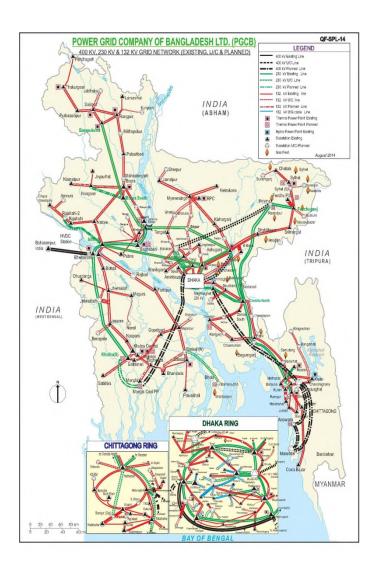
Financial Cooperation with Bangladesh

BMZ No. 2012 66 436

Transmission System Improvement Western Zone



Tender Documents for Design, Supply, Installation, Testing & Commissioning of 230/132 kV and 132/33 kV Substations, Northern Zone, on Turnkey Basis

Contract No. PGCB/KfW/2012.66.436/NZSS

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1. Schedule A: Introduction and Preamble to the Price and Technical Schedules

1.1 Brief Description of the Overall Project

Providing access to affordable and reliable electricity to all citizens is a national goal of the Government of Bangladesh (GoB). In 1996, the GoB split the transmission segment and formed the Power Grid Company of Bangladesh (PGCB). PGCB is fully responsible for all transmission assets.

Bangladesh is facing chronic power shortages that could undermine its economic sustainability. Inadequate, irregular power and poor quality power supply were identified to be the major constraints for sustaining economic growth and development of the country.

PGCB launched a vast program for the improving and strengthening of its transmission system. The objective is expansion and strengthening of the 230 kV and 132 kV transmission systems of the Western Zone. The project spreads over eleven (11) regions, i.e. Ishurdi, Rajshahi, Baghabari, Bangura, Jhenaidah, Rajbari, Miithapukur, Khulna, Gopalgani, Mongla and Bagherhat.

The aim of the system expansion is to contribute to an efficient power transmission in PGCB's transmission system, to eliminate the operational bottlenecks and to provide an adequate infrastructure for future power sector development.

The GoB received from the German Government financial assistance to be used for strengthening the transmission system in the country, especially the 230 kV and 132 kV transmission facilities. KfW will provide a loan, while the remaining costs will be financed from PGCB funds.

1.2 Description of this Package

The work covered by this specification for the construction of new and the extension and renovation of existing 230/X kV and 132/X kV AIS substations and civil works is outlined below.

The scope of works under this turnkey contract is: design, supply, manufacture, quality assurance, inspection and testing, delivery, new packing for export, insurance, shipment & transport to the site, complete construction and installation, jointing, terminating, bonding, earthing, painting, setting to work, site testing and commissioning, defect liability for all equipment, including all civil works.

Especially the civil design has to incorporate countermeasures against flooding so as not to affect any substation equipment during the wet season. Given the recorded past maximum flood water level in the project area, sufficient ground level height for land formation is required at the Contractor's responsibility.

The Contractor's responsibility is to provide that all parts of the works are completed in every respect for commercial operation, to the requirements of the Engineer.

All details, accessories etc. required for the complete installation and satisfactory operation of the works not specifically mentioned in this specification are deemed included in the contract price.



The Contractor is responsible for ensuring that all and/or any item(s) of work required for the safe, efficient and satisfactory completion and functioning of the works, are included in the Bid Price whether they be described in the specification or not.

In case of extension & renovation works, not all required as-built drawings may be available for the existing plants & equipment that are required to be modified/renovated; the Contractor is also responsible to make drawings as required to complete the works.

The Bidder shall be deemed to have visited site, inspected, gathered data and verified details of the as-built system in order to design, supply and interface their new equipment.

All necessary materials, adjustments, dismantling, remedial and tiding-up work in order to complete the work specified shall be included in the contract price.

The Contractor is responsible for ensuring that all and/or and any item(s) of work required for the safe, efficient and satisfactory completion and functioning of the works, are included in the Bid Price whether they be described in the specification or not.

The bid price shall include costs of witnessing of factory acceptance tests by the Employer's Engineer (three Engineers in each visit, maximum seven days for each visit) for power transformers 230/132 kV, power transformers 132/33 kV, circuit breakers 230 and 132 kV, disconnectors 230 and 132 kV, instrument transformers 230 and 132 kV, substation automation system, protection relays, and communication equipment.

Factory acceptance tests shall be organized separately for each equipment. In case both equipment 230 kV and 132 kV (circuit breakers, disconnectors, instrument transformers) will be manufactured at the same location, one Factory Acceptance Test shall be foreseen.

The bid price shall include costs of training at the Manufacturer's premises for four Employers' Engineer (each for a period of maximum fourteen days) for installation, testing, operation and maintenance of OLTC, circuit breakers 230 and 132 kV, substation automation system equipment, protection equipment, DFDR, and communication equipment.

The bid price shall include costs of training during and after the installation. The Contractor should provide trainer(s) (authorised by the Manufacturer for on-site training on operation and maintenance of the works, for each new substation, for no more than 15 (fifteen) Employer's staff for minimum 1 (one) week.

The bid price shall include supply and delivery of mandatory spare parts, maintenance tools and test equipment.

The bid price shall include all other miscellaneous works required.

The drawings provided in the bidding documents are indicative only and hence the entire scope of works is not fully reflected in those drawings.

The programme of works shall be as shown in Schedule C of times for delivery and completion. Within one month of acceptance of the bid, the Contractor shall submit a programme chart detailing times required for the design, supply, delivery, installation, testing and commissioning for the complete work.

The descriptions presented below outline the basic requirements for each Section of the Works. This



is not intended to detail each and every item necessary to complete the works, but to outline the facilities to be provided under the contract.

The Contractor shall be responsible for ensuring that all items necessary for the safe, efficient and complete functioning of the work in compliance with the Specification are provided, whichever they described or not.

The following method of reference shall be used to identify the various required items:

Denomination	Description
Α	245 kV switchgear
В	145 kV switchgear
С	36 kV switchgear
D	235/132/33 kV auto transformers and 132/33 kV transformers
Е	Neutral earthing equipment
F	Earthing / auxiliary transformers
G	Control, protection, substation automation and metering etc.
Н	Fibre optic multiplexer equipment for communication and protection
I	Multicore low voltage power and control cables
J	Batteries, chargers and dc distribution
K	LVAC distribution
L	Civil works, building and foundations
М	Building lighting, small power and air conditioning
N	Switchyard lighting
Р	Earthing and lightning protection

The Contractor is to carry out the works taking full account of the limitations imposed by existing sites and the requirement to maintain all existing supplies during the construction works.

Any temporary works, structures, connections, etc., necessary to achieve this requirement are to be included in the bid price.

The works under this contract include the following:

- Extension of the new 230/132 kV Substation Rajshahi
- New 132/33 kV Substation Bangura
- Extension of the existing 132/33 kV Substation Baghabari
- New 132/33 kV Substation Milthapukur

1.2.1 Extension of the new 230/132 kV Substation Rajshahi

The scope of work under this contract includes design, supply, delivery, installation, testing & commissioning of:

- complete new 230/132/33kV air insulated switchgear (AIS) substation.
- 230 kV double busbar system, two (2) 230 kV overhead line bays (Bheramara HVDC-1 and Bheramara HVDC-2), two (2) 230 kV transformer bays, one (1) 230 kV bus coupler bay and space



for future extension for four (4) 230 kV bays

• two (2) three phase, 230/132/33 kV, 225/300 MVA autotransformers,

The 132 kV part of the substation, including two (2) 132 kV transformer bays for connection of two (2) three phase, 230/132/33 kV, 225/300 MVA autotransformers, **is not in the scope of works** and shall be built under another project.

The scope of work furthermore includes:

- design, supply, delivery, installation, connection with existing equipment, testing & commissioning
 of associated substation control and monitoring system, relay protection, metering, telecommunication, AC & DC auxiliary power supply, cables, metal structure, earthing and lightning protection,
- extension of the existing substation automation/control & monitoring system
- land development of the complete required 230 kV switchyard area by cutting, land filling, compacting up to a suitable level; general land development for other parts of the substation will be done by another project.
- the approximate total area of the substation is 15 acres; the area required for the 230 kV switchyard part is approx. 10 acres.
- complete outdoor civil works for the required 230 kV switchyard area, including 230 kV gantry foundation, 230 kV and 33 kV equipment foundation, power transformer foundations, oil pit, blast wall, part of the security boundary wall around the required 230 kV switchyard, internal roads, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing,
- complete civil works and facilities for **extension of existing** control building, including finishing works like rendering, colour, floor finishing, etc.,
- supply and delivery of mandatory spare parts, maintenance tools and test equipment.

The equipment to be supplied, installed and commissioned is shown on the bid drawings.

1 A	245 kV switchgear, equipment connection and steel structures
	One (1) set of complete equipment for switchgear 230 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following:
1A1.1	Two (2) sets of 245 kV, 3150A, 50kA, 50Hz, 1050/460 kV BIL, live tank type, SF_6 gas circuit breakers with three spring-stored energy operating mechanism.
1A1.2	Three (3) sets of 245 kV, 3150A, 50kA, 50Hz, 1050/460 kV BIL, live tank type, SF6 gas circuit breakers with one spring-stored energy operating mechanism.
1A2.1	Two (2) sets of 245kV, 3150A, 50kA, 50Hz, 1050/460 kV BIL, three pole, centre break, post type, motor operated disconnectors with motor-operated earthing switches.
1A2.2	Two (2) sets of 245kV, 2.000A, 50kA, 50Hz, 1050/460 kV BIL, three pole, centre break, post type, motor operated disconnectors with motor-operated earthing switches.
1A2.3	Eight (8) sets of 245kV, 2000A, 50kA, 50Hz, 1050/460 kV BIL, three pole, centre break, post type, motor operated disconnectors.
1A3.1	Three (3) single-phase, 5-core, multi ratio, 245kV, 3200-1600/1A, 50kA, 50Hz, 1050/460 kV BIL, post type current transformer.
1A3.2	Twelve (12) single-phase, 5-core, multi ratio, 245kV, 1600-800/1A, 50kA, 50Hz, 1050/460 kV BIL, post type current transformer.



1A4	Twelve (12) single-phase, 2-secondary winding, 245kV, 230/V3 / 110/V3 / 110/V3 kV/V/V, 50kA, 50Hz, 1050/460 kV BIL, capacitor type voltage transformers.
1A5	Twelve (12) 245kV, 192kV continuous operating voltage, 10kA nominal discharge current, 50Hz, Heavy duty station class, gapless metal oxide type, single phase surge arresters.
1A7.X	One (1) lot of conductors for double busbar and for connection of the 230 kV switchgear, 245 kV, 3150 & 2000 A, 50 kA.
1A8.X	One (1) lot of insulators and fittings including all necessary clamps and connectors required for completing 230 kV switchgear.
1A9.X	One (1) lot of gantry steel structures and equipment supports required for completing 230 kV switchgear.
1A10.X	All other necessary material and equipment to complete 230 kV switchgear.
1C	36 kV Switchgear, equipment connection and steel structures
	One (1) set of complete equipment for switchgear 33 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following:
1C5	Six (6) 36kV, 30kV continuous operating voltage, 10kA nominal discharge current, 50Hz, 170/70 kV BIL, gapless metal oxide type, single phase surge arresters.
1C7.X	One (1) lot of conductors for connection of the 33 kV switchgear, 36 kV, 2000A, 25 kA.
1C8.X	One (1) lot of insulators and fittings including all necessary clamps and connectors required for completing 33 kV switchgear.
1C9.X	One (1) lot of gantry steel structures and equipment supports required for completing 33 kV switchgear.
1C10.X	All other necessary material and equipment to complete 33 kV switchgear.
1D	Transformers
1D1	Two (2) 235/132/33 kV three phase 225/300 MVA, YNa0d1, ONAN/ONAF, Auto transformer unit, equipped with 33 kV tertiary winding (brought out to terminal bushings) shall be designed, calculated, supplied, delivered, installed, tested and commissioned, under this contract.
1D3	Two (2) sets of Nitrogen Injection Fire Protection System (NIFPS) shall be provided for the new 235/132/33 kV, three phase, 225/300 MVA, YNa0d1, ONAN/ONAF, autotransformer units
1D10.X	All other necessary material and equipment to complete transformers
1 G	Control, Protection, Substation Automation and Metering - Extension of the Existing System New equipment shall be integrated into the existing system. One (1) lot of complete equipment for control, protection, alarm, SAS and metering panels for the 230 kV system shall be designed, calculated, supplied, delivered, installed, tested and commissioned, under this contract. The sequence of the control panels and protection panels shall mirror the actual switchyard layout. Space shall be provided adjacent to the control and relay suites for each voltage level to accommodate sufficient panels for the future circuits indicated in the substation layout drawings. A control panel shall accommodate complete switchgear.



	200 IA/ transmission line mustastica aclass acres of Mais 4 0 Mais 2 0 controlled 1 H I
	230 kV transmission line protection relay panels of Main-1 & Main-2 protection shall be supplied and installed. The equipment to be supplied, installed and commissioned is shown on Bid Drawings comprising the following.
1G1.1	Control, protection and SAS for two (2) sets of 230kV Overhead Line circuits
1G2.1	Control, protection and SAS for two (2) set of 235/132/33kV Auto Transformer circuit and associated Earthing/Auxiliary Transformer circuits.
1G3.1	Busbar 230 kV protection panels in one (1) lot.
1G4.X	Tariff metering panel(s) to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh and MVAr meters (accuracy class 0.2) for each line and transformer feeder. For each feeder, minimum two (2) meters (main-1 & main-2) are to be provided.
1G5.X	Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders.
1G6.X	One (1) lot of hardware and software to provide telecontrol & telemetering facilities required both at the existing National Load Despatch Centre (NLDC) at Aftabnagar and the back-up station at Biddut Bhaban for integration of the complete new 230/132 kV substation. All required electrical signals shall be transmitted to the NLDC and the back-up station through the industrial gateway of the substation automation system. All HV circuit breakers, motorized disconnectors, tap changer, etc., shall be controlled from the NLDC through the gateway of the substation automation system using the IEC 60870-5-104 protocol. All necessary modification works in the software of the master station of the NLDC and the
1G7.X	back-up station are to be carried out. Extension of the existing equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment in NLDC
1G10.X	All other necessary material and equipment to complete control, protection, substation automation and metering system.
1H	Fibre Optic Multiplexer Equipment for Teleprotection and Communication
1H1.X	Fibre Optic Multiplexer Equipment - Extension of the Existing System New equipment shall be integrated into the existing system. One (1) set of complete equipment for indoor fibre optic multiplexer equipment for protection & communication at substation shall be designed, supplied, delivered, installed, tested and commissioned, under this contract. Fibre optic multiplexer equipment is to be provided for. Distance relay carrier signal (main and back-up) Bus protection / breaker failure relay SCADA data from switchgear and control system Hot-line telephone system
1H3.X	One (1) lot of underground optical fibre (48 cores) cables from terminal box at gantry structure to MDF (Main distribution Frame) shall be designed, supplied, delivered, installed, tested and commissioned in control room. The Contract includes supply and installation of MDF and digital cables with adequate length.



41	Multipara Law Voltage Assellians Down and Control Cobles
11	Multicore Low Voltage Auxiliary Power and Control Cables One (1) complete set of multicore low voltage auxiliary power and control cables between
1I1.X	all items of equipment supplied under the contract and for connection and integration of the new equipment with the existing equipment shall be designed, supplied, delivered, installed, tested and commissioned with necessary gland, terminated, and identified by colours & tags. The production of the overall substation cable routing and core schedules shall also be provided.
1I10.X	All other necessary material and equipment to complete LV auxiliary power and control cables.
1J	LV DC, Batteries, Chargers and DC Distribution
1J1.X	 Extension of the existing system. New equipment shall be integrated into the existing system. One (1) set of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned, to provide extension of the existing LV DC auxiliary power supply and for connection and integration of new equipment with the existing equipment. One (1) set DC distribution switchboard.
1J2.X	 Extension of the existing system. New equipment shall be integrated into the existing system. One (1) set of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned, to provide extension of the existing 48V DC auxiliary power supply and for connection and integration of new equipment with the existing equipment. One (1) set DC distribution switchboard.
1J10.X	All other necessary material and equipment to complete LV DC distribution system.
1K	LV AC Distribution
1K1.X	 Extension of the existing system. New equipment shall be integrated into the existing system. One (1) set of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned, to provide extension of the existing LV AC auxiliary power supply and for connection and integration of new equipment with the existing equipment One (1) set AC distribution switchboard.
1K10.X	All other necessary material and equipment to complete LV AC distribution system.
1L	Civil Works, Control Building and Foundations
1L1.X	 One (1) lot of complete land development of required 230 kV switchyard area as shown in the bid drawing by cutting, land filling, compacting up to a suitable level. General land development for other parts of the substation will be done by another project; the approximate total area of the substation is 15 acres. The area required for the 230 kV switchyard part is approx. 10 acres.



1L2.X	One (1) lot of complete design, supply and construction of outdoor civil works of required 230 kV switchyard area , including 230 kV gantry foundation, 230 kV and 33 kV equipment foundation, power transformers foundation, oil pit, blast wall, part of the security boundary wall around the required 230 kV switchyard , internal roads, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing
1L3.X	One (1) lot of complete design, supply and construction of civil works and facilities for extension of the existing control building, including finishing works such as rendering, colour, floor finishing, etc.
1N	Switchyard Lighting
1N1.X	One (1) set of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned, to provide extension of the existing switchyard lighting for security, roadway and switchyard and emergency DC lighting at strategic locations for equipment operations and inspections.
1P	Earthing and Lightning Protection
1P.1.X	One (1) set of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned, to provide extension of the existing earthing system and lightning protection screen including connections, connectors and clamps, to suit the substation overall arrangement and provide supporting design calculations.
1P.2	Two (2) sets of 3-phase portable (maintenance) earthing equipment devices with connectors and telescopic glass fibre operating pole suitable for plant supplied.

1.2.2 New 132/33 kV Substation Bangura

The scope of work under this turnkey contract is design, supply, delivery, installation, testing & commissioning of:

• complete new 132/33kV air insulated switchgear (AIS) substation.

The scope of work under this turnkey contract includes design, supply, delivery, installation, connection with existing equipment, testing & commissioning of

- 132 kV single busbar system, one (1) 132 kV overhead line bays (Baghabari), two (2) 132 kV transformer bays and space for future extension for six (6) 132 kV bays
- two (2) three phase, 132/33 kV, 50/75 MVA power transformers,
- 33 kV single busbars system, two (2) 33 kV transformer bays, two (2) 33 kV auxiliary power transformer bays, one (1) bus coupler bay and space for eight (8) 33 kV bays
- two (2) three phase, 33/0.415 kV, 200 kVA, auxiliary power transformers
- associated substation control and monitoring system, relay protection, metering, telecommunication, AC & DC auxiliary power supply, cables, metal structure, earthing and lightning protection
- land development of complete switchyard area by cutting, land filling, compacting up to a suitable level including slope protection; the approximate total area of the substation is 5 acres.
- complete outdoor civil works, including 132 kV and 33 kV gantry foundations, 132 kV and 33 kV equipment foundations, power transformers and auxiliary transformer foundations, oil pit, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surface.



ing

- complete civil works and facilities for new two-storey control room building with cable basement, including foundation works, superstructure works, finishing works such as rendering, colour, water supply, sanitary, floor finishing, rain water drainage system, lightning protection, water supply including deep tube well for drinking water, pump house, pump, water reservoir, water pipe lines, etc., sewage facilities including septic tank, etc.
- supply and delivery of mandatory spare parts, maintenance tools and test equipment.

The equipment to be supplied, installed and commissioned as shown on the bid drawings.

1B	145 kV Switchgear, equipment connection and steel structures
	One (1) set of complete equipment for switchgear 132 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following:
1B1.1	One (1) sets of 145 kV, 1250 A, 40 kA, 50 Hz, 650/275 kV BIL, live tank type, SF6 gas circuit breakers with three spring-stored energy operating mechanism.
1B1.4	Two (2) sets of 145 kV, 1250 A, 40 kA, 50 Hz, 650/275 kV BIL, live tank type, SF6 gas circuit breakers with one spring-stored energy operating mechanism.
1B2.3	One (1) sets of 145 kV, 1250 A, 40 kA, 50 Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnectors with motor-operated earthing switches
1B2.5	Three (3) sets of 145 kV, 1250 A, 40 kA, 50 Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnectors.
1B3.2	Nine (9) single-phase, 5-core, multi ratio, 145 kV, 1600-800-400/1A, 40 kA, 50 Hz, 650/275 kV BIL, post type current transformer.
1B4	Six (6) single-phase, 2-secondary winding, 145 kV, 130/V3 / 110/V3 / 110/V3 kV/V/V, 40 kA, 50 Hz, 650/275 kV BIL, capacitor type voltage transformers.
1B5	Nine (9) 145 kV, 120 kV continuous operating voltage, 10 kA nominal discharge current, 50 Hz, Heavy duty station class, gapless metal oxide type, single phase surge arresters.
1B6	Three (3) sets of 145 kV, 50 Hz, 650/275 kV BIL, single pole, post insulators.
1B7.X	One (1) lot of conductors for single busbar and for connection of the 132 kV switch-gear, 145 kV, 2000 A and 1250 A, 40 kA.
1B8.X	One (1) lot of insulators and fittings including all necessary clamps and connectors required for completing 132 kV switchgear.
1B9.X	One (1) lot of gantry steel structures and equipment supports required for completing 132 kV switchgear.
1B10.X	All other necessary material and equipment to complete the 132 kV switchgear.
1C	36 kV Switchgear, equipment connection and steel structures
	One (1) set of complete equipment for switchgear 33 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following:
1C1	Two sets of 36 kV, 1600 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, vacuum circuit breaker, for outdoor installation with one spring-stored energy operating mechanism
1C2.1	Three (3) sets of 36 kV, 1600 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre break, post type, manually operated disconnectors



1C2.2	Two (2) sets of 36 kV, 100 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, centre break, post type, manually operated disconnectors with integrated fuse of 10 A
1C3.1	Six (6) single-phase, 4-core, single ratio, 36 kV, 1600/1A, 25 kA, 50 Hz, 170/70 kV BIL, post type current transformer.
1C3.2	Six (6) (12) single-phase, 4-core, single ratio, 36 kV, 10/1A, 25 kA, 50 Hz, 170/70 kV BIL, post type current transformer.
1C4	Twelve (12) single-phase, 2-secondary winding, 36 kV, 33/V3 / 110/V3 / 110/V3 kV/V/V, 25 kA, 50 Hz, 170/70 kV BIL, inductive type voltage transformers.
1C5	Six (6) 36 kV, 30 kV continuous operating voltage, 10 kA nominal discharge current, 50 Hz, 170/70 kV BIL, gapless metal oxide type, single phase surge arresters.
1C7.X	One (1) lot of conductors for double busbar and for connection of the 33 kV switchgear, 36 kV, 2000 A, 25 kA.
1C8.X	One (1) lot of insulators and fittings including all necessary clamps and connectors required for completing 33 kV switchgear.
1C9.X	One (1) lot of gantry steel structures and equipment supports required for completing 33 kV switchgear.
1C10.X	All other necessary material and equipment to complete the 33 kV switchgear.
1D	Transformers
1D2	Two (2) 132/33 kV three phase 50/75 MVA, Dyn1, ONAN/ONAF Power transformer unit shall be designed, calculated, supplied, delivered, installed, tested and commissioned, under this contract.
1D4	Two (2) sets of water-spray fire protection system shall be provided for new 132/33 kV three phase 50/75 MVA, Dyn1, ONAN/ONAF power transformer units
1D10.X	All other necessary material and equipment to complete the transformers
1F	Earthing/Auxiliary Transformers
1F2	Two (2) 200 kVA, 33/0.4 kV, Dyn11, 3-phase earthing transformers to supply the substation auxiliary loads shall be designed, calculated, supplied, delivered, installed, tested and commissioned, under this contract.
1F10.X	All other necessary material and equipment to complete the auxiliary transformers.
1G	Control, Protection, Substation Automation and Metering One (1) lot of complete equipment for control, protection, alarm, SAS and metering panels for 132, 33 kV as well as LV AC and LV DC system shall be designed, calculat- ed, supplied, delivered, installed, tested and commissioned, under this contract. The sequence of the control panels and protection panels shall mirror the actual switchyard layout. Space shall be provided adjacent to the control and relay suites for each voltage level to accommodate sufficient panels for the future circuits indicated in the substation layout drawings. A control panel shall accommodate the complete switchgear. 132 kV transmission line protection relay panels of Main-1 & Main-2 protection shall be supplied and installed. The equipment to be supplied, installed and commissioned is shown on Bid Drawings comprising the following.
1G1.2	Control, protection and SAS for one (1) sets of 132 kV overhead line circuit.
	, ,



1G2.2	Control, protection and SAS for two (2) set of 132/33 kV power transformer circuit.
1G3.X	Busbar protection panels in one (1) lot.
1G4.X	Tariff metering panel(s) to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh and MVAr meters (accuracy class 0.2) for each line, transformer feeder and auxiliary transformer. For each feeder, minimum two (2) meters (main-1 & main-2) are to be provided.
1G6.X	One (1) lot of hardware and software to provide telecontrol & telemetering facilities required both at the existing National Load Despatch Centre (NLDC) at Aftabnagar and Back up station at Biddut Bhaban for integration of complete new 132/33 kV Substation. All required electrical signals shall be transmitted to the NLDC and Back up station through the Industrial Gateway of the Substation automation system. All HV circuit breakers, motorized disconnectors, tap changer, etc., shall be controlled from NLDC through the Gateway of the Substation automation system using IEC 60870-5-104 protocol. All necessary modification works in the software of the master station of the NLDC and the back-up station are to be carried out.
1G7.X	Extension of the existing equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment in NLDC
1G10.X	All other necessary material and equipment to complete the control, protection, substation automation and metering system.
1H	Fibre Optic Multiplexer Equipment for Teleprotection and Communication
1H1.X	Fibre Optic Multiplexer Equipment One (1) set of complete equipment for Indoor Fibre Optic Multiplexer Equipment for protection & communication at substation shall be designed, supplied, delivered, installed, tested and commissioned, under this contract. Fibre optic multiplexer equipment is to be provided for. • Distance relay carrier signal (main and back-up) • Bus-protection / breaker failure relay • SCADA data from switchgear and control system • Hot-line telephone system
1H2.X	One (1) set of complete equipment for Telephone System shall be designed, supplied, delivered, installed, tested and commissioned
1H3.X	One (1) lot of underground optical fibre (48 cores) cables from terminal box at gantry structure to MDF (Main distribution Frame) shall be designed, supplied, delivered, installed, tested and commissioned in control room. The contract includes supply and installation of MDF and digital cables with adequate length.
11	Multicore Low Voltage Auxiliary Power and Control Cables
111.X	One (1) lot complete set of multicore low voltage auxiliary power and control cables between all items of equipment supplied under the Contract shall be designed, supplied, delivered, installed, tested and commissioned with necessary gland, terminated, and identified by colours & tags. The production of the overall substation cable routing and core schedules shall also be provided.
	All other necessary material and equipment to complete the LV auxiliary power and



1J	LV DC, Batteries, Chargers and DC Distribution	
1J1.X	 One (1) lot consists of two (2) sets 110 V substation alkaline batteries complete with chargers and distribution switchboard shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide all DC supplies to equipment being supplied for the new substation. One set shall be used as standby supply. The system shall generally be as shown in the bid drawings and shall include the following. (a) Two (2) sets Ni-cadmium 100% batteries complete, each capacity shall not be less than 400 Ah at the 5-hour rate of discharge. (b) Two (2) sets battery chargers complete, each float charge shall not be less than 75 A rating. (c) One (1) set DC distribution switchboard. 	
1J2.X	One (1) lot consists of two (2) sets of 48V DC system complete with chargers and distribution switchboard shall be designed, supplied, delivered, installed, tested and commissioned in the control building to provide all DC supplies for fibre optic multiplexure equipment for communication and protection. One set shall be used as standby supply. The system shall generally be as shown in Bid Drawings and shall include the following. (a) Two (2) sets 100% Ni-cadmium batteries complete, each capacity shall not be less than 250 Ah at the 5-hour rate of discharge. (b) Two (2) sets battery chargers complete, each float charge shall not be less than 50 A rating. (c) One (1) set DC distribution switchboard.	
1J10.X	All other necessary material and equipment to complete the LV DC distribution system.	
1K	LV AC Distribution	
1K1.X	One (1) set LV AC switchboard for substation services shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide the 400/230V supplies to all equipment being supplied. The system shall generally be as per Bid Drawings and shall include one 125A outdoor weatherproof, 3-phase with neutral and earth switched socket outlet and plug to IEC 60309; to be installed, cabled and connected adjacent to the auto transformers.	
1K10.X	All other necessary material and equipment to complete the LV AC distribution system.	
1L	Civil Works, Control Building and Foundations	
1L1.X	One (1) lot of complete land development of complete switchyard area as shown in the bid drawing by cutting, land filling, compacting up to a suitable level including slope protection; The approximate total area of the substation is 5 acres.	
1L2.X	One (1) lot of complete design, supply and construction of outdoor civil works, including 132 kV and 33 kV gantry foundation, 132 kV and 33 kV equipment foundation, power transformers and auxiliary transformer foundations, oil pit, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing	
1L3.X	One (1) lot of complete design, supply and construction of civil works and facilities for a new two-storey control room building with cable basement, including foundation works,	



	super structure works, finishing works like rendering, colour, water supply, sanitary, floor finishing, rain water drainage system, lightning protection, water supply including deep tube well for drinking water, pump house, pump, water reservoir, water pipe lines, etc., sewage facilities including septic tank, etc.
1M	Building Lighting, Small Power, Air Conditioning and Ventilation
1M1.X	One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned, to provide lighting, LV power supply, air conditioning system, ventilation and emergency DC lighting for the substation control building.
1N	Switchyard Lighting
1N1.X	One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned, to provide switchyard lighting for security, roadway and switchyard and emergency DC lighting at strategic locations for equipment operations and inspections.
1P	Earthing and Lightning Protection
1P1.X	One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned, of earthing system and lightning protection screen including connections, connectors and clamps, to suit the substation overall arrangement and provide supporting design calculations.
1P2	Two (2) sets of 3-phase portable (maintenance) earthing equipment devices with connectors and telescopic glass fibre operating pole suitable for plant supplied.

1.2.3 Extension of the Existing 132/33 kV Substation Baghabari

The existing 230/132 kV substation has a 132 kV switchyard, with one and half breaker arrangement. One (1) existing, fully equipped 132 kV bay shall be used.

The scope of work under this turnkey contract is:

- re-testing & re-commissioning of a one (1) existing 132 kV overhead line bay.
- supply, delivery, installation, connection with existing equipment, **if any**, testing & commissioning of associated control and relay protection, metering, telecommunication, AC & DC auxiliary power supply, cables, metal structure, earthing and lightning protection and associated civil works.

The equipment to be supplied, installed and commissioned is shown on the bid drawings.

1B	145 kV Switchgear, equipment connection and steel structures					
	One (1) existing, fully equipped 132 kV shall be re-tested and re-commissioned, under this contract.					
1B10.X	All other necessary material and equipment, if any, to complete the 132 kV switchgear.					
1G	Control, Protection, Substation Automation and Metering One (1) existing, fully equipped 132 kV shall be re-tested and re-commissioned, under this contract.					
1G7.X	Extension of the existing equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment in NLDC					



All other necessary material and equipment, if any, to complete the control, protection, substation automation and metering system.
Fibre Optic Multiplexer Equipment for Teleprotection and Communication
One (1) existing, fully equipped 132 kV shall be re-tested and re-commissioned, under this
contract.
Multicore Low Voltage Auxiliary Power and Control Cables
One (1) existing, fully equipped 132 kV shall be re-tested and re-commissioned, under this contract.
All other necessary material and equipment, if any, to complete the LV auxiliary power and control cables.
LV DC, Batteries, Chargers and DC Distribution
One (1) existing, fully equipped 132 kV shall be re-tested and re-commissioned, under this
contract.
All other necessary material and equipment, if any, to complete the LV DC distribution sys-
tem.
LV AC Distribution
One (1) existing, fully equipped 132 kV shall be re-tested and re-commissioned, under this contract.
All other necessary material and equipment, if any, to complete the LV AC distribution sys-
tem.
Earthing and Lightning Protection
One (1) existing, fully equipped 132 kV shall be re-tested and re-commissioned, under this
contract.
All other necessary material and equipment, if any, to complete the earthing and lightning
protection system.

1.2.4 New 132/33 kV Substation Miithapukur

The scope of work under this turnkey contract is design, supply, delivery, installation, testing & commissioning of:

complete new 132/33kV air insulated switchgear (AIS) substation.

The scope of work under this turnkey contract includes design, supply, delivery, installation, connection with existing equipment, testing & commissioning of

- 132 kV double busbar system, four (4) 132 kV overhead line bays (Palashbari-1, Palashbari-2, Rangur-1 and Rangur-2), two (2) 132 kV transformer bays, one (1) 132 kV bus coupler bay and space for future extension for four (4) 132 kV bays
- two (2) three phase, 132/33 kV, 50/75 MVA power transformers,
- 33 kV single busbars system, two (2) 33 kV transformer bays, two (2) 33 kV auxiliary power transformer bays, one (1) bus coupler bay and space for eight (8) 33 kV bays
- two (2) three phase, 33/0.415 kV, 200 kVA, auxiliary power transformers
- associated substation control and monitoring system, relay protection, metering, telecommunication, AC & DC auxiliary power supply, cables, metal structure, earthing and lightning protection
- land development of complete switchyard area by cutting, land filling, compacting up to a suitable level including slope protection; the approximate total area of the substation is 5 acres.
- complete outdoor civil works, including 132 kV and 33 kV gantry foundation, 132 kV and 33 kV equipment foundation, power transformer and auxiliary transformer foundations, oil pit, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road,



internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing

- Complete civil works and facilities for new two-storey control room building with cable basement, including foundation works, super structure works, finishing works like rendering, colour, water supply, sanitary, floor finishing, rain water drainage system, lightning protection, water supply including deep tube well for drinking water, pump house, pump, water reservoir, water pipe lines, etc., sewage facilities including septic tank, etc.
- supply and delivery of mandatory spare parts, maintenance tools and test equipment. The equipment to be supplied, installed, and commissioned is shown on the bid drawings.

1B	145 kV Switchgear, equipment connection and steel structures			
	One (1) set of complete equipment for switchgear 132 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following:			
1B1.1	Four (4) sets of 145 kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF ₆ gas circuit breakers with three spring-stored energy operating mechanism.			
1B1.3	One (1) sets of 145 kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF ₆ gas circuit preakers with one spring-stored energy operating mechanism.			
1B1.4	Two (2) sets of 145 kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, live tank type, SF ₆ gas circuit breakers with one spring-stored energy operating mechanism.			
1B2.2	Two (2) sets of 145kV, 2000A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnectors with motor-operated earthing switches			
1B2.3	Four (4) sets of 145kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnectors with motor-operated earthing switches.			
1B2.5	Twelve (12) sets of 145kV, 1250A, 40kA, 50Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnectors.			
1B3.2	Twenty one (21) single-phase, 5-core, multi ratio, 145kV, 1600-800-400/1A, 40kA, 50Hz, 650/275 kV BIL, post type current transformer.			
1B4	Eighteen (18) single-phase, 2-secondary winding, 145kV, 130/V3 / 110/V3 / 110/V3 kV/V/V, 40kA, 50Hz, 650/275 kV BIL, capacitor type voltage transformers.			
1B5	Eighteen (18) 145kV, 120kV continuous operating voltage, 10kA nominal discharge current, 50Hz, Heavy duty station class, gapless metal oxide type, single phase surge arresters.			
1B7.X	One (1) lot of conductors for double busbar and for connection of the 132 kV switchgear, 145 kV, 2000 A and 1250 A, 40 kA.			
1B8.X	One (1) lot of insulators and fittings including all necessary clamps and connectors required for completing 132 kV switchgear.			
1B9.X	One (1) lot of gantry steel structures and equipment supports required for completing 132 kV switchgear.			
1B10.X	All other necessary material and equipment to complete the 132 kV switchgear.			
1C	36 kV Switchgear, equipment connection and steel structures			
	One (1) set of complete equipment for switchgear 33 kV shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following:			
1C1	Two sets of 36 kV, 1600 A, 25kA, 50Hz, 170/70 kV BIL, three pole, vacuum circuit breaker, for outdoor installation with one spring-stored energy operating mechanism			
1C2.1	Three (3) sets of 36kV, 1600A, 25kA, 50Hz, 170/70 kV BIL, three pole, centre break, post type, manually operated disconnectors			



1C2.2	Two (2) sets of 36kV, 100A, 25kA, 50Hz, 170/70 kV BIL, three pole, centre break, post type, manually operated disconnectors with integrated fuse of 10A				
1C3.1	Six (6) single-phase, 4-core, single ratio, 36kV, 1600/1A, 25kA, 50Hz, 170/70 kV BIL, post type current transformer.				
1C3.2	Six (6) (12) single-phase, 4-core, single ratio, 36kV, 10/1A, 25kA, 50Hz, 170/70 kV BIL, post type current transformer.				
1C4	Twelve (12) single-phase, 2-secondary winding, 36kV, 33/V3 / 110/V3 / 110/V3 kV/V/V, 25kA, 50Hz, 170/70 kV BIL, inductive type voltage transformers.				
1C5	Six (6) 36kV, 30kV continuous operating voltage, 10kA nominal discharge current, 50Hz, 170/70 kV BIL, gapless metal oxide type, single phase surge arresters.				
1C7.X	One (1) lot of conductors for double busbar and for connection of the 33 kV switchgear, 36 kV, 2000A, 25 kA.				
1C8.X	One (1) lot of insulators and fittings including all necessary clamps and connectors required for completing 33 kV switchgear.				
1C9.X	One (1) lot of gantry steel structures and equipment supports required for completing 33 kV switchgear.				
1C10.X	All other necessary material and equipment to complete the 33 kV switchgear.				
1D	Transformers				
1D2	Two (2) 132/33 kV three phase 50/75 MVA, Dyn1, ONAN/ONAF Power transformer unit shall be designed, calculated, supplied, delivered, installed, tested and commissioned, under this contract.				
1D4	Two (2) sets of water-spray fire protection system shall be provided for new 132/33 kV three-phase 50/75 MVA, Dyn1, ONAN/ONAF power transformer units				
1D10.X					
1010.7	All other necessary material and equipment to complete the transformers.				
1F	All other necessary material and equipment to complete the transformers. Earthing/Auxiliary Transformers				
1F 1F2	Earthing/Auxiliary Transformers Two (2) 200 kVA, 33/0.4 kV, Dyn11, 3-phase earthing transformers to supply the substation auxiliary loads shall be designed, calculated, supplied, delivered, installed, tested and				
1F 1F2	Earthing/Auxiliary Transformers Two (2) 200 kVA, 33/0.4 kV, Dyn11, 3-phase earthing transformers to supply the substation auxiliary loads shall be designed, calculated, supplied, delivered, installed, tested and commissioned, under this contract.				



1G2.2	Control, protection and SAS for two (2) set of 132/33kV Power Transformer circuit.					
1G3.X	Busbar protection panels in one (1) lot.					
1G4.X	Tariff metering panel(s) to accommodate programmable & recordable digital 3-phase, 4-wire import and export MWh and MVAr meters (accuracy class 0.2) for each line, transformer feeder and auxiliary transformer. For each feeder, minimum two (2) meters (main-1 & main-2) are to be provided.					
1G6.X	One (1) lot of hardware and software to provide telecontrol & telemetering facilities required both at the existing National Load Despatch Centre (NLDC) at Aftabnagar and the backstation at Biddut Bhaban for integration of complete new 132/33 kV Substation. All required electrical signals shall be transmitted to the NLDC and Back up station through the industrial gateway of the substation automation system. All HV circuit breakers, motorized disconnectors, tap changer, etc., shall be controlled from NLDC through the gateway of the substation automation system using IEC 60870-5-1 protocol. All necessary modification works in the software of the master station of NLDC and the back-up station are to be carried out.					
1G7.X	Extension of the existing equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment in NLDC					
1G10.X	All other necessary material and equipment to complete the control, protection, substation automation and metering system.					
1H	Fibre Optic Multiplexer Equipment for Teleprotection and Communication					
	Fibre Optic Multiplexer Equipment					
1H1.X	One (1) set of complete equipment for indoor fibre optic multiplexer equipment for protection & communication at substation shall be designed, supplied, delivered, installed, tested and commissioned, under this contract. Fibre Optic Multiplexer Equipment is to be provided for. Distance relay carrier signal (main and back-up) Bus-protection / breaker failure relay SCADA data from switchgear and control system Hot-line telephone system					
1H1.X 1H2.X	tion & communication at substation shall be designed, supplied, delivered, installed, tested and commissioned, under this contract. Fibre Optic Multiplexer Equipment is to be provided for. Distance relay carrier signal (main and back-up) Bus-protection / breaker failure relay SCADA data from switchgear and control system					
	tion & communication at substation shall be designed, supplied, delivered, installed, tested and commissioned, under this contract. Fibre Optic Multiplexer Equipment is to be provided for. Distance relay carrier signal (main and back-up) Bus-protection / breaker failure relay SCADA data from switchgear and control system Hot-line telephone system One (1) set of complete equipment for Telephone System shall be designed, supplied, de-					
1H2.X	tion & communication at substation shall be designed, supplied, delivered, installed, tested and commissioned, under this contract. Fibre Optic Multiplexer Equipment is to be provided for. Distance relay carrier signal (main and back-up) Bus-protection / breaker failure relay SCADA data from switchgear and control system Hot-line telephone system One (1) set of complete equipment for Telephone System shall be designed, supplied, delivered, installed, tested and commissioned One (1) lot of underground optical fibre (48 cores) cables from terminal box at gantry structure to MDF (Main distribution Frame) shall be designed, supplied, delivered, installed, tested and commissioned in control room. The Contract includes supply and installation of					
1H2.X 1H3.X	tion & communication at substation shall be designed, supplied, delivered, installed, tested and commissioned, under this contract. Fibre Optic Multiplexer Equipment is to be provided for. Distance relay carrier signal (main and back-up) Bus-protection / breaker failure relay SCADA data from switchgear and control system Hot-line telephone system One (1) set of complete equipment for Telephone System shall be designed, supplied, delivered, installed, tested and commissioned One (1) lot of underground optical fibre (48 cores) cables from terminal box at gantry structure to MDF (Main distribution Frame) shall be designed, supplied, delivered, installed, tested and commissioned in control room. The Contract includes supply and installation of MDF and digital cables with adequate length.					



1J	LV DC, Batteries, Chargers and DC Distribution					
1J1.X	 One (1) lot consists of two (2) sets 110V substation alkaline batteries complete with chargers and distribution switchboard shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide all DC supplies to equipment being supplied for the new substation. One set shall be used as standby supply. The system shall generally be as shown in Bid Drawings and shall include the following. a. Two (2) sets Ni-cadmium 100% batteries complete, each capacity shall not be less than 400 Ah at the 5-hour rate of discharge. b. Two (2) sets battery chargers complete, each float charge shall not be less than 75 A rating. c. One (1) set DC distribution switchboard. 					
1J2.X	One (1) lot consists of two (2) sets of 48V DC system complete with chargers and distribution switchboard shall be designed, supplied, delivered, installed, tested and commissioned in the control building to provide all DC supplies for fibre optic multiplexure equipment for communication and protection. One set shall be used as standby supply. The system shall generally be as shown in Bid Drawings and shall include the following. a. Two (2) sets 100% Ni-cadmium batteries complete, each capacity shall not be less than 250 Ah at the 5-hour rate of discharge. b. Two (2) sets battery chargers complete, each float charge shall not be less than 50A rating. c. One (1) set DC distribution switchboard.					
1J10.X	All other necessary material and equipment to complete the LV DC distribution system.					
1K	LV AC Distribution					
1K1.X	One (1) set LV AC switchboard for substation services shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, to provide the 400/230V supplies to all equipment being supplied. The system shall generally be as per Bid Drawings and shall include one 125A outdoor weatherproof, 3-phase with neutral and earth switched socket outlet and plug to IEC 60309; to be installed, cabled and connected adjacent to the auto transformers.					
1K10.X	, and the second					
1L	Civil Works, Control Building and Foundations					
1L1.X	One (1) lot of complete land development of complete switchyard area as shown in the bid drawing by cutting, land filling, compacting up to a suitable level including slope protection. The approximate total area of the substation is 5 acres.					
1L2.X	One (1) lot of complete design, supply and construction of outdoor civil works, including 132 kV and 33 kV gantry foundations, 132 kV and 33 kV equipment foundations, power transformer and auxiliary transformer foundations, oil pit, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing					
1L3.X	One (1) lot of complete design, supply and construction of civil works and facilities for a new two-storey control room building with cable basement, including foundation works, superstructure works, finishing works like rendering, colour, water supply, sanitary, floor finishing, rain water drainage system, lightning protection, water supply including deep tube well for drinking water, pump house, pump, water reservoir, water pipe lines, etc., sewage					



	facilities including septic tank, etc.
1M	Building Lighting, Small Power, Air Conditioning and Ventilation
1M1.X	One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned, to provide lighting, LV power supply, air conditioning system, ventilation and emergency DC lighting for the substation control building.
1N	Switchyard Lighting
1N1.X	One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned, to provide switchyard lighting for security, roadway and switchyard and emergency DC lighting at strategic locations for equipment operations and inspections.
1P	Earthing and Lightning Protection
1P1.X	One (1) lot of complete equipment shall be designed, supplied, delivered, installed, tested and commissioned, of earthing system and lightning protection screen including connections, connectors and clamps, to suit the substation overall arrangement and provide supporting design calculations.
1P2	Two (2) sets of 3-phase portable (maintenance) earthing equipment devices with connectors and telescopic glass fibre operating pole suitable for plant supplied.



1.3 Terminal Points

1.3.1 Transmission Line Circuit Connections

The slack spans including overhead earth wires between the 230kV and 132kV overhead line terminal towers and the substation gantry structures shall be supplied and terminated by the overhead line contractors. All required insulators and hardwires shall also be supplied by the overhead line contractors.

Eyebolts/U-bolts or other suitable fixtures for terminating the slack spans on the switchyard gantry shall be provided under this substation Contract.

The overhead line Contractor shall provide a jumper from the slack span of sufficient length to terminate on the substation entry equipment. The supply of appropriate clamps and the actual termination of the jumper to the substation equipment shall be carried out under this contract.

PLC facilities such as line trap and coupling capacitor, new or currently used in existing substations shall be carried out under this contract.

Bonding of the incoming earth wire to the station earthing screen and supply of earthing conductor and connection of the terminal tower earth electrode into the substation earth grid shall be carried out under this contract.

The overhead line Contractor shall terminate the OPGW at the substation gantry in the terminal joint boxes provided by the overhead line contractors. The connection between OPGW joint boxes at Substation gantry and control room building via underground optical fibre cables shall be carried out under this contract that include supply & installation of fibre optic cable of size similar to OPGW.

1.3.2 Communication and SCADA Equipment

The voice communication, teleprotection signalling and main distribution frame (MDF) for optical fibre cable will be supplied and installed under this contract.

Necessary equipment for incorporating new & existing equipment system into the existing SCADA system shall also be supplied and installed under this contract

Complete design, supply, delivery, installation, testing & commissioning of hardware and software shall be provided for the tele-control & tele-metering facilities required at the existing National Load Despatch Centre (NLDC) at Rampura for integration of the scope of the work.

In order to provide the tele-control & tele-metering facilities required at the existing NLDC, all plant supplied under this contract shall be equipped with potential free auxiliary contacts for indications and alarms. CT and VT circuits shall be fitted, where required, with the appropriate shorting and fused terminals.

All required electrical signals for signalization and control shall be transmitted to the NLDC through the Industrial Gateway of the substation automation system. All HV breakers, motorized disconnectors, tap changer, etc. shall be controlled form NLDC through the Gateway of the substation automation system using IEC 60870-5- 104 protocol. Necessary transducer, control & interposing relays, RTUs, etc. shall be used. Necessary interfacing between the Substation Automation gateway and the communication equipment is to be carried out.



A sufficient investigation shall be made on the existing telecommunication and SCADA system for new and existing transmission lines and associated new and existing substations so that necessary equipment shall be provided for complete telecommunication system after the new and existing transmission lines and substations are connected/reconnected.

All and complete connection between the new equipment and the existing equipment for control & protection system, SCADA, communication system, and low voltage supply system shall be provided.

In addition, to realize the complete SCADA system after completion of the project, modification of the existing software in the master computer of the national control centre, and modification / extension / renovation of hardware (installing additional printed circuit cards or other equipment, etc. if required) shall be made under this contract.



1.4 System Electrical Parameters

1.4.1 System Conditions

Equipment supplied under this contract shall be suitable for the following system conditions:

Description	Unit		Required	
Nominal system voltage between phases	kV	230	132	33
System frequency	Hz		50	
Rated voltage between phases	kV	245	145	36
Rated lightning impulse withstand voltage	kV	1050	650	170
Rated power frequency withstand voltage	kV, 1 min	460	275	70
Rated symmetrical short-circuit current	kA, 1 sec	50	40	25

1.4.2 System Earthing

The 230/138/33kV auto-transformers and 132/33kV power transformers are solidly earthed.

The 230 kV system 132 kV system is solidly earthed at the power transformer 132 kV neutrals and 230/138/33 kV auto-transformer neutrals but not earthed at the Grid supply points.

The 33 kV system is solidly earthed at some of the 132/33 kV grid substations and resistance earthed at some of the grid substations.

1.4.3 Minimum Substation Clearances

Air insulated connections shall have electrical clearances as listed in the following table:-

Description	Unit		Required	
Nominal system voltage	kV	230	132	33
Minimum clearance between live metal parts and earth	mm	2100	1300	380
Minimum clearance between live metal	mm	2400	1500	430
Minimum safety clearance between ground and the nearest point not at earth potential of an insulator	mm		2500	
Minimum safety clearance between ground and the nearest live unscreened conductor (BS 7354 "Safety Working Clearance")	mm	4270	3500	2740
Minimum insulator creepage distance (at rated voltage between phases)	mm/kV		25	



1.4.4 Low Voltage AC System

Description	Unit	Required
Rated service voltage (3 phase, 4 wire 50 Hz)	V	415 / 230
Tolerance on rated voltage	%	+15%, -15%
Switchgear symmetrical breaking capacity	kA	15 kA, 3 sec
System earthing	-	solid

1.4.5 Low Voltage DC System

For d.c. motor driven auxiliaries, relays, tripping, indicating lamps and controls.

Description	Unit	Required
Nominal DC voltage	V	110
Tolerance on rated voltage	%	+15%, -15%

For telecommunication & SCADA

Description	Unit	Required
Nominal DC voltage	V	48
Tolerance on rated voltage	%	+15%, -15%

1.5 Climatic Conditions

All plant and equipment supplied under the Contract shall be entirely suitable for the climatic conditions prevailing at site.

The project area and vicinity is close to sea level and is in a tropical climate.

The ambient shade temperature variation is between 4°C and 45°C with periods of high humidity.

Between May and November, low lying areas are subject to flooding. Flooding countermeasure shall be taken for the civil design, so as not to affect to any equipment in the substation during wet season. Depend on the past recorded maximum flood water level at the project area, sufficient ground level height shall be required for land formation at the Contractor's responsibility. The flooding can be taken as advantage at certain Sites in that the heavy loads may be floated on barges to close proximity to the Sites.

The project area is designated a zone of moderate intensity for earthquakes.

The seismic factor is 0.1 g.

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Atmospheric pollution is moderate and special insulator design or washing is not required. The area is subject to high winds of typhoon strength.

Description	Unit	Required
Maximum ambient shade temperature	°C	45
Minimum ambient shade temperature	°C	4
Maximum daily average temperature	°C	35
Maximum annual average temperature	°C	25
Maximum wind velocity	km/h	160
Minimum wind velocity for line rating purposes	km/h	3.2
Solar radiation	W/m²	1000
Rainfall	mm/year	2500
Relative humidity, maximum	%	100
Relative humidity, average	%	80
Altitude	m	< 1000
Atmospheric pollution	-	medium
Icing		no ice or snow expected
Seismic factor	g	0.1
Soil type	-	alluvial
Soil temperature (at 1.1m)	°C	30°C. at 1.1 meter depth
Soil thermal resistivity	°Cm/W	1.5
Isokeraunic Level (thunderstorm days/year)	days/year	80

The information in this chapter is given solely for the general assistance of Bidders; no responsibility for it will be accepted nor will any claim based on this clause be considered.



2. Schedule B: Bid Prices & Schedules

The attached price schedules shall be filled by the Bidder, signed and stamped and shall be attached to the bid.

(Please use the attached excel file BGD 1800 NZSS vol 3 schedule b price schedules.xlsx)



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					Foreign Curre	ency (in)
Item	Description	Code	Unit	Quantity		Total Price ²
				(1)	CIP (2)	CIP $(3) = (1) \times (2)$
	Extension of the New 230/132 kV Substa	ation	Paich		(2)	(0) = (1) x (2)
•		ation	ixajsi	laili		
Α	230 kV Switchgear					
A1.1	245 kV, 3150 A, 50 kA, 50 Hz, 1050/460 kV BIL, three pole, live tank, SF6 gas circuit breaker with three spring-stored energy operating mechanism		set	2		
A1.2	245 kV, 3150 A, 50 kA, 50 Hz, 1050/460 kV BIL, three pole, live tank, SF6 gas circuit breaker with one spring-stored energy operating mechanism		set	3		
A2.1	245 kV, 3150 A, 50 kA, 50 Hz, 1050/460 kV BIL, three pole, centre break, post type, motor operated disconnector with motor operated earthing switch		set	2		
A2.2	245 kV, 2000 A, 50 kA, 50 Hz, 1050/460 kV BIL, three pole, centre break, post type, motor operated disconnector with motor operated earthing switch		set	2		
A2.3	245 kV, 2000 A, 50 kA, 50 Hz, 1050/460 kV BIL, three pole, centre break, post type, motor operated disconnector		set	8		
A3.1	245 kV, 50 kA, 50 Hz, 1050/460 kV BIL, single phase, 5-cores, 3200-1600/1/1/1/1/1 A, 0.2, 0.2, 5P20, 5P20; Fs=10, Fs=10; 5 /15 / 30 / 30 / 30 VA, head type, post type current transformer		set	3		
A3.2	245 kV, 50 kA, 50 Hz, 1050/460 kV BIL, single phase, 5-cores, 1600-800/1/1/1/1/1 A, 0.2, 0.2, 5P20, 5P20; Fs=10, Fs=10; 5 /15 / 30 / 30 / 30 VA, head type, post type current transformer		set	12		
A4	245 kV, 50 kA, 50 Hz, 1050/460 kV BIL, single phase, 2-secondary windings, 230/V3 / 110/V3 / 110/V3 kV/V/V, 0.2, 3P; 25 / 75 VA, capacitor voltage transformer		set	12		
A5	245 kV, Um = 245 kV, Ur = 192 kV, Uc = 154 kV, 10 kA nominal discharge current, 50 Hz, 1050/460 kV BIL, single phase, heavy duty, gapless, metal oxide type surge arrester		set	12		
A7.X	245 kV, 3150 A and 2000 A, 50 kA, Conductors for double busbars and for connection of the 230 kV switchgears		lot	1		
A8.X	245 kV, 3150 A and 2000 A, 50 kA, Insulators and fittings including all necessary clamps and connectors for double busbars and for connection and completing of the 230 kV switchgears		lot	1		

			Unit		Foreign Curre	ncy (in)		
Item	Description	Code		Quantity	0	Total Price ²		
	·			(4)	CIP	CIP		
A9.X	245 kV, Gantry steel structure and equipment support for completing of the 230 kV switchgears		lot	(1) 1	(2)	$(3) = (1) \times (2)$		
	Necessary material and equipment to complete 230 kV Switchgear		lot	1				
			101	_ '				
С	33 kV Switchgear							
	36 kV, Um = 36 kV, Ur = 30 kV, Uc = 24 kV, 10 kA nominal discharge current, 50 Hz, 170/70 kV BIL, single phase, gapless, metal oxide type surge arrester		set	6				
C7.X	36 kV, 2000 A, 25 kA, Conductors for connection of the 33 kV switchgears		lot	1				
	36 kV, 2000 A, 25 kA, Insulators and fittings including all necessary clamps and connectors for connection and completing of the 33 kV switchgears		lot	1				
C9.X	33 kV, Gantry steel structure and equipment support for completing of the 33 kV switchgears		lot	1				
C10.X	Necessary material and equipment to complete 33 kV Switchgear		lot	1				
D	Transformers							
1 1 1 1	235/132/33 kV, 225/300 MVA, YNa0d1, ONAN/ONAF, three phase, oil-immersed, hermetically sealed, autotransformer, with On-load tap changer, with tertiary winding (brought out to terminal bushings)		set	2				
	Nitrogen Injection Fire Protection System (NIFPS), for new 235/132/33 kV, three phase, 225/300 MVA, YNa0d1, ONAN/ONAF, auto transformer unit		set	2				
D10.X	Necessary material and equipment to complete Transformers		lot	1				
G	G Control, Protection, Substation Automation System and Metering							
G1.1	Control, protection and SAS for 230 kV Overhead Line circuit		set	2				
1 (7/1	Control, protection and SAS for 230/132/33 kV Autotransformer circuits and associated Earthing/Auxiliary Transformer circuit		set	2				
G3.1	Control, protection and SAS for 230 kV Busbars		set	1		-		

Item	Description	Code	Unit	Quantity	_	ncy (in) Total Price ² CIP (3) = (1) x (2)		
G4.X	Tariff Metering pane(s) to accommodate for each feeder minimum two (2) (main-1 & main-2) programmable & recordable digital 3-phase, 4-wire import and export MWh and MVAr meters with accuracy class 0.2		set	1				
G5.X	Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders		set	1				
G6.X	The hardware and software to provide telecontrol & telemetering facilities required both at the existing National Load Despatch Centre (NLDC) at Aftabnagar and back-up station at Biddut Bhaban for integration of complete new 230/132 kV Substation. All required electrical signals shall be transmitted to the NLDC and back-up station through the Industrial Gateway of the Substation automation system. All HV circuit breakers, motorized disconnectors, tap changer, etc., shall be controlled from NLDC through the Gateway of the Substation automation system using IEC 60870-5-104 protocol. All necessary modification works in the software of the master station of NLDC and back-up station are to be carried out.		set	1				
	Extension of the existing equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment in NLDC		set	1				
G10.X	Necessary material and equipment to complete Control, Protection, SAS and Metering system		lot	1				
н	Fibre Optic Multiplexer Equipment for Teleprotection & Co	mmunica	tion					
H1.X	Fibre Optic Multiplexer Equipment, complete equipment for control, protection & communication at substation		set	1				
	MDF and underground optical fibre (48 cores) cables from terminal box at gantry structure to MDF (Main distribution Frame)		set	1				
- 1	Multicore Low Voltage Auxiliary Power and Control Cables							
I1.X	Multicore low voltage auxiliary power and control cables between all items of equipment supplied under the Contract and for connection and integration of new equipment with the existing equipment, with necessary gland, terminated, and identified by colours & tags, including the overall substation cable routing and core schedules		lot	1				
I10.X	Necessary material and equipment to complete LV Auxiliary Power and Control Cables		lot	1				

					Foreign Curre	ncy (in)	
Item	Description	Code	Unit	Quantity	Unit Price ²	Total Price ²	
100	2000p.iiciii	Jour			CIP	CIP	
				(1)	(2)	$(3) = (1) \times (2)$	
J	LV DC, Batteries, Chargers and DC Distribution	1					
J1.X	The complete equipment to provide extension of the existing LV DC Auxiliary Power Supply and for connection and integration of new equipment with the existing equipment. DC distribution switchboard.		lot	1			
J2.X	The complete equipment to provide extension of the existing 48 V DC Auxiliary Power Supply and for connection and integration of new equipment with the existing equipment. DC distribution switchboard.		lot	1			
J10.X	Necessary material and equipment to complete LV DC Distribution system		lot	1			
К	LV AC Distribution						
K1.X	The complete equipment to provide extension of the existing LV AC Auxiliary Power Supply and for connection and integration of new equipment with the existing equipment. DC distribution switchboard.		lot	1			
K10.X	Necessary material and equipment to complete LV AC Distribution system		lot	1			
L	Civil Works, Control Building and Foundations	5					
L1.X	Land development of complete required 230 kV switchyard area by cutting, land filling, compacting up to a suitable level.		lot	1			
LZ.A	Complete outdoor civil works of required 230 kV switchyard area , including 230 kV gantry foundation, 230 kV and 33 kV equipment foundation, power transformers foundation, oil pit, blast wall, internal roads, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing		lot	1			
L3.X	Complete civil works and facilities for extension of existing control building, including finishing works like rendering, colour, floor finishing, etc.		lot	1			
М	Building Lighting, Small Power, Air Conditioning and Ventilation						
M1.X	Complete equipment to provide lighting, LV power supply, air conditioning system, ventilation and emergency DC lighting for the substation control building.		lot	1			

					Foreign Curre	ncy (in)
Item	Description	Code	Unit	Quantity	Unit Price ² CIP	Total Price ²
				(1)	(2)	$(3) = (1) \times (2)$
N	Switchyard Lighting					
	Complete equipment to provide extension of the existing switchyard lighting for security, roadway and switchyard and emergency DC lighting at strategic locations for equipment operations and inspections.		lot	1		
Р	Earthing and Lightning Protection					
P1.X	Complete equipment to provide extension of the existing earthing system and lightning protection and for connection and integration of new equipment with the existing equipment, including connections, connectors and clamps, to suit the substation extension, including supporting design calculations.		lot	1		
	3-phase portable (maintenance) earthing equipment devices with connectors and telescopic glass fibre operating pole suitable for plant supplied.		set	2		
	Mandatory Spare Parts					
Α	230 kV Switchgear					
AS.1	Circuit breaker 230 kV, Tripping coil		set	4		
AS.2	Circuit breaker 230 kV, Closing coil		set	4		
AS.3	Circuit breaker 230 kV, Motor, in motor drive mechanism, complete with accessories		set	1		
AS.4	Circuit breaker 230 kV, auxiliary contacts, in motor drive mechanism, complete with accessories, one of each type		set	1		
AS.5	Circuit breaker 230 kV, Contactors, relays, selector switches, push buttons, counters, heaters, etc., in motor drive mechanism and control cubicle, one of each type		set	1		
AS.6	Circuit breaker 230 kV, SF6 temperature compensated manometer		set	2		
AS.7	Circuit breaker 230 kV, SF6 gas (40 kg) cylinder		set	1		
	Disconnector 230 kV with earthing switch - complete pole, together with one complete motor drive mechanism of main blades and one complete motor drive mechanism of the earthing blades		set	2		

Name of Bidder:

Signature of Bidder:

					_	ncy (in)	
Item	Description	Code	Unit	Quantity	Unit Price ² CIP	Total Price ² CIP	
				(1)	(2)	$(3) = (1) \times (2)$	
	245 kV, 50 kA, 50 Hz, 1050/460 kV BIL, single phase, 5-cores, 1600-800/1/1/1/1/1 A, 0.2, 0.2, 5P20, 5P20; Fs=10, Fs=10; 5 /15 / 30 / 30 / 30 VA, head type, post type current transformer		set	3			
	245 kV, 50 kA, 50 Hz, 1050/460 kV BIL, single phase, 2-secondary windings, 230/V3 / 110/V3 / 110/V3 kV/V/V, 0.2, 3P; 25 / 75 VA, capacitor voltage transformer		set	3			
	245 kV, Um = 245 kV, Ur = 192 kV, Uc = 154 kV, 10 kA nominal discharge current, 50 Hz, 1050/460 kV BIL, single phase, heavy duty, gapless, metal oxide type surge arrester		set	3			
С	33 kV Switchgear						
	36 kV, Um = 36 kV, Ur = 30 kV, Uc = 24 kV, 10 kA nominal discharge current, 50 Hz, 170/70 kV BIL, single phase, gapless, metal oxide type surge arrester		set	1			
D	Transformers Transformers						
DS.1	Transformer Bushing 230 kV		piece	1			
DS.2	Transformer Bushing 132 kV		piece	1			
DS.3	Transformer Bushing 33 kV		piece	1			
DS.4	Transformer oil		kg	10,000			
DS.5	Transformer silica gel		kg	40			
DS.6	Transformer ventilator with motor		set	2			
1 1 1 2 7	Contactors, relays, selector switches, push buttons, counters, heaters, etc., in transformer control cabinet, one of each type		lot	1			
DS.8	Contactors, relays, auxiliary contacts, selector switches, push buttons, counters, heaters, etc., in OLTC Motor Drive mechanism, one of each type		lot	1			
DS.9	Thermometer, one of each type		lot	1			
DS.10	Thermostat, one of each type		lot	1			

Name of Bidder:

Signature of Bidder:

Item	Description	Code	Unit	Quantity	Unit Price ² CIP	Total Price ² CIP
G	Control, Protection, Substation Automation System and	l Metering		(1)	(2)	$(3) = (1) \times (2)$
GS.1	Line differential protection relay 230 kV		set	1		
GS.3	Line distance protection relay 230 kV		set	1		
GS.5	Transformer 230/132 kV differential relay with complete REF function		set	1		
GS.7	Overcurrent and earth fault relay 230 kV		set	1		
GS.10	Bay control unit		set	1		
GS.11	Trip Circuit Supervision relay, 3phase		set	1		
GS.13	Electronic meter, same as installed, including communication unit		set	1		
J	LV DC, Batteries, Chargers and DC Distribution	n				
JS.1	Contactors, relays, MCBs, selector switches, push buttons, counters, heaters, etc., one of each type		lot	1		
K	LV AC Distribution					
KS.1	Contactors, relays, MCBs, selector switches, push buttons, counters, heaters, etc., one of each type		lot	1		
	Subtotal Rajshahi Substation to Schedule 5 - Grand Summary					

