

TPU-1

Universal Teleprotection Terminal



Highly flexible configuration for diverse applications

- Can be used in any available communication media
- Compatible with IEC 61850 Ed.2 standard
- Analog and digital signal acquisition modules



TPU-1



Description

TPU-1 technology

The use of the most advanced technology in digital signal processing together with ZIV's wide experience in digital and analog teleprotection terminals have resulted in a robust, reliable, secure, fully configurable and highly flexible teleprotection equipment.

The TPU-1 design covers encoded, single tone or Teleprotection over IP packet networks, and the option of selecting IEC 61850.

Product overview

The flexible design of TPU-1 terminals allows the use of different types of modules depending on each application. This modularity allows TPU-1 terminals to manage one or two digital and/or analog channels. In cases where the TPU-1 terminal manages two channels, it can be configured to operate as two independent teleprotection terminals (in a single chassis).

A TPU-1 terminal configured to work over analog channels is capable of transmitting and receiving up to four combined (single tone) or up to thirty two encoded (dual tone) commands.

A TPU-1 terminal configured to work over digital channels allows the two way transmission of up to eight teleprotection commands using digital lines with electrical or optical interface. The electrical interface can be 2 Mbit/s or 64 kbit/s according to Recommendation G.703 of the ITU-T, as well as 64 kbit/s, 56 kbit/s or 32 kbit/s according to Recommendations V.11 / X.21 and V.35 of the ITU-T. The optical interface of the TPU-1 can be for single-mode (2nd or 3rd windows) or for multimode (as per C37.94 standard). It is also available an IP interface that allows up to 8 commands to be transmitted through an IP/Ethernet network.

Key features:

- Modular design.
- Extremely high security and dependability.
- Operates in analog and/or digital channels.
- SNMP agent.
- IP interface.
- Compatible with IEC 61850 standard.
- Complies with ANSI C37.90.1 and ANSI C37.90.2 standards.
- Complies with IEC 60834-1 and IEC 6100-6-5 standards.

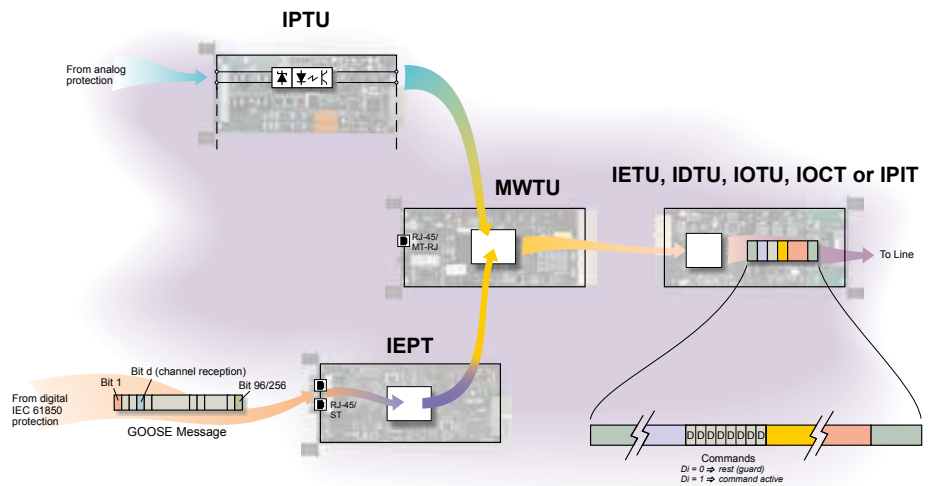


Figure 1 Command transmission procedure (digital channel)

Product overview

TPU-1 terminals can be IEC 61850 compatibles, so communication between a TPU-1 and a protection device inside a substation can be carried out according to this standard (GOOSE messages). However, if a protection device is not compatible with IEC 61850 standard, TPU-1 terminals can also communicate with it using analog protection interfaces (relays).

The TPU-1 terminals, furthermore, include an SNMP agent able to send notifications (unsolicited information spontaneously transmitted) about alarms and events of the terminal to the devices specified by the user, and this makes it possible to monitor the TPU-1 terminal from an SNMP management application.

TPU-1 terminals comply with IEC 60834-1 and IEC 6100-6-5 standards and also with ANSI C37.90.1 and ANSI C37.90.2 standards.

