

3. INSTALLATION

3.1. Conditions for use

Hanggng Brake unit should be installed inside the house where is ventilative.

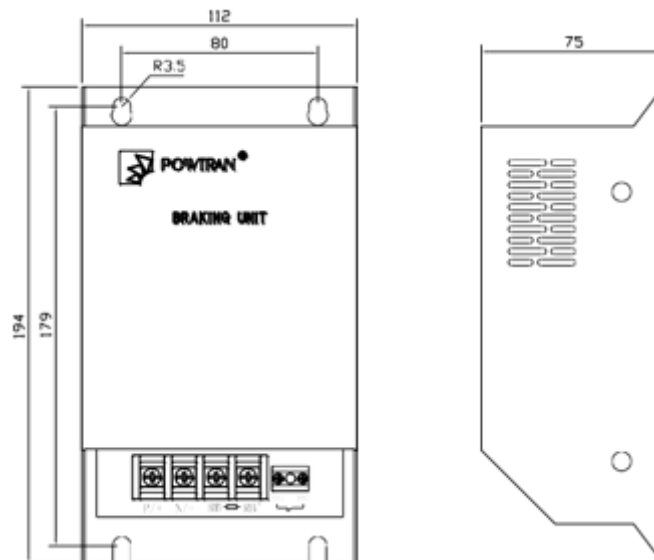
Ambient condition should accord with the followings: (1).Ambient temperature $-10^{\circ}\text{C}\sim 40^{\circ}\text{C}$. $0^{\circ}\text{C}\sim 40^{\circ}\text{C}$

(2).Prevent dropping dust, powder, cotton fiber or fine metal powder from entering it.

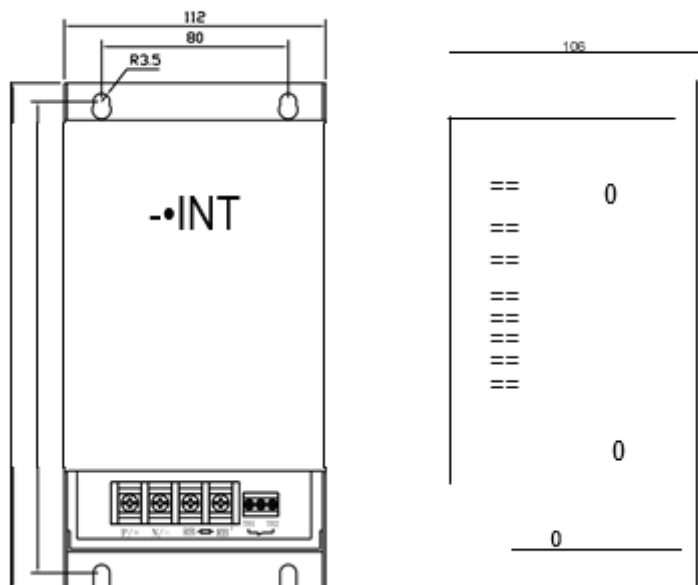
(3).Prevent oil, salt and corrosive gas from entering it. (4).Avoid vibration.

(5).Avoid high temperature and moisture and avoid being wetted due to raining, with the humidity below 90%RH (not dewing). (6).Prohibit the use in the dangerous environment where inflammable or combustibile or explosive gas, liquid or solid exists.

