

Voltage Measurement Module

Starline_V

User Manual

08/2024



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1 Functions and Main Features

1.1 Functions

The Starline V module is designed for the Starline series of products to provide accurate voltage monitoring and power supply, supporting the measurement and transmission of multiple voltage parameters. When used with Starline M and Starline E modules, the V module can achieve comprehensive energy management functions. Through the Starline Bus (RJ12) bus, the V module can be seamlessly connected with other devices to ensure efficient data transmission and integration.

Models:

- V10 (basic version)
- V-20 (advanced version, not yet released)

Main functions:

1.Electrical parameter measurement:

- Voltage measurement: Including three-phase voltages U_{ab} , U_{bc} , U_{ca} ; phase voltages V_a , V_b , V_c ; and frequency f .

- Compatible with multiple voltage types: Support 1P (1*230V), 3P+N (3*400V), 3P (3*230V), 2P+N (2*120V), 3P+N (3*208V) to meet various application requirements.

2.Communication function:

- Modbus RTU protocol: Support Modbus RTU protocol to facilitate data exchange with the host computer or remote monitoring system.

- Starline Bus (RJ12) communication: Communication and power supply between devices are realized through the RJ12 interface, ensuring stable operation of the system and simplifying the installation.

3.Data acquisition and processing:

- Real-time monitoring: Real-time monitoring of voltage and frequency to ensure the power quality and stable operation of the system.

- Data transmission: The voltage data is transmitted to other modules or the host

computer system in real time via Starline Bus, supporting centralized monitoring and management.

1.2 Main Features

| Features/Applications | V-10 (Basic Version) | V-20 (Advanced Version) |
|--------------------------|---|---|
| Metering and monitoring | Voltage measurement: Uab, Ubc, Uca, Va, Vb, Vc, frequency (f) | Voltage measurement: Uab, Ubc, Uca, Va, Vb, Vc, frequency (f) |
| Phase voltage unbalance | Not supported | Support |
| Line voltage unbalance | Not supported | Support |
| Quality analysis | Not supported | THDva, THDvb, THDvc; THDuab, THDubc, THDuca |
| Alarm function | Not supported | Over-limit alarm, phase voltage unbalance alarm, line voltage unbalance alarm |
| Width/Modules | 27mm / 1.5 | 27mm / 1.5 |
| Applicable voltage range | Support 1P (1*230V), 3P+N (3*400V), 3P (3*230V), etc. | Same as V-10, with added advanced analysis functions |

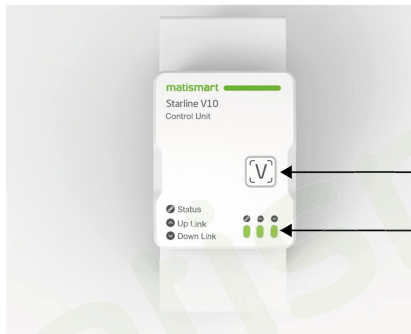
2 Product Advantages

2.1 Functions and Advantages

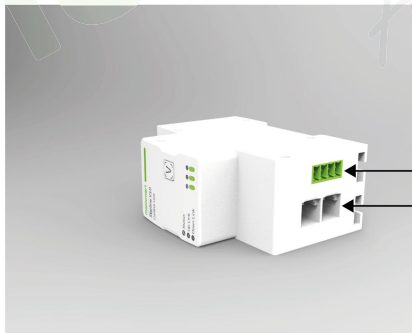
| Functions | Advantages |
|---|---|
| Single voltage measurement point for the whole system | <ul style="list-style-type: none"> • Cost saving: Reduce the number of measurement devices, reduce installation and maintenance costs, and is suitable for small systems that do not require distributed voltage measurement. • Simplify the system: Reduce hardware requirements and improve system simplicity and reliability. |
| Voltage metering, measurement and monitoring | <ul style="list-style-type: none"> • Accurate power metering: High-precision voltage measurement to ensure accurate power parameters of the system. • Real-time voltage monitoring: Support real-time monitoring of voltage fluctuations to detect potential problems timely. • Voltage quality analysis: Comprehensively analyze voltage quality to help identify power quality issues in the system and improve power management efficiency. |
| Suitable for all types of power grids | <ul style="list-style-type: none"> • Wide compatibility: Support single-phase, three-phase and various global voltage standards to meet the needs of different power systems. • International design: Adapt to different power systems around the world and ensures voltage compatibility in international applications. |
| Standard Starline Bus (RJ12) interface | <ul style="list-style-type: none"> • Easy connection: The RJ12 interface is designed to be pluggable, which is easy to connect and disconnect and improves installation efficiency. • High reliability: The interface has an anti-misinsertion design. The plug is stably fixed after insertion, ensuring a stable connection and reducing the risk of poor contact. • Strong versatility: Conform to Starline standards and is compatible with other modules in the entire Starline system. |
| Electricity safety | <ul style="list-style-type: none"> • Hot-plug safety: Support hot-plug of sub-circuits through the RJ12 port, ensuring that there is no dangerous voltage during the connection and disconnection process, improving power safety. |

