

TEST REPORT



Power Testing & Technology Institute

R414-0725**Test Report**

APPARATUS	<u>VCS (Vacuum Contactor Switch)</u>
TYPE	VC-6G-44EE
RATINGS	3 Poles, 50/60 Hz, 7.2 kV, 400 A, 4 kA
STANDARD	IEC 62271-106(2011)
PERFORMED TEST	Verification of coordination with SCPDs
REQUEST DATE	April 14, 2014
DATE OF TESTS	February 07, 2014
CLIENT	LSIS Co., Ltd.
MANUFACTURER	LSIS Co., Ltd.

Test result

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

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

The test results apply only to the specific samples tested.

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Number of pages : total(18), cover(1), records(11), Oscillogram(6)



LSIS Co.,Ltd

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Date of issue **April 24, 2014**

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95, Baekbong-ro, Heungdeok-gu, Cheongju-si,
Chungcheongbuk-do, Korea, 361-720**Contents**

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The measurement uncertainty of the test results in this document is maximum 5 % for voltage, current and time. Which is estimated at the level of twice the standard deviation (corresponding to a confidence level of 95 % for the coverage factor of 1.96 in the case of normal distribution).

Apparatus designation by the client

Apparatus	Vacuum Contactor
Manufacturer	LSIS Co., Ltd.
Type	VC-6G-44EE

Rating

Number of poles	3
Rated frequency	50/60 Hz
Rated voltage	7.2 kV
Rated normal current	400 A
Power frequency withstand voltage	20 kV
Lightning impulse withstand voltage	60 kV
Rated short-circuit making current	10.4 kAp
Rated short-circuit breaking current	4 kA
Rated short-time withstand current	6.3 kA
Rated duration of short-circuit	1 s
Rated opening time	≤ 40 ms
Rated closing time	≤ 100 ms
Closing devices	110 V d.c.
Opening devices	110 V d.c.
Motor	110 V d.c.

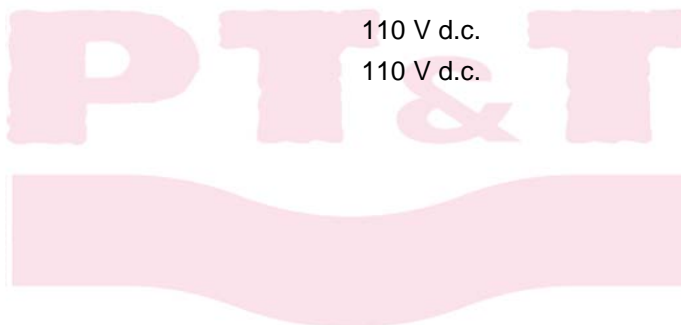


Table of performed tests

Test item	Test result	Date	Page
1. No load operation checks	-	-	5
2. Verification of coordination with SCPDs	-	-	-
2.1 Rated short circuit breaking current	Passed	2014.02.07	6
2.1 Rated short circuit making current	Passed	2014.02.07	7
Under blank			
Test results			
<ul style="list-style-type: none"> - No visible damage was observed. - After the test, the test object was operated correctly. 			

1. No load operation checks

Test condition	Osc. no.	Operating sequence	Control voltage (V d.c)		Closing time ms	Opening time ms
			C V	O V		
After verification of coordination with SCPDs	1410 0780	CO	93.5	93.5	118.7 120.3 119.8	28.0 27.7 28.5
	1410 0781	CO	110	110	100.2 101.8 101.3	25.3 25.0 25.7
Condition during and after the test	- The test object was operated normally.					



2. Verification of coordination with SCPDs

2.1 Test duty A - 100 % break tests

Test condition					
Standards		IEC 62271-106:2011			
Operation duty		O x 1			
Circuit condition	Test circuit	GMD3S			
	Frequency	60 Hz ^{+10 %}			
	Applied voltage	-			
	Recovery voltage	7.2 kV ^{±5 %} , Duration ≥ 0.3 s			
	Breaking current	40 kA ^{+5 %}			
	Making current	104 kA ^{+5 %}			
Power factor		Average ≤ 0.15			
Operating voltage	Closing coil	85 % of the rated voltage			
	Opening coil	85 % of the rated voltage			
TRV	Classification	Peak value (u _c)	Time to peak (t ₃)	Delay time (t _d)	Rate of rise (u _o /t ₃)
	Standards	12.4 kV	104 μs	-	0.119 kV/ μs
	Measured value (30% calibration) (Osc. No 14100760)	4.2 kV	61.3 μs	-	0.228 kV/ μs

Results											
Condition before the test		New specimen									
Osc. No.	Interval	Applied voltage (Phase to earth) kV	Cut off current peak kA	Recovery voltage			Making angle	Close time s	Fuse break time ms	Total break time ms	Result
	Operation duty			Phase to earth kV	Phase to phase kV	TRV u _c kV					
1410 0760	-	-	(12.38)	-	-	-	-	-	-	-	30% Calibration
		-	(12.43)	-	-	-	-	-	-	-	
		-	(12.14)	-	-	-	-	-	-	-	
1410 0769	O	-	33.8	4.2	7.3	-	-	-	8.0	-	Passed
		-	-51.7	3.5	6.1	-	-	-	5.4	-	
		-	30.5	5.2	9.0	-	-	-	8.2	-	
Condition during and after tests		<ul style="list-style-type: none"> - No visible damages were observed. - Note. () means rms value of short-circuit current. 									

