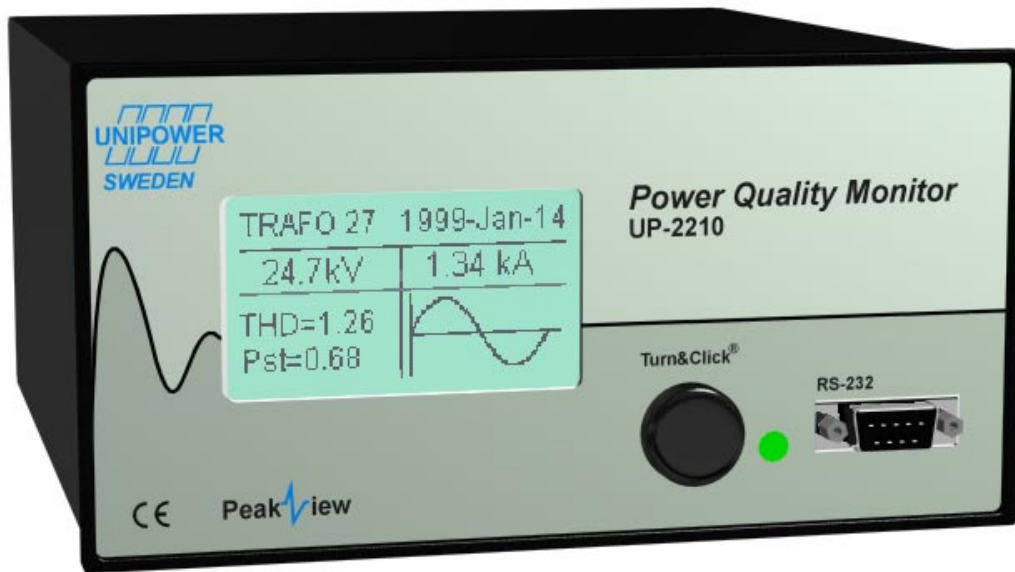


# Power Quality Monitor for permanent installation

## PQ-Monitor system UP-2210



The UP-2210 system is the ultimate system for permanent power quality monitoring in any electrical power network. The system measures all quality parameters simultaneously and analyzes the power quality each and every cycle thanks to specially designed hardware. This unique system performs automatic evaluations according to the current industry standards such as the EN 50 160, voltage quality, and the IEC 1000-4-15, flicker quality. UP-2210 allows you continuous remote quality control and will be the key element of your Power Quality control system.

## New energy situation demands new measurement systems

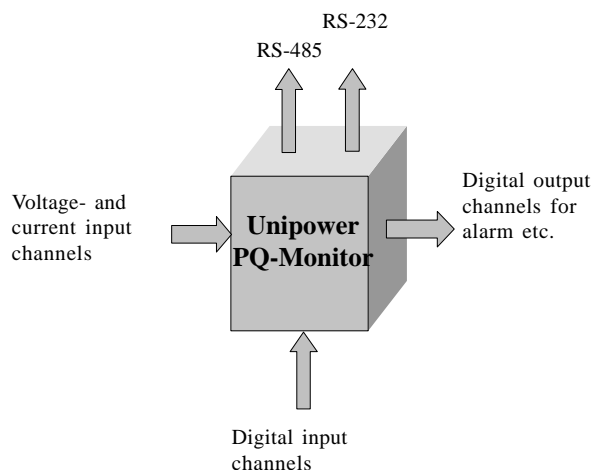
During the last three to five years an increasing interest in power quality has been developing. Today, both customer and producer alike are concerned about power quality. Until now, most power quality measurements were made with portable energy analyzers. UNIPOWER has developed a unique system designed to complement the portable energy analyzers. The system is a complete power quality monitoring system which can be permanently installed on location and not only monitors all power quality parameters simultaneously, but automatically reports any failures. Any power quality problem arising will be detected at an early stage thereby avoiding potentially costly failures and malfunctions.

