Schedule D: Schedules of Technical Data (STD)

Schedule of Technical Data (STD) for 132 KV AIS

Schedule of Technical Data (STD) for 132 KV AIS

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
1.	**CURRENT TRANSFORMER FOR MAIN TRANSFORMER HV NEUTRAL POINT**			
1.1	**General Data**			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type		Oil-insulated, hermetically sealed, post type	
	Standards		IEC 61869-1&2	
	Installation		outdoor	
1.2	**Rated Characteristics**			
	Highest voltage for equipment	kV	72.5	
	Rated frequency	Hz	50	
	Rated power frequency withstand voltage (r.m.s. value), AC (50 Hz, 1 min)	kV	140	
	Rated lightning impulse withstand voltage (peak value), LI (1.2/50 μs)	kV	325	
	Rated short-time (3 s) thermal current (I_{th})	kA	40	
	Rated dynamic current (I_{dyn})	kA	100	
	Rated continuous thermal current	%In	120	
	Rated characteristics of CTs cores		AS SCH A	
1.3	**Design and Construction**			
	Insulator material		Porcelain	
	Insulating material		Oil – paper	
	Minimum creepage distance to earth	mm		
	Permissible partial discharges levels:			
	- PD test voltage: U_m	pC	≤ 10	
	- PD test voltage: $1.2\times U_m/\sqrt{3}$	pC	≤ 5	
	Winding conductor		Copper	
	Secondary terminals enclosure minimum degree of mechanical protection		IP55	

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	HV terminals:			
	- shape			
	- dimension	mm×mm		
	- number of holes	pcs		
	- dimensions of holes	mm		
	- distance between holes	mm		
	- material suitable to		Al connector	
	Earthing terminal:			
	- shape			
	- dimension	mm×mm		
	- number of holes	pcs		
	- dimensions of holes	mm		
	- distance between holes	mm		
	- material suitable to		copper	
	Terminal for tgδ measurement		Yes	
	Oil sampling valve		Yes	
	Weights and dimensions:			
	- total weight	kg		
	- total height	mm		
2	**CURRENT TRANSFORMER FOR MAIN TRANSFORMER LV ARTIFICIAL NEUTRAL POINT 33kv**			
2.1	**General Data**			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type		Oil-insulated, hermetically sealed, post type	
	Standards		IEC 61869-1&2	
	Installation		outdoor	
2.2	**Rated Characteristics**			
	Highest voltage for equipment	kV	36	

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Rated frequency	Hz	50	
	Rated power frequency withstand voltage (r.m.s. value), AC (50 Hz, 1 min)	kV	70	
	Rated lightning impulse withstand voltage (peak value), LI (1,2/50 μs)	kV	170	
	Rated short-time (3 s) thermal current	kA	40	
	Rated dynamic current	kA	100	
	Rated continuous thermal current	%In	120	
	Rated characteristics of CTs cores		AS SCH A	
2.3	**Design Characteristics**			
	Insulator material		Porcelain	
	Insulating material		Oil – paper	
	Minimum creepage distance to earth	mm		
	Permissible partial discharges levels:			
	- PD test voltage: U_m	pC		
	- PD test voltage: $1.2\times U_m/\sqrt{3}$	pC		
	Winding conductor		Copper	
	Secondary terminals enclosure minimum degree of mechanical protection		IP55	
	HV terminals:			
	- shape			
	- dimension	mm×mm		
	- number of holes	pcs		
	- dimensions of holes	mm		
	- distance between holes	mm		
	- material suitable to		Al connector	
	Earthing terminal:			
	- shape			
	- dimension	mm×mm		
	- number of holes	pcs		
	- dimensions of holes	mm		

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	- distance between holes	mm		
	- material suitable to		copper	
	Oil sampling valve		Yes	
	Weights and dimensions:			
	- total weight	kg		
	- total height	mm		
3.	**132 KV CAPACITIVE VOLTAGE TRANSFORMER**			
3.1	**General Data**			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type		Oil-insulated, hermetically sealed, capacitive type	
	Standards		IEC 61869-1&5	
	Installation		outdoor	
	System earthing		Solidly earthed neutral	
3.2	**Site Conditions**			
	Altitude above sea level	m		
	Minimum ambient temperature	°C	-10	
	Maximum ambient temperature	°C	45	
	Daily average temperature	°C	38	
3.3	**Rated Characteristics**			
	Highest voltage for equipment	kV	145	
	Rated network operating voltage	kV	132	
	Rated frequency	Hz	50	
	Rated power frequency withstand voltage (r.m.s. value), AC (50 Hz, 1 min)	kV	275	
	Rated lightning impulse withstand voltage (peak value), LI (1.2/50 μs)	kV	650	
	Rated power frequency withstand voltage (r.m.s. value), AC (50 Hz, 1 min) for second windings	kV	3	

