



ROBSTRIDE POWERBOARD

Power supply board

User Manual

RobStride Dynamics

<https://www.robstride.com/>

Power Supply Board User Manual V1.3

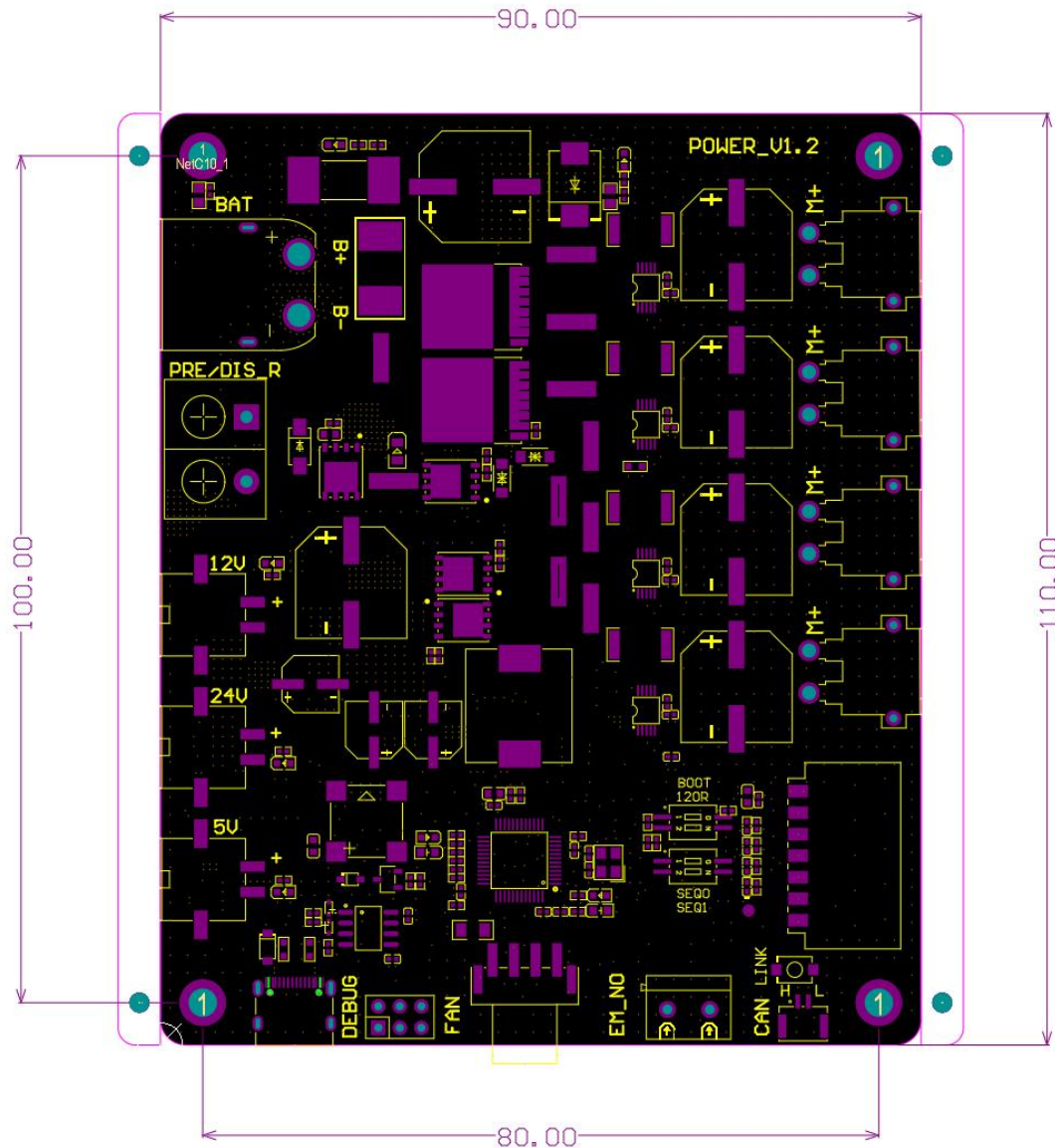
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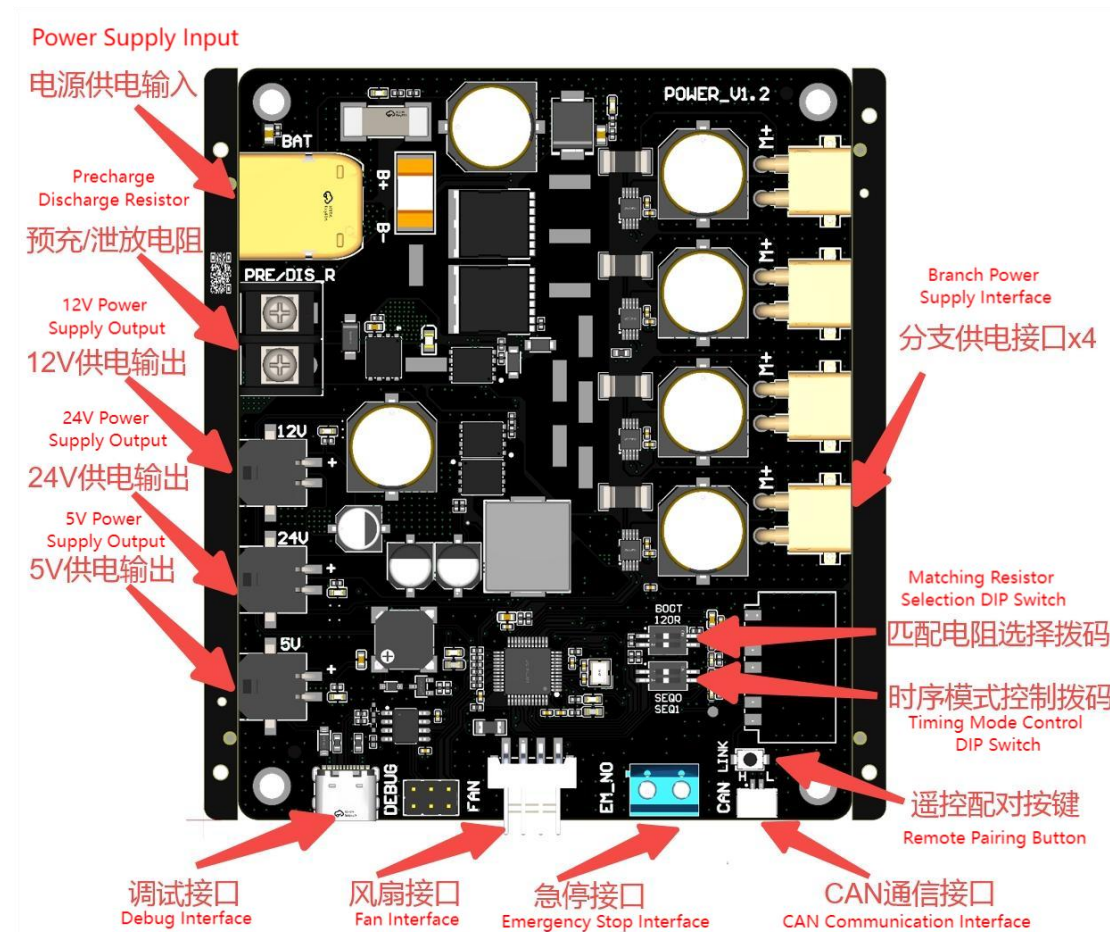
Power supply board specifications and parameters:

一、 Outline and Mounting Dimensions



The external dimensions and mounting dimensions are shown in the image above. It is installed using four M3 screws, and the maximum height is 16.5mm. For detailed structural dimensions, please refer to the 3D files on the official website.

二、 Interface Definition:



三、 Electrical Characteristics:

1. Insulation Withstand Voltage: The module's insulation withstand voltage to the mounting holes is greater than 500V.
2. Input Voltage Range: 20V~65V (Note: The 24V power supply interface will be shut off when the input voltage is below 30V).
3. Over/Under Voltage Protection Points: Overvoltage 65V, Undervoltage 20V.
4. Branch Circuit Current Rating: Rated 20A, Peak 40A.
5. Total Branch Circuit Overcurrent Protection Point: 80A/30ms software overcurrent, 100A/1ms hardware overcurrent.
6. Total Branch Circuit Short-Circuit Protection Point: 150A/1.2us (Additionally equipped with a one-time fuse A²S=5270).
7. 24V Power Supply Interface: Rated 4A, Current Limit 6A, with short-circuit protection function (Ta=25°C).
8. 12V Power Supply Interface: Rated 2A, Current Limit 3A, with short-circuit protection

function ($T_a=25^{\circ}\text{C}$).

9. **5V Power Supply Interface:** Rated 2A, Current Limit 3A, with short-circuit protection function ($T_a=25^{\circ}\text{C}$).

10. **Sampling Accuracy:** Voltage sampling accuracy for each channel $\pm 1\%$, total current sampling accuracy $\pm 2\%$, branch current sampling accuracy $\pm 1\%$.

11. **Pre-charge Resistor:** Recommended resistance range $3\sim 10\Omega/50\text{W}+$ (The pre-charge resistor also acts as a discharge resistor; the resistor power needs to be increased appropriately depending on the discharge requirements).

12. **Emergency Stop Logic:** Default connection is normally open (Emergency stop function only applies to individual branch power supplies).

13. **Overtemperature Protection Point:** 100°C .

四、 Power On/Off Sequence Control:

After the power board is powered on, the 5V output and the internal 3.3V are powered on by default. The MCU determines the power-on sequence mode based on the status of the DIP switches **MODE0** and **MODE1**.

- **Mode 1:** When **MODE** is in the 00 state, the power board uses the default power-on/off sequence. Power-on: 24V, 12V, and 5V are powered on simultaneously, and the motor power is supplied after 1 second. After power-on, the power-on/off status of each power supply can be controlled via communication commands or a remote control.
- **Mode 2:** When **MODE** is in the 11 state, it is not powered on by default. Power-on is controlled by the remote control or communication commands. Button A controls the power supply to the four motor branches, button B controls the 24V power supply, button C controls the 12V power supply, and double-clicking button D powers off all power supplies. The power-off sequence is: motor branch power supply, 12V power supply, and 24V power supply are powered off in that order.

五、 Protection Function

Emergency Stop: When a branch circuit load is abnormal, the user can immediately press the emergency stop button. The branch circuit power supply will be cut off in approximately 5us. The emergency stop state is considered an unrecoverable fault and requires releasing the emergency stop and then reapplying power to restore the power supply.

Over/Under Voltage: A power supply input interface voltage less than 20V is considered an undervoltage state, and a voltage exceeding 65V is considered an overvoltage.

Undervoltage is a recoverable fault, while overvoltage is an unrecoverable fault.

Overcurrent/Short Circuit: Overcurrent and short-circuit faults in each branch circuit are

unrecoverable faults and require reapplying power to restore the power supply. Overcurrent and short-circuit faults in the 24V, 12V, and 5V circuits are recoverable faults.

Discharge: The default discharge enable voltage is 64V, and the discharge disable voltage is 60V. The user can input the maximum power supply voltage via CAN communication commands. Discharge enable voltage = maximum voltage + 6V; discharge disable voltage = maximum voltage + 2V.

Error Reporting: If an error occurs, the power board needs to be restarted.

Remote control buttons and command control are disabled and will not function.

Sound Effects:

1. Error
2. Overcurrent Error
3. Are you ready? (Initialization complete startup sound effect)

六、 Fan Interface

The power supply board fan connector pinout is shown in the image on the right. The fan is powered by 12V, and the connector model is X2510WRS-04-9TSN. In subsequent versions (V1.3) of the power supply board, the fan connector model will be changed to a standard PC motherboard fan connector, compatible with standard PC cooling fans.

七、 Communication Protocol

1. CAN Communication Configuration

波特率(Baud rate)	1Mbps (默认) (1 Mbps (default))
帧类型(Frame type)	数据帧(Data frame)
总线协议(Bus protocol)	CAN2.0
ID	29 位 id(29-bit ID)
数据包大小(Packet size)	8Bytes

2. COM Communication Configuration

波特率(Baud rate)	921600 bit/s (默认) (default)
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帧类型(Frame type)	数据帧(Data frame)
总线协议(Bus protocol)	USB2.0
数据包大小(Packet size)	8Bytes

The data transmitted through the COM port is based on the CAN communication protocol standard. The main difference lies in the addition of frame header and trailer identifiers to the CAN data frame (specifically, "AT" as the frame header and "0D0A" as the frame trailer). The following analysis will use the format and content of the CAN data frame as a reference.

