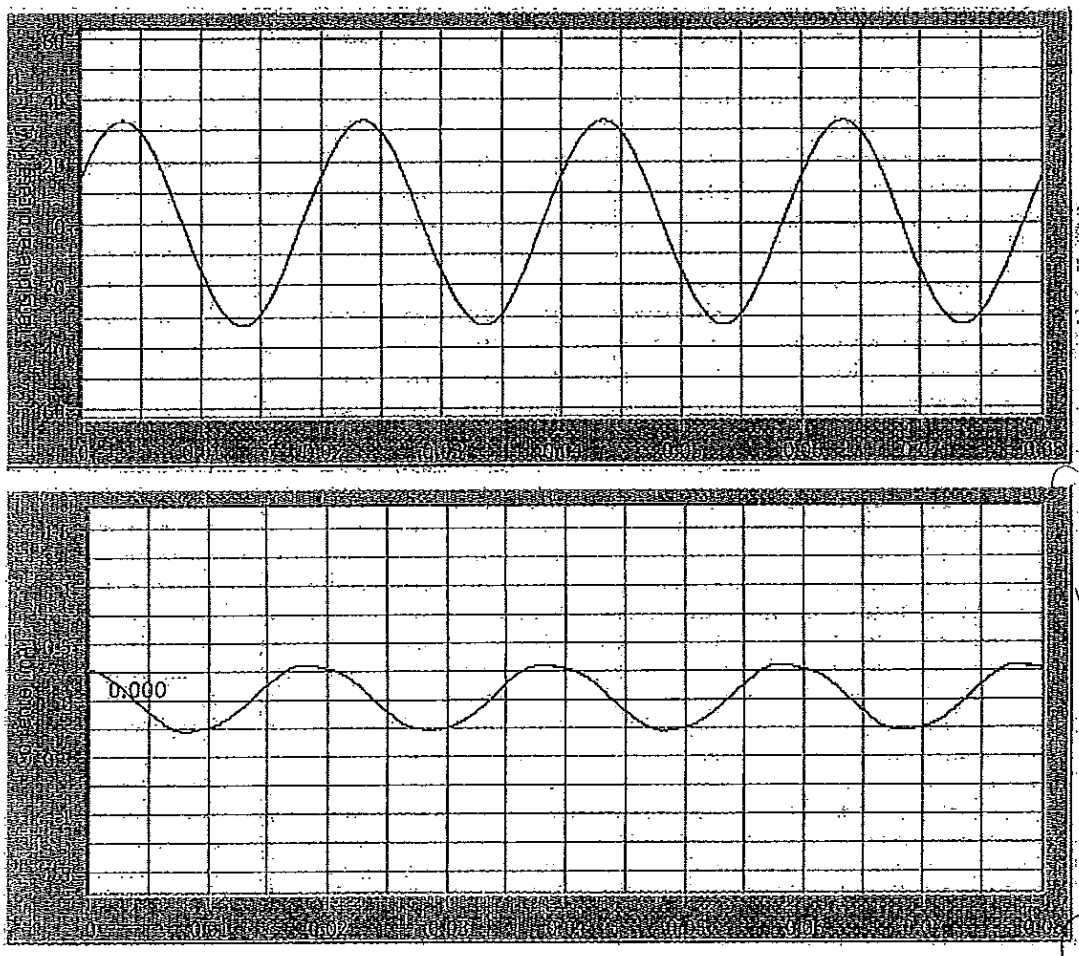
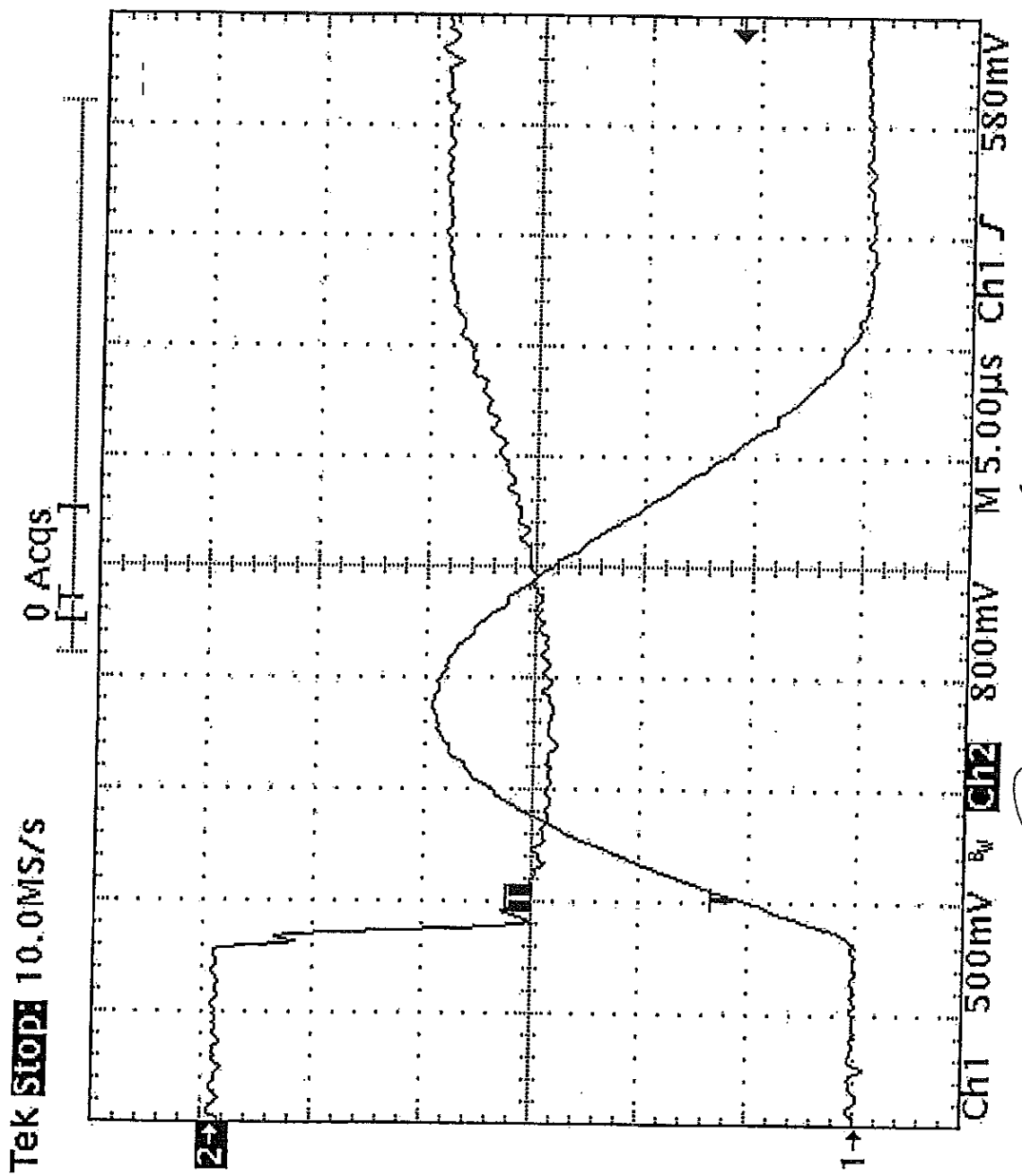


CESI TEST A4/509306 oscillogram n.1

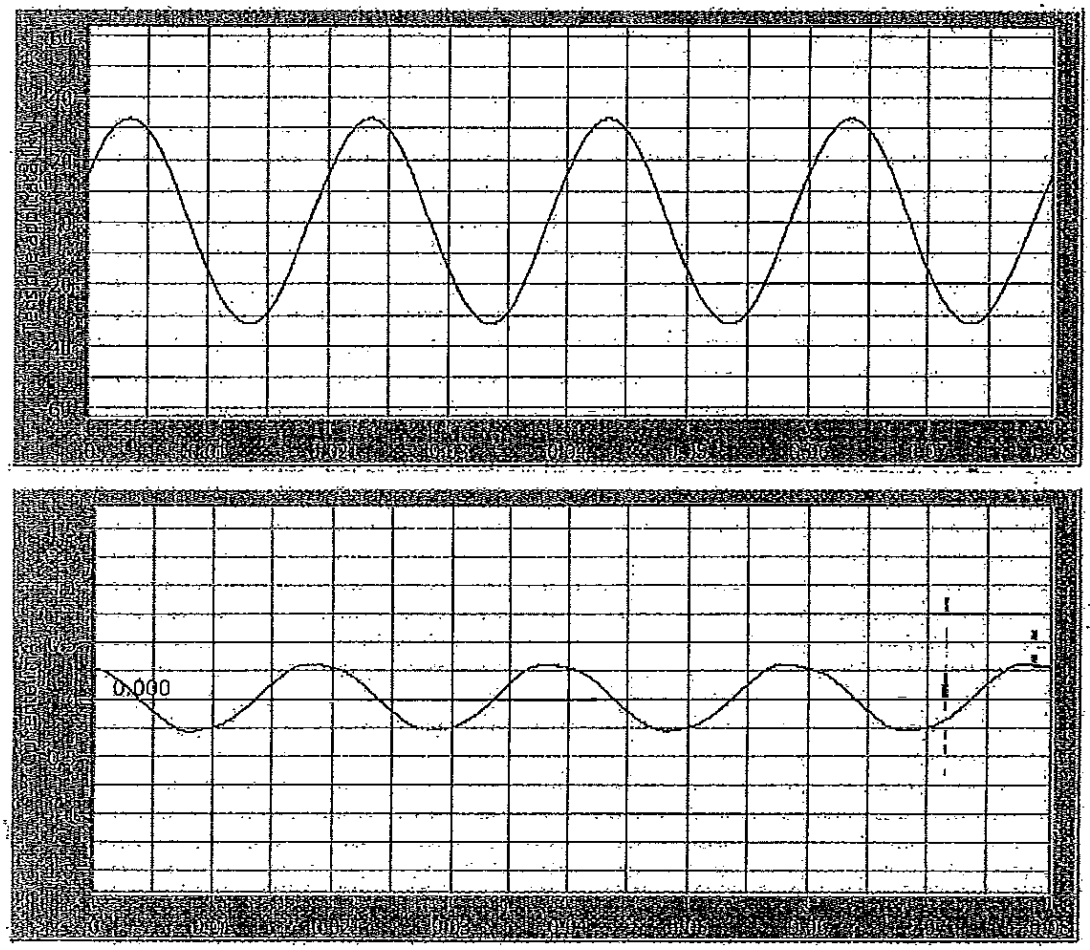
ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
САМОКОВ

249

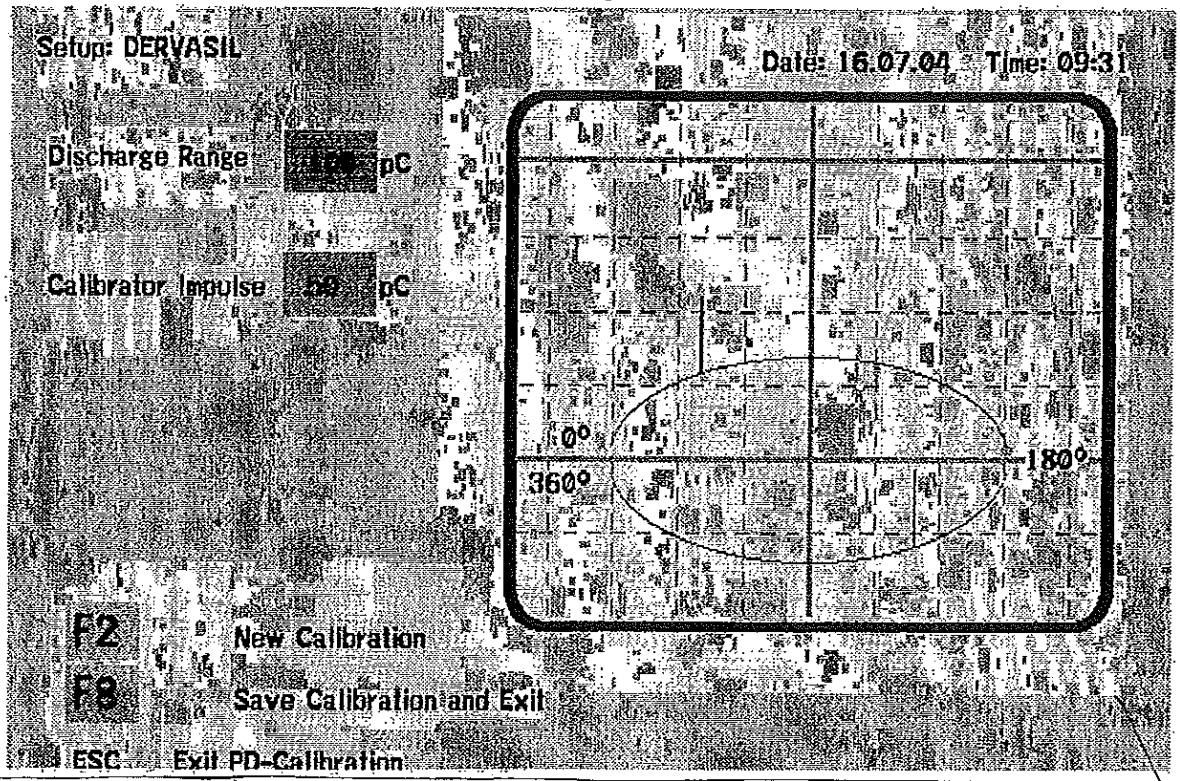


CESI TEST A4/509306 oscillogram n. 2

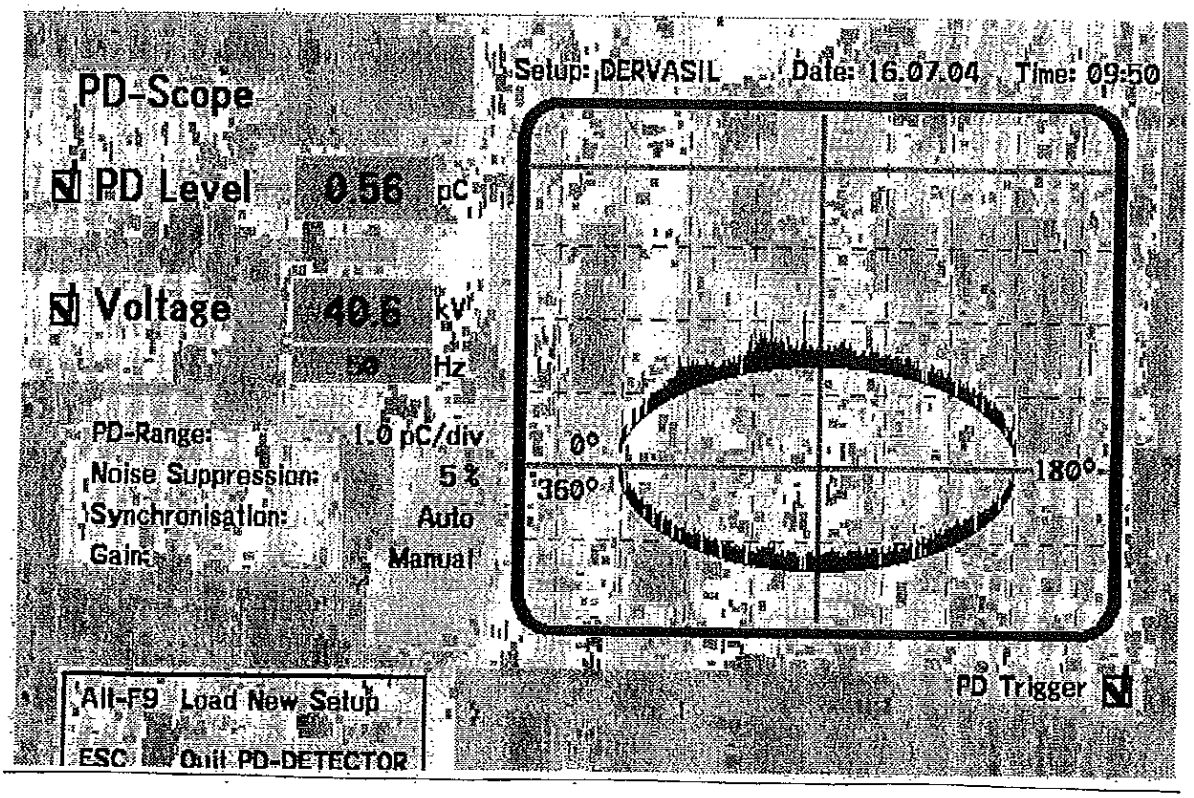


CESI TEST A4/509306 oscillogram n. 3

oscillogram no.04



oscillogram no.05



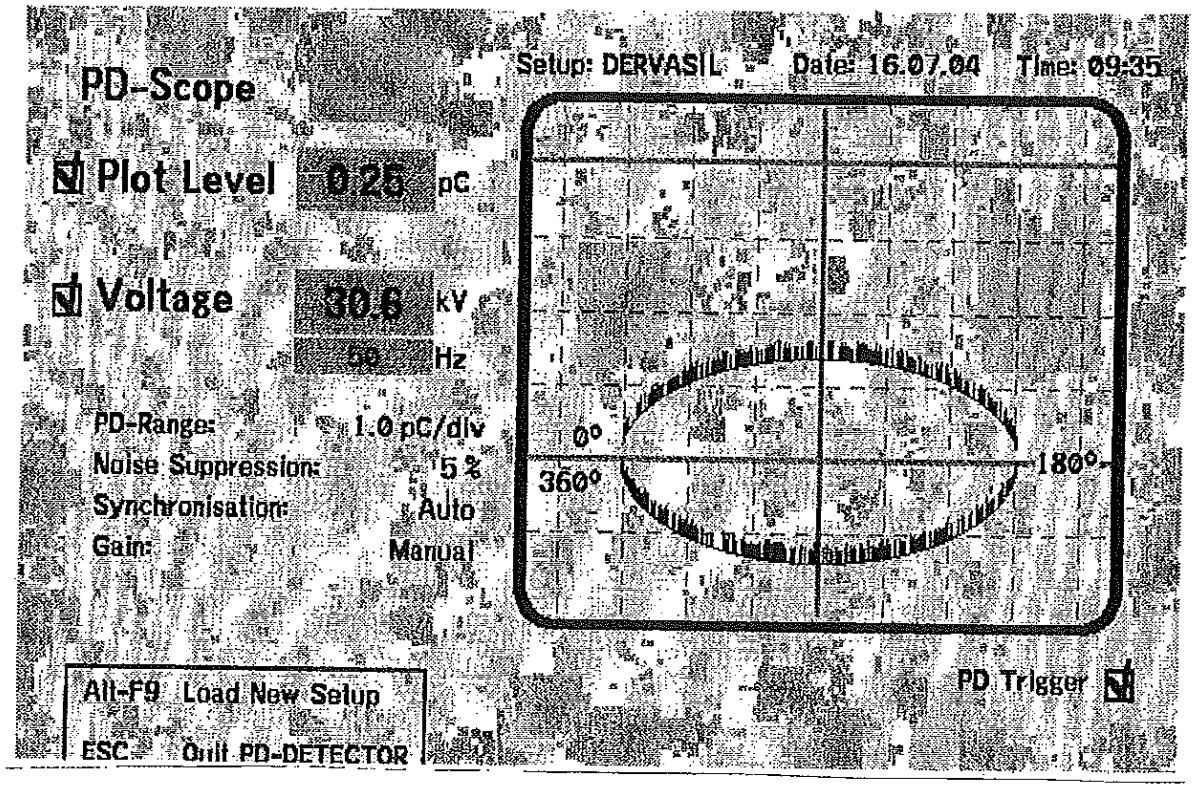
CESI TEST A4/509306

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
ГАМОКОВ

952

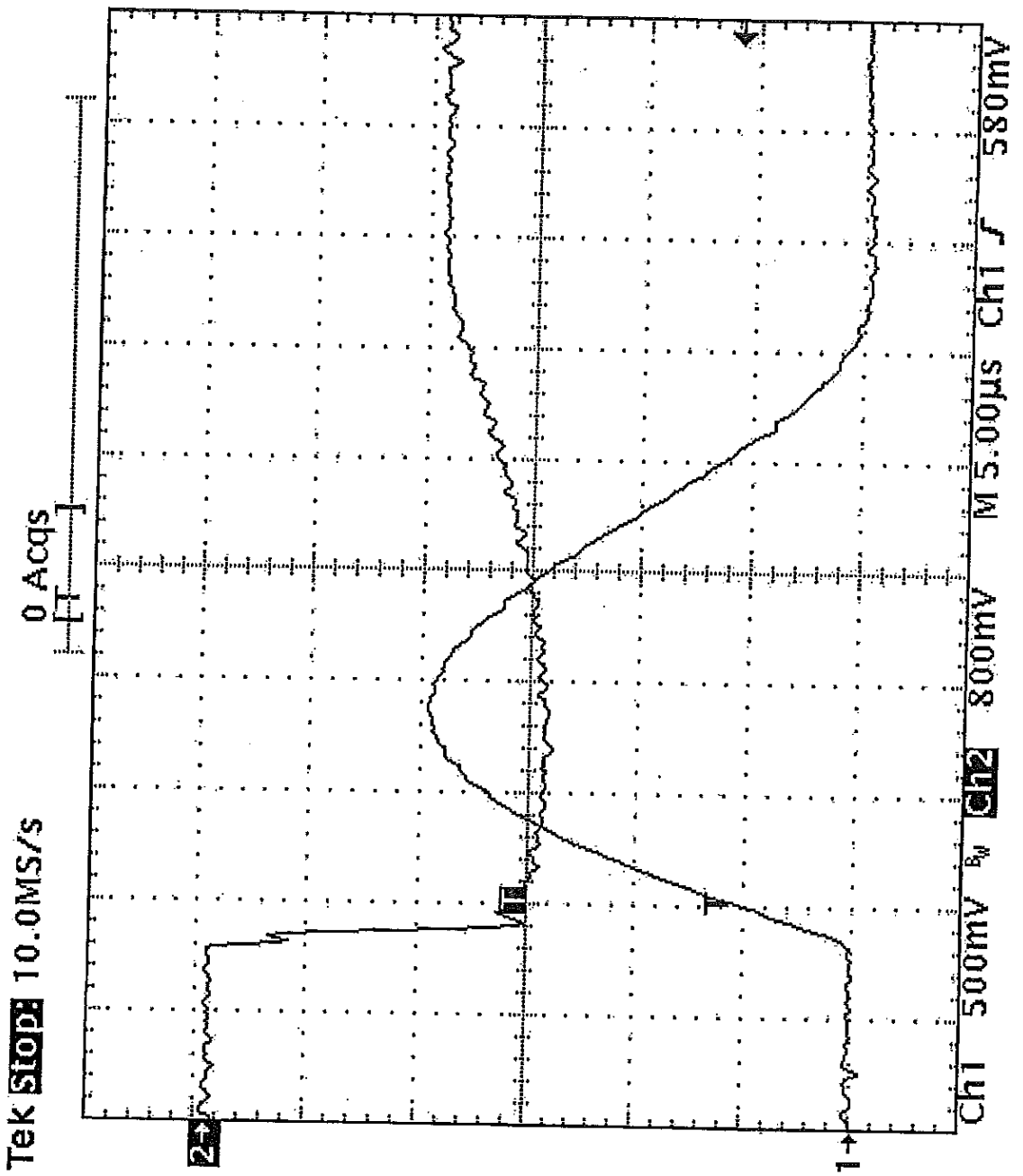
oscillogram no.06



CESI TEST A4/509306

"ВАК - 02" ООД
САМОКОВ

ВЯРНО С ОРИГИНАЛА



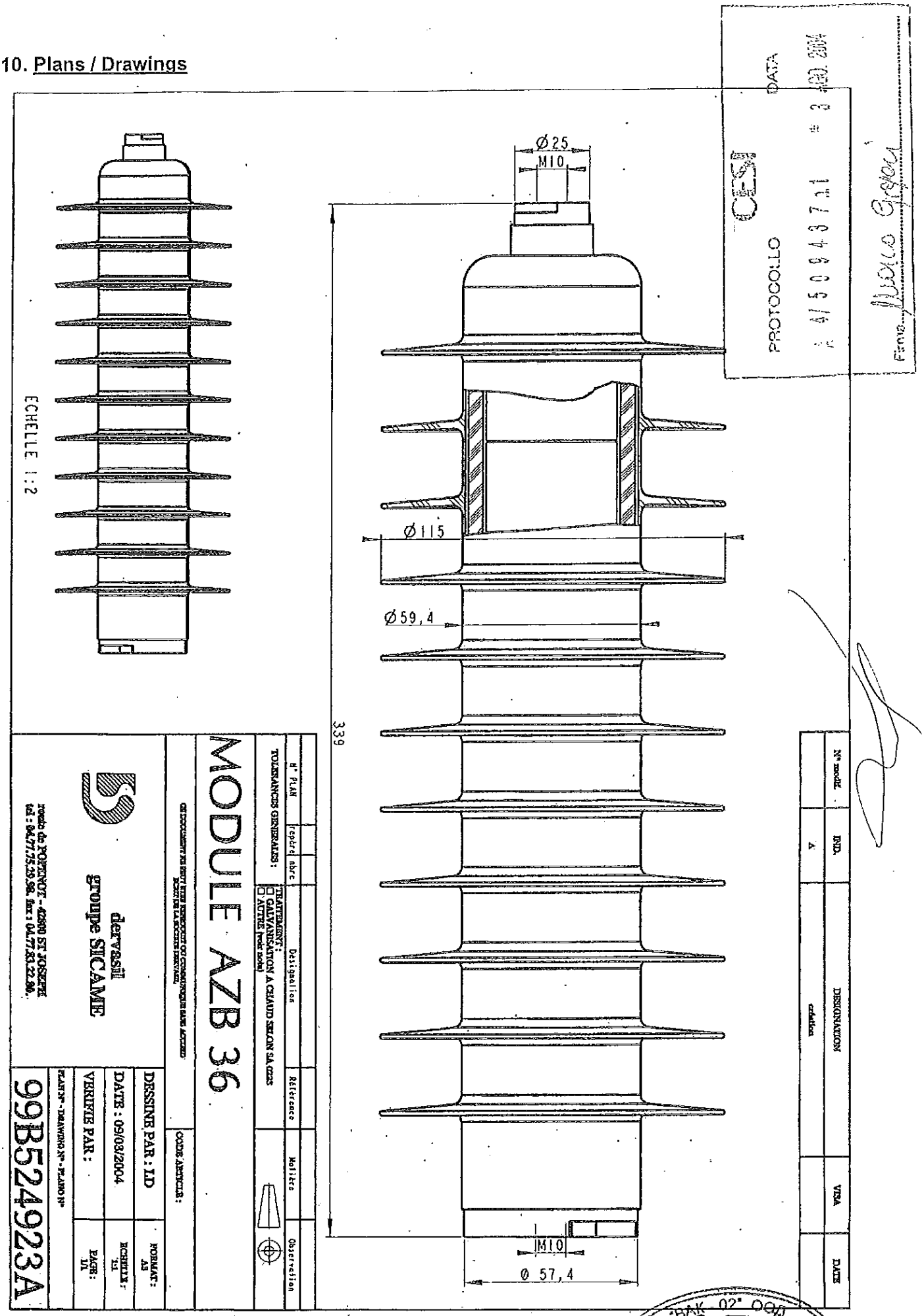
CESI TEST A4/509306 oscillogram n. 7

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

254

10. Plans / Drawings



client	Dervasil - Saint Joseph (France)
equipment under test	Polymer housed metal-oxide surge arresters Type AZB 27
tests performed	Weather ageing test - Test series A
normative documents	IEC Standard 60099-4 Edition 2.0 (2004-05).
receipt date of the sample	May 24, 2004
test date	from July 8, 2004 to August 24, 2004
no. of pages	22 no. of pages annexed 8

the test results relate only to the sample tested
this document shall not be reproduced except in full without the written approval of CESI

first issue date	May 12, 2005	
prepared	PeC/TEST - G. Fedeli	на основание чл. 2 от ЗЗЛД
verified	PeC/TEST - A. Sironi	
approved	PeC/TEST - M. de Nigris	

CESI
CENTRO ELETTROTECNICO SPERIMENTALE ITALIANO
Business Unit
Prove di Componenti

на основание чл. 2 от ЗЗЛД

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
САМОКОВ

256

tests witnessed by: /

identification of the object: Performed

The Manufacturer guarantees that the tested surge arrester is manufactured according to the submitted drawings.
CESI checked that these drawings adequately represent in shape and dimensions the essential details and the parts of the tested object.
These drawings identified by CESI and numbered A5/021441 no.1 to 10 have been returned to the Client.

The data necessary to permit repetition of the tests are contained in the document marked: —

The measurement uncertainties of the test results reported in this document are the following:
- dielectric tests with impulse voltage : **peak voltage: ± 3 % ; time parameters: ± 10 %**
- dielectric tests with impulse current : **peak value: ± 3 % ; time parameters: ± 10 %**
- dielectric tests with alternating voltage : **voltage (rms): ± 3 %**
- dielectric tests with direct voltage : **voltage: ± 3 %**

The measurement uncertainties are estimated at the level of twice the standard deviation (corresponding, in the case of normal distribution, to a confidence level of about 95 %) and have to be considered as maximum values.

---

laboratory information

CESI testing team: G. Fedeli

test laboratory: P188

activity code: 41285B
keywords: 12015R 23801L 31020W 44060J 53001D

"ВАК - 02" ООД САМОКОВ

ВЯРНО С ОРИГИНАЛА

contents	page	test date
Test object	4	
Test carried out and test procedure	8	
Summary of test result	9	
Initial measurements	11	05/12/04
Weather ageing test. Test circuit	13	
Weather ageing test. Test arrangement	14	
Weather ageing test. Pictures after the test	16	07/08/04 to 08/24/04
Final measurements	21	08/30/04

Reference documents annexed:

Oscillograms (8 pages), CESI no. A4/510342

Test object

Type: Two polymer housed metal-oxide surge arrester type AZB 27.
The test objects were identified by Cesi as sample W1 and sample W2.

electrical characteristics (claimed by the client)

manufacturer's name	DERVASIL - Saint Joseph (France)
nominal discharge current - I_N [kA]	10,0
rated voltage - U_n [kV]	27,0
continuous operating voltage - U_c [kV]	22,0
line discharge class	1
rated frequency - [Hz]	50

Dimensional characteristics of the test objects, claimed by the Client:

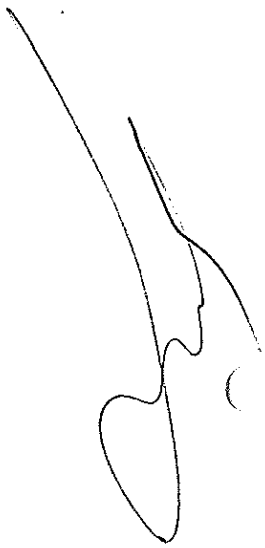
total height [mm]	272,4
sheds diameter [mm]	119
core diameter [mm]	59,4

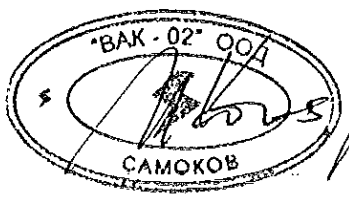
ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

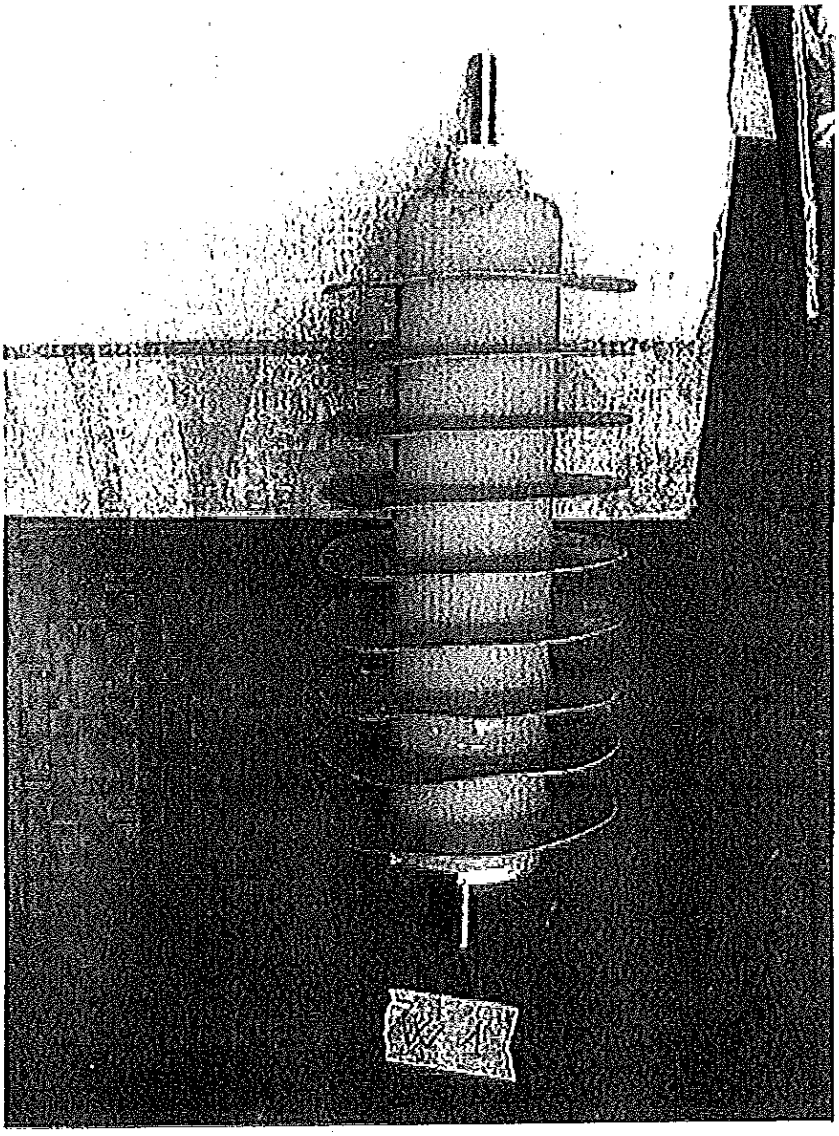
Dimensional characteristics of the test objects measured by Cesi

total height [mm]	270
creepage distance [mm]	711
arching distance [mm]	297
number of sheds [n]	9
sheds diameter [mm]	116
core diameter [mm]	59,5
sheds spacing [mm]	25
sheds projection [mm]	30

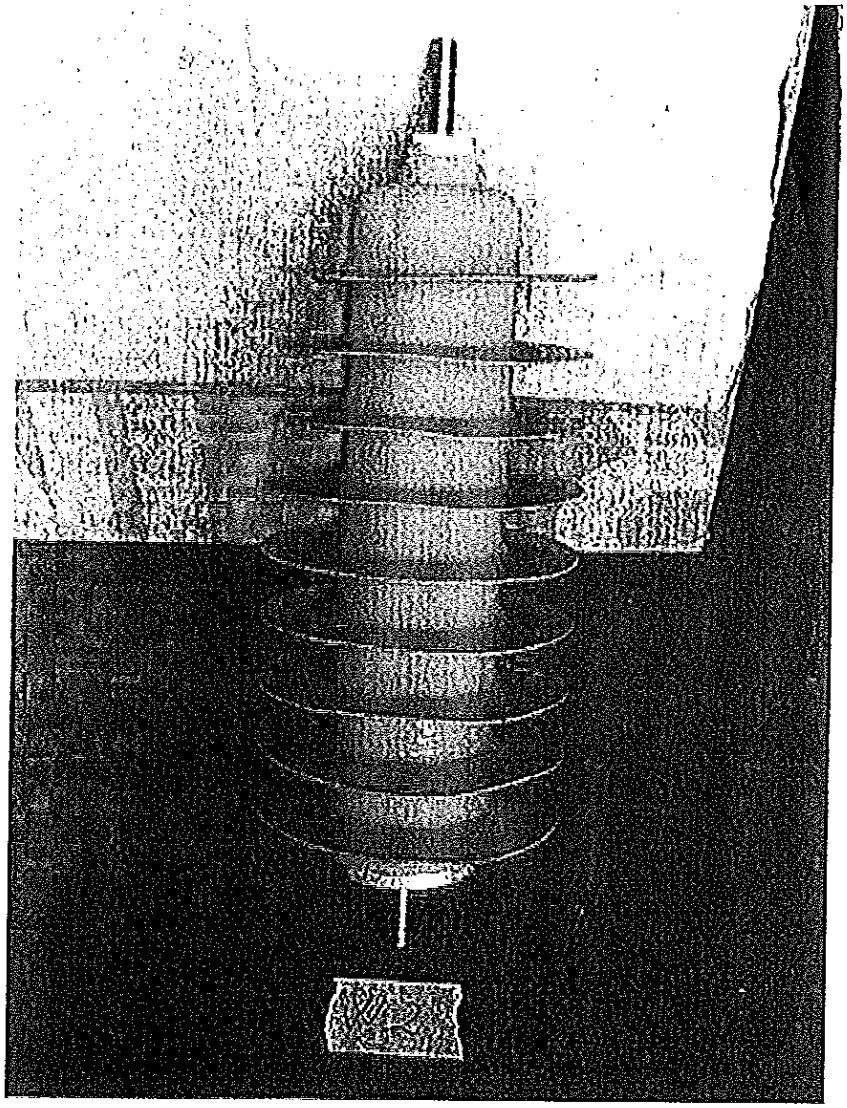




Picture of the test object W1



Picture of the test object W2



Test carried out and test procedure

Test has been carried out according with IEC Standard 60099-4 (2004-05) edition 2.0 "Metal-oxide surge arrester without gaps for a.c. system", at clause 10.8.14 .

Initial measurement

- The reference voltage have been measured at reference current equal to 5 mA_{pk}

- Internal partial discharge have been measured.
The application voltage has been increased up to rated voltage (U_r) and maintained for 10 sec.
The voltage has been decreased to 1,05 times the continuous operating voltage (U_c) and the partial discharge level has been measured according to the reference standard.

Weather ageing test. Test series A: 1000 hours

Note: During the weather ageing test, the test objects were tested in parallel with a Dervasil insulator.

The test samples have been assembled in the test room in vertical position spaced each-other and from the chamber walls in order to avoid electrical field disturbance.
Test objects have been cleaned with deionized water before starting the test.

The surge arresters have been energized at U_{test} = 22 kV_{rms} and kept for a total duration of 1000 hours in the test room filled with salt fog.

The water flow rate was 0,4 ± 0,1 l/h*m^3

At the beginning the salinity of the water solution was 10 Kg/m^3.Than it has been decresed to 5 Kg/m^3 after 591 hours, and to 2,5 Kg/m^3 after 610 hours (see the paragraph "summary of test result").

The salt fog was not directly sprayed against the test specimens.

A scheme and a view of the test configuration are shown at pages 14 and 15.

The test sample has been visually inspected after about 500 hours and at test completion.
Photos were taken at the end of the test.

Final measurement

The initial measurement were repeated.

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

263

Summary of test result

Test series A: 1000 hours

The external flashovers occured during the test are noted in table below. The test salinity had to be changed twice.

sample W1	sample W2	test salinity	salinity change
1st Flashover after 565 h		10 g/l	
2nd Flashover after 591 h		10 g/l	from 10 to 5 g/l
3rd Flashover after 595 h		5 g/l	
	1st Flashover after 610 h	5 g/l	from 5 to 2,5 g/l
	2nd Flashover after 976 h	2,5 g/l	
	3nd Flashover after 981 h	2,5 g/l	

Visual inspection

Note: Sheds are numbered starting from the live side.

- After 500 hours

No tracking, shed puncture or significant erosions have been evidenced by the visual inspection carried out after 500

- After 1000 hours

Sample W1:

An overall view of the object after 1000 hours is shown in the photo at page 16.
No tracking, significant erosion or puncture was observed.
Shallow and diffuse erosions were visible on all circunference of the core between sheds n.2 and n.3 and, in less diffused way, also on the core between sheds n.3 and n.4 (see photo at page 17).

Sample W2:

An overall view of the object after 1000 hours is shown in the photo at page 18.
No tracking, significant erosion or puncture was observed.
Shallow erosions on the cores between sheds n.2-3, sheds n.4-5 and sheds n.6-7 (see photo at page 19).
Shallow and diffuse erosions were visible on all circunference of core between sheds n.8 and n.9 (see photo at page 20).

Variation of the reference voltage

Type	before test	after test	variation
	kV	kV	%
W1	27,26	27,9	+ 2,3
W2	28,03	28,4	+ 1,3

Acceptance criteria: satisfied

Partial discharge level

Type	before test	after test
	pC	pC
W1	<1	<1
W2	<1	<1

Acceptance criteria: satisfied

Conclusion: the acceptance criteria specified by the standard are satisfied. The test result is positive.

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

265

Measurement of the reference voltage - initial

test object: Polymer housed metal-oxide surge arresters
test circuit: /

date: May 12, 2004

sample W1						
oscill.	voltage	current	current	current	power	3rd harmonic amplitude
no.	kV	+ mA_{cr}	- mA_{cr}	mA_{rms}	W	μA
1	27,26	4,94	4,82	1,04	25,18	/

date: May 12, 2004

sample W2						
oscill.	voltage	current	current	current	power	3rd harmonic amplitude
no.	kV	+ mA_{cr}	- mA_{cr}	mA_{rms}	W	μA
2	28,03	3,95	5,04	1,37	23,80	/

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САЛЮКОВО

266

Measurement of partial discharges - initial

test object: Polymer housed metal-oxide surge arresters
test circuit: /
measurement circuit: /
arrangement: ---

atmospheric conditions		
b	t	h
kPa	°C	g / m³
/	24	/

date: May 13, 2004

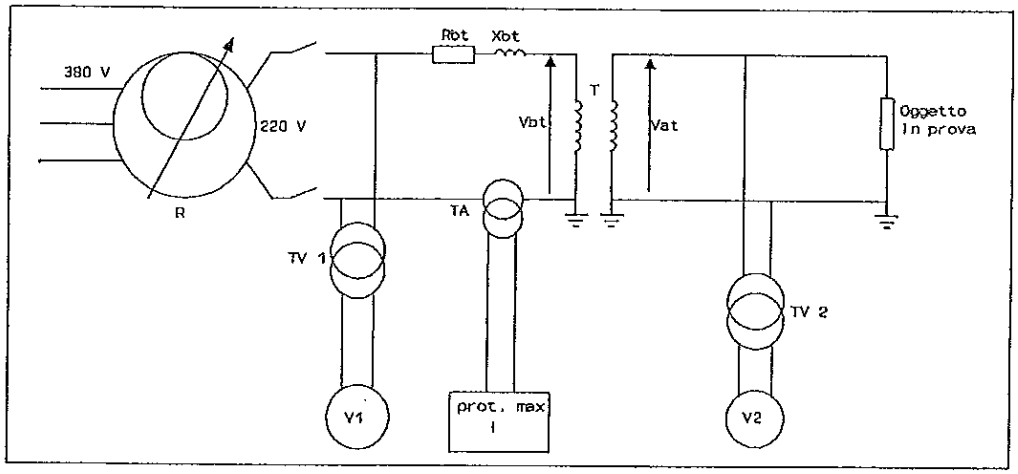
sample W1

test condition	applied voltage	duration of voltage application	temperature of the test object	voltage increase Q max	voltage decrease Q max	oscillogram	note
	kV_{rms}	sec	°C	pC	pC	no.	
rated voltage	27	10	24	/	/	/	/
22 x 1,05	23,1	/	24	/	≤ 1	/	/

sample W2

test condition	applied voltage	duration of voltage application	temperature of the test object	voltage increase Q max	voltage decrease Q max	oscillogram	note
	kV_{rms}	sec	°C	pC	pC	no.	
rated voltage	27	10	24	/	/	/	/
22 x 1,05	23,1	/	24	/	≤ 1	/	/

Weather ageing test.



power frequency test circuit (plant P188)

R : regulator type M.E.S.A.; power 66 kVA ; output voltage 220 V ; CESI no. 29991
TA : current reducer ; ratio 150A / 5A
TV_1: voltage reducer ; ratio 220V / 100V
V_1 : direct reading voltmeter
T : booster transformer PIVI type TMO/230 ; power 50 kVA ; ratio 220 V / 30 kV ; primary current 227 A ; secondary current 1,67 A ; CESI no. 38675
TV_2: voltage reducer CGS type VSO 534 ; CESI no. 287 ; ratio 30/0,1 kV
V_2 : voltmeter ANALOGIC Type DP100 ; CESI no. 9533

check of the test circuit date: August 8, 2004

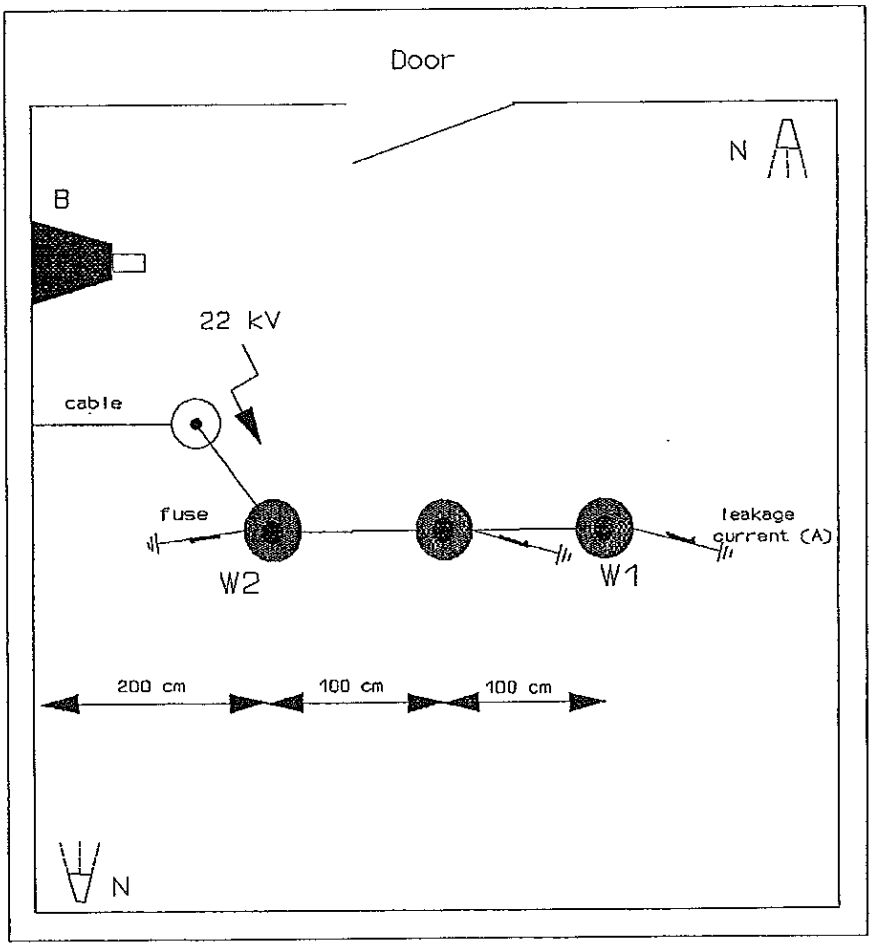
low voltage				high voltage k = 300		k_t
V_1	V_{bt}	I_1	I_{bt}	V_2	V_{AT}	V_{AT} / V_1
V	V	A	A	V	kV	
/	/	/	/	50,1	15,0	/
/	/	/	/	73,3	22,0	/
/	/	/	/	/	/	/

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

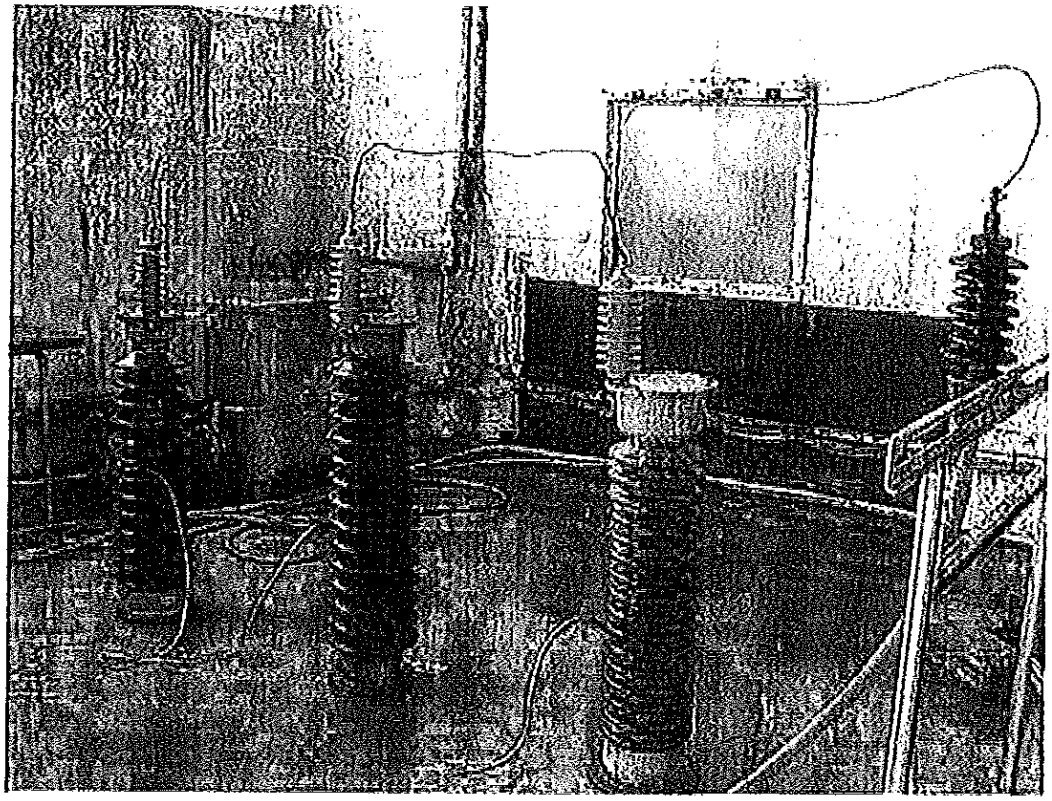
268

Weather ageing test. Test arrangement
Plant: pollution test room planimetry

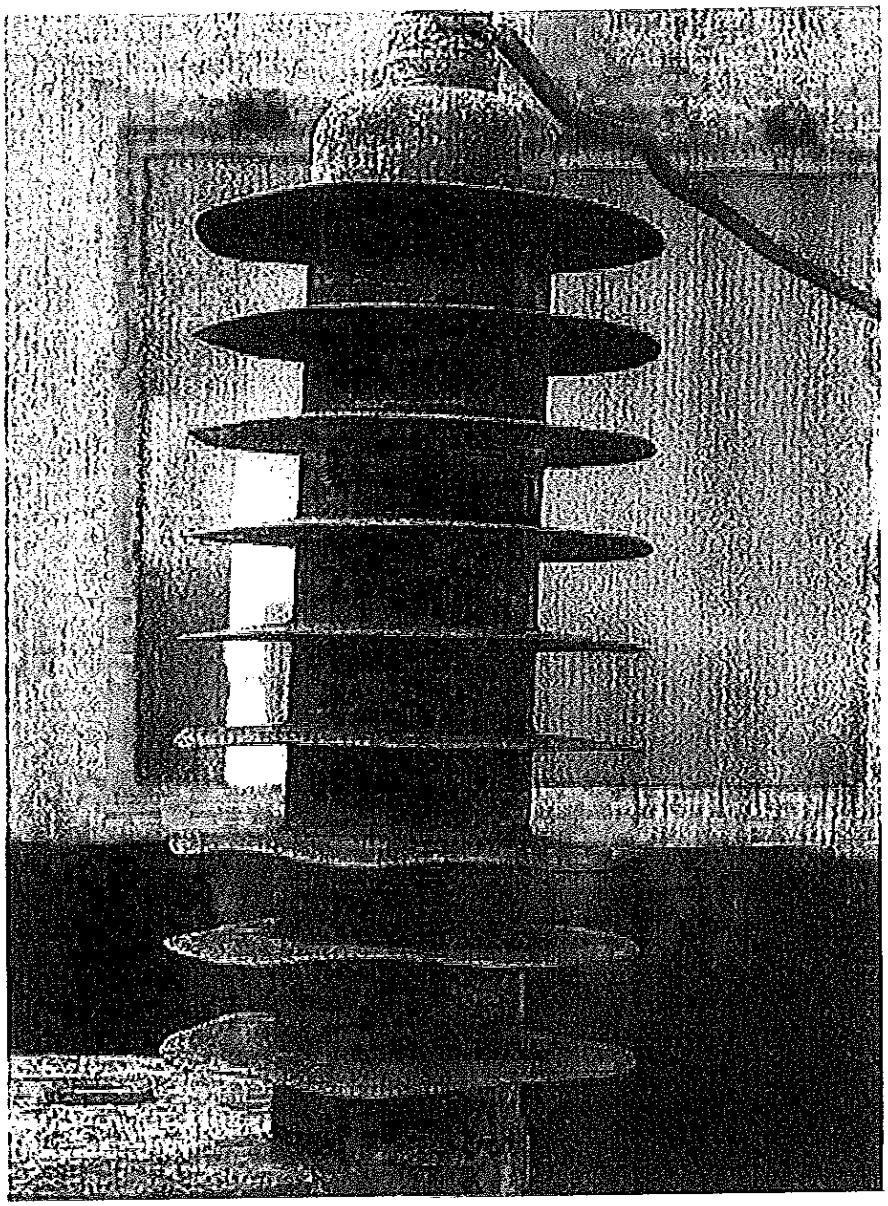


Test room volume: 360m³
B: bushing
N: spray nozzles. Number of spray nozzles: 4
W1, W2: test objects

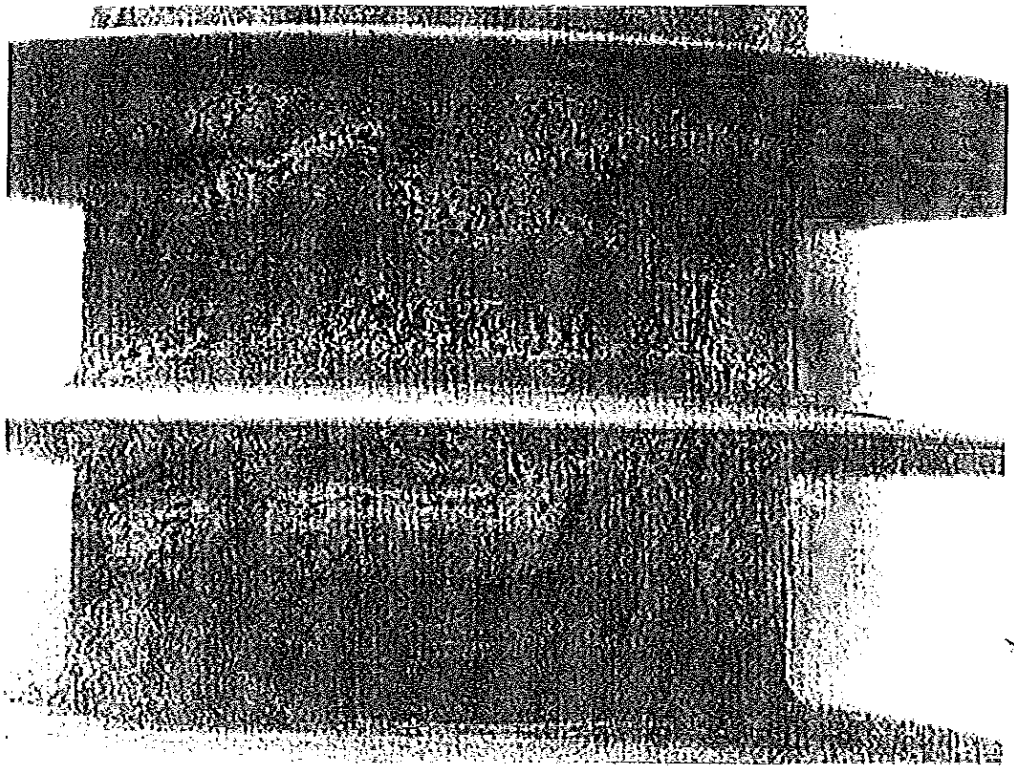
Picture of the test arrangement



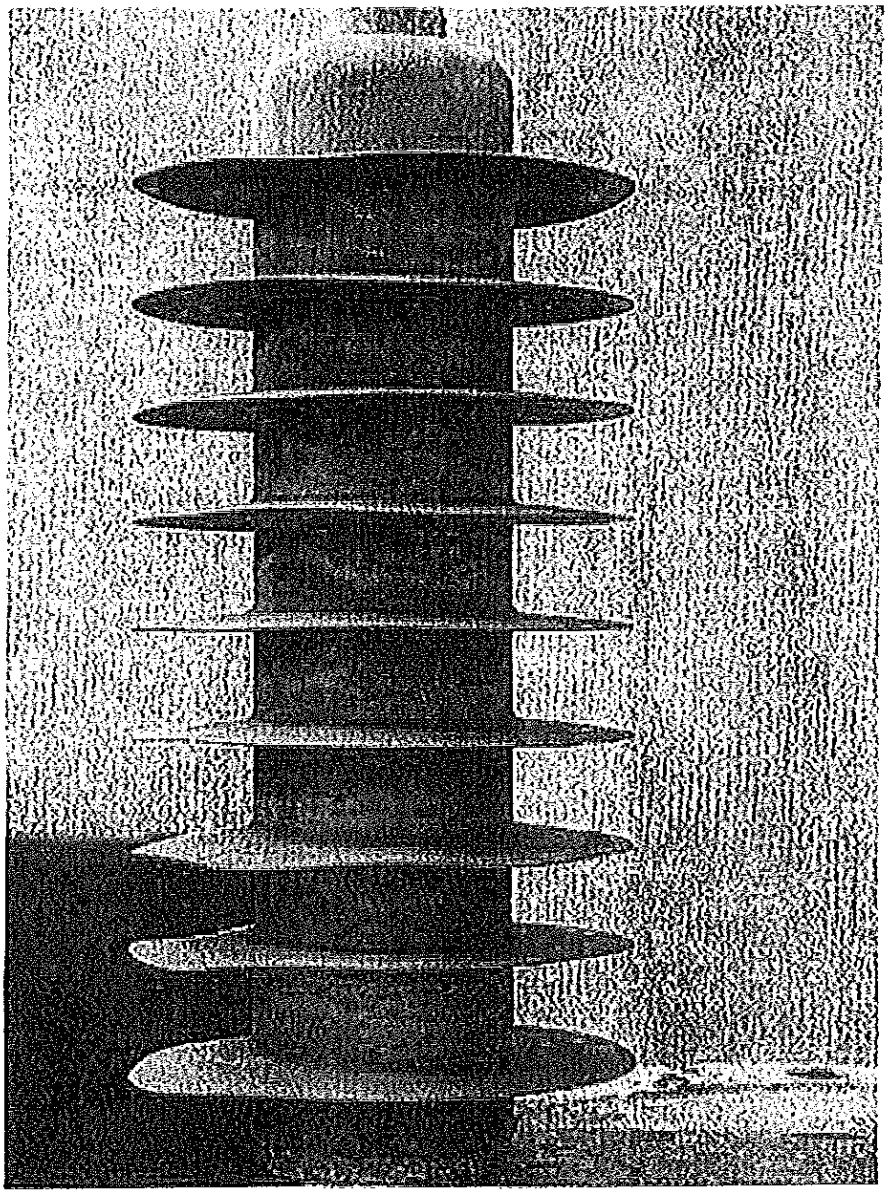
Picture of the test sample W1 after the test



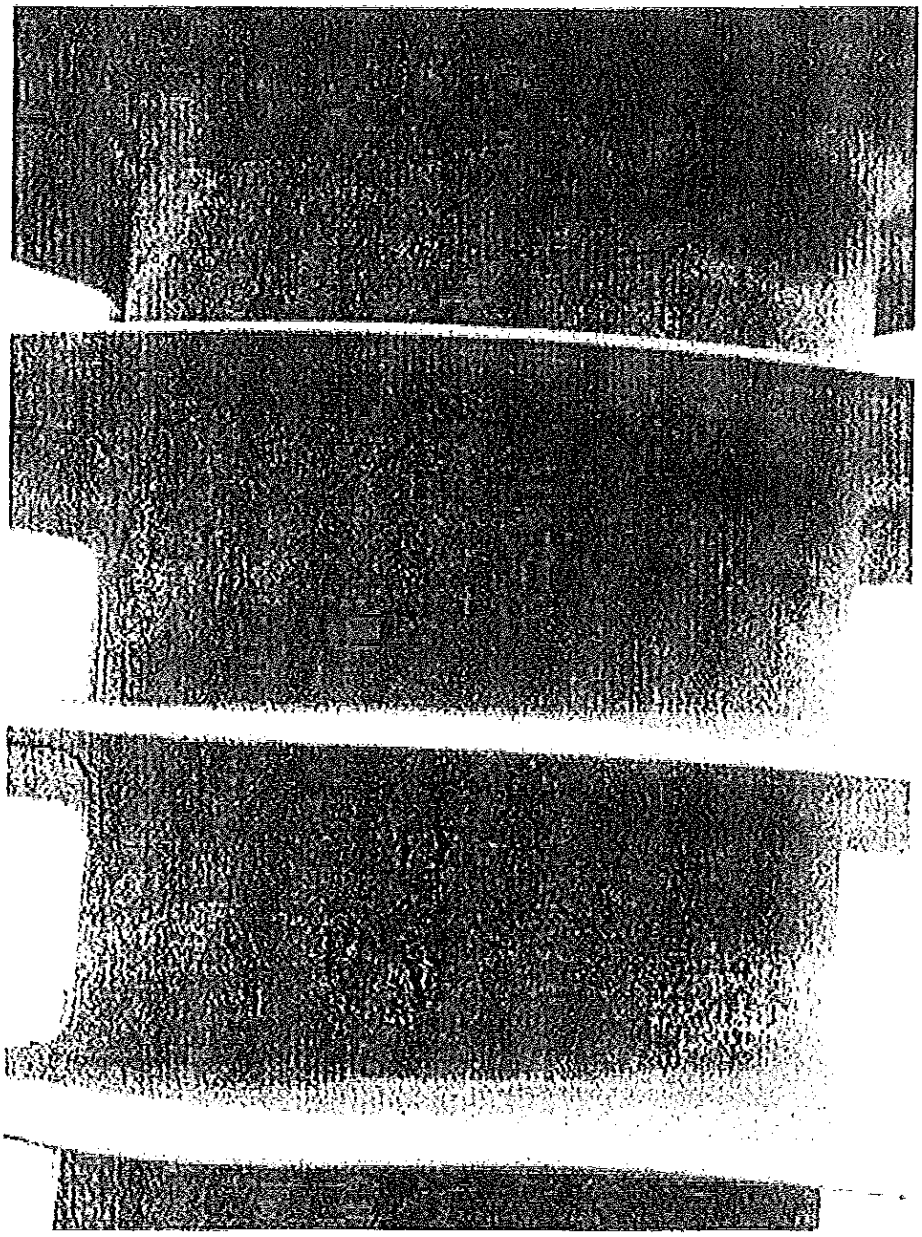
Picture of the test sample W1 after the test



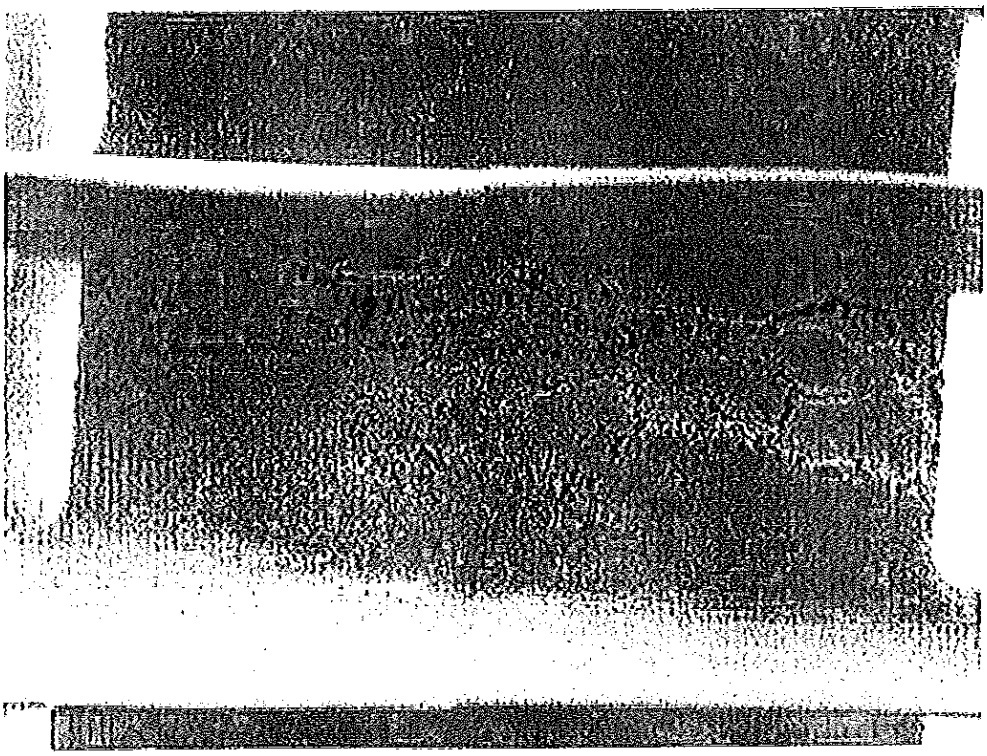
Picture of the test sample W2 after the test



