



RESEARCH-DEVELOPMENT AND TESTING NATIONAL
INSTITUTE FOR ELECTRICAL ENGINEERING

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High Voltage Laboratory - HVL

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TYPE TEST REPORT

No.42111 / 07.08.2009

- CUSTOMER: PANEL ELEKTRIK SAN VE TIC LTD. STI**
Org. San. Böl. Cad. No. 27 Yakapinar / ADANA / TURKEY
- MANUFACTURER: PANEL ELEKTRIK SAN VE TIC LTD. STI**
Org. San. Böl. Cad. No. 27 Yakapinar / ADANA / TURKEY
- TESTED PRODUCT: Incoming / outgoing cubicle with circuit breaker**
type MMMH - 36 - 04, Serial no. 04 - 2009 - 0004
- REFERENCE STANDARD: IEC 60271 - 200 / 2003**
- TESTS PERFORMED: I - Lightning impulse voltage test**
II - AC power frequency voltage test
- TEST DATE: 05 ÷ 06.08.2009**
- TEST RESULTS: The product passed the tests.**
- Report has 13 pages and it is edited in 4 copies from which 3 copies for customer.**

HEAD OF HIGH VOLTAGE DIVISION

Eng. PĂTRU ION



HEAD OF LABORATORY

Eng. UNGUREANU AUREL

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TEST REPORT No. 42111

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1. Identification of the test product:

Type: MMMH - 36 - 04

Serial / year: 04 - 2009 - 0004

Drawings: MMMH 36-04-01 ; MMMH-36-04-02

Contract / Test order: 2266/ 01.06.2009 / 21099 / 03.08.2009

Product receiving date: 04.08.2009

Product condition at receiving: New

2. Technical characteristics established by manufacturer:

Rated voltage.....	36 kV
Rated lightning impulse withstand voltage	
- To earth and between phases.....	170 kV
- Across the isolating distance.....	195 kV
Rated power frequency withstand voltage	
- To earth and between phases..	70 kV
- Across the isolating distance.....	80 kV
Rated current.....	630 A

During the test the cubicle type MMMH-36-04 was equipped with:

- Switch, type DSG36, no.081217-26, manufacturer ULUSOY.
- Circuit breaker, type DS5AG - 3D, no.35663, manufacturer DEMITAŞ.
- Grounding Disconnector, type UET36-1, manufacturer ULUSOY.
- Isolator with capacitive sensor, type UKAP36, manufacturer ULUSOY.
- Current transformers, type CTM30, no. 16544; 16548; 16552; manufacturer ESIT

The operating pressure is 2 Bar at 25.2 °C.

3. Tests program: I - Lightning impulse voltage test II - AC power frequency voltage test

4. Responsibles for test: Eng. A. Ungureanu (I)
Eng. D. Ştefan (II)

ayn
SK

5. Present at the tests: -



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I. Lightning impulse voltage test

1. Reception date : 04. 08.2009

2. Test date : 05.08.2009

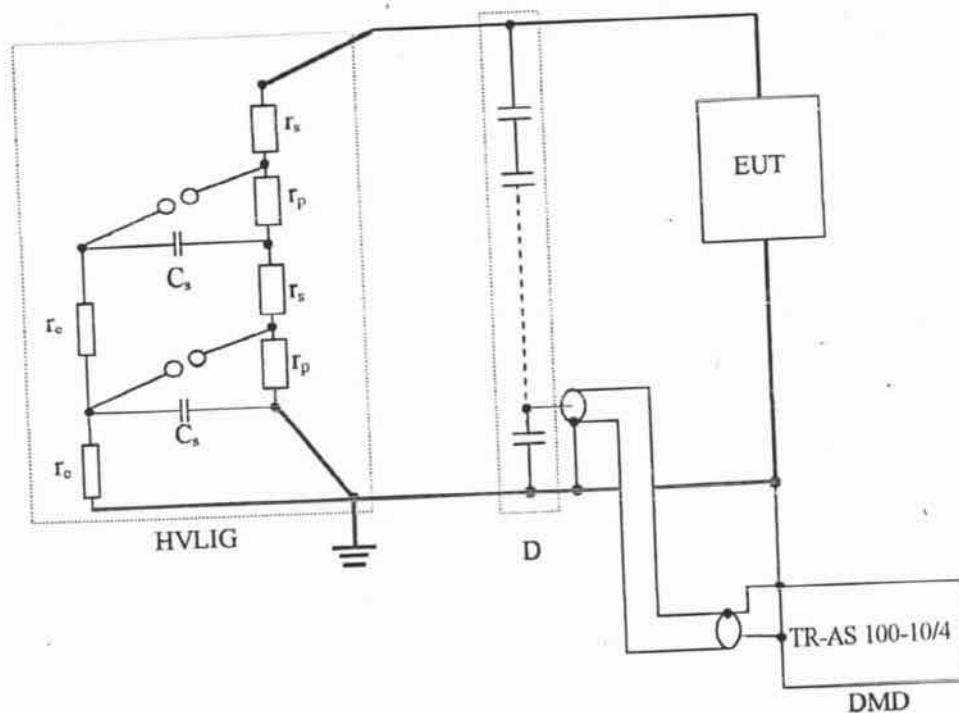
3. Atmospheric conditions :

