TPS-3000

Analog / digital teleprotection equipment ready for ETH links

The distance protection device is the system located at the end of the power line and has the purpose of isolating faults on HV lines, transformers, reactances and other elements of the plant. It measures voltage, current, impedance and, in the event of a fault, it opens the breaker to avoid failures and damages to the electrical plant. In case of faults or anomalies on the power line, the distance protection devices communicate to the TPS-3000 the circuit-breaker trip signal to be sent to the remote teleprotection device, so that the remote distance protection intervenes to protect the power line. The reaction time is less than 10ms and within this interval the power line is completely disconnected and protected.

MAIN INTEGRATED FUNCTIONALITIES

BENEFITS

The **TPS-3000** device guarantees a high level of protection, stability and resilience of the power grid with real-time reactions to the events.

TPS-3000 is an extremely flexible and cost effective power line protection solution. The set of functions and applications is complete and satisfies the needs of any type of scenario.

MAIN FUNCTIONS AND FEATURES

- Management of contact commands and commands according to IEC 61850;
- capacity: up to 8 contact commands (up to 16 commands with expansion subframe) and up to 8 GOOSE;
- full configurability of command usage and priority;
- management of independent or simultaneous commands;
- high hardware modularity;
- various digital/analog line interfaces (optical fiber, E1 2 Mbit/s G.703/G.704, co-directional 64 kbit/s G.703, 32/64/128 kbit/s V.11/X.21, analog and digital powerline carrier, 2/4 wire copper circuit, IEEE C37.94, IP/ethernet);
- line interface redundancy;
- support for transit commands for point-to-multipoint connections and T-line;
- management of startup and out-of-service signalling;
- redundancy of the power supply unit;
- monitoring of optical transceivers according to SFF-8472 on the LU Fiber Optics.

Alarm configurability;

- Event recording in non-volatile memory with 1 ms resolution;
- command statistics;
- accurate alarm indications;
- remote configuration and monitoring, cybersecurity;
- access security (RADIUS, SSH, user profiling).

Terminal addressing for switched or routed networks;

- General diagnostic self-test;
- ethernet RJ45 interface for configuration and monitoring;
- GPS, IRIG-B, NTP and IEEE 1588 synchronization.

OPERATING PRINCIPLES

Digital Line Interfaces

The operating principle is based on guard signals decoding and on sending a certain number of decoded commands using specific sequences of bits. When the TPS-3000 is idle, the guard signal is continuously transmitted to monitor the connection, check its quality and detect any interruptions. When a command is transmitted, the TPS-3000 sends the corresponding bits in a specific sequence.

- Multiplex channels with the digital user interface;
- radio channels with the digital user interface;
- fiber optic channels;
- multiplex channels with IEEE C37.94 interface;
- IP Packet Networks.

Analog Line Interfaces

The TPS-3000 device uses shift modulation as its operating principle and is based on the Frequency Shift Keying (FSK) operating method. In idle mode, the guard tone is constantly transmitted, to allow connection monitoring in order to detect a drop or degradation in quality. If an event is transmitted, the guard tone is turned off and the FSK signal, corresponding to a particular command or set of commands, is transmitted. The command frequencies are sent at the maximum power made available by the transmission equipment.

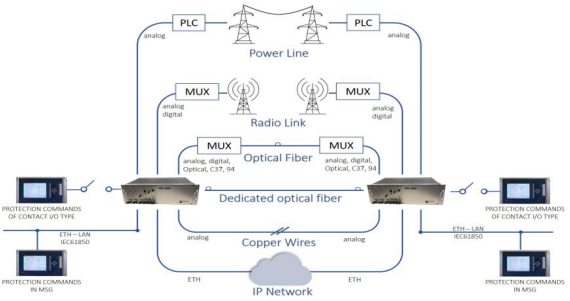
- Analog powerline carrier;
- digital powerline carrier;
- dedicated telephone circuits 2/4 wires;
- multiplex channels with the analog user interface;
- radio channels with the analog user interface.

