ELECTREX
the energy saving technology

Fast D6 H Transducer & Energy Analizer

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

The Fast D6 H is a microprocessor based electric energy transducer with outstanding flexibility and accuracy designed to meet the most demanding applications of electrical parameters and harmonics 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). A patented digital measurement system, an automatic scale change on current and voltage 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. 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).

Readings

The following readings are available on serial communication (Modbus protocol). They are read as numerical registers in 32 bit floating point format according to IEEE754 standards.

Parameter		*Type*	L1	L2	L3	Σ
Voltage		**V L-N**	h	h	h	h
		V L-L	h	h	h	h
Current		**I-phase**	h	h	h	
		I-neutral				h
Power Factor		**PF**	h	h	h	h
Frequency		**Hz**				h
Harmonic distort.		**THD-V**	h	h	h	h
		THD-I	h	h	h	h
Life time		**h (1/100 h)**				h
Active power	*Instantaneous*	**P**	h	h	h	h
	Rolling avg.	**Pm**				h
	Max. Demand	**Pmd**				h
Reactive power	*Instantaneous*	**Q**	h	h	h	h
	Rolling avg.	**Qm-ind**				h
	Rolling avg.	**Qm-cap**				h
	Max. Demand	**Qmd-ind**				h
	Max. Demand	**Qmd-cap**				h
Apparent power	*Instantaneous*	**S**	h	h	h	h
	Rolling avg.	**Sm**				h
	Max. Demand	**Smd**				h
Active energy		**KWh**				h
Reactive energy		**Kvarh-ind**				h
		Kvarh-cap				h
Apparent energy		**KVAh**				h
FFT Harmonics		**H Voltage**	h	h	h	
		H Current	h	h	h	
		H Power & dir.	h	h	h	

Serial communication

The Fast D6 H 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 Fast protocol provides as well "*full compliance*" with the Modbus and with its default configurations. A transmission speed of up to 38400 bps., with maximum 125 registers (equivalent to 62 parameters) per query with no waiting time between queries, ensure an unrivalled communication speed and dialogue efficiency.

Versatile in applications

The Fast D6 H 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.
Basic set up is by dip-switch setting on the front panel and more extensive instrument configuration is made by serial port.
A Led indicator, pulsing with a frequency proportional to the active import power, is also provided for field calibration verification by means of external optical devices.

Digital outputs

The Fast D6 H 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 programmable.
The outputs may be alternatively configured as outputs of the internal alarm functions or as remote output devices controlled via serial line and Modbus commands.

Alarms

The Fast D6 H is equipped with 2 programmable alarms giving the widest configuration flexibility. 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 via serial port by means of Modbus *Holding registers*.

SET UP

Transducer configuration is by two methods:
- a LOCAL set-up, carried out by means of a dip-switch selector located underneath the removable front plate
- a REMOTE set up carried out via serial line.

Local set-up via Dipswitch selectors

The number of combinations supported by the dip switch selector (12 switches) restricts the options to an essential number and type of settings such as:

- Serial port setting (parity, speed)
- Instrument address (1…31)
- Wiring configuration (4-wire STAR or 3-wire Delta)
- 2 or 4 quadrant operating mode
- Set up mode selection (Local or Remote)

The dip switch settings can be inspected at any time, with no need to access the transducer, by means of the transparent windows provided on the font panel.

Remote set-up via MODBUS

It allows extending of the configuration to all the numerous possibilities offered by the transducer.

- **Metering:**
  Sets Network type (2, 3, 4 wires), LT/HT, CT and VT value, import or import/export mode, power integration interval and Counters hold time.
- **Digital outputs**:
  Sets their working mode as Pulse transmission, Alarms or remote Modbus-controlled Output devices.
- **Pulse transmission**
  Sets the pulse rate and duration.
- **Alarms:**
  Sets alarm Parameter(s), Threshold(s), Hysteresis, Min or Max mode and alarm delay time. It is enabled when the digital outputs are set to operate as ALARMS.
- **Analogue outputs:**
  Sets output Parameter(s), 4-20 or 0-20 mA mode, full scale value(s), offset value(s). Distinct settings for the two output channels can be made. It is automatically enabled upon connection of the dual 4-20mA analogue option.
- **Instrument address**
  Sets the instrument address in the 1-247 range
- **Serial transmission:**
  Sets extra functions like *Words/Bytes* swap flags (swaps Big Endian to Little Endian format). TX delay time

The configuration of the transducer via Modbus can be operated by using a commercial program certified for Modbus protocol and able to write Holding Registers. Specialised technical literature on Modbus mapping and commands is available separately. Alternatively the Energy Brain software (configurator version) represents an easy all-users tool.

HARDWARE EXPANSIONS (optional modules)

The Fast D6 H is fitted with 2 expansion sockets for the connection of external expansion modules supporting specific communication functions (serial, analogue, digital).

The optional modules connect by means of plug-in connectors and they are self-supplied. The relevant set-up functions are automatically enabled upon connection of the option(s).

Technical specification

- *Add-on modules*
- *Compact and lightweight*
- *No power supply required*
- *Connection: Input: plug-in cable + connector*
  Output(s): plug-in terminal board
- *Weight: max. 45 gr.*
- *Size: 2 DIN modules*
- *Suiting other Electrex panel meters*

Option module D2 RS485

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.

Option module D2 RS232

Opto isolated RS232 port with programmable speed, 2400 bps to 38400 bps.

Option module D2 2AO4-20 mA

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 or 0 mA) and/or the 20 mA output to match any desired positive or negative measurement value.

Option module D2 2 x 4-20 mA option

It features 2 opto isolated inputs (for counting or on-off) 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.

