

Reasoned document for the final draft Specification no TI/SPC/PSI/PROTCT/6072 for Control and Relay Panel For 25 kV AC ~~2014~~
966812/2022/O/o PED/TI/RDSO
 including Numerical Type Protection Relays for Traction Transformer, OHE Protection, 25 kV Shunt Capacitor Bank and Transmission
 line for 25 kV AC TSS on Indian Railways.

CLAUSE NO.	CLAUSE, AS IT EXISTS IN RDSO SPECIFICATION/ STR	CLAUSE, AS IT SHOULD READ AFTER INCORPORATION OF COMMENTS/ SUGGESTION IN THE RDSO SPECIFICATION/ STR PROVIDED BY RESPECTIVE FIRMS	FIRM'S REMARKS	RDSO'S REMARKS
1.2	The RTU & communicable relays approved are 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.	<u>M/S ALIND</u> The RTU & communicable relays approved are communicating on IEC 60870-5-103 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.	Typo error.	Comment may be accepted as this is a typographical error.
5.2.2.5	The operation of distance protection relays, instantaneous over current relays, wrong phase coupling relays, PT fuse failure relays, Delta-I relays, Panto flash over, master trip, inter trip relay etc. for 25 kV individual feeders and relay healthy, auto reclose, lockout are also required to be telesignalled to RCC. In addition to above the numerical protection relays provided in the panel shall have number of other telesignals available (details of which shall be available in the relay catalogues/ design particulars). The	<u>M/S ASHIDA</u> Communication port of all the protection relays of IEC 60870-5-103 & IEC 61850 shall be wired separate terminal or Switch to interface with RTU. The Operation of all Protection Relays mapping addresses on IEC 60870- 5-103 & IEC 61850 shall be provided to communicate to RCC.	All the numerical relays have a feature to communicate digitally with SCADA, hard wired of each relay operation not required.	Comments may not be accepted. As per telephonic discussion with SSE/HWH and SSE/Nagpur, some of the SCADA system in their division provided as per old SCADA specification no. 0990 and still are in service. The SCADA systems which were provided as per old SCADA spc. No. 0990 is not featured to communicate digitally with numerical relays.

966812/2022/O/c PED/T/R/DSO	successful tenderer shall wire all circuits for protection of such numerical relay and terminate on separate terminal blocks, for inter-connection with RTU for future use.			The old SCADA system required hard wired (analog) interface to communicate the operation of relays to RCC. Hence, hard wiring of protection function in control and relay panel can not be removed till all the SCADA system in Indian railway capable to communicate digitally with numerical relays.
5.2.2.6	The failure of trip circuit shall be telesignalled to RCC. For this purpose, the successful tenderer shall provide necessary wiring and terminate it on terminal block for inter-connection with RTU.	<u>M/S ASHIDA</u> The failure of trip circuit shall be telesignalled to RCC. For this purpose, the successful tenderer shall provide necessary arrangement in Relay for inter-connection with RTU.		
5.2.2.7	Telesignal of low and high 110 volt DC control voltage.	<u>M/S ASHIDA</u> -----		
5.4.3	Digital type smart energy meter with accuracy class 0.2S or better shall be provided for two incomers.	<u>M/S ASHIDA</u> -----	Supply of Digital type smart energy meter is included in SCADA Spec. Shall be deleted in one of the Spec.	Comment may be accepted as smart energy meter is already included in SCADA specification no. TI/SPC/RCC/SCADA/0133. The para 5.4.3 deleted.
5.4.7	All circuits including the input modules of instruments shall be capable of withstanding at least 20% overload for 8 hours and 20 times for 3 second.	<u>M/S ASHIDA</u> All circuits including the input modules of instruments shall be capable of withstanding at least 20% overload for 8 hours and 20 times for 1 second. <u>M/S ALIND</u> All circuits including the input modules of instruments shall be capable of withstanding at least 20% overload for 8 hours and 20 times for 1 second.	ICTs are used for protection of overload. Meters for over load 20 times 3 sec is not regular available. As the leading manufacturers of meters like AE/ MECO/ SECURE/ RISHABH etc. were not having this rating (20In for 3sec), the spec shall be changed.	Comments may be accepted as per justification given by the firms.
5.9.2	* Trip circuit of CBs Unhealthy - Yellow	<u>M/S ALIND</u>	The facility is available with	A note may be added that "if, trip circuit

