

TEST REPORT

Padmount Transformer

3 Phase 1000kVA 13800x4800D - 480y V

P.O. No. : DS21-211

Jul. 2023

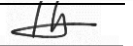


Tested by : Kang, Min-Jae



date : 2023-07-19

Checked by : Ha, Jae-gyeong



date : 2023-07-19

Approved by : Kim, Seung-Hwan



date : 2023-07-19

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1. Rating

1. Phase	:	3 Ø	2. Capacity	:	1,000 kVA
3. Rated frequency	:	60 Hz	4. Vector Group	:	Dyn1
5. Cooling method	:	ONAN	6. Core type	:	Wound
7. Rated voltage	(High voltage / Low voltage)	:	13800 x 4800 / 480	V	
8. Rated current	(High voltage / Low voltage)	:	41.8 x 120.3 / 1202.8	A	
9. Insulation level	(High voltage / Low voltage)	:	95 / 30	kV(BIL)	
10. Oil volume	:	440 GAL	11. Total weight	:	11795 lbs
12. Serial No.	:	OP1000-2324			
13. Date of manufacture	:	Jul. 2023			
14. Standard	:	IEEE C57.12.00			

2. Measurement of voltage ratio

DUAL Switch POS. 2

Tolerance : ± 0.5%

Tap Voltage				Rated ratio	Measured value						Results
HV		LV			H1 phase		H2 phase		H3 phase		
No.	Voltage	No.	Voltage		Ratio	Error(%)	Ratio	Error(%)	Ratio	Error(%)	
A	14400	-	480	51.962	51.895	-0.13	51.890	-0.14	51.895	-0.13	<i>Good</i>
B	13800	-	480	49.796	49.750	-0.09	49.748	-0.10	49.748	-0.10	
C	13200	-	480	47.631	47.604	-0.06	47.604	-0.06	47.606	-0.05	
D	12470	-	480	44.997	45.030	0.07	45.030	0.07	45.030	0.07	
E	12000	-	480	43.301	43.314	0.03	43.314	0.03	43.314	0.03	

DUAL Switch POS. 1

Tap Voltage				Rated ratio	Measured value						Results
HV		LV			H1 phase		H2 phase		H3 phase		
No.	Voltage	No.	Voltage		Ratio	Error(%)	Ratio	Error(%)	Ratio	Error(%)	
-	4800	-	480	17.321	17.296	-0.14	17.296	-0.14	17.296	-0.14	<i>Good</i>

3. Check of phase relationship

Dyn1

Good

4. Measurement of winding resistance

DUAL Switch POS. 2

Ambient temperature : 29 °C

Tap No.	Tap Voltage	Measured value(Ω)					
		H1-H2		H2-H3		H3-H1	
		at 29°C	at 55°C	at 29°C	at 55°C	at 29°C	at 55°C
A	14400	0.788900	0.869654	0.790450	0.871362	0.787150	0.867724
B	13800	0.756900	0.834378	0.758500	0.836142	0.755350	0.832669
C	13200	0.723300	0.797339	0.724850	0.799047	0.721800	0.795685
D	12470	0.686400	0.756661	0.688000	0.758425	0.685050	0.755173
E	12000	0.658800	0.726236	0.660350	0.727945	0.657500	0.724803

DUAL Switch POS. 1

Ambient temperature : 29 °C

Tap No.	Tap Voltage	Measured value(Ω)					
		H1-H2		H2-H3		H3-H1	
		at 29°C	at 55°C	at 29°C	at 55°C	at 29°C	at 55°C
-	4800	0.088730	0.097813	0.089040	0.098154	0.088770	0.097857

Tap No.	Tap Voltage	Measured value(Ω)					
		x1-x2		x2-x3		x3-x1	
		at 29°C	at 55°C	at 29°C	at 55°C	at 29°C	at 55°C
-	480	0.00064510	0.00071113	0.00063355	0.00069840	0.00064950	0.00071598

5. Insulation Resistance Measurement

- 1) Winding insulation resistance measurement - 2500V, 1000G Ω Meter.

