GUJARAT ENERGY TRANSMISSION CORPORATION LTD.

SARDAR PATEL VIDYUT BHAVAN,
RACE COURSE, VADODARA - 390 007

TECHNICAL SPECIFICATIONS

FOR

Protection Relays for 11kV & 22kV System

GETCO / E / TS- CRP 3604B / R1 August, 2022

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SECTION: I

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SECTION –II

TECHNICAL SPECIFICATIONS FOR PROTECTION RELAYS

1.0 SCOPE

1.1 The overall scope of work proposed to be assigned to the successful Bidder according to this specification covers the following aspects.

1.1.1 The design, manufacture & testing at manufacturer's works and supply of the Protection Relays as detailed in the Schedule 'A' **or Technical Specifications of 11 / 22 kV Indoor VCB Panels / Control & Relay Panels, as the case may be.** .

1.1.2 Design and manufacture of Protection Relays to meet the requirements of Protection of power equipments viz.

a) 11 / 22 kV Feeders and Transformers
b) 11 kV side of 220/11kV, 132/11kV, 66/11kV Transformers
c) 22 kV side of 220/22kV, 132/22kV, 66/22kV Transformers
d) 11 / 22 kV Capacitor Banks

1.1.2.1 Design and fabrication of Protection Relays along with all necessary accessories like switches, indicating LED etc. to provide self contained and ready to use Protection Relays as per this specification.

1.1.3 Complete testing at manufacturer's works.

1.1.4 F.O.R. destination supply of completely assembled Protection Relays.

1.1.5 Supervision of testing and commissioning of these Protection Relays at site.

1.1.6 It is not the intent to specify completely all the details of the design and construction of Protection Relays, however, the Protection Relays shall conform in all respects to high standards of engineering, design and workmanship, meeting the GTP requirement as per clause 4.0 and shall be capable of performing continuous industrial operation in a manner acceptable to the purchaser, who will interpret the meaning of drawings and specifications. The purchaser has the power to reject any work of material which, in his judgment, is not in accordance therewith. The offered Protection Relays shall be complete with all components necessary for their effective trouble free operation. Such components shall be deemed to a part of scope of supply whether those are specifically brought out in this specification and/or the commercial order or not.

2.0 SCHEDULE OF REQUIREMENT

2.1 The requirements of Protection relays are indicated in Schedule A of the tender / **Technical Specifications of 11 / 22 kV Indoor VCB Panels / Control & Relay Panels, as the case may be.**.

2.2 The consignee details/ Delivery instructions shall be issued by CE (Project)/ ACE (Testing), GETCO, Corporate office, Vadodara, to the successful bidder after successful inspection and testing of all relays & equipments at manufacturer's works.

2.3 Any special tools, jigs and testing equipment, if required, for the maintenance / testing of the equipment offered shall be quoted as optional items. Unit prices of such equipment shall be quoted.

2.4 Recommended spares

The Bidder shall furnish in his offer, a list of recommended spare with unit rates for Protection relays that may be required for trouble free operation for a period of 25 years. The purchaser reserves the right of selection of items and quantities of these spares to be ordered.

3.0 STANDARDS:

Unless otherwise specified elsewhere, in this specification, the rating, performance and testing of Protection Relays shall conform to the upto date version of all relevant standards.

4.0 PRINCIPAL TECHNICAL PARAMETERS:

The Protection Relays covered in these specifications shall have the technical requirements listed in **Annexure – II.**

5.0 GENERAL TECHNICAL REQUIREMENTS:

5.1 SCOPE OF WORK.

5.1.1 Supply of Protection Relays as specified in accompanying schedule 'A' **or Technical Specifications of 11 / 22 kV Indoor VCB Panels / Control & Relay Panels, as the case may be** and in this specification together with such auxiliary equipment and materials as required. The Bidder shall indicate make, type and designation of each Protection Relays in the bid.

5.1.2 Preparation and furnishing of all the required drawings including schematic, internal external cable connection drawings and wiring schedules. All wires shall be ferruled at both ends including shorting links also and shall be clearly shown in the schematic drawings.

5.1.3 Testing of Protection Relays and associated equipment at work and furnishing of test certificates.

5.1.4 Preparation and furnishing of commissioning instructions, operation and maintenance manuals with all operational features/optional features.

5.1.5 The successful bidders have to submit Three sets of drawings i.e. GA, Cutout and Relay Terminal Diagram, Schematics and Operation & Maintenance manuals in hard & soft copies. One such set shall be supplied along with each relay.

5.2 GENERAL REQUIREMENT FOR THE PROTECTION RELAYS:

Design, material selection and workmanship shall be such as it result in neat appearance inside and outside with no weld, rivets or bolt heads apparent from outside and with all exterior surface true and smooth.

RELAYS:

5.2.1 The relay shall confirm to the requirements of IS: 3231/IEC-60255/ IEC-61000 and other applicable standards. Relays shall be suitable for flush or semi-flush mounting on the front with connections from the rear.

