

TEST REPORT



KERI



한국전기연구원
KOREA ELECTROTECHNOLOGY
RESEARCH INSTITUTE

INFORMATION SHEET

1. Type Test Certificate

A Certificate contains a record of a series of type tests carried out strictly in accordance with IEC, and/or regional standard and national standard that are identical to IEC standard. The equipment tested has fulfilled the requirements of this standard and the relevant ratings assigned by the manufacturer are endorsed by KERI. The Certificate is applicable only to the equipment tested. KERI is responsible for the validity and the contents of the Certificate. The responsibility for conformity of any apparatus having the same designation as the one tested rests with the manufacturer. The certificate contains the essential drawings and a description of the equipment tested. Detailed rules are given in KERI's Type Test Certification Procedure.

2. Test Report

2.1 Type Test Report

A Type Test Report contains a record of a series of type tests carried out strictly in accordance with a standard recognized by KERI. The equipment tested has fulfilled the requirements of this standard and the relevant ratings assigned by the manufacturer are endorsed by KERI. The Type Test Report is applicable only to the equipment tested. KERI is responsible for the validity and the contents of the Type Test Report. The responsibility for conformity of any apparatus having the same designation as the one tested rests with the manufacturer. The Type Test Report contains the essential drawings and a description of the equipment tested. Detailed rules are given in KERI's Test Procedure.

2.2 Performance Test Report

A Performance Test Report contains a record of one or more tests which have been carried out according to the applicant's instructions. These tests are not necessarily in accordance with a recognized standard. The test results do not verify ratings of the test object. Detailed rules are given in KERI's Test Procedure.

KERI issues three types of Performance Test Report.

2.2.1 The tests have been carried out strictly in accordance with a recognized standard. The apparatus has complied with the relevant requirements.

This sentence will appear on the front page of Performance Test Report if the tests have been performed in accordance with a recognized standard, but the series of tests does not completely fulfil the requirements for a Certificate of Compliance (for example, if the number of test series is not a complete series of type tests). The Report contains verified drawings and a description of the equipment tested. The condition of the test object after the tests is assessed and recorded in the Report.

2.2.2 The tests have been carried out in accordance with the applicant's instructions. Test procedure and test parameters were based on a recognized standard.

This sentence will appear on the front page of Performance Test Report if the number of test duties, the test procedure and the test parameters are based on a recognized standard and related the ratings assigned by the manufacturer. Verification of the drawings (if submitted) and assessment of the condition after the tests is only done on the applicant's request.

2.2.3 The tests have been carried out according to the applicant's instructions.

This sentence will appear on the front page of Performance Test Report if the test shots, test procedure and/or test parameters are not in accordance with a recognized standard.



TEST REPORT

2011TS00328

1/20

CLASSIFICATION Performance Test

APPARATUS Surge protective device

DESIGNATION LM-34-40-90M
AC (380 ~ 415) V L-N 275 V L-L 465 V 2.0 kV 65 kA

RECEIPT No. TRD10S02884 (December 29, 2010)

APPLICANT Ground Co., Ltd.
#209, Suntech City 2 307-2 Sangdaewon-dong Joongwon-gu Seongnam-si
Gyeonggi-do Korea

MANUFACTURER Ground Co., Ltd.
#209, Suntech City 2 307-2 Sangdaewon-dong Joongwon-gu Seongnam-si
Gyeonggi-do Korea

DATE OF TESTS January 26, 2011 ~ February 21, 2011

DATE OF ISSUE March 02, 2011

The tests have been carried out in accordance with the applicant's instructions.

This Test Report has been issued by KERI.

The test results are shown in the records of tests with the performance of the apparatus tested and the observations made during the tests. The oscillograms are attached hereto.

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

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TOTAL No. OF PAGES(20) : records (8), photographs (2), circuit diagrams (0), drawings & descriptions (0), attachments(0), oscillograms (10)



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DF-CA-21/11/05

Table of contents

Items	Sheet No.
Table of contents	2/20
Ratings	2/20
List of tests	3/20
Test results	4/20 ~ 8/20
Photographs	9/20 ~ 10/20
Circuit diagrams and parameters	-
Drawings	-
Attachments	-
Oscillograms	11/20 ~ 20/20

Tested by :

Kim, Young-Sung
Ryu, Jae-Nam

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Witnessed by :**Photographs :**

Photo. SG01 Appearance of EUT(equipment under the test)
Photo. SG02 Measurement of residual voltage test and operating duty test
Photo. SG03 Measurement of the front of wave sparkover voltage test

Circuit diagrams and parameters : N.A.

Drawings : N.A.

Attachments : N.A.

Surge protective device

Manufacturer
Designation

Ground Co., Ltd
LM-34-40-90M

Ratings of the test object assigned by manufacturer and proved by tests : N.A.

Ratings of the test object assigned by manufacturer

Rated voltage	AC (380~415) V
Maximum continuous operating voltage U_c	L-N 275 V L-L 465 V
Voltage protection level	2.0 kV
Max discharge current I_{max}	65 kA
Nominal discharge current I_n	20 kA
Frequency	(50~60) Hz

List of tests	Claus	Date	Sheet No.
1 Measurement of residual voltage test	Applicant's instructions	2011.01.26	4/20
2 Measurement of the front of wave sparkover voltage test	Applicant's instructions	2011.01.26	5/20
3 Operating duty test	Applicant's instructions	2011.01.26	6/20
4 TOV test by low voltage system faults	Applicant's instructions	2011.01.26	7/20
5 TOV test by high voltage system faults	Applicant's instructions	2011.02.08	7/20
6 Short-circuit withstand capability	Applicant's instructions	2011.02.15 ~2011.02.21	8/20
7 Description of tests	-	-	8/20



1 Measurement of residual voltage test

1.1 Line-Neutral, Line-Ground

Test method and requirement	Applied point	Polarity	Result	
			kV	#1
<ul style="list-style-type: none"> o Test specification <ul style="list-style-type: none"> - Short-circuit current of the generator : (8×20) μs, 20 kA - Polarity of impulses : positive and negative o Requirement <ul style="list-style-type: none"> - No damage shall be observed o Measurement <ul style="list-style-type: none"> - Measuring the residual voltages on protected line terminals 	Line-Neutral	Positive	1.50	
		Negative	1.59	
	Line-Ground	Positive	-	
		Negative	-	
	Line-Line	Positive	-	
		Negative	-	

