
High-frequency switching mode rectifier module

Instruction



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Chapter 1 Overview

1.1 Preface

the AT series high-frequency switching mode rectifier module modules have been widely used in the DC power system and relative equipments of power plant, electric substation, hydropower station, oil and gas industry, steel works, chemical plant, min industry etc.

1.2 Main characteristic of the module

- Modular design, realize N+1 backup, hot-pluggable. The DC system can be easily expanded and on line maintenance.
- The friendly man-machine interface. Large screen to show and operation.
- RS-485 interface, realize “4 remote” function with monitor and controllers.
- Intelligent battery charging and discharging with monitor and controllers, automatic battery boost charge and float charge.
- High efficiency, Nearly 95%-96%;
- Lightly, 220V/10A natural cooling module only 9kg;
- Little volume, 220V/10A natural cooling module dimension only 325mm × 230mm × 130mm;
- After the full bridge rectifying circuit rectifies 3-phase AC to DC, then adjusted by reactive PFC, power factor>0.94;
- Function against reverse pour: each module has been added diode against reverse pour at output terminal.
- LED digital screen, digital calibrate, stable current ,fault alarm
- **Output overvoltage protection**

To prevent the disastrous accident caused by outputting overvoltage to DC load, there is overvoltage protection circuit in the module. when output overvoltage occurs, the module lock automatically, the fault indication light is on, the fault module stop working automatically and doesn't affect the normal operation of the entire system. The over

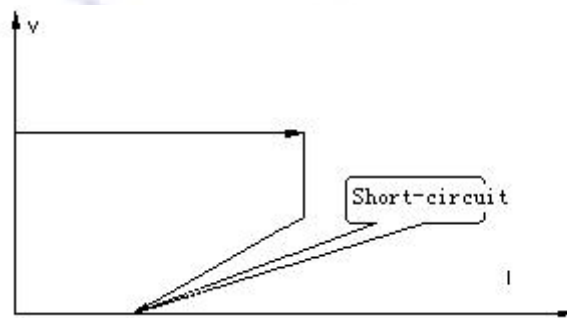
voltage protection point is 320VDC \pm 5% for the 220VDC module, and the over voltage protection point is 160VDC \pm 5% for the 110VDC module

● **Output current limitation protect**

The maximum output current of each module is limited to 105% of the rated output current. When the module is over the current limit, the module will lower the output voltage to protect the module itself.

● **Output short-circuit protection**

When output short circuit, the module will reduce the output voltage to 0VDC immediately, and will limit the output current below 15% of the rated current to protect the module. The module will operate under this short circuit state for a long periods of time, and will not get damaged. The module can return to normal working automatically after the fault disappeared.



● Fig.1-1 output short-circuit protection characteristics

● **Module parallel protection**

There is parallel protection circuit in each module, the fault module can automatically quit from the DC system, so will not affect the other other modules.

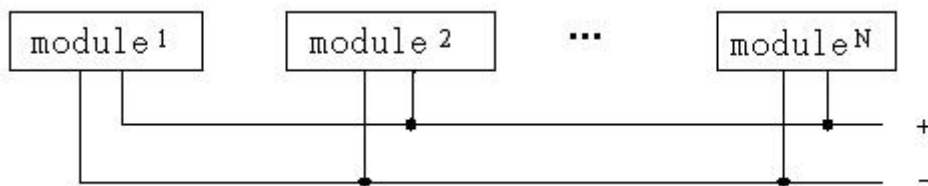


Fig.1-2 output of module parallel

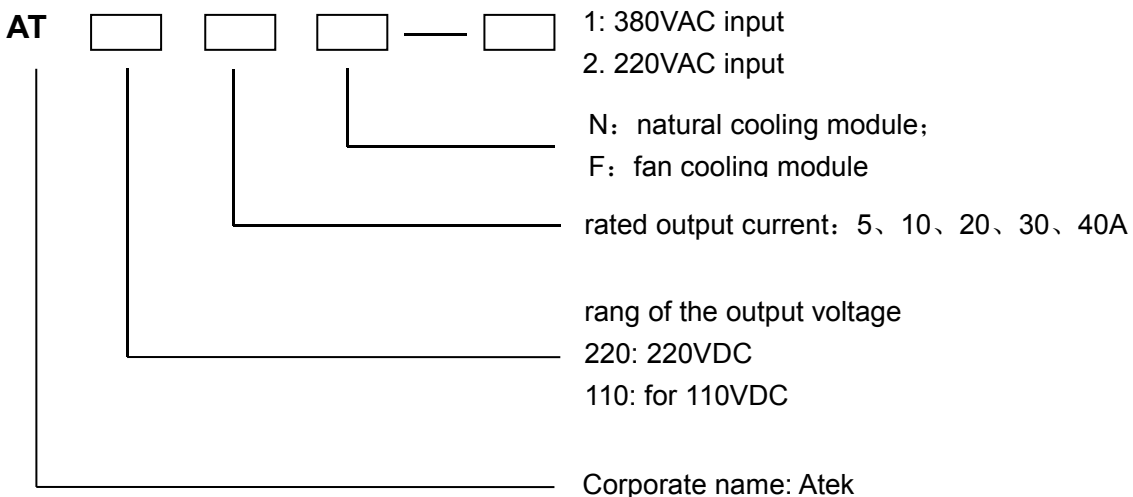
● **Over-temperature protection**

When design the module, there is already enough temperature redundancy for the module, under special circumstance, when the module detects that the temperature of the radiator is over 85 °C , it will stop working automatically to protect itself. When the temperature decrease below 75 °C , the module will start working automatically.

● **Module fault dry contract signal output**

When the module is with output over-voltage, over current, and over temperature, it will make alarm and output the dry contact signal..

1.3 Module model name:



1.4 Technical characteristics

220VDC output, 380VAC input module series:



module		AT	AT	AT	AT	AT	AT	AT
project		22005N	22010N	22020N	22010F	22020F	22030F	22040F
rated output current(A)		5	10	20	10	20	30	40
power (KW)		1.5	3	6	3	6	9	12
weight(kg)		4.6	7.5	14.3	4	6.2	19	19
size (H*W*D mm)		179*109*2 60	230*130*325	323*146*4 00	160*84*2 99.5	160*84*40 0	303*136* 410	303*136* 410
cooling method		natural cooling			fan cooling			
heat sink temperature rise		$\leq 30^{\circ}\text{C}$			$\leq 20^{\circ}\text{C}$			
rang of input AC (VAC)	min	323						
	Typical value	380						
	max	437						
rang of the output voltage (VDC)	min	176						
	Typical value	220						
	max	300						
voltage stabilization		$\pm 0.5\%$						
Current stabilization		$\pm 1\%$						
PFC		≥ 0.94						
Efficiency		$\geq 94\%$						
noise (dB)		natural cooling 50, fan cooling 55.						
Storage temperature ($^{\circ}\text{C}$)	min	-40						
	Typical value	25						
	max	60						
working temperature ($^{\circ}\text{C}$)	min	-10						
	Typical value	25						
	max	40						
uneven current sharing when parallel operation		$\leq \pm 3\%$						
time delay of start-up (s)		3~8						
Wave factor		$\leq 0.2\%$						
Load		Continuous working with Grade I(100%) rating output current						
Automatic current limiting		When output is over the limit value, the output current will not increase and keep constant current output						
Output overvoltage protection function		After output overvoltage occurs($320 \pm 5\text{VDC}$), the module locks up automatically						
output short circuit protection		When output short circuit, the module draws the output voltage to 0VDC immediately. The module will resume when the short circuit disappear.						
Insulating strength		Input to housing (earth) 2100VAC 1minute 5mA, no breakdown, no flashover						
		Input to output 2100VAC 1minute 4mA, no breakdown, no flashover						
		Output to housing (earth) 2100VAC 1minute 4mA, no breakdown, no flashover						