Picture of the test sample W2 after the test



Picture of the test sample W2 after the test



Measurement of the reference voltage - Final

test object: Polymer housed metal-oxide surge arresters
test circuit: /

date: August 30, 2004

sample W1

oscill.	voltage	current	current	current	power	3rd harmonic amplitude
no.	kV	+ mA_{cr}	- mA_{cr}	mA_{rms}	W	μA
3	27,9	4,88	5,04	/	/	/

date: August 30, 2004

sample W2

oscill.	voltage	current	current	current	power	3rd harmonic amplitude
no.	kV	+ mA_{cr}	- mA_{cr}	mA_{rms}	W	μA
4	28,4	4,32	5,04	/	/	/

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

286

Measurement of partial discharges - Final

test object: Polymer housed metal-oxide surge arresters

test circuit: /

measurement circuit: /

arrangement: ---

atmospheric conditions		
b	t	h
kPa	°C	g / m³
/	25	/

date: August 30, 2004

Sample W1

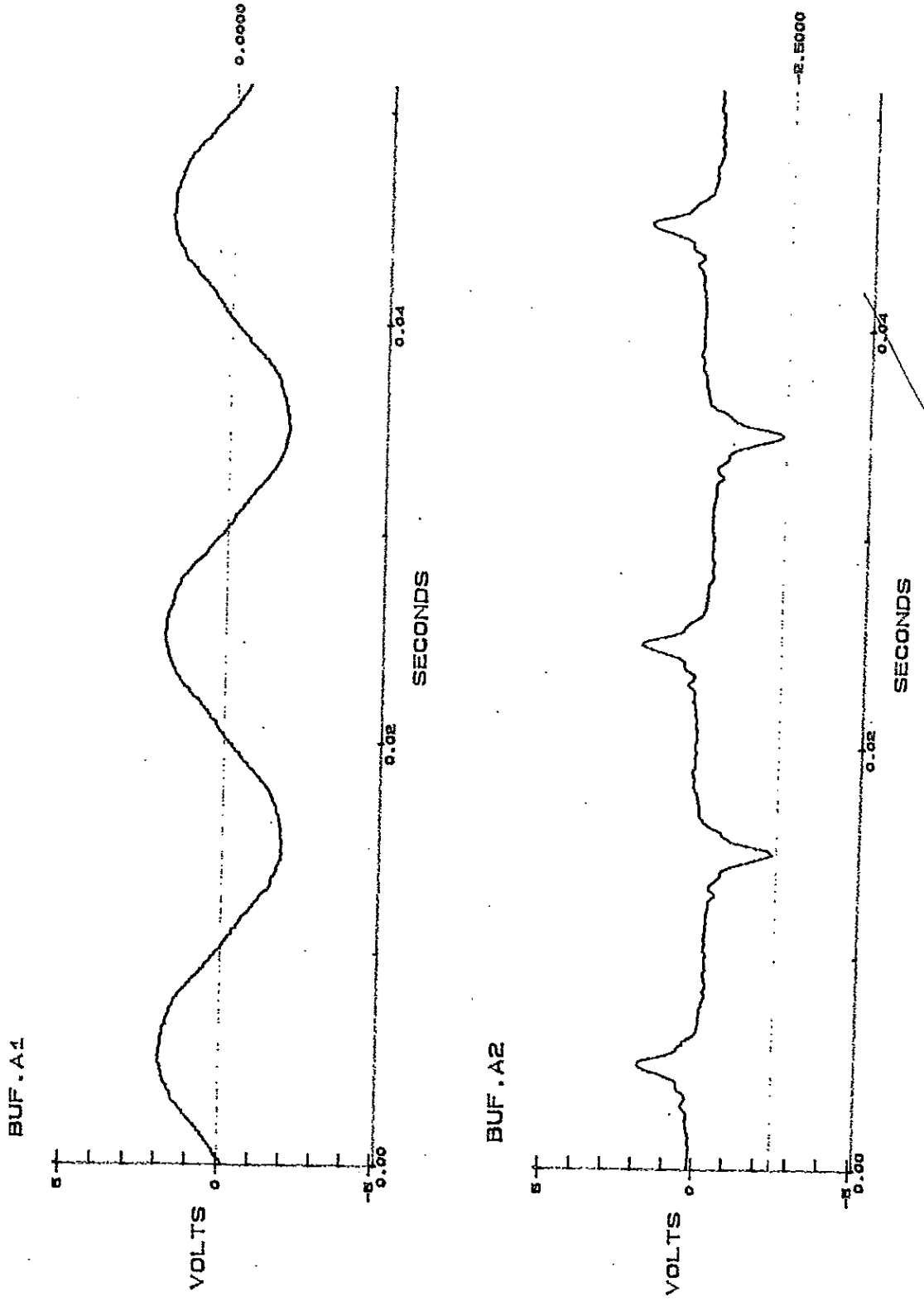
test condition	applied voltage	duration of voltage application	temperature of the test object	voltage increase Q max	voltage decrease Q max	oscillogram	note
	kV_{rms}	sec	°C	pC	pC	no.	
rated voltage	27	10	25	/	/	/	/
22 x 1,05	23,1	/	25	/	≤ 1	7	/

Sample W2

test condition	applied voltage	duration of voltage application	temperature of the test object	voltage increase Q max	voltage decrease Q max	oscillogram	note
	kV_{rms}	sec	°C	pC	pC	no.	
rated voltage	27	10	25	/	/	/	/
22 x 1,05	23,1	/	25	/	≤ 1	8	/

Note: background noise ≤ 1 pC, see oscillogram n.5
"direct" calibration: 50 pC - see oscillogram n.6

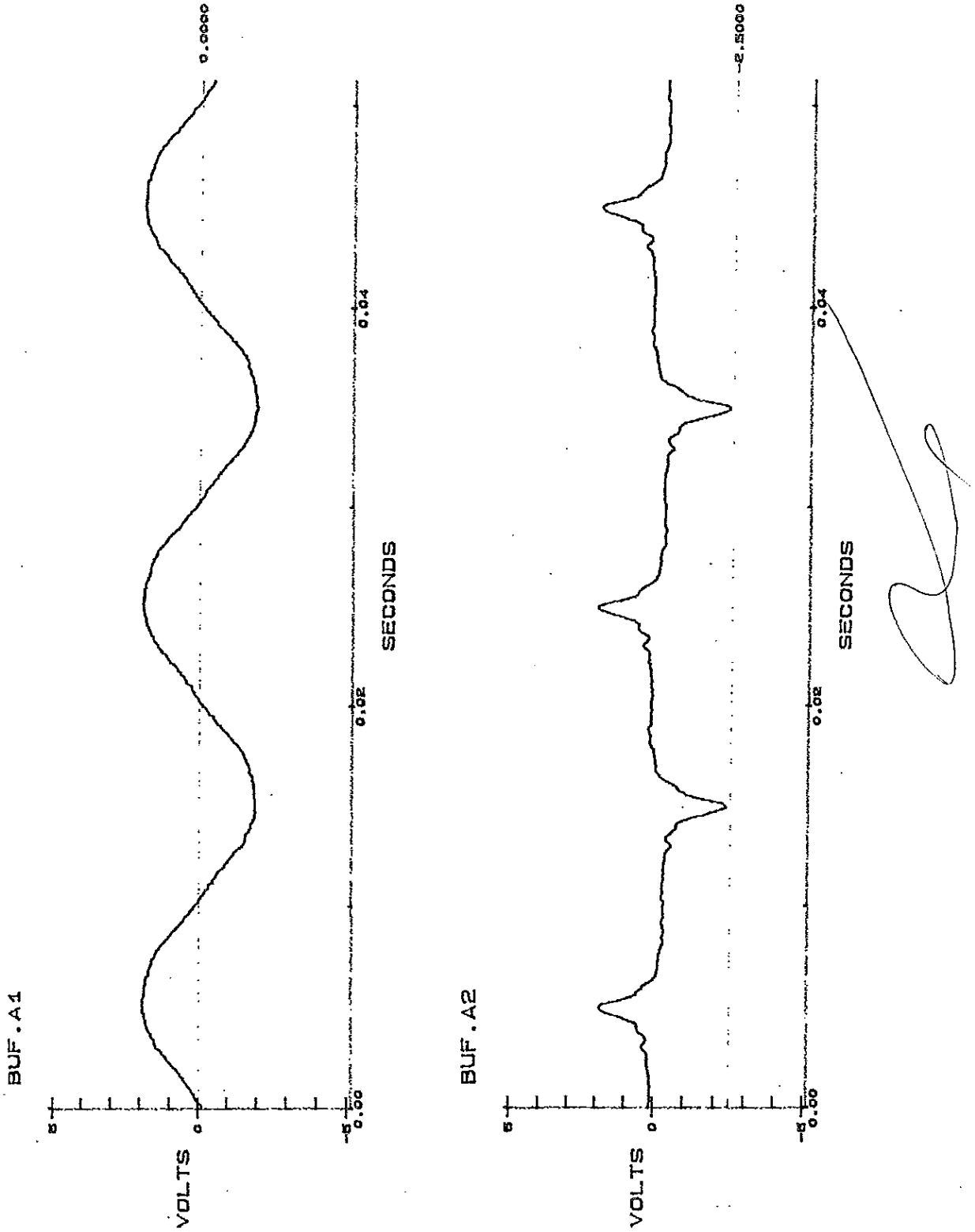
oscillogram no.01



CESI TEST A4510342

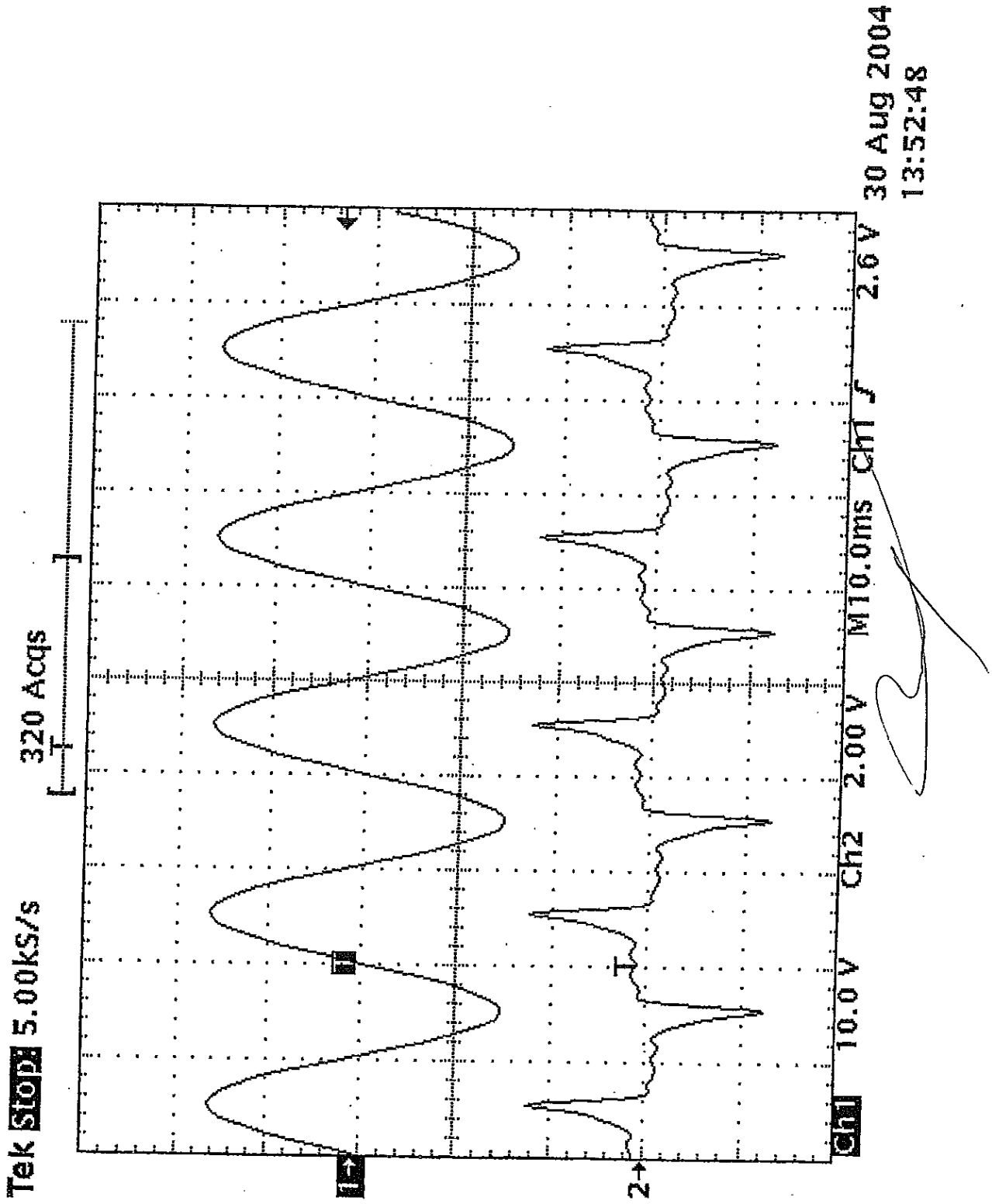
"ВАК - 02" ООД
САМОКОВ

oscillogram no.02



CESI TEST A4510342

oscillogram no.03



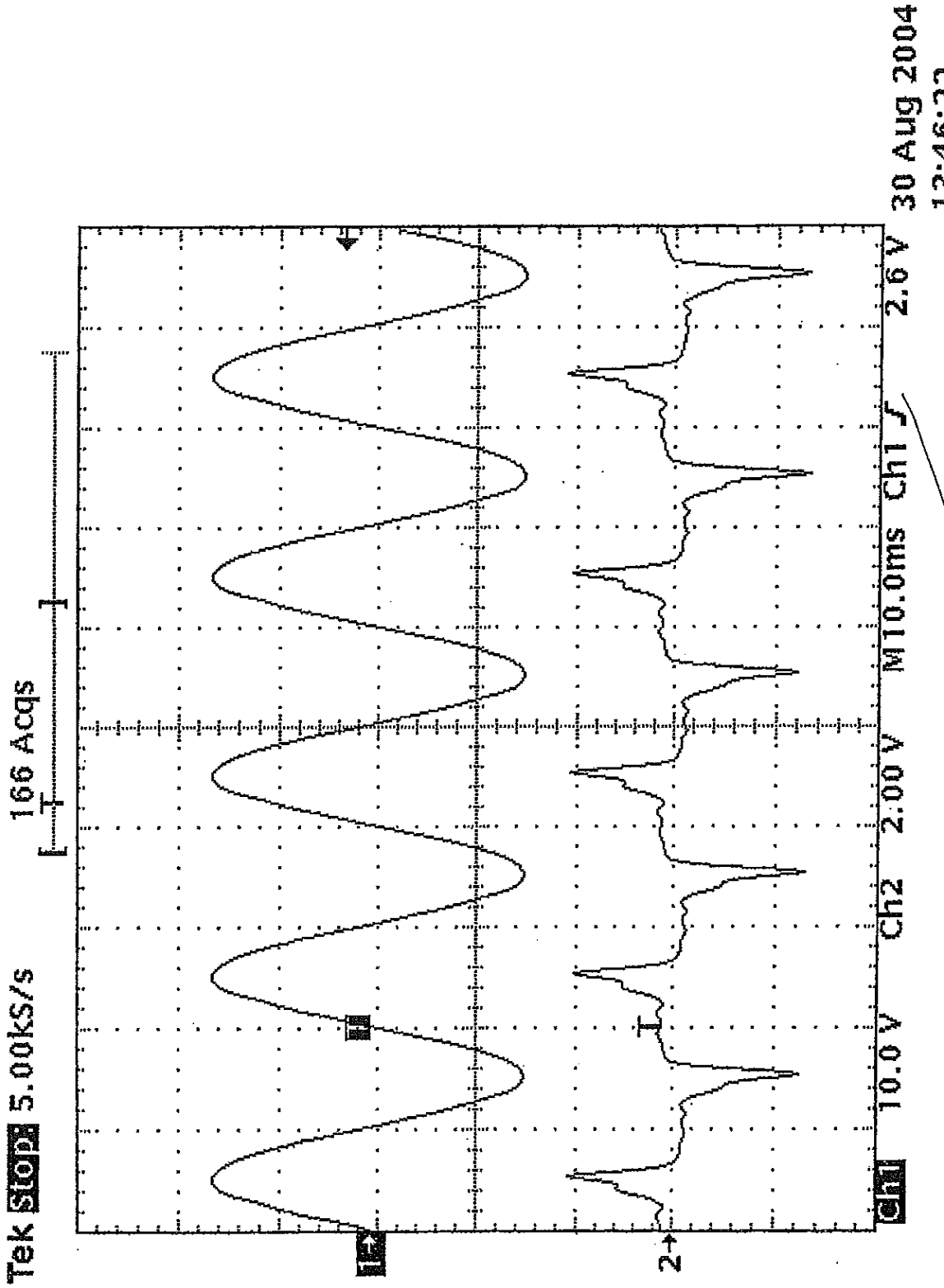
CESI TEST A4510342

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД

280

oscillogram no.04

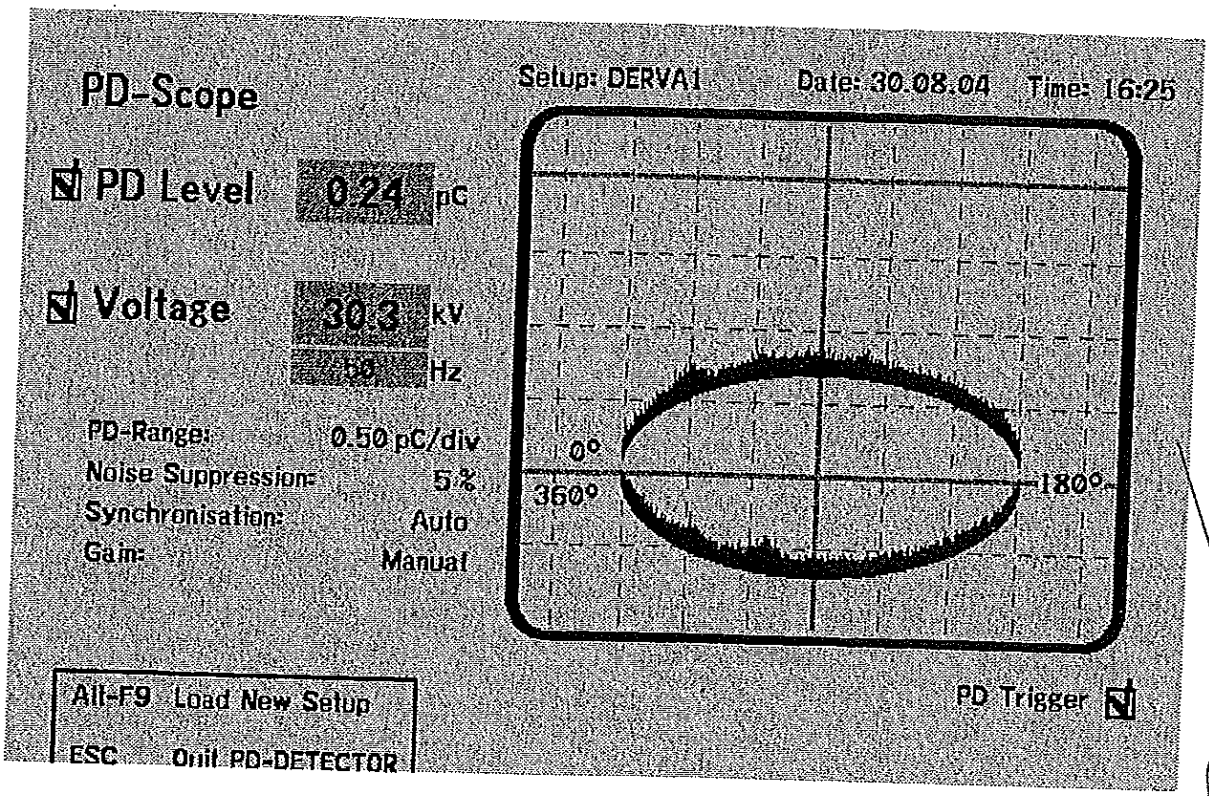


CESI TEST A4510342

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
С. МОКОВ

oscillogram no.05



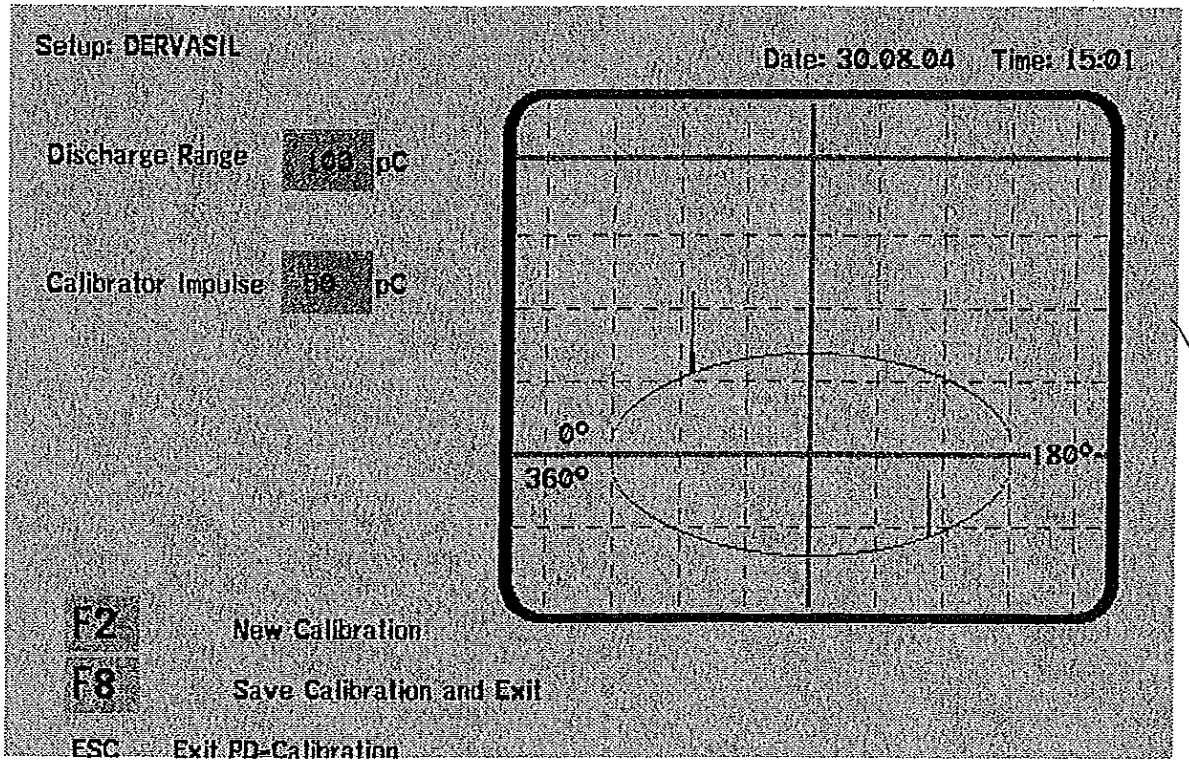
CESI TEST A4510342

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
САМОКОВ

582

oscillogram no.06



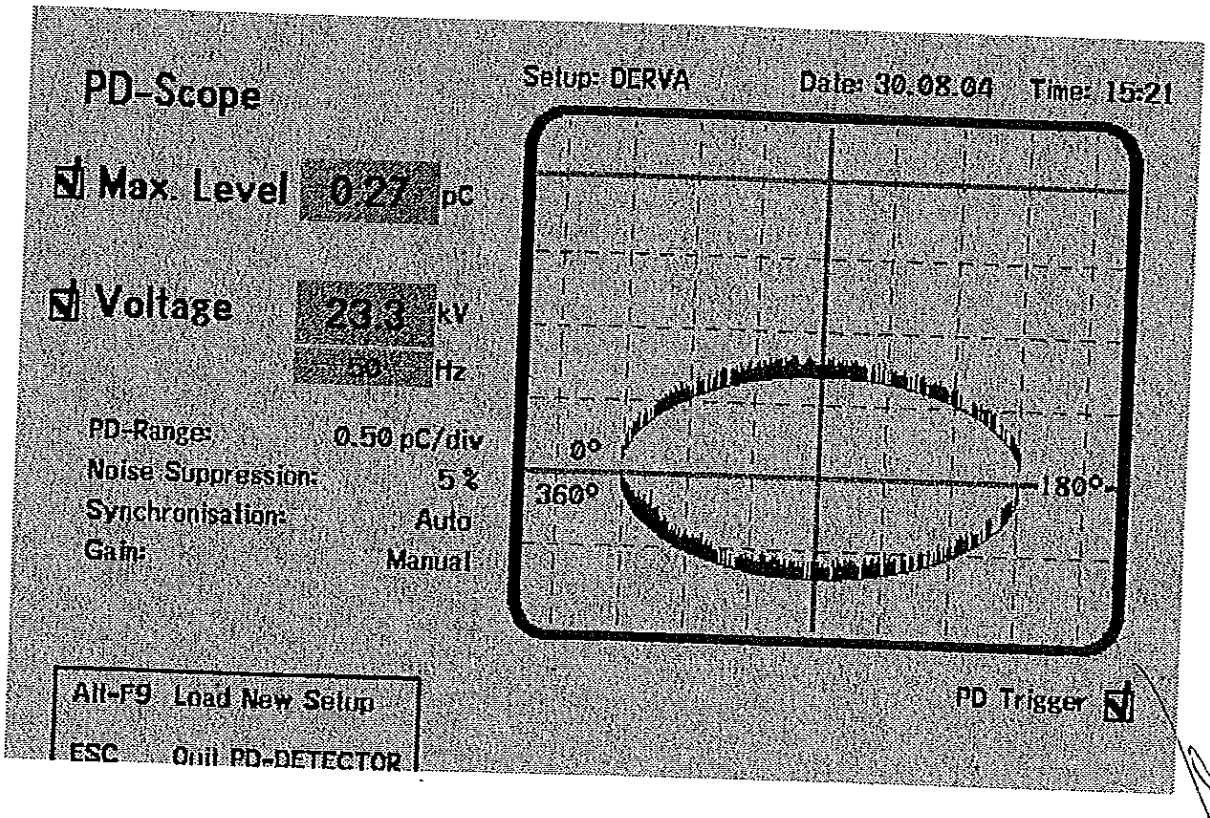
CESI TEST A4510342

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
САМОКОВ

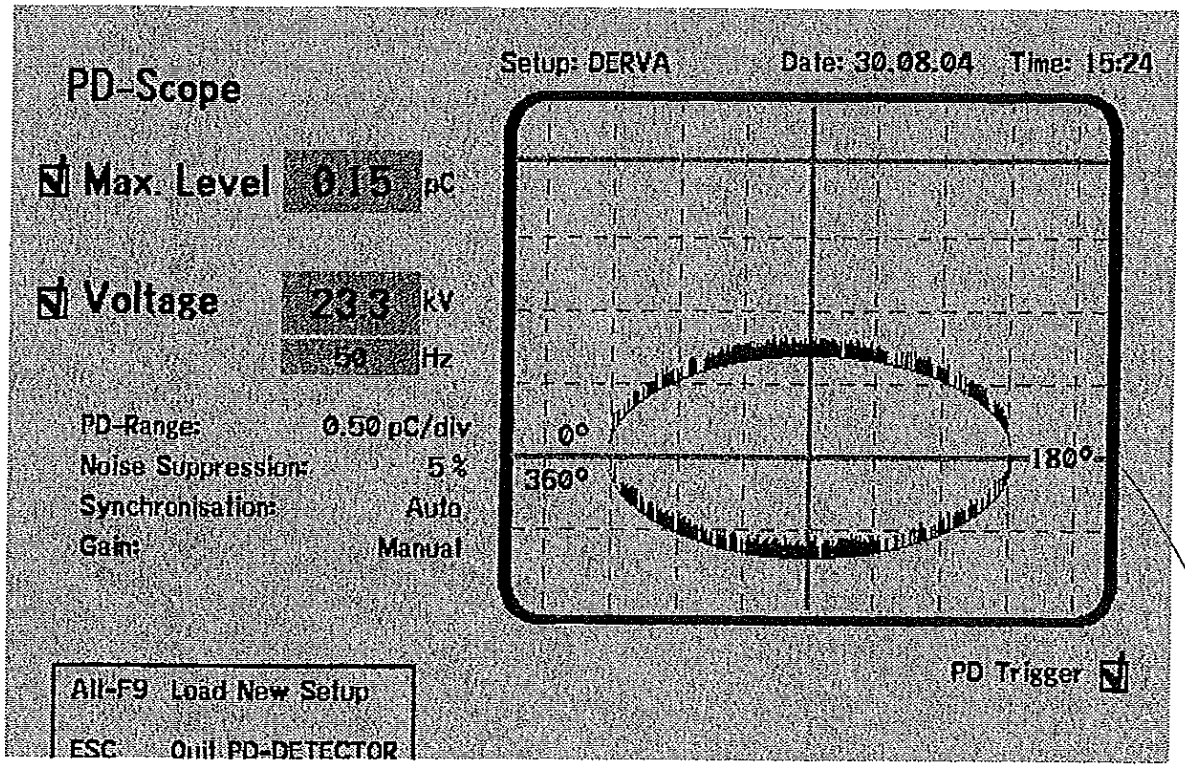
283

oscillogram no.07



CESI TEST A4510342

oscillogram no.08



CESI TEST A4510342

СПИСЪК НА ОТДЕЛНИТЕ ИЗПИТВАНИЯ НА ВЕНТИЛЕН ОТВОД ТИП AZC 150 И ВЕНТИЛЕН ОТВОД ТИП AZC 270

1. Изпитание на изолационната устойчивост на корпуса на вентилния отвод
2. Изпитание на остатъчно напрежение
3. Изпитание за устойчивост на дълготраен токов импулс
4. Изпитание при работен режим с високо-токов импулс:
   - Изпитание с ускорено стареене
   - Изпитание при режим с високо-токов импулс и комутационно пренапрежение
5. Изпитание на късо съединение
6. Изпитание с вътрешно частично разреждане
7. Изпитание на огъващ момент
8. Изпитание с проникване на влага
9. Изпитание с атмосферно стареене

Съставил: на основание чл. 2 от ЗЗЛД

"ВАК - 02" ООД
САМОКОВ

dervasil

Manfacturer: .DERVASIL. . . . . Surge Arrester Type: . AZBD. . . . . .

TEST DESIGNATION	Clauses of IEC 60099-4 (2006-07)	Laboratory	Laboratory accreditation	Validity of accreditation	Test Report Number	Test dates	Report date	Requested Sample to be tested according IEC 600099-4	Tested Samples	Comments
DRY LIGHTNING IMPULSE WITHSTAND VOLTAGE TEST	8.2.6	EGU (Czech Rep)	CAI N°110/2006	30.4.2011	9422/08	13.11.2008	20.11.2008	on Longuest housing i.e AZBD 42	AZBD 42 Ur = 42 kV Uc = 35 kV	
WET POWER FREQUENCY VOLTGE TEST	8.2.8	EGU (Czech Rep)	CAI N°110/2006	30.4.2011	9422/08	13.11.2008	20.11.2008	on Longuest housing i.e AZBD 42	AZBD 42 Ur = 42 kV Uc = 35 kV	
RESIDUAL VOLTAGE TEST	8.3	CESI (Italy)	SINCERT 018B rev04	1.6.2010	A8007148	1.4.2008	23.9.2008	As authorized by IEC test has been performed on Metal Oxide Resistor Ur = 6 kV	Metal oxide resistor for arrester type AZBD Ur= 6 IV	
LONG DURATION CURRENT IMPULSE WITHSTAND TEST	10.8.4	CESI (Italy)	SINCERT 018B rev04	1.6.2010	A8018267	1.4.2008	3.9.2008	As authorized by IEC test has been performed on Surge Arrester section Ur = 9 kV	AZBD 090 Ur = 9 kV Uc = 8,4 kV	Energy max of choc = 15,98 kJ which corresponds to 1,9 kJ/kv Uc

HIGH CURRENT IMPULSE OPERATING DUTY TEST	10.8.5	CESI (Italy)	SINCERT 018B rev04	1.6.2010	A8018272	1.4.2008	3.9.2008	As authorized by IEC test has been performed on Surge Arrester section with disconnector and support Ur = 9 kV	AZBD 090 Ur = 9 kV Uc = 8,4 kV	Energy max of choc = 33,1 kJ which corresponds to 3,94 kJ/kv Uc
DISCONNECTOR TEST	8.6.3.1	CESI (Italy)	SINCERT 018B rev04	1.6.2010	A5/8453	8.3.2005	14.3.2005		Disconnector	
INTERNAL PARTIAL DISCHARGE TEST	10.8.8	EGU (Czech Rep)	CAI N°110/2006	30.4.2011	9422/08	13.10.2008	20.11.2008	on Longuest housing i.e AZBD 42	AZBD 42 Ur = 42 kV Uc = 35 kV	
TEST OF BENDING MOMENT	10,8,9	Dervasil Lab			N°224	28/10/2008	28.10.2008	on Longuest housing i.e AZBD 42	AZBD 42 Ur = 42 kV Uc = 35 kV	Cantilever load 350 Nm - Torque load 70 Nm
MOISTURE INGRESS TEST	10,8,13	VNL (Hungaria)	NAT-1-1251/2007	8.7.2011						

WEATHER AGEING TEST	10.8.14.2.1	CESI (Italy)	SINCERT 018B rev04	1.6.2010	A5/022740	12.5.2005	24.8.2004	Longest with minimum specific creepage distance	Surge Arrester AZB27 Ur=27 kV Uc = 22 kV	AZB and AZBD have same profile housing, same leakage distance and injected silicone rubber housing . This test is also valid for AZBD arresters

St Joseph on

dervasil
SAS au capital de 907 190 €
Route de Paponot - 42800 SAINT-JOSEPH
Tél. 04 77 75 29 98 - Fax 04 77 83 22 80
RC St-Etienne 423 136 977 - Code NAF 312 A

На основание чл. 2 от ЗЗЛД

dervasil

Производител: .DERVASIL. . . . . Тип вентилен отвод: . AZBD. . . . . .

ОПИСАНИЕ НА ИЗПИТАНИЕТО	Клаузи от IEC 60099- 4 (2006- 07)	Лаборатория	Акредитация на лабораторията	Дата на акредитацията	Номер на протокола	Дата на изпитване	Дата на протокола	Изисканите мостри да бъдат изпитани съгласно IEC 600099-4	Изпитани мостри	Коментари
ИЗПИТАНИЕ ЗА УСТОЙЧИВОСТ НА ИМПУЛСНО АТМОСФЕРНО ПРЕНАПРЕЖЕНИЕ В СУХО СЪСТОЯНИЕ	8.2.6	EGU (Czech Rep)	CAI N°110/2006	30.4.2011	9422/08	13.11.2008	20.11.2008	върху най-дългия корпус - AZBD 42	AZBD 42 Ur = 42 kV Uc = 35 kV	
ИЗПИТАНИЕ С НАПРЕЖЕНИЕ С ПРОМИШЛЕНА ЧЕСТОТА ВЪВ ВЛАЖНО СЪСТОЯНИЕ	8.2.8	EGU (Czech Rep)	CAI N°110/2006	30.4.2011	9422/08	13.11.2008	20.11.2008	върху най-дългия корпус - AZBD 42	AZBD 42 Ur = 42 kV Uc = 35 kV	
ИЗПИТАНИЕ НА ОСТАТЪЧНО НАПРЕЖЕНИЕ	8.3	CESI (Italy)	SINCERT 018B rev04	1.6.2010	A8007148	1.4.2008	23.9.2008	Като оторизиран от IEC извършено изпитване на метало-окисен ресистор Ur = 6 kV	метало-окисен ресистор за вентилен отвод тип AZBD Ur= 6 kV	

"ВИК - 02" ООД САМОКОВ

ИЗПИТАНИЕ ЗА УСТОЙЧИВОСТ НА ДЪЛГОТРАЕН ТОКОВ ИМПУЛС	10.8.4	CESI (Italy)	SINCERT 018B rev04	1.6.2010	A8018267	1.4.2008	3.9.2008	Като оторизиран от IEC извършено изпитване на вентилен отвод раздел Ur = 9 kV	AZBD 090 Ur = 9 kV Uc = 8,4 kV	Максимална енергия = 15,98 kJ което съответства на 1,9 kJ/kv Uc
ИЗПИТАНИЕ ПРИ РАБОТЕН РЕЖИМ С ВИСОКО-ТОКОВ ИМПУЛС	10.8.5	CESI (Italy)	SINCERT 018B rev04	1.6.2010	A8018272	1.4.2008	3.9.2008	Като оторизиран от IEC извършено изпитване на вентилен отвод раздел с разединител Ur = 9 kV	AZBD 090 Ur = 9 kV Uc = 8,4 kV	Максимална енергия = 33,1 kJ което съответства на 3,94 kJ/kv Uc
ИЗПИТАНИЕ С РАЗЕДИНИТЕЛ	8.6.3.1	CESI (Italy)	SINCERT 018B rev04	1.6.2010	A5/8453	8.3.2005	14.3.2005		разединител	
ИЗПИТАНИЕ С ВЪТРЕШНО ЧАСТИЧНО РАЗРЕЖДАНЕ	10.8.8	EGU (Czech Rep)	CAI N°110/2006	30.4.2011	9422/08	13.10.2008	20.11.2008	върху най-дългия корпус - AZBD 42	AZBD 42 Ur = 42 kV Uc = 35 kV	
ИЗПИТАНИЕ НА ОГЪВАЩ МОМЕНТ	10,8,9	Dervasil Lab			N°224	28/10/2008	28.10.2008	върху най-дългия корпус - AZBD 42	AZBD 42 Ur = 42 kV Uc = 35 kV	товар на огъване 350 Nm - товар на усукване 70 Nm
ИЗПИТАНИЕ С ПРОНИКВАНЕ НА ВЛАГА	10,8,13	VNL (Hungaria)	NAT-1-1251/2007	8.7.2011						

ИЗПИТАНИЕ С АТМОСФЕРНО СТАРЕЕНЕ	10.8.14.2.1	CESI (Italy)	SINCERT 018B rev04	1.6.2010	A5/022740	12.5.2005	24.8.2004	Най-дълъг с минимално разстояние на специфичен път на утечка	Вентилен отвод AZB27 Ur=27 kV Uc = 22 kV	Вентилен отвод тип AZB и AZBD имат същия корпус, същото изолационно разстояние по повърхността и обвивка от силиконов каучук. Това изпитание също е валидно за отводи AZBD.

St Joseph on
May 28th, 2013

dervasil
SAS au capital de 907 190 €
Route de Poponet - 42800 SAINT-JOSEPH
Tél. 04 77 75 29 98 - Fax 04 77 83 22 80
RC St-Etienne 423 136 977 - Code NAF 312 A

на основание чл. 2 от ЗЗЛД

E G U – H V Laboratory a. s.
High voltage testing laboratory
Podnikatelská 267, 190 11 Praha 9, Běchovice

ilac-MRA
L 1029
ACCREDITED TESTING LABORATORY No.: 1029
Accredited by Czech Accreditation Institute, o.p.s.

CUSTOMER:
DERVASIL
Route de Popenot
42800 Saint Joseph
France

ORDER No.:
CG080905 mod 1

DATE OF TEST:
The 13th of October 2008
The 13th of November 2008

TEST No.:
9422/08

TEST REPORT
No.: 9422/08

TEST OBJECT: SURGE ARRESTERS

MANUFACTURER: DERVASIL, FRANCE

TEST STANDARDS: IEC 60060-1:1989, IEC 60099-4:2006-07 Ed. 2.1

ACCREDITED TESTING LABORATORY EGU - HV Laboratory a.s. PRAGUE No. 1029

TEST PERFORMED BY:
Marek Brosch
на основание чл. 2 от ЗЗЛД

DIRECTOR OF EGU - HV Laboratory a.s.:
Václav Skle
на основание чл. 2 от ЗЗЛД

CO

PAGES: 11

In Prague 9 - Běchovice: 2008-11-20

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
САМОКОВ

293

TEST OBJECT

SURGE ARRESTERS AZB-D 42

Drawing No.: No. 99B000210B (see Figure 1)

Characteristics of arresters are :
Ur = 42 kV
Uc = 35 kV
In = 10 kA class 1

The creepage distance: 1045 mm
The arcing distance: 365 mm

Insulation withstand characteristics are :
190 kV dry lightning impulse withstand voltage
70 kV wet power-frequency voltage

DATE OF DELIVERY

2008-10-10 and 2008-10-22

SCHEDULE OF TESTS

1.	Internal partial discharge test	surge arrester #1 sn 08/0006
2.	Dry lightning impulse withstand voltage test	surge arrester #2 sn D42 0030
3.	Wet power-frequency voltage test	surge arrester #2 sn D42 0030

ACCREDITED TESTING LABORATORY EGU-HV Laboratory a.s. PRAGUE No 1006

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

294

TEST PROCEDURE

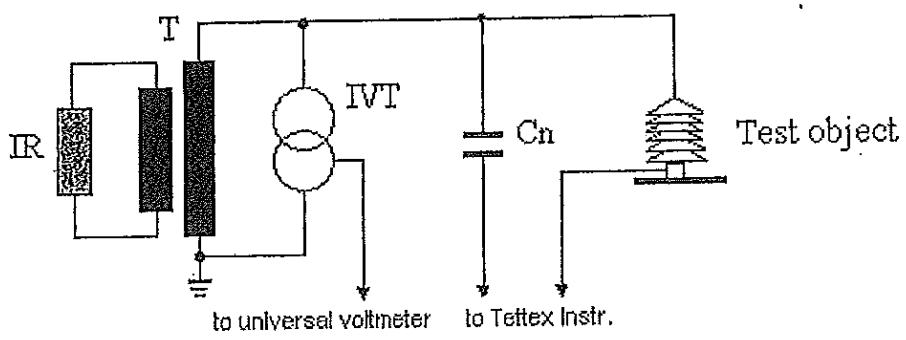
1. Internal partial discharge test

The test was carried out according to IEC 60099-4, clause 10.8.8.

The test voltage was increased to the rated voltage of the arrester, held 2 s to 10 s, and then decreased to 1,05 times the continuous operating voltage of the arrester.

The test arrangement is given on Figure 3.

Testing and measuring equipment:



IR – induced regulator ČKD Praha, 6/0-3 kV, 50 kVA
T – test transformer Fischer-Köln, 3-6/250 kV, 250 kVA
IVT – instrument voltage transformer Škoda, 380/√3 kV / 100/√3 V, serial No. 917355
PD measuring system Tettex, type 2801, serial No. 123989
universal voltmeter Siemens, type MU 15, serial No. 879953
digital stop-watch Speedo, type Speedo
measuring system for atmospheric condition COMET, type D4130, serial No. 04900257

2. Dry lightning impulse withstand voltage test

Test was carried out in compliance with IEC 60099-4, clause 8.2.6 and in compliance with IEC 60060-1, clause 20.1.2.

Fifteen (15) full lightning impulses of positive polarity was applied to the arrester followed by fifteen (15) full lightning impulses of negative polarity.

The impulse withstand voltage of 190 kV was applied to the arrester.

The wave shape of the test lightning impulse is given in Figure 2.

The test arrangement is given on Figure 4.

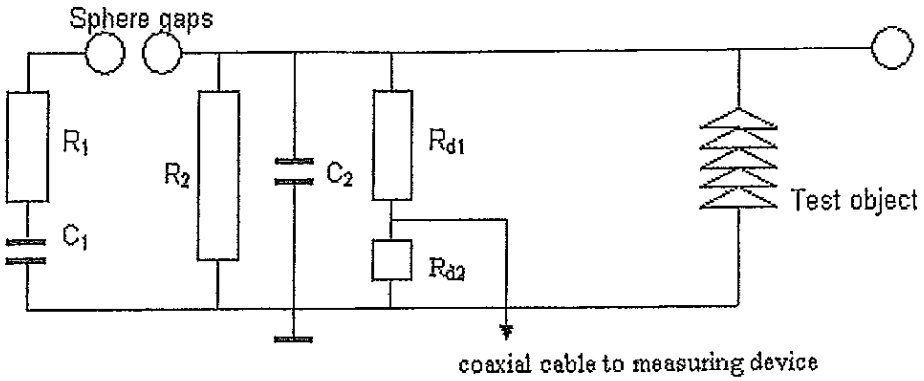
ACCREDITED TESTING LABORATORY EGU - HV Laboratory a.s. PRAGUE No. 1029

"ВАК - 02" ООД САМОКОВ

ВЯРНО С ОРИГИНАЛА

295

Testing and measuring equipment:



impulse generator TuR Dresden 750 kV, 30 kJ
R_{d1}/R_{d2} - resistive divider Haefely, type R 800, serial No. 554333
digital voltmeter Haefely, type 64 M, serial No. 604160
measuring system Haefely Trench, type HiAS 743, serial No. 080649-01
measuring system for atmospheric condition COMET, type D4130, serial No. 04900257
yard stick, type 30-847, serial No. 101

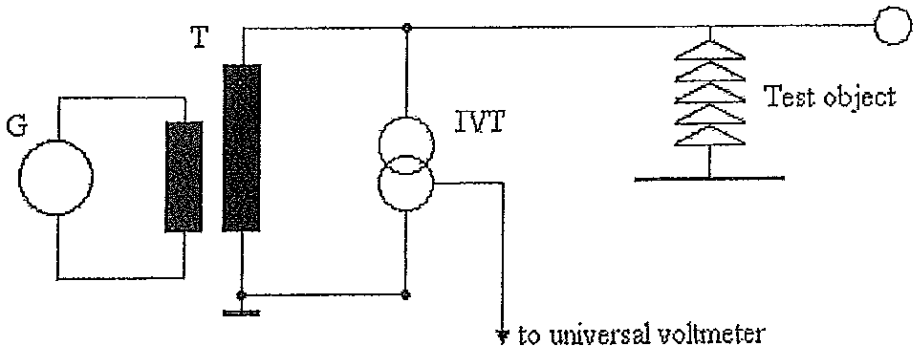
3. Wet power frequency voltage test

Test was carried out in compliance with IEC 60099-4, clause 8.2.8 and in compliance with IEC 60060-1, clause 17.

The one minute wet power-frequency withstand voltage (U_{WAC}) was applied according to IEC 60060-1, clause 17.1.

The test arrangement is given on Figure 5.

Testing and measuring equipment:



G - synchronous generator BEZ Bratislava 6 kV, 1300 kVA, 50 Hz
T - test transformer Fischer-Köln, 3-6/250 kV, 250 kVA
IVT – instrument voltage transformer Škoda, 380/√3 kV / 100/√3 V, serial No. 917355
universal voltmeter Siemens, type MU 15, serial No. 879953
measuring system for atmospheric condition COMET, type D4130, serial No. 04900257
conductivity meter ino Lab Con Level 1, serial No. 99440007
yard stick, type 30-847, serial No. 101
digital stop-watch Speedo, type Speedo

UNCERTAINTY OF MEASUREMENT

QUANTITY	UNCERTAINTY (k=2)	
Lightning impulse voltage	U_m T_1 T_2	1,5 % 2,6 % 2,2 %
Power-frequency voltage	1,7 %	
Partial discharges	8,0 %	
Air pressure	0,04 kPa	
Temperature	0,7 °C	
Relative humidity	4 %	
Time	0,2 %	
Length (1 – 5 000 mm)	620 µm	
Conductivity (0,1 µS/cm – 500 mS/cm)	1,3 %	

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

LIST OF SYMBOLS

b air pressure (kPa),
t air temperature (°C),
RH relative air humidity (%),
U test voltage (kV), corresponding to actual atmosphere,
Q internal partial discharge (pC),
$\mathbf{U_{WLI}}$ specified dry lightning impulse withstand voltage (kV),
ri average value of rainfall intensity (mm/min):
- v.c. - vertical component,
- h.c. - horizontal component,

ρ water resistivity (Ωm),
$\mathbf{U_{WAC}}$ specified wet power-frequency withstand voltage (kV), corresponding to standard reference atmosphere (test duration - 60 s).

ACCREDITED TESTING LABORATORY EGU - HV Laboratory a.s. PRAGUE No. 1029

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

TEST RESULTS

1. Internal partial discharge test

Table 1

sample	*#1*	
b (kPa)	99,3	
t (°C)	16,7	
RH (%)	56,7	
U (kV)	Q (pC)	
	↓	↑
0	0,5	0,5
35	2	2
36,8	3	3
42	6	6

Measured values of partial discharges on arrester are less then 10 pC specified by IEC 60099-4 clause 10.8.8.

Surge arrester #1, drawing No. 99B000210B p a s s e d the internal partial discharge test according to IEC 60099-4, clause 10.8.8.

2. Dry lightning impulse withstand voltage test

Table 2

sample	*#2*	
Polarity	+	-
b (kPa)	99,2	99,2
t (°C)	16,3	16,3
RH (%)	44,6	44,6
U_{WLI} (kV)	190	190
No. of flashovers	0	0

No internal and external disruptive discharges were occurred during the test with the specified dry lightning impulse withstand voltage 190 kV (corrected value 179 kV).

Surge arrester #2, drawing No. 99B000210B p a s s e d the dry lightning impulse withstand voltage test according to IEC 60099-4, clause 8.2.6.

ACCREDITED TESTING LABORATORY EGU-HV Laboratory a.s. PRAGUE No. 1029

"ВАК - 02" ООД САМОКОВ

298

3. Wet power frequency voltage test

Table 3

sample		*#2*
b (kPa)		99,2
t (°C)		15,9
RH (%)		54,6
ri (mm/min)	v.c.	1,0
	h.c.	1,0
ρ (Ωm)		103
U_{WAC} (kV)		**70**

No flashover and no puncture was occurred during the test with the specified wet power frequency withstand voltage 70 kV.

Surge arrester #2, drawing No. 99B000210B p a s s e d the wet power frequency voltage tests according to IEC 60099-4, clause 8.2.8.

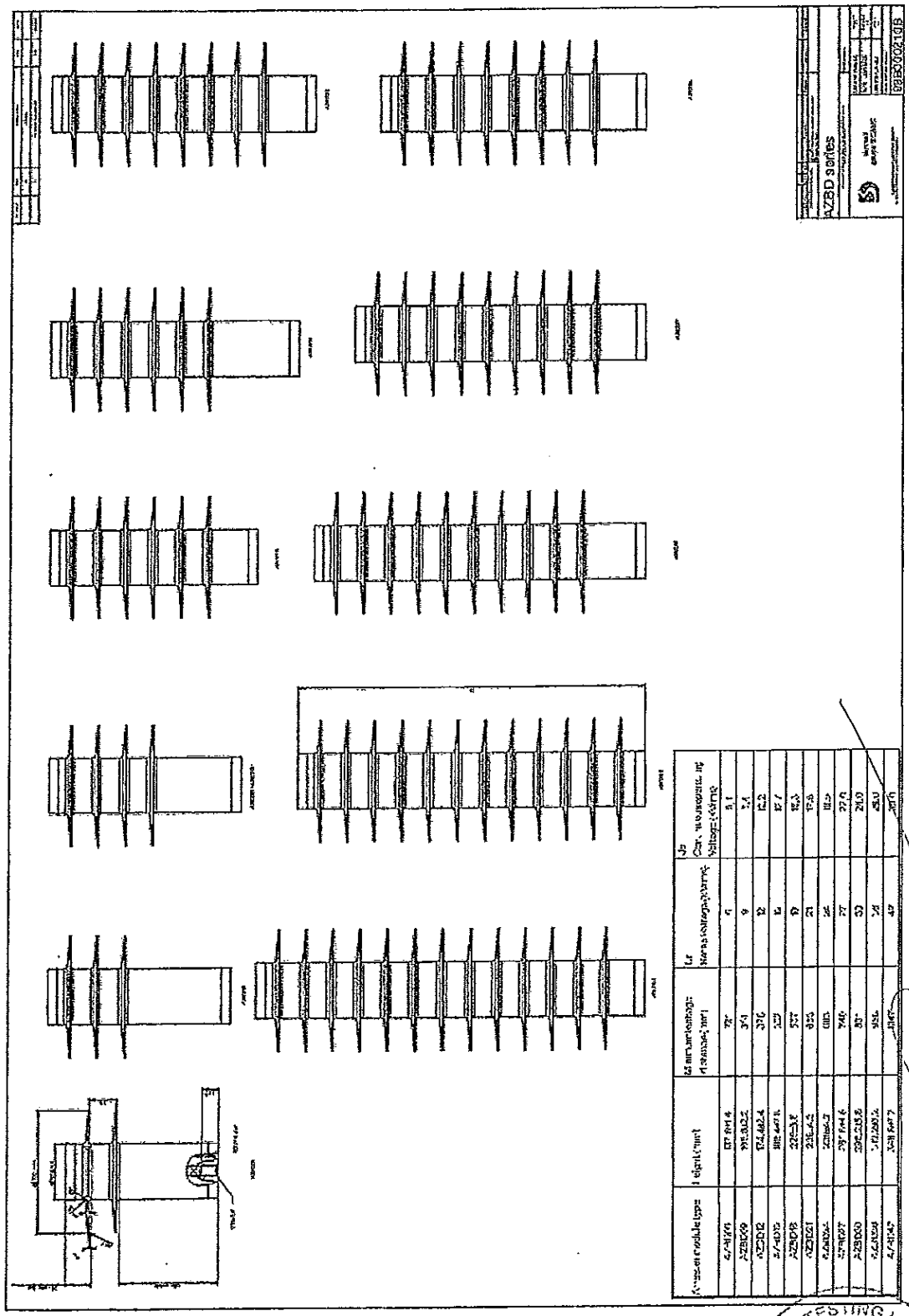
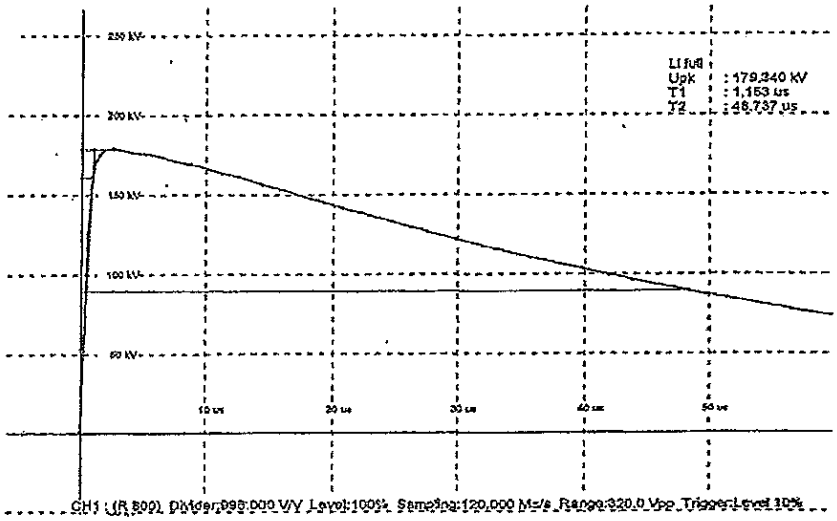


Figure 1
Surge arrester, drawing No. 99B000210B

LI / SURGE ARRESTER

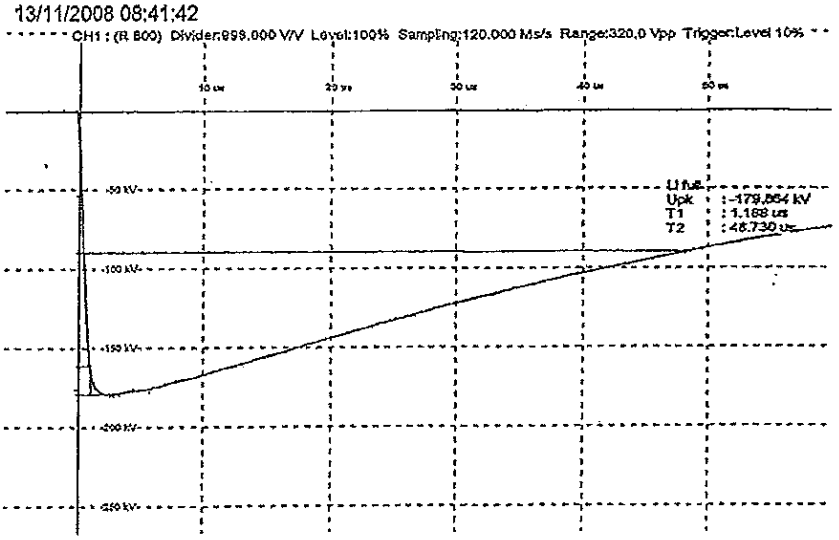
13/11/2008 08:32:55



LI full
Upk : 179.340 kV
T1 : 1.153 us
T2 : 48.737 us

LI / SURGE ARRESTER

13/11/2008 08:41:42



LI full
Upk : -179.864 kV
T1 : 1.188 us
T2 : 48.730 us

Figure 2
Wave shape of lightning impulse voltage

ACCREDITED TESTING LABORATORY EGU - HV Laboratory a.s. PRAGUE

"ВАК - 02" ООД САМОКОВ

ВЯРНО С ОРИГИНАЛА

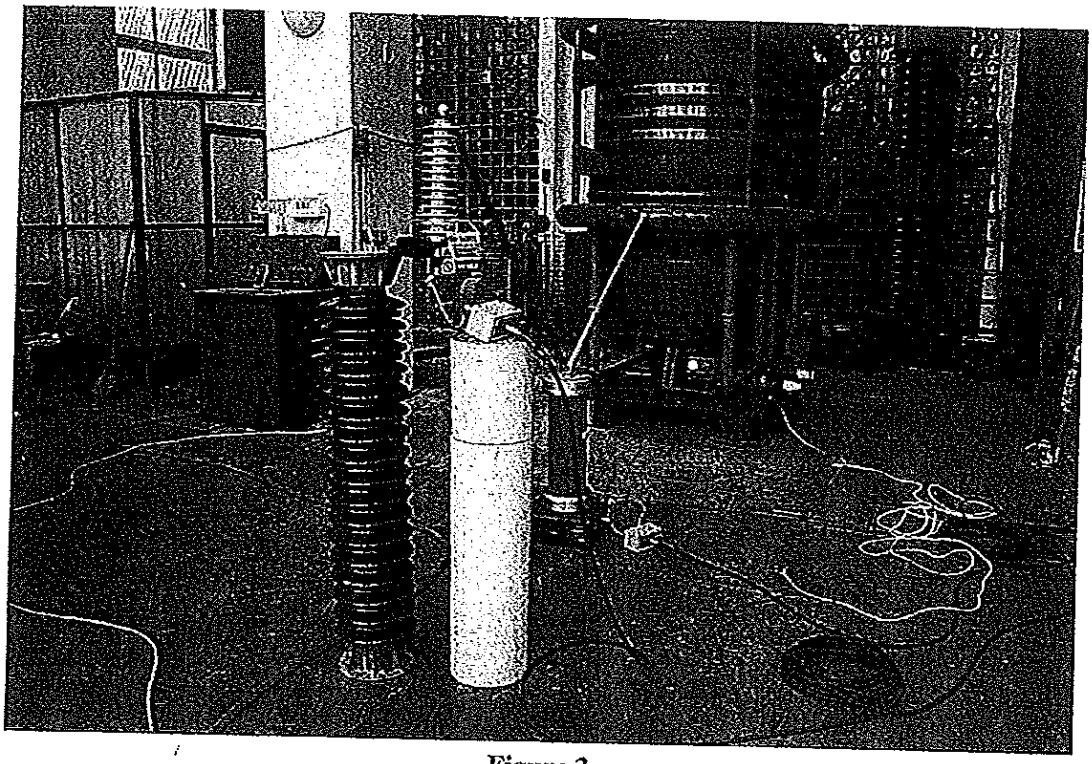


Figure 3
Surge arrester, drawing No. 99B000210B,
test arrangement under internal partial discharge test

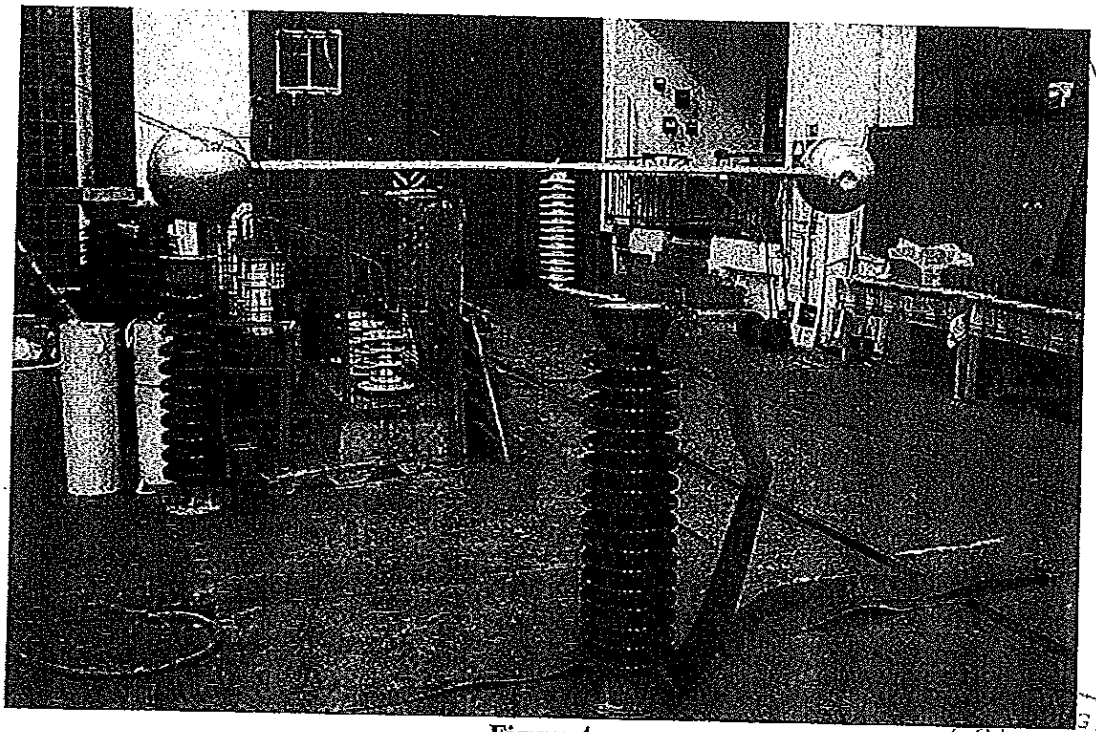


Figure 4
Surge arrester, drawing No. 99B000210B,
test arrangement under the dry lightning impulse voltage test

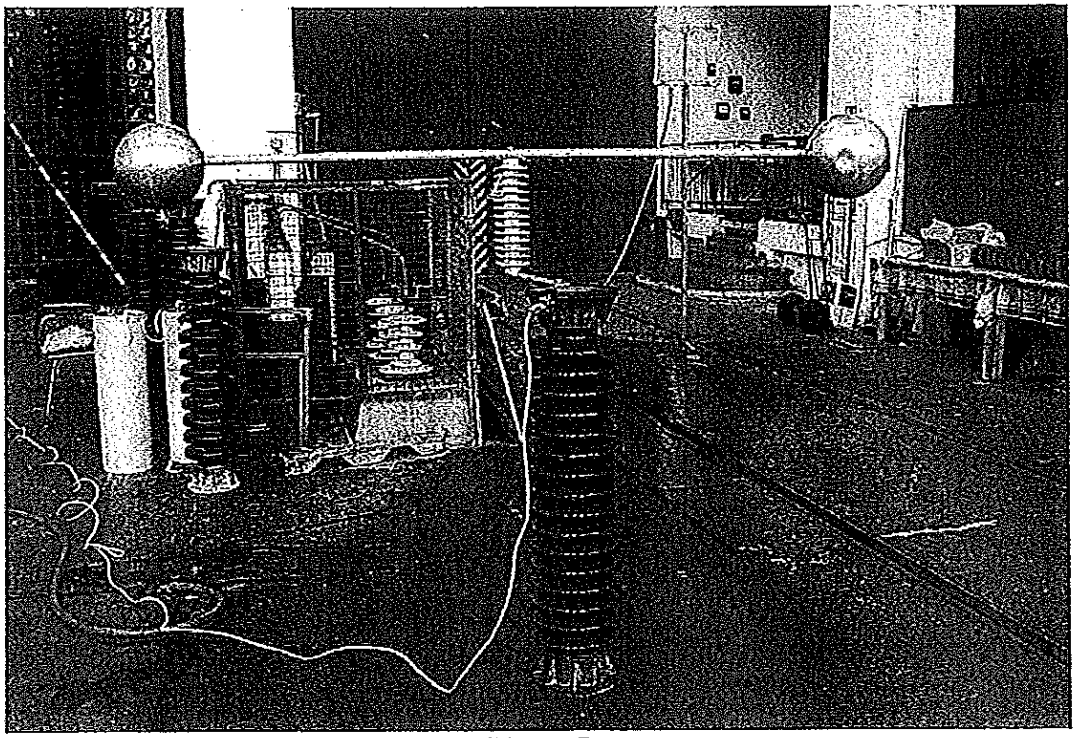


Figure 5
Surge arrester, drawing No. 99B000210B,
test arrangement under the wet power frequency voltage test

[redacted]

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
САМОКОВ

304

Test Report

CESI

Client	**DERVASIL**
Address of the Client	**Route de Popenot F-42800 Saint Joseph (FRANCE)**
Tested samples/items	Metal-oxide resistor block for polymer-housed metal-oxide surge arrester type AZBD
Tests carried out	Residual voltage test
Standards/Specifications	IEC 60099-4 – Edition 2.1 (2006-07)
Tests date	**from** April 01, 2008 **to** April 02, 2008

No. of pages	15	**No. of pages annexed**	19
Issue date	September 23, 2008		
Prepared	LAP - Gregori Marco		
Verified	LAP - Sironi Alberto, LAP - Arneodo Giorgio		
Approved	LAP - Nicolini Roberto		

CESI S.p.A.
Energy Division

CESI
Centro Elettrotecnico
Sperimentale Italiano
Giacinto Motta spa

Via R. Rubattino 54
20134 Milano - Italia
Telefono +39 022125.1
Fax +39 0221255440
http://www.cesi.it

Capitale sociale 8 550 000 Euro
interamente versato
Codice fiscale e numero
iscrizione CCIAA 00793580150

Registro Imprese di Milano
Sezione Ordinaria
N. R.E.A. 429222
P.I. IT00793580150

Tests witnessed by:

Identification of the object: Not requested

The data necessary to permit repetition of the tests are contained in the document marked: -----

The measurement uncertainties of the test results reported in this document are the following:

- dielectric tests with impulse voltage	: peak voltage: ± 3 %	time parameters: ± 10 %	
- dielectric tests with impulse current	: peak value: ± 3 %	time parameters: ± 10 %	
- dielectric tests with alternating voltage	: voltage (rms): ± 3 %	time parameters: ± 3,5 %	
- dielectric tests with direct voltage	: voltage: ± 3 %	time parameters: ± 3,5 %	
- partial discharge measurement	: up to 10 pC: ± 1 pC	above 10 pC: ± 10 %	
- atmospheric conditions	: temperature: ± 2 °C	pressure: ± 0,133 kPa	humidity: ± 10 %

The measurement uncertainties are estimated at the level of twice the standard deviation (corresponding, in the case of normal distribution, to confidence level of about 95%) and have to be considered as maximum values.

