

REG1K0100G Charging Module

User's Manual

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Chapter 1 Introduction to Charging Module REG1K0100G

REG1K0100G charging module is developed specially by Shenzhen Infypower Co., Ltd. for electric vehicle charging station. With three-phase non neutral conductor AC input, it has the advantages of high efficiency, high power density and low harmonic.

1.1 Model

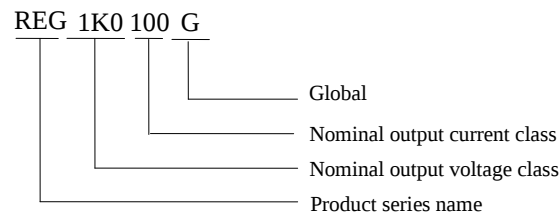


Fig. 1-1 Model

1.2 Structure

Appearance



Fig. 1-2 Appearance

Front panel

There are indicator lights on the front panel of the charging module, as shown in Fig. 1-3 and Fig. 1-4. Refer to Table 1-1 for the instructions of the indicator lights.



Fig. 1-3 Front Panel

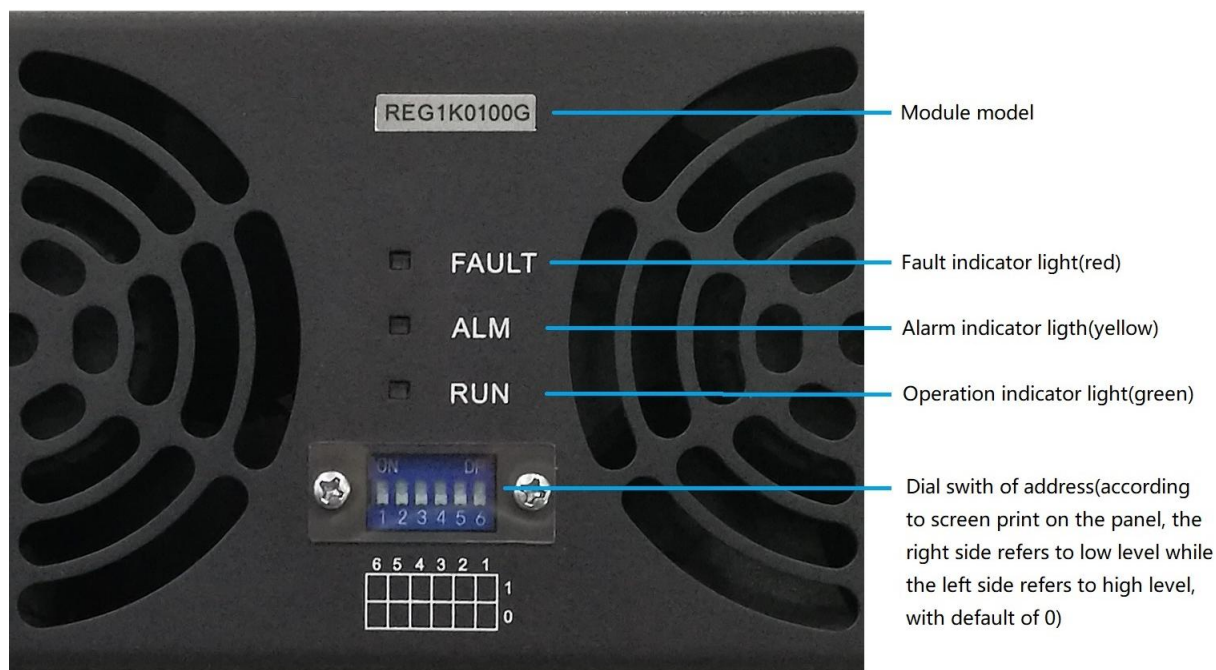


Fig. 1-4 Schematic Diagram of Front Panel Information

Note: The dial code is a binary 8421 code format, and the high and low bits are arranged from right to left; The DIP switch is down, indicating 0, and it is up, indicating 1. Please see the example and the conversion information table in Figure 1-5 as follow. The maximum effective address of the dial code is 60.