Item	Description	Code	Unit	Quantity	_	ncy (in) Total Price ² CIP (3) = (1) x (2)
III	New 132/33 kV Substation Ban	gura				
В	132 kV Switchgear					
B1.1	145 kV, 1250 A, 40 kA, 50 Hz, 650/275 kV BIL, three pole, live tank, SF6 gas circuit breaker with three spring-stored energy operating mechanism		set	1		
B1.4	145 kV, 1250 A, 40 kA, 50 Hz, 650/275 kV BIL, three pole, live tank, SF6 gas circuit breaker with one spring-stored energy operating mechanism		set	2		
B2.3	145 kV, 1250 A, 40 kA, 50 Hz, 650/275 kV BIL three pole, centre break, post type, motor operated disconnector with motor operated earthing switch		set	1		
B2.5	145 kV, 1250 A, 40 kA, 50 Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnector		set	3		
B3.2	145 kV, 40 kA, 50 Hz, 650/275 kV BIL, single phase, 5-cores, 1600-800-400/1/1/1/1/1 A, 0.2, 0.2, 5P20, 5P20, 5P20; Fs=10, Fs=10; 5 /15 / 30 / 30 / 30 VA, head type, post type current transformer		set	9		
B4	145 kV, 40 kA, 50 Hz, 650/275 kV BIL, single phase, 2-secondary windings, 132/V3 / 110/V3 / 110/V3 kV/V/V, 0.2, 3P; 25 / 75 VA, capacitor voltage transformer		set	6		
B5	145 kV, Um = 145 kV, Ur = 120 kV, Uc = 96 kV, 10 kA nominal discharge current, 50 Hz, 650/275 kV BIL, single phase, heavy duty, gapless, metal oxide type surge arrester		set	9		
В6	145 kV, 50 Hz, 650/275 kV BIL, single phase, post insulator		set	3		
B7.X	145 kV, 2000 A and 1250 A, 40 kA, conductors for single busbars and for connection of the 132 kV switchgears		lot	1		
B8.X	145 kV, 2000 A and 1250 A, 40 kA, Insulators and fittings including all necessary clamps and connectors for single busbars and for connection and completing of the 132 kV switchgears		lot	1		
B9.X	145 kV, Gantry steel structure and equipment support for completing of the 132 kV switchgears		lot	1		
B10.X	Necessary material and equipment to complete 132 kV Switchgear		lot	1	_	_

					Foreign Curre	ncy (in)
Item	Description	Code	Unit	Quantity		Total Price ²
				(1)	CIP (2)	CIP $(3) = (1) \times (2)$
С	33 kV Switchgear			(17)	(-)	(0) - (1) x (2)
	36 kV, 1600 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, live tank, vacuum circuit breaker, for outdoor installation, with spring-stored energy operating mechanism		set	2		
C2.1	36 kV, 1600 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, vertical break, post type, hand operated disconnector		set	3		
	36 kV, 100 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, vertical break, post type, hand operated disconnector, with integrated fuse 10 A		set	2		
	36 kV, 25 kA, 50 Hz, 170/70 kV BIL, single phase, 4-cores, 1600/1/1/1, 0.2, 0.2, 5P20, 5P20; Fs=10, Fs=10; 5 / 15 / 30 / 30 VA, post type current transformer		set	6		
	36 kV, 25 kA, 50 Hz, 170/70 kV BIL, single phase, 4-cores, 10/1/1/1, 0.2, 0.2, 5P20, 5P20; Fs=10, Fs=10; 5 / 15 / 30 / 30 VA, post type current transformer		set	6		
	36 kV, 25 kA, 50 Hz, 170/70 BIL, single phase, 2-secondary windings, 33/V3 / 110/V3 / 110/V3 kV/V/V, 0.2, 3P; 25 / 75 VA, inductive voltage transformer		set	12		
1 (5	36 kV, Um = 36 kV, Ur = 30 kV, Uc = 24 kV, 10 kA nominal discharge current, 50 Hz, 170/70 kV BIL, single phase, gapless, metal oxide type surge arrester		set	6		
C7.X	36 kV, 2000 A, 25 kA, Conductors for double busbars and for connection of the 33 kV switchgears		lot	1		
	36 kV, 2000 A, 25 kA, Insulators and fittings including all necessary clamps and connectors for double busbars and for connection and completing of the 33 kV switchgears		lot	1		
C9.X	33 kV, Gantry steel structure and equipment support for completing of the 33 kV switchgears		lot	1		
C10.X	Necessary material and equipment to complete 33 kV Switchgear		lot	1		
D	Transformers					
D2	132/33 kV, 50/75 MVA, Dyn1, ONAN/ONAF, three phase, oil-immersed, hermetically sealed, power transformer, with On-load tap changer		set	2		

Item	Description	Code	Unit	Quantity		ncy (in) Total Price ² CIP			
				(1)	(2)	$(3) = (1) \times (2)$			
D4	Water Spray Fire Protection System, for new 132/33 kV, three phase, 50/75 MVA, Dyn1, ONAN/ONAF Power transformer unit		set	2					
D10.X	Necessary material and equipment to complete Transformers		lot	1					
F	Earthing/Auxiliary Transformer								
F2	33/0.415 kV, 200 kVA, Dyn11, ONAN, three phase, oil-immersed, power transformer, with Off-load tap changer, (to provide an earthing point for the neutral and) to supply the substation auxiliary loads		set	2					
F10.X	Necessary material and equipment to complete Auxiliary Transformers		lot	1					
G	G Control, Protection, Substation Automation System and Metering								
G1.2	Control, protection and SAS for 132 kV Overhead Line circuit		set	1					
G2.2	Control, protection and SAS for 132/33 kV Power transformer circuit		set	2					
G2.3	Control, protection and SAS for 33/0.415 kV Auxiliary power transformer circuit and AC & DC Auxiliary Power Supply		set	2					
G3.2	Control, protection and SAS for 132 kV Busbars		set	1					
G4.X	Tariff metering pane(s) to accommodate for each line, transformer and auxiliary transformer feeder minimum two (2) (main-1 & main-2) programmable & recordable digital 3-phase, 4-wire import and export MWh and MVAr meters with accuracy class 0.2		set	1					
G6.X	The hardware and software to provide telecontrol & telemetering facilities required both at the existing National Load Despatch Centre (NLDC) at Aftabnagar and back-up station at Biddut Bhaban for integration of complete new 230/132 kV Substation. All required electrical signals shall be transmitted to the NLDC and back-up station through the Industrial Gateway of the Substation automation system. All HV circuit breakers, motorized disconnectors, tap changer, etc., shall be controlled from NLDC through the Gateway of the Substation automation system using IEC 60870-5-104 protocol. All necessary modification works in the software of the master station of NLDC and back-up station are to be carried out.		set	1					
G7.X	Extension of the existing equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment in NLDC		set	1					

Name of Bidder:

Item	Description	Code	Unit	Quantity	Foreign Curre Unit Price ² CIP (2)	ncy (in) Total Price ² CIP (3) = (1) x (2)				
G10.X	Necessary material and equipment to complete Control, Protection, SAS and Metering system		lot	1						
н	Fibre Optic Multiplexer Equipment for Teleprotection & Communication									
H1.X	Fibre Optic Multiplexer Equipment, complete equipment for control, protection & communication at substation		set	1						
H2.X	Telephone system, complete equipment		set	1						
	MDF and underground optical fibre (48 cores) cables from terminal box at gantry structure to MDF (Main distribution Frame)		set	1						
ı	Multicore Low Voltage Auxiliary Power and Control Cables									
I1.X	Multicore low voltage auxiliary power and control cables between all items of equipment supplied under the Contract, with necessary gland, terminated, and identified by colours & tags, including the overall substation cable routing and core schedules		lot	1						
I10.X	Necessary material and equipment to complete LV Auxiliary Power and Control Cables		lot	1						
J	LV DC, Batteries, Chargers and DC Distribution	n								
11 Y	110 V DC Auxiliary Power Supply, substation alkaline batteries complete with chargers and distribution switchboard, to provide all DC supplies to equipment being supplied for the new substation, consisting of: (a) Two (2) sets Ni-cadmium 100% batteries complete, each capacity shall not be less than 400 Ah at the 5-hour rate of discharge. (b) Two (2) sets battery chargers complete, each float charge shall not be less than 75 A rating. (c) One (1) set DC distribution switchboard.		lot	1						
12 Y	48 V DC system, complete with chargers and distribution switchboard to provide all DC supplies for fibre optic multiplexure equipment for communication and control & protection, consisting of: (a) Two (2) sets Ni-cadmium 100% batteries complete, each capacity shall not be less than 250 Ah at the 5-hour rate of discharge. (b) Two (2) sets battery chargers complete, each float charge shall not be less than 50 A rating. (c) One (1) set DC distribution switchboard.		lot	1						

					Foreign Curre	ncy (in)			
Item	Description	Code	Unit	Quantity		Total Price ²			
	2.33 p				CIP	CIP			
				(1)	(2)	$(3) = (1) \times (2)$			
J10.X	Necessary material and equipment to complete LV DC Distribution system		lot	1					
K	LV AC Distribution								
K1.X	LV AC switchboard for substation services to provide the 400/230V supplies to all equipment being supplied, including one (1) 125 A outdoor weatherproof, 3-phase with neutral and earth switched socket outlet and plug to IEC 60309; to be installed, cabled and connected adjacent to the transformers		lot	1					
K10.X	Necessary material and equipment to complete LV AC Distribution system		lot	1					
L	Civil Works, Control Building and Foundations								
L1.X	Land development of complete switchyard area by cutting, land filling, compacting up to a suitable level including slope protection.		lot	1					
L2.X	Complete outdoor civil works, including 132 kV and 33 kV gantry foundation, 132 kV and 33 kV equipment foundation, power transformers and auxiliary transformers foundation, oil pit, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing		lot	1					
L3.X	Complete civil works and facilities for new two-storey control room building with cable basement, including foundation works, super structure works, finishing works like rendering, colour, water supply, sanitary, floor finishing, rain water drainage system, lightning protection, water supply including deep tube well for drinking water, pump house, pump, water reservoir, water pipe lines, etc., sewage facilities including septic tank, etc.		lot	1					
M	Building Lighting, Small Power, Air Conditioning and V	entilation							
M1.X	Complete equipment to provide lighting, LV power supply, air conditioning system, ventilation and emergency DC lighting for the substation control building.		lot	1					
N	Switchyard Lighting								
N1.X	Complete equipment to provide switchyard lighting for security, roadway and switchyard and emergency DC lighting at strategic locations for equipment operations and inspections.		lot	1					

Item	Description	Code	Unit	Quantity	_	ncy (in) Total Price ² CIP (3) = (1) x (2)			
Р	Earthing and Lightning Protection								
P1.X	Complete equipment of earthing system and lightning protection screen including connections, connectors and clamps, to suit the substation overall arrangement, including supporting design calculations.		lot	1					
P2	3-phase portable (maintenance) earthing equipment devices with connectors and telescopic glass fibre operating pole suitable for plant supplied.		set	2					
	Mandatory Spare Parts								
В	132 kV Switchgear								
BS.1	Circuit breaker 132 kV, Tripping coil		set	1					
BS.2	Circuit breaker 132 kV, Closing coil		set	1					
BS.3	Circuit breaker 132 kV, Motor, in motor drive mechanism, complete with accessories		set	1					
BS.4	Circuit breaker 132 kV, auxiliary contacts, in motor drive mechanism, complete with accessories, one of each type		set	1					
BS.5	Circuit breaker 132 kV, Contactors, relays, selector switches, push buttons, counters, heaters, etc., in motor drive mechanism and control cubicle, one of each type		set	1					
BS.6	Circuit breaker 132 kV, SF6 temperature compensated manometer		set	1					
BS.7	Circuit breaker 132 kV, SF6 gas (40 kg) cylinder		set	1					
BS.8	Disconnector 132 kV with earthing switch - complete pole, together with one complete Motor drive mechanism of main blades and one complete Motor drive mechanism of the earthing blades		set	1					
B3.2	145 kV, 40 kA, 50 Hz, 650/275 kV BIL, single phase, 5-cores, 1600-800-400/1/1/1/1/1 A, 0.2, 0.2, 5P20, 5P20, 5P20; Fs=10, Fs=10; 5 /15 / 30 / 30 VA, head type, post type current transformer		set	1					
B4	145 kV, 40 kA, 50 Hz, $650/275$ kV BIL, single phase, 2-secondary windings, $132/V3 / 110/V3 / 110/V3$ kV/V/V, 0.2, 3P; 25 / 75 VA, capacitor voltage transformer		set	1					
B5	145 kV, Um = 145 kV, Ur = 120 kV, Uc = 96 kV, 10 kA nominal discharge current, 50 Hz, 650/275 kV BIL, single phase, heavy duty, gapless, metal oxide type surge arrester		set	1					

Name of Bidder:

					Foreign Curre	ncy (in)
Item	Description	Code	Unit	Quantity	Unit Price ²	Total Price ²
item	Description	Oode	Oilit		CIP	CIP
				(1)	(2)	$(3) = (1) \times (2)$
С	33 kV Switchgear					
CS.1	Circuit breaker 33 kV, Tripping coil		set	1		
CS.2	Circuit breaker 33 kV, Closing coil		set	1		
CS.3	Circuit breaker 33 kV, Motor, in motor drive mechanism, complete with accessories		set	1		
CS.4	Fuse 10 A		set	3		
	36 kV, 25 kA, 50 Hz, 170/70 kV BIL, single phase, 4-cores, 1600/1/1/1, 0.2, 0.2, 5P20, 5P20; Fs=10, Fs=10; 5 / 15 / 30 / 30 VA, post type current transformer		set	1		
C3.2	36 kV, 25 kA, 50 Hz, 170/70 kV BIL, single phase, 4-cores, 10/1/1/1, 0.2, 0.2, 5P20, 5P20; Fs=10, Fs=10; 5 / 15 / 30 / 30 VA, post type current transformer		set	1		
C4	36 kV, 25 kA, 50 Hz, 170/70 BIL, single phase, 2-secondary windings, 33/V3 / 110/V3 / 110/V3 kV/V/V, 0.2, 3P; 25 / 75 VA, inductive voltage transformer		set	1		
C5	36 kV, Um = 36 kV, Ur = 30 kV, Uc = 24 kV, 10 kA nominal discharge current, 50 Hz, 170/70 kV BIL, single phase, gapless, metal oxide type surge arrester		set	1		
D	Transformers					
DS.2	Transformer Bushing 132 kV		piece	1		
DS.3	Transformer Bushing 33 kV		piece	1		
DS.4	Transformer oil		kg	5,000		
DS.5	Transformer silica gel		kg	20		
DS.6	Transformer ventilator with motor		set	2		
DS.7	Contactors, relays, selector switches, push buttons, counters, heaters, etc., in Transformer control cabinet, one of each type		lot	1		
DS.8	Contactors, relays, auxiliary contacts, selector switches, push buttons, counters, heaters, etc., in OLTC Motor Drive mechanism, one of each type		lot	1		
DS.9	Thermometer, one of each type		lot	1		

					Foreign Curre	ncy (in)		
Item	Description	Code	Unit	Quantity		Total Price ²		
					CIP	CIP		
				(1)	(2)	$(3) = (1) \times (2)$		
DS.10	Thermostat, one of each type		lot	1				
F	Earthing/Auxiliary Transformer							
FS.1	Transformer Bushing 33 kV		piece	1				
G	G Control, Protection, Substation Automation System and Metering							
GS.2	Line differential protection relay 132 kV		set	1				
GS.4	Line distance protection relay 132 kV		set	1				
GS.6	Transformer 132/33 kV differential relay with complete REF function		set	1				
GS.8	Overcurrent and earth fault relay 132 kV		set	1				
GS.10	Bay control unit		set	1				
GS.11	Trip Circuit Supervision relay, 3phase		set	1				
GS.13	Electronic meter, same as installed, including communication unit		set	1				
J	LV DC, Batteries, Chargers and DC Distribution	า						
JS.1	Contactors, relays, MCBs, selector switches, push buttons, counters, heaters, etc., one of each type		lot	1				
K	K LV AC Distribution							
KS.1	Contactors, relays, MCBs, selector switches, push buttons, counters, heaters, etc., one of each type	_	lot	1	_	_		
	Subtotal Bangura Substation to Schedule 5 - Grand Summary							

					Foreign Curre	ency (in)
Item	Description	Code	Unit	Quantity	Unit Price ²	Total Price ²
				(4)	CIP	CIP
		. =		(1)	(2)	$(3) = (1) \times (2)$
IV	Extension of the Existing 132/33 kV Subst	ation	Bagh	abari		
В	132 kV Switchgear					
B10.X	Necessary material and equipment to complete 132 kV Switchgear		lot	1		
G	Control, Protection, Substation Automation System and	l				
	Extension of the existing equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment in NLDC		set	1		
G10.X	Necessary material and equipment to complete Control, Protection, SAS and Metering system		lot	1		
1	Multicore Low Voltage Auxiliary Power and Control	Cables				
I10.X	Necessary material and equipment to complete LV Auxiliary Power and Control Cables		lot	1		
J	LV DC, Batteries, Chargers and DC Distribution	n				
J10.X	Necessary material and equipment to complete LV DC Distribution system		lot	1		
K	LV AC Distribution					
K10.X	Necessary material and equipment to complete LV AC Distribution system		lot	1		
Р	Earthing and Lightning Protection					
P10.X	Necessary material and equipment to complete earthing and lightning protection		lot	1		
	Subtotal Baghabari Substation to Schedule 5 - Grand Summary					
	·			ı l		

Item	Description	Code	Unit	Quantity	Unit Price ² CIP	Total Price ² CIP		
V	New 132/33 kV Substation Miitha	apuku	r	(1)	(2)	$(3) = (1) \times (2)$		
В	132 kV Switchgear							
B1.1	145 kV, 1250 A, 40 kA, 50 Hz, 650/275 kV BIL, three pole, live tank, SF6 gas circuit breaker with three spring-stored energy operating mechanism		set	4				
B1.3	145 kV, 2000 A, 40 kA, 50 Hz, 650/275 kV BIL, three pole, live tank, SF6 gas circuit breaker with one spring-stored energy operating mechanism		set	1				
B1.4	145 kV, 1250 A, 40 kA, 50 Hz, 650/275 kV BIL, three pole, live tank, SF6 gas circuit breaker with one spring-stored energy operating mechanism		set	2				
B2.2	145 kV, 2000 A, 40 kA, 50 Hz, 650/275 kV BIL three pole, centre break, post type, motor operated disconnector with motor operated earthing switch		set	2				
B2.3	145 kV, 1250 A, 40 kA, 50 Hz, 650/275 kV BIL three pole, centre break, post type, motor operated disconnector with motor operated earthing switch		set	4				
B2.5	145 kV, 1250 A, 40 kA, 50 Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnector		set	12				
	145 kV, 40 kA, 50 Hz, 650/275 kV BIL, single phase, 5-cores, 1600-800-400/1/1/1/1/1 A, 0.2, 0.2, 5P20, 5P20, 5P20; Fs=10, Fs=10; 5 /15 / 30 / 30 / 30 VA, head type, post type current transformer		set	21				
B4	145 kV, 40 kA, 50 Hz, 650/275 kV BIL, single phase, 2-secondary windings, 132/V3 / 110/V3 / 110/V3 kV/V/V, 0.2, 3P; 25 / 75 VA, capacitor voltage transformer		set	18				
B5	145 kV, Um = 145 kV, Ur = 120 kV, Uc = 96 kV, 10 kA nominal discharge current, 50 Hz, 650/275 kV BIL, single phase, heavy duty, gapless, metal oxide type surge arrester		set	18				
B7.X	145 kV, 2000 A and 1250 A, 40 kA, Conductors for double busbars and for connection of the 132 kV switchgears		lot	1				
B8.X	145 kV, 2000 A and 1250 A, 40 kA, Insulators and fittings including all necessary clamps and connectors for double busbars and for connection and completing of the 132 kV switchgears		lot	1				

					Foreign Curre	ncy (in)
Item	Description	Code	Unit	Quantity		Total Price ²
				(4)	CIP	CIP
DO V	445 IAV Contraction of the structure and equipment our part for completing of the 420 IAV quitely good		lat	(1) 1	(2)	$(3) = (1) \times (2)$
B9.X	145 kV, Gantry steel structure and equipment support for completing of the 132 kV switchgears		lot	1		
B10.X	Necessary material and equipment to complete 132 kV Switchgear		lot	1		
С	33 kV Switchgear					
	36 kV, 1600 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, live tank, vacuum circuit breaker, for outdoor installation, with spring-stored energy operating mechanism		set	2		
C2.1	36 kV, 1600 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, vertical break, post type, hand operated disconnector		set	3		
	36 kV, 100 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, vertical break, post type, hand operated disconnector, with integrated fuse 10 A		set	2		
C3.1	$36\ kV$, $25\ kA$, $50\ Hz$, $170/70\ kV$ BIL, single phase, 4-cores, $1600/1/1/1/1$, 0.2 , 0.2 , $5P20$, $5P20$; Fs=10, Fs=10; $5/15/30/30\ VA$, post type current transformer		set	6		
	36 kV, 25 kA, 50 Hz, 170/70 kV BIL, single phase, 4-cores, 10/1/1/1, 0.2, 0.2, 5P20, 5P20; Fs=10, Fs=10; 5 / 15 / 30 / 30 VA, post type current transformer		set	6		
	36 kV, 25 kA, 50 Hz, 170/70 BIL, single phase, 2-secondary windings, 33/V3 / 110/V3 / 110/V3 kV/V/V, 0.2, 3P; 25 / 75 VA, inductive voltage transformer		set	12		
	36 kV, Um = 36 kV, Ur = 30 kV, Uc = 24 kV, 10 kA nominal discharge current, 50 Hz, 170/70 kV BIL, single phase, gapless, metal oxide type surge arrester		set	6		
C7.X	36 kV, 2000 A, 25 kA, Conductors for double busbars and for connection of the 33 kV switchgears		lot	1		
	36 kV, 2000 A, 25 kA, Insulators and fittings including all necessary clamps and connectors for double busbars and for connection and completing of the 33 kV switchgears		lot	1		
C9.X	33 kV, Gantry steel structure and equipment support for completing of the 33 kV switchgears		lot	1		
C10.X	Necessary material and equipment to complete 33 kV Switchgear		lot	1		

					Foreign Curre	ncy (in)		
Item	Description	Code	Unit	Quantity	Unit Price ²	Total Price ²		
		000.0			CIP	CIP		
				(1)	(2)	$(3) = (1) \times (2)$		
D	Transformers							
D2	132/33 kV, 50/75 MVA, Dyn1, ONAN/ONAF, three phase, oil-immersed, hermetically sealed, power transformer, with On-load tap changer		set	2				
D4	Water Spray Fire Protection System, for new 132/33 kV, three phase, 50/75 MVA, Dyn1, ONAN/ONAF Power transformer unit		set	2				
D10.X	Necessary material and equipment to complete Transformers		lot	1				
F	F Earthing/Auxiliary Transformer							
	33/0.415 kV, 200 kVA, Dyn11, ONAN, three phase, oil-immersed, power transformer, with Off-load tap changer, (to provide an earthing point for the neutral and) to supply the substation auxiliary loads		set	2				
F10.X	Necessary material and equipment to complete Auxiliary Transformers		lot	1				
G	Control, Protection, Substation Automation System and	l Metering						
G1.2	Control, protection and SAS for 132 kV Overhead Line circuit		set	4				
G2.2	Control, protection and SAS for 132/33 kV Power transformer circuit		set	2				
1 (コン イ	Control, protection and SAS for 33/0.415 kV Auxiliary power transformer circuit and AC & DC Auxiliary Power Supply		set	2				
G3.2	Control, protection and SAS for 132 kV Busbars		set	1				
	Tariff Metering pane(s) to accommodate for each line, transformer and auxiliary transformer feeder minimum two (2) (main-1 & main-2) programmable & recordable digital 3-phase, 4-wire import and export MWh and MVAr meters with accuracy class 0.2		set	1				

					Foreign Curre	ncy (in)
Item	Description	Code	Unit	Quantity	Unit Price ² CIP	Total Price ² CIP
				(1)	(2)	$(3) = (1) \times (2)$
G6.X	The hardware and software to provide telecontrol & telemetering facilities required both at the existing National Load Despatch Centre (NLDC) at Aftabnagar and back-up station at Biddut Bhaban for integration of complete new 230/132 kV Substation. All required electrical signals shall be transmitted to the NLDC and back-up station through the Industrial Gateway of the Substation automation system. All HV circuit breakers, motorized disconnectors, tap changer, etc., shall be controlled from NLDC through the Gateway of the Substation automation system using IEC 60870-5-104 protocol. All necessary modification works in the software of the master station of NLDC and back-up station are to be carried out.		set	1		
	Extension of the existing equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment in NLDC		set	1		
G10.X	Necessary material and equipment to complete Control, Protection, SAS and Metering system		lot	1		
н	Fibre Optic Multiplexer Equipment for Teleprotection & Co	mmunica	tion			
H1.X	Fibre Optic Multiplexer Equipment, complete equipment for control, protection & communication at substation		set	1		
H2.X	Telephone system, complete equipment		set	1		
	MDF and underground optical fibre (48 cores) cables from terminal box at gantry structure to MDF (Main distribution Frame)		set	1		
I	Multicore Low Voltage Auxiliary Power and Control	Cables				
I1.X	Multicore low voltage auxiliary power and control cables between all items of equipment supplied under the Contract, with necessary gland, terminated, and identified by colours & tags, including the overall substation cable routing and core schedules		lot	1		
I10.X	Necessary material and equipment to complete LV Auxiliary Power and Control Cables		lot	1		

					Foreign Curre	ncy (in)
Item	Description	Code	Unit	Quantity	Unit Price ²	Total Price ²
					CIP	CIP
				(1)	(2)	$(3) = (1) \times (2)$
J	LV DC, Batteries, Chargers and DC Distribution	n				
J1.X	110 V DC Auxiliary Power Supply, substation alkaline batteries complete with chargers and distribution switchboard, to provide all DC supplies to equipment being supplied for the new substation, consisting of: (a) Two (2) sets Ni-cadmium 100% batteries complete, each capacity shall not be less than 400 Ah at the 5-hour rate of discharge. (b) Two (2) sets battery chargers complete, each float charge shall not be less than 75 A rating. (c) One (1) set DC distribution switchboard.		lot	1		
12 Y	48 V DC system, complete with chargers and distribution switchboard to provide all DC supplies for fibre optic multiplexure equipment for communication and control & protection, consisting of: (a) Two (2) sets Ni-cadmium 100% batteries complete, each capacity shall not be less than 250 Ah at the 5-hour rate of discharge. (b) Two (2) sets battery chargers complete, each float charge shall not be less than 50 A rating. (c) One (1) set DC distribution switchboard.		lot	1		
J10.X	Necessary material and equipment to complete LV DC Distribution system		lot	1		
K	LV AC Distribution					
K1.X	LV AC switchboard for substation services to provide the 400/230V supplies to all equipment being supplied, including one (1) 125 A outdoor weatherproof, 3-phase with neutral and earth switched socket outlet and plug to IEC 60309; to be installed, cabled and connected adjacent to the transformers		lot	1		
K10.X	Necessary material and equipment to complete LV AC Distribution system		lot	1		
L	Civil Works, Control Building and Foundations	3				
L1.X	Land development of complete switchyard area by cutting, land filling, compacting up to a suitable level including slope protection.		lot	1		

					Foreign Curre	ncy (in)
Item	Description	Code	Unit	Quantity	0	Total Price ²
				(4)	CIP	CIP
L2.X	Complete outdoor civil works, including 132 kV and 33 kV gantry foundation, 132 kV and 33 kV equipment foundation, power transformers and auxiliary transformers foundation, oil pit, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing		lot	1	(2)	(3) = (1) x (2)
L3.X	Complete civil works and facilities for new two-storey control room building with cable basement, including foundation works, super structure works, finishing works like rendering, colour, water supply, sanitary, floor finishing, rain water drainage system, lightning protection, water supply including deep tube well for drinking water, pump house, pump, water reservoir, water pipe lines, etc., sewage facilities including septic tank, etc.		lot	1		
М	Building Lighting, Small Power, Air Conditioning and V	entilation				
	Complete equipment to provide lighting, LV power supply, air conditioning system, ventilation and emergency DC lighting for the substation control building.		lot	1		
N	Switchyard Lighting					
N1.X	Complete equipment to provide switchyard lighting for security, roadway and switchyard and emergency DC lighting at strategic locations for equipment operations and inspections.		lot	1		
Р	Earthing and Lightning Protection					
	Complete equipment of earthing system and lightning protection screen including connections, connectors and clamps, to suit the substation overall arrangement, including supporting design calculations.		lot	1		
	3-phase portable (maintenance) earthing equipment devices with connectors and telescopic glass fibre operating pole suitable for plant supplied.		set	2		

					Foreign Curre	ncy (in)
Item	Description	Code	Unit	Quantity		Total Price ²
				(4)	CIP	CIP
				(1)	(2)	$(3) = (1) \times (2)$
	Mandatory Spare Parts					
В	132 kV Switchgear					
BS.1	Circuit breaker 132 kV, Tripping coil		set	2		
BS.2	Circuit breaker 132 kV, Closing coil		set	2		
BS.3	Circuit breaker 132 kV, Motor, in motor drive mechanism, complete with accessories		set	1		
BS.4	Circuit breaker 132 kV, auxiliary contacts, in motor drive mechanism, complete with accessories, one of each type		set	1		
	Circuit breaker 132 kV, Contactors, relays, selector switches, push buttons, counters, heaters, etc., in motor drive mechanism and control cubicle, one of each type		set	1		
BS.6	Circuit breaker 132 kV, SF6 temperature compensated manometer		set	3		
BS.7	Circuit breaker 132 kV, SF6 gas (40 kg) cylinder		set	1		
BS.8	Disconnector 132 kV with earthing switch - complete pole, together with one complete Motor drive mechanism of main blades and one complete Motor drive mechanism of the earthing blades		set	3		
B3.2	145 kV, 40 kA, 50 Hz, 650/275 kV BIL, single phase, 5-cores, 1600-800-400/1/1/1/1/1 A, 0.2, 0.2, 5P20, 5P20, 5P20; Fs=10, Fs=10; 5 /15 / 30 / 30 VA, head type, post type current transformer		set	3		
	145 kV, 40 kA, 50 Hz, $650/275$ kV BIL, single phase, 2-secondary windings, $132/V3$ / $110/V3$ / $110/V3$ kV/V/V, 0.2, 3P; 25 / 75 VA, capacitor voltage transformer		set	3		
B5	145 kV, Um = 145 kV, Ur = 120 kV, Uc = 96 kV, 10 kA nominal discharge current, 50 Hz, 650/275 kV BIL, single phase, heavy duty, gapless, metal oxide type surge arrester		set	3		
С	33 kV Switchgear					
CS.1	Circuit breaker 33 kV, Tripping coil		set	1		
CS.2	Circuit breaker 33 kV, Closing coil	_	set	1		

Name of Bidder:

					Foreign Curre	ncy (in)
Item	Description	Code	Unit	Quantity		Total Price ²
	·			(4)	CIP	CIP
CS 3	Circuit breaker 33 kV, Motor, in motor drive mechanism, complete with accessories		set	(1)	(2)	$(3) = (1) \times (2)$
	Fuse 10 A		set	3		
	36 kV, 25 kA, 50 Hz, 170/70 kV BIL, single phase, 4-cores, 1600/1/1/1/1, 0.2, 0.2, 5P20, 5P20; Fs=10, Fs=10;					
	5 / 15 / 30 / 30 VA, post type current transformer		set	1		
C3.2	36 kV, 25 kA, 50 Hz, 170/70 kV BIL, single phase, 4-cores, 10/1/1/1, 0.2, 0.2, 5P20, 5P20; Fs=10, Fs=10; 5 / 15 / 30 / 30 VA, post type current transformer		set	1		
	36 kV, 25 kA, 50 Hz, 170/70 BIL, single phase, 2-secondary windings, 33/V3 / 110/V3 / 110/V3 kV/V/V, 0.2, 3P; 25 / 75 VA, inductive voltage transformer		set	1		
	36 kV, Um = 36 kV, Ur = 30 kV, Uc = 24 kV, 10 kA nominal discharge current, 50 Hz, 170/70 kV BIL, single phase, gapless, metal oxide type surge arrester		set	1		
D	Transformers					
DS.2	Transformer Bushing 132 kV		piece	1		
DS.3	Transformer Bushing 33 kV		piece	1		
DS.4	Transformer oil		kg	5,000		
DS.5	Transformer silica gel		kg	20		
DS.6	Transformer ventilator with motor		set	2		
DS.7	Contactors, relays, selector switches, push buttons, counters, heaters, etc., in transformer control cabinet, one of each type		lot	1		
DS.8	Contactors, relays, auxiliary contacts, selector switches, push buttons, counters, heaters, etc., in OLTC Motor Drive mechanism, one of each type		lot	1		
DS.9	Thermometer, one of each type		lot	1		
DS.10	Thermostat, one of each type		lot	1		

					Foreign Curre	ncy (in)			
Item	Description	Code	Unit	Quantity		Total Price ²			
	·			(4)	CIP	CIP			
				(1)	(2)	$(3) = (1) \times (2)$			
F	Earthing/Auxiliary Transformer								
FS.1	Transformer Bushing 33 kV		piece	1					
G	Control, Protection, Substation Automation System and	l Metering							
GS.2	Line differential protection relay 132 kV		set	1					
GS.4	Line distance protection relay 132 kV		set	1					
GS.6	Transformer 132/33 kV differential relay with complete REF function		set	1					
GS.8	Overcurrent and earth fault relay 132 kV		set	1					
GS.10	Bay control unit		set	1					
GS.11	Trip Circuit Supervision relay, 3phase		set	1					
GS.13	Electronic meter, same as installed, including communication unit		set	1					
J	LV DC, Batteries, Chargers and DC Distribution	n							
JS.1	Contactors, relays, MCBs, selector switches, push buttons, counters, heaters, etc., one of each type		lot	1					
K	K LV AC Distribution								
KS.1	Contactors, relays, MCBs, selector switches, push buttons, counters, heaters, etc., one of each type		lot	1					
	Subtotal Miithapukur Substation to Schedule 5 - Grand Summary								

Country of Origin Declaration Form

Item	Description	Code	Country

Bidders shall enter a code representing the country of origin of all imported plant and equipment.

Name of Bidder:

² Specify currency. Create and use as many columns for Unit Price and Total Price as there are currencies.

				Foreign Cur	rency (in)	Local Curre	ncy (in BDT)
Item	Description	Unit	Quantity	Unit Price2	Total Price2	Unit Price	Total Price
Item	Description	Onit		EXW	EXW	EXW	EXW
			(1)	(2)	(3)=(1)x(2)	(4)	(5)=(1)x(4)
I	Extension of NEW 230/132 kV Subst	tation	n Rajs	shahi			
Α	230 kV Switchgear						
A1.1	245 kV, 3150 A, 50 kA, 50 Hz, 1050/460 kV BIL, three pole, live tank, SF6 gas circuit breaker with three spring-stored energy operating mechanism	set	2				
A1.2	245 kV, 3150 A, 50 kA, 50 Hz, 1050/460 kV BIL, three pole, live tank, SF6 gas circuit breaker with one spring-stored energy operating mechanism	set	3				
A2.1	245 kV, 3150 A, 50 kA, 50 Hz, 1050/460 kV BIL, three pole, centre break, post type, motor operated disconnector with motor operated earthing switch	set	2				
A2.2	245 kV, 2000 A, 50 kA, 50 Hz, 1050/460 kV BIL, three pole, centre break, post type, motor operated disconnector with motor operated earthing switch	set	2				
A2.3	245 kV, 2000 A, 50 kA, 50 Hz, 1050/460 kV BIL, three pole, centre break, post type, motor operated disconnector	set	8				
A3.1	245 kV, 50 kA, 50 Hz, 1050/460 kV BIL, single phase, 5-cores, 3200-1600/1/1/1/1/1 A, 0.2, 0.2, 5P20, 5P20, 5P20; Fs=10, Fs=10; 5 /15 / 30 / 30 / 30 VA, head type, post type current transformer	set	3				
A3.2	245 kV, 50 kA, 50 Hz, 1050/460 kV BIL, single phase, 5-cores, 1600-800/1/1/1/1/1 A, 0.2, 0.2, 5P20, 5P20, 5P20; Fs=10, Fs=10; 5 /15 / 30 / 30 / 30 VA, head type, post type current transformer	set	12				
A4	245 kV, 50 kA, 50 Hz, 1050/460 kV BIL, single phase, 2-secondary windings, 230/V3 / 110/V3 / 110/V3 kV/V/V, 0.2, 3P; 25 / 75 VA, capacitor voltage transformer	set	12				
A5	245 kV, Um = 245 kV, Ur = 192 kV, Uc = 154 kV, 10 kA nominal discharge current, 50 Hz, 1050/460 kV BIL, single phase, heavy duty, gapless, metal oxide type surge arrester	set	12				
A7.X	245 kV, 3150 A and 2000 A, 50 kA, Conductors for double busbars and for connection of the 230 kV switchgears	lot	1				
A8.X	245 kV, 3150 A and 2000 A, 50 kA, Insulators and fittings including all necessary clamps and connectors for double busbars and for connection and completing of the 230 kV switchgears	lot	1				
A9.X	245 kV, Gantry steel structure and equipment support for completing of the 230 kV switchgears	lot	1				

Name of Bidder:

				Foreign Cur	rency (in)	Local Currency (in BDT)	
Item	Description	Unit	Quantity	Unit Price2	Total Price2	Unit Price	Total Price
1.0	2000/ipiio.ii			EXW	EXW	EXW	EXW
			(1)	(2)	(3)=(1)x(2)	(4)	(5)=(1)x(4)
A10.X	Necessary material and equipment to complete 230 kV Switchgear	lot	1				
С	33 kV Switchgear						
(5	36 kV, Um = 36 kV, Ur = 30 kV, Uc = 24 kV, 10 kA nominal discharge current, 50 Hz, 170/70 kV BIL, single phase, gapless, metal oxide type surge arrester	set	6				
C7.X	36 kV, 2000 A, 25 kA, Conductors for connection of the 33 kV switchgears	lot	1				
	36 kV, 2000 A, 25 kA, Insulators and fittings including all necessary clamps and connectors for connection and completing of the 33 kV switchgears	lot	1				
C9.X	33 kV, Gantry steel structure and equipment support for completing of the 33 kV switchgears	lot	1				
C10.X	Necessary material and equipment to complete 33 kV Switchgear	lot	1				
D	Transformers						
	235/132/33 kV, 225/300 MVA, YNa0d1, ONAN/ONAF, three phase, oil-immersed, hermetically sealed, autotransformer, with On-load tap changer, with tertiary winding (brought out to terminal bushings)	set	2				
	Nitrogen Injection Fire Protection System (NIFPS), for new 235/132/33 kV, three phase, 225/300 MVA, YNa0d1, ONAN/ONAF, auto transformer unit	set	2				
D10.X	Necessary material and equipment to complete Transformers	lot	1				
G	Control, Protection, Substation Automation System	and Me	tering				
G1.1	Control, Protection and SAS for 230 kV Overhead Line circuit	set	2				
	Control, Protection and SAS for 230/132/33 kV Autotransformer circuits and associated Earthing/Auxiliary Transformer circuit	set	2				
G3.1	Control, Protection and SAS for 230 kV Busbars	set	1				

				Foreign Cur	rency (in)	Local Curre	ncy (in BDT)			
Item	Description	Unit	Quantity	Unit Price2	Total Price2	Unit Price	Total Price			
ite	Description	O i iii		EXW	EXW	EXW	EXW			
	Lawith Malaysia and (a) to accompany data to a cash to a day any and the (2) (and a 4 % and a 2)		(1)	(2)	(3)=(1)x(2)	(4)	(5)=(1)x(4)			
G4.X	Tariff Metering pane(s) to accommodate for each feeder minimum two (2) (main-1 & main-2) programmable & recordable digital 3-phase, 4-wire import and export MWh and MVAr meters with accuracy class 0.2	set	1							
G5.X	Digital Fault and Disturbance Recorder (DFDR) to accommodate all feeders	set	1							
G6.X	National Load Despatch Centre (NLDC) at Aftabnagar and back-up station at Biddut Bhaban for integration of complete new 230/132 kV Substation. All required electrical signals shall be transmitted to the NLDC and back-up station through the Industrial Gateway of the Substation automation system. All HV circuit breakers, motorized disconnectors, tap changer, etc., shall be controlled from NLDC through the Gateway of the Substation automation system using IEC 60870-5-104 protocol. All necessary modification works in the software of the master station of NLDC and back-up station are to be carried	set	1							
G7.X	Extension of the existing equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment in NLDC	set	1							
G10.X	Necessary material and equipment to complete Control, Protection, SAS and Metering system	lot	1							
н	Fibre Optic Multiplexer Equipment for Teleprotection 8	k Commi	unication							
H1.X	Fibre Optic Multiplexer Equipment, complete equipment for control, protection & communication at substation	set	1							
1 H X X	MDF and underground optical fibre (48 cores) cables from terminal box at gantry structure to MDF (Main distribution Frame)	set	1							
1	Multicore Low Voltage Auxiliary Power and Control Cables									
11 Y	Multicore low voltage auxiliary power and control cables between all items of equipment supplied under the Contract and for connection and integration of new equipment with the existing equipment, with necessary gland, terminated, and identified by colours & tags, including the overall substation cable routing and core schedules	lot	1							
I10.X	Necessary material and equipment to complete LV Auxiliary Power and Control Cables	lot	1							

				Foreign Cur	rency (in)	Local Curre	ncy (in BDT)			
Item	Description	Unit	Quantity	Unit Price2	Total Price2	Unit Price	Total Price			
I.c.	Description	O.I.I.		EXW	EXW	EXW	EXW			
			(1)	(2)	(3)=(1)x(2)	(4)	(5)=(1)x(4)			
J	LV DC, Batteries, Chargers and DC Distrib	ution								
J1.X	The complete equipment to provide extension of the existing LV DC Auxiliary Power Supply and for connection and integration of new equipment with the existing equipment. DC distribution switchboard.	lot	1							
J2.X	The complete equipment to provide extension of the existing 48 V DC Auxiliary Power Supply and for connection and integration of new equipment with the existing equipment. DC distribution switchboard.	lot	1							
J10.X	Necessary material and equipment to complete LV DC Distribution system	lot	1							
К	LV AC Distribution									
K1.X	The complete equipment to provide extension of the existing LV AC Auxiliary Power Supply and for connection and integration of new equipment with the existing equipment. DC distribution switchboard.	lot	1							
K10.X	Necessary material and equipment to complete LV AC Distribution system	lot	1							
L	Civil Works, Control Building and Foundat	tions								
L1.X	Land development of complete required 230 kV switchyard area by cutting, land filling, compacting up to a suitable level.	lot	1							
L2.X	Complete outdoor civil works of required 230 kV switchyard area, including 230 kV gantry foundation, 230 kV and 33 kV equipment foundation, power transformers foundation, oil pit, blast wall, internal roads, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing	lot	1							
	Complete civil works and facilities for extension of existing control building, including finishing works like rendering, colour, floor finishing, etc.	lot	1							
М	Building Lighting, Small Power, Air Conditioning ar	nd Ventil	ation							
M1.X	Complete equipment to provide lighting, LV power supply, air conditioning system, ventilation and emergency DC lighting for the substation control building.	lot	1							

				Foreign Cur	rency (in)	Local Curre	ncy (in BDT)
Item	Description	Unit	Quantity	Unit Price2	Total Price2	Unit Price	Total Price
Item	Description	Onit		EXW	EXW	EXW	EXW
			(1)	(2)	(3)=(1)x(2)	(4)	(5)=(1)x(4)
N	Switchyard Lighting						
N1.X	Complete equipment to provide extension of the existing switchyard lighting for security, roadway and switchyard and emergency DC lighting at strategic locations for equipment operations and inspections.	lot	1				
Р	Earthing and Lightning Protection						
P1.X	Complete equipment to provide extension of the existing earthing system and lightning protection and for connection and integration of new equipment with the existing equipment, including connections, connectors and clamps, to suit the substation extension, including supporting design calculations.	lot	1				
	3-phase portable (maintenance) earthing equipment devices with connectors and telescopic glass fibre operating pole suitable for plant supplied.	set	2				
	Mandatory Spare Parts						
Α	230 kV Switchgear						
AS.1	Circuit Breaker 230 kV, Tripping coil	set	4				
AS.2	Circuit Breaker 230 kV, Closing coil	set	4				
AS.3	Circuit Breaker 230 kV, Motor, in motor drive mechanism, complete with accessories	set	1				
AS.4	Circuit Breaker 230 kV, Auxiliary contacts, in motor drive mechanism, complete with accessories, one of each type	set	1				
AS.5	Circuit Breaker 230 kV, Contactors, relays, selector switches, push buttons, counters, heaters, etc., in motor drive mechanism and control cubicle, one of each type	set	1				
AS.6	Circuit Breaker 230 kV, SF6 temperature compensated manometer	set	2				
AS.7	Circuit Breaker 230 kV, SF6 gas (40 kg) cylinder	set	1				
	Disconnector 230 kV with Earthing Switch - complete pole, together with one complete motor drive mechanism of main blades and one complete Motor drive mechanism of the earthing blades	set	2				

Schedule 2: Plant & Equipment (including Mandatory Spare Parts) Supplied from within the Employer's Country

				Foreign Cur	rency (in)	Local Curre	ncy (in BDT)
Item	Description	Unit	Quantity	Unit Price2	Total Price2	Unit Price	Total Price
ite	Bescription	0		EXW	EXW	EXW	EXW
			(1)	(2)	(3)=(1)x(2)	(4)	(5)=(1)x(4)
	245 kV, 50 kA, 50 Hz, 1050/460 kV BIL, single phase, 5-cores, 1600-800/1/1/1/1/1 A, 0.2, 0.2, 5P20, 5P20, 5P20; Fs=10, Fs=10; 5 /15 / 30 / 30 VA, head type, post type current transformer	set	3				
	245 kV, 50 kA, 50 Hz, 1050/460 kV BIL, single phase, 2-secondary windings, 230/V3 / 110/V3 / 110/V3 kV/V/V, 0.2, 3P; 25 / 75 VA, capacitor voltage transformer	set	3				
	245 kV, Um = 245 kV, Ur = 192 kV, Uc = 154 kV, 10 kA nominal discharge current, 50 Hz, $1050/460$ kV BIL, single phase, heavy duty, gapless, metal oxide type surge arrester	set	3				
С	33 kV Switchgear						
C5	36 kV, Um = 36 kV, Ur = 30 kV, Uc = 24 kV, 10 kA nominal discharge current, 50 Hz, 170/70 kV BIL, single phase, gapless, metal oxide type surge arrester	set	1				
D	Transformers						
DS.1	Transformer Bushing 230 kV	piece	1				
DS.2	Transformer Bushing 132 kV	piece	1				
DS.3	Transformer Bushing 33 kV	piece	1				
DS.4	Transformer oil	kg	10,000				
DS.5	Transformer silica gel	kg	40				
DS.6	Transformer ventilator with motor	set	2				
DS.7	Contactors, relays, selector switches, push buttons, counters, heaters, etc., in Transformer control cabinet, one of each type	lot	1				
DS.8	Contactors, relays, auxiliary contacts, selector switches, push buttons, counters, heaters, etc., in OLTC Motor Drive mechanism, one of each type	lot	1				
DS.9	Thermometer, one of each type	lot	1				
DS.10	Thermostat, one of each type	lot	1				

Name of Bidder: Si

				Foreign Cur	rency (in)	Local Curre	ncy (in BDT)			
Item	Description	Unit	Quantity	Unit Price2	Total Price2	Unit Price	Total Price			
	2000. p.io.i			EXW	EXW	EXW	EXW			
			(1)	(2)	(3)=(1)x(2)	(4)	(5)=(1)x(4)			
G	Control, Protection, Substation Automation System	and Me	tering							
GS.1	1 Line differential protection relay 230 kV set 1									
GS.3	Line distance protection relay 230 kV	set	1							
GS.5	Transformer 230/132 kV differential relay with complete REF function	set	1							
GS.7	Overcurrent and earth fault relay 230 kV	set	1							
GS.10	Bay control unit	set	1							
GS.11	Trip Circuit Supervision relay, 3phase	set	1							
GS.13	Electronic meter, same as installed, including communication unit	set	1							
J	LV DC, Batteries, Chargers and DC Distrib	ution								
JS.1	Contactors, relays, MCBs, selector switches, push buttons, counters, heaters, etc., one of each type	lot	1							
К	LV AC Distribution									
KS.1	Contactors, relays, MCBs, selector switches, push buttons, counters, heaters, etc., one of each type	lot	1							
	Subtotal Rajshahi Substation to Schedule 5 - Grand Summary									

Name of Bidder:

				Foreign Cur	rency (in)	Local Curre	ncy (in BDT)			
Item	Description	Unit	Quantity	Unit Price2	Total Price2	Unit Price	Total Price			
	2000p.i.o.ii	J		EXW	EXW	EXW	EXW			
			(1)	(2)	(3)=(1)x(2)	(4)	(5)=(1)x(4)			
III	New 132/33 kV Substation B	angu	ıra							
В	132 kV Switchgear	132 kV Switchgear								
B1.1	145 kV, 1250 A, 40 kA, 50 Hz, 650/275 kV BIL, three pole, live tank, SF6 gas circuit breaker with three spring-stored energy operating mechanism	set	1							
B1.4	145 kV, 1250 A, 40 kA, 50 Hz, 650/275 kV BIL, three pole, live tank, SF6 gas circuit breaker with one spring-stored energy operating mechanism	set	2							
B2.3	145 kV, 1250 A, 40 kA, 50 Hz, 650/275 kV BIL three pole, centre break, post type, motor operated disconnector with motor operated earthing switch	set	1							
B2.5	145 kV, 1250 A, 40 kA, 50 Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnector	set	3							
B3.2	145 kV, 40 kA, 50 Hz, 650/275 kV BIL, single phase, 5-cores, 1600-800-400/1/1/1/1/1 A, 0.2, 0.2, 5P20, 5P20, 5P20; Fs=10, Fs=10; 5 /15 / 30 / 30 / 30 VA, head type, post type current transformer	set	9							
B4	145 kV, 40 kA, 50 Hz, 650/275 kV BIL, single phase, 2-secondary windings, 132/V3 / 110/V3 / 110/V3 kV/V/V, 0.2, 3P; 25 / 75 VA, capacitor voltage transformer	set	6							
B5	145 kV, Um = 145 kV, Ur = 120 kV, Uc = 96 kV, 10 kA nominal discharge current, 50 Hz, 650/275 kV BIL, single phase, heavy duty, gapless, metal oxide type surge arrester	set	9							
В6	145 kV, 50 Hz, 650/275 kV BIL, single phase, post insulator	set	3							
B7.X	145 kV, 2000 A and 1250 A, 40 kA, Conductors for single busbars and for connection of the 132 kV switchgears	lot	1							
B8.X	145 kV, 2000 A and 1250 A, 40 kA, Insulators and fittings including all necessary clamps and connectors for single busbars and for connection and completing of the 132 kV switchgears	lot	1							
B9.X	145 kV, Gantry steel structure and equipment support for completing of the 132 kV switchgears	lot	1							
B10.X	Necessary material and equipment to complete 132 kV Switchgear	lot	1							

				Foreign Cur	rency (in)	Local Curre	ncy (in BDT)
Item	Description	Unit	Quantity	Unit Price2	Total Price2	Unit Price	Total Price
				EXW	EXW	EXW	EXW
			(1)	(2)	(3)=(1)x(2)	(4)	(5)=(1)x(4)
С	33 kV Switchgear						
	36 kV, 1600 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, live tank, vacuum circuit breaker, for outdoor installation, with spring-stored energy operating mechanism	set	2				
1 (.21	36 kV, 1600 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, vertical break, post type, hand operated disconnector	set	3				
	36 kV, 100 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, vertical break, post type, hand operated disconnector, with integrated fuse 10 A	set	2				
	36 kV, 25 kA, 50 Hz, 170/70 kV BIL, single phase, 4-cores, 1600/1/1/1, 0.2, 0.2, 5P20, 5P20; Fs=10, Fs=10; 5 / 15 / 30 / 30 VA, post type current transformer	set	6				
	36 kV, 25 kA, 50 Hz, 170/70 kV BIL, single phase, 4-cores, 10/1/1/1, 0.2, 0.2, 5P20, 5P20; Fs=10, Fs=10; 5 / 15 / 30 / 30 VA, post type current transformer	set	6				
	36 kV, 25 kA, 50 Hz, 170/70 BIL, single phase, 2-secondary windings, 33/V3 / 110/V3 / 110/V3 kV/V/V, 0.2, 3P; 25 / 75 VA, inductive voltage transformer	set	12				
1 1	36 kV, Um = 36 kV, Ur = 30 kV, Uc = 24 kV, 10 kA nominal discharge current, 50 Hz, 170/70 kV BIL, single phase, gapless, metal oxide type surge arrester	set	6				
C7.X	36 kV, 2000 A, 25 kA, Conductors for double busbars and for connection of the 33 kV switchgears	lot	1				
C8.X	36 kV, 2000 A, 25 kA, Insulators and fittings including all necessary clamps and connectors for double busbars and for connection and completing of the 33 kV switchgears	lot	1				
C9.X	33 kV, Gantry steel structure and equipment support for completing of the 33 kV switchgears	lot	1				
C10.X	Necessary material and equipment to complete 33 kV Switchgear	lot	1				
D	Transformers						
D2	132/33 kV, 50/75 MVA, Dyn1, ONAN/ONAF, three phase, oil-immersed, hermetically sealed, power transformer, with On-load tap changer	set	2				

Name of Bidder:

				Foreign Cur	rency (in)	Local Curre	ncy (in BDT)
Item	Description	Unit	Quantity	Unit Price2	Total Price2	Unit Price	Total Price
Item	Description	Oiiii		EXW	EXW	EXW	EXW
			(1)	(2)	(3)=(1)x(2)	(4)	(5)=(1)x(4)
D4	Water Spray Fire Protection System, for new 132/33 kV, three phase, 50/75 MVA, Dyn1, ONAN/ONAF Power transformer unit	set	2				
D10.X	Necessary material and equipment to complete Transformers	lot	1				
F	Earthing/Auxiliary Transformer						
	33/0.415 kV, 200 kVA, Dyn11, ONAN, three phase, oil-immersed, power transformer, with Off-load tap changer, (to provide an earthing point for the neutral and) to supply the substation auxiliary loads	set	2				
F10.X	Necessary material and equipment to complete Auxiliary Transformers	lot	1				
G	Control, Protection, Substation Automation System	and Me	tering				
G1.2	Control, Protection and SAS for 132 kV Overhead Line circuit	set	1				
G2.2	Control, Protection and SAS for 132/33 kV Power transformer circuit	set	2				
G2.3	Control, Protection and SAS for 33/0.415 kV Auxiliary power transformer circuit and AC & DC Auxiliary Power Supply	set	2				
G3.2	Control, Protection and SAS for 132 kV Busbars	set	1				
	Tariff Metering pane(s) to accommodate for each line, transformer and auxiliary transformer feeder minimum two (2) (main-1 & main-2) programmable & recordable digital 3-phase, 4-wire import and export MWh and MVAr meters with accuracy cl. 0.2	set	1				
G6.X	National Load Despatch Centre (NLDC) at Aftabnagar and Back up station at Biddut Bhaban for integration of complete new 230/132 kV Substation. All required electrical signals shall be transmitted to the NLDC and Back up station through the Industrial Gateway of the Substation automation system. All HV circuit breakers, motorized disconnectors, tap changer, etc., shall be controlled from NLDC through the Gateway of the Substation automation system using IEC 60870-5-104 protocol. All necessary modification works in the software of the master station of NLDC and Back up station are to be carried out	set	1				
G7.X	Extension of the existing equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment in NLDC	set	1				

Name of Bidder:

Item	Description	Unit	Quantity	_	rency (in) Total Price2 EXW	
			(1)	(2)	(3)=(1)x(2)	(5)=(1)x(4)
G10.X	Necessary material and equipment to complete Control, Protection, SAS and Metering system	lot	1			
Н	Fibre Optic Multiplexer Equipment for Teleprotection 8	k Commu	unication			
H1.X	Fibre Optic Multiplexer Equipment, complete equipment for control, protection & communication at substation	set	1			
H2.X	Telephone system, complete equipment	set	1			
H3.X	MDF and underground optical fibre (48 cores) cables from terminal box at gantry structure to MDF (Main distribution Frame)	set	1			
- 1	Multicore Low Voltage Auxiliary Power and Con-	trol Cabl	es			
I1.X	Multicore low voltage auxiliary power and control cables between all items of equipment supplied under the Contract, with necessary gland, terminated, and identified by colours & tags, including the overall substation cable routing and core schedules	lot	1			
I10.X	Necessary material and equipment to complete LV Auxiliary Power and Control Cables	lot	1			
J	LV DC, Batteries, Chargers and DC Distrib	ution				
J1.X	TTO V DC Auxiliary Power Supply, substation alkaline batteries complete with chargers and distribution switchboard, to provide all DC supplies to equipment being supplied for the new substation, consisting of: (a) Two (2) sets Ni-cadmium 100% batteries complete, each capacity shall not be less than 400 Ah at the 5-hour rate of discharge. (b) Two (2) sets battery chargers complete, each float charge shall not be less than 75 A rating. (c) One (1) set DC distribution switchboard.	lot	1			
12. V	48 V DC system, complete with chargers and distribution switchboard to provide all DC supplies for fibre optic multiplexure equipment for communication and control & protection, consisting of: (a) Two (2) sets Ni-cadmium 100% batteries complete, each capacity shall not be less than 250 Ah at the 5-hour rate of discharge. (b) Two (2) sets battery chargers complete, each float charge shall not be less than 50 A rating. (c) One (1) set DC distribution switchboard.	lot	1			

				Foreign Cur	rency (in)	Local Curre	ncy (in BDT)
Item	Description	Unit	Quantity	Unit Price2	Total Price2	Unit Price	Total Price
Item	Description	Onne		EXW	EXW	EXW	EXW
			(1)	(2)	(3)=(1)x(2)	(4)	(5)=(1)x(4)
J10.X	Necessary material and equipment to complete LV DC Distribution system	lot	1				
K	LV AC Distribution						
K1.X	LV AC switchboard for substation services to provide the 400/230V supplies to all equipment being supplied, including one (1) 125 A outdoor weatherproof, 3-phase with neutral and earth switched socket outlet and plug to IEC 60309; to be installed, cabled and connected adjacent to the transformers	lot	1				
K10.X	Necessary material and equipment to complete LV AC Distribution system	lot	1				
L	Civil Works, Control Building and Foundate	tions					
L1.X	Land development of complete switchyard area by cutting, land filling, compacting up to a suitable level including slope protection.	lot	1				
L2.X	Complete outdoor civil works, including 132 kV and 33 kV gantry foundation, 132 kV and 33 kV equipment foundation, power transformers and auxiliary transformers foundation, oil pit, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing	lot	1				
L3.X	Complete civil works and facilities for new two-storey control room building with cable basement, including foundation works, super structure works, finishing works like rendering, colour, water supply, sanitary, floor finishing, rain water drainage system, lightning protection, water supply including deep tube well for drinking water, pump house, pump, water reservoir, water pipe lines, etc., sewage facilities including septic tank, etc.	lot	1				
M	Building Lighting, Small Power, Air Conditioning at	nd Ventil	ation				
	Complete equipment to provide lighting, LV power supply, air conditioning system, ventilation and emergency DC lighting for the substation control building.	lot	1				
N	Switchyard Lighting						
	Complete equipment to provide switchyard lighting for security, roadway and switchyard and emergency DC lighting at strategic locations for equipment operations and inspections.	lot	1				

				Foreign Cur	rency (in)	Local Curre	ncy (in BDT)
Itom	Description	Unit	Quantity	Unit Price2	Total Price2	Unit Price	Total Price
Item	Description	Onit		EXW	EXW	EXW	EXW
			(1)	(2)	(3)=(1)x(2)	(4)	(5)=(1)x(4)
Р	Earthing and Lightning Protection						
P1.X	Complete equipment of earthing system and lightning protection screen including connections, connectors and clamps, to suit the substation overall arrangement, including supporting design calculations.	lot	1				
P2	3-phase portable (maintenance) earthing equipment devices with connectors and telescopic glass fibre operating pole suitable for plant supplied.	set	2				
	Mandatory Spare Parts						
В	132 kV Switchgear						
BS.1	Circuit Breaker 132 kV, Tripping coil	set	1				
BS.2	Circuit Breaker 132 kV, Closing coil	set	1				
BS.3	Circuit Breaker 132 kV, Motor, in motor drive mechanism, complete with accessories	set	1				
BS.4	Circuit Breaker 132 kV, Auxiliary contacts, in motor drive mechanism, complete with accessories, one of each type	set	1				
BS.5	Circuit Breaker 132 kV, Contactors, relays, selector switches, push buttons, counters, heaters, etc., in motor drive mechanism and control cubicle, one of each type	set	1				
BS.6	Circuit Breaker 132 kV, SF6 temperature compensated manometer	set	1				
BS.7	Circuit Breaker 132 kV, SF6 gas (40 kg) cylinder	set	1				
BS.8	Disconnector 132 kV with Earthing Switch - complete pole, together with one complete Motor drive mechanism of main blades and one complete Motor drive mechanism of the earthing blades	set	1				
B3.2	145 kV, 40 kA, 50 Hz, 650/275 kV BIL, single phase, 5-cores, 1600-800-400/1/1/1/1/1 A, 0.2, 0.2, 5P20, 5P20, 5P20; Fs=10, Fs=10; 5 /15 / 30 / 30 VA, head type, post type current transformer	set	1				
B4	145 kV, 40 kA, 50 Hz, 650/275 kV BIL, single phase, 2-secondary windings, 132/V3 / 110/V3 / 110/V3 kV/V/V, 0.2, 3P; 25 / 75 VA, capacitor voltage transformer	set	1				

Name of Bidder:

				Foreign Cur	rency (in)	Local Curre	ncy (in BDT)
ltom	Deparintion	Unit	Quantity	Unit Price2	Total Price2	Unit Price	Total Price
Item	Description	Unit		EXW	EXW	EXW	EXW
			(1)	(2)	(3)=(1)x(2)	(4)	(5)=(1)x(4)
B5	145 kV, Um = 145 kV, Ur = 120 kV, Uc = 96 kV, 10 kA nominal discharge current, 50 Hz, 650/275 kV BIL, single phase, heavy duty, gapless, metal oxide type surge arrester	set	1				
С	33 kV Switchgear						
CS.1	Circuit Breaker 33 kV, Tripping coil	set	1				
CS.2	Circuit Breaker 33 kV, Closing coil	set	1				
CS.3	Circuit Breaker 33 kV, Motor, in motor drive mechanism, complete with accessories	set	1				
CS.4	Fuse 10 A	set	3				
C3.1	36 kV, 25 kA, 50 Hz, 170/70 kV BIL, single phase, 4-cores, 1600/1/1/1, 0.2, 0.2, 5P20, 5P20; Fs=10, Fs=10; 5 / 15 / 30 / 30 VA, post type current transformer	set	1				
C3.2	36 kV, 25 kA, 50 Hz, 170/70 kV BIL, single phase, 4-cores, 10/1/1/1, 0.2, 0.2, 5P20, 5P20; Fs=10, Fs=10; 5 / 15 / 30 / 30 VA, post type current transformer	set	1				
C4	36 kV, 25 kA, 50 Hz, 170/70 BIL, single phase, 2-secondary windings, 33/V3 / 110/V3 / 110/V3 kV/V/V, 0.2, 3P; 25 / 75 VA, inductive voltage transformer	set	1				
C5	36 kV, Um = 36 kV, Ur = 30 kV, Uc = 24 kV, 10 kA nominal discharge current, 50 Hz, 170/70 kV BIL, single phase, gapless, metal oxide type surge arrester	set	1				
D	Transformers						
DS.2	Transformer Bushing 132 kV	piece	1				
DS.3	Transformer Bushing 33 kV	piece	1				
DS.4	Transformer oil	kg	5,000				
DS.5	Transformer silica gel	kg	20				
DS.6	Transformer ventilator with motor	set	2				
DS.7	Contactors, relays, selector switches, push buttons, counters, heaters, etc., in Transformer control cabinet, one of each type	lot	1				

Name of Bidder:

				Foreign Cur	rency (in)	Local Curre	ncy (in BDT)	
Item	Description	Unit	Quantity	Unit Price2	Total Price2	Unit Price	Total Price	
item	Description	Unit		EXW	EXW	EXW	EXW	
			(1)	(2)	(3)=(1)x(2)	(4)	(5)=(1)x(4)	
DS.8	Contactors, relays, auxiliary contacts, selector switches, push buttons, counters, heaters, etc., in OLTC Motor Drive mechanism, one of each type	lot	1					
DS.9	Thermometer, one of each type	lot	1					
DS.10	Thermostat, one of each type	lot	1					
F	Earthing/Auxiliary Transformer							
FS.1	Transformer Bushing 33 kV	piece	1					
G	G Control, Protection, Substation Automation System and Metering							
GS.2	Line differential protection relay 132 kV	set	1					
GS.4	Line distance protection relay 132 kV	set	1					
GS.6	Transformer 132/33 kV differential relay with complete REF function	set	1					
GS.8	Overcurrent and earth fault relay 132 kV	set	1					
GS.10	Bay control unit	set	1					
GS.11	Trip Circuit Supervision relay, 3phase	set	1					
GS.13	Electronic meter, same as installed, including communication unit	set	1					
J	LV DC, Batteries, Chargers and DC Distrib	ution						
JS.1	Contactors, relays, MCBs, selector switches, push buttons, counters, heaters, etc., one of each type	lot	1					
К	LV AC Distribution							
KS.1	Contactors, relays, MCBs, selector switches, push buttons, counters, heaters, etc., one of each type	lot	1					
	Subtotal Bangura Substation to Schedule 5 - Grand Summary							