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Rated capacity	pF		
	Rated voltage factor/Rated time	p.u. / s	1.5 / 30 1.2 / continuous	
	Static withstand terminal load	N		
	Rated characteristics of VTs for Feeder (OHTL) Bay		AS SCH A	
	Rated characteristics of VTs for Bus Section Bay		AS SCH A	
	Rated characteristics of VTs for GT Bay		AS SCH A	
3.4	**Design and Construction**			
	Insulator material		Porcelain	
	Insulating material		Oil – paper	
	Minimum creepage distance to earth	mm		
	Permissible partial discharges levels:			
	- PD test voltage: U_m	pC	≤ 10	
	- PD test voltage: $1.2 \times U_m/\sqrt{3}$	pC	≤ 5	
	Winding conductor		Copper	
	Secondary terminals enclosure minimum degree of mechanical protection		IP55	
	HV terminals:			
	- shape			
	- dimension	mm×mm		
	- number of holes	pcs		
	- dimensions of holes	mm		
	- distance between holes	mm		
	- material suitable to		Al connector	
	Earthing terminal:			
	- shape			
	- dimension	mm×mm		
	- number of holes	pcs		

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	- dimensions of holes	mm		
	- distance between holes	mm		
	- material suitable to		copper	
	Terminal for tgδ measurement		Yes	
	Oil sampling valve		Yes	
	Weights and dimensions:			
	- total weight	kg		
	- total height	mm		
4.	**SURGE ARRESTER**			
4.1	**General Data**			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type		Metal oxide, gapless	
	Standards		IEC 60099-4	
	Installation		outdoor	
	System earthing		Solidly earthed neutral	
4.2	**Site Conditions**			
	Altitude above sea level	m		
	Minimum ambient temperature	°C	-10	
	Maximum ambient temperature	°C	45	
	Daily average temperature	°C	38	
4.3	**Rated Characteristics**			
	Highest voltage for equipment	kV	145	
	Rated network operating voltage	kV	132	
	Rated frequency	Hz	50	
	Rated power frequency withstand voltage (r.m.s. value), AC (50 Hz, 1 min)	kV	275	
	Rated lightning impulse withstand voltage (peak value), LI (1.2/50 μs)	kV	650	
	Rated voltage of surge arrester (Ur)	kV	≥ 120	

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Rated continuous operating voltage (Uc)	kV		
	Rated discharge current (8/20 μs)	kA	10	
	High current impulse (4/10 μs)	kA		
	Long duration impulse current (2 ms)	kA		
	Line discharge class (IEC 60099-4)		3	
	Surge arrester short-circuit/pressure relief capability	kA	63	
	Maximum residual voltages at:			
	- 10 kA, 1/2 μs	kV		
	- 5 kA, 8/20 μs	kV		
	- 10 kA, 8/20 μs	kV		
	- 20 kA, 8/20 μs	kV		
	- 40 kA, 8/20 μs	kV		
	- 0.5 kA, 30/60 μs	kV		
	- 1 kA, 30/60 μs	kV		
	- 2 kA, 30/60 μs	kV		
	Temporary overvoltage for 1 s	kV		
	Temporary overvoltage for 10 s	kV		
	Overvoltage factor		Acc. To IEC	
	Energy dissipation capacity	kJ/kV		
4.4	**Design and Construction**			
	Insulator material		Porcelain	
	Minimum creepage distance to earth	mm		
	Number of units			
	Specified long-term load (SLL)	N		
	Specified short-term load (SSL)	N		
	Mean breaking load (MBL)	N		
	Accessories:			
	- grading ring		Yes	
	- earth terminal		Yes	
	- insulating bases		Yes	
	- discharge counter with leakage current meter		Yes	
	HV terminals:			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	- shape			
	- dimension	mm×mm		
	- number of holes	pcs		
	- dimensions of holes	mm		
	- distance between holes	mm		
	- material suitable to		Al connector	
	Weights and dimensions:			
	- weight	kg		
	- height	mm		
	- arrester diameter	mm		
	- grading ring diameter	mm		
5.	**TENSION AND SUSPENSION INSULATORS**			
5.1	**General Data**			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type		Composite type	
	Standards		IEC 61109 IEC 60120 IEC 60372	
	Installation		Outdoor	
5.2	**Site Conditions**			
	Altitude above sea level	m		
	Minimum ambient temperature	°C	-10	
	Maximum ambient temperature	°C	45	
	Daily average temperature	°C	38	
5.3	**Rated Characteristics**			
	Highest voltage for equipment	kV	145	
	Rated network operating voltage	kV	132	
	Rated frequency	Hz	50	
	Rated power frequency withstand voltage (r.m.s. value), AC (50 Hz, 1 min)	kV	275	