966812/2022/O/o PED/TI/RDSO		Shall be deleted.	numerical relay with LED and also window is available in Annunciator.	supervision function of circuit breaker is implemented in numerical relay and annunciation window for the same is provided, the LEDs for trip circuit of CBs unhealthy on the panel is not required". This will permit both options for trip circuit supervision through numerical relays or through auxiliary relay.
	*DC under / over voltage - Yellow	<u>M/S ALIND</u> Shall be deleted.	The facility is available with numerical relay with LED and also window is available in Annunciator.	Comment may be accepted as numerical relay for DC voltage monitoring is specified in para 5.7 of the specification. In place of LED, annunciation window for DC under/over voltage included in the specification.
5.12	Suitable rating MCB's as per IS/IEC 60898-1 of reputed make. make shall be provided in all potential circuits.	<u>M/S ALIND</u> Suitable rating MCB's as per IS/IEC 60898-1 of reputed make shall be provided in all potential circuits.	Typo error. Repetition of word "make".	Comment may be accepted as a typographical error.
6.2.4	The numerical relays shall have in-built contact multiplication relays for each protection and monitoring function. It shall be ensured that at least two (02) numbers of auxiliary contacts for each protection and monitoring function shall be available on the Relay for indication/annunciation and tele- signaling functions. The relay shall have sufficient no. of output contacts to meet the requirement. For external	<u>M/S ASHIDA</u> The numerical relays shall have in-built contact multiplication relays for each protection and monitoring function. It shall be ensured that at least two (02) numbers of auxiliary contacts for protection and monitoring function shall be available on the Relay. Sufficient Alarm contacts shall be available in the relay for Annunciation as mentioned in clause 5.5.3.	All the numerical relays have a feature to communicate digitally with SCADA, hard wired of each relay operation not required.	Comments may not be accepted as per telephonic discussion with SSE/HWH and SSE/Nagpur, some of the SCADA system in their division provided as per old SCADA specification no. 0990 and still are in service. The SCADA systems which were provided as per old

<p>966812/2022/O/o PED/IR/DSO</p>	<p>connection one NO contacts for each protection and one set of NO contacts to trip circuit breaker and one set of NO contacts for each protection and monitoring function shall be available for the purpose of telesignalling to RCC through SCADA and other for annunciation at control and relay panel.</p>			<p>SCADA spc. No. 0990 is not featured to communicate digitally with numerical relays. The old SCADA system required hard wired (analog) interface to communicate the operation of relays to RCC, hence, hard wiring of protection function in control and relay panel can not be removed till all the SCADA system in Indian railway capable to communicate digitally with numerical relays.</p>
<p>6.2.34</p>	<p>In case feeder breaker fails to clear the fault despite feeder protection relay giving trip command. At least 3 NO contact of LBB shall be available to trip upstream circuit breaker.</p>	<p><u>M/S ALIND</u> In case feeder breaker fails to clear the fault despite feeder protection relay giving trip command. At least 2 NO contact of LBB shall be available to trip upstream circuit breakers. If more circuit breakers are provided in the upstream side, more NO contacts shall be provided in terms of contact multiplication relays.</p>	<p>As per conventional 25kV Double Transformer TSS Layout, there is only 2 LV breakers.</p>	<p>Comment may be accepted in spite of justification given by the firm is not correct. Some TSS of 25KV traction system provided with 3 numbers of traction transformers. However, multiplication of LBB contact externally through auxiliary relay may be permitted, the existing para may be corrected as “In case feeder breaker fails to clear the fault despite feeder protection relay giving trip command. At least 2 NO contact of LBB shall be available to trip upstream circuit breakers. If more circuit breakers are provided in the upstream side, more NO contacts of LBB shall be</p>

