TOPBAND 拓邦

TOPBAND

MG500-C Microgrid controller

Product Specification

Revision record：

Version	Modification Content	Modification Date	Personnel
V1.0	First draft	2025/09/25	
V1.1	Updated the description for the network port	2025/11/11	

Contents

1. Overview

The MG Series Microgrid Controller is a high-performance communication and control device specially designed for new energy systems. It can be used as a microgrid controller, EMS controller, virtual power plant control node, communication manager, protocol converter, and energy storage controller. Together with the EMS cloud platform, APP terminal, and other microgrid controllers, it forms a cloud-edge-terminal integrated IEMS intelligent energy management system.

The MG Series supports the access of devices such as BMS, PCS, EMS controllers, photovoltaic systems, energy storage systems, air conditioners, charging piles, meters, HVAC, and lighting. It is compatible with communication protocols including IEC61850, IEC104, Modbus, TCP/IP, DL/T645, MQTT, and HTTP. Equipped with optimal AI algorithm optimization, it supports new energy generation forecasting, demand response, charging pile forecasting and scheduling, building load forecasting and scheduling, and production load forecasting. It makes full use of renewable energy, coordinates the balance between power supply and demand in the system, and can achieve optimal economy and minimal carbon emissions for the microgrid system.

Figure 1 MG500-C Appearance Diagram

2. Typical Applications

- Industrial and commercial energy storage
- Wind-solar-storage power stations

- Microgrid systems
- Virtual Power Plant
- Edge intelligent gateways

3. Basic Characteristics

Table 1 Product Basic Characteristics Table

MG500		
Hardware Interface/Peripheral	Resources	Remark
System Resources		
CPU	4-Core Cortex®-A55	
NPU	1TOPS	
Main Frequency	2GHz	Maximum frequency
Memory	2GB/4GB LPDDR4	Memory can be optional 2GB or 4GB
Storage	32GB + 128G SSD	SSD solid-state drive is optional
Operating System	Linux	
Peripheral resources		
Power Supply	Two-way redundancy	DC 9~36V
Gigabit Ethernet	1 channel 10/100/1000Mbps	Optical port or electrical port optional
100Mbps Ethernet	4 channels 10/100Mbps	Same network segment Ethernet
RS485	8 channels	Isolated type
RS232	2 channels	Isolated type
CAN	2 channels	Isolated type
DI	4 channels	
DO	4 channels	
USB3.0	2 channels	
HDMI2.0	1 channel	
Wireless Communication	WiFi/BLE, 4G/5G	5G optional
Indicator Lights	30 pcs	
Environmental Parameters		

Operating Temperature	-25~55℃	
Operating Humidity	5%~95% (no condensation, no icing)	
Operating Altitude	Below 3000 meters	
Mechanical Characteristics		
Mechanical Dimensions	200x235x52 mm	
Protection Class	IP50	

4. Software Functions

Table 2 Software Function Strategy List

List of software functions			
Serial Number	Strategy Name	Strategy Explanation	Remark
1	Manual Strategy	Supports manual grid-connection and off-grid switching	Supported by PCS
2	Peak Shaving and Valley Filling	Users can configure electricity price templates according to local time-of-use electricity prices, set the charging and discharging power of PCS in different time periods to form peak shaving and valley filling strategy templates; provides functions to configure strategy templates by day or week. It adapts to the strategy operation mode in multi-region and multi-electricity price environments.	
3	Demand Control	When the photovoltaic system outputs at maximum capacity, if the load power still exceeds the set demand power, the energy storage system is controlled to output power to suppress the power exceeding the demand, so as to improve the economy of the system.	
4	Dynamic	A total meter is connected to the	

