



RESEARCH-DEVELOPMENT AND TESTING NATIONAL
INSTITUTE FOR ELECTRICAL ENGINEERING

ICMET CRAIOVA HIGH POWER DIVISION

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ÎNCERCARE



SR EN ISO / CEI 17025: 2005
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nr. LI 004 / 2007

TEST REPORT No. 10189

CUSTOMER: PANEL ELEKTRIK SAN VE TIC LTD. ŞTİ.
Org. San. Böl. 17. Cad. No.27 Yakapinar / ADANA / TURKEY

MANUFACTURER: PANEL ELEKTRIK SAN VE TIC LTD. ŞTİ.
Org. San. Böl. 17. Cad. No.27 Yakapinar / ADANA / TURKEY

TESTED PRODUCT: 36 kV, 630 A, 16 kA Metal Enclosed Switchgear

REFERENCE STANDARD: IEC 62271-200/2003, Annex A

TEST PERFORMED: Internal arc test

TEST DATE: 21.05.2008

TEST RESULT: Passed the tests

Report has 18 pages and it is edited in 4 copies from which 3 copies for customer.

HEAD OF HIGH POWER DIVISION:

Dr. Eng. George Curcanu

HEAD OF LABORATORY:

Eng. Constantin Iancu

DATE OF ISSUE: 20.06.2008



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1. IDENTIFICATION OF TEST PRODUCT

Type	PNL-36-01, PNL-36-02, PNL-36-03
Serial number/year	Prototype
Technical specification /Drawing	See pages 12 to 14 / See pages 15 to 17
Contract No.:	2162 / 3.03.2008
Product receiving date:	19.05.2008
Product condition at receiving:	New

2. TECHNICAL CHARACTERISTICS ESTABLISHED BY MANUFACTURER

Rated voltage	36 kV
Rated normal current	630 A
Rated frequency	50 Hz
Rated short - time withstand current:	
- peak value	40 kA
- r.m.s. value	16 kA
Duration	1 s
IAC clasification	AFL
Internal fault current (Ik)	16 kA
Rated duration of internal fault	1 s

3. TESTS PROGRAM

Current calibration test.

Three internal arc tests on three Metal Enclosed Switchgears assembly with three-phase arc initiation point inside of Metal Enclosed Switchgear as follows:

- in cables compartment on PNL-36-01 input terminals;
- in bus bar compartment on bars between PNL-36-01 and PNL-36-02
- in circuit breaker compartment on circuit breaker upper terminals of PNL-36-03.

Arc initiation was made with cooper wire having 0.5 mm diameter.

Test parameters were: $I_p = 40$ kA, $I_k = 16$ kA, $t_k = 1$ s, $f = 50$ Hz

6 kV three-phase voltage were applied on the input terminals of Metal Enclosed Switchgear PNL-36-03. Supply was made by copper cables of 240 mm². For the test the Metal Enclosed Switchgears assembly was settled down on a 2750x1400x600 mm cable channel and placed in a special room with floor, two perpendiculars walls and ceiling. The distances between the Metal Enclosed Switchgears assembly, walls and ceiling were:

- 120 mm from the lateral right wall
- 600 mm from the ceiling
- 120 mm from the rear wall

The combined vertical and horizontal indicators (simulators) made of cotton fabric 140g/m² were placed in the front and left side of Metal Enclosed Switchgears assembly at 300 mm distance corresponding to accessibility class A.

Tests are performed according to own procedure PT 03.07.

4. RESPONSIBLE FOR TESTS: Ing. Ilie Sboru**5. PRESENT AT THE TESTS:** Mr. Cenk Yuzereroglu from Panel Elektrik - Turkey**6. TEST REPORT DOCUMENTATION**

Oscillograms	4;	Tables	3 ;
Photos	9;	Drawings	3 .

