# Power Quality Analyser
# ANALYST 3P

- **Three phase power quality analyser and disturbance recorder**

- **Colour display**

- **Portable, robust and easy to use**

- **Ideal for troubleshooting, load profiling and energy optimisation**

- **Key parameters for three phase systems including voltage and current harmonics to the 40th**

- **Power and Energy measurement**

- **Easy to use PQLog View download, analysis and reporting software**



## Applications

Justification of the installation of energy saving devices requires „bench marking" before and after to ensure efficient operation. Liberalisation of the energy market and the increasing use of modern electronic equipment that can pollute the supply, "Power Quality" is becoming increasingly important for energy providers and final customers alike. The consequences of poor power quality include malfunction and reduced lifetime of electronic equipment, inefficient use of energy and potential safety hazards due to overheating.

**ANALYST 3P** is an ideal troubleshooting tool to measure and monitor the performance and efficiency of electrical plant and equipment.

**ANALYST 3P** has been designed for the rapid location of disturbances within electrical systems. It provides the perfect solution for electricians, service personnel and plant managers, who are frequently confronted with disturbance problems.

## Measuring system

**ANALYST 3P** measures all essential power quality parameters in 50 and 60 Hz systems: r.m.s. values of voltage and current, events, harmonics, voltage, power and line frequency.

The most important power parameters are measured including active power, apparent power, reactive power, power factor, phase angle and active and reactive energy.

An instant view of voltage and current waveforms is provided through an oscilloscope mode capable of displaying current and voltage waveforms for all 3 phases simultaneously.

The online harmonics measurement mode quickly shows the state of voltage and current harmonics and THD.

The measured parameters are sampled at 10.24kHz, can be recorded over time and displayed on the colour screen in chart mode and downloaded to a PC for further analysis and report generation. The chart mode facility is ideal for identifying intermittent problems, trends with time and peak demand figures. The firmware of **ANALYST 3P** can be updated via a standard RS232 interface.

## Operation

**ANALYST 3P** was designed with easy operation in mind. The desired measuring function is directly selected using a central dial. **ANALYST 3P** will immediately deliver the relevant measuring results.
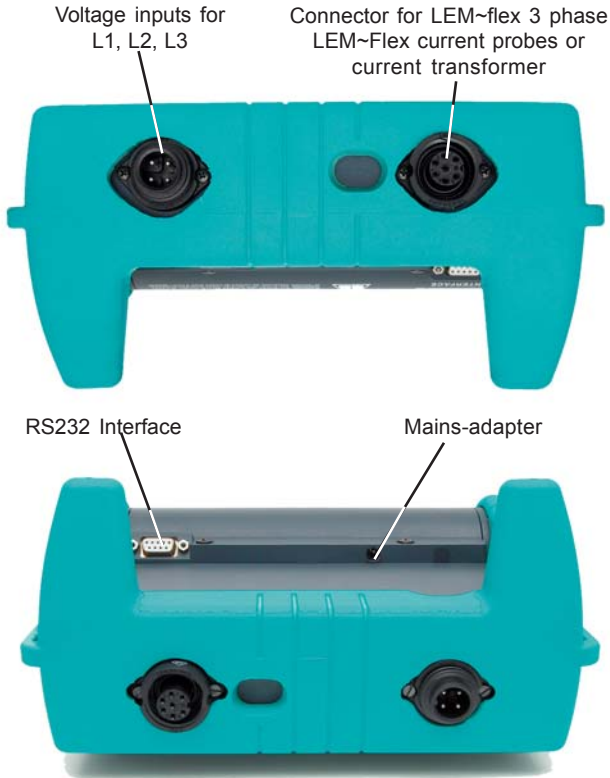




Additional functions can be accessed via intuitive buttons. It is also possible to change the measuring parameters.