2.2 Test duty B - 100 % make tests

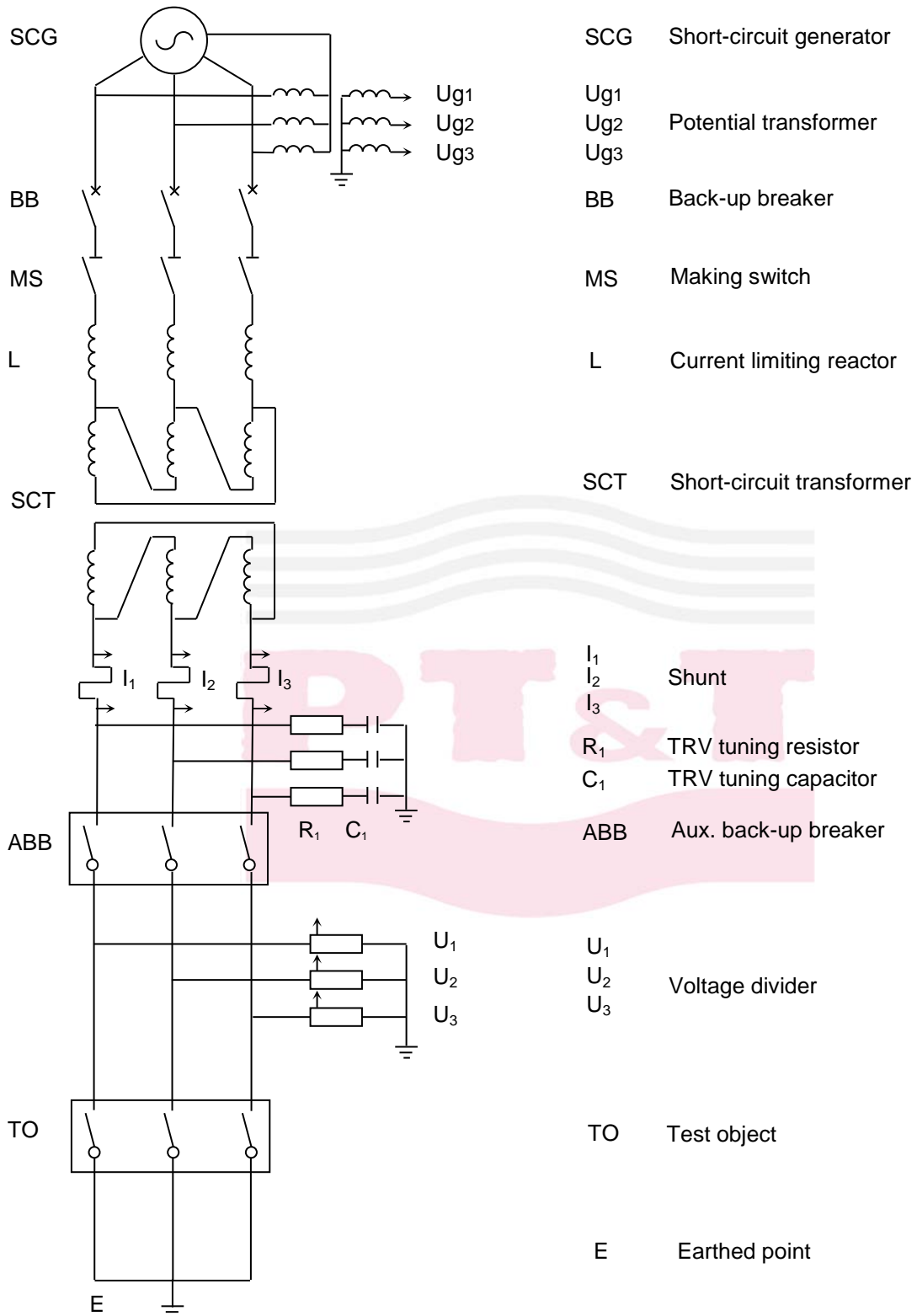
Test condition					
Standards		IEC 62271-106:2011			
Operation duty		C x 1			
Circuit condition	Test circuit	GMD3S			
	Frequency	60 Hz ^{±10%}			
	Applied voltage	7.2 kV ^{+10%}			
	Recovery voltage	7.2 kV ^{±5%} , Duration ≥ 0.3 s			
	Breaking current	40 kA ^{+5%}			
	Making current	104 kA ^{+5%}			
	Power factor	Average ≤ 0.15			
Operating voltage	Closing coil	85 % of the rated voltage			
	Opening coil	85 % of the rated voltage			
TRV	Classification	Peak value (u _c)	Time to peak (t ₃)	Delay time (t _d)	Rate of rise (u _c /t ₃)
	Standards	12.4 kV	104 μs	-	0.119 kV/ μs
	Measured value (30% calibration) (Osc. No 14100760)	4.2 kV	61.3 μs	-	0.228 kV/ μs

Results											
Condition before the test		After test duty A – 100% break tests									
Osc. No.	Interval Operation duty	Applied voltage (Phase to earth) kV	Cut off current peak kA	Recovery voltage			Making angle	Close time s	Fuse break time ms	Total break time ms	Result
				Phase to earth kV	Phase to phase kV	TRV u _c kV					
1410 0760	-	-	(12.38)	-	-	-	-	-	-	-	30% Calibration
		-	(12.43)	-	-	-	-	-	-		
		-	(12.14)	-	-	-	-	-	-		
1410 0776	C	4.3	-	-	10.4	-	-	-	-	-	Passed
		4.4	-45.8	4.5		-	-		4.7		
		4.4	45.6	-4.7		-	-		4.7		
Condition during and after tests		<ul style="list-style-type: none"> - No visible damages were observed. - The fuse of phase (R) did not melt. - Note. () means rms value of short-circuit current. - Power frequency recovery voltage was not maintained for 0.3s due to equipment problems 									

