

HPI6000 Frequency Inverter



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Introduction



HPI6002(0.4-15)KW

All plastic molding design, light weight, compact size, noble elegant model design make the product elegant appearance.

The control panel can be disassembled with built-in speed potentiometer and easy to adjust frequency.

HPI6003(0.75-90) KW

Friendly user interface, programme operation, LED digital indication, built-in PID regulator, easy to meet the different requirements of automation

HPI6006(110-500) KW

All components adopt the industrial or military class, key components are imported, such as EUPEC module, EPCOS capacitor.

Adopts perfect EMC design to minimize interference of electrical system and ensure stability of operation.



HPI6000 Series Frequency Inverters

Characteristic



• Motor parameter automatic adjustment

Built-in dynamic parameter automatic adjustment function, automatically identify motor parameter, ensure stability and precision of system.

• Protection function in all fields

Protection of under-voltage, over-voltage, over-current, prevention of motor stall, over-load and over-heat.

• Three operating modes

1. Standard V/F mode: Sine PWM wave output, AC current output detection, compensation for distortion due to dead time effect, reduction of motor torque vibration.

Advantages: Improve operation characteristic at low frequency, optimize working condition, enhance efficiency.

2. Sensorless vector mode: Frequency inverter operates through sensorless vector control calculation system, supply extra torque compensation voltage, not only increases motor torque at low speed, but also compensates the slippage difference caused by the load increasing.

Advantages: Realize parameter automatic adjustment, high torque at low frequency, high precision of rotation speed.

Adopt advanced programmable control terminals with the function of all kinds of machinery parameter setting in advance to increase the additional value of inverter.

3. Output power (torque) control mode: Output frequency can be decreased automatically while output power exceed upper limit value.

Advantages: This function can substitute the tension sensor, magnetic powder coupler, mechanical clutch and so on.

• Communication function

Built-in RS-485 standard communication, one or more frequency inverters can be dynamically controlled by one computer at the same time, besides that, one computer may simultaneously control nearly 99 frequency inverters (Relay amplifier must be installed when the number of frequency inverters exceeds 31 units). Supply HPI protocol and standard MODBUS Protocol.

• High output frequency

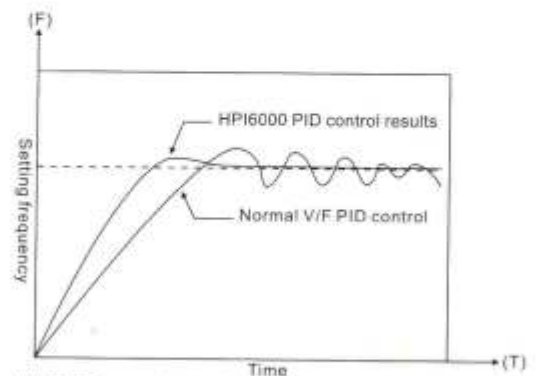
The range of output frequency of KV6000 Vector Frequency Inverter is from 0 to 650Hz, much better than other traditional frequency inverter.

Power of motor: 0.75~500KW

Voltage supply: 220V/380V/460V/575V/660V

• Rich function of built-in PID regulator

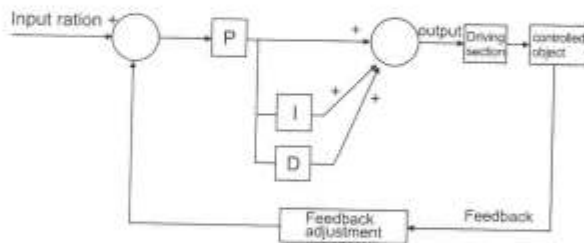
Fan, pump, compressor, boiler, central air conditioning and so on, most of them belongs to degression torque load, achieve the close-loop circuit controlling by PID adjustment. HPI6000 frequency inverter adopts the up-to-date fuzzy control technology to achieve the best PID adjustment function (See the following diagram PID comparison with other traditional inverter)



HPI6000 comparison with other brand frequency inverter

Characteristic

It can be selected PID automatically by digital signal terminal during the operation.
It can be monitored PID output value and related parameter by analog AM output signal.
Suitable for all kinds of the sensor. PID feedback signal can be voltage(0-5/0-10v) or current (4-20mA)



HPI6000 PID control principle diagram

• Unique cooling Fan

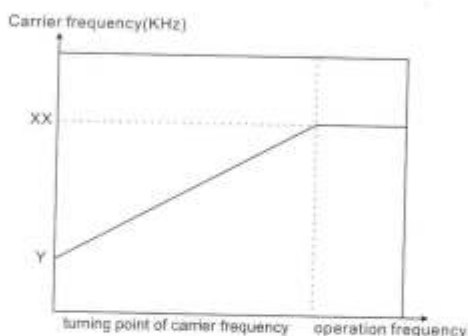
Cooling fan with ON/OFF automatic control function so as to extend life of fan.