A high-resolution colour display enables the representation of graphs.
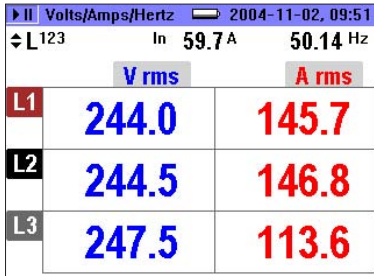


LEM

## Connectors

Voltage inputs for L1, L2, L3

Connector for LEM~flex 3 phase LEM~Flex current probes or current transformer

RS232 Interface

Mains-adapter

## Measurement Functions

### Volt, Ampere, Hertz

| | | |
|---|---|---|
| ▶II Volts/Amps/Hertz | 2004-11-02, 09:51 | |
| ↕ L123 | In 59.7 A | 50.14 Hz |

| | V rms | A rms |
|---|---|---|
| L1 | 244.0 | 145.7 |
| L2 | 244.5 | 146.8 |
| L3 | 247.5 | 113.6 |

- Measuring r.m.s. values of voltage and current
- Display as digital measurement values (multimeter function) and as time curve (recorder function).

**Voltage inputs:**
$U_N$ ranges Y:      57 to 480 V AC
$U_N$ ranges D:      100 to 830 V AC

| Intrinsic error | Resolution | Operating error |
|---|---|---|
| ± (0.2 % of m.v. + 5 dig) | 0.1 V | ± (0.5 % of m.v. + 10 dig) |

**Current inputs:**
LEM~flex and current clamps with voltage output are supported. All current sensors must meet 600 V / CATIII.
LEM~flex $I_N$ ranges: 15 / 150 / 3000 Amp AC (sinewave); Current probe ranges: 50 / 500 mV AC; CF (typical): 2.83

| Intrinsic error | Resolution | Operating error |
|---|---|---|
| ± (0.5 % of m.v. + 10 dig) | 1 A | ± (1 % of m.v. + 10 dig) |
| ± (0.5 % of m.v. + 10 dig) | 0.1 A | ± (1 % of m.v. + 10 dig) |
| ± (0.5 % of m.v. + 20 dig) | 0.01 A | ± (1 % of m.v. + 20 dig) |

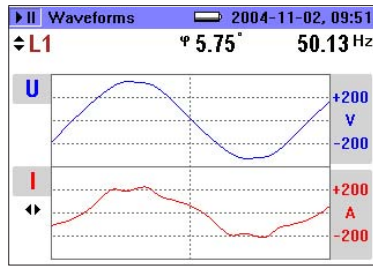The errors of the current sensors themselves are not accounted for here.

By using LEM~flex:
LEM~flex measuring error:      ±(2 % of m. v. + 10 digit)
Position influence:      ±(3 % of m. v. + 10 digit)

**Frequency measurement:**
Measuring range: 46 - 54 Hz and 56 - 64 Hz

| Intrinsic error | Resolution | Operating error |
|---|---|---|
| ± (0.2 % of m.v. + 5 dig) | 0.01 Hz | ± (0.5 % of m.v. + 10 dig) |

## Waveform

| | | |
|---|---|---|
| ▶II Waveforms | 2004-11-02, 09:51 | |
| ↕ L1 | φ 5.75° | 50.13 Hz |

U    +200 V / -200
I    +200 A / -200

- Graphic representation of waveforms for voltage and current as well as a numerical representation of the φ angle.
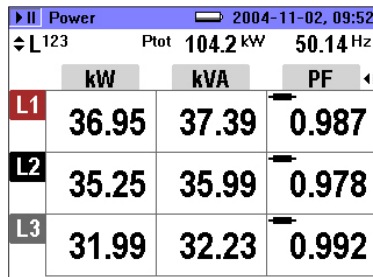- Quality assessment of the line voltage and the load currents

Errors see Volt, Ampere, Hertz.

## Harmonics

| | | |
|---|---|---|
| ▶II Harmonics | 2004-11-02, 09:51 | |
| ↕ L3 | THD 11.9 % | |
| | Irms 130.9 A | |