※ See Osc. SG01

1.2 Neutral-Ground

Test method and requirement	Applied point	Polarity	Result			
			0.1 I _n	0.2 I _n	0.5 I _n	1.0 I _n
<ul style="list-style-type: none"> o Test specification <ul style="list-style-type: none"> - Short-circuit current of the generator : (8×20) μs, 20 kA - Polarity of impulses : positive and negative o Requirement <ul style="list-style-type: none"> - No damage shall be observed o Measurement <ul style="list-style-type: none"> - Measuring the residual voltages on protected line terminals 	Neutral-Ground	Positive	0.95	0.86	0.86	0.99
		Negative	0.97	0.93	0.95	1.06

※ See Osc. SG02~SG03

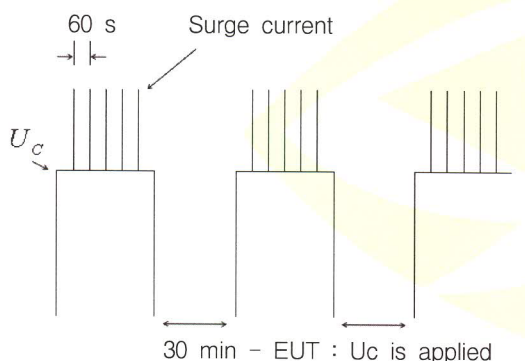
2 Measurement of the front of wave sparkover voltage test

Test method and requirement	Applied point	Polarity	Result kV #1
o Test specification - Open-circuit voltage of the generator : (1.2×50) μs, 6 kV - Short-circuit current of the generator : (8×20) μs 3 kA - Effective output impedance of the generator $Z_f : 2 \Omega$ - Polarity of impulses : positive and negative - EUT : energized o Measurement - Measuring the sparkover voltages on protected line terminals	Line-Neutral	Positive	N.A.
		Negative	N.A.
	Line-Ground	Positive	-
		Negative	-
	Neutral-Ground	Positive	0.99
			1.04
			0.99
			1.04
		Negative	1.10
			1.15
			1.10
			1.13
Line-Line	positive	-	
	Negative	-	

※ See Osc. SG04

3 Operating duty test

3.1 Preconditioning test

Test method and requirement	Applied point	Result #2
<p>o Test specification</p> <ul style="list-style-type: none"> - Short-circuit current of the generator : 20 kA, (8×20) μs - Impulses are to be applied 1 min apart. Each impulse is applied at 30° around the clock starting at 0° - 15 impulses are applied in groups of five impulses - Interval between the groups 30 min  <p>60 s Surge current</p> <p>U_c</p> <p>30 min - EUT : U_c is applied</p> <p>o Requirement</p> <ul style="list-style-type: none"> - No damage shall be observed 	Line-Neutral	No damage observed
	Line-Ground	-
	Neutral-Ground	No damage observed
	Line-Line	-

3.2 Operating duty test

Test method and requirement	Applied point	Polarity	Result #2
<p>o Test specification</p> <ul style="list-style-type: none"> - Short-circuit current of the generator I_{max} : 65 kA, (8×20) μs - Applied 0.1I_{max}, 0.2I_{max}, 0.5I_{max}, 0.75I_{max} and 1.0I_{max} <p>o Requirement</p> <ul style="list-style-type: none"> - No damage shall be observed - Claus 7.6.6 of IEC 61643-1 pass criteria should be fulfilled 	Line-Neutral	Positive	No damage observed Claus 7.6.6 of pass criteria is fulfilled
	Line-Ground	Positive	-
	Neutral-Ground	Positive	No damage observed Claus 7.6.6 of pass criteria is fulfilled
	Line-Line	Positive	-

※ See Osc. SG05

4 TOV test by low voltage system faults

Test method and requirement	Applied point	Result #3
<ul style="list-style-type: none"> o Test specification <ul style="list-style-type: none"> - Maximum continuous operating voltage of the power system (U_{cs}) : 264 V - Temporary overvoltage test value(U_T) : $U_{cs} \times 1.55(L-PE)$ $U_{cs} \times 1.32(L-N)$ o Requirement <ul style="list-style-type: none"> - failure mode : There shall be clear evidence of effective and permanent disconnection by the device. - withstand mode : After test, thermal stability and the performance shall be fulfilled and claus 7.7.6.2 of IEC 61643-1 pass criteria should be fulfilled 	Line - Ground	withstood Claus 7.7.6.2 of pass criteria is fulfilled
	Line - Neutral	withstood Claus 7.7.6.2 of pass criteria is fulfilled

5 TOV test by high voltage system faults

Test method and requirement	Applied point	Result #4
<ul style="list-style-type: none"> o Test specification <ul style="list-style-type: none"> - Maximum continuous operating voltage of the power system (U_{cs}) - Temporary overvoltage test value(U_T) : $U_{cs} + 1\ 200\ V(L-PE)$, $1\ 200\ V(N-PE)$ o Requirement <ul style="list-style-type: none"> - failure mode : There shall be clear evidence of effective and permanent disconnection by the device. - withstand mode : After test, thermal stability and the performance shall be fulfilled and claus 7.7.4.2 of IEC 61643-1 pass criteria should be fulfilled 	Line - Ground	withstood Claus 7.7.4.2 of pass criteria is fulfilled
	Line - Neutral	withstood Claus 7.7.4.2 of pass criteria is fulfilled
	Neutral-Ground	withstood Claus 7.7.4.2 of pass criteria is fulfilled
	Line - Line	withstood Claus 7.7.4.2 of pass criteria is fulfilled

6 Short-circuit withstand capability

6.1 Test of the declared short-circuit withstand capability

Test conditions	Test requirements	Test results	
		#5	#6
U _c : 465 V Test current : 10 000 A power factor : 0.45 ~ 0.5	Neither the muslin paper nor the cheese cloth shall catch fire The power short-circuit current shall be interrupted by one of the disconnectors (internal or external) required by the manufacturer. Claus 7.7.3 of IEC 61643-1 pass criteria should be fulfilled.	Claus 7.7.3 of pass criteria is fulfilled	Claus 7.7.3 of pass criteria is fulfilled

※ See Osc. SG06~SG08

6.2 Test at low short-circuit current

Test conditions	Test requirements	Test results	
		#7	
U _c : 465 V Test current : 1 200 A power factor : 0.9 ~ 0.95	Neither the muslin paper nor the cheese cloth shall catch fire The power short-circuit current shall be interrupted by one of the disconnectors (internal or external) required by the manufacturer. Claus 7.7.3 of IEC 61643-1 pass criteria should be fulfilled.	Claus 7.7.3 of pass criteria is fulfilled	

※ See Osc. SG09~SG10

7 Description of tests

- 7.1 This test report is carried out in accordance with the applicant's instructions for the specimen submitted by test applicant.
- 7.2 Test item 6.1 and 6.2 is performed with MCCB (3P 440 V 125 A 38 kA) which is submitted by applicant.
- 7.3 Line-Line and Line-Ground of test item 1, 2 and 3 are not carried out by applicant's instructions.
- 7.4 The reference standard is IEC 61643-1:2005 End.