• Special control function for industrial mechanic design

HPI6000 sensorless vector inverter adopts the design of programmable control terminal, nearly 100 kinds of selective function from digital input and output terminals, 3 group of analog signal input, with many kinds modes for restart function after the trouble and instant power off and breakdown, built-in PID adjustment function, singal treatment function needed by gearing proportion, Frequency oscillation function in spinning, more speed section choice, automatic operation function and so on.. HPI6000's unique torque limitation function can be used in winding machine.

• Unique variable carrier frequency (2~16KHz)

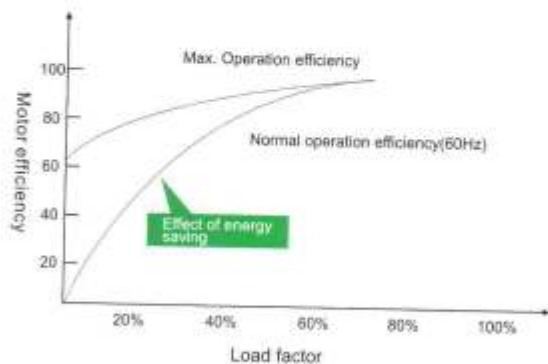
HPI6000 sensorless vector frequency inverter can switch the carrier frequency automatically during the operation.



When operation frequency is higher than the turning point of carrier frequency, the carrier frequency becomes maximum setting value of the carrier frequency, otherwise the carrier frequency automatically adjusts between the maximum carrier frequency and the minimum carrier frequency according to the operation frequency.

• Energy saving control

To achieve the high efficiency during the energy saving control operation of HPI6000 sensorless frequency inverter through maximum efficiency control, sensorless vector control and constant power control and V/F control. Not only fan and pump, but also ordinary mechanical apparatus run at extraordinary energy saving effect.



• Safe and precise protection function

With the high speed and high precision current limitation control function to control the trip caused by over current and improve the operation continuity of restart after instantaneous stop and stall and restart from the trouble.

More advantages of HPI6000 driving characteristics comparison with traditional products.

• HPI6000 sensorless vector control mode

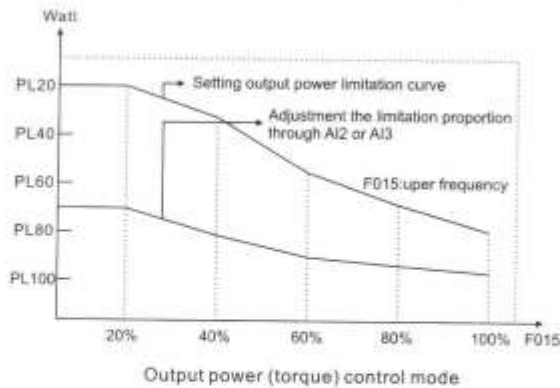
- *The function of automatic parameter identification and automatic slipperly difference compensation
- *Stable dynamic performance, quick response
- *Rotating speed with high precision (highest precision 0.5%)
- *Achieve output torque (power) control mode
- *High torque at low rotor speed (150% rated torque at 15~300rpm)

• Spatial voltage vector control

- *Normal V/F control mode
- *Torque shortage at low frequency, motor oscillation at low rotating speed, high fluctuation of rotating speed
- *Open-loop circuit control, poor dynamic response. Torque cannot be adjusted even in the entire rotating speed range. Torque response is very poor when the rotating speed is near to 0rpm.
- *Poor rotating speed adjustment.

