Powtran PI9000 series inverter Introduction

PI9000 series inverters are high performance open loop vector inverter for controlling asynchronous AC induction motors and permanent magnet synchronous motors. Applying the most advanced sensorless vector control technology with keeps pace with the leading international technology and DSP control system. The product enhances its reliability to meet the requirement of environment adaptability, customized and industrialized design with more optimized functions, more flexible application and more stable performance.

PI9100 series ,High performance vector control inverter

Rating :0.4 KW to 7.5 KW, 3 phase 220V/380 V

PI91000, 0.4KW～7.5KW,3 ph 220/380V

PI9200 series, High performance vector control inverter

Rating :5.5KW ～160 KW, 3 phase 220V/380V/480V/690V

PI92000,5.5 KW～160KW ,3 phase 220V/380V/480/690V

PI9300 系列

PI9300 High performance vector control inverter

Rating :220KW-550KW ,3 phase 380V/480V/690V

PI9300 220KW～550KW ,3 phase380/690V

PI9400 系列

High performance vector control inverter

Rated power ,55-220KW, Rated voltage, 3 phase 380V/480V

PI9400 55KW～220KW,3 phase380V/480V

POWTRAN | 普 传 科 技

PI9100/9200/9300/9400

PI9100/9200/9300/9400 High Performance Vector Control Inverter

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Rated power 0.75KW ～550KW, Rated input voltage 220V/380V/480V/690V
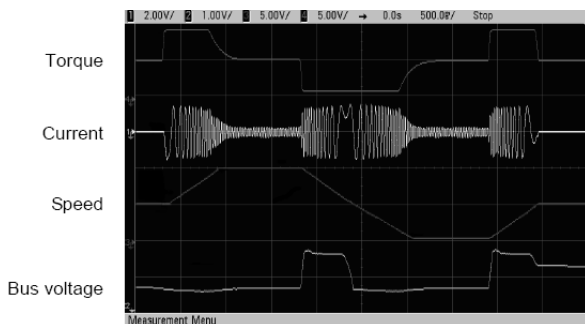
PI9000 inverter family

PI9000 series high performance vector control inverter technical feature introduction.

1. **Compatible with various motors, can be widely used for driving asynchronous motors and permanent magnet synchronous motors.**

2. **Excellent control performance in sensorless vector control mode.**

a. Four-quadrant operation of the motor in   sensorless vector control mode . The torque ,current ,spinning speed and DC bus voltage have quick response ,and the motor has stable operation.

b. 0.1 s acceleration/deceleration is available with no-load.

c. During forward and reverse running, the current and speed will keep stable.

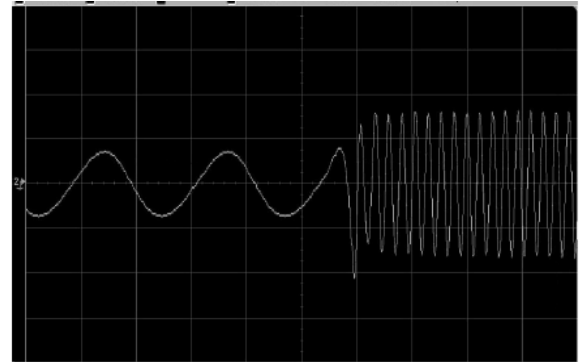d. Quick and reliable braking can be get when deceleration with braking unit.

3. **Large torque at low speed stable operation under vector control**

   a.) **Start torque :** 0.5Hz can get 150% torque (in sensorless open loop vector control mode).

   0.0Hz can get 180% output torque (in sensor close loop vector control mode).

b.)**Speed stabilization accuracy:**

a). **≤±0.5%,**in sensorless open loop vector control mode

b).≤±0.2%,in sensor close loop vector control mode

Current waveform: Suddenly increase to full load at 0.5Hz

Application: it is easy can use in Medium and large wire-drawing machine, pipe and cable processing, lifting equipment, rolling mill, lift application.

4. **Excellent torque response time.**

a. Torque response time less than 40ms in the sensorless vector control mode.

b. Torque response time less than 5 ms in the sensor vector control mode.

c. Keep output torque stable and make motor running smoothing.

Application: It is easy can use winding/unwinding equipment, multi-point driver ,rolling mills ,printing machine and packaging machine, paper machine.

