# DTSZ2-ΩP
## DIGITAL TRANSFORMER VOLTAGE REGULATOR

## Application Field.

To maintain a system voltage within finite limits, it is necessary to regulate the system voltage. This is achieved by the use of regulating transformers, the most common type of which is the on-load tap changing transformer, which maintains a stable secondary voltage by selecting appropriate taps.

The tap changer operation is controlled automatically by voltage regulating relay, which continuously monitors the system and initiates the tap changer mechanism.

The **DTSZ2-EP** digital transformer voltage regulator is designed to perform voltage regulation of high/medium voltage transformers with on-load tap-changers.

## Operation

The device measures the voltage on the voltage input. If the measured value violates the limits of the band for a time period longer than the time setting, the device generates up or down regulation command, the length of which can be set as well. After sending the command the device waits for the signal "Drive in operation". If the voltage after the regulation is not inside the dead band, after the regulation time period another regulation command is issued, which actuates the tap changer mechanism to regulate the power system voltage. If after the command within the "TimeOut" period no signal "Drive in operation" is received, which means that the tap changer does not react – e.g. because the mechanism is in end-position, or the circuit is broken – the automatic device gets inhibited. To prevent tap change initiation for undervoltage condition, the operation is inhibited where the system voltage falls below "U Inhibit". In this case no commands are initiated.

The inhibited state automatically terminates if the conditions are not valid any more.

Using the input "AutInhibit" the device can be inhibited externally as well.

When setting the parameters care must be taken that the voltage dead band should be broader than the voltage difference between any adjacent taps.

# Main features of *ΩProt* family

- It is a small-sized device based on a microprocessor
- The device can be mounted to a standard **Ω** rail
- It is smaller than other devices of similar feature
- Four independent output relay contacts which can be freely programmed by a software matrix, and each has a possibility to be set for latching
- One optical fiber connector pair (transmitter, receiver) for communicating with a SCADA system or with a PC and for programming the protection, receiving on-line information, and reading events stored
- Eight signal LED-s on the front side of the device for giving additional information about the operation
- Acknowledge pushbutton for acknowledgement of warning signals and for resetting latched relays
- Terminals are on the front side of case
- Easy parameter setting
- Easy commissioning
- Built-in self test function with dc supply check, trip/close circuit supervision and Watch Dog
- Two types of event recording:
  - event log for storing collected data of the last 50 protection operations
  - event sequence recorder with 1 ms resolution for 300 events
- Battery backed-up RAM to store events and running real time clock
- Clock synchronisation on serial link

## Design

The DTI2-ΩP digital overcurrent protection is built into a closed dust-proof steel case. The case can be mounted to a standard **Ω** rail, the width in the rail is 120 mm. 16 terminals are placed on the front side of the case for external connections. The optical fiber cable connections are located on the upper left part of the front side.

## Communication with the protection

The man-machine communication is done by using a serial link between the device and a computer via fiber optic cable, because the device does not have its own display and keyboard. The complete software for parameter handling, on-line data displaying and event record read out is supplied by the manufacturer.

# Technical data

| | |
|---|---|
| Rated secondary current, $I_n$ | 1 A or 5 A |
| Rated zero sequence current $I_{no}$<br>(other value can be given when ordering) | 0.1A, 1A or 5 A |
| Main C.T., primary rated current | 50 to 1500 A, steps 25 A |
| Zero sequence main C.T., primary current, $I_{on}$<br>in case of core balance type C.T. | 50 to 1500 A, steps 25 A<br>150/5 A |
| Overload capacity, in current circuits,     continuous<br>1 s | $2xI_n$<br>$100xI_n$ ($I_n = 1$ A)<br>$50xI_n$ ($I_n = 5$ A) |
| Dynamic current limit | $100xI_n$ |
| Accuracy, overcurrent relays (over 50 % $I_n$) | $\pm 2$ % |
| Accuracy, timers | $\pm 3$ ms, at step of 10 ms<br>$\pm 12$ ms, at step of 1 s |
| Resetting ratio, overcurrent relays<br>(on request, other value) | 95 % |
| Overcurrent relays, setting range (in per cent of<br>   main C.T. primary rated current)<br>   phase relays<br>   zero sequence relays<br>   zero sequence relays with core balance type C.T. | range               step<br><br>50...2500 %,      5 %<br>10...104 %,      2 %<br>10...104 ‰,      2 ‰ |
| Timers, setting range, overcurrent relays | 0...60000 ms,      10 ms |
| Dependent characteristic equations | |
|         Normal inverse | $t = k \dfrac{0{,}14}{I^{0{,}02} - 1}$ |
|         Very inverse | $t = k \dfrac{13{,}5}{I - 1}$ |
|         Extremely inverse | $t = k \dfrac{80}{I^2 - 1}$ |
|         Time constant setting range | k= 0,02-1(steps of 0,02) |
|         Special characteristics (e.g. Fig1) | |
| External communication channel | optical fiber cable |
| Communication rate (Baud Rate)   (optical fiber cable) | 150...19200 Baud  (in double steps) |
| Automatic self monitoring system, daily start time | 0...23 hours 59 minutes (in steps of one minute) |
| Blocking of automatic self monitoring system | setting to 60 minutes |
| Number of output contacts (programmable with matrix) | 4 pcs of print-relays |
| Output contacts, electrical data<br>    rated switching voltage<br>    continuous load current<br>    making current<br>    d.c. breaking capability at 220 V,<br>        at pure conductive load<br>        at load of L/R = 40 ms | <br>250 V<br>8 A<br>16 A<br><br>0,25 A<br>0,14 A |
| Auxiliary d.c. voltage (the same supply unit)<br>    voltage tolerance<br>    or AC supply voltage<br>    voltage tolerance | 220 V or 110 V<br>      88...310 V<br>220 V<br>    -10% …+20% |
| Permissible ambient temperature | 0°...50°C |
| Insulation test (IEC 255) | 2 kV, 50 Hz,<br>5 kV, 1,2/50 µs |
| Disturbance test (IEC 255) | 2,5 kV, 1 MHz |
| Electrostatic discharge (ESD, IEC 801-2) | 8 kV |
| Burst test (IEC 801-4) | 2 kV |

## Size

| Width | Height | Depth |
|---|---|---|
| 120 mm | 90 mm | 80 mm |

## Data to be ordered

- Type of protection [e.g. DTI2-$\Omega$P-2f $I_0$]
- Rated C.T. current [1 A, 5 A]
- Feeding of zero sequence relays [main C.T., core balance type C.T.]
- In case of core balance type C.T., its ratio [150/5A or other]
- The type of the output relays(K1 … K4) : NO or NC individually