Technical date

• Output power (torque) control mode



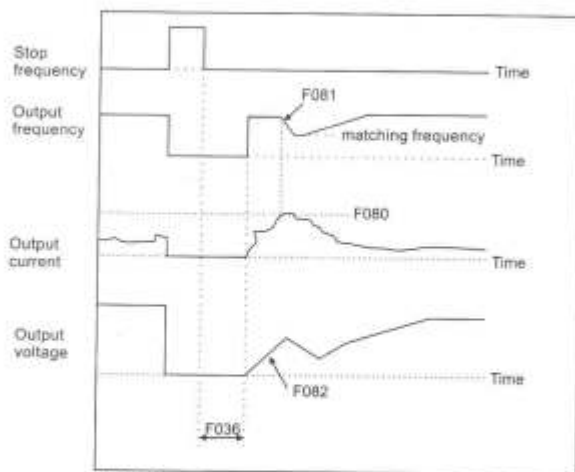
Apply in automatic tension control (Example: apply in reeling machine), output power (torque). This control mode can substitute the mechanical clutch and the magnetic power clutch

• Gearing proportion control

HPI6000 series frequency inverter with the function of the parameter automatic identification and slippery difference compensation, in this way, the slippery difference of low speed and high speed will be the same, the precision of speed adjusting will be higher, that is the reason to ensure the rotating speed precision and adjustment automatically under voltage changed and load factor changed. It is specialized in mechanical system of high torque precision drive and more motors gearing proportion control.

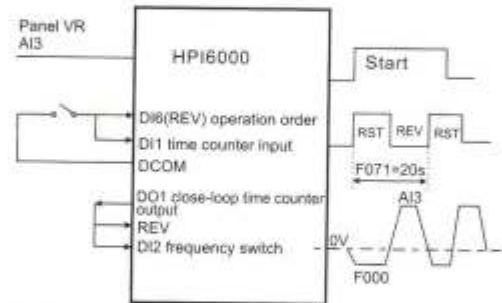
• Speed tracing when instantaneous power off and restart after the trouble.

For speed tracing function, when restart after instantaneous power off, it can detect the rotating speed at that time, then input the proper frequency to reduce the surge current, it is specialized in fan and pump.



HPI6000 rotating speed tracing

• Operation frequency with the elastic choice, the time counter realizes the operation control automatically.

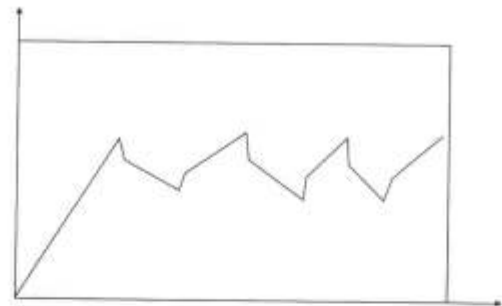


HPI6000 simple connection realizes file complex processing

Note:

The function of DI1, DO1 can be set the time counter with period of 20sec by F041, F045 and F071. When SW1 is "on", the frequency inverter starts to run, the time counter starts. The output of time counter decides the motor REV or RST, repeat it every 20sec. The first 10sec, the frequency inverter RST with 60HZ. The last 10sec, the frequency inverter forward with VR setting value.

• Automatic operation function



Automatic operation function with many kinds of changes instead of the simple PLC, it is for many special requirements. With simple setting, the operator can to achieve the industrial mechanical needed function.

