TPS-D

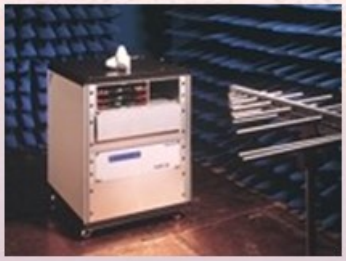
Teleprotection

Teleprotection signalling equipment for power networks

Friendly commissioning

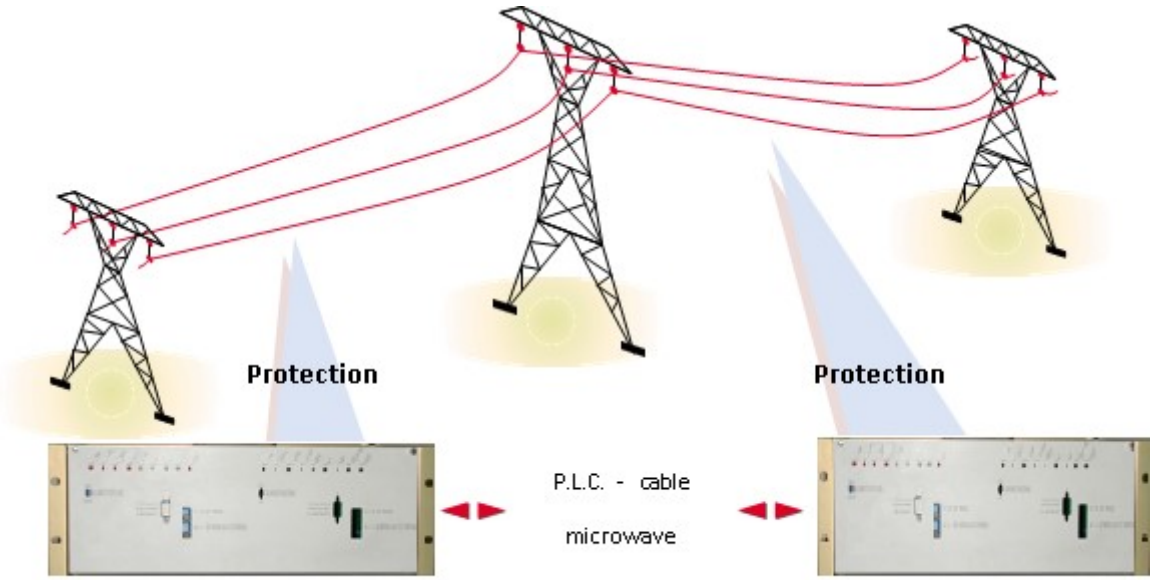
Modulare Design

Flexibility due to digital processing



Reinforced electromagnetic compatibility

Presentation



Fields of utilization

The safety and operational requirements of large power networks call for fast, reliable and secure exchanges between the protection systems which are installed at each end of a high-voltage transmission line. These signals, which are delivered in the form of contacts, require the use of special high-performance telecommunication systems.
This teleprotection signalling equipment makes use of a special coding system so that it is adaptable to many different types of transmission medium.

Teleprotection signalling equipment is used in all applications where the following transmission characteristics are essential:

- very short transfer time,
- optimum reliability (missing command rate) and security (unwanted command rate),
- immunity to interference due to the electrical environment.

Principle

The TPS-D equipment is used to create full duplex point-to-point links on a four-wire transmission medium, providing an analogue access point.
It provides **independent and simultaneous** transmission of two or four commands, by frequency-encoding the state of each contact.

Special features

The use of digital signal processing techniques endows the TPS-D with a high degree of performance and flexibility.

The TPS-D equipment can therefore be adapted to any type of transmission medium (PLC, microwave, cable, optical fiber…).
One of its greatest advantages is to offer the system operator the ability to use the channel in the absence of a command, for transmission of other signals (telephony, data,...).

Two or four simultaneous and independent commands.

Transfer time of 7 to 20 ms according to application.

Improved reliability and security.

Channel available when no order is transmitted.

High immunity to electrical interference.

Versatile application.

Simplified commissioning procedure.

Operating, maintenance and fault-diagnosis facilities.

Time-stamped event recording (commands, incidents).

Compliant with standards IEC 834-1, IEC 1000-4-X, CE and Y2K.

Operation

The TPS-E equipment was designed for ease of operation, commissioning and maintenance of the links.

It includes an RS232C port which allows the connection of a PC, and hence handling all operations concerning commissioning and preventive maintenance without connecting any other instrument.

Customising the operating parameters

This allows the user to choose:

- for each command, the desired application (blocking, permissive tripping, direct tripping) ;
- the transfer time, reliability and security levels can therefore be selected,
- the effective bandwidth,
- prolongation of the command on both transmit and receive,
- the transmit and receive levels.

Event consultation

This is used to gain access to the following data without interrupting operation:

- the number of commands sent and received (order counters),
- the received signal level,
- the customising parameter values,
- time-stamped events record,
- incident report.

Testing and maintenance facility

This is used to perform:

- link auto test,
- local loop,
- relay change-over (alarm, command output, blocking),
- transmission of command frequencies.

