

525961/2021/O/o PED/TI/RDSO

Reason document for the final draft of Specification no TI/SPC/PSI/PROTCT/7101 of Control and Relay Panel Including Numerical type protection relays for Scott-connected/V-Connected Single-Phase Traction Transformers, OHE protection, 55 kV AT Protection & Shunt Capacitor Bank Protection for 2x25 kV Traction Sub-station, Sectioning and Paralleling Post, Sub-Sectioning & Paralleling Post and Auto Transformer Post

SN	Clause No.	Description	Comments Received from	RDSO's remark																
1.	Page2	SPECIFICATION NO. TI/SPC/PSI/PROTCT/7200	<u>M/s ALIND</u> SPECIFICATION NO. TI/SPC/PSI/PROTCT/7101 Typo error	Accepted as typographical error. The specification number appeared in the header of draft specification corrected as 7101 in place of 7200.																
2.	Page2	SPECIFICATION No. TI/SPC/PSI/PROTCT/7101 <table border="1"> <thead> <tr> <th>Amendment Number</th> <th>Amendment /Revision</th> <th>Total pages including drawings</th> <th>Date of Issue</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Revision 1</td> <td>79</td> <td>--</td> </tr> </tbody> </table>	Amendment Number	Amendment /Revision	Total pages including drawings	Date of Issue	0	Revision 1	79	--	<u>M/s ALIND</u> SPECIFICATION No. TI/SPC/PSI/PROTCT/7101 <table border="1"> <thead> <tr> <th>Amendment Number</th> <th>Amendment /Revision</th> <th>Total pages including drawings</th> <th>Date of Issue</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>NA</td> <td>80</td> <td>--</td> </tr> </tbody> </table> Typo error	Amendment Number	Amendment /Revision	Total pages including drawings	Date of Issue	0	NA	80	--	Noted, page number will be corrected according to actual numbers at the time of issue final specification.
Amendment Number	Amendment /Revision	Total pages including drawings	Date of Issue																	
0	Revision 1	79	--																	
Amendment Number	Amendment /Revision	Total pages including drawings	Date of Issue																	
0	NA	80	--																	
3.	Page3	8.0 Tests	<u>M/s ALIND</u> 8.0 Testing of C&R Panel and Numerical Relays Typo error	Accepted Description of clause no. 8.0 in the index corrected																
4.	Page3	Error in Page No. Column of INDEX & Annexure Tables	<u>M/s ALIND</u> To be done accordingly	Noted, page number will be corrected according to actual page numbers at the time of issue final specification																
5.	1.1	220/132 kV and 25 kV circuit breakers, interrupters and protection of 220 or 132/50 kV Scott connected/V-Connected single phase traction transformers	<u>M/s ALIND</u> V connected Transformer also to be mentioned. The scope of the specification also applicable for V connected Transformers. As V connected Transformer TSS is specified in 2.1.2, 7.1 & 7.2.5, it shall be a typo error.	Accepted																
6.	1.2	The latest protocol for communication of protective relays is IEC 61850. Efforts are made to implement the Control & Relay Panel incorporated with protective relays communicating with RTU on IEC 61850. The RTU & communicable relays approved are communicating on IEC 60870-4-103 which is very	<u>M/s APPSIL, Lucknow</u> The latest protocol for communication of protective relays is IEC 61850. Efforts are made to implement the Control & Relay Panel incorporated with protective relays communicating with RTU on IEC 61850. The RTU & communicable relays approved are	Comments of M/s APPSIL is not understandable, IEC 61850 protocol for relay communicating with RTU is already mentioned in the specification																

525961/2021/O/o PED/TT/RDSO

		<p>old protocol and may not support other devices in future in the substation, hence it is the need of hour to implement the IEC 61850 compliant Protective Relays and SCADA interfaced with RTU based on IEC 61850 protocol.</p>	<p>communicating on IEC 60870-4-103 which is very old protocol and may not support other devices in future in the substation, hence it is the need of hour to implement the IEC 61850 compliant Protective Relays and SCADA interfaced with RTU based on IEC 61850 protocol.</p> <p>IEC 61850 standard is released in 2003. It is widely used for as communication standard throughout the Globe. We request you to incorporate IEC 61850 along with legacy standard in RDSO Technical Specification for Control & Relay Panel.</p>	
			<p>M/s ALIND IEC 61850 is not recommended for the Railways. IEC 61850 is basically used for within substation communication and interoperability in complex substations. In Indian Railways context, where all TSS have same protection, interoperability within the substation becomes redundant. Only physical wiring can be avoided for the interlocks. But that poses a safety concern in case of a missing strong communication network. IEC 61850 for external communication for SCADA/SAS and RAS depends on IEC 60870-104 protocol only. Hence IEC 61850 is not suitable for an extended network like Indian Railways where the substations are not in a single location but spread across distances. The Number of devices that current RS 485 based systems can handle is much higher than the number of systems in each substation of Indian Railways thus limiting any advantage of Ethernet based IEC 61850. This will only add a layer of complexity without an actual benefit since for all external communications, the RTU will use 104 or 103 Protocol thus losing the added benefits of IEC61850. Only systems internal to the substations can communicate</p>	<p>Not accepted as:</p> <ol style="list-style-type: none"> 1. IEC 61850 protocol is used in the relay for communication with RTU. The communication between RTU and RCC is on IEC 60870-104 protocol. 2. IEC 61850 protocol is the latest and most of the utilities are using this protocol. DFCCIL is also using this protocol for communication between IEDs & RTU. 3. As per CEA notification August, 2010, all main protection relays provided for transmission lines, transformers and bus-bar shall be numerical type and communication protocol shall be as per IEC 61850/relevant IS. 4. We should encourage to implement latest technology.

			<p>with IEC61850. All the protections of a single TSS being much smaller in nature than multiple TSS substations in Utility and Industry, IEC61850 will only add complexity and redundancy. IEC 60870-103 can also be mapped to ethernet based systems like IEC 61850. Hence until and unless there is any practical need for extensive and critical within substation communication of large number of systems, IEC 61850 will remain redundant only. Diving directly to a newer system may have severe impact in the day to day operations and management.</p>	
			<p>M/S ASHIDA Not Required IEC 61850 protocol mainly offers great deal of flexibility in protection scheme. Using GOOSE, interlocks can be re-arranged without physical wiring change. This is a big advantage in a complex & customized protection. However, for Indian Railways sub-stations, which are highly standardized, where all TSS have same protection, this would not offer any advantage. In fact it will only add a layer of complexity, which current staff may not be ready for. This is based on our experience with IEC61850 sub-station automation / SCADA system that we have supplied to various utilities. Further IEC61850 based Sub-station automation Systems can provide a local mimic at sub-station level, which in case of unmanned TSS is of no use. Remote control, even in case of IEC61850 based SAS, uses IEC104 protocol. IEC61850 is not suitable for communication beyond a single sub-station.</p>	
7.	1.3	The relays communicating on IEC 60870-5-103 have been commissioned on Bina-katni Section on Indian Railways in past which may need to be procured for replacement as per the same	<p>M/S ALIND IEC 61850 is not recommended for the Railways. Please refer to comment for point no. 11.6</p>	Refer RDSO remarks on para 1.2 on M/s ALIND comments

525961/2021/O/o PED/TI/RDSO

		protocol at which SCADA system is working. In this regard, the specification for C&R Panel comprising communicable relays is also applicable for relays communicating on IEC 60870-5-103.		
8.	1.4	New RE work or simultaneously replacement of both, control & relay panels and SCADA system, the communication between RTU and relays shall be on IEC 61850 protocols only.	M/S ALIND IEC 61850 is not recommended for the Railways. Please refer to comment for point no. 11.6	
9.	1.5	The vendor is free to develop control & relay panel incorporated with numerical relays communicating with SCADA on IEC 60870-5.103 or IEC 61850 or both. In same relay. In the master list of RDSO approved vendors, a remark will be mentioned for status of particular vendor approved for type of communication protocol support with relay.	M/S ALIND IEC 61850 is not recommended for the Railways. Please refer to comment for point no. 11.6 M/S ASHIDA Not Required Like IEC61850 that can be mapped to number of automation protocols, current IEC60870-5-103 can also be mapped to protocols liked IEC61850-5-104 which is a high speed Ethernet based protocol. Thus IEC 61850 offers no advantage here. In fact current RDSO standard 0130 Rev2 specifies in details mapping between IEC103 & 104 protocols. Same is proved at numerous sub-stations currently Number of devices even in most complicated TSS would not exceed 24 devices. So limit of 32 devices on RS-485 is quite safe. Further it is possible to use fibre-optic cables for communication even for IEC103 protocol.	
10.	3.0	SERVICE CONDITIONS Max. & Minimum relative humidity as per IEC 60068-2-30 : ≥97% & 22%	<u>M/s APPSIL, Lucknow</u> 3.0 SERVICE CONDITIONS Max. & Minimum relative humidity as per IEC 60068-2-30 : ≥97% & 10% . All the destructive tests in the relay shall be as per IEC 60255.	Accepted
11.	4	4.0 GOVERNING SPECIFICATIONS 4.1 The main components covered by this specification shall conform to the following standard specifications (latest version), which shall be applied in the manner altered , amended	<u>M/s APPSIL, Lucknow</u> 4.0 GOVERNING SPECIFICATIONS 4.1 The main components covered by this specification shall conform to the following standard specifications (latest version), which	Accepted. Title of the said IEC, referred in the specification modified.

525961/2021/O/o PED/TI/RDSO

		<p>or supplemented by the specification and Indian Electricity Rules where applicable.</p> <p>1. IEC 60255-151 -Single input energizing quantity measuring relays with dependent or independent time.</p> <p>2. IEC 60255-26 - Electrical disturbance tests</p>	<p>shall be applied in the manner altered, amended or supplemented by the specification and Indian Electricity Rules where applicable.</p> <p>1. IEC 60255-151 -Single input energizing quantity measuring relays with dependent or independent time.</p> <p>This standard is for functional requirements for over/under current protection. We request you to revise this for over / under current protection.</p> <p>2. IEC 60255-26 Electrical disturbance tests Inplace of "Electrical disturbance tests" the name can be Electromagnetic compatibility requirements as specified in the standard. Please modify type test requirement as per relevant IEC standards.</p>					
12.	4.1	<table border="1"> <tr> <td>IEC 60870 IEC 60870-5-103</td> <td>Telecontrol equipment and systems - Part 5-103: Transmission protocols - Companion standard for the informative interface of protection equipment</td> </tr> </table>	IEC 60870 IEC 60870-5-103	Telecontrol equipment and systems - Part 5-103: Transmission protocols - Companion standard for the informative interface of protection equipment	<p><u>M/S ALIND</u></p> <table border="1"> <tr> <td>IEC 60870-5-103</td> <td>Telecontrol equipment and systems - Part 5-103: Transmission protocols - Companion standard for the informative interface of protection equipment</td> </tr> </table> <p><u>Typo error</u></p>	IEC 60870-5-103	Telecontrol equipment and systems - Part 5-103: Transmission protocols - Companion standard for the informative interface of protection equipment	Accepted as typographical error. IEC 60870 IEC 60870-5-103 corrected by IEC 60870-5-103.
IEC 60870 IEC 60870-5-103	Telecontrol equipment and systems - Part 5-103: Transmission protocols - Companion standard for the informative interface of protection equipment							
IEC 60870-5-103	Telecontrol equipment and systems - Part 5-103: Transmission protocols - Companion standard for the informative interface of protection equipment							
13.	4.1	IEC 61850 Communication networks and systems for power utility automation	<p><u>M/S ASHIDA</u></p> <p><u>Not required</u></p> <p>IEC 61850 is not recommended</p>	Not accepted as IEC 61850 protocol is the feature of protection relays covered in the specification.				
14.	4.1	IS:8686 Static protective relays	<p><u>M/S ASHIDA</u></p> <p><u>Obsolete by BIS</u></p>	Not accepted As IS 8686 is still active standard. However, IS 8686-1977 is deleted as same IS appeared twice.				
15.	4.1	IS 8686-1977 Static protective relays.	<p><u>M/S ASHIDA</u></p> <p><u>Obsolete by BIS</u></p>					
16.	5.1.1	The control & relay (C&R) panel shall be of the vertical self-supporting steel construction, low voltage, back-to-back duplex corridor type with	<p><u>M/s APPSIL, Lucknow</u></p> <p>The control & relay (C&R) panel shall be of the vertical self-supporting steel construction, low</p>	Not accepted as: 1. To reset relays LEDs/Flag manually, needs to open glass door every time.				

