



## Digital Energy

# Gridcom T390

Universal Power Line Carrier (PLC) for High Voltage (HV) Transmission Lines

### COST EFFECTIVE AND RELIABLE SOLUTION COVERING THE OPERATIONAL NEEDS OF A POWER SUBSTATION

Integrated system, combined with high performance and flexibility, allowing utilities to reliably transmit voice, data, teleprotection and any other services over HV transmission lines.

#### KEY OUTCOMES

- Increased transmission capacity and efficiency
- Improved reliability, security, and stability
- Reduce costs by using existing HV power lines
- Highly configurable and customizable. No factory returns for upgrades
- Fast recovery time

#### KEY FEATURES

- Analog, Digital or mixed communication modes within the same hardware platform
- Integration within digital communication networks (IP networking, RS232 /RS422 (V11), RS485 interfaces)
- Radius authentication and SSH encryption
- Optimized bandwidth allocation with superimposed mode: Up to 320 kbit/s @ 48 kHz total bandwidth

#### OVERVIEW

### Using the Power Transmission Line as the Transport Medium

Electrical utilities need to exchange information regarding their electrical network in an efficient and effective manner, whilst preserving their initial investment. Despite the growing use of digital communication systems, communications over power line is still often the most cost effective and reliable solution. Using power lines as a communication medium allows the operator to have full control, without the associated costs of renting a dedicated communication line from a telecom operator.

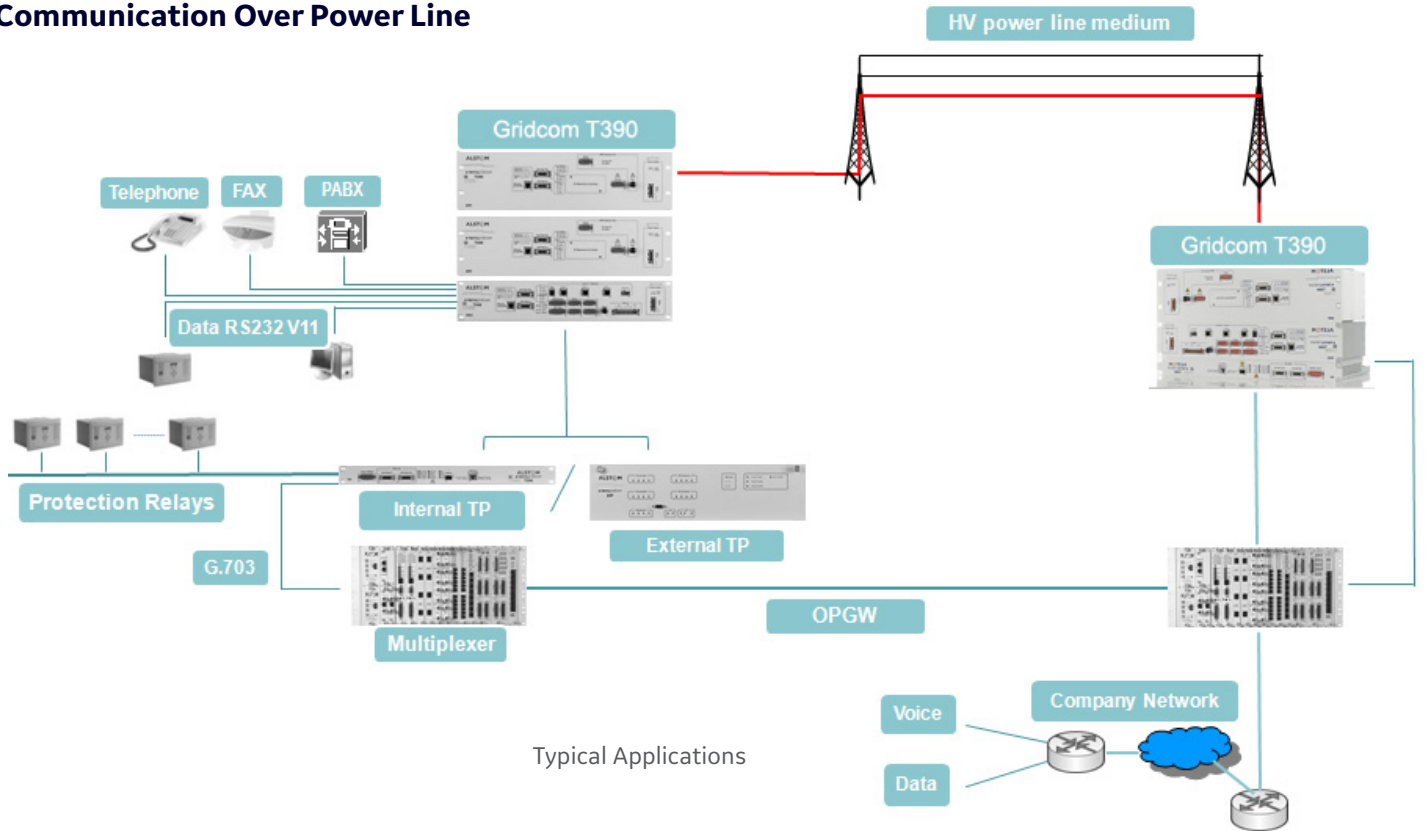
GE's Gridcom T390 is a completely integrated universal analog and/or digital Power Line Carrier. Adapted to power utilities environments and constraints, Gridcom T390 provides a dependable communication link in the most demanding substation conditions. T390 is a robust back-up solution for critical services, and an Ethernet bridging solution to substations with no optical fiber access.



