

POWER GRID COMPANY OF BANGLADESH



BIDDING DOCUMENT FOR

Design, Supply, Installation, Testing & Commissioning of 400/230kV,
500/750MVA Transformer and associated Switchgear in existing
Meghnaghat 400/230kV AIS substation

VOLUME 3 OF 3

Memo No: 27.21.0000.101.07.427.24.2467

ICB No.: PGCB/400kVTx/Meghnaghat SS

Employer: Power Grid Company of Bangladesh Limited

Country: Bangladesh

Issued on: May 06, 2024

Contents of the Bidding Documents

VOLUME 1

Part 1: Bidding Procedures

- Section 1: Instructions to Bidders (ITB)
- Section 2: Bid Data Sheet (BDS)
- Section 3: Evaluation and Qualification Criteria (EQC)
- Section 4: Bidding Forms (BDF)
- Section 5: Eligible Countries (ELC)

Part 2: Employer's Requirements

- Section 6: Employer's Requirements (ERQ)

Part 3: Conditions of Contract and Contract Forms

- Section 7: General Conditions of Contract (GCC)
- Section 8: Special Conditions of Contract (SCC)
- Section 9: Contract Forms (COF)

VOLUME 2

- Scope of Work
- Technical Specifications
- Drawings forming Part of Specifications

VOLUME 3

- Schedule A: Introduction & Preamble to the Price & Technical Schedules
- Schedule B: Bid Prices & Schedules
- Schedule C: Bar Chart Program of Key Activities-Delivery & Completion Time Schedule
- Schedule D: Manufacturers, Places of Manufacture and Testing
- Schedule E: Technical Particulars and Guarantees
- Schedule F: Departure from the Specifications
- Schedule G: Proposed Alternative Standards
- Schedule H: Proposed Contract and Site Organization
- Schedule I: Drawings and Documents to be submitted with the Bid
- Schedule J: Proposed Subcontractors

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

1. Scope of Supply of Plant and Services

1.1 Description of Overall Project

PGCB's Meghnaghat 400/230kV Grid substation is one of major 400kV substation in Bangladesh power system. This substation is connected to Aminbazar 400/230/132kV and Mudunaghat 400/230kV substation by 400kV transmission line. Moreover, some large power stations are directly connected to this grid substation through 400kV switchyard. Currently, Meghnaghat 400/230kV Grid substation has two 750MVA 400/235/33kV power transformers installed in the switchyard. The 230kV switchyard of Meghnaghat has two part – one is the old switchyard and other one is newly built switchyard. Both part of the switchyard are interconnected.

To increase power flow from 400kV to 230kV voltage level, PGCB has decided to install a new 400/235/33 kV Auto transformer at Meghnaghat substation (as 3rd transformer) to strengthen the 230kV old switchyard as indicated in the Single line diagram attached in volume 2 of the document.

230kv new switchgear shall be installed in two different area as indicated in the attached layout. Some will be installed adjacent to the transformer 230kv side and remaining will be Installed in the old switchyard. From transformer LV side equipment to old switchyard will be a short line .Both 400kv and 230kv old substation busbar are one and Half breaker system.

1.2 Description of this Package

The work covered by this specification is related to the Substation Meghnaghat– installation of a new 400/230/33 kV transformer with associated switchgears as well as connections.

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.

The Contractor's responsibility is to provide that all parts of the works be 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 and renovation works, not all required as-built drawings may be available for the existing plant and equipment, which required modification/renovation; the Contractor is also responsible to make drawings as required to complete the works.

The Bidder is 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 tidying-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 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 scope also includes witnessing of factory acceptance tests by the Employer's Engineer (two Engineers in visit, and eleven (11) days for each visit, excluding travelling time) for:

- 750/750/150 MVA power transformer 400/235/33 kV

1.3 Basic Scope of Supply of Plant and Services

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

- One (01) three phase, 400/235/33 kV, 500/750 MVA autotransformer with associated facility,
- 400kV equipment with associated facility for one partial diameter (Diameter 06),
- 230kV equipment with associated facility for transformer adjacent area,
- Upgradation 230kV equipment with associated facility for complete diameter in old switchyard,
- Control, Protection and SAS hardware with panel for new transformer as well as interconnection facility,
- Extension of auxiliary system for new transformer as well as switchgears,
- Interconnection gantries between new 400kV switchyard and old 230kV switchyard,
- necessary works for re-design, re-location, modification and re-connection of the existing, equipment/switchgear for connection with the new equipment/switchgear.

1.4 Detailed Description of the Scope of Supply

Please refer price schedule of this Volume 3 of the tender document.

.

1.5 Type Test Requirements for Major Plant / Equipment

Please refer to Schedule-I of this Volume 3 of the tender document.

1.6 Terminal Points

1.6.1 Transmission Line Circuit Connections (Not applicable)

The slack spans including overhead earth wires between the 230 kV overhead line terminal towers/gantry 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 the substation gantry and control room building via underground optical fibre cables shall be carried out under this contract; it includes supply & installation of fibre optic cable of a size similar to the OPGW.

1.6.2 Substation Connections

The Contractor shall provide all equipment and shall provide all works and services inside the both Substation. All parts of new and existing substation shall be connected at the appropriate way.

- Control & protection systems shall be tested & commission by OEM engr. Or their certified Engr.
- Communication systems shall be connected. tested & commission
- Lightning protection systems shall be established

1.7 System Electrical Parameters

1.7.1 System Conditions

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

Description	Unit	Required		
Nominal system voltage between phases	kV	400	230	33
System frequency	Hz	50		
Rated voltage between phases	kV	420	245	36
Rated lightning impulse withstand voltage	kV	1425	1050	170
Rated switching impulse withstand voltage	kV	1050	-	-
Rated power frequency withstand voltage	kV, 1 min	-	460	703
Rated symmetrical short-circuit current	kA, 1 sec	63	50	31.5

1.7.2 System Earthing

The 400/235/33kV autotransformers are solidly earthed.

The 400 kV & 230 kV systems are solidly earthed at the 400/235/33 kV autotransformer neutrals but not earthed at the Grid supply points.

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

1.7.3 Minimum Substation Clearances

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

Description	Unit	Required		
Nominal system voltage	kV	400	230	33
Minimum clearance between live metal parts and earth	mm	3500	2100	380
Minimum clearance between live metal	mm	4000	2400	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	6400	4600	2800
Minimum insulator creepage distance (at rated voltage between phases)	mm/kV	25		

1.7.4 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, 1 sec
System earthing	-	solid

1.7.5 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%

1.8 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 any substation equipment during the wet season. As per the recorded past maximum flood water levels in the project area, sufficient ground level height for land formation is required at the Contractor's responsibility. On certain sites, the flooding can be taken as an advantage in that the heavy loads may be floated on barges to close proximity of the sites.

The project area is a designated zone of moderate earthquake intensity. The seismic factor is 0.1 g. Atmospheric pollution is moderate and no special insulator design or washing is 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/m ²	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 1.1 m)	°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 clause is given solely for the general assistance of Bidders and no responsibility for it will be accepted nor will any claim based on this clause be considered.

Schedule B: Bid Prices & Schedules

General

1. The Price Schedules are divided as follows:

Schedule No. 1: Plant and Mandatory Spare Parts Supplied from Abroad
Schedule No. 2: Plant and Mandatory Spare Parts Supplied from within the Employer's Country
Schedule No. 3: Design Services
Schedule No. 4: Installation and Other Services

2. The Schedules do not generally give a full description of the plant to be supplied and the services to be performed under each item. Bidders shall be deemed to have read the Employer's Requirements and other sections of the Bidding Document and reviewed the Drawings to ascertain the full scope of the requirements included in each item prior to filling in the rates and prices. The entered rates and prices shall be deemed to cover the full scope as previously mentioned, including overheads and profit.
3. If Bidders are unclear or uncertain as to the scope of any item, they shall seek clarification in accordance with ITB 7 of Volume 1 prior to submitting their bid.

Pricing

4. The units and rates in figures entered into the Price Schedules should be typewritten or if written by hand, must be in print form. Price Schedules not presented accordingly may be considered nonresponsive. The Bidder shall initial any alterations necessary due to errors, etc.

As specified in the Bid Data Sheet and Special Conditions of Contract, prices shall be subject to adjustment in accordance with the corresponding Appendix (Price Adjustment) to the Contract Agreement.

5. Bid prices shall be quoted in the manner indicated and in the currencies specified in the Instructions to Bidders in the Bidding Document.

For each item, Bidders shall complete each appropriate column in the respective Schedules, giving the price breakdown as indicated in the Schedules.

Prices given in the Schedules against each item shall be for the scope covered by that item as detailed in Volume 2 (Employer's Requirements) or elsewhere in the Bidding Document.

6. Payments will be made to the Contractor in the currency or currencies indicated under each respective item.

7. When requested by the Employer for the purposes of making payments or part payments, valuing variations or evaluating claims, or for such other purposes as the Employer may reasonably require, the Contractor shall provide the Employer with a breakdown of any composite or lump sum items included in the Schedules.

Schedule B: Schedules of Rates and Prices

Schedule No. 1: Plant and Mandatory Spare Parts Supply from Abroad

Schedule No. 2: Plant and Mandatory Spare Parts Supplied from Within the Employer's Country

Schedule No. 3: Design Services

Schedule No. 4: Installation and Other Services

Please see the separate Excel file for the above.

The Bidder shall fill, sign and stamp the attached price schedules and shall attach them to the bid.

(Price schedules are attached at the end of this document.)

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

Bidders shall fill, sign and stamp the attached time schedule and shall attach it to the bid.

The Bidder shall provide

- Filled general time schedule, provided below and as Appendix 4 to the Section 9: Contract Forms,
- Detail proposal for Mobilization Schedule, Section 4: Bidding Forms, item 5.3. and
- Detail proposal for the Construction Schedule, Section 4: Bidding Forms, item 5.4.

Please find the time schedule attached.

Time Schedule

Time Schedule (continued)

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

Item	Equipment	Type of Equipment	Manufacturer's Name and Address	Place of Manufacture and Testing	Nationality
Power Transformer					
1.1.	Power transformer400/235/33 kV				
1.1.1:	HV Bushing				
1.1.2	MV Bushing				
1.1.3	LV Busing				
1.1.4	On Load Tap Changer				

Item	Equipment	Type of Equipment	Manufacturer's Name and Address	Place of Manufacture and Testing	Nationality
High Voltage Equipment 400 kV					
2.1	400kV Circuit breaker				
2.2	400kv Disconnecter				
2.3	400kv Current transformer				
2.4	400kV Capacitive Voltage transformer				
2.5	400KV Lightning/Surge Arrester				
High Voltage Equipment 230 kV					
3.1	230kV Circuit breaker				
3.2	230kV Disconnecter				
3.3	230kv Current transformer				
3.4	230kV Capacitive Voltage transformer				
3.5	230kV Lightning/Surge Arrester				
CRP & SAS Equipment					
4.1	Transformer/Line Protection Relay				
	Busbar Protection Relay				
4.2	SAS Hardware				
4.3	DFDR Hardware				
Insulator					
5.1	Disc Insulator				
Name of Bidder:					
Signature of Bidder:					

Schedule E: Technical Particulars and Guarantees

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.

2. Technical Data Schedules

Please find the technical data schedules attached in ANNEXURE-A

Schedule F: Departures from the Specifications

Bidders shall list all departures from the requirements of the specification in this schedule, whether they are commercial, financial, technical or of a contractual nature, and shall attach this list to the technical proposal.

Any item not listed in this schedule is deemed in full accordance with the requirements of the specification.

No other document or detail accompanying the tender will be considered when evaluating departures. Bidders are not permitted to offer any alternative to this schedule.

Item	Volume	Clause	Detail of Departure from Specification

Schedule G: Proposed Alternative Standards to which Equipment shall be provided

The Bidder shall list below all alternative engineering and design standards, which he proposes to use in his design, manufacture and testing of equipment to be supplied. Should these standards differ from the specified standard in any respect, the Bidder shall detail the differences between the proposed and specified standard.

Compliance with any standard equal or superior to those specified will be considered acceptable.

If no alternative standards are listed, it is deemed that the standards specified in the bidding document are fully complied with.

[illegible]

Schedule H: Proposed Contract and Site Organization

Personnel

The data on their experience should be supplied using the Form below for each candidate.

The Bidder must demonstrate that he has the personnel for the key positions that meet the following requirements:

No.	Position	Total Work Experience (years)	Work Experience In Similar Projects (years)
1	Contractor's Representative Project Director / Project Manager	15	10
2	Substation Design Engineer	12	8
3	Site Manager	10	5
4	HV Electrical Engineer	10	5
5	Protection & Control Engineer	10	5
6	Substation Civil Engineer	10	5
7	Health & Safety (Accident Prevention) Officer	8	5

The Bidder shall provide details of the proposed personnel and their experience records in the relevant information forms included in Section 4 (Bidding Forms) of Volume 1 of the Bidding Document and below.

Schedule I: Drawings and Documents to be submitted with the Bid

Refer to volume 01

Schedule J: 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
1.	Electrical Works Subcontractor		
2	Civil Works Subcontractor		
Name of Bidder:			
Signature of Bidder:			

Switchgear 420 kV

A1: Circuit Breaker 420 kV

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	Circuit Breaker - General			
1.1.	Manufacturer		Insert	
1.2	Type		Insert	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
1.5	Standards		IEC 62271-100 IEC 60273 IEC 60694 IEC 60815	
1.6	Quality control		ISO 9001 ISO 14001 ISO 18001	
1.7	Isolating and quenching medium		SF ₆	
1.8	Type of circuit breaker		Outdoor	
1.9	Design		Double breaking	
1.10	Operating mechanism		Motor-wound spring	
1.11	Number of poles	pcs.	3 (1 per phase)	
1.12	Number of operating mechanisms per circuit breaker	pcs.	3 (1 per phase)	
1.13	Control Switching Device	pcs.	3 (1 per phase)	
2.	Circuit Breaker – Characteristics			
2.1	Nominal system voltage	kV _{rms}	400	
2.2	Highest voltage for equipment U _n	kV _{rms}	420	
2.3	Rated lightning impulse withstand voltage	kV _{peak}	1425	
2.4	Rated switching impulse withstand voltage	kV	1050	
2.5	Rated frequency f _r	Hz	50	
2.6	Rated current I _r	A	≥ 4000	
2.7	Rated short-circuit breaking current I _{sc}	kA _{rms}	≥ 50	
2.8	Rated peak withstand current I _p (equal short-circuit making current)	kA	≥ 125	
2.9	D.C. component of the rated short-circuit breaking current	%	54%	
2.10	First-pole-to-clear factor • Terminal fault • Short-line fault • Out-of-phase	p.u. p.u. p.u.	1.3 1.0 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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
2.16	Auto reclosing		1p+3p	
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	Insert	
		ms	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	Insert	
		ms	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 I_{sc}		≥ 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	Mpa	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 200 x 100	
3.1.3.3	Number of holes		Min 8	
3.1.3.4	Dimensions of holes	mm	$\varnothing 14$	
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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	Type		Insert	
3.2.2	Motor - auxiliary supply voltage	V. AC	230/415	
3.2.3	Rated power of motor	W	Insert	
3.2.4	Control voltage	V. DC	110	
3.2.5	Number of making coils per phase	pcs.	1	
3.2.6	Rated power of making coils	W	Insert	
3.2.7	Number of breaking coils per phase	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 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)			

A2. Disconnecter 420 kV, without Earthing Switch

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	Disconnecter- General			
1.1	Manufacturer		Insert	
1.2	Type		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		Horizontal Double 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.	3	
1.12	Type of earthing blade operating mechanism		Not applicable	
1.13	Number of earthing blade operating mechanism		0	
2.	Disconnecter - Characteristics			
2.1	Nominal system voltage	kV _{rms}	400	
2.2	Highest voltage for equipment U _n	kV _{rms}	420	
2.3	Rated lightning impulse withstand voltage	kV _{peak}	1425	
2.4	Rated switching impulse withstand voltage	kV	1050	
2.5	Rated frequency f _r	Hz	50	
2.7	Rated current I _r	A	≥ 4000	
2.8	Rated short withstand current I _k	kA _{rms}	≥ 50	
2.9	Rated duration of short-circuit on main blades	s	1	
2.10	Rated duration of short-circuit on earthing blades	s	Not applicable	
2.11	Rated maximum withstand current I _p	kA	≥ 125	
2.12	Capacity of making and breaking transfer load of busbar system at 300 V (rms)	A	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	> 2000	
2.17.2	Transversal loading, static F _b	N	> 660	
2.17.3	Vertical force F _c	N	> 1500	
2.17.4	Direct loading, dynamic	N	> 4500	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
2.17.5	Transversal loading, dynamic	N	Insert	
3.	Disconnecter - Design and Construction			
3.1	Disconnecter			
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 200 x 100	
3.1.5.3	Number of holes		Min 8	
3.1.5.4	Dimensions of holes	mm	$\varnothing 14$	
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.	3	
3.2.2	Type		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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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)			

