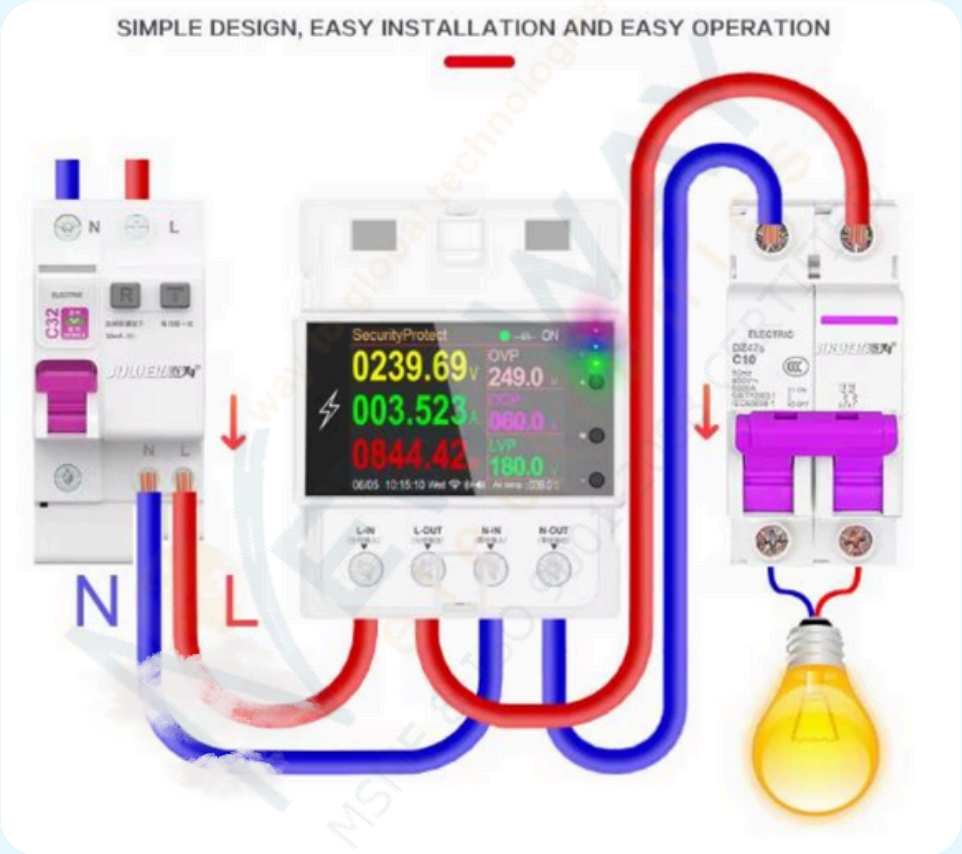
SMART WIFI-BASED UTILITY METER BY IOTFIED

INTRODUCTION

In today's fast-paced world, energy management is becoming increasingly important, and smart technology is leading the way. A Smart WiFi-based utility meter is the future of electricity consumption management, offering seamless control and visibility over your energy usage from the convenience of a mobile application. This meter goes beyond traditional utility meters, providing a host of features that not only make energy management easier but also save money and contribute to environmental sustainability.



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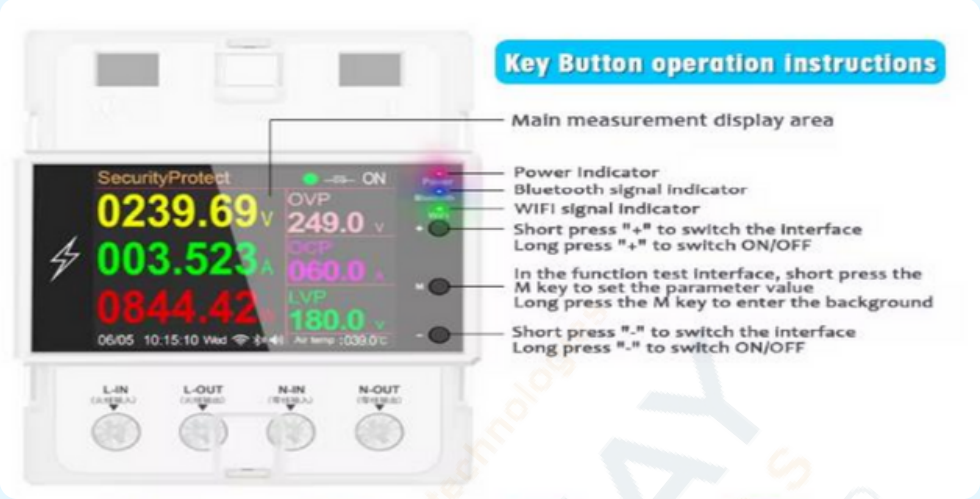