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Rated lightning impulse withstand voltage (peak value), LI (1.2/50 μs)	kV	650	
	Breaking load of complete string	N		
5.4	**Design and Construction**			
	Insulator material		Composite	
	Colour of insulator			
	Minimum creepage distance of complete string	mm		
	Minimum creepage distance of cap and pin insulator	mm		
	Number of insulators per string	pcs		
	Fitting's material			
	Arcing horns or rings material			
	Overall length of string	mm		
	Mass of complete string together with all fittings	kg		
6.	**TACSR CONDUCTOR**			
6.1	**General Data**			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type			
	Standards		IEC 61089 BS EN 50182 IEC 60888 BS EN 50189 IEC 60889	
	Installation		Outdoor	
6.2	**Site Conditions**			
	Altitude above sea level	m		
	Minimum ambient temperature	°C	-10	
	Maximum ambient temperature	°C	45	
	Daily average temperature	°C	38	
6.3	**Rated Characteristics, Design and Construction**			
	Rated cross-sectional area	mm^2		

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Total cross-sectional area	mm^2		
	Overall diameter	mm		
	Number of wires:			
	- Aluminium	pcs		
	- Steel	pcs		
	Wire diameter:			
	- Aluminium	mm		
	- Steel	mm		
	Rated current (ambient temperature +45 ºC)	A		
	Resistance at 20 °C	Ω/km		
	Total weight	kg/km		
	Modulus of elasticity	N/m^2		
	Coefficient of linear expansion	1/°C		
	Ultimate tensile strength	daN/m^2		
7.	**OVERHEAD SHIELD CONDUCTOR**			
7.1	**General Data**			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type			
	Standards		IEC 61089	
	Installation		Outdoor	
7.2	**Site Conditions**			
	Altitude above sea level	m		
	Minimum ambient temperature	°C	-10	
	Maximum ambient temperature	°C	45	
	Daily average temperature	°C	38	
7.3	**Rated Characteristics, Design and Construction**			
	Rated cross-sectional area	mm^2		
	Total cross-sectional area	mm^2		
	Overall diameter	mm		

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Number of steel wires	pcs		
	Steel wire diameter	mm		
	Resistance at 20 °C	Ω/km		
	Total weight	kg/km		
	Modulus of elasticity	N/m²		
	Coefficient of linear expansion	1/°C		
	Ultimate tensile strength	daN/mm²		
8.	**CONNECTORS**			
8.1	**General Data**			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Standards		IEC 61284	
	Installation		Outdoor	
8.2	**Site Conditions**			
	Altitude above sea level	m		
	Minimum ambient temperature	°C	-10	
	Maximum ambient temperature	°C	45	
	Daily average temperature	°C	38	
8.3	**Rated Characteristics, Design and Construction**			
	Sizes of conductors:			
	- tubular	mm		
	- TACSR	mm		
	Rated current	A	Same as for conductors at same temperature rise	
	Rated short-time (3 s) withstand current	kA	40	
	Material of connectors		Aluminium/Bi-metal where necessary	
	Connectors type (non-limitative)			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
9	**Steel structure and quality of material**			
	General Data			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type			
	Standards			
	Maximum ratio of unsupported length of steel compression members to their least radius of gyration			
	Main members (legs, cross arm struts etc)		120	
	Other members with calculated stress		200	
	Tension only members		350	
	Members without calculated stress		250	
	Maximum ultimate stresses, for checking tower designs not subjected to test			
	Compression members: - Where L = unsupported length of member R = least radius of gyration of a member			
	Mild steel	Newton /mm2	248/(1+L/17000 R)	
	High tensile steel	Newton /mm2	373/(1+L/14300 R)	
	Tension members (elastic limit):-			
	Mild steel	Newton /mm2	250	
	High tensile steel	Newton /mm2	370	
	Shear on bolts:-			
	Mild steel	Newton /mm2	234	
	High tensile steel	Newton /mm2	350	
	Bearing on bolts: -			
	Mild steel	Newton /mm2	465	
	High tensile steel	Newton /mm2	700	