Default state, address 0 (code:000000);



address 3 (code:000011);



address 60 (code:111100)

000000	0	000111	7	001110	14	010101	21	011100	28	100011	35	101010	42	110001	49	111000	56
000001	1	001000	8	001111	15	010110	22	011101	29	100100	36	101011	43	110010	50	111001	57
000010	2	001001	9	010000	16	010111	23	011110	30	100101	37	101100	44	110011	51	111010	58
000011	3	001010	10	010001	17	011000	24	011111	31	100110	38	101101	45	110100	52	111011	59
000100	4	001011	11	010010	18	011001	25	100000	32	100111	39	101110	46	110101	53	111100	60
000101	5	001100	12	010011	19	011010	26	100001	33	101000	40	101111	47	110110	54		
000110	6	001101	13	010100	20	011011	27	100010	34	101001	41	110000	48	110111	55		

Fig. 1-5 Front panel DIP switch information and conversion information

Table 1-1 Instructions for Indicator Light

Indicator Light	Normal State	Abnormal State	Cause of Abnormality
Operation indicator light (green)	On	Off	No input power supply
		Flash	Background monitor operating the module
Alarm indicator light (yellow)	Off	On	AC input overvoltage/voltage shortage, internal over-temperature and abnormal bus voltage (self-recovery available if the alarm disappear)
		Flash	Communication interruption
Fault indicator light (red)	Off	On	Output overvoltage, output short circuit, internal address conflict and internal bus fault
		Flash	Fan fault

Definition of module interfaces

The back-end of the charging module is equipped with AC input socket and DC output socket, as shown in Fig. 1-6 .

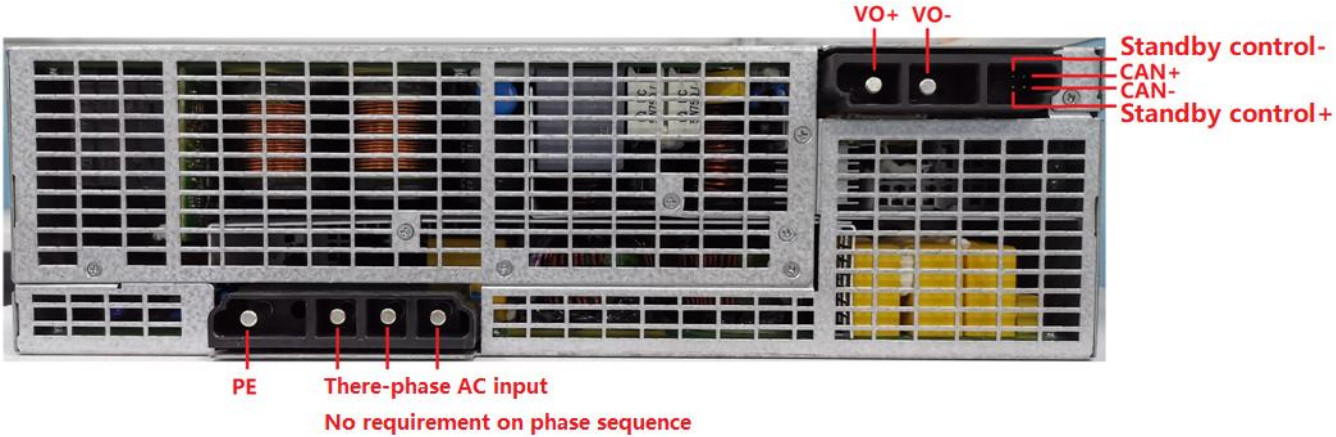


Fig. 1-6 Schematic Diagram for Definition of Three-phase AC Input Mode Port

The charging module is labeled with nameplate, as shown in Fig. 1-7.

