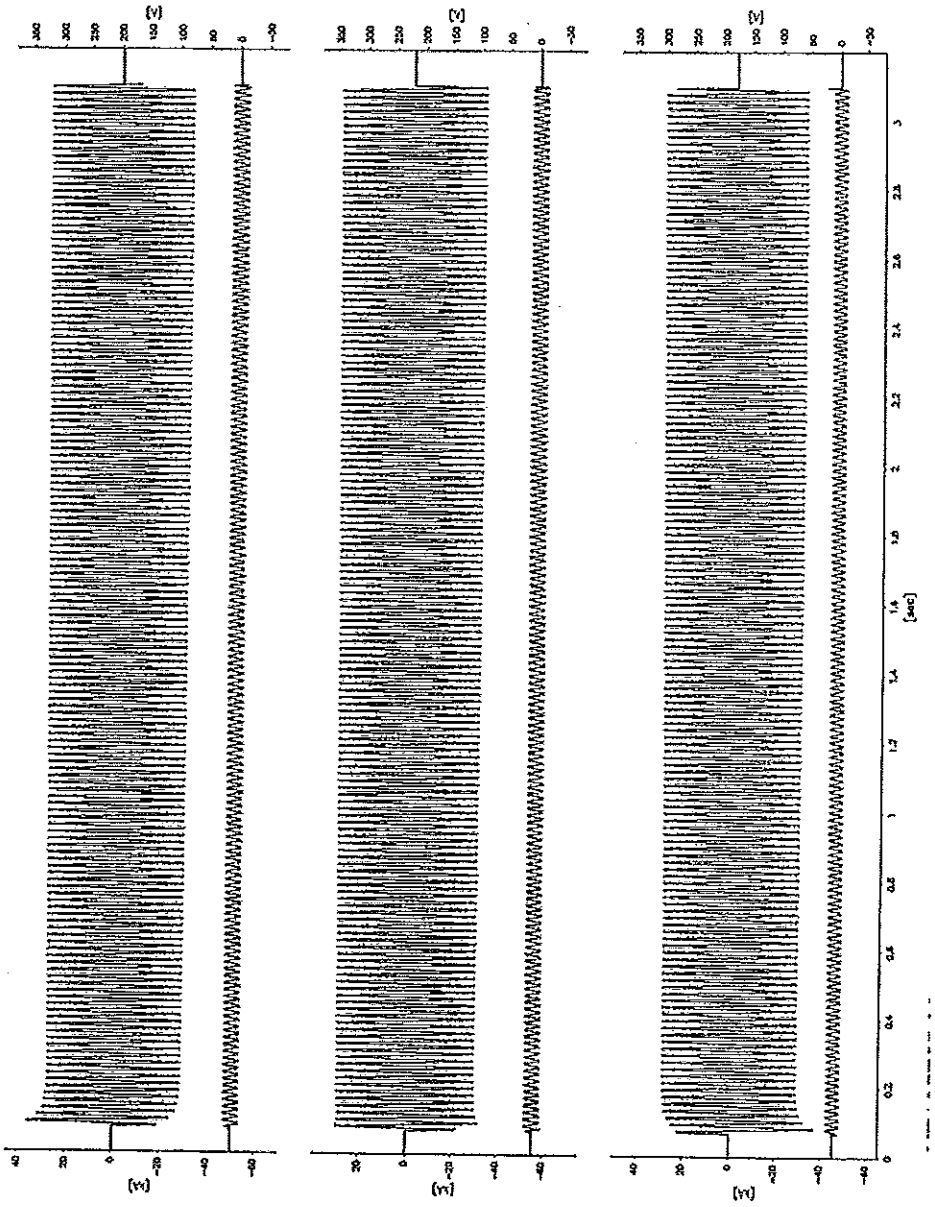
Oscillogram
PEHLA 0511Ra / 04



ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" „Табаков и синове" ООД ПЛОВДИВ

Test Results
Basic Short-Circuit Making and Breaking Tests

Test performed: Basic short-circuit making and breaking tests (T30)
Date of test: 09th March 2005
Condition of test object before test: As after PEHLA 0511Ra / 04.
Test arrangement: Direct test circuit, circuit-breaker in gas insulated switchgear
Connections to test object: Infeed via copper bars to the busbar connection of the switchgear, short-circuited via copper bar at the cable terminals, short-circuit point earthed via cable.

Test No. PEHLA 0511Ra			07		08	-	-	-
Operating sequence and time intervals			O-0.3s-CO-15s-CO			-	-	-
Applied voltage		kV	-	24.5	24.2	-	-	-
Making current (peak)	L1	kA	-	10.4	11.2	-	-	-
	L2	kA	-	15.1	15.5	-	-	-
	L3	kA	-	14.9	13.2	-	-	-
Breaking current (r.m.s.)	L1	kA	6.58	6.67	6.58	-	-	-
	L2	kA	6.68	6.77	6.81	-	-	-
	L3	kA	6.54	6.73	6.66	-	-	-
	Average value	kA	6.60	6.72	6.69	-	-	-
Recovery voltage (r.m.s)	L1	kV	13.8	14.2	14.0	-	-	-
	L2	kV	14.1	14.2	14.0	-	-	-
	L3	kV	14.1	14.4	14.3	-	-	-
Transient recovery voltage	Voltage u_1	kV	-	-	-	-	-	-
	Time t_1	µs	-	-	-	-	-	-
	TRV peak value u_c	kV	44.5	43.0	44.5	-	-	-
	Time t_3	µs	-	-	-	-	-	-
	Time delay t_d	µs	-	-	-	-	-	-
	Rate of rise u_c/t_3	kV/µs	-	-	-	-	-	-
C-Operation	Voltage of closing device	V	-	94	94	-	-	-
	Closing time	ms	-	63.4	62.6	-	-	-
	Pre-arcing time	ms	-	-	-	-	-	-
	Make time	ms	-	63.4	62.6	-	-	-
O-Operation	Voltage of opening device	V	77	77	77	-	-	-
	Opening time	ms	59.8	60.7	59.0	-	-	-
	Arcing time L1	ms	4.6	8.2	8.2	-	-	-
	L2	ms	9.6	7.8	3.0	-	-	-
	L3	ms	9.4	2.8	8.2	-	-	-
	Break time	ms	69.4	68.9	67.2	-	-	-
Emission of flame/gas/oil, occurrence of NSDD			no	no	no	-	-	-
Number of valid test			-	-	-	-	-	-
Test result			P	P	P	-	-	-

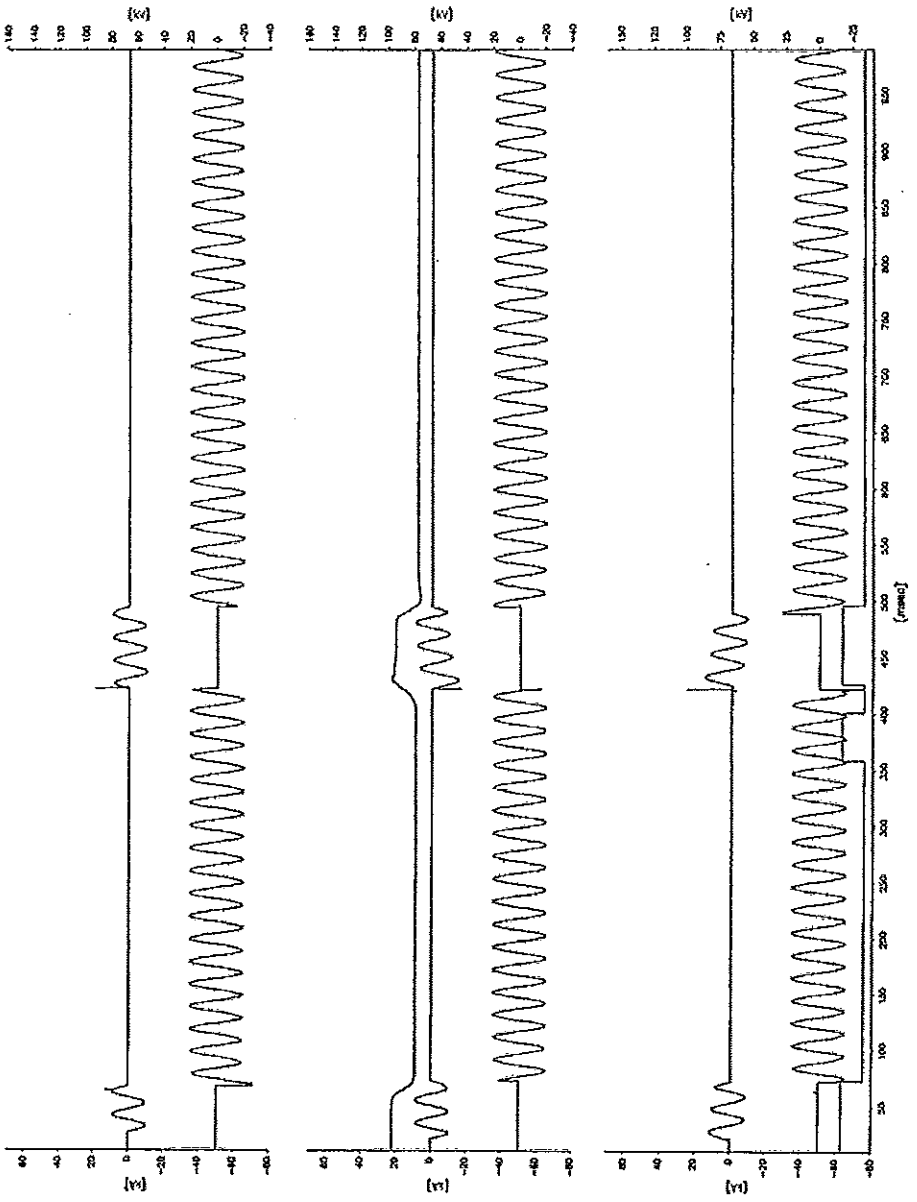
Legend: P: Passed in terms of the applied standard N: Not passed in terms of the applied standard
Remarks: PEHLA 0511Ra / 05 and 06: No-load operations

Condition of test object after test: Switchgear and circuit-breaker were not inspected.

ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОСИЛУКС" ООД „Табакови синове" ПЛОВДИВ

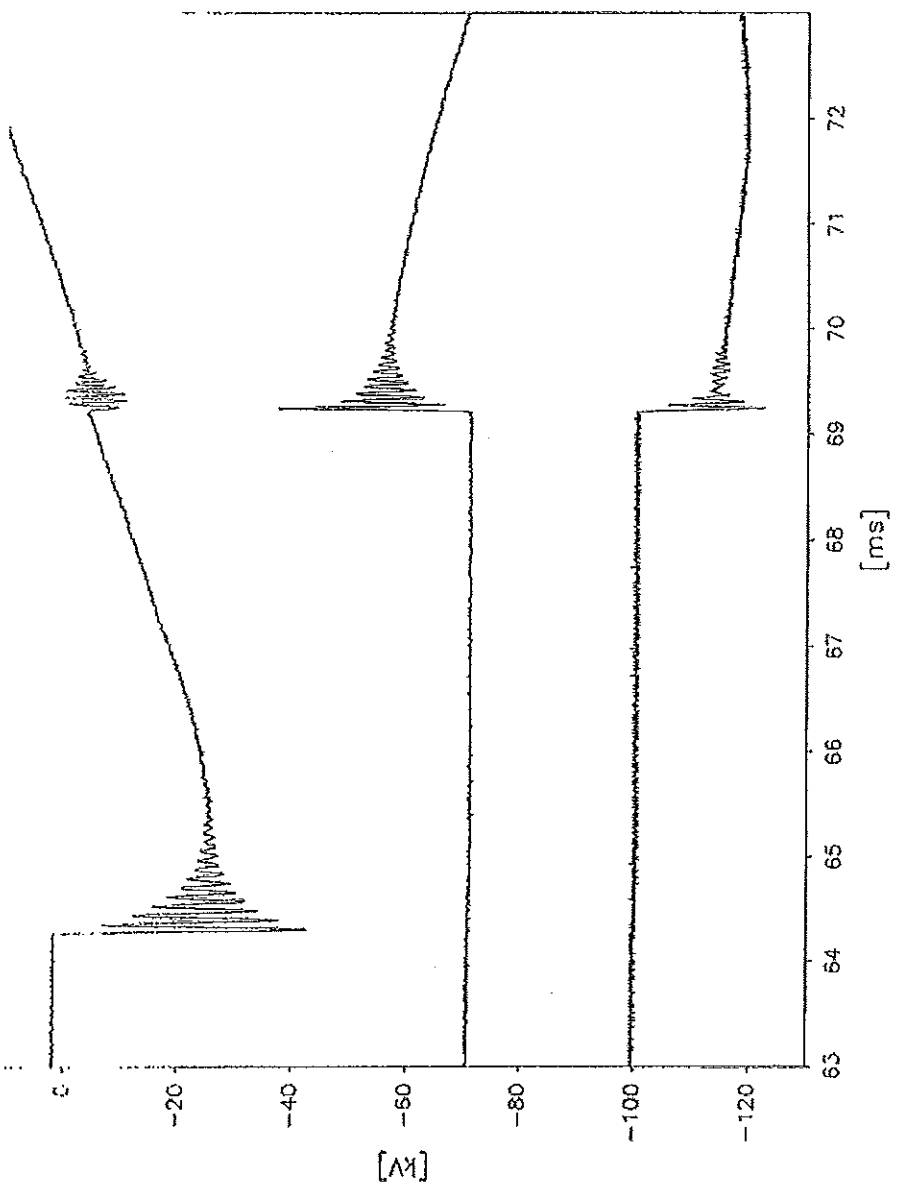
Oscillogram
PEHLA 0511Ra / 07



ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" „Табаков и синове" ООД ПЛОВДИВ

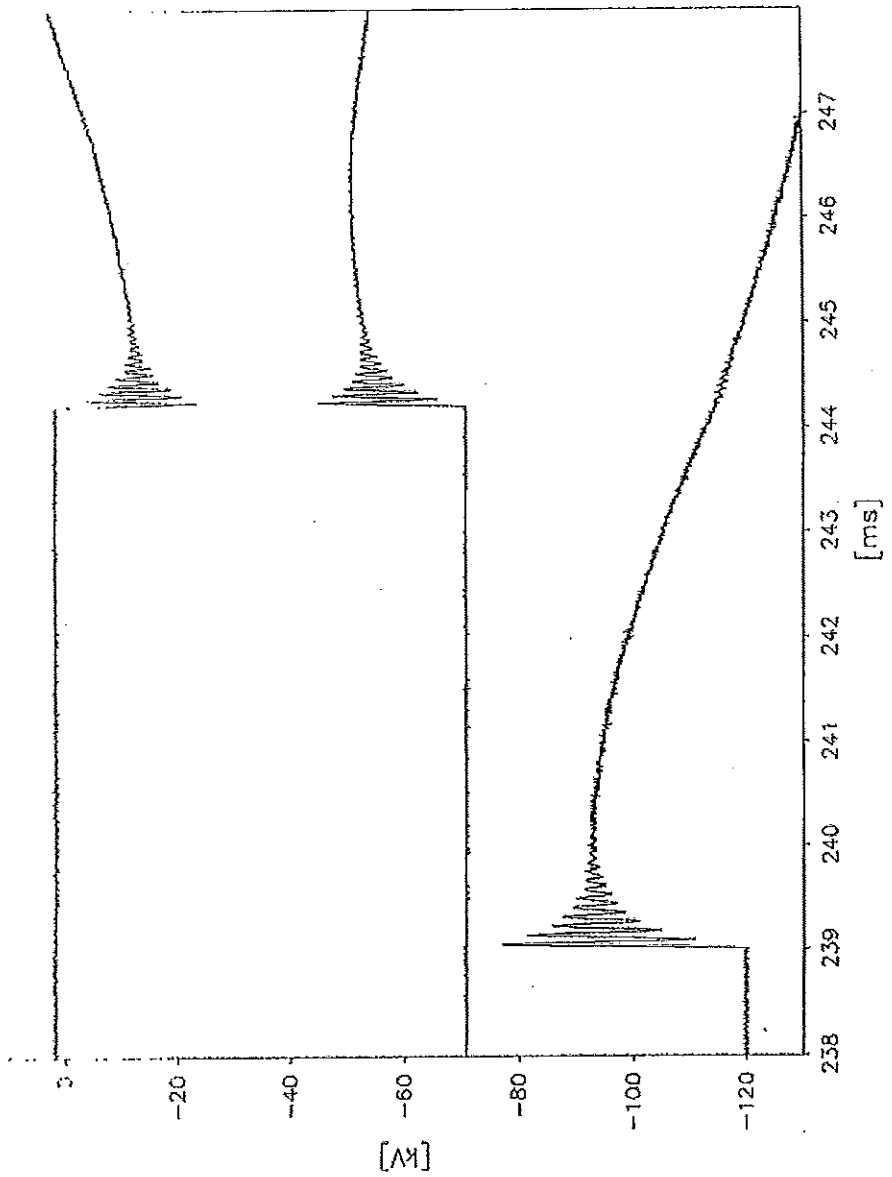
Oscillogram
PEHLA 0511Ra / 07



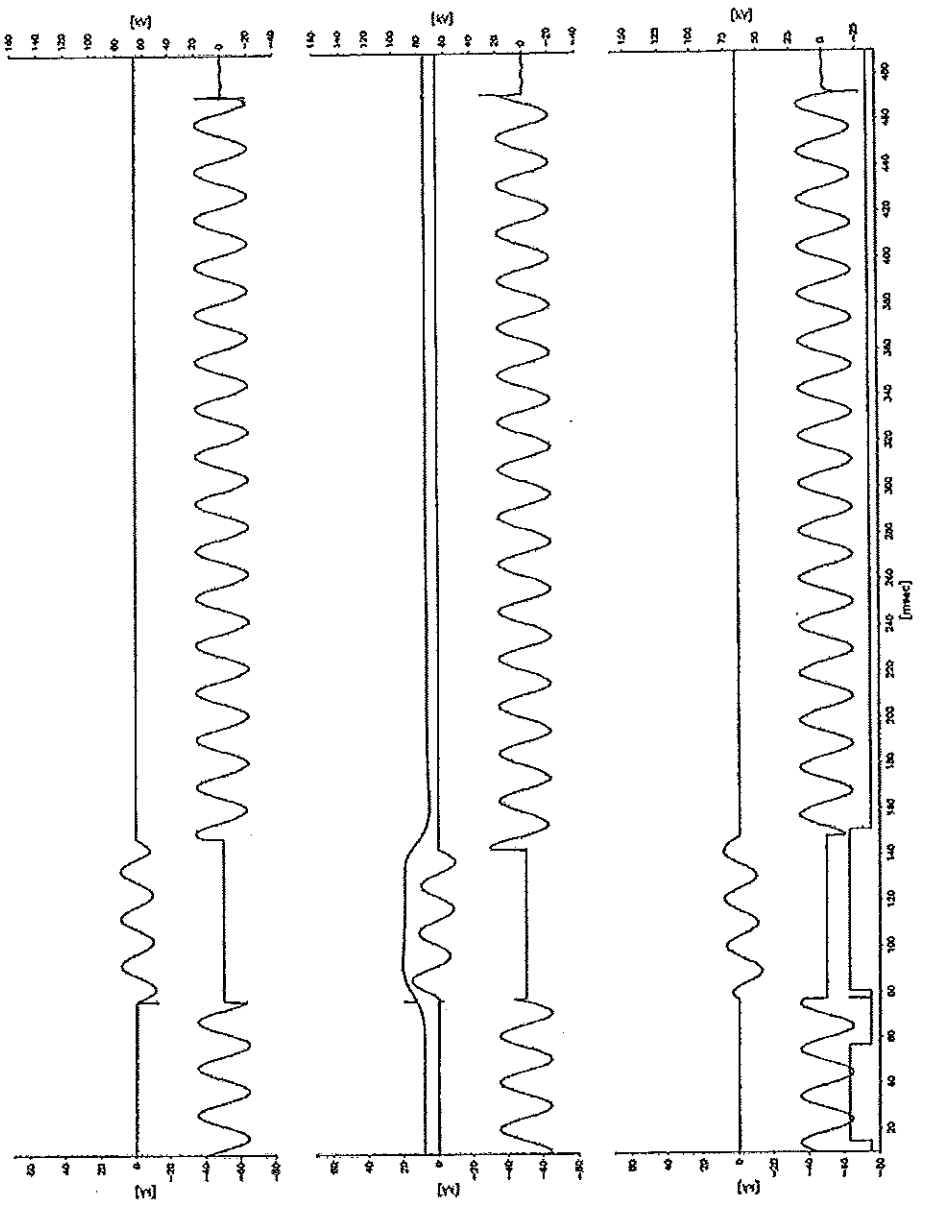
ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ООД
гр. ПЛОВДИВ
„Табаков и синове"

Oscillogram
PEHLA 0511Ra / 07



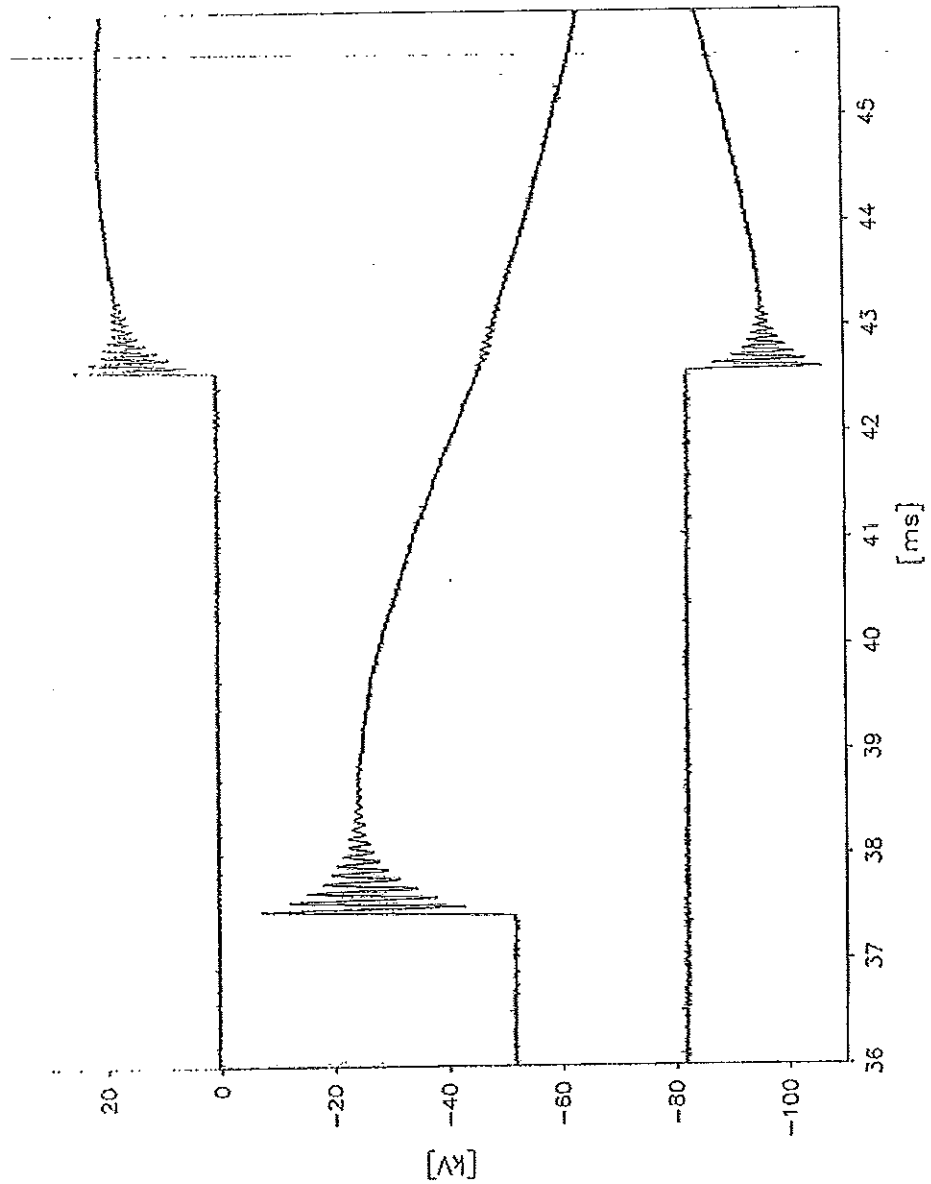
Oscillogram
PEHLA 0511Ra / 08



ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ООД
ПЛОВДИВ
„Табаков и синове"

Oscillogram
PEHLA 0511Ra / 08



ВЯРНО С ОРИГИНАЛА

ЕЛЕКТРОЛУКС" ООД, гр. Пловдив, "Табаков и синове"

Test Results
Basic Short-Circuit Making and Breaking Tests

Test performed: Basic short-circuit making and breaking tests (T60)
Date of test: 09th March 2005
Condition of test object before test: As after Test Pehla 0511Ra / 08
Test arrangement: Direct test circuit, circuit-breaker in air-insulated switchgear
Connections to test object: Infeed via copper bars to the busbar connection of the switchgear, short-circuited via copper bar at the cable terminals, short-circuit point earthed via cable.

Test No. PEHLA 0511Ra			11	12	-	-	-
Operating sequence and time intervals			O-0.3s-CO-15s-CO		-	-	-
Applied voltage		kV	-	25.0	24.1	-	-	-
Making current (peak)	L1	kA	-	20.1	25.5	-	-	-
	L2	kA	-	32.5	32.9	-	-	-
	L3	kA	-	29.8	25.7	-	-	-
Breaking current (r.m.s.)	L1	kA	12.5	13.0	12.5	-	-	-
	L2	kA	12.8	13.5	12.8	-	-	-
	L3	kA	12.6	13.1	13.1	-	-	-
	Average value	kA	12.6	13.2	12.8	-	-	-
Recovery voltage (r.m.s)	L1	kV	14.1	14.2	13.6	-	-	-
	L2	kV	14.2	14.5	13.8	-	-	-
	L3	kV	14.2	14.8	14.4	-	-	-
Transient recovery voltage	Voltage u_1	kV	-	-	-	-	-	-
	Time t_1	µs	-	-	-	-	-	-
	TRV peak value u_c	kV	41.6	42.0	42.5	-	-	-
	Time t_3	µs	-	-	-	-	-	-
	Time delay t_d	µs	-	-	-	-	-	-
	Rate of rise u_c/t_3	kV/µs	-	-	-	-	-	-
C-Operation	Voltage of closing device	V	-	94	94	-	-	-
	Closing time	ms	-	62.8	63.5	-	-	-
	Pre-arcing time	ms	-	-	-	-	-	-
	Make time	ms	-	62.8	63.5	-	-	-
O-Operation	Voltage of opening device	V	77	77	77	-	-	-
	Opening time	ms	58.6	56.5	59.4	-	-	-
	Arcing time L1	ms	7.8	7.6	8.2	-	-	-
	L2	ms	3.4	7.6	3.8	-	-	-
	L3	ms	9.0	2.6	8.8	-	-	-
	Break time	ms	67.6	64.1	68.2	-	-	-
Emission of flame/gas/oil, occurrence of NSDD			no	no	no	-	-	-
Number of valid test			-	-	-	-	-	-
Test result			P	P	P	-	-	-

Legend: P: Passed in terms of the applied standard N: Not passed in terms of the applied standard

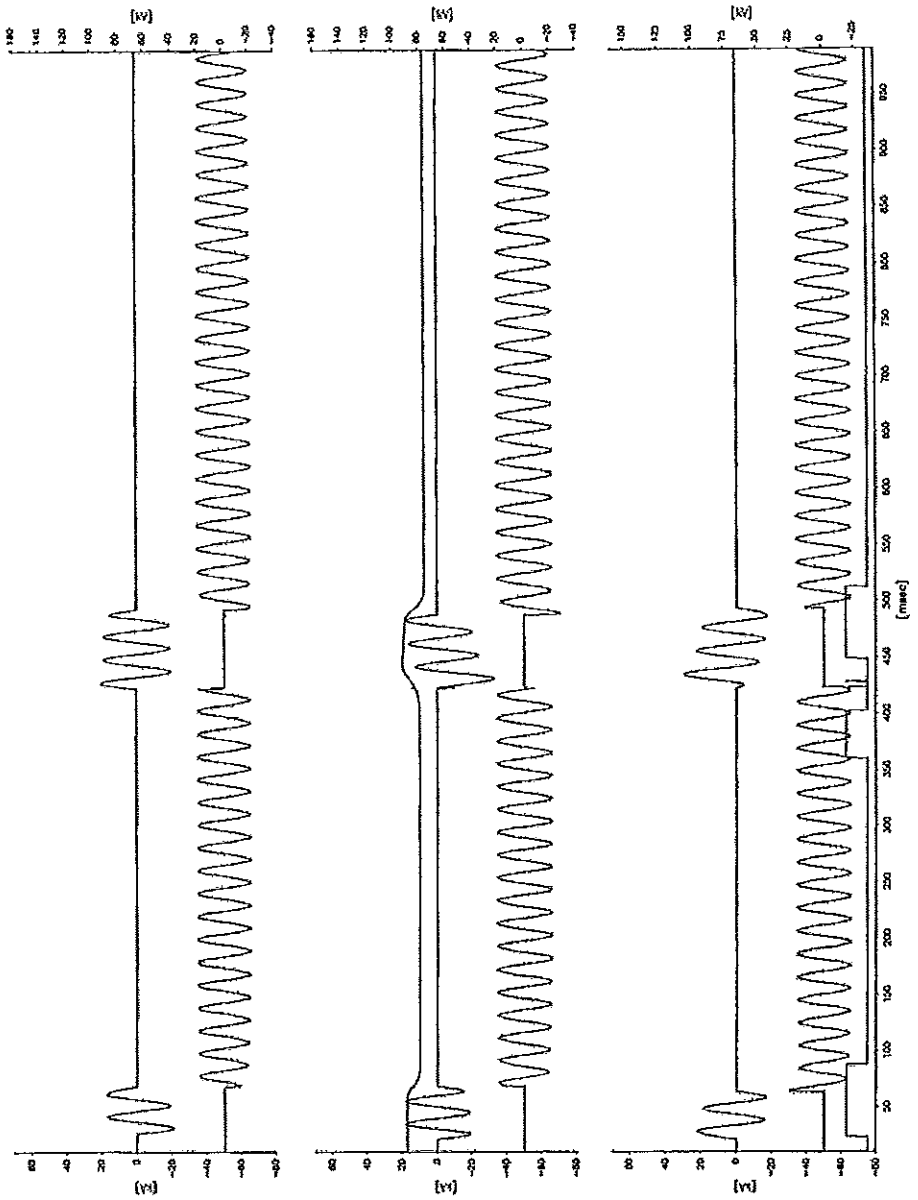
Remarks: PEHLA 0511Ra / 09 and 10: Tests with reduced values

Condition of test object after test: Switchgear and circuit-breaker were not inspected.

ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОМАКС" „Табаков и синове" СОЕ ПЛОВДИВ

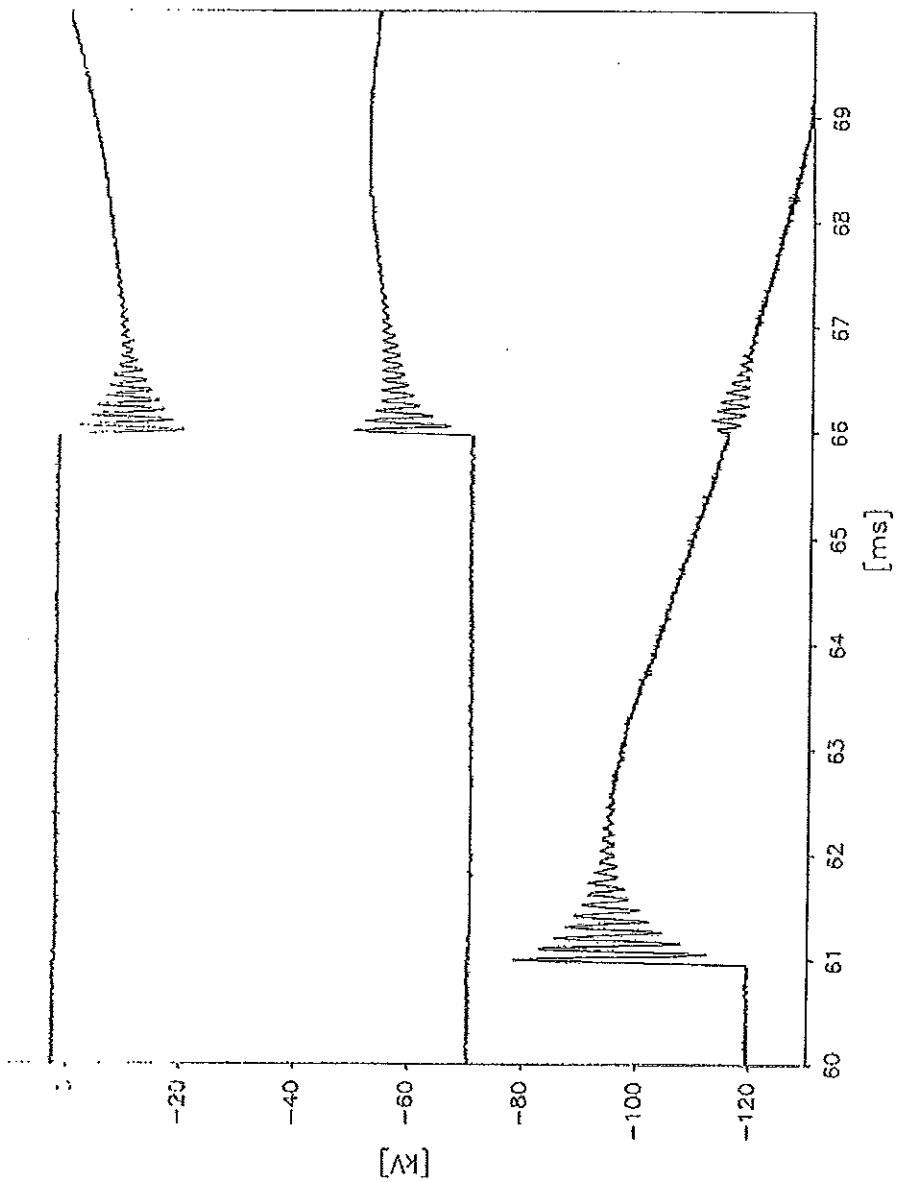
Oscillogram
PEHLA 0511Ra / 11



ВЯРНО С ОРИГИНАЛА

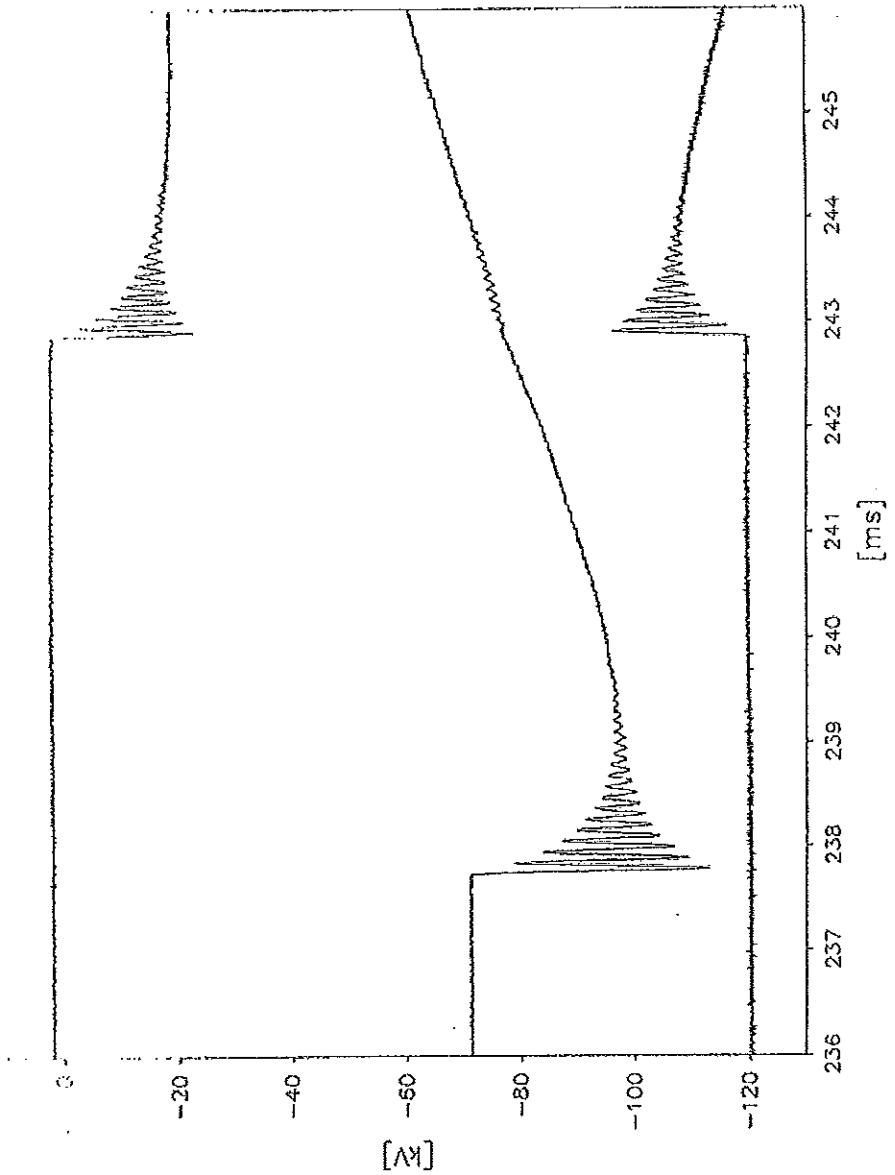
„ЕЛЕКТРОМАКС" ООД
ПЛОВДИВ
„Табакови синове"

Oscillogram
PEHLA 0511Ra / 11



ВЯРНО С ОРИГИНАЛА

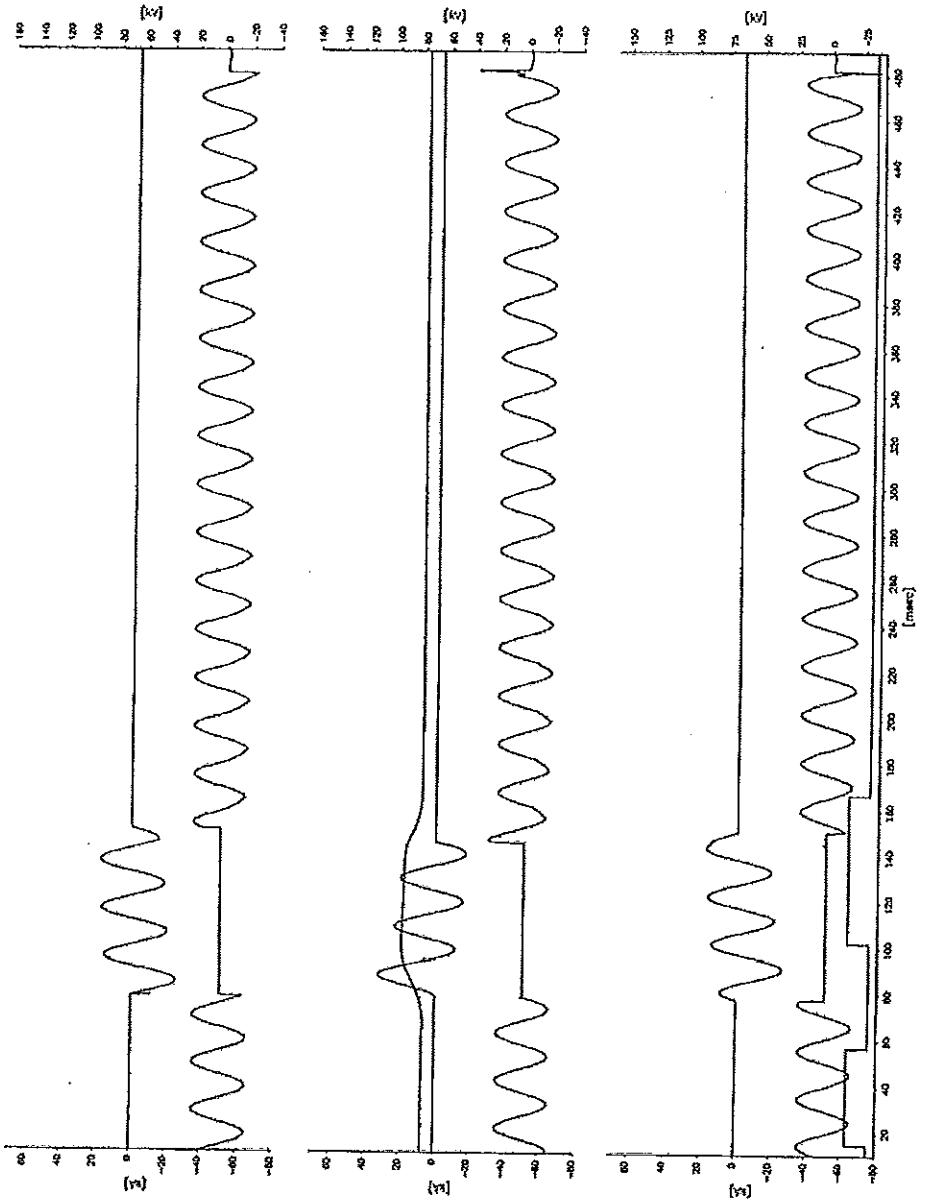
Oscillogram
PEHLA 0511Ra / 11



ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОУКС" ООД „Тютюн и синове" ПЛОВДИВ

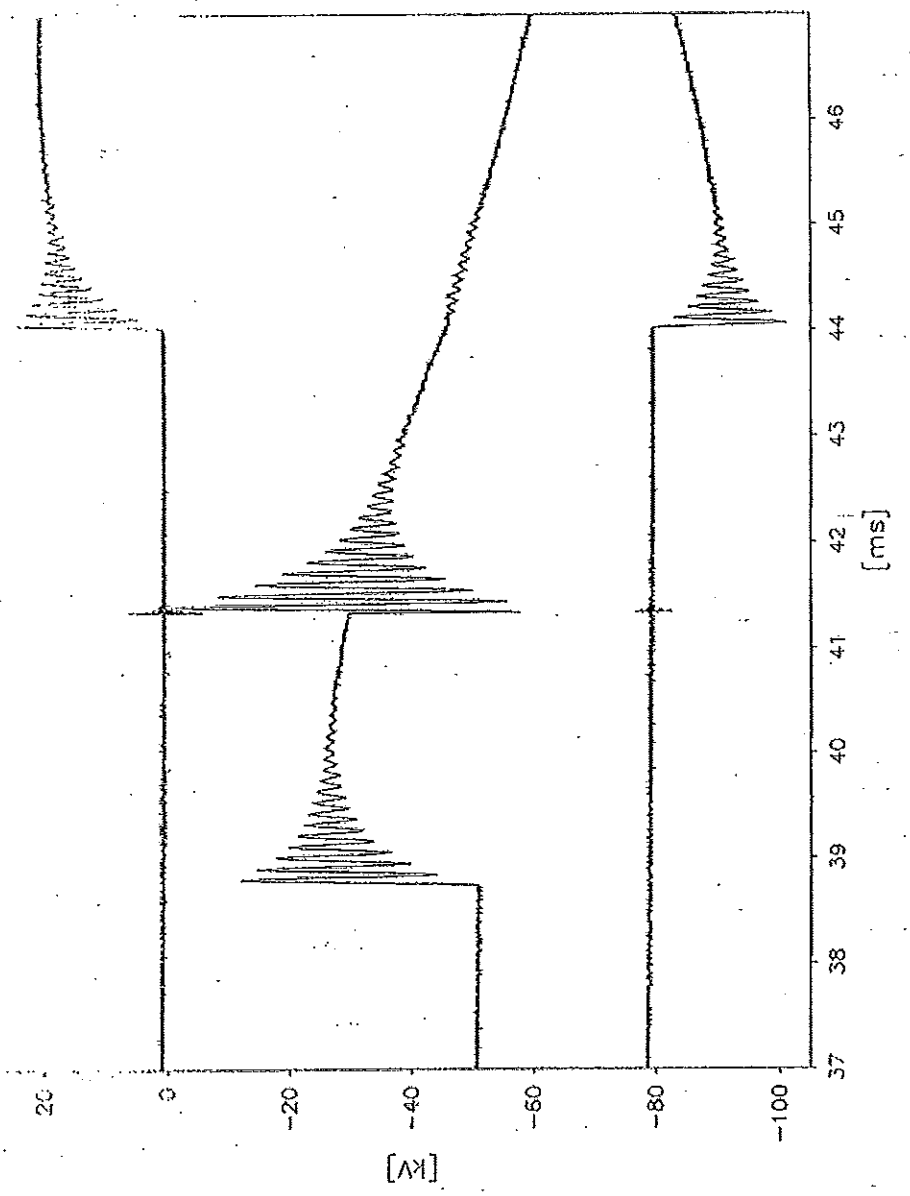
Oscillogram
PEHLA 0511Ra / 12



ВЯРНО С ОРИГИНАЛА

ЕЛЕКТРОМАКС
ПЛОВДИВ
"Табаков и синове" ООД

Oscillogram
PEHLA 0511Ra / 12



ВЯРНО С ОРИГИНАЛА

ЕЛЕКТРОАКУС ЕООД „Табаков и синове" ПЛОВДИВ

Test Results
Basic Short-Circuit Making and Breaking Tests

Test performed: Basic short-circuit making and breaking tests (T100s)
Date of test: 09th March 2005
Condition of test object before test: As after PEHLA 0511Ra / 12.
Test arrangement: Direct test circuit, circuit-breaker in gas insulated switchgear
Connections to test object: Infeed via copper bars to the busbar connection of the switchgear, short-circuited via copper bar at the cable terminals, short-circuit point earthed via cable.

Test No. PEHLA 0511Ra			15		16	-	-	-
Operating sequence and time intervals			O-0.3s-CO-15s-CO			-	-	-
Applied voltage		kV	-	25.3	24.3	-	-	-
Making current (peak)	L1	kA	-	40.3	47.5	-	-	-
	L2	kA	-	49.7	49.7	-	-	-
	L3	kA	-	48.0	38.5	-	-	-
Breaking current (r.m.s.)	L1	kA	20.4	20.3	19.8	-	-	-
	L2	kA	20.5	20.0	21.1	-	-	-
	L3	kA	19.6	19.8	20.1	-	-	-
	Average value	kA	20.2	20.0	20.4	-	-	-
Recovery voltage (r.m.s)	L1	kV	13.7	14.1	14.0	-	-	-
	L2	kV	14.2	14.7	14.0	-	-	-
	L3	kV	14.0	14.5	14.1	-	-	-
Transient recovery voltage	Voltage u_1	kV	-	-	-	-	-	-
	Time t_1	µs	-	-	-	-	-	-
	TRV peak value u_c	kV	41.0	40.0	40.0	-	-	-
	Time t_3	µs	-	-	-	-	-	-
	Time delay t_d	µs	-	-	-	-	-	-
	Rate of rise u_c/t_3	kV/µs	-	-	-	-	-	-
C-Operation	Voltage of closing device	V	-	94	94	-	-	-
	Closing time	ms	-	62.9	63.0	-	-	-
	Pre-arcing time	ms	-	-	-	-	-	-
	Make time	ms	-	62.9	63.0	-	-	-
O-Operation	Voltage of opening device	V	77	77	77	-	-	-
	Opening time	ms	61.0	61.3	61.6	-	-	-
	Arcing time L1	ms	3.8	7.4	6.6	-	-	-
	L2	ms	8.6	8.4	2.6	-	-	-
	L3	ms	8.8	3.2	6.8	-	-	-
	Break time	ms	69.8	69.7	68.4	-	-	-
Emission of flame/gas/oil, occurrence of NSDD			no	no	no	-	-	-
Number of valid test			-	-	-	-	-	-
Test result			P	P	P	-	-	-

Legend: P: Passed in terms of the applied standard N: Not passed in terms of the applied standard

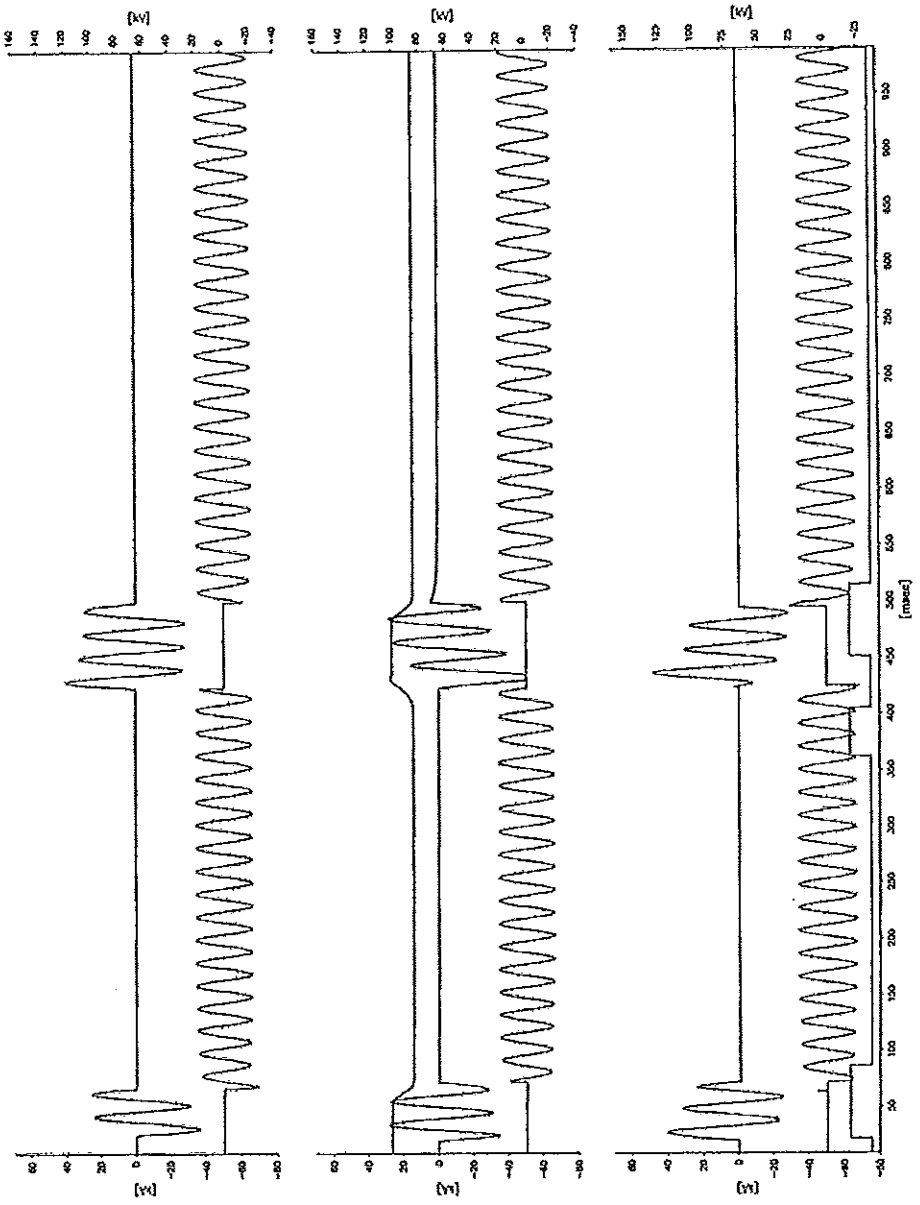
Remarks: PEHLA 0511Ra / 13 and 14: Tests with reduced values

Condition of test object after test: Switchgear and circuit-breaker were not inspected.

ЯРНО С ОРИГИНАЛА

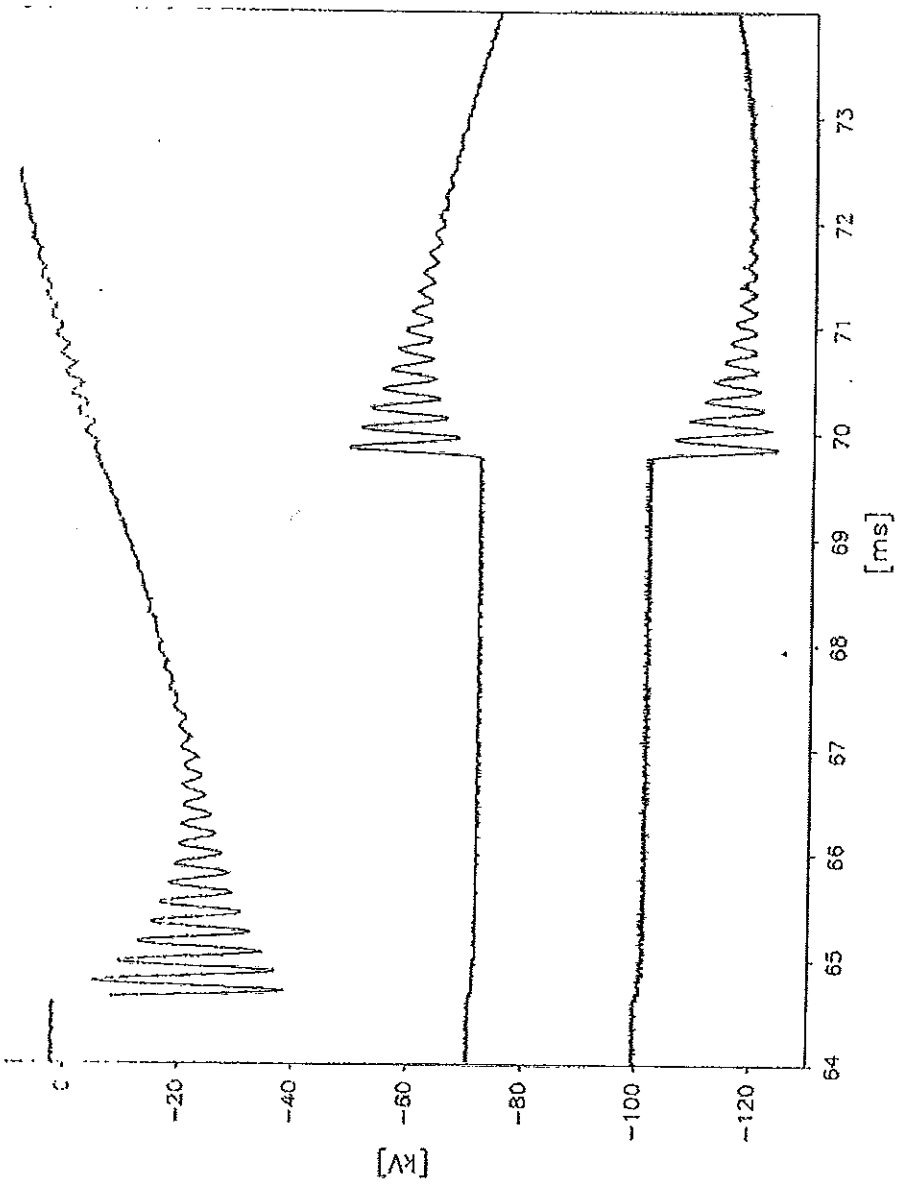
"ЕЛЕКТРОМУКС" ООД "Табаков и сиНове" ТЮЛЬПИ

Oscillogram
PEHLA 0511Ra / 15

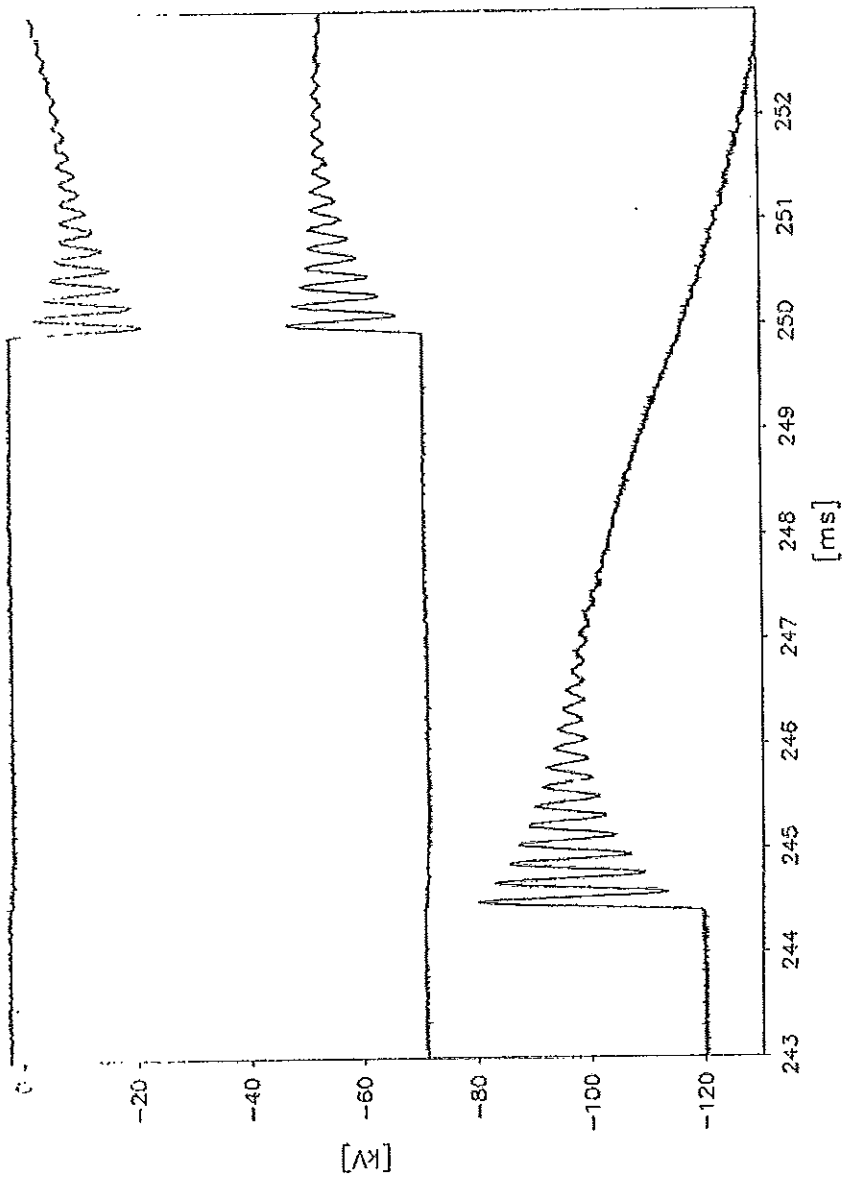


ЯРНО С ОРИГИНАЛА

Oscillogram
PEHLA 0511Ra / 15



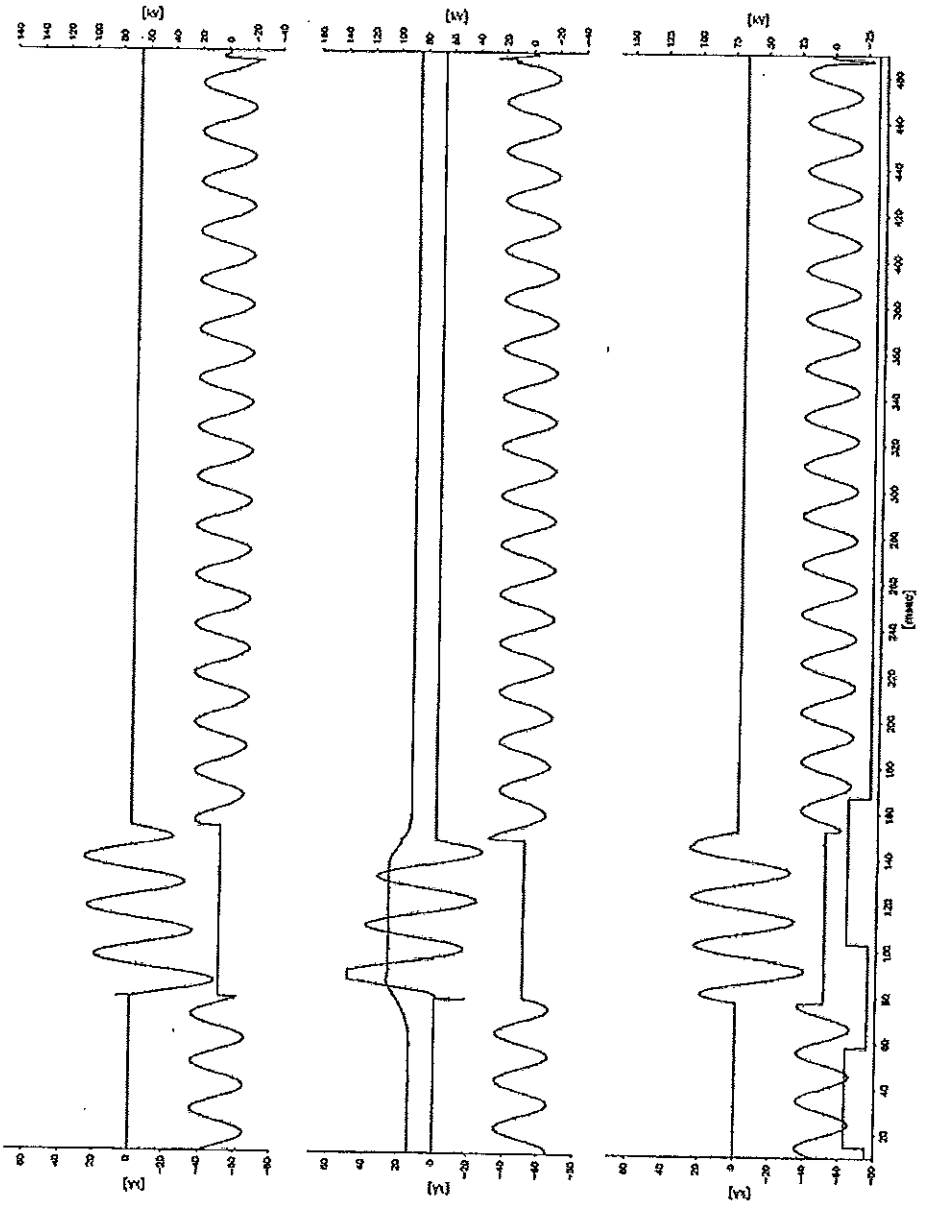
Oscillogram
PEHLA 0511Ra / 15



ВЯРНО С ОРИГИНАЛА

"Табаков и синове" ОО

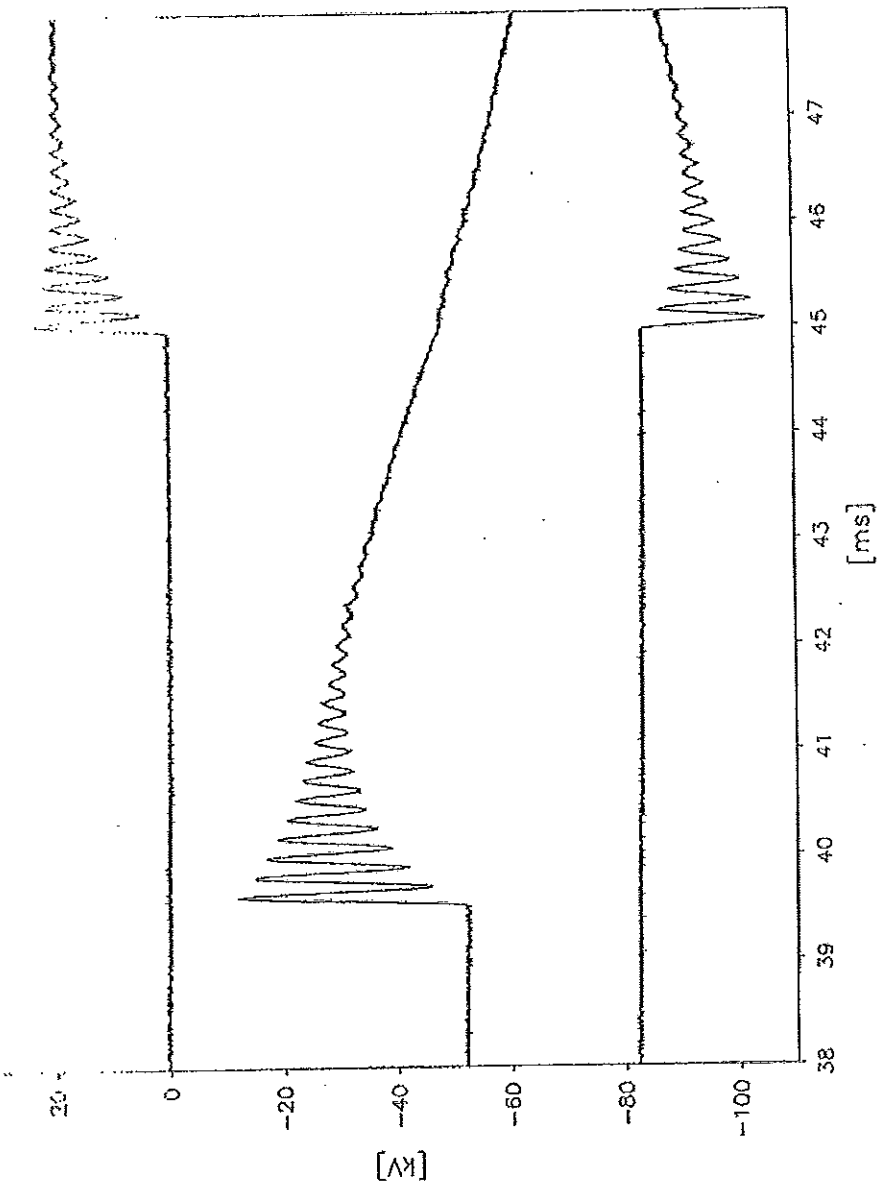
Oscillogram
PEHLA 0511Ra / 16



ВЯРНО С ОРИГ.