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Tension of conductors for purposes of structure design and application			
	Busbar conductors total per phase Dependent upon Substation design	N		
	Earth conductors per conductor Dependent upon Substation design	N		
	Downleads, line conductors total per phase	kN	10	
	Downleads, per earth conductor	kN	4.5	
	Quality of materials of structure			
	▪ Grade			
	Mild steel : steel / steel			
	High tensile steel: steel / steel nuts and bolts			
	▪ Tensile breaking stress	N/mm2		
	Mild steel : steel / steel			
	High tensile steel: steel / steel nuts and bolts			
	▪ Elongation on breaking	%		
	Mild steel : steel / steel			
	High tensile steel: steel / steel nuts and bolts			
	▪ Gauge length of specimen	mm		
	Mild steel : steel / steel			
	High tensile steel: steel / steel nuts and bolts			
	▪ Diameter of specimen	mm		
	Mild steel : steel / steel			
	High tensile steel: steel / steel nuts and bolts			
	▪ Yield point as percentage of breaking stress			
	Mild steel : steel / steel			
	High tensile steel: steel / steel nuts and bolts			
	Quality of materials of insulators and fittings			
	▪ Grade			
	- Insulator unit metalwork			
	Steel			
	Malleable cast iron			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Insulator caps			
	- Phase and earth conductor metal fittings			
	Steel			
	Malleable cast iron			
	Insulator caps			
	▪ Tensile breaking stress	N/mm2		
	- Insulator unit metalwork			
	Steel			
	Malleable cast iron			
	Insulator caps			
	Phase and earth conductor metal fittings			
	- Steel	%		
	Malleable cast iron			
	Insulator caps			
	▪ Gauge length of specimen	mm		
	- Insulator unit metalwork			
	Steel			
	Malleable cast iron			
	Insulator caps			
	Phase and earth conductor metal fittings			
	- Steel			
	Malleable cast iron			
	Insulator caps			
	▪ Diameter of specimen	mm		
	- Insulator unit metalwork			
	Steel			
	Malleable cast iron			
	Insulator caps			
	Phase and earth conductor metal fittings			
	- Steel			
	Malleable cast iron			
	Insulator caps			
	▪ Yield point as percentage of breaking stress			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	- Insulator unit metalwork			
	Steel			
	Malleable cast iron			
	Insulator caps			
	Phase and earth conductor metal fittings			
	- Steel			
	Malleable cast iron			
	Insulator caps			
10.	**NEUTRAL EARTHING RESISTOR (NER) CUBICLE**			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type			
	Installation		outdoor	
	Degree of mechanical protection		IP55	
	NER cubicle outer steel sheet thickness	mm		
	NER cubicle painting colour (RAL)			
	Dimensions and weights of NER cubicle:			
	- width	mm		
	- depth	mm		
	- height	mm		
	- weight	kg		
10.1	**Neutral Earthing Resistor (NER)**			
	General Data			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type		Steel-grid type	
	Standards		IEEE Std C57.32	
	Installation		outdoor	
	Rated Characteristics			
	Rated voltage	kV		

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Rated frequency	Hz	50	
	Rated current for 10 s	A		
	Rated time	s	10	
	Rated resistivity	Ω		
	Rated power	kW		
	Resistor's absorbed energy	kJ		
	Design and Construction			
	Resistor material			
	Material of post insulators		porcelain	
	Dimensions and weights of resistor:			
	- width	mm		
	- depth	mm		
	- height	mm		
	- weight	kg		
10.2	**Transformer Neutral Disconnector**			
	General Data			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type			
	Standards		IEC 62271-102	
	Installation			
	Type of operating mechanism of disconnector		Manual operating mechanism	
	Rated Characteristics			
	Highest voltage for equipment	kV	36	
	Rated frequency	Hz	50	
	Rated power frequency withstand voltage (r.m.s. value), AC (50 Hz, 1 min):			
	- phase to earth	kV	70	
	- across the isolating distance	kV	80	
	Rated lightning impulse withstand voltage (peak value), LI (1,2/50 μs):			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	- phase to earth	kV	170	
	- across the isolating distance	kV	195	
	Rated current Ir	A		
	Rated short-time withstand current I_k	kA	31.5	
	Duration of short circuit (t_k)	s	≥3	
	Rated peak withstand current I_p	kA	80	
	Disconnector mechanical endurance	Class		
	Design Characteristics			
	Insulator material			
	Mass of complete disconnector	kg		
10.3	**Neutral Earthing Disconnector with Earthing Switch**			
	General Data			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type			
	Standards		IEC 62271-102	
	Installation			
	Type of operating mechanism of disconnector		Manual operating mechanism	
	Type of operating mechanism of earthing switch		Manual operating mechanism	
	Rated Characteristics			
	Highest voltage for equipment	kV	36	
	Rated frequency	Hz	50	
	Rated power frequency withstand voltage (r.m.s. value), AC (50 Hz, 1 min):			
	- phase to earth	kV	70	
	- across the isolating distance	kV	80	
	Rated lightning impulse withstand voltage (peak value), LI (1,2/50 μs):			
	- phase to earth	kV	170	
	- across the isolating distance	kV	195	