110VDC output, 380VAC input module series:



module		AT11010N	AT11020N	AT11040N
project				
rated output current(A)		10	20	40
power (KW)		1.5	3	6
weight(kg)		4.7	7	14
size (H*W*D mm)		179*109*260	230*130*325	323*146*400
cooling method		natural cooling		
heat sink temperature rise		$\leq 30^{\circ}\text{C}$		
rang of input AC (VAC)	min	323		
	Typical value	380		
	max	437		
rang of the output voltage (VDC)	min	88		
	Typical value	110		
	max	150		
voltage stabilization		$\pm 0.5\%$		
Current stabilization		$\pm 1\%$		
PFC		≥ 0.94		
Efficiency		$\geq 94\%$		
noise (dB)		50		
Storage temperature ($^{\circ}\text{C}$)	min	-40		
	Typical value	25		
	max	60		
working temperature ($^{\circ}\text{C}$)	min	-10		
	Typical value	25		
	max	40		
uneven current in parallel operation		$\leq \pm 3\%$		
time delay of start-up (s)		3~8		
Wave factor		$\leq 0.2\%$		
Load		Continuous working with Grade I(100%) rating output current		
Automatic current limiting		When output is over the limit value, the output current will not increase and keep constant current output		
Output overvoltage protection function		when output overvoltage occurs($160 \pm 3\text{VDC}$), the module locks up automatically		
output short circuit protection		When output short circuit, the module draws the output voltage to 0VDC immediately. The module will resume when the short circuit disappear.		
Insulating strength		Input to housing (earth) 2100VAC 1minute 5mA, no breakdown, no flashover		
		Input to output 2100VAC 1minute 4mA, no breakdown, no flashover		
		Output to housing (earth) 2100VAC 1minute 4mA, no breakdown, no flashover		

220VAC input module series:

Model		AT22005N -220AC	AT22010N -220AC	AT11010N -220AC	AT11020N -220AC
Items					
Output current (A)		5	10	10	20
Power (KW)		1.5	3.0	1.5	3
weight(kg)		4.6	7.7	4.7	6.8
size (H*W*D mm)		179*109*260	230*130*325	179*109*260	230*130*325
cooling method		natural cooling			
Input voltage range (VAC)	Min	187			
	Typical	220			
	Max	253			
Output Adjustable Voltage rang(VDC)	Min	176			88
	Typical	220			110
	Max	300			150
voltage stabilization		±0.5%			
Current stabilization		±1%			
Charger efficiency (efficiency)		≥93%			
Audible Noise max (dB)		50			
Storage temperature (°C)	Min	-40			
	Typical	25			
	Max	60			
Working Conditions temperature (°C)	Min	-10			
	Typical	25			
	Max	40			
uneven current in parallel operation		<±3%			
Start delay (s)		3S-8S			
Ripple factor		≤0.5%			
Load grade		Continuous working with Grade I(100%) rating output current			
Automatic current limiting technology		When output is over the limit value, the output current will not increase and keep constant current output			
Output overvoltage protection function		When output voltage exceeds 320V±5VDC(220V module)/160V±3VDC (110V module), then it will switch off output to prevent the equipment broken			
output short circuit protection		When output short circuit, the module draws the output voltage to 0 immediately. The module will resume when the short circuit disappear.			
Insulating strength		Input to housing (earth) 2100VAC 1minute 5mA, no breakdown, no flashover			
		Input to output 2100VAC 1minute 4mA, no breakdown, no flashover			
		Output to housing (earth) 2100VAC 1minute 4mA, no breakdown, no flashover			

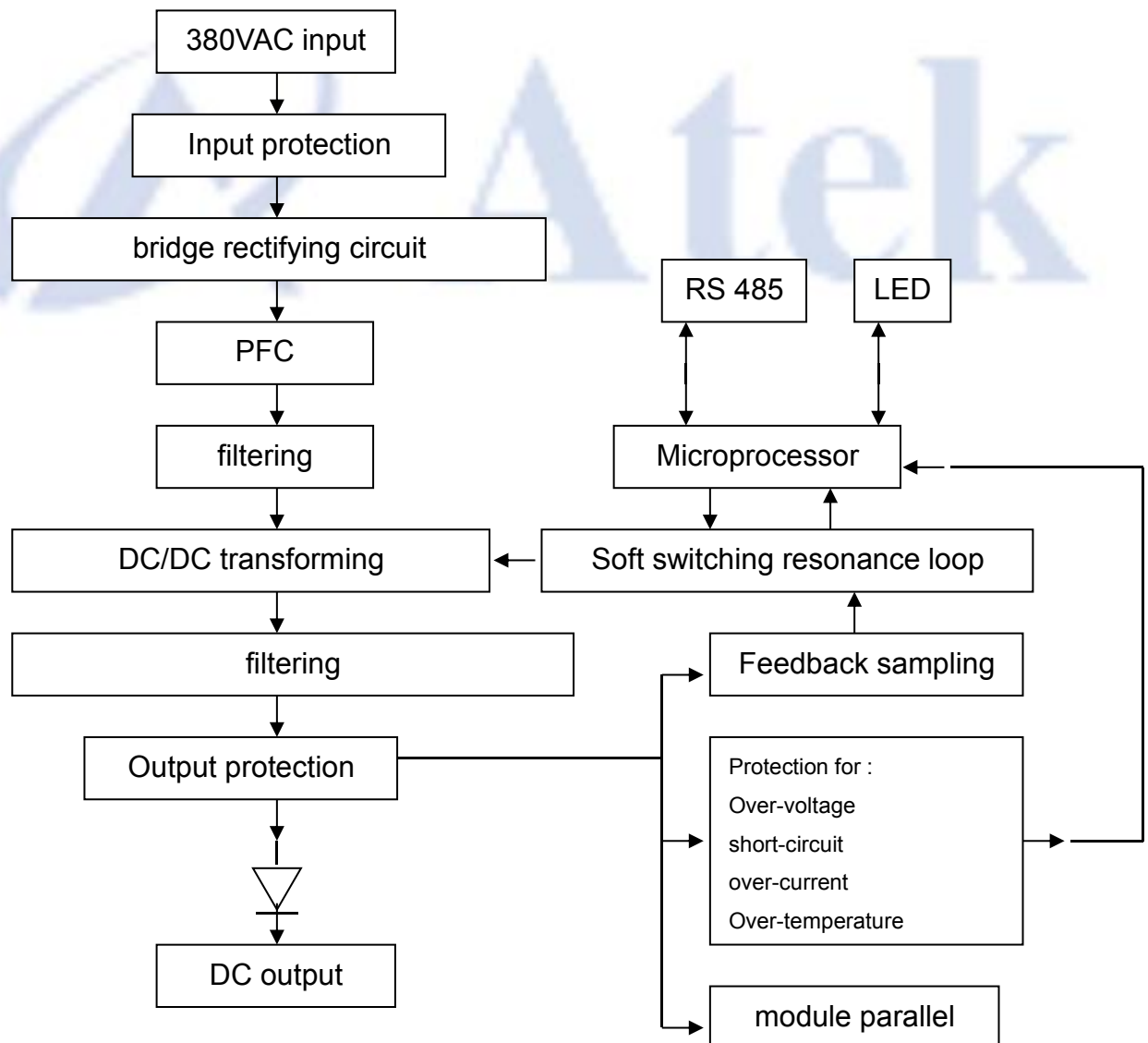
Chapter 2 Operating Condition

- 1、 Altitude $\leq 2000\text{m}$;
- 2、 Storage temperature: $-40^{\circ}\text{C}\sim+60^{\circ}\text{C}$; operation temperature: $-10^{\circ}\text{C} \sim 40^{\circ}\text{C}$;
- 3、 Relative humidity: $\leq 96\%$ (when surrounding temperature 25°C) ;
- 4、 No conductive and explosive dust, no caustic gas;
- 5、 Indoor use.;

Note: If it is used in a special environment that does not meet the above conditions, you should offer us your special requirements when you place order, so that we can make special design to ensure the product can operate reliably.

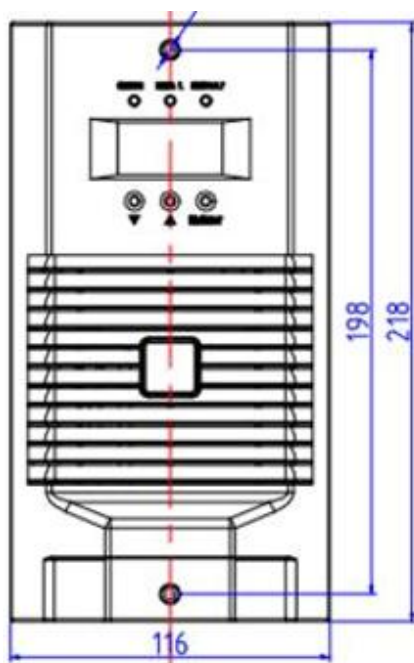
Chapter 3 Rectifier Module Operation instruction