„ЕЛЕКТРОСЛУЖ" ПЛОВДИВ „Табакови синове" ООД

Oscillogram
PEHLA 0511Ra / 16



Test Results
Basic Short-Circuit Making and Breaking Tests

Test performed: Basic short-circuit making and breaking tests (T100a)
Date of test: 09th March 2005
Condition of test object before test: As after PEHLA 0511Ra / 16.
Test arrangement: Direct test circuit, circuit-breaker in gas insulated switchgear
Connections to test object: Infeed via copper bars to the cable terminals of the switchgear, short-circuited via copper bars at the busbar connection, short-circuit point earthed via cable.

Test No. PEHLA 0511Ra			19	20	21	-	-	-
Operating sequence and time intervals			O-3min-O-3min-O			-	-	-
Applied voltage		kV	-	-	-	-	-	-
Breaking current (r.m.s.)	L1	kA	18.7	18.6	17.9	-	-	-
	L2	kA	18.2	19.0	18.7	-	-	-
	L3	kA	18.7	18.0	18.8	-	-	-
	Average value	kA	18.5	18.5	18.5	-	-	-
Breaking current - last current loop (peak)	L1	kA	-	-	-	-	-	-
	L2	kA	-	-	-	-	-	-
	L3	kA	-	-	-	-	-	-
Duration of the last current loop	L1	ms	-	-	-	-	-	-
	L2	ms	-	-	-	-	-	-
	L3	ms	-	-	-	-	-	-
DC-component	L1	%	< 20	< 20	< 20	-	-	-
	L2	%	< 20	< 20	< 20	-	-	-
	L3	%	< 20	< 20	< 20	-	-	-
Recovery voltage (r.m.s)	L1	kV	13.6	13.4	13.7	-	-	-
	L2	kV	13.9	13.5	13.9	-	-	-
	L3	kV	13.7	13.8	13.8	-	-	-
Transient recovery voltage	Voltage u_1	kV	-	-	-	-	-	-
	Time t_1	µs	-	-	-	-	-	-
	TRV peak value u_c	kV	39.9	38.9	38.4	-	-	-
	Time t_3	µs	-	-	-	-	-	-
	Time delay t_d	µs	-	-	-	-	-	-
	Rate of rise u_c/t_3	kV/µs	-	-	-	-	-	-
O-Operation	Voltage of opening device	V	121	121	121	-	-	-
	Opening time	ms	46.6	46.9	47.7	-	-	-
	Arcing time L1	ms	5.2	8.4	8.6	-	-	-
	L2	ms	5.2	3.6	8.6	-	-	-
	L3	ms	0.8	8.4	3.8	-	-	-
	Break time	ms	51.8	55.3	56.3	-	-	-
Emission of flame/gas/oil, occurrence of NSDD			no	no	no	-	-	-
Number of valid test			-	-	-	-	-	-
Test result			P	P	P	-	-	-

Legend: P: Passed in terms of the applied standard N: Not passed in terms of the applied standard

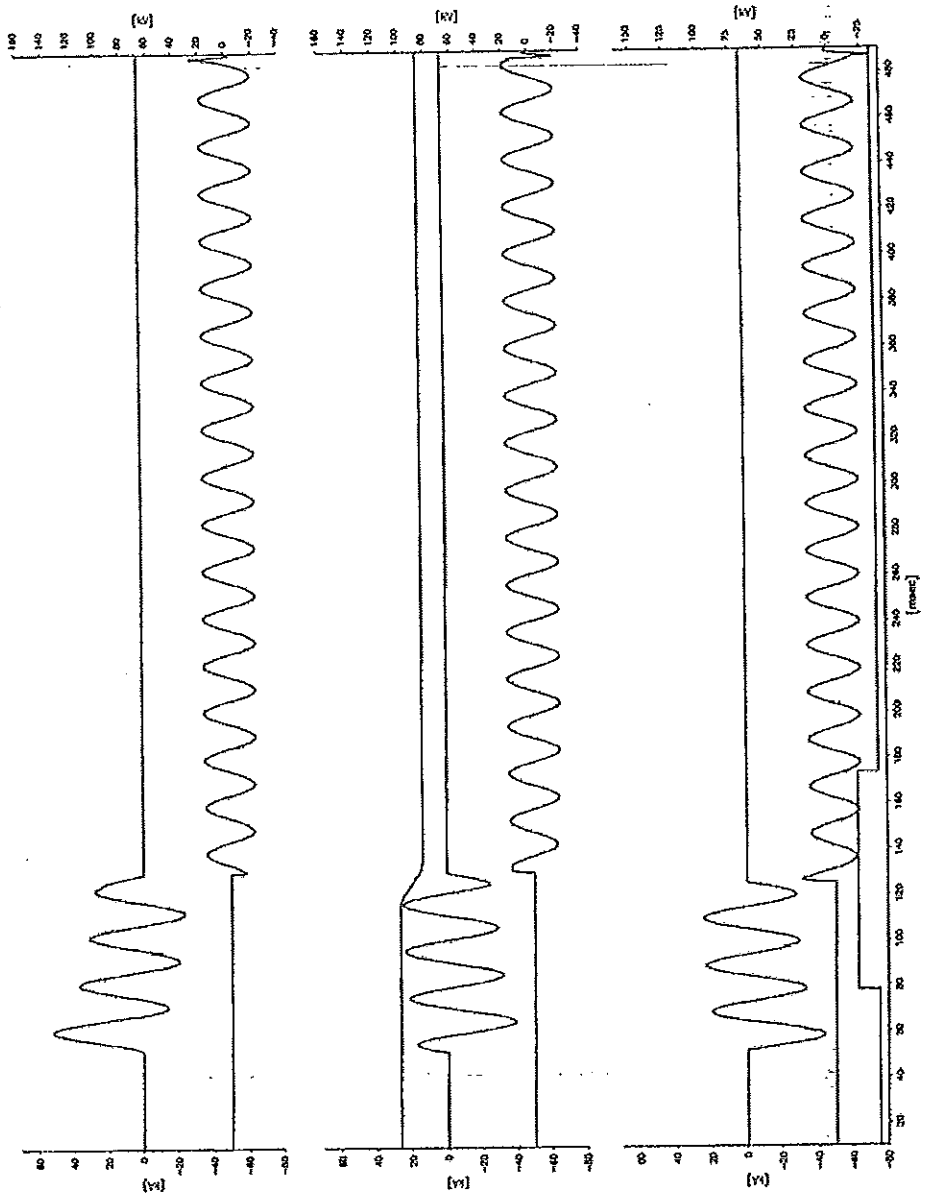
Remarks:
Before PEHLA 0511Ra / 17: Infeed direction inverted
PEHLA 0511Ra / 17 and 18: Test with reduced values
PEHLA 0511Ra / 19 to 21: Tests for determination of DC-component

Condition of test object after test: Switchgear and circuit-breaker were not inspected

ВЯРНО С ОРИГ.

"ЕЛЕКТРОЛУКС" ООД "Табаков и синове" ПЛОВДИВ

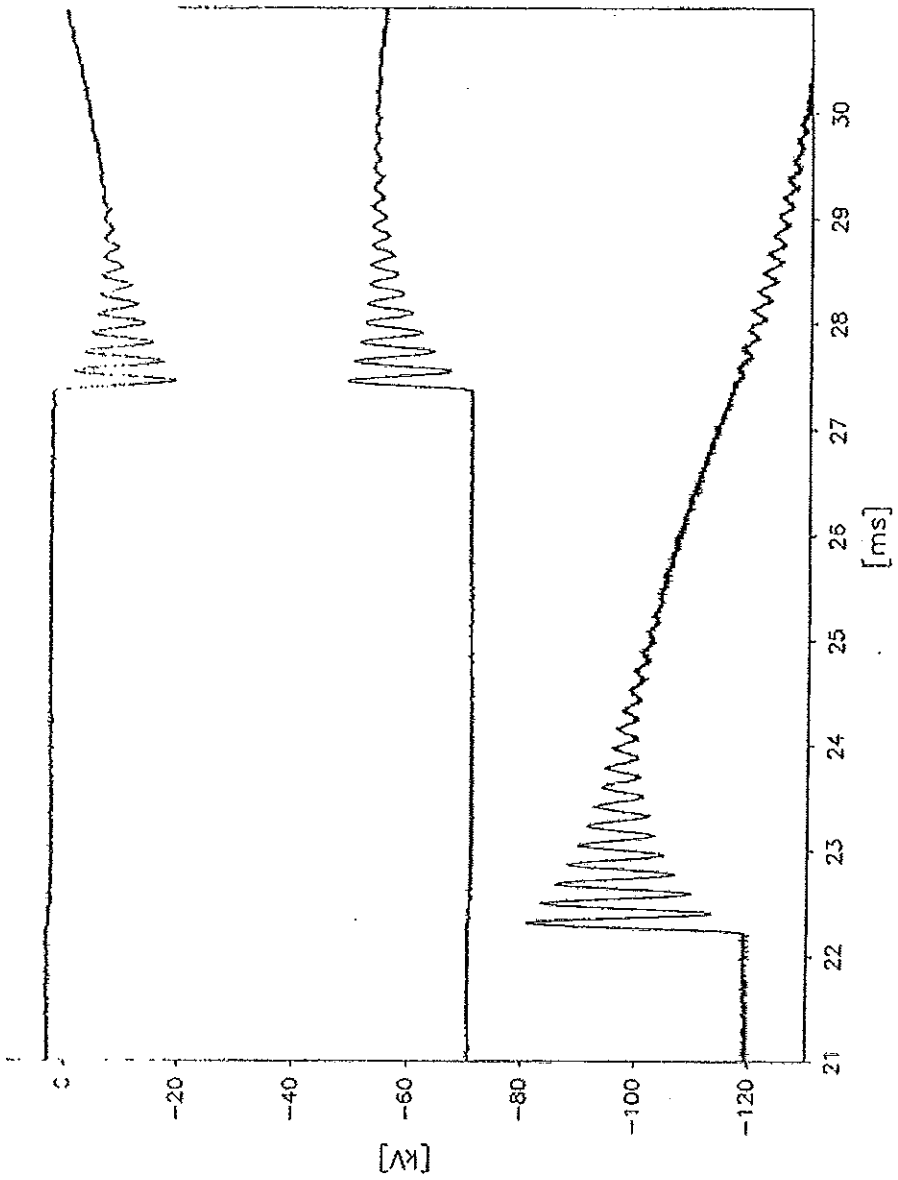
Oscillogram
PEHLA 0511Ra / 19



ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ПЛОВДИВ „Табаков и синове" ООД

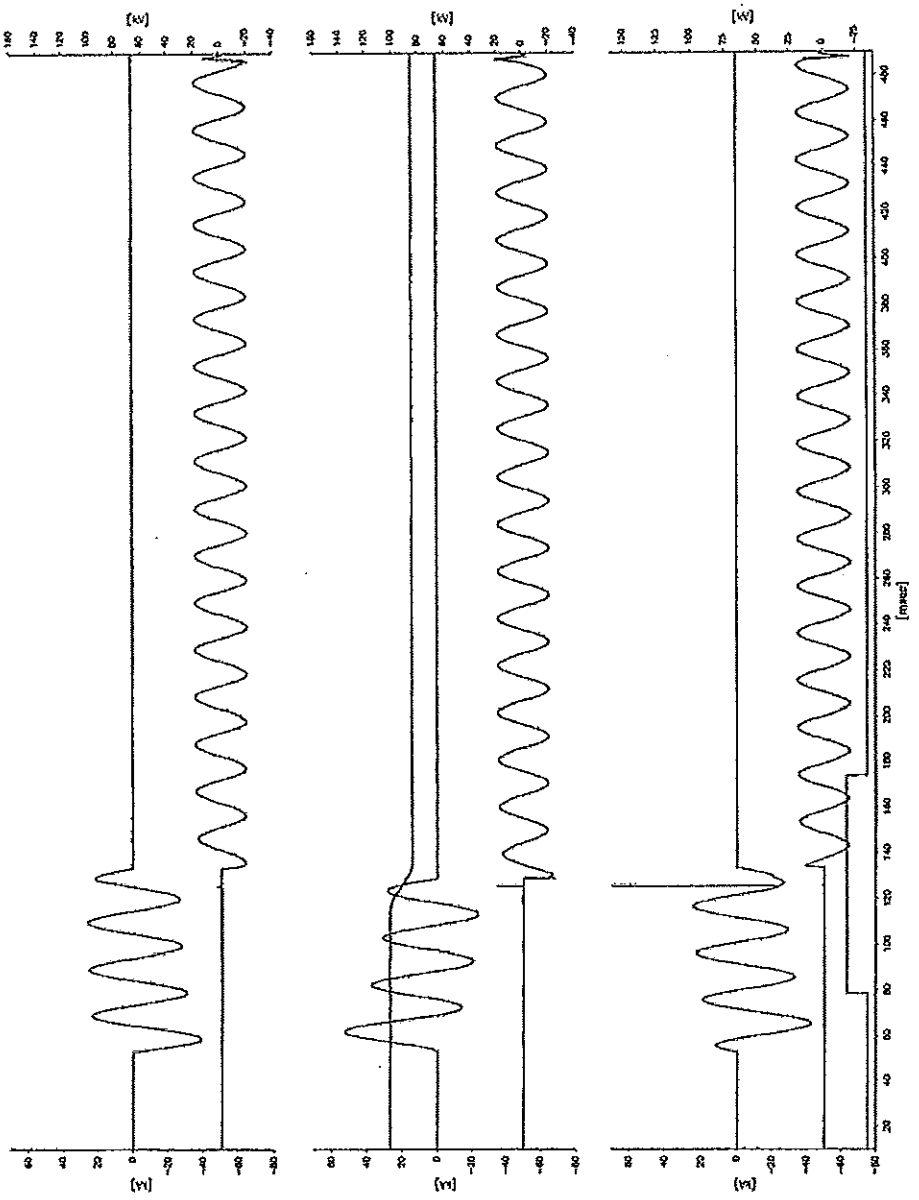
Oscillogram
PEHLA 0511Ra / 19



ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ООД
гр. Пловдив
„Табаков и синове"

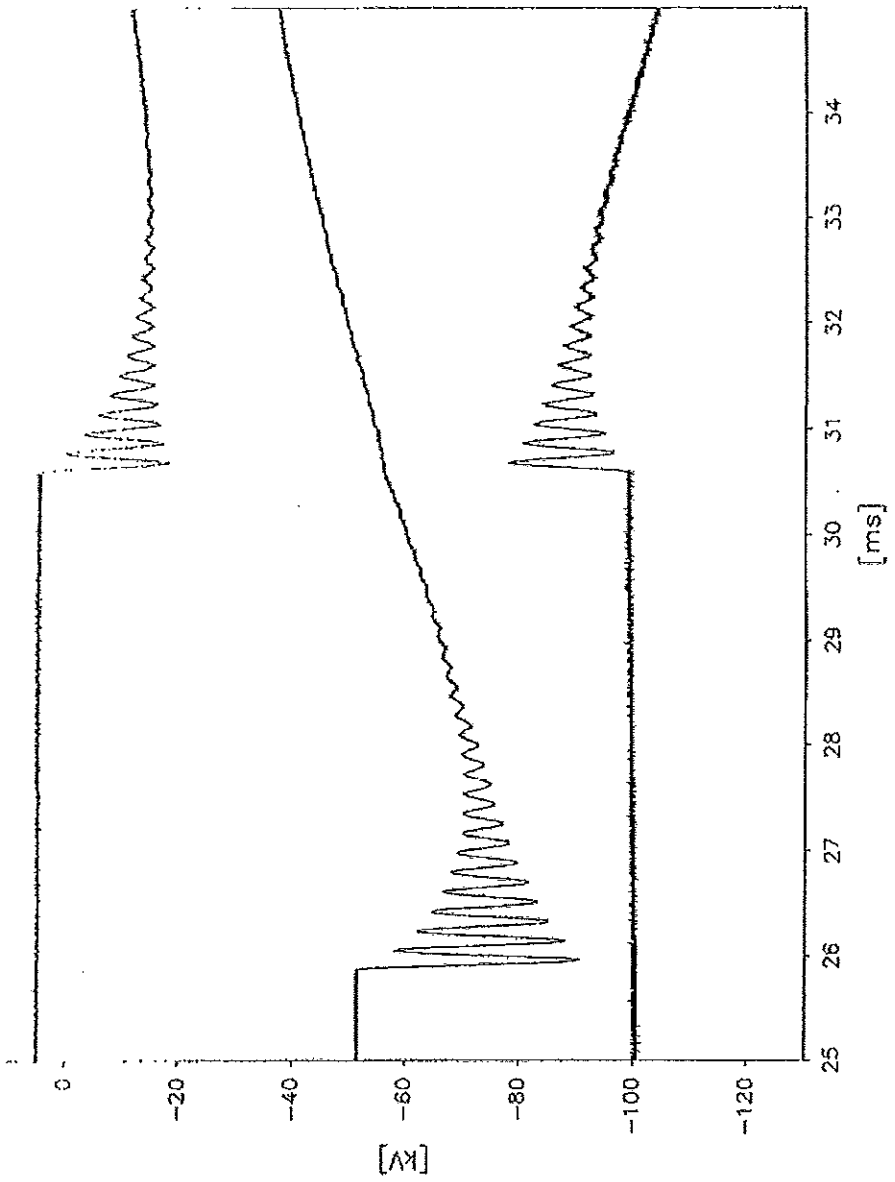
Oscillogram
PEHLA 0511Ra / 20



ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ООД
Пловдив
„Табаков и синове"

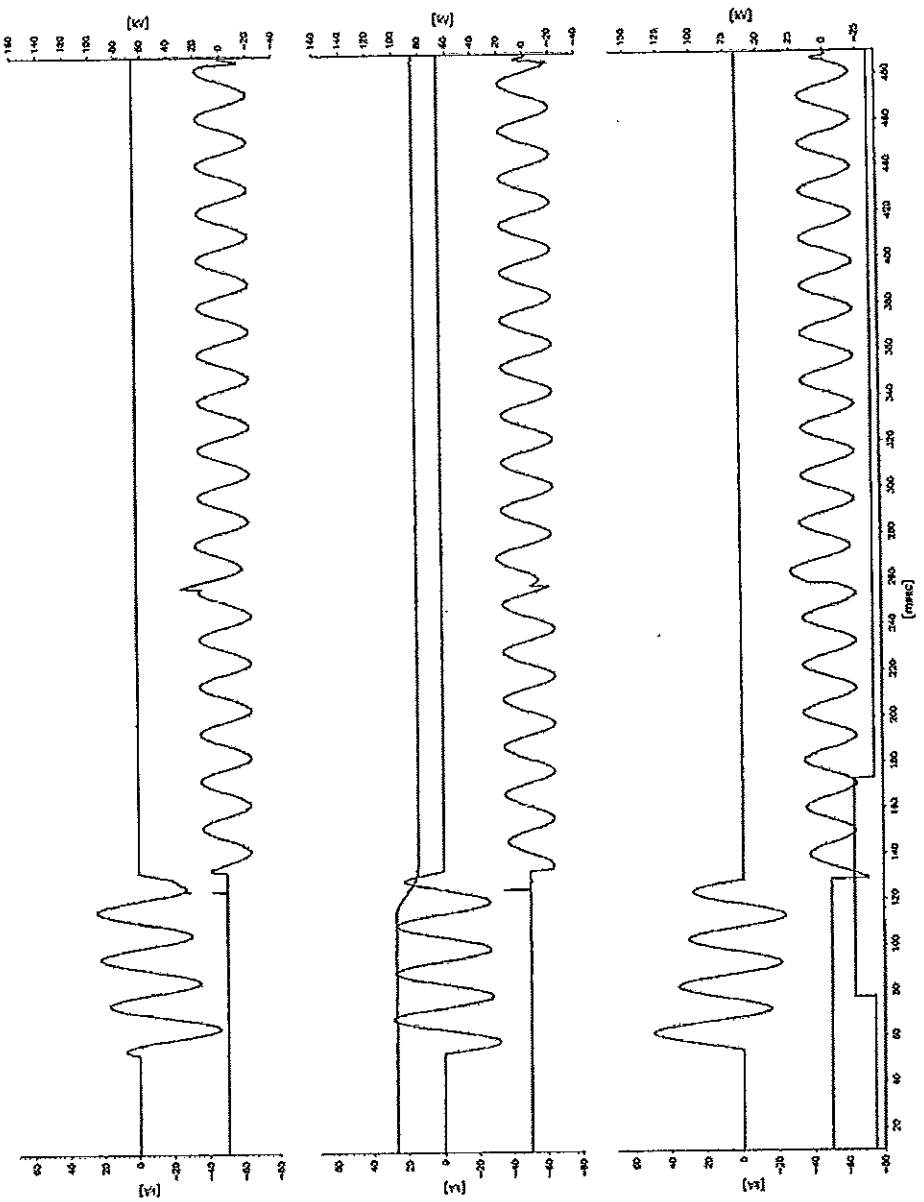
Oscillogram
PEHLA 0511Ra / 20



ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ООД
Пловдив
Табаков и синове

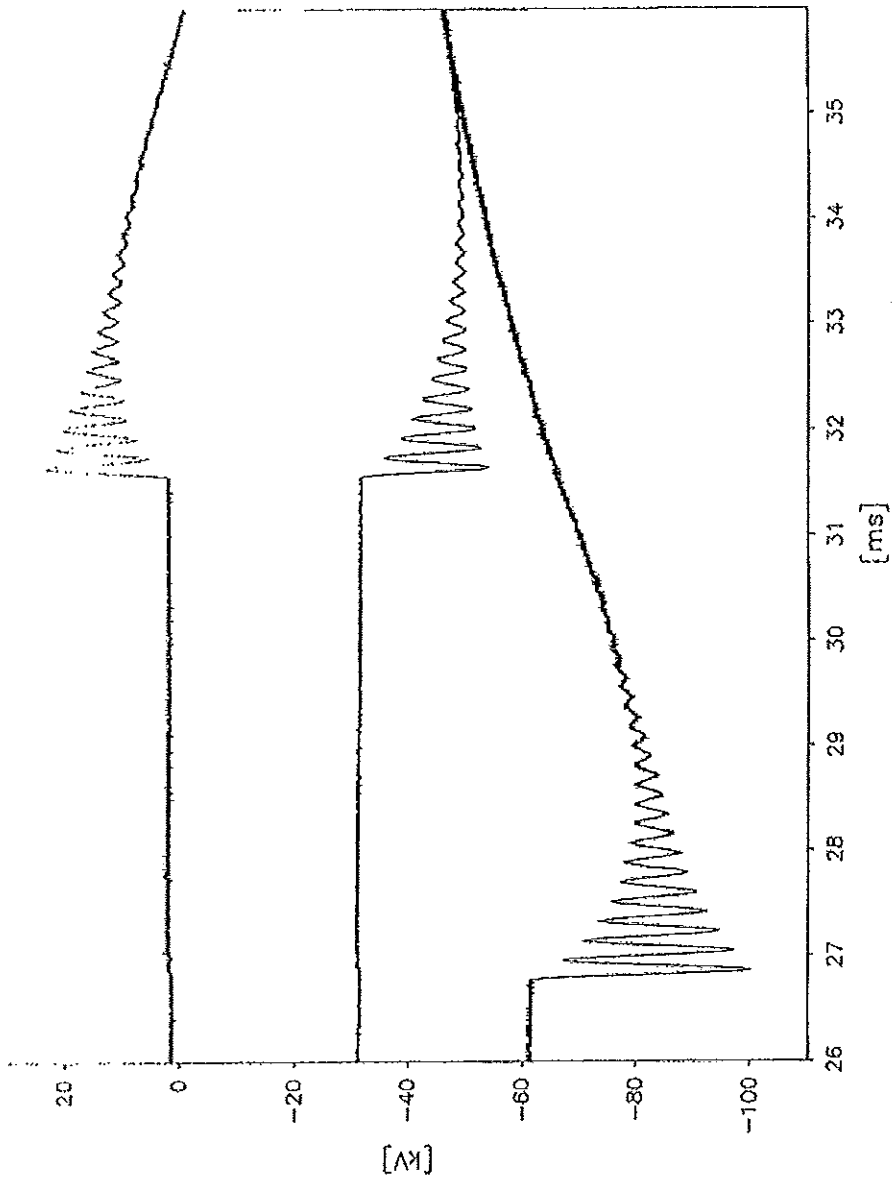
Oscillogram
PEHLA 0511Ra / 21



ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ООД
ПЛОВДИВ
„Табаков и синове"

Oscillogram
PEHLA 0511Ra / 21



ВЯРНО С ОРИГИНАЛА

ЕЛЕКТРОЛУКС, Табаковци синове, ООД, ПЛОВДИВ

Test Results

Basic Short-Circuit Making and Breaking Tests

Test performed: Basic short-circuit making and breaking tests (T100a)
Date of test: 09th March 2005
Condition of test object before test: As after PEHLA 0511Ra / 21.
Test arrangement: Direct test circuit, circuit-breaker in gas insulated switchgear
Connections to test object: Infeed via copper bars to the cable terminals of the switchgear, short-circuited via copper bars at the busbar connection, short-circuit point earthed via cable.

Test No. PEHLA 0511Ra			23	24	25	26	27	28
Operating sequence and time intervals			O-3min-O-3min-O-3min-O-3min-O-3min-O-					
Applied voltage		kV	-	-	-	-	-	-
Breaking current (r.m.s.)	L1	kA	20.7	20.5	20.6	20.6	20.5	20.5
	L2	kA	20.1	19.8	19.9	20.9	20.5	20.6
	L3	kA	20.7	20.1	20.0	20.5	19.7	19.8
Average value		kA	20.5	20.1	20.2	20.7	20.2	20.3
Breaking current - last current loop (peak)	L1	kA	36.9	-	-	-	-	-
	L2	kA	-	37.3	37.3	37.3	-	-
	L3	kA	-	-	-	-	36.0	36.0
Duration of the last current loop	L1	ms	12.8	-	-	-	-	-
	L2	ms	-	12.6	12.6	12.6	-	-
	L3	ms	-	-	-	-	12.2	12.2
DC-component	L1	%	32.2	< 20	< 20	< 20	35.7	35.7
	L2	%	< 20	37.8	39.9	37.8	< 20	< 20
	L3	%	< 20	28.3	29.7	28.0	33.7	34.0
Recovery voltage (r.m.s)	L1	kV	13.9	13.7	13.7	13.7	13.7	13.8
	L2	kV	13.9	13.6	14.1	13.7	14.1	14.0
	L3	kV	14.2	13.5	14.1	14.1	14.0	14.1
Transient recovery voltage	Voltage u_1	kV	-	-	-	-	-	
	Time t_1	µs	-	-	-	-	-	
	TRV peak value u_c	kV	40.8	39.6	37.4	41.4	37.4	37.4
	Time t_3	µs	-	-	-	-	-	-
	Time delay t_d	µs	-	-	-	-	-	-
	Rate of rise u_c/t_3	kV/µs	-	-	-	-	-	-
O-Operation	Voltage of opening device	V	121	121	121	121	121	121
	Opening time	ms	47.0	47.3	45.8	44.6	47.0	46.0
	Arcing time L1	ms	3.8	6.6	6.4	6.0	0.8	0.8
	L2	ms	7.8	6.4	8.0	10.2	6.6	6.6
	L3	ms	8.0	0.8	1.8	10.4	6.4	6.6
	Break time	ms	55.0	53.7	53.8	55.0	53.6	52.6
Emission of flame/gas/oil, occurrence of NSDD			no	no	no	no	no	no
Number of valid test			-	-	-	-	-	-
Test result			P	P	P	P	P	P

Legend: P: Passed in terms of the applied standard N: Not passed in terms of the applied standard

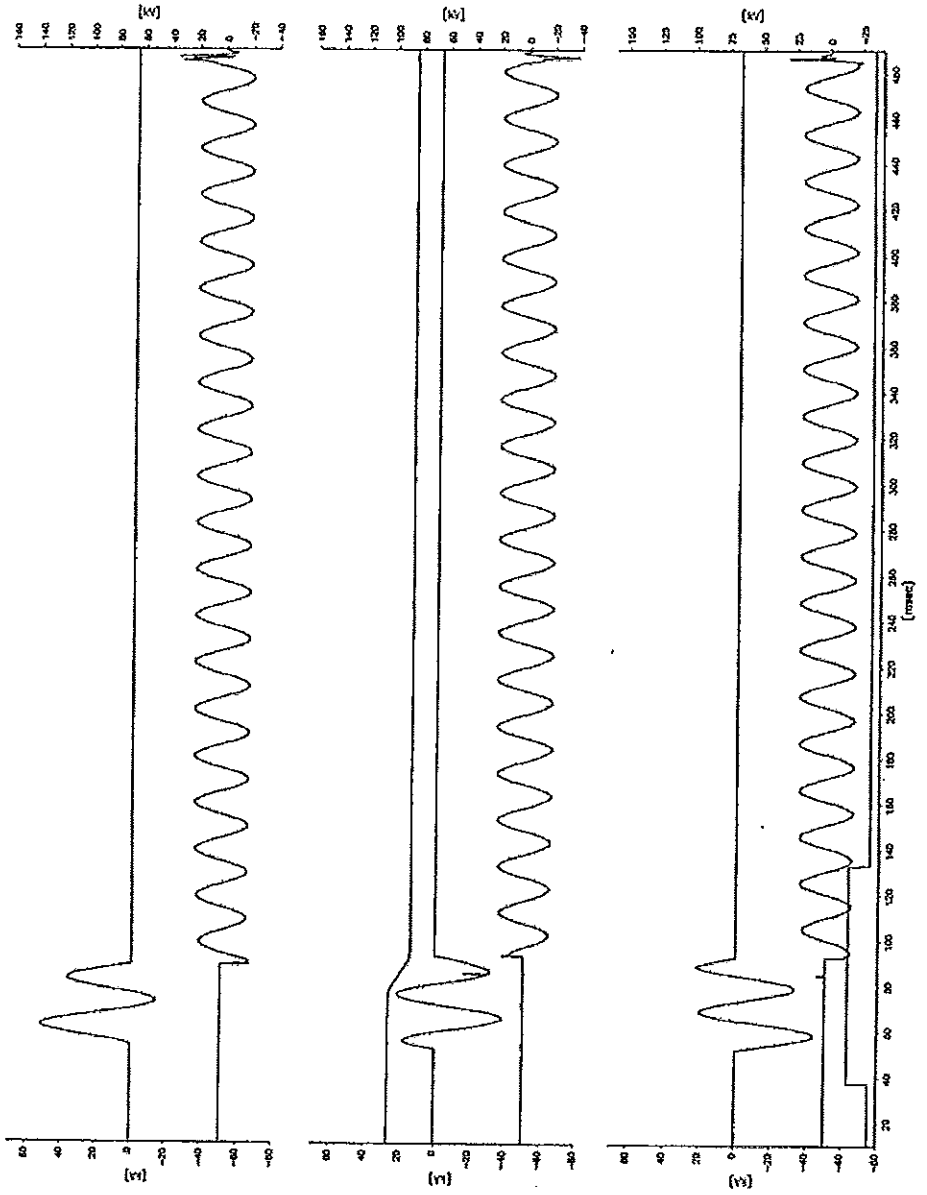
Remarks: PEHLA 0511Ra / 22: Test with reduced values.

Condition of test object after test: Switchgear and circuit-breaker were not inspected.

ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ООД „Табаков и синове" ПЛОВДИВ

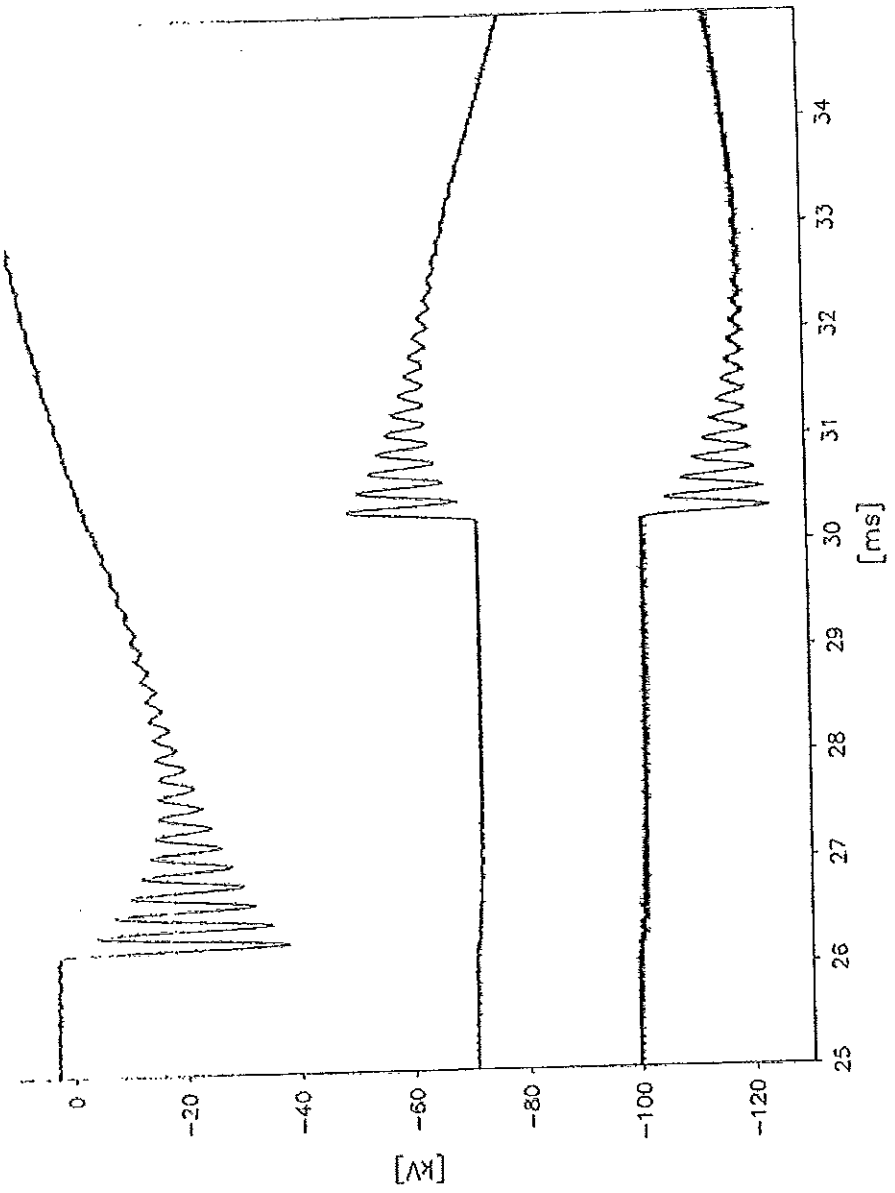
Oscillogram
PEHLA 0511Ra / 23



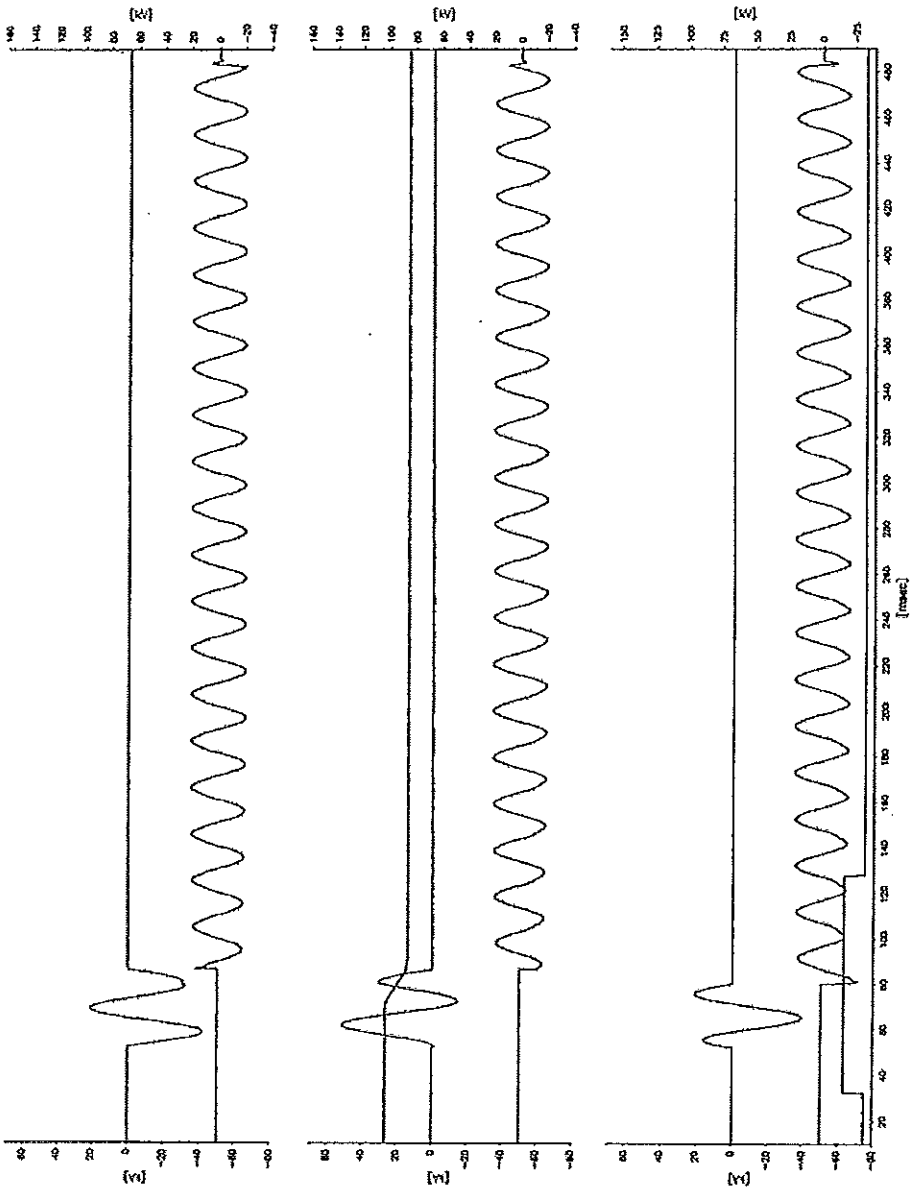
ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ООД ПЛОВДИВ Табаков и синове

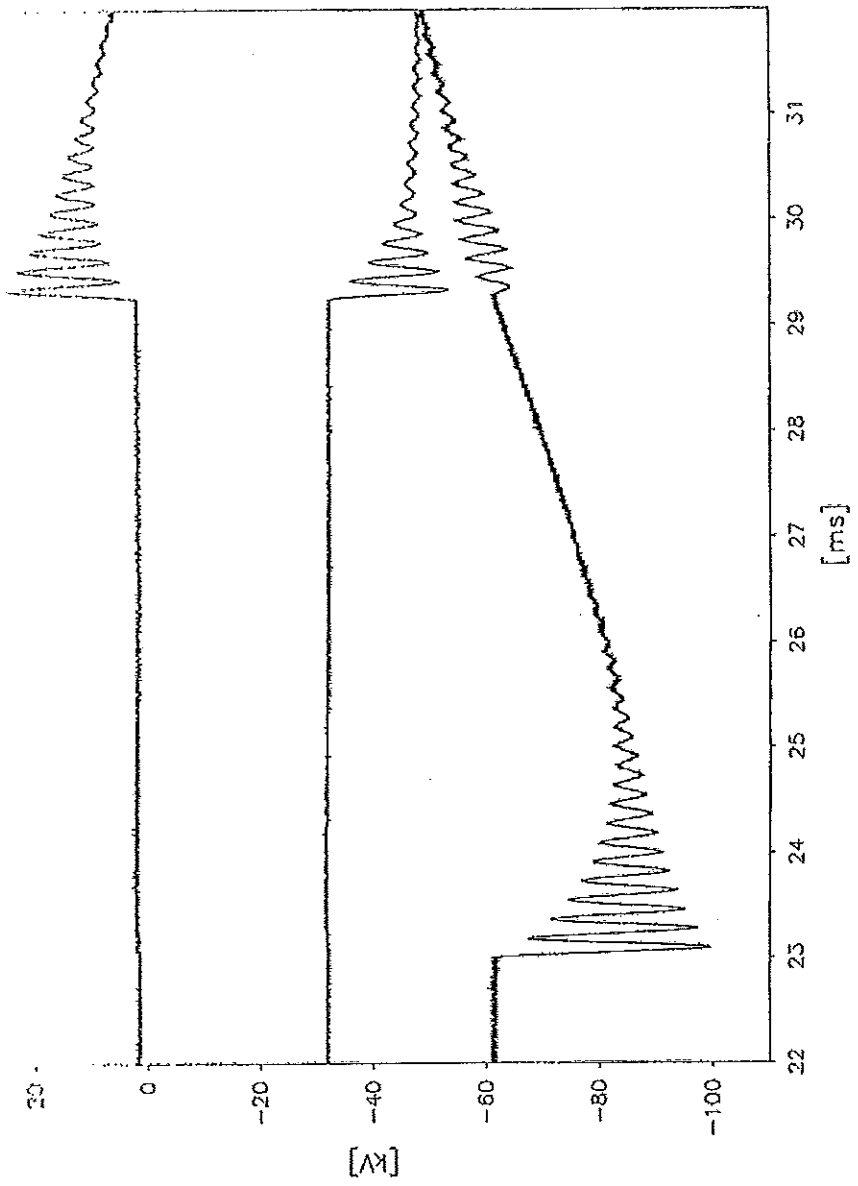
Oscillogram
PEHLA 0511Ra / 23



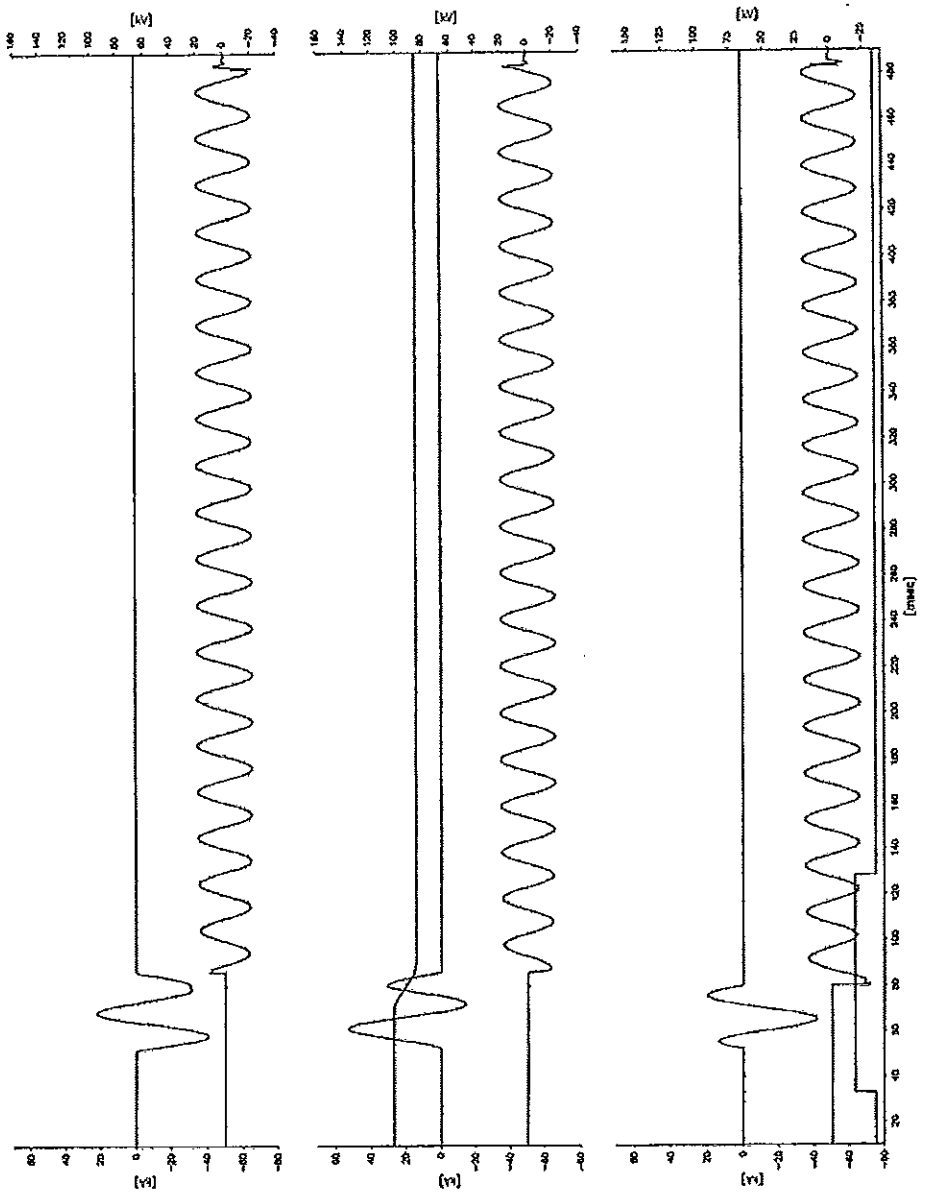
Oscillogram
PEHLA 0511Ra / 24



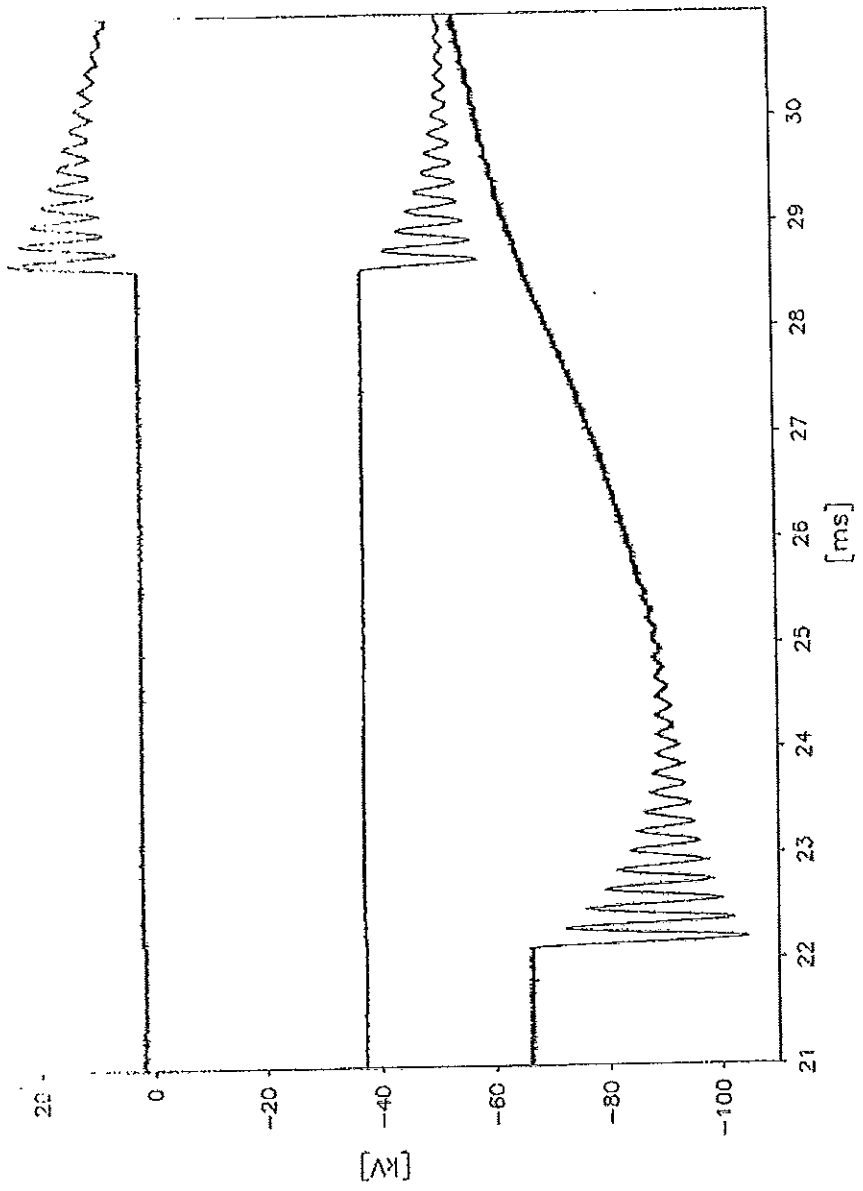
Oscillogram
PEHLA 0511Ra / 24



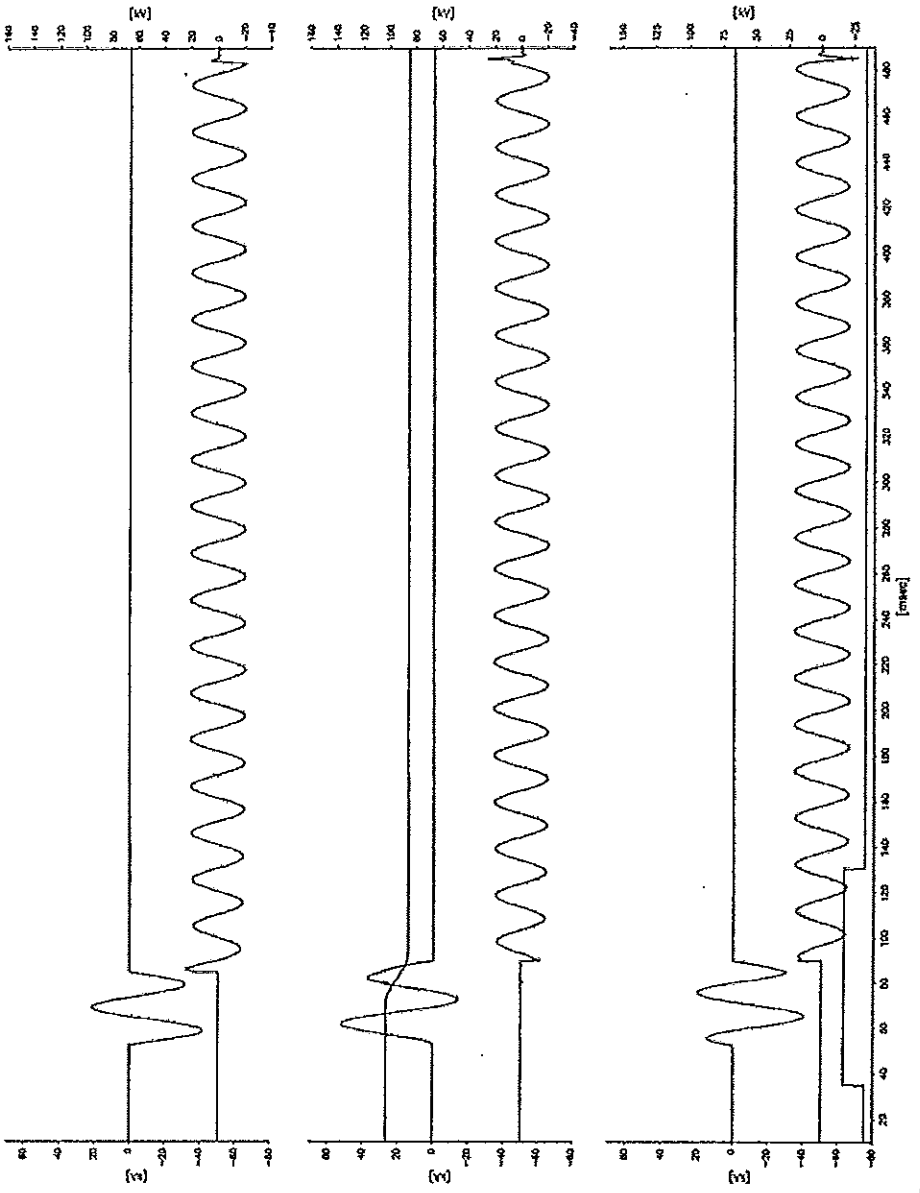
Oscillogram
PEHLA 0511Ra / 25



Oscillogram
PEHLA 0511Ra / 25



Oscillogram
PEHLA 0511Ra / 26

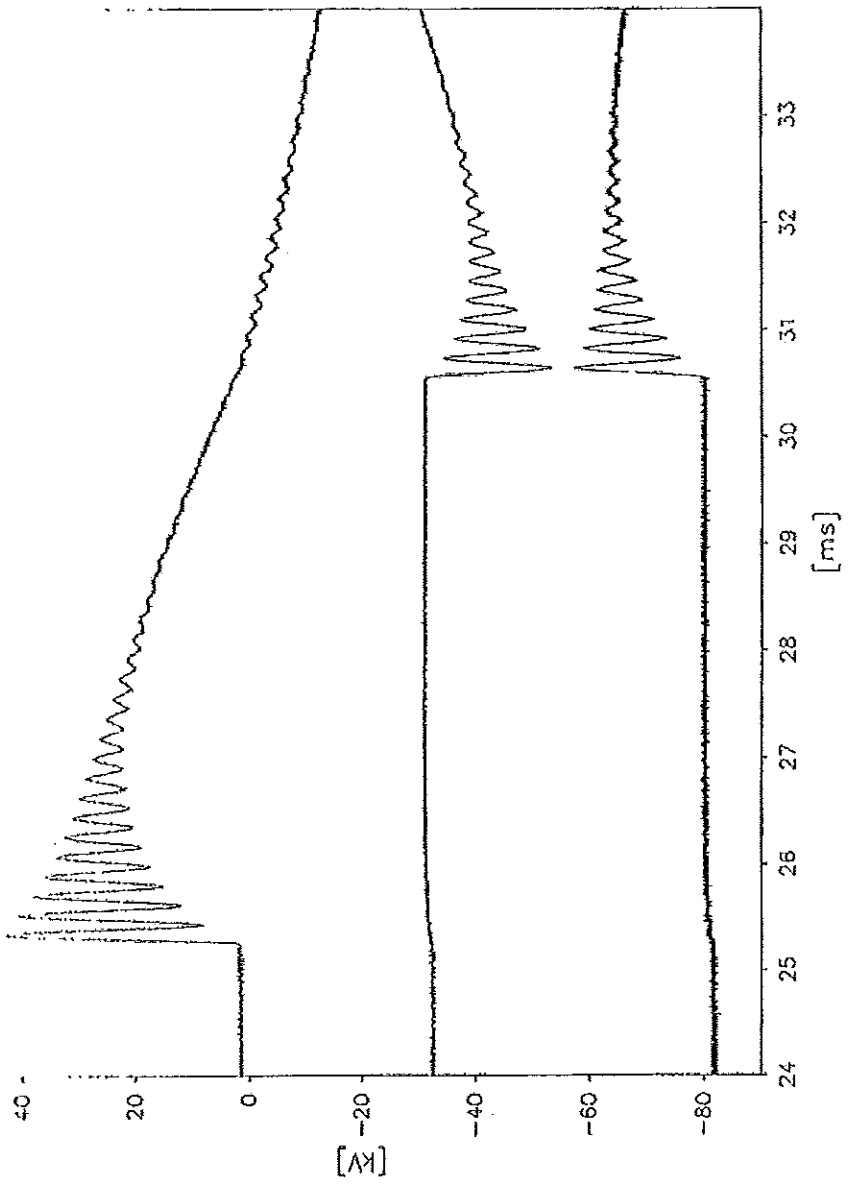


ВЯРНО С ОРИГИНАЛА

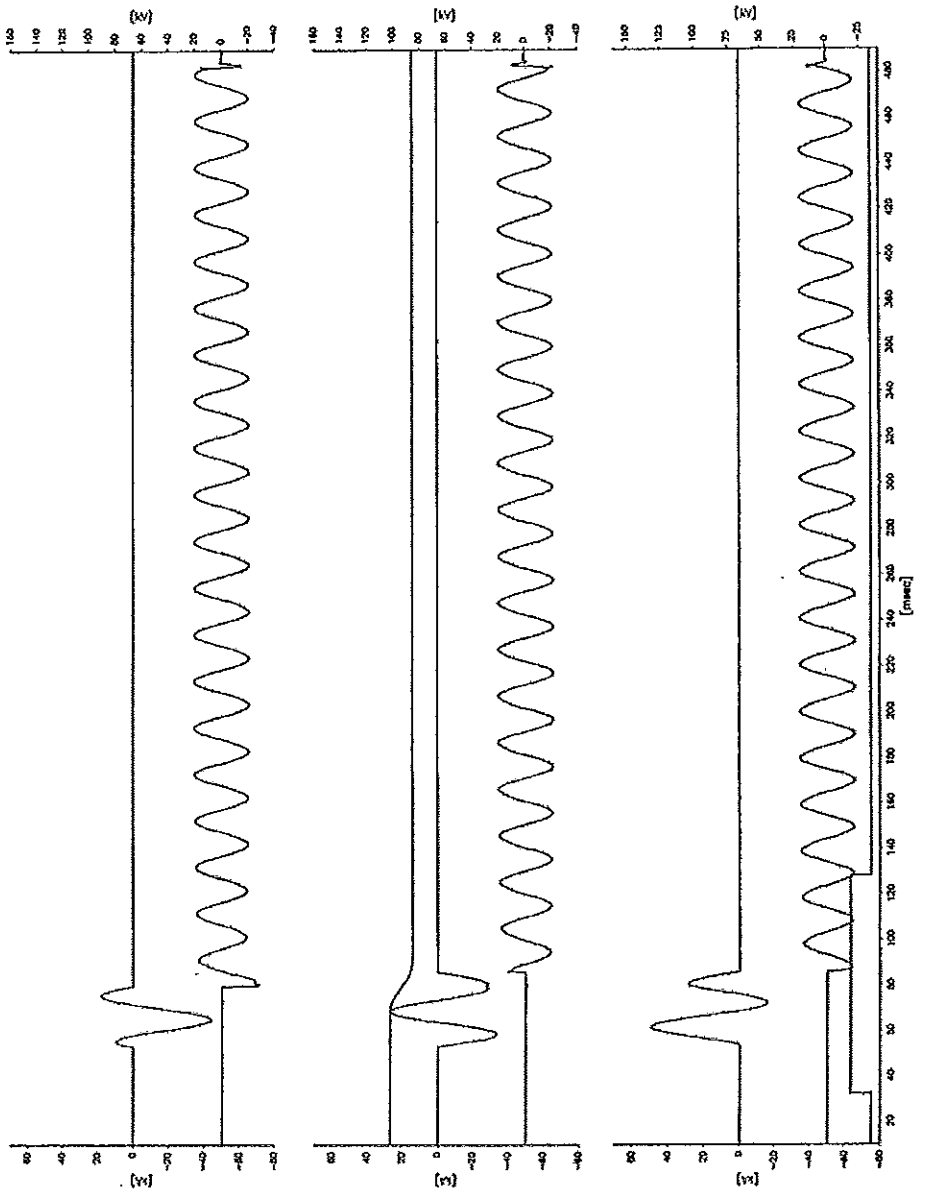
"ЕЛЕКТРОМУКС" ООД
ПЛОВДИВ
"Табаков и синове"

