

TEST REPORT

Padmount Transformer

3 Phase 1000kVA 13800x4160D - 480y V

P.O. No. : DS21-211

Jul. 2023

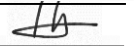


Tested by : Kang, Min-Jae



date : 2023-07-24

Checked by : Ha, Jae-gyeong



date : 2023-07-24

Approved by : Kim, Seung-Hwan



date : 2023-07-24

CONTENTS

Test Items	Sheet No.
1. Rating -----	003
2. Measurement of voltage ratio -----	003
3. Check of phase relationship -----	003
4. Measurement of winding resistance -----	004
5. Insulation Resistance Measurement -----	004
6. Measurement of no-load loss and current -----	004
7. Load losses and impedance voltage -----	005
8. Efficiency & Voltage regulation -----	005
9. Temperature rise test -----	006
10. Applied voltage test -----	006
11. Induced voltage test -----	006
12. Lightning impulse test -----	006
13. Insulation power factor test -----	006
14. Oil leakage test -----	006

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 4160 / 480	V	
8. Rated current	(High voltage / Low voltage)	:	41.8 x 138.8 / 1202.8	A	
9. Insulation level	(High voltage / Low voltage)	:	95 / 30	kV(BIL)	
10. Oil volume	:	440 GAL	11. Total weight	:	11800 lbs
12. Serial No.	:	OP1000-2325			
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	51.910	-0.10	51.905	-0.11	51.910	-0.10	<i>Good</i>
B	13800	-	480	49.796	49.766	-0.06	49.762	-0.07	49.764	-0.07	
C	13200	-	480	47.631	47.620	-0.02	47.616	-0.03	47.606	-0.05	
D	12470	-	480	44.997	45.042	0.10	45.038	0.09	45.044	0.10	
E	12000	-	480	43.301	43.326	0.06	43.324	0.05	43.326	0.06	

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(%)	
-	4160	-	480	15.011	15.012	0.01	15.012	0.01	15.015	0.03	<i>Good</i>

3. Check of phase relationship

Dyn1

Good

4. Measurement of winding resistance

DUAL Switch POS. 2

Ambient temperature : 28 °C

Tap No.	Tap Voltage	Measured value(Ω)					
		H1-H2		H2-H3		H3-H1	
		at 28°C	at 55°C	at 28°C	at 55°C	at 28°C	at 55°C
A	14400	0.790250	0.874585	0.791300	0.875747	0.787950	0.872040
B	13800	0.757650	0.838506	0.758850	0.839834	0.755450	0.836071
C	13200	0.723950	0.801209	0.725200	0.802593	0.721850	0.798885
D	12470	0.687150	0.760482	0.688350	0.761810	0.685150	0.758269
E	12000	0.660550	0.731043	0.661400	0.731984	0.658300	0.728553

DUAL Switch POS. 1

Ambient temperature : 28 °C

Tap No.	Tap Voltage	Measured value(Ω)					
		H1-H2		H2-H3		H3-H1	
		at 28°C	at 55°C	at 28°C	at 55°C	at 28°C	at 55°C
-	4160	0.088175	0.097585	0.088410	0.097845	0.088015	0.097408

Tap No.	Tap Voltage	Measured value(Ω)					
		x1-x2		x2-x3		x3-x1	
		at 28°C	at 55°C	at 28°C	at 55°C	at 28°C	at 55°C
-	480	0.00064350	0.00071217	0.00063455	0.00070227	0.00064500	0.00071383

5. Insulation Resistance Measurement

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

HV Winding to LV Winding	:	20900 M Ω
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HV Winding to Earth	:	22600 M Ω
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LV Winding to Earth	:	16700 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 : 28 °C

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

Items	Guaranteed value	Measurement value	Results
No-load loss (W)	-	1398	Good
No-load current (%)	-	0.24	

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	-	4935	<i>Good</i>
	B	13,800	-	4972	
	E	12,000	-	5297	