525961/2021/O/o PED/TI/RDSO

		central roofed-in access.	<p>voltage, simplex type with swing & glass door.</p> <p>Supporting note: This design will provide the additional protection for the components mounted on the panel.</p> <p>Supporting Note: Duplex Panel will occupy more space. Considering our Proposal for upgradating existing Control & Relay Panel with BCU (Bay Control Unit) based solution we do not envisage requirement for duplex panel hence we request you to modify this requirement to simplex panel.</p>	<p>2. Bay control unit is not the feature of this specification for monitoring and control of traction equipment.</p> <p>3. Bay control unit system is generally used for bigger sub-station where all the control operation carried out locally.</p> <p>4. Refer para 5.1.8 wherein it is mentioned "Any other construction of the panels may also be suggested by the panel manufacturers to RDSO, which may be considered based on the merits like savings, size, maintainability etc. of the proposed design"</p>
17.	5.1.5	The panel shall be fabricated from sheet steel of thickness not less than 3mm for front, rear, doors and base panels, and not less than 2.0 mm for side, roof and door panels.	<p><u>M/S ALIND</u></p> <p>The panel shall be fabricated from sheet steel of thickness not less than 3mm for front, rear, door panel and base panels, and not less than 2.0 mm for side, roof and doors.</p> <p>Typo error</p>	Accepted as typographical error.
18.	5.1.8	The control & relay panel shall normally of duplex type front side for mimic diagram, control switches, indication and annunciation LEDs and instruments & rear side consists of Protective relays. Any other construction of the panels may also be suggested by the panel manufacturers to RDSO, which may be considered based on the merits like savings, size, maintainability etc. of the proposed design.	<p><u>M/s APPSIL, Lucknow</u></p> <p>The control & relay panel shall normally of duplex Simplex type front side for mimic diagram, control switches, indication and annunciation LEDs and instruments & rear side consists of Bay Control Unit and Protective relays. Any other construction of the panels may also be suggested by the panel manufacturers to RDSO, which may be considered based on the merits like savings, size, maintainability etc. of the proposed design.</p> <p>Supporting note: Control & Relay Panels with Bay Control Unit offers the advantages of controlling the switchgear from IED improves overall reliability at a reduced space occupancy when compared to conventional system.</p>	Refer RDSO's remark on para 5.1.1
19.	5.1.9	An indicative list of the equipment to be provided on the control panels is at Annexure-C. Any additional equipment needed for satisfactorily working and adequate protection for TSS	<p><u>M/S ALIND</u></p> <p>An indicative list of the equipment to be provided on the control panels is at Annexure-C. Any additional equipment needed for</p>	Accepted as the increase of size of panel provides space inside the panel for maintenance and space for providing additional relays if required in future

525961/2021/O/o PED/TI/RDSO

		equipment which is not covered in Annexure-C shall also to be provided by the tenderer. The C & R panel shall be of 2.3 m (max.) height 1.0 m width and about 2 m deep (between front and rear faces) for single transformer, for double transformer the width of panel should be double.	satisfactorily working and adequate protection for TSS equipment which is not covered in Annexure-C shall also to be provided by the tenderer. The C & R panel shall be of 2.3 m (max.) height 1.2 m width and about 2 m deep (between front and rear faces) for single transformer, for double transformer the width of panel should be double. Dimensions are optimized considering operator point of view for accessing the internal terminal wiring and maintenance.	
20.	5.1.10	Equipment as per clause 2.3 for protection of Auto Transformers at SP/SSP/AT shall be provided on Control & Relay Panel along with requisite control switch, indicating lamps etc. for control of switchgears and motorized Isolators as per the site requirement. Any additional equipment needed for satisfactorily working and adequate protection for AT protection and control of switchgears at SSP/SP/AT Posts shall also to be provided by the tenderer. The C & R panel shall be small enough to accommodate the different items on the panel without comprising ease of maintenance. The control and relay panels for 25 kV shunt capacitor bank shall be separate and its size will be decided by RDSO at the time of design drawings approval. The purchaser shall indicate its requirement in the tender clearly.	<u>M/S ALIND</u> Equipment as per clause 2.3 for protection of Auto Transformers at SP/SSP/AT shall be provided as separate Control & Relay Panel along with requisite control switch, indicating lamps etc. for control of switchgears and motorized Isolators as per the site requirement. Any additional equipment needed for satisfactorily working and adequate protection for AT protection and control of switchgears at SSP/SP/AT Posts shall also to be provided by the tenderer. The C & R panel shall be small enough to accommodate the different items on the panel without comprising ease of maintenance. The control and relay panels for 25 kV shunt capacitor bank shall also be separate and its size will be decided by RDSO at the time of design drawings approval. The purchaser shall indicate its requirement in the tender clearly. Typo error	Not accepted as SSP/SP/AT will equipped with single C&R panel. The addition of word "separate" is not required.
21.	5.1.13	The sheet steel as well as other steel works shall be properly treated and then an under coat suitable to serve as base and binder for the finishing coat shall be applied. The exterior and base frame of the panel shall be coated with industrially accepted Siemens gray shade and	<u>M/s APPSIL, Lucknow</u> The sheet steel as well as other steel works shall be properly treated and then an under coat suitable to serve as base and binder for the finishing coat shall be applied. The exterior and base frame of the panel shall be	Accepted

525961/2021/O/o PED/TI/RDSO

		interior surfaces of the panels shall be epoxy powder coated of white color followed by at least 200-degree bake ovening. The finish shall be virtually scratchproof with all metal surfaces coated to a uniform thickness on the powder coat line.	coated with industrially accepted Siemens gray shade and interior surfaces of the panels shall be epoxy powder coated of white color followed by at least 180-degree bake ovening. The finish shall be virtually scratchproof with all metal surfaces coated to a uniform thickness on the powder coat line.	
			<u>M/S ASHIDA</u> The exterior and base frame of the panel shall be coated with industrially accepted Siemens gray shade (RAL 7032) and interior surfaces of the panels shall be epoxy powder coated of white color followed by at least 200-degree bake ovening	Accepted, its provide more clarity for vendors about colour of panel
22.	5.13.2	5.13.2 The interior and central corridors of control panel shall be adequately illuminated by 240 Vac, 20-watt CFL"s.	<u>M/s APPSIL, Lucknow</u> 5.13.2 The interior and central corridors of control panel shall be adequately illuminated by 240 Vac, 6-watt LED. Supporting note: CFL is very old technology. LED is latest and more reliable than CFL.	Accepted as LED is more energy efficient and longer life as compared to CFL but in place of 6 watt LED, 9 watt LED is incorporated in the final draft. The lumens of 9 watt LED is close to 20 watt CFL.
23.	5.2.8	The numerical relay shall also have a feature to communicate with RTU on IEC 60870-5-103 through serial communication port RS 485 or IEC 61850 standard protocol via high-speed Ethernet switch connected on LAN in the sub-station or both protocols.	<u>M/s APPSIL, Lucknow</u> The numerical relay shall also have a feature to communicate with RTU on IEC 60870-5-103 through serial communication port RS 485 or IEC 61850 standard protocol via high-speed Ethernet switch connected on LAN in the sub-station or both protocols. Supporting note: If both editions are supported by protection IEDs, it will provide the flexibility in RTU integration with either of the edition of IEC61850 (Old or new RTUs).	Vendor is free to develop Control & Relay panel incorporating with numerical relays communicating with RTU on IEC 61850-5-103 or IEC 61850 or both protocol. The vendor approval of control and relay panel will be accorded according to protocol implanted in the numerical relay. Supporting both protocol by numerical relays cannot made mandatory to provide flexibility to vendors to develop relay with individual protocol or both.
			<u>M/S ASHIDA</u> The numerical relay shall also have a feature to communicate with RTU on IEC 60870-5-103 through serial communication port RS 485. IEC61850 is not needed	Refer RDSO's remark of para 1.2
24.	5.2.3.1	TR alarm: This has to come whenever any alarm viz. Buchholz alarm, oil winding temp. high alarm, pressure relief device alarm and low	<u>M/S ALIND</u> TR alarm: This has to come whenever any alarm viz. Buchholz alarm, oil & winding temp.	Accepted, Alarm contact for PRD on traction transformer is not available, hence deleted

525961/2021/O/o PED/TI/RDSO

		oil level alarm occurs.	high alarm and low oil level alarm occurs. No alarm contacts will be available in TR for PRD. + Typo error	
25.	5.2.3.4	Tele-signaling of breaker / interrupter trip circuit fail Necessary wiring and terminals for supervision of trip circuit failure shall be provided for interconnection with RTU. TR trip circuit fail: whenever the 110Vdc supply to the concerned control circuit fails, or any of the trip-circuits of HV & LV breakers fail.	M/S ALIND Tele-signalling of breaker trip circuit fail Necessary wiring and terminals for supervision of trip circuit failure shall be provided for interconnection with RTU. Trip circuit fail: whenever the 110Vdc supply to the concerned control circuit fails, or any of the trip-circuits of HV & LV breakers fail. There is no relay provided/ required for interrupter. + Typo error	Accepted, the word 'TR' deleted as typographical error. Relays are not provided for interrupters but in such case trip circuit supervision will be provided by using auxiliary relay, the same is clarified in para 5.8.1 of the specification.
26.	5.2.4	Telemetry of current, voltage etc. For the purpose of telemetry to the RCC, all the potential & current transformer terminations shall be provided on a terminal board. The CT terminations shall be shorted using links. By re-arranging the links, it shall be possible to connect the current circuits of the transducers of the remote-control equipment in series with the relays etc. of the C & R panel.	M/S ALIND Telemetry of current, voltage etc. For the purpose of telemetry to the RCC, all the potential & current transformer terminations shall be provided on a terminal block. The CT terminations shall be shorted using links. By re-arranging the links, it shall be possible to connect the current circuits of the transducers of the remote-control equipment in series with the relays etc. of the C & R panel. Typo error	Accepted, the word 'board' corrected by word 'block'.
27.	5.2.8	The numerical relay shall also have a feature to communicate with RTU on IEC 60870-5-103 through serial communication port RS 485 or IEC 61850 standard protocol via high-speed Ethernet switch connected on LAN in the sub-station or both protocols.	M/S ALIND IEC 61850 is not recommended for the Railways. Please refer to comment for point no. 11.6	Refer RDSO's remark of para 1.2
28.	5.3	MIMIC DIAGRAM The scheme of connection at the traction sub-station (including feeder post) showing the circuit breakers, transformers, isolators and interrupters shall be represented by a single line mimic diagram on the control panel. The color of the bus bar shall be signal red to shade 537 of IS:5 for	<u>M/s APPSIL, Lucknow</u> MIMIC DIAGRAM The scheme of connection at the traction sub-station (including feeder post) showing the circuit breakers, transformers, isolators and interrupters shall be represented by a single line mimic diagram on the control panel. The	Refer RDSO's remark of para 5.1.8

