SECTION 26 10 00
MEDIUM-VOLTAGE PROTECTIVE RELAY
[MULTIFUNCTION OVERURRENT PROTECTION – SIPROTEC 5]

PART 1 - GENERAL

1.1 SCOPE

A. This section defines medium voltage protective relays for use in multifunction overcurrent protection.

1.2 ***[RELATED DOCUMENTS***

A. ***Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.***
   1. ***Related Sections include the following:***
      a. ***Section 26 13 13 – Medium Voltage Circuit Breaker Switchgear]***

1.3 SUBMITTALS

A. Provide product information prior to fabrication and installation. Product data shall include all dimensions, electrical ratings and maintenance data (if applicable).

B. Submit shop drawings and product data for approval and final documentation in the quantities listed according to the Conditions of the Contract. Customer name, customer location and customer order number shall identify all transmittals.

C. ***[Final Documents: Record documentation to include wiring diagrams, instruction and installation manuals [and certified test reports]].***

1.4 RELATED STANDARDS

A. Comply with requirements of latest revisions of applicable industry standards.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of this equipment shall have a minimum of 5 years experience producing similar electrical equipment.

1.6 DELIVERY, STORAGE AND HANDLING

A. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from potential damage from weather and construction operations. If the meters are installed in equipment, store the equipment so condensation will not form on or in it. If necessary, apply temporary heat where required to obtain suitable service conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. ***[The SIPROTEC 5 protective relay shall be by Siemens or pre-approved equal. Approved manufacturers are as follows:***
   1. ***SIEMENS Energy***
   2. ***.]***

2.2 HARDWARE

A. The hardware for the SIPROTEC 5 relay shall have the following features:
   1. Device shall be individually configurable, modular and scalable to provide for upgrades and changes without return to factory.
   2. Individual and field scalable HW display, push buttons, LEDs, function keys shall be customized either at the factory or on site.

3. Device shall be IP51 or higher. All expansion modules shall not degrade EMC capabilities.
4. Device shall be expandable at site to add CT and VT inputs up to a maximum of 24.
5. Expansion modules shall be interchangeable between relays.
6. At minimum two pluggable communication modules shall support up to 4 communication ports which can be individually programmed for retrofit at site without opening the device.
7. Internal clock battery shall be replaceable without opening the device.
8. The complete device shall be equipped with pluggable terminal blocks to ensure easy connection, pre-wiring and safe exchange of the device or modules.
9. Wide dynamic thermal range for the CT inputs to the relay up to 500A for 1 sec independent of the rated secondary current.
10. Interchangeable CT inputs with different accuracies at site.
11. Comprehensive hardware supervision for fast detection of transient errors at sampling level (ADC) to avoid misoperation of protection functions.
12. Voltage thresholds for binary inputs and the secondary current rating to the CT-modules of the device shall be settable at site via software without opening the device or changing jumpers.
13. Input circuits shall be removable without open circuiting CTs.
14. The relay's front and rear design shall be "hand safe" (electrically isolated), with no energized connections or screws exposed.
15. The relay shall include conformal coated circuit boards.

2.3 COMMUNICATIONS

A. The communications of the SIPROTEC 5 relay shall have the following features:
1. SNMP shall be available in all devices for asset management.
2. The device shall have an Integrated Ethernet port for Engineering PC and IEC 61850 (reporting and GOOSE).
3. The device shall have plug-in Ethernet modules to support ring and star communication architectures.
4. Plug-in Ethernet modules shall be capable of Rapid Spanning Tree Protocol (RSTP), High Available Seamless Redundancy Protocol (HSR), and Parallel Redundancy Protocol (PRP).
5. A loss of a protection data interface connected in a multi terminal ring configuration shall not interrupt the protection system and shall have self healing features to continue the power supply.
6. The device shall have protocol independent communication modules for increasing the flexibility and availability.
7. Reporting functions and self-checking functions shall be included in the device.
8. Device shall support NERC CIP cyber-security requirements and standards, including:
   a. complex device passwords
   b. device access and activity logs in non-volatile memory
   c. link between device and engineering tool shall be encrypted
   d. the software certificate (hash code) shall validate the manufacturer's software is valid to the relay.
9. Web Browser to view relay information, settings, alarms, and measurements.
10. Time synchronization with IEEE 1588.
11. Optional Phasor Measurement Unit (PMU) for detection of synchrophasor measured values and transmission with standard IEEE C37.118 protocol.
12. Powerful fault recording (buffer for a max. record time of 80 sec. at 8 kHz or 320 sec. at 2 kHz).

