EVENTS MONITORED AND REPORTED TO COD VIA DNP V3.0 PROTOCOL

Transient Fault	Flow Inversion	Neutral Enabled
Persistent Fault	Inverted Sensor	Radio Communication status (3 phases)
Outage	Current Surge	Transient Fault (group)
Restoration	Low Ultracapacitors	Neutral Overcurrent

MEASUREMENT AND INFORMATION REPORTED TO OPERATION CENTER VIA DNP V3.0 PROTOCOL

Sensor Serial Number	Neutral Angle
Current	Tri-Phase Current Module
Voltage	Tri-Phase Current Angle
Battery / UC Voltage	Neutral Module

INSTALLATION

onhead mkt

Electronics to Business

TECSYS® Smart Power

Smart Sensor

Distribution Network Monitoring

P&D ANEEL

coelba Grupo Neoenergia

institutos lactec

TECSYS® Smart Power

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WHAT IS IT?

▪ Tri-phase fault location system in distribution networks up to 34.5 kV using low-cost smart current sensors;
▪ Each set consists of three sensor units that collect the data from each phase and a remote unit that processes the data;
▪ The Remote unit receives real-time data from each of the Sensors and sends them to the electric utility company's operations center. Field installation with light equipment (use of ladder and hot stick) and without the need to interrupt the power supply.

SENSOR UNIT MODULE

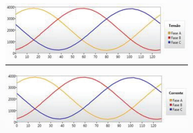
▪ Current measurement up to 400A and surge current up to 4kA;
▪ Powered by solar panel and energy backup with ultracapacitors with autonomy of up to 36 hours.
▪ Low energy consumption;
▪ Processing system using 16-bit and 12 MIPS CISC microcontroller;
▪ Internal memory using FRAM technology;
▪ To be used in primary distribuition networks (up to 34.5 kV);
▪ Equipped with voltage presence and current flow inversion detectors;
▪ Sub-GHz low power radio communication between sensor and remote units;
▪ Sensor Weight: 1.4kg (complete).

POWER LOSS SMART SENSOR

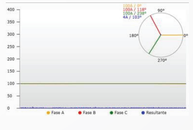
Tecsys' Power Loss Smart Sensor combines energy calculation from the voltage angle and current measurement with embedded fault detection reported to Operation Center in one system to maximize functionality and data acquisition of overhead distribution networks. Its newly patented power factor measurement is capable of determining technical and non-technical power losses on the grid. It also features an algorithm that keeps constant track of the network status, detecting a wide array of events, such as persistent or transient faults and neutral unbalance.
Every 3 sensors are tied to a remote terminal unit that consolidates all the information via a sub-GHz radio and converts them into DNP 3.0 protocol. The data is made available in a serial port, which is then integrated in any type of communication network available (Sigfox, LoRa, 4G/5G).

REMOTE MODULE UNIT

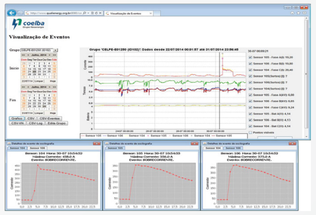
▪ Can be powered using the low-voltage network or a photovoltaic module;
▪ Communication with Operation Center using DNP3 protocol through GPRS modem;
▪ Supports up to two communication modems;
▪ Dual voltage power supply 127/220V;
▪ Automatic recharge battery control system;
▪ Energy backup autonomy of up to 6 hours with lead-acid battery or 40 minutes with ultracapacitor module;
▪ Up to 5 days of autonomy with photovoltaic module;
▪ Sub-GHz low power radio communication between sensor and remote units;
▪ Automatically identifies and controls Sensors;
▪ Supports DNP V3.0 protocol;
▪ Current unbalance calculation between phases;
▪ Provides real-time measured current phasors;
▪ Installation on power poles;
▪ Remote Weight: 5.0kg (without modems).



Oscillography



Neutral Overcurrent



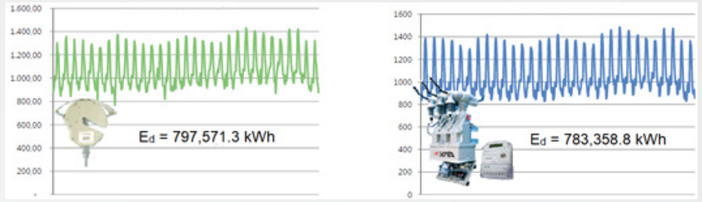
Current Events

REAL TIME MONITORING

MAIN FUNCTIONS:

▪ Detect the short-circuit current;
▪ Calculation of excessive neutral current due to unbalanced phase loads;
▪ Reporting of events to the Operations center;
▪ Provides data to assist operators to locate flaws on the grid through the installation of sensors in strategic locations.

Smart Sensor (kW) **Energy meter (kW)**



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All the data is then processed by SINAPGRID, an electrical network analysis software that processes the power flow and presents the information in an intuitive graphical interface. It compares the energy calculated by the Smart Sensors with the distributed and billed energy to differentiate between technical and non-technical losses on the grid.

The energy calculation algorithm is a two-step process that utilizes synchronized measurement of the current of the distribution network and the voltage of the low-voltage network with a maximum delay of 40 µs.

The Power Loss Smart Sensor also features:

▪ Maintenance free solar powered sensors;
▪ Maintenance - free ultracapacitor energy reserve pack;
▪ Easy to integrate in preexisting networks;
▪ Time stamped solicited and unsolicited messages.