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## Communication Over Power Line

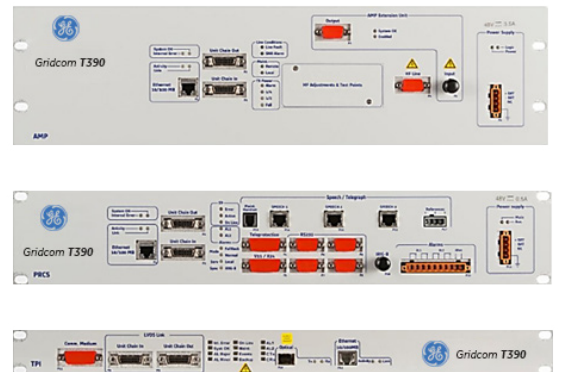


## Integrated & Modular with Front Panel Mounting

Gridcom T390 integrates:

- **Amplifier unit:** AMP/AMPX offers adjustable (2-80W) transmission power
- **Processing unit:** PRCS
- **Optional, integrated Teleprotection unit:** TPI provides up to 4 independent commands, with 8 input contacts and 14 heavy duty outputs

Each unit has a specific function, can be installed separately, and configured to customer requirements, offering high level of flexibility without any factory returns. All connections, including the power supply, are on the front of the unit to allow easy checking of the wiring.

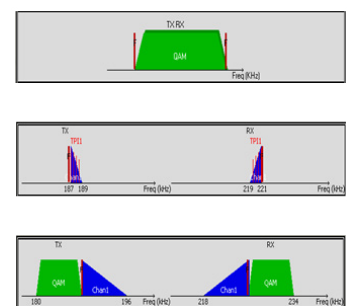


Front Panel Mounting

## Versatile System, Supporting Analog, Digital & Mix Mode

Offering perfect operational flexibility

Gridcom T390 provides the possibility to support Analog, Digital, and mixed transmission on the same hardware platform. Customers can purchase an analog PLC, then upgrade by simple firmware key activation, if the condition and application allow this. Compared to a conventional chassis, the number of interfaces is not given by the size of the chassis.