				Foreign Cur	rency (in)	Local Curre	ncy (in BDT)				
Item	Description	Unit	Quantity	Unit Price2	Total Price2	Unit Price	Total Price				
1.0	2000. p. 1011			EXW	EXW	EXW	EXW				
		<u> </u>	(1)	(2)	(3)=(1)x(2)	(4)	(5)=(1)x(4)				
IV	Extension of existing 132/33 kV Substation Baghabari										
В	132 kV Switchgear										
B10.X	Necessary material and equipment to complete 132 kV Switchgear	lot	1								
G	Control, Protection, Substation Automation System	and Me	tering								
	Extension of the existing equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment in NLDC	set	1								
G10.X	Necessary material and equipment to complete Control, Protection, SAS and Metering system	lot	1								
1	Multicore Low Voltage Auxiliary Power and Con	trol Cabl	es								
I10.X	Necessary material and equipment to complete LV Auxiliary Power and Control Cables	lot	1								
J	LV DC, Batteries, Chargers and DC Distrib	ution									
J10.X	Necessary material and equipment to complete LV DC Distribution system	lot	1								
К	LV AC Distribution										
K10.X	Necessary material and equipment to complete LV AC Distribution system	lot	1								
Р	Earthing and Lightning Protection										
P10.X	Necessary material and equipment to complete earthing and lightning protection	lot	1								
	Subtotal Baghabari Substation to Schedule 5 - Grand Summary										

				Foreign Cur	rency (in)	Local Currency (in BDT)		
Item	Description	Unit	Quantity	Unit Price2	Total Price2	Unit Price	Total Price	
Item	Description	Onic		EXW	EXW	EXW	EXW	
			(1)	(2)	(3)=(1)x(2)	(4)	(5)=(1)x(4)	
V	New 132/33 kV Substation Miit	thapı	ukur					
В	132 kV Switchgear							
B1.1	145 kV, 1250 A, 40 kA, 50 Hz, 650/275 kV BIL, three pole, live tank, SF6 gas circuit breaker with three spring-stored energy operating mechanism	set	4					
B1.3	145 kV, 2000 A, 40 kA, 50 Hz, 650/275 kV BIL, three pole, live tank, SF6 gas circuit breaker with one spring-stored energy operating mechanism	set	1					
B1.4	145 kV, 1250 A, 40 kA, 50 Hz, 650/275 kV BIL, three pole, live tank, SF6 gas circuit breaker with one spring-stored energy operating mechanism	set	2					
B2.2	145 kV, 2000 A, 40 kA, 50 Hz, 650/275 kV BIL three pole, centre break, post type, motor operated disconnector with motor operated earthing switch	set	2					
B2.3	145 kV, 1250 A, 40 kA, 50 Hz, 650/275 kV BIL three pole, centre break, post type, motor operated disconnector with motor operated earthing switch	set	4					
B2.5	145 kV, 1250 A, 40 kA, 50 Hz, 650/275 kV BIL, three pole, centre break, post type, motor operated disconnector	set	12					
B3.2	145 kV, 40 kA, 50 Hz, 650/275 kV BIL, single phase, 5-cores, 1600-800-400/1/1/1/1/1 A, 0.2, 0.2, 5P20, 5P20, 5P20; Fs=10, Fs=10; 5 /15 / 30 / 30 / 30 VA, head type, post type current transformer	set	21					
B4	145 kV, 40 kA, 50 Hz, 650/275 kV BIL, single phase, 2-secondary windings, 132/V3 / 110/V3 / 110/V3 kV/V/V, 0.2, 3P; 25 / 75 VA, capacitor voltage transformer	set	18					
B5	145 kV, Um = 145 kV, Ur = 120 kV, Uc = 96 kV, 10 kA nominal discharge current, 50 Hz, 650/275 kV BIL, single phase, heavy duty, gapless, metal oxide type surge arrester	set	18					
B7.X	145 kV, 2000 A and 1250 A, 40 kA, Conductors for double busbars and for connection of the 132 kV switchgears	lot	1					
B8.X	145 kV, 2000 A and 1250 A, 40 kA, Insulators and fittings including all necessary clamps and connectors for double busbars and for connection and completing of the 132 kV switchgears	lot	1					
B9.X	145 kV, Gantry steel structure and equipment support for completing of the 132 kV switchgears	lot	1					

Name of Bidder:

			l	Foreign Cur	rency (in)	Local Curre	ncy (in BDT)
Item	Description	Unit	Quantity	Unit Price2	Total Price2	Unit Price	Total Price
	Description	O i iii		EXW	EXW	EXW	EXW
			(1)	(2)	(3)=(1)x(2)	(4)	(5)=(1)x(4)
B10.X	Necessary material and equipment to complete 132 kV Switchgear	lot	1				
С	33 kV Switchgear						
	36 kV, 1600 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, live tank, vacuum circuit breaker, for outdoor installation, with spring-stored energy operating mechanism	set	2				
C2.1	36 kV, 1600 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, vertical break, post type, hand operated disconnector	set	3				
C2.2	36 kV, 100 A, 25 kA, 50 Hz, 170/70 kV BIL, three pole, vertical break, post type, hand operated disconnector, with integrated fuse 10 A	set	2				
C3.1	36 kV, 25 kA, 50 Hz, 170/70 kV BIL, single phase, 4-cores, 1600/1/1/1, 0.2, 0.2, 5P20, 5P20; Fs=10, Fs=10; 5 / 15 / 30 / 30 VA, post type current transformer	set	6				
	36 kV, 25 kA, 50 Hz, 170/70 kV BIL, single phase, 4-cores, 10/1/1/1, 0.2, 0.2, 5P20, 5P20; Fs=10, Fs=10; 5 / 15 / 30 / 30 VA, post type current transformer	set	6				
	36 kV, 25 kA, 50 Hz, 170/70 BIL, single phase, 2-secondary windings, $33/V3 / 110/V3 / 110/V3 kV/V/V$, 0.2, 3P; 25 / 75 VA, inductive voltage transformer	set	12				
C5	36 kV, Um = 36 kV, Ur = 30 kV, Uc = 24 kV, 10 kA nominal discharge current, 50 Hz, 170/70 kV BIL, single phase, gapless, metal oxide type surge arrester	set	6				
C7.X	36 kV, 2000 A, 25 kA, Conductors for double busbars and for connection of the 33 kV switchgears	lot	1				
C8.X	36 kV, 2000 A, 25 kA, Insulators and fittings including all necessary clamps and connectors for double busbars and for connection and completing of the 33 kV switchgears	lot	1				
C9.X	33 kV, Gantry steel structure and equipment support for completing of the 33 kV switchgears	lot	1				
C10.X	Necessary material and equipment to complete 33 kV Switchgear	lot	1				
D	Transformers						
D2	132/33 kV, 50/75 MVA, Dyn1, ONAN/ONAF, three phase, oil-immersed, hermetically sealed, power transformer, with On-load tap changer	set	2				

Name of Bidder:

				Foreign Cur	rency (in)	Local Curre	ncy (in BDT)
Item	Description	Unit	Quantity	Unit Price2	Total Price2	Unit Price	Total Price
iteiii	Description	Oilit		EXW	EXW	EXW	EXW
		(1) (2) (3)=(1)	(3)=(1)x(2)	(4)	(5)=(1)x(4)		
D4	Water Spray Fire Protection System, for new 132/33 kV, three phase, 50/75 MVA, Dyn1, ONAN/ONAF Power transformer unit	set	2				
D10.X	Necessary material and equipment to complete Transformers	lot	1				
F	Earthing/Auxiliary Transformer						
	33/0.415 kV, 200 kVA, Dyn11, ONAN, three phase, oil-immersed, power transformer, with Off-load tap changer, (to provide an earthing point for the neutral and) to supply the substation auxiliary loads	set	2				
F10.X	Necessary material and equipment to complete Auxiliary Transformers	lot	1				
G	Control, Protection, Substation Automation System	and Me	tering				
G1.2	Control, Protection and SAS for 132 kV Overhead Line circuit	set	4				
G2.2	Control, Protection and SAS for 132/33 kV Power transformer circuit	set	2				
G2.3	Control, Protection and SAS for 33/0.415 kV Auxiliary power transformer circuit and AC & DC Auxiliary Power Supply	set	2				
G3.2	Control, Protection and SAS for 132 kV Busbars	set	1				
	Tariff Metering pane(s) to accommodate for each line, transformer and auxiliary transformer feeder minimum two (2) (main-1 & main-2) programmable & recordable digital 3-phase, 4-wire import and export MWh and MVAr meters with accuracy cl. 0.2	set	1				
G6.X	National Load Despatch Centre (NLDC) at Aftabnagar and Back up station at Biddut Bhaban for integration of complete new 230/132 kV Substation. All required electrical signals shall be transmitted to the NLDC and Back up station through the Industrial Gateway of the Substation automation system. All HV circuit breakers, motorized disconnectors, tap changer, etc., shall be controlled from NLDC through the Gateway of the Substation automation system using IEC 60870-5-104 protocol. All necessary modification works in the software of the master station of NLDC and Back up station are to be carried	set	1				
G7.X	Extension of the existing equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment in NLDC	set	1				

Name of Bidder:

Signature of Bidder:

				Foreign Cur	rency (in)	Local Curre	ncy (in BDT)
Item	Description	Unit	Quantity	Unit Price2	Total Price2	Unit Price	Total Price
	2000p.i.o.i.	J		EXW	EXW	EXW	EXW
			(1)	(2)	(3)=(1)x(2)	(4)	(5)=(1)x(4)
G10.X	Necessary material and equipment to complete Control, Protection, SAS and Metering system	lot	1				
Н	Fibre Optic Multiplexer Equipment for Teleprotection 8	k Commu	unication				
H1.X	Fibre Optic Multiplexer Equipment, complete equipment for control, protection & communication at substation	set	1				
H2.X	Telephone system, complete equipment	set	1				
H3.X	MDF and underground optical fibre (48 cores) cables from terminal box at gantry structure to MDF (Main distribution Frame)	set	1				
1	Multicore Low Voltage Auxiliary Power and Con	trol Cabl	es				
I1.X	Multicore low voltage auxiliary power and control cables between all items of equipment supplied under the Contract, with necessary gland, terminated, and identified by colours & tags, including the overall substation cable routing and core schedules	lot	1				
I10.X	Necessary material and equipment to complete LV Auxiliary Power and Control Cables	lot	1				
J	LV DC, Batteries, Chargers and DC Distrib	ution					
J1.X	110 V DC Auxiliary Power Supply, substation alkaline batteries complete with chargers and distribution switchboard, to provide all DC supplies to equipment being supplied for the new substation, consisting of: (a) Two (2) sets Ni-cadmium 100% batteries complete, each capacity shall not be less than 400 Ah at the 5-hour rate of discharge. (b) Two (2) sets battery chargers complete, each float charge shall not be less than 75 A rating. (c) One (1) set DC distribution switchboard.	lot	1				
12. V	48 V DC system, complete with chargers and distribution switchboard to provide all DC supplies for fibre optic multiplexure equipment for communication and control & protection, consisting of: (a) Two (2) sets Ni-cadmium 100% batteries complete, each capacity shall not be less than 250 Ah at the 5-hour rate of discharge. (b) Two (2) sets battery chargers complete, each float charge shall not be less than 50 A rating. (c) One (1) set DC distribution switchboard.	lot	1				

				Foreign Cur	rency (in)	Local Curre	ncy (in BDT)
Item	Description	Unit	Quantity	Unit Price2	Total Price2	Unit Price	Total Price
itein	Description	Unit		EXW	EXW	EXW	EXW
			(1)	(2)	(3)=(1)x(2)	(4)	(5)=(1)x(4)
J10.X	Necessary material and equipment to complete LV DC Distribution system	lot	1				
K	LV AC Distribution						
K1.X	LV AC switchboard for substation services to provide the 400/230V supplies to all equipment being supplied, including one (1) 125 A outdoor weatherproof, 3-phase with neutral and earth switched socket outlet and plug to IEC 60309; to be installed, cabled and connected adjacent to the transformers	lot	1				
K10.X	Necessary material and equipment to complete LV AC Distribution system	lot	1				
L	Civil Works, Control Building and Foundat	tions					
L1.X	Land development of complete switchyard area by cutting, land filling, compacting up to a suitable level including slope protection.	lot	1				
L2.X	Complete outdoor civil works, including 132 kV and 33 kV gantry foundation, 132 kV and 33 kV equipment foundation, power transformers and auxiliary transformers foundation, oil pit, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing	lot	1				
L3.X	Complete civil works and facilities for new two-storey control room building with cable basement, including foundation works, super structure works, finishing works like rendering, colour, water supply, sanitary, floor finishing, rain water drainage system, lightning protection, water supply including deep tube well for drinking water, pump house, pump, water reservoir, water pipe lines, etc., sewage facilities including septic tank, etc.	lot	1				
M	Building Lighting, Small Power, Air Conditioning a	nd Ventil	ation				
M1.X	Complete equipment to provide lighting, LV power supply, air conditioning system, ventilation and emergency DC lighting for the substation control building.	lot	1				
N	Switchyard Lighting						
N1.X	Complete equipment to provide switchyard lighting for security, roadway and switchyard and emergency DC lighting at strategic locations for equipment operations and inspections.	lot	1				

				Foreign Cur	rency (in)	Local Curre	ncy (in BDT)
Item	Description U		Quantity	Unit Price2	Total Price2	Unit Price	Total Price
Item	Description	Onit		EXW	EXW	EXW	EXW
			(1)	(2)	(3)=(1)x(2)	(4)	(5)=(1)x(4)
Р	Earthing and Lightning Protection						
P1.X	Complete equipment of earthing system and lightning protection screen including connections, connectors and clamps, to suit the substation overall arrangement, including supporting design calculations.	lot	1				
	3-phase portable (maintenance) earthing equipment devices with connectors and telescopic glass fibre operating pole suitable for plant supplied.	set	2				
	Mandatory Spare Parts						
В	132 kV Switchgear						
BS.1	Circuit Breaker 132 kV, Tripping coil	set	2				
BS.2	Circuit Breaker 132 kV, Closing coil	set	2				
BS.3	Circuit Breaker 132 kV, Motor, in motor drive mechanism, complete with accessories	set	1				
BS.4	Circuit Breaker 132 kV, Auxiliary contacts, in motor drive mechanism, complete with accessories, one of each type	set	1				
BS.5	Circuit Breaker 132 kV, Contactors, relays, selector switches, push buttons, counters, heaters, etc., in motor drive mechanism and control cubicle, one of each type	set	1				
BS.6	Circuit Breaker 132 kV, SF6 temperature compensated manometer	set	3				
BS.7	Circuit Breaker 132 kV, SF6 gas (40 kg) cylinder	set	1				
BS.8	Disconnector 132 kV with Earthing Switch - complete pole, together with one complete Motor drive mechanism of main blades and one complete Motor drive mechanism of the earthing blades	set	3				
B3.2	145 kV, 40 kA, 50 Hz, 650/275 kV BIL, single phase, 5-cores, 1600-800-400/1/1/1/1/1 A, 0.2, 0.2, 5P20, 5P20, 5P20; Fs=10, Fs=10; 5 /15 / 30 / 30 VA, head type, post type current transformer	set	3				
B4	145 kV, 40 kA, 50 Hz, 650/275 kV BIL, single phase, 2-secondary windings, 132/V3 / 110/V3 / 110/V3 kV/V/V, 0.2, 3P; 25 / 75 VA, capacitor voltage transformer	set	3				

				Foreign Cur	rency (in)	Local Curre	ncy (in BDT)
ltom.	Deparintion	l lmi4	Quantity		Total Price2		_
Item	Description	Unit		EXW	EXW	EXW	EXW
		Set 1 Set 1 Set 3 Set 1 Set 3 Set 3 Set 1 Set Set 1 Set Set	(2)	(3)=(1)x(2)	(4)	(5)=(1)x(4)	
B5	145 kV, Um = 145 kV, Ur = 120 kV, Uc = 96 kV, 10 kA nominal discharge current, 50 Hz, $650/275$ kV BIL, single phase, heavy duty, gapless, metal oxide type surge arrester	set	3				
С	33 kV Switchgear	33 kV Switchgear					
CS.1	Circuit Breaker 33 kV, Tripping coil	set	1				
CS.2	Circuit Breaker 33 kV, Closing coil	set	1				
CS.3	Circuit Breaker 33 kV, Motor, in motor drive mechanism, complete with accessories	set	1				
CS.4	Fuse 10 A	set	3				
	36 kV, 25 kA, 50 Hz, 170/70 kV BIL, single phase, 4-cores, 1600/1/1/1, 0.2, 0.2, 5P20, 5P20; Fs=10, Fs=10; 5 / 15 / 30 / 30 VA, post type current transformer	set	1				
C3.2	36 kV, 25 kA, 50 Hz, 170/70 kV BIL, single phase, 4-cores, 10/1/1/1, 0.2, 0.2, 5P20, 5P20; Fs=10, Fs=10; 5 / 15 / 30 / 30 VA, post type current transformer	set	1				
C4	36 kV, 25 kA, 50 Hz, 170/70 BIL, single phase, 2-secondary windings, 33/V3 / 110/V3 / 110/V3 kV/V/V, 0.2, 3P; 25 / 75 VA, inductive voltage transformer	set	1				
C5	36 kV, Um = 36 kV, Ur = 30 kV, Uc = 24 kV, 10 kA nominal discharge current, 50 Hz, 170/70 kV BIL, single phase, gapless, metal oxide type surge arrester	set	1				
D	Transformers						
DS.2	Transformer Bushing 132 kV	piece	1				
DS.3	Transformer Bushing 33 kV	piece	1				
DS.4	Transformer oil	kg	5,000				
DS.5	Transformer silica gel	kg	20				
DS.6	Transformer ventilator with motor	set	2				
DS.7	Contactors, relays, selector switches, push buttons, counters, heaters, etc., in transformer control cabinet, one of each type	lot	1				

Name of Bidder:

Signature of Bidder:

				Foreign Cur	rency (in)	Local Curre	ncy (in BDT)
Hom	Deparintion	l lmit	Quantity		Total Price2		
Item	Description	Unit		EXW	EXW	EXW	EXW
			(1)	(2)	(3)=(1)x(2)	(4)	(5)=(1)x(4)
DS.8	Contactors, relays, auxiliary contacts, selector switches, push buttons, counters, heaters, etc., in OLTC Motor Drive mechanism, one of each type	lot	1				
DS.9	Thermometer, one of each type	lot	1				
DS.10	Thermostat, one of each type	lot	1				
F	Earthing/Auxiliary Transformer						
FS.1	Transformer Bushing 33 kV	piece	1				
G	Control, Protection, Substation Automation System	Control, Protection, Substation Automation System and Metering					
GS.2	Line differential protection relay 132 kV	set	1				
GS.4	Line distance protection relay 132 kV	set	1				
GS.6	Transformer 132/33 kV differential relay with complete REF function	set	1				
GS.8	Overcurrent and earth fault relay 132 kV	set	1				
GS.10	Bay control unit	set	1				
GS.11	Trip Circuit Supervision relay, 3phase	set	1				
GS.13	Electronic meter, same as installed, including communication unit	set	1				
J	LV DC, Batteries, Chargers and DC Distrib	ution					
JS.1	Contactors, relays, MCBs, selector switches, push buttons, counters, heaters, etc., one of each type	lot	1				
К	LV AC Distribution						
KS.1	Contactors, relays, MCBs, selector switches, push buttons, counters, heaters, etc., one of each type	lot	1				
	Subtotal Miithapukur Substation to Schedule 5 - Grand Summary						

Schedule 3: Design Services

				Foreign Cur	rency (in)	Local Curre	ncy (in BDT)		
Item	Description	Unit	Quantity	Unit Price ²	Total Price ²	Unit Price	Total Price		
Item	Description	Oilit		foreign portion	foreign portion	local portion	local portion		
			(1)	(2)	$(3) = (1) \times (2)$	(4)	(5)=(1) x (4)		
I	Extension of NEW 230/132	Extension of NEW 230/132 kV Substation Rajshahi							
21	Design and engineering services, local and foreign part	Lump sum	1						
	Subtotal Rajshahi Substation to Schedule 5 - Grand Summar								
III	New 132/33 kV Su	bstation	Bangur	a					
21	Design and engineering services, local and foreign part	Lump sum	1						
	Subtotal Bangura Substation to Schedule 5 - Grand Summar	y							
V	New 132/33 kV Subs	station M	liithapul	kur					
21	Design and engineering services, local and foreign part	Lump sum	1	_	_	_	_		
	Subtotal Miithapukur Substation to Schedule 5 - Grand Summa								

Name of Bidder:

Signature of Bidder:

			Foreign Currency (in) Local Curr								
l			Quantity	Unit Price ²	Total Price ²	Unit Price	Total Price				
Item	Description	Unit		foreign portion		local portion	local portion				
			(1)	(2)	$(3) = (1) \times (2)$	(4)	(5)=(1) x (4)				
ı	Extension of NEW 230/132	Extension of NEW 230/132 kV Substation R									
0	0 General										
	Complete new 230/132/33 kV air insulated substation. The 132 kV part of the substation is not in the scope of works .										
Α	230 kV Swit	chgear									
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1								
С	33 kV Swite	chgear									
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1								
D	Transform	ners									
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1								
G	Control, Protection, Substation Aut	omation S	ystem and	Metering							
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1								
33.X	Extension of the existing equipment, Installation, testing and commissioning of new equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment in NLDC	Lump sum	1								

				Foreign Cur	rency (in)	Local Curre	ncy (in BDT)
Item	Description	Unit	Quantity	Unit Price ²	Total Price ²	Unit Price	Total Price
l tem	Description	Oilit		foreign portion	foreign portion	local portion	local portion
			(1)	(2)	$(3) = (1) \times (2)$	(4)	(5)=(1) x (4)
Н	Fibre Optic Multiplexer Equipment for	Teleproted	tion & Cor	mmunication			
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1				
- 1	Multicore Low Voltage Auxiliary	Power and	d Control (Cables			
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1				
J	LV DC, Batteries, Chargers	s and DC D	istribution	1			
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1				
K	LV AC Distr	ibution					
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1				
L	Civil Works, Control Build	ing and Fo	oundations				
L1.X	Land development of complete required 230 kV switchyard area by cutting, land filling, compacting up to a suitable level. Approximate total area of the substation is 15 acres. Approximate required 230 kV switchyard part is 10 acres.	Lot	1				
L2.X	Complete outdoor civil works of required 230 kV switchyard area, including 230 kV gantry foundation, 230 kV and 33 kV equipment foundation, power transformers foundation, oil pit, blast wall, part of the security boundary wall, around the required 230 kV switchyard, internal roads, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing						
1	Outdoor gantry foundation 230 kV switchyard	Lot	1				
2	Outdoor equipment foundation 230 kV switchyard	Lot	1				

				Foreign Cur	rency (in)	Local Curre	ncy (in BDT)
Item	Description	Unit	Quantity	Unit Price ²	Total Price ²	Unit Price	Total Price
itein	Description	Unit		foreign portion	foreign portion	local portion	local portion
			(1)	(2)	$(3) = (1) \times (2)$	(4)	(5)=(1) x (4)
3	Outdoor equipment foundation 33 kV switchyard	Lot	1				
4	Power Transformer foundation including oil pit	Lot	1				
5	Blast wall	Lot	1				
6	part of the security boundary wall, around the required 230 kV switchyard						
7	Internal roads, concrete culverts	Lot	1				
8	Surface and switchyard drainage system including outfall.	Lot	1				
9	Cable Trench including soak pit, PVC pipes etc.	Lot	1				
10	Switchyard surface finishing.	Lot	1				
11	Gravel surfacing.	Lot	1				
L3.X	Complete civil works and facilities for extension of existing control building, including finishing works like rendering, colour, floor finishing, etc.	Lot	1				
N	Switchyard I	Lighting					
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1				
Р	Earthing and Lightr	ning Protec	tion				
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1				
	Installation and O	ther Servic	es				
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment - General, not mentioned before	Lump sum	1				
41.X	Transport of material and equipment	Lump	1				
42.X	Insurance of material and equipment during transport	Lump	1				

	Description			Foreign Cur	rency (in)	Local Currency (in BDT)	
Item		Unit	Quantity	Unit Price ²	Total Price ²	Unit Price	Total Price
		Onit		foreign portion	foreign portion	local portion	local portion
			(1)	(2)	$(3) = (1) \times (2)$	(4)	(5)=(1) x (4)
43.X	Environmetal and Social Services - PROVISIONAL SUM (for potential physical measures and the unforeseen which may not be covered by the current description of the scope of supply – however strictly related to environmental and social services only) It is not fixed sum and it may be implemented fully, partly or even not implemented in the end	Lump sum	1	7,000.00	7,000.00		
	Subtotal Rajshahi Substation to Schedule 5 - Grand Summary						

				Foreign Cui	rency (in)	Local Curre	ncy (in BDT)				
	Post today		Quantity	Unit Price ²	Total Price ²	Unit Price	Total Price				
Item	Description	Unit			foreign portion	local portion	local portion				
			(1)	(2)	$(3) = (1) \times (2)$	(4)	(5)=(1) x (4)				
III	New 132/33 kV Subs	station B	angura								
0	General General										
	Complete new 132/33 kV Air Insulated Substation										
В	132 kV Swit	chgear									
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1								
С	33 kV Switch	chgear									
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1								
D	Transform	mers									
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1								
F	Earthing/Auxiliary	Transform	ier								
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1								
G	Control, Protection, Substation Aut	omation S	ystem and	Metering							
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1								
33.X	Extension of the existing equipment, Installation, testing and commissioning of new equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment in NLDC	Lump sum	1								

Name of Bidder:

Signature of Bidder:

			I	Foreign Cur	rency (in)	Local Curre	ncy (in BDT)	
Item	Description	Unit	Quantity	Unit Price ²	Total Price ²	Unit Price	Total Price	
itein	Description	Offic		foreign portion	foreign portion	local portion	local portion	
			(1)	(2)	$(3) = (1) \times (2)$	(4)	(5)=(1) x (4)	
Н	Fibre Optic Multiplexer Equipment for	Teleproted	tion & Cor	nmunication				
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1					
ı	Multicore Low Voltage Auxiliary	Power and	d Control (Cables				
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1					
J	J LV DC, Batteries, Chargers and DC Distribution							
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1					
K	LV AC Distr	ibution						
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1					
L	Civil Works, Control Build	ing and Fo	oundations					
L1.X	Land development of complete switchyard area by cutting, land filling, compacting up to a suitable level including slope protection. Approximate total area of the substation is 5 acres.	Lot	1					
L2.X	Complete outdoor civil works, including 132 kV and 33 kV gantry foundation, 132 kV and 33 kV equipment foundation, power transformers and auxiliary transformers foundation, oil pit, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing							
1	Outdoor gantry foundation 132 kV switchyard	Lot	1					
2	Outdoor gantry foundation 33 kV switchyard	Lot	1					

			Ī	Foreign Cur	rency (in)	Local Curre	ncy (in BDT)
Item	Description	Unit	Quantity	Unit Price ²	Total Price ²	Unit Price	Total Price
item	Description	Unit		foreign portion	foreign portion	local portion	local portion
			(1)	(2)	$(3) = (1) \times (2)$	(4)	(5)=(1) x (4)
3	Outdoor equipment foundation 132 kV switchyard	Lot	1				
4	Outdoor equipment foundation 33 kV switchyard	Lot	1				
5	Power Transformer foundation including oil pit	Lot	1				
6	Auxiliary/Station Transformer foundation.	Lot	1				
7	Blast wall	Lot	1				
8	Substation Main gate	Lot	1				
9	Guard house.	Lot	1				
10	Security Boundary Wall	Lot	1				
11	Internal fence	Lot	1				
12	Access road	Lot	1				
13	Internal roads and parking, concrete culverts	Lot	1				
14	Surface and switchyard drainage system including outfall.	Lot	1				
15	Cable Trench including soak pit, PVC pipes etc.	Lot	1				
16	Switchyard surface finishing.	Lot	1				
17	Gravel surfacing.	Lot	1				
L3.X	basement, including foundation works, super structure works, finishing works like rendering, colour, water supply, sanitary, floor finishing, rain water drainage system, lightning protection, water supply including deep tube well for drinking water, pump house, pump, water reservoir, water pipe lines, etc., sewage facilities including septic						
1	Complete Foundation works.	Lot	1				
2	Complete Super structures works.	Lot	1				
3	Complete all finishing works like rendering, colour, water supply & sanitary works, floor finish, furniture, drain & apron, rain water pipes etc.	Lot	1				
4	Water supply, including Pump house with deep tube well for drinking water, motor, pump, water reservoir, water pipe line, necessary fittings etc. all complete.	Lot	1				

				Foreign Cur	rency (in)	Local Curre	ncy (in BDT)
Item	Description	Unit	Quantity	Unit Price ²	Total Price ²	Unit Price	Total Price
Item	Description	Ollit		foreign portion	foreign portion	local portion	local portion
			(1)	(2)	$(3) = (1) \times (2)$	(4)	(5)=(1) x (4)
5	Sewage facilities, including Septic tank, soak well etc. all complete	Lot	1				
М	Building Lighting, Small Power, Air	ing and Ve	entilation				
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1				
N	Switchyard L						
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1				
Р	Earthing and Lightn	ing Protec	tion				
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1				
	Installation and Ot	her Servic	es				
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment - General, not mentioned before	Lump sum	1				
41.X	Transport of material and equipment	Lump	1				
42.X	Insurance of material and equipment during transport	LUMP SUM	1				
43.8	Environmetal and Social Services - PROVISIONAL SUM (for potential physical measures and the unforeseen which may not be covered by the current description of the scope of supply – however strictly related to environmental and social services only) It is not fixed sum and it may be implemented fully, partly or even not implemented in the end	Lump sum	1	7,000.00	7,000.00		
	Subtotal Bangura Substation to Schedule 5 - Grand Summary						

				Foreign Cur	rency (in)	Local Curre	ncy (in BDT)	
	Down to the	11.74	Quantity	Unit Price ²	Total Price ²	Unit Price	Total Price	
Item	Description	Unit		foreign portion	foreign portion	local portion	local portion	
			(1)	(2)	$(3) = (1) \times (2)$	(4)	(5)=(1) x (4)	
IV	Extension of the existing 132/3	3 kV Sub	station I	Baghabari				
0	General							
	Re-design, re-testing and re-commissioning of one existing 132 kV overhead line bay							
В	132 kV Switchgear							
32.X	Extension of the existing equipment, Installation, testing and commissioning of new equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment	Lump sum	1					
G	Control, Protection, Substation Aut	omation S	ystem and	Metering				
32.X	Extension of the existing equipment, Installation, testing and commissioning of new equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment	Lump sum	1					
33.X	Extension of the existing equipment, Installation, testing and commissioning of new equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment in NLDC	Lump sum	1					
Н	Fibre Optic Multiplexer Equipment for	Teleprotec	tion & Cor	nmunication				
32.X	Extension of the existing equipment, Installation, testing and commissioning of new equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment	Lump sum	1					
ı	Multicore Low Voltage Auxiliary	Power and	d Control (Cables				
32.X	Extension of the existing equipment, Installation, testing and commissioning of new equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment	Lump sum	1					

				Foreign Cur	rency (in)	Local Curre	ncy (in BDT)	
Item	Description	Unit	Quantity	Unit Price ²	Total Price ²	Unit Price	Total Price	
itein	Description	Oilit		foreign portion	foreign portion	local portion	local portion	
			(1)	(2)	$(3) = (1) \times (2)$	(4)	(5)=(1) x (4)	
J	LV DC, Batteries, Chargers	and DC D	istribution	ı				
32.X	Extension of the existing equipment, Installation, testing and commissioning of new equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment	Lump sum	1					
K	LV AC Distribution							
32.X	Extension of the existing equipment, Installation, testing and commissioning of new equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment	Lump sum	1					
L	Civil Works, Control Build	ing and Fo	undations					
32.X	Extension of the existing equipment, Installation, testing and commissioning of new equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment	Lump sum	1					
Р	Earthing and Lightn	ing Protec	tion					
32.X	Extension of the existing equipment, Installation, testing and commissioning of new equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment	Lump sum	1					
	Installation and O	her Servic	es					
32.X	Extension of the existing equipment, Installation, testing and commissioning of new equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment - General, not mentioned before	Lump sum	1					
41.X	Transport of material and equipment	Lump	1					
42.X	Insurance of material and equipment during transport	Lump sum	1					

		Unit		Foreign Currency (in)		Local Currency (in BDT)	
Item	Description		Quantity	Unit Price ²	Total Price ²	Unit Price	Total Price
	Description			foreign portion	foreign portion	local portion	local portion
			(1)	(2)	$(3) = (1) \times (2)$	(4)	(5)=(1) x (4)
43.X	Environmetal and Social Services - PROVISIONAL SUM (for potential physical measures and the unforeseen which may not be covered by the current description of the scope of supply – however strictly related to environmental and social services only) It is not fixed sum and it may be implemented fully, partly or even not implemented in the end	Lump sum	1	4,000.00	4,000.00		
	Subtotal Baghabari Substation to Schedule 5 - Grand Summary						

				Foreign Cur	rency (in)	Local Curre	ncy (in BDT)
Item	Description	Unit	Quantity	Unit Price ²	Total Price ²	Unit Price	Total Price
iteiii	Description	Oiiii		foreign portion	foreign portion	local portion	local portion
			(1)	(2)	$(3) = (1) \times (2)$	(4)	(5)=(1) x (4)
V	New 132/33 kV Substa	ation Mii	thapukur				
0	Genera	al					
	Complete new 132/33 kV Air II	nsulated S	ubstation				
В	132 kV Swit	chgear					
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1				
С	33 kV Switch	hgear					
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1				
D	Transform	mers					
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1				
F	Earthing/Auxiliary	Transform	ier				
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1				
G	Control, Protection, Substation Aut	omation S	ystem and	Metering			
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1				
33.X	Extension of the existing equipment, Installation, testing and commissioning of new equipment, necessary adjustment, adaptation, modification, integration and configuration of new and existing equipment in NLDC	Lump sum	1				

				Foreign Cur	rency (in)	Local Curre	ncy (in BDT)
			Quantity	Unit Price ²	Total Price ²	Unit Price	Total Price
Item	Description	Unit			foreign portion	local portion	local portion
			(1)	(2)	$(3) = (1) \times (2)$	(4)	(5)=(1) x (4)
Н	Fibre Optic Multiplexer Equipment for	Teleprotec	tion & Cor	nmunication			
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1				
ı	Multicore Low Voltage Auxiliary	Power and	d Control C	Cables			
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1				
J	LV DC, Batteries, Chargers and DC Distribution						
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1				
K	LV AC Distr	ibution					
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1				
L	Civil Works, Control Build	ing and Fo	oundations				
L1.X	Land development of complete switchyard area by cutting, land filling, compacting up to a suitable level including slope protection. Approximate total area of the substation is 5 acres.	Lot	1				
L2.X	Complete outdoor civil works, including 132 kV and 33 kV gantry foundation, 132 kV and 33 kV equipment foundation, power transformers and auxiliary transformers foundation, oil pit, blast wall, substation main gate and guard house, security boundary wall and internal fencing, access road, internal roads and parking, concrete culvert, surface and switchyard drainage system including outfall, cable trench including soak pit, PVC pipes etc., switchyard surface finishing and gravel surfacing						
1	Outdoor gantry foundation 132 kV switchyard	Lot	1				
2	Outdoor gantry foundation 33 kV switchyard	Lot	1				

				Foreign Cur	rency (in)	Local Curre	ncy (in BDT)
Ham	Description	Unit	Quantity	Unit Price ²	Total Price ²	Unit Price	Total Price
Item	Description	Unit		foreign portion	foreign portion	local portion	local portion
			(1)	(2)	$(3) = (1) \times (2)$	(4)	(5)=(1) x (4)
3	Outdoor equipment foundation 132 kV switchyard	Lot	1				
4	Outdoor equipment foundation 33 kV switchyard	Lot	1				
5	Power Transformer foundation including oil pit	Lot	1				
6	Auxiliary/Station Transformer foundation.	Lot	1				
7	Blast wall	Lot	1				
8	Substation Main gate	Lot	1				
9	Guard house.	Lot	1				
10	Security Boundary Wall	Lot	1				
11	Internal fence	Lot	1				
12	Access road	Lot	1				
13	Internal roads and parking, concrete culverts	Lot	1				
14	Surface and switchyard drainage system including outfall.	Lot	1				
15	Cable Trench including soak pit, PVC pipes etc.	Lot	1				
16	Switchyard surface finishing.	Lot	1				
17	Gravel surfacing.	Lot	1				
L3.X	Complete civil works and facilities for new two-storey control room building with cable basement, including foundation works, super structure works, finishing works like rendering, colour, water supply, sanitary, floor finishing, rain water drainage system, lightning protection, water supply including deep tube well for drinking water, pump house, pump, water reservoir, water pipe lines, etc., sewage facilities including septic tank etc.						
1	Complete Foundation works.	Lot	1				
2	Complete Super structures works.	Lot	1				
3	Complete all finishing works like rendering, colour, water supply & sanitary works, floor finish, furniture, drain & apron, rain water pipes etc.	Lot	1				
4	Water supply, including Pump house with deep tube well for drinking water, motor, pump, water reservoir, water pipe line, necessary fittings etc. all complete.	Lot	1				

				Foreign Cur	rency (in)	Local Curre	ncy (in BDT)
Item	Description	Unit	Quantity	Unit Price ²	Total Price ²	Unit Price	Total Price
Item	Description	Oilit		foreign portion	foreign portion	local portion	local portion
			(1)	(2)	$(3) = (1) \times (2)$	(4)	(5)=(1) x (4)
5	Sewage facilities, including Septic tank, soak well etc. all complete	Lot	1				
M	Building Lighting, Small Power, Air	entilation					
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1				
N	Switchyard L	ighting					
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1				
Р	Earthing and Lightn	ing Protec	tion				
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment	Lump sum	1				
	Installation and Ot	ther Servic	es				
31.X	Installation, testing and commissioning of the equipment, necessary adjustment, adaptation, modification, integration and configuration of the equipment - General, not mentioned before	Lump sum	1				
41.X	Transport of material and equipment	Lump	1				
42.X	Insurance of material and equipment during transport	Lump	1				
43.8	Environmetal and Social Services - PROVISIONAL SUM (for potential physical measures and the unforeseen which may not be covered by the current description of the scope of supply – however strictly related to environmental and social services only) It is not fixed sum and it may be implemented fully, partly or even not implemented in the end	Lump sum	1	7,000.00	7,000.00		
	Subtotal Miithapukur Substation to Schedule 5 - Grand Summary						

Schedule 5: Grand Summary (Schedules 1 to 4)

		Total	Price				
		Foreign Currency (in)	Local Currency (in BDT)				
I	Extension of NEW 230/132 kV Substation	Rajshahi					
Schedule No. 1:	Plant & Equipment (including Mandatory Spare Parts) Supplied from Abroad						
Schedule No. 2:	Plant & Equipment (including Mandatory Spare Parts) Supplied from within the Employer's Country						
Schedule No. 3:	Design Services						
Schedule No. 4:	Installation and Other Services						
II	New 132/33 kV Substation Bangur	a					
Schedule No. 1:	Plant & Equipment (including Mandatory Spare Parts) Supplied from Abroad						
Schedule No. 2:	Plant & Equipment (including Mandatory Spare Parts) Supplied from within the Employer's Country						
Schedule No. 3:	Design Services						
Schedule No. 4:	Installation and Other Services						
III	Extension of existing 132/33 kV Substation Baghabari						
Schedule No. 1:	Plant & Equipment (including Mandatory Spare Parts) Supplied from Abroad						
Schedule No. 2:	Plant & Equipment (including Mandatory Spare Parts) Supplied from within the Employer's Country						
Schedule No. 4:	Installation and Other Services						

Schedule 5: Grand Summary (Schedules 1 to 4)

		Total	Price							
		Foreign Currency (in)	Local Currency (in BDT)							
IV	New 132/33 kV Substation Miithap	New 132/33 kV Substation Miithapukur								
Schedule No. 1:	Plant & Equipment (including Mandatory Spare Parts) Supplied from Abroad									
Schedule No. 2:	Plant & Equipment (including Mandatory Spare Parts) Supplied from within the Employer's Country									
Schedule No. 3:	Design Services									
Schedule No. 4:	Installation and Other Services									
GRAND TO	TAL									

Name of Bidder:

Signature of Bidder:

Schedule 6: Spare Parts

				Foreign Cur	rrency (in)	Loc	cal Currency (in B	DT)
Item	Description	Unit	Quantity	Unit Price ²	Total Price ²	Unit Price	Total Price	VAT
10111	2000 puon			CIP	CIP	EXW	EXW	on EXW
			(1)	(2)	$(3) = (1) \times (2)$	(4)	(5)=(1) x (4)	(6)
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

² Specify currency. Create and use as many columns for Unit Price and Total Price as there are currencies.

Name of Bidder:

Signature of Bidder:

3. Schedule C: Bar Chart Program of Key Activities - Delivery & Completion Time Schedule

To be filled by the Bidder to be attached to the bid.

(Bidders may use the attached excel file BGD 1800 NZSS vol 3 schedule c time schedule.xlsx)



BGD 1800 NZSS Vol 3 2016 11 16.docx

3.1 New 230/132 kV Substation Rajshahi

## Analy Dutwer 1 1 1 1 1 1 1 1 1	Extension of the Existing 230/132 kV Substation					•				Т	ime F	Period	l in d	ays										
Sin surger Look development Look develop	Rajshahi Activity	Duration	30	60	90	120	150	180	210 2	240 2	70 30	0 330	360	390	420	450	480	510	540	570	600	630 6	60 6	90 72
Oxend Intelligence of Control of	DESIGN																							
GOLDON CONTROLLED CONT	•							-	+	+	+							\vdash	\dashv	\dashv	\dashv	\dashv	+	+
Set Plans Solges for process PP (PRINCE) CPS (PS) PP (PS)	I GENERAL																							
In acc PRIOR DESIGN. Fig. 12 and Design of Section of 1970 Year system. Fig. 12 and Design of 1970 Year System. Fig. 12 and Y											-							\vdash	\dashv	_	-	 - -	+	+
18. In the record and composed and control and the control of the	II ELECTRICAL DESIGN																							
So Technological Accordance of State Control C									_		_	_						Н		\dashv	_	_	\dashv	+
Description reconstruction and description recognition (Control Control Contro										\pm													+	\pm
Fee control materials per of the visit standard to the control of												\bot							\blacksquare	_		_	工	Ŧ
PES come procedures and 2010 VISSA No Environment Comments of Comments of Comments Comments of Comments Comment							_	\dashv	\dashv	+	+	+	\vdash					Н	\dashv	\dashv	\dashv	\dashv	+	+
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F-Ansattation of Localization (Control Control									_	+	+	+						Н	\blacksquare	一	一	 	+	+
E Périodición and control système E 105-central president installation E 105-central president installation E 105-central president installation G 105-bit pper - ECCELOSCOT G 105-bit pp	E7-Installation of outdoor lighting - EXTENSION																				耳		士	#
REFORMER CONTROL CONTR									+	_	+							\vdash	\dashv	\dashv	\dashv	\dashv	+	+
ETZ-END STATESCH (CN) DSSSAN																					士		士	士
In Child California — EXTENDION Continuing to California of California								_	_	4	+	_								_	_	_	4	+
GS-Site receiling, caster duct, path and internal stones - EXTENSION Septembrisher SO DAY washingting GS-Site receiling and septembrisher GS-Site receiling and septembrisher GS-Site receiling and received and septembrisher GS-Site received and septembrisher GS-	III CIVIL DESIGN																	П			┪	H	Ħ	
CS-Franchistor St 12N - voorthyward SC Franchistor St 12N - voorthyward GS Franchistor St 22N - voorthyward GS Franchis																		\Box	二	\sqsupset	コ	コ	ユ	I
GS-Fundations for Stal V seischiyads GS-Fundations for Stal V seischipads GS-Fundations for GS-Fundations GS-Fundations for GS-Fund			Н	\dashv	\dashv	\dashv	\dashv	\dashv	\dashv	+	+	+	\vdash	$\vdash \vdash$	\dashv	\dashv		$\vdash \vdash$	\dashv	\dashv	\dashv	+	+	+
GS-Transchwation tab and bundation GS-Total children were green GT-Steele structure by 250 kV equipment GT-Steele structure by 250 kV equipment GT-Steele structure by 250 kV equipment GS-Steel structure by 250 kV equipment GS-Control building GS-	G3-Foundations for 132 kV switchyard										#													中
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67-Steed structure to 126 NV expurement CosSoled structure Coss	G6-Oil pit and oil sewerage		H						_	\pm	士	士						\Box	一	_	士	\pm	士	士
Go-Schord students for 33 kV registroner G10-Lighting and reflector politics - EXTENSION G10-Lighting and reflector politics - EXTENSION G10-Lighting and reflector politics - EXTENSION MI-Air consistency and sensition of control busing MI-Air consistency Training Training Training MI-Air control of the caught of the	G7-Steel structure for 230 kV equipment						J	I	7	1	Ţ	Ţ							耳	コ	耳	工	工	Ŧ
GS-Control building of inforcer policy - EXTENSION CST-Mark ruppy and severage CST-Mar											F										\dashv		+	+
MI - CHANACH ESSKIN MI - Accordination and verification of control building MI - Accordination and verification of control building MI - Accordination and verification of control building MI - Accordination and verification of the coupment Manufacturings of the coupment Manufacturing of the coupmen	G9-Control building										Ţ												#	#
N MECHANICAL DESIGN MANUFACTURING of the EQUIPMENT Design of the outputment Manufacturing Thraing Thra											+									\dashv	_	_	+	+
MANASTACTURINACIO d'INCERCITATION DE LA CONTRACTOR DE LA	IV MECHANICAL DESIGN																						T	
Design of the equipment Training Traini																								1
Manufacturing Factory Acceptance Test Factory Acceptance Test Delivery CRIL WORKS Access and informal roads - EXTENSION Site Investign - EXTENSION Access and informal roads - EXTENSION Burlay and opaphrometon conductors Burlay and opaphrometon conductors Access and access and informal roads - EXTENSION Installation of access and access a																								
Factory Acceptance Test								+	+	+	+							\vdash	\dashv	\dashv	\dashv	-	+	+
Delivery Mebitization and preparation works Site leading = EXERNSION Gate and fence Access and internal rouds = EXTENSION Barthing system = EXTENSION Cate and fence Access and internal rouds = EXTENSION Barthing system = EXTE																		口	\Box	\Box	耳	耳	丰	エ
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Mobilization and preparation works Site leveling - EXTENSION Cast eand fence Access and internal roads - EXTENSION Earthing system - EXTENSION Cast eand fence Cable trenches - EXTENSION Carlo fundamy - EXTENSION Transformer foundations and oil pit Control building - EXTENSION Gantry and equipment fundations Gantry and equipment fundations Gantry and equipment fundations Frishing works and demobilization Frishing works and demobilization Frishing works and preparation works Mobilization and preparation works Installation outside - EXTENSION Installation of works Installation of control, Relay protection, SCADA and Metering equipment Installation of control, Relay protection, SCADA and Metering equipment Installation of control, Relay protection, SCADA and Metering equipment Installation of control, Relay protection, SCADA and Metering equipment Installation of control, Relay protection, SCADA and Metering equipment Installation of control, Relay protection, SCADA and Metering equipment Installation of Control, Relay protection, SCADA and Metering equipment Installation of Control, Rel																							=	
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Outdoor lighting - EXTENSION Testing of the equipment Commissioning Installation, indoor Installation of control, Relay protection, SCADA and Metering equipment Installation of AC and DC Auxiliary Power Supply equipment - EXTENSION Installation of AC and DC Auxiliary Power Supply equipment - EXTENSION Installation of Telecommunication equipment Installation of cable channels - EXTENSION Installation of cables Secondary connections Secondary connections Farthing/Grounding of equipment Parametrization Testing of the equipment Commissioning Finishing works and demobilization Name of Bidder:			П	耳			\Box	1	耳	1	Ţ	1		П				口	二	コ	コ	耳	ユ	#
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Installation, indoor Installation of control, Relay protection, SCADA and Metering equipment Installation of AC and DC Auxiliary Power Supply equipment - EXTENSION Installation of ACU Batteries Installation of Telecommunication equipment Installation of cable channels - EXTENSION Installation of cable channels - EXTENSION Installation of cables Secondary connections Earthing/Grounding of equipment Parametrization Testing of the equipment Commissioning Finishing works and demobilization Name of Bidder:	Testing of the equipment		П								\downarrow							口	〓		1	〓	#	士
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Installation of Telecommunication equipment Installation of Telecommunication equipment Installation of Cable channels - EXTENSION Installation of cable channels - EXTENSION Secondary connections Earthing/Grounding of equipment Parametrization Testing of the equipment Commissioning Finishing works and demobilization Name of Bidder:	Installation of control, Relay protection, SCADA and Metering equipment																							
Installation of Telecommunication equipment Installation of cable channels - EXTENSION Installation of cables Secondary connections Earthing/Grounding of equipment Parametrization Testing of the equipment Commissioning Finishing works and demobilization Name of Bidder:			П	J	J	J	J	J	Ţ	Ţ	F		L		J			ЦĪ	J	J	耳	\bot	丁	\bot
Installation of cable channels - EXTENSION Installation of cables Secondary connections Earthing/Grounding of equipment Parametrization Testing of the equipment Commissioning Finishing works and demobilization Name of Bidder:	Installation of Telecommunication equipment									-	-							П	\dashv	\dashv	一	十	干	+
Secondary connections Earthing/Grounding of equipment Parametrization Testing of the equipment Commissioning Finishing works and demobilization Name of Bidder:	Installation of cable channels - EXTENSION		П				_	_	1		1							口	二	コ	耳	耳	丰	丰
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Testing of the equipment Commissioning Finishing works and demobilization Name of Bidder:	Earthing/Grounding of equipment		П								丰							口	〓		1	〓	#	ユ
Commissioning Finishing works and demobilization Name of Bidder:			\vdash	\dashv	-	\dashv	\dashv	\dashv	\dashv	+	+	+	\vdash	$\vdash \vdash$	-			Н	\dashv	\dashv	\dashv	\dashv	+	+
Name of Bidder:	Commissioning		\Box					_	_	_	士	士							\exists	_	_	_+	_	_
	Finishing works and demobilization								┚		Ţ									⇉	\Box			
Signature of Bidder:	Name of Bidder:																_	_		_	_	_	_	
	Signature of Bidder:																							
	-																							



3.2 New 132 kV Substation Bangura

New 132/33 kV Substation Bangura									Т	ime F	Period	in d	ays										
Activity	Duration	30	60	90	120	150	180	210	240 2	70 30	0 330	360	390	420	450	480	510	540	570	600	630	660 6	90 72
DESIGN																							
Site survey Geotechnical survey		_						_	_	+	+	-										+	+
I GENERAL																							
EG0-General documentation																							工
EG1-Main design of fire protection II ELECTRICAL DESIGN																							+
E1-Technical description and calculation of 230 kV switchyard																							
E1-Technical description and calculation of 132 kV switchyard E2-Technical description and calculation of 33 kV switchyard	+							_		-	+											-	+
E3-Electro installation part of 230 kV switchyard																							
E3-Electro installation part of 132 kV switchyard																							工
E4-Electro installation part of 33 kV switchyard E5-Electro installation part of 230/132/33 kV transformation																							
E5-Electro installation part of 132/33 kV transformation																							
E6-Earthing and lightning protection E7-Installation of outdoor lighting											-											_	4
E8-Auxiliary power supply	+				Н					+	+												+
E9-Protection and control system																							エ
E10-Telecomunications E11-Fire alarm system	+									+	+											+	+
E12-Earthing installation, lighting protection, Installation of control building																							+
III CIVIL DESIGN																							4
G1-Sinhro plan G2-Site levelling, cable duct, path and internal fence in substations	+	\vdash	\vdash	\vdash	Н		\dashv	-	+	+	+	\vdash									-+	+	+
G3-Foundations for 230 kV switchyard																							
G3-Foundations for 132 kV switchyard					П			耳	丁	Ţ	\perp		HĪ								耳	Ŧ	丰
G4-Foundations for 33 kV switchyard G5-Transformation tub and foundation	+		\vdash	H	Н	Н	\dashv		+	+	+	\vdash	Н			\blacksquare			-	\vdash	_	+	+
G6-Oil pit and oil sewerage									士	土												士	土
G7-Steel structure for 230 kV equipment G7-Steel structure for 132 kV equipment				F						1													4
G8-Steel structure for 132 kV equipment G8-Steel structure for 33 kV equipment	+	\vdash	\vdash	\vdash	Н		\Box	-+	+	+	+	\vdash							-		-+	+	+
G9-Control building									土	ᆂ	上											土	土
G10-Lightning and reflector poles G11-Water supply and sewerage		<u> </u>	\vdash	L	Н		-	-I	$-\Gamma$	+	\perp		H						=		<u> </u>	$-\Gamma$	丰
IV MECHANICAL DESIGN																							+
M1-Air conditioning and ventilation of control building																							工
MANUFACTURING of the EQUIPMENT																							
Design of the equipment Manufacturing	<u> </u>							_	_	\perp	-											-	+
Training	+				Н					+	+											+	+
Factory Acceptance Test																							I
Delivery					Ш					_													<u> </u>
CIVIL WORKS																							
Mobilization and preparation works Site levelling	+	<u> </u>			Н				_	+	+											+	+
Gate and fence																							ユ
Access and internal roads Earthing system										_												_	+
Cable trenches	 							1	1	+	+											+	+
Transformer foundations and oil pit																							工
Control building Gantry and equipment foundations	 									+												-	+
Steel structure																							+
Finishing works and demobilization					Ш																		\perp
ELECTRICAL WORKS																							
Mobilization and preparation works Installation, outdoor																							+
Installation of metal support structure																							
Installation of switchgear 230 kV									Ţ				F									1	4
Installation of switchgear 132 kV Installation of switchgear 33 kV	+	-	\vdash		Н		\dashv	-	+	+	+	\vdash	\vdash						-		-	+	+
Installation of power transformers					П				土	丄	上											土	土
Installation of auxiliary power transformers Primary connections	 	<u> </u>		H	\vdash		\Box	_	\perp	+	+	H	\vdash						_		_	+	+
Installation of cables	†	\vdash	\vdash		H		\dashv		+	+	+	\vdash	H								-	+	+
Secondary connections									1	퇶												1	ヰ
Earthing/Grounding of the equipment Outdoor lighting	+		\vdash	\vdash	Н		\Box		\dashv	+	+	-	\vdash									+	+
Testing of the equipment					H				_†	士	士											_+	\pm
Commissioning										T												T	I
Installation, indoor Installation of control, Relay protection, SCADA and Metering equipment																							#
Installation of AC and DC Auxiliary Power Supply equipment	<u> </u>	L			H					士	士	L											士
Installation of ACU Batteries					П			耳	1	\bot	lacksquare	Ē	\Box									\bot	\bot
Installation of Telecommunication equipment Installation of cable channels	+	-	\vdash		Н		\dashv	-	+	+	+	\vdash	\vdash						-		-	+	+
Installation of cables									1	ᆂ													土
Secondary connections Earthing/Grounding of equipment	 	<u> </u>		H	Н			_	\perp	+	\perp	\vdash	\vdash									\perp	+
	+		\vdash		Н		\dashv	+	\dashv	+	+										_	+	+
Parametrization	+								\Box	丰													丰
Testing of the equipment	_	1	1	l	Ш							$ldsymbol{f eta}$	Ш									_	- 1
Testing of the equipment Commissioning		1							Į.		- 1												一
Testing of the equipment Commissioning Finishing works and demobilization																							_
Testing of the equipment Commissioning					Ш																	_	
Testing of the equipment Commissioning Finishing works and demobilization										<u> </u>													
Testing of the equipment Commissioning Finishing works and demobilization											<u> </u>												<u> </u>
Testing of the equipment Commissioning Finishing works and demobilization Name of Bidder:									ļ_			<u> </u>										_	<u></u>
Testing of the equipment Commissioning Finishing works and demobilization										-													<u></u>
Testing of the equipment Commissioning Finishing works and demobilization Name of Bidder:																							_
Testing of the equipment Commissioning Finishing works and demobilization Name of Bidder:										- -													



3.3 Extension of the Existing 132/33 kV Substation Baghabari

Extension of the existing 132/33 kV Substation					•				Ti	ime F	eriod	in da	ays									
Baghabari Activity	Duration	30	60	90	120	150	180	210 2	240 27	70 30	330	360	390	420	450	480 5	510 5	i40 5	70 60	0 630	660	690 72
DESIGN																						
Site survey Geotechnical survey						_								_		_	\dashv	\blacksquare	+	+	Н	
I GENERAL																						
EG0-General documentation - RE - DESIGN EG1-Main design of fire protection						\dashv								_	+	+	+	+	+	+	Н	
II ELECTRICAL DESIGN																	耳					
E1-Technical description and calculation of 230 kV switchyard E1-Technical descript. and calc. of 132 kV switchyard - RE - DESIGN		Н						_			_			_	_	_	+	+	+	╇	Н	lacksquare
E2-Technical description and calculation of 33 kV switchyard																						
E3-Electro installation part of 230 kV switchyard E3-Electro installation part of 132 kV switchyard - RE - DESIGN		Н														_	+	+	+	+	Н	$oldsymbol{+}$
E4-Electro installation part of 33 kV switchyard E5-Electro installation part of 230/132/33 kV transformation						\blacksquare									_	4	4	4	Ŧ	F		
E5-Electro installation part of 132/33 kV transformation																						
E6-Earthing and lightning protection - RE - DESIGN E7-Installation of outdoor lighting																	\dashv	-	+	_		
E8-Auxiliary power supply - RE - DESIGN																	〓					
E9-Protection and control system - RE - DESIGN E10-Telecomunications - RE - DESIGN								_			+						\dashv	+	+	+	H	\vdash
E11-Fire alarm system																	_					
E12-Earthing installation, lighting protection, Installation of control building III CIVIL DESIGN																	+	+				
G1-Sinhro plan - RE - DESIGN						_											#	工	工	Ŧ		
G2-Site levelling, cable duct, path and internal fence in substations G3-Foundations for 230 kV switchyard															7	7	1	+	+			
G3-Foundations for 132 kV switchyard G4-Foundations for 33 kV switchyard						4	4	7	7	T			\blacksquare	4	1	1	4	#	#	F		4
G5-Transformation tub and foundation															_	_						
G6-Oil pit and oil sewerage G7-Steel structure for 230 kV equipment						1		4					\blacksquare	4	4	1	4	Ŧ	4	+		Ŧ
G7-Steel structure for 132 kV equipment																1	#		#			
G8-Steel structure for 33 kV equipment G9-Control building								-		+					4	+	4	+	+	+		
G10-Lightning and reflector poles															#	#	#	#	#			
G11-Water supply and sewerage IV MECHANICAL DESIGN															7	1	+	+	+			
M1-Air conditioning and ventilation of control building																	4					
MANUFACTURING of the EQUIPMENT Design of the equipment															4		4	\blacksquare				
Manufacturing																			士			
Training Factory Acceptance Test		Н				\dashv		_	_	+	+		\dashv	4	+	\dashv	+	+	+	+	Н	\vdash
Delivery Delivery																						
CIVIL WORKS																						
Mobilization and preparation works Site levelling															-		\vdash	+			Н	
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3.4 New 132/33 kV Substation Miithapukur

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4. Schedule D: Manufacturers, Places of Manufacture and Testing

The following form shall be filled and attached to the bid. Bidders are free to propose more than one Manufacturer for each item.

Manufacturers

The following Manufacturers are proposed for carrying out the facilities:

Item	Equipment	Type of Equipment	Manufacturer's Name and Address	Place of Manufacture and Testing	Nationality
		Power T	ransformer		
1.1.	Power transformer 230/132/33 kV				
1.2.	Power transformer 132/33 kV				
		Auxiliary Pov	wer Transformer		
2	Auxiliary power transformer 33/0.4 kV				
		230 kV	Equipment		
3.1.	Circuit breakers 230 kV				
3.2.	Disconnectors 230 kV				
3.3.	Current transformers 230 kV				
3.4.	Voltage transformers 230 kV				
3.5.	Surge arresters 230 kV				
		132 kV	Equipment		
4.1.	Circuit breakers 132 kV				
4.2.	Disconnectors 132 kV				
4.3.	Current transformers 132 kV				
4.4.	Voltage transformers 132 kV				



Item	Equipment	Type of Equipment	Manufacturer's Name and Address	Place of Manufacture and Testing	Nationality
4.5.	Surge arresters 132 kV				
		33 kV I	Equipment		
5.1.	Circuit breakers 33 kV				
5.2.	Disconnectors 33 kV				
5.3.	Current transformers 33 kV				
5.4.	Voltage transformers 33 kV				
5.5.	Surge arresters 33 kV				
		Control, Protection,	and Metering Equipmen	t	
6.1	Control & monitoring equipment				
6.2	Relay protection equipment				
6.3.	Control & protection panels				
6.4.	Metering equipment				
6.5.	Metering panels				
6.6.	DFDR				
		Telecommuni	cation Equipment		
7.	Communication equipment				
		Auxiliary Power	Supply Equipment		
8.1.	ACU battery				
8.2.	Charger				
8.3	DC distribution switchboard				
8.4	AC distribution switchboard				



Item	Equipment	Type of Equipment	Manufacturer's Name and Address	Place of Manufacture and Testing	Nationality
		Conductors, In	sulators & Fittings		
9.1.	Conductors				
9.2.	Insulators				
9.3.	Fittings				
		Multicore LV Auxiliary	Power and Control Cab	les	
10.1	Cables				
	Name of Bidder:				
	Signature of Bidder:				



5. Schedule E: Technical Particulars and Guarantees

5.1 General

The technical data schedules hereafter provide more details on the specific technical criteria and complement the Information given in the Bidding documents.

They form an essential part of bid submission and will be used in bid evaluation.

They should be fully completed and submitted with the bid.