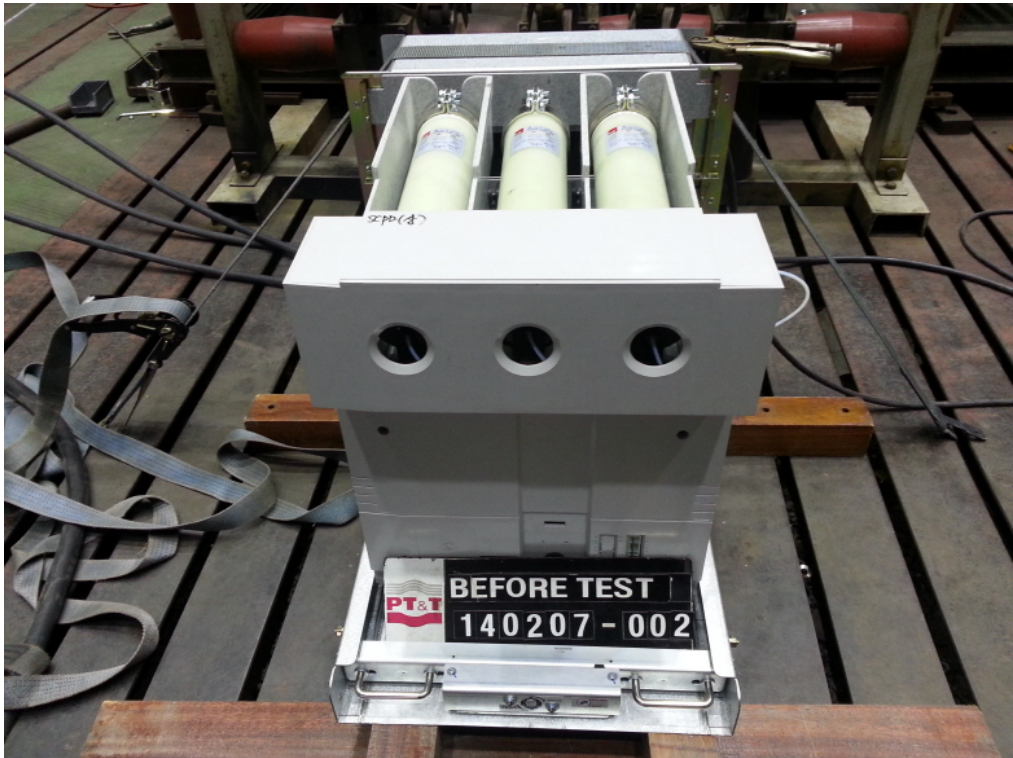
■ Test circuit condition

Test Items	Coordination with SCPD tests					
Test circuit	GMD3S					
Number of phases	3					
Frequency (Hz)	60					
Generator connections	Y					
Generator neutral	Not earthed					
Transformer connections	Δ/Δ					
Transformer ratio (kV)	18/8.6					
Transformer neutral	Not earthed					
Short-circuit point	Earthed					
Load neutral point	-					
Supply circuit	Impedance (Ω)	2.110				
	Power factor	<0.15				
TRV Control elements	Resistance R1 (Ω)	-				
	Capacitance C1 (μF)	0.99				
Load circuit	Resistance R _L (Ω)	-				
	Reactance L _L (mH)	-				
	Capacitance C _L (μF)	-				