Reference temperature : 85 °C

Items	Tap No.	Voltage	Guaranteed	Measurement	Results
% Impedance (%)	A	14,400	-	5.73	<i>Good</i>
	B	13,800	5.75±7.5%	5.70	
	E	12,000	-	5.71	

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

Items	Tap No.	Voltage	Guaranteed	Measurement	Results
Load loss (W)	C	4,160	-	5924	<i>Good</i>

Reference temperature : 85 °C

Items	Tap No.	Voltage	Guaranteed	Measurement	Results
% Impedance (%)	C	4,160	-	6.69	<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)	-	99.27 %	<i>Good</i>
Efficiency (at 50% load)	-	99.43 %	
Voltage regulation at power factor 1.0	-	0.84 %	

9. Temperature rise test

(Type test)

Items	Guaranteed value	Measurement value	Results
Insulation oil	65 °C	59.7 °C	<i>Good</i>
H.V. windings	65 °C	59.8 °C	
L.V. windings	65 °C	57.7 °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	0.34	<i>Good</i>
H-L	10	0.30	
L-G	3	0.36	

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.



HC Transformer & Switchgear

#5

WINDING
13800 x 4160 DELTA VOLTS
480 Y/277 VOLTS

PADMOUNTED TRANSFORMER
65 °C AVG. RISE 1000kVA ONAN

THREE PHASE 60 HERTZ

SERIAL NO. OP1000-2325

OIL IMMERSED TRANSFORMER

MFG. DATE 07.2023

IMPEDANCE 5.70 % AT 1000 kVA

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

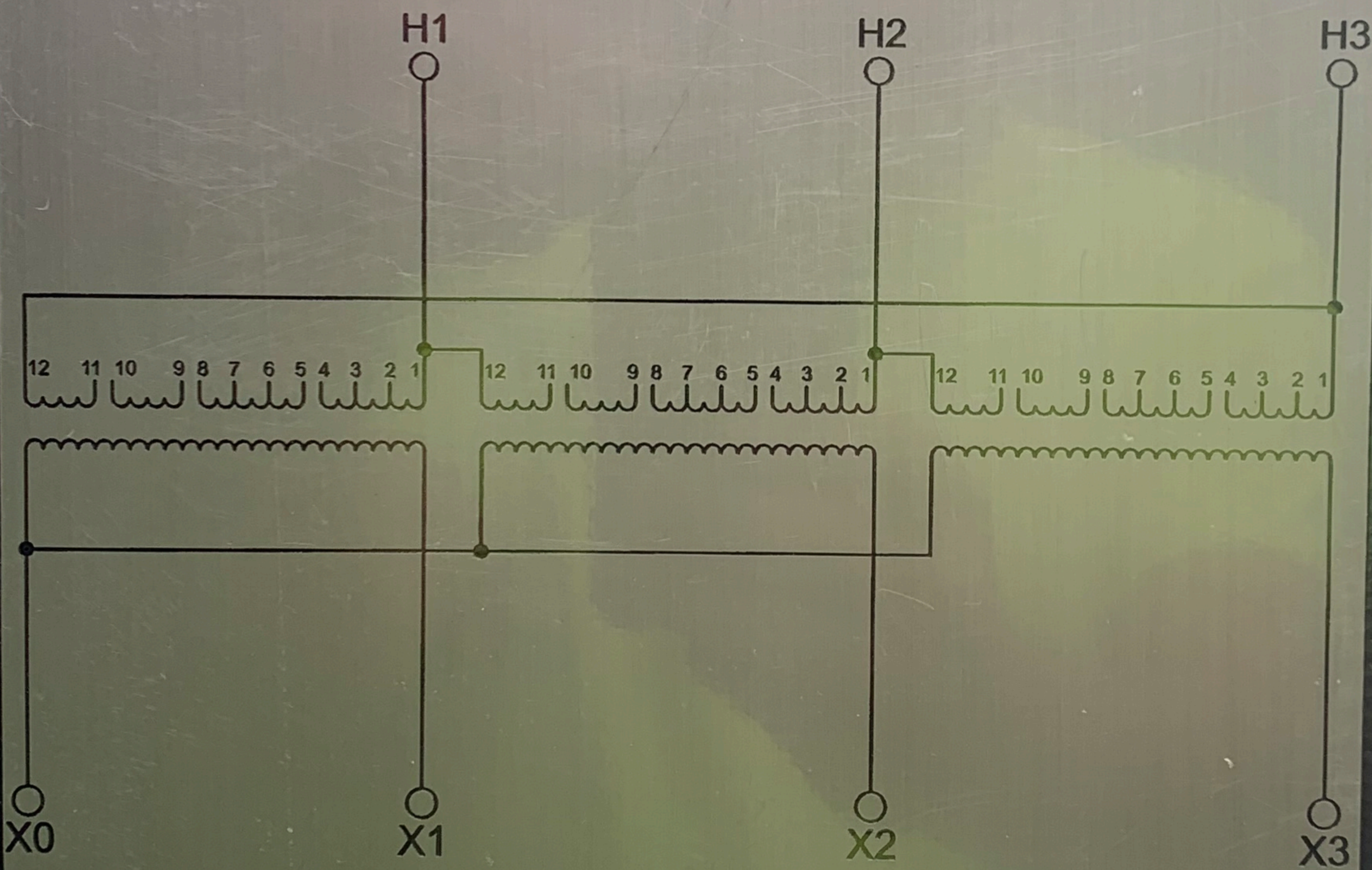
APPROXIMATE WEIGHT IN LBS :

