Schedule D: Schedules of Technical Data (STD)

The Schedule of Technical Data (STD) shall be filled-in and dully signed and stamped by the Tenderer.

Any deviation from the required value shall be show clearly in the schedule L. and statement of compliance.

Schedule of Technical Data (STD) 132 kV GIS and cables

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
1	**132kV GAS INSULATED SWITCHGEAR**			
1..1	**GENERAL**			
1.1.1.	Manufacturer & Place of manufacturing			
1.1.2.	Type designation			
1.1.3.	Type		Metal enclosed, gas insulated GIS-indoor	
1.1.4.	Standards	IEC	IEC 62271-203, 62271-1, 62271-110, 62271-100, 60270, 60376, 60480	
1.1.5.	Rated voltage	kV	145	
1.1.6	System Voltage	kV	132	
1.1.7.	Rated frequency	Hz	50	
1.1.8.	Lightning impulse withstand voltage			
	Phase to earth	KVp	650	
	Across the isolating distance	kVp	750	
1.1.9.	Power frequency withstand voltage			
	Phase to earth	kV	275	
	Across the isolating distance	kV	315	
	Phase to earth at SF6 pressure of 1 bar	kV	1.1 U phase	
1. 1.10.	Rated short-time withstand current (3 s)	kA	40	
1. 1.11.	Rated peak withstand current	kA	100	
1. 1.12.	Type of busbars		Double Busbars	
1. 1.13.	Type of enclosure		Three phase enclosed	
1. 1.14.	Material of enclosure for:			
	Circuit breaker		Al/St	

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Busbars		Al/St	
	Other compartments		Al/St	
1. 1.15.	Material of HV conductor		Al/Cu	
1. 1.16.	Material of contacts (indicate bi-metallic where used)			
1. 1.17.	Type of contact		Tulip	
1. 1.18.	Minimum subdivision of switchgear:			
	Busbars		Yes	
	Busbar isolator			
	Circuit breaker		Yes	
	Circuit isolator		Yes	
	Cable box		Yes	
	Voltage transformer		Yes	
1. 1.19.	Method of compensation of expansion and contraction			
	For busbars			
	For enclosure			
1. 1.20.	Type of pressure relief device		Bursting disk	
1. 1.21.	Rupturing pressure	bar		
1. 1.22.	Type of filter employed for moisture absorption		Molecular Sieve	
1. 1.23.	Design lifetime of moisture absorbent	Years	10	
1. 1.24.	Total mass of switchgear (average per bay)	kg		
1. 1.25.	Mass of heaviest single component to be handled during erection	kg		
1. 1.26.	Total mass of SF6 gas (average per bay)	kg		
1. 1.27.	Density of gas in:			
	Circuit breaker compartment	(g/l)		
	Other than circuit breaker compartments	(g/l)		
1. 1.27.A	Maximum Permissible moisture content of gas at 20^{o} C			
1.1.28.	Nominal working gas pressure at 15^{o}C in:			
	Circuit breaker compartment	bar		
	Other than circuit breaker compartment	bar		
1. 1.29.	Nominal working gas pressure at 45^{o}C in:			
	Circuit breaker compartment	bar		
	Other than circuit breaker compartment	bar		

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
1. 1.30.	Design maximum pressure for:			
	Circuit breaker compartment	bar		
	Other than circuit breaker compartment	bar		
1. 1.31.	Maximum leakage rate for any gas compartment	per annum	Less than 0.5%	
1. 1.32.	Maximum leakage rate for the whole switchgear	per annum	As per IEC	
1.1.32. A	Maximum time of degassing and filling of largest compartment			
1. 1.33.	Minimum operating period without total replacement of SF6 gas	years	10	
1. 1.33.A	Material used for gas seal			
1. 1.34.	Minimum thickness of enclosure	mm		
1. 1.35.	Internal arc fault duration with “no burn through” and “no fragmentation” with rated short time withstand current for the period of:	ms	300 or: secondary (back up) protection fault clearance time under worst condition, whichever is greater	
1. 1.36.	Minimum factors of safety for switchgear			
	Busbars or other connections based on elastic limit		2.5	
	Complete insulators based on electro-mechanical test		2.5	
	Insulator metal fittings based on elastic limit		2.5	
	Steel structures based on elastic limit of tension members and on crippling loads of compression members		2.5	
	Foundations for structures against overturning or uprooting under maximum simultaneous working loadings		2.5	
1. 1.37.	Seismic factor			
1.2.	**CIRCUIT BREAKER**			
1.2.1.	Manufacturer & Place of manufacturing			
1.2.2.	Type designation			
1.2.3.	Type		Single pressure puffer, SF6	
1.2.4.	Standards		IEC 62271-203,	

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
			IEC 62271-100, 60376, 60480	
1.2.5.	Rated voltage	kV	132	
1.2.6a.	Rated Current – Busbars, Bus Section and Bus coupler			
	at 40^{0}C	A	As SCHEDULE A	
	at 50^{0}C (Contractor to confirm by calculation)	A		
1.2.6b.	Rated Current –Line / Transformer Feeder bays			
	at 40 ^{0}C	A	As SCHEDULE A	
	at 50 ^{0}C (Contractor to confirm by calculation)	A		
1.2.6c.	Rated Current – Incoming transformer bays			
	at 40 ^{0}C	A	As SCHEDULE A	
	at 50 ^{0}C (Contractor to confirm by calculation)	A		
1.2.7.	Rated frequency	Hz	50	
1.2.8.	Lightning impulse withstand voltage			
	Phase to earth	KVp	650	
	Across the isolating distance	KVp	750	
1.2.9.	Power frequency withstand voltage			
	Phase to earth	kV	275	
	Across the isolating distance	kV	315	
1.2.10.	Rated short-time withstand current (1 s)	kA	40	
1.2.11.	Rated peak withstand current	KAp	100	
1.2.12.	Rated operating sequence		O -0.3 sec- CO -3 min – CO	
1.2.13.	Auto reclosing		O -0.3 sec- CO -3 min – CO	
1.2.14.	Rated making current	KAp	100	
1.2.16.	Rated breaking current (asymmetrical)	KA	To IEC 62271-100	
	%dc	%dc		
1.2.17.	Rated breaking current under out-of-phase conditions	kA	10	
1.2.18.	First phase to clear factor		1.5	
1.2.18 a	Transient Recovery Voltages	TRVs	To IEC 62271-100	
1.2.19.	Rated capacitive breaking current		To IEC 62271-100	