Insert

A3.Disconnector 420 kV, without Earthing Switch

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	Disconnector- General			
1.1	Manufacturer		Insert	
1.2	Type		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		Horizontal Double 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.	3	
1.12	Type of earthing blade operating mechanism		Not applicable	
1.13	Number of earthing blade operating mechanism		0	
2.	Disconnector - Characteristics			
2.1	Nominal system voltage	kV _{rms}	400	
2.2	Highest voltage for equipment U _n	kV _{rms}	420	
2.3	Rated lightning impulse withstand voltage	kV _{peak}	1425	
2.4	Rated switching impulse withstand voltage	kV	1050	
2.5	Rated frequency f _r	Hz	50	
2.7	Rated current I _r	A	≥ 2000	
2.8	Rated short withstand current I _k	kA _{rms}	≥ 50	
2.9	Rated duration of short-circuit on main blades	s	1	
2.10	Rated duration of short-circuit on earthing blades	s	Not applicable	
2.11	Rated maximum withstand current I _p	kA	≥ 125	
2.12	Capacity of making and breaking transfer load of busbar system at 300 V (rms)	A	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	> 2000	
2.17.2	Transversal loading, static F_b	N	> 660	
2.17.3	Vertical force F_c	N	> 1500	
2.17.4	Direct loading, dynamic	N	> 4500	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
2.17.5	Transversal loading, dynamic	N	Insert	
3.	Disconnecter - Design and Construction			
3.1	Disconnecter			
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 200 x 100	
3.1.5.3	Number of holes		Min 8	
3.1.5.4	Dimensions of holes	mm	$\varnothing 14$	
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.	3	
3.2.2	Type		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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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)			

A4: Current Transformers 420 kV

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	Type		Outdoor	
1.8	Shape / design		Head type	
1.9	Sealing		Hermetically closed	
2.	Current Transformers - Characteristics			
2.1	Nominal system voltage	kV _{rms}	400	
2.2	Highest voltage for equipment U _n	kV _{rms}	420	
2.3	Rated lightning impulse withstand voltage	kV _{peak}	1425	
2.4	Rated switching impulse withstand voltage	kV	1050	
2.5	Rated frequency f _r	Hz	50	
2.6	Rated short-time thermal current I _{th} , 1 s	kA	50	
2.7	Rated dynamic current I _{dyn}	kV _{peak}	125	
2.8	Rated continuous thermal current (40°C):			
	• I core	% I _n	120	
	• II core	% I _n	120	
	• III core	% I _n	120	
	• IV core	% I _n	120	
	• V core VI core	% I _n	120	
2.9	Rated transformer ratio:			
	• I core	A/A	4000-2000/1	
	• II core	A/A	4000-2000/1	
	• III core	A/A	4000/-2000/1	
	• IV core	A/A	4000-2000/1	
	• V core	A/A	4000-2000/1	
	• VI core	A/A	4000-2000/1	

2.10	Accuracy class: • I core • II core • III core • IV core • V core • VI core		5P20 5P20 0.2S 5P20 PX PX	
2.11	Security factor: • III core		Fs=5	
2.12	Rated power: • I core • II core • III core	VA VA VA	60 60 15	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
	- IV core - V core - VI core	VA VA VA	60 - -	
2.13	Rated mechanical terminal loads	Class	Min. Class II	
3.	Current Transformers - Design and Construction			
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)	μ V	Max. 2500	
3.5	Permissible level of partial discharges: - Test voltage $1.2 \cdot U_M / \sqrt{3}$ - 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 200 x 100	
3.8.4	Number of holes		Min 8	
3.8.5	Dimensions of holes	mm	$\varnothing 14$	
3.8.6	Distance between holes	mm	50	
3.8.7	Material suitable for		Al terminal	
3.10	tg δ 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)			

A5: Capacitive Voltage Transformers 420 kV

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	Voltage Transformers - General			
1.1	Manufacturer		Insert	
1.2	Type		Capacitive	
1.3	Model designation			
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	Type		Outdoor	
1.8	Shape		Insert	
1.9	Sealing		Hermetically closed	
2.	Voltage Transformers - Characteristics			
2.1	Nominal system voltage	kV _{rms}	400	
2.2	Highest voltage for equipment U _n	kV _{rms}	420	
2.3	Rated lightning impulse withstand voltage	kV _{peak}	1425	
2.4	Rated switching impulse withstand voltage	kV	1050	
2.5	Rated frequency f _r	Hz	50	
2.6	Rated short-time thermal current I _{th} , 1 s	kA	50	
2.7	Rated dynamic current I _{dyn}	kV _{peak}	125	
2.8	Rated primary voltage	kV	400/√3	
2.9	Rated secondary voltage • I winding • II winding • III winding	V V V	110√3 110√3 110√3	
2.10	Accuracy class: • I winding • II winding • III winding		0.2 1/3P 1/3P	
2.11	Rated power: • I winding • II winding • III winding	VA VA	20 75 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 Construction			
3.1	Insulator material		Porcelain, brown	
3.2	Insulating medium		Oil-paper - Mixed dielectric	
3.3	Minimum creepage distance	mm/kV	Min. ≥ 25 mm/kV	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
3.4	Max. radio interference voltage at 0.5-2 MHz (acc. to IEC 60694)	μV	Max. 2500	
3.5	Permissible level of partial discharges: • Test voltage $1.2 \cdot U_M / \sqrt{3}$ • 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		Vertical or horizontal	
3.8.3	Dimensions	mm x mm	Min 200 x 100	
3.8.4	Number of holes		Min 8	
3.8.5	Dimensions of holes	mm	$\varnothing 14$	
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 stainless 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)			

A6: Surge Arresters 420 kV

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	Surge Arresters - General			
1.1	Manufacturer		Insert	
1.2	Type		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}	400	
2.2	Highest voltage for equipment U _n	Kv _{rms}	420	
2.4	Rated voltage of surge arrester U _r	Kv _{rms}	390	
2.5	Max. continuous operating voltage U _c	Kv _{rms}	312	
2.8	Rated frequency	Hz	50	
2.9	Nominal discharge current I _n (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	4	
3.2	Energy dissipation capacity (per Kv of rated voltage)	Kj/Kv	≥ 6.5	
3.3	Long duration current impulse (2000 μs)	A	≥ 1200	
3.4	Maximum residual voltage U _{res}			
3.4.1	For switching impulse current 30/60 μs at 0,5 Ka	Kv _{peak}	≤ 675	
3.4.2	For switching impulse current 30/60 μs at 1 Ka	Kv _{peak}	≤ 700	
3.4.3	For switching impulse current 30/60 μs at 2 Ka	Kv _{peak}	≤ 725	
3.4.4	For lightning impulse current 8/20 μs at 5 Ka	Kv _{peak}	≤ 880	
3.4.5	For lightning impulse current 8/20 μs at 10 Ka	Kv _{peak}	≤ 936	
3.4.6	For lightning impulse current 8/20 μs at 20 Ka	Kv _{peak}	≤ 1011	
3.5.	Dielectric endurance of arrester housing)			
3.5.1	Lightning impulse withstand voltage of arrester housing up (1.2/50 μs)	Kv	≥ 1500	
3.5.2	Power frequency withstand voltage of arrester housing (1 min wet)	Kv	≥ 750	
3.6.	Mechanical requirements			
3.6.1	Specified short-term load SSL (F _{dyn})	N	≥ 1000	
3.6.2	Specified long-term load SSL (F _{stat})	N	≥ 750	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	
3.11	Surge arrester weight	kg	Insert	
3.12	Voltage distribution ring present / ring diameter	yes / no / 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	
3.14.6	Surge counter	Yes/no	yes	
	Overall compliance with the requirements (yes/no)			

A7: Post Insulator 420 kV

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	Post Insulators – General			
1.1	Manufacturer		Insert	
1.2	Type		Insert	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
1.5	Standards		IEC 60168 IEC 60273 IEC 60672 IEC 60694	
1.6	Quality control		ISO 9001	
1.7	Design		Solid core, porcelain, outdoor	
2	Post Insulators – Characteristics			
2.1	Nominal system voltage	kV _{rms}	400	
2.2	Highest voltage for equipment U _n	kV _{rms}	420	
2.3	Rated lightning impulse withstand voltage	kV _{peak}	1425	
2.4	Rated switching impulse withstand voltage	kV	1050	
2.5	Rated frequency f _r	Hz	50	
2.6	Minimum creepage distance	mm/kV	Min. ≥ 25 mm/kV	
2.7	Failing load bending (p ₀) (C10)	N	≥ 12500 Calculation is required during design	
2.8	Failing load torsion	Nm	≥ 4000 Calculation is required during design	
3	Post Insulators – Design and 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 _{tg}	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 (yes/no)			

C1: Surge Arrester 36 kV

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	Surge Arresters – General			
1.1	Manufacturer		Insert	
1.2	Type		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 I _n (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)	A	≥ 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	
3.11	Surge arrester weight	kg	Insert	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
3.12	Voltage distribution ring present / ring diameter	yes / no / 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	
3.14.6	Surge counter	Yes/no	yes	

D1.400/235/33 kV 500/750 MVA ONAN/ONAF Autotransformer

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1	General			
1.1	Manufacturer		Insert	
1.2	Type		Autotransformer three-phase, oil immersed, with tertiary winding, hermetically sealed, with on-load tap changer, outdoor	
1.3	Model designation		Insert	
1.4	Country of origin		Insert	
1.5	Standards		IEC 60044 IEC 60076 IEC 60137 IEC 60214 IEC 60354 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			
2.1	Rated power: • Primary / secondary winding • Tertiary - minimum	MVA MVA	750/750 ≥ 150	
2.2	Rated power by cooling ONAN / ONAF • Primary / secondary winding	MVA	500 / 750	
2.3	Rated voltage of windings: • HV winding • MV winding • LV - stabilizing winding	kV kV kV	400 235 33	
2.4	Tap changer(tap position shall be as per nameplate drawing)			
	• Manufacturer		MR Germany /HITACHI SWEDEN	
	• Country of origin		GERMANY/SWEDEN	
	• Model designation		INSERT	
	• Type of tap changing		On-load	
	• Tap changer location		At High voltage side	
	• Type of voltage regulation	%	C.F.V.V.	
	• Tapping range	%	±8x1.25	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
	• Tapping step		1.25	
	• Rating		Rated power 750 MVA, all taps	
2.5	Frequency	Hz	50	
2.6	Connection of three-phase windings (group of vector IEC 60076)		YNa0d1	
2.7	Neutral point insulation		Li95	
2.8	Low voltage winding connection (LV)		delta, as per nameplate drawing	
3	Special technical requirements			
3.1	Short circuit impedance corrected to reference temperature of 75°C at rated frequency and rated power			
3.1.1	HV - MV, on the basis of rated power with on-load tap changer in middle position 9B	%	13 ±10 %	
3.1.2	HV - LV, on the basis of rated power with on-load tap changer in middle position 9B	%	13.67	
3.1.3	MV - LV, on the basis of rated power 150MVA with on-load tap changer in middle position	%	10.24	
3.2	Zero-sequence impedance, with tap changer in middle position: • HV/MV • HV/LV • MV/LV	% % %	Insert Insert Insert	
3.3	Autotransformer capacity to withstand external short circuits			
3.3.1	Short-circuit duration	s	2	
3.3.2	Symmetrical short-circuit with-stand capacity and asymmetrical short-circuit withstand capacity during indicated period: • HV winding • MV winding • LV winding • Pre-fault voltage	kA kA kA p.u.	50 50 31.5 1.05	
3.4	Guaranteed losses			
3.4.1	a. No-load losses with tap changer in nominal tap position: at rated voltage and rated frequency	kW	Insert	
	b. No-load losses with tap changer in tap position Plus(+) extreme tap position at 110% rated voltage, at rated frequency	kW	Insert	
	c. No-load losses with tap changer in tap position minus(-) extreme tap position at 90% rated voltage, at rated frequency	kW	Insert	
	d. average no load loss ; N (this value will be evaluated)	kW	(a+b+c)/3	

3.4.2	No-load losses capitalized value	BDT/kW	600,000	
3.4.3	Tolerance to be applied to no-load losses in % of the guaranteed value	%	10	
No.	Description HV-LV	Unit	Minimum Requirements Data	Guaranteed
3.4.4	a. On-load losses at 75°C, at rated voltage and rated frequency, with tap changer in normal position	kW	Insert	
	b. On-load losses at 75°C, with tap changer in plus(+) extreme tap position at 110% rated voltage and rated frequency,	kW	Insert	
	c. On-load losses at 75°C, with tap changer in minus(-) extreme tap position at 90% rated voltage and rated frequency,	kW	Insert	
	d. average on load losses ;L (this value will be evaluated)	kW	(a+b+c)/3	
3.4.5	On-load losses capitalized value	BDT/kW	300,000	
3.4.6	Tolerance to be applied to on-load losses in % on the guaranteed value	%	10	
3.5	Ancillary equipment(Cooling fans)			
3.5.1	Load of ancillary equipment at max continuous rating ;M (this value will be evaluated)	kW	Insert	
3.5.2	Capitalized valued of ancillary equipment load	BDT/kW	300,000	
3.5.3	Tolerance to be applied to ancillary equipment load in % of the guaranteed value	%	20	
3.6	Insulation level			
3.6.1	High voltage (HV)		LI 1425 SI1050	
3.6.2	Medium voltage (MV)		LI 1050 AC 460	
3.6.3	Neutral		LI 95 AC 38	
3.6.4	Low voltage (LV)		LI 170 AC 70	
3.7	The highest voltage for equipment (effective value)			
3.7.1	High voltage (HV)	kV	420	
3.7.2	Medium voltage (MV)	kV	245	
3.7.3	Neutral	kV	17.5	
3.7.4	Low voltage (LV)	kV	52	
3.8	Rated insulation level			
3.8.1	Induced voltage (ACSD, ACLD)	kV	In acc. to IEC 60076-3	
3.9	Efficiencies			
3.9.1	If cosφ = 1.0 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	
3.9.2	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	• $\cos\varphi = 0.80$ (inductive)		Insert	
3.11	No-load current at rated frequency			
3.11.1	At 0.90 U_n		Insert	
3.11.2	At 1.00 U_n		Insert	
3.11.3	At 1.05 U_n		Insert	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	≤ 55	
3.12.2	Winding	K	≤ 60	
3.12.3	Hottest spot	K	≤ 73	
3.13	At the emergency cases it is allowed: - Continuous overload at the highestwinding temperature which exceeds by 2.5°C the guaranteed limit value - Continuous voltage increase when the topoil temperature exceeds the guaranteed limit by 2.5°C at rated power (in % of the rated voltage)	MVA %	Compliant to 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 $\frac{3}{4}$ rated power $\frac{1}{2}$ rated power		Insert Insert Insert	
3.14.1.2	After operation under 20 min - full rated power $\frac{3}{4}$ rated power $\frac{1}{2}$ rated power		Insert Insert Insert	
3.14.1.3	After operation under 120 min - full rated power $\frac{3}{4}$ rated power $\frac{1}{2}$ 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 $\frac{3}{4}$ rated power $\frac{1}{2}$ rated power		Insert Insert Insert	
3.14.2.2	After operation under 15 min - full rated power $\frac{3}{4}$ rated power $\frac{1}{2}$ rated power		Insert Insert Insert	
3.14.2.3	After operation under 15 min - full rated power $\frac{3}{4}$ rated power $\frac{1}{2}$ rated power		Insert Insert Insert	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	
4	Oil			
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		Insert	
4.9	Corrosive Sulphur		Non-Corrosive	
4.10	PCB content		Without PCB	
5	Bushing			
5.1	HV bushing			
5.1.1	Quantity		3	
5.1.2	Class	kV	420	
5.1.3	Manufacturer		Insert	
5.1.4	Type		RIP	
5.1.5	Rated current	A	≥ 2000	
5.1.6	Rated short circuit current (2 s)	kA rms	50	
5.1.7	Rated lightning impulse withstand voltage	kV peak	1425	
5.1.8	Rated switching impulse withstand voltage	kV peak	1050	
5.1.9	Rated power frequency withstand voltage	kV rms	Not applicable	
5.1.10	Connectors			
5.1.10.1	Shape	mm	Ø 50	
5.1.10.2	Length	mm	125	
5.1.10.3	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 LV bushing)			
5.2.1	Quantity		1	
5.2.2	Class	kV	52	
5.2.3	Manufacturer		Insert	
5.2.4	Type		Insert	
5.2.5	Rated current	A	≥ 2000	
5.2.6	Rated short-circuit current (2 s)	kA rms	50	
5.2.7	Rated lightning impulse withstand voltage	kV peak	170	
5.2.8	Rated switching impulse withstand voltage	kV peak	-	
5.2.9	Rated power frequency withstand voltage	kV rms	70	
5.2.10	Connectors			
5.2.10.1	Shape	mm	Flat	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
5.2.10.2	Length	mm	-	
5.2.10.3	Suitable for		Cu 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	245	
5.3.3	Manufacturer		Insert	
5.3.4	Type		RIP	
5.3.5	Rated current	A	≥ 2500	
5.3.6	Rated short-circuit current (2 s)	kA rms	50	
5.3.7	Rated lightning impulse withstand voltage	kV peak	1050	
5.3.8	Rated switching impulse withstand voltage	kV peak	-	
5.3.9	Rated power frequency withstand voltage	kV rms	460	
5.3.10	Connectors			
5.3.10.1	Shape	mm	Ø 50	
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		3	
5.4.2	Class	kV	52	
5.4.3	Manufacturer		Insert	
5.4.4	Type		RIP	
5.4.5	Rated current	A	≥ 2500	
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		Al 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			
6.1	Maximum flux density in the legs			
	• At rated voltage	T	Insert	
	• At 105 % of the rated voltage	T	Insert	
6.2	Maximum flux density in the yokes:			
	• At rated voltage	T	Insert	
	• At 105 % of the rated voltage	T	Insert	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
6.3	Maximum current density in windings at rated power and normal tap changer position: • HV winding • MV winding • LV - stabilizing winding	A/mm ² A/mm ² A/mm ²	Insert Insert Insert	
6.4	Winding resistance at 75°C and middle tap changer position: • HV winding • MV winding • LV - stabilizing winding	Ω Ω Ω	Insert Insert 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 & Continuous	
6.6.2	MV winding		Cu - Continuous	
6.6.3	LV - stabilizing winding		Cu - Helical	
6.7	Audible noise level (acc. to NEMA TR1), at 105 % of rated voltage, at maximum power and with complete cooling system in service	dB	Insert	
6.8	Radio Interference Voltage at 0.5 MHz as specified in IEC 60694	μV	2500 max	
7	Weights and dimensions			
7.1	Total weight of autotransformer, equipped for service	kg	As per GA.	
7.2	Core and oil assembly	kg	As per GA*	
7.3	Total mass excluding oil	kg	As per GA*	
7.4	Tank and accessories	kg	As per GA*	
7.5	Oil mass in tank	kg	As per GA*	
7.6	Oil mass in coolers	kg	As per GA*	
7.7	Oil mass total	kg	As per GA*	
7.8	Total mass	kg	As per GA*	
7.9	Maximum shipping weight (the heaviest item)	kg	As per GA*	
7.10	Height from foundation to: • Highest point of HV bushing • Highest point of tank • Highest point of conservator • Highest point of lifting hook for removal of core and oil assembly	mm mm mm mm	As per GA* As per GA* As per GA* As per GA*	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
7.11	Outer dimensions: • Length • Width	mm mm	As per GA* As per GA*	
7.12	Informative dimensional sketch		To be enclosed with bid	
7.13	Maximum shipping dimensions of tank: • Outside height • Outside width • Outside length	mm mm mm	As per GA As per GA As per GA	
7.14	Transportation drawing		To be enclosed with bid	
8	Tap changer			
8.1	Manufacturer		MR, Germany/HITACHI SWEDEN	
8.2	Type		INSERT	
8.3	Insulation level	kV	Li 1050	
8.4	Rated current	A	≥ 1000	
8.5	Number of steps		17	
8.6	Regulating coil		At auto point	
8.7	Short-circuit withstand	kA rms	Insert	
8.8	BIL to ground through the regulating coil	kV peak	Insert	
8.9	Power frequency withstand voltage for 1 minute through the regulating coil	kV rms	Insert	
8.10	Tap position indicator		Digital code matrix (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 power autotransformer			
10.1	CT in HV bushings, for protection, WTI and/or Tap Changer		AS PER NAMEPLATE DRAWING	
10.2	CT in MV bushings, for protection, WTI and/or Tap Changer		AS PER NAMEPLATE	
10.3	CT in neutral bushing , for protection		DRAWING	
10.4	CT in LV bushings, for protection		AS PER NAMEPLATE	
11	Layout			
11.1	Primary winding bushings		Longitudinal axis	
11.2	Secondary winding bushings		Longitudinal axis (opposite to HV)	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
11.3	Conservator tank		To be defined in design stage	
11.4	Tap changer		To be defined in design stage	
11.5	Control cabinet		To be defined in design stage	
11.6	Coolers		To be defined in design stage	
11.7	Connection drawing, block diagram		To be enclosed with bid	
12	Cooling groups			
12.1	Number of cooling groups (total)	Qty.	Insert	
12.2	Number of cooling groups (for rated power)	Qty.	Insert	
12.3	Number of stand-by cooling groups	Qty.	Insert	
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	Autotransformer tank			
14.1	Type of design			
14.2	Thickness of transformer tank: • Sides • Bottom • Top	mm mm mm	Insert Insert Insert	
14.3	Material of the autotransformer tank		Insert	
14.4	Wheels			
14.4.1	Wheel number for each rail of two pair rails		Insert	
14.4.2	Axial inter space in transversal direction between two pairs of rails	mm	4520	
14.4.3	Transversal distance between wheels in pair	mm	1435	
14.4.4	Distance between wheels in longitudinal direction	mm	1435	
14.5	Corrosion protection of the tank		YES	
14.6	Vacuum withstand of the complete tank with cooler	mbar	1	
14.7	Over-pressure withstand of the complete autotransformer	bar	0.3	
15	Conservator			
15.1	Type		With diaphragm	
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	