525961/2021/O/o PED/TI/RDSO

		<p>220/132 kV, golden yellow to shade 356 of IS:5 for 25 / 50 kV and black for 240V. The mimic diagram shall be made of aluminum strip or reflector PVC strip and fixed on the panel. The width of the mimic shall be of 8mm. The successful tenderer will be required to submit his proposal for layout of equipment on the control panel to the purchaser for his approval.</p>	<p>color of the bus bar shall be signal red to shade 537 of IS:5 for 220/132 kV, golden yellow to shade 356 of IS:5 for 25 / 50 kV and black for 240V. The mimic diagram shall be made of aluminum strip or reflector PVC strip and fixed on the panel. The width of the mimic shall be of 8mm. The successful tenderer will be required to submit his proposal for layout of equipment on the control panel to the purchaser for his approval.</p> <p>For the Control panel with BCU, only common alarm lamp shall be provided for each Control panel. Each BCU of the control panel shall energize this common alarm lamp on occurrence of alarms/Trips. All alarms shall be available in the BCU mimic/HMI.</p> <p>Supporting note: We request RDSO to consider Control & relay Panel with Bay Control Unit which will have MIMIC using Large HMI in Bay Control IED in line with RDSO requirement. This will avoid any additional panel requirement and reduces space requirement for Control & Relay Panel solution.</p>	
29.	5.3.1	<p>The scheme of connection at the traction sub-station (including feeder post) showing the circuit breakers, transformers, isolators and interrupters shall be represented by a single line mimic diagram on the control panel. The color of the bus bar shall be signal red to shade 537 of IS:5 for 220/132 kV, golden yellow to shade 356 of IS:5 for 25 / 50 kV and black for 240V. The mimic diagram shall be made of aluminum strip or reflector PVC strip and fixed on the panel. The width of the mimic shall be of 8mm. The successful tenderer will be required to submit his proposal for layout of equipment on the control panel to the purchaser for his approval.</p>	<p><u>M/S ALIND</u></p> <p>The scheme of connection at the traction sub-station (including feeder post) showing the circuit breakers, transformers, isolators and interrupters shall be represented by a single line mimic diagram on the control panel. The color of the bus bar shall be signal red to shade 537 of IS:5 for 220/132 kV, Golden yellow to shade 356 of IS:5 for 25/50kV MAIN/ M Bus and Blue to shade 356 of IS:5 for 25/50kV TEASER/ T Bus, Green to shade for Earth and black for 240V. The mimic diagram shall be made of aluminium strip or reflector PVC strip and fixed on the panel. The width of the mimic shall be of 8mm. The successful tenderer will be required to submit</p>	<p>Accepted, its provides better visualization to discriminate equipment connected with main and teaser bus.</p>

525961/2021/O/o PED/TI/RDSO

			his proposal for layout of equipment on the control panel to the purchaser for his approval. Colour defined for main, teaser & Earth	
		The instruments shall generally conform to IS 13875 part 1-3 and shall have typical accuracy of 99.9% at full scale and resolution of 1% to 100% of full scale.	<u>M/S ASHIDA</u> The color of the bus bar shall be signal red to shade 537 of IS:5 for 220/132 kV, Golden yellow to shade 356 of IS:5 for MAIN/ F Bus and Blue TEASER/ T Bus of 50/25 kV, Green for Earth and black for 240V.	
30.	5.4.2	The instruments shall generally conform to IS 13875 part 1-3 and shall have typical accuracy of 99.9% at full scale and resolution of 1% to 100% of full scale. The traction load current and voltage waveforms are not true sinusoidal hence the digital type meters should also have capability to measure the true RMS value of voltage and current waveforms (up to the crest factor of 3.0) distorted due to presence of harmonics.	<u>M/S ALIND</u> The instruments shall generally conform to IS 13875 part 1-3 and shall have class of accuracy of 0.5 or less. The traction load current and voltage waveforms are not true sinusoidal hence the digital type meters should also have capability to measure the true RMS value of voltage and current waveforms (up to the crest factor of 3.0) distorted due to presence of harmonics. Range adjusted due to the non-availability of the same of reputed makes in the market.	Accepted as reputed make meter of 0.1 accuracy class is not available in the market. Accuracy class 0.5 or better is incorporated.
			<u>M/ASHIDA</u> The instruments shall generally conform to IS 13875 part 1-3 and shall have typical accuracy $\pm 0.5\%$ of range + 1 Digit (10... 100% of Nominal value)	
31.	5.4.4	Power factor meter shall have range of lagging 0.5 to leading 0.5 in suitable span, with accuracy +/- 1%. The power factor meter should be capable of measurement of power factor for non-sinusoidal waveforms generated by traction loads by using the suitable techniques to average the instantaneous power then divide it by multiplication of true RMS voltage and current.	<u>M/S ALIND</u> Power factor meter shall have range of lagging 0.5 to leading 0.5 in suitable span, with accuracy +/- 2°. The power factor meter should be capable of measurement of power factor for non-sinusoidal waveforms generated by traction loads by using the suitable techniques to average the instantaneous power then divide it by multiplication of true RMS voltage and current. Range adjusted due to the non availability of the same of reputed makes in the market.	Accepted as reputed make meter of +/-1 % accuracy is not available in the market. Accuracy +/-2 0 and range of Lag. 0.1 to Lead 0.1 is incorporated in the final draft.
		Power factor meter shall have range of lagging	<u>M/S ASHIDA</u>	

525961/2021/O/o PED/TI/RDSO

		0.5 to leading 0.5 in suitable span, with accuracy +/- 1%	Power factor meter shall have range of lagging 0.5 to leading 0.5 in suitable span, with accuracy $\pm 2^\circ$ (0.1 Lag...1...0.1 Lead)	
32.	5.5	<p>ANNUNCIATION</p> <p>Red LEDs and bell, both operating on 110 V DC. supply, shall be provided on the control panel for giving individual visual and audible alarm whenever any of the protective relays operates. The visual alarm shall be of flasher type, which shall continuously flicker till acknowledged, after which it shall only glow. The annunciation LEDs shall be provided on the control panel at the top in suitable number of rows for concerned transformer/circuit - breaker/PT etc. The alarm accepting, visual resetting and annunciation testing buttons shall be mounted on the control panel at a convenient place & height. The alarm bell shall be mounted inside the C & R panel.</p>	<p><u>M/s APPSIL, Lucknow</u></p> <p>ANNUNCIATION</p> <p>Red LEDs and bell, both operating on 110 V DC. supply, shall be provided on the control panel for giving individual visual and audible alarm whenever any of the protective relays operates. The visual alarm shall be of flasher type, which shall continuously flicker till acknowledged, after which it shall only glow. The annunciation LEDs shall be provided on the control panel at the top in suitable number of rows for concerned transformer/circuit - breaker/PT etc. The alarm accepting, visual resetting and annunciation testing buttons shall be mounted on the control panel at a convenient place & height. The alarm bell shall be mounted inside the C & R panel.</p> <p>For the Control panel with BCU, only common alarm lamp shall be provided for each Control panel. Each BCU of the control panel shall energize this common alarm lamp on occurrence of alarms/Trips. All alarms shall be available in the BCU mimic/HMI.</p> <p>Supporting Note: In the Proposed Solution for Control & Relay Panel with BCU (Bay Control Unit) and (Protection IED) suitable LED indication will be available for Annunciation purpose for various events. Hence a dedicated / standalone Annunciation System will not be required.</p>	<p>Not accepted as:</p> <ol style="list-style-type: none"> 1. Bay control unit is not the feature of Railway control and relay panel. 2. Bay control system require IED with every switching devices. 3. Bay control unit is useful where all control operation of switching devices performed locally. In Indian Railways few of the TSSs are also unmanned and all the control operation is being done from centralised place at division level called RCC.
33.	5.4 & 5.9	<p>5.4 INDICATING INSTRUMENTS</p> <p>Scalable 4 digits bright red LED display digital Ammeters, Voltmeters and power factor meters shall be provided as indicated in Annexure- C. The instruments shall be of the switchboard type, back connected, suitable for semi-flush or flush panel mounting, provided with dust tight cases of</p>	<p><u>M/s APPSIL, Lucknow</u></p> <p>5.4 INDICATING INSTRUMENTS</p> <p>Scalable 4 digits bright red LED display digital Ammeters, Voltmeters and power factor meters shall be provided as indicated in Annexure- C. The instruments shall be of the switchboard type, back connected, suitable</p>	Refer RDSO's remark of para 5.1.8

525961/2021/O/o PED/TI/RDSO

		<p>IP 54 class. 5.9 INDICATING LEDS Low consumption, extra bright LED indicating lamps of approximately 20 mm diameter with insulated housing having group of good quality LEDs inside, suitable for panel use shall be provided. The LEDs shall be suitably wired to glow at 110 V DC or 240V AC. supply, as required.</p>	<p>for semi flush or flush panel mounting, provided with dust tight cases of IP 54 class. 5.9 INDICATING LEDS Low consumption, extra bright LED indicating lamps of approximately 20 mm diameter with insulated housing having group of good quality LEDs inside, suitable for panel use shall be provided. The LEDs shall be suitably wired to glow at 110 V DC or 240V AC. supply, as required. For the Control panel with BCU, only common alarm lamp shall be provided for each Control panel. Each BCU of the control panel shall energize this common alarm lamp on occurrence of alarms/Trips. All alarms shall be available in the BCU mimic/HMI. Supporting note: All the required Indication to be provided at BCU front HMI. Hence discrete Indicating LEDs are not required.</p>					
34.	5.7.6	<p>The relays shall be capable to show live DC & AC voltage parameters on the LCD display. Manufacturer shall clearly indicate/furnish the sampling rate, accuracy and range of above measurements at the time of design & development to RDSO. It shall also be capable to display the numerical values of the latest 1000 events (i.e. dc low alarm & trip, dc high alarm & ac low & high alarm) with date and time stamping in serial order on the LCD display.</p>	<p><u>M/S ALIND</u> The relays shall be capable to show live DC & AC voltage parameters on the LCD display. Manufacturer shall clearly indicate/furnish the sampling rate, accuracy and range of above measurements at the time of design & development to RDSO. It shall also be capable to display the numerical values of the latest 100 fault events (i.e. dc low alarm & trip, dc high alarm & ac low & high alarm) with date and time stamping in serial order on the LCD display. Analysing latest 1000 events in the HMI/ LCD through keypad is not a great deal. Latest 100 fault events as specified shall be optimum requirement as in an operator point of view.</p>	<p>Accepted, Relay will interface with RTU, occurrence of events on relay will automatically transfer to RCC. Existing capacity i.e. numerical value of latest 1000 events on LCD display, revised as latest 8 events</p>				
35.	5.9.2	<table border="1" data-bbox="283 1380 772 1526"> <tr> <td data-bbox="283 1380 525 1526">HV incoming supply healthy indication (for each phase)</td> <td data-bbox="525 1380 772 1526">Red</td> </tr> </table>	HV incoming supply healthy indication (for each phase)	Red	<p><u>M/S ALIND</u></p> <table border="1" data-bbox="907 1412 1474 1526"> <tr> <td data-bbox="907 1412 1218 1526">HV incoming supply healthy indication (for each phase)</td> <td data-bbox="1218 1412 1474 1526">Red (R phase), Yellow (Y phase)& Blue (B phase)</td> </tr> </table> <p>For easy identification</p>	HV incoming supply healthy indication (for each phase)	Red (R phase), Yellow (Y phase)& Blue (B phase)	<p>Accepted Different colour of LEDs for each phase will provide discrimination amongst the incoming phases</p>
HV incoming supply healthy indication (for each phase)	Red							
HV incoming supply healthy indication (for each phase)	Red (R phase), Yellow (Y phase)& Blue (B phase)							