3 Voltage Measurement Module Diagram

3.1 Voltage Measurement Module @曹婷婷 补充



1. Configuration button
2. Device status LED
3. Uplink status LED
4. Downlink status LED



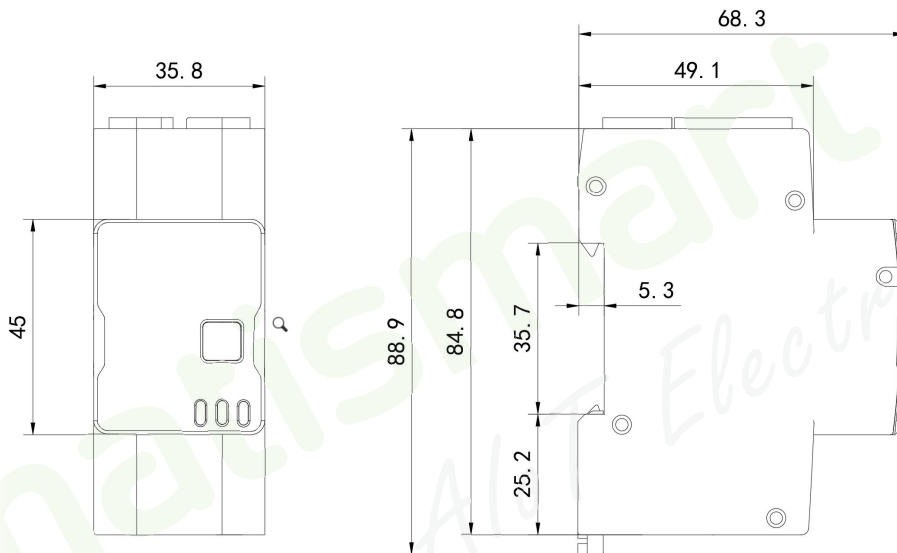
5. RS485 port
6. RJ12 cascade interface
6. RJ12 downlink device interface