Technical data

Technical data and specification list

HPI6000 sensorless vector frequency inverter		
Specification and structure		Type
Series		G series general type P series pump and fan type Z series injection molding machine type B series elevator
Structure	Protection	Protection IP20
	Rated voltage	220V/380V
Power input	Phase number and frequency	3 phase 50/60 Hz
	Permission mobility scale	Voltage:±20%, frequency:±5%
	Low voltage protection point	80% rated voltage
Power output	Over current	G series 150% one minute P series 130% one minute Z . B series 200% one minute
	Cooling method	Air cooling
	Temperature protection	Fan starts when radiator temperature is above 45 °C ,trip to OH when 80 °C
Control and output data	Control mode	sensorless vector control constant power control VF control
	Frequency output scale	0.00~650.00Hz
	Frequency resolution	Keyboard setting:0.01Hz analog setting:0.1Hz
	Basic frequency	0.5~650Hz
	Dynamic braking	Under 11kw built in brake unit,15kw brake unit external connection
	DC braking	DC braking voltage can be adjust 0~30%,permission 0.5~650Hz braking, braking adjusted 0.0~25sec. Accelerating time 0.1~6553sec
	Low frequency torque compensation	0~30%
	Motor overheat detection	For motor overheat protection function, preset input terminal to be OH, open-loop can be run, close-loop trips and indicates O.H.
Control signal	Standard function	Rotating speed tracing, suspension deceleration, PID control, automatic speed compensation automatic adjustment voltage output.(AVR), 16 section of speed operation, power (torque) control, frequency jump, torque limitation, more speed section operation automatically up-down control, frequency oscillation operation, signal superposition control, automatic reset, time counter, FWD and REV unit.
	Analog input	0~5/10V,0~20MA,0~1A(Z), protectionmeter,3groups,can be superposed.
	Analog output	0~10V programmable analog output
	Digital input	6 groups multifunction programmable digital input terminals,99 functions can be selected
Communication interface	Digital output	2 groups programmable open loop electrode output, one of group with relay output, total 93 kinds of function can be selected
	RS-485	Built-in communication, dynamic control more inverters up to 99
Indication function	7sections indication	Output current, power factor angle, output power, input power, power factor, time of counter etc. Overload accumulation to be standard value, power output limitation output frequency switch calculation, DC bus bar voltage, output voltage, temperature etc.
Protection function	Standard function	Circuit shortage, over-voltage, under-voltage protection, ground connection, output loose phase, motor over-heat
Installation environment requirement	Ambient temperater	-10~50 °C(radiator not up to 80 °C) sunlight not perpendicular incidence
	Ambient humidty	Within 90%RH(no water condensation)
	Ambient environment	Without rust, flammability, explosivity, adsorbable dust.
	Shaking	Below 0.5G
	Altitude	Under 1000m, shall reduce the rated current if exceed

Control panel introduction

Function



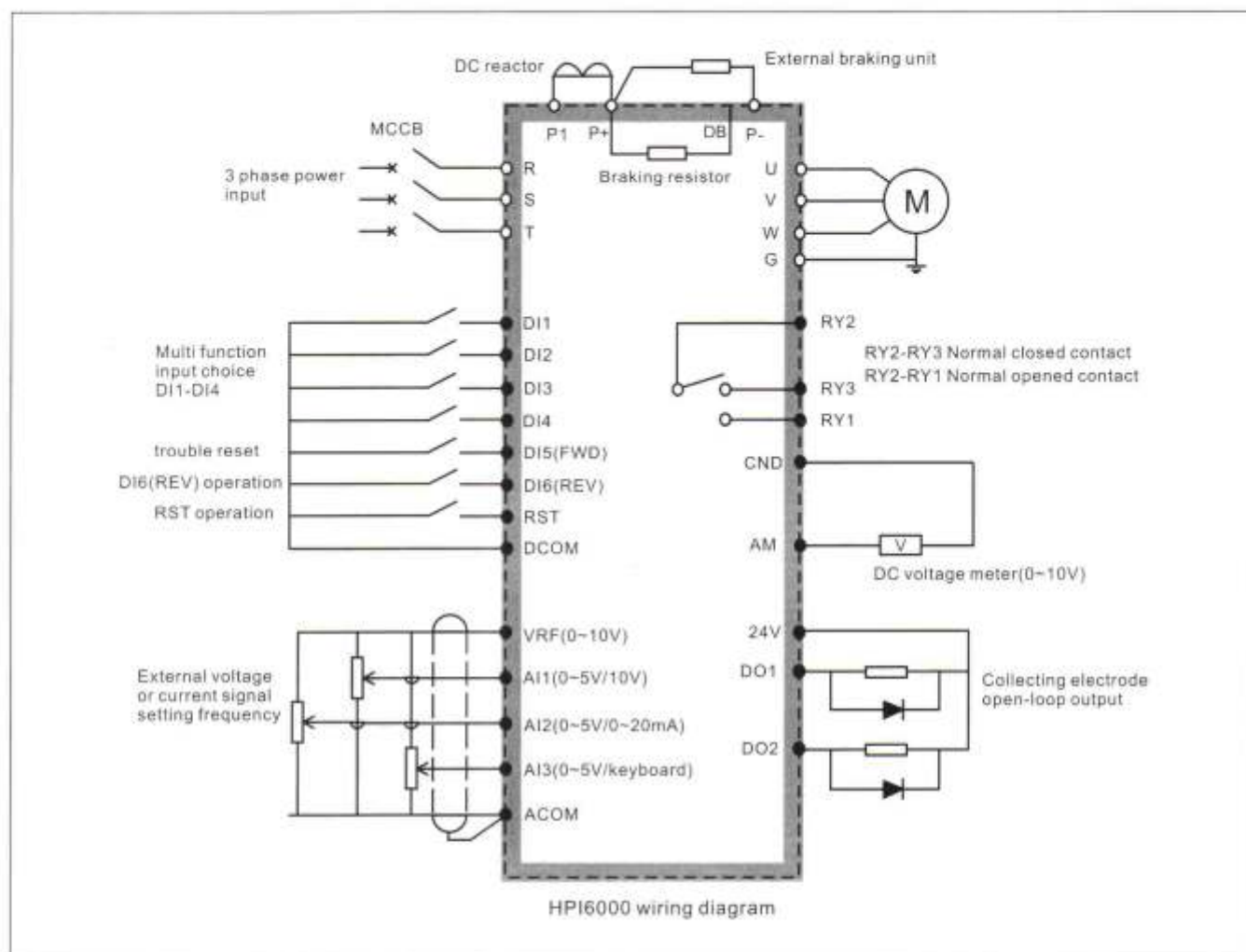
	Monitor key	Inverter can be switch between CTL MODE and MON MODE
	Programmable key	Inverter can be switch between PAR MODE and ALM MODE
	FWD key	When F039=0,FWD to be effected
	REV key	When F039=0,REV to be effected
	Up key	Parameter up
	Down key	Parameter down
	Stop key	To stop during operation, To clear trouble and reset during the trouble, To move the position during the read/write status.
	Read/write key	For read parameter data or confirm the input data.

