

Specification of Numerical relays for SBPDCL Project
PI No.240992441
WO No.99057A47601 / 99059A47501
Specification has been divided into following sections :- Annexure-A - Technical Specification of Numerical Overcurrent & Earth fault relay Annexure-B - Technical Specification of Numerical Transformer Differential relay GTP for Numerical Overcurrent & Earth Fault relay GTP for Transformer Differential Protection Relay Checklist for Bill of Material & Acceptance Criteria Services support clause <u>Bidders offer should consist of the following :</u> Compliance to Annexure- & B Duly filed GTP for O/C & E/F relay and Transformer Differential relay Duly filled checklist for BOM & Acceptance criteria Compliance to Services Clause

Technical Specification of : Numerical relays**Project : SBPDCL****WO No.99057A47601 / 99059A47501**

Item-01		Overcurrent & Earth Fault relay with Bay control features	
Sl. No.	Feature and Function	Technical requirement	Bidders Compliance (Yes/No)
1	Purpose and application	It is intended to automate the Switchgears specified in the scope of supply and use Communicable Numeric relays for Protection, Control, Metering and Status monitoring. This specification is based on the understanding that an integrated Automation System along with protections shall be provided and same shall have provisions for Integration with SCADA system. All the feeders shall be remote controlled from EMPLOYER's SCADA and from the local console of the numerical relays. Numerical multifunctional combined Microprocessor based Feeder protection and management relay to protect the 33kV/11 KV Feeder from all electrical and other faults along with reporting system, Disturbance record for fault analysis. Manufacturer should comply with any especial requirement or feature asked for retrofitting the relays. Relay should be IEC 61850 Edition-2 compliant. Relay should have 4 CT input for O/C and E/F protection. There should be option for derivation of E/F internally. Relay should have 3VT input for measurement of voltage , Active & reactive power, power factor, frequency.	
2	Main Protection Feature	1. Relay should have minimum two group of setting. Setting group changeover required from digital status input. 2. Electrical over load protection with selectable IEC curves with two stage, first stage to be used as IDMT and second stage to be used as high set for short circuit protection. Offered relay should have total 4 stages of Non directional over current protection with site selectable IEC curves. 3. Earth fault protection in two stages with IEC characteristics. First stage to be used as IDMT and second stage to be used as instantaneous elements. Earth fault element should be suitable for both CBCT and residual type CT connection. 4. Negative phase sequence Protection with IEC Curves. 5. CB Fail Protection & time settable as per user. 6. The relay should be immune to DC switching while carrying current i.e. no spurious trip should be generated if relay DC is made On and Off 7. The relay should conform to the IEC255-4 or BS 142 for Inverse time characteristics. 8. The relay should have features to monitor for broken conductor and CB opening time . 9. The relay shall have separate in builtTrip circuit supervision for Trip circuit-1 & 2.	
3	Processor feature	Relay shall be completely Numerical with protective elements having software algorithm based on sampling of Analog inputs. Sampling Rate of Analog Signal: The sampling rate should be 1600 Hz for 50 Hz signal or better for each analog channel.	
4	Operational Philosophy	The operation of Relay shall be possible both locally from the Switchgear and remote & Local Work station. The local position shall be displayed in remote / local workstation and remote operation shall be blocked if the switch is in Local. Clear control priorities shall prevent initiation of operation of a single switch at the same time from more than one of the various control levels and there shall be interlocks among various control levels. The priority shall always be with the lowest enabled control level. Relay accuracy shall not be affected by system frequency fluctuation.	
5	Status/Optical Inputs/Digital inputs	1. Minimum 16 number status inputs are required 2. All status inputs should be 30 V DC 3. Setting group is required to be changed with any Digital input status. 4. Trip circuit supervision with DI status 5. The digital inputs shall be acquired by exception with 1ms resolution. Contact bouncing in digital inputs shall not be assumed as change of state. 6. Relay should have comprehensive self diagnostic feature with remote indication of relay failure and alarm shall be generated without tripping of circuit . 7. Provision of Testing output relays without any current injection. 8. No. of programmable LEDs - at least 8 nos. with latching option.	
6	Main measuring and reporting feature	All measurements should be in primary quantities. Minimum following displays are required in alpha numeric:- 1. Three phase (Positive sequence) current 2. Neutral(zero sequence) current 3. All the trips should have clear indication on the relay terminals 4. Resetting should be selectable as hand reset or auto reset. 5. The default relay LED shall be user defined to display primary circuit loading. 6. Three Phase voltage, Active & reactive power, power factor, frequency	
7	Memory and Recording Feature	1. The relay setting and programming should be stored in EEPROM so that during Aux. Power failure the said data is not lost. 2. Relay should have event log, trip log and DR record. All logs should go in to history. 3. All tripping of relay should initiate DR in auto without extra binary input. Triggering of DR with binary input should be user configurable. 4. The last 2 fault DR records should be in flash memory and DR will not erase in case of DC supply fail for more than 2 days. 5. Should be able to record at least 5 oscillographic disturbances and 5 fault records and 1000 event records. 6. Minimum Four no. of latest trip log with cause of trip should be stored in memory along with date and time stamping. The memory should not be lost with the switching off of DC. 7. The relay should have fault-recording feature with current waveform and Digital Input status. The fault waveform should consist of minimum four current waveforms of three phase current and zero sequence current and DI status. Triggering time for Pre and Post should have user selectable. This record should be in flash memory for minimum 7(seven) days even after switching off the DC supply. 8. The fault should be date and time stamped. 9. Communication protocol IEC 61850 Edition-2. 10. FIFO feature	