Photographs :

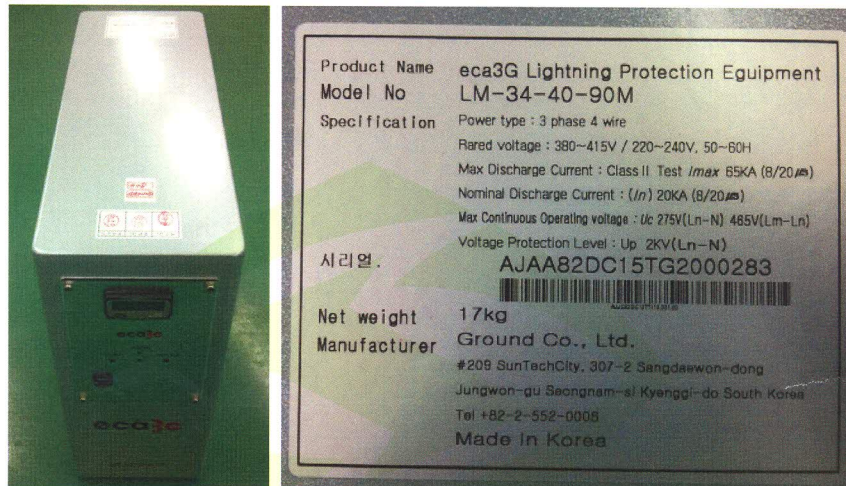


Photo. SG01 : Appearance of EUT(equipment under the test)



Photo. SG02 : Measurement of residual voltage test and operating duty test

Photographs :

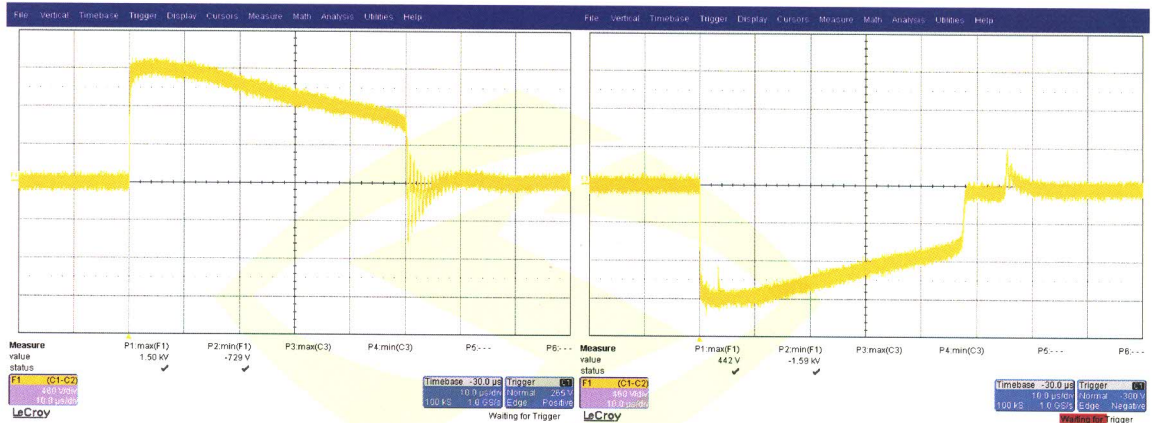


Photo. SG03 : Measurement of the front of wave sparkover voltage test

Oscillograms :

