# CEM 04

# USER MANUAL

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# INDEX

1 GENERAL DESCRIPTION.....3

2 HARDWARE FEATURES.....3

3 SOFTWARE FEATURES.....3

4 APPLICATIONS.....4

5 DETAILED DESCRIPTION.....4

6 DATA MEMORY MAP.....5

7 EEPROM MEMORY MAP.....6

8 CONTACTS.....7

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# 1 GENERAL DESCRIPTION

CEM_04 is a smart energy meter that controls and measure the energy consumed up to four independent users, logging the data for billing.
It can be connected in a network of meters allowing the complete management of electrical supply of small villages. The network can be managed by a PLC or a PC than can select the production of energy, choosing among different sources, renewable or traditional and monitoring the plant efficiency by both local or remote tools.

# 2 HARDWARE FEATURES

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| Wide power supply range: 160..250 Vac |
| Up to 1KW per user power control |
| One global AC power input an four AC power outputs, relè controlled (one per user) |
| User friendly HMI with wide display and four keys |
| Two RS485 ports for network connection |
| 64 Kbyte memory for data logger |

# 3 SOFTWARE FEATURES

| |
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| Four independent energy measurement, each per user |
| Definition of four time slots with different energy cost and single slot and single user independent accounting. |
| Single user prepaid credit. The credit is decreased on time slot basis, and energy supply is stopped when reaches zero |
| Four partial energy counter for hour by hour energy consumption log |
| Four partial energy counter for energy source generation log |
| Programmable Immediate Threshold to monitor the instantaneous power |
| Programmable Fifteen minute threshold to monitor the mean energy |

# 4 APPLICATIONS

Connecting a meter network to a KERNEL PLC or DLC allow a complete management of a production / distribution energy plant. The PLC has dedicate functions to :

- Assign a time slot cost to every counter
- Assign a prepaid credit to every single user of single counter.
- Automatic daily log of single and user single time slot energy consumed
- Automatic hourly log of total energy delivered
- Read/clear of partial energy counters to check the hourly production of energy and different energy source monitoring
- Time and date meter synchronization
- GPRS modem or Ethernet connection for remote management

# 5 DETAILED DESCRIPTION

The meter is designed to connect up to four users, it is powered by 230 Vac and the same Vac (phase) is connected to an input connector, the common of the four outputs relays, meanwhile the neutral is connected directly to outputs, so the output Vac phase is driven by the four outputs relays, controlled by the firmware.

An output relays is enabled when :

- the user is enabled
- the user has residual prepaid credit
- the user has not exceeded one of the Threshold

If one of the Threshold is exceeded the output is disconnected for a programmable time, after the time is elapsed the output is reconnected and the cycle is repeated.
When the corresponding output is connected the meter measure the power supplied to the single user and accumulate it to count the energy supplied, meanwhile it decrements the prepaid credit on the basis of the current time slot.
At the same time the meter updates two independent counters, one can be read hourly by the PLC to calculate and log the total amount of energy produced in a hour and the other can be read every time the PLC decide to switch from one source of energy to another, to keep track of the energy produced by every energy source.
When the complexity of a plant increase the PLC can be programmed to manage the different energy sources, renewable or traditional, switching or mixing one to another, choosing time by time the best and cheaper energy source.
Every function can be controlled on the PLC HMI in the control room or by remote connection using a GPRS modem or Ethernet connection or bridge.

