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Press report

## **Energy and PQ monitoring with BACnet certificate**

*Power quality analysers and energy measurement devices – standard tools in the energy management of clinics and data centres – are also increasingly replacing simple consumption meters in less critical objects. BACnet, which is recognised itself as one of the leading bus systems in building management, is an excellent choice for integrating these devices into control technology and energy management. Certified products ensure reliable and manufacturer-independent communication.*

When it comes to energy, operators of larger properties are battling on several fronts: costs and supply security should not interfere with each other or compromise convenience or user friendliness. In addition, modern building automation and IT structures in offices impose quality demands that in the past were only associated with data centres. After all, even short voltage drops can result in computer crashes, data losses and all kinds of problems with controls.

Another aspect includes the energy management systems as described in DIN EN ISO 50001. While compliance with this energy management standard is voluntary, certification in line with it (or a registered environmental management system according to the EMAS directive) is required in order to be eligible for partial exemption of the EEG reallocation charge in Germany. Regardless of the standard, making consumption transparent and identifying sources of energy waste is of course critical for every company.

Power quality analysers and energy measurement devices, such as the UMG series from Janitza electronics GmbH, are ideal universal tools for tackling this task. They are typically used in hotels, hospitals, shopping centres, trade fairs, and data centres. Several thousand devices can be installed in data centres. Of course, the analysers not only record and save the data locally but they also provide it to the control and management level through various interfaces (image 1). Janitza devoted considerable technical efforts and expenses to certify specific devices for one of these interfaces, namely BACnet. Rudolf Müller, Director of Sales and Marketing, explained the measure: *"BACnet has developed into one of the most important standards for building services technology, because of its compatibility with a wide range of hardware. Its strict standards require standard, manufacturer-independent communication. It also eliminates the need for additional interfaces or converters. Once our UMG measurement device receives its BACnet ID and is integrated into the network, it is detected by the system and displayed in the browser. That makes the configuration process very easy."* The BACnet-compliant devices from the manufacture based in North Hessen also offer another unique

advantage, explained Rudolf Müller: *"Our BACnet-certified devices can simultaneously operate as a master for Modbus slaves. There are already hardly any comparable certified-products available on the market, but as far as I know we are one the only company currently offering this feature. As of January 2014, there was no comparable device listed on the BACnet homepage."* To understand the philosophy of BACnet and the advantages it offers the user, it's worth taking a closer look at this bus system.

### **BACnet, the building manager**

There are a number of established bus systems for building automation, such as Lon or KNX/EIB. However, they are designed for building systems technology, e.g. the field level. BACnet (***B*uilding *A*utomation and *C*ontrol *N*etworks**) has become the standard for open communication at the control and management level.

BACnet was developed as an open, independent and licence-free standard for building automation with the aim of establishing interoperability between devices and systems of different manufacturers without requiring the use of gateways. The globally recognised standard DIN EN ISO 16484-5 regulates all the physical and communicative basic and processing functions necessary for this.

Messages and services are used with BACnet according to the client/server principle. The main protocol elements include the object types, services and networks. They offer a host of advantages in practice. For example, a device is frequently "broken down" into individual data points for standards in the field level. For a switching signal, it makes no difference, for example, whether two sensing devices are in a joint housing or are physically separated. With BACnet, a device is considered as one object, i.e. the "white" network that is part of the many different measured values, saved data and presettings of a network analyser for this special device. This approach provides a special benefit, for example, for assigning reading and writing rights to other devices in the network. This requires a great deal of effort and represents a large source of errors for each individual data point.

### **The BACnet structure: objects, properties, services**

As mentioned above, BACnet is based on subjects such as a network analyser. This means that all of the information, for example, voltage data includes not only the numeric value, but also information such as the physical unit, name and description of the measuring point, installation location and the type of the measurement value sensor or limit values. Standard object types are primarily described in the DIN EN ISO 16484-5:2004 and some of the others were standardised by the American National Standards Institute (ANSI). The standard allows the manufacturer to develop several other object types. However, the standard prohibits manufactures from replacing standard object types with their own.

The properties of an object are specified in an object-specific defined data record. Standard object types have mandatory properties that are only readable (R) or writeable (W). Typical R properties include physical units. In contrast, a setpoint, for example, is generally a writeable property. By now it must be clear just how important it is to have well-organised management of the reading and writing rights.

The third key term is services. They describe the communication behaviour and are assigned categories, such as access to objects, alarm and event processing and configuration and diagnostics. The "generate signal" example illustrates how the BACnet client/server principle supports the user. For example, the change of value (COV) service allows you to configure the device so that the current value is automatically transmitted to a previously defined receiver when an analogue or binary value changes. A threshold value (COV\_Increment) can also be defined for analogue measured variables. This eliminates the need for permanent polling of measured values by a central unit.

To ensure the interoperability between devices from different manufacturers, all participants must agree which services and procedures must be supported on the server and client side. These lists are referred to BACnet interoperability building blocks (BIBBs).

### **Network protocol and interfaces**

The question of the transmission remains to be answered. BACnet can be operated on a wide range of physical networks. BACnet/IP (BACnet over IP) is widespread, particularly in public buildings. It is considered powerful and future-proof. Janitza products also use it. As stated above, it simultaneously operates as a master device for Modbus slaves. For example, they may include additional, simpler measurement devices or data loggers that supplement the main device, e.g submetering. As a result, these more cost-effective products can also be integrated in the BACnet architecture. At the same time, you save IP addresses and thus additional costs. Image 2 illustrates such an application.