18PE0402

Oscillogram
PEHLA 0511Ra / 26



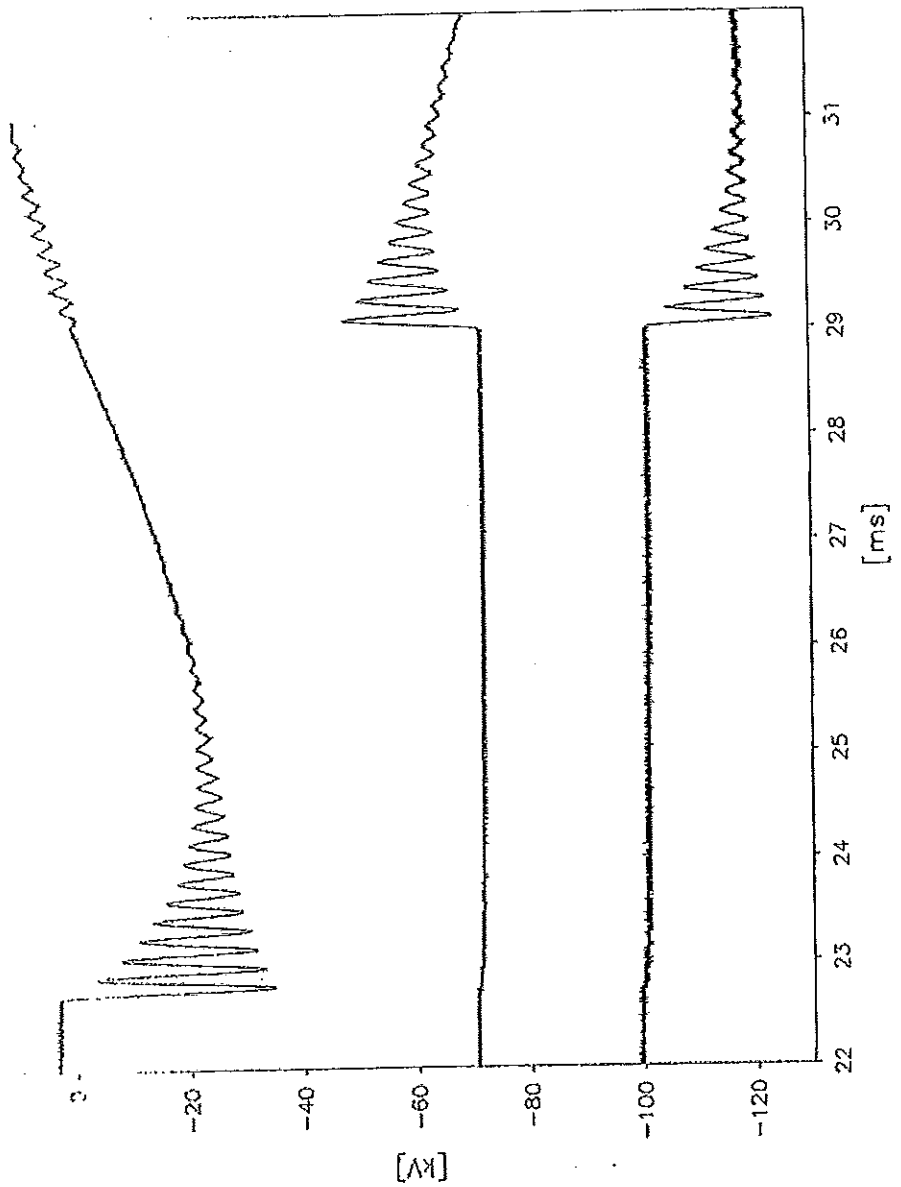
Oscillogram
PEHLA 0511Ra / 27



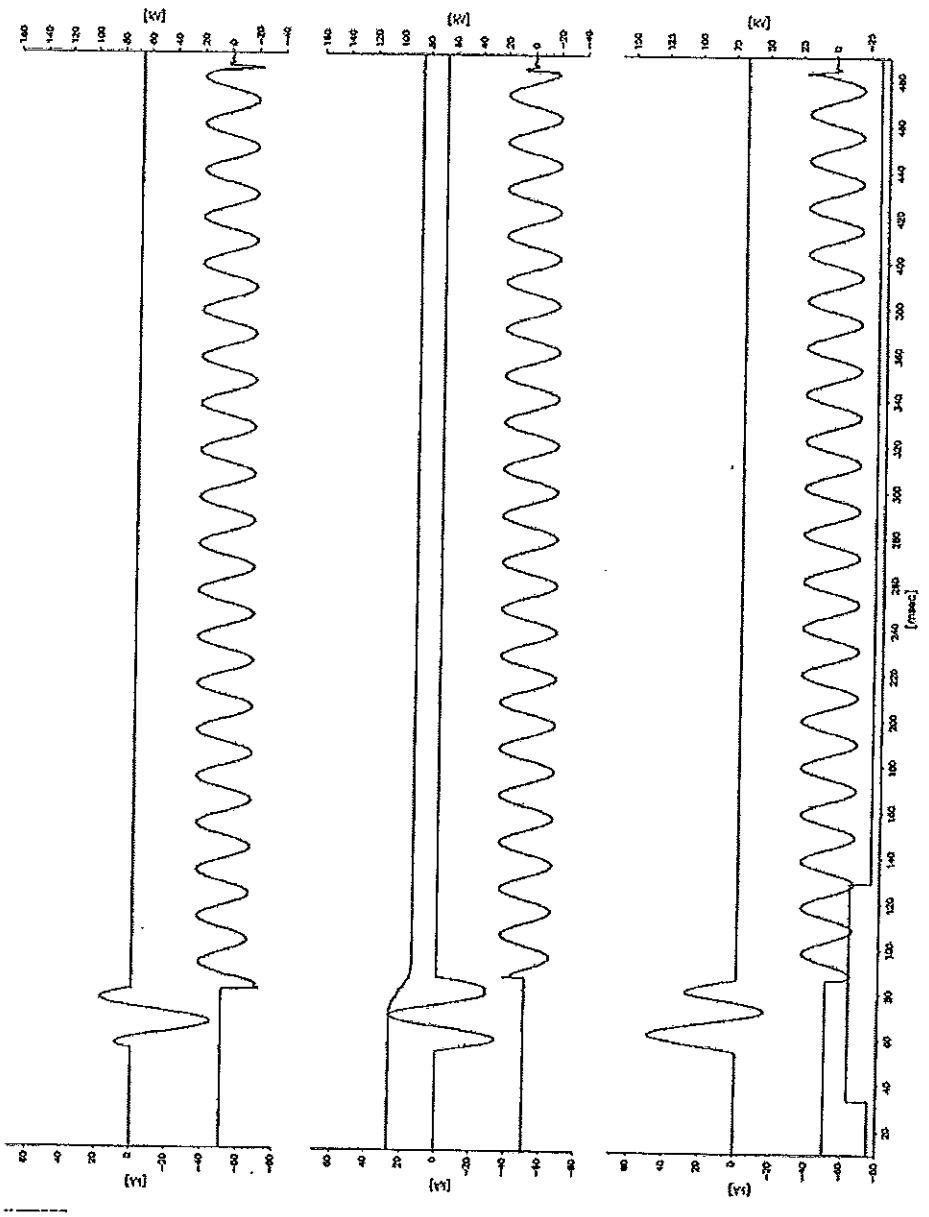
ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛИКС" ООД
ПЛОВДИВ
„Табаков и синове"

Oscillogram
PEHLA 0511Ra / 27



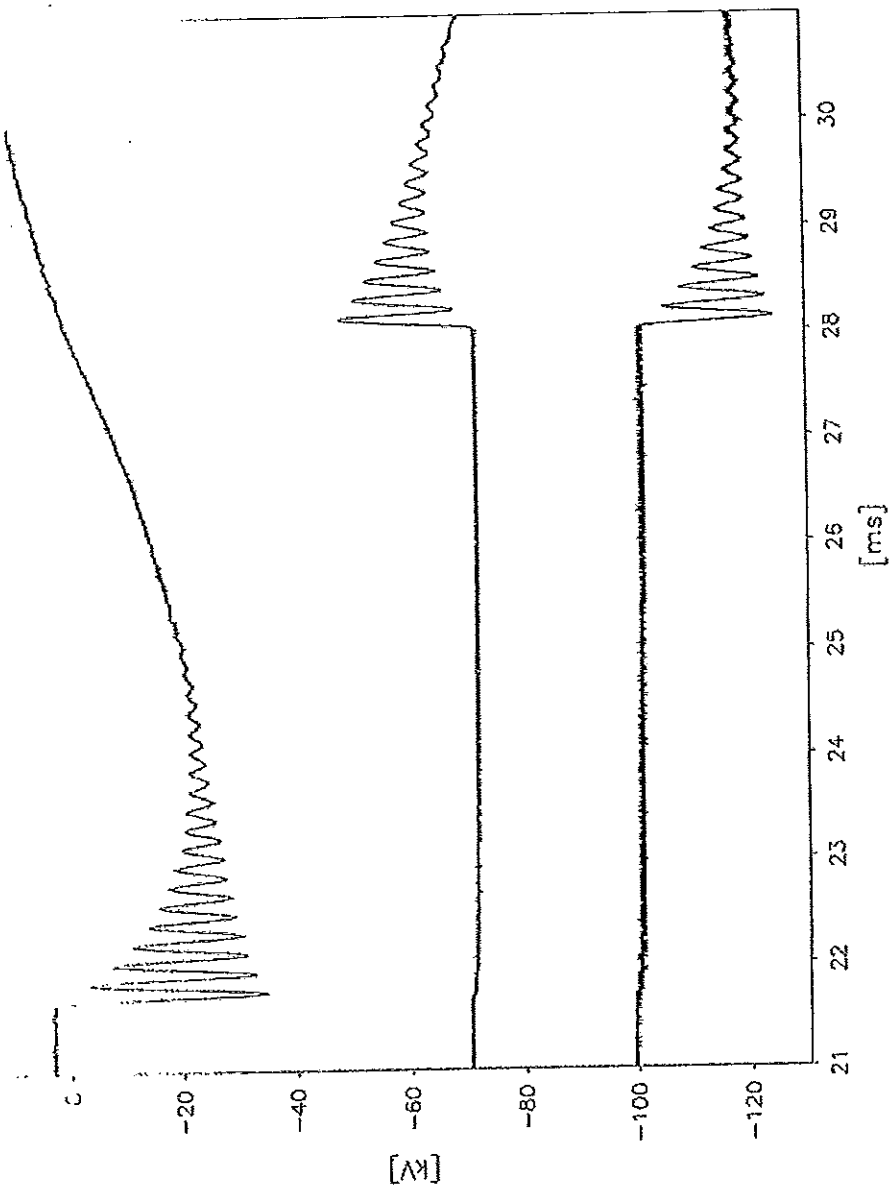
Oscillogram
PEHLA 0511Ra / 28



ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОМАКС" ЕООД
ПЛОВДИВ
„Табакови синове"

Oscillogram
PEHLA 0511Ra / 28



ВЕРНО С ОРИГИНАЛА

ЕЛЕКТРОЛУКС ООД
ПЛОВДИВ
"Табаков и синове"

Test Results

Basic Short-Circuit Making and Breaking Tests

Test performed: Basic short-circuit making and breaking tests (T10)
Date of test: 10th March 2005
Condition of test object before test: As after PEHLA 0511Ra / 28.
Test arrangement: Direct test circuit, circuit-breaker in gas insulated switchgear
Connections to test object: Infeed via copper bars to the busbar connection of the switchgear, short-circuited via copper bar at the cable terminals, short-circuit point earthed via cable.

Test No. PEHLA 0511Ra			29		30	-	-	-
Operating sequence and time intervals			O-0.3s-CO-15s-CO			-	-	-
Applied voltage		kV	-	24.5	24.2	-	-	-
Making current (peak)	L1	kA	-	4.02	3.6	-	-	-
	L2	kA	-	4.85	5.2	-	-	-
	L3	kA	-	5.48	5.3	-	-	-
Breaking current (r.m.s.)	L1	kA	2.21	2.31	2.30	-	-	-
	L2	kA	2.28	2.34	2.28	-	-	-
	L3	kA	2.24	2.31	2.25	-	-	-
	Average value	kA	2.24	2.32	2.28	-	-	-
Recovery voltage (r.m.s)	L1	kV	13.8	14.5	14.3	-	-	-
	L2	kV	14.0	14.6	14.2	-	-	-
	L3	kV	13.7	14.6	14.5	-	-	-
Transient recovery voltage	Voltage u_1	kV	-	-	-	-	-	-
	Time t_1	µs	-	-	-	-	-	-
	TRV peak value u_c	kV	46.5	48.5	44.0	-	-	-
	Time t_3	µs	65.0	65.0	65.0	-	-	-
	Time delay t_d	µs	-	-	-	-	-	-
	Rate of rise u_c/t_3	kV/µs	0.715	0.746	0.677	-	-	-
C-Operation	Voltage of closing device	V	-	94	94	-	-	-
	Closing time	ms	-	63.4	64.4	-	-	-
	Pre-arcing time	ms	-	-	-	-	-	-
	Make time	ms	-	63.4	64.4	-	-	-
O-Operation	Voltage of opening device	V	77	77	77	-	-	-
	Opening time	ms	61.3	63.1	60.4	-	-	-
	Arcing time L1	ms	3.8	2.2	9.4	-	-	-
	L2	ms	9.0	7.0	9.4	-	-	-
	L3	ms	9.0	7.0	4.0	-	-	-
	Break time	ms	70.3	70.1	69.8	-	-	-
Emission of flame/gas/oil, occurrence of NSDD			no	no	no	-	-	-
Number of valid test			-	-	-	-	-	-
Test result			P	P	P	-	-	-

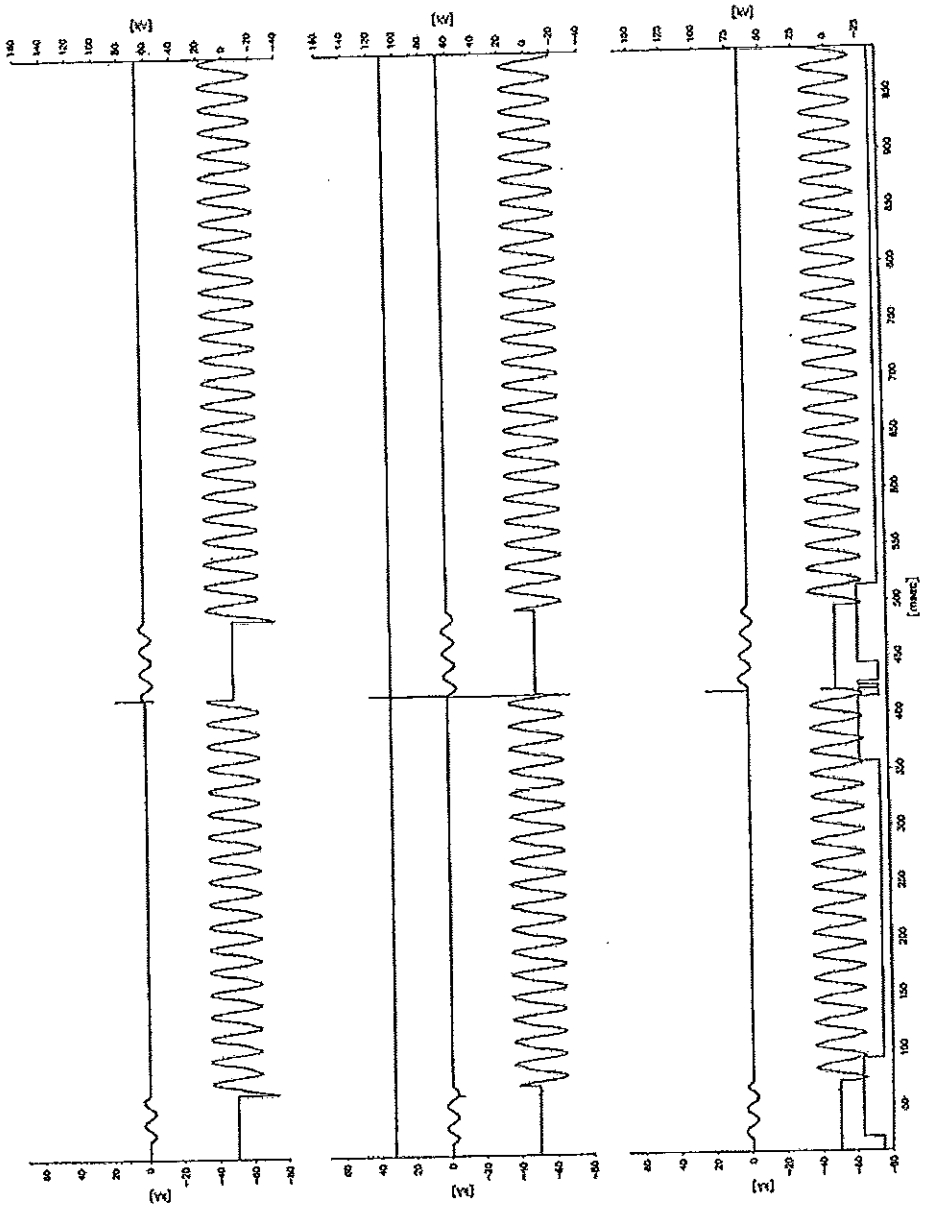
Legend: P: Passed in terms of the applied standard N: Not passed in terms of the applied standard
Remarks: PEHLA 0511Ra / 31: No-load operation

Condition of test object after test: The condition of the circuit-breaker after the test series corresponds to the conditions given in clause 6.102.9.4 of IEC 62271-100 / Ed. 1.1 / 2003-05. Visual inspection, no-load measurements before and after the test series, measurements of the resistance of the main circuit before and after the test series as well as a power frequency voltage check according to clause 6.2.11 of IEC 62271-100 / Ed. 1.1 / 2003-05 (with 80% and 100% of the rated power frequency withstand voltage) after the test series are carried out to prove the condition of the circuit-breaker.

ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛИКС" ООД ПЛОВДИВ „Табаков и синове"

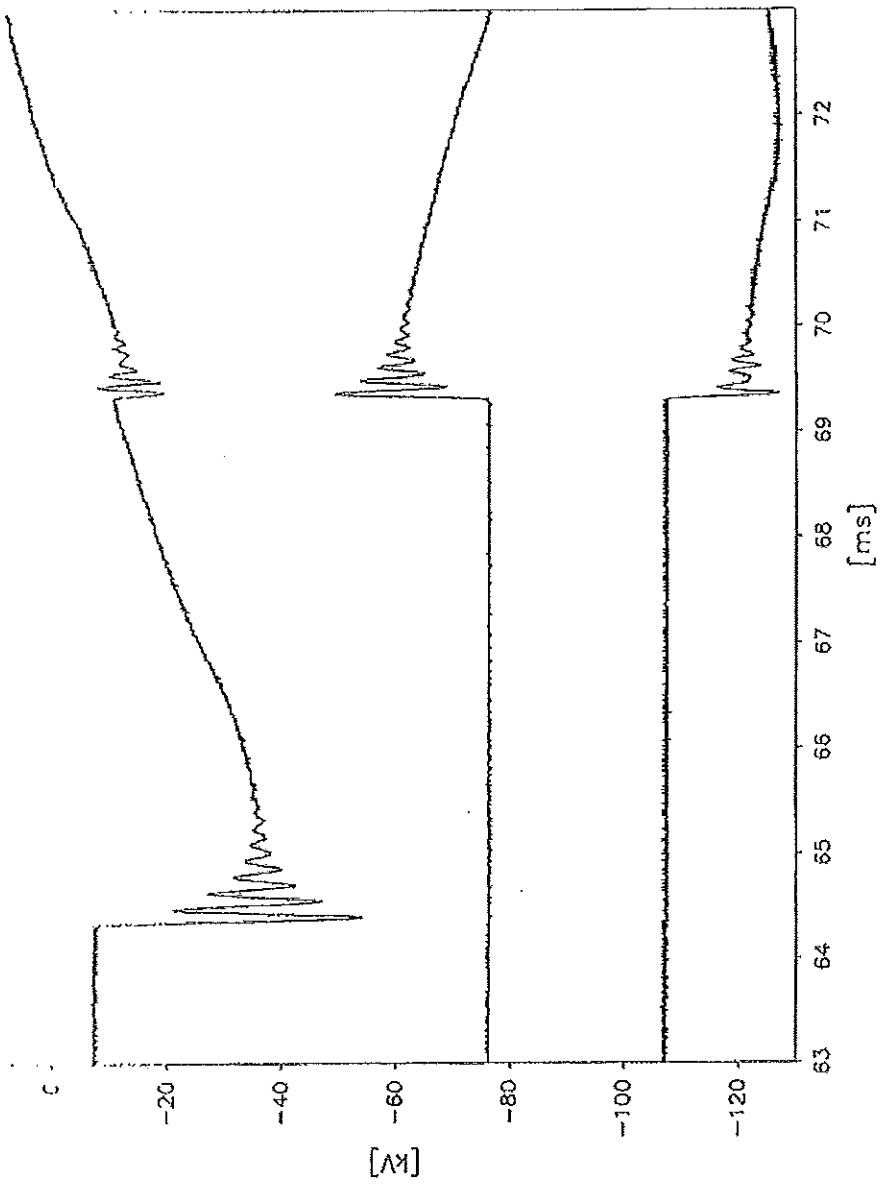
Oscillogram
PEHLA 0511Ra / 29



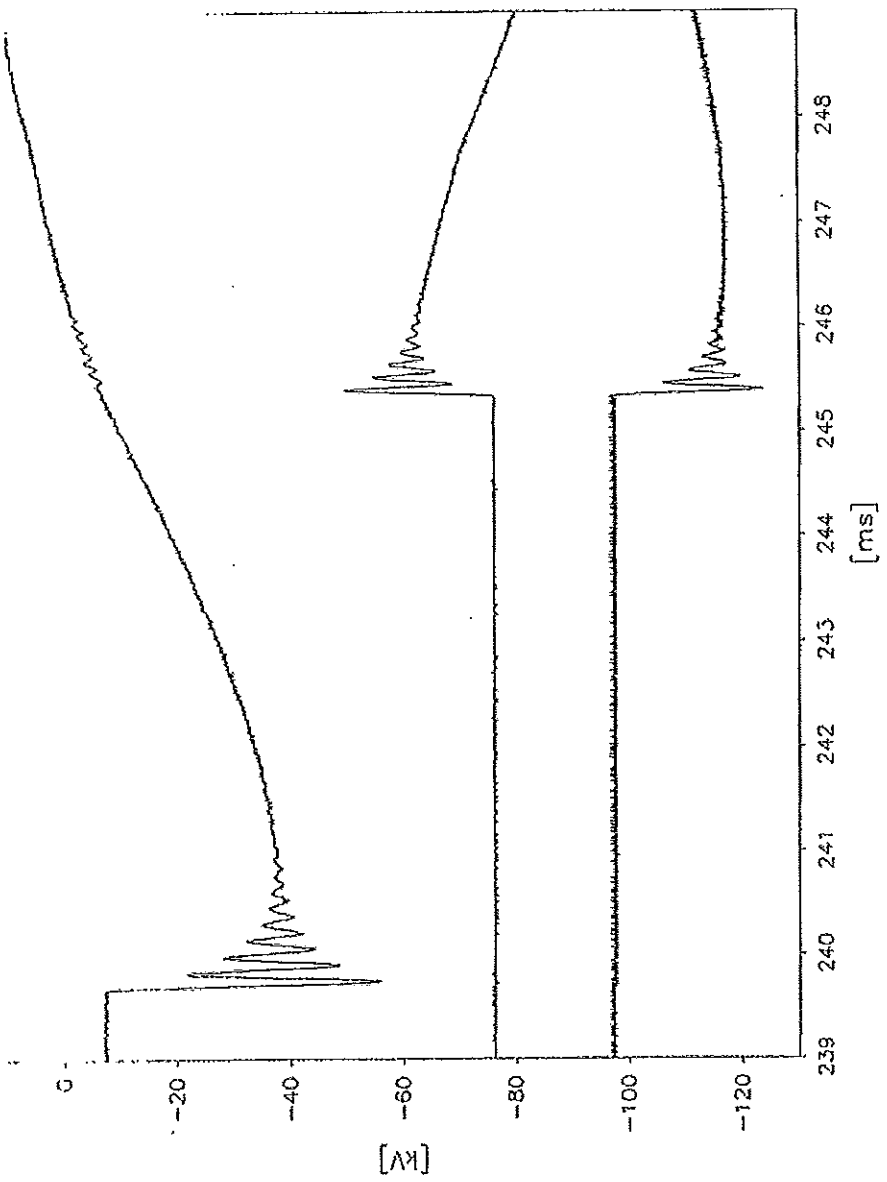
ВЯРНО С ОРИГИНАЛА

"ЕЛЕКТРОМАКС" ООД
ПЛОВДИВ
"Табакови синове"

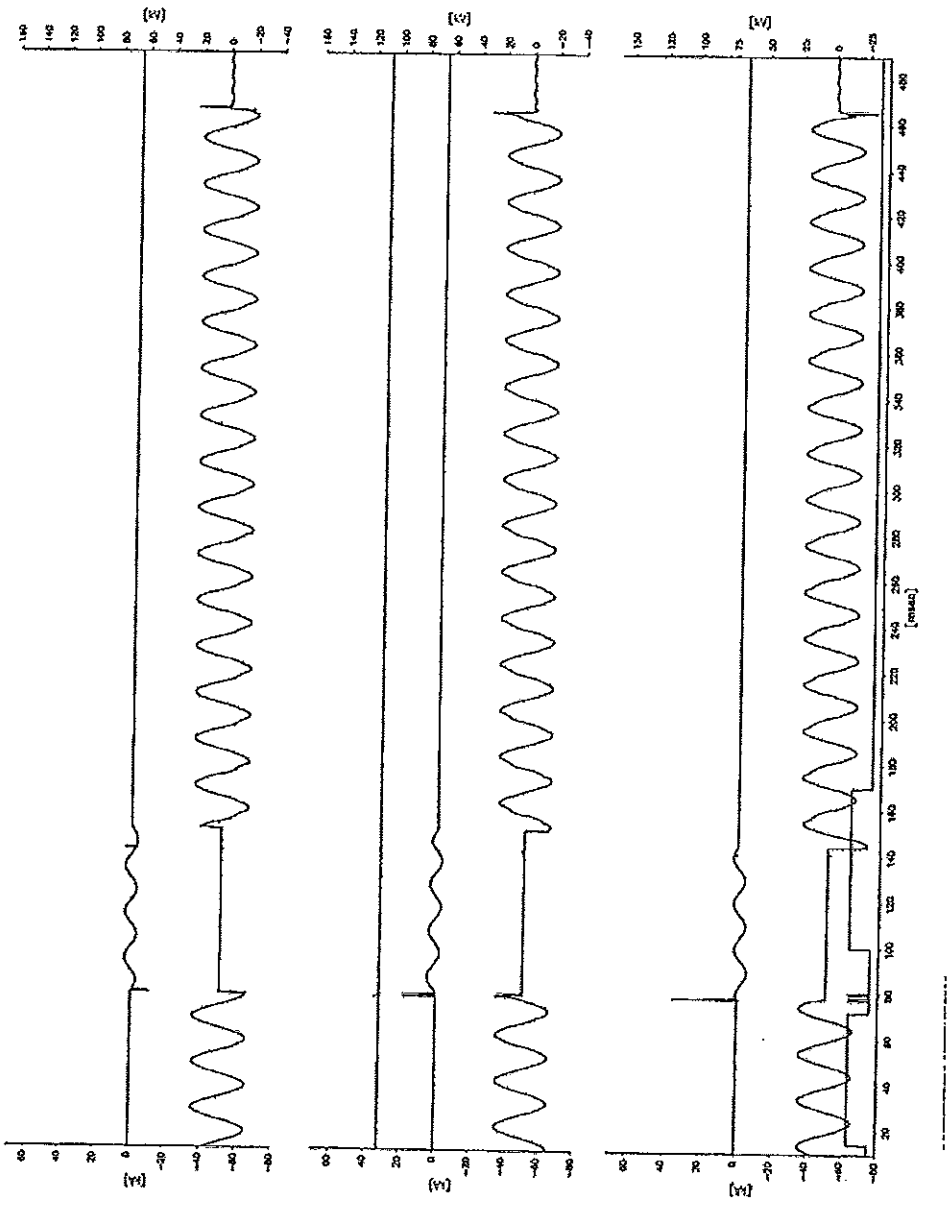
Oscillogram
PEHLA 0511Ra / 29



Oscillogram
PEHLA 0511Ra / 29

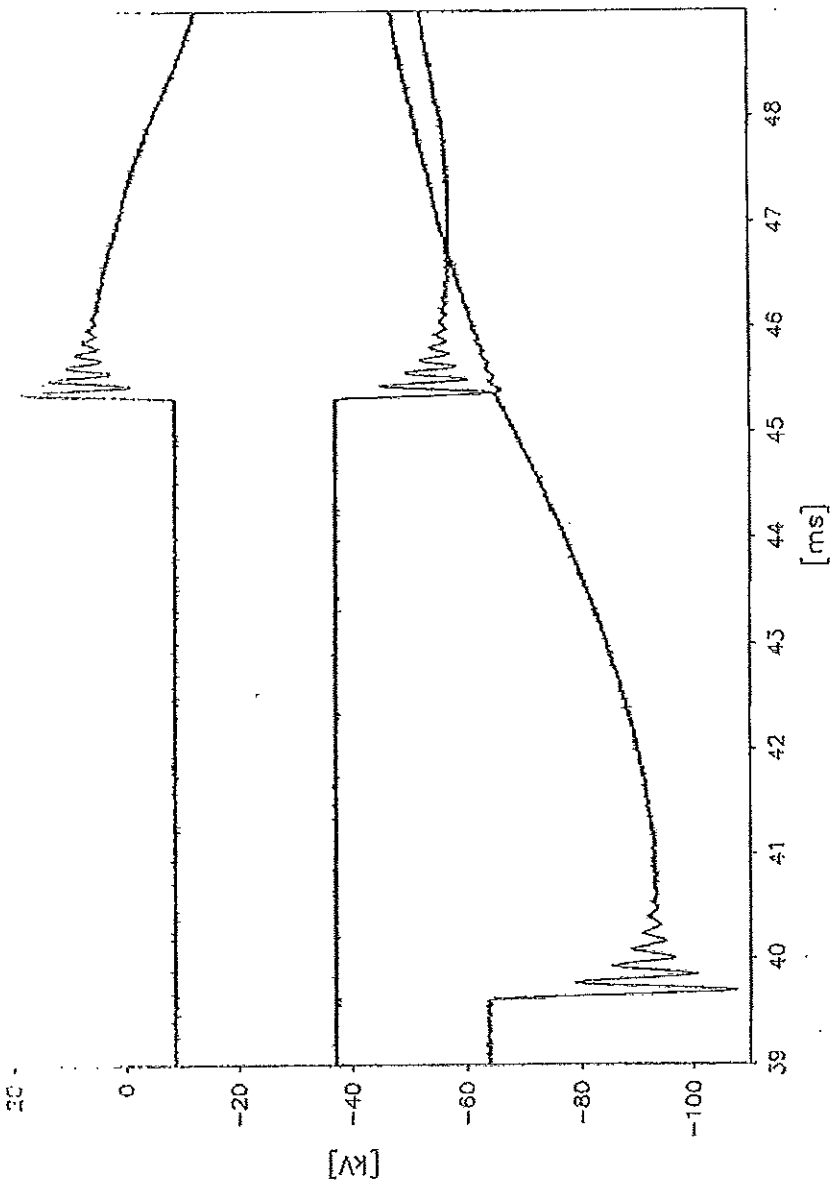


Oscillogram
PEHLA 0511Ra / 30



Oscillogram

PEHLA 0511Ra / 30



ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОСЛУКС" ООД „Табакови синове" ПЛОВДИВ

Test Results
No-load Operations

Test performed: No-load operation
Date of test: 09th March 2005
Condition of test object before test: As after Test PEHLA 0511Ra / 05.

Test No. PEHLA 0511Ra				06		06A		06B	
Operating sequence				O – 0.3s – CO		O – 0.3s – CO		O – 0.3s – CO	
C-Operation	Voltage of closing device		V	-	110	-	121	-	94
	Closing time	L1	ms	-	59.6	-	57.6	-	63.6
		L2	ms	-	59.8	-	57.8	-	63.8
		L3	ms	-	59.6	-	57.4	-	63.4
O-Operation	Voltage of opening device		V	110	110	121	121	77	77
	Opening time	L1	ms	46.0	45.6	43.2	43.8	61.0	60.0
		L2	ms	45.8	45.4	43.0	43.6	60.8	59.8
		L3	ms	46.0	45.6	43.2	43.8	60.8	60.0

Remarks: The voltage values correspond to 100% of the rated supply voltage in Test PEHLA 0511Ra / 06, 110% in Test PEHLA 0511Ra / 06A and 70% (O) resp. 85% (C) in Test PEHLA 0511Ra / 06B.

Test performed: No-load operation
Date of test: 10th March 2005
Condition of test object before test: As after Test PEHLA 0511Ra / 30.

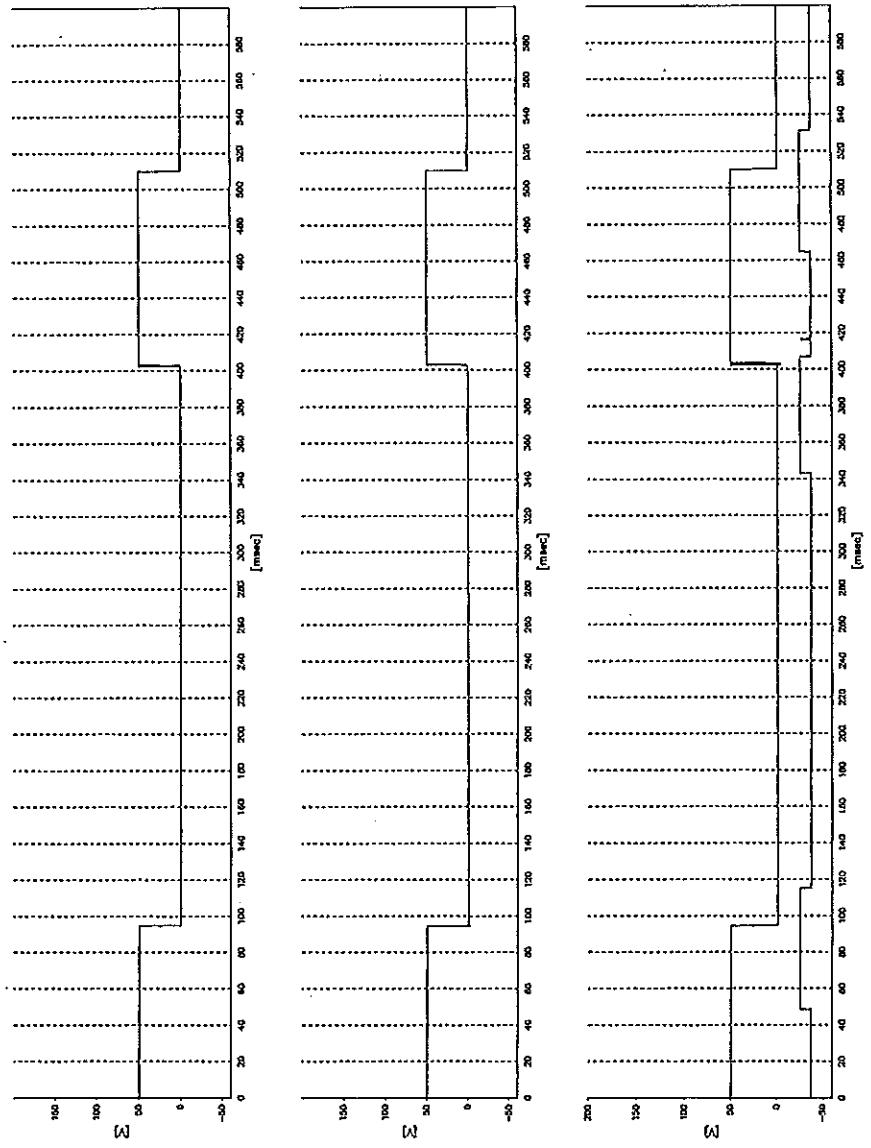
Test No. PEHLA 0511Ra				31		31A		31B	
Operating sequence				O – 0.3s – CO		O – 0.3s – CO		O – 0.3s – CO	
C-Operation	Voltage of closing device		V	-	110	-	121	-	94
	Closing time	L1	ms	-	60.6	-	58.6	-	64.8
		L2	ms	-	60.6	-	58.6	-	64.8
		L3	ms	-	60.0	-	58.0	-	64.2
O-Operation	Voltage of opening device		V	110	110	121	121	77	77
	Opening time	L1	ms	46.2	46.0	43.6	43.0	58.8	57.8
		L2	ms	45.8	45.6	43.2	42.6	58.4	57.2
		L3	ms	46.4	46.2	43.8	43.4	59.0	58.0

Remarks: The voltage values correspond to 100% of the rated supply voltage in Test PEHLA 0511Ra / 31, 110% in Test PEHLA 0511Ra / 31A and 70% (O) resp. 85% (C) in Test PEHLA 0511Ra / 31B.

ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОМУКС" ООД Пловдив Табаковци синове

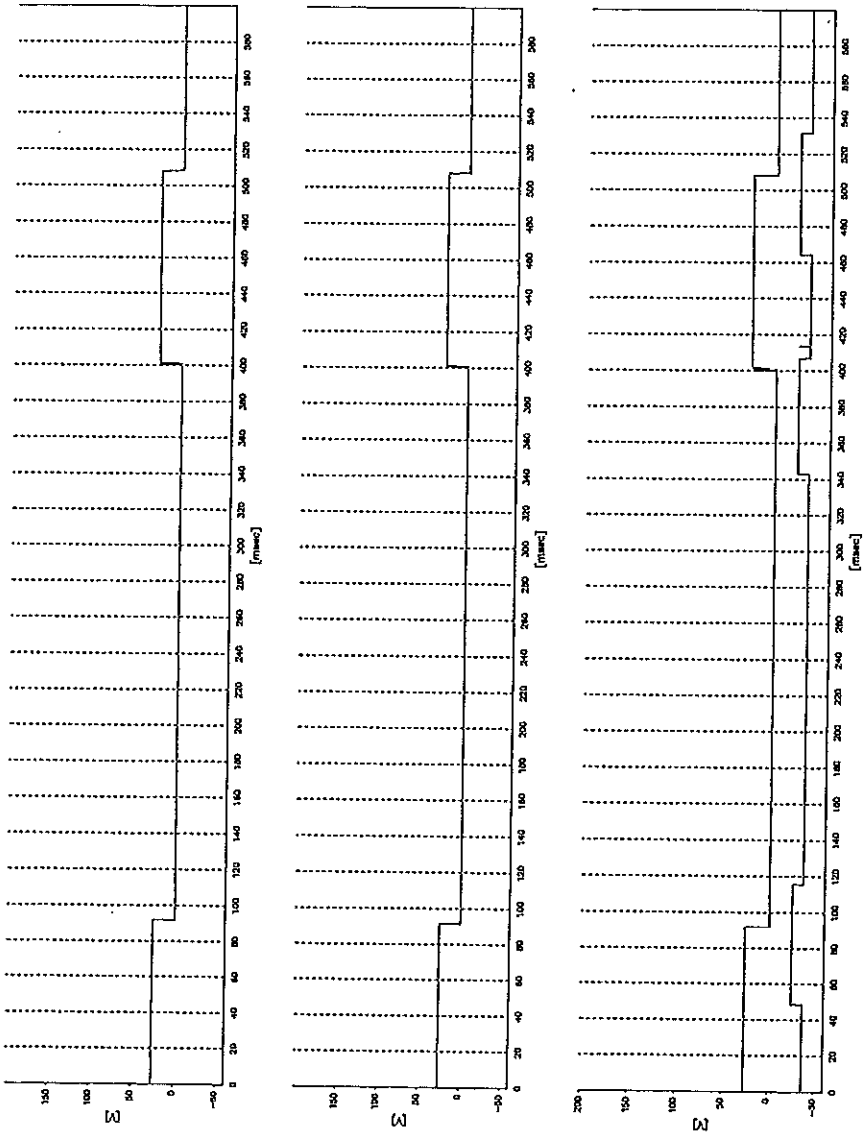
Oscillogram
PEHLA 0511Ra / 06



ВЯРНО С ОРИГИНАЛА

ЕЛЕКТРОЛУКС
ПЛОВДИВ
"Табаков и синове" СОД

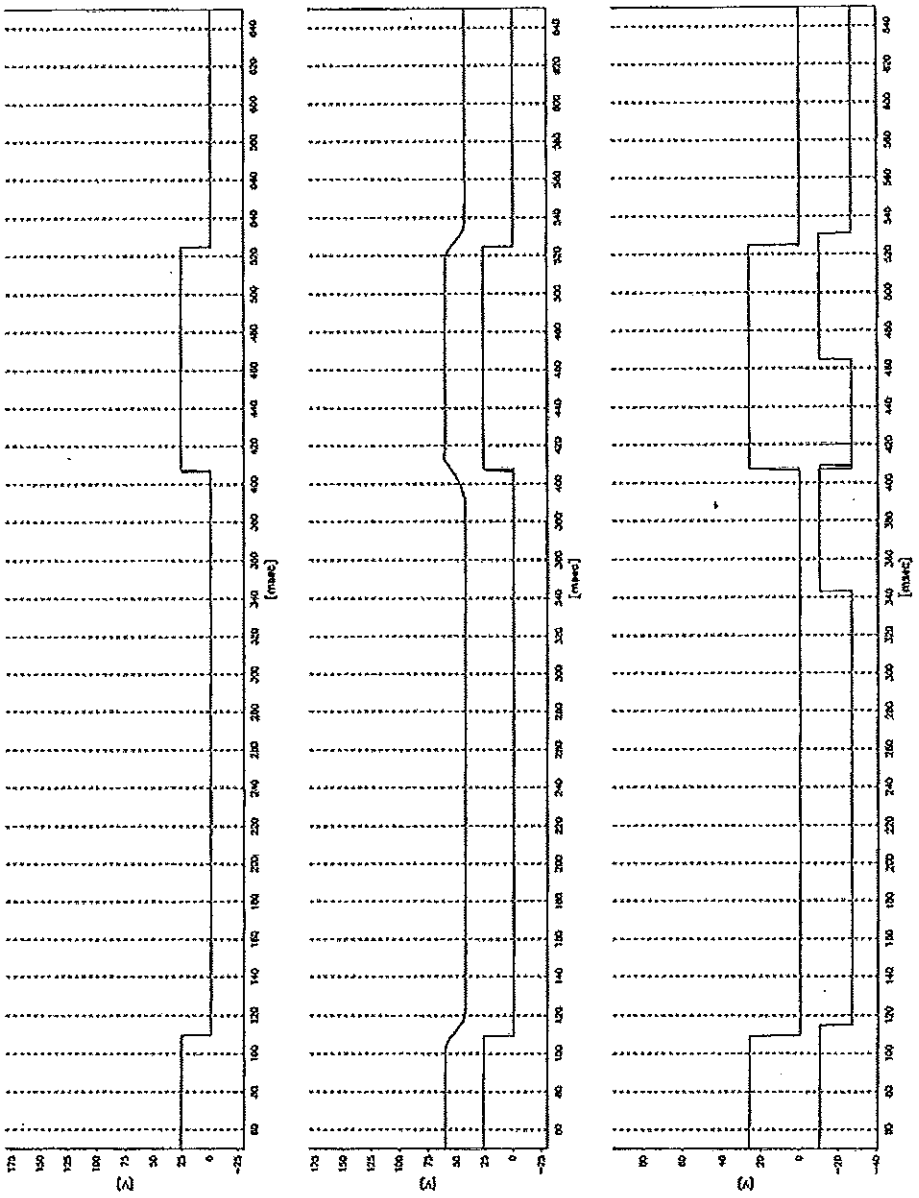
Oscillogram
PEHLA 0511Ra / 06A



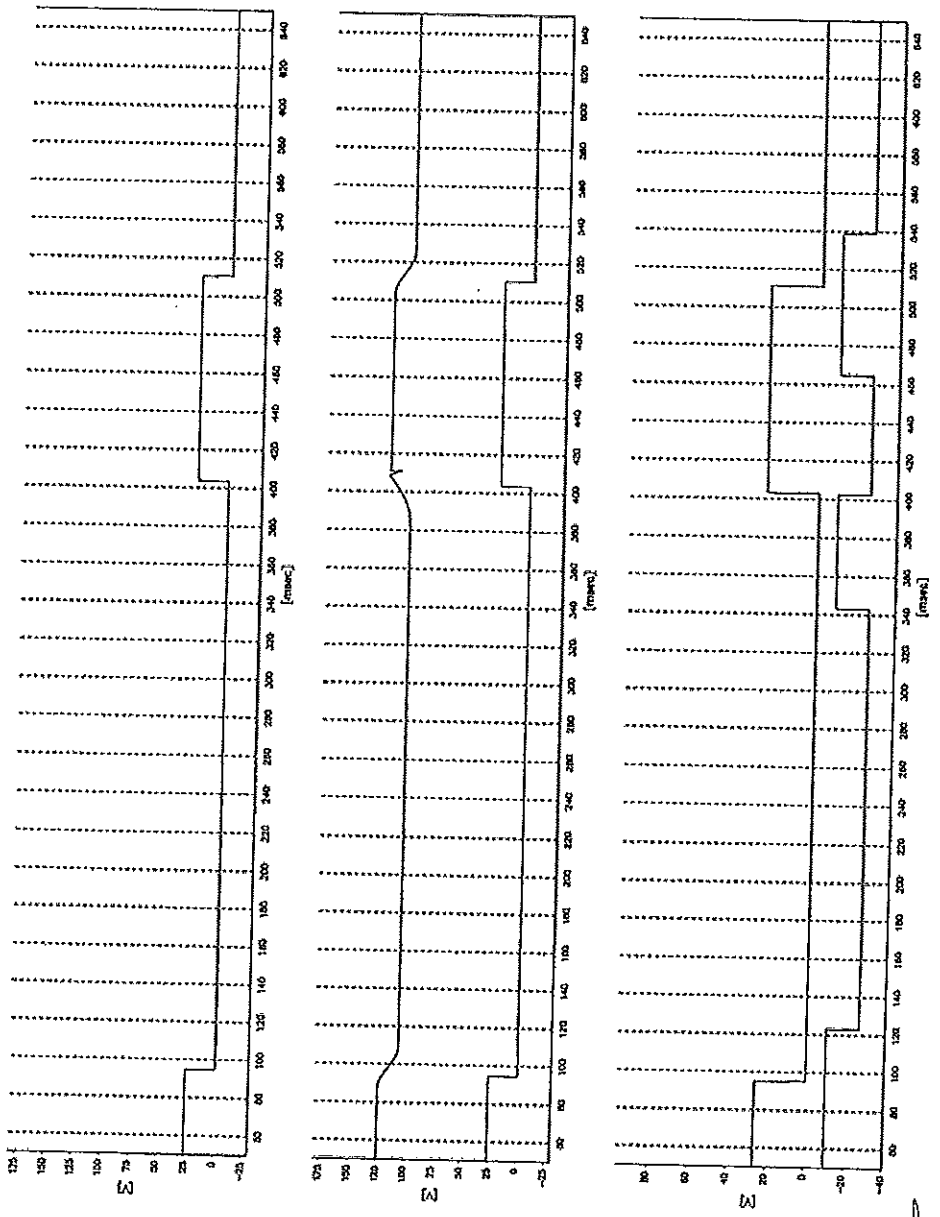
ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОУКС" ООД
ПЛОВДИВ
Табаков и сиНовЕ

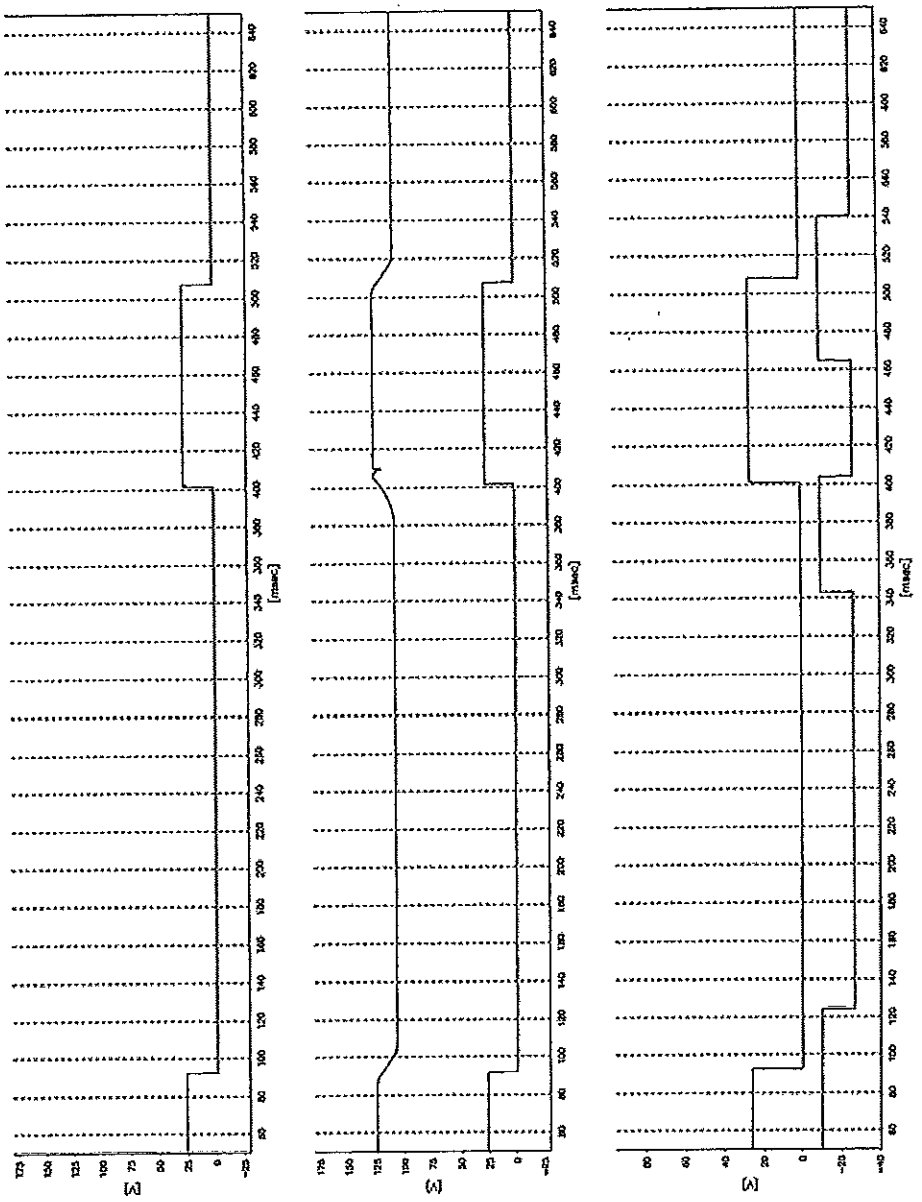
Oscillogram
PEHLA 0511Ra / 06B



Oscillogram
PEHLA 0511Ra / 31



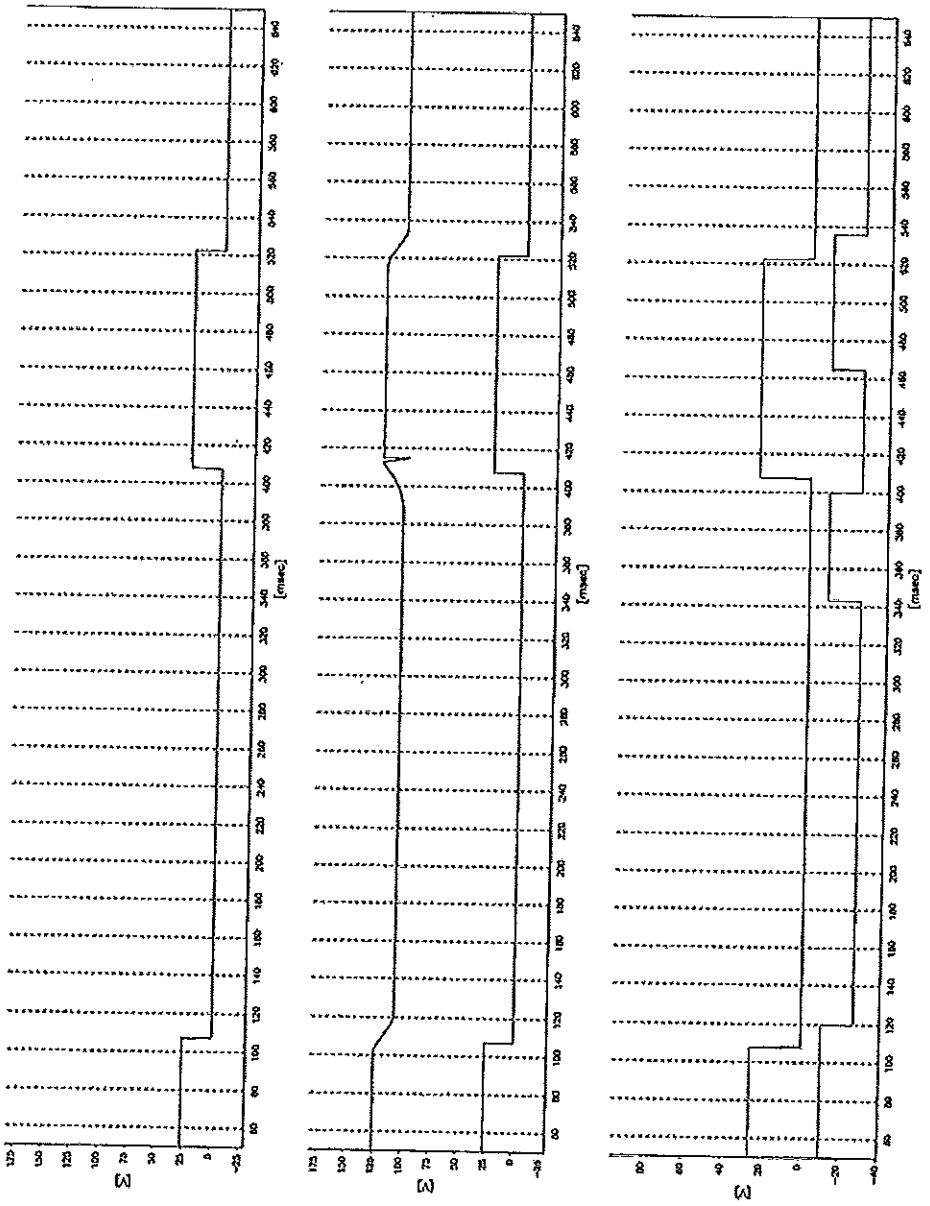
Oscillogram
PEHLA 0511Ra / 31A



ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ООД
ПЛОВДИВ
"Табакови синове"

Oscillogram
PEHLA 0511Ra / 31B



ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ПЛОВДИВ „Табакови синове" ООД

Test Results
Voltage Test as a Condition Check

Test performed: Voltage test as a condition check according to IEC 62271-100 Subcl. 6.2.11

Date of test: 10th March 2005

Condition of test object before test: As after test PEHLA 0511Ra / 31

Test arrangement: High voltage test transformer connected to the contact arms of the circuit-breaker

Connections to test object: Connection of high voltage to one contact arm of the open poles via copper wire Ø 0.5 mm, the other contact arm earthed via copper wire Ø 0.5 mm

Test arrangement			Test voltage	Result
Condition	Voltage applied to	Earthed	kV	
-	-	-	40.0 – 1 min	ok
-	-	-	50.0 – 1 min	ok

Remarks: -

Condition of test object after test: No visible or functional change or damage.

ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ООД ПЛОВДИВ Табаков и синове

Measurement of the Resistance of the Main Circuit

Test performed: Measurement of the Resistance of the Main Circuit

Date of test: 09th March 2005

Condition of test object: As after Test PEHLA 0511Ra / 06.

Measurement before test No. PEHLA 0511Ra / 07			
Ambient air temperature: 21.0 °C			
Resistance measurement at direct current of: 100 A (d.c.)			
Measurement between points (see sheet 70)	Resistance of the main circuit μΩ		
	L1	L2	L3
1 - 2	26.2	27.1	26.2
-	-	-	-
-	-	-	-

Remarks: -

Date of test: 10th March 2005

Condition of test object: As after Test PEHLA 0511Ra / 30.