- pressure $p = 999 \text{ mbar}$;
 - temperature $t = 25.2 \pm 0.1 \text{ }^{\circ}\text{C}$;
 - relative humidity $h_r = 58.3 \%$

4. Correction factors: $k_1 = 0.969$; $k_2 = 1.012$

5. Test standard: IEC 62271 - 1 / 2007, clause 6.2; IEC 62271 - 200 / 2003, clause 6.2.6.2

6. Test circuit diagram and equipment used :



HVLIG - High Voltage Lightning Impulse Generator 4.2 MV, serial no. 5 -1197, connection I 2 (two stages)
 Value of each stage elements

$C_s = 0.288 \text{ } \mu\text{F}$; $r_s = 70.5 \text{ } \Omega$; $r_p = 230 \text{ } \Omega$

D - Capacitor divider, dividing ratio $k_{div} = 698.7$

DMD - Digital Measuring Device type TR - AS 100 - 10 / 4, Dr.Strauss, serial no. 241, Channel 3

EUT - Equipment Under Test.

Measuring uncertainty for the peak value of lightning impulse is: 1.8 %.

The uncertainty stated is expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor $k = 2$. The value of measurand lies within the assigned range of values with probability of 95 %.



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7. Table with testing sequence and results (see also oscillograms from page 6)

Position of switching devices		Voltage applied to	Earth connected to	Free terminal	Pol.	Level of testing voltage [kV]	Test result (see also note no.2)
Switch	Circuit breaker						
closed	closed	R	F, S, T	-	Neg.	170	Withstood 15 impulses
					Pos.	170	Withstood 15 impulses
		S	F, R, T	-	Neg.	170	Withstood 15 impulses
					Pos.	170	Withstood 15 impulses
		T	F, R, S	-	Neg.	170	Withstood 15 impulses
					Pos.	170	Withstood 15 impulses
closed	open	R	F, S, T, r, s, t	-	Neg.	170	Withstood 15 impulses
					Pos.	170	Withstood 15 impulses
		S	F, R, T, r, s, t	-	Neg.	170	Withstood 15 impulses
					Pos.	170	Withstood 15 impulses
		T	F, R, S, r, s, t	-	Neg.	170	Withstood 15 impulses
					Pos.	170	Withstood 15 impulses
		r	F, R, S, T, s, t	-	Neg.	170	Withstood 15 impulses
					Pos.	170	Withstood 15 impulses
		s	F, R, S, T, r, t	-	Neg.	170	Withstood 15 impulses
					Pos.	170	Withstood 15 impulses
		t	F, R, S, T, r, s	-	Neg.	170	Withstood 15 impulses
					Pos.	170	Withstood 15 impulses
open	closed	R	F, S, T, r, s, t	-	Neg.	170	Withstood 15 impulses
					Pos.	170	Withstood 15 impulses
		S	F, R, T, r, s, t	-	Neg.	170	Withstood 15 impulses
					Pos.	170	Withstood 15 impulses
		T	F, R, S, r, s, t	-	Neg.	170	Withstood 15 impulses
					Pos.	170	Withstood 15 impulses
		r	F, R, S, T, s, t	-	Neg.	170	Withstood 15 impulses
					Pos.	170	Withstood 15 impulses
		s	F, R, S, T, r, t	-	Neg.	170	Withstood 15 impulses
					Pos.	170	Withstood 15 impulses
		t	F, R, S, T, r, s	-	Neg.	170	Withstood 15 impulses
					Pos.	170	Withstood 15 impulses
open	closed	R	r	F, S, T, s, t	Neg.	195	Withstood 15 impulses
					Pos.	195	Withstood 15 impulses
		S	s	F, R, T, r, t	Neg.	195	Withstood 15 impulses
					Pos.	195	Withstood 15 impulses
		T	t	F, R, S, r, s	Neg.	195	Withstood 15 impulses
					Pos.	195	Withstood 15 impulses
		r	R	F, S, T, s, t	Neg.	195	Withstood 15 impulses
					Pos.	195	Withstood 15 impulses
		s	S	F, R, T, r, t	Neg.	195	Withstood 15 impulses
					Pos.	195	Withstood 15 impulses
		t	T	F, R, S, r, s	Neg.	195	Withstood 15 impulses
					Pos.	195	Withstood 15 impulses