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8	Auxiliary Supply	30 V to - 30% to + 10%, 2 wire unearthed system. Necessary software shall be in-built for proper shutdown and restart in case of power failure. Auxiliary supply burden will be around 20Watt.	
9	Rated CT/PT secondary	5/1 Amp(User selectable) , CTs used to be protection class	
10	Rated frequency	50 HZ +/- 5%	
11	Ambient condition	1. Operating ambient temperature upto 55 Deg C 2. Operating Humidity upto 100 % 3. Relay shall meet the requirement for withstanding electromagnetic interference according to relevant parts of IEC 61850. Failure of single component within the equipment shall neither cause unwanted operation nor lead to a complete system breakdown.	
12	Module and Mounting	1. Relay should be flush mounted type 2. If module is drawout type then it should have CT shorting facility of make before break type. 3. Mounting in switchgears located in non AC rooms. 4. Galvanic isolation between field connection and relay hardware should be there.	
13	Watchdog and self monitoring	The relay should have facility to monitor the healthiness of its circuits and components by own monitoring system. In case of any problems, the alarm should be generated by one of the output contacts. The alarm as soft signal to be sent to SCADA system as well. Necessary support documentation explaining the self diagnostic feature shall be furnished Watch dog contact shall be provided in addition to required 16 BI and 7 BO .	
14	Settings	Approximate settings possible should be as follows:- 1. Nominal Feeder current 2% to 110 % 2. CT Ratio setting 10-1000(approx.) 3. Earth fault current 1 to 40% with time delay IEC Curves, 2nd stage for instantaneous trip (less than 50 ms) 4. Over current trip- 50% to 200% in step of 1% for 1/5 Amp with time delay as per IEC Curves. 5. High set with delay 200% to 2000% in step of 1%. 6. IEC Curves for all O/C and E/F have user selectable. 7. Definite time Sensitive Earth Fault setting 1 to 40% with definite time setting range 0.1 to 10 sec.	
15	Output Relays	Minimum 7 number output relays are required out of which 1. One potential free change over contact should be provided for start inhibit of relay. 2. All o/p contact should be freely programmable. 3. Rating of trip contacts:- a) Contact durability>10K operation b) 15 Amp make and carry for 3 sec for trip contact c) Make and carry for trip contacts L/R<=40ms 4. Rating of Alarm contacts:-	
16	Relay software and Man Machine Interface	1. The relay should have native IEC 61850 Edition-2 Communication Protocol with HSR and PRP redundancy support . 2. Should have password protected key padlock. 3. Necessary software for relay setting , retrieving DR, event log, trip log should be supplied by the Manufacturer. Necessary License is to be issued for EMPLOYER, if required. 4. Manufacturer has to supply communication hardware for relay setting, DR downloading from front port. This device should be compatible to USB/Ethernet port. 5. It shall be possible to transfer the data stored in the DFR to computer on IEEE/COMTRADE format. The data format shall be compatible for dynamic protection relay testing on relay test kit. COMTRADE data viewing software to be provided. 6. Multiuser/Corporate license for installation on minimum 11 nos. of PCs:- Bidder should supply 7 nos of full version of relay software(should work on Windows XP, Windows 7 & Windows 10) with all the necessary applicable license to configure & manage the relay using dedicated front communication port or rear ethernet port. Bidder should also supply 11 nos. of communication cable along with necessary hardware (Like Serial to USB converter in case the relay has serial type front port) Any additional software if required for remote communication and for other facilities available in the Relay.	
17	WEB HMI	1.1. Relay should have WEB HMI function. There should be provision of monitoring the measurement of various analog values, status of input & output etc. by using a standard web browser (Google Chrome, Mozilla Firefox, Internet explorer etc.) instead of using dedicated relay software.	
18	MIMIC Display	Offered relay shall have large LCD backlit display which supports mimic (e.g. user configurable single line diagram which may include various objects like Circuit breaker, busbar, isolator, earth switch etc.) and should display freely assignable analogue values. The device shall have control buttons for direct or select-before-execute type CB control.	
19	Date and time	Date and Time stamping with faults and record. The clock should be powered from internal cell and should not require setting after every DC switching. The internal cell life minimum 5 years. Time synchronization by IRIG-B or SNTP. For time synchronization through SNTP is to be provided from clock signal coming from RTU. In case of IRIG-B, time synchronization will be done with GPS clock signal from GPS receiver located at substation.	
20	Lugs and terminators	All CT and PT terminals shall be provided as fixed (screwed) type terminals on the relay to avoid any hazard due to loose connection leading to CT opening or any other loose connection. Necessary amount of lugs should be supplied along with each relay for CT connection and control wiring.	

