

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
15.5	Pressure rise inside the tank due to oil expansion		Insert	
15.6	Diagraph design parameters: - Maximum diagraph stress at highest working pressure - Diagraph construction details - Type of diagraph material		Insert Insert Insert	
15.7	Corrosion protection of conservator		Insert	
15.8	Oil level indicators with alarm for minimum oil level	pcs.	2	
16	Operating conditions			
16.1	At the altitude (above sea level)	m	≤ 1000	
16.2	Maximum ambient temperature	°C	+ 45	
16.3	Average daily temperature	°C	+ 35	
16.4	Average annual temperature	°C	+ 30	
16.5	Minimum ambient temperature	°C	– 5	
16.6	Tertiary winding		Will be used	
16.7	Parallel operation		Yes	
	Overall compliance with the requirements (yes/no)			

* Guaranteed values subject to deduction from Contract Price

**These values are required for Foundation design & shipping purpose only. During detail design, these values may vary from Bid value due to attaining desired electrical output.

* Estimated values. Actual values shall be measured during execution of the contract and shall be included on the name plate.

2.3 132/33 kV 50/75 MVA ONAN/ONAF Power transformer

SN	Description		Unit	Minimum Requirement	Manufacturer's Data
1.1	Name of the Manufacturer			Insert	
1.2	Type/Model			Insert	
2.1	Continuous Rating-	ONAN	MVA	50	
		ONAF	MVA	75	
2.2	Voltage ratio at no-load HV/LV		kV	132/33	
3	Tap Changer				
3.1	HV Tap Changer (On load type)			On load vacuum type	

SN	Description	Unit	Minimum Requirement	Manufacturer's Data
	Tapping Range		+10% to -10%	
	Size of tapping step		1.25%	
	No. of steps		17	
4	Vector Group		Dyn1	
5	On-load voltage control equipment:			
	(A) Type.		Insert	
	(B) Manufacturer		MR, Germany/ABB SWEDEN/Equivalent	
	(C) Range	%	+10 to -10	
	(D) Size of steps	%	1.25	
	(E) Power frequency withstand test voltage (BS.4571) between :			
	first and last contacts of the selector switch		275	
	between any two adjacent contacts of the selector		275	
	between open diverter switch contacts		275	
	(F) Type test certificate, reference:		refer to test report submitted with tender	
6	Type of cooling		ONAN/ONAF	
7	Winding temperature rise at CMR under service conditions stated in schedule of technical requirement	°C	55	
8	Top oil temperature under service conditions stated in Schedule of Technical Requirement			
	(A) CMR	°C	50	
	(B) ONAN rating	°C	50	
	Maximum hot spot temperature rise in core at rated power	°C	73	
10	Maximum hot spot temperature rise in copper at rated power	°C	73	
11	Temperature gradient at rating specified	°C	25	
12	Flux density in iron at normal voltage and frequency and at normal ratio -(no load)			
	(A) Cores	Tesla	1.733	

SN	Description	Unit	Minimum Requirement	Manufacturer's Data
	(B) Yokes	Tesla	1.733	
	(C) Volts/turn	V	143	
13	Magnetizing current (approx) at nominal ratio and			
	at 0.9 x nominal voltage	%	0.1	
	at 1.0 x nominal voltage	%	0.2	
	at 1.1 x nominal voltage	%	0.6	
	at 1.2 x nominal voltage	%	1.74	
14	Harmonic component of magnetizing current at rated voltage as percentage of fundamental			
	(A) Fifth harmonic	%	<15%	
	(B) Seventh harmonic	%	<3%	
15*	No-load loss (excluding cooling plant losses) at rated voltage, ratio and frequency	kW	Insert	
16*	Copper loss (excluding cooling plant losses) at 75 °C and rated voltage, ratio (nominal tap), frequency & 120 MVA	kW	Insert	
17*	Auxiliary loss at 120MVA (Total power input to fans for operation of total insulated cooling capacity	kW	Insert	
18	Total loss at 75 °C and normal ratio and 120MVA (SI.No.15+16+17)	kW	Insert	
19	Regulation at 75 °C and normal ratio-			
	(A) At unity power factor %	%	0.3	
	(B) At 0.8 lagging power factor	%	8.12	
20	(i) Impedance voltage at 75 °C and CMR between HV & LV windings			
	(A) at extreme minus tap (17)	%	12.2	
	normal tap (9a,9b,9c)	%	12.5	
	extreme plus tap (1)	%	13.07	