5.2 Technical Data Schedules

Please find hereafter the following schedules:



BGD 1800 NZSS Vol 3 2016 11 16.docx

5.2.1 A: Switchgear 230 kV

5.2.1.1 A1.1: Circuit Breaker 230 kV, Three OM

NI.	5	Mini	mum Requirements	
No.	Description	Unit	Data	Guaranteed
1.	Circuit Breaker - General			
1.1.	Manufacturer		Insert	
1.2	Туре		Insert	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
			IEC 62271-100	
			IEC 60273	
1.5	Standards		IEC 60694	
			IEC 60815	
			ISO 9001	
1.6	Quality control		ISO 14001	
	Lasting seems:		ISO 18001	
1.7	Isolating and quenching medium		SF ₆	
1.8	Type of circuit breaker		Outdoor	
1.9	Design		Single breaking	
1.10	Operating mechanism		Motor-wound spring	
1.11	Number of poles	pcs.	3	
1.11	Number of operating mechanisms per circuit	роз.	3	
1.12	breaker	pcs.	3	
2.	Circuit Breaker - Characteristics			
2.1	Nominal system voltage	kV _{rms}	230	
2.2	Highest voltage for equipment U _n	kV _{rms}	245	
2.3	Rated lightning impulse withstand voltage	kV _{peak}	1050	
2.4	Rated short duration power frequency voltage	kV	460	
2.5	Rated frequency fr	Hz	50	
2.6	Rated current I _r	Α	≥ 3150	
2.7	Rated short-circuit breaking current I _{sc}	kA _{rms}	≥ 50	
2.8	Rated peak withstand current I _p (equal short-	kA	≥ 125	
2.0	circuit making current)	KA	2 120	
2.9	D.C. component of the rated short-circuit breaking	%	> 30	
	current			
	First-pole-to-clear factor			
2.10	Terminal fault	p.u.	1.3	
	Short-line fault	p.u.	1.0	
	Out-of-phase	p.u.	2.0	
2.11	Standard value of transient recovery voltage (T100)	kV	Insert	
2.12	Rate of rise recovery voltage	kV/µs	Insert	
2.13	Rated operating sequence		O-0.3 s-CO-3 min-CO	
2.14	Duration of short-circuit	s	≥ 1	
2.15	Rated out-of-phase breaking current	kA	Insert	
2.10				



		Minir	num Requirements	
No.	Description	Unit	Data	Guaranteed
2.17	Maximum total break time (trip initiation to final arc extinction) pos.3.7.135 acc. to IEC 62271-100)	ms	≤ 60	
2.18	Time of final arc extinction (3.7134 acc. IEC 62271-100)	ms	20 ± 5	
2.19	 Opening time (trip initiation to contact separation) Without current With 100 % rated breaking current 	ms ms	Insert Insert	
2.20	Maximum time interval between opening inter- rupters	ms	Insert	
2.21	Maximum time interval between opening of first and last phase of three-phase circuit breakers	ms	3	
2.22	Time for making (trip initiation to contact touch) Without current 100 % making current	ms ms	Insert Insert	
2.23	Minimum dead time	ms	Insert	
2.24	Restrike performance during capacitive current switching	Class	C2	
2.25	 Number of operations without maintenance CO at no-load CO at rated current CO at rated breaking current lsc 		≥ 10000 ≥ 2500 ≥ 5	
2.26	The frequency of mechanical operations	Class	M2	
2.27	Rated electrical endurance	Class	Min E1	
2.28	Rated pressure of a circuit breaker	Мра	Insert	
2.29	Total mass of SF ₆ gas in a circuit breaker	kg	Insert	
2.30	Rated mechanical terminal loads			
2.30.1	Static horizontal force, longitudinal FthA	N	≥ 1750	
2.30.2	Static horizontal force, transversal F _{thB}	N	≥ 1250	
2.30.3	Static vertical force F _{tv}	N	≥ 1500	
2.30.4	Dynamic horizontal force, longitudinal Fwx	N	Insert	
2.30.5	Dynamic horizontal force, transversal	N	Insert	
3.	Circuit Breaker - Design and Construction	1		1
3.1	Circuit Breaker			
3.1.1	Insulator material		Porcelain	
3.1.2	Minimum creepage distance	mm/kV	Min. ≥ 25	
3.1.3	HV terminal	pcs.	2	
3.1.3.1	Shape		Flat	
3.1.3.2		mm x mm	Min 100 x 100	
3.1.3.3	Number of holes		Min 4	
3.1.3.4		mm	Ø 14	
	Distance between holes	mm	50	
	Material suitable for		Al terminal	
3.1.5	Weight and dimensions			
3.1.5.1	• •	mm	Insert	
	Total height	mm	Insert	
3.1.5.3	Pole weight	kg	Insert	



		Minir	Minimum Requirements	
No.	Description	Unit	Data	Guaranteed
3.1.5.4	Weight of operating mechanism	kg	Insert	
	Total weight (with metal structure)	kg	Insert	
3.1.6	Minimum distance	g		
3.1.6.1		mm	Insert	
3.1.6.2		mm	Insert	
3.2	Operating mechanism			
3.2.1	Туре		Insert	
3.2.2	Motor - auxiliary supply voltage	V. DC	110	
3.2.3	Rated power of motor	W	Insert	
3.2.4	Control voltage	V. DC	110	
3.2.5	Number of making coils	pcs.	1	
3.2.6	Rated power of making coils	W	Insert	
3.2.7	Number of breaking coils	pcs.	2	
3.2.8	Rated power of breaking coils	W	 Insert	
3.2.9	Heater		Yes	
3.2.10	Heater supply voltage	V. Hz	230. 50	
3.2.11	Total heater power	W	Insert	
	Minimum number of available contacts		moore	
3.2.12	(NO/NC/V)		12NO+12NC+1V	
3.2.15	Water-tight corrosion-resistant housing		IP54	
3.2.17	Operating mechanism material		Al or stainless steel	
3.2.19	A crank for manual spring loading		Yes	
3.4	Accessories in central control panel			
3.4.1	Anti-pumping relay		Yes	
3.4.2	Local/remote control selector switch		Yes	
3.4.3	Local operation push buttons		Yes	
3.4.4	Minimum pressure lock-out and alarm relays		Yes	
3.4.5	Service outlet (socket) - 230 V, 50 Hz		Yes	
3.4.6	Lighting switch		Yes	
3.4.7	Lighting - 230 V, 50 Hz		Yes	
3.4.8	Heater - 230 V, 50 HZ		Yes	
3.4.9	Operation counter		Yes	
3.4.10	Motor MCB (miniature circuit breakers) (for all operating mechanisms)		Yes	
3.4.11	Time phase discrepancy relay		Yes	
3.4.12	Weatherproof, corrosion resistance enclosure, Al		IP54	
2 2 4 2	or stainless steel		V	
3.2.16	Cu earthing rails inside central control cabinet		Yes	
3.2.18	Detachable plates, the bottom of central control cabinet		Yes	
3.4.13	Set of cables for connection of operating mechanism and central control panel of circuit breaker		Yes	
3.4.14	Galvanized horizontal and vertical metal structure with minimum 70 µm zinc layer		Yes	
	Overall compliance with the requirements (yes/no)		



5.2.1.2 A1.2: Circuit Breaker 230 kV, One OM

NI-	Paradiation	Minii	mum Requirements	Custontood
No.	Description	Unit	Data	Guaranteed
1.	Circuit Breaker - General			
1.1.	Manufacturer		Insert	
1.2	Туре		Insert	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
			IEC 62271-100	
1 5	Standarda		IEC 60273	
1.5	Standards		IEC 60694	
			IEC 60815	
			ISO 9001	
1.6	Quality control		ISO 14001	
			ISO 18001	
1.7	Isolating and quenching medium		SF ₆	
1.8	Type of circuit breaker		Outdoor	
1.9	Design		Single breaking	
1.10	Operating mechanism		Motor-wound spring	
1.11	Number of poles	pcs.	3	
	Number of operating mechanisms per circuit	•	,	
1.12	breaker	pcs.	1	
2.	Circuit Breaker - Characteristics			
2.1	Nominal system voltage	kV _{rms}	230	
2.2	Highest voltage for equipment U _n	kV _{rms}	245	
2.3	Rated lightning impulse withstand voltage	kV _{peak}	1050	
2.4	Rated short duration power frequency voltage	kV	460	
2.5	Rated frequency f _r	Hz	50	
2.6	Rated current I _r	Α	≥ 3150	
2.7	Rated short-circuit breaking current I _{sc}	kA _{rms}	≥ 50	
2.8	Rated peak withstand current Ip (equal short-	IzΛ	> 10 E	
2.0	circuit making current)	kA	≥ 125	
2.9	D.C. component of the rated short-circuit breaking	%	> 30	
2.9	current	/0	> 50	
	First-pole-to-clear factor			
2.10	Terminal fault	p.u.	1.3	
2.10	Short-line fault	p.u.	1.0	
	Out-of-phase	p.u.	2.0	
2.11	Standard value of transient recovery voltage	kV	Insert	
2.12	(T100)	k\//c	lnco#t	
2.12	Rate of rise recovery voltage	kV/μs	Insert	
2.13	Rated operating sequence	_	O-0.3 s-CO-3 min-CO	
2.14	Duration of short-circuit	S	≥1	
2.15	Rated out-of-phase breaking current	kA	Insert	
2.16	Auto reclosing		No	



		Minir	num Boquiromento	
No.	Description	Unit	num Requirements Data	Guaranteed
	Maximum total break time (trip initiation to final	Unit	Dala	
2.17	arc extinction) pos.3.7.135 acc. to IEC 62271-	ms	≤ 60	
2.17	100)	1113	2 00	
	Time of final arc extinction (3.7134 acc. IEC			
2.18	62271-100)	ms	20 ± 5	
	Opening time (trip initiation to contact separation)			
2.19	Without current	ms	Insert	
	With 100 % rated breaking current	ms	Insert	
0.00	Maximum time interval between opening inter-			
2.20	rupters	ms	Insert	
0.04	Maximum time interval between opening of first		0	
2.21	and last phase of three-phase circuit breakers	ms	3	
	Time for making (trip initiation to contact touch)			
2.22	Without current	ms	Insert	
	100 % making current	ms	Insert	
2.23	Minimum dead time	ms	Insert	
2.24	Restrike performance during capacitive current	Class	C2	
2.27	switching	Olass		
	Number of operations without maintenance			
2.25	CO at no-load		≥ 10000	
	CO at rated current		≥ 2500	
	CO at rated breaking current lsc		≥ 5	
2.26	The frequency of mechanical operations	Class	M2	
2.27	Rated electrical endurance	Class	Min E1	
2.28	Rated pressure of a circuit breaker	Мра	Insert	
2.29	Total mass of SF ₆ gas in a circuit breaker	kg	Insert	
2.30	Rated mechanical terminal loads			
2.30.1	Static horizontal force, longitudinal F _{thA}	N	≥ 1750	
2.30.2	Static horizontal force, transversal F _{thB}	N	≥ 1250	
2.30.3	Static vertical force F _{tv}	N	≥ 1500	
2.30.4	Dynamic horizontal force, longitudinal F _{wx}	N	Insert	
2.30.5	Dynamic horizontal force, transversal	N	Insert	
3.	Circuit Breaker - Design and Construction			
3.1	Circuit Breaker			
3.1.1	Insulator material		Porcelain	
3.1.2	Minimum creepage distance	mm/kV	Min. ≥ 25	
3.1.3	HV terminal	pcs.	2	
3.1.3.1	Shape		Flat	
3.1.3.2	Dimensions	mm x mm	Min 100 x 100	
3.1.3.3	Number of holes		Min 4	
3.1.3.4	Dimensions of holes	mm	Ø 14	
3.1.3.5	Distance between holes	mm	50	
3.1.3.6	Material suitable for		Al terminal	
3.1.5	Weight and dimensions			
3.1.5.1	Support insulator height	mm	Insert	
3.1.5.2	Total height	mm	Insert	
3.1.5.3	Pole weight	kg	Insert	



	2	Minimum Requirements		
No.	Description	Unit	Data	Guaranteed
3.1.5.4	Weight of operating mechanism	kg	Insert	
3.1.5.5	Total weight (with metal structure)	kg	Insert	
3.1.6	Minimum distance			
3.1.6.1	Between poles	mm	Insert	
	To ground	mm	Insert	
3.2	Operating mechanism			
3.2.1	Туре		Insert	
3.2.2	Motor - auxiliary supply voltage	V. DC	110	
3.2.3	Rated power of motor	W	Insert	
3.2.4	Control voltage	V. DC	110	
3.2.5	Number of making coils	pcs.	1	
3.2.6	Rated power of making coils	W	Insert	
3.2.7	Number of breaking coils	pcs.	2	
3.2.8	Rated power of breaking coils	·W	Insert	
3.2.9	Heater		Yes	
3.2.10	Heater supply voltage	V. Hz	230. 50	
3.2.11	Total heater power	W	Insert	
3.2.12	Minimum number of available contacts (NO/NC/V)		12NO+12NC+1V	
3.2.15	Water-tight corrosion-resistant housing		IP54	
3.2.17	Operating mechanism material		Al or stainless steel	
3.2.19	A crank for manual spring loading		Yes	
3.4	Accessories in central control panel			
3.4.1	Anti-pumping relay		Yes	
3.4.2	Local/remote control selector switch		Yes	
3.4.3	Local operation push buttons		Yes	
3.4.4	Minimum pressure lock-out and alarm relays		Yes	
3.4.5	Service outlet (socket) - 230 V, 50 Hz		Yes	
3.4.6	Lighting switch		Yes	
3.4.7	Lighting - 230 V, 50 Hz		Yes	
3.4.8	Heater - 230 V, 50 HZ		Yes	
3.4.9	Operation counter		Yes	
3.4.10	Motor MCB (miniature circuit breakers) (for all operating mechanisms)		Yes	
3.4.11	Time phase discrepancy relay		Yes	
3.4.12	Weatherproof, corrosion resistance enclosure, Al or stainless steel		IP54	
3.2.16	Cu earthing rails inside central control cabinet		Yes	
3.2.18	Detachable plates, the bottom of central control		Yes	
3.4.13	Set of cables for connection of operating mechanism and central control panel of circuit breaker		Yes	
3.4.14	Galvanized horizontal and vertical metal structure with minimum 70 µm zinc layer		Yes	
	Overall compliance with the requirements (



5.2.1.3 A2.1: Disconnector 230 kV, 3150 A, with Earthing Switch

N.	Description Minimum Req Unit	um Requirements	Currenteed	
No.		Unit	Data	Guaranteed
1.	Disconnector- General			
1.1	Manufacturer		Insert	
1.2	Туре		Insert	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
1.5	Standards		IEC 62271-102 IEC 60273 IEC 60694 IEC 60815	
1.6	Quality control		ISO 9001 ISO 14001 ISO 18001	
1.7	Type of disconnector		Outdoor	
1.8	Design		Centre break	
1.9	Number of poles	pcs.	3	
1.10	Type of main blade operating mechanism		Motor driven	
1.11	Number of main blade operating mechanisms	pcs.	1	
1.12	Type of earthing blade operating mechanism		Motor driven	
1.13	Number of earthing blade operating mechanism		1	
2.	Disconnector - Characteristics			
2.1	Nominal system voltage	kV _{rms}	230	
2.2	Highest voltage for equipment U _n	kV _{rms}	245	
2.3	Rated lightning impulse withstand voltage	kV _{peak}	1050	
2.4	Rated short duration power frequency voltage	kV	460	
2.5	Rated frequency f _r	Hz	50	
2.7	Rated current I _r	Α	≥ 3150	
2.8	Rated short withstand current I _k	kA _{rms}	≥ 50	
2.9	Rated duration of short-circuit on main blades	S	3	
2.10	Rated duration of short-circuit on earthing blades	S	3	
2.11	Rated maximum withstand current lp	kA	≥ 125	
2.12	Capacity of making and breaking transfer load of busbar system at 300 V (rms)	А	1600	
2.13	Nominal supply voltage			
2.13.1	Controls and alarm (signalling) circuits	V d.c.	110	
2.13.2	Motors	V d.c.	110	
2.13.3	Heaters	V a.c. / Hz	230 / 50	
2.14	Opening time	S	Insert	
2.15	Closing time	s	Insert	
2.16	Mechanical endurance	Class	M2	
2.17	Rated mechanical terminal loads of terminals			
2.17.1	Direct loading, static Fa	N	> 1000	
2.17.2	Transversal loading, static F _b	N	> 330	
2.17.3	Vertical force F _c	N	> 1250	
2.17.4	Direct loading, dynamic	N	> 4500	
2.17.5	Transversal loading, dynamic	N	Insert	



		Minim	imum Requirements	
No.	Description	Unit	Data	Guaranteed
	5: 1 5 : 10 : 1	Office	Data	
3.	Disconnector - Design and Construction			
3.1	Disconnector			
3.1.1	Insulator material		Porcelain, brown	
3.1.2	Minimum creepage distance	mm/kV	Min. ≥ 25 mm/kV	
3.1.3	Quality of insulator	+	Min. C130	
3.1.4	Rated failing load of insulator (C10)	N	Min. 10000	
3.1.5	HV terminals			
3.1.5.1	Shape		Flat	
3.1.5.2	Dimensions	mm x mm	Min 100 x 100	
3.1.5.3	Number of holes		Min 4	
3.1.5.4	Dimensions of holes	mm	Ø 14	
3.1.5.5	Distance between holes	mm	50	
3.1.5.6	Material suitable for		Al terminal	
3.1.7	Weight and dimensions			
3.1.7.1	Pole height	mm	Insert	
3.1.7.2	Support insulator height	mm	Insert	
3.1.7.3	Total height	mm	Insert	
3.1.7.4	Pole length	mm	Insert	
3.1.7.5	Distance between support axis of a pole	mm	Insert	
3.1.7.6	Shipping dimensions	mm	Insert	
3.1.7.7	Pole weight	kg	Insert	
3.1.7.8	Weight of operating mechanism	kg	Insert	
3.1.7.9	Total weight	kg	Insert	
3.1.7.10	Shipping weight	kg	Insert	
3.2	Operating mechanism			
3.2.1	Number of operating mechanism	pcs.	1+1	
3.2.2	Туре		Insert	
3.2.3	Rated power of motor	W	Insert	
3.2.4	Total heater power	W	Insert	
3.2.5	Minimum number of available contacts (NO/NC/V)		12NO+12NC	
3.2.9	Motor - auxiliary supply voltage	V, DC	110	
3.2.10	Heater, 230 V, 50 Hz	,	Yes	
3.2.11	Water-tight corrosion-resistant housing		IP54	
3.2.12	Selection switch (local/neutral/remote)		Yes	
3.2.13	Manual closing button		Yes	
3.2.14	Manual opening button		Yes	
3.2.15	Anti-condensation heater inside the operating		Yes	
2 2 4 2	mechanism cabinet		Vaa	
3.2.16	Single-phase socket		Yes	
3.2.17	Voltage presence controller		Yes	
3.2.18	Motor MCB (miniature circuit breakers)		Yes	
3.2.19	Heater MCB (miniature circuit breaker)		Yes	



Na	Description	Minin	num Requirements	Cuerenteed
No.	Description	Unit	Data	Guaranteed
3.2.20	Single-phase socket MCB (miniature circuit breaker)		Yes	
3.2.21	Equipotential bonding rails		Yes	
3.2.22	Housing of Al or stainless steel		Yes	
	Overall compliance with the requirements (yes/no)			



5.2.1.4 A2.2: Disconnector 230 kV, 2000 A, with Earthing Switch

No.	Description	Minimum Requirements		Guaranteed
NO.	Description	Unit	Data	Guaranteeu
1.	Disconnector- General			
1.1	Manufacturer		Insert	
1.2	Туре		Insert	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
	Courting or origin		IEC 62271-102	
			IEC 60273	
1.5	Standards		IEC 60694	
			IEC 60815	
			ISO 9001	
1.6	Quality control		ISO 14001	
			ISO 18001	
1.7	Type of disconnector		Outdoor	
1.8	Design		Centre break	
1.9	Number of poles	pcs.	3	
1.10	Type of main blade operating mechanism	P 00.	Motor driven	
1.11	Number of main blade operating mechanisms	pcs.	1	
1.12	Type of earthing blade operating mechanism	poo.	Motor driven	
1.13	Number of earthing blade operating mechanism		1	
		<u> </u>	·	
2.	Disconnector - Characteristics	1		
2.1	Nominal system voltage	kV _{rms}	230	
2.2	Highest voltage for equipment U _n	kV _{rms}	245	
2.3	Rated lightning impulse withstand voltage	kV _{peak}	1050	
2.4	Rated short duration power frequency voltage	kV	460	
2.5	Rated frequency f _r	Hz	50	
2.7	Rated current I _r	Α	≥ 2000	
2.8	Rated short withstand current I _k	kA _{rms}	≥ 50	
2.9	Rated duration of short-circuit on main blades	S	3	
2.10	Rated duration of short-circuit on earthing	s	3	
2.10	blades	3		
2.11	Rated maximum withstand current Ip	kA	≥ 125	
2.12	Capacity of making and breaking transfer load	А	1600	
2.12	of busbar system at 300 V (rms)	^	1000	
2.13	Nominal supply voltage			
2.13.1	Controls and alarm (signalling) circuits	V d.c.	110	
2.13.2	Motors	V d.c.	110	
2.13.3	Heaters	V a.c. / Hz	230 / 50	
2.14	Opening time	S	Insert	
2.15	Closing time	S	Insert	
2.16	Mechanical endurance	Class	M2	
2.17	Rated mechanical terminal loads of terminals			
2.17.1	Direct loading, static Fa	N	> 1000	
2.17.2	Transversal loading, static F _b	N	> 330	
2.17.3	Vertical force F _c	N	> 1250	



		Minimum Requirements		
No.	Description	Unit	Data	Guaranteed
2.17.4	Direct loading, dynamic	N	> 4500	
2.17.5	Transversal loading, dynamic	N	Insert	
		•		•
3.	Disconnector - Design and Construction)		T
3.1	Disconnector			
3.1.1	Insulator material	" " "	Porcelain, brown	
3.1.2	Minimum creepage distance	mm/kV	Min. ≥ 25 mm/kV	
3.1.3	Quality of insulator	<u> </u>	Min. C130	
3.1.4	Rated failing load of insulator (C10)	N	Min. 10000	
3.1.5	HV terminals	+	Cla4	
3.1.5.1	Shape		Flat	
3.1.5.2	Dimensions	mm x mm	Min 100 x 100	
3.1.5.3	Number of holes		Min 4	
3.1.5.4	Dimensions of holes	mm	Ø 14	
3.1.5.5	Distance between holes	mm	50	
3.1.5.6	Material suitable for		Al terminal	
3.1.7	Weight and dimensions		luna a ut	
3.1.7.1	Pole height	mm	Insert	
	Support insulator height	mm	Insert	
3.1.7.3	Total height	mm	Insert	
3.1.7.4	Pole length	mm	Insert	
3.1.7.5 3.1.7.6	Distance between support axis of a pole	mm	Insert	
3.1.7.6	Shipping dimensions	mm	Insert	
3.1.7.8	Pole weight	kg	Insert	
3.1.7.9	Weight of operating mechanism Total weight	kg	Insert Insert	
3.1.7.10	Shipping weight	kg kg	Insert	
3.2	Operating mechanism	kg	IIISEIL	
3.2.1	Number of operating mechanism	nce	1+1	
3.2.2	Type	pcs.	Insert	
3.2.3	Rated power of motor	W	Insert	
3.2.4	Total heater power	W	Insert	
3.2.5	Minimum number of available contacts (NO/NC/V)	***	12NO+12NC	
3.2.9	Motor - auxiliary supply voltage	V, DC	110	
3.2.10	Heater, 230 V, 50 Hz	V, DO	Yes	
3.2.11	Water-tight corrosion-resistant housing		IP54	
3.2.12	Selection switch (local/neutral/remote)		Yes	
3.2.13	Manual closing button		Yes	
3.2.14	Manual opening button		Yes	
3.2.15	Anti-condensation heater inside the operating mechanism cabinet		Yes	
3.2.16	Single-phase socket	† †	Yes	
3.2.17	Voltage presence controller	1	Yes	
3.2.18	Motor MCB (miniature circuit breakers)	† †	Yes	
3.2.19	Heater MCB (miniature circuit breaker)	1	Yes	
	Single-phase socket MCB (miniature circuit			
3.2.20	breaker)		Yes	



Na	Description	Minimum Requirements		Commentered
No.	Description	Unit	Data	Guaranteed
3.2.21	Equipotential bonding rails		Yes	
3.2.22	Housing of AI or stainless steel		Yes	
	Overall compliance with the requirements (yes/no)			



5.2.1.5 A2.3: Disconnector 230 kV without Earthing Switch

Na	Description	Minin	num Requirements	nents
No.	Description	Unit	Data	Guaranteed
1.	Disconnector- General			
1.1	Manufacturer		Insert	
1.2	Туре		Insert	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
1.5	Standards		IEC 62271-102 IEC 60273 IEC 60694 IEC 60815	
1.6	Quality control		ISO 9001 ISO 14001 ISO 18001	
1.7	Type of disconnector		Outdoor	
1.8	Design		Centre break	
1.9	Number of poles	pcs.	3	
1.10	Type of main blade operating mechanism		Motor driven	
1.11	Number of main blade operating mechanisms	pcs.	1	
1.12	Type of earthing blade operating mechanism		not applicable	
1.13	Number of earthing blade operating mechanism		not applicable	
2.	Disconnector - Characteristics			
2.1	Nominal system voltage	kV _{rms}	230	
2.2	Highest voltage for equipment U _n	kV _{rms}	245	
2.3	Rated lightning impulse withstand voltage	kV _{peak}	1050	
2.4	Rated short duration power frequency voltage	kV	460	
2.5	Rated frequency f _r	Hz	50	
2.7	Rated current I _r	Α	≥ 2000	
2.8	Rated short withstand current I _k	kA _{rms}	≥ 50	
2.9	Rated duration of short-circuit on main blades	s	3	
2.10	Rated duration of short-circuit on earthing blades	s	Not applicable	
2.11	Rated maximum withstand current lp	kA	≥ 100	
2.12	Capacity of making and breaking transfer load of busbar system at 300 V (rms)	А	1600	
2.13	Nominal supply voltage			
2.13.1	Controls and alarm (signalling) circuits	V d.c.	110	
2.13.2	Motors	V d.c.	110	
2.13.3	Heaters	V a.c. / Hz	230 / 50	
2.14	Opening time	s	Insert	
2.15	Closing time	s	Insert	
2.16	Mechanical endurance	Class	M2	
2.17	Rated mechanical terminal loads of terminals			
2.17.1	Direct loading, static F _a	N	> 1000	
2.17.2	Transversal loading, static F _b	N	> 330	
2.17.3	Vertical force Fc	N	> 1250	
2.17.4	Direct loading, dynamic	N	> 4500	
2.17.5	Transversal loading, dynamic	N	Insert	



		Minimum Requirements	num Requirements	
No.	Description	Unit	Data	Guaranteed
	Discourant Design and Construction	· ·	Dutu	
3.	Disconnector - Design and Construction			
3.1	Disconnector			
3.1.1	Insulator material	427	Porcelain, brown	
3.1.2	Minimum creepage distance	mm/kV	Min. ≥25 mm/kV	
3.1.3	Quality of insulator	-	Min. C130	
3.1.4	Rated failing load of insulator (C10)	N	Min. 10000	
3.1.5	HV terminals	+	- 1-1	
3.1.5.1	Shape	+	Flat	
3.1.5.2	Dimensions	mm x mm	Min 100 x 100	
3.1.5.3	Number of holes	+	Min 4	
3.1.5.4	Dimensions of holes	mm	Ø 14	
3.1.5.5	Distance between holes	mm	50	
3.1.5.6	Material suitable for		Al terminal	
3.1.7	Weight and dimensions			
3.1.7.1	Pole height	mm	Insert	
3.1.7.2	Support insulator height	mm	Insert	
3.1.7.3	Total height	mm	Insert	
3.1.7.4	Pole length	mm	Insert	
3.1.7.5	Distance between support axis of a pole	mm	Insert	
3.1.7.6	Shipping dimensions	mm	Insert	
3.1.7.7	Pole weight	kg	Insert	
3.1.7.8	Weight of operating mechanism	Kg	Insert	
3.1.7.9	Total weight	Kg	Insert	
3.1.7.10	Shipping weight	kg	Insert	
3.2	Operating mechanism			
3.2.1	Number of operating mechanism	pcs.	1	
3.2.2	Туре		Insert	
3.2.3	Rated power of motor	W	Insert	
3.2.4	Total heater power	W	Insert	
3.2.5	Minimum number of available contacts (NO/NC/V)		12NO+12NC	
3.2.9	Motor - auxiliary supply voltage	V, DC	110	
3.2.10	Heater, 230 V, 50 Hz		Yes	
3.2.11	Water-tight corrosion-resistant housing		IP54	
3.2.12	Selection switch (local/neutral/remote)		Yes	
3.2.13	Manual closing button		Yes	
3.2.14	Manual opening button		Yes	
3.2.15	Anti-condensation heater inside the operating mechanism cabinet		Yes	
3.2.16	Single-phase socket		Yes	
3.2.16	Voltage presence controller		Yes	
3.2.17	Motor MCB (miniature circuit breakers)		Yes	
	·	+ +		
3.2.19	Heater MCB (miniature circuit breaker)		Yes	



Na	Deceription	Minimum Requirements		Cususuntasad
No.	Description	Unit	Data	Guaranteed
3.2.20	Single-phase socket MCB (miniature circuit breaker)		Yes	
3.2.21	Equipotential bonding rails		Yes	
3.2.22	Housing of AI or stainless steel		Yes	
	Overall compliance with the requirements (yes/no)			



5.2.1.6 A3.1: Current Transformers 230 kV, 3200-1600/1 A/A

	Bassintan	Minin	num Requirements	
No.	Description	Unit	Data	Guaranteed
1.	Current Transformers - General	•		
1.1.	Manufacturer		Insert	
1.2	Туре		Insert	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
1.5	Standards		IEC 60044-1	
1.6	Quality control		ISO 9001	
1.7	Type		Outdoor	
1.8	Shape / design		Head type	
1.9	Sealing		Hermetically closed	
		1	riomiodidally dioded	I
2.	Current Transformers - Characteristics	1 1)/		
2.1	Nominal system voltage	kV _{rms}	230	
2.2	Highest voltage for equipment Un	kV _{rms}	245	1
2.3	Rated lightning impulse withstand voltage	kV _{peak}	1050	
2.4	Rated short duration power frequency voltage	kV	460	
2.5	Rated frequency f _r	Hz	50	
2.6	Rated short-time thermal current lth, 1 s	kA	50	
2.7	Rated dynamic current I _{dyn}	kV peak	125	
	Rated continuous thermal current (40°C):			
	• I core	% In	200	
2.8	• Il core	% In	200	
	• III core	% In	120	
	• IV core	% In	120	
	V core Pote distributions are retire.	% In	120	
	Rated transformer ratio:	A/A	3200-1600/1	
	I core II core	A/A A/A	3200-1600/1	
2.9	• III core	A/A A/A	3200-1600/1	
	IV core	A/A A/A	3200-1600/1	
	V core	A/A A/A	3200-1600/1	
	Accuracy class:	7,77	0200 1000/1	
	I core		0.2	
	• Il core		0.2	
2.10	• III core		5P20	
	IV core		5P20	
	• V core		5P20	
	Security factor:		J. 20	
2.11	I core		Fs=10	
-	• II core		Fs=10	
2.12	Rated power:			
	• I core	VA	10	
	• Il core	VA	15	
	• III core	VA	30	
	IV core	VA	30	
	V core	VA	30	



NI-	Description	Minir	num Requirements	
No.	Description	Unit	Data	Guaranteed
2.13	Rated mechanical terminal loads	Class	Min. Class II	
3.	Current Transformers - Design and Const	ruction		
3.1	Insulator material		Porcelain, brown	
3.2	Insulating medium		Oil-paper	
3.3	Minimum creepage distance	mm/kV	Min. ≥ 25 mm/kV	
3.4	Max. radio interference voltage at 0.5-2 MHz (acc. IEC 60694)	μV	Max. 2500	
	Permissible level of partial discharges:			
3.5	 Test voltage 1.2*U_M/√3 	рC	Max. ≤ 5	
	. Test voltage U _M	рC	≤ 10	
3.7	Min. LV enclosure protection		IP54	
3.8	HV terminals			
3.8.1	Shape		Flat	
3.8.2	Position		Horizontal	
3.8.3	Dimensions	mm x mm	Min 100 x 100	
3.8.4	Number of holes		Min 4	
3.8.5	Dimensions of holes	mm	Ø 14	
3.8.6	Distance between holes	mm	50	
3.8.7	Material suitable for		Al terminal	
3.10	tgō test terminal		Yes	
3.11	Oil drain cock and sampling device		Yes	
3.13	Secondary reconnection		Yes	
3.14	Outdoor metal part made of aluminium or stainless steel		Yes	
3.15	Mass and dimensions			
3.15.1	Total mass	kg	Insert	
3.15.2	Height	mm	Insert	
	Overall compliance with the requirements	(yes/no)		



5.2.1.7 A3.2: Current Transformers 230 kV, 1600-800/1 A/A

	Description	Minim	num Requirements	Guaranteed
No.		Unit	Data	
1.	Current Transformers - General			
1.1.	Manufacturer		Insert	
1.2	Туре		Insert	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
1.5	Standards		IEC 60044-1	
1.6	Quality control		ISO 9001	
1.7	Type		Outdoor	
1.8	Shape / design		Head type	
1.9	Sealing		Hermetically closed	
			Tiermetically closed	<u> </u>
2.	Current Transformers - Characteristics	T 137		
2.1	Nominal system voltage	kV _{rms}	230	
2.2	Highest voltage for equipment U _n	kV _{rms}	245	
2.3	Rated lightning impulse withstand voltage	kV _{peak}	1050	
2.4	Rated short duration power frequency voltage	kV	460	
2.5	Rated frequency f _r	Hz	50	
2.6	Rated short-time thermal current lth, 1 s	kA	50	
2.7	Rated dynamic current I _{dyn}	kV peak	125	
	Rated continuous thermal current (40°C):			
	• I core	% In	200	
2.8	• Il core	% In	200	
	• III core	% In	120	
	• IV core	% In	120	
	• V core	% In	120	
	Rated transformer ratio:		4000 000/4	
	• I core	A/A	1600-800/1	
2.9	• Il core	A/A	1600-800/1	
	• III core	A/A	1600-800/1	
	• IV core	A/A	1600-800/1	
	• V core	A/A	1600-800/1	
	Accuracy class:		0.0	
	• I core		0.2	
2.10	• II core		0.2 5P20	
	• III core			
	• IV core		5P20	
	V core Security feator:		5P20	
2.11	Security factor: • I core		Fs=10	
2.11	I core II core		Fs=10 Fs=10	
	Rated power:		F9=10	
	I core	VA	10	
	Il core	VA	15	
2.12	• III core	VA	30	
	IV core	VA	30	
	V core	VA	30	
	▼ V COIE	٧٨	30	<u> </u>



NI-	Description	Minir	num Requirements	
No.	Description	Unit	Data	Guaranteed
2.13	Rated mechanical terminal loads	Class	Min. Class II	
3.	Current Transformers - Design and Const	ruction		
3.1	Insulator material		Porcelain, brown	
3.2	Insulating medium		Oil-paper	
3.3	Minimum creepage distance	mm/kV	Min. ≥ 25 mm/kV	
3.4	Max. radio interference voltage at 0.5-2 MHz (acc. IEC 60694)	μV	Max. 2500	
	Permissible level of partial discharges:			
3.5	 Test voltage 1.2*U_M/√3 	рC	Max. ≤ 5	
	. Test voltage U _M	рC	≤ 10	
3.7	Min. LV enclosure protection		IP54	
3.8	HV terminals			
3.8.1	Shape		Flat	
3.8.2	Position		Horizontal	
3.8.3	Dimensions	mm x mm	Min 100 x 100	
3.8.4	Number of holes		Min 4	
3.8.5	Dimensions of holes	mm	Ø 14	
3.8.6	Distance between holes	mm	50	
3.8.7	Material suitable for		Al terminal	
3.10	tgō test terminal		Yes	
3.11	Oil drain cock and sampling device		Yes	
3.13	Secondary reconnection		Yes	
3.14	Outdoor metal part made of aluminium or stainless steel		Yes	
3.15	Mass and dimensions			
3.15.1	Total mass	kg	Insert	
3.15.2	Height	mm	Insert	
	Overall compliance with the requirements	(yes/no)		



5.2.1.8 A4: Voltage Transformers 230 kV

N	Description	Mini	mum Requirements	0
No.		Unit	Data	Guaranteed
1.	Voltage Transformers - General			
1.1	Manufacturer		Insert	
1.2	Туре		Capacitive	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
1.5	Standards		IEC 60044-2 IEC 60273 IEC 60694 IEC 60815	
1.6	Quality control		ISO 9001	
1.7	Туре		Outdoor	
1.8	Shape		Insert	
1.9	Sealing		Hermetically closed	
2.	Voltage Transformers - Characteristics			
2.1	Nominal system voltage	kV _{rms}	230	
2.2	Highest voltage for equipment U _n	kV _{rms}	245	
2.3	Rated lightning impulse withstand voltage	kV _{peak}	1050	
2.4	Rated short duration power frequency voltage	kV	460	
2.5	Rated frequency f _r	Hz	50	
2.6	Rated short-time thermal current lth, 1 s	kA	50	
2.7	Rated dynamic current I _{dyn}	kV _{peak}	125	
2.8	Rated primary voltage	kV	230/√3	
2.0	Rated secondary voltage	IX V	200/10	
2.9	I winding	V	110√3	
	Il winding	V	110√3	
	Accuracy class:		1.10,10	
2.10	I winding		0.2	
	Il winding		1/3P	
	Rated power:			
2.11	I winding	VA	25	
	Il winding	VA	75	
2.12	Load		Simultaneously	
2.13	Voltage factor	p.u./s	1.5/30	
2.14	Rated mechanical strength	Class	Min. Class II	
2.15	Power frequency withstand tests on secondary windings, 1 min	kV rms	3	
3.	Voltage Transformers - Design and Const	ruction		
3.1	Insulator material	3. 2. 2. 2	Porcelain, brown	
3.2	Insulating medium		Oil-paper - Mixed dielec- tric	
3.3	Minimum creepage distance	mm/kV	Min. ≥ 25 mm/kV	
3.4	Max. radio interference voltage at 0.5-2 MHz (acc. to IEC 60694)	μV	Max. 2500	



NI-	De amintia a	Minii	mum Requirements	
No.	Description	Unit	Data	Guaranteed
	Permissible level of partial discharges:			
3.5	Test voltage 1.2*U _M /√3	рC	Max. ≤ 5	
	Test voltage U _M	рC	≤ 10	
3.7	Min. LV enclosure protection		IP54	
3.8	HV terminals			
3.8.1	Shape		Flat	
3.8.2	Position		Vertical or horizontal	
3.8.3	Dimensions	mm x mm	Min 100 x 100	
3.8.4	Number of holes		Min 4	
3.8.5	Dimensions of holes	mm	Ø 14	
3.8.6	Distance between holes	mm	50	
3.8.7	Material suitable for		Al terminal	
3.10	Oil drain cock and sampling device		Yes	
3.11	Enable sealing after accuracy class checks (sealing possibilities)		Yes	
3.13	Outdoor metal part made of aluminium or stain-		Yes	
3.13	less steel		162	
3.14	Mass and dimensions			
3.14.1	Total mass	kg	Insert	
3.14.2	Height	mm	Insert	
	Overall compliance with the requirements (yes/no)			



5.2.1.9 A5: Surge Arresters 230 kV

Description	Minimum Requirements		
	Unit	Data	Guaranteed
Surge Arresters - General			
		Insert	
		_	
-		Insert	
 			
		ISO 9001	
Design		Metal oxide, gapless,	
Short circuit testing authority		Insert authority	
-			
	kV rms	230	
-			
-			
·			
•			
` ' '			
-		100	
		3	
Energy dissipation capacity (per kV of rated	kJ/kV	≥ 6.5	
	А	≥ 850	
For switching impulse current 30/60 µs at 0,5 kA	kV _{peak}	≤ 375	
For switching impulse current 30/60 µs at 1 kA	kV _{peak}	≤ 385	
For switching impulse current 30/60 µs at 2 kA		≤ 405	
For lightning impulse current 8/20 µs at 5 kA	kV _{peak}	≤ 435	
For lightning impulse current 8/20 µs at 10 kA	kV _{peak}	≤ 465	
For lightning impulse current 8/20 µs at 20 kA	kV _{peak}	≤ 515	
Dielectric endurance of arrester housing)			
Lightning impulse withstand voltage of arrester housing up (1.2/50 µs)	kV	≥ 925	
Power frequency withstand voltage of arrester	kV	≥ 425	
-			
	N	≥ 2250	
•			
•			
· -	****		
	mm		
	Surge Arresters - General Manufacturer Type Model designation Country of origin Standards Quality control Design Short circuit testing authority Surge Arresters - Characteristics Nominal system voltage Highest voltage for equipment U _n Rated voltage of surge arrester U _r Max. continuous operating voltage U _c Rated frequency Nominal discharge current In (8/20 μs) High current impulse of an arrester (4/10 μs) Surge Arresters - Design and Construction Line discharge class Energy dissipation capacity (per kV of rated voltage) Long duration current impulse (2000 μs) Maximum residual voltage U _{res} For switching impulse current 30/60 μs at 0,5 kA For switching impulse current 30/60 μs at 1 kA For switching impulse current 8/20 μs at 5 kA For lightning impulse current 8/20 μs at 10 kA For lightning impulse current 8/20 μs at 20 kA Dielectric endurance of arrester housing) Lightning impulse withstand voltage of arrester housing up (1.2/50 μs)	Surge Arresters - General Manufacturer Type Model designation Country of origin Standards Quality control Design Short circuit testing authority Surge Arresters - Characteristics Nominal system voltage Highest voltage for equipment Un Rated voltage of surge arrester Ur Max. continuous operating voltage Uc Rated frequency Hz Nominal discharge current In (8/20 µs) High current impulse of an arrester (4/10 µs) Surge Arresters - Design and Construction Line discharge class Energy dissipation capacity (per kV of rated voltage) Long duration current impulse (2000 µs) Aximum residual voltage Ures For switching impulse current 30/60 µs at 0,5 kA For switching impulse current 30/60 µs at 1 kA For switching impulse current 30/60 µs at 2 kA For lightning impulse current 8/20 µs at 5 kA For lightning impulse current 8/20 µs at 10 kA For lightning impulse current 8/20 µs at 2 kA For lightning impulse current 8/20 µs at 2 kA For lightning impulse current 8/20 µs at 2 kA For lightning impulse current 8/20 µs at 2 kA For lightning impulse withstand voltage of arrester housing up (1.2/50 µs) Power frequency withstand voltage of arrester housing (1 min wet) Mechanical requirements Specified short-term load SSL (F _{dyn}) N Specified long-term load SSL (F _{stat}) N Minimum creepage distance mm/kV Housing insulating material Insulating basement	Surge Arresters - General Unit Data Manufacturer Insert Type Insert Model designation Insert Country of origin Insert Standards IEC 60099-4 Quality control ISO 9001 Design Metal oxide, gapless, outdoor Short circuit testing authority Insert authority Surge Arresters - Characteristics Nominal system voltage Nominal system voltage kV ms Highest voltage for equipment Un kV ms Rated voltage of surge arrester Ur kV ms Rated voltage of surge arrester Ur kV ms Max. continuous operating voltage Uc kV ms Rated frequency Hz 50 Nominal discharge current In (8/20 μs) kA peak 10 High current impulse of an arrester (4/10 μs) kA peak 10 Surge Arresters - Design and Construction Class 3 Line discharge class Class 3 Energy dissipation capacity (per kV of rated voltage) kJ/kV ≥ 6.5 Long duration



Na	Description		num Requirements	Cususutand
No.	Description	Unit	Data	Guaranteed
3.11	Surge arrester weight	kg	Insert	
3.12	Voltage distribution ring present / ring diame-	yes / no /	Incort	
3.12	ter	mm	Insert	
3.14	HV terminal			
3.14.1	Shape		Flat	
3.14.2	Dimension	mm x mm	Min 100 x 100	
3.14.3	Number of holes		Min 4	
3.14.4	Distance between holes	mm x mm	50 x 50	
3.14.5	Material suitable for		Al terminal	
	Overall compliance with the requirements (yes/no)			



5.2.2 B: Switchgear 132 kV

5.2.2.1 B1.1: Circuit Breaker 132 kV, three OM

		Minimum Requirements		
No.	Description	Unit	Data	Guaranteed
1.	Circuit Breaker - General			
1.1.	Manufacturer		Insert	
1.2	Туре		Insert	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
			IEC 62271-100	
			IEC 60273	
1.5	Standards		IEC 60694	
			IEC 60815	
			ISO 9001	
1.6	Quality control		ISO 14001	
			ISO 18001	
1.7	Isolating and quenching medium		SF ₆	
1.8	Type of circuit breaker		Outdoor	
1.9	Design		Single breaking	
1.10	Operating mechanism		Motor-wound spring	
1.11	Number of poles	pcs.	3	
	Number of operating mechanisms per circuit			
1.12	breaker	pcs.	3	
2.	Circuit Breaker - Characteristics			
2.1	Nominal system voltage	kV _{rms}	132	
2.2	Highest voltage for equipment U _n	kV _{rms}	145	
2.3	Rated lightning impulse withstand voltage	kV _{peak}	650	
2.4	Rated short duration power frequency voltage	kV	275	
2.5	Rated frequency f _r	Hz	50	
2.6	Rated current I _r	Α	≥ 1250	
2.7	Rated short-circuit breaking current I _{sc}	kA _{rms}	≥ 40	
2.8	Rated peak withstand current I _p (equal short-circuit	kA	≥ 100	
	making current)			
2.9	D.C. component of the rated short-circuit breaking current	%	> 30	
	First-pole-to-clear factor			
	Terminal fault	p.u.	1.3	
2.10	Short-line fault	p.u.	1.0	
	Out-of-phase	p.u.	2.0	
	Standard value of transient recovery voltage			
2.11	(T100)	kV	Insert	
2.12	Rate of rise recovery voltage	kV/μs	Insert	
2.13	Rated operating sequence		O-0.3 s-CO-3 min-CO	
2.14	Duration of short-circuit	S	≥ 1	
2.15	Rated out-of-phase breaking current	kA	Insert	
2.16	Auto reclosing		1p+3p	



		Minir	num Requirements	
No.	Description	Unit	Data	Guaranteed
2.17	Maximum total break time (trip initiation to final arc extinction) pos.3.7.135 acc. to IEC 62271-100)	ms	≤ 60	
2.18	Time of final arc extinction (3.7.134 acc. IEC 62271-100)	ms	20 ± 5	
2.19	 Opening time (trip initiation to contact separation) Without current With 100 % rated breaking current 	ms ms	Insert Insert	
2.20	Maximum time interval between opening inter- rupters	ms	Insert	
2.21	Maximum time interval between opening of first and last phase of three-phase circuit breakers	ms	3	
2.22	Time for making (trip initiation to contact touch)Without current100 % making current	ms ms	Insert Insert	
2.23	Minimum dead time	ms	Insert	
2.24	Restrike performance during capacitive current switching	Class	C2	
2.25	 Number of operations without maintenance CO at no-load CO at rated current CO at rated breaking current lsc 		≥ 10000 ≥ 2500 ≥ 5	
2.26	The frequency of mechanical operations	Class	M2	
2.27	Rated electrical endurance	Class	Min E1	
2.28	Rated pressure of a circuit breaker	Мра	Insert	
2.29	Total mass of SF ₆ gas in a circuit breaker	kg	Insert	
2.30	Rated mechanical terminal loads			
2.30.1	Static horizontal force, longitudinal F _{thA}	N	≥ 1250	
2.30.2	Static horizontal force, transversal F _{thB}	N	≥ 750	
2.30.3	Static vertical force F _{tv}	N	≥ 1000	
2.30.4	Dynamic horizontal force, longitudinal F _{wx}	N	Insert	
2.30.5	Dynamic horizontal force, transversal	N	Insert	
3.	Circuit Breaker - Design and Construction	 		Γ
3.1	Circuit Breaker			
3.1.1	Insulator material		Porcelain	
3.1.2	Minimum creepage distance	mm/kV	Min. ≥ 25	
3.1.3	HV terminal	pcs.	2	
3.1.3.1	Shape		Flat	
	Dimensions	mm x mm	Min 100 x 100	
3.1.3.3	Number of holes		Min 4	
	Dimensions of holes	mm	Ø 14	
3.1.3.5	Distance between holes	mm	50	
3.1.3.6	Material suitable for		Al terminal	
3.1.5	Weight and dimensions			
	Support insulator height	mm	Insert	
	Total height	mm	Insert	
3.1.5.3	Pole weight	kg	Insert	



		Minimum Requirements		
No.	Description	Unit	Data	Guaranteed
3.1.5.4	Weight of operating mechanism	kg	Insert	
3.1.5.5	Total weight (with metal structure)	kg	Insert	
3.1.6	Minimum distance			
3.1.6.1	Between poles	mm	Insert	
3.1.6.2	To ground	mm	Insert	
3.2	Operating mechanism			
3.2.1	Туре		Insert	
3.2.2	Motor - auxiliary supply voltage	V. DC	110	
3.2.3	Rated power of motor	W	Insert	
3.2.4	Control voltage	V. DC	110	
3.2.5	Number of making coils	pcs.	1	
3.2.6	Rated power of making coils	W	Insert	
3.2.7	Number of breaking coils	pcs.	2	
3.2.8	Rated power of breaking coils	W	Insert	
3.2.9	Heater		Yes	
	Heater supply voltage	V. Hz	230. 50	
	Total heater power	W	Insert	
	Minimum number of available contacts (NO/NC/V)		12NO+12NC+1V	
	Water-tight corrosion-resistant housing		IP54	
3.2.17	-		Al or stainless steel	
3.2.19	A crank for manual spring loading		Yes	
3.4	Accessories in central control panel		. 00	
3.4.1	Anti-pumping relay		Yes	
3.4.2	Local/remote control selector switch		Yes	
3.4.3	Local operation push buttons		Yes	
3.4.4	Minimum pressure lock-out and alarm relays		Yes	
3.4.5	Service outlet (socket) - 230 V, 50 Hz		Yes	
3.4.6	Lighting switch		Yes	
3.4.7	Lighting - 230 V, 50 Hz		Yes	
	Heater - 230 V, 50 HZ		Yes	
3.4.9	Operation counter		Yes	
3.4.10	Motor MCB (miniature circuit breakers) (for all operating mechanisms)		Yes	
3.4.11	Time phase discrepancy relay		Yes	
3.4.12	Weatherproof, corrosion resistance enclosure, Al or stainless steel		IP54	
3.2.16	Cu earthing rails inside central control cabinet		Yes	
3.2.18	Detachable plates, the bottom of central control cabinet		Yes	
3.4.13	Set of cables for connection of operating mechanism and central control panel of circuit breaker		Yes	
3.4.14	Galvanized horizontal and vertical metal structure with minimum 70 µm zinc layer		Yes	
	Overall compliance with the requirements (yes/no)		



5.2.2.2 B1.2: Circuit Breaker 132 kV, 3150 A, one OM

NI-	Bassintian	Minir	mum Requirements	Guaranteed
No.	Description	Unit	Data	
1.	Circuit Breaker - General			
1.1.	Manufacturer		Insert	
1.2	Туре		Insert	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
			IEC 62271-100	
1.5	Standards		IEC 60273	
1.5	Standards		IEC 60694	
			IEC 60815	
			ISO 9001	
1.6	Quality control		ISO 14001	
			ISO 18001	
1.7	Isolating and quenching medium		SF ₆	
1.8	Type of circuit breaker		Outdoor	
1.9	Design		Single breaking	
1.10	Operating mechanism		Motor-wound spring	
1.11	Number of poles	pcs.	3	
4.40	Number of operating mechanisms per circuit			
1.12	breaker	pcs.	1	
2.	Circuit Breaker - Characteristics			
2.1	Nominal system voltage	kV _{rms}	132	
2.2	Highest voltage for equipment U _n	kV_{rms}	145	
2.3	Rated lightning impulse withstand voltage	kV _{peak}	650	
2.4	Rated short duration power frequency voltage	kV	275	
2.5	Rated frequency f _r	Hz	50	
2.6	Rated current I _r	Α	≥ 3150	
2.7	Rated short-circuit breaking current I _{sc}	kA _{rms}	≥ 40	
0.0	Rated peak withstand current Ip (equal short-		> 400	
2.8	circuit making current)	kA	≥ 100	
2.0	D.C. component of the rated short-circuit breaking	0/	. 20	
2.9	current	%	> 30	
	First-pole-to-clear factor			
2.10	Terminal fault	p.u.	1.3	
2.10	Short-line fault	p.u.	1.0	
	Out-of-phase	p.u.	2.0	
2.11	Standard value of transient recovery voltage	kV	Incort	
2.11	(T100)	ΚV	Insert	
2.12	Rate of rise recovery voltage	kV/μs	Insert	
2.13	Rated operating sequence		O-0.3 s-CO-3 min-CO	
2.14	Duration of short-circuit	S	≥ 1	
2.15	Rated out-of-phase breaking current	kA	Insert	
2.16	Auto reclosing		No	



		Minimum Requirements		
No.	Description	Unit	Data	Guaranteed
	Maximum total break time (trip initiation to final	Onit	Data	
2.17	arc extinction) pos.3.7.135 acc. to IEC 62271-	ms	≤ 60	
	100)			
	Time of final arc extinction (3.7134 acc. IEC			
2.18	62271-100)	ms	20 ± 5	
	Opening time (trip initiation to contact separation)			
2.19	Without current	ms	Insert	
	With 100 % rated breaking current	ms	Insert	
2.20	Maximum time interval between opening inter-	ms	Insert	
2.20	rupters	1115	msert	
2.21	Maximum time interval between opening of first	ms	3	
2.21	and last phase of three-phase circuit breakers	1113		
	Time for making (trip initiation to contact touch)			
2.22	Without current	ms	Insert	
	100 % making current	ms	Insert	
2.23	Minimum dead time	ms	Insert	
2.24	Restrike performance during capacitive current	Class	C2	
	switching			
	Number of operations without maintenance		. 40000	
2.25	CO at no-load		≥ 10000	
	CO at rated by a clining assurant lead		≥ 2500	
2.26	CO at rated breaking current lsc The frequency of machanical energians.	Class	≥ 5	
2.26	The frequency of mechanical operations	Class	M2	
2.27	Rated electrical endurance Rated pressure of a circuit breaker	Class Mpa	Min E1 Insert	
2.29	Total mass of SF ₆ gas in a circuit breaker	kg	Insert	
2.30	Rated mechanical terminal loads	Ng	msen	
2.30.1	Static horizontal force, longitudinal F _{thA}	N	≥ 1750	
	Static horizontal force, transversal F _{thB}	N	≥ 1750 ≥ 1250	
	Static vertical force F _{tv}	N	≥ 1500	
	Dynamic horizontal force, longitudinal F _{wx}	N	Insert	
2.30.5	Dynamic horizontal force, transversal	N	Insert	
	•		moore	
3.	Circuit Breaker - Design and Construction	1 1		
3.1	Circuit Breaker			
3.1.1	Insulator material		Porcelain	
3.1.2	Minimum creepage distance	mm/kV	Min. ≥ 25	+
3.1.3	HV terminal	pcs.	2	+
3.1.3.1	·		Flat	+
	Dimensions	mm x mm	Min 100 x 100	+
	Number of holes		Min 4	+
	Dimensions of holes	mm	Ø 14	+
	Distance between holes	mm	50	+
	Material suitable for		Al terminal	+
3.1.5	Weight and dimensions		1	+
	Support insulator height	mm	Insert	+
	Total height	mm	Insert	+
3.1.5.3	Pole weight	kg	Insert	_1



	B	Minimum Requirements		
No.	Description	Unit	Data	Guaranteed
3.1.5.4	Weight of operating mechanism	kg	Insert	
3.1.5.5	Total weight (with metal structure)	kg	Insert	
3.1.6	Minimum distance	_		
3.1.6.1	Between poles	mm	Insert	
	To ground	mm	Insert	
3.2	Operating mechanism			
3.2.1	Туре		Insert	
3.2.2	Motor - auxiliary supply voltage	V. DC	110	
3.2.3	Rated power of motor	W	Insert	
3.2.4	Control voltage	V. DC	110	
3.2.5	Number of making coils	pcs.	1	
3.2.6	Rated power of making coils	W	Insert	
3.2.7	Number of breaking coils	pcs.	2	
3.2.8	Rated power of breaking coils	W	Insert	
3.2.9	Heater	**	Yes	
3.2.10		V. Hz	230. 50	
	Total heater power	W	Insert	
	Minimum number of available contacts (NO/NC/V)	VV	12NO+12NC+1V	
	·		IP54	
3.2.17	-		Al or stainless steel	
3.2.17			Yes	
3.4	Accessories in central control panel		163	
3.4.1	·		Yes	
3.4.1	Anti-pumping relay Local/remote control selector switch		Yes	
3.4.3	Local operation push buttons		Yes	
3.4.4	Minimum pressure lock-out and alarm relays		Yes	
3.4.5	Service outlet (socket) - 230 V, 50 Hz		Yes	
3.4.6	Lighting switch		Yes	
3.4.7	Lighting - 230 V, 50 Hz		Yes	
	Heater - 230 V, 50 HZ		Yes	
3.4.9	Operation counter		Yes	
3.4.10	Motor MCB (miniature circuit breakers) (for all operating mechanisms)		Yes	
3.4.11	Time phase discrepancy relay		Yes	
3.4.12	Weatherproof, corrosion resistance enclosure, Al or stainless steel		IP54	
3.2.16			Yes	
	Detachable plates, the bottom of central control			
3.2.18	cabinet		Yes	
3.4.13	Set of cables for connection of operating mechanism and central control panel of circuit breaker		Yes	
3.4.14	Galvanized horizontal and vertical metal structure with minimum 70 µm zinc layer		Yes	
	Overall compliance with the requirements (yes/no)		



5.2.2.3 B1.3: Circuit Breaker 132 kV, 2000 A, one OM

M-	Paradiation.	Minii	num Requirements	0
No.	Description	Unit	Data	Guaranteed
1.	Circuit Breaker - General			
1.1.	Manufacturer		Insert	
1.2	Туре		Insert	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
			IEC 62271-100	
1.5	Ctandarda		IEC 60273	
1.5	Standards		IEC 60694	
			IEC 60815	
			ISO 9001	
1.6	Quality control		ISO 14001	
			ISO 18001	
1.7	Isolating and quenching medium		SF ₆	
1.8	Type of circuit breaker		Outdoor	
1.9	Design		Single breaking	
1.10	Operating mechanism		Motor-wound spring	
1.11	Number of poles	pcs.	3	
4.40	Number of operating mechanisms per circuit		4	
1.12	breaker	pcs.	1	
2.	Circuit Breaker - Characteristics			
2.1	Nominal system voltage	kV _{rms}	132	
2.2	Highest voltage for equipment U _n	kV _{rms}	145	
2.3	Rated lightning impulse withstand voltage	kV _{peak}	650	
2.4	Rated short duration power frequency voltage	kV	275	
2.5	Rated frequency f _r	Hz	50	
2.6	Rated current I _r	А	≥ 2000	
2.7	Rated short-circuit breaking current I _{sc}	kA _{rms}	≥ 40	
0.0	Rated peak withstand current Ip (equal short-	Ι- Δ	> 400	
2.8	circuit making current)	kA	≥ 100	
2.0	D.C. component of the rated short-circuit breaking	0/	. 20	
2.9	current	%	> 30	
	First-pole-to-clear factor			
2.10	Terminal fault	p.u.	1.3	
2.10	Short-line fault	p.u.	1.0	
	Out-of-phase	p.u.	2.0	
2.11	Standard value of transient recovery voltage	kV	Incort	
2.11	(T100)	ΚV	Insert	
2.12	Rate of rise recovery voltage	kV/µs	Insert	
2.13	Rated operating sequence		O-0.3 s-CO-3 min-CO	
2.14	Duration of short-circuit	S	≥ 1	
2.15	Rated out-of-phase breaking current	kA	Insert	
2.16	Auto reclosing		No	



		Minimum Requirements		
No.	Description	Unit	Data	Guaranteed
	Maximum total break time (trip initiation to final	Onit	Data	
2.17	arc extinction) pos.3.7.135 acc. to IEC 62271-	ms	≤ 60	
	100)			
	Time of final arc extinction (3.7134 acc. IEC			
2.18	62271-100)	ms	20 ± 5	
	Opening time (trip initiation to contact separation)			
2.19	Without current	ms	Insert	
	With 100 % rated breaking current	ms	Insert	
2.20	Maximum time interval between opening inter-	ms	Insert	
2.20	rupters	1115	msert	
2.21	Maximum time interval between opening of first	ms	3	
2.21	and last phase of three-phase circuit breakers	1113		
	Time for making (trip initiation to contact touch)			
2.22	Without current	ms	Insert	
	100 % making current	ms	Insert	
2.23	Minimum dead time	ms	Insert	
2.24	Restrike performance during capacitive current	Class	C2	
	switching			
	Number of operations without maintenance		. 40000	
2.25	CO at no-load		≥ 10000	
	CO at rated by a clining assurant lead		≥ 2500	
2.26	CO at rated breaking current lsc The frequency of machanical energians.	Class	≥ 5	
2.26	The frequency of mechanical operations	Class	M2	
2.27	Rated electrical endurance Rated pressure of a circuit breaker	Class Mpa	Min E1 Insert	
2.29	Total mass of SF ₆ gas in a circuit breaker	kg	Insert	
2.30	Rated mechanical terminal loads	Ng	msen	
2.30.1	Static horizontal force, longitudinal F _{thA}	N	≥ 1750	
	Static horizontal force, transversal F _{thB}	N	≥ 1750 ≥ 1250	
	Static vertical force F _{tv}	N	≥ 1500	
	Dynamic horizontal force, longitudinal F _{wx}	N	Insert	
2.30.5	Dynamic horizontal force, transversal	N	Insert	
	•		moore	
3.	Circuit Breaker - Design and Construction	1 1		
3.1	Circuit Breaker			
3.1.1	Insulator material		Porcelain	
3.1.2	Minimum creepage distance	mm/kV	Min. ≥ 25	+
3.1.3	HV terminal	pcs.	2	+
3.1.3.1	·		Flat	+
	Dimensions	mm x mm	Min 100 x 100	+
	Number of holes		Min 4	+
	Dimensions of holes	mm	Ø 14	+
	Distance between holes	mm	50	+
	Material suitable for		Al terminal	+
3.1.5	Weight and dimensions		1	+
	Support insulator height	mm	Insert	+
	Total height	mm	Insert	+
3.1.5.3	Pole weight	kg	Insert	_1



		Minimum Requirements		
No.	Description	Unit	Data	Guaranteed
3.1.5.4	Weight of operating mechanism	kg	Insert	
3.1.5.5	Total weight (with metal structure)	kg	Insert	
3.1.6	Minimum distance			
3.1.6.1	Between poles	mm	Insert	
	To ground	mm	Insert	
3.2	Operating mechanism			
3.2.1	Туре		Insert	
3.2.2	Motor - auxiliary supply voltage	V. DC	110	
3.2.3	Rated power of motor	W	Insert	
3.2.4	Control voltage	V. DC	110	
3.2.5	Number of making coils	pcs.	1	
3.2.6	Rated power of making coils	W	Insert	
3.2.7	Number of breaking coils	pcs.	2	
3.2.8	Rated power of breaking coils	W	Insert	
3.2.9	Heater	**	Yes	
		V. Hz	230, 50	
	Total heater power	W	Insert	
	Minimum number of available contacts (NO/NC/V)	VV	12NO+12NC+1V	
	Water-tight corrosion-resistant housing		IP54	
3.2.17	-		Al or stainless steel	
3.2.17	A crank for manual spring loading		Yes	
3.4	Accessories in central control panel		163	
3.4.1	·		Yes	
3.4.1	Anti-pumping relay Local/remote control selector switch		Yes	
3.4.3	Local operation push buttons		Yes	
3.4.4	Minimum pressure lock-out and alarm relays		Yes	
3.4.5	Service outlet (socket) - 230 V, 50 Hz		Yes	
3.4.6	Lighting switch		Yes	
3.4.7	Lighting - 230 V, 50 Hz		Yes	
	Heater - 230 V, 50 HZ		Yes	
3.4.9	Operation counter		Yes	
3.4.10	Motor MCB (miniature circuit breakers) (for all operating mechanisms)		Yes	
3.4.11	Time phase discrepancy relay		Yes	
3.4.12	Weatherproof, corrosion resistance enclosure, Al or stainless steel		IP54	
3.2.16	Cu earthing rails inside central control cabinet		Yes	
3.2.18	Detachable plates, the bottom of central control cabinet		Yes	
3.4.13	Set of cables for connection of operating mechanism and central control panel of circuit breaker		Yes	
3.4.14	Galvanized horizontal and vertical metal structure with minimum 70 µm zinc layer		Yes	
	Overall compliance with the requirements (yes/no)		



5.2.2.4 B1.4: Circuit Breaker 132 kV, 1250 A, one OM

Ma	Paradiation.	Minimum Requirements	0	
No.	Description	Unit	Data	Guaranteed
1.	Circuit Breaker - General			
1.1.	Manufacturer		Insert	
1.2	Туре		Insert	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
			IEC 62271-100	
1.5	Standards		IEC 60273	
1.5	Standards		IEC 60694	
			IEC 60815	
			ISO 9001	
1.6	Quality control		ISO 14001	
			ISO 18001	
1.7	Isolating and quenching medium		SF ₆	
1.8	Type of circuit breaker		Outdoor	
1.9	Design		Single breaking	
1.10	Operating mechanism		Motor-wound spring	
1.11	Number of poles	pcs.	3	
4.40	Number of operating mechanisms per circuit		4	
1.12	breaker	pcs.	1	
2.	Circuit Breaker - Characteristics			
2.1	Nominal system voltage	kV _{rms}	132	
2.2	Highest voltage for equipment U _n	kV _{rms}	145	
2.3	Rated lightning impulse withstand voltage	kV _{peak}	650	
2.4	Rated short duration power frequency voltage	kV	275	
2.5	Rated frequency f _r	Hz	50	
2.6	Rated current I _r	А	≥ 1250	
2.7	Rated short-circuit breaking current I _{sc}	kA _{rms}	≥ 40	
0.0	Rated peak withstand current Ip (equal short-	Ι- Δ	> 400	
2.8	circuit making current)	kA	≥ 100	
2.0	D.C. component of the rated short-circuit breaking	0/	. 20	
2.9	current	%	> 30	
	First-pole-to-clear factor			
2.10	Terminal fault	p.u.	1.3	
2.10	Short-line fault	p.u.	1.0	
	Out-of-phase	p.u.	2.0	
2.11	Standard value of transient recovery voltage	kV	Insert	
2.11	(T100)	۲V	IIISEIL	
2.12	Rate of rise recovery voltage	kV/µs	Insert	
2.13	Rated operating sequence		O-0.3 s-CO-3 min-CO	
2.14	Duration of short-circuit	S	≥ 1	
2.15	Rated out-of-phase breaking current	kA	Insert	
2.16	Auto reclosing		No	



		Minir	num Requirements	
No.	Description	Unit	Data	Guaranteed
2.17	Maximum total break time (trip initiation to final arc extinction) pos.3.7.135 acc. to IEC 62271-100)	ms	≤ 60	
2.18	Time of final arc extinction (3.7134 acc. IEC 62271-100)	ms	20 ± 5	
2.19	 Opening time (trip initiation to contact separation) Without current With 100 % rated breaking current 	ms ms	Insert Insert	
2.20	Maximum time interval between opening inter- rupters	ms	Insert	
2.21	Maximum time interval between opening of first and last phase of three-phase circuit breakers	ms	3	
2.22	Time for making (trip initiation to contact touch) • Without current • 100 % making current	ms ms	Insert Insert	
2.23	Minimum dead time	ms	Insert	
2.24	Restrike performance during capacitive current switching	Class	C2	
2.25	 Number of operations without maintenance CO at no-load CO at rated current CO at rated breaking current lsc 		≥ 10000 ≥ 2500 ≥ 5	
2.26	The frequency of mechanical operations	Class	M2	
2.27	Rated electrical endurance	Class	Min E1	
2.28	Rated pressure of a circuit breaker	Мра	Insert	
2.29	Total mass of SF ₆ gas in a circuit breaker	kg	Insert	
2.30	Rated mechanical terminal loads			
2.30.1	Static horizontal force, longitudinal F _{thA}	N	≥ 1750	
2.30.2	Static horizontal force, transversal F _{thB}	N	≥ 1250	
	Static vertical force F _{tv}	N	≥ 1500	
	Dynamic horizontal force, longitudinal F _{wx}	N	Insert	
2.30.5		N	Insert	
3.	Circuit Breaker - Design and Construction			
3.1	Circuit Breaker			
3.1.1	Insulator material		Porcelain	
3.1.2	Minimum creepage distance	mm/kV	Min. ≥ 25	
3.1.3	HV terminal	pcs.	2	
	Shape		Flat	
	Dimensions	mm x mm	Min 100 x 100	
	Number of holes		Min 4	
	Dimensions of holes	mm	Ø 14	
	Distance between holes	mm	50	
	Material suitable for		Al terminal	
3.1.5	Weight and dimensions			
	Support insulator height	mm	Insert	
	Total height	mm	Insert	
3.1.5.3	Pole weight	kg	Insert	