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Item-01		Overcurrent & Earth Fault relay with Bay control features	
Sl. No.	Feature and Function	Technical requirement	Bidders Compliance (Yes/No)
21	Manuals, Drawings and Literature	1. The relays should be supplied with manuals with all technical and operating instructions. 2. All the internal drawings indicating the logics and block diagram details explaining principle of operation should be given at the time of supply. 3. Mapping details shall be submitted in IEC format.	
22	Standard documentation per Relay, according to IEC 61850 Edition-2	1. MICS document (model implementation conformance statement) 2. PICS(protocol implementation conformance statement) 3. Conformance Test certificate from KEMA/CPRI. 4. PIXIT document All the above mentioned certificates shall be submitted. 5. ICD file 6. SCD file	
23	Extendibility in Future	The Manufacturer shall provide all necessary software tools along with source codes to perform addition of bays in future and complete integration with SCADA by the User. These software tools shall be able to configure relay, add analog variable, alarm list, event list, modify interlocking logics etc. for additional bays/equipments which shall be added in future.	
24	Lifespan	The supplier should mention following:- 1. Product maturity: The Manufacturer should mention the time period for which the product is in the market 2. Expected production life 3. Hardware/Firmware change notification process. Upgrades to be provided free of cost within the Guarantee period/5 years whichever is later, if needed. 4. Lifespan of standard tools and processes for relay configuration, querying and integration.	
25	Standards	The relay should conform to the IEC255-5 or equivalent BS / ANSI for following:- 1. Overload withstand test 2. Dielectric withstand: 2kV in common, 1 kV in differential mode 3. Impulse Voltage: 5kV in common, 1kV in differential mode 4. Insulation resistance>100 M-ohm. 5. Vibration: Shock and bump and Seismic 6. Storing and transportation 7. Radio Interference: IEC 61000 for high frequency disturbance, Transient disturbance, Electrostatic discharge 8. KEMA Certification for the particular model offered with respect to IEC61850 Edition-2 Protocol.	
26	Communication Port	1. Two nos. IEC 61850 Edition-2 protocol compliant Ethernet RJ45/F.O port for communication with SCADA system through two managed Ethernet Switches operating in redundant mode. The communication shall be made in 1+1 mode between individual IED to Switch and IED should support PRP and HSR redundancy, such that failure of one set of LAN shall not affect the normal operation of SCADA. However, it shall be alarmed in SCADA. 2. Functioning of Relay shall not hamper to fault occurring any interconnected relay. 3. One Front port Ethernet RJ45/USB 2.0 for relay parameterization and configuration etc. with the help of PC. In case RS-232 port offered, suitable interfacing cable with one end having RS 232 port and other end USB 2.0 to be provided to connect with PC free of cost. 4. Relay should generate GOOSE message as per IEC 61850 Edition-2 standard for interlocking and also ensure interoperability with third party relays.	
27	Name Plate and marking	Each IED shall be clearly marked with manufacturer's Name, type, serial no. and electrical rating data. Name plates shall be made of anodized aluminium with white engraving on black surface.	
28	Performance Guarantee	Relays will be guaranteed for the period of five years from the date of last dispatch. Any problem in the said period should be attended free of charge inclusive of repair/replacement of relays/ component (both H/W, S/W).	
29	Type Test	Dielectric Withstand Test—IEC 60255-5 High Voltage Impulse Test, class III --- IEC 60255-5(5kV peak, 1.2/50 micro Sec;3 Positive and 3 negative shots at interval of 5 Sec.) DC Supply Interruption ---- IEC 60255-11 AC Ripple on DC supply ---- IEC 60255-11 Voltage Dips and Short Interruptions --- IEC 61000-4-11 High frequency Disturbance ---- IEC 60255-22-1, Class III Fast Transient Disturbance ---- IEC 60255-22-4, Class-IV Surge withstand capability ---- IEEE/ANSI C 37.90.1(1989) Degree of Protection Electromagnetic compatibility Mechanical stress/vibration test Temperature withstand Type test reports for the above tests shall be submitted for the approval of SBPDCL/NBPDCL along with Tender, failing which order may be rejected. Wherever the above mentioned standards and IEC 61850 Edition-2 overlap, the latter will prevail.	

