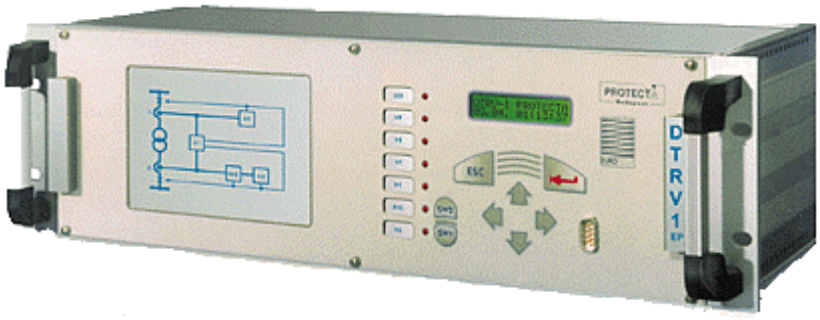
DKTRV-EP

COMPLEX DIGITAL TRANSFORMER PROTECTION FOR MEDIUM VOLATGE NETWORKS



Application field

The ***DKTRV-EP*** type complex digital transformer protection of PROTECTA Co. Ltd. is designed to perform all protection functions of medium voltage / 0.4 kV auxiliary dry type or oil insulated transformers, applied in power plants and in industrial plants. It contains phase and earth fault protection, overload protection, back-up protection for the transformer and breaker failure protection.

Main characteristics

The ***DKTRV-EP*** type complex transformer protection has the following main features:

- Contains all necessary protection functions for medium voltage / 0.4 kV transformers,
- For phase fault protection it has a two phase, two stage overcurrent protection, providing a high current set high speed stage and a low current set delayed stage.
- The setting of the high set current stage usually does not reach over the transformer,
- The delayed stage is a positive and negative sequence voltage polarised overcurrent protection, the setting of which must assure that the protection reaches over the transformer,
- For earth fault protection a directional, zero sequence overcurrent function is provided,
- The earth fault directional characteristics have two characteristic angles to be set independently, and have a reset hysteresis.
- The overload protection is an overcurrent protection with long time delay,

- The complex protection handles the external Buchholz (gas) protection of oil insulated transformers,
- An independent two phase, self-powered, back-up protection (KZT) is added to the numerical part,
- In the standard factory configuration the device has 14 output contacts (11 NO and 3 NC contacts), 3 of them is fix (1 NC for self test and two NO for trip initiated by the reserve protection) 11 contacts can be freely assigned with the software matrix,
- The protection is microprocessor controlled with the exception of the back-up protection and voltage relays,
- The automatics contain continuous self-check functions.

Working principle

The device is a fully microprocessor based construction, the functions and their versions are realised basically on software.

The analogue current inputs are connected via inductive internal measuring transformers and low-pass filters to the multiplexer then to the A/D converter, where all phase currents and the zero sequence current signals are sampled in every 0,5 ms. All overcurrent stages are applied for each input current.

The protection contains the following overcurrent stages:

- two phase definite time high current set overcurrent stage (I>>),
- two phase definite time voltage polarised low current set overcurrent stage(I>),
- zero sequence, directional, definite time overcurrent function ($3I_0$>),
- two phase definite time low current set overload stage (I>Overload),
- autonomous, self-powered definite time, voltage polarised overcurrent back-up protection.

The setting of the high set, high speed overcurrent function must assure that the protection does not reach over the transformer.

The low set short-circuit overcurrent protection is a positive and negative sequence, 0.4 kV polarised overcurrent protection. The timer of this function starts, if the positive sequence voltage drops, or there is negative sequence voltage component, and at the same time the overcurrent function starts as well. The setting must assure that the protection reaches over the transformer.

The earth fault protection is a directional, zero sequence, definite time overcurrent protection. Both characteristic angles of the directional lines can be set independently and as it is required, and has a reset hysteresis as well. To the directional measurement the zero sequence voltage is measured as the secondary residual voltage of the medium voltage level voltage transformers.

The overload protection is an overcurrent protection with long set time delay.

The complex protection handles the external Bucholz (gas) protection of the oil-isolated transformers. It accepts the starting signal only if it is at least 12 ms long, and when receiving the trip impulse; the signal is latched until the acknowledgement in the operation menu.

The autonomous, self-powered, two phase, definite time reserve overcurrent relay (KZT) operates independently of the digital part. In normal operation it is blocked by positive and negative sequence 0.4 kV components so that at submission of the trip command it takes into account the signals of the non-digital voltage module. If the DC voltage supplying the protection fails, then in case of operation of the reserve protection it closes the own trip contacts without voltage checking.

The device contains continuous and periodic self-checking and monitoring function. The continuous checking measures the presence of the supply voltage as well. The periodic checking starts at the pre-set time, and it can be started directly with the help of the menu system. Both self-checking system gives alarm signal in case of the detected failure, the red LED at the display is powered, and the LDC automatically displays an error message.

The integrated reserve protection of the DKTRV complex protection is a ***KZT*** type self-powered autonomous overcurrent protection. This protection is located in an independent plug-in module of the DKTRV device. This protection is a classic electronic protection designed with IC technology. Its rated current is fix, and is the same, as that of the DKTRV protection. This device contains three induction type intermediate current transformers. The secondary side of them supplies partly the power consumption of the protection itself with an AC/DC power supply unit, and they feed the electronics of the overcurrent relays (I>) and the timers (t).

Technical Data

General technical specification see in **EuroProt system information sheet**
Type tests see in **EuroProt system information sheet**
Design and sizes see in **EuroProt system information sheet**

Setting ranges

Positive sequence voltage relays	(0.1 …0.8) U_n, step 0.1 U_n
Negative sequence voltage relays	(0.1 …0.45) U_n, step 0.05 U_n
High set short-circuit overcurrent setting (I>>/I_n)	250 …2500 %, step 5%
Low set short-circuit overcurrent setting (I>/I_n)	50 …450 %, step 5%
Zero sequence setting (3Io>/I_n)	10 – 104 %, step 2 %
Application of core balance CT (3Io>/I_n)	10 – 104 ‰, step 2 ‰
Time delay, high set short-circuit overcurrent protection t (I>>)	0…1000 ms, step: 10 ms
Time delay, low set short-circuit overcurrent protection t (I>)	0 ...10000 ms, step: 50 ms
Time delay, zero sequence overcurrent protection t (3Io>)	0... 10000 ms, step: 50 ms
Time delay, overload protection t (overload)	0...50000 ms, step: 50 ms
Time delay, reserve protection t (reserve)	0...10000 ms, step: 100 ms
Time delay, breaker failure protection t (BF)	0...1000 ms, step: 50 ms
Healthy-to-work failure signal timer t[fail]	0...100 s, step: 1 s
Time delay, T1 additional timer t (Mxs T1)	0...50000 ms, step: 50 ms
Time delay, T2 additional timer t (Mxs T2)	0...50000 ms, step: 50 ms
CT rated primary current, In[AV]	50...1250 A, step: 50 A

Options

The device can be extended by optional units:

- SCADA connection (see *EuroProt* system information sheet),
- output relays with 4 A breaking capability.

Ordering information

- Protection type [DTRV-EP],
- Protection case type [19" cabinet frame mounted device, or panel mounted device
- Rated current [1 A, 5 A],
- Rated voltage [100 V, 200 V],
- Output relay contact type [NC or NO, if deviates from the *Technical Data*],
- Need of output relays with 4 A breaking capability,
- Other options,
- Needed trip circuit supervision.