I    10 % 5
1  5  9  13  17  21  25  29  33  37

- Calculation of harmonics with graphic representation
- Scalable bar chart with detailed information on every harmonic
- Recording of harmonics
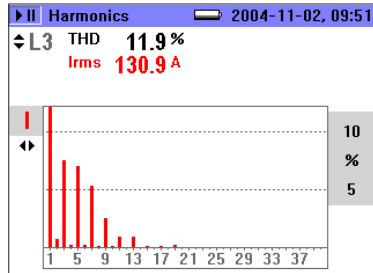
Measurement range: 1st ... 40th harmonic
( for harmonic values < 50 % of $U_m$ )

| | Accuracy |
|---|---|
| $U_m$, $I_m$ THDU, THDI | As per IEC 1000-4-7, class B |
| $U_m \geq 3$ % $U_N$ | 5 % $U_m$ |
| $U_m < 3$ % $U_N$ | 0.15 % $U_N$ |
| $I_m \geq 10$ % $I_N$ | 5 % $I_m$ |
| $I_m < 10$ % $I_N$ | 0.5 % $I_N$ |
| THDU | for THD <3 %:      < 0.15 %      at $U_N$<br>for THD ≥3 %:      < 5 %      at $U_N$ |
| THDI | for THD <10 %:      < 0.5 %      at $I_N$<br>for THD ≥10 %:      < 5 %      at $I_N$ |

$_m$ - for Measured value
$_N$ - for Nominal ranges of the measurement instrument

## Power and Energy

| | | |
|---|---|---|
| ▶II Power | 2004-11-02, 09:52 | |
| ↕ L123 | Ptot 104.2 kW | 50.14 Hz |

| | kW | kVA | PF |
|---|---|---|---|
| L1 | 36.95 | 37.39 | 0.987 |
| L2 | 35.25 | 35.99 | 0.978 |
| L3 | 31.99 | 32.23 | 0.992 |

- Calculations of active power, apparent power, reactive power, distortion power and power factor cosine φ, active and reactive energy,
- Display of power flow direction
- Indication whether capacitive / inductive

Measuring range: see measurements of U and I; Power deviations are derived by adding the deviations of current and voltage; Additional error through PF: Specified deviations x (1-IPFI)

**Maximum Range** with Voltage range 830 V delta-connection and 3000 A current range is 2.490 MW

| Intrinsic error | Resolution | Operating error |
|---|---|---|
| ± (0.7 % of m.v. + 15 dig) | 1 kW | ± (1.5 % of m.v. + 20 dig) |

**Typical Range** with Voltage range 230 V star-connection and 150 A current range is 34.50 kW

| Intrinsic error | Resolution | Operating error |
|---|---|---|
| ± (0.7 % of m.v. + 15 dig) | 1W…10W | ± (1.5 % of m.v. + 20 dig) |

The errors of the current sensors themselves have not been considered.

**PF Power Factor**

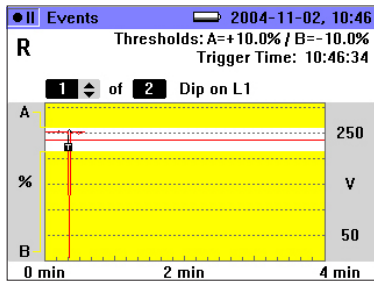| Range | Resolution | Accuracy |
|---|---|---|
| 0.000 to 1.000 | 0.001 | ±1% of full scale |

**Energy Measurement (kWh, kVAh, kVARh)**

| Intrinsic error | Resolution | Operating error |
|---|---|---|
| ± (0.7 % of m.v. + F variation error* +15 dig) | 1W…10W | ± (1.5 % of m.v. + F variation error* +20 dig) |

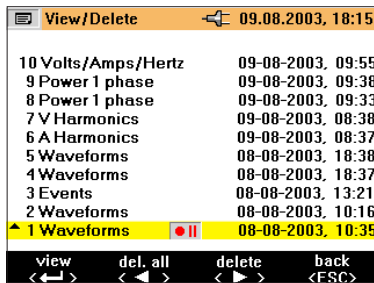* Frequency variation error 2 % m.v. + 2* (% maximum frequency deviation)

## Events



- Detection of voltage dips, voltage swells and voltage interruptions
- Automatic triggering and recording based on half-cycle r.m.s. values

**Half-cycle r.m.s. values:**

| Intrinsic error | Resolution | Operating error |
|---|---|---|
| ± (1 % of m.v. + 10 dig) | 0.1 V | ± (2 % of m.v. + 10 dig) |

## Other

### Screenshots



- Saving of all measurement results
- On-site management and viewing of data
- Sorting of measurement results according to date and time.

