Digital power line carrier e-terra gridcom T390

The ideal comprehensive solution for your communication requirements over HV Transmission Lines.

The Digital Power line Carrier e-terra gridcom T390 is an HV line transmission solution perfectly adapted to power utilities environment and its constraints. Built on an innovative technology, e-terra gridcom T390 is the cost effective alternative or back up to an optical fibre communication network. With its comprehensive system of integrated tools and services such as the Ethernet interface and its modular design, T390 Digital Power line Carrier provides a complete integrated system combined with a high flexibility for your operation needs.

The e-terra gridcom T390 Universal Power Line Carrier provides:

- An easy integration within a Digital communication Network (e.g.: Ethernet transmission , V11 interface, RS 232 interfaces)
- Analogue or Digital or mix of the 2 communication modes without having to change the Hardware
- The fastest transmission speed at up to 128kbits/s on 16 kHz only
- SNMP Network management systems compatibility
- A cost effective solution upgradable according to a customer’s need and compatible with all application from retrofit of existing PLC without having to change costly HV equipment to new substation providing additional services and optimized for interconnection with Digital networks.
- A solution to limit the customer cost of ownership by providing within one hardware solution for all type of Power Line Carrier application
- An outstanding quality of service and level of reliability
- Narrow band intertripping application to send up to 4 independent Teleprotection command over analogue on 2; 2.5 or 4 KHz

Customer Benefits

- Modular architecture
- IP LAN Transport Capability
- Comprehensive system and outstanding quality of service
- Ownership costs reduction
- Management capacities improved
- Transmission speed at up to 128kbits/s on 16 kHz
Modular architecture

With a modular architecture in both hardware through the use of racks not cards and software, the e-terra gridcom T390 provides our customers with the best flexibility of use without any return to the factory.

Each module has a specific function and can be installed separately. It can be configured as per the customer needs and upgraded by the customer himself. The number of interfaces is not given by the size of the chassis so several service modules can be added according to your needs. You just pay for what you need and adjust the equipment to reach the exact system required.

The e-terra gridcom T390 Universal Power Line Carrier integrates:

- 1 or 2 Amplifier Module for up to 80 W output power
- 1 processing module PRCS -full (2U) subrack with 4 RS 232, 1 x V11 interface for communication up to 74 kbps, 1*RJ45 for LAN 10/100 Mbit interface, 1*maintenance telephone handset interface, 3x2/4W E&M or 2*FXO/FXS, 1*2/4W E&M and 1 external Teleprotection interface

- SRV (2U) service subrack can be added as an additional module that provides all the features required for the extended configuration: (3 Rs232, 1 x V11, 1*LAN, 1*maintenance telephone handset, 2*FXO/FXS, 1*2/4W E&M
IP LAN transport capability (*optional)

By providing direct Ethernet interface, the e-terra gridcom T390 Universal Power Line Carrier can easily transport LAN network and be integrated directly for exchange of data between substation automation platforms or associated with IP based solution like Voice over IP and Video over IP. Thus, e-terra gridcom T390 offers the possibility to be ready for the next generation of IP Telecom Networks.

In order to support modern IP network, the LAN function supports VLAN and offers bridge and neighbouring capacities.

Comprehensive system providing a perfect operation flexibility and an outstanding quality of service

Universal concept

The e-terra gridcom T390 Universal Power Line Carrier provides a comprehensive set of transmission characteristics according to the network constraints. It can operate like a conventional analogue Power Line Carrier working on 2.5 or 4 kHz or a combination of analogue and digital mode. Digital transmission bandwidths can be separated or superimposed making it easier to allocate the e-terra gridcom T390 Universal Power Line Carrier transmission band into congested frequency plan.

- Digital communication activated by a simple firmware key for transmission of high speed data (V11, Ethernet, and RS232) or compressed speech (Fig. 1)
- Analogue communication, reliable transmission for uncompressed speech, teleprotection signals and low speed data (Fig. 2)
- Mix communication (Analogue/Digital) (Fig. 3)

The e-terra gridcom T390 provides a solution for all type of PLC application within one hardware with its “same hardware / various firmware” concept to offer Power Utilities a large range of features, transmission mode and services.

Some of the applications provided by the e-terra gridcom T390 are:

- Transfer of distance protection information for the Electrical network safety
- Transfer of (RTU) data for SCADA application
- Remote control of substation minimizing necessary staff
- Telephone network
- Key data secured by private Power utility PLC network

e-terra gridcom T390 offers up to 4 built-in modems per analog channel instead of one reducing costs of implementation and offering more access.