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Rated current Ir	A		
	Rated short-time withstand current I_k	kA	31.5	
	Duration of short circuit (t_k)	s	≥3	
	Rated peak withstand current I_p	kA	80	
	Disconnector mechanical endurance	Class		
	Design Characteristics			
	Insulator material			
	Mass of complete disconnector with earthing switch	kg		
10.4	**Neutral Current Transformer**			
	General Data			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type		Epoxy resin	
	Serial number			
	Standards		IEC 61869-1&2	
	Installation			
	Rated Characteristics 33 kV			
	Rated voltage	kV	33	
	Rated frequency	Hz	50	
	Highest voltage for equipment	kV	36	
	Rated power frequency withstand voltage (r.m.s. value), AC (50 Hz, 1 min)	kV	70	
	Rated lightning impulse withstand voltage (peak value), LI (1,2/50 μs)	kV	170	
	Rated short-time (3 s) thermal current	kA	31.5	
	Rated dynamic current	kA	80	
	Rated transformation ratio	A/A	As schedule A	
	Accuracy class		5P20	
	Rated output	VA		
	Design Characteristics			
	Insulation material		Epoxy resin	
	Mass of complete current transformer	kg		

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
11.	**400 V AC DISTRIBUTION BOARD/SWITCHGEAR**			
	General Data			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type		Free-standing type	
	Standards		IEC 60947	
	Installation		indoor	
	Number of panels within distribution board/switchgear	pcs		
	Panels painting colour (RAL)		RAL 6019	
	Degree of mechanical protection		IP41	
	Rated Characteristics for Distribution Board/Switchgear			
	Rated voltage	V	400	
	Rated frequency	Hz	50	
	Highest voltage for equipment	V		
	Rated busbar current	A	Min. 400	
	Rated short-time (1 s) withstand current	kA	40	
	Rated peak withstand current	kA	100	
	Busbars			
	Conductor material			
	Phase conductor cross section	mm^2		
	Phase conductor total dimensions	mm×mm		
	Phase conductor moment of inertia			
	Mass of phase conductor	kg/m		
	Resistance at 20 °C	mΩ/mm		
	Resistance coefficient	10^{-3}/°C		
	Phase conductor maximum permissible temperature:			
	- Continuous current	°C		
	- Short-circuit current, 1 s	°C		
	Modulus of elasticity	N/mm^2		
	Coefficient of linear expansion	10^{-5}/°C		