Measurement of residual voltage test

voltage graph

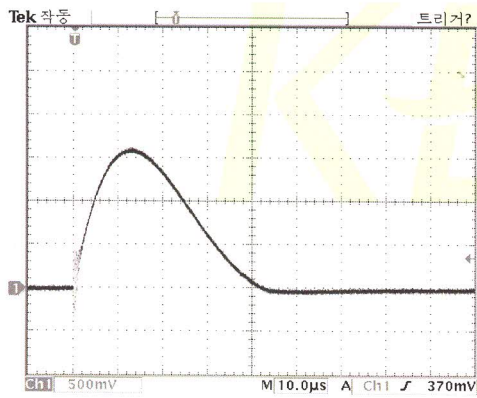


Positive

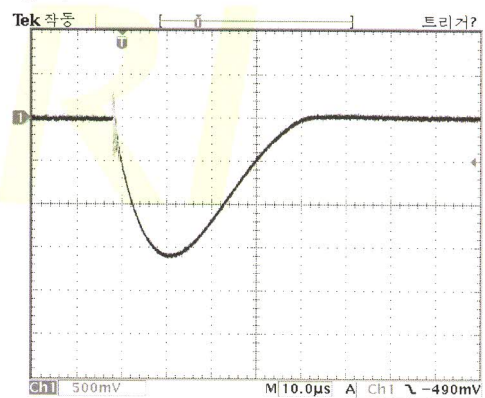
Negative

Line-Neutral

current graph



Positive



Negative

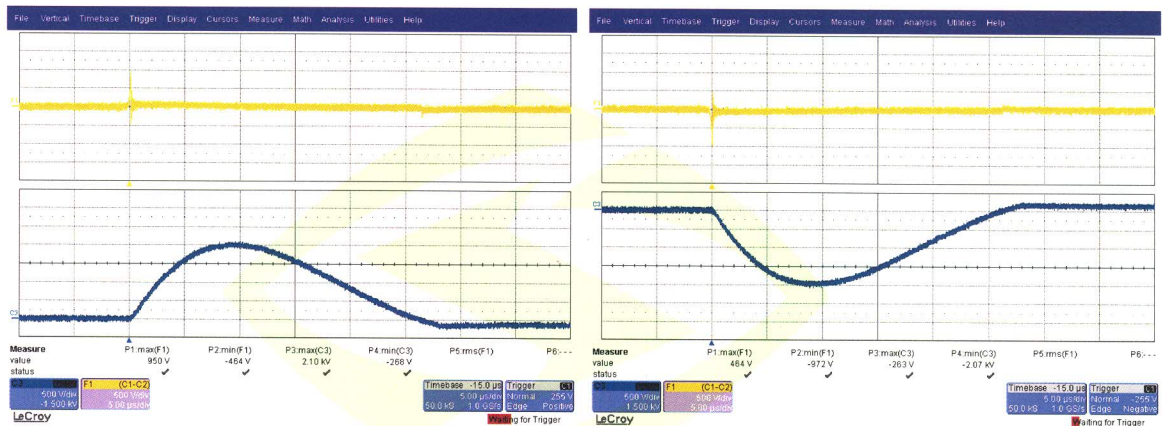
Line-Neutral

12 000 : 1

Osc. SG01

Oscilloscograms :

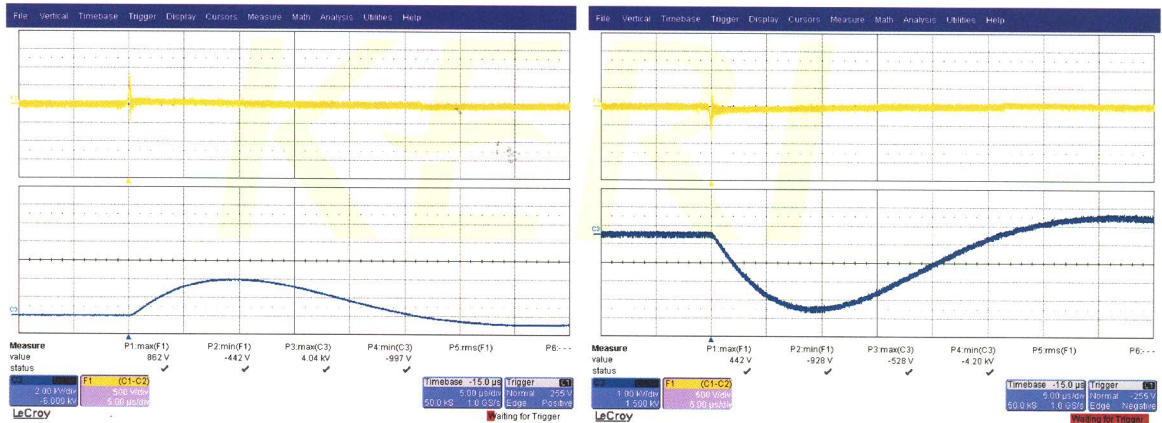
Measurement of residual voltage test



Positive

Negative

0.1In
Neutral-Ground



Positive

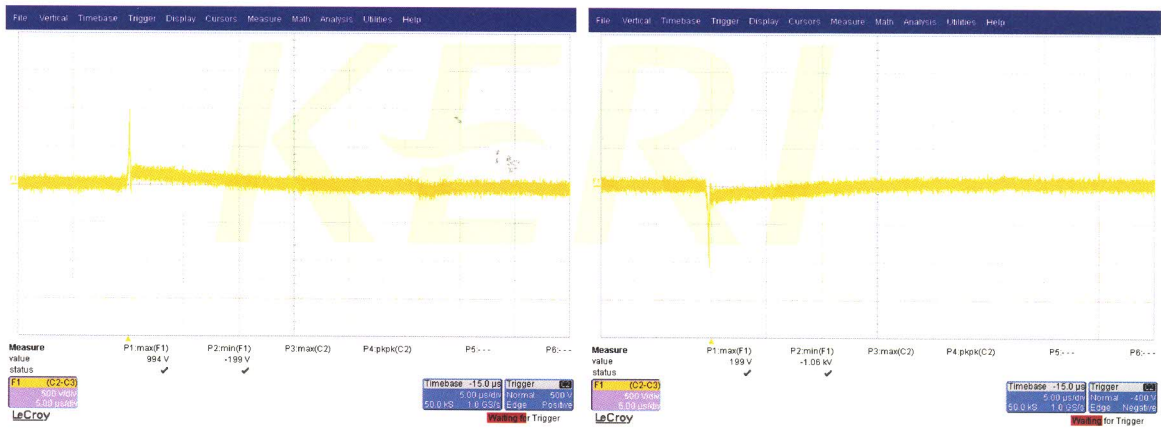
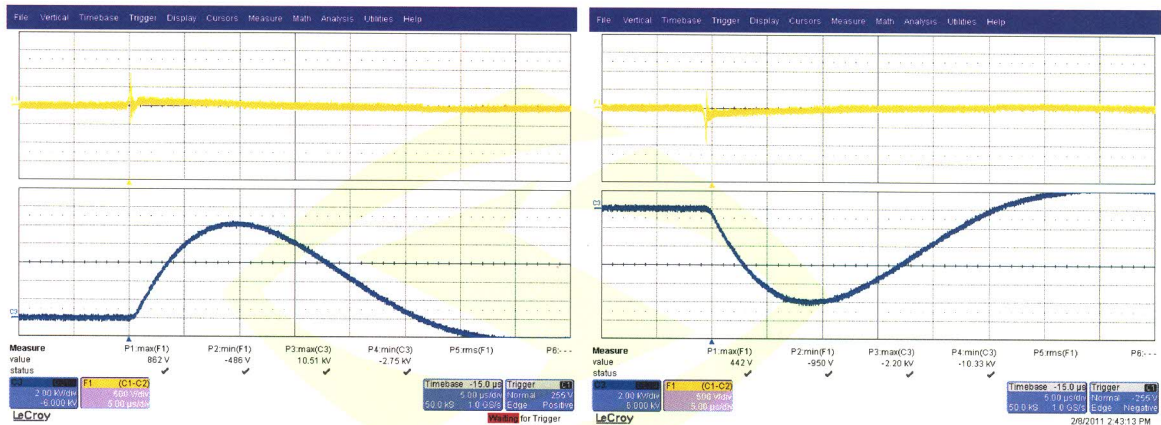
Negative