525961/2021/O/o PED/TI/RDSO

	5.11.2	<p>The size of wires in the meter and relay circuits connected to the current transformers shall not be less than 4 sq.mm copper and in potential and other circuits not less than 2.5 sq. mm copper.</p>	<p><u>M/s APPSIL, Lucknow</u></p> <p>The size of wires in the meter and relay circuits connected to the current transformers shall not be less than 2.5 sq.mm copper and in potential and other circuits not less than 1.5 sq. mm copper.</p> <p>Supporting note: Older Electro-Mechanical relays are of high burden however burden of Numerical Relays is very low hence 1.5sqmm copper wire will meet all requirements of RDSO.</p> <p>Additionally 4sqmm cable provided between CT to terminal block of C&R panel because of longer lengths, Additionally note that further 2.5sqmm wire is used to connect Numerical relays/digital meters inside C&R panel as these wire length will be negligible. Similarly, multicore 2.5sqmm cables provided from field equipment to C&R terminal block for other control circuit further 1.5Sqmm cable used for control circuit wiring inside the panels. The modern numerical relays / meters are suitable for 1.5 sq.mm terminations only.</p>	<p>Not accepted The existing size of wires are already being used in control and relay panel with numerical relays in Indian Railways. The auxiliary power requirement of CB is approx. 1000 watt at 110 V DC, the 1.5 sq. mm copper wire is suitable.</p>
36.	5.11.7	<p>TEST TERMINAL BLOCK (TTB)</p> <p>It is to be developed in a such way that when testing kit is connected to the TTB (testing jack), relay connections will get disconnected from main circuit automatically and connected to testing circuit. After testing and removal of testing kit from TTB (jack), relays will get reconnected to main circuit automatically. The relay and panel wiring to be compatible to each other so that the testing of the relay can be done without removal of Numerical Relay from the panel and disturbing the connection in the panel and back panel of the relay.</p>	<p><u>M/s APPSIL, Lucknow</u></p> <p>Automated test switch</p> <p>It is to be developed in a such way that when testing kit is connected to the Test switch (testing jack), relay connections will get disconnected from main circuit and CT terminal towards field will be shorted automatically and connected to testing circuit. After testing and removal of testing kit from TTB (jack), relays will get reconnected to main circuit automatically. The relay and panel wiring to be compatible to each other so that the testing of the relay can be done without removal of Numerical Relay from the panel and disturbing the connection in the panel and back panel of the relay.</p> <p>Supporting note: Automated CT shorting toward field will</p>	<p>Accepted and permitted both option i.e. test terminal block or Automated test switch. While test kit connected to TTB/Test switch, the CT terminal toward field will be shorted is also incorporated in the final draft.</p>

525961/2021/O/o PED/TI/RDSO

			ensure the safe & flawless testing environment and remove the human errors.	
37.	5.11.7.4	If one test block is not sufficient, two test blocks shall be provided to accommodate all CT/PT wiring as per requirements and specifications.	<u>M/s APPSIL, Lucknow</u> If one test block is not sufficient, two test blocks shall be provided to accommodate all CT/PT and trip output wiring as per requirements and specifications.	Not accepted This para is related to test terminal block. Trip output is no relevance with test terminal block.
38.	5.11.7.5	All protective relays fed with CT/PT shall be provided with test terminal blocks.	<u>M/s APPSIL, Lucknow</u> All protective relays fed with CT/PT and trip outputs shall be provided with test terminal blocks.	Not accepted This para is related to test terminal block. Trip output is no relevance with test terminal block.
39.	5.13.2	The interior and central corridors of control panel shall be adequately illuminated by 240V ac, 20-watt CFL"s. The central corridor CFL shall be controlled by door operated switches provided on the doors on either side of the corridor and others lamps shall be controlled by ON/OFF switches provided inside the panel.	<u>M/S ALIND</u> The interior and central corridors of control panel shall be adequately illuminated by 240V ac, 9-watt LED's. The central corridor CFL shall be controlled by door operated switches provided on the doors on either side of the corridor and others lamps shall be controlled by ON/OFF switches provided inside the panel. CFL replaced with LED	Accepted as LED is more energy efficient and longer life as compared to CFL
40.	6.1.2	The enclosure class of module/relays shall be IP 54 as per IEC 60529 The relays shall be of the draw-out (Plug-in), switch board type, back - connected and suitable for semi-flush or flush mounting, with dust-tight covers in dull black enamel finish. The enclosure class of module/relays shall be IP 54 as per IEC 60529	<u>M/S ASHIDA</u> The enclosure class of module/relays shall be IP 52 as per IEC 60529 IP 52 is sufficient as panel are in door type <u>M/s SIEMENS</u> The relays shall be of the draw-out / with pluggable card type (Plugin), switch board type, back - connected and suitable for semi-flush or flush mounting, with dust-tight covers in dull black enamel finish. The enclosure class of module/relays shall be IP 51 as per IEC 60529. Since relays are mounted in panel in indoor TSS, IP51 shall be accepted. Also non drawout relays with plug in card feature shall be accepte	1. Since relays are mounted in panel and panel install indoor TSS, the enclosure class IP51 for relay is accepted. 2. The comments of M/s SIEMENS is accepted. The draw out features of relays facilitates quick replacement of relays without removing of wire terminations from relays in case the relay becomes faulty. As frequent replacement of the relays are generally not required in the field, it is required during fault in the relay, hence, non-draw-out type relays may be accepted to attract more vendors.
41.	6.1.3	The numerical relays shall have in built contact multiplication relays for alarm and trip conditions of transformer and CBs. It shall be ensured that adequate numbers of auxiliary contacts for	<u>M/s APPSIL, Lucknow</u> The numerical relays shall have in built contact multiplication relays for alarm and trip conditions of transformer and CBs. It shall be	Not accepted Requirement of BI & BO depends on number of protection and monitoring function implemented in the module. It may vary from relay to relay. The

525961/2021/O/o PED/TI/RDSO

		indication, control, monitoring and tele-signaling functions are available.	ensured that adequate numbers of auxiliary contacts for indication, control, monitoring and tele-signaling functions are available. Each numerical relay shall be provided with atleast 9 BI & 14 BO.	vendor is free to use suitable number of BI & BO to meets functional requirements of relay.
42.	6.1.5	The relays shall conform to the test as per IEC tests as mentioned in clause 8.1.5.1	M/S ALIND The relays shall conform to the tests as per Latest IEC/IS standards as mentioned in clause 1.5.1 Typo error	Accepted and corrected as "The relays shall conform to the tests as per Latest IEC/IS standards as mentioned in clause 8.1.5.1. Further a reference IS 17064 added in clause 8.1.5.1 for Electromechanical relay.
43.	6.1.8	The relay manufacturer shall study the effect of harmonics present in the existing Railway traction supply system and its effect on the relay pick up values & operating time of the relay and suitable methodology shall be adopted to eliminate the effect of harmonics	M/S SIEMENS we request for data of harmonics present in system so that its effect on relays can be checked	Accepted, Typical harmonic present in the traction current is given at clause no. 2.4.2 of specification. The existing para modified as "typical percentages of harmonics present in the traction current is given in clause 2.4.2. The effect of the same on the relay pick up values & operating time and suitable methodology shall be adopted to eliminate the effect of harmonics"
44.	6.1.10	The numerical protection relays except integrated feeder protection module should have facility to record at least 50 cycles (45 prior to and 5 after fault sensing) of fault waveforms. At a time up to 20 fault such waveforms for currents & voltage shall be storable and shall be retrievable through USB port (or any other superior type) through a Laptop computer.	<u>M/s APPSIL, Lucknow</u> The numerical protection relays except integrated feeder protection module should have facility to record at least 3 seconds (1s prior to and 3s after fault sensing) of fault waveforms & shall supports 100 such records and retrievable through USB port (or any other superior type) through a Laptop computer. The Distance and Transformer numerical protection relays must support min 40 analog input channels and 300 binary inputs Channels for Disturbance recording. Supporting Note: The recording of disturbance for a longer period provides detailed understanding of the event.	<ol style="list-style-type: none"> 1. The comments of M/s APPSIL for increasing disturbance record time to 4 sec. in place of 50 cycles is not required to incorporate in final draft specification as existing disturbance record time i.e. at least 50 cycles (45 prior to and 5 after fault sensing) of fault waveforms is sufficient and working satisfactorily. Further 45 cycles recording prior to actual fault is good enough to analyze the fault. 2. The storage of 100 numbers of fault records in the relay is not much beneficial as relay will interface with SCADA, disturbance data recorded by relay on occurrence of fault will transfer automatically to RCC, hence not accepted. 3. The firm suggestion i.e. "Distance and Transformer numerical protection relays must support min 40 analog input