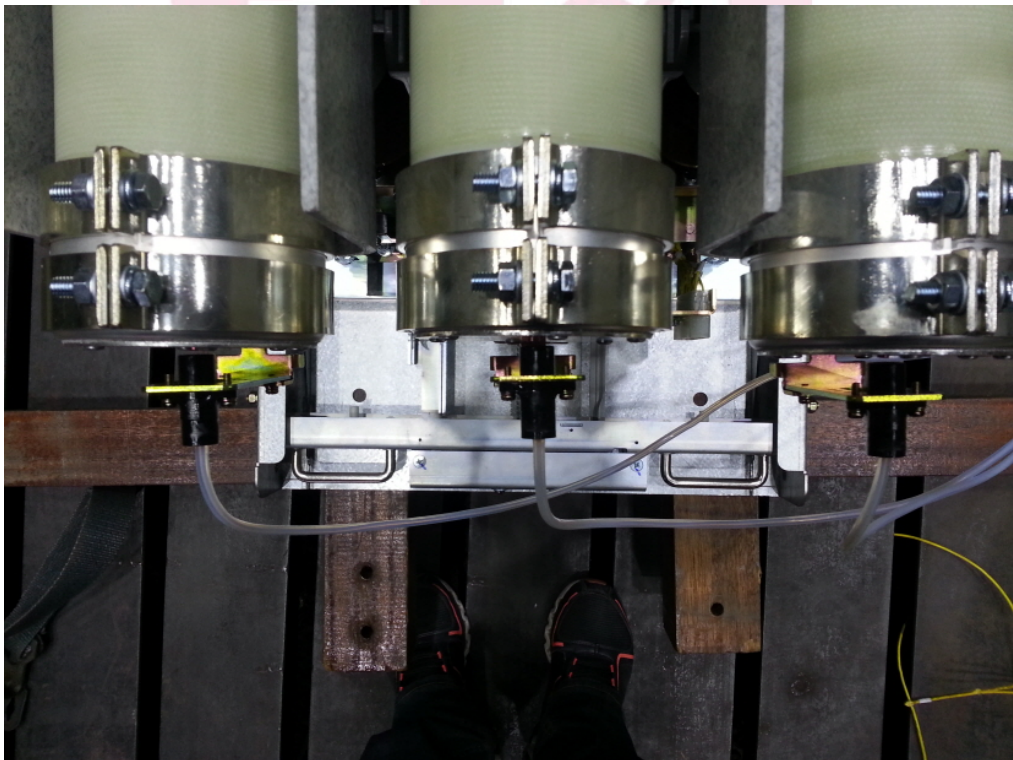
■ Test circuit diagram GMD3S



■ Verification of coordination with SCPDs

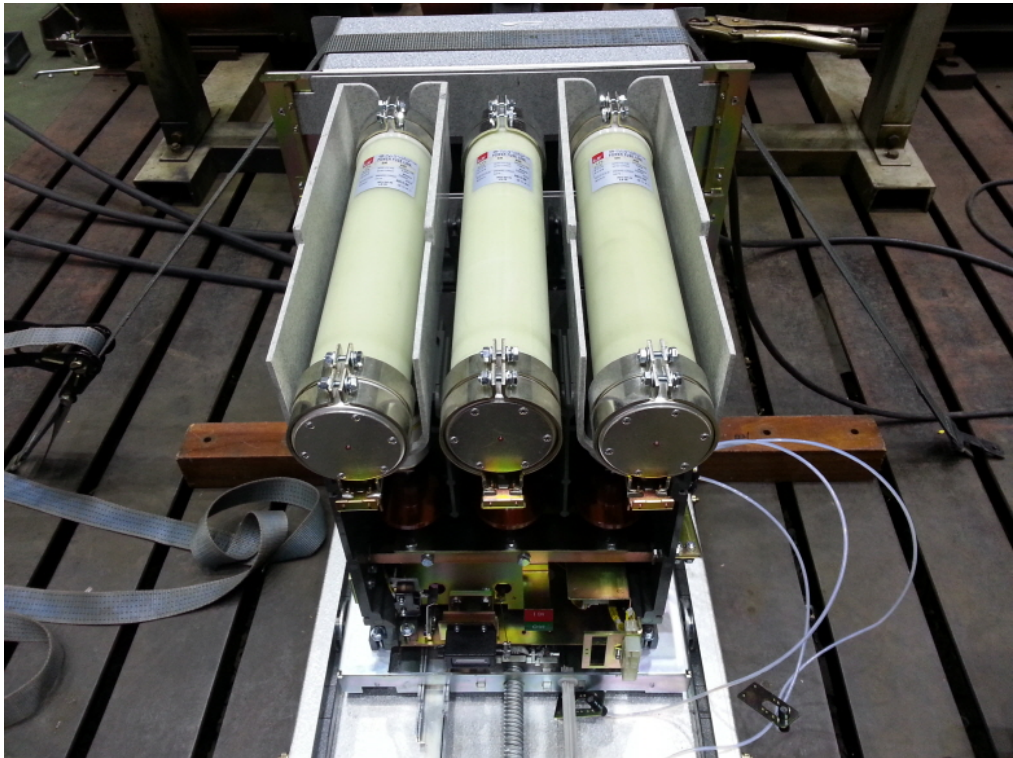


<Before test>



<Before test duty A - 100 % breaking tests>

■ Verification of coordination with SCPDs



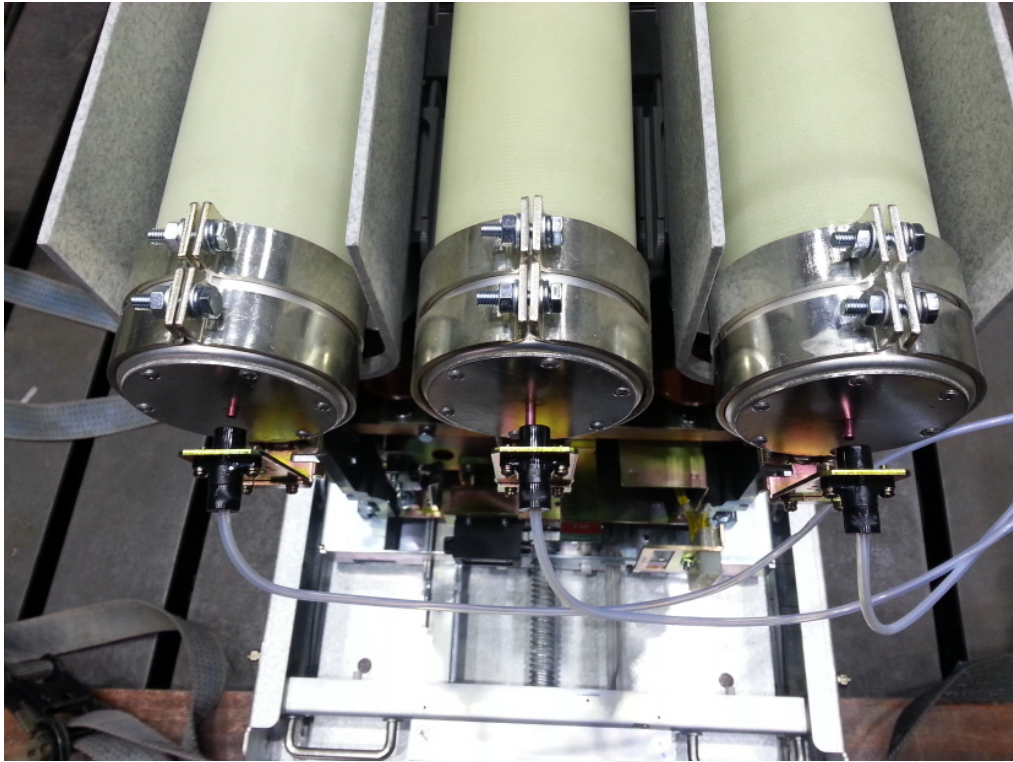
<Before test duty B - 100 % making tests>

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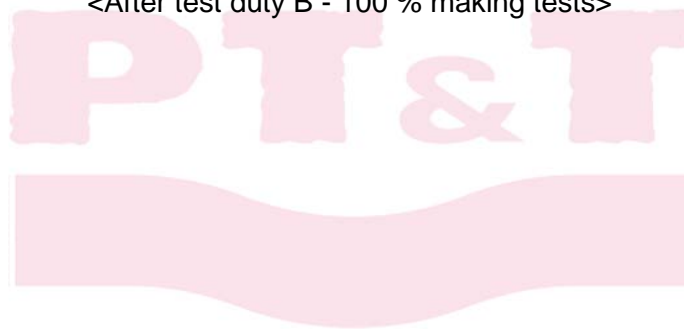


