PS - 004

Step-down Substation Protection Module

Overview

In the design of electrical power systems, the ANSI Standard Device Numbers ANSI/IEEE Standard denote what features a protective device supports such as a relay or circuit breaker. These types of devices protect electrical systems and components from damage when an unwanted event occurs, such as an electrical fault. Device numbers are used to identify the functions of devices. This module is used to introduce trainees to step down transformation from 380 VAC to 208 /VAC, in addition to controlling loads buses (loads transfer and bus coupling) using isolators and circuit breakers.



Specifications

- Directional active power protection (ANSI Standard: 32P)
- Negative sequence/ unbalanced voltage protection (ANSI Standard: 46)
- Non-directional definite-time overcurrent protection (ANSI Standard: 51P)

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Technical Data

Directional active power protection (ANSI Standard: 32P)

- The protective reverse power relay will prevent a generator running in parallel with other generators from running as a motor («motoring») in case of lost prime mover torque, and will thus protect the prime mover.
- Ensure that the remaining generators connected to the system are not overloaded.
- Protects against reverse power due to an increase of the power of other generators connected to the system.
- The applied TDM (Time-Division-Multiplication) principle ensures an accurate measurement of the RMS value of the power (U × I × cos-φ), irrespective of wave form.
- Works with 3-wire and 4-wire connection.
- LED indication of fault condition
- Timer controlled tripping
- LED indication for activated relay
- Reverse power set point: (0…25%) of rated active power of synchronous generator
- Tripping time delay: 0…20sec
- Relay contact: Single change-over switch
- Contact ratings: 250V-8A (AC)

Negative sequence/ unbalanced voltage protection (ANSI Standard: 46)

- A three phase current balance protection relay continuously monitors a three phase AC current through current transformers, tripping upon an unbalanced load condition.
- The output relay trips when the monitored current is outside of the user adjustable limit and the LED ceases to illuminate indicating a fault condition.
- The relay also has a built-in time delay, used to avoid nuisance tripping.
- The output relay is set to de-energize in the unbalanced condition ensuring the protection relay is failsafe.
- The relay requires an auxiliary supply to operate.
- The unbalance trip point is adjustable from 3% to 20% of the nominal current
- The set point is adjusted through the front control knob.
- The time delay is adjustable from 0.1 to 10 seconds
- Relay output: Single change-over contact
- Contact rating: 250V AC, 5A (resistive)

Non-directional definite-time overcurrent protection (ANSI Standard: 51P)

- protection of generators against over-currents .
- The relay measures the highest of the 3-phase currents, providing an RMS measurement at sinusoidal currents.
- The measurement is based on average values for measured current.
- The set point values are set on the front of the relays by means of potentiometers.
- If a current exceeds a set point, the output is activated.
- If exceeded, a fault signal is generated, and the associated yellow LED is lit.
- Measurement of 3-phase currents
- LED indication of fault condition
- Timer-controlled tripping
- LED indication for activated relay
- When the set point is exceeded, its timer starts and will run as long as the fault condition prevails.
- If the fault disappears, the timer is reset. When the timer expires, the contact is activated and the associated red LED is lit.
- Over-current setting: 0.5 to 1.5 × In
- Tripping delay time for over-current: 0 to 20sec
- Number of contacts: Single change-over switch per relay type
- Contact ratings: 250 V AC/24 V DC, 8 A (200,000 change-overs at resistive load)

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Experiments

- Directional Overcurrent Protection against upstream faults
- Protecting step down power transformer against overheating due to unbalanced load condition
- Relay coordination settings between protection relays

Scope of Delivery

- Step-down Substation Protection Module (PS - 004)

Options

- Digital content (BI-01)

Required for Operation

- Step-down Substation Module (PS - 001.6)

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