				<p>channels and 300 binary inputs Channels for Disturbance recording” is not accepted as number of analog and binary input depends on number of protection function integrated in single module. Vendor is free to select suitable number of analog and binary input for meeting functional requirement of specification.</p> <p>4. The words “except feeder protection module” is deleted as capacity disturbance record should be same.</p>
			<p><u>M/S SIEMENS</u> 8 waveform records for current/voltage shall be storable. Duration of each record shall be 50 cycles (1 sec). Since relays are connected to SCADA DR /waveform can be transferred to SCADA immediately after occurrence. Hence 8 DR capacity can be acceptable. Request to consider</p>	<p>The comment of M/s Siemens i.e. 8 waveform records for current/voltage is accepted as relays are connected to SCADA, disturbance record (DR) /waveform can be transferred to SCADA immediately after occurrence.</p>
			<p><u>M/S ALIND</u> The numerical protection relays except integrated feeder protection module should have facility to record at least 50 cycles (45 prior to and 5 after fault sensing) of fault waveforms. At a time up to 100 fault such waveforms for currents & voltage shall be storable and shall be retrievable through USB port (or any other superior type) through a Laptop computer. For the sites where overloads and tripping are more, 20 no. DRs will be very small as it will overwrite in less period of time. Even though the DRs are saved in SCADA server, for local analysis a minimum number of DRs (at least for a month shall be available in relay memory itself.</p>	<p>The comment of m/s Alind for the storage of 100 numbers of fault records in the relay is not much beneficial as relay will interface with SCADA, disturbance data recorded by relay on occurrence of fault will transfer automatically to RCC, hence not accepted.</p>
45.	6.1.12	The numerical relay manufacturers shall provide full support for up gradation of the software time to time to maintain the satisfactory performance throughout the useful life of the relay.	<p><u>M/S ALIND</u> The numerical relay manufacturers shall provide full support for up gradation of the software time to time to maintain the</p>	<p>Accepted, the word based on site conditions/requirement is added in the para.</p>

525961/2021/O/o PED/TI/RDSO

			satisfactory performance throughout the useful life of the relay based on site conditions/ requirement. Based on customer feedback	
46.	6.1.14	The numerical relays shall be capable of storing minimum 1000 events serially with date and time stamp of 1ms accuracy. The events definitions shall be configurable and generally include tripping of different protection elements, auxiliary relay operations, trip circuit monitoring etc. The events shall be retrievable through an external laptop/PC.	M/S ALIND The numerical relays shall be capable of storing minimum 5000 events serially with date and time stamp of 1ms accuracy. The events definitions shall be configurable and generally include tripping of different protection elements, auxiliary relay operations, trip circuit monitoring etc. The events shall be retrievable through an external laptop/PC. As per the latest SCADA specification/ requirement, number of Tags are much more as many information will be passed to SCADA on every Trip event like PICK UP ACTED/ RELEASED, TRIP ACTED/ RELEASED, MTR OPERATED/RELEASED, BREAKER TRIP ACTED/ RELEASED, BREAKER CLOSE ACTED/ RELEASED etc. For keeping events for at least last one month data, relay shall store at least 5000 events as per the previous specifications.	Not accepted as, Numerical relays will interface with SCADA system. The events recorded by relays will transfer to RCC through SCADA automatically
47.	6.1.16	The numerical relays shall be compact in nature and every effort shall be made to minimize the hardwiring within the relays and maximum components shall be on the PCB's. The SMT (surface mounted technology) PCB's shall only be used.	M/S ALIND The numerical relays shall be compact in nature and every effort shall be made to minimize the hardwiring within the relays and maximum components shall be on the PCB's. Effort shall be made to implement SMT(surface mounted technology) PCB's wherever possible. All components are not available in SMT packages as it includes Trip relays also.	Accepted as, Some component like transformers, auxiliary relay etc. is not possible to assemble on PCB through SMT.
48.	6.1.19	Numerical relays shall have backlit LCD display adequate size of size at least 20 x 4 LCD characters for display of relay status, settings etc. Bright LEDs shall be used for display of power ON conditions and trip indications of each relay element. The parameters of the module shall be settable through a membrane	<u>M/s APPSIL, Lucknow</u> Numerical relays shall have backlit LCD display adequate size for display of relay status, settings etc. Minimum 15 nos. of bright LEDs shall be used for display of power ON conditions and trip indications of each relay element. The parameters of the module shall	Not accepted as, Number of LEDs indication depends on number of protection and monitoring functions integrated in a single module.

525961/2021/O/o PED/TI/RDSO

		keypad.	be settable through a membrane keypad.	
49.	6.1.19	Numerical relays shall have backlit LCD display adequate size of size at least 20 x 4 LCD characters for display of relay status, settings etc. Bright LEDs shall be used for display of power ON conditions and trip indications of each relay element. The parameters of the module shall be settable through a membrane keypad.	<u>M/S ALIND</u> Numerical relays shall have backlit LCD display of size at least 20 x 4 LCD characters for display of relay status, settings etc. Bright LEDs shall be used for display of power ON conditions and trip indications of each relay element. The parameters of the module shall be settable through a membrane keypad. As more online parameters are coming for major relays, Decreasing the display size/ number of characters shall cause difficulties in showing all online parameters in the display as per specification.	Not accepted as, Number of characters on LCD display shall be suitably decided by particular manufacturers to meets functional requirement of relays as per this specification
50.	6.1.23	At present SCADA system is available for Railway traction application hence for its full utilization in controlling/ monitoring of protection system, numerical relays shall be capable of communicating with the RTU based on standard IEC 60870-5-103 or IEC 61850 or both protocols for transfer of information stored in relays to the RTU. The relay shall have necessary hardware and firmware interface for this purpose.	<u>M/s APPSIL, Lucknow</u> At present SCADA system is available for Railway traction application hence for its full utilization in controlling/ monitoring of protection system, numerical relays shall be capable of communicating with the RTU based on standard IEC 60870-5-103 and IEC 61850 or both-protocols for transfer of information stored in relays to the RTU. The relay shall have necessary hardware and firmware interface for this purpose. The Distance & Transformer Protection IEDs must have suitable provision for Ethernet Ports on the rear side upto 4 ports to meet current application requirement and future application requirements without need to replace the Protection IEDs.	Not accepted as 1. Or option is given to provide flexibility to manufacturer to develop relays for any one protocol or both. Their approval will be accorded accordingly. 2. Requirement of ports shall be decided by the particular manufacturers to meets functional requirements of relays.
51.	1.2 / 1.5 / 5.2.8/6.1.23	Relay /RTU shall support IEC103 or IEC 61850 or Both	<u>M/S SIEMENS</u> Relay shall support connectivity with RTU on either IEC103 or IEC61850 Relay can support any 1 protocol	Not accepted as, Vendor is free to develop any one protocol or both in the same module. Their approval will be accorded accordingly
52.	6.1.24	Suitable password protection shall be provided on the relays to avoid unauthorized changes in the relay settings.	<u>M/s APPSIL, Lucknow</u> Suitable password protection shall be provided on the relays to avoid unauthorized changes in the relay settings. The Distance and Transformer Protection IED shall support IEC	Not accepted as, There is no direct link with outside network, protection relays are used in IR, interfaced with RTU for transferring events and disturbance to RCC. The adequate care has

			<p>62351-8, and provide a full NERC-CIP (Critical Infrastructure Protection) level 5 cyber security compliance, including:</p> <p>a. Role based user authority and password management.</p> <p>b. Centralized user authority and password management support</p> <p>c. Cybersecurity-related logged events (user log-in; log-in unsuccessful; password changes, etc.)</p> <p>We request you to include Cyber Security requirements defined in IEC 62351-8 for Control & Relay Panels.</p>	<p>been taken in SCADA system against cyber-attacks</p>
			<p>M/S ASHIDA</p> <p>At present SCADA system is available for Railway traction application hence for its full utilization in controlling/ monitoring of protection system, numerical relays shall be capable of communicating with the RTU based on standard IEC 60870-5-103 or IEC 61850 or both protocols for transfer of information stored in relays to the RTU. IEC61850 protocol is not required.</p>	<p>Not accepted: Refer RDSO's remark for para 1.2</p>
53.	6.1.26	<p>The module shall also be capable to display I, V, Z, R, X Phase angle & fault clearing time (wherever applicable) of latest 20 faults at relay LCD of adequate size. The CTs & PTs provided at TSS may have different ratio's, hence to display the actual value (line value) of I, the CT primary current shall be settable</p>	<p><u>GE T&D India Ltd.</u></p> <p>Relay can Store at a time upto 15 Fault Records inside the relay memory. However, these can be extracted to Dedicated Laptop/PC or Remote Workstation/SCADA for further backup and also Logic nodes of Fault records are designed accomodate IEC61850 standard and same can be made available to SCADA as and when fault triggered in the relay. Fault record is used to get the first hand information about the fault once there is a fault, which can be read from the LCD display by the operator. From our long experience, even a backup of 5 Numbers of fault records enough for further analysis and investigation purpose as this is required only during the occurrence of fault and required for the operator to get an</p>	<ol style="list-style-type: none"> 1. If V, I and its angle are available all other values like R, X and Z are derived quantities. It is pertinent to mention that these records can also be easily obtained from the disturbance record (which is planned to be stored in RCC). Therefore, for display on relay the electrical parameters like V, I, phase angles and either R, X, Z or distance or Z and its angle is accepted. 2. The number of faults for displaying different parameters is reduced to 8 in line with disturbance record stored in the relay reduced to 8. (Para 6.1.10 of Reasoned Document)

			<p>information of fault. Otherwise all the information available in Disturbance recorder which we are complying as per the specification.</p> <p>Fault Data like Prefault Voltages/Current, Post fault Voltages/Current, Start, Trip Signals, Fault time, Fault location details are available in Fault record.</p> <p>Data like Z, R and X are not available as there data derivatives of primary data Voltage and Current Vectors, along with the fault angle which is already available in Fault record data. Moreover, instead R & X, relay directly displays the fault location in terms of km or ohms or % of line length as required which is more relevant for analysis.</p>	
			<p><u>M/S SIEMENS</u></p> <p>The module shall also be capable to display current and voltage of all phases, fault clearing time, Distance , fault date and time of latest 20 fault at relay LCD . R , X and Z value is not displayed since relay directly displays the distance to fault</p>	
			<p><u>M/s APPSIL, Lucknow</u></p> <p>The module shall also be capable to display I, V, Z, R, X Phase angle & shall be possible to calculate fault clearing time from the list of events (wherever applicable)</p> <p>Supporting Note: Fault clearing time helps in analysing events/ incidents.</p>	<p>Noted, Display of fault clearing time on relay LCD is already specified in existing para. Hence, no need to change the existing para.</p>
			<p><u>M/S ALIND</u></p> <p>The module shall also be capable to display I, V, Z, R, X Phase angle & fault clearing time (wherever applicable) of latest 100 faults at relay LCD of adequate size. The CT's & PTs provided at TSS may have different ratio's, hence to display the actual value (line value) of I, the CT primary current shall be settable.</p> <p>For the sites where overloads and tripping are more, 20 no. DRs will be very small as it will</p>	<p>Not accepted as, There is no need to store large numbers of fault parameters in relay memory, the relay will interface with RTU for transferring these parameters to RCC. The number of faults for display its parameters on relay LCD is further to 15.</p>