	Description	Mini	0	
No.	Description	Unit	Data	Guaranteed
3.1.5.4	Weight of operating mechanism	kg	Insert	
3.1.5.5	Total weight (with metal structure)	kg	Insert	
3.1.6	Minimum distance			
3.1.6.1	Between poles	mm	Insert	
3.1.6.2	To ground	mm	Insert	
3.2	Operating mechanism			
3.2.1	Туре		Insert	
3.2.2	Motor - auxiliary supply voltage	V. DC	110	
3.2.3	Rated power of motor	W	Insert	
3.2.4	Control voltage	V. DC	110	
3.2.5	Number of making coils	pcs.	1	
3.2.6	Rated power of making coils	W	Insert	
3.2.7	Number of breaking coils	pcs.	2	
3.2.8	Rated power of breaking coils	W	Insert	
3.2.9	Heater		Yes	
	Heater supply voltage	V. Hz	230. 50	
	Total heater power	W	Insert	
	Minimum number of available contacts (NO/NC/V)		12NO+12NC+1V	
	Water-tight corrosion-resistant housing		IP54	
	Operating mechanism material		Al or stainless steel	
	A crank for manual spring loading		Yes	
3.4	Accessories in central control panel		. 00	
3.4.1	Anti-pumping relay		Yes	
3.4.2	Local/remote control selector switch		Yes	
3.4.3	Local operation push buttons		Yes	
3.4.4	Minimum pressure lock-out and alarm relays		Yes	
3.4.5	Service outlet (socket) - 230 V, 50 Hz		Yes	
3.4.6	Lighting switch		Yes	
3.4.7	Lighting - 230 V, 50 Hz		Yes	
3.4.8	Heater - 230 V, 50 HZ		Yes	
3.4.9	Operation counter		Yes	
3.4.10	Motor MCB (miniature circuit breakers) (for all op-		Yes	
	erating mechanisms)			
3.4.11	Time phase discrepancy relay		Yes	
3.4.12	Weatherproof, corrosion resistance enclosure, Al or stainless steel		IP54	
3.2.16	Cu earthing rails inside central control cabinet		Yes	
3.2.18	Detachable plates, the bottom of central control		Yes	
2 4 42	Cabinet Set of cables for connection of operating mecha-		Vaa	
3.4.13	nism and central control panel of circuit breaker		Yes	
3.4.14	Galvanized horizontal and vertical metal structure with minimum 70 µm zinc layer		Yes	
	Overall compliance with the requirements (yes/no)		



5.2.2.5 B2.1: Disconnector 132 kV, 3150 A, with Earthing Switch

	2	Minim	num Requirements	
No.	Description	Unit	Data	Guaranteed
1.	Disconnector- General			
1.1	Manufacturer		Insert	
1.2	Туре		Insert	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
1.5	Standards		IEC 62271-102 IEC 60273 IEC 60694 IEC 60815	
1.6	Quality control		ISO 9001 ISO 14001 ISO 18001	
1.7	Type of disconnector		Outdoor	
1.8	Design		Centre break	
1.9	Number of poles	pcs.	3	
1.10	Type of main blade operating mechanism		Motor driven	
1.11	Number of main blade operating mechanisms	pcs.	1	
1.12	Type of earthing blade operating mechanism		Motor driven	
1.13	Number of earthing blade operating mechanism		11	
2.	Disconnector - Characteristics			
2.1	Nominal system voltage	kV _{rms}	132	
2.2	Highest voltage for equipment Un	kV _{rms}	145	
2.3	Rated lightning impulse withstand voltage	kV _{peak}	650	
2.4	Rated short duration power frequency voltage	kV	275	
2.5	Rated frequency f _r	Hz	50	
2.7	Rated current I _r	Α	≥ 3150	
2.8	Rated short withstand current I _k	kA _{rms}	≥ 40	
2.9	Rated duration of short-circuit on main blades	S	3	
2.10	Rated duration of short-circuit on earthing blades	S	3	
2.11	Rated maximum withstand current lp	kA	≥ 100	
2.12	Capacity of making and breaking transfer load of busbar system at 300 V (rms)	А	1600	
2.13	Nominal supply voltage			
2.13.1	Controls and alarm (signalling) circuits	V d.c.	110	
2.13.2	Motors	V d.c.	110	
2.13.3	Heaters	V a.c. / Hz	230 / 50	
2.14	Opening time	S	Insert	
2.15	Closing time	S	Insert	
2.16	Mechanical endurance	Class	M2	
2.17	Rated mechanical terminal loads of terminals			
2.17.1	Direct loading, static Fa	N	> 500	
2.17.2	Transversal loading, static F _b	N	> 170	



		Minimum Requirements			
No.	Description	Unit		Guaranteed	
			Data		
2.17.3	Vertical force F _c	N	> 1000		
2.17.4	Direct loading, dynamic	N	> 1500		
2.17.5	Transversal loading, dynamic	N	Insert		
3.	Disconnector - Design and Construction				
3.1	Disconnector				
3.1.1	Insulator material		Porcelain, brown		
3.1.2	Minimum creepage distance	mm/kV	Min. ≥ 25 mm/kV		
3.1.3	Quality of insulator		Min. C130		
3.1.4	Rated failing load of insulator (C10)	N	Min. 10000		
3.1.5	HV terminals				
3.1.5.1	Shape		Flat		
3.1.5.2	Dimensions	mm x mm	Min 100 x 100		
3.1.5.3	Number of holes		Min 4		
3.1.5.4	Dimensions of holes	mm	Ø 14		
3.1.5.5	Distance between holes	mm	50		
3.1.5.6	Material suitable for	111111	Al terminal		
3.1.7	Weight and dimensions	1	Aiteilillai		
3.1.7.1	Pole height	mm	Insert		
	-	mm			
3.1.7.2	Support insulator height	mm	Insert		
3.1.7.3	Total height	mm	Insert		
	Pole length	mm	Insert		
3.1.7.5	Distance between support axis of a pole	mm	Insert		
	Shipping dimensions	mm	Insert		
	Pole weight	kg	Insert		
	Weight of operating mechanism	kg	Insert		
	Total weight	kg	Insert		
3.1.7.10	Shipping weight	kg	Insert		
3.2	Operating mechanism				
3.2.1	Number of operating mechanism	pcs.	1+1		
3.2.2	Туре		Insert		
3.2.3	Rated power of motor	W	Insert		
3.2.4	Total heater power	W	Insert		
3.2.5	Minimum number of available contacts (NO/NC/V)		12NO+12NC		
3.2.9	Motor - auxiliary supply voltage	V, DC	110		
3.2.10	Heater, 230 V, 50 Hz		Yes		
3.2.11	Water-tight corrosion-resistant housing		IP54		
3.2.12	Selection switch (local/neutral/remote)		Yes		
3.2.13	Manual closing button		Yes		
3.2.14	Manual opening button		Yes		
3.2.15	Anti-condensation heater inside the operating mechanism cabinet		Yes		
3.2.16	Single-phase socket		Yes		
3.2.17	Voltage presence controller	1	Yes		
3.2.17	Motor MCB (miniature circuit breakers)	+ +	Yes		
3.2.19	Heater MCB (miniature circuit breaker)		Yes		



No.	Description	Minin	imum Requirements	Cuerontood
NO.	Description	Unit	Data	Guaranteed
3.2.20	Single-phase socket MCB (miniature circuit breaker)		Yes	
3.2.21	Equipotential bonding rails		Yes	
3.2.22	Housing of AI or stainless steel		Yes	
	Overall compliance with the requirements (yes/no)			



5.2.2.6 B2.2: Disconnector 132 kV, 2000 A, with Earthing Switch

No.	Deceyintian	Minim	Minimum Requirements	Cuarantand
NO.	Description	Unit	Data	Guaranteed
1.	Disconnector- General			
1.1	Manufacturer		Insert	
1.2	Туре		Insert	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
1.5	Standards		IEC 62271-102 IEC 60273 IEC 60694 IEC 60815	
1.6	Quality control		ISO 9001 ISO 14001 ISO 18001	
1.7	Type of disconnector		Outdoor	
1.8	Design		Centre break	
1.9	Number of poles	pcs.	3	
1.10	Type of main blade operating mechanism		Motor driven	
1.11	Number of main blade operating mechanisms	pcs.	1	
1.12	Type of earthing blade operating mechanism		Motor driven	
1.13	Number of earthing blade operating mechanism		1	
2.	Disconnector - Characteristics			
2.1	Nominal system voltage	kV _{rms}	132	
2.2	Highest voltage for equipment U _n	kV _{rms}	145	
2.3	Rated lightning impulse withstand voltage	kV _{peak}	650	
2.4	Rated short duration power frequency voltage	kV	275	
2.5	Rated frequency f _r	Hz	50	
2.7	Rated current I _r	Α	≥ 2000	
2.8	Rated short withstand current I _k	kA _{rms}	≥ 40	
2.9	Rated duration of short-circuit on main blades	S	3	
2.10	Rated duration of short-circuit on earthing blades	S	3	
2.11	Rated maximum withstand current lp	kA	≥ 100	
2.12	Capacity of making and breaking transfer load of busbar system at 300 V (rms)	Α	1600	
2.13	Nominal supply voltage			
2.13.1	Controls and alarm (signalling) circuits	V d.c.	110	
2.13.2	Motors	V d.c.	110	
2.13.3	Heaters	V a.c. / Hz	230 / 50	
2.14	Opening time	S	Insert	
2.15	Closing time	S	Insert	
2.16	Mechanical endurance	Class	M2	
2.17	Rated mechanical terminal loads of terminals			
2.17.1	Direct loading, static Fa	N	> 500	
2.17.2	Transversal loading, static F _b	N	> 170	



		Minimum Requirements		
No.	Description	Unit		Guaranteed
			Data	
2.17.3	Vertical force F _c	N	> 1000	
2.17.4	Direct loading, dynamic	N	> 1500	
2.17.5	Transversal loading, dynamic	N	Insert	
3.	Disconnector - Design and Construction			
3.1	Disconnector			
3.1.1	Insulator material		Porcelain, brown	
3.1.2	Minimum creepage distance	mm/kV	Min. ≥ 25 mm/kV	
3.1.3	Quality of insulator		Min. C130	
3.1.4	Rated failing load of insulator (C10)	N	Min. 10000	
3.1.5	HV terminals			
3.1.5.1	Shape		Flat	
3.1.5.2	Dimensions	mm x mm	Min 100 x 100	
3.1.5.3	Number of holes		Min 4	
3.1.5.4	Dimensions of holes	mm	Ø 14	
3.1.5.5	Distance between holes	mm	50	
3.1.5.6	Material suitable for	111111	Al terminal	
3.1.7			Aiteilillai	
	Weight and dimensions	mm	Incort	
3.1.7.1	Pole height	mm	Insert	
3.1.7.2	Support insulator height	mm	Insert	
3.1.7.3	Total height	mm	Insert	
	Pole length	mm	Insert	
3.1.7.5	Distance between support axis of a pole	mm	Insert	
	Shipping dimensions	mm	Insert	
	Pole weight	kg	Insert	
	Weight of operating mechanism	kg	Insert	
	Total weight	kg	Insert	
3.1.7.10	Shipping weight	kg	Insert	
3.2	Operating mechanism			
3.2.1	Number of operating mechanism	pcs.	1+1	
3.2.2	Туре		Insert	
3.2.3	Rated power of motor	W	Insert	
3.2.4	Total heater power	W	Insert	
3.2.5	Minimum number of available contacts (NO/NC/V)		12NO+12NC	
3.2.9	Motor - auxiliary supply voltage	V, DC	110	
3.2.10	Heater, 230 V, 50 Hz		Yes	
3.2.11	Water-tight corrosion-resistant housing		IP54	
3.2.12	Selection switch (local/neutral/remote)		Yes	
3.2.13	Manual closing button		Yes	
3.2.14	Manual opening button	1	Yes	
3.2.15	Anti-condensation heater inside the operating mechanism cabinet		Yes	
2 2 4 2		+	Vaa	
3.2.16	Single-phase socket		Yes	
3.2.17	Voltage presence controller	+	Yes	
3.2.18	Motor MCB (miniature circuit breakers)	+	Yes	
3.2.19	Heater MCB (miniature circuit breaker)		Yes	



No.	Description	Minin	mum Requirements	Cuerenteed
NO.	Description	Unit	Data	Guaranteed
3.2.20	Single-phase socket MCB (miniature circuit breaker)		Yes	
3.2.21	Equipotential bonding rails		Yes	
3.2.22	Housing of AI or stainless steel		Yes	
	Overall compliance with the requirements (yes/no)			



5.2.2.7 B2.3: Disconnector 132 kV, 1250 A, with Earthing Switch

	Minimum Requirements			
No.	Description	Unit	Data	Guaranteed
1.	Disconne	ctor- Gene	eral	
1.1	Manufacturer		Insert	
1.2	Туре		Insert	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
1.5	Standards		IEC 62271-102 IEC 60273 IEC 60694 IEC 60815	
1.6	Quality control		ISO 9001 ISO 14001 ISO 18001	
1.7	Type of disconnector		Outdoor	
1.8	Design		Centre break	
1.9	Number of poles	pcs.	3	
1.10	Type of main blade operating mechanism		Motor driven	
1.11	Number of main blade operating mechanisms	pcs.	1	
1.12	Type of earthing blade operating mechanism		Motor driven	
1.13	Number of earthing blade operating mechanism		1	
2.	Disconnector - Characteristics			
2.1	Nominal system voltage	kV _{rms}	132	
2.2	Highest voltage for equipment U _n	kV _{rms}	145	
2.3	Rated lightning impulse withstand voltage	kV _{peak}	650	
2.4	Rated short duration power frequency voltage	kV	275	
2.5	Rated frequency f _r	Hz	50	
2.7	Rated current I _r	А	≥ 1250	
2.8	Rated short withstand current I _k	kA _{rms}	≥ 40	
2.9	Rated duration of short-circuit on main blades	S	3	
2.10	Rated duration of short-circuit on earthing blades	S	3	
2.11	Rated maximum withstand current Ip	kA	≥ 100	
2.12	Capacity of making and breaking transfer load of busbar system at 300 V (rms)	А	1600	
2.13	Nominal supply voltage			
2.13.1	Controls and alarm (signalling) circuits	V d.c.	110	
2.13.2	Motors	V d.c.	110	
2.13.3	Heaters	V a.c. / Hz	230 / 50	
2.14	Opening time	S	Insert	
2.15	Closing time	S	Insert	
2.16	Mechanical endurance	Class	M2	
2.17	Rated mechanical terminal loads of terminals			
2.17.1	Direct loading, static Fa	N	> 500	
2.17.2	Transversal loading, static F _b	N	> 170	



		Minimum Requirements		
No.	Description	Unit		Guaranteed
			Data	
2.17.3	Vertical force F _c	N	> 1000	
2.17.4	Direct loading, dynamic	N	> 1500	
2.17.5	Transversal loading, dynamic	N	Insert	
3.	Disconnector - Design and Construction			
3.1	Disconnector			
3.1.1	Insulator material		Porcelain, brown	
3.1.2	Minimum creepage distance	mm/kV	Min. ≥ 25 mm/kV	
3.1.3	Quality of insulator		Min. C130	
3.1.4	Rated failing load of insulator (C10)	N	Min. 10000	
3.1.5	HV terminals			
3.1.5.1	Shape		Flat	
3.1.5.2	Dimensions	mm x mm	Min 100 x 100	
3.1.5.3	Number of holes		Min 4	
3.1.5.4	Dimensions of holes	mm	Ø 14	
3.1.5.5	Distance between holes	mm	50	
3.1.5.6	Material suitable for	111111	Al terminal	
3.1.7			Aiteilillai	
	Weight and dimensions	mm	Incort	
3.1.7.1	Pole height	mm	Insert	
3.1.7.2	Support insulator height	mm	Insert	
3.1.7.3	Total height	mm	Insert	
	Pole length	mm	Insert	
3.1.7.5	Distance between support axis of a pole	mm	Insert	
	Shipping dimensions	mm	Insert	
	Pole weight	kg	Insert	
	Weight of operating mechanism	kg	Insert	
	Total weight	kg	Insert	
3.1.7.10	Shipping weight	kg	Insert	
3.2	Operating mechanism			
3.2.1	Number of operating mechanism	pcs.	1+1	
3.2.2	Туре		Insert	
3.2.3	Rated power of motor	W	Insert	
3.2.4	Total heater power	W	Insert	
3.2.5	Minimum number of available contacts (NO/NC/V)		12NO+12NC	
3.2.9	Motor - auxiliary supply voltage	V, DC	110	
3.2.10	Heater, 230 V, 50 Hz		Yes	
3.2.11	Water-tight corrosion-resistant housing		IP54	
3.2.12	Selection switch (local/neutral/remote)		Yes	
3.2.13	Manual closing button		Yes	
3.2.14	Manual opening button	1	Yes	
3.2.15	Anti-condensation heater inside the operating mechanism cabinet		Yes	
2 2 4 2		+	Vaa	
3.2.16	Single-phase socket		Yes	
3.2.17	Voltage presence controller		Yes	
3.2.18	Motor MCB (miniature circuit breakers)	+	Yes	
3.2.19	Heater MCB (miniature circuit breaker)		Yes	



No.	Decemention	Minin	mum Requirements	Cuerenteed
NO.	Description	Unit	Data	Guaranteed
3.2.20	Single-phase socket MCB (miniature circuit breaker)		Yes	
3.2.21	Equipotential bonding rails		Yes	
3.2.22	Housing of Al or stainless steel		Yes	
	Overall compliance with the requirements (yes/no)			



5.2.2.8 B2.4: Disconnector 132 kV, 2000 A

	S	Minim	num Requirements	
No.	Description	Unit	Data	Guaranteed
1.	Disconnector- General			
1.1	Manufacturer		Insert	
1.2	Туре		Insert	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
1.5	Standards		IEC 62271-102 IEC 60273 IEC 60694 IEC 60815	
1.6	Quality control		ISO 9001 ISO 14001 ISO 18001	
1.7	Type of disconnector		Outdoor	
1.8	Design		Centre break	
1.9	Number of poles	pcs.	3	
1.10	Type of main blade operating mechanism		Motor driven	
1.11	Number of main blade operating mechanisms	pcs.	1	
1.12	Type of earthing blade operating mechanism		Not applicable	
1.13	Number of earthing blade operating mechanism		Not applicable	
2.	Disconnector - Characteristics			
2.1	Nominal system voltage	kV _{rms}	132	
2.2	Highest voltage for equipment U _n	kV _{rms}	145	
2.3	Rated lightning impulse withstand voltage	kV _{peak}	650	
2.4	Rated short duration power frequency voltage	kV	275	
2.5	Rated frequency f _r	Hz	50	
2.7	Rated current I _r	Α	≥ 2000	
2.8	Rated short withstand current Ik	kA _{rms}	≥ 40	
2.9	Rated duration of short-circuit on main blades	s	3	
2.10	Rated duration of short-circuit on earthing blades	s	Not applicable	
2.11	Rated maximum withstand current lp	kA	≥ 100	
2.12	Capacity of making and breaking transfer load of busbar system at 300 V (rms)	А	1600	
2.13	Nominal supply voltage			
2.13.1	Controls and alarm (signalling) circuits	V d.c.	110	
2.13.2	Motors	V d.c.	110	
2.13.3	Heaters	V a.c. / Hz	230 / 50	
2.14	Opening time	S	Insert	
2.15	Closing time	S	Insert	
2.16	Mechanical endurance	Class	M2	
2.17	Rated mechanical terminal loads of terminals			
2.17.1	Direct loading, static Fa	N	> 500	
2.17.2	Transversal loading, static F _b	N	> 170	



		Minimum Requirements		
No.	Description	Unit		Guaranteed
			Data	
2.17.3	Vertical force F _c	N	> 1000	
2.17.4	Direct loading, dynamic	N	> 1500	
2.17.5	Transversal loading, dynamic	N	Insert	
3.	Disconnector - Design and Construction			
3.1	Disconnector			
3.1.1	Insulator material		Porcelain, brown	
3.1.2	Minimum creepage distance	mm/kV	Min. ≥ 25 mm/kV	
3.1.3	Quality of insulator		Min. C130	
3.1.4	Rated failing load of insulator (C10)	N	Min. 10000	
3.1.5	HV terminals			
3.1.5.1	Shape		Flat	
3.1.5.2	Dimensions	mm x mm	Min 100 x 100	
3.1.5.3	Number of holes		Min 4	
3.1.5.4	Dimensions of holes	mm	Ø 14	
3.1.5.5	Distance between holes	mm	50	
3.1.5.6	Material suitable for	111111	Al terminal	
3.1.7	Weight and dimensions		Aiteilillai	
		mm	Incort	
3.1.7.1	Pole height	mm	Insert	
3.1.7.2	Support insulator height	mm	Insert	
3.1.7.3	Total height	mm	Insert	
	Pole length	mm	Insert	
3.1.7.5	Distance between support axis of a pole	mm	Insert	
	Shipping dimensions	mm	Insert	
	Pole weight	kg	Insert	
	Weight of operating mechanism	kg	Insert	
	Total weight	kg	Insert	
3.1.7.10	Shipping weight	kg	Insert	
3.2	Operating mechanism			
3.2.1	Number of operating mechanism	pcs.	1	
3.2.2	Туре		Insert	
3.2.3	Rated power of motor	W	Insert	
3.2.4	Total heater power	W	Insert	
3.2.5	Minimum number of available contacts (NO/NC/V)		12NO+12NC	
3.2.9	Motor - auxiliary supply voltage	V, DC	110	
3.2.10	Heater, 230 V, 50 Hz		Yes	
3.2.11	Water-tight corrosion-resistant housing		IP54	
3.2.12	Selection switch (local/neutral/remote)		Yes	
3.2.13	Manual closing button		Yes	
3.2.14	Manual opening button		Yes	
3.2.15	Anti-condensation heater inside the operating mechanism cabinet		Yes	
3.2.16	Single-phase socket		Yes	
3.2.17	Voltage presence controller	1	Yes	
3.2.17	Motor MCB (miniature circuit breakers)	+ +	Yes	
3.2.19	Heater MCB (miniature circuit breaker)		Yes	



No	Description	Minimum Requirements		Cuerenteed
No.	Description	Unit	Data	Guaranteed
3.2.20	Single-phase socket MCB (miniature circuit breaker)		Yes	
3.2.21	Equipotential bonding rails		Yes	
3.2.22	Housing of Al or stainless steel		Yes	
	Overall compliance with the requirements (yes/no)			



5.2.2.9 B2.5: Disconnector 132 kV, 1250 A

NI-	Paradiation.	Minim	num Requirements	0
No.	Description	Unit	Data	Guaranteed
1.	Disconnector- General			
1.1	Manufacturer		Insert	
1.2	Туре		Insert	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
1.5	Standards		IEC 62271-102 IEC 60273 IEC 60694 IEC 60815	
1.6	Quality control		ISO 9001 ISO 14001 ISO 18001	
1.7	Type of disconnector		Outdoor	
1.8	Design		Centre break	
1.9	Number of poles	pcs.	3	
1.10	Type of main blade operating mechanism		Motor driven	
1.11	Number of main blade operating mechanisms	pcs.	1	
1.12	Type of earthing blade operating mechanism		Not applicable	
1.13	Number of earthing blade operating mechanism		Not applicable	
2.	Disconnector - Characteristics			
2.1	Nominal system voltage	kV _{rms}	132	
2.2	Highest voltage for equipment Un	kV _{rms}	145	
2.3	Rated lightning impulse withstand voltage	kV _{peak}	650	
2.4	Rated short duration power frequency voltage	kV	275	
2.5	Rated frequency f _r	Hz	50	
2.7	Rated current I _r	Α	≥ 1250	
2.8	Rated short withstand current I _k	kA _{rms}	≥ 40	
2.9	Rated duration of short-circuit on main blades	S	3	
2.10	Rated duration of short-circuit on earthing blades	S	Not applicable	
2.11	Rated maximum withstand current lp	kA	≥ 100	
2.12	Capacity of making and breaking transfer load of busbar system at 300 V (rms)	А	1600	
2.13	Nominal supply voltage			
2.13.1	Controls and alarm (signalling) circuits	V d.c.	110	
2.13.2	Motors	V d.c.	110	
2.13.3	Heaters	V a.c. / Hz	230 / 50	
2.14	Opening time	s	Insert	
2.15	Closing time	s	Insert	
2.16	Mechanical endurance	Class	M2	
2.17	Rated mechanical terminal loads of terminals			
2.17.1	Direct loading, static Fa	N	> 500	
2.17.2	Transversal loading, static F _b	N	> 170	
2.17.3	Vertical force F _c	N	> 1000	



		Minimum Requirements		
No.	Description	Unit	Data	Guaranteed
2.17.4	Direct loading, dynamic	N	> 1500	
2.17.5	Transversal loading, dynamic	N	Insert	
3.	Disconnector - Design and Construction			
3.1	Disconnector			
3.1.1	Insulator material		Porcelain, brown	
3.1.2	Minimum creepage distance	mm/kV	Min. ≥ 25 mm/kV	
3.1.3	Quality of insulator		Min. C130	
3.1.4	Rated failing load of insulator (C10)	N	Min. 10000	
3.1.5	HV terminals	.,		
3.1.5.1	Shape		Flat	
3.1.5.2	·	mm x mm	Min 100 x 100	
	Number of holes		Min 4	
3.1.5.4		mm	Ø 14	
	Distance between holes	mm	50	
	Material suitable for		Al terminal	
3.1.7	Weight and dimensions			
	Pole height	mm	Insert	
	Support insulator height	mm	Insert	
	Total height	mm	Insert	
	Pole length	mm	Insert	
	Distance between support axis of a pole	mm	Insert	
	Shipping dimensions	mm	Insert	
3.1.7.7	Pole weight	kg	Insert	
3.1.7.8	Weight of operating mechanism	kg	Insert	
3.1.7.9	Total weight	kg	Insert	
3.1.7.10	Shipping weight	kg	Insert	
3.2	Operating mechanism			
3.2.1	Number of operating mechanism	pcs.	1	
3.2.2	Туре		Insert	
3.2.3	Rated power of motor	W	Insert	
3.2.4	Total heater power	W	Insert	
3.2.5	Minimum number of available contacts (NO/NC/V)		12NO+12NC	
3.2.9	Motor - auxiliary supply voltage	V, DC	110	
3.2.10	Heater, 230 V, 50 Hz		Yes	
3.2.11	Water-tight corrosion-resistant housing		IP54	
3.2.12	Selection switch (local/neutral/remote)		Yes	
3.2.13	Manual closing button		Yes	
3.2.14	Manual opening button		Yes	
3.2.15	Anti-condensation heater inside the operating mechanism cabinet		Yes	
3.2.16	Single-phase socket		Yes	
3.2.17	Voltage presence controller		Yes	
3.2.18	Motor MCB (miniature circuit breakers)		Yes	
3.2.19	Heater MCB (miniature circuit breaker)		Yes	
3.2.20	Single-phase socket MCB (miniature circuit breaker)		Yes	



Na	Description	Minin	num Requirements	Cusuantasal
No.	Description	Unit	Data	Guaranteed
3.2.21	Equipotential bonding rails		Yes	
3.2.22	Housing of AI or stainless steel		Yes	
	Overall compliance with the requirements (yes/no)			



5.2.2.10 B3.1: Current Transformer 132 kV, 3200-1600/1 A/A

	5	Minir	num Requirements	
No.	Description	Unit	Data	Guaranteed
1.	Current Transformers - General			
1.1.	Manufacturer		Insert	
1.2	Туре		Insert	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
1.5	Standards		IEC 60044-1	
1.6	Quality control		ISO 9001	
1.7	Туре		Outdoor	
1.8	Shape / design		Head type	
1.9	Sealing		Hermetically closed	
2.	Current Transformers - Characteristics	-1	,	
2.1	Nominal system voltage	kV _{rms}	132	
2.2	Highest voltage for equipment U _n	kV _{rms}	145	
2.3	· · ·		650	
	Rated lightning impulse withstand voltage	kV _{peak}		
2.4	Rated short duration power frequency voltage	kV	275	
2.5	Rated frequency f _r	Hz	50 40	
2.6	Rated short-time thermal current lth, 1 s Rated dynamic current I _{dyn}	kA kV peak	100	
2.1	Rated dynamic current (dyn Rated continuous thermal current (40°C):	kv peak	100	
	I core	% In	200	
	Il core	% In	200	
2.8	• III core	% In	120	
	IV core	% In	120	
	• V core	% In	120	
	Rated transformer ratio:	70	120	
	• I core	A/A	3200-1600/1	
	• Il core	A/A	3200-1600/1	
2.9	III core	A/A	3200-1600/1	
	IV core	A/A	3200-1600/1	
	V core	A/A	3200-1600/1	
	Accuracy class:			
	• I core		0.2	
2.10	II core		0.2	
2.10	III core		5P20	
	IV core		5P20	
	V core		5P20	
	Security factor:			
2.11	I core		Fs=10	
	Il core		Fs=10	



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NI-	Description	Minir	num Requirements	0
No.	Description	Unit	Data	Guaranteed
	Rated power:			
	I core	VA	10	
2.12	II core	VA	15	
2.12	III core	VA	30	
	IV core	VA	30	
	V core	VA	30	
2.13	Rated mechanical terminal loads	Class	Min. Class II	
3.	Current Transformers - Design and Constr	uction		
3.1	Insulator material		Porcelain, brown	
3.2	Insulating medium		Oil-paper	
3.3	Minimum creepage distance	mm/kV	Min. ≥ 25 mm/kV	
3.4	Max. radio interference voltage at 0.5-2 MHz (acc. to IEC 60694)	μV	Max. 2500	
	Permissible level of partial discharges:			
3.5	Test voltage 1.2*U _M /√3	рC	Max. ≤ 5	
	Test voltage U _M	рC	≤ 10	
3.7	Min. LV enclosure protection		IP54	
3.8	HV terminals			
3.8.1	Shape		Flat	
3.8.2	Position		Horizontal	
3.8.3	Dimensions	mm x mm	Min 100 x 100	
3.8.4	Number of holes		Min 4	
3.8.5	Dimensions of holes	mm	Ø 14	
3.8.6	Distance between holes	mm	50	
3.8.7	Material suitable for		Al terminal	
3.10	tgδ test terminal		Yes	
3.11	Oil drain cock and sampling device		Yes	
3.13	Secondary reconnection		Yes	
3.14	Outdoor metal part made of aluminium or stain- less steel		Yes	
3.15	Mass and dimensions			
3.15.1	Total mass	kg	Insert	
3.15.2	Height	mm	Insert	
	Overall compliance with the requirements			



5.2.2.11 B3.2: Current Transformer 132 kV, 1600-800-400/1 A/A

		Minin	num Requirements		
No.	Description	Unit	Data	Guaranteed	
1.	Current Transformers - General				
1.1.	Manufacturer		Insert		
1.2	Type		Insert		
1.3	Model designation		Insert		
1.4	Country of origin		Insert		
1.5	Standards		IEC 60044-1		
1.6	Quality control		ISO 9001		
1.7	Туре		Outdoor		
1.8	Shape / design		Head type		
1.9	Sealing		Hermetically closed		
2.	Current Transformers - Characteristics		•		
2.1	Nominal system voltage	kV _{rms}	132		
2.2	Highest voltage for equipment U _n	kV rms	145		
2.3	Rated lightning impulse withstand voltage	kV rms	650		
2.4	Rated short duration power frequency voltage	kV peak	275		
2.5	Rated frequency f _r	Hz	50		
2.6	Rated short-time thermal current lth, 1 s	kA	40		
2.7	Rated dynamic current I _{dyn}	kV peak	100		
	Rated continuous thermal current (40°C):	IN POUR	100		
	I core	% In	200		
	• Il core	% In	200		
2.8	• III core	% In	120		
	IV core	% In	120		
	• V core	% In	120		
	Rated transformer ratio:				
	• I core	A/A	1600-800-400/1		
2.9	• II core	A/A	1600-800-400/1		
2.9	• III core	A/A	1600-800-400/1		
	IV core	A/A	1600-800-400/1		
	• V core	A/A	1600-800-400/1		
	Accuracy class:				
	• I core		0.2		
2.10	• II core		0.2		
	• III core		5P20		
	• IV core		5P20		
	• V core		5P20		
0.44	Security factor:		F- 40		
2.11	• I core		Fs=10		
	Il core Pated power:		Fs=10		
	Rated power: • I core	VA	10		
	• Il core	VA	15		
2.12	• III core	VA	30		
	• IV core	VA	30		
	• V core	VA	30		



NI-	Description	Minir	num Requirements	0
No.	Description	Unit	Data	Guaranteed
2.13	Rated mechanical terminal loads	Class	Min. Class II	
3.	Current Transformers - Design and Constr	uction		
3.1	Insulator material		Porcelain, brown	
3.2	Insulating medium		Oil-paper	
3.3	Minimum creepage distance	mm/kV	Min. ≥ 25 mm/kV	
3.4	Max. radio interference voltage at 0.5-2 MHz (acc. IEC 60694)	μV	Max. 2500	
	Permissible level of partial discharges:			
3.5	Test voltage 1.2*U _M /√3 Test voltage 1.2*U _M /√3 Test voltage 1.2*U _M /√3	pC	Max. ≤ 5	
	Test voltage U _M	pC	≤ 10	
3.7	Min. LV enclosure protection		IP54	
3.8	HV terminals			
3.8.1	Shape		Flat	
3.8.2	Position		Horizontal	
3.8.3	Dimensions Number of balance	mm x mm	Min 100 x 100	
3.8.4	Number of holes		Min 4	
3.8.5	Dimensions of holes Distance between holes	mm	Ø 14 50	
3.8.7	Material suitable for	mm	Al terminal	
3.10	tgō test terminal		Yes	
3.11	Oil drain cock and sampling device		Yes	
3.13	Secondary reconnection		Yes	
3.14	Outdoor metal part made of aluminium or stain- less steel		Yes	
3.15	Mass and dimensions			
3.15.1	Total mass	kg	Insert	
3.15.2	Height	mm	Insert	
	Overall compliance with the requirements (yes/no)			



5.2.2.12 B4: Voltage Transformer 132 kV

		Minimum Requirements		
No.	Description	Unit	Data	Guaranteed
4	Valtaria Transfermana Comerci		2	
1.	Voltage Transformers - General			
1.1	Manufacturer		Insert	
1.2	Type		Capacitive	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
			IEC 60044-2	
1.5	Standards		IEC 60273	
			IEC 60694	
4.0	Overlite a sectoral		IEC 60815	
1.6	Quality control		ISO 9001	
1.7	Туре		Outdoor	
1.8	Shape		Insert	
1.9	Sealing		Hermetically closed	
2.	Voltage Transformers - Characteristics			
2.1	Nominal system voltage	kV _{rms}	132	
2.2	Highest voltage for equipment U _n	kV _{rms}	145	
2.3	Rated lightning impulse withstand voltage	kV _{peak}	650	
2.4	Rated short duration power frequency voltage	kV	275	
2.5	Rated frequency f _r	Hz	50	
2.6	Rated short-time thermal current lth, 1 s	kA	40	
2.7	Rated dynamic current I _{dyn}	kV _{peak}	100	
2.8	Rated primary voltage	kV	132/√3	
	Rated secondary voltage			
2.9	I winding	V	110√3	
	II winding	V	110√3	
	Accuracy class:			
2.10	I winding		0.2	
	II winding		1/3P	
	Rated power:			
2.11	I winding	VA	25	
	II winding	VA	75	
2.12	Load		Simultaneously	
2.13	Voltage factor	p.u./s	1.5/30	
2.14	Rated mechanical strength	Class	Min. Class II	
2.45	Power frequency withstand tests on secondary	ls\ / ***** *		
2.15	windings, 1 min	kV rms	3	
3.	Voltage Transformers - Design and Const	ruction		
3.1	Insulator material		Porcelain, brown	
			Oil-paper - Mixed dielec-	
3.2	Insulating medium		tric	
3.3	Minimum creepage distance	mm/kV	Min. ≥ 25 mm/kV	
	Max. radio interference voltage at 0.5-2 MHz			
3.4	(acc. IEC 60694)	μV	Max. 2500	



NI-	December 1	Minii	mum Requirements	0
No.	Description	Unit	Data	Guaranteed
	Permissible level of partial discharges:			
3.5	 Test voltage 1.2*U_M/√3 	рС	Max. ≤ 5	
	Test voltage U _M	рС	≤ 10	
3.7	Min. LV enclosure protection		IP54	
3.8	HV terminals			
3.8.1	Shape		Flat	
3.8.2	Position		Vertical or horizontal	
3.8.3	Dimensions	mm x mm	Min 100 x 100	
3.8.4	Number of holes		Min 4	
3.8.5	Dimensions of holes	mm	Ø 14	
3.8.6	Distance between holes	mm	50	
3.8.7	Material suitable for		Al terminal	
3.10	Oil drain cock and sampling device		Yes	
3.11	Enable sealing after accuracy class checks (sealing possibilities)		Yes	
2.42	Outdoor metal part made of aluminium or stain-		Vaa	
3.13	less steel		Yes	
3.14	Mass and dimensions			
3.14.1	Total mass	kg	Insert	
3.14.2	Height	mm	Insert	
Overall compliance with the requirements (yes/no)				



5.2.2.13 B5: Surge Arrester 132 kV

	Description	Minimum Requirements		
No.		Unit	Data	Guaranteed
1.	Surge Arresters - General			
1.1	Manufacturer		Insert	
1.2	Туре		Insert	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
1.5	Standards		IEC 60099-4	
1.6	Quality control		ISO 9001	
1.7	Design		Metal oxide, gapless, outdoor	
1.8	Short circuit testing authority		Insert authority	
2.		•	,	1
2.1	Surge Arresters - Characteristics	kV _{rms}	122	
	Nominal system voltage		132	
2.2	Highest voltage for equipment Un	kV _{rms}	145	
2.4	Rated voltage of surge arrester U _r	kV _{rms}	120	
2.5	Max. continuous operating voltage U _c	kV _{rms}	96	
2.8	Rated frequency	Hz	50	
2.9	Nominal discharge current In (8/20 µs)	kA _{peak}	10	
2.10	High current impulse of an arrester (4/10 µs)	kA _{peak}	100	
3.	Surge Arresters - Design and Construction	on		
3.1	Line discharge class	Class	3	
3.2	Energy dissipation capacity (per kV of rated voltage)	kJ/kV	≥ 6.5	
3.3	Long duration current impulse (2000 µs)	Α	≥ 850	
3.4	Maximum residual voltage U _{res}			
3.4.1	For switching impulse current 30/60 µs at 0,5 kA	kV _{peak}	≤ 235	
3.4.2	For switching impulse current 30/60 µs at 1 kA	kV _{peak}	≤ 240	
3.4.3	For switching impulse current 30/60 µs at 2 kA	kV _{peak}	≤ 255	
3.4.4	For lightning impulse current 8/20 µs at 5 kA	kV _{peak}	≤ 280	
3.4.5	For lightning impulse current 8/20 µs at 10 kA	kV _{peak}	≤ 300	
3.4.6	For lightning impulse current 8/20 µs at 20 kA	kV _{peak}	≤ 320	
3.5.	Dielectric endurance of arrester housing)			
3.5.1	Lightning impulse withstand voltage of arrester housing up (1.2/50 µs)	kV	≥ 550	
3.5.2	Power frequency withstand voltage of arrester housing (1 min wet)	kV	≥ 250	
3.6.	Mechanical requirements			
3.6.1	Specified short-term load SSL (F _{dyn})	N	≥ 3750	
3.6.2	Specified long-term load SSL (F _{stat})	N	≥ 2500	
3.7	Minimum creepage distance	mm/kV	≥ 25 mm/kV	
3.8.	Housing insulating material		Composite/Silicon	
3.9	Insulating basement		Yes	
3.10	Surge arrester height	mm	Insert	



No	Description		num Requirements	Cusuantand
No.	Description	Unit	Data	Guaranteed
3.11	Surge arrester weight	kg	Insert	
3.12	Voltage distribution ring present / ring diame-	yes / no /	Incort	
3.12	ter	mm	Insert	
3.14	HV terminal			
3.14.1	Shape		Flat	
3.14.2	Dimension	mm x mm	Min 100 x 100	
3.14.3	Number of holes		Min 4	
3.14.4	Distance between holes	mm x mm	50 x 50	
3.14.5	Material suitable for		Al terminal	
	Overall compliance with the requirements (yes/no)			



5.2.2.14 B6: Post Insulator Arrester 132 kV

		Minim		
No.	Description	Unit	Data	Guaranteed
1.	Post Insulators - General			
1.1	Manufacturer		Insert	
1.2	Туре		Insert	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
			IEC 60168	
1.5	Standards		IEC 60273	
1.5	Standards		IEC 60672	
			IEC 60694	
1.6	Quality control		ISO 9001	
1.7	Design		Solid core, porcelain,	
1.7	Design		outdoor	
2	Post Insulato	ors - Charact	eristics	
2.1	Nominal system voltage	kV _{rms}	132	
2.2	Highest voltage for equipment U _n	kV _{rms}	145	
2.3	Rated lightning impulse withstand voltage	kV _{peak}	650	
2.4	Rated short duration power frequency voltage	kV	275	
2.5	Rated frequency f _r	Hz	50	
2.6	Minimum creepage distance	mm/kV	Min. ≥ 25 mm/kV	
2.7	Failing load bending (p0) (C10)	N	≥ 10000	
2.8	Failing load torsion	Nm	≥ 4000	
3	Post Insulators - I	Design and 0	Construction	
3.1	Insulation material		Porcelain, brown	
3.2	Material quality acc. IEC 60672		Min. C130	
3.3	Min. material density ρ _a	Mgm ⁻³	≥ 2.5	
3.4	Min. stretch strength of material σ_{fg}	MPa	≥ 140	
3.5	Insulator height	mm	Insert	
3.6	Max. diameter of insulating part	mm	Insert	
3.7	Diameter of upper base	mm	Insert	
3.8	Number of holes on upper base		Insert	
3.9	Diameter distance between holes on upper base	mm	Insert	
3.10	Hole type on upper base		Insert	
3.11	Diameter on lower base	mm	Insert	
3.12	Number of holes on lower base		Insert	
3.13	Diameter distance between holes on lower base	mm	Insert	
3.14	Hole type on lower base		Insert	
3.15	Insulator weight	kg	Insert	
	Overall compliance with the requirements	s (yes/no)		



C: Switchgear 33 kV 5.2.3

5.2.3.1 C1: Circuit Breaker 33 kV

	Description	Minii	mum Requirements	_
No.		Unit	Data	Guaranteed
1.	Circuit Breaker - General			
1.1.	Manufacturer		Incort	
1.1.			Insert	
	Type Model designation		Insert	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
			IEC 62271-100 IEC 60273	
1.5	Standards			
			IEC 60694	
			IEC 60815	
4.0	Overlite and test		ISO 9001	
1.6	Quality control		ISO 14001	
4.7	Landa Gran and arrange him and addition		ISO 18001	
1.7	Isolating and quenching medium		Vacuum	
1.8	Type of circuit breaker		Outdoor	
1.9	Design		Single breaking	
1.10	Operating mechanism		Motor-wound spring	
1.11	Number of poles	pcs.	3	
1.12	Number of operating mechanisms per circuit	pcs.	1	
	breaker	F ***	·	
2.	Circuit Breaker - Characteristics			
2.1	Nominal system voltage	kV _{rms}	33	
2.2	Highest voltage for equipment U _n	kV _{rms}	36	
2.3	Rated lightning impulse withstand voltage	kV _{peak}	170	
2.4	Rated short duration power frequency voltage	kV	70	
2.5	Rated frequency f _r	Hz	50	
2.6	Rated current I _r	Α	≥ 1600	
2.7	Rated short-circuit breaking current Isc	kA _{rms}	≥ 25	
0.0	Rated peak withstand current Ip (equal short-			
2.8	circuit making current)	kA	≥ 63	
0.0	D.C. component of the rated short-circuit break-	0/	00	
2.9	ing current	%	> 30	
	First-pole-to-clear factor			
0.40	Terminal fault	p.u.	1.3	
2.10	Short-line fault	p.u.	N.A.	
	Out-of-phase	p.u.	N.A.	
0.44	Standard value of transient recovery voltage	1-1/	la a aut	
2.11	(T100)	kV	Insert	
2.12	Rate of rise recovery voltage	kV/μs	Insert	
2.13	Rated operating sequence		O-0.3 s-CO-3 min-CO	
2.14	Duration of short-circuit	S	≥ 1	
2.15	Rated out-of-phase breaking current	kA	Insert	
2.16	Auto reclosing		3p	



		Minir	num Requirements	
No.	Description	Unit	Data	Guaranteed
2.17	Maximum total break time (trip initiation to final arc extinction) pos.3.7.135 acc. to IEC 62271-	ms	≤ 100	
	100)			
2.18	Time of final arc extinction (3.7134 acc. IEC 62271-100)	ms	20 ± 5	
	Opening time (trip initiation to contact separation)			
2.19	Without current	ms	Insert	
	With 100 % rated breaking current	ms	Insert	
2.20	Maximum time interval between opening inter-	ms	Insert	
	rupters Maximum time interval between opening of first			
2.21	and last phase of three-phase circuit breakers	ms	3	
	Time for making (trip initiation to contact touch)			
2.22	Without current	ms	Insert	
	100 % making current	ms	Insert	
2.23	Minimum dead time	ms	Insert	
2.24	Restrike performance during capacitive current switching	Class	C2	
	Number of operations without maintenance			
2.25	CO at no-load		≥ 10000	
2.25	CO at rated current		≥ 2500	
	CO at rated breaking current lsc		≥ 5	
2.26	The frequency of mechanical operations	Class	Min M1	
2.27	Rated electrical endurance	Class	Min E1	
2.28	Rated pressure of a circuit breaker	Мра	Insert	
2.29	Total mass of SF ₆ gas in a circuit breaker	kg	Insert	
2.30	Rated mechanical terminal loads			
2.30.1	Static horizontal force, longitudinal F _{thA}	N	Insert	
2.30.2	Static horizontal force, transversal F _{thB}	N	Insert	
2.30.3	Static vertical force F _{tv}	N	Insert	
2.30.4	Dynamic horizontal force, longitudinal F _{wx}	N	Insert	
2.30.5	Dynamic horizontal force, transversal	N	Insert	
3.	Circuit Breaker - Design and Construction) 		<u></u>
3.1	Circuit Breaker			
3.1.1	Insulator material		Porcelain	
3.1.2	Minimum creepage distance	mm/kV	Min. ≥ 25	
3.1.3	HV terminal	pcs.	2	
3.1.3.1	Shape		Flat	
3.1.3.2	Dimensions	mm x mm	Min 100 x 50	
3.1.3.3	Number of holes		Min 2	
3.1.3.4		mm	Ø 14	
3.1.3.5	Distance between holes	mm	50	
3.1.3.6	Material suitable for		Al terminal	
3.1.5	Weight and dimensions			
3.1.5.1	Support insulator height	mm	Insert	
3.1.5.2	Total height	mm	Insert	



NI-	Description	Minimum Requirements		0
No.	Description	Unit	Data	Guaranteed
3.1.5.3	Pole weight	kg	Insert	
3.1.5.4	Weight of operating mechanism	kg	Insert	
3.1.5.5	Total weight (with metal structure)	kg	Insert	
3.1.6	Minimum distance			
3.1.6.1	Between poles	mm	Insert	
3.1.6.2	To ground	mm	Insert	
3.2	Operating mechanism			
3.2.1	Туре		Insert	
3.2.2	Motor - auxiliary supply voltage	V. DC	110	
3.2.3	Rated power of motor	W	Insert	
3.2.4	Control voltage	V. DC	110	
3.2.5	Number of making coils	pcs.	1	
3.2.6	Rated power of making coils	W	Insert	
3.2.7	Number of breaking coils	pcs.	1	
3.2.8	Rated power of breaking coils	W	Insert	
3.2.9	Heater		Yes	
3.2.10	Heater supply voltage	V. Hz	230. 50	
3.2.11	Total heater power	W	Insert	
3.2.12	Minimum number of available contacts (NO/NC/V)		6NO+6NC+1V	
3.2.15	Water-tight corrosion-resistant housing		IP54	
3.2.17	Operating mechanism material		Al or stainless steel	
3.2.19	Local/remote control selector switch		Yes	
3.4	Local operation push buttons			
3.4.1	Anti-pumping relay		Yes	
3.4.2	Operation counter		Yes	
3.4.3	Motor MCB (miniature circuit breakers)		Yes	
3.4.4	Heater - 230 V, 50 HZ		Yes	
3.4.5	Cu earthing rails inside central control cabinet		Yes	
3.4.6	Detachable plates, the bottom of central control cabinet		Yes	
3.4.7	Galvanized horizontal and vertical metal structure with minimum 70 µm zinc layer		Yes	
	Overall compliance with the requirements (yes/no)			



5.2.3.2 C2.1: Disconnector 33 kV

	Minimum Requirements			
No.	Description	Unit	Data	Guaranteed
1.	Disconnector- General			
1.1	Manufacturer		Insert	
1.2	Туре		Insert	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
1.5	Standards		IEC 62271-102 IEC 60273 IEC 60694 IEC 60815	
1.6	Quality control		ISO 9001 ISO 14001 ISO 18001	
1.7	Type of disconnector		Outdoor	
1.8	Design		Vertical break, horizontal or wall mounting	
1.9	Number of poles	pcs.	3	
1.10	Type of operating mechanism		Hand operated	
1.11	Number of operating mechanisms	pcs.	1	
2.	Disconnector - Characteristics			
2.1	Nominal system voltage	kV _{rms}	33	
2.2	Highest voltage for equipment U _n	kV _{rms}	36	
2.3	Rated lightning impulse withstand voltage	kV _{peak}	170	
2.4	Rated short duration power frequency voltage	kV	70	
2.5	Rated frequency f _r	Hz	50	
2.7	Rated current I _r	Α	≥ 1600	
2.8	Rated short withstand current I _k	kA _{rms}	≥ 25	
2.9	Rated duration of short-circuit	s	3	
2.10	Rated maximum withstand current lp	kA	≥ 63	
2.13	Nominal supply voltage			
2.13.1	Controls and alarm (signalling) circuits	V d.c.	110	
2.13.2	Heaters	V a.c. / Hz	230 / 50	
2.14	Opening time	s	Insert	
2.15	Closing time	S	Insert	
2.16	Mechanical endurance	Class	Min M1	
2.17	Rated mechanical terminal loads of terminals			
2.17.1	Direct loading, static Fa	N	Insert	
2.17.2	Transversal loading, static F _b	N	Insert	
2.17.3	Vertical force F _c	N	Insert	
2.17.4	Direct loading, dynamic	N	Insert	
2.17.5	Transversal loading, dynamic	N	Insert	
3.	Disconnector - Design and Construction			
3.1	Disconnector			



NI-	Description	Minim	num Requirements	0
No.	Description	Unit	Data	Guaranteed
3.1.1	Insulator material		Porcelain, brown	
3.1.2	Minimum creepage distance	mm/kV	Min. ≥ 25 mm/kV	
3.1.3	HV terminals			
3.1.3.1	Shape		Flat	
3.1.3.2	Dimensions	mm x mm	Min 100 x 50	
3.1.3.3	Number of holes		Min 2	
3.1.3.4	Dimensions of holes	mm	Ø 14	
3.1.3.5	Distance between holes	mm	50	
3.1.3.6	Material suitable for		Al terminal	
3.1.4	Weight and dimensions			
3.1.4.1	Pole height	mm	Insert	
3.1.4.2	Pole length	mm	Insert	
3.1.4.3	Distance between support axis of a pole	mm	Insert	
3.1.4.4	Shipping dimensions	mm	Insert	
3.1.4.5	Pole weight	kg	Insert	
3.1.4.6	Total weight	kg	Insert	
3.1.4.7	Shipping weight	kg	Insert	
3.2	Operating mechanism			
3.2.1	Number of operating mechanism	pcs.	1	
3.2.2	Туре		Insert	
3.2.3	Minimum number of available contacts (NO/NC)	pcs.	6NO+6NC	
3.2.4	Anti-condensation heater inside the operating		Yes	
3.2.4	mechanism cabinet		res	
3.2.5	Heater, 230 V, 50 Hz		Yes	
3.2.6	Total heater power	W	Insert	
3.2.7	Water-tight corrosion-resistant housing		IP54	
3.2.8	Housing of Al or stainless steel		Yes	
3.2.9	Equipotential bonding rails		Yes	



5.2.3.3 C2.2: Disconnector 33 kV with integrated fuse

		Minin	num Requirements	
No.	Description	Unit	Data	Guaranteed
1.	Disconnector- General			
1.1	Manufacturer		Insert	
1.2	Туре		Insert	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
	,		IEC 62271-102	
4.5			IEC 60273	
1.5	Standards		IEC 60694	
			IEC 60815	
			ISO 9001	
1.6	Quality control		ISO 14001	
			ISO 18001	
1.7	Type of disconnector		Outdoor	
			Vertical break, horizon-	
4.0	Design		tal or wall mounting,	
1.8	Design		with integrated fuse	
			10 A	
1.9	Number of poles	pcs.	3	
1.10	Type of operating mechanism		Hand operated	
1.11	Number of operating mechanisms	pcs.	1	
2.	Disconnector - Characteristics			
2.1	Nominal system voltage	kV _{rms}	33	
2.2	Highest voltage for equipment U _n	kV _{rms}	36	
2.3	Rated lightning impulse withstand voltage	kV ms	170	
2.4	Rated short duration power frequency voltage	kV	70	
2.5	Rated frequency f _r	Hz	50	
2.7	Rated current I _r	A	≥ 100	
2.8	Rated short withstand current I _k	kA _{rms}	≥ 25	
2.9	Rated duration of short-circuit	S	3	
2.10	Rated maximum withstand current lp	kA	≥ 63	
2.13	Nominal supply voltage	IV.	- 00	
2.13.1	Controls and alarm (signalling) circuits	V d.c.	110	
2.13.1	Heaters	V a.c. / Hz	230 / 50	
2.13.2	Opening time	S S	Insert	
2.15	Closing time	S	Insert	
2.16	Mechanical endurance	Class	Min M1	
2.17	Rated mechanical terminal loads of terminals	Oiass	IVIII (IVI I	
2.17.1	Direct loading, static Fa	N	Insert	
2.17.1	Transversal loading, static F _b	N	Insert	
2.17.2	Vertical force F _c	N	Insert	
	Direct loading, dynamic	N		
2.17.4			Insert	
2.17.5	Transversal loading, dynamic	N	Insert	



NI-	Description		Minimum Requirements	
No.	Description	Unit	Data	Guaranteed
3.	Disconnector - Design and Construction			
3.1	Disconnector			
3.1.1	Insulator material		Porcelain, brown	
3.1.2	Minimum creepage distance	mm/kV	Min. ≥ 25 mm/kV	
3.1.3	HV terminals			
3.1.3.1	Shape		Flat	
3.1.3.2	Dimensions	mm x mm	Min 100 x 50	
3.1.3.3	Number of holes		Min 2	
3.1.3.4	Dimensions of holes	mm	Ø 14	
3.1.3.5	Distance between holes	mm	50	
3.1.3.6	Material suitable for		Al terminal	
3.1.4	Weight and dimensions			
3.1.4.1	Pole height	mm	Insert	
3.1.4.2	Pole length	mm	Insert	
3.1.4.3	Distance between support axis of a pole	mm	Insert	
3.1.4.4	Shipping dimensions	mm	Insert	
3.1.4.5	Pole weight	kg	Insert	
3.1.4.6	Total weight	kg	Insert	
3.1.4.7	Shipping weight	kg	Insert	
3.2	Operating mechanism			
3.2.1	Number of operating mechanism	pcs.	1	
3.2.2	Туре		Insert	
3.2.3	Minimum number of available contacts (NO/NC)		6NO+6NC	
3.2.4	Anti-condensation heater inside the operating mechanism cabinet		Yes	
3.2.5	Heater, 230 V, 50 Hz		Yes	
3.2.6	Total heater power	W	Insert	
3.2.7	Water-tight corrosion-resistant housing		IP54	
3.2.8	Housing of Al or stainless steel		Yes	
3.2.9	Equipotential bonding rails		Yes	
3.3	Fuse			
3.3.1	Integrated fuse 10 A		Yes	
	Overall compliance with the requirements (yes/no)			



5.2.3.4 C3.1: Current Transformer 33 kV, 1600/1 A/A

	Description	Minin	num Requirements	
No.		Unit	Data	Guaranteed
1.	Current Transformers - General			
1.1.	Manufacturer		Insert	
1.2	Туре		Insert	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
1.5	Standards		IEC 60044-1	
1.6	Quality control		ISO 9001	
1.7	Туре		Outdoor, post type	
2.	Current Transformers - Characteristics			
2.1	Nominal system voltage	kV _{rms}	33	
2.2	Highest voltage for equipment U _n	kV _{rms}	36	
2.3	Rated lightning impulse withstand voltage	kV _{peak}	170	
2.4	Rated short duration power frequency voltage	kV	70	
2.5	Rated frequency f _r	Hz	50	
2.6	Rated short-time thermal current lth, 1 s	kA	25	
2.7	Rated dynamic current I _{dyn}	kV peak	63	
	Rated continuous thermal current (40°C):	itt pouit		
	• I core	% In	200	
2.8	• Il core	% In	200	
	• III core	% In	120	
	IV core	% In	120	
	Rated transformer ratio:			
	• I core	A/A	1600/1	
2.9	Il core	A/A	1600/1	
	III core	A/A	1600/1	
	IV core	A/A	1600/1	
	Accuracy class:			
	• I core		0.2	
2.10	Il core		0.2	
	III core		5P20	
	IV core		5P20	
	Security factor:			
2.11	• I core		Fs=10	
	Il core		Fs=10	
	Rated power:			
	• I core	VA	10	
2.12	• Il core	VA	15	
	• III core	VA	30	
0.40	IV core Peter description of the series of the serie	VA	30 Min. Olasa I	
2.13	Rated mechanical terminal loads	Class	Min. Class I	
3.	Current Transformers - Design and Const	ruction		
3.1	Insulator material		Porcelain or araldite	
3.2	Insulating medium		Oil-paper or araldite	
3.3	Minimum creepage distance	mm/kV	Min. ≥ 25 mm/kV	



NI-	Donamin dan	Minin	num Requirements	
No.	Description	Unit	Data	Guaranteed
3.4	Max. radio interference voltage at 0.5-2 MHz (acc. IEC 60694)	μV	Max. 2500	
3.5	Permissible level of partial discharges: • Test voltage 1.2*U _M /√3 • Test voltage U _M	pC pC	Max. ≤ 5 ≤ 10	
3.7	Min. LV enclosure protection		IP54	
3.8	HV terminals			
3.8.1	Shape		Flat	
3.8.2	Position		Horizontal	
3.8.3	Dimensions	mm x mm	Min 100 x 50	
3.8.4	Number of holes		Min 2	
3.8.5	Dimensions of holes	mm	Ø 14	
3.8.6	Distance between holes	mm	50	
3.8.7	Material suitable for		Al terminal	
3.10	Mass and dimensions			
3.11	Total mass	kg	Insert	
3.13	Height	mm	Insert	
	Overall compliance with the requirements (yes/no)			



5.2.3.5 C3.2: Current Transformer 33 kV, 10/1 A/A

NI-	Description	Minimum Requirements	Guarantood	
No.	Description	Unit	Data	Guaranteed
1.	Current Transformers - General			
1.1.	Manufacturer		Insert	
1.2	Туре		Insert	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
1.5	Standards		IEC 60044-1	
1.6	Quality control		ISO 9001	
1.7	Туре		Outdoor, post type	
2.	Current Transformers - Characteristics			
2.1	Nominal system voltage	kV _{rms}	33	
2.2	Highest voltage for equipment U _n	kV _{rms}	36	
2.3	Rated lightning impulse withstand voltage	kV _{peak}	170	
2.4	Rated short duration power frequency voltage	kV	70	
2.5	Rated frequency f _r	Hz	50	
2.6	Rated short-time thermal current lth, 1 s	kA	25	
2.7	Rated dynamic current I _{dyn}	kV peak	63	
	Rated continuous thermal current (40°C):			
2.8	• I core	% In	200	
2.0	II core	% In	120	
	III core	% In	120	
	Rated transformer ratio:			
2.9	I core	A/A	10/1	
2.0	Il core	A/A	10/1	
	• III core	A/A	10/1	
	Accuracy class:			
2.10	• I core		0.2	
	• II core		5P20	
	• III core		5P20	
2.11	Security factor:		Fo. 40	
	I core Retad powers		Fs=10	
	Rated power: • I core	VA	5	
2.12	Il core	VA	5 15	
	• III core	VA	15	
2.13	Rated mechanical terminal loads	Class	Min. Class I	
3.	Current Transformers - Design and Consti			
3.1	Insulator material		Porcelain or araldite	
3.2	Insulating medium		Oil-paper or araldite	
3.3	Minimum creepage distance	mm/kV	Min. ≥ 25 mm/kV	
	Max. radio interference voltage at 0.5-2 MHz			
3.4	(acc. to IEC 60694)	μV	Max. 2500	
	Permissible level of partial discharges:			
3.5	Test voltage 1.2*U _M /√3 Test voltage 1.2*U _M /√3	pC	Max. ≤ 5	
	Test voltage U _M	pC	≤ 10	



NI-	Description	Minimum Requirements		Cuarantaad
No.	Description	Unit	Data	Guaranteed
3.7	Min. LV enclosure protection		IP54	
3.8	HV terminals			
3.8.1	Shape		Flat	
3.8.2	Position		Horizontal	
3.8.3	Dimensions	mm x mm	Min 100 x 50	
3.8.4	Number of holes		Min 2	
3.8.5	Dimensions of holes	mm	Ø 14	
3.8.6	Distance between holes	mm	50	
3.8.7	Material suitable for		Al terminal	
3.10	Mass and dimensions			
3.11	Total mass	kg	Insert	
3.13	Height	mm	Insert	
Overall compliance with the requirements (yes/no)				



5.2.3.6 C4: Voltage Transformer 33 kV

	Description	Minim	um Requirements	
No.		Unit	Data	Guaranteed
1.	Voltage Transformers - General			
1.1	Manufacturer		Insert	
1.2	Type		Inductive	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
			IEC 60044-2	
4.5	Oten dende		IEC 60273	
1.5	Standards		IEC 60694	
			IEC 60815	
1.6	Quality control		ISO 9001	
1.7	Туре		Outdoor, post type	
2.	Voltage Transformers - Characteristics			
2.1	Nominal system voltage	kV _{rms}	33	
2.2	Highest voltage for equipment U _n	kV _{rms}	36	
2.3	Rated lightning impulse withstand voltage	kV _{peak}	170	
2.4	Rated short duration power frequency voltage	kV	70	
2.5	Rated frequency f _r	Hz	50	
2.6	Rated short-time thermal current lth, 1 s	kA	25	
2.7	Rated dynamic current I _{dyn}	kV _{peak}	63	
2.8	Rated primary voltage	kV	33/√3	
	Rated secondary voltage		,	
2.9	• I winding	V	110√3	
	• II winding	V	110√3	
2.10	Accuracy class:		0.2	
2.10	I winding Il winding		1/3P	
	Rated power:		1/31	
2.11	I winding	VA	25	
	Il winding	VA	75	
2.12	Load		Simultaneously	
2.13	Voltage factor	p.u./s	1.5/30	
2.14	Rated mechanical strength	Class	Min. Class I	
0.45	Power frequency withstand tests on secondary	14) / 1100 0	0	
2.15	windings, 1 min	kV rms	3	
3.	Voltage Transformers - Design and Const	ruction		
3.1	Insulator material		Porcelain or araldite	
3.2	Insulating medium		Oil-paper or araldite	
3.3	Minimum creepage distance	mm/kV	Min. ≥ 25 mm/kV	
2.4	Max. radio interference voltage at 0.5-2 MHz	\/	May 2500	
3.4	(acc. IEC 60694)	μV	Max. 2500	
	Permissible level of partial discharges:			
3.5	Test voltage 1.2*UM/√3	рС	Max. ≤ 5	
	Test voltage UM	pC	≤ 10	
3.7	Min. LV enclosure protection		IP54	



Nie	Description	Minimum Requirements		Minimum Requirements		Guarantood
No.	Description	Unit	Data	Guaranteed		
3.8	HV terminals					
3.8.1	Shape		Flat			
3.8.2	Position		Vertical or horizontal			
3.8.3	Dimensions	mm x mm	Min 100 x 50			
3.8.4	Number of holes		Min 2			
3.8.5	Dimensions of holes	mm	Ø 14			
3.8.6	Distance between holes	mm	50			
3.8.7	Material suitable for		Al terminal			
3.10	Mass and dimensions					
3.11	Total mass	kg	Insert			
3.13	Height	mm	Insert			
	Overall compliance with the requirements (yes/no)					



5.2.3.7 C5: Surge Arrester 33 kV

		Minir	num Requirements	
No.	Description	Unit	Data	Guaranteed
1.	Surge Arresters - General			
1.1	Manufacturer		Insert	
1.2	Туре		Insert	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
1.5	Standards		IEC 60099-4	
1.6	Quality control		ISO 9001	
1.7	Design		Metal oxide, gapless, outdoor	
1.8	Short circuit testing authority		Insert authority	
2.	Surge Arresters - Characteristics			
2.1	Nominal system voltage	kV _{rms}	33	
2.2	Highest voltage for equipment U _n	kV _{rms}	36	
2.4	Rated voltage of surge arrester U _r	kV _{rms}	30	
2.5	Max. continuous operating voltage U _c	kV _{rms}	24	
2.8	Rated frequency	Hz	50	
2.9	Nominal discharge current In (8/20 µs)	kA _{peak}	10	
2.10	High current impulse of an arrester (4/10 µs)	kA peak	100	
3.	Surge Arresters - Design and Construction			•
3.1	Line discharge class	Class	3	
3.2	Energy dissipation capacity (per kV of rated voltage)	kJ/kV	≥ 6.5	
3.3	Long duration current impulse (2000 µs)	Α	≥ 850	
3.4	Maximum residual voltage U _{res}			
3.4.1	For switching impulse current 30/60 µs at 0,5 kA	kV _{peak}	≤ 65	
3.4.2	For switching impulse current 30/60 µs at 1 kA	kV _{peak}	≤ 67.5	
3.4.3	For switching impulse current 30/60 µs at 2 kA	kV _{peak}	≤ 70	
3.4.4	For lightning impulse current 8/20 µs at 5 kA	kV _{peak}	≤ 75	
3.4.5	For lightning impulse current 8/20 µs at 10 kA	kV _{peak}	≤ 80	
3.4.6	For lightning impulse current 8/20 µs at 20 kA	kV _{peak}	≤ 90	
3.5.	Dielectric endurance of arrester housing)			
3.5.1	Lightning impulse withstand voltage of arrester housing up (1.2/50 µs)	kV	≥ 235	
3.5.2	Power frequency withstand voltage of arrester housing (1 min wet)	kV	≥ 105	
3.6.	Mechanical requirements			
3.6.1	Specified short-term load SSL (F _{dyn})	N	≥ 7500	
3.6.2	Specified long-term load SSL (F _{stat})	N	≥ 5000	
3.7	Minimum creepage distance	mm/kV	≥ 25 mm/kV	
3.8.	Housing insulating material		Composite/Silicon	
3.9	Insulating basement		Yes	
3.10	Surge arrester height	mm	Insert	



No	Description	Minin	num Requirements	Cusuantand
No.	Description	Unit	Data	Guaranteed
3.11	Surge arrester weight	kg	Insert	
3.12	Voltage distribution ring present / ring diame-	yes / no /	lnoort	
3.12	ter	mm	Insert	
3.14	HV terminal			
3.14.1	Shape		Flat	
3.14.2	Dimension	mm x mm	Min 100 x 50	
3.14.3	Number of holes		Min 2	
3.14.4	Distance between holes	Mm	50	
3.14.5	Material suitable for		Al terminal	
	Overall compliance with the requirements (yes/no)			



5.2.4 D: Transformers

5.2.4.1 D1: 230/132/33 kV 225/300 MVA Autotransformer

Na	Description	Mini	mum Requirements	Cuerenteed
No.		Unit	Data	Guaranteed
1	General			
1.1	Manufacturer		Insert	
			Autotransformer three-	
			phase, oil immersed,	
4.0	T		with tertiary winding,	
1.2	Type		hermetically sealed, with	
			on-load tap changer,	
			outdoor	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
			IEC 60044	
			IEC 60076	
			IEC 60137	
			IEC 60214	
1.5	Standards		IEC 60354	
1.5	Standards		IEC 60529	
			IEC 60815	
			IEC 60947	
			NEMA TR-1	
			CENELEC EN 50216	
1.6	Quality control		ISO 9001	
1.7	Tertiary winding function		Stabilizing winding &	
			auxiliary power supply	
1.8	Thermal insulation class		A	
2	Ratings and properties	1	1	
	Rated power:			
2.1	Primary / secondary winding	MVA	300 / 300	
	Tertiary - minimum	MVA	100	
	Rated power (MVA) by cooling ONAN / ONAF			
2.2	Primary / secondary winding	MVA	225 / 300	
	Tertiary - minimum	MVA	75 / 100	
	Rated voltage of windings:			
2.3	HV winding	kV	235	
-	MV winding	kV	135	
	LV - stabilizing winding	kV	34.5	
2.4	Tap changer:			
	Manufacturer			
	Country of origin			
	Model designation			
	Type of tap changing		On-load	
	Tap changer location		Neutral point	
	Type of voltage regulation	%	V.F.V.V.	



