

Specification for Smart Panels : Energy management system to monitor, control and maintain building installations

The specification describes functionalities and technical features of an Energy management system for non-critical building for :

- ISO 50001 and green building compliance
- Multi-site benchmarking of energy consumption.
- Network and Asset management.

Energy management system consists of a Low Voltage switchboard with the use of a simple communication architecture to deliver :

- On-line energy consumption monitoring (Cloud connectivity)
- Real time access to energy consumption, energy quality, network status and simple control of devices through local communicating interfaces
- Data collection and transmit CSV file to FTP server.

Table of contents:

1	Presentation	3
2	Architecture	3
2.1	Energy Server	3
2.2	Interfaces	3
2.3	Switchboard display.....	4
2.4	Communication network	4
3	Manufacturer certified system	5
4	Installation, commissioning and maintenance	5
5	Operation	5
5.1	Data collection	5
5.2	Data access	5
5.3	Device alarm management.....	6
5.4	Data export	6
6	Data reliability and security	6
6.1	Archiving of data	6
6.2	Saving of the data in case of breakdown	6
6.3	Security of data.....	7
7	Services	7
8	Documentation	7

1 Presentation

Communicating low voltage switchboards are a response to regulatory incentives and the need to control power consumption and energy costs. They also improve continuity of service by increasing the availability of power.

Communicating low voltage switchboards embeds an Energy Server to provide secure web access and to collect and store measurement WAGES (water, air, gas, electricity, steam), consumption readings and environmental parameters, such as temperature, humidity, and CO₂ levels, in a commercial building. Data is periodically transmitted as a report to an Internet database server.

Once received by the server, the data is ready to be processed and displayed as web pages for investors or occupants of the building.

Communicating low voltage switchboard will be tested according to the standard IN 61439-1&2 and will offer a group perfectly integrated by devices of protection and of the electrical distribution, functional mechanical units of integration, interfaces of communication of devices, of software and service adapted to non-critical buildings offering a system of Energy Management.

The system of energy management will propose real-time functions of visualization, monitoring, simple control and maintenance of equipments using an open protocol such as Modbus TCP/IP or Modbus RS485 serial line:

- Energy cost management : energy saving & optimization (water, air, gas, electricity steam)
- Electrical Distribution network management : protection, monitoring & control
- Asset management: use optimization, predictive maintenance, equipment alarming.

The communicating low voltage switchboard will offer an Ethernet TCP / IP connection to link with the local area network of communication installed in the building (LAN) and will offer a simple access to the real-time data of the installation by the use of an Internet web browser.

2 Architecture

2.1 Energy Server

The Energy Server shall have digital inputs, analog inputs, two Ethernet ports, which can be used either as a switch or separated ports (one IP address for each) and one Modbus serial line port.

The Wi-Fi and GPRS modules shall be easily installed or removed after wiring of the box. Installation of these modules shall not require additional wires or tools. It shall not require contact with the active part of a printed circuit board.

The Energy Server settings shall be accessible through web pages with logging access.

It shall be possible to define a different logging interval for each of six different device types: water, air, gas, electricity, steam, or environmental values.

The data logger shall be able to export logged data in CSV file format.

The data logger is able to manage data export with a proxy server.

2.2 Interfaces

Besides Energy Server, the solution will be articulated around interfaces of Energy Management which will collect the data via TCP / IP and Modbus networks to whom will be connected, communicating circuit breakers, modules of interface having logic and analog inputs, pulse input of counting, logic outputs, energy meters and power meters.

Communication interfaces will allow real time monitoring and devices control for all the layers of electrical distribution structures (feeders up to incomer channel circuit breakers).

Communication interfaces will be compliant to Device Profile Web Service (DPWS) for discovery on the local area network (LAN).

The Energy management interface will offer a direct access to the functions of acquisition, visualization, simple control of load and device.

The Energy management interface will integrate functions of acquisition of:

- values of communicating circuit breakers with embedded capacities of measure
- counting of pulses, electric, gas meters or water meters,
- values of communicating energy meters or power meters,
- logical statements of the technical equipments
- alarms with timestamp
- analogical sensor values of temperature.

The Energy management interface will integrate functions of visualization via web pages:

- data of energy consumption
- Followed electric values for the installations monitoring
- alarms and events
- Followed from the qualitative value of the energy
- state / status of equipments, opened, closed, activated, typical of release
- Followed from the operation data and from predictive maintenance.

The Energy management interface will integrate functions of simple control of load and device via logic outputs, orders of actuator, by the use of pages.

2.3 Switchboard display

The system will integrate a switchboard display unit which will be connected via the Ethernet TCP / IP network to the interfaces of communicating switchboard.

The switchboard display unit will offer a direct and real-time access of display, simple control of load and device.

The switchboard display unit will integrate functions of visualization:

- data of energy consumption
- Followed electric values for the monitoring of the installations
- alarms and events
- Followed from the qualitative value of the energy
- state / status of equipments, opened, closed, activated, typical of release
- Followed from the operation data and from predictive maintenance.

The switchboard display unit will integrate functions of simple control of load and device via logic outputs, orders of actuator.

2.4 Communication network

The system architecture will have to lean on the Ethernet TCP/IP 10/100 Mbps local area network existing in the building.

The main switchboard, the terminal panelboard will be linked on the Ethernet TCP / IP network by means of type RJ45's connection.

