



PRODUCT STANDARD

SWITCHGEAR ENGINEERING DIVISION

SG 12979P/Rev-0

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SPECIFICATION FOR DIGITAL RTCC RELAY

1.0 SCOPE :-

This standard covers specification and acceptance norms for Transformer Monitoring cum Tap Changer Control System (TMTCS) / Digital RTCC Relay for control and monitoring of cooling equipment, condition monitoring equipment and OLTC control of power transformers. Each digital RTCC relay shall be used to control a bank of transformers (i.e. 3 Nos. 1-Phase units or 1 No. 3-Phase unit). Digital RTCC relay should be microprocessor based adopting the latest state of the art design & technology with in-built large LCD Display for ease of programming and viewing. The Digital RTCC relay should provide facilities such as transformer cooler control & data logging, control of OLTC & remote tap position indication at local/remote end, temperature indication, alarms & trips, emergency over load control, recording of accumulated "use of life", local display of status of control and alarm function etc. The relay shall be suitable for communication to SCADA/SAS over IEC-61850 protocol.

2.0 TECHNICAL PARAMETERS :-

1	Type	Numerical Relay
2	Mounting	Flush Panel Mounting
3	Reference standards	IS 3231 / IEC 60255/ IEC 61850/ IEC 60068
4	Auxiliary supply	90-260V AC/DC $\pm 15\%$
5	Display	LCD Display or better
6	PT Supply	110V AC $\pm 10\%$, 50 Hz {VTR shall be programmable}
7	CT Supply	1 A / 5 A (site selectable) {CTR shall be programmable}
8	Keypad	Push Button type or Touch Screen
9	Selection Keys	Manual /Auto, Local / Remote, Raise/Lower, Home
10	Parallel Mode	Master/Follower/Independent/ OFF mode
11	Binary Inputs	32 Binary Inputs (at least 7 freely programmable)
12	Analog Inputs	16 (4-20mA) Analog inputs
13	Binary Outputs	16 Binary outputs (at least 7 freely programmable)
14	Analog Outputs	Not required (4-20mA) Analog outputs
15	LED's	12 Nos. freely programmable LED's
16	Under voltage blocking	Internal blocking at 80% of regulated value. Restoration at 85% of regulated value.
17	Time delay resetting	Instantaneous resetting with voltage deviation occurring in opposite direction.
18	Operating Temperature	0 – 50 degree C.
19	Line drop compensator	Required with resistive and reactive compensation of either polarity up to 20% and suitable for operation with 1A/5A, 5VA current transformer.

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REV.

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3.0 GENERAL TECHNICAL SPECIFICATION:

- i) The relay shall operate from the nominal reference voltage derived from a 1 phase / 3 phase Voltage transformer (VT).
- ii) The relay shall have at least 4 selectable set point voltages & it shall also be possible to select these set points from SCADA.
- iii) The relay shall have the following methods as option for the compensation of voltage: Apparent Current (Z-Comp.), Line drop compensation (LDC), Active Current, Reactive current.
- iv) The relay bandwidth shall be adjustable to suit per step voltage of 1.25%.
- v) The relay shall have following options regarding time behavior with time factor selectable from 1 to 30 sec (Linear, Integral, Fast Integral).
- vi) The relay shall incorporate an under voltage / over voltage blocking facility which shall make the control inoperative if voltage falls / rises by percentage value of set point value with automatic restoration of control when nominal voltage rises / falls to value.
- vii) The relay shall ensure positive completion of lowering/raising of the OLTC tap, once the command is issued from the relay. "Step-by-Step" operation shall be ensured so that only one tap change from each tap changing pulse shall be effected. If the command remains in the "operate" position, lock-out of the mechanism is to be ensured.
- viii) The relay shall have integrated features for the display of following parameters
 - Tap changer position display
 - Nominal Voltage
 - Load current
 - Bandwidth
 - Measuring values V. I. Active power, Reactive power, Apparent power, Phase angle, Power factor, Reactive current and frequency.
- ix) Following minimum indication/alarms shall be provided in digital RTCC relay either through relay display panel or through relay LEDs:
 - INCOMPLETE STEP alarm
 - OLTC motor overload protection alarm
 - Supply to DM Motor fail
 - OLTC IN PROGRESS alarm
 - OLTC Upper/Lower limit reached alarm
 - 415V Main AC supply fail alarm
 - 415V Standby AC supply fail alarm
 - Local/Remote Selector switch position in DM box
 - OLTC Tap position indications (Either by resistance or by 4-20ma input)
 - Independent-combined-remote selector switch positions of CMB

