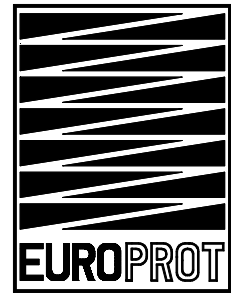


DTSZ2-EP

DTSZ2-HA-EP

DIGITAL TRANSFORMER VOLTAGE (AND COOLING) REGULATOR



Field of application

The **EuroProt** type complex protection in respect of hardware and software is a modular device. The modules are assembled and configured according to the requirements, and then the functions are determined - within the hardware limitations - by the software. This information sheet describes the individual characteristics of a specific application: the factory configuration **DTSZ-EP** numerical transformer voltage regulator. The general description of the members of the **EuroProt** type complex protection family can be found in document "**EuroProt** complex protection, hardware and software description and user's manual" (further "**EuroProt manual**").

The **DTSZ-EP** numerical transformer voltage regulator of PROTECTA Electronics Co. Ltd. is designed to perform all regulation tasks of high/medium voltage transformers. It is suitable to regulate the secondary voltage of two or three winding transformers, compounding the simulated line drop voltage, to perform voltage supervision (limitation), and to initiate interaction with compensating capacitor banks as well.

Concerning the voltage to be regulated, the automatic voltage regulator has two dead-band settings, which makes possible the regulation with short time delay in case of large voltage deviation.

An additional short regulation time delay can be set as well, for the case, if after performing the regulation command the voltage does not return immediately within the pre-set limits. During the „remembering time” the subsequent regulating command is issued after this short time delay.

The **DTSZ2-HA-EP** version of the regulator includes the full temperature regulator function (controlling the cooling fans) for the transformers as well.

As an option the included control (SCADA) functions can extend the device to the complex field unit of the medium voltage network.

Main features

The ***DTSZ-EP*** digital transformer voltage regulator has the following features:

- The DTSZ-EP voltage regulator can serve two or three winding transformers.,
- The automatic voltage regulator function (ATSZ) keeps the voltage of the regulated medium voltage side within the prescribed limits, calculated with load current compensation,
- The function for voltage supervision and limitation (FHA) monitors the voltages of all sides of the transformer, and if it is necessary, it interacts to the process of voltage regulation and to the operation of the capacitor bank(s),
- The automatic voltage regulation can be disabled by manual interaction,
- The voltage setting can be decreased and reset on the front panel and by remote signals too,
- The voltage regulator device can serve for dual bus-bar secondary schemes as well,
- The automatic cooling regulator function of ***DTSZ2-HA-EP*** version keeps the temperature of the transformer within defined limits, it controls cooling fans, and in case of failure, it signals the alarm state. The temperature controller function does not interact to voltage regulation (ATSZ) and voltage limitation (FHA),
- The temperature controller function (HA) in case of the energised state of the transformer, with operation of the temperature relay, starts all the fans. In case of fan failure it gives alarm signal after the defined time delay,
- The temperature controller function (HA) monitors the voltage as well, and if the voltage drops below 50 % the function is inhibited.