一、CAN Communication Data Format

Data Field	29-bit ID			8-Byte Data Area
Size	bit0~7	bit8~23	Bit24~bit28	Byte0~Byte7
Description	Target Address	Data Area 2	Communication Type	Data Area 1
Explanation	POWER_ID	2 bytes	00	Main data area, 8 bytes

二、Communication Type Description

1.CAN Communication Type 01: (Control and Query Frame)

Data Field	29-bit ID			8-Byte Data Area
Size	bit0~7	bit8~23	Bit24~bit28	Byte0~Byte7
Description	Target Address	Data Area 2	Communication Type	Data Area 1
Explanation	POWER_ID		01	Byte0: A1 (Enable) A0 (Disable) 12V Byte1: A1 (Enable) A0 (Disable) VMBUS Byte2: A1 (Enable) A0 (Disable) 24V Byte3: A1 (Enable) Restart Byte4: A1 (Enable) A0 (Disable) Clear Faults

应答帧：见通信类型 3

2.CAN Communication Type 02: (Query Frame)

Data Field	29-bit ID			8-Byte Data Area
Size	bit0~7	bit8~23	Bit24~bit28	Byte0~Byte7
Description	Target Address	Data Area 2	Communication Type	Data Area 1
Explanation	POWER_ID		02	Byte0: CA (Response frame: see communication type 4) 00 (Response frame: see communication type 3)

应答帧：见通信类型 3 和 4

3.CAN Communication Type 03 and 04: (Status Frame)Feedback from the power board, transmitted upon receiving a Query Frame or Control Frame.

Data Field	29-bit ID			8-Byte Data Area
Size	bit0~15	Bit16~23	Bit24~bit28	Byte0~Byte7
Description	Target Address	Data Area 2	Communication Type	Data Area 1
Explanation	Bits 16-23: Current sampling 0~65535: 0~655.35A	POWER_ID	03	Byte0-Byte1: Battery voltage 0~65535: 0~655.35V Byte2-Byte3: Motor voltage0~65535 : 0~655.35V

				Byte 4: Power board temperature 0-255: 0~255°C Bytes5-7:Fault status information (1=Fault,0= Normal) Bit0:Powerchip overcurrent Bit1:Powerchip overtemperature Bit2: Power board overtemperature (100°C) Bit3:Sampling overcurrent Bit4:Sampled VBUS voltage overvoltage Bit5:Sampled VBUS voltage undervoltage Bit6:Sampled VMBUSvoltage overvoltage Bit7:Sampled VMBUSvoltage undervoltage Bit8: Sampled 24V voltage overvoltage Bit 9: Sampled 24V voltage undervoltage Bit 10: Sampled 12V voltage overvoltage Bit 11: Sampled 12V voltage undervoltage Bit12:Output branch
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				sampling overcurrent Bit13:INA238 fault frame Bit14:Softstart abnormalfault frame Bit 20: 0=Off, 1=On (12V) Bit 21: 0=Off, 1=On (Soft Start) Bit 22: 0=Off, 1=On (VMBUS) Bit 23: 0=Off, 1=On (24V)
Explanation		POWER_ID	04	Byte0-Byte1: AL Current 0~65536: 0~655.36A Byte2-Byte3: AR Current 0~65536: 0~655.36A Byte4-Byte5: LL Current 0~65536: 0~655.36A Byte6-Byte7: LR Current 0~65536: 0~655.36A

4.CAN Communication Type 05: (Version Query Frame)

Data Field	29-bit ID			8-Byte Data Area
Size	bit0~7	bit8~23	Bit24~bit28	Byte0~Byte7
Description	Target Address	Data Area 2	Communication Type	Data Area 1
Explanation	POWER_ID		05	0

Response Frame

Data Field	29-bit ID			8-Byte Data Area
Size	bit0~15	Bit16~23	Bit24~bit28	Byte0~Byte7
Description	Target Address	Data Area 2	Communication Type	Data Area 1
Explanation		POWER_ID	05	Version number, e.g., PBV1.00 (ASCII)

5.CAN Communication Type 06: (Auto-Report Frame)

Data Field	29-bit ID			8-Byte Data Area
Size	bit0~7	bit8~23	Bit24~bit28	Byte0~Byte7
Description	Target Address	Data Area 2	Communication Type	Data Area 1
Explanation	POWER_ID		06	Byte[0]: 01 - On 00- Off

