

SHIJIAZHUANG MAXWELL TECHNOLOGY CO., LTD

MXR100200B Charging Module

User's Manual

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Chapter 1 MXR100200B Charging Module Overview

MXR100200B is a low-voltage and high-current charging module with three industry-leading outstanding advantages: super wide constant power range, large output current and ultra-high full-load working temperature. At the same time, high reliability, high efficiency, high power factor, high power density, low standby power consumption are the main characteristics of this series of modules.

1.1 Specifications

Table1-1 charging module Parameters

Item	Specifications
Basic Specifications	
Dimensions	84mm(H)×218mm(W)×459mm(D)
Weight	≤12kg
Efficiency(full load)	>93.5%
Standby Power Consumption	8.5W±0.5W
Cooling Mode	Forced air cooling
Communications Bus Protocol	CAN bus
No. of Parallel Modules	≤60pcs
Indicator	Green: normal operation Yellow: alarm Red: fault
Input Characteristics	
Rated Input Voltage	480Vac±10%, three phase + protective earth
Input Voltage Range	190Vac~530Vac, three phase + protective earth
Input Current	<40A
Grid Frequency	45Hz~65Hz
Power Factor	≥0.99 (10KW≤Output power ≤20KW)
ITHD	≤5% (10KW≤Output power≤20KW)
Output Characteristic	
Voltage Range	20Vdc~120Vdc
Current Range	0A~200A (continuously adjustable)
Rated Current	200A
Steady voltage	≤±0.5% (60V-100V, 0~20MHz)
current precision	≤±1% (output current 20% rated current~100% rated current).
Current Sharing	≤±5%

Imbalance	
Ripple Voltage Peak Value Coefficient	≤1%
Environmental Specifications	
Operating Temperature	−40°C ~ +75°C, output derating at above 50°C
Storage Temperature	−40°C ~ +75°C
Relative Humidity	≤95%RH, non-condensing
Altitude	No derating below 2000m, When the altitude is above 2000 m, the operating temperature decreases by 1°C for each additional 100 m.
MTBF	>500,000 hours
Certification	
approval standards	UL1564
Others	
Startup Time	Output startup time 3~8s
Insulation Resistance	DC/AC to enclosure, DC to AC ≥10MΩ
Dielectric Strength	AC input connector to Enclosure, 3500Vdc voltage, 1min, no breakdown or flashover, steady state leakage current <10mA; AC input connector to DC output connector, 3500V DC voltage, 1min, no breakdown or flashover, steady state leakage current <10mA; DC output connector to Enclosure, 3500V DC voltage, 1min, no breakdown or flashover, steady state leakage current <10mA;
ROHS	R5

1.2 Function Details

1.2.1 Hot-plugging

Hot-plugging charging modules, easy installation and maintenance.

1.2.2 Current sharing

Auto current sharing between modules, current imbalance less than 5%.

1.2.3 AC input Power limiting

The relationship between output power and input voltage is shown in Chart 1-1. When input voltage is between 323Vac~530Vac, module can output maximum power.

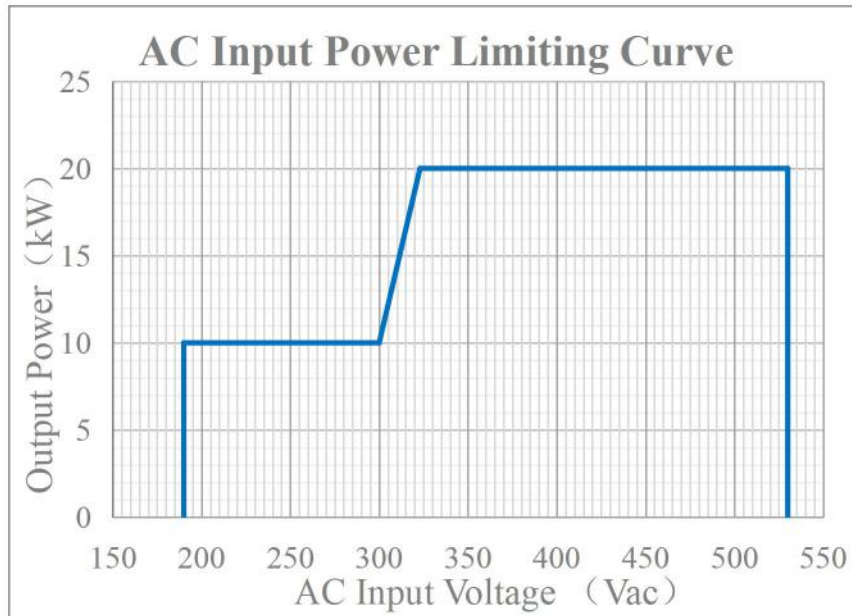


Chart 1-1 AC Input Power Limiting Curve

1.2.4 Output constant power control

MXR100200B is at rated input voltage, allowed output power is 20kw, relationship between output voltage and output current is shown in Chart 1-2.