7. DATA OF TESTING AND MEASURING CIRCUIT

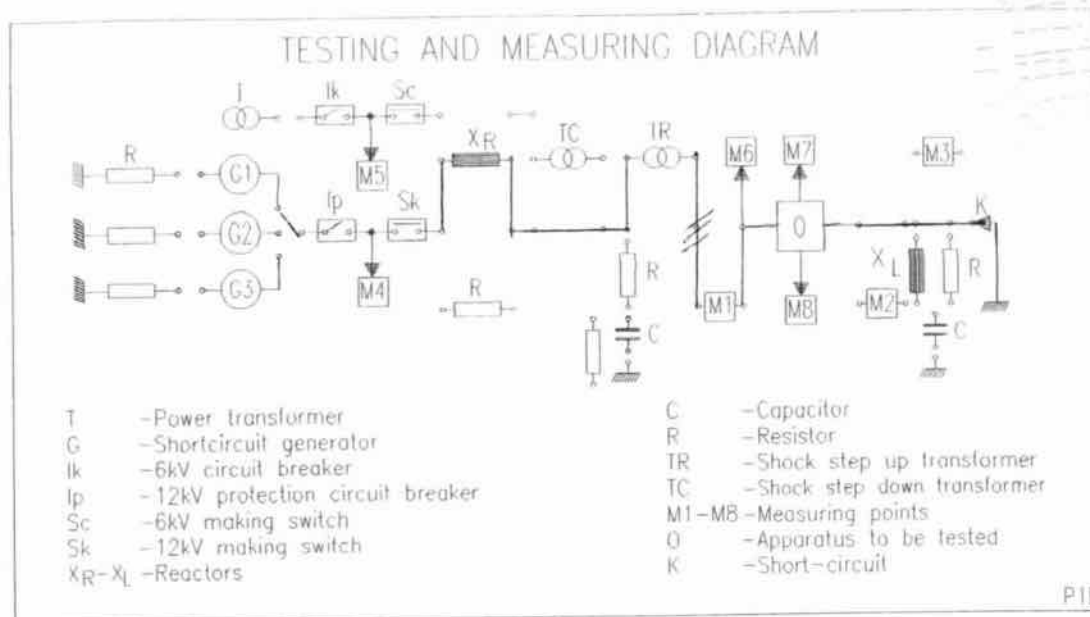


Table 1

Phases number	3
Source/ connection	G1 / Δ
Transformer/Rate	TC 4, 5, 6 / 1.07
Earthing	Source
	Apparatus
	Net earthing connection
Reactor [Ω]	0.6
Power factor	<0.15
M1 - Apparatus current – Rogowski coils 30 kA/V	
M4 - Supply source voltage - Voltage transformer 15000 V/100 V	
M6 - Apparatus voltage – Voltage transformer 35000/100V	

8. INTERNAL ARC TEST

The test results are presented in table 2.

Table 2

Oscillogram No.	URS UST UTR [kV]	IpR IpS IpT [kA]	ItR ItR ItT [kA]	tt [sec.]	It med [kA]	DURS DUST DUTR [V]	Remarks
72022/2008	5.95 5.95 5.95	40.5 - -	16.39 16.01 16.1	0.22	16.16	- - -	Current calibration
72023/2008	6.5 6.5 6.5	40.2 - -	16.52 16.21 16.29	1.0	16.34	805 786 785	Internal arc test in the cable compartment
72024/2008	6.4 6.4 6.4	40.1 - -	16.92 16.38 16.44	1.0	16.58	832 800 800	Internal arc test in the bus bar compartment
72025/2008	6.4 6.4 6.4	40.02 - -	16.31 16.02 16.06	1.0	16.13	820 792 790	Internal arc test in the circuit breaker compartment

Measurements were performed with uncertainty of: 1% for voltage; 1% for current; 0.5% for time and the confidence level P = 95 %.

8.1. Symbols used in tables and oscillograms

$I_R I_S I_T$ = Short-circuit current

$I_{pR} I_{pS} I_{pT}$ = Peak values of short-time withstand currents on the phases R, S, T.

$I_{tR} I_{tS} I_{tT}$ = R.m.s. values of short - time withstand currents on the phases R, S, T.

t_t = The duration of short - circuit

$I_{t\ med}$ = Effective current mean value

DURS, DUST, DUTR = Voltage drop on arc

URS, UST, UTR = No-load applied voltage

8.2 Remarks

1. Aspect of the Metal Enclosed Switchgears assembly and simulators in the test circuit before the test in cable compartment is presented in photo 1.
2. Aspect of the Metal Enclosed Switchgears assembly and simulators in the test circuit after the test in cable compartment is presented in photo 2.
3. Aspect of the pressure relief flaps after the test in cable compartment is presented in photo 3.
4. Aspect of the Metal Enclosed Switchgears assembly and simulators in the test circuit before the test in bus bar compartment is presented in photo 4.
5. Aspect of the Metal Enclosed Switchgears assembly and simulators in the test circuit after the test in bus bar compartment is presented in photo 5.
6. Aspect of the pressure relief flaps after the test in bus bar compartment is presented in photo 6.
7. Aspect of the Metal Enclosed Switchgears assembly and simulators in the test circuit before the test in circuit breaker compartment is presented in photo 7.
8. Aspect of the Metal Enclosed Switchgears assembly and simulators in the test circuit after the test in circuit breaker compartment is presented in photo 8.
9. Aspect of the pressure relief flaps after the test in circuit breaker compartment is presented in photo 9.
10. At all tests:
 - the doors didn't open and from the Metal Enclosed Switchgears assembly didn't fly off parts
 - the indicators didn't ignite.
11. The diaphragms for pressure relief had the position and dimensions presented in drawing from page 12.
12. For accessibility class A the indicators were made of black cotton (140g/m²).