3.1 Operating diagram of the module

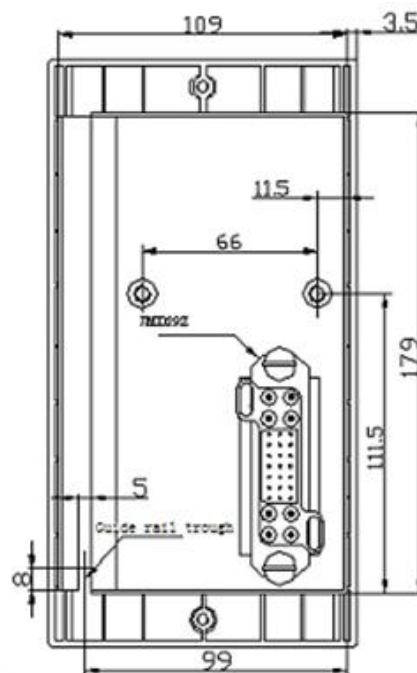


3.2 Dimension

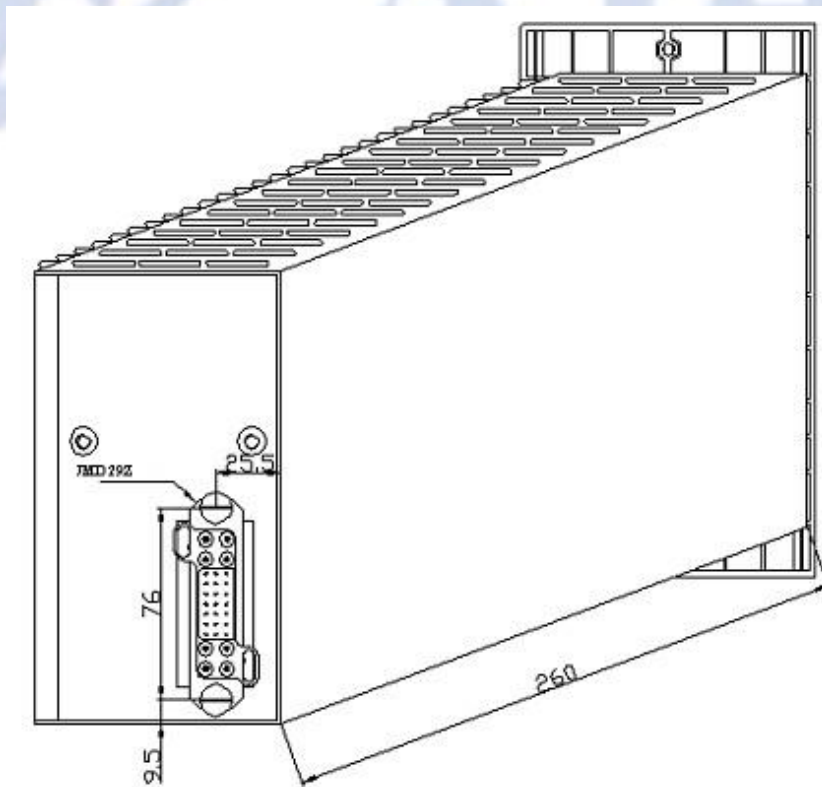
AT22005N, AT11010N, AT22005N-220AC, AT11010N-220AC



Front

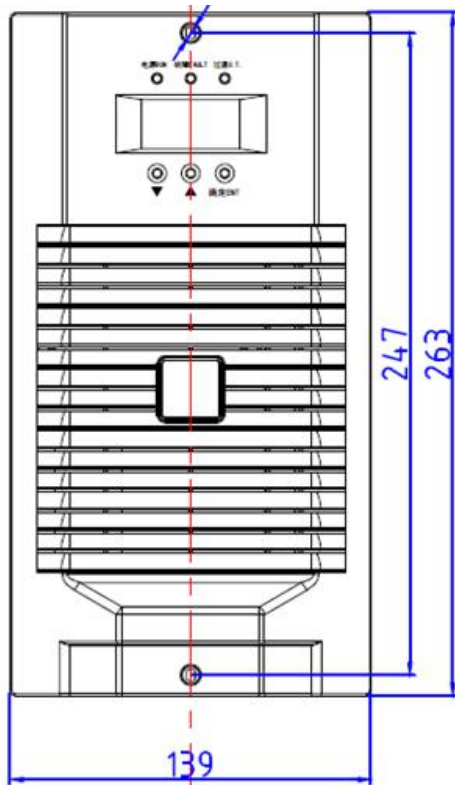


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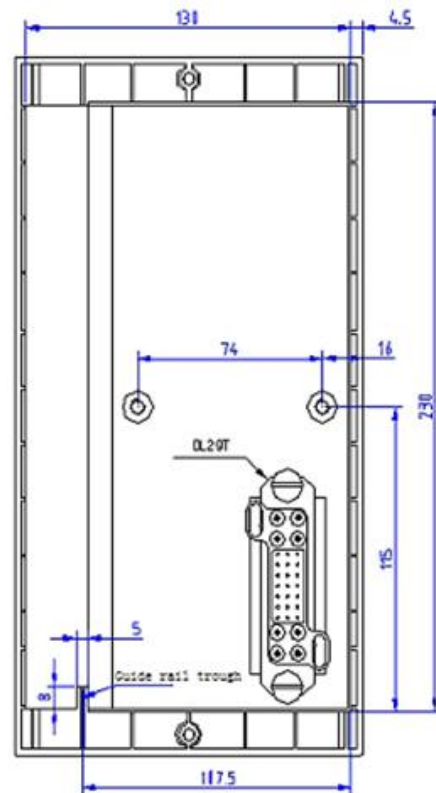


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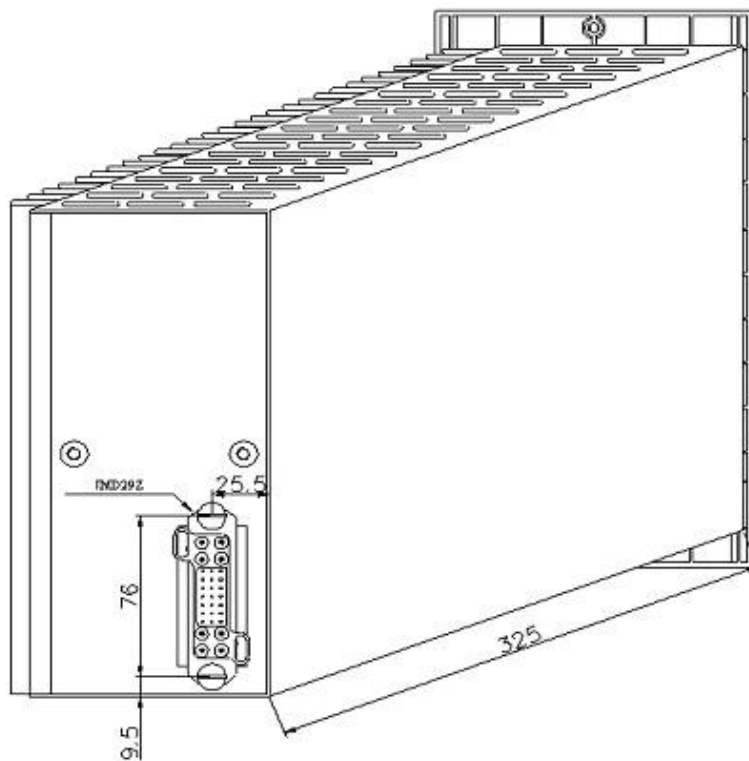
AT22010N, AT11020N, AT22010N-220AC, AT11020N-220AC



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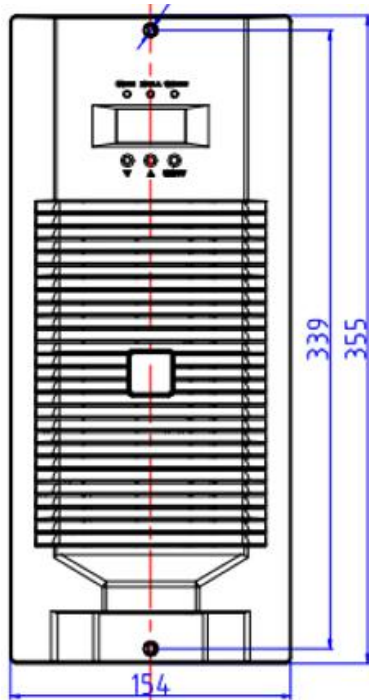


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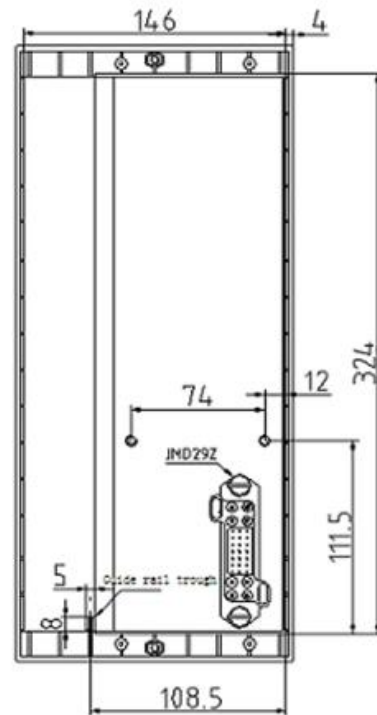