	Expansion	low-voltage side of the main incoming transformer to collect the transformer load rate in real time. When the transformer load rate reaches the limit value (configurable), protection is triggered, and the system performs actions such as reducing charging or discharging of the energy storage according to the configured parameters.	
5	Anti-reverse Current Control	A total meter is connected to the low-voltage side of the main incoming transformer to collect reverse power data in real time. When reverse power occurs and reaches the limit value (configurable), the system performs actions such as standby, reducing discharging, or charging of the energy storage according to the configured parameters. The anti-reverse current strategy of the system is realized by software protection. If faster and more reliable protection is required, a corresponding reverse power protection device should	
6	Ordered Charging	Charging is carried out within the transformer capacity. If the charging power is close to the transformer capacity limit, priority is given to controlling the maximum photovoltaic output or energy storage discharge. If it is still not satisfied, derated operation is adopted. For the removal of charging piles, ordered charging is carried out in the way of first charged first cut off.	
7	Fluctuation Suppression	Controls charging and discharging according to the change of load power. For example, if the power change rate is greater than a set value, discharging is performed, which is mainly used to reduce the impact	

		on the power grid.	
8	Power Factor Regulation Control	Track the gateway power factor and control the energy storage PCS to continuously adjust reactive power output.。	
9	Photovoltaic Absorption (Self-consumption with No Surplus Power Feeding into Grid):	When the photovoltaic power generation exceeds the load power, if the energy storage is not fully charged, the surplus power will be charged into the energy storage system; if the energy storage is fully charged (which would otherwise cause power to be fed into the main grid), the photovoltaic output will be limited to balance with the real-time load power, so as to prevent surplus power from feeding into the grid.	
10	Backup Power Mode	When the grid is detected to be energized, charge to the set SOC (configurable) at the maximum supported charging power, then the energy storage enters standby mode; when the SOC drops below the minimum backup power SOC (configurable)due to standby loss, continue charging to the set SOC (configurable), then enter backup power standby mode. Start off-grid operation when grid power failure is detected.	
11	Energy Storage-Diesel Generator Coordination	When the grid is powered off, the energy storage grid-forming system gives priority to output; when the energy storage SOC is lower than the set minimum SOC, the energy storage enters standby mode, and the diesel generator grid-forming system is started to output.	
12	Data External Communication	Support external protocols (Modbus-RTU/Modbus-TCP);enable read-write functions and support external control.	
13	Multi-Unit	Support parallel operation of multiple	

	Parallel Operation	cabinet controllers, with the station control system uniformly issuing charging and discharging power, grid-connected and off-grid switching and other functions; if one of the cabinet controllers fails and shuts down, reallocate the output power of other cabinet controllers.	
14	Data Acquisition	Support protocols such as Modbus RTU, Modbus TCP, DLT645, IEC61850, IEC104, CAN2.0, etc.	
15	Data Upload to Cloud	Upload all data of connected devices to the cloud platform via MQTT protocol (device data of cabinet controllers is directly uploaded by the cabinet controllers); support the platform to issue control strategies; support customized connection to third-party platforms.	
16	Local Data Monitoring	Equipped with a screen, enabling local viewing of real-time status of all connected devices; support log query; support local data storage; support local issuance of strategies; support customized language display.	
17	Remote Upgrade	Support remote upgrade of station control EMS equipment.	

5. Operating Conditions

Table 3 Operating Environment Parameter Table

Environmental Conditions		
Operating Temperature	-25~55℃	
Operating Humidity	5%~95(no condensation, no icing)	
Operating Altitude	Below 3000 meters	

Table 4 Operating Power Parameter Table

Power Supply and Power Consumption

Operating Voltage	DC 9~36V ±10%	
Rated Power	<30W	CPU and peripherals at full load

Note: The MG500 has 2-channel redundant power interfaces, which can work with any one power supply connected. When two redundant power supplies are connected at the same time, they can switch seamlessly, and any power supply failure will not affect the use.