Management system

Choose between integrated Web management with the possibility of a LAN connection or local management system based on a Web interface.

In both cases, an internal data channel allows the remote terminal to be supervised from the terminal connected to the management system.

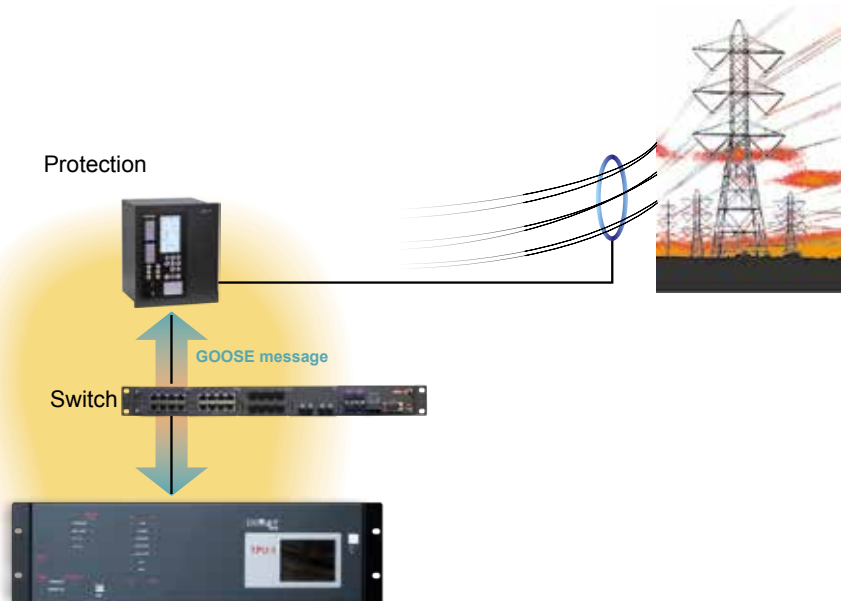


Figure 2 Teleprotection-protection communication by means of IEC 61850 standard



Applications

TPU-1 terminals can be used in any type of application, providing the appropriate modules.

Mixed protection interfaces

Provides simultaneous operation with analog protection interfaces and IEC 61850 protection interfaces, in order to simplify the migration to IEC 61850 in substations.

Back-up channel

Equipped with two communication interfaces, it has a back-up channel that can prevent any possible failure of the main channel.

Two independent teleprotection terminals in a single shelf

Possibility of protecting two lines with a single TPU-1 terminal.

Teleprotection over IP packet networks

Equipped with a specific communications module, the TPU-1 can transmit the teleprotection information over IP packet networks.

Key features:

- Up to four combined (single tone) or up to thirty two encoded (dual tone) commands in analog channels.
- Up to eight commands in digital channels; E1/T1 interfaces (G.703), 64 kbit/s (G.703, V.11/X.21 or V.35) and 64 kbit/s with optical interface or C37.94 standard.
- Transmission of teleprotection commands over IP packet networks.