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Rated line charging breaking current	A	50	
	Rated cable charging breaking current	A	160	
	Rated Single/Back to Back Capacitor bank breaking current	A	400	
1.2.20.	Rated small inductive/reactor breaking currents of:		To IEC 62271-110	
	small inductive	A	10, 20, 50 and 100	
	reactor	A	306	
1.2.21.	Maximum overvoltage factor on any switching duty	pu	2.3	
1.2.22.	Maximum overvoltage factor when interrupting rated line/cable/capacitor bank charging currents	pu	2.3	
1.2.23.	Maximum overvoltage factor when switching small inductive/reactor currents	pu	2.3	
1.2.24.	Maximum total break time (trip initiation to final arc extinction)	ms	60	
1.2.25.	Opening time (trip initiation to contact separation)			
	Without current	ms		
	With 100% rated breaking current	ms		
1.2.26.	Maximum time interval between opening of first and last phase of three phase circuit breakers	ms	3	
1.2.27.	Maximum time interval between opening of interrupters of one phase	-	-	
1.2.28.	Closing time from energisation of close coil to latching of circuit breaker in fully closed position	ms		
1.2.29.	Making time (energisation of close coil to contact touch)			
	Without current	ms		
	100% making current	ms		
1.2.30.	Maximum time interval between closure of first and last phase of three phase circuit breaker	ms	3	
1.2.31.	Maximum time interval between closure of interrupters of one phase	-	-	
1.2.32.	Minimum time from extinction of main arc to contact make during auto-reclosing duty	ms	300	
1.2.33.	Mechanical life of circuit breaker and mechanism in No. of operations		10,000	
1.2.34.	Electrical contact life in number of operations at:			
	Rated current - 2000 A			
	Fault current - 40 kA		20	
	Cumulative ampere rating			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
1.2.35.	Number of current interrupting break units in series per phase		One	
1.2.36.	Type of operating mechanism		Spring-charged or hydraulic	
1.2.37.	Type of power device (motor charged)			
	For closing		Spring or hydraulic	
	For opening		Spring or hydraulic	
1.2.38.	Hand operating facility		Yes	
1.2.39.	Hand charging facility		Yes	
1.2.40.	Manual spring release		Yes	
1.2.41.	Mechanical on/off indicator		Yes	
1.2.42.	Mechanical spring charge / discharge indication		Yes	
1.2.43.	Charging time	s		
1.2.44.	Number of trip coils		2	
1.2.45.	Number of close coils		1	
1.2.46.	Nominal control and operating voltage	V	110 DC	
1.2.47.	Nominal heater voltage	V	240 AC	
1.2.48.	Rated power of trip coil	W		
1.2.49.	Rated power of close coil	W		
1.2.50.	Rated motor power	W		
1.2.51.	Total load of heaters for circuit breaker	W		
1.2.52.	Mass of circuit breaker complete (three pole)	kg		
1.2.53.	Mass of single phase circuit breaker	-	-	
1.2.54	Emergency Trip Facility during failure of DC supply		Yes	
1.3.	**ISOLATORS**			
1.3.1.	Manufacturer & Place of Manufacturing			
1.3.2.	Type designation			
1.3.3.	Type of operating mechanism		Motor	
1.3.4.	Standards		IEC 62271-1, 62271-102, 62271-203, 62271-104	
1.3.5.	Rated voltage	kV	145	
1.3.6.	Rated normal current - Busbars, Bus Section and Bus Coupler / TRANSF Incomer & O/G Feeder			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Required current at 40°C	A	2500/2000 (to match CB)	
	Required current at 50°C (Contractor to confirm by calculation)	A		
1.3.7.	Rated frequency	Hz	50	
1.3.8.	Lightning impulse withstand voltage			
	Phase to earth	KVp	650	
	Across the isolating distance	KVp	750	
1.3.9.	Power frequency withstand voltage			
	Phase to earth	kV	275	
	Across the isolating distance	kV	315	
1.3.10	Rated short time withstand current (1 s)	kA	40	
1.3.11.	Rated peak withstand current	KAp	100	
1.3 .12.	Maximum capacitive current that can be interrupted by the isolator	A		
1.3.13.	Total time from initiation of opening operation to isolator in fully open position	s		
1.3.14	Time from contact separation to extinct of capacitive arc	s		
1.3.15	Total time from initiation of opening operation to time when isolator gap can withstand phase voltage	s		
1.3.16	Hand operating facility		yes	
1.3.17	Locking arrangement in on/off position		yes	
1.3.18	Nominal control and operating voltage	V	110 DC	
1.3.19	Automatic isolation of control supplies when lock off		yes	
1.3.20.	Accessibility to operating mechanism from ground level or catwalk		yes	
1.3.21.	Nominal heater voltage	V	240 AC	
1.3.22.	Rated power of operation coil	W		
1.3.23.	Rated motor power	W		
1.3.24.	Total load of heaters for isolator	W		
1.3.25.	Total mass of three phase isolator complete	kg		
1.3.26	Mass of single phase isolator	kg		
1.3.27.	Contact type		Tulip	
1.4.	**EARTHING SWITCH**			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
1.4.1.	Manufacturer & place of manufacturing			
1.4.2.	Type designation			
1.4.3.	Type of operating mechanism		Motor	
1.4.4.	Standards		IEC 62271-102, IEC 62271-1, 62271-203	
1.4.5.	Rated voltage	kV	145	
1.4.6.	Rated frequency	Hz	50	
1.4.7.	Lightning impulse withstand voltage phase to earth	KVp	650	
1.4.8.	Power frequency withstand voltage phase to earth	kV	275	
1.4.9.	Rated short time withstand current (1 s)	kA	40	
1.4.10.	Rated peak withstand current	kA	100	
1.4.11.	Hand operating facility		yes	
1.4.12.	Locking arrangement in on/off position		yes	
1.4.13.	Nominal control and operating voltage	V	110 DC	
1.4.14.	Automatic isolation of control supplies when lock off		yes	
1.4.15	Accessibility to operating mechanism from ground level or catwalk		yes	
1.4.16.	Nominal heater voltage	V	240 AC	
1.4.17.	Rated power of operating coil	W		
1.4.18.	Rated motor power	W		
1.4.19.	Total load of heaters for earthing switch	W		
1.4.20.	Total mass of earthing switch complete	kg		
1.5.	**HIGH SPEED EARTHING SWITCH**			
1.5.1.	Manufacturer & place of manufacturing			
1.5.2.	Type designation			
1.5.3.	Type of operating mechanism		Motor-spring	
1.5.4.	Standards		IEC 62271-102, IEC 62271-1, 62271-203	
1.5.5.	Rated voltage	kV	145	
1.5.6.	Rated frequency	Hz	50	
1.5.7.	Lightning impulse withstand voltage phase to earth	KVp	650	
1.5.8.	Power frequency withstand voltage phase to earth	kV	275	