966812/2022/O/o PED/TI/RDSO				provided in the C&R panel through externally contact multiplication relays.
7.2(iii)	The instantaneous element time shall be within 20 ms. at 1.5 times the setting value.	<u>M/S ALIND</u> The operating time of instantaneous OCR shall not be more than 25 ms ±10 ms at 2 times of set value.	Making common timing for feeder OCR with 7101 spec.	Comment may not be accepted. The operating time shall not be more than 25 ms ±10 ms at 2 times of set value is specified for Instantaneous OCR of feeder. However, in line to specification no. 7101-C&R panel of 2x25KV, this para may be corrected as “the instantaneous element time shall not be more than 25 ms. at 5 times the setting value.
7.2(vi)e.	Pressure relief device with alarm and trip contacts.	<u>M/S ALIND</u> Pressure relief device with trip contacts.	No alarm contacts are available for PRD in conventional 25kV single phase Transformers.	Comment may be accepted as per justification given by the firm.
7.3.1.1(iii)	The operating value errors of the relay shall not be more than + 5 % including for voltage input to the relay from 121 volts down to 11 Volts and current 1 to 60 Amps, the frequency variations of 48 to 52 Hz and temperature variation over the range —10 °C to +55 °C for normal environmental condition and —25°C to +55°C for special environmental condition.	<u>M/S ALIND</u> The operating value errors of the relay shall not be more than ± 5 % including for voltage input to the relay from 121 volts down to 11 Volts and current 1 to 60 Amps, the frequency variations of 48 to 52 Hz and temperature variation over the range —10°C to +55°C for normal environmental condition and—25°C to +55°C for special environmental condition.	Typo error	Comment may be accepted as a typographical error.
7.3.1.1(vi)	At least 3 NO contact of LBB shall be available to trip upstream circuit breaker.	<u>M/S ALIND</u> At least 2 NO contact of LBB shall be available to trip upstream	See remarks for point 11.6.	Comment may be accepted in spite of justification given by the firm is not correct. Some

<p>966812/2022/O/o PED/TI/RDSO</p>		<p>circuit breaker.</p>		<p>TSS of 25KV traction system provided with 3 numbers of traction transformers. However, multiplication of LBB contact externally through auxiliary relay may be permitted, the existing para may be corrected as “In case feeder breaker fails to clear the fault despite feeder protection relay giving trip command. At least 2 NO contact of LBB shall be available to trip upstream circuit breakers. If more circuit breakers are provided in the upstream side, more NO contacts of LBB shall be provided in the C&R panel through externally contact multiplication relays.</p>
<p>7.3.1.1(x)</p>	<p>A “Switch onto fault” feature (SOTF) shall be provided in the relay to provide high speed tripping (of the order of one cycle) in case the breaker is closed onto an existing fault on the line. It shall use level detector logic for clearing close-up existing faults and/or a distance comparator principle for clearing faults existing at remote end.</p>	<p><u>M/S ASHIDA</u> A “Switch onto fault” feature (SOTF) shall be provided in the relay to provide high speed tripping (of the order of one & half cycle) in case the breaker is closed onto an existing fault on the line. It shall use level detector logic for clearing close-up existing faults and/or a distance comparator principle for clearing faults existing at remote end.</p>	<p>In numerical relay one (1) complete cycle should be given for fault detection and 5-10 ms for output contact operation. Then reliability of protection relays increase substantially.</p>	<p>Comment may be accepted as per justification given by the firm.</p>
<p>7.3.1.3</p>	<p>To allow the desired amount of regenerative current to flow into the grid, the impedance setting shall be set accordingly, The methodology to be defined for distinguishing the WPC fault and the regenerative</p>	<p><u>M/S ALIND</u> To allow the desired amount of regenerative current to flow into the grid, the voltage setting shall be set accordingly, The methodology to be</p>	<p>Distinguishing WPC and regenerative OCR will be difficult in terms of impedance. It can be achieved with the magnitude of</p>	<p>Comment may be accepted as per justification given by the firm.</p>