8.3 Assessment of the test result

Table 3

Criterion	Result
1. The doors, covers etc. correctly secured do not open	Fulfilled
2. Parts which may cause a hazard do not fly off	Fulfilled
3. Arcing does not cause holes to develop in the freely accessible external parts of the enclosure as a result of burning or other effects	Fulfilled
4. The indicators arranged vertically do not ignite	Fulfilled
5. The indicators arranged horizontally do not ignite	Fulfilled
6. All earthing connections are still effective	Fulfilled

9. TEST RESULT: PASSED THE TEST



Photo 1 - Aspect of the Metal Enclosed Switchgears assembly and simulators in the test circuit before the test in cable compartment



Photo 2 - Aspect of the Metal Enclosed Switchgears assembly and simulators in the test circuit after the test in cable compartment



Photo 3 – Aspect of the pressure relief flaps after the test in cable compartment



Photo 4 - Aspect of the Metal Enclosed Switchgears assembly and simulators in the test circuit before the test in bus bar compartment



Photo 5 - Aspect of the Metal Enclosed Switchgears assembly and simulators in the test circuit after the test in bus bar compartment



Photo 6 – Aspect of the pressure relief flaps after the test in bus bar compartment



Photo 7 - Aspect of the Metal Enclosed Switchgears assembly and simulators in the test circuit before the test in circuit breaker compartment



Photo 8 - Aspect of the Metal Enclosed Switchgears assembly and simulators in the test circuit after the test in circuit breaker compartment



Photo 9 – Aspect of the pressure relief flaps after the test in circuit breaker compartment



METAL ENCLOSED SWITCHGEAR DATA SHEET

PRODUCT TYPE: PNL-36-01

PRODUCT DESCRIPTION: 36 kV., 630 A, 16 kA, Metal Enclosed Switchgear with SF6 Gas Insulated Load Break Switch and Earthing Switch

TECHNICAL SPECIFICATIONS OF METAL ENCLOSED SWITCHGEAR

RATED VOLTAGE (Ur)	: 36 kV
ISOLATION VOLTAGE (Ud)	: 70 kV
LIGHTNING IMPULSE	
WITHSTAND VOLTAGE (Up)	: 170 kV
RATED CURRENT (Ir)	: 630 A
RATED FREQUENCY (fr)	: 50 / 60 Hz
SHORT CIRCUIT CURRENT (Ik)	: 16 kA
PEAK WITHSTAND CURRENT (Ip)	: 40 kA
SHORT CIRCUIT DURATION (tk)	: 1 s
AMBIENT TEMPERATURE	: -5 / 40° C
ACCESSIBILITY CLASS	: AFL
MIN DISTANCE TO REAR	: 120 mm

DESCRIPTION OF PRODUCTS USED IN SWITCHGEAR

LOAD BREAK SWITCH

BRAND	: BATEL
TYPE	: BYA-36-63-16
RATED VOLTAGE (Ur)	: 36 kV
RATED NOMINAL CURRENT	: 630 A
RATED FREQUENCY	: 50/60 Hz
SHORT CIRCUIT CURRENT (Ik)	: 16 kA
PEAK WITHSTAND CURRENT (Ip)	: 40 kA
SHORT CIRCUIT DURATION (tk)	: 1 s

EARTHING SWITCH

BRAND	: DEMİTAŞ
TYPE	: DES-16-M1
RATED VOLTAGE	: 36 kV
SHORT CIRCUIT CURRENT (Ik)	: 16 kA
PEAK WITHSTAND CURRENT (Ip)	: 40 kA
SHORT CIRCUIT DURATION (tk)	: 1 s

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METAL ENCLOSED SWITCHGEAR DATA SHEET

PRODUCT TYPE: PNL-36-02

PRODUCT DESCRIPTION: 36 kV., 630 A, 16 kA, Metal Enclosed Switchgear for Measurement with SF6 Gas Insulated Load Break Switch, Earthing Switch, Current Transformer, Voltage Transformer and Fuse combination.

TECHNICAL SPECIFICATIONS OF METAL ENCLOSED SWITCHGEAR

RATED VOLTAGE (Ur)	: 36 kV
ISOLATION VOLTAGE (Ud)	: 70 kV
LIGHTNING IMPULSE	
WITHSTAND VOLTAGE (Up)	: 170 kV
RATED CURRENT (Ir)	: 630 A
RATED FREQUENCY (fr)	: 50 / 60 Hz
SHORT CIRCUIT CURRENT (Ik)	: 16 kA
PEAK WITHSTAND CURRENT (Ip)	: 40 kA
SHORT CIRCUIT DURATION (tk)	: 1 s
AMBIENT TEMPERATURE	: -5 / 40° C
ACCESSIBILITY CLASS	: AFL
MIN DISTANCE TO REAR	: 120 mm

DESCRIPTION OF PRODUCTS USED IN SWITCHGEAR

LOAD BREAK SWITCH

BRAND	: BATEL
TYPE	: BYA-36-63-16
RATED VOLTAGE (Ur)	: 36 kV
RATED NOMINAL CURRENT	: 630 A
RATED FREQUENCY	: 50/60 Hz
SHORT CIRCUIT CURRENT (Ik)	: 16 kA
PEAK WITHSTAND CURRENT (Ip)	: 40 kA
SHORT CIRCUIT DURATION (tk)	: 1 s