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
1.5.9.	Rated short time withstand current (1 s)	kA	40	
1.5.10.	Rated peak withstand current	KAp	100	
1.5.11.	Rated short-circuit making current	KAp	100	
1.5.12.	Rated capacitive symmetrical breaking current	A		
1.5.13.	Rated inductive symmetrical breaking current	A		
1.5.14.	Total time from initiation of opening operation to earth switch in fully open position	ms		
1.5.15.	Time from contact separation to extinction of arc when interrupting rated breaking current	ms		
1.5.16.	Making time	ms		
1.5.17.	Charging time	s		
1.5.18.	Hand operating facility		yes	
1.5.19.	Locking arrangement in on/off position		yes	
1.5.20.	Nominal control and operating voltage	V d.c.	110	
1.5.21.	Automatic isolation of control supplies when lock off		yes	
1.5.22.	Accessibility to operating mechanism from ground level or catwalk		yes	
1.5.23.	Nominal heater voltage	V	240 AC	
1.5.24.	Rated power of operation coil	W		
1.5.25.	Rated motor power	W		
1.5.26.	Total load of heaters for earthing switch	W		
1.5.27.	Total mass of earthing switch complete	kg		
1.6.	**CURRENT TRANSFORMER**			
1.6.1.	GIS CURRENT TRANSFORMER			
1.6.1.1	Manufacturer & place of manufacturing			
1.6.1.2.	Type		Toroidal, GIS enclosed	
1.6.1.3.	Standards		IEC 62271-1, 61869-1&2	
1.6.1.4.	Rated voltage			
	GIS	kV	145	
1.6.1.5.	Lightning impulse withstand voltage phase to earth			
	GIS	kVp	650	
	Cores	kVp	As per. IEC	
1.6.1.6.	Power frequency withstand voltage phase to earth			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	GIS	kV	275	
	Cores	kV	3 kV (EK < 2kV)	
		kV	5 kV (EK ≥ 2kV)	
1.6.1.7.	Rated power frequency between secondaries		3kV	
1.6.1.8.	Inter-turn test			
	M/P type		4.5 kV peak	
	Class PX		As per IEC	
1.6.1.9.	Rated frequency	Hz	50	
1.6.1.10	Rated continuous thermal current at 45°C		Rated extended primary current	
1.6.1.11	Rated short-time withstand current (3 s)	kA	40	
1.6.1.12	Rated dynamic current	kAp	100	
1.6.1.13	Are earthed metal screens fitted between primary and secondary windings			
1.6.1.14	Is current transformer housed in a separate gas compartment			
1.6.1.15	Transformer bays current transformer:		As SCH A	
	Number of cores			
	Rated extended primary current		140%	
1.6.1.16	Line bays current transformer		As SCH A	
	Number of cores			
	Rated extended primary current		120%	
1.6.1.17	Bus Section & Bus Coupler CT No.1		As SCH A	
	Number of cores			
	Rated extended primary current		120%	
1.6.1.18	Bus Section & Bus Coupler CT No. 2		As SCH A	
	Number of cores		2	
	Rated extended primary current		120%	
1.7.	**VOLTAGE TRANSFORMERS**			
1.7.1.	Manufacturer & Place of manufacturing			
1.7.2.	Type designation for			
1.7.3.	Type		Inductive, SF6 gas insulated, enclosed	

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
1.7.4.	Standards		IEC 61869-1 & 61869-3,62271-1, 62271-203,	
1.7.5.	Rated voltage	kV	145	
1.7.6.	Rated frequency	Hz	50	
1.7.7.	Rated lightning impulse phase to earth	KVp	650	
1.7.8.	Power frequency withstand voltage phase to earth	kV	275	
1.7.9.	Maximum permissible partial discharge level Um	pC	10	
1.7.10.	Maximum permissible partial discharge level 1.2Um /√3	pC	5	
	Over voltage factor	p.u. / s	1.5 / 30 1.2 / continuous	
1.7.11.	Maximum capacitive current discharge rating	A	TBA	
1.7.12.	Method of suppressing ferro- resonance phenomena			
1.7.13.	Transformer voltage transformer- three phase		As SCH A	
1.7.14	Busbar voltage transformer- single phase		As SCH A	
1.7.15	Mass of single-phase voltage transformer	kg		
1.8.	**Surge Arresters**			
1.8.1.	Type			
1.8.2.	Standard		IEC 60099-4, 60099-1 60099-5, 62271-1	
1.8.3.	Rated/system voltage	kV	145/132	
	- Maximum overvoltage factor on the system due to any switching duty	pu	2.3	
1.8.4.	Rated system frequency	Hz	50	
1.8.5.	Condition of system neutral		Solidly earthed neutral	
1.8.6.	Nominal Discharge current	KA crest	10	
1.8.7.	Energy capability as per IEC 60099-4	KJ/kV	7.4	
1.8.8.	Rated voltage - MOA	kV	120	
1.8.9.	Long duration discharge class as per IEC 60099-4	Class	3	
1.8.10.	Maximum Continuous Operating Voltage (COV)	kV	98	
1.8.11.	TOV capability for			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	1 sec	kV	152	
	10 sec	kV	120	
1.8.12.	Maximum residual voltage with current wave			
	Switching Surges of 30/60 μs at 1kA	kV	240	
	Lightning Surges 8/20 μs - 10kA	kV	290	
	Steep Impulse 1 μs - 10kA	kV		
1.8.14.	Discharge current withstand strength			
	High current (4/10 μs)	KAp	100	
	Low current 2000A	Ap	900	
1.8.15.	Pressure relief capability			
	High current (0.2 s)	kA	50	
	Low current		As per IEC	
1.8.16.	Rating of earth connection	KA/sec	40/1	
1.8.17.	Surge counter provided		Yes	
1.9.	**CABLE BOX**			
1.9.1.	Manufacturer & Place of manufacturing			
1.9.2.	Type of designation		Suitable for GIS plug in cable terminations	
1.9.3.	Standards		IEC 62271-209	
1.9.4.	Rated voltage	kV	145	
1.9.5.	Lightning impulse withstand voltage phase to earth	kVp	650	
1.9.6.	Power frequency withstand voltage phase to earth	kV	275	
1.9 .7.	Cable HV test withstand capability	kV		
1.9.8.	Rated frequency	Hz	50	
1.9.9.	Rated normal current at 40°C	A		
1.9.10.	Required current at 45°C (Contractor to confirm by calculation)	A	2000	
1.9.11.	Rated short time withstand current (3s)	kA	40	
1.9.12.	Rated peak withstand current	kA	100	
1.9.13.	Total mass of three phase cable box complete	kg		
	Local control cabinet		As per PTS	
	General Data			
	Manufacturer			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type		Free-standing type	
	Type designation by the manufacturer			
	Standards			
	Installation		indoor	
	Panels painting colour (RAL)		RAL 6019	
	Degree of mechanical protection		IP41	
	Location		Per each GIS bays	
	Heating and lighting voltage	V AC	230	
	Control voltage	V DC	110	
1.10.	**Manufacturer quality system in accordance to ISO 9000, 9001, 9002, 9003 and 9004**		Yes	
1.10.1	Date of issue		Latest	
1.10.2	Validity		Valid Certificates - Yes	
1..11.	**Type test certificate to be issued by independent laboratory or independently witnessed type test certificate to be submitted**		Yes	
1.12	**GIS Crane**			
	General			
	Manufacturer name			
	country of manufacturing			
	Applicable standards		DIN 15018, DIN 15020	
	Construction Data			
	Operating mechanism	DIN	1Am	
	Crane span	m		
	Minimum lifting capacity	kg	5000	
	Max. deflection under design load	mm	1/750 of the span	
	Design safety factor	DIN/FEM	150%	
	Speed (dual)			
	– hoist	m/mm	0.8/5	
	– traversing	m/mm	5/20	