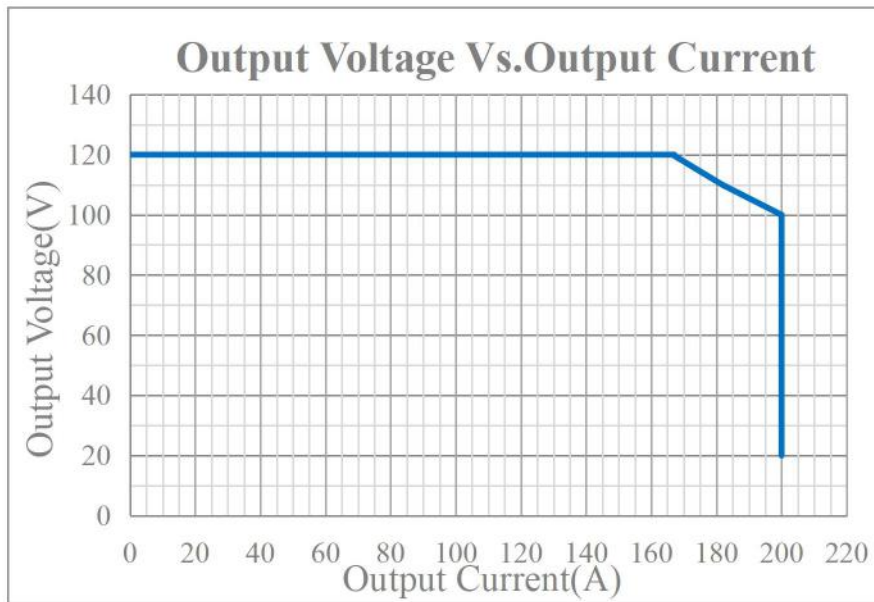


Chart 1-2 Output Voltage vs. Output Current

1.2.5 Temperature derating

This module provides full power output at ambient temperature below 50 °C;

This module is operated by derating at ambient temperature above 50 °C. It is a piecewise linear limit power;

The ambient temperature is 75°C and the output power of the module is 5kW;

The output power of this module reduces till 0 at ambient temperature of 75 °C.