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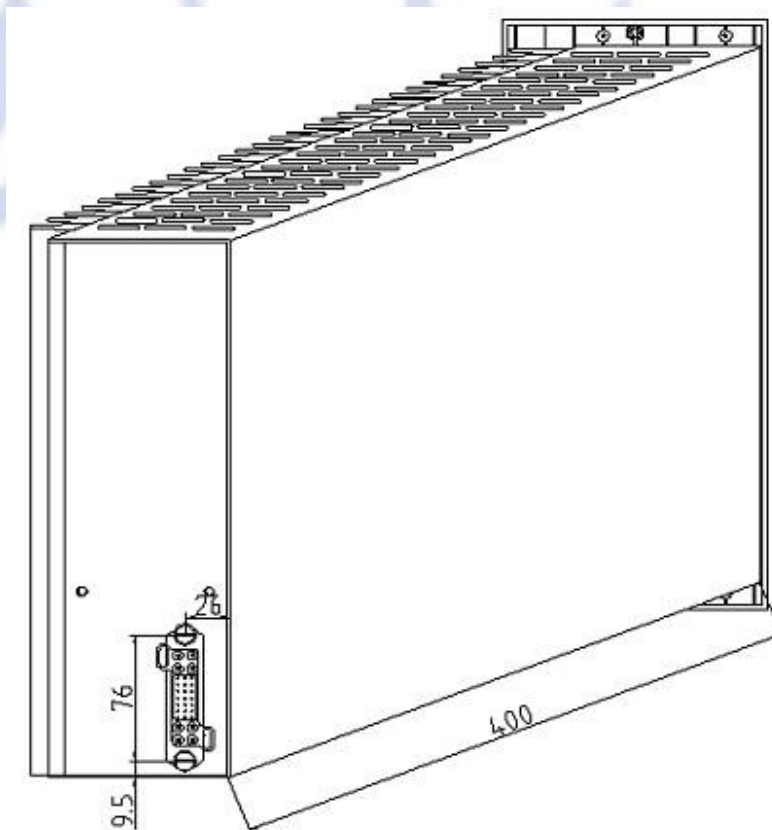
AT22020N, AT11040N, AT30020N,



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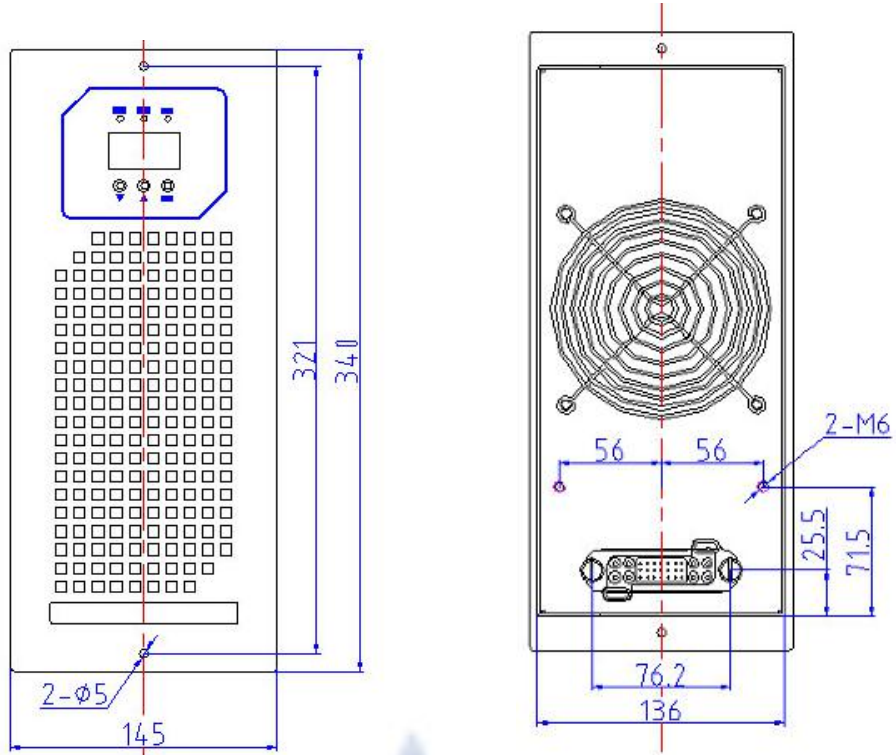


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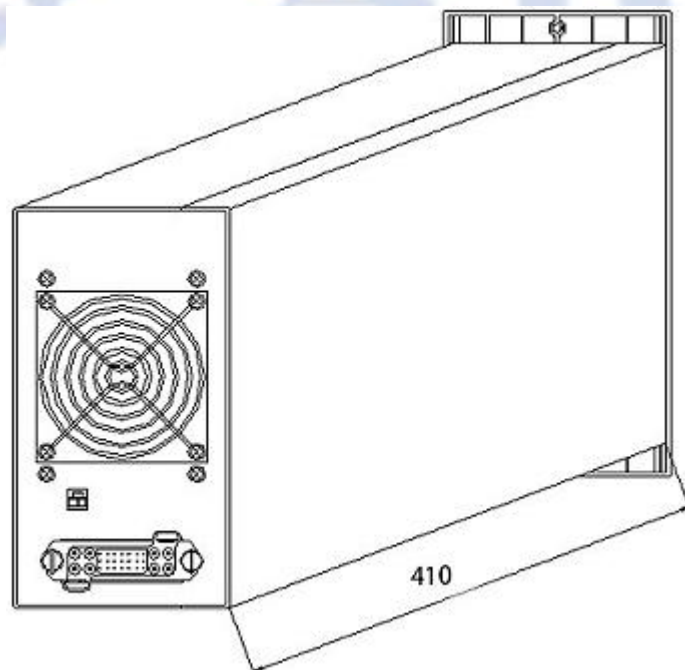
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AT22030F, AT22040F



