



Grid Solutions
a GE and Alstom joint venture

TELECOM PRODUCT SOLUTIONS

e-terragridcom TPI

Integrated teleprotection

e-terragridcom TPI is an integrated teleprotection module for the **e-terragridcom T390** power line carrier, assuring secure, reliable and prompt communications between protection relays for secure operation of the power system.

Reliable, secure and prompt signalling for a protected power system

The **e-terragridcom TPI** provides integrated teleprotection over power line carriers (PLC) where no optical fiber is available or as an alternate communication solution.

With its dual path communications channels, the **e-terragridcom TPI** can deliver maximized performance according to customer requirements, drawing on the benefits of an optical digital link in parallel with the PLC link.



COMMUNICATION INTERFACE REDUNDANCY AND CONNECTIVITY

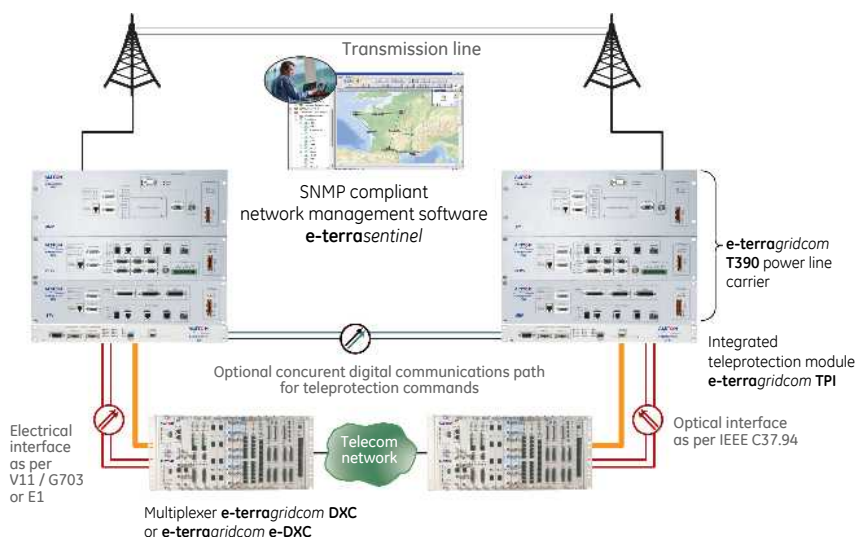
To improve the security and reliability of teleprotection commands, the **e-terragridcom TPI** offers the option of concurrent digital paths to the PLC, thus improving the dependability (Pmc) and Transfer Time (T0).

Furthermore, embedded logical operations enable commands to be initiated upon multiple input conditions and applied on multiple communications links.

On the reception side, an "OR" function can be applied, to activate the output by the first received signal.

CUSTOMER BENEFIT

- Modular
- Integrated
- Communications redundancy
- Optimised bandwidth
- Manageable



COMMUNICATIONS LINK OPTIONS

The **e-terragridcom** TPI can be equipped with an optical SFP module for "inter or intrastation" communications, allowing direct connection of the **e-terragridcom** TPI or connection to a multiplexer compatible with IEEE C37.94 without intermediate conversion equipment.

The **e-terragridcom** TPI connectivity can be extended with the addition of electrical communications interfaces for V11/ X21, G703-1 64 kbits/s and G703-6 2 Mbits/s.

MODULAR ARCHITECTURE

The **e-terragridcom** T390 PLC modular architecture can include up to two **e-terragridcom** TPI modules.

- Each module is equipped with eight inputs and 14 heavy duty outputs, programmable through the Human Machine Interface (HMI) as main output, copy, or alarm.

- Supports up to four commands in analog mode (or six with priority).
- Supports up to eight commands in digital mode (can also be applied to alarms and position information).

TELEPROTECTION CONFIGURATION AND MAINTENANCE

The teleprotection module is fully configurable via the graphical HMI of the PLC using an allocation matrix.

The HMI automatically recognises the **e-terragridcom** TPI module(s) and the PLC.

The graphical HMI allows remote configuration using the PLC's IP address with AES encryption security. This includes compatibility with SNMP network management systems.