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Item-01		Overcurrent & Earth Fault relay with Bay control features	
Sl. No.	Feature and Function	Technical requirement	Bidders Compliance (Yes/No)
30	Training	Suitable training to be imparted to employer persons on the following items:- 1. Relay setting and parameterization 2. Relay configuration with respect to I/P, O/P and functional block for protection. 3. GOOSE configuration. 4. Configuration and Interfacing required for third party SCADA System Integration. 5. Diagnostic features The details of syllabus to be finalized with SBPDCL/NBPDCL .	
31	Password Protection	Relay shall have password protection for changes of settings/ configuration/test/setting group.	
32	Setting	(a) Three Phase Non Directional Over Current Protection (i) Plug Setting Low Set Stage - 0.05...5.00 × In, in steps 0.01 High Set Stage - 0.10...40.00 × In in steps 0.01 Inst Stage - 1.00...40.00 × In in steps 0.01 (ii) Time Setting Time multiplier Low Stage and High Set stage 0.05...15.00 in step 0.01 Operate delay time For Low stage and high stage 40...200000 ms in step 10 Operate delay time For Inst Stage 20...200000 ms in step 10 (iii) Operation accuracy: ±1.5% of the set value or ±0.002 × In	
		(b) Three Phase Non Directional Earth Fault Protection (i) Plug Setting Start value Low Stage - 0.010...5.000 × In, in step 0.005 High stage - 0.10...40.00 × In, in step 0.01 Inst Stage - 1.00...40.00 × In, in step 0.01 (ii) Time Setting Time multiplier Low and High stage - 0.05...15.00 in step 0.01 Operate delay time Low & High stage - 40...200000 ms in step 10 Inst Stage - 20...200000 ms in step 10 (iii) Operation accuracy: ±1.5% of the set value or ±0.002 × In	
33	Harsh Environment Coating	All the PCBs in the Relay shall be provided with Harsh environment coating (G3 compliant) for environment protection and topicalization.	
34	Measurement	The measured values are true RMS for current and voltage. All measured and derived values can be displayed on front panel LCD display or transferred locally or remotely on user request.	
35	Inter-operability test and Demonstration:	The demonstration and inter –operability test will be an integral part of the evaluation process, for which due intimation will be sent to the bidders. The manufacturer shall have to demonstrate inter –operability test with other bidders participating in the tender in presence of SBPDCL's officials. All the necessary arrangement to perform the inter-operability test will be under the scope of the bidders. The following points to be checked during the interoperability test :- a) Necessary user friendly configuration tool shall be provided to configure the RELAY. It should be compatible with SCD / ICD files generated by a third party system b) Goose signals shall be freely configurable for any kind of signals using graphic tool/user friendly software. c) Time synchronization from the SNTP server. d) Signal exchange over GOOSE communication from one make of relay to the other make of relays. e) Binary signals to be exchanged. f) Control command to be published. g) One LED to be configured with GOOSE signal received from the other RELAY for checking quick indication of the signal receipt. h) Protection operation signal to be configured to other relays. i) Disturbance recorder needs to be configured for the signal exchange j) GOOSE receiving time to be shown in the relay display from event recorded and disturbance recorder. GOOSE transfer time should be less than message type 1A, Performance Class P1 i.e. 10 ms. k) One of protection stage should be set to minimum time value (e.g. 20 ms) and injecting the current value in all relays in series. Checking the protection function blocking with published GOOSE signal of protection start from other relay. This shall ensure that GOOSE communication signal from other relay reaches before 20 ms. l) Disturbance fault records to be captured in COMTRED format (.DAT and .CFG). Each relay DR function needs to be configured for protection start, protection trip, breaker control commands as well as waveform recording of current and voltage signals. m) Port redundancy to be checked. n) Communication failure is to be checked by opening the communication cable while GOOSE message transfer. All the Bidder has to bring the following equipment to demonstrate the Interoperability testing. a) Each Type of offered relay (Relay Type and complete article no should match as per tender offering) – 1 no. each b) Ethernet Switch (Type of Port as offered in Numerical Relays) – 2 nos. c) GPS / SNTP Server – 1 no. d) Required Patch Cord – 1 set & e) Power Supply Modules – as required.	

