

# SINGLE-PHASE ENERGY METER

## MK-30-LCD-RS485 & MK-60-LCD-RS485



### 1.- MAIN FEATURES

Electronics-based, Class 1 rated, electrical energy meter, with LCD display, for its use in L.V. single-phase networks. These energy meters are appropriate for any application that requires the monitoring of partial energy consumptions.

Additional relay output for pulse output usage.

Besides the energy value, the voltage, current and power measurements of the mains will be also displayed in the screen.

According to the type, a RS-485 communication system is implemented (for data retrieval from a PC). In this case, the relay output can be set to work as a pulse or alarm output.

### 2.- MK-LCD-RS485 types.

Type	Currents (lb)	Code
MK-LCD-RS485	30 A	771212
	60A	771216

### 3.- Installation



This manual contains information and warnings that must be followed for operating the ENERGY METER safely and maintaining the instrument in a safe operating condition.

Whether the instrument is not used as manufacturer's specifications, the protection of the instrument can be damaged.



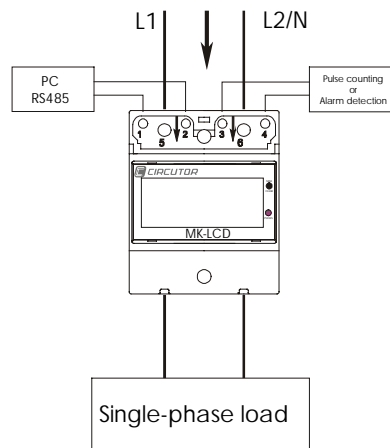
#### Mounting:

The instrument is to be mounted on a DIN rail. All wiring connections keep inside the switchboard cabinet.

Note that with the instrument powered on, the terminals, cover opening actions or elements removal may allow accessing dangerous parts. The instrument must not be used until this is completely installed.

The monitored line should be provided with a circuit breaker or any equivalent element (fuses) to disconnect the instrument from the power supply network. This switching device must be placed near the instrument and will be easily accessible.

The instrument is directly power supplied from the cables crossing the MK-LCD. The power supply and voltage-current measuring circuit must be wired with cables of appropriate cross-section according to the current flowing through the MK-LCD.



Terminal No.	Terminal description
1	RS-485 (-)
2	RS-485 (+)
3	Relay RL1 output
4	Relay common
5	Voltage/Current L1 input
6	Voltage N/L2 input

**Note:** If, once the installation has been completed, the power and energy readout blinks, it means that the meter is detecting the energy as a generated energy.

### 4.- Operation mode

The MK-LCD has a total value counter and a partial value counter (a "P" letter goes before this latest counter in display).

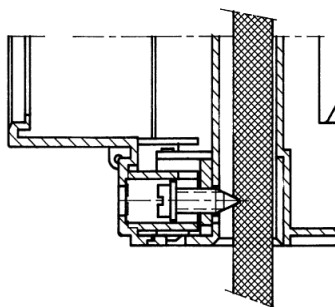
A push-button enables the user to perform the following actions:

- Display of maximum values: Pressing the button for less than 3 seconds.
- Reset the partial energy counter to zero: Pressing the button for more than 3 seconds.

### 5.- MAINTENANCE

Before any adjustment, replacement, maintenance or repairing operation is carried out, the instrument must be disconnected from any power supply source.

When any protection failure is suspected to exist, the instrument must be immediately put out of service. The instrument's design allow a quick replacement in case of any failure. In this case contact a qualified service representative.



### 6.- Specifications

#### Power supply/measuring circuit:

- Single-phase : 110 V - 230 V a.c.
- Tolerance : -15 % / +20 %
- Frequency : 50 - 60 Hz
- Burden : <0.25VA
- Working temperature: 0 to 50 ° C
- Rated current (lb): According to type
- Permanent overload: 2 lb
- Start current: 0,1% lb

#### Accuracy class : Class 1

#### Mechanical features :

- Case type: Modular self-extinguishing plastic
- Current cable input: Maximum Ø 11 mm
- Voltage connection: Metallic terminal with "pozidriv" No.2 / flat mixed screw.
- Pulse and RS-485 output: Metallic terminal with flat headed screw.
- Mounting: Symmetric DIN 46277 (EN50022) rail
- Protection : Frontal cover: IP 51 Terminals: IP 20
- Dimensions : 70 x 80 x 75 mm (4-module relay – DIN 43 880)
- Weight : 0.200 kg.

#### Display:

- Type: LCD (6 digits) without reset
- Energy unit : kW·h
- Maximum count: 999999 kW·h

#### Output relay characteristics :

- Type: opto-isolated transistor (open collector)
- Maximum switching voltage : 24 V c.c.
- Maximum switching current : 50 mA
- Maximum frequency: 1 pulse/s
- Energy output : 100 pulses/kW·h
- Pulse duration : 500 ms
- Safety ..... Class III – 300 V a.c. (EN-61010)

Protection against electric shock:



by class II double-isolation

#### Standards :

EN-61036, EN-61010

### 7.- TECHNICAL SERVICE

For any inquiry about the instrument performance or whether any failure happens, contact to technical service:



Lepanto 49 - 08223 TERRASSA (Barcelona) Spain  
Tel. (+34) 93 745 29 00  
Fax (+34) 93 745 29 14  
e-mail: central@circutor.es  
web: www.circutor.com

## 8.- MK-LCD COMMUNICATIONS

A single or diverse MK-LCD-RS485 meters can be connected to a PC, in order to get a central site for data managing purposes. If more than one single meter is networked through one single serial line, then each meter must be assigned with an identification number.