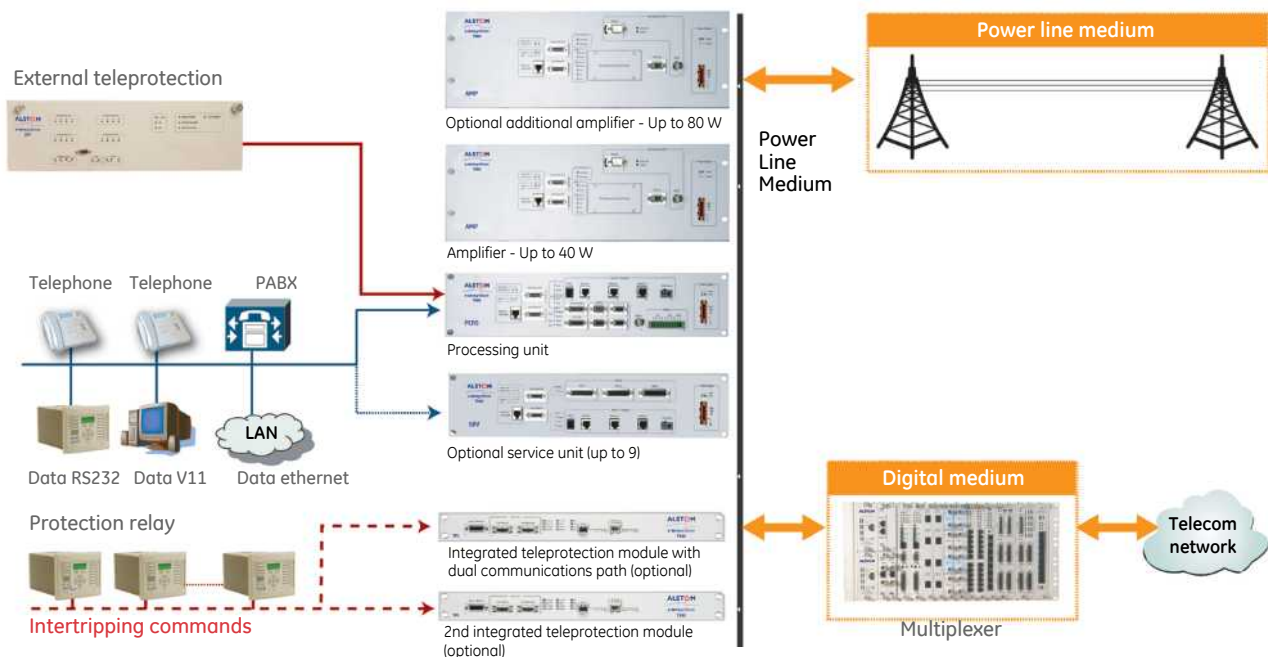
BANDWIDTH OPTIMISATION

To benefit from the maximum ratio between transmission speed and bandwidth, the **e-terragridcom** TPI can transmit teleprotection signals within the PLC digital communications stream. Since **e-terragridcom** TPI command signals cut the digital transmission, a Fast Recovery Time algorithm allows resynchronization of the digital communications link after tripping commands that can be as low as 200 ms.

The **e-terragridcom** TPI module can also work with analog channels of 2, 2.5 or 4 kHz.

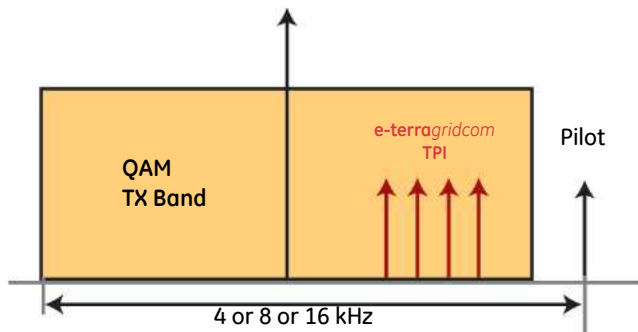
Two possibilities are offered:

- Dedicated band to teleprotection command for best transfer times and security.
- "Silent mode" over the speech channel. In the idle state, the teleprotection does not require any bandwidth. When a trip command is activated, only the channel dedicated to voice transmission can be cut depending on activation or non-activation of the boost facility.



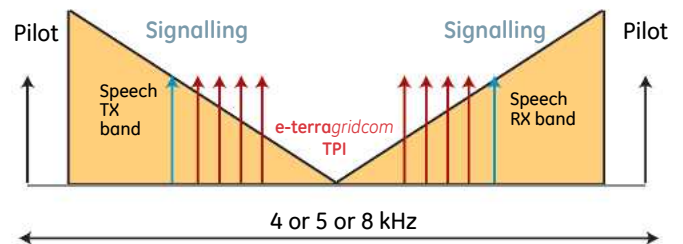
ONE TPI IN QAM

- Command in the **e-terragridcom** T390 digital band (QAM separated or adjacent mode)
- Four independent commands or six with priority scheme
- 4 / 8 / 16 kHz per band
- Functioning in superimposed mode 16 kHz