Prepared By: Santosh K Singh

Approved By: Murtaza Hussain

Date: 17.03.2020

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ANNEXURE- B TO PURCHASE INDENT NO.240992441 REV.NO. 00

Technical Specification of : Numerical relays

Project : SBPDCL

WO No.99057A47601 / 99059A47501

SL.NO.	Technical requirement	Bidders Compliance (Yes/No)
Item-01	Transformer differential relay	
	Transformer Differential relay shall have following features :	
1	Numerical based differential protection relay with inbuilt current amplitude & vector group compensation feature & also with differential high set element for two winding power transformer compliant to IEC 60255.	
2	Necessary software, cables, connectors and other accessories as required for download, analyze data etc. shall be within the scope of successful manufacturer.	
3	The relay shall be very fast in operation with an operating time less than 40 millisecond at 5 times setting.	
4	The relays shall be inherently stable for external through fault conditions without affecting the speed of operation for internal faults.	
5	The relay shall have either a built in facility of ratio and phase angle correction or necessary interposing Auxiliary current transformers of universal type, shall be provided in the respective panel.	
6	The relay shall be provided with 2nd harmonic restraint or any other inrush proof feature to prevent operation due to magnetizing inrush current when the transformer is charged either from HV or LV side. But this shall not affect the speed of operation for internal fault.	
7	It shall be provided with 5th harmonic restraint features to prevent operation due to possible over excitation of the transformer. This shall also not affect the speed of operation for internal fault.	
8	The relay shall have adjustable bias setting range 20% to 50% and adjustable operating setting range of 10% to 50% at zero bias.	
9	The relay shall have three instantaneous high set over current units for clearing heavy internal fault.	
10	The relay shall be with 2-bias winding.	
11	The relay shall be such that there will not be any necessity of changing the setting of the relay whenever the transformer taps are changed from +5% to -10%.	
12	Differential relay shall have facility for setting, parameterization, downloading the storage data, data captured by disturbance recorder etc. locally through PC. Windows based Licensed software for establishing the facility to be considered in the scope of the supply by the Manufacturer.	
13	The relay shall have disturbance recording (with time stamping) function with suitable no. of analog and digital channels, Memory size and number of disturbances stored in the relay shall be clearly indicated in the offer. No. of site selectable BI/ BO shall be 8/8 with additional watchdog contact.	
14	The relay should have facility to monitor the healthiness of its circuits and components by own monitoring system. In case of any problems, the alarm should be generated by one of the output contacts. The alarm as soft signal to be sent to SCADA system as well. Necessary support documentation explaining the self diagnostic feature shall be furnished.	
15	The relay shall have 7 CT elements -Six for differential & one for REF Protection.	
16	For REF Protection, following accessories shall be supplied along with relay without any price implication to BHEL- a) Suitable nonlinear resistor (metrosil) shall be supplied to limit the peak voltage b) Suitable stabilizing resistor shall be supplied to prevent mal operation during external faults if necessary.	
17	Operating time for REF protection shall be less than 40 ms.	
18	All CT terminals shall be provided as fixed (screwed) type terminals on the relay to avoid any hazard due to loose connection leading to CT opening or any other loose connection. Necessary amount of lugs should be supplied along with each relay for CT connection and control wiring.	
19	Communication Port : 1. Two nos. IEC 61850 Edition-2 protocol compliant Ethernet RJ45/F.O port for communication with SCADA system through two managed Ethernet Switches operating in redundant mode. The communication shall be made in 1+1 mode between individual IED to Switch and IED should support PRP and HSR redundancy, such that failure of one set of LAN shall not affect the normal operation of SCADA. However, it shall be alarmed in SCADA. 2. Functioning of Relay shall not hamper to fault occurring any interconnected relay. 3. One Front port Ethernet RJ45/USB 2.0 for relay parameterization and configuration etc. with the help of PC. In case RS-232 port offered, suitable interfacing cable with one end having RS 232 port and other end USB 2.0 to be provided to connect with PC free of cost. 4. Relay should generate GOOSE message as per IEC 61850 Edition-2 standard for interlocking and also ensure interoperability with third party relays.	
20	Relays will be guaranteed for the period of five years from the date of last dispatch. Any problem in the said period should be attended free of charge inclusive of repair/replacement of relays/ component (both H/W, S/W).	
21	All the PCBs in the Relay shall be provided with Harsh environment coating (G3 compliant) for environment protection and topicalization.	