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

PART_A:(Employer Requirement: GTP) Control voltage shall be 110vdc / 220vdc as per site

No.	Description(Employer requirement)	Minimum requirement data		Guaranteed
1.	Circuit Breaker - General			
1.1	Type		Live tank	
1.2	Standards		IEC 62271-100, 60273, 60694,60815	
1.3	Quality control		ISO 9001, 14001,18001	
1.4	Isolating and quenching medium		SF6	
1.5	Type of circuit breaker		Outdoor	
1.6	Design		Single breaking	
1.7	Operating mechanism		Motor-wound spring	
1.8	Number of poles	pcs.	3	
1.9	Number of operating mechanisms per circuit breaker	pcs.	1	
2.	Circuit Breaker - Characteristics			
2.1	Nominal system voltage	kV _{rms}	230	
2.2	Highest voltage for equipment Un	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	A	3150	
2.7	Rated short -circuit breaking current I _{sc}	KA _{rms}	50	
2.8	Rated peak withstand current I _p (equal short-circuit making current)	kA	125	
2.9	D.C. component of the rated short-circuit breaking current	%	45	
2.10	First-pole-to-clear factor	p.u.	1.3	
	• Terminal fault	p.u.	1	
	• Short-line fault	p.u.	2	
	• Out-of-phase			
2.11	Standard value of transient recovery voltage (T100)	kV	215	
2.12	Rate of rise recovery voltage	kV/μs	1.54	
2.13	Rated operating sequence		0-0.3s-CO-3min-CO	
2.14	Duration of short-circuit	s	1	
2.15	Rated out-of-phase breaking current	kA	10	
2.16	Auto reclosing		3p	
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	

No.	Description(Employer requirement)	Minimum requirement Unit data		Guaranteed
2.19	Opening time (trip initiation to contact separation) · Without current · With 100 % rated breaking current	ms ms	33 ± 7	
2.20	Maximum time interval between opening of first and last phase of three-phase circuit breakers	ms	≤3	
2.21	Time for making (trip initiation to contact touch) · Without current · 100 % making current	Ms ms	95±15 95±15	
2.22	Minimum dead time	ms	≥300	
2.23	Restrike performance during capacitive current switching	Class	C2	
2.24	Number of operations without maintenance · CO at no-load · CO at rated current · CO at rated breaking current I _{sc}		10000 6000 20	
2.25	The frequency of mechanical operations	Class	M2	
2.26	Rated electrical endurance	Class	E2	
3.	Circuit Breaker - Design and Construction			
3.1.1	Insulator material		Porcelain	
3.1.2	Minimum creepage distance	mm/kV	31	
3.1.3	HV terminal	pcs.	2	
3.1.3.1	Shape		Flat	
3.1.3.2	Dimensions	mm x mm	180x160	
3.1.3.3	Distance between holes	mm	50	
3.1.3.4	Material suitable for		Al terminal	
3.1.6.1	Between poles distance	mm	2000-3000	
3.2	Operating mechanism			
3.2.1	Motor - auxiliary supply voltage	V. AC	230/415	
3.2.2	Control voltage	V. DC	110	
3.2.3	Number of making coils	pcs.	1	
3.2.4	Number of breaking coils	pcs.	2	
3.2.5	Heater		Yes	
3.2.6	Heater supply voltage	V. Hz	230, 50	
3.2.7	Minimum number of available contacts (NO/NC)		12NO+12NC	
3.2.8	Water-tight corrosion-resistant housing		IP55	
3.2.9	Operating mechanism material		stainless steel	
3.2.10	A crank for manual spring loading		Yes	
3.3	Accessories in central control panel			
3.3.1	Anti-pumping relay		Yes	
3.3.2	Local/remote control selector switch		Yes	
3.3.3	Local operation push buttons		Yes	
3.3.4	Minimum pressure lock-out and alarm relays		Yes	
3.3.5	Service outlet (socket) - 230 V, 50 Hz		Yes	

No.	Description(Employer requirement)	Minimum requirement Unit	data	Guaranteed
3.3.6	Lighting switch		Yes	
3.3.7	Lighting - 230 V, 50 Hz		Yes	
3.3.8	Heater - 230 V, 50 HZ		Yes	
3.3.9	Operation counter		Yes	
3.3.10	Motor MCB (miniature circuit breakers) (for all operating mechanisms)		Yes	
3.3.11	Time phase discrepancy relay		Yes	
3.3.12	Weatherproof, corrosion resistance enclosure, Al or stainless steel		Yes	
3.3.13	Cu earthing rails inside central control cabinet		Yes	
3.3.14	Detachable plates, the bottom of central control cabinet		NO	
3.3.15	Galvanized horizontal and vertical metal structure with minimum 70 µm zinc layer		Yes	
	Overall compliance with the requirements (yes/no)		Yes	

Signature & seal of the Manufacturer

Signature & seal of the supplier

PART_B(Manufacturer information)

No.	Description(to be inserted)	Manufacturer information	
		Unit	data
1	Manufacturer		
2	Model		
3	Country of origin		
4	Rated pressure of SF ₆ gas	MPa	
5	Total mass of SF ₆ gas	kg	
6	Rated mechanical terminal loads		
6.1	Static horizontal force longitudinal F _{thA}	N	
6.2	Static horizontal force longitudinal F _{thB}	N	
6.3	Static vertical force F _{IV}	N	
6.4	Dynamic horizontal force longitudinal F _{wx}	N	
7	Weight and dimension		
7.1	Support insulator height	mm	
7.2	Total height	mm	
7.3	Pole weight	kg	
7.4	Weight of operating mechanism	kg	
7.5	Total weight	kg	
8	Rated motor power	w	
9	Rated power of making coil	w	
10	Rated power of breaking coil	w	
11	Total heater power	w	
	Overall compliance with the requirements (yes/no)		

PART_A:(Employer Requirement:
GTP)862,865,868B **Circuit Breaker**

No.	Description(Employer requirement)	Minimum requirement Unit data		Guaranteed
1.	Circuit Breaker - General			
1.1	Type		Live tank	
1.2	Standards		IEC 62271-100, 60273, 60694,60815	
1.3	Quality control		ISO 9001, 14001,18001	
1.4	Isolating and quenching medium		SF6	
1.5	Type of circuit breaker		Outdoor	
1.6	Design		Single breaking	
1.7	Operating mechanism		Motor-wound spring	
1.8	Number of poles	pcs.	3	
1.9	Number of operating mechanisms per circuit breaker	pcs.	3	
2.	Circuit Breaker - Characteristics			
2.1	Nominal system voltage	kV _{rms}	230	
2.2	Highest voltage for equipment Un	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	A	3150	
2.7	Rated short -circuit breaking current I _{sc}	KA _{rms}	50	
2.8	Rated peak withstand current I _p (equal short-circuit making current)	kA	125	
2.9	D.C. component of the rated short-circuit breaking current	%	45	
2.10	First-pole-to-clear factor · Terminal fault · Short-line fault · Out-of-phase	p.u. p.u. p.u.	1.3 1 2	
2.11	Standard value of transient recovery voltage (T100)	kV	215	
2.12	Rate of rise recovery voltage	kV/μs	1.54	
2.13	Rated operating sequence		0-0.3s-CO- 3min-CO	
2.14	Duration of short-circuit	s	3	
2.15	Rated out-of-phase breaking current	kA	10	
2.16	Auto reclosing		1p + 3p	
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	

No.	Description(Employer requirement)	Minimum requirement Unit	data	Guaranteed
2.19	Opening time (trip initiation to contact separation) · Without current · With 100 % rated breaking current	ms ms	33 ± 7	
2.20	Maximum time interval between opening of first and last phase of three-phase circuit breakers	ms	≤3	
2.21	Time for making (trip initiation to contact touch) · Without current · 100 % making current	Ms ms	95±15 95±15	
2.22	Minimum dead time	ms	≥300	
2.23	Restrike performance during capacitive current switching	Class	C2	
2.24	Number of operations without maintenance · CO at no-load · CO at rated current · CO at rated breaking current I _{sc}		10000 6000 20	
2.25	The frequency of mechanical operations	Class	M2	
2.26	Rated electrical endurance	Class	E2	
3.	Circuit Breaker - Design and Construction			
3.1.1	Insulator material		Porcelain	
3.1.2	Minimum creepage distance	mm/kV	31	
3.1.3	HV terminal	pcs.	2	
3.1.3.1	Shape		Flat	
3.1.3.2	Dimensions	mm x mm	180x160	
3.1.3.3	Distance between holes	mm	50	
3.1.3.4	Material suitable for		Al terminal	
3.1.6.1	Between poles distance	mm	2000-3000	
3.2	Operating mechanism			
3.2.1	Motor - auxiliary supply voltage	V. AC	230/415	
3.2.2	Control voltage	V. DC	220	
3.2.3	Number of making coils per phase	pcs.	1	
3.2.4	Number of breaking coils per phase	pcs.	2	
3.2.5	Heater		Yes	
3.2.6	Heater supply voltage	V. Hz	230, 50	
3.2.7	Minimum number of available contacts (NO/NC/V)		12NO+12NC+1 V	
3.2.8	Water-tight corrosion-resistant housing		IP55	
3.2.9	Operating mechanism material		stainless steel	
3.2.10	A crank for manual spring loading		Yes	
3.3	Accessories in central control panel			
3.3.1	Anti-pumping relay		Yes	
3.3.2	Local/remote control selector switch		Yes	
3.3.3	Local operation push buttons		Yes	
3.3.4	Minimum pressure lock-out and alarm relays		Yes	
3.3.5	Service outlet (socket) - 230 V, 50 Hz		Yes	

No.	Description(Employer requirement)	Minimum requirement Unit	data	Guaranteed
3.3.6	Lighting switch		Yes	
3.3.7	Lighting - 230 V, 50 Hz		Yes	
3.3.8	Heater - 230 V, 50 HZ		Yes	
3.3.9	Operation counter		Yes	
3.3.10	Motor MCB (miniature circuit breakers) (for all operating mechanisms)		Yes	
3.3.11	Time phase discrepancy relay		Yes	
3.3.12	Weatherproof, corrosion resistance enclosure, Al or stainless steel		Yes	
3.3.13	Cu earthing rails inside central control cabinet		Yes	
3.3.14	Detachable plates, the bottom of central control cabinet		NO	
3.3.15	Galvanized horizontal and vertical metal structure with minimum 70 µm zinc layer		Yes	
	Overall compliance with the requirements (yes/no)		Yes	

(To be filled by Equipment manufacturer and endorsed by the supplier/bidder)

PART_B(Manufacturer information)

No.	Description(to be inserted)	Manufacturer information	
		Unit	data
1	Manufacturer		
2	Model		
3	Country of origin		
4	Rated pressure of SF ₆ gas	MPa	
5	Total mass of SF ₆ gas	kg	
6	Rated mechanical terminal loads		
6.1	Static horizontal force longitudinal F _{thA}	N	
6.2	Static horizontal force longitudinal F _{thB}	N	
6.3	Static vertical force F _{tV}	N	
6.4	Dynamic horizontal force longitudinal F _{wx}	N	
7	Weight and dimension		
7.1	Support insulator height	mm	
7.2	Total height	mm	
7.3	Pole weight	kg	
7.4	Weight of operating mechanism	kg	
7.5	Total weight	kg	
8	Rated motor power	w	
9	Rated power of making coil	w	
10	Rated power of breaking coil	w	
11	Total heater power	w	
	Overall compliance with the requirements (yes/no)		

Signature & seal of the Manufacturer

Signature & seal of the supplier

PART_A:(Employer Requirement:GTP)(**disconnecter**)

Control voltage shall be 110vdc / 220vdc as per site

No.	Description(Employer requirement)	Minimum requirement Unit data		Guaranteed
1.	General			
1.1	Standards		IEC 62271-102 IEC 60273 IEC 60694 IEC 60815	
1.2	Quality control		ISO 9001 ISO 14001 ISO 18001	
1.3	Type of disconnecter		Outdoor	
1.4	Design		Double side Break	
1.5	Number of poles	pcs.	3	
1.6	Type of main blade operating mechanism		Motor driven and manual operation	
1.7	Number of main blade operating mechanisms	pcs.	1	
1.8	Type of earthing blade operating mechanism		Not applicable	
1.9	Number of earthing blade operating mechanism		Not applicable	
2.	Disconnecter switch - 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	A	3000	
2.7	Rated short withstand current I _k	kA _{rms}	50	
2.8	Rated duration of short-circuit on main blades	s	1	
2.9	Rated duration of short-circuit on earthing blades	s	Not applicable	
2.10	Rated maximum withstand current I _p	kA	≥ 125	
2.11	Capacity of making and breaking transfer load of busbar system at 300 V (rms) 300V	A	1600	
2.12	Nominal supply voltage			
2.13.1	Controls and alarm (signalling) circuits	V d.c.	220	
2.13.2	Motors	V a.c.	415	
2.13.3	Heaters	V a.c. / Hz	230 / 50	
2.14	Opening time	s	12±2	
2.15	Closing time	s	12±2	
2.16	Mechanical endurance	Class	M2	
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 120 x 100	
3.1.5.3	Number of holes		Min 4	
3.1.5.4	Dimensions of holes	mm	Ø18	
3.1.5.5	Distance between holes	mm	60	
3.1.5.6	Material suitable for		Al terminal	
3.2	Operating mechanism			
3.2.1	Number of operating mechanism	pcs.	1	
3.2.9	Motor - auxiliary supply voltage	V, AC	415	
3.2.11	Water-tight corrosion-resistant housing		IP55	
3.2.22	Housing of Al or stainless steel		Stainless steel	
3.2.23	Minimum number of available contacts (NO/NC)		10/10	
3.2.12	Selection switch (local/neutral/remote)		Yes	
3.3.1	Manual closing button		Yes	
3.3.2	Manual opening button		Yes	
3.3.3	Anti-condensation heater inside the operating mechanism cabinet		Yes	
3.3.4	Selection switch (local/neutral/remote)		Yes	
3.3.5	Manual closing button		Yes	
3.3.6	Manual opening button		Yes	
3.3.7	Anti-condensation heater inside the operating mechanism cabinet		Yes	
3.3.8	Selection switch (local/neutral/remote)		Yes	
	Overall compliance with the requirements (yes/no)		Yes	