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	– Maximum travelling	m/mm	5/20	
	Clearance (from operating floor to hook in top position)	m		
	Limit of hook approaches for hoist			
	– Left	m		
	– right	m		
	– front	m		
	– rear	m		
	– up	m		
	– down	m		
	Minimum clearance above platform	m	2	
	Material			
	– hook			
	– block			
	Total weight	kg		
	Operation of crane			
	pendent controller as emergency control		yes	
	radio remote controller		yes	
	Crane classification as per DIN 15018			
	lifting class		H2	
	stress group		B3	
	Electrical Data			
	Operating voltage	V	230/400	
	Rated voltage	V	230/400	
	Frequency	Hz	50	
	Insulation level - power frequency withstand voltage, 1 min.	kV	1	
	Supporting documents			
	Technical literature enclosed		yes	
	Standard conditions of installation enclosed		yes	
	Relevant drawings enclosed		yes	
2	**132 kV CONTROL, PROTECTION & METERING EQUIPMENT**			
2.1	**Control & Protection Panel for 132 kV OHTL Feeder Bay**			
	General Data			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type		Free-standing type	
	Type designation by the manufacturer			
	Standards			
	Installation		indoor	
	Panels painting colour (RAL)		RAL 6019	
	Degree of mechanical protection		IP41	
	Main Protection Relay			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	Supply voltage	V		
	Consumption	W		
	Number and type of current analogue inputs	No		
	Number and type of voltage analogue inputs	No		
	Number of RTD inputs	No		
	Number of mA inputs	No		
	Number and type of binary inputs (110 V DC)	No		
	Number and type of binary outputs (110 V DC)	No		
	Number of Ethernet ports for IEC 61850 communication	No		
	Protection functions (to specify)			
	Software (to specify)			
	Back-up Protection Relay			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Standards			
	Supply voltage	V		
	Consumption	W		
	Number and type of current analogue inputs	No		
	Number and type of voltage analogue inputs	No		
	Number of RTD inputs	No		
	Number of mA inputs	No		
	Number and type of binary inputs (110 V DC)	No		
	Number and type of binary outputs (110 V DC)	No		
	Number of Ethernet ports for IEC 61850 communication	No		
	Protection functions (to specify)			
	Software (to specify)			
	Trip Circuit Supervision Device			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	LED signalization		Yes	
	Number of auxiliary contacts			
	Tripping Relays			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	Supply voltage	V		
	Consumption at rated voltage	W		
	Number of auxiliary contacts	No		
	Contacts data:			
	- voltage	V		

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	- current carrying capacity, continual	A		
	- breaking capacity at 110 V DC	A		
	- trip time	ms		
	Synchro-check relay			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	Multi-function digital Meter			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	Supply voltage	V		
	Consumption at rated voltage	W		
	Auxiliary voltage	V DC	110	
	Consumption at rated voltage	W		
	Auxiliary voltage	V DC	110	
	Transducers for Supervisory Indications			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	Panel Design Characteristics			
	Mimic diagram		Yes	
	Annunciator		Yes	
	Lockable control selector switch (“*Remote/Supervisory*”)		Yes	

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Lockable selector switch (“*Off/Synchro*”)		Yes	
	Auto-reclosure selector switch (“*On/Off*”)		Yes	
	Synchronising socket		NA	
	Anti-condensation heater		Yes	
	Internal lighting		Yes	
	Type of indication lamps		LED	
	Panel steel sheet thickness	mm		
	Dimensions and masses of the Control and Protection panel:			
	- width	mm		
	- depth	mm		
	- height	mm		
	- weight	kg		
2.2	**Control & Protection Panel for 132 kV Transformer Bay**			
	General Data			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type		Free-standing type	
	Type designation by the manufacturer			
	Standards			
	Installation		indoor	
	Panels painting colour (RAL)		RAL 6019	
	Degree of mechanical protection		IP41	
	Main Protection Relay			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	Supply voltage	V		
	Consumption	W		

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Number and type of current analogue inputs	No		
	Number and type of voltage analogue inputs	No		
	Number of RTD inputs	No		
	Number of mA inputs	No		
	Number and type of binary inputs (110 V DC)	No		
	Number and type of binary outputs (110 V DC)	No		
	Number of Ethernet ports for IEC 61850 communication	No		
	Protection functions (to specify)			
	Software (to specify)			
	Back-up Protection Relay			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	Supply voltage	V		
	Consumption	W		
	Number and type of current analogue inputs	No		
	Number and type of voltage analogue inputs	No		
	Number of RTD inputs	No		
	Number of mA inputs	No		
	Number and type of binary inputs (110 V DC)	No		
	Number and type of binary outputs (110 V DC)	No		
	Number of Ethernet ports for IEC 61850 communication	No		
	Protection functions (to specify)			
	Software (to specify)			
	Trip Circuit Supervision Device			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Standards			
	LED signalization		Yes	
	Number of auxiliary contacts	No		
	Tripping Relays			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	Supply voltage	V		
	Consumption at rated voltage	W		
	Number of auxiliary contacts	No		
	Contacts data:			
	- voltage	V		
	- current carrying capacity, continual	A		
	- breaking capacity at 110 V DC	A		
	- trip time	ms		
	Multi-function Digital Meter			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	Supply voltage	V		
	Consumption at rated voltage	W		
	Auxiliary voltage	V DC	110	
	Consumption at rated voltage	W		
	Auxiliary voltage	V DC	110	
	Transducers for Supervisory Indications			
	Manufacturer			
	Place and country of Manufacture			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	Panel Design Characteristics			
	Mimic diagram		Yes	
	Annunciator		Yes	
	Lockable control selector switch (“*Remote/Supervisory*”)		Yes	
	Synchronising socket		NA	
	Anti-condensation heater		Yes	
	Internal lighting		Yes	
	Type of indication lamps		LED	
	Panel steel sheet thickness	mm		
	Dimensions and masses of the Control and Protection panel:			
	- width	mm		
	- depth	mm		
	- height	mm		
	- weight	kg		
2.2	**Control & Protection Panel for 400/132/33 kV Transformer for 132kv side**			
	General Data			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type		Free-standing type	
	Type designation by the manufacturer			
	Standards			
	Installation		indoor	
	Panels painting colour (RAL)		RAL 6019	
	Degree of mechanical protection		IP41	
	Main Protection Relay			
	Manufacturer			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	Supply voltage	V		
	Consumption	W		
	Number and type of current analogue inputs	No		
	Number and type of voltage analogue inputs	No		
	Number of RTD inputs	No		
	Number of mA inputs	No		
	Number and type of binary inputs (110 V DC)	No		
	Number and type of binary outputs (110 V DC)	No		
	Number of Ethernet ports for IEC 61850 communication	No		
	Protection functions (to specify)			
	Software (to specify)			
	Trip Circuit Supervision Device			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	LED signalization		Yes	
	Number of auxiliary contacts	No		
	Tripping Relays			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	Supply voltage	V		