Several software packages can be selected according to customer requirements. The system comes in analogue mode. It can be upgraded by software licence to digital, superimposed digital. The features LAN to LAN and SNMP management are also optional and can be activated at any time. Now Power Utilities can switch to digital application smoothly, and still benefit the advantages of the analogue mode avoiding then the drawbacks of a radical and irreversible transition.
Teleprotection functionalities

**e-terra gridcom TPI module**

The advantages of the **e-terra gridcom TPI** modules are:

- Transmission in analogue of up to 6 commands in 4 kHz band to transfer more information
- Up to 2 digital (optional) redundant communication path: 1 as per optical SFP interface module or as per X21/V11 or G703.1 64 kbit/s or G703.6 2 Mbit/s to improve the overall protection scheme security with each path up to 8 command transmission
- Up to 8 inputs (depending on version) with logical combination capability
- Up to 14 heavy duty output (depending on version) freely allocated through the HMI to cope with all customer expectation
- Configuration using MiCOM T1 HMI for all **e-terra gridcom TPI** modules with possibility to monitor through an NMS using SNMP protocol
- Modular design allowing a full compliance of IEC 60834

In order to maintain digital communication and overall Quality of Services, the **e-terra gridcom T390** relay is equipped with the FRT mode allowing digital transmission to be recovered in 200 ms after a teleprotection command transmission.

**Outstanding quality of service**

Reliable technology should be provided to Power Utilities in order to ensure the security of the electrical power network. The **e-terra gridcom T390** Universal Power Line Carrier offers several transmission speed capacity and operating modes adapted to the needs of each user. To guarantee the continuity of the selected services when conditions become critical (for example a power failure), the system provides an automatic fall back mode (i.e. from 72kbps to 42kbps) and an improved service recovery time. The system recovers its full capacity when the line conditions are restored.

**Reduced cost of ownership**

Cost effective solution

Costs related to change in technology are often preventing customer willingness to upgrade their telecom network.

Thus, the **e-terra gridcom T390** Universal Power Line Carrier has been designed to reduce as much as possible the customer cost ownership by employing up to date modular technologies and by using a user friendly software.

It is able to be fit in all application from retrofit of existing analogue Power Line Carrier without having to change costly HV equipment to new substation providing additional services and optimized for the interconnection with Digital Networks.

**Easy commissioning**

To save time and money, ALSTOM Grid provides you the solution to assist commissioning engineer. Powerful tools have been integrated into the **e-terra gridcom T390** Universal Power line Carrier Human Machine Interface that provides a comprehensive set of features, including recording capabilities and a set of measurement integrated tools very useful during the on site commissioning.

No need of extra tools like BER tester or level generator since these features are performed by the **e-terra gridcom T390** Universal Power Line Carrier and can be read through the HMI software.

External teleprotection

**e-terra gridcom T390** PLC still offers the possibility to connect an external analogue teleprotection with boost facilities to allow transmission of commands in an analogue band.
**Maintenance cost reduction**

Expertise can be deported as SNMP functions allow you to detect and diagnose at distance any trouble on your network, reducing the customer charges.

**Highly manageable**

**Network Management using SNMP protocol (*Optional)**

*e-terra*gridcom T390, with its integrated SNMP protocol compatibility, offers Power Utilities the possibility to supervise your *e-terra*gridcom T390 network without using expensive proprietary Network management system.

All parameters of your Power line Carrier Network can be monitored anywhere with your PC and few mouse-clicks to optimize your Quality of service. Maintenance is made easier as diagnosis can be performed remotely in advanced and then optimizes site cost. Power Utilities can then monitor their entire telecom network using a single Network Management System.

**Supervision and programming**

- All the programming parameters, alarms, transmission parameters and performances; are available at any time thanks to the Ethernet Interface
- The complete link (2 PLC) can be managed remotely but also another link connected to the first one
- The transmission quality can be monitored
- A complete set of tools is available for commissioning, with no requirement for external measurement equipment
- Remote alarms and measurements are independent on the QAM signal

**Easy operation and upgrades**

*e-terra*gridcom T390 Universal Power Line Carrier offers a full remote management and configuration. No need to be an expert, the Human Machine Interface running on Windows 2000/XP has been particularly designed to be user friendly. With its 100% upgradeable software and hardware, you can remain up-to-date with the latest release and optimize your cost of ownership.

**Security pack**

The security pack enables an AES 128 bit encryption when connecting through the HMI to *e-terra*gridcom T390 preventing from any unauthorized access.

**Transmission speed at up to 128kbps on 16khz**

The *e-terra*gridcom T390 Universal Power Line Carrier provides a comprehensive set of transmission characteristics according to the network constraints.

It can operate like a conventional analogue Power Line Carrier working on 2; 2.5 or 4 kHz duplex bandwidth or fully digital mode or up to 128kbps on 16kHz. The choice of a digital modulation is given to the customer in order to adapt it depending on the Signal on Noise ratio of the link in order to reach the best compromise between the number of access, speed and bandwidth allocation.

More the superimposed digital mode allows to use the same band of 4, 8 or 16 kHz for transmission and reception dividing then by two the bandwidth requirement, a key point for congested Power Line Carrier frequency plan.
Compatibility with Scada Polling mode
The polling mode is used widely on PLC network for Scada application in order to retrieve information on a series of RTU over many PLC links.

Today e-terra gridcom T390 offers this polling mode also in digital, allowing the use of fastest transmission rates up to 38400 bit/s.