PART_B (Manufacturer information)

No.	Description(to be inserted)	Manufacturer information	
		Unit	data
1	Manufacturer		insert
2	Model		insert
3	Country of origin		insert
2.17	Rated mechanical terminal loads of terminals		insert
2.17.1	Direct loading, static F_a	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
3.1.7	Weight and dimensions		insert
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
3.1.7.5	Distance between support axis of a pole	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
3.2.2	Mechanism Type		insert
3.2.3	Rated power of motor	W	insert
3.2.4	Total heater power	W	insert
	Overall compliance with the requirements (yes/no)		

Signature & seal of the Manufacturer

Signature & seal of the supplier

PART_A:(Employer

Requirement:GTP)(861,863,864,866,867,869) **disconnecter**

No.	Description(Employer requirement)	Minimum requirement Unit	data	Guaranteed
1.	General			
1.1	Standards		IEC 62271-102 IEC 60273 IEC 60694 IEC 60815	
1.2	Quality control		ISO 9001 ISO 14001 ISO 18001	
1.3	Type of disconnecter		Outdoor	
1.4	Design		Double side Break	
1.5	Number of poles	pcs.	3	
1.6	Type of main blade operating mechanism		Motor driven and manual operation	
1.7	Number of main blade operating mechanisms	pcs.	1	
1.8	Type of earthing blade operating mechanism		Not applicable	
1.9	Number of earthing blade operating mechanism		Not applicable	
2.	Disconnecter switch - 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	A	3000	
2.7	Rated short withstand current I _k	kA _{rms}	50	
2.8	Rated duration of short-circuit on main blades	s	1	
2.9	Rated duration of short-circuit on earthing blades	s	Not applicable	
2.10	Rated maximum withstand current I _p	kA	≥ 125	
2.11	Capacity of making and breaking transfer load of busbar system at 300 V (rms) 300V	A	1600	
2.12	Nominal supply voltage			
2.13.1	Controls and alarm (signalling) circuits	V d.c.	220	
2.13.2	Motors	V a.c.	415	
2.13.3	Heaters	V a.c. / Hz	230 / 50	
2.14	Opening time	s	12±2	
2.15	Closing time	s	12±2	
2.16	Mechanical endurance	Class	M2	
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 120 x 100	
3.1.5.3	Number of holes		Min 4	
3.1.5.4	Dimensions of holes	mm	Ø18	
3.1.5.5	Distance between holes	mm	60	
3.1.5.6	Material suitable for		Al terminal	
3.2	Operating mechanism			
3.2.1	Number of operating mechanism	pcs.	1	
3.2.9	Motor - auxiliary supply voltage	V, AC	415	
3.2.11	Water-tight corrosion-resistant housing		IP55	
3.2.22	Housing of Al or stainless steel		Stainless steel	
3.2.23	Minimum number of available contacts (NO/NC)		10/10	
3.2.12	Selection switch (local/neutral/remote)		Yes	
3.3.1	Manual closing button		Yes	
3.3.2	Manual opening button		Yes	
3.3.3	Anti-condensation heater inside the operating mechanism cabinet		Yes	
3.3.4	Selection switch (local/neutral/remote)		Yes	
3.3.5	Manual closing button		Yes	
3.3.6	Manual opening button		Yes	
3.3.7	Anti-condensation heater inside the operating mechanism cabinet		Yes	
3.3.8	Selection switch (local/neutral/remote)		Yes	
	Overall compliance with the requirements (yes/no)		Yes	

PART_B (Manufacturer information)

No.	Description(to be inserted)	Manufacturer information	
		Unit	data
1	Manufacturer		insert
2	Model		insert
3	Country of origin		insert
2.17	Rated mechanical terminal loads of terminals		insert
2.17.1	Direct loading, static F_a	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
3.1.7	Weight and dimensions		insert
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
3.1.7.5	Distance between support axis of a pole	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
3.2.2	Mechanism Type		insert
3.2.3	Rated power of motor	W	insert
3.2.4	Total heater power	W	insert
	Overall compliance with the requirements (yes/no)		

Signature & seal of the Manufacturer

Signature & seal of the supplier

PART_A:(Employer Requirement: GTP) disconnecter

No.	Description(Employer requirement)	Minimum requirement Unit data		Guaranteed
1.	General			
1.1	Standards		IEC 62271-102 IEC 60273 IEC 60694 IEC 60815	
1.2	Quality control		ISO 9001 ISO 14001 ISO 18001	
1.3	Type of disconnecter		Outdoor	
1.4	Design		Double side Break	
1.5	Number of poles	pcs.	3	
1.6	Type of main blade operating mechanism		Motor driven and manual operation	
1.7	Number of main blade operating mechanisms	pcs.	1	
1.8	Type of earthing blade operating mechanism		MOTOR operation	
1.9	Number of earthing blade operating mechanism		1	
2.	Disconnecter switch - 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	A	3000	
2.7	Rated short withstand current I _k	kA _{rms}	50	
2.8	Rated duration of short-circuit on main blades	s	1	
2.9	Rated duration of short-circuit on earthing blades	s	1	
2.10	Rated maximum withstand current I _p	kA	≥ 125	
2.11	Capacity of making and breaking transfer load of busbar system at 300 V (rms) 300V	A	1600	
2.12	Nominal supply voltage			
2.13.1	Controls and alarm (signalling) circuits	V d.c.	220	
2.13.2	Motors	V a.c.	415	
2.13.3	Heaters	V a.c. / Hz	230 / 50	
2.14	Opening time	s	12±2	
2.15	Closing time	s	12±2	
2.16	Mechanical endurance	Class	M2	

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 120 x 100	
3.1.5.3	Number of holes		Min 4	
3.1.5.4	Dimensions of holes	mm	18	
3.1.5.5	Distance between holes	mm	60	
3.1.5.6	Material suitable for		Al terminal	
3.2	Operating mechanism			
3.2.1	Number of operating mechanism	pcs.	1	
3.2.9	Motor - auxiliary supply voltage	V, AC	415	
3.2.11	Water-tight corrosion-resistant housing		IP55	
3.2.22	Housing of Al or stainless steel		Stainless steel	
3.2.23	Minimum number of available contacts (NO/NC)		10/10	
3.2.12	Selection switch (local/neutral/remote)		Yes	
3.3.1	Manual closing button		Yes	
3.3.2	Manual opening button		Yes	
3.3.3	Anti-condensation heater inside the operating mechanism cabinet		Yes	
3.3.4	Selection switch (local/neutral/remote)		Yes	
3.3.5	Manual closing button		Yes	
3.3.6	Manual opening button		Yes	
3.3.7	Anti-condensation heater inside the operating mechanism cabinet		Yes	
3.3.8	Selection switch (local/neutral/remote)		Yes	
	Overall compliance with the requirements (yes/no)		Yes	

PART_B(Manufacturer information)

No.	Description(to be inserted)	Manufacturer information data	
1	Manufacturer		insert
2	Model		insert
3	Country of origin		insert
2.17	Rated mechanical terminal loads of terminals		insert
2.17.1	Direct loading, static F_a	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
3.1.7	Weight and dimensions		insert
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
3.1.7.5	Distance between support axis of a pole	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
3.2.2	Mechanism Type		insert
3.2.3	Rated power of motor	W	insert
3.2.4	Total heater power	W	insert
	Overall compliance with the requirements (yes/no)		

Signature & seal of the Manufacturer

Signature & seal of the supplier

PART_A:(Employer Requirement: GTP) 231S-232G

No.	Description(Employer requirement)	Minimum requirement Unit data		Guaranteed
1.	General			
1.1	Standards		IEC 62271-102 IEC 60273 IEC 60694 IEC 60815	
1.2	Quality control		ISO 9001 ISO 14001 ISO 18001	
1.3	Type of disconnecter		Outdoor	
1.4	Design		Double side Break	
1.5	Number of poles	pcs.	3	
1.6	Type of main blade operating mechanism		Motor driven and manual operation	
1.7	Number of main blade operating mechanisms	pcs.	1	
1.8	Type of earthing blade operating mechanism		Manual operation	
1.9	Number of earthing blade operating mechanism		1	
2.	Disconnecter switch - 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	A	3000	
2.7	Rated short withstand current I _k	kA _{rms}	50	
2.8	Rated duration of short-circuit on main blades	s	1	
2.9	Rated duration of short-circuit on earthing blades	s	1	
2.10	Rated maximum withstand current I _p	kA	≥ 125	
2.11	Capacity of making and breaking transfer load of busbar system at 300 V (rms) 300V	A	1600	
2.12	Nominal supply voltage			
2.13.1	Controls and alarm (signalling) circuits	V d.c.	220	
2.13.2	Motors	V a.c.	415	
2.13.3	Heaters	V a.c. / Hz	230 / 50	
2.14	Opening time	s	12±2	
2.15	Closing time	s	12±2	
2.16	Mechanical endurance	Class	M2	

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 120 x 100	
3.1.5.3	Number of holes		Min 4	
3.1.5.4	Dimensions of holes	mm	18	
3.1.5.5	Distance between holes	mm	60	
3.1.5.6	Material suitable for		Al terminal	
3.2	Operating mechanism			
3.2.1	Number of operating mechanism	pcs.	1	
3.2.9	Motor - auxiliary supply voltage	V, AC	415	
3.2.11	Water-tight corrosion-resistant housing		IP55	
3.2.22	Housing of Al or stainless steel		Stainless steel	
3.2.23	Minimum number of available contacts (NO/NC)		10/10	
3.2.12	Selection switch (local/neutral/remote)		Yes	
3.3.1	Manual closing button		Yes	
3.3.2	Manual opening button		Yes	
3.3.3	Anti-condensation heater inside the operating mechanism cabinet		Yes	
3.3.4	Selection switch (local/neutral/remote)		Yes	
3.3.5	Manual closing button		Yes	
3.3.6	Manual opening button		Yes	
3.3.7	Anti-condensation heater inside the operating mechanism cabinet		Yes	
3.3.8	Selection switch (local/neutral/remote)		Yes	
	Overall compliance with the requirements (yes/no)		Yes	

PART_B(Manufacturer information)

No.	Description(to be inserted)	Manufacturer information data	
1	Manufacturer		insert
2	Model		insert
3	Country of origin		insert
2.17	Rated mechanical terminal loads of terminals		insert
2.17.1	Direct loading, static F_a	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
3.1.7	Weight and dimensions		insert
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
3.1.7.5	Distance between support axis of a pole	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
3.2.2	Mechanism Type		insert
3.2.3	Rated power of motor	W	insert
3.2.4	Total heater power	W	insert
	Overall compliance with the requirements (yes/no)		

Signature & seal of the Manufacturer

Signature & seal of the supplier

Voltage Transformers 245 kV

No.	Description	Unit	Minimum Requirements Data	Guaranteed
1.	Voltage Transformers - General			
1.1	Manufacturer		Insert	
1.2	Type		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	Type		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 I _{th} , 1 s	kA	N/A	
2.7	Rated dynamic current I _{dyn}	kA _{peak}		
2.8	Rated primary voltage	kV		230/√3
2.9	Rated secondary voltage			
	• I winding	V	110√3	
	• II winding	V	110√3	
2.10	Accuracy class:			
	• I winding		0.2	
	• II winding		1/3P	
2.11	Rated power:			
	• 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	
2.15	Power frequency withstand tests on secondary windings, 1 min	kV _{rms}	3	
2.16	capacitance	pF	4,400	
3.	Voltage Transformers - Design and Construction			
3.1	Insulator material		Porcelain, brown	
3.2	Insulating medium		Oil-paper - Mixed dielectric	
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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
3.5	Permissible level of partial discharges: - Test voltage $1.2 \cdot U_M / 3$ - Test voltage U_M	pC pC	Max. s 5 s 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	mmxmm	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 stainless 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)			

Surge Arresters 245 kV

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1.	Surge Arresters - General			
1.1	Manufacturer		insert	
1.2	Type		Outdoor	
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}	230	
2.2	Highest voltage for equipment U _n	kV _{rms}	245	
2.4	Rated voltage of surge arrester U _r	kV _{rms}	192	
2.5	Max. continuous operating voltage U _c	kV _{rms}	154	
2.8	Rated frequency	Hz	50	
2.9	Nominal discharge current I _n (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)	A	≥ 850	
3.4	Maximum residual voltage U _{res}			
3.4.1	For switching impulse current 30/60 μs at 0,5 kA	kV _{peak}	≤ 375	
3.4.2	For switching impulse current 30/60 μs at 1 kA	kV _{peak}	≤ 385	
3.4.3	For switching impulse current 30/60 μs at 2 kA	kV _{peak}	≤ 405	
3.4.4	For lightning impulse current 8/20 μs at 5 kA	kV _{peak}	≤ 435	
3.4.5	For lightning impulse current 8/20 μs at 10 kA	kV _{peak}	≤ 465	
3.4.6	For lightning impulse current 8/20 μs at 20 kA	kV _{peak}	≤ 515	
3.5.	Dielectric endurance of arrester housing)			
3.5.1	Lightning impulse withstand voltage of arrester housing up (1.2/50 μs)	kV	≥ 925	
3.5.2	Power frequency withstand voltage of arrester housing (1 min wet)	kV	≥ 425	
3.6.	Mechanical requirements			
3.6.1	Specified short-term load SSL (F _{dyn})	N	≥ 2250	
3.6.2	Specified long-term load SSL (F _{stat})	N	≥ 1550	
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	
3.11	Surge arrester weight	kg	Insert	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
3.12	Voltage distribution ring present / ring diameter	yes / no / 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	
3.14.6	Surge counter	yes/no	yes	
	Overall compliance with the requirements (yes/no)			yes

Current Transformers 230 kV

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	Type		Outdoor	
1.8	Shape / design		Head type	
1.9	Sealing		Hermetically closed	
2.	Current 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 power frequency withstand voltage	kV	460	
2.5	Rated frequency f _r	Hz	50	
2.6	Rated short-time thermal current I _{th} , 1 s	kA	50	
2.7	Rated dynamic current I _{dyn}	kV _{peak}	125	
2.8	Rated continuous thermal current (40°C):			
	• I core	% I _n	120	
	• II core	% I _n	120	
	• III core	% I _n	120	
	• IV core	% I _n	120	
2.9	Rated transformer ratio:			
	• I core	A/A	2400-1600/1	
	• II core	A/A	2400-1600/1	
	• III core	A/A	2400-1600/1	
	• IV core	A/A	2400-1600/1	
2.10	Accuracy class:			
	• I core		5P20	
	• II core		5P20	
	• III core		5P20	
	• IV core		0.2s	
2.11	Security factor:			
	• IV core		Fs=5	
	Rated power:			
	• I core	VA	30	
	• II core	VA	30	
2.12	• III core	VA	30	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
	- IV core - V core	VA VA	15 -	
2.13	Rated mechanical terminal loads	Class	Min. Class II	
3.	Current Transformers - Design and Construction			
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)	μ V	Max. 2500	
3.5	Permissible level of partial discharges: - Test voltage $1.2 \cdot U_M / \sqrt{3}$ - 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 200 x 100	
3.8.4	Number of holes		Min 8	
3.8.5	Dimensions of holes	mm	$\varnothing 14$	
3.8.6	Distance between holes	mm	50	
3.8.7	Material suitable for		Al terminal	
3.10	tg δ 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)			

Control and Monitoring Equipment - General

No.	Description	Minimum Requirements		Data offered by Bidder
		Unit	Data	
1	General			
2	Manufacturer			
3	Country of origin			
4	Standards for Environment			
5	Environmental testing: Temperature		IEC 60068-2-1/2	
6	Environmental testing: Humidity		IEC 60068-2-3	
7	Operating conditions: climatic conditions		IEC 60654	
8	Telecontrol equipment and system: environment conditions		IEC 60870-2-2	
9	Standards for EMC			
10	Electromagnetic compatibility - electrostatic discharges		IEC 61000-4-2	
11	Electromagnetic compatibility - electromagnetic field		IEC 61000-4-4	
12	Electromagnetic compatibility - impulse voltage immunity requirements (lightning)		IEC 61000-4-5	
13	Electromagnetic compatibility - continuous wave (CW) current injection		IEC 61000-4-6	
14	Electromagnetic compatibility for electrical and electronic equipment		IEC60801	
15	Telecontrol equipment and system: power supply and electromagnetic compatibility		IEC 60870-2-1	
16	Standards for Interfaces			
17	Communication networks and systems in substations		IEC 61850 Edition 2	
18	Telecontrol equipment and system: transmission protocol		IEC 60870-5-101 IEC 60870-5-104 IEC 60870-5-102 IEC 60870-5-103	
19	International standards organisation			
20	Quality system model for quality assurance in design/development manufacture and testing		ISO 9001	
21	Quality system model for quality assurance in production, installation and servicing		ISO 9002	
	Overall compliance with the requirements (yes/no)			

Bay Control Unit

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14251	Bay Control Unit			
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 I _r	A	1	
2.2.3	Permissible overload, continuous		4xI _r	
2.2.4	Permissible overload, 1 s		100xI _r	
2.2.5	Burden at I _r	VA	< 0.5	
2.3	a.c. voltage inputs			
2.3.1	Number of inputs		Min. 4	
2.3.2	Rated voltage Ph-Ph U _r	V	100	
2.3.3	Permissible overload, continuous	% U _r	150	
2.3.4	Permissible overload, 1 s	% U _r	250	
2.3.5	Burden at U _r	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 root		Max. 8	
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 L/R<40 ms, at rated voltage	A	0.1	
2.5.4	Current carrying capacity at rated voltage for signalling contacts, continuous	A	Insert	
2.5.5	Number of tripping contacts (high-speed output)	pcs.	Insert	
2.5.6	Current carrying capacity at rated voltage for tripping contacts, continuous	A	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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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			
2.8.1	HMI with single line diagram, measurement, signalling and control		Yes	
2.9	Synchronism & energising check			
2.9.1	Frequency difference range	mHz.	Insert	
2.9.2	Voltage difference range	% Ur	Insert	
2.9.3	Phase difference range	°	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. They must be parameterized, configured and delivered as per Engineer's requirements.