EARTHING SWITCH

BRAND	: DEMİTAŞ
TYPE	: DES-16-M1
RETED VOLTAGE	: 36 kV
SHORT CIRCUIT CURRENT (Ik)	: 16 kA
PEAK WITHSTAND CURRENT (Ip)	: 40 kA
SHORT CIRCUIT DURATION (tk)	: 1 s

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METAL ENCLOSED SWITCHGEAR DATA SHEET

PRODUCT TYPE: PNL-36-03

PRODUCT DESCRIPTION: 36 kV., 630 A, 16 kA, Metal Enclosed Switchgear with SF6 Gas Insulated Circuit Breaker, SF6 Gas Insulated Switch, Earthing Switch and Current Transformer,

TECHNICAL SPECIFICATIONS OF METAL ENCLOSED SWITCHGEAR

RATED VOLTAGE (Ur)	: 36 kV
ISOLATION VOLTAGE (Ud)	: 70 kV
LIGHTNING IMPULSE	
WITHSTAND VOLTAGE (Up)	: 170 kV
RATED CURRENT (Ir)	: 630 A
RATED FREQUENCY (fr)	: 50 / 60 Hz
SHORT CIRCUIT CURRENT (Ik)	: 16 kA
PEAK WITHSTAND CURRENT (Ip)	: 40 kA
SHORT CIRCUIT DURATION (tk)	: 1 s
AMBIENT TEMPERATURE	: -5 / 40° C
ACCESSIBILITY CLASS	: AFL
MIN DISTANCE TO REAR	: 120 mm

DESCRIPTION OF PRODUCTS USED IN SWITCHGEAR

SF6 GAS INSULATED CIRCUIT BREAKER

BRAND	: DEMİTAŞ
TYPE	: DSSAG-3
RATED VOLTAGE (Ur)	: 36 kV
RATED NOMINAL CURRENT	: 630 A
RATED FREQUENCY	: 50/60 Hz
SHORT CIRCUIT CURRENT (Ik) / (Ip)	: 16 kA / 40 kA (3 sec)

SF6 GAS INSULATED SWITCH

BRAND	: BATEL
TYPE	: BNA-36-63-16
RATED VOLTAGE (Ur)	: 36 kV
RATED NOMINAL CURRENT	: 630 A
RATED FREQUENCY	: 50/60 Hz
SHORT CIRCUIT CURRENT (Ik) / (Ip)	: 16 kA / 40 kA (1 sec)

