Transformer Terminals RET 541/543/545

Protection, control, measurement and supervision

Protect two-winding power transformers

and power generator-transformer blocks

Integrated voltage regulator

Ready for the harshest environments

Support a wide range of communication protocols

The RET 541/543/545

transformer terminals

bring reliability and better service to your distribution network and provide all the functions you need to protect and control your transformers. Their easy to use control panel and comprehensive communications and connectivity give you access to all the functions you need, whatever your application.

Terminal that meets your application
The RET 541/543/545 Transformer Terminals are designed for the protection, control, measurement and supervision of two-winding power transformers and power generator-transformer blocks in distribution networks. The terminals are loaded with functionality to suit your application. Besides the three-phase stabilized current differential function featuring 2nd and 5th harmonic restraint, the Basic version terminals incorporate three-phase overcurrent, non-directional earth-fault, restricted earth-fault, transformer thermal overload and phase unbalance protection.

The Multi version terminals further include overvoltage and undervoltage supervision, residual voltage and overexcitation protection, overfrequency and underfrequency protection, and underimpedance protection. Enhanced with an optional automatic voltage regulator function the terminal forms an integrated transformer management unit. A special Control version terminal with just voltage regulator and control functions is also available.

Protection that your network deserves
The power transformer represents one of the most valuable discrete units in your power distribution network, so do not compromise but specify a complete protection system. RET 541/543/545 terminals can also be used in harsh environments for example, in heavy industry, marine and offshore applications.

A single product for versatile options
While offering full protection with local and remote control in a cost-effective way, the integrated terminal technology of the RET 541/543/545 units provides a wide variety of control logic, measurement and condition monitoring functions, thus minimizing the need for auxiliary relays and panel work.

Easy adaptation to specific needs
The user-friendly graphical configuration tools available allow you to engineer your own application-specific configurations and MIMICs corresponding to different switchgear configurations and systems. The process status is shown on a large dynamic graphical display, which is also available as an external unit. Detailed information, for instance, measured values, events and application-specific alarms, are presented in display views.

Supporting a wide range of communication protocols which are commonly used by utilities and industrial plants, the terminals are easily integrated into different control systems. A connectivity package for IEC 61850 based systems is also available.

An optional RTD1 card provides versatile analog inputs for e.g. tap position supervision of an on-load tap changer, RTD* inputs for transformer top and bottom oil temperature monitoring, and ambient temperature biasing for accurate thermal overload protection. The mA outputs allow users to transfer any measurement data to PLCs**.

* RTD – Resistance Temperature Detector,
** PLC – Programmable Logic Controller

Innovative technology

RET 541/543/545 transformer terminals are part of ABB's substation automation concept and the RE500 series. Innovative solutions like IEC 61850 support and simultaneous dual port communication meet all your system requirements. The flexible connectivity caters for all your communications needs and helps to cover future demands. Their common configuration, setting and monitoring tools offer you yet another benefit: you only need to learn how to use one of our products, because all of our RE500 series protection relays and monitoring and control terminals use the same technology.

You can download the connectivity package from www.abb.com/substationautomation

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Technical Data
RET 541/543/545

Protection functions — ANSI number

Basic version
- 3ΔI>, 3ΔI>> — 87T
  3-phase differential protection of 2-winding transformers with stabilized and instantaneous stages
- 3I >, 3I >, 3I >>, 3I >>> — 2*50/51
  3-phase non-directional overcurrent protection, 4 stages
- I_0 >, I_0 >>, I_0 >>> — 50N/51G
  Non-directional earth-fault protection, 3 stages
- ΔI_{01}, ΔI_{02} — 2*87N
  High-impedance based restricted earth-fault protection
- ΔIo — 87N
  Stabilized low-impedance based restricted earth-fault protection
- $3I_{2f}$ > — 68
  3-phase transformer inrush and motor start-up detector
- 3 — 49T
  3-phase thermal overload protection for transformers
- I_2 >, I_2 >> — 46
  Negative-phase-sequence protection, 2 stages
- Fuse failure supervision — 60
- CBFP Circuit-breaker failure protection — 62BF
  Included into each protection function

Additional protection in Multi version
- I_0 > →, I_0 >> →, I_0 >>> → — 67N
  Directional earth-fault protection, 3 stages
- U_0 >, U_0 >>, U_0 >>> — 59N
  Residual overvoltage protection, 3 stages
- 3U >, 3U >> — 59
  3-phase overvoltage protection, 2 stages
- 3U <, 3U << — 27
  3-phase undervoltage protection, 2 stages
- U1 <, U2 >, U1 > — 27/47/59
  3-phase sequence voltage protection, 2 stages
- U/f >, U/f >> — 24
  Overexcitation protection, 2 stages
- f <, f >, df/dt — 81U/81O
  Under-/overfrequency incl. rate of change, 5 stages
- 3I > →, 3I >> →, 3I >>> → — 67
  3-phase directional overcurrent protection, 3 stages
- Z <, Z << — 21
  3-phase underimpedance protection, 2 stages

Optional function to Basic and Multi versions, standard function of Control version
- UREG 90V Automatic voltage regulator with Master-Follower, Negative Reactance and MCC principles

Measurement functions
- 3I — 3-phase current
- I_0, U_0 — Neutral current, residual voltage
- 3U — 3-phase voltage
- E/P/Q/pf — 3-phase energy/active power/reactive power/power factor
- f — System frequency
- — Transient disturbance recorder

Inputs/outputs	RET 541	RET 543	RET 545
Freely assignable digital inputs	15	25	34
Power outputs (NO single-pole)	0	2	3
Power outputs (NO double-pole)	5	9	11
Outputs with trip circuit supervision	2	2	2
Signal outputs (NO)	2	2	4
Signal outputs (NO/NC)	5	5	8
Self-supervision outputs	1	1	1

With optional RTD1 card for RET 541 and RET 543: 8 RTD/mA inputs and 4 isolated mA outputs

Energizing inputs
- 3 different analog input modules available: 6 CTs and 3 VTs, 7 CTs and 2 VTs and 8 CTs and 1 VT
- Current inputs for 1 A and 5 A
- Voltage inputs for 100 V - 120 V

Communication & Connectivity
- SPA, LON®, IEC 60870-5-103, MODBUS® RTU/ASCII[1)], DNP 3.0, PROFIBUS DP[2)], IEC 61850[3)]
  [1)] Requires the use of an RS-232 to RS-485 converter module RER 133
  [2)] With interface adapter SPA-ZC 302
  [3)] With interface adapter SPA-ZC 400
- Connectivity package

Condition monitoring
- Trip-circuit supervision (TCS)
- CB wear
- Breaker travel time
- Breaker operations counter
- Breaker inactive time
- Spring charging control
- Gas pressure
- Supervision of energizing inputs
- Scheduled maintenance
- Battery supervision
- Tap changer operations counter

Control
- Circuit breaker with indication, 2 instances
- Direct open for CBs via HMI
- Disconnector with indication, 5 instances
- 3-state disconnector with indication, 2 instances
- Object status indication, 8 instances
- On/off switch, 4 instances
- Control position selector (remote/local/logic)
- 8 Alarm LEDs with 3 colours and free text