Note:

- HZ: Indication of frequency data
- I: Indication of current
- FWD: Indication of FWD
- REV: Indication of REV



Basic connection diagram



Instruction of control terminal function

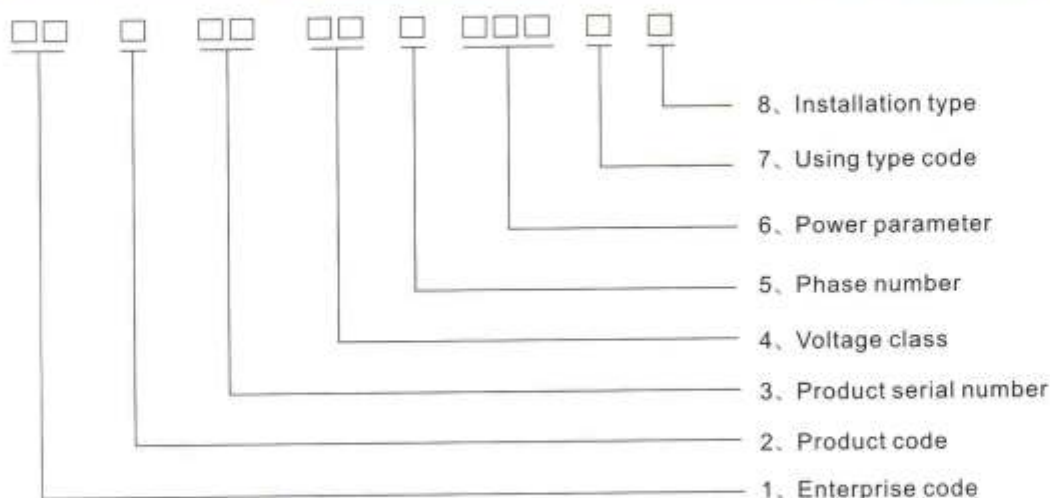
Type	No.	Function	Factory setting
Analog input output	A11	Analog signal input (0-5V,0-10V)	0-10V
	A12	Analog signal input (0-5V,0-20mA)	4-20mA
	A13	Analog signal input (0-5V,potentiometer adjusting speed)	potentiometer adjusting speed
	AM	Analog signal input (0-10V)	Output frequency
Control terminal	DI1	Multifunction input terminal 1	Between Din(n=1,2,3,4)-DCOM, circuit short connection to be effected, other function set by F041-F044
	DI2	Multifunction input terminal 2	
	DI3	Multifunction input terminal 3	
	DI4	Multifunction input terminal 4	
	DI6 (REV)	FWD control terminal	Effective when COM terminal to be closed
	RST	REV control terminal	
	REV	Trouble reset input terminal	
digital output terminal	DO1/DO2	Multifunction programmable collecting electrode output, setting by F045, F046	Max load current 50A, Max voltage 24V
Relay output terminal	RY1 RY2 RY3	Relay output terminal multifunction programmable relay output, setting by F047	Contact capacity 250VAC-3A 30VAC-1A
Power connection	24V	Supply power of 24 V	24V-100mA
	DCOM	Common terminal 24 V	
	VRF	Supply 10V/5V analog power 5V/50mA 10V/20mA	JP7 jump line choice 5VDC/10VDC
	ACOM	analog power ground terminal	