SN	Description	Unit	Minimum Requirement	Manufacturer's Data
	(B) Maximum Impedance over tapping range	%	13.07	
	Corresponding tap			
	(C) Minimum Impedance over tapping range.	%	12.2	
	Corresponding tap		Insert	
	Impedance voltage 75 °C and CMR between HV & LV at normal tap.	%	12.5	
21	Equivalent circuit zero sequence impedance :			
	HV-LV	%	10.5	
22	Maximum current density in windings at C.M.R.			
	(A) HV winding	A/mm ²	3.0	
	(B) LV winding	A/mm ²	3.1	
	(C) SV winding	A/mm ²	N.A.	
23	Noise level	dB	<78	
24	Types of transformers (shell or core)		core type	
25	Core steel			
	(a) Type		Insert	
	(b) Grade		Grade A	
26	Types of winding-			
	(A) HV		Inner shield continuous type	
	(B) LV		Continuous type	
27	Insulation of			
	(a) HV windings		Insulation paper (thermally upgraded)	
	(b) LV windings		Insulation paper (thermally upgraded)	
28	Insulation of			
	(A) Yoke bolts		Insulation paper (thermally upgraded)	
	(B) Side plates		Insulation paper (thermally upgraded)	
29	Safe working temperature of core plate insulation	°C	105	
30	winding connections brazed or crimped		crimped	
31	For fault with zero impedance external to the transformer and infinite system			

SN	Description	Unit	Minimum Requirement	Manufacturer's Data
	(a) Maximum axial force	kN	225	
	(b) Maximum tensile stress in winding	kN/m ²	HV: 65.6 LV: 44.3	
32	Is facility provided for adjustment of axial pressure on windings	Yes/No	Yes	
33	Thickness of transformer tank			
	(A) Sides	mm	8	
	(B) Bottom	mm	12	
34	Material used for gaskets for oil-tight joints		Rubber	
	Radiators, Valves, Fans			
35	Thickness of radiator plates	mm	1.2	
36	Valve type/material :			
	(A) 100mm and below		Φ80, Φ50, Φ25, copper	
	(B) Above 100mm		N.A.	
37	Equipment for ONAF + cooling state-		Radiators on the main tank	
38	Number of coolers/radiators or cooler banks per transformer			
39	Number of air blowers per transformer			
40	Speed of air blowers	rpm		
41	Rating of each air blower motor	kW	0.5	
42	Starting current of each air blower motor	A	1.35	
	Oil Volumes and Weights			
43	Total oil required including cooler system	litres	Insert	
44	Volume of oil to fill transformer to above the top yoke	litres	Insert	
45	Total volume of conservator	litres	Insert	
46	Weight of active copper	tonnes	Insert	
47	Weight of active iron in core	tonnes	Insert	
48	Weight of core and winding assembly	tonnes	Insert	
49	Weight of each cooler bank complete with oil if mounted separately from transformer	tonnes	Insert	
50	Total weights of complete transformers, including attached coolers, voltage regulating equipment, all fittings and oil	tonnes	Insert	
51	Weight of transformer arranged for transport	tonnes	(with oil filled)	
52	Manufacture, type and class of oil to IEC 296		Keramay 25#, A class	

SN	Description	Unit	Minimum Requirement	Manufacturer's Data
53	Transformer Parts Subject To Short-Circuit Test			
	Breif description of transformer or parts thereof subjected to short-circuit test		refer to test report submitted with tender	
	Transformer Bushing Insulators			
54	Maker		132KV: Insert 33KV: Insert	
55	Insulator material (solid, oil-paper etc)		132KV: RIP 33KV: solid	
56	Maker's type reference and rated voltage		132KV: Insert 33KV: Insert	
57	Rated current	Amp	132KV: 1250A 33KV: 2000A	
58	BCT particulars			
	i) HV Side: 132KV			
	Core 1,2:		Core 1,2 : 400/1A, 5P20, 30VA	
	Core 3:		Core 3: 400/5A, 0.5, 15VA (matched with WTI meter at phase B)	
	ii) LV Side: 33KV			
	Core 1,2:		Core 1: 1600/1A, 5P20, 30VA	
			Core 2: 1600/1A, 5P20, 30VA	
	Core 3:		Core 3: 1600/5A, 0.5, 15VA (matched with WTI) at phase b Core 3:1600/5A 0.5, 15VA for AVR (at phase c)	
	iii) Neutral:			
	Core 1:		1600/1A, 5P20, 30VA	
	Core 2:		1600/1A, 5P20, 30VA	
59	Manufacture of porcelain		132KV: Insert 33KV: Insert	

SN	Description	Unit	Minimum Requirement	Manufacturer's Data
60	Length of insulator (overall)	mm	132KV: Insert 33KV: Insert	
61	Weight of insulator	Kg	132KV: Insert 33KV: Insert	
62	Electrostatic capacity of complete bushings	pF	132KV: 250—350pF 33KV: N.A.	
63	Dry lightning impulse voltage withstand (1.2/50wave)	KV	132KV: 750kV 33KV: 200kV	
64	50Hz wet withstand voltage without arcing horns	KV	132KV: 355kV 33KV: 95kV	
65	Total creepage distance of outdoor shedding	mm	132KV: 5075 mm 33KV: 1256mm	
66	Protected creepage distance of shedding	mm	132KV: 1450mm 33KV: 485mm	