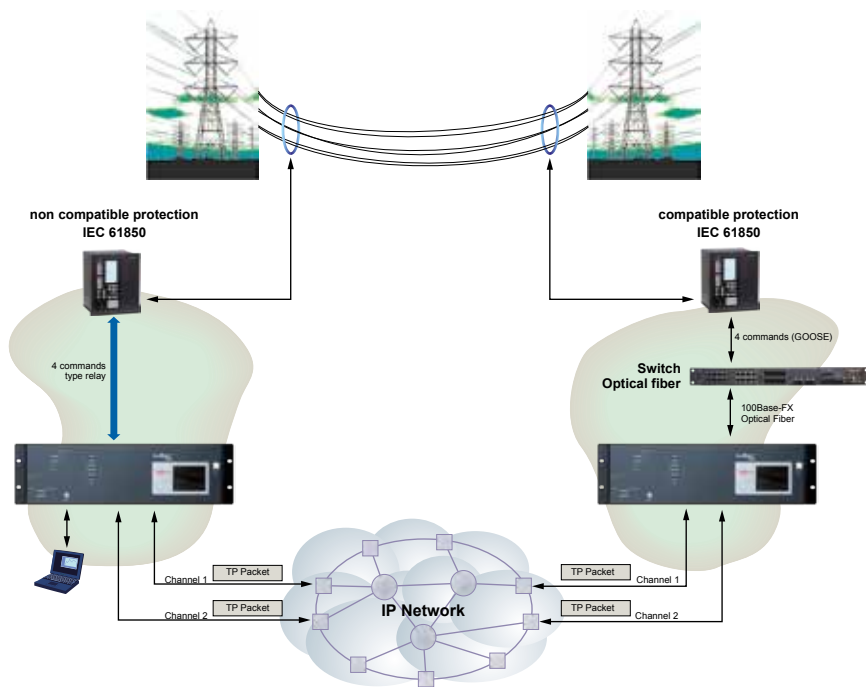


Figure 3 Interface for communications channel over IP

Transits

Possibility of transiting teleprotection commands in T (Teed-line) or ring configurations.

Telesignalling and remote measurements

Possibility of transmitting and receiving analog measurements and digital signals, using the TPU-1 as an intertripping and remote measurements terminal in cogeneration applications.

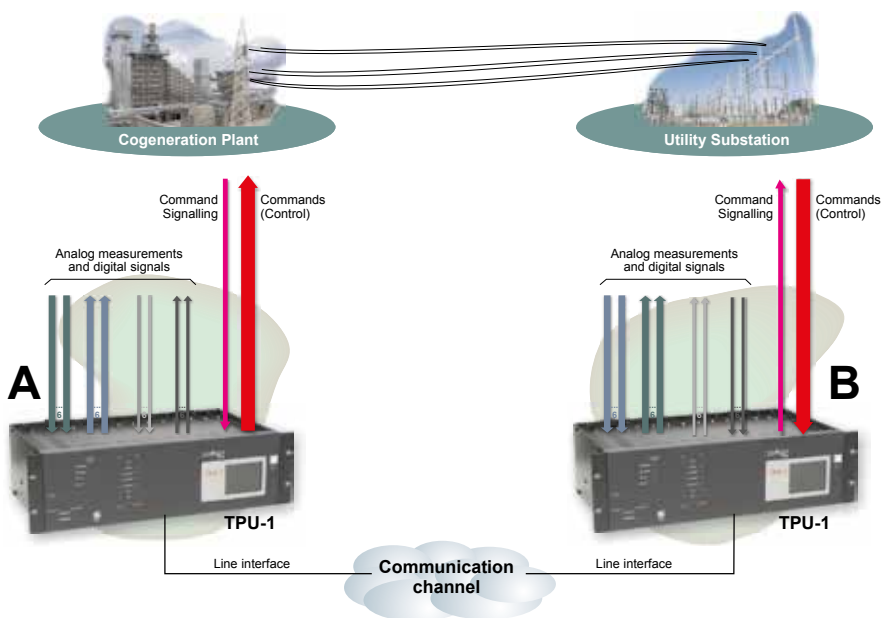


Figure 4 Telesignalling and remote measurements

Teleprotection in a 2.5 kHz band

Equipped with a specific module, the TPU-1 can achieve a better use of the frequency spectrum.

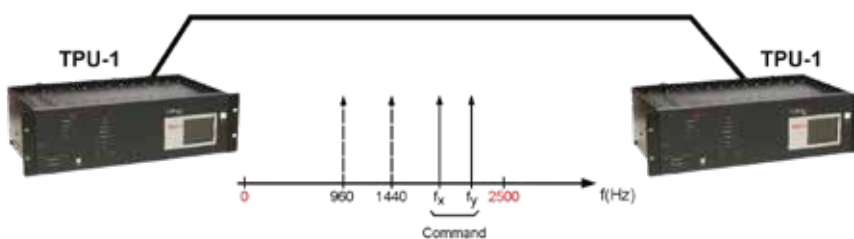


Figure 5 Teleprotection in a 2.5 kHz band



Key features:

- Two independent teleprotection terminals.
- IRIG-B port and NTP protocol for GPS time synchronization.
- Chronological register with 1ms resolution.
- Internal channel for end-to-end supervision and data transmission.
- Integrated Web management system with LAN connection and Local management system based on a web interface.
- Additional optional features like LCD screen for command counters, power-supply redundancy, shielded cables for cabinet-mounting terminal blocks, etc.