5.2.2 The relays shall be suitable for VT secondary of 63.5V & 110V and CT secondary current of 1 or 5 amp, 50Hz. The relays shall be suitable for auxiliary DC supply voltage of 110V or 220V, as specified in 'Schedule A'. The relays and timers shall be designed for the DC voltage specified, and shall operate satisfactorily between 80% and 110% of rated voltage. It shall have adequate thermal capacity for continuous operation.

5.2.3 The protection relays shall be suitable for efficient and reliable operation of the protection scheme described in the specification. Necessary auxiliary relays and timers required for interlocking schemes for multiplying of contacts suiting contact duties of protection relays and monitoring of control supplies and circuits etc. also required for the complete protection schemes described in the specification shall be provided. All protection relays shall be provided with at least two pairs of potential free isolated output contacts. Auxiliary relays and timers shall have pairs of contacts as required to complete the scheme. The contacts shall be of silver plated copper with spring action. Relay case shall have adequate number of terminals for making potential free external connections to the relays coils and contacts, including spare contacts.

5.2.4 All protection relays, auxiliary relays and timers except the lockout relays and interlocking relays specified shall be provided with self-reset type contacts. All protection relays and timers shall be provided with externally hand reset, positive action operation indicators with inscription. All protection relays which do not have built-in hand-reset operation indicators shall have additional auxiliary relays with operating indicators (flag relays) for this purpose.

5.2.5 Timers shall be of continuous rating. Time delay in terms of milli second obtained by the external capacitor resistor combination is not acceptable. The variable pot type timer is not acceptable.

5.2.6 Relay shall not give trip command when it is de-energized.

5.2.7 All protection relays shall be provided with one extra isolated pair of contacts wired to terminals exclusively for future use.

5.2.8 For Numerical relays, the scope shall include the following.

a) Necessary original customized licensed software and hardware to upload / down load the data to/from the relay from/to the Computer in the substation. However, the supply of Computer is not in the scope of supply.

b) The software shall be suitable for operations like switching, retrieval of information or changing of setting groups, if DR facility is available then retrieval of oscillographic fault data from the relay memory and to store fault record data as oscilloraphic records in standard COMTRADE format. The software shall be suitable to provide oscillographic data into several different graphical representations that can be used to analyze the fault or event captured by the relay It shall also be possible to calculate additional values from the captured signals and displaying analog curve with time base phasor diagram, locus diagrams, harmonic graphs, etc. Automatic download of DR files should also be possible. The software shall be suitable for creating / modifying logics of the protection relay.

c) The relay shall have communication facility with RS232/RS485/RJ45/USB port for local communication with Computer.

d) The quantity of communication cable and converter (if any) to be supplied to connect the relay with Computer shall be as indicated in Schedule 'A' of respective tender **or 1 No. / 10 Nos. of VCB Panels / Control & Relay Panels.**

5.2.9 **-Deleted-**

5.2.10 All relays and their drawings shall have phase indications as R-Red, Y-Yellow, B-Blue.

6.0 TYPE TESTS:

The following tests from NABL accredited laboratory shall be carried out in accordance with latest / amended / up to date IS/IEC. The bidder has to submit all the type test reports as stated hereunder for the offered item along with the technical bid. The type test reports from NABL approved laboratory shall not be older than seven years. Type test reports shall be valid as on the last date of submission of bid.

a. Performance tests:
   i. Accuracy requirements
   ii. Limits of operating range of auxiliary energizing inputs and auxiliary Voltage dependence.
   iii. Limits of frequency range and frequency dependence
   iv. Rated burden
   v. Mechanical Endurance test
   vi. Characteristic and Functional test

b. Thermal requirements:
   i. Maximum allowable temperature
   ii. Limits of short time thermal withstand value of input energizing quantities.
   iii. Limiting dynamic value

c. Insulation Tests:
- i. Dielectric Tests
- ii. Impulse Voltage withstand Test
- iii. Insulation resistance measurement

d. Influencing Quantities
- i Permissible ripples
- ii. Interruption of input voltage

e. Electromagnetic Compatibility Test:
- i. 1 MHZ burst disturbance test
- ii. Electrostatic Discharge Test
- iii. Radiated Electromagnetic Field Disturbance Test
- iv. Electrical Fast transient Disturbance Test
- v. Conducted Disturbances Tests induced by Radio Frequency Field
- vi. Magnetic Field Test
- vii. Emission (Conducted and Radiated) Test.
- viii. Surge Immunity Test

f. Contact performance Test
- i. Contact making/Breaking capacity test
- ii. Continuous capacity test

g. Environmental tests:
- i. Dry Cold Test
- ii. Dry Heat test
- iii. Storage temperature test
- iv. Damp heat cyclic test

h. Mechanical Tests:
- i. Vibration response & Vibration endurance test
- ii. Bump test
- iii. Shock response test
- iv. Seismic test

i. Enclosure Test:
- i. Degree of Protection test – IP51

j. Safety Test:
- i. Single fault condition assessment
- ii. Earth bonding impedance test
- iii. Mechanical resistance to shock and impact
- iv. Protection against electrical shock
- v. Protection against the spread of fire

6.0.2 **Important Note :**

In case of non-submission / partial submission or type test reports of which validity is over, the bidder shall submit pending type test report/s from NABL accredited laboratory, in the event of an order, before commencement of supply

without affecting delivery schedule, free of cost to GETCO. Confirmation for above shall be invariably submitted along with technical bid.

