



LAPP Insulators GmbH
Bahnhofstraße 5
D-95632 Wunsiedel
High voltage laboratory Selb
www.lappinsulators.de

Test Certificate No: 45/12

Test object : **Outdoor – Post – Insulator IOC - 35 – 2000.**

LAPP- drawing no. : ----- **Mat. no.:** I.N. 7443/2.2.Bi.C

Overall height : 500 mm, **Arcing distance** : 340 mm.

Arcing accessories : Without.

Customer : ----

Customer order no. : ----

Participants : Dr. Seifert / LAPP Insulators GmbH - Wunsiedel,
Mr. Meyer / LAPP Insulators GmbH – Selb.

Test result : The specified values could be verified,
the tests were passed successfully.

Date : 18. June 2012

Dr.-

LAPP Insulators GmbH

Customer

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Contents

<u>Summary of the electrical test results</u>		Nominal values, acc.to drawing	Test result
1. <u>Lightning impulse test</u>			
1.1	Dry lightning impulse withstand voltage, positive	>195 kV	226 kV
	Dry lightning impulse withstand voltage, negative	>195 kV	305 kV
1.2	50 % Dry lightning impulse flashover voltage, positive	----	235 kV
	50 % Dry lightning impulse flashover voltage, negative	----	317 kV
2. <u>Power frequency test</u>			
2.1	Wet power frequency withstand voltage	>80 kV	100 kV
2.2	Wet power frequency flashover voltage	-----	121 kV
2.3	Dry power frequency withstand voltage	-----	142 kV
2.4	Dry power frequency flashover voltage	-----	159 kV
3.	Appendix: High voltage laboratory Selb (top view) Circuit diagram for test voltages Oscillogram for lightning impulse voltage Drawing		

Note : The above data reflect the results of our quality tests. Legally they are not to be understood as a guarantee of specific properties. The guaranty of the faultless quality of our products and services is rather stipulated in our sales contract and our general conditions of sale. In addition, we warrant the liability according to the liability law for products.

1. Ascertainment of lightning impulse voltage

1.1 Lightning impulse withstand voltage

Withstand voltage test procedure D acc. to IEC 60060-1, subclause 20.1.4.

Withstand voltage (U_{10}) is: $U_{10} = U_{50} (1-1,3z)$ deviation $z = 0,03$

test sample no.	measured voltage (U_{10}) positive polarity – negative polarity	Measured voltage corrected (U_{10}) positive polarity – negative polarity
IOC - 35 – 2000	217 kV 305 kV	226 kV 305 kV

1.2 50 % Dry lightning impulse flashover voltage

Withstand voltage test procedure D acc. to IEC 60060-1, subclause 20.1.4, part b.

(U_{50} according the up - and - down method).

test sample no.	measured voltage (U_{50}) positive polarity – negative polarity	measured voltage corrected (U_{50}) positive polarity – negative polarity
IOC - 35 – 2000	225 kV 317 kV	235 kV 317 kV

Test specification: **IEC 60168 and IEC 60060 - 1.**

Ambient air conditions during test at : 12. June 2012

Air pressure 939,1 hPa, temperature 19,7 °C, humidity rel. / abs. 54,1 % / 9,16 g/m³.

Correction factor to point no.	1.2 positive polarity - negative polarity	
Air density correction fact. k1	0,964	1,000
Humidity correction fact. k2	0,995	1,000
Correction factor $K_t = k1*k2$	0,959	1,000

The values of voltage are corrected to an air pressure of 1013 hPa, a temperature of 20 °C and an absolute humidity of 11 g/m³.

2. Ascertainment of power frequency voltage

2.1 Wet power frequency withstand voltage

Withstand voltage test procedure acc. to IEC 60060-1, subclause 17.1.

test sample no.	measured voltage wet	measured voltage corrected wet
IOC - 35 – 2000	95 kV	100 kV

2.2 Wet power frequency flashover voltage

Disruptive discharge voltage test procedure acc. to IEC 60060-1, subclause 17.2.

test sample no.	measured voltage wet	measured voltage corrected wet
IOC - 35 – 2000	112 kV	121 kV

Test specification: **IEC 60168 and IEC 60060 - 1.**

Characteristics of the artificial rain at : 12. June 2012

Resistivity of the rain water 102,5 Ω m at 17,1 °C.

Average rain intensities: horizontal component 1,3 mm/min,
vertical component 1,4 mm/min.

