ELECTREX
the energy saving technology

Flash-N Energy Analyser

Flash-NH Energy & Harmonics Analyser

- **Highest performance**
- **Highest versatility**
- **Highest reliability**

The **Flash-N** is a microprocessor based Energy analyser with outstanding flexibility and accuracy designed to meet the most demanding applications of electrical parameters analyses and energy supply monitoring in the industrial environment.

All the readings are “true-RMS” and they are obtained with a continuous sampling of the voltage and current waveforms in order to ensure the maximum metering accuracy of rapidly varying loads (e.g. spot welding) as well as the instrument’s suitability for energy quality supervision functions.

A patented digital measurement system, an automatic scale change on current inputs and a compensation system of the internal amplifiers’ offsets ensure the maximum metering accuracy and stability irrespective of the signal level and the environmental working conditions.

The **Flash-N** is a revolutionary instrument that may be upgraded after installation to new user needs and to its installation parameters. Two expansion ports make it possible to select the data transmission mode by means of a simple connection of optional modules (RS232, RS485, Analog, I/O) while the instrument architecture is designed to enable the implementation, in the field, at any time, of the harmonics analyses by means of simple code entries operated via front key board.

Simple to use

A large high-contrast LCD display with backlight allows the simultaneous reading of 4 parameters and their symbols with high visibility digits.

A bar-graph indicator supplements the reading mode of 3 parameters in analogue format also.

A Led indicator, pulsing with a frequency proportional to the active import power, is also provided on the front panel for field calibration verification by means of external optical devices.

9 keys, with clear indication of their function, make the instrument use simple and intuitive.

Versatile in application

The **Flash-N** is suitable for virtually all type of electrical grid, 3- and 4-wire, symmetrical and asymmetrical, balanced or unbalanced, single- and bi-phase, Low Tension and High Tension, with 1, 2 or 3 CTs as well as for 2 and 4 quadrant (import/export) measurement.

A simple keyboard programming allows the setting of all the operational parameters such as grid type, LV/HT, CT and VT ratios (free setting) integration time (1-60 min), alarms (thresholds, delays, hysteresis), digital outputs and configuration of the optional modules that may be connected.

Readings

Parameter	*Type*	L1	L2	L3	Σ	*Range*
Voltage	V L-N	•	•	•	•	*20,0V...400 kV*
	V L-L	•	•	•	•	
Current	I-phase	•	•	•		*10 mA…10,0 kA*
	I-neutral				•	
Power Factor	PF	•	•	•	•	*0,00ind...1,00…0,00cap*
Frequency	Hz				•	*45 … 65 Hz*
Harmonic distort.	THD-V	•	•	•	•	*0…199,9%*
	THD-I	•	•	•	•	
Life time	h (1/100 h)				•	*0,01…99.999,99 hours*
Active power	P	•	•	•	•	*± 0,00…1999 MW*
	Pm (1)				•	
	Pmd (1)				•	
Reactive power	Q	•	•	•	•	*± 0,00…1999 Mvar*
	Qm-ind (1)				•	
	Qm-cap (1)				•	
	Qmd-ind (1)				•	
	Qmd-cap (1)				•	
Apparent power	S	•	•	•	•	*± 0,00…1999 MVA*
	Sm (1)				•	
	Smd (1)				•	
Active energy	KWh (2)				•	*0,1 kWh…99.999,9 MWh*
Reactive energy	Kvarh-ind (2)				•	*0,1 kvarh…99.999,9 Mvarh*
	Kvarh-cap (2)				•	
Apparent energy	KVAh (2)				•	*0,1kVAh…99.999,9 MVAh*

Flash-N with FFT harmonics option or Flash-NH

FFT Harmonics	*H Voltage*	•	•	•		*Value (H01), % (H02-H31)*
	H Current	•	•	•		*Value (H01), % (H02-H31)*
	H Power & dir.	•	•	•		*Value (H01), % (H02-H31)*

(1) Mean value over the integration time (1.. 60 min. programmable)

(2) Energies are displayed as 6 digit floating-point readings; internal energy metering performed with 0,1 kWh minimum resolution and 99.999.999,9999 kWh maximum energy count before rollover.