525961/2021/O/o PED/TI/RDSO

			<p>overwrite in less period of time. Even though the DRs are saved in SCADA server, for local analysis a minimum number of DRs (at least for a month shall be available in relay memory itself.</p>	
54.	6.1.27	<p>a. Current carrying capacity- 5 Amps Continuously at 110 V DC/ 230 V AC</p> <p>b. Making & carry 250 V ac, 50 Hz for 3 seconds: 30 Amps</p> <p>c. Breaking: 220V, 50-60 Hz Cos ϕ 0.4: 5A 220 V dc, L/R = 45 milli sec :0.5 A</p>	<p><u>M/s APPSIL, Lucknow</u></p> <p>a. Current carrying capacity- 5 Amps Continuously at 110 V DC/ 230 V AC</p> <p>b. Making & carry 250 V ac, 50 Hz for 200 milli seconds: 30 Amps</p> <p>c. Breaking: 220V AC, 50-60 Hz Cos ϕ 0.4: 8A 110 V dc, L/R = 40 milli sec : 0.4A 220 V dc, L/R = 40 milli sec :0.2 A</p> <p>Supporting Note: With Electro-Mechanical Relays there was a need for increased current rating for making and breaking for a longer period of time however with present Numerical Relays / IEDs and static relays used for auxiliary purpose, higher currents is not required.</p>	Accepted, The rating of contact corrected as per IEC 60255- 1.
55.	6.1.27 iv a)	Making capacity of contact shall be 30A for 3 sec	<p><u>M/s SIEMENS</u></p> <p>Making capacity of contact shall be 30A for 0.2 sec Relays are designed ,developed and tested as per global standard IEC60255. relays with recommended contact rating are already being used by various customer across the globe. Clause 1.2.12.1 specifies 200 msec as ON time for making capacity test. It means contact shall be rated for 30A for 0.2 sec</p>	
56.	6.1.27 iv (c)	Breaking capacity of contact shall be 1. 5A for 220V, 50-60 Hz Cos ϕ 0.4 and 0.5 A for 220 V dc, L/R = 45 milli sec	<p><u>M/s SIEMENS</u></p> <p>Breaking capacity of contact shall be 30 W at L/R = 40 ms for 220Vdc Relays are designed ,developed and tested as per global standard IEC60255. relays with recommended contact rating are already being used by various customer across the globe. Clause 1.2.12.1 specifies 200 msec as ON time for making</p>	

525961/2021/O/o PED/TI/RDSO

			capacitance test. It means contact shall be rated for 30A for 0.2 sec	
57.	6.1.27 (3)	IEC 60255 -27	<u>M/S ASHIDA</u> IEC 60255 -26	Accepted as suggested IEC is correct.
		6.1.27 The relays shall generally conform to following standards 4.a Current carrying capacity 5 Amps Continuously at 110 V DC/ 230 V AC	<u>M/s APPSIL, Lucknow</u> 6.1.27 The relays shall generally conform to following standards 4.a Current carrying capacity 5 Amps Continuously at 110 V DC/ 230 V AC As per IEC 60255-1 subclause 6.11 Contact current: Continuous ≥ 5 A, Short time ≥ 30 A, 200 ms The duty cycle for the short time rating shall consist of the sequence 200 ms on, 15 s off We request you to amend the technical specification as per relevant IEC standard.	Refer RDSO's remark for para 6.1.27
		6.1.27 The relays shall generally conform to following standards High Frequency Disturbance IEC 60255 -27 Longitudinal mode 2.5kV, 1 Mhz across auxiliary dc and current/voltage sensing terminals an earth. Transverse mode 1 kV, 1 MHz across auxiliary dc and current/voltage sensing terminals.	<u>M/s APPSIL, Lucknow</u> 6.1.27 The relays shall generally conform to following standards High Frequency Disturbance IEC 60255 -27 Longitudinal mode 2.5kV, 1 Mhz across auxiliary dc and current/voltage sensing terminals an earth. Transverse mode 1 kV, 1 MHz across auxiliary dc and current/voltage sensing terminals. High Frequency Disturbance Tests as per IEC60255-26 subclause 6.3 Damped oscillatory wave test - As per IEC 60255-26 subclause 6.3 Voltage oscillation frequency - 1 Mhz Test level Differential mode - 1 kV Common mode-2.5 kV We request you to amend the technical specification as per relevant IEC standard.	Accepted as suggested IEC is correct.
		6.1.27 The relays shall generally conform to following standards 4b. Making & carry 250 V ac, 50 Hz for 3 seconds: 30A	<u>M/s APPSIL, Lucknow</u> 6.1.27 The relays shall generally conform to following standards Making & carry 250 V ac, 50 Hz for 3 seconds: 30A	Refer RDSO's remark for para 6.1.27

525961/2021/O/o PED/TI/RDSO

			As per IEC 60255-1 subclause 6.11 Making & carry 250V ac , 50 ≥1 000 W at L/R = 40 ms We request you to amend the technical specificaiton as per relevant IEC standard.	
		6.1.27 The relays shall generally conform to following standards 4c Breaking: 220V, 50-60 Hz Cos \emptyset 0.4 - 5A 220 V dc, L/R = 45 milli sec - 0.5A	<u>M/s APPSIL, Lucknow</u> 6.1.27 The relays shall generally conform to following standards 4c. Breaking: As per IEC 60255-1 subclause 6.11 220V AC, 50-60 Hz Cos \emptyset 0.4: 8A 110 V dc, L/R = 40 milli sec : 0.4A 220 V dc, L/R = 40 milli sec :0.2 A We request you to amend the technical specificaiton as per relevant IEC standard.	Refer RDSO's remark for para 6.1.27
58.	7.1 (I)	Relays shall confirm IEC tests as mentioned in clause 8.2.1.1 (xiv).	M/S ALIND Relays shall confirm IEC tests as mentioned in clause 8.2.1.1 Typo error	Accepted
59.	7.2.1 & 7.2.2	7.2.1 The complete protection of transformer shall generally be covered in three numerical relays. Two relays shall cover the entire protective functions of the traction transformer primary and secondary sides as detailed below. (i) Earth Fault relay (EF) with Instantaneous and IDMT curves. (ii) Instantaneous OCR (only for primary side). (iii) IDMT OCR with additional elements of 3 stage independent current and time settable definite time over current relays with enable/disable facility (iv) CB trip circuit supervision relays. (v) Contact multiplication function for CB AP/GP low alarm, AP/GP low trip & lockout. (vi) Other transformer auxiliary alarm relay contact multiplication function. 7.2.2 Third relay shall cover the differential protection along with transformer auxiliary trip relay contact multiplication functions.	M/S ALIND 7.2.1 The complete protection of transformer shall generally be covered in minimum number of numerical relays. Relays shall cover the entire protective functions of the traction transformer primary and secondary sides as detailed below. (i) Earth Fault relay (EF) with Instantaneous and IDMT curves. (ii) Instantaneous OCR (only for primary side). (iii) IDMT OCR with additional elements of 3 stage independent current and time settable definite time over current relays with enable/disable facility (iv) CB trip circuit supervision relays. (v) Contact multiplication function for CB AP/GP low alarm, AP/GP low trip & lockout. (vi) Other transformer auxiliary tripping relay with contact multiplication functions. (vii) Differential Protection Relay For scott connected transformer, more	Not accepted The clubbing of Differential protection with IDMT OCR leads failure of differential, IDMT OCR & REF protection simultaneously on the event of any fault in the relay .

525961/2021/O/o PED/TI/RDSO

			number of relays required for protection (Considering main & teaser windings).	
60.	7.2.1	The complete protection of transformer shall generally be covered in three numerical relays. Two relays shall cover the entire protective functions of the traction transformer primary and secondary sides	M/S ASHIDA The complete protection of transformer shall generally be covered minimum Number of numerical relays for traction transformer primary and Secondary sides as detailed below. More relays are required for protection of T and M winding of transformer.	
61.	7.2.2	Third relay shall cover the differential protection along with transformer auxiliary trip relay contact multiplication functions.	M/S ASHIDA Differential protection along with transformer auxiliary trip relay contact multiplication functions.	
62.	7.2.3	e. Pressure relief device with alarm and trip contacts.	M/S ALIND e. Pressure relief device with trip contacts. Pressure relief device tripping only provided	Accepted as, There is no alarm contact is available for PRD trip.
63.	7.3.1	e. Adjustable bias setting shall also be provided. The bias at minimum operating current setting shall be 10 to 50% in steps of 5% to suit the tapping range of the traction transformer and other design considerations.	<u>M/s APPSIL, Lucknow</u> e. Adjustable bias setting shall also be provided. The bias at minimum operating current setting shall be 10 to 50% in steps of 5% to suit the tapping range of the traction transformer and other design considerations or The restrained area shall contain three sections. The first section shall have the constant operating level independent of the bias current; the remaining two sections shall have settable slopes. The start of first section can be settable from 20% to 130% of the rated current , the start of second section can be settable from 100% to 800% of the rated current, the slope between section 1 & section 2 shall be settable with range of 10% to 50% in step of 1% of bias restraint characteristic. The slope beyond section 2 shall be settable with a range of 30% to 100% in steps of 1% of bias restraint characteristics.	1. Point-e accepted as both feature serve the transformer differential protection requirement. 2. Point-f is not accepted as REF protection is provided which cover protection upto switchyard CT.

525961/2021/O/o PED/TI/RDSO

			<p>f. Differential protection Extended Differential protection covering upto Switchyard CTs of HV & LV to be offered.</p> <p>Supporting Note: e. As per CIGRE Technical Brochure 463 slope characteristics can either be starting from origin or from a fixed value , both methods provide equal protection to the transformer.</p> <p>f. Since it is a un-earthed system, extended differential protection will ensure the protection cover till switchyard CTs. Request you include either as part of the same Differential relay with dedicated CT inputs OR with standalone relay.</p>	
64.	7.3.1	d. The current setting of the relay shall be adjustable, preferably between the range of 5% and 80% in steps of 5% or less. The minimum current setting shall be as low as possible to obtain better sensitivity.	<p><u>M/S SIEMENS</u></p> <p>d. The current setting of the relay shall be adjustable, preferably between the range of 10% and 200% in steps of 5% or less. The minimum current setting shall be as low as possible to obtain better sensitivity. Request to consider relay with 10-200% setting which is general setting for differential relay</p>	Accepted as, Differential current setting is generally set at 30%. 5% setting is not required to set on the relay in the field. The setting range corrected as 10 to 200% in steps of 5%
65.	7.3.2	Protection against internal earth faults within the transformer shall be provided by means of a sensitive, high speed, earth leakage instantaneous relay of very low pick up current. Such relays shall be provided separately of both the primary and secondary sides of the transformer. The current setting for this relay shall be adjustable between 2% and 40% of 5 Amps in step of 1%. The operating time of the relay shall not exceed 1.5 cycle for current of 5 times the relay setting.	<p><u>M/S SIEMENS</u></p> <p>Protection against internal earth faults within the transformer shall be provided by means of a sensitive, high speed, earth-leakage instantaneous relay of very low pick up current. Such relays shall be provided separately of both the primary and secondary sides of the transformer. The current setting for this relay shall be adjustable between 2% and 40% of 5 Amps in step of 1%. The operating time of the relay shall not exceed 2 cycle for current of 5 times the relay setting. Request to accept relay with operating time of 25 msec +/-10 msec for this function. Tolerance for different operating conditions to</p>	Accepted

