

ENVIS Application for Energy Efficiency according to EN 16001:2009

Presented solution builds an automated energy and power quality monitoring system from the line of SM and SIMON analysers, various supported energy meters and the power factor correction systems with NOVAR controllers in combination with the ENVIS software. It is an ideal solution for precise transparent energy management system which allows to monitor various parameters of the energy usage in whole company or in its various units. Measured data are stored in database for further deep analysis and various alarms can be configured to immediately alert the responsible staff in case of exceptional events.

The EN 16001:2009 standard contains requirements and guidance for proper implementation of energy management systems. The main goal of this guidance is increasing of energy efficient operations throughout all processes in your organisation. Nowadays with high energy prices the energy management is becoming even more important. EN 16001:2009 helps with implementation of such an energy consumption monitoring system. Systematic approach to energy efficiency evaluation is a main assumption for successful application of this standard.

In this document we present a portfolio of products and services provided by KMB systems to simplify the burden of permanent energy efficient operation in accordance with common regulations and standards. The presented energy management system fulfills all requirements to implement a policy and system for continual improvements of the energy usage and reliability in an organisation. The system performs automatic monitoring, measuring and analysis of energy consumption and power quality in all key points on the electrical network and will be further described in this brochure.

One of the most important task to achieve energy efficient operation is identification and review of all aspects of energy consumption. Systems in use must be also fully reconfigurable and adjustable for future assignments as each implementer (re)defines its own aspects which are significant for monitoring, analysis and gradual improvements. Usually places with highest energy consumption, high reactive power demand, unexpected generation or with high peak energy load are amongst the first to be optimized. Cost and return of investment analysis must be also a part of a good design. Our systems do represent a perfect fit for such monitoring campaigns booth permanent and temporary to provide all required information at different layers of detail.

Yet another key aspect of the system is its sustainability - the ability to be effectively operated in a long term and utilized not only in time of the certification but also long time after. For this feature the software is designed to perform routine tasks autonomously on the background. It only invites the respective stakeholder to take an action upon certain

alerts (via email, SMS, SNMP Trap). Other listed users are periodically updated with adjustable short form excerpt reports for simple overview of a part or the whole system status.

Thanks to the constant monitoring of the energy there is also possibility of instant noticing of deviations and disorders in energy which could then be early corrected. With our system company would not only fulfill EN 16001:2009 standard but it also gains system which monitors power quality by EN 50160 standard. Power quality monitoring system provides historical data in support for claims the quality of supplied power from the contractor. There are also other benefits of power quality monitoring like improved lifetime of connected appliances or positive environmental influence.

With our software and hardware product range the whole energy monitoring, measuring and analyzing process becomes much faster, easier, more accurate and thus more efficient. With proper equipment the whole energy management system can be precisely tailored to company's needs.

Typical solution consists of a complete power quality analysis and load (generation) monitoring on all places of common coupling¹. SMPQ is a perfect fit for this application. Other key nodes in the infrastructure can be monitored with simpler analyzers such as SMY, SMV or SMP. For the complete submetering we recommend and offer KWZ electricity meters. ENVIS software can also read out data from many other M-Bus or ModBus enabled electricity meters which might already be in place. NOVAR power factor controllers are with an optional remote communication also allows the technical staff to permanently monitor a state of installed PFC systems and immediately react to its failures.

Data collection for all mentioned instruments typically involves RS485 or Ethernet infrastructure and can be also implemented over Wifi, GPRS, PLC or other locally suitable solutions.

¹Point of Common Coupling (PCC) - a node in the power distribution network, where energy is exchanged/traded between supplier and consumer.