SECURITY AND DEPENDABILITY (IEC 60834-1)

Both with digital (optical fiber, E1 G.703/G.704, V.11, IEEE C37.94, IP/ETH) and analog (analog/digital power line carrier, low frequency channels) interfaces, the device is able to guarantee high performances of security and reliability with the various protection schemes (intertripping, permissive underreach, permissive overreach and blocking). The transmission time, security and dependability are user-programmable for all analog and digital interfaces.

PERFORMANCE

- Nominal transmission time compliant with IEC 60834-1.



TECHNICAL SPECIFICATIONS

POWER SUPPLY

Number of units:	1 or 2 (redundancy)
main power supply:	24/48 and 110/132 VDC (-20% ÷ +15%) 230 VAC [50Hz] (-20% ÷ +15%) 220 VDC
power consumption:	< 35 W (VDC) < 50W (VAC).

COMMAND INTERFACE

Commands:	contact IEC 61850 protocol.

Contact Commands

Number of commands:	up to 8 (16 with expansion subrack)
input number for interface:	2 (transmission controls and start)
output number for interface:	3 (1 main output + 2 auxiliary)
command input:	optocoupler
voltage range:	24/48/60/110/125/220 VDC
current range:	max. 20 mA
command output:	photo MOS relay
contact type:	normally open
max. operating voltage:	230 VAC/250 VDC
max. current:	2A
max. switchable power:	400 VA/500W.

IEC61850 protocol commands

Electrical interface:	RJ45, 100Base-TX, max. range 20m
ports number:	1 or 2 (redundancy)
security protocols:	PRP o HSR
GOOSE max. number:	8
optical interface:	1,310nm, LC connector, length 1.5 km.

ALARM INTERFACE

Electromechanical relays

Contact type:	SPDT (Single-Pole Double-Throw)
max. operating voltage:	250 VDC /200 VAC
max. operating current:	2A
switchable power:	400 VA.

Relè Photo MOS Relay

contact type:	Photo MOS Relay NCO (Normally closed)
max working voltage:	250 VDC
max current:	0.5A
switchable power:	400 VA.

LINE INTERFACE

Line Unit in Short Reach F.O.

Optical fiber (short distance)

transmission support:	single-mode (10/125 µm)
wavelength:	1310 nm
max. distance:	15 km
optical connectors:	SFP LC.

Line Unit in Intermediate Reach F.O.

Optical fiber (intermediate distance)

transmission support:	single-mode (10/125 µm)
wavelength:	1310 nm
max. distance:	40 km
optical connectors:	SFP LC.

Line Unit in Long Reach F.O.

Optical fiber (long distance)

transmission support:	single-mode (10/125 µm)
wavelength:	1550 nm
max. distance:	80 km
optical connectors:	SFP LC.

Line Unit in Extra-Long Reach F.O.

Optical fiber (extra-long distance)

transmission support:	single-mode (10/125 µm)
wavelength:	1550 nm
max. distance:	120 km
optical connectors:	SFP LC.

ITU-T- G.703/G.704 2Mbit/s Line Unit

Data rate:	2 Mbit/s
line code:	HDB3/AM
impendance:	120 Ω balanced/75 Ω unbalanced.

ITU-T - G.703 Line Unit

G.703 co/counter-directional

Data rate:	64 Kbit/s
line code:	HDB3/AMI
impedance:	120 Ω balanced.

ITU-T-V11 Line Unit

128 kb/s /64/32 kb/s V.11/X.24

data rate:	64/32/128 Kbit/s
impedance:	100 Ω balanced/high impedance.

IEEE C37.94 Line Unit

Optic fiber (up to 2 Km)

transmission support:	multi-mode (50/125 o 62.5/125 µm)
wavelength:	820 nm
data rate:	Nx64 Kbit/s (N=1...12).
optical connectors:	ST (BFOC/2.5).

LU Ultra Long Reach F.O.

Line Unit Ultra-Long Reach F.O. (ultra-long distance)

transmission support:	single-mode (10/125 µm)
wavelength:	1550 nm
distance:	200 km
optical connectors:	SFP LC
sensibility:	-45 dBm
link budget:	47 dB
TX power min:	2 dBm.