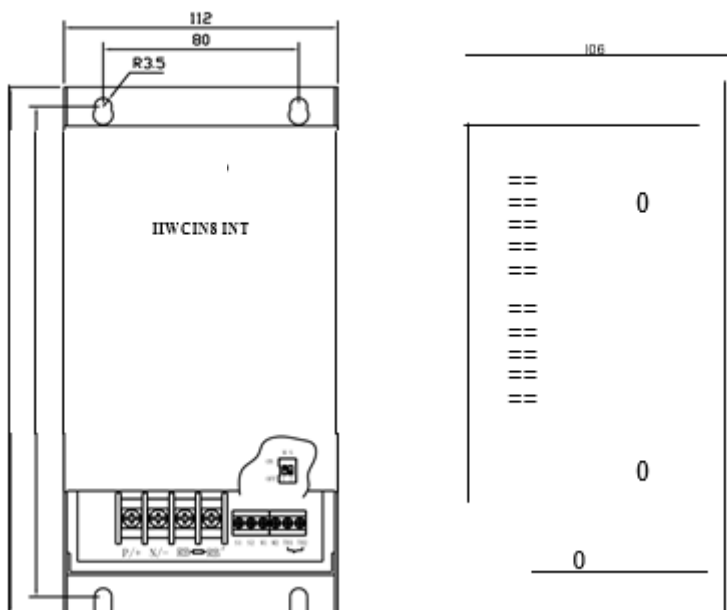
3.2. Sharp size



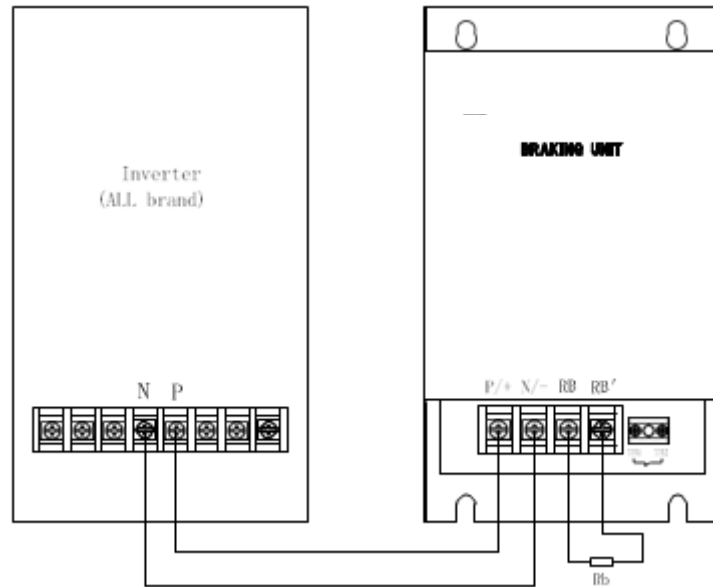
PB6014



PB6024



3.3. Main Circuit specification



Connection diagram of Brake unit and Inverter

Note : The distance of the connection between the inverter and brake unit should as short as possible less than 2cm.

No limitation to the distance between the brake resistor (Rb) and brake unit, but the shorter distance may cause less faults because of the broken cable.

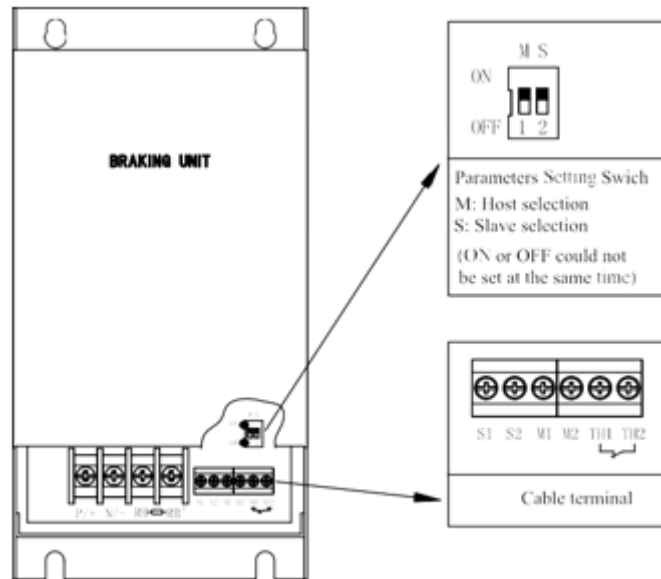
P,N is the “+”“-” of the DC bus in the inverter, P is positive, N is negative.

The DC cables should be winded to reduce the radiation and inductance.



Warning: Incorrect connection of the main circuit will lead the damage to the brake unit and inverter.

4. FUNCTION PARAMETER DESCRIPTION



Parameter setting switch and control terminal

Note: Only PB6034 have M, S slave and host selection, but other type no. The voltage class is set OK during the factory setting.

