

EDMI Mk30 单相电能表技术说明书

Mk30 Single-Phase (DIN Mounting)

Technical Reference Manual

| 版本 Version | 修改日期 Modification Date | 修改说明 Description | 修改人 Modified By | 适用范围 Applicability Scope |
|---------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|--------------------------------|
| V1.0 | 2013-04-17 | 初版 First Edition | 陈文艺 (EDMI Shenzhen) | Mk30 v1.6 s211 |
| V1.1 | 2013-07-16 | <p>Added English Translation (brown text colour).</p> <p>Based on Pan Jin Song's inputs:</p> <ul style="list-style-type: none"> - Added Appendix B (Hardware Manufacturing Code - Chapter 3 Electrical Parameters: Added "120VAC" option to "额定电压 Nominal (Rated) Voltage" - Figures 2-1 and 2-4: Updated with Shenzhen's photo of Meter with new Logo - Mentioned the version of Mk30 firmware for this manual. - Section 4.4.3: Clarified meaning for "OP2" indicator light in Calibration mode and Normal Operation mode. - Appendix A: Clarified meaning for "拉闸选择 (Tampering) Relay/Switch Selection"; Also exclude "软件识别号 Firmware ID" and "硬件版本号 Hardware Version Number" from Main Parameters Table because they are version numbers, not parameters (这两个不是“参数”，而是版本号，通常也不设置的); | Seow Gek Hoon (EDMI Singapore) | |



| 版本 Version | 修改日期 Modification Date | 修改说明 Description | 修改人 Modified By | 适用范围 Applicability Scope |
|---------------|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------|
| V1.2 | 2013-07-18 | Chapter 5 第五章: 增加 LCD 全显图示, 增加图标说明。Added “All Segments Turned On” Display and explanation of Display Icons. | 陈文艺 (EDMI Shenzhen) | |
| V1.3 | 2013-07-25 | 修改 “2.5 通信接口 Communication Interfaces” 部分描述, 增加两线通信接口说明。 -增加 Two-wire 接线方式 Section 2.5 – Clarified about Technical Specifications Document versions for RF modules. Appendix B: Changed to Updated Hardware Manufacturing Code. Replaced revised sections 2.1 to 2.4 that include new photos (top and bottom views) and wiring diagrams from by EDM I Shenzhen, but remove “output” from No. 7 and No. 8 descriptions in Section 2.1 Page 6. | 陈文艺 (EDMI Shenzhen) Seow Gek Hoon (EDMI Singapore) | |
| V1.4 | 2013-12-05 | 1. 修改黄色 OP1 指示灯为跳闸指示灯 (参考说明第 6 页); 2. 修改黄色 OP1 指示灯描述为控制内置负荷开关跳闸时点亮 (参考说明第 14 页); 3. 修改红色 OP2 通讯指示灯的描述 (参考说明第 14 页); 4. 修改了通讯安全性及权限说明中的部分描述 (参考说明第 22 页) 1. Modify the yellow OPI indicator light as tripping indicating lamp(refer to page 6) 2. Modify the description of yellow light as switching it on when the tripping happens in the built-in load (refer to page 14); 3. Modify the description of the red OP2 communications indicator lamp (refer to page 14); 4. Modify a part description of the | 张贵群 (EDMI Shenzhen) | S223 |



| 版本 Version | 修改日期 Modification Date | 修改说明 Description | 修改人 Modified By | 适用范围 Applicability Scope |
|---------------|------------------------------|------------------------------------------------------------------------|-----------------------|--------------------------------|
| | | communication security and authority introduction(refer to page 22) | | |



目录 Table of Contents

| | Page |
|---------------------------------------------------------------------------------------------------|------|
| 第一章 电能表简介 Chapter 1 Introduction of Electricity Meter | 5 |
| 第二章 外观及安装尺寸 Chapter 2 External Features & Installation Dimensions | 6 |
| 2.1 外观（示例图） External Features (Typical Drawing) | 6 |
| 2.2 外形尺寸及安装尺寸 External Dimensions and Installation Dimensions | 7 |
| 2.3 接线图 Connection Diagrams | 9 |
| 2.4 电能脉冲输出端子 Energy Pulse Output Terminal | 9 |
| 2.5 通信接口 Communication Interfaces | 10 |
| 2.6 硬件编程口（内置） Hardware Programming Port (Built-in) | 11 |
| 第三章 电气参数 Chapter 3 Electrical Parameters | 12 |
| 3.1 工作电压（具体见铭牌标注） Operating Voltage (Refer to Specific Voltage Marked on Nameplate) | 12 |
| 3.2 电流规格（具体见铭牌标注） Current Specifications (Refer to Specific Voltage Marked on Nameplate) | 12 |
| 3.3 精度 Accuracy | 12 |
| 3.4 功耗 Power Consumption | 12 |
| 3.9 工作环境 Operating Environment | 13 |
| 第四章 功能介绍 Chapter 4 Introduction of Meter Functions | 14 |
| 4.1 计量功能 Metrology | 14 |
| 4.2 测量功能 Measurement Function | 14 |
| 4.3 预付费和后付费功能 Prepaid and Post-pay Functions | 14 |
| 4.4 LED 指示说明 Description of LED Indicators | 15 |
| 4.5 告警记录 Alarm Logging | 15 |
| 4.6 通信 Communications | 16 |
| 4.7 具有预付费和后付费的切换功能 Function to Switch between Prepaid and Post-pay Modes | 17 |
| 4.8 强制拉合继电器功能 Forced-closing Relay Function | 18 |
| 第五章 LCD 显示 Chapter 5 LCD Display | 20 |
| 5.1 LCD 全显内容 LCD with All Segments Turned On | 20 |
| 5.2 LCD 图标说明 LCD Icons Description | 20 |
| 5.3 预付费模式下显示项 | 21 |
| 5.4 后付费模式下显示项 | 21 |
| 第六章 包装储运 Chapter 6 Packaging, Storage and Transportation | 22 |
| 附件 Appendix A: | 23 |
| A.1 通讯安全性及权限说明 Communication Security and Permissions Description | 23 |
| A.2 主要参数的默认值 Default Values of Main Parameters | 25 |
| Appendix B: Mk30 Hardware Manufacturing Code V1 003 As at 2013-07-23 | 26 |



第一章 电能表简介 Chapter 1 Introduction of Electricity Meter

本用户手册用于描述 EDM1 Mk30 型电能表。包括基本性能描述和基本操作（例如安装、通信和设置等）。

The use of this user manual is to describe EDM1 Mk30 Electricity Meter, including its basic performance and basic operations (such as installation, communications and setting up, etc.).