Laboratory information

Receipt date of the sample	March 05, 2008
Test location	CESI – Via Rubattino 54 – Milan
CESI testing team	Mr L. Podavitte – Mr I. Guacci
Test laboratory	P177
Activity code	AE08LAP016

"ВАК - 02" ООД ДАМОКОВ

306

content	page	test date
Test object characteristics	4	
Photograph of the test sample	5	
Reference standard	6	
Test carried out	6	
Test object identification	6	
Test procedure	7	
Lightning impulse residual voltage test	from page 8 to 9	April 01, 2008
Switching impulse residual voltage test	10	April 01, 2008
Steep current impulse residual voltage test (measurement of inductive error)	11	April 02, 2008
Steep current impulse residual voltage test	12	April 02, 2008
Technical data	from page 13 to 15	

Pages annexed:

oscillograms n. 19 pages

Test object characteristics

type: Metal-oxide resistor block for polymer-housed metal-oxide surge arrester type AZBD

electrical characteristics (assigned by the client)

Manufacturer's name	DERVASIL – SAINT JOSEPH (FRANCE)
Nominal discharge current – I_n [kA]	10
Rated voltage – U_r [kV]	6,0
Reference current - $I_{ref.}$ [mA]	5,0
Line discharge class	1
Standard rated frequency - [Hz]	50/60
year of manufacture	2008

"ВАК - 02" ООД САМОКОВ

308

Picture of the test object

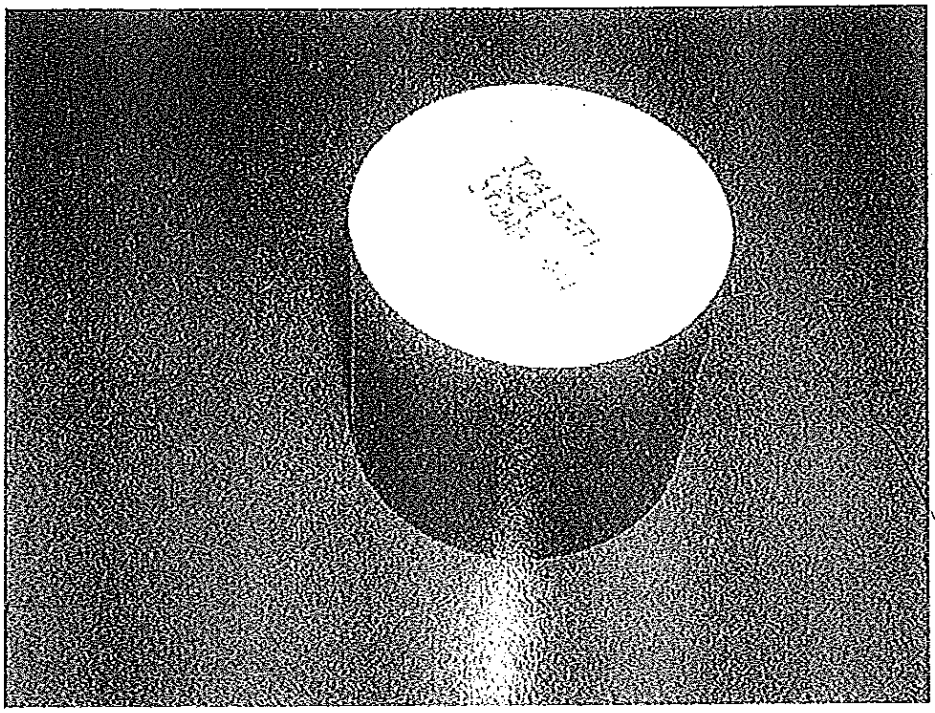


Photo no. 1

Metal-oxide resistor block for polymer-housed metal-oxide surge arrester type AZBD

Reference Standard

IEC 60099-4 – Edition 2.1 (2006-07) - Clause 8.3
"Metal-oxide surge arresters without gaps for a.c. system"

Test carried out	Number of sample tested
Lightning impulse residual voltage test	3
Switching impulse residual voltage test	
Steep current impulse residual voltage test	

Test object identification

Test object name	Identification of test sample (given by CESI)
Metal-oxide resistor block for polymer-housed metal-oxide surge arrester type AZBD	RV1-RV2-RV3

Test procedure

The following tests have been carried out on the same three samples

a) Lightning impulse residual voltage test
- wave-shape 8/20 µs
- peak current I_n = 10 kA, 0,5 I_n = 5 kA & 2 I_n = 20 kA

b) Switching impulse residual voltage test
- wave-shape front time in the range 30µs to 100µs, tail time twice the virtual time
- peak current 125 A & 500 A (according to table 4 of the reference standard)

c) Steep current impulse residual voltage test
- wave-shape front time equal to 1 µs, tail time less than 20 µs
- peak current I_n = 10 kA
- note Correction of the inductive error
  The inductive error was determined replacing the surge arrester section with a metal part having the same dimensions and measuring the voltage across the metal part in this condition..
  Being the inductive error (peak value) in the range 2% to 20% of the measured residual voltage (peak value) the correction was applied by substracting the impulse voltage shape measured on the surge arrester section and the impulse voltage shape on the metal part.

Test result

See pages 8 & 9

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

Residual voltage tests

Lightning impulse residual voltage test.

Test circuit: A0120

Date: April 01, 2008

Sample	Requested current	Charging voltage	Oscillogram	Current waveshape	Discharge current	Residual voltage	Lightning impulse protection level
No.		kV	No.	µs	kA	kV	kV
RV1	$0,5 \times I_n$	21,8	07	8,7/18,9	5,00	15,11	16,18
	I_n	30,0	01	8,7/18,9	10,11	16,14	
	$2,0 \times I_n$	45,4	04	8,7/18,9	20,15	17,68	
RV2	$0,5 \times I_n$	21,8	08	8,7/18,9	5,02	15,09	
	I_n	29,8	02	8,7/18,9	10,04	16,18	
	$2,0 \times I_n$	45,4	05	8,7/18,9	20,07	17,69	
RV3	$0,5 \times I_n$	21,8	09	8,7/18,9	5,02	15,08	
	I_n	29,8	03	8,7/18,9	10,05	16,10	
	$2,0 \times I_n$	45,4	06	8,7/18,9	20,00	17,59	

	Oscilloscope settings			
	Requested current	sampling division	input	Attenuation
		µs	V_{div}	
Current	$0,5 \times I_n$	5	0,5	20:10
	I_n		1,0	50:10
	$2 \times I_n$		1,0	50:10
Voltage	$0,5 \times I_n$	5	1,0	20:5
	I_n		1,0	20:5
	$2 \times I_n$		1,0	20:5

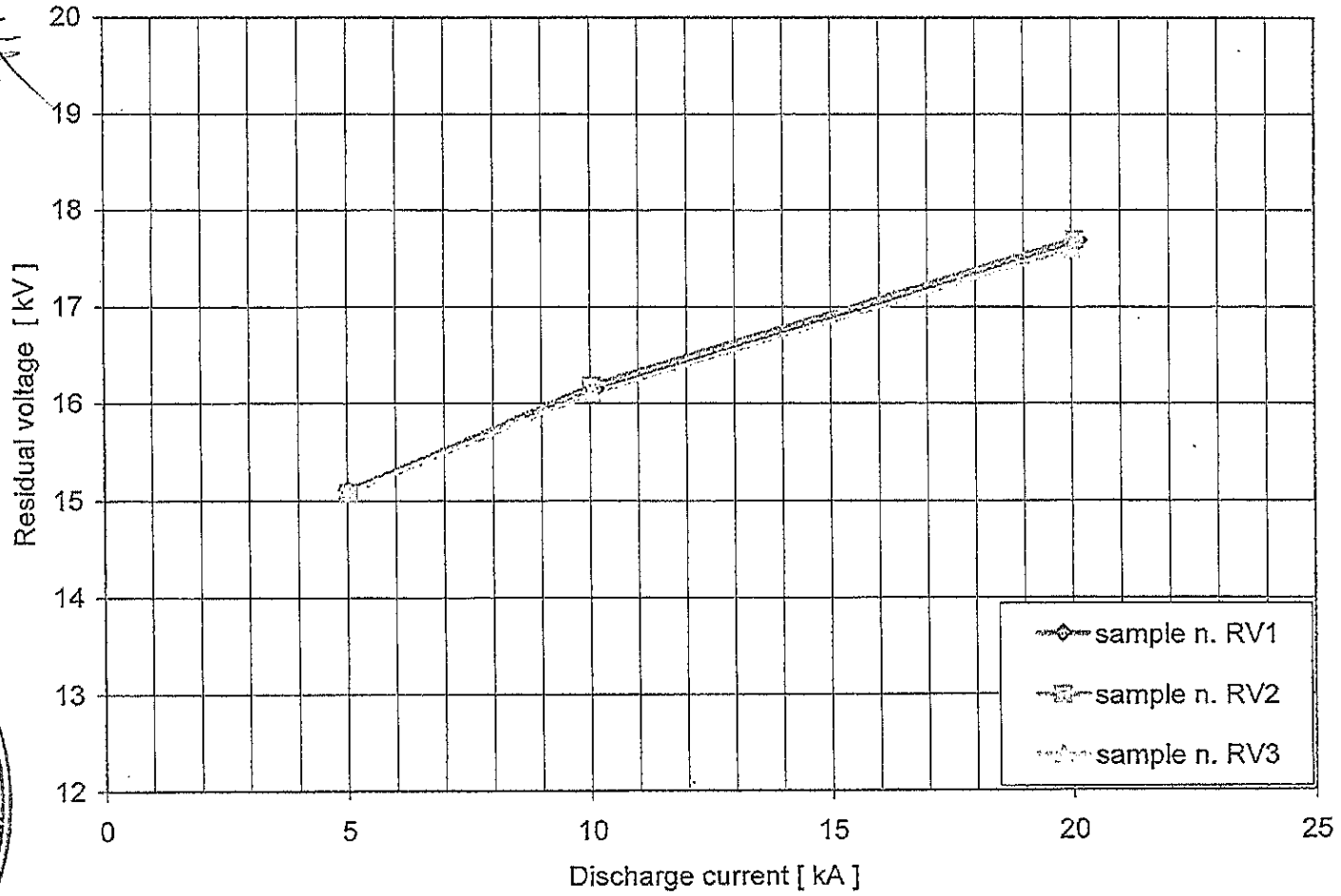
Notes:

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

312

Lightning impulse protection level



Residual voltage tests

Switching impulse residual voltage test.

Test circuit: A0122

Date: April 01, 2008

Sample	Requested current	Charging Voltage	Oscillogram	Current waveshape	Discharge current	Residual voltage	Switching impulse protection level
No.	A	kV	No.	µs	A	kV	kV
RV1	125	12,4	10	31/72	128	11,96	12,74
	500	18,3	13	33/71	510	12,74	
RV2	125	12,3	11	3172	130	11,97	
	500	18,3	14	33/71	511	12,67	
RV3	125	12,3	12	3172	128	12,05	
	500	18,1	15	33/71	497	12,52	

	Oscilloscope settings		
	sampling division	Input	attenuation
	µs	V_{div}	
125ACurrent	20	0,5	10:10
Voltage		1,0	20:5
250Acurrent		0,5	50:10
Voltage		0,5	20:5

Notes:

314

Residual voltage tests

Steep current impulse residual voltage test.

Measurement of the inductive error

Test circuit: A0121B

Date: April 02, 2008

Sample	Charging voltage	Oscillogram	Current waveshape	Discharge current	Peak voltage	Inductive error
No.	kV	No.	µs	kA	V	%
aluminium blocks	34,5	16	0,98/2,2	10,00	550	2÷20 (1)

	Oscilloscope settings		
	sampling division	input	attenuation
	µs	V_{div}	
Current	1	2	x 10
Voltage		---	---

Notes: (1) correction is required

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

A1439IG

Residual voltage tests

Steep current impulse residual voltage test.

Test circuit: A0121B

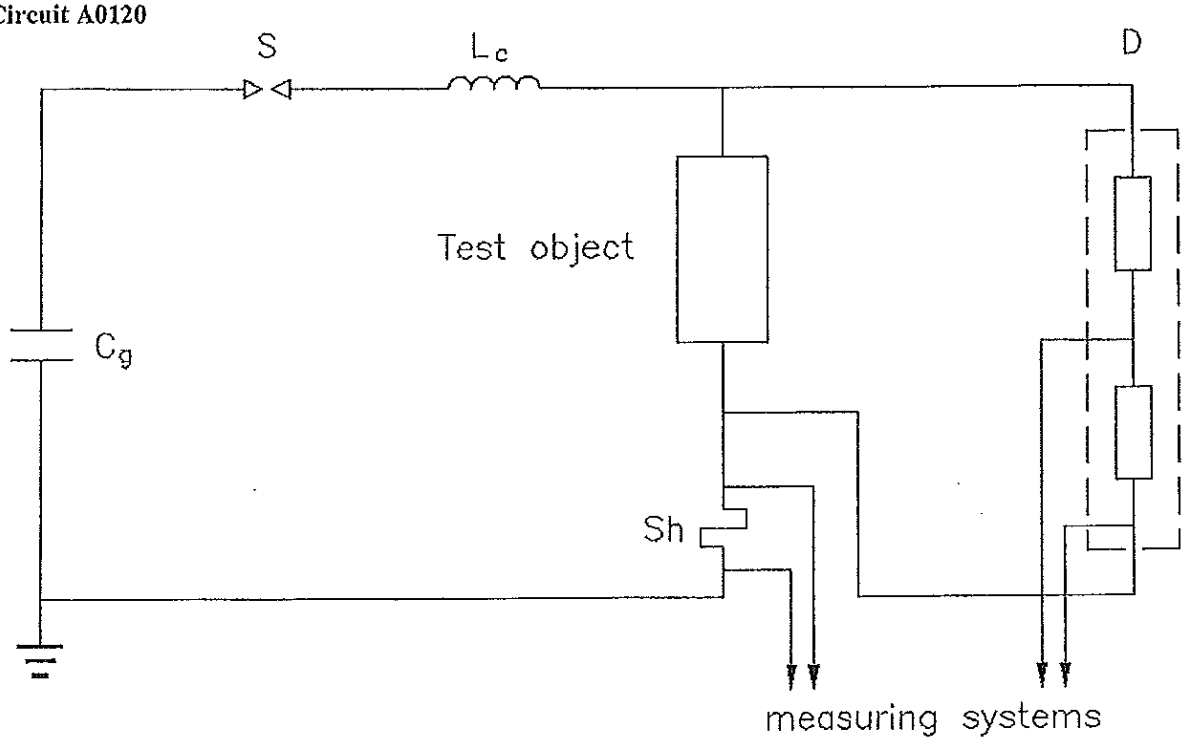
Date: April 02, 2008

Sample	Charging voltage	Oscillogram	Current waveshape	Discharge current	Corrected residual voltage	Steep current impulse protection level
No.	kV	No.	µs	kA	kV	kV
RV1	34,5	17	0,98/2,2	10,10	17,21	17,21
RV2	34,5	18		10,01	17,15	
RV3	34,5	19		10,06	17,21	

	Oscilloscope settings		
	sampling division	input	attenuation
	µs	V_{div}	
Current	1	2	x10
Voltage		5,0	---

Notes:

Circuit A0120



Impulse generator

No. of stages	1
Cg	4,98 µF
Lc	10 µH
S	- Spark-gap

Voltage measuring system.

D	- Voltage divider SAGI; CESI No.11120
	- Electro optical system CESI No.11521/522;
OSC	- Oscilloscope type TEKTRONIX TDS 540A; CESI No.13217 (on channel No.2)

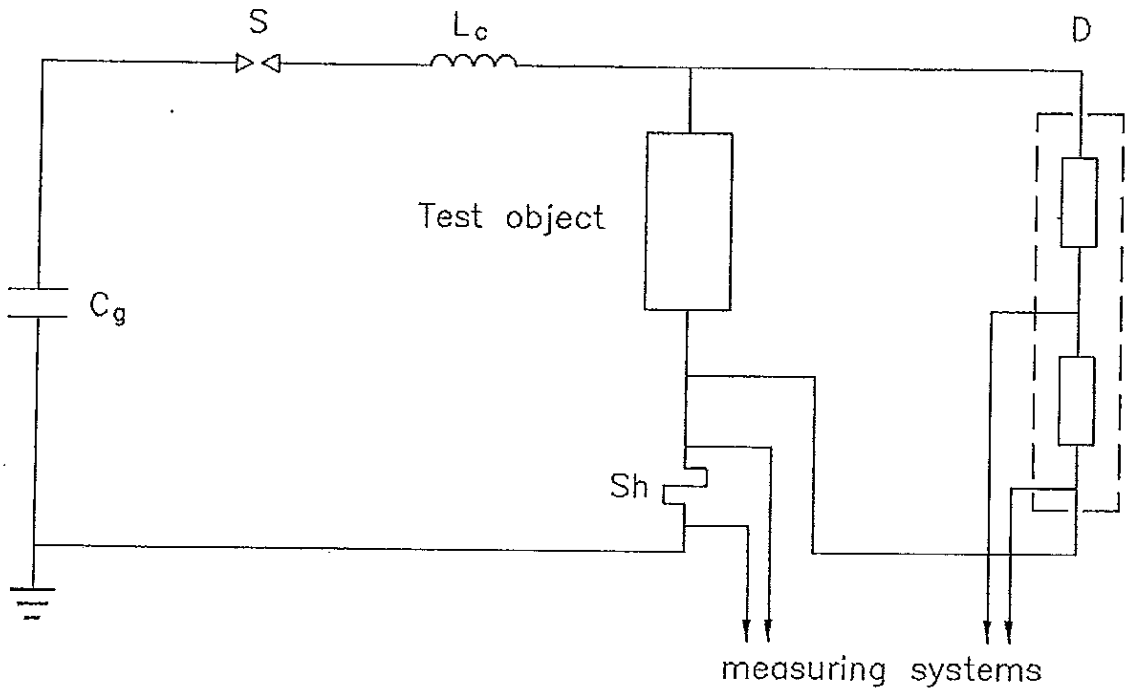
Current measuring system

Sh	- Current shunt CESI No.6042; R= 2 mΩ; peak current= 250 kA
	- Electro optical system CESI No.11517/518;
OSC	- Oscilloscope type TEKTRONIX TDS 540A; CESI No.13217 (on channel No.1)

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

Circuit A0122



Impulse generator

No. of stages	1
Cg	2,49µF
Lc	120 µH
S	- Spark-gap

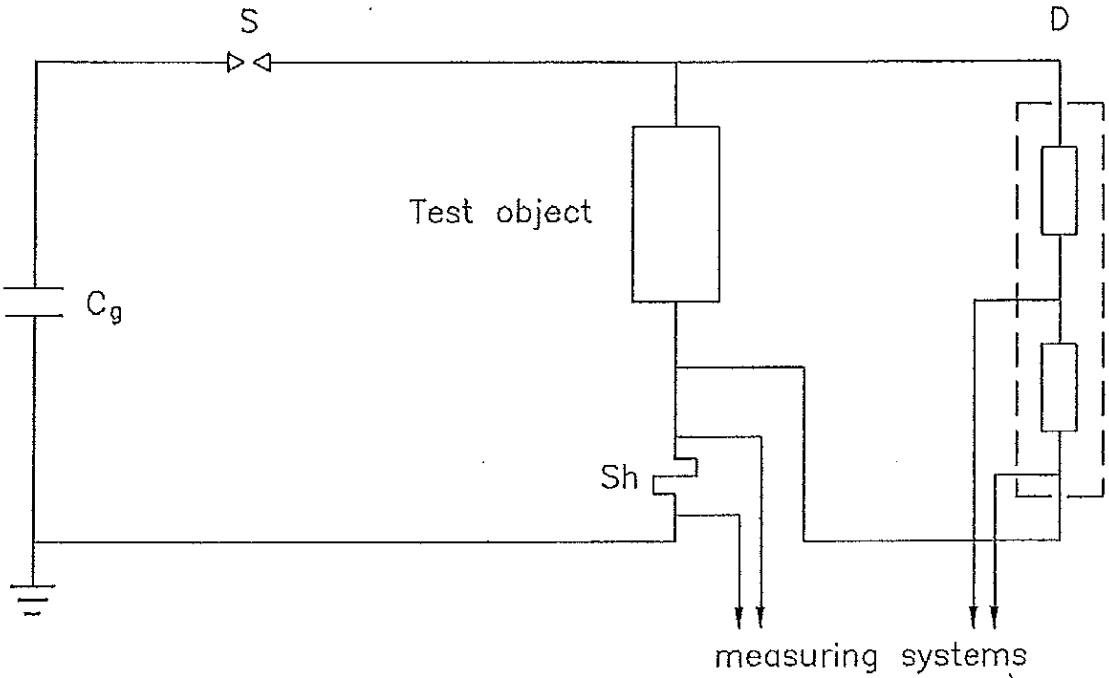
Voltage measuring system.

D	- Voltage divider SAGI; CESI No.13027
	- Electro optical system CESI No 11521/522
OSC	- Oscilloscope type TEKTRONIX TDS 540A; CESI No.13217 (on channel No.2)

Current measuring system

Sh	- Current shunt CESI No.6037; R= 20 mΩ; peak current= 250 kA
	- Electro optical system CESI No11517/518
OSC	- Oscilloscope type TEKTRONIX TDS 540A; CESI No.13217 (on channel No.1)

Circuit A0121B



Impulse generator

No. of stages	1
Cg	0,500 µF
S	- Spark-gap

Voltage measuring system.

D	- Voltage divider SAGI; CESI No.11120
OSC	- Oscilloscope type TEKTRONIX TDS 540A; CESI No.13217 (on channel No.2)

Current measuring system

Sh	- Current Pearson CESI No.6042; 0,01 V x A
OSC	- Oscilloscope type TEKTRONIX TDS 540A; CESI No.13217 (on channel No.1)

319

ISO

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
САМОКОВ

320

Client	**DERVASIL**
Address of the Client	**Route de Popenot F- 42800 Saint Joseph (FRANCE)**
Tested samples/items	Polymer-housed metal-oxide surge arrester type AZBD090
Tests carried out	Long-duration current impulse withstand test

Standards/Specifications	IEC 60099-4 – Edition 2.1 (2006-07)	
Tests date	**from** April 01, 2008	**to** April 02, 2008

No. of pages	21	**No. of pages annexed**	28
Issue date	September 03, 2008		
Prepared	LAP - Gregori Marco		
Verified	LAP - Arneodo Giorgio, LAP - Sironi Alberto		
Approved	LAP - Nicolini Roberto		

CESI S.p.A.
Energy Division
Technical Area Components

на основание чл. 2 от ЗЗЛД

CESI
Centro Elettrotecnico Sperimentale Italiano Giacinto Motta spa
Via R. Rubattino 54
20134 Milano - Italia
Telefono +39 022125.1
Fax +39 0221255440
http://www.cesi.it
Capitale sociale 8 550 000 Euro interamente versato
Codice fiscale e numero iscrizione CCIAA 00793580150
Registro Imprese di Milano Sezione Ordinaria
N. R.E.A. 429222
P.I. IT00793580150

ВЯРНО С ОРИГИНАЛА

ВАК 02 ФОД САМОКОВ

321

Tests witnessed by:

Identification of the object: Requested

The Manufacturer guarantees that the tested object is manufactured according to the submitted drawings.
CESI checked that these drawings adequately represent in shape and dimensions the essential details and the parts of the tested object.
These drawings identified by CESI and numbered **A8024793 no. 1 to 3** are annexed to this document..

The data necessary to permit repetition of the tests are contained in the document marked: ---

The measurement uncertainties of the test results reported in this document are the following:

- dielectric tests with impulse voltage	: peak voltage: ± 3 %	time parameters: ± 10 %	
- dielectric tests with impulse current	: peak value: ± 3 %	time parameters: ± 10 %	
- dielectric tests with alternating voltage	: voltage (rms): ± 3 %	time parameters: ± 3,5 %	
- dielectric tests with direct voltage	: voltage: ± 3 %	time parameters: ± 3,5 %	
- partial discharge measurement	: up to 10 pC: ± 1 pC	above 10 pC: ± 10 %	
- atmospheric conditions	: temperature: ± 2 °C	pressure: ± 0,133 kPa	humidity: ± 10 %

The measurement uncertainties are estimated at the level of twice the standard deviation (corresponding, in the case of normal distribution, to confidence level of about 95%) and have to be considered as maximum values.

Laboratory information

Receipt date of the sample	June 19, 2008
Test location	CESI – Via Rubattino 54 – Milan
CESI testing team	Mr L. Podavitte – Mr I. Guacci
Test laboratory	P177
Activity code	AE08LAP012

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

322

content	page a	test date
Test object characteristics	4	
Picture of the test sample	5	
Reference standard	6	
Test carried out	6	
Test object identification	6	
Test procedure	7	
Visual inspection and summary of the test result	8	
Power frequency voltage characteristics	9	June 23, 2008
Lightning impulse residual voltage measurement before the test	10	June 23, 2008
Switching impulse residual voltage test	11	June 24, 2008
Voltage correction factor and energy calculations	12	June 24, 2008
Long duration current impulse withstand test	from page 13 to 15	June 24, 2008
Lightning impulse residual voltage measurement after the test	16	June 25, 2008
Additional long duration current impulse	17	June 25, 2008
Technical data of the test circuit	from page 18 to 21	
Pages annexed:		
oscillograms n. 24 pages		
DERVASIL drawing no. 99B000210B; CESI no. A8024793/1 - n.1 page		
DERVASIL drawing no. 99B000224A; CESI no. A8024793/3 - n.1 page		
DERVASIL technical document no. 99B000226A; CESI no. A8024793/2- n.1 page		
DERVASIL technical document no. 99B000224A; CESI no. A8024794 - n.1 page		

Test object characteristics

type: Polymer-housed metal-oxide surge arrester type AZBD090

electrical characteristics (assigned by the client)

Manufacturer's name	DERVASIL – Saint Joseph (France)
Nominal discharge current – I_n [kA]	10
Rated voltage – U_r [kV]	1,07 x Uref
Continuous operating voltage - U_c [kV]	0,89 x Uref
Reference current - $I_{ref.}$ [mA]	5,0
Line discharge class	1
Standard rated frequency - [Hz]	50/60
year of manufacture	2008

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

324

Picture of the test object

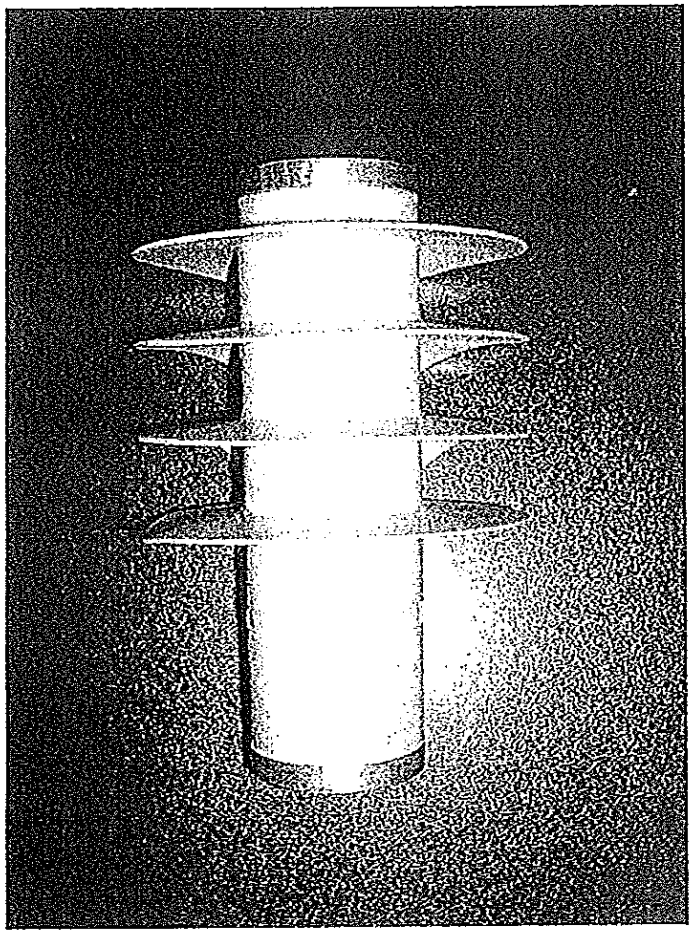


Photo no. 1

polymer housed metal oxide surge arrester

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
САМОКОВ

325

Reference Standard

IEC 60099-4 (2006-07) – Edition 2.1 - Clause 10.8.4
"Metal-oxide surge arresters without gaps for a.c. system"

Test carried out	Number of sample tested
Long-duration current impulse withstand test	3

Test object identification

Test object name	Identification of test sample (given by CESI)
Polymer-housed metal-oxide surge arrester type AZBD090	LD1-LD2-LD3

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
ДАМЯНОВ

326

Test procedure

The test procedure consisted of the following sequence:

a) Measurement of the power frequency reference voltage at the reference current

b) Measurement of the lightning impulse residual voltage at nominal discharge current

c) Measurement of the switching impulse residual voltage at the lowest current peak prescribed by the standard in table 4 that is 125 A

d) Calculation of the specified energy associated to each long duration current impulse according to clause 8.4.2 of the reference standard

e) Application of eighteen long duration current impulses with the specified energy and a virtual duration of 2000 µs in six groups of three operations each.
- intervals between operations of the same group: 60 seconds
- interval between different groups: as required to cool down the samples to near ambient temperature

f) Measurement of the lightning impulse residual voltage at nominal discharge current for comparison with initial value

g) After cooling down to near ambient temperature cooling down to near ambient temperature application of a nineteenth impulse to check the sample integrity

Test result

The visual inspection of the sample after the test has revealed no sign of physical damage.
The variation of lightning impulse residual voltage before and after the test was less than 5% (maximum allowed variation according to reference standard is 5%).
The oscillographic record of the 19th impulse did not reveal any sign of internal discharge.

<u>The acceptance criteria are fulfilled. The test result is positive</u>

325

Summary of test results

Variation of lightning impulse residual voltage at I_n

Sample	before test		after test		Variation
	discharge current	residual voltage	discharge current	residual voltage	
	kA	kV	kA	kV	%
LD1	10,10	31,69	10,15	31,81	+ 0,38
LD2	10,08	31,97	10,13	31,92	- 0,16
LD3	10,05	31,72	10,09	31,78	+ 0,19

Visual inspection after the test

The visual inspection of the surge arrester sections after the test has revealed no sign of physical damage

Long-duration current impulse withstand test.

Reference voltage test.

Test circuit: A0019

Date: June 23, 2008

Sample No. LD1						
Oscillogram	Voltage	current	current	current	power	3rd harmonic amplitude
No.	kV	+ mA_{cr}	- mA_{cr}	mA_{rms}	W	µA
1	13,45	5,04	4,32	1,50	13,47	---

Sample No. LD2						
oscillogram	Voltage	current	current	current	Power	3rd harmonic amplitude
No.	kV	+ mA_{cr}	- mA_{cr}	mA_{rms}	W	µA
2	13,57	5,02	4,06	1,49	13,50	---

Sample No. LD3						
oscillogram	Voltage	current	current	current	Power	3rd harmonic amplitude
No.	kV	+ mA_{cr}	- mA_{cr}	mA_{rms}	W	µA
3	13,49	5,03	4,42	1,52	12,73	---

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

329

Long-duration current impulse withstand test.

Lightning impulse residual voltage measurement before the test

Test circuit: A0120

Date: June 23, 2008

Sample	Requested current	Charging Voltage	Oscillogram	Current waveshape	Discharge current	Residual voltage
No.		kV	No.	µs	kA	kV
LD1	I_n	45,3	4	8,7/20,0	10,10	31,69
LD2		45,4	5		10,08	31,97
LD3		45,3	6		10,05	31,72

	Oscilloscope settings		
	Sampling division	Input	attenuation
	µs	V_{div}	
Current	5	1,0	50:10
Voltage	5	1,0	50:5

Notes:

A1146IG

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

330

Long-duration current impulse withstand test.

Switching impulse residual voltage test.

Test circuit: A0122

Date: June 24, 2008

Sample	Requested current	Charging voltage	Oscillogram	Current waveshape	Discharge current	Residual voltage
No.	A	kV	No.	µs	A	kV
LD1	125	24,7	7	31/79	129	23,80
LD2		24,8	8		128	23,88
LD3		24,7	9		125	23,73

	Oscilloscope settings		
	sampling division	input	attenuation
	µs	V_{div}	
Current	20	0,5	10:10
Voltage	20	1,0	20:5

Notes:

Long-duration current impulse withstand test.

Voltage correction factor and energy calculations

Date: June 24, 2008

Sample	U_{ref} [1]	KU_r [2]	KU_c [3]	U_r' [4]	U_c' [5]
No.	kV			kV	kV
LD1	13,45	1,07	0,89	14,392	11,971
LD2	13,57			14,520	12,077
LD3	13,49			14,433	12,006

[1] U_{ref} : measured reference voltage
[2] KU_r : maximum guaranteed factor for calculation of Ur
[3] KU_c : maximum guaranteed factor for calculation of Uc
[4] U_r' : corrected rated voltage [4] = [1] × [2]
[5] U_c' : corrected continuous operating voltage [5] = [1] × [3]

Sample	U_r'	U_L	U_{res}	T	Z	W	W'
No.	kV	kV d.c.	kV	µs	Ω	kJ	kJ/kV
LD1	14,392	46,054	23,73	2000	70,521	15,024	1,044
LD2	14,520	46,464			71,148	15,165	1,044
LD3	14,434	46,189			70,727	15,071	1,044

U_{res} : switching impulse residual voltage
U_L, T, Z : see table 5 of IEC 60099-4 at clause 8.4.2
W : $= U_{res} \times (U_L - U_{res}) \times (T / Z)$

A11761G

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
ХАМЛОКОВ

332

Long-duration current impulse withstand test.

Test circuit: A0017

Date: June 24, 2008

Sample	Impulse	Charging voltage U_o	Oscillogram	Peak current I	Residual voltage U_{res}	Energy E
No.	No.	kV	No.	A	kV	kJ
LD1	1	51,4		286	24,36	15,54
	2	51,4		286	24,56	15,67
	3	51,4	10	286	24,68	15,73
	4	51,4		288	24,43	15,69
	5	51,4		287	24,63	15,72
	6	51,4		286	24,73	15,71
	7	51,4		288	24,50	15,70
	8	51,4		286	24,62	15,69
	9	51,4	13	284	24,78	15,70
	10	51,4		289	24,56	15,98
	11	51,4		286	24,66	15,68
	12	51,4		286	24,78	15,74
	13	51,4		286	24,51	15,63
	14	51,4		286	24,66	15,68
	15	51,4		284	24,73	15,67
	16	51,4		286	24,49	15,66
	17	51,4		284	24,67	15,64
	18	51,4	16	285	24.,80	15,69

Notes:

Measured waveshape	
virtual duration	virtual total duration
µs	µs
2000	2560

Oscilloscope settings			
	sampling division	Input	Attenuation
	µs	V_{div}	
Current	500	0,5	10:10
Voltage	500	1,0	10:5

Continued

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

333

Continued

Date: June 24, 2008

Sample	Impulse	Charging voltage U_c	Oscillogram	Peak current I	Residual voltage U_{res}	Energy E
No.	No.	kV	No.	A	kV	kJ
LD2	1	51,4		286	24,63	15,71
	2	51,4		284	24,90	15,68
	3	51,4	11	283	24,96	15,69
	4	51,4		286	24,68	15,70
	5	51,4		283	24,85	15,68
	6	51,4		285	24,92	15,78
	7	51,4		284	24,74	15,69
	8	51,4		284	24,87	15,73
	9	51,4	14	283	24,99	15,76
	10	51,4		284	24,74	15,67
	11	51,4		283	24,87	15,70
	12	51,4		283	24,98	15,73
	13	51,4		284	24,71	15,70
	14	51,4		284	24,90	15,75
	15	51,4		283	24,98	15,74
	16	51,4		285	24,78	15,75
	17	51,4		284	24,92	15,75
	18	51,4	17	284	25,00	15,75

Notes:

Measured waveshape	
virtual duration	virtual total duration
µs	µs
2000	2560

Oscilloscope settings			
	sampling division	input	Attenuation
	µs	V_{div}	
Current	500	0,5	10:10
Voltage	500	1,0	10:5

Continued

Continued

Date: June 24, 2008

Sample	Impulse	Charging voltage U_c	Oscillogram	Peak current I	Residual voltage U_{res}	Energy E
No.	No.	kV	No.	A	kV	kJ
LD3	1	51,4		287	24,54	15,67
	2	51,4		286	24,68	15,68
	3	51,4	12	286	24,83	15,70
	4	51,4		286	24,56	15,67
	5	51,4		287	24,73	15,78
	6	51,4		286	24,83	15,82
	7	51,4		286	24,61	15,66
	8	51,4		286	24,72	15,78
	9	51,4	15	284	24,85	15,71
	10	51,4		287	24,62	15,76
	11	51,4		284	24,77	15,68
	12	51,4		283	24,86	15,71
	13	51,4		286	24,58	15,70
	14	51,4		284	24,73	15,66
	15	51,4		284	24,88	15,71
	16	51,4		286	24,64	15,71
	17	51,4		284	24,77	15,71
	18	51,4	18	285	24,91	15,81

Notes:

Measured waveshape	
Virtual duration	virtual total duration
µs	µs
2000	2560

Oscilloscope settings			
	sampling division	input	Attenuation
	µs	V_{div}	
Current	500	0,5	10:10
Voltage	500	1,0	10:5

Continued

A1177IG

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

335

Long-duration current impulse withstand test.

Lightning impulse residual voltage measurement after the test

Test circuit: A0120

Date: June 25, 2008

Sample	Requested Current	Charging voltage	Oscillogram	Current waveshape	Discharge current	Residual voltage
No.		kV	No.	µs	kA	kV
LD1	I_n	31,4	22	8,7/20,0	10,15	31,81
LD2		31,3	23		10,13	31,92
LD3		31,4	24		10,09	31,78

	Oscilloscope settings		
	sampling division	input	attenuation
	µs	V_{div}	
Current	5	1,0	50:10
Voltage	5	1,0	20:5

Notes:

A11761G

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

336

Long -duration current impulse withstand test.

check of the integrity of the internal parts with a nineteenth shot at ambient temperature

Test circuit: A0017

Date: June 24, 2008

Sample	Impulse	Charging voltage V_c	Oscillogram	Peak current I	Residual voltage V_r	Energy E
No.	No.	kV	No.	A	kV	kJ
LD1	19	51,4	19	286	24,52	15,64
LD2	19	51,4	20	285	24,80	15,64
LD3	19	51,4	21	288	24,69	15,72

Notes:

Measured waveshape	
virtual duration	virtual total duration
µs	µs
2000	2560

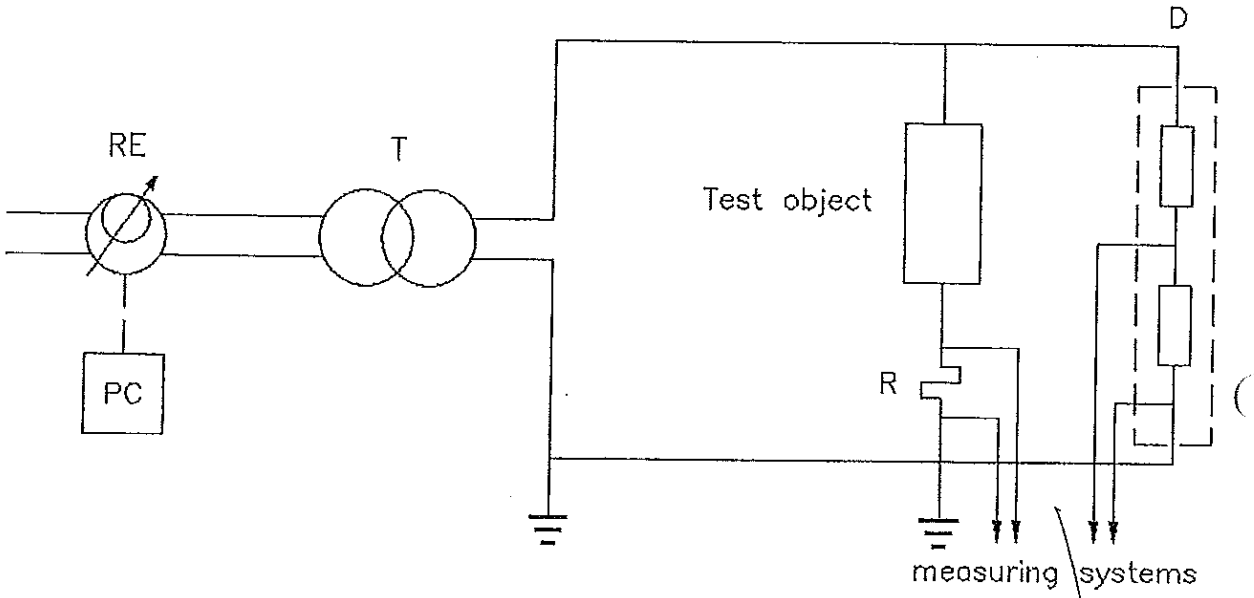
Oscilloscope settings			
	sampling division	input	attenuation
	µs	V_{div}	
Current	500	0,5	10:10
Voltage	500	1,0	10:5

continued

ВЯРНО С ОРИГИНАЛА

"ЕАК - 02" ООД САМОКОВ

Circuit A0019



Power frequency supply

RE - programmable supply type LARCET A.C. Power Source 5000 P.S.; CESI no. 23702-32191
PC - personal computer
T - voltage transformer type SPECIALTRASFO; power 30 kVA; voltage 200 V/15-30 kV

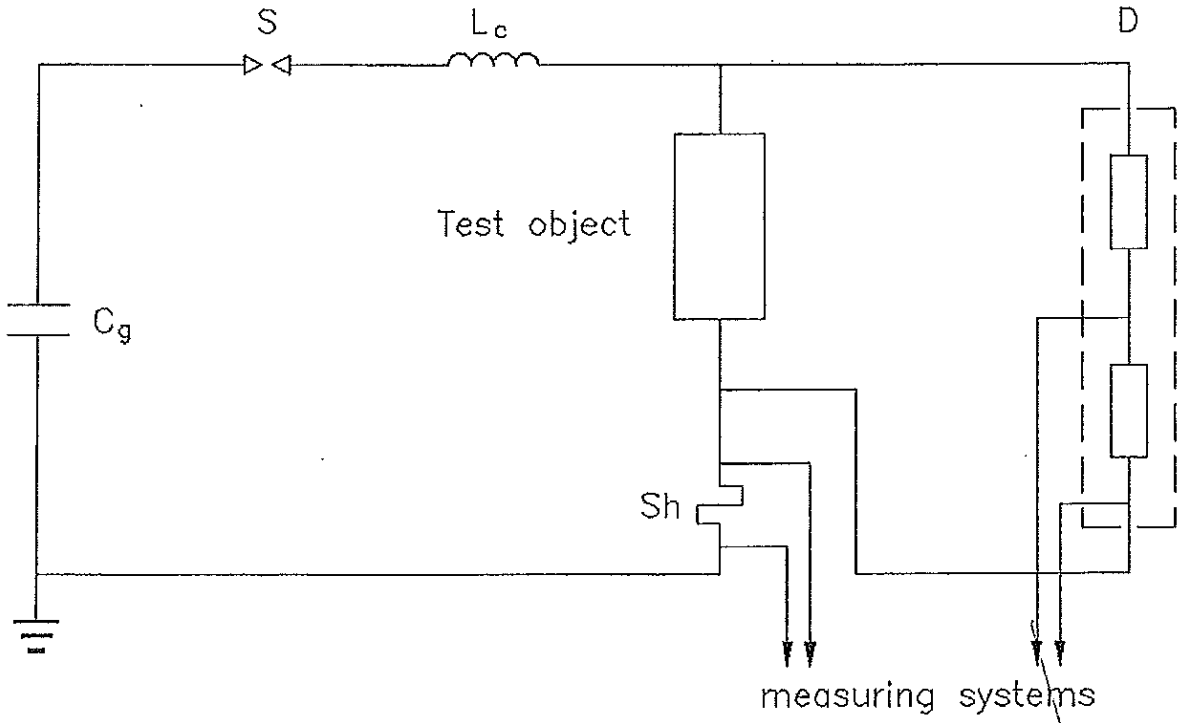
Current measuring system

R - Current shunt CESI No.31120; R= 941,4 Ω
- Electro optical system CESI No.11517/518; attenuation 5:5
OSC - Oscilloscope type SONY TEKTRONIX RTD 710A; CESI No.9090

Voltage measuring system

D - Voltage divider SAGI; CESI No.11120
- Electro optical system CESI No.11521/522; attenuation 50:5
OSC - Oscilloscope type SONY TEKTRONIX RTD 710A; CESI No.9090

Circuit A0120



Impulse generator

No. of stages	1
Cg	4,98 μF
Lc	10 μH
S	- Spark-gap

Voltage measuring system.

D	- Voltage divider SAGI; CESI No.13027
	- Electro optical system CESI No.11521/522;
OSC	- Oscilloscope type TEKTRONIX TDS 540A; CESI No.13217 (on channel No.2)

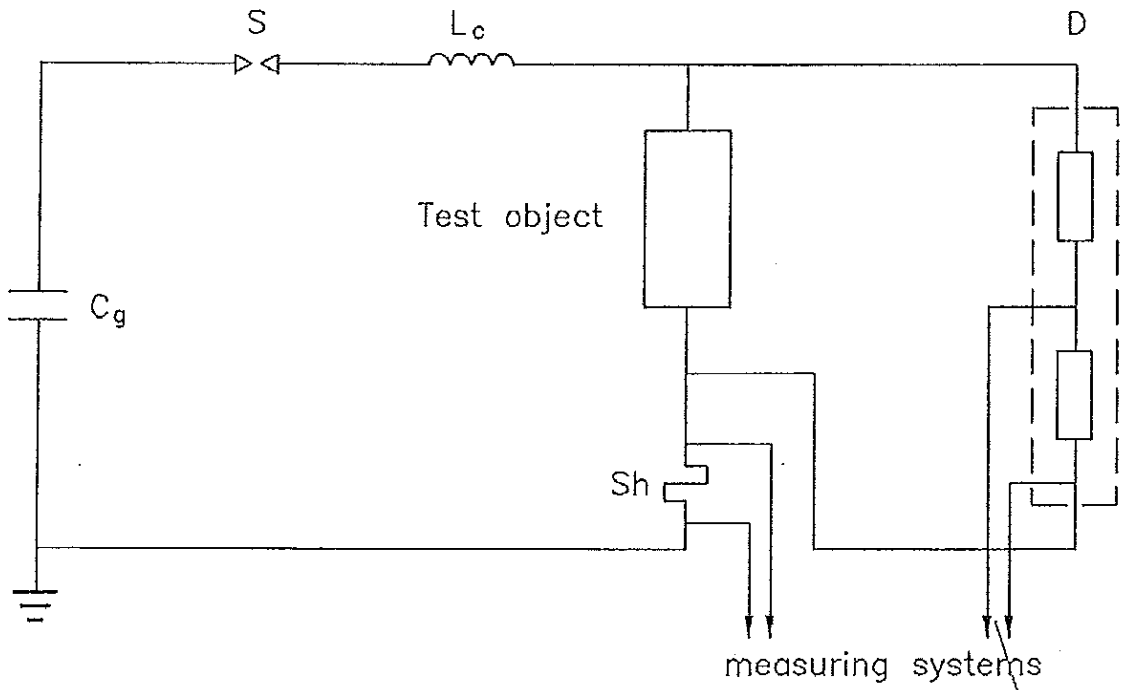
Current measuring system

Sh	- Current shunt CESI No.6042; R= 2 mΩ; peak current= 250 kA
	- Electro optical system CESI No.11517/518;
OSC	- Oscilloscope type TEKTRONIX TDS 540A; CESI No.13217 (on channel No.1)

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
САМОКОВ

Circuit A0122



Impulse generator

No. of stages	1
Cg	2,49 µF
Lc	100 µH
S	- Spark-gap

Voltage measuring system.

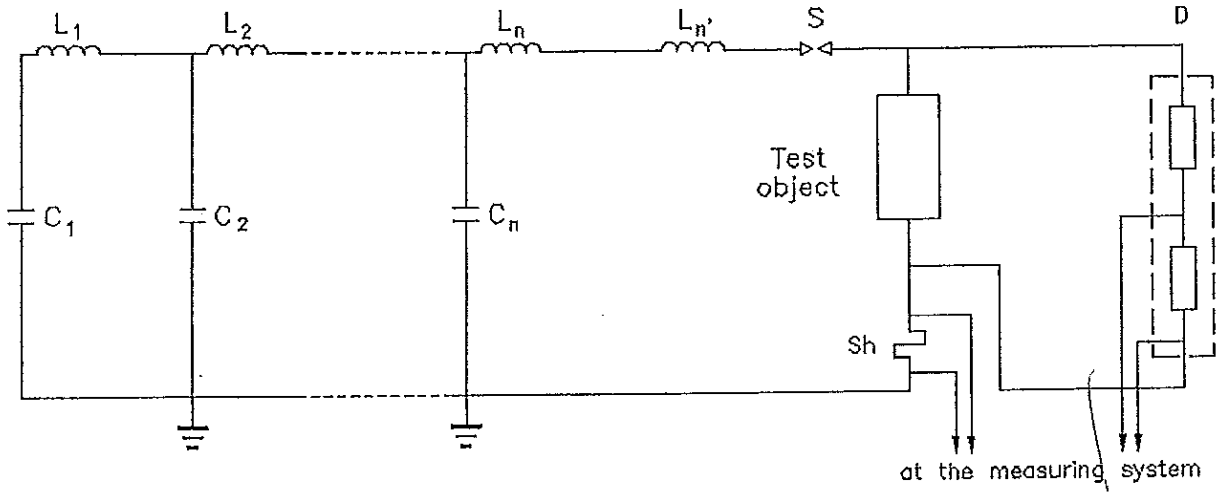
D	- Voltage divider SAGI; CESI No.11120
	- Electro optical system CESI No 11521/522
OSC	- Oscilloscope type TEKTRONIX TDS 540A; CESI No.13217 (on channel No.2)

Current measuring system

Sh	- Current shunt CESI No.6037; R= 20 mΩ; peak current= 250 kA
	- Electro optical system CESI No 11517/519
OSC	- Oscilloscope type TEKTRONIX TDS 540A; CESI No.13217 (on channel No.1)

340

Circuit A0017



Impulse generator

$C_1 \ldots C_{10}$	- capacitors 37,5 µF
C_{12}	- capacitors 18,75 µF
$L_1 \ldots L_{11}$	- inductors 666 µH
L_{12}	- inductor (600+500) µH
S :	- spark gap

Voltage measuring system.

D	- Voltage divider SAGI; CESI No.11120
	- Electro optical system CESI No
OSC	- Oscilloscope type TEKTRONIX TDS 540A; CESI No.13217 (on channel No.2)

Current measuring system

Sh	- Current shunt CESI No.6042; R= 2 m Ω
	- Electro optical system CESI No 11521/11522.
OSC	- Oscilloscope type TEKTRONIX TDS 540A; CESI No.13217 (on channel No.1)

341

ЗЕС

Client	DERVASIL
Address of the Client	Route de Popenot F-42800 Saint Joseph (FRANCE)
Tested samples/items	Polymer-housed metal-oxide surge arrester type AZBD092 assembled with additional thermal insulation and fitted with disconnectors
Tests carried out	High current impulse operating duty test
Standards/Specifications	IEC 60099-4 – Edition 2.1 (2006-07)
Tests date	from April 01, 2008 to April 02, 2008

No. of pages	25	No. of pages annexed	46
Issue date	September 03, 2008		

Prepared LAP - Gregori Marco

Verified LAP - Sironi Alberto, LAP - Arneodo Giorgio

Approved LAP - Nicolini Roberto

CESI S.p.A.
Energy Division
Technical Area Components

на основание чл. 2 от ЗЗЛД

CESI
Centro Elettrotecnico Sperimentale Italiano Giacinto Motta spa

Via R. Rubattino 54
20134 Milano - Italia
Telefono +39 022125.1
Fax +39 0221255440
http://www.cesi.it

Capitale sociale 8 550 000 Euro interamente versato
Codice fiscale e numero iscrizione CCIAA 00793580150

Registro Imprese di Milano
Sezione Ordinaria
N. R.E.A. 429222
P.I. IT00793580150

Tests witnessed by:

---- ----

Identification of the object: Requested

The Manufacturer guarantees that the tested object is manufactured according to the submitted drawings.
CESI checked that these drawings adequately represent in shape and dimensions the essential details and the parts of the tested object.
These drawings identified by CESI and numbered **A8024793 no. 1 to 2** are annexed to this document..

The data necessary to permit repetition of the tests are contained in the document marked: ----

The measurement uncertainties of the test results reported in this document are the following:

- dielectric tests with impulse voltage	: peak voltage: ± 3 %;	time parameters: ± 10 %	
- dielectric tests with impulse current	: peak value: ± 3 %;	time parameters: ± 10 %	
- dielectric tests with alternating voltage	: voltage (rms): ± 3 %	time: ± 3,5 %	
- dielectric tests with direct voltage	: voltage: ± 3 %	time: ± 3,5 %	
- atmospheric conditions	: temperature: ± 2 °C;	pressure: ± 0,133 kPa;	humidity: ± 10 %

The measurement uncertainties are estimated at the level of twice the standard deviation (corresponding, in the case of normal distribution, to confidence level of about 95%) and have to be considered as maximum values.

Laboratory information

Receipt date of the sample	June 19, 2008
Test location	CESI – Via Rubattino 54 – Milan
CESI testing team	Mr L. Podavitte
Test laboratory	P177
Activity code	AE08LAP016

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

content	page	test date
Test object characteristics	4	
Picture of the test object	5	
Reference standard	6	
Test carried out	6	
Test object identification	6	
Test procedure	7	
Visual inspection and summary of test result	8	
High current operating duty test	from page 9 to 17	from June 23 to June 30, 2008
Technical data	from page 18 to 25	

Pages annexed:

Oscillograms n. 43 pages
DERVASIL drawing no. 99B000210B; CESI no. A8024793/1 - n.1 page
DERVASIL drawing no. 99B000226A; CESI no. A8024793/2 - n.1 page
DERVASIL technical document no. 99B000224A; CESI no. A8024794 - n.1 page

Test object characteristics

type: Polymer-housed metal-oxide surge arrester type AZBD092 assembled with additional thermal insulation and fitted with disconnectors

electrical characteristics (assigned by the client)

Manufacturer's name	DERVASIL – SAINT JOSEPH (FRANCE)
Nominal discharge current – I_n [kA]	10
Rated voltage – U_r [kV]	1,03 x Uref
Continuous operating voltage - U_c [kV]	0,83 x Uref
Reference current - $I_{ref.}$ [mA]	5,0
Line discharge class	1
Standard rated frequency - [Hz]	50/60
year of manufacture	2008

NOTE:

The thermal model was supplied by the manufacturer
The verification of the thermal equivalency according to annexe B was not carried out by CESI

ВЯРНО С ОРИГИНАЛА

"РАК - 02" ООД САМОКОВ

346

Picture of the test object

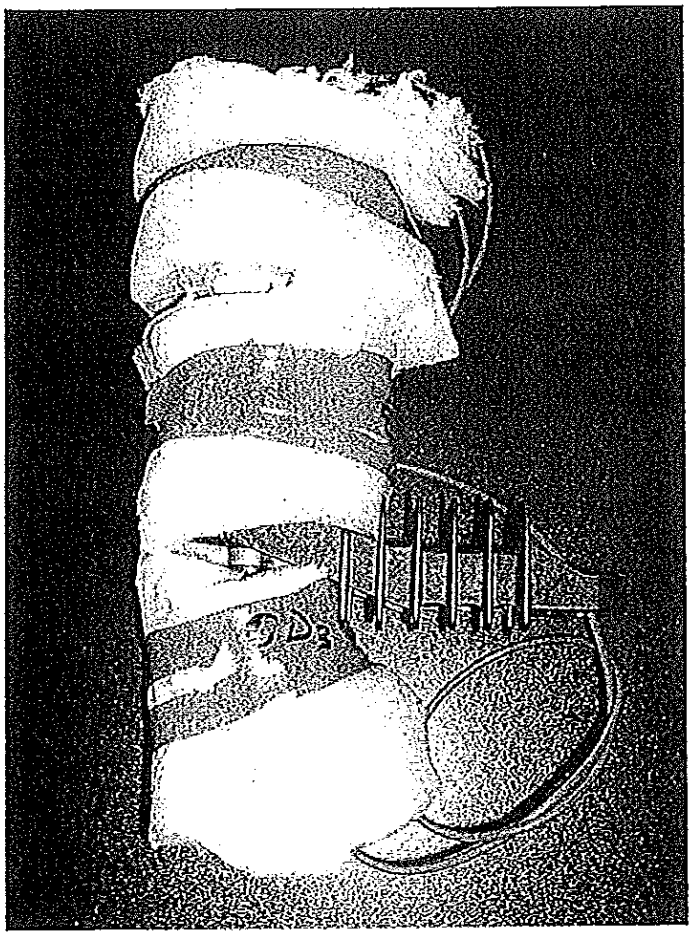


Photo no. 1

Polymer-housed metal-oxide surge arrester

343

Reference standard

IEC 60099-4 (2006-07) – Edition 2.1 – Clause 10.8.5

" Metal-oxide surge arresters without gaps for a.c. system "

Test carried out

test carried out	number of sample tested
High current impulse operating duty test	3

Test object identification

test object names	identification of test sample (assigned by the CESI)
Polymer-housed metal-oxide surge arrester type AZBD092 assembled with additional thermal insulation	OD1-OD2-OD3

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

348

Test procedure

The test procedure consisted of the following sequence:

a) Measurement of the power frequency reference voltage at the reference current

b) Measurement of the lightning impulse residual voltage at the nominal discharge current

c) Calculation of the voltage correction factors according to the reference standard

d) Conditioning 1: application of twenty impulses 8/20 µs at the nominal discharge current superimposed to the power frequency voltage at 1,2 times U_c in four groups of five impulses
   - interval between impulses of the same group: 50-60 seconds
   - interval between groups: 30 minutes
   - polarity of the impulses: same as that of the half cycle of power frequency voltage during which it occurred (positive)
   - synchronization of the impulses: 60 electrical degrees before the peak of the power frequency.

e) Conditioning 2: application of one high current impulse 4/10 µs at 100 kA

f) Heating in an oven at the temperature of 60 °C till thermal equilibrium

g) Application of a second high current impulse 4/10 µs at 100 kA. A time shorter than 100 ms after the application of the second high current shot energization at U_r' for 10 sec. and then at U_c' for 30 min. to verify the thermal stability.

h) Measurement of the lightning impulse residual voltage at nominal discharge current for comparison with initial value with two impulses at 50 sec to 60 sec. time interval in between

TEST RESULT

The visual inspection of the sample after the test has revealed no sign of physical damage.
The variation of lightning impulse residual voltage before and after the test was less than 5% (maximum allowed variation according to reference standard is 5%).
The oscillographic record of the two last lightning impulse at nominal discharge current did not reveal any sign of internal discharge.
The thermal stability was achieved
The disconnectors did not operate

<u>The acceptance criteria are fulfilled. The test result is positive</u>

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
СЛИВЕН

349

Variation of lightning impulse residual voltage at I_n

Sample	before test		after test		Variation
	discharge current	residual voltage	discharge current	residual voltage	
	kA	kV	kA	kV	%
OD1	10,09	32,27	10,11	33,1	+ 2,57
OD2	10,12	32,02	9,90	33,4	+ 4,20
OD3	10,02	32,00	10,08	33,1	+ 3,40

Visual inspection after the test

The visual inspection of the polymer-housed metal-oxide surge arrester after the test has revealed no sign of physical damage

350

High current impulse operating duty test.

Reference voltage test

Test circuit: A0019

Date: June 23, 2008

Sample No. OD1						
Oscillogram	voltage	current	current	current	power	3rd harmonic amplitude
No.	kV	+ mA_{cr}	- mA_{cr}	mA_{rms}	W	µA
1	13,60	5,06	4,62	1,56	14,31	--

Sample No. OD2						
Oscillogram	voltage	current	current	Current	power	3rd harmonic amplitude
No.	kV	+ mA_{cr}	- mA_{cr}	mA_{rms}	W	µA
2	13,55	5,04	4,22	1,50	13,53	--

Sample No. OD3						
Oscillogram	voltage	current	current	Current	power	3rd harmonic amplitude
No.	kV	+ mA_{cr}	- mA_{cr}	mA_{rms}	W	µA
3	13,50	5,08	4,38	1,53	13,76	--

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
САМОКОВ

351

High current impulse operating duty test.

Lightning impulse residual voltage measurement before the test

Test circuit: A0120

Date: June 23, 2008

Sample	Requested current	Charging voltage	Oscillogram	Current waveshape	Discharge current	Residual Voltage
No.		kV	No.	µs	kA	kV
OD1	I_n	45,8	4	8,7/19,2	10,09	32,27
OD2		45,8	5		10,12	32,02
OD3		45,5	6		10,02	32,00

	Oscilloscope settings		
	sampling division	input	Attenuation
	µs	V_{div}	
Current	5	1,0	50:10
Voltage	5	1,0	50:5

Notes:

A115HG

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

352

Voltage correction factor and energy calculations

Date: June 24, 2008

Sample	U_{ref} [1]	KU_r [2]	KU_C [3]	U_r' [4]	U_c' [5]	U_*' [6]
No.	kV			kV	kV	kV
OD1	13,60	1,03	0,83	14,008	11,288	13,546
OD2	13,55			13,957	11,247	13,496
OD3	13,50			13,905	11,205	13,446

[1] U_{ref} : measured reference voltage
[2] KU_r : factor claimbed by the manufacturer for calculation of U_r'
[3] KU_C : factor claimbed by the manufacturer for calculation of U_c'
[4] U_r' : corrected rated voltage [4] = [1] × [2]
[5] U_c' : corrected continuous operating voltage [5] = [1] × [3]
[6] U_*' : corrected voltage to be applied during the conditioning [6] = 1,2 × [5]

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

High current impulse operating duty test.

Conditioning: application of twenty 8/20 μs current impulses (first part)

Test circuit: A0015

Date: June 26, 2008

Imp.	Osc.	Sample No. OD1		Osc.	Sample No. OD2		Osc.	Sample No. OD3	
		charging	peak current		Charging	peak current		charging	peak current
No.	No.	kV	kA	No.	kV	kA	No.	kV	kA
1	7	60,4	10,0		60,4	10,0		60,4	10,0
2		60,4	10,0		60,4	10,0		60,4	10,0
3		60,4	10,0		60,4	10,0		60,4	10,0
4		60,4	10,0		60,4	10,0		60,4	10,0
5	8	60,4	10,0	9	60,4	10,0	10	60,4	10,0
6		60,4	10,0		60,4	10,0		60,4	10,0
7		60,4	10,0		60,4	10,0		60,4	10,0
8		60,4	10,0		60,4	10,0		60,4	10,0
9		60,4	10,0		60,4	10,0		60,4	10,0
10	11	60,4	10,0	12	60,4	10,0	13	60,4	10,0
11		60,4	10,0		60,4	10,0		60,4	10,0
12		60,4	10,0		60,4	10,0		60,4	10,0
13		60,4	10,0		60,4	10,0		60,4	10,0
14		60,4	10,0		60,4	10,0		60,4	10,0
15		60,4	10,0		60,4	10,0		60,4	10,0
16		60,4	10,0		60,4	10,0		60,4	10,0
17		60,4	10,0		60,4	10,0		60,4	10,0
18		60,4	10,0		60,4	10,0		60,4	10,0
19		60,4	10,0		60,4	10,0		60,4	10,0
20	14	60,4	10,0	15	60,4	10,0	16	60,4	10,0

Power frequency voltage applied to the test sample during current impulse applications [kV]	Sample No. OD1	Sample No. OD2	Sample No. OD3
	13,546	13,496	13,446

	Oscilloscope settings		
	sampling division	Input	attenuation
	ms	V_{div}	
Current	10	1,0	50:10
Voltage	10	1,0	50:5

Notes:

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

A1152IG

354

High current impulse operating duty test.

