

33/0.415kV AUXILIARY TRANSFORMER		UNIT	DATA	
ITEM	DESCRIPTION		ITEM	DESCRIPTION
1	System performance data			
1.1	Nominal power rating at site conditions	KVA	200 (Malindi SS and 132/33kV New Kilifi)	
1.2	Nominal service voltage	kVrms	33/0.415kV	
1.3	Max. system voltage	kVrms	36	
1.4	System earthing		Solid	
1.5	Rated frequency	Hz	50	
1.6	3-Phase short circuit			
1.6.1	Rated value	kArms	25	
1.6.2	Dynamic value	kApeak	63	
1.7	Max radio interference level measured at 1.1 rated system voltage at 1 MHz	microV	By Manufacturer	
1.8	Station service aux. AC supply			
1.8.1	Rated voltage	V	415/240	
1.8.2	Voltage variation	%	±10%	
1.8.3	Phase		3 (4 wires)	
1.8.4	Frequency	Hz	50	
1.8.5	Neutral earthing		Solid	
1.9	Station service aux. DC supply			
1.9.1	Rated voltage	V	110	
2	Auxiliary transformer specifications			
2.1	Number of transformers		2	
2.2	Manufacturer, type designation and country		Should be Filled By Tenderer	
2.3	Type			
2.3.1	Indoor/Outdoor		Outdoor	
2.3.2	Stationary/Mobile		Stationary	
2.4	Rated capacity of secondary winding at site conditions	kVA	200 (Malindi SS)	
2.5	Type of cooling		ONAN	
2.6	Vector group		Dyn11/ Dyn11	
2.7	Impedance voltage between HV and LV windings at 75 °C	%	4.5	
2.8	Rated voltage of windings	kVrms	33	
2.9	Highest system voltages	kVrms	36	
2.10	Rated frequency	Hz	50	
2.11	Insulation levels			

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2.11.1	Windings (HV/LV)			
2.11.1.1	Rated voltage	kVrms	33/0.415	
2.11.1.2	Highest voltage for equipment	kVrms	36/1	
2.11.1.3	Rated one min. power frequency withstand voltage	kVrms	70/3	
2.11.1.4	Rated lightning impulse withstand voltage	kVpeak	170/N.A	
2.11.2	Bushings (HV/LV)			
2.11.2.1	Rated voltage	kVrms	33/0.415	
2.11.2.2	Highest voltage for equipment	kVrms	36/1	
2.11.2.3	Rated one min. power frequency withstand voltage	kVrms	140/10	
2.11.2.4	Rated lightning impulse withstand voltage	kVpeak	325/20	
2.12	Tap changer			
2.12.1	Whether manual off circuit tap changer is required	Yes/No	Yes	
2.12.2	Type (Onload - Off load)		Off load	
2.12.3	Manufacturer & country			
2.12.4	Total range(number of steps)		±2*2.5%	
2.12.5	Location		HV-N	
2.12.6	Rated current	A	5 (Min)	
2.13	Losses			
2.13.1	No load losses at 75 °C, rated frequency and rated voltage on principal tapping	kW	Max. 0.65	
2.13.2	Load losses at rated frequency, 75°C And rated current on principal tapping	kW	Max. 3.0	
2.13.3	Evaluation rate of no load loss at Tendering stage	\$/kW	9000	
2.13.4	Evaluation rate of load loss & cooling loss at Tendering stage	\$/kW	4000	
2.14	Exciting current			
2.14.1	At rated voltage	A	By manufacturer	
2.14.2	At 110% rated voltage	A	By manufacturer	

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2.15	Temperature rise (corrected for altitude, ambient condition and IEC 60076-2)			
2.15.1	Top oil	°C	57	
2.15.2	Winding	°C	62	
2.15.3	Hot Spot	°C	75	
2.16	Max. sound level (acc. to IEC 60076-10)	dB	50	
2.17	Vacuum withstand capacity of total transformer	mmHg	Acc. To Technical Specification	
2.19	Core and winding data			
2.19.1	Manufacturer of steel core material			
2.19.2	Type of steel core lamination		By manufacturer	
2.19.3	Flux density of core			
2.19.3.1	At rated voltage	Wb/m2	1.727	
2.19.3.2	As above at 110% rated voltage	Wb/m2	1.9	
2.19.4	Thickness of steel core lamination	mm	≤0.3	
2.19.5	Main limb/yoke cross section	cm2	By manufacturer	
2.19.6	Current density at rated power and voltage			
2.19.6.1	HV winding	A/mm2	By manufacturer	
2.19.6.2	LV winding	A/mm2	By manufacturer	
2.19.7	Current density at rated short circuit current			
2.19.7.1	HV winding	A/mm2	By manufacturer	
2.19.7.2	LV winding	A/mm2	By manufacturer	
2.20	Thickness of transformer plates			
2.20.1	Tank	mm	By manufacturer	
2.20.2	Sides	mm	By manufacturer	
2.20.3	Bottom	mm	By manufacturer	
2.20.4	Radiator plates	mm	By manufacturer	
2.21	Bushings (HV/LV)			
2.21.1	Manufacturer & country			
2.21.2	External creepage distance	mm	min (1116)	
2.21.3	Protected creepage distance	mm	By manufacturer	
2.21.4	Rated normal	A	5420	