6.1 Acceptance and routine tests.

All acceptance and routine tests as stipulated in the relevant standards shall be carried out by the supplier at works in presence of Purchaser's representative without any extra cost.

Immediately after finalization of the programme of acceptance testing, the supplier shall give two weeks advance intimation to the purchaser to enable him to depute his representative for witnessing the tests.

6.1.1 List of Acceptance and routine tests

1. Identification and verification of Type / Designation, Detailed model no. and Rating
2. Physical inspection
3. High voltage test (2kV for 1 min.)
4. IR test
5. Permissible auxiliary voltage test
6. Secondary Injection
7. Functional test
8. Trip time measurement
9. Binary Input, Output and LED operation checks
10. Communication with the Computer through software

The tests shall be carried out with Numerical Relay Testing Kit at the Supplier's works.

6.2 QUALITY ASSURANCE PLAN:

6.2.1 The Bidder shall invariably furnish along with his offer the quality assurance plan adopted by him / his sub-supplies in the process of manufacturing all major equipment/component.

6.2.2 Precaution taken for ensuring usage of quality raw materials and sub-components shall be stated in the quality assurance plan.

6.2.3 The Bidder should specifically express their consent to accept additions, revisions to their quality assurance plan to meet the purchaser's requirements if needed. The final quality assurance plan to be adopted, with mutual consent, shall be decided after discussion with successful Bidder.

6.3 INSPECTION:

6.3.1 All the material / item shall be offered for inspection by purchaser. The inspection may be carried out by the purchaser at any stage of manufacture. The successful bidder shall grant free access to the purchaser's representative at a reasonable time when the work is in progress. Inspection and acceptance of any equipment, under this specification, by the purchaser shall not relieve the supplier of his obligation of

furnishing equipment in accordance with the specifications and shall not prevent subsequent rejection if the equipment is found to be defective.

6.3.2 The supplier shall keep the purchaser informed well in advance, about the manufacturing program so that the arrangement can be made for inspection.

6.3.3 The purchaser reserves the right to insist for witnessing the acceptance routine testing of bought out items.

6.3.4 No material / item shall be dispatched without dispatch instruction from purchaser.

7.0 PERFORMANCE GUARANTEE

All relays supplied against this specification shall be guaranteed for a period of 24 months from the date of receipt at the destination store center. However, any engineering error, omission, wrong provision, equipment failure etc., if found during actual commissioning or guarantee period of the equipment, it shall be **replaced** by the bidder within 3 months at free of cost. Any transportation required shall be arranged by the bidder. **The guarantee period in such case shall be considered from the date of the replacement i.e. receipt of the new relay at the site.**

8.0 DOCUMENTATION:

The bidder shall furnish as a part of their offer, complete set in duplicate of technical Literature/manuals (one copy shall invariably the original & not the photo copy), and one set of typical schematic drawings in respect of all relays/schemes offered by them.

After issue of detailed purchase order, the successful bidder shall submit Three sets of drawings, literature and manuals along with detailed bill off material for approval to the CE (Projects), GETCO , Sardar Patel Vidyut Bhavan, Race Course, Vadodara - 390 007.

The manufacturing of the equipment shall be strictly in accordance with the approved drawings and no deviation will be permitted without the written approval of the GETCO. Any manufacturing not as per the approval, shall be at the supplier's risk.

The successful bidder shall provide set of approved drawings, technical literature and commissioning manuals (Hard as well as soft copy) to each consignee. These shall be as per clause no.5.1.5

8.0.1 List of drawings to be submitted by successful bidder

1. Front view showing all Input, Output and Communication ports
2. Rear view showing all Input, Output and Communication ports.
3. Top view
4. Terminal diagram
5. Electrical connection diagram
6. Functional diagram
7. Technical Data sheet
8. Cutout details

9. Housing / mounting arrangement drawing
10. Ordering code details

9.0 PACKING AND TRANSPORT

9.1. All Protection Relays/material shall be suitably packed for transport, carriage at site and outdoor storage during transit. The supplier shall be responsible for any damage to the Protection Relays during transit due to improper and inadequate packing. The cases containing easily damageable material shall be very carefully packed and marked with appropriate caution symbols i.e. `FRAGILE' `HANDLE WITH CARE', `USE NO HOOK' etc. The contents of each package shall bear marking that can be readily identified from the package list and packing shall provide complete protection from moisture, termites and mechanical shocks etc.