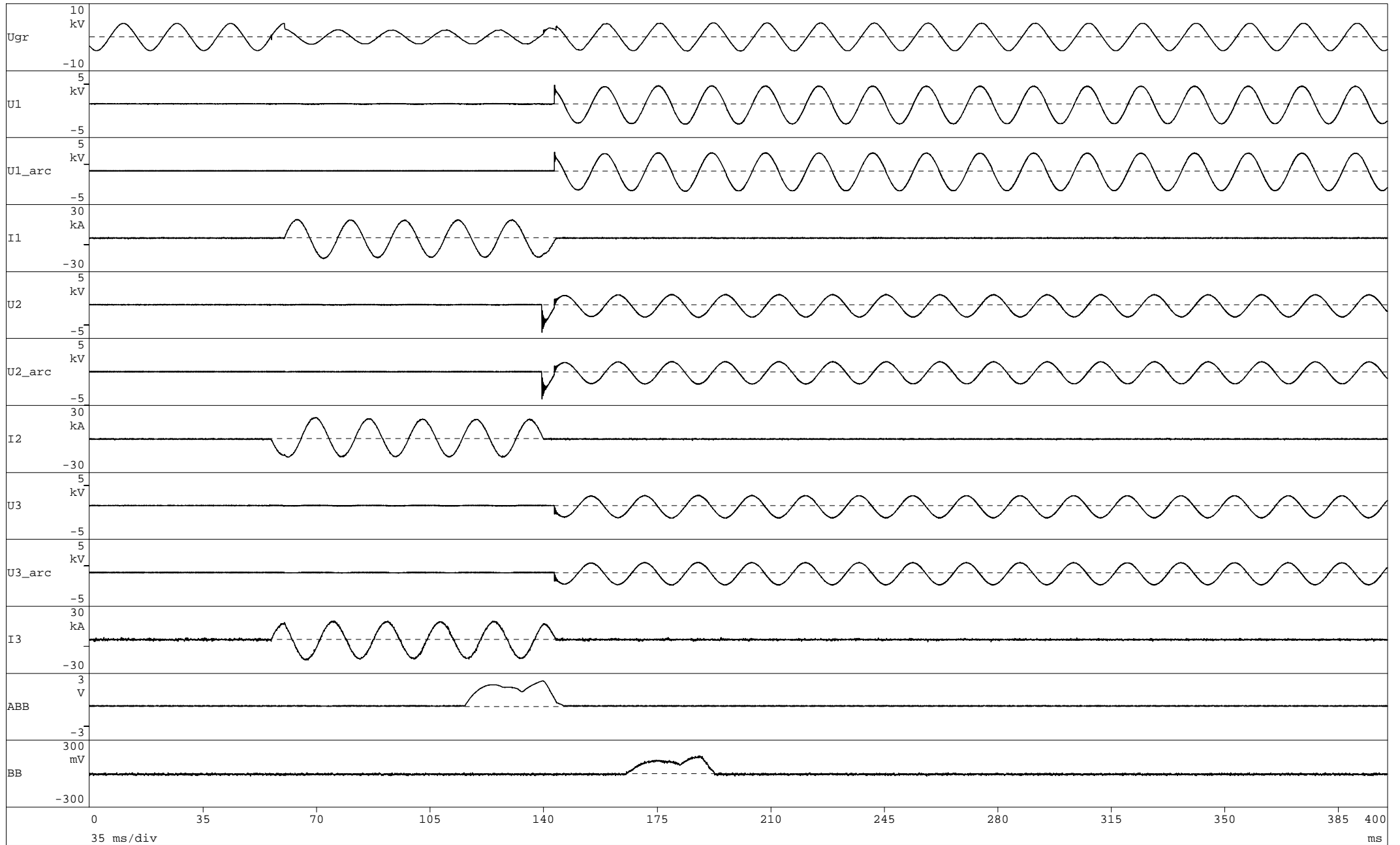
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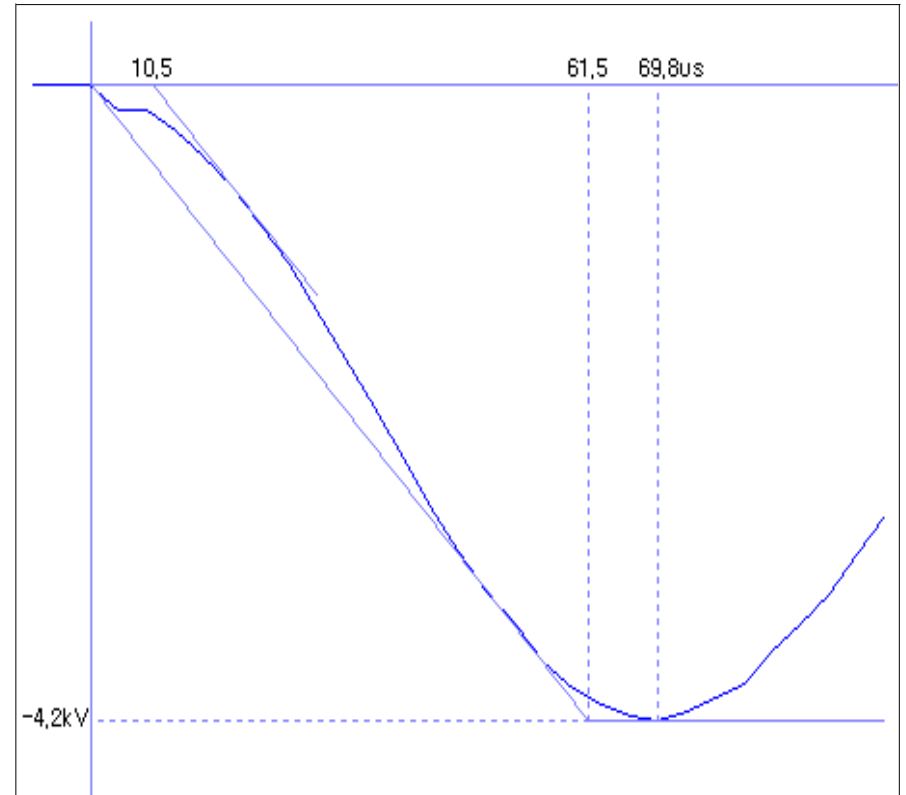
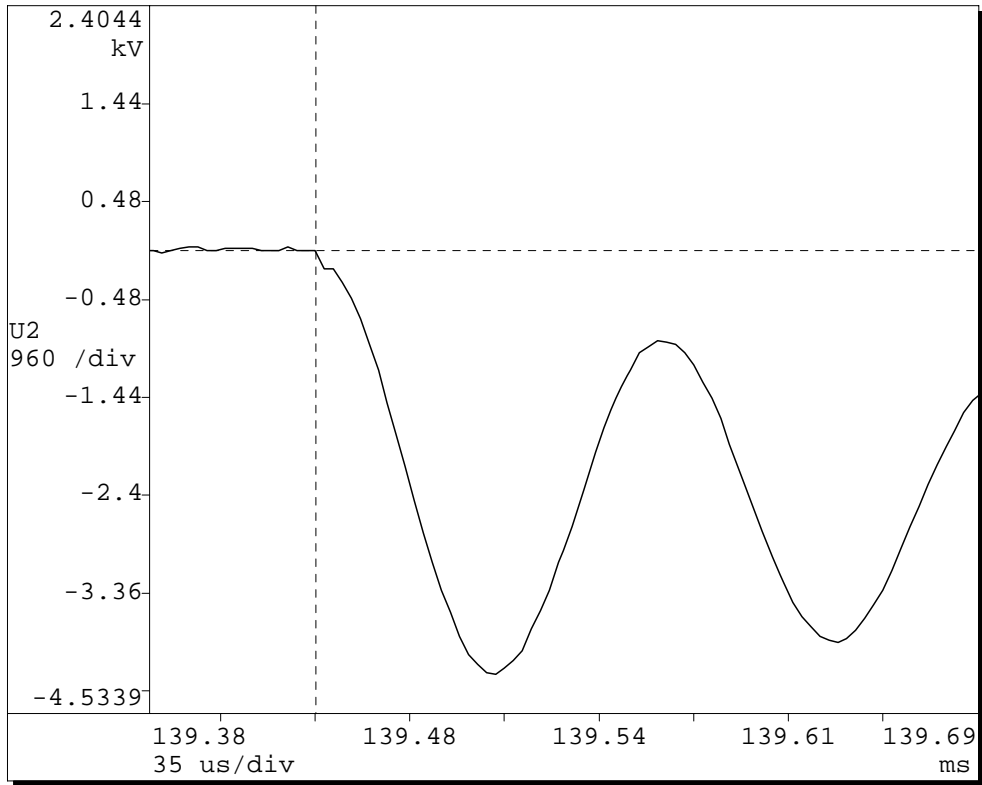
■ Verification of coordination with SCPDs