Conditioning: Application of the first impulse 100 kA 4/10 µs high current impulses (second part)

Test circuit: A0121

Date: June 27, 2008

Sample	Impulse	Charging voltage	Oscillogram	Discharge current	Residual Voltage	current waveshape	Energy
No.	No.	kV	No.	kA	kV	µs	kJ
OD1	1	93,5 x 2	17	98,0	53,1	4,5/9,8	33,1
OD2	1	93,5 x 2	18	98,5	52,1		33,0
OD3	1	93,5 x 2	19	99,0	53,8		33,0

	Oscilloscope settings		
	sampling division	input	attenuation
	µs	V_{div}	
Current	2	2,0	300:10

Notes: **opposite polarity 4,6 %**

A1153IG

High current impulse operating duty test.

Application of the second high current impulse, of the rated voltage U_r' and evaluation of thermal stability

Test circuit: A0123 – A0020 – A0131

Sample No.: OD1

Preheating temperature: 61 °C

Date: June 30, 2008

Second high current impulse application

Oscillogram	Charging voltage	Residual voltage	Discharge current	Energy	Current waveshape
No.	kV	kV	kA	kJ	µs
20	94,0 x 2	---	99,0	---	4,5/9,8

Corrected rated voltage U_r' application

Oscillogram	Time	Voltage	Current	Current	Power
No.	s	kV	+ mA_{cr}	- mA_{cr}	W
21	0	14,008	96,0	130,0	327
22	10		61,0	96,0	

Corrected continuos operating voltage U_c' application to evaluate the thermal stability

Oscillogram	Time	Voltage	Current	Current	Power
No.	min	kV	+ mA_{cr}	- mA_{cr}	W
23	0	11,288	1,51	2,96	10,35
	5		1,20	1,12	3,03
	10		1,18	1,08	2,83
24	15		1,16	1,05	2,50
	20		1,12	1,03	2,21
	25		1,11	1,02	2,14
25	30		1,10	1,01	2,05

continued

356

continued

Sample No.: OD2

Preheating temperature: 61 °C

Date: June 30, 2008

Second high current impulse application

Oscillogram	Charging voltage	Residual voltage	Discharge current	Energy	Current
No.	kV	kV	kA	kJ	µs
26	94,0 x 2	---	99,0	---	4,5/9,8

Corrected rated voltage U_r' application

Oscillogram	Time	Voltage	Current	Current	Power
No.	s	kV	+ mA_{cr}	- mA_{cr}	W
27	0	13,957	105,0	156,0	260
28	10		48,0	71,0	

Corrected continuos operating voltage U_c' application to evaluate the thermal stability

Oscillogram	Time	Voltage	Current	Current	Power
No.	min	kV	+ mA_{cr}	- mA_{cr}	W
29	0	11,247	2,50	3,01	10,80
	5		1,24	1,12	2,81
	10		12,0	1,07	2,40
30	15		1,18	1,06	2,18
	20		1,17	1,02	2,12
	25		1,15	1,01	2,00
31	30		1,13	0,99	1,88

continued

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
САМОКОВ

357

continued

Sample No.: OD3

Preheating temperature: 61 °C

Date: June 30, 2008

Second high current impulse application

Oscillogram	Charging voltage	Residual voltage	Discharge current	Energy	Current
No.	kV	kV	kA	kJ	µs
32	94,0 x 2	---	103,0	---	4,5/9,8

Corrected rated voltage U_r' application

Oscillogram	Time	Voltage	Current	Current	Power
No.	s	kV	+ mA_{cr}	- mA_{cr}	W
33	0	13,905	60,0	80,0	185
34	10		46,0	70,0	

Corrected continuos operating voltage U_c' application to evaluate the thermal stability

Oscillogram	Time	Voltage	Current	Current	Power
No.	min	kV	+ mA_{cr}	- mA_{cr}	W
35	0	11,205	2,30	2,80	9,51
	5		1,30	1,18	3,51
	10		1,26	1,16	3,27
36	15		1,24	1,10	3,09
	20		1,22	1,06	2,72
	25		1,21	1,03	2,54
37	30		1,18	1,01	2,40

continued

ВЯРНО С ОРИГИНАЛА

A1155IG

"ВАК - 02" ООД САЛЮКОВ

358

High current impulse operating duty test.

Lightning impulse residual voltage measurement after the test

Test circuit: A0120

Date: June 30, 2008

Sample	Requested current	Charging voltage	Oscillogram	Current waveshape	Discharge current	Residual voltage
No.		kV	No.	µs	kA	kV
OD1	I_n	45,8	38	8,7/19,0	9,95	33,0
		45,9	39		10,11	33,1
OD2		45,9	40		9,90	33,4
		46,0	41		9,90	33,4
OD3		46,1	42		10,16	33,4
		46,1	43		10,08	33,1

	Oscilloscope settings		
	sampling division	input	attenuation
	µs	V_{div}	
Current	5	1,0	50:10
Voltage	5	1,0	20:5

Notes:

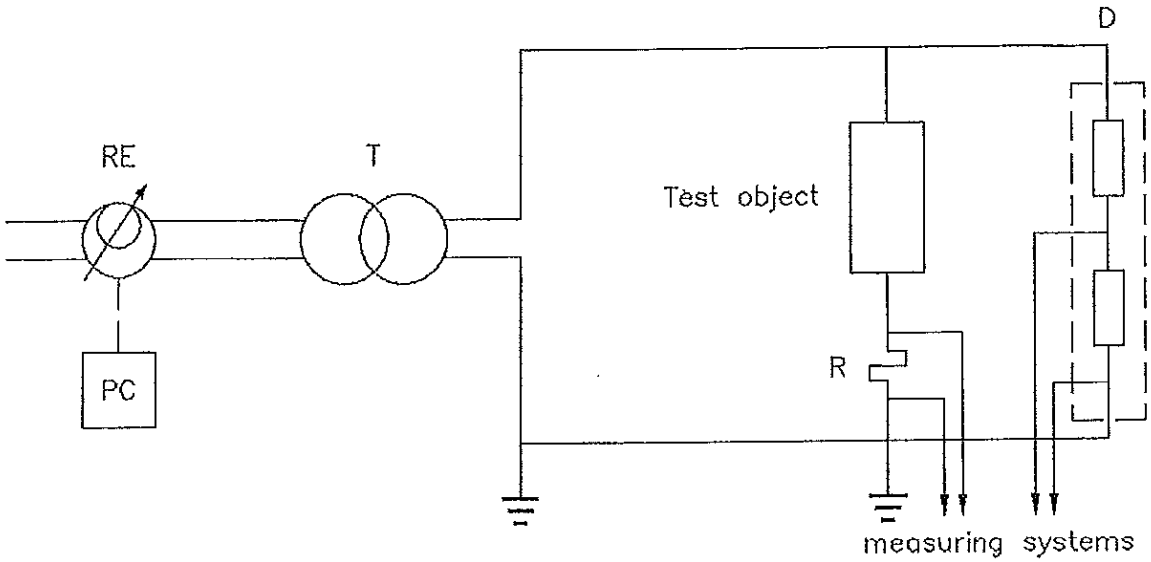
A12451G

ВЯРНО С ОРИГИНАЛА

ВАК - 02" ООД САМОКОВ

359

Circuit A0019



Power frequency supply

RE - programmable supply type LARCET A.C. Power Source 5000 P.S.; CESI no. 23702-32191
PC - personal computer
T - voltage transformer type SPECIALTRASFO; power 30 kVA; voltage 200 V/15-30 kV

Current measuring system

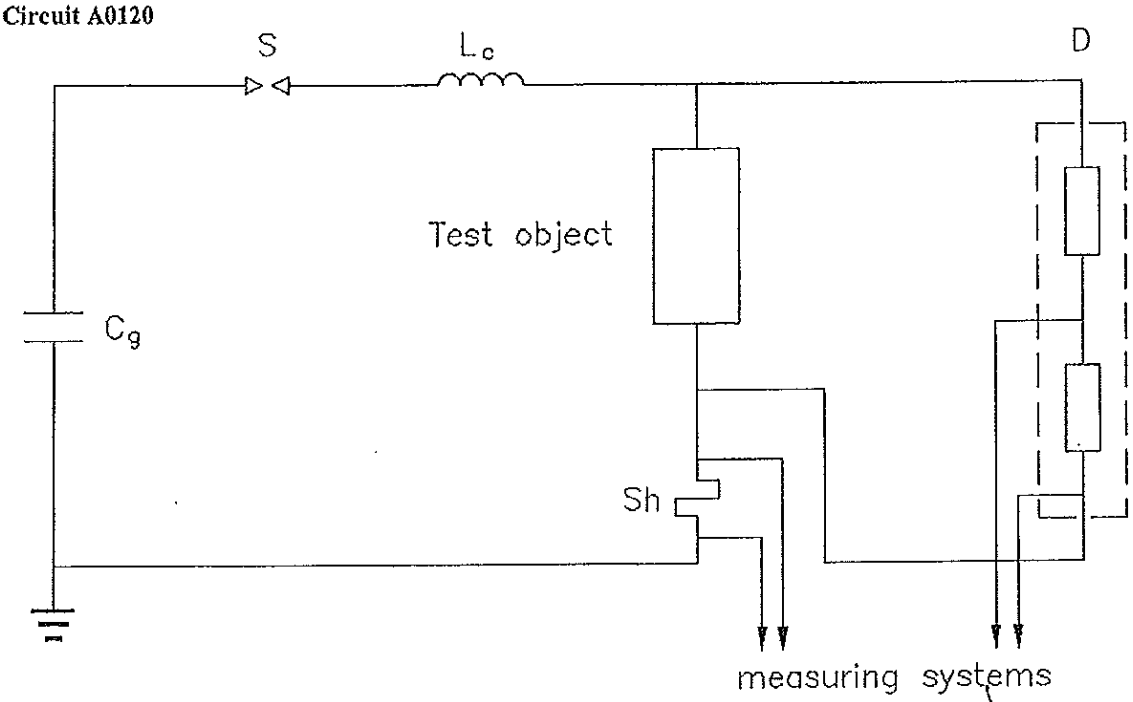
R - Current shunt CESI N°.31120; R= 941,4 Ω
- Electro optical system CESI N°.--; attenuation 5:5
OSC - Oscilloscope type SONY TEKTRONIX RTD 710; CESI N°. 6318

Voltage measuring system

D - Voltage divider SAGI; CESI N°.11120
- Electro optical system CESI N°.11520/11524; attenuation 5:5
OSC - Oscilloscope type SONY TEKTRONIX RTD 710; CESI N°.6318

360

Circuit A0120



Impulse generator

No. of stages	1
Cg	4,98 μF
Lc	10 μH
S	- Spark-gap

Voltage measuring system.

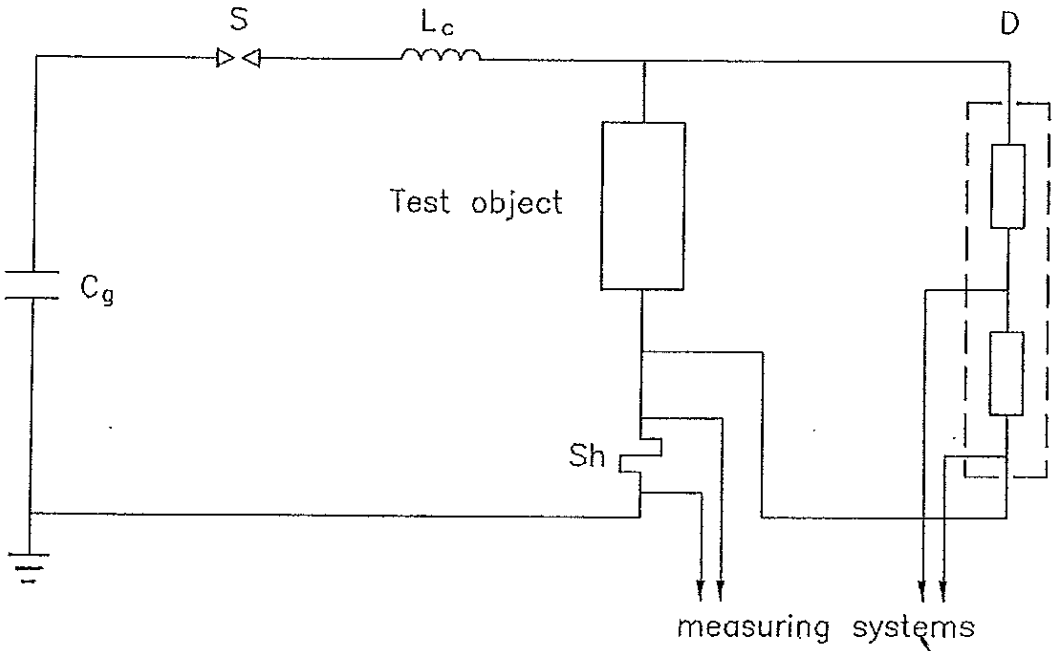
D	- Voltage divider SAGI; CESI No.11120
	- Electro optical system CESI No. 11521/522
OSC	- Oscilloscope type TEKTRONIX TDS 540A; CESI No.13217 (on channel No.2)

Current measuring system

Sh	- Current shunt CESI No.6042; R= 2 mΩ; peak current= 250 kA
	- Electro optical system CESI No. 11517/518
OSC	- Oscilloscope type TEKTRONIX TDS 540A; CESI No.13217 (on channel No.1)

361

Circuit A0122



Impulse generator

No. of stages	I
Cg	4,98 µF
Lc	100 µH
S	- Spark-gap

Voltage measuring system.

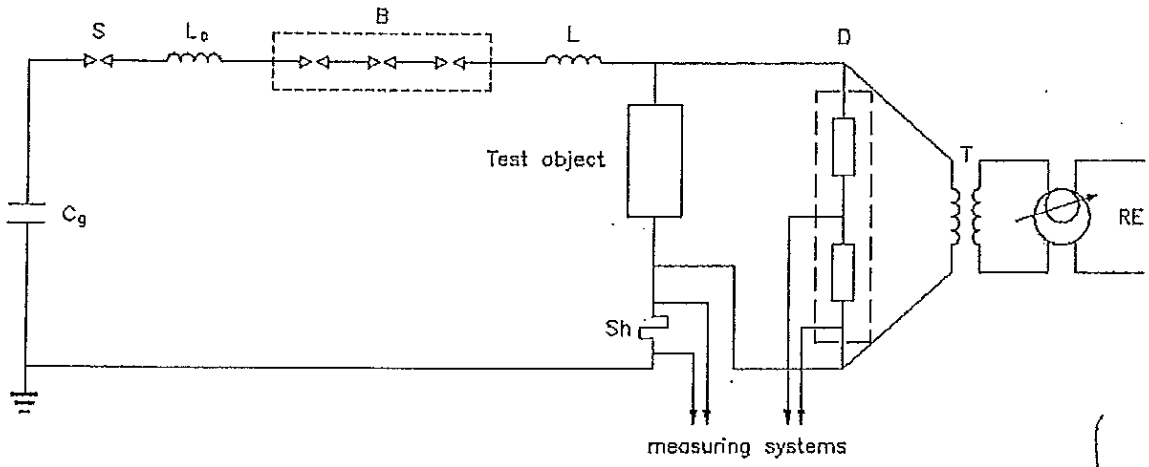
D	- Voltage divider SAGI; CESI No.11120
	- Electro optical system CESI No.11521/522; attenuation 5:5
OSC	- Oscilloscope type TEKTRONIX TDS 540A; CESI No.13217 (on channel No.2)

Current measuring system

Sh	- Current shunt CESI No.6042; R= 2 mΩ; peak current= 250 kA
	- Electro optical system CESI No.11517/518; attenuation 5:5
OSC	- Oscilloscope type TEKTRONIX TDS 540A; CESI No.13217 (on channel No.1)

362

Circuit A0015



Impulse generator

No. of stages: 1
C_g - Capacitor 4,98 µF
L - Inductance of the circuit
L_c - Inductor 10 µH
S - Spark gap
One resistor block has been added

Power frequency supply

RE - Regulator type specialtrasfo; power 20 kVA; voltage 380 V/ 220 V
T - Transformer type Pivi; power 30 kVA; voltage 220 V/ 15 kV
B - Blocking gap

Current measuring system

Sh_1 - Current shunt CESI No.6042; R = 0,002 Ω
- Electro optical system CESI No.11517/11518; attenuation 20:5
OSC - Oscilloscope type Tektonix 540A; CESI No.13217 (on channel No.1)

Voltage measuring system

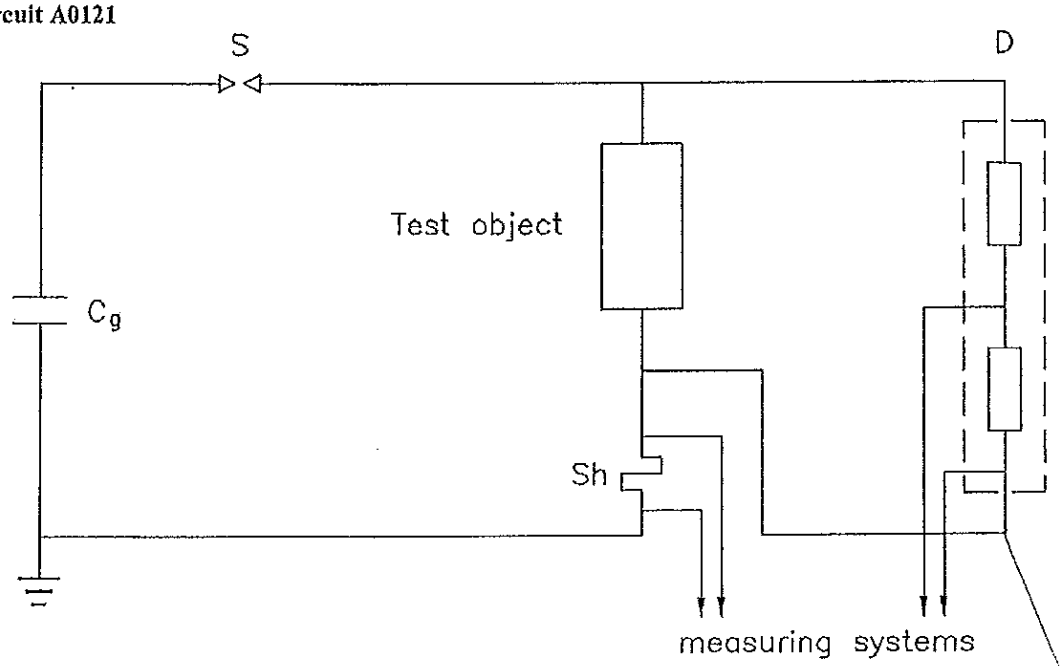
D - Voltage divider SAGI ; CESI No.1120; k = 1010
- Electro optical system CESI No.11520/11521; attenuation 50:5
OSC - Oscilloscope type Tektonix 540A; CESI No.13217 (on channel No.2)

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
САМОКОВ

363

Circuit A0121



Impulse generator

No. of stages	2
Cg	3,32 µF

S - Spark-gap

Three blocks in series have been added

Voltage measuring system.

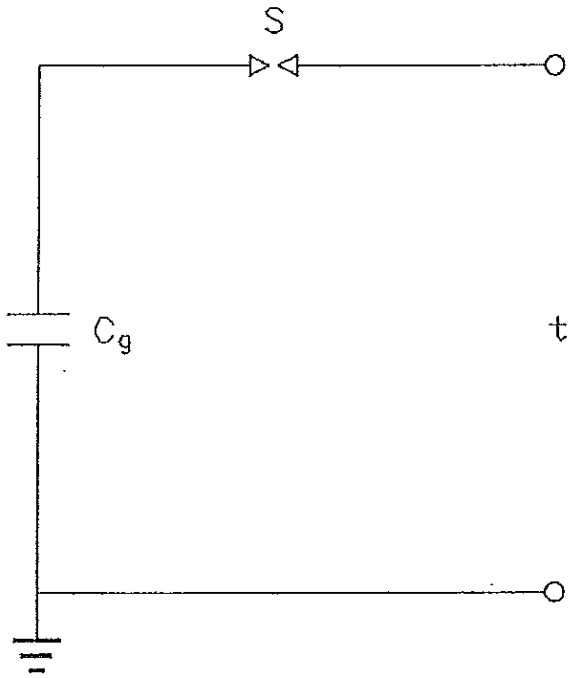
D	- Voltage divider SAGI; CESI No.11120
	- Electro optical system CESI No11517/518
OSC	- Oscilloscope type TEKTRONIX TDS 540A; CESI No.13217 (on channel No.2)

Current measuring system

Sh	- Current shunt CESI No.6042; R= 2 mΩ; peak current= 250 kA
	- Electro optical system CESI No11521/522
OSC	- Oscilloscope type TEKTRONIX TDS 540A; CESI No.13217 (on channel No.1)

364

Circuit A0123



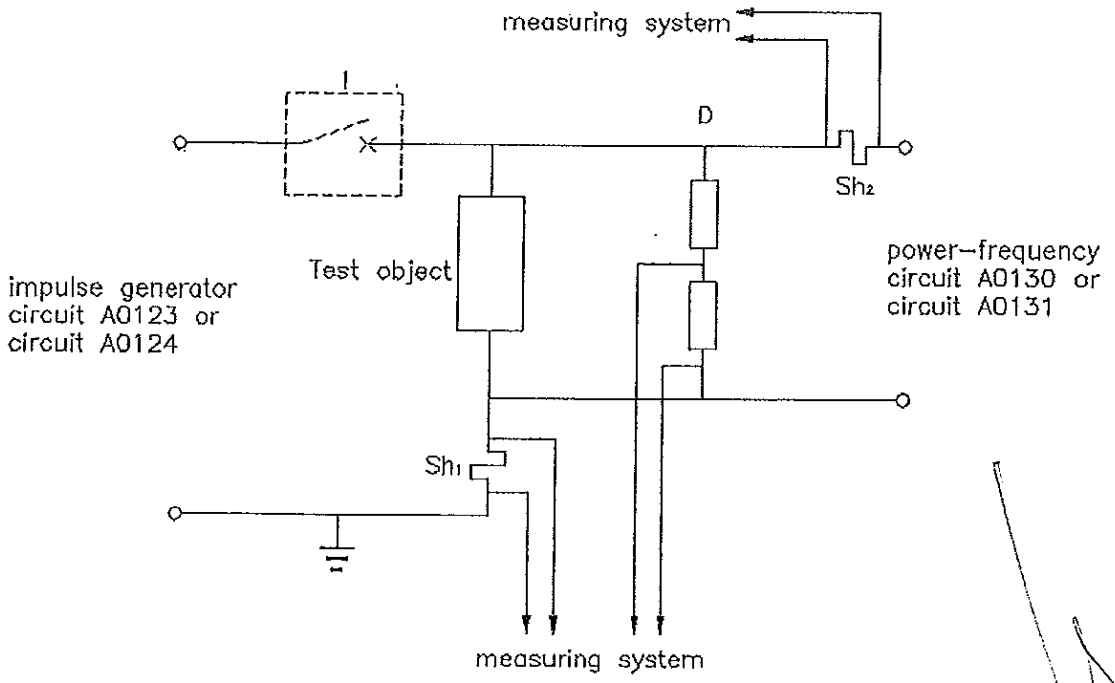
Impulse generator circuit

No. of stages 2
Cg 3,32 µF

S - spark-gap

365

Circuit A0020



Impulse generator circuit A0124

I - Circuit-breaker

Impulsive current measuring system

Sh_1 - Current shunt CESI No.6039; R= 20 m Ω
- Electro optical system CESI No.11517/518; attenuation 5:5

OSC_1 - Oscilloscope type TEKTRONIX TDS 540A; CESI No.13217 (on channel No.1)

Power frequency circuit A0130

Voltage measuring system.

D - Voltage divider SAGI; CESI No.11120
- Electro optical system CESI No.8009/8015; attenuation 50:5

OSC_1 - Oscilloscope type TEKTRONIX TDS 540A; CESI No.13217 (on channel No.2)

OSC_2 - Oscilloscope type SONY TEKTRONIX RTD 710A; CESI No.9090 (on channel No.2)

Power frequency current measuring system

Sh_2 (TOV) - Current shunt CESI R= 500 Ω - Electro optical system CESI No.8011/8017

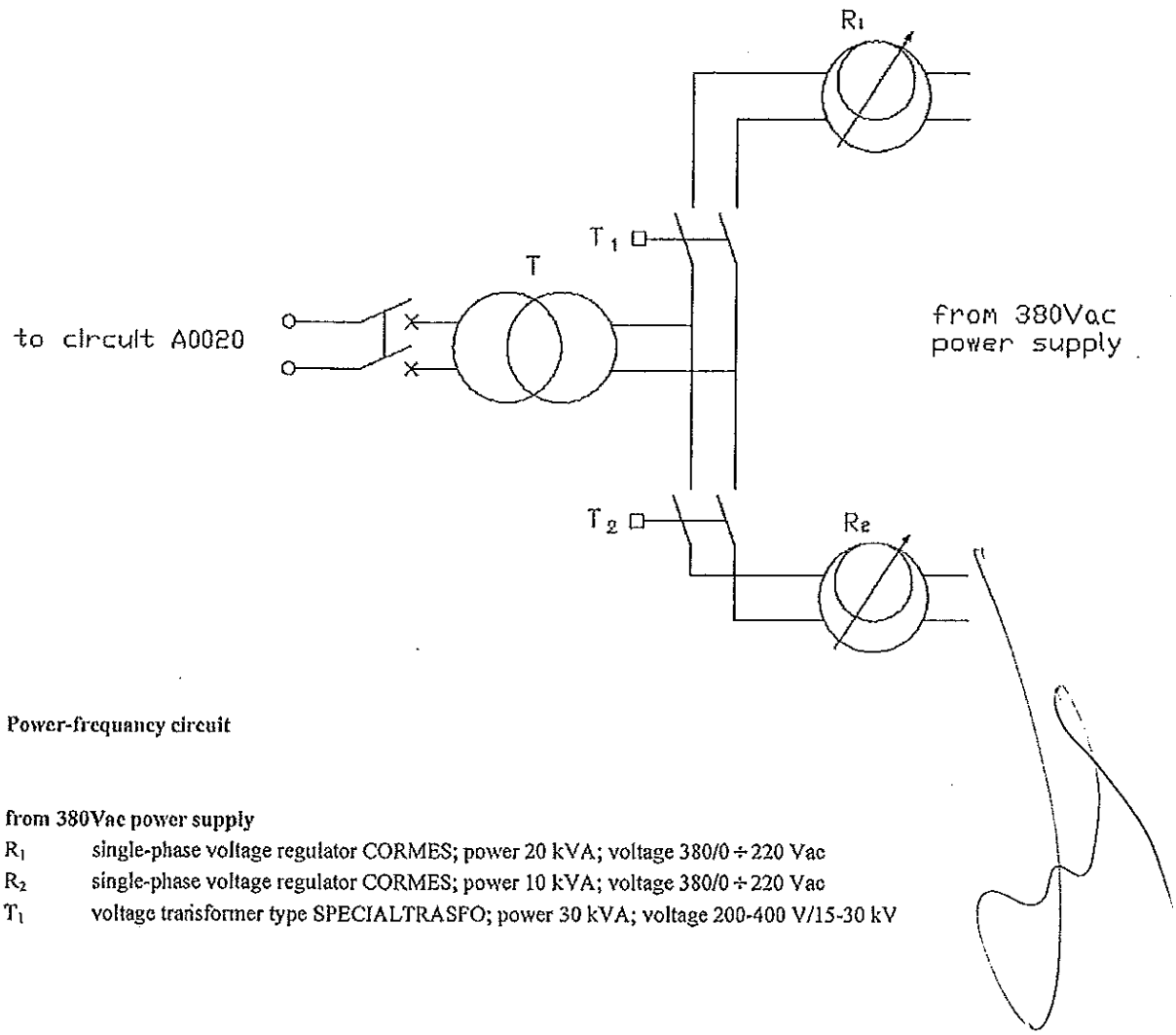
OSC_2 - Oscilloscope type TEKTRONIX TDS 744A; CESI No.13937 (on channel No.1)

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

366

Circuit A0131



Power-frequency circuit

from 380Vac power supply

R_1	single-phase voltage regulator CORMES; power 20 kVA; voltage 380/0 ÷ 220 Vac
R_2	single-phase voltage regulator CORMES; power 10 kVA; voltage 380/0 ÷ 220 Vac
T_1	voltage transformer type SPECIALTRASFO; power 30 kVA; voltage 200-400 V/15-30 kV

363

Client	DERVASIL F-42800 Saint Joseph – France
Tested equipment	Disconnectors for polymer housed metal-oxide surge arresters
Tests carried out	Time-versus current curve
Standards/Specifications	Specification ENEL DY1018 (11-2003)
Test date	from March 8, 2005 to March 8, 2005

No. of pages	15	No. of pages annexed	28
Issue date	March 14, 2005		
Prepared	BU PeC/TEST - M. Levati		
Verified	BU PeC/TEST - R. Malgesini		
Approved	BU PeC/TEST - M. de Nigris		

на основание чл. 2 от ЗЗЛД

CESI
CENTRO ELETTROTECNICO SPERIMENTALE ITALIANO
Business Unit
Prove di Componenti
Il Responsabile del Laboratorio

на основание чл. 2 от ЗЗЛД

CESI
Centro Elettrotecnico
Sperimentale Italiano
Giacinto Motta spa
Via R. Rubattino 64
20134 Milano - Italia
Telefono +39 022125 1
Fax +39 0221255449
http://www.cesi.it

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
САМОКОВ

368

Tests witnessed by /

Identification of the object requested

The Manufacturer guarantees that the tested object is manufactured according to the submitted drawing.
CESI checked that this drawing adequately represents in shape and dimensions the essential details and the parts of the tested object.
This drawing, identified by CESI and numbered A5/009432 No. 1, is annexed to this document.

Only for laboratory requirement, in order to reproduce the test conditions, all the laboratory data are contained in the document marked: -

The measurement uncertainties of the test results reported in this document comply with the following limits:

voltage : ± 5 % ; current : ± 5 % ; time : ± 5 %

The measurement uncertainties are estimated at the level of twice the standard deviation (corresponding, in the case of normal distribution, to a confidence level of about 95 %) and have to be considered as maximum estimated values referred to that type of measurement.

Receipt date of the sample March 7, 2005

Test location CESI – Via Rubattino 54 – Milan

Activity code 31757A

I2001IG

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ЕООД
САМОКОВ

369

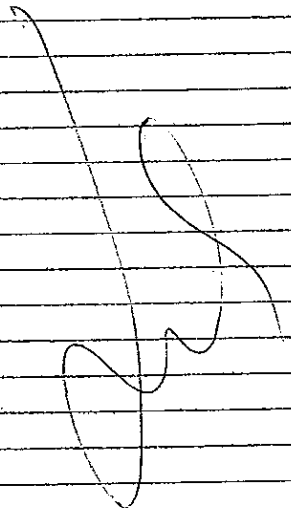
Contents	Page	Test date
Rated characteristics of the surge arrester for witch the disconnectors are designed to be used	4	---
Disconnector operation test – Arrangements and test modalities	5	---
Test results	5	---
Single-phase current tests results	6 4 8	March 8, 2005
Time current versus curve	9	---
Test circuit M0015	10	---
Photographs of test arrangement	11	---
Photographs of some samples after the test	11 4 12	---
Laboratory informations	13 ÷ 15	---

Pages annexed:

- Oscillogram from test report MP-A5/008453 (total pages: 27)
- drawing no. A5/009432 (1 page)

Rated characteristics of the surge arrester for witch the disconnectors are designed to be used

Manufacturer	DERVASIL F-42800 Saint Joseph (France)
Duty cycle voltage rating	up to 17,5 kV
Frequency	50 Hz
Classifying current	5 kA & 10 kA
Classification	distribution normal & heavy duty



ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
САМОКОВ

3Л1

Disconnector operation test

Arrangements and test modalities

The disconnectors were tested with-out the surge arrester and with an insulating bracket also supplied by the manufacturer

The bolded junction from the disconnector and the flexible conductor was performed applying a torque force of 20 Nm for 30s.

The applied voltage was about 16750 V

The test voltage was applied for 400 ms and after 400 ms with-out voltage, the test voltage was reapplied due to verify the effective disconnection

Five samples of disconnectors were tested for each of the four current values stated by the Standard.

Test results

In all the tests the disconnectors operated and the separation was permanent and effective.
The operation times (time to first movement) are reported in the table from page 6 to page 8 and in the diagram to page 9.
A view of some disconnector after the test is shown in the photos from page 11 to page 12.

The test result is positive

Single-phase current tests results

Test circuit: M0015

Reference number of the oscillograms: MP--A5/008453

Calibration of the test circuit						
Test	Oscillogram	Prospective current		Power factor	Supply voltage	Frequency
		rms value	peak value			
No.	No./sheet	A	A	-	V	Hz
T1	3/1	613	1560	0,07	16770	50

Date: March 8, 2005

Test	Oscillogram	Sample tested	voltage	current	time to first movement	restart of the current	Photo of one sample after the test	Test result
No.	No./sheet	No.	V	A	ms	yes / not	no.	
1	5/2	1	16630	599	14,5	not	3	positive
2	6/2	2	16580	603	4,9	not		positive
3	7/2	3	16620	597	10,3	not		positive
4	8/2	4	16620	592	15,0	not		positive
5	9/2	5	16540	594	6,6	not		positive

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

continued

continued

Test circuit: M0015

Reference number of the oscillograms: MP--A5/008453

Calibration of the test circuit						
Test	Oscillogram	Prospective current		Power factor	Supply voltage	Frequency
		rms value	peak value			
No.	No./sheet	A	A	-	V	Hz
T2	11/1	200	525	0,05	16530	50

Date: March 8, 2005

Test	Oscillogram	Sample tested	voltage	current	time to first movement	restart of the current	Photo of one sample after the test	Test result
No.	No./sheet	No.	V	A	ms	yes / not	no.	
6	12/2	6	16530	198	23,6	not	4	positive
7	13/2	7	16580	199	29,7	not		positive
8	14/2	8	16500	196	17,1	not		positive
9	15/2	9	16510	197	36,5	not		positive
10	16/2	10	16500	198	28,2	not		positive

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

continued

continued

Test circuit: M0015

Reference number of the oscillograms: MP–A5/008453

Calibration of the test circuit						
Test	Oscillogram	Prospective current		Power factor	Supply voltage	Frequency
		rms value	peak value			
No.	No./sheet	A	A	-	V	Hz
T3	17/1	19,72	53,0	0,03	16730	50

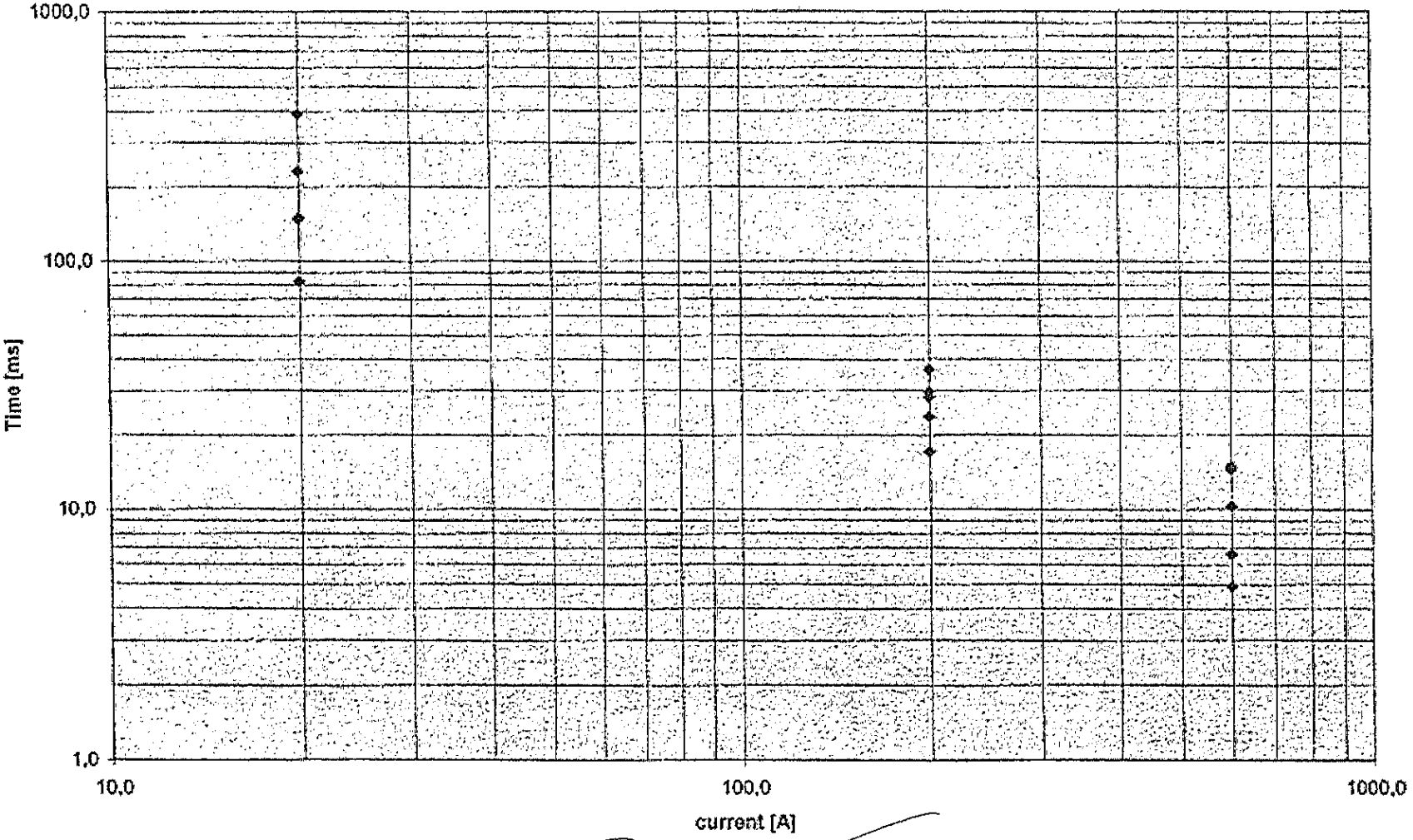
Date: March 8, 2005

Test	Oscillogram	Sample tested	voltage	current	time to first movement	restart of the current	Photo of one sample after the test	Test result
No.	No./sheet	No.	V	A	ms	yes / not	no.	
11	18/2	11	16710	19,5	82,6	not		positive
12	20/1	12	16670	19,6	387	not		positive
13	21/*	13	16760	19,77	147	not	5	positive
14	22/*	14	16680	19,8	230	not		positive
15	24/1	15	16680	19,8	149	not		positive

* manca l'oscillogramma

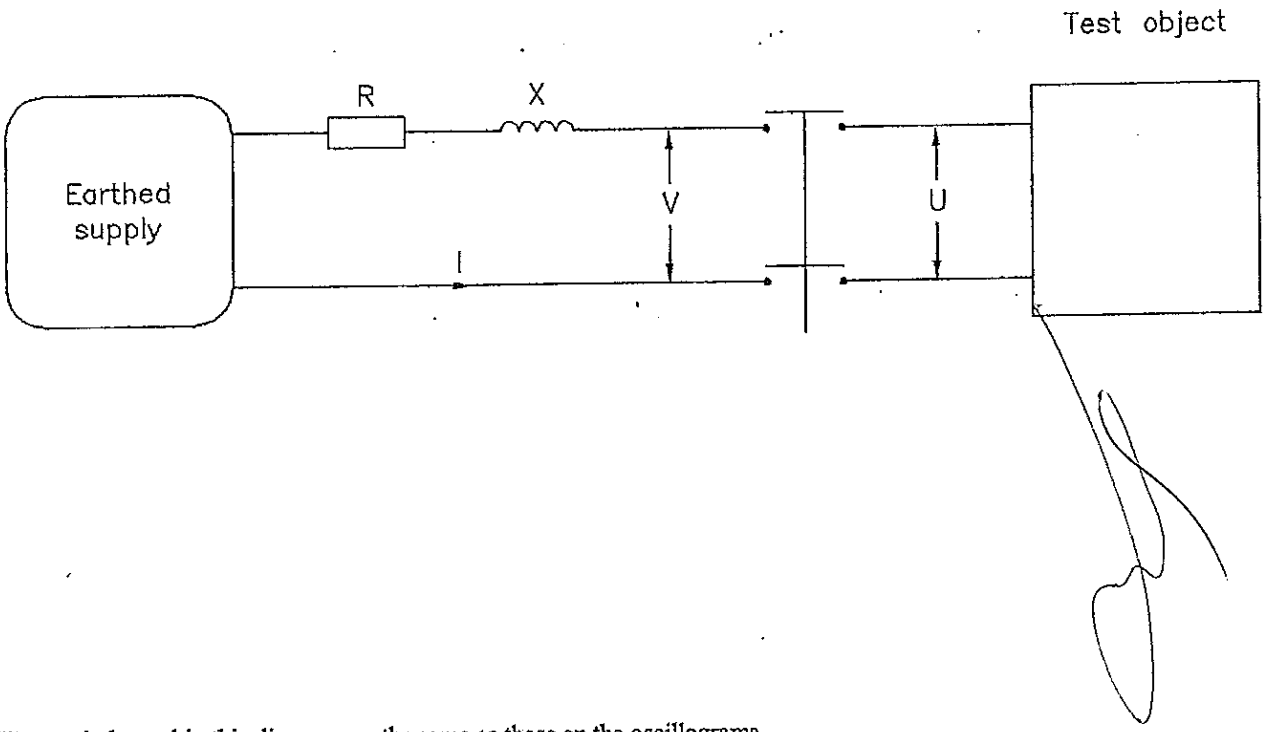
ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ



me current versus curve

Test circuit M0015



The symbols used in this diagram are the same as those on the oscillograms.

Photographs of test arrangement

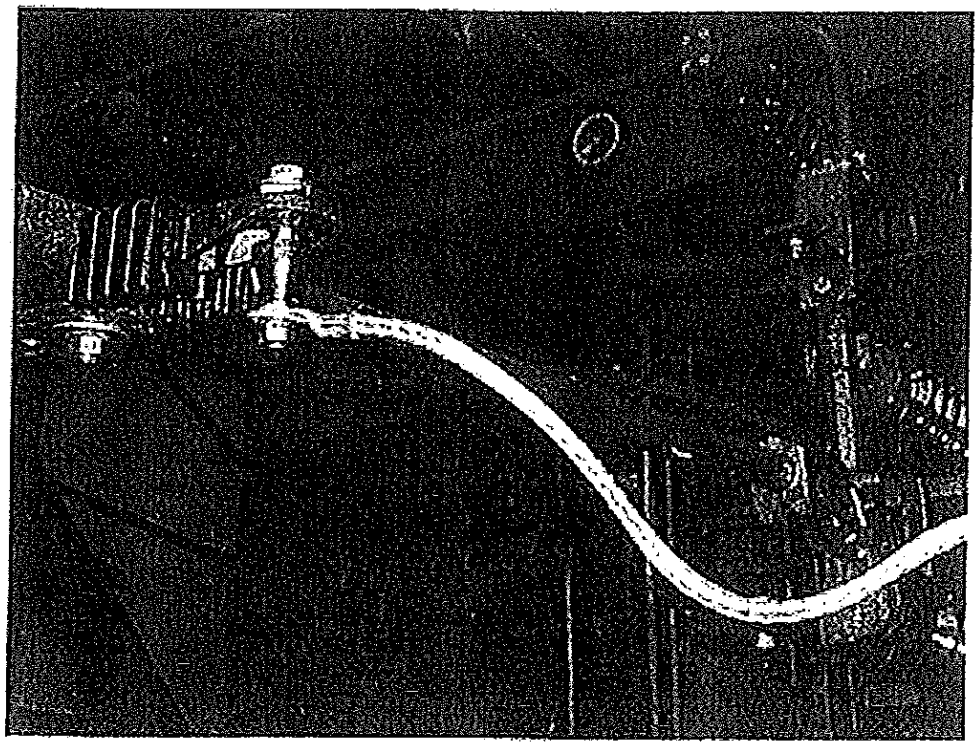


Photo no. 1

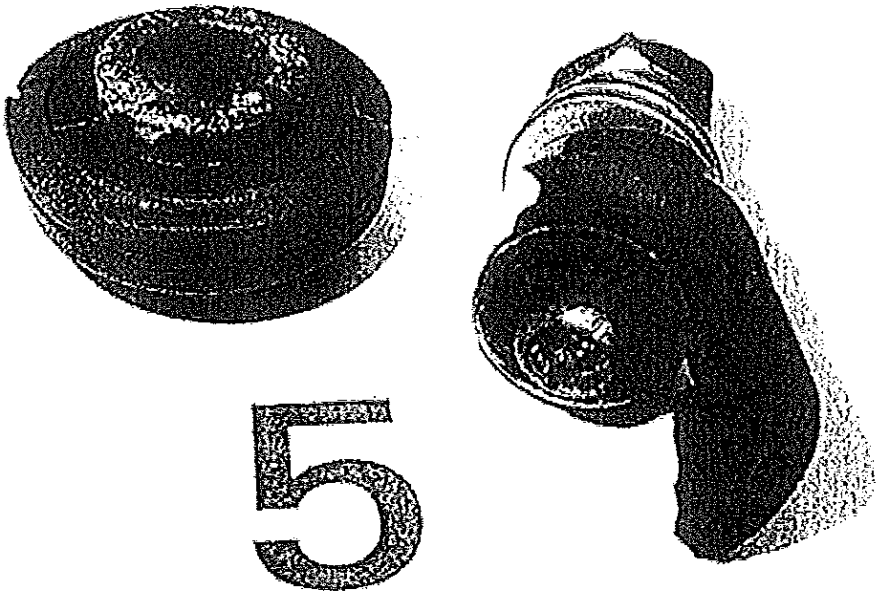


Photo no. 2

Photographs of some samples after the test

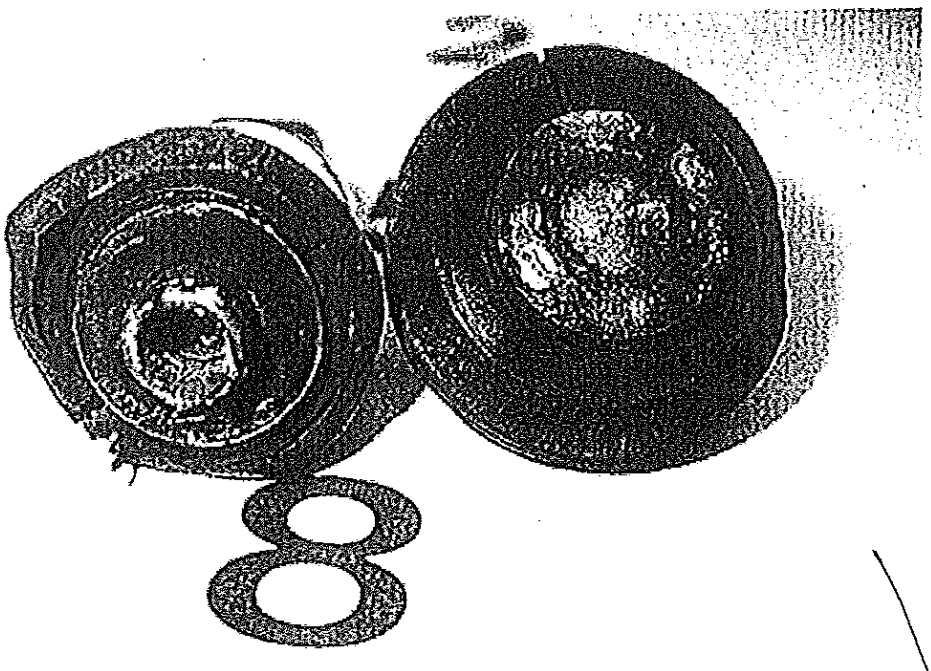


Photo no. 3

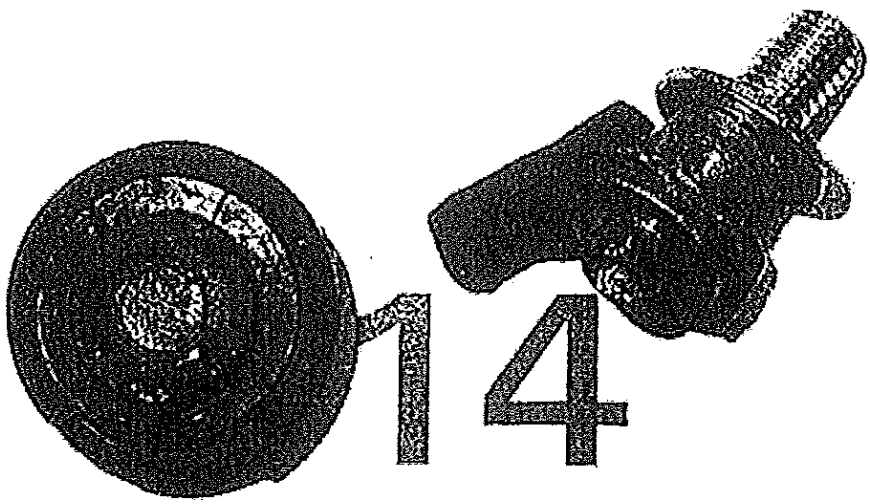


Photo no. 4

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

379

Laboratory information

Requested values and test circuit parameters

Test	Requested values					X_{AT}	X_{bt}	Synchronizer position	Time of the test
	voltage	r.m.s. current	peak current	I^2t	duration				
No.	V	A	A	MA^2s	s	Ω	Ω	°	-
T1	16650	600	-	-	0,1	20,0x2	-	37	13:00
1 to 5	"	600	-	-	0,1	20,0x2	-	127	13:10
T2	"	200	-	-	0,1	71,2x2	-	37	14:00
6 to 10	"	200	-	-	0,5	71,2x2	-	127	14:05
T3	"	20	-	-	0,1	x2	-	37	15:00
11 to 15	"	20	-	-	5,0	225,4x2	-	127	15:05

Laboratory information

Test laboratory: P102 / MP1
CESI testing team: C. Assi
C. Carniel
G. Vassallo

Date: March 8, 2005

Characteristics of supply circuit

Tests		Supply	OTE MV		OTE LV	
from	to		K	position	K	position
T1	15	23 kV Lambrate	4,2	-		

Characteristics of measuring system

Measure	Transducer		KRENZ		TRANSISCOPE
			TRC	channel	channel
-	ref.	position	No.	No.	No.
I	G1		1	1	
U	N1 - N2		1	2	
V	A1 - A3		1	3	

Symbols assigned in 'ref.' column refer to the measuring equipment listed in page "Laboratory P102 – MP1. Measuring system characteristics."

Other measuring equipment:
Ohmmeter CESI number: /

381

Laboratory P102 – MP1
Measuring system characteristics

Ref.	Type	CESI No.
A1	Voltage transformer TV2 – R-T	5534
A2	Voltage transformer TV2 – S-R	5535
A3	Resistive dividers for TV2	14142
B1	Resistive divider K= 206,5	11465
B2	Resistive divider K= 206,5	11466
B3	Resistive divider K= 206,5	11467
B4	Resistive divider K= 206,5	11468
C1	Current transformer TA2 – R	17060
C2	Current transformer TA2 – S	17061
C3	Current transformer TA2 – T	17059
C4	Resistive burden for TA2	5562
D1	Current transformer 4000 A / 5 A	14466
D2	Resistive burden for TA3	17072
E1	Shunt 40 μΩ – 100 kA – R	8231
E2	Shunt 40 μΩ – 100 kA – S	8232
E3	Shunt 40 μΩ – 100 kA – T	8230
F1	Shunt 1,6 mΩ – 5 kA – R	7964
F2	Shunt 1,6 mΩ – 5 kA – S	7968
F3	Shunt 1,6 mΩ – 5 kA – T	7966
G1	Shunt 1,6 mΩ – 5 kA – additional	7965
G2	Shunt 1,6 mΩ – 5 kA – additional	7963
G3	Shunt 1,6 mΩ – 5 kA – additional	7967
H1	Shunt 80 μΩ – 100 kA	5524
H2	Shunt 80 μΩ – 100 kA	5525
H3	Shunt 80 μΩ – 100 kA	5526
J1	Electro-optical link for thermocouple T	13372
J2	Electro-optical link for thermocouple T	14556
J3	Electro-optical link for thermocouple J	17074
J4	Electro-optical link for thermocouple J	17076
J5	Electro-optical link for thermocouple J	17078
J6	Electro-optical link for thermocouple K	22463
J7	Electro-optical link for thermocouple K	22465
J8	Electro-optical link for thermocouple K	22467
J9	Electro-optical link for thermocouple K	22469

Ref.	Type	CESI No.
K1	Shunt 160 μΩ – 30 kA	5559
K2	Shunt 160 μΩ – 30 kA	5560
K3	Shunt 160 μΩ – 30 kA	5561
L1	Shunt 111 mΩ	9754
L2	Shunt 111 mΩ	9758
L3	Shunt 111 mΩ	9759
=	KRENZ TRC1	13119
=	KRENZ TRC2	13120
M1	Voltage transformer 24 kV / 100 V	3387
N1	Divider RC 30 kV	14677
N2	Divider RC 30 kV	14678
N3	Divider RC 30 kV	14679
N4	Divider RC 30 kV	11990
N5	Divider RC 30 kV	11991
N6	Divider RC 30 kV	11992
P1	Schering bridge	696
P2	Resistive box	8461

Measuring software: SAD – P102	Software release: 4.2 – 31/12/2002	Hardware: VAX 4200 with VMS 5.4

Prepared by: G. Zuccalà

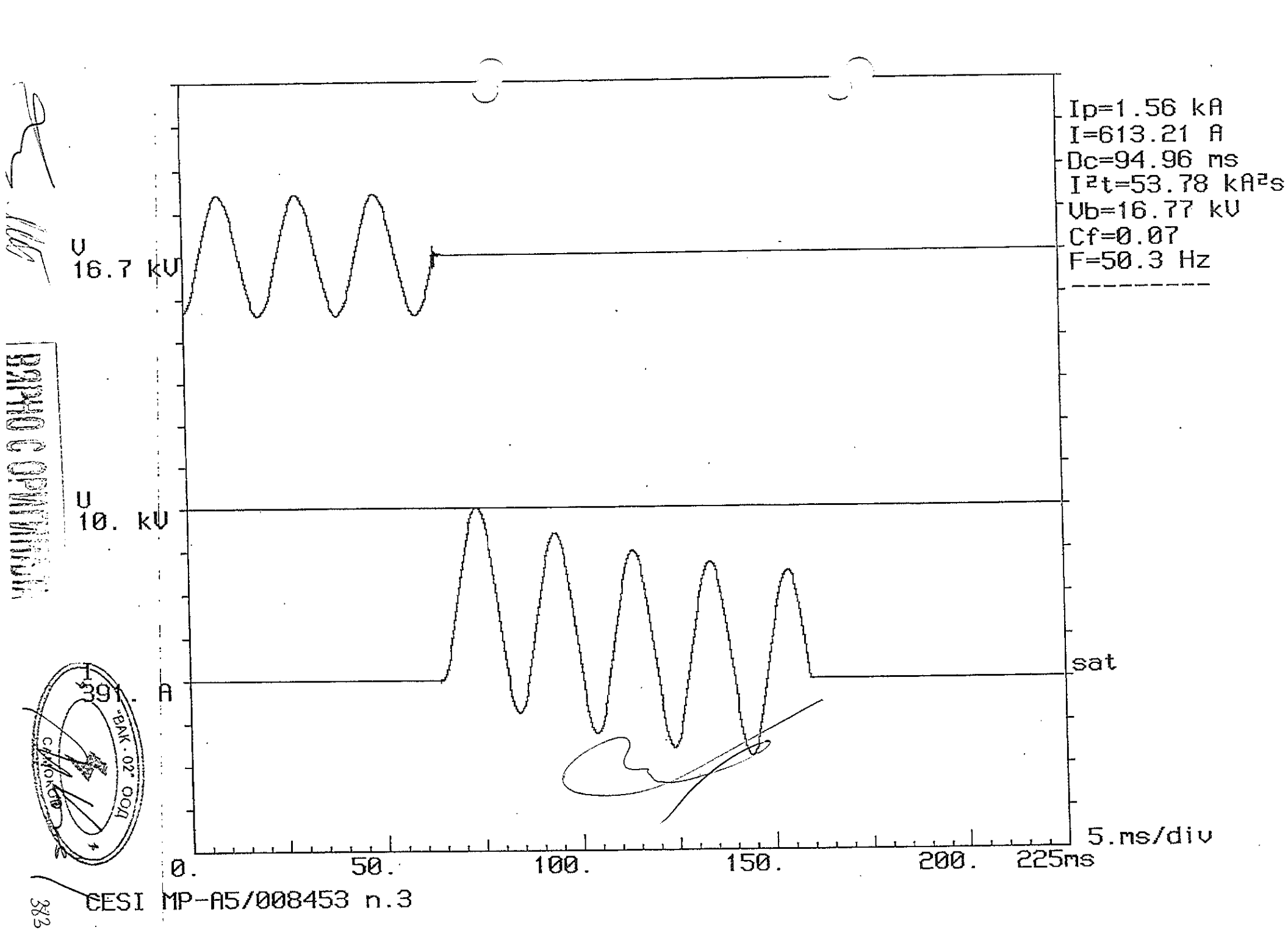
Date: 01/03/2004

ВЯРНО С ОРИГИНАЛА

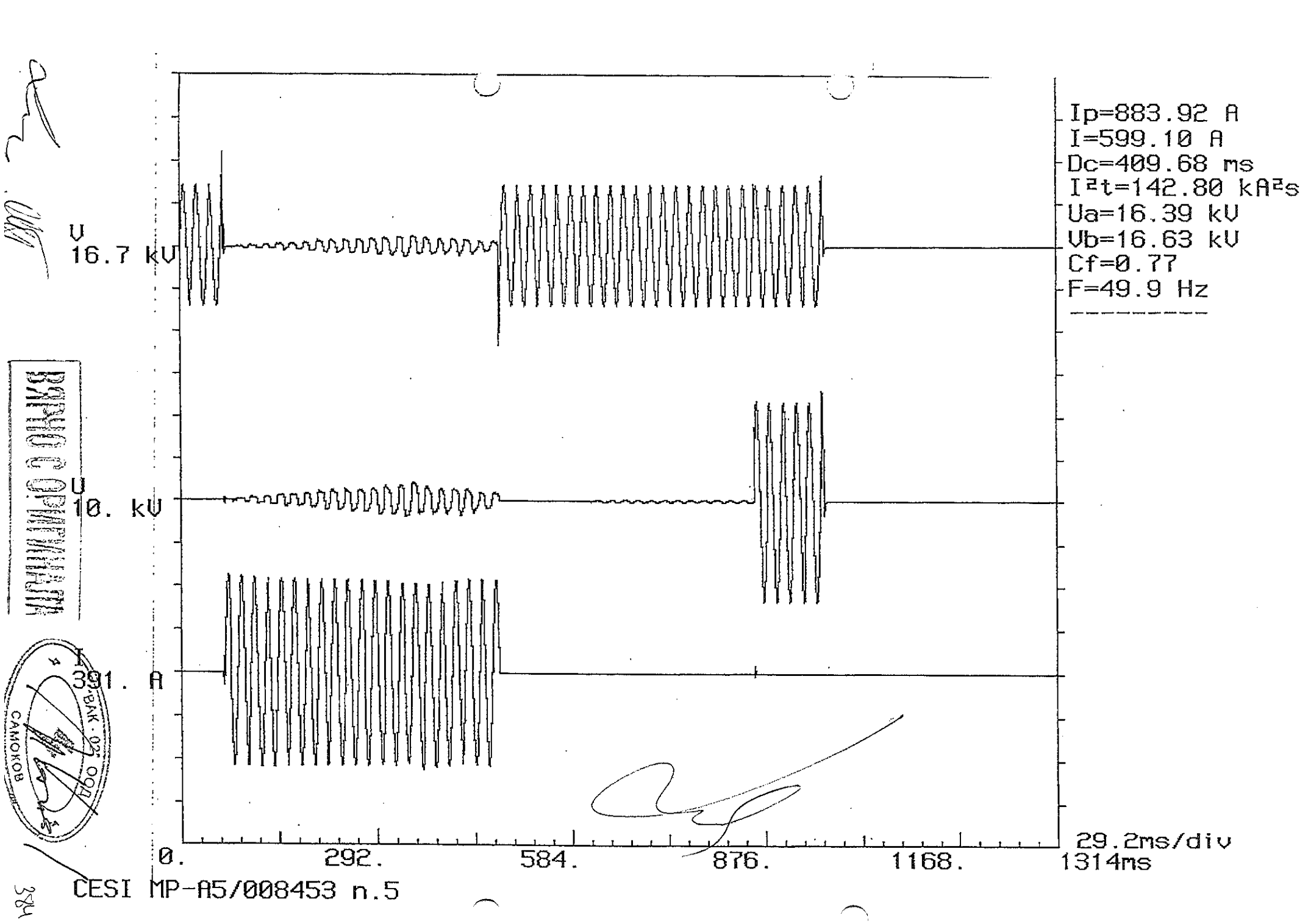
"ВАК - 02" ООД
САМОКОВ

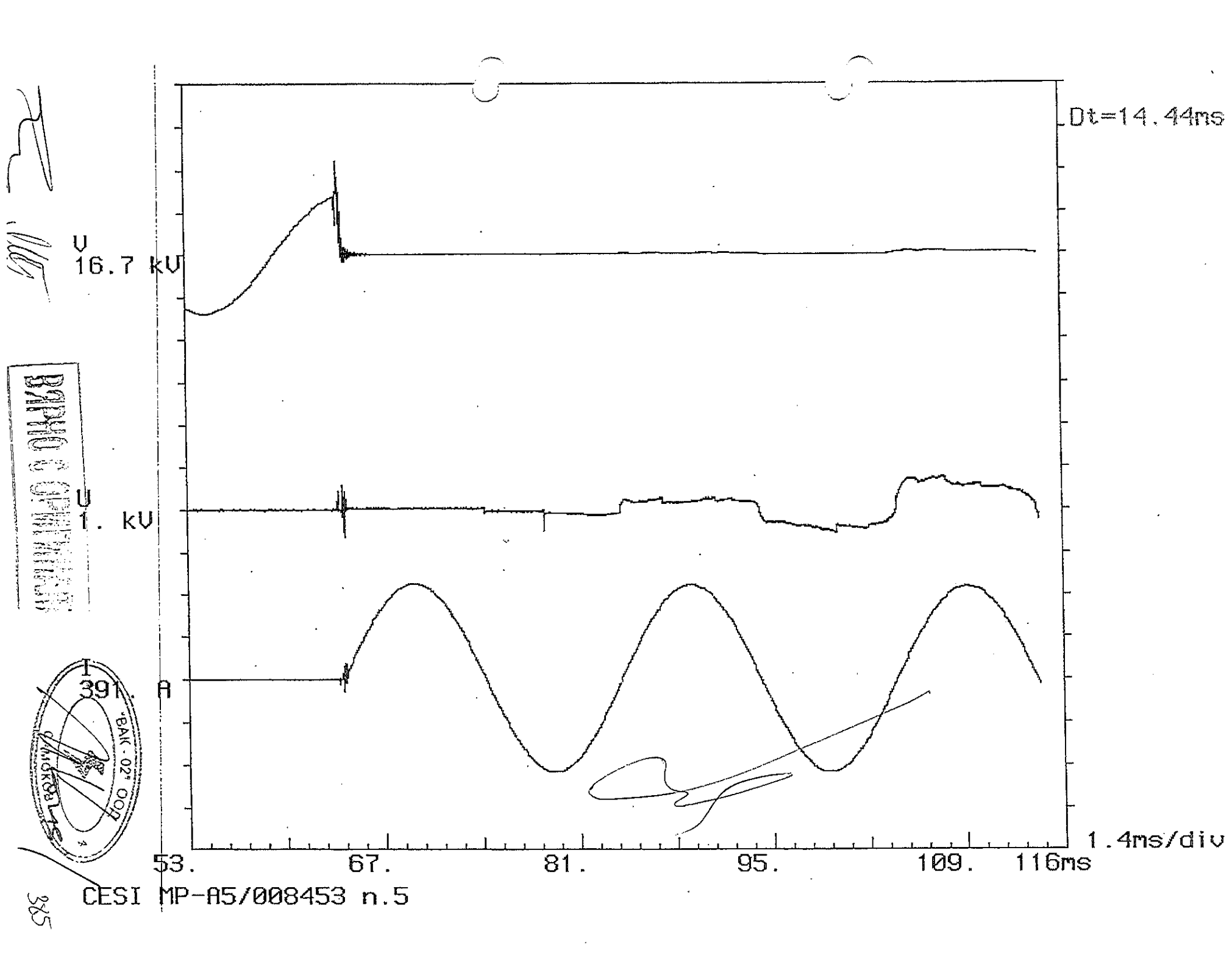
M2009IG

382

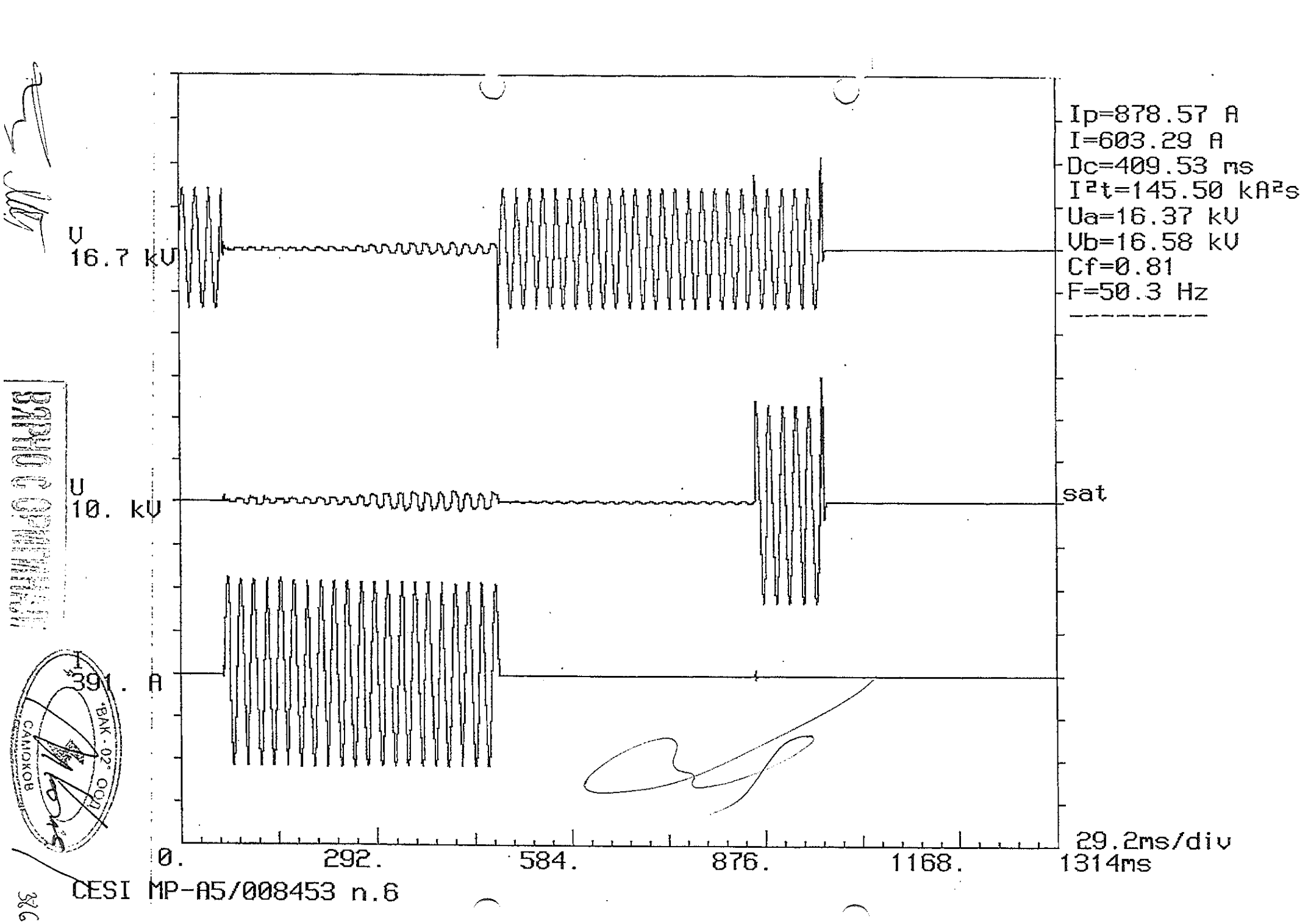


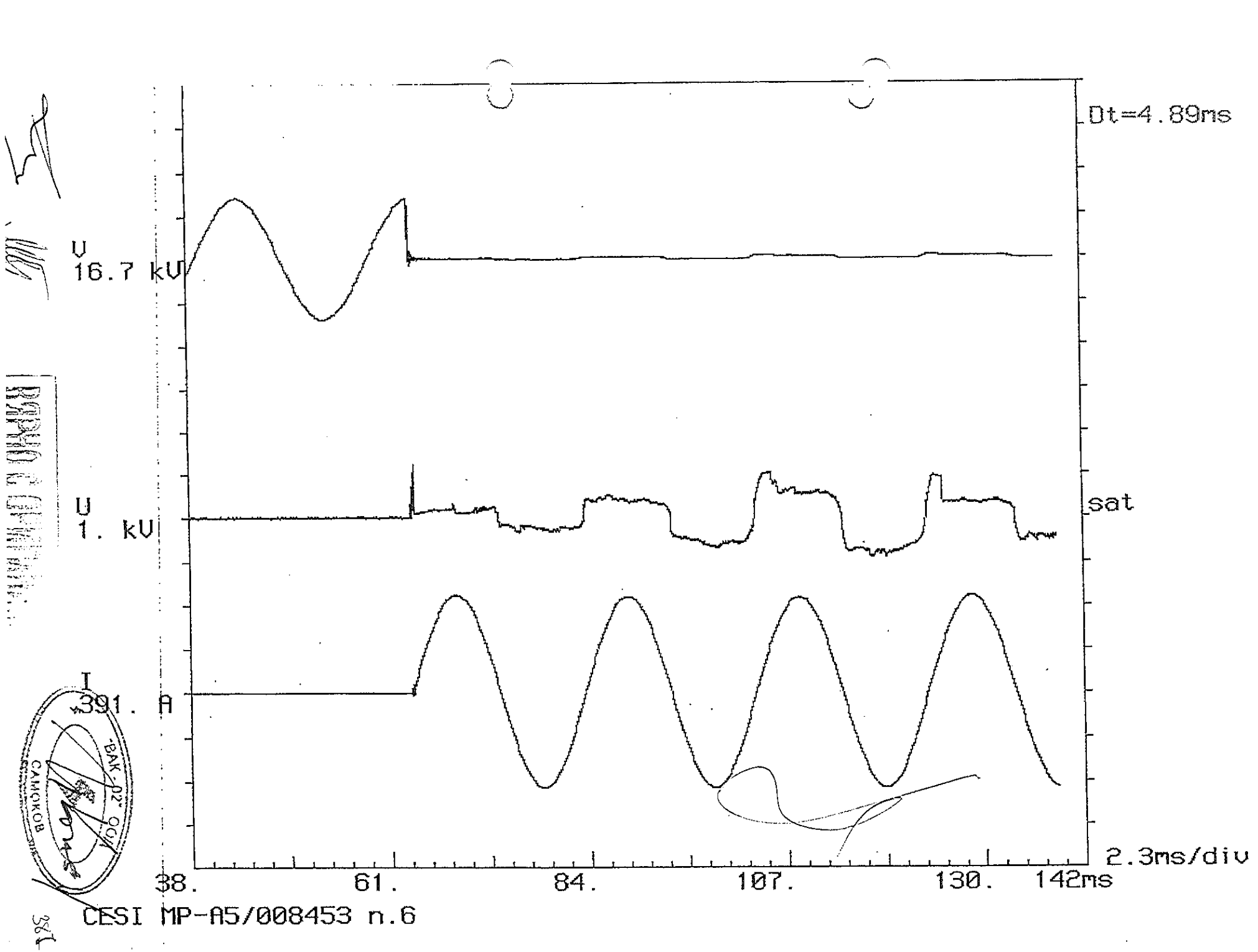
CESI MP-A5/008453 n.3


V
16.7 kV
U
10. kV
I
391. A
Ip=883.92 A
I=599.10 A
Dc=409.68 ms
I²t=142.80 kA²s
Ua=16.39 kV
Vb=16.63 kV
Cf=0.77
F=49.9 Hz
0.
292.
584.
876.
1168.
29.2ms/div
1314ms
CESI MP-A5/008453 n.5