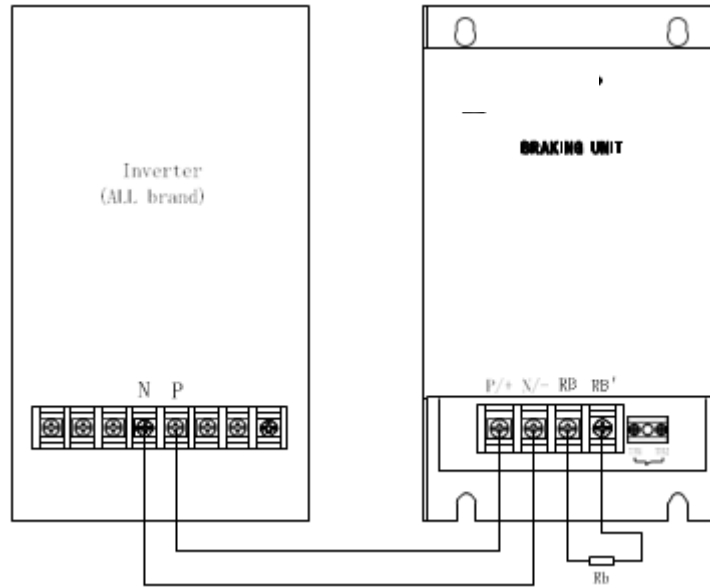


Warning: Incorrect selection of the slave and host will lead abnormal running and damage!

Description of control circuit terminal of the brake unit

Terminal	Specification	Note	
Parameter Setting switch	1	Slave and host selection switch, when M is ON, the brake unit is set to be host brake unit	Factory setting: ON
	2	Slave and host selection switch, when S is ON, the brake unit is set to be slave brake unit.	Factory setting: OFF
Control	M1/M2	Slave and host control terminal	
	S1/S2	Slave and host control terminal	
	TH1/TH2	OH protection switch(always close)	

5. SINGLE UNIT RUNNING



Connection diagram of single brake unit and inverter

When 1 unit is used, please refer to the above diagram, connect the inverter, brake unit and brake resistor and run it.

6. PARALLELED RUNNING

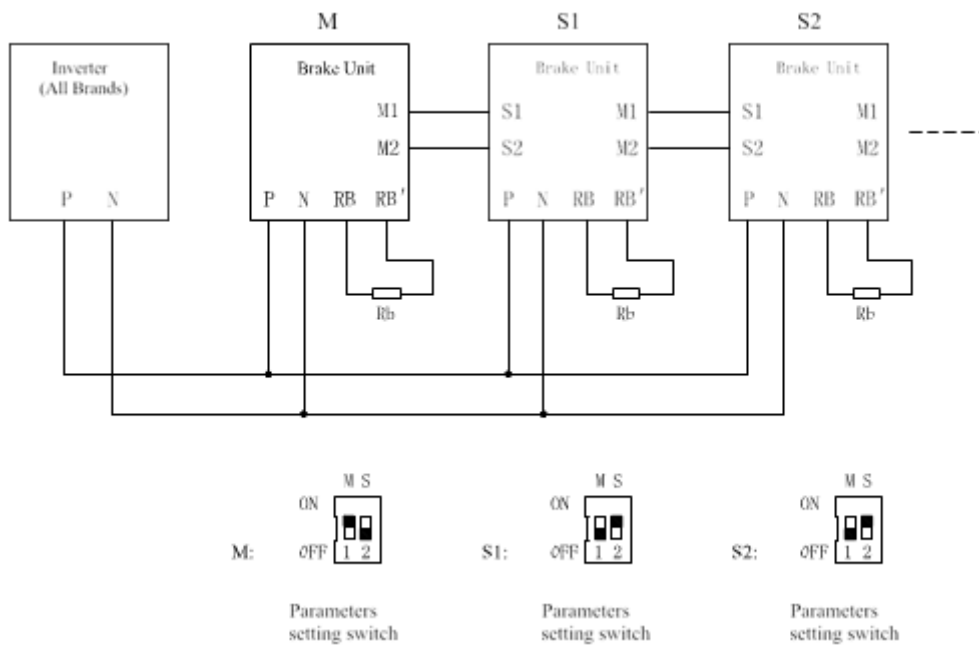


Diagram of the connection of paralleled running brake unit and inverter (Only PB6034 with this function). If 2 or more over brake units are paralleled, please refer to the above diagram and connect the inverters, multiple brake units and brake resistors.