Symbols used: R, S, T, r, s, t – terminals; F – frame.

Notes:

1. The test consists in application of 15 impulses for each polarity and each test configuration at specified voltage level.
2. During the test no more of two disruptive discharges occurred for each complete series of 15 impulses and no one in the last 5 consecutive impulses.
3. During the test the grounding disconnector it was in open position.

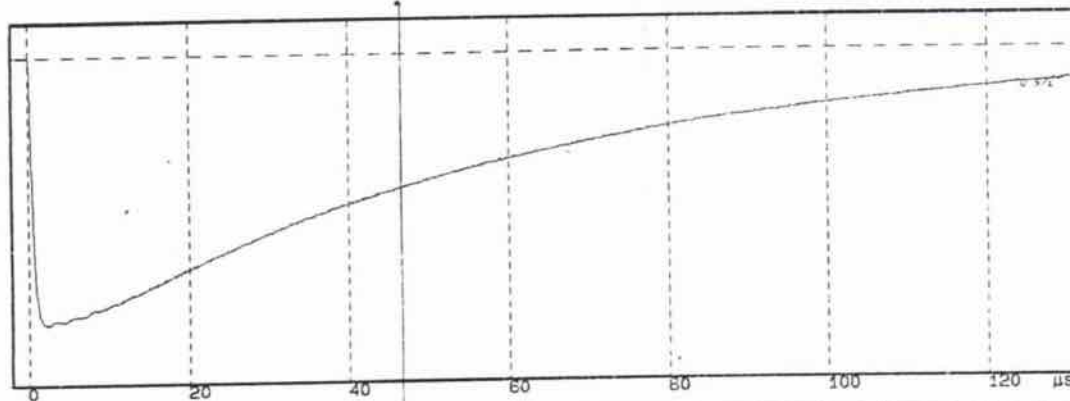
8. Conclusion: The product passed the test.



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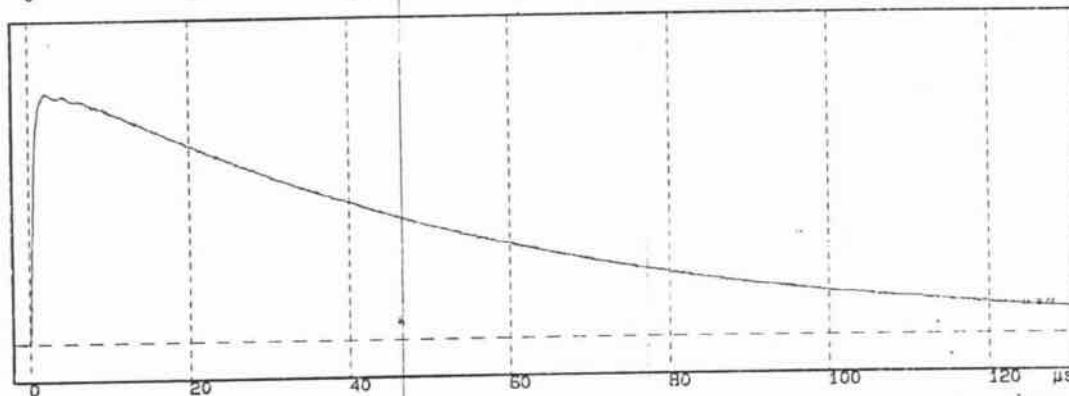
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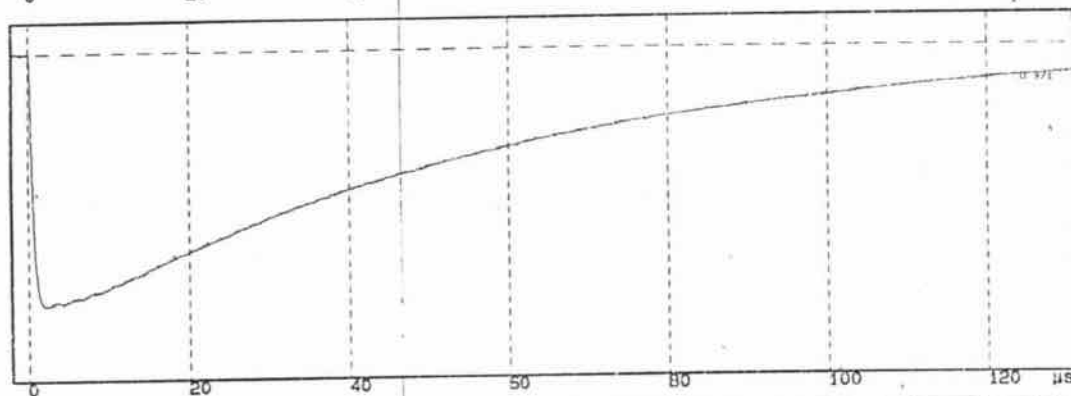
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K3: U LI
Up = -154 kV
T1 = 1.15 μs
T2 = 46.4 μs