 INFY POWER 英飞源技术	
Model:	REG1K0100G
AC Input:	380-480V~ 3P+PE 50/60Hz, 58A Max
DC Output:	150-1000V  0-100A
Power:	30kW
Shenzhen Infypower Co.,Ltd Made in China	

Fig. 1-7 Nameplate Label

1.3 Functional details

- 1. Hot plug
Plug technology is applied to the charging module to provide convenience for installation and maintenance. The access of the charging module to the system shall not disturb the output voltage of the system.
- 2. Advanced current sharing technology
Under constant voltage working mode, the charging modules can share current automatically within 10S, with degree of unbalance less than ±0.5A.
- 3. Super standby control
With external 12V or 5V standby control singal, the charging modules can be controlled into super standby mode which housekeeping power are also shut down(no communication in this status), under this mode, the best standby loss will be get, it is <2W@380Vac, <3.5W@480Vac. This control is only active when the charging modules are standby(not wroking), the control singal will be ingored when the the charging modules are in working status.
- 4. Control of input limited power
Refer to Fig. 1-8 for the relation between the output power and input voltage of the charging module. When the input voltage is within 320 Vac ~ 530 Vac (return difference is less than 5V), the module can output the maximum power of 30 KW; when the input voltage is within 260 Vac ~ 320 Vac, the module can still work normally under limited power mode.

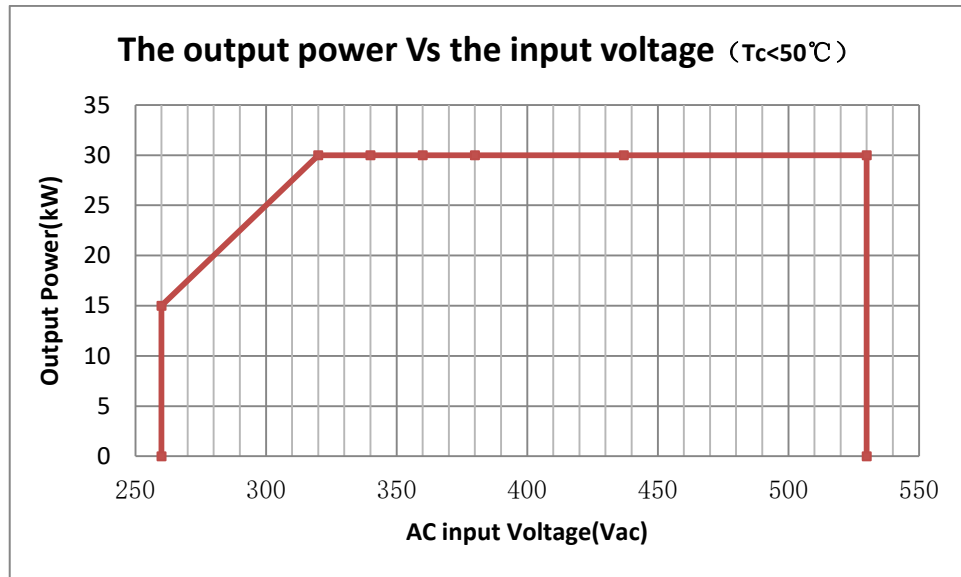


Fig. 1-8 Relation curve between the output power and the input voltage of three-phase AC input mode

5. Control of output constant power

When there is a rated input voltage, the output power of the module is 30 KW. Refer to Fig. 1-9 for the relation between the output voltage and the output current of the module.