0.2In
Neutral-Ground

Osc. SG02

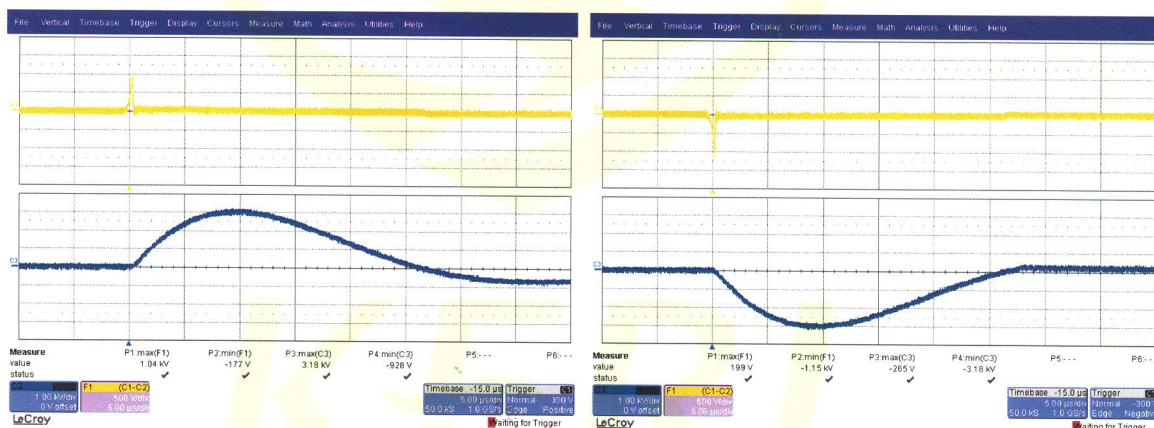
Oscillograms :

Measurement of residual voltage test



Oscillograms :

Measurement of the front of wave sparkover voltage test



Positive

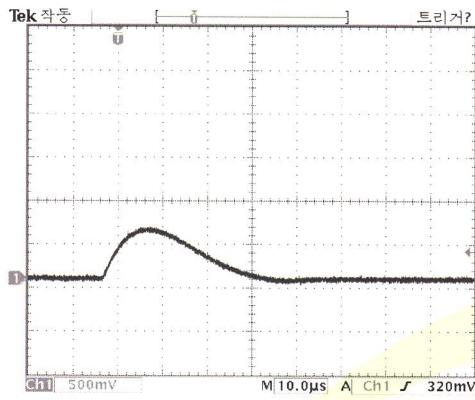
Neutral-Ground(N-G)

Negative

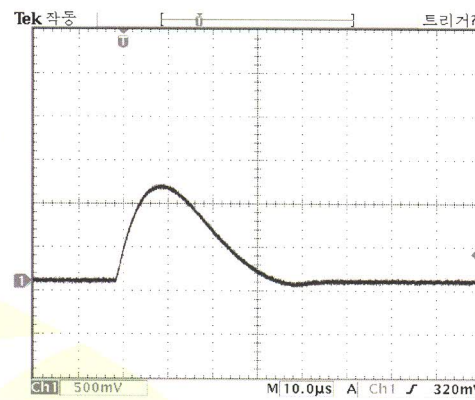
Osc. SG04

Oscillograms :