Response frame: See communication type 3

6.CAN Communication Type 07: (Parameter Read Frame)

Data Field	29-bit ID			8-Byte Data Area
Size	bit0~7	bit8~23	Bit24~bit28	Byte0~Byte7
Description	Target Address	Data Area 2	Communication Type	Data Area 1
Explanation	POWER_ID		07	Byte[0]-Byte[1]: index (See parameter table) Low byte first, high byte last

Response frame:

Data Field	29-bit ID			8-Byte Data Area
Size	bit0~15	Bit16~23	Bit24~bit28	Byte0~Byte7
Description	Target Address	Data Area 2	Communication Type	Data Area 1
Explanation		POWER_ID	07	Byte[0]-Byte[1]: index Byte[4]-Byte[7]: data Low byte first, high byte last

7.CAN Communication Type 08: (Parameter Modification Frame)

Data Field	29-bit ID			8-Byte Data Area
Size	bit0~7	bit8~23	Bit24~bit28	Byte0~Byte7
Description	Target Address	Data Area 2	Communication Type	Data Area 1
Explanation	POWER_ID		08	Byte[0]-Byte[1]: index (See parameter table) Byte[4]-Byte[7]: data Low byte first, high byte last

Response frame: See communication type 3

Read-Write Parameter Table:

参数 index	Parameter Name	Description	Type	Byte	MAX	MIN	Default Value	PermissionR/W
6001	Can_baud	CAN baud rate	uint8_t	4	4	1	1	W/R
6002	Com_baud	COM baud rate	uint8_t	4	4	1	1	W/R
6003	RDF	Restore default parameters	uint8_t	4	—	—	—	W
6004	remoteCtrl	Remote control	uint8_t	4	1	0	0	R/W
6005	fanspeedCtrl	Fan speed control	uint8_t	4	5	1	3	R/W
6006	POWER_ID	CAN ID	uint8_t	4	AA	0	AA	R/W
6007	soundEffect	Power-on sound effect	uint8_t	4	1	0	0	R/W
8001	currocpt	Overcurrent threshold	float	4	80A	10A	80A	W/R
8003	sdT	Discharge voltage	float	4	58V	24V	58V	W/R
8004	arTime	Automatic reporting interval	float	4	2S	5ms	5ms	W/R

Note:

1. CAN baud rate (1: 1MBPS; 2: 500K; 3: 250K; 4: 125K)
2. COM baud rate (1: 921600; 2: 115200; 3: 19200; 4: 9600)
3. 6004: 1 disables the remote control function, 0 enables the remote control function (default is enabled, takes effect immediately).
4. Fan speed control (duty cycle: (1: 15%; 2: 25%; 3: 50%; 4: 75%; 5: 99%) takes effect immediately)
5. The discharge voltage needs to be written as the full charge voltage of the input device.

To restore default parameters, Bytes[2]-Bytes[7] of the data area must all be 0.

Precautions

- Please use the product according to the operating parameters specified in this document; otherwise, it may cause serious damage to the product!
- Before use, please check that all components are intact, the wiring is correct, and the voltage setting is correct.
- Do not switch modes while the module is powered on. If you need to switch modes, power off the module, switch modes, and then power it on again.
- Low resistance value of the discharge resistor
- **Advantages:** Effective discharge, can effectively suppress the rise in bus voltage caused by power feedback.
- **Disadvantages:** Due to the large discharge current, the discharge resistor has high power consumption and a large size. The switching on and off of the discharge module can cause some bus voltage fluctuations, especially in scenarios with long bus lines. The rapidly changing discharge current may induce voltage spikes on the bus, the magnitude of which depends on the discharge resistance and the length of the power supply line.
-
- **High discharge resistor value**
Advantages: Low discharge current, resulting in smaller power and size requirements for the discharge resistor; the bus voltage remains relatively stable during the discharge opening and closing processes.
Disadvantages: Relatively weaker clamping capability for the busbar power supply.
- **Discharge Voltage Adjustment:**
To adjust the power board's discharge activation and deactivation voltages, you need to input the system's maximum supply voltage range via communication commands. The power board will calculate the discharge activation and deactivation thresholds based on this voltage.
- **Pre-charge Resistor:**
The power board's power-on self-test will determine the pre-charge status. If a pre-charge resistor is not connected, the power board will not power on. The pre-charge resistor also acts as a discharge resistor, and its power rating should be selected appropriately based on the load capacitance and power supply conditions.
- **24V Power Supply**
The 24V power supply circuit has a light-load low-power mode. When the load is less than 20mA, there may be slightly larger ripple, which is normal.
- **Heat Dissipation:**
- The rated current listed in the specifications is based on test data at TA=25°C. The actual

rated current depends on the operating conditions. If necessary, an external fan can be added to improve the power board's output capability.