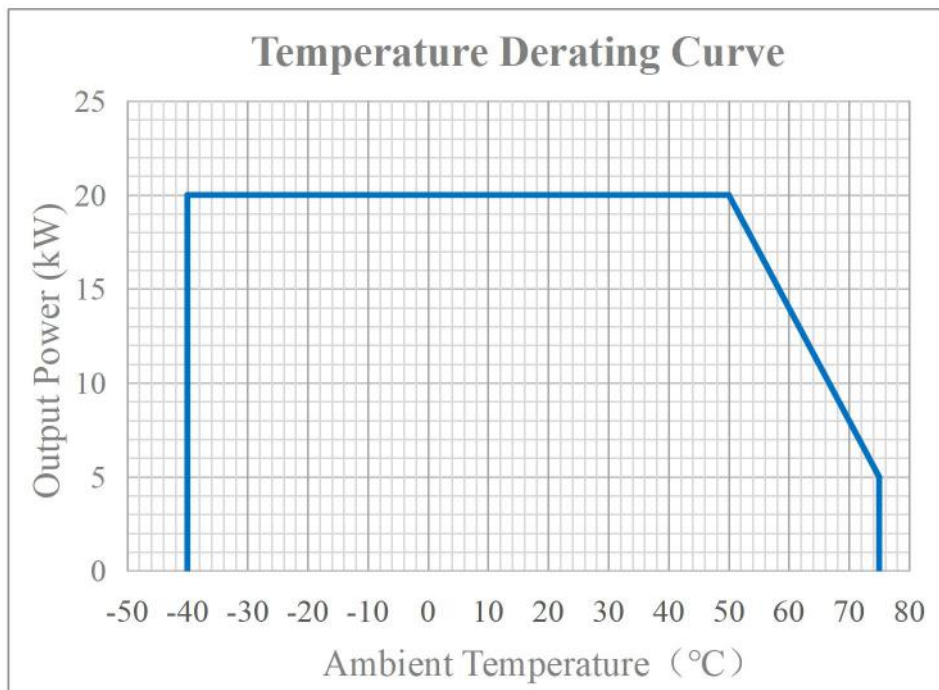


Chart 1-3 Temperature Derating Curve

1.2.6 Output current configuration

Through external monitor module, current of module can be configured continuously between 0A to 200A.

1.2.7 Output voltage adjustment

Through external monitor module, output voltage of modules can be adjusted continuously from 20Vdc to 100Vdc, minimum adjustable pace is 0.1Vdc.

1.2.8 Input over/under voltage protection

When input voltage is less than 185Vac or greater than 535Vac, protection alarm indicator goes on, the module will stop working, no output.

When overvoltage or undervoltage alarm occurs, module will report it to the monitor; LED digital tube shows fault code E03. After the fault is rectified, the system automatically restarts if you have controlled the startup.

1.2.9 Output overvoltage protection

The overvoltage protection point can be set by monitoring. The value ranges from 35Vdc to 115Vdc. The factory default value is 115Vdc. The red indicator on the rear panel of overvoltage protection is on, and the LED digital tube shows the fault code E06. The module automatically shuts down and restarts within 10s. When the overvoltage triggering times reach 4 times within 5 minutes, the module is locked.

The undervoltage protection point is 15V. After the undervoltage protection, the module will stop working and have no output. The yellow indicator on the panel is on, and the LED digital tube displays the fault code E01. Undervoltage protection The module restarts automatically after the power-off for 5 seconds.

1.2.10 Over temperature protection

When the ambient sampling temperature of the module is higher than 75 °C, the yellow indicator on the panel is on, and the module stops working and has no output. After the

overtemperature protection, the module will report the alarm information to the monitoring system, and the LED nixie tube displays the fault code E02. After the fault is rectified, the system will restart automatically if you have controlled the startup

1.2.11 Internal bus fault protection

When the module is short-circuited, the protection is shut down, the red indicator on the panel is on, and the LED digital tube shows the fault code E05, and the "module fault" is reported to the monitoring system. At the same time, the module is locked, and it is necessary to disconnect the module from the system or the monitoring system to send the short-circuit reset instruction to reset before starting up.

1.2.12 Short circuit protection

The module will shut down when a short circuit situation occurs, red indicator goes on and module will report "module failure" to the monitor. LED digital tube shows fault code E05

1.2.13 Background communication failure

If the communication of MXR100200B module is interrupted for more than 10s, the module will provide shutdown protection, have no voltage output, the yellow indicator on the panel will turn on. After the communication of the module is recovered, the yellow indicator on the panel off, and the module will be recovered to work in default state.

Chapter 2 Structure and Installation

2.1 Structure

2.1.1 Front Panel

Indicators, LED digital tubes and buttons on the front panel of the charging module are shown in Figure 2-1 and 2-2.