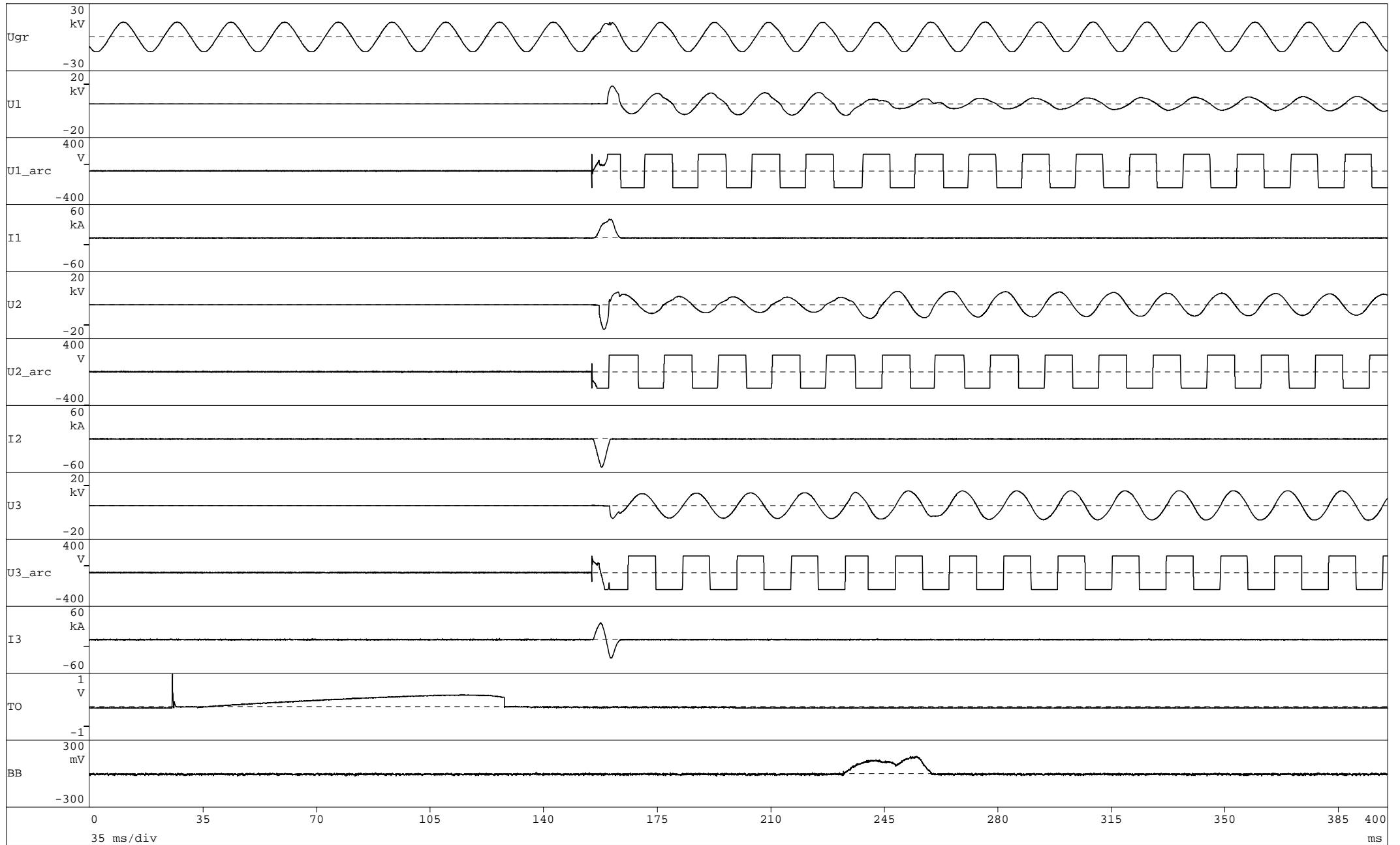


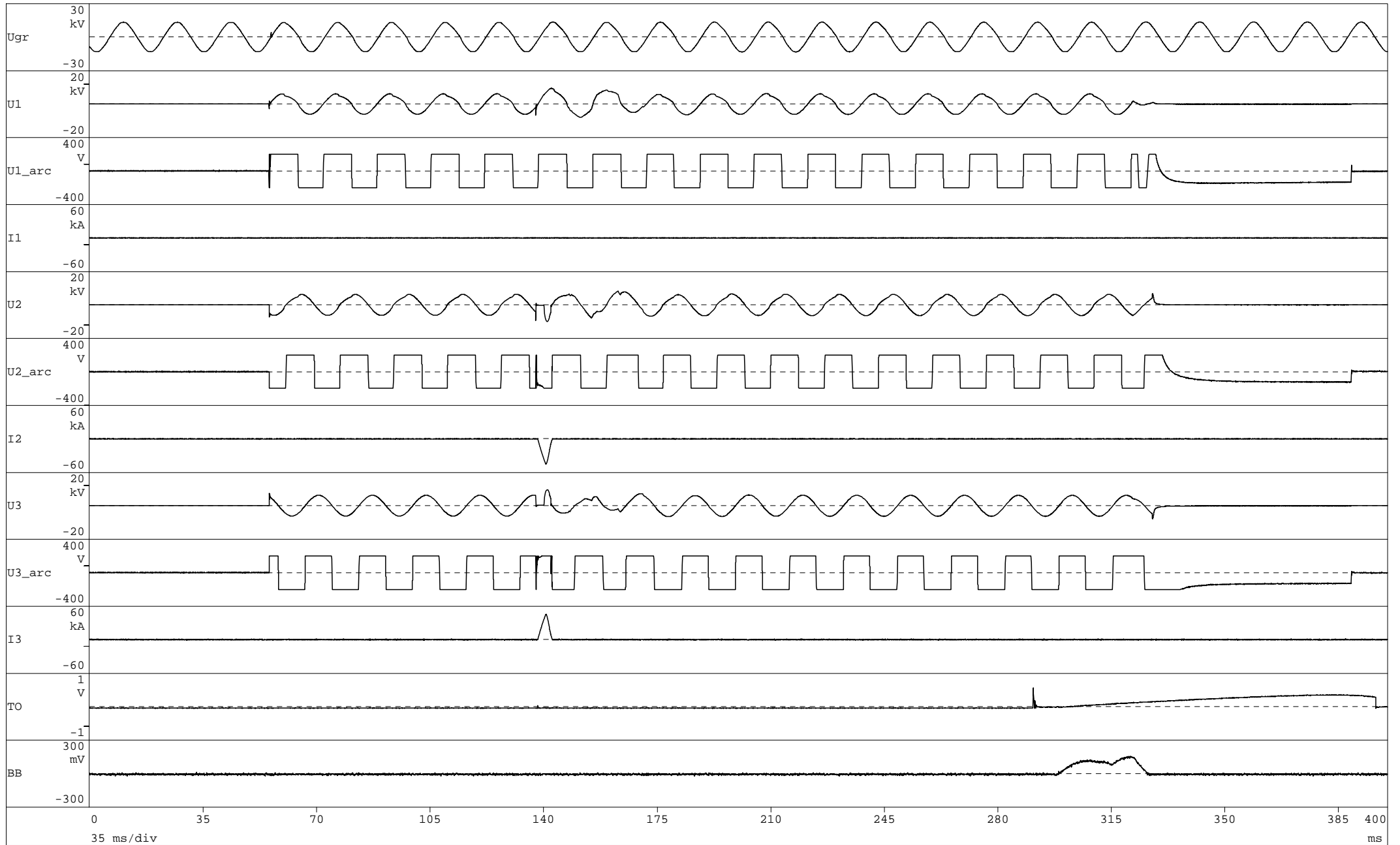