1. Main Measurement Display Area: o
The display shows real-time information such as:
Voltage (V): Current voltage being supplied to the system.
Current (A): The amount of current being used.
Power (kW): Power consumption in kilowatts.
Operational Protection Status: Indicators such as Over Voltage Protection (OVP), Over Current Protection (OCP), and Low Voltage Protection (LVP).
2. Power Indicator: o This shows whether the device is powered on or off, indicating the system's operational status.
3. Bluetooth Signal Indicator:Shows the status of the Bluetooth connection, which might be used to link the meter with other nearby devices or apps. 4. WiFi Signal Indicator: o Displays whether the meter is connected to WiFi, which is essential for remote control and monitoring through the mobile application. Button Functions 1. "+" Button: o Short press: Switches between different interfaces, likely showing various meter readings (such as voltage, current, and power). o Long press: Turns the system ON/OFF, allowing you to control the power supply to connected appliances. 2. M Key (Middle Button): o Short press: Used to enter the function test interface and set specific parameter values. o Long press: Allows access to the background interface, where advanced settings may be modified. 3. "-" Button: o Short press: Similar to the "+" button, it switches between different interfaces for monitoring various metrics. o Long press: Also functions as an ON/OFF switch, controlling the power supply.

Additional Features 1. Mobile Control: The device can be controlled through a mobile application over WiFi, allowing remote switching and real-time monitoring. 2. Scheduling Program: This feature enables users to schedule automatic on/off times for devices, ensuring energy efficiency. 3. Energy Monitoring: The meter tracks energy consumption and provides real-time data on usage, helping users to optimize their power consumption. 4. Timing Function: Users can set specific timers to control when the power should be switched on or off, ideal for automatic management. 5. Protective Function: Built-in protections, like OVP (Over Voltage Protection) and OCP (Over Current Protection), safeguard against electrical surges or faults. 6. Sharing: Multiple users can access the meter's data and controls via the app, making it convenient for household sharing or multi-user management. 7. Voice Control: Integrated with smart home ecosystems (like Google Home or Alexa) to enable voice commands. 8. Power Switch: The device offers easy switching of power supply remotely or manually using the buttons.

Connection to WiFi: Once connected to the WiFi, the smart meter is controlled remotely through a mobile app. This allows you to: o Monitor energy usage in real-time. o Turn devices or circuits on and off from anywhere. o Set schedules for automatic operation of appliances. o Receive notifications about the system's performance (e.g., voltage fluctuations, current usage). Safety and Protection: The system provides essential protection features like over-voltage, over-current, and low-voltage alarms to prevent damage to your home appliances.

In smart utility meter management, the integration of scheduling, timer, and loop timer features greatly enhances control and automation for users. These features allow you to optimize energy consumption, automate daily routines, and make your system more efficient. Here's how each of these functionalities works:

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1. Schedule The scheduling feature enables you to set specific times for turning appliances or devices on and off automatically. For example, you can program your air conditioner to turn on before you get home or schedule lights to switch off after sunrise. Benefits: Energy Efficiency: Avoid leaving devices on when not needed by scheduling automatic power-offs. Convenience: Pre-schedule appliances to run during off-peak hours when electricity rates are lower. Comfort: Automatically control devices like heating or cooling systems to ensure comfort without manual intervention. 2. Timer The timer function allows you to set a countdown for switching off a device after a specified duration. This is useful for managing devices that do not need to run continuously. Benefits: Safety: Prevent devices from overheating or running unnecessarily by automatically powering them off. Energy Savings: Save on electricity by limiting the time certain appliances run, such as water heaters or pumps 3. Loop Timer The loop timer allows repeated on/off cycles at fixed intervals. This is particularly useful for devices that need intermittent operation, such as irrigation systems, pumps, or lighting setups that require periodic activation. Benefits: Automation: Automate devices to cycle on and off at regular intervals, reducing manual effort..
Optimized Usage: Maintain control over devices that need to function periodically without being left on continuously.

Application Use-Case Example: Using the same smart utility management app, you can easily set schedules for turning off lights at night, program your washing machine to run in the early hours when electricity rates are cheaper, or use a loop timer to automate water sprinklers in your garden. These features collectively contribute to energy savings, increased safety, and ease of use.

Mobile Application Overview The accompanying mobile application is designed to make managing your smart utility meter simple and efficient. The app covers every aspect of utility management, from initial installation to usage tracking, and from recharging to receiving alerts. It acts as the control hub for all meterrelated tasks, ensuring users have full control over their energy consumption remotely. Below are the key features and benefits:

1. Installation and Setup The mobile application guides users through the entire process of installing and setting up their smart utility meter. It provides step-by-step instructions, ensuring that users can install the meter correctly and pair it with the application. The setup process is intuitive and user-friendly, allowing even non-technical individuals to complete it easily.
2. Usage Monitoring Once the meter is installed, the mobile application provides real-time monitoring of electricity consumption. It displays usage statistics in an easy-to-read dashboard, including current consumption, historical usage trends, and energy cost estimations. This helps users stay informed about their electricity usage patterns and identify ways to reduce waste.
3. Remote Control One of the standout features of the smart utility meter is remote control. Through the mobile app, users can remotely turn on or off devices connected to their meter from anywhere. Whether you're at home, at work, or on vacation, you can control your electricity consumption with just a tap, giving you complete peace of mind and preventing unnecessary energy waste.
4. Prepaid Meter Recharge For prepaid electricity meters, the app makes it extremely convenient to recharge your balance. Users can check their current meter balance at any time and receive alerts when the balance is
5. Notifications and Alerts The app provides automatic notifications for important events, such as low balance alerts, device status updates, and unusual energy consumption patterns. This ensures that users are always informed about their energy usage and meter status. Alerts can be customized based on personal preferences, allowing users to stay in control without being overwhelmed by information. 6. Scheduling and Automation The app allows users to automate their electricity usage by setting schedules for when devices should be turned on or off. This can be particularly useful for optimizing energy consumption, such as scheduling appliances to run during off-peak hours. In addition, the app offers a timer feature and loop timer for periodic tasks, further enhancing convenience and energy savings.

Admin Panel: The admin panel of a smart utility meter management system is crucial for managing, maintaining, and controlling the overall infrastructure of smart meters deployed in households or businesses. The administrator oversees the proper functioning of all meters, ensuring efficient energy distribution, resolving issues, and managing user accounts. Below are the essential aspects of admin-side operations in a smart utility meter management system:

1. User Account Management User Registration and Setup: Admins handle the registration of users in the system. They can add new users, assign meters to them, and manage permissions. User Permissions: Admins can define roles (e.g., user, technician, supervisors) and control what each role can access in the system, such as adjusting meter settings or viewing historical data. Account Activation and Deactivation: Admins can activate or deactivate user accounts as needed, for instance, in case of unpaid bills or a change of ownership.

2. Meter Management Remote Meter Configuration: Admins can configure meter settings remotely, such as adjusting threshold values for over-voltage protection or enabling specific features like energy usage monitoring. Meter Calibration: Admins are responsible for ensuring that the meters are calibrated correctly. Remote recalibration can be initiated if any discrepancies in readings are detected.