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2.21.5	Short circuit current (HV)	kA	25	
2.21.6	Test tap required	Yes/No	No	
2.21.7	Rated normal/short circuit current for neutral	(A/kA)		
2.21.4	Bushing type current transformers (Required)	Yes/No	Yes	
2.21.4.1	No of cores (HV,HVN,LV,LVN)		According to SLD	
2.21.4.2	Specifications		According to SLD	
2.22	Type of terminals			
2.22.1	HV		Air bushing	
2.22.2	LV		Cable Box	
2.22.3	HV-N		Air bushing	
2.22.4	LV-N		Cable Box	
2.22.5	Filling medium for cable box		Air	
2.23	Overall Dimensions (H*W*L)	mm*mm*mm		
2.24	Weights			
2.24.1	Core and coils	kg	By manufacturer	
2.24.2	Tank and fittings	kg	By manufacturer	
2.24.3	Weight of oil	kg	By manufacturer	
2.24.4	Total Weight of complete transformer	kg	By manufacturer	
2.25	Regulation at full load and 75°C winding temperature			
2.25.1	a) Unity Power Factor		By manufacturer	
2.25.2	b) 0.8 PF lag		By manufacturer	
2.26	Efficiency (at P.F.=1 )			
2.26.1	At full load	%	By manufacturer	
2.26.2	At 3/4 full load	%	By manufacturer	
2.26.3	At 1/2 full load	%	By manufacturer	
2.26.3	Max. and the load at which it occurs	%	By manufacturer	
2.27	Oil			
2.27.1	Manufacture			
2.27.2	Country of manufacture			
2.27.3	Naphthenic or Paraphenic based oil		Naphthenic	
2.27.4	Type – inhibited/ trace inhibited/ non-inhibited		non-inhibited	
2.27.5	Details of inhibitor			
2.27.6	Details of passivators			

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2.27.7	Viscosity at 40 °C (Acc. to ISO 3104)	mm <sup>2</sup> /s	Max. 12	
2.27.8	Viscosity at -30 °C (Acc. to ISO 3104)	mm <sup>2</sup> /s	Max. 1800	
2.27.9	Pour point (Acc. To ISO 3016)	°C	Max. -40	
2.27.10	Water content (Acc. To IEC 60814)	mg/kg	Max. 40	
2.27.11	Breakdown voltage (Acc. To IEC 60156)			
2.27.11.1	As delivered	kV	Min. 30	
2.27.11.2	After laboratory treatment	kV	Min. 70	
2.27.12	Density at 20 °C (Acc. To ISO3675 or ISO12185)	g/ml	Max. 0.895	
2.27.13	DDF at 90 °C (Acc. To IEC 60247 / IEC 61620)		Max. 0.005	
2.27.14	Appearance		Clear, free from sediment and suspended matter	
2.27.15	Acidity (Acc. To IEC 62021-1 / IEC 62021-2)	mg KOH/g	Max. 0.01	
2.27.16	Interfacial tension (Acc. To EN 14210/ASTM D971)	mN/m	Min. 40	
2.27.17	Total Sulphur content (Acc. To IP 373 / ISO 14596)	%	Max. 0.05	
2.27.18	Corrosive Sulphur (Acc. To DIN 51353)		Not corrosive	
2.27.19	Copper Corrosion (Acc. To IEC 62535)		Not corrosive	
2.27.20	Potentially corrosive Sulphur (Acc. To IEC 62535)		Not corrosive	
2.27.21	DBDS (Acc. To IEC 62697-1)	mg/kg	Not detectable ( <5 )	
2.27.22	Inhibitors of IEC 60666 (Acc. To IEC 60666)	%	(U) uninhibited oil (Max. 0.01)	
2.27.23	Metal passivator additives of IEC 60666	mg/kg	Max. 5	
2.27.24	2-Furfural and related compounds content (Acc. To IEC 61198)	mg/kg	Max. 0.05 (for each individual compound)	

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2.27.25	Oxidation stability (Acc. To IEC 61125:1992 (Method C))			
2.27.25.1	Test duration (for uninhibited oil)	h	164	
2.27.25.2	Total acidity (Acc. To 1.9.4 of IEC 61125:1992)	mg KOH/g	Max. 1.2	
2.27.25.3	Sludge (Acc. To 1.9.1 of IEC 61125:1992)	%	Max. 0.8	
2.27.25.4	DDF at 90 °C (Acc. To 1.9.6 of IEC 61125, Amendment 1 (2004) +IEC 60247)		Max. 0.5	
2.27.26	Flash point (Acc. To ISO 2719)	°C	Min. 135	
2.27.27	PCA content (Acc. To IP 346)	%	Max. 3	
2.27.28	PCB content (Acc. To IEC 61619)	mg/kg	Not detectable (Max. 2)	
2.27.29	Quantity of oil			
2.27.29.1	Main tank	Liters		
2.27.29.2	Conservator	Liters		
2.27.29.3	Radiator	Liters		
2.27.31	Total oil required for commissioning	Liters		
2.27.32	Total oil provided (including 5% extra)	Liters		
2.27.33	Way of shipping		By drums	
2.27.34	Total number of drums provided			
2.28	Accessories make, type and country			
2.28.1	Buchholz relay		Yes	
2.28.2	Pressure relief device		Yes	
2.28.3	Silicagel breather		Yes	
2.28.4	Control Cabinet		Yes	
2.28.5	Cables		Yes	
2.28.6	Oil level gauge		Yes	
2.8.7	Winding temperature indicator		Yes	
2.28.8	Oil temperature indicator		Yes	
2.29	Whether wheels are required	Yes/No	No	
2.30	Whether switch-fuse unit is required	Yes/No	No	

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ITEM	DESCRIPTION		ITEM	DESCRIPTION
2.31	Type of conservator (Air bag/ Conventional )		Conventional	
2.32	Max. vibration (at rated condition) P-P	Micron	50	