Mk30 的 firmware 和 Mk29D 完全一样，本手册支持已发布的 V1.6 S211 版本。

Mk30 firmware is exactly the same as Mk29D. This manual supports v1.6 s211 version that is already released.

Mk30 是一款符合 STS 标准的单相电能表，采用专用大规模集成电路及高性能 CPU，并使用先进的 SMT 工艺制造。该表操作使用简单、方便，分体式的设计，可选择不同的通信方式搭配不同的手持终端进行通信，同时合理的设计更加符合用户的需求。

Mk30 is a single-phase electricity meter that conforms to STS standard; it uses special large-scale integrated circuit and high performance CPU, as well as advanced SMT process manufacturing. The operation and use of this electricity meter is simple to use and convenient; designed as split type, it can select different communication modes for working (pairing) with different handheld terminals for communication; at the same time, its rational design is more able to conform to user's requirements.

产品符合 IEC62052-11、IEC62053-21、IEC 62055-31 、IEC 62055-41 标准。

This product complies with IEC62052-11, IEC62053-21, IEC 62055-31 and IEC 62055-41 standards.

本手册的目标人员是：公司内部技术人员、工程人员、测试人员等，不建议直接提供给客户。

Target audience for this manual are: Technical, engineering, testing personnel, etc. This manual is not recommended to be given to customers (end-users).

本手册为相关人员提供该设备的具体参数规格、操作方式，技术原理及流程。

This manual will provide the device's specific parameters, specifications, operation method, technical principle and process to the relevant personnel.

请按照目录顺序阅读本手册。

Please read this manual sequentially according to its Table of Contents.



第二章 外观及安装尺寸 Chapter 2 External Features & Installation Dimensions

2.1 外观（示例图） External Features (Typical Drawing)

电表的外观如图 2-1 所示（标签印字会不同）。

External view of Meter is as shown in Figure 2-1. (Printed label may differ).

Top View



Front View



Bottom View



Figure 图 2-1 外观图 External Views



| Item No. | 说明 Description |
|----------|------------------------------------------------------------------------------------------|
| 1 | 火线进 (Live) Line-in L-in |
| 2 | 零线进 Neutral-in N-in |
| 3 | 火线出 (Live) Line-out L-in |
| 4 | 零线出 Neutral-out N-out |
| 5 | 脉冲正极 Pulse Positive Terminal Pulse+ |
| 6 | 脉冲负极 Pulse Negative Terminal Pulse- |
| 7 | RS485 A / Two-wire+ 正极端子(选配): RS485 A / Two-wire+ Positive Terminal (Optional) |
| 8 | RS485 B / Two-wire- 负极端子(选配): RS485 B / Two-wire- Negative Terminal (Optional) |
| 9 | PULSE: 脉冲指示灯 Pulse Indicator Light |
| 10 | OP1: 跳闸指示灯 Tripping indicating lamp |
| 11 | OP2: 通讯指示灯 Communications Indicator Light |
| 12 | 光电口 Optical Port |
| 13 | 显示器 LCD Display |

2.2 外形尺寸及安装尺寸 External Dimensions and Installation Dimensions

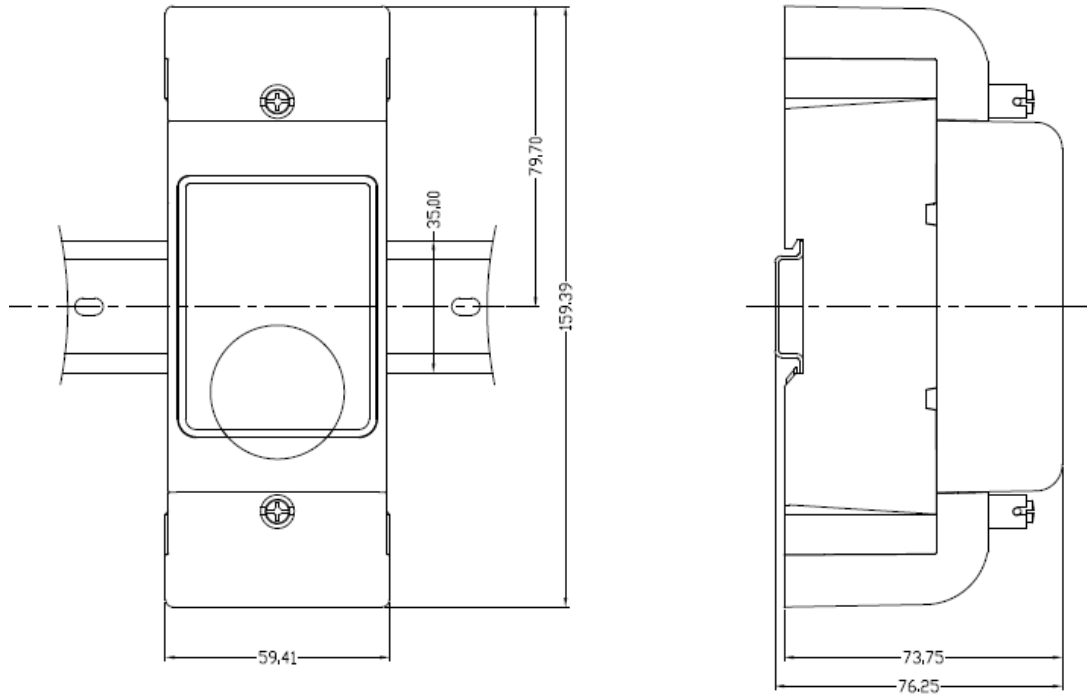
电能表外形尺寸和安装尺寸如图 2-2。

External dimensions and installation dimensions of Electricity Meter are as shown in Figure 2-2.