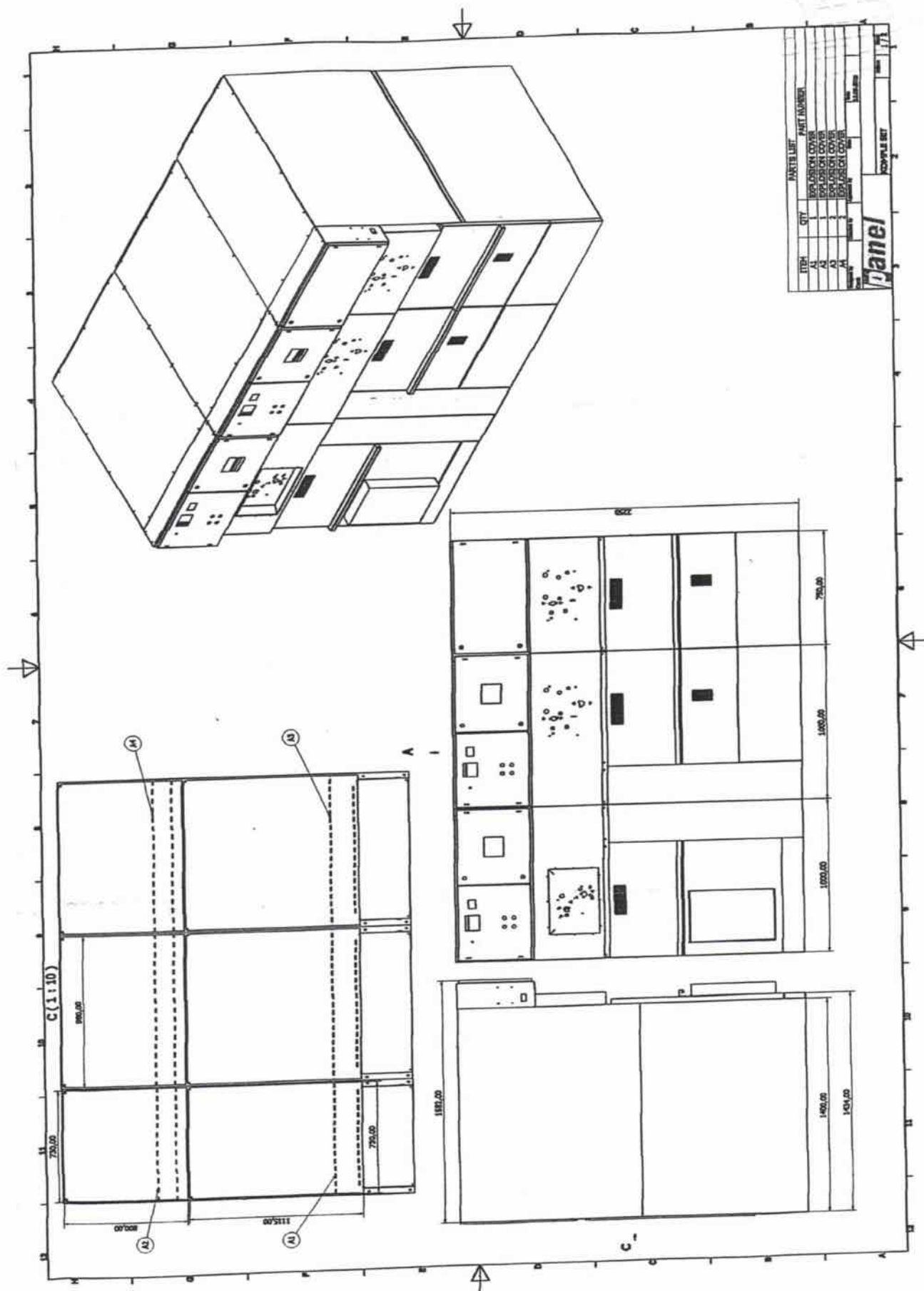
EARTHING SWITCH

BRAND / TYPE	: DEMİTAŞ / DES-16-M1	:
RATED VOLTAGE	: 36 kV	
SHORT CIRCUIT CURRENT (Ik) / (Ip)	: 16 kA / 40 kA (1 sec)	

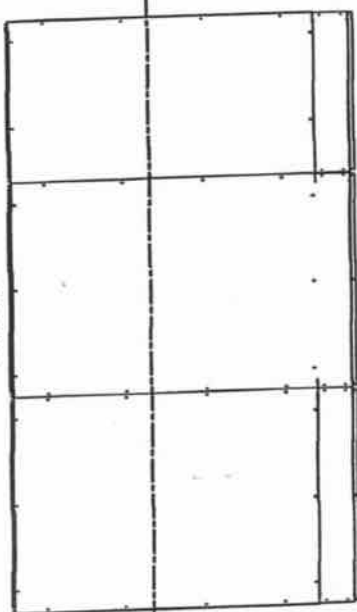
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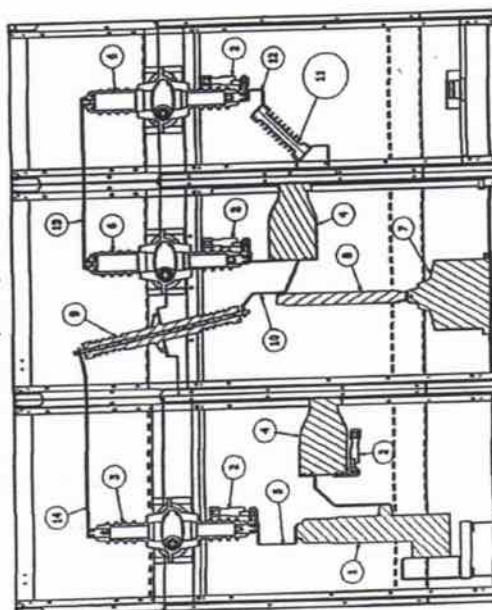
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A (1:10)



B-B (1:10)