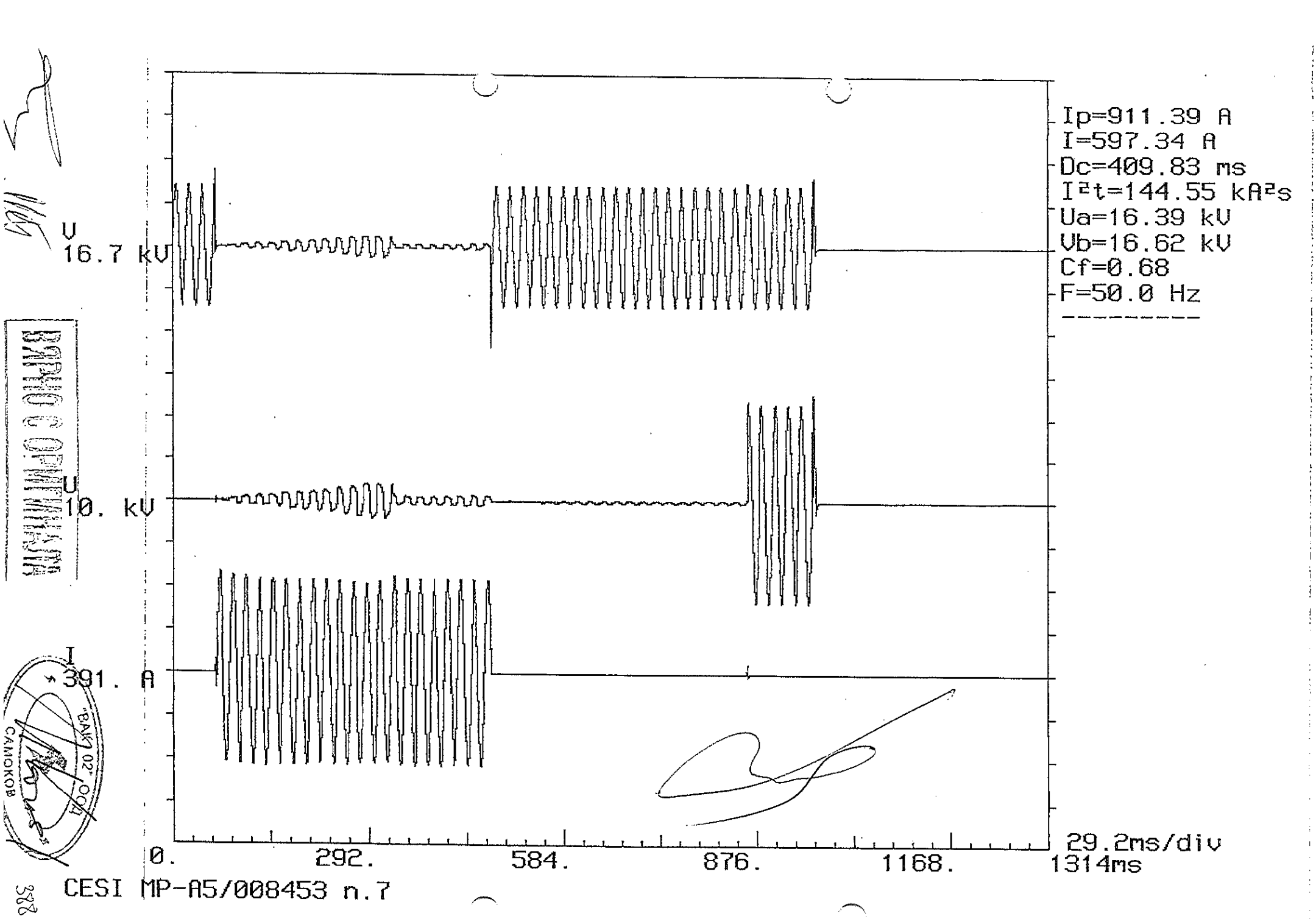


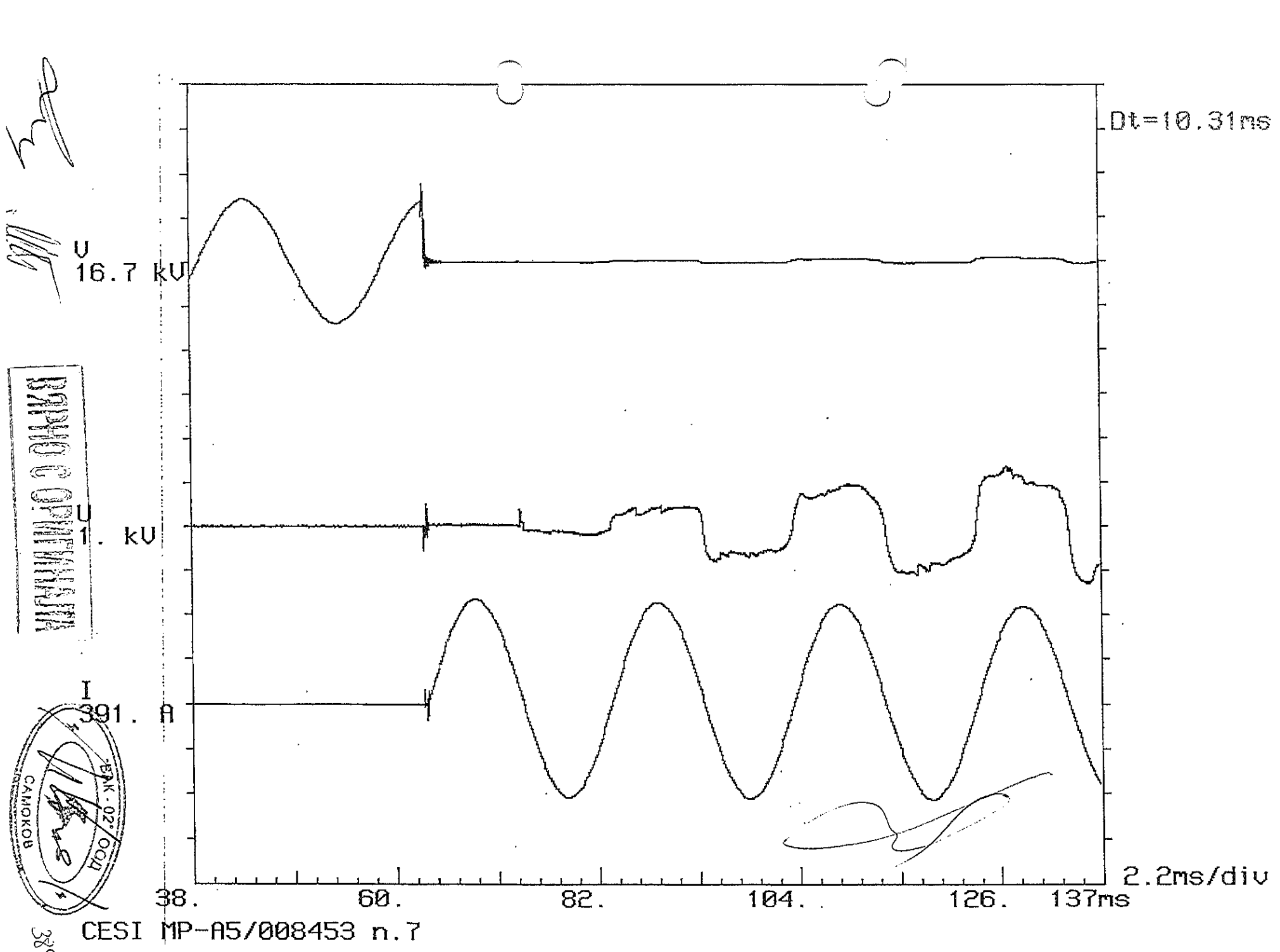
CESI MP-A5/008453 n.5


Ip=878.57 A
I=603.29 A
Dc=409.53 ms
I²t=145.50 kA²s
Ua=16.37 kV
Vb=16.58 kV
Cf=0.81
F=50.3 Hz
V
16.7 kV
U
10. kV
sat
391. A
0.
292.
584.
876.
1168.
1314ms
29.2ms/div
CESI MP-A5/008453 n.6



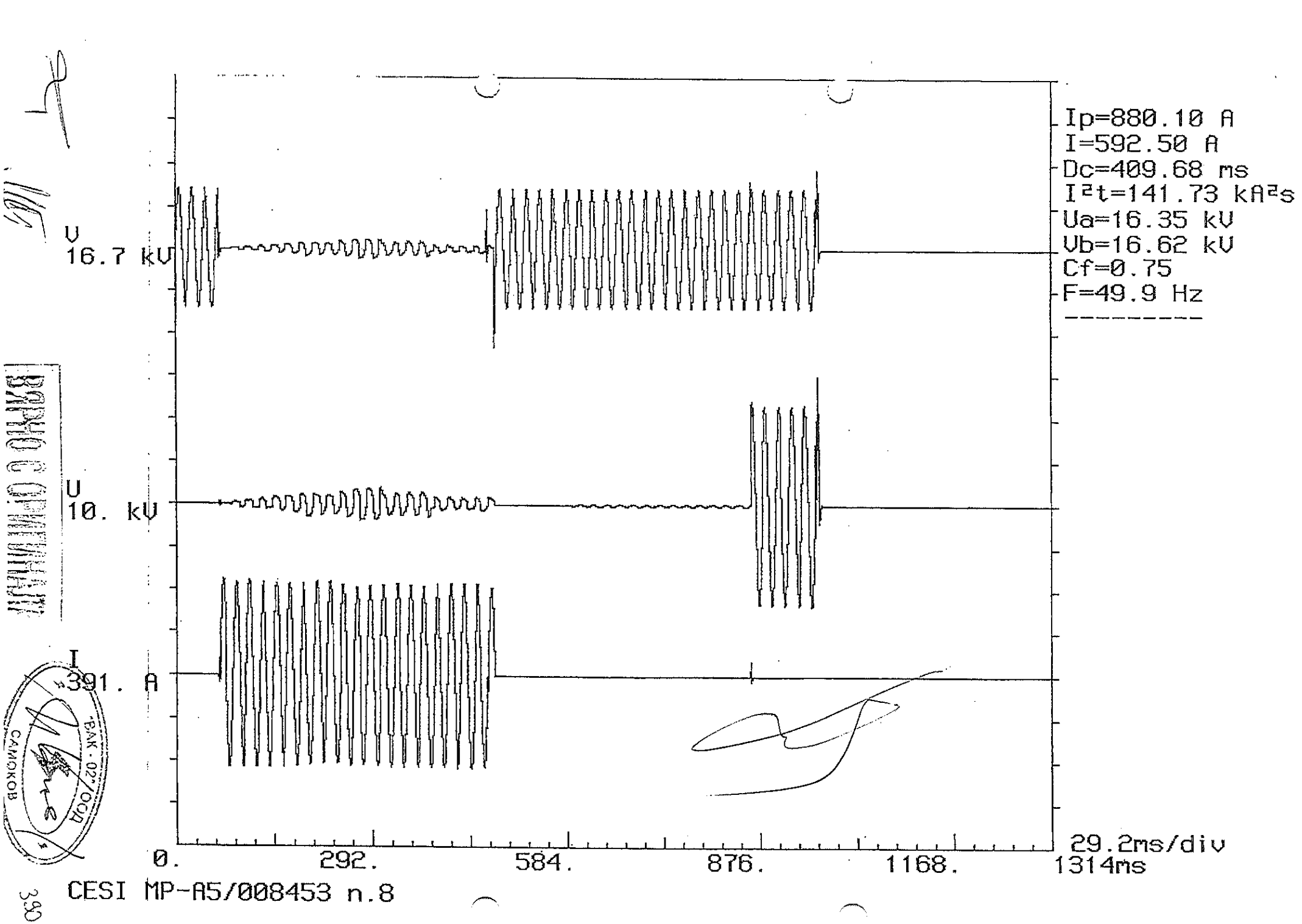
CESI MP-A5/008453 n.6


V
16.7 kV
U
10. kV
I
391. A
Ip=911.39 A
I=597.34 A
Dc=409.83 ms
I²t=144.55 kA²s
Ua=16.39 kV
Vb=16.62 kV
Cf=0.68
F=50.0 Hz
0.
292.
584.
876.
1168.
1314ms
29.2ms/div
CESI MP-A5/008453 n.7



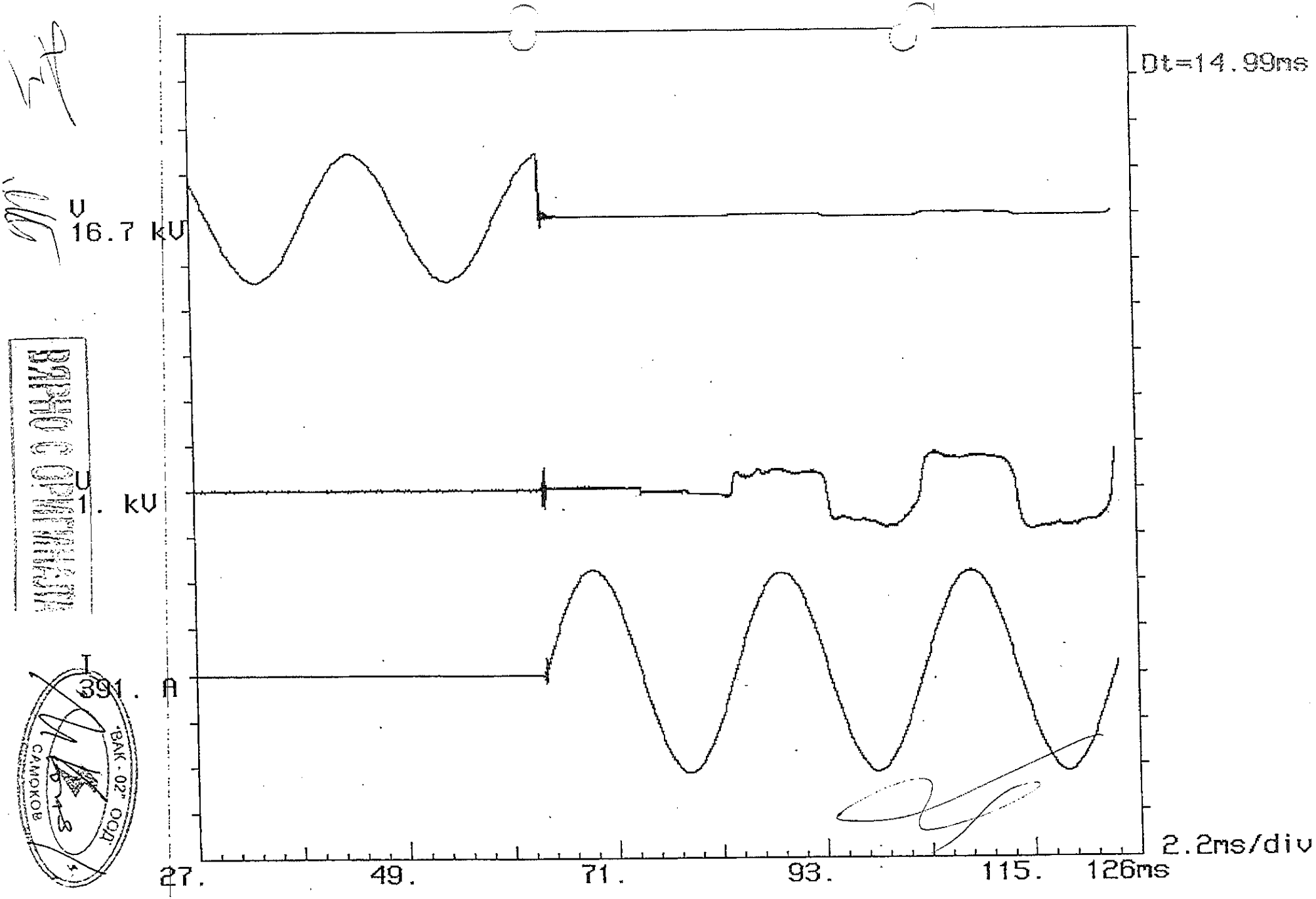
CESI MP-A5/008453 n.7

389

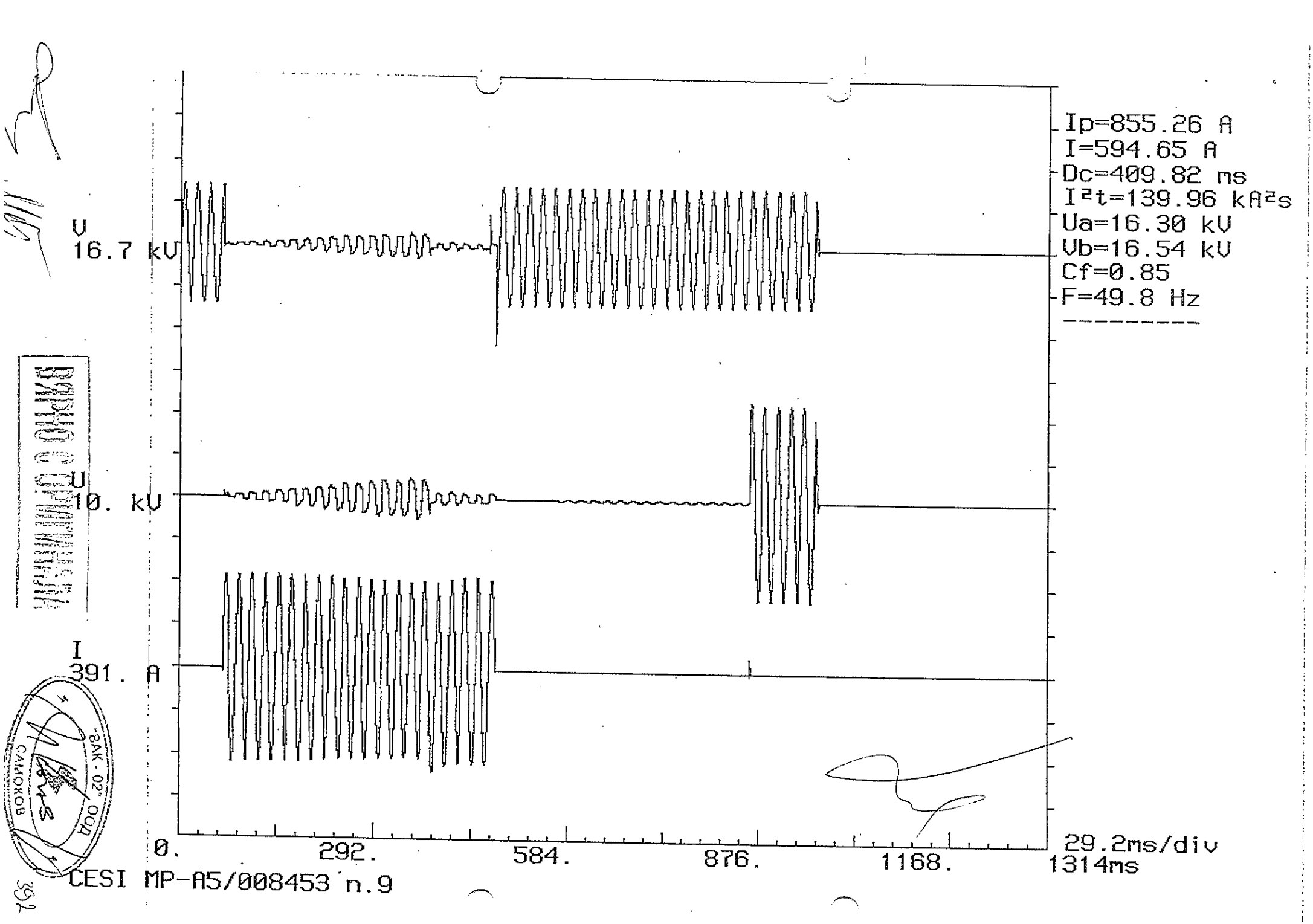


CESI MP-A5/008453 n.8

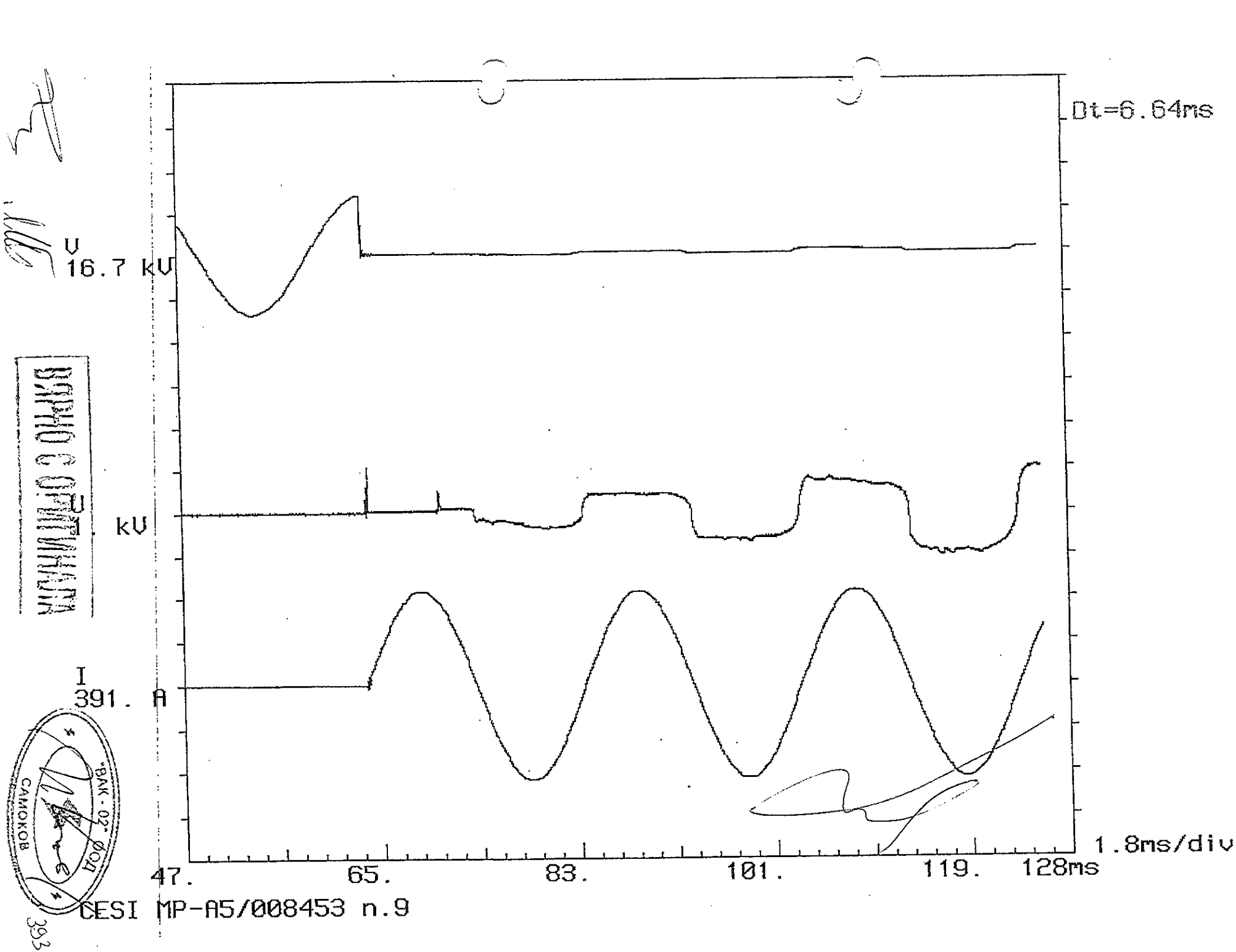
390

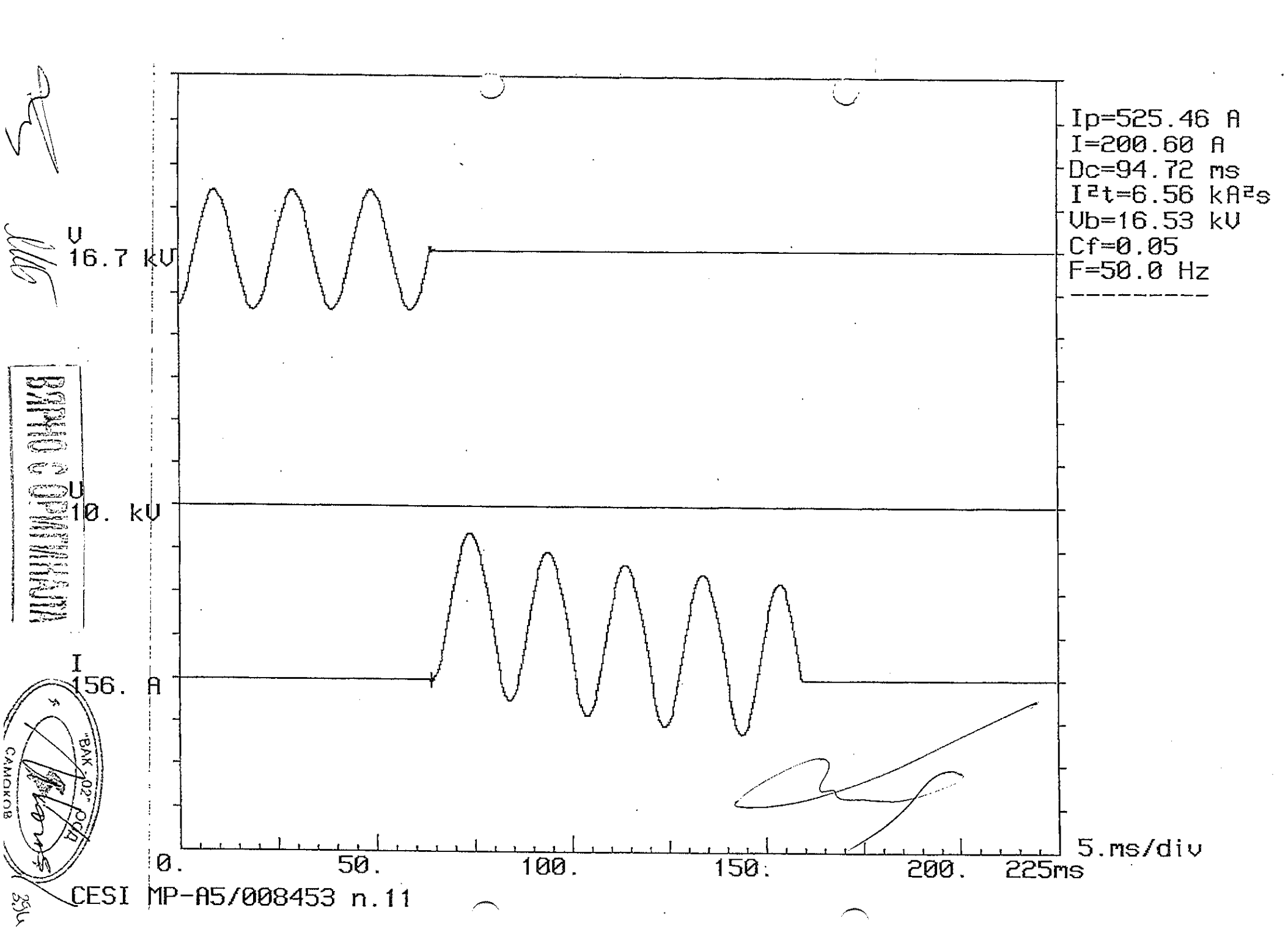


CESI MP-A5/008453 n.8

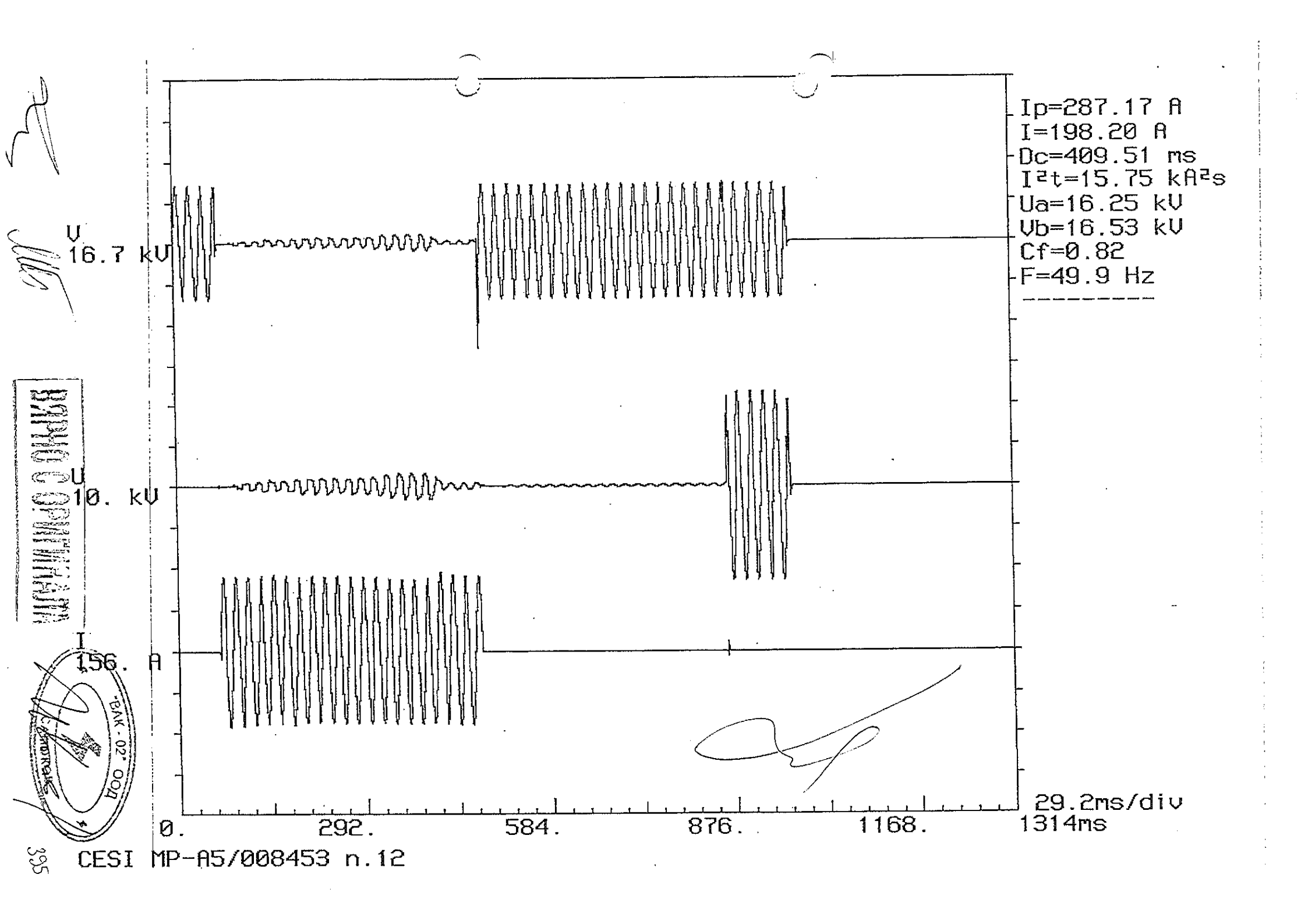


CESI MP-A5/008453 n.9

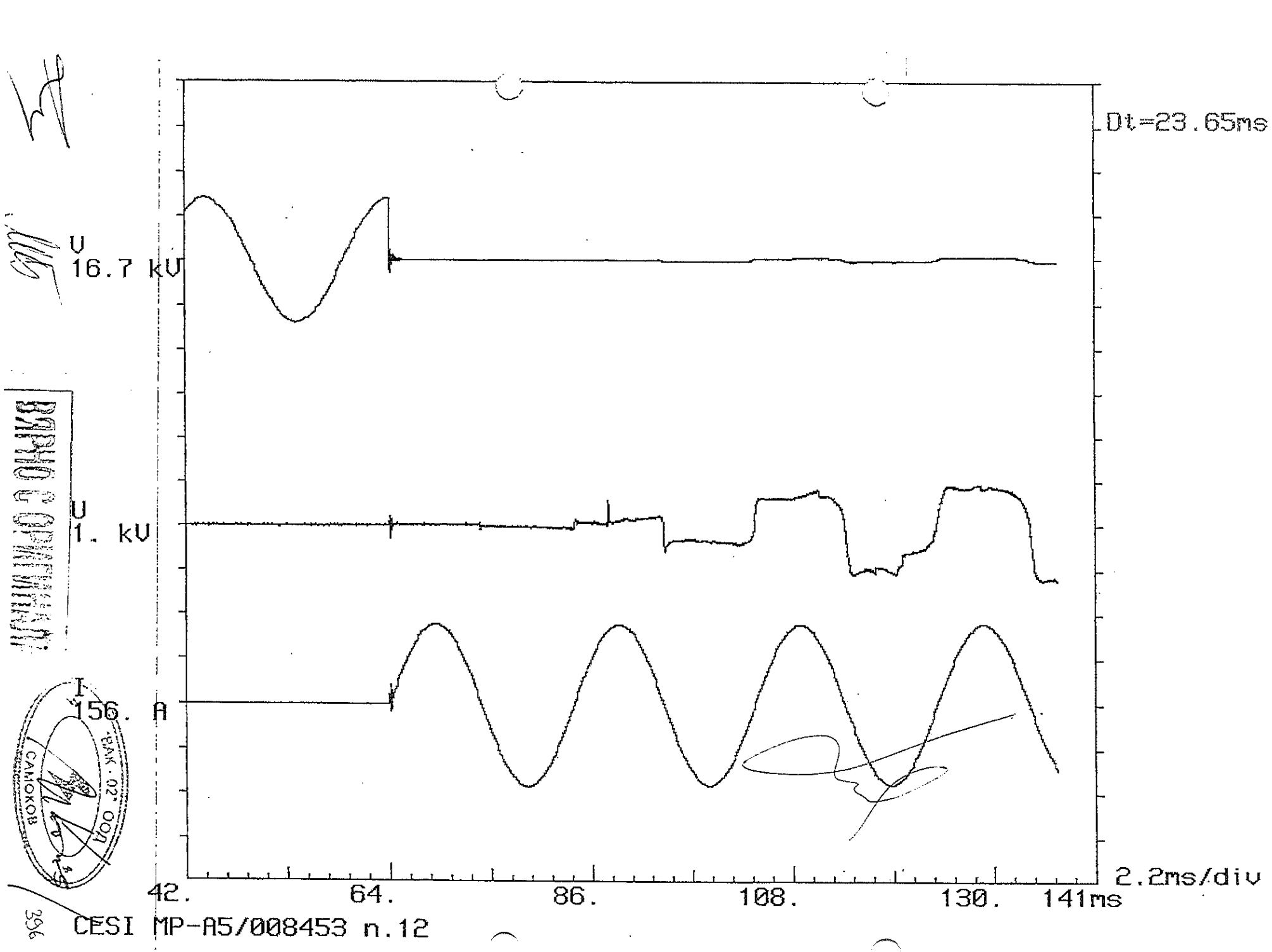

Dt=6.64ms
V
16.7 kV
U
1. kV
I
391. A
47.
65.
83.
101.
119.
128ms
1.8ms/div
CESI MP-A5/008453 n.9