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GTP for Numerical Overcurrent & Earth Fault relay

Sl. No.	Feature and Function	Bidders Compliance (Yes/No)
1	Make, Type, Model No and Version No and Ordering Code	
2	Conformance to i. IEC255-4 i. ii. IEC 61850 61850 Edition 2 ii. PRP and HSR support	
3	No. of CT inputs for O/C and E/F Protection	
4	Type test report submitted(y/n)	
5	Relay shall be of Numeric Design	
6	Relay designed for bay protection and Control	
7	Size of Relay LCD screen	
8	Relay is equipped with CB close and open key/push buttons	
9.1	Relay has following protection functions: a. Three phase over current b. Earth fault c. Thermal overload function d. Broken conductor protection function e. Circuit Breaker Maintenance function	
9.2	a. One time delayed element and two high set elements b. Setting range and step for IDMT element for both current and Time Multiplier Setting c. Selectable Current/Time Curve for IDMT element d. Setting range and step for high set elements for both current and time delay	
10	Sampling rate and frequency of analog signal	
11	Whether remote controllable from SCADA	
12	a. No. of Digital Inputs b. Voltage rating of Digital Inputs c. Provision of testing without current injection	
13	Supervision for CB open and Closed status	
14	No. of programmable LEDs and no. of Latched LEDs	
15	Analog Measurement and display supported	
16	Fault Record storage capacity	
17	Event storage capacity	
18	Disturbance record storage capacity	
19	MMI with keypad and LCD provided	
20	Rated DC Supply and tolerance	
21	Rating of CT/PT secondary	
22	Rated frequency	
23	a. Operating ambient temperature & humidity. b. Withstanding capability of Electromagnetic Interference as per relevant part of IEC 61850.	
24	Mounting	
25	Watchdog	
26	a. Nominal Feeder current b. CT Ratio setting c. Earth fault current with time delay IEC Curves, 2nd stage for instantaneous trip(less than 50 ms) d. High set with delay e. IEC Curves for all O/C and E/F have user selectable?	

GTP for Numerical Overcurrent & Earth Fault relay

Sl. No.	Feature and Function	Bidders Compliance (Yes/No)
27	a. No. of Digital Output Contacts	
	b. Contact rating	
28	Mode of Time Synchronization	
29	Type of Lugs and terminators (CT Ring Type, Other Ring or PIN Type)	
30	MTBF	
31	Lifespan	
32	Compliance to Type Test	
33	Communication Port	
	a. Rear port- details b. Front port-details	
34	Whether Communication Ports are native to the Relay	
35	Protocol supported for Rear Port	
36	Protocol supported for Front port	
37	Start and trip output contacts are freely programmable	
38	Cable for connection of Relay to laptop(USB port) along with converter and power supply if required for relay local setting	
39	Basic application software for setting change, parameterisation	
40	CD with software(licensed) to download disturbance recorder, event log and evaluation of those records	
41	Graphical configuration tool for I/P, O/P and functional building block for protection and control	
42	Any other software required for integration with SCADA.	