Terminal function

- *6 groups digital programmable input (100 functions for option)
- *3 groups analog input
- *1 group analog programmable output (17 functions for option)
- *2 groups collecting electrode (94 functions for option)
- *1 group programmable relay output (94 functions for option)
- *10V/5V accessory power supply output for analog setting input
- *24V-100mA accessory power supply output for digital input

Model instruction

Instruction of frequency inverter model



Annotation:

1. Enterprise code; HP means hagn, SL means solcom
2. Product code; R:soft starter, I:frequency inverter
3. Product serial number; 10:1000 series, 60:6000 series
4. Voltage class; 02:220V;03:380V;05:575V; 06:660V;09:960V ;11:1140V
5. Phase number; T:trip phase S :single phase
6. Power parameter; D75:0.75KW, 075:75KW, 315:315KW
7. Using type code; G:constant torque type P:blower/water pump type
Z :injection molding machine type B:lifting type
8. Installation type; A:cabinet machine B:hang-up machine C:bare machine D :spare parts

Classification of HPI6000 series

Classification	HPI6002	HPI6003	HPI6004	HPI6005	HPI6006
Voltage class	AC220V	AC380V	AC460V	AC575V	AC660V
Voltage range	AC220~240V	AC380~440V	AC460~480V	AC575~600V	AC660~690V

Frequency inverter model range

G cabinet machine

Power (KW)	Nominal value	Current (A)	Nominal value	Current (A)	Nominal value	Current (A)	Nominal value	Current (A)	Nominal value	Current (A)
	HPI6002T		HPI6003T		HPI6004T		HPI6005T		HPI6006T	
0.75	D75GB	4	D75GB	2.5	D75GB	2.5	D75GB	--	D75GB	--
1.5	1D5GB	7	1D5GB	3.7	1D5GB	3.7	1D5GB	2.5	1D5GB	--
2.2	2D2GB	10	2D2GB	5	2D2GB	5	2D2GB	4	2D2GB	--
4	3D7GB	16	3D7GB	9	3D7GB	8	3D7GB	6.5	3D7GB	--
5.5	5D5GB	20	5D5GB	13	5D5GB	11	5D5GB	8.5	5D5GB	--
7.5	7D5GB	30	7D5GB	16	7D5GB	15	7D5GB	10	7D5GB	--
11	011GB	42	011GB	25	011GB	22	011GB	17	011GB	15
15	015GB	55	015GB	32	015GB	27	015GB	22	015GB	18
18.5	018GB	70	018GB	38	018GB	34	018GB	26	018GB	22
22	022GB	80	022GB	45	022GB	40	022GB	33	022GB	28
30	030GB	110	030GB	60	030GB	55	030GB	41	030GB	35
37	037GB	130	037GB	75	037GB	65	037GB	52	037GB	45
45	045GB	160	045GB	90	045GB	80	045GB	62	045GB	52
55	055GB	200	055GB	110	055GB	100	055GB	76	055GB	63
75	075GB	260	075GB	150	075GB	130	075GB	104	075GB	86
93	095GB	320	095GB	170	095GB	147	095GB	117	095GB	98
110	110GA	380	110GA	210	110GA	180	110GA	145	110GA	121
132	132GA	420	132GA	250	132GA	216	132GA	173	132GA	150
160	160GA	550	160GA	300	160GA	259	160GA	207	160GA	175
187	187GA	600	187GA	340	187GA	300	187GA	230	187GA	198
200	200GA	660	200GA	380	200GA	328	200GA	263	200GA	218
220	220GA	720	220GA	415	220GA	358	220GA	287	220GA	240
250			250GA	470	250GA	400	250GA	325	250GA	270
280			280GA	520	280GA	449	280GA	360	280GA	330
315			315GA	600	315GA	516	315GA	415	315GA	345
355			350GA	680	350GA	590	350GA	470	350GA	390
400			400GA	750	400GA	650	400GA	520	400GA	430

- 1: over-current multiple of G type is 1.5; over-current multiple of G type is 1.2; over-current multiple of B type and Ztype is 2.
- 2: within braking unit when power is under15KW.
- 3: within DC reactor when power is under30KW.
- 4: 0.75~30KW are plastic shells.
- 5: 110KW~400KW are cabinet types.