HV Winding to LV Winding	:	47100 M Ω
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HV Winding to Earth	:	28600 M Ω
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LV Winding to Earth	:	20500 M Ω
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- 2) Core & Clamp insulation resistance measurement - 1000V, 1G Ω Meter.

Core- Earth	:	>1000 M Ω
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Clamp- Earth	:	>1000 M Ω
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Core- Clamp	:	>1000 M Ω
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6. Measurement of no-load loss and current

Test frequency 60 Hz, Ambient temperature : 29 °C

LV side connection at rated voltage 480 V, Tap No: C

Items	Guaranteed value	Measurement value	Results
No-load loss (W)	-	1416	Good
No-load current (%)	-	0.27	

7. Load losses and impedance voltage

Reference temperature : 55 °C at. 13800-480V

Items	Tap No.	Voltage	Guaranteed	Measurement	Results
Load loss (W)	A	14,400	-	4819	<i>Good</i>
	B	13,800	-	4936	
	E	12,000	-	5599	

Reference temperature : 85 °C

Items	Tap No.	Voltage	Guaranteed	Measurement	Results
% Impedance (%)	A	14,400	-	5.74	<i>Good</i>
	B	13,800	5.75±7.5%	5.78	
	E	12,000	-	6.08	

Reference temperature : 55 °C at. 4800-480V

Items	Tap No.	Voltage	Guaranteed	Measurement	Results
Load loss (W)	C	4,800	-	4624	<i>Good</i>

Reference temperature : 85 °C

Items	Tap No.	Voltage	Guaranteed	Measurement	Results
% Impedance (%)	C	4,800	-	5.22	<i>Good</i>

8. Efficiency & Voltage regulation

Reference temperature : 55 °C at. 13800-480V

Items	Guaranteed value	Measurement value	Results
Efficiency (at 100% load)	-	99.37 %	<i>Good</i>
Efficiency (at 50% load)	99.43 %	99.47 %	
Voltage regulation at power factor 1.0	-	0.69 %	

Reference temperature : 55 °C at. 4800-480V

Items	Guaranteed value	Measurement value	Results
Efficiency (at 100% load)	-	99.40 %	<i>Good</i>
Efficiency (at 50% load)	-	99.49 %	
Voltage regulation at power factor 1.0	-	0.63 %	

9. Temperature rise test

(Type test)

Items	Guaranteed value	Measurement value	Results
Insulation oil	65 °C	57.9 °C	<i>Good</i>
H.V. windings	65 °C	59.6 °C	
L.V. windings	65 °C	58.8 °C	

10. Applied voltage test

Items	Test voltage(kV)	Duration(sec.)	Results
HV side	34	60	<i>Withstood</i>
LV side	10	60	

11. Induced voltage test

Supply	Test voltage(kV)	Duration(sec.)	Frequency(Hz)	Results
LV	0.96	40	180	<i>Withstood</i>

12. Lightning impulse test

	Test voltage(kV)	Test sequence	Results
HV Line	95	FW-FW	<i>Withstood</i>
HV Neutral	-	-	
LV Line	-	-	
LV Neutral	-	-	

13. Insulation power factor test

Reference temperature : 20 °C

Items	Test voltage (kV)	Measurement value	Results
H-G	10	0.46	<i>Good</i>
H-L	10	0.16	
L-G	3	0.50	

14. Oil leakage test

Test result : Passed

One transformer tank with other fittings and radiator were over pressured to normal pressure plus 0.50 kgf/cm² for 12 hours.

After this test, the completed transformer with accessories proved no leaks.