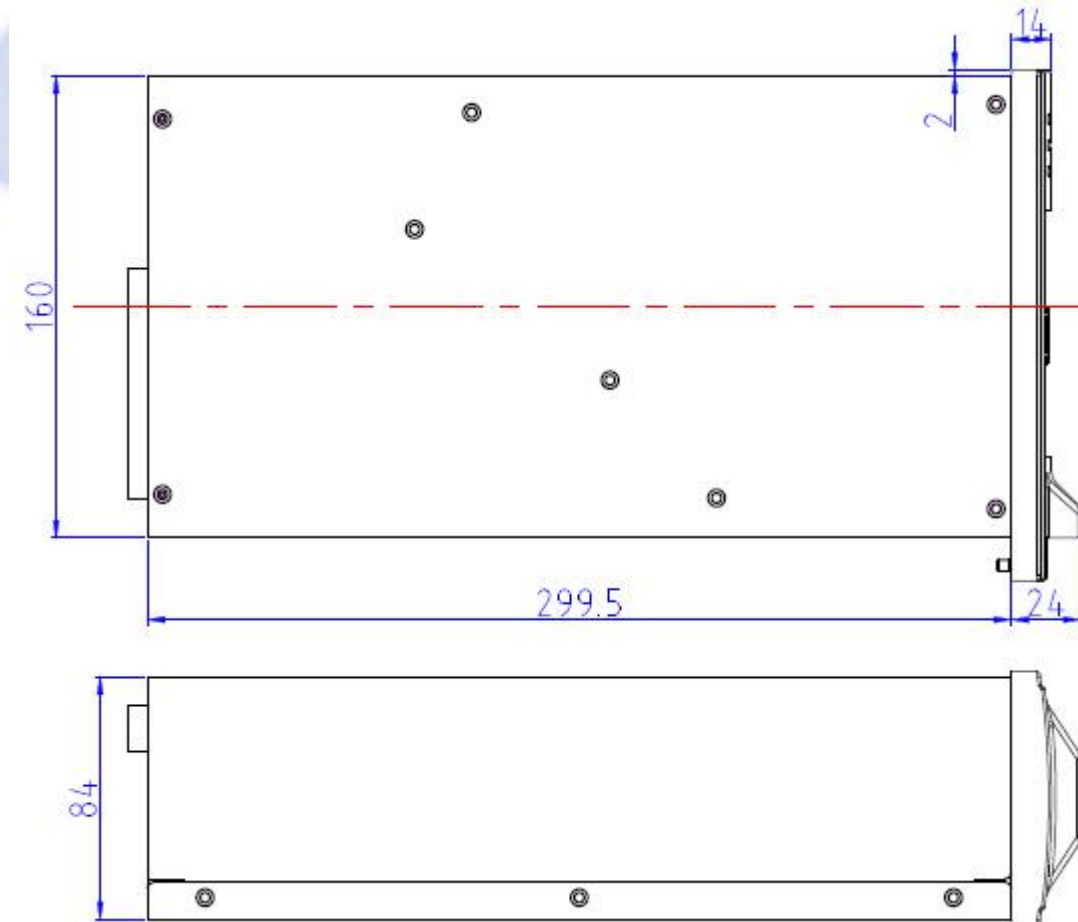
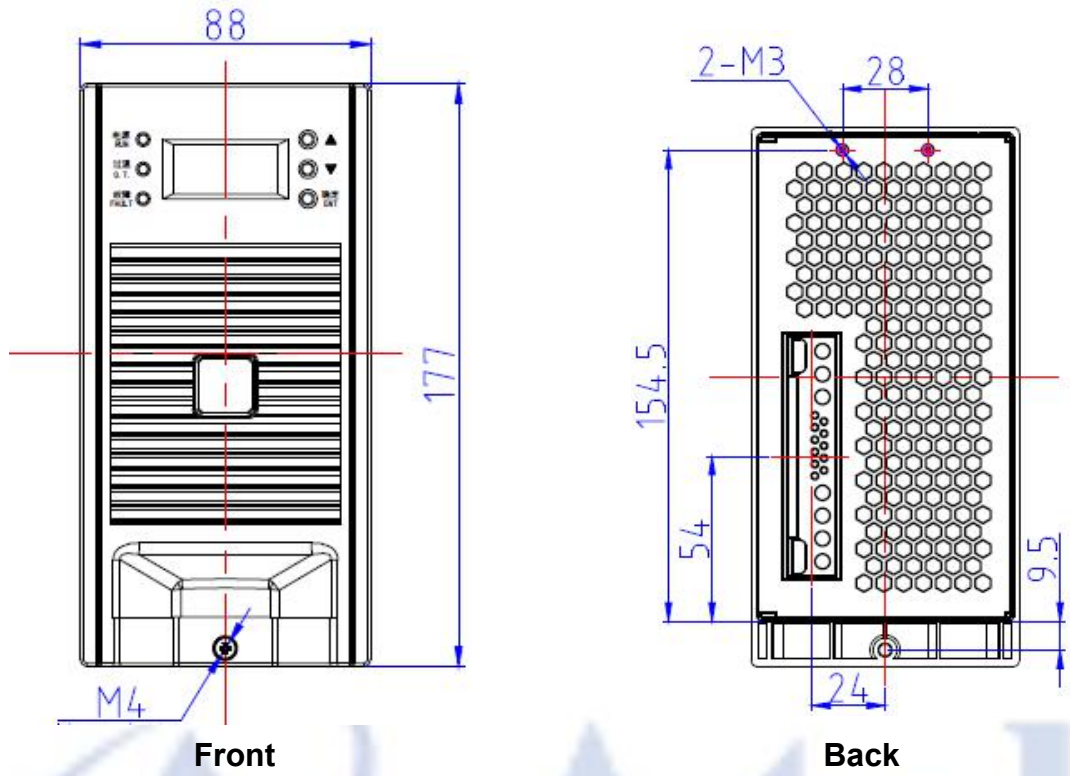
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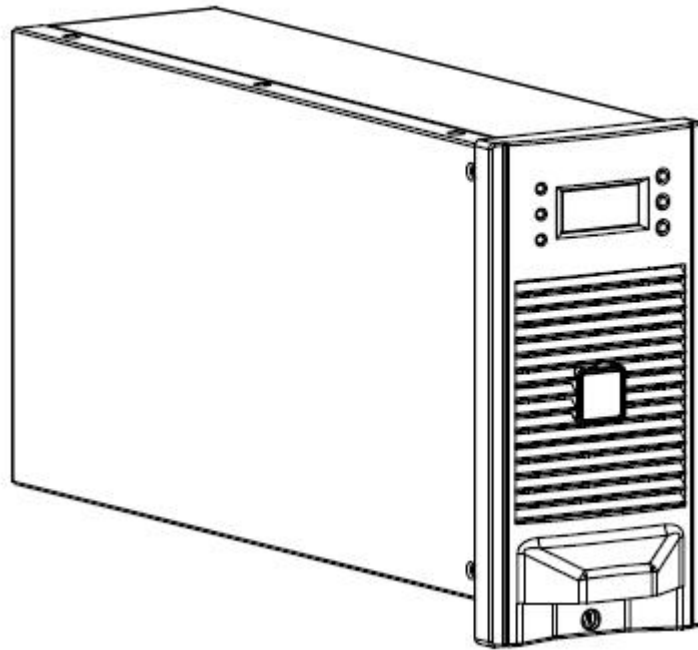
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Overall