Figure 2-1 Front Panel

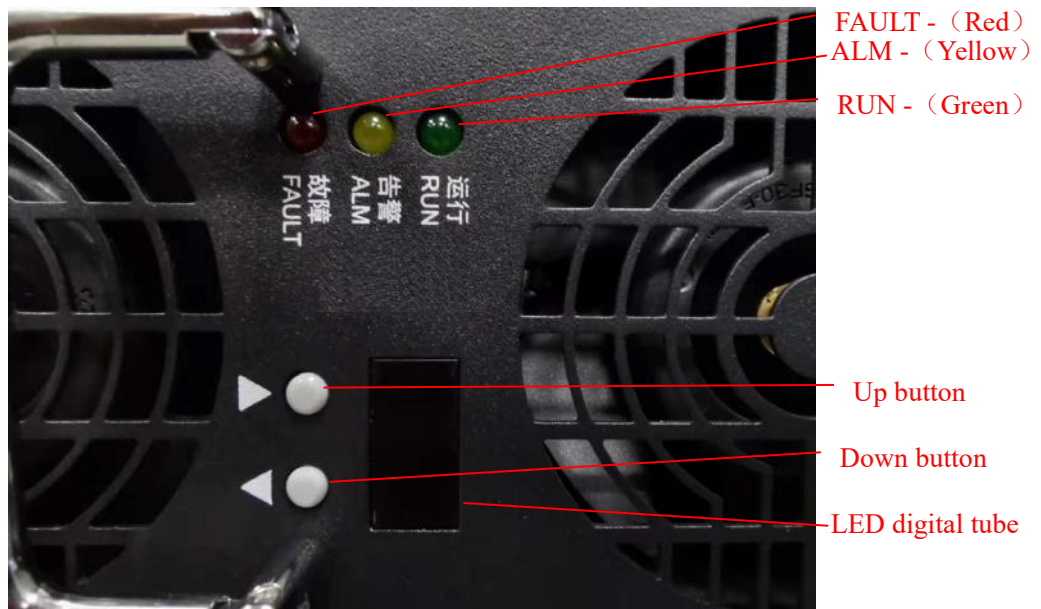


Figure 2-2 Front Panel Information

Front panel has three indicators, Indicator descriptions see Table 2-1.

Table 2-1 Indicator Descriptions

Indicator	Normal State	Abnormal State	Description
Run (green)	Steady On	Off	Charger has no input power
ALM(yellow)	Off	Steady on	AC input fault, over temperature, bus voltage fault, output under voltage, severe current imbalance, Fan fault
Fault (red)	Off	Steady on	Output over voltage, output short circuit, internal address conflict

LED digital tube can display module output voltage, output current, address, group number, fault code, packet mode, operation mode and on-off status information.

Module has two button, up button (▲) and down button (▼). The module information can be viewed by pressing the button. Press (▲) or (▼) to display in sequence as shown in Figure 2-3, the first page is the output voltage by default.

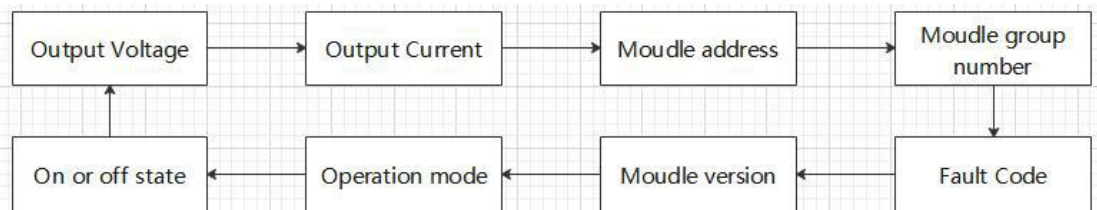



Figure 2-3 Module information display sequence

Module parameters can also be set by pressing buttons: module output voltage, output current, address, group number, operation mode, on/off state. When the module runs in debug mode, it can start up, shut down, and adjust parameters by pressing the button. To set module parameters, perform the following steps:

1. Press (▲) or (▼) to switch the display to the information interface.
2. Press (▲) or (▼) for about 2.5 seconds, then release, and the display will blinking.
3. Press (▲) or (▼) to change setting.
4. Press (▲) or (▼) for about 2.5 seconds and release to save the data.

2.1.1.1 Setting the Module Address

The default address is 0x00. The value ranges from 0x00 to 0x3F. When setting the module address, press (▲) or (▼) until the interface  appears, press (▲) or (▼) about 2.5 seconds release, the interface flashing, and then press consecutive short press (▲), to reach the required address, press (▲) or (▼) about 2.5 seconds save.

2.1.1.2 Set the module to debug mode

After being powered on, the module is in standby state, and its running mode is normal by default. Press (▲) or (▼) until the he interface $\overline{-R-}$ appears, press (▲) or (▼) is about 2.5 seconds release, interface, short press again (▲), appear interface, press (▲) or save (▼) is about 2.5 seconds.

2.1.1.3 Set the module on/off and adjust the parameters in manual mode

Taking setting 100V/200A output of the module as an example, this paper describes how to control the switch on and off of the module and adjust parameters in debugging mode.

Assuming the module default output voltage is 20V, press (▲) or (▼) to switch to the output voltage page, press (▲) or (▼) about 2.5 seconds release, the interface flashing, display value for the default setting voltage value 20, and then continuously short press (▲), the interface 100, press (▲) or (▼) about 2.5 seconds save, the module set output voltage is 100V. After long press save, the set voltage value will take effect.