5. **Torque control and limit function.**

Torque control is available in sensor vector control mode. This protection function can limit the output torque make you machine in safe condition all the time .Enhance the efficiency at most don't worry will cause machine damage .
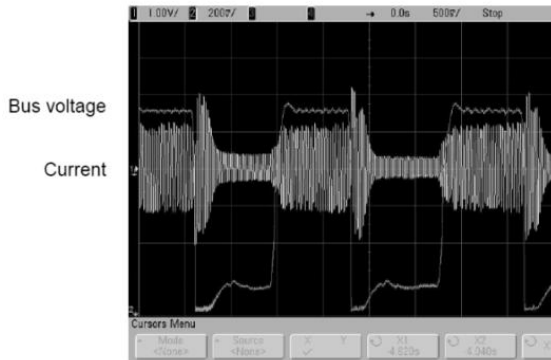
Make the load safe all the time is our promise.

Application: Fan/pump, the equipment whose operation shall be traced upon the power recovery after instantaneous power failure .such as fan, blower, rolling milling, pump.

6. Fast current limit function to make really tripless operation.(cycle by cycle current limit function).

Special design fast current limiting algorithm, reduce over current fault probability occur .realize on trip in fluctuation load heavy load.

Overload capability: 150% rated current for 1 minutes, 180% rated current for 2 seconds.

Show stable control with no trip during 0.1s acceleration time

Application: Lifting ,rolling mill ,CNC machine ,weaving machine ,paper machine

7. Rich I/O terminal.

   a. Multiple branches I/O terminals; 2 analog input; 2 analog output; 0-20mA/0-10V.

   b. 8 digital input, one of them can used for high pulse frequency. compatible with active PNP or NPN input

   c. 2 terminal Y open collector output, 2-way relay output with 15 optional signal selecting.

   d. Complete isolation RS485 communication module. Modbus protocol is supported .can communicate with laptop, CAN BUS.

8. Strong Adaptability

   PI9000 has a compact structure, independent air duct, high power density and low requirements on installation environment. The independent air duct enhances the protection effect, so that PI9000 series can be used in various hostile working environments.

9. High performance Keypad

(1) The standard LED keypad supports parameters loading and unloading and digital potentiometer.

(2) The optional external LCD keypad supports parameters loading and unloading with display running information in English or Chinese.

10. Command DC bus is available.

11. DC power supply is available.

PI9100 inverter   Motor

12. Various Application Function

function	Effect
V/F separation setting	Meet the requirement of different power supplied and realized flexible setting to V/F curves.
Carrier frequency automatic adjusting	0.5 to 15kHZ; automatically adjust carrier frequency according to the load characteristics.
Speed Tracking	Available on asynchronous motor and permanent magnet synchronous motor and the situation of big inertia load, reversal rotating during starting and continuous frequent shifting.
simple PLC function	up to 16 sections speed automatic running
energy displaying	display the total consumed energy .No need to use the power meter
Advanced energy saving technology	Use energy saving control of frequency converter to realized high efficient running of asynchronous motor.

Quick and accuracy PID control function	Easy to realize close-loop control system for the process control
Timing control	Timing control function: time setting range(0h to 65535h)
Automatic voltage regulation(AVR)	Automatically maintain a constant output voltage when the voltage of electricity grid changes

13. International communication Protocol

Multiple communication models:

Standard configured Modbus communication

Optional , communication card with ProfiBus.

Powerful PC software establish communication with PC freely .

(1). Send control commands (starting, stopping, and fault reset) to the inverter

(2). Send speed or torque reference signal to the inverter

(3). Read /write the state and actual value from the inverter

(4). Monitor all motor running state in PC.

14. High Reliability and adapts complicated site severe environments.

PI9000 series obtains CE certification and has multiple protection functions and high reliability.

a. PI9000 adopts thermal simulation technique; therefore, it has good heat dissipation effect and maintains high reliability.

b. PI9000 series passes various tests in terms of high temperature, low temperature, low pressure and vibration, which ensures high reliability before delivery.

c. PI9000 series has got TUV-SUD certification, and has TUV mark and CE certification mark. It reaches the highest technical standards in Europe.

1). PI9000 test items before leaving factory.