Measurement after test No. PEHLA 0511Ra / 31			
Ambient air temperature: 21.0 °C			
Resistance measurement at direct current of: 100 A (d.c.)			
Measurement between points (see sheet 70)	Resistance of the main circuit μΩ		
	L1	L2	L3
1 - 2	32.2	36.8	29.7
-	-	-	-
-	-	-	-

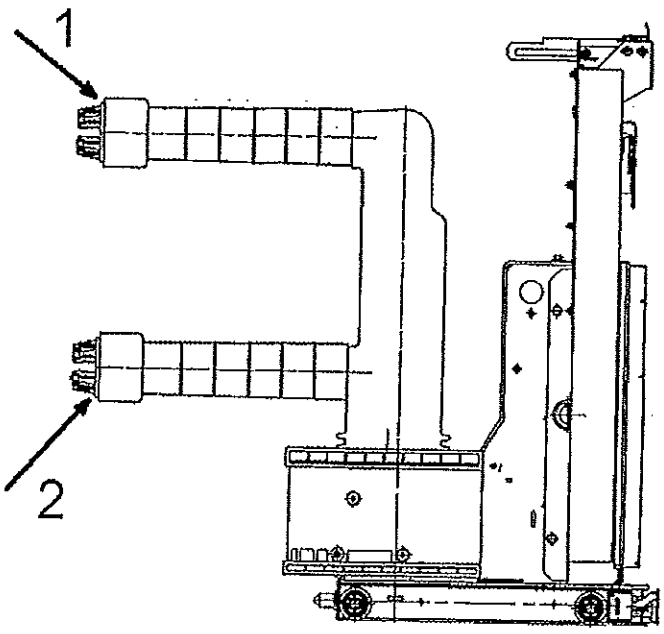
Remarks: -

ВЯРНО С ОРИГИНАЛА

"ЕЛЕКТРОЛУКС" ООД "Табаков и синове" ПЛОВДИВ

Measurement of the Resistance of the Main Circuit

Measurement points



Photos

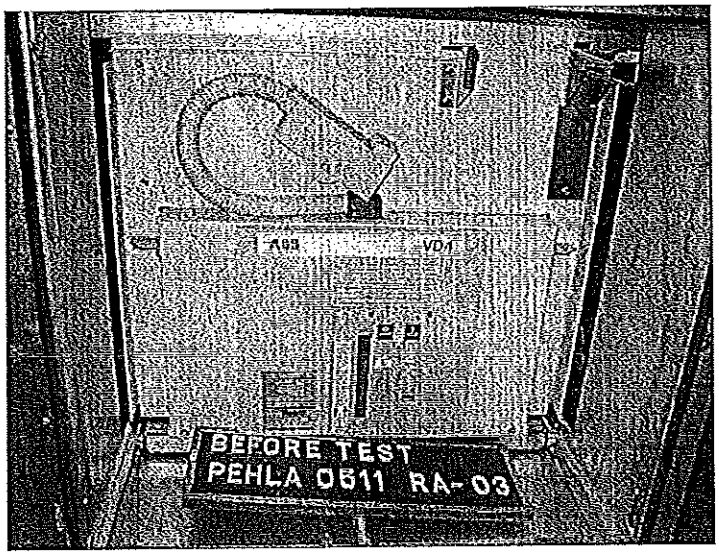


Photo No. 01
Before Test no. PEHLA 0511Ra / 03

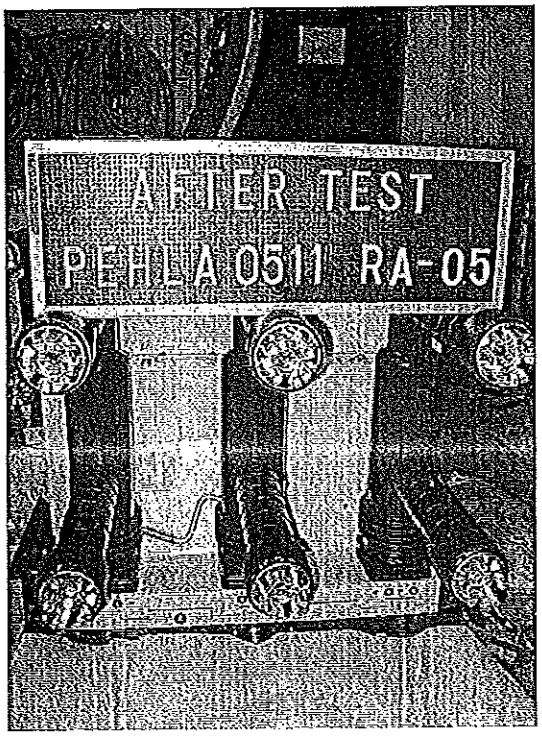


Photo No. 02
After Test no. PEHLA 0511Ra / 05

ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ООД ПЛОВДИВ Табаков и синове

Photos

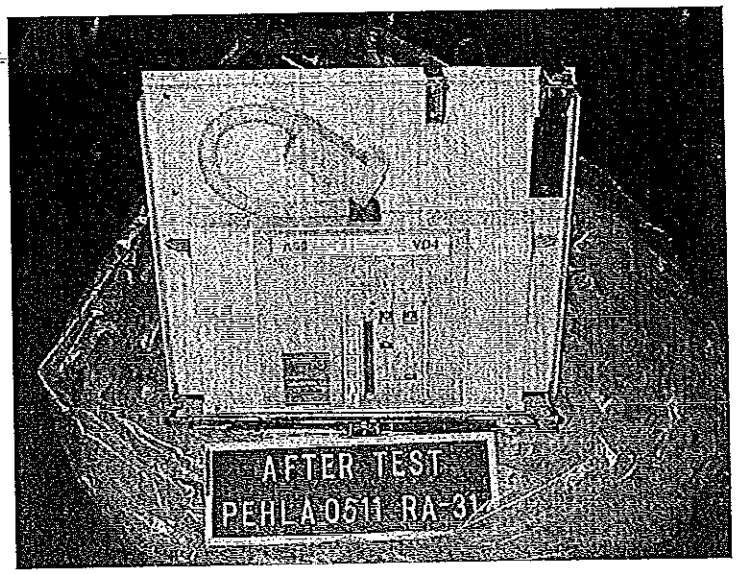


Photo No. 03
After Test no. PEHLA 0511Ra / 31

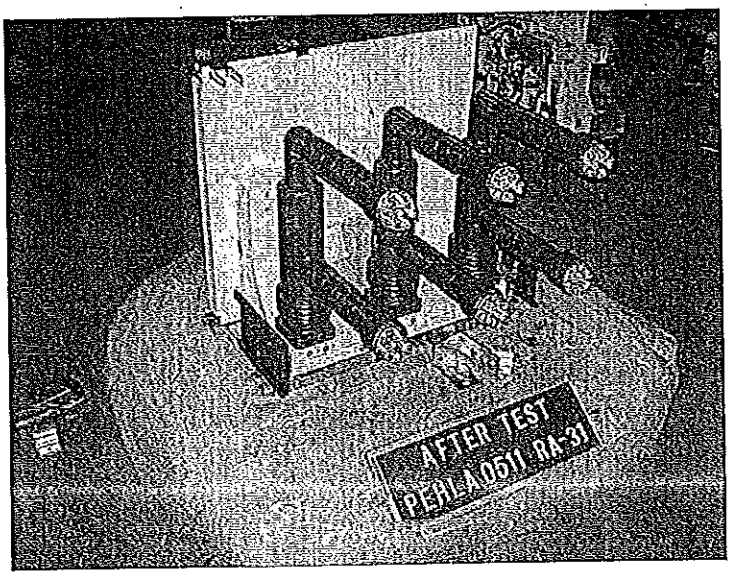


Photo No. 04
After Test no. PEHLA 0511Ra / 31

PEHLA

GESELLSCHAFT FÜR ELEKTRISCHE HOCHLEISTUNGSPRÜFUNGEN
Member of the Short-Circuit-Testing Liaison (STL)

Test Report

Report No.: 0045 Ra **Copy No.:** 0 **Contents:** 19 Sheets

Equipment under test:	Metal-clad air-insulated switchgear panel type ZS1.2, rated voltage 24 kV, drawing-no. GCE 8010459 R0104, with vacuum circuit-breaker type VD4P 2420-25.
Manufacturer:	ABB Calor Emag Mittelspannung GmbH, D-40472 Ratingen, Germany
Client:	ABB Calor Emag Mittelspannung GmbH, D-40472 Ratingen, Germany
Testing station:	PEHLA - Testing Station Ratingen
Date of test:	28th November 2000
Applied test specifications:	IEC 60298: 1990-12, clauses 6.1.1, 6.1.3 - 6.1.7, IEC 60694: 1996-05, clauses 6.2.1, 6.2.3 - 6.2.6.
Tests performed:	Dielectric type test. Standard lightning impulse withstand voltage test at 125 kV and power-frequency withstand voltage test at 50 kV to earth, between phases and across open switching device.
Test results:	The ZS1.2-type panel passed the dielectric type test successfully. The respective requirements are met.

GESELLSCHAFT FÜR ELEKTRISCHE HOCHLEISTUNGSPRÜFUNGEN

Technical Committee

Mannheim, 07th December 2000

ВЯРНО С ОРИГИНАЛА

Accreditation

The PEHLA-Testing Station Ratingen has been approved by the DATech (German accreditation body for technology) according to DIN EN 45001 for tests in the field of high-voltage switchgear and controlgear and power engineering equipment (Registration-No. DAT-P-032/93).

Under reference to DIN EN 45001 PEHLA states the following:

- The accreditation of the PEHLA-Testing Station or any of its test reports by themselves in no way constitute or imply product approval by DATech or any other body.

- If someone refers to a test in an accredited PEHLA-Testing Station this reference shall include the accreditation body, i.e. DATech, the relevant scope of the accreditation and the appropriate registration number.

STL-Member

PEHLA is foundation-member of the Short-Circuit Testing Liaison (STL) which has been founded in March 1969. STL is a forum for the international cooperation of the testing organisations with the further full members ASTA (GB), CESI (I), ESEF (F), KEMA (NL), SATS (N; S, SF) and STLNA (USA). In the framework of EC, STL has been recognised in 1992 by EOTC as agreement group.

PEHLA-Documents

A Certificate

is issued for type tests which have successfully been carried out in full compliance with the relevant specifications or standards and STLGuides valid at the time of the test.
For these tests the equipment under test must be clearly identified by technical description, drawings and additional specifications.

A Test Document

is issued for parts of type tests which have successfully been carried out in full compliance with the relevant specifications or standards and STL Guides valid at the time of test.
For these tests the equipment under test must be clearly identified by technical description, drawings and additional specifications.

A Test Report

is issued for all other tests which have been carried out according to specifications, standards or "PEHLA-Richtlinien" (PEHLA Guides) and/or clients instructions.
Similarly, this test report contains all test results, details of the conditions under which the tests were carried out, also details relating to the behaviour of the equipment during test, and its condition after the tests.

Addresses:

Office:	PEHLA-Geschäftsstelle Hallenweg 40 D-68219 Mannheim
Testing Station:	PEHLA-Testing Station Ratingen Oberhausener Str. 33 D-40472 Ratingen
Manufacturer:	ABB Calor Emag Mittelspannung GmbH Oberhausener Str. 33 D-40472 Ratingen
Client:	ABB Calor Emag Mittelspannung GmbH Oberhausener Str. 33 D-40472 Ratingen

ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛЮКС" ООД „Табаков и синове" ПЛОВДИВ

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ЕЛЕКТРОЛУКС "Табаков и синове" ООД ПЛОВДИВ

List of Test Participants

Representatives of the Test Committee:

Mr. A. Meier	PEHLA- Testing Station Ratingen
Mr. W. Stolz	PEHLA- Testing Station Mannheim

Test Engineer:

Mr. U. Lisseck	PEHLA- Testing Station Ratingen

Other Participants: -

ВЯРНО С ОРИГИНАЛА

Technical Data of Test Object

Switchgear

Ratings assigned by the manufacturer

Test Object: Metal-clad air-insulated switchgear panel
Type: ZS1.2
Manufacturer: ABB Calor Emag Mittelspannung GmbH, D-40472 Ratingen, Germany
Serial-No.: 07550027/2017/00 **Year of manufacture:** 2000
Drawing No.: GCE8010459 R0104 index 00

Rated voltage	24 kV
Rated lightning impulse withstand voltage	125 kV
Rated switching impulse withstand voltage	- kV
Rated power frequency withstand voltage	50 kV
Rated frequency	50/60 Hz
Rated normal current of busbar	2500 A
Rated normal current of tee-off	2500 A
Rated peak withstand current	63 kA
Rated short-time withstand current	25 kA
Rated duration of short-circuit	3 s
Insulating medium	air
Rated operating pressure (abs./20 °C)	- kPa
Minimum operating pressure (abs./20 °C)	- kPa
Permissible values for internal arc faults:	
Peak current	63 kA
Short-time current	25 kA
Duration of short-circuit	1 s
Max. ambient air temperature	40 °C

The above switchgear panel is fully described in the mentioned drawings.

Essential characteristics and installed devices:

-- busbar 2 x 80 mm x 10 mm / R 5 mm, Cu, insulated, with bushing plate (left and right).
-- busbar tee-off conductor 2 x 100 mm x 10 mm / R 5 mm, Cu, insulated.
-- tulip insulator with contact pin Ø = 79 mm.
-- current transformer type TPU 65.11, manufacturer: ABB, serial-no. L1: 058 246; L2: 058 247; L3: 058 248.
-- earthing switch type EK6 2406-275, serial-no. 06/050/00.
-- cable conductor 2 x 100 mm x 10 mm / R 5 mm, Cu, bare.

Date of receipt of test object: 27th November 2000

ВЕРНО С ОРИГИНАЛА

ЕЛЕКТРОЛУКС ПЛОВДИВ "Табаков и синове" ООД

Technical Data of Test Object

Switching Device - Circuit-Breaker

Ratings assigned by the manufacturer

Test Object:	Vacuum circuit-breaker
Type:	VD4P 2420-25
Manufacturer:	ABB Calor Emag Mittelspannung GmbH, D-40472 Ratingen, Germany
Serial-No.:	7008269/4002/00 **Year of manufacture:** 2000
Drawing No.:	GCE 7000162 R1104 index 00 (circuit-breaker)
Vacuum interrupter:	Type VG4S, L1: No. 00G4S01196, L2: No. 00G4S01192, L3: No. 00G4S01194
Drawing No.:	GCE 7005535 R0102 index 02 (interrupter)

Rated voltage	24	kV
Rated lightning impulse withstand voltage	125	kV
Rated switching impulse withstand voltage	-	kV
Rated power frequency withstand voltage	50	kV
Rated frequency	50/60	Hz
Rated normal current	2000	A
Rated peak withstand current	63	kA
Rated short-time withstand current	25	kA
Rated duration of short-circuit	3	s
Rated short-circuit breaking current	25	kA
D.C. component	30	%
Rated short-circuit making current	63	kA
Rated transient recovery voltage:		
Peak value	41	kV
Rate of rise	0.47	kV/µs
First-pole-to-clear-factor	1.5	
Rated operating sequence	O-0.3 s –CO-3 min-CO	
Arc extinguishing medium	Vacuum	
Number of poles	3	
Number of units per pole	1	
Rated opening time	≤ 45	ms
Rated closing time	approx. 60	ms
Rated voltage of trip coil	220	V-DC
Rated voltage of closing coil	220	V-DC
Rated supply voltage	220	V-DC
Rated frequency of supply voltage	-	Hz
Max. ambient air temperature	40	°C
Further specifications:	-	

Essential characteristics: -

Date of receipt of test object: 27th November 2000

ВЯРНО С ОРИГИНАЛА

ЕЛЕКТРОЛУКС "Табакови и синове" ООД ПЛОВДИВ

List of Drawings

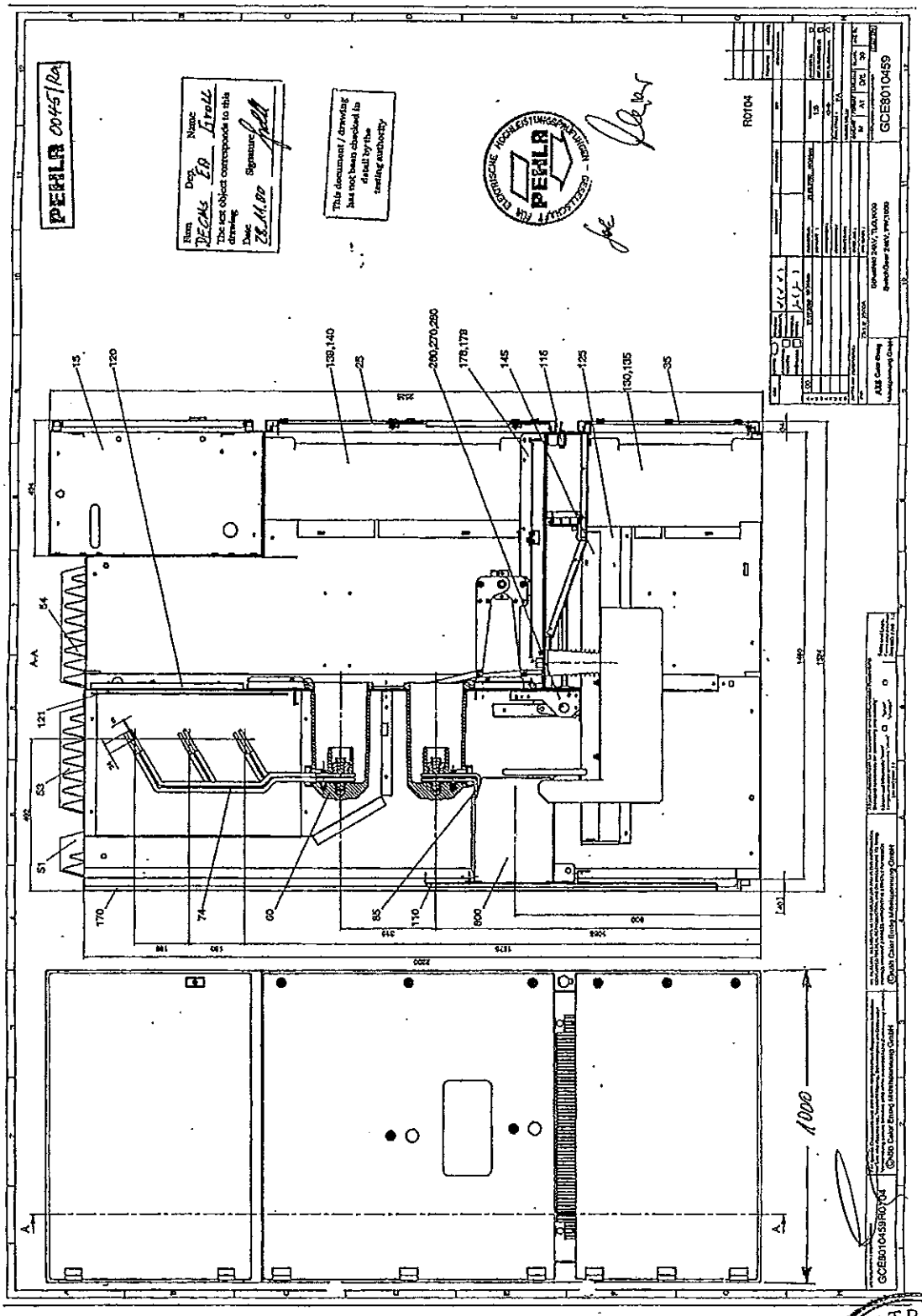
The manufacturer has guaranteed, that the equipment submitted for test has been manufactured in full accordance with the following drawings. PEHLA has verified that these drawings adequately represented the equipment tested. These drawings have been stamped and signed by PEHLA representatives and are kept
☒ with the test documents at the test laboratory.
☐ at the client.

A copy of the following drawings is part of this Test Report.

Drawing-No.	Index	Title	Additional remarks
GCE 8010459 R0104	00	SwitchGear 24kV; PW.1000	-
GCE 8012050 R0101	01	Cable connecting bar system 2500A	-
GCE 7000162 R1104	00	Einschub für ZS1.2 24kV VD4P 2420..25	-

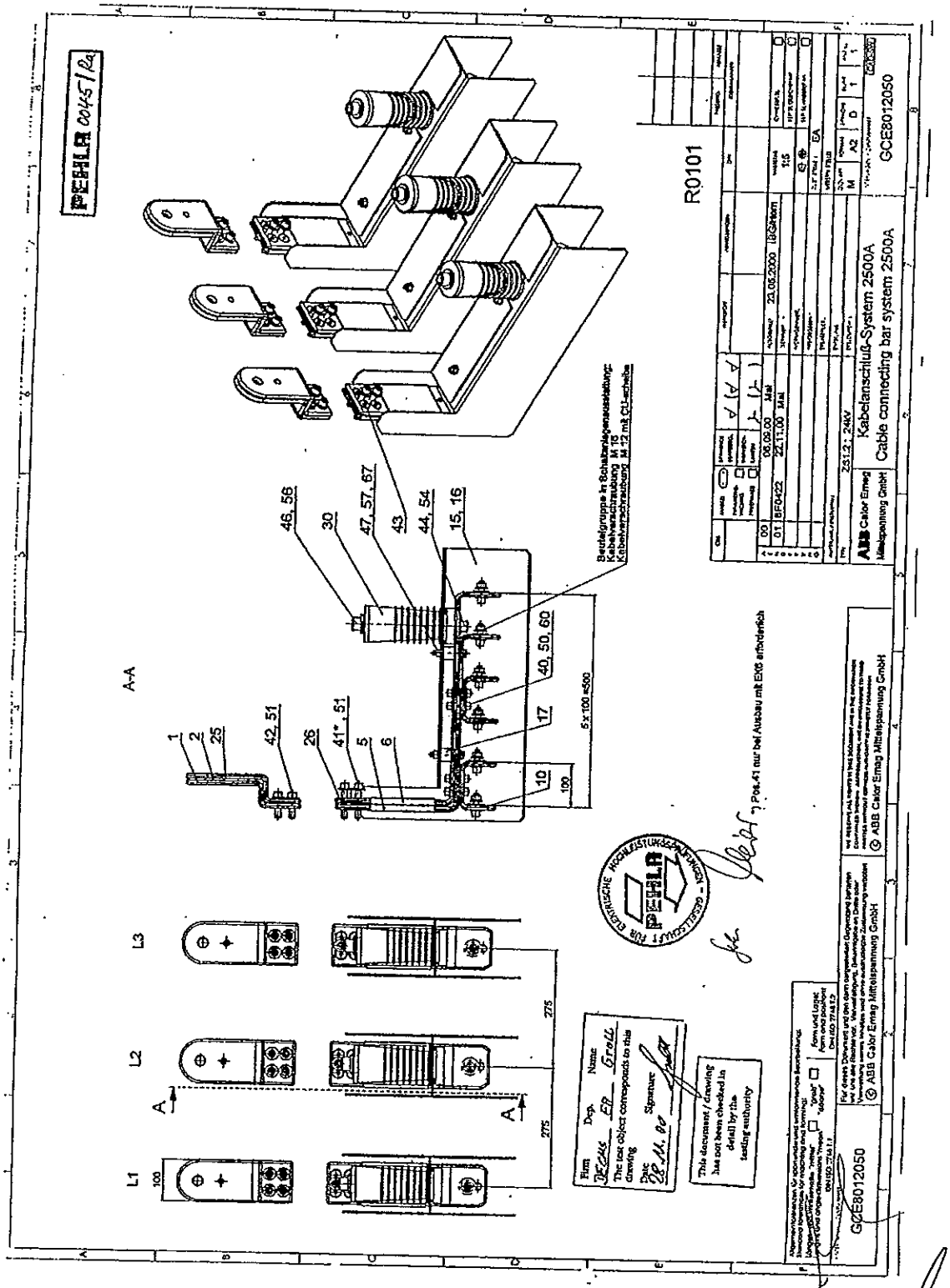
ВЯРНО С ОРИГИНАЛА

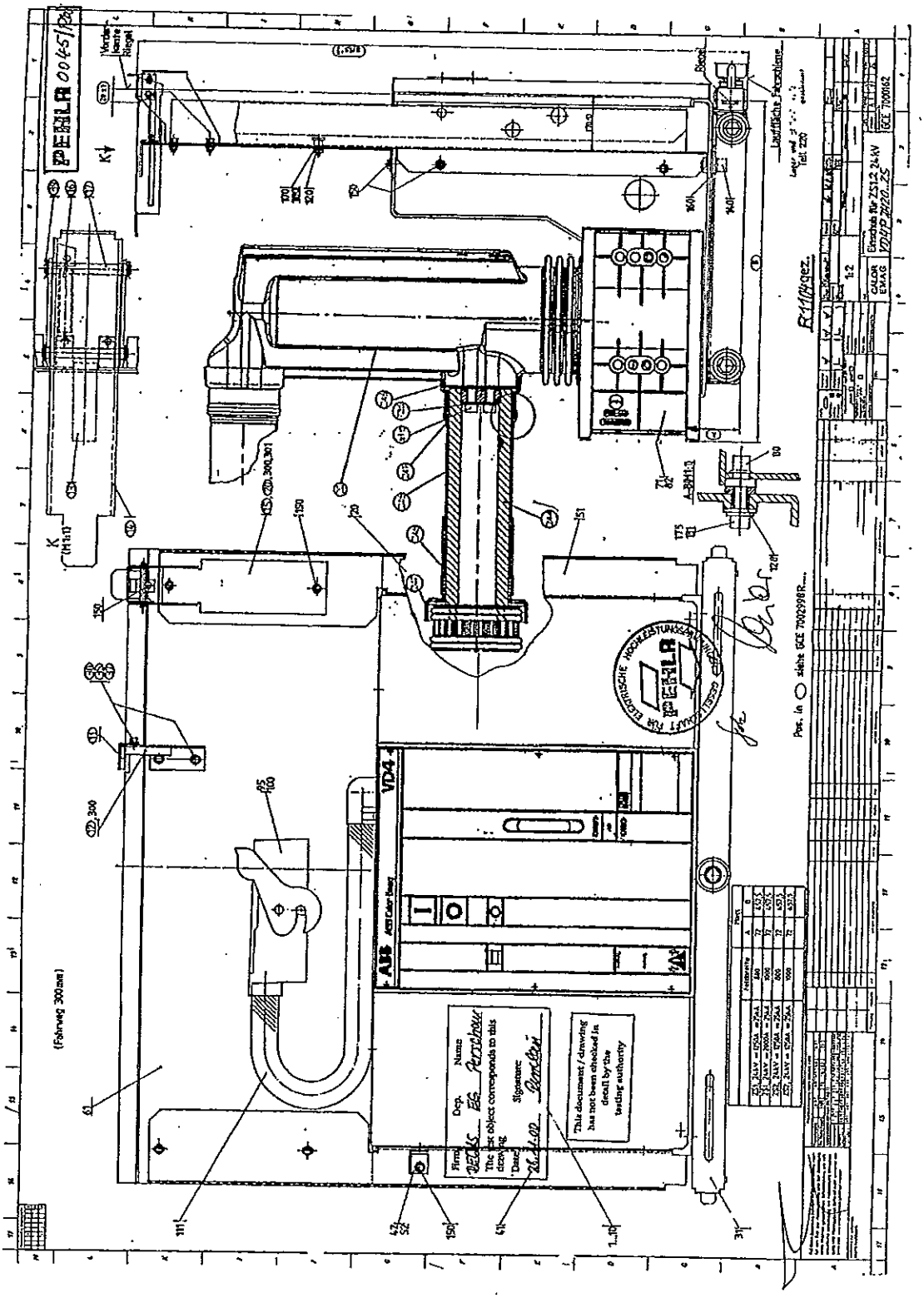
„ЕЛЕКТРОЛУКС" „Табакови синове" ООД ПЛОВДИВ



ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ООД ПЛОВДИВ „Табаков/ул. синове"


PEHLA 0045/Ra
R0101
GCE8012050
Kabelanschluß-System 2500A
Cable connecting bar system 2500A
ABB Calor Emag Mittelspannung GmbH
A-A
L1
L2
L3
46, 56
30
47, 57, 67
43
44, 54
15, 16
40, 50, 60
17
10
5x100=500
1
2
25
42, 51
26
41*, 51
5
6
*) Pos.41 nur bei Ausbau mit EN5 erforderlich
GESELLSCHAFT FÜR ELEKTRISCHE HOCHLEISTUNGSPRÜFUNGEN
PEHLA
This document / drawing has not been checked in detail by the testing authority
ВЯРНО С ОРИГИНАЛА
ЕЛЕКТРОСЪЮКС
ПЛОВДИВ
„Табаков и синове" ООД

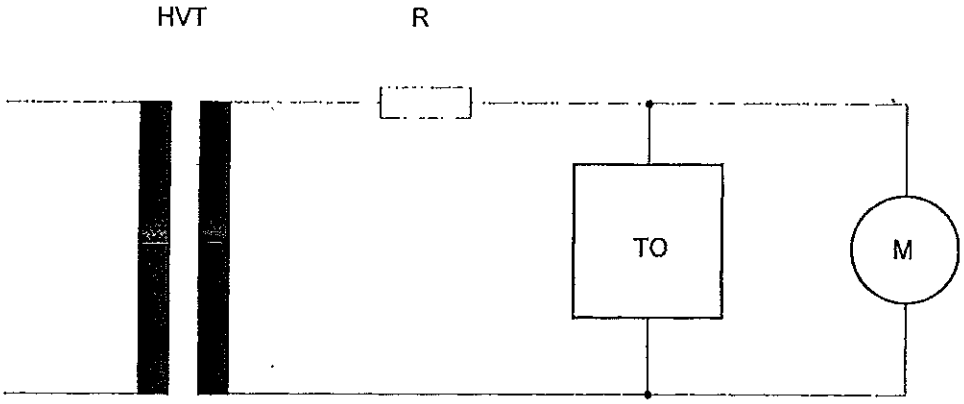


ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОУКС" ООД
ПЛОВДИВ
„Табаков и синове"

Technical Data of Test Circuit

Power Frequency Voltage



Technical Data

HVT - High Voltage Test Transformer: Type TEO 250/20, serial-no. 268 734, manufacturer: Meßwandler-Bau, Bamberg

Rated Voltage	260	kV
Rated Capacity	50	kVA
Short Circuit Impedance	14.6	%

TO - Test Object: ZS1.2/24 kV-type panel, 2500 A

M - Voltage Measurement: Capacitive Divider Type CM 300 (Ident-No. ELK-000994) in connection with a Peak Voltmeter Type DMI 551/Haefely (Ident-No. ELK-000989)

Verification of Calibration:

- Capacitive Divider (Ident-No. ELK-000994, ELK-000990, ELK-000992): calibrated on April 1998 at DEACE/LH, Calibration Report-No. 9800086.

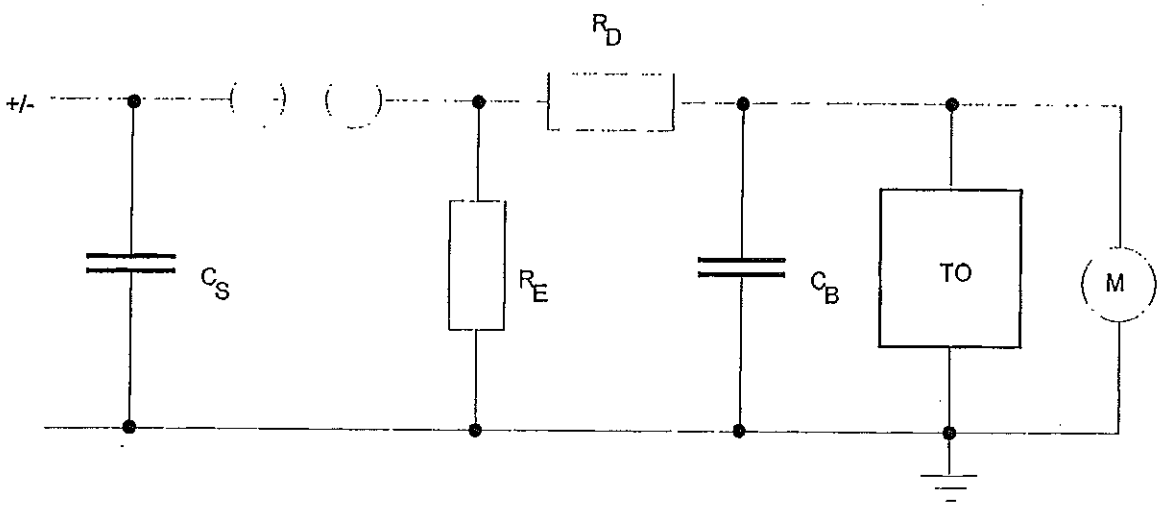
- Peak Voltmeter Typ DMI 551 (Ident-No. ELK-000989): calibrated on April 2000 at DECMS/LK, Calibration Report No. 2000353.

ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ООД ПЛОВДИВ „Табаковец синове"

Technical Data of Test Circuit

Lightning Impulse Voltage 1.2/50



Technical Data

Impulse Generator Type SGS-200/6, WO: 513809, manufacturer: Haefely

Maximum Charging Voltage	U_Σ	=	200 kV
Number of Stages	n	=	2
Surge Capacity per Stage	C_S	=	600 nF
Load Capacitance	C_B	=	1000 pF
Damping Resistance	R_D	=	$R_{SI} + R_{SE}$
Internal Front Resistance per Stage	R_{SI}	=	20 Ω
External Front Resistance	R_{SE}	=	300 Ω
Discharge Resistance	R_E	=	2 R_P
Tail Resistance per Stage	R_P	=	115 Ω

TO - Test Object: ZS1.2/24 kV-type panel, 2500 A

M - Voltage Measurement: Capacitive Divider Type CS 200 SPZ (Ident-No. ELK-000893, ELK-000894) in connection with a Peak Voltmeter Type DMI 551/ Haefely (Ident-No. ELK-000989) and Oscilloscope Type TDS520 (Ident-No. ELK-000545).

Verificatin of Calibration:

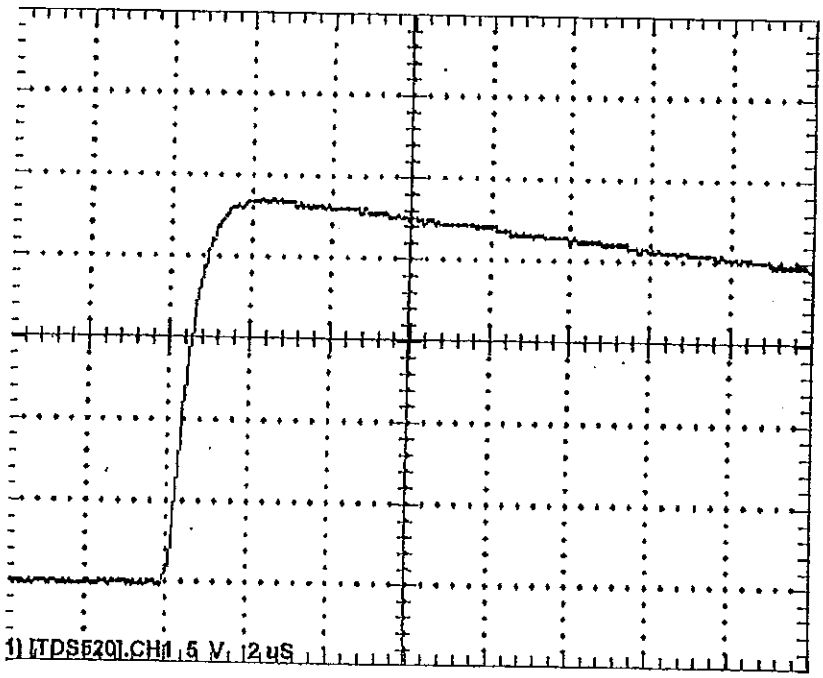
- Capacitive Divider (Ident-No. ELK-000893, ELK-000894, ELK-000922, ELK-001074): Calibrated in February 1998 at FGH Mannheim, FGH-Calibration-Report-No. 050 DKD-K-15901 98-02.
- Peak Voltmeter Type DMI 551 (Ident-No. ELK-000989): Calibrated in Mai 2000 at FGH Mannheim, FGH-Calibration-Report-No. 073 DKD-K-15901 00-05.
- Oscilloscope Type TDS520 (Ident-No. ELK-000545): calibrated in March 2000 at DECMS/LK, Calibration-Report-No. 2000297.

ВЯРНО С ОРИГИНАЛА

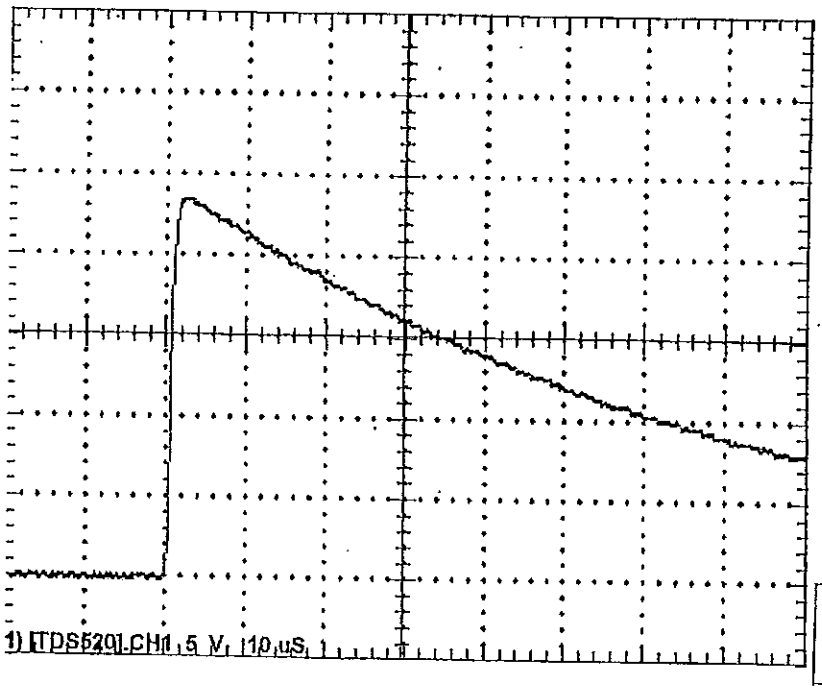
„ЕЛЕКТРОЛУКС" ООД ПЛОВДИВ „Табаков и синове"

Lightning Impulse Voltage with the Test Object connected

(Standard Value: 1.2 ± 30 % / 50 ± 20 % / peak ±3 %)



T_1 = 1.26 µs



T_2 = 51.0 µs

ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ООД
ПЛОВДИВ
"Табаков и синове"

Atmospheric Conditions during Tests

Date of test: 28th November 2000

IEC17A/567/Q: Corrigendum to subclause 6.2.1 of IEC60694, 2000-01 (Indices: ~ power frequency voltage; + positive lightning impulse voltage; - negative lightning impulse voltage)							
Input data				Correction factors		calculated	applied
air temperature t:		19.5	°C	air density correction factors	$k_{1\sim}$:	1.006	-
air pressure b:		1017	hPa		k_{1+}:	1.006	-
air humidity h:		7.212	g/m³		k_{1-} :	1.006	-
50% disruptive-discharge voltages	$U_{B\sim}$:		kV	air humidity correction factors	$k_{2\sim}$:	0.954	-
	U_{B+}:		kV		k_{2+}:	0.962	-
	U_{B-}:		kV		k_{2-} :	0.962	-
minimum discharge path L:			m	atmospheric correction factors	$K_{t\sim}$:	0.960	0.960
					K_{t+} :	0.967	0.967
					K_{t-} :	0.967	0.967

ВЯРНО С ОРИГИНАЛА

ЕЛЕКТРОЛУКС ООД ПЛОВДИВ "Табаков и синове"

Lightning Impulse Voltage Test
Power Frequency Voltage Test

Test performed: Test of insulation phase-to-phase, phase-to-ground and against shutter.

Date of test: 28th November 2000

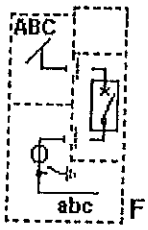
Condition of test object before test: Factory new, clean and dry.

Connections to test object: For further details see the entry in column 'Condition'

Front time T_1: 1.26 µs Time to half-value T_2: 51.0 µs Test frequency f: 50 Hz

All voltage values are corrected with the applied atmospheric correction factor.
The applied test voltages refer to the standard atmosphere of 20 °C, 1013 hPa and 11 g/m³.

Test Arrangement 1:



Condition	Voltage applied to	Earthed	Applied power frequency voltage ~ kV Applied lightning impulse voltage ± kV	Result Test duration or number of impulses / breakdowns
Vacuum circuit-breaker in test position, shutters closed. Infeed of the test voltage at the led-out busbar right hand.	A	BCabcF	50 +125 -125	1 minute/0 15/0 15/0
	B	ACabcF	50 +125 -125	1 minute/0 15/0 15/0
	C	ABabcF	50 +125 -125	1 minute/0 15/0 15/0
Vacuum circuit-breaker in test position, shutters closed. Infeed at the cable connecting bar in the cable compartment.	a	ABCbcF	50 +125 -125	1 minute/0 15/0 15/0
	b	ABCacF	50 +125 -125	1 minute/0 15/0 15/0
	c	ABCabF	50 +125 -125	1 minute/0 15/0 15/0

Remarks: A,a = Phase L1, B,b = Phase L2, C,c = Phase L3, F = Frame

Lightning Impulse Voltage Test
Power Frequency Voltage Test

Test performed: Test of insulation phase-to-phase, phase-to-ground and across open switching device.

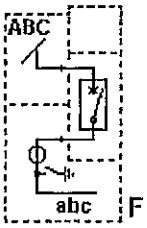
Date of test: 28th November 2000

Conditlon of test object before test: Factory new, clean and dry.

Connections to test object: For further details see the entry in column 'Condition'

Front time T_1: 1.26 µs Time to half-value T_2: 51.0 µs Test frequency f: 50 Hz

All voltage values are corrected with the applied atmospheric correction factor.
The applied test voltages refer to the standard atmosphere of 20 °C, 1013 hPa and 11 g/m³.

Test arrangement 2: 			Applied power frequency voltage ~ kV	Result
Condition	Voltage applied to	Earthed	Applied lightning impulse voltage ± kV	Test duration or number of Impulses / breakdowns
Vacuum circuit-breaker in service position and open. Infeed of the test voltage at the led-out busbar right hand.	A	BCabcF	50 +125 -125	1 minute/0 15/0 15/0
	B	ACabcF	50 +125 -125	1 minute/0 15/0 15/0
	C	ABabcF	50 +125 -125	1 minute/0 15/0 15/0
Vacuum circuit-breaker in service position and open. Infeed of the test voltage at the cable connecting bar in the cable compartment.	a	ABCbcF	50 +125 -125	1 minute/0 15/0 15/0
	b	ABCacF	50 +125 -125	1 minute/0 15/0 15/0
	c	ABCabF	50 +125 -125	1 minute/0 15/0 15/0

Remarks: A,a = Phase L1, B,b = Phase L2, C,c = Phase L3, F = Frame

ВЕРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ООД ПЛОВДИВ „Табакови синове"

Lightning Impulse Voltage Test
Power Frequency Voltage Test

Test performed: Test of insulation phase-to-phase and phase-to-ground.

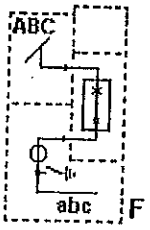
Date of test: 28th November 2000

Condition of test object before test: Factory new, clean and dry.

Connections to test object: Infeed of the test voltage at the led-out busbar right hand.

Front time T_1: 1.26 µs Time to half-value T_2: 51.0 µs Test frequency f: 50 Hz

All voltage values are corrected with the applied atmospheric correction factor.
The applied test voltages refer to the standard atmosphere of 20 °C, 1013 hPa and 11 g/m³.

Test Arrangement 3: 			Applied power frequency voltage ~ kV	Result
Condition	Voltage applied to	Earthed	Applied lightning impulse voltage ± kV	Test duration or number of impulses / breakdowns
Vacuum circuit-breaker in service position and closed	Aa	BCbcF	50 +125 -125	1 minute/0 15/0 15/1
	Bb	ACacF	50 +125 -125	1 minute/0 15/0 15/0
	Cc	ABabF	50 +125 -125	1 minute/0 15/0 15/0

Remarks: A,a = Phase L1, B,b = Phase L2, C,c = Phase L3, F = Frame

ВЯРНО С ОРИГИНАЛА

ЕЛЕКТРОНИКС ООД "Табаков и синове" ПЛОВДИВ

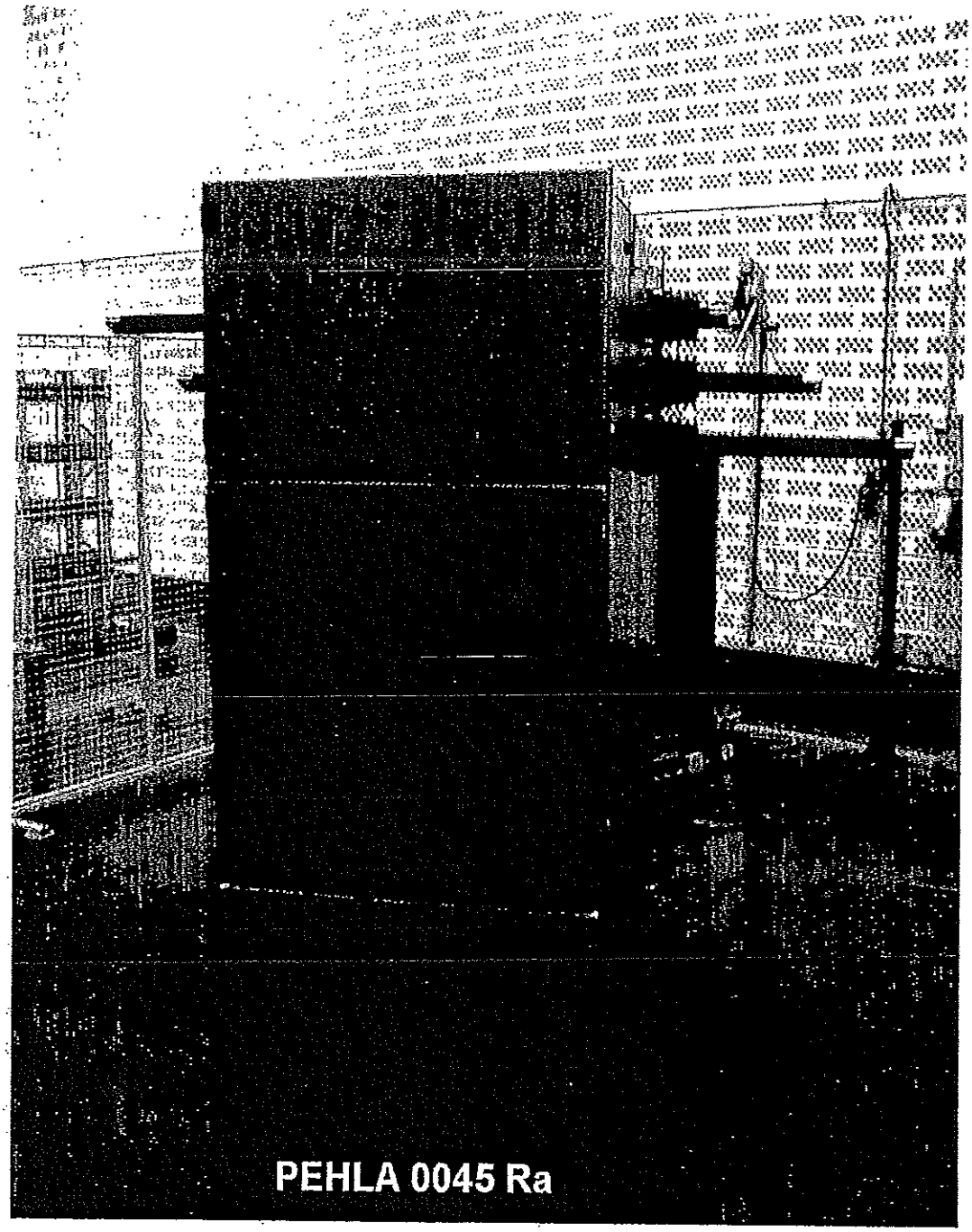


Fig. 1: ZS1.2 / 24 kV-type panel

ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ООД
ПЛОВДИВ
"Табаков и синове"

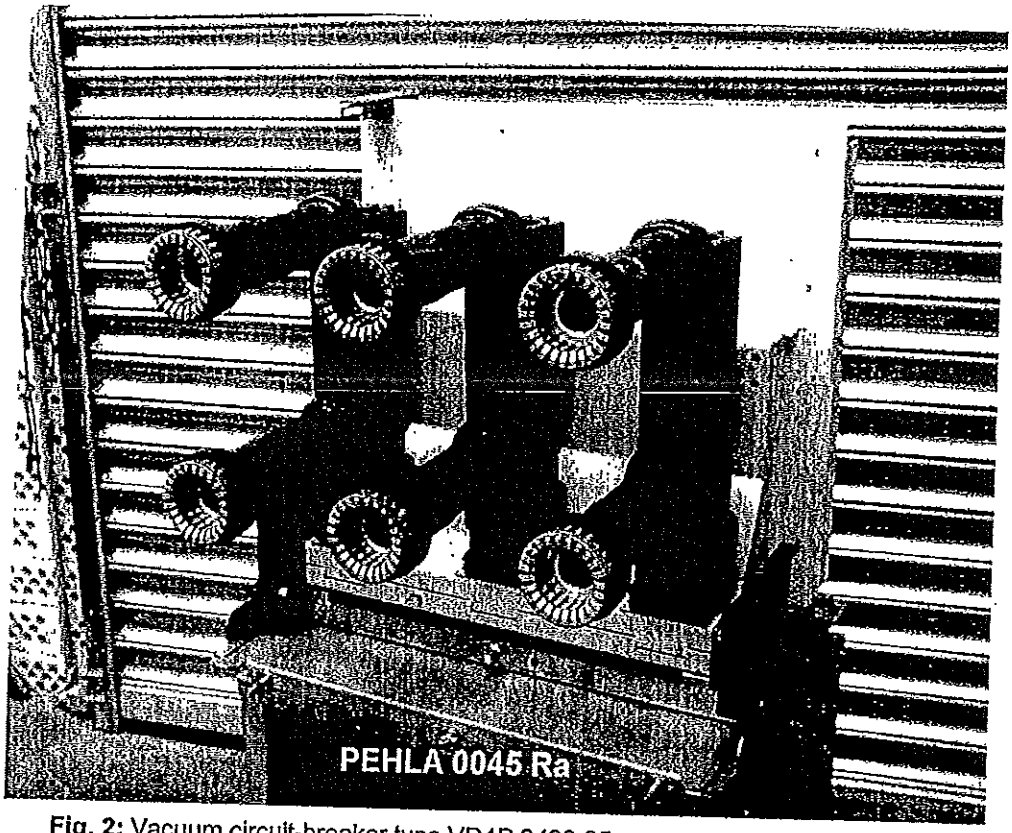


Fig. 2: Vacuum circuit-breaker type VD4P 2420-25

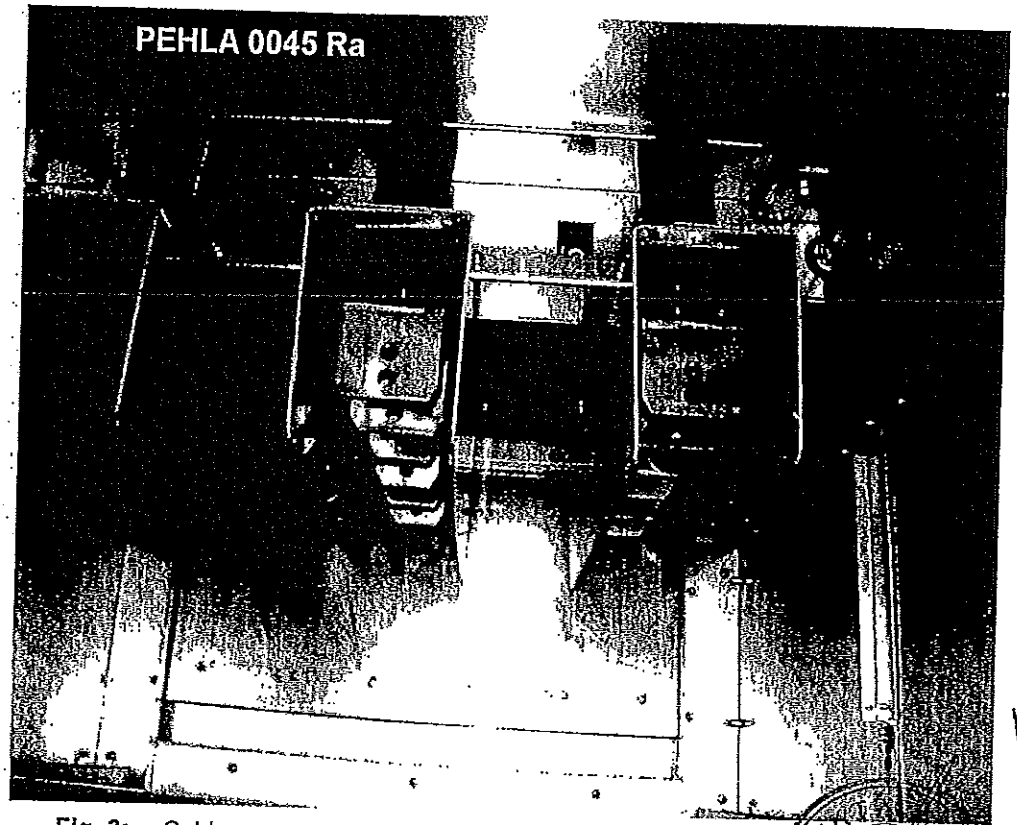


Fig. 3: Cable compartement

ВЯРНО С ОРИГИНАЛА

Приложение 1.3 - Акредитация

ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ООД
ПЛОВДИВ
„Табаков и синове"

ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO

Membro degli Accordi di Mutuo Riconoscimento EA, ILAC e IAF
Signatory of EA, ILAC and IAF Mutual Recognition Agreements

CERTIFICATO DI ACCREDITAMENTO
Accreditation Certificate

Accreditamento n° / *Accreditation n°* **0253** Rev. **1**

Si dichiara che / *We declare that* **ABB S.p.A. Power Products Division**
Sede/Headquarters:
Via Friuli 4 - 24044 Dalmine BG

è conforme ai requisiti della norma / *meets the requirements of the standard* UNI CEI EN ISO/IEC 17025:2005 "Requisiti generali per la competenza dei Laboratori di prova e taratura" / *EN ISO/IEC 17025:2005 "General Requirements for the Competence of Testing and Calibration Laboratories" standard*

quale / *as* **Laboratorio di Prova** / ***Testing Laboratory***

L'accreditamento attesta la competenza tecnica del Laboratorio relativamente allo scopo riportato nelle schede allegate al presente certificato. Le schede possono variare nel tempo. I requisiti gestionali della ISO/IEC 17025:2005 (sezione 4) sono scritti in un linguaggio idoneo all'attività dei Laboratori di Prova, sono conformi ai principi della ISO 9001:2008 ed allineati con i suoi requisiti applicabili.
Il presente certificato non è da ritenersi valido se non accompagnato dalle schede allegate e può essere sospeso o revocato in qualsiasi momento nel caso di inadempienza accertata da parte di ACCREDIA.
La vigenza dell'accreditamento può essere verificata sul sito WEB (www.accredia.it) o richiesta direttamente ai singoli Dipartimenti .

The accreditation certifies the technical competence of the laboratory limited to the scope detailed in the attached Enclosure. The scope may vary in the time. The management system requirements in ISO/IEC 17025:2005 (Section 4) are written in a language relevant to Testing Laboratories operations and meet the principles of ISO 9001:2008 and are aligned with its pertinent requirements.
The present certificate is valid only if associated to the annexed schedule, and can be suspended or withdrawn at any time in the event of non fulfilment as ascertained by ACCREDIA.
The in force status of the accreditation may be checked in the WEB site (www.accredia.it) or on direct request to appointed Department.

Data di 1ª emissione / *1st Issue date*	Data di modifica / *Modification date*	Data di scadenza / *Expiring date*
1999-07-08	2015-07-16	2019-07-11

Il Direttore Generale / *The General Director* (Dr. Filippo Trifiletti)

Il Direttore di Dipartimento / *Department Director* (Dr.ssa Silvia Tramontin)

Il Presidente / *The President* (Ing. Giuseppe Rossi)

Sede operativa e legale: Via Guglielmo Saliceto, 7/9 | 00161 Roma - Italy | Tel. +39 06 8440991 | Fax +39 06 8841198
info@accredia.it | www.accredia.it | Partita IVA - Codice Fiscale 10566361001

ВЯРНО С ОРИГИНАЛА

DAkkS
Deutsche
Akkreditierungsstelle

Deutsche Akkreditierungsstelle GmbH
German Accreditation Body

Entrusted according to Section 8 subsection1 AkkStelleG in connection with Section 1 subsection 1 AkkStelleGBV
Signatory to the Multilateral Agreements of
EA, ILAC and IAF for Mutual Recognition

Accreditation

The Deutsche Akkreditierungsstelle GmbH (German Accreditation Body) attests that the testing laboratory

PEHLA GbR
PEHLA-Prüffeld Ratingen
Oberhausener Straße 33, 40472 Ratingen

is competent under the terms of DIN EN ISO/IEC 17025:2005 to carry out tests in the following fields:

High-Voltage Switchgear and Controlgear,
Low-Voltage Switchgear and Controlgear Assemblies,
Current and Voltage Transformers,
Power transformers and Busbar Systems

The accreditation certificate shall only apply in connection with the notice of accreditation of 2012-05-09 with the accreditation number D-PL-12072-06 and is valid until 2017-05-08. It comprises the cover sheet, the reverse side of the cover sheet and the following annex with a total of 5 pages.

Registration number of the certificate: D-PL-12072-06-01

Frankfurt am Main, 2012-05-09

Dipl.-Ing. (FH) Ralf Egner
Head of Division 2

This document is a translation. The definitive version is the original German accreditation certificate.

See notes overleaf.

ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОМАКС" ООД
ПЛОВДИВ
„Табаков и синове"

Deutsche Akkreditierungsstelle GmbH

Office Berlin
Spittelmarkt 10
10117 Berlin

Office Frankfurt am Main
Gartenstraße 6
60594 Frankfurt am Main

Office Braunschweig
Bundesallee 100
38116 Braunschweig

The accreditation was granted pursuant to the Act on the Accreditation Body (AkkStelleG) of 31 July 2009 (Federal Law Gazette I p. 2625) and the 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 (Official Journal of the European Union L 218 of 9 July 2008, p. 30). DAkkS is a signatory to the Multilateral Agreements for Mutual Recognition of the European co-operation for Accreditation (EA), International Accreditation Forum (IAF) and International Laboratory Accreditation Cooperation (ILAC). The signatories to these agreements recognise each other's accreditations.

The up-to-date state of membership can be retrieved from the following websites:
EA: www.european-accreditation.org
ILAC: www.ilac.org
IAF: www.iaf.nu

ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO
Membro degli Accordi di Mutuo Riconoscimento EA, ILAC e IAC
Signatory of EA, ILAC and IAC Mutual Recognition Agreements

CERTIFICATO DI ACCREDITAMENTO
Accreditation Certificate

Accreditamento n° / *Accreditation n°* **0030** Rev. **2**

Si dichiara che / *We declare that* **CESI S.p.A.**
Sede/Headquarters:
Via Rubattino 54 - 20134 Milano MI

è conforme ai requisiti della norma / *meets the requirements of the standard* UNI CEI EN ISO/IEC 17025:2005 "Requisiti generali per la competenza dei Laboratori di prova e taratura" / *EN ISO/IEC 17025:2005 "General Requirements for the Competence of Testing and Calibration Laboratories" standard*

quale / *as* **Laboratorio di Prova** / ***Testing Laboratory***

L'accreditamento attesta la competenza tecnica del Laboratorio relativamente allo scopo riportato nelle schede allegate al presente certificato. Le schede possono variare nel tempo. I requisiti gestionali della ISO/IEC 17025:2005 (sezione 4) sono scritti in un linguaggio idoneo all'attività dei Laboratori di Prova, sono conformi ai principi della ISO 9001:2008 ed allineati con i suoi requisiti applicabili.
Il presente certificato non è da ritenersi valido se non accompagnato dalle schede allegate e può essere sospeso o revocato in qualsiasi momento nel caso di inadempienza accertata da parte di ACCREDIA.
La vigenza dell'accreditamento può essere verificata sul sito WEB (www.accredia.it) o richiesta direttamente ai singoli Dipartimenti .

The accreditation certifies the technical competence of the laboratory limited to the scope detailed in the attached Enclosure. The scope may vary in the time. The management system requirements in ISO/IEC 17025:2005 (Section 4) are written in a language relevant to Testing Laboratories operations and meet the principles of ISO 9001:2008 and are aligned with its pertinent requirements.
The present certificate is valid only if associated to the annexed schedule, and can be suspended or withdrawn at any time in the event of non fulfilment as ascertained by ACCREDIA.
The in force status of the accreditation may be checked in the WEB site (www.accredia.it) or on direct request to appointed Department.