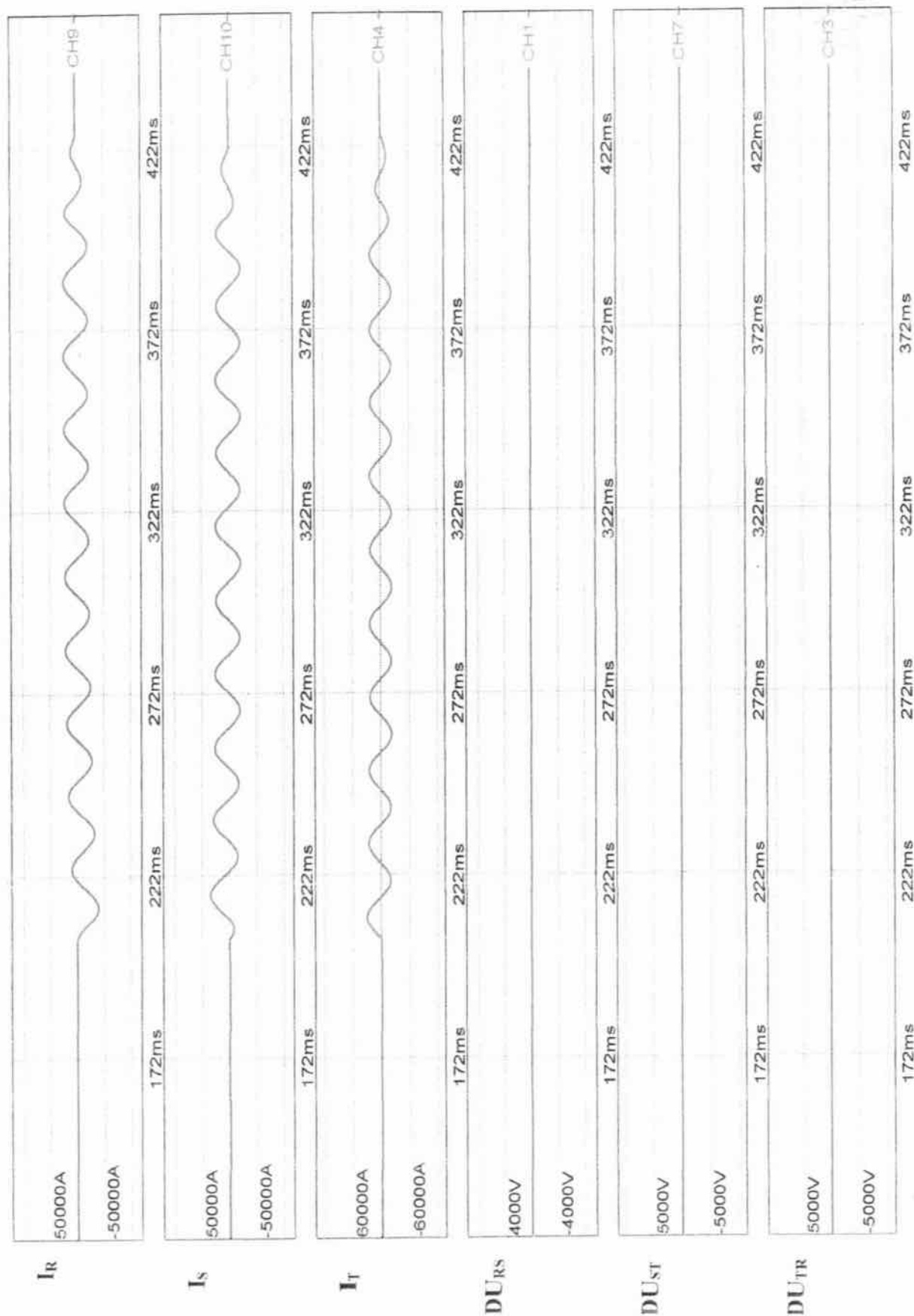


ITEM	QTY	PARTS LIST	PART NUMBER
1	1	25 KV PE INSULATED CIRCUIT BREAKER	
2	1	GROUND SWITCH	
3	1	25 KV PE INSULATED SWITCH	
4	1	CURRENT TRANSFORMER	
5	1	COPPER BAR	
6	1	25 KV PE INSULATED LOAD BREAK SWITCH	
7	1	CURRENT TRANSFORMER	
8	1	FLAT	
9	1	SALT RISING FOR INDOOR USE	
10	1	COPPER BAR	
11	1	VOLTAGE DETECTOR PORT INSULATOR	
12	1	COPPER BAR	
13	1	COPPER BAR	
14	1	COPPER BAR	