Alarms

The **Flash-N** is equipped with 2 programmable alarms offering the maximum configuration flexibility for adapting to the most diverse requirements. Each alarm can be selected to link to any one of the parameters available, either as a minimum or as a maximum alarm. Linking of both alarms to the same parameter is also possible for operating as dual threshold alarm. Special alarms are also available such as min. or max. voltage and max. current applicable to the 3 phases and current unbalance on the 3 phases. The alarms configuration includes the option of precise setting of a delay time (1-99 sec), an hysteresis cycle (in %) and the activation of the output contacts. The alarms state information is always available on serial communication as Modbus "*coils*". The alarms are entirely programmable by keyboard and via serial port with the Energy Brain software or by means of Modbus *Holding registers*.

Serial communication

The **Flash-N** supports an RS485 or RS232 serial communication by means of optional add-on modules. The protocol is the MODBUS RTU or ASCII, suitable for communication with PLCs and with SCADA programs. The **Flash-N** protocol provides as well "*full compliance*" with the Modbus and with its default configurations. The instrument data are read as numerical registers composed by mantissa and exponent in the IEEE format. A transmission speed of up to 38400 bps., with maximum 124 registers (equivalent to 62 parameters) per query with no waiting time between queries, ensure an unrivalled communication speed and dialogue efficiency.

Digital outputs

The **Flash-N** is equipped, as standard feature, with two optically isolated transistor outputs rated 27 Vdc 27 mA per DIN 43864 standards. The two outputs are factory set to the transmission of pulses proportional to the Active energy and the Reactive energy: the pulse number and rate are user programmable. The outputs may be alternatively configured as outputs of the internal alarms or as remote output devices controlled via serial line and Modbus commands.

User-friendly architecture

The **Flash-N** is a revolutionary instrument in its kind, because it may be easily adapted to follow the user needs at any time after its installation. The instrument architecture is designed for field implementation of hardware expansions as well as for the implementation of additional metering capabilities. The benefit for the user is the possibility of spreading the initial investment and, most of all, the confidence of an instrument that will allow, at any time, new and unanticipated technical requirement.

HARDWARE EXPANSIONS (optional modules)

The **Flash-N** is fitted with 2 expansion sockets for the connection of external expansion modules supporting specific communication functions (serial, analogue, digital).

FIRMWARE EXPANSIONS (option)

The instrument firmware already embeds the possibility of additional metering possibilities like the FFT harmonics analyses that may be implemented at any time by the entry, via front keyboard, of a unique PUK code that may be ordered separately to Electrex.

HARDWARE EXPANSIONS (optional modules)

The **Flash-N** is fitted with 2 expansion sockets for the connection of external expansion modules by means of plug-in connectors. The optional modules are self-supplied; the applicable programming menu is automatically enabled by the instrument upon connection of the option(s).

- **RS485option**
  Opto isolated RS485 port with 2400 bps to 38400 bps. programmable speed. It supports instrument networking with other units up to a distance of 1000 meters and up to max 128 meters connected on the same communication pair with no need of additional line amplifiers.

- **RS232 option**
  Opto isolated RS232 port with programmable speed, 2400 bps to 38400 bps. 9-pole (D-sub9) connector.

- **2 x 4-20 mA option**
  2 galvanically isolated analogue outputs; 4-20 mA or 0-20 mA transmission. Extremely high accuracy and signal stability thanks to a 10 bit digital to analogue conversion that maintains the accuracy of the original parameter. It ensures a response time of max. 50 ms. with max. 200 ms. update interval. Each of the two outputs may be linked to any one of the parameters available with the additional possibility of setting the zero output (4 o 0 mA) and/or the 20 mA output to match any desired positive or negative measurement value.

- **Digital I/O option**
  Module for the acquisition of the ON-OFF state of external contacts (example: MCBs, switches, auxiliary contacts, etc.).
  It features 2 opto isolated inputs and 2 relay outputs with changeover contacts rated 30V 2A (resistive load) that may be used as remote output devices or as additional output contacts for the internal alarms. The inputs and outputs state is handled exclusively via serial port and Modbus commands and no user setting is available on display.