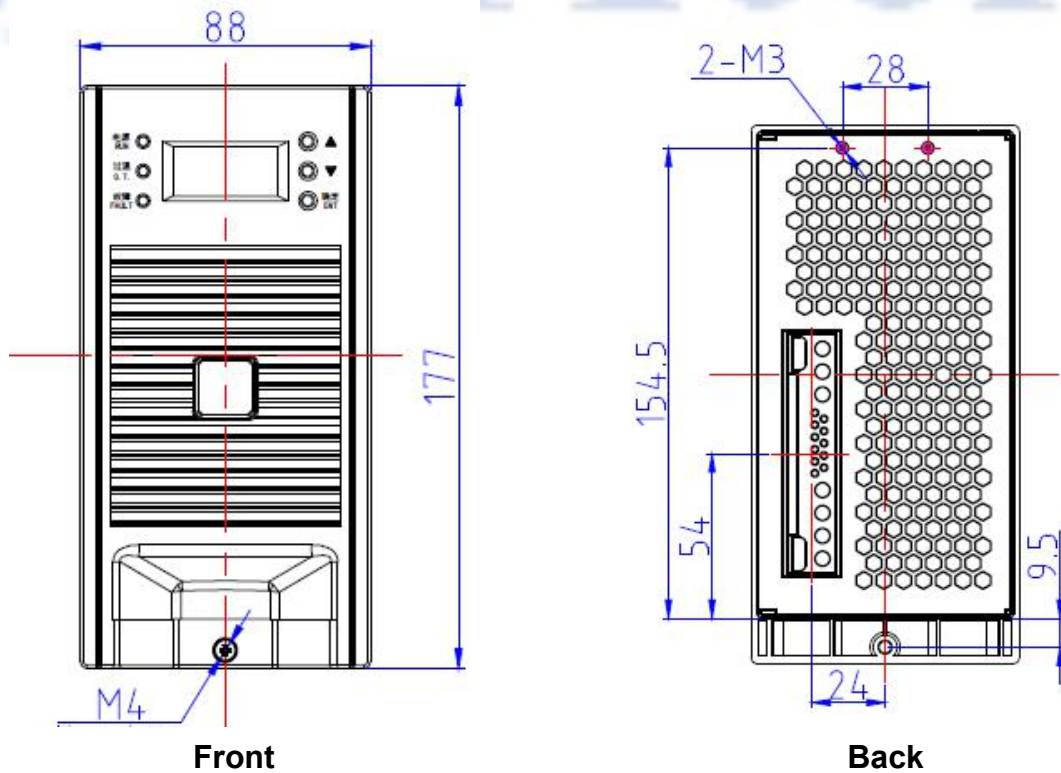
AT22010F, AT11020F

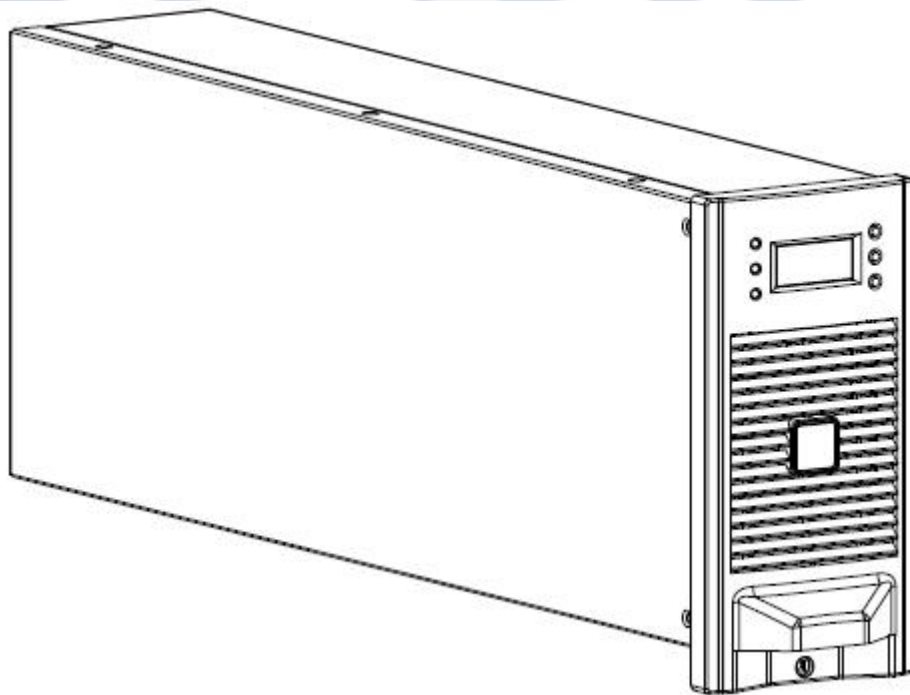
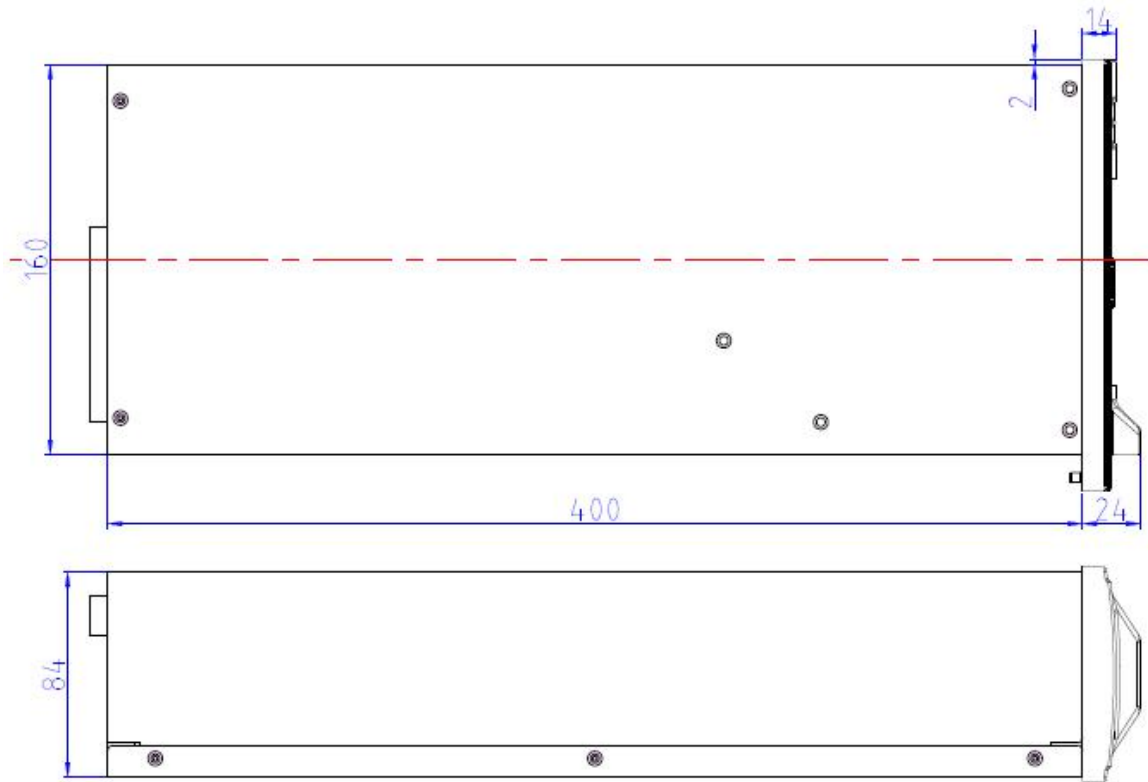