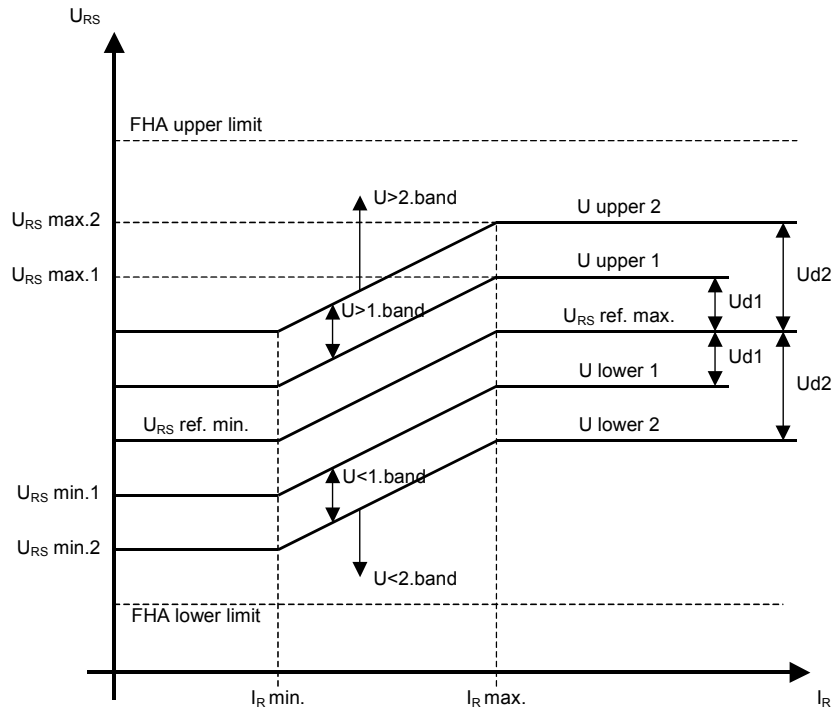
Working principle

The ***DTSZ-EP*** transformer voltage regulator performs automatic voltage regulation and voltage limitation (voltage monitoring) functions for the high voltage/medium voltage transformers for the main distribution network.

The main task of the ***automatic voltage regulation function*** (ATSZ) is to regulate the secondary voltage of the high/medium voltage regulating transformers in order to keep the voltage of the consumers, connected on different locations to the network, within the allowed limits, independent of the load current. To achieve this the voltage of the medium voltage bus-bar is regulated. The necessary bus-bar voltage-load characteristics are determined based on voltage profile investigation for the given network, the characteristics of the voltage regulator are set based on these results.

The automatic voltage regulator has two setting ranges concerning the voltage to be regulated, and four different regulation time delays can be set to this (both upper limits and to the lower limits separately). In case of violation of the narrower setting range the automatic voltage regulator performs the regulation with longer time delay, according to the setting. If the regulated voltage moves outside the broader range, the automatic voltage regulator performs the regulation with appropriate shorter time delay.

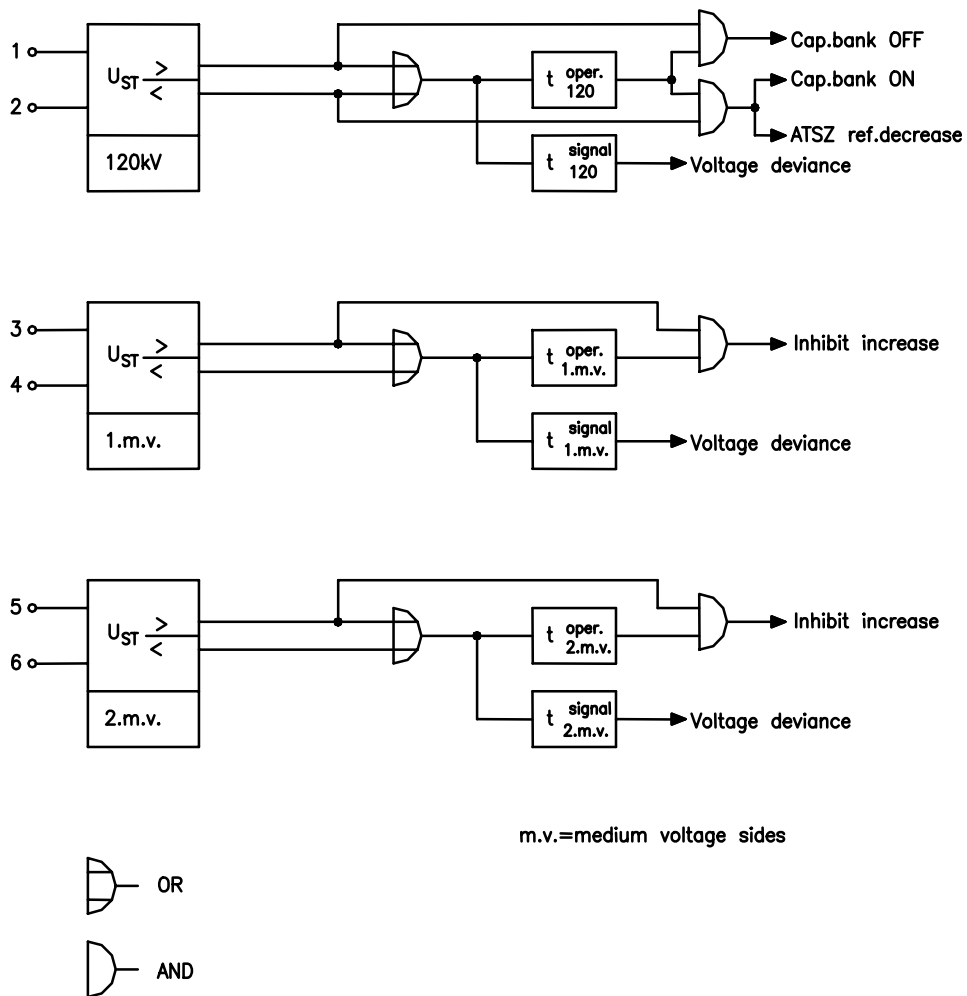
An additional shorter regulating time can be set for the device. If the voltage does not return within the allowed limits after performing the regulation command, within the „remembering time” the subsequent regulating command is issued after this short time delay. The characteristic of the voltage regulator is shown on the following figure.