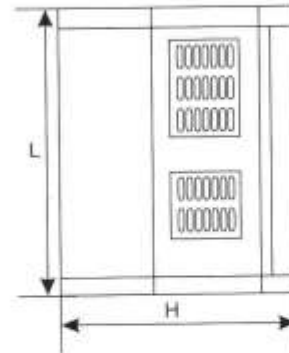
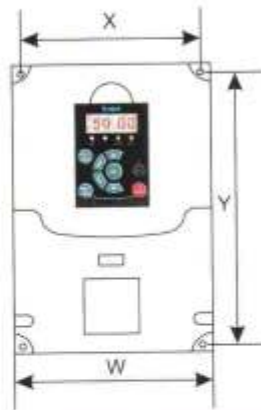
Frequency inverter model range

P series blower, water pump

Power (KW)	Nominal value	Current (A)	Nominal value	Current (A)	Nominal value	Current (A)	Nominal value	Current (A)	Nominal value	Current (A)
	HPI6002T		HPI6003T		HPI6004T		HPI6005T		HPI6006T	
7.5	7D5PB	30	7D5PB	16	7D5PB	15	7D5PB	10	7D5PB	15
11	011PB	42	011PB	25	011PB	22	011PB	17	011PB	18
15	015PB	55	015PB	32	015PB	27	015PB	22	015PB	22
18.5	018PB	70	018PB	38	018PB	34	018PB	26	018PB	28
22	022PB	80	022PB	45	022PB	40	022PB	33	022PB	35
30	030PB	110	030PB	60	030PB	55	030PB	41	030PB	45
37	037PB	130	037PB	75	037PB	65	037PB	52	037PB	52
45	045PB	160	045PB	90	045PB	80	045PB	62	045PB	63
55	055PB	200	055PB	110	055PB	100	055PB	76	055PB	86
75	075PB	260	075PB	150	075PB	130	075PB	104	075PB	98
93	095PB	320	095PB	170	095PB	147	095PB	117	095PB	121
110	110PA	380	110PA	210	110PA	180	110PA	145	110PA	150
132	132PA	420	132PA	250	132PA	216	132PA	173	132PA	175
160	160PA	550	160PA	300	160PA	259	160PA	207	160PA	198
187	187PA	600	187PA	340	187PA	300	187PA	230	187PA	218
200	200PA	660	200PA	380	200PA	328	200PA	263	200PA	240
220	220PA	720	220PA	415	220PA	358	220PA	287	220PA	270
250			250PA	470	250PA	400	250PA	325	250PA	330
280			280PA	520	280PA	449	280PA	360	280PA	345
315			315PA	600	315PA	516	315PA	415	315PA	390
355			350PA	680	350PA	590	350PA	470	350PA	430
400			400PA	750	400PA	650	400PA	520	400PA	

Note: the outline dimension of P type is one size smaller than G type.

Installation dimension



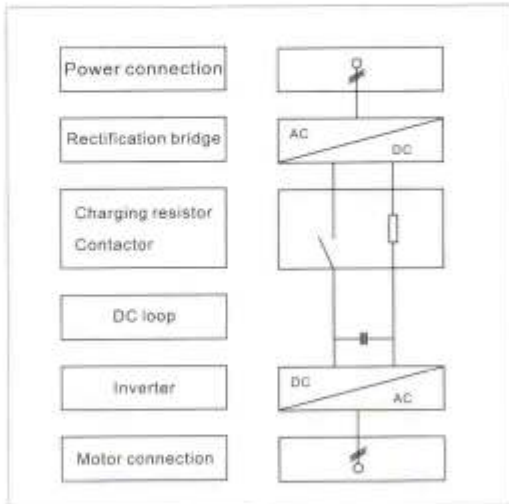
Power degree (kW)	L (mm)	W (mm)	H (mm)	X (mm)	Y (mm)	Mounting hole (φ)	Gross weight (kg)	Chart Number
0.4~0.75	140	85	125	77	132	4	1.5	Chart 1
1.5~2.2	170	125	165	157	112	5	2	
3.7~5.5	219	150	174	136	205	5	3	
7.5~15	300	216	212	202	290	6		
18.5~30	380	270	275	255	365	7		Chart 2
37~55								
75~92								



Power degree (kW)	L (mm)	W (mm)	H (mm)	Y (mm)	Gross weight (kg)	Chart Number
110~132	700	510	1600	508		Chart 3
160~200	800	560	1800	608		
220~315	1000	600	2000	808		Chart 4
350~400	1200	660	2000	1008		

Application case

Application for one motor drive, such as: pump, blower, compressor, extruding machine, mixer, ball mill machine, mine elevator, metallurgical mill machine.