IEEE C37.94 Line Unit SFP LC

Optic fiber (up to 2 Km)

transmission support:	multi-mode (50/125 o 62.5/125 µm)
wavelength:	850 nm
data rate:	Nx64 Kbit/s (N=1...12).
optical connectors:	SFP LC
sensibility:	-32 dBm
link budget:	9 dB
TX power min:	-23 dBm.

Ethernet Line Unit

IP/Ethernet Interface:	two port types 10/100 B-TX (RJ45) and 100 B-FX (via SFP)

fast Ethernet SFP Module

transmission support:	multi-mode (50/125 or 62,5/125 µm)
wavelenght:	1310 nm
max distance:	2 km
optical Connectors:	SFP LC.

Low Frequency Line Unit

Type:	2/4 wires
band:	0 ÷ 4 kHz
impedance:M	600 Ω balanced/unbalanced
nominal level of guard:	-10 dBm
nominal command level:	0 dBm
range TX:	0 ÷ -25 dBm (step 1 dBm)
dynamic range RX:	25 dB.

Low Frequency Line Unit for powerline carriers

Type:	4 wires
band TX:	0 ÷ 4 kHz
band RX:	12 ÷ 16 kHz
impedance:	600 Ω unbalanced
nominal level of guard:	-33 dBm
nominal guard level in carrier boost mode:	-15 dBm
nominal command level:	-15 dBm
standard:	Enel CC5002.

Plastic Optical Fiber Line Unit for powerline carriers

transmission support:	plastic optical fiber (1mm)
wavelength:	650 nm
guaranteed attenuation:	12 dB
optical connectors:	snap-on duplex.

SUPERVISION AND PROGRAMMING INTERFACE

TX/RX:	10/100/1000 Mbit/s
electrical interface:	ethernet 10/100/1000 Base-T.

ENVIRONMENTAL CONDITIONS

Operating temperature:	-20 ÷ +60 °C
storage and transport temperature:	-40 ÷ +70 °C
relative humidity:	≤ 93% ÷ 40 °C.

STANDARD

EMC Directive 2014/30/UE – IEC 60834-1, EN IEC 61000-6-2, EN IEC 61000-6-4, EN IEC 61000-6-5, IEC 60870-2-1
CEI - EN 60255-26, EN 55032
teleprotection Command Systems EN/IEC - EN/IEC 61000-6-4, EN 55022 class A (emissions), EN/IEC 61000-6-2 (immunity)
low voltage directive 2014/35/UE (LVD and Safety),
EN IEC 62368-1 (Safety).

MECHANICAL CHARACTERISTICS

Dimensions:	482.52x253x132,5 mm (3 SU)
weight:	<8 kg.

APPROVAL CERTIFICATIONS:

EMC

- IEC 61850-3
- CEI EN 61000-6-5
- IIC 60255-26
- EN 60870-2-1
- CEIE EN IEC 61000-6-2
- CEI EN IEC 61000-6-4
- EN 60870-2-1
- CEI EN 60068-2-1
- CEI EN 60068-2-2
- CEI EN 60068-2-78
- CEI EN 60068-2-30
- CEI EN 60068-2-14

Electric Safety

- CEI EN IEC 62368-1
- CEI EN 60255-27

Mechanical compatibility

- IEC 60255-21-1
- IEC 60255-21-2
- IEC 60255-21-3
- CEI EN 60068-2-6
- CEI EN 60068-2-27.

Climate Compatibility

- IEC 61850-3
- IIC 60255-26

DigitalPlatforms Spa Offices

29010 Cadeo (PC), Italy, Via Emilia 231 - ph. +39 0523.50161 – fax. +39 0523.5016333
64018 Tortoreto (TE), Italy, Via Nazionale km 404,500 - ph. +39 0861.772511 – fax. +39 0861.772555
00155 Roma (RM), Italy, Via Andrea Noale 351 - ph. +39 062291879 – fax. +39 0622709440

www.selta.com
www.dplatforms.it
marketing@selta.com
sales.et@selta.com