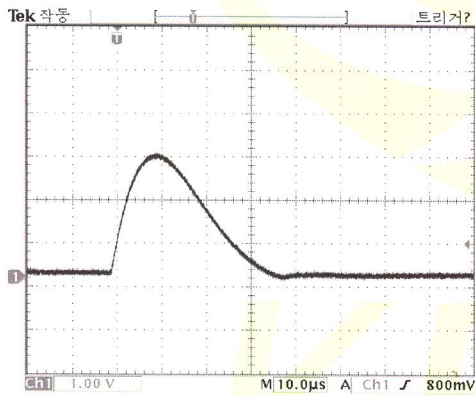
Operating duty test



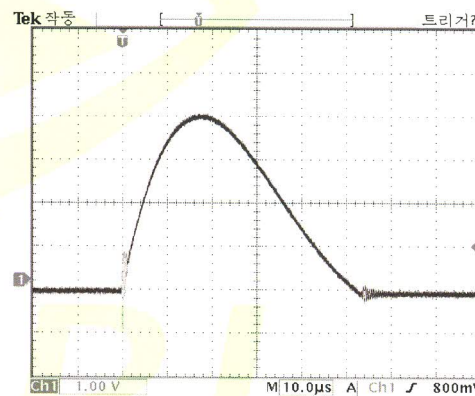
20.00 %
0.1In



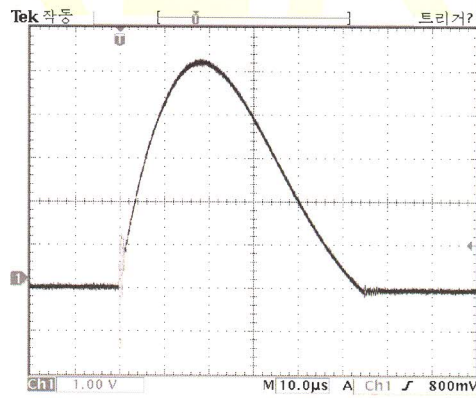
20.00 %
0.2In



20.00 %
0.5In



20.00 %
0.75In

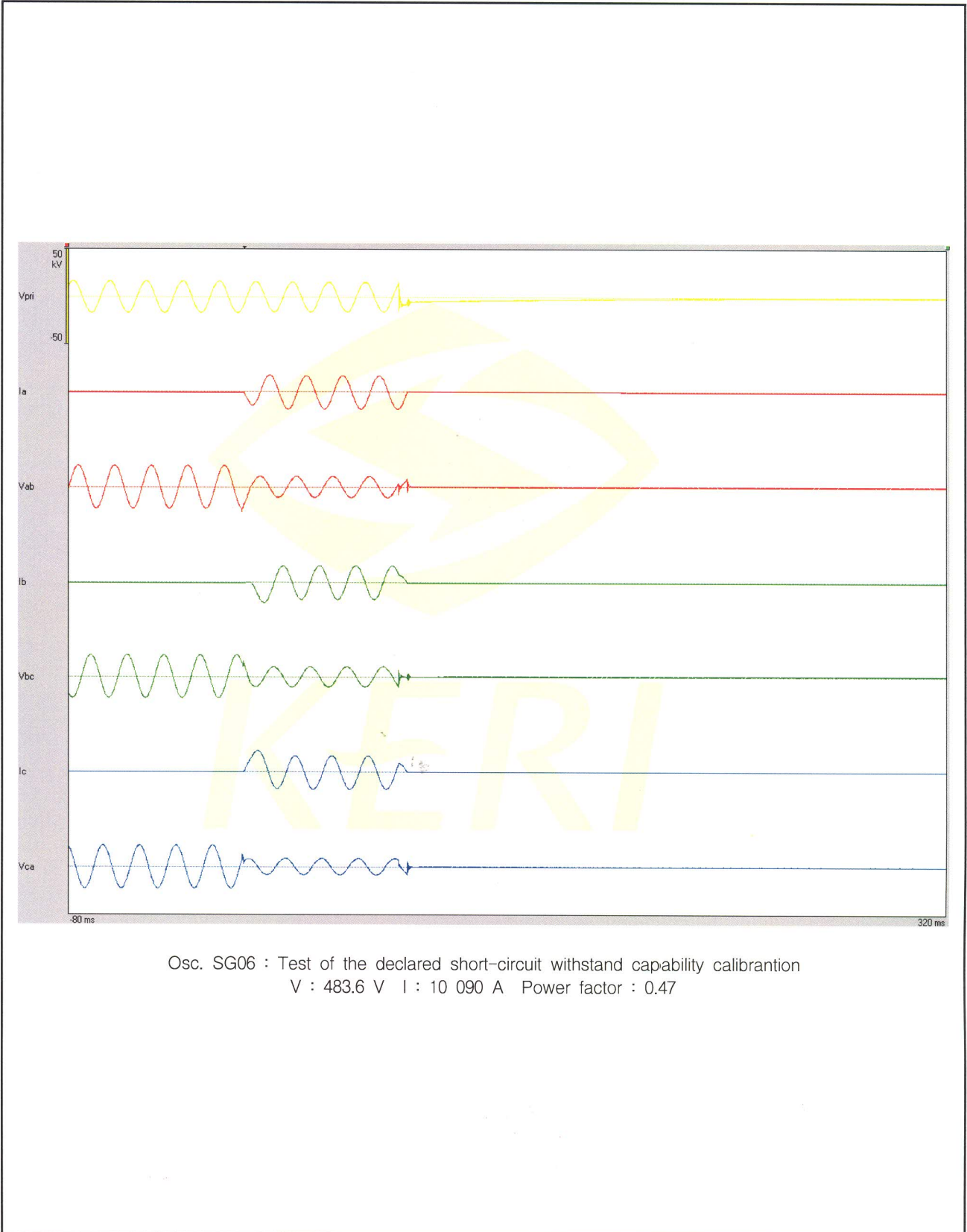


20.00 %
1.0In

12 000 : 1

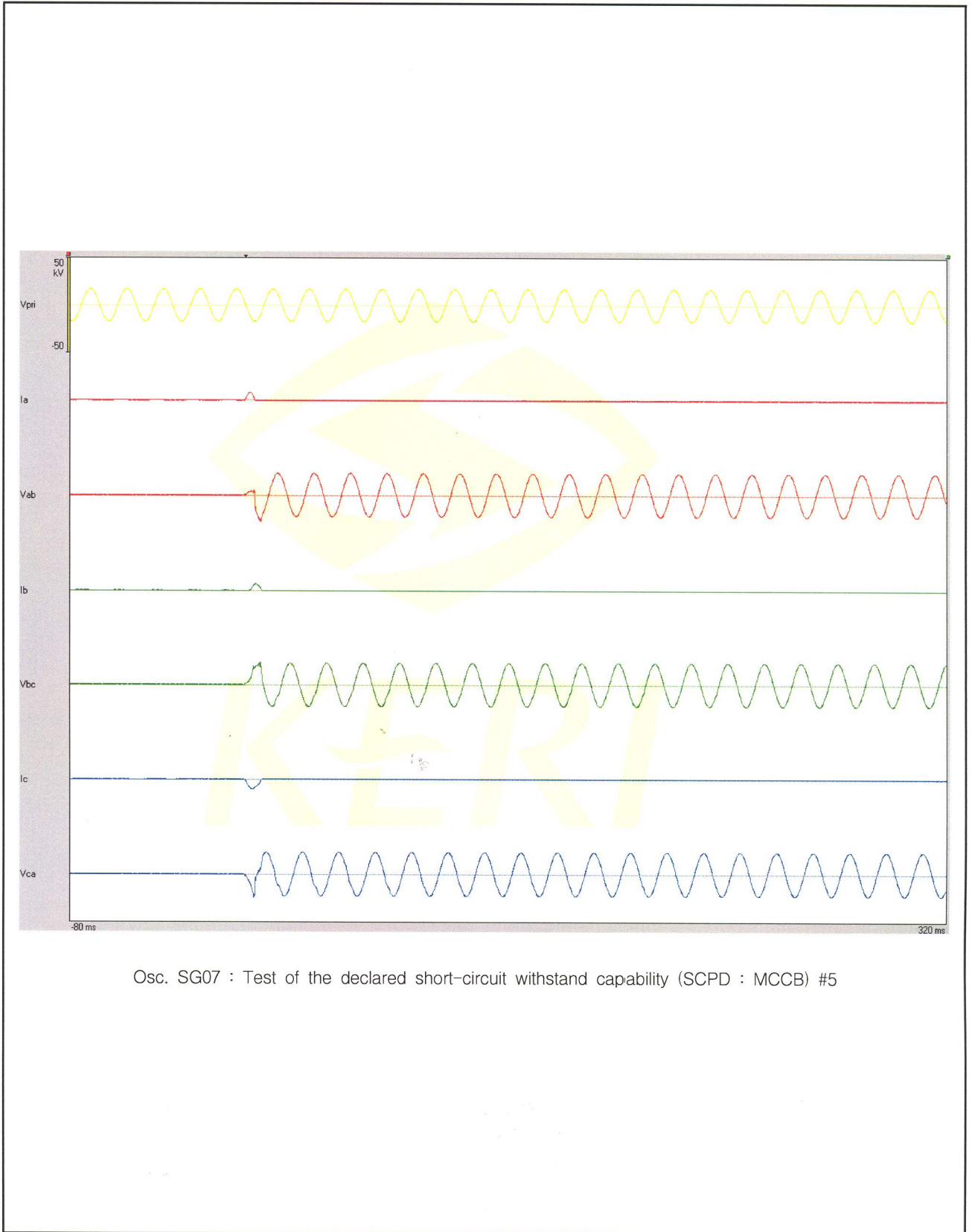
Osc. SG05

Oscilloscograms :