		Mini	mum Requirements	Guaranteed	
No.	Description		Unit Data		
	Tapping range	%	±10		
	Tapping step	70	1.25		
	1 Tapping Glop		Rated power 300 MVA,		
	Rating		all taps		
2.5	Frequency	Hz	50		
	Connection of three-phase windings (group of				
2.6	vector IEC 60076)		YNa0d1		
2.7	Neutral point insulation		Si145		
			Open delta, with four		
2.8	Low voltage winding connection (LV)		terminals brought out		
	, ,		outside of the tank		
2	Chariel technical requirements				
3	Special technical requirements				
2.4	Short circuit impedance corrected to reference				
3.1	temperature of 75°C at rated frequency and				
	rated power				
3.1.1	HV - MV, on the basis of rated power	%	13 ±10 %		
3.1.1	300 MWA with on-load tap changer in middle position	70	13 ±10 %		
	HV - LV, on the basis of rated power 'x' MWA				
3.1.2	with on-load tap changer in middle position	%	Insert		
	MV - LV, on the basis of rated power 'x' MWA				
3.1.3	with on-load tap changer in middle position	%	Insert		
	Zero-sequence impedance, with tap changer				
	in middle position:				
3.2	HV/MV	%	Insert		
5.2	HV/LV	%	Insert		
	MV/LV	%	Insert		
	Autotransformer capacity to withstand external				
3.3	short circuits				
3.3.1	Short-circuit duration	s	2		
0.01.	Symmetrical short-circuit with-stand capacity		_		
	and asymmetrical short-circuit withstand ca-				
	pacity during indicated period:				
3.3.2	HV winding	kA	50		
	MV winding	kA	40		
	LV winding	kA	25		
	Pre-fault voltage	p.u.	1.05		
3.4	Guaranteed losses				
	No-load losses with tap changer in 9th regula-				
	tion position:				
3.4.1	at rated voltage and rated <u>frequency (this</u>)	kW	Insert		
	value will be evaluated)				
	at 110 % rated voltage, at rated frequency	kW	Insert		
	No-load losses with tap changer in 17th regu-	· <u> </u>			
	lation position:				
	at 110 % rated voltage, at rated frequency	kW	Insert		
3.4.2	No-load losses capitalized value	€/kW	7000		



	Description	Mini		
No.		Unit	mum Requirements Data	Guaranteed
	Tolerance to be applied to no-load losses in %			
3.4.3	of the guaranteed value	%	10	
	On-load losses at 75°C, at rated voltage and			
3.4.4	rated frequency, with tap changer in normal	kW	Insert	
	position (this value will be evaluated)			
3.4.5	On-load losses capitalized value	€/kW	3500	
0.4.0	Tolerance to be applied to on-load losses in %	0.4	40	
3.4.6	on the guaranteed value	%	10	
0.5	Ancillary equipment (fans, pumps, heaters,			
3.5	etc.)			
3.5.1	Load of ancillary equipment (this value will	kW	Incort	
3.3.1	be evaluated)	KVV	Insert	
3.5.2	Capitalized valued of ancillary equipment load	€/kW	3500	
3.5.3	Tolerance to be applied to ancillary equipment	%	20	
3.3.3	load in % of the guaranteed value	70	20	
3.6	Insulation level			
3.6.1	High voltage (HV)		LI 1050 AC 460	
3.6.2	Medium voltage (MV)		LI 650 AC 275	
3.6.3	Neutral		LI 650 AC 275	
3.6.4	Low voltage (LV)		LI 170 AC 70	
3.7	The highest voltage for equipment (effective			
3.1	value)			
3.7.1	High voltage (HV)	kV	245	
3.7.2	Medium voltage (MV)	kV	145	
3.7.3	Neutral	kV	145	
3.7.4	Low voltage (LV)	kV	36	
3.8	Rated insulation level			
3.8.1	Induced voltage (ACSD, ACLD)	kV	In acc. to IEC 60076-3	
3.9	Efficiencies			
	If $\cos \varphi = 1.0$ and:			
	25 % load of the rated value		Insert	
3.9.1	50 % load of the rated value		Insert	
	75 % load of the rated value		Insert	
	100 % load of the rated value		Insert	
	If cosφ = 0.8 (inductive) and:			
	25 % load of the rated value		Insert	
3.9.2	50 % load of the rated value		Insert	
	75 % load of the rated value		Insert	
	100 % load of the rated value		Insert	
C 1-	Voltage drop at the terminals of secondary			
3.10	winding at rated temperature and at the middle			
0.40.4	tap changer position			
3.10.1	cosφ = 1.00		Insert	
3.10.2	cosφ = 0.95 (inductive)		Insert	
3.10.3	cosφ = 0.90 (inductive)		Insert	
3.10.4	cosφ = 0.80 (inductive)		Insert	
3.11	No-load current at rated frequency			
3.11.1	At 0.90 Un		Insert]



	Description	Minimum Requirements		Guarantaad
No.		Unit	Data	Guaranteed
3.11.2	At 1.00 Un		Insert	
3.11.3	At 1.05 Un		Insert	
	Temperature rise limits, at rated power, with			
3.12	complete cooling system in service and at low-			
	est voltage tap			
3.12.1	Top oil	K	≤ 50	
3.12.2	Winding	K	≤ 55	
3.12.3	Hottest spot	K	≤ 65	
	At the emergency cases it is allowed:			
	Continuous overload at the highest wind-			
	ing temperature which exceeds by 2.5°C			
	the guaranteed limit value	MVA	Compliant to	
3.13	Continuous voltage increase when the top	%	IEC 60076-7	
	oil temperature exceeds the guaranteed			
	limit by 2.5°C at rated power (in % of the			
	rated voltage)			
	Guaranteed value of overloads in % of the rated			
3.14	power			
	Normal overloads prediction which can occur			
3.14.1	once a day (in % of the rated power) within the			
	winding temperature rise limit of 75°C			
	After operation under 15 min			
	full rated power		Insert	
3.14.1.1	¾ rated power		Insert	
	• ½ rated power		Insert	
	After operation under 20 min			
	full rated power		Insert	
3.14.1.2	¾ rated power		Insert	
	½ rated power		Insert	
	After operation under 120 min			
	full rated power		Insert	
3.14.1.3	¾ rated power		Insert	
	½ rated power		Insert	
	Sudden transient overloads (in % of the rated			
3.14.2	power) with the winding temperature rise limit of			
	85°C			
	After operation under 15 min			
	full rated power		Insert	
3.14.2.1	¾ rated power		Insert	
	• ½ rated power		Insert	
	After operation under 15 min			
0.44.0.0	full rated power		Insert	
3.14.2.2	¾ rated power		Insert	
	½ rated power		Insert	
	After operation under 15 min			
0.440=	full rated power		Insert	
3.14.2.3	¾ rated power		Insert	
	½ rated power		Insert	



		Minim	Minimum Requirements	
No.	Description	Unit	Data	Guaranteed
	Guaranteed values of loads at ambient temper-	Offic	Data	
	ature of 40°C, without danger of exceeding the			
	oil and winding temperature limits:			
3.15	with all cooling groups in operation (ex-		Insert	
00	cluding stand-by cooling group)			
	 with one cooling group out of operation 		Insert	
	with two cooling groups out of operation		Insert	
4	Oil	<u> </u>		
4.1	New		Insert	
4.2	Manufacturer		Insert	
4.3	Type		Insert	
4.4	Standard		IEC 60296	
4.5	Minimum flash point	°C	Insert	
4.6	Viscosity at 20°C	mm ² /s	Insert	
4.7	Maximum dielectric strength	kV/cm	Insert	
4.8	Data sheet attached	KV/OIII	Insert	
4.9	Corrosive Sulphur		No	
4.10	PCB content		Without PCB	
			William 1 0B	
5	Bushing			
5.1	HV bushing (245 kV)			
5.1.1	Quantity		3	
5.1.2	Class	kV	245	
5.1.3	Manufacturer		Insert	
5.1.4	Туре		Insert	
5.1.5	Rated current	Α	≥ 1000	
5.1.6	Rated short circuit current (2 s)	kA rms	50	
5.1.7	Rated lightning impulse withstand voltage	kV peak	1050	
5.1.8	Rated switching impulse withstand voltage	kV peak	N.A.	
5.1.9	Rated power frequency withstand voltage	kV rms	460	
	Connectors			
5.1.10.1	•	mm	Ø 50	
5.1.10.2	-	mm	125	
	Suitable for		Al wire	
5.1.11	Minimum creepage distance (25 mm/kV)	mm/kV	≥ 25 mm/kV	
5.1.12	Full vacuum withstand of complete bushing		YES	
5.2	Neutral bushing (identical as MV bushing)			
5.2.1	Quantity		1	
5.2.2	Class	kV	145	
5.2.3	Manufacturer		Insert	
5.2.4	Type	Α.	Insert	
5.2.5	Rated current	A	≥ 1600	
5.2.6	Rated short-circuit current (2 s)	kA rms	40	
5.2.7	Rated lightning impulse withstand voltage	kV peak	650	
5.2.8	Rated switching impulse withstand voltage	kV peak	-	
5.2.9	Rated power frequency withstand voltage	kV rms	275	
5.2.10	Connectors		~	
5.2.10.1	Shape	mm	Ø 50	



	Description	Minimu	m Requirements	
No.		Unit	Data	Guaranteed
5.2.10.2	Length	mm	125	
5.2.10.3	Suitable for		Al wire	
5.2.11	Minimum creepage distance (25 mm/kV)	mm/kV	≥ 25 mm/kV	
5.2.12	Full vacuum withstand of complete bushing		YES	
5.3	MV bushings			
5.3.1	Quantity		3	
5.3.2	Class	kV	145	
5.3.3	Manufacturer		Insert	
5.3.4	Туре		Insert	
5.3.5	Rated current	Α	≥ 1600	
5.3.6	Rated short-circuit current (2 s)	kA rms	40	
5.3.7	Rated lightning impulse withstand voltage	kV peak	650	
5.3.8	Rated switching impulse withstand voltage	kV peak	-	
5.3.9	Rated power frequency withstand voltage	kV rms	275	
5.3.10	Connectors			
5.3.10.1	Shape	mm	Ø 60	
5.3.10.2	Length	mm	125	
5.3.10.3	Suitable for		Al wire	
5.3.11	Minimum creepage distance (25 mm/kV)	mm/kV	≥ 25 mm/kV	
5.3.12	Full vacuum withstand of complete bushing		YES	
5.4	LV bushings			
5.4.1	Quantity		4	
5.4.2	Class	kV	36	
5.4.3	Manufacturer		Insert	
5.4.4	Туре		Insert	
5.4.5	Rated current	A	≥ 2000	
5.4.6	Rated short-circuit current (2 s)	kA rms	25	
5.4.7	Rated lightning impulse withstand voltage	kV peak	170	
5.4.8	Rated switching impulse withstand voltage	kV peak	-	
5.4.9	Rated power frequency withstand voltage	kV rms	70	
5.4.10	Connectors			
5.4.10.1	Shape	mm	Flat	
5.4.10.2	Length	mm	-	
5.4.10.3	Adjusted for Cu wire		Cu wire	
5.4.11	Minimum creepage distance (25 mm/kV)	mm/kV	≥ 25 mm/kV	
5.4.12	Full vacuum withstand of complete bushing		YES	
6	Design Data			
	Maximum flux density in the legs			
6.1	At rated voltage	Т	Insert	
	At 105 % of the rated voltage	Т	Insert	
	Maximum flux density in the yokes:			
6.2	At rated voltage	Т	Insert	
	At 105 % of the rated voltage	Т	Insert	



	Description	Mini	Minimum Requirements		
No.		Unit	Data	Guaranteed	
	Maximum current density in windings at rated				
	power and normal tap changer position:	A / 2			
6.3	HV winding	A/mm ²	Insert		
	MV winding	A/mm ²	Insert		
	LV - stabilizing winding	A/mm ²	Insert		
	Winding resistance at 75°C and middle tap				
	changer position:				
6.4	HV winding	Ω	Insert		
	MV winding	Ω Ω	Insert		
	LV - stabilizing winding	12	Insert		
6.5	Core construction				
6.5.1	Method of joining of legs		Insert		
6.5.2	Method of joining of yokes		Insert		
6.5.3	Joining material		Insert		
6.5.4	Number of legs		Insert		
6.5.5	Type of core steel		Insert		
6.5.6	Specific loss of core steel at 1.7 T inductance	W/kg	< 1.11		
6.6	Winding conductor				
6.6.1	HV winding		Cu - 'Interleaved'		
			Cu - Interleaved / disc -		
6.6.2	MV winding		transposed, cured in		
			epoxy coating		
			Cu - transposed, cured		
6.6.3	LV - stabilizing winding		in epoxy coating		
	Audible noise level (acc. to NEMA TR1), at				
6.7	105 % of rated voltage, at maximum power	dB	Insert		
	and with complete cooling system in service				
0.0	Radio Interference Voltage at 0.5 MHz as	.,	0500		
6.8	specified in IEC 60694	μV	2500 max		
7	Weights and dimensions				
	Total weight of autotransformer, equipped for				
7.1	service	kg	Insert		
7.2	Core and oil assembly	ka	Insert		
7.3	Total mass excluding oil	kg	Insert		
	-	kg			
7.4	Tank and accessories	kg	Insert		
7.5	Oil mass in tank	kg	Insert		
7.6	Oil mass in coolers	kg	Insert		
7.7	Oil mass total	kg	Insert		
7.8	Total mass	kg	Insert		
7.9	Maximum shipping weight (the heaviest item)	kg	Insert		
	Height from foundation to:		lana aut		
	Highest point of HV bushing Highest point of tools	mm	Insert		
7.10	Highest point of tank	mm	Insert		
	Highest point of conservator	mm	Insert		
	Highest point of lifting hook for removal of	mm	Insert		
	core and oil assembly				



No. 7.11		Minir	Minimum Requirements	
7.11	Description	Unit	Data	Guaranteed
7.11	Outer dimensions:			
	Length	mm	Insert	
	Width	mm	Insert	
7.12	Informative dimensional sketch		To be enclosed with bid	
	Maximum shipping dimensions of tank:			
7.40	Outside height	mm	Insert	
7.13	Outside width	mm	Insert	
	Outside length	mm	Insert	
7.14	Transportation drawing		To be enclosed with bid	
8	Tap changer			
8.1	Manufacturer		Insert	
8.2	Туре		Insert	
8.3	Insulation level	kV	Si 145	
8.4	Rated current	А	≥ 1600	
8.5	Number of steps		17	
8.6	Regulating coil		At neutral point	
8.7	Short-circuit withstand	kA rms	Insert	
8.8	BIL to ground through the regulating coil	kV peak	Insert	
	Power frequency withstand voltage for 1 mi-	•		
8.9	nute through the regulating coil	kV rms	Insert	
8.10	Tap position indicator		Digital code matrix	
0.44	Audiancaunt		(BCD)	
8.11	Auxiliary supply		3x400 V / 230 V, 50 Hz	
9	Auxiliary power supply			
9.1	Motors		3x400 V / 50 Hz	
9.2	Heaters		230 V / 50 Hz	
9.3	Control voltage		110 V DC	
9.4	Oil pump		3x400 V / 50 Hz	
10	Current transformer incorporated into the po	ower autotra	nsformer	
			In all phases, 3 cores	
10.1	CT in HV bushings, for protection, WTI and		characteristics shall be	
	Tap Changer		defined in design stage	
	CT in MV bushings for protection WTI and		In all phases, 3 cores	
10.2	CT in MV bushings, for protection, WTI and Tap Changer		characteristics shall be	
	Tap Changer		defined in design stage	
			In all phases, 2 cores	
10.3	CT in neutral bushing , for protection		characteristics shall be	
			defined in design stage	
	Layout			
11	Primary winding bushings		Longitudinal axis	
11 11.1	, , ,		Longitudinal axis (oppo-	
	Secondary winding bushings		site to HV/	
11.1	Secondary winding bushings		site to HV)	
11.1	Secondary winding bushings Conservator tank		site to HV) To be defined in design stage	



	Mini		
Description	Unit	Data	Guaranteed
		To be defined in design	
Control cabinet		stage	
		To be defined in design	
Coolers		stage	
Connection drawing, block diagram		To be enclosed with bid	
Cooling groups			
Number of cooling groups (total)	Qty.	4	
· · · · ·		3	
		1	
Number of coolers in a cooling group		Insert	
		Insert	
•		Insert	
-	mbar	Yes	
Dehumidifying agent	kg	Insert	
Autotransformer tank			
Type of design			
Thickness of transformer tank:			
• Sides	mm	Insert	
Bottom	mm	Insert	
• Top	mm	Insert	
Material of the autotransformer tank		Insert	
Wheels			
Wheel number for each rail of two pair rails		Two pairs	
Axial inter space in transversal direction be-	mm	4520	
tween two pairs of rails	111111	4520	
Transversal distance between wheels in pair	mm	1435	
Distance between wheels in longitudinal direc-	mm	1/25	
tion	111111	1433	
Corrosion protection of the tank		YES	
Vacuum withstand of the complete tank with	mhar	1	
cooler	IIIDai	ı	
Over-pressure withstand of the complete auto-	bor	0.3	
transformer	Dai	0.3	
Conservator			
		With diaphragm	
	nce		
·			
	111	IIISGIL	
	%	Insert	
sion		Insert	
	Number of cooling groups (total) Number of cooling groups (for rated power) Number of stand-by cooling groups Number of coolers in a cooling group Number of spare fans Rating of each cooler Full vacuum withstand of complete cooler Dehydrating breather Type of dehydrating breather Dehumidifying agent Autotransformer tank Type of design Thickness of transformer tank: Sides Bottom Top Material of the autotransformer tank Wheels Wheel number for each rail of two pair rails Axial inter space in transversal direction between two pairs of rails Transversal distance between wheels in pair Distance between wheels in longitudinal direction Corrosion protection of the tank Vacuum withstand of the complete tank with cooler Over-pressure withstand of the complete auto-	Control cabinet Coolers Connection drawing, block diagram Cooling groups Number of cooling groups (total) Number of stand-by cooling groups Number of stand-by cooling group Number of spare fans Rating of each cooler Full vacuum withstand of complete cooler Dehydrating breather Type of dehydrating breather Dehumidifying agent Autotransformer tank Type of design Thickness of transformer tank: Sides Mme Top Material of the autotransformer tank Wheels Wheel number for each rail of two pair rails Axial inter space in transversal direction between two pairs of rails Transversal distance between wheels in pair Distance between wheels in longitudinal direction Corrosion protection of the tank Vacuum withstand of the complete autotransformer Conservator Type Number of compartments Dess. Total volume of conservator Minimum volume of conservator between highest and lowest levels as percentage of total cold oil at 0°C of the volume of autotransformer Corrosion protection of the volume of autotransformer	Control cabinet Coolers Coolers To be defined in design stage Connection drawing, block diagram Cooling groups Number of cooling groups (total) Number of cooling groups (total) Number of stand-by cooling groups Number of stand-by cooling group Number of stand-by cooling group Number of spare fans Qty. Insert Number of spare fans Number of design Insert Number of spare fans Number of each rail of two pair rails Number of cach rail of two pair rails Number of spare fans Number of cach rail of two pair rails Transversal distance between wheels in pair Distance between wheels in longitudinal direction between two pairs of rails Transversal distance between wheels in pair Distance between wheels in longitudinal direction Dover-pressure withstand of the complete auto- transformer Corrosion protection of the tank Vacuum withstand of the complete auto- transformer Corporation protection of the tank Vacuum withstand of the complete auto- transformer Corporation protection of the tank Vacuum withstand of the complete auto- transformer Corporation protection of the tank Vacuum withstand of the complete auto- transformer Number of compartments pcs. 2 Number of compartments Number of compar



NI-	Description	Minim	Minimum Requirements	
No.		Unit	Data	Guaranteed
	Diagraph design parameters:			
	 Maximum diagraph stress at highest work- 		Insert	
15.6	ing pressure			
	Diagraph construction details		Insert	
	Type of diagraph material		Insert	
15.7	Corrosion protection of conservator		Insert	
45.0	Oil level indicators with alarm for minimum oil		0	
15.8	level	pcs.	2	
16	Operating conditions			
16.1	At the altitude (above sea level)	m	≤ 1000	
16.2	Maximum ambient temperature	°C	+ 45	
16.3	Average daily temperature	°C	+ 35	
16.4	Average annual temperature	°C	+ 30	
16.5	Minimum ambient temperature	°C	- 5	
	Overall compliance with the requirements (ye	s/no)		



5.2.4.2 D2: 132/33 kV 50/75 MVA Power transformer

No	Description	Mini	Guaranteed	
No.		Unit	Data	Guaranteed
1	General			
1.1	Manufacturer		Insert	
			Power transformer	
			three-phase, oil im-	
			mersed, two windings,	
1.2	Туре		without tertiary winding,	
			hermetically sealed, with	
			on-load tap changer,	
			outdoor	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
			IEC 60044	
			IEC 60076	
			IEC 60137	
			IEC 60214	
1.5	Standards		IEC 60354	
1.5	Standards		IEC 60529	
			IEC 60815	
			IEC 60947	
			NEMA TR-1	
			CENELEC EN 50216	
1.6	Quality control		ISO 9001	
1.7	Tertiary winding function		N.A.	
1.8	Thermal insulation class		A	
2	Ratings and properties	T	T	I
2.1	Rated power:			
	Primary / Secondary winding	MVA	75 / 75	
2.2	Rated power (MVA) by cooling ONAN / ONAF	MVA	50 / 75	
	Rated voltage of windings:			
2.3	HV winding	kV	135	
	MV winding	kV	34.5	
2.4	Tap changer:			
	Manufacturer			
	Country of origin			
	Model designation			
	Type of tap changing		On-load	
	Tap changer location		Insert	
	Type of voltage regulation	%	C.F.V.V.	
	Tapping range	%	±10	
	Tapping step		1.25	
	Rating	MVA	75, all taps	
2.5	Frequency	Hz	50	
2.6	Connection of three-phase windings (group of		Dyn1	
2.0	vector IEC 60076)		-	
2.7	Neutral point insulation		Si 36	



		Minim	num Requirements	
No.	Description	Unit	Data	Guaranteed
2.8	Low voltage winding connection (LV)	Oint	N.A.	
3	Special technical requirements			
	Short circuit impedance corrected to reference			
3.1	temperature of 75°C at rated frequency and			
	rated power			
	HV - MV, on the basis of rated power 300 MWA	21	10. 10.07	
3.1.1	with on-load tap changer in middle position	%	12 ±10 %	
0.4.0	HV - LV, on the basis of rated power 'x' MWA	0/	N. A	
3.1.2	with on-load tap changer in middle position	%	N.A.	
3.1.3	MV - LV, on the basis of rated power 'x' MWA	0/	NI A.	
3.1.3	with on-load tap changer in middle position	%	N.A:	
	Zero-sequence impedance, with tap changer in			
3.2	middle position:	%	Insert	
	HV/MV	/0	IIISEIL	
3.3	Power transformer capacity to withstand exter-			
0.0	nal short circuits			
3.3.1	Short-circuit duration	S	2	
	Symmetrical short-circuit with-stand capacity			
	and asymmetrical short-circuit withstand ca-			
3.3.2	pacity during indicated period:			
	HV winding	kA	40	
	MV winding	kA	25	
	Pre-fault voltage	p.u.	1.05	
3.4	Guaranteed losses			
	No-load losses with tap changer in 9 th regula-			
	tion position:			
	at rated voltage and rated frequency (this value will be evaluated)	kW	Insert	
3.4.1	at 110 % rated voltage, at rated frequency	kW	Insert	
	No-load losses with tap changer in 17th regula-			
	tion position:	kW	Insert	
	at 110 % rated voltage, at rated frequency			
3.4.2	No-load losses capitalized value	€/kW	7000	
	Tolerance to be applied to no-load losses in %			
3.4.3	of the guaranteed value	%	10	
	On-load losses at 75°C, at rated voltage and			
3.4.4	rated frequency, with tap changer in normal po-	kW	Insert	
	sition (this value will be evaluated)			
3.4.5	On-load losses capitalized value	€/kW	3500	
2.4.0	Tolerance to be applied to on-load losses in %	0/	40	
3.4.6	on the guaranteed value	%	10	
3.5	Ancillary equipment (fans, pumps, heaters, etc.)			
3.5.1	Load of ancillary equipment (this value will be	kW	Incort	
3.3.1	evaluated)	KVV	Insert	
3.5.2	Capitalized valued of ancillary equipment load	€/kW	3500	
3.5.3	Tolerance to be applied to ancillary equipment	%	20	
	load in % of the guaranteed value	/0	20	
3.6	Insulation level			



		Mini	mum Requirements		
No.	Description	Unit	Data	Guaranteed	
3.6.1	High voltage (HV)		LI 650 AC 275		
3.6.2	Medium voltage (MV)		LI 270 AC 70		
3.6.3	Neutral		LI 270 AC 70		
3.6.4	Low voltage (LV)		N.A.		
3.7	The highest voltage for equipment (effective value)				
3.7.1	High voltage (HV)	kV	145		
3.7.2	Medium voltage (MV)	kV	36		
3.7.3	Neutral	kV	36		
3.7.4	Low voltage (LV)	kV	N.A.		
3.8	Rated insulation level				
3.8.1	Induced voltage (ACSD, ACLD)	kV	In accordance with IEC 60076-3		
3.9	Efficiencies				
	If cosφ = 1.0 and:				
	25 % load of the rated value		Insert		
3.9.1	50 % load of the rated value		Insert		
	75 % load of the rated value		Insert		
	100 % load of the rated value		Insert		
3.9.2	If cosφ = 0.8 (inductive) and: • 25 % load of the rated value • 50 % load of the rated value • 75 % load of the rated value • 100 % load of the rated value		Insert Insert Insert Insert		
3.10	Voltage drop at the terminals of secondary winding at rated temperature and at the middle tap changer position				
3.10.1	cosφ = 1.00		Insert		
3.10.2	cosφ = 0.95 (inductive)		Insert		
3.10.3	cosφ = 0.90 (inductive)		Insert		
3.10.4	cosφ = 0.80 (inductive)		Insert		
3.11	No-load current at rated frequency				
3.11.1	At 0.90 Un		Insert		
3.11.2	At 1.00 Un		Insert		
3.11.3	At 1.05 Un		Insert		
3.12	Temperature rise limits, at rated power, with complete cooling system in service and at lowest voltage tap				
3.12.1	Top oil	K	≤ 50		
3.12.2	Winding	K	≤ 55		
3.12.3	Hottest spot	K	≤ 65		



		Minimum Requirements		
No.	Description	Unit	Data	Guaranteed
0.40	At the emergency cases it is allowed: Continuous overload at the highest winding temperature which exceeds by 2.5°C the guaranteed limit value	MVA	Compliant to	
3.13	Continuous voltage increase when the top oil temperature exceeds the guaranteed lim- it by 2.5°C at rated power (in % of the rated voltage)	%	IEC 60076-7	
3.14	Guaranteed value of overloads in % of the rated power			
3.14.1	Normal overloads prediction which can occur once a day (in % of the rated power) within the winding temperature rise limit of 75°C			
3.14.1.1	After operation under 15 min • full rated power • ¾ rated power • ½ rated power		Insert Insert Insert	
3.14.1.2	After operation under 20 min • full rated power • ¾ rated power • ½ rated power		Insert Insert Insert	
3.14.1.3	After operation under 120 min full rated power ''4 rated power '2 rated power		Insert Insert Insert	
3.14.2	Sudden transient overloads (in % of the rated power) with the winding temperature rise limit of 85°C			
3.14.2.1	After operation under 15 min • full rated power • ¾ rated power • ½ rated power		Insert Insert Insert	
3.14.2.2	After operation under 15 min full rated power ''4 rated power rated power		Insert Insert Insert	
3.14.2.3	After operation under 15 min full rated power ''4 rated power rated power		Insert Insert Insert	
3.15	Guaranteed values of loads at ambient temperature of 40°C, without danger of exceeding the oil and winding temperature limits: • with all cooling groups in operation (excluding stand-by cooling group) • with one cooling group out of operation • with two cooling groups out of operation		Insert Insert Insert	



		Minimu	um Requirements	
No.	Description	Unit	Data	Guaranteed
4	Oil			
4.1	New		Insert	
4.2	Manufacturer		Insert	
4.3	Туре		Insert	
4.4	Standard		IEC 60296	
4.5	Minimum flash point	°C	Insert	
4.6	Viscosity at 20°C	mm²/s	Insert	
4.7	Maximum dielectric strength	kV/cm	Insert	
4.8	Data sheet attached		Insert	
4.9	Corrosive Sulphur		NO	
4.10	PCB content		Without PCB	
5	Bushing			
5.1	HV bushing (245 kV)			
5.1.1	Quantity		3	
5.1.2	Class	kV	145	
5.1.3	Manufacturer	1	Insert	
5.1.4	Туре		Insert	
5.1.5	Rated current	Α	≥ 400	
5.1.6	Rated short circuit current (2 s)	kA rms	50	
5.1.7	Rated lightning impulse withstand voltage	kV peak	650	
5.1.8	Rated switching impulse withstand voltage	kV peak	N.A.	
5.1.9	Rated power frequency withstand voltage	kV rms	275	
5.1.10	Connectors	KV IIIIS	210	
5.1.10.1	• Shape	mm	Ø 40	
	Length	mm	125	
	Suitable for	111111	Al wire	
5.1.11	Minimum creepage distance (25 mm/kV)	mm/kV	≥ 25 mm/kV	
5.1.12	Full vacuum withstand of complete bushing	TITITI/K V	YES	
5.2	MV bushings		ILO	
5.2.1	Quantity		3	
5.2.2	Class	kV	145	
5.2.3	Manufacturer	K V	Insert	
5.2.4	Type		Insert	
5.2.5	Rated current	A	≥ 1600	
5.2.6	Rated short-circuit current (2 s)	kA rms	40	
5.2.7	Rated lightning impulse withstand voltage	kV peak	650	
5.2.8	Rated switching impulse withstand voltage	kV peak	000	+
5.2.9	Rated power frequency withstand voltage	kV peak kV rms	275	
		VA IIII2	210	+
5.2.10 5.2.10.1	Connectors Shape	mm	Ø 50	
5.2.10.1	·	mm	125	
	Suitable for	mm	Al wire	
		mm/k)/		
5.2.11	Minimum creepage distance (25 mm/kV)	mm/kV	≥ 25 mm/kV YES	
5.2.12	Full vacuum withstand of complete bushing		150	
5.3	Neutral bushing (identical as MV bushing)			
5.3.1	Quantity	137	1 145	
5.3.2	Class	kV	145	



		Minir	nimum Requirements		Minimum Requirements	
No.	Description	Unit	Data	Guaranteed		
5.3.3	Manufacturer		Insert			
5.3.4	Туре		Insert			
5.3.5	Rated current	Α	≥ 1600			
5.3.6	Rated short-circuit current (2 s)	kA rms	40			
5.3.7	Rated lightning impulse withstand voltage	kV peak	650			
5.3.8	Rated switching impulse withstand voltage	kV peak	-			
5.3.9	Rated power frequency withstand voltage	kV rms	275			
5.3.10	Connectors	KV IIIIS	210			
	Shape	mm	Ø 50			
	Length		125			
	Suitable for	mm	Al wire			
		mm/kV				
5.3.11	Minimum creepage distance (25 mm/kV)	mm/kv	≥ 25 mm/kV			
5.3.12	Full vacuum withstand of complete bushing		YES			
6	Design data	1				
	Maximum flux density in the legs	_				
6.1	At rated voltage	T _	Insert			
	• At 105 % of the rated voltage	Т	Insert			
	Maximum flux density in the yokes:	_				
6.2	At rated voltage	T	Insert			
	At 105 % of the rated voltage	Т	Insert			
	Maximum current density in windings at rated					
6.3	power and normal tap changer position:	A/mm ²	Insert			
	HV winding	A/mm ²	Insert			
	MV winding					
	Winding resistance at 75°C and middle tap					
6.4	changer position:	Ω	Insert			
	HV winding	Ω	Insert			
	MV winding					
6.5	Core construction					
6.5.1	Method of joining of legs		Insert			
6.5.2	Method of joining of yokes		Insert			
6.5.3	Joining material		Insert			
6.5.4	Number of legs		Insert			
6.5.5	Type of core steel		Insert			
6.5.6	Specific loss of core steel at 1.7 T inductance	W/kg	< 1.11			
6.6	Winding conductor					
6.6.1	HV winding		Cu - 'Interleaved'			
			Cu - 'Interleaved' / 'disc'			
6.6.2	MV winding		- transposed, cured in			
			epoxy coating			
	Audible noise level (acc. to NEMA TR1), at					
6.7	105 % of rated voltage, at maximum power	dB	Insert			
	and with complete cooling system in service					
	Radio Interference Voltage at 0.5 MHz as		0500			
6.8	specified in IEC 60694	μV	2500 max			
7	Weights and dimensions		•			
	Total weight of transformer, equipped for ser-					
7.1	vice	kg	Insert			



		Minimum Requirements		
No.	Description	Unit	Data	Guaranteed
7.2	Core and oil assembly	kg	Insert	
7.3	Total mass excluding oil	kg	Insert	
7.4	Tank and accessories	kg	Insert	
7.5	Oil mass in tank	kg	Insert	
7.6	Oil mass in coolers	kg	Insert	
7.7	Oil mass total	kg	Insert	
7.8	Total mass	kg	Insert	
7.9	Maximum shipping weight (the heaviest item)	kg	Insert	
7.5	Height from foundation to:	Ng	moert	
	Highest point of HV bushing	mm	Insert	
	Highest point of the bushing Highest point of tank	mm	Insert	
7.10	Highest point of tank Highest point of conservator	mm	Insert	
	Highest point of conservator Highest point of lifting hook for removal of	mm	Insert	
	core and oil assembly		moore	
	Outer dimensions:			
7.11	Length	mm	Insert	
/	Width	mm	Insert	
7.12	Informative dimensional sketch		To be enclosed with bid	
7.12	Maximum shipping dimensions of tank:		To be cholosed with bid	
	Outside height	mm	Insert	
7.13	Outside width	mm	Insert	
	Outside length	mm	Insert	
7.14	Transportation drawing		To be enclosed with bid	
8	Tap changer	1	10 00 cholodod with bla	
8.1	Manufacturer		Insert	
8.2	Туре		Insert	
8.3	Insulation level	kV	Si 145	
8.4	Rated current	A	≥ 400	
8.5	Number of steps	- /\	17	
8.6	Regulating coil		Insert	
8.7	Short-circuit withstand	kA rms	Insert	
8.8	BIL to ground through the regulating coil	kV peak	Insert	
0.0	Power frequency withstand voltage for 1 mi-	KV peak	IIISCIT	
8.9	nute through the regulating coil	kV rms	Insert	
	Trace arroagh are regulating con		Digital code matrix	
8.10	Tap position indicator		(BCD)	
8.11	Auxiliary supply		3x400 V / 230 V, 50 Hz	
9	Auxiliary power supply	1	UNTUU V / 230 V, 30 HZ	
9.1	Motors		3x400 V / 50 Hz	
	Heaters			
9.2 9.3			230 V / 50 Hz 110 V DC	
	Control voltage	+	İ	
9.4 10	Oil pump Current transformer incorporated into the po	wor transfer	3x400 V / 50 Hz	
10	Current transformer incorporated into the po	wei lialisio		
10.4	CT in HV bushings, for protection, WTI and		In all phases, 3 cores Characteristics shall be	
10.1	Tap Changer		defined in design stage	
			denned in design stage	



		Minimum Daminomanta				
No.	Description		mum Requirements	Guaranteed		
		Unit	Data			
10.2	CT in MV bushings, for protection, WTI and		In all phases, 3 cores Characteristics shall be			
10.2	Tap Changer		defined in design stage			
11	Layout		defined in design stage			
11.1	Primary winding bushings		Longitudinal axis			
11.1	Trimary winding businings		Longitudinal axis (oppo-			
11.2	Secondary winding bushings		site to HV)			
			To be defined in design			
11.3	Conservator tank		stage			
			To be defined in design			
11.4	Tap changer		stage			
			To be defined in design			
11.5	Control cabinet		stage			
			To be defined in design			
11.6	Coolers		stage			
11.7	Connection drawing, block diagram		To be enclosed with bid			
12	Cooling groups	•				
12.1	Number of cooling groups (total)	Qty.	4			
12.2	Number of cooling groups (for rated power)	Qty.	3			
12.3	Number of stand-by cooling groups	Qty.	1			
12.4	Number of coolers in a cooling group	Qty.	Insert			
12.5	Number of spare fans	Qty.	Insert			
12.6	Rating of each cooler	kW	Insert			
12.7	Full vacuum withstand of complete cooler	mbar	YES			
13	Dehydrating breather					
13.1	Type of dehydrating breather		Insert			
13.2	Dehumidifying agent	kg	Insert			
14	Transformer tank					
14.1	Type of design					
	Thickness of transformer tank:					
440	Sides	mm	Insert			
14.2	Bottom	mm	Insert			
	• Top	mm	Insert			
14.3	Material of the autotransformer tank		Insert			
14.4	Wheels					
14.4.1	Wheel number for each rail of two pair rails		Two pairs			
14.4.2	Axial inter space in transversal direction be-	mm	4520			
14.4.2	tween two pairs of rails	mm	4020			
14.4.3	Transversal distance between wheels in pair	mm	1435			
14.4.4	Distance between wheels in longitudinal direc-	mm	1435			
14.4.4	tion	mm	1430			
14.5	Corrosion protection of the tank		YES			
14.6	Vacuum withstand of the complete tank with	mbar	1			
17.0	cooler	mbai	1			
14.7	Over-pressure withstand of the complete auto-	bar	0.3			
17.7	transformer	Dai	0.5			
15	Conservator	1	T	_		
15.1	Туре		With diagraph			



NI.	Paradiation	Minimum Requirements		0
No.	Description	Unit	Data	Guaranteed
15.2	Number of compartments	pcs.	2	
15.3	Total volume of conservator	m^3	Insert	
15.4	Minimum volume of conservator between highest and lowest levels as percentage of total cold oil at 0°C of the volume of autotransformer	%	Insert	
15.5	Pressure rise inside the tank due to oil expansion		Insert	
15.6	Diagraph design parameters: Maximum diagraph stress at highest working pressure Diagraph construction details Type of diagraph material		Insert Insert Insert	
15.7	Corrosion protection of conservator		Insert	
15.8	Oil level indicators with alarm for minimum oil level	pcs.	2	
16	Operating conditions			
16.1	At the altitude (above sea level)	m	≤ 1000	
16.2	Maximum ambient temperature	°C	+ 45	
16.3	Average daily temperature	°C	+ 35	
16.4	Average annual temperature	°C	+ 30	
16.5	Minimum ambient temperature	°C	- 5	
	Overall compliance with the requirements (yes/no)			



5.2.5 F: Auxiliary Transformers

5.2.5.1 F1: 33/0.415 kV 200 kVA Auxiliary Transformer

NI	Paradiation	Minimum Requirements		0
No.	Description	Unit	Data	Guaranteed
1	General			
1.1	Manufacturer		Insert	
			Power transformer	
			three-phase, oil im-	
1.2	Туре		mersed, two windings,	
1.2	Туре		without tertiary winding,	
			with off-load tap chang-	
			er, outdoor	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
1.5	Standards		IEC 60076	
1.6	Quality control		ISO 9001	
2	Ratings and properties			
2.1	Rated power:	kVA	200	
2.2	Type of cooling ONAN / ONAF	-	ONAN	
	Rated voltage of windings:			
2.3	MV winding	kV	34.5	
	LV winding	V	415	
	Tap changer:			
	Type of tap changing		Off-load	
2.4	Tapping range	%	±5	
2.4	Tapping step	% %	2.5	
	Rating	70	Rated power 200 kVA,	
			all taps	
2.5	Frequency	Hz	50	
2.6	Connection of three-phase windings (group of		ZNyn11	
2.0	vector IEC 60076)		ZINYIII I	
3	Special technical requirements			
3.1	Power transformer capacity to withstand exter-			
3.1	nal short circuits			
3.1.1	Short-circuit duration	S	3	
	Symmetrical short-circuit with-stand capacity			
	and asymmetrical short-circuit withstand ca-			
3.1.2	pacity during indicated period:			
	MV winding	kA	25	
	LV winding	kA	-	
3.2	Guaranteed losses			
3.2.1	No-load losses with tap changer in normal posi-	kW	Insert	
J.Z. I	tion, at rated voltage and rated frequency	IVAA	IIISCIL	
3.2.2	Tolerance to be applied to no-load losses in %	%	10	
J.Z.Z	of the guaranteed value	/0	10	



		Minim	Minimum Requirements		
No.	Description	Unit	Data	Guaranteed	
3.2.3	On-load losses at 75°C, at rated voltage and rated frequency, with tap changer in normal position	kW	Insert		
3.2.4	Tolerance to be applied to on-load losses in % on the guaranteed value	%	10		
3.3	Insulation level				
3.3.1	Medium voltage (MV)		LI 170 AC 70		
3.3.2	Low voltage (LV)		LI - AC 3		
3.4	The highest voltage for equipment (effective value)				
3.4.1	Medium voltage (MV)	kV	36		
3.4.2	Low voltage (LV)	kV	1.1		
3.5	Temperature rise limits, at rated power, with complete cooling system in service and at lowest voltage tap				
3.5.1	Top oil	K	≤ 50		
3.5.2	Winding	K	≤ 55		
3.5.3	Hottest spot	K	≤ 65		
4	Oil				
4.1	New		Insert		
4.2	Manufacturer		Insert		
4.3	Туре		Insert		
4.4	Standard		IEC 60296		
4.5	Minimum flash point	°C	Insert		
4.6	Viscosity at 20°C	mm²/s	Insert		
4.7	Maximum dielectric strength	kV/cm	Insert		
4.8	Data sheet attached		Insert		
4.9	Corrosive Sulphur		NO		
4.10	PCB content		Without PCB		
5	Bushing				
5.1	MV bushing (36 kV)				
5.1.1	Quantity		3 + 1		
5.1.2	Class	kV	36		
5.1.3	Manufacturer		Insert		
5.1.4	Туре		Insert		
5.1.5	Rated current	Α	≥ 100		
5.1.6	Rated short circuit current (3 s)	kA rms	25		
5.1.7	Rated lightning impulse withstand voltage	kV peak	170		
5.1.8	Rated switching impulse withstand voltage	kV peak	N.A.		
5.1.9	Rated power frequency withstand voltage	kV rms	70		
5.1.10	Minimum creepage distance (25 mm/kV)	mm/kV	≥ 25 mm/kV		
5.2	LV bushings (3 kV)				
5.2.1	Quantity	137	3 + 1		
5.2.2	Class	kV	3		
5.2.3	Manufacturer		Insert		
5.2.4	Type	Δ.	Insert		
5.2.5	Rated current	Α	≥ 400		



		Minimum Requirements		
No.	Description	Unit	Data	Guaranteed
5.2.6	Rated short-circuit current (3 s)	kA rms	-	
5.2.7	Rated lightning impulse withstand voltage	kV peak	N.A.	
5.2.8	Rated switching impulse withstand voltage	kV peak	-	
5.2.9	Rated power frequency withstand voltage	kV rms	3	
5.2.10	Minimum creepage distance (25 mm/kV)	mm/kV	≥ 25 mm/kV	
6	Design data	IIIII/KV	2 25 HIII/KV	
6.1	Maximum flux density, at rated voltage	TT	Insert	
0.1	Maximum current density in windings at rated	11	IIISEIT	
	power and normal tap changer position:			
6.2	MV winding	A/mm ²	< 4	
	LV winding	A/mm ²	< 4	
	Winding resistance at 75°C and middle tap			
	changer position:			
6.4	MV winding	Ω	Insert	
	LV winding	Ω	Insert	
7	Weights and dimensions			
•	Total weight of transformer, equipped for ser-			
7.1	vice	kg	Insert	
	Height from foundation to highest point of HV			
7.10	bushing	mm	Insert	
	Outer dimensions:			
7.11		mm	Insert	
7.11	Length Width	mm		
7.12	Informative dimensional sketch	mm	Insert To be enclosed with bid	
7.12			To be enclosed with bid	
	Maximum shipping dimensions of tank: • Outside height	mm	Insert	
7.13	Outside width		Insert	
	Outside length	mm	Insert	
711		mm	To be enclosed with bid	
7.14 8	Transportation drawing		To be enclosed with bid	
8.1	Dehydrating breather		Inport	
	Type of dehydrating breather	l.m	Insert	
8.2	Dehumidifying agent	kg	Insert	
9	Conservator		\\/ith_alaborale=tic=e	
9.1	Туре		With dehydrating	
0.0	Number of compositions at a		breather	
9.2	Number of compartments	pcs.	1	
9.3	Total volume of conservator	m ³	Insert	
9.8	Oil level indicators with alarm for minimum oil	pcs.	1	
	level	<u> </u>		
10	Operating conditions		1,1000	
10.1	At the altitude (above sea level)	m °C	≤ 1000	
10.2	Maximum ambient temperature	°C	+ 45	
10.3	Average daily temperature	°C	+ 35	
10.4	Average annual temperature	°C	+ 30	
10.5	Minimum ambient temperature	°C	– 5	
	Overall compliance with the requirements (ye	es/no)		



5.2.5.2 F2: 33/0.415 kV 200 kVA Auxiliary Transformer

		Mini	mum Requirements	Cuerenteed
No.	Description	Unit	Data	Guaranteed
1	General			
1.1	Manufacturer		Insert	
			Power transformer	
			three-phase, oil im-	
4.0	Time		mersed, two windings,	
1.2	Туре		without tertiary winding,	
			with off-load tap chang-	
			er, outdoor	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
1.5	Standards		IEC 60076	
1.6	Quality control		ISO 9001	
2	Ratings and properties			
2.1	Rated power:	kVA	200	
2.2	Type of cooling ONAN / ONAF	-	ONAN	
	Rated voltage of windings:			
2.3	MV winding	kV	34.5	
	LV winding	V	415	
	Tap changer:			
	Type of tap changing		Off-load	
	Tapping range		±5	
2.4	Tapping step	%	2.5	
	Rating	%	Rated power 200 kVA,	
			all taps	
2.5	Frequency	Hz	50	
	Connection of three-phase windings (group of		5 44	
2.6	vector IEC 60076)		Dyn11	
3	Special technical requirements			
0.4	Power transformer capacity to withstand exter-			
3.1	nal short circuits			
3.1.1	Short-circuit duration	S	3	
	Symmetrical short-circuit with-stand capacity			
	and asymmetrical short-circuit withstand ca-			
3.1.2	pacity during indicated period:			
	MV winding	kA	25	
	LV winding	kA	-	
3.2	Guaranteed losses			
204	No-load losses with tap changer in normal posi-	121	lnc s #	
3.2.1	tion, at rated voltage and rated frequency	kW	Insert	
200	Tolerance to be applied to no-load losses in %	0/	40	
3.2.2	of the guaranteed value	%	10	
	On-load losses at 75°C, at rated voltage and			
3.2.3	rated frequency, with tap changer in normal po-	kW	Insert	
	sition			
224	Tolerance to be applied to on-load losses in %	0/	10	
3.2.4	on the guaranteed value	%	10	



		Minimu	Minimum Requirements	
No.	Description	Unit	Data	Guaranteed
3.3	Insulation level			
3.3.1	Medium voltage (MV)		LI 170 AC 70	
3.3.2	Low voltage (LV)		LI - AC 3	
	The highest voltage for equipment (effective		21 710 0	
3.4	value)			
3.4.1	Medium voltage (MV)	kV	36	
3.4.2	Low voltage (LV)	kV	1.1	
	Temperature rise limits, at rated power, with			
3.5	complete cooling system in service and at low-			
	est voltage tap			
3.5.1	Top oil	К	≤ 50	
3.5.2	Winding	К	≤ 55	
3.5.3	Hottest spot	К	≤ 65	
4	Oil			
4.1	New		Insert	
4.2	Manufacturer		Insert	
4.3	Туре		Insert	
4.4	Standard		IEC 60296	
4.5	Minimum flash point	°C	Insert	
4.6	Viscosity at 20°C	mm²/s	Insert	
4.7	Maximum dielectric strength	kV/cm	Insert	
4.8	Data sheet attached		Insert	
4.9	Corrosive Sulphur		NO	
4.10	PCB content		Without PCB	
5	Bushing			
5.1	MV bushing (36 kV)			
5.1.1	Quantity		3 + 1	
5.1.2	Class	kV	36	
5.1.3	Manufacturer		Insert	
5.1.4	Туре		Insert	
5.1.5	Rated current	А	≥ 100	
5.1.6	Rated short circuit current (3 s)	kA rms	25	
5.1.7	Rated lightning impulse withstand voltage	kV peak	170	
5.1.8	Rated switching impulse withstand voltage	kV peak	N.A.	
5.1.9	Rated power frequency withstand voltage	kV rms	70	
5.1.10	Minimum creepage distance (25 mm/kV)	mm/kV	≥ 25 mm/kV	
5.2	LV bushings (3 kV)			
5.2.1	Quantity		3 + 1	
5.2.2	Class	kV	3	
5.2.3	Manufacturer		Insert	
5.2.4	Туре		Insert	
5.2.5	Rated current	А	≥ 400	
5.2.6	Rated short-circuit current (3 s)	kA rms	-	
5.2.7	Rated lightning impulse withstand voltage	kV peak	N.A.	
5.2.8	Rated switching impulse withstand voltage	kV peak	-	
5.2.9	Rated power frequency withstand voltage	kV rms	3	
5.2.10	Minimum creepage distance (25 mm/kV)	mm/kV	≥ 25 mm/kV	



		Mini	mum Requirements	
No.	Description	Unit	Data	Guaranteed
6	Design data	•		
6.1	Maximum flux density, at rated voltage	TT	Insert	
	Maximum current density in windings at rated			
	power and normal tap changer position:		,	
6.2	MV winding	A/mm ² A/mm ²	< 4	
	LV winding	A/mm	< 4	
	Winding resistance at 75°C and middle tap			
6.4	changer position:	Ω	Insert	
0.4	MV winding	Ω	Insert	
	LV winding	12	IIISEIT	
7	Weights and dimensions			
7.1	Total weight of transformer, equipped for ser-	ka	Insert	
7.1	vice	kg	insert	
7.10	Height from foundation to highest point of HV	mm	Insert	
7.10	bushing	mm	IIISEIT	
	Outer dimensions:			
7.11	Length	mm	Insert	
	Width	mm	Insert	
7.12	Informative dimensional sketch		To be enclosed with bid	
	Maximum shipping dimensions of tank:			
7.13	Outside height	mm	Insert	
7.15	Outside width	mm	Insert	
	Outside length	mm	Insert	
7.14	Transportation drawing		To be enclosed with bid	
8	Dehydrating breather	T		
8.1	Type of dehydrating breather		Insert	
8.2	Dehumidifying agent	kg	Insert	
9	Conservator	T	T	
9.1	Туре		With dehydrating	
3.1	Туре		breather	
9.2	Number of compartments	pcs.	1	
9.3	Total volume of conservator	m ³	Insert	
9.8	Oil level indicators with alarm for minimum oil	pcs.	1	
3.0	level	pcs.	1	
10	Operating conditions	T		
10.1	At the altitude (above sea level)	m	≤ 1000	
10.2	Maximum ambient temperature	°C	+ 45	
10.3	Average daily temperature	°C	+ 35	
10.4	Average annual temperature	°C	+ 30	
10.5	Minimum ambient temperature	°C	- 5	
	Overall compliance with the requirements (ye	es/no)		



5.2.6 G-P: Control, Relay Protection, Substation Automation System & Metering

All auxiliary equipment such as MCBs, heaters, lighting, AC sockets, terminals, auxiliary relays, wiring and necessary electrical/optical converters for communication, etc. shall be foreseen

Enough auxiliary relays/contactors for OHL/transformer/busbar protection shall be foreseen and delivered as built-in elements in the cubicles.

The central unit for busbar protection must be supported for min. 16 bays.

The design proposal of the cubicles is subject of approval.

The cubicles shall be delivered completely wired and tested.

5.2.6.1 14291 - Control Cubicle for OHL & Bus Coupler

Na	Description	Minimu	um Requirements Data Guarant	Currenteed
No.	Description	Unit		Guaranteed
14291	Control Cubicle for OHL & Bus Couplers with Switch / Co	ode numb	per: 14291	
1.1	Control cubicle for OHL & bus couplers with LAN switch			
1.1.1	Bay control unit for OHL & bus couplers (Code: 14251)	pcs.	1	
1.1.2	Back-up control panel (Code: 14254)	pcs.	1	
1.1.3	Front panel annunciation for OHL & TR (Code: 14255)	pcs.	1	
1.1.4	Ethernet switch-process LAN (Code: 14273)	pcs.	1	
1.2	Other equipment (specify if any)		Insert	
	Overall compliance with the requirements (yes/no)			

5.2.6.2 14292 - Control Cubicle for Power Transformers HV Side

Na	Description	Minimu	um Requirements Data Guarante	Cuarantaad
No.	Description	Unit		Guaranteed
14292	Control Cubicle for Power Transformers HV Side with LA	N Switch	/ Code number: 14	1292
1.1	Control cubicle for power transformers HV side with LAN swi	tch		
1.1.1	Bay control unit for power transformers HV & LV (Code: 14252)	pcs.	1	
1.1.2	Back-up control panel (Code: 14254)	pcs.	1	
1.1.3	Front panel annunciation for OHL & TR (Code: 14255)	pcs.	1	
1.1.4	Ethernet switch process LAN (Code: 14273)	pcs.	1	
1.2	Other equipment (specify if any)		Insert	
	Overall compliance with the requirements (yes/no)			



Bangladesh: Tender Documents for 230/132 kV and 132/33 kV Substations, Northern Zone Contract No. PGCB/KfW/2012.66.436/NZSS

5.2.6.3 14293 - Control Cubicle for Power Transformers LV Side

Nie	Paradiation.	Minimu	um Requirements	Cuerenteed
No.	Description	Unit	Data	Guaranteed
14293	GENERAL (Control Cubicle for Power Transformers LV S	Side / Cod	de number: 14293)	
1.1	Control cubicle for power transformers LV side			
1.1.1	Bay control unit for power transformers HV&LV (Code: 14252)	pcs.	1	
1.1.2	Back-up control panel (Code: 14254)	pcs.	1	
1.1.3	Front panel annunciation for OHL & TR (Code: 14255)	pcs.	1	
1.1.4	Ethernet switch-process LAN (Code: 14273)	pcs.	1	
1.1.5	AVR (Code: 14008)	pcs.	1	
1.2	Other equipment (specify if any)		Insert	
	Overall compliance with the requirements (yes/no)			

5.2.6.4 14294 - Control Cubicle for LV AC & DC Switchgear

No	Description	Minim	um Requirements	Cuarantaad
No.	Description	Unit	Data	Guaranteed
14294	Control Cubicle for LV AC & DC SWG / Code number: 1	4294		
1.1	Control cubicle for LV AC&DC SWG			
1.1.1	Bay control unit for LV AC&DC SWG (Code: 14253)	pcs.	4	
1.1.2	Front panel annunciation for control room (Code: 14256)	pcs.	1	
1.1.3	Weather station interface unit item (Code: 14272-item 1.2.5)	pcs.	1	
1.1.4	Horn on/off switch		Yes	
	Overall compliance with the requirements (yes/no))		

5.2.6.5 14295 - Control Cubicle for SCADA Server

No	Description.	Minimu	ım Requirements	Currenteed
No.	Description	Unit	Data	Guaranteed
14295	Control Cubicle for SCADA Server / Code number: 14295	;		
1.1	Cubicle for SCADA servers			
1.1.1	SCADA server (Code: 14261)	pcs.	2	
1.1.2	Ethernet switch-process LAN (Code: 14273)	pcs.	2	
1.1.3	Ethernet switch-control room LAN (Code: 14274)	pcs.	2	
1.1.4	Time synchronisation device (GPS) (Code: 14271)	pcs.	2	
	Overall compliance with the requirements (yes/no)			



5.2.6.6 14101 - Protection Cubicle No. 1 for 230 kV OHL

Nia	Description	Minin	num Requirements	Guarantood
No.	Description	Unit	Data	Guaranteed
14101	Protection Cubicle No. 1 for 230 kV OHL / Code number	: 14101		
1.1	Protection cubicle No. 1 for 230 kV OHL			
1.1.1	Protection terminal for 230 kV OHL - Main 1 (Code: 14001)	pcs.	1	
1.1.2	Trip circuit supervision relay (Code: 14011)	pcs.	3	
1.1.3	Tripping unit (Code: 14012)	pcs.	4 (To be confirmed with detailed design)	
1.1.4	Test socket (Code: 14013)	pcs.	1	
	Overall compliance with the requirements (yes/no)			

5.2.6.7 14102 - Protection Cubicle No. 2 for 230 kV OHL

Na	Description	Minim	um Requirements	Guaranteed
No.	Description	Unit	Data	
14102	Protection Cubicle No. 2 for 230 kV OHL / Code number:	14102		
1.1	Protection cubicle No. 2 for 230 kV OHL			
1.1.1	Protection terminal for 230 kV OHL - Main 2 (Code: 14002)	pcs.	1	
1.1.2	Busbar & breaker failure protection bay unit (Code: 14010)	pcs.	1	
1.1.3	Trip circuit supervision relay (Code: 14011)	pcs.	3	
1.1.4	Tripping unit (Code: 14012)	pcs.	4 (To be confirmed with detailed design)	
1.1.5	Test socket (Code: 14013)	pcs.	2	
	Overall compliance with the requirements (yes/no)			



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5.2.6.8 14103 - Protection Cubicle No. 3 for 132 kV OHL

N-	December 1	Minim	um Requirements	Cuarantaad
No.	Description	Unit	Data	Guaranteed
14103	Protection Cubicle No. 3 for 132 kV OHL / Code number:	14103		
1.1	Protection cubicle No. 3 for 132 kV OHL-Long			
1.1.1	Protection terminal for 132 kV OHL Main 1 (Code: 14003)	pcs.	1	
1.1.2	Protection terminal for 132 kV OHL Main 2 (Code: 14004)	pcs.	1	
1.1.3	Busbar & breaker failure protection bay unit (Code: 14010)	pcs.	1	
1.1.4	Trip circuit supervision relay (Code: 14011)	pcs.	6	
1.1.5	Tripping unit (Code: 14012)	pcs.	8 (To be confirmed with detailed design)	
1.1.6	Test socket (Code: 14013)	pcs.	3	
	Overall compliance with the requirements (yes/no)			

5.2.6.9 14104 - Protection Cubicle No. 4 for Power Transformer HV Side

No	Description	Minim	um Requirements	Cuerenteed
No.	Description	Unit	Data	Guaranteed
14104	Protection Cubicle No. 4 for Power Transformer HV Side	/ Code nu	umber: 14104)	
1.1	Protection cubicle No. 5 for Power Transformer HV Side			
1.1.1	Protection terminal for power transformer Main 1 (Code: 14005)	pcs.	1	
1.1.2	Busbar & breaker failure protection bay unit (Code: 14010)	pcs.	1	
1.1.3	Trip circuit supervision relay (Code: 14011)	pcs.	6	
1.1.4	Tripping unit (Code: 14012)	pcs.	4 (To be confirmed with detailed design)	
1.1.5	Test socket (Code: 14013)	pcs.	2	
	Overall compliance with the requirements (yes/no)			

5.2.6.10 14105 - Protection Cubicle No. 5 for Power Transformer LV Side

No	Description	Minim	um Requirements	Cuarantaad
No.	Description	Unit	Data	Guaranteed
14105	Protection Cubicle No. 5 for Power Transformer LV Side /	Code nu	mber: 14105	
1.1	Protection cubicle No. 5 for Power Transformer LV Side			
1.1.1	Protection terminal for power transformer Main 2 (Code:	pcs.	1	
	14006)	P 00.	•	
1.1.2	Protection terminal for power transformer LV Side (Code:	pcs.	1	
1.1.2	14007)	p00.	'	



No	Description	Minim	um Requirements	Cuarantand
No.	Description	Unit	Data	Guaranteed
1.1.3	Busbar & breaker failure protection bay unit (Code: 14010)	pcs.	1	
1.1.4	Trip circuit supervision relay (Code: 14011)	pcs.	2	
			3	
1.1.5	Tripping unit (Code: 14012)	pcs.	(To be confirmed	
			with detailed design)	
1.1.6	Test socket (Code: 14013)	pcs.	3	
	Overall compliance with the requirements (yes/no)			

5.2.6.11 14106 - Protection Cubicle No. 6 for Bus Couplers 230 kV & 132 kV

No.	Description	Minim	um Requirements	Guaranteed
	Description	Unit	Data	
14106	Protection Cubicle No. 6 for Bus couplers 230 kV & 132 k	V / Code	number: 14106	
1.1	Protection cubicle No. 6 for bus couplers 230 kV & 132 kV			
1.1.1	Protection terminal for bus couplers 230 kV & 110 kV (Code: 14009)	pcs.	1	
1.1.2	Busbar & breaker failure protection central unit (Code: 14010)	pcs.	2	
1.1.3	Trip circuit supervision relay (Code: 14011)	pcs.	2	
1.1.4	Tripping unit (Code: 14012)	pcs.	2 (To be confirmed with detailed de- sign)	
1.1.5	Test socket (Code: 14013)	pcs.	2	
	Overall compliance with the requirements (yes/no)			

5.2.6.12 14251 - Bay Control Unit for OHL and Bus Couplers

Na	Description	Minin	0		
No.		Unit	Data	Guaranteed	
14251	Bay Control Unit for OHL and Bus Couplers / Code number: 14251				
1.1	Manufacturer		Insert		
1.2	Country of origin		Insert		
1.3	Terminal type		Insert		
1.4	Terminal version (software version)		Insert		
1.5	Standards		IEC		
2	Characteristics				
2.1	Auxiliary supply voltage				
2.1.1	Rated auxiliary supply voltage	V d.c.	110 ±15 %		
	Interruption in auxiliary d.c. voltage:				
2.1.2	Without resetting	ms	> 50		
	Restart time	S	Insert		



No.	Description		num Requirements	Guaranteed
		Unit	Data	
2.2	a.c. current inputs			
2.2.1	Number of inputs	_	Min. 4	
2.2.2	Rated current Ir	A	1	
2.2.3	Permissive overload, continuous		4xlr	
	Permissive overload, 1 s		100xlr	
2.2.5		VA	< 0.5	
2.3	a.c. voltage inputs			
2.3.1	Number of inputs		Min. 4	
2.3.2	Rated voltage Ph-Ph Ur	V	100	
2.3.3	Permissive overload, continuous	% Ur	150	
2.3.4	Permissive overload, 1 s	% Ur	250	
2.3.5	Burden at Ur	VA	< 0.3	
2.4	Binary inputs		Min. 45	
2.4.1	Number of BI groups with common root		Max. 4	
2.4.2	Number of inputs per BI group with common		Max. 8	
2.4.2	root		IVIAX. O	
2.4.3	Rated voltage	V d.c.	110	
2.5	Binary outputs		Min. 24	
2.5.1	Number of BO with common contact		Max. 4	
2.5.2	Rated voltage	V d.c.	110	
2.5.3	Breaking capacity at inductive load with		0.4	
2.5.3	L/R<40 ms, at rated voltage	А	0.1	
2.5.4	Current carrying capacity at rated voltage for signalling contacts, continuous	А	Insert	
2.5.5	Number of tripping contacts (high-speed out-	pcs.	Insert	
	put)	-		
2.5.6	Current carrying capacity at rated voltage for tripping contacts, continuous	А	5	
2.6	LED indications			
2.6.1	Number of LED's		Min. 16	
2.6.2	Multi-colour LED's	Yes/No	Insert	
2.7	Communication ports		Yes	
2.7.1	Port for front-connected PC			
2.7.1.1	Protocols supported		Insert	
2.7.1.2	Communication speed	Kbit/s	Insert	
2.7.1.3	PC side connector type		Insert	
	System interface			
	Number of rear ports		2	
	Protocols supported		IEC 61850	
	Communication speed	Mbit/s	Min. 100	
	Connector type		RJ45 or FO	
	Time synchronisation		SNTP	
2.8	Human-machine interface			
	HMI with single line diagram, measurement,			
2.8.1	signalling and control		Yes	
2.9	Synchronism & energising check			
2.9.1	Frequency difference range	mHz.	Insert	



NI-	Description	Minin		
No.		Unit	Data	Guaranteed
2.9.2	Voltage difference range	% Ur	Insert	
2.9.3	Phase difference range	o	Insert	
2.9.4	Operating time for synchro check function	ms	Insert	
2.9.5	Operating time for energising check function	ms	Insert	
2.10	Event recorder			
2.10.1	Max. number of events		Insert	
2.10.2	Time tagging resolution	ms	1	
2.11	Self-supervision		Yes	
2.12	Measurement			
2.12.1	Active power measurement		Yes	
2.12.2	Reactive power measurement		Yes	
2.12.3	Energy measurement		Yes	
2.12.4	Voltage measurement		Yes	
2.12.5	Frequency measurement		Yes	
2.12.6	Current measurement		Yes	
Overall compliance with the requirements (yes/no)				

Bay Control Units must be from the same manufacturer as substation protection system. Bay Control Units must be parameterized, configured and delivered as per Engineer's requirements.