Assume that the module default output current is 40A, press (▲) or (▼) to switch to the output current page, press (▲) or (▼) about 2.5 seconds release, the interface flashing, display value for the default setting current value of 40, and then continuously short press (▲), the interface 200, press (▲) or (▼) about 2.5 seconds save, the module set output current is 200A. After long press save, the set current value will take effect.

2.1.1.4 Automatic page hopping

When a module is faulty, the module panel jumps to the fault code display page, and the module alarm information is displayed on the LED nixie tube in the form of fault codes, as shown in Table 2-2. When the module is working normally, after 20 seconds, if the module is powered on, it will automatically jump to the voltage display page; if the module is powered off, it will jump to the on/off display page.

Table 2-2 Fault Codes Display Meaning

Fault code	Meaning
E01	Output undervoltage
E02	Overtemperature (Including environment over temperature of ambient temperature and internal over temperature of module because of air duct blocked)
E03	AC over/under voltage、 AC no-full-phase
E05	Output short circuit
E06	Output overvoltage
E07	Address confliction
E08	Fan fault
E09	Current sharing alarm

2.1.2 The connector Definitions

The rear end of the charging module has AC input connector and DC output connector. As show in figure 2-4.

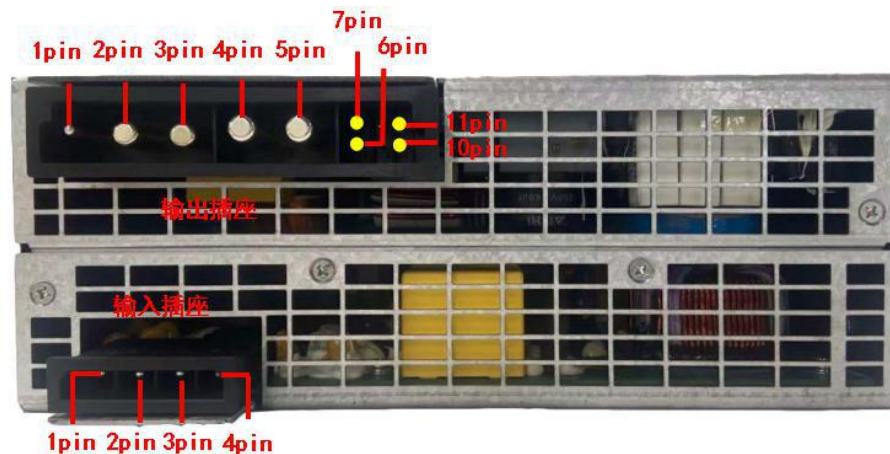


Figure 2-4 Schematic Diagram for Definition of Three-phase AC Input/DC Output Port

Input socket pin definition:

1pin: Input ground cable (PE)

2-4pin: three-phase AC input (A, B, or C), without phase sequence requirements

Output socket pin definition:

1pin: hot swap detection port

2-3pin: positive output port

4-5pin: negative output port

6-7pin: The output terminal is inserted into the detection interface

10-11pin: CAN communication interface 10-11PIN: CAN communication interface. The

10-pin is CANH and the 11-pin is CANL

2.1.3 Label

Label is attached to the top cover of charging module, see figure 2-5.