6.1. Host and slave select of function setting

- (1) The factory setting of the brake unit is set to be the host (M), do not modify the factory setting if only one brake unit is used.
- (2) When 2 or more over brake units are paralleled, the control terminal (S) is used. Please refer to the "Host and slave control connection".

6.2. Host and slave control connection

- (1) The brake unit has host/slave switch. Set the brake unit 1 to be "M", the brake unit 2 and 3 to be "S"
- (2) Connect separately M1, M2 of the brake unit 1 with S1, S2 of the brake unit 2; Connect separately M1, M2 of the brake unit 2 with S1, S2 of the brake unit 3. Etc.

Note : Double wind the M1, M2 and S1, S2, and please make it as short as you can; the maximum paralleled brake units is only 10.

7. VOLTAGE SET AND CALCULATION

Voltage	Input power voltage of inverter	Brake start voltage(PN)
380V	370VAC~450VAC	670VDC±3

7.1. Why brake voltage 670V ?

Brake unit voltage is from 630V to 700V, how to select the right voltage? In China, it should select according to Chinese electric net. Brake voltage should be on the following 2 standards:

- Brake voltage should be large enough and not lead the brake unit misact because of the raised voltage of the electric net.

The electric net fluctuates in China. Some places the voltage will be over AC 450V, the inverter DC voltage is 640V, the safe voltage should be larger than that. If the brake voltage is set low, the brake resistors may be burned. The actual fluctuation is ±20%.

- Brake unit voltage should be low enough, make the inverter run at about the rated voltage, ensure the safe running of the equipments.

High brake voltage could ensure that the brake unit would not misact but too high voltage will do damage to the long running equipments, especially to the inverter with spares of low voltage. At the same time, high voltage will also make the motor voltage saturated, motor waste and decline control precision.

7.2. PB60 brake unit characteristic :

- Special circuit design for any resistor in the market, no need for senseless resistor.
- When abnormal working, no damage to the inverter. P-N will not be short circuited if the cable connection is good.
- Suitable for domestic electric net, normal running in 300V to 460V.
- Profession manufacture, keeps improving.

7.3. Brake unit function :

In the system of frequency conversion, motor decelerates and stops by reducing the frequency. At the moment of frequency reduction, motor's synchronization rotate speed declines, and because of machinery inertia, motor rotor rotate speed remains. When synchronization rotate speed is smaller than rotor rotate speed, the phase of rotor current almost becomes 180, motor turns from electromotion to electricity generation. Meanwhile torque of motor axis changes to brake torque and decelerate the motor speed quickly, motor is during regeneration brake, motor regeneration energy feedback to DC bus via fly-wheel diode. Because the energy in the DC circuit could not feedback to electric net by diode bridge but only absorbed by inverter, although other section could waste some energy but capacitor could accumulate electric charge for a short time and forms " pumps raise voltage" to enlarge the DC bus voltage. Too high DC voltage will damage the spares. So to manage such regeneration energy, brake unit (resistor) should be used to waste them, otherwise the inverter will be OU or faulted.

7.4. Brake current calculation :

Brake current is the DC current in the brake unit and brake resistor.

380V Standard AC motor: P Motor power。

K----- Conversion efficiency of the machine energy when feedback comes. Usually 0.7 (applicable for most occasion)

V DC working voltage. 670V

I Brake current.

Calculation norm: Motor electricity regeneration should be absorbed completely by resistor.

Motor electricity regeneration=1000*P*K=Resistor absorbing power.

7.5. Brake resistor calculation and selection :

Resistor value indirectly decides the system control moment. Too small brake moment will lead inverter OU.