#97



HC Transformer & Switchgear

WINDING 13800 x 4800 DELTA VOLTS
 480 Y/277 VOLTS

PADMOUNTED TRANSFORMER
 65°C AVG. RISE 1000 KVA ONAN

THREE PHASE 60 HERTZ SERIAL NO. UP1000-2321

OIL IMMERSERD TRANSFORMER MFG. DATE 07.20.23

IMPEDANCE 5.78 % AT 1000 kVA

FULL WAVE IMPULSE TEST LEVEL : HV 95 kV, LV 30 kV

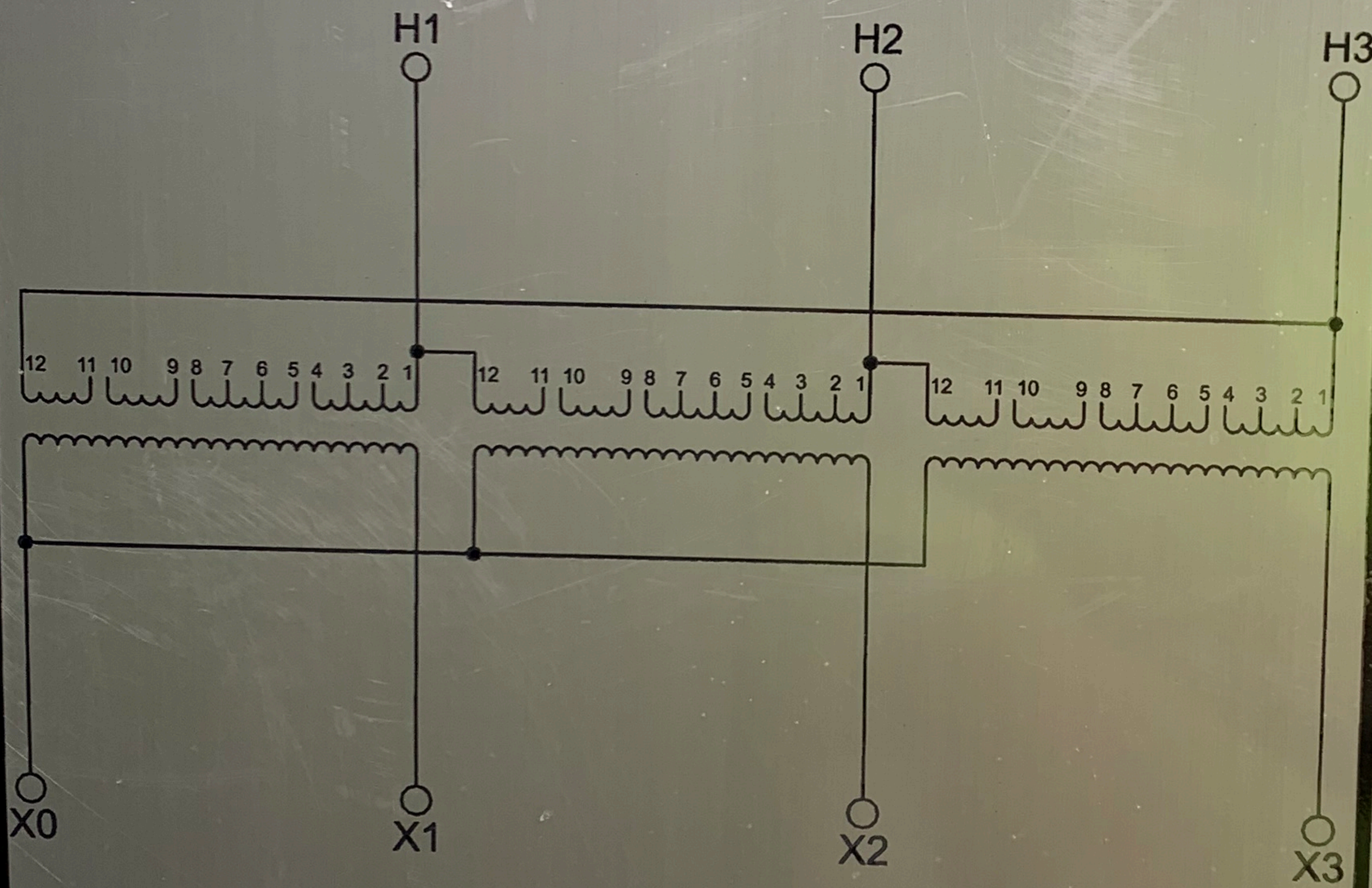
APPROXIMATE WEIGHT IN LBS :