Bay Control Unit for Power Transformers HV & LV

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14252	Bay Control Unit for Power Transformers HV&LV			
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 I _r	A	1	
2.2.3	Permissive overload, continuous		4xI _r	
2.2.4	Permissive overload, 1 s		100xI _r	
2.2.5	Burden at I _r	VA	< 0.5	
2.3	a.c. voltage inputs			
2.3.1	Number of inputs		Min. 4	
2.3.2	Rated voltage Ph-Ph U _r	V	100	
2.3.3	Permissive overload, continuous	% U _r	150	
2.3.4	Permissive overload, 1 s	% U _r	250	
2.3.5	Burden at U _r	VA	< 0.3	
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. 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	A	0.1	
2.6.4	Current carrying capacity at rated voltage for signalling contacts, continuous	A	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	A	5	
2.7	LED indications			
2.7.1	Number of LED's		Min. 16	
2.7.2	Multi-colour LED's	Yes/No	Insert	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	°	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.

Fibre Optic Cables

No.	Description	Minimum Requirements		Data offered by Bidder
		Unit	Data	
1	Manufacturer			
2	Type		Metal-free with single mode fibres	
3	Standards:			
4	• for single mode fibres		ITU-T-G-655 IEC 793-1	
5	• for fibre optic cables		IEC 793-2 IEC 794-1 IEC 794-2	
6	Number of optical fibres	pcs.	48	
7	Operational wavelength	nm	1550	
8	G655: Attenuation coefficient (at 1550 nm)	dB/km	≤ 0.23	
9	G655: Dispersion coefficient (at 1550 nm)		≤ 3.5	
10	Cut off wavelength (at 1550 nm)	nm	- 1450	
11	Tensile strength (without temporary or permanent optical degradation and mechanical cable damage)	N	1000	
12	Permissible bending radius	mm	> 400	
13	Mode field diameter and tolerance	um	9.5 ± 0.5	
14	Mode field non-circularity	%	Max 6	
15	Mode field concentricity error	µm	Max 1	
16	Cladding diameter and tolerance	µm	125 ± 3	
17	Cladding non-circularity	%	Max 2	
18	Primary coating material		Silicone or similar material	
19	Diameter over primary coating and tolerance	µm	250 ± 15	
20	Type of secondary coating		Loose-buffered	
21	Secondary coating material		Fibre-reinforced plastic	
22	Central strength member		Non-hygroscopic	
23	Filler		Jelly filler	
24	Binding type (wrapper)		Polyester type	
25	Inner jacket			
26	• material		PE tapes	
27	• radial thickness	mm		
28	Belt insulation			
29	• material		PE	
30	• radial thickness	mm	1.5	
31	Outer jacket	mm		
32	• material		High density polyethylene	
33	• radial thickness	mm	1.5	
34	Anti-termite protection		"Rigid" plastic over the outer cable jacket	
35	Overall diameter of completed cable	mm		

No.	Description	Minimum Requirements		Data offered by Bidder
		Unit	Data	
36	Mass of completed cable	kg/m		
37	Manufacturer quality system in accordance with ISO 9000, 9001, 9002, 9003, 9004		Yes	
38	Type test reports		To be included in bid	
	Overall compliance with the requirements (yes/no)			

Fibre Optic Cables & Terminal Equipment

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14298	Fibre Optic Cables & Terminal Equipment			
1.1	Sufficient quantity of adequate glass fibre optic cables for overall Protection & Control & Monitoring & Metering system should be foreseen and included in the bid.		Yes	
1.2	Below proposed quantities shall be verified according to Bidder's specific design.		Yes	
1.3	Final quantities must be estimated and delivered as per single line diagram and substation layouts.		Yes	
1.4	At least 20% spare in cable length, as well as in number of fibres in cable, should be foreseen.		Yes	
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			
2.1	Fibre optic terminations. Overall quantities of specific fibre optic terminations should be closely related to number of fibres in each cable (each fibre, used or spare, should be properly terminated). At least 20% spare terminations for each proposed type should be foreseen.		Yes	
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	
2.2	Optical distributor with connectors Overall quantity of optical distributor with connectors should be closely related to number of relay houses. optical distributor with connectors should be foreseen for both cable ends. At least 10% spare optical distributors with connectors should be foreseen.		Yes	
2.2.1	Fibre optic cable gland		To accept metal-free optical cable	
2.2.3	Patch-cord connection		Yes	
2.2.4	Type of optical connectors		Insert	
2.2.5	Manufacturer		Insert	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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)			

-

Protection Terminal for Power Transformers - Main 1

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
	Protection Terminal for Power Transformers - Main 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			
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. 9	
2.2.2	Rated current I _r	A	1	
2.2.3	Permissive overload, continuous		4xI _r	
2.2.4	Permissive overload, 1 s		100xI _r	
2.2.5	Burden at I _r	VA	< 0.5	
2.3	a.c. voltage inputs			
2.3.1	Number of inputs		Min 4	
2.3.2	Rated voltage Ph-Ph U _r	V	100	
2.3.3	Permissive overload, continuous	% U _r	150	
2.3.4	Permissive overload, 1 s	% U _r	250	
2.3.5	Burden at U _r	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	A	0.1	
2.5.5	Current carrying capacity at rated voltage for signalling contacts, continuous	A	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	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	
2.7.1	Port for front-connected PC			

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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		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	Cross block function		Yes	
2.10.9	Zero sequence subtraction		Yes	
2.11	Restricted earth fault protection for autotransformer / 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 inrush restraint			
2.13.1.1	Setting range	% Ir	Insert	
2.13.1.2	Min. operating time at $I > 10 \cdot I_{set}$	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	
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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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 $I > 10 \cdot I_{set}$	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 requirements (yes/no)			

Protection Terminal for Power Transformers - Main 2

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14004	Protection Terminal for Power Transformers - Main 2			
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. 9	
2.2.2	Rated current I _r	A	1	
2.2.3	Permissive overload, continuous		4xI _r	
2.2.4	Permissive overload, 1 s		100xI _r	
2.2.5	Burden at I _r	VA	< 0.5	
2.3	a.c. voltage inputs			
2.3.1	Number of inputs		Min 4	
2.3.2	Rated voltage Ph-Ph U _r	V	100	
2.3.3	Permissive overload, continuous	% U _r	150	
2.3.4	Permissive overload, 1 s	% U _r	250	
2.3.5	Burden at U _r	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	A	0.1	
2.5.5	Current carrying capacity at rated voltage for signalling contacts, continuous	A	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	A	5	
2.6	LED indications			
2.6.1	Number of LED's		Insert	
2.6.2	Multi-colour LED's	Yes/No	Insert	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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 $I > 10 \cdot I_{set}$	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	
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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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 $I > 10 \cdot I_{set}$	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 requirements (yes/no)			

Protection Terminal for LV side of Power Transformer

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
	Protection Terminal for LV side of Power Transformer			
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 I _r	A	1	
2.2.3	Permissive overload, continuous		4xI _r	
2.2.4	Permissive overload, 1 s		100xI _r	
2.2.5	Burden at I _r	VA	< 0.5	
2.3	a.c. voltage inputs			
2.3.1	Number of inputs		Min. 4	
2.3.2	Rated voltage Ph-Ph U _r	V	100	
2.3.3	Permissive overload, continuous	% U _r	150	
2.3.4	Permissive overload, 1 s	% U _r	250	
2.3.5	Burden at U _r	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	A	0.1	
2.5.5	Current carrying capacity at rated voltage for signalling contacts, continuous	A	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	A	5	
2.6	LED indications			
2.6.1	Number of LED's		Insert	
2.6.2	Multi-colour LED's	Yes/No	Insert	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	Distance protection			
2.10.1	Number of protection zones		Min. 5	
2.10.2	Basic operating time	ms	< 30	
2.10.3	Operational characteristic		Quadrilateral	
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	
2.12	Secondary circuits supervision: • VT circuits supervision • CT circuits supervision		Yes Yes	
2.13	Automatic switch onto fault logic • Impedance criteria • Instantaneous overcurrent criteria		Yes Yes	
2.14	Multistage three-phase overcurrent protection			
2.14.1	Number of stages		Min. 2	
2.14.2	Setting range	% Ir	Insert	
2.14.3	Characteristics			
2.14.3.1	Definite time delayed	Yes/no	Yes	
2.14.3.2	Normal inverse	Yes/No	Yes	
2.14.3.3	Very inverse	Yes/No	Insert	
2.14.3.4	Extremely inverse	Yes/No	Insert	
2.15	Multistage earth fault overcurrent protection			
2.15.1	Number of stages		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	
2.15.4.2	Normal inverse	Yes/No	Yes	
2.15.4.3	Very inverse	Yes/No	Insert	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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 bi-nary 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 (yes/no)			

-Automatic Voltage Regulation

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
	Automatic Voltage Regulation /			
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		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	
2.5.2.4	Connector type		RJ45 or FO	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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)			

Protection Terminal for Busbars

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
	Protection Terminal for Busbars			
1.1	Manufacturer		AS PER PSD	
1.2	Country of origin		AS PER PSD	
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 I _r	A	1	
2.2.3	Permissive overload, continuous		4xI _r	
2.2.4	Permissive overload, 1 s		100xI _r	
2.2.5	Burden at I _r	VA	< 0.5	
2.3	a.c. voltage inputs			
2.3.1	Number of inputs		Min. 4	
2.3.2	Rated voltage Ph-Ph U _r	V	100	
2.3.3	Permissive overload, continuous	% U _r	150	
2.3.4	Permissive overload, 1 s	% U _r	250	
2.3.5	Burden at U _r	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	A	0.1	
2.5.5	Current carrying capacity at rated voltage for signalling contacts, continuous	A	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	A	5	
2.6	LED indications			
2.6.1	Number of LED's		Insert	
2.6.2	Multi-colour LED's	Yes/No	Insert	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	Multistage three-phase overcurrent protection			
2.10.1	Instantaneous overcurrent protection			
2.10.1.1	Setting range	% Ir	Insert	
2.10.1.2	Min. operating time at $I > 10 \cdot I_{set}$	ms	30	
2.10.2	Time delayed overcurrent protection			
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	
2.10.2.3.3	Very inverse	Yes/No	Insert	
2.10.2.3.4	Extremely inverse	Yes/No	Insert	
2.11	Multistage earth fault overcurrent protection			
2.11.1	Instantaneous earth fault overcurrent protection			
2.11.1.1	Setting range	% Ir	Insert	
2.11.1.2	Min. operating time at $I > 10 \cdot I_{set}$	ms	30	
2.11.2	Time delayed earth fault overcurrent protection			
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	
2.13.4	Characteristics			
2.13.4.1	Definite time delayed	Yes/no	Yes	
2.13.4.2	Normal inverse	Yes/No	Yes	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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)			

Busbar and Breaker Failure Protection Bay Unit

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
	Busbar and Breaker failure protection bay unit			
1.1	Manufacturer		AS PER PSLD	
1.2	Country of origin		AS PER PSLD	
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	
1.5.3	Central unit for busbar protection must be 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	
2	Characteristics			
2.1	Auxiliary supply voltage			
2.1.1	CU, BU Rated auxiliary supply voltage	V d.c.	110 ±15 %	
2.1.2	CU auxiliary supply redundant		Yes	
2.1.3	Interruption in auxiliary d.c. voltage: • Without resetting • Restart time	ms s	> 50 Insert	
2.2	a.c. current inputs BU			
2.2.1	Number of inputs		Min. 3	
2.2.2	Rated current I _r	A	1	
2.2.3	Permissive overload, continuous		4xI _r	
2.2.4	Permissive overload, 1 s		100xI _r	
2.2.5	Burden at I _r	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 L/R<40 ms, at rated voltage	A	0.1	
2.4.5	Current carrying capacity at rated voltage for signalling contacts, continuous	A	Insert	
2.4.6	Number of tripping contacts (high-speed output)	pcs.	Min. 3	
2.4.7	Current carrying capacity at rated voltage for tripping contacts, continuous	A	5	
2.5	LED indications CU, BU			
2.5.1	Number of LED's		Insert	
2.5.2	Multi-colour LED's	Yes/No	Insert	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
2.6	Communication ports CU, BU			
2.6.1	Port for front-connected PC			
2.6.1.1	Protocols supported		Insert	
2.6.1.2	Communication speed	Kbit/s	Insert	
2.6.1.3	PC connector type		Insert	
2.6.2	CU, BU communication media		FO	
2.6.3	CU rear station (system) communication ports			
2.6.3.1	Number of rear ports		Insert	
2.6.3.2	Protocols supported		IEC 61850	
2.6.3.3	Communication speed	Mbit/s	Insert	
2.6.3.4	Connector type		RJ45	
2.6.4	Time synchronisation		SNTP	
2.7	Busbar differential protection			
2.7.1	Operating time	ms	< 20	
2.7.2	Internal CT ratio adaptability		Yes	
2.7.3	Multiple tripping criteria, check and bus zone		Yes	
2.7.4	Current transformer supervision		Yes	
2.7.5	External signal of load transfer starting		Insert	
2.7.6	Busbar protection system should be suitable/adaptable for future switchgear extension or modification		Yes	
2.7.7	Bay-selective intertripping		Yes	
2.7.8	Phase-segregated measurement system		Yes	
2.8	Breaker failure protection			
2.8.1	Setting range	% Ir	Insert	
2.8.2	Re-trip time delay range	s	0-1	
2.8.3	Re-trip operation mode 1/3ph		Yes	
2.8.4	Back-up time delay range	s	0-1	
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		Insert	
2.8.9	Selectable operation mode (current, unbalance, low current)		Insert	
2.8.10	Independent settable delay times for all operation modes		Yes	
2.8.11	Low current mode using the circuit breaker auxiliary contact		Yes	
2.8.12	End fault protection		Yes	
2.8.13	Independent breaker failure protection per bay unit		Yes	
2.9	Disturbance recorder CU, BU			
2.9.1	Number of digital 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	
2.9.5	Pre-fault time	ms	≥ 300	
2.9.6	Recording time	ms	≥ 2000	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	
	Overall compliance with the requirements (yes/no)			

Trip Circuit Supervision Relay

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
	Trip Circuit Supervision Relay			
1.1	Manufacturer		Insert	
1.2	Country of origin		Insert	
1.3	Type		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	A	0.1	
2.2.4	Current carrying capacity at rated voltage for signalling contacts, continuous	A	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)			

Tripping Unit - High-Speed Tripping Relay

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
	Trip Circuit Supervision Relay			
1.1	Manufacturer		Insert	
1.2	Country of origin		Insert	
1.3	Type		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	A	0.1	
2.2.4	Current carrying capacity at rated voltage for signalling contacts, continuous	A	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)			

Digital Multiplexer Interfaces

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1	Manufacturer			
2	Type			
3	Standards		ITU-T G.703, G.704, G.706 G.711, G.732, G.823, V.11, V.24 V.28	
4	Channel units		Ethernet 10/100 V24/28 V35 X24/V11 2-wires FXS	
5	Remote subscriber interface		ITU-T G.711	
6	• Nominal impedance	Ω	600	
7	• Subscriber line feed		Yes	
8	• Dialling		Yes	
9	• Ringing detection		Yes	
10	PABX interface			
11	• Nominal impedance	Ω	600	
12	• Transmission speed	kbps	64	
13	Timing		Co- and contra-directional G.703	
14	64 kbps data interface			
15	• Data transmission speed	kbps	64	
16	Timing		Co- and contra-directional G.703	
17	• Nominal impedance		120	
18	• Code		AMI	
19	Jitter		ITU-T G.823	
20	Data interface for transmission of asynchronous data channel with bit rate up to 9600 bps			
21	• Bit rate	kbps	64	
22	• Data transmission speed	bps	9600	
23	• Operating mode		Asynchronous	
24	• Electrical interface		ITU-T V.28	
25	• Functional interface		ITU-T V.24	
26	Rated power supply voltage	V DC	48, plus pole earthed	
27	Mounting		Inside SDH rack	
28	Manufacturer quality system in accordance with ISO 9000, 9001, 9002, 9003, 9004		Yes	
29	Type test reports		To be included in bid	
	Overall compliance with the requirements (yes/no)			