Technical data

Receiver
- Sensitivity: -20 dBm
- AGC range: 60 dB
- Selectivity: In accordance with IEC 60495

Speech interface
- Interface: 2W/4W with E&M or DTMF
- Number of interface: 3 in Processing module (Possibility of up to 4 additional services modules with 3 speech interface each)
- Mode: Central Battery, FXO, FXS, transit
- Impedance: 600 W
- Mode: balanced / isolated
- Return loss better than 14 dB
- Input level adjustment:
  - Max level +7 dBm
  - Min level -30 dBm
  - Step 0.5 dB
- Output level adjustment:
  - Max level +7 dBm
  - Min level -30 dBm
  - Step 0.5 dB
- 4W to 2W loss: 3.5 dB
- Compression: 2400bps, or 16kbps ADPCM
- Fax: G3 Fax includes ITU-T V.17, V.27ter, V.29, V.21 fax data pump with G3 Fax logic according to T.30 (used to transmit and receive facsimile data at rates up to 14.4 kbps.)

General features
- Frequency range: 20 to 700 kHz
- TX and RX band: superimposed (Digital band only) or separated and adjacent
- Choice of channel in 1 kHz steps
- Choice of carrier frequency in 1 Hz steps
- Transmitter power: 1W to 80W PEP selectable by 1W step
- Line output: balanced or unbalanced
- Impedance: 50, 75, 125, 150 W
- R.F Bandwidth analogue: 2; 2.5 kHz or 4 kHz per channel
- User Bandwidth digital: 16 kHz max up to 128kbps
  - 8 kHz max up to 72kbps
  - 4 kHz max up to 32kbps

Data interface
- V11 from 1kb/s to 72kb/s Internal or external Clock mode
- Number of interface: 1
- V24/V28 Interface RS232
  - 300, 600, 1200, 2400, 4800, 9600, 14400, 19200, 28800 Bps (Synchronous only)
  - 38400 Bps (Synchronous only)
- Number of interface: 4 (Possibility of up to 4 additional services modules with 3 data interface each)
- LAN
  - 10/100 baseT interface
  - Bridge and neighbouring features
  - VLAN support
- Number of interface: min 2 (1 per module)
**Embedded Multiplexer**
- Up to 64 different services
- 300 bps of accuracy to allocate each service
- Bridging capability for compressed speech
- Transmission

**External teleprotection**
- Interface: 4W
- Impedance: 600 W
- Mode: Balanced/Isolated
- Return loss: > 14 dB
- Input level adjustment: Max level +7 dBm, Min level -30 dBm, Step 3 dB
- Output level adjustment: Max level +7 dBm, Min level -30 dBm
- PLC Time Delay: less than 7 ms depending on the type of external Teleprotection

**Miscellaneous**
- Event recorder: up to 4000 events
- Accuracy: 1 ms
- Synchronization: IRIG B or through SNTP server

**Operating condition**
- Power supply voltage: 48 VDC +/- 20%
- Operating temperature: -30°C / +55°C
- Storage temperature: -40°C / +70°C
- Max relative humidity: 95% at 23°C
- Storage Temperature: -40°C < T < +70°C

**Insulation & CEM**
- Basic constraints PLC: IEC 60495
- EMC: as per EN 61000-6-2, EN 61000-6-4, EN 61000-6-5

**Mechanical Characteristics**

**Dimensions**
- Amplifiers: Height x Length x width: 134 mm (3U) x 483 mm (19”) x 260 mm
  - Weight: 9 kg
- Processing: 89 mm (2U) x 483 mm (19”) x 260 mm
  - Weight: 4.3 Kg
- Service: 89 mm (2U) x 483 mm (19”) x 260 mm
  - Weight: 4.2 Kg

**Management system**
- Fully SNMP V2 compatible
- Security pack: data encryption as per AES 128 bit protocol
A NEW ERA
In the constantly evolving world of power line technology, the e-terragridcom T390 Universal Power Line Carrier represents a new generation in reliable information transmission.

World class expertise

- With this 5th generation of Power Line Carrier, e-terragridcom T390 Universal Power Line Carrier, ALSTOM Grid brings unrivalled expertise to Power Line Carrier market.
- e-terragridcom T390 Universal Power Line Carrier brings an outstanding level of reliability and quality of service to Power Line Carrier applications, ensuring fast, simple and reliable installation and configuration.
- Encompassing the products and service for global solutions, ALSTOM Grid’s Telecom offering gives complete peace of mind.
- We have 50 years experience of designing, manufacturing and supplying a complete range of telecommunication equipment. Anywhere in the world, our experts can provide the solution for all of your telecom requirements, enabling you to focus on your core business.

- Comprehensive range of software and hardware
- High modularity
- IP LAN transport capability
- Network management through SNMP
- Reduced costs of ownership
- 3 built-in modems per channel instead of one
- More Teleprotection commands in reduced bandwidth
- Fastest transmission speed at up to 128kbps
- Ready for the next generation of IP networks