9.2 Wherever necessary proper arrangement for attaching slings for lifting shall be provided and all packages clearly marked with gross weight, signs showing `UP' and 'DOWN' sides of boxes, contents of each package, order no. and date, name of the plant/Substation of which the material in the package form part of it and any handling & unpacking instructions considered necessary shall be shown on it. Any material found short inside the intact packing cases shall be supplied by the manufacturer/supplier without any extra cost.

9.3 Bidder shall ascertain, prior to shipment, from concerned authorities, the transport limitations like weight and maximum allowable package size for transportation. Fragile material such as Instruments and other glass material shall be carefully covered with shock absorbing protection materials, such as thermocol, silica gel or equivalent moisture absorbent material in small cotton bags shall be placed inside the packing wherever necessary

9.4 Each consignment shall be accompanied by a detailed packing list containing the following information.

a) Purchase order reference
b) Name of consignee
c) Details of consignment
d) Destination
e) Total weight of consignment
f) Handling and unpacking instructions
g) Bill of materials indicating contents of each package
h) Sign showing upper/lower side of the crate
i) Manual, software CD & communication cable

10.0 SCHEDULES:

10.1. The Bidder shall fill in the following schedules which form a part of the tender and offer. If the schedules are not submitted duly filled in with the offer, the offer is likely to be rejected.

Schedule – B	Guaranteed Technical Particulars

10.2 - Deleted –

10.3 **The bidder shall bring out all the technical deviation/s at the specified annexure – XII only.**

11 INFORMATION TO BE FILLED IN INVARIABLY BY THE BIDDER:

For ready reference of the purchaser, the items of information required to be invariably furnished by him in his offer, are listed below:

1. Schedule - `B'. (Guaranteed Technical Particulars)
2. Documents and drawing listed in Clause no. 8.0

12. GUARANTEE FOR MAINTENANCE SPARES AND SERVICES:

The bidder shall guarantee for supplying maintenance spares and services as well as repairing of protection relay for a period of the life expectancy of 25 years.

13. GENERAL:

13.1. The successful bidder has to provide soft copy for all the drawings as a part of supply contract to the CE (Projects) GETCO, HO, VADODARA for documentation.

13.2. The successful Bidder has to provide instruction manual, all drawings, literature etc. for all relays and devices, write up for testing and commissioning procedures, relay setting calculations etc. detailed circuit diagrams with trouble shooting protocols to all consignee destinations as well as to the ACE (Testing), GETCO, and the CE(Projects) GETCO, HO, VADODARA

13.3. The successful bidder has to impart training on each type of protection relay to be supplied, to GETCO engineers at each circle (13 Nos) at GETCO site by deputing his Service Engineer free of cost. The retrofitting of the relays is not in the scope of the supplier. The programme of the training shall be mutually discussed and finalized by purchaser with suppliers.

13.4. The successful bidder has to depute his service engineer for supervision of testing and commissioning of relays at free of cost.

ANNEXURE: I
PROTECTION RELAYS – LIST OF STANDARDS

Sr.No.	Standard no.	Title
1.	IS-3231	Electrical relays for power system protection.
2.	IEC-255 Part 1 to 3	Electrical relays for power system protection.
3.	BS – 142	Electrical relays for power system protection
4.	IS – 1248 IS – 2419	Indicating instruments.
5.	BS – 89	Indicating instruments
6.	IS – 6236	Recorders
7.	BS-90	Recorders
8.	BS – 152	Relay coding, auxiliary wiring and panel and wiring.
9.	IS – 8686	Static protection relays
10.	IS – 2147	Degree of protection for cubicles
11.	IS – 5	Colour for ready mixed paints and channels.
12.	IS – 3842 Part- II to IV	Application guide for protection
13.	IS – 6005	Code of practice for phosphating iron and steel
14.	IS-5578	Guide for making of insulated conductors.
15.	IS – 11353	Guide for uniform system of marking and identification of conductors and apparatus terminals.
16.	IS – 9482-1980	Characteristics values of input and outputs of single side band PLCC terminals.
17.	IS- 9528 Part-1 and 2	Planning of (single side band) power line carrier systems.
18.	IS – 10706 – 1983	Methods of tests for single side band PLC terminals.
19.	IS-8997-1978	Coupling device for PLC systems (note This is to be referred for the PLCC terminal connections.
20.	IEC-686-1	Transducers
21.	IS – 2206	Fuses
22.	IS – 9000	Dry heat test
23.	IEC – 801-4	Electrical heat transient bursts.
24.	IS 694	PVC Insulated cable for working voltage up to & including 1100 volt.