Ambient air conditions during test at : 12. June 2012

Air pressure 939,1 hPa, temperature 19,7 °C, humidity rel. / abs. 54,1 % / 9,16 g/m³.

Correction factor to point no.	2.1	2.2
Air density correction fact. k1	0,948	0,928
Humidity correction fact. k2	1,000	1,000
Correction factor $K_t = k1 \cdot k2$	0,948	0,928

The values of voltage are corrected to an air pressure of 1013 hPa, a temperature of 20 °C and an absolute humidity of 11 g/m³.

2. Ascertainment of power frequency voltage

2.3 Dry power frequency withstand voltage

Withstand voltage test procedure acc. to IEC 60060-1, subclause 17.1.

test sample no.	measured voltage dry	measured voltage corrected dry
IOC - 35 – 2000	130 kV	142 kV

2.4 Dry power frequency flashover voltage

Disruptive discharge voltage test procedure acc. to IEC 60060-1, subclause 17.2.

test sample no.	Measured voltage Dry	measured voltage corrected dry
IOC - 35 – 2000	150 kV	159 kV

Test specification: **IEC 60168 and IEC 60060 - 1.**

Ambient air conditions during test at : 12. June 2012

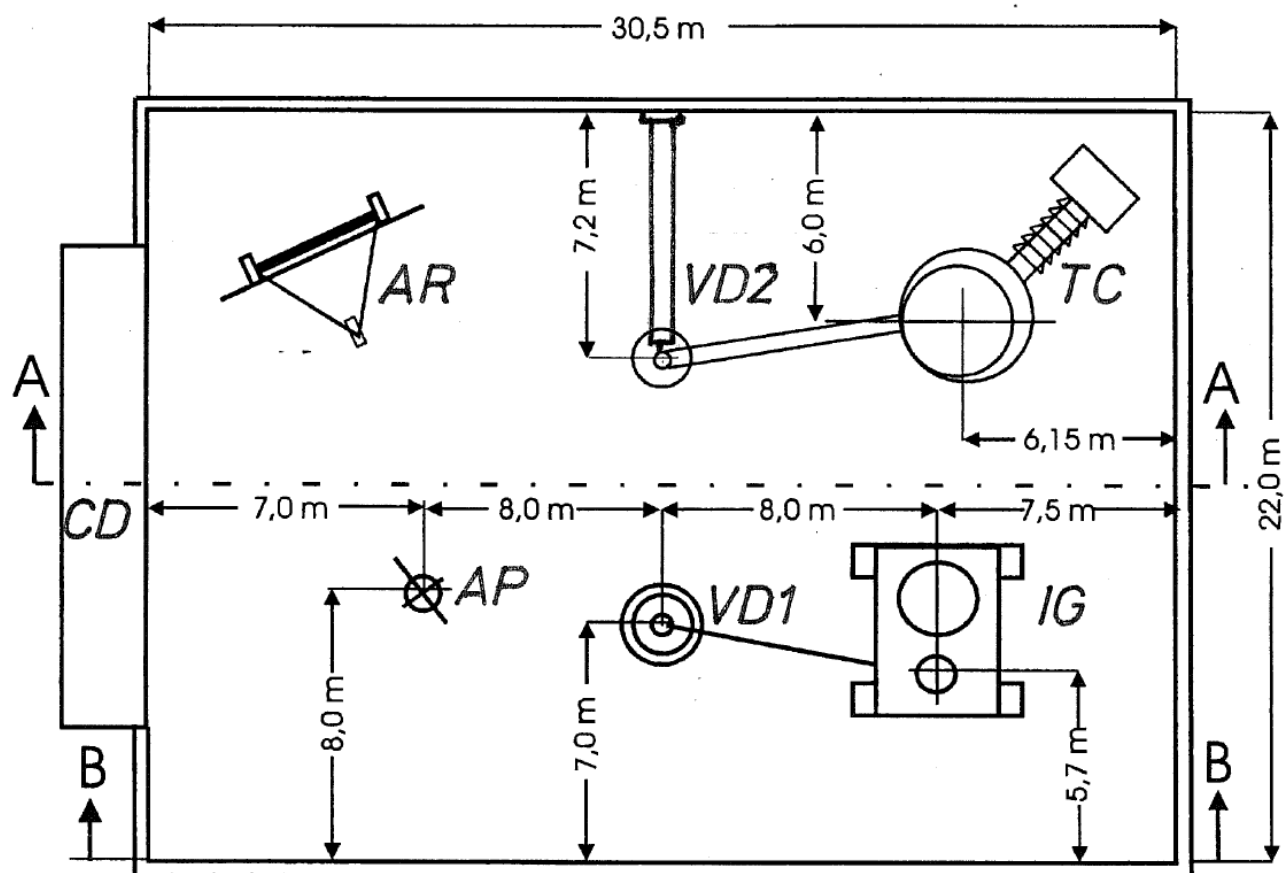
Air pressure 939,1 hPa, temperature 19,7 °C, humidity rel. / abs. 54,1 % / 9,16 g/m³.