966812/2022/O/C	current whose impedance and angle lies in the WPC setting zone.	defined for distinguishing the WPC fault and the regenerative current whose impedance and angle lies in the WPC setting zone.	voltage during these conditions. On a WPC fault, the voltage will drop considerably, but on a regenerative OCR, the voltage will remain at its rated value.	
7.3.1.4	<p>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 25ms. The operating time of stage 2 OCR shall be settable in the range of 0 sec to 100sec in steps of 10ms. The operating value error of OCR shall not exceed + 5 %.</p> <p>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>	<p><u>M/S ALIND</u></p> <p>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 25ms. The operating time of stage 2 OCR shall be settable in the range of 0 sec to 100sec in steps of 10ms. The operating value error of OCR shall not exceed ± 5 %.</p> <p>The stage 1 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>	Typo error.	Comment may be accepted as a typographical error.
	<p>Over current relay</p> <p>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. The operating time of stage 2 OCR shall be settable in the range of 0 sec to 100sec in steps of 10 ms. The</p>	<p><u>M/S ASHIDA</u></p> <p>Over current relay</p> <p>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 at 5 times of set value. The operating time of stage 2 OCR shall be settable in the range of 0</p>	The conventional practice to specify operating time of OCR element is at 5 time of set value.	Comment may be accepted as per justification given by the firm.

966812/2022/OI of PED/IR/RDSO	operating value error of OCR shall not exceed + 5 %.	sec to 100sec in steps of 10 ms. The operating value error of OCR shall not exceed + 5 %.		
7.3.1.5	<p>Thermal overload protection In the present feeding arrangement of OHE, the over load protection cannot be utilised. The protection is only included for future use if feasible. Thermal Overload Settings:</p> <p>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><u>M/S ASHIDA</u></p> <p>Thermal overload protection In the present feeding arrangement of OHE, the over load protection cannot be utilised. The protection is only included for future use if feasible. Thermal Overload Settings:</p> <p>Characteristic: Single 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>	Single characteristic should be sufficient for feeder relay.	Comment may be accepted as per justification given by firm.
7.3.2.1(viii)	The operating value error of the relay shall not be more than + 5 %.	<p><u>M/S ALIND</u></p> <p>The operating value error of the relay shall not be more than ± 5 %.</p>	Typo error.	Comment may be accepted as a typographical error.
7.3.2.1(ix)	Delta-I relay shall have also a feature to detect the rate of change of impedance. If tripping is needed based on the rate of change of impedance may be finalized during design drawing approval by RDSO and manufacturer. The rate of change of impedance and operating time shall be settable in suitable steps.	<p><u>M/S ALIND</u></p> <p>Shall be deleted.</p>	The Delta Impedance feature implemented in the 6071 spec relay was not relevant to the IR and no setting guideline is available for the same from RDSO.	Comment may be accepted as per justification given by the firm.
7.3.2.2(ii)	The normal operating time of relay shall be 30 \pm 10 ms. Additional time delay shall be settable in the range from 00 to 1000 ms. in steps of 20 ms.	<p><u>M/S ASHIDA</u></p> <p>The normal operating time of relay shall be two cycle. Additional time delay shall be settable in the range from 00 to 1000 ms. in steps of 20 ms.</p>	Time should be in accordance with DPR relay.	Comment may be accepted as per justification given by the firm. The para corrected "The normal operating time of distance protection relay at equal to or less than 80% of set impedance shall be less than 40ms. Additional