List Of IEC Standards

Sr.No.	Standard no.	Title
Electromagnetic Compatibility type test:		
1.	IEC-60255-22-1, Class-III,	MHz burst disturbance
2.	IEC-60255-22-2, Class-III IEC-61000-4-2, Class-III	Electrostatic discharge Direct application Indirect application
3.	IEC-60255-22-4, Class-A	Fast transient disturbance
4.	IEC-, 60255-22-5	Surge immunity test
5.	IEC-60255-22-7, Class-A	Power frequency immunity test
6.	IEC-61000-4-8, Class-V	Power frequency magnetic field test
7.	IEC- 60255-22-3	Radiated electromagnetic field disturbance
8.	EN-61000-4-3	Radiated electromagnetic field disturbance
9.	IEEE/ANSI/C37.90.2	Radiated electromagnetic field disturbance
10.	IEC- 60255-22-3	Conducted electromagnetic field disturbance
11.	IEC- 60255-25	Radiated emission
Insulation tests:		
1.	IEC- 60255-5	Dielectric test Impulse voltage test Insulation resistance
Environmental tests:		
1.	IEC-60068-2-1	Cold test Storage test
2.	IEC-60068-2-2	Dry heat test
3.	IEC-60068-2-3	Damp heat test, steady state
4.	IEC-60068-2-30	Damp heat test, cyclic
CE compliance		
1.	IEC- 60255-26	Immunity
2.	IEC- 60255-26	Emissive Test
3.	EN-50178	Low voltage directive
Mechanical tests		
1.	IEC- 60255-21-1	Vibration
2.	IEC- 60255-21-2	Shock and bump
3.	IEC- 60255-21-3	Seismic

ANNEXURE: II

PRINCIPAL TECHNICAL PARAMETERS OF RELAYS

1. Numerical Non-Directional O/C and E/F Protection Relay

(A) Features:

a) Shall be Numerical type.
b) Shall have 3 Over Current and 1 Earth Fault element.
c) TRUE RMS Measurement.
d) Have selectable and front panel programmable standard inverse, very inverse & IDMT Characteristic for Over Current and Earth Fault protection
e) Definite Time delay for all protections.
f) Selectable CT Secondary. i.e. 1A & 5A
g) High set over current with selectable time delay
h) High set Earth fault with selectable time delay
i) Negative phase sequence (NPS) over current protection
j) Broken conductor (BC) detection having Under Current Guard feature to inhibit it during very low current.
k) User configurable logic for any combination of Negative phase sequence over current protection, broken conductor detection, and internal timer and assigning its output to any trip contact.
l) User configurable logic to inhibit any protection, block the tripping by external binary input(s), internal timer, combination of both external binary input(s) and internal timer.
m) Shall have Breaker Failure Protection as in built feature.
n) Include hand reset Flag/LED indicators (Total 08 nos.) for phase identification for all faults and NPS/BC operated.
o) Readable Human Machine Interface Comprising of 2-3 line alphanumeric LED/ LCD display.
p) Should be able to store at least previous 5 events along with fault data viz. Fault current, Faulty Phase etc. with date & time stamp of 1 ms resolution.
q) Shall have Self monitoring feature.
r) Shall be communicable type.
s) The phase sequence shall be selectable as ‘A-B-C’ and ‘A-C-B’.

(B) Technical Parameters:

1. Analogue Inputs:
   (i) Rated Current : 1A & 5A (site selectable), 50 Hz ±2.5 Hz
   (ii) Rated Burden : <0.2VA/0.5VA for 1/5 Amp
   (iii) Over load capability: 3xIn continuous
   100xIn 1 Sec
   250xIn Dynamic
2. Auxiliary Supply: 110/220 V DC ±15 %
   (i) Power consumption: < 15W
   (ii) Ripple (peak to peak): < 12%

(C) Relay settings:

1. Over Current: 50% - 200% (In steps of 5%)
2. Earth Fault: 5% - 80% (In steps of 5%)
3. High set O/C: 0.5 – 15 times In or more.
4. High set E/F: 0.5 – 12 times In or more.
5. Time multiplier for: 0.025 – 1.0 (In steps of 0.025) (Independent for O/C & E/F)
6. Definite Time delay for NPS and BC element: 0.00 to 2 sec (in steps of 0.01 sec)
7. Time delay for high set element: 0.02 to 2 sec (in steps of 0.01 sec)
8. Pick up: Within 1.1 times of set current value.
9. Reset current: 95% to 90% of pick-up current.
10. Operating Time: As per selectable characteristic. For Inst. Element < 40 ms for 2xIn.
11. NPS over current : 10% - 100% (In steps of 5%)
12. Broken Conductor : NPS/PPS ratio - 10 – 100 (In steps of 1)
13. **LBB Protection Settings :**
    (i) Current Setting : 0.1 to 2 X In (in steps of 0.1 Amp)
    (ii) Time delay : 0.1 to 2 sec(In steps of 0.02 Sec)

(D) Other Features:

1. Provide sufficient number of potential free contacts to cater the needs of connection to alarm annunciation.
    a. Output contacts: 1. Minimum 2 N/O Trip contacts with
        (i) Continuous carrying current - 5 A
        (ii) Make & Carry for 0.5 s 30 A
        (iii) Make & Carry for 3.0 s 15 A
    2. Minimum 2 N/O contacts for 'protection Start/Pickup'. It shall be site configurable for any one, more than one 'protection Start/Pickup'
    b. Signaling contact: Minimum 2 Nos. for following signals
        1. Relay Faulty
        2. Relay Operated
2. Binary Inputs: Min 4 Nos.
3. Local Computer Communication:
    a. RS232/RS485/RJ45/USB
4. Housing
    a. Flush Mounting
    b. Screw Terminals (‘O’ Lug for CT Connection)
    c. Degree of Protection IP51