### PQ-System UP-2210

Unipower has received a lot of requests over the last year for a power quality system designed for permanent installation. We have listened to our customers and the result is a new power quality monitoring system called UP-2210. The system consists of a measurement unit that is permanently installed on location, which communicates with a host computer. The host computer evaluates, displays and gives measure reports. The figure below shows a principal outline for such an installation. As usual, UNIPOWER has put a lot of effort into developing an easy-to-use system. Mainly, it's just a question of fastening one end to the points of interest within the power network, connecting the other end to the host computer and press the start button. From a remote PC, the operator automatically receives all reports generated concerning power quality. The operator can also study the measurement values in real time.

### Measure unit

The measure unit is based upon a powerful digital signal processor (DSP) which makes it possible to simultaneously monitor all power quality parameters with high precision. Each cycle is analyzed in accordance with the common standards such IEC 1000-4-7 and IEC-1000-4-15 (IEC 868).



### Analog inputs

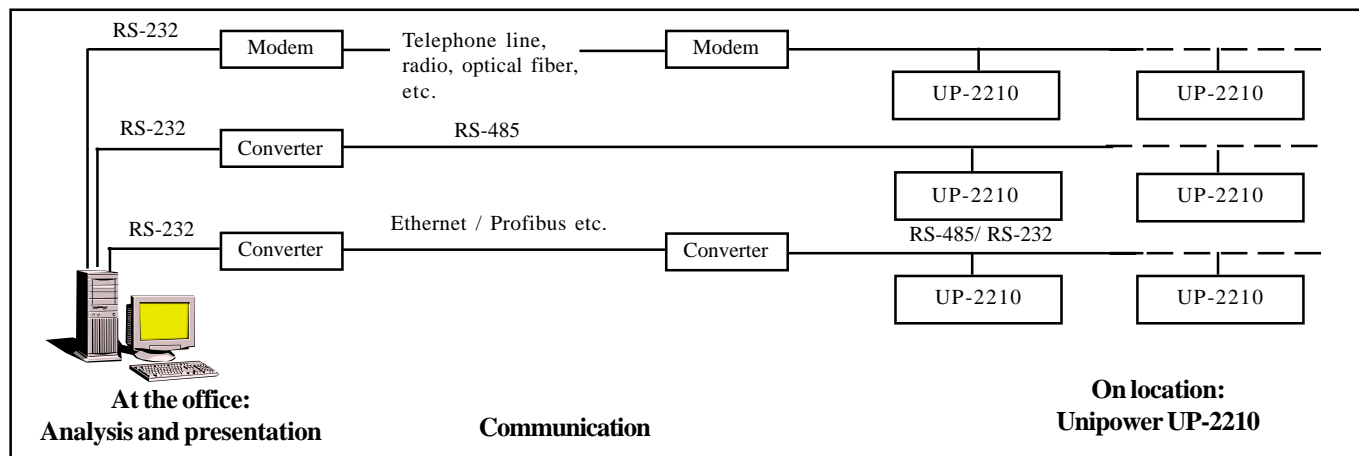
The measure unit has 4 voltage and 4 current input channels. The fourth current input channel is very important because the current of all three phases and the neutral connector must be measured simultaneously. Both voltage and current channels can be installed to existing VT and CT's as well as a wide range of voltage transducers and current clamps.

### Digital Inputs

The measure unit is equipped with 32 digital inputs which can receive pulses from all kinds of equipment such as kWh meters, water-meters, circuit breakers, etc.

### Digital Outputs

The UP-2210 is also equipped with 2 general digital outputs which can be preprogrammed to alarm when certain pre-set conditions are met such as excessive harmonics.



Principal Overview of the UP-2210 system.

## Power Quality

The UP-2210 system is a full-featured power quality monitor able to discover any power quality problems your network might encounter. Since the system measures and analyzes cycle-by-cycle, quality problems are discovered as soon as they occur, thereby alerting you of potentially costly problems in the power network before any damage occurs. Below are some of the most usual power quality problems.