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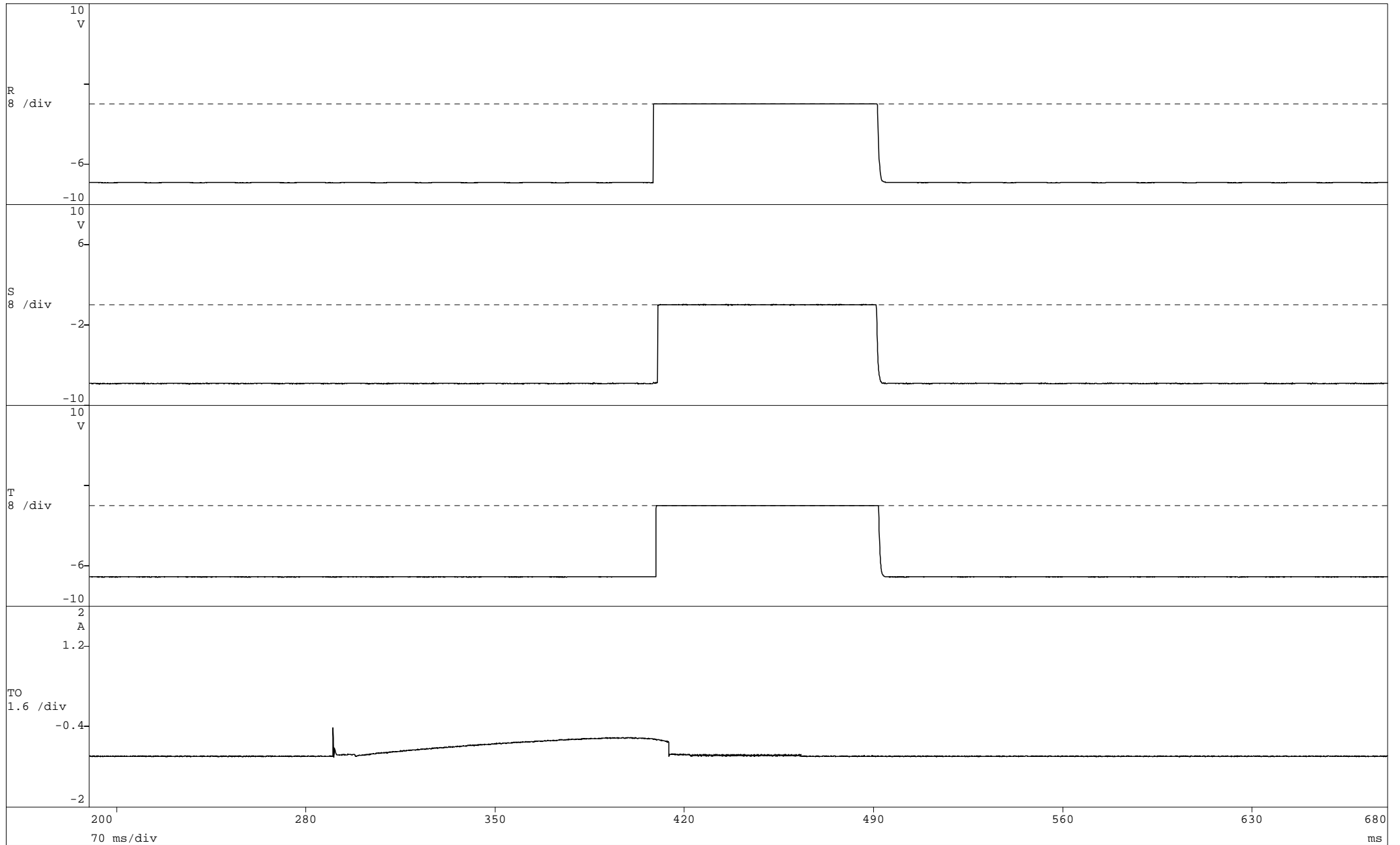