7. Power supply
8. Voltage sampling

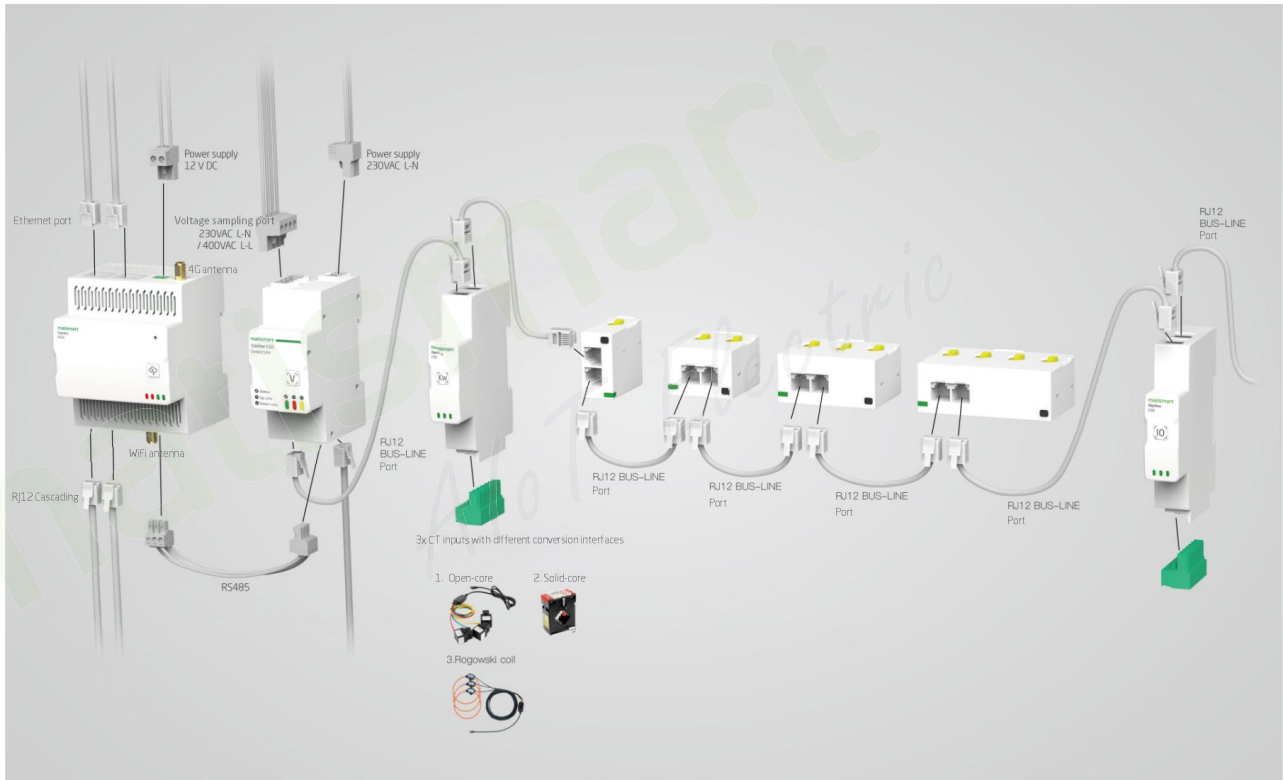
4 Hardware

4.1 Dimensions(mm)



5 Installation and Wiring

5.1 Starline_V10 Wiring



6 Automatic Address Assignment

6.1 Automatic Address Assignment via Button

Configuration steps:

1. Enter configuration mode

- Long press the configuration button until all the indicators light up, indicating that device has entered configuration mode.

2. Select the configuration function

Select different configuration modes according to your needs:

- Mode 1: Assign all addresses
 - Short press the configuration button once, indicator 1 lights up, indicating that the "Assign all addresses" mode is selected.
- Mode 2: New device address assignment
 - Short press the configuration button twice, indicator 2 lights up, indicating that the "New device address assignment" mode is selected.
- Mode 3: Confirm whether the configured device is online
 - Short press the configuration button three times, and indicator 3 lights up, indicating that the "Confirm whether the configured device is online" mode is selected.

3. Confirm the selection and execute the configuration

- After selecting the required configuration mode, long press the Configure button to confirm and send the configuration.
- The indicator will flash or turn on, indicating that the configuration has been successfully sent and has taken effect.

Configuration completed

By following the above steps, you can successfully configure the working mode of the Starline V module and ensure that the device operates as expected.

6.2 Automatic Address Assignment via Host Computer Configuration Software

Configuration steps:

1. Enter configuration interface

- Open the host computer configuration software and enter the device settings page.
- On the device settings page, select the "Communication Parameters" to enter the configuration interface.

2. Select the configuration function

Select the following configuration mode as needed:

- Mode 1: Assign all addresses
 1. In the configuration interface, select the "Assign All Addresses".
 2. Click the "Send Configuration Command" to execute address assignment.
 3. Check the system prompts to confirm whether all device addresses have been successfully configured.
- Mode 2: New device address assignment
 1. In the configuration interface, select the "New device address assignment".
 2. Click the "Send Configuration Command" button to execute the address assignment for the new device.
 3. Check the system prompts to confirm whether the address of the new device has been successfully assigned.
- Mode 3: Confirm whether the configured device is online
 1. In the configuration interface, select the "Confirm whether the configured device is online".
 2. Click the "Send Configuration Command" button to check the device online.
 3. Check the online status of the devices and make sure all devices are in normal working status.

3. Complete configuration

- After completing the corresponding configuration according to the selected configuration mode, click the "Save Settings" to ensure that the configuration

takes effect.

- Exit the configuration interface and confirm the device status.

Configuration notes:

- Make sure the device is properly connected and working when you configure it.
- After the configuration is complete, periodically check the online status of the device to ensure that the device runs stably.
- If the configuration is abnormal, repeat the configuration steps or refer to the device manual for troubleshooting.