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Incoming Circuit Breakers & Bus Section Circuit Breaker			
	General Data			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type		Withdrawable Air Circuit Breaker (ACB) / Moulded Case Circuit Breaker (MCCB)	
	Standards		IEC 60947-2	
	Rated Characteristics			
	Rated voltage	V	400	
	Rated frequency	Hz	50	
	Rated current	A	Min. 400	
	Rated short-circuit breaking capacity I_{cu}	kA	40	
	Rated short-circuit making capacity I_{cm}	kA	100	
	Rated short-time (3 s) withstand current I_{cw}	kA	40	
	Electronic Protection Unit			
	Type		electronic	
	Serial number			
	Protection functions		LSI	
	Other functions (to be specified)			
	Dimensions and Masses			
	Circuit breaker dimensions (W×D×H)	mm		
	Circuit breaker weight	kg		
	Current Transformers			
	General Data			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type			
	Standards		IEC 61869-1&2	
	Rated Characteristics			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Rated voltage	V	400	
	Rated frequency	Hz	50	
	Rated primary current	A	Min. 400	
	Rated continuous thermal current / Rated extended primary current	A		
	Rated secondary current	A		
	Rated short-time (3 s) thermal current	kA	40	
	Rated dynamic current	kA	100	
	Rated output	VA		
	Accuracy class			
	Design Characteristics			
	Insulation material			
	Mass of complete current transformer	kg		
	Moulded Case Circuit Breakers (MCCBs)			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type			
	Standards		IEC 60947-2	
	Number of MCCBs **MCCBs Rated Characteristics**		According to Contractor's Design approved by Client	
	Miniature Circuit Breakers (MCBs)			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type			
	Standards		IEC 60947-5-1	
	Number of MCBs **MCBs Rated Characteristics**		According to Contractor's Design approved by Client	
	Automatic Transfer Switch (ATS)			
	General Data			
	Manufacturer & Place of Manufacture			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Place of Factory Inspection and Testing			
	Type designation			
	Type			
	Standards			
	Dimensions (W×D×H)	mm		
	Measuring Instruments			
	General Data			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type			
	Standards			
	Instrument dimensions (W×D×H)	mm		
	Selector Switches			
	General Data			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type			
	Standards			
	Cubicles/Panels Design Characteristics			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type			
	Standards			
	Dimensions of the Panel:			
	- width	mm		
	- depth	mm		
	- height	mm		
	Cubicle outer steel sheet thickness	mm		
	Minimum free space around switchboard necessary for operation and overhauls (maintenance):			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	- front side	mm		
	- rear side	mm		
	- lateral side	mm		
	Overal dimensions of the switchboard (W×D×H)	mm		
	Dimensions and masses of the largest panel for transport:			
	- width	mm		
	- depth	mm		
	- height	mm		
	- weight	kg		
12	**110 V DC SYSTEM**			
12.1	**110 V DC BATTERY**			
	General Data			
	Manufacturer			
	Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type		Ni-Cd type	
	Serial number			
	Standards		IEC 60623	
	Installation		indoor	
	Rated Characteristics			
	Number of battery banks	No	2	
	Rated voltage of the battery bank	V DC	110	
	Number of cells for each battery bank	No		
	Rated voltage per cell	V DC	1.2	
	Rated discharge period	h	5	
	Minimum 5 h capacity (C_{5h})	Ah	≥ 450	
	5 h discharge current	A		
	1 h discharge current	A		
	Battery float charging voltage per cell	V DC	1.4	
	Battery boost charging voltage per cell	V DC	1.55	
	Minimum battery voltage per cell	V DC	1.1	
	Internal resistance per cell	mΩ/cell		
	Maximum permitted ambient temperature	°C		

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Minimum permitted ambient temperature	°C		
	Design and Construction			
	Dimensions and weights of cells:			
	- cell width	mm		
	- cell depth	mm		
	- cell height	mm		
	- cell weight with electrolyte	kg		
	- cell weight without electrolyte	kg		
	Electrolyte relative density	kg/m^3		
	Material of the battery stands			
12.2	**MAIN BATTERY FUSES**			
	General Data			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type			
	Standards		IEC 60269	
	Installation		indoor	
	Rated Characteristics			
	Rated voltage	V DC		
	Rated current	A		
	Rated breaking current	kA		
	Fuse characteristic			
	Design and Construction			
	Fuses to be installed in appropriate fuse box		Yes	
	Fuse box painting colour (RAL)		RAL 6019	
	Fuse box degree of mechanical protection		IP41	
	Dimensions of the fuse box (W×D×H)	mm		
	Weight of the complete fuse box	kg		
12.3	**BATTERY CHARGER - RECTIFIER**			
	General Data			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Manufacturer			
	Standards			
	Installation		indoor	
	Operation method		Parallel with pertaining battery	
	Rated Characteristics			
	Number of battery chargers	No	2	
	Rated input characteristics:			
	- voltage	V		
	- current (at rated capacity)	A		
	- frequency	Hz	50	
	- permitted voltage variations	%		
	- output	kW		
	Rated output characteristics:			
	- voltage	V DC	110	
	- permitted voltage variations	%		
	Efficiency:			
	- at 25% of rated capacity	%		
	- at 50% of rated capacity	%		
	- at 75% of rated capacity	%		
	- at 100% of rated capacity	%		
	Design and Construction			
	Dimensions of battery charger (W×D×H)	mm		
	Weight of battery charger	kg		
	Battery charger panel painting colour (RAL)		RAL 6019	
	Battery charger panel degree of mechanical protection		IP41	
	Dimensions and masses of the battery charger panel:			
	- width	mm		
	- depth	mm		
	- height	mm		