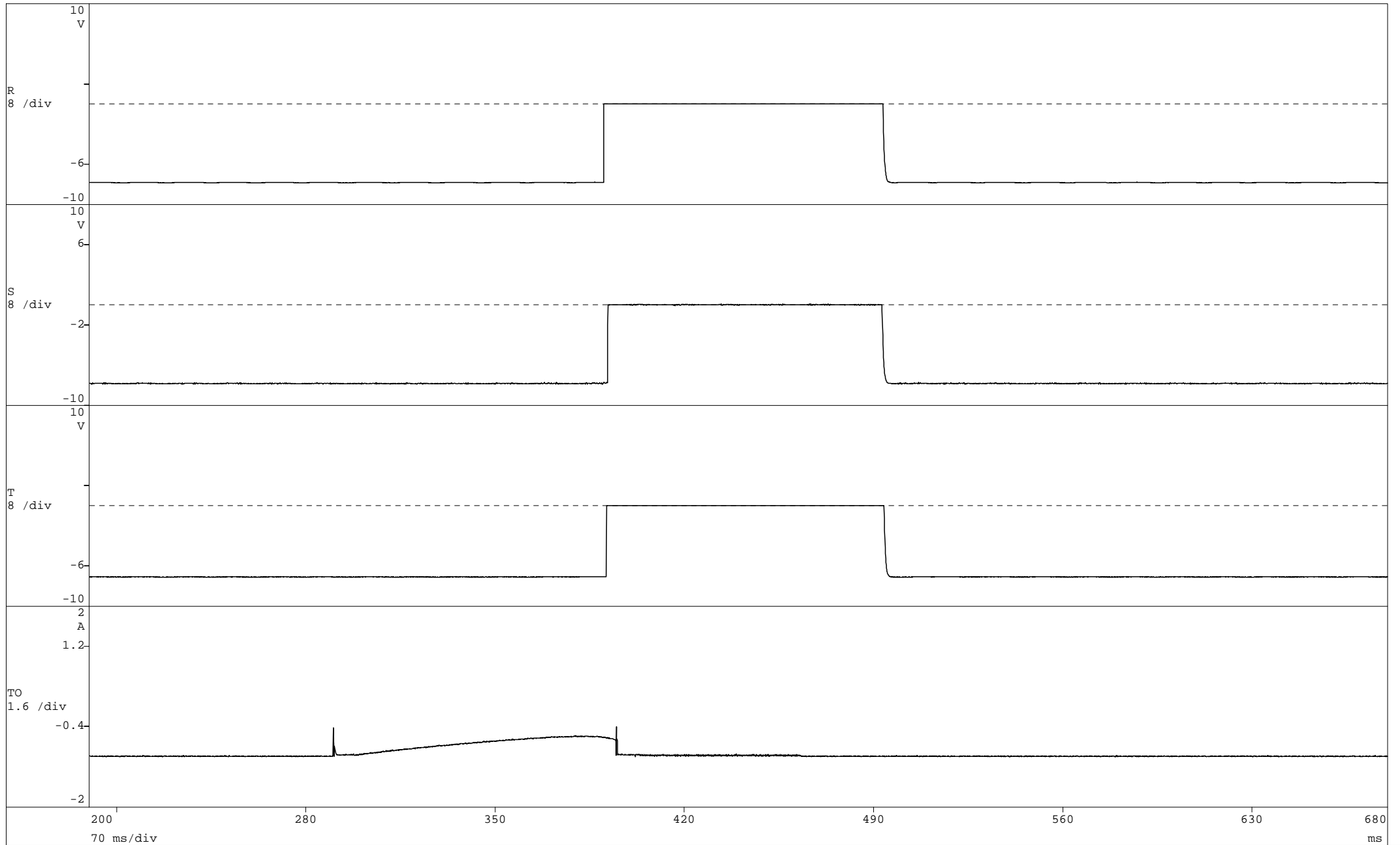






Date : 2014-02-07 4:50:42 오후
 Rec. No. : 14100776







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개발시험	규정된 절차에 따라 명확히 검정된 피시험품에 대해 국가규격, 국제규격등에 정해진 개발시험 요건에 따라 제조자가 부여한 모든 정격특성 및 정격성능에 대한 시험
성능시험	개발시험 항목중 일부의 정격특성 및 정격성능에 대해 개발시험 절차 및 요건에 따른 시험
항목시험	개발시험절차와 공인규격 또는 기술기준에 따라 시험했으나, 시험항목이 충족되지 않는 경우
참고시험	시험 의뢰자의 요구조건에 따른 시험

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TYPE TEST REPORT	is issued to prove and to verify that a duly and clearly identified equipment is satisfactory to the type test requirements of a recognized standard with respect to all the rated characteristics and performance
PERFORMANCE TEST REPORT	is issued to prove and to verify only a part of the rated characteristics and performance is satisfactory to all the requirements and procedures as of type test
TEST REPORT – I	is issued for the tests followed type test procedure and in accordance with a recognized standard but incomplete to form type test or performance test
TEST REPORT – II	is issued for the tests carried out in accordance with the instructions of the client