The use of the communication network Modbus RS485 is limited to the connection of equipment to interfaces of the same switchboard or panelboard.

3 Manufacturer certified system

The solution must be certified "Tested, validated, Documented" by the manufacturer.

- Tested:
 - All the configurations of the solution was tested by the manufacturer
 - Products answer the current standards, the results of test are available.
- Validated:
 - The system - equipment, software, and services - was validated on specific platforms recreating conditions of environment equivalent to that of the complete life cycle of the system : of the initial customer request, by way of the order, the installation, the commissioning, the support and the associated services, until the obsolescence.
- Documented:
 - The manufacturer realized a set of guides, of tools of training, and documentation allowing the good operation of the system

4 Installation, commissioning and maintenance

The solution shall be designed, installed, configured and maintained in any autonomy by an electrical installers.

The needs of evolution can also be easily implementation by an electrical installors with a simple addition of device and a simple extension of the existing configuration.

The electrical installers must be trained and certified by the manufacturer.

The installation will be facilitated by the provision of tools of configuration having functions of auto discovery of the present devices on the networks of communication.

The commissioning can be made since any PC using an Internet web browser.

This mode of configuration will be possible with an Ethernet connection.

Energy Server and interfaces of Energy Management can be fixed in electrical panel on rail DIN in closer of the energy and power meters and circuit breakers.

5 Operation

The users will have access to the data since a PC connected to building network by using a simple Internet web browser and since switchboard display.

5.1 Data collection

The Energy Server logging interval shall be configurable from 1 to 60 minutes.

It shall be possible to define a different logging interval for each of six different device types: water, air, gas, electricity, steam, or environmental values.

The interfaces shall collect the data in intervals of time (weather) of 5, 10, 15, 20, or 30mn to supply real-time information and allow:

- A continuity of the measure
- A fast answer to the detected problems: technical alarms, abnormal consumption.

5.2 Data access

On site Real time monitoring and control

Data displayed on graphics or recorded into files are of a great interest for optimizing the use of energy in the building.

On a PC display with common browser

- shows monitoring web pages hosted into the local Ethernet interfaces,
- alarm events generate automatic email notifications,
- allows control (open, close, reset...) of various equipments.

On a touch screen display connected to Ethernet

- shows essential electrical information and alarms concerning the electrical network,
- allows control (open, close, reset...) of various equipments.

On line Energy consumption Monitoring

On line applications are Software-as-a-Service (SaaS) tools that provide energy consumption information to help site manager optimize energy use and reduce operating expenses:

- information to suit a diverse audience
- Identify energy savings opportunities
- Track consumption and carbon footprint reduction
- See the impact of your energy initiatives Tailor energy

Applications allow you to add additional applications incrementally, while a 'plug and play' design ensures the applications will connect seamlessly.

Additionally, open standards mean StruxureWare applications will work with virtually any software, hardware, or system you're already using, so there's no need to start over.

On line applications automate data collection via an open, scalable, and secure energy management information system, and can be used to communicate advanced results and performance to a broad audience for a shared understanding throughout an organization.

On line applications will be expanded in the future and will be added periodically to address the user evolve needs.

5.3 Device alarm management

Energy management system shall transmit device alarms via email.

5.4 Data export

The solution will have to allow the issue of reports (files .csv with compatibility of MSEXcel) manually or automatically, or transmitted by e-mail or by file transfers on FTP servers.

6 Data reliability and security

6.1 Archiving of data

The data of interfaces must be able to be automatically archived on not volatile memory and on FTP server.

6.2 Saving of the data in case of breakdown

Energy Server will have to store reports to be transmitted in case of cut of the Ethernet communication network; it will have to send back them on the return to the communication.

The counting of the pulses in the interface must be maintained in case of cut of the communication; the current value of the meter will be restored on the return to the communication.

The current value of the pulse meters in the interface must be stored in case of cut of the power supply of these interfaces and will be restored on the return to the power supply.

6.3 Security of data

The access to the data must be protected by passwords in a hierarchical structure.

7 Services

The Energy Server can act as a solution and service enabler, from a remote energy management system, either within the building or located outside of the building.

The data logger shall enable encryption of data using the SSL protocol.

The data logger shall enable remote and automatic firmware upgrades & configuration without disturbing data acquisition.

The system must be associated with a range of services intended to support the electrical installers and the end user by bringing to them of the technical support and the council in Energy efficiency issue.

In system support, the electrical installers will have to be able to benefit, on behalf of the manufacturer :

- of trainings
- of a phone support accessible to the office hours, 5 days a week, by experimented engineers having tools of remote repair such as Webex, Anywhere and VPN PC.
- of a remote control of the smooth running of the solution during the final phase of installation by engineers support experimented
- of a FAQ to search, inform and to maintain a synthesis of the solution
- of a technician's on-site intervention to accompany the partner in his first project.

In system support, the end user will have to be able to benefit:

- of a technical support hours of office / 5j.
- of a periodic and proactive follow-up of the system for operations of proactive maintenance by engineers support experimented
- of a follow-up personalized by the solution by an experimented agent
- of a support Energy Efficiency by the sending of report on the use of the energy, on the optimization of the energy bill and on the recommendations for reduce the energy consumption
- of energy audits by the intervention of an expert in energy efficiency.

8 Documentation

The manufacturer will have to give complete set of user and installation guides of the system, documents of training, and of tools.