RS485 RS232 2AO4-20mA 2DI-2RO

FFT HARMONICS ANALYSES

The Fast D6 H with the FFT Harmonics has all the parameters necessary for a comprehensive Harmonics analyses. It supports a 32 bit calculation which gives superior metering accuracy, classifying the Fast D6 H as a genuine Energy & Harmonics transducer with a performance comparable with many sophisticated and expensive transducers.

General features

The FFT harmonics 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.

Modbus communication

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

- 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.

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%

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.

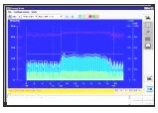
MAIN FUNCTIONS

Configuration

The available choices enable the maximum flexibility in adapting the software to the type of network (several types of simultaneously connected networks too) and to the operator needs.

- Field instruments set up (CT, PT, alarms, etc.)
- Network configuration (instrument, customer, groups, locations, etc) with individual setting of the communication mean local (by RS232/RS485, Ethernet) or remote (by Modem, GSM, Internet) and communication parameters (speed, etc.)
- Scheduling of the data collection and download agenda (distinct for location and customer) with daily, weekly or monthly intervals

Load and energy profiles/graphs

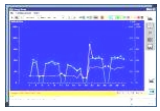


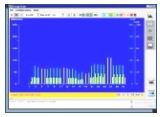
- Demand profiles (day, month and year)
- Energy profiles (day, month and year)
- Time-of-use Demand and Energy profiles
- MD profiles (per month, year and per tariff)
- Up to 4 graphs displayed simultaneously
- Zoom and parameter selection tools
- Graphical and numerical print-out

On line readings display

- On line display of the readings supplied by the field instruments.

Data collection and storage



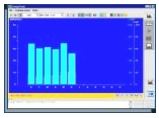


- Automatic or manual download of power and energy data from the field instrument with automatic saving into the internal data base (Access® PostgresSQL® or MySQL®).
- Data export to other DBs by means of built-in ODBC or in txt format.

Time-of-use tariffs

- Handling of time of use tariffs
- Built in editor for TOU tariff & Calendar set up.

Virtual channels

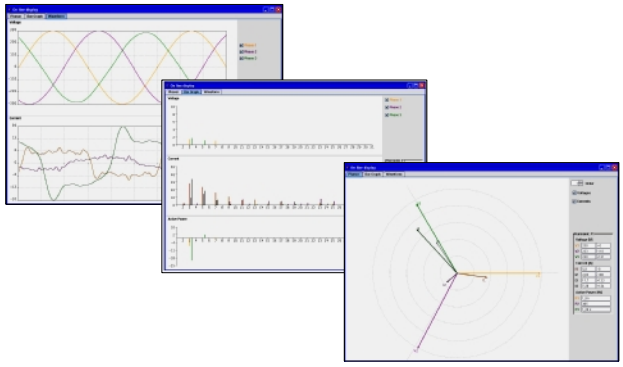


- Creation of virtual channels (e.g. "summation" of departments, channel "combinations", etc.).
- Data display and treatment likewise a physical channel.
- Merging of variables and complex mathematical formulas particularly useful, example, for carrying out simulations.

On-line graphs

- Graphs supported for instruments equipped with FFT harmonics.

Available only with on-line connected Instrument(s).



Technical specification

Readings (on serial transmission only)

Voltage ..... U_{1-N}, U_{2-N}, U_{3-N}, U_{1-2}, U_{2-3}, U_{3-1}, $U_{LL\,\Sigma}$, $U_{LN\,\Sigma}$
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 for Voltage, Current, Power & Direction ...
..... Value (H01), % (H02-H31)

The readings are available on serial communication (MODBUS protocol). They are read as numerical registers in 32 bit floating point format according to IEEE754 standards.

Electrical characteristics

Connection ..... 3-phase, single- & bi-phase, LT and HT grids
balanced, unbalanced, 3- and 4-wire, 1, 2, 3 CTs
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
Mains frequency ..... 45¸65 Hz
Power supply ..... 85¸265 Vac, 100¸374 Vdc
(separate from the measurement inputs)
Self consumption ..... 5 VA

Front panel

Indicators: ..... Power On (green), Calibration led (red)
Set up selector ..... Dip switch

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

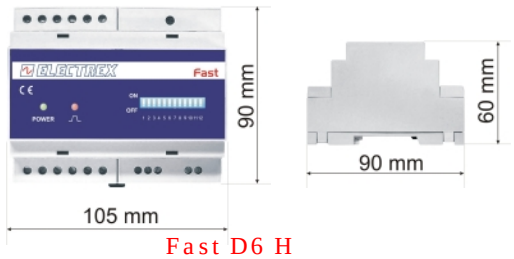
Transmission

Digital outputs 2
Output rating 27Vdc-27mA (DIN43864)
Operating mode: ..... programmable functionality
- pulse output
- alarm
- remote output

Options ... 2 ports for the connection of external expansion modules
- RS485 communication port
- RS232 communication port
- Dual analogue output 4-20 mA
- Two digital inputs and two relay outputs

Mechanical and environmental

Working temperature range. ..... -20/+60 °C
Humidity ..... 95% R.H. non condensing
Enclosure ..... Self-extinguishing plastic material class V0
Protection degree ..... IP20 (terminals side)
Size ..... 6 DIN Modules
Mount ..... DIN rail
Terminals ..... screw connector
suitable for cables up to 4 mm^2.
Weight ..... approx. 240 gr. Net



Fast D6 H

How to order

Type	P.N.
Fast D6 H 85÷265V	PFA 1610-82
Option module D2 RS485	PFE 830-00
Option module D2 RS232	PFE 825-00
Option module D2 2AO4-20mA	PFE 835-00
Option module 96 2DI 2RO	PFE 425-00
Adapter Cable Interface 96/DIN	PCACL00-00

ELECTREX
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 Data sheet Fast D6 H 2007 12 12-ENG

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