5. Temperature and humidity

a. Ambient temp	-10 to 55 ° C
b. Relative humidity	10% to 90% Non Condensing
c. Operate range	0-95%
d. Storage temp.	-40 to 70 ° C

2. Unbalance Current Protection Relay

(A) Features:

It shall

a) be Single pole OR two pole type (in case of controlling 2 Banks), as specified in 'Schedule A'
b) be of numerical type
c) True Fundamental Frequency Measurement.
d) be two Stage / pole so that alarm & tripping can be set at different values of current
e) have alarm and trip output contacts.
f) Have a local Human Machine Interface (HMI) comprising of 2-3 line alphanumeric LED/ LCD readable display and a soft touch key pad to access to settings, events and records.
g) Include hand reset, programmable as per site requirement, Flag/LED indicators (Min. 04 nos.) for identification of all Alarms and Protection operated.
h) be high speed with typical operating time of less than 25 ms.
i) be provided with sufficient number of potential free contacts to cater the needs of connection to alarm annunciation, data acquisition and optional trip facility to be connected by purchaser whenever needed.
j) Shall be able to store at least last 3 events with fault data viz. Fault current with time stamp of 1ms resolution
k) have continuous self hardware & software monitoring and diagnostic feature.

(B) Technical Parameters:

1. Analogue Inputs:
   (i) Rated Current: 1A, 50 Hz, ±2.5 Hz
   (ii) Rated Burden: < 0.2VA
   (iii) Over load capability: 3xIn continuous
   100xIn 1 Sec.
   250xIn Dynamic

2. Auxiliary Supply: 110/220 V DC ±15 %
   (i) Power consumption: < 15W
   (ii) Ripple (peak to peak): < 12%

(C) Relay settings:

1. Current Setting (Alarm): 10% - 50%
   (In steps of 5%)

2. Current Setting (Tripping): 10% - 50%
(In steps of 5%)

3.Time delay : 0.04 to 2 sec
(in steps of 0.01 sec)
(It is inclusive of output contact operating time)

4. Pick up: Within 1.1 times of set current value.

5. Operating Time: < 25 ms.

(D) Other Features:

1. Binary inputs :

(i) Min 5 nos. and suitable for station Aux. DC Supply
(ii) Programmable at site as per requirement
(iii) Threshold voltage: > 60 % Aux. DC Supply

2. Outputs:

(i) Trip contacts : Minimum 2 N/O contacts with
(a) Continuous Carrying Current - 5 A
(b) Make & Carry for 0.5 Sec - 20 A
(c) Make & Carry for 0.2 Sec - 30 A

(ii) Signaling contacts :
(a) Minimum 4 Nos, suitable for Station Aux. DC Supply
(b) Programmable at site as per requirement

3. Communication:

a. Front Port - RS232 / USB / RJ45
b. Rear Port - RS485
c. Protocol - IEC-60870-5-103

4. Housing

a. Flush Mounting
b. Screw Terminals ('O' Lug for CT Connection)
c. Degree of Protection IP51

5. Temperature and humidity

a. Ambient temp: -10 to 55 °C
b. Relative humidity: 10% to 90%
Non Condensing
c. Operate range: 0-95%
d. Storage temp: -40 to 70 °C

3. Neutral Displacement Relay

The relay shall
1) be Single Pole type
2) be of electromagnetic/static type
3) have voltage setting of 5.4, 7.5, 12.5 & 20 V, 50 Hz AC
4) have alarm and trip output contacts
5) be high speed with typical operating time of less than 25 ms
6) be provided with Hand reset flag/LED type operation indicator

4. Over Voltage Protection Relay

The relay shall

1) be electromagnetic/static type
2) work on Auxiliary Supply voltage of 110 / 220 V DC
3) monitor all the three phases
4) have adjustable voltage setting range of 100-150% of rated voltage of 63.5 V Ph to E / 110 V Ph to Ph
5) have inbuilt timer with adjustable time setting range of 0 to 10 seconds continuously or in step of 1 Sec
6) have independent alarm & trip out put contacts
7) have drop off to pick up ratio equal to or greater than 95%
8) be provided with Hand reset flag/LED type operation indicator
9) have minimum Three NO type potential free self reset contacts

5. Under Voltage Protection Relay

The relay shall

1) be electromagnetic/static type
2) work on Auxiliary Supply voltage of 110 / 220 V DC
3) monitor all the three phases
4) have adjustable voltage setting range of 40-90% of rated voltage of 63.5 V Ph to E / 110 V Ph to Ph
5) have inbuilt timer with adjustable time setting range of 0 to 10 seconds continuously or in step of 1 Sec
6) be provided with Hand reset flag/LED type operation indicator
7) have minimum Three NC type potential free self reset contacts