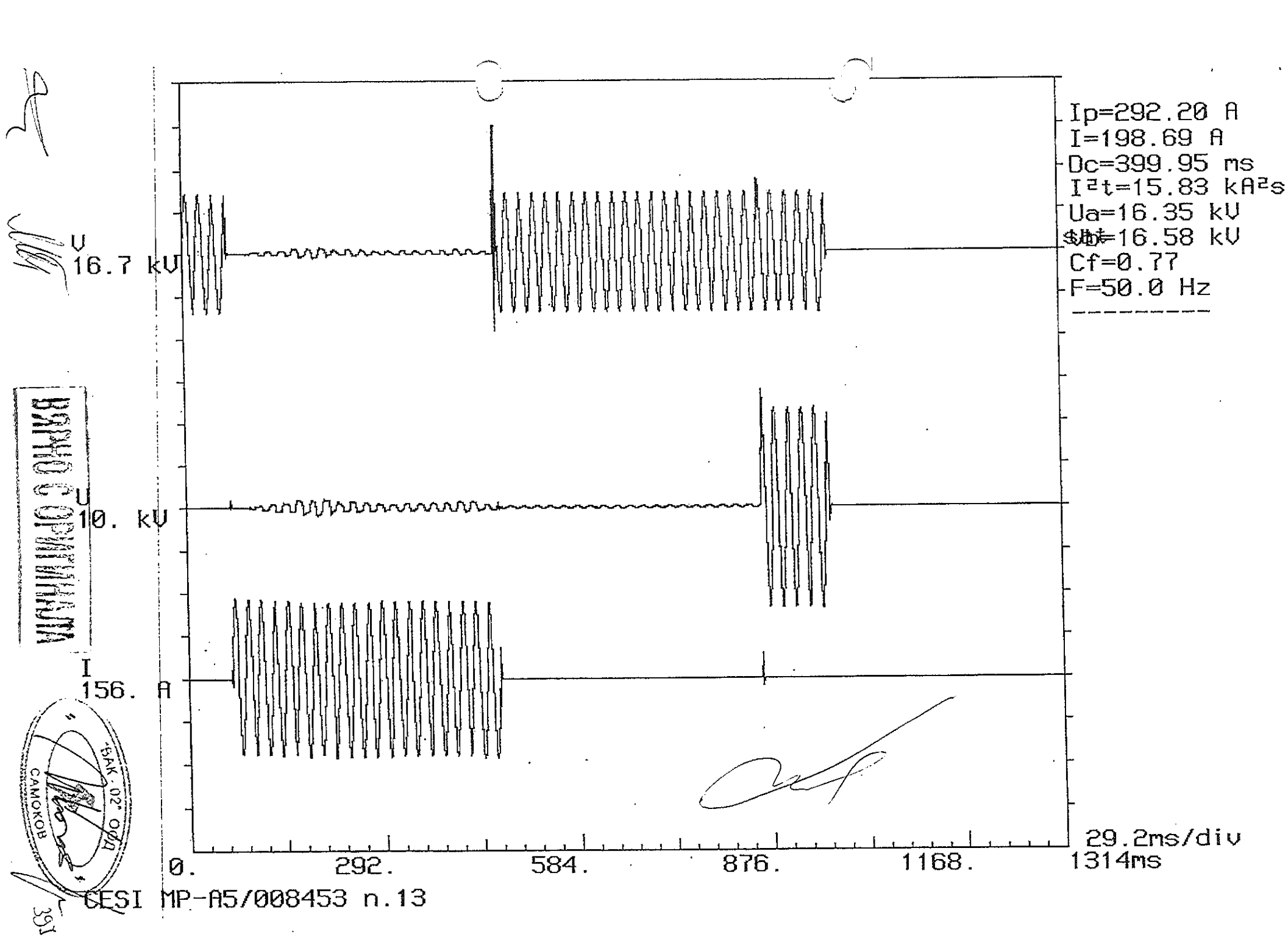
CESI MP-A5/008453 n.11



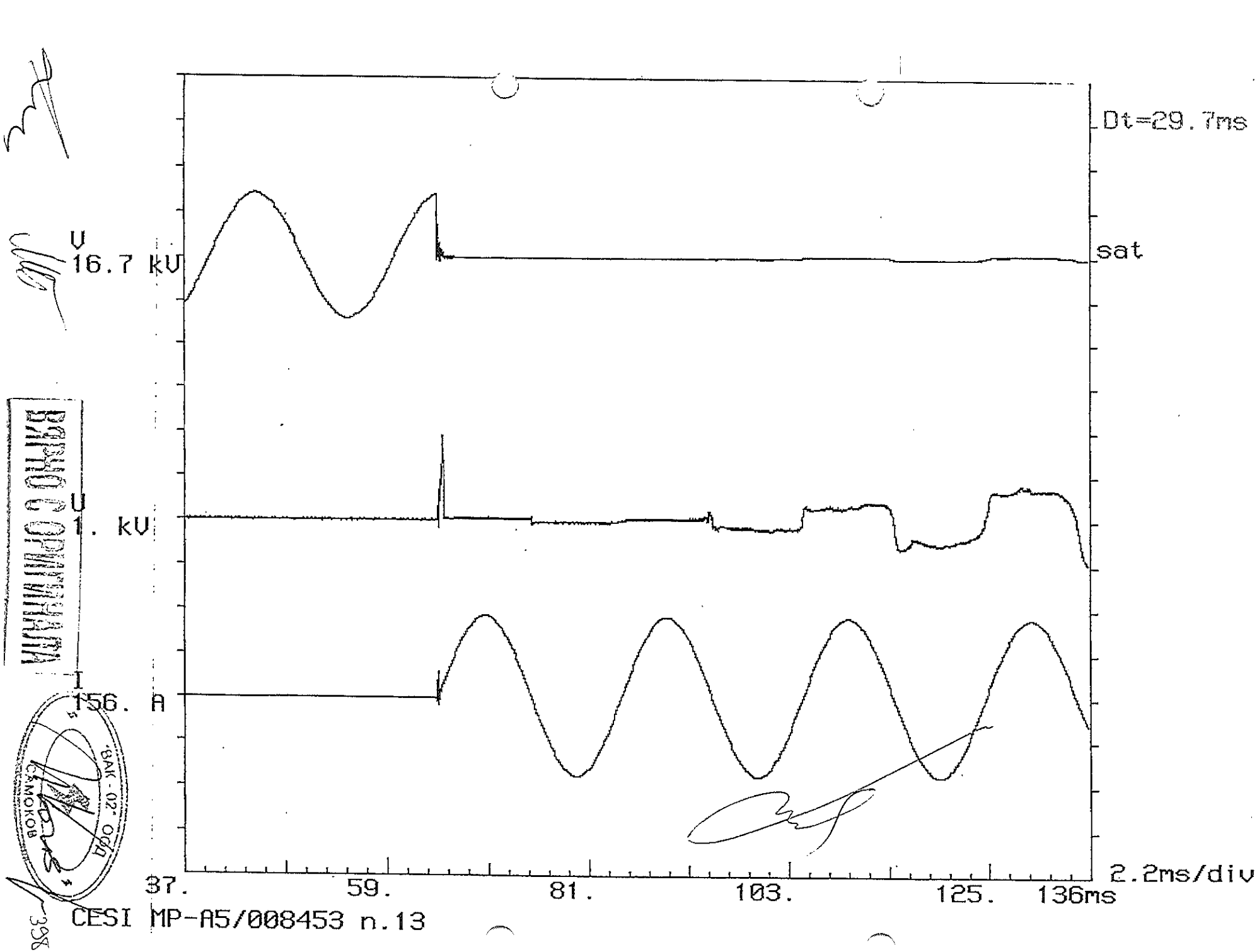
CESI MP-A5/008453 n.12



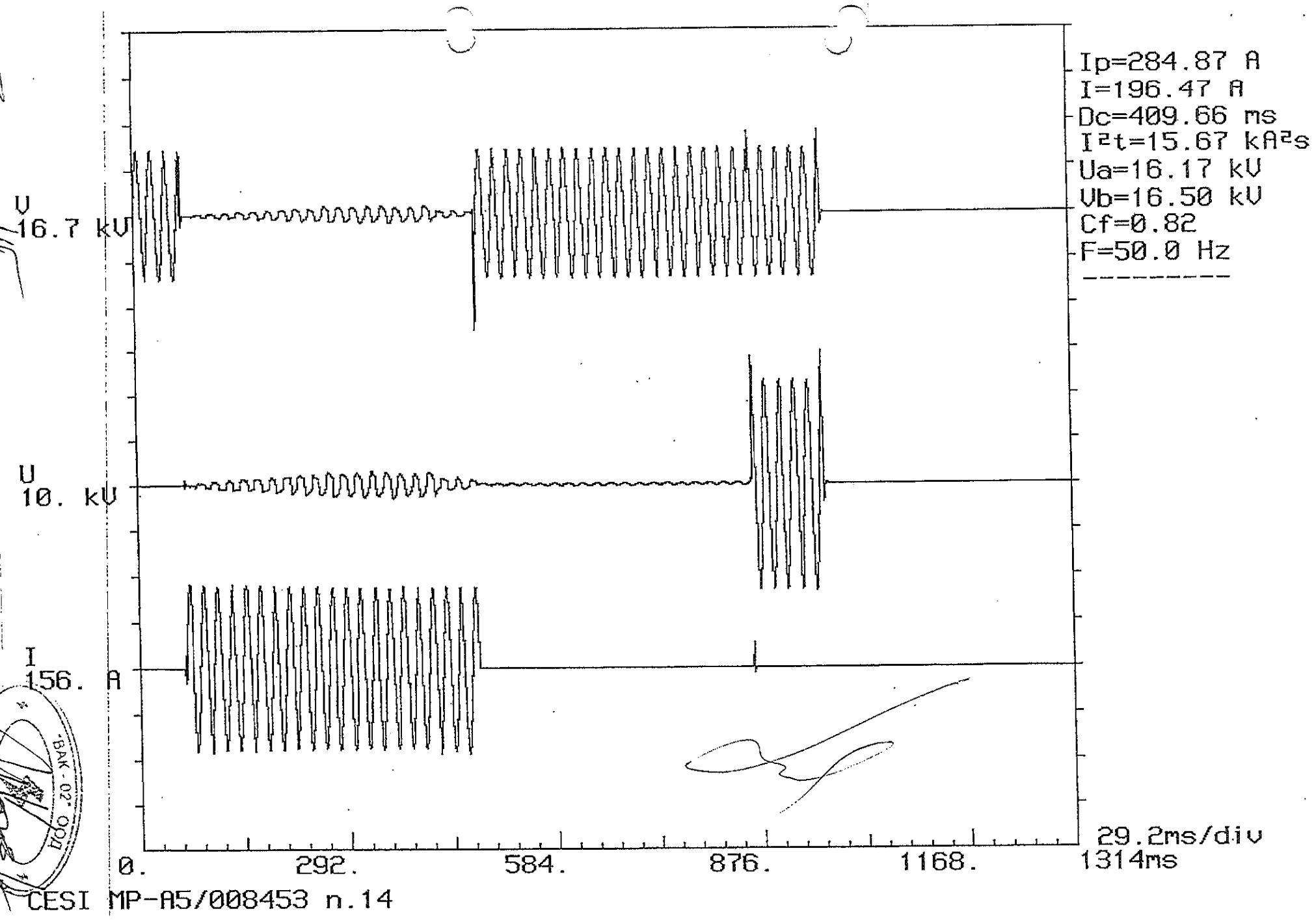
CESI MP-A5/008453 n.12



CESI MP-A5/008453 n.13

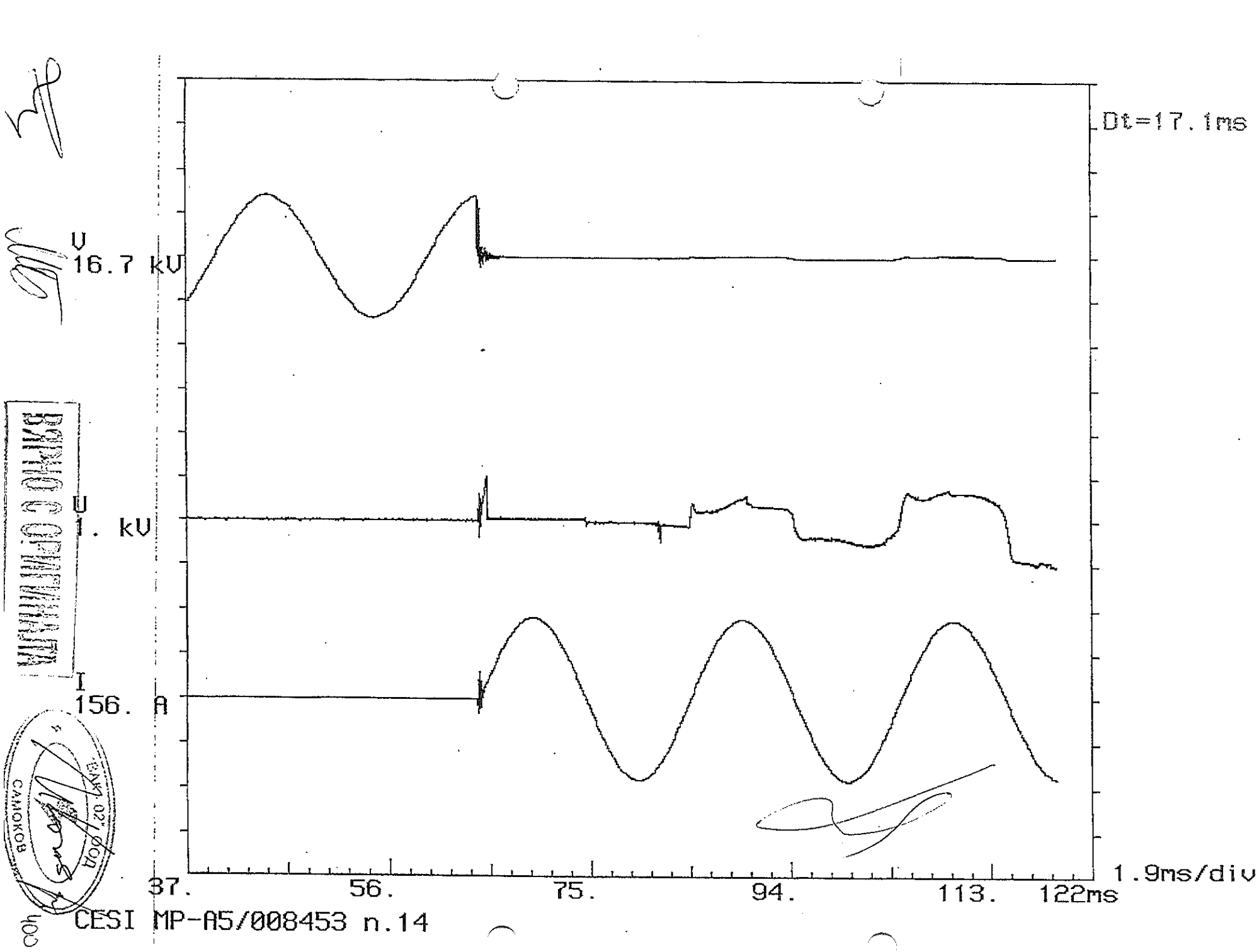


CESI MP-A5/008453 n.13

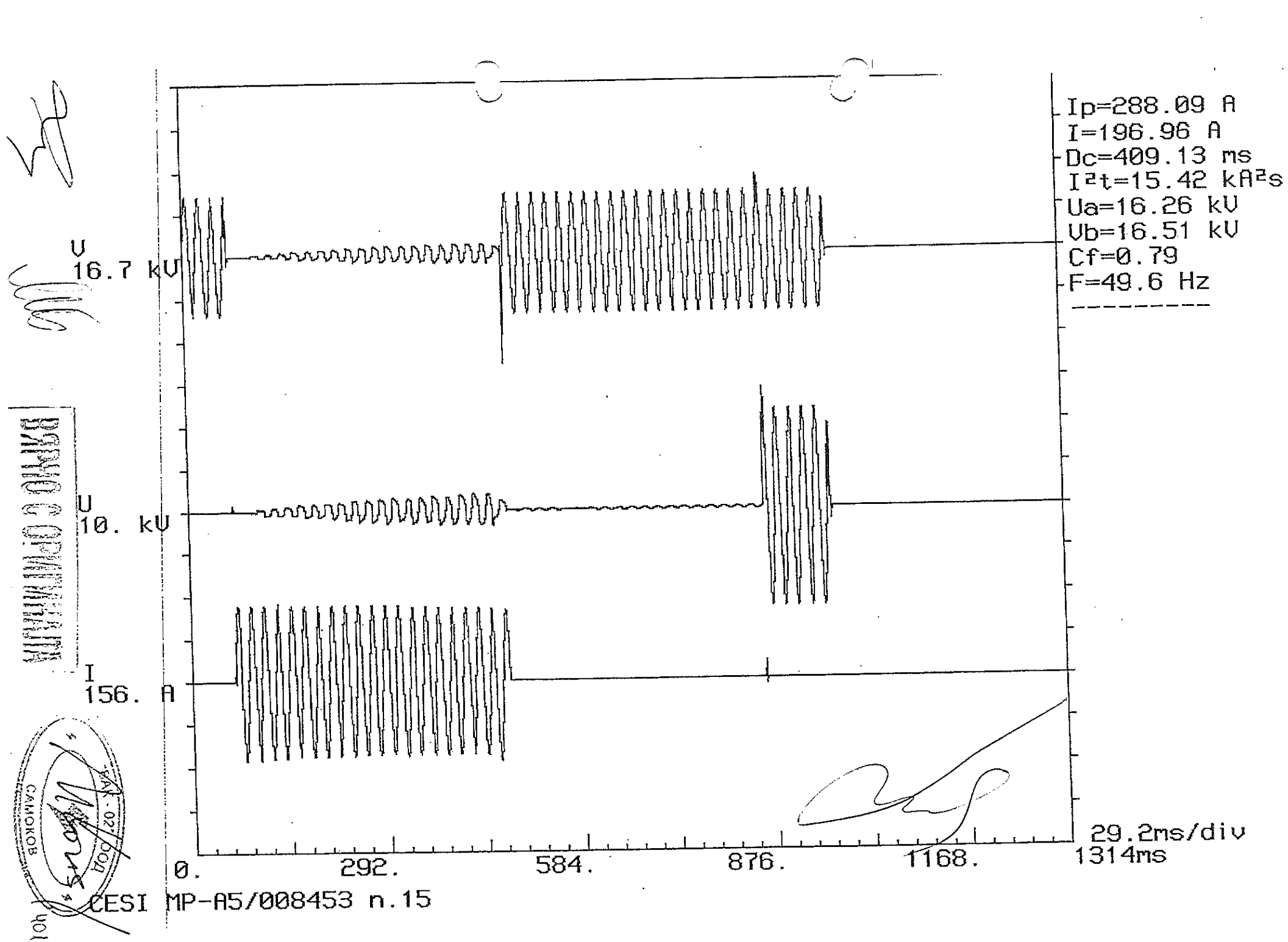


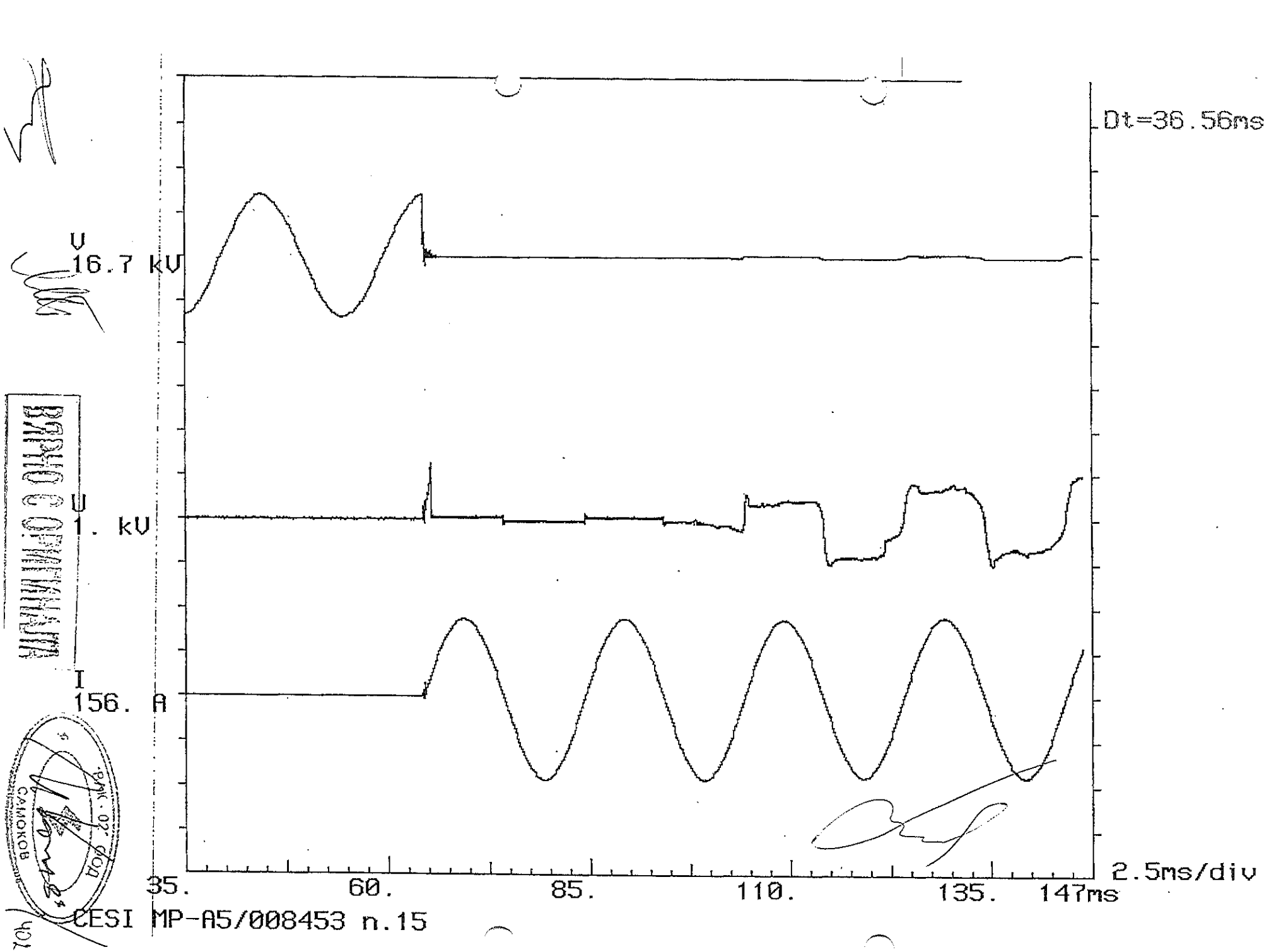
CESI MP-A5/008453 n.14

399

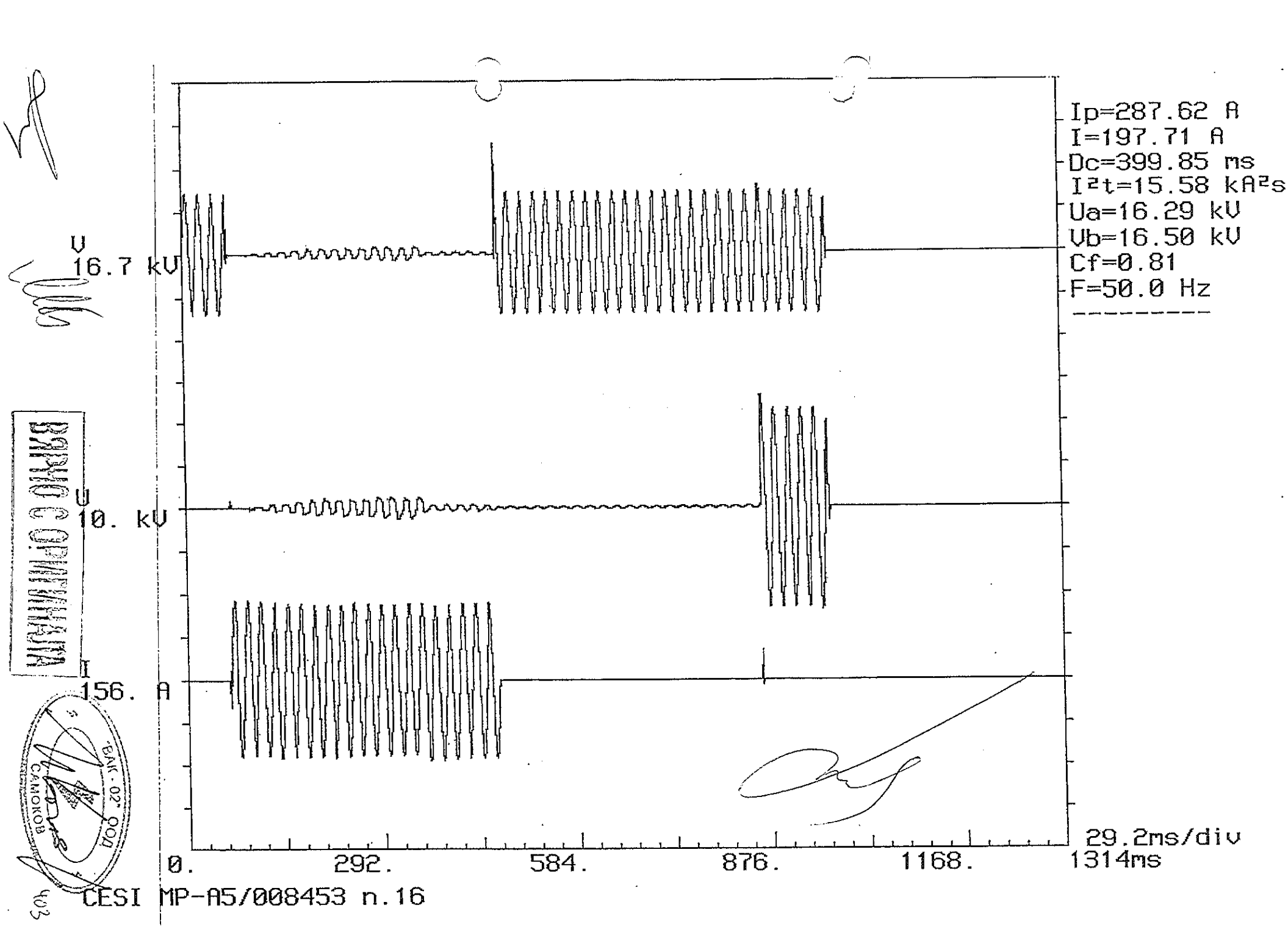


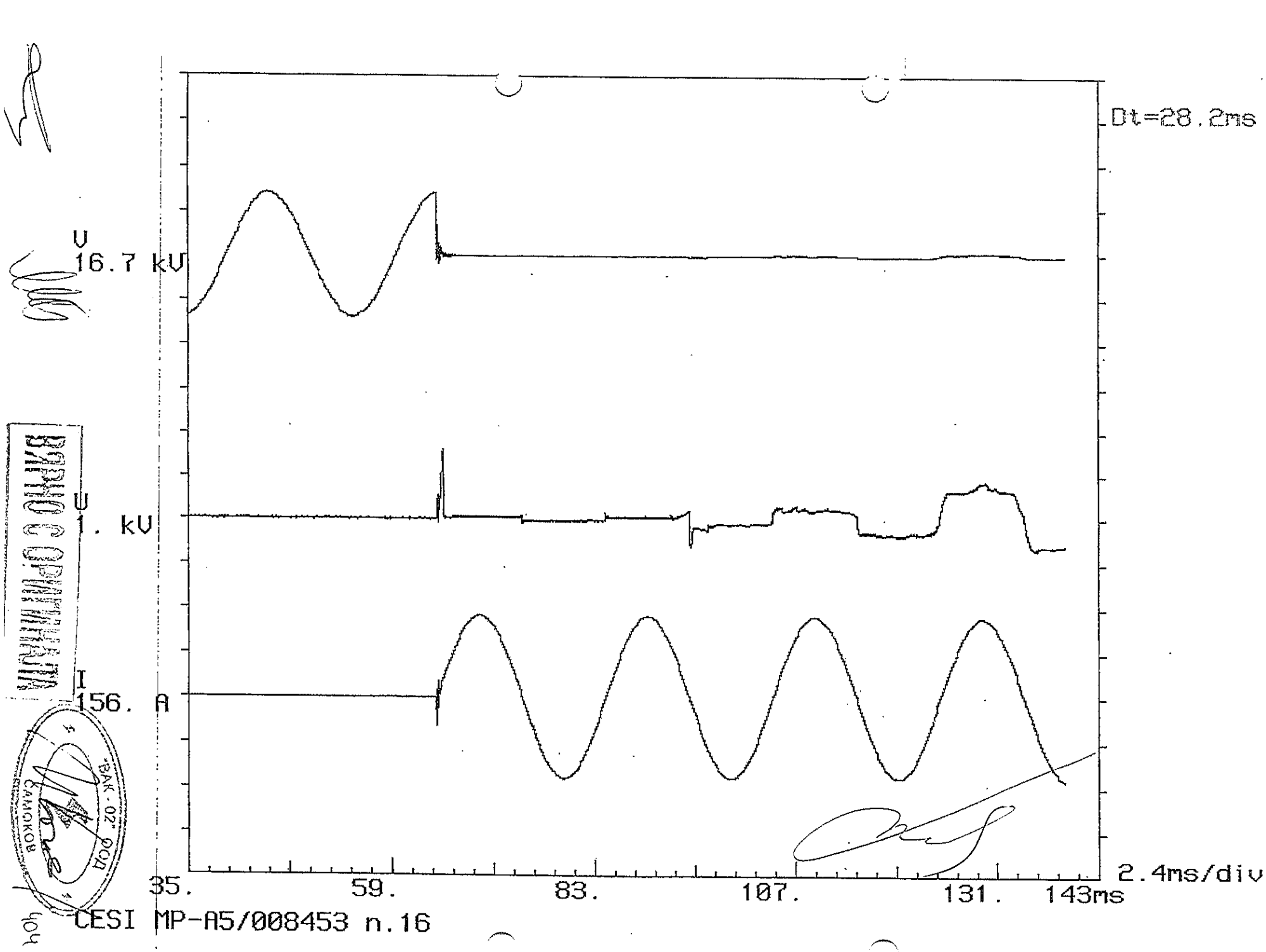
CESI MP-A5/008453 n.14

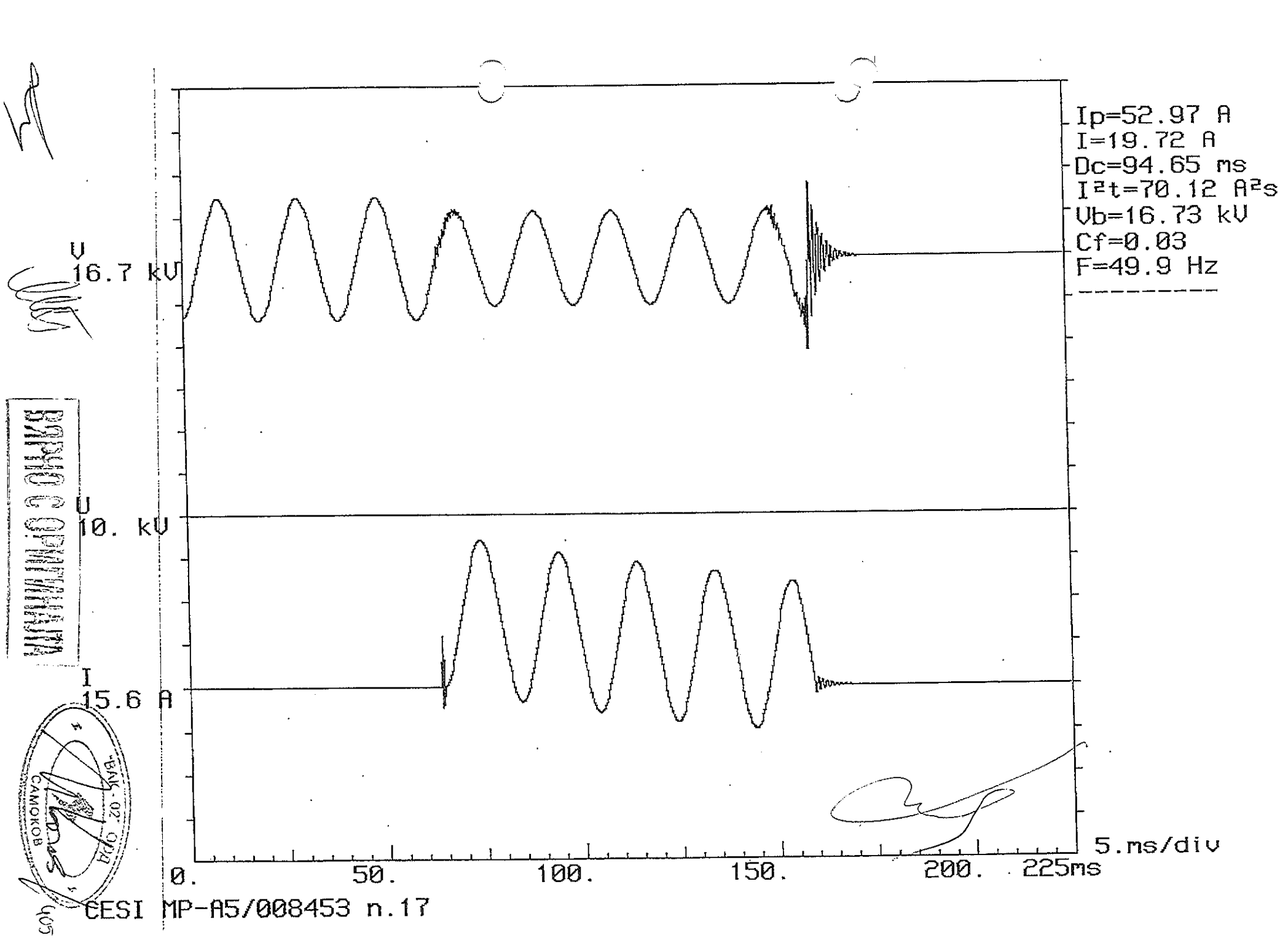

Ip=288.09 A
I=196.96 A
Dc=409.13 ms
I²t=15.42 kA²s
Ua=16.26 kV
Vb=16.51 kV
Cf=0.79
F=49.6 Hz
V
16.7 kV
U
10. kV
I
156. A
0.
292.
584.
876.
1168.
29.2ms/div
1314ms
CESI MP-A5/008453 n.15



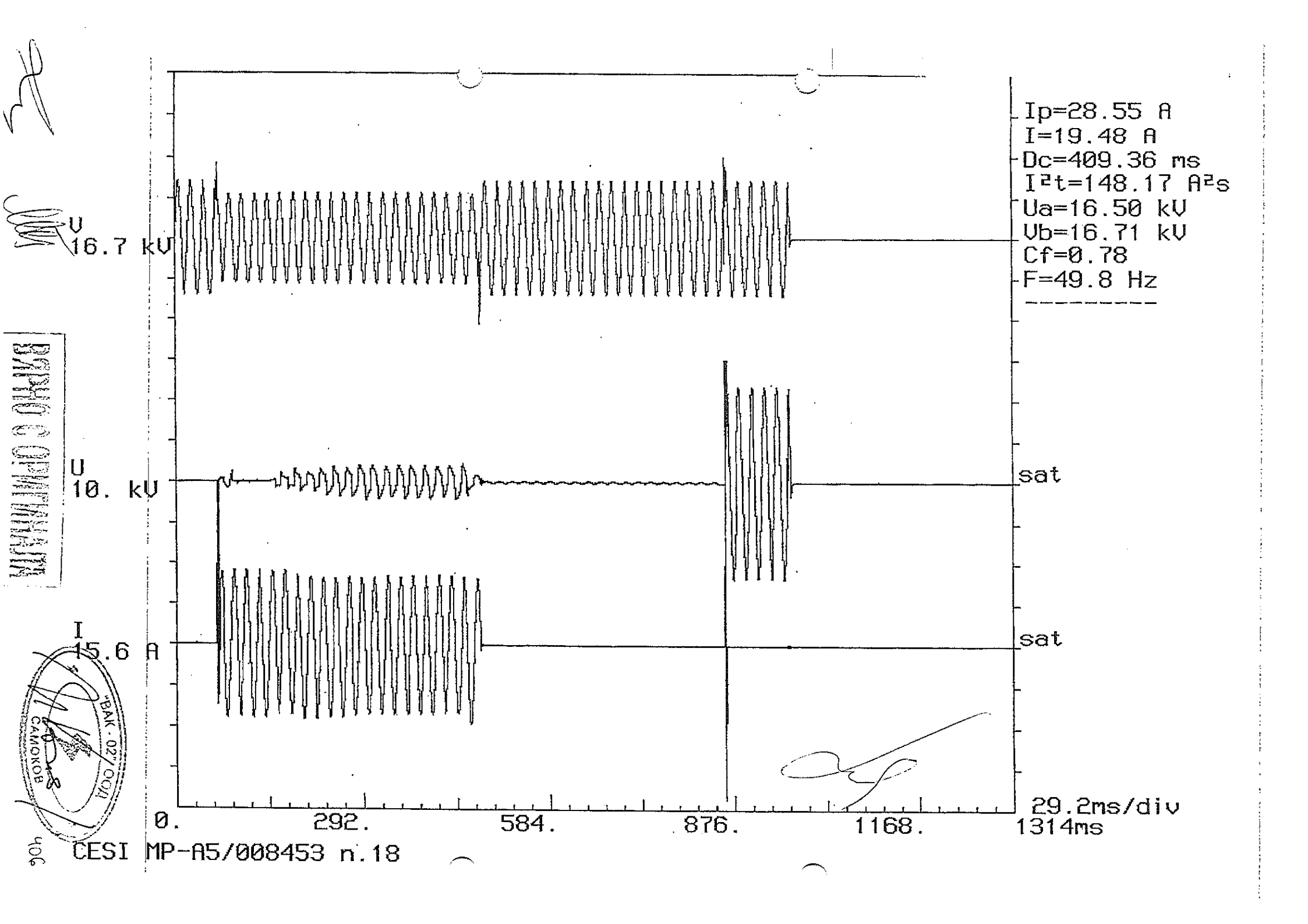
CESI MP-A5/008453 n.15

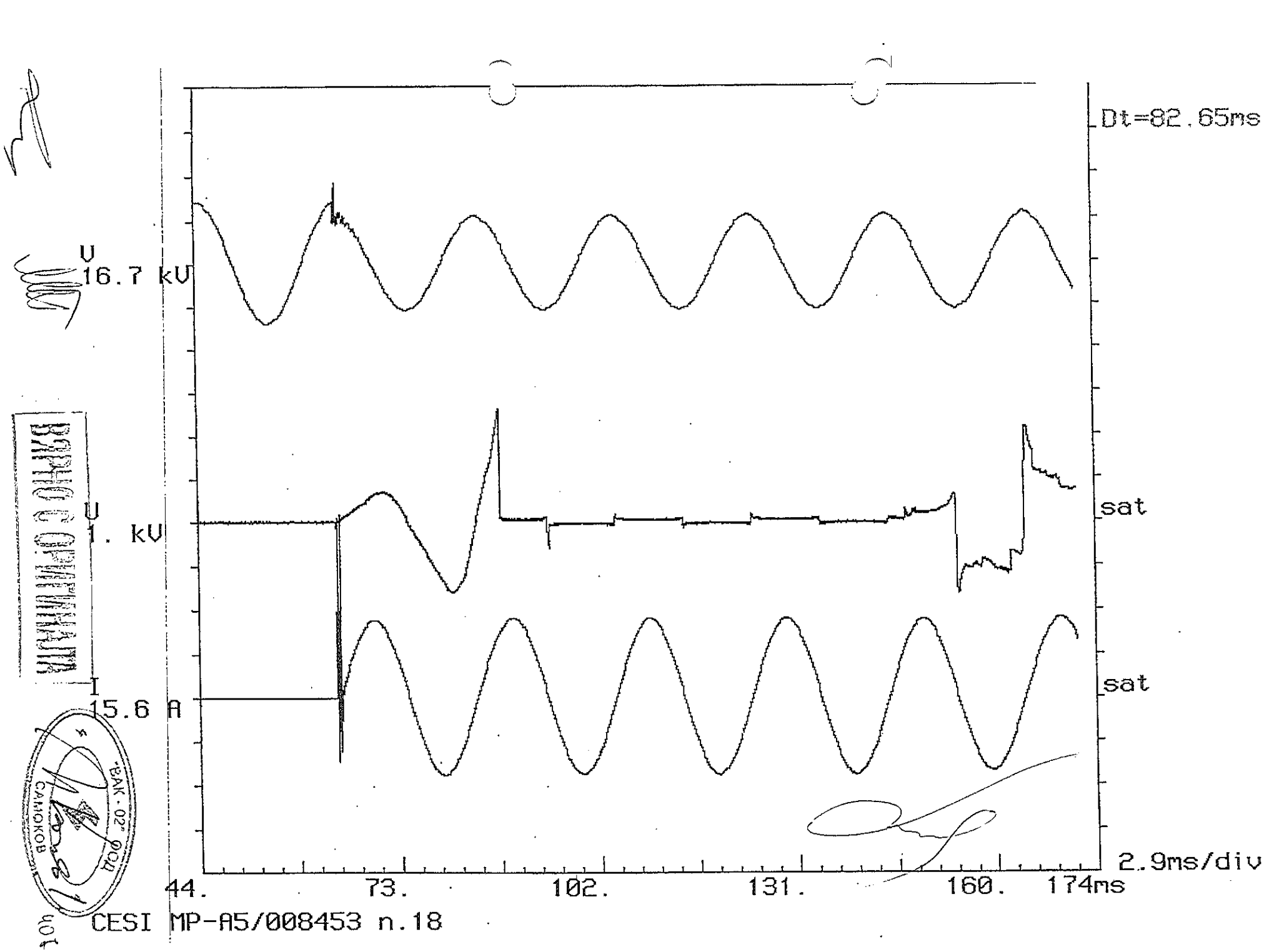

Ip=287.62 A
I=197.71 A
Dc=399.85 ms
I²t=15.58 kA²s
Ua=16.29 kV
Vb=16.50 kV
Cf=0.81
F=50.0 Hz
V
16.7 kV
U
10. kV
I
156. A
0.
292.
584.
876.
1168.
29.2ms/div
1314ms
CESI MP-A5/008453 n.16


Dt=28.2ms
V
16.7 kV
I
1. kV
I
156. A
35.
59.
83.
107.
131.
143ms
2.4ms/div
CESI MP-A5/008453 n.16

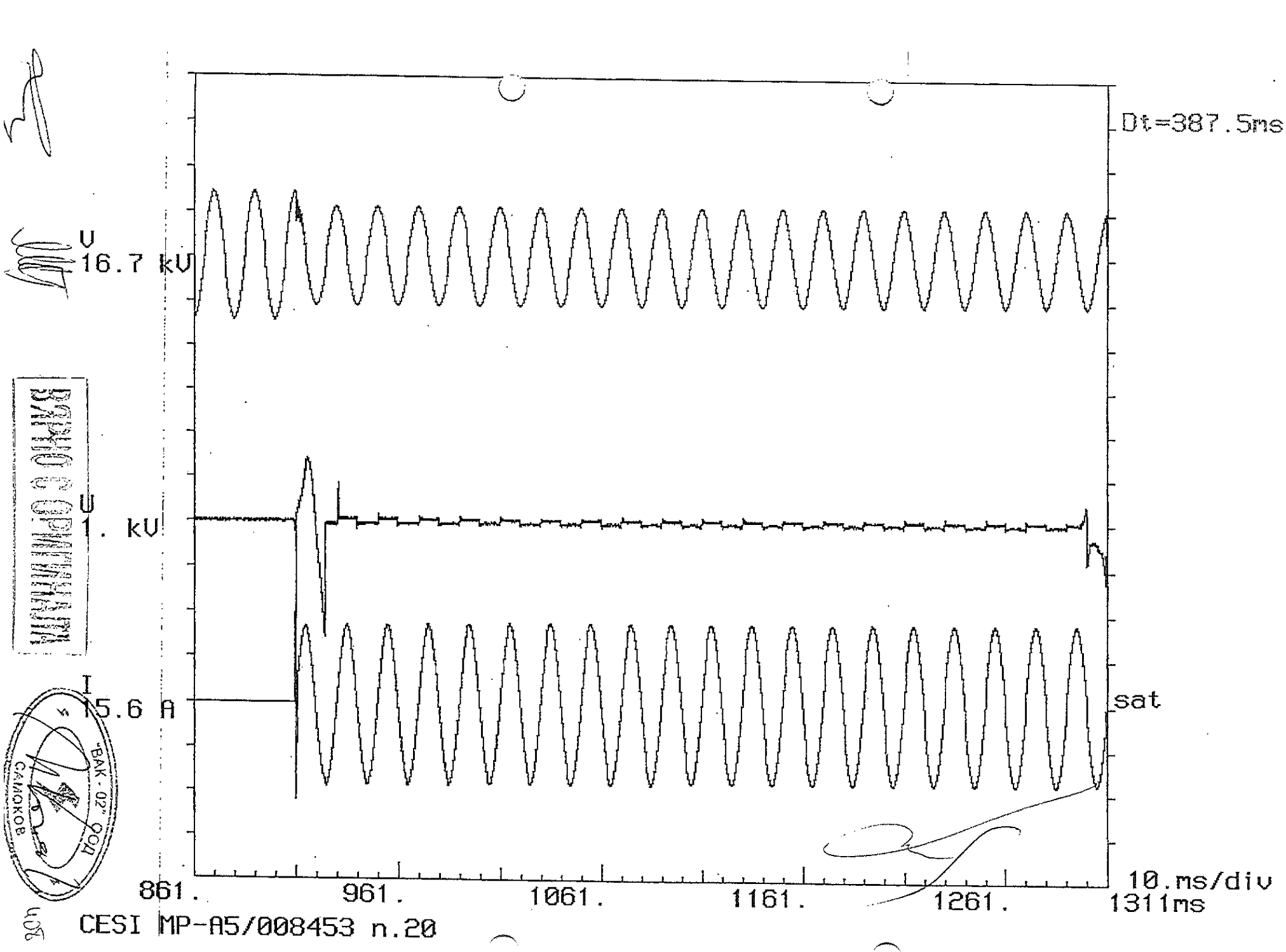


CESI MP-A5/008453 n.17

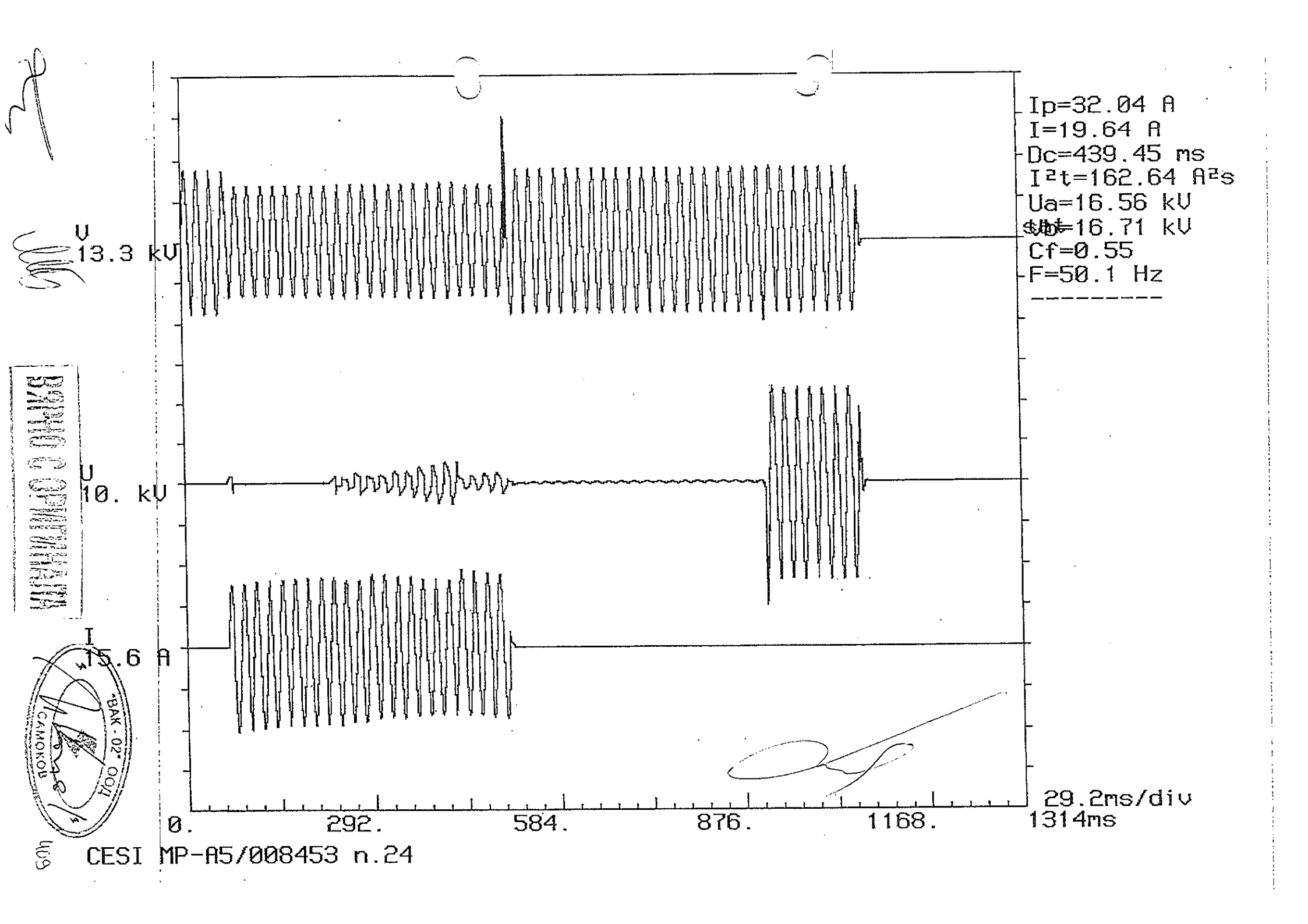

U
16.7 kV
U
10. kV
I
15.6 A
Ip=28.55 A
I=19.48 A
Dc=409.36 ms
I²t=148.17 A²s
Ua=16.50 kV
Ub=16.71 kV
Cf=0.78
F=49.8 Hz
sat
sat
0.
292.
584.
876.
1168.
1314ms
29.2ms/div
CESI MP-A5/008453 n.18



CESI MP-A5/008453 n.18

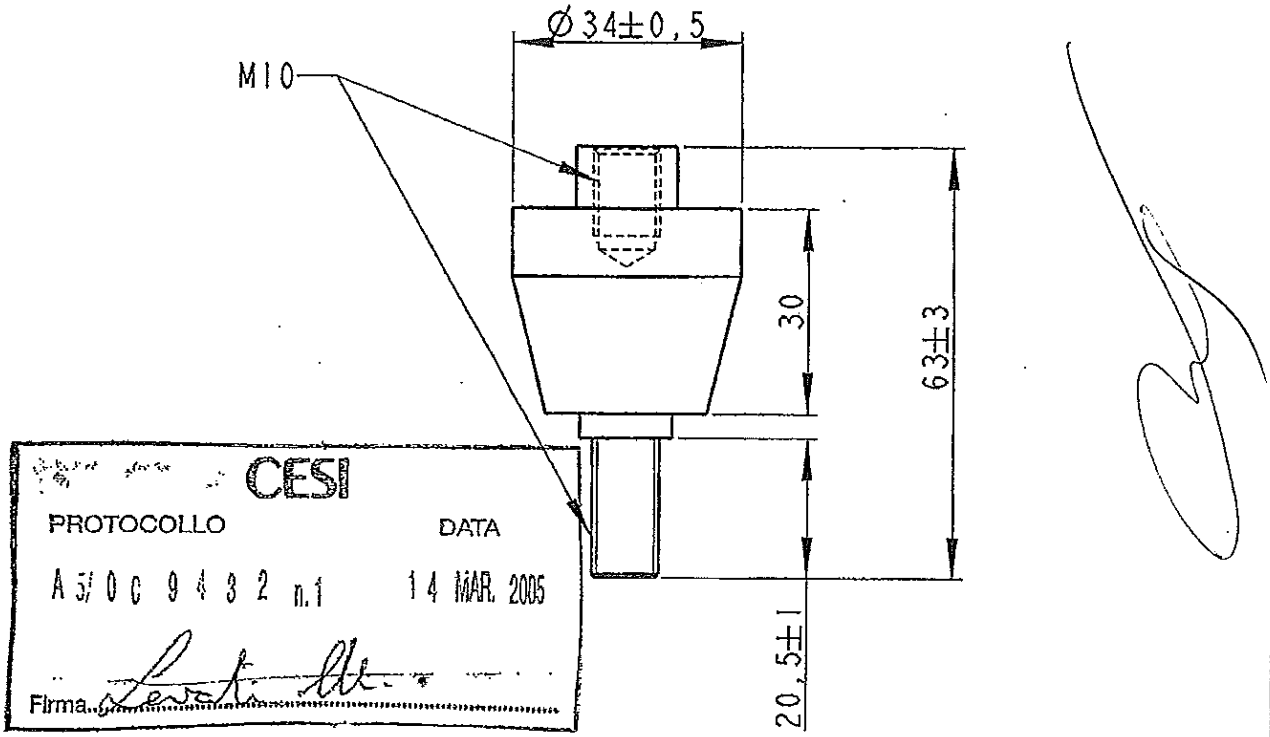


CESI MP-A5/008453 n.20



CESI MP-A5/008453 n.24

N° modif.	IND.	DESIGNATION	VISA	DATE
	A	création		
031	B	modification embout fileté	LD	04/03/05



Fournitures conforme avec la spécification Dervasil SP0809
Fournisseur LAMCO
terminal material : brass

N° PLAN	repère	nbre	Désignation	Référence	Matière	Observation
TOLERANCES GENERALES :			TRAITEMENT : ☐ GALVANISATION A CHAUD SELON SA 0223 ☐ AUTRE (voir nota)			

DECONNECTEUR

CODE ARTICLE :

dervasil
groupe SICAME

route de POPENOT - 42800 ST JOSEPH
tel : 04.77.75.29.98. fax : 04.77.83.22.80.

DESSINE PAR : LD	FORMAT : A6
DATE : 11/01/2005	ECHELLE : 1:1
VERIFIE PAR : CG	PAGE : 1/1
PLAN N° - DRAWING N° - PLANO N°	
99B000053B	

410

dervasil TECHNICAL SERVICE	TEST REPORT N° 224	MC 98 002 IND. A MAJ : 25/03/98

PRODUCT: Lightning ArresterAZBD 42

TESTS CARRIED OUT: BENDING TEST

STANDARD: IEC 60099-4 - § 10.8.9

N° SAMPLES : 0019, 0020, 0021, 0022, 0023,

TEST DATE: 28/10/2008

TEST PLACE:

- DERVASIL Laboratory

TEST PERFORMED BY: M. DZIRI

на основание чл. 2 от ЗЗЛД

CONCLUSION : Lightning Arrester AZBD 420 passed bending test

TECHNICAL DIRECTOR

на основание чл. 2 от ЗЗЛД

"ВАК - 02" ООД

1 - Identification of Samples

Lightning arrestes 0019, 0020, 0021, 0022, 0023 are manufactured with :
ZnO blocks lot 7641 Otowa 5 kV
Moulding : HTV Silicone

Height : 360 mm
Leakage distance :1045 mm
Arcing distance : 365 mm

2 - Test Equipment:

10 kg weights
Dial Torque Wrench20-100 Nm

3 - Test Procedure

3.1 Mechanical test

Following strengths were applied successively to sample
Cantilever load : 1000 N.corresponding to 350 Nm
Torque Load : 70 Nm.

Test	Result
Cantilever load 1000N 1min	No permanent distorsion
Torque load 70 Nm	No permanent distorsion

3.2 Electrical tests

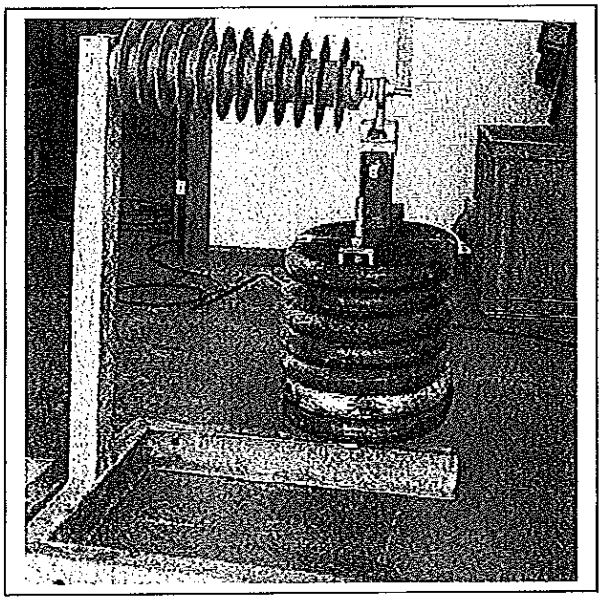
Levels of Partial Discharges have been measured before and after mechanical tests. No variations occurred.

412

4 - Breaking tests

Sample 0020 was tested until breaking

Weight (kg)	Cantilever load (Nm)	
1200	420	RAS
1300	450	RAS
1400	490	RAS
1500	520	RAS
1600	560	RAS
1700	590	RAS
1800	630	RAS
1900	660	Breaking after 20s



413

dervasil	TEST REPORT	MC 98 002 IND. A
		MAJ : 25/03/98
TECHNICAL SERVICE	N° 228	

PRODUCT: Lightning ArresterAZBD 42

TESTS CARRIED OUT: MOISTURE INGRESS TEST

STANDARD: IEC 60099-4 - § 10.8.13.

N° SAMPLES : 0023

TEST DATE: 19/01/2009 to 23/01/2009

TEST PLACE:

- DERVASIL Laboratory for themomechanical test
- FERRAZ Laboratory for initial and final verification

TEST PERFORMED BY: M. DZIRI

CONCLUSION : Lightning Arrester AZBD 420 passed moisture ingress test

TECHNICAL DIRECTOR

"ВАК - 02" ООД

414

1 - Identification of Samples

Lightning arrester 0023 is manufactured with :
ZnO blocks lot 7641 Otowa 5 kV
Moulding : HTV Silicone

Height : 360 mm
Leakage distance :1045 mm
Arcing distance : 365 mm

2 - Test Equipment:

10 kg weights
Dial Torque Wrench20-100 Nm
HV generator
Oven WEISSTECKNIC for thermal cycle

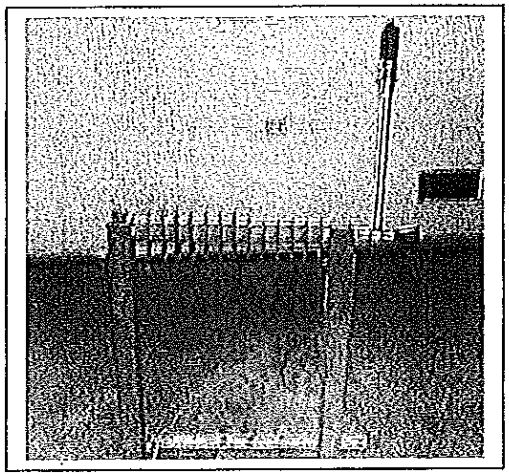
3 - Test Procedure

3.1 Initial measurement

- Measurement of Watt Loss at Uc = 35 kV
- Measurement of Discharge Partial level at 1.05*Uc = 36.75 kV
- Measurement of residual voltage at 2500 A (8/20µs wave)

3.2 Torque preconditionning

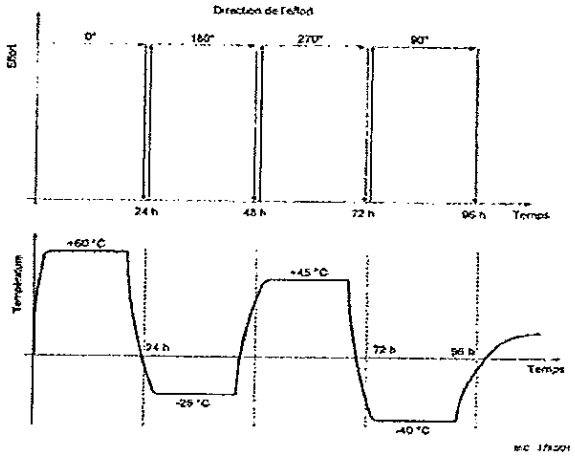
Torque Load at 70 Nm has been applied during 30s to sample

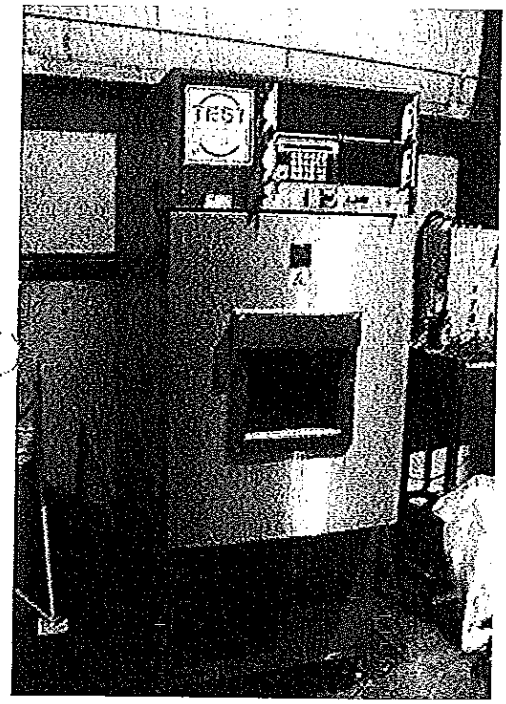


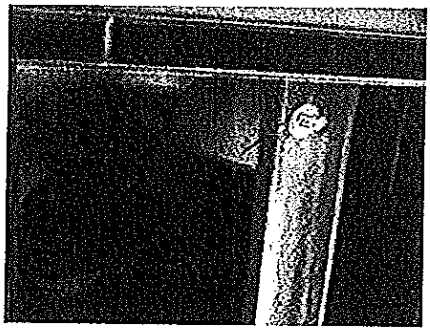
415

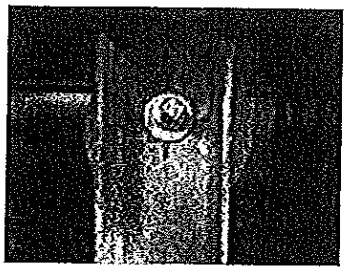
3.3 Thermomechanical preconditionning

Sample has been submitted to two 48 h thermal cycles of heating and cooling under mechanical load of 100 kg. Direction of load was changed every 24 h





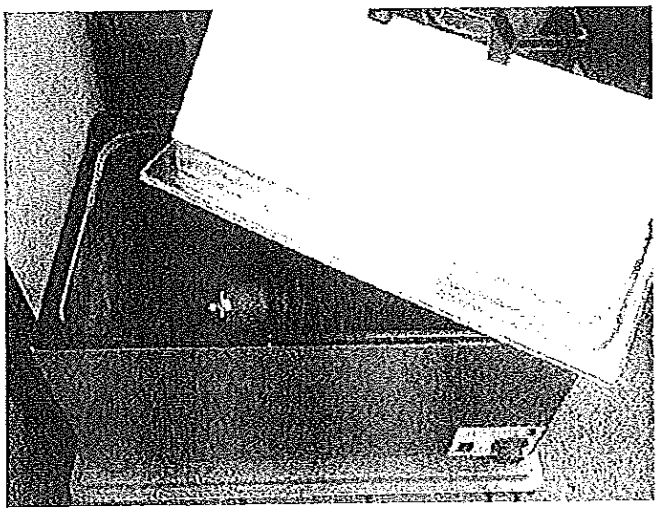




416

3.4 Water immersion

Sample has been immersed in a vessel, in boiling deionized water with 1 kg/ of NaCl, for 42h. After end sample remains in water at 50°C.



3.5 Final measurement

- Visual inspection
- Measurement of Watt Loss at Uc = 35 kV
- Measurement of Discharge Partial level at 1.05*Uc = 36.75 kV
- Measurement of residual voltage at 2500 A (8/20µs wave)

4 - Test Results

	Before test		After test		Variation
Watt loss	35 kV	0.692 W	35 kV	0.802 W	15.9%
Residual Voltage	2500 A	98 kV	2500 A	98 kV	0%
Partial discharge level		< 6pC		< 6pc	

Visual inspection after test: no damages

417

client	Dervasil - Saint Joseph (France)
equipment under test	Polymer housed metal-oxide surge arresters Type AZB 27
tests performed	Weather ageing test - Test series A
normative documents	IEC Standard 60099-4 Edition 2.0 (2004-05).
receipt date of the sample	May 24, 2004
test date	from July 8, 2004 to August 24, 2004
no. of pages	22 no. of pages annexed 8

the test results relate only to the sample tested
this document shall not be reproduced except in full without the written approval of CESI

first issue date	May 12, 2005	
prepared	PeC/TEST - G. Fedeli	на основание чл. 2 от ЗЗЛД
verified	PeC/TEST - A. Sironi	
approved	PeC/TEST - M. de Nigris	

CESI
CENTRO ELETTROTECNICO SPERIMENTALE ITALIANO
Business Unit
Prova
Il Respons

на основание чл. 2 от ЗЗЛД

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
САМОКОВ

415

tests witnessed by: /

identification of the object: Performed

The Manufacturer guarantees that the tested surge arrester is manufactured according to the submitted drawings.
CESI checked that these drawings adequately represent in shape and dimensions the essential details and the parts of the tested object.
These drawings identified by CESI and numbered A5/021441 no.1 to 10 have been returned to the Client.

The data necessary to permit repetition of the tests are contained in the document marked: —

The measurement uncertainties of the test results reported in this document are the following:
- dielectric tests with impulse voltage : **peak voltage: ± 3 % ; time parameters: ± 10 %**
- dielectric tests with impulse current : **peak value: ± 3 % ; time parameters: ± 10 %**
- dielectric tests with alternating voltage : **voltage (rms): ± 3 %**
- dielectric tests with direct voltage : **voltage: ± 3 %**

The measurement uncertainties are estimated at the level of twice the standard deviation (corresponding, in the case of normal distribution, to a confidence level of about 95 %) and have to be considered as maximum values.

---

laboratory information

CESI testing team: G. Fedeli

test laboratory: P188

activity code: 41285B
keywords: 12015R 23801L 31020W 44060J 53001D

ВЯРНО С ОРИГИНАЛА

"ВАК-02" ООД САМОКОВ

contents	page	test date
Test object	4	
Test carried out and test procedure	8	
Summary of test result	9	
Initial measurements	11	05/12/04
Weather ageing test. Test circuit	13	
Weather ageing test. Test arrangement	14	
Weather ageing test. Pictures after the test	16	07/08/04 to 08/24/04
Final measurements	21	08/30/04

Reference documents annexed:

Oscillograms (8 pages), CESI no. A4/510342

Test object

Type: Two polymer housed metal-oxide surge arrester type AZB 27.
The test objects were identified by Cesi as sample W1 and sample W2.

electrical characteristics (claimed by the client)

manufacturer's name	DERVASIL - Saint Joseph (France)
nominal discharge current - I_N [kA]	10,0
rated voltage - U_n [kV]	27,0
continuous operating voltage - U_c [kV]	22,0
line discharge class	1
rated frequency - [Hz]	50

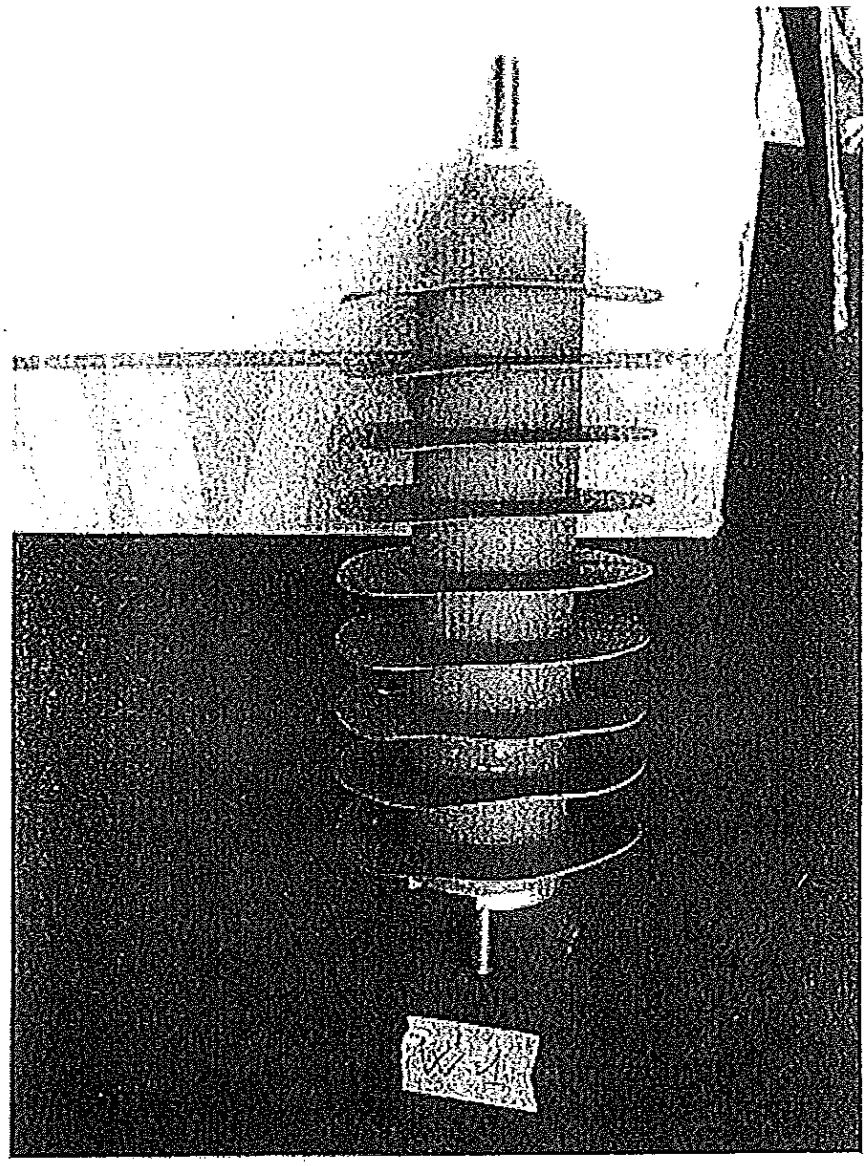
Dimensional characteristics of the test objects, claimed by the Client:

total height [mm]	272,4
sheds diameter [mm]	119
core diameter [mm]	59,4

Dimensional characteristics of the test objects measured by Cesi

total height [mm]	270
creepage distance [mm]	711
arching distance [mm]	297
number of sheds [n]	9
sheds diameter [mm]	116
core diameter [mm]	59,5
sheds spacing [mm]	25
sheds projection [mm]	30

Picture of the test object W1

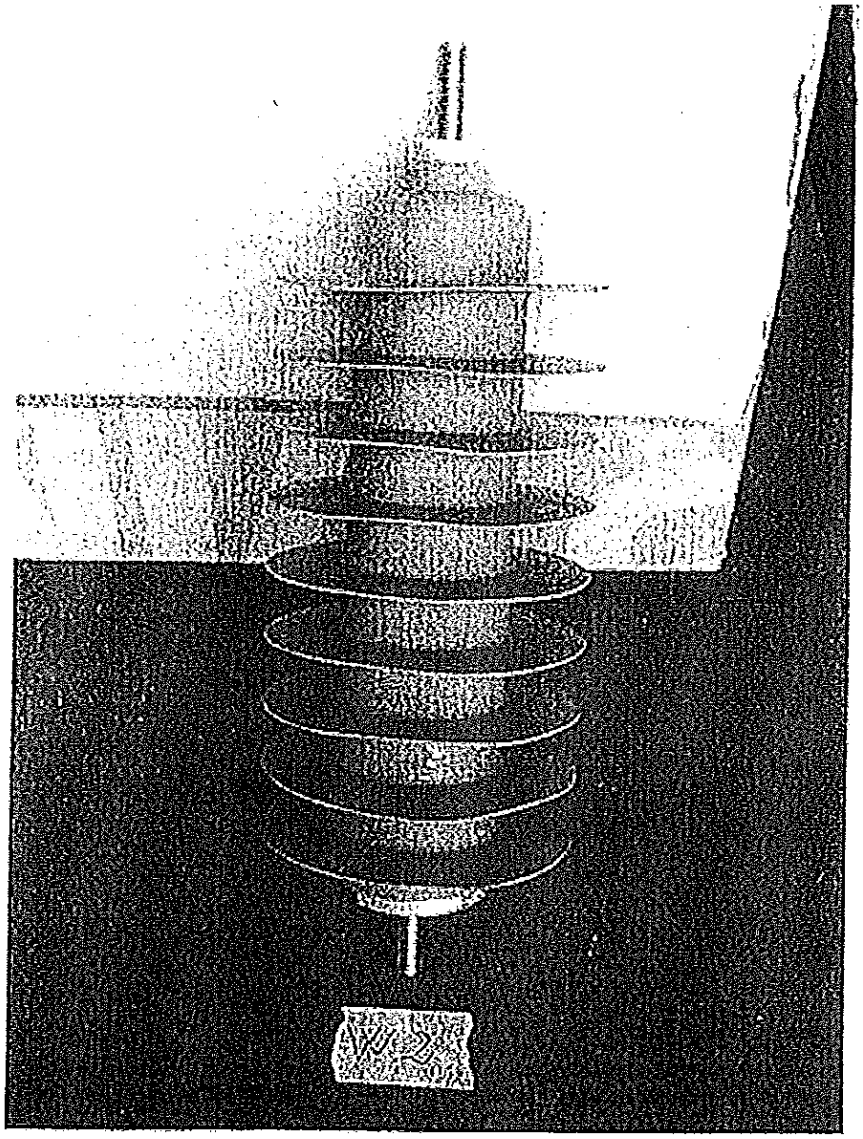


ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
САМОКОВ

423

Picture of the test object W2



424

Test carried out and test procedure

Test has been carried out according with IEC Standard 60099-4 (2004-05) edition 2.0 "Metal-oxide surge arrester without gaps for a.c. system", at clause 10.8.14 .

Initial measurement

- The reference voltage have been measured at reference current equal to 5 mA_{pk}

- Internal partial discharge have been measured.
The application voltage has been increased up to rated voltage (U_r) and maintained for 10 sec.
The voltage has been decreased to 1,05 times the continuous operating voltage (U_c) and the partial discharge level has been measured according to the reference standard.

Weather ageing test. Test series A: 1000 hours

Note: During the weather ageing test, the test objects were tested in parallel with a Dervasil insulator.

The test samples have been assembled in the test room in vertical position spaced each-other and from the chamber walls in order to avoid electrical field disturbance.
Test objects have been cleaned with deionized water before starting the test.

The surge arresters have been energized at U_{test} = 22 kV_{rms} and kept for a total duration of 1000 hours in the test room filled with salt fog.

The water flow rate was 0,4 ± 0,1 l/h*m^3

At the beginning the salinity of the water solution was 10 Kg/m^3.Than it has been decresed to 5 Kg/m^3 after 591 hours, and to 2,5 Kg/m^3 after 610 hours (see the paragraph "summary of test result").

The salt fog was not directly sprayed against the test specimens.

A scheme and a view of the test configuration are shown at pages 14 and 15.

The test sample has been visually inspected after about 500 hours and at test completion.
Photos were taken at the end of the test.

Final measurement

The initial measurement were repeated.

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

425

Summary of test result

Test series A: 1000 hours

The external flashovers occured during the test are noted in table below. The test salinity had to be changed twice.

sample W1	sample W2	test salinity	salinity change
1st Flashover after 565 h		10 g/l	
2nd Flashover after 591 h		10 g/l	from 10 to 5 g/l
3rd Flashover after 595 h		5 g/l	
	1st Flashover after 610 h	5 g/l	from 5 to 2,5 g/l
	2nd Flashover after 976 h	2,5 g/l	
	3nd Flashover after 981 h	2,5 g/l	

Visual inspection

Note: Sheds are numbered starting from the live side.

- After 500 hours

No tracking, shed puncture or significant erosions have been evidenced by the visual inspection carried out after 500

- After 1000 hours

Sample W1:

An overall view of the object after 1000 hours is shown in the photo at page 16.
No tracking, significant erosion or puncture was observed.
Shallow and diffuse erosions were visible on all circunference of the core between sheds n.2 and n.3 and, in less diffused way, also on the core between sheds n.3 and n.4 (see photo at page 17).

Sample W2:

An overall view of the object after 1000 hours is shown in the photo at page 18.
No tracking, significant erosion or puncture was observed.
Shallow erosions on the cores between sheds n.2-3, sheds n.4-5 and sheds n.6-7 (see photo at page 19).
Shallow and diffuse erosions were visible on all circunference of core between sheds n.8 and n.9 (see photo at page 20).

ВЯРНО С ОРИГИНАЛА

"БАК - 02" ООД САМОКОВ

426

Variation of the reference voltage

Type	before test	after test	variation
	kV	kV	%
W1	27,26	27,9	+ 2,3
W2	28,03	28,4	+ 1,3

Acceptance criteria: satisfied

Partial discharge level

Type	before test	after test
	pC	pC
W1	<1	<1
W2	<1	<1

Acceptance criteria: satisfied

Conclusion: the acceptance criteria specified by the standard are satisfied. The test result is positive.

ВЯРНО С ОРИГИНАЛА

BAK - 92 OOA
CAMOKOB

421

Measurement of the reference voltage - initial

test object: Polymer housed metal-oxide surge arresters
test circuit: /

date: May 12, 2004

sample W1						
oscill.	voltage	current	current	current	power	3rd harmonic amplitude
no.	kV	+ mA_{cr}	- mA_{cr}	mA_{rms}	W	µA
1	27,26	4,94	4,82	1,04	25,18	/

date: May 12, 2004

sample W2						
oscill.	voltage	current	current	current	power	3rd harmonic amplitude
no.	kV	+ mA_{cr}	- mA_{cr}	mA_{rms}	W	µA
2	28,03	3,95	5,04	1,37	23,80	/

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

Measurement of partial discharges - initial

test object: Polymer housed metal-oxide surge arresters

test circuit: /

measurement circuit: /

arrangement: —

atmospheric conditions		
b	t	h
kPa	°C	g / m³
/	24	/

date: May 13, 2004

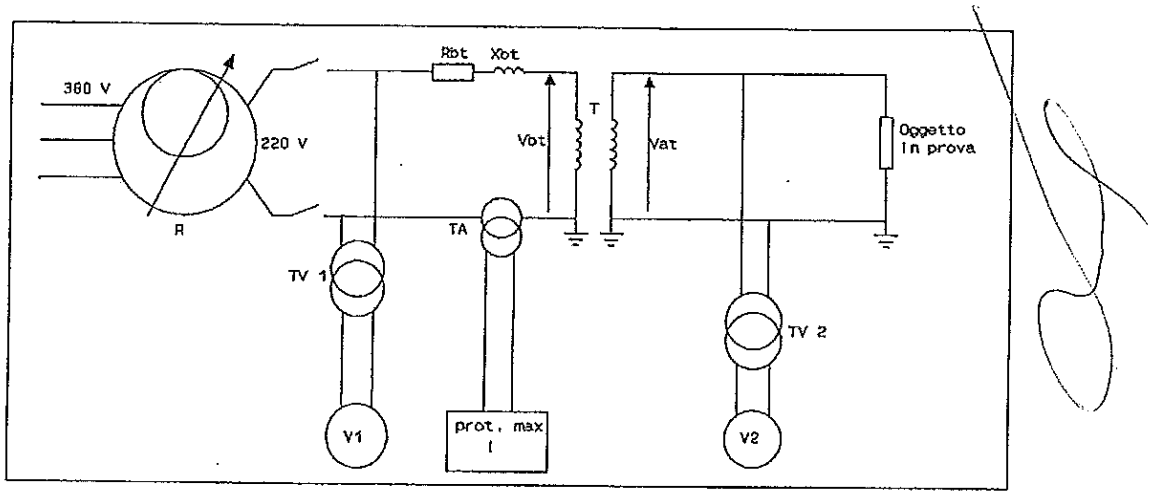
sample W1

test condition	applied voltage	duration of voltage application	temperature of the test object	voltage increase Q max	voltage decrease Q max	oscillogram	note
	kV_{rms}	sec	°C	pC	pC	no.	
rated voltage	27	10	24	/	/	/	/
22 x 1,05	23,1	/	24	/	≤ 1	/	/

sample W2

test condition	applied voltage	duration of voltage application	temperature of the test object	voltage increase Q max	voltage decrease Q max	oscillogram	note
	kV_{rms}	sec	°C	pC	pC	no.	
rated voltage	27	10	24	/	/	/	/
22 x 1,05	23,1	/	24	/	≤ 1	/	/

Weather ageing test.



power frequency test circuit (plant P188)

R : regulator type M.E.S.A.; power 66 kVA ; output voltage 220 V ; CESI no. 29991
TA : current reducer ; ratio 150A / 5A
TV_1 : voltage reducer ; ratio 220V / 100V
V_1 : direct reading voltmeter
T : booster transformer PIVI type TMO/230 ; power 50 kVA ; ratio 220 V / 30 kV ; primary current 227 A ; secondary current 1,67 A ; CESI no. 38675
TV_2 : voltage reducer CGS type VSO 534 ; CESI no. 287 ; ratio 30/0,1 kV
V_2 : voltmeter ANALOGIC Type DP100 ; CESI no. 9533

check of the test circuit

date: August 8, 2004

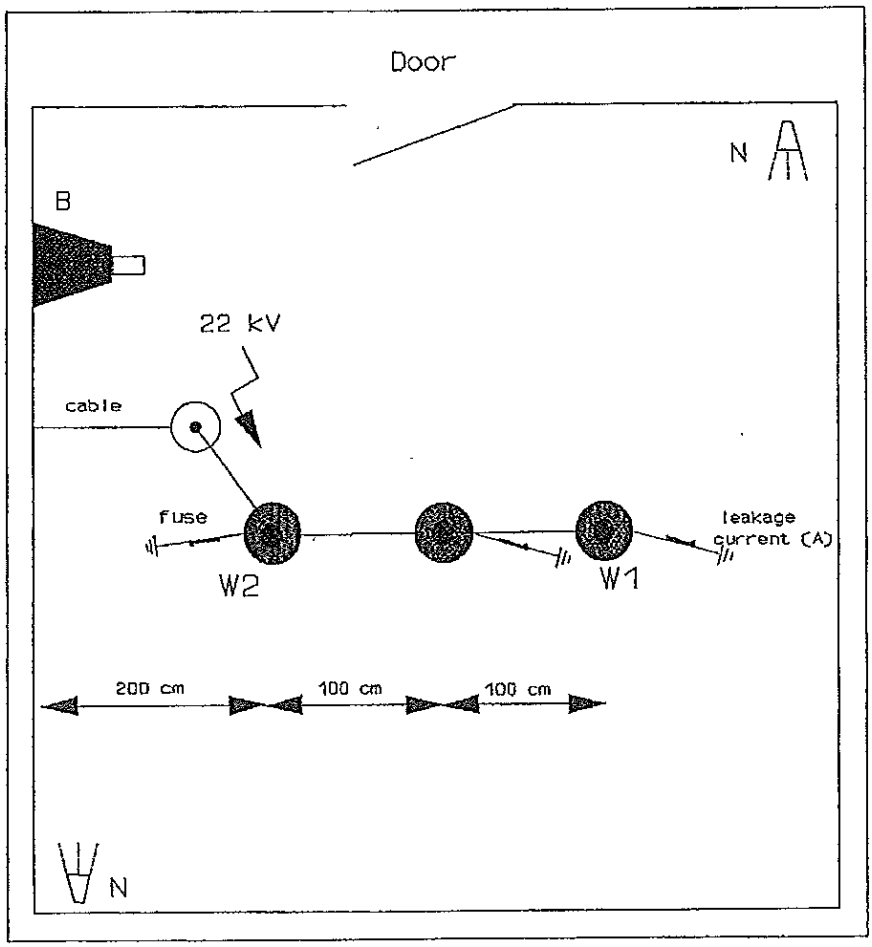
low voltage				high voltage k = 300		k_1
V_1	V_{tx}	I_1	I_{tx}	V_2	V_{AT}	V_{AT} / V_1
V	V	A	A	V	kV	
/	/	/	/	50,1	15,0	/
/	/	/	/	73,3	22,0	/
/	/	/	/	/	/	/

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

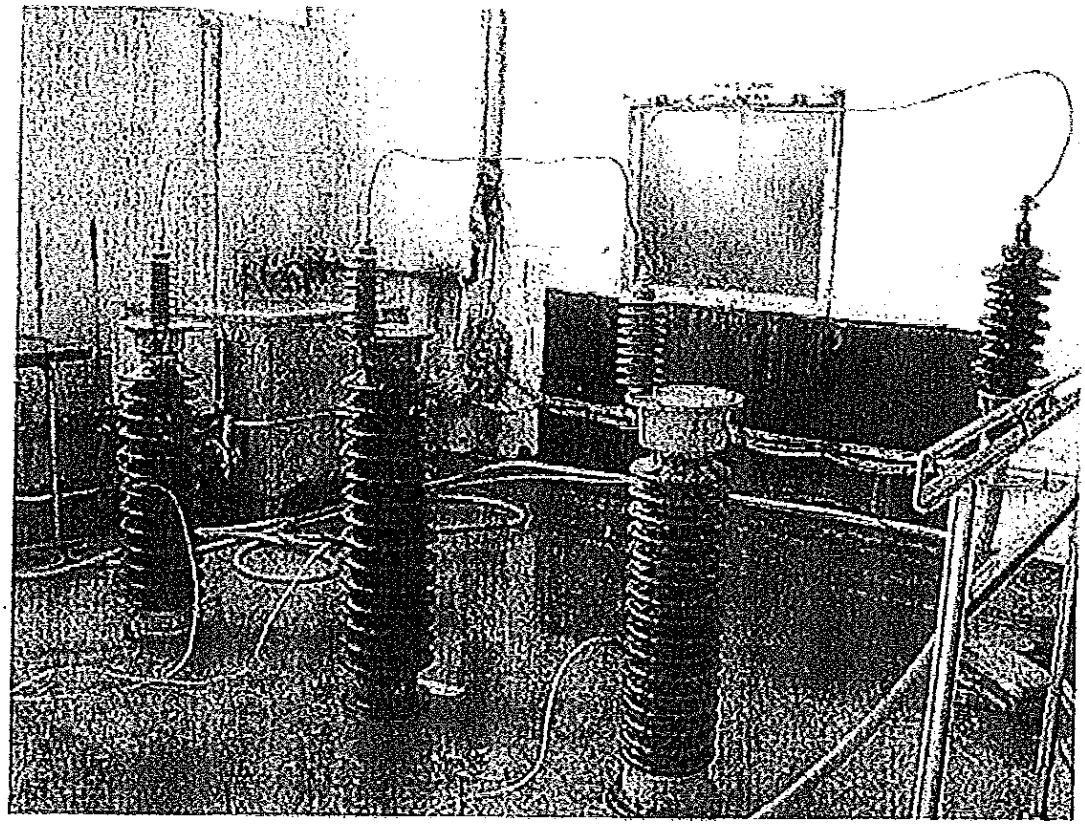
430

Weather ageing test. Test arrangement
Plant: pollution test room planimetry

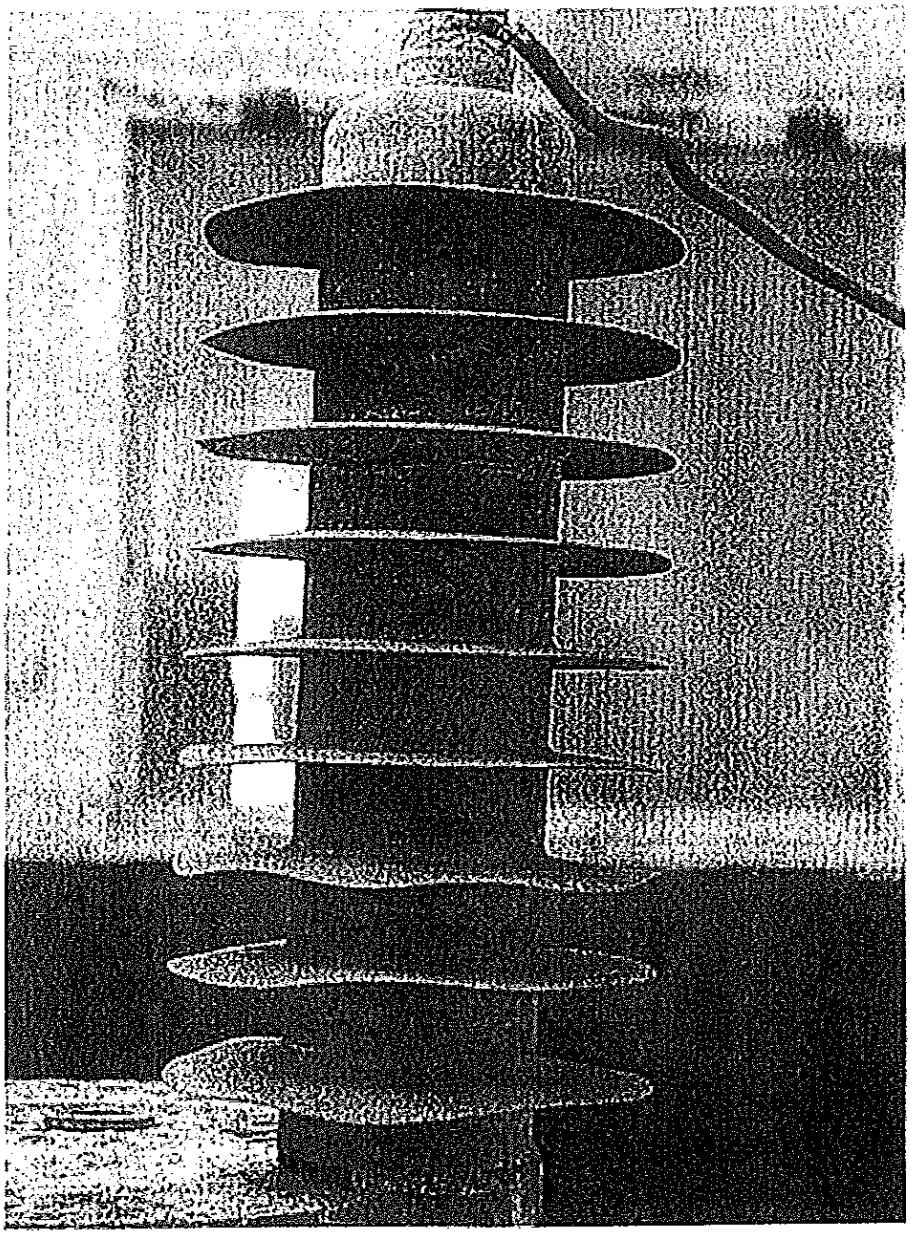


Test room volume: 360m³
B: bushing
N: spray nozzles. Number of spray nozzles: 4
W1, W2: test objects

