

Summary for Sugg Parkway Substation Power Transformer with LTC

Design Configuration	3-phase, 2-winding, step-down	
Phase Rotation	DELTA - WYE (ungrounded)	
Frequency	30° lagging	
Capacity	60 Hz	
	ONAN/ONAF1/ONAF2	
	20.0/26.7/33.3//37.3 MVA 55C//65C	
	<i>Note: OFAF also accepted</i>	
Winding	HV	LV
Material	Copper	Copper
Nominal	115 kV	13.2Y/7.62 kV
BIL	550 kV	110 kV
Operating	115 kV	13.1Y/7.57 kV
Surge Arresters	HV	LV
Manufacturer	Ohio Brass, PVN with ESPTM silicone alloy weather shed polymer	
	76 kV MCOV	8.4 kV MCOV
Bushings	HV	LV
Type	Condenser / OIP	Solid-Bulk / Stud type
Continuous Current	600 Amps	2000 Amps
Nominal Voltage	115 kV	15 kV
BIL	550 kV	110 kV
Color	Light Gray	Light Gray
Manufacturer	ABB, Type O+C or equal	ABB, Type A or equal
Accessories	Connector, NEMA 4-hole, tinned plated	
Impedance	8.0 % @ 20 MVA of HV winding	
Tap Changers	None Required	
DETC		
OLTC		
Application	Wye-connected at Neutral End	
Adjustment	+/-10 %	
Steps	5/8 %	
Tap Range	16L-N-16R	
Operation	CFVV - Constant Flux Voltage Variation	
Mechanism	Reinhausen MR Type RMV-II-2000-15	
Control	Beckwith M-2001D 6SLAA, M-2270B panel	
Tap Indication	Beckwith M-2025D w/ Beckwith or Incon Sensors	
Paralleling	Beckwith M-0115A	
Sensor	Temperature Sensor	
Pressure Relief	Qualitrol XPRD Xtra Protection Relief Device, 8 psi	
Fault Pressure	Qualitrol Series 900-200, activate transformer lockout	
Environment		
Ambient Temp		
Min/Ave/Max	-20/30/40 °C	
Altitude	100 feet	

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Current Transformers															
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Accuracy	Winding Temperature & LDC														
Cooling System															
Rating	ONAN, ONAF1, ONAF2														
Radiators															
Design	Individually mounted with butterfly valves at each main port														
Accessories	Removable fill plug, top Bronze Ball Valve, bottom														
Fan and/or Pump															
Control	Automatic based on Winding Temperature														
Design	230 VAC, 1ph, 60 Hz														
Accessories	Guards, stainless steel Undervoltage relay for all phases														
Control															
System	Qualitrol 509-200. ITM 509-00043381:CS-41915														
Inputs	Ambient Temperature Main Tank, Liquid Temperature LTC Tank, Liquid Temperature Fan/Pump, Stage 1, Running Current Fan/Pump, Stage 2, Running Current Secondary Current (X2)														
Positive Pressure System															
Operating Range	Nitrogen System in weatherproof enclosure 0.5 - 5.0 psig														
Min. Alarm	0.0 psig														
Max. Alarm	5.5 psig														
Supply Min. Alarm	200 psig														
Sound Level															
<i>Lesser of the Latest edition of NEMA TR-1 or</i>															
Function	ONAN, ONAF1, ONAF2														
Level	75, 77, 78 dB(A)														
Core Ground															
Bushing and externally grounded Installed in an enclosure															

Summary for Sugg Parkway Substation Power Transformer with LTC

Case & Cover (continued)	
Grounding Bus	<p>1/4" x 4" copper ground bus to connect each diagonal corner grounding pad, XO bushing, and surge arresters</p> <p>Supported by 5 kV insulators</p> <p>XO bushing connected with 1600-ampere flexible jumper to NEMA 4-hole bushing terminal pad</p> <p>Grounding pads connected with 600-ampere flexible jumper to NEMA 2-hole grounding pad</p> <p>Grounding shall provide NEMA 4-hole at each lower end for bonding to ground grid</p>
Testing Reqmnts	<p>Winding Resistance</p> <p>Winding Insulation Resistance</p> <p>Core Insulation Resistance</p> <p>Ratio Tests all taps</p> <p>Polarity and Phase Rotation</p> <p>Insulation Power Factor</p> <p>Control Cooling Losses</p> <p>Single Phase Excitation</p> <p>No Load Losses and excitation at 100% & 110% before & after impulse tests</p> <p>Impedance and Load Losses at rated current & rated frequency</p> <p>Temperature Rise/Heat Run</p> <p>Sweep Frequency Response Analysis before & after impulse tests</p> <p>Dielectric Tests</p> <p style="padding-left: 40px;">Low frequency</p> <p style="padding-left: 40px;">Lightning Impulse</p> <p style="padding-left: 40px;">Partial Discharge</p> <p style="padding-left: 40px;">Induced-voltage</p> <p style="padding-left: 40px;">Applied voltage</p>
Accessories	
Fault Pressure	Qualitrol Series 900 or equal
FP target Relay	GE Type HAA
Lockout Relay	Electroswitch Type LOR with hand reset
Pressure Relief	Qualitrol XPRD, Xtra Protection Relief Device, 8 psi
Liquid Level	
Pressure Vacuum Gauge	
Pressure Vacuum Bleeder	
Gas-In-Oil Monitor	GE Hydran M2
Inputs	<p>Ambient Temp (4-20 mA)</p> <p>Liquid Temp (4-20 mA)</p>
Outputs	<p>High Gas (2 levels)</p> <p>High Moisture (2 levels)</p> <p>Failure Alarm</p>

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Evaluation		
Total Ownership Cost		Price + A*No Load Losses + B*Load Losses
No Load Losses Factor (A)		\$13,500 per kW
Load Losses Factor (B)		\$5,000 per kW
Shipping		FOB Pad Assemble & Field Test
Drawings		Approval via AutoCad 2000 As-Built via AutoCad 2000
Field Service		Supervise installation of Component Parts <u>Field Testing</u> Insulation Power Factor Sweep Frequency Response Analysis Core Insulation Resistance Ratio Tests (Main/LTC all taps & CTs all taps) Functional Testing of Alarms & Controls Oil Filling - Test for PCB & Moisture Content Oil Sample - Lab - Dissolved Gas Analysis & Moisture
Oil Standards		IEEE PC57.106 - Lastest edition
	Dielectric (ASTM D1816, 2mm gap)	52 kV
	Dissipation Factor (ASTM D924, 25°C)	0.01%
	Interfacial Tension (ASTM 971)	38 mN/m, min
	Color (ASTM D1500)	1.0 max
	Visual Examination (ASTM D1524)	bright and clear
	Neutralization Number (ASTM D974)	0.015 mg KOH/g, max
	Water Content (ASTM D1533)	10 mg/kg, max
	Oxidation Inhibitor (ASTM D2668, Type II)	> 0.08 % - 0.3%