长端钮盖外形尺寸和安装尺寸

External dimensions and installation dimensions of long terminal cover





短端钮盖外形尺寸和安装尺寸

External dimensions and installation dimensions of short terminal cover

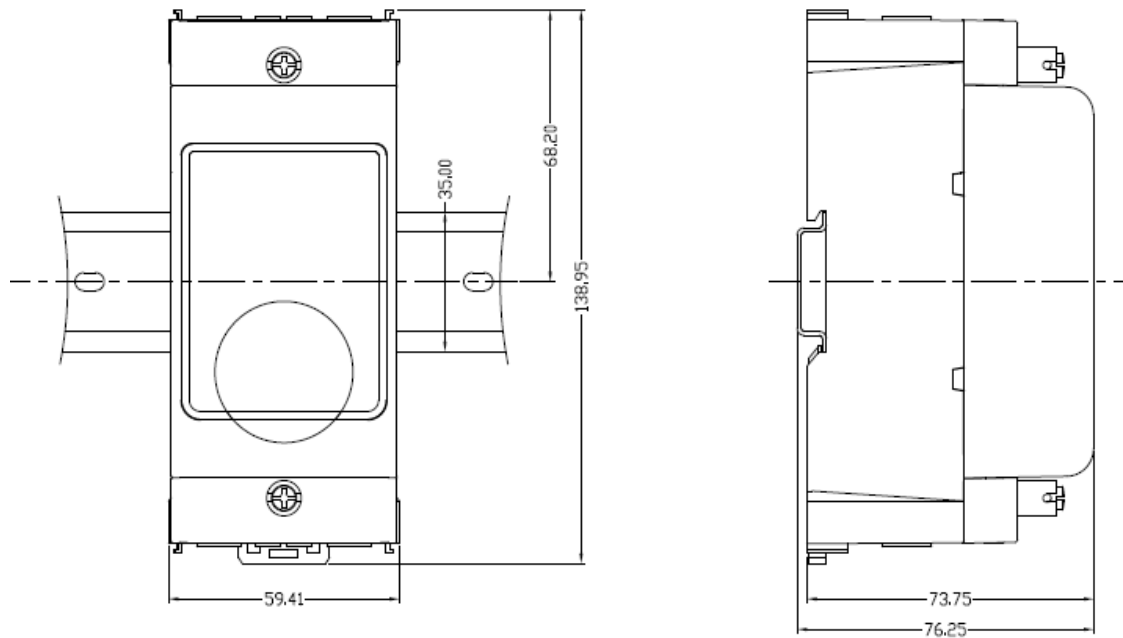


Figure 图 2-2 外形尺寸和安装尺寸图

External Dimensions and Installation Dimensions Diagrams



2.3 接线图 Connection Diagrams

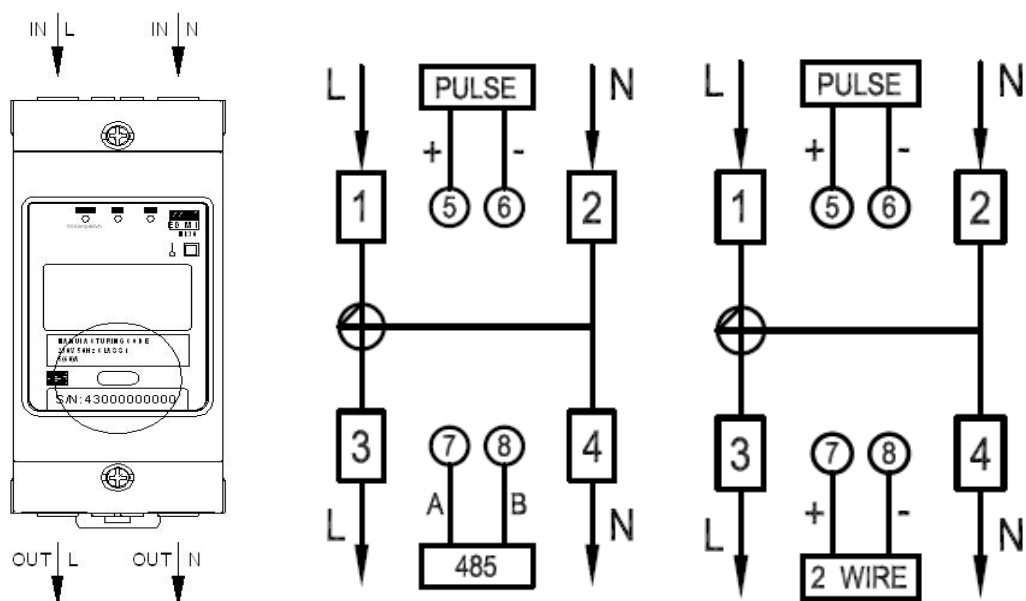


Figure 图 2-3 现场接线示意图 Field Wiring Schematic Diagram

2.4 电能脉冲输出端子 Energy Pulse Output Terminal

电能脉冲输出端子是光电隔离的无源脉冲输出端子，其输出脉冲频率正比于瞬时有功功率，用来测量电能计量准确度。Pulse+ 接外部采集端正极，Pulse- 接外部采集端负极。端子接线图参照图 2-3。

The energy pulse output terminal is a passive pulse output terminal that is isolated photoelectrically. Its output pulse frequency is proportional to the instantaneous active power. It is used to measure the accuracy of electric energy metering. Connect "Pulse+" to positive pole (anode) of external acquisition terminal, and connect "Pulse-" to negative pole (cathode) of external acquisition terminal. As for the terminal wiring diagram, please refer to Figure 2-3.