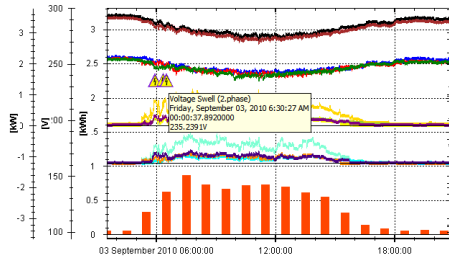


Figure 1: Visualized Electricity meter reading in combined chart

Typical ENVIS Use Cases

Management gains basic summary of power costs and consumption in whole company or in individual operation units.

Economists and logistics have got access to detailed information about energy usage in company. On the basis of this information planning and cost savings analysis can be performed.

Technical staff can monitor in detail all measured parameters of energy in each monitored part of company. Parameters like power consumption or peak energy in each department or quality of power received from contractor are directly provided to them. Thanks to received data, they can then react to changes or make requested steps for improvements.

Software for Energy Monitoring Systems

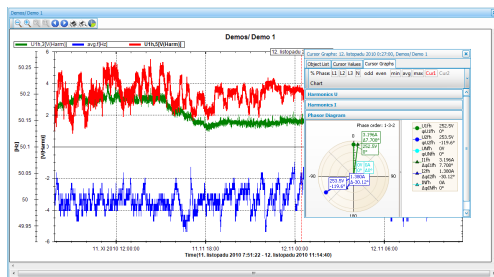


Figure 2: Detailed record of measured values and the actual voltage/current phase diagram is displayed in the ENVIS software.

ENVIS Application (fig. 2) is the tool for energy management, analysis and data processing for all the mentioned instruments. Configuration and data acquisition of instruments is provided in a standalone component² called ENVIS.Daq. This suite is free of

²The ENVIS.Daq application can be operated independently on the main ENVIS application thus allowing it to be run by several different users also on low power laptops, PCs and other similar devices.

charge in its standard version. Standard version allows downloading of archive records and its subsequent processing. Provides basic features for their analytic evaluation, visualization and reporting. Data from connected instruments are usually stored to a SQL server or binary files. They can then be also exported to various formats like XLS, CSV, PDF and HTML. Each measurement could be archived to binary files and stored on hard disk. Application allows online monitoring of state of each instrument and actual values of measured quantities.

Power Quality Evaluation			
Quantity	Limits	Values (out of limits)	
Measure Duration	1 week	413:23:00	
Interval	10 min	10 min	
Frequency 99.5 %	50 Hz +1% -1%	---	
Frequency 100 %	50 Hz +4% -6%	---	
Unbalance 95 %	2%	100 - 100 / 100%	

Quantity	Limits	I1	I2	I3
Voltage 95 %	230 +10% -10%	239.9 - 259.5 / 50.0%	239.9 - 259.5 / 50.0%	239.6 - 259.2 / 49.4%
Voltage 100 %	230 +10% -15%	237.1 - 260.2 / 50.0%	237.1 - 260.2 / 50.0%	236.9 - 260.0 / 49.4%
Flicker Pst 95 %	1	---	---	---
THD 95 %	8%	2.42 - 3.42 / 0.0%	2.42 - 3.42 / 0.0%	2.42 - 3.42 / 0.0%

Figure 3: One of evaluation tables form report created by ENVIS

ENVIS.Online is key service for implementation of automatic monitoring system. Ensures periodic reading and record of measured data (automated data acquisition) from installed instruments to the central database(s). It also provides features for continuous monitoring of key parameters of installed instruments. It periodically creates various reports (fig.4) from measured data. These records are distributed to its users via e-mail. ENVIS.Online can also monitor specified conditions in the infrastructure and generate alerts (email, SMS, SNMP trap) when these conditions are not met.