Technical specifications

Number of channels	2, analog and/or digital with electric or optic interface and/or with communications over IP
Capacity	
Over digital channels or IP	From 1 to 8 commands
Over analog channels	From 1 to 4 commands (single tone) From 1 to 32 commands (dual tone)
Nominal transmission time	
Over digital channels	
Transmission speed of 64 kbit/s	From 2.1 ms to 15.66 ms
Transmission speed of 2 Mbit/s (1/2 slots)	From 2.1 ms to 7.8 ms
Over analog channels	Programmable among 7 ms, 8.5 ms, 15 ms and 25 ms
Security and dependability	According to IEC 60834-1 standard
Line interfaces	
Digital	
module IETU	64 kbit/s, G.703, V.35 or V.11/X.21 with SUB-D male 15 pin connector
module IDTU	E1/T1, G.703 with two BNC or a RJ-45 connector
module IOTU	64 kbit/s, single mode 1300 nm or 1550 nm FO with FC connector (LASER transmitter)
module IOCT	C37.94 (1 slot of 64 kbit/s of the 2 Mbit/s frame), multimode 830±35 nm with ST connector
module IEPT	IEC 61850 server and GOOSE input/output. Two ports type 10/100Base-Tx (RJ-45) or 100Base-Fx multimode (ST)
module IPIT	IP/Ethernet interface. Two ports type 10/100Base-Tx (RJ-45) or 100Base-Fx multimode (ST)
Analog	
module IBTU	Single tone (4 combined commands), dual tone (32 encoded commands)
Nominal impedance	600 Ω
Return loss	> 20 dB
Transmit level	Programmable between -30 dBm and 0 dBm
Power boosting	Programmable between 0 dB and +6 dB
Receiver level	Programmable between -40 dBm and 0 dBm
Relay interface modules	IRTU module. 2, 4 or 8 relays for signalling and/or alarm
Command inputs	
Digital command inputs	According to IEC 61850 standard
Analog command inputs	Optocoupled
Number of inputs	Configurable (1 to 32). With one IPTU:2. With eight IPTU:16. With one ICTU:4. With eight ICTU:32
Nominal operating voltage	Selectable among 24 V _{DC} , 48 V _{DC} , 110 V _{DC} or 125 V _{DC} and 220 V _{DC} .
Command outputs	
Digital command outputs	According to IEC 61850 standard
Analog command outputs	Solid-state relay (semiconductor)
Number of outputs	Configurable (1 to 32). With one IPTU:2. With eight IPTU:16. With one ICTU:4. With eight ICTU:32
Maximum current	2 A permanent and 3 A for maximum 20 s
Maximum voltage	300 V _{DC}

Telesignalling and remote measurements	Modules MCTU and DSTU
Operating conditions	
Power supply	48 V _{DC} , 24 V _{DC} 110 V _{DC} or V _{AC} to 250 V _{DC} or 220 V _{AC} Possibility of having redundancy of the power supply
Consumption	With 8 IPTU modules: 1.5 A With 4 ICTU modules: 1.2 A
Storage conditions	In accordance with IEC 721-3-1, class 1K5
Dimensions	Height: 133 mm; Width: 482 mm (19"); Depth: 256 mm
Minimum weight	7 kg
IP protection level	IP30 according to IEC 60529
Applicable standards	Complies with IEC 60834-1 and IEC 6100-6-5 standards Compatible with IEC 61850 standard Complies with ANSI C37.90.1 and ANSI C37.90.2 standards
Management interfaces	
Integrated web management	10/100Base TX with RJ-45 connector
Local management based on a Web interface	USB. Upon request RS-232C interface
SNMP agent	
SNMP protocol	v1, v2c and v3
Functions	<p>Transmission of both unconfirmed and confirmed notifications (traps and informs) of alarms and events of the terminal. The last type is only accepted for the V2c and V3 protocol versions</p> <p>Supervision of certain monitorable parameters of the terminal by means of a GET operation, these being:</p> <ul style="list-style-type: none"> – network parameters (IP, subnet mask and gateway) – internal clock and time synchronization – state of the transmitted and received command counters and of the input and output activation counters – alarm signal state – event monitoring – signal/Noise ratio in the analog channel <p>Set to zero of the transmitted and received command counters and of the input and output activation counters by means of a SET operation</p> <p>Modification of the network parameters (IP, subnet mask and gateway) by means of a SET operation</p>
Supervision by means of SNMP agent	Possible from an SNMP application





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