6. Interface Parameters

6.1. Front Panel Introduction

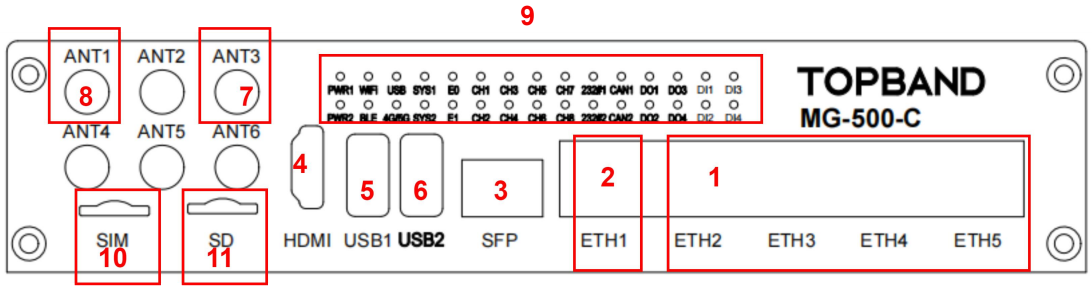


Figure 2 Front Panel Schematic Diagram

Table 5 Front Panel Function List

Serial Number	Interface	Description	Remarks
1	10/100Mbps Ethernet electrical port in the same network segment		
2	10/100/1000Mbps Ethernet electrical port		Only one of the electrical port and optical port can be used at the same time
3	10/100/1000Mbps Ethernet optical port		

4	HDMI2.0 interface		
5	USB3.0 HOST interface		
6	USB3.0 OTG interface		
7	WiFi/BLE antenna interface		ANT3
8	4G antenna interface		ANT1
9	Indicator light group		
10	SIM card interface		microSIM
11	SD card interface		

6.2. Rear Panel Introduction

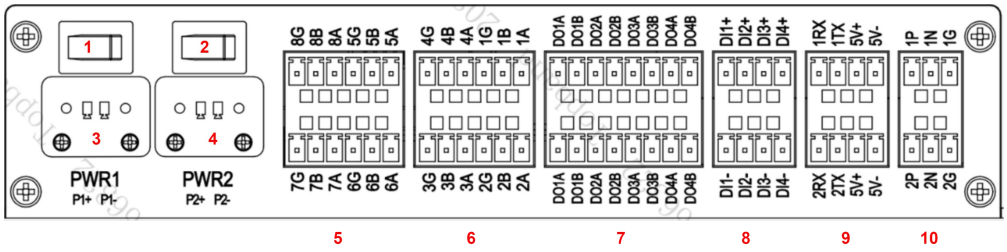


Figure 3 Rear Panel Schematic Diagram

Table 6 Rear Panel Function List

Serial Number	Interface	Description	Remarks
1	Power 1 switch		
2	Power 2 switch		
3	Power 1 input terminal	Redundant power interface	
4	Power 2 input terminal	Redundant power interface	
5	RS485 interface terminal	RS485 interface	
6	RS485 interface terminal	RS485 interface	
7	DO interface terminal	Normally open relay contacts	
8	DI interface terminal	Optocoupler input	
9	RS232 interface terminal	RS232 interface	
10	CAN interface terminal	CAN interface	

6.3. Power Input

The MG500 has 2-channel redundant power interfaces, which can work with any one power supply connected. When two redundant power supplies are connected at the same time, they can switch seamlessly, and any power supply failure will not affect the use. The rated input voltage is DC 9~36V ±10%, and the rated maximum power is 30W (CPU and all peripherals at full load).

Table 7 Power Input Terminal Definition Description

Silk Screen	Interface	Description	Remarks
P1+	Power 1 positive	Redundant power channel 1+	
P1-	Power 1 negative	Redundant power channel 1-	
P2+	Power 2 positive	Redundant power channel 2+	
P2-	Power 2 negative	Redundant power channel 2-	

6.4. RS485 Interface

The device is equipped with 8 isolated RS485 interfaces, supporting a communication baud rate of 2400~115200 bps.