Basic structure

• Application in injection molding machine

- 1) Easy to operate
- 2) High reliability
- 3) Soft start, extending the service life of equipment and mold
- 4) Reducing the noise, improving the working environment
- 5) To detect the signal of pressure and flowrate and trace to control automatically, then supply the proper power to achieve the energy saving, energy saving up to 30%-70%.

• Application in air compressor

To supply high torque under low speed.

- 1) Keep the pressure of compressed air constant
- 2) Energy saving, reduce the cost of operation.
- 3) Improve the pressure control precision
- 4) Extending the service life of compressor
- 5) Reduce the noise of compressor

• Application in CNC lathe

The frequency inverter can detect the parameter of motor dynamic operation and adjust the parameter automatically, in this way, ensure the highest efficiency during the motor operation.

• Application in escalator

For escalator, it will be waste when it operates with no passenger, if use energy saving technology of HPI6000 frequency inverter, the escalator will operate when passenger on according to the sensor, the escalator also can decrease the speed or stop when passenger off according to the sensor.

• Application in elevator

HPI6000 frequency inverter adopts sensorless vector control technology to meet the requirement of elevator with high starting torque, it means the frequency inverter can supply 150% torque when 0HZ.

• Application in mixer

HPI6000 frequency inverter adopts voltage /frequency control to start motor softly, in order to avoid the strike of electric net and motor itself and other equipments from motor starting with full voltage.



Application case

• Application in water pump

HPI6000 frequency inverter adopts the technology of changing frequency to adjust the speed. It can adjust the speed of the motor to control flowrate and balance the demand and supply to reduce the consumption of the motor. It also realizes to control the speed of motor with stepless speed regulation.

• Application in blower

HPI6000 frequency inverter adopts the built-in PID to adjust and control the rotating speed of blower to keep the air flowrate constantly, in this way, to meet the requirement of energy saving.

- 1) High efficiency: To adopt the technology of changing frequency to adjust speed, adjust the air flowrate directly, reduce the useless power, increase the working efficiency of system.
- 2) Energy saving: After changing frequency to adjust the speed, the blower operates at 30-45HZ, energy saving above 25%-70%, the frequency is lower, the energy saving rate is higher.
- 3) Extending system life: To realize the changing frequency soft starting, reduce the strike of electric net and motor itself, increasing the life of the motor and the system.
- 4) To boost the quality of blower operation: After changing frequency to adjust the speed, it can adjust the rotating speed and frequency to control the proper air flowrate.

• Application in textile machinery

- 1) To control the speed of motor with stepless speed regulation.
- 2) High precision speed, stable speed value.
- 3) Easy to adjust the speed
- 4) To protect the motor and start smoothly.

• Application in woodworking machinery

Stable speed adjustment and high efficiency.

• Application in printing machine

HPI6000 frequency inverter shall adjust the speed of main motor and rinsing motor to achieve the process of paper feed, inking, printing and ink rinsing.

• Application in extruding machine

- 1) High torque output when 0HZ
- 2) Automatic energy saving operation function can reduce the current according to the torque changing, in this way, not only energy saving, but also guarantee the reliable and stable.

• Application in horizontal type paper soaking production line

- 1) Adopt the RS485 communication to contact computer and ensure the system stable.
- 2) Technical grade modulation design, precision control synchronous, succinct man-machine conversation.

• Application in pulping papermaking production line

- 1) The frequency inverter with small volume and light weight, easy to install, simple testing, easy to operate, low noise without shaking.
- 2) Speed adjustment with high precision, the motor rotating speed without changed when the load and net voltage changed, so the frequency inverter has a good adaptability.
- 3) The frequency inverter with complete protection function, high integrated level, so it is more reliable, easy to maintain due to self-diagnosis function.
- 4) Good energy saving to save about 30% .
- 5) To adjust the motor with infinitely variable speeds, low starting current, and without the strike of electric net and motor itself and other equipments.



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