Characteristics of the automatic voltage regulator

The **voltage limitation function** (FHA) (voltage monitoring) means, that the automatic voltage regulator monitors the voltages on all sides of the transformer, in order to prevent extreme high or extreme low voltage in case of regulator failure or in case of abnormal voltage states of the network, and in case of high voltage side voltage/reactive power states to influence the operation of the regulator.

If necessary the switching on or off the capacitor banks connected to the bus-bar is controlled by the regulator as well. In case of three winding transformers the voltage of the not regulated side is monitored, and if necessary, the operation of the voltage regulator must be influenced by the voltage of the supervised third voltage level.



Logic scheme of the voltage limitation function

The **automatic temperature regulator function** (HA) is in operation, if

- the power supply is switched on,
- the regulated U_{line} voltage can be measured (its value is higher than 50 %),
- the temperature regulation is enabled.

If the conditions mentioned above are fulfilled, the automatic voltage regulator receives the starting command of the transformer temperature protection. The starting command means that the temperature of the operating transformer reaches the pre-set value, so the intervention of the cooling automatics is necessary. The effect of the starting is that the temperature regulator submits energising command to all cooling fans. Depending on the number of existing cooling fans or fan groups, the appropriate number of closing contacts is used.

If the energising contacts are closed, and during this time a fan fails or stops, a signal is received via the "contact error" digital input. After the pre-set time delay the error signal "Cooling disturbance" is issued.

The cooling automatic function can be enabled or disabled with auxiliary signals via the digital inputs. The enabling/disabling is controlled by signal impulse.

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

<i>Setting ranges</i>	
FHA Voltage max. value	100...130%, steps 1%
FHA Voltage min. value	70...100%, steps 1%
ATSZ Voltage ref. max.	70...130%, steps 1%
ATSZ Voltage ref. min.	70...130%, steps 1%
ATSZ $U_{d1.band}$ value	1...30%, steps 1%
ATSZ $U_{d2.band}$ value	1...30%, steps 1%
ATSZ ref. value remote setting, U_{remote}	0...30%, steps 1%
ATSZ upper knee point, max. current setting	10...150%, steps 1%
ATSZ lower knee point, min. current setting	10...150%, steps 1%
ATSZ Rated primary current of CT-s for capacitor banks, expressed as percentage of transformer CT rated primary current	1...100%, steps 1%
Time delay setting range	0 ... 600 s, steps 1 s

Options

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

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

Ordering information

- Device type [DTSZ2(-HA)-EP],
- Protection case type [19" cabinet frame mounted device or panel mounted device with flash mounted form or panel mounted device with raised-hinged form,
- Rated current [1 A, 5 A],
- Rated voltage [100 V, 200 V],
- Type of output contacts [NO, NC; if deviates from the *Technical data*],
- Options if needed
- Supervisor circuit for external circuits.