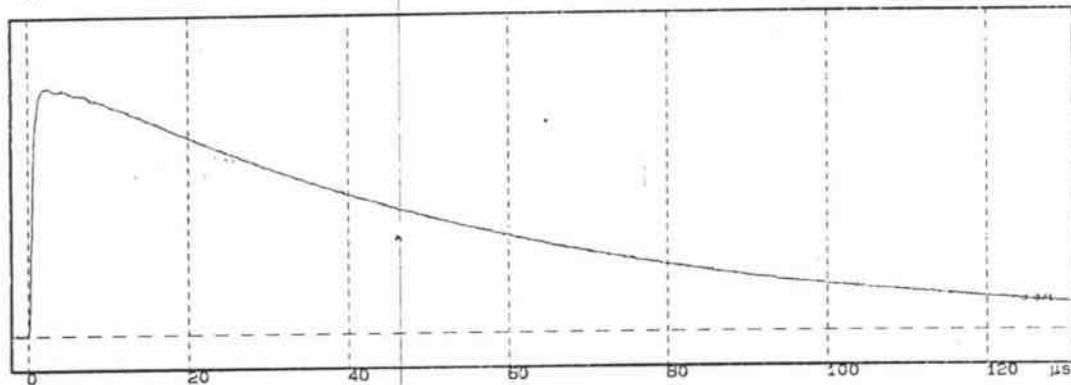
No. 213097

K3: U LI
Up = 185 kV
T1 = 1.20 μs
T2 = 46.0 μs



No. 213215

K3: U LI
Up = -193 kV
T1 = 1.16 μs
T2 = 45.9 μs



No. 213232

K3: U LI
Up = 195 kV
T1 = 1.17 μs
T2 = 45.0 μs



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II. AC power frequency voltage test