CORE AND COIL	<u>5,600</u>	TANK AND FITTINGS	<u>3,005</u>	OIL	<u>3,190</u>	TOTAL	<u>11,795</u>
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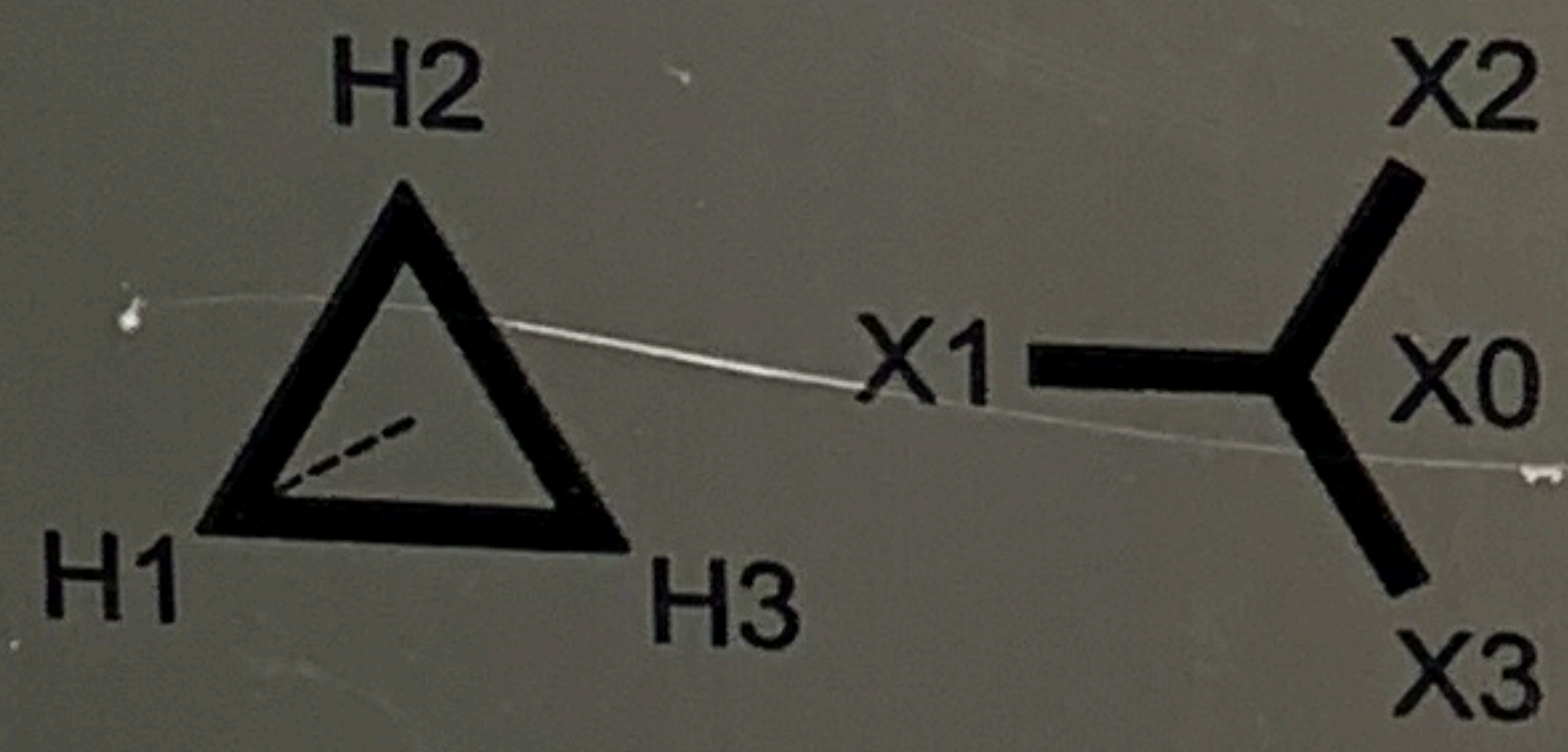
GALLONS OF INSULATION OIL :

TANK	<u>425</u>	RADIATOR	<u>15</u>	TOTAL	<u>440</u>
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DO NOT ATTEMPT TO HANDLE, INSTALL, USE OR SERVICE THIS TRANSFORMER BEFORE READING INSTRUCTION BOOK. TO DO SO MAY LEAD TO BODILY INJURY OR PROPERTY DAMAGE OR BOTH



