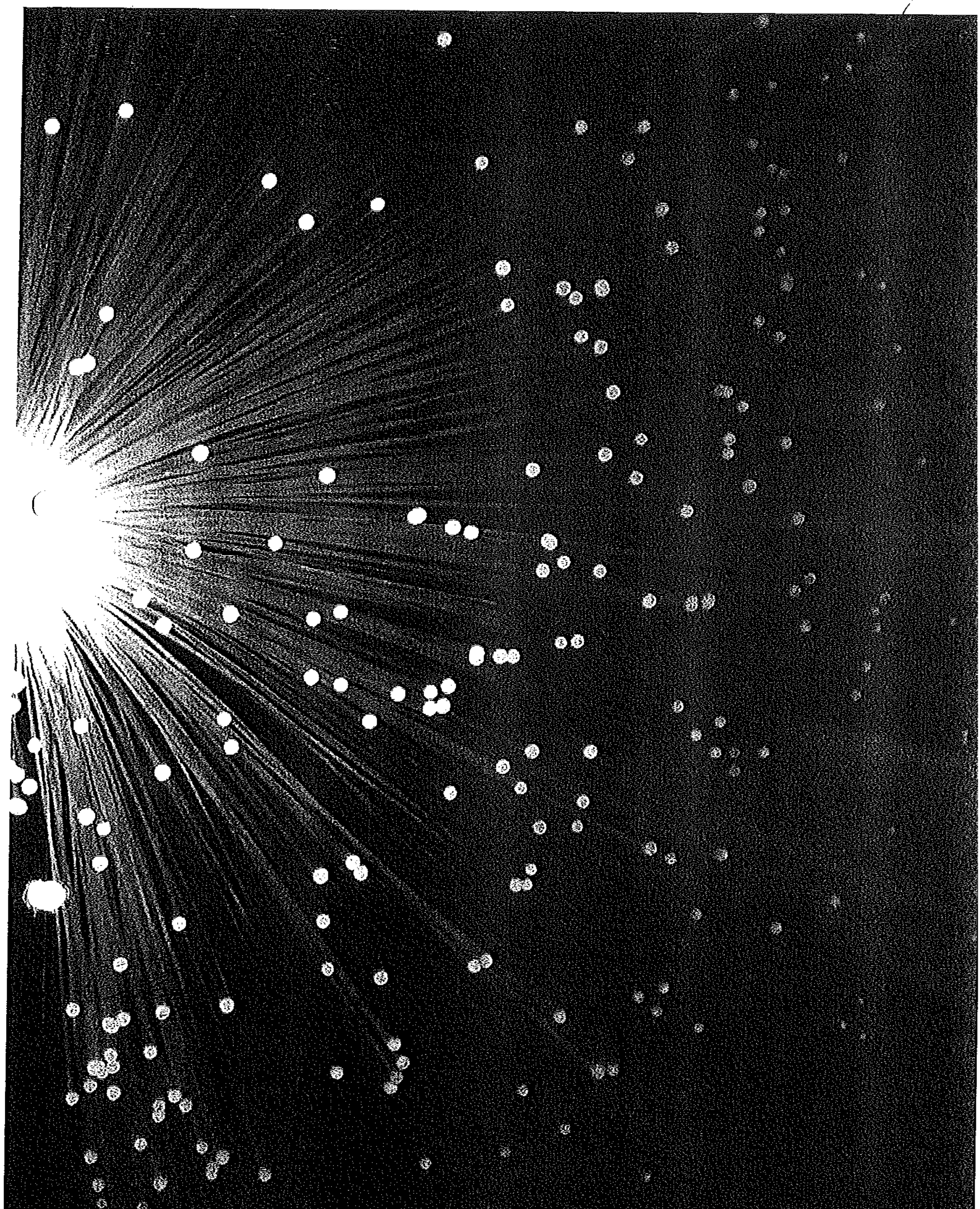
„Подмяна на маслонапълнена кабелна електропроводна линия 110 kV „Зенит" от линеен ножов разединител 110 kV на ПС „Хаджи Димитър" до линеен ножов разединител 110 kV в ПС „Подуяне", реф. № PPC 17 – 169

Техническо предложение

Техническа документация

Приложение № 2 към Предложение за изпълнение на поръчката по т.15.2. от Техническото предложение – Заверени копия на документи за Оптичен кабел:

- Приложение № 2.1. към т.15.2.1. от Техническото предложение – Последно издание на каталога на производителя.



Fiber optic cables

Product catalogue 2018

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