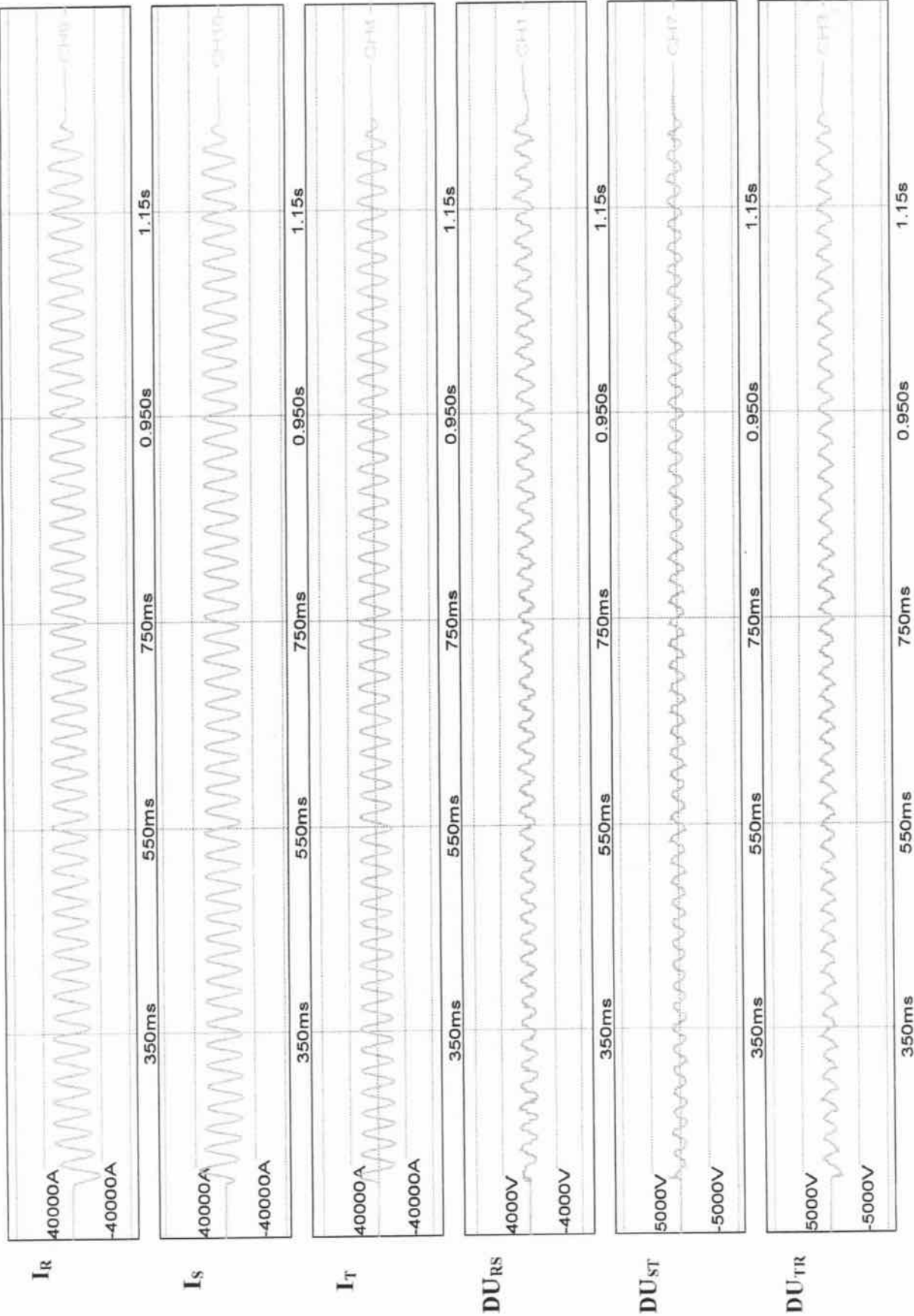
panel

COUPLE SET

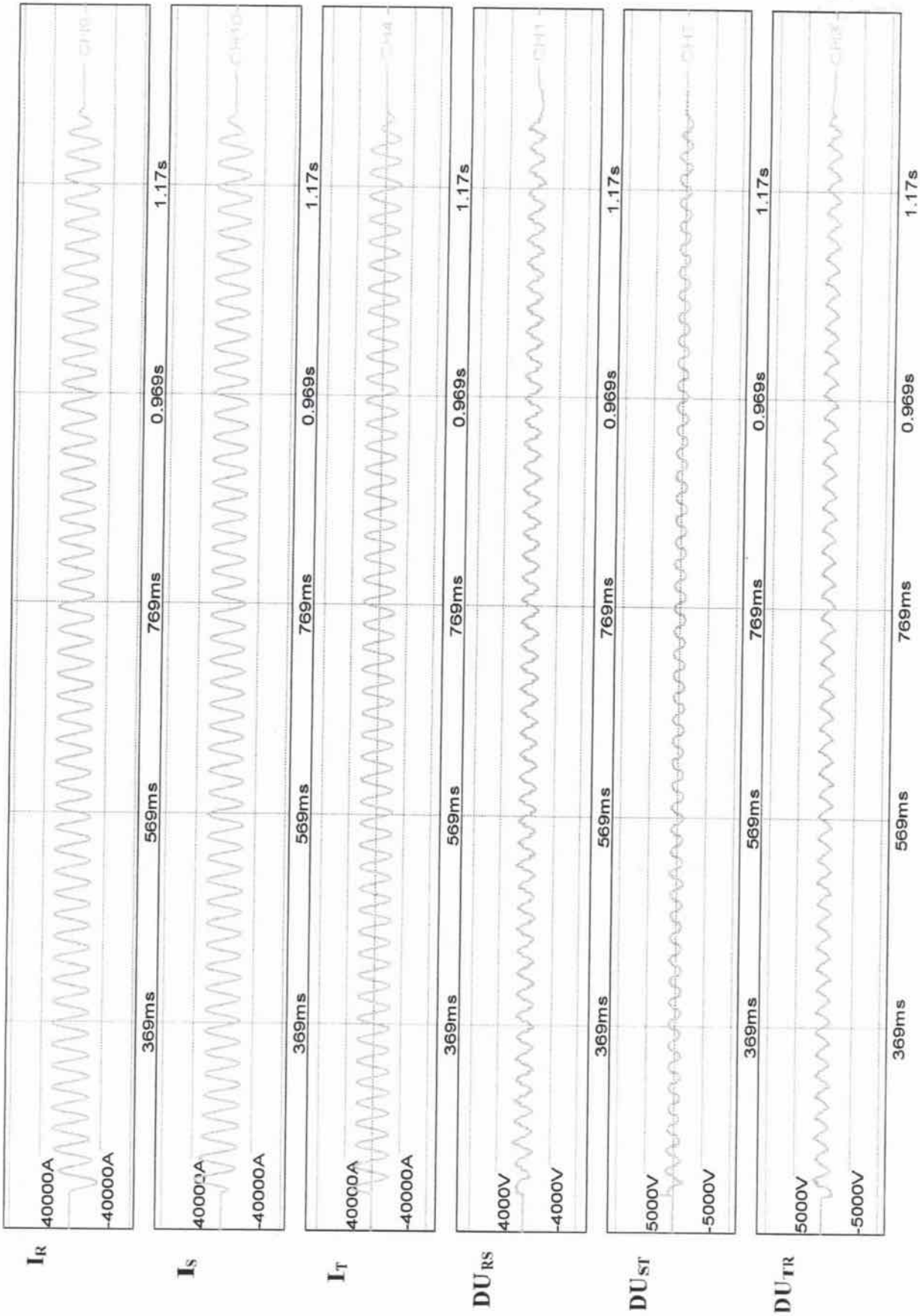
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