# 6 DATA MEMORY MAP

| DATA | RO or R/W | TYPE | Description |
|---|---|---|---|
| DATA.00 | RO | WORD | Current Page |
| DATA.01 | R/W | WORD | Command |
| DATA.96 | RO | WORD | User 1 Instantaneous Current [A] |
| DATA.97 | RO | WORD | User 2 Instantaneous Current [A] |
| DATA.98 | RO | WORD | User 3 Instantaneous Current [A] |
| DATA.99 | RO | WORD | User 4 Instantaneous Current [A] |
| DATA.108 | RO | WORD | User 1 Instantaneous Power [1/10 W] |
| DATA.109 | RO | WORD | User 2 Instantaneous Power [1/10 W] |
| DATA.110 | RO | WORD | User 3 Instantaneous Power [1/10 W] |
| DATA.111 | RO | WORD | User 4 Instantaneous Power [1/10 W] |
| DATA.128 / 129 | RO | FLOAT | User 1 WATTSEC |
| DATA.130 / 131 | RO | FLOAT | User 2 WATTSEC |
| DATA.132 / 133 | RO | FLOAT | User 3 WATTSEC |
| DATA.134 / 135 | RO | FLOAT | User 4 WATTSEC |
| DATA.144 / 145 | R/W | FLOAT | User 1 HOURLY Partial Counter |
| DATA.146 / 147 | R/W | FLOAT | User 2 HOURLY Partial Counter |
| DATA.148 / 149 | R/W | FLOAT | User 3 HOURLY Partial Counter |
| DATA.150 / 151 | R/W | FLOAT | User 4 HOURLY Partial Counter |
| DATA.152 / 153 | R/W | FLOAT | User 1 SOURCE Partial Counter |
| DATA.154 / 155 | R/W | FLOAT | User 2 SOURCE Partial Counter |
| DATA.156 / 157 | R/W | FLOAT | User 3 SOURCE Partial Counter |
| DATA.158 / 159 | R/W | FLOAT | User 4 SOURCE Partial Counter |

***Legend :***
*RO = Read Only DATA*
*R/W = Read / Write DATA*

# 7 EEPROM MEMORY MAP

| DATA | EE | TYPE | Description |
|---|---|---|---|
| TO BE DEFINED | EE | WORD | Output disconnection time when threshold reached |
| TO BE DEFINED | EE | WORD | Immediate Threshold |
| TO BE DEFINED | EE | WORD | Fifteen minute Threshold |
| TO BE DEFINED | EE | FLOAT | User 1 Prepaid Credit |
| TO BE DEFINED | EE | FLOAT | User 2 Prepaid Credit |
| TO BE DEFINED | EE | FLOAT | User 3 Prepaid Credit |
| TO BE DEFINED | EE | FLOAT | User 4 Prepaid Credit |
| TO BE DEFINED | EE | FLOAT | Time Slot 1 Energy Cost |
| TO BE DEFINED | EE | FLOAT | Time Slot 2 Energy Cost |
| TO BE DEFINED | EE | FLOAT | Time Slot 3 Energy Cost |
| TO BE DEFINED | EE | FLOAT | Time Slot 4 Energy Cost |
| TO BE DEFINED | EE | FLOAT | User 1 Total Energy Consumed |
| TO BE DEFINED | EE | FLOAT | User 2 Total Energy Consumed |
| TO BE DEFINED | EE | FLOAT | User 3 Total Energy Consumed |
| TO BE DEFINED | EE | FLOAT | User 4 Total Energy Consumed |
| TO BE DEFINED | EE | FLOAT | Slot 1 User 1 Energy Consumed |
| TO BE DEFINED | EE | FLOAT | Slot 1 User 2 Energy Consumed |
| TO BE DEFINED | EE | FLOAT | Slot 1 User 3 Energy Consumed |
| TO BE DEFINED | EE | FLOAT | Slot 1 User 4 Energy Consumed |
| TO BE DEFINED | EE | FLOAT | Slot 2 User 1 Energy Consumed |
| TO BE DEFINED | EE | FLOAT | Slot 2 User 2 Energy Consumed |
| TO BE DEFINED | EE | FLOAT | Slot 2 User 3 Energy Consumed |
| TO BE DEFINED | EE | FLOAT | Slot 2 User 4 Energy Consumed |
| TO BE DEFINED | EE | FLOAT | Slot 3 User 1 Energy Consumed |
| TO BE DEFINED | EE | FLOAT | Slot 3 User 2 Energy Consumed |
| TO BE DEFINED | EE | FLOAT | Slot 3 User 3 Energy Consumed |
| TO BE DEFINED | EE | FLOAT | Slot 3 User 4 Energy Consumed |
| TO BE DEFINED | EE | FLOAT | Slot 4 User 1 Energy Consumed |
| TO BE DEFINED | EE | FLOAT | Slot 4 User 2 Energy Consumed |
| TO BE DEFINED | EE | FLOAT | Slot 4 User 3 Energy Consumed |
| TO BE DEFINED | EE | FLOAT | Slot 4 User 4 Energy Consumed |

# 8 CONTACTS

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