Firmware Updates: Admins can remotely update the firmware of meters to ensure they are using the latest version, which includes bug fixes, performance improvements, or additional features. Device Health Monitoring: Admins have access to diagnostic tools to monitor the health and operational status of each meter. Any malfunctions or potential issues can be flagged, and automatic alerts can be sent to technicians.

3. Data and Analytics Management Energy Consumption Data: Admins can view and analyze data across multiple users or areas to study overall energy consumption patterns. User-Specific Reports: The system generates reports for individual users that show their energy usage over time, enabling admins to offer suggestions for optimization. Global Data Insights: Admins can see broader trends, such as peak consumption times, total energy demand in a specific region, or potential areas of energy wastage. Meter Data Synchronization: Admins ensure that all meter data is regularly synchronized with the central server for real-time reporting and analysis.

4. Prepaid Meter Management Recharge Systems: Admins manage the systems that allow users to recharge their prepaid meters. They oversee the integration of payment gateways and monitor transactions to ensure they are secure and processed correctly. Balance Management: Admins monitor user balances and ensure they receive lowbalance alerts. In some cases, they may offer manual interventions, such as balance adjustments or promotional offers. Billing Reports: Admins generate and manage reports on energy consumption for users on prepaid meters, ensuring accurate billing.

5. Remote Control and Automation Management On/Off Switching: Admins can remotely control the on/off status of any connected meter or specific appliances in case of technical issues, emergencies, or user requests. Scheduling Setup: Admins can create, modify, or override scheduled programs for users to ensure energy efficiency, such as turning off meters during peak hours or emergencies.
Automated Alerts: Admins set up system-wide alerts for various issues like meter tampering, over-consumption, or system faults, ensuring rapid response to any problems.

6. Security Management System Authentication: Admins enforce security protocols such as two-factor authentication (2FA) to ensure only authorized personnel have access to the system.

Encryption Management: Admins oversee the encryption of data transmissions between meters, mobile applications, and the central system to protect user data from potential security threats. Access Logs: The admin side includes the ability to view detailed access logs, showing who has accessed which parts of the system and what changes have been made. Security Alerts: Admins receive automatic alerts for any unusual activity, such as attempts to tamper with meters or unauthorized access to the system.

7. Notifications and Alerts

Threshold Management: Admins set global thresholds for critical parameters like voltage, current, and energy usage. When a meter exceeds these thresholds, an alert is sent to both the admin and the user.
User Alerts: Admins can configure custom alerts for users based on their energy usage, balance, or device status. They can also push notifications for things like firmware updates or maintenance schedules.
Emergency Shutdown: In cases of system failure, fire, or other emergencies, admins have the power to remotely shut down meters or sections of the electrical grid to prevent accidents.

8. Maintenance and Support Issue Tracking: Admins have access to an issue tracker where users or technicians can log problems related to the meters. Admins can prioritize these issues based on severity and assign them to appropriate teams for resolution. Technician Scheduling: Admins can schedule technicians to perform onsite maintenance or installations and track their progress through the system.
Help Desk Integration: Some admin panels are integrated with support systems that allow users to submit tickets or requests directly, which the admin can monitor and resolve.

10. Admin Dashboard

Centralized Control Panel: The admin side typically comes with a comprehensive dashboard where all meters, users, and systems can be monitored in one place. This dashboard provides a real-time overview of the system's health, including energy usage trends, meter statuses, alerts, and notifications. Custom Reports Generation: Admins can generate detailed reports based on energy consumption, system performance, and operational efficiency.

Advantages of the Smart WiFi Utility Meter

1. Remote Access: Control your meter and connected devices from anywhere in the world through the mobile app.
2. Energy Efficiency: Monitor and manage electricity usage in real time, identifying areas where energy can be saved.
3. Convenience: Recharge your prepaid meter directly from the app, receive balance alerts, and set automated schedules.
4. Cost Savings: Optimize electricity consumption to avoid high bills, especially by taking advantage of off-peak times.
5. Safety: Shut down devices remotely in case of emergencies, reducing the risk of electrical hazards.
6. Environmental Impact: Reduce energy waste and lower your carbon footprint by managing energy efficiently.