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Consumption at rated voltage	W		
	Number of auxiliary contacts	No		
	Contacts data:			
	- voltage	V		
	- current carrying capacity, continual	A		
	- breaking capacity at 110 V DC	A		
	- trip time	ms		
	Synchro-check relay			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	Multi-function Digital Meter			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	Supply voltage	V		
	Consumption at rated voltage	W		
	Auxiliary voltage	V DC	110	
	Consumption at rated voltage	W		
	Auxiliary voltage	V DC	110	
	Transducers for Supervisory Indications			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Panel Design Characteristics			
	Mimic diagram		Yes	
	Annunciator		Yes	
	Lockable control selector switch (“*Remote/Supervisory*”)		Yes	
	Lockable selector switch (“*Off/Synchro*”)		Yes	
	Synchronising socket		NA	
	Anti-condensation heater		Yes	
	Internal lighting		Yes	
	Type of indication lamps		LED	
	Panel steel sheet thickness	mm		
	Dimensions and masses of the Control and Protection panel:			
	- width	mm		
	- depth	mm		
	- height	mm		
	- weight	kg		
2.3	**Control & Protection Panel for 132 kV Bus Coupler Bay**			
	General Data			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type		Free-standing type	
	Type designation by the manufacturer			
	Standards			
	Installation		indoor	
	Panels painting colour (RAL)		RAL 6019	
	Degree of mechanical protection		IP41	
	Protection Relay			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Supply voltage	V		
	Consumption	W		
	Number and type of current analogue inputs	No		
	Number and type of voltage analogue inputs	No		
	Number of RTD inputs	No		
	Number of mA inputs	No		
	Number and type of binary inputs (110 V DC)	No		
	Number and type of binary outputs (110 V DC)	No		
	Number of Ethernet ports for IEC 61850 communication	No		
	Protection functions (to specify)			
	Software (to specify)			
	Trip Circuit Supervision Device			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	LED signalization		Yes	
	Number of auxiliary contacts	No		
	Tripping Relays			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	Supply voltage	V		
	Consumption at rated voltage	W		
	Number of auxiliary contacts	No		
	Contacts data:			
	- voltage	V		
	- current carrying capacity, continual	A		

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	- breaking capacity at 110 V DC	A		
	- trip time	ms		
	Synchro-check relay			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	Digital Multifunctional Meter			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	Supply voltage	V		
	Consumption at rated voltage	W		
	Auxiliary voltage	V DC	110	
	Transducers for Supervisory Indications			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	Panel Design Characteristics			
	Mimic diagram		Yes	
	Annunciator		Yes	
	Lockable control selector switch (“*Remote/Supervisory*”)		Yes	
	Lockable selector switch (“*Off/Synchro*”)		Yes	
	Synchronising socket		NA	
	Anti-condensation heater		Yes	

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Internal lighting		Yes	
	Type of indication lamps		LED	
	Panel steel sheet thickness	mm		
	Dimensions and masses of the Control and Protection panel:			
	- width	mm		
	- depth	mm		
	- height	mm		
	- weight	kg		
2.4	**Control & Protection Panel for 132 kV Bus Section Bay**			
	General Data			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type		Free-standing type	
	Type designation by the manufacturer			
	Standards			
	Installation		indoor	
	Panels painting colour (RAL)		RAL 6019	
	Degree of mechanical protection		IP41	
	Protection Relay			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	Supply voltage	V		
	Consumption	W		
	Number and type of current analogue inputs	No		
	Number and type of voltage analogue inputs	No		
	Number of RTD inputs	No		
	Number of mA inputs	No		

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Number and type of binary inputs (110 V DC)	No		
	Number and type of binary outputs (110 V DC)	No		
	Number of Ethernet ports for IEC 61850 communication	No		
	Protection functions (to specify)			
	Software (to specify)			
	Trip Circuit Supervision Device			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	LED signalization		Yes	
	Number of auxiliary contacts	No		
	Tripping Relays			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	Supply voltage	V		
	Consumption at rated voltage	W		
	Number of auxiliary contacts	No		
	Contacts data:			
	- voltage	V		
	- current carrying capacity, continual	A		
	- breaking capacity at 110 V DC	A		
	- trip time	ms		
	Synchro-check relay			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Type			
	Type designation by the manufacturer			
	Standards			
	Digital Multifunctional Meter			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	Supply voltage	V		
	Consumption at rated voltage	W		
	Auxiliary voltage	V DC	110	
	Transducers for Supervisory Indications			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	Panel Design Characteristics			
	Mimic diagram		Yes	
	Annunciator		Yes	
	Lockable control selector switch (“*Remote/Supervisory*”)		Yes	
	Lockable selector switch (“*Off/Synchro*”)		Yes	
	Synchronising socket		NA	
	Anti-condensation heater		Yes	
	Internal lighting		Yes	
	Type of indication lamps		LED	
	Panel steel sheet thickness	mm		
	Dimensions and masses of the Control and Protection panel:			
	- width	mm		
	- depth	mm		

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	- height	mm		
	- weight	kg		
2.5	**132 kV High Impedance Busbar Protection Panel**			
	General Data			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type		Free-standing type	
	Type designation by the manufacturer			
	Standards			
	Installation		indoor	
	Panels painting colour (RAL)		RAL 6019	
	Degree of mechanical protection		IP41	
	High Impedance Busbar Protection Relay			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	Supply voltage	V		
	Consumption	W		
	Number and type of current analogue inputs	No		
	Number and type of voltage analogue inputs	No		
	Number of RTD inputs	No		
	Number of mA inputs	No		
	Number and type of binary inputs (110 V DC)	No		
	Number and type of binary outputs (110 V DC)	No		
	Number of Ethernet ports for IEC 61850 communication	No		
	Protection functions (to specify)			
	Software (to specify)			
	CT Supervision Relays			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	Number of auxiliary contacts	No		
	Tripping Relays			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	Supply voltage	V		
	Consumption at rated voltage	W		
	Number of auxiliary contacts	No		
	Contacts data:			
	- voltage	V		
	- current carrying capacity, continual	A		
	- breaking capacity at 110 V DC	A		
	- trip time	ms		
	Transducers for Supervisory Indications		NA	
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	Panel Design Characteristics			
	Annunciator		Yes	
	Selector Switch in\out of service for each protection relay		Yes	
	Anti-condensation heater		Yes	

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Internal lighting		Yes	
	Type of indication lamps		LED	
	Panel steel sheet thickness	mm		
	Dimensions and masses of the Control and Protection panel:			
	- width	mm		
	- depth	mm		
	- height	mm		
	- weight	kg		
2.6	**132 kV Circuit Breaker Failure Protection Panel**			
	General Data			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type		Free-standing type	
	Type designation by the manufacturer			
	Standards			
	Installation		indoor	
	Panels painting colour (RAL)		RAL 6019	
	Degree of mechanical protection		IP41	
	Circuit Breaker Failure Protection Relay			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	Supply voltage	V		
	Consumption	W		
	Number and type of current analogue inputs	No		
	Number and type of voltage analogue inputs	No		
	Number of RTD inputs	No		
	Number of mA inputs	No		