Technical specification

- *Add-on modules*
- *Compact and lightweight*
- *Fixing to instrument rear panel*
- *No power supply required*
- *Connection:*
  Input: plug-in cable + connector
  Output(s): plug-in terminal board
  9-pole (D-sub9) for RS232
- *Weight: max. 45 gr.*
- *Size: 60 x 40 x 20 mm.*
- *Suiting other Electrex panel meters*

FFT HARMONICS ANALYSES (option)

The **Flash-N** features the option of expanding its measurement capability by adding on new parameters to the existing ones. The FFT harmonics option adds all the parameters necessary for a comprehensive Harmonics analyses.

It supports a 32 bit calculation which gives superior metering accuracy and allows to classify the **Flash-N** as a genuine Energy & Harmonics analyser with a performance comparable with many sophisticated and expensive analysers.

General features

The FFT harmonics option supports all the readings that are needed for a superior analyses of the problems related to harmonics. Readings give both the harmonics power and the direction providing an invaluable tool for immediate examination of the harmonics flow inside one's own plant and for identifying potentially undesirable imported problems.

The FFT harmonics option can be implemented on **Flash-N** at any time, after instrument installation and requires no tools nor accessories. It is simply performed by the entry, via front keyboard, of a unique PUK code that may be ordered for the serial number of the instrument to be upgraded..

The FFT harmonics option may also be supplied in the meter by ordering the instrument type **Flash-NH** with the option.

Technical specification

Harmonics range..... Odd and Even harmonics up to 31st order
Parameters.... H_U, H_I, H_P & sign (direction) per order, per phase
Parameters up date interval ..... approx. 1 s
Readings indication:
H01 .. floating pnt. values with automatic unit/K/M exponent
H02-31... values in % of fund. (3½ digit, range 0,0÷100,0%)
H direction ..... (+) or (-) sign on power
Modbus readings:
Voltage, current , phase angle per harmonic order, per phase
Accuracy:
H_U & H_I ..±(0,1%rdg.+1LSD) for H01 to max. ±2,0% for H31
H_P .....±(0,2%rdg.+2LSD) for H01 to max. ±2,0% for H31
Phase angles .... ±0,1deg. for H01 to max ±3,0deg. for H31
Sampling frequency..... 64 x f (mains frequency)
FFT size ..... 64 points
FFT calculation accuracy..... 32 bits
Window..... rectangular
Minimum reading..... 1%

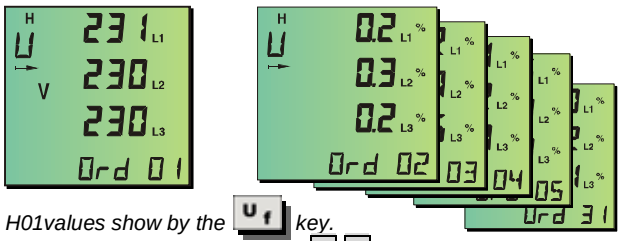
Harmonics data on serial line

A total of 384 readings related to harmonics are enabled as Modbus registers on serial port by the FFT harmonics option.

- Current harmonics per order and per phase
- Voltage harmonics per order and per phase
- Phase angle in degrees (range -180,0÷180.0°) of each harmonic order, per phase, referred to L1 voltage fundamental. These parameters may be used for external reconstruction of vectorial diagrams such as those supported by the Energy Brain software.