### Data storage

- Stores up to 50 screenshots, event data and course-of-time data in the flash memory
- Total of approx. 1.5 MB storage space for measurement data
- Storage duration 1440: average intervals in the functions of performance, harmonic component, Hz, volt, amps and power parameters.
- Auto-Screenshot saves up to 6 screenshots during one recording session, which can be viewed with the View Auto-Screenshotsoption.

### Interface

- RS232 interface for data transfer and firmware upgrades
- Standard RS232 SUB-D connector (9-pole / female)
- RS232 configuration: up to 115.2 kBaud, 8 data bits, no parity, 1 stop-bit.

### Software

PQLogView software enables download, display, analysis and reporting of recorded measurements and saved screens. Recording of measured values may be displayed numerically and graphically. Energy may be plotted as an integral value or averaged with a demand period (minimum period = average set in instrument).
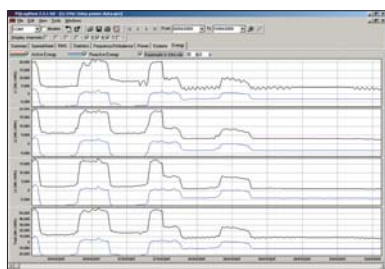


## Updates

- Firmware updates by user via RS232 interface and Flash Update software
- Due to flash technology, the device does not need to be opened

## Technical Data

**Display:**

| | |
|---|---|
| Display | 1/4 VGA display, Colour transmissive LCD 320 x 240 pixels with backlight. |

**Ambient Conditions:**

| | | |
|---|---|---|
| Working temp. range | -10° C...+50° C | (+14° F...+122° F ) |
| Operating temp. range | 0° C...+40° C | (+32° F...+104° F ) |
| Storage temp. range | -20° C...+60° C | ( -4° F...+140° F ) |
| Reference temp. | +23° C ± 2K | (+73° F ± 4° F ) |
| Climate class | C1 (IEC654-1), -5°C...+45°C, 5 %...95 % RH, no dew | |

**Error indication:**

| | |
|---|---|
| Intrinsic error | Refers to the reference temperature range and is guaranteed for 2 years |
| Operating error | Refers to the operating temperature range and is guaranteed for 2 years |
| Temperature coefficient | ±0.1% of the measuring value per K |

**Safety class and Safety features:**

| | |
|---|---|
| Protective holster | Robust rubber holster protects against mechanical damage |
| Safety class | IP65 as per EN60529 |
| Safety | IEC 61010-1, 600 V CAT III, double or |

# Scope of delivery, accessories, service

## Analyser

| | | |
|---|---|---|
| ANALYST 3P Set | ANALYST 3P basic unit + LEM~flex set for 3 currents and carrying case | SH0621G |

## Accessories

| | | |
|---|---|---|
| Current transformer | Clip-on current transformer 3-phase 1 / 10 A 5 / 50 A 20 / 200 A | SX8305A SX8350A SX8320A |
| Voltage measuring cable | Measuring cable 3-phase, 2 m long, 4 insulated alligator clips dolphin grips | E438080005 |
| Voltage measuring cable for the UK | Measuring cable 3-phase, see above, UK colours | E438080011 |
| Voltage measuring cable for the USA | Measuring cable 3-phase, see above, USA colours | E438080018 |
| LEM~flex 3-phase for ANALYST 3P | 15/150/3000 A with 7-pole plug | SX8315A |
| Replacement accumulator pack | NiMH - 2700mAh / 7.2 V | EP0610A |
| Carrying case | Transportation and protective carrying case | EP0611A |

## Service

| Certificate | | |
|---|---|---|
| ANALYST 3P | ASC 02 (LEM-certificate with list of calibration points) for ANALYST 3P | EP0620A |
| ANALYST 3P | ASC 05 (ÖKD-certificate) for ANALYST 3P | EP0621A |
| ANALYST 3P + LEM~flex 3 | ASC-02 for ANALYST 3P incl. 3-phase LEM~flex set | EP0622A |
| LEM~flex 3 | ASC-02 (LEM-certificate with list of calibration points) for 3-phase LEM~flex set (without ANALYST 3P) | EP0624A |
| ANALYST 3P + LEM~flex 4 | ASC-05 for ANALYST 3P incl. 3-phase LEM~flex set | On request |

Distributor:

**www.lem.com**