### **BACnet standard device profiles**

To make it easier to integrate devices of different manufacturer in one project, the standard describes standardised types (profiles) of BACnet devices. Each profile determines the minimum BIBBs that the devices must control if they are to be considered standardised BACnet devices.

For a specific device, its manufacturer prepares a declaration of conformity, a protocol implementation conformance statement (PICS). Among other things, this document includes all supported BIBBs, object types, character sets and communication options, a product description, the standard device profile, etc. The complete description would go beyond the purpose of this contribution. Janitza devices are classified as BACnet Smart Actuators (B-SA) (image 3).

### **Certificates for all requirements.**

On the one hand, the above sections suggest the vast development work required to completely meet the standard. On the other hand, it is clear that with complex devices, a user can always check whether the product is behaving in line with the standard, especially in situations that occur infrequently. The BACnet standard therefore requires several stages for the certification:

- Manufacturers that use BACnet can apply for a free vendor ID. Their devices are then listed. The significance of this list, however, is very limited. Theoretically, a manufacturer can use the BACnet transmission for proprietary protocols.
- A further step includes devices with the BTL logo (BACnet Testing Laboratories). Products with this logo have been temporarily or subsequently tested by a testing laboratory. The testing laboratory compile the actual tested BIBBs, object types and other performance features of the device in a certificate (product listing).
- Only products with this logo are approved for the third stage of the certification by a national accreditation body according to EN ISO/IEC 17025 (General Requirements for the Competence of Calibration and Testing Laboratories). Janitza has completed this step (image 4).

It is very important for potential customers to know the difference between these BACnet certificates, especially when it involves complex devices, such as network analysers. Depending on the application, be it faults in critical system or the exemption of the EEG reallocation charge, the measured data must be completely trustworthy and reliable.

### **Expenses for the manufacturer – benefits for the user**

Janitza electronics GmbH has invested a great deal of time and money for the certification. Rudolf Müller described the process: *"It was a very elaborate process. Just the software alone for the internal tests costed € 30,000. The actual certification is performed by an external testing laboratory and it was very difficult to acquire the capacities in Germany. But, as a result, with these devices in our product range, we can now consider ourselves one of the leading companies on this market."* The entire project took almost a year and required Janitza to make significant changes to the protocol. Rudolf Müller considers the expenses to be justified: *"According to our experience, such certifications help establish genuine compatibility, that is not just paper work for the protocol certifications,"* surmised Mr. Müller.

Janitza had the UMG 604 and UMG 605 product lines certified for mounting DIN rail assembly and the UMG 508 and UMG 511 for front panel installation (image 5). Since it involves the most modern Ethernet (TCP/IP) measurement devices of the Janitza product range, it was only natural to implement the BACnet protocol on them. All four are very powerful network or power quality analysers with large

measurement data memories. They have embedded web servers for a separate homepage and e-mail functions. A graphic programming environment makes it possible to prepare user-specific Jasic<sup>®</sup> programs comparable to a PLC.

The devices record all relevant data for consumption recording (kWh, kvarh...) and for analysing the power quality (transients, harmonics, start-up currents, flicker, short interruptions, minimum and maximum values, etc.). The GridVis<sup>®</sup>-Basic software included in the scope of delivery allows for comprehensive analyses at the touch of a button (image 6).

The next product is the UMG 96RM-E, an even more cost-effective Ethernet energy measurement device. Its certification is expected in the second quarter of 2014. It offers six current measuring channels and a RCM measurement (residual current). They make it possible to monitor the insulation status of an installation. This is especially important for continuous processes in which the power supply must not under any circumstances be interrupted (image 7).

Janitza offers a comprehensive range of BACnet devices for a wide variety of applications. The external certification ensures reliable, system-wide communication – an essential requirement for working with critical data.

**Janitza electronics GmbH**

For more than 50 years the German company Janitza electronics GmbH has been active in the field of manufacturing systems for efficient power application, energy measurement and cost savings. As a globally well-known supplier of network monitoring and energy management systems, digital integrated measurement devices, reactive power controllers and compensation systems, the company stands for the highest quality standards and innovations. Its products are manufactured based on the latest technological developments and state-of-the-art production technology. Quality management at Janitza is a continuous, corporate executive function (e.g. ISO 50001). We rely on our comprehensive expertise, competent consultation and development of concepts to the commissioning of tailored solutions to meet the demands and requirements of our customers.

[www.janitza.de](http://www.janitza.de)

## Image captions

Fold-out picture

Image 1: The data from a UMG device can be read out with the corresponding software and displayed in any desired format.

Image 2: An application with two in-feeds, BACnet masters and Modbus slaves

Image 3: An excerpt of the "PICS" declaration of conformity Janitza devices are classified as BACnet Smart Actuators (B-SA)

Image 4: The certificate of a national accreditation body confirms the conformity according to EN ISO/IEC 17025

Image 5: Certified for BACnet: The UMG series 511, 508, 605 and 604

Image 6: The GridVis<sup>®</sup> software enables comprehensive analyses at the touch of a button

Image 7: The UMG 96RM-E energy measurement devices offer continuous monitoring of the operating and residual current transformer (RCM) in power distribution.

((Image source)) Janitza electronics GmbH

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