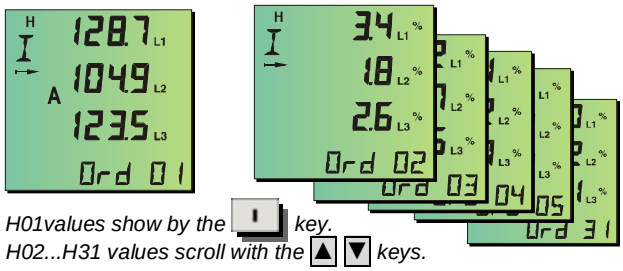
HARMONICS READINGS

- **Voltages Harmonics**
  - H01: value in V per phase
  - H02...31: value in % of the fundamental per phase



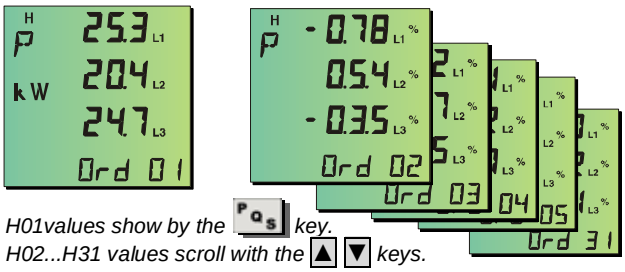
H01values show by the U1 *key.*
H02...H31 values scroll with the ▲ ▼ *keys.*

- **Currents Harmonics**
  - H01: value in A per phase
  - H02...31: value in % of the fundamental per phase



H01values show by the I *key.*
H02...H31 values scroll with the ▲ ▼ *keys.*

- **Harmonics Powers/Direction**
  - H01: value in W per phase
  - H02...31: value in % of the fundamental per phase
  - + or – sign indicating the harmonics origin downstream (load) or upstream (source) the measurement point.



H01values show by the Pos *key.*
H02...H31 values scroll with the ▲ ▼ *keys.*

ENERGY BRAIN software

The Energy Brain is the software package designed for the monitoring of all types of local and/or wide area networks of instruments. It is suitable for application with all the Electrex instruments equipped with communication port and it supplies all the functions needed for an accurate monitoring and targeting of industrial energy consumption.

Configuration

The options provided allow the maximum flexibility in adapting the software to the type of network (different types of simultaneously connected networks also) and to operator needs.

Several Energy Brain versions are available to meet number of channels and user requirements. Detailed information available separately.

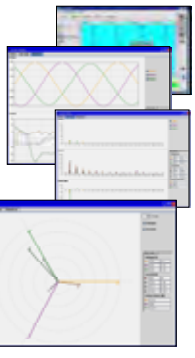
On line readings

- *Parameters*
- *Harmonic vectors, bar graphs, waveforms**

(*) available only with FFT harmonics option

Load and energy profiles

- *Demand profiles (DD, MM & YY graphs)*
- *Energy profiles (DD, MM & YY graphs)*
- *MD-TOU tariff profiles (MM & YY graphs)*
- *Up to 4 simultaneous graphs*
- *Zoom and parameter selection tools*
- *Graphical and numerical print-out*



Flash-N / Flash-NH

ENERGY & HARMONICS ANALYSER

Technical specification

Readings

Voltage ..... $U_{1\text{-}N}$, $U_{2\text{-}N}$, $U_{3\text{-}N}$, $U_{1\text{-}2}$, $U_{2\text{-}3}$, $U_{3\text{-}1}$, $U_{LL\,\Sigma}$, $U_{LN\,\Sigma}$
Current ..... I_1, I_2, I_3, I_Σ, $I_{neutral}$
Power factor ..... PF_1, PF2, PF_3, PF_Σ
Frequency ..... f
Life time ..... Hours, hours/100
Voltage THD ..... THD-U_1, THD-U_2, THD-U_3, THD-U_Σ
Current THD ..... THD-I_1, THD-I_2, THD-I_3, THD-I_Σ
Instantaneous powers ..... P_1, P_2, P_3, P_Σ
Q_1, Q_2, Q_3, Q_Σ
S_1, S_2, S_3, S_Σ
Average powers ..... PmΣ, QmΣ(ind), QmΣ(cap), SmΣ (imp/exp)
PmΣ, QmΣ(ind), QmΣ(cap), SmΣ (imp/exp)
Max. powers (MD) . PmdΣ, QmdΣ(ind), QmdΣ(cap), SmdΣ (imp/exp)
Active Energy ..... Ea (import/export)
Reactive energy ..... Er (ind), Er (cap) (import/export)
Apparent energy ..... Es (import/export)
Harmonics (FFT) . (*) only on Flash-N with FFT harm. option or Flash-NH
(*) ..... H_{U1}, H_{U2}, H_{U3} (1-31st order)
(*) ..... H_{I1}, H_{I2}, H_{I3} (1-31st order)
(*) . Harmonics power & direction (1-31st order)