CORE AND COIL	<u>5,580</u>	TANK AND FITTINGS	<u>3,025</u>	OIL	<u>3,195</u>	TOTAL	<u>11,800</u>
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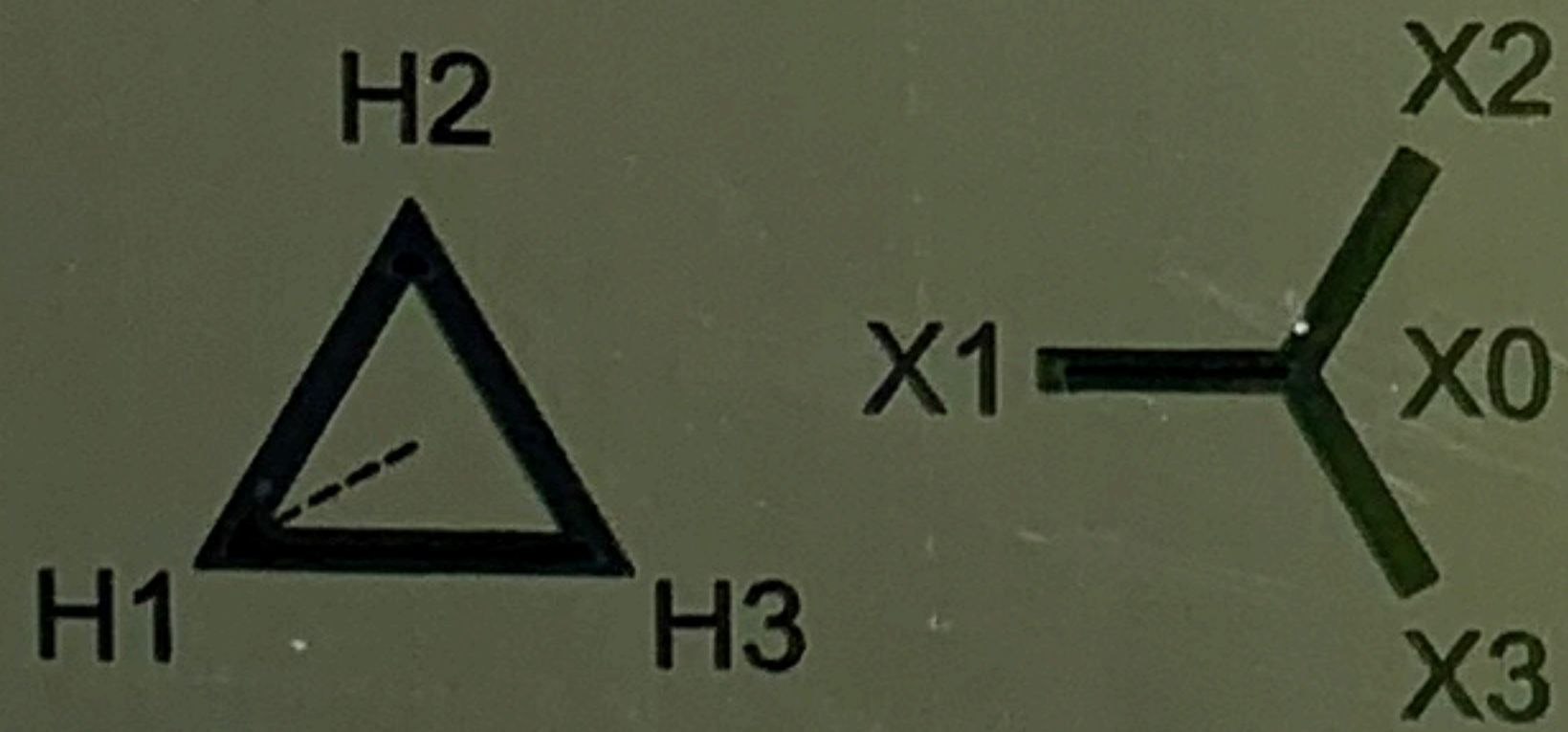
GALLONS OF INSULATION OIL :