6. Power Factor Controller Relay

The relay shall

1) be Numerical type
2) work on Auxiliary Supply voltage of 110 / 220 V DC
3) have measurement of one phase i. e. it shall have one CT(1A) input and one VT (110V) Input
4) have adjustable power factor setting range of 0.7 inductive to 0.7 capacitive
5) have inbuilt timer with adjustable time setting range of 0 to 10 Mins continuously or in step of 1 Min
6) Have a local Human Machine Interface (HMI) comprising of 2-3 line alphanumeric LED/ LCD readable display and a soft touch key pad to access to measurement, settings, events and records
7) be provided with Hand reset flag/LED type operation indicator
8) have minimum Four NO and Two NC type potential free self reset contacts of its own or through Contact Multiplication Relays replicating the contacts the relay

SCHEDULE – B

GUARANTEED TECHNICAL PARTICULARS

(TO BE FILLED IN BY THE BIDDER AND FURNISH WITH TECHNICAL BID)

The GTP is to be filled up in this format and, in the page of Tender Specification only, to be submitted in duplicate along with the offer. This is intended for speedy comparison of various bidders GTP. The Bidder shall fill in the particulars against appropriate items in respect of each rating and type of Protection Relays offered in the broad categories listed below:

The bidder must fill up all the points of GTP for offered item/s. Instead of indicating "refer drawing, or as per IS/IEC", the exact value/s must be filled in.

1	**Numerical Non-Directional Overcurrent and Earth Fault Relay with High Set**	To be filled - in by Bidder
1	Make	
2	Type / Designation	
3	Analogue Inputs	
	(i) Rated Current (Amp)	
	(ii) Rated Burden (VA)	
	(a) For 1 Amp	
	(b) For 5 Amp	
	(iii) Over load capability (X In)	
	(a) Continuous	
	(b) 1 Sec	
	(c) Dynamic	
4	Auxiliary Supply	
	(i) DC Supply Voltage (Volts)	
	(ii) Power consumption (Watts)	
	(iii) Ripple (peak to peak) (%)	
	Settings	
5	Over Current Protection	
	(i) Current Range in %	
	(ii) Current Steps in %	
6	Earth Fault Protection	
	(i) Current Range in %	
	(ii) Current Steps in %	
7	High set O/C Protection	
	(i) Current Range in %	
	(ii) Current Steps in %	
8	High set E/F Protection	
	(i) Current Range in %	
	(ii) Current Steps in %	
9	Time multiplier for IDMT characteristics	
	(i) Time Multiplier Range	
	(ii) Steps	

10	Definite Time delay for all protection	
	(i) Time Delay Range in sec	
	(ii) Steps in sec	
11	Whether all Time Multiplier and Time Delay Settings are independent for O/C and E/F	
12	Time delay for high set element	
	(i) Time Delay Range in sec	
	(ii) Steps in sec	
13	LBB Protection Settings	
	(i) Current Range (X In)	
	(ii) Time delay	
	(a) Range (Sec)	
	(b) Steps (Sec)	
14	Pick up value (X In)	
15	Reset current (X In)	
16	Operating Time For Inst. Element	
	Inputs / Outputs	
17	No. of tripping contact	
18	Tripping contacts rating	
	(i) Continuous carrying current (Amp)	
	(ii) Make & Carry for 0.5 sec (Amp)	
	(iii) Make & Carry for 3.0 sec (Amp)	
19	No. of output contacts for 'protection Start/Pickup'	
20	No. of Signaling contact	
21	No. of binary inputs	
	General points and Features	
22	Communication protocol	
23	Mounting Type	
24	Terminals	
25	Temperature and Humidity	
26	In built Breaker Failure Protection provided	
27	Negative phase sequence (NPS) O/C protection	
a	Over current setting	
	(i) Current Range in %	
	(ii) Steps in %	
28	Broken conductor (BC) detection	
	(i) Range	
	(ii) Steps	
29	SCADA compatibility, if available	
30	Enclosure Ingress Protection	
31	Shall have provision for user configurable logic for any combination of Negative phase sequence over current protection, Broken conductor detection, and internal timer and assigning its output to any trip contact.	
32	Shall have provision for user configurable logic to inhibit any protection, block the tripping by external binary input(s), internal timer, combination of both external binary input(s) and internal timer.	