2.5 通信接口 **Communication Interfaces**

电能表可按通信需求的不同，选配其中一种通信模块，可选项有：

According to different communication requirements, one of the following communication modules may be selected for the electricity meter. The available options are:

- MA7105 RF (2.4G) 模块，可与 Gateway 产品配合工作，例如 GW30 等；通信指标参见“MA7105 (2.4G) 微功率无线模块技术说明书”，目前的最新版本是“V11_20130610”。
MA7105 RF (2.4G) Module – This can be for use with Gateway products such as GW30; as for its communications characteristics/ index, please refer to "MA7105 (2.4 G) Micro-power Wireless Module Technical Specifications" document whose current latest version is "V11_20130610".
- MSi4432 RF (480M) 模块，可与有 RF 通讯功能的 CIU 产品配合工作，例如 HD14 等；通信指标参见“MSi4432 低功率无线模块说明书”，目前最新版本是“V10_20130516”。
MSi4432RF (480M) Module - This can be for use with CIU products that have RF-communications capability such as HD14; as for its communications characteristics/ index, please refer to "MSi4432 Low-power Wireless Module Technical Specifications" document whose current latest version is "V10_20130516".
- PLC 电力载波通信模块，通信指标参见文件“钜泉 DBPSK 载波模块技术说明书”，目前最新版本是“V10_20130416”；
PLC Electric Power Carrier-Wave Communication Module - As for its communications characteristics/ index, please refer to "Hi-Trend Technology's DBPSK Carrier-Wave Module Technical Specifications" document whose current latest version is "V10_20130416".
- RS485 通信模块，接线方式见图 2-3，通信波特率：2400bps。通信协议参见文件“MK29D 通讯协议”目前最新版本为 V2.5。
RS485 Communications Module – Wiring method is as shown in Figure 2-3; Communication Baud Rate: 2400 bps; as for its communications characteristics/ index, please refer to "Mk29D Communications Protocol" document whose current latest version is V2.5.
- 两线通信模块，可与有两线(2-wire)通讯功能的 CIU 产品配合工作，例如 HD16 等；接线方式见图 2-3，通信指标参见文件“两线(2-wire)通信模块技术说明书”。
Two-wire Communication Module - This can be for use with CIU products that have RF-communications capability such as HD16 (2-wire). Wiring method is as shown in Figure 2-3; as for its communications characteristics/ index, please refer to "Two-wire Communication Module Technical Specifications" document.



2.6 硬件编程口 (内置) **Hardware Programming Port (Built-in)**

该表计 J10 为硬件编程口, 当需设置表号、初始化电能表等设置时, 硬件编程标志需有效(短接一次即可)。

This meter' s J10 is the Hardware Programming Port; when the meter' s Serial Number needs to be set, to initialize the meter and other devices, the Hardware Programming Flag needs to be valid (just need to be connected once and for a short while).



第三章 电气参数 Chapter 3 Electrical Parameters

3.1 工作电压（具体见铭牌标注） Operating Voltage (Refer to Specific Voltage Marked on Nameplate)

额定电压 Nominal (Rated) Voltage U_b : 220VAC, 230VAC, 240VAC, 120VAC

工作电压范围 Operating Voltage Range: 85VAC ~ 420VAC

3.2 电流规格（具体见铭牌标注）

Current Specifications (Refer to Specific Voltage Marked on Nameplate)

基本电流 Basic Current I_b : 5A, 10A

最大电流 Maximum Current I_{max} : 60A, 100A

3.3 精度 Accuracy

准确度等级 Accuracy Class: IEC62053-21 Class 1 或 Class 2

基本误差 Basic Error:

| 负载电流 Load Current (A) | 功率因数 Power Factor ($\cos\phi$) | 百分数误差极限 Error Limit Percentage (%) | |
|------------------------------|----------------------------------------|---------------------------------------|-----------|
| | | Class 1 | Class 2 |
| $0.05I_b \leq I < 0.1I_b$ | 1.0 | ± 1.5 | ± 2.5 |
| $0.1I_b \leq I \leq I_{max}$ | | ± 1.0 | ± 2.0 |
| $0.1I_b \leq I < 0.2I_b$ | 0.5 (滞后 Lag) | ± 1.5 | ± 2.5 |
| | 0.8 (超前 Lead) | ± 1.5 | - |
| $0.2I_b \leq I \leq I_{max}$ | 0.5 (滞后 Lag) | ± 1.0 | ± 2.0 |
| | 0.8 (超前 Lead) | ± 1.0 | - |
| $0.2I_b \leq I < I_b$ | 0.25 (滞后 Lag) | ± 3.5 | - |
| $0.2I_b \leq I < I_b$ | 0.5 (超前 Lead) | ± 2.5 | - |

3.4 功耗 Power Consumption

电压回路 Voltage Circuit: $< 2W$ 10VA

电流回路 Current Circuit: $< 2.5VA$



3.5 启动、潜动 **Meter Start and Creeping**

启动: 在功率因数为 1 和电流为 $0.4\% I_b$ 下, 在标准要求的时间内电能表能启动和连续记录。

Meter Start: When the Power Factor is 1 and the Current is $0.4\% I_b$, the electricity meter is able to start and record continuously within the time required by the standard.

潜动: 在参比电压的 115% 而电流线路无电流时, 在标准要求的时间内, 电能表测试输出不多于一个脉冲。

Creeping: When reference voltage is 115% and there is no current in the electric current circuit, the electricity meter is tested to output not more than one pulse within the time required by the standard.