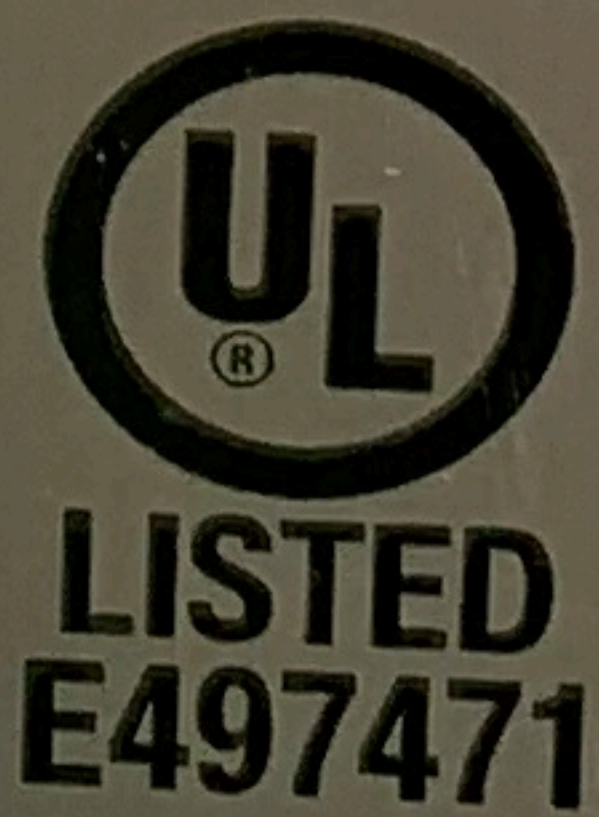
PHASOR DIAGAM :



WINDING	VOLTS	AMPS AT 1000kVA	TAP CHANGER		DUAL SWITCH	
			POS.	CONNECT	POS.	CONNECT
HV1 DELTA	14400	40.1	A	4-5	2	8-9 10-11
	13800	41.8	B	5-3		
	13200	43.7	C	3-6		
	12470	46.3	D	6-2		
	12000	48.1	E	2-7		
HV2 DELTA	4800	120.3	A	4-5	1	1-9-11 8-10-12
LV WYE	480	1202.8				

* NOTE
 .1TAP CHANGER ON 13800V ONLY

TRANSFORMER IS ONAN
 CONDUCTOR MATERIAL - HV WINDING AL, LV WINDING AL
 TRANSFORMER WILL BE FILLED WITH TYPE II MINERAL OIL CONTAINING LESS THAN 2 PPM PCB
 UNTANKING WEIGHT (HEAVIEST PIECE) 5,445 LBS
 THE 25 °C LIQUID LEVEL IS 10 INCHES BELOW TOP OF HIGHEST MANHOLE FLANGE
 LIQUID LEVEL CHANGES 0.4 INCHES FOR EACH 10 °C CHANGE IN AVERAGE LIQUID TEMPERATURE
 THIS TRANSFORMER TANK IS DESIGNED
 TO WITHSTAND COMPLETE VACUUM AND AN INTERNAL PRESSURE OF 7 PSI
 THE TRANSFORMER MUST NOT BE ENERGIZED FROM ANY VOLTAGE SOURCE
 WHEN DE-ENERGIZED TAP CHANGERS ARE OPERATED
 THE TRANSFORMER IS DESIGNED
 FOR OPERATION BETWEEN PRESSURE LIMITS OF 10 PSI POSITIVE AND 8 PSI NEGATIVE
 THE LV WINDING NEUTRAL MUST BE PERMANENTLY GROUNDED
 EITHER DIRECTLY OR THROUGH A LOW IMPEDANCE



2016DOE COMPLIANT
 MANUFACTURED BY IEN HANCHANG, SOUTH KOREA

UNIT 97



UNIT 97

DFSU6873736
OP1000-2324

WARNING
DANGER
HIGH VOLTAGE
ELECTRICITY
DO NOT TOUCH
OR OPEN
DO NOT REMOVE
COVER
OR LOCK





DUAL
VOLTAGE
SWITCH

TAP
CHANGER

H1

H2

H3

⏏



X0

X1

X2

X3

⊥

⊥