1. Reception date : 04.08.2009

2. Test date : 06.08.2009

3. Atmospheric conditions :

pressure

$p = 999 \text{ mbar}$

temperature

$t = 24 \pm 0.1 \text{ }^{\circ}\text{C}$

relative humidity

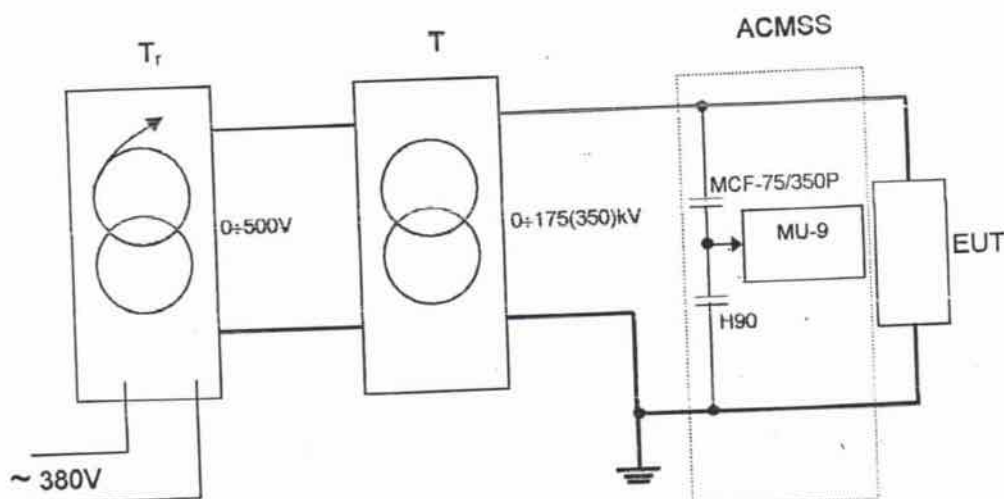
$h_r = 62 \%$

4. Correction factors:

$k_\delta = 0.975$; $k_h = 0.975$

5. Test standard: IEC 62271 - 200 / 2003, cl.6.2.6.1

6. Test circuit diagram and equipment used :



Tr - Regulating transformer 380 V / 0 ÷ 500 V

T - High voltage set up transformer 0.5 / 175 (350) kV; 350 kVA, serial no. 3-1963

EUT - Equipment Under Test

ACMS - AC measuring system 350 kV consists of: high voltage compressed gas capacitor type MCF 75/350P, no.853889 and low voltage arm type H90, no.898939 + digital peak voltmeter type MU9, no.892204.

Measuring uncertainty is 1.2 %.

The reported uncertainty is an expanded uncertainty, based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95 %.



7. Testing sequence and results :

Position of switching devices		Voltage applied to	Earth connected to	Free terminals	Level of testing voltage kV_{rms}	Test result
Switch	Circuit breaker					
closed	closed	R	F, S, T	-	70	Withstood 60 sec.
		S	F, R, T	-	70	Withstood 60 sec.
		T	F, R, S	-	70	Withstood 60 sec.
closed	open	R	F, S, T, r, s, t	-	70	Withstood 60 sec.
		S	F, R, T, r, s, t	-	70	Withstood 60 sec.
		T	F, R, S, r, s, t	-	70	Withstood 60 sec.
		r	F, R, S, T, s, t	-	70	Withstood 60 sec.
		s	F, R, S, T, r, t	-	70	Withstood 60 sec.
		t	F, R, S, T, r, s	-	70	Withstood 60 sec.
open	closed	R	F, S, T, r, s, t	-	70	Withstood 60 sec.
		S	F, R, T, r, s, t	-	70	Withstood 60 sec.
		T	F, R, S, r, s, t	-	70	Withstood 60 sec.
		r	F, R, S, T, s, t	-	70	Withstood 60 sec.
		s	F, R, S, T, r, t	-	70	Withstood 60 sec.
		t	F, R, S, T, r, s	-	70	Withstood 60 sec.
open	closed	R	r	F, S, T, s, t	80	Withstood 60 sec.
		S	s	F, R, T, r, t	80	Withstood 60 sec.
		T	t	F, R, S, r, s	80	Withstood 60 sec.
		r	R	F, S, T, s, t	80	Withstood 60 sec.
		s	S	F, R, T, r, t	80	Withstood 60 sec.
		t	T	F, R, S, r, s	80	Withstood 60 sec.

Symbols used: R, S, T, r, s, t – terminals;
F – frame.

Notes:

1. The test consists in application of power frequency voltage, for 1 min., for each test configuration at specified voltage level.
2. During the test no disruptive discharges occurred for each voltage application.
3. During the test the grounding disconnector it was in open position.

8. Conclusion: The product passed the test.



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LVD
panel

ELEKTRİK SANAYİ VE TİCARET LTD. ŞTİ.