Teleprotection Signalling Interface

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1	Manufacturer			
2	Type			
3	Standards		IEC 61000-4 IEC 60834-1 EN 60950-1 IEC 60255-5	
4	Number of command channels	pcs.	2 x 4	
5	Electrical interfaces			
6	• Command inputs			
7	– nominal operating voltage	V	48 VDC	
8	– optocoupler		Yes	
9	• Command outputs			
10	– nominal contact voltage	V	48 VDC	
11	– maximum switching power	VA	60 W	
12	– maximum switching current	A	0.2A	
13	Voltage withstand	kV	Acc. to IEC 834 -1 and IEC 225	
14	Operating time incl. propagation (max)	ms.	20	
15	Rated power supply voltage	V DC	48, plus pole earthed	
16	Mounting		Inside SDH rack	
17	Manufacturer quality system in accordance with ISO 9000, 9001, 9002, 9003 and 9004		Yes	
18	Type test reports		To be included in bid	
	Overall compliance with the requirements (yes/no)			

Optical Distribution Frame

No.	Description	Unit	Minimum Requirements Data	Data offered by Bidder
1	Manufacturer			
2	Type			
3	Standards		IP65	
4	• for single mode fibres		ITU-T655 IEC 793-1 IEC 793-2	
5	• for fibre optic cables		IEC 794-1 IEC 794-2	
6	Fibre optical cable gland		To accept metal-free optical cable, min 2*48 single mode fibres, with a loose tube Capability to accept 2*48 additional cores	
7	Patch cord connection		To accept 2*48 metal-free optical patch cords with 1 single mode fibre each. Connected pigtailed Capability to accept 2*48 additional cores	
8	Maximum optical attenuation per slice	dB	0.1	
9	Type of optical connectors		LC	
10	Housing		Tamper-proof sealed rugged con- struction	
11	Installation		Mounted on wall	
12	Dimensions	mm		
13	Mass	kg		
14	Manufacturer quality system in accord- ance with ISO 9000, 9001, 9002, 9003, 9004		Yes	
15	Type test reports		To be included in bid	
	Overall compliance with the requirements (yes/no)			

Fibre Optic Multiplexer Equipment

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1	General:			
	Manufacturer			
	Model No.			
	Type			
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 G.704, selectable	
3.3	HDSL, 2Mbit/s interface: • no of copper wires • Capacity on 2Mbit/s or on 1Mbit/s • Capacity selectable	No. of channels channels / pair of wire	4 or 2 30 or 15 30 / 2 pairs 30 / 1 pair 15 / 1 pair	
4	Available user interfaces			
4.1	Voice interfaces for trunk lines:			
4.1.1	1 + 1 com path protection, available for all		yes	
4.1.2	Analogue, 4wire with E&M: • Input level • Output level	dBr dBr	+7.5 ... -16.0 +7.0 ... -16.5	
4.1.3	Analogue, 2wire with E&M: • Input level • Output level	dBr dBr	+6.5 ... -12.5 -1.0 ... -20.0	
4.1.4	Digital, 2Mbit/s CAS or PRI		yes	
4.2	Voice interfaces for remote subscriber:			
4.2.1	2wire, subscriber side	dBr	-5 ... +4/-7.5 ... -1	
4.2.2	2wire, PABX side	dBr	-5 ... +4/-7.5 ... -3	
4.3	Integrated teleprotection			
4.3.1	Interface for Commands:			
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			

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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:			
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 / IPor 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.

Digital Fault and Disturbance Recorder (DFDR)

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
1	General			
1.1	Manufacturer		siemens	
1.2	Type		7KE85	
1.3	Model designation		Insert	
1.4	Country of origin		Germany	
1.5	Power supply	V, DC	DC 110 V	
1.6	Power supply - printer	V, Hz	AC 230 V, 50 Hz	
2	Analogue inputs			
2.1	Number of channels		Minimum 160	
2.1.1	Expandability		Minimum 32	
2.2	Nominal current	Amp	1A / 5A	
2.3.1	Nominal voltage	Vac/	Insert	
2.3.2	Nominal current	mA/Amp	Insert	
2.4	Frequency response		Insert	
2.5	Cut-off frequency			
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 all feeders/inputs		Min2for FAST and 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	2Vn 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		N/O or N/C, 110 VDC	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
3.3	Type		Potential or potential free contact	
3.4	Resolution	ms	Insert	
4	Memory			
4.1	Size	MB	64 MB or higher	
4.2	Type		Solid state	
4.3	Pre-fault time (fast scanning rate)	sec	0.1-2 user programmable	
4.4	Post-fault (fast scanning rate)	sec	0.1-2 user programmable	
4.5	Pre and post-fault time (slow scanning rate)	sec	min. 180 user programmable	
4.6	In-built hard disk (auto-maintained)	GB	min. 4 GB	
5	Sensors / Triggering criteria			
	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.	Pending / 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			
7.1.	Max. operation voltage DC/AC	Vac /	250Vac or above, 60 or above	
7.2.	Make and carry for 0.5 sec	A	Min 8A	
7.3.	Carry continuously	A	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	
8.3.	Standard serial port (EIA-232-D)	Yes / No	Yes	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	Minimum 40 GB	
10.7.	Printer	Yes/No	Yes	
10.8.	Modem	Yes/No	Yes.	
	Overall compliance with the requirements (yes/no)			

Protection Terminal for OHL-Main 1

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14001	Protection Terminal for OHL-Main 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			
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 I _r	A	1	
2.2.3	Permissible overload, continuous		4xI _r	
2.2.4	Permissible overload, 1 s		100xI _r	
2.2.5	Burden at I _r	VA	< 0.3	
2.3	a.c. voltage inputs			
2.3.1	Number of inputs		Min. 4	
2.3.2	Rated voltage Ph-Ph U _r	V	100	
2.3.3	Permissible overload, continuous	% U _r	150	
2.3.4	Permissible overload, 1 s	% U _r	250	
2.3.5	Burden at U _r	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 %	
2.5.4	Breaking capacity at inductive load with L/R<40 ms, at rated voltage	A	0.1	
2.5.5	Current carrying capacity at rated voltage for signalling contacts, continuous	A	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	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	
2.7.1	Port for front-connected PC			

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	Distance protection			
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			
2.11.1	Operational modes		Intertrip Permissive under-reach Permissive overreach Blocking	
2.12	Power swing detection		Yes	
2.13	Secondary circuits supervision: • VT circuits supervision • CT circuits supervision		Yes Yes	
2.14	Automatic switch onto fault logic • Impedance criteria • Instantaneous overcurrent criteria		Yes 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	
2.16.2	Number of stages		Min. 2	
2.16.3	Setting range	% Ir	Insert	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
2.16.4	Type of protection		Non-directional	
2.16.5	Characteristics			
2.16.5.1	Definite time delayed	Yes/no	Yes	
2.16.5.2	Normal inverse	Yes/No	Yes	
2.16.5.3	Very inverse	Yes/No	Insert	
2.16.5.4	Extremely inverse	Yes/No	Insert	
2.17	Directional earth fault protection			
2.17.1	Number of stages		Insert	
2.17.2	Setting range	% Ir	Insert	
2.17.3	Type of protection		Directional	
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	
2.17.5	Minimum polarizing voltage	% Ur	3 %	
2.17.6	Communication scheme logic		Yes	
2.17.6.1	Permissive and blocking		Yes	
2.17.7	Single and three-pole tripping schemes		Yes	
2.18	Current negative sequence protection			
2.18.1	Number of stages		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			
2.19.2.1	Setting range of 1 stage	% Ir	Insert	
2.19.2.2	Time delay range of 1 stage	min	> 20	
2.19.2.3	Setting range of 2 stage	% Ir	Insert	
2.19.2.4	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, etc.)		Insert	
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	
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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
2.21.2	Voltage difference range	% Ur	Insert	
2.21.3	Phase difference range	°	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 binary 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	
3.2	Setting and configuration of Protection Terminal approved by Engineer		Yes	
	Overall compliance with the requirements (yes/no)			

Protection Terminal for OHL - Main 2

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
14002	Protection Terminal for OHL - Main 2 / Code number: 14002			
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 I _r	A	1	
2.2.3	Permissive overload, continuous		4xI _r	
2.2.4	Permissive overload, 1 s		100xI _r	
2.2.5	Burden at I _r	VA	< 0.5	
2.3	a.c. voltage inputs			
2.3.1	Number of inputs		Min. 4	
2.3.2	Rated voltage Ph-Ph U _r	V	100	
2.3.3	Permissive overload, continuous	% U _r	150	
2.3.4	Permissive overload, 1 s	% U _r	250	
2.3.5	Burden at U _r	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	A	0.1	
2.5.5	Current carrying capacity at rated voltage for signalling contacts, continuous	A	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	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	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
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	Distance protection			
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			
2.11.1	Operational modes		Intertrip Permissive under-reach Permissive overreach Blocking	
2.12	Power swing detection		Yes	
2.13	Secondary circuits supervision: • VT circuits supervision • CT circuits supervision		Yes Yes	
2.14	Automatic switch onto fault logic • Impedance criteria • Instantaneous overcurrent criteria		Yes 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	
2.16.2	Number of stages		Min. 2	

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
2.16.3	Setting range	% Ir	Insert	
2.16.4	Type of protection		Non-directional	
2.16.5	Characteristics			
2.16.5.1	Definite time delayed	Yes/no	Yes	
2.16.5.2	Normal inverse	Yes/No	Yes	
2.16.5.3	Very inverse	Yes/No	Insert	
2.16.5.4	Extremely inverse	Yes/No	Insert	
2.17	Directional earth fault protection			
2.17.1	Number of stages		Insert	
2.17.2	Setting range	% Ir	Insert	
2.17.3	Type of protection		Directional	
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	
2.17.5	Minimum polarizing voltage	% Ur	3 %	
2.17.6	Communication scheme logic		Yes	
2.17.6.1	Permissive and blocking		Yes	
2.17.7	Single and three-pole tripping schemes		Yes	
2.18	Current negative sequence protection			
2.18.1	Number of stages		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			
2.19.2.1	Setting range of 1 stage	% Ir	Insert	
2.19.2.2	Time delay range of 1 stage	min	> 20	
2.19.2.3	Setting range of 2 stage	% Ir	Insert	
2.19.2.4	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, etc.)		Insert	
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	
2.20.11	AR operation 1/3ph in 1 st and 2 nd zone		Yes	
2.21	Synchronism & energising check			

No.	Description	Minimum Requirements		Guaranteed
		Unit	Data	
2.21.1	Frequency difference range	mHz.	Insert	
2.21.2	Voltage difference range	% Ur	Insert	
2.21.3	Phase difference range	°	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- 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	
3.2	Setting and configuration of Protection Terminal approved by Engineer		Yes	
	Overall compliance with the requirements (yes/no)			

Bay Description	Device	Signal	Signal Type	IEC Address
Dia 416	Circuit Breaker	Local/Remote Switch	Digital Input (single bit)	620
		Breaker Fault		621
		Status (Open/Close)	Digital Input (double bit)	30840
		Control (Open/Close)	Digital Output (double bit)	46190
	Isolator-I	Status (Open/Close)	Digital Input (double bit)	30841
		Control (Open/Close)	Digital Output (double bit)	46191
	Isolator-II	Status (Open/Close)	Digital Input (double bit)	30842
		Control (Open/Close)	Digital Output (double bit)	46192
Dia 417	Circuit Breaker	Local/Remote Switch	Digital Input (single bit)	622
		Breaker Fault		623
		Status (Open/Close)	Digital Input (double bit)	30843
		Control (Open/Close)	Digital Output (double bit)	46193
	Isolator-I	Status (Open/Close)	Digital Input (double bit)	30844
		Control (Open/Close)	Digital Output (double bit)	46194
	Isolator-II	Status (Open/Close)	Digital Input (double bit)	30845
		Control (Open/Close)	Digital Output (double bit)	46195
Dia 418	Circuit Breaker	Local/Remote Switch	Digital Input (single bit)	624
		Breaker Fault		625
		Status (Open/Close)	Digital Input (double bit)	30846
		Control (Open/Close)	Digital Output (double bit)	46196
	Isolator-I	Status (Open/Close)	Digital Input (double bit)	30847
		Control (Open/Close)	Digital Output (double bit)	46197
	Isolator-II	Status (Open/Close)	Digital Input (double bit)	30848
		Control (Open/Close)	Digital Output (double bit)	46198

Bay Description	Device	Signal	Signal Type	IEC Address
400kV side of TR ICT-3	Trafo Feeder	Active power (MW)	Analog	35910
		Reactive Power (MVAR)		35911
		Current (Amp)		35912
		Voltage (kV)		35913
		Tap Indication		35914
		Bay Fault	Digital Input (single bit)	626
		Protection Class 1 Trip		627
		Protection Class 2 Trip		628
		Transformer Alarm		629
		Transformer Trip		630
		Trafo Temperature Alarm		631
		Trafo Temperature Trip		632
		Local/Remote Switch for Tap Changer		633
		Tap Changer Alarm		634
		Tap Changer Trip		635
		Tap Changer	Digital Output (double bit)	46199
	Line Isolator	Status (Open/Close)	Digital Input (double bit)	30849
		Control (Open/Close)	Digital Output (double bit)	46200
	Earth Isolator	Status (Open/Close)	Digital Input (double bit)	30850
230kV side of TR ICT-3	Trafo Feeder	Active power (MW)	Analog	35915
		Reactive Power (MVAR)		35916
		Current (Amp)		35917
		Voltage (kV)		35918
		Bay Fault	Digital Input (single bit)	636
		Protection Class 2 Trip		637
	Circuit Breaker	Local/Remote Switch	Digital Input (single bit)	638
		Breaker Fault		639
		Status (Open/Close)	Digital Input (double bit)	30851
		Control (Open/Close)	Digital Output (double bit)	46201
	Feeder Isolator	Status (Open/Close)	Digital Input (double bit)	30852
		Control (Open/Close)	Digital Output (double bit)	46202
	Bus Isolator	Status (Open/Close)	Digital Input (double bit)	30853
		Control (Open/Close)	Digital Output (double bit)	46203
	Earth Isolator	Status (Open/Close)	Digital Input (double bit)	30854

 Su'J o,vis,onalEngineer
 SC ADA& Maintenance Division,PGCB
 r/LJC61-roanMatrogat, Bockla,D173<a


 A.M. Hossain
 ID NO: 01201
 Executive Engineer
 DA & Maintenance Division, PGCB
 PG Building, Aftabnagar, Dhaka.

Bay Description	Device	Signal	Signal Type	Remarks
Dia	Circuit Breaker 852B	Local/Remote Switch	Digital Input (single bit)	
		Breaker Fault		
		Status (Open/Close)	Digital Input (double bit)	
		Control (Open/Close)	Digital Output (double bit)	
	851S Isolator-I	Status (Open/Close)	Digital Input (double bit)	
		Control (Open/Close)	Digital Output (double bit)	
	Isolator-II 853S	Status (Open/Close)	Digital Input (double bit)	
		Control (Open/Close)	Digital Output (double bit)	
Dia	Circuit Breaker 855B	Local/Remote Switch	Digital Input (single bit)	
		Breaker Fault		
		Status (Open/Close)	Digital Input (double bit)	
		Control (Open/Close)	Digital Output (double bit)	
	Isolator-I 854S	Status (Open/Close)	Digital Input (double bit)	
		Control (Open/Close)	Digital Output (double bit)	
	Isolator-II 856S	Status (Open/Close)	Digital Input (double bit)	
		Control (Open/Close)	Digital Output (double bit)	
Dia	Circuit Breaker 858B	Local/Remote Switch	Digital Input (single bit)	
		Breaker Fault		
		Status (Open/Close)	Digital Input (double bit)	
		Control (Open/Close)	Digital Output (double bit)	
	Isolator-I 857S	Status (Open/Close)	Digital Input (double bit)	
		Control (Open/Close)	Digital Output (double bit)	
	Isolator-II 859S	Status (Open/Close)	Digital Input (double bit)	
		Control (Open/Close)	Digital Output (double bit)	
230kV side of ICT-III	Trafo Feeder	Active power (MW)	Analog	
		Reactive Power (MVAR)		
		Current (Amp)		
		Voltage (kV)		
		Bay Fault	Digital Input (single bit)	
		Protection Class 2 Trip		
	Line Isolator	Status (Open/Close)	Digital Input (double bit)	
		Control (Open/Close)	Digital Output (double bit)	
	Earth Isolator	Status (Open/Close)	Digital Input (double bit)	



Schedule_1 : Supplied from abroad

Item	Description	Country of origin	Unit	Quantity	Foreign Currency Portion []		REMARKS
					unit price CIP	Total price CIP	
1	2	3	4	5	6	(7)=(5)X(6)	9
A	420 kV switchgear, equipment connection and steel structures						
A1	420kV, 4000A, 50kA/1sec, 50Hz, 1425kVp BI single pole operated SF6 gas circuit breakers with CSD		set	2			
A2	420kV, 4000A, 50kA/1sec, 50Hz, 1425kVp BIL. motor operated disconnectors HDB without earth switch		no.s	4			
A3	420kV, 2000A, 50kA/1sec, 50Hz, 1425kVp BIL. motor operated disconnectors HDB without earth switch		no.s	1			
A4	Single-phase, 6-core, 420kV, 50kA/1 sec, 4000-2000/1 A, 50Hz, 1425kVp BIL, current transformer		no.s	9			
A5	Single-phase, 3-winding, 420kV, 50KA/1sec, 50Hz, 1425kVp BIL. capacitive voltage transformers		no.s	3			
A6	390kV rated voltage, 303kV(rms) continuous operating voltage at 50°C, 10kA, 50Hz, Heavy duty station class, metal oxide type. single phase surge arresters silicon composite		no.s	3			
A7	Post type support insulators for busbar and switchgear with support structures for 400kV diameters		lot	1			
A8	Rigid tubular bus(6"), flexible conductors, insulators, fittings including all necessary clamps and connectors for completing 420kV, 4000A 50kA/sec, 50Hz 1425kVp BIL, busbar		lot	1			
A9	Rigid tubular bus(4.5"), flexible conductors, insulators, fittings including all necessary clamps and connectors for completing 420kV switchgear connection		lot	1			
A10	Steel structures for gantry, equipment support, accessories and fittings for 420kV busbar and switchgear		lot	1			