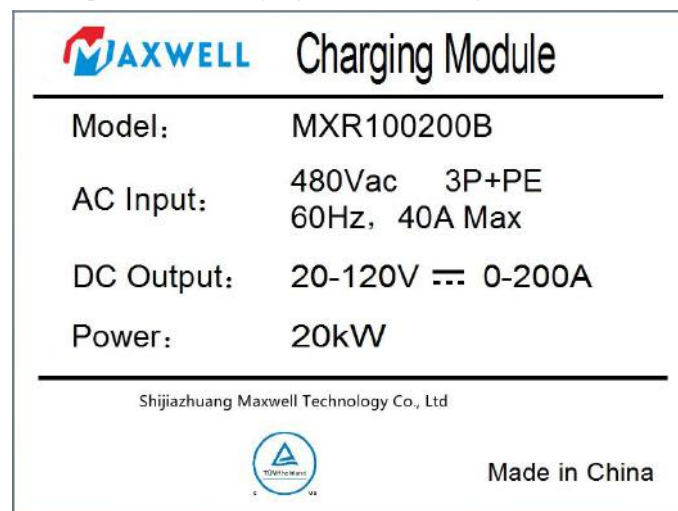


Figure 2-5 Nameplate Label

2.2 Dimensions

2.2.1 The dimension of MXR100200B is shown in figure 2-6.

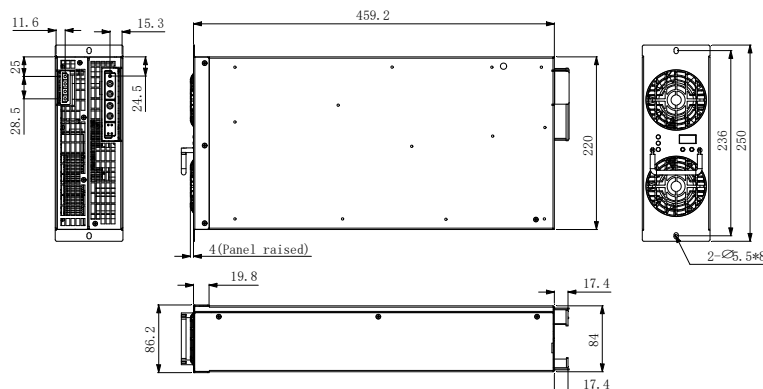


Figure 2-6 Module Dimensions (mm)

2.2.2 MXR100200B module system connector installation standard:

1) System connector (input cable connector, output cable connector) are installed on the connector installation panel, see Figure 2-7

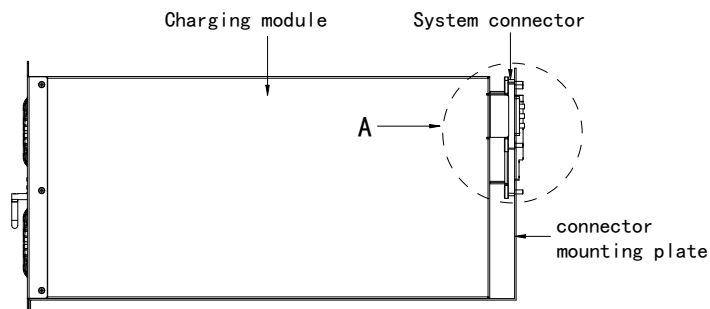


Fig. 2-7 Mounting of system connector

2) After the module is mounted on the pile, it is required that module connector and system connector are tightly connected, no gaps allowed. Ensure module connector and system connector are connected reliably, see Figure 2-8.

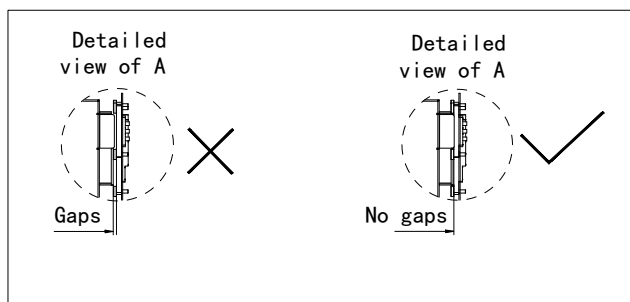


Figure 2-8 Module connector and System connector Installation

2.3 Installation

Installation steps of charging module are as follows,

1. Grab handle of charging module with one hand, and hold charging module with the other. Insert charging module into the corresponding position of the cabinet.
2. Slowly push the charging module into slot completely.
3. Tighten fixing screws on the charging module panel and fix it on the cabinet.
4. Charging modules should installed into the cabinet from left to right.

2.4 Use

After the charging modules are installed in the system cabinet, the system can run upon power-on.

Operating environment

1. Overvoltage/installation category: overvoltage category II.
2. Pollution grade: pollution grade II.
3. Altitude: No derating if it is ≤ 1000 m. The working temperature decreases by 1°C for every 100 m rise when the altitude is >1000 m.
4. AC input distribution system: TN or TT system.
5. System exhaust air volume and fan type selection requirements:

(1) There are two methods to calculate the exhaust air volume of system

Method 1: According to the total loss of system

According to the thermal formula, $V=Q/(C_P*\rho*\Delta T)$, the system exhaust air volume V (m^3/s) can be calculated, where C_P is the specific heat of air at the current temperature ($\text{kJ}/(\text{kg}*\text{K})$), ρ is air density (kg/m^3) at the current temperature, and the current temperature is the average temperature of the inlet air and the outlet air, ΔT is the temperature difference between the inlet and the outlet of the system (13°C is generally selected for outdoor cabinet), Q is the total loss of the system (unit: kw) (Q value shall also be added with solar radiation in the strong sunlight regions).