525961/2021/O/o PED/TI/RDSO

			be considered.	
66.	7.3.3 (1)	TMS setting shall be from 0.01-1.0 instep of 0.01	<u>M/S SIEMENS</u> TMS setting shall be 0.025 to 1 in steps of 0.005. since instantaneous relay is being also used, IDMT relay with 0.025 TMS setting shaould be acceptable. Request to consider.	Accepted as, Lower setting 0.01 is not required in the field. The fine steps i.e. in steps of 0.005 is useful for better time coordination between various level of protection relays.
67.	-----	The differential and earth leakage relays (both on the primary and secondary sides) along with over-current relays on primary side shall cause inter-tripping of the HV and LV circuit breakers associated with the transformer. The intertripping of the associated transformer circuit breakers on HV and LV sides shall also be affected due to other f aults in the transformer, namely Buchholz trip, excessive winding temperature and excessive oil temperature trip. The IDMT over-current relay on the secondary side shall, however, trip the respective circuit breaker on LV side only. The inter-tripping of associated transformer circuit breakers envisaged above shall be affected through a high-speed tripping relay with hand reset contacts. Such inter-tripping relay shall lock out the closing of circuit breakers from all modes of closing commands viz. remote control, local control at the panel and also at the circuit breaker mechanism, until the inter-trip relay or the lock out relay (if provided separately), is reset manually.	<u>M/S ALIND</u> Repeated lines in 7.3.5	The clause 7.3.5.1 deleted and inter tripping of HV and LV with phase failure relay is modified as on tripping of phase failure relay, LV CB will trip only. The tripping of ITR needs manual reset of ITR relay. Phase failure relay is use for detection of pole discrepancy of circuit breaker, hence tripping of HV & LV CB with phase failure relay is not appropriate.
		4 nos. PTs are added at the output of LV breakers. Any unbalance in voltages of Traction and Feeder lines when the LV breaker is in closed condition shall be monitored. Voltage unbalance features in the relay will facilitate pole discrepancy or phase failure condition. i.e. $V1+V2=0$ (Vector sum) in balanced conditions. Trip $V1+V2\neq 0$ (Vector sum) if pole discrepancy/ any phase failure condition.	<u>GE T&D India Ltd.</u> In Scot connected /Autotransformer feed system with Catenary and Feeder Voltages ,The VTS feature of the IED operates on detection of one phase voltage lost and another is normal. This gives operation for the loss of one phase voltage.It is part of traction Catenary Protection itself. This techinques is more advantageous as it checks the healthiness of the other VT always rather than summing both operate based on differential	The protection of pole discrepancy will be provided with CB, hence this relay is not required and deleted.

525961/2021/O/o PED/TI/RDSO

			<p>voltage, which can happen due to many reasons.</p> <p>Moreover ,Logic can be made using Presence of one Voltage(V1) with absence of another Voltage(V2) with Boolean Logic in PSL. As this protection is not related to Transformer Protection ,we request to consider this logic in any of the IED mounted in the feeder panel.</p>	
			<p><u>M/ SIEMENS</u></p> <p>More clarification required about type of connection since it is not visible in SLD.</p>	
68.	7.4.4.1.6	<p>Setting Range and steps</p> <p>Forward Resistance (RF) 0.01 – 99.99 Ω in steps of 0.01 Ω</p> <p>Backward Resistance (RB) 0.01 – 99.99 Ω in steps of 0.01 Ω</p> <p>Forward Reactance (XF) 0.01 – 99.99 Ω in steps of 0.01 Ω</p> <p>Backward Reactance (XB) 0.01 – 99.99 Ω in steps of 0.01 Ω</p> <p>Angle (A1) 00 – 70 deg in steps of 1 deg</p> <p>Angle (A2) 00 – 70 deg in steps of 1 deg</p> <p>Zmin 0.01 – 99.99 Ω in steps of 0.01 Ω</p> <p>Relay Characteristic Angle 50 to 90 degree in steps of 1 degree</p>	<p><u>GE T&D India Ltd.</u></p> <p>With reference Draft SPECIFICATION NO. TI/SPC/PSI/PROTCT/5071(06/2014)</p> <p>OHE configuration Impedance</p> <ol style="list-style-type: none"> 1. One OHE without BT and RC 0.41 @70 Deg Ohms/km 2. Two OHEs without BT and RC 0.24 @70 Deg Ohms/km 3. One OHE with BT and RC 0.70 @70 Deg Ohms/km 4. Two OHEs with BT and RC 0.43 @ 70 Deg Ohms/km, <p>In realistic, even one km line will have line resistance of more than 100 milli ohms and Reach more than 400 milli ohm. For such values it is difficult to set impedance values and practically impossible to set and apply the distance protection relays.</p> <p>Kindly request to consider the minimum range .</p> <p>Setting Range and steps</p> <p>Forward Resistance (RF) 0.05 – 500 Ω in steps of 0.01 Ω</p> <p>Backward Resistance (RB) 0.05 – 500Ω in steps of 0.01 Ω</p> <p>Forward Reach (ZF) 0.05 – 750 Ω in steps of</p>	<ol style="list-style-type: none"> 1. Lower setting range 0.05 of XF, SB, RF, RB is accepted as 0.01 ohm setting is not required in the field. 2. Setting of Z (impedance) parameters in place of X (reactance) parameters is accepted as Z magnitude and its angle, as this is in terms of polar co-ordinate and R-X is in Cartesian co-ordinate system. Both setting can be permitted to attract more vendors. 3. Load Blinding Angle: 15 – 65 deg in steps of 1 deg in place of 0 – 70 deg in steps of 1 deg is accepted as this setting range meets functional requirement of distance protection required. 4. Relay characteristic angle setting of 20 to 90 deg. is not required, this angle are generally set at 70 deg in the field, hence not accepted.

525961/2021/O/o PED/TI/RDSO

			<p>0.01 Ω Backward Reach (ZB) 0.05 – 750 Ω in steps of 0.01 Ω Load Blinding Angle: 15 – 65 deg in steps of 1 deg Zmin 0.01 – 500 Ω in steps of 0.01 Ω Relay Characteristic Angle 20 to 90 degree in steps of 1 degree</p> <p>In addition to there is load deblocking setting based on undervoltage ,Load Blinder $V <: 1$ to 70V in steps of 500mV.This feature will help to clear the real fault evenside the load blinding region. Load Blinder is available in forward as well as reverse region ,to cater regenerative braking .</p>	
69.	7.4.4.1.8	The relay shall be blocked for operation in case 2nd harmonic component in current exceeds more than set value. The percentage of second harmonic for block the operation shall be settable from 5 to 20 % in steps of 1%.	<p><u>GE T&D India Ltd.</u> Settable from 10 to 100 % in steps of 5%.</p>	Accepted as second harmonic content in IR is generally set at 15%. The steps of fine setting of 2 nd harmonics is also not required.
70.	7.4.4.2	Over current relay Two stage over current relay (stage 1- instantaneous and stage 2- definite time) shall be provided. The current setting of OCR shall be settable individually in the range of 20% to 1000% in steps of 1%. The operating time of instantaneous OCR shall not be more than 25 ms. +/- 10 ms. at 2 times of set value. The operating time of stage 2 OCR shall be settable in the range of 1 sec to 900 sec in steps of 1sec. The operating value error of OCR shall not exceed + 5 %. The over current relay shall have also a feature to block trip command if 2nd harmonic component in current exceeds more than set value. Setting to enable/ disable the 2nd harmonic blocking function shall be provided for over current relay.	<p><u>GE T&D India Ltd.</u> Definite Time Range from 0 to 100s instep of 10ms, In case to Thermal Overload. Generally timer is set relatively small to take care of the thermal withstand time of the equipment to be protected.</p> <p>In addition, P44T relay also incorporates a current based thermal replica using load current to model heating and cooling of the protected plant. The element can be set with both alarm and trip stages. Thermal Overload Settings: Characteristic : Single/Dual Thermal Trip : 0.08*In to 4*In step 0.01In Thermal Alarm : 50% to 100% step 1% Time Constant: 1 to 200 step 1</p>	<p>1. Definite time range from 0 to 100 sec in steps of 10 ms is accepted. 2. Thermal over load protection can not be utilised in indian railway present feeding arrangements as single feeder CB feeds supply to multiple lines. However, for future use this protection is included in the specification</p>

525961/2021/O/o PED/TI/RDSO

			Time Constant: 1 to 200 step 1	
71.	7.4.4.5. 1	PTFF trip logic Conditions when PT voltage is less than the set value but the current is more than the set current, then PTFF trip contact shall be closed to trip the feeder CB, the operating time of PTFF trip element shall not exceed 30±10 ms. The PT voltage shall be settable in the range of 0 to 20 volts in steps of 1 volt and current shall be settable in the range of 0 to 5Amp in the steps of 0.1 Amp.	<p><u>GE T&D India Ltd.</u></p> <p>The relay is incorporated with advance PT Fuse failure using Superimposed current technology as mentioned below. If all phases voltages to the IED are lost, the logic of one phase lost shall not operate the VTS function. However, under such circumstances, a collapse of the all phases voltages occurs. If this is detected without a corresponding change in any of the phase current signals (which would indicate a fault), a VTS condition is raised. The IED detects the presence of superimposed current signals, which are changes in the current applied to the IED. These signals are generated by comparing the present value of the current with the value from one cycle previously. Under normal load conditions, the value of superimposed current should therefore be zero. Under a fault condition a superimposed current signal is generated which prevents operation of the VTS. To avoid blocking VTS due to changing load condition, the superimposed current signal can only prevent operation of the VTS during the time window of 40 ms following the voltage collapse. The phase voltage level detectors are fixed and drop off at 10 V and pickup at 30 V. The sensitivity of the superimposed current elements is fixed at 0.1 In.</p> <p>PTFF logic can also be made using the PSL (Programmable Scheme Logic) .</p>	Not accepted as, IR traction is a single phase system. The explanation is given for 3 phase system by GE & T&D. In place of giving comments on existing para, M/s GE T&D explained their own make feature of relays.
72.	----- ---	The numerical integrated feeder protection module should have facility to record (DR) at least 50 cycles (45 prior to and 5 after fault sensing) of fault waveforms. At a time, upto 100 20 fault waveforms (DR) for currents & voltage	<p><u>M/s APPSIL, Lucknow</u></p> <p>The numerical integrated feeder protection module should have facility to record (DR) at least 3 seconds (1s prior to and 3s after fault sensing) of fault waveforms & shall supports</p>	Already explained in clause no. 6.1.10, hence deleted.