5.2.6.13 14252 - Bay Control Unit for Power Transformers HV & LV

N.a.	Deceriation	Minimum Requirements		Cuerenteed	
No.	Description	Unit	Data	Guaranteed	
14252	Bay Control Unit for Power Transformers HV&LV / Code number: 14252				
1.1	Manufacturer		Insert		
1.2	Country of origin		Insert		
1.3	Terminal type		Insert		
1.4	Terminal version (software version)		Insert		
1.5	Standards		IEC		
2	Characteristics				
2.1	Auxiliary supply voltage				
2.1.1	Rated auxiliary supply voltage	V d.c.	110 ±15 %		
	Interruption in auxiliary d.c. voltage:				
2.1.2	Without resetting	ms	> 50		
	Restart time	S	Insert		
2.2	a.c. current inputs				
2.2.1	Number of inputs		Min. 4		
2.2.2	Rated current Ir	Α	1		
2.2.3	Permissive overload, continuous		4xlr		
2.2.4	Permissive overload, 1 s		100xlr		
2.2.5	Burden at Ir	VA	< 0.5		
2.3	a.c. voltage inputs				
2.3.1	Number of inputs		Min. 4		
2.3.2	Rated voltage Ph-Ph Ur	V	100		
2.3.3	Permissive overload, continuous	% Ur	150		
2.3.4	Permissive overload, 1 s	% Ur	250		
2.3.5	Burden at Ur	VA	< 0.3		
2.4	mA inputs				
2.4.1	Number of mA inputs	pcs.	Min. 2		
2.4.2	Input range		4-20 mA		
2.5	Binary inputs		Min. 45		
2.5.1	Number of BI groups with common root		Max. 4		
2.5.2	Number of inputs per BI group with common root		Max. 8		
2.5.3	Rated voltage	V d.c.	110		
2.6	Binary outputs		Min. 24		
2.6.1	Number of BO with common contact		Max. 4		
2.6.2	Rated voltage	V d.c.	110		
2.6.3	Breaking capacity at inductive load with L/R<40 ms, at rated voltage	Α	0.1		
2.6.4	Current carrying capacity at rated voltage for	А	Insert		
205	signalling contacts, continuous				
2.6.5	Number of tripping contacts (high-speed output)	pcs.	Insert		
2.6.6	Current carrying capacity at rated voltage for tripping contacts, continuous	Α	5		
2.7	LED indications				
2.7	Number of LED's		Min 16		
2.7.1		Yes/No	Min. 16		
2.7.2	Multi-colour LED's	I 62/INO	Insert		



NI-	Description	Minim	0	
No.		Unit	Data	Guaranteed
2.8	Communication ports		Yes	
2.8.1	Port for front-connected PC			
2.8.1.1	Protocols supported		Insert	
2.8.1.2	Communication speed	Kbit/s	Insert	
2.8.1.3	PC side connector type		Insert	
2.8.2	System interface			
2.8.2.1	Number of rear ports		2	
2.8.2.2	Protocols supported		IEC 61850	
2.8.2.3	Communication speed	Mbit/s	Min. 100	
2.8.2.4	Connector type		RJ45 or FO	
2.8.3	Time synchronisation		SNTP	
2.9	Human-machine interface			
2.9.1	HMI with single line diagram, measurement, signalling and control		Yes	
2.10	Synchronism & energising check			
2.10.1	Frequency difference range	mHz.	Insert	
2.10.2	Voltage difference range	% Ur	Insert	
2.10.3	Phase difference range	0	Insert	
2.10.4	Operating time for synchro check function	ms	Insert	
2.10.5	Operating time for energising check function	ms	Insert	
2.11	Event recorder			
2.11.1	Max. number of events		Insert	
2.11.2	Time tagging resolution	ms	1	
2.12	Self-supervision		Yes	
2.13	Measurement			
2.13.1	Active power measurement		Yes	
2.13.2	Reactive power measurement		Yes	
2.13.3	Energy measurement		Yes	
2.13.4	Voltage measurement		Yes	
2.13.5	Frequency measurement		Yes	
2.13.6	Current measurement		Yes	
	Overall compliance with the requirements (yes/no)			

Bay Control Units for Transformer HV & LV side must be from the same manufacturer as substation protection system. Bay Control Units for Transformer HV & LV side must be parameterized, configured and delivered as per Engineer's requirements.



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5.2.6.14 14253 - Bay Control Unit for LV AC & DC

Na	Description	Minimum Requirements		Cususutand	
No.	Description	Unit Da	Data	Guaranteed	
14253	Bay Control Unit for LV AC&DC -SWG / Code number: 14253				
1.1	Manufacturer		Insert		
1.2	Country of origin		Insert		
1.3	Terminal type		Insert		
1.4	Terminal version (software version)		Insert		
1.5	Standards		IEC		
2	Characteristics				
2.1	Auxiliary supply voltage				
2.1.1	Rated auxiliary supply voltage	V d.c.	110 ±15 %		
	Interruption in auxiliary d.c. voltage:				
2.1.2	Without resetting	ms	> 50		
	Restart time	S	Insert		
2.2	a.c. current inputs				
2.2.1	Number of inputs		Min. 3		
2.2.2	Rated current Ir	Α	5		
2.2.3	Permissive overload, continuous		4xlr		
2.2.4	Permissive overload, 1 s		100xlr		
2.2.5	Burden at Ir	VA			
2.3	a.c. voltage inputs				
2.3.1	Number of inputs		Min. 3		
2.3.2	Rated voltage Ph-Ph Ur	V	250		
2.3.3	Permissive overload, continuous	% Ur	150		
2.3.4	Permissive overload, 1 s	% Ur	250		
2.3.5	Burden at Ur	VA			
2.4	mA inputs				
2.4.1	Number of mA inputs	pcs.	Min. 4		
2.4.2	Input range		4-20 mA		
2.5	Binary inputs		Min. 45		
2.5.1	Number of BI groups with common root		Max. 4		
2.5.2	Number of inputs per BI group with common root		Max. 8		
2.5.3	Rated voltage	V d.c.	110		
2.6	Binary outputs		Min. 4		
2.6.1	Number of BO with common contact		Insert		
2.6.2	Rated voltage	V d.c.	110		
	Breaking capacity at inductive load with				
2.6.3	L/R<40 ms, at rated voltage	А	0.1		
2.6.4	Current carrying capacity at rated voltage for signalling contacts, continuous	Α	Insert		
2.6.5	Number of tripping contacts (high-speed output)	pcs.	Insert		
2.6.6	Current carrying capacity at rated voltage for tripping contacts, continuous	А	5		
2.7	LED indications				
1		1			



	Description	Minimu	Minimum Requirements	
No.		Unit	Data	Guaranteed
2.7.1	Number of LED's		Insert	
2.7.2	Multi-colour LED's	Yes/No	Insert	
2.8	Communication ports		Yes	
2.8.1	Port for front-connected PC			
2.8.1.1	Protocols supported		Insert	
2.8.1.2	Communication speed	Kbit/s	Insert	
2.8.1.3	PC side connector type		Insert	
2.8.2	System interface			
2.8.2.1	Number of rear ports		2	
2.8.2.2	Protocols supported		IEC 61850	
2.8.2.3	Communication speed	Mbit/s	Min. 100	
2.8.2.4	Connector type		RJ45 or FO	
2.8.3	Time synchronisation		SNTP	
2.9	Human-machine interface			
2.9.1	HMI with single line diagram, measurement,		Yes	
2.9.1	signalling and control			
2.10	Event recorder			
2.10.1	Max. number of events		Insert	
2.10.2	Time tagging resolution	ms	1	
2.11	Self-supervision		Yes	
2.12	Measurement			
2.12.1	Voltage measurement		Yes	
2.12.2	Frequency measurement		Yes	
2.12.3	Current measurement		Yes	
	Overall compliance with the requirements (yes/no)			

Bay Control Units must be from the same manufacturer as substation protection system. Bay Control Units must be parameterized, configured and delivered as per Engineer's requirements.



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5.2.6.15 14254 - Back-Up Control Panel

	B tut	Minimum Requirements		
No.	Description	Unit	Data	Guaranteed
14254	Back-up Control Panel / Code number: 14254			
1.1	Scheme elements			
1.1.1	Switch selector for HV apparatus	pcs.	1	
1.1.2	Close/open push buttons for HV apparatus		Yes	
1.1.3	Ammeter	pcs.	Min. 1	
1.1.4	Voltmeter	pcs.	1	
1.1.5	Voltmeter selector switch	pcs.	1	
1.1.6	Local/Remote switch		Yes	
1.1.7	Push button for lamp tests		Yes	
1.1.8	Switchgear status indicator		Yes	
1.1.9	Horn on/off switch		Yes	
	Overall compliance with the requirements (yes/no)			

- Back-up control panel must have single-line bay diagram with indicators for switchgear status and push buttons for switchgear control for every HV apparatus in the bay.
- Design proposal of the back-up control panel is subject to Engineer's approval
- Back-up control panels should be delivered completely wired and tested.

5.2.6.16 14255 - Front Panel Annunciation for OHL & Power Transformers

	B tut	Minimum Requirements	Cususutasal	
No.	Description	Unit	Data	Guaranteed
14255	Front Panel annunciation for OHL & TR / Code i	number: 14	255	
1.1	Panel mounting		Yes	
1.2	Number of inputs		Min. 16	
1.3	Contact type		NO/NC	
1.4	Galvanic isolation		Yes	
	Self-monitoring			
1.5	via front indication		Yes	
	via relay contact			
1.6	Response delay time		Adjustable	
1.7	Bright LED technology		Yes	
1.8	Audible device output		Yes	
1.9	Lamp test button		Yes	
1.10	Acknowledgement button		Yes	
1.11	Horn acknowledgement button		Yes	
	Overall compliance with the requirements (yes/	no)		

Front panel annunciation must be parameterised, configured and delivered as per Engineer's requirements.



5.2.6.17 14256 - Front Panel Annunciation for Control Room

N	B	Minin	num Requirements	
No.	Description	Unit	Data	Guaranteed
14256	Front Panel annunciation for Control Room /	Code numb	er: 14256	
1.1	Panel mounting		Yes	
1.2	Number of inputs		Min. 48	
1.3	Contact type		NO/NC	
1.4	Galvanic isolation		Yes	
1.5	Self-monitoringvia front indicationvia relay contact		Yes	
1.6	Response delay time		Adjustable	
1.7	Bright LED technology		Yes	
1.8	Audible device output		Yes	
1.9	Lamp test button		Yes	
1.10	Acknowledgement button		Yes	
1.11	Horn acknowledgement button		Yes	
	Overall compliance with the requirements (yes/no)			

Front panel annunciation must be parameterised, configured and delivered as per Engineer's requirements.

5.2.6.18 14261 - SCADA Server

Nie	Description.	Minim	num Requirements	0
No.	Description	Unit	Data	Guaranteed
14261	SCADA Server / Code number: 14261			
1.1	Manufacturer		Insert	
1.2	Country of origin		Insert	
1.3	Туре		Insert	
1.4	Standards		IEC	
1.5	Type of housing		Industrial 19" rack	
2	Characteristics			
2.1	Auxiliary supply voltage			
2.1.1	Rated auxiliary supply voltage	V d.c.	110 ±15 %	
2.1.2	Dual power supply		Yes	
2.2	Processor type		Insert	
2.3	Processor clock	GHz	Insert	
2.4	Memory type		Insert	
2.5	Memory capacity	MB	Insert	
2.6	Video display adapter type		Insert	
2.7	Video display adapter memory		Insert	
2.8	Hard disc type		Insert	
2.9	Rotating hard disc	Yes/No	Insert	
2.10	Hard disc capacity	GB	Insert	
2.11	Number of hard discs	pcs.	Insert	



	B tut	Minimu	Minimum Requirements		Minimum Requirements	
No.	Description	Unit	Data	Guaranteed		
2.12	RAID controller type		Insert			
2.13	DVD RW type		Insert			
2.14	Serial interface RS232		Yes			
2.15	Number of serial interfaces		Min. 2			
2.16	Fast Ethernet network interface card type		Insert			
2.17	Number of fast Ethernet network interface cards	pcs.	4			
2.18	Fans	Yes/No	Insert			
2.19	Monitor 19"	pcs.	1			
2.19.1	Manufacturer		Insert			
2.19.2	Country of origin		Insert			
2.19.3	Туре		TFT			
2.19.4	Standards		IEC			
2.19.5	Supply voltage					
2.19.5.1	Rated auxiliary supply voltage	V a.c.	110 ±15 %			
2.19.5.2	Power consumption	W	Insert			
2.20	Vertical frequency	Hz	Insert			
2.21	Max. resolution		Insert			
Overall compliance with the requirements (yes/no)						

SCADA servers must be in hot-standby redundant configuration.



5.2.6.19 14262- Operator Workstation

		Minin	Minimum Requirements		
No.	Description	Unit	Data	Guaranteed	
14262	Operator Workstation / Code number: 14262				
1.1	Manufacturer		Insert		
1.2	Country of origin		Insert		
1.3	Туре		Insert		
1.4	Standards		IEC		
1.5	Type of housing		Insert		
2	Characteristics				
2.1	Auxiliary supply voltage				
2.1.1	Rated auxiliary supply voltage	V d.c.	110 ±15 %		
2.2	Processor type	v u.o.	Insert		
2.3	Processor clock	GHz	Insert		
2.4	Memory type	OFFE	Insert		
2.5	Memory capacity	MB	Insert		
2.6	Video display adapter type	IVID	Dual head capability		
2.7	Video display adapter type Video display adapter memory	MB	Insert		
2.8	Hard disc type	IVID	Insert		
2.9	Rotating hard disc	Yes/No	Insert		
2.10	Hard disc capacity	GB	Insert		
2.11	Number of hard discs	pcs.	Insert		
2.12	RAID controller type	ροσ.	Insert		
2.13	DVD RW type		Insert		
2.14	Sound card type		Insert		
2.15	Fast Ethernet network interface card type		Insert		
2.16	Number of fast Ethernet network interface cards	pcs.	4		
2.17	Fans	Yes/No	Insert		
2.18	Monitor 24"	pcs.	2		
2.18.1	Manufacturer		Insert		
2.18.2	Country of origin		Insert		
2.18.3	Туре		TFT		
2.18.4	Standards		IEC		
2.18.5	Supply voltage		-		
2.18.5.1	Rated auxiliary supply voltage	V a.c.	110 ±15 %		
2.18.5.2	Power consumption	W	Insert		
2.19	Visible diagonal	II .	Insert		
2.20	Vertical frequency	Hz	Insert		
2.21	Max. resolution		Insert		
	Overall compliance with the requirements (yes/no)				



5.2.6.20 14263 - Printer

Ma	December 1	Minin	linimum Requirements	0
No.	Description	Unit	Data	Guaranteed
14263	Printer / Code number: 14263			
1.1	Manufacturer		Insert	
1.2	Model		Insert	
1.3	Country of origin		Insert	
1.4	Standards		IEC / ISO	
2	Characteristics			
2.1	Auxiliary supply voltage			
2.1.1	Rated auxiliary supply voltage	V d.c.	110 ±15 %	
2.2	Туре		Colour laser	
2.3	Format		A4	
2.4	Resolution	dpi	Insert	
2.5	Memory	MB	Insert	
2.6	Parallel port	Yes/No	Insert	
2.7	Fast Ethernet port		Yes	
2.8	USB port	Yes/No	Insert	
2.9	Minimum speed	Page/min	Insert	
	Overall compliance with the requirements (yes/no)			



5.2.6.21 14264- Monitoring Workstation

NI-	Donasis ties	Minim	num Requirements	Custontos d
No.	Description	Unit	Data	Guaranteed
14264	Monitoring Workstation / Code number: 14264	ļ		
1.1	Manufacturer		Insert	
1.2	Country of origin		Insert	
1.3	Туре		Insert	
1.4	Standards		IEC	
1.5	Type of housing		Insert	
2	Characteristics			
2.1	Auxiliary supply voltage			
2.1.1	Rated auxiliary supply voltage	V d.c.	110 ±15 %	
2.2	Processor type		Insert	
2.3	Processor clock	GHz	Insert	
2.4	Memory type		Insert	
2.5	Memory capacity	MB	Insert	
2.6	Video display adapter type		Insert	
2.7	Video display adapter memory	MB	Insert	
2.8	Hard disc type		Insert	
2.9	Rotating hard disc	Yes/No	Insert	
2.10	Hard disc capacity	GB	Insert	
2.11	Number of hard discs	pcs.	Insert	
2.12	RAID controller type		Insert	
2.13	DVD RW type		Insert	
2.14	Sound card type		Insert	
2.15	Serial interface RS232		Yes	
2.16	Fast Ethernet network interface card type		Insert	
2.17	Number of fast Ethernet network interface cards	pcs.	1	
2.18	Fans	Yes/No	Insert	
2.19	Monitor 24"	pcs.	1	
2.19.1	Manufacturer	•	Insert	
2.19.2	Country of origin		Insert	
2.19.3	Туре		TFT	
2.19.4	Standards		IEC	
2.19.5	Supply voltage			
2.19.5.1	Rated auxiliary supply voltage	V a.c.	110 ±15 %	
2.19.5.2		W	Insert	
2.20	Vertical frequency	Hz	Insert	
2.21	Max. resolution		Insert	
	Overall compliance with the requirements (yes	s/no)		



5.2.6.22 14271 - Time Synchronization Device

	B	Minim	mum Requirements	
No.	Description	Unit	Data	Guaranteed
14271	Time Synchronization Device / Code number:	14271		
1.1	Manufacturer		Insert	
1.2	Country of origin		Insert	
1.3	Туре		Insert	
1.4	Standards		IEC	
2	Characteristics			
2.1	Auxiliary supply voltage			
2.1.1	Rated auxiliary supply voltage	V d.c.	110 ±15 %	
2.2	Rack mounting case		Insert	
2.3	Synch. Pulse output, 1 min	Yes/No	Insert	
2.4	Fast Ethernet port / FO		Yes	
2.5	Serial port		Yes	
2.6	Protocol		NTP	
	Overall compliance with the requirements (yes/no)			



5.2.6.23 14272 - Weather Station

M-	De a suintiana	Minin	num Requirements	0
No.	Description	Unit	Data	Guaranteed
14272	Weather Station / Code number: 14272			
1.1	Terminal Type		Insert	
1.2	Terminal version (software version)		Insert	
1.3	Standards		IEC	
2	Characteristics			
2.1	Hygro-thermo transmitter with weather thermal radiation shield			
2.1.1	Input	°C	-40+60	
2.1.1.1	Output	mA	4-20	
2.1.1.2	Accuracy		1/3 Class B (±0.3 K)	
2.1.2	Input	% rel. h	0100	
2.1.2.1	Output	mA	4-20	
2.1.2.2	Accuracy	% rel. h	±3	
2.2	Wind transmitter	Yes/No		
2.2.1	Input	m/s		
2.2.2	Output	mA		
2.2.3	Accuracy	%		
2.3	Wind direction transmitter	Yes/No		
2.3.1	Input	0		
2.3.2	Output	mA		
2.3.3	Accuracy	0		
2.4	Baro transmitter	Yes/No		
2.4.1	Input	mbar		
2.4.2	Output	mA		
2.5	Interface unit		Yes	
2.6	Overvoltage protection		Yes	
2.7	Installation		Indoor	
	Overall compliance with the requirements (yes/no)			



5.2.6.24 14273- Ethernet Switch Process LAN

		Mini	mum Requirements	
No.	Description	Unit	Data	Guaranteed
14273	Ethernet Switch-Process LAN / Code number:	14273		
1.1	Terminal Type		Insert	
1.2	Terminal version (software version)		Insert	
1.3	Standards		IEC	
2	Characteristics			
2.1	Auxiliary supply voltage			
2.1.1	Rated auxiliary supply voltage	V d.c.	110 ±15 %	
2.1.2	Dual power supply		Yes	
2.2	Ethernet ports			
2.2.1	Number of ports		Min. 6xRJ45 or Min. 6xFO for IED con- nections AND 2xFO (1 GB) for process LAN	
2.2.1	Type of ports		RJ45 or FO and Fibre Optical (1 GB)	
2.3	Immunity to EMI and heavy electrical surges		Insert	
2.4	Temperature range			
2.4.1	Operation		050°C	
2.4.2	Storage		−20+70°C	
2.5	Switching method an layer		Store & Forward Layer 3 (IEC 61850), RSTP (802.1w); eRSTP [™] or RSTP (802.1D-2004) network fault recovery	
2.6	Switching latency		≤ 5µs	
2.7	Switching bandwidth		≤ 1.6 Gbps	
2.8	Failsafe output relay		Potential-free	
2.9	Cyber security features			
2.9.1	Multi-level passwords		Yes	
2.9.2	SSH/SSL encryption		Yes	
2.9.3	Enable/disable ports, MAC based port security		Yes	
2.9.4	Port based network access control		Yes	
2.10	System features			
2.10.1	Automatic learning negotiation and crossover detection			
2.10.2	Port configuration, status, statistics, mirroring, security			
2.10.3	Network fault recovery		≤ 5 ms	
2.11	Type Test Reports		To be included with bid	
2.12	Installation		Indoor	
	Overall compliance with the requirements	s (yes/no)		

Technical characteristics of optical ports of process LAN Ethernet switches must comply with appropriate characteristics of fibre optic cables for protection and control (see Code No. 14296).



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5.2.6.25 14274 - Ethernet Switch Control Room

Ma	Description	Description Minim	mum Requirements	Cususutas d
No.	Description	Unit	Data	Guaranteed
14274	Ethernet Switch-Control Room / Code number	r: 14274		
1.1	Terminal Type		Insert	
1.2	Terminal version (software version)		Insert	
1.3	Standards		IEC	
2	Characteristics			
2.1	Auxiliary supply voltage			
2.1.1	Rated auxiliary supply voltage	V d.c.	110 ±15 %	
2.1.2	Dual power supply		Yes	
2.2	Ethernet ports			
2.2.1	Number of ports		Min. 16	
2.2.1	Type of ports		RJ45	
2.3	Immunity to EMI and heavy electrical surges		Insert	
2.4	Temperature range			
2.4.1	Operation		050°C	
2.4.2	Storage		−20+70°C	
2.5	Switching method an layer		Store & Forward Layer 3 (IEC 61850), RSTP (802.1w); eRSTPTM or RSTP (802.1D-2004) network fault recovery	
2.6	Switching latency		≤ 5µs	
2.7	Switching bandwidth		≤ 1.6 Gbps	
2.8	Failsafe output relay		Potential-free	
2.9	Cyber security features			
2.9.1	Multi-level passwords		Yes	
2.9.2	SSH/SSL encryption		Yes	
2.9.3	Enable/disable ports, MAC based port security		Yes	
2.9.4	Port based network access control		Yes	
2.10	System features			
2.10.1	Automatic learning negotiation and crossover detection			
2.10.2	Port configuration, status, statistics, mirroring, security			
2.10.3	Network fault recovery		≤ 5 ms	
2.11	Type Test Reports		To be included with bid	
2.12	Installation		Indoor	
	Overall compliance with the requirements	s (yes/no)		



5.2.6.26 14281 - Protection Monitoring Software

No.	Description	Minin	Minimum Requirements	
NO.		Unit	Data	Guaranteed
14281	Protection Monitoring Software / Code number	er: 14281		
1.1	Protection Monitoring Software			
1.1.1	Communication with protection terminals		Yes	
1.1.2	Protection terminal configuration		Yes	
1.1.3	Protection terminal parameter setting		Yes	
1.1.4	Disturbance data collecting		Yes	
1.1.5	Disturbance data analysing		Yes	
1.1.6	Other software:		Insert	
	Overall compliance with the requirements (yes/no)			



5.2.6.27 14282 - SCADA Software

	B tut	Minir	Minimum Requirements	
No.	Description	Unit	Data	Guaranteed
14282	SCADA Software / Code number: 14282			
1.1	Basic SCADA server software			
1.1	Basic SCADA server software	pcs.	2	
1.1.1	Communication with 2 higher level control centres		Yes	
1.1.2	Real-time database management		Yes	
1.1.3	Data processing		Yes	
1.1.4	Data acquisition		Yes	
1.1.5	Alarm and event processing		Yes	
1.1.6	Data archiving		Yes	
1.1.7	Report generation and printing		Yes	
1.1.8	Redundancy management		Yes	
1.2	Operator workstation software	pcs.	2	
1.3	Communication software	pcs.	2	
1.3.1	Communication with 2 higher level control centres		Yes	
1.4	Application libraries	pcs.	1, optional	
1.5	Software tools	pcs.	1	
1.5.1	Database creating, maintaining and viewing		Yes	
1.5.2	User interface definition		Yes	
1.5.3	Report definition		Yes	
1.5.4	System configuration		Yes	
1.5.5	Historical data maintaining		Yes	
1.5.6	Database and historical data export/import		Yes	
1.5.7	Analysis and diagnostic tools		Yes	
1.5.8	Training simulator		Yes	
1.5.9	Other software tools according to Contractor's concept:		Insert	
	Overall compliance with the requirements	s (yes/no)		



5.2.6.28 14298 - Fibre Optic Cables & Terminal Equipment

Na	Description	Minimum Requirements	Guaranteed
No.	Description	Unit Data	
14298	Fibre Optic Cables & Terminal Equipment / Co	ode number: 14298	
	Sufficient quantity of adequate glass fibre op-		
1.1	tic cables for overall Protection & Control &	Yes	
1.1	Monitoring & Metering system should be fore-	163	
	seen and included in the bid.		
1.2	Below proposed quantities shall be verified	Yes	
	according to specific Bidder's design.		
4.0	Final quantities must be estimated and deliv-		
1.3	ered as per Single Line Diagram and Substa-	Yes	
	tion layouts.		
1.4	At least 20% spare in cable length, as well as in number of fibres in cable, should be fore-	Yes	
1.4	seen.	i es	
1.5	Fibre optic ducted cables shall be foreseen.	Yes	
1.6	Type of fibre optic	Multimode	
1.7	Number of fibres in cable	Min. 4	
1.8	Operational Wave length	Insert	
1.9	Attenuation factor maximum	Insert	
1.10	Band-width minimum	Insert	
1.11	Manufacturer	Insert	
2	Characteristics		
	Fibre optic terminations.		
	Overall quantities of specific fibre optic termi-		
	nations should be closely related to number of		
2.1	fibres in each cable (each fibre, used or spare,	Yes	
	should be properly terminated).		
	At least 20% spare terminations for each pro-		
	posed type should be foreseen.		
2.1.1	Plug connectors type	Insert	
2.1.2	Connection technology	Insert	
2.1.3	Plug pin type	Insert	
2.1.4	Manufacturer	Insert	
	Optical distributor with connectors		
	Overall quantity of Optical Distributor with Connectors should be closely related to num-		
	ber of relay houses. Optical Distributor with		
2.2	Connectors should be foreseen for both cable	Yes	
	ends.		
	At least 10% spare Optical Distributors with		
	Connectors should be foreseen.		
2.2.4	Fibro entic coble gland	To accept metal-	
2.2.1	Fibre optic cable gland	free optical cable	
2.2.3	Patch-cord connection	Yes	
2.2.4	Type of optical connectors	Insert	
2.2.5	Manufacturer	Insert	



Na	Decemention	Minimum Requireme	num Requirements	Guaranteed
No.	Description	Unit	Data	Guaranteed
2.3	Patch-cord with optical connectors Overall quantity of fibre optic patch-cord cables should be closely related to number of protection and control devices (terminals) in each particular relay house. At least 20% spare patch-cord cables should be foreseen.		Yes	
	Overall compliance with the requirements (yes/no)			

- Quantities and specifications of optical distributor with connectors and patch-cord with optical connectors predicted according to the optical ring configuration for control and according to the configuration of busbar protection.
- Technical characteristics of fibre optic cables for protection and control have influence on optical ports characteristics of process LAN Ethernet switches.



5.2.6.29 14299 - Special Control Equipment and Tools

Na	Passintian	Minimum Requirements	0	
No.	Description	Unit	Data	Guaranteed
14299	Special Control Equipment and Tools / Code r	number: 142	299	
1.1	Special Control Equipment and Tools			
1.1.1	Special equipment and tools for setting, repairing, handling and maintaining of control system	set	1	
1.1.2	Software needed for configuration, setting, commissioning, testing, communication, interfacing with substation system	set	1	
1.1.3	Laptop brand-name computer	pcs.	2	
1.1.4	Test plugs, including all necessary accessories (transport case, cables, plugs, etc.)	set	2	
	Overall compliance with the requirements (yes/no)			



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5.2.6.30 14001 - Protection Terminal 230 kV OHL-Main 1

No.	Description	Minimum Requirements		Guaranteed
140.		Unit	Data	Guaranteed
14001	Protection Terminal 230 kV OHL-Main 1 / Code	number: 140	001	
1.1	Manufacturer		Insert	
1.2	Country of origin		Insert	
1.3	Terminal type		Insert	
1.4	Terminal version (software version)		Insert	
1.5	Standards		IEC	
2	Characteristics			
2.1	Auxiliary supply voltage			
2.1.1	Rated auxiliary supply voltage	V d.c.	110 ±15 %	
	Interruption in auxiliary d.c. voltage:			
2.1.2	Without resetting	ms	> 50	
	Restart time	s	Insert	
2.2	a.c. current inputs			
2.2.1	Number of inputs		Min. 4	
2.2.2	Rated current Ir	А	1	
2.2.3	Permissive overload, continuous		4xIr	
2.2.4	Permissive overload, 1 s		100xlr	
2.2.5	Burden at Ir	VA	< 0.3	
2.3	a.c. voltage inputs			
2.3.1	Number of inputs		Min. 4	
2.3.2	Rated voltage Ph-Ph Ur	V	100	
2.3.3	Permissive overload, continuous	% Ur	150	
2.3.4	Permissive overload, 1 s	% Ur	250	
2.3.5	Burden at Ur	VA	< 0.3	
2.4	Binary inputs		Minimum 16	
2.4.1	Number of BI groups with common root		Insert	
2.4.2	Number of inputs per BI group with common root		< 8	
2.4.3	Rated voltage	V d.c.	110 ±15 %	
2.5	Binary outputs		Min. 16	
2.5.1	Number of modules		Insert	
2.5.2	Number of outputs per group with common root			
2.5.3	Rated voltage	V d.c.	110 ±15 %	
	Breaking capacity at inductive load with			
2.5.4	L/R<40 ms, at rated voltage	A	0.1	
0.5.5	Current carrying capacity at rated voltage for		la a a at	
2.5.5	signalling contacts, continuous	A	Insert	
2.5.6	Number of tripping contacts (high-speed output)	pcs.	6	
257	Current carrying capacity at rated voltage for			
2.5.7	tripping contacts, continuous	A	5	
2.6	LED indications			
2.6.1	Number of LED's		Insert	
2.6.2	Multi-colour LED's	Yes/No	Insert	
2.7	Communication ports		Yes	



		Minimum Requirements		
No.	Description	Unit	Data	Guaranteed
2.7.1	Port for front-connected PC	Offic	Data	
2.7.1.1	Protocols supported		Insert	
2.7.1.2	Communication speed	Kbit/s	Insert	
	•	KDIUS	_	
2.7.1.3	PC side connector type System interface		Insert	
2.7.2.1	· ·		2	
	Number of rear ports Protocols supported		IEC 61850	
2.7.2.2	• •	Mhit/o		
2.7.2.3	Communication speed	Mbit/s	Min. 100	
2.7.2.4	Connector type		RJ45 or FO	
2.7.3	Time synchronisation		SNTP Yes	
2.8	Human-machine interface			
2.8.1	LCD alphanumeric display, No. of rows		Insert	
2.9	Number of setting parameter groups		Min. 4	
2.10	Distance protection		N	
2.10.1	Number of protection zones		Min. 5	
2.10.2	Basic operating time	ms	< 25	
2.10.3	Operational characteristic		Quadrilateral	
2.10.4	Zone 1 direction software selectable		Insert	
2.10.5	Zone 2 direction software selectable		Insert	
2.10.6	Zone 3 direction software selectable		Insert	
2.10.7	Zone 4 direction software selectable		Insert	
2.10.8	Zone 5 direction software selectable	_	Insert	
2.10.9	Minimum impedance setting	Ω	Insert	
2.10.10	Full scheme protection phase segregated		Yes	
2.11	Communication scheme logic			
			Intertrip	
2.11.1	Operational modes		Permissive under-reach	
	•		Permissive overreach	
			Blocking	
2.12	Power swing detection		Yes	
	Secondary circuits supervision:		.,	
2.13	VT circuits supervision		Yes	
	CT circuits supervision		Yes	
0.44	Automatic switch onto fault logic		V	
2.14	Impedance criteria		Yes	
0.45	Instantaneous overcurrent criteria		Yes	
2.15	Multistage three-phase overcurrent protection		1	
2.15.1	Directional		Insert	
2.15.2	Number of stages	0/ 1	Min. 2	
2.15.3	Setting range	% Ir	Insert	
2.15.4	Characteristics	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		
	Definite time delayed	Yes/no	Yes	
	Normal inverse	Yes/No	Yes	
	Very inverse	Yes/No	Insert	
	Extremely inverse	Yes/No	Insert	
2.16	Multistage earth fault overcurrent protection			
2.16.1	Directional		Insert	



	Description	Minim	Minimum Requirements		
No.		Unit	Data	Guaranteed	
2.16.2	Number of stages		Min. 2		
2.16.3	Setting range	% Ir	Insert		
2.16.4	Type of protection	70	Non-directional		
2.16.5	Characteristics		Tron an obtaina		
2.16.5.1		Yes/no	Yes		
	Normal inverse	Yes/No	Yes		
	Very inverse	Yes/No	Insert		
	Extremely inverse	Yes/No	Insert		
2.17	Directional earth fault protection	103/140	moort		
2.17.1	Number of stages	1	Insert		
2.17.1	Setting range	% Ir	Insert		
2.17.2	Type of protection	70 11	Directional		
2.17.4	Characteristics		Directional		
	Definite time delayed	Yes/no	Yes		
	Normal inverse	Yes/No	Yes		
	Very inverse	Yes/No	Insert		
	Extremely inverse	Yes/No			
2.17.4.4	Minimum polarizing voltage	% Ur	Insert 3 %		
	• • •	% UI			
2.17.6	Communication scheme logic		Yes		
	Permissive and blocking	+	Yes		
2.17.7	Single and three-pole tripping schemes	+ +	Yes		
2.18	Current negative sequence protection	+ +	lin n nut		
2.18.1	Number of stages	0/ 1-	Insert		
2.18.2	Setting range	% Ir	Insert		
2.18.3	Characteristic	+	Definite time		
2.19	Power system supervision				
2.19.1	Broken conductor check	+	Yes		
2.19.2	Overload protection	0/ 1			
	Setting range of 1 stage	% Ir	Insert		
	Time delay range of 1 stage	min	> 20		
	Setting range of 2 stage	% Ir	Insert		
	Time delay range of 2 stage	S	> 20		
2.19.2.5	Blocking external (system or HMI)	++	Yes		
2.19.3	Additional supervision functions (thermal state,		Insert		
	etc.)	+			
2.20	Autoreclosing				
2.20.1	Number of shots		Min. 2		
2.20.2	AR program	+	1/3 pole		
2.20.3	Reclosing pulse duration	S	Insert		
2.20.4	Dead time range	S	Insert		
2.20.5	Counters for AR operation	+	Yes		
2.20.6	Inhibit time range	S	Insert		
2.20.7	Reclaim time range	S	Insert		
2.20.8	Synchronism & energising check during 3 ph AR		Yes		
2.20.9	Evolving faults treatment		Yes		
2.20.10	AR blocking for CB not ready		Yes		



	Description	Minimu	Minimum Requirements		
No.	Description	Unit	Data	Guaranteed	
2.20.11	AR operation 1/3ph in 1 st and 2 nd zone		Yes		
2.21	Synchronism & energising check				
2.21.1	Frequency difference range	mHz.	Insert		
2.21.2	Voltage difference range	% Ur	Insert		
2.21.3	Phase difference range	0	Insert		
2.21.4	Operating time for synchro check function	ms	Insert		
2.21.5	Operating time for energizing check function	ms	Insert		
2.22	Disturbance recorder				
2.22.1	Number of digital signals		Min. 40		
2.22.2	Number of analogue signals		Min. 8		
2.22.3	External/manual initiation of recording		Yes		
2.22.4	Sampling rate	kHz	Insert		
2.22.5	Pre-fault time	ms	≥ 300		
2.22.6	Recording time	ms	≥ 2000		
2.22.7	Number of recorded disturbances		Min. 5		
2.22.8	Total recording time with max. analogue and bi-	s	> 10		
2.22.0	nary signals	, and	7 10		
2.22.9	Output file comtrade format		Yes		
2.23	Event recorder				
2.23.1	Max. number of events		Insert		
2.23.2	Time tagging resolution	ms	1		
2.24	Fault locator, measurement in (km)		Yes		
2.25	Self-supervision		Yes		
2.26	Measurement				
2.26.1	Active power measurement		Yes		
2.26.2	Reactive power measurement		Yes		
2.26.3	Voltage measurement		Yes		
2.26.4	Current measurement		Yes		
3	Additional requirements				
3.1	Test socket		Yes		
3.2	Setting and configuration of Protection Terminal approved by Engineer		Yes		
	Overall compliance with the requirements	(yes/no)			



5.2.6.31 14002 - Protection Terminal 230 kV OHL Main 2

	Description	Minir	Minimum Requirements	
No.		Unit	Data	Guaranteed
14002	Protection Terminal 230 kV OHL Main 2 / Code	number: 14	1002	
1.1	Manufacturer		Different than Main 1	
1.2	Country of origin		Insert	
1.3	Terminal type		Insert	
1.4	Terminal version (software version)		Insert	
1.5	Standards		IEC	
2	Characteristics	<u> </u>		<u> </u>
2.1	Auxiliary supply voltage			
2.1.1	Rated auxiliary supply voltage	V d.c.	110 ±15 %	
	Interruption in auxiliary d.c. voltage:			
2.1.2	Without resetting	ms	> 50	
	Restart time	S	Insert	
2.2	a.c. current inputs			
2.2.1	Number of inputs		Min. 4	
2.2.2	Rated current Ir	Α	1	
2.2.3	Permissive overload, continuous		4xlr	
2.2.4	Permissive overload, 1 s		100xlr	
2.2.5	Burden at Ir	VA	< 0.5	
2.3	a.c. voltage inputs			
2.3.1	Number of inputs		Min. 4	
2.3.2	Rated voltage Ph-Ph Ur	V	100	
2.3.3	Permissive overload, continuous	% Ur	150	
2.3.4	Permissive overload, 1 s	% Ur	250	
2.3.5	Burden at Ur	VA	< 0.3	
2.4	Binary inputs		Min. 16	
2.4.1	Number of BI groups with common root		Insert	
2.4.2	Number of inputs per BI group with common root		< 8	
2.4.3	Rated voltage	V d.c.	110 ±15 %	
2.5	Binary outputs		Min. 16	
2.5.1	Number of modules		Insert	
2.5.2	Number of outputs per group with common root		Max. 3	
2.5.3	Rated voltage	V d.c.	110 ±15 %	
2.5.4	Breaking capacity at inductive load with	А	0.1	
_	L/R<40 ms, at rated voltage			
2.5.5	Current carrying capacity at rated voltage for signalling contacts, continuous	Α	Insert	
2.5.6	Number of tripping contacts (high-speed output)	pcs.	6	
2.5.7	Current carrying capacity at rated voltage for	А	5	
	tripping contacts, continuous			
2.6	LED indications			
2.6.1	Number of LED's		Insert	<u> </u>
2.6.2	Multi-colour LED's	Yes/No	Insert	
2.7	Communication ports		Yes	



		Minimum Requirements		
No.	Description	Unit	Data	Guaranteed
2.7.1	Port for front-connected PC	Offic	Data	
2.7.1.1			Insert	
2.7.1.2		Kbit/s	Insert	
2.7.1.3	•	TOIUS	Insert	
2.7.2	System interface		moert	
2.7.2.1	Number of rear ports		2	
2.7.2.2	Protocols supported		IEC 61850	
2.7.2.3	Communication speed	Mbit/s	Min. 100	
2.7.2.4	·	IVIDIUS	RJ45 or FO	
2.7.3	Time synchronisation		SNTP	
2.8	Human-machine interface		Yes	
2.8.1	LCD alphanumeric display, No. of rows		Insert	
2.9	Number of setting parameter groups		Min. 4	
2.10	Distance protection		IVIIII. T	
2.10.1	Number of protection zones		Min. 5	
2.10.2	Basic operating time	ms	< 25	
2.10.3	Operational characteristic	1110	Quadrilateral	
2.10.4	Zone 1 direction software selectable		Insert	
2.10.5	Zone 2 direction software selectable		Insert	
2.10.6	Zone 3 direction software selectable		Insert	
2.10.7	Zone 4 direction software selectable		Insert	
2.10.8	Zone 5 direction software selectable		Insert	
2.10.9	Minimum impedance setting	Ω	Insert	
2.10.10	-		Yes	
2.11	Communication scheme logic		1.00	
2.11.1	Operational modes		Intertrip Permissive under-reach Permissive overreach Blocking	
2.12	Power swing detection		Yes	
	Secondary circuits supervision:			
2.13	VT circuits supervision		Yes	
	CT circuits supervision		Yes	
	Automatic switch onto fault logic			
2.14	Impedance criteria		Yes	
	Instantaneous overcurrent criteria		Yes	
2.15	Multistage three-phase overcurrent protection			
2.15.1	Directional		Insert	
2.15.2	Number of stages		Min. 2	
2.15.3	Setting range	% Ir	Insert	
2.15.4	Characteristics			
2.15.4.1		Yes/no	Yes	
2.15.4.2	Normal inverse	Yes/No	Yes	
2.15.4.3	Very inverse	Yes/No	Insert	
2.15.4.4	Extremely inverse	Yes/No	Insert	
2.16	Multistage earth fault overcurrent protection			
2.16.1	Directional		Insert	



	Description	Minim	Minimum Requirements		
No.		Unit	Data	Guaranteed	
2.16.2	Number of stages		Min. 2		
2.16.3	Setting range	% Ir	Insert		
2.16.4	Type of protection	70	Non-directional		
2.16.5	Characteristics		Tron an obtaina		
2.16.5.1		Yes/no	Yes		
	Normal inverse	Yes/No	Yes		
	Very inverse	Yes/No	Insert		
	Extremely inverse	Yes/No	Insert		
2.17	Directional earth fault protection	103/140	moort		
2.17.1	Number of stages	1	Insert		
2.17.1	Setting range	% Ir	Insert		
2.17.2	Type of protection	70 11	Directional		
2.17.4	Characteristics		Directional		
	Definite time delayed	Yes/no	Yes		
	Normal inverse	Yes/No	Yes		
	Very inverse	Yes/No	Insert		
	Extremely inverse	Yes/No			
2.17.4.4	Minimum polarizing voltage	% Ur	Insert 3 %		
	• • •	% UI			
2.17.6	Communication scheme logic		Yes		
	Permissive and blocking	+	Yes		
2.17.7	Single and three-pole tripping schemes	+ +	Yes		
2.18	Current negative sequence protection	+ +	lin n nut		
2.18.1	Number of stages	0/ 1-	Insert		
2.18.2	Setting range	% Ir	Insert		
2.18.3	Characteristic	+	Definite time		
2.19	Power system supervision				
2.19.1	Broken conductor check	+	Yes		
2.19.2	Overload protection	0/ 1			
	Setting range of 1 stage	% Ir	Insert		
	Time delay range of 1 stage	min	> 20		
	Setting range of 2 stage	% Ir	Insert		
	Time delay range of 2 stage	S	> 20		
2.19.2.5	Blocking external (system or HMI)	++	Yes		
2.19.3	Additional supervision functions (thermal state,		Insert		
	etc.)	+			
2.20	Autoreclosing				
2.20.1	Number of shots		Min. 2		
2.20.2	AR program	+	1/3 pole		
2.20.3	Reclosing pulse duration	S	Insert		
2.20.4	Dead time range	S	Insert		
2.20.5	Counters for AR operation	+	Yes		
2.20.6	Inhibit time range	S	Insert		
2.20.7	Reclaim time range	S	Insert		
2.20.8	Synchronism & energising check during 3 ph AR		Yes		
2.20.9	Evolving faults treatment		Yes		
2.20.10	AR blocking for CB not ready		Yes		



	B	Minim		
No.	Description	Unit	Data	Guaranteed
2.20.11	AR operation 1/3ph in 1 st and 2 nd zone		Yes	
2.21	Synchronism & energising check			
2.21.1	Frequency difference range	mHz.	Insert	
2.21.2	Voltage difference range	% Ur	Insert	
2.21.3	Phase difference range	0	Insert	
2.21.4	Operating time for synchro check function	ms	Insert	
2.21.5	Operating time for energising check function	ms	Insert	
2.22	Disturbance recorder			
2.22.1	Number of digital signals		Min. 40	
2.22.2	Number of analogue signals		Min. 8	
2.22.3	External/manual initiation of recording		Yes	
2.22.4	Sampling rate	kHz	Insert	
2.22.5	Pre-fault time	ms	≥ 300	
2.22.6	Recording time	ms	≥ 2000	
2.22.7	Number of recorded disturbances		Min. 5	
2.22.8	Total recording time with max. analogue and bi-		> 10	
2.22.0	nary signals	S	> 10	
2.22.9	Output file comtrade format		Yes	
2.23	Event recorder			
2.23.1	Max. number of events		Insert	
2.23.2	Time tagging resolution	ms	1	
2.24	Fault locator, measurement in (km)		Yes	
2.25	Self-supervision		Yes	
2.26	Measurement			
2.26.1	Active power measurement		Yes	
2.26.2	Reactive power measurement		Yes	
2.26.3	Voltage measurement		Yes	
2.26.4	Current measurement		Yes	
3	Additional requirements			
3.1	Test socket		Yes	
	Setting and configuration of Protection Terminal			
3.2	approved by Engineer		Yes	
	Overall compliance with the requirements (yes/no)			



5.2.6.32 14003 - Protection Terminal 132 kV OHL Main 1

		Minir	Minimum Requirements	
No.	Description	Unit	Data	Guaranteed
14003	Protection Terminal 132 kV OHL Main 1 / Code	number: 14	4003	
1.1	Manufacturer		Insert	
1.2	Country of origin		Insert	
1.3	Terminal type		Insert	
1.4	Terminal version (software version)		Insert	
1.5	Standards		IEC	
2	Characteristics			<u>, </u>
2.1	Auxiliary supply voltage			
2.1.1	Rated auxiliary supply voltage	V d.c.	110 ±15 %	
	Interruption in auxiliary d.c. voltage:			
2.1.2	Without resetting	ms	> 50	
	Restart time	s	Insert	
2.2	a.c. current inputs			
2.2.1	Number of inputs		Min. 4	
2.2.2	Rated current Ir	Α	1	
2.2.3	Permissive overload, continuous		4xlr	
2.2.4	Permissive overload, 1 s		100xlr	
2.2.5	Burden at Ir	VA	< 0.5	
2.3	a.c. voltage inputs			
2.3.1	Number of inputs		Min. 4	
2.3.2	Rated voltage Ph-Ph Ur	V	100	
2.3.3	Permissive overload, continuous	% Ur	150	
2.3.4	Permissive overload, 1 s	% Ur	250	
2.3.5	Burden at Ur	VA	< 0.3	
2.4	Binary inputs		Min. 16	
2.4.1	Number of BI groups with common root		Insert	
2.4.2	Number of inputs per BI group with common root		< 8	
2.4.3	Rated voltage	V d.c.	110 ±15 %	
			Min. 16 (code 14004)	
2.5	Binary outputs		Min. 24 (code 14004A)	
2.5.1	Number of modules		Insert	
2.5.2	Number of outputs per group with common root		Max. 3	
2.5.3	Rated voltage	V d.c.	110 ±15 %	
	Breaking capacity at inductive load with			
2.5.5	L/R<40 ms, at rated voltage	А	0.1	
0.5.0	Current carrying capacity at rated voltage for	^	luct	
2.5.6	signalling contacts, continuous	А	Insert	
2.5.7	Number of tripping contacts (high-speed output)	pcs.	6	
	Current carrying capacity at rated voltage for			
2.5.8	tripping contacts, continuous	А	5	
2.6	LED indications			
2.6.1	Number of LED's		Insert	
2.6.2	Multi-colour LED's	Yes/No	Insert	



	Minimum Requirements		mum Requirements	0	
No.	Description	Unit	Data	Guaranteed	
2.7	Communication ports		Yes		
2.7.1	Port for front-connected PC				
2.7.1.1	Protocols supported		Insert		
2.7.1.2	Communication speed	Kbit/s	Insert		
2.7.1.3	PC side connector type		Insert		
2.7.2	System interface				
2.7.2.1	Number of rear ports		2		
2.7.2.2	Protocols supported		IEC 61850		
2.7.2.3	Communication speed	Mbit/s	Min. 100		
2.7.2.4	Connector type		RJ45 or FO		
2.7.3	Time synchronisation		SNTP		
2.8	Human-machine interface		Yes		
2.8.1	LCD alphanumeric display, No. of rows		Insert		
2.9	Number of setting parameter groups		Min. 4		
2.10	Line differential protection				
2.10.1	Sensitive differential current trip stage		Yes		
2.10.2	High current differential trip stage		Yes		
2.10.3	Inrush restraint 2 nd harmonic		Yes		
2.10.4	Crossblock function		Yes		
2.10.5	Operating time, typical	ms	< 30		
2.10.6	Resetting time at I _{diff} =0	ms	Insert		
2.10.7	Transfer trip operating time	ms	< 40		
2.11	Remote end data communication				
2.11.1	Transmission type		Insert		
2.11.2	Data transfer rate	Kbit/s	Insert		
	FO protection interface				
	Type of fibre optic	μm	Insert		
	Connector type	•	Insert		
	Wavelength	nm	1300		
	Optical transmitter injected power	dBm	Insert		
	Optical receiver sensitivity	dBm	Insert		
	Transmission distance (estimated)	km	Min. 15		
2.12	Back-up Distance protection				
2.12.1	Number of protection zones		Min. 4		
2.12.2	Operating time	ms	< 35		
2.12.3	Operating characteristic		quadrilateral		
2.12.4	Zone 1 direction software selectable		Insert		
2.12.5	Zone 2 direction software selectable		Insert		
2.12.6	Zone 3 direction software selectable		Insert		
2.12.7	Zone 4 direction software selectable		Insert		
2.12.8	Minimum impedance setting	Ω	Insert		
2.12.9	Full scheme protection phase segregated		Yes		
2.13	Communication scheme logic				
			Intertrip Permissive under-reach		
2.13.1	Operational modes		Permissive under-reach Permissive overreach Blocking		



		Minimu	Minimum Requirements	
No.	Description	Unit	Data	Guaranteed
2.14	Power swing detection		Yes	
	Secondary circuits supervision:			
2.15	VT circuits supervision		Yes	
	CT circuits supervision		Yes	
	Automatic switch onto fault logic			
2.16	Impedance criteria		Yes	
	Instantaneous overcurrent criteria		Yes	
2.17	Multistage three-phase overcurrent protection			
2.17.1	Directional		Insert	
2.17.2	Number of stages		Min. 2	
2.17.3	Setting range	% Ir	Insert	
2.17.4	Characteristics			
2.17.4.1	Definite time delayed	Yes/no	Yes	
2.17.4.2	Normal inverse	Yes/No	Yes	
2.17.4.3	Very inverse	Yes/No	Insert	
2.17.4.4	Extremely inverse	Yes/No	Insert	
2.18	Multistage earth fault overcurrent protection			
2.18.1	Directional		Insert	
2.18.2	Number of stages		Min. 2	
2.18.3	Setting range	% Ir	Insert	
2.18.4	Type of protection		Non-directional	
2.18.5	Characteristics			
2.18.5.1	Definite time delayed	Yes/no	Yes	
2.18.5.2	Normal inverse	Yes/No	Yes	
2.18.5.3	Very inverse	Yes/No	Insert	
	Extremely inverse	Yes/No	Insert	
2.19	Current negative sequence protection			
2.19.1	Number of stages		Insert	
2.19.2	Setting range	% Ir	Insert	
2.19.3	Characteristic		Insert	
2.20	Directional earth fault protection			
2.20.1	Number of stages		Insert	
2.20.2	Setting range	% Ir	Insert	
2.20.3	Type of protection		Directional	
2.20.4	Characteristics			
2.20.4.1	Definite time delayed	Yes/no	Yes	
	Normal inverse	Yes/No	Yes	
	Very inverse	Yes/No	Insert	
	Extremely inverse	Yes/No	Insert	
2.20.5	Minimum polarizing voltage	% Ur	3 %	
2.20.6	Communication scheme logic		Yes	
2.20.6.1	Permissive and blocking		Yes	
2.20.7	Single and three-pole tripping schemes	1	Yes	
2.21	Power system supervision			
2.21.1	Broken conductor check		Yes	
2.21.2	Overload protection			
	Setting range of 1 stage	% Ir	Insert	



		Minimum Requirements		
No.	Description	Unit	Data	Guaranteed
2.21.2.2	Time delay range of 1 stage	min	> 20	
	Setting range of 2 stage	% Ir	Insert	
	Time delay range of 2 stage	S	> 20	
	Blocking external (system or HMI)		Yes	
2.22	Autoreclosing			
2.22.1	Number of shots		Min. 2	
2.22.2	AR program		1/3 pole	
2.22.3	Reclosing pulse duration	s	Insert	
2.22.4	Dead time range	S	Insert	
2.22.5	Counters for AR operation		Yes	
2.22.6	Inhibit time range	S	Insert	
2.22.7	Reclaim time range	s	Insert	
	Synchronism & energising check during 3 ph			
2.22.8	AR		Yes	
2.22.9	Evolving faults treatment		Yes	
2.22.10	AR blocking for CB not ready		Yes	
2.22.11	AR operation 1/3ph in 1 st and 2 nd zone		Yes	
2.23	Synchronism & energising check			
2.23.1	Frequency difference range	mHz.	Insert	
2.23.2	Voltage difference range	% Ur	Insert	
2.23.3	Phase difference range	۰	Insert	
2.23.4	Operating time for synchro check function	ms	Insert	
2.23.5	Operating time for energising check function	ms	Insert	
2.24	Disturbance recorder			
2.24.1	Number of digital signals		Min. 40	
2.24.2	Number of analogue signals		Min. 8	
2.24.3	External/manual initiation of recording		Insert	
2.24.4	Sampling rate	kHz	Insert	
2.24.5	Pre-fault time	ms	≥ 300	
2.24.6	Recording time	ms	≥ 2000	
2.24.7	Number of recorded disturbances		Min. 5	
2.24.8	Total recording time with max. analogue and bi-		> 10	
2.24.0	nary signals	S	> 10	
2.24.9	Output file comtrade format		Yes	
2.25	Event recorder			
2.25.1	Max. number of events		Insert	
2.25.2	Time tagging resolution	ms	1	
2.26	Fault locator, measurement in (km)		Yes	
2.27	Self-supervision		Yes	
2.28	Measurement			
2.28.1	Active power measurement		Yes	
2.28.2	Reactive power measurement		Yes	
2.28.3	Voltage measurement		Yes	
2.28.4	Current measurement		Yes	



Na	Description	Minimum Requirements		Cusumtes
No.	Description	Unit	Data	Guaranteed
3	Additional requirements			
3.1	Test socket		Yes	
3.2	Setting and configuration of Protection Terminal approved by Engineer		Yes	
	Overall compliance with the requirements (yes/no)			



5.2.6.33 14004 - Protection Terminal 132 kV OHL Main 2

No.	Description	Minimum Requirements		Guaranteed
NO.	Description	Unit	Data	Guaranteeu
14004	Protection Terminal 132 kV OHL Main 2 / Code	number: 14	004	
1.1	Manufacturer		Different than Main 1	
1.2	Country of origin		Insert	
1.3	Terminal type		Insert	
1.4	Terminal version (software version)		Insert	
1.5	Standards		IEC	
2	Characteristics			
2.1	Auxiliary supply voltage			
2.1.1	Rated auxiliary supply voltage	V d.c.	110 ±15 %	
	Interruption in auxiliary d.c. voltage:			
2.1.2	Without resetting	ms	> 50	
	Restart time	S	Insert	
2.2	a.c. current inputs			
2.2.1	Number of inputs		Min. 4	
2.2.2	Rated current Ir	Α	1	
2.2.3	Permissive overload, continuous		4xlr	
2.2.4	Permissive overload, 1 s		100xlr	
2.2.5	Burden at Ir	VA	< 0.5	
2.3	a.c. voltage inputs			
2.3.1	Number of inputs		Min. 4	
2.3.2	Rated voltage Ph-Ph Ur	V	100	
2.3.3	Permissive overload, continuous	% Ur	150	
2.3.4	Permissive overload, 1 s	% Ur	250	
2.3.5	Burden at Ur	VA	< 0.3	
2.4	Binary inputs		Min. 16	
2.4.1	Number of BI groups with common root		Insert	
2.4.2	Number of inputs per BI group with common root		< 8	
2.4.3	Rated voltage	V d.c.	110 ±15 %	
2.5	Binary outputs	v u.o.	Min. 16	
2.5.1	Number of modules		Insert	
2.5.2	Number of outputs per group with common root		Max. 3	
2.5.3	Rated voltage	V d.c.	110 ±15 %	
	Breaking capacity at inductive load with			
2.5.4	L/R<40 ms, at rated voltage	А	0.1	
2.5.5	Current carrying capacity at rated voltage for	А	Insert	
	signalling contacts, continuous			
2.5.6	Number of tripping contacts (high-speed output)	pcs.	6	
2.5.7	Current carrying capacity at rated voltage for tripping contacts, continuous	А	5	
2.6	LED indications			
			Incort	
2.6.1	Number of LED's	Voc/No	Insert	
2.6.2	Multi-colour LED's	Yes/No	Insert	



		Minir	num Requirements	
No.	Description	Unit	Data	Guaranteed
2.7	Communication ports		Yes	
2.7.1	Port for front-connected PC			
2.7.1.1	Protocols supported		Insert	
2.7.1.2	Communication speed	Kbit/s	Insert	
2.7.1.3	·	1 1014 5	Insert	
2.7.2	System interface			
2.7.2.1	Number of rear ports		2	
2.7.2.2	Protocols supported		IEC 61850	
2.7.2.3	Communication speed	Mbit/s	Min. 100	
2.7.2.4	Connector type		RJ45 or FO	
2.7.3	Time synchronisation		SNTP	
2.8	Human-machine interface		Yes	
2.8.1	LCD alphanumeric display, No. of rows		Insert	
2.9	Number of setting parameter groups		Min. 4	
2.10	Distance protection			
2.10.1	Number of protection zones		Min. 5	
2.10.2	Basic operating time	ms	< 30	
2.10.3	Operational characteristic	1110	Quadrilateral	
2.10.4	Zone 1 direction software selectable		Insert	
2.10.5	Zone 2 direction software selectable		Insert	
2.10.6	Zone 3 direction software selectable		Insert	
2.10.7	Zone 4 direction software selectable		Insert	
2.10.8	Zone 5 direction software selectable		Insert	
2.10.9	Minimum impedance setting	Ω	Insert	
2.11	Communication scheme logic	1	moore	
2.11.1	Operational modes		Intertrip Permissive under-reach Permissive overreach Blocking	
2.12	Power swing detection		Yes	
	Secondary circuits supervision:			
2.13	VT circuits supervision		Yes	
	CT circuits supervision		Yes	
	Automatic switch onto fault logic			
2.14	Impedance criteria		Yes	
	Instantaneous overcurrent criteria		Yes	
2.15	Multistage three-phase overcurrent protection			
2.15.1	Directional		Insert	
2.15.2	Number of stages		Min. 2	
2.15.3	Setting range	% Ir	Insert	
2.15.4	Characteristics			
2.15.4.1	Definite time delayed	Yes/no	Yes	
2.15.4.2	Normal inverse	Yes/No	Yes	
2.15.4.3	Very inverse	Yes/No	Insert	
2.15.4.4	Extremely inverse	Yes/No	Insert	
2.16	Multistage earth fault overcurrent protection			
2.16.1	Directional		Insert	



		Minim	Minimum Requirements		
No.	Description	Unit	Data	Guaranteed	
2.16.2	Number of stages	0	Min. 2		
2.16.3	Setting range	% Ir	Insert		
2.16.4	Type of protection	70 11	Non-directional		
2.16.5	Characteristics		Tron an obtaina		
	Definite time delayed	Yes/no	Yes		
	Normal inverse	Yes/No	Yes		
	Very inverse	Yes/No	Insert		
	Extremely inverse	Yes/No	Insert		
2.17	Directional earth fault protection	103/140	moort		
2.17.1	Number of stages		Insert		
2.17.2	Setting range	% Ir	Insert		
2.17.2	Type of protection	70 11	Directional		
2.17.4	Characteristics	1	Directional		
	Definite time delayed	Yes/no	Yes		
	Normal inverse	Yes/No	Yes		
	Very inverse	Yes/No	Insert		
	Extremely inverse	Yes/No	Insert		
2.17.4.4	Minimum polarizing voltage	% Ur	3 %		
2.17.6	Communication scheme logic	/ ₀ UI	Yes		
	Permissive and blocking		Yes		
2.17.0.1	Single and three-pole tripping schemes	+	Yes		
	· · · · · ·		165		
2.18	Current negative sequence protection		lnoort		
2.18.1 2.18.2	Number of stages	% Ir	Insert Insert		
	Setting range	70 11			
2.18.3	Characteristic		Definite time		
2.19	Prover system supervision		Vac		
2.19.1	Broken conductor check		Yes		
2.19.2	Overload protection	0/ 1=	lannut		
	Setting range of 1 stage	% Ir	Insert		
	Time delay range of 1 stage	min	> 20		
	Setting range of 2 stage	% Ir	Insert		
	Time delay range of 2 stage	S	> 20		
2.19.2.5	Blocking external (system or HMI)		Yes		
2.19.3	Additional supervision functions (thermal state,		Insert		
2.20	etc.)				
	Autoreclosing	+	Min O		
2.20.1	Number of shots		Min. 2		
2.20.2	AR program		1/3 pole		
2.20.3	Reclosing pulse duration	S	Insert		
2.20.4	Dead time range	S	Insert		
2.20.5	Counters for AR operation		Yes		
2.20.6	Inhibit time range	S	Insert		
2.20.7	Reclaim time range	S	Insert		
2.20.8	Synchronism & energising check during 3 ph		Yes		
2 20 2	AR		Vaa		
2.20.9	Evolving faults treatment		Yes	+	
2.20.10	AR blocking for CB not ready		Yes		