MMM36-04 INCOMING / OUTGOING CUBICLE WITH CIRCUIT BREAKER	
Rated Voltage	36 kV
Rated power frequency withstand voltage (1 min)	
Phase to earth and phase to phase	70 kV
At Isolating distance	80 kV
Rated Lightning Impulse withstand voltage 1.2/50ms	
Phase to earth and phase to phase	170 kV
Across Interrupter	195 kV
Rated frequency	50/60 Hz
Rated current	630 A
Rated peak withstand voltage	40 kA
Rated short-time withstand current (1s)	16 kA
Switch	
Brand	ULUSOY
Type	DSG36
Serial Number	081217-26
Operating Pressure	0.5 Bar
Min. Operating Pressure	0.4 Bar
Rated Voltage	36 kV
Rated Frequency	50 / 60 Hz
Rated current	630 A
Circuit Breaker	
Brand	DEMİTAŞ
Type	DS5AG-3D
Serial Number	35663
Rated Voltage	36 kV
Rated Frequency	50 / 60 Hz
Rated current	630 A
Operating Pressure	2 Bar
Min. Operating Pressure	1.9 Bar
Grounding Disconnector	
Brand	ULUSOY
Type	UET36-1
Rated short-time withstand current (1s)	16 kA
Rated short-circuit making current (peak)	40 kA
Isolator with capacitive sensor	
Brand	ULUSOY
Type	UKAP36

Address: H.Sabancı Organize San. 17 Cad. No: 27 ADANA/TURKEY

Tel: 00 90 322 394 36 97

Fax: 00 90 322 394 37 00



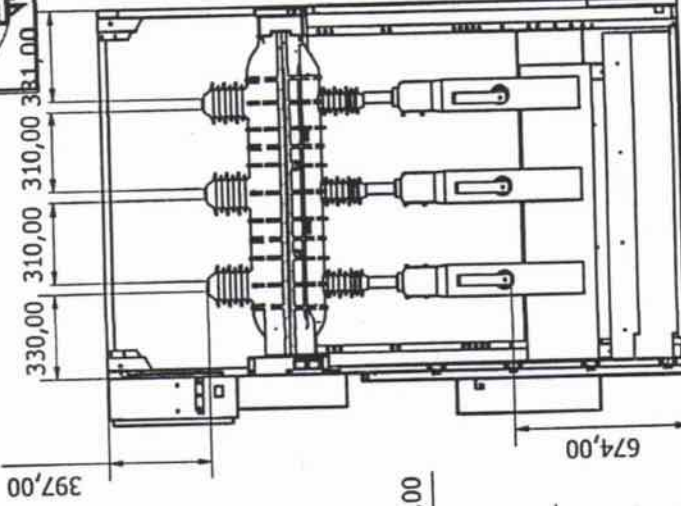
HVD
panel

ELEKTRİK SANAYİ VE TİCARET LTD. ŞTİ

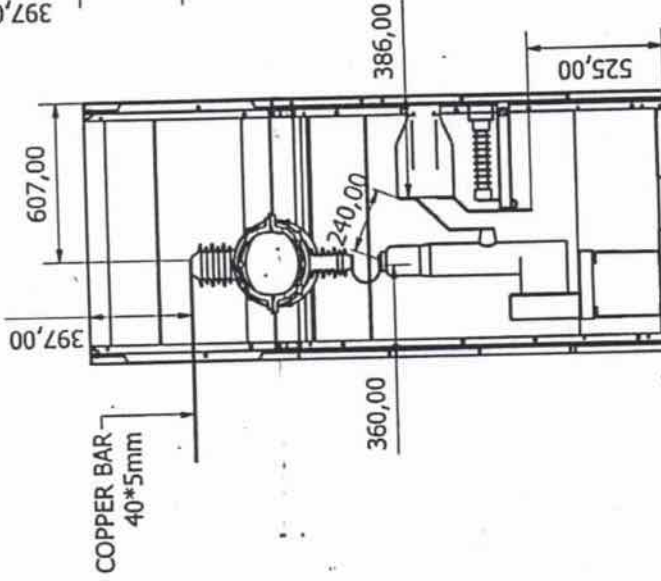
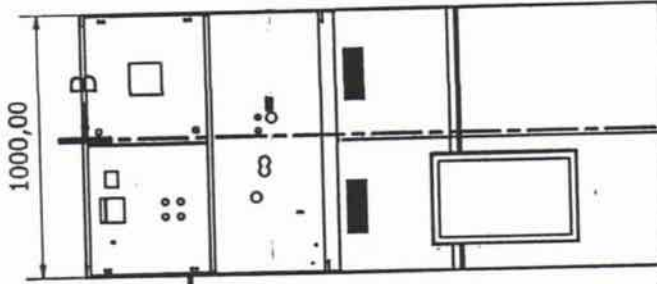
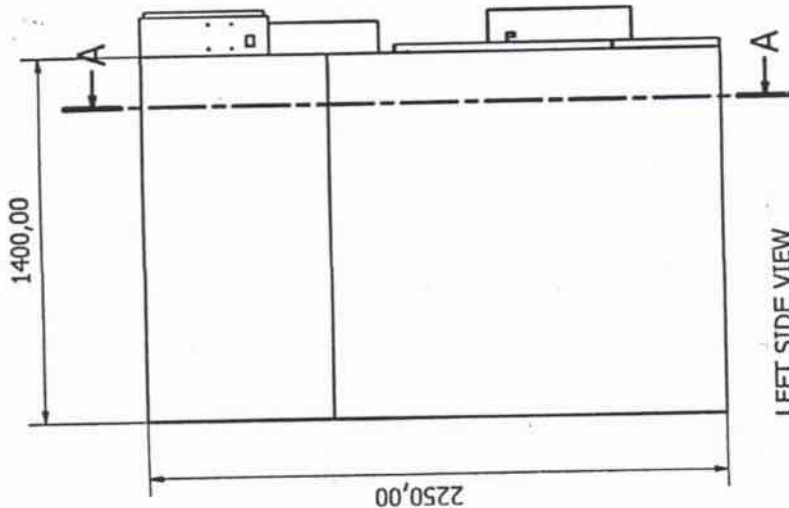
Current Transformer	
Brand	ESİT
Type	CTM30
Transform ratio	600/5
In	400
Serial Number R	16544
Serial Number S	16548
Serial Number T	16552



B-B (1:20)

MMM 36-04
TESTING UNIT
SECTION VIEW B-B

A-A (1:20)

MMM 36-04
TESTING UNIT
SECTION VIEW A-AMMM 36-04
TESTING UNIT
FRONT VIEW

LEFT SIDE VIEW

LIGHTNING IMPULSE TEST CONFIGURATION
FOR MMMH 36-04

PANEL ELEKTRİK

Organize Sanayi Bölgesi
17. Cad No:27
Yakapınar/ADANA/TÜRKİYE

www.panelelektrik.com

Designed by
Cenk YÜZERERÖĞLÜThird Angle Projection
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Approved by

MMM 36- 04-01

Date

30.07.2009

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PARTS LIST

ITEM QTY PART NUMBER

1 1 MMMH 36-04

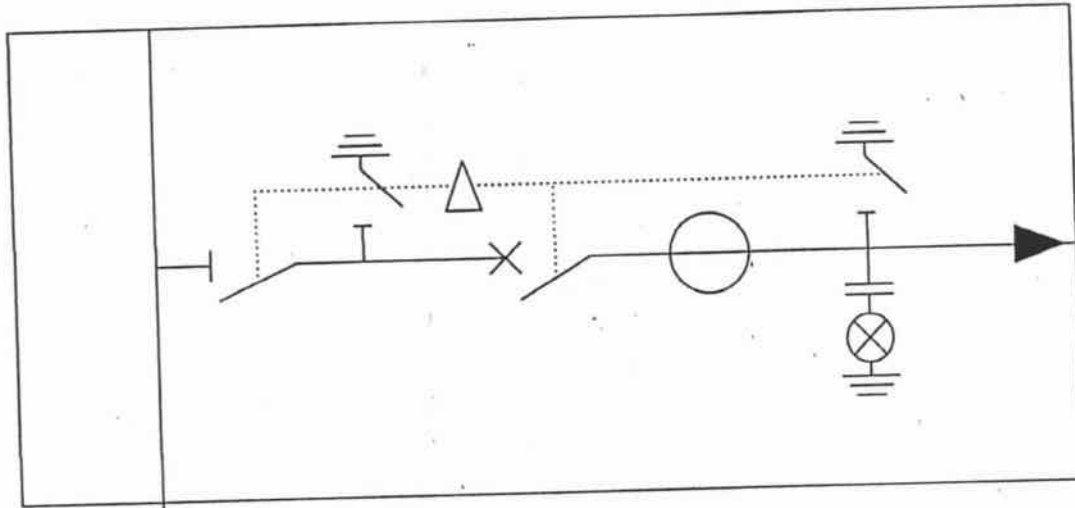
DESCRIPTION
OUTGOING UNIT WITH CIRCUIT BREAKER



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**LIGHTNING IMPULSE TEST CONFIGURATION
SINGLE LINE DIAGRAM FOR MMMH 36-04**



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MMMh 36- 04-02

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