Data di 1ª emissione / *1st Issue date*	Data di modifica / *Modification date*	Data di scadenza / *Expiring date*
1992-02-27	**2016-04-14**	**2020-03-09**

Il Direttore Generale / *The General Director* (Dr. Filippo Trifiletti)

Il Direttore di Dipartimento / *Department Director* (Dr.ssa Silvia Tramontin)

Il Presidente / *The President* (Ing. Giuseppe Rossi)

Mod. CA-01 rev. 01

ACCREDIA
Sede operativa e legale: Via Guglielmo Saliceto, 7/9 | 00161 Roma - Tel. +39 06 884 [illegible] Fax +39 06 884 [illegible]
info@accredia.it | www.accredia.it | Partita IVA - Codex Fiscale 10566361001

ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO
Membro degli Accordi di Mutuo Riconoscimento EA, IAF e ILAC
Signatory of EA, IAF and ILAC Mutual Recognition Agreements

CERTIFICATO DI ACCREDITAMENTO
Accreditation Certificate

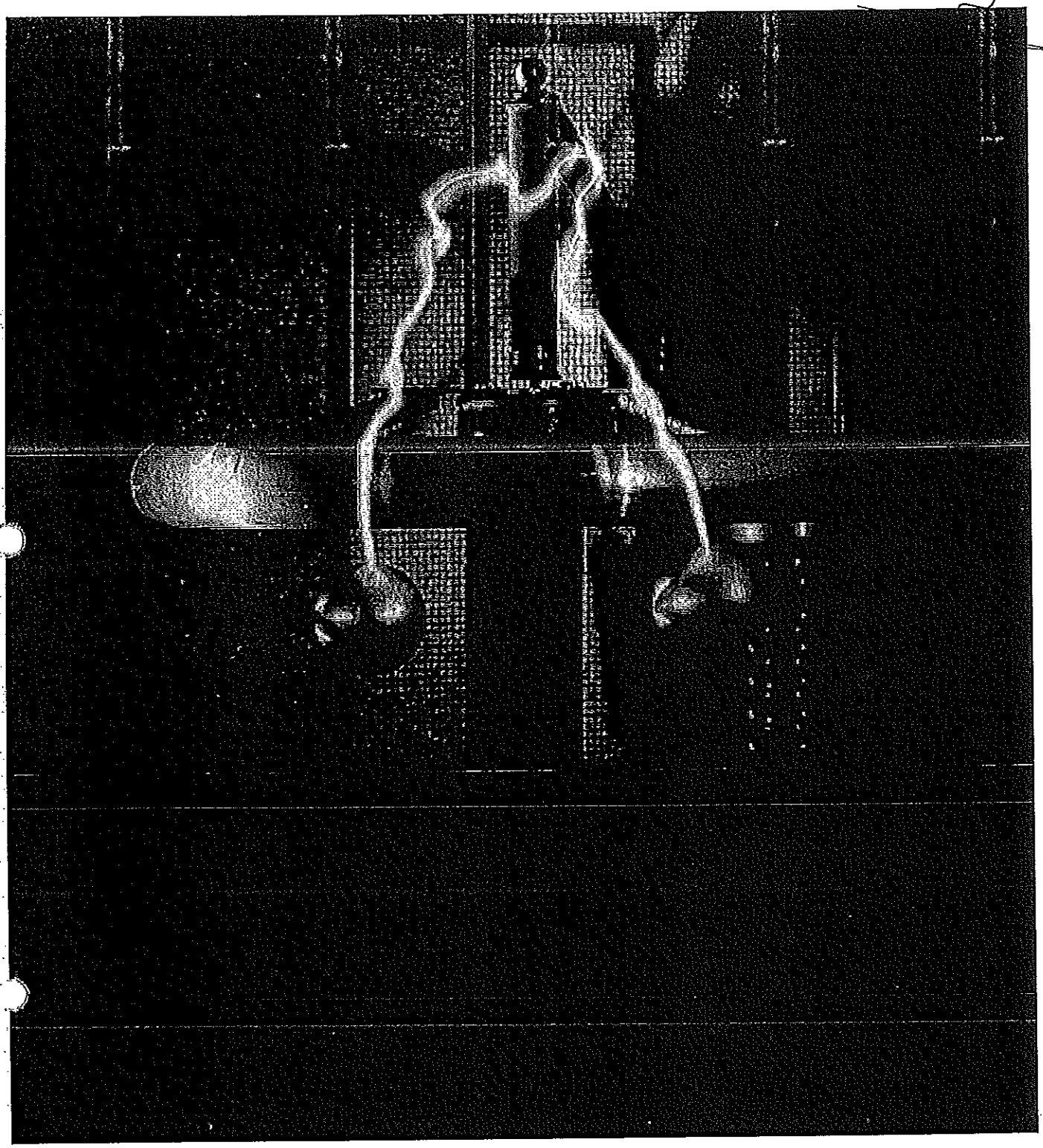
Accreditamento n° / *Accreditation n°* **0030** Rev. **2**

Si dichiara che / *We declare that*

Sedi operative:

CESI S.p.A.
Via Rubattino 54
20134 Milano MI
CESI S.p.A. - Sede di Piacenza
Via Nino Bixio 39
29100 Piacenza PC
CESI S.p.A. - Sede di Seriate
Via Pastrengo 9
24068 Seriate BG

Mod. CA-01 rev. 01



ВЯРНО С ОРИГИНАЛА

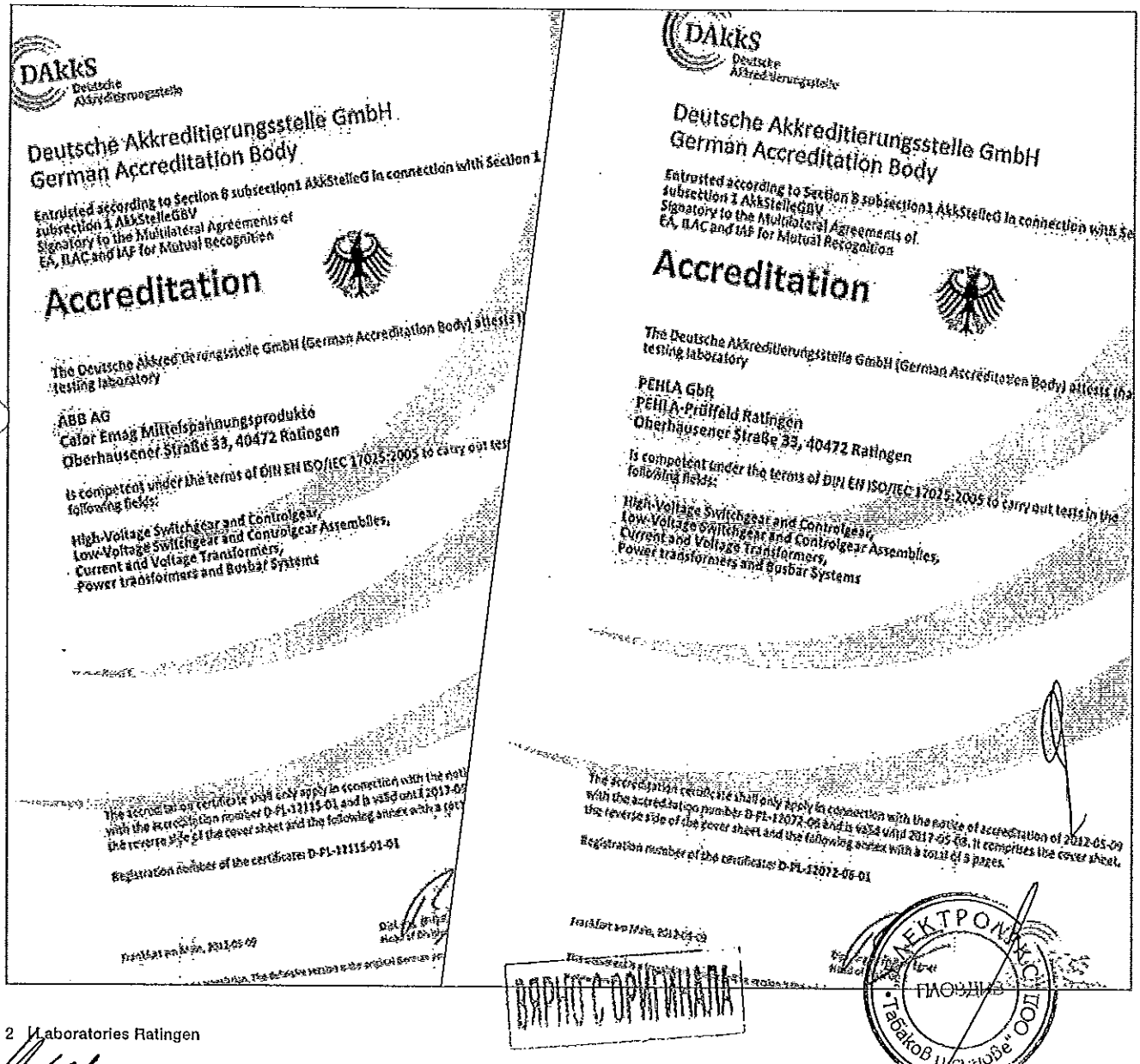
ЕЛЕКТРОЛУКС" ЕООД ПЛОВДИВ абакови и синове

Power and productivity for a better world™

ABB

Introducing Laboratories Ratingen

Since 1954, the laboratories of ABB AG – Calor Emag Medium Voltage Products have performed tests on medium voltage equipment. Our laboratories, which are located in Ratingen, Germany, contain all the facilities necessary for tests in the medium voltage range.
The ABB Laboratories Ratingen and PEHLA Testing Laboratories Ratingen are accredited by the German Accreditation Authority (DAkkS). As a shareholder of PEHLA GbR we are also a member laboratory of the Short-circuit Testing Liaison. We provide our customers with high performance and independent testing carried out in accordance with customer requirements or national and international standards.

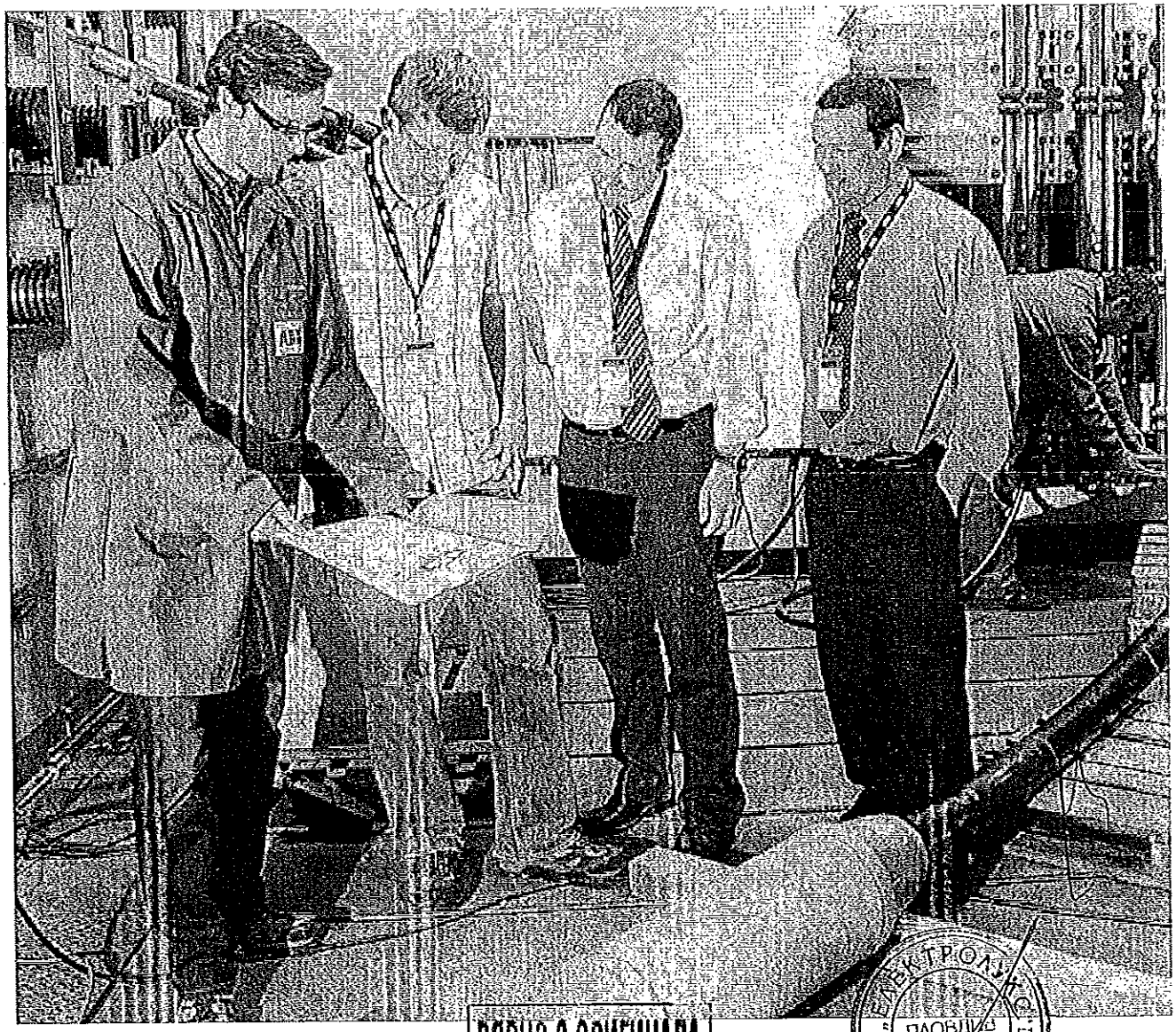


Why testing at Laboratories Ratingen?

With 60 years of experience we know how to perform tests professionally. Starting with the planning and preparation phase we cooperate closely with our customers in order to ensure an optimal testing. Our organization provides flexible planning which ensures short-term reservation.
When testing at the Laboratories Ratingen our customers may choose to either prepare the test objects on their own or make use of our assembly and installation service. By request an on-site testing can be performed in the customer's facilities. All test results will be evaluated by our team of highly qualified and experienced experts in close cooperation with the customers. Our laboratories are equipped with a SF_6 module to handle and recycle the gas for environmental safety. The accreditation as ABB Laboratories Ratingen and as PEHLA Testing Laboratories Ratingen ensures that all tests are fully independent.

Services we provide:

- On-site testing and diagnostics with mobile test equipment
- Independent witnessing of tests
- Inspections, examinations and diagnostics
- Manufacturing of prototypes and individual parts
- Assembly of prototypes and test objects
- Assembly and Installation work
- Calibration of electrical and mechanical measuring equipment



Our documentation to the customers

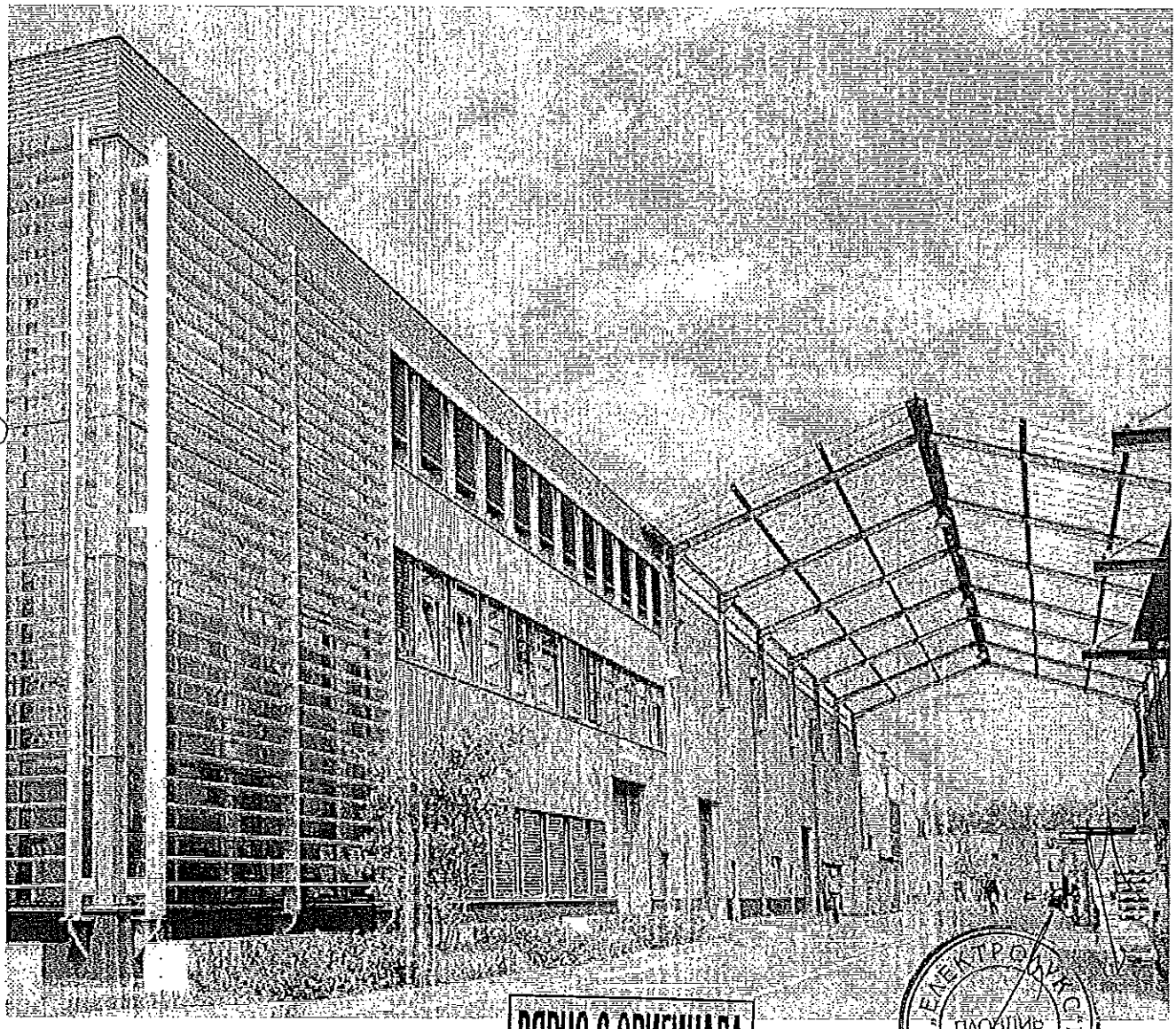
When testing at Laboratories Ratingen different types of documentation can be issued.

Type test certificate
A type test certificate is issued for type tests which have successfully been carried out in full compliance with the relevant specifications or standards and STL Guides valid at the time of the test. For these tests the test object must be clearly identified by technical description, drawings and additional specifications.

Test document
A test document is issued for parts of type tests which have successfully been carried out in full compliance with the relevant specifications or standards and STL Guides valid at the time of test. For these tests the test object must be clearly identified by technical description, drawings and additional specifications.

Test report
A test report is issued for all other tests which have been carried out according to specifications, standards or "PEHLA-Richtlinien" (PEHLA Guides) and/or clients' instructions. Similarly, this test report contains all test results, details of the conditions under which the tests were carried out, also details relating to the behaviour of the test object, and its condition after the tests.

Test confirmation
A test confirmation is issued immediately after the tests. It confirms that the tests have been conducted and is valid only until publishing the detailed results in an entire document.



Development tests, type tests or acceptance tests

Laboratories Ratingen are able to offer any kind of test your company needs.

The laboratories are fully equipped to perform complete type tests on medium voltage equipment with state-of-the-art technology. All tests can be carried out as ABB tests or as PEHLA tests.

Tests we provide

- Type tests
- Development tests
- Acceptance tests (also in other test laboratories)
- Certification tests

Our test portfolio:

Tests \ Products	MV circuit-breaker	Metal enclosed switchgear	Power transformer	Disconnector & earthing switch	Switch fuse unit	Earthig facility	Bushing	Instrument transformer	Fuse	Cable accessory	Auxiliary circuit	Substation
Making and Breaking test	●	●		●	●				●		●	●
STC test	●	●	●	●		●	●	●		●	●	●
Internal arc test		●										●
Capacitive switching test	●			●								
Temperature rise test	●	●		●	●	●	●	●	●	●	●	●
Climatic test	●	●	●	●	●	●	●	●	●	●	●	
Dielectric test	●	●		●	●	●	●	●	●	●	●	●
IP/IK-coding test	●	●										●
Partial discharge test	●	●		●	●	●	●	●		●		●
Mechanical operation test	●	●		●	●						●	
Mechanical endurance test	●			●	●						●	
High and low temperature test	●	●		●			●		●		●	
Tightness test	●	●		●			●					
Pressure test	●	●		●								

● Tests at Ratingen possible

Tests not applicable to this product

Overview of standards

High-voltage switchgear and controlgear	IEC 62271-1	IEC 62271-100	IEC 62271-102
	IEC 62271-103	IEC 62271-104	IEC 62271-105
	IEC 62271-106	IEC 62271-110	IEC 62271-111
	IEC 62271-200	IEC 62271-201	IEC 62271-202
	IEC 62271-203	IEC 62271-304	IEC 60529
High-voltage test techniques	IEC 60060-1	IEC 60060-2	IEC 60270
Power transformers	IEC 60076-5	IEC 60076-11	
High-voltage fuses	IEC 60282-1	IEC 60282-2	
Bushings	IEC 60137		
Insulators	IEC 60660		
Instrument transformers	IEC 61869-1	IEC 61869-2	IEC 61869-3
Live working	IEC 60832-1	IEC 60832-2	IEC 61230
Low-voltage switchgear and controlgear	IEC 60947-1	IEC 60947-2	IEC 60947-3
ANSI / IEEE	IEEE C37.04 ANSI C37.54	ANSI C37.06 IEEE C37.60	IEEE C37.09

Other standards on request.

Testing facilities

The Laboratories Ratingen are coordinating tests very well even if different kind of tests in more than one laboratory are required. Customers, who need various tests, can therefore rely on well-organized test procedures – quickly and at fair conditions.

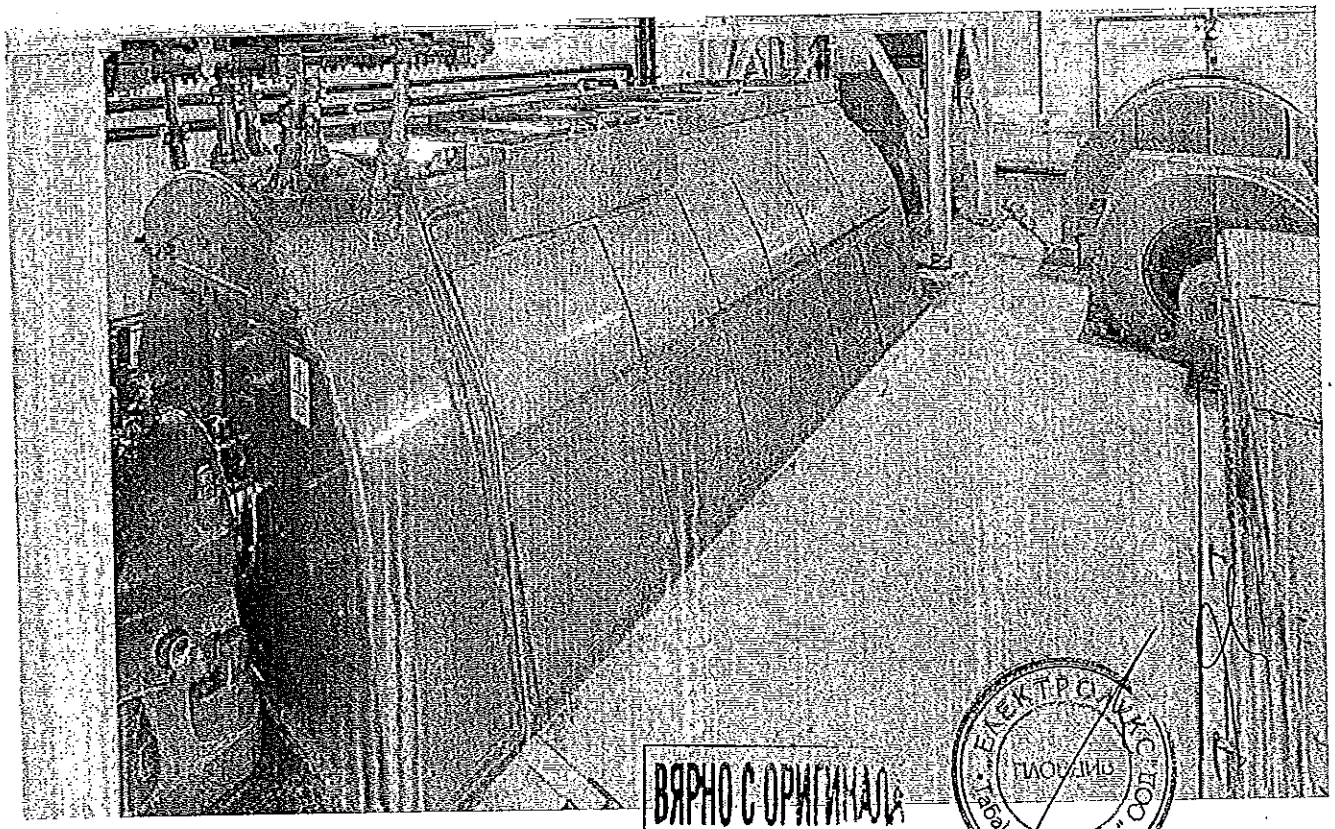
High-power testing laboratory
The high power testing laboratory is equipped with a 2800 MVA short-circuit test generator and oil-insulated power transformers and is therefore able to perform making and breaking tests at several voltage- and short-circuit current levels.

A special dry-type power transformer is available to perform peak-withstand current- and short-time withstand current test up to 250 kA and 100 kA r.m.s for three seconds.

Inside the room simulation of the arcing test bay, internal arcing tests can be performed for switchgear, containers or even substations.

A capacitor bank allows to perform different capacitive tests (e.g. line- or cable-charging current switching tests, back-to-back- and single-capacitor-bank current switching tests).

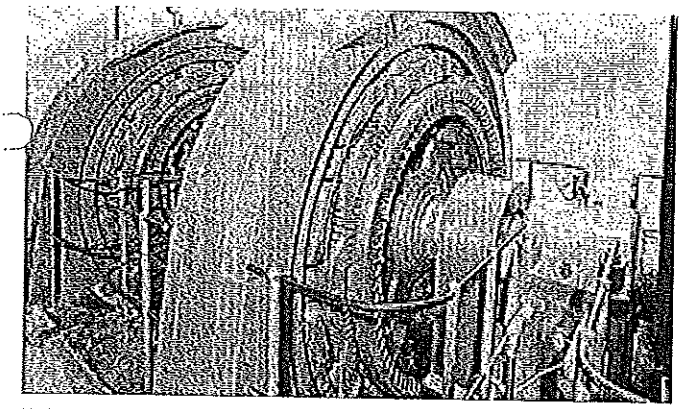
With the miscellaneous equipment like different reactors and resistors, measurement equipment etc., it is possible to perform a wide range of load current switching tests as well.

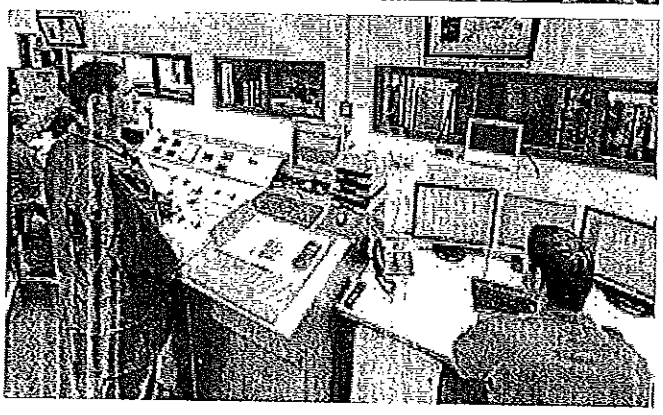


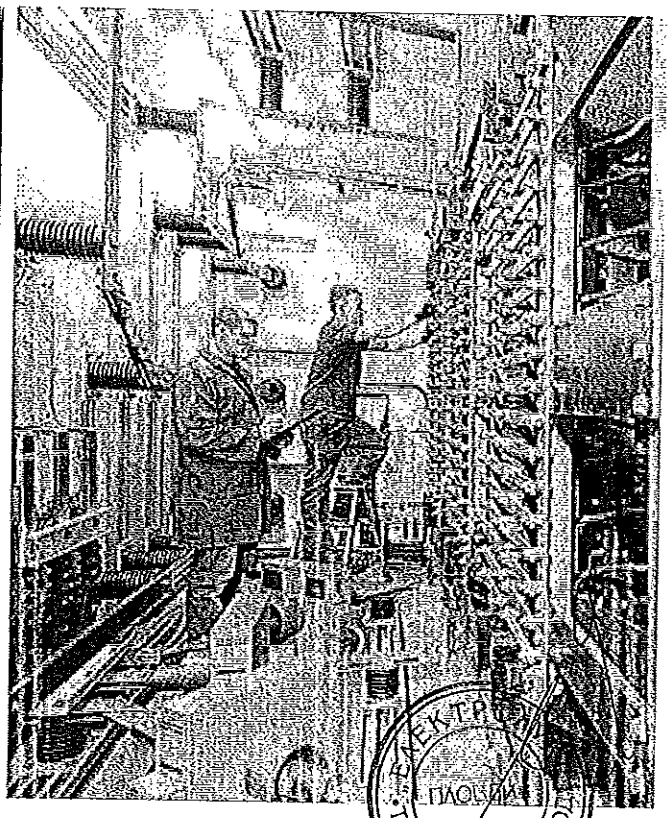
Testing facilities

The tests, which can be performed at our high power testing laboratory, are:

- Short-circuit making and breaking capacity test
  up to
  - 50 kA at 12 kV
  - 31.5 kA at 17.5 kV
  - 25 kA at 24 kV
  - 16 kA at 40.5 kV
- Switching capacity test
  Load currents
  - Capacitive
  - Inductive
  - Ohmic
  - Inductive-ohmic
- Peak withstand current test
  - Up to 250 kA
- Short-time withstand current test
  - Up to 100 kA and up to 3s (4s)
- Internal arc fault test
  - Up to 50 kA
- Different tests
  - beyond the standards according to client's instructions



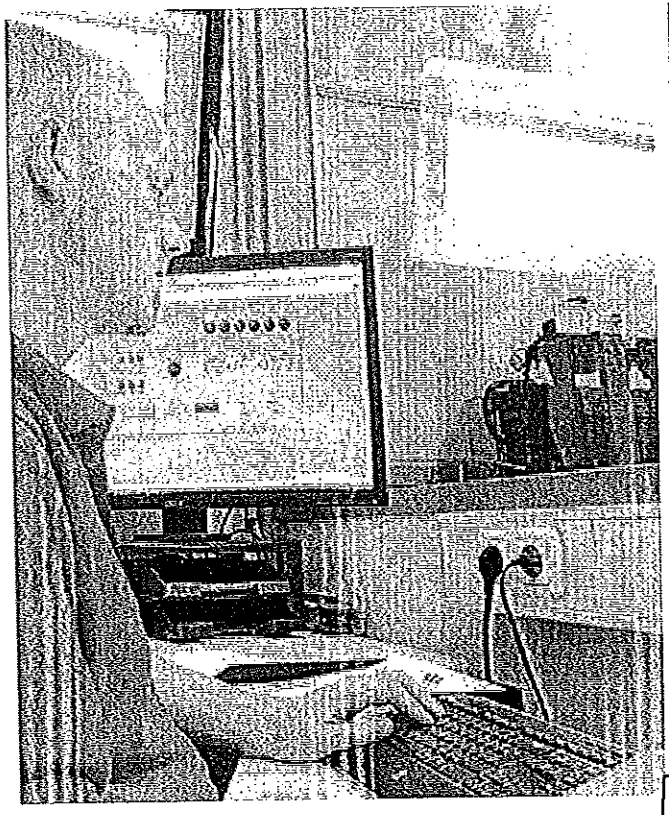


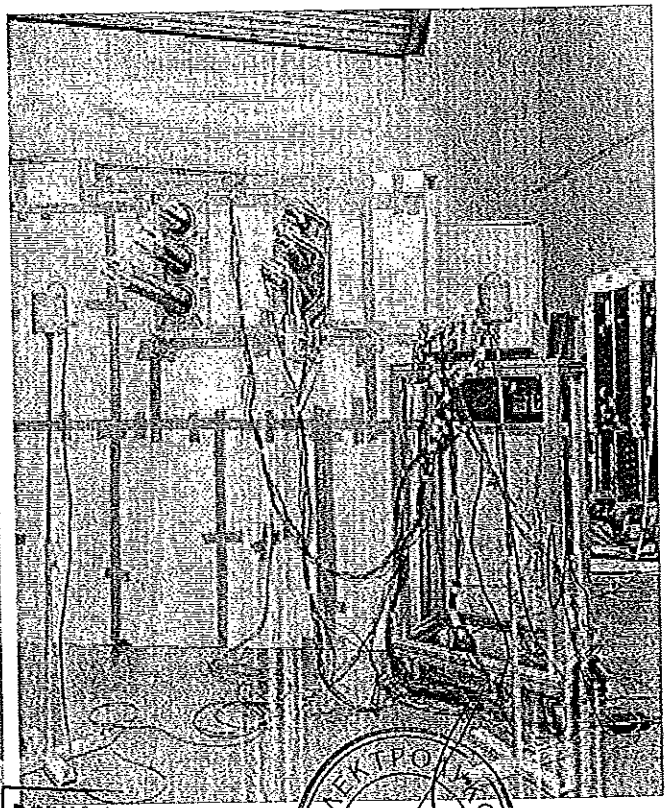


Temperature-rise testing laboratory
The temperature-rise testing laboratory is suited to perform tests with a continuous current up to 5000 A on switchgear and switching devices. Through automated and computer controlled tests we use our recourses in the most efficient and effective way. Therefore we can offer precise, reliable and quick tests during day and night-time to our customers.

During the test, currents and temperatures are checked every 10 minutes. Shorter measurement intervals for currents and temperatures are possible. A control circuit guarantees a constant three-phase current through the entire test. The test is automatically stopped if a temperature limit is exceeded or the test duration is over.

- Temperature-rise tests
  - Up to 180 measuring points can be connected
  - Single-phase and three-phase
    - Up to 5000 A at 50 Hz
    - Up to 4000 A at 60 Hz
- Additionally we can offer
  - Magnetic field measurement
  - Thermal imaging





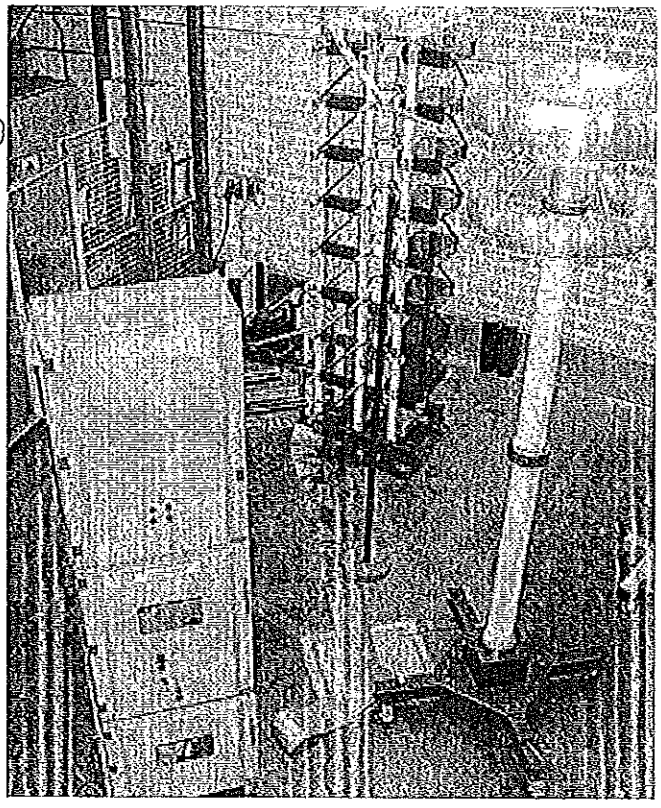
Testing facilities

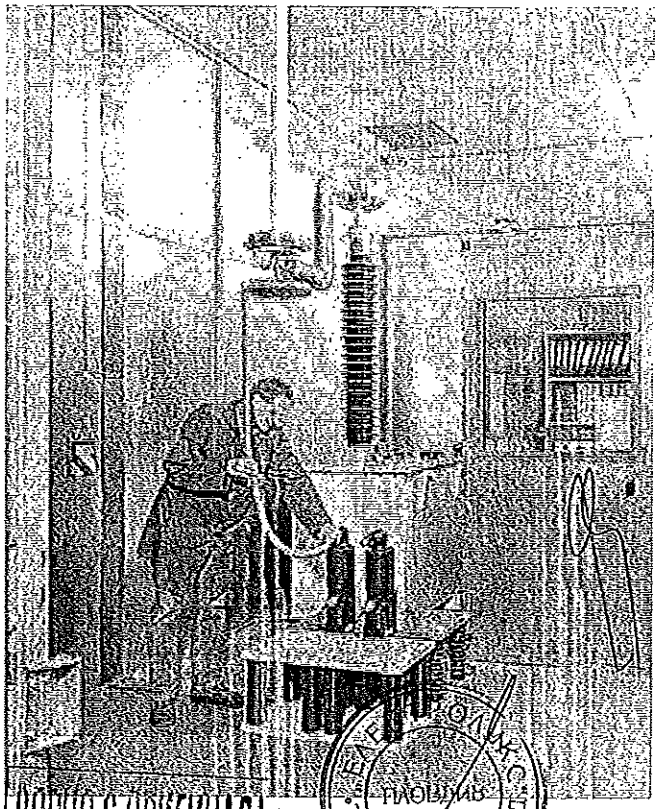
High-voltage testing laboratory
With the test facilities in our high voltage testing laboratory all dielectric and partial discharge tests for medium voltage equipment can be carried out. For sensitive partial discharge tests a special test chamber is available with a background level < 1 pC.

In order to offer on-site testing the high-voltage laboratory has mobile test equipment.

The high-voltage testing laboratory performs the following tests:

- Standard lightning impulse voltage tests
  - Up to 800 kV
- Power-frequency voltage tests
  - Stationary up to 260 kV
  - Mobile up to 230 kV
- Partial discharge tests
  - Stationary up to 150 kV
  - Mobile up to 230 kV
- Degree of protection tests
- Tests on auxiliary and control circuits





Mechanical testing laboratory
The mechanical testing laboratory offers different functional, environmental and material tests especially on medium and low voltage equipment and their components.

The functional tests include endurance tests on switching devices, kinematic chain tests and function tests on any kind of interlocking or control system. For long-duration tests automatic control and monitoring systems are available to supervise various signals for diagnostics.

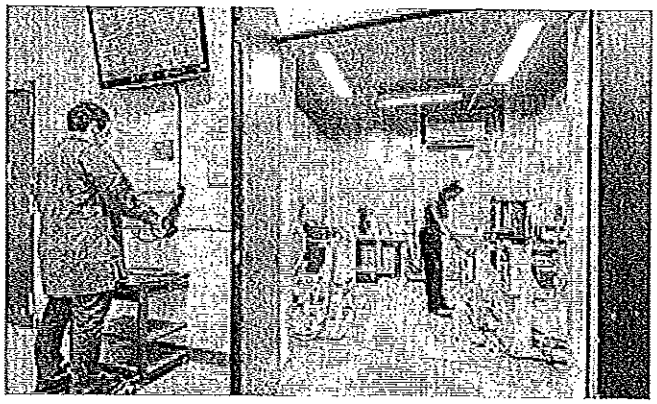
A wide range of measurement equipment is able to record via special sensors many additional data for detailed investigation of the test objects characteristics, like travels, rotation angles, forces, torques, pressures, temperatures, binary signal states and gas densities.

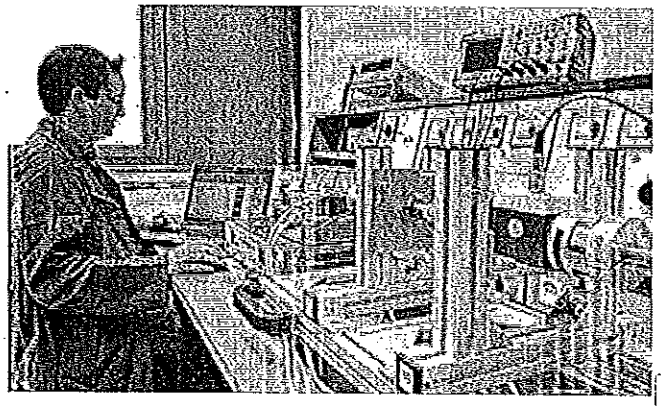
For gas-filled equipment we offer additionally gas-tightness and pressure withstand tests.

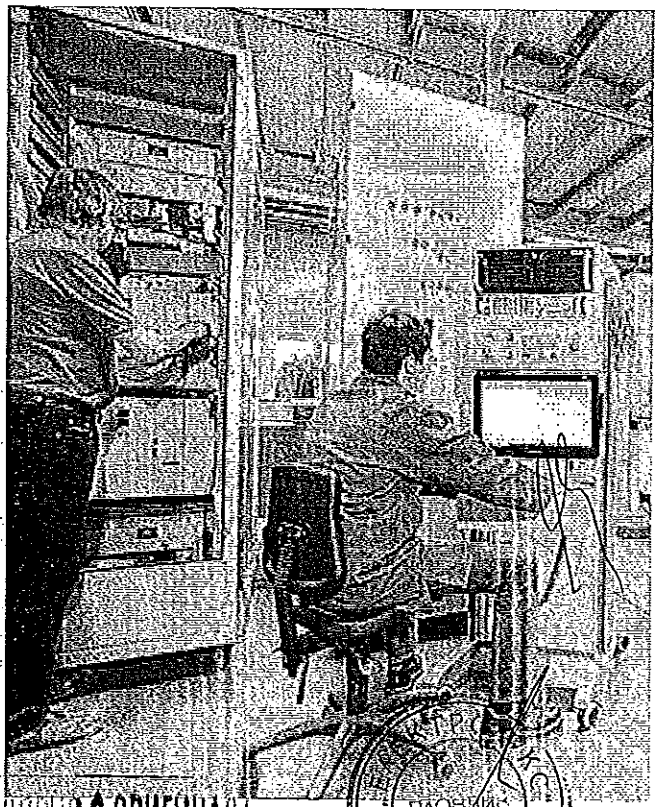
The environmental tests combine the above mentioned measurements and functional tests with special conditions during storage and/or operation like extreme temperatures, humidity, vibrations, inclination and other impacts.

Material testing concentrates on load tests like tensile, compression, mechanical impact IK-coding, torsion and bending tests.

High-speed video recording can be used for visual examination of very fast processes (up to 10,000 pic./s).







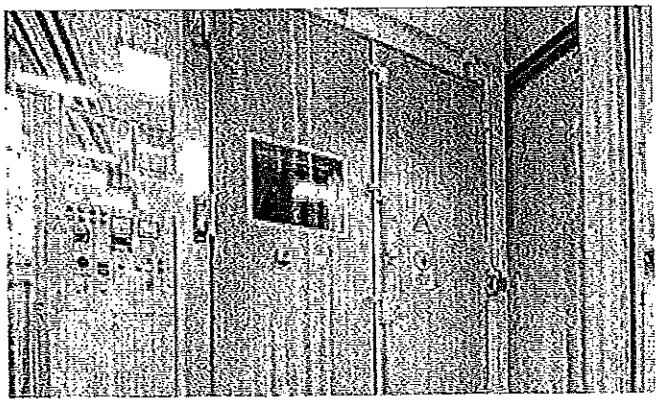
Testing facilities

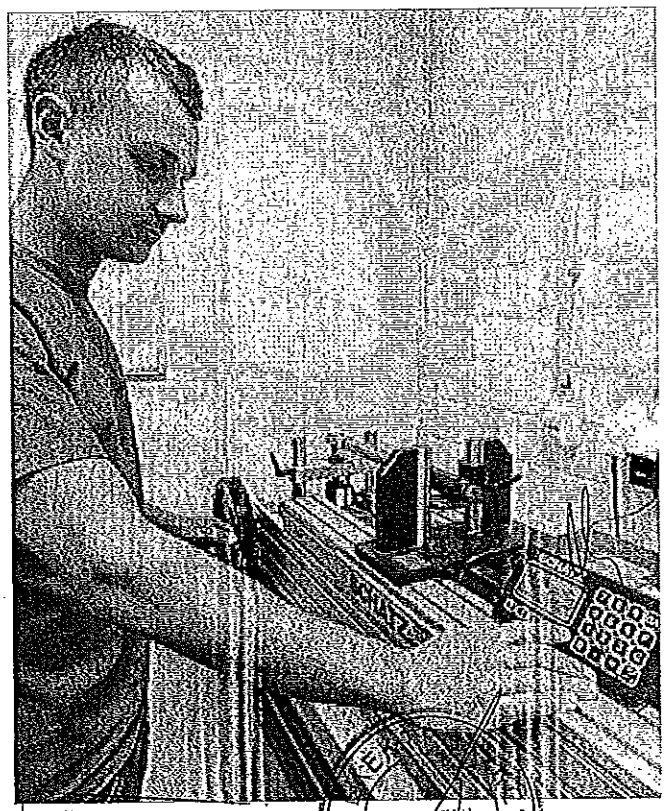
Material testing laboratory
In this laboratory various climatic tests on materials, components and complete medium voltage switchgear panels can be carried out.

The testing facilities include two accessible climatic / thermo chambers. The main tests offered by the material testing laboratory are:

- Temperature tests
  - Range: -70 °C to +150 °C
  - Test voltage: 95 kV (1-phase)
- Climatic tests
  - Temperature range: +20 °C to +90 °C
  - Humidity range: 10 - 98 %
  - Test voltage: 95 kV (1-phase)
- Corrosion tests
  - Salt fog tests
  - Fog tests with sulfur dioxide
  - Tests with condensed water containing climate

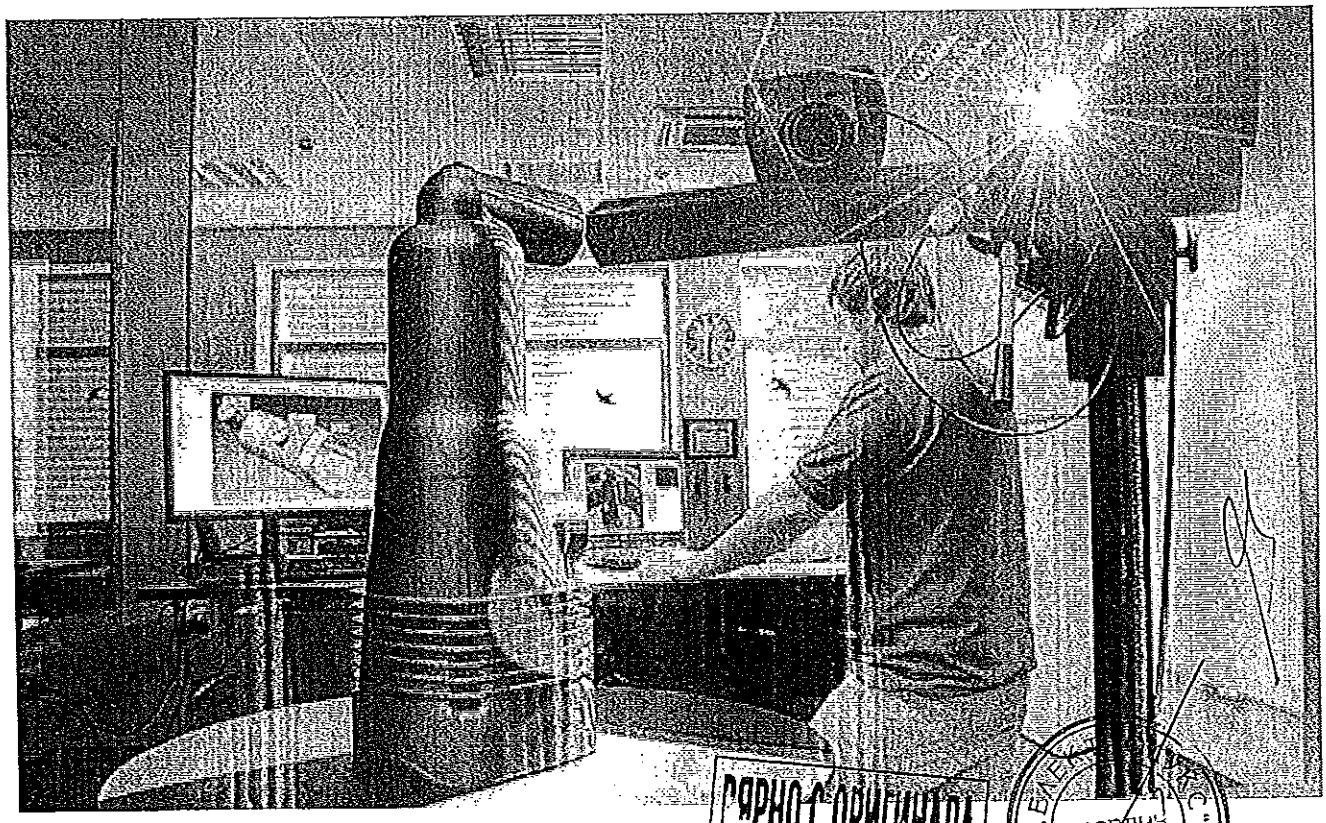
Calibration service
At the calibration laboratory we are able to calibrate electrical measurement instruments, force measurement instruments, length measurement equipment, torque wrenches and pressure gas equipment.





Initial sampling inspection
Objects with different size can be digitized with top-quality by 3D-scanning.

The 3D scanner will also be used for
- Quality checks
  - Comparison of nominal/actual measurement data according to CAD data set
  - Measurement of form and position tolerances without complex construction
  - Measurement of free formed surfaces
  - Serial measurement for quality checks, process safety
- Toolroom
  - Generation of drawings for CAD system derives from scan process
  - Check of initial batches

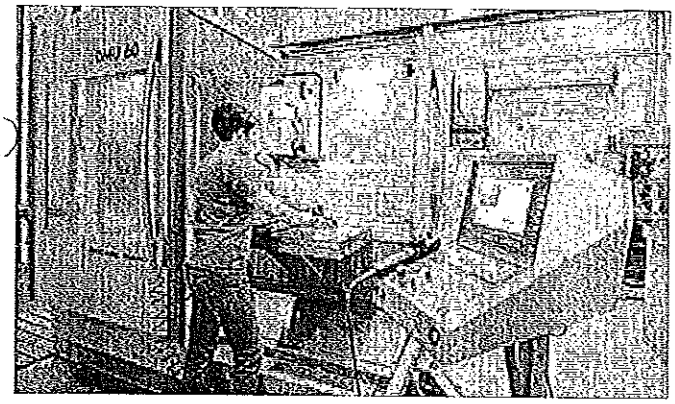


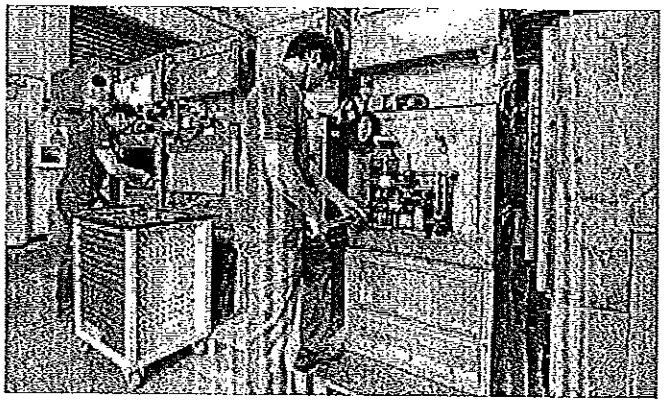
Workshop of the Laboratories

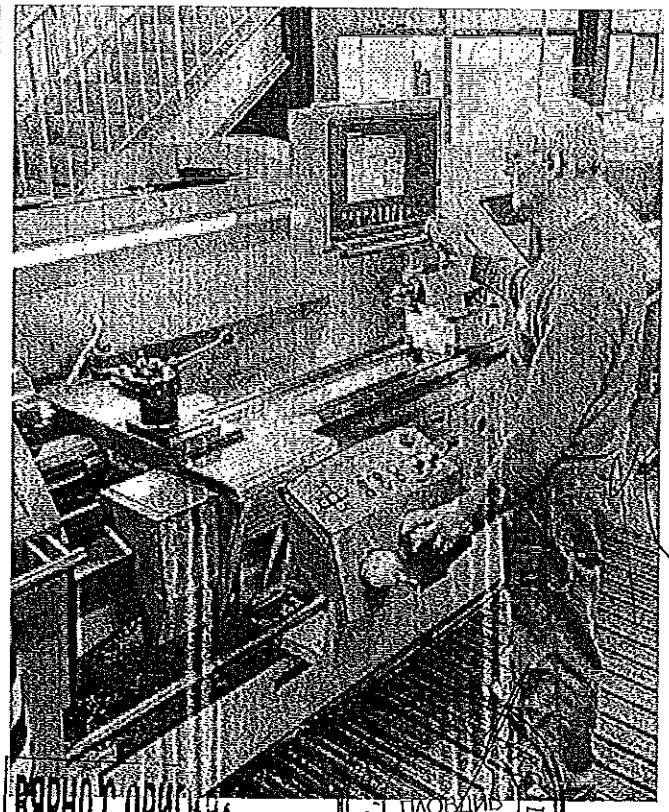
The workshop manufactures prototypes and test arrangements as well as provides complete assembly and installation service in connection with tests.

If defects occur during tests our workshop offers immediate repair service and manufacturing of spare parts.

In order to offer optimal service the workshop is fully equipped for all kind of metal processing.







Contacts at the Laboratories Ratingen

If you need more information on Laboratories Ratingen or if you would like to make reservations for a test please contact:

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Anlage zur Akkreditierungsurkunde D-PL-12115-01-00 nach DIN EN ISO/IEC 17025:2005

Gültigkeitsdauer: 20.04.2017 bis 19.04.2022 Ausstellungsdatum: 20.04.2017

Urkundeninhaber:

ABB AG
Kallstater Str. 1, 68309 Mannheim

Standort:
ABB AG
Calor Emag Mittelspannungsprodukte
Oberhausener Straße 33, 40472 Ratingen

Prüfungen in den Bereichen:

Geräte und Anlagen der Nieder-, Mittel- und Hochspannung

Dem Prüflaboratorium ist, ohne dass es einer vorherigen Information und Zustimmung der DAkkS bedarf, die Anwendung der hier aufgeführten genormten oder ihnen gleichzusetzenden Prüfverfahren mit unterschiedlichen Ausgabeständen gestattet.

Das Prüflaboratorium verfügt über eine aktuelle Liste aller Prüfverfahren im flexiblen Akkreditierungsbereich.

Fachbereich	Norm / Hausverfahren / Version	Titel der Norm oder des Hausverfahrens (ggf. Abweichungen / Modifizierungen von Normverfahren angeben)	Prüfbereich / Einschränkung
Elektrotechnik	DIN EN 61869-1 VDE 0414-9-1: April 2010 IEC 61869-1 Edition 1.0, 2007-10	Messwandler – Teil 1: Allgemeine Anforderungen (IEC 61869-1:2007, modifiziert); Deutsche Fassung EN 61869-1:2009 Instrument transformers – Part 1: General requirements (IEC 61869-1:2007, modified); German version EN 61869-1:2009	

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ЕЛЕКТРОЛЮКС ПЛОВДИВ "Табаков и синове" ООД

Fachbereich	Norm / Hausverfahren / Version	Titel der Norm oder des Hausverfahrens (ggf. Abweichungen / Modifizierungen von Normverfahren angeben)	Prüfbereich / Einschränkung
Elektrotechnik	DIN EN 61869-2 VDE 0414-9-2: 2013-07 + DIN EN 61869-2 Berichtigung 1: 2014-06; VDE 0414-9-2 Berichigung 1: 2014-06 IEC 61869-2 Edition 1.0, 2012-09	Messwandler – Teil 2: Zusätzliche Anforderungen für Stromwandler (IEC 61869-2:2012); Deutsche Fassung EN 61869-2:2012 Instrument transformers – Part 2: Additional requirements for current transformers (IEC 61869-2:2012); German version EN 61869-2:2012	
Elektrotechnik	DIN EN 61869-3 (VDE 0414-9-3): Mai 2012 IEC 61869-3 Edition 1.0, 2011-07	Messwandler – Teil 3: Zusätzliche Anforderungen für induktive Spannungswandler (IEC 61869-3:2011); Deutsche Fassung EN 61869-3:2011 Instrument transformers – Part 3: Additional requirements for inductive voltage transformers (IEC 61869-3:2011); German version EN 61869-3:2011	
Elektrotechnik	DIN EN 61869-4 VDE 0414-9-4: April 2015 IEC 61869-4 Edition 1.0, 2013-11	Messwandler - Teil 4: Zusätzliche Anforderungen für kombinierte Wandler (IEC 61869-4:2013) Deutsche Fassung EN 61869-4:2014 Instrument transformers - Part 4: Additional requirements for combined transformers German version EN 61869-4:2014	
Elektrotechnik	DIN EN 61869-5 (VDE 0414-9-5) Mai 2012 IEC 61869-5 Edition 1.0, 2011-07	Messwandler - Teil 5: Zusätzliche Anforderungen für kapazitive Spannungswandler (IEC 61869-5:2011); Deutsche Fassung EN 61869-5:2011 Instrument transformers – Part 5: Additional requirements for capacitor voltage transformers (IEC 61869-5:2011); German version EN 61869-5:2011	

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ЕЛЕКТРОМАКС "Табаков и синове" ПАЗАРДЖИК

Fachbereich	Norm / Hausverfahren / Version	Titel der Norm oder des Hausverfahrens (ggf. Abweichungen / Modifizierungen von Normverfahren angeben)	Prüfbereich / Einschränkung
Elektrotechnik	DIN EN 60060-1 (VDE 0432-1) Oktober 2011 IEC 60060-1 Edition 3.0, 2010-09	Hochspannungs-Prüftechnik – Teil 1: Allgemeine Begriffe und Prüfbedingungen (IEC 60060-1:2010); Deutsche Fassung EN 60060-1:2010 High-voltage test techniques – Part 1: General definitions and test requirements (IEC 60060-1:2010); German version EN 60060-1:2010	
Elektrotechnik	DIN EN 60060-2 (VDE 0432-2) Oktober 2011 IEC 60060-2 Edition 3.0, 2010-11	Hochspannungs-Prüftechnik – Teil 2: Messsysteme (IEC 60060-2:2010); Deutsche Fassung EN 60060-2:2011 High-voltage test techniques – Part 2: Measuring systems (IEC 60060-2:2010); German version EN 60060-2:2011	(without annex A) (ohne Anhang A)
Elektrotechnik	DIN EN 60076-5 (VDE 0532-76-5) Januar 2007 IEC 60076-5 Third Edition, 2006-02	Leistungstransformatoren – Teil 5: Kurzschlussfestigkeit (IEC 60076-5:2006); Deutsche Fassung EN 60076-5:2006 Power transformers – Part 5: Ability to withstand short-circuit (IEC 60076-5:2006); German version EN 60076-5:2006	
Elektrotechnik	DIN EN 60076-11 (VDE 0532-76-11) April 2005 IEC 60076-11 First Edition, 2004-05	Leistungstransformatoren – Teil 11: Trockentransformatoren (IEC 60076-11:2004); Deutsche Fassung EN 60076-11:2004 Power transformers – Part 11: Dry-type transformers (IEC 60076-11:2004); German version EN 60076-11:2004	
Elektrotechnik	DIN EN 60137 (VDE 0674-5) Juli 2009 IEC 60137	Isolierte Durchführungen für Wechselspannungen über 1 000 V (IEC 60137:2008); Deutsche Fassung EN 60137:2008 Insulated bushings for alternating voltages above	

Fachbereich	Norm / Hausverfahren / Version	Titel der Norm oder des Hausverfahrens (ggf. Abweichungen / Modifizierungen von Normverfahren angeben)	Prüfbereich / Einschränkung
	Edition 6.0, 2008-07	1000 V (IEC 60137:2008); German version EN 60137:2008	
Elektrotechnik	DIN EN 62271-103 (VDE 0671-103) April 2012 IEC 62271-103 Edition 1.0, 2011-06	Hochspannungs-Schaltgeräte und -Schaltanlagen – Teil 103: Lastschalter für Bemessungsspannungen über 1 kV bis einschließlich 52 kV (IEC 62271-103:2011); Deutsche Fassung EN 62271-103:2011 High-voltage switchgear and controlgear – Part 103: Switches for rated voltages above 1 kV up to and including 52 kV (IEC 62271-103:2011); German version EN 62271-103:2011	
Elektrotechnik	DIN EN 62271-104 (VDE 0671-104) November 2015 IEC 62271-104 Edition 2.0, 2015-02	Hochspannungs-Schaltgeräte und -Schaltanlagen – Teil 104: Wechselstrom-Lastschalter für Bemessungsspannungen über 52 kV (IEC 62271-104:2015); Deutsche Fassung EN 62271-104:2015 High-voltage switchgear and controlgear – Part 104: Alternating current switches for rated voltages higher than 52 kV (IEC 62271-104:2015); German version EN 62271-104:2015	

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Fachbereich	Norm / Hausverfahren / Version	Titel der Norm oder des Hausverfahrens (ggf. Abweichungen / Modifizierungen von Normverfahren angeben)	Prüfbereich / Einschränkung
Elektrotechnik	DIN EN 60270 (VDE 0434) August 2001 + DIN EN 60270 Berichtigung 1: November 2002; VDE 0414-9-2 Berichigung 1: November 2002 IEC 60270 Third edition, 2000-12 + Amendement 1 Third edition, 2015-11	Hochspannungs-Prüftechnik Teilentladungsmessungen (IEC 60270:2000) Deutsche Fassung EN 60270:2001 High-voltage test techniques – Partial discharge measurement (IEC 60270:2000); German version EN 60270:2001	
Elektrotechnik	DIN EN 60282-1 (VDE 0670-4) August 2010 IEC 60282-1 Edition 7.1, 2014-07	Hochspannungssicherungen Teil 1: Strombegrenzende Sicherungen (IEC 60282-1:2009) Deutsche Fassung EN 60282-1:2009 High-voltage fuses – Part 1: Current-limiting fuses (IEC 60282-1:2009); German version EN 60282-1:2009	
Elektrotechnik	IEC 60282-2 Edition 3.0, 2008-04	High-voltage fuses – Part 2: Expulsion fuses	
Elektrotechnik	DIN EN 62271-106 (VDE 0671-106) Juni 2011 IEC 62271-106 Edition 1.0, 2011-08	Hochspannungs-Schaltgeräte und -Schaltanlagen – Teil 106: Wechselstrom-Schütze, Kombinationsstarter und Motorstarter mit Schützen (IEC 62271-106:2011); Deutsche Fassung EN 62271-106:2011 High-voltage switchgear and controlgear – Part 106: Alternating current contactors, contactor-based controllers and motor-starters (IEC 62271-106:2011); German version EN 62271-106:2011	

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Fachbereich	Norm / Hausverfahren / Version	Titel der Norm oder des Hausverfahrens (ggf. Abweichungen / Modifizierungen von Normverfahren angeben)	Prüfbereich / Einschränkung
Elektrotechnik	DIN EN 60529 (VDE 0470-1) September 2014 IEC 60529 Edition 2.2, 2013-08	Schutzarten durch Gehäuse (IP-Code) (IEC 60529:1989 + A1:1999 + A2:2013) Deutsche Fassung EN 60529:1991 + A1: 2000 + A2:2013 Degree of protection provided by enclosures (IP Code) (IEC 60529:1989 + A1:1999 + A2:2013) German version EN 60529:1991 + A1: 2000 + A2:2013	
Elektrotechnik	DIN EN 60660 (VDE 0441-3) Dezember 2000 IEC 60660 Edition 2.0, 1999-10	Isolatoren Prüfungen an Innenraum-Stützern aus organischem Werkstoff für Netze mit Nennspannungen über 1 kV bis kleiner 300 kV (IEC 60660:1999) Deutsche Fassung EN 60660:1999 Insulators – Tests on indoor post insulators of organic material for systems with nominal voltages greater than 1 kV up to but not including 300 kV (IEC 60660:1999); German version EN 60660:1999	
Elektrotechnik	DIN EN 60832-1 (VDE 0682-211) Dezember 2010 IEC 60832-1 Edition 1.0, 2010-02	Arbeiten unter Spannung – Isolierende Stangen und auswechselbare Arbeitsköpfe – Teil 1: Isolierende Stangen (IEC 60832-1:2010) Deutsche Fassung EN 60832-1:2010 + Cor.:2010 Live working - Insulating sticks and attachable devices - Part 1: Insulating sticks (IEC 60832-1:2010) German version EN 60832-1:2010 + Cor.:2010	
Elektrotechnik	DIN EN 60832-2 (VDE 0682-212) Dezember 2010 IEC 60832-2 Edition 1.0, 2010-02	Arbeiten unter Spannung – Isolierende Stangen und auswechselbare Arbeitsköpfe Teil 2: Auswechselbare Arbeitsköpfe (IEC 60832-2:2010); Deutsche Fassung EN 60832-2:2010 + Cor.:2010 Live working - Insulating sticks and attachable devices - Part 2: Attachables devices (IEC 60832-2:2010); German version EN 60832-2:2010 + Cor.:2010	