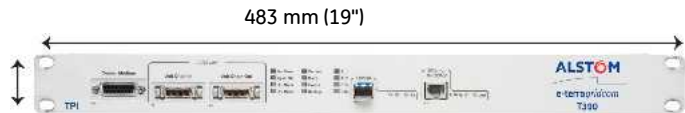


ONE TPI IN SPEECH BAND, SILENT MODE OR DUAL TONE PER CHANNEL (UP TO TWO)

- Analog modulation (separated or adjacent)
- Four commands or six with priority scheme
- Silent mode (no bandwidth use) in speech band or dual tone (1800 Hz band) (RF band allocation by HMI)
- 2 / 2.5 / 4 kHz per band



436 mm
(1U)



TECHNICAL DATA

FEATURES

Teleprotection module for **e-terragridcom** T390 digital power line carrier

Transmission of up to four independent commands over **e-terragridcom** T390 (up to six with priority)

Transmission of up to eight independent commands over digital link

Commands can be sent simultaneously over both communications mediums if available, for better reliability and transfer times

Commands configurable as blocking, permissive or direct tripping

Optimised communications through **e-terragridcom** T390

Compliant with digital **e-terragridcom** T390 PLC communications (TP in QAM)

COMMUNICATIONS INTERFACES

Overhead line via **e-terragridcom** T390 power line carrier

Redundant communications interface as an option

64 kbit/s with G703.1

2 Mbit/s with G703.6

From 32 to 256 kbit/s with V11 / V35 (RS422 – X24 protocol)

Optical interface for direct link or IEEE C37.94 to **e-terragridcom** DXC or any other multiplexer with compatible interface or

- Direct single mode up to 250 km

- Communications over single or dual fibre

TECHNICAL DATA FEATURES

Teleprotection module for Digital Power Line Carrier e-terragridcom T390
Transmission of up to four independent commands over e-terragridcom T390 (up to six with priority)
Transmission of up to eight independent commands over digital link
Commands can be sent simultaneously over both communications mediums if available, for better reliability and transfer times
Commands configurable as blocking, permissive or direct tripping
Optimised communications through e-terragridcom T390
Compliant with digital e-terragridcom T390 PLC communications (TP in QAM)
Communications interfaces
Overhead line through Power Line Carrier e-terragridcom T390
Redundant communication interface as an option (to be chosen among)
64 Kbit/s with G703.1
Two Mbit/s with G703.6
From 32 to 256 Kbit/s with V11 / V35 (RS422 – X24 protocol)
Optical interface for direct link or IEEE C37.94 to e-terragridcom DXC or any other multiplexer with compatible interface or
- Direct single mode up to 250 km
- Communication on single or dual fibre
Human Machine Interface
Integrated test tools
Command forcing with loop-back function offering transfer time measurement
Real transfer time and BER measurement on the digital link
Cross-connection matrix for Input , Output and communication path
Input and Output logical combinations with "logical command" capacity
Inputs and Outputs
Eight Inputs – Command acquisition by voltage (24 to 250 VDC) with optoelectronic decoupling
14 heavy duty outputs (eight N/O and six N/O-N/C) - up to 290 Vdc, 100 W, Breaking capacity up to 8 A*)

STANDARDS COMPLIANCE

IEC recommendations

- Teleprotections performance immunity
- EM Emission IEC: 61000-6-4
- EM Immunity IEC: 61000-6-2
- Electrical Safety EN 60950
- Relay Ratings IEEE C37.90.1 / .2 / .3
- IEC 60834-1
- EMC: as per CISP22 (2006)
- Communication Interface IEEE C37.94 supported

OVERHEAD LINE VIA e-terragridcom T390 POWER LINE CARRIER

	Analogue mode	Digital mode
Permissive Transfer Time (T ₀)	TP over speech 12 ms TP in QAM 12 ms	6,5 ms (64 kbps)
Probability of unwanted command (Puc)	Puc up to 10 ⁻⁹	Puc 6E E-30
Probability of missing command (Puc)	Up to 10 ⁻⁶	Pmc 1E E-35

OPERATING CONDITIONS

Power supply voltage	48 Vdc -30% to +25%
Operating temperature	-30°C / +55°C as per IEC 60068-2-1 and -2
Max relative humidity	95% at 40°C as per IEC 60068-2-3
Storage temperature	-45°C < T < +70°C as per IEC 60870-2-1 and -2
Mechanical test	IEC 60255-21-1 and -2

For more information please contact
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