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	- weight	kg		
12.4	**110 V DC DISTRIBUTION BOARD/SWITCHGEAR**			
	General Data			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type		Free-standing type	
	Standards		IEC 60947	
	Installation		indoor	
	Number of panels within distribution board/switchgear	pcs		
	Panels painting colour (RAL)		RAL 6019	
	Degree of mechanical protection		IP41	
	Rated Characteristics for Distribution Board/Switchgear			
	Rated voltage	V DC	110	
	Rated busbar current	A		
	Busbars			
	Conductor material			
	Phase conductor cross section	mm^2		
	Phase conductor total dimensions	mm×mm		
	Phase conductor moment of inertia			
	Mass of phase conductor	kg/m		
	Resistance at 20 °C	mΩ/mm		
	Resistance coefficient	10^{-3}/°C		
	Phase conductor maximum permissible temperature:			
	- Continuous current	°C		
	- Short-circuit current, 1 s	°C		
	Modulus of elasticity	N/mm^2		
	Coefficient of linear expansion	10^{-5}/°C		
	Incoming Circuit Breakers & Bus section Circuit Breaker			
	General Data			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type			
	Standards		IEC 60947-2	
	Rated Characteristics			
	Rated voltage	V DC	110	
	Rated current	A		
	Dimensions and Masses			
	Circuit breaker dimensions (W×D×H)	mm		
	Circuit breaker weight	kg		
	Miniature Circuit Breakers (MCBs)			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type		Two-pole	
	Standards		IEC 60947-5-1	
	Number of MCBs **MCBs Rated Characteristics**		According to Contractor's Design approved by Client	
	Measuring Instruments			
	General Data			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type			
	Standards			
	Instrument dimensions (W×D×H)	mm		
	Cubicles/Panels Design Characteristics			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Standards			
	Dimensions of the Panel:			
	- width	mm		
	- depth	mm		
	- height	mm		
	Cubicle outer steel sheet thickness	mm		
	Minimum free space around switchboard necessary for operation and overhauls (maintenance):			
	- front side	mm		
	- rear side	mm		
	- lateral side	mm		
	Overall dimensions of the switchboard (W×D×H)	mm		
	Dimensions and masses of the largest panel for transport:			
	- width	mm		
	- depth	mm		
	- height	mm		
	- weight	kg		
13	STANDBY DIESEL GENERATOR			
	General Data			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type			
	Standards			
	Rated voltage (3pahse/single phase)	V	400/230	
	Frequency	Hz	50	
	Continuous site Rating	KVA	As schedule A	
	Rated power of proposed diesel generator	KW		
	Power factor	Cos phi	0.8	
	Power factor at MCR	Cos phi		
	Fuel consumption	g/kWh		

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
13.1	Enclosure			
	Type of Enclosure		Weather protected and sound attenuated	
	Concrete Room		Yes	
	Sun shield for bulk tank		Yes	
13.2	ALTERNATOR			
	Nominal Voltage	V	400/230 - 3 phase	
	Voltage Stability	%	± 1%	
	Voltage Adjustment Range	%	± 5%	
	Frequency Stability	%	- 5%	
	Voltage recovery time, dynamic	sec	< 1 sec	
	Efficiency at 4/4 load 0.8 pf		91%	
	exciter type			
	Automatic Voltage Regulator type			
	Insulation Class		F/H	
	Waveform Distortion Factor		< 5%	
	Test voltage at power frequency, one minute	kV		
	Circuit Breaker		3 poles with shunt trip	
	LV terminals		Cable Box	
13.3	ENGINE / Diesel motor			
	Manufacturer			
	Power of diesel motor at ISO conditions	KW		
	Power of diesel motor at Site conditions	KW		
	N° of cylinders			
	Bore x strokes	mm		
	Aspiration		Natural or Exhaust gas turbo-charged	
	Speed	rpm	< 1500	
	Lower Calorific value of fuel	MJ/KG	41	
	Daily service fuel tank capacity	Hrs	9	

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Bulk fuel tank capacity	Days	5	
	Bulk fuel storage capacity	litres		
	Daily storage tank capacity	litres		
13.4	Control Panel			
	Local alarm and remote annunciator modules		Yes	
	Remote Start Signal		Yes	
	Refilling System		Yes	
14	**CURRENT TRANSFORMER FOR MAIN TRANSFORMER LV ARTIFICIAL NEUTRAL POINT 11kv**			
14.1	General Data			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type		Oil-insulated, hermetically sealed, post type	
	Standards		IEC 61869-1&2	
	Installation		outdoor	
14.2	Rated Characteristics			
	Highest voltage for equipment	kV	12	
	Rated frequency	Hz	50	
	Rated power frequency withstand voltage (r.m.s. value), AC (50 Hz, 1 min)	kV	28	
	Rated lightning impulse withstand voltage (peak value), LI (1,2/50 ☐s)	kV	75	
	Rated short-time (3 s) thermal current	kA		
	Rated dynamic current	kA		
	Rated characteristics of CTs cores		AS SCH A	
14.3	Design Characteristics			
	Insulator material		Porcelain	
	Insulating material		Oil – paper	
	Minimum creepage distance to earth	mm		