Schedule_1 : Supplied from abroad

Item	Description	Country of origin	Unit	Quantity	Foreign Currency Portion []		REMARKS
					unit price CIP	Total price CIP	
1	2	3	4	5	6	(7)=(5)X(6)	9
B	245 kV switchgear, equipment connection and steel structures						
B1	245kV, 3150A, 50kA/1sec, 50Hz, 1050kVp BIL. gang operated, SF6 gas circuit breakers (control voltage 110vdc)		no.s	01			
B2	245kV, 3150A, 50kA/1sec, 50Hz, 1050kVp BIL. single-pole operation, SF6 gas circuit breakers (control voltage 220vdc)		no.s	03			
B3	245kV, 3000A, 50kA/1sec, 50Hz. 1050kVp BIL, motor operated disconnectors with motor operated earthing switch (143-89L Control voltage 110vdc , 231S-232G control voltage 220vdc)		no.s	02			
B4	245kV, 3000A, 50kA/1sec. 50Hz, 1050kVp BIL, motor operated disconnectors without earthing switch (143-89T Control vol 110vdc, remaining ds control voltage 220vdc)		no.s	07			
B5	Single-phase, 5-core, 245kV, 2400-1600A/1A, 50kA/1sec, 50Hz 1050kVp BIL, current transformer		no.s	24			
B6	Single-phase, 3-winding, 245kV, 50kA/sec, 50Hz, 1050kVp BIL. capacitor type voltage transformers		no.s	3			
B7	196kV rated voltage, 160kV(rms) continuous operating voltage at 50°C 10kA, 50Hz, Heavy duty station class, metal oxide type, single phase surge arresters silicon Composite		no.s	6			
B8	Post type support insulators for switchgear for 245kV busbar and switchgear(new & old switchyard)		lot	1			
B9	Rigid tubular bus, flexible conductors, insulators, fittings :including all necessary clamps and connectors for completing 245kv switchgear connection (new & old switchyard)		lot	1			
B10.1	Steel structures for equipment support, accessories and fittings for 245kV switchgears (new & old switchyard)		lot	1			
B10.2	Steel structures for new termination and interconnection gantry for 245kV switchgears (new & old switchyard)		SET	10			

Schedule_1 : Supplied from abroad

Item	Description	Country of origin	Unit	Quantity	Foreign Currency Portion []		REMARKS
					unit price CIP	Total price CIP	
1	2	3	4	5	6	(7)=(5)X(6)	9
C	36 kV Switchgear, equipment connection and steel structures						
C1	Surge arrester 36 kV, single phase, gapless, metal oxide type, Uc = 30 kV, Ur = 24 kV, 10 kA nominal discharge current, 50 Hz, 170 / 70 kV BIL, silicon composit		no.s	3			
C2	The lot of conductors 36 kV, for connection of the 36 kV switchgear,		lot	1			
C3	The lot of fittings including all necessary clamps and connectors required for completing 36 kV switchgear.		lot	1			
C4	Equipment support structure required for completing 36 kV switchgear.		lot	1			
D	Transformers						
	The set of complete equipment 400/235/33 kV for transformation of energy shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following:						
D1	The Auto-transformer 400/235/33 kV,500/750 MVA, YNa0d1, ONAN/ONAF, with tertiary winding, three phase, oil immersed, hermetically closed, with on-load tap changer; with single phase, current transformers in all bushings. Characteristics of CTs and tap changer are defined in nameplate drawing		no.s	1			
D2	Water spray system to be extended from the existing for the auto – transformer(necessary equipment and valves)		lot	1			
D3	Online DGA SYSTEM for the auto-transformer		lot	1			

Schedule_1 : Supplied from abroad

Item	Description	Country of origin	Unit	Quantity	Foreign Currency Portion []		REMARKS
					unit price CIP	Total price CIP	
1	2	3	4	5	6	(7)=(5)X(6)	9
E	Control, Protection, Substation Automation and Metering						
E1	Control,monitoring,substation automation system for 400kv diameter(two control panels for each diameter)		set	1			
E2	Protection panel for 400/235/33kv transformer HV & LV side as per PSLD		set	1			
E3	RTCC panel for auto-transformer		no.s	1			
E4	400kv busbar protection panel with bay units as per PSLD		set	1			
E5	Extension of 400KV DFDR system with necessary modules		lot	1			
E6	Control,monitoring,substation automation system for 230kv line feeder(110vdc)		set	1			
E7	Protection panel for 230kv line feeder as per PSLD (110Vdc)		set	1			
E8	Extension of 230kv DFDR system for new switchyard		lot	1			
E9	Metering panel for 400kv & 230kv new switchyard as per PSLD		lot	1			
E10	Modification of existing aminbazar _2 feeder control panel in old switchyard(control voltage 220vdc)		lot	1			
E11	Modification of aminbazar _2 feeder protection panel in old switchyard (control voltage 220vdc) as per PSLD (Relays shall be replaced to match with E7)		lot	1			

Schedule_1 : Supplied from abroad

Item	Description	Country of origin	Unit	Quantity	Foreign Currency Portion []		REMARKS
					unit price CIP	Total price CIP	
1	2	3	4	5	6	(7)=(5)X(6)	9
E12	Re-connection of the outdoor control and protection wiring from the existing MK to the new equipment in old switchyard. Necessary new MK shall be provided if require.		lot	1			
F	Multicore cables						
F1	Multicore control and power cable for 400kv,230kv new &230 kv old switchyard control,protection,monitoring,metering circuits		lot	1			
G	Earthing and Lightning Protection						
G1	Earthing protection for 400kv ,230kv new & 230kv old substation		lot	1			
G2	Lightning protection for 400kv ,230kv new & 230kv old substation		lot	1			
G3	Portable(maintenance) earthing equipment device		set	1			
H	Batteries, chargers & DC distribution						
H1	DC supply extension from DCDB through MCB for the control ,protection ,monitoring of 400kv & 230kv new switchyard.		lot	1			

Schedule_1 : Supplied from abroad

Item	Description	Country of origin	Unit	Quantity	Foreign Currency Portion []		REMARKS
					unit price CIP	Total price CIP	
1	2	3	4	5	6	(7)=(5)X(6)	9
I	LVAC Distribution						
I1	AC supply extension from ACDB through MCB for the control, protection, monitoring of 400kv & 230kv new switchyard.		lot	1			
J	Civil Works, Control Building and Foundations						
	Complete outdoor civil works excluding Main Control Building and SPR buildings						
J1	Outdoor gantry foundation 400kV switchyard		lot	1			
J2	Outdoor equipment foundation 400kV switchyard		lot	1			
J3	Outdoor gantry foundation 230kV switchyard(new & old switchyard)		SET	10			
J4	Outdoor equipment foundation 230 kV switchyard		lot	1			
J5	Transformer foundation for 750MVA including oil pit,grills,necessary fittings,gravels and carriage way		no.s	1			
J6	blast wall with foundation		no.s	1			
J7	Outdoor Equipment foundation in 33kv switchyard		lot	1			

Schedule_1 : Supplied from abroad

Item	Description	Country of origin	Unit	Quantity	Foreign Currency Portion []		REMARKS
					unit price CIP	Total price CIP	
1	2	3	4	5	6	(7)=(5)X(6)	9
J8	cable trench with soakpit		lot	1			
J9	Chain link fencing		meter	100			
J10	Civil works for water spray system		lot	1			
J11	Gravelling in 400kv and 230kv switchyard area		lot	1			
J12	Switchyard lighting surface finishing(excluding gravelling) with drainage system including a network of water pits connected with pipes throughout the substation outlet		lot	1			
J13	Dismantle of the existing 230kv equipment for diameter _7 (aminbazar_2) and dismantled equipment transport to the store(same substation)		lot	1			
K	TELECOM & SCADA						
K1	Teleprotection for 230kv interconnection line		lot	1			
K2	Extension of existing Telecommunication for 400kv & 230kv side		lot	1			
K3	Scada integration for the 400/235/33 kv transformer diameter and new 230kv switchyard		lot	1			
K4	OPGW		KM	2			

Schedule_1 : Supplied from abroad

Item	Description	Country of origin	Unit	Quantity	Foreign Currency Portion []		REMARKS
					unit price CIP	Total price CIP	
1	2	3	4	5	6	(7)=(5)X(6)	9
L	Switchyard lighting						
L1	Switchyard lighting for 400kv & 230kv new switchyard		lot	1			
M	Mandatory spares						
M1	Busbar protection bay unit 7SS85		no.s	2			
M2	Breaker failure relay 7VK87		no.s	2			
M3	clamp –connectors for the diameter_7		lot	1			
M4	Insulators & fittings for the diameter_7		lot	1			
M5	Flexible conductor(TACSR 810mm2)		km	2			
M6	Transformer 400 Kv bushings (For 750MVA Transformer)		no.s	2			
M7	Transformer 230 Kv bushings (For 750MVA Transformer)		no.s	2			
M8	SF ₆ GAS CYLINDER ,50Kg		NO.	1			
M9	SF ₆ GAS LEAKAGE DETECTOR		NO.	1			

Schedule_2 : Supplied from Employer's country

Item	Description	Country of origin	Unit	Quantity	local Currency Portion [BDT]		REMARKS
					unit price EXW	Total price EXW	
1	2	3	4	5	6	(7)=(5)X(6)	9
A	420 Kv switchgear, equipment connection and steel structures						
A1	420Kv, 4000A, 50kA/1sec, 50Hz, 1425kVp BI single pole operated SF6 gas circuit breakers with CSD		set	2			
A2	420Kv, 4000A, 50KA/1sec, 50Hz, 1425kVp BIL. Motor operated disconnectors HDB without earth switch		no.s	4			
A3	420Kv, 2000A, 50KA/1sec, 50Hz, 1425kVp BIL. Motor operated disconnectors HDB without earth switch		no.s	1			
A4	Single-phase, 6-core, 420Kv, 50KA/1 sec, 4000-2000/1 A, 50Hz, 1425kVp BIL, current transformer		no.s	9			
A5	Single-phase, 3-winding, 420Kv, 50KA/1sec, 50Hz, 1425kVp BIL. Capacitive voltage transformers		no.s	3			
A6	390Kv rated voltage, 303Kv(rms) continuous operating voltage at 50°C, 10Ka, 50Hz, Heavy duty station class, metal oxide type. Single phase surge arresters silicon composite		no.s	3			
A7	Post type support insulators for busbar and switchgear with support structures for 400Kv diameters		lot	1			
A8	Rigid tubular bus(6"), flexible conductors, insulators, fittings including all necessary clamps and connectors for completing 420Kv, 4000A ,50KA/sec, 50Hz 1425kVp BIL, busbar		lot	1			
A9	Rigid tubular bus(4.5"), flexible conductors, insulators, fittings including all necessary clamps and connectors for completing 420Kv switchgear connection		lot	1			
A10	Steel structures for gantry, equipment support, accessories and fittings for 420Kv busbar and switchgear		lot	1			

Schedule_2 : Supplied from Employer's country

Item	Description	Country of origin	Unit	Quantity	local Currency Portion [BDT]		REMARKS
					unit price EXW	Total price EXW (7)=(5)X(6)	
1	2	3	4	5	6	(7)=(5)X(6)	9
B	245 Kv switchgear, equipment connection and steel structures						
B1	245Kv, 3150A, 50Ka/1sec, 50Hz, 1050kVp BIL. Gang operated, SF6 gas circuit breakers (control voltage 110vdc)		no.s	01			
B2	245Kv, 3150A, 50Ka/1sec, 50Hz, 1050kVp BIL. Single-pole operation, SF6 gas circuit breakers (control voltage 220vdc)		no.s	03			
B3	245Kv, 3000A, 50Ka/1sec, 50Hz. 1050kVp BIL, motor operated disconnectors with motor operated earthing switch (143-89L Control voltage 110vdc , 231S-232G control voltage 220vdc)		no.s	02			
B4	245Kv, 3000A, 50Ka/1sec. 50Hz, 1050kVp BIL, motor operated disconnectors without earthing switch (143-89T Control vol 110vdc, remaining ds control voltage 220vdc)		no.s	07			
B5	Single-phase, 5-core, 245Kv, 2400-1600A/1A, 50Ka/1sec, 50Hz 1050kVp BIL, current transformer		no.s	24			
B6	Single-phase, 3-winding, 245Kv, 50Ka/sec, 50Hz, 1050kVp BIL. Capacitor type voltage transformers		no.s	3			
B7	196Kv rated voltage, 160Kv(rms) continuous operating voltage at 50°C 10Ka, 50Hz, Heavy duty station class, metal oxide type, single phase surge arresters silicon Composite		no.s	6			
B8	Post type support insulators for switchgear for 245Kv busbar and switchgear(new & old switchyard)		lot	1			
B9	Rigid tubular bus, flexible conductors, insulators, fittings :including all necessary clamps and connectors for completing 245kv switchgear connection (new & old switchyard)		lot	1			
B10.1	Steel structures for equipment support, accessories and fittings for 245Kv switchgears (new & old switchyard)		Lot	1			
B10.2	Steel structures for new termination and interconnection gantry for 245Kv switchgears (new & old switchyard)		set	10			

Schedule_2 : Supplied from Employer's country

Item	Description	Country of origin	Unit	Quantity	local Currency Portion [BDT]		REMARKS
					unit price EXW	Total price EXW (7)=(5)X(6)	
1	2	3	4	5	6	(7)=(5)X(6)	9
C	36 Kv Switchgear, equipment connection and steel structures						
C1	Surge arrester 36 Kv, single phase, gapless, metal oxide type, Uc = 30 Kv, Ur = 24 Kv, 10 Ka nominal discharge current, 50 Hz, 170 / 70 Kv BIL, silicon composit		no.s	3			
C2	The lot of conductors 36 Kv, for connection of the 36 Kv switchgear,		lot	1			
C3	The lot of fittings including all necessary clamps and connectors required for completing 36 Kv switchgear.		Lot	1			
C4	Equipment support structure required for completing 36 Kv switchgear.		Lot	1			
D	Transformers						
	The set of complete equipment 400/235/33 Kv for transformation of energy shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following:						
D1	The Auto-transformer 400/235/33 Kv,500/750 MVA, Yna0d1, ONAN/ONAF, with tertiary winding, three phase, oil immersed, hermetically closed, with on-load tap changer; with single phase, current transformers in all bushings. Characteristics of CTs and tap changer are defined in nameplate drawing		no.s	1			
D2	Water spray system to be extended from the existing for the auto – transformer(necessary equipment and valves)		lot	1			
D3	Online DGA SYSTEM for the auto-transformer		lot	1			

Schedule_2 : Supplied from Employer's country

Item	Description	Country of origin	Unit	Quantity	local Currency Portion [BDT]		REMARKS
					unit price EXW	Total price EXW (7)=(5)X(6)	
1	2	3	4	5	6	(7)=(5)X(6)	9
E	Control, Protection, Substation Automation and Metering						
E1	Control,monitoring,substation automation system for 400kv diameter(two control panels for each diameter)		set	1			
E2	Protection panel for 400/235/33kv transformer HV & LV side as per PSLD		set	1			
E3	RTCC panel for auto-transformer		no.s	1			
E4	400kv busbar protection panel with bay units as per PSLD		set	1			
E5	Extension of 400KV DFDR system with necessary modules		lot	1			
E6	Control,monitoring,substation automation system for 230kv line feeder(110vdc)		set	1			
E7	Protection panel for 230kv line feeder as per PSLD (110Vdc)		set	1			
E8	Extension of 230kv DFDR system for new switchyard		lot	1			
E9	Metering panel for 400kv & 230kv new switchyard as per PSLD		lot	1			
E10	Modification of existing aminbazar _2 feeder control panel in old switchyard(control voltage 220vdc)		lot	1			
E11	Modification of aminbazar _2 feeder protection panel in old switchyard (control voltage 220vdc) as per PSLD (Relays shall be replaced to match with E7)		lot	1			

Schedule_2 : Supplied from Employer's country

Item	Description	Country of origin	Unit	Quantity	local Currency Portion [BDT]		REMARKS
					unit price EXW	Total price EXW (7)=(5)X(6)	
1	2	3	4	5	6	(7)=(5)X(6)	9
E12	Re-connection of the outdoor control and protection wiring from the existing MK to the new equipment in old switchyard. Necessary new MK shall be provided if require.		Lot	1			
F	Multicore cables						
F1	Multicore control and power cable for 400kv,230kv new &230 kv old switchyard control,protection,monitoring,metering circuits		lot	1			
G	Earthing and Lightning Protection						
G1	Earthing protection for 400kv ,230kv new & 230kv old substation		lot	1			
G2	Lightning protection for 400kv ,230kv new & 230kv old substation		lot	1			
G3	Portable(maintenance) earthing equipment device		set	1			
H	Batteries, chargers & DC distribution						
H1	DC supply extension from DCDB through MCB for the control ,protection ,monitoring of 400kv & 230kv new switchyard.		Lot	1			