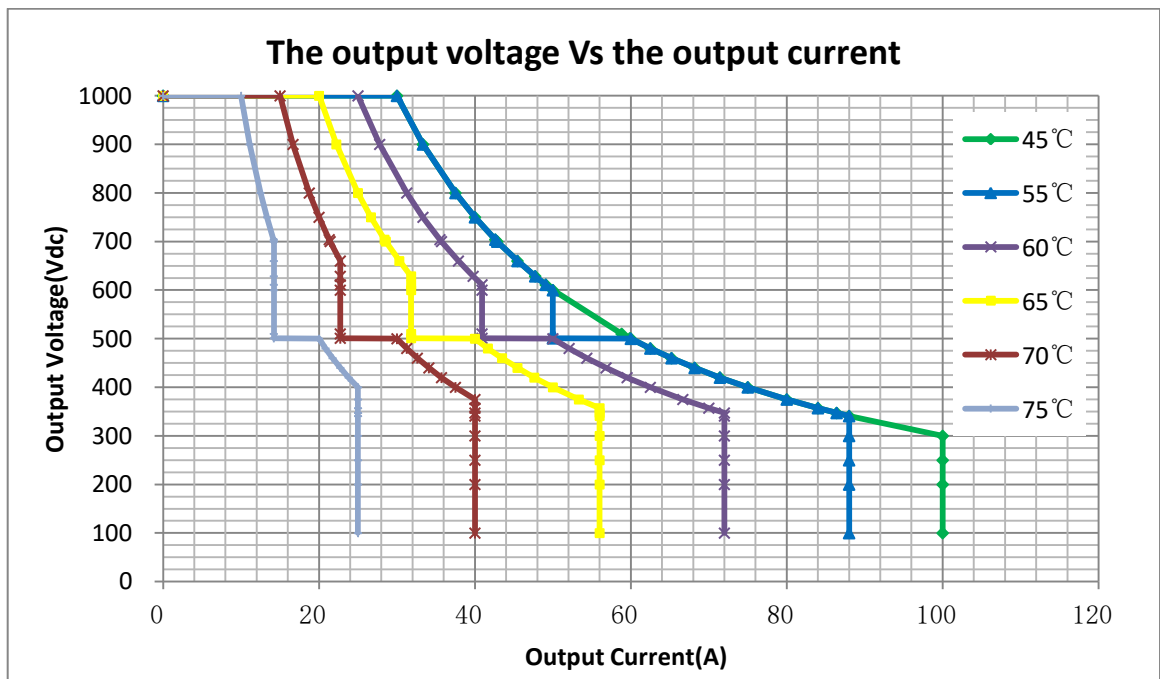


Fig. 1-9 Relation curve between the output voltage and the output current of the module

6. Temperature limited power

Under 45 °C ambient temperature, the module can output full power of 30 kW and the max output current is 100A;

Under 55 °C ambient temperature, the module can output full power of 30 kW and the max output current is 88A;

Over 55 °C ambient temperature, the module shall be used by derating with the power Linearly .

Under 65 °C ambient temperature, the allowable output power of the module is 20 kW and the max output current is 56A.

Under 75 °C ambient temperature, the output power of the module is reduced to 10 kW and the max output current is 25A.

Under 78 °C ambient temperature, the output power of the module is reduced to 0.

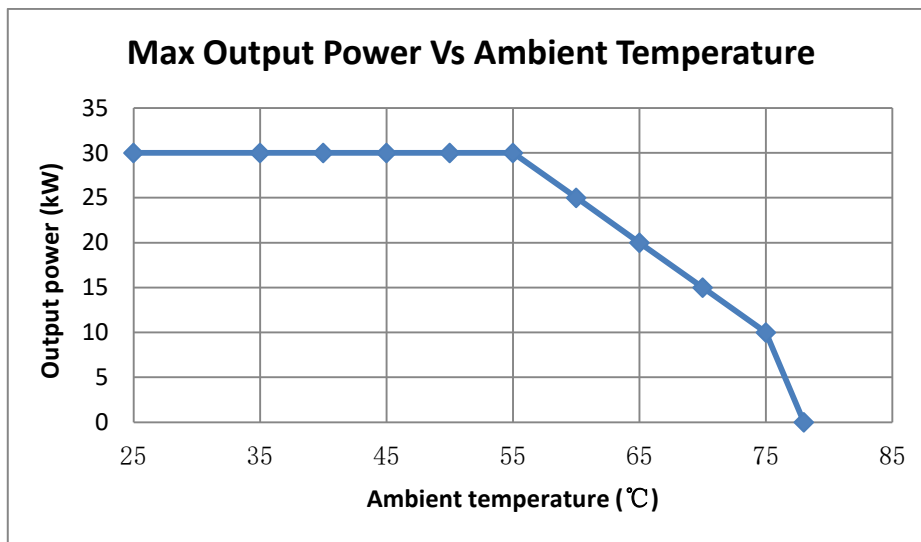


Fig. 1-10 Relation Curve between Max output power and ambient temperature

7. Efficiency

Under Rated input voltage , the efficiency is $\geq 95.2\%$ @1000V-30A, $\geq 95.0\%$ @350-500V&680-1000V, 50%~100%Load.