3.6 电能表常数 **Meter Constant**

电能表常数 **Meter Constant:** 1000imp/kWh (具体见铭牌标注) (Refer to Specific Voltage Marked on Nameplate)

3.7 电磁兼容 **Electromagnetic Compatibility (EMC)**

对静电放电、高频电磁场、电快速瞬变脉冲群、浪涌的抗干扰度符合 IEC62053-21:2003 中的要求。

Regarding Electrostatic Discharge, High frequency electromagnetic fields, and Electrical Fast Transient (EFT) and Surge Immunity, this meter meets IEC62053-21:2003 requirements.

3.8 防尘和防水 **Ingress Protection (IP) Rating (i.e. Environmental Protection against Dust and Water)**

满足 IEC60529 规定的 IP54 Indoor meter 的要求。

Fulfills IP54 Indoor meter requirements in IEC60529 specifications.

3.9 工作环境 **Operating Environment**

工作温度范围 **Operating Temperature Range:** $-25 \sim +55^{\circ}\text{C}$;

工作极限温度范围 **Limit Temperature Range:** $-40 \sim +70^{\circ}\text{C}$;

湿度范围 **Humidity Range:** $<95\%$ (无凝露 **No condensation**);



第四章 功能介绍 Chapter 4 Introduction of Meter Functions

各项功能详细设置请参见“MK29D 寄存器手册”目前最新版本为 V2.13;

Please refer to "MK29D Register Manual" for each function's setup details; Currently, the latest version is V2.13.

4.1 计量功能 Metrology

- 测量、累计有功总电能; Measures and calculates Accumulated Total Active Power
- 具有反向电能指示; Has Reverse Power indicator
- 断电后, 电能数据不丢失。Electricity data is not lost after power disconnection/disruption

4.2 测量功能 Measurement Function

- 1) 测量电表的有功功率、电流、电压等运行参数;
Measuring meter has operation parameters such as active power, current, voltage, etc.
- 2) 测量误差不超过 $\pm 1\%$ (引用误差)。
Measurement error is not more than $\pm 1\%$ error (Quoted Error).

4.3 预付费和后付费功能 Prepaid and Post-pay Functions

可以通过设置相关寄存器, 让电能表工作再预付费或者后付费模式。详情见寄存器手册说明, “MK29D 寄存器手册” (目前最新版本为 V2.13);

The electricity meter's operation can be in prepaid or post-pay mode by setting up the relevant registers; Please refer to the Register Manual for detail instructions. (Currently, the latest version of "MK29D Register Manual" is V2.13);

- 1) 设置为预付费模式下, 电能表符合 STS 标准的加密解密算法;
When set to "Prepaid" mode, the electricity meter complies with STS standard for encryption and decryption algorithm;
- 2) 可以通过使用 CIU 输入 TOKEN 对表进行充值、测试和管理;
Token may be input (i.e. entered) by using CIU to perform top-up (i.e. add energy credits), testing or management;
- 3) 内置负荷开关, 控制用户负载通断。
The built-in load switch controls the connection or disconnection of user's load.



4.4 LED 指示说明 Description of LED Indicators

- 1) **红色 PULSE 脉冲指示灯:** 用户用电时闪烁, 频率正比与瞬时有功功率;
Red "PULSE" Pulse Indicator Light: Flashes (i.e. blinks) when user is using electricity; its frequency is proportional to the instantaneous active power;

- 2) **黄色 OP1 跳闸指示灯:** 控制内置负荷开关跳闸时点亮;

Yellow OP1 Tripping indicating lamp: Switch it on when the tripping happens in the built-in load;

- 3) **红色 OP2 通讯指示灯:** 在电表处于允许校表状态时, 该指示灯常亮; 校表结束后该指示灯熄灭; 在电表处于正常工作状态下(禁止交表状态), 该指示灯还可为通讯指示灯, 在通讯时和 LCD 上的通讯指示符号同步闪烁。

While the electric meter is in a state of allowing adjusting meter, the indicator light keeps on; it will go off after adjusting meter; this indicator light can also be the communication indicator light when the meter in the common working state(adjust forbidden), the light and the LCD indicator symbol will flash synchronization when the communication happens.

When meter calibration is completed, the meter enters the Normal Operation mode (meter calibration is disallowed at such time), this indicator light will now function as Communications indicator light. When communications is in progress, this indicator light will flash (i.e. blink) in synchronization with the LCD's Communications icon.

4.5 告警记录 Alarm Logging

- 1) 记录曾经发生过的反向电能事件状态;
Meter records reverse power events (statuses) that have occurred.
- 2) 记录曾经发生过的继电器故障事件状态;
Meter records the statuses of faulty (malfunctioned) relay events (statuses) that have occurred.
- 3) **Tamper 电功能:** 电表在检测到反向功率(反向功率阈值设定为 200W, 判断时间为 1min)
Electricity Anti-Tampering Function: The meter detects Reverse Power (Reverse Power Threshold is set as 200W; and this tampering determination time is set as 1 minute).

过载断电功能: 过载(过载阈值设定为 13800W(Imax 为 60A 的电表)、23000W(Imax 为 100A 的电表), 判断时间为 1min) 时, 将进行断电告警。

Power Disconnection Function When Power is Overloaded: Overload Threshold is



set as 13800W (for 60A I_{max} electricity meters), or 23000W (for 100A electricity meters); this tampering determination time is set as 1 minute. When overload occurs, Power Disconnection alarm is raised.

剩余用电量断电：预付费模式下剩余电量用完时继电器断开，程序默认剩余电量用完值为 0。

Power Disconnection Function When Remaining Energy Credits (Energy Balance) Runs Out: If pre-paid mode, the relay is opened (disconnected) when Remaining Energy Credits (Energy Balance) is used up; Zero is the default value used by the program to determine if Energy Balance (Energy Credits) is used up.