Table 8 RS485 Interface Terminal Definition Description

Silk Screen	Interface	Description	Remarks
1A	RS485 Channel 1	RS485 signal A	
1B		RS485 signal B	
1G		RS485 signal ground	
2A	RS485 Channel 2	RS485 signal A	
2B		RS485 signal B	
2G		RS485 signal ground	
3A	RS485 Channel 3	RS485 signal A	
3B		RS485 signal B	
3G		RS485 signal ground	
4A	RS485 Channel 4	RS485 signal A	
4B		RS485 signal B	
4G		RS485 signal ground	
5A	RS485 Channel 5	RS485 signal A	
5B		RS485 signal B	
5G		RS485 signal ground	
6A	RS485 Channel 6	RS485 signal A	
6B		RS485 signal B	
6G		RS485 signal ground	
7A	RS485 Channel 7	RS485 signal A	
7B		RS485 signal B	
7G		RS485 signal ground	
8A	RS485 Channel 8	RS485 signal A	
8B		RS485 signal B	
8G		RS485 signal ground	

6.5. Wireless Communication

The MG500 has a built-in 4G/5G communication module, supporting optional 4G CAT1, 4G CAT4, and 5G communication modules, with a built-in SIM card and optional data plans.

The MG500 supports 802.11b/g/n and Bluetooth 5.2 communication.

Table 9 Wireless Communication Antenna Terminal Definition Description

Silk Screen	Interface	Description	Remarks
4G	4G communication antenna interface	SMA male thread with inner hole	
WIFI/BLT	WIFI,Bluetooth communication antenna interface	SMA male thread with inner hole	

6.6. Ethernet Interface

The MG500 is equipped with 4 10/100Mbps adaptive Ethernet ports. When the IP addresses of external devices connected to ETH1, ETH2, ETH3, and ETH4 are in the same network segment as that of the MG500 host, they can communicate with each other.

The 10/100/1000Mbps adaptive Ethernet port of MG500B shares an IP address with the SFP optical module interface, and only one of the electrical port and optical module can be inserted at a time. If both the electrical port and optical module are inserted, the electrical port has priority.

Note: The device is not equipped with an optical module as standard. To use the optical port, an optical module and optical fiber accessories need to be purchased separately. The device supports a maximum of 1.25G optical modules.

Table 10 Ethernet Interface Definition Description

Silk Screen	Interface	Description	Remark
ETH1	10/100Mbps Ethernet interface in the same network segment		
ETH2			
ETH3			
ETH4			
ETH5	10/100/1000Mbps Ethernet interface		
SFP	1.25G optical module interface		

6.7. DO Interface

The MG500 has 4 relay output channels. O+ and O- are the two ends of the normally open relay contacts; the maximum capacity of the relay contacts is 5A 250VAC or 5A 30VDC;

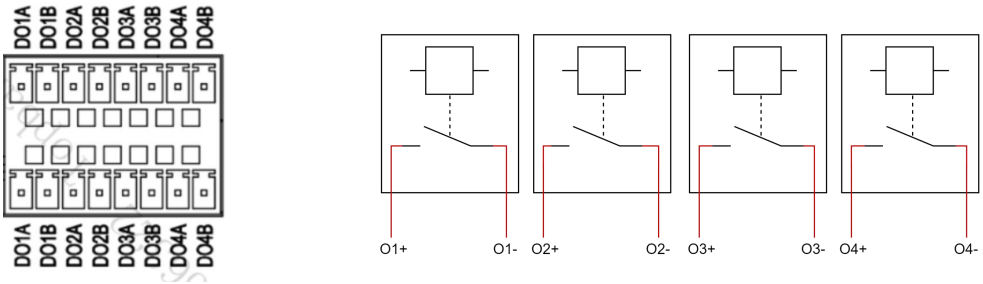


Figure 4 DO Interface Terminal Diagram and Internal Schematic Diagram

Note:

1. The upper and lower rows of DO1A are internally connected.

2. The descriptions of the relay contacts such as +, -, A, and B are only for contact description, and the contacts themselves have no polarity.

