

# Measuring with Swiss precision

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**The energy consumption of governmental buildings is exactly recorded in Berlin – ecological concepts**

The consumption of electric energy increases inexorably in the industrialised nations. The saving programs of individual countries cannot compensate the growing demand for electricity. This trend will probably not change during coming years. One of the reasons is the increasing use of computers, the power consumption of which should not be underestimated.

## Number of PC households increases exponentially

Computer and Internet access presently account for more than one percent of the total consumption of all households in Germany – that is more than the consumption for lighting. The German Electricity Association (Verband der Elektrizitätswirtschaft - VDEW) ascribes this predominantly to the surge in PC purchases and Internet connections of recent years. The number of households with a PC increased from 39 percent in 1998 to 61 percent in 2003. In 1998, 3.1 million households had an Internet connection, 18.2 million was the figure for 2003. By now, the energy consumption for information and communication amounts to one eighth of the consump-



Picture 1: Multifunctional power monitors for all measurands in electrical systems.

tion of all household appliances. In total, the share of household appliances in the energy consumption of households amounts to eight percent.

## Multifunctional devices replace displays

Previously, analogue displays were used to record and represent the most important data of the energy supply network – one for each measured variable like voltage, current, power or frequency. Today, multifunctional instruments in compact design – as shown in Figure 1 – measure more than 100 variables. These may be displayed, stored or read out via a computer.

Additional functions like minimum and maximum values, bimetal, drag indicator record the chronological change of measured values. Zero shift, asymmetry as well as harmonics indicate the quality of networks. The instruments measure in all four quadrants and thus both in energy production and consumption.

In times of power liberalisation, customers want to have an exact overview – not only of consumed energy but also of the most important parameters of the rotary current network. The federal government sets a good example and

records the energy consumption of the different buildings in the Berlin “Spreebogen”. For example, 17 power meters have been installed in the individual outlets of a low-voltage facility. Previously, devices had been installed in control cabinets which could not display the energy meters in a reliable fashion. Since the control cabinets had already been notched to 144x144 millimetres, SINEAX A230 of Camille Bauer with a class accuracy of 0.2 (current, voltage) was chosen.

## Network condition and quality under control

The reconstructed supply installation in the Berlin government section present a big challenge for the operator since energy consumption, network condition and quality can only be estimated approximately in advance. SINEAX A230 offers a good price/performance ratio in this respect since it also records network quality parameters apart from the important network condition variables. In the 17 outlets, the energy consumption values of the individual parts of the building are measured and documented. Together with power data and load limit values of the wiring this provides an overview of

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Figure 2: The dome: Energetically sophisticated concept.  
(Photograph by: Partner für Berlin/FTB Werbefotografie)

the system and enables early extension measures. The power meter has two limit value outputs, which are activated if important limit values are exceeded.

Active, reactive and apparent power continually provide an overview of the energy consumption of the network for the operator. From these figures, a performance factor is calculated in all quadrants which can be used to verify, for example, the effectiveness of the reactive current compensation facilities.

It is evident, that current values must be easily readable. The large, well-lit seven-segment display of SINEAX A230 perfectly meets this requirement. The flat design of the line hardly takes up any space in the control cabinet. Devices can easily be installed and wired behind the power meters.

Small, slip-on modules extend the scope of functions of the devices. Depending on the application functions like data logger, analogue output, MODBUS, Profibus or Ethernet may be easily realised – even subsequently. Users only slip on the module and can do this without any tools.

Power meters with rechargeable batteries, charger, clip-on ammeter and connecting cable are available for mobile use. These devices are excellently suited for temporary use and also have

a data logger. The same enables an easy read-out of measured values by software which is available free of charge on the Internet page of Camille Bauer. It even enables users to transfer the data including date and time to the Excel spreadsheet by a mouse click. The whole line is of a modular design and provides the right device for every application. There are no additional costs for functions which are not used.

### **Berlin sets a good example**

The federal buildings in the “Spreebogen” which use Camille Bauer instruments are supposed to be an example in relation to ecological energy supply for the whole country. According to the press department of the German “Bundestag” they feature an intelligent resource-conserving energy and heating concept. For example, the annual CO<sub>2</sub> emission of the “Reichstag” building has been reduced from approximately 7,000 to 1,000 tons.

Experts are of the opinion that the excellent pollution balance is not least owing to two combined heat and power plants (CHP) which exclusively use vegetable oil from regrowing raw materials. The CHPs are responsible for the base load and supply the government

buildings with power from generators and heat from the exhaust fumes. Since they do not use conventional fuel but biodiesel they achieve an excellent utilisation of primary energy and particularly low CO<sub>2</sub> emission. Biodiesel consists of special chemical compounds of vegetable oil, animal or old edible fats, which occur in deep-frying.

Raw materials are usually the most common vegetable oils, i.e. rapeseed in northern Europe, soy beans in the US or palm oil in countries with a more tropical climate. The refinement and esterifying process results in a particularly clean oil free of phosphate and sulphur.

While burning gas and petroleum produces dangerous gases, the regrowing raw materials bind the CO<sub>2</sub> in the atmosphere through photosynthesis. Burning vegetable oil thus does not pollute the environment with additional carbon dioxide.

The two combined heat and power plants using biodiesel (exact description: vegetable oil methyl ester) and the solar power facility of 300 square metres on the roof of the “Reichstag” building can cover 82 percent of the electricity demand in the “Reichstag” and the adjacent parliament buildings. Additional power from the mains must only be used during peak times.