8. Regulation of output current limiting point

The module has the function of stepless current limiting. The current limiting point within the scope of 0.1A~100A is adjustable through the external monitoring module. When the output voltage is within 150Vdc ~ 1000Vdc, the current limiting accuracy of the module is $\pm 0.3A$.

9. Regulation of output voltage

The output voltage of the module can be regulated constantly through the external monitoring module, with regulation range of 150Vdc ~ 1000Vdc and minimum regulation step of 0.1 Vdc.

10. Fan control

The built-in processor of the module can regulate the speed of the fan according to the internal temperature and output current of the module.

11. Protection of input overvoltage/ voltage shortage

When the input voltage is less than 260 Vac or more than 530 Vac, the protection indicator light is on and the module stops working, without output. Meanwhile, this condition will be transmitted to the monitoring module. When the input voltage returns to normal range(there have hysteresis here, the input voltage should be more than 275Vac and less than 520Vac) , the protection indicator will be off and the modules recover to standby status.

12. Output overvoltage protection

The overvoltage protection point is 1040Vdc (± 10 Vdc). The module can be started after manual intervention upon overvoltage protection.

13. Over-temperature protection

The environmental over-temperature protection point is 78 °C. When the temperature inside is too high, the module will stop working; when the temperature inside recovers, the module will be on standby status.

14. Protection of internal bus fault

When the internal bus voltage of the module is beyond the overvoltage/ voltage shortage protection point, the module will be powered off automatically. At this time, there is no output from the module and the fault indicator light is on.

15. Short circuit protection

In case of short circuit of the module, it will be subjected to protective shutdown and the red indicator light of the panel is on, and this condition will be transmitted to the monitor of the “module fault”.

16. Interruption of background communication

When the module communication is interrupted for more than 10S, the alarm indicator light on the panel will flash and the module will shutdown. When the communication is recovered between 10s~20s, the module works again as default parameters, when the communication is recovered after 20s, the module recovers to standby status. The alarm indicator light returns to normal status when the communication recovers.

17. Protection against fan fault

When the fan failed, a fan failure alarm occur and the module will shut down, without voltage output and the fault indicator light(red) will flash. When fault removal, the module will work automatically again.

18. Monitoring performance

The charging module is equipped with CAN bus. It can also be converted to RS232 via the protocol converter, and the RS485 protocol communicates with the external monitoring module.

Refer to Table 1-2 for the list of the monitoring information.

Table 1-2 List of Module Monitoring Details

Command / Signal Issued by the Monitoring Module of the Charger System	Charging Module Information Collected by the Monitoring Module of the Charger System
Module start-up/ shutdown Setting of function of output current slow rise Regulation of the current limiting point of charging module Regulation of the output voltage of charging module	Input voltage, output voltage and output current Current limiting point and temperature of charging module DC output overvoltage point DC switch state Fault alarm and protection alarm Temperature limited power and input limited power AC power failure Current unbalance Address