Correction factor to point no.	2.3	2.4
Air density correction fact. k1	0,928	0,953
Humidity correction fact. k2	0,986	0,991
Correction factor $K_t = k1 \cdot k2$	0,915	0,944

The values of voltage are corrected to an air pressure of 1013 hPa, a temperature of 20 °C and an absolute humidity of 11 g/m³.

3. Appendix

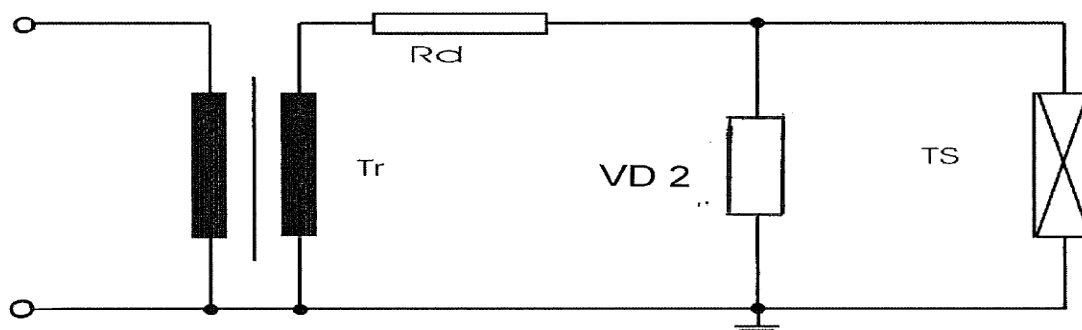
High voltage laboratory Selb (top view)



IG	Impulse Generator	View A	Arrangement for
VD 1	Voltage Divider (only for BIL and SIL)		Power frequency test
VD 2	Voltage Divider (only for AC – Test)		
TC	Transformer Cascade	View B	Arrangement for
AR	Artificial rain device		Impulse voltage test
AP	Attachment point of test sample		
CD	Command and control devices		

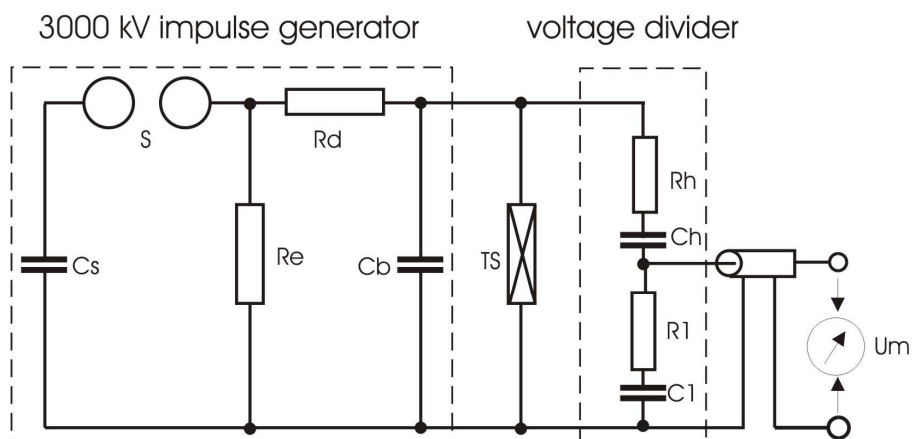
3. Appendix

Circuit diagram for test voltage



Circuit diagram for test with power frequency voltage

Tr	Transformer cascade	1300 kV 1300 kVA
Rd	Protecting resistor	20 kΩ
VD 2	Voltage Divider	1300 kV 300 pF
TS	Test sample	



Circuit diagram for test with lightning impulse voltage 1,2/50 μ s
and switching impulse voltage 250/2500 μ s