GTP for Transformer Differential Protection Relay		
Parameter	Rating	Bidders Compliance (Yes/No)
Aux. voltage	30 V or 110 V D.C to be decided during detailed engineering stage	
C.T. secondary	Selectable 1 amps / 5 amps for both HV & LV sides	
Online display of HV & LV phase currents & differential current		
Adjustable bias setting	10 to 50% In.	
Operation based on fundamental frequency		
Programmable HV/LV CT ratio of T/F vector group		
Inbuilt REF protection		
Inbuilt HV & LV side over current & earth fault protection		
Inbuilt transformer trouble auxiliary relay		
Backlit LCD display		
Harmonic restrain feature		
Storing facility of latest 5 fault events with real time clock		
Password protection		
DC burden	Quiescent condition – approx 4 watt	
	Under trip condition – 30 Volt - approx 4 watt, 110 Volt - approx 7 watt.	
AC burden	Through current only – approx 0.15 VA for 1 amp & 0.30 VA for 5 amp (per bias circuit) Bias & differential Ckt only: 2.8 VA for 1 amp & 3.2 VA for 5 amp.	
Contact arrangements	Two change over self reset tripping contacts & two annunciation contacts	
Contact rating	Make & carry 7500VA for 0.2 sec. with max 30 A & 300 V AC or DC carry continuously 5 amp AC or DC break 1250 VA AC or 50 W DC resistive, 25 W L/R – 0.04 s subject to max. 5 amp & 300 Volts	
Current Input	Six for differential & one for REF	
Self diagnosis feature for healthiness of relay		
Flush mounted / draw out type		
Type test report submitted		

Checklist for Bill of Material				
Sl. No.	Material	Qty	Bidders compliance (Yes/No)	
			Ann-A Item-01 (O/C & E/F relay)	Ann-B Item-01 (Transformer Diff. relay)
1	Relay (Model No.) -	Qty as per Tender		
2	Lugs suitable for current and control, wiring	Qty as per Tender X Number of TBs in relay + 20% extra.		
3	Cable for connection of Relay to laptop(USB port). Along with converter and power supply if required for relay local setting	10 set		
4	Manual, Hard copy in good quality paper properly bounded	10 set		
5	Copy of Type Test certificate along with manual	With offer		
6	Basic application software for setting change,	10 nos.		
7	CD with software(licensed) to download disturbance recorder, event log and evaluation of those records	10 nos.		
8	Graphical configuration tool for I/P, O/P and functional building block for protection	10 nos.		
9	Any other software required for integration with SCADA.	10 nos.		

Acceptance Criteria

- 1 Visual checks for cracks and surface finish.
- 2 Availability of all routine test certificates.
- 3 Make & type of relays as per PO spec/QA approval/BHEL Engg.document.
- 4 Verification from customer / BHEL engg approved datasheet.
- 5 Availability of BHEL Engineering /customer clearance for type test reports.
- 6 Guarantee certificate
- 7 Compliance of BHEL/ Customer observations (If any) identified in inspection report

S.No.	Services Support Clause	Bidders Compliance (Yes/No)
1	It is the Bidder's responsibility to configure each protection relay to provide the protection, control and monitoring facilities required as per approved schematic drawing preferable at bidder's works or else at BHEL works. A full set of relay configuration and setting files shall be included in the design and documentation submissions.	
2	The bidder shall provide support to BHEL personnel for programming, testing and demonstration of all functions of numerical relays during inspection at BHEL Bhopal works, free of cost for 2 visits of 3 man days each. The support shall be provided to the satisfaction of customer.	
3	The bidder shall test & commission 1 No relay of each variety (i.e. O/C & E/F relay and Transformer Differential relay) in each circle of SBPDCL & NBPDCCL during which a proper demonstration/ training at site shall be provided to the local site personnel. Each Testing & Commissioning visit shall be of 3 mandays. Currently, no. of circles in SBPDCL are 11 & no. of circles in NBPDCCL are 09.	
4	Bidder shall provide in-house training on Numerical relays to SBPDCL & NBPDCCL Engineers at relay manufacturer works. The in-house training will be imparted to one batch of each DISCOM & each batch will consist of 20 personnel (max.). Boarding & lodging of personnel shall not be in the scope of bidder. Training to be imparted to employer persons on the following items:- 1. Relay setting and parameterization 2. Relay configuration with respect to I/P, O/P and functional block for protection. 3. GOOSE configuration. 4. Configuration and Interfacing required for third party SCADA System Integration. 5. Diagnostic features The details of syllabus to be finalized with SBPDCL/NBPDCCL .	