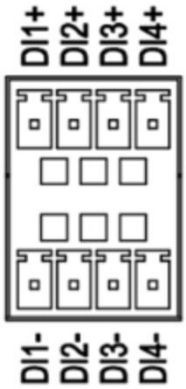
Table 11 DO Interface Terminal Definition Description

Silk Screen	Interface	Description	Remark
DO1A	DO1	DO1 normally open relay contact A	
DO1B		DO1 normally open relay contact B	
DO2A	DO2	DO2 normally open relay contact A	
DO2B		DO2 normally open relay contact B	
DO3A	DO3	DO3 normally open relay contact A	
DO3B		DO3 normally open relay contact B	
DO4A	DO4	DO4 normally open relay contact A	
DO4B		DO4 normally open relay contact B	

6.8. DI Interface

The MG500 has 4 optocoupler inputs; I+ is the input positive pole, and I- is the input negative pole;

The input voltage is DC12V~24V;



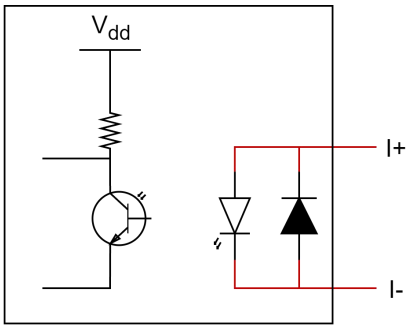


Figure 5 DI Interface Terminal Definition and Internal Schematic Diagram

Table 12 DI Interface Terminal Definition Description

Silk Screen	Interface	Description	Remarks
DI1+	DI1	DI1 optocoupler +	
DI1-		DI1 optocoupler -	
DI2+	DI2	DI2 optocoupler +	
DI2-		DI2 optocoupler -	
DI3+	DI3	DI3 optocoupler +	
DI3-		DI3 optocoupler -	
DI4+	DI4	DI4 optocoupler +	
DI4-		DI4 optocoupler -	

Note: The optocoupler input does not support reverse connection. Do not reverse the input interface of the optocoupler. Long-term reverse connection or exceeding the rated input voltage may cause damage to the device!

6.9. RS232 Interface

The MG500 has 2 RS232 interfaces; TX is the data transmitting end of the device, RX is the data receiving end of the device, 5V+ is the isolated power output, and 5V- is the RS232 communication ground;

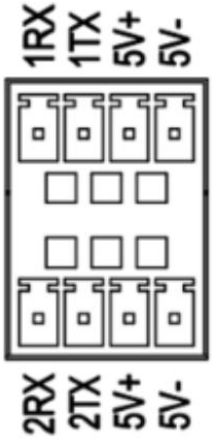


Figure 6 RS232 Terminal Schematic Diagram

Table 13 RS232 Terminal Definition Description

Silk Screen	Interface	Description	Remarks
1RX	RS232 Interface 1	RS232 Interface 1 receiving	
1TX		RS232 Interface 1 transmitting	
5V+		RS232 interface 5V power +	
5V-		RS232 interface 5V power -	RS232 reference ground
2RX	RS232 Interface 2	RS232 Interface 2 receiving	
2TX		RS232 Interface 2 transmitting	
5V+		RS232 interface 5V power +	
5V-		RS232 interface 5V power -	RS232 reference ground

Note:

1. The 5V power supply is only for the RS232's own communication, with a maximum external current <100mA; otherwise, it may cause abnormal RS232 communication.

2. RS232 is non-differential communication, and the communicating devices need a common ground.

6.10. CAN Interface

The MG500 supports 2 independent isolated CAN communications, with a maximum communication baud rate of 1Mbps.

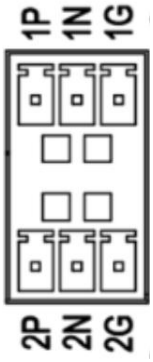


Figure 7 CAN Interface Terminal Schematic Diagram

Table 14 CAN Interface Terminal Definition Description

Silk Screen	Interface	Description	Remarks
1P	CAN1	CAN1 signal P	
1N		CAN1 signal N	
1G		CAN1 signal reference ground	
2P	CAN2	CAN2 signal P	
2N		CAN2 signal N	
2G		CAN2 signal reference ground	

Note: 1G and 2G are internally connected.Note: 1G and 2G are internally connected.。