### Harmonics

Harmonic distortion is caused by nonlinear devices. Several problems in the power system are related to harmonics. For example, capacitor banks can easily be damaged and neutral connectors can be overheated because of high level harmonic distortion. To prevent any harmonic related problems it is necessary to measure continuously. The UP-2210 system monitors the harmonics, both amplitude and phase, up to the 50th harmonic. Furthermore, the THD- and K factors are also calculated. The measure method for harmonics are based on the standard IEC-1000-4-7.

### Transients, sags and swells

Disturbances in the power system are transients, swells or sags. The transients are very fast disturbances which come from lightning, capacitor switching etc. Voltage sags are short-duration interruptions generally caused by faults such as short circuits in the utility system. For the reliability of the power system, it is important to know the occurrence of disturbance in order to prevent costly failures. The UP-2210 discovers all kind of disturbances and it's analysis categorizes the type of disturbance in order to find the disturbance source.

### Flicker

Fluctuating loads cause voltage variations that are often referred to as flicker. Lamps connected to such voltage produce a flickering light which is very irritating to the human eye. The UP-2210 measures voltage flicker according to the proposed IEC-1000-4-15 (IEC-868) standard and calculates all flicker parameters such as IFL, PST and PLT.

### Voltage unbalance

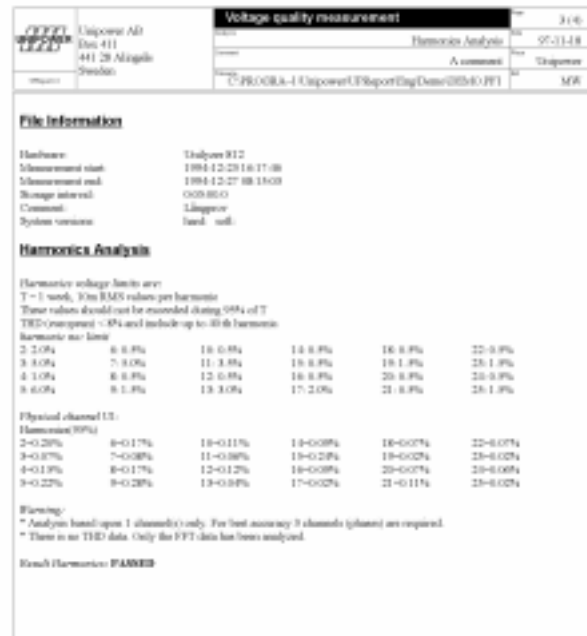
Unbalance is a condition in which the three phase voltages differ in amplitude. This unbalance is frequently expressed as the ratio of the negative phase sequence divided by the positive phase sequence as a percentage. Even small amounts of unbalance decreases the efficiency of a three phase motor. Monitoring the voltage unbalance can improve efficiency and increase the longevity of a motor.

## COMMUNICATION

One of the main ideas of the UP-2210 is the automatic communication that is established between a main computer at the office and the permanently installed measure unit. The communication can be established in different ways. Physically it can be made via a wire, phone connection radio, fiber wire, etc. The unit is equipped with both an RS-232 and an RS-485 user interface. Data are transferred safely via some internationally known communication protocol such as Profibus, Modbus etc. The main computer administrates all communication automatically. Of course, real-time data can be analyzed on site if a portable PC is connected with the permanently installed unit.

## EVALUATION OF DATA

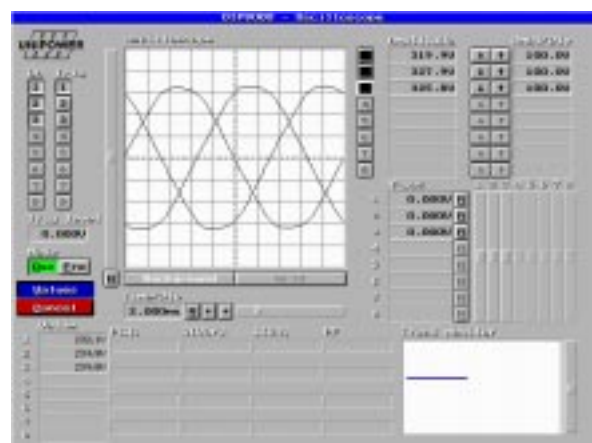
Transferred data from the measure unit to the main computer is automatically evaluated in the program Unipower Report by the main computer. The software is a report generator which compare data with demanded standards such as EN 50 160, SS 421 18 11, etc. The operator can review the generated reports or further evaluate the data in Power Profile to obtain more detailed graphs.



