



RESEARCH-DEVELOPMENT AND TESTING NATIONAL
INSTITUTE FOR ELECTRICAL ENGINEERING

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HIGH VOLTAGE DIVISION - HVD

High Voltage Laboratory - HVL

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TYPE TEST REPORT

No.42112 / 07.08.2009

- 1.CUSTOMER: PANEL ELEKTRIK SAN VE TIC LTD. STI**
Org. San. Böl. Cad. No. 27 Yakapinar / ADANA / TURKEY
- 2.MANUFACTURER: PANEL ELEKTRIK SAN VE TIC LTD. STI**
Org. San. Böl. Cad. No. 27 Yakapinar / ADANA / TURKEY
- 3. TESTED PRODUCT: 36 kV Load Break Switch and Fuse combination Switchgear,**
type MMMH - 36 - 02, Serial no. 02 - 2009 - 0006
- 4. REFERENCE STANDARD: IEC 60271 - 200 / 2003**
- 5. TESTS PERFORMED:** I - Lightning impulse voltage test
II - AC power frequency voltage test
- 6. TEST DATE:** 04 + 05.08.2009
- 7. TEST RESULTS:** The product passed the tests.
- 8. Report has 12 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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1. Identification of the test product:

Type: MMMH - 36 - 02

Serial / year: 02 - 2009 - 0006

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

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-36-02 was equipped with:

- Load break switch, type LBS36, no.080905-25, manufacturer ULUSOY.
- Fuses 36 kV / 30 A, type BID, manufacturer EFO.
- Grounding disconnecter, type UET36-2, manufacturer ULUSOY.
- Isolator with capacitive sensor, type UKAP36, manufacturer ULUSOY.

The operating pressure is 0.5 Bar at 26.5 °C.

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

4. Responsibles for test: Eng. I. Badea (I)
Eng. D. Ștefan (II)

5. Present at the tests: -



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I. Lightning impulse voltage test

1. Reception date : 04. 08.2009

2. Test date : 04.08.2009

3. Atmospheric conditions :

- pressure

- temperature

- relative humidity

$p = 997 \text{ mbar};$

$t = 26.5 \pm 0.1 ^\circ\text{C};$

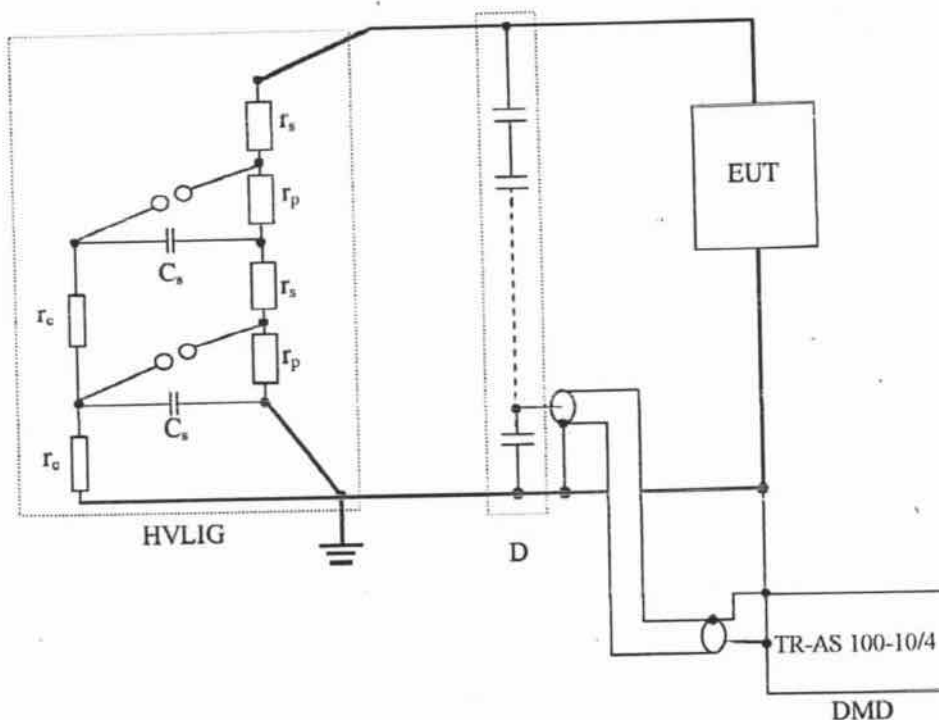
$h_r = 51 \%$

$k_1 = 0.963; k_2 = 1.003$

4. Correction factors:

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 :



HVLI - High Voltage Lightning Impulse Generator 4.2 MV, serial no. 5 -1197, connection I 2 (two stages)

Value of each stage elements

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

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 %.

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

Position of switching devices Load break switch	Voltage applied to	Earth connected to	Free terminal	Pol.	Level of testing voltage [kV]	Test result (see also note no.2)
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
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	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.

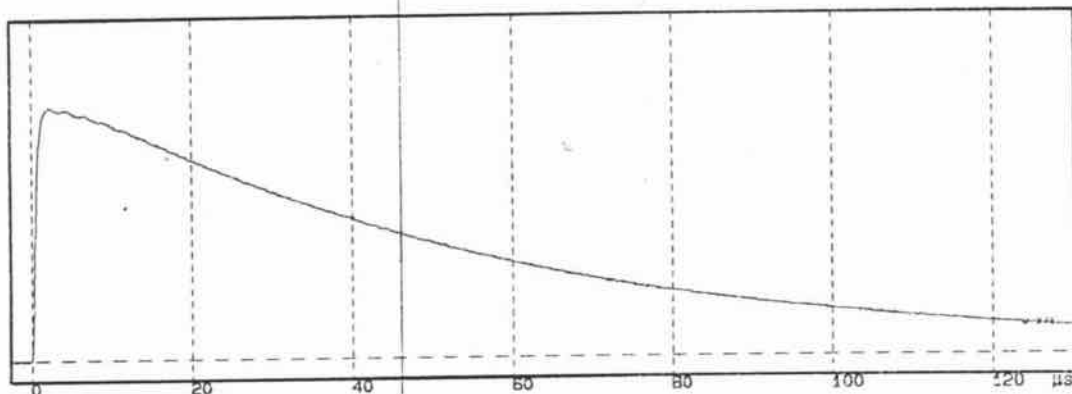
8. Conclusion: The product passed the test.



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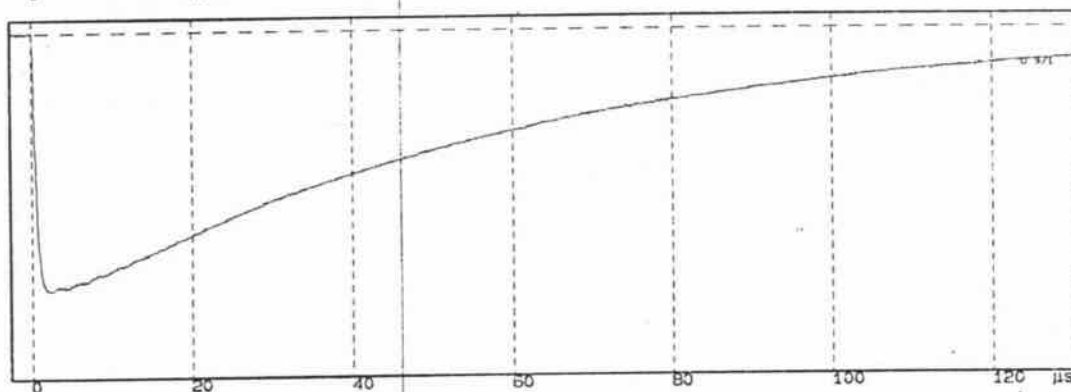
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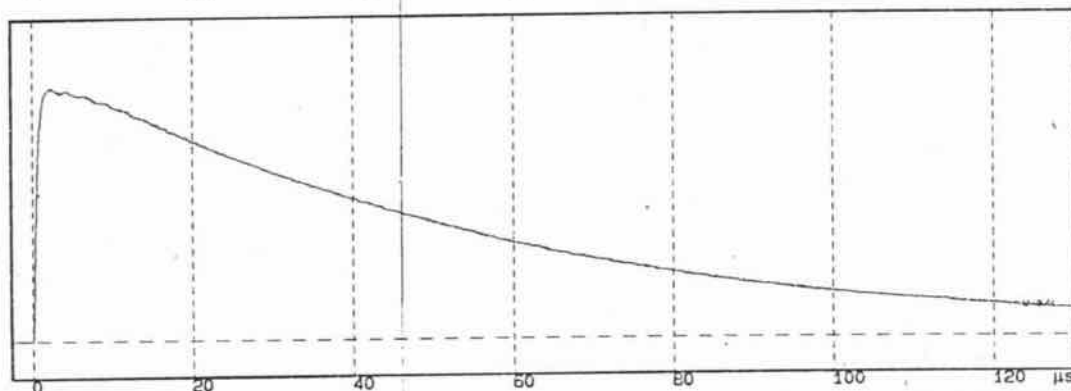
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K3: U LI
Up= 167 kV
T1= 1.20 μs
T2= 45.5 μs



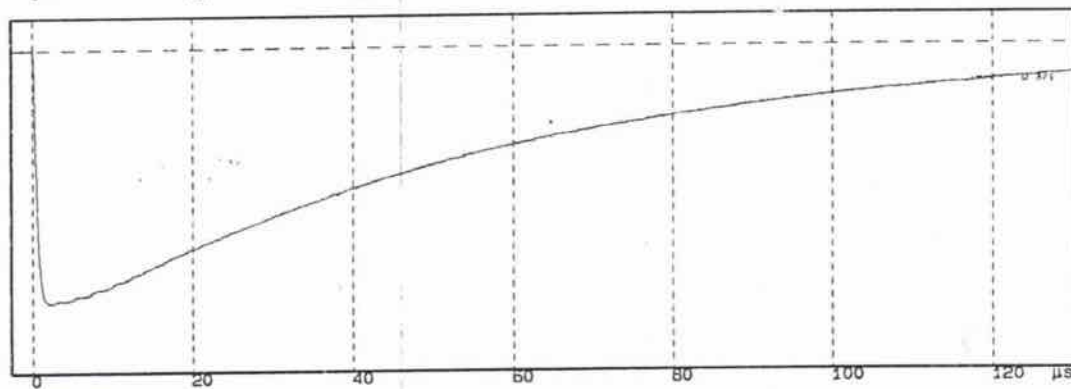
No. 212885

K3: U LI
Up= -166 kV
T1= 1.21 μs
T2= 45.7 μs



No. 213106

K3: U LI
Up= 194 kV
T1= 1.17 μs
T2= 46.2 μs



No. 213121

K3: U LI
Up= -196 kV
T1= 1.17 μs
T2= 45.9 μs



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II. AC power frequency voltage test

1. Reception date : 04.08.2009

2. Test date : 05.08.2009

3. Atmospheric conditions :

pressure

$p = 999 \text{ mbar}$

temperature

$t = 245.6 \pm 0.1 \text{ } ^\circ\text{C}$

relative humidity

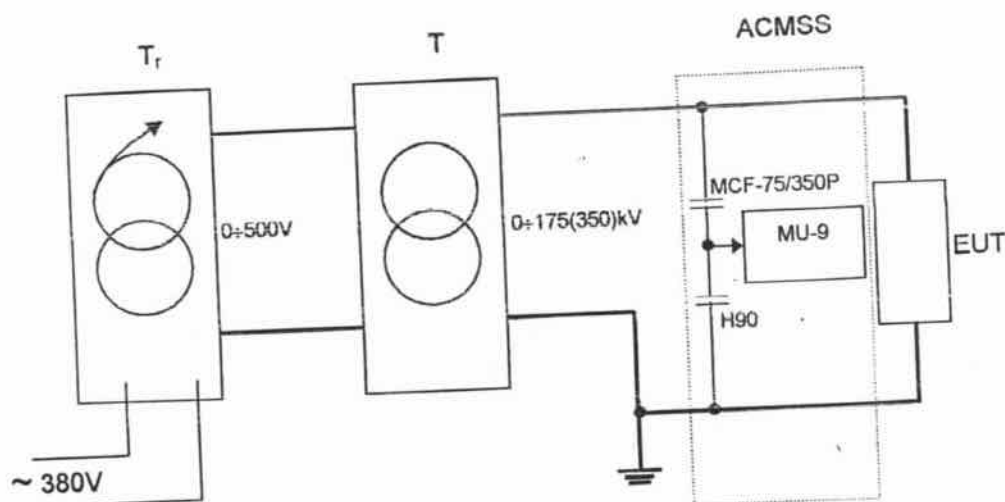
$h_r = 58 \%$

4. Correction factors:

$k_\delta = 0.969; k_h = 0.964$

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

6. Test circuit diagram and equipment used :



Tr - Regulating transformer 380 V / $0 \div 500 \text{ V}$

T - High voltage set up transformer $0.5 / 175 (350) \text{ kV}$; 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 Load break switch	Voltage applied to	Earth connected to	Free terminals	Level of testing voltage kV_{rms}	Test result
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.
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	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.



HVD

panel

ELEKTRİK SANAYİ VE TİCARET LTD. ŞTİ.

MMM36-02 LOAD BREAK SWITCH COMBINATION WITH FUSE	
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
Load Break Switch	
Brand	ULUSOY
Type	LBS36
Serial Number	080905-25
Operating Pressure	0.5 Bar
Min. Operating Pressure	0.4 Bar
Rated Voltage	36 kV
Rated Frequency	50 / 60 Hz
Rated current	630 A
Fuses	
Brand	EFO
Type	BID
Rated Voltage	36 kV
Dimension	537 mm
Serial Number R	
Serial Number S	
Serial Number T	
Grounding Disconnecter	
Brand	ULUSOY
Type	UET36-2
Rated short-time withstand current (1s)	1 kA
Rated short-circuit making current (peak)	2,5 kA
Isolator with capacitive sensor	
Brand	ULUSOY
Type	UKAP36