7 LED Indicator

Running LED status

| Name | LED indication | Status | Description |
|-------------------------------|--|--------------------------------|-------------|
| RUN indicator (green, red) | Green light flashes (1 flash/second (1Hz)) | The device is running normally | |

Uplink LED status

| Name | LED indication | Status | Description |
|--------------------------------|--------------------|--|-----------------------|
| Uplink COM indicator (blue) | Blue light flashes | Serial port data transmission or reception | The address is normal |
| | Blue light off | No data transmission or reception | |

Downlink LED status

| Name | LED indication | Status | Description |
|----------------------------------|-----------------------------|--|-----------------------|
| Downlink COM indicator (blue) | Blue light flashes (normal) | Serial port data transmission or reception | The address is normal |
| | Blue light off | No data transmission or reception | |

8 Electrical Characteristics

8.1 Power System Input

| Characteristics | Value |
|-------------------------------------|---|
| Voltage measurement characteristics | 230VAC L-N $\pm 20\%$; 400VAC L-L $\pm 20\%$ |
| Frequency | 45 ... 65 Hz |
| Frequency accuracy | Class 0.02 |
| Grid type support | Single phase/two phase/two phase with neutral/three phase/three phase with neutral |
| Voltage configuration support | 1P (1×230V), 2P (240V), 2P+N (2×120V), 3P (3×230V), 3P+N (3×208V), 3P+N (3×400V) |
| Power consumption | ≤ 0.1 VA |
| Voltage measurement accuracy | Class 0.2 |
| Connection | <ul style="list-style-type: none"> • Voltage sampling and power supply: connected via terminals and cables • Power supply and communication: connected to Starline BUS via RJ12 interface • Modbus uplink: connection via terminals and cables |

8.2 Mechanical Characteristics

| Characteristics | Value |
|---------------------|---|
| IP protection grade | IP40 |
| Shell type | DIN rail or backplane mounting |
| Shell material | High strength and high temperature resistant engineering plastics |
| Installation mode | Suitable for DIN rail or backplane installation, easy to integrate into distribution cabinet or control cabinet |

| | |
|--------------------------|---|
| Dimensions | 27mm (width) * 68.3mm (depth) * 88.9mm (height), suitable for compact installation |
| Weight | About 150g (depending on the model) |
| Module power consumption | ≤ 0.1 VA |
| Vibration tolerance | Able to withstand up to 2g vibration, suitable for industrial environments with high vibration |
| Protective design | Dustproof and waterproof design (suitable for harsh industrial environments), in line with IP40 standards |

8.3 Environmental Characteristics

| Characteristics | Value |
|---|---|
| Operating temperature | -15 ~ 55 °C |
| Storage temperature | -25 ~ 70 °C |
| Relative humidity | 5 ... 95% non-condensing |
| Altitude | Below 2000 meters above sea level |
| Anti-interference ability | High |
| Shockproof | Able to withstand normal shock and vibration, adapt to the special requirements of industrial environment |
| Anti-electromagnetic interference (EMI) | Comply with CE standards and have good anti-electromagnetic interference ability |

8.4 Modbus Communication

| Characteristics | Valid Value | Default Value | Description |
|-----------------|----------------|---------------|-----------------------------|
| Baud rate | 19200 | 19200 | The default value is 19200. |
| Data bit | 8 | 8 | |
| Check bit | No check, odd, | No check | |

| | | | |
|-----------------------------------|--------------------------|---------------------|---|
| | even | | |
| Stop bit | 1 | 1 | |
| Address | 1 – 247 | 128 | The device address assignment range: 1 ~ 247. Supports multi-device management, and the address of each device is assigned within this range, with the default address being 128. |
| Communication protocol | Modbus RTU, Starline Bus | Modbus RTU | Supports standard Modbus RTU protocol and Starline Bus protocol, compatible with different systems and devices. |
| Maximum communication distance | 1200m (RS485) | 1200m (RS485) | Through the RS485 interface, the communication distance can reach up to 1200 meters, which is suitable for remote monitoring and multi-device networking. |
| Communication interface type | RJ12 (Starline Bus) | RJ12 (Starline Bus) | Use standard RJ12 interface for data communication, easy to plug and unplug, and ensure the stability of the connection. |
| Connection mode | Serial connection | Serial connection | The serial connection mode is adopted to reduce the complexity of the line and is suitable for the access of most industrial field devices. |
| Anti-electromagnetic interference | High | High | The device is designed with strong anti-electromagnetic interference capability to ensure stable operation in places with complex electrical environments. |