Legal Notice

- Before using this product, please carefully read this manual and operate the product according to its instructions. The company will not be held liable for any property damage or personal injury resulting from the user's failure to follow the instructions in this manual. Because this product consists of numerous small parts, please keep it away from children to prevent accidents. To extend the product's lifespan, do not use this product in high-temperature or high-pressure environments. This manual has been compiled to include as much information as possible regarding the product's functions and usage instructions. However, due to continuous product improvements and design changes, there may still be discrepancies between this manual and the product you purchased.
- This manual may differ from the actual product in terms of color and appearance; please refer to the actual product.
- This manual is published by Beijing Lingzu Times Technology Co., Ltd. (hereinafter referred to as Lingzu). Lingzu may make necessary improvements and changes to any inaccurate or outdated information in this manual, or make improvements to the program and/or equipment at any time. Such changes will be uploaded as an electronic version of the manual to the company's official website; please check the download center section for details (www.robstride.com). All images are for functional illustration purposes only; please refer to the actual product.

After-Sales Service Policy

- This product's after-sales service strictly adheres to the "Consumer Rights Protection Law of the People's Republic of China" and the "Product Quality Law of the People's Republic of China." The service content is as follows:

1. Warranty period and coverage

- a. Customers who purchase this product through online channels can enjoy a 7-day no-reason return service starting from the day after receipt. When returning the product, the customer must provide valid proof of purchase and return the invoice. The customer must ensure that the returned product maintains its original quality and functionality, is in good condition, and that all trademarks and labels on the

product and its accessories are intact. Any gifts received must also be returned. Returns will not be processed if the product shows signs of man-made damage, unauthorized disassembly, missing packaging, or missing parts. The customer is responsible for the return shipping costs (see "After-Sales Service Fee Standards" for details). If the customer has not paid the shipping costs, the actual amount will be deducted from the refund. The refund will be issued within seven days of receiving the returned product. The refund method will be the same as the payment method. The actual arrival date may be affected by factors such as banks and payment institutions.

- b. The warranty period for this product is 1 year.
- c. Within 7 days from the day after the customer receives the product, if a non-man-made performance failure occurs, after testing and confirmation by the Lingzu After-Sales Service Center, a return will be processed. The customer must provide valid proof of purchase and return the invoice. Any gifts received must also be returned.
- d. From 7 days to 15 days after the customer receives the product, if a non-man-made performance failure occurs, after testing and confirmation by the Lingzu After-Sales Service Center, an exchange will be processed, replacing the entire product. After the exchange, the warranty period for the product will be recalculated.
- e. From 15 days to 365 days after the customer receives the product, if a product quality defect is confirmed by the Lingzu After-Sales Service Center, free repair services will be provided. The replaced defective product will become the property of Lingzu Company. Non-defective products will be returned as is. This product has undergone rigorous testing before leaving the factory. If the fault is not due to a product quality defect, we reserve the right to refuse the customer's return or exchange request.

2.The following situations are not covered under the warranty:

- a. The warranty period has expired as defined by the warranty terms.
- b. Product damage or malfunction caused by incorrect use not in accordance with the instruction manual.
- c. Damage or malfunction caused by improper operation, maintenance, installation, modification, testing, or other improper use.

- d. Normal mechanical wear and tear not caused by quality defects.
- e. Damage caused under abnormal operating conditions, including but not limited to drops, impacts, liquid immersion, and severe collisions.
- f. Damage caused by natural disasters (such as floods, fires, lightning strikes, earthquakes, etc.) or force majeure.
- g. Damage caused by use exceeding the specified parameters.
- h. Other malfunctions or damage not caused by product design, technology, manufacturing, or quality issues.

In the event of any of the above situations, the user will be responsible for the repair costs.