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Permissible partial discharges levels:			
	- PD test voltage: Um	pC		
	- PD test voltage: 1.2×Um/√3	pC		
	Winding conductor		Copper	
	Secondary terminals enclosure minimum degree of mechanical protection		IP55	
	HV terminals:			
	- shape			
	- dimension	mm×mm		
	- number of holes	pcs		
	- dimensions of holes	mm		
	- distance between holes	mm		
	- material suitable to		Al connector	
	Earthing terminal:			
	- shape			
	- dimension	mm×mm		
	- number of holes	pcs		
	- dimensions of holes	mm		
	- distance between holes	mm		
	- material suitable to		copper	
	Oil sampling valve		Yes	
	Weights and dimensions:			
	- total weight	kg		
	- total height	mm		
15	**132 KV Open terminal EARTHING SWITCH**			
15.1.	General Data			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type		Single break / vertical plane	

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Standards		IEC 62271-102	
	Installation		Outdoor	
	Number of poles	pcs	3	
	Type of operating mechanism of earthing switch (swing lever)		motorised operating mechanism	
	Number of operating mechanisms of earthing switch		1	
	System earthing		Solidly earthed neutral	
15.2.	Site Conditions			
	Altitude above sea level	m		
	Minimum ambient temperature	°C	-10	
	Maximum ambient temperature	°C	50	
	Daily average temperature	°C	38	
15.3.	Rated Characteristics			
	Highest voltage for equipment	kV	145	
	Rated network operating voltage	kV	132	
	Rated frequency	Hz	50	
	Rated power frequency withstand voltage (r.m.s. value), AC (50 Hz, 1 min)	kV	70	
	Rated lightning impulse withstand voltage (peak value), LI (1,2/50 μs)	kV	170	
	Rated Current	A	As schedule A	
	Rated short-time withstand current Ik	kA	40	
	Duration of short circuit (tk)	s	≥ 3	
	Rated peak withstand current Ip	kA	100	
	Disconnector mechanical endurance	Class	M2	
	Earthing switch electrical endurance	Class	E0	
	Rated mechanical terminal loads:			
	- static horizontal force, longitudinal FthA	N		
	- static horizontal force, transversal FthB	N		
	- static vertical force FtV	N		
	- dynamic horizontal force, longitudinal	N		
	- dynamic horizontal force, transversal	N		

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
15.4.	Design and Construction			
	EARTH SWITCH			
	Insulator material		Porcelain	
	Minimum creepage distance to earth	mm		
	HV Terminals:			
	- shape			
	- dimensions	mm×mm		
	- number of holes	pcs		
	- dimensions of holes	mm		
	- distance between holes	mm		
	- material corresponding to			
	Weights and dimensions:			
	- total height	mm		
	- distance between poles	mm		
	- isolating distance	mm		
	- total weight including operating mechanisms	kg		
15.5.	Operating Mechanism			
	Type			
	Waterproof, corrosion resistance housing		IP55	
	Material of housing			
	Rated motor voltage	V DC	110	
	Rated motor power	W		
	Control and signalling voltage	V DC	110	
	Number of closing coils	pcs	1	
	Rated closing coil power	W		
	Number of opening coils	pcs	1	
	Rated opening coil power	W		
	Rated heater, lighting and socket outlet voltage	V AC	230	
	Rated heater power	W		
	Number of auxiliary contacts available			
	Class of auxiliary contacts		Class 1	
	Accessories in the Operating Mechanism Cubicle:			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	- manual operating crank		Yes	
	- local/manual/remote control selector switch		Yes	
	- local operation lockable rotary switch		Yes	
	- door switch for lighting control		Yes	
	- lighting, heating and socket outlet for 230 V, 50 Hz		Yes	
	- miniature circuit breaker for motor		Yes	
	- miniature circuit breaker for lighting, heating and socket outlet		Yes	
	- earthing busbar with connection to external earthing terminal		Yes	
	- cable entry flange		Yes	