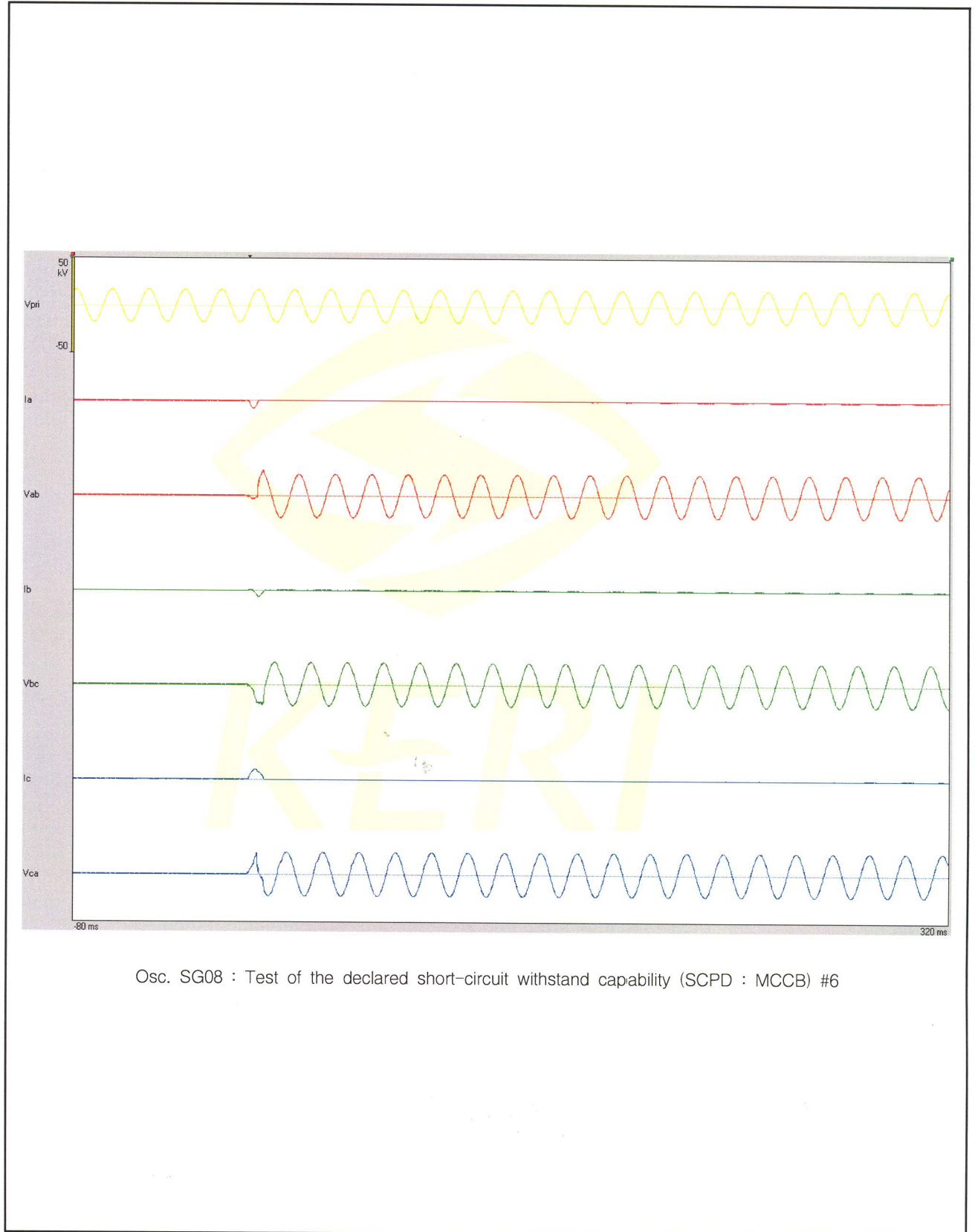
Osc. SG06 : Test of the declared short-circuit withstand capability calibration
V : 483.6 V I : 10 090 A Power factor : 0.47

Oscillograms :