966812/2022/O/o PED/TI/RDSO				time delay shall be settable in the range from 50 to 1000 ms. in steps of 20 ms.”
7.3.3(viii)	The proposed scheme to eliminate the flashover during the panto bridging at IOL is indicated at Annexure-6. The relay shall be suitable for operation from the 25kV potential transformers of the following particulars:	<u>M/S ALIND</u> The proposed scheme to eliminate the flashover during the panto bridging at IOL is indicated at Annexure-I . The relay shall be suitable for operation from the 25kV potential transformers of the following particulars:	Typo error.	Comment may be accepted as a typographical error.
9.0	Echnical Data Literature And Drawings.	<u>M/S ALIND</u> Technical Data Literature And Drawings.	Typo error.	Comment may be accepted as typographical error.
10.4	(i) Fault clearing time characteristics and time coordination and settings of various protective relay. (ii) Measurement of insulation resistance of the complete panel wiring including wiring between CT, PT and control circuit with all equipments mounted on the panel, by using 1000 V tester. (iii) Lead burden should be measured between current transformer and the relays to check any poor contact in the secondary circuit of CT s. Correctness of CTs and PTs polarity shall be ensured. (iv) Check functioning of the control circuit, switches, push button, auxiliary relays, master trip relays, alarms, annunciations and	<u>M/S ASHIDA</u> (i) Check operation of relays by injecting secondary injection test and measure the operating times and pick up values of the relays. Measure the errors between operating value and set value. (ii) All auxiliary relays should be checked at their pickup values and confirm that auxiliary relays reset when voltage and current supply is removed after operation. (iii) Check functioning of the control circuit, switches, push button, auxiliary relays, master trip relays, alarms, annunciations and indications etc. by operating the associated switchgear at TSS without energizing the OHE. (iv) Check Correctness of CTs and PTs polarity shall be ensured.	Re-arranged the test sequence during commissioning.	Comment may not be accepted as test mentioned in the para is not meant to be carried out sequency. Further content of para modified and some para omitted without giving any justification which is not acceptable.

<p>966812/2022/O/o PED/IR/DSO</p>	<p>indications etc. by operating the circuit breaker at TSS without energizing the OHE.</p> <p>(v) All auxiliary relays should be checked at their pickup values and confirm that auxiliary relays reset when voltage and current supply is removed after operation.</p> <p>(vi) Check the functioning and correctness of various telecommand and telesignal circuits.</p> <p>(vii) Check operation of relays with circuit breaker by injecting the primary current by using primary injection test kit. Measure the errors between operating value and set value. Conduct secondary injection test and measure the operating times and pick up values of the relays.</p> <p>(viii) Operate protective relays manually and/or by injecting secondary current/voltage and ensure that appropriate CB tripping, inter tripping of primary and secondary CBs. There should be no mal operation of any circuits and in every tripping appropriate flag indication along with alarm/annunciation should appear.</p> <p>ix) Railways/purchaser along with contractors shall ensure load tests and confirmatory tests of OHE protective relays as per “Para 20941 and 20942 of ACTM Volume-II (Part-I)”.</p> <p>(x) Any other operational/functional test considered necessary for</p>	<p>v) Check operation of relays with circuit breaker by injecting the primary current by using primary injection test kit.</p> <p>(vi) Check the functioning and correctness of various telecommand and telesignal circuits.</p> <p>(vii) Operate protective relays manually and/or by injecting secondary current/voltage and ensure that appropriate CB tripping, inter tripping of primary and secondary CBs. There should be no mal operation of any circuits and in every tripping appropriate flag indication along with alarm/annunciation should appear.</p> <p>(viii) Fault clearing time characteristics and time coordination and settings of various protective relay.</p> <p>(ix) Railways/purchaser along with contractors shall ensure load tests and confirmatory tests of OHE protective relays as per “Para 20941 and 20942 of ACTM Volume-II (Part-I)”.</p> <p>(x) Any other operational/functional test considered necessary for ensuring safe and correct working of C & R panel.</p>		
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966812/2022/07	ensuring safe and correct working of O&P EDITH RDSO			
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