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Fachbereich	Norm / Hausverfahren / Version	Titel der Norm oder des Hausverfahrens (ggf. Abweichungen / Modifizierungen von Normverfahren angeben)	Prüfbereich / Einschränkung
Elektrotechnik	DIN EN 60947-1: (VDE 0660-100) Oktober 2011	Niederspannungsschaltgeräte – Teil 1: Allgemeine Festlegungen (IEC 60947-1:2007 + A1:2010); Deutsche Fassung EN 60947-1:2007 + A1:2011	
	DIN EN 60947-1/A2 (VDE 0660-100/A2) Mai 2014	Niederspannungsschaltgeräte – Teil 1: Allgemeine Festlegungen (IEC 17B/1806/CDV:2013); Deutsche Fassung EN 60947-1:2007/FprA2:2013	
	IEC 60947-1 Edition 5.2 2014-09 + Amendement 1 + 2	Low-voltage switchgear and controlgear - Part 1: General rules (IEC 60947-1:2007 + A1:2010); German version EN 60947-1:2007 + A1:2011	
Elektrotechnik	DIN EN 60947-2: VDE 0660-101 Januar 2014	Niederspannungsschaltgeräte – Teil 2: Leistungsschalter (IEC 60947-2:2006 + A1:2009 + A2:2013); Deutsche Fassung EN 60947-2:2006 + A1:2009 + A2:2013	
	DIN EN 60947-2 (VDE 0660-101) März 2015	Niederspannungsschaltgeräte – Teil 2: Leistungsschalter (IEC 121A/26/CDV:2014); Deutsche Fassung FprEN 60947-2:2014	
	IEC 60947-2 Edition 5.0 2016-06	Low-voltage switchgear and controlgear – Part 2: Circuit-breakers (IEC 60947-2: 2016); German version EN 60947-2:2006 + A1:2009 + A2:2013	

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Elektrotechnik	DIN EN 60947-3: VDE 0660-10 Dezember 2012	Niederspannungsschaltgeräte - Teil 3: Lastschalter, Trennschalter, Lasttrennschalter und Schalter-Sicherungs-Einheiten (IEC 60947-3:2008 + A1:2012); Deutsche Fassung EN 60947-3:2009 + A1:2012	
	DIN EN 60947-3 Berichtigung 1 (VDE 0660-107 Berichtigung 1) März 2015	Niederspannungsschaltgeräte – Teil 3: Lastschalter, Trennschalter, Lasttrennschalter und Schalter-Sicherungs-Einheiten (IEC 60947-3:2008 + A1:2012); Deutsche Fassung EN 60947-3:2009 + A1:2012, Berichtigung zu DIN EN 60947-3 (VDE 0660-107):2012-12; (IEC-Cor.:2013 zu IEC 60947-3:2008/A1:2012)	
	DIN EN 60947-3/A2:2015-03; VDE 0660-107/A2:2015-03	Niederspannungsschaltgeräte – Teil 3: Lastschalter, Trennschalter, Lasttrennschalter und Schalter-Sicherungs-Einheiten (IEC 121A/7/CDV:2014); Deutsche Fassung EN 60947-3:2009/FprA2:2014	
	IEC 60947-3 Edition 3.1 2012-04 + Amendement 1	Low-voltage switchgear and controlgear – Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units (IEC 60947-3:2008 + A1:2012); German version EN 60947-3:2009 + A1:2012	
Elektrotechnik	DIN EN 61230, (VDE 0683-100) Juli 2009	Ortsveränderliche Geräte zum Erden oder Erden und Kurzschließen (IEC 61230:2008); Deutsche Fassung EN 61230:2008	
	IEC 61230 Edition 2.0, 2008-07	Live working - Portable equipment for earthing or earthing and short-circuiting (IEC 61230:2008); German version EN 61230:2008	

Fachbereich	Norm / Hausverfahren / Version	Titel der Norm oder des Hausverfahrens (ggf. Abweichungen / Modifizierungen von Normverfahren angeben)	Prüfbereich / Einschränkung
Elektrotechnik	DIN EN 61869-1 VDE 0414-9-1 April 2010 IEC 61869-1 Edition 1.0, 2007-10	Messwandler Teil 1: Allgemeine Anforderungen (IEC 61869-1:2007, modifiziert); Deutsche Fassung EN 61869-1:2009 Instrument transformers - Part 1: General requirements (IEC 61869-1:2007, modified); German version EN 61869-1:2009	
Elektrotechnik	DIN EN 62271-1 VDE 0671-1 August 2009 + DIN EN 62271-1/A1 VDE 0671-1/A1 April 2012 IEC 62271 Edition 1.1, 2011-08	Hochspannungs-Schaltgeräte und -Schaltanlagen Teil 1: Gemeinsame Bestimmungen (IEC 62271-1:2007); Deutsche Fassung EN 62271-1:2008 Hochspannungs-Schaltgeräte und –Schaltanlagen Teil 1: Gemeinsame Bestimmungen (IEC 62271-1:2007/A1:2011); Deutsche Fassung EN 62271-1:2008/A1:2011 High-voltage switchgear and controlgear - Part 1: Common specifications (IEC 62271-1:2007); German version EN 62271-1:2008	
Elektrotechnik	DIN EN 62271-100 VDE 0671-100 August 2013 IEC 62271-100 Edition 2.1, 2012-09	Hochspannungs-Schaltgeräte und -Schaltanlagen Teil 100: Wechselstrom-Leistungsschalter (IEC 62271-100:2008 + A1:2012); Deutsche Fassung EN 62271-100:2009 + A1:2012 High-voltage switchgear and controlgear – Part 100: Alternating current circuit-breakers (IEC 62271-100:2008 + A1:2012); German version EN 62271-100:2009 + A1:2012	

Fachbereich	Norm / Hausverfahren / Version	Titel der Norm oder des Hausverfahrens (ggf. Abweichungen / Modifizierungen von Normverfahren angeben)	Prüfbereich / Einschränkung
Elektrotechnik	DIN EN 62271-102 VDE 0671-102 August 2013 +	Hochspannungs-Schaltgeräte und -Schaltanlagen Teil 102: Wechselstrom-Trennschalter und -Erdungsschalter (IEC 62271-102:2001 + Corrigenda 2002 & 2003 + A1:2011); Deutsche Fassung EN 62271-102:2002 + Cor.:2008 + A1:2011	
	DIN EN 62271-102/A2 VDE 0671-102/A2 Dezember 2013	Hochspannungs-Schaltgeräte und -Schaltanlagen Teil 102: Wechselstrom-Trennschalter und -Erdungsschalter (IEC 62271-102:2001/A2:2013); Deutsche Fassung EN 62271-102:2002/A2:2013	
	IEC 62271-102 Edition 1.2, 2013-02	High-voltage switchgear and controlgear – Part 102: Alternating current disconnectors and earthing switches (IEC 62271-102:2001 + Corrigenda 2002 & 2003 + A1:2011 + A2:2013); German version EN 62271-102:2002 + Cor.:2008 + A1:2011 + A2:2013	
Elektrotechnik	DIN EN 62271-105 VDE 0671-105 August 2013	Hochspannungs-Schaltgeräte und -Schaltanlagen Teil 105: Wechselstrom-Lastschalter-Sicherungs-Kombinationen für Bemessungsspannungen über 1 kV bis einschließlich 52 kV (IEC 62271-105:2012); Deutsche Fassung EN 62271-105:2012	
	IEC 62271-105 Edition 2.0, 2012-09	High-voltage switchgear and controlgear – Part 105: Alternating current switch-fuse combinations for rated voltages above 1 kV up to and including 52 kV (IEC 62271-105:2012); German version EN 62271-105:2012	
Elektrotechnik	DIN EN 62271-110 VDE 0671-110 August 2013	Hochspannungs-Schaltgeräte und -Schaltanlagen Teil 110: Schalten induktiver Lasten (IEC 62271-110:2012 + corrigendum Oct. 2012); Deutsche Fassung EN 62271-110:2012	
	IEC 62271-110 Edition 3.0, 2012-09	High-voltage switchgear and controlgear – Part 110: Inductive load switching (IEC 62271-110:2012 + corrigendum Oct. 2012); German version EN 62271-110:2012	

ЗРНО С ОРИГИНАЛА

„ЕЛЕКТРОАКС" ООД, Табаков и синове, ПЛОВДИВ

Fachbereich	Norm / Hausverfahren / Version	Titel der Norm oder des Hausverfahrens (ggf. Abweichungen / Modifizierungen von Normverfahren angeben)	Prüfbereich / Einschränkung
Elektrotechnik	E DIN EN 62271-111 VDE 0671-111 September 2014 IEC 62271-111: 2012(E) IEEE Std C37.60- 2012(E) Edition 2.0 2012-09	Hochspannungs-Schaltgeräte -und Schaltanlagen Teil 111: Automatische Wiedereinschalter und Fehlerunterbrecher für Wechselspannungssysteme bis 38 kV (IEC 17A/1060/CD:2014) High-voltage switchgear and controlgear – Part 111: Automatic circuit reclosers and fault interrupters for alternating current systems up to 38 kV	
Elektrotechnik	DIN EN 62271-200 VDE 0671-200 August 2012 + Berichtigung 1 IEC 62271-200 Edition 2.0, 2011-10 + Corrigendum 1	Hochspannungs-Schaltgeräte und -Schaltanlagen Teil 200: Metallgekapselte Wechselstrom-Schaltanlagen für Bemessungsspannungen über 1 kV bis einschließlich 52 kV (IEC 62271-200:2011); Deutsche Fassung EN 62271-200:2012 + Berichtigung 1:2016-01 High-voltage switchgear and controlgear – Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV (IEC 62271-200:2011 + Corrigenda 2015); German version EN 62271-200:2012 + Berichtigung 1:2016-01	
Elektrotechnik	DIN EN 62271-201 VDE 0671-201 Juli 2007 IEC 62271-201 Edition 2.0, 2014-03	Hochspannungs-Schaltgeräte und -Schaltanlagen Teil 201: Isolierstoffgekapselte Wechselstrom-Schaltanlagen für Bemessungsspannungen über 1 kV bis einschließlich 52 kV (IEC 62271-201:2006); Deutsche Fassung EN 62271-201:2006 High-voltage switchgear and controlgear - Part 201: AC insulation-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV (IEC 62271-201:2014);	

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Elektrotechnik	DIN EN 62271-202 VDE 0671-202 August 2007 IEC 62271-202 Edition 2.0, 2014-03	Hochspannungs-Schaltgeräte und -Schaltanlagen Teil 202: Fabrikfertige Stationen für Hochspannung/Niederspannung (IEC 62271-202:2006); Deutsche Fassung EN 62271-202:2007 High-voltage switchgear and controlgear – Part 202: High-voltage/ low-voltage prefabricated substation (IEC 62271-202:2014);	
Elektrotechnik	DIN EN 62271-203 VDE 0671-203 November 2012 IEC 62271-203 Edition 2.0, 2011-09	Hochspannungs-Schaltgeräte und -Schaltanlagen Teil 203: Gasisolierte metallgekapselte Schaltanlagen für Bemessungsspannungen über 52 kV (IEC 62271-203:2011); Deutsche Fassung EN 62271-203:2012 High-voltage switchgear and controlgear – Part 203: Gas-insulated metal-enclosed switchgear for rated voltages above 52 kV (IEC 62271-203:2011); German version EN 62271-203:2012	
Elektrotechnik	E DIN EN 62271-304 VDE 0671-304 April 2007 IEC/TS 62271-304 Edition 1.0, 2008-05	Zusätzliche Anforderungen an gekapselte Schaltgerätekombinationen und Hochspannungsschaltanlagen von 1 kV bis 52 kV für den Einsatz unter erschwerten klimatischen Bedingungen (IEC 17C/373/CD:2006) High-voltage switchgear and controlgear – Part 304: Design classes for indoor enclosed switchgear and controlgear for rated voltages above 1 kV up to and includuing 52 kV to be used in severe climatic conditions (IEC/TS 62271-304:2008)	

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Elektrotechnik	E DIN IEC 62271-37-013 VDE 0671-37-013: 2012-09 IEC/IEEE 62271-37-013 Edition 1.0, 2015-10	Hochspannungs-Schaltgeräte und -Schaltanlagen Teil 37-013: Wechselstrom-Generatorschalter (IEC 17A/993/CD:2011) High-voltage switchgear and controlgear – Part 37-013: Alternating-current generator circuit-breakers	
Elektrotechnik	DIN EN 60068-2-1 VDE 0468-2-1 Januar 2008 IEC 60068-2-1 Edition 6.0, 2007-03	Umgebungseinflüsse - Teil 2-1: Prüfverfahren - Prüfung A: Kälte (IEC 60068-2-1:2007); Deutsche Fassung EN 60068-2-1:2007 Environmental testing – Part 2-1: Tests – Test A: Cold (IEC 60068-2-1:2007); German version EN 60068-2-1:2007	
Elektrotechnik	DIN EN 60068-2-2 VDE 0468-2-2 Mai 2008 IEC 60068-2-2 Edition 5.0, 2007-07	Umgebungseinflüsse - Teil 2-2: Prüfverfahren - Prüfung B: Trockene Wärme (IEC 60068-2-2:2007); Deutsche Fassung EN 60068-2-2:2007 Environmental testing – Part 2-2: Tests – Test B: Dry heat (IEC 60068-2-2:2007) German version EN 60068-2-2:2007	
Elektrotechnik	DIN EN 60068-2-30 Juni 2006 IEC 60068-2-30 Edition 3.0, 2005-08	Umgebungseinflüsse - Teil 2-30: Prüfverfahren - Prüfung Db: Feuchte Wärme, zyklisch (12 + 12 Stunden) (IEC 60068-2-30:2005); Deutsche Fassung EN 60068-2-30:2005 Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle) (IEC 60068-2-30:2005) German version EN 60068-2-30:2005	
Elektrotechnik	IEC 62262 Edition 1.0, 2002-02	Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code) German version SN EN 62262:2002	

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Elektrotechnik	DIN EN 60068-2-75 VDE 0468-2-75 2015-08 IEC 60068-2-75 Edition 2.0, 2014-09	Umgebungseinflüsse - Teil 2-75: Prüfungen - Prüfung Eh: Hammerprüfungen (IEC 60068-2-75:2014); Deutsche Fassung EN 60068-2-75:2014 Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests (IEC 60068-2-75:2014) German version EN 60068-2-75:2014	
Elektrotechnik	IEEE Std C37.04- 1999 June 1999	IEEE Standard Rating Structure for AC High-Voltage Circuit Breakers IEEE Std C37.04-1999 (Revision of IEEE Std C37.04-1979)	
Elektrotechnik	IEEE Std C37.06-2009 November 2009	IEEE Standard for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis - Preferred Ratings and Related Required Capabilities for Voltages Above 1000 V IEEE Std C37.06-2009 (Revision of ANSI C37.06-2000)	
Elektrotechnik	IEEE Std C37.09-1999 (R2007) June 1999	IEEE Standard Test Procedure for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis IEEE Std C37.09™-1999 (R2007) (Revision of IEEE Std C37.09-1979)	
Elektrotechnik	ANSI C37.54-2002 March 2003	American National Standard For Indoor Alternating Current High-Voltage Circuit Breakers Applied as Removable Elements in Metal-Enclosed Switchgear— Conformance Test Procedures	
Elektrotechnik	ANSI C37.20.2-2015	IEEE Standard for Metal-Clad Switchgear	
Elektrotechnik	ANSI C37.20.7-2007	IEEE Guide for Testing Metal-Enclosed Switchgear Rated Up to 38 kV for Internal Arcing Faults	
Elektrotechnik	ANSI C37.122.2-2011	IEEE Guide for the Application of Gas Insulated Substations 1kV to 52kV	
Elektrotechnik	IEEE Std C57.13-2008	IEEE Standard Requirements for Instrument Transformers	

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Elektrotechnik	E DIN EN 61180 VDE 0432-10 Juli 2013	Hochspannungs-Prüftechnik für Niederspannungsgeräte Begriffe, Prüfung und Prüfbedingungen, Prüfgeräte	
	DIN EN 61180-1 VDE 0432-10 Mai 1995	Hochspannungs-Prüftechnik für Niederspannungsgeräte Begriffe, Prüfung und Prüfbedingungen (IEC 61180-1:1992); Deutsche Fassung EN 61180-1:1994	
	IEC 61180-1 Edition 1.0, 1992-10	High-voltage test techniques for low voltage equipment – Part 1: Definitions, test and procedure requirements (IEC 61180-1:1992); German version EN 61180-1:1994	
	DIN EN 61180-2 VDE 0432-11 Mai 1995	Hochspannungs-Prüftechnik für Niederspannungsgeräte Prüfgeräte (IEC 61180-2:1994); Deutsche Fassung EN 61180-2:1994	
	IEC 61180-2 Edition 1.0, 1994-06	High-voltage test techniques for low-voltage equipment – Part 2: Test equipment (IEC 61180-2:1994); German version EN 61180-2:1994	

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„ЕЛЕКТРОЛУК" ПЛОВДИВ „Табаков и синове" ООД

Fachbereich	Norm / Hausverfahren / Version	Titel der Norm oder des Hausverfahrens (ggf. Abweichungen / Modifizierungen von Normverfahren angeben)	Prüfbereich / Einschränkung
Elektrotechnik	DIN EN 61439-1 VDE 0660-600-1 Juni 2012 +	Niederspannungs-Schaltgerätekombinationen Teil 1: Allgemeine Festlegungen (IEC 61439-1:2011); Deutsche Fassung EN 61439-1:2011	
	DIN EN 61439-1 Bbl 1 VDE 0660-600-1 Bbl 1 Berichtigung 1 Dezember 2014 +	Berichtigung zu DIN EN 61439-1 Beiblatt 1 (VDE 0660-600-1 Beiblatt 1):2014-06	
	DIN EN 61439-1 VDE 0660-600-1 Beiblatt 1: Juni 2014	Niederspannungs-Schaltgerätekombinationen Teil 1: Allgemeine Festlegungen; Beiblatt 1: Leitfaden für die Spezifikation von Schaltgerätekombinationen (IEC/TR 61439-0:2013)	
	IEC 61439-1 Edition 2.0, 2011-08	Low-voltage switchgear and controlgear assemblies – Part 1: General rules (IEC 61439-1:2011); German version EN 61439-1:2011	
	IEC/TR 61439-0 Edition 2.0, 2013-04	Low-voltage switchgear and controlgear assemblies – Part 0: Guidance to specifying assemblies	
Elektrotechnik	DIN EN 61439-2 VDE 0660-600-2 Juni 2012	Niederspannungs-Schaltgerätekombinationen Teil 2: Energie-Schaltgerätekombinationen (IEC 61439-2:2011); Deutsche Fassung EN 61439-2:2011	
	IEC 61439-1 Edition 2.0, 2011-08	Low-voltage switchgear and controlgear assemblies – Part 2: Power switchgear and controlgear assemblies (IEC 61439-2:2011); German version EN 61439-2:2011	

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ЕЛЕКТРОСАЛ „Табаков и синове" ООД ПЛОВДИВ

Fachbereich	Norm / Hausverfahren / Version	Titel der Norm oder des Hausverfahrens (ggf. Abweichungen / Modifizierungen von Normverfahren angeben)	Prüfbereich / Einschränkung
Elektrotechnik	DIN EN 61439-3 VDE 0660-600-3 Februar 2013 +	Niederspannungs-Schaltgerätekombinationen Teil 3: Installationsverteiler für die Bedienung durch Laien (DBO) (IEC 61439-3:2012); Deutsche Fassung EN 61439-3:2012	
	DIN EN 61439-3 VDE 0660-600-3 Berichtigung 1 Oktober 2014	Berichtigung zu DIN EN 61439-3 (VDE 0660-600-3):2013-02; (IEC-Cor.:2013 zu IEC 61439-3:2012)	
	IEC 61439-3 Edition 1.0, 2012-02	Low-voltage switchgear and controlgear assemblies -- Part 3: Distribution boards intended to be operated by ordinary persons (DBO) (IEC 61439-3:2012); German version EN 61439-3:2012	
Elektrotechnik	DIN EN 61439-4 VDE 0660-600-4 September 2013	Niederspannungs-Schaltgerätekombinationen Teil 4: Besondere Anforderungen für Baustromverteiler (BV) (IEC 61439-4:2012); Deutsche Fassung EN 61439-4:2013	
	IEC 61439-4 Edition 1.0, 2012-11	Low-voltage switchgear and controlgear assemblies -- Part 4: Particular requirements for assemblies for construction sites (ACS) (IEC 61439-4:2012); German version EN 61439-4:2013	

Fachbereich	Norm / Hausverfahren / Version	Titel der Norm oder des Hausverfahrens (ggf. Abweichungen / Modifizierungen von Normverfahren angeben)	Prüfbereich / Einschränkung
Elektrotechnik	DIN EN 61439-5 VDE 0660-600-5 Oktober 2011	Niederspannungs-Schaltgerätekombinationen Teil 5: Schaltgerätekombinationen in öffentlichen Energieverteilungsnetzen (IEC 61439-5:2010); Deutsche Fassung EN 61439-5:2011	
	E DIN EN 61439-5 VDE 0660-600-5 Juli 2014	Niederspannungs-Schaltgerätekombinationen Teil 5: Schaltgerätekombinationen in öffentlichen Energieverteilungsnetzen (IEC 17D/492/CDV:2013); Deutsche Fassung FprEN 61439-5:2013	
	IEC 61439-5 Edition 2.0, 2014-08	Low-voltage switchgear and controlgear assemblies - Part 5: Assemblies for power distribution in public networks (IEC 61439-5:2014);	
Elektrotechnik	DIN EN 60439-1 VDE 0660-500 Beiblatt 2 Mai 2009	Niederspannungs-Schaltgerätekombinationen Teil 1: Typgeprüfte und partiell typgeprüfte Kombinationen – Technischer Bericht: Verfahren für die Prüfung unter Störlichtbogenbedingungen (IEC/TR 61641:2008)	
	IEC TR 61641 Edition 3.0, 2014-09	Enclosed low-voltage switchgear and controlgear assemblies – Guide for testing under conditions of arcing due to internal fault	

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Приложение 2.1 - Каталог на TPU 6x.xx

ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОНИКС"
ПЛОВДИВ
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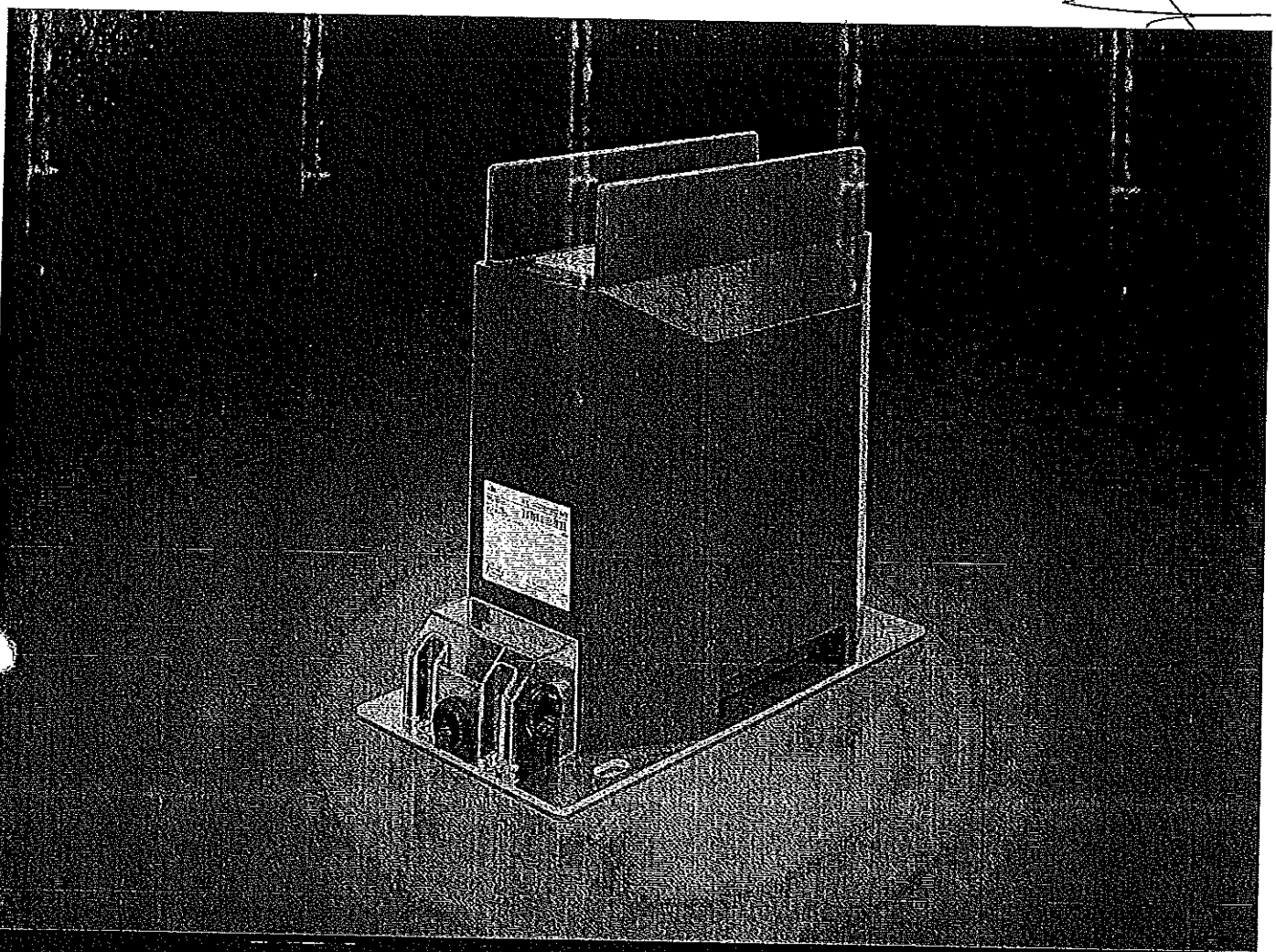


Medium Voltage Product

Technical parameters	Value
Highest voltage for equipment	24 up to 25 kV
Power frequency test voltage, 1 min.	50 up to 55 kV
Lighting impulse test voltage	up to 125 kV
Rated primary current	10 - 3 200 A
Rated short-time thermal current	2 - 100...1s kA
Burdens, classes	5-30/0.2-5/5P; 10P VA/cl (acc. to other param. - Ith)
Reconnectable (primary till 400-800 A)	primary or secondary

Description

The TPU 6x.xx transformers are cast in epoxy resin and designed for insulation voltages up to 25 kV. The 24 kV version has the same dimensions as the 25 kV. For certain types of panels there is a need for extra long creepage distance on the transformers. For this purpose you can order current transformers with „ribs on the top". The transformers are manufactured in conformity with dimensions stated hereunder. The TPU 6x.xx transformers are designed as single-turn or multi-turn versions, with one transformer ratio or with double ratio having the possibility to be reconnectable on the primary or on the secondary side. The number of secondary windings (from 1 to 6 – max. 12 secondary terminals - 2 rows), depends on the combination of the technical parameters (such as the accuracy class, burden, short-circuit current, overcurrent factor...) and the transformer dimensions size.

When agreed between the manufacturer and the customer the TPU transformers can be provided with the voltage indication system. For this purpose, however, it is necessary to know in what insulation level the transformers shall operate. The secondary windings are used for measurement or protection purposes, or for special use (testing winding, „X" class windings). One terminal of each secondary winding used and one terminal of short-circuited and not used winding have to be earthed during the transformer operation. The secondary windings are lead out into a cast-type secondary terminal box with plastic cover. The terminal cover is sealable. The terminals are provided with M5 screws for the termination and with throughgoing holes for direct earting (first row of secondary terminals).

Technical data

The transformer can be mounted in any position. The transformer body is fixed by using four screws. Earth clamp M8 is on the transformer base plate.

Rated primary voltages
24 kV; 25 kV

Rated primary currents
10; 15; 20; 25; 30; 40; 50; 60; 75; 100; 150; 200; 300; 400; 500; 600; 750; 1 000; 1 250; 1 500; 2 000; 2 500; 3 000 and 3 200 A; primary reconnectable modification max till 400-800 A. Other primary currents can also be agreed upon with the customer.

Rated secondary currents
5 A; 1 A, others on request (possibility to combine different values in one transformer)

Accuracy classes
0.2; 0.2S; 0.5; 0.5S; 1; 3; 5; 5P10; 5P15; 5P20; 10P10; 10P15; 10P20; others on request.

Rated frequency
50 Hz or 60 Hz, others on request

The transformers are designed and manufactured in conformity with the following standards and recommendations: IEC, VDE, ANSI, BS, GOST and CSN, others on request.

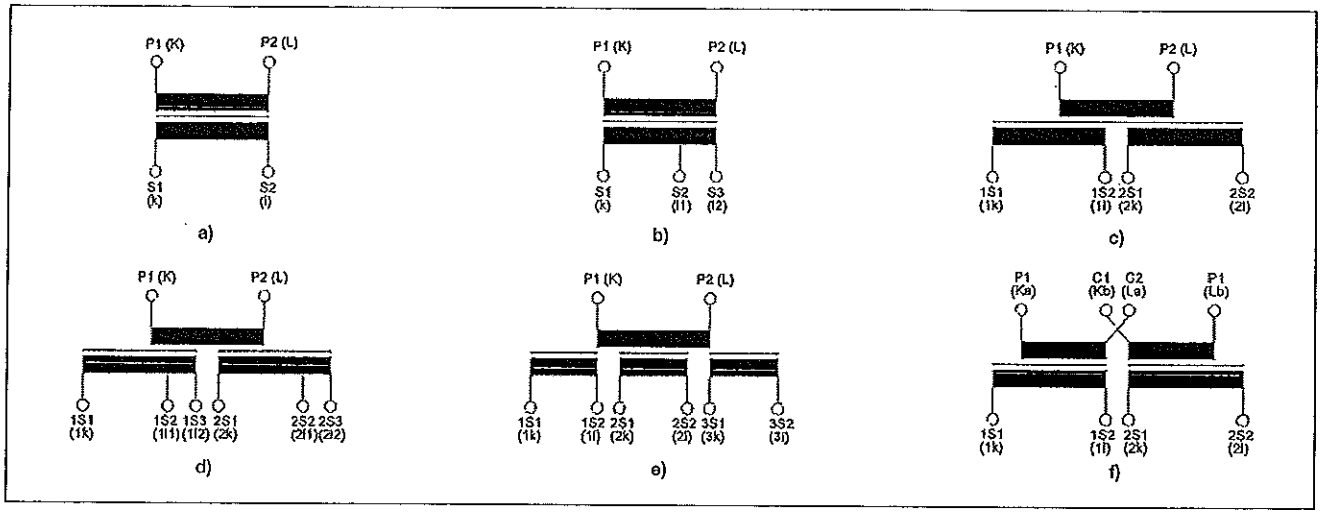
Cantilever strength
5 kN

Permissable torques for screw connections		
M5	max 3.5 Nm	min 2.8 Nm
M8	max 20 Nm	min 16 Nm
M12	max 70 Nm	min 56 Nm

Code designation - TPU current transformers

TPU	4	x	.	x	x
	voltage	current		dimension	primary terminals
	6....up to 25 kV	0... to 600 A multiturn		1..short 178 mm, DIN	1..no pr.rec., no ribs /40x80mm, 80x80mm/
		3...to 1 250 A singleturn		2..long 178 mm, DIN	2..prim. rec., no ribs /40x80mm, 80x80mm/
		4...to 1 500 A singleturn			3..no pr.rec., with ribs /60x68mm, 80x80mm/
		5...to 2 000 A singleturn			4..prim. rec., with ribs /40x80mm, 80x80mm/
		6...to 2 500 A singleturn			5..no pr.rec., with ribs /40x80mm, 80x80mm/
		7...to 3 000 A singleturn			
		8...to 3 200 A singleturn			

Marking of current transformer outlets - example



a) Single-core design | b) Double-core design | c) Three-core design | d) Single-core design, reconnectable on the secondary side | e) Double-core design, reconnectable on the secondary side | f) Double-core design, reconnectable on the primary side

Standartized insulation levels of TPU 6x.xx transformers

24/50/125 kV
25/50/125 kV
25/55/125 kV

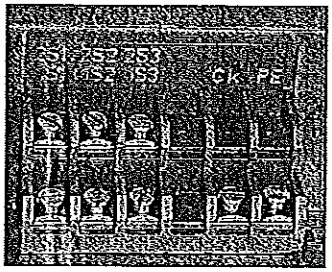


Fig. 1. 1 Secondary terminal box
(3 secondaries and voltage indicator)

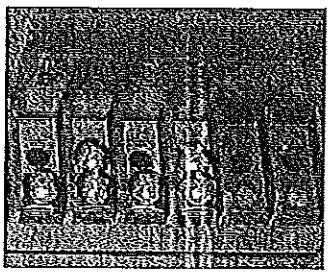


Fig. 2. 2 Secondary terminal box
(2 secondaries and grounding screw)

Standartized transformers

Type	Ithn/dyn [kA]	Ratio [A]	Burden [VA]	Class	FS/ALF
60.11	6.3/16	20//5	10	5P	15
60.11	6.3/16	20//5	20	5P	10
60.11	6.3/16	20//5/5	15/15	0.5/5P	FS5/10
60.11	12.5/31.5	20//5	10	5P.	15
60.21	12.5/31.5	20//5/5	15/15	0.5/5P	FS5/5
60.21	16/40	20//5	15	5P	15
60.21	16/40	20//5/5	10/10	0.5/10P	FS5/10
60.11	6.3/16	30//5	15	5P	15
60.11	6.3/16	30//5	20	5P	10
60.11	6.3/16	30//5/5	15/15	0.5/5P	FS5/15
60.11	12.5/31.5	30//5	10	5P	15
60.11	12.5/31.5	30//5	20	5P	10
60.21	12.5/31.5	30//5/5	15/15	0.5/5P	FS5/10
60.21	25/63	30//5	10	5P	15
60.21	25/63	30//5	15	5P	10
60.21	25/63	30//5/5	10/10	0.5/5P	FS5/10
60.11	6.3/16	50//5	15	5P	15
60.11	6.3/16	50//5	30	5P	10
60.11	6.3/16	50//5/5	15/15	0.5/5P	FS5/10
60.11	16/40	50//5	10	5P	15
60.11	16/40	50//5	30	5P	10
60.21	16/40	50//5/5	15/15	0.5/5P	FS5/15
60.11	31.5/80	50//5	10	5P	15
60.21	31.5/80	50//5	30	5P	10
60.21	31.5/80	50//5/5	15/15	0.5/5P	FS5/10
60.11	16/40	100//5	15	5P	15
60.11	16/40	100//5/5	15/15	0.5/5P	FS5/15
60.11	31.5/80	100//5	15	5P	15
60.11	31.5/80	100//5/5	15/15	0.5/5P	FS5/10
60.11	31.5/63	200//5	15	5P	15
60.11	31.5/63	200//5	30	5P	15
60.11	31.5/63	200//5/5	15/15	0.5/5P	FS5/15
60.11	40/100	200//5	15	5P	15
60.11	40/100	200//5	30	5P	10
60.11	40/100	200//5/5	15/15	0.5/5P	FS5/10
60.11	31.5/80	300//5	15	5P	15
60.11	31.5/80	300//5	30	5P	10
60.11	31.5/80	300//5/5	15/15	0.5/5P	FS5/15
60.11	50/125	300//5	15	5P	15
60.11	50/125	300//5	30	5P	10

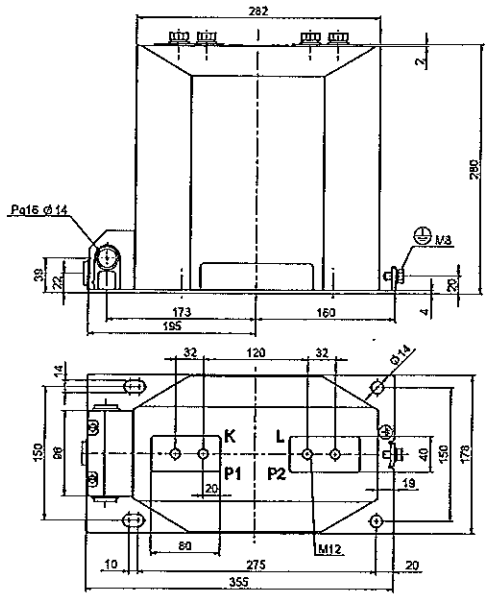
Type	Ithn/dyn [kA]	Ratio [A]	Burden [VA]	Class	FS/ALF
60.11	50/125	300//5/5	15/15	0.5/5P	FS5/15
60.11	40/100	400//5	30	5P	15
60.11	40/100	400//5/5	15/15	0.5/5P	FS5/15
60.11	50/125	400//5	15	5P	15
60.11	50/125	400//5/5	15/15	0.5/5P	FS5/15
60.11	50/125	500//5	30	5P	10
60.11	50/125	500//5/5	15/15	0.5/5P	FS5/15
60.11	50/125	600//5	30	5P	10
60.11	50/125	600//5/5	15/15	0.5/5P	FS10/15
61.11	50/125	400//5	10	5P	15
61.11	50/125	400//5/5	10/10	0.5/5P	FS5/10
62.11	50/125	600//5	15	5P	15
62.11	50/125	600//5	20	5P	10
62.11	50/125	600//5/5	15/15	0.5/5P	FS5/10
63.11	50/125	750//5	15	5P	15
63.11	50/125	750//5	30	5P	10
63.11	50/125	750//5/5	15/15	0.5/5P	FS5/10
63.11	63/160	1 000//5	10	5P	20
63.11	63/160	1 000//5	20	5P	15
63.11	63/160	1 000//5	30	5P	10
63.11	63/160	1 000//5/5	15/15	0.5/5P	FS5/10
63.11	63/160	1 250//5	15	5P	15
63.11	63/160	1 250//5	30	5P	10
63.11	63/160	1 250//5/5	15/15	0.5/5P	FS5/15
64.11	63/160	1 500//5	15	5P	15
64.11	63/160	1 500//5	30	5P	10
64.11	63/160	1 500//5/5	15/15	0.5/5P	FS5/15
65.11	80/200	2 000//5	15	5P	20
65.11	80/200	2 000//5	30	5P	15
65.11	80/200	2 000//5/5	15/15	0.5/5P	FS5/15
66.11	100/250	2 500//5	15	5P	20
66.11	100/250	2 500//5.	30	5P	15
66.11	100/250	2 500//5/5	30/30	0.5/5P	FS5/15
67.11	100/250	3 000//5	15	5P	15
67.11	100/250	3 000//5	30	5P	20
67.11	100/250	3 000//5/5	30/30	0.5/5P	FS5/15
68.11	100/250	3 200//5	15	5P	15
68.11	100/250	3 200//5	30	5P	20
68.11	100/250	3 200//5/5	30/30	0.5/5P	FS5/15

ВЯРНО С ОРИГИНАЛА

Dimensional Drawing

TPU 60.11
TPU 63.11

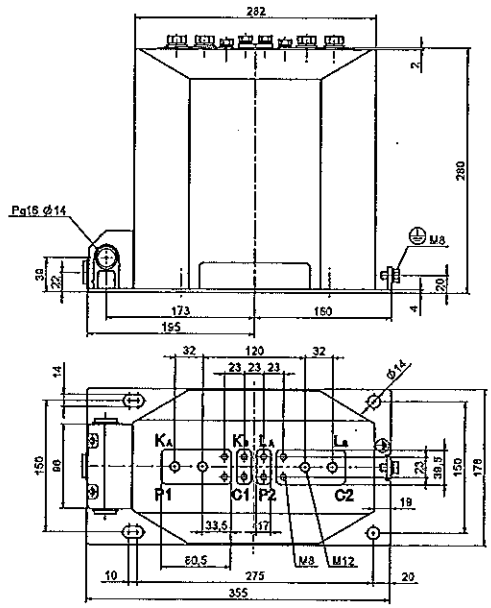
Weight: 31-35 kg
Creepage distance: 270 mm



Drawing n.	Polarity
44615000	P1 to secondary terminal
44615010	P2 to secondary terminal

TPU 60.12

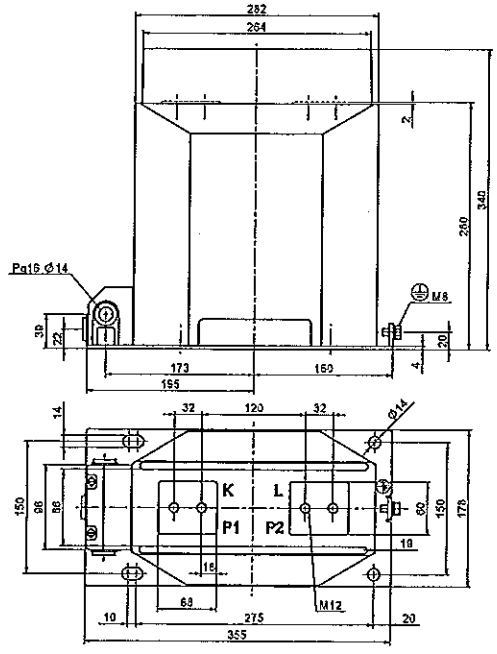
Weight: 31-35 kg
Creepage distance: 282 mm



Drawing n.	Polarity
44615020	P1 to secondary terminal
44615030	P2 to secondary terminal

TPU 60.13
TPU 63.13

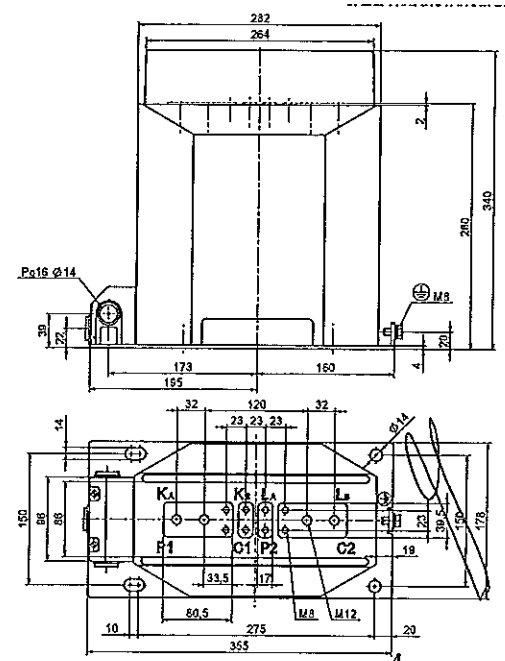
Weight: 31-35 kg
Creepage distance: 280 mm



Drawing n.	Polarity
44615040	P1 to secondary terminal
44615050	P2 to secondary terminal

TPU 60.14

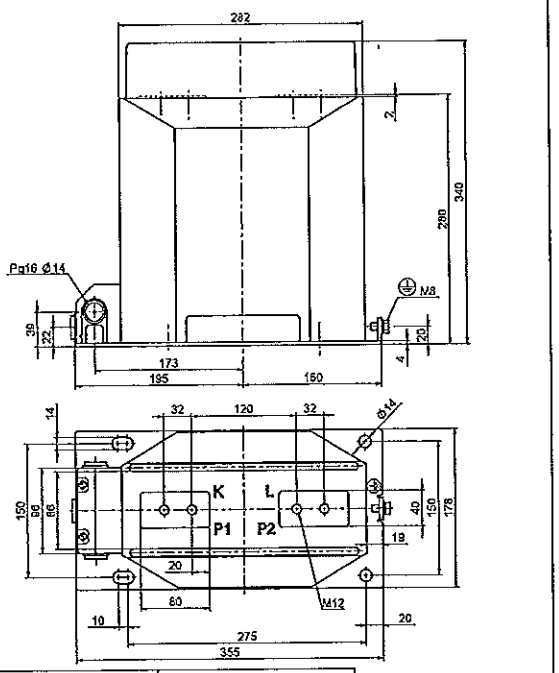
Weight: 31-35 kg
Creepage distance: 282 mm



Drawing n.	Polarity
44615060	P1 to secondary terminal
44615070	P2 to secondary terminal

TPU 60.15
TPU 63.15

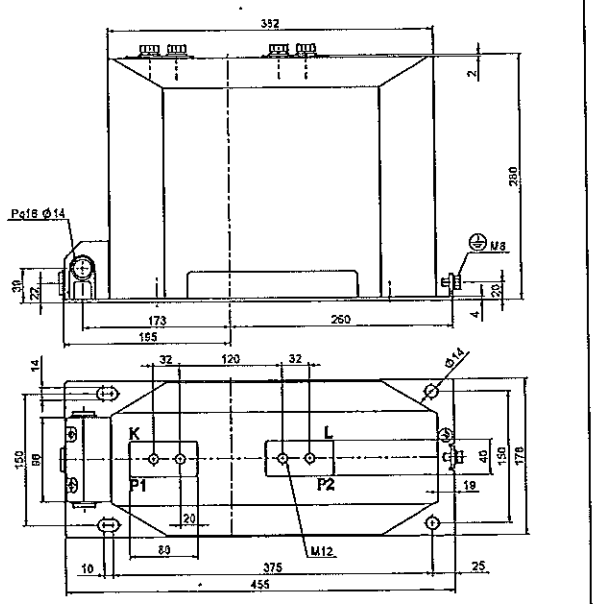
Weight: 31-35 kg
Creepage distance: 280 mm



Drawing n.	Polarity
1VL4600577R0101	P1 to secondary terminal
1VL4600577R0102	P2 to secondary terminal

TPU 60.21
TPU 63.21

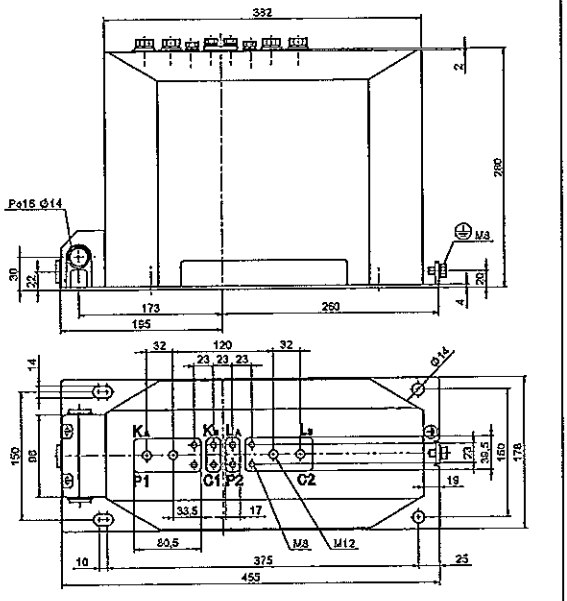
Weight: 43-49 kg
Creepage distance: 270 mm



Drawing n.	Polarity
44615080	P1 to secondary terminal
44615090	P2 to secondary terminal

TPU 60.22

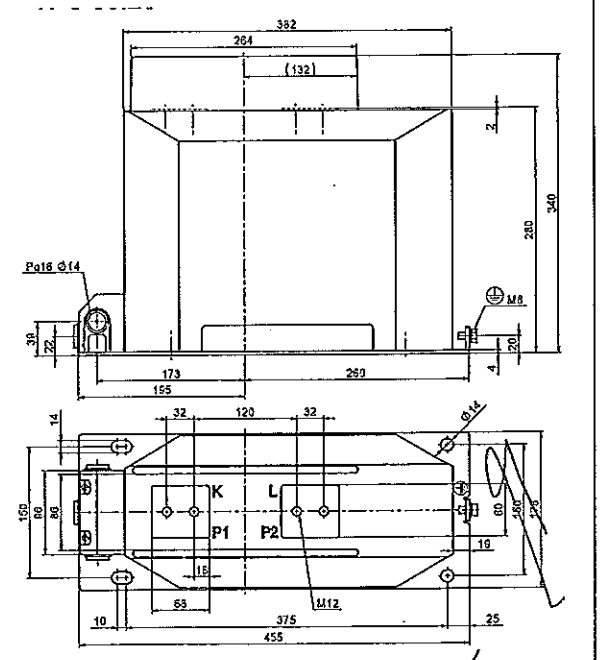
Weight: 43-49 kg
Creepage distance: 282 mm



Drawing n.	Polarity
44615100	P1 to secondary terminal
44615110	P2 to secondary terminal

TPU 60.23
TPU 63.23

Weight: 43-49 kg
Creepage distance: 280 mm

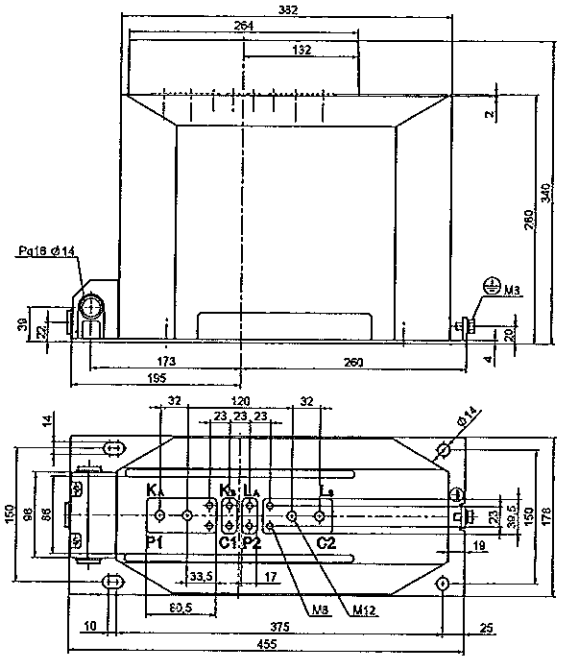


Drawing n.	Polarity
44615120	P1 to secondary terminal
44615130	P2 to secondary terminal

ВЯРНО С ОРИГИНАЛА

TPU 60.24

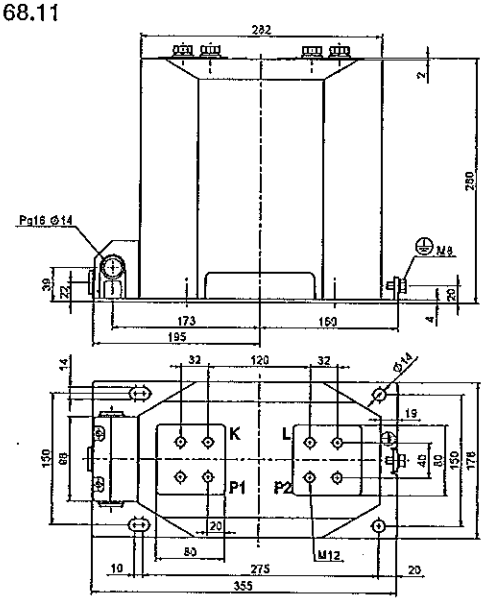
Weight: 43-49 kg
Creepage distance: 282 mm



Drawing n.	Polarity
44615140	P1 to secondary terminal
44615150	P2 to secondary terminal

TPU 64.11
TPU 65.11
TPU 66.11
TPU 67.11
TPU 68.11

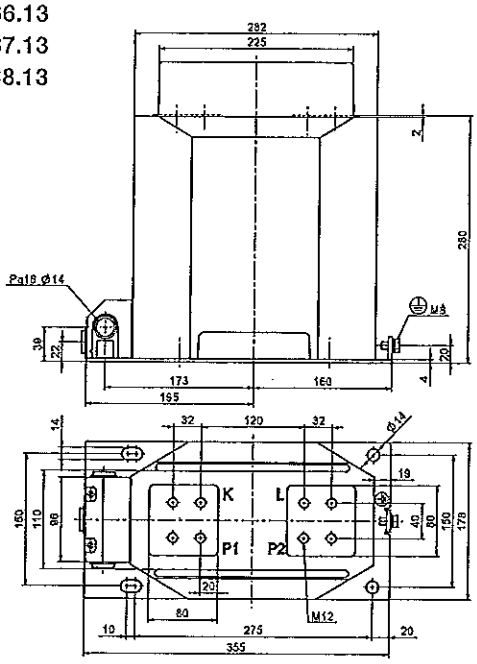
Weight: 36-41 kg
Creepage distance: 270 mm



Drawing n.	Polarity
44615160	P1 to secondary terminal
44615170	P2 to secondary terminal

TPU 64.13
TPU 65.13
TPU 66.13
TPU 67.13
TPU 68.13

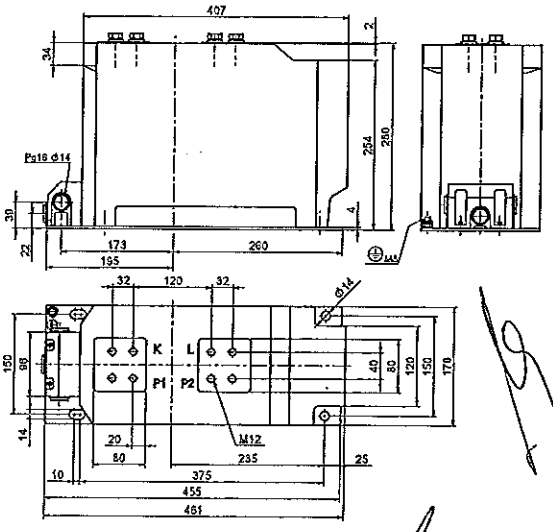
Weight: 36-41 kg
Creepage distance: 270 mm



Drawing n.	Polarity
44615180	P1 to secondary terminal
44615190	P2 to secondary terminal

TPU 64.21
TPU 65.21
TPU 66.21
TPU 67.21
TPU 68.21

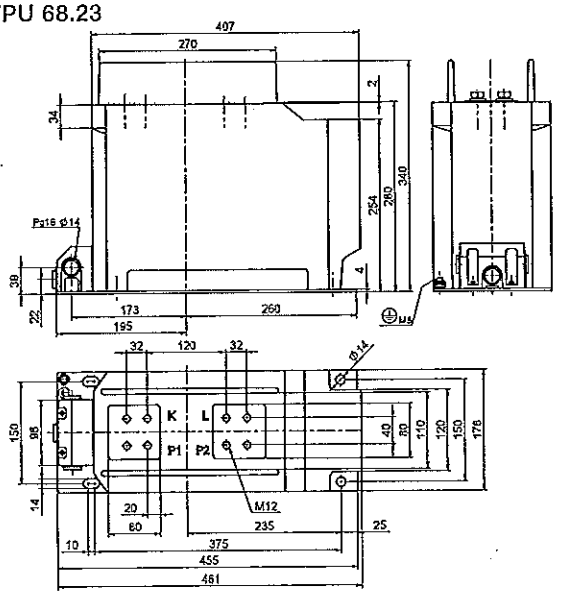
Weight: 50-57 kg
Creepage distance: 272 mm



Drawing n.	Polarity
44615200	P1 to secondary terminal
44615210	P2 to secondary terminal

TPU 64.23
TPU 65.23
TPU 66.23
TPU 67.23
TPU 68.23

Weight: 50-57 kg
Creepage distance: 272 mm



Drawing n.	Polarity
44615220	P1 to secondary terminal
44615230	P2 to secondary terminal

ВЯРНО С ОРИГИНАЛА

Contact us

ABB s.r.o.
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1VLC000502 Rev.7, en. 2016.08.05

Power and productivity
for a better world™

Приложение 2.2 - Удостоверение за одобрен тип

ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ООД „Табаков и синове" ПЛОВДИВ

РЕПУБЛИКА БЪЛГАРИЯ
Български институт по метрология

REPUBLIC OF BULGARIA
Bulgarian Institute of Metrology

ДОПЪЛНЕНИЕ № 15.09.4507.2

КЪМ УДОСТОВЕРЕНИЕ
ЗА ОДОБРЕН ТИП СРЕДСТВО ЗА ИЗМЕРВАНЕ № 06.01.4507
Measuring Instrument Type-approval Certificate-Revision 1

Издадено на производител: *Issued to manufacturer:*	ABB S.r.o., Република Чехия
На основание на: *In Accordance with:*	чл. 30, ал.2 от Закона за измерванията
Относно: *In Respect of:*	измервателни токови трансформатори за средно напрежение тип TPU xx.xx (TPU 4x.xx, TPU 6x.xx, TPU 7x.xx)
Технически и метрологични характеристики: *Technical and metrological characteristics:*	приложение, неразделна част от настоящото удостоверение за одобрен тип средство за измерване
Срок на валидност: *Valid until:*	14.09.2025 г.
Средството за измерване е вписано в регистъра на одобрените за използване типове средства за измерване под №: *Reference №:*	4507
Дата на издаване на първоначалното удостоверението за одобрен тип: *Date:*	05.01.2006 г.
Дата на издаване на допълнението към удостоверението за одобрен тип: *Date:*	14.09.2015 г.

ПРЕДСЕДАТЕЛ:
доц. д-р Димитър Станков

ВЯРНО С ОРИГИНАЛА

Приложение към Допълнение № 15.09.4507.2 към удостоверение № 06.01.4507

Издадено на производител: ABB S.r.o., Република Чехия

Относно: измервателни токови трансформатори за средно напрежение тип TPU xx.xx. (TPU 4x.xx, TPU 6x.xx, TPU 7x.xx)

Описание на допълнение № 15.09.4507.2 към удостоверение за одобрен тип № 06.01.4507

Издаденото допълнение № 15.09.4507.2 към удостоверение за одобрен тип № 06.01.4507 е за удължаване на срока на валидност на одобряване на типа до 14.09.2025 година.

ВЯРНО С ОРИГИНАЛА

РЕПУБЛИКА БЪЛГАРИЯ
Български институт по метрология

REPUBLIC OF BULGARIA
Bulgarian Institute of Metrology

ДОПЪЛНЕНИЕ № 15.09.4507.1

КЪМ УДОСТОВЕРЕНИЕ ЗА ОДОБРЕН ТИП СРЕДСТВО ЗА ИЗМЕРВАНЕ № 06.01.4507

Measuring Instrument Type-approval Certificate-Revision 1

Издадено на производител: *Issued to manufacturer:*	ABB S.r.o., Република Чехия
На основание на: *In Accordance with:*	чл. 32, ал. 1 от Закона за измерванията (ДВ, бр. 46 от 2002 г., изм. бр. 88 от 05 г., изм. и доп. бр. 95 от 2005 г.)
Относно: *In Respect of:*	измервателни токови трансформатори за средно напрежение тип TPU xx.xx
Технически и метрологични характеристики: *Technical and metrological characteristics:*	приложение, неразделна част от настоящото удостоверение за одобрен тип средство за измерване
Срок на валидност: *Valid until:*	05.01.2016 г.
Средството за измерване е вписано в регистъра на одобрените за използване типове средства за измерване под №: *Reference №:*	4507
Дата на издаване на допълнението към удостоверението за одобрен тип: *Date:*	03.09.2015 г.

ПРЕДСЕДАТЕЛ:

доц. д-р Димитър Станков

ВЯРНО С ОРИГИНАЛА

518

Приложение към Допълнение № 15.09.4507.1 към удостоверение № 06.01.4507

Издадено на производител: ABB S.r.o., Република Чехия

Относно: измервателни токови трансформатори за средно напрежение тип TPU xx.xx

Описание на допълнението към удостоверение за одобрен тип № 06.01.4507

В **т. 1.1. Технически и метрологични характеристики** да се допълни:

- Номинални първични токове:
  - за TPU 4x.xx: от 10 A до 3200 A;
  - за TPU 6x.xx: от 10 A до 3200 A;
  - за TPU 7x.xx: от 10 A до 2500 A.

В **т. 1.3. Схеми на местата за поставяне на знаци, удостоверяващи резултатите от контрола и места за пломбиране** да се допълни:

- Знакът за одобрен тип ще бъде гравиран на табелата с номинални данни от завода производител;
- Знакът за първоначална проверка (марка за залепване) се поставя до гравирания знак за одобрен тип.

ВЯРНО С ОРИГИНАЛА

"ЕЛЕКТРОЛУКС" ООД ПЛОВДИВ "Табаков и синове"

Приложение 2.3 - Типови изпитания

ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОАУКС" ПЛОВДИВ „Табаков и синове" ООД

PEHLA

GESELLSCHAFT FÜR ELEKTRISCHE
HOCHLEISTUNGSPRÜFUNGEN
Member of the
SHORT-CIRCUIT TESTING LIAISON (STL)

Certificate No. 14241Ra

Copy No. 1

TYPE TEST CERTIFICATE OF COMPLETE TYPE TEST

APPARATUS:	Current transformer
DESIGNATION:	TPU 60.11 Rated voltage: 24 kV Rated normal current: 600 A Rated frequency: 60 Hz
SERIAL NUMBER:	1VLT5114049944
MANUFACTURER:	ABB s.r.o., PPMV, Brno, Czech Republic under license of ABB Technology Ltd., Zurich, Switzerland
TESTED FOR:	ABB Technology Ltd., Zurich, Switzerland
DATE(S) OF TEST:	22nd October and 04th, 19th and 20th November 2014
TESTED BY:	PEHLA-Testing Laboratory Ratingen, Germany ABB s.r.o. Laboratory Brno, Czech Republic on behalf of PEHLA-Testing Laboratory Ratingen, Germany

The apparatus, constructed in accordance with the description, drawings and photographs incorporated in this certificate has been subjected to the series of proving tests in accordance with

IEC 61869-1, Ed. 1.0, 2007-10, cl. 7.3.2, 7.3.3, 7.3.4, 7.3.6
IEC 61869-2, Ed. 1.0, 2012-09, cl. 7.2.2, 7.2.3, 7.2.6.201 - 203, 7.2.201, 7.3.1, 7.3.5.201 - 203, 7.3.201, 7.3.203 and 204, 7.5.2

This Type Test Certificate has been issued by PEHLA following exclusively the STL Guides.