6.11.USB3.0 Interface

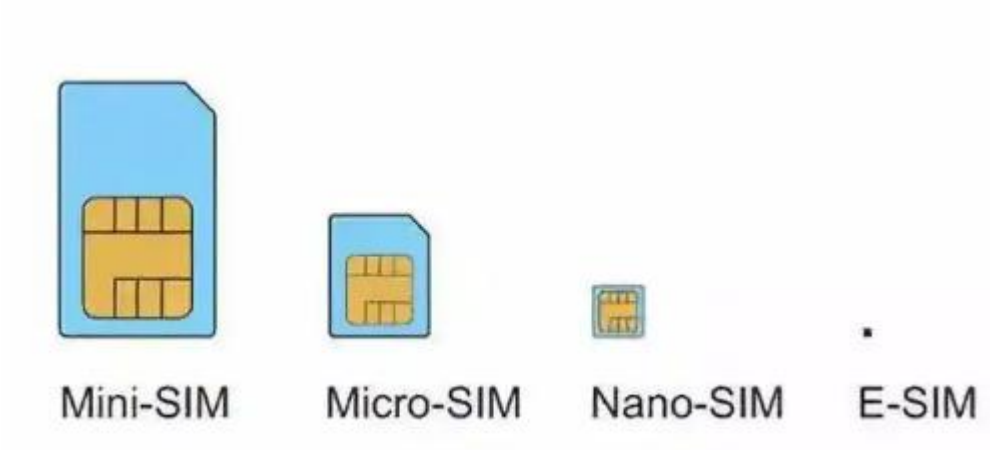
The MG500 has 2 USB3.0 interfaces, among which USB1 is a HOST interface and USB2 is an OTG interface.

6.12.HDMI Interface

The HDMI of MG500 is compatible with HDMI1.4 and HDMI2.0.
It supports a maximum of 10bits color depth;
It supports a maximum display output of 1080p@120Hz and 4096x2304@60Hz;
It supports RGB/YUV (10bit) format;
It supports HDCP1.4/2.2;

6.13.SIM Card Interface

MG500-C is designed with an external SIM card and has no built-in SIM card. The external SIM card supports the microSIM card standard.



6.14.SD Card Interface

MG500-C is equipped with an external SD card interface, supporting the specification of Micro SD Card (also known as Trans-flash Card).