Overall

AT 22020F

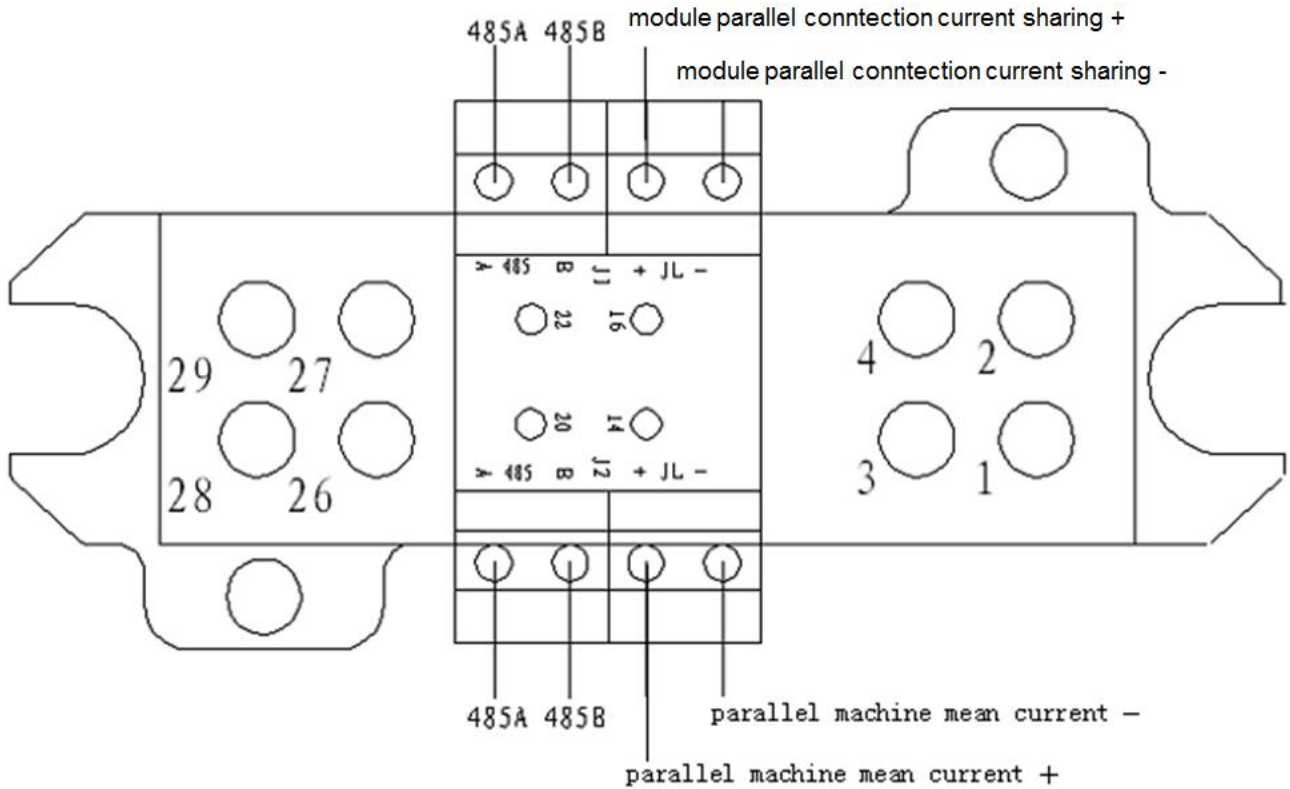




Overall

3.3 Installation of module

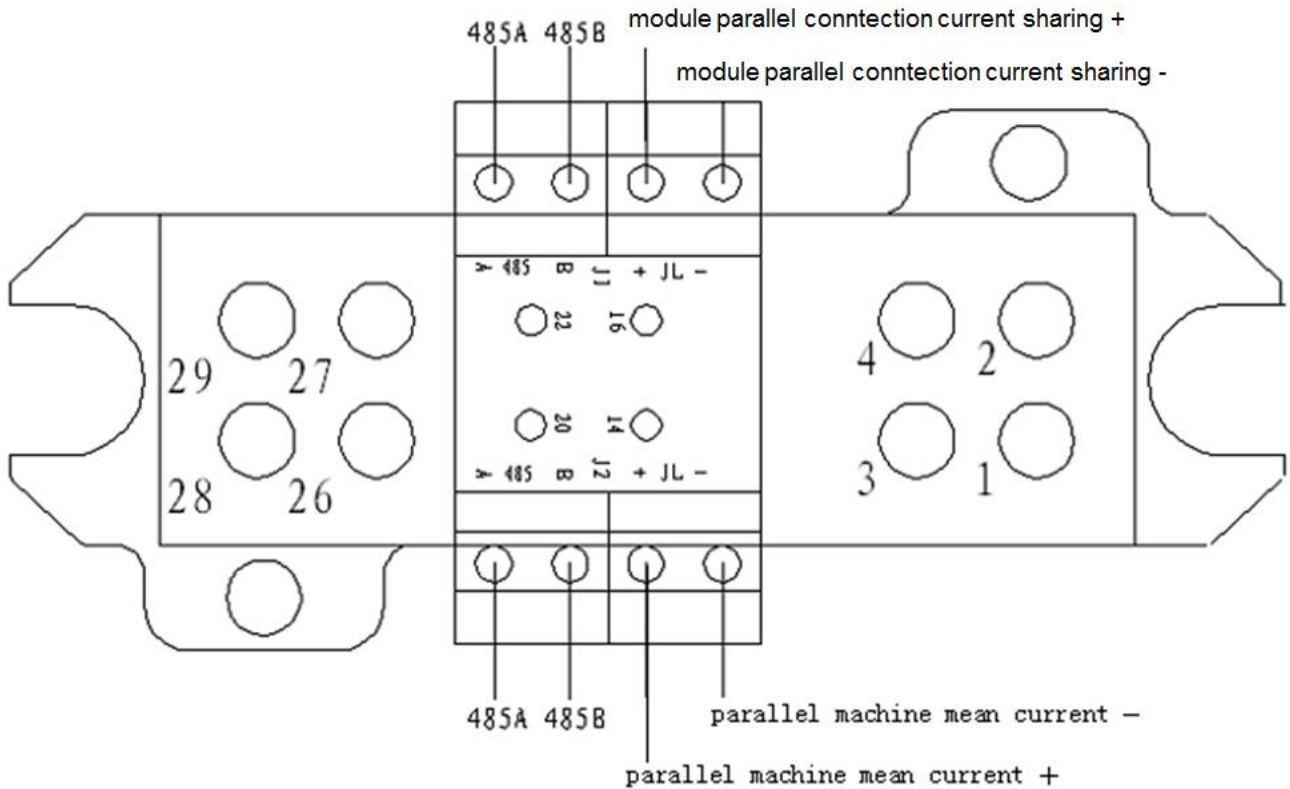
- 1、 AT22005N, AT22010N, AT22020N, AT11010N, AT11020N:
 definitions for the module input and output plug socket (JMD29T)



port	standard	define	function
1	12#	DC+	DC output+
2	12#	DC-	DC output-
22	20#	485B	RS485
20	20#	485A	
16	20#	JL+	current sharing for module parallel
14	20#	JL-	
26	12#	G	earth
27	12#	A	Input380V
28	12#	B	Inptu380V (L)
29	12#	C	Input 380V (N)

2、 AT22040F、 AT11040N、 AT22030F:

definitions for the module input and output plug socket (JMD29T)



port	standard	define	function
1, 3	12#	DC+	DC output+
2, 4	12#	DC-	DC output-
22	20#	485B	RS485
20	20#	485A	
16	20#	JL+	current sharing for module parallel
14	20#	JL-	
26	12#	G	earth
27	12#	A	Input380V
28	12#	B	Inptu380V
29	12#	C	Input 380V

Note: ①No define port is empty

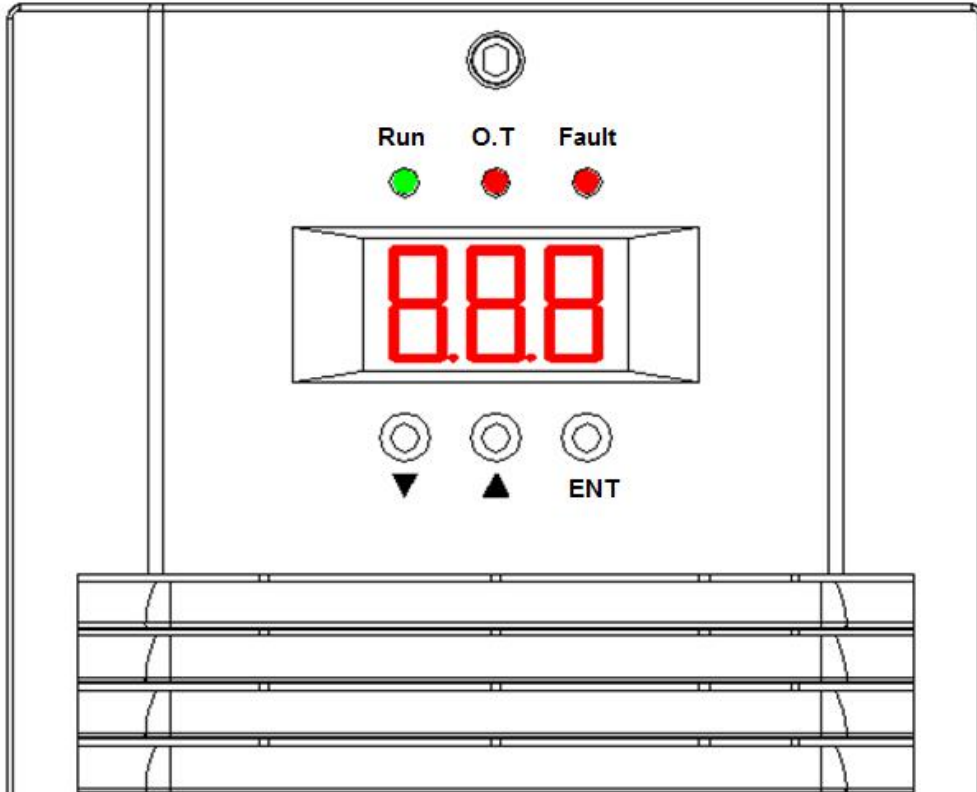
②The natural cooling module top, bottom, left and right side should be with the good natural ventilation environment

③The fan cooling module's front and back should be with the good air ventilation environment.

④ when module parallel connection, need to connect the “current sharing +” and “current sharing -” for each module, then the output will make the current sharing automatically-between each module.

⑤ connect RS485A and RS485B of each module to the monitor and controller, then the monitor and controllers will control the module automatically.

3.4 Operation Introduction



3.4.1 Indication light

There are three indication lights on the module panel, table 4-1 shows the function of them.

table 4-1

Operation instructions	Normal State	Fault State	Fault Reasons
RUN Power indicator light (green)	on	off	No input voltage
O.T. Over temperature light (red)	off	on	Module internal overheating
Fault Fault light (red)	off	on	Module internal fault

3.4.2 Buttons for displaying panel switch

The up and down button is used to switch the display of current and voltage. If the screen is displaying the output voltage, after you push the button, it will display the output current. if you push the button again, then it will display the output voltage.

3.4.3 Introduction of operation:

(1) When power on, the display will show the existing output DC voltage.

(2) Touch “▲” or “▼” button, it will show the existing voltage (voltage accuracy is 1V)”, or existing current (current accuracy is 0.1A) , or the “existing failure code”

(3) Long press (hold down) the button “ENT”, it will be the “Setting mode”. The default setting mode is “F01”, touch“▲” or “▼” button to show the options from “F01” to “F15”. If short time press the button “ENT”, it will choose this option, If long press “ENT”, it will not choose, and will return to the display mode.

(4) when it show the options from “F01” to “F15”, then short press “ENT” button to enter parameter setting mode, all parameters will flicker, touch“▲” or “▼” button to change the parameter, then short press “ENT” button, it will save this parameter. If long press “ENT” button, it will return to display mode without saving the parameter.

(5) In the Setting mode, if no button operation within 15 seconds, it will return to the display mode without saving the parameter.

Re : Instruction and function for button code

Item	Code	function	specs	default	Step size
1	F01	Working mode set	0: independent; 1: manual; 2: auto	2	
2	F02	Module communication protocol	0: Modbus; 1: TH	0	
3	F03	Over voltage alarm set	under voltage alarm ~ max value	260V/130V	1V
4	F04	Under voltage alarm set	Min value ~ over voltage value	190V/95V	1V
5	F05	charging status when module power on	0: float charge; 1: boost charge	0	
6	F06	Float charge voltage set	Min value ~ boost charge	242V/121V	1V

			voltage		
7	F07	Boost charge voltage set	Float charge voltage ~ max value	253V/126V	1V
8	F08	Charging current limit set	10% ~ max value	105% of the rated value	0.1A
9	F09	Current set from float charge to boost charge	The current of switching to float charge ~ max value	80% of the current limitation value	0.1A
10	F10	Current set from boost charge to boost charge	0.5 ~ the current of switching to boost charge	20% of the current limitation value	0.1A
11	F11	end current charging time	0 ~ 10hours	3h	1hour
12	F12	Max boost charging time set	0 ~ 99hours	10h	1 hour
13	F13	timing boost charging time set	0 ~ 999days	180days	1day
14	F14	dry contact output of module fault	0: normally open; 1: normally close	reserve	
15	F15	Module's address set	0—31	0	

3.4.4 Fault Display

Alarm information are displayed in the LED display with fault code. Fault code as shown in Table below.