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Number and type of binary inputs (110 V DC)	No		
	Number and type of binary outputs (110 V DC)	No		
	Number of Ethernet ports for IEC 61850 communication	No		
	Protection functions (to specify)			
	Software (to specify)			
	Tripping Relays			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	Supply voltage	V		
	Consumption at rated voltage	W		
	Number of auxiliary contacts			
	Contacts data:			
	- voltage	V		
	- current carrying capacity, continual	A		
	- breaking capacity at 110 V DC	A		
	- trip time	ms		
	Transducers for Supervisory Indications		NA	
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation by the manufacturer			
	Standards			
	Panel Design Characteristics			
	Annunciator		NA	
	Selector Switch in\out of service for each protection relay		Yes	
	Anti-condensation heater		Yes	
	Internal lighting		Yes	
	Type of indication lamps		LED	

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Panel steel sheet thickness	mm		
	Dimensions and masses of the Control and Protection panel:			
	- width	mm		
	- depth	mm		
	- height	mm		
	- weight	kg		
2.7	**132 kV Fault recorder Panel**			
	General Data			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type		Free-standing type	
	Standards			
	Installation		indoor	
	Panels painting colour (RAL)		RAL 6019	
	Degree of mechanical protection		IP41	
	Fault recorder			
	Manufacturer & Place of Manufacture			
	Place of Factory Inspection and Testing			
	Type designation			
	Type			
	Standards			
	Supply voltage	V		
	Consumption	W		
	Number of analogue inputs	No	128	
	Number of digital inputs	No	256	
	Distance to fault (fault locater) feature		Yes	
	Inter trigger between recorders		Yes	
	Accessories shall comply with NEPCO requirements		Yes	
	Software packages with full facility		Yes	
	Non-volatile storage as specification		Yes	
	Global positioning system(GPS) with all accessories		Yes	

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Panel Design Characteristics			
	Annunciator		NO	
	Anti-condensation heater and fans		Yes	
	Internal lighting		Yes	
	Type of indication lamps		LED	
	Panel steel sheet thickness	mm		
	Dimensions and masses of the Control and Protection panel:			
	- width	mm		
	- depth	mm		
	- height	mm		
	- weight	kg		
3	**132 kV CABLES**			
3.1	**132kV Cables for transformer feeders**			
3.1.1	**General Data**			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type		XLPE insulated with copper conductor with metallic screen	
	Type designation			
	Standards		IEC 60840, IEC 60287, IEC 60949	
3.1.2	**Rated Characteristics**			
	Rated voltage (U_0/U)	kV	76/132	
	Highest voltage for equipment (Um)	kV	145	
	Rated frequency	Hz	50	
	Rated impulse withstand voltage	kV	650	
	Rated one-minute power frequency withstand voltage	kV	275	
	Rated short-time power frequency withstand voltage, 5 min. between conductor and sheath (2.5×U_0)	kV		
	Power frequency test voltage applied after installation, 12 min. (2×U_0)	kV		

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Test DC voltage applied after installation, 15 min.	kV		
	Continuous current carrying capacity per cable for transformer feeder, per phase, at site conditions: – installation in air (concrete cable trench/ cable trough / within substation of 0.7m depth and 2m wide) – max. ambient temperature 50°C – three (3) three- phase circuits lied at same cable trench – direct bared	A		
	Calculation of continuous cable carrying capacity to be enclosed			
	Cable laying arrangement – cable laying formation (tref/ flat) – number of cables per phase – cable depth – centre of cable below ground level – spacing between phases for flat /tref formation – spacing between circuits	- pcs mm mm mm		
	Cable laying arrangement drawing for which specified current is guaranteed to be enclosed			
	Rated short-time (3 s) withstand current of conductor	kA	40	
	Rated short-time (1 s) withstand current of metallic screen	kA	40	
	Rated peak withstand current	kA	100	
	Maximum conductor temperature during:			
	- Continuous operation	°C	90	
	- Short-circuit current, 5 s	°C	250	
	Electrical resistance at 20 °C for:			
	- DC current	Ω/m		
	- AC current	Ω/m		
	Electric protection/screen DC resistance	Ω/m		
	Inductive resistance at 20 °C for AC current	Ω/m		
	Capacitance at 20 °C	pF/m		
	Insulation resistance at 20 °C	MΩ/m		
	Maximum partial discharges at $2 \times U_0$	pC		
	Guaranteed Losses:			
	- Dielectric losses at rated voltage	W/m		
	- Conductor losses during continuous operation	W/m		
	- Additional losses at rated voltage and during continuous operation	W/m		

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Maximum mechanical tension on the cable	N		
3.1.3	**Design Characteristics**			
	Type of conductor			
	Conductor material		copper	
	Overall conductor cross section	mm^2		
	Number of conductor cores			
	Core diameter	mm		
	Overall conductor diameter	mm		
	Conductor screen type		semi-conducting screen	
	Conductor screen material			
	Conductor screen thickness	mm		
	Insulation material		XLPE	
	Insulation thickness	mm		
	Nominal overall diameter of insulation	mm		
	Max. continuous operating temperature			
	Compound identification reference			
	Insulation screen type		semi-conducting screen	
	Insulation screen material			
	Insulation screen thickness	mm		
	Water barriers			
	Electric protection/screen type			
	Electric protection/screen material			
	No of electric protection/screen wires			
	Diameter of electric protection/screen wires	mm		
	Electric protection/screen thickness	mm		
	Electric protection/screen cross section	mm^2		
	Short time current density of screen (1sec)	A/mm^2		
	Filler material			
	Armour type			
	Armour material			
	External sheath type			
	External sheath material			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	External sheath thickness	mm		
	External sheath cross section	mm^2		
	Overall cable diameter	mm		
	Minimum cable bending radius	m		
	Cable weight	kg/m		
3.2	**132kV Cables for OHL feeders**			
3.2.1	**General Data**			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type		XLPE insulated with copper conductor with metallic screen	
	Type designation			
	Standards		IEC 60840, IEC 60287, IEC 60949	
3.2.2	**Rated Characteristics**			
	Rated voltage (U_0/U)	kV	76/132	
	Highest voltage for equipment (Um)	kV	145	
	Rated frequency	Hz	50	
	Rated impulse withstand voltage	kV	650	
	Rated one-minute power frequency withstand voltage	kV	275	
	Rated short-time power frequency withstand voltage, 5 min. between conductor and sheath (2.5×U_0)	kV		
	Power frequency test voltage applied after installation, 12 min. (2×U_0)	kV		
	Test DC voltage applied after installation, 15 min.	kV		
	Continuous current carrying capacity per cable for OHL feeder, per phase, at site conditions: – installation in air (concrete cable trench/ cable trough / within substation of 0.7m depth and 2m wide) – max. ambient temperature 50°C – one (1) three- phase circuits laid at the same cable trench – direct bared	A	Min 1600	