Picture of the test arrangement

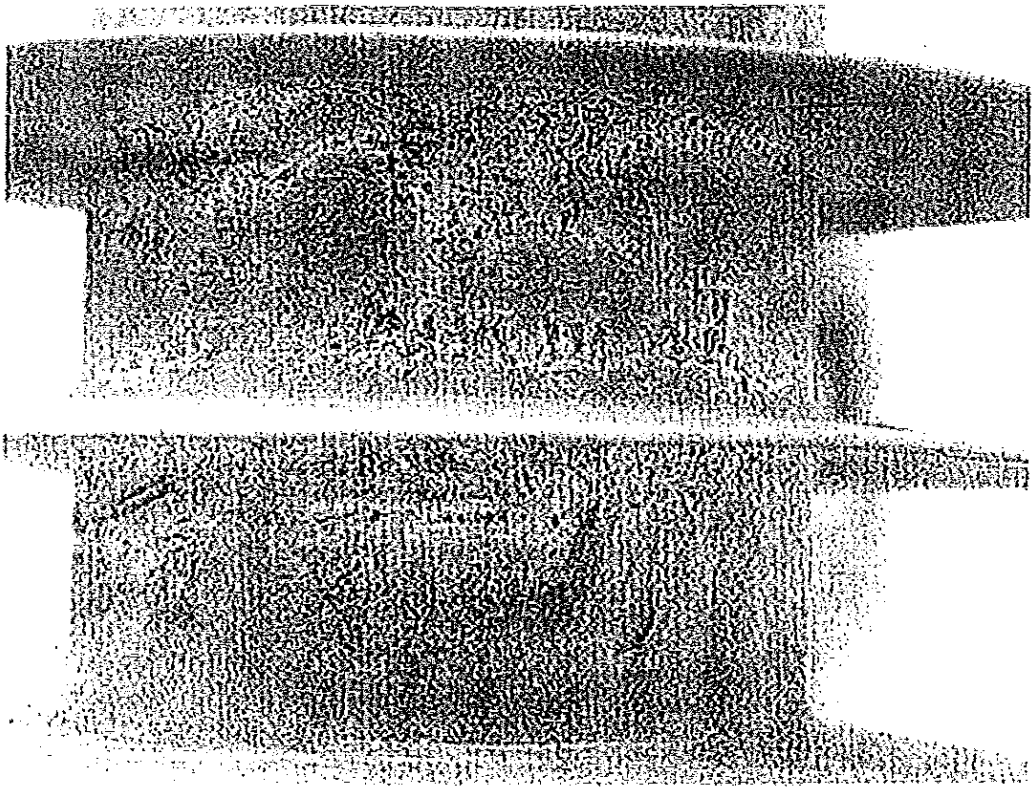


Picture of the test sample VI after the test



433

Picture of the test sample W1 after the test

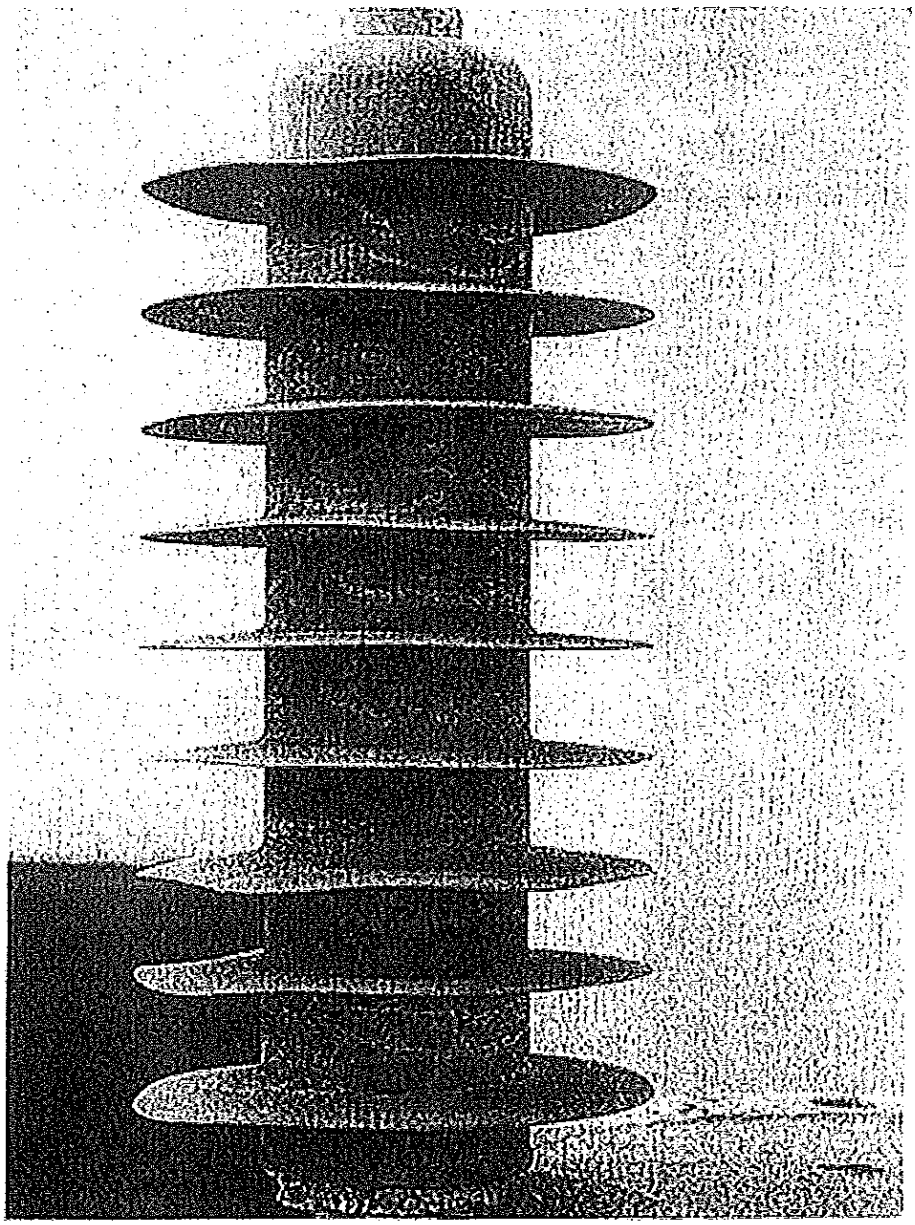


ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
САМОКОВ

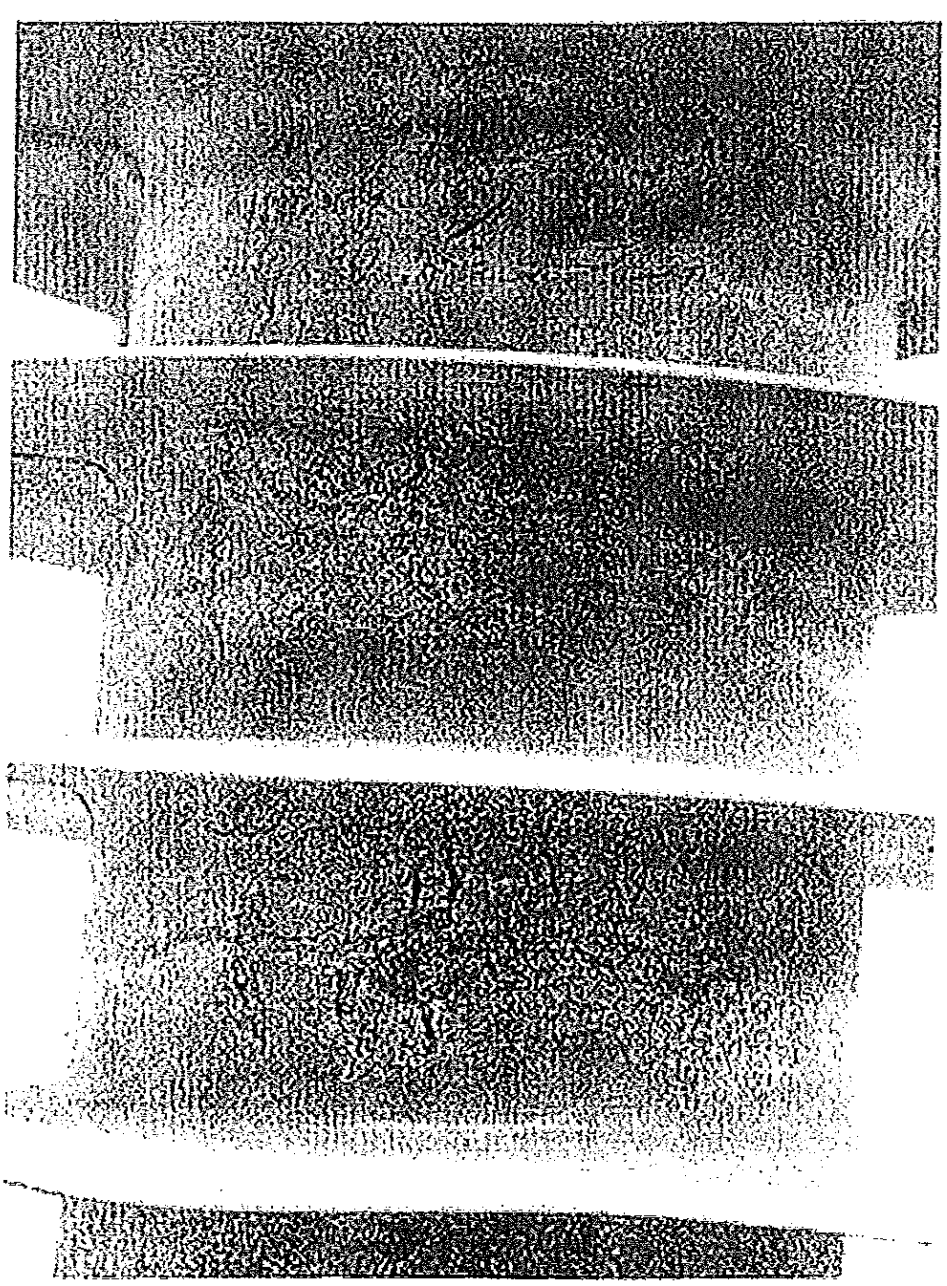
434

Picture of the test sample W2 after the test



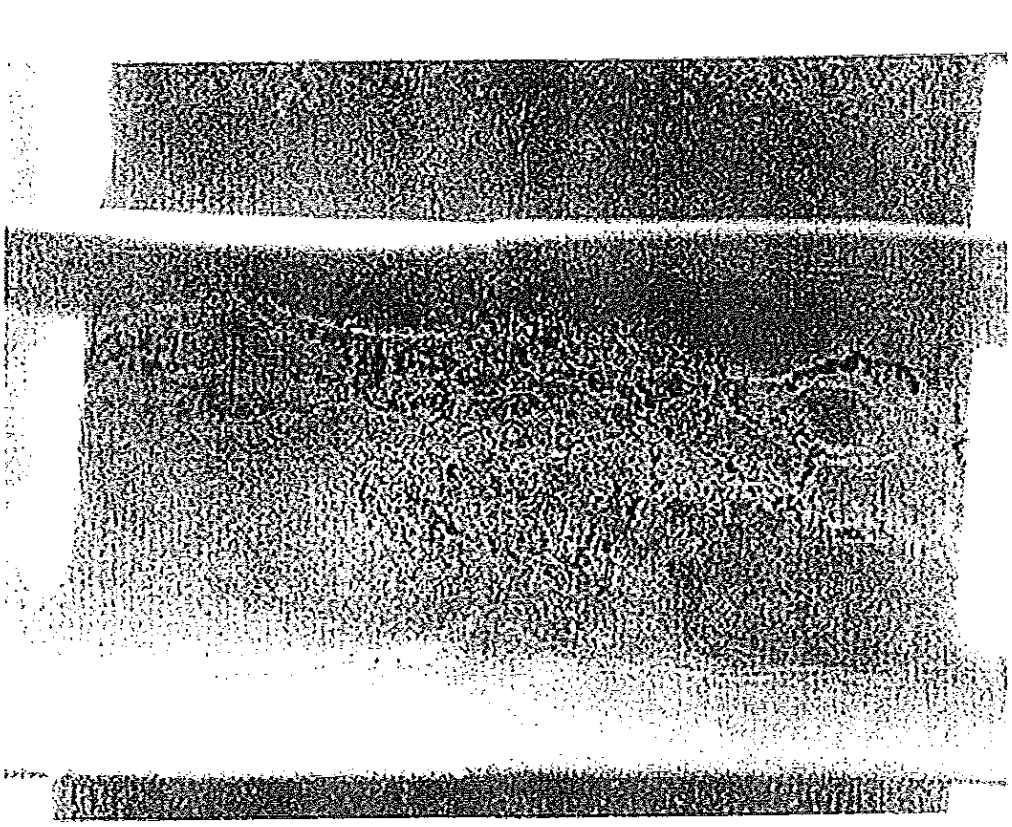
435

Picture of the test sample W2 after the test



436

Picture of the test sample W2 after the test



437

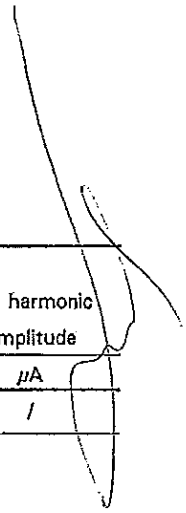
Measurement of the reference voltage - Final

test object: Polymer housed metal-oxide surge arresters
test circuit: /

date: August 30, 2004

sample W1

oscill.	voltage	current	current	current	power	3rd harmonic amplitude
no.	kV	+ mA_{cr}	- mA_{cr}	mA_{rms}	W	μA
3	27,9	4,88	5,04	/	/	/



date: August 30, 2004

sample W2

oscill.	voltage	current	current	current	power	3rd harmonic amplitude
no.	kV	+ mA_{cr}	- mA_{cr}	mA_{rms}	W	μA
4	28,4	4,32	5,04	/	/	/

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД САМОКОВ

438

Measurement of partial discharges - Final

test object: Polymer housed metal-oxide surge arresters
test circuit: /
measurement circuit: /
arrangement: ----

atmospheric conditions		
b	t	h
kPa	°C	g / m³
/	25	/

date: August 30, 2004

Sample W1

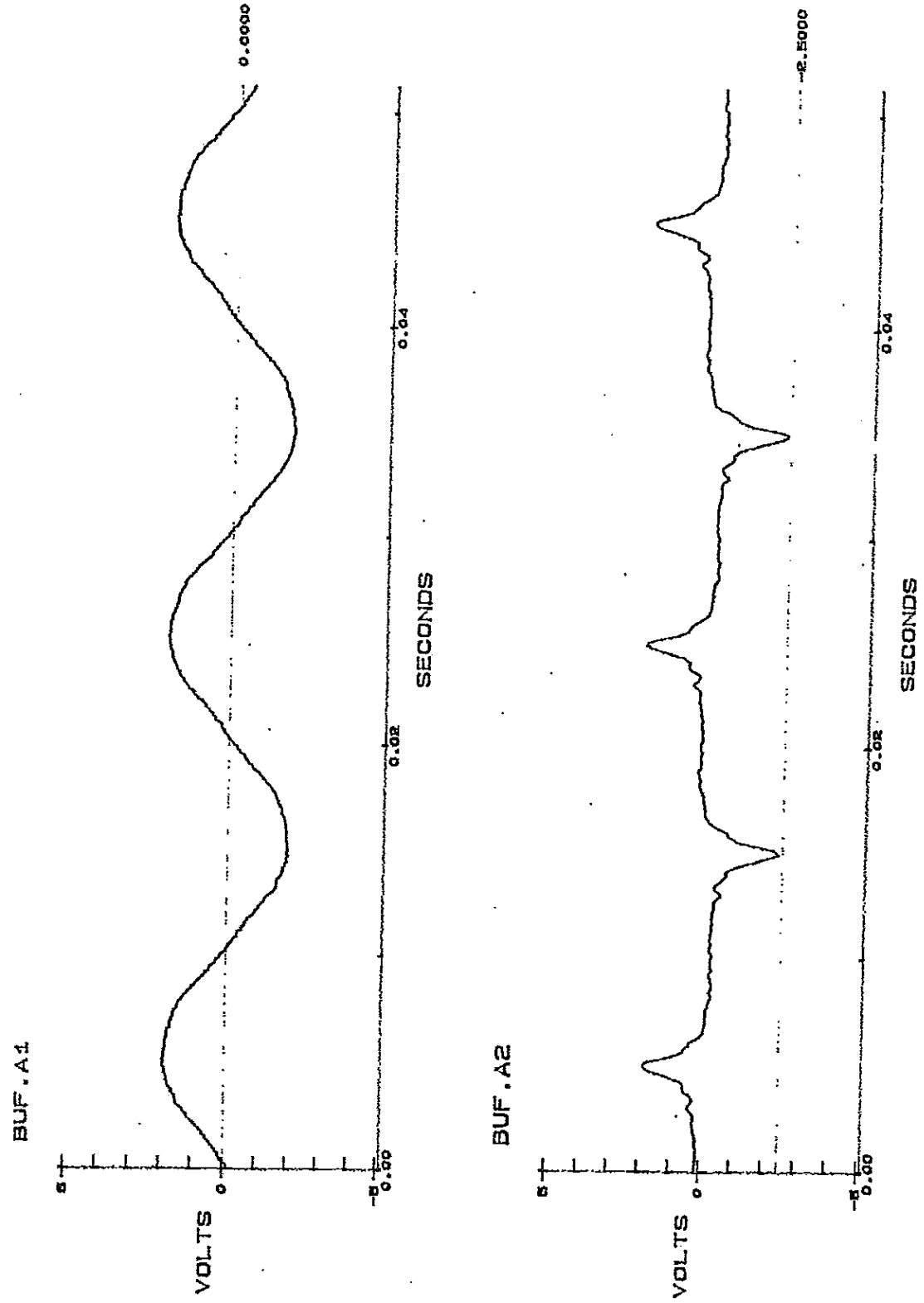
test condition	applied voltage	duration of voltage application	temperature of the test object	voltage increase Q max	voltage decrease Q max	oscillogram	note
	kV_{rms}	sec	°C	pC	pC	no.	
rated voltage	27	10	25	/	/	/	/
22 x 1,05	23,1	/	25	/	≤ 1	7	/

Sample W2

test condition	applied voltage	duration of voltage application	temperature of the test object	voltage increase Q max	voltage decrease Q max	oscillogram	note
	kV_{rms}	sec	°C	pC	pC	no.	
rated voltage	27	10	25	/	/	/	/
22 x 1,05	23,1	/	25	/	≤ 1	8	/

Note: background noise ≤ 1 pC, see oscillogram n.5
"direct" calibration: 50 pC - see oscillogram n.6

oscillogram no.01



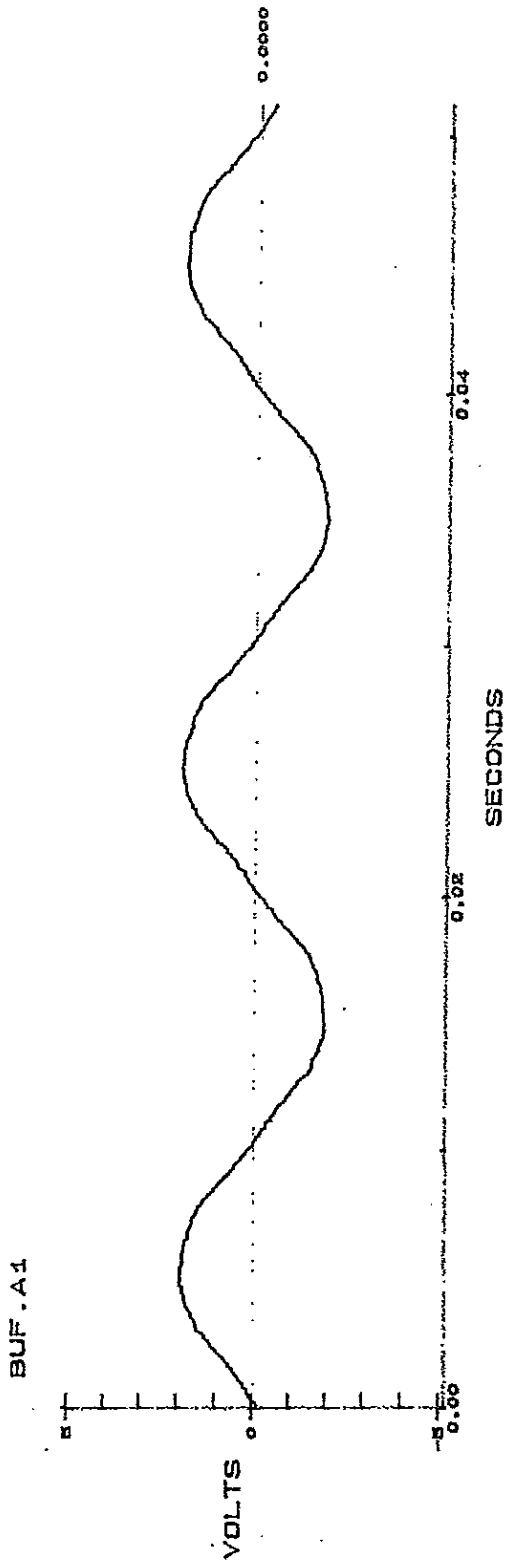
CESI TEST A4510342

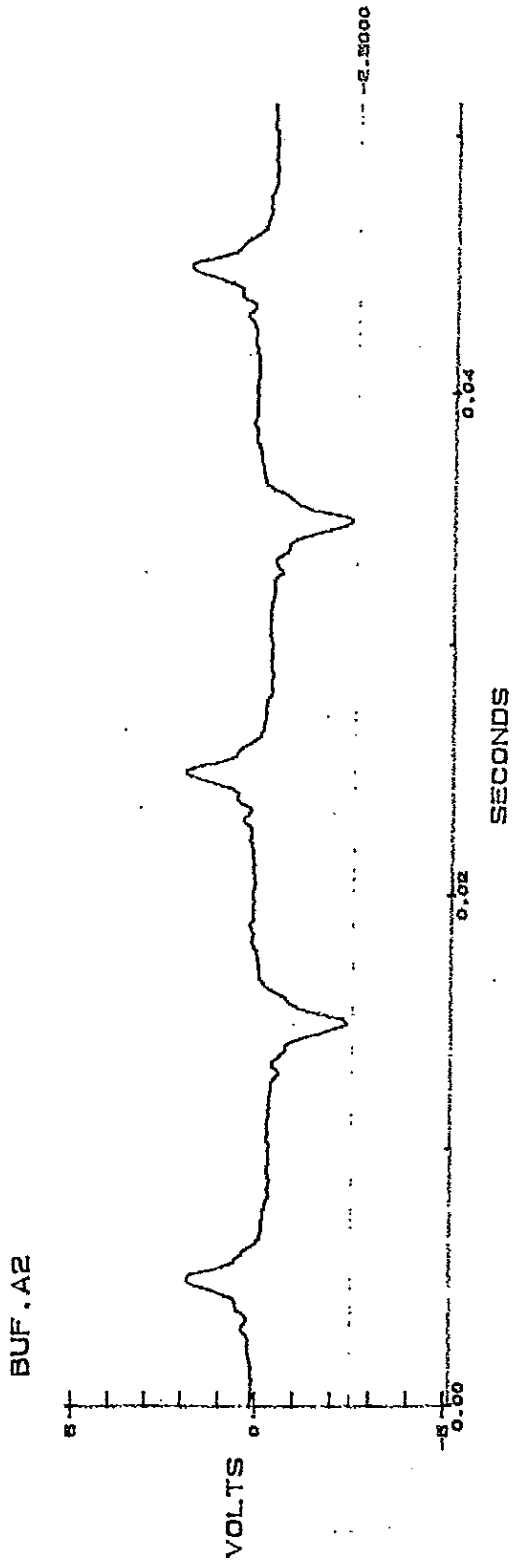
ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
САМОКОВ

440

oscillogram no.02



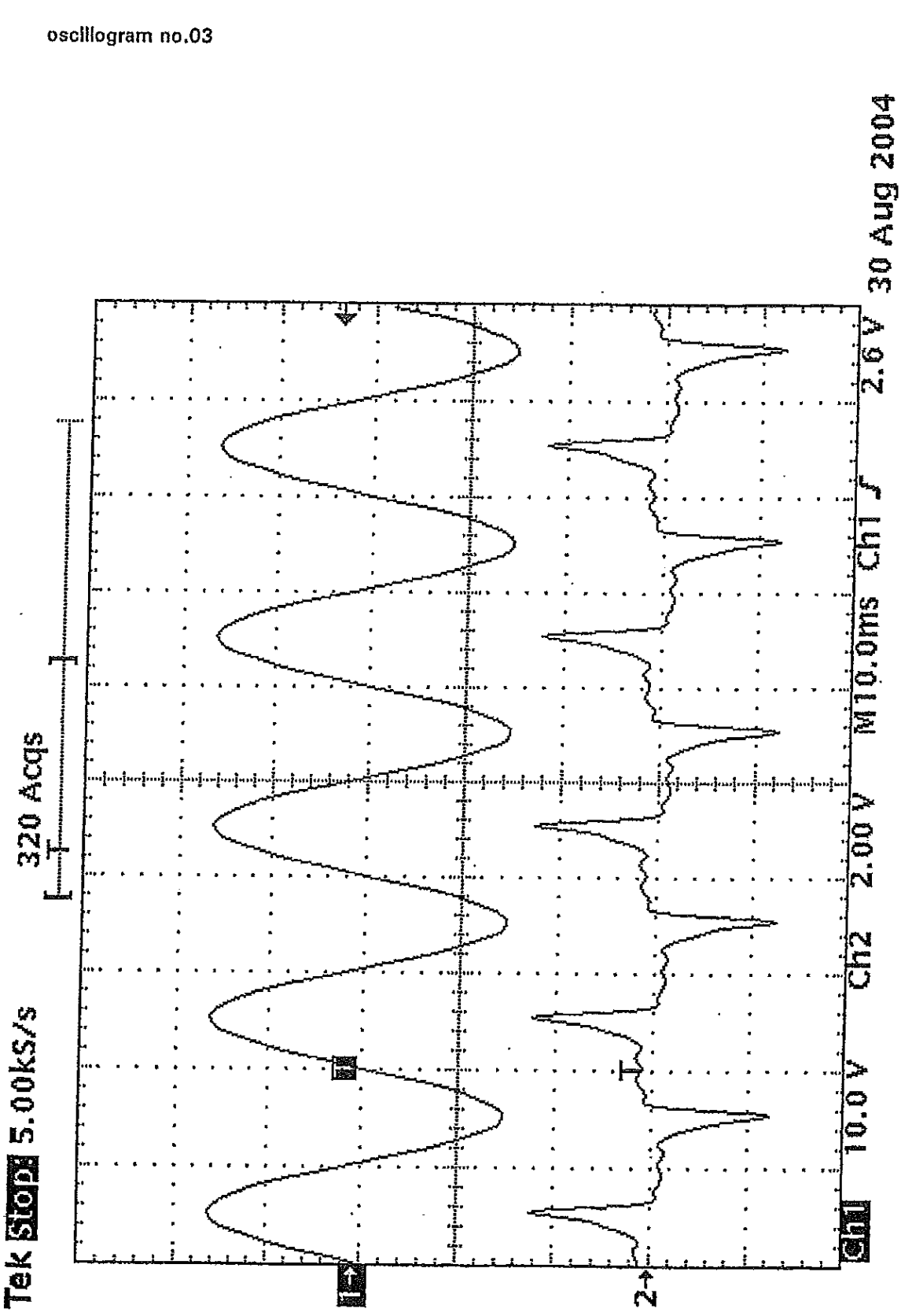


CESI TEST A4510342

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
САМОКОВ

oscillogram no.03



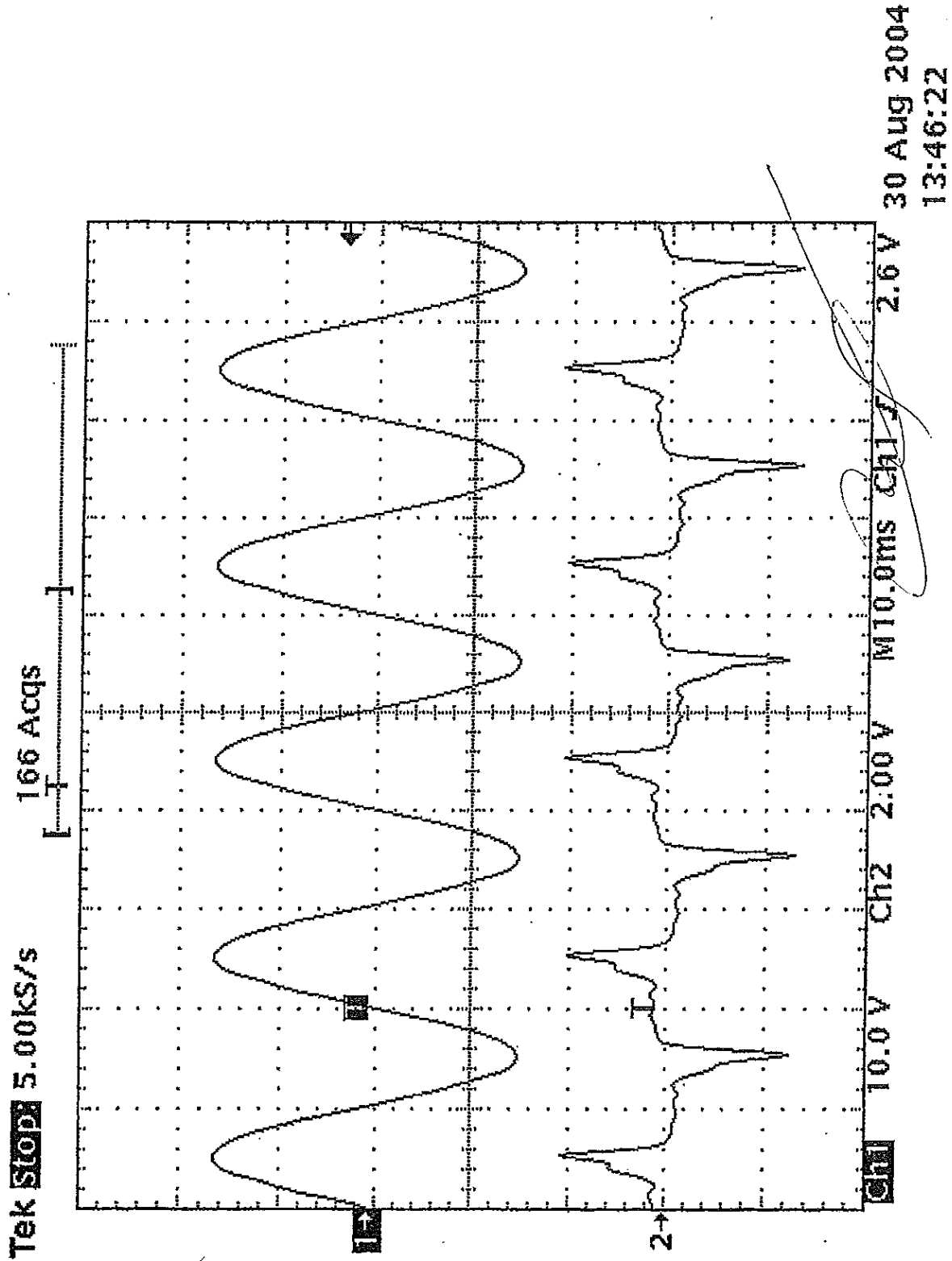
CESI TEST A4510342

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
САМОКОВ

442

oscillogram no.04

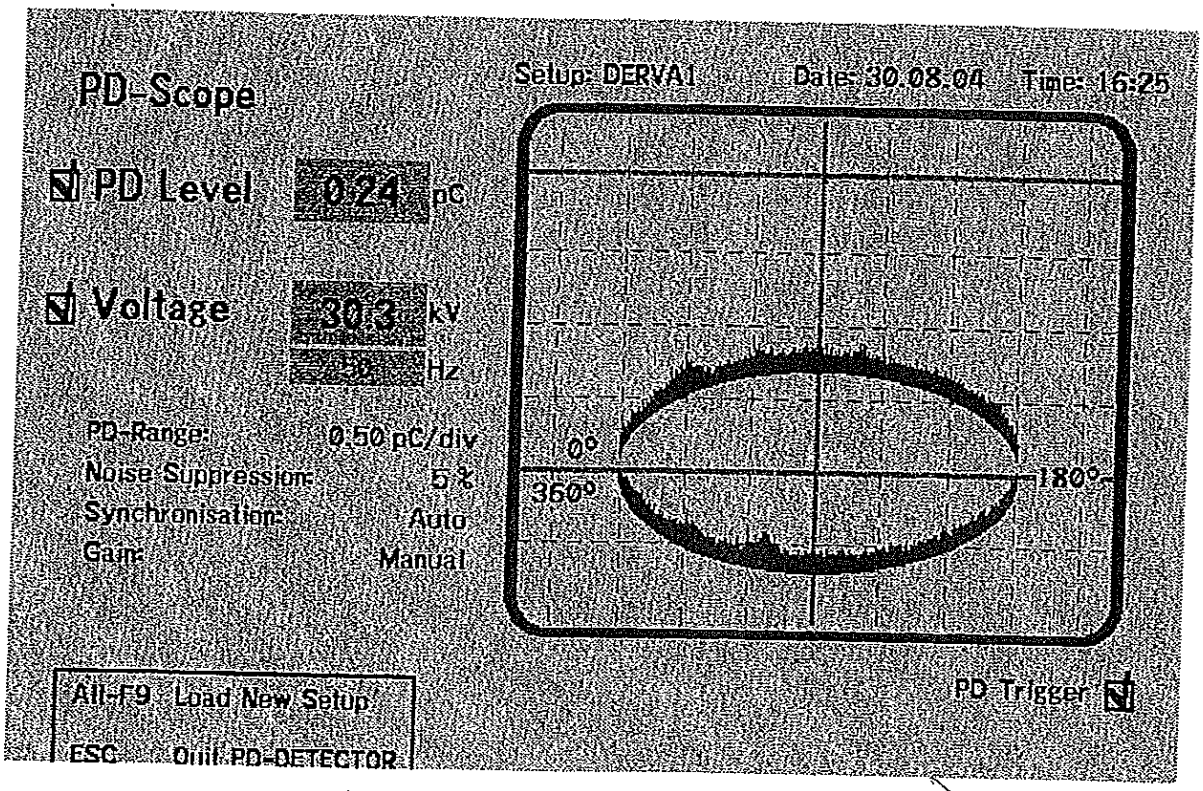


CESI TEST A4510342

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД

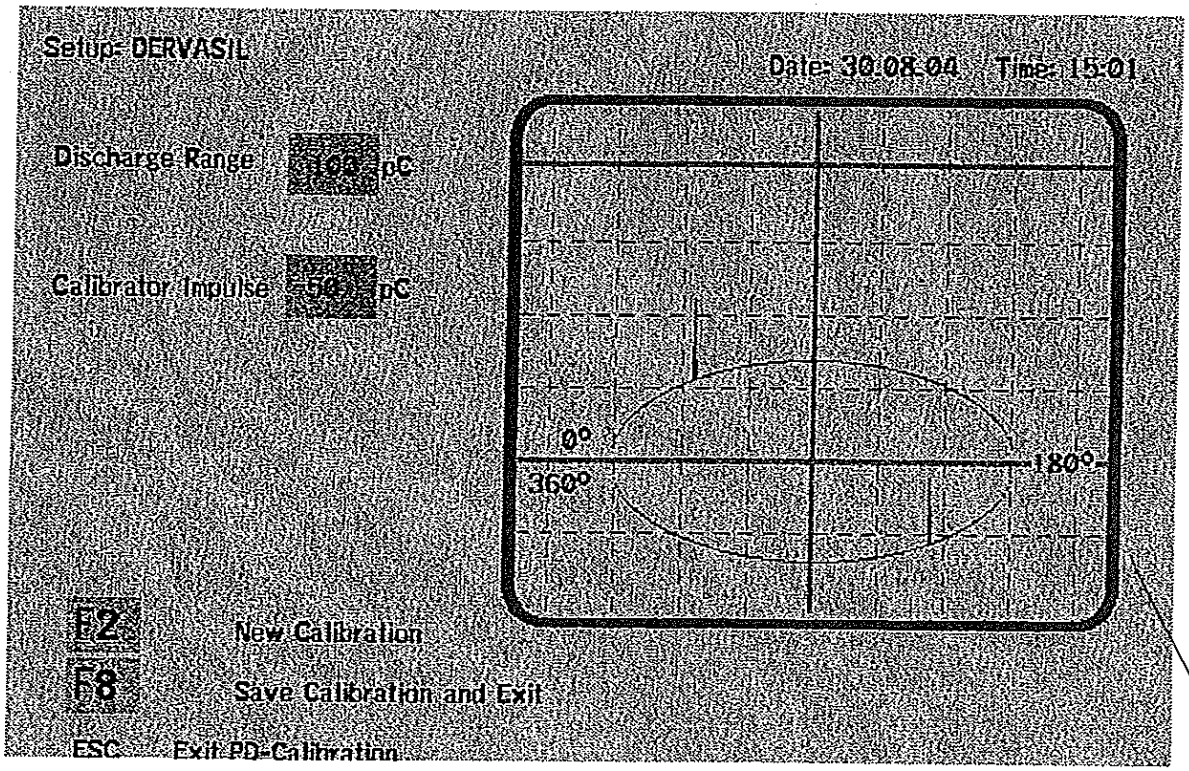
oscillogram no.05



CESI TEST A4510342

1103

oscillogram no.06

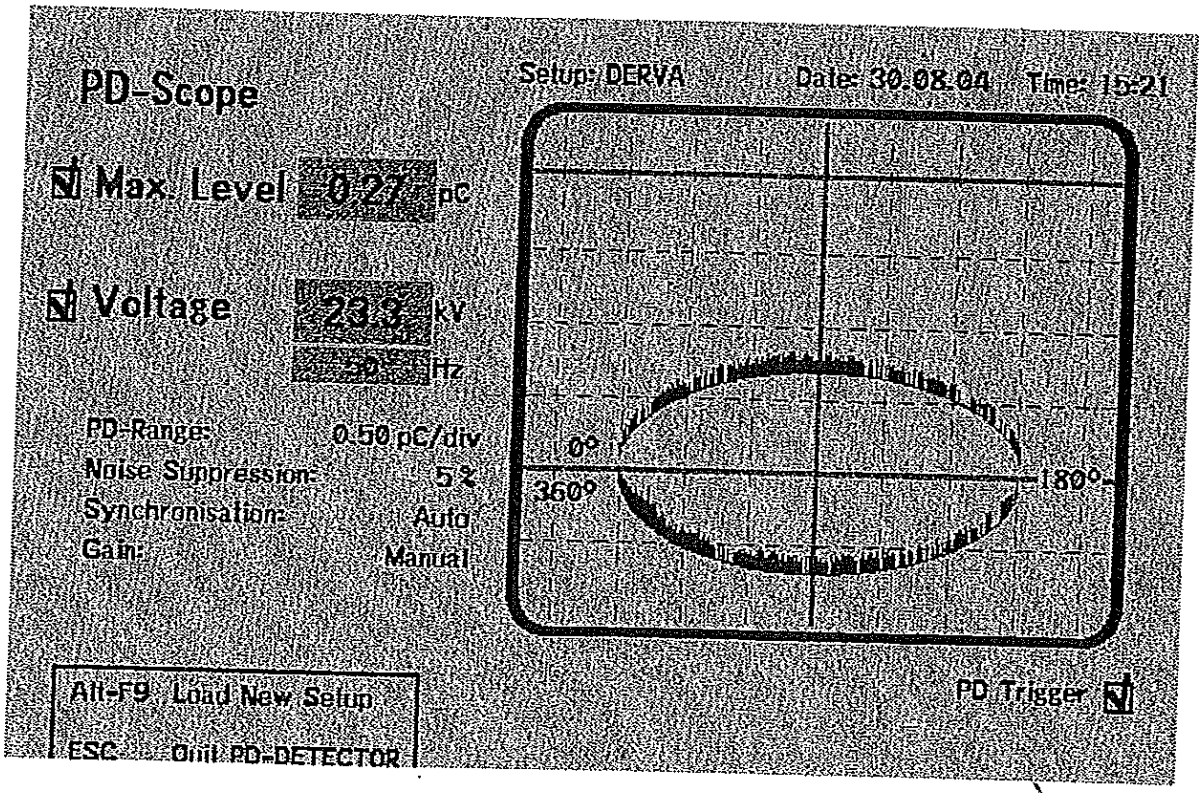


CESI TEST A4510342

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
САМОКОВ

oscillogram no.07



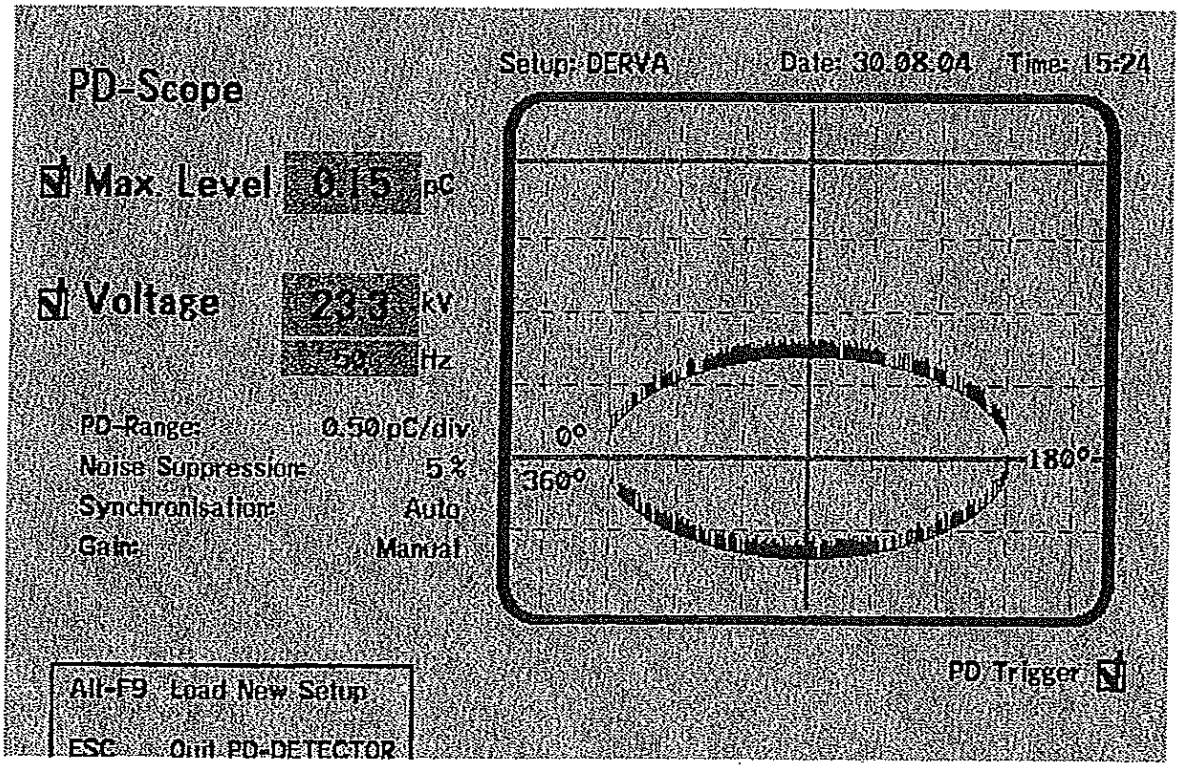
CESI TEST A4510342

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
САМОКОВ

445

oscillogram no.08



CESI TEST A4510342

ВЯРНО С ОРИГИНАЛА

"ЕАК - 02" ООД
САМОКОВ

446

СПИСЪК НА ОТДЕЛНИТЕ ИЗПИТВАНИЯ НА ВЕНТИЛЕН ОТВОД ТИП AZBD 270

1. Изпитване с вътрешно частично разреждане;
2. Изпитание за устойчивост на импулсно атмосферно пренапрежение в сухо състояние;
3. Изпитание с напрежение с промишлена честота във влажно състояние;
4. Изпитание на остатъчно напрежение;
5. Изпитание за устойчивост на дълготраен токов импулс;
6. Изпитание при работен режим с високо-токов импулс;
7. Изпитание с разединител;
8. Изпитание на огъващ момент;
9. Изпитание с проникване на влага;
10. Изпитание с атмосферно стареене.

Съставил: на основание чл. 2 от ЗЗЛД

"ВАК-02" ООД САМОКОВ

"ВАК-02" ООД САМОКОВ

Приложение 2.4

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* **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* **1992-02-27**
на основание чл. 2 от ЗЗЛД

The General Director
(Dr. Filippo Trifiletti)

Data di modifica / *Modification date* **2016-04-14**
на основание чл. 2 от ЗЗЛД

(Dr.ssa Silvia Tramontin)

Data di scadenza / *Expiring date* **2020-03-09**
на основание чл. 2 от ЗЗЛД

Il Presidente
The President
(Ing. Giuseppe Rossi)

ВЯРНО С ОРИГИНАЛА

Sede operativa e legale: Via Guglielmo Saliceto, 7/9 | 00161 Roma - Italy | Tel. +39 06 8440991 | Fax +39 06 8841799
info@accredia.it | www.accredia.it | Partita IVA - Codice Fiscale 10566361001

"ВАК - 02" ООД
САМОКОВ

448

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° **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

ACCREDIA
Sede operativa e legale: Via Guglielmo Saliceto, 7/9 | 00161 Roma - Italy | Tel. +39 06 8440991 | Fax +39 06 8841199
info@accredia.it | www.accredia.it | Partita IVA - Codice Fiscale 10566361001

"ВАК - 02" ООД
СЛИВЕН

449

СЕРТИФИКАТ ЗА АКРЕДИТАЦИЯ

Регистрационен № 0030 ред. **2**

Ние декларираме, че **CESI S.p.A.**
Via Rubattino, 54 20134 - MILANO (Ml)

Отговаря на изискванията на стандарта
EN ISO/IEC 17025:2005 Общи изисквания относно компетентността на лабораториите за изпитване и калибриране

като ***Изпитваща лаборатория***

Акредитацията удостоверява техническата компетентност на лабораторията ограничена до данните за обхват в прикачените приложения. Обхватът може да търпи промени във времето. Изискванията на системата за управление съгласно ISO/IEC 17025:2005 (Секция 4) са написани на език, подходящи за употеба от Изпитващите лаборатории и отговарят на принципите на ISO 9001:2008 и са приведени в съответствие изисквания му. Настоящото удостоверение е валидно само, ако е придружено с приложените допълнения и може да бъде спряно или оттеглено по всяко време, в случай на неизпълнение, както е установено от ACCREDIA.
Статута на акредитацията може да се провери на интернет страницата (wvsw.accredia.it) или с директно запитване към съответния отдел.

1-ва дата на издаване	Дата на промяна	Дата на изтичане
1992-02-27	2016-04-14	2020-03-09

Генерален Директор

Директор
Дирекция

Президент

на основание чл. 2 от ЗЗЛД

"ВАК - 02" ООД
САМОКОВ

450

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. 156 / 2016

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

to the Testing Laboratory No. **1029**
High voltage testing laboratory

Scope of accreditation:

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

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

ČSN EN ISO/IEC 17025:2005

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.

This Certificate of Accreditation replaces, to the full extent, Certificate No.: 370/2015 of 26 May 2015, or any administrative acts building upon it.

The Certificate of Accreditation is valid until: **14 March 2021**

на основание чл. 2 от ЗЗЛД

Prague: 14 March 2016

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

Jiří Růžička
Director
Czech Accreditation Institute
Public Service Company

"ВАК - 02" ООД
СКМОКОВ

451

ilac-MRA

НАЦИОНАЛЕН ОРГАН ПО АКРЕДИТАЦИЯ

Подпис EA MLA
Чешки Институт по акредитация
Olšanska 54/3, 130 00 Прага 3

Сертификат за акредитация

Номер 156/2016

EGU – **Лаборатория В.Н a.s.**
със седалище Podnikatelska 267,190 11 Praha 9, Bechovice, ID **No. 25634330**

за тестова лаборатория номер. 1029
Лаборатория за изпитвания високо напрежение

Обхват на акредитацията:

Изпитвания високо напрежение, измерване на радио-интерференция, напреженови и диелектрични изпитвания на електрически изделия и оборудване и механични тестове на изолатори до степен, посочена в приложението към този сертификат.

Този сертификат за акредитация е доказателство за акредитация издаден, въз основа на покриване на критериите за акредитация в съответствие с

ČSN EN ISO/IEC 17025:2005

В дейностите си, изпълнявани в рамките на обхвата и за периода на валидност на настоящия сертификат, притежателя на настоящия сертификат има право да се позовава на този сертификат, при условие че акредитацията не е преустановена и притежателя отговаря на спесифичните акредитационни условия, в съответствие със съответните регламенти, приложими за дейността на акредитирания орган за оценка на съответствието.

Сертификатът за акредитация заменя, в пълна степен, Сертификат с номер 370/2015 от 26 май 2015 г., или някакви административни актове създадени за него.

Сертификатът е валиден до **14 Март 2021**

Прага, 14 Март 2016

ЗАЩИТЕН ПЕ[на основание чл. 2 от ЗЗЛД]
И[illegible]А

Чешки институт за акредитация, (Czech Accreditation Institute, p.s.c.)

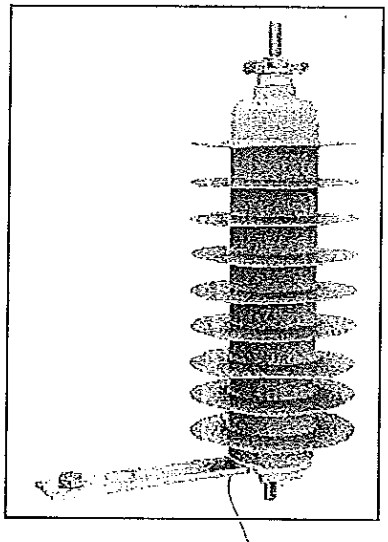
[на основание чл. 2 от ЗЗЛД]

"БАК - 02" ООД
САМОКОВ

452

Приложение 2.5

Operating,storage and installation instructions
Lightning Arresters AZC --0

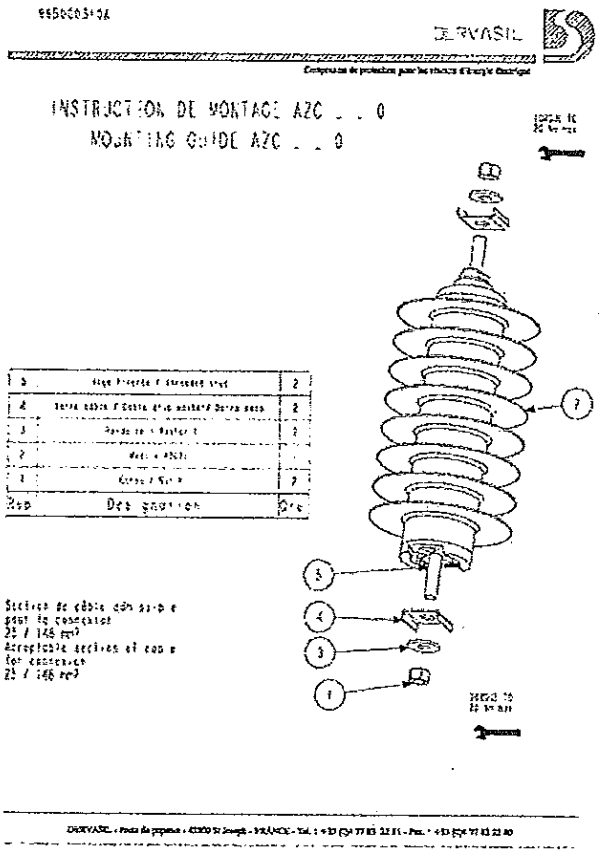


DERVASIL offers a range of latest generation lightning arresters with silicone rubber housing and metal oxide varistors. :

- **10 kA Lightning arresters Class 2**

These arresters do not have internal spark gaps. They exhibit stable characteristics, with practically constant, very short response times (30 to 50 ns).
Direct injection of silicone rubber over the internal varistors ensures both absolute sealing, excellent behaviour without explosion in case of short-circuit. They have been tested in accordance with last version of IEC standard 60099-4.

MOUNTING GUIDE



15/04/2011 13:26:00

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
САМОКОВ

453

Operating,storage and installation instructions
Lightning Arresters AZC --0

PACKING

Lightning arresters are packed in stable cardboard boxes. Each cardboard box contains:

- **3 lightning arresters fitted with threaded studs.**
- **3 plastic bags with nuts and washes**
- **1 mounting guide**

TRANSPORT AND STORAGE

Secure lightning arresters against crushing, falling or sliding during transport and storage
Respect safety precautions for proper handling during transport and storage
Store lightning arresters in their cardboard box and in clean and ventilated room

INSPECTION

After opening of boxes, check:

- **Lightning arrester marking must correspond to the bought product**
- **Presence of all components according to this guide**
- **Cleanness of threaded rods to avoid any seizing during installation of lightning arrester**
- **Cleanness of external silicone housing which must be without cuts or holes.**

15/04/2011 13:26:00

454

RECOMMENDATIONS AND MAINTENANCE

PERSONNEL IN CHARGE OF INSTALLATION MUST BE PROFESSIONAL AND SAFE WORKING TRAINED.
ONLY PERSONNEL WHO HAVE UNDERSTOOD OPERATING AND INSTALLATION INSTRUCTIONS MAY BE ALLOWED TO MOUNT LIGHTNING ARRESTERS

AVOID ANY USE OF SHARP TOOLS WHICH COULD DAMAGE LIGHTNING ARRESTER HOUSING, NOTABLY DURING BOX OPENING.

MINIMUM CLEARANCE DISTANCE BETWEEN ARRESTERS AND BETWEEN ARRESTERS AND EARTH ARE SPECIFIED ON THE TABLE PAGE 1. THESE DISTANCES MUST BE USED FOR LIGHTNING ARRESTER MOUNTING.

FOR LIGHTNING ARRESTER TYPR AZB _ _ 2, CONNECT ALWAYS DISCONNECTOR TO THE EARTH WITH FLEXIBLE CABLE TO AVOID BLOCKAGE OF DISCONNECTOR OPERATING.

TO CONNECT AND TO MOUNT LIGHTNING ARRESTER, DO NOT EXCEED SPECIFIED TORQUE.

AFTER LIGHTNING ARRESTER INSTALLATION, CLEAN SILICONE HOUSING WITH SOFT AND CLEAN CLOTH.

LIGHTNING ARRESTERS INSTALLED ACCORDING TO THIS GUIDE DO NOT REQUIRE ANY PREVENTIVE MAINTENANCE.
REPLACE LIGHTNING ARRESTERS IF FAULT INDICATOR OR DISCONNECTOR OPERATE OR AFTER FLASHOVER.

ENVIRONMENT ASPECT

The lightning arresters DERVASIL do not contain any dangerous material for environment.
After use they must be destroyed in an approved center.

15/04/2011 13:26:00

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
САМОКОВ

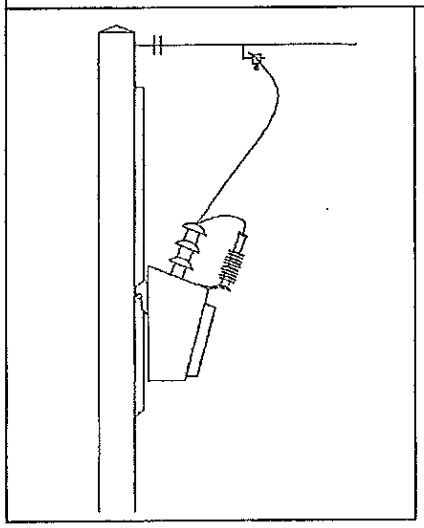
455

INSTALLATION EXAMPLE

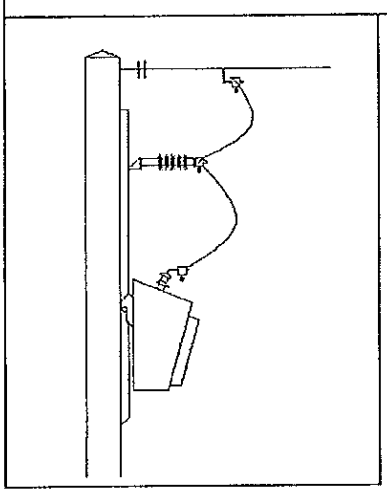
Always mount lightning arresters as close as possible to the apparatuses to be protected

TRANSFORMER PROTECTION

Vertical position on transformer tank

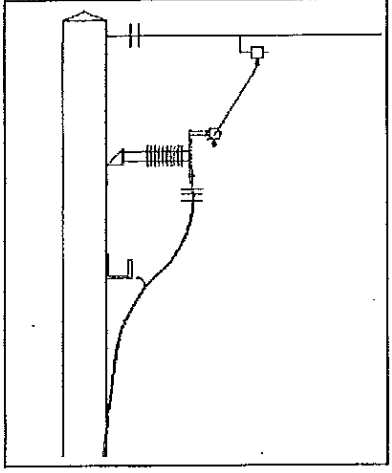


Horizontal position



CABLE PROTECTION

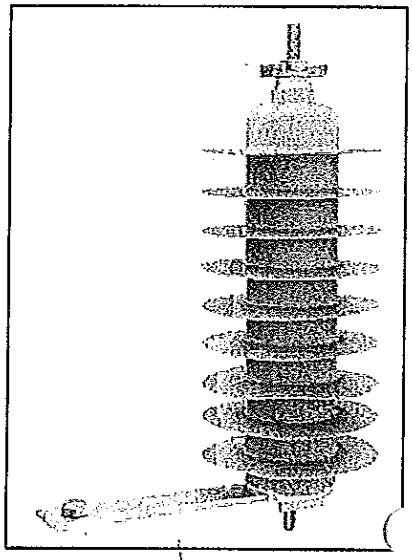
Horizontal position



DERVASIL Route de Popenot 42800 Saint Joseph FRANCE
Téléphone : +33 (0)4 77 83 22 81 – Fax : +33 (0)4 77 83 22 80
Email : info@dervasil.com
Web : www.dervasil.com

15/04/2011 13:26:00

Инструкции за експлоатация, монтаж, обслужване и съхранение на склад Вентилни отводи AZC --0

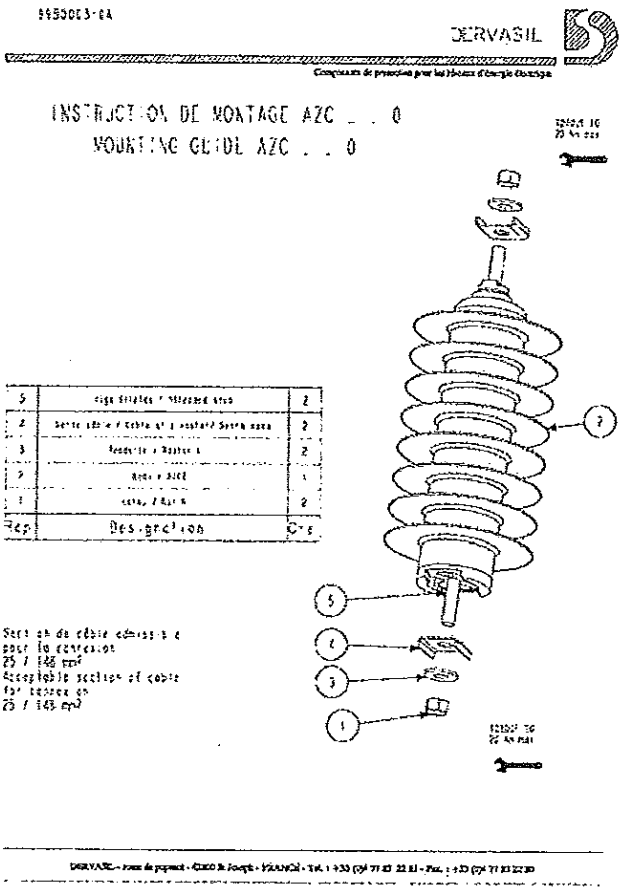


DERVASIL предлага диапазон от най-последно поколение вентилни отводи със силиконов гумен корпус и металооксидни варистори. :

- **10 kA Вентилни отводи Клас 2**

Тези вентилни отводи нямат вътрешни искрови междини. Те показват стабилни характеристики с частична константа, много кратки времена за реакция (30 до 50 ns).
Пряко инжектиране на силиконова гума над вътрешните варистори гарантира абсолютно уплътняване, отлично поведение без експлозия при късо съединение. Тествани са в съответствие с последната версия на IEC стандарта 60099-4.

РЪКОВОДСТВО ЗА МОНТАЖ



15/04/2011 13:26:00

"ВАК-02" ООД
САМОКОВ

458

ОПАКОВКА

Вентилните отводи са опаковани в стабилни картонени кутии. Всяка картонена кутия съдържа:

- 3 вентилни отвода закрепени с резбовани щифтове.
- 3 пластмасови чувала с гайки и шайби
- 1 ръководство за монтаж

ТРАНСПОРТИРАНЕ И СЪХРАНЕНИЕ НА СКЛАД

Да се защитят вентилните отводи срещу удар, падане или плъзгане по време на транспортиране и съхранение
Спазвайте предпазните мерки за безопасност за подходящи манипулации по време на транспортирането и съхранението
Съхраняване на вентилните отводи в техните картонени кутии и в чисто и проветрено помещение.

ИНСПЕКЦИЯ

След отваряне на кутиите, проверете:

- **Маркировката на вентилните отводи трябва да съответства на закупения продукт**
- **Наличието на всички компоненти съгласно това ръководство**
- **Почистването на резбованите щанги за избягване на всякакво заяждане по време на монтажа на вентилните отводи**
- **Почистване на външния силиконов корпус, който трябва да бъде без нарязвания или отвори.**

15/04/2011 13:26:00

"ВАК - 02" ООД
СЪМОКОВ

458

ПРЕПОРЪКИ И ПОДДРЪЖКА

ПЕРСОНАЛЪТ, ОТГОВОРЕН ЗА МОНТАЖА, ТРЯБВА ДА БЪДЕ ПРОФЕСИОНАЛЕН И ОБУЧЕН ЗА БЕЗОПАСНА РАБОТА.
САМО ПЕРСОНАЛ, КОЙТО Е РАЗБРАЛ ИНСТРУКЦИИТЕ ЗА ЕКСПЛОАТАЦИЯ И МОНТАЖ, МОЖЕ ДА МОНТИРА ВЕНТИЛНИ ОТВОДИ

ДА СЕ ИЗБЯГВА ИЗПОЛЗВАНЕТО НА ОСТРИ ИНСТРУМЕНТИ, КОИТО МОГАТ ДА ПОВРЕДЯТ КОРПУСА НА ВЕНТИЛНИТЕ ОТВОДИ, ОСОБЕНО ПО ВРЕМЕ НА ОТВАРЯНЕ НА КУТИЯТА.

