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 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.

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.

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 4  Telesignalling and remote measurements
Figure 5  Teleprotection in a 2.5 kHz band
## Technical specifications

### Number of channels
- Over digital channels or IP: 2, analog and/or digital with electric or optic interface and/or with communications over IP
- Over analog channels: From 1 to 8 commands

### Capacity
- Over digital channels: 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: 2.1 ms to 15.66 ms
  - Transmission speed of 2 Mbit/s (1/2 slots): 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

#### Command inputs

- Digital command inputs: According to IEC 61850 standard
- Analog command inputs: Optocoupled
- Number of inputs:
- Nominal operating voltage: Selectable among 24 Vdc, 48 Vdc, 110 Vdc or 125 Vdc and 220 Vdc.

#### Command outputs

- Digital command outputs: According to IEC 61850 standard
- Analog command outputs: Solid-state relay (semiconductor)
- Number of outputs:
- Maximum current: 2 A permanent and 3 A for maximum 20 s
- Maximum voltage: 300 Vdc
Telesignalling and remote measurements
Modularities MCTU and DSTU

Operating conditions
Power supply
- 48 VDC, 24 VDC
- 110 VDC or VAC to 250 VDC or 220 VAC
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
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
Supervision of certain monitorable parameters of the terminal by means of a GET operation, these being:
- 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
Set to zero of the transmitted and received command counters and of the input and output activation counters by means of a SET operation
Modification of the network parameters (IP, subnet mask and gateway) by means of a SET operation

Supervision by means of SNMP agent
Possible from an SNMP application
6 Manufacturing facilities & 14 Customer support centers

Chicago (USA)  
Mexico (MEX)  
Niteroi (BRA)  

Dublin (IRL)  
Newcastle (GBR)  

Paris (FRA)  

Zamudio (ESP)  
Madrid (ESP)  
Barcelona (ESP)  

Dubai (ARE)  
Ryhad (SAU)  
Bangalore (IND)  
Singapore (SGP)  
Yakarta (IDN)  

Making the Smart Grid Real ...with you