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Calculation of continuous cable carrying capacity to be enclosed			
	Cable laying arrangement – cable laying formation (tref/ flat) – number of cables per phase – cable depth – centre of cable below ground level – spacing between phases for flat/tref formation – spacing between circuits	- pcs mm mm mm		
	Cable laying arrangement drawing for which specified current is guaranteed to be enclosed			
	Rated short-time (3 s) withstand current of conductor	kA	40	
	Rated short-time (1 s) withstand current of metallic screen	kA	40	
	Rated peak withstand current	kA	100	
	Maximum conductor temperature during:			
	- Continuous operation	ºC	90	
	- Short-circuit current, 5 s	ºC	250	
	Electrical resistance at 20 °C for:			
	- DC current	Ω/m		
	- AC current	Ω/m		
	Electric protection/screen DC resistance	Ω/m		
	Inductive resistance at 20 °C for AC current	Ω/m		
	Capacitance at 20 °C	pF/m		
	Insulation resistance at 20 °C	MΩ/m		
	Maximum partial discharges at $2 \times U_0$	pC		
	Guaranteed Losses:			
	- Dielectric losses at rated voltage	W/m		
	- Conductor losses during continuous operation	W/m		
	- Additional losses at rated voltage and during continuous operation	W/m		
	Maximum mechanical tension on the cable	N		
3.2.3	**Design Characteristics**			
	Type of conductor			
	Conductor material		copper	
	Overall conductor cross section	mm^2		
	Number of conductor cores			
	Core diameter	mm		

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Overall conductor diameter	mm		
	Conductor screen type		semi-conducting screen	
	Conductor screen material			
	Conductor screen thickness	mm		
	Insulation material		XLPE	
	Insulation thickness	mm		
	Nominal overall diameter of insulation	mm		
	Max. continuous operating temperature			
	Compound identification reference			
	Insulation screen type		semi-conducting screen	
	Insulation screen material			
	Insulation screen thickness	mm		
	Water barriers			
	Electric protection/screen type			
	Electric protection/screen material			
	No of electric protection/screen wires			
	Diameter of electric protection/screen wires	mm		
	Electric protection/screen thickness	mm		
	Electric protection/screen cross section	mm^2		
	Short time current density of screen (1sec)	A/mm^2		
	Filler material			
	Armour type			
	Armour material			
	External sheath type			
	External sheath material			
	External sheath thickness	mm		
	External sheath cross section	mm^2		
	Overall cable diameter	mm		
	Minimum cable bending radius	m		
	Cable weight	kg/m		
4	OUTDOOR CABLE TERMINATIONS			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
4.1	**General Data**			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Type designation			
	Standards		IEC 60840	
	Installation		Outdoor	
4.2	**Site Conditions**			
	Altitude above sea level	m		
	Minimum ambient temperature	°C	-10	
	Maximum ambient temperature	°C	45	
	Daily average temperature	°C	38	
43	**Rated Characteristics**			
	Rated voltage (U0/U)	kV	76/132	
	Highest voltage for equipment (Um)	kV	145	
	Rated frequency	Hz	50	
	Continuous current carrying capacity of the cable	A		
	Rated short-time (3s) withstand current	kA	40	
	Rated peak withstand current	kA	100	
	Maximum conductor temperature during:			
	- Continuous operation	ºC	90	
	- Short-circuit current, 5 s	ºC	250	
	Maximum cable conductor cross section **to be coordinated with 132kV cable for OHL feeder cross section**	mm2		
	Conductor material			
	Diameter over dielectric min. - max.	mm		
	Diameter over sheath max.	mm		
	Screen cross section	mm2		
	Outdoor diameter of the cable	mm		
	Insulator material			
	Termination length	mm		

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Termination diameter	mm		
	Minimum creepage distance to earth	mm	5510	
	Screw/Press connection			
	Weight of completed termination	kg		
	Whether cable termination is complete with all accessories		Yes	
5	**CABLE TERMINATIONS FOR GIS**			
5.1	**General Data**			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type		Plug-in type	
	Type designation			
	Standards		IEC 62271-209, IEC 60840	
	Installation		Indoor, suitable for installation in the GIS cable box	
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**			
	Rated voltage (U0/U)	kV	76/132	
	Highest voltage for equipment (Um)	kV	145	
	Rated frequency	Hz	50	
	Continuous current carrying capacity of the cable	A		
	Rated short-time (3s) withstand current	kA	40	
	Rated peak withstand current	kA	100	
	Maximum conductor temperature during:			
	- Continuous operation	ºC	90	
	- Short-circuit current, 5 s	ºC	250	
	Maximum cable conductor cross section	mm2		

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	to be coordinated with 132kV cables for OHL feeder cross section and for TR feeder cross section			
	Maximum cable conductor cross section	mm2		
	Conductor material			
	Diameter over dielectric min. - max.	mm		
	Diameter over sheath max.	mm		
	Screen cross section	mm2		
	Outdoor diameter of the cable	mm		
	Insulator material		Epoxy resin	
	Colour of the insulator			
	Screw/Press connection			
	Weight of completed termination	kg		
	Whether cable termination is complete with all accessories		Yes	
6	**TRANSFORMER CABLE TERMINATIONS**			
6.1	General Data			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type		Dry / immersed	
	Type designation			
	Standards		IEC 62271-209, IEC 60840, EN 50299	
	Installation		Inside transformer cable box	
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			
	Rated voltage (U0/U)	kV	76/132	
	Highest voltage for equipment (Um)	kV	145	
	Rated frequency	Hz	50	
	Continuous current carrying capacity of the cable	A		

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Rated short-time (3s) withstand current	kA	40	
	Rated peak withstand current	kA	100	
	Maximum conductor temperature during:			
	- Continuous operation	ºC	90	
	- Short-circuit current, 5 s	ºC	250	
	Maximum cable conductor cross section **to be coordinated with 132kV cables for TR feeder cross section**	mm2		
	Maximum cable conductor cross section	mm2		
	Conductor material			
	Diameter over dielectric min. - max.	mm		
	Diameter over sheath max.	mm		
	Screen cross section	mm2		
	Outdoor diameter of the cable	mm		
	Insulator material		Epoxy resin	
	Colour of the insulator			
	Screw/Press connection			
	Weight of completed termination	kg		
	Whether cable termination is complete with all accessories		Yes	
7	**33 kV CABLES**		**FOR EACH TYPE**	
	General Data			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type		XLPE insulated with copper conductor	
	Standards		IEC 60502	
	Rated Characteristics			
	Rated voltage (U_0/U)	kV	18/30	
	Highest voltage for equipment (Um)	kV	36	
	Rated frequency	Hz	50	
	Rated one-minute power frequency withstand voltage	kV		