Figure 4: ENVIS.Online with Reports plugin

Brief Overview of Supported Instruments

	Memory [Mb]	Meter	Communication	IEC 61000-4-30	EN 50160	Installation
SML	-	-	Opt ^a	-	-	91x91
SMM	-	-	Opt ^a	-	-	DIN-35
SMN	-	-	Opt ^a	-	-	DIN-35
SMY	1	-	✓ ^b	-	-	91x91
SMZ	1	✓ ^c	✓ ^b	-	-	138x138
SMV	512	✓	✓ ^d	S	-	91x91
SMP	512	✓	✓ ^d	S	-	91x91
SMPQ	512	✓	✓ ^d	S	✓	91x91
SIMON 341+	8	✓	✓ ^e	B	-	Portable
SIMON PQ	512	✓	✓ ^f	S	✓	Portable
BRAVO	512	✓	✓ ^f	S	✓	Portable

^aOptional RS232/485, external Ethernet or GPRS.

^bLocal RS232, optional RS232/485, external Ethernet or GPRS.

^cOrdering option E

^dLocal USB, optional RS232/485 or Ethernet, external GPRS.

^eLocal USB or RS232/485, external Ethernet or GPRS.

^fLocal USB or Wifi.



Figure 5: Three-phase static meter KWZ-3PH-I5

Electricity Meters (M-Bus, ModBus)

are key instruments for energy efficiency monitoring. Our software supports meters with M-Bus or Modbus interface from different manufacturers. It is also possible to add new meters from another manufacturers (which might be already installed) upon request by simply creating a description file for the register of a new instrument.

Power Quality Analyzers

are builtin instruments with advanced functions and embedded memory for long term monitoring and recording of all data which are critical to fluent, reliable and save operation of your instalation.

SMV, SMP is a standard solution for monitoring of power consumption and voltage/power quality evaluation. Measured values are displayed on four row numeric LED display (SMV) or on a comfortable LCD screen (SMP). Instruments are equipped

with precise class 0.5S active power electricity meter (EN 62053-21) and a class 2 reactive power electricity meter (EN 62053-23) with TOU tariffs and four-quadrant operation. Automated meter readings and all other measured quantities can be recorded in a large enough internal memory and also communicated to a PC database for further processing. It is possible to protect data in instruments by passwords on two different levels for better security. Optionally instruments could be equipped with module for voltage events recording by standard EN 50160.



Figure 6: SMPQ power quality analyzer

SMPQ is a fully equipped power quality analyzer which builds on top of SMP instrument. Compared to previous instruments this adds a continual power quality evaluation in accordance to EN 50160. This feature also includes measuring of short term and long term flicker severity indices (IEC 61000-4-15). Instrument also evaluates harmonic and inter-harmonic distortion according to standard IEC 61000-4-7. All SMPQ instruments are also equipped with a voltage events logger.

Panel Multimeters and Loggers

are simpler built-in analysers for basic submetering applications with less feauteres when compared to the fully equipped power quality analysers. In many applications these lightweight instruments play a significant role in mass data collection throughout the whole infrastructure.



Figure 7: SMY multifunctional panel meter

SMY, SMZ are instruments with built in memory which allows them to record actual values on it. With remotely connected PC, actual values can be read and visualized. Also data stored in internal memory can be downloaded to PC and further analyzed.

Basic electricity meter with readings capability is included.

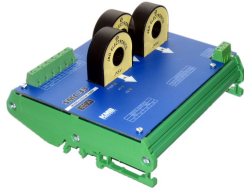


Figure 8: SMC multifunctional meter

SMC is multi-functional programmable measuring instrument with internal memory. Instruments does not contain any display or other controls - it is rather a remotely controlled and configured probe. Configuration and visualization of the retrieved data is made solely with ENVIS software.



Figure 9: SMN multifunctional meter

SML, **SMM**, **SMN** instruments are simple three phase multimeters without built in memory. This instruments are display or communicate all measured values. The communication interface allows it to be simply configured and managed via ENVIS from a remote PC. In combination with ENVIS.Online its actual values can be periodically downloaded and stored to a SQL database for further processing.

Portable Analyzers

are mostly used for temporary measuring campaigns and to discover sources of various problems such as outages, distortion, fuse tripping etc. This instruments are compact and uses flexible sensors for current measuring which simplifies installation. Data from all our recent analysers can be processed in ENVIS.