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1

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PARTS LIST

4

3

DESCRIPTION

ITEM QTY PART NUMBER

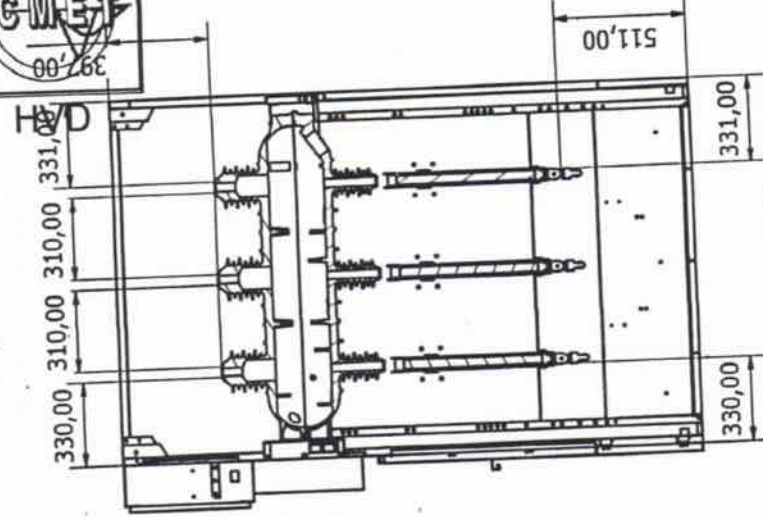
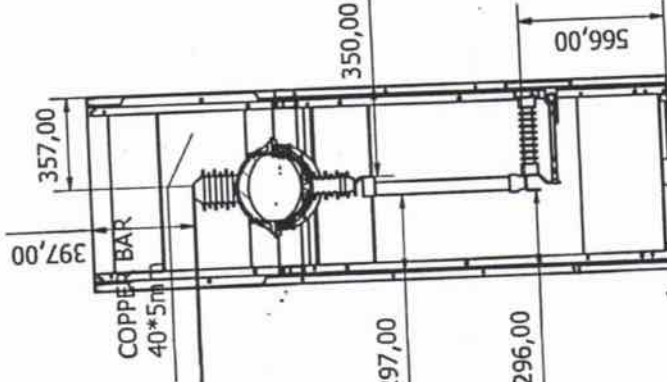
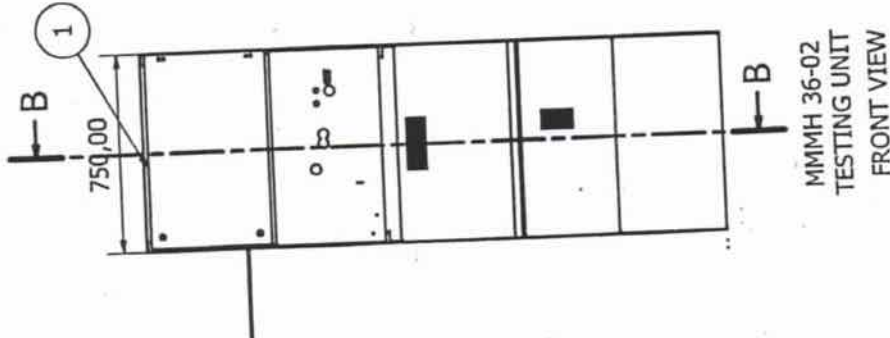
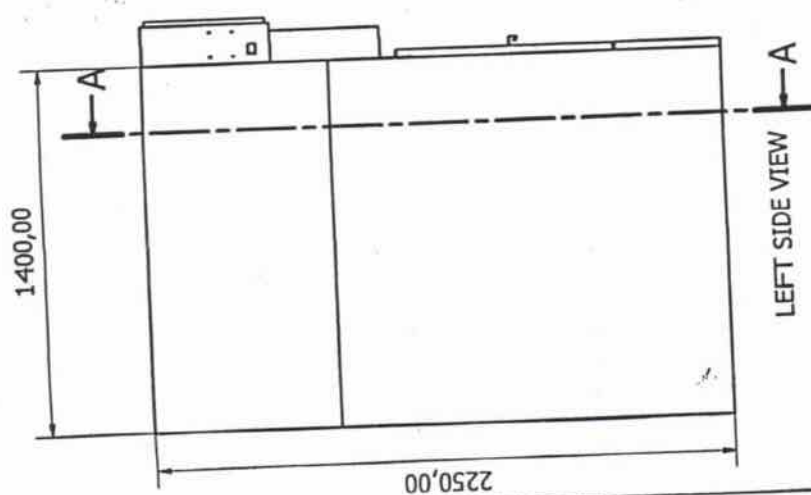
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MMM 36-02

OUTGOING UNIT WITH FUSE LOAD BREAK SWITCH COMBINATION

A-A (1:20)

B-B (1:20)



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LIGHTNING IMPULSE TEST CONFIGURATION FOR MMMH 36-02



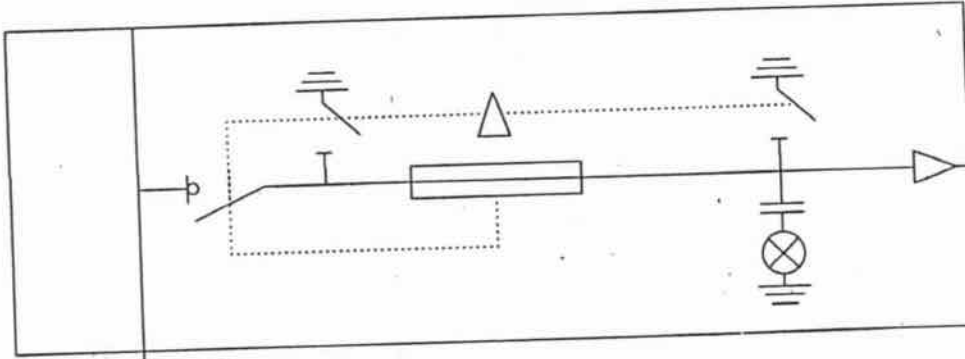
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MMM 36-02
TESTING UNIT



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**LIGHTNING IMPULSE TEST CONFIGURATION
SINGLE LINE DIAGRAM FOR MMMH 36-02**

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