The results are shown in the record of Proving Tests and the oscillograms attached hereto. The values obtained and the general performances are considered to comply with the above Standard(s) and to justify the ratings assigned by the manufacturer as listed on page No. 7.

The Certificate applies only to the apparatus tested. The responsibility for conformity of any apparatus having the same designations with that tested rests with the Manufacturer.

This Certificate comprises 34 sheets in total.

GESELLSCHAFT FÜR ELEKTRISCHE HOCHLEISTUNGSPRÜFUNGEN

M. Wollinger
Management Committee

H. Spitzer
Dr. T. Ebke
Technical Committee

Mannheim, 21st January 2015

ВЯРНО С ОРИГИНАЛА

DAkkS Deutsche Akkreditierungsstelle D-PL-12062-01-01

Notes

Accreditation

The PEHLA GbR, PEHLA-Testing Laboratory Ratingen has been approved by the DAkkS (German Accreditation Body) according to EN ISO/IEC 17025 for tests in the field of high-voltage switchgear and controlgear and power engineering equipment (Registration-No. D-PL-12072-06-01).

STL-Member

PEHLA is founder member of the SHORT-CIRCUIT TESTING LIAISON (STL) which has been established in 1969. STL is a forum for the international cooperation of the testing organisations with the further full members ASTA (UK), CESI (IT), CPRI (IND), ESEF (FR), KEMA (NL), KERI (KR), SATS (NO, SE, FI), STLNA (US, CA) and JSTC (JP). In the frame-work of EC, STL (EU) has been recognised in 1992 by EOTC as agreement group.

PEHLA-Documents

A Type Test Certificate

is issued for type tests which have successfully been carried out in full compliance with the relevant specifications or standards and STL Guides valid at the time of the test. For these tests the test object must be clearly identified by technical description, drawings and additional specifications.

A Test Document

is issued for parts of type tests which have successfully been carried out in full compliance with the relevant specifications or standards and STL Guides valid at the time of test. For these tests the test object must be clearly identified by technical description, drawings and additional specifications.

A Test Report

is issued for all other tests which have been carried out according to specifications, standards or "PEHLA-Richtlinien" (PEHLA Guides) and/or clients' instructions. Similarly, this test report contains all test results, details of the conditions under which the tests were carried out, also details relating to the behaviour of the test object, and its condition after the tests.

A Test Confirmation

is issued immediately after the tests. It confirms that the tests have been conducted and is valid only until publishing the detailed results in an entire document.

Uncertainty of the measurement systems

The PEHLA - Testing Laboratories apply the PEHLA Guide No. 12 for determining the uncertainties of measurement, based on ENV 13005 (Guide to the expression of uncertainty in measurement). As long as no explicit statements are made, the uncertainties required by the relevant standards have been complied with.

Addresses

Office:	PEHLA-Geschäftsstelle Hallenweg 40 68219 Mannheim Germany Internet: www.pehla.com	Client:	ABB AG Kallstadter Str. 1 68309 Mannheim Germany as shareholder and contractor of PEHLA GbR
Testing Station:	PEHLA-Testing Laboratory Ratingen Oberhausener Str. 33 40472 Ratingen Germany		ABB s.r.o. Laboratory Vídeňská 117 619 00 Brno Czech Republic on behalf of PEHLA-Testing Laboratory Ratingen
Manufacturer:	ABB s.r.o. Vídeňská 117 619 00 Brno Czech Republic under license of ABB Technology Ltd. Zurich, Switzerland		
Tested for:	ABB Technology Ltd. Affolternstrasse 44 8050 Zurich, Switzerland		

ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ООД • „Табаковци синове" ПЛОВДИВ

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„ЕЛЕКТР... АД" ПЛОВДИВ „Табаков и синове" ООД

List of Test Participants
Part 1: 22nd October 2014, ABB s.r.o. Laboratory Brno, Czech Republic

Representatives of Technical Committee:

Dr. Horst Günther	PEHLA-Testing Laboratory Ratingen, Germany
Mr. Nikolaus Beierlein	PEHLA-Testing Laboratory Regensburg, Germany

Test Engineer / Test Operator:

Mr. Jiri Zila	ABB s.r.o. Laboratory Brno, Czech Republic
Dr. Otakar Benes	ABB s.r.o. Laboratory Brno, Czech Republic
Mr. Petr Prikryl	ABB s.r.o. Laboratory Brno, Czech Republic

Representatives of Client:

Mr. Marcel Jancik	ABB s.r.o. Brno, Czech Republic

Further Participants:

-

List of Test Participants
Part 2: 04th November 2014, PEHLA Testing Laboratory Ratingen, Germany

Representatives of Technical Committee:

Mr. Sebastian Soballa	PEHLA-Testing Laboratory Ratingen, Germany
Mr. Herbert Feld	PEHLA-Testing Laboratory Berlin-Marzahn, Germany

Test Engineer / Test Operator:

Mr. Sebastian Soballa (Test Engineer)	PEHLA-Testing Laboratory Ratingen, Germany
Mr. Frank Idaszeck (Test Operator)	PEHLA-Testing Laboratory Ratingen, Germany

Representatives of Client:

Mr. Marcel Jancik	ABB s.r.o. PPMV, Brno, Czech Republic
Mr. Jiri Zila	ABB s.r.o. PPMV, Brno, Czech Republic

Further Participants:

-

ЕЛЕКТРОЛУКС "ТОО" "Табаков и синове" ПЛОВДИВ

ВЯРНО С ОРИГИНАЛА

List of Test Participants
Part 3: 19th and 20th November 2014, ABB s.r.o. Laboratory Brno, Czech Republic

Representatives of Technical Committee:

Dr. Horst Günther	PEHLA-Testing Laboratory Ratingen, Germany
Mr. Nikolaus Beierlein	PEHLA-Testing Laboratory Regensburg, Germany

Test Engineer / Test Operator:

Mr. Jiri Zila	ABB s.r.o. Laboratory Brno, Czech Republic
Dr. Otakar Benes	ABB s.r.o. Laboratory Brno, Czech Republic
Mr. Petr Prikryl	ABB s.r.o. Laboratory Brno, Czech Republic

Representatives of Client:

Mr. Marcel Jancik	ABB s.r.o. PPMV, Brno, Czech Republic

Further Participants:

-

ВЯРНО С ОРИГИНАЛА

Technical Data of Test Object
Current Transformer

Test object:	Current transformer
Designation:	TPU 60.11
Manufacturer:	ABB s.r.o., PPMV, Brno, Czech Republic under license of ABB Technology Ltd., Zurich, Switzerland
Serial No.:	1VLT5114049944
Year of manufacture:	2014
Drawing No.:	1VL34610700

Ratings assigned by the manufacturer:

Highest voltage for equipment	24 kV
Rated primary current	600 A
Rated continuous thermal current	120 %
Rated secondary current	1/1 A
Rated frequency	50 Hz
Rated peak withstand current	80 kA
Rated short-time withstand current	31.5 kA
Duration of short-circuit	1 s
Core 1	
Accuracy class	0.5 FS 5
Rated burden	15 VA
Core 2	
Accuracy class	5P10
Rated burden	15 VA
Power-frequency voltage between sections	3 kV
Inter-turn overvoltage	4.5 kV_{peak}
Insulation class	E
Temperature category	-5/40

Further data: -

ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОНИКС" ООД ПЛОВДИВ „Табаков и синове"

List of Identified Drawings

The manufacturer has submitted to the testing laboratory drawings and other data containing sufficient information to unambiguously identify by type the essential details and parts of the test object presented for test.
The drawings have been stamped and signed by the manufacturer in order to guarantee that the drawings or data schedules truly represent the test object to be tested.
Further these drawings have been stamped and signed by PEHLA representatives and are kept
☐ at the client.
☒ with the test documents at the test laboratory.
The testing laboratory has checked that drawings and data schedules adequately represent the essential details and parts of the test object to be tested, but is not responsible for the accuracy of the detailed information.
The drawing(s) contained in this document are identical with the checked, stamped and signed drawings.

Drawing No.	Rev.	P/D *)	Title	Additional remarks
1VL34610700	-	D	Transformer TPU 60.11 – TPU 63.11	Included in test report
-	-	P	Transformer TPU 60.11 assembly	-
1VL4600638R0101	-	D	Casting TPU 60.11	-
1VL4600636R0101	-	D	Internal parts TPU 60.11(5)	-
1VL3461099A-100A 34611003	002	D	Positioning plate of TPU	-
1VL3461039A 34610390	-	D	Svorkovnice	-

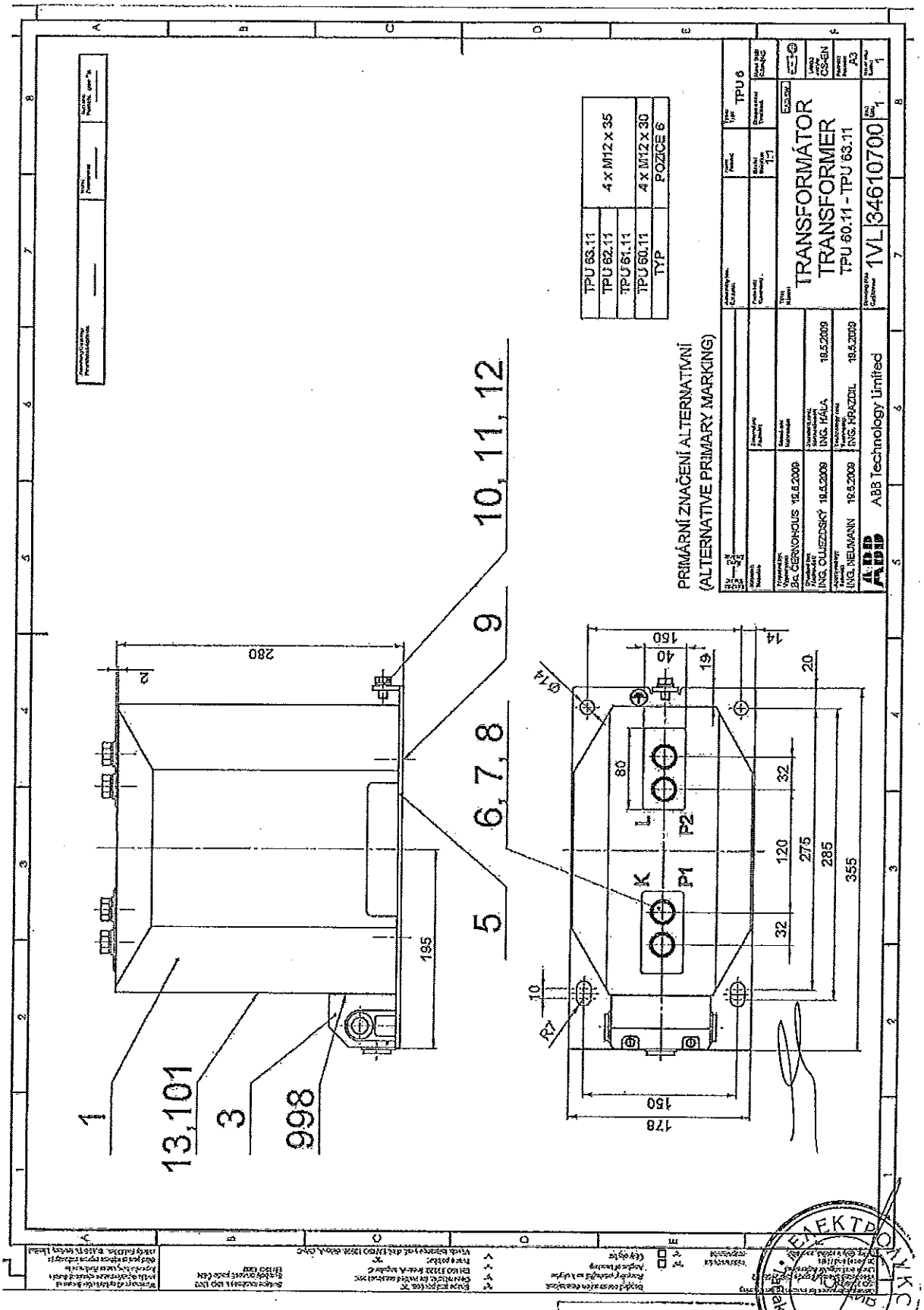
*) P: Parts list, D: Drawing

„ЕЛЕКТРОЛУКС" ООД ГЛОВДИВ „Табаков и синове"

ВЯРНО С ОРИГИНАЛА

Drawing No. 1VL34610700

Current Transformer



Test Results
Accuracy Test

Test performed: Accuracy test
Date of test: 22nd October 2014
Condition of test object: Factory new
Ambient air temperature: 22.7 °C
Humidity: 49.8 %

1. Test performed: **Test for ratio error and phase displacement**

secondary winding 1S1 - 1S2

accuracy class		0.5							
rated current primary / secondary	A	600 / 1							
test current	%	120	100	20	5	120	100	20	5
	A	720	600	120	30	720	600	120	30
rated burden	VA	15							
burden during test	VA	15				3.75			
power factor cosφ		0.8				1.0			
limited ratio error	%	0.500	0.500	0.750	1.500	0.500	0.500	0.750	1.500
limited phase displacement δ	min	30.00	30.00	45.00	90.00	30.00	30.00	45.00	90.00
ratio error	%	0.038	0.007	-0.186	-0.616	0.198	0.192	0.140	-0.010
phase displacement δ	min	1.22	1.86	7.40	17.9	4.63	5.04	9.20	20.6

secondary winding 2S1 - 2S2

accuracy class		5P	
rated current primary / secondary	A	600 / 1	
test current	%	120	100
	A	720	600
rated burden	VA	15	
burden during test	VA	15	
power factor cosφ		0.8	
limited ratio error	%	1.000	
limited phase displacement δ	min	60.00	
ratio error	%	-0.102	-0.107
phase displacement δ	min	1.58	1.73

Result: Test passed

ЕЛЕКТРОЛУКС "Табаков и синове" ООД ПЛОВДИВ

ВЯРНО С ОРИГИНАЛА

Test Results
Accuracy Test before STC Test (2)

2. Test performed: **Tests for winding resistance (R_{ct}), knee point, security factor and composite error**

2.1 Measuring winding 1S1 – 1S2

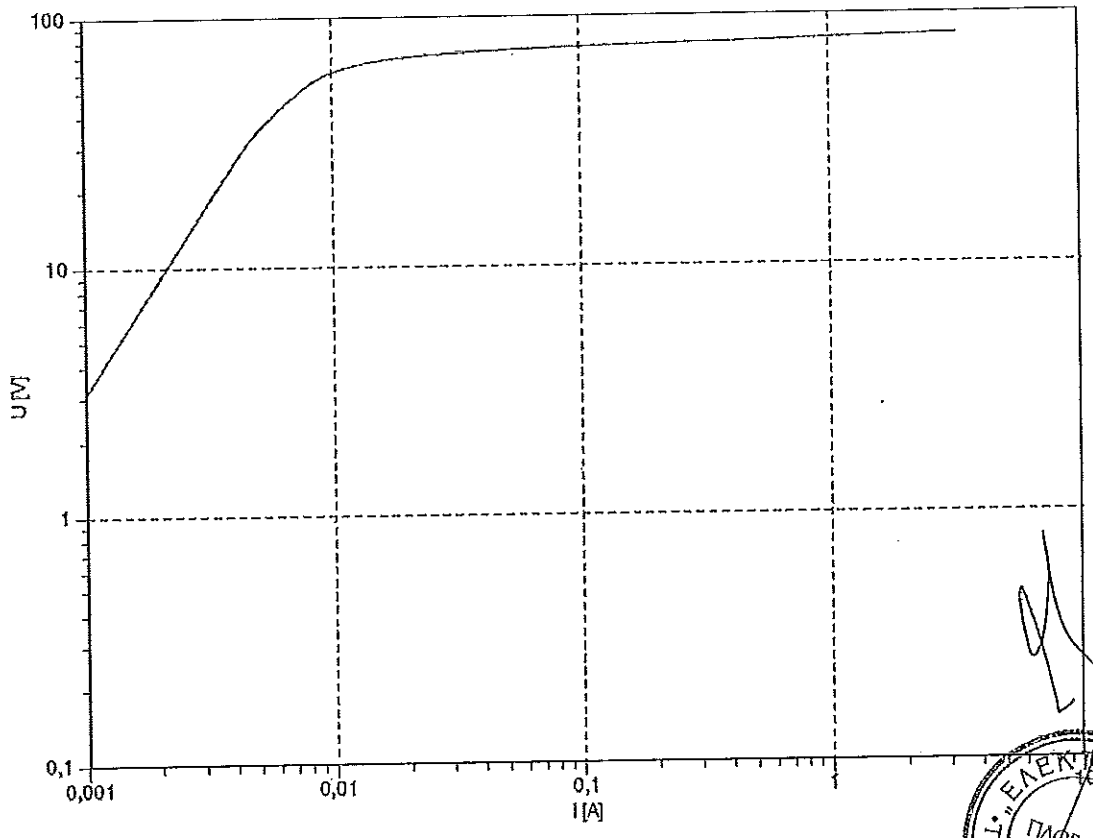
EXCITATION CURVE

RATED DATA

Type	:	TPU 60.11
Serial number	:	1VLT5114049944
Year of production	:	2014
Ratio	:	600//1/1 A
Burden	:	15/15 VA
Accuracy class	:	0,5/5P
Security factor / ALF	:	5/10

MEASURED VALUES

Winding	:	1s1 - 1s2
Resistance of winding (75°C)	:	6,0679 Ohm
Security factor e->n	:	4,11
Knee point U / I	:	61,59 V / 0,0112 A



ВЯРНО С ОРИГИНАЛА

"ЕЛЕКТРОЛУКС" ООД, Пловдив, Табаков и синове

Test Results
Accuracy Test before STC Test (3)

2.2 Measuring winding 2S1 – 2S2

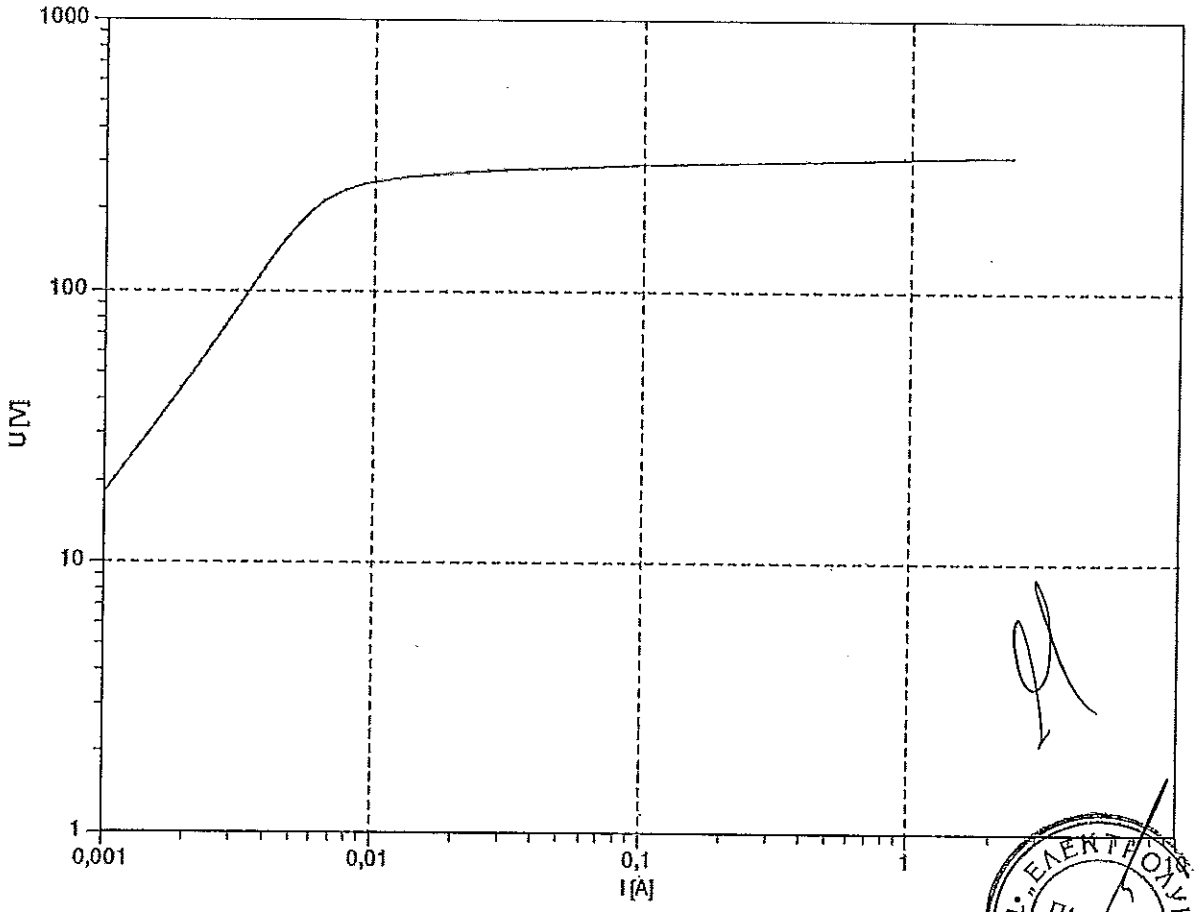
EXCITATION CURVE

RATED DATA

Type	:	TPU 60.11
Serial number	:	1VLT5114049944
Year of production	:	2014
Ratio	:	600//1/1 A
Burden	:	15/15 VA
Accuracy class	:	0,5/5P
Security factor / ALF	:	5/10

MEASURED VALUES

Winding	:	2s1 - 2s2
Resistance of winding (75°C)	:	9,2195 Ohm
Security factor e->n	:	13,87
Composite error	:	0,1 %
Knee point U / I	:	239,99 V / 0,0087 A



Test Results
Power-Frequency Voltage Withstand Test on Secondary Terminals

Test performed:	Power-frequency voltage withstand test on secondary terminals
Date of test:	22nd October 2014
Condition of test object:	As after previous accuracy test
Ambient air temperature:	22.7 °C
Humidity:	49.8 %

- The test voltage of 3 kV, 50 Hz was applied for 60 s in turn between the short circuited terminals of each winding and earth. The frame F and all the other terminals were connected to earth.

Voltage applied to winding	Connected to earth	Test voltage / duration	Result
(1S1-1S2)	(2S1-2S2) + F	3 kV / 60 s	passed
(2S1-2S2)	(1S1-1S2) + F	3 kV / 60 s	passed

Result: Test passed

ВЯРНО С ОРИГИНАЛА

Test Results
Inter-Turn Overvoltage Test

Test performed:	Inter-turn overvoltage test
Date of test:	22nd October 2014
Condition of test object:	As after previous accuracy test and power-frequency voltage withstand test on secondary terminals
Ambient air temperature:	22.7 °C
Humidity:	49.8 %

- The primary winding of the current transformer was excited for 60 s with the extended rated current. The secondary winding was open-circuited. The applied current was limited if the voltage of 4.5 kV peak was obtained before reaching the extended rated current.

Tested winding	Test primary current / duration	Voltage at secondary winding	Result
(1S1-1S2)	720 A / 60 s	2.28 kV_{peak}	passed
(2S1-2S2)	720 A / 60 s	3.38 kV_{peak}	passed

Result: Test passed

ЕЛЕКТРОЛУКС "Табаков и синове" ООД ПЛОВДИВ

ВЯРНО С ОРИГИНАЛА

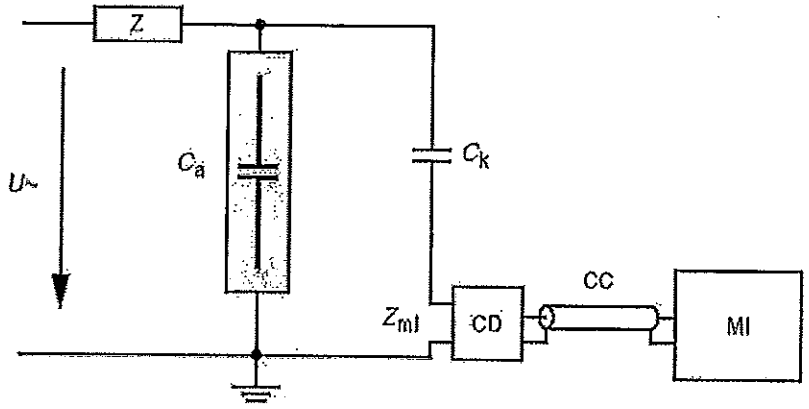
Test Results
Verification of Markings

Test performed:	Verification of markings
Date of test:	22nd October 2014
Condition of test object:	As after previous accuracy test, power-frequency voltage withstand test on secondary terminals and inter-turn overvoltage test

Result: The terminal markings of the test object are verified to be correct in accordance with the requirements of the applied test specifications.

ВЯРНО С ОРИГИНАЛА

Technical Data of Test Circuit
Power-Frequency Voltage Withstand Tests on Primary Terminals and Partial Discharge Measurement



Technical Data:

High voltage supply:

Frequency Inverter, Type SL 11000-3, ZSE Praha, serial No. 3400497

Motor frequency: Selectable range up to 220 Hz

U ~ High Voltage Test Transformer type T100, HIGH VOLT Prüftechnik Dresden GmbH serial No. 885168

Primary voltage	230	V
Rated voltage	100	kV
Rated power	6.6	kVA

100 kV Alternating Voltage Measuring system WGBS 11/100-135, HIGH VOLT Prüftechnik Dresden GmbH, serial No. 884900, consisting of:

100 kV voltage measuring capacitor, type CDCT 0615B12, serial No.0521589-10001

Low voltage measuring part, Type MC 20-4, serial No. 885172

Peak voltmeter, type MU 18, serial No. 885173

C_a	Test object
Z	Filter 40 mH
Z_{mI}	Input impedance of measuring system 50 Ω
CC	Connecting coaxial cable, type L34/10 (50 Ω, length 10 m)
C_k	Coupling capacitor 100 kV / 1nF
CD	Coupling device
MI	Measuring instrument system

Tolerances: According to the IEC 60060-2 cl. 7.1.1 the limits of the measurement uncertainly amount are 3% for the $U_{peak} / \sqrt{2}$

Test Procedure

Power-Frequency Voltage Withstand Tests on Primary Terminals and Partial Discharge Measurement

The power-frequency withstand test on primary terminal and the partial discharge measurement (routine tests) were performed before and after lightning impulse voltage test, temperature-rise test and the short circuit withstand capability test (type tests).

The PD measurements were performed in accordance with IEC61869-1, Ed. 1.0, 2007-10 clause 7.3.2.2 procedure A. Procedure A means the partial discharge test voltages are reched while decreasing the voltage after the power-frequency withstand test. The corresponding partial discharge levels are measured in a time within 30 s.

Calibration:
Before starting the PD measurements the PD test circuit was calibrated in the actual test arrangement.

PD test procedure:
After the power-frequency voltage was applied the voltage is decreased without interruption to 1.2 U_m and the PD level is measured in a time of 30 s. After that the voltage is decreased without interruption furthermore to 1.2 $U_m/\sqrt{3}$ and the PD level is measured in a time of 30 s.

Criteria to pass the test:
The maximum permissible partial discharge quantities are specified IEC61869-1, Ed. 1.0, 2007-10 clause 5.3.3.1 as follows:

at 1.2 x U_m / PD ≤ 50 pC
at 1.2/√3 x U_m / PD ≤ 20 pC

The measured PD values before type tests are given in the table on sheet 18.
The measured PD values after type tests test are given in the table on sheet 26.

ЕЛЕКТРОЛУКС "Табаков и синове" ООД ПЛОВДИВ

ВЯРНО С ОРИГИНАЛА

Test Results

Power-Frequency Voltage Withstand Tests on Primary Terminals and Partial Discharge Measurement

Test performed:	Power-frequency voltage withstand test on primary terminals and partial discharge measurement
Date of test:	22nd October 2014
Condition of test object:	As after previous accuracy test, power-frequency voltage withstand test on secondary terminals and inter-turn overvoltage test
Test frequency:	50 Hz

Temperature ϑ: 22.7 °C Humidity f: 49.8 % Pressure p: 997 hPa
The atmospheric correction factor was not applied.

Test Arrangement:
See photo at page 32

Test performed: **Power-frequency voltage test**

Test arrangement		Test Voltage	Result
Voltage applied to	Earthed	Power frequency voltage in kV	Test duration / disruptive discharges
Primary terminal	Secondary windings and frame	50	60 s / 0

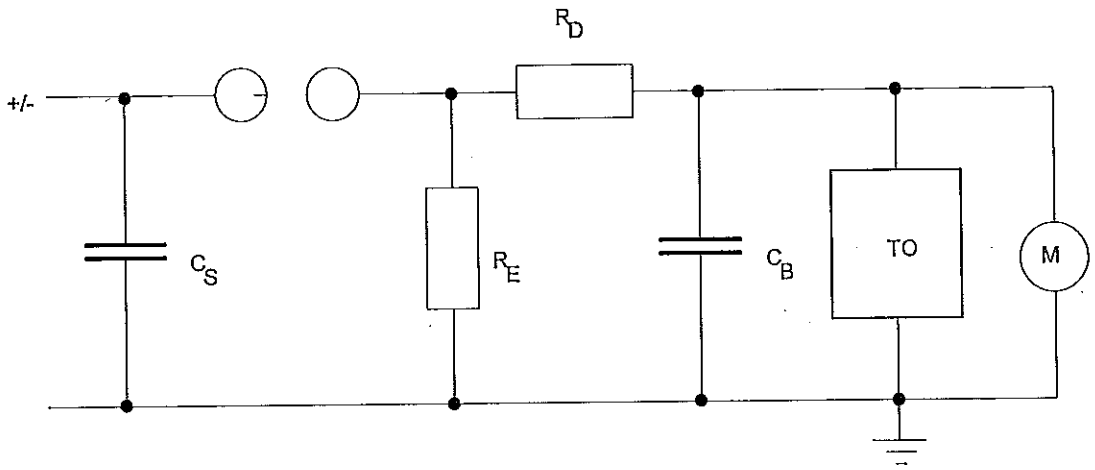
Test performed: **Partial discharge measurement**

Pre-stress: 50 kV for 60 s
Background noise level: 0.2 pC

Test arrangement		Result	
Voltage applied to	Earthed	Test voltage for 30 s	
		28.8 kV	16.6 kV
		Partial discharge in pC	
Primary terminal	Secondary windings and frame	≤ 0.2	≤ 0.2

Result: Tests passed

Technical Data of Test Circuit
Lightning Impulse Voltage Test on Primary Terminals



Technical Data:

Maximum Charging Voltage	U_Σ	=	400	kV
Number of Stages	n	=	4	
Surge Capacity per Stage	C_S	=	1000	nF
Load Capacitance	C_B	=	2000	pF
Damping Resistance	R_D	=	R_{SI}	
Internal Front Resistance per Stage	R_{SI}	=	43	Ω
Discharge Resistance	R_E	=	4	R_P
Tail Resistance per Stage	R_P	=	66	Ω

TO - Test Object

M - Voltage Measurement

Measurement:

Measuring Divider Type SMC 2000/400 (Serial-No. 885217)

Measuring Cable, Length L35/25 (50 Ω, length 25 m)

Impulse Voltage Measuring System, 25 MHz Digital Recorder, Type TR-AS 25-8 (Serial-No. 247)

Tolerances:

According IEC60060-1 Edition 3.0 2010-09 clause 7.2.2

Test voltage value	± 3	%
Front time T_1	± 30	%
Time to half-value T_2	± 20	%

Test Results
Impulse Voltage Withstand Test on Primary Terminals

Test performed: Lightning impulse voltage test
Date of test: 22nd October 2014
Condition of test object: As after routine tests

Temperature ϑ: 22.7 °C Humidity f: 49.8 % Pressure p: 997 hPa
According to IEC61869-1 cl. 7.2.3.2.1 no correction for atmospheric conditions.

Front time T_1: 1.2 µs Time to half-value T_2: 50 µs

Test arrangement		Test Voltage	Result
Voltage applied to	Earthed	Lightning impulse voltage kV	number of impulses / disruptive discharges
Primary terminal	Secondary windings and frame	+ 125	15 / 0
		- 125	15 / 0

Result: Test passed

ВЕРНО С ОРИГИНАЛА

Technical Data of Test Circuit
Short-Time Current Tests

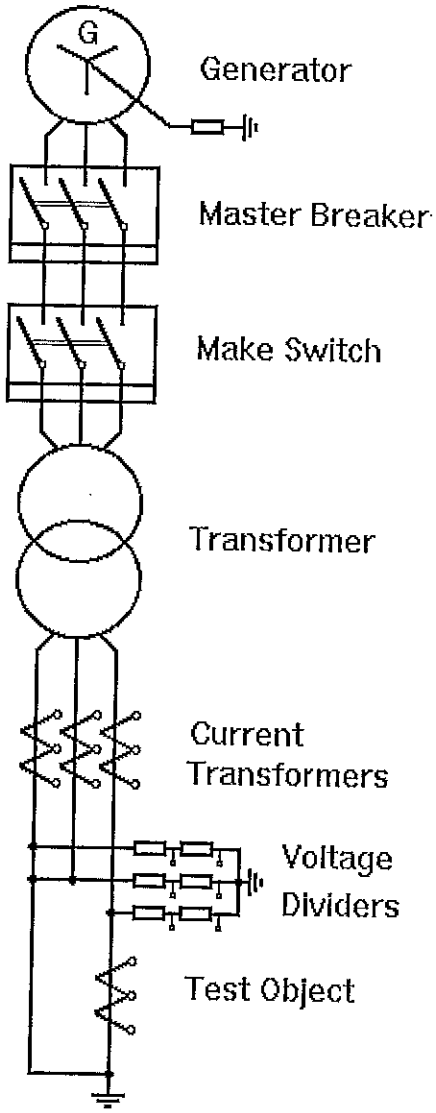
Test performed		STC	-
Test No.	PEHLA 14241Ra /	02 - 05	-
Test circuit			
Circuit diagram	Sheet No.	22	-
Current circuit			
Number of phases		3	-
Power frequency	Hz	50	-
Power factor		< 0.15	-
Earthing conditions			
Generator / System		earthed via 5 kΩ	-
Transformer		not earthed	-
Short-circuit point		earthed	-
Test object		earthed	-
Test object (test values)			
Number of phases		1	-
Measurement			
Voltage measurement		Voltage Dividers 1000 V / 1 V	-
Current measurement		Current Transf. 50 kA / 5 A	-

Remarks: -

"ЕЛЕКТРОЛУКС" "Табаков и синове" ООД ПЛОВДИВ

ВЯРНО С ОРИГИНАЛА

Circuit Diagram
Short-Time Current Tests



Test Results
Short-Time Current Tests

Test performed: Short-time current tests
Date of test: 04th November 2014
Condition of test object before test: As after routine tests and impulse voltage withstand test
Test arrangement: Direct test circuit.
Connections to test object: Infeed via copper bars with a length of approx. 0.5 m each to the terminals of the current transformer. Secondary windings short-circuited. One side of the infeed and the current transformer earthed via cable.
Gas pressure (abs. rel. to 20 °C): - MPa

Test No.			PEHLA 14241Ra /		03	04	05	-	-	-
Peak withstand current			L1	kA	81.1	54.3	55.9	-	-	-
			L2	kA	-	-	-	-	-	-
			L3	kA	-	-	-	-	-	-
Short-circuit current	First cycle		L1	kA	34.3	29.9	30.6	-	-	-
			L2	kA	-	-	-	-	-	-
			L3	kA	-	-	-	-	-	-
	Last cycle		L1	kA	33.6	31.5	35.7	-	-	-
			L2	kA	-	-	-	-	-	-
			L3	kA	-	-	-	-	-	-
	Equivalent current		L1	kA	33.4	30.2	32.9	-	-	-
			L2	kA	-	-	-	-	-	-
			L3	kA	-	-	-	-	-	-
		Average value		kA	-	-	-	-	-	-
	Duration of short-circuit			s	0.321	1.04	3.10	-	-	-
Short-time withstand current			L1	kA	-	30.9	33.5	-	-	-
			L2	kA	-	-	-	-	-	-
			L3	kA	-	-	-	-	-	-
		Average value		kA	-	-	-	-	-	-
	Related to rated duration of short-circuit			s	-	1.00	3.00	-	-	-
Duration of short-circuit				s	-	0.96	3.38	-	-	-
Related to rated short-time withstand current				kA	-	31.5	31.5	-	-	-
Emission of flame/gas/oil					no	no	no	-	-	-
Test result (P/N)					P	P	P	-	-	-
Resistance of the main circuit before test			L1	µΩ	-	-	-	-	-	-
Test current: - A (d.c.)			L2	µΩ	-	-	-	-	-	-
			L3	µΩ	-	-	-	-	-	-
		Ambient air temperature		°C	-	-	-	-	-	-
Resistance of the main circuit after test			L1	µΩ	-	-	-	-	-	-
Test current: - A (d.c.)			L2	µΩ	-	-	-	-	-	-
			L3	µΩ	-	-	-	-	-	-
		Ambient air temperature		°C	-	-	-	-	-	-

Legend: P: Passed in terms of the applied standard N: Not passed in terms of the applied standard

Remarks: PEHLA 14241Ra / 01: Current calibration
PEHLA 14241Ra / 02: Pre-test with reduced values

Condition of test object after test: No visible or functional change or damage.
Result: Test passed

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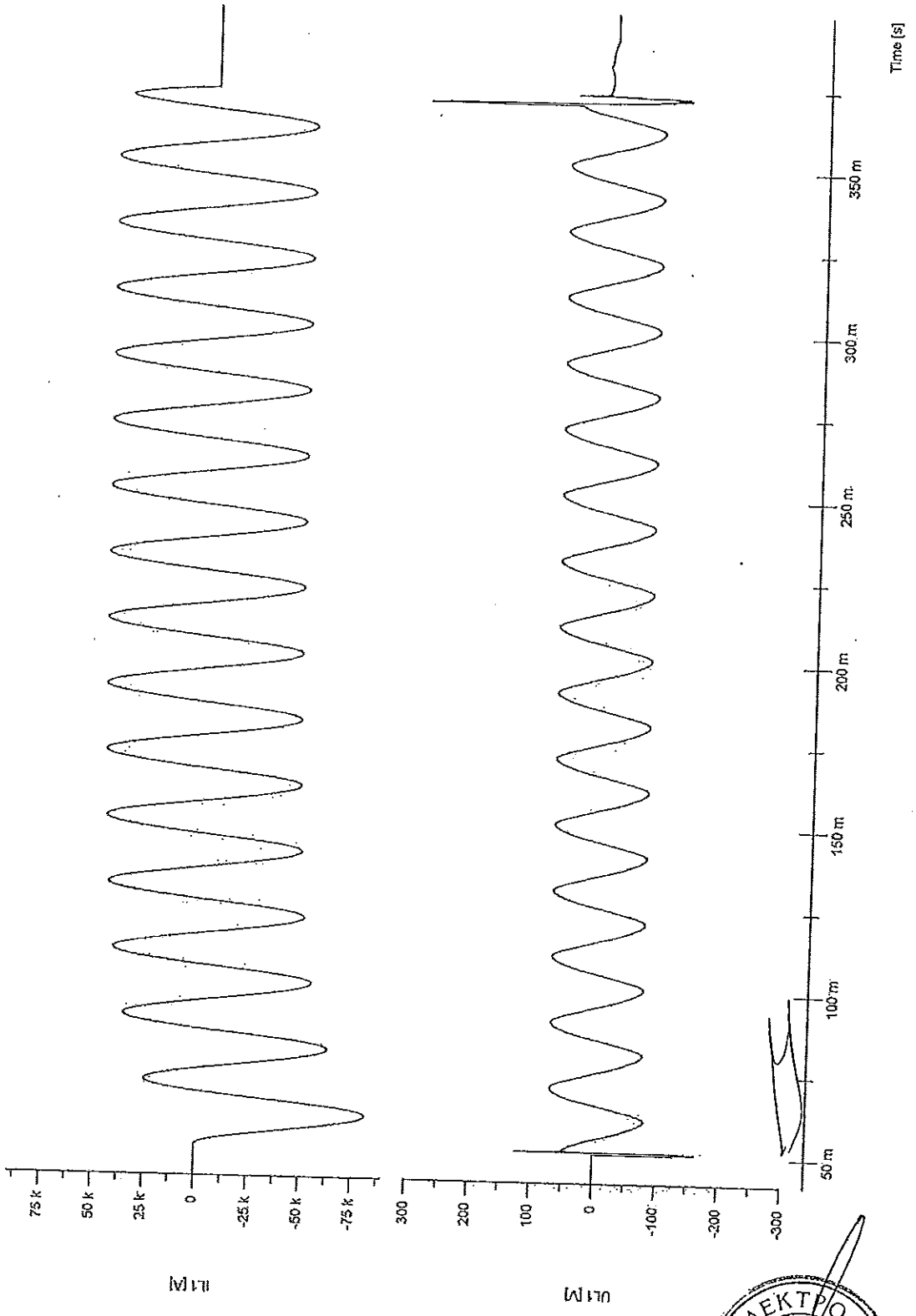
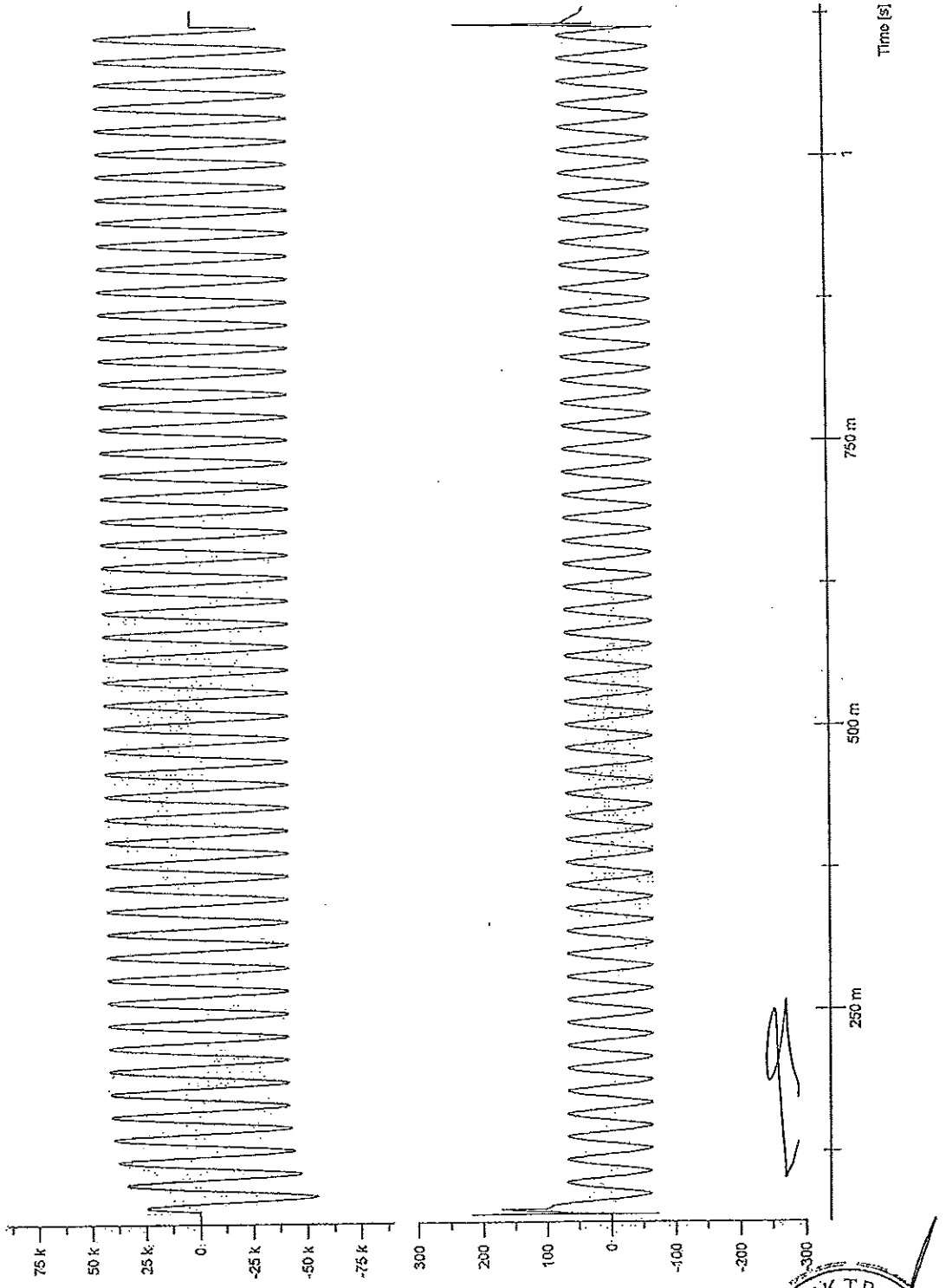
ВЯРНО С ОРИГИНАЛА

Oscillogram No. PEHLA 14241Ra / 03
Dynamic Test



Oscillogram No. PEHLA 14241Ra / 04
Thermal Test - 1s



ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОМЕКС" ООД
ПЛОВДИВ
Табаков и синове

Test Results

Power-Frequency Voltage Withstand Tests on Primary Terminals and Partial Discharge Measurement after STC Tests

Test performed:	Power-frequency voltage withstand test on primary terminals and partial discharge measurement
Date of test:	19th November 2014
Condition of test object:	As after routine tests, impulse voltage withstand test and short-time current tests
Test frequency:	50 Hz

Temperature ϑ: 23.2 °C Humidity f: 40.0 % Pressure p: 990 hPa
The atmospheric correction factor was not applied.

Test Arrangement:

See photo at page 32

Test performed: **Power-frequency voltage test**

Test arrangement		Test Voltage	Result
Voltage applied to	Earthed	Power frequency voltage in kV	Test duration / disruptive discharges
Primary terminal	Secondary windings and frame	50 [1)]	60 s / 0

Test performed: **Partial discharge measurement**

Pre-stress: 50 kV for 60 s
Background noise level: 0.2 pC

Test arrangement		Result	
Voltage applied to	Earthed	Test voltage for 30 s	
		28.8 kV	16.6 kV
		Partial discharge in pC	
Primary terminal	Secondary windings and frame	≤ 0.2	≤ 0.2

Remarks: -

1) According client's requirements the power frequency voltage test and the partial discharge measurement were done at 100 % of the test voltage

Result: Tests passed

ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ООД ПЛОВДИВ „Табаков и синове"

Test Results

Power Frequency Voltage Withstand Tests on Secondary Terminals after STC Test

Test performed:	Power-frequency voltage withstand test on secondary terminals
Date of test:	19th November 2014
Condition of test object:	As after routine tests, impulse voltage withstand test, short-time current test and power-frequency withstand test on primary terminals and partial discharge measurement after STC tests
Ambient air temperature:	23.0 °C
Humidity:	40.6 %

- The test voltage of 3 kV, 50 Hz was applied for 60 s in turn between the short circuited terminals of each winding and earth. The frame F and all the other terminals were connected to earth.

Voltage applied to winding	Connected to earth	Test voltage / duration	Result
(1S1-1S2)	(2S1-2S2) + F	3 kV / 60 s	passed
(2S1-2S2)	(1S1-1S2) + F	3 kV / 60 s	passed

Result: Test passed

ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ООД, Пловдив, Табаков и синове

Test Results
Temperature-Rise Test

Test performed: Temperature-rise test
Date of test: 19th and 20th November 2014
Condition of test object: As after routine tests, impulse voltage withstand, short-time current tests and voltage tests after STC tests
Connections to test object: Infeed of current to the primary winding. The infeed bars consist of Cu bars 1 x 60 x 10 mm²

Duration of test: 15:00 h
Test frequency: 50 Hz

Ambient temperature:

Description	Temperature °C
At the beginning of test	23.8
At the end of test	24.0

Test current:

Description	Current A
At the beginning of test	720
At the end of test	720

Temperature rise at primary bars:

Measuring point	Description of the measuring point	Nature of measuring point	Final temperature °C	Limited temperature K	Final temperature rise K
1	Left side of infeed bar	One side silver coated Cu in air	49.3	75.0	25.3
2	Right side of infeed bar	One side silver coated Cu in air	48.4		24.4

Calculation of temperature rises of windings according formula:

$$\Theta = \frac{R_{end} - R_{start}}{R_{start}} \times (235°C + \vartheta_{astart}) - (\vartheta_{aend} - \vartheta_{astart})$$

Θ	calculated temperature rise
R_{start}	resistance start of test - cold condition
R_{end}	resistance end of test - reaching a stable temperature
ϑ_{astart}	ambient temperature start test
ϑ_{aend}	ambient temperature end of test

secondary winding	R_{start}	R_{end}	ϑ_{astart}	ϑ_{aend}	Θ	Θ_{lim}
	in Ω	in Ω	in °C	in °C	in K	in K
1S1 - 1S3	5.06	5.56	23.8	24.0	25.4	80.0
2S1 - 2S3	7.68	8.44			25.4	

Remarks:
- The permissible temperature rises are valid for an ambient air temperature of 40 °C.
- The temperatures were measured by thermocouples type L. The thermocouples were inserted into drilling holes and fixed by peening.
- The maximum increase of temperature-rise in the last hour was smaller than 1.0 K.

Result: Test passed

18PE0402

ВЕРНО С ОРИГИНАЛА

"ЕЛЕКТРОЛУКС" ООД "Табаков и синове" ПЛОВДИВ

Test Results
Accuracy Test after STC Tests and Voltage Tests

Test performed: Accuracy test
Date of test: 20th November 2014
Condition of test object: As after routine tests, impulse voltage withstand test, short-time current tests, voltage test after STC tests and temperature-rise test
Ambient air temperature: 23.3 °C
Humidity: 39.9 %

Test performed: Test for ratio error

accuracy class		0.5							
rated current primary / secondary	A	600 / 1							
test current	%	120	100	20	5	120	100	20	5
	A	720	600	120	30	720	600	120	30
rated burden	VA	15							
burden during test	VA	15				3.75			
power factor cosφ		0.8				1.0			
limited ratio error	%	0.500	0.500	0.750	1.500	0.500	0.500	0.750	1.500
limited ratio error after STC	%	0.250	0.250	0.375	0.750	0.250	0.250	0.375	0.750
ratio error before STC	%	0.038	0.007	-0.186	-0.616	0.198	0.192	0.140	-0.010
upper limit of ratio error after STC	%	0.288	0.257	0.189	0.134	0.448	0.442	0.515	0.740
lower limit of ratio error after STC	%	-0.212	-0.243	-0.561	-1.366	-0.052	-0.058	-0.235	-0.760
ratio error after STC	%	0.017	-0.004	-0.227	-0.610	0.186	0.178	0.116	-0.003

secondary winding 2S1 - 2S2

accuracy class		5P	
rated current primary / secondary	A	600 / 1	
test current	%	120	100
	A	720	600
rated burden	VA	15	
burden during test	VA	15	
power factor cosφ		0.8	
limited ratio error	%	1	
limited ratio error after STC	%	0.5	
ratio error before STC	%	-0.102	-0.107
upper limit of ratio error after STC	%	0.398	0.393
lower limit of ratio error after STC	%	-0.602	-0.607
ratio error after STC	%	-0.105	-0.107

Test performed: Test for composite error

secondary winding 2S1 - 2S2

accuracy class		5P
limited comp. error before STC test	%	5
limited comp. error after STC test	%	2.5
composite error before STC	%	0.1
limit comp. Erro after STC	%	2.6
composite error after STC	%	0.1

Result: Test passed

ВЕРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" „Табаков и синове" ООД ПЛОВДИВ

Photos

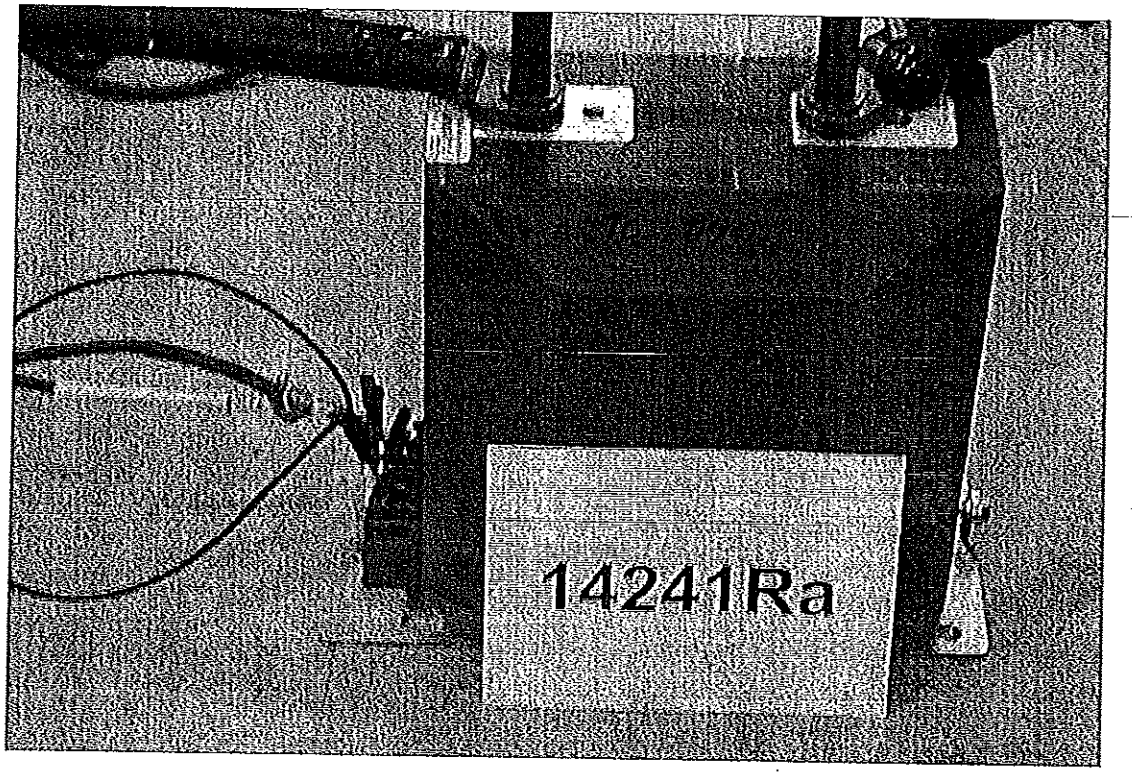


Photo No. 01:
During accuracy test

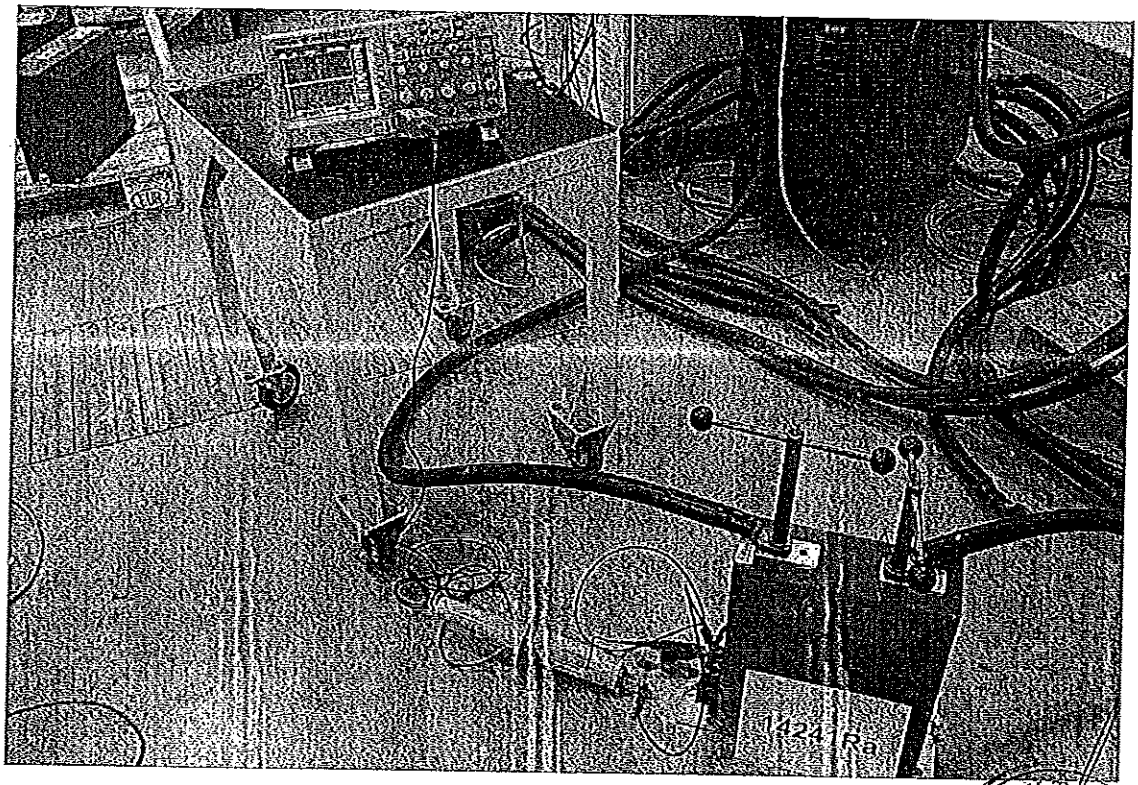


Photo No. 02:
During inter-turn overvoltage

Photos

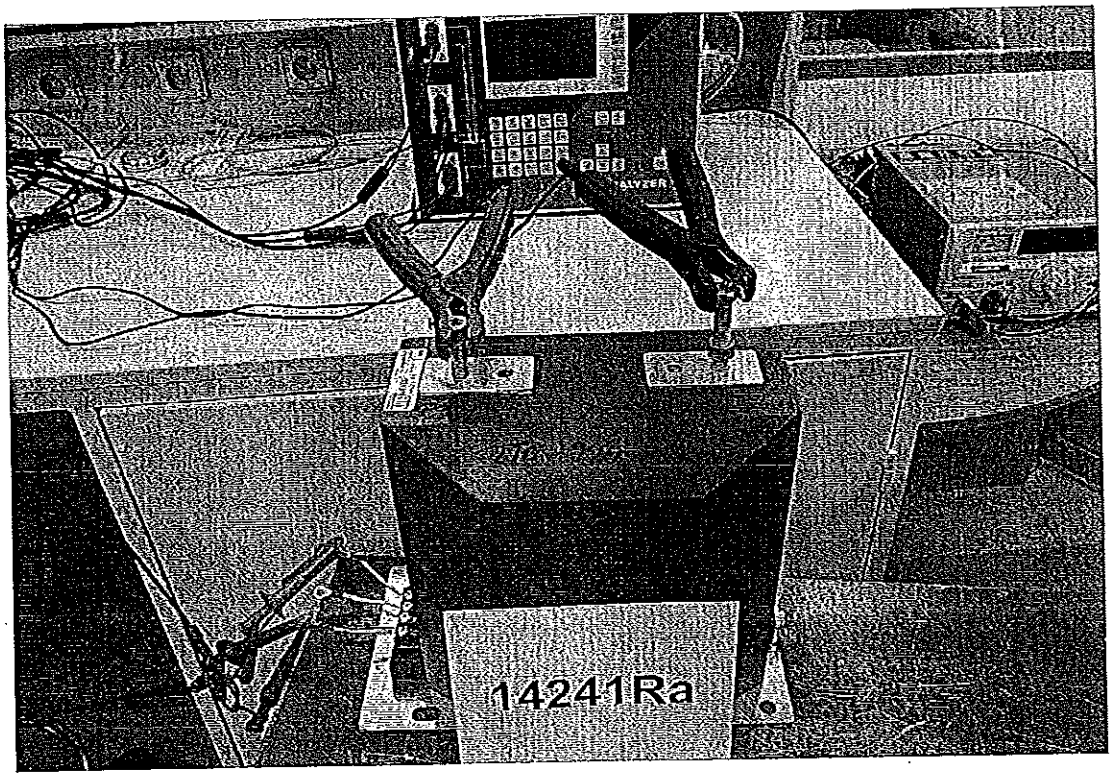


Photo No. 03:
During knee point test

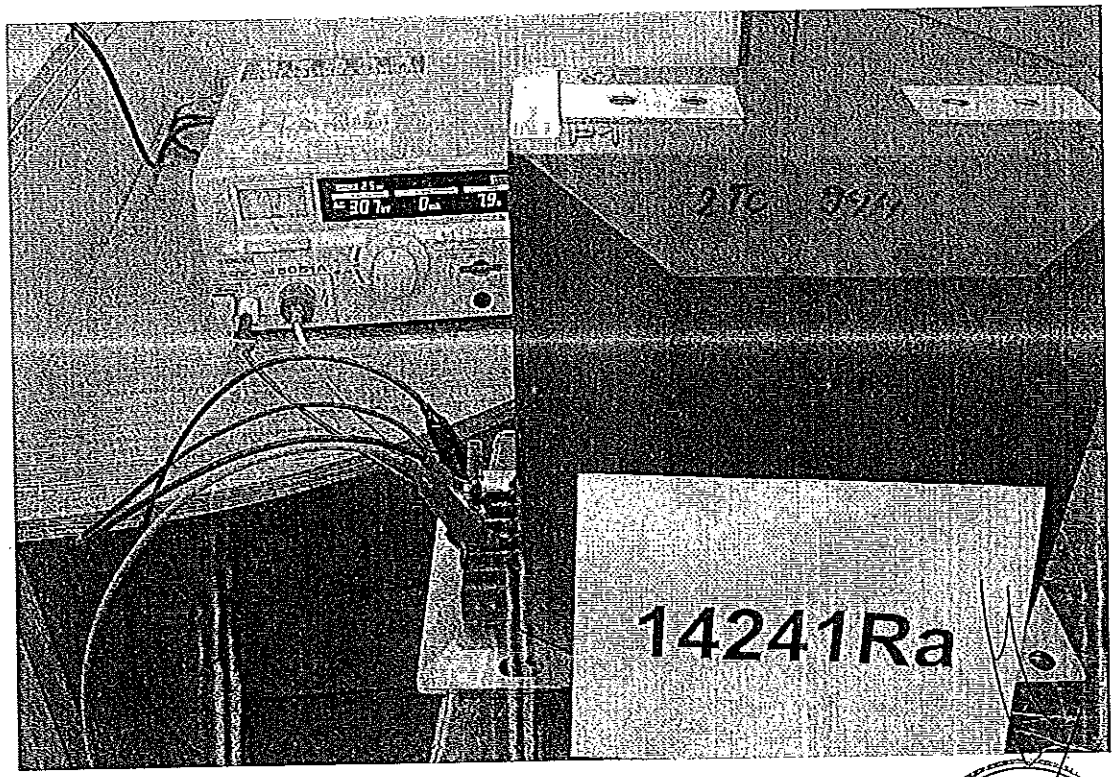


Photo No. 04:
During 3 kV test

ВЕРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ГЛОВДИВ „Табаков и сие" ООД