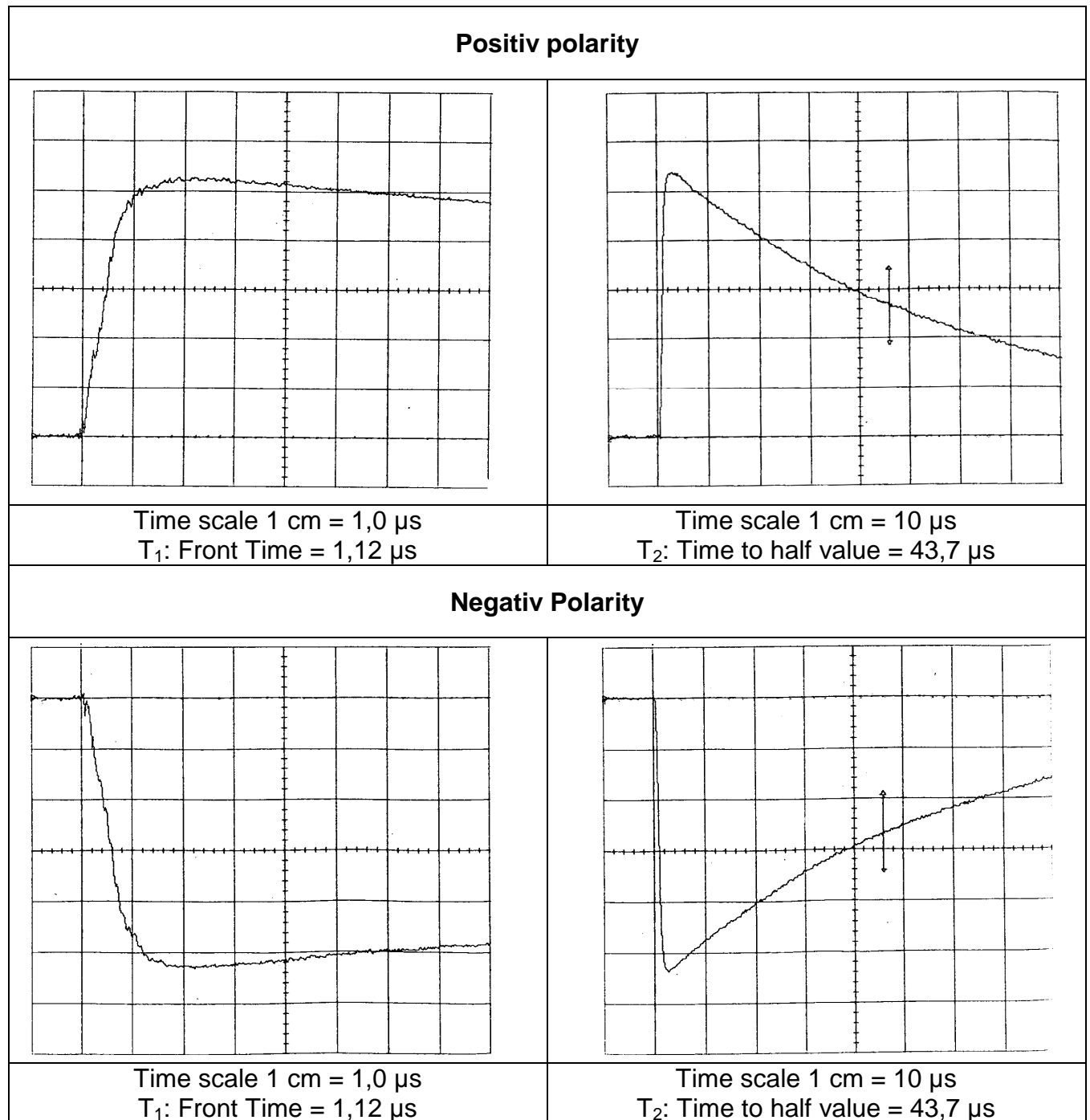
Cs	: Main capacitor	26700 pF
Rd	: Damping resistor	282 Ω / (45 kΩ switching voltage)
Re	: Discharging resistor	1920 Ω / (180 kΩ switching voltage)
Cb	: Parallel capacitor	800 pF
TS	: Test sample	
Um	: Measured voltage	
S	: Ignition spark gap	

Voltage divider

R1	: Resistor	0,353 Ω
C1	: Capacitor	279,2 nF
Rh	: Resistor	720 Ω
Ch	: Capacitor	130 pF

3. Appendix

Oscillogram for lightning impulse voltage



3. Appendix

Drawing