Schedule_2 : Supplied from Employer's country

Item	Description	Country of origin	Unit	Quantity	local Currency Portion [BDT]		REMARKS
					unit price EXW	Total price EXW (7)=(5)X(6)	
1	2	3	4	5	6	(7)=(5)X(6)	9
I	LVAC Distribution						
I1	AC supply extension from ACDB through MCB for the control, protection, monitoring of 400kv & 230kv new switchyard.		Lot	1			
J	Civil Works, Control Building and Foundations						
	Complete outdoor civil works excluding Main Control Building and SPR buildings						
J1	Outdoor gantry foundation 400Kv switchyard		lot	1			
J2	Outdoor equipment foundation 400Kv switchyard		lot	1			
J3	Outdoor gantry foundation 230Kv switchyard(new & old switchyard)		SET	10			
J4	Outdoor equipment foundation 230 Kv switchyard		lot	1			
J5	Transformer foundation for 750MVA including oil pits,grills,necessary fittings,gravels and carriage way		no.s	1			
J6	Blast wall with foundation		no.s	1			
J7	Outdoor equipment foundation in 33kv switchyard		lot	1			

Schedule_2 : Supplied from Employer's country

Item	Description	Country of origin	Unit	Quantity	local Currency Portion [BDT]		REMARKS
					unit price EXW	Total price EXW (7)=(5)X(6)	
1	2	3	4	5	6	(7)=(5)X(6)	9
J8	Cable trench with soakpit		lot	1			
J9	Chain link fencing		meter	100			
J10	Civil works for water spray system		lot	1			
J11	Gravelling in 400kv and 230kv switchyard area		lot	1			
J12	Switchyard surface finishing(EXCLUDING GRAVELLING) with drainage system including a network of water pits connected with pipes throughout the substation outlet		lot	1			
J13	Dismantle of the existing 230kv equipment for diameter _7 (aminbazar_2) and dismantled equipment transport to the store (same substation)		lot	1			
K	TELECOM & SCADA						
K1	Teleprotection for 230kv interconnection line		lot	1			
K2	Extension of existing Telecommunication for 400kv & 230kv side		lot	1			
K3	Scada integration for the 400/235/33 kv transformer diameter and new 230kv switchyard		lot	1			

Schedule_2 : Supplied from Employer's country

Item	Description	Country of origin	Unit	Quantity	local Currency Portion [BDT]		REMARKS
					unit price EXW	Total price EXW	
1	2	3	4	5	6	(7)=(5)X(6)	9
L	Switchyard lighting						
L1	Switchyard lighting for 400kv & 230kv new switchyard		lot	1			

Schedule No. 3. Design Services

Item	Description	Country of origin	Unit	Quantity	Unit Price ¹		Total Price ¹	
					Local Currency Portion [BDT]	Foreign Currency Portion []	Local Currency Portion [BDT]	Foreign Currency Portion []
1	2	2*	3	4	5	6	7 = 4 x 5	8 = 4 x 6
1	400Kv equipment, transformer and associate facility		Lump sum	1				
2	245Kv equipment ,gantry and associate facility		Lump sum	1				
Total cost								

Schedule_4: Installation & services

Item	Description	Country of origin	Unit	Quantity	Foreign Currency Portion []		Local Currency Portion [BDT]	
					unit price Foreign portion	Total price Foreign portion	unit price local portion	Total price local portion
1	2	3	4	5	6	(7)=(5)X(6)	8	(9)=(5)X(8)
A	420 Kv switchgear, equipment connection and steel structures							
A1	420Kv, 4000A, 50KA/1sec, 50Hz, 1425kVp BI single pole operated SF6 gas circuit breakers with CSD		set	2				
A2	420Kv, 4000A, 50KA/1sec, 50Hz, 1425kVp BIL. Motor operated disconnectors HDB without earth switch		No.s	4				
A3	420Kv, 2000A, 50KA/1sec, 50Hz, 1425kVp BIL. Motor operated disconnectors HDB without earth switch		No.s	1				
A4	Single-phase, 6-core, 420Kv, 50KA/1 sec, 4000-2000/1 A, 50Hz, 1425kVp BIL, current transformer		No.s	9				
A5	Single-phase, 3-winding, 420Kv, 50KA/1sec, 50Hz, 1425kVp BIL. Capacitive voltage transformers		No.s	3				
A6	390Kv rated voltage, 303Kv(rms) continuous operating voltage at 50°C, 10Ka, 50Hz, Heavy duty station class, metal oxide type. Single phase surge arresters silicon composite		No.s	3				
A7	Post type support insulators for busbar and switchgear with support structures for 400Kv diameters		lot	1				
A8	Rigid tubular bus(6"), flexible conductors, insulators, fittings including all necessary clamps and connectors for completing 420Kv, 4000A ,50KA/sec, 50Hz 1425kVp BIL, busbar		lot	1				
A9	Rigid tubular bus(4.5"), flexible conductors, insulators, fittings including all necessary clamps and connectors for completing 420Kv switchgear connection		lot	1				
A10	Steel structures for gantry, equipment support, accessories and fittings for 420Kv busbar and switchgear		lot	1				

Schedule_4: Installation & services

Item	Description	Country of origin	Unit	Quantity	Foreign Currency Portion []		Local Currency Portion [BDT]	
					unit price Foreign portion	Total price Foreign portion	unit price local portion	Total price local portion
1	2	3	4	5	6	(7)=(5)X(6)	8	(9)=(5)X(8)
B	245 Kv switchgear, equipment connection and steel structures							
B1	245Kv, 3150A, 50KA/1sec, 50Hz, 1050kVp BIL. Gang operated, SF6 gas circuit breakers (control voltage 110vdc)		no.s	01				
B2	245Kv, 3150A, 50KA/1sec, 50Hz, 1050kVp BIL. Single-pole operation, SF6 gas circuit breakers (control voltage 220vdc)		no.s	03				
B3	245Kv, 3000A, 50KA/1sec, 50Hz. 1050kVp BIL, motor operated disconnectors with motor operated earthing switch (143-89L Control voltage 110vdc , 231S-232G control voltage 220vdc)		no.s	02				
B4	245Kv, 3000A, 50Ka/1sec. 50Hz, 1050kVp BIL, motor operated disconnectors without earthing switch (143-89T Control vol 110vdc, remaining ds control voltage 220vdc)		no.s	07				
B5	Single-phase, 5-core, 245Kv, 2400-1600A/1A, 50Ka/1sec, 50Hz 1050kVp BIL, current transformer		no.s	24				
B6	Single-phase, 3-winding, 245Kv, 50Ka/sec, 50Hz, 1050kVp BIL. Capacitor type voltage transformers		no.s	3				
B7	196Kv rated voltage, 160Kv(rms) continuous operating voltage at 50°C 10Ka, 50Hz, Heavy duty station class, metal oxide type, single phase surge arresters silicon Composite		no.s	6				
B8	Post type support insulators for switchgear for 245Kv busbar and switchgear(new & old switchyard)		lot	1				
B9	Rigid tubular bus, flexible conductors, insulators, fittings :including all necessary clamps and connectors for completing 245kv switchgear connection (new & old switchyard)		lot	1				
B10.1	Steel structures for equipment support, accessories and fittings for 245Kv switchgears (new & old switchyard)		lot	1				
B10.2	Steel structures for new termination and interconnection gantry for 245Kv switchgears (new & old switchyard)		set	10				

Schedule_4: Installation & services

Item	Description	Country of origin	Unit	Quantity	Foreign Currency Portion []		Local Currency Portion [BDT]	
					unit price Foreign portion	Total price Foreign portion	unit price local portion	Total price local portion
1	2	3	4	5	6	(7)=(5)X(6)	8	(9)=(5)X(8)
C	36 Kv Switchgear, equipment connection and steel structures							
C1	Surge arrester 36 Kv, single phase, gapless, metal oxide type, Uc = 30 Kv, Ur = 24 Kv, 10 Ka nominal discharge current, 50 Hz, 170 / 70 Kv BIL, silicon composit		no.s	3				
C2	The lot of conductors 36 Kv, for connection of the 36 Kv switchgear,		lot	1				
C3	The lot of fittings including all necessary clamps and connectors required for completing 36 Kv switchgear.		Lot	1				
C4	Equipment support structure required for completing 36 Kv switchgear.		Lot	1				
D	Transformers							
	The set of complete equipment 400/235/33 Kv for transformation of energy shall be designed, supplied, delivered, installed, tested and commissioned, under this contract, comprise the following:							
D1	The Auto-transformer 400/235/33 Kv,500/750 MVA, Yna0d1, ONAN/ONAF, with tertiary winding, three phase, oil immersed, hermetically closed, with on-load tap changer; with single phase, current transformers in all bushings. Characteristics of CTs and tap changer are defined in nameplate drawing		no.s	1				
D2	Water spray system to be extended from the existing for the auto – transformer(necessary equipment and valves)		lot	1				
D3	Online DGA SYSTEM for the auto-transformer		lot	1				

Schedule_4: Installation & services

Item	Description	Country of origin	Unit	Quantity	Foreign Currency Portion []		Local Currency Portion [BDT]	
					unit price Foreign portion	Total price Foreign portion	unit price local portion	Total price local portion
1	2	3	4	5	6	(7)=(5)X(6)	8	(9)=(5)X(8)
E	Control, Protection, Substation Automation and Metering							
E1	Control,monitoring,substation automation system for 400kv diameter(two control panels for each diameter)		set	1				
E2	Protection panel for 400/235/33kv transformer HV & LV side as per PSLD		set	1				
E3	RTCC panel for auto-transformer		no.s	1				
E4	400kv busbar protection panel with bay units as per PSLD		set	1				
E5	Extension of 400KV DFDR system with necessary modules		lot	1				
E6	Control,monitoring,substation automation system for 230kv line feeder(110vdc)		set	1				
E7	Protection panel for 230kv line feeder as per PSLD (110Vdc)		set	1				
E8	Extension of 230kv DFDR system for new switchyard		lot	1				
E9	Metering panel for 400kv & 230kv new switchyard as per PSLD		lot	1				
E10	Modification of existing aminbazar _2 feeder control panel in old switchyard(control voltage 220vdc)		lot	1				
E11	Modification of aminbazar _2 feeder protection panel in old switchyard (control voltage 220vdc) as per PSLD (Relays shall be replaced to match with E7)		lot	1				

Schedule_4: Installation & services

Item	Description	Country of origin	Unit	Quantity	Foreign Currency Portion []		Local Currency Portion [BDT]	
					unit price Foreign portion	Total price Foreign portion	unit price local portion	Total price local portion
1	2	3	4	5	6	(7)=(5)X(6)	8	(9)=(5)X(8)
E12	Re-connection of the outdoor control and protection wiring from the existing MK to the new equipment in old switchyard. Necessary new MK shall be provided if require.		Lot	1				
F	Multicore cables							
F1	Multicore control and power cable for 400kv,230kv new &230 kv old switchyard control,protection,monitoring,metering circuits		lot	1				
G	Earthing and Lightning Protection							
G1	Earthing protection for 400kv ,230kv new & 230kv old substation		lot	1				
G2	Lightning protection for 400kv ,230kv new & 230kv old substation		lot	1				
G3	Portable(maintenance) earthing equipment device		set	1				
H	Batteries, chargers & DC distribution							
H1	DC supply extension from DCDB through MCB for the control ,protection ,monitoring of 400kv & 230kv new switchyard.		Lot	1				

Schedule_4: Installation & services

Item	Description	Country of origin	Unit	Quantity	Foreign Currency Portion []		Local Currency Portion [BDT]	
					unit price Foreign portion	Total price Foreign portion	unit price local portion	Total price local portion
1	2	3	4	5	6	(7)=(5)X(6)	8	(9)=(5)X(8)
I	LVAC Distribution							
I1	AC supply extension from ACDB through MCB for the control, protection, monitoring of 400kv & 230kv new switchyard.		Lot	1				
J	Civil Works, Control Building and Foundations							
	Complete outdoor civil works excluding Main Control Building and SPR buildings							
J1	Outdoor gantry foundation 400Kv switchyard		lot	1				
J2	Outdoor equipment foundation 400Kv switchyard		lot	1				
J3	Outdoor gantry foundation 230kV switchyard(new & old switchyard)		set	10				
J4	Outdoor equipment foundation 230 Kv switchyard		lot	1				
J5	Transformer foundation for 750MVA including oil pits,grills,necessary fittings,gravels and carriage way		no.s	1				
J6	Blast wall with foundation		no.s	1				
J7	outdoor equipment foundation in 33kv switchyard		lot	1				

Schedule_4: Installation & services

Item	Description	Country of origin	Unit	Quantity	Foreign Currency Portion []		Local Currency Portion [BDT]	
					unit price Foreign portion	Total price Foreign portion	unit price local portion	Total price local portion
1	2	3	4	5	6	(7)=(5)X(6)	8	(9)=(5)X(8)
J8	Cable trench with soakpit		lot	1				
J9	chain link Fencing		meter	100				
J10	Civil works for water spray system		lot	1				
J11	Gravelling in 400kv and 230kv switchyard area		lot	1				
J12	Switchyard surface finishing(excluding gravelling) with drainage system including a network of water pits connected with pipes throughout the substation outlet		lot	1				
J13	Dismantle of the existing 230kv equipment for diameter _7 (aminbazar_2) and dismantled equipment transport to the store (same substation)		lot	1				
K	TELECOM & SCADA							
K1	Teleprotection for 230kv interconnection line		lot	1				
K2	Extension of existing Telecommunication for 400kv & 230kv side		lot	1				
K3	Scada integration for the 400/235/33 kv transformer diameter and new 230kv switchyard		lot	1				
K4	OPGW		KM	2				

Schedule_4: Installation & services

Item	Description	Country of origin	Unit	Quantity	Foreign Currency Portion []		Local Currency Portion [BDT]	
					unit price Foreign portion	Total price Foreign portion	unit price local portion	Total price local portion
1	2	3	4	5	6	(7)=(5)X(6)	8	(9)=(5)X(8)
L	Switchyard lighting							
L1	Switchyard lighting for 400kv & 230kv new switchyard		lot	1				

Guaranteed technical Particulars (GTP)
Thermal resistant Aluminum Alloy Conductor Steel Reinforced(TACSR)
(To be filled by equipment manufacturer and endorsed by the supplier/bidder)

PART_A: (Employer Requirement:GTP)

SL No.	Description(Employer requirement)	Minimum requirements		Guaranteed
		Unit	data	
1	Standard		IEC 60888/61089 /62004	
2	Structure Center :steel wire Layer1: steel wire Layer2:thermal resistant AL alloy wire Layer3: thermal resistant AL alloy wire Layer4: thermal resistant AL alloy wire	Nos. /mm	1/3.2 6/3.2 9/4.8 15/4.8 21/4.8	
3	Conductor diameter	mm	38 approx	
4	Cross section area	mm ²	810 approx	
5	Rated tensile strength	kN	190	
6	Modulus of elasticity	GPa	63.7	
7	Coefficient of linear expansion	10 ⁻⁶ /°c	20.8	
8	Max dc resistance at 20°c	Ω/km	0.0361	
9	Properties of TAL wire before stranding			
9.1	Diameter and tolerance	mm	4.8±0.048	
9.2	Min tensile strength	MPa	150	
9.3	Min elongation @250mm	%	2	
9.4	Max resistivity @20°c	Ω.mm ² /m	0.028735	
10	Properties of steel wire before stranding			
10.1	Diameter and tolerance	mm	3.20±0.05	
10.2	Min tensile strength	MPa	1250	
10.3	Min tension @1% elongation	MPa	1100	
10.4	Min elongation @250mm	%	3.5	
10.5	Min mass of zinc coating	g/m ²	245	
11	Overall compliance with above requirements and detail specification describe in other parts.	Yes/no	yes	

Manufacturer information
Thermal resistant Aluminum Alloy Conductor Steel Reinforced(TACSR)
(To be filled by equipment manufacturer and endorsed by the supplier/bidder)

PART:B (Manufacturer information)

No.	Description (to be inserted)	Manufacturer information	
		unit	data
1	Manufacturer		insert
2	Model/Type		insert
3	Stranding direction of outer layer		insert
4	Conductor weight	Kg/km	insert
5	Maximum Continuous operating temperature	⁰ C	insert
6	Current capacity (A) As per IEEE 738 Ambient temperature 45 ⁰ C Wind speed 0.5m/s Wind direction 45 degree Solar radiation 0.1Wcm ² absorptivity and emissivity of conductor surface 0.5	A	insert
7	Minimum Current carrying capacity at ambient temperature 45 ⁰ C and maximum sag	A	insert
8	Maximum Current carrying capacity at ambient temperature 45 ⁰ C and operating temperature 85 ⁰ C	A	insert
9	Maximum Current carrying capacity at ambient temperature 45 ⁰ C and operating temperature 150 ⁰ C	A	insert
10	Maximum Current carrying capacity at maximum continuous operating temperature for the conductor	A	insert
11	Maximum short circuit withstand	KA for sec	insert
12	Lay ratio		insert
13	Sag at maximum continuous operating temp	mm	insert
14	Overall compliance	(YES/NO)	YES

Signature & seal of the manufacturer

Signature & seal of the supplier