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Rated short-time power frequency withstand voltage, 5 min. between conductor and sheath (2.5×U_0)	kV		
	Power frequency test voltage applied after installation, 12 min. (2×U_0)	kV		
	Test DC voltage applied after installation, 15 min.	kV		
	Continuous current carrying capacity of the cable	A		
	Rated short-time (3 s) withstand current	kA	31.5	
	Rated peak withstand current	kA	80	
	Maximum conductor temperature during:			
	- Continuous operation	ºC	90	
	- Short-circuit current, 5 s	ºC	250	
	Electrical resistance at 20 °C for:			
	- DC current	Ω/m		
	- AC current	Ω/m		
	Inductive resistance at 20 °C for AC current	Ω/m		
	Capacitance at 20 °C	pF/m		
	Insulation resistance at 20 °C	MΩ/m		
	Maximum partial discharges at 2×U_0	pC		
	Guaranteed Losses:			
	- Dielectric losses at rated voltage	W/m		
	- Conductor losses during continuous operation	W/m		
	- Additional losses at rated voltage and during continuous operation	W/m		
	Maximum mechanical tension on the cable	N		
	Design Characteristics			
	Number of conductor cores			
	Core diameter	mm		
	Overall conductor cross section	mm^2		
	Overall conductor diameter	mm		
	Conductor material		copper	
	Conductor screen type		semi-conducting screen	
	Conductor screen material			
	Conductor screen thickness	mm		

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Insulation material		XLPE	
	Insulation thickness	mm		
	Insulation screen type		semi-conducting screen	
	Insulation screen material			
	Insulation screen thickness	mm		
	Electric protection/screen type			
	Electric protection/screen material			
	Electric protection/screen thickness	mm		
	Electric protection/screen cross section	mm^2		
	Filler material			
	Armour type			
	Armour material			
	External sheath type			
	External sheath material			
	External sheath thickness	mm		
	External sheath cross section	mm^2		
	Overall cable diameter	mm		
	Minimum cable bending radius	m		
	Cable mass	kg/m		
8	**LV CABLES**		**FOR EACH TYPE**	
	LV Incoming Power Supply Cables			
	General Data			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type			
	Standards		IEC 60502	
	Rated Characteristics			
	Rated voltage (U_0/U)	kV	0.6/1	
	Highest voltage for equipment (Um)	kV		
	Rated frequency	Hz	50	
	Rated one-minute power frequency withstand voltage	kV		

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Rated short-time power frequency withstand voltage, 5 min. between conductor and sheath (2.5×U_0)	kV		
	Power frequency test voltage applied after installation, 12 min. (2×U_0)	kV		
	Test DC voltage applied after installation, 15 min.	kV		
	Continuous current carrying capacity of the cable	A		
	Rated short-time (3 s) withstand current	kA	40	
	Rated peak withstand current	kA	100	
	Maximum conductor temperature rise during:			
	- Continuous operation	K		
	- Short-circuit current, 3 s	K		
	Electrical resistance at 20 °C for:			
	- DC current	Ω/m		
	- AC current	Ω/m		
	Inductive resistance at 20 °C for AC current	Ω/m		
	Capacitance at 20 °C	pF/m		
	Insulation resistance at 20 °C	MΩ/m		
	Maximum partial discharges at 2×U_0	pC		
	Guaranteed Losses:			
	- Dielectric losses at rated voltage	W/m		
	- Conductor losses during continuous operation	W/m		
	- Additional losses at rated voltage and during continuous operation	W/m		
	Maximum mechanical tension on the cable	N		
	Design Characteristics			
	Number of conductor cores			
	Core diameter	mm		
	Overall conductor cross section	mm^2		
	Overall conductor diameter	mm		
	Conductor material			
	Conductor screen type			
	Conductor screen material			
	Conductor screen thickness	mm		
	Insulation material			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	Insulation thickness	mm		
	Insulation screen type			
	Insulation screen material			
	Insulation screen thickness	mm		
	Electric protection/screen type			
	Electric protection/screen material			
	Electric protection/screen thickness	mm		
	Electric protection/screen cross section	mm^2		
	Filler material			
	Armour type			
	Armour material			
	External sheath type			
	External sheath material			
	External sheath thickness	mm		
	External sheath cross section	mm^2		
	Overall cable diameter	mm		
	Minimum cable bending radius	m		
	Cable mass	kg/m		
	Other LV Power Cables			
	General Data			
	Manufacturer/Country of origin			
	Type			
	Standards			
	Rated Characteristics			
	Rated voltage (U_0/U)	kV	0.6/1	
	Highest voltage for equipment (Um)	kV		
	Rated frequency	Hz	50	
	Test voltage			
	Other Characteristics		According to Contractor's Design approved by Client	
9	**11 kV CABLES**			

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	General Data			
	Manufacturer			
	Place and country of Manufacture			
	Place of Factory Inspection and Testing			
	Type		XLPE insulated with copper conductor	
	Standards		IEC 60502	
	Rated Characteristics			
	Rated voltage (U0/U)	kV		
	Highest voltage for equipment (Um)	kV		
	Rated frequency	Hz		
	Rated one-minute power frequency withstand voltage	kV		
	Rated short-time power frequency withstand voltage, 5 min. between conductor and sheath (2.5×U0)	kV		
	Power frequency test voltage applied after installation, 12 min. (2×U0)	kV		
	Test DC voltage applied after installation, 15 min.	kV		
	Continuous current carrying capacity of the cable	A		
	Rated short-time (1 s) withstand current	kA		
	Rated peak withstand current	kA		
	Maximum conductor temperature during:			
	- Continuous operation	°C	90	
	- Short-circuit current, 5 s	°C	250	
	Electrical resistance at 20 °C for:			
	- DC current	Ω/m		
	- AC current	Ω/m		
	Inductive resistance at 20 °C for AC current	Ω/m		
	Capacitance at 20 °C	pF/m		
	Insulation resistance at 20 °C	MΩ/m		
	Maximum partial discharges at 2×U0	pC		
	Guaranteed Losses:			
	- Dielectric losses at rated voltage	W/m		
	- Conductor losses during continuous operation	W/m		

ITEM	DESCRIPTION	UNIT	DATA	
			Required	Offered
	- Additional losses at rated voltage and during continuous operation	W/m		
	Maximum mechanical tension on the cable	N		
	Design Characteristics			
	Number of conductor cores			
	Core diameter	mm		
	Overall conductor cross section	mm2		
	Overall conductor diameter	mm		
	Conductor material		copper	
	Conductor screen type		semi-conducting screen	
	Conductor screen material			
	Conductor screen thickness	mm		
	Insulation material		XLPE	
	Insulation thickness	mm		
	Insulation screen type		semi-conducting screen	
	Insulation screen material			
	Insulation screen thickness	mm		
	Electric protection/screen type			
	Electric protection/screen material			
	Electric protection/screen thickness	mm		
	Electric protection/screen cross section	mm2		
	Filler material			
	Armour type			
	Armour material			
	External sheath type			
	External sheath material			
	External sheath thickness	mm		
	External sheath cross section	mm2		
	Overall cable diameter	mm		
	Minimum cable bending radius	m		
	Cable mass	kg/m		