Experiment Type	Experiment Name	Classification
Mechanical reliability Experiments	Packaging Experiments	Package compression experiment
		Package Resonance imaging and storage test
		Package random vibration test
		Package dropping test
		Package rolling test
		Package dumping test
		Package inclined impact test
	Impact Test	Half-sine shock test(working and non-working state)
		Trapezoidal wave impulse test(non-working state)
	Vibration Test	sinusoidal vibration test (working state)
		Random vibration test(working and non-working state)
Climatic Environmental Reliability Test	Temperature Experiment	Low temperature storage test
		High temperature storage test
		Temperature gradient experiments
		Temperature impact test
	Salt Spray test	constant thermal test
		Alternation thermal test
	Low Air Pressure Test	Low temperature and low pressure test
		High temperature and low pressure test

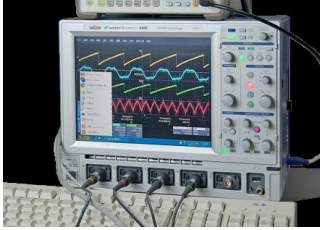### 2.) Advantage testing facilities in Powtran laboratory.

Motor control laboratory   constant temperature Experimental facilities

Vibration test branch   electronic instrument facilities

IPM MITSUBSHI Intelligent power module
Advanced power switch components
Characteristic: GTR high current density , low saturation voltage, resistance to high voltage, high input impedance, high switching frequency, low driving power
Efficiency : easy operation, small frame, integrated performance diversification, enhance the system reliability

(PI9130B 0.75~2.2kW 系列用)

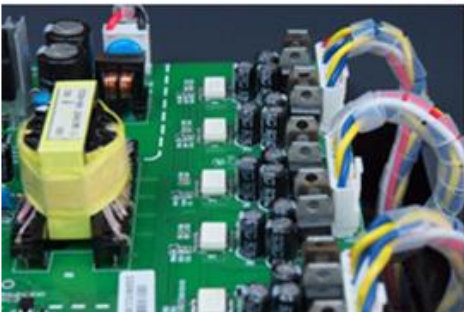| 600Hz oscilloscope | Power analyzer and dynamometer controller | Aging room | thermal testing with fluke |

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3). Powtran has established advantage quality management to make sure quality of products.

Quality management	
Quality control standard	ISO9001,ISO14001
Quality control system	R&D quality Management, supplier Management, Manufacture Quality Management, Service Quality Management
Information management system	ERP,CRM,OA, barcode tracking system
Workflow management system	KPI performance management, PDCA

4.) Powtran select world top class component to make sure outstanding the quality, and keep stable quality.

--Raw material is sourced from reliable vendors, have some supplier with EMERSION CHINA.

--Client's queries are promptly addressed

--Final range is stringently tested, using advantage Quality Management to monitor every testing step, easy tracing.

--Selecting world famous brand components and materials, such as Infineon's IGBT, Texas Instrument's DSP, IXYS 's rectifier.etc. o make sure our super and reliable quality.

Standard specifications of PI9000 inverter.

Items		Specifications
Power	Voltage and frequency levels	Single-phase/220,50/60Hz Three-phase 220V,50/60Hz
		Three phase380,50/60Hz
		Three-phase 480V,50/60Hz
		Three-phase 690V,50/60Hz
	Allowable fluctuation	Voltage:±15% Frequency:±5%
Control system	Control system	High performance vector control inverter based on DSP
	Output frequency	Vector control:0 to 300Hz V/F control:0 to 3200Hz
	Control method	V/F control, vector control W/O PG, vector control W/ PG
	Automatic torque boost function	Realize low frequency (1Hz) and large output torque control under the V/F control mode.
	Acceleration/deceleration control	Straight or S-curve mode. Four times available and time range is 0.0 to 6500.0s.
	V/F curve mode	Linear, square root/m-th power, custom V/F curve
	Over load capability	G type: rated current 150% - 1 minute, rated current 180% - 2 seconds
		F type: rated current 120% - 1 minute, rated current 150% - 2 seconds
	Maximum frequency	Vector control:0 to 300Hz V/F control:0 to 3200Hz
	Carrier Frequency	0.5 to 15kHZ;automatically adjust carrier frequency according to the load characteristics.
	Input frequency resolution	Digital setting: 0.01Hz Analog setting: maximum frequency×0.025%
	Start torque	G type: 0.5Hz/150% (vector control W/O PG)
		F type: 0.5Hz/100% (vector control W/O PG)
	Speed range	1:100 (vector control W/O PG) 1:1000 (vector control W/ PG)
	Steady-speed precision	Vector control W/O PG: ≤ ± 0.5% (rated synchronous speed)
		Vector control W/ PG: ≤ ± 0.02% (rated synchronous speed)
	Torque response	≤ 40ms (vector control W/O PG)
	Torque boost	Automatic torque boost; manual torque boost(0.1% to 30.0%)
	DC braking	DC braking frequency: 0.0Hz to max. frequency, braking time:
		0.0 to 36.0 seconds, braking current value:

Items		Specifications
		0.0% to 100.0%
	Jogging control	Jog Frequency Range: 0.00Hz to max. frequency; Jog Ac/deceleration time: 0.0s to 3600.0s
	Multi-speed operation	Achieve up to 16-speed operation through the control terminal
	Built-in PID	Easy to realize closed-loop control system for the process control.
	Automatic voltage regulation(AVR)	Automatically maintain a constant output voltage when the voltage of electricity grid changes
	Torque limit and control	"Excavator" feature - torque is automatically limited during the operation to prevent frequent over current trip;the closed-loop vector mode is used to control torque.
Personalization function	Self-inspection of peripherals after power-on	After powering on, peripheral equipment will perform safety testing, such as ground, short circuit, etc.
	Common DC bus function	Multiple inverters can use a common DC bus.
	Cycle-by-cycle current limiting	The current limiting algorithm is used to reduce the inverter over current probability, and improve whole unit anti-interference capability.
	Timing control	Timing control function: time setting range(0h to 65535h)
Running	**Input signal**	Running method	Keyboard/terminal/communication
		Frequency setting	10 frequency settings available, including adjustable DC(0 to 10V),adjustable DC(0 to 20mA), panel potentiometer, etc.
		Start signal	Rotate forward/reverse
		Multi-speed	At most 16-speed can be set(run by using the multi-function terminals or program)
		Emergency stop	Interrupt controller output
		Wobbulator run	Process control run
		Fault reset	When the protection function is active, you can automatically or manually reset the fault condition.
		PID feedback signal	Including DC(0 to 10V), DC(0 to 20mA)

Items			Specifications
Output signal		Running status	Motor status display, stop, ac/deceleration, constant speed, program running status.
		Fault output	Contact output - AC 250V 5A, DC 30V 5A
		Analog output	Two-way analog output, 16 signals can be selected such as frequency, current, voltage and other, output signal range (0 to 10V / 0 to 20mA).
		Output signal	At most 3-way output, there are 40 signals each way
Run function			Limit frequency, jump frequency, frequency compensation, auto-tuning, PID control
DC current braking			Built-in PID regulates braking current to ensure sufficient braking torque under no overcurrent condition.
Running command channel			Three channels: operation panel, control terminals and serial communication port. They can be switched through a variety of ways.
Frequency source			Total 5 frequency sources: digital, analog voltage, analog current, multi-speed and serial port. They can be switched through a variety of ways.
Input terminals			6 digital input terminals, compatible with active PNP or NPN input mode, one of them can be for high-speed pulse input(0 to 100KHZ square wave); 2 analog input terminals for voltage or current input.
Output terminals			2 digital output terminals, one of them can be for high-speed pulse output(0 to 100KHZ square wave); one relay output terminal; 2 analog output terminals respectively for optional range (0 to 20mA or 0 to 10V),they can be used to set frequency, output frequency, speed and other physical parameters .

Items			Specifications
Protection function		Inverter protection	Overvoltage protection, under voltage protection, over current protection, overload protection, overheat protection, over current stall protection, overvoltage stall protection, phase missing protection (optional), external fault, communication error, PID feedback signal abnormalities, PG failure and short circuit to ground protection.
		IGBT temperature display	Displays current temperature IGBT
		Inverter fan control	Can be set
		Instantaneous power-down restart	Less than 15 milliseconds: continuous operation. More than 15 milliseconds: automatic detection of motor speed, instantaneous power-down restart.
		Speed start tracking method	The inverter automatically tracks motor speed after it starts
		Parameter protection function	Protect inverter parameters by setting administrator Password and decoding
Display	LED/OLED display keyboard	Running information	Has 6 monitoring objects: running frequency, set frequency, actual motor current, current percentage, DC bus voltage, output voltage, actual motor speed, cumulativel running time, IGBT temperature, PID reference value, PID feedback value, input terminal status, output terminal status, analog AI1 value, analog AI2 value, current stage of multi-speed, torque set value.
		Error message	At most save five error message, