SELTA offers a complete line of PLC products such as line traps, coupling devices, PLC terminals, and teleprotection equipment and also supports the Client in the design of a customised PLC system.

**STE-D**, the universal SELTA PLC system, is a new generation of high performing analog and digital PLCs, based on Digital Signal Processing technology (DSP), supporting all applications from legacy analog to most advanced digital solutions with a future-proof concept. The new STE-D is able both to interface toward teleprotection devices and to support the integrated teleprotection functionality internally.

### Benefits
- Cost attractiveness in case of transmission of small to medium information flows over medium/long distances
- High reliability for service operation communications (in particular voice, remote control and teleprotection) in case of HV and HHV power lines
- Possibility to employ it as back-up bearer to increase the availability of telecommunication service
- Security of maintenance and configuration through Radius autentification and SSH support
STE-D can be configured through a dedicated tool depending on customer’s need:

- it can be used as an access node in TDM networks through a multiplexer with drop/insert function
- it can be employed in IP networks through an integrated router
- it works as analogue or as hybrid analog/digital PLC equipment with a dedicated BBPU (Base Band Processing Unit)
- an interface for teleprotections reduces costs and manages 1 to 8 commands

STE-D integrates the key applications of energy utilities:

- transparent transmission of voice-frequency signals, such as band limited speech with superimposed remote operation;
- digital transmission of compressed voice;
- transmission of up to 4 voice channels not compressed;
- fully transparent transmission of asynchronous data up to 19200 bps with minimum delay in point-multipoint applications, typical of SCADA polling;
- adaptive multiplexing of data services with traffic flow control;
- synchronous data transmission from 1,2 kbps up to 92.8 kbps;
- Ethernet/IP routing/bridging for LAN interconnections;
- easy connection of external switches, multiplexers and routers for network integration, service aggregation and traffic management via standard interfaces.

STE-D can transmit at different bit rates with error correction through the Trellis Code Modulation and the use of FEC (Forward Error Correction) technologies.

<table>
<thead>
<tr>
<th>Bit Rate</th>
<th>16 kHz Bandwidth</th>
<th>8 kHz Bandwidth</th>
<th>4 kHz Bandwidth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>from 92.8 kb/s</td>
<td>from 64 kb/s</td>
<td>from 32 kb/s</td>
</tr>
<tr>
<td>S/N @ BER &lt;10^{-7}</td>
<td>28 dB</td>
<td>8 dB</td>
<td>8 dB</td>
</tr>
<tr>
<td></td>
<td>to 16 kb/s</td>
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</tr>
</tbody>
</table>

**PLC universal equipment**

**Integrated teleprotection**

A teleprotection unit is integrated in STE-D and allow to manage up to 8 commands, with several benefits:

- complete configurability of both the use and the priority of the commands;
- independent and / or simultaneous management of the commands;
- different protection schemes editable by the user with reliability, security and transmission times compliant with IEC 60834-1 standard

- wide programming of the command parameters
- set-reset command (continuous commands)
- alarms configurability
- events recording in non-volatile memory (2048 events: commands and alarms, 1ms resolution).
- commands statistics
- command crossing time test
- LAN interface for configuration and diagnostics
- time synchronization By IRIG-B and NTP
General characteristics

**Bit rate:** up to 92.8 kb/s @ 16 kHz

**Bandwidth:** 4, 8, 16 kHz, with possibility of overlapping transmission/reception with echo canceler

**Modulation:** QAM/TCM

**Frequency range:** 40 ÷ 500 kHz

**Carrier frequency:** programmable

**BER:** $< 10^{-7}$ with S/N=28 dB (noise measured in 16kHz)

**Max. line attenuation:** up to 40 dB

**User interface:** X.21/V.11, ITU-T G.703 co-directional

**Line connection:** balanced/ unbalanced.

**Nominal impedance:**
  - 50, 75 Ω (unbalanced)
  - 124, 150 Ω (balanced)

**Return loss:** $\geq 12$ dB

**Full compatibility with the analog transmission systems**

**Configuration and monitoring of local and remote equipment**

**Integrated multiplexer and Drop-Insert function (ITU-T X.50)**

**Router/bridge integrated functions**

**Adaptive bit rate**

**Automatic channel equalization**

**Integrate multiplexer**

**Data interface:** X.20bis/V.28 and X.21bis/V.28 from 1.2Kb/s up to 19.2Kb/s.

**Connections:** Point-Point and Point-Multipoint

**Voice Interfaces:** 2/4 wires + E/M, FXS, FXO

**Voice compression:** ITU-T G.729A (8 kb/s) and G.726 ADPCM (16, 24, 32, 40 kb/s compression) FXS-FXO and FXS-FXS (direct call)

**Integrate call generator**

**Analog interface for telegraphic services:**

300÷3720Hz / 300÷3400Hz

**Digital interface towards teleprotections (TPU_POF)**

**Type of interface:** POF (Plastic Optical Fiber)

**Input criterion:** teleprotection signals pulse

**System performances**

- **V11 G.703 data interface**: 92.8 kb/s + 3.2 kb/s
- **10 TBase Ethernet Interface**: 92.8 kb/s + 3.2 kb/s
- **TDM and IP over the same carrier**

**Security**

SSH secure communication session with
Authentication at Local Server or Radius Server

**Power supply**

**Input voltage:**
- 24 Vdc (+20%, 15%)
- 48Vdc (+20%, 15%)
- 110 Vdc (+ 20%, -15%)

**Consumption:** $\leq 300$ Watt (with complete equipment)

**Output power (PEP at the peak):** 2/80 W

**Environmental features**

**Temperature:** (-5 ÷ 55) °C

**Relative Humidity:** 93% @ 40°C (compliant with IEC 721-3-3)

**Mechanical features**

**Dimensions:** 483 x 400 x 280 mm

**Weight:** < 14 Kg fully equipped

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**Digital application**

- Ethernet Users
- External Router
- Channel Radio
- Speech/Data
- External MUX

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**STE-D**

**HIGHVOLTAGE 
MODEM 
AND D/I 
(network node in TDM solution)**

**STE-D**

**INTEGRATEDMUX AND D/I 
(network node in IP solution)**

**STE-D**

**Speech/Data 
users**

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**selta.com**
Analog Application

System data

Transmitted information: voice, telegraphic transit, low/high speed data, teleprotection signalling

Channels nr.: up to 4

Effective LF bandwidth: 300–3720 Hz

Kind of transmission: SSB

HF bandwidth: 40 ÷ 500 kHz

Bandwidth: 4 kHz

Canalization:
- Tx/Rx on adjacent bandwidth
- Tx/Rx on spaced bandwidth

Output power (P.E.P.) 2–80 W

Low frequency (LF) voice

Speech bandwidth:
- 300÷2000; 300÷2200 Hz (progr.)
- 300÷2400; 300÷3400 Hz

Interface: 2/4 wires (programmable)

Impedance: 600 Ω balanced

Ground Balancing: 40 dB

Balancing: 14 dB

Compandor: can be disabled through configuration or external control

Integrated telegraphic source

Kind of modulation: FSK, ON/OFF

Speed and channeling: compliant with ENEL, CCITT R35, R37, R38 A and B e V23 standards

Universal call converter

Setting mode: Automatic line extension (ALE)
- Central battery (CB)
- Local battery (LB)

Connection to phone / exchange: 2 wires

Impedance: 600 Ω balanced

Insertion loss: 2 dB

Call generator:
- Frequency: 25/50 Hz programm.
  Voltage: 50 Vrms su 3kΩ
  Power: 20 mA (max)

Call receiver: sensibility: 20 Vrms

impedance: 3 kΩ

Telegraphic transit

Nº. of channels: 1 to 3

Selectable bandwidth: 2240÷3720; 2440÷3720 Hz
2640÷3720; 300÷3720 Hz
2160÷3400 Hz

Interface: 4 wires

I/O impedance: 600 Ω balanced

Balance on the ground: 40 dB

Balancing: 14 dB

3c/2b local loop: available

Asynchronous data modem

Nominal value: 50/100/200 Bd (ITU-T/ENEL)
600 Bd (ENEL)
600/1200 Bd V.23

Data interface: ITU-T V.24/EIA RS232

3c/2b local loop: available

B.N.B.F

Useful channel bandwidth: 300÷3720 Hz

3c/2b local loop: available

Analog interface towards teleprotections (TPU-BF)

Interface: 4 wires

Impedance: 600 Ω sbilanciata

Bandwidth: 0÷4 kHz (Tx) e 12÷16 kHz (Rx)

Balancing: 14 dB

Input criterion: teleprotection signals pulse

High frequency section (HF)

Output power (P.E.P.): 2–80 W

Line impedance (2 wired): 50, 75 Ω unbalanced
124, 150 Ω balanced

Return loss: ≥ 12 dB

Tx/Rx filter programmable line: 40÷500 kHz

Spurious emissions: compliant with IEC 495

AGC: available

Channel equalization: ± 12 dB

Frequency stability and accuracy: ±20 ppm up to -5÷+45°C

Diagnostic/maintenance

On line diagnostic

- control of configuration
- control of Tx HF power
- measurement of line attenuation and S/N ratio

Channel equalization: semi-automatic

Service channel: FSK(+30Hz) 50Bd