Transmission Mode

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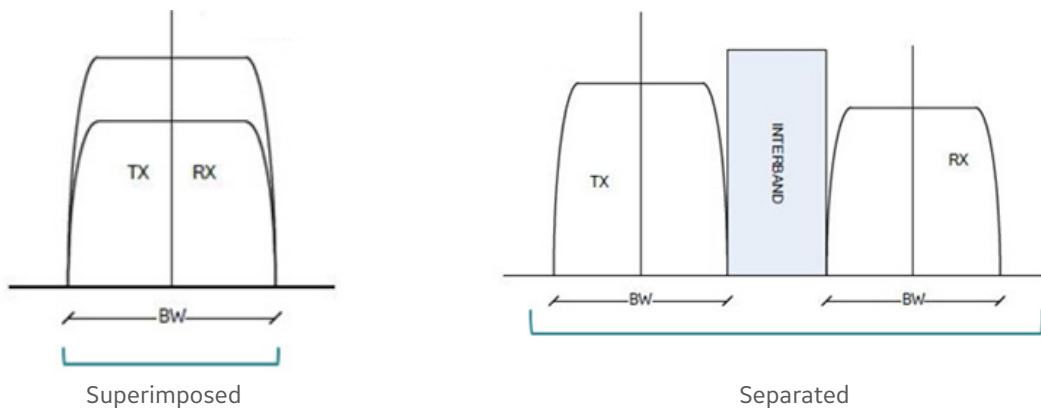
### Improved Capacity & Efficiency

Offering superimposed mode and TP over QAM for the highest LAN to LAN performance for your applications

High speed transmission for RTU: For SCADA, some RTU's may require higher communication capability. Some substations have to provide a communication capability to perform remote operations such as configuration, telemaintenance, and monitoring. Mainly IP based, these services require up to several hundred kbit/s transmission.

Equipped with an Ethernet interface, Gridcom T390 can transmit LAN and WAN information from one end to the other. This feature, designed to support IP traffic transmission on energy company networks, implements an L2 bridge at network level (full transparent bridging) with advanced capabilities, compliant with 802.1q for VLAN transport, capable to go upto 320kbits/s @ 48 kHz total bandwidth in superimposed mode.

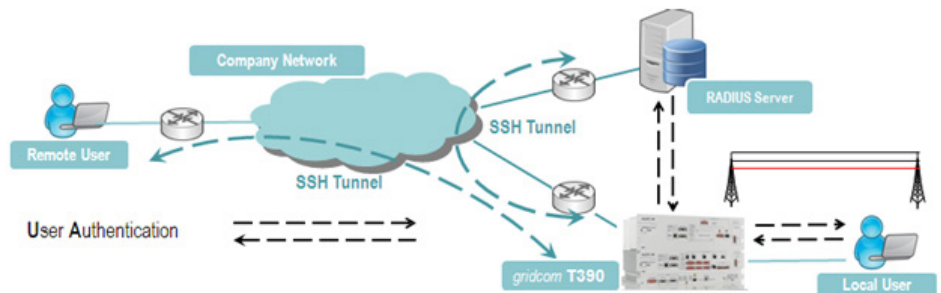
Gridcom T390 is designed to support superimposed mode, allowing transmission (TX) and reception (RX) to share the same frequency band. Superimposed mode is vital for digital PLC applications as it allows optimal bandwidth optimization, and can reduce the total bandwidth occupation by half.



### Secure & Reliable Solution

Offering RADIUS Remote User Authentication and SSH encryption, which adapts to your centralized user management topology, with a guarantee of communication confidentiality and data integrity between PLC and user.

- Remote user access is secured by User Authentication (via RADIUS or PLC).
- Local user can securely access PLC by submitting login/password per connection.
- Communication between remote user and the Gridcom T390 is secured by SSH tunnel encryption (Algorithm AES128, 3DES).
- Radius failure management is realized with RADIUS authentication mode fallback to PLC authentication mode.



Enhanced Security Features for Remote Users

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## High Level of Configuration & Customization

Offering a powerful, embedded HMI configuration, commissioning, and test tool.