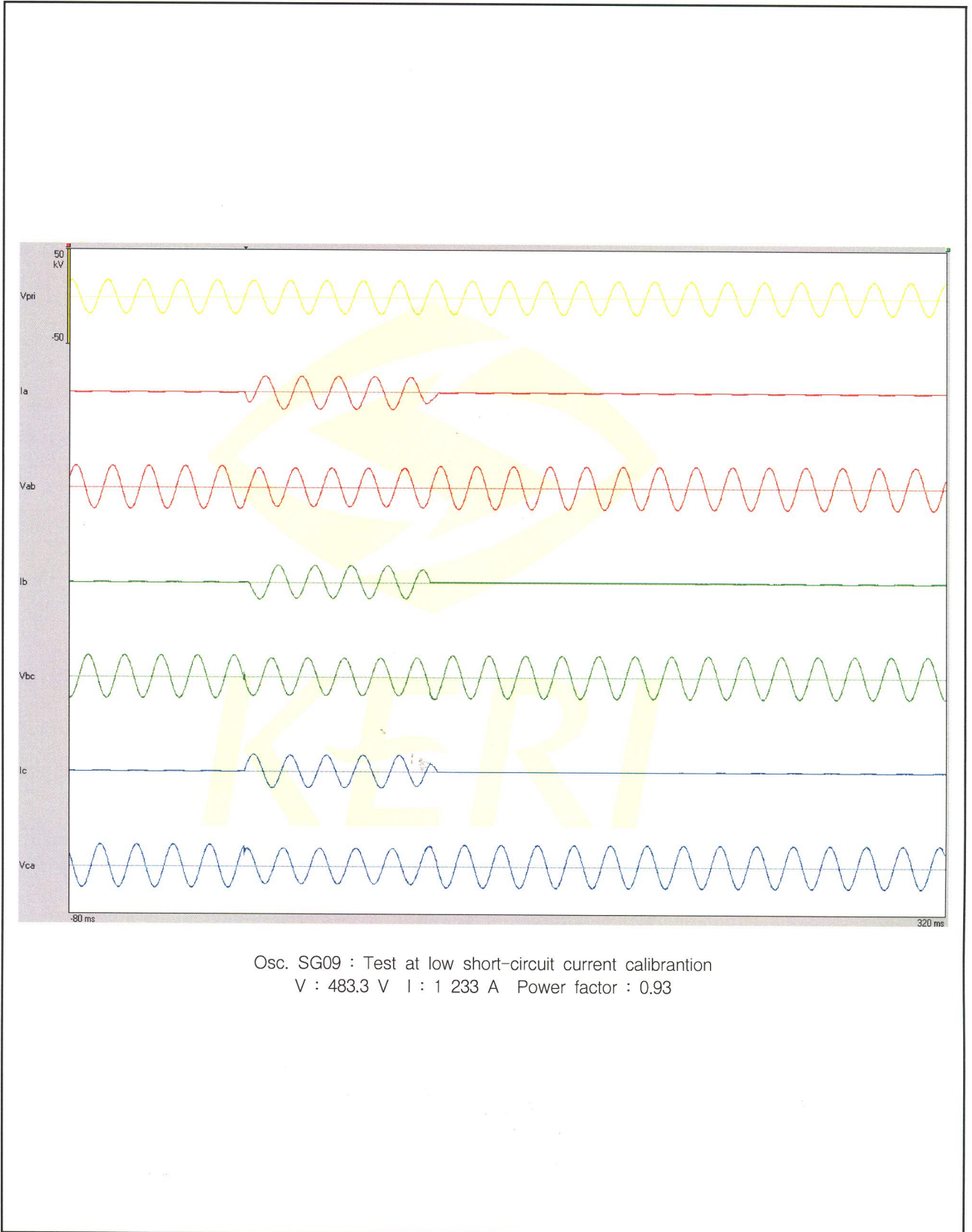
Osc. SG07 : Test of the declared short-circuit withstand capability (SCPD : MCCB) #5

Oscillograms

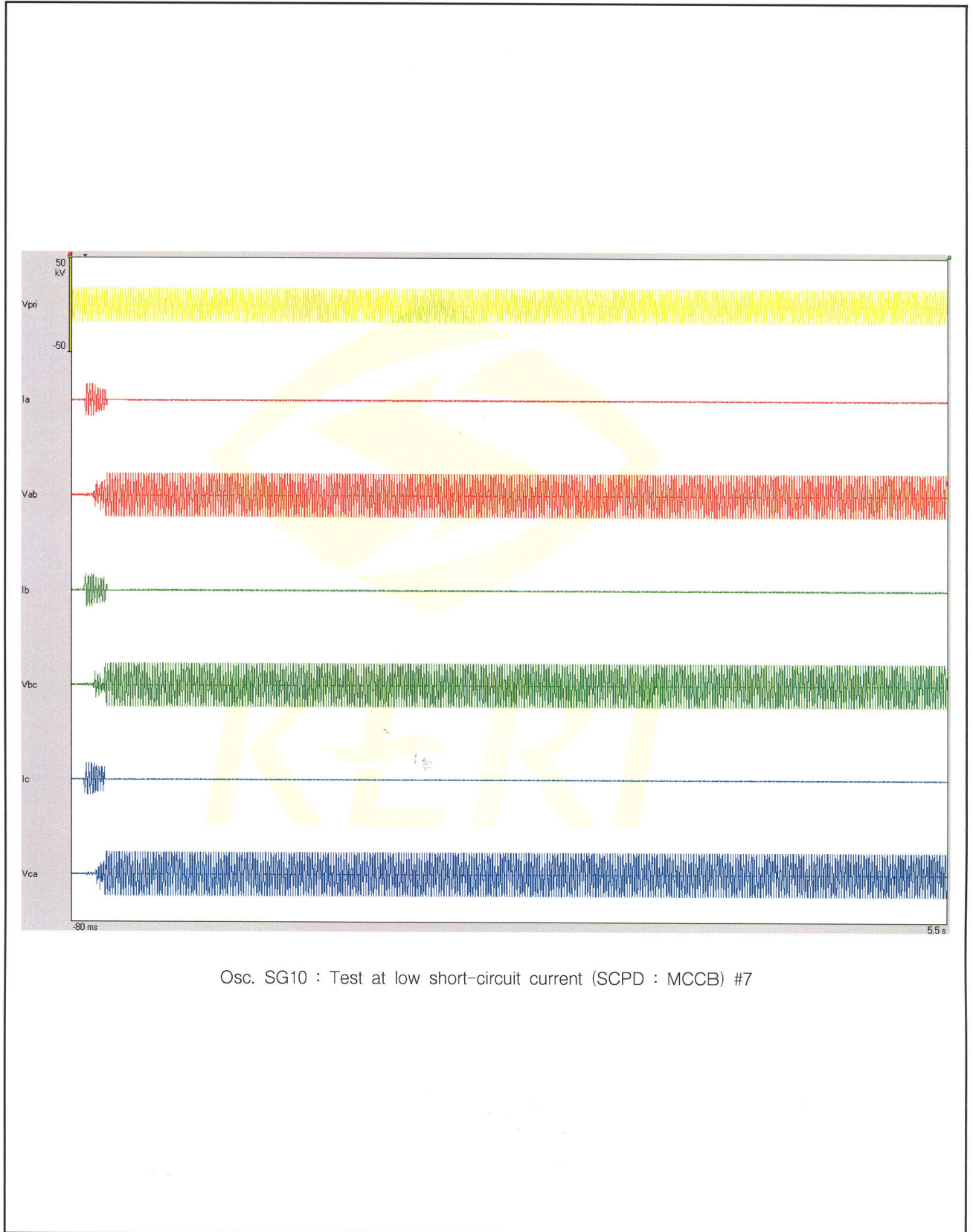


Osc. SG08 : Test of the declared short-circuit withstand capability (SCPD : MCCB) #6

Oscillograms :



Oscillograms :



Osc. SG10 : Test at low short-circuit current (SCPD : MCCB) #7