发生上述事件后，继电器拉闸，而合闸条件必须通过清除 Tamper 的 Token 清除上述事件，电表才允许合闸（同时上述现象应该消失）。电表的初始化也可以清除上述事件。
After the above incidents occurred, the relay switch is opened (disconnected). And the condition for closing (connecting) the relay is the above events must be cleared by using the Clear Tamper Token, then the electricity meter will allow the relay switch to close (connect) (at the same time, the above phenomena should disappear). Initializing the electricity meter can also remove the above events.

4.6 通信 Communications

1) 接触式红外光口 Contact-type Infra-red Port

2) 光学特性 Optical Properties:

- 参比温度 Reference Temperature $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$
- 波长 Wavelength: 900nm ~ 1000nm
- 发射器在距离表面 $10\text{mm} \pm 1\text{mm}$ 处产生信号为最佳作用区，称参考面，该参考面处辐射照度 E_e/T 的极限值为：

The best action zone for signal generation is when the transmitter is at 10 mm +/- 1 mm distance from the surface. This is called the radiation reference surface and the limits of this reference surface's irradiance E_e/T are:

ON 状态 State: $500 \mu\text{W}/\text{cm}^2 \leq E_e/T \leq 5000 \mu\text{W}/\text{cm}^2$

OFF 状态 State: $E_e/T \leq 10 \mu\text{W}/\text{cm}^2$

- 接收器在距离表面 $10\text{mm} \pm 1\text{mm}$ 的参考平面处的辐射照度 E_e/R ，其极限值为：
 E_e/R is the radiation reference surface's irradiance when the receiver is at 10 mm +/- 1 mm distance from the surface. Its limits are:



ON 状态 **State:** $E_e/R \geq 200 \mu W/cm^2$

OFF 状态 **State:** $E_e/R \leq 20 \mu W/cm^2$

- 数据传输的光路周围光照强度小于 16000lx（类似太阳光，包括荧光）
The surroundings of optical path used by data transmission have illumination intensity of less than 16000 lx (similar to sunlight and fluorescent light).

3) 波特率 **Baud Rate:** 2400bps

4) 通信协议：参见文件“MK29D 通讯协议”目前最新版本为 V2.5；
Communication Protocol: Refer to "MK29D Communication Protocol" file; Currently, the latest version is V2.5;

5) 通信接口检查 **Communication Interface Checks**

6) 测试软件：Mk29D(RF)红外通讯检查 V2
Test Software: Mk29D (RF) Infrared Communication Checks V2

4.7 具有预付费和后付费的切换功能 **Function to Switch between Prepaid and Post-pay Modes**

通过 token 码切换电表预付费、后付费功能：

The switch between Prepaid and Post-pay modes is by means of Token code:

- 1) 电表在切换到后付费模式后，电表剩余电量递减到 0 也不断继电器。切换到后付费后液晶显示的内容将切换到后付费的显示内容；

After the meter is switched to Post-pay mode, the relay will not be disconnected when the Energy Balance (Energy Credits) is decreased progressively to zero. After the meter is switched to Post-pay mode, its LCD contents will be switched to Post-pay display contents;

- 2) 切换到预付费方式，一般需要先用 Token（生产状态下的表进行初始化）将剩余电量清 0，然后再充值，继电器才会合上。因为可能由于后付费方式下运行，电表已经处于赊欠状态（剩余电量为负数），如果在这种条件下充值，可能无法保证剩余电量回到大于 0 的条件，也无法使继电器，继续工作。

To switch the meter to Pre-pay mode, generally requires the use of Token (Initialization of a meter during Production state) to clear (reset) the Remaining Energy Credits (Energy Balance) to zero, then add energy credits (i.e. do a top-up) so that the relay can be closed (connected).

In the Post-pay operation mode, it is possible that the meter may already be in a Debt state (i.e. negative Energy balance). However, if energy credits are added in such a situation, it may not be possible to ensure the Remaining Energy Credits (Energy Balance) will return to Positive (i.e. greater than zero) condition and to ensure that the



relay will resume operation.

4.8 强制拉合继电器功能 **Forced-closing Relay Function**

无论电表是在预付费方式还是在后付费方式，都可以实施强制拉合闸操作，强制拉合闸操作有两种方法。

Whether the meter is in Prepaid or Post-pay mode, it can implement compulsory closing (connecting) operation. There are two ways to do the compulsory closing (connecting) operation.

1) 通过扩展的 **Token** 进行拉闸与合闸的操作。扩展的 **Token** 如下定义：

Relay opening (disconnecting) and closing (connecting) operation proceed by means of an extended **Token**. Extended **Tokens** are defined as follows:

| Class | Sub_Class | RND | TID | PropData | CRC | 功能 Functions |
|--------|-----------|--------|---------|--------------------------------------------------------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2 bits | 4 bits | 4 bits | 24 bits | 16 bits | 16 bits | |
| 2 | 11 | | | 1110 1010 0101 0101 [0xEA55] – Hex (59989) – Decimal | | 无条件断继电器，相应的在 Relay.status 寄存器置位 bit – 3 Uncon_Off_Relay 。 Unconditional Relay; Corresponds to Bit 3 in Relay Status Register. |
| | | | | 1110 1010 1010 1010 [0xEAAA] – Hex (60074) – Decimal | | 清除继电器的任务，此后继电器的任务将根据其它的条件重新判断置位。如果没有其它需要断继电器的条件存在，继电器将合闸。 Role of clearing (resetting) the relay; After that, relay's role (register's bit) will be re-evaluated according to other conditions. If no relay-opening (disconnecting) condition exists, then the relay will close |



| Class | Sub_Class | RND | TID | PropData | CRC | 功能 Functions |
|-------|-----------|-----|-----|----------|-----|--------------|
| | | | | | | (connect). |