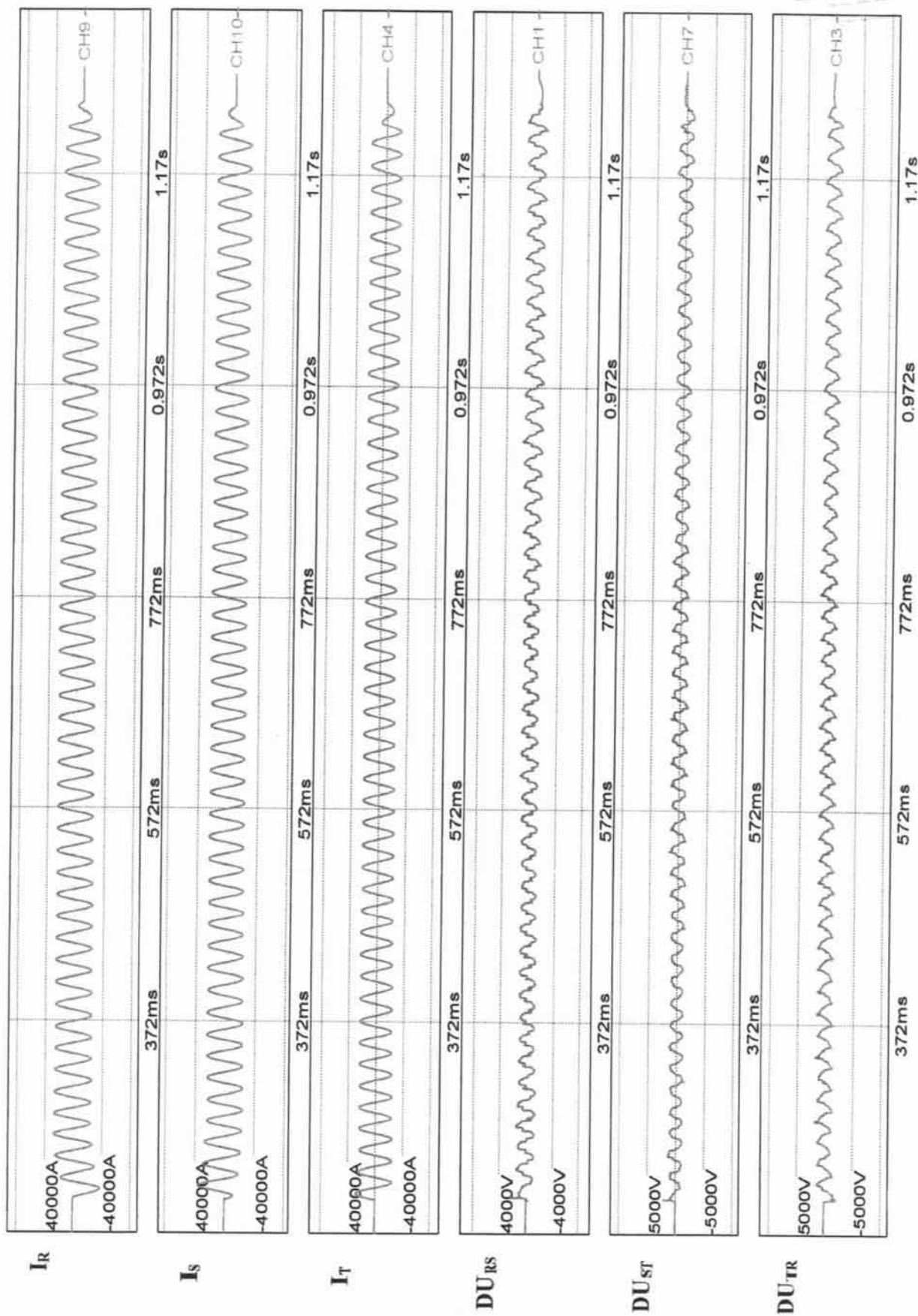
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Oscillogram No. 72024 / 2008



Oscillogram No. 72025 / 2008