Method 2: According the exhaust air volume of the module

System air volume $V=n*V$, where n is the number of system modules and V is the maximum air output of a single module, $v=131\text{CFM}$ ($0.0618\text{m}^3/\text{s}$).

(2) The Selection of System Fan

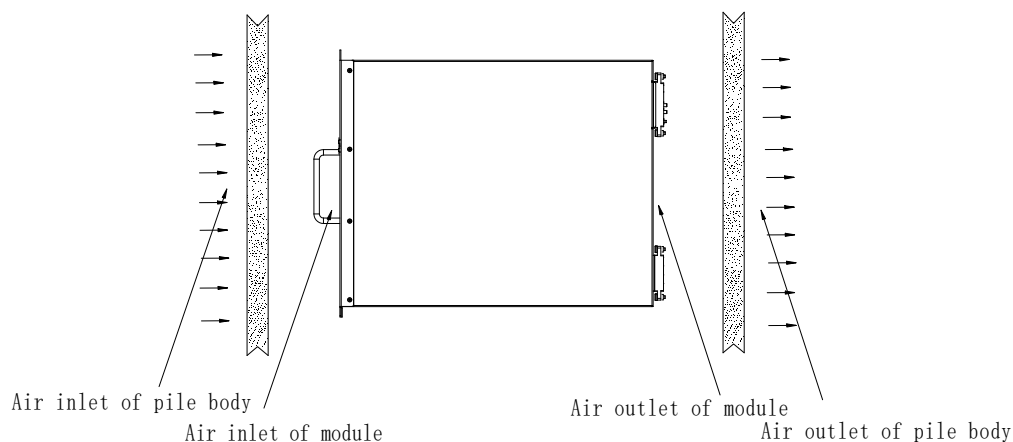
The selection of system fan is decided by the system exhaust air volume V , and the main parameters are the maximum exhaust air volume and wind pressure of the fan, the maximum exhaust air volume of the system fan is equal to 1.5 ~ 2 times of the system exhaust air volume ($1.5 \sim 2$) * v) when the pressure of wind is equal to the system impedance. If the pressure of wind is high and the system impedance is small, it can be close to 1.5 times; if the pressure of wind is low and the system impedance is large, it can be 2 times or even more than 2 times.

In general, the pressure of wind is not less than 200Pa, which can be calculated as 2 times.

6. Module usage suggestion

When the charging module is used in the charging pile system, ΔT : The difference in

temperature of air intake and air outtake of the module (including the air intake and air outtake of charging pile) should not exceed 25°C, the specific test points are shown in the following figure:



7. Cabinet cabling suggestions

A. Separate power cabling in the cabinet from CAN communication cabling to avoid spatial coupling interference between each other;

B. The AC inlet or DC outlet cables of the internal charging module should be fixed on the two sides of the enclosure and cannot block the module inlet and outlet channels.

C. The three-phase colors of the AC input cables are red, green, and yellow (the default color varies according to the requirements of different countries or regions). The dc output power cables are positive in red (for a 2-3PIN port) and negative in black (for a 4-5pin port), as shown in Figure 2-9,2-10.

D. When installing the AC input or DC output terminals on the system side in the module enclosure, use the screws that match the terminals. Ensure that the screws are tight and have sufficient tolerance allowance. Screws are provided with the cable or terminal package.

E. CAN bus must be connected in a bus line, and a 120-Ω resistor must be added at both ends of the CAN bus. The first end CAN be placed inside the monitoring device.

F. CAN communication cable (10-11pin interface) on DC output power cable, white CANL, black CANH.

G. The hot swap test cable (1-pin interface) on the DC output power cable must be shorted to the positive output terminal (2-3-pin interface).

H. Connect the output terminal of the DC output power cable to the label cable (6-7pin interface). Short-circuit the 6-7pin port in normal use.