380V Standard DC motor: P Motor power

K----- Conversion efficiency of the machine energy when feedback comes. Usually 0.7 (applicable for most occasion)

V DC working voltage. 670V

R Brake resistor equivalent value

Q Brake resistor rated waste power

S Brake resistor waste power safety coefficient 1.4

Kc----- The proportion of regeneration in the motor working procession (evaluate according to the load)

Normal Kc Value as below:

Centrifuge Kc=5%—20%

Elevator Kc=10%—15%

Oil field 油田磕头机 Kc=10%—20% Crane lower than 100m
Kc=20%—40% Occasional brake load Kc=5%

Others Kc=10%

Calculation norm: Motor electricity regeneration should be absorbed completely by resistor.

Motor regeneration energy=1000*P*K=resistor absorptivity V^2/R)

Resistor power calculation norm:

otor electricity regeneration should be absorbed completely by resistor and transfer to heat energy.

$Q=P*K*Kc*S=P*0.7*Kc*1.4$ Approximately $Q=P*Kc$

And : resistor power=motor power* Kc

7.6. Brake unit safty limit

Current in brake unit is $670/R$. Such current should not be larger than that the allowable maximum current.

8. FAULT DIAGNOSIS AND SOLUTIONS

No.	Fault	Possible cause
1	The brake resistor heated badly when it brakes.	Main circuit power IGBT of the unit short circuit
		Incorrect selection of the brake unit voltage
		Brake unit faulted
2	Inverter OU	Lack of braking of the brake resistor
		Not suited brake unit voltage
		Brake unit faulted
3	No brake sound	Brake resistor short or open circuit
		Cable connection not good
		Brake unit fault
4	relay action over heat protection	Heat sink temperature over 80°C

The electric net voltage is too high, please select the high voltage setting.



Warning : Open the P and N, ensure there is no voltage between PN when use and inspect the unit! This unit control circuit is not isolated circuit.

9. STANDARD SPECIFICATION

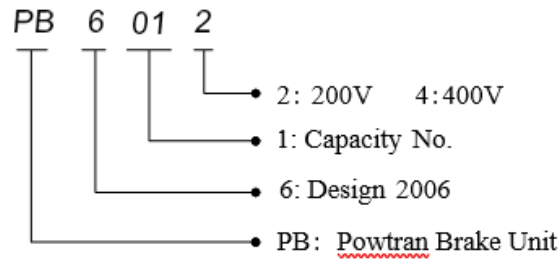
9.1. Model specification

400V (380/415)

Type	Sharp size	Allowed max. brake current (65°C)*
PB6014	A	40A
PB6024	B	75A
PB6034	B	100A

The allowed maximum current of the power spares IGBT inside the brake unit with the certain temperature.

9.2. Model designation



9.3. 400V specification and selection reference

KW	Brake Unit		Brake resistor (150% brake torque)	
	Type	Qty(pc)	Type	Qty(pc)
5.5	PB0614	1	75Ω/780W	1
7.5		1	50Ω/1040W	1
11		1	50Ω/1040W	1
15		1	40Ω/1560W	1
18.5		1	32Ω/4800W	1
22		1	27.2Ω/4800W	1
30		1	20Ω/6000W	1
37	PB6024	1	16Ω/9600W	1
45		1	13.6Ω/9600W	1
55		1	10Ω/12000W	1
75	PB6034	1	6.8Ω/12000W	1
93		1	6.8Ω/12000W	1
110		1	6.8Ω/12000W	1
132	PB6034	2	6.8Ω/12000W	2
160		2	6.8Ω/12000W	2
187		3	6.8Ω/12000W	3
200	PB6034	3	6.8Ω/12000W	3
220		3	6.8Ω/12000W	3
250		3	6.8Ω/12000W	3
280		3	6.8Ω/12000W	3

9.4. Brake resistor selection

- (1) PB6014 and 30KW inverter, the brake resistor should be with 130% brake torque.
- (2) Not any earthing accident allowed to the brake resistor, otherwise it will lead the serious damage to the unit and inverter.
- (3) Selection of the brake resistor capacity is for reference, it depends on the load inertia, brake frequency, etc characteristic. Please inquire Powtran when you have questions.