*Document from the automatic report generator, Unipower Report, which automatically analyzes the measure data according to existing standards.*

### Real-time analysis

The user can study the real-time values of the measurement and waves in an optional unit at any given time. See graph below



*Oscilloscope, trend graph and real-time values displayed remotely. A Phasor diagram and Harmonic graph is also available in real-time.*

## Technical Specification

### Voltage inputs

Voltage channels	4 differential inputs
Channel input level	0 - 275 V TRMS
Resolution	14 bit (84 dB)
Sampling-rate	12,8kHz
Input impedance	10 Mohm
Bandwidth	3.1 kHz
Accuracy	<0.1% (exkl. transducer)

For maximum accuracy, automatic synchronization to the power frequency is performed by a phase-locked loop.

### Current inputs

Current channels	4 differential inputs
Channel input level	0 - 6 A TRMS
Resolution	14 bit
Sampling-rate	12,8kHz
Input impedance	10 Mohm
Bandwidth	3.1 kHz
Accuracy	<0.1 % (exkl. transducer)

### Transient voltage inputs

Transient input channels	3 differential inputs
Channel input level	+/- 2000 V peak
Resolution	14 bit
Detectable transients	Fast transients (> 500 ns) sags, swells and short interruptions
Input impedance	10 Mohm
voltage levels	+/- 3000V

### Digital inputs

32 digital inputs

### Digital outputs

2 digital output relays

### Calculated parameters

Power [kW]	
Reactive power [kVAR]	
Apparent power [kVA]	
Energy [kWh]	
Reactive energy [kVARh]	
Frequency	45 - 75 Hz
Harmonics	0 - 50:th harmonics of voltage, current and power
Harmonic Resolution	0.1%
THD	According to american and european definitions
K-factor	
Flicker:	IFL, Pst, Plt calculated according to standard IEC 1000-4-15 (IEC-868)

### Communication

The UP-2210 has a built-in RS-232 and a RS-485 interface. This opens up a variety of flexible possibilities for communication. We prefer the MODBUS driver, used by many power network monitoring software as well as the Modbus and Ethernet protocols. Of course, the UP-2210 can easily be connected to an ordinary modem.

### Software

All necessary software for communication, evaluation and documentation is available for both Window 95/98 and Windows NT platforms.

### Standards

Voltage quality	EN 50 160, SS 421 18 11
Harmonics measurements	IEC 1000-4-7
Flicker measurements	IEC 1000-4-15 (IEC 868)

### Mechanical data

Size W x D x H	190 x 218 x 97 mm
Operational temperature	-10 to +55 C
Humidity	10% - 90% non condensing
Weight	2.1 kg
Safety	EN 61 010-1
EMC	Complies with EN 50 081-1,2; EN 50 082-1,2

### Calibration and selftest

The calibration of UP-2210 is extremely simple because it is software based. Just apply a reference voltage to the analogue inputs and press the calibration button in the software and UP-2210 is calibrated. To assure maximum reliability the UP-2210 always performs an automatic selftest before measuring.

## UP-2210 main features:

All data are processed in real time by a 32 bit Digital Signal Processor.

High speed sampling frequency of 12.8 kHz gives a better accuracy of all measured parameters.

High accuracy in all measured parameters thanks to a synchronisation between the sampling of the input signals and the power frequency. The synchronisation is made possible by a built-in PLL (phase-locked loop).

Easily upgradeable with newer software versions thanks to the built in Flash memory.

The evaluation software programs PowerProfile and Unipower Report are developed specially to make the analysis process easy and straight-forward. Unipower Report makes an automatic report according to national and international standards. Any new standards can easily be adopted to Unipower Report as a plug-in module.

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**For more information, contact your local dealer:**