Table 4-2

Item	Code	Fault instruction	Red light display
1	E01	Output under voltage (alarm)	flicker
2	E02	Output over voltage (alarm)	flicker
3	E04	Output over voltage (power off)	Keep on always
4	E05	Over temperature (power off)	Keep on always
5	E06	Input under/over voltage (power off)	Keep on always
6	E07	Input phase failure (alarm, output power limitation)	flicker

3.4.5 Communication Function

The module can communicate with the host PC via RS485 modbus. It can send the output voltage and current, the module protection and alarm information to the host PC, accepting and implementing the command from the host PC.

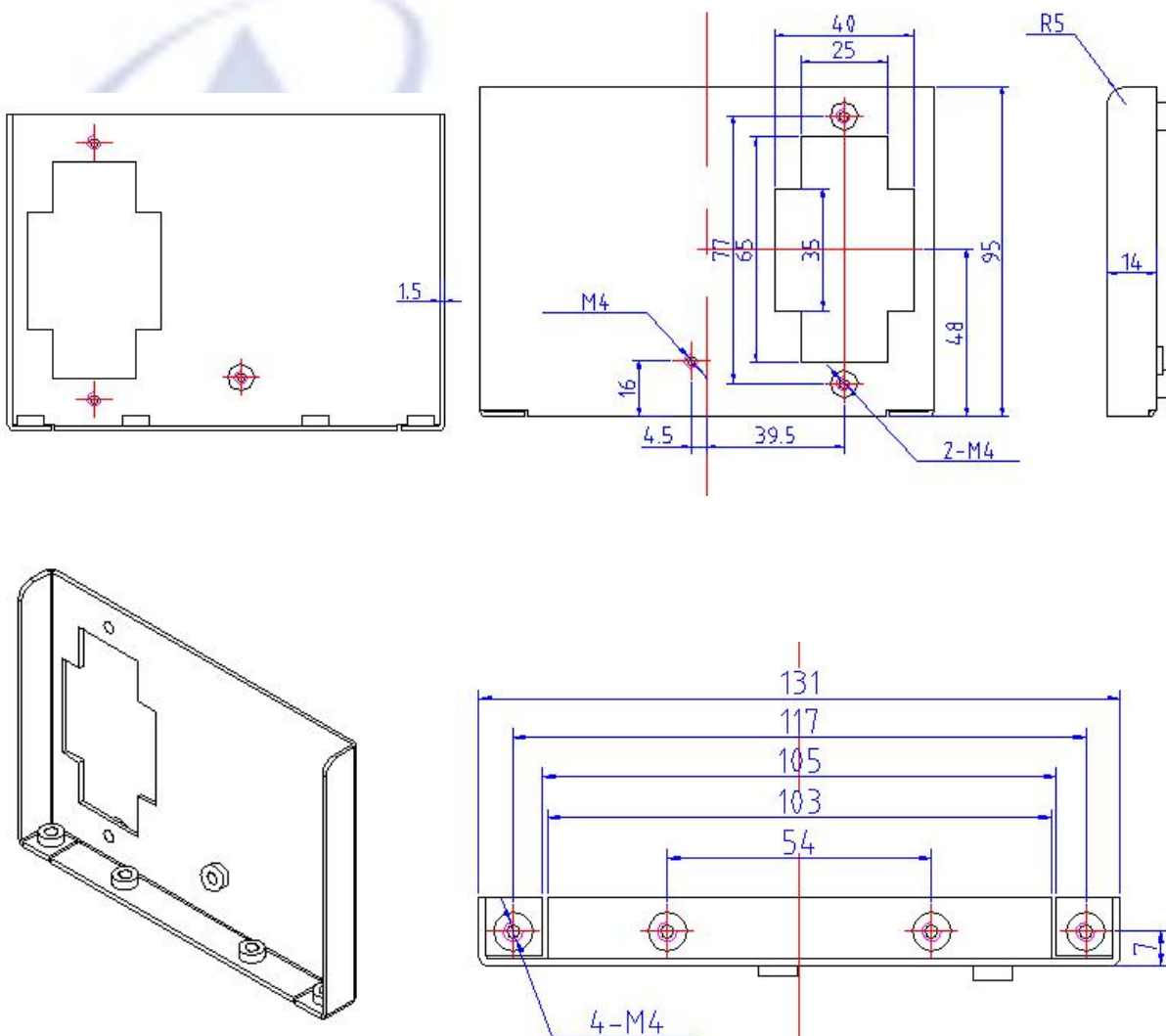
Note : When the module is in automatic mode, and no communication with monitor and controllers in 4 minutes. The module output voltage would become 234VDC automatically.

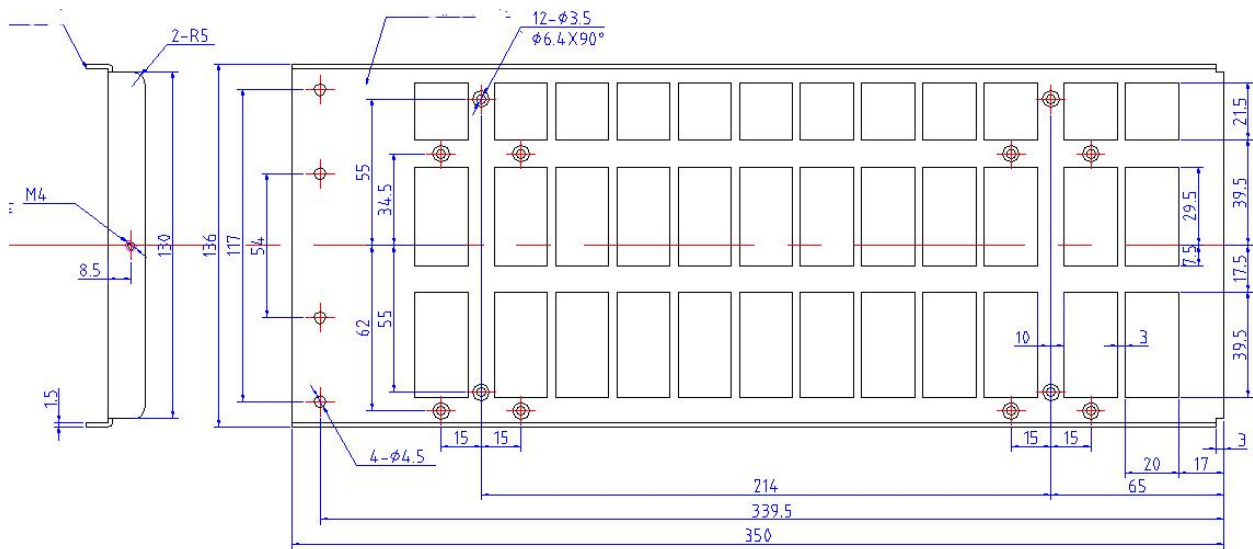
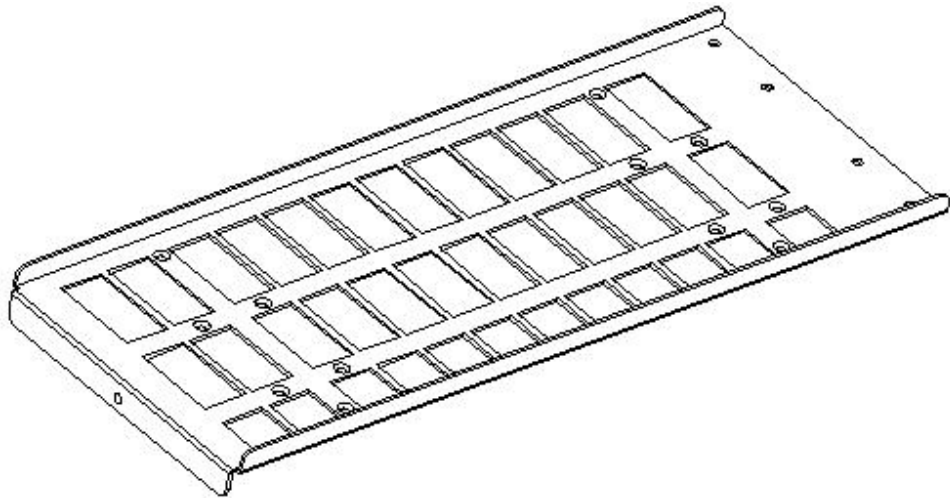
Appendix

Module shelf:



AT22010N, AT11020N, AT22010N-220AC, AT11020N-220AC





AT22020N, AT11040N, AT30020N