1.4 Technical Parameters

Table 1-3 Technical Parameters of Charging Module

Category	Name	Parameter
Environmental conditions	Operation temperature	-40 ℃ ~ +75 ℃, derating is require when the temperature is above 55 ℃.
	Storage temperature	-40 ℃ ~ +70 ℃
	Relative humidity	≤95%RH, without condensation
	Cooling mode	Forced air cooling
	Altitude	2,000 m a.s.l., derating is require when the altitude is above 2,000 m a.s.l.
	Atmospheric pressure	79 kPa ~ 106 kPa
AC input	Input system	Three phases + PE
	Voltage range	260 Vac ~ 530 Vac
	The maximum static voltage borne under no operation	600 Vac
	Rated voltage	400/480 Vac
	Maximum current	58A
	Grid frequency	45 Hz~ 65 Hz
	Rated frequency	50Hz/60Hz
	Standby power consumption	<12W@380Vac, <14W@480Vac with normal sandby mode <2W@380Vac, <3.5W@480Vac with super sandby mode
DC output	Three-phase equilibrium	The difference between the maximum and minimum voltage of neutral conductor for three-phase input ≤ 10V
	Voltage range	150 Vdc ~ 1000Vdc
	Current range	0 ~ 100A (current limiting point is settable)
	Rated current	30A (required for setting of current limiting point)
	Steady voltage precision	<±0.5%
	Steady current precision	≤±1% (rated range of 20% ~ 100% for output load)
	Load regulation rate	≤±0.5%
	Grid regulation rate	≤±0.1% (testing range is 320V ~ 530V)
	Startup overshoot	≤±3%
Power factor and THD	Peak-to-peak value noise	≤1% (200~1000V, 0~20MHz)
	Power factor	≥0.95 Full-load output power of @25%~50%
		≥0.98 Full-load output power of @50%~100%
		≥0.99 Full-load output power, input nominal voltage and frequency of @100%
Efficiency	THD	≤5% Full-load output power of @50%~100%
	Under Rated input voltage	≥95.2%@1000V-30A, ≥95.0%@350-500V&680-1000V, 50%~100%load with rated input.
EMC	Emission	ClassB(RE is Class A for Output Port according to standard)

Category	Name	Parameter
		According to IEC 61000-6-3
	Immunity	According to IEC 61000-6-1
Certification	CE/TUV	IEC61851-1
	TUVus	UL2202
Other	Instant impulse current upon startup	<60A
	Current sharing	In case of load of 10%~100%, the module current sharing error $\leq$ rated output current of $\pm 5\%$.
	Noise	$\leq 60\text{dB}$ (1m away, ambient temperature is 25°C, under rated input voltage and output is 1000V-30A)
	Startup duration (select the startup mode through the monitoring module)	Normal startup mode: the time delay from AC power-on to module output is $\leq 8\text{s}$. Output delayed startup: The startup duration can be set through the monitoring module, with default output startup duration of 3~8s.
	Earthing resistance	Earthing resistance $\leq 0.1\Omega$, bearable current $\geq 25\text{A}$
	Lighting protection	5kA
	Insulation resistance	The insulation resistance of DC part and AC part to housing and the AC part to the DC part shall be $\geq 10\text{M}\Omega$.
	Insulation strength	Within the 1 min of the AC input terminal to the CAN side 4242V DC voltage, there is no breakdown and flashover and the steady leakage current is less than 1mA; Within the 1 min of the AC input terminal to the enclosure 2121V DC voltage, there is no breakdown and flashover and the steady leakage current is less than 1mA; Within the 1 min of the AC input terminal to the DC output terminal 2121V DC voltage, there is no breakdown and flashover and the steady leakage current is less than 1mA; Within the 1 min of the DC output terminal to the enclosure 2121V DC voltage, there is no breakdown and flashover and the steady leakage current is less than 1mA; Within the 1 min of the DC output terminal to the CAN side 4242V DC voltage, there is no breakdown and flashover and the steady leakage current is less than 1mA; Within the 1 min of the CAN to the enclosure 707V DC voltage, there is no breakdown and flashover and the steady leakage current is less than 1mA.
	ROHS	R6
Mechanical parameters	Size	110Mm (H) $\times$ 385mm (W) $\times$ 395mm (D), Detail dimension list in appendix B.
	Weight	$\leq 22.5\text{kg}$

Chapter 2 Installation and Instructions

2.1 Installation

The charging module shall be installed according to the following steps:

1. Grasp the handle of the charging module with one hand and hold the charging module with the other hand to insert the module into corresponding position of the cabinet.
2. Push the charging module into the slot slowly.
3. Tighten the two set screws on the panel of the charging module and fix the module on the cabinet.
4. Install the charging module in the cabinet successively from left to right.

2.2 Application

The charging module can operate when the system is powered on after it is installed in the system cabinet.

Application environment

1. Overvoltage category for installation: Overvoltage category II.
2. Degree of pollution: PD2.
3. Altitude: below 2,000 m a.s.l.; derating is required when the altitude is above 2,000 m a.s.l.
4. AC input distribution system: TN or TT system.
5. Safety precautions for the DIP switch at front panel: After setting the module address using the DIP switch, the cover of the DIP switch must be locked. Do not touch the DIP switch when the module is in the charged state!

Chapter 3 Maintenance Guide

3.1 Fault Phenomenon and Troubleshooting Suggestions

Table 3-1 Troubleshooting Suggestions

Abnormality	Related Alarm	Cause Analysis		Treatment Suggestions
Operation indicator light (green) off	Module communication interruption	No input and output voltage		Ensure there is input and output voltage
	No alarm	Reverse connection of input power supply or disconnection of input fuse		Re-connect the input power supply or replace the fuse with another input fuse with the same capacity
Protection indicator light (yellow) on	Module protection	The module is subjected to over-temperature protection. Main causes include:	Fan blocking	Remove the object blocking the operation of the fan
			Obstructed air duct:	Remove the obstacle at the air inlet
			Too high environmental temperature	Lower the environmental temperature
			Not insert the charging module fully in place	Re-insert the charging module
	Unbalanced module current	The average current of the module is more than 3A.		Check whether there is normal communication for the charging module and whether the communication line is connected normally. If there is normal communication but there is still abnormality in the system, the charging module shall be replaced.
	Module protection	PFC output overvoltage protection		Change the position of the abnormal charging module and the normal charging module. If the abnormal charging module still fails to work, the charging module shall be replaced.
	Module protection	AC input voltage beyond the normal range		Ensure that the AC input voltage is within the normal range.
Protection indicator light (yellow) flashing	Module communication interruption	Module communication interruption		Check the connection of the communication line
Fault indicator light (red) on	Module fault	Module overvoltage or output short circuit		Pull out the charging module and restart it. In case of fault protection again, the charging module shall be replaced.
Fault indicator light (red) flashing	Fan fault	Fan fault		Replace the fan

3.2 Fan Replacement

The fan shall be replaced in the following methods:

1. Power off and take out the module, dismantle the 6 bolts fixed on the front panel with cross screwdriver, pull out the front panel and disconnect the lamp panel cable plug.
2. Disconnect the power line of the fan and take out the faulty fan.
3. Plug the power line of the fan into the corresponding socket, align the blowing direction of the fan to the inside direction of the case and install the new fan.
4. Install the front panel and fix it with 6 bolts.
5. Check whether the new fan runs normally. If it does, it indicates that the new fan is replaced successfully.

3.3 Replacement of Charging Module

In case of fault of the charging module, please replace it according to the following steps:

1. The charging module may have a high temperature on its surface, so attention shall be paid to avoid scald when you pull out the charging module;
2. Check whether the appearance of the charging module is intact;
3. Disconnect the AC input air switch of the charging module in fault and loosen the fixed bolts on the panel;
4. Grasp the handle of the charging module in fault and pull it out gently from the cabinet;
5. Push the new charging module slowly into the cabinet in place;
6. Tighten the fixed bolts on the panel;
7. Close the AC input air switch of the charging module;
8. Check whether the monitoring module can identify the new charging module and whether the new charging module can share current with other charging modules.

If all items are in normal condition, it indicates that the charging module operates normally.

Appendix A Identification Table of Toxic and Harmful Substances or Elements

Note: In July 2018, the formal reports which meeting the ROHS ten requirements will be provided.

Appendix B Module dimension