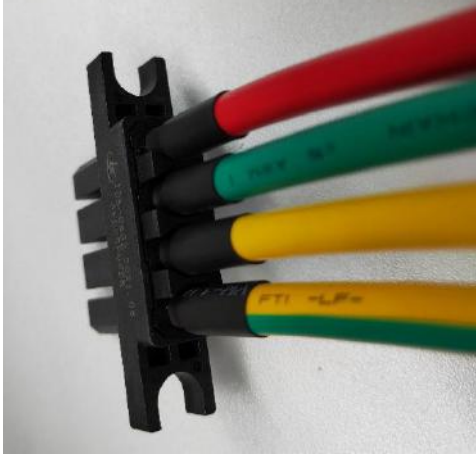


Figure2-9 Ac input cable diagram of the module



Figure2-10 Dc output cable of the module

Chapter 3 Maintenance Guide

3.1 Troubleshooting

Chart 3-1 Troubleshooting Instructions (Standard Protocol)

Indicator	Description	Analysis	Solution.
Run Indicator (Green) off	Module communication fail	No input voltage	Ensure there is input voltage .
		Charging module is not fully plugged in the slot	Re-plug the module.
Alarm Indicator (Yellow) Steady On	Module overheat Fault code:E02	Fan blocked	Remove the object that prevents the fan from.
		Air duct blocked	Remove the object that blocks air duct or clear dust.
	Module current imbalance Fault code:E09	The difference between the module current and average current is too large	Check charging module communication, check communication cable connection; If the communication is good and alarm persists, replace charging module.
	PFC voltage abnormal	PFC output over/under voltage protection	Swap charging module with alarm with a normal charging module, if alarm persists, replace charging module.
	AC over/under voltage Fault code:E03	AC input voltage is not in the normal range	Ensure AC input voltage is in the normal range
	Module communication fail	Module communication fail	Check communication cable connection
	Module short circuit Fault code:E05	Module positive and negative pole short circuit	Power off the charging module, check whether the positive and negative poles on the output circuit are short circuited, and reboot after confirming that there is no short circuit. If alarm persists, replace charging module.

Fault Indicator (Red) Steady On	Module overvoltage Fault code:E06	Module output voltage exceeds the set output overvoltage value	Power off the charging module, check whether the module output voltage has been changed, and check that the module output voltage is less than the set module output overvoltage value. And then, reboot after pulling out the charging module, if alarm persists, replace charging module.
	Address conflict Fault code:E07	Address conflict	Check if module operates in DIP switch mode. If so, check if there is a conflict in DIP switch address.
	Fan fault	Fan fault	Replace the fan.

3.2 Replace Charging Module

In case of module fault, please follow the steps below to replace charging module,

1. Surface temperature of charging module maybe high, be careful when pulling a module out;
2. Check whether the appearance of new charging module is intact; set DIP switch address the same as the replaced module;
3. Disconnect the ac input circuit breaker of the fault charging module, loosen the fixing screws on the panel;
4. Grab the handle of the failed charge module, pull it out of the cabinet slowly;
5. Slowly push the new charging module into the cabinet;
6. Tighten the fixing screws on the panel;
7. Close the charging module ac input circuit breaker;
8. Check whether the monitor module can identify the newly replaced charging module, and check current sharing between newly replaced charging module and. If all items are normal, it indicates that newly replaced module is in normal operation.

Appendix I Identification Chart of Toxic and Harmful Substance

Component	Toxic or harmful substances or elements					
	Lead	Mercury	Cadmium	Hexavalent Chromium	Polybrominated Biphenyl	Polybrominated Diphenyl Ethers
	Pb	Hg	Cd	Cr6+	PBB	PBDE
Fan	X	O	O	O	O	O
Manufactured board	X	O	O	O	O	O
Metals	X	O	O	O	O	O
<p>○ : indicates that the content of the toxic and hazardous substance in all homogeneous materials of the part is below the limit requirement specified in SJ/T 11363—2006.</p> <p>×: indicates that the content of the toxic or hazardous substance contained in at least one of the homogeneous materials of the part exceeds the limit requirement of SJ/T 11363—2006.</p>						
<p>Toxic and hazardous substances contained in the following components and applications are limited to the current technical level and cannot be replaced reliably or there is no mature technical solution:</p> <ol style="list-style-type: none"> 1. The solder contains lead; 2. Lead in copper; 3. High temperature solders contain lead. 						
<p>Remarks about environmental protection period of use: The environmental protection period of use of the this product (marked on the product) refers to the period, from the production date, under normal conditions of use, complying with the safety precautions, during which product contained toxic and harmful substances or elements will not have serious impact on the environment, personal and property.</p>						
<p>Scope of application: MXR series charging module.</p>						