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 DIAGRAM :



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	4160	138.8	D	6-2	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) 5,580 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.



LISTED
E497471

2016 DOE COMPLIANT
MANUFACTURED BY IEN HANCHANG, SOUTH KOREA

UNIT 5

WARNING
DANGER
HIGH VOLTAGE
ELECTRICITY
DO NOT TOUCH
OR OPEN





UNIT 5

JOHN W. MULLINS INC.
CONTRACTOR RIGGER

DUAL
VOLTAGE
SWITCH

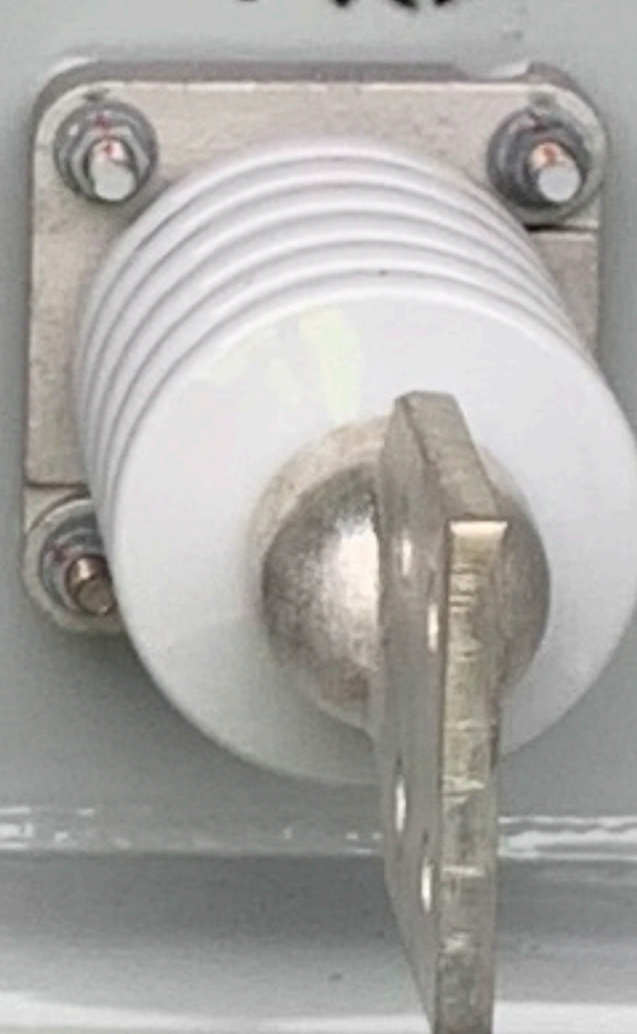
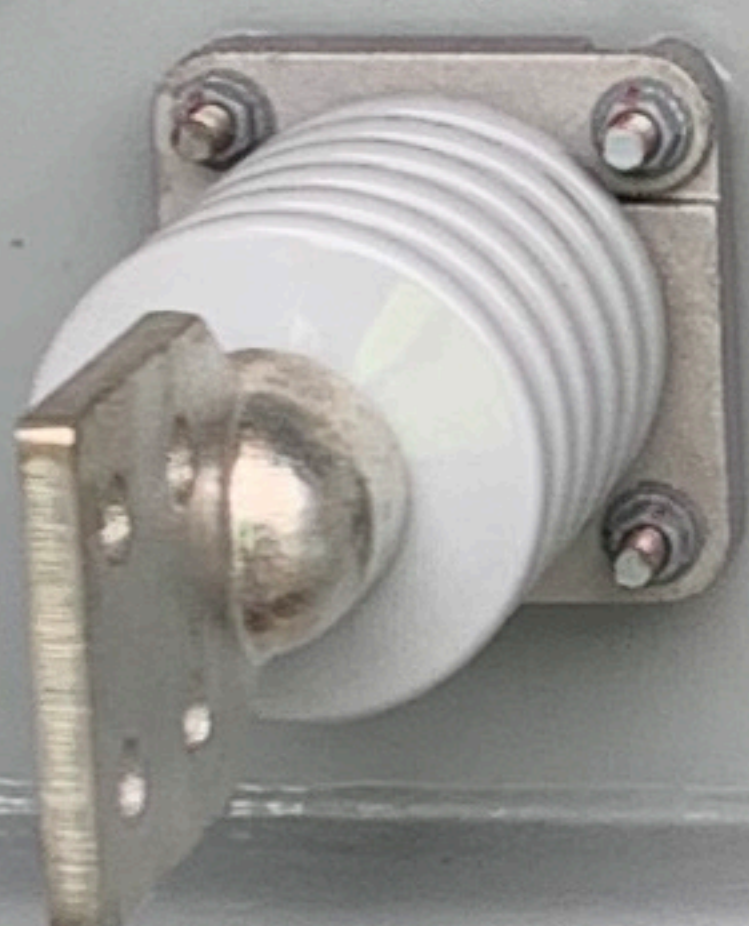
TAP
CHANGER



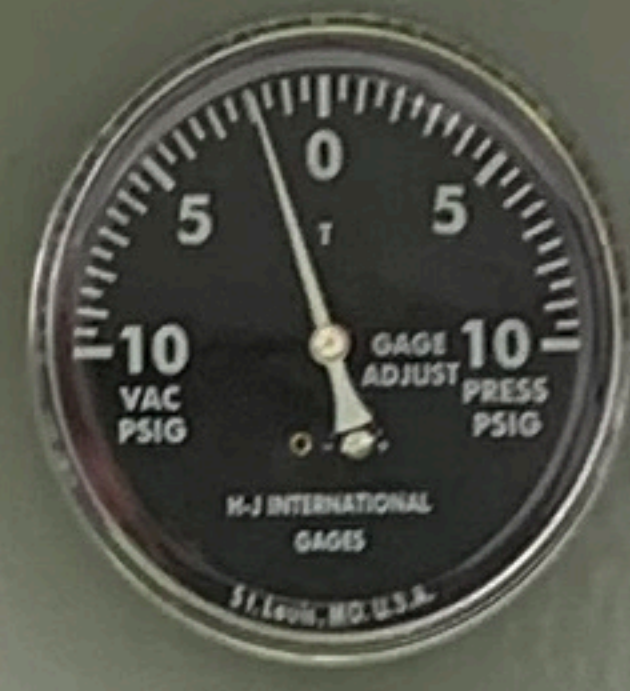
H1

H2

H3



2321



X0

X1

X2

X3