- 2) 通过通讯口（远程和本地都可以）进行强制拉合闸操作，必须使用我们公司提供的专门的继电器控制程序 **Mk29D Relay Control V1.0** 以及后续的升级版本实施。

强制拉合闸的限制：电表安装继电器以后，可以进行强制拉闸。但是没有所谓的“强制合闸”，而是“取消强制拉闸”的状态。取消强制拉闸以后，电表是否合闸，要根据电表的状态来决定的，包括剩余电量，过载，**Tamper** 状只有在电表没有其它拉闸条件存在的 情况下电表才会合闸。

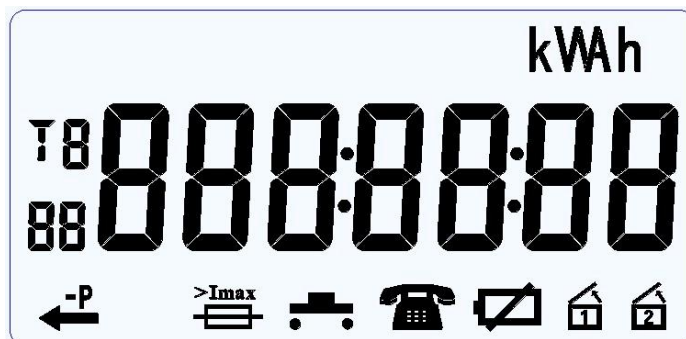
Forced opening (disconnecting) and closing (connecting) of relay is done by via communication port (remote and local) and must be implemented using a specialized Relay Control program “Mk29D Relay Control V1.0” and its subsequent upgrade versions provided by our Company.

Limit in forced opening (disconnecting) and closing (connecting) of relay: After the relay is installed in the meter, the meter can implement forced opening (disconnecting) of relay. However, there is no so-called "forced closing (connecting)", but rather "cancellation of forced closing". After cancellation of forced closing, whether the meter's relay is closed or opened, it will depend according to the state of the meter (including Remaining Energy Credits (Energy Balance), Overload, Tamper status). Relay in the meter will close (connect) only if no other relay-opening (disconnecting) conditions exist.





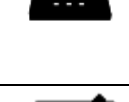




第五章 LCD 显示 Chapter 5 LCD Display

5.1 LCD 全显内容 LCD with All Segments Turned On


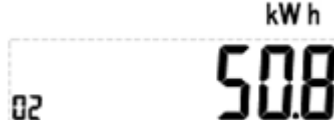


5.2 LCD 图标说明 LCD Icons Description


| 图标 Display Icon | 说明 Description |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
|  | 功率反向 Power Reversal |
|  | 功率过载 Power Overloading |
|  | 不使用* Not Used* |
|  | 当此图标点亮时，表示接收到外部发来的数据。 When this icon is lit (ON), it indicates that Display Meter is in the process of receiving data externally. |
|  | 不使用* Not Used* |
|  | 不使用* Not Used* |
|  | 电能单位，kW，kWh，A，W Units of Measurement for Energy: kW，kWh，A，W |



5.3 预付费模式下显示项

| 序号 Item No. | 显示屏 Display Screen | 显示内容说明 Explanation of Display Content |
|----------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| 1 |  | 轮显第01 屏 Auto-Scrolling Display's No. 01 Screen 当前有功总电量为 0.5kWh Meter Units To-Date (Current Total Energy) is 0.5 kWh. |
| 2 |  | 轮显第02 屏 Auto-Scrolling Display's No. 02 Screen 当前剩余电量为 50.8kWh Credits Remaining (Current Energy Balance) is 50.8 kWh |

5.4 后付费模式下显示项

| | LCD Display | Description |
|---|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| 1 |  | 轮显第01 屏 Auto-Scrolling Display's No. 01 Screen 当前有功总电量为 43.56kWh Meter Units To-Date (Current Total Energy) is 43.56 kWh. |

以上数据非表计实际数据，只做举例说明，表计具体参数见客户要求。

The above are not actual data, but only examples for explanation; Refer to Customer's requirements for Meter's specific parameters.

上述列表的显示菜单内容轮显项目数会随着付费模式的切换而改变，但自动轮显的项目数不改变，轮显时间(自动轮显时间间隔为 3s)也不会改变。

The display menu contents and number of auto-scrolling items in above list will change when the payment mode is switched, but the number of items in auto-scrolling display and the auto-scroll display time (auto-scrolling time interval is 3 s) will not change.



第六章 包装储运 Chapter 6 Packaging, Storage and Transportation

1) 包装、储存应符合 GB/T 15464 有关规定。

Packaging and storage should conform to GB/T 15464 specifications.

2) 若在仓库内保管应在原包装条件下，放在支架上且叠放高度不超过 5 层。

If in a warehouse environment, the equipment should be in their original packaging and stacked in less than 5 layers on the storage shelves.

3) 存放电能表的地方应清洁，空气中不应有腐蚀性气体，应防潮。其环境温度-30℃~70℃，相对湿度不超过 85%。

Keep the place of storage clean and free from corrosive or explosive gases in the air. Maintain an ambient temperature of between -30 °C to +70 °C and a comparative humidity of less than 85%.



附件 Appendix A:

A.1 通讯安全性及权限说明 **Communication Security and Permissions Description**

通讯写数据全部需要密码，密码等级 02 级。

All communications data writing need a password and the password level is 02.