МИНИМАЛНАТА МЕЖДИНА МЕЖДУ ВЕНТИЛНИТЕ ОТВОДИ И МЕЖДУ ВЕНТИЛНИТЕ ОТВОДИ И ЗАЗЕМЯВАНЕТО Е ОПРЕДЕЛЕНА НА ТАБЛИЦАТА НА СТРАНИЦА 1. ТЕЗИ РАЗСТОЯНИЯ ТРЯБВА ДА СЕ ИЗПОЛЗВАТ ЗА МОНТАЖ НА ВЕНТИЛНИТЕ ОТВОДИ.

ЗА ВЕНТИЛНО ОТВОДИ ТИП AZC_ _ 2, ВИНАГИ СВЪРЗВАЙТЕ РАЗЕДИНИТЕЛЯ КЪМ ЗЕМЯ С ГЪВКАВ КАБЕЛ, ЗА ДА ИЗБЕГНЕТЕ БЛОКИРАНЕТО НА РАБОТАТА НА РАЗЕДИНИТЕЛЯ..

ЗА СВЪРЗВАНЕ И МОНТАЖ НА ВЕНТИЛНИ ОТВОДИ ДА НЕ СЕ ПРЕВИШАВА ОПРЕДЕЛЕНИЯ ВЪРТЯЩ МОМЕНТ.

СЛЕД МОНТАЖА НА ВЕНТИЛНИТЕ ОТВОДИ, ПОЧИСТЕТЕ СИЛИКОНОВИЯ КОРПУС С МЕКА И ЧИСТА КЪРПА.

ВЕНТИЛНИТЕ ОТВОДИ, КОИТО СА МОНТИРАНИ СЪГЛАСНО ТОВА РЪКОВОДСТВО, НЕ ИЗИСКВАТ НИКАКВО ПРОФИЛАКТИЧНО ТЕХНИЧЕСКО ОБСЛУЖВАНЕ.
ЗАМЕНЕТЕ ВЕНТИЛНИТЕ ОТВОДИ, АКО Е ПОВРЕДЕН ИНДИКАТОРЪТ ИЛИ РАЗЕДИНИТЕЛЯТ РАБОТИ ИЛИ СЛЕД ПРЕМОСТВАНЕ

ЕКОЛОГИЧЕН АСПЕКТ

Вентилните отводи DERVASIL не съдържат никакви материали, опасни за околната среда. След използване те трябва да бъдат разрушени в одобрен център.

15/04/2011 13:26:00

"ВАК 02" ООД САМОКОВ

459

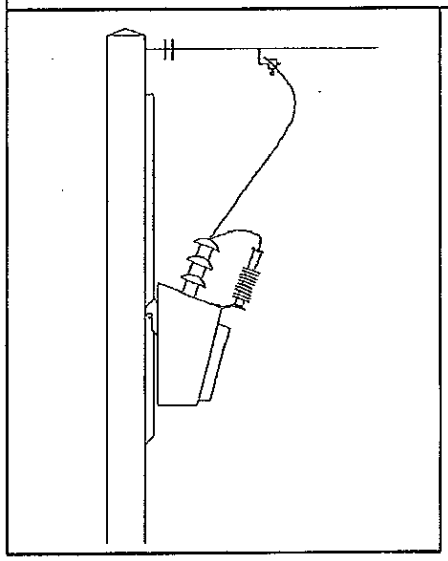
Инструкции за експлоатация, монтаж, обслужване и съхранение на склад
Вентилни отводи AZC --0

ПРИМЕР ЗА МОНТАЖ

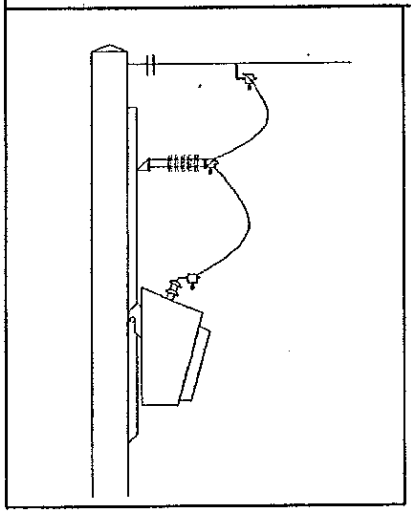
Винаги монтирайте вентилните отводи колкото е възможно по-близо до оборудването, за да бъде то защитено

ЗАЩИТА НА ТРАНСФОРМАТОРА

Вертикално положение на казана на трансформатора

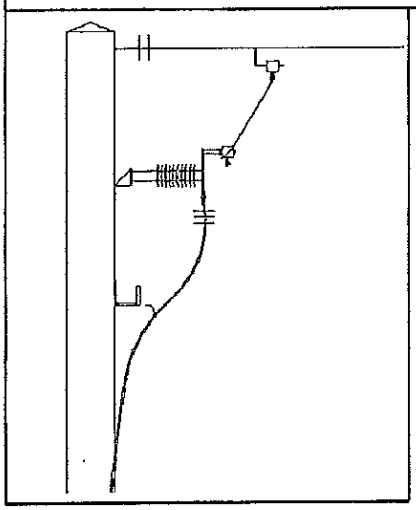


Хоризонтално положение



КАБЕЛНА ЗАЩИТА

Хоризонтално положение

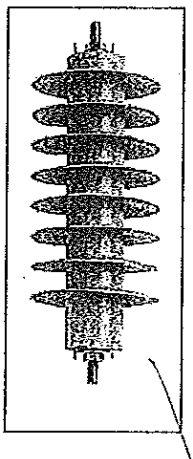


DERVASIL Route de Popenot 42800 Saint Joseph FRANCE
Téléphone : +33 (0)4 77 83 22 81 – Fax : +33 (0)4 77 83 22 80
Email : info@dervasil.com
Web : www.dervasil.com

15/04/2011 13:26:00 02" ООД САМОКОВ

460

Operating, storage and installation instructions
Lightning Arresters AZBD- - - 0



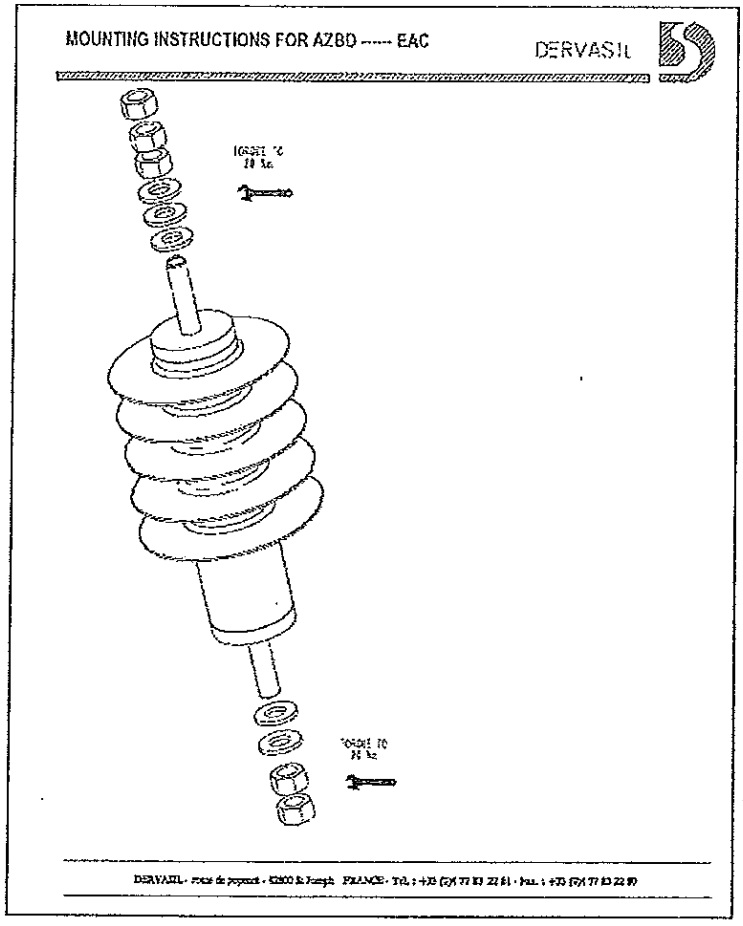
storage

DERVASIL offers a range of latest generation lightning arresters with silicone rubber housing and metal oxide varistors. :

- **10 kA Lightning arresters Class 1**

These arresters do not have internal spark gaps. They exhibit stable characteristics, with practically constant, very short response times (30 to 50 ns).
Direct injection of silicone rubber over the internal varistors ensures both absolute sealing, excellent behaviour without explosion in case of short-circuit. They have been tested in accordance with last version of IEC standard 60099-4.

MOUNTING GUIDE



dervasil

Operating, storage and installation instructions
Lightning Arresters AZBD- - - 0

PACKING

Lightning arresters are packed in stable cardboard boxes. Each cardboard box contains:

- 3 lightning arresters fitted with threaded studs.
- 3 plastic bags with nuts and washes
- 1 mounting guide

TRANSPORT AND STORAGE

Secure lightning arresters against crushing, falling or sliding during transport and storage
Respect safety precautions for proper handling during transport and storage
Store lightning arresters in their cardboard box and in clean and ventilated room

INSPECTION

After opening of boxes, check:

- Lightning arrester marking must correspond to the bought product
- Presence of all components according to this guide
- Cleanness of threaded rods to avoid any seizing during installation of lightning arrester
- Cleanness of external silicone housing which must be without cuts or holes.

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
САМОКОВ

dervasil

Operating, storage and installation instructions
Lightning Arresters AZBD- - - 0

RECOMMENDATIONS AND MAINTENANCE

PERSONNEL IN CHARGE OF INSTALLATION MUST BE PROFESSIONAL AND SAFE WORKING TRAINED.
ONLY PERSONNEL WHO HAVE UNDERSTOOD OPERATING AND INSTALLATION INSTRUCTIONS MAY BE ALLOWED TO MOUNT LIGHTNING ARRESTERS

AVOID ANY USE OF SHARP TOOLS WHICH COULD DAMAGE LIGHTNING ARRESTER HOUSING, NOTABLY DURING BOX OPENING.

MINIMUM CLEARANCE DISTANCE BETWEEN ARRESTERS AND BETWEEN ARRESTERS AND EARTH ARE SPECIFIED ON THE TABLE PAGE 1. THESE DISTANCES MUST BE USED FOR LIGHTNING ARRESTER MOUNTING.

FOR LIGHTNING ARRESTER TYPR AZB _ _ 2, CONNECT ALWAYS DISCONNECTOR TO THE EARTH WITH FLEXIBLE CABLE TO AVOID BLOCKAGE OF DISCONNECTOR OPERATING.

TO CONNECT AND TO MOUNT LIGHTNING ARRESTER, DO NOT EXCEED SPECIFIED TORQUE.

AFTER LIGHTNING ARRESTER INSTALLATION, CLEAN SILICONE HOUSING WITH SOFT AND CLEAN CLOTH.

LIGHTNING ARRESTERS INSTALLED ACCORDING TO THIS GUIDE DO NOT REQUIRE ANY PREVENTIVE MAINTENANCE.
REPLACE LIGHTNING ARRESTERS IF FAULT INDICATOR OR DISCONNECTOR OPERATE OR AFTER FLASHOVER.

ENVIRONMENT ASPECT

The lightning arresters DERVASIL do not contain any dangerous material for environment.
After use they must be destroyed in an approved center.

17/12/2010 10:42:00

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД
САМОКОВ

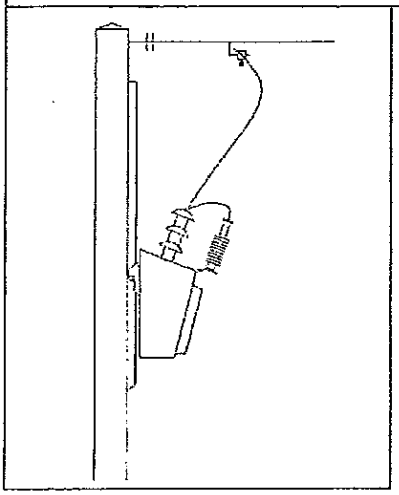
463

INSTALLATION EXAMPLE

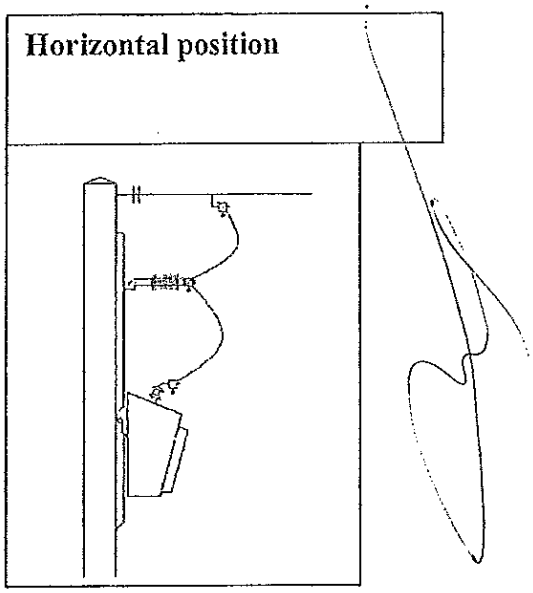
Always mount lightning arresters as close as possible to the apparatuses to be protected

TRANSFORMER PROTECTION

Vertical position on transformer tank

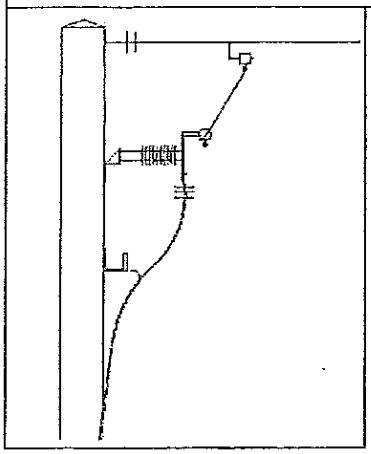


Horizontal position



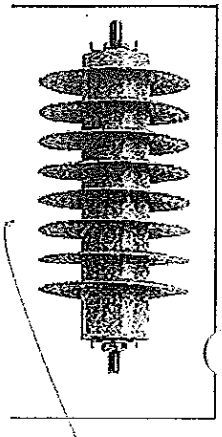
CABLE PROTECTION

Horizontal position



DERVASIL Route de Popenot 42800 Saint Joseph FRANCE
Téléphone : +33 (0)4 77 83 22 81 – Fax : +33 (0)4 77 83 22 80
Email : info@dervasil.com
Web : www.dervasil.com

Инструкции за експлоатация, монтаж, обслужване и съхранение на склад
Вентилни отводи AZBD— 0

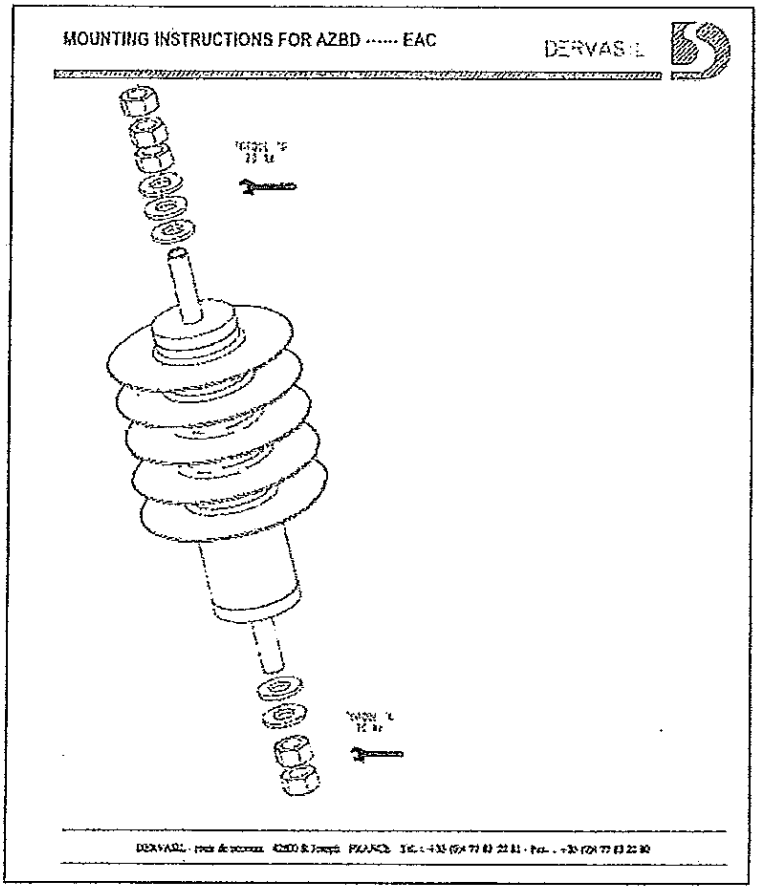


DERVASIL предлага диапазон от най-последно поколение вентилни отводи със силиконов гумен корпус и металооксидни варистори.

- **10 kA Вентилни отводи Клас 1**

Тези вентилни отводи нямат вътрешни искрови междини. Те показват стабилни характеристики с частична константа, много кратки времена за реакция (30 до 50 ns).
Пряко инжектиране на силиконова гума над вътрешните варистори гарантира абсолютно уплътняване, отлично поведение без експлозия при късо съединение. Тествани са в съответствие с последната версия на IEC стандарта 60099-4

РЪКОВОДСТВО ЗА МОНТАЖ



17/12/2010 10:42:00

"ВАК - 02" ООД
САМОКОВ

465

ОПАКОВКА

Вентилните отводи са опаковани в стабилни картонени кутии. Всяка картонена кутия съдържа:

- **3 вентилни отвода, закрепени с резбовани щифтове.**
- **3 найлонови торби с гайки и шайби**
- **1 инструкция за монтаж**

ТРАНСПОРТИРАНЕ И СЪХРАНЕНИЕ НА СКЛАД

Да се защитят вентилните отводи срещу удар, падане или плъзгане по време на транспортиране и съхранение. Спазвайте предпазните мерки за безопасност за подходящи манипулации по време на транспортирането и съхранението.Съхранявайте вентилните отводи в техните картонени кутии и в чисто и проветрено помещение.

ИНСПЕКЦИЯ

След отваряне на кутиите, проверете:

- **Маркировката на вентилните отводи трябва да съответства на закупения продукт**
- **Наличието на всички компоненти съгласно това ръководство**
- **Почистване на резбованите щанги за избягване на всякакво заяждане по време на монтажа на вентилните отводи**
- **Почистване на външния силиконов корпус, който трябва да бъде без нарязвания или отвори.**

"ВАК-02" ООД
САМОКОВ

466

ПРЕПОРЪКИ И ПОДДРЪЖКА

ПЕРСОНАЛЪТ, ОТГОВОРЕН ЗА МОНТАЖА, ТРЯБВА ДА БЪДЕ ПРОФЕСИОНАЛЕН И ОБУЧЕН ЗА БЕЗОПАСНА РАБОТА.
САМО ПЕРСОНАЛ, КОЙТО Е РАЗБРАЛ ИНСТРУКЦИИТЕ ЗА ЕКСПЛОАТАЦИЯ И МОНТАЖ, МОЖЕ ДА МОНТИРА ВЕНТИЛНИ ОТВОДИ

ДА СЕ ИЗБЯГВА ИЗПОЛЗВАНЕТО НА ОСТРИ ИНСТРУМЕНТИ, КОИТО МОГАТ ДА ПОВРЕДЯТ КОРПУСА НА ВЕНТИЛНИТЕ ОТВОДИ, ОСОБЕНО ПО ВРЕМЕ НА ОТВАРЯНЕ НА КУТИЯТА.

МИНИМАЛНАТА МЕЖДИНА МЕЖДУ ВЕНТИЛНИТЕ ОТВОДИ И МЕЖДУ ВЕНТИЛНИТЕ ОТВОДИ И ЗАЗЕМЯВАНЕТО Е ОПРЕДЕЛЕНА НА ТАБЛИЦАТА НА СТРАНИЦА 1. ТЕЗИ РАЗСТОЯНИЯ ТРЯБВА ДА СЕ ИЗПОЛЗВАТ ЗА МОНТАЖ НА ВЕНТИЛНИТЕ ОТВОДИ.

ЗА ВЕНТИЛНО ОТВОДИ ТИП AZB _ _ 2, ВИНАГИ СВЪРЗВАЙТЕ РАЗЕДИНИТЕЛЯ КЪМ ЗЕМЯ С ГЪВКАВ КАБЕЛ, ЗА ДА ИЗБЕГНЕТЕ БЛОКИРАНЕТО НА РАБОТАТА НА РАЗЕДИНИТЕЛЯ..

ЗА СВЪРЗВАНЕ И МОНТАЖ НА ВЕНТИЛНИ ОТВОДИ ДА НЕ СЕ ПРЕВИШАВА ОПРЕДЕЛЕНИЯ ВЪРТЯЩ МОМЕНТ.

СЛЕД МОНТАЖА НА ВЕНТИЛНИТЕ ОТВОДИ, ПОЧИСТЕТЕ СИЛИКОНОВИЯ КОРПУС С МЕКА И ЧИСТА КЪРПА.

ВЕНТИЛНИТЕ ОТВОДИ, КОИТО СА МОНТИРАНИ СЪГЛАСНО ТОВА РЪКОВОДСТВО, НЕ ИЗИСКВАТ НИКАКВО ПРОФИЛАКТИЧНО ТЕХНИЧЕСКО ОБСЛУЖВАНЕ.
ЗАМЕНЕТЕ ВЕНТИЛНИТЕ ОТВОДИ, АКО Е ПОВРЕДЕН ИНДИКАТОРЪТ ИЛИ РАЗЕДИНИТЕЛЯТ РАБОТИ ИЛИ СЛЕД ПРЕМОСТВАНЕ

ЕКОЛОГИЧЕН АСПЕКТ

Вентилните отводи DERVASIL не съдържат никакви материали, опасни за околната среда. След използване те трябва да бъдат разрушени в одобрен център.

17/12/2010 10:42:00

"ВАК - 02" ФОД
САМОКОВ

467

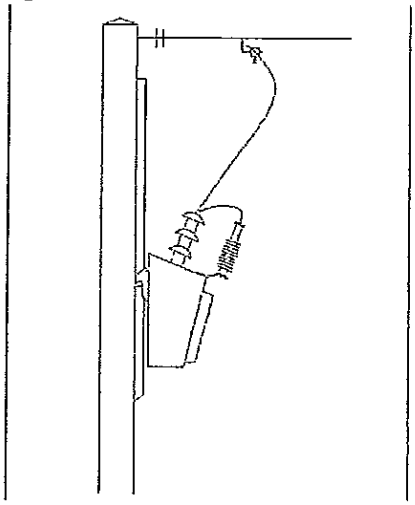
Инструкции за експлоатация, монтаж, обслужване и съхранение на склад
Вентилни отводи AZBD— 0

ПРИМЕР ЗА МОНТАЖ

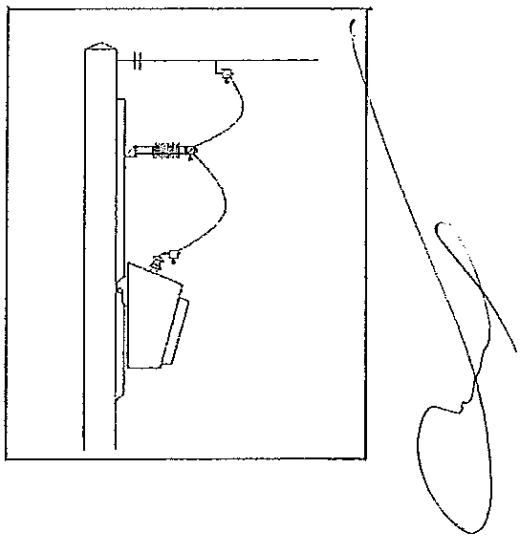
Винаги монтирайте вентилните отводи колкото е възможно по-близо до оборудването, за да бъде то защитено

ЗАЩИТА НА ТРАНСФОРМАТОРА

Вертикално положение на казана на трансформатора

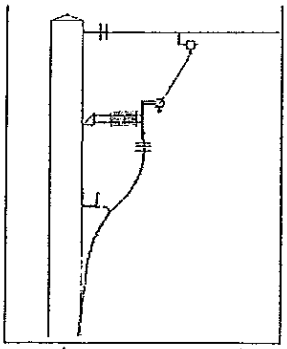


Хоризонтално положение



КАБЕЛНА ЗАЩИТА

Хоризонтално положени



DERVASIL Route de Popenot 42800 Saint Joseph FRANCE
Téléphone : +33 (0)4 77 83 22 81 - Fax : +33 (0)4 77 83 22 80
Email : info@dervasil.com Web : www.dervasil.com

17/12/2010 10:42:00

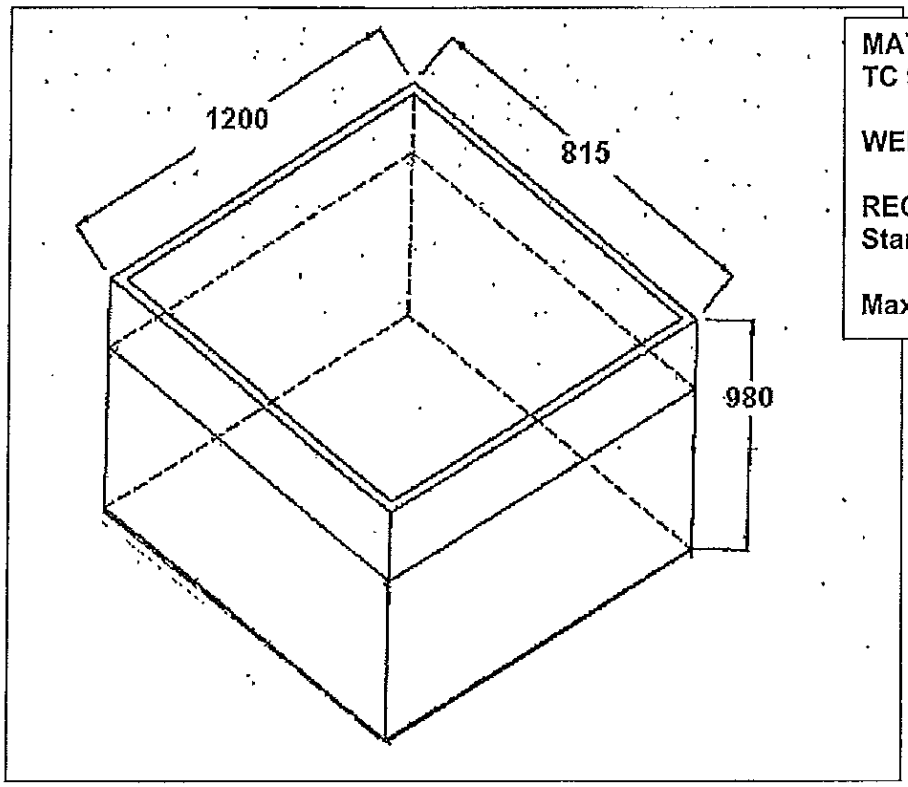
"ВАК - 02" ООД САМОКОВ

468

dervasil

QUALITY DEPART.

SPECIFICATION OF PURCHASE	SP Indice A
PACKING CARDBOARD BOX AND PALLET	DATE : 09/06/2005
	PAGE : 1 / 5



MATERIAL: Cardboard
TC 900 thickness 14.4 mm

WEIGHT: 11 kG

RECYCLABLE :
Standard EN13430

Max Charge :400 kG

LIST OF UPDATE

Revision	Date	Description of modifications
A	12/09/00	Creation of the specification

This document is an element of the knowledge of the company, and for this reason it can not be distributed to the outside

	Date	Function	Name	V
Writing	09/06/2005	R & D	DUSSOL L	
Verification	09/06/2005	Purchase	MOUNIER S	
Approval	09/06/2005	Director	GAZZOLA C	

на основание чл. 2 от ЗЗЛД

на основание чл. 2 от ЗЗЛД

ВЯРНО С ОРИГИНАЛА

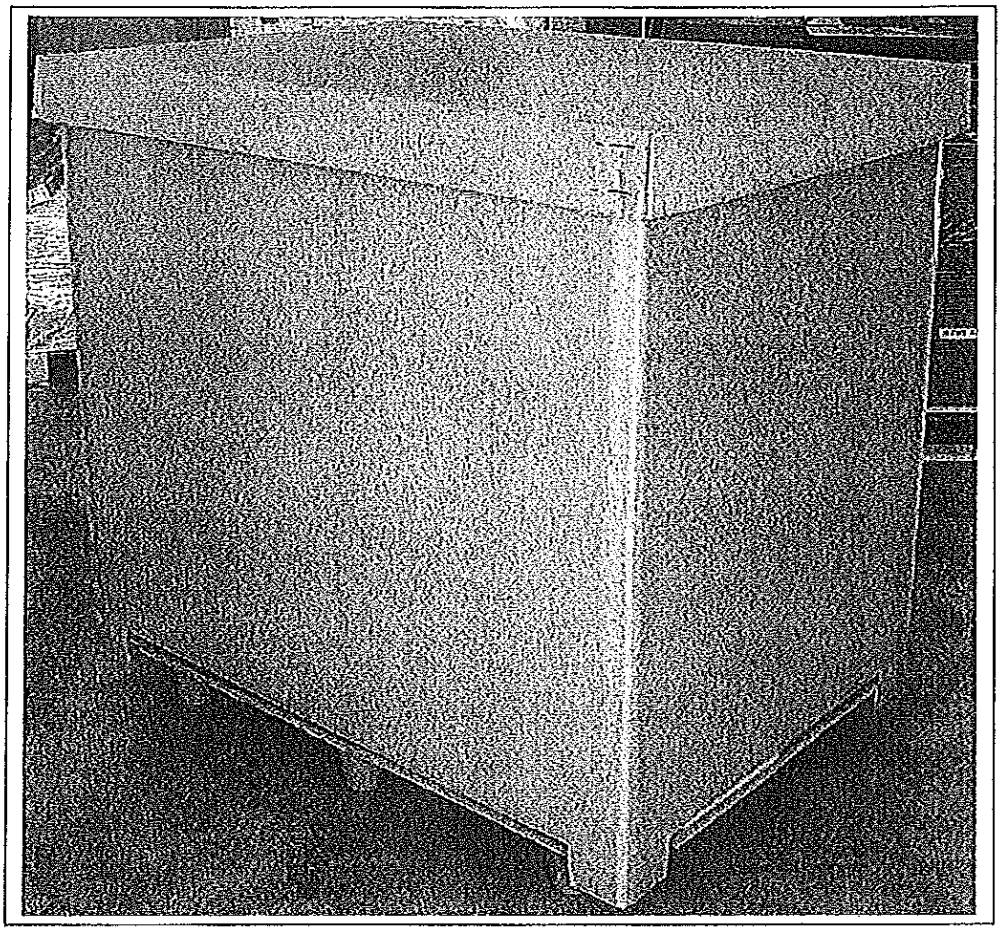
"ВАК-02" ООД САМОКОВ

469

dervasil

QUALITY DEPART.

SPECIFICATION OF PURCHASE	SP Indice A
PACKING CARDBOARD BOX AND PALLET	DATE : 09/06/2005
	PAGE : 2 / 5



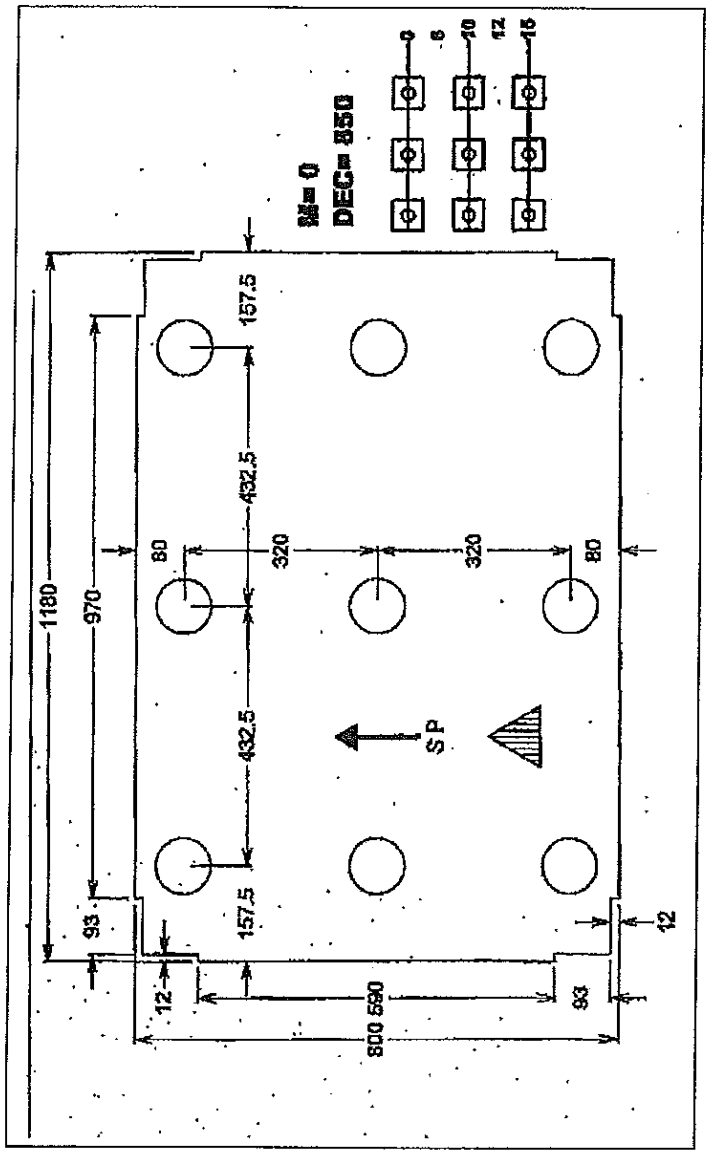
ВЯРНО С ОРИГИНАЛА

РАК - 02" ОФД
САМОКОВ

dervasil

QUALITY DEPART.

SPECIFICATION OF PURCHASE	SP Indice A
PACKING CARDBOARD BOX AND PALLET	DATE : 09/06/2005
	PAGE : 3 / 5



MATERIAL: Cardboard TC 700 thickness 14.6 mm - 9 PLOTS

HEIGHT : 140 mm

WEIGHT: 2 kG

RECYCLABLE : Standard EN13430

Max Charge :600 kG

PALLET

ВЗЯТО С ОРИГИНАЛА

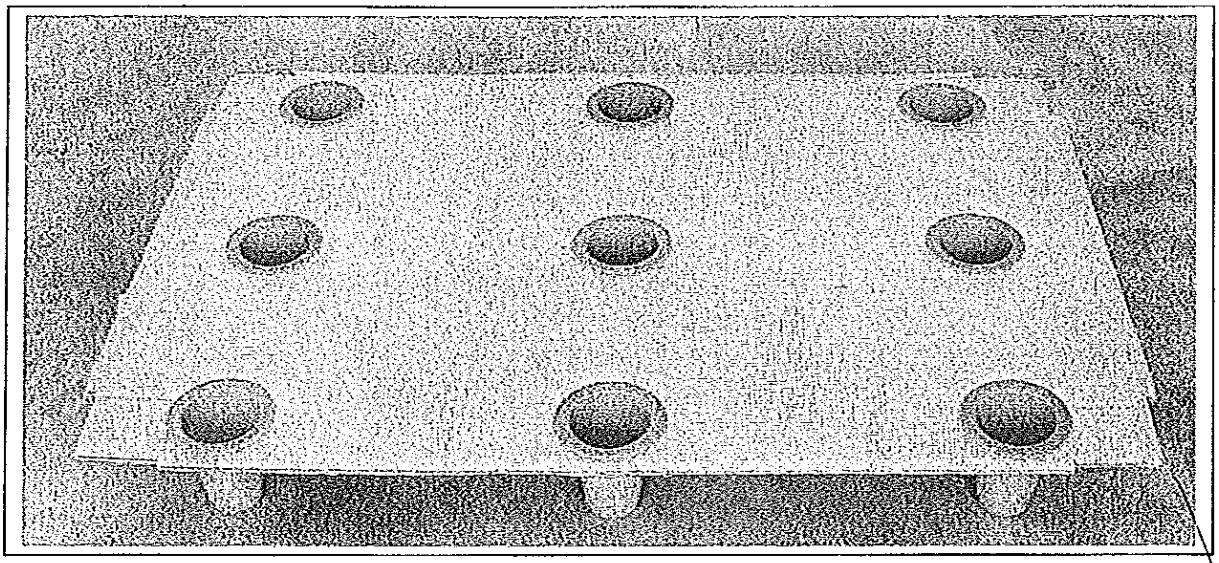
"ВАК 02" ООД
САМОКОВ

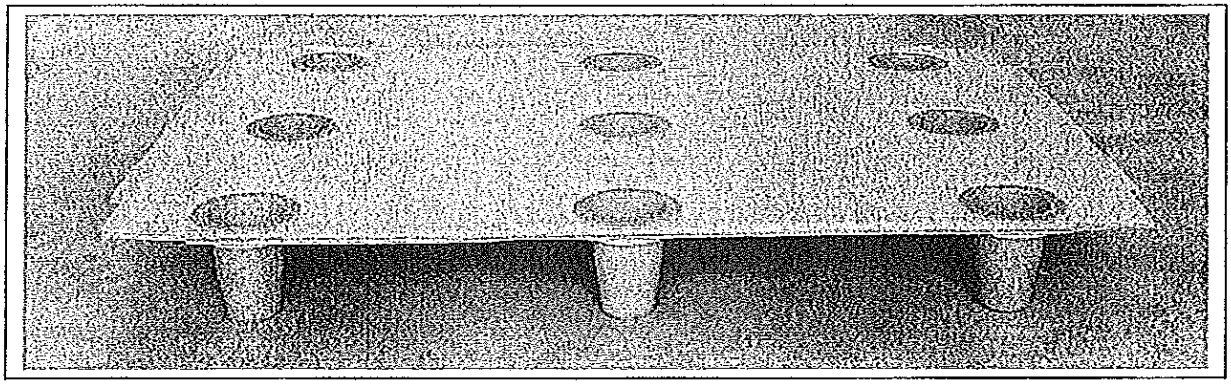
431

dervasil

QUALITY DEPART.

SPECIFICATION OF PURCHASE	SP Indice A
PACKING CARDBOARD BOX AND PALLET	DATE : 09/06/2005
	PAGE : 4 / 5





ВЯРНО С ОРИГИНАЛА

"РАК 02" ООД
САМОКОВ

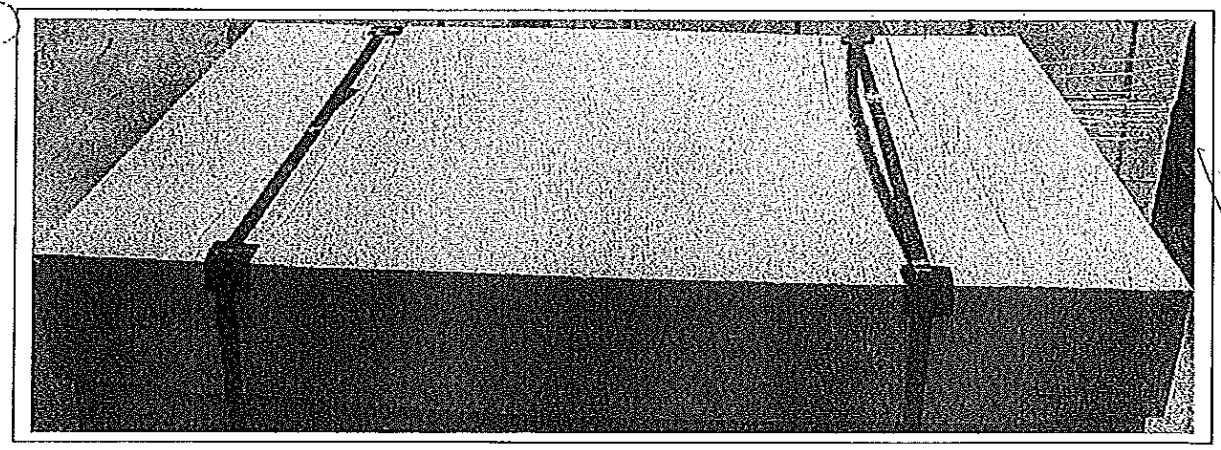
4/2

dervasil

QUALITY DEPART.

SPECIFICATION OF PURCHASE	SP Indice A
PACKING CARDBOARD BOX AND PALLET	DATE : 09/06/2005
	PAGE : 5 / 5

STEEL STRAPPING



ВЯРНО С ОРИГИНАЛА

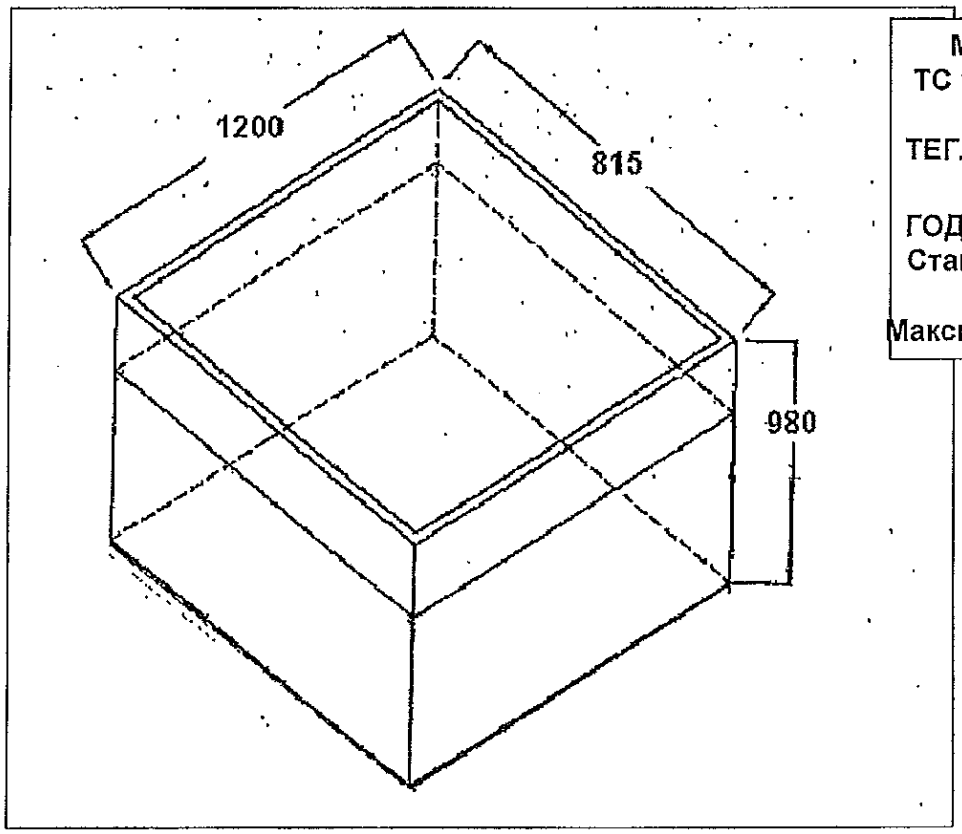
"ВАХ - 02" ООД
САМОКОВ

413

dervasil

ОТДЕЛ ПО КАЧЕСТВОТО

СПЕЦИФИКАЦИЯ ЗА ПОКУПКА НА ОПАКОВЪЧНИ КУТИИ И ПАЛЕТИ	SP Indice A
	ДАТА: 09/06/2005
	СТРАНИЦА: 1 / 5



МАТЕРИАЛ: Картон ТС 900 дебелина 14.4 mm

ТЕГЛО: 11 kG

ГОДНИ ЗА РЕЦИКЛИРАНЕ : Стандарт EN13430

Максимално зареждане:400 kG

СПИСЪК НА АКТУАЛИЗАЦИИТЕ

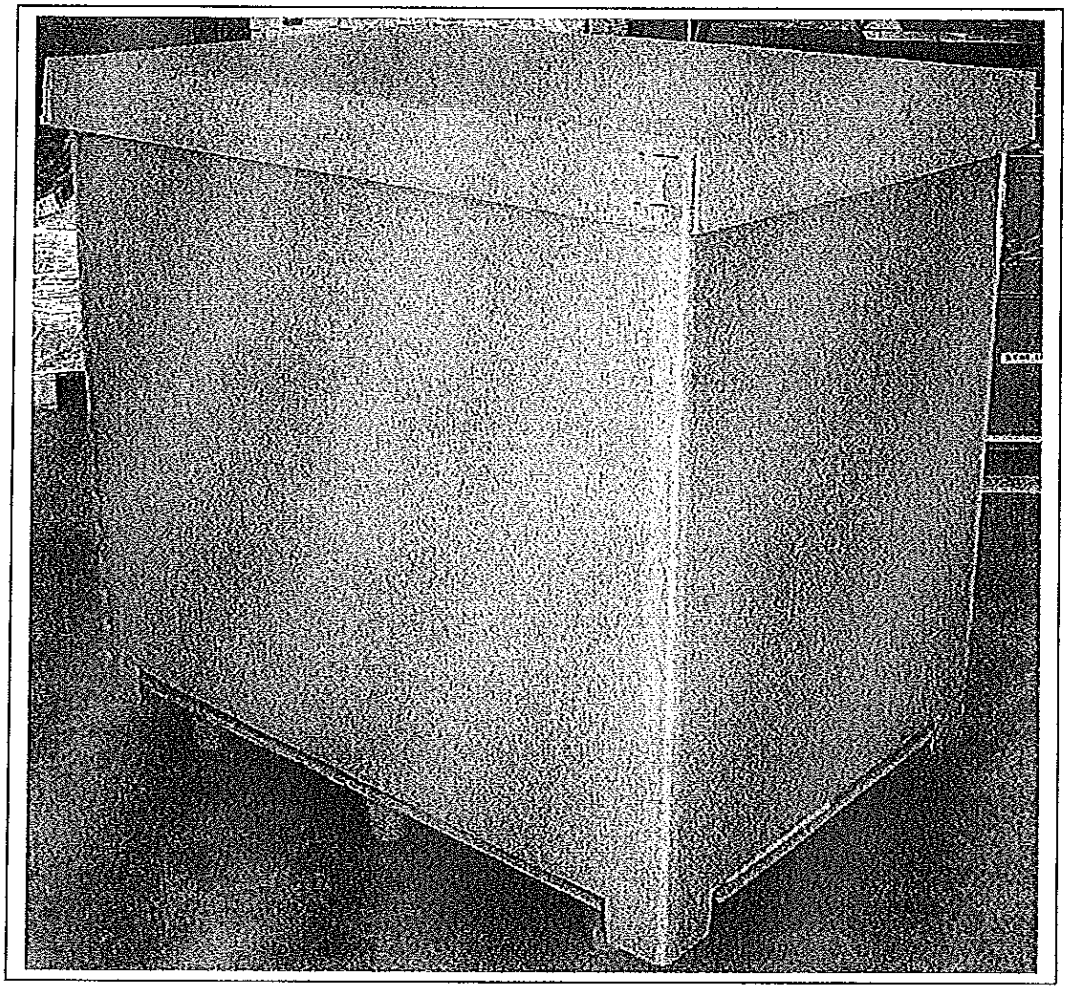
Редакция	Дата	Описание на промените
A	12/09/00	Изготвяне на спецификация

Този документ е елемент от ноу-хау на компанията и поради тази причина той не може да бъде разпространяван извън нея

	Дата	Функция	Име	Подпис
Вписване	09/06/2005	R & D	DUSSOL L	на основание чл. 2 от ЗЗЛД
Верификация	09/06/2005	Покупка	MOUNIER S	
Одобрил	09/06/2005	Директор	GAZZOLA C	на основание чл. 2 от ЗЗЛД

на основание чл. 2 от ЗЗЛД

"ВАХ - 02" ООД САМОКОВ



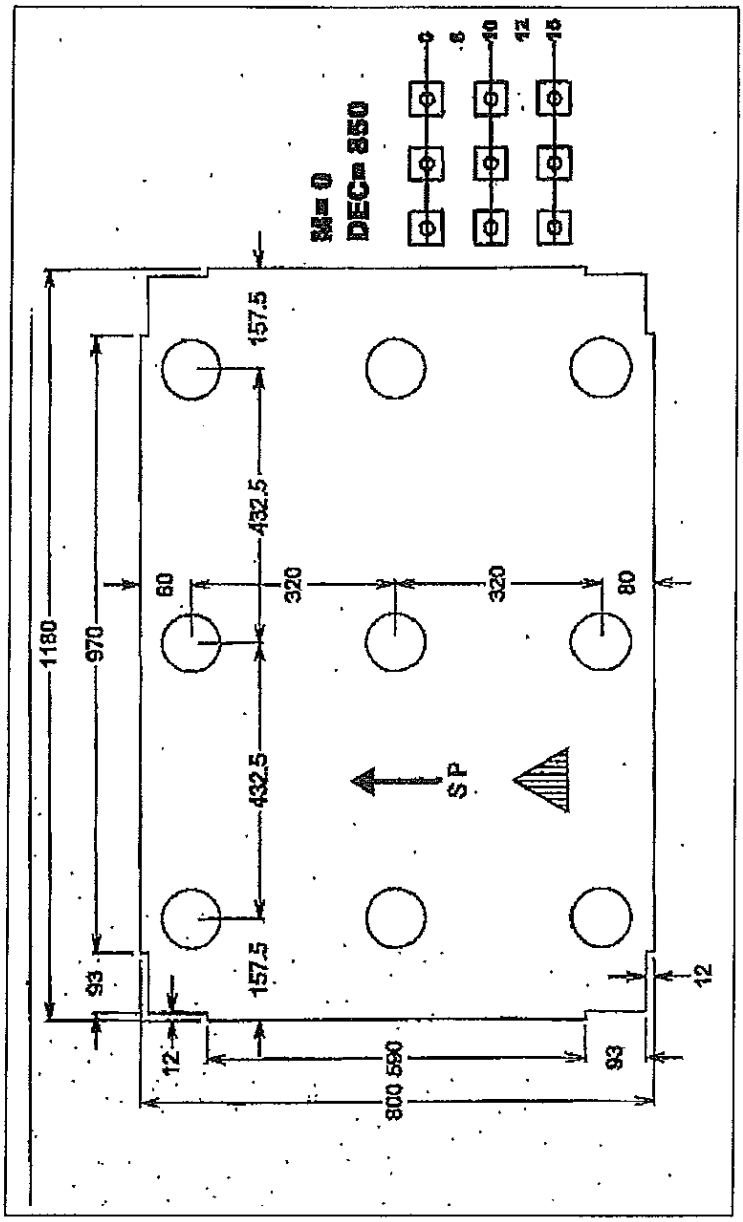
"ВМ - 02" ООД
САМОКОВ

475

dervasil

ОТДЕЛ ПО КАЧЕСТВОТО

СПЕЦИФИКАЦИЯ ЗА ПОКУПКА НА ОПАКОВЪЧНИ КУТИИ И ПАЛЕТИ	SP Indice A
	ДАТА: 09/06/2005
	СТРАНИЦА: 3 / 5



МАТЕРИАЛ: Картон TC 700
дебелина 14.6 mm - 9 PLOTS

ВИСОЧИНА : 140 mm

ТЕГЛО: 2 kG

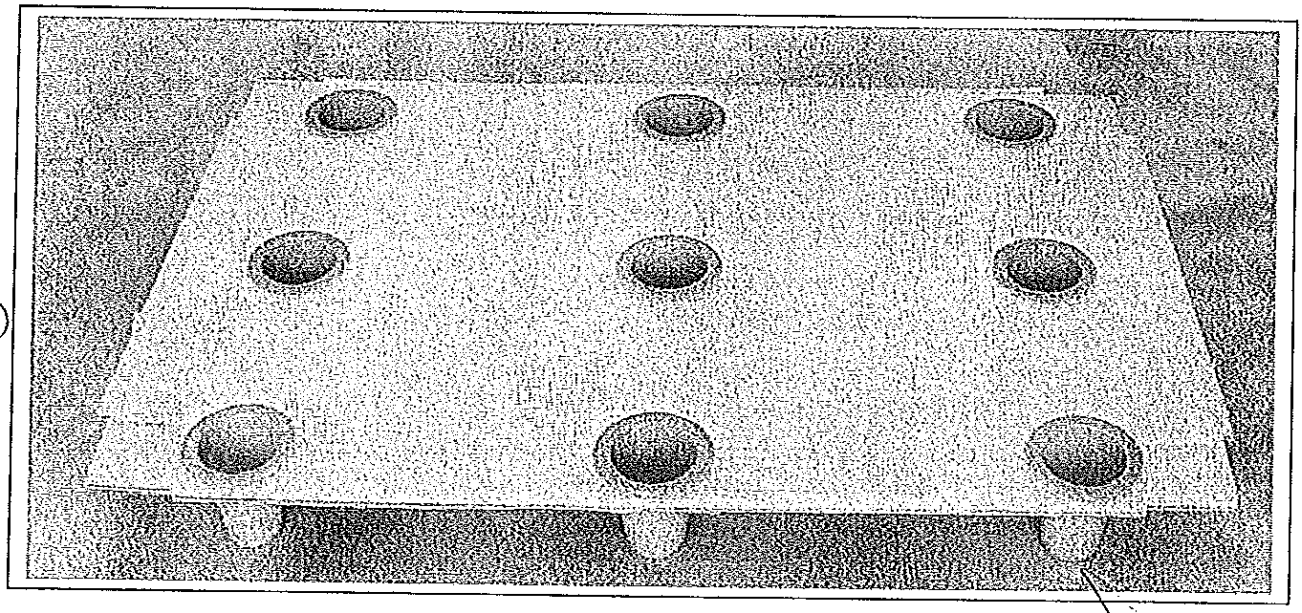
ПОДЛЕЖИ НА РЕЦИКЛИРАНЕ :
Стандарт EN13430

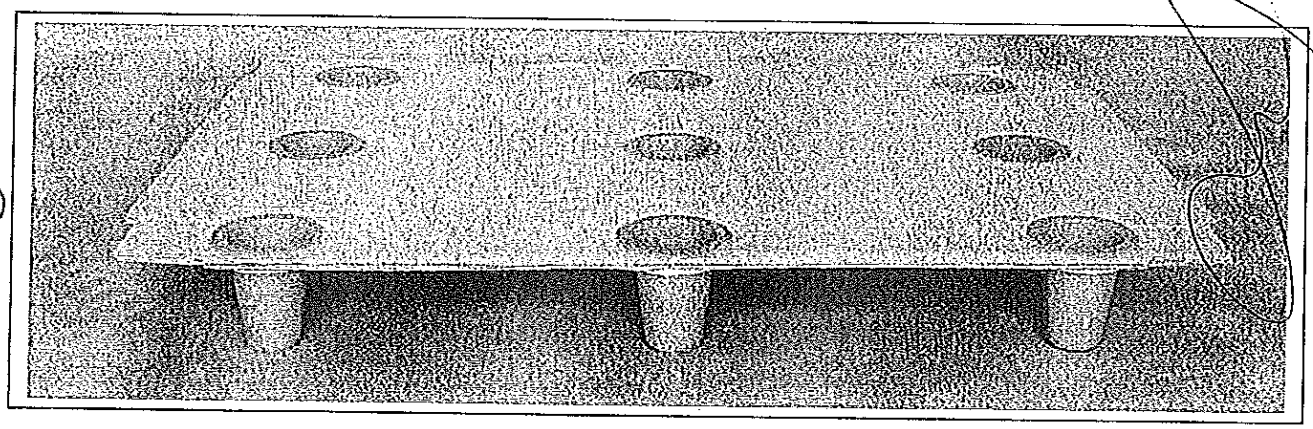
Максимален заряд :600 kG

ПАЛЕТ

"ВАК - 02" ООД
САМОКОВ

476

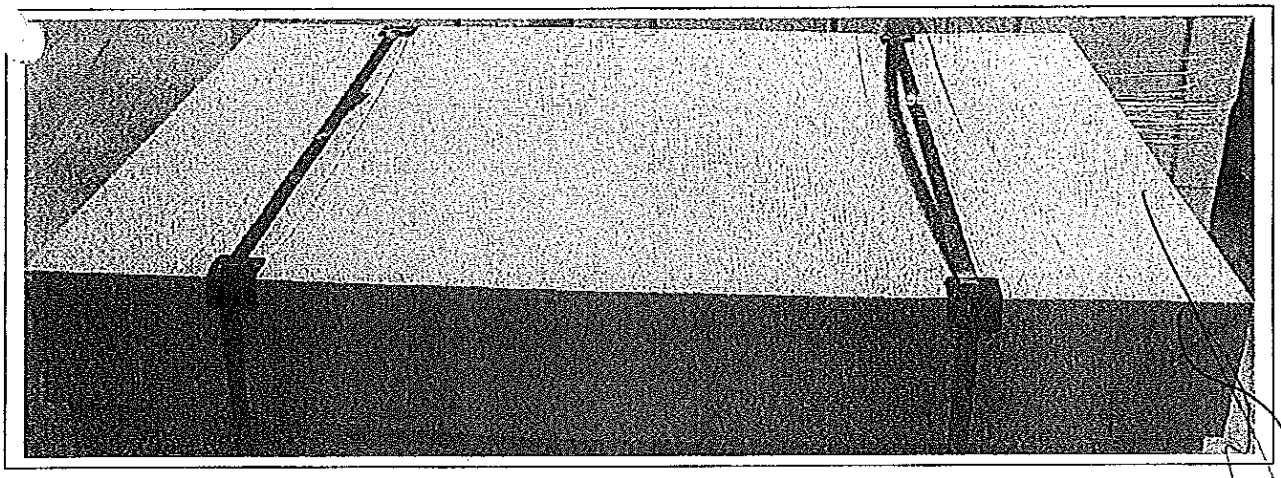




"ВАК - 02" ООД
САМОКОВ

477

СТОМАНЕНА ЛЕНТА



"ВАК - 02" ООД

428

Приложение 2.6

dervasil

groupe sicame

SAS au capital de 907 190 €

COMPOSANTS DE PROTECTION POUR LES RÉSEAUX D'ÉNERGIE ÉLECTRIQUE

Direction – Services commerciaux – Usine
Route de Popenot
42800 SAINT JOSEPH

Tél. (33) 04 77 75 29 98
Fax (33) 04 77 83 22 80
E-mail : info@dervasil.com

V/REF

N/REF.

Certificate

EMETTEUR

To whom it may concerns

We undersign, DERVASIL S.A.S, subsidiary of SICAME S.A, French manufacturer for hardware and accessories for electrical lines and network since 1955 with headquarters located at 19230 POMPADOUR CEDEX / France represented by Stéphane Pradella, Area manager, certify that :

The Medium Voltage Lightening Arresters manufactured by our company in France DERVASIL S.A.S
Types AZC and AZBD

are manufactured according to ISO 9001-2008, AFAQ certified and qualified by type tests performed in independent laboratories.
Dervasil MV Arresters are conforming to international standards EN 60099-4 and IEC/TS 60815-3.

Dervasil (Ferraz) Arresters with silicone housing are now installed on French network for more than 20 years and are still giving full service satisfaction.

Therefore, we can certify a lifetime of more than 20 years.

St Joseph on
May 28th, 2013

dervasil
SAS au capital de 907 190 €
Route de Popenot - 42800 SAINT-JO
Tél. 04 77 75 29 98 - Fax 04 77 83
RC St-Etienne 423 136 977 - Code NAF

на основание чл. 2 от ЗЗЛД

ВЯРНО С ОРИГИНАЛА

"ВАК - 02" ООД

479

DERVASIL
Управление
Route De Popenot
42800 Saint-Joseph
Тел.(33) 04 77 75 29 98
Факс.(33) 04 77 83 22 80
E-mail : info@dervasil.com

Сертификат

До тези, за които се отнася.

Ние долуподписаните, DERVASIL S.A.S., филиал на SICAME S.A, френски производител на оборудване/части и аксесоари за електрически мрежи от 1955г. със седалище в 19230 Pompadour **CEDEX/Франция представлявано от Stéphane PRADELLA, Регионален мениджър,** потвърждаваме че:

Вентилните отводи за средно напрежение типове AZC и AZBD, произведени във Франция от DERVASIL S.A.S

са в съответствие с ISO 9001 – 2008, сертифицирани от AFAQ и проверени с протоколи от изпитвания на независими лаборатории.

Вентилните отводи за средно напрежение на Dervasil са в съответствие с международния стандарт EN 60099-4 и IEC/TS 60815-3.

Вентилните отводи на Dervasil (Ferraz) със силиконова обвивка, които са били инсталирани във френската електрическа мрежа от преди повече от 20 години са все още в употреба и дават удовлетворителни резултати.

Следователно декларираме експлоатационната дълготрайност повече от 20 години (минимум 20 години).

St Joseph
28.05.2013

на основание чл. 2 от ЗЗЛД

"ВАК - 02" ООД
САМОКОВ

480

Приложение №3 към Техническото предложение

СРОКОВЕ ЗА ДОСТАВКА

№	Наименование	Мярка	Количество със срок на доставка до 7 кал. дни	Количество със срок на доставка до 30 кал. дни
1	2	3	4	5
1	Вентилен отвод метало - оксиден тип без искрови разрядници, 10 kV, 10kA, клас 2	бр.	3	5
2	Вентилен отвод метало - оксиден тип без искрови разрядници, 20 kV, 10kA, клас 1	бр.	20	50
3	Вентилен отвод метало - оксиден тип без искрови разрядници, 20 kV, 10kA, клас 2	бр.	20	50

Забележки:

1/ Срокът на доставките започва да тече от датата на изпращане на поръчката.

2/ Количествата в колона 4, със срок на доставка до 7 /седем/ календарни дни, се доставят след SAP поръчка до посочените в обявлението складове на Възложителя за покриване на спешни нужди на Възложителя.

Възложителят може до поръчва посоченото спешно количество веднъж месечно.

3/ В случай, че крайният срок на доставката съвпада с празничен или неработен ден, то доставката се извършва не по-късно от първия работен ден след изтичането на срока.

4/ При поръчки на Възложителя на количества в рамките на потвърдените от Изпълнителя и недоставени в посочените срокове, ще бъдат налагани неустойки, съгласно условията на договора.

5/ Възложителят може да поръча количества по-малки от посочените в колони 4 и 5.

6/ Възложителят може да поръчва количества по-високи от посочените в колони 4 и 5, като това обстоятелство ще бъде посочено текстово в съответната поръчка изпратена към Изпълнителя. С потвърждението на поръчката, Изпълнителят вписва в същата очаквана дата за доставка на количествата надвишаващи посочените в колони 4 и 5.

7/ Количествата за доставка в колони 4 и 5 са отделни и независими едно от друго.

8/ Количествата за доставка в колона 5 не включват в себе си количествата за доставка в колона 4.

9/ Възложителят има право да направи едновременно поръчки за доставка на количества от колони 4 и 5.

"ВАК - 02" ООД

Дата 02.04.2018 г.

ПОДПИС и ПЕЧАТ: Ивайло Конярски
Управител

"ВАК - 02" ООД
САМОКОВ

481

поставя се в комплекта на техническото предложение
ОБРАЗЕЦ!

Д Е К Л А Р А Ц И Я

за приемане на условията в проекта на рамково споразумение и проекта на конкретен договор, неразделна част от рамковото споразумение

Долуподписаният Ивайло Арангелов Конярски, в качеството ми на представляващ **„ВАК-02" ООД**, участник в процедура за възлагане на обществена поръчка с реф. № PPD17-158 и предмет: **„Доставка на вентилни отводи средно напрежение (СрН)"**,

ДЕКЛАРИРАМ, ЧЕ:

1. Приемам условията в проекта на рамково споразумение, приложен в документацията за участие.
2. Приемам условията в проекта на конкретен договор, неразделна част от рамковото споразумение, приложен в документацията за участие.

"ВАК - 02" ООД

на основание чл. 2 от ЗЗЛД

Дата 02.04.2018 г.

Декларатор: _____
/ Ивайло Конярски /

"ВАК - 02" ООД

поставя се в комплекта на техническото предложение
ОБРАЗЕЦ!

Д Е К Л А Р А Ц И Я
за срока на валидност на офертата

Долуподписаният Ивайло Арангелов Конярски, притежаващ лична карта № 640267725, издадена на 02.06.2010 г. от МВР София област – гр. София, адрес: гр. Самоков, ул Христо Йончев № 7А, в качеството ми на Управител на „ ВАК-02" ООД, участник в процедура за възлагане на обществена поръчка с реф. № PPD17-158 и предмет: **„Доставка на вентилни отводи средно напрежение (СрН)",**

ДЕКЛАРИРАМ, ЧЕ:

С подаване на настоящата оферта, направените от нас предложения и поети ангажименти са валидни за срока, посочен в обявлението, считано от крайния срок за подаване на офертите.

Дата 02.04.2018 г.

Декларатор: на основание чл. 2 от ЗЗЛД
/ Ивайло Конярски /

Забележка:
Декларацията се подписва от законния представител на участника или от надлежно упълномощено лице, което подава офертата.

"ВАК-02" ООД САМОКОВ

483