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- x) It is preferred that 12 nos. of freely programmable LEDs duly tagged or stickered shall be available to indicate different Operations / Alarm / Faults condition. If stickers are provided, then 5 sets of such stickers shall be supplied free of cost for future replacement.
- xi) The relay shall have facility to compensate the VT and CT-errors.
- xii) The relay shall have facility to register the tap changer statistics. In the statistics mode, the relay shall display the no. of tap changing operations occurred on each tap.
- xiii) The relay shall have facility to record the voltage and current with respect to time. Each of voltage value shall be measured for 100ms and averaged for 1 second. The recorded values shall be presented in graphical format on the device.
- xiv) The relay shall have integrated feature to make the parallel operation of 10 transformers working in parallel. The relay shall be self-sufficient and shall not require any additional devices like parallel balancing module etc. At least following principal shall be available in the relay as standard.
 - Master Follower / Master Slave (Auto Mode)
 - Circulating current
 - Independent Mode (Manual/Auto Mode)
- xv) Communication between the Digital RTCC relays to execute the commands for parallel operation shall be implemented using required communication protocol. GOOSE messaging between Digital RTCC relays for OLTC parallel operation is not permitted. Suitable communication hardware shall be provided to communicate up to distance of 1km between digital RTCC relays. Scope shall also include communication cables between digital RTCC relays. Cables as required for parallel operation of OLTCs of all transformers (including existing transformers wherever required) from Digital RTCC relays shall be considered included in the scope of bidder.
- xvi) The relay shall have facility to monitor or control the following parameters.
 - Monitoring of life time consumption of transformer
 - Monitoring of operating hours of Tap changer, Fans and Pump
 - Control of cooling levels of transformer
 - Recording of Hot spot temperature for each winding and max. achieved.
- xvii) The relay shall have facility to record specific events (Event-Recorder) like under voltage, over voltage, Over-current, Auto/Manual, local/remote etc. with date and time stamping.
- xviii) The relay shall have different LEDs to indicate Service and Blocked condition.
- xix) The relay shall have software to make the parameter settings of the device and it shall also be possible to do the parameter setting through keyboard /touch screen of the relay.
- xx) The relay shall have suitable interface to make communication with higher level SCADA/SAS system over IEC61850 protocol. Any software or CID/ICD file required for the purpose shall be supplied. The supplied software shall not have restriction in loading into multiple computers for downloading and analyzing the data. Software shall indicate the current overview of all measured parameters of connected transformer online in real time.



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- xxi) The following minimum ports shall be available on the device.
- RS 232 port or equivalent for doing the parameter setting and local communication with device.
 - Fiber optic ports for communication with higher level SCADA with IEC 61850 protocol.

{Rear communication port confirmation to be obtained during order execution}

- xxii) It shall be possible to communicate via bus with all similar devices located at different location by making communication link with any one device through its RS485 port.
- xxiii) The relay shall have facility by which a customer specific software program can be written and incorporated as feature in the relay.
- xxiv) The relay shall be capable of retaining its information & configuration in the event of a power failure.
- xxv) The relay shall have security levels to limit access to unauthorized user.
- xxvi) The relay shall have self-check of power on and shall continually monitor all functions and the validity of all input values to make sure the control system is in a healthy condition. Any monitoring system problem shall initiate the alarm.

4.0 SERVICES (on each relay basis) (Commissioning & Training):

- i) The commissioning shall include programming and testing of the relay in line with approved schematics. Communication of RTCC relays over IEC61850 protocol to upper level system is to be done during the visit. Services shall also include demonstration of all functions of relay & one-time training for successful operation of the relay.
- ii) The supplier shall offer the price of services (It. No. 02) on each relay basis considering two man-days for each relay, however it is supplier's responsibility to meet the customer satisfaction for the above service within the time frame.
- iii) Necessary site readiness checklist to be prepared by the vendor and given to end user for ensuring the readiness of site before visiting.
- iv) Maximum time allowed for deputation of engineer to the site cannot exceed 1 week after request from BHEL.
- v) Vendor to obtain completion certificate/MOM from the end user after the visit and furnish to BHEL for acceptance.



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5.0 QUALIFYING REQUIREMENT :-

- i) The vendor shall ensure the offered relay shall comply the relevant parts of IEC-60255, IEC-60068, IEC-61850, IEC-61010, IEC-61326, IEC-60529, IEC-60688 & IEC-61000 etc. or all other applicable IEC.
- ii) Type test reports shall not be more than 5 years old. Any discrepancy or inadequacy found in any of the type test reports & IEC 61850 compliance reports shall be resolved by supplier with customer by way of re-test without any binding on BHEL and free of cost.
- iii) The relay shall be type tested as per relevant IS/IEC and it shall be in successful operation for at least 2 years for transformer/OLTC application.
- iv) All items shall be guaranteed by the vendor for successful operation for a period of 24 months from the date of receipt at BHEL Bhopal or 18 months from commissioning whichever is later.
- v) The offer shall be submitted in 2 bids. The bidder's technical representative shall visit BHEL Bhopal for technical discussions and on the spot finalization of technical issues, if needed, within a week after technical bid opening. Exact date will be confirmed to vendor by BHEL.
- vi) Each clause of the specification shall be read and complied while quoting, once the relay is ordered no deviation in the specification will be considered.

6.0 ROUTINE TESTS AS PER RELEVANT IS/IEC STANDARDS:-

- (1) Power frequency at 2 KV for 1 minute
- (2) Insulation resistance.
- (3) Functional tests (as per vendor's recommendation)

7.0 ACCEPTANCE CRITERIA:-

- (1) Routine test reports furnished along with the consignment to be examined.
- (2) 100% visual check.

8.0 DOCUMENTS TO BE FURNISHED WITH OFFER :-

- (1) Two copies of Descriptive leaflets,
- (2) Dimension Drawing with mounting arrangements,
- (3) Connection diagram,
- (4) Instruction manual,

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