Characteristics

Operating

- Number of commands: ..... 2 or 4
- Command acquisition: ..... by contact (closed = command) or voltage (48 V, 110 V)
  - insulation: ..... by opto-electronic component
  - command acknowledgment by relays: ..... 1 normally open contact (300 VDC / 100 W)
- Command restitution: ..... by contact (Static relays)
  - contact characteristics: ..... 1 normally open contact (300 VDC max / 300 W / 2A max)
  - ancillary command restitution by relays: ..... 1 normally open or normally closed contact (300 VDC / 100 W)
- Security / Reliability: ..... better than CEI 834 - 1
- Alarms: ..... Transmission / Reception
- interface by relays: ..... POWER SUPPLY = RELAY CONTACT TO GROUND OR / RX / TX / LOOP = OPEN COLLECTOR TO GROUND OR = ANY OUTPUT RELAYS ON HV INTERFACE

Transmission

- Line access impedance:
  - impedance: ..... 600 ohms or high-impedance
- Adjustment: ..... 0-30 dB
- TX/RX Bandwidth: ..... 300 ÷ 3700 Hz
- Transmitter:
  - Analog interface (LF)
    - Output: ..... Balanced/Unbalanced
    - Band: ..... 0 ÷ 4 kHz
    - Warning level: ..... -10 dBm ± 0.5 dB
    - Return loss: ..... > 14 dB
    - Attenuation of symmetry: ..... > 40 dB
  - OCV interface
    - Output: ..... Unbalanced
    - Band: ..... 0 ÷ 4 kHz
    - Warning level: ..... -10 dBm ± 0.5 dB
    - Return loss: ..... > 14 dB
    - Attenuation of symmetry: ..... > 40 dB
- Receiver:
  - Analog interface (LF)
    - Output: ..... Balanced/Unbalanced
    - Band: ..... 0 ÷ 4 kHz
    - Warning level: ..... -30 dBm ± 0.5 dB
    - Return loss: ..... > 14 dB
    - Attenuation of symmetry: ..... > 40 dB
  - OCV interface
    - Output: ..... Unbalanced
    - Band: ..... 12 ÷ 16 kHz
    - Warning level: ..... -33 dBm ± 3 dB
    - Return loss: ..... > 14 dB
    - Attenuation of symmetry: ..... > 40 dB

Optical interface

SINGLE MODE

Electro-optical characteristics of the transmitter

Parameter	Symbol	Min	Typ	Max	Unit	Note
Center Wavelength	λc	1270	1310	1355	nm	
Spectral Width (RMS)	σ			1	nm	
Sidemode Supression ratio	SSRmin	30			dB	
Optical Output Power	Po	-9		-3	dBm	1
Extinction Ratio	ER	9			dB	
Optical Rise/Fall Time	tr / tf			260	ps	2
Relative Intensity Noise	RIN			-120	dB/Hz	
Total Jitter Contribution	TX Δ TJ			0.284	UI	3
Eye Mask for Optical Output	Compliant with IEEE802.3 z					

Electro-optical characteristics of the receiver

Parameter	Symbol	Min	Typ	Max	Unit	Note
Optical Input Wavelength	λc	1270	1310	1355	nm	
Receiver Overload	Pol	-3			dBm	4
RX Sensitivity	Sen			-23	dBm	4
RX_LOS Assert	LOS A	-40			dBm	
RX_LOS De-assert	LOS D			-24	dBm	
RX_LOS Hysteresis	LOS H	0.5			dBm	

General specifications

Parameter	Symbol	Min	Typ	Max	Unit	Note
Data Rate	BR		1.25		Gb/s	
Bit Error Rate	BER			10^{-12}		
Max. Supported Link Length on 9/125μm SMF@1.25Gb/s	LMAX		20		Km	
Total System Budget	LB	14			dB	

MULTI MODE

Electro-optical characteristics of the transmitter

Parameter	Symbol	Min	Typ	Max	Unit	Note
Center Wavelength	λc	840	850	860	nm	
Spectral Width (RMS)	σ			0.85	nm	
Optical Output Power	Po	-9		-3	dBm	1
Extinction Ratio	ER	9			dB	
Optical Rise/Fall Time	tr / tf			260	ps	2
Relative Intensity Noise	RIN			-120	dB/Hz	
Eye Mask for Optical Output	Compliant with IEEE802.3 z					

Electro-optical characteristics of the receiver

Parameter	Symbol	Min	Typ	Max	Unit	Note
Optical Input Wavelength	λc	770		860	nm	
Receiver Overload	Pol	0			dBm	4
RX Sensitivity	Sen			-17	dBm	4

RX_LOS Assert	LOS A	-35			dBm	
RX_LOS De-assert	LOS D			-18	dBm	
RX_LOS Hysteresis	LOS H	0.5			dBm	

General specifications

Parameter	Symbol	Min	Typ	Max	Unit	Note
Data Rate	BR		1.25		Gb/s	
Bit Error Rate	BER			10^{-12}		
Max. Supported Link Length on 9/125μm SMF@1.25Gb/s	LMAX		550		m	
Total System Budget	LB	8			dB	

G703 Interface

- **E1 G703 codirectional**

Bit rate	2048 Kbps ± 50 ppm
Code line	HDB3
Impedance	75/120 Ohm
Return loss	> 12 dB 51.2 KHz to 102.4 KHz > 18 dB 102.4 KHz to 2048 KHz > 14 dB 2048 KHz to 3072 KHz

- **64Kb/s G703 codirectional**

Bit rate	64 Kb/s
Code line	64Kbps codirectional line code
Impedance	120 Ohm
Return loss	> 12 dB 4 KHz to 13 KHz > 18 dB 13 KHz to 256 KHz > 14 dB 256 KHz to 384 KHz

Environment

- Power supplies: ..... 24VDC, 48 VDC (Typical), 110 VDC, 220VDC
- Maximum consumption: ..... TBD
- Operating temperature: ..... - 10 °C to + 55 °C
- Storage temperature: ..... - 40 °C to + 70 °C
- Relative humidity at 23˚ C: ..... TBD
- Insulation - EMC: ..... EN61000-4-16, IEC 834-1 and IEC 1000-4-X

Mechanical

- Weight: 4.8 kg