



- **extension of measurement functions**
- **indication of selected states and events**
- **fault recorder of selected states and events**

**Storm protection functions extend selected units of this series with a set of functions designed to indicate fault conditions in electrical grids. The functions can be used in modules (base units) and module assemblies (base unit + expansion module) with three-phase measuring transducer functions. The set of offered functions corresponds to the usual requirements for protective functions in three-phase electric grids of all voltage levels, different types of lines and ways of grounding the neutral point.**

### → Basic characteristics

- standard set of protection functions allows to use a combination of time-independent (instantaneous), time-dependent overcurrent, non-directional and directional and earth directional protection
- the output of all protection functions is only an indication in their current version, ie the trip pulse is not activated and the start or action information is further processed and transmitted as an event (signal or alarm) to the higher-level control system or to the physical output (DO) base units, eg for a local display panel
- use in base units resp. combinations of base units and expansion modules, so the Storm-03 or Storm-01 + Storm-81
- all functions of the units and expansion modules, AC and DC measurements, DI, DO, all communication interfaces and protocols are retained when the protective functions are used
- protection functions use combination of measuring  $3x U + 3x I$ , eventually  $4x (3x U + U_0) + 4x I (3x I + I_0)$  in all combinations offered by basic units and expansion modules, ie direct and indirect measurements - measuring transformers or measuring sensors (resistive and capacitive dividers, Rogowski coils)

- use in three-phase electric networks of all voltage levels, with frequencies 50 and 60 Hz, overhead lines and cables, with different combination of grounding of the neutral point - effectively and inefficiently (choke, resistor) grounded or isolated
- fault recorder function, recording of selected values (measurement and signalling) triggered by a defined event is also available, faults records are stored in the base unit memory and are available in Comtrade format
- configuration, parameterization and diagnostics of functions is possible via supplied SW, locally and remotely, on request it is possible to supply functions for specific basic units in pre-set configuration and parameterization (Plug & Play)
- specific parameterization of the protection functions, in which the parameters of these functions are part of the data model and their values can be transferred from or to the higher-level control system

### → Typical applications

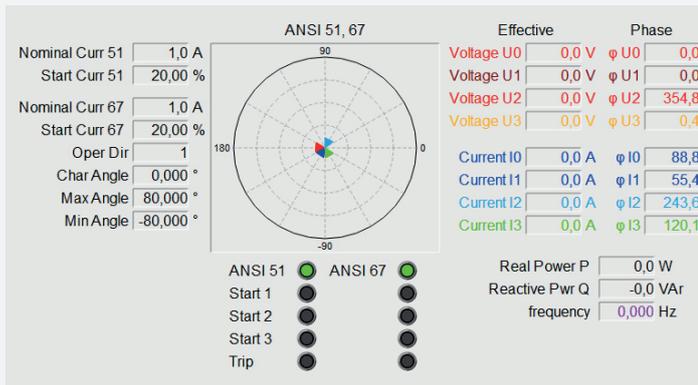
- general extension of Storm terminal functions used in electrical grids, stations and equipment of all voltage levels
- comprehensive solution of monitoring and control unit Storm of remote controlled switch disconnecter, including indication of fault conditions in the grid, enabling rapid fault location and isolation and supply recovery
- solution of a simple short-circuit indicator combined with the current measurement function in small distribution grids (Local DSO, industrial companies), with current transformers installed directly on MV distribution loop cables
- extending the functionality of RTU/PLC terminals in power systems, power distribution switchgears or individual devices or machines in industry, transport or telecommunications



## → Specification of functions and basic parameters

### three-phase instantaneous overcurrent protection ANSI 50

- indicates the state corresponding to the immediate tripping of short-circuit currents  $3I >>>$
- the parameters are set: starting current, zeroing ratio, switch-off time

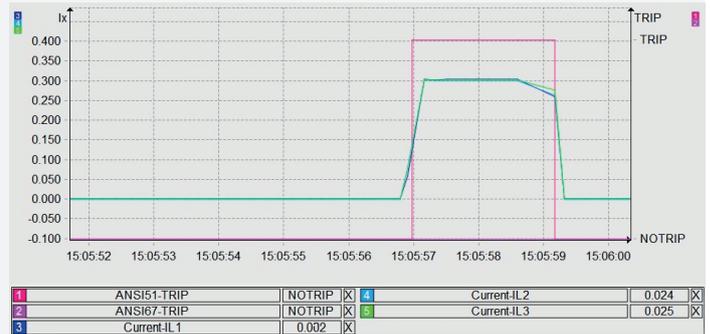


### Three-phase overcurrent non-directional protection ANSI 51

- indicates the state corresponding to the time-delayed switching off of the over currents  $3I >>$  and  $3I >$
- it is possible to set operating characteristics for time-dependent and independent protection
- parameters are set: protection characteristic, starting current, switching time (for DMT), multiplication factor and minimum switching time (for IDMT), zeroing ratio, register reset time
- it is possible to add an ANSI 67 directional element with the possibility of parameterization of the forward characteristic and the characteristic angle RCA

### Directional overcurrent protection ANSI 67

- uses the ANSI 51 principle, which is complemented by a blocking input controlled by a directional element
- parameters identical to ANSI 51 and typical angles are set (characteristic, minimum and maximum for the forward direction), change of direction of action



### Ground fault detection ANSI 67N

- use especially in isolated and inefficiently grounded grids (choke, resistor)
- the protection monitors the zero current component  $I_0$  with polarization according to the zero voltage components  $U_0$ , according to the HW version the values  $I_0$  and  $U_0$  are calculated or measured directly
- it is possible to set operating characteristics for time-dependent and independent protection
- allows to change the characteristic with respect to the grounding of the neutral point  $I_0 \cos$  (projection of current  $I_0$  on the characteristic axis) and  $I_0 \text{Dir}$  (evaluation of overcurrent  $I_0$  with direction detection with respect to the characteristic axis)
- the parameters of the protection characteristic, the start-up evaluation criterion, the direction of action, the characteristic angle, the starting current and voltage, the switching time (for DMT) and the multiplication factor (for IDMT) are set