		Minimum Requirements		
No.	Description	Unit	Data	Guaranteed
2.20.11	AR operation 1/3ph in 1 st and 2 nd zone		Yes	
2.21	Synchronism & energising check			
2.21.1	Frequency difference range	mHz.	Insert	
2.21.2	Voltage difference range	% Ur	Insert	
2.21.3	Phase difference range	0	Insert	
2.21.4	Operating time for synchro check function	ms	Insert	
2.21.5	Operating time for energising check function	ms	Insert	
2.22	Disturbance recorder			
2.22.1	Number of digital signals		Min. 40	
2.22.2	Number of analogue signals		Min. 8	
2.22.3	External/manual initiation of recording		Yes	
2.22.4	Sampling rate	kHz	Insert	
2.22.5	Pre-fault time	ms	≥ 300	
2.22.6	Recording time	ms	≥ 2000	
2.22.7	Number of recorded disturbances		Min. 5	
2.22.8	Total recording time with max. analogue and bi-	_	. 40	
2.22.8	nary signals	S	> 10	
2.22.9	Output file comtrade format		Yes	
2.23	Event recorder			
2.23.1	Max. number of events		Insert	
2.23.2	Time tagging resolution	ms	1	
2.24	Fault locator, measurement in (km)		Yes	
2.25	Self-supervision		Yes	
2.26	Measurement			
2.26.1	Active power measurement		Yes	
2.26.2	Reactive power measurement		Yes	
2.26.3	Voltage measurement		Yes	
2.26.4	Current measurement		Yes	
3	Additional requirements			
3.1	Test socket		Yes	
	Setting and configuration of Main Protection Ter-		.,	
3.2	minal approved by Engineer		Yes	
	Overall compliance with the requirements	(yes/no)		



5.2.6.34 14005 - Protection Terminal for Power Transformers Main 1

No.	Description	Minimum Requirements		Guaranteed
NO.	Description	Unit	Data	Guaranteeu
14005	Protection Terminal for Power Transformers	/lain 1 / Cod	le number: 14005	1
1.1	Manufacturer		Insert	
1.2	Country of origin		Insert	
1.3	Terminal type		Insert	
1.4	Terminal version (software version)		Insert	
1.5	Standards		IEC	
2	Characteristics			<u></u>
2.1	Auxiliary supply voltage			
2.1.1	Rated auxiliary supply voltage	V d.c.	110 ±15 %	
	Interruption in auxiliary d.c. voltage:			
2.1.2	Without resetting	ms	> 50	
	Restart time	S	Insert	
2.2	a.c. current inputs			
2.2.1	Number of inputs		Min. 9	
2.2.2	Rated current Ir	Α	1	
2.2.3	Permissive overload, continuous		4xlr	
2.2.4	Permissive overload, 1 s		100xlr	
2.2.5	Burden at Ir	VA	< 0.5	
2.3	a.c. voltage inputs			
2.3.1	Number of inputs		Min 4	
2.3.2	Rated voltage Ph-Ph Ur	٧	100	
2.3.3	Permissive overload, continuous	% Ur	150	
2.3.4	Permissive overload, 1 s	% Ur	250	
2.3.5	Burden at Ur	VA	< 0,3	
2.4	Binary inputs		Min. 16	
2.4.1	Number of BI groups with common root		Insert	
2.4.2	Number of inputs per BI group with common root		< 8	
2.4.3	Rated voltage	V d.c.	110 ±15 %	
2.5	Binary outputs		Min. 16	
2.5.1	Number of modules		Insert	
2.5.2	Number of outputs per group with common root		Max. 3	
2.5.3	Rated voltage	V d.c.	110 ±15 %	
2.5.4	Breaking capacity at inductive load with	A	0.1	
2.5.5	L/R<40 ms, at rated voltage Current carrying capacity at rated voltage for	A	Insert	
	signalling contacts, continuous			
2.5.6	Number of tripping contacts (high-speed output)	pcs.	6	
2.5.7	Current carrying capacity at rated voltage for tripping contacts, continuous	Α	5	
2.6	LED indications			
2.6.1	Number of LED's		Insert	
2.6.2	Multi-colour LED's	Yes/No	Insert	



NI-	Description .	Minimu	Minimum Requirements	
No.	Description	Unit	Data	Guaranteed
2.7	Communication ports		Yes	
2.7.1	Port for front-connected PC			
2.7.1.1	Protocols supported		Insert	
2.7.1.2	Communication speed	Kbit/s	Insert	
2.7.1.3	PC side connector type		Insert	
2.7.2	System interface			
2.7.2.1	Number of rear ports		2	
2.7.2.2	Protocols supported		IEC 61850	
2.7.2.3	Communication speed	Mbit/s	Min. 100	
2.7.2.4	Connector type		RJ45 or FO	
2.7.3	Time synchronisation		SNTP	
2.8	Human-machine interface		Yes	
2.8.1	LCD alphanumeric display, No. of rows		Insert	
2.9	Number of setting parameter groups		Min. 4	
2.10	Autotransformer / Transformer Differential protection			
2.10.1	Inrush restraint		Yes	
2.10.2	Over excitation restraint		Yes	
2.10.3	Basic differential current range	% Ir	Insert	
2.10.4	Operating characteristic with 2 slope	70 11	Yes	
2.10.5	High non-restraint differential current range	% Ir	Insert	
2.10.6	Operating time	ms	< 30	
2.10.7	Internal CT ratio and vector group compensa-	1113	Yes	
2.10.8	Cross block function		Yes	
2.10.9	Zero sequence subtraction		Yes	
2.10.0	Restricted earth fault protection for autotrans-		100	
2.11	former / transformer			
2.11.1	Low Impedance		Yes	
2.11.2	Internal CT ratio vector group compensation		Yes	
2.11.3	Basic differential current range	% Ir	Insert	
2.11.4	Operating time	ms	< 30	
2.12	Current negative sequence protection	1110	100	
2.12.1	Number of stages		Insert	
2.12.2	Setting range	% Ir	Insert	
2.12.3	Characteristic	70 11	Insert	
2.12.3	Multistage three-phase overcurrent protection	pcs.	Min. 2	1
2.13.1	Instantaneous overcurrent protection with in-	роз.	IVIIII. Z	
0.40.4.4	rush restraint	0/ 1=	lannu	
2.13.1.1	Setting range	% Ir	Insert	
2.13.1.2	Min. operating time at I > 10*I _{set}	ms	< 30	+
2.13.2	Time delayed overcurrent protection	0/ 1	1 .	+
2.13.2.1	Setting range	% Ir	Insert	+
2.13.2.2	Type of protection		Non-directional	+
2.13.2.3	Characteristics		.,	
2.13.2.3.1		Yes/no	Yes	+
2.13.2.3.2	Normal inverse	Yes/No	Yes	1



No.	Description	Minimum Requirements		
		Unit	Data	Guaranteed
2.13.2.3.3	Very inverse	Yes/No	Insert	
2.13.2.3.4	Extremely inverse	Yes/No	Insert	
2.14	Multistage earth fault overcurrent protection	pcs.	Min. 2	
2.14.1	Instantaneous earth fault overcurrent protection with inrush restraint			
2.14.1.1	Setting range	% Ir	Insert	
2.14.1.2	Min. operating time at $I > 10*I_{set}$	ms	< 30	
2.14.2	Time delayed earth fault overcurrent protection			
2.14.2.1	Setting range	% Ir	Insert	
2.14.2.2	Type of protection		Non-directional	
2.14.2.3	Characteristics			
2.14.2.3.1	Definite time delayed	Yes/no	Yes	
2.14.2.3.2	Normal inverse	Yes/No	Yes	
2.14.2.3.3	Very inverse	Yes/No	Insert	
	Extremely inverse	Yes/No	Insert	
2.15	Thermal overload protection		Yes	
2.16	Disturbance recorder			
2.16.1	Number of digital signals		Min. 40	
2.16.2	Number of analogue signals		Min. 9	
2.16.3	External/manual initiation of recording			
2.16.4	Sampling rate	kHz	Insert	
2.16.5	Pre-fault time	ms	≥ 300	
2.16.6	Recording time	ms	≥ 2000	
2.16.7	Number of recorded disturbances		Min. 5	
2.16.8	Total recording time with max. analogue and binary signals	s	> 10	
2.16.9	Output file comtrade format		Yes	
2.17	Event recorder			
2.17.1	Max. number of events		Insert	
2.17.2	Time tagging resolution	ms	1	
2.18	Self-supervision		Yes	
3	Additional requirements			
3.1	Test socket		Yes	
3.2	Setting and configuration of Protection Terminal approved by Engineer		Yes	
	Overall compliance with the requirements (yes/no)			



5.2.6.35 14006 - Protection Terminal for Power Transformers Main 2

No.	Description	Minimum Requirements Unit Data		Guaranteed		
NO.						
14006	Protection Terminal for Power Transformers Main 2 / Code number: 14006					
1.1	Manufacturer		Different than Main 1			
1.2	Country of origin		Insert			
1.3	Terminal type		Insert			
1.4	Terminal version (software version)		Insert			
1.5	Standards		IEC			
2	Characteristics					
2.1	Auxiliary supply voltage					
2.1.1	Rated auxiliary supply voltage	V d.c.	110 ±15 %			
2.1.2	Interruption in auxiliary d.c. voltage:Without resettingRestart time	ms s	> 50 Insert			
2.2	a.c. current inputs					
2.2.1	Number of inputs		Min. 9			
2.2.2	Rated current Ir	Α	1			
2.2.3	Permissive overload, continuous		4xIr			
2.2.4	Permissive overload, 1 s		100xlr			
2.2.5	Burden at Ir	VA	< 0.5			
2.3	a.c. voltage inputs					
2.3.1	Number of inputs		Min 4			
2.3.2	Rated voltage Ph-Ph Ur	V	100			
2.3.3	Permissive overload, continuous	% Ur	150			
2.3.4	Permissive overload, 1 s	% Ur	250			
2.3.5	Burden at Ur	VA	< 0,3			
2.4	Binary inputs		Min. 16			
2.4.1	Number of BI groups with common root		Insert			
2.4.2	Number of inputs per BI group with common root		< 8			
2.4.3	Rated voltage	V d.c.	110 ±15 %			
2.5	Binary outputs		Min. 16			
2.5.1	Number of modules		Insert			
2.5.2	Number of outputs per group with common root		Max. 3			
2.5.3	Rated voltage	V d.c.	110 ±15 %			
2.5.4	Breaking capacity at inductive load with L/R<40 ms, at rated voltage	А	0.1			
2.5.5	Current carrying capacity at rated voltage for signalling contacts, continuous	А	Insert			
2.5.6	Number of tripping contacts (high-speed output)	pcs.	6			
2.5.7	Current carrying capacity at rated voltage for tripping contacts, continuous	А	5			
2.6	LED indications					
2.6.1	Number of LED's		Insert			



		Minimu	Minimum Requirements	
No.	Description	Unit	Data	Guaranteed
2.6.2	Multi-colour LED's	Yes/No	Insert	
2.7	Communication ports		Yes	
2.7.1	Port for front-connected PC			
2.7.1.1	Protocols supported		Insert	
2.7.1.2	Communication speed	Kbit/s	Insert	
2.7.1.3	PC side connector type		Insert	
2.7.2	System interface			
2.7.2.1	Number of rear ports		2	
2.7.2.2	Protocols supported		IEC 61850	
2.7.2.3	Communication speed	Mbit/s	Min. 100	
2.7.2.4	Connector type		RJ45 or FO	
2.7.3	Time synchronisation		SNTP	
2.8	Human-machine interface		Yes	
2.8.1	LCD alphanumeric display, No. of rows		Insert	
2.9	Number of setting parameter groups		Min. 4	
2.10	Autotransformer / Transformer Differential protection			
2.10.1	Inrush restraint		Yes	
2.10.2	Overexcitation restraint		Yes	
2.10.3	Basic differential current range	% Ir	Insert	
2.10.4	Operating characteristic with 2 slope		Yes	
2.10.5	High non-restraint differential current range	% Ir	Insert	
2.10.6	Operating time	ms	< 30	
2.10.7	Internal CT ratio and vector group compensation		Yes	
2.10.8	Crossblock function		Yes	
2.10.9	Zero sequence subtraction		Yes	
2.11	Restricted earth fault protection for auto- transformer / transformer			
2.11.1	Low Impedance		Yes	
2.11.2	Internal CT ratio vector group compensation		Yes	
2.11.3	Basic differential current range	% Ir	Insert	
2.11.4	Operating time	ms	< 30	
2.12	Current negative sequence protection			
2.12.1	Number of stages		Insert	
2.12.2	Setting range	% Ir	Insert	
2.12.3	Characteristic		Insert	
2.13	Multistage three-phase overcurrent protection	pcs.	Min. 2	
2.13.1	Instantaneous overcurrent protection with in- rush restraint			
2.13.1.1	Setting range	% Ir	Insert	
2.13.1.2	Min. operating time at I > 10*I _{set}	Ms	< 30	
2.13.2	Time delayed overcurrent protection			
2.13.2.1	Setting range	% Ir	Insert	
2.13.2.2	Type of protection		Non-directional	



NI-	Description	Minimu	um Requirements	Cuerante - 1
No.	Description	Unit	Data	Guaranteed
2.13.2.3	Characteristics			
2.13.2.3.1	Definite time delayed	Yes/no	Yes	
2.13.2.3.2	Normal inverse	Yes/No	Yes	
2.13.2.3.3	Very inverse	Yes/No	Insert	
2.13.2.3.4	Extremely inverse	Yes/No	Insert	
2.14	Multistage earth fault overcurrent protection	pcs.	Min. 2	
2.14.1	Instantaneous earth fault overcurrent protection with inrush restraint			
2.14.1.1	Setting range	% Ir	Insert	
2.14.1.2	Min. operating time at I > 10*I _{set}	Ms	< 30	
2.14.2	Time delayed earth fault overcurrent protection			
2.14.2.1	Setting range	% Ir	Insert	
2.14.2.2	Type of protection		Non-directional	
2.14.2.3	Characteristics			
2.14.2.3.1	Definite time delayed	Yes/no	Yes	
2.14.2.3.2	Normal inverse	Yes/No	Yes	
2.14.2.3.3	Very inverse	Yes/No	Insert	
2.14.2.3.4	Extremely inverse	Yes/No	Insert	
2.15	Thermal overload protection		Yes	
2.16	Disturbance recorder			
2.16.1	Number of digital signals		Min. 40	
2.16.2	Number of analogue signals		Min. 9	
2.16.3	External/manual initiation of recording			
2.16.4	Sampling rate	kHz	Insert	
2.16.5	Pre-fault time	ms	≥ 300	
2.16.6	Recording time	ms	≥ 2000	
2.16.7	Number of recorded disturbances		Min. 5	
2.16.8	Total recording time with max. analogue and binary signals	s	> 10	
2.16.9	Output file comtrade format		Yes	
2.17	Event recorder			
2.17.1	Max. number of events		Insert	
2.17.2	Time tagging resolution	ms	1	
2.18	Self-supervision		Yes	
3	Additional requirements			
3.1	Test socket		Yes	
3.2	Setting and configuration of Protection Terminal approved by Engineer		Yes	
	Overall compliance with the requirement	nts (yes/no)		



5.2.6.36 14007 - Protection Terminal for LV side of Power Transformer

No.	Description	Minimum Requirements		Guarantood
NO.		Unit	Data	Guaranteed
14007	Protection Terminal for LV side of Power Tra	nsformer / C	ode number: 14007	
1.1	Manufacturer		Insert	
1.2	Country of origin		Insert	
1.3	Terminal type		Insert	
1.4	Terminal version (software version)		Insert	
1.5	Standards		IEC	
2	Characteristics			
2.1	Auxiliary supply voltage			
2.1.1	Rated auxiliary supply voltage	V d.c.	110 ±15 %	
	Interruption in auxiliary d.c. voltage:			
2.1.2	Without resetting	ms	> 50	
	Restart time	s	Insert	
2.2	a.c. current inputs			
2.2.1	Number of inputs		Min. 4	
2.2.2	Rated current Ir	Α	1	
2.2.3	Permissive overload, continuous		4xlr	
2.2.4	Permissive overload, 1 s		100xlr	
2.2.5	Burden at Ir	VA	< 0.5	
2.3	a.c. voltage inputs			
2.3.1	Number of inputs		Min. 4	
2.3.2	Rated voltage Ph-Ph Ur	V	100	
2.3.3	Permissive overload, continuous	% Ur	150	
2.3.4	Permissive overload, 1 s	% Ur	250	
2.3.5	Burden at Ur	VA	< 0.3	
2.4	Binary inputs		Min. 16	
2.4.1	Number of BI groups with common root		Insert	
2.4.2	Number of inputs per BI group with common root		< 8	
2.4.3	Rated voltage	V d.c.	110 ±15 %	
2.5	Binary outputs		Min. 16	
2.5.1	Number of modules		Insert	
2.5.2	Number of outputs per group with common root		Max. 3	
2.5.3	Rated voltage	V d.c.	110 ±15 %	
	Breaking capacity at inductive load with			
2.5.4	L/R<40 ms, at rated voltage	Α	0.1	
2.5.5	Current carrying capacity at rated voltage for signalling contacts, continuous	А	Insert	
2.5.6	Number of tripping contacts (high-speed output)	pcs.	6	
2.5.7	Current carrying capacity at rated voltage for tripping contacts, continuous	А	5	
2.6	LED indications			
2.6.1	Number of LED's		Insert	



		Minimum Requirements		
No.	Description	Unit	Data	Guaranteed
2.6.2	Multi-colour LED's	Yes/No	Insert	
2.7	Communication ports	1 30/110	Yes	
2.7.1	Port for front-connected PC		100	
2.7.1.1	Protocols supported	†	Insert	
2.7.1.2	Communication speed	Kbit/s	Insert	
2.7.1.3	PC side connector type	110100	Insert	
2.7.2	System interface		moore	
2.7.2.1	Number of rear ports		2	
2.7.2.2	Protocols supported	†	IEC 61850	
2.7.2.3	Communication speed	Mbit/s	Min. 100	
2.7.2.4	Connector type	IVIDIUS	RJ45 or FO	
2.7.3	Time synchronisation		SNTP	
2.7.3	Human-machine interface		Yes	
2.8.1	LCD alphanumeric display, No. of rows		Insert	
2.9	Number of setting parameter groups		Min. 4	
2.10	Distance protection		IVIIII. 4	
2.10.1	•	+	Min. 5	
2.10.1	Number of protection zones Basic operating time	ma	< 30	
	•	ms	Quadrilateral	
2.10.3	Operational characteristic			
2.10.4	Zone 1 direction software selectable		Yes (F/R/ND)	
2.10.5	Zone 2 direction software selectable		Yes (F/R/ND)	
2.10.6	Zone 3 direction software selectable	+	Yes (F/R/ND)	+
2.10.7	Zone 4 direction software selectable	+	Yes (F/R/ND)	+
2.10.8	Zone 5 direction software selectable		Yes (F/R/ND)	
2.10.9	Minimum impedance setting	Ω	Insert	
2.10.10	Full scheme protection phase segregated		Yes	
2.11	Power swing detection	+	Yes	
0.40	Secondary circuits supervision:		.,	
2.12	VT circuits supervision		Yes	
	CT circuits supervision		Yes	
0.40	Automatic switch onto fault logic		.,	
2.13	Impedance criteria		Yes	
0.44	Instantaneous overcurrent criteria		Yes	
2.14	Multistage three-phase overcurrent protection		Min O	
2.14.1	Number of stages	0/ 1-	Min. 2	
2.14.2	Setting range	% Ir	Insert	
2.14.3	Characteristics) / /		
2.14.3.1	Definite time delayed	Yes/no	Yes	
	Normal inverse	Yes/No	Yes	
	Very inverse	Yes/No	Insert	+
	Extremely inverse	Yes/No	Insert	
2.15	Multistage earth fault overcurrent protection		1.4° O	
2.15.1	Number of stages	0/ 1	Min. 2	
2.15.2	Setting range	% Ir	Insert	
2.15.3	Type of protection	+	Non-directional	
2.15.4	Characteristics	,, ,		+
2.15.4.1	Definite time delayed	Yes/no	Yes	



Ne	December 1	Minim	um Requirements	
No.	Description	Unit	Data	Guaranteed
2.15.4.2	Normal inverse	Yes/No	Yes	
2.15.4.3	Very inverse	Yes/No	Insert	
2.15.4.4	Extremely inverse	Yes/No	Insert	
2.16	Directional earth fault protection			
2.16.1	Number of stages		Insert	
2.16.2	Setting range	% Ir	Insert	
2.16.3	Type of protection		Insert	
2.16.4	Characteristics			
2.16.4.1	Definite time delayed	Yes/no	Insert	
2.16.4.2	Normal inverse	Yes/No	Insert	
2.16.4.3	Very inverse	Yes/No	Insert	
2.16.4.4	Extremely inverse	Yes/No	Insert	
2.16.5	Minimum polarizing voltage	% Ur	Insert	
2.16.6	Communication scheme logic		Insert	
2.17	Power system supervision			
2.17.1	Broken conductor check		Yes	
2.18	Disturbance recorder			
2.18.1	Number of digital signals		Min. 40	
2.18.2	Number of analogue signals		Min. 8	
2.18.3	External/manual initiation of recording		Insert	
2.18.4	Sampling rate	kHz	Insert	
2.18.5	Pre-fault time	ms	≥ 300	
2.18.6	Recording time	ms	≥ 2000	
2.18.7	Number of recorded disturbances		Min. 5	
2.18.8	Total recording time with max. analogue and binary signals	s	> 10	
2.18.9	Output file comtrade format		Yes	
2.19	Event recorder			
2.19.1	Max. number of events		Insert	
2.19.2	Time tagging resolution	ms	1	
2.20	Self-supervision		Yes	
2.21	Measurement			
2.21.1	Active power measurement		Yes	
2.21.2	Reactive power measurement		Yes	
2.21.3	Voltage measurement		Yes	
2.21.4	Current measurement		Yes	
3	Additional requirements			
3.1	Test socket		Yes	
3.2	Setting and configuration of Protection Terminal approved by Engineer		Yes	
	Overall compliance with the requirements	s (yes/no)		



5.2.6.37 14008 - Automatic Voltage Regulation

	Description	Minimu	m Requirements	
No.		Unit	Data	Guaranteed
14008	Automatic Voltage Regulation / Code numl	ber: 14008		·
1.1	Manufacturer		Insert	
1.2	Country of origin		Insert	
1.3	Terminal type		Insert	
1.4	Terminal version (software version)		Insert	
1.5	Standards		IEC	
2	Characteristics			
2.1	Auxiliary supply voltage			
2.1.1	Rated auxiliary supply voltage	V d.c.	110 ±15 %	
	Interruption in auxiliary d.c. voltage:			
2.1.2	Without resetting	ms	> 50	
	Restart time	S	Insert	
2.2	a.c. current inputs			
2.2.1	Number of inputs		1	
2.2.2	Rated current for 110 kV	A	1	
2.2.3	Permissive overload, continuous		3xlr	
2.2.4	Permissive overload, 1 s		100xlr	
2.2.5	Burden at Ir	VA	< 0.5	
2.3	a.c. voltage inputs			
2.3.1	Number of inputs		Min 4	
2.3.2	Rated voltage Ph-Ph Ur	V	100	
2.3.3	Permissive overload, continuous	% Ur	150	
2.3.4	Permissive overload, 1 s	% Ur	250	
2.3.5	Burden at Ur	VA	< 0.3	
2.4	Voltage control function			
2.4.1	Set voltage range	% U _{r2}	Insert	
2.4.2	Set voltage dead-band range	% U _{r2}	Insert	
2.4.3	Upper limit busbar voltage range	% U _{r2}	Insert	
2.4.4	Lower limit busbar voltage range	% U _{r2}	Insert	
2.4.5	Line voltage drop compensation	Yes/No	Insert	
2.4.6	Regulation for capacitive load	Yes/No	Insert	
2.4.7	Undervoltage blocking range	% U _{r2}	Insert	
2.4.8	Overcurrent blocking range	% I _r	Insert	
2.4.9	Parallel operation		Yes	
2.4.10	Parallel operation principal		Insert	
2.5	Communication ports		Yes	
2.5.1	Port for front-connected PC			
2.5.1.1	Protocols supported		Insert	
2.5.1.2	Communication speed	Kbit/s	Insert	
2.5.1.3	PC side connector type		Insert	
2.5.2	System interface			
2.5.2.1	Number of rear ports		Min. 1	
2.5.2.2	Protocols supported		IEC 61850	
2.5.2.3	Communication speed	Mbit/s	Min. 100	



No	Pagarintian		Minimum Requirements	
No.	Description	Unit	Data	Guaranteed
2.5.2.4	Connector type		RJ45 or FO	
2.5.3	External time synchronisation		Insert	
2.6	Tap changer, tap position		BCD code	
2.7	Self-supervision		Yes	
3	Additional requirements			
3.1	Test socket		Yes	
3.2	Setting and configuration of Automatic Voltage Regulator approved by Engineer		Yes	
	Overall compliance with the requirements (yes/no)			



5.2.6.38 14009 - Protection Terminal for Bus couplers 230 kV & 132 kV

No.	Description	Minimum Requirements		Guaranteed
NO.		Unit	Data	Guaranteeu
14009	Protection Terminal for Bus couplers 230	kV & 132 kV	/ Code number: 14009	
1.1	Manufacturer		Insert	
1.2	Country of origin		Insert	
1.3	Terminal type		Insert	
1.4	Terminal version (software version)		Insert	
1.5	Standards		IEC	
2	Characteristics			
2.1	Auxiliary supply voltage			
2.1.1	Rated auxiliary supply voltage	V d.c.	110 ±15 %	
2.1.2	Interruption in auxiliary d.c. voltage: Without resetting Restart time	ms s	> 50 Insert	
2.2	a.c. current inputs			
2.2.1	Number of inputs		Min. 4	
2.2.2	Rated current Ir	Α	1	
2.2.3	Permissive overload, continuous		4xIr	
2.2.4	Permissive overload, 1 s		100xlr	
2.2.5	Burden at Ir	VA	< 0.5	
2.3	a.c. voltage inputs			
2.3.1	Number of inputs		Min. 4	
2.3.2	Rated voltage Ph-Ph Ur	V	100	
2.3.3	Permissive overload, continuous	% Ur	150	
2.3.4	Permissive overload, 1 s	% Ur	250	
2.3.5	Burden at Ur	VA	< 0.3	
2.4	Binary inputs		Min. 8	
2.4.1	Number of BI groups with common root		Insert	
2.4.2	Number of inputs per BI group with common root		Insert	
2.4.3	Rated voltage	V d.c.	110 ±15 %	
2.5	Binary outputs		Min. 8	
2.5.1	Number of modules		Insert	
2.5.2	Number of outputs per group with common root		Max. 3	
2.5.3	Rated voltage	V d.c.	110 ±15 %	
2.5.4	Breaking capacity at inductive load with L/R<40 ms, at rated voltage	А	0.1	
2.5.5	Current carrying capacity at rated voltage for signalling contacts, continuous	А	Insert	
2.5.6	Number of tripping contacts (high-speed output)	pcs.	6	
2.5.7	Current carrying capacity at rated voltage for tripping contacts, continuous	Α	5	
2.6	LED indications			
2.6.1	Number of LED's		Insert	



	Description.	Minimu	Minimum Requirements	
No.	Description	Unit	Data	Guaranteed
2.6.2	Multi-colour LED's	Yes/No	Insert	
2.7	Communication ports		Yes	
2.7.1	Port for front-connected PC			
2.7.1.1	Protocols supported		Insert	
2.7.1.2	Communication speed	Kbit/s	Insert	
2.7.1.3	PC side connector type		Insert	
2.7.2	System interface			
2.7.2.1	Number of rear ports		2	
2.7.2.2	Protocols supported		IEC 61850	
2.7.2.3	Communication speed	Mbit/s	Min. 100	
2.7.2.4	Connector type		RJ45 or FO	
2.7.3	Time synchronisation		SNTP	
2.8	Human-machine interface		Yes	
2.8.1	LCD alphanumeric display, No. of rows		Insert	
2.9	Number of setting parameter groups		Min. 4	
	Multistage three-phase overcurrent protec-			
2.10	tion			
2.10.1	Instantaneous overcurrent protection			
2.10.1.1	Setting range	% Ir	Insert	
2.10.1.2	Min. operating time at I > 10*I _{set}	ms	30	
2.10.2	Time delayed overcurrent protection	1110		
2.10.2.1	Setting range	% Ir	Insert	
2.10.2.2	Type of protection		Non-directional	
2.10.2.3	Characteristics			
2.10.2.3.1	Definite time delayed	Yes/no	Yes	
2.10.2.3.2	Normal inverse	Yes/No	Yes	
	Very inverse	Yes/No	Insert	
2.10.2.3.4	Extremely inverse	Yes/No	Insert	
2.11	Multistage earth fault overcurrent protection			
	Instantaneous earth fault overcurrent pro-			
2.11.1	tection			
2.11.1.1	Setting range	% Ir	Insert	
2.11.1.2	Min. operating time at I > 10*I _{set}	ms	30	
	Time delayed earth fault overcurrent pro-			
2.11.2	tection			
2.11.2.1	Setting range	% Ir	Insert	
2.11.2.2	Type of protection		Non-directional	
2.11.2.3	Characteristics			
2.11.2.3.1	Definite time delayed	Yes/no	Yes	
2.11.2.3.2	Normal inverse	Yes/No	Yes	
2.11.2.3.3	Very inverse	Yes/No	Insert	
2.11.2.3.4	Extremely inverse	Yes/No	Insert	
2.12	Directional earth fault protection			
2.12.1	Number of stages		Insert	
2.12.2	Setting range	% Ir	Insert	
2.12.3	Type of protection	, ,	Directional	
	,	1	oo.io.iui	1



NI.	Description	Minimu	Minimum Requirements		
No.	Description	Unit	Data	Guaranteed	
2.13.4.1	Definite time delayed	Yes/no	Yes		
2.13.4.2	Normal inverse	Yes/No	Yes		
2.13.4.3	Very inverse	Yes/No	Insert		
2.13.4.4	Extremely inverse	Yes/No	Insert		
2.13.5	Minimum polarising voltage	% Ur	3 %		
2.14	Current negative sequence protection				
2.14.1	Number of stages		Insert		
2.14.2	Setting range	% Ir	Insert		
2.14.3	Characteristic		Insert		
2.15	Disturbance recorder				
2.15.1	Number of digital signals		Min. 40		
2.15.2	Number of analogue signals		Min. 8		
2.15.3	External/manual initiation of recording		Insert		
2.15.4	Sampling rate	kHz	Insert		
2.15.5	Pre-fault time	ms	≥ 300		
2.15.6	Recording time	ms	≥ 2000		
2.15.7	Number of recorded disturbances		Min. 5		
2.15.8	Total recording time with max. analogue and binary signals	s	> 10		
2.15.9	Output file comtrade format		Yes		
2.16	Event recorder				
2.16.1	Max. number of events		Insert		
2.16.2	Time tagging resolution	ms	1		
2.17	Self-supervision		Yes		
3	Additional requirements				
3.1	Test socket		Yes		
3.2	Setting and configuration of Protection Terminal approved by Engineer		Yes		
Overall compliance with the requirements (yes/no)					



5.2.6.39 14010 - Busbar and Breaker Failure Protection for 230 and 132 kV Busbars

	Description	Mini	Minimum Requirements		
No.		Unit	Data	Guaranteed	
14010	Busbar and Breaker failure protection fo	r 230 and 1	I32 kV Busbars/Code n	umber: 14010	
1.1	Manufacturer		Insert		
1.2	Country of origin		Insert		
1.3	Type of installation		Distributed		
1.4	Standards		IEC		
1.5	Central Unit (CU)				
1.5.1	Terminal type		Insert		
1.5.2	Terminal version (software version)		Insert		
	Central unit for busbar protection must be		.,		
1.5.3	supported for min. 16 bays		Yes		
1.6	Bay Unit (BU)				
1.6.1	Terminal type		Insert		
1.6.2	Terminal version (software version)		Insert		
		- U		•	
2	Characteristics		<u> </u>	1	
2.1	Auxiliary supply voltage		110 150/		
2.1.1	CU, BU Rated auxiliary supply voltage	V d.c.	110 ±15 %		
2.1.2	CU auxiliary supply redundant		Yes		
0.4.0	Interruption in auxiliary d.c. voltage:		50		
2.1.3	Without resetting	ms	> 50		
0.0	Restart time	S	Insert		
2.2	a.c. current inputs BU		Min O		
2.2.1	Number of inputs		Min. 3		
2.2.2	Rated current Ir	A	1		
2.2.3	Permissive overload, continuous		4xlr		
2.2.4	Permissive overload, 1 s	\ \	100xlr		
2.2.5	Burden at Ir	VA	< 0.5		
2.3	Binary inputs CU, BU		Min. 20 / 8		
2.3.1	Number of modules		Insert		
2.3.2	Number of inputs per module		Insert		
2.3.3	Rated voltage	V d.c.	110 ±15 %		
2.4	Binary outputs CU, BU		Min. 6 / 4		
2.4.1	Number of modules		Insert		
2.4.2	Number of outputs per module	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	Insert		
2.4.3	Rated voltage	V d.c.	110 ±15 %		
2.4.4	Breaking capacity at inductive load with	Α	0.1		
	L/R<40 ms, at rated voltage				
2.4.5	Current carrying capacity at rated voltage for	Α	Insert		
	signalling contacts, continuous				
2.4.6	Number of tripping contacts (high-speed out-	pcs.	Min. 3		
	Current carrying capacity at rated voltage for				
2.4.7	tripping contacts, continuous	Α	5		
2.5	LED indications CU, BU				
2.5.1	Number of LED's		Insert		
2.0.1	INGUING OF LED 9	1	IIISEIL	J	



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2.7.6 ble/adaptable for future switchgear extension or modification 2.7.7 Bay-selective intertripping 2.7.8 Phase-segregated measurement system 2.8 Breaker failure protection 2.8.1 Setting range 2.8.2 Re-trip time delay range 2.8.3 Re-trip operation mode 1/3ph 2.8.4 Back-up time delay range 2.8.5 Trip operating time setting resolution 2.8.6 Trip delay range 2.8.7 Single-phase with/without current 2.8.8 2-stage operation bay trip repeat/trip busbar 2.8.9 Selectable operation mode (current, unbalance, low current) 2.8.10 Independent settable delay times for all operation modes 2.8.11 Low current mode using the circuit breaker auxiliary contact 2.8.12 End fault protection 2.8.13 Independent breaker failure protection per bay unit 2.9 Disturbance recorder CU, BU 2.9.1 Number of digital signals	2.7.5	External signal of load transfer starting		Insert	
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2.7.8 Phase-segregated measurement system 2.8 Breaker failure protection 2.8.1 Setting range		or modification			
2.8 Breaker failure protection 2.8.1 Setting range	2.7.7	Bay-selective intertripping		Yes	
2.8.1 Setting range	2.7.8	Phase-segregated measurement system		Yes	
2.8.2 Re-trip time delay range 2.8.3 Re-trip operation mode 1/3ph 2.8.4 Back-up time delay range 2.8.5 Trip operating time setting resolution 2.8.6 Trip delay range 2.8.7 Single-phase with/without current 2.8.8 2-stage operation bay trip repeat/trip busbar 2.8.9 Selectable operation mode (current, unbalance, low current) 2.8.10 Independent settable delay times for all operation modes 2.8.11 Low current mode using the circuit breaker auxiliary contact 2.8.12 End fault protection 2.8.13 Independent breaker failure protection per bay unit 2.9 Disturbance recorder CU, BU 2.9.1 Number of digital signals S 0-1 Yes 1 Independent settable delay times for all operation modes Yes 1 Insert 1 Yes 1 Yes 1 Yes 1 Yes 1 Independent breaker failure protection per bay unit Yes 1 Insert 1 Insert 1 Yes 1 Insert 1 Yes 1 Independent breaker failure protection per bay unit 1 Insert	2.8	Breaker failure protection			
2.8.3 Re-trip operation mode 1/3ph 2.8.4 Back-up time delay range 2.8.5 Trip operating time setting resolution 2.8.6 Trip delay range 2.8.7 Single-phase with/without current 2.8.8 2-stage operation bay trip repeat/trip busbar 2.8.9 Selectable operation mode (current, unbalance, low current) 2.8.10 Independent settable delay times for all operation modes 2.8.11 Low current mode using the circuit breaker auxiliary contact 2.8.12 End fault protection 2.8.13 Independent breaker failure protection per bay unit 2.9 Disturbance recorder CU, BU 2.9.1 Number of digital signals Selectable operation mode (current, unbalance, low current) Insert Yes Yes 1. Yes	2.8.1	Setting range	% Ir	Insert	
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2.8.5 Trip operating time setting resolution ms 1 2.8.6 Trip delay range s 0-1 2.8.7 Single-phase with/without current Yes 2.8.8 2-stage operation bay trip repeat/trip busbar 2.8.9 Selectable operation mode (current, unbalance, low current) 2.8.10 Independent settable delay times for all operation modes 2.8.11 Low current mode using the circuit breaker auxiliary contact 2.8.12 End fault protection 2.8.13 Independent breaker failure protection per bay unit Yes 2.9 Disturbance recorder CU, BU 2.9.1 Number of digital signals 1 member of digital signals signals	2.8.3	Re-trip operation mode 1/3ph		Yes	
2.8.6 Trip delay range 2.8.7 Single-phase with/without current 2.8.8 2-stage operation bay trip repeat/trip busbar 2.8.9 Selectable operation mode (current, unbalance, low current) 2.8.10 Independent settable delay times for all operation modes 2.8.11 Low current mode using the circuit breaker auxiliary contact 2.8.12 End fault protection 2.8.13 Independent breaker failure protection per bay unit 2.9 Disturbance recorder CU, BU 2.9.1 Number of digital signals	2.8.4	Back-up time delay range	s	0-1	
2.8.7 Single-phase with/without current 2.8.8 2-stage operation bay trip repeat/trip busbar 2.8.9 Selectable operation mode (current, unbalance, low current) 2.8.10 Independent settable delay times for all operation modes 2.8.11 Low current mode using the circuit breaker auxiliary contact 2.8.12 End fault protection 2.8.13 Independent breaker failure protection per bay unit 2.9 Disturbance recorder CU, BU 2.9.1 Number of digital signals Insert Yes Yes Yes Insert	2.8.5	Trip operating time setting resolution	ms	1	
2.8.8 2-stage operation bay trip repeat/trip busbar 2.8.9 Selectable operation mode (current, unbalance, low current) 2.8.10 Independent settable delay times for all operation modes 2.8.11 Low current mode using the circuit breaker auxiliary contact 2.8.12 End fault protection 2.8.13 Independent breaker failure protection per bay unit 2.9 Disturbance recorder CU, BU 2.9.1 Number of digital signals	2.8.6	Trip delay range	s	0-1	
2.8.9 Selectable operation mode (current, unbalance, low current) 2.8.10 Independent settable delay times for all operation modes 2.8.11 Low current mode using the circuit breaker auxiliary contact 2.8.12 End fault protection 2.8.13 Independent breaker failure protection per bay unit 2.9 Disturbance recorder CU, BU 2.9.1 Number of digital signals	2.8.7	Single-phase with/without current		Yes	
2.8.9 ance, low current) 2.8.10 Independent settable delay times for all operation modes 2.8.11 Low current mode using the circuit breaker auxiliary contact 2.8.12 End fault protection 2.8.13 Independent breaker failure protection per bay unit 2.9 Disturbance recorder CU, BU 2.9.1 Number of digital signals	2.8.8	2-stage operation bay trip repeat/trip busbar		Insert	
2.8.10 Independent settable delay times for all operation modes 2.8.11 Low current mode using the circuit breaker auxiliary contact 2.8.12 End fault protection 2.8.13 Independent breaker failure protection per bay unit 2.9 Disturbance recorder CU, BU 2.9.1 Number of digital signals Yes Yes Yes Yes	200	Selectable operation mode (current, unbal-		la a a ut	
2.8.10 tion modes 2.8.11 Low current mode using the circuit breaker auxiliary contact 2.8.12 End fault protection 2.8.13 Independent breaker failure protection per bay unit 2.9 Disturbance recorder CU, BU 2.9.1 Number of digital signals	2.8.9	ance, low current)		insert	
2.8.11 Low current mode using the circuit breaker auxiliary contact 2.8.12 End fault protection 2.8.13 Independent breaker failure protection per bay unit 2.9 Disturbance recorder CU, BU 2.9.1 Number of digital signals Yes Yes Yes	0.040	Independent settable delay times for all opera-		Vaa	
2.8.11 auxiliary contact 2.8.12 End fault protection 2.8.13 Independent breaker failure protection per bay unit 2.9 Disturbance recorder CU, BU 2.9.1 Number of digital signals Yes Yes Yes Independent breaker failure protection per bay unit Insert	2.8.10	tion modes		res	
2.8.12 End fault protection Yes 2.8.13 Independent breaker failure protection per bay unit 2.9 Disturbance recorder CU, BU 2.9.1 Number of digital signals Insert	2044	Low current mode using the circuit breaker		Vaa	
2.8.13 Independent breaker failure protection per bay unit 2.9 Disturbance recorder CU, BU 2.9.1 Number of digital signals Insert	∠.ŏ.11	auxiliary contact		res	
2.8.13 unit 2.9 Disturbance recorder CU, BU 2.9.1 Number of digital signals Insert	2.8.12	End fault protection		Yes	
2.9 Disturbance recorder CU, BU 2.9.1 Number of digital signals Insert	20.40	Independent breaker failure protection per bay		Vaa	
2.9.1 Number of digital signals Insert	∠.8.13	unit		Yes	
	2.9	Disturbance recorder CU, BU			
	2.9.1	Number of digital signals		Insert	
_ ∠.э.∠ Inumber of analogue signals Insert	2.9.2	Number of analogue signals		Insert	
2.9.3 External/manual initiation of recording Insert					
2.9.4 Sampling rate kHz Insert			kHz		



Na	Description	Minimum Requirements		0
No.	Description	Unit	Data	Guaranteed
2.9.5	Pre-fault time	ms	≥ 300	
2.9.6	Recording time	ms	≥ 2000	
2.9.7	Number of recorded disturbances		Min. 5	
2.9.8	Total recording time with max. analogue and binary signals	s	> 10	
2.9.9	Output file comtrade format		Yes	
2.10	Event recorder CU, BU			
2.10.1	Max. number of events		Insert	
2.10.2	Time tagging resolution	ms	1	
2.11	Self-supervision CU, BU		Yes	
3	Additional requirements			
3.1	Test socket BU		Yes	
3.2	Setting and configuration approved by Engineer		Yes	
3.4	Centralised, user-friendly configuration and all necessary software tools for full parameterization, and (re)configuration in case of extensions should be delivered		Yes	
	Overall compliance with the requirements	s (ves/no)		



5.2.6.40 14011 - Trip Circuit Supervision Relay

Na	Description	Minimu	Minimum Requirements	
No.	Description	Unit	Data	Guaranteed
14011	Trip Circuit Supervision Relay / Code numbe	er: 14011		
1.1	Manufacturer		Insert	
1.2	Country of origin		Insert	
1.3	Туре		Insert	
1.4	Standards		IEC	
2	Characteristics			
2.1	Auxiliary supply voltage			
2.1.1	Rated auxiliary supply voltage	V d.c.	110 ±15 %	
2.2	Binary outputs			
2.2.1	Number of outputs	NO/NC	Min. 2/2	
2.2.2	Rated voltage	V d.c.	110	
2.2.3	Breaking capacity at inductive load with L/R<40 ms, at rated voltage	А	0.1	
2.2.4	Current carrying capacity at rated voltage for signalling contacts, continuous	А	Insert	
2.3	Supervised circuits			
2.3.1	Voltage range of supervised circuits	V d.c.	110 ±15 %	
2.3.2	Injected current of supervised circuits	mA	Insert	
2.3.3	Operating time range	s	Insert	
2.3.4	Resetting time range	s	Insert	
	Overall compliance with the requiremen	ts (yes/no)		



5.2.6.41 14012 - Tripping Unit - High-Speed Tripping Relay

Na	No. Description		Minimum Requirements		
NO.	Description	Unit	Data	Guaranteed	
14011	4011 Trip Circuit Supervision Relay / Code number: 14011				
1.1	Manufacturer		Insert		
1.2	Country of origin		Insert		
1.3	Туре		Insert		
1.4	Standards		IEC		
2	Characteristics				
2.1	Auxiliary supply voltage				
2.1.1	Rated auxiliary supply voltage	V d.c.	110 ±15 %		
2.2	Binary outputs				
2.2.1	Number of outputs	NO/NC	Min. 2/2		
2.2.2	Rated voltage	V d.c.	110		
2.2.3	Breaking capacity at inductive load with L/R < 40 ms, at rated voltage	А	0.1		
2.2.4	Current carrying capacity at rated voltage for signalling contacts, continuous	А	Insert		
2.3	Supervised circuits				
2.3.1	Voltage range of supervised circuits	V d.c.	110 ±15 %		
2.3.2	Injected current of supervised circuits	mA	Insert		
2.3.3	Operating time range	S	Insert		
2.3.4	Resetting time range	S	Insert		
	Overall compliance with the requirements (yes/no)				



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5.2.6.42 14013 - Test Socket

NI-	Description	Minimum Requirements			
No.	Description	Unit	Data	Guaranteed	
14013	Test socket / Code number: 14013				
1.1	Manufacturer		Insert		
1.2	Country of origin		Insert		
1.3	Type Line main 1 and 2 Line back-up and bus coupler Transformer main 1 and 2 Bay unit BBF Distance protection (code 14007)		Insert		
1.4	Standards		IEC		
1.5	Each protection device must have its own test socket		Yes		
1.6	Test socket must obtain safe online protection testing and maintaining, and performing whole tripping test with following AR		Yes		
1.7	Test socket should have enough contacts to: Short-circuit current inputs from CT's Isolate voltage inputs from VT's Isolate trip circuit for each phase separately Isolate CB close command Isolate signalling voltage Inhibit breaker failure initialising Inhibit sending of communication signal Allow functional testing of protection		Yes		
1.8	Socket should be designed for 4 mm banana plugs access		Yes		
	Overall compliance with the requirements (yes/no)				



5.2.6.43 19001 - Battery

	Decement's an	Minii	num Requirements	
No.	Description	Unit	Data	Guaranteed
19001	110 V & 48 V Battery units / Code number: 190	001		
1.1	Manufacturer		Insert	
1.2	Type designation		Insert	
1.3	Country of origin		Insert	
1.4	Standards		IEC	
1.5	Quality control		ISO 9001	
1.6	Rated voltage	V	110 (for 110 V DC) 48 (for 48 V DC)	
1.7	Number of cells per battery unit	pcs	92 (for 110 V DC) 40 (for 48 V DC)	
1.8	Type of cell		Ni-Cd	
1.9	Operating voltage per cell	V	1,2	
1.10	Floating voltage per cell	V	1,40 - 1,42	
1.11	Equalizing voltage per cell	V	1,55 - 1,65	
1.13	Rated capacity at 20°C			
	For 3h discharge time	Ah	Insert	
	For 5h discharge time	Ah	Insert	
	For 10h discharge time	Ah	300 (for 110 V DC) 150 (for 48 V DC)	
1.14	Discharge voltage per cell	V	1,0	
1.15	Spec. gravity of electrolyte	1	1,2±0,02	
1.16	Positive plate	-	Tubular	
1.17	Negative plate	-	Pasted	
1.18	Type of container	-	Plastic polymer	
1.19	Cell condition	-	Pre-charged	
1.20	The battery stands steel frame		Yes	
1.21	The battery stands earth-quake endurance type		Yes	
1.22	Overall dimensions of one cell	mm Insert		
1.23	Quantity of electrolyte per one cell	litre Insert		
1.24	Length/width/height of assembled battery	mm	Insert	
1.25	Weight of battery and stands in service	kg	Insert	
	Overall compliance with the requirements	s (yes/no)		



5.2.6.44 19002 - Battery Charger

NI.	Description	Minin	Minimum Requirements	
No.		Unit	Data	Guaranteed
19002	Battery Charger / Code number: 19003)			
1.1	Manufacturer			
1.2	Type designation			
1.3	Type		Thyristor controlled	
1.4	Country of origin		-	
1.5	Standards		IEC	
1.6	Rated input voltage	V	3 x 400 / 230	
1.7	Rated input current (at rated output)	Α	Insert	
1.8	Input voltage variation	%	±5	
1.9	Power factor	1	> 0,80	
1.10	Efficiency	%	> 85	
1.11	Degree of protection		IP42	
1.12	Noise level	dB	< 65 dB max	
1.13	Type of rectifiers	-	Modular with MCU	
1.14	Number of modules (n+2)	pcs	Insert	
1.15	Module rated output current	A	Insert	
1.16	MCU protocol		IEC 61850	
			Both constant current &	
1.21	Charging characteristic		constant voltage	
1.22	Rated frequency	Hz	50	
	Insulation - HV, between input and			
1.23	output/ground	V AC, min	1000 V AC, 1 min	
		MW; V	10 MW , 500 V DC,	
1.24	Insulation resistance	DC, min	1 min	
1.25	Rated capacity	kVA	Insert	
1.26	Rated output voltage	V d.c.	110	
1.27	Rated output current	А	100	
1.28	Rated frequency	Hz	50	
1.29	Voltage & Frequency variation	%	±5	
1.30	Voltage ripple	%	±5	
1.31	Ripple frequency	Hz	<u>+2</u>	
			3 levels: charge, float &	
1.32	Charge modes	-	boost	
1.33	Float voltage per cell	V	1.42	
1.34	Boost voltage per cell	V	1.53	
1.35	Float & Boost voltage adjustable	-	Yes	
	<u> </u>		Input voltage	
			Output voltage	
4.00			Output current	
1.36	Measurement		Battery current	
			Load current	
			Earth-fault voltage	
	Overall compliance with the requirement	nte (veelee)		
	Overall compliance with the requireme	ins (yes/iio)		



5.2.6.45 Fibre Optic Multiplexer Equipment

	Description	Minim	Minimum Requirements	
No.		Unit	Data	Guaranteed
1	General:			•
•	Manufacturer			
	Model No.			
	Туре			
1.1	Type of multiplexer		SDH: ADM	
1.2	Complying to ITU-T rec.		Yes	
1.3	Transmission Capacity	Mbit/s	STM-4: 620	
1.4	Access capacity on 64 Kbit/s	channels	Minimum 200	
1.5	Access capacity on 2 Mbit/s	channels	Minimum 40	
1.6	Redundant central processor		Shall be available	
1.7	Digital cross connect function		Fully non-blocking	
2	Available aggregates:		-	•
2.1	Optical aggregates (ITU-T G.957)		L-1.1, L-1.2	
3	Available trunk interfaces:			
3.1	HDB3, 2 Mbit/s interfaces per module	No.	Minimum 8	
3.2	Complying to ITU-T rec.		G.703, transparent	
3.2	Complying to 110-1 rec.		G.704, selectable	
	HDSL, 2Mbit/s interface:	No. of	4 or 2	
	 no of copper wires 	channels	30 or 15	
3.3	Capacity on 2Mbit/s or on 1Mbit/s	channels /	30 / 2 pairs	
	Capacity selectable	pair of	30 / 1 pair	
		wire	15 / 1 pair	
4	Available user interfaces			1
4.1	Voice interfaces for trunk lines:			
4.1.1	1 + 1 com path protection, available for all		yes	
	Analogue, 4wire with E&M:			
4.1.2	• Input level	dBr	+7.516.0	
	Output level Output level	dBr	+7.016.5	
442	Analogue, 2wire with E&M:	dD.	+6.512.5	
4.1.3	Input levelOutput level	dBr dBr	+6.512.5 -1.020.0	
4.1.4	Digital, 2Mbit/s CAS or PRI	ubi	yes	
4.2	Voice interfaces for remote subscriber:		yes	
4.2.1	2wire, subscriber side	dBr	-5 +4 / -7.51	
4.2.2	2wire, Subscriber side 2wire, PABX side	dBr	-5 +4 / -7.53	
4.3	Integrated teleprotection	GD1	J 17 1.J J	
4.3.1	Interface for Commands:			1
4.3.1.1	Number of independent commands	No.	4	
4.3.1.2	Transmission time max.	ms	6	
4.3.1.3	Signal voltage	V _{peak}	250	
4.3.1.4	1 + 1 com path protection	, , , , , ,	yes	
4.3.2	Interface(s) for Differential Protection:		,	
4.3.2.1	Electrical interface: G.703	Kbit/s	64	
4.3.2.2	Optical Interface	Kbit/s	Minimum 64	
4.4	Data: channels per module			



	B 1.41.	Minim	um Requirements	
No.	Description	Unit	Data	Guaranteed
4.4.1	1 + 1 com path protection, available for all		yes	
4.4.2	V.24/V.28 (RS-232): up to 38.4kbit/s	No.	4	
4.4.3	V.11/X.24 (RS-422): 64kbit/s	No.	4	
4.4.4	V.35: 64kbit/s	No.	4	
4.4.5	V.36 (RS-449): 64kbit/s	No.	2	
4.4.6	G.703: 64kbit/s	No.	8	
4.4.7	Ethernet: 10/100 BaseT WAN capacity Protocols	No. Mbit/s	4 Min: 2x 2Mbit/s Min.: IP	
4.5	Integrated alarm gathering module:		14111111	
4.5.1	Number of external alarms per module	No.	Min. 20	
4.5.2	Auxiliary power supply for ext. contacts		Yes	
4.6	Network Management System			
4.6.1	Type/Name of configuration tool			
4.6.2	For fault / configuration management		Yes / yes	
4.6.3	For local / remote operation		Yes / yes	
4.6.4	Data communication network (DCN)		Ethernet / IP or Ethernet / OSI	
4.7	Ambient Conditions:			
4.7.1	Storage: ETS 300 019-1-1, class 1.2	°C / % hum	-5 + 55 / class 1.2	
4.7.2	Transport: ETS 300 019-1-2, class 2.2	°C / % hum	-5 + 70 / class 2.2	
4.7.3	Operation: ETS 300 019-1-3, class 3.1E	°C / % hum	-5 +45 / class 3.1E	
4.8	Power Supply			
4.8.1	Operation	V DC	48 / 60 (-15/+20%)	
4.8.2	Fully redundant power supply		yes	
Overall compliance with the requirements (yes/no)				

Bidder shall provide all necessary information which deemed to be necessary to complete the project in all respects.



5.2.7 Digital Fault and Disturbance Recorder (DFDR)

		Minimum Requirements		
No.	Description	Unit	Data	Guaranteed
4	O-ward.	<u> </u>		
1.1	General Manufacturer		Insert	
1.2	Type		Insert	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
1.5	Power supply	V, DC	DC 110 V	
1.6	Power supply - printer	V, Hz	AC 230 V, 50 Hz	
		·,·. <u>–</u>	7.0 200 1, 00 1.2	
2	Analogue inputs Number of channels		Minimum 160	
2.1	1		Minimum 160	
2.1.1	Expandability	Δ	Minimum 32	
2.2	Nominal current	Amp	1A / 5A	
2.3.1	Nominal voltage	Vac/Vdc	Insert	
2.3.2	Nominal current	mA/Amp	Insert	
2.4	Frequency response		Insert	
2.5	Cut-off frequency	ID.	. ,	
2.5.1	Bandwidth	dB	insert	
2.5.2	Attenuation at	dB	Insert	
2.5.3	Auto adjusted anti-aliasing filters for chosen sampling rate	Yes/No	Yes	
2.5.4	Simultaneously programmable sampling rate for		Min 2 for FAST and	
2.0.4	all feeders/inputs		SLOW Recording	
2.5.4.1	Locally changeable		Yes	
2.5.4.2	Remotely changeable		Yes	
2.5.5	Possible sampling rates			
2.5.5.1	Slow. 1Hz-500Hz	Samples / sec	Insert	
2.5.5.2	Fast: 0.5 kHz - 6kHz	Samples / sec	Insert	
2.5.5.3	Continuous (variable rate)	Samples / sec	Insert	
2.6	DC coupled inputs	Yes/No	Yes	
2.7	Resolution	bits	12 or better	
2.8	Accuracy	%	Min 0.5	
2.9	Burden			
2.9.1	Current circuit	VA	Insert	
2.9.2	Voltage circuit	VA	Insert	
2.10	Over load			
2.10.1	Current	% In	100% In continuously, min 600 % In for 1 sec.	
2.10.2	Voltage circuit	% Vn	2 Vn and max. 350 Vn	
3	Digital inputs			
3.1	Number of channels		Minimum 480	
3.1.1	Expandability		Minimum 96	
3.2	Selectable input level	Vdc	N/O or N/C, 110 VDC	



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		Minimum Requirements		
No.	Description	Unit Data		Guaranteed
		Offic	Potential or potential	
3.3	Туре		free contact	
3.4	Resolution	mc	Insert	
3.4	Resolution	ms Insert		
4	Memory			
4.1	Size	MB	64 MB or higher	
4.2	Туре		Solid state	
4.3	Pre-fault time (fast scanning rate)	sec	0.1-2 user programma- ble	
4.4	Post-fault (fast scanning rate	sec	0.1-2 user programma- ble	
4.5	Pre and post-fault time (slow scanning rate)	sec	min. 180 user pro- grammable	
4.6	In-built hard disk (auto-maintained	GB	min. 4 GB	
	, ,			
5	Sensors / Triggering criteria		<u> </u>	
	All sensors/triggers are preferable programmable and virtually recordable	Yes/No	Yes	
5.1.	Logical combination sensor	Yes/No	Yes	
5.2.	Three phase over or under voltage / current	Yes/No	Yes	
5.3.	Mono phase over or under voltage / current	Yes/No	Yes	
5.4.	*du/dt, dp/dt, dq/dt, [Single/3 Phases], df/dt. etc.	Yes/No	Yes	
5.5.	RMS [voltage / current]	Yes/No	Yes	
5.6.	Zero sequence	Yes/No	Yes	
5.7.	Negative, positive sequence	Yes/No	Yes	
5.8.	Frequency	Yes/No	Yes	
5.9.	DC Step	Yes/No	Yes	
5.10.	Pendling / swing	Yes/No	Yes	
5.11.	Digital level and edge	Yes/No	Yes	
5.12.	Sensor trigger	Yes/No	Yes	
5.13.	Event trigger	Yes/No	Yes	
5.14.	Manual trigger	Yes/No	Yes	
5.15.	Remote trigger	Yes/No	Yes	
6	Clock System			
6.1.	Internal clock	Yes/No	Yes	
6.2.	Accuracy		Insert	
6.3.	External synchronization	Yes/No	Yes	
6.4.	Time resolution between 2 synchronized pulses		Insert	
7	Output Alarm Relay Contact		ı	
7.1.	Max. operation voltage DC/AC	Vac / Vdc	250 Vac or above, 60 Vdc or above	
7.2.	Make and carry for 0.5 sec	Α	Min 8A	
7.3.	Carry continuously	Α	Min 5A	
7.4.	Break (DC) - resistive	W	Insert	
8	Interface for Data Communication			
8.1.	Full definition compression	Yes/No	Yes	
8.2.	Maximum transmission rate	bits / sec	Insert	



N	December 1 in 1	Minimum Requirements		0
No.	Description	Unit	Data	Guaranteed
8.3.	Standard serial port (EIA-232-D)	Yes / No	Yes	
8.4.	Printer port	Yes/No	Yes	
8.5.	Dedicated serial port for modem	Yes/No	Yes	
9	Printer Data			
9.1.	Printer amplitude (scaling peak to peak)		Insert	
9.2.	Time scale	mm/s	Insert	
9.3.	Printer resolution	-	Insert	
9.4.	Auto printing	Yes/No	Yes	
9.5	Fault priority transmission	Yes/No	Yes	
9.6	Fault location (distance calculation)	Yes/No	Yes	
10	Communication and remote analysing unit			
10.1.	Processor Pentium	MHz	Minimum 450 MHz	
10.2.	Co-processor Pentium	Yes/No	Yes	
10.3.	Main memory capacity	Mb	Minimum 64 MB	
10.4.	Colour graphics board S-VGA	Yes/No	Yes	
10.5	Screen S-VGA	Yes/No	Yes	
10.6	Hard disk unit	GB	GB Minimum 40 GB	
10.7	Printer	Yes/No	Yes	
10.8	Modem	Yes/No	Yes.	
	Overall compliance with the requirements (yes/no)			



5.2.8 Technical information

5.2.8.1 Drawings and Other Technical Information to be provided

Ref.	Description	Denomination / Description of Material in the Bid	Reference in the Bid
1	Contractor's quality control system		
1.1	Copy of the QA system accreditation certificates		
1.2	Quality system manual with typical procedures and quality control sheets		
1.3	Environmental management manual		
1.4	Occupational health and safety manual		
2	Standards		
2.1	Copy of technical standards proposed for use instead of a relevant IEC or other international standard, with list of differences from relevant international standard, if any		
3	Substation arrangement		
3.1	Substation Single Line Diagrams		
3.2	Substation Layout drawing		
3.2	Cross-section drawing		
4	Circuit breakers		
4.1	Manufacturer's authorization letter		
4.2	Manufacturer's quality assurance certificates		
4.3	Technical data sheet		
4.4	Drawing		
4.5	List of performed type tests		
4.6	Type test certificates		
4.7	Descriptive catalogue		
4.8	Reference list for the last five years for the offered type		
4.9	List of mandatory special tools		
4.10	List of mandatory spare parts		
4.11	List of recommended spare parts		
4.12	Training plan and program		
5	Disconnectors		
5.1	Manufacturer's authorization letter		
5.2	Manufacturer's quality assurance certificates		
5.3	Technical data sheet		
5.4	Drawing		
5.5	List of performed type tests		
5.6	Type test certificates		
5.7	Descriptive catalogue		



Ref.	Description	Denomination / Description of Material in the Bid	Reference in the Bid
5.8	Reference list for the last five years for the offered type		
5.9	List of mandatory special tools		
5.10	List of mandatory spare parts		
5.11	List of recommended spare parts		
5.12	Training plan and program		
6	Current transformers		
6.1	Manufacturer's authorization letter		
6.2	Manufacturer's quality assurance certificates		
6.3	Technical data sheet		
6.4	Drawing		
6.5	List of performed type tests		
6.6	Type test certificates		
6.7	Descriptive catalogue		
6.8	Reference list for the last five years for the offered type		
7	Voltage transformers		
7.1	Manufacturer's authorization letter		
7.2	Manufacturer's quality assurance certificates		
7.3	Technical data sheet		
7.4	Drawing		
7.5	List of performed type tests		
7.6	Type test certificates		
7.7	Descriptive catalogue		
7.8	Reference list for the last five years for the offered type		
8	Surge arresters		
8.1	Manufacturer's authorization letter		
8.2	Manufacturer's quality assurance certificates		
8.3	Technical data sheet		
8.4	Drawing		
8.5	List of performed type tests		
8.6	Type test certificates		
8.7	Descriptive catalogue		
8.8	Reference list for the last five years for the effected type.		
9	the offered type Control system		
9.1	Control system Manufacturer's authorization letter		
9.1	Manufacturer's quality assurance certif-		
	icates		
9.3	Technical data sheet Drawing		
9.4	Drawing List of performed type tests		
9.5	List of performed type tests		



Ref.	Description	Denomination / Description of Material in the Bid	Reference in the Bid	
9.6	Type test certificates			
9.7	Descriptive catalogue			
9.8	Reference list for the last five years for			
	the offered type			
9.9	List of mandatory special tools			
9.10	List of mandatory spare parts			
9.11	List of recommended spare parts			
9.12	Training plan and program			
10	Relay Protection System			
10.1	Manufacturer's authorization letter			
10.2	Manufacturer's quality assurance certificates			
10.3	Technical data sheet			
10.4	Drawing, system topology, block dia- grams			
10.5	General description of hardware			
10.6	General description of software			
10.7	Descriptive catalogue			
10.8	Reference list for the last five years for the offered type			
10.9	List of mandatory special tools			
10.10	List of mandatory spare parts			
10.11	List of recommended spare parts			
10.12	Training plan and program			
11	Metering System			
11.1	Manufacturer's authorization letter			
11.2	Manufacturer's quality assurance certificates			
11.3	Technical data sheet			
11.4	Drawing			
11.5	General description of hardware			
11.6	General description of software			
11.7	Descriptive catalogue			
11.8	Reference list for the last five years for the offered type			
11.9	List of mandatory special tools			
11.10	List of mandatory spare parts			
11.11	List of recommended spare parts			
12	Communication System			
12.1	Manufacturer's authorization letter			
12.2	Manufacturer's quality assurance certificates			
12.3	Technical data sheet			
12.4	Drawing, system topology			
12.5	General description of hardware			
12.6	General description of software			



Ref.	Description	Denomination / Description of Material in the Bid	Reference in the Bid
12.7	Descriptive catalogue		
12.8	Reference list for the last five years for the offered type		
12.9	List of mandatory special tools		
12.10	List of mandatory spare parts		
12.11	List of recommended spare parts		
	Overall compliance with the requirements (yes/no)		



6. Schedule F: Proposed Subcontractors

The following form shall be filled and attached to the bid. Bidders are free to propose more than one Subcontractor for each item.

Subcontractors

The following Subcontractors are proposed for carrying out the facilities:

Item	Service	Subcontractor's Name and Address	Nationality	
11.	Design			
11.2	Civil works			
11.3	Electrical works / installation, testing and commissioning			
11.4	NLDC			
Name of Bidder:				
Signature of Bidder:				