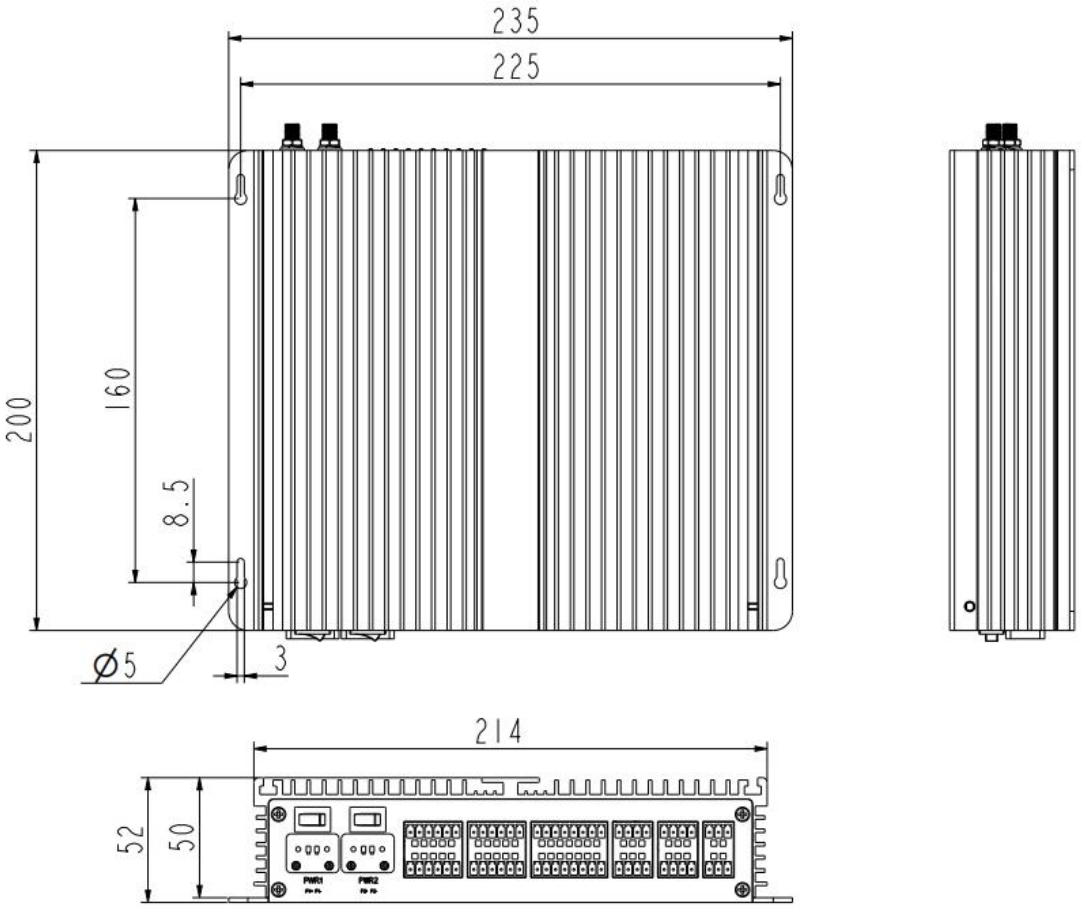
6.15 .Safety Grounding

The MG500-C is provided with 2 chassis grounding holes on the side of its enclosure. During operation, the metal enclosure of the MG500 must be grounded; otherwise, it may lead to performance degradation or personal injury.

7. Electromagnetic Compatibility

Test Item	Test Standard	Test Interface	Test Level	Remarks
Electrical Fast Transient/Burst Immunity	IEC 61000-4-4	Power interface RS485 interface RS232 interface CAN interface DI, DO interfaces Ethernet interface	Level 4	
Electrostatic Discharge Immunity Test	IEC 61000-4-2	Power interface RS485 interface RS232 interface CAN interface DI, DO interfaces Ethernet interface HDMI interface USB interface Indicator lights Antenna interface	Level 4	
Surge (Impact) Immunity Test	IEC 61000-4-5	Power interface	Level 4	
Radio Frequency Electromagnetic Field Radiation Immunity	IEC 61000-4-3	Power interface RS485 interface RS232 interface CAN interface Ethernet interface	Level 3 (10V/m)	
Conducted Disturbance Immunity Induced by Radio Frequency Field	IEC 61000-4-6	Power interface RS485 interface RS232 interface CAN interface	Level 3 (10V/m)	

8. Mechanical Dimensions



9. Packing List

Serial Number	Name	Model	Quantity	Description
1	MG500 Main Unit	MG500	1	
2	Terminal Block	3.81-2P- with screws	2	Power terminal
3	Terminal Block	3.81-6P	4	RS485 terminal
4	Terminal	3.81-8P	1	DO terminal

	Block			
5	Terminal Block	3.81-4P	4	RS232 terminal, DI terminal
6	Terminal Block	3.81-3P	2	CAN terminal
7	Metric Screw	M4*8, Phillips pan head with flat washer	6	Mounting screws, grounding screws

10.Compatibility

The low-speed interfaces of MG500-C are consistent with those of MG500-B. It has newly added an SD card interface and an external SIM card interface; other features remain unchanged. The position of the high-speed interface has been modified, and the hardware can be directly replaced.

11.Declaration

Shenzhen Topband Co., Ltd. (hereinafter referred to as "Topband") strives to provide accurate and reliable product information. However, due to the timeliness of the content in this manual, Topband cannot fully guarantee the timeliness and

applicability of this document at any time. Topband reserves the right to update the content of this manual without prior notice. For the latest version of the information, please contact Topband staff. Thank you for your understanding and support!

Shenzhen Topband Co., Ltd.
Topband Industrial Park, Shiyan Street, Bao'an District, Shenzhen, China
Stock Code: 002139.SZ
Tel: 0755-2765 1888