Photos

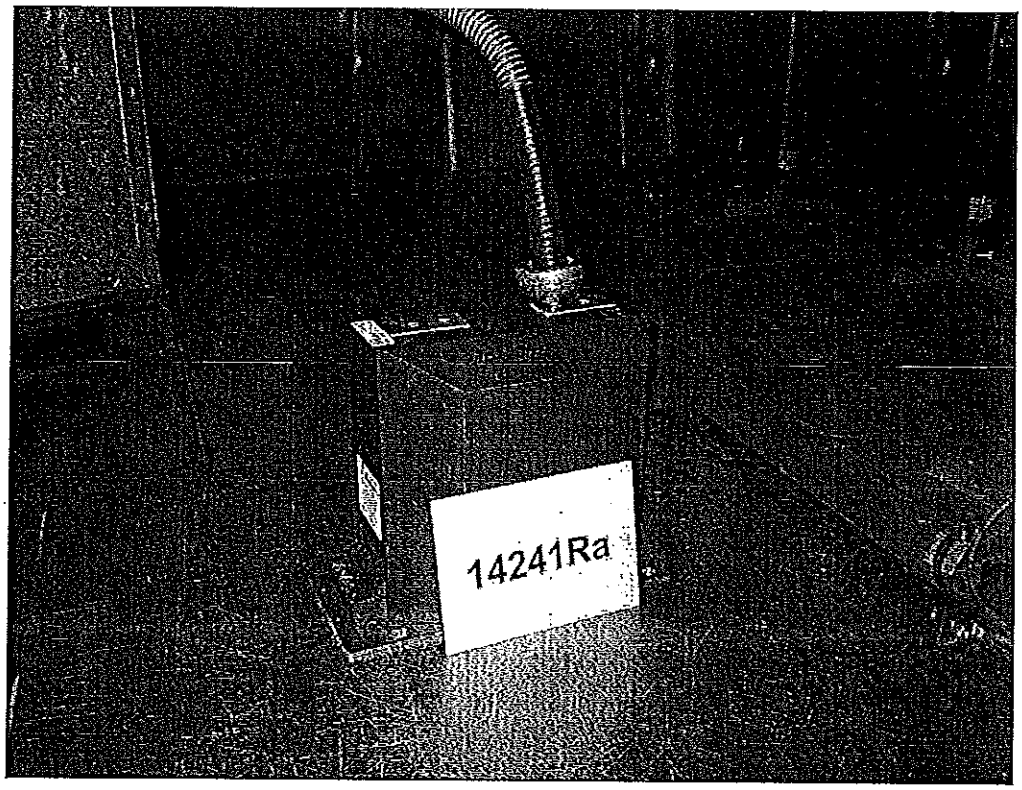


Photo No. 05:
Power frequency and PD test

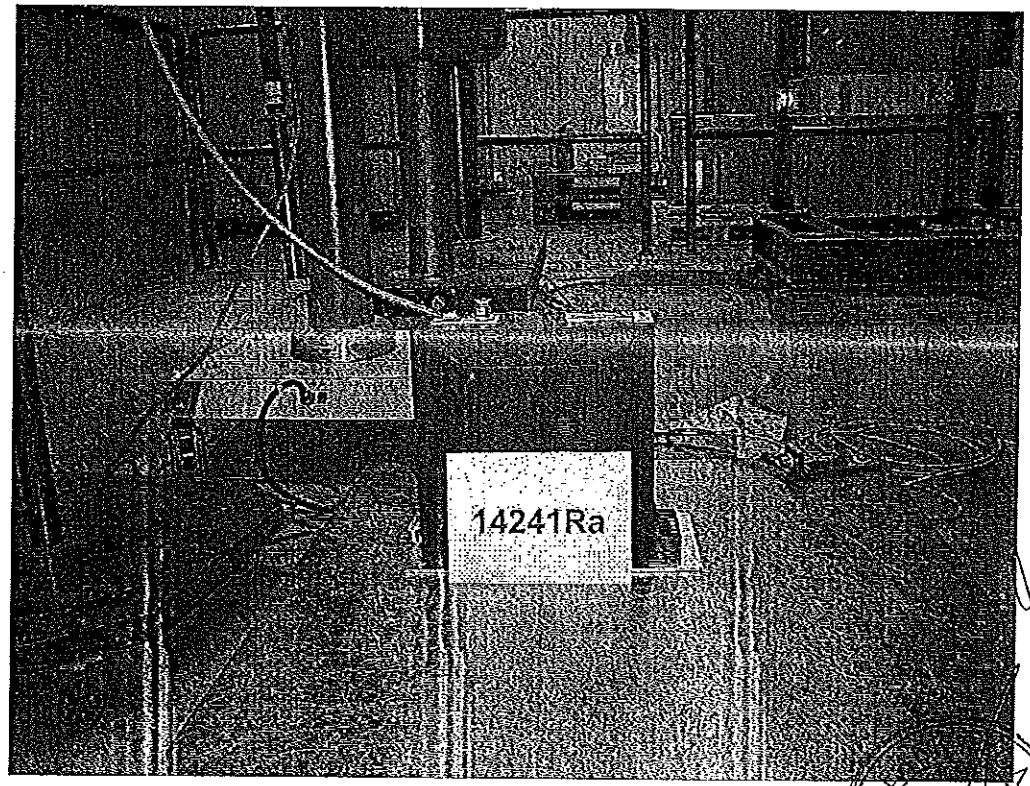


Photo No. 06:
BIL test

Photos

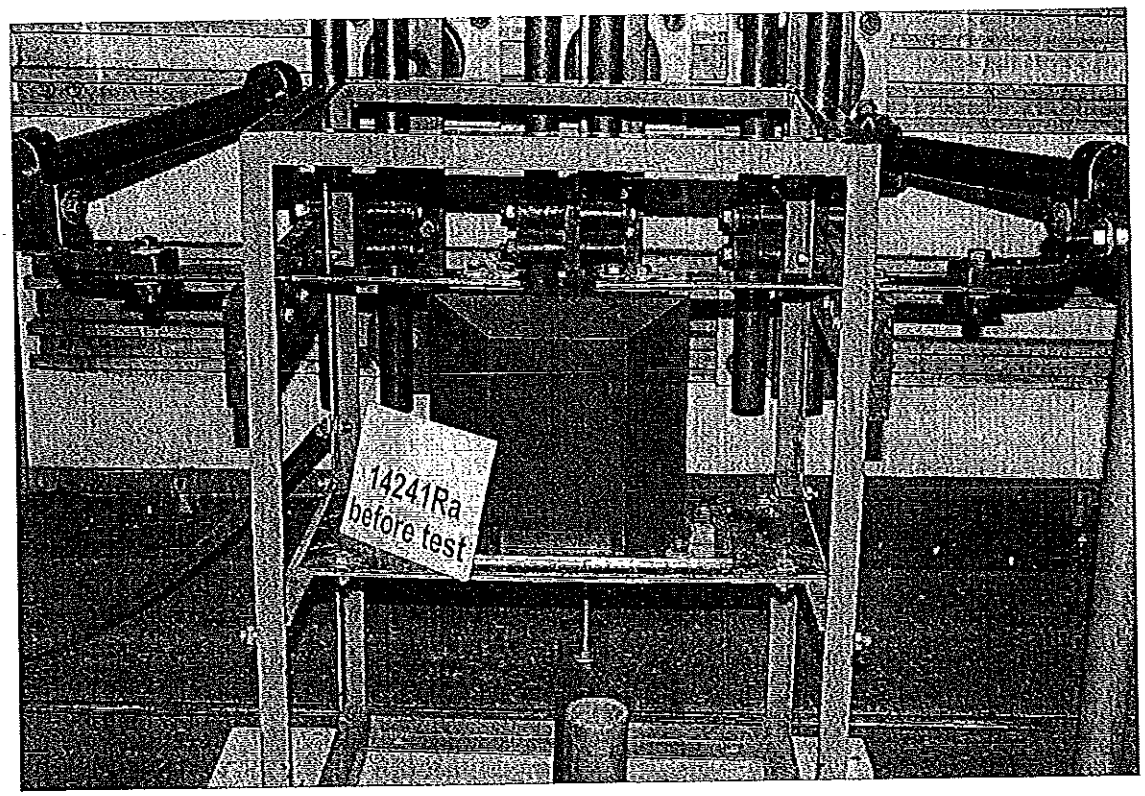


Photo No. 07:
Before STC test

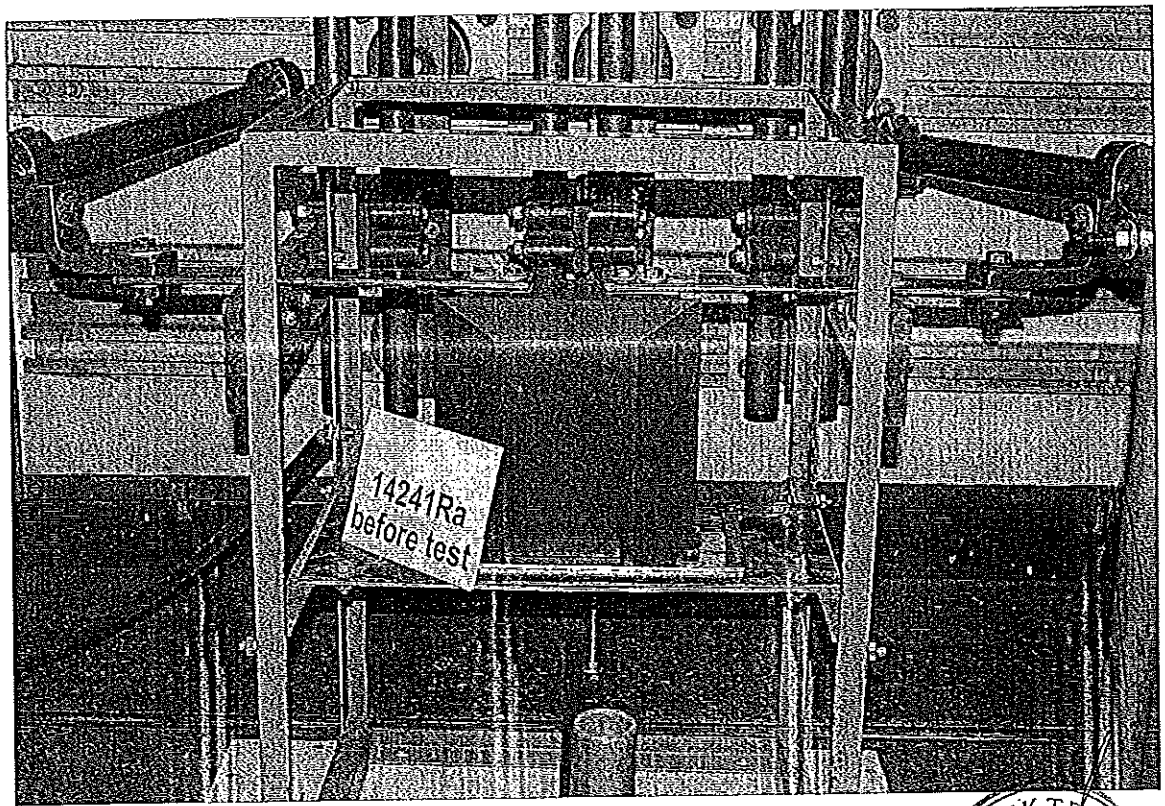


Photo No. 08:
After STC test

Photos

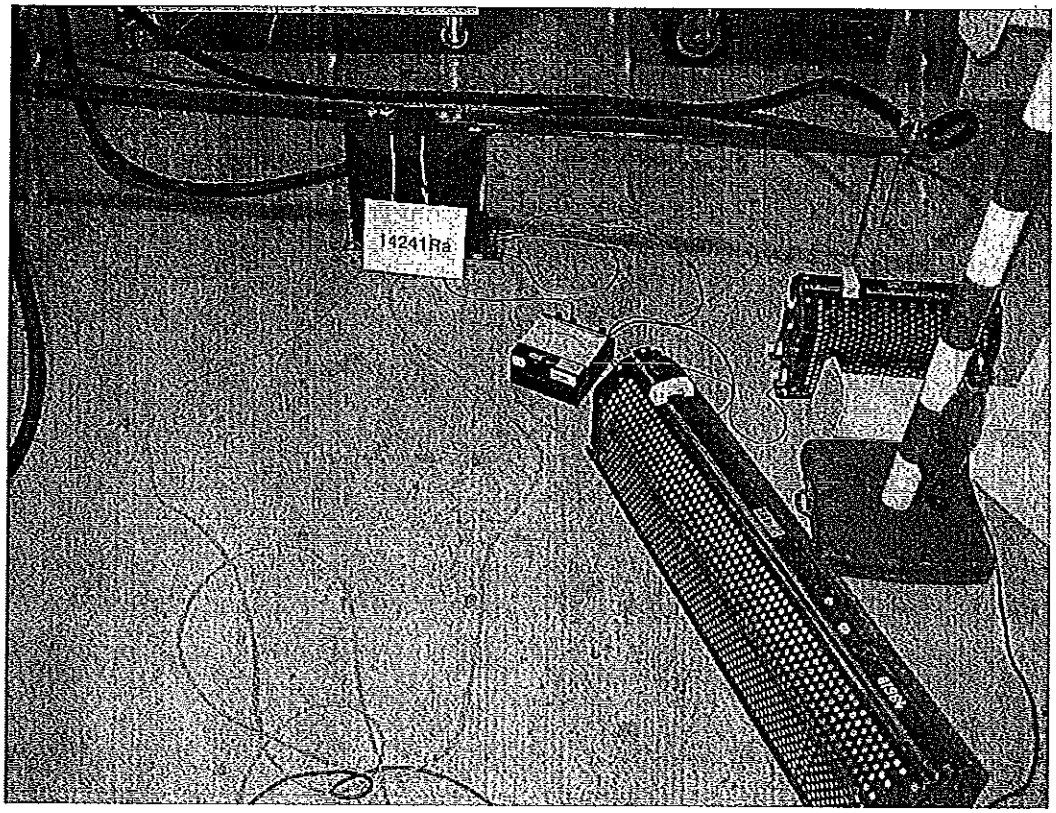


Photo No. 09:
Temperature-rise test

ВЕРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" Пловдив „Табаков и синове" ООД

Приложение 2.4 - Акредитация на лабораторията на АББ

ВЕРНО С ОРИГИНАЛА

NÁRODNÍ AKREDITAČNÍ ORGÁN

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

issues

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

CERTIFICATE OF ACCREDITATION

No. 852 / 2015

ABB, s.r.o.
with registered office Štětkova 1638/18, 140 00 Praha 4, Company Registration No. 49682563

to the Testing Laboratory No. 1693
ABB s.r.o. Technical Laboratory PPMV Brno

Scope of accreditation:

Testing of air-insulated high-voltage switchgear and controlgear, instrument current and voltage transformers for high-voltage, electronic instrument current and voltage transformers for high-voltage to the extent as specified in the appendix to this Certificate.

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

ČSN EN ISO/IEC 17025:2005

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

The Certificate of Accreditation is valid until: **11 December 2018**

Prague: 11 December 2015

Český institut pro akreditaci, o.p.s.

Jiří Růžička
Director
Czech Accreditation Institute
Public Service Company

- 1 -

ВЕРНО С ОРИГИНАЛА

ЕЛЕКТРОЛУКС "Табаков и синове" ООД ПЛОВДИВ

The Appendix is an integral part of
Certificate of Accreditation No. 852/2015 of 11/12/2015

Accredited entity according to ČSN EN ISO/IEC 17025:2005:

ABB s.r.o.
ABB s.r.o. Technical Laboratory PPMV Brno
Vídeňská 117, 119 00 Brno

The Laboratory is qualified to update standards identifying the test procedures.
The Laboratory provides expert opinions and interprets test results.

Tests:

Ordinal number [1)]	Test procedure/method name	Test procedure/method identification	Tested object
1.1	Temperature rise test	IEC 61869-1 ed.1, p.7.2.2 IEC 61869-2 ed.1, p.7.2.2 ČSN EN 61869-1 p. 7.2.2 ČSN EN 61869-2 p. 7.2.2	Instrument current transformers
1.2	Impulse voltage withstand test on primary terminals	IEC 61869-1 ed.1, p. 7.2.3 IEC 61869-2 ed.1, p. 7.2.3 ČSN EN 61869-1 p. 7.2.3 ČSN EN 61869-2 p. 7.2.3	Instrument current transformers
1.3	Accuracy tests	IEC 61869-2 ed.1, p. 7.2.6, 7.3.5 ČSN EN 61869-2 p. 7.2.6, 7.3.5	Instrument current transformers
1.4	Power-frequency voltage withstand tests on primary terminals	IEC 61869-1 ed.1, p. 7.3.1 IEC 61869-2 ed.1, p. 7.3.1 ČSN EN 61869-1 p. 7.3.1 ČSN EN 61869-2 p. 7.3.1	Instrument current transformers
1.5	Partial discharge measurement	IEC 61869-1 ed.1, p.7.3.2 ČSN EN 61869-1 p. 7.3.2	Instrument current transformers
1.6	Power-frequency voltage withstand tests between sections	IEC 61869-1 ed.1, p. 7.3.3 ČSN EN 61869-1 p. 7.3.3	Instrument current transformers
1.7	Power-frequency voltage withstand tests on secondary terminals	IEC 61869-1 ed.1, p. 7.3.4 ČSN EN 61869-1 p. 7.3.4	Instrument current transformers
1.8	Verification of markings	IEC 61869-1 ed.1, p. 7.3.6 ČSN EN 61869-1 p. 7.3.6	Instrument current transformers
1.9	Determination of the secondary winding resistance	IEC 61869-2 ed.1, p. 7.3.201 ČSN EN 61869-2 p. 7.3.201	Instrument current transformers

ВЯРНО С ОРИГИНАЛА

The Appendix is an integral part of
Certificate of Accreditation No. 852/2015 of 11/12/2015

Accredited entity according to ČSN EN ISO/IEC 17025:2005:

ABB s.r.o.
ABB s.r.o. Technical Laboratory PPMV Brno
Vídeňská 117, 119 00 Brno

Ordinal number [1]	Test procedure/method name	Test procedure/method identification	Tested object
1.10	Determination of the secondary loop time constant using the Omicron instrument	IEC 61869-2 ed.1, p. 7.3.202 ČSN EN 61869-2 p. 7.3.202	Instrument current transformers
1.11	Measurement of limit current and voltage	IEC 61869-2 ed.1, p. 7.3.203 ČSN EN 61869-2 p. 7.3.203	Instrument current transformers
1.12	Inter-turn overvoltage test	IEC 61869-2 ed.1, p. 7.3.204 ČSN EN 61869-2 p. 7.3.204	Instrument current transformers
1.13	Determination of the remanence factor	IEC 61869-2 ed.1, p. 7.5.1, 2B.2 ČSN EN 61869-2 p. 7.5.1, 2B.2	Instrument current transformers
1.14	Determination of the instrument security factor (FS) of measuring current transformers	IEC 61869-2 ed.1, p. 7.5.2, 2A.5, 2A.6 ČSN EN 61869-2 p. 7.5.2, 2A.5, 2A.6	Instrument current transformers
2.1	Temperature rise test	IEC 61869-1 ed.1, p.7.2.2 IEC 61869-3 ed.1, p.7.2.2 ČSN EN 61869-1 p. 7.2.2 ČSN EN 61869-3 p. 7.2.2	Instrument voltage transformers
2.2	Impulse voltage withstand test on primary terminals	IEC 61869-1 ed.1, p. 7.2.3 IEC 61869-3 ed.1, p. 7.2.3 ČSN EN 61869-1 p. 7.2.3 ČSN EN 61869-3 p. 7.2.3	Instrument voltage transformers
2.3	Accuracy tests	IEC 61869-3 ed.1, p. 7.2.6, 7.3.5 ČSN EN 61869-3 p. 7.2.6, 7.3.5	Instrument voltage transformers
2.4	Power-frequency voltage withstand tests on primary terminals	IEC 61869-1 ed.1, p. 7.3.1 IEC 61869-3 ed.1, p. 7.3.1 ČSN EN 61869-1 p. 7.3.1 ČSN EN 61869-3 p. 7.3.1	Instrument voltage transformers

ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ЕООД ПЛОВДИВ „Табаков и синове"

The Appendix is an integral part of
Certificate of Accreditation No. 852/2015 of 11/12/2015

Accredited entity according to ČSN EN ISO/IEC 17025:2005:

ABB s.r.o.
ABB s.r.o. Technical Laboratory PPMV Brno
Vídeňská 117, 119 00 Brno

Ordinal number [1]	Test procedure/method name	Test procedure/method identification	Tested object
2.5	Partial discharge measurement	IEC 61869-1 ed.1, p.7.3.2 IEC 61869-3 ed.1, p.7.3.2 ČSN EN 61869-1 p. 7.3.2 ČSN EN 61869-3 p. 7.3.2	Instrument voltage transformers
2.6	Power-frequency voltage withstand tests between sections	IEC 61869-1 ed.1, p. 7.3.3 ČSN EN 61869-1 p. 7.3.3	Instrument voltage transformers
2.7	Power-frequency voltage withstand tests on secondary terminals	IEC 61869-1 ed.1, p. 7.3.4 ČSN EN 61869-1 p. 7.3.4	Instrument voltage transformers
2.8	Verification of markings	IEC 61869-1 ed.1, p. 7.3.6 ČSN EN 61869-1 p. 7.3.6	Instrument voltage transformers
3.1	Insulation electric strength tests	IEC 62271-1 ed.1, p. 6.2 IEC 62271-200 ed.2, p. 6.2 ČSN EN 62271-1 p. 6.2 ČSN EN 62271-200 ed.2, p. 6.2	Metal-enclosed switchgear and controlgear
3.2	Measurement of circuit resistance	IEC 62271-1 ed.1, p. 6.4 IEC 62271-200 ed.2, p. 6.4 ČSN EN 62271-1 p. 6.4 ČSN EN 62271-200 ed.2, p. 6.4	Metal-enclosed switchgear and controlgear
3.3	Temperature-rise tests	IEC 62271-1 ed.1, p. 6.5 IEC 62271-200 ed.2 , p. 6.5 ČSN EN 62271-1 p. 6.5 ČSN EN 62271-200 ed.2, p. 6.5	Metal-enclosed switchgear and controlgear
3.4	Tests of mechanical function	IEC 62271-200 ed.2, p. 6.102 ČSN EN 62271-200 ed.2, p. 6.102	Metal-enclosed switchgear and controlgear

Český institut pro akreditaci, o.p.s.

ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ООД
ПЛОВДИВ
„Табаков и синове"

The Appendix is an integral part of
Certificate of Accreditation No. 852/2015 of 11/12/2015

Accredited entity according to ČSN EN ISO/IEC 17025:2005:

ABB s.r.o.
ABB s.r.o. Technical Laboratory PPMV Brno
Vídeňská 117, 119 00 Brno

Ordinal number [1)]	Test procedure/method name	Test procedure/method identification	Tested object
3.5	IP code verification IP 2X, IP 3X, IP 4X	IEC 62271-1 ed.1, p. 6.7.1 IEC 62271-200 ed.2, p. 6.7.1 ČSN EN 62271-1 p. 6.7.1 ČSN EN 62271-200 ed.2, p. 6.7.1	Metal-enclosed switchgear and controlgear
3.6	Partial discharge measurement	IEC 62271-1 ed.1, p. 6.2.9 IEC 62271-200 ed.2, p. 6.2.9 ČSN EN 62271-1 p. 6.2.9 ČSN EN 62271-200 ed.2, p. 6.2.9	Metal-enclosed switchgear and controlgear
3.7	Additional tests on auxiliary and control circuits	IEC 62271-200 ed.2, p. 6.10 ČSN EN 62271-200 ed.2, p. 6.10	Metal-enclosed switchgear and controlgear
4.1	Impulse voltage withstand test (Primary voltage terminals Um<300kV)	IEC 60044-7 ed.1, p. 8.2.1 ČSN EN 60044-7 p. 8.2.1	Electronic voltage transformers
4.2	Basic tests	IEC 60044-7 ed.1, p. 8.3.1 ČSN EN 60044-7 p. 8.3.1	Electronic voltage transformers
4.3	Test for accuracy versus temperature	IEC 60044-7 ed.1, p. 8.2.3 ČSN EN 60044-7 p. 8.2.3	Electronic voltage transformers
4.4	Test for accuracy versus frequency	IEC 60044-7 ed.1, p. 8.3.3 ČSN EN 60044-7 p. 8.3.3,	Electronic voltage transformers
4.5	Test of resistance to overheating	IEC 60044-7 ed.1, p. 8.2.4 ČSN EN 60044-7 p. 8.2.4	Electronic voltage transformers
4.6	Impulse voltage withstand test for low-voltage components	IEC 60044-7 ed.1, p. 8.8 ČSN EN 60044-7 p. 8.8	Electronic voltage transformers

Český institut pro akreditaci, o.p.s.

ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" Табакови синове" ООД

560

The Appendix is an integral part of
Certificate of Accreditation No. 852/2015 of 11/12/2015

Accredited entity according to ČSN EN ISO/IEC 17025:2005:

ABB s.r.o.
ABB s.r.o. Technical Laboratory PPMV Brno
Vídeňská 117, 119 00 Brno

Ordinal number [1)]	Test procedure/method name	Test procedure/method identification	Tested object
4.7	Transient performance test	IEC 60044-7 ed.1, p. 8.9 ČSN EN 60044-7 p. 8.9	Electronic voltage transformers
4.8	Power-frequency withstand tests on primary terminals and partial discharge measurement	IEC 60044-7 ed.1, p. 9.2 ČSN EN 60044-7 p. 9.2	Electronic voltage transformers
4.9	Power-frequency voltage withstand test for low-voltage components	IEC 60044-7 ed.1, p. 9.3 ČSN EN 60044-7 p. 9.3	Electronic voltage transformers
Hydraulic loss test5.1	Temperature-rise test	IEC 60044-8 ed.1, p. 8.2 ČSN EN 60044-8 p. 8.2	Electronic current transformers
5.2	Impulse voltage withstand test (Primary voltage terminals Um<300kV)	IEC 60044-8 ed.1, p. 8.2.3 ČSN EN 60044-8 p. 8.2.3	Electronic current transformers
5.3	Power-frequency voltage withstand test	IEC 60044-8 ed.1, p. 8.7.3 ČSN EN 60044-8 p. 8.3.7,	Electronic current transformers
5.4	Impulse-voltage withstand test	IEC 60044-8 ed.1, p. 8.7.4 ČSN EN 60044-8 p. 8.7.4	Electronic current transformers
5.5	Basic accuracy tests	IEC 60044-8 ed.1, p. 8.2.9 ČSN EN 60044-8 p. 8.2.9	Electronic current transformers
5.6	Temperature cycle accuracy test	IEC 60044-8 ed.1, p. 8.9.3 ČSN EN 60044-8 p. 8.3.9,	Electronic current transformers
5.7	Test for accuracy versus frequency	IEC 60044-8 ed.1, p. 8.9.4 ČSN EN 60044-8 p. 8.9.4	Electronic current transformers
5.8	Test for composite error	IEC 60044-8 ed.1, p. 8.10.1 ČSN EN 60044-8 p. 8.10.1	Electronic current transformers

ВЯРНО С ОРИГИНАЛА

561

The Appendix is an integral part of
Certificate of Accreditation No. 852/2015 of 11/12/2015

Accredited entity according to ČSN EN ISO/IEC 17025:2005:

ABB s.r.o.
ABB s.r.o. Technical Laboratory PPMV Brno
Vídeňská 117, 119 00 Brno

Ordinal number [1)]	Test procedure/method name	Test procedure/method identification	Tested object
5.9	Power-frequency withstand tests on primary terminals and partial discharge measurement	IEC 60044-8 ed.1, p. 9.2 ČSN EN 60044-8 p. 9.2	Electronic current transformers
5.10	Power-frequency voltage withstand test for low-voltage components	IEC 60044-8 ed.1, p. 9.3 ČSN EN 60044-8 p. 9.3	Electronic current transformers

1) Asterisk at the ordinal number identifies the tests, which the Laboratory is qualified to carry out outside the permanent laboratory premises.

Český institut pro akreditaci, o.p.s.
-1-

ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" „Табаков и синове" ООД ПЛОВДИВ

562

Приложение 2.4 - Акредитация на лабораторията

ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ООД
ПЛОВДИВ
Табаков и синове

DAkkS
Deutsche
Akkreditierungsstelle

Deutsche Akkreditierungsstelle GmbH
German Accreditation Body

Entrusted according to Section 8 subsection1 AkkStelleG in connection with Section 1 subsection 1 AkkStelleGBV
Signatory to the Multilateral Agreements of
EA, ILAC and IAF for Mutual Recognition

Accreditation

The Deutsche Akkreditierungsstelle GmbH (German Accreditation Body) attests that the testing laboratory

PEHLA GbR
PEHLA-Prüffeld Ratingen
Oberhausener Straße 33, 40472 Ratingen

is competent under the terms of DIN EN ISO/IEC 17025:2005 to carry out tests in the following fields:

High-Voltage Switchgear and Controlgear,
Low-Voltage Switchgear and Controlgear Assemblies,
Current and Voltage Transformers,
Power transformers and Busbar Systems

The accreditation certificate shall only apply in connection with the notice of accreditation of 2012-05-09 with the accreditation number D-PL-12072-06 and is valid until 2017-05-08. It comprises the cover sheet, the reverse side of the cover sheet and the following annex with a total of 5 pages.

Registration number of the certificate: **D-PL-12072-06-01**

Frankfurt am Main, 2012-05-09

Dipl.-Ing. (FH) Ralf Egner
Head of Division 2

This document is a translation. The definitive version is the original German accreditation certificate.

See notes overleaf.

ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ООД
Табаков и синове
ПЛОВДИВ

564

Deutsche Akkreditierungsstelle GmbH

Office Berlin
Spittelmarkt 10
10117 Berlin

Office Frankfurt am Main
Gartenstraße 6
60594 Frankfurt am Main

Office Braunschweig
Bundesallee 100
38116 Braunschweig

The accreditation was granted pursuant to the Act on the Accreditation Body (AkkStelleG) of 31 July 2009 (Federal Law Gazette I p. 2625) and the 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 (Official Journal of the European Union L 218 of 9 July 2008, p. 30). DAkkS is a signatory to the Multilateral Agreements for Mutual Recognition of the European co-operation for Accreditation (EA), International Accreditation Forum (IAF) and International Laboratory Accreditation Cooperation (ILAC). The signatories to these agreements recognise each other's accreditations.

The up-to-date state of membership can be retrieved from the following websites:
EA: www.european-accreditation.org
ILAC: www.ilac.org
IAF: www.iaf.nu

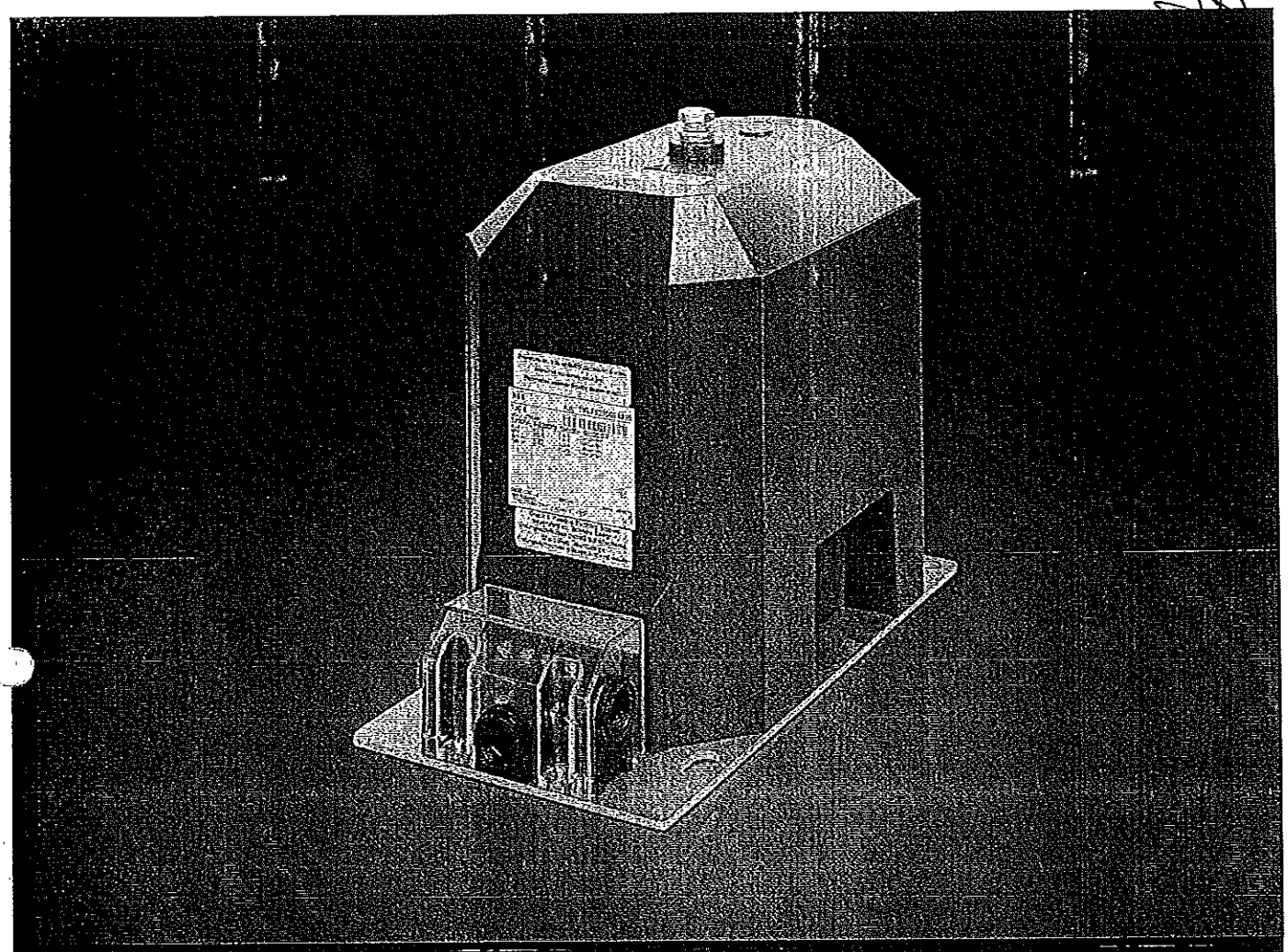
ВЯРНО С ОРИГИНАЛА

"ЕЛЕКТРОЛУКС" "Табаков и синове" ООД ПЛОВДИВ

Приложение 3.1 - Каталог на ТЈС 6

ВЯРНО С ПРИЛОЖЕНИЕ

„ЕЛЕКТРОСЕРВИЗ" ООД
ПЛОВДИВ
„Табаков и синове" ООД



Medium Voltage Product

Power and productivity
for a better world™

ABB

Parameters	Units
Highest voltage for equipment	17.5 - 24 (25) kV
Power frequency test voltage, 1 min.	38 - 50 (55) kV
Lightning impulse test voltage	95 - 125 kV
Max. rated burden, classes	25/0.2 - 100/0.5 - 150/1 VA/cl
Residual winding	50 - 200/6P VA/cl

Description

The TJC 6 single-pole insulated voltage transformers are cast in epoxy resin and designed mostly for insulation voltages of 17,5 to 25 kV.

Insulation voltages different from the above are the subject of an agreement between the manufacturer and the customer.

If no other value is required the transformers are manufactured with a overvoltage factor of 1.9 x Un/8 hrs. One outlet of the primary winding, including the respective terminal is insulated from the earth to a level which corresponds to the rated insulation value. The transformer is mostly equipped with two secondary windings, the first one for either measuring or protection purposes, the other for being connected into an open-delta connection in a threephase system. One terminal of each secondary winding and one of the open-delta connected terminals have to be earthed during the transformer operation. When not required otherwise, the secondary windings are lead out into a casttype secondary terminal board.

The transformer can be mounted in any position. The transformers are fixed by four screws, the M8 bolted earthing clamp is located on the transformer base plate. The secondary terminal board is covered with a transparent and sealable cover made of plastic material.

Rated primary voltages

11/√3 kV; 15/√3 kV; 20/√3 kV; 22/√3 kV;
Other primary voltages can also be supplied on request.

Rated secondary voltages

100/√3 V; 110/√3 V – accuracy classes 0.2; 0.5; 1 (measuring winding) or 3P; 6P (protection winding).
Other secondary voltages can also be supplied on request.

Rated voltages for open-delta connection

100/3 V; 110/3 V- class 6P.
Other voltages for open-delta connection can also be supplied based on customer requirement.

Rated frequency

50 Hz; 60 Hz.

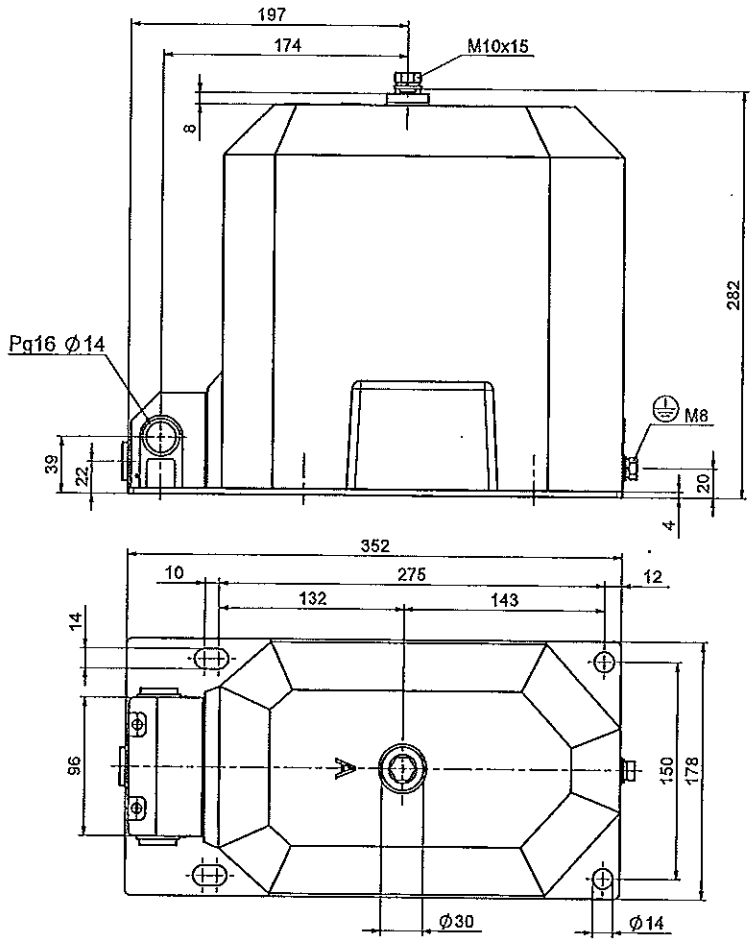
Based on a discussion with the manufacturer the transformer can also be designed for two primary voltage levels (with change over secondary side).

The transformers are manufactured conformably to the requirements and recommendations of the following standards and regulations: IEC, VDE, ANSI, BS, GOST and CSN.

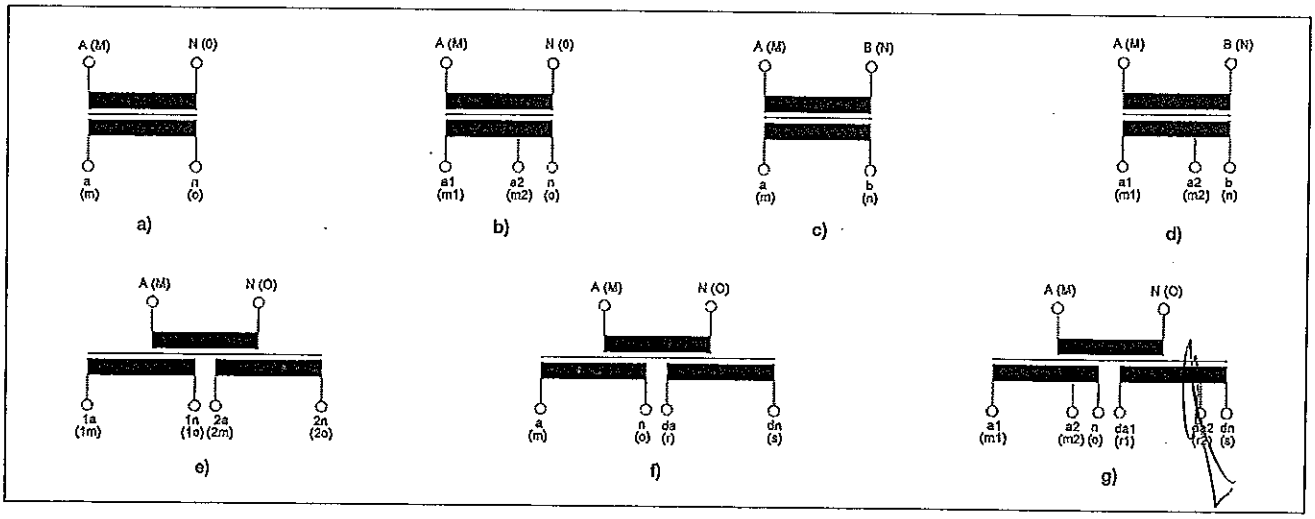
Dimensional Drawing

TJC 6

Weight: appr. 20 kg
Creepage Distance: 338 mm



Marking of the voltage transformer outlets



a) Single-pole insulated transformer | b) Single-pole insulated transformer with a tap | c) Double-pole insulated transformer | d) Double-pole insulated transformer with a tap | e) Single-pole insulated transformer with two secondary windings | f) Single-pole insulated transformer with two secondary windings, with one of which being the auxiliary (residual) winding | g) Single-pole insulated transformer with two secondary, tapped windings, with one which being the auxiliary (residual) winding.

Standard execution of the transformers

Primary voltage; [V]	Secondary voltage			Residual winding		
	voltage; [V]	accuracy	burden; [VA]	voltage; [V]	accuracy	burden; [VA]
15 000/√3	100/√3	0.2	10;15;25			
15 000/√3	100/√3	0.2	10;15;25	100/3	6P	50
15 000/√3	100/√3	0.2	10;15;25	100/3	6P	100
15 000/√3	110/√3	0.2	10;15;25			
15 000/√3	110/√3	0.2	10;15;25	110/3	6P	50
15 000/√3	110/√3	0.2	10;15;25	110/3	6P	100
15 000/√3	100/√3	0.5	15;25;50			
15 000/√3	100/√3	0.5	15;25;50	100/3	6P	50
15 000/√3	100/√3	0.5	15;25;50	100/3	6P	100
15 000/√3	110/√3	0.5	15;25;50			
15 000/√3	110/√3	0.5	15;25;50	110/3	6P	50
15 000/√3	110/√3	0.5	15;25;50	110/3	6P	100
15 000/√3	100/√3	1	50;75;100			
15 000/√3	100/√3	1	50;75;100	100/3	6P	50
15 000/√3	100/√3	1	50;75;100	100/3	6P	100
15 000/√3	110/√3	1	50;75;100			
15 000/√3	110/√3	1	50;75;100	110/3	6P	50
15 000/√3	110/√3	1	50;75;100	110/3	6P	100
20 000/√3	100/√3	0.2	10;15;25			
20 000/√3	100/√3	0.2	10;15;25	100/3	6P	50
20 000/√3	100/√3	0.2	10;15;25	100/3	6P	100
20 000/√3	110/√3	0.2	10;15;25			
20 000/√3	110/√3	0.2	10;15;25	110/3	6P	50
20 000/√3	110/√3	0.2	10;15;25	110/3	6P	100
20 000/√3	100/√3	0.5	15;25;50			
20 000/√3	100/√3	0.5	15;25;50	100/3	6P	50
20 000/√3	100/√3	0.5	15;25;50	100/3	6P	100
20 000/√3	110/√3	0.5	15;25;50			
20 000/√3	110/√3	0.5	15;25;50	110/3	6P	50
20 000/√3	110/√3	0.5	15;25;50	110/3	6P	100
20 000/√3	100/√3	1	50;75;100			
20 000/√3	100/√3	1	50;75;100	100/3	6P	50
20 000/√3	100/√3	1	50;75;100	100/3	6P	100
20 000/√3	110/√3	1	50;75;100			
20 000/√3	110/√3	1	50;75;100	110/3	6P	50
20 000/√3	110/√3	1	50;75;100	110/3	6P	100
22 000/√3	100/√3	0.2	10;15;25			
22 000/√3	100/√3	0.2	10;15;25	100/3	6P	50
22 000/√3	100/√3	0.2	10;15;25	100/3	6P	100
22 000/√3	110/√3	0.2	10;15;25			
22 000/√3	110/√3	0.2	10;15;25	110/3	6P	50
22 000/√3	110/√3	0.2	10;15;25	110/3	6P	100
22 000/√3	100/√3	0.5	15;25;50			
22 000/√3	100/√3	0.5	15;25;50	100/3	6P	50
22 000/√3	100/√3	0.5	15;25;50	100/3	6P	100
22 000/√3	110/√3	0.5	15;25;50			
22 000/√3	110/√3	0.5	15;25;50	110/3	6P	50
22 000/√3	110/√3	0.5	15;25;50	110/3	6P	100
22 000/√3	100/√3	1	50;75;100			
22 000/√3	100/√3	1	50;75;100	100/3	6P	50
22 000/√3	100/√3	1	50;75;100	100/3	6P	100
22 000/√3	110/√3	1	50;75;100			
22 000/√3	110/√3	1	50;75;100	110/3	6P	50
22 000/√3	110/√3	1	50;75;100	110/3	6P	100

Contact us

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www.abb.com

1VLC000521 Rev.3, en 2016 0.10.06

ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ООД
ПЛОВДИВ
"Табаков и синове"

Power and productivity
for a better world™

ABB

Приложение 3.2 - Удостоверение за одобрен тип

„ЕЛЕКТРОМАКС"
ГЛОВДИВ
„Табаков и сйнове" ООД

ВЯРНО С ОРИГИНАЛ

РЕПУБЛИКА
БЪЛГАРИЯ

ДЪРЖАВНА АГЕНЦИЯ ЗА МЕТРОЛОГИЯ И ТЕХНИЧЕСКИ НАДЗОР
STATE AGENCY FOR METROLOGY AND TECHNICAL SURVEILLANCE

УДОСТОВЕРЕНИЕ
ЗА ОДОБРЕН ТИП СРЕДСТВО ЗА ИЗМЕРВАНЕ
Measuring Instrument Type-approval Certificate

№ 06.01.4505

Издадено на: *Issued to:*	"АВВ България" ЕООД, гр. София, ул. "Триадица" № 5
На основание на: *In Accordance with:*	чл. 32, ал. 1 от Закона за измерванията (ДВ, бр. 46 от 2002 г.)
Относно: *In Respect of:*	измервателен напрежителен трансформатор за средно напрежение тип TJC. (TJC 4, TJC 6, TJC 7)
Производител: *Manufacturer:*	ABB EJF s.r.o., Република Чехия
Знак за одобрен тип: *Type Approval Mark:*	BG 06 4505
Технически и метрологични характеристики: *Technical and metrological characteristics:*	приложение, неразделна част от настоящото удостоверение за одобрен тип средство за измерване
Срок на валидност: *Valid until:*	05.01.2016 г.
Вписва се в регистъра на одобрените за използване типове средства за измерване под №: *Reference №:*	4505
Дата на издаване на удостоверението за одобрен тип: *Date:*	05.01.2006 г.

ПРЕДСЕДАТЕЛ:
К. Катеринов

ВЯРНО С ОРИГИНАЛА!

Приложение към удостоверение за одобрен тип № 06.01.4505

Издадено на: "АВВ България" ЕООД, гр. София

Относно: измервателен напрежителен трансформатор за средно напрежение тип TJC... (TJC 4, TJC 6, TJC 7)

Описание на типа:

Еднополюсните галванически разделящи напржителни трансформатори тип TJC .... (TJC 4, TJC 6, TJC 7) са херметизирани с отливка от епоксидна смола и са проектирани за номинално ниво на изолацията както следва:

- тип TJC 4 - от 3,6/10/40 kV до 12/28/75 kV;
- тип TJC 6 - от 17,5/38/95 kV до 24(25)/ 50(55)/ 125 kV;
- тип TJC 7 - от 36/70/170 kV до 40,5/95/200 kV.

Трансформаторите се изпълняват с две втори чни намотки, първата от които служи едновременно за измерване и за релейна защита, а другата е за свързване в отворен триъгълник при трифазна система.

Вторичните намотки са изведени на клеморед от лят тип, покрит с прозрачно капаче от пластмасов материал, което може да се пломбира.

По желание на клиента могат да се изработят също и намотки за различни първични и вторични напрежения.

Възможна е също и изработка с две първични напрежения (с превключване на вторичната страна).

Трансформаторите се произвеждат с фактор на пренапрежение от 1,9x Un/8 часа.

Трансформаторът може да се монтира във всяко положение.

1.1. Технически и метрологични характристики:

Тип трансформатор	**TJC 4**	**TJC 6**	**TJC 7**
Максимално напрежение на апарата, kV	от 3,6 до 12	от 17,5 до 24(25)	от 36 до 40,5
Номинално първично напрежение , kV	3/√ 3; 3,3/√ 3; 6/√3; 6,6/√ 3; 10/√ 3; 11/√ 3	11/√ 3 ; 15/√ 3 20/√ 3 ; 22/√ 3	30/√ 3; 33/√ 3; 35/√ 3
Номинално вторично напрежение , kV	100/√ 3 ; 110/√ 3		
Номинална честота, Hz	50; 60		
Клас на точност: - измервателни намотки - защитни намотки	0,2 ; 0,5; 1 3P; 6P		
Изпитващо напрежение с промишлена честота, kV	от 10 до 28	от 38 до 50 (55)	от 70 до 95
Изпитващо импулсно напрежение, kV	от 40 до 75	от 95 до 125	от 170 до 200
Максимален номинален товар/ клас , VA/ клас - измервателни намотки	25 / 0,2 50/ 0,5 100 / 1	25 / 0,2 100 / 0,5 150 / 1	50 / 0,2 150 / 0,5 250 / 1
Максимален номинален товар/ клас , VA/ клас - нулева намотка	50-200 / 6P		

ВЯРНО С ОРИГИНАЛА!

РЕПУБЛИКА БЪЛГАРИЯ
Български институт по метрология

REPUBLIC OF BULGARIA
Bulgarian Institute of Metrology

ДОПЪЛНЕНИЕ № 15.09.4505.1

КЪМ УДОСТОВЕРЕНИЕ
ЗА ОДОБРЕН ТИП СРЕДСТВО ЗА ИЗМЕРВАНЕ № 06.01.4505
Measuring Instrument Type-approval Certificate-Revision 1

Издадено на производител: *Issued to manufacturer:*	ABB S.r.o., Република Чехия
На основание на: *In Accordance with:*	чл. 30, ал.2 от Закона за измерванията
Относно: *In Respect of:*	измервателен напреженов трансформатор за средно напрежение тип TJC...(TJC4; TJC6; TJC7)
Технически и метрологични характеристики: *Technical and metrological characteristics:*	приложение, неразделна част от настоящото удостоверение за одобрен тип средство за измерване
Срок на валидност: *Valid until:*	14.09.2025 г.
Средството за измерване е вписано в регистъра на одобрените за използване типове средства за измерване под №: *Reference №:*	4505
Дата на издаване на първоначалното удостоверението за одобрен тип: *Date:*	05.01.2006 г.
Дата на издаване на допълнението към удостоверението за одобрен тип: *Date:*	14.09.2015 г.

ПРЕДСЕДАТЕЛ:
доц. д-р Димитър Станков

ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ООД
Пловдив
Табаков и синове

Приложение към Допълнение № 15.09.4505.1 към удостоверение № 06.01.4505

Издадено на производител: ABB S.r.o., Република Чехия

Относно: измервателен напреженов трансформатор за средно напрежение тип TJC...(TJC4; TJC6; TJC7)

Описание на допълнение № 15.09.4505.1 към удостоверение за одобрен тип № 06.01.4505

Издаденото допълнение № 15.09.4505.1 към удостоверение за одобрен тип № 06.01.4505 е за удължаване на срока на валидност на одобряване на типа до 14.09.2025 година.

Приложение 3.3 - Акредитация

ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ООД
ПЛОВДИВ
„Табаков и синове"

DAkkS
Deutsche
Akkreditierungsstelle

Deutsche Akkreditierungsstelle GmbH
German Accreditation Body

Entrusted according to Section 8 subsection1 AkkStelleG in connection with Section 1 subsection 1 AkkStelleGBV
Signatory to the Multilateral Agreements of
EA, ILAC and IAF for Mutual Recognition

Accreditation

The Deutsche Akkreditierungsstelle GmbH (German Accreditation Body) attests that the testing laboratory

PEHLA GbR
PEHLA-Prüffeld Ratingen
Oberhausener Straße 33, 40472 Ratingen

is competent under the terms of DIN EN ISO/IEC 17025:2005 to carry out tests in the following fields:

High-Voltage Switchgear and Controlgear,
Low-Voltage Switchgear and Controlgear Assemblies,
Current and Voltage Transformers,
Power transformers and Busbar Systems

The accreditation certificate shall only apply in connection with the notice of accreditation of 2012-05-09 with the accreditation number D-PL-12072-06 and is valid until 2017-05-08. It comprises the cover sheet, the reverse side of the cover sheet and the following annex with a total of 5 pages.

Registration number of the certificate: **D-PL-12072-06-01**

ВЯРНО С ОРИГИНАЛА

Frankfurt am Main, 2012-05-09

Dipl.-Ing. (FH) Ralf Egner
Head of Division 2

This document is a translation. The definitive version is the original German accreditation certificate.

See notes overleaf.

Deutsche Akkreditierungsstelle GmbH

Office Berlin
Spittelmarkt 10
10117 Berlin

Office Frankfurt am Main
Gartenstraße 6
60594 Frankfurt am Main

Office Braunschweig
Bundesallee 100
38116 Braunschweig

The accreditation was granted pursuant to the Act on the Accreditation Body (AkkStelleG) of 31 July 2009 (Federal Law Gazette I p. 2625) and the 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 (Official Journal of the European Union L 218 of 9 July 2008, p. 30). DAkkS is a signatory to the Multilateral Agreements for Mutual Recognition of the European co-operation for Accreditation (EA), International Accreditation Forum (IAF) and International Laboratory Accreditation Cooperation (ILAC). The signatories to these agreements recognise each other's accreditations.

The up-to-date state of membership can be retrieved from the following websites:
EA: www.european-accreditation.org
ILAC: www.ilac.org
IAF: www.iaf.nu

ВЯРНО С ОРИГИНАЛА

„ЕЛЕКТРОЛУКС" ООД
ПЛОВДИВ
Табаков и синове

Д Е К Л А Р А Ц И Я

за конфиденциалност и извършен оглед на обект по предмета на поръчката

Долуподписаният Георги Николов Табаков в качеството ми на представляващ „Електролукс Табаков и синове“ ООД,участник в процедура за възлагане на обществена поръчка с реф. № PPD 17 – 052 и предмет: „Модернизация (ретрофит) на електрически уредби 110/20 (10) кV и въвеждането им в режим на телемеханика“,

Д Е К Л А Р И Р А М, ЧЕ:

1/ Представител на участника, когото представлявам е извършил оглед на енергийния обект от обхвата на Обособена позиция 7 /ОП 7/ - Модернизация (ретрофит) на закрита разпределителна уредба 20 кV във възлова станция „ТЕЦ Плевен”, а именно: възлова станция „ТЕЦ Плевен и съм запознат със съществуващото положение в обекта.

2/ Няма да разпространявам поверителна информация, във връзка с извършения оглед на обекта на Възложителя, като ми е известно, че за поверителна се счита всяка информация, относно пропускателния режим в обекта, организацията на работната сила и работния процес, наличното оборудване и техническите схеми на функционирането му, системите за защита и сигурност в обекта и всичко, което е свързано с наличното оборудване, съоръжения и тяхното функциониране в съответния обект.

3/ Прилагам документ за извършен оглед, съставен на място в подстанцията.

Приложение: съгласно текста

Дата 25.07.2017 г.

Декларатор:
/Георги Табаков-Управител/

ДЕКЛАРАЦИЯ

за конфиденциалност във връзка с посещение на обект

Долуподписаният Светлана Георгиева Ванкина
(собствено, бащино и фамилно име)

ЕГН 6612134721, притежаващ лична карта № 647038823, издадена на 30.08.2010
от МВР-Пловдив с постоянен адрес: гр. Пловдив ЖК Тракия
бл. 14 вх. Б

Представител на "Електромонтаж Табаков и синове" ООД
(наименование на юридическото лице/физическото лице и вид на търговеца)

Със седалище и адрес на управление:
гр. Пловдив, ул. "Седянка" 9,

заинтересовано лице по смисъла на §2, т.14 от Допълнителните разпоредби на Закона за обществените поръчки за открита процедура за възлагане на обществена поръчка с предмет: „Модернизация (ретрофит) на електрически уредби 110/20 (10) kV и въвеждането им в режим на телемеханика ", реф. № PPD 17 - 052, във връзка с посещението на обекта, предмет на обществената поръчка, с цел запознаване със съществуващото му положение, включително с действащите електрически съоръжения и спецификата на ПС ВС "ТЕЦ Плевен"

ДЕКЛАРИРАМ:

1. Няма да разгласявам по никакъв начин информацията станала ми известна при запознаване със съществуващото му положение, включително с действащите електрически съоръжения и спецификата на ПС ВС "ТЕЦ Плевен"
2. Наясно съм, че разгласяване на информация по смисъла на настоящата декларация представлява всякакъв вид устно или писмено изявление, предаване наинформация на хартиен, електронен или друг носител, включително по поща, факс или електронна поща, както и всякакъв друг начин на разгласяване наинформация, в това число чрез средствата за масово осведомяване, печатните издания или интернет.

Известна ми е отговорността по чл.313 от Наказателния кодекс.

Дата 18.07.17 г.

Декларатор: _____
подпис

_____
трите имена

ЕЛЕКТРОМОНТАЖ ТАБАКОВ И СИНОВЕ ООД ПЛОВДИВ

Лице ка Възложител: Християн Димитров

ДЕКЛАРАЦИЯ

за приемане на условията в проекта на договор

Долуподписаният Георги Николов Табаков в качеството ми на представляващ „Електролукс Табаков и синове" ООД, участник в обществена поръчка с реф. № PPD 17 – 052 и предмет: „Модернизация (ретрофит) на електрически уредби 110/20 (10) kV и въвеждането им в режим на телемеханика", Обособена позиция 7 /ОП 7/ - Модернизация (ретрофит) на закрита разпределителна уредба 20 kV във възлова станция „ТЕЦ Плевен".

Д Е К Л А Р И Р А М, ЧЕ:

Приемам условията в проекта на договор, приложен в документацията за участие.

Дата 25.07.2017 г.

Декларатор:
/Георги Табаков-Управител/

Д Е К Л А Р А Ц И Я

за срока на валидност на офертата

Долуподписаният Георги Николов Табаков, притежаващ лична карта №641449027, издадена на 17.11.2010 г..от МВР– гр. Пловдив, адрес с.Белащица, общ.Родопи, обл.Пловдив, ул."Съединение" №2Б в качеството ми на Управител на „Електролукс Табаков и синове" ООД участник в процедура за възлагане на обществена поръчка с предмет: „Модернизация (ретрофит) на електрически уредби 110/20 (10) kV и въвеждането им в режим на телемеханика", реф. № PPD 17-052,
Обособена позиция 7 /ОП 7/ - Модернизация (ретрофит) на закрита разпределителна уредба 20 kV във възлова станция „ТЕЦ Плевен".

Д Е К Л А Р И Р А М, ЧЕ:

С подаване на офертата за участие в обществената поръчка, направените от нас предложения и поети ангажименти са валидни за срока, посочен в обявлението, считано от крайния срок за подаване на офертите.

Дата 25.07.2017 г.

Декларатор:
/Георги Табаков-Управител/