DGBV-EP

DIGITAL GENERATOR AND GENERATOR-TRANSFORMER UNIT PROTECTION

Field of application

The devices of the **EuroProt** complex protection family are modular devices. The modules are selected, assembled and configured according to the tasks to be performed. This information sheet describes one of the several possibilities: the **DGBV-EP** factory configuration. The general description concerning the **EuroProt** devices can be found in the document „**EuroProt** complex protection, hardware and software description and user's manual", (further "*EuroProt manual*").

The **DGBV-EP** factory configuration produced by PROTECTA Electronics Co. Ltd. is assembled to perform generator and generator-transformer unit protection. The experts of Protecta compile the complex system individually, fulfilling the special request of the users. The design is based on planning and designing experiences of several decades.

The main considerations of developing the ***DGBV-EP*** digital generator and generator-transformer unit protection are:

- Covering all protection and automation tasks in connection with the objects to be protected,
- Optimal assignment of protection function to the measuring transformers,
- Providing the necessary back-up protection functions,
- Fulfilling the individual and special requests of the user,
- Cost-optimised solution.

Main characteristics

Configuration of the complex protection:

- Independent racks in cabinet or cabinets, powered by independent power supply units,
- Individual EuroProt protection units in each racks, with dedicated connections to measuring transformers,
- Optimal functional assignment,
- Fully numerical signal processing in each functions,
- The individual functional units send commands and signals to the trip matrix located in independent unit, where, according to the setting, each signal of protection functions is directed to the appropriate interfering unit. The individual interactions can be disabled or enabled here, to support the commissioning,
- Signals and information can be received from auxiliary protective devices (gas protection, temperature protection),
- Continuous monitoring of CB circuits,
- Communication with each units in racks, LED signalling, display of numeric values and text messages,
- The individual racks are connected to fibre-optic loops, polled by monitoring and relay setting program,
- Digital event recorder, for monitoring the starting and trip commands of individual protection functions with 1 ms time resolution and for recording the measured analogous signals.

The usual protection and automation functions are:

- Differential protection for the generator, for the transformer, for the auxiliary transformer and for the whole unit,
- Overcurrent protection,
- Field failure protection,
- Under-impedance protections,
- Definite time or IDMT overload and overcurrent protection,
- Unbalanced load (negative phase sequence) protection,
- over voltage protection,
- Reverse power protection,
- Stator earth fault protection,
- Rotor earth fault protection,
- Multi-stage under/over frequency protection,
- Automatic synchroniser.

Hardware characteristics of individual devices:

- Fully numerical type, with individual A/D converters, digital signal processors (DSP) and separate main processor,
- Optical-coupler inputs,
- Output contacts, type of output contacts (NC, NO) can be defined at design time,
- Design for 19" rack cabinets.

Communication:

- Relay setting with 2x16 character LCD display, suitable also for text messages and for event log display,
- On-line screen of a connected PC to support of commissioning,
- Auxiliary communication connection selectable for RS 232 or fibre optic cable,
- Optional SCADA connection with IEC 870 protocol,
- Parameters can be saved and saved parameters can be downloaded again,
- Real-time clock with battery-fed RAM, (which can be synchronised via fibre-optic connection by auxiliary PC, by the SCADA system, or via opto-coupler digital input).

Working principles

The EuroProt devices are microprocessor-based systems, the functions and their versions are realised by software.

The man-machine communication is performed by a six button-keypad on the front plate, the 2x 16 characters LCD display above them, with seven signal LED-s and with two SW pushbuttons. With external PC and with the handling software the device can be set, checked and monitored more easily. To display the rows and columns of the trip matrix and for other important signalling a large LCD display is provided, containing further LED-s.

The analog current ad voltage inputs are connected to the multiplexer and further to the A/D converter via intermediate measuring transformers, where the sampling time is 0,5 ms for each current and voltage signal. The sampled digital values of the 16 bit A/D converter are transported to the CPU via high-speed serial bus by the CAN controller. The digital signal processor performs arithmetic operation with high speed. The output of the DSP is the evaluated result of the measurements; these signals are directed as "relay started" signals to the central processor. The central processor performs logic function and time delay measurements. The opto-coupler inputs and relay outputs communicate with the central processor via parallel bus.

The detailed information of the individual protection functions are described in different information sheets.

Basic technical data of individual devices

Rated secondary current, I_n	1A or 5 A
Rated secondary voltage (line-to-line), U_n	100 V or 200 V
Rated frequency	50 Hz or 60 Hz
Overload capacity, voltage circuit, thermal, continuous	$2xU_n/\sqrt{3}$
current circuit, thermal, continuous 1 s	$4xI_n$ $100xI_n$ (if I_n = 1 A) $50xI_n$ (if I_n = 5 A)
Dynamic current limit	$100xI_n$
Accuracy of digital impedance protection functions (above 50% In)	± 5%
Accuracy of digital current protection functions (above 50% In)	± 2%
Accuracy of timers, with 10 ms steps with 1 s steps	± 3 ms ± 12 ms
Resetting ratio of current relays	95%
Output relay contacts	*to be specified at projecting*
Type of output contacts (NO/NC):	*to be specified at projecting*
Output contacts, electrical data: rated switching voltage continuous load current making current DC breaking capability at 220 V, at pure conductive load at load of L/R = 40 ms *Optionally*, at load of L/R = 40 ms	 250 V 8 A 16 A 0,25 A 0,14 A 4 A
Auxiliary DC voltage (the same supply unit) voltage tolerance	220 V or 110 V 88...310 V
Permissible ambient temperature	0°...50°C
Insulation test (IEC 255)	2 kV, 50 Hz 5 kV, 1,2/50 µs
Disturbance test (IEC 255)	2,5 kV, 1 MHz
Electrostatic discharge (ESD)	8 kV (IEC 801-2)
Burst test	2 kV (IEC 801-4)

Design, size

The DGBV-EP complex protection equipment is delivered in a steel-sheet cabinet with standard 19" hinged rack system and locked door, accessible from the front side. When selecting the cabinet type the manufacturer can consider the special requirements of the user. If not specified at ordering, the cabinet is of RITTAL PS type.

Options

As option the device can be fitted with the following units:

- Digital disturbance recorder (see separate information sheet),
- SCADA connection (see *EuroProt* system information sheet),
- Relay contacts with 4 A breaking capability,
- Output circuit supervision in each phases.
-

Ordering information

When ordering, the experts of PROTECTA are ready for consultation and for the necessary engineering activity.