Electrical characteristics

Connection ..... 3-phase, single- & bi-phase, LT and HT grids balanced, unbalanced, 3- and 4-wire
Voltage inputs Direct ..... from 20 to 500V phase-phase (max. 1,7 crest factor)
Via external VTs with max. 400 kV primary rating programmable VT values
Overload ..... max, 900 Vrms peak for 1 sec.
Current inputs ..... via 1, 2 or 3 external CTs max. 10kA primary; .../1A and ../5A secondary programmable CT values
Overload ..... max. 100Arms peak for 1 sec.
Input burden ..... < 0,5 VA
Power supply ..... 85÷265 Vac, 100÷374 Vdc (separate from the measurement inputs)
Self consumption ..... 5 VA

Front panel

Display ..... LCD, STN type, green color 256 segment
Display size ..... 63 x 65 mm.
Backlighting ..... Electro luminescent
Keyboard ..... 9 keys with explicit function recall
Calibration Led ..... Available on front panel

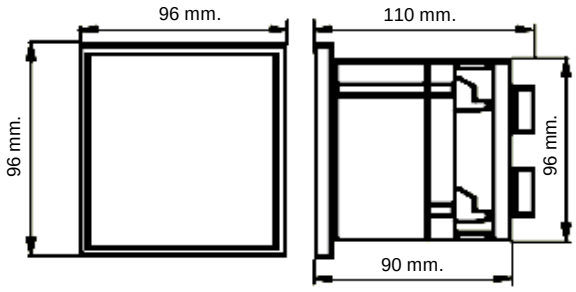
Functional characteristics

Measurement ..... True-RMS up to the 31st harmonic
Quadrants ..... 2 and 4 quadrant measurement (programmable)
Accuracy ..... Class 1 on energy complying with IEC EN 61036.
Sampling ..... Continuous sampling of current and voltage waveforms
Compensation ... Automatic compensation of the amplifiers offsets
Scale change ... Automatic scale change on current inputs (2 scales)
Isolation ..... Galvanic isolation on all inputs and outputs
Standards
- Safety: ..... IEC EN 61010 class 2
- E.M.C.: ..... IEC EN 61326-1A
- Accuracy: ..... EC EN 61036

Outputs: ..... 2 digital outputs rated 27Vdc-27mA (DIN43864) with programmable functionality (pulse output or alarm)
Options .. 2 ports for the connection of external expansion modules
- RS485 communication port
- RS232 communication port
- Dual analogue output 4-20 mA
- Digital I/Os
- Additional options for future application

Mechanical and environmental

Working temperature range ..... -20/+60 °C
Humidity ..... 90% R.H. non condensing
Enclosure ..... Self-extinguishing plastic material class V0
Protection degree ..... IP51 on front panel
Size ..... 96 x 96 x 90 mm. (110 mm. with options)
Mount ..... flush mount
Panel cut ..... 92 x 92 mm
Terminals ..... plug-in type with screw protection suitable for cables up to 4 mm^2.
Weight ..... approx. 380 gr. net



Flash-N **Flash-NH**

How to order

Type	P.N.
Flash-N	PFE 408-00
Flash-NH *(including FFT Harmonics option)*	PFE 405-50
RS 485 option	PFE 420-00
RS 232 option	PFE 421-00
Dual 4-20mA option	PFE 422-00
I/O option	*(pending)*
FFT Harmonics option *(1)*	PFSW 399-00

(1) The S.No. of the instrument to upgrade must be indicated when ordering

Flash-N and Flash-NH are also available in DIN rail format. Please refer to Flash-D and Flash-DH data sheet.

Subject to modification without prior notice *Flash-N –NH 2006-03*