33	Nos. of LED indications (Min. 08 nos.)	
	(i) O/C Protection Operated	
	(ii) E/F Protection Operated	
	(iii) Highset Operated	
	(iv) Broken Conductor Protection Operated	
	(v) Negative Phase Sequence Protection Operated	
	(vi) R – Phase	
	(vii) Y – Phase	
	(viii) B – Phase	
34	Nos. of events with fault data and date & time stamping	
35	Software	
	(i) Name & designation	
	(ii) Validity	
	(iii) No. of copies	
	(iv) Language (English)	
36	Local Computer communication port	
	(i) Front	
	(ii) Rear	
2	**Unbalance Current Protection Relay**	
1	Make	
2	Type / designation	
3	Analogue Inputs	
	(i) Rated Current (Amp)	
	(ii) Rated Burden (VA)	
	(iii) Over load capability (X In)	
	(a) Continuous	
	(b) 1 Sec	
	(c) Dynamic	
4	Auxiliary Supply	
	(i) DC Supply Voltage (Volts)	
	(ii) Power consumption (Watts)	
	(iii) Ripple (peak to peak) (%)	
	Relay Settings	
5	Current Settings for Alarm Stage	
	(i) Current Range (% In)	
	(ii) Current Steps (%)	
6	Current Settings for Tripping Stage	
	(i) Current Range (% In)	
	(ii) Current Steps (%)	
7	High Set Over Current Protection	
	(i) Current Range (% In)	
	(ii) Current Steps (%)	
8	Time multiplier for IDMT characteristics	
	(i) Time Multiplier Range	
	(ii) Steps	
9	Definite Time delay for all protection	
	(i) Time Delay Range (Sec)	
	(ii) Steps (Sec)	

10	Time delay for high set element	
	(i) Time Delay Range (Sec)	
	(ii) Steps (Sec)	
11	Pick up value (X In)	
12	Reset current (X In)	
13	**Binary Inputs**	
	(i) Nos. of Inputs	
	(ii) Threshold voltage (Volts)	
	(iii) Whether programmable at site as per requirement	
14	**Output Contacts**	
	(i) Nos. of Tripping Contacts	
	(ii) Tripping Contacts Rating	
	(a) Continuous Carrying Current (Amp)	
	(b) Make & Carry for 0.5 sec (Amp)	
	(c) Make & Carry for 3.0 sec (Amp)	
	(iii) Nos. of Signaling Contacts	
	(iv) Whether programmable at site as per requirement	
	General points and Features	
15	Number of CT inputs	
16	Whether Single Pole or Two Pole	
17	Nos. of Stages / Pole	
18	Operating time (milliseconds)	
19	Nos. of LED indications	
20	Nos. of events with fault data and date & time stamping	
21	Local Computer Communication :	
	(i) Protocol	
	(ii) Front Port	
	(iii) Rear port	
22	Mounting Type	
23	Terminals	
24	Enclosure Ingress Protection	
25	Temperature and Humidity	
26	SCADA compatibility, if available	
27	Software	
	(i) Name & designation	
	(ii) Validity	
	(iii) No. of copies	
	(iv) Language (English)	
3	**Neutral Displacement Relay**	
1	Make	
2	Type / designation	
3	Voltage Setting Range	
4	No. of Output Contacts	
5	Operating Time (ms)	
6	Type of Operation Indicator	
4	**Over Voltage Protection Relay**	
1	Make	

2	Type / designation	
3	Analogue Inputs	
	(i) Rated Voltage (Volt)	
	(ii) Rated Burden (VA)	
4	Auxiliary Supply	
	(i) DC Supply Voltage (Volts)	
	(ii) Power consumption (Watts)	
5	Voltage Settings for Alarm	
	(i) Voltage Range (% Vn)	
	(ii) Voltage Steps (%)	
6	Voltage Settings for Tripping	
	(i) Voltage Range (% Vn)	
	(ii) Voltage Steps (%)	
7	Inbuilt Timer	
	(i) Time Delay Range (Sec)	
	(ii) Steps (Sec)	
8	Nos. of Poles	
9	Whether monitors all the three phases	
10	Output Contacts – Independent for Alarm & Tripping	
11	Nos. of Auxiliary Output Contacts	
12	Drop off to Pick up ratio	
5	**Under Voltage Protection Relay**	
1	Make	
2	Type / designation	
3	Analogue Inputs	
	(i) Rated Voltage (Volt)	
	(ii) Rated Burden (VA)	
4	Auxiliary Supply	
	(i) DC Supply Voltage (Volts)	
	(ii) Power consumption (Watts)	
5	Voltage Settings for Alarm	
	(i) Voltage Range (% Vn)	
	(ii) Voltage Steps (%)	
6	Voltage Settings for Tripping	
	(i) Voltage Range (% Vn)	
	(ii) Voltage Steps (%)	
7	Inbuilt Timer	
	(i) Time Delay Range (Sec)	
	(ii) Steps (Sec)	
8	Nos. of Poles	
9	Whether monitors all the three phases	
10	Output Contacts – Independent for Alarm & Tripping	
11	Nos. of Auxiliary Output Contacts	
6	**Power Factor Controller Relay**	
1	Make	
2	Type / designation	

3	Analogue Inputs	
	(i) Rated Voltage (Volt)	
	(ii) Rated Current (Amp)	
	(iii) Rated Burden (VA)	
4	Auxiliary Supply	
	(i) DC Supply Voltage (Volts)	
	(ii) Power consumption (Watts)	
5	Power Factor Setting	
	(i) Power Factor Range	
	(ii) Steps	
6	Inbuilt Timer	
	(i) Time Delay Range (Sec)	
	(ii) Steps (Sec)	
7	No. of Output Contacts	
	(i) NO Contacts	
	(ii) NC Contacts	