Figure 10: Modular portable analyzer SIMON PQ

SIMON PQ modular power quality analyzer. Determined for continual monitoring of four currents and volages in basic configuration. Number of currents is possible to extend up to 6x4 current inputs. Instrument is based on SMPQ panel meter and shares most of its parameters. For example it measures flicker and interharmonics and allows recording and evaluation of power quality accordance standard EN 50160. Compact dimensions and protection rating IP65 predisposes this instrument for use in heavy-duty conditions and tight places.



Figure 11: Protatable analyzer SIMON 341+

SIMON 341+ is innovated dataloggin device for measuring and recording of voltage, current, power, power factor, frequency, THD, harmonics and other quantities in low voltage networks. It is based on previous generation of portable SIMON analyzers and supports also same current sensors. Compare to previous version is smaller and provides wider range of measured quantities with better precision and continual measuring.

BRAVO is a programmable network monitor and registration measuring instrument for measuring the three-phase distribution systems. It is designed for measurements in substations, switch cabinet low voltage distribution networks or directly by customers.

Power Factor Correction



Figure 12: Fast NOVAR 1312 power factor controller

NOVAR PFC is fully automatic, configurable and programable power factor controller. It exists in various models from basic model 10xx, through higher class models 11xx and 12xx with better sensitivity and optional communication port or special case models for fast PF correction (NOVAR 13xx) using thyristor switch modules KATKA or so called three phase power factor correction (NOVAR 14xx), where a combination of single-phase and three-phase capacitors and reactors, which are also in our product range, can be used to compensate reactive power in unbalanced conditions.

Presented system assembled from SM instruments and NOVAR pf controllers in combination with ENVIS software package is ideal solution for precise transparent energy management system. System al-

lows to monitor energy usage in whole company or in its various parts. Measured data stored in database can be then visualized, evaluated or analyzed.

For other informations you can visit our web pages www.kmb.cz. Any of your questions can be directed on our phone +420 485 130 314 or e-mail kmb@kmb.cz. In case of orders you can directly use e-mail obchod@kmb.cz.



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- [1] EN 16001:2009. *Energy management systems – Requirements with guidance for use*, European Committee for Standardization, 2009
- [2] *Documentation for measuring instruments and ENVIS software*, [online] URL:<http://www.kmb.cz/>

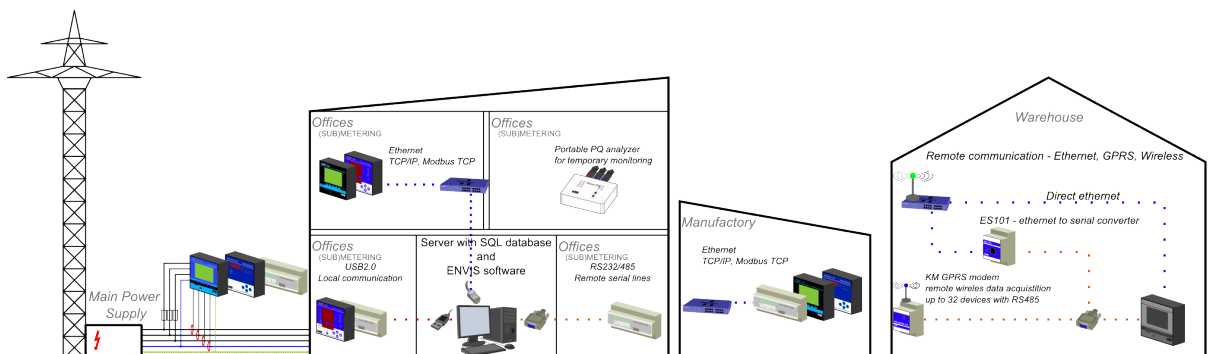


Figure 13: Example of possible monitoring system