2.4 IEC61850

A. IEC 61850 used in the SIPROTEC 5 relay shall have the following features:
1. IEC 61850 solutions shall be configurable with basic protocol knowledge.
2. Internal data structure of the device shall be designed according IEC 61850.

3. Logical Device (LD) names, prefix and suffix of all Logical Nodes (LN) shall be changeable.
4. User-defined signals shall be assigned to any Logical Node.
5. Logical nodes shall be editable (copied/deleted/moved) in the IEC 61850 structure.
6. New and user defined Logical Nodes shall be supplied from a library.
7. Device settings shall be changeable by IEC 61850 protocol.
8. Device shall be compatible with IEC 61850 Edition 1 and 2.
9. The engineering tool shall operate with IEC 61850 Edition 1 and Edition 2 devices.
10. The engineering tool shall create integrated and consistent engineering of system and device from SLD (Single line diagram) to device parameterization.
11. Open interfaces according to IEC61850 shall provide user independent system configuration (ICD, IID, CID, SCD, MICS).
12. Device shall support sending GOOSE messages with a simulation flag, for commissioning purposes.
13. Device shall support Dynamic Report Control Blocks (DRCB).

2.5 ENGINEERING

A. The engineering of the SIPROTEC 5 relay shall have the following features:
1. Engineering tool shall:
a. Display events for advanced analysis.
b. Enable the import of Single Line diagram drawings with support of *.ssd or ELCAD.
c. Allow the user to develop the required SLD from the on-board library.
d. Include ready to use application template for frequently used applications. These templates shall be easily adaptable to multiple applications.
e. Support open interfaces such as XML or CSV oriented export files.
f. Allow for all tasks from plant design of protection and communications, to commissioning and event analysis.
g. Allow multi users in order to enhance parallel engineering.
h. Allow user to program settings in Microsoft Excel.
i. Allow user to build user application templates.
j. Support role-based access control.
k. Download fault records from SIPROTEC 5 relays.
2. The configuration of the HW shall be done graphically. The front and rear view of the relay shall be made available.
3. The device settings shall also be represented graphically.
4. The user shall be able to define and create displays.
5. The engineering software shall display the protection tripping characteristics and the operation point graphically.
6. The engineering software shall be able to export simulation file for testing in a digital twin.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The relay shall be installed at the factory by a manufacturer's trained employee.

B. Additional connections to relay, where applicable, shall be done in the field by ***[the manufacturer's start-up service group] [the installing contractor]***.

3.2 ADJUSTING AND CLEANING

A. The relay(s) shall be adjusted in the field by ***[the manufacturer's start-up service group] [the installing contractor]*** to the setting provided by the responsible project engineer.

B. Clean exposed surfaces using manufacturer recommended materials and methods.

3.3 TESTING

A. Commissioning and Maintenance - Test Suite

1. Test of protection functions shall be possible while relay is in service.
2. Graphical display shall show the local and remote measured phasors and values.
3. Online graphical display shall show the operating load point of the power system network.
4. The integrated test facilities shall support:
    a. HW and wiring test of a panel
    b. Offline logic debugging
    c. Test sequencer for testing of the protection functions without the use of an external test device
    d. Protocol test for IEC 61850 and DNP 3
    e. Time synchronization test
    f. Simulation of telegrams for testing communication channel availability.
    g. Testing and reporting breaker availability including interlocking conditions.

3.4 WARRANTY

A. Equipment manufacturer warrants that all goods supplied are free of non-conformities in workmanship and materials for six years from date of shipment.

3.5 ***[STARTUP SERVICES]***

A. ***Engage a factory authorized service representative to perform startup service.***

B. ***Train Owner's maintenance personnel on procedures and schedules for energizing and de-energizing, troubleshooting, servicing and maintaining equipment and schedules.***

C. ***Verify that switchgear is installed and connected according to the Contract Documents.***

D. ***Verify that electrical control wiring installation complies with manufacturer's submittal by means of point-to-point continuity testing. Verify that wiring installation complies with requirements in Division [26] [16] Sections.***

E. ***Complete installation and startup check list according to manufacturer's written instructions.]***

END OF SECTION