525961/2021/O/o PED/TI/RDSO

		<p>shall be storable and shall be retrievable through USB port (or any other superior type) through Laptop computer.</p>	<p>100 such records and retrievable through USB port (or any other superior type) through a Laptop computer. Supporting note: The disturbance records upto 3 seconds with 100 such records will help to analyse fault in feeder protection module.</p>	
		<p>The numerical integrated feeder protection module should have facility to record (DR) at least 50 cycles (45 prior to and 5 after fault sensing) of fault waveforms. At a time, up to 100 20 fault waveforms (DR) for currents & voltage shall be storable and shall be retrievable through USB port (or any other superior type) through Laptop computer. The transmission of DR data from numerical relay shall be storable in COMTRADE format with suitable software tool. The DR file shall also be retrievable through SCADA on demand or automatically as soon as DR is generated. However, the relay will store latest fault waveforms of 20 events.</p>	<p><u>M/S ALIND</u> The numerical integrated feeder protection module should have facility to record (DR) at least 50 cycles (45 prior to and 5 after fault sensing) of fault waveforms. At a time, up to 100 fault waveforms (DR) for currents & voltage shall be storable and shall be retrievable through USB port (or any other superior type) through Laptop computer. The transmission of DR data from numerical relay shall be storable in COMTRADE format with suitable software tool. The DR file shall also be retrievable through SCADA on demand or automatically as soon as DR is generated. However, the relay will store latest fault waveforms of 100 events. For the sites where overloads and tripping are more, 20 no. DRs will be very small as it will overwrite in less period of time. Even though the DRs are saved in SCADA server, for local analysis a minimum number of DRs (at least for a month shall be available in relay memory itself.</p>	
		<p>The numerical integrated feeder protection module should have facility to record (DR) at least 50 cycles (45 prior to and 5 after fault sensing) of fault waveforms. At a time, upto 20 fault waveforms (DR)</p>	<p><u>M/S ASHIDA</u> The numerical integrated feeder protection module should have facility to record (DR) at least 200 cycles (195 prior to and 5 after fault sensing) of fault waveforms. At a time, upto 100 fault waveforms (DR) For better fault analysis, we recommend DR memory should be increase from 50 cycles to 200 cycles.</p>	
		<p>However, the relay will store latest fault waveforms of 20 events.</p>	<p><u>M/S ASHIDA</u> \However, the relay will store latest fault waveforms of 100 events.</p>	

525961/2021/O/o PED/TI/RDSO

			Minimum 100 faults are required for segregation of faulty section and testing of relay , 20 events are overlaps and cannot analyse the actual tripping fault wave form.	
73.	7.4.5	<p>7.4.5 Delta- I type fault selective relay</p> <p>7.4.5.1 Delta I Protection</p> <p>7.4.5.1.1 Principle of operation: The relay shall have following characteristics</p> <p>i. Threshold Detection of Vectorial difference of current from suitable base Characteristic(ΔI)</p> <p>ii. Polygonal characteristic with load blinding</p>	<p><u>GE T&D India Ltd.</u></p> <p>Reply: We understand that polygonal characteristic load blinding is an additional supervision for Delta-I Protection. Being Delta I, Protection is used to detect high impedance fault which is of resistive nature, it may restrict the coverage of high impedance fault which falls on the real load region. Hence in our opinion, there is should not any restriction on resistive side ,so that we can get maximum benefit in covering the high resistive fault. Also this Polygonal characteristic with load blinding is part of Distance Impedance Protection which is already available in Traction Catenary relay. In our proposed relay, Delta-I protection is provide as built in function of Traction Catenary relay along with Polygonal Characteristic with load Blinder.</p>	Not accepted as Delta-I and polygonal characteristic distance protection are independent characteristic. The polygonal characteristic DPR in Delta-I is included as backup to main DPR. Reactance blinder setting is included in the Deltal relay, it may useful to minimise falls operation of relay due to load current.
74.	7.5.1	7.5.1 IDMT over current relay 0.01 – 1(In steps of 0.01)	<p><u>GE T&D India Ltd.</u></p> <p>In real time situation ,the over current pickup settings will be set to full load current plus 20 to 25% margin ,full load of 0.01A in the secondary is un realistic .Kindly request to consider the minimum range. Available setting :0.025to 1(In Steps of 0.01)</p>	Accepted as lower setting 0.01 is not required in the field. The fine steps of settings useful for better time coordination between various level of protection relays.
			<p><u>GE T&D India Ltd.</u></p> <p>Kindly request incorporate the Wrong Phase Coupling ,Phanto Flash over and Train Start up protection feature which is most beneficial for Traction Application</p>	Not accepted as details and reason for including these protection is not mentioned. Further, these protection is not provided in existing 2x25kv ac traction used in Indian Railways.
			<p><u>GE T&D India Ltd.</u></p> <p>Traction IED P44T has below features as a integral part of the relay</p> <p>Distance zones, full-scheme protection</p> <p>Load blinder</p> <p>Delta-I Protection</p>	This is not terms as comments, firm explained the protection function integrated in their make relay

525961/2021/O/o PED/TI/RDSO

			<p>Wrong Phase Coupling Phanto Flashover Switch on to fault and trip on reclose Broken conductor (open jumper), used to detect open circuit faults Thermal overload protection Undervoltage protection stages Overvoltage protection stages Voltage transformer supervision Auto-reclose - shots supported (4)</p>	
			<p><u>GE T&D India Ltd.</u> Minimum Range of Overcurrent protection and Distance protection to consider with realistic system condition.</p>	Not accepted as, This comment is not understandable.
		TMS setting shall be from 0.01-1.0 instep of 0.01	<p><u>M/S SIEMENS</u> TMS setting shall be 0.025 to 1 in steps of 0.005. since instantaneous relay is being also used, IDMT relay with 0.025 TMS setting shaould be acceptable. Request to consider</p>	Accepted as lower setting 0.01 is not required in the field. The fine steps i.e. in steps of 0.005 is useful for better time coordination between various level of protection relays
75.	7.5.2	Capacitor OV relay shall have setting range of 100 to 200% with IDMT char	<p><u>M/S SIEMENS</u> Relay OV function shall have setting range of 5-200 V with DMT char and time setting of 0-20 sec it is general practice to use DMT based voltage protection since no co-ordination with upstream /downstream is required</p>	Not accepted as IDMT characteristic provides faster operation for higher voltage
76.	7.5.3	Capacitor UV relay shall have setting range of 20 to 90% with IDMT char	<p><u>M/S SIEMENS</u> Relay UV function shall have setting range of 5-200 V with DMT char and time setting of 0-20 sec it is general practice to use DMT based voltage protection since no co-ordination with upstream /downstream is required</p>	Not accepted as IDMT characteristic provides faster operation for sudden fall in voltage.
77.	8.1.1	Manufacturers developing only control and relay panel shall ensure that numerical protective relays and different mechanical relays to be provided in C&R panel shall be purchased from RDSO approved sources existing in latest RDSO's Vendor Directory of their make only. In this context, information regarding source/vendor of numerical relays / mechanical relays shall be	<p><u>M/S ALIND</u> Shall not be entertained</p> <p>If panel builders are supplying control & Relay panels by hiring relays from approved vendors, there may not be proper service support.</p>	The vendor who desire to develop control and relay panel, the protection relay shall also be developed by them. The existing para revised as " The first control and relay panel and protection relays developed as per this specification shall be type tested by RDSO"

525961/2021/O/o PED/TI/RDSO

		furnished in the QAP diligently.		
78.	-----	The Purchaser shall get conducted the type tests for the first order. The charges for various type tests shall be quoted separately and these charges shall be taken for evaluation. The purchaser reserves the right to conduct the entire type test or any of the type tests as considered necessary Type & Routine tests on protection relays and C & R panel.	<u>M/S ALIND</u> The Purchaser shall get conducted the type tests for the first order. The charges for various type tests shall be quoted separately and these charges shall be taken for evaluation. The purchaser reserves the right to conduct the entire type test or any of the type tests as considered necessary. Typo error	This clause is no relevance hence deleted
79.	8.1.5.1 (ii)	Insulation resistance test- should be 10 mega ohm or more between the electric circuit and earth with 1000 V.	<u>M/s APPSIL, Lucknow</u> ii. Insulation resistance test- should be 10 mega ohm or more between the electric circuit and earth with 1000 V. As per IEC60255-27 sub clause 10.6.4.4 The insulation resistance shall not be less than 100 MΩ at 500 V DC for equipment in a new condition. We request you to amend the technical specification as per relevant IEC standard.	Accepted as suggested IEC is correct for this test.
80.	8.1.5.1 (v)	Overload Test	<u>M/s APPSIL, Lucknow</u> V. Overload Test IEC60255-27 sub clause 10.6.5.3 Overcurrent: minimum 1 s overcurrent withstand should be 100 In; continuous withstand should be at least 4 In. Overvoltage: The equipment VT input circuits shall withstand overvoltages declared by the manufacturer, without damage, both continuously and for 10 s duration. We request you to amend the technical specification as per relevant IEC standard.	Accepted and corrected as Over current: minimum 1 s overcurrent withstand should be 100 In; continuous withstand should be at least 4 In. Overvoltage: Over voltage: The equipment VT input circuits shall withstand overvoltage 1.15 times continuously and 1.5 times for 10 seconds without damage
81.	8.1.5.1 (vi)	Impulse voltage withstand test applicable to test voltage class III.	<u>M/s APPSIL, Lucknow</u> vi. Impulse voltage withstand test applicable to test voltage class III. IEC60255-27 subclause 10.6.4.2.4.2 Impulse voltage withstand test applicable to test voltage Clause 3- 5KV We request you to amend the technical	Accepted as suggested IEC is correct for this test.

525961/2021/O/o PED/TT/RDSO

			specificaiton as per relevant IEC standard.	
82.	8.1.5.1 (vii)	Temperature rise test.	<u>M/s APPSIL, Lucknow</u> vii. Temperature rise test. This test is not available in IEC60255-1 , please delete the same after checking IEC60255-1	Not accepted as temperature rise limit is specified under clause 7.3 & 7.11 of IEC 60255-1-general fire hazards from over heating and fire.
83.	8.1.5.1 (xi)	Vibration test- as per IEC 60255-21-1, Clause-I-Frequency 10-150 Hz, acceleration 1gn in all 3 axis, 20 sweep @ 1 octave/minute.	<u>M/s APPSIL, Lucknow</u> xi. Vibration test / vibration endurance test- as per IEC 60255-21-1, Clause-I- Frequency 10-150 Hz, acceleration 1gn in all 3 axis, 20 sweep @ 1 octave/minute. "Test name can be vibration endurance test as specified in the standard" We request you to amend the technical specificaiton as per relevant IEC standard.	Accepted as correct name in IEC is mentioned vibration endurance test
84.	8.1.5.1 (xiv)	EM Compatibility tests a) 1 MHz burst immunity test as per IEC60255-26 & IEC61000-4-18: Common Mode: 2.5kV Differential mode: 1kV Duration: 2 sec	<u>M/s APPSIL, Lucknow</u> xiv. EM Compatibility tests a) 1 MHz burst immunity test as per IEC60255-26 & IEC61000-4-18: Common Mode: 2.5kV Differential mode: 1kV Duration: 2 sec Damped oscillatory wave test - As per IEC 60255-26 subclause 6.3 & IEC61000-4-18 Voltage oscillation frequency - 1Mhz Test level Differential mode - 1kV Common mode-2.5kV We request you to amend the technical specificaiton as per relevant IEC standard.	Accepted as suggested IEC is correct for this test.
85.	8.1.5.2	Routine tests The following tests on the protection relays shall be carried out during routine tests by Railways/ inspecting agencies at the manufacturer's works as per this specification. (i) Visual Checks (ii) Insulation Resistance (iii) Dielectric strength (iv) Setting range and Functional tests	<u>M/s APPSIL, Lucknow</u> Routine tests The following tests on the protection relays shall be carried out during routine tests by Railways/ inspecting agencies at the manufacturer's works as per this specification. (i) Visual Checks (ii) Insulation Resistance (iii) Dielectric strength (iv) Setting range and Functional tests Kindly note (II) Insulation Resistance & (III) Dielectric Strength will be covered in Type Test in line with relevant IEC standard. It is not required to be part of Routine Tests.	Not accepted as these tests are essential to ensure insulation level of product