02 级密码默认值 (Level 02 password's default value) : 000000

| 序号 Item No. | 操作事件 Operational Events | 权限说明 Permissions Description |
|-------------------|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | 继电器测试 Testing the Relay | 02 级密码 (Level 02 password) |
| 2 | 读表地址 Reading the Meter's Address | 无密码 (No password) |
| 3 | 设表通讯地址 Installing Meter's Communications Address | 需要编程允许，且不需要密码 programming allowed and without password. |
| 4 | 修改密码 Changing the Password | 需要用户初始密码(权限 02, 密码 000000 只在生产时使用，电表出厂时，密码自动改为用户初始密码: 权限 02, 密码: xx xx xx)。生产状态不能修改此 000000 密码，用户以后也不可以将密码修改成 00 00 00。 Needs user initialize the password(authority 02,password 000000), the password can be used only in production, after the factory Settings, the password will be changed into user' s :authority 02, password: xx xx xx xx).Meters in production status can't change this password 000000, and users can't change their password to 000000 after the factory setting. |
| 5 | 总用电量和总充值电量清零 | 02 级密码 (Level 02 password) |
| 6 | 电表初始化 Initializing the Meter | 02 级密码+编程允许 (Level 02 password + "Allow Programming" mode) |
| 7 | 编程允许命令 Command to Enter "Allow Programming" Mode | 02 级密码+电表上盖打开(Level 02 password + Opening Meter Lid) |
| 8 | LCD 测试命令 Command to Test | 无密码 (No password) |



| | | |
|----|--------------------------------------------------|--------------------------------------------|
| | LCD | |
| 9 | 结束编程允许命令 Command to End "Allow Programming" Mode | 02 级密码 (Level 02 password) |
| 10 | 其它写数据 Other Writing of Data | 都需要 02 级密码 (All require Level 02 password) |



A.2 主要参数的默认值 Default Values of Main Parameters

| 参数 Parameter | 默认值 Default Value |
|-----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| 剩余电量告警门限 Remaining Energy Credits (Energy Balance) Alarm Threshold | 0 kWh |
| 赊欠用电门限 Energy Debt Threshold | 0 kWh |
| 反向功率判定阈值 Threshold for Determining Reverse Power | 200 W |
| 反向功率判定时间 Time Interval for Determining Reverse Power | 60 s |
| 过载门限 Overload Threshold | 13800 W (Imax 为 60A 的电能表; Imax for 60A Meter); 23000W (Imax 为 100A 的电能表; Imax for 100A Meter) |
| 过载判定时间 Time Interval for Determining Overload | 60 s |
| 拉闸选择 (Tampering) Relay/Switch Selection | 无 None (This means setting Register 0x0000f106's bits/flags No. 1 ~ 7 to zero) |
| 软件识别号 Firmware ID | S211 |
| 硬件版本号 Hardware Version Number | V1.4 |



Appendix B: Mk30 Hardware Manufacturing Code V1 003

As at 2013-07-23

| M | k | 3 | 0 | - | ??? | - | ? | - | ??? | - | ?? |
|-------------------------------------------------------------------------------|---|---|---|---|-----|---|---|---|-----|---|----|
| Rated Voltage | | | | | | | | | | | |
| 1 = 120V | | | | | | | | | | | |
| 2 = 220V | | | | | | | | | | | |
| 3 = 230V | | | | | | | | | | | |
| 4 = 240V | | | | | | | | | | | |
| Accuracy | | | | | | | | | | | |
| 1 = Class 1 ,50Hz | | | | | | | | | | | |
| 2 = Class 2 ,50Hz | | | | | | | | | | | |
| 3 = Class 1 ,60Hz | | | | | | | | | | | |
| 4 = Class 2 ,60Hz | | | | | | | | | | | |
| Current Range | | | | | | | | | | | |
| A = 5(15)A | | | | | | | | | | | |
| B = 5(20)A | | | | | | | | | | | |
| C = 5(30)A | | | | | | | | | | | |
| D = 5(100)A | | | | | | | | | | | |
| E = 10(40)A | | | | | | | | | | | |
| F = 10(60)A | | | | | | | | | | | |
| G = 10(100)A | | | | | | | | | | | |
| H = 15(45)A | | | | | | | | | | | |
| I = 20(80)A | | | | | | | | | | | |
| J = 30(100)A | | | | | | | | | | | |
| Terminal Cover Length | | | | | | | | | | | |
| S = Short Terminal Cover | | | | | | | | | | | |
| L = Long Terminal Cover | | | | | | | | | | | |
| Optical Communication ports | | | | | | | | | | | |
| 0 = IEC Flag | | | | | | | | | | | |
| 1 = No optical port | | | | | | | | | | | |
| Remote Communication Ports | | | | | | | | | | | |
| 0 = No remote comm | | | | | | | | | | | |
| 1 = RS485 (2-wire) | | | | | | | | | | | |
| 2 = PLC, for CIU | | | | | | | | | | | |
| 3 = RF, for cluster application | | | | | | | | | | | |
| 4 = RF, for CIU | | | | | | | | | | | |
| 5 = Two-wires, for CIU | | | | | | | | | | | |
| Standard I/O Options | | | | | | | | | | | |
| 0 = No I/O | | | | | | | | | | | |
| 1 = Energy pulse output | | | | | | | | | | | |
| LCD Display | | | | | | | | | | | |
| 0 = Not Fitted | | | | | | | | | | | |
| 1 = 7 Digits, Fitted | | | | | | | | | | | |
| LED Options | | | | | | | | | | | |
| 0 = 1 Energy Pulse LED + Disconnect Indicator LED + Communicate Indicator LED | | | | | | | | | | | |
| 1 = 1 Energy Pulse LED+ Disconnect Indicator LED | | | | | | | | | | | |
| 2 = 1 Energy Pulse LED | | | | | | | | | | | |

A Note About Selection in MK30 Hardware Manufacturing Code:

In “Standard I/O Options” segment, “Energy Pulse Output” is optional. (电能脉冲输出端子是可选配的)。

But in “LED Options” segment, the “Energy Pulse LED” which is needed by factory for meter calibration must always be present. (通常说的脉冲指示灯，用于校表的，由于工厂生产上也需要，所以必须存在)。

Currently, due to prepayment metering and utility companies’ requirements, Mk30 will come fitted with Disconnect Relay,

目前只考虑配继电器；如果市场有需求，可以增加没有继电器的规格。