Communications are established by means of the MODBUS © protocol (Modbus-RTU)

### 8.1.- Communication parameters

When the Mk-LCD is powered on, the display will consecutively show:

- A first screen where the meter model can be viewed.
- A second screen that indicates the communication parameter setting:



Identification Baud rate Parity Data bits Stop bits

### 8.2.- Implemented functions

#### FUNCTION 01:

For reading the relay status

#### FUNCTION 03 and 04:

For reading n Words (16 bits- 2 bytes).  
Function used for reading the electrical parameters measured by the MK.

#### FUNCTION 16 (10 Hex):

For writing multiple records.

### 8.3.- To take into account

The meter does not check if saved parameters are within the permissible range, hence, in case that any wrong parameter is saved, the meter will be then automatically set with the default value for this faulty parameter.

The new saved configuration will not be effective until the meter is reset.

### 8.4.- Communication setting

<b>Reading</b>	
NP0403E80003CRC	
<b>Answer</b>	
NP0406aabbccddeeffCRC	

<b>Writing</b>	
NP1003E8000306aabbccddeeffCRC	
<b>Answer</b>	
NP1003E80003CRC	

Where:

Description	Value
<b>NP</b> : Identification No.	
<b>aa</b> : MODBUS	00
<b>bb</b> : Identification No.	01-FF (01-255 (Decimal))
<b>cc</b> : Baud rate	01 2400 02 4800 03 9600 (def)
<b>dd</b> : Parity	00 No 01 Odd 02 Even
<b>ee</b> : Data Bits	01 8 bits
<b>ff</b> : Stop Bits	00 1 Stop bit 01 2 Stop bit

## 8.5.- Reading measured parameters

Example:

<b>Reading</b>	
NP030000000CCRC	
<b>Answer</b>	
NP030018ttttcccaaaaffffeeeppppCRC	

PARAMETER	Unit	MODBUS RECORDS HEXADECIMAL (longs)	
		Present	Max.
<b>t: Voltage</b>	Vx10	00-01	60-61
<b>c: Current</b>	mA	02-03	62-63
<b>a: Active power</b>	W	04-05	64-65
<b>f: Frequency</b>	Hzx10	06-07	66-67
<b>e: Active energy</b>	Wh	08-09	
<b>p: Partial energy</b>	Wh	0A-0B	

### 8.6.- Reading digital outputs

<b>Reading relay status</b>	
NP0100000003CRC	
<b>Answer</b>	
NP0101XXCRC	

XX (hexadecimal) → in binary mode

b7	b6	b5	b4	b3	b2	b1	b0
----	----	----	----	----	----	----	----

bit **b0** = relay 1 (1 = ON; 0 = OFF)

### 8.7.- Reset to zero

#### - Reset

<b>Question</b>	
NP0507D0FF00CRC	
<b>Answer</b>	
None answer	

#### - Partial energy

<b>Question</b>	
NP050834FF00CRC	
<b>Answer</b>	
NP050834FF00CRC	

#### - Maximum values

<b>Question</b>	
NP050836FF00CRC	
<b>Answer</b>	
NP050836FF00CRC	

#### - Maximum and partial energy

<b>Question</b>	
NP050837FF00CRC	
<b>Answer</b>	
NP050837FF00CRC	

### 8.8.- Alarm / Pulse setting

**Output pulse every a fixed value of accumulated kWh (ENERGY):** The user can define the value corresponding to the energy consumed for generating a pulse (0.5 s long): kWh / 1 pulse.

**ALARM condition:** The parameter to be controlled, the maximum value, the minimum value, and the delay are user-definable for the relay output.

**Default configuration of the MK meter:**  
Parameter No.: 10 → Active Energy  
Pulse ratio: 0.010 → 10 W  
1 pulse / 10 W → 100 pulses / 1 kW

### - Relay 1

<b>Writing</b>	
NP10047E00060Caaaaaaabbbbbbb ccccddeCRC	
<b>Answer</b>	
NP10047E0006CRC	

<b>Reading</b>	
NP04047E0006CRC	
<b>Answer</b>	
NP0406aaaaaaabbbbbbb ccccddeCRC	

Where:

Description	Value
<b>NP</b> : Identification No	
<b>a</b> : MAX value or energy pulse	According to parameter
<b>b</b> : MIN value	According to parameter
<b>c</b> : Delay	0 to 9999
<b>d</b> : Parameter No.	0-6
<b>e</b> : Not used	Any value

PARAMETER	Code
None	0
Voltage	1
Current	2
Active power	3
Frequency	4
Active energy	5
Partial energy	6

**ALARM ACTIVATION:** Alarm operation depends on the set values for MAXIMUM and MINIMUM.

<b>MAX &gt; MIN</b>	ON OFF ON
	----- ===== ----- Min Max
<b>MAX &lt; MIN</b>	OFF ON OFF
	===== ----- ===== Max Min

ON = alarm enabled -----> closed relay  
OFF = alarm disabled ---> open relay

The value set as the **DELAY** time is applied either to the alarm enabling or disabling action when the tripping condition occurs.