The Windows based HMI provides a comprehensive set of features including:

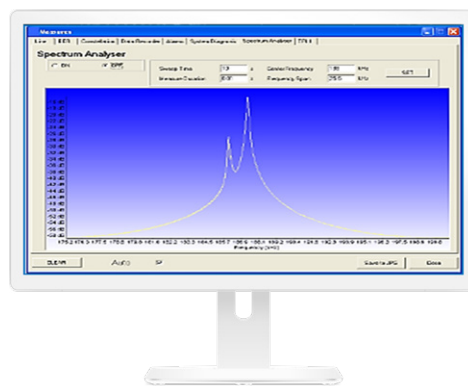
- Embedded configuration tools
- Embedded commissioning and measurement tools
- Recording capabilities
- Commissioning tools as spectrum analyzer and data recorder are integrated in the HMI to help commissioning

Numerous operations are available in maintenance (TEST) mode:

- Line measurements: SNR, AGC, TX PEP, etc.
- Digital measurements: BER, QAM (Constellation)
- Data recorder
- System diagnostics: event recorder, history logging & loopback
- Alarms status monitoring
- Spectrum Analyzer
- TPI (if a TPI is present in the system)



BER, QAM/TCM  
(Constellation)



Embedded Spectrum Analyzer for  
RX Band Measurement and Monitoring



Data Recorder

**Technical Data**

	AMP/AMPX	PRCS	TPI
Weight	8800g/7560g	4300g	3600g
Dimension	480x260x134mm	480x260x89mm	480x260x44,5mm
MTBF	66 years @ 30°C	22 years @ 30°C	29 years @ 30°C
<b>Power Supply</b>			
Input type	DC voltage		
Voltage	48V= typical (38 to 72V wide range)		
Power typ.	72W (AMP) /15W (PRCS)/ 19W (TPI)		
<b>Environmental (in operation)</b>			
Nominal temperature	-5 °C / +50°C according to 721-3-3 class 3K5		
Max temperature	-30°C / + 55 °C according to IEC 495 clause 3.1		
Max relative humidity	95 % at 23 °C non condensing		
Environmental (Storage)	-40 °C < T < +70°C		
Continuous max voltage	160 VDC - 250 VAC		
Continuous max current	200 A		
Peak current	100 A during 30 ms		
<b>Certification</b>			
Insulation	IEC 60495 / IEC 60950		
EMC (emissions)	Radiated and conducted		
	IEC 61000-6-4 /EN 55022(CISPR11)		
	IEC 61000 4-2/-3/-4/-5/-6/-8/-12/-16/-17/-18		
EMC (immunity)	IEC 61000-6-2 /IEC 61000-6-5		
Safety	IEC 60950-1/ IEC 60255		
Climatic	IEC 60721-3-3, Class 3K5		
Mechanical	IEC 60721-3-2, Cat.2M1		
<b>Transmission Capacity</b>			
Frequency range	24 to 700 kHz (configurable by step of 0.12Hz)		
Carrier frequency stability	<±1ppm over the operating temperature range		
Bandwidth allocation	Superimposed, Separated		
Channel capacity	Software configurable by step of 1 kHz		
Transmitter power (AMP)	1W to 40 W PEP		
Transmitter power (AMP + AMPX)	2W to 80 W PEP		
Line output	Balanced or unbalanced, 50, 75, 125, 150Ohm		
Max Digital bit rate	327kbit/s		

**Technical Data**

Maximum throughput v.s. bandwidth (kbit/s)									
Transmission BW (kHz)	2	4	8	16	32	40	48	50	
QAM4	3,2	6,4	12,8	25,6	51,2	64	80	81,92	
QAM16	6,4	12,8	25,6	51,2	102,4	128	160	163,84	
QAM64	9,6	19,2	38,4	76,8	153,6	192	240	245,76	
QAM256	12,8	25,6	51,2	102,4	204,8	256	320	327,68	
Data & Voice Services									
V11	220 Kbit/s for QAM64								
V24/28 (RS232)	Digital: 300 ~38400bit/s Analog: 300/ 600/ 1200 bit/s								
Speech	Digital: 2400bit/s* Analog band: 300-2000Hz, 300-2200Hz, 300-2400Hz, 300-3400Hz								
Ethernet (LAN to LAN)	IEEE802.3/IEEE802.1q								
Cyber Security									
User Authentication	RADIUS and PLC								
Encryption	SSH (AES128, 3DES)								
TPI (Internal Teleprotection)									
Performance I/O	According to 60834-1 8 inputs with logical combination 14 heavy duty outputs								
Back to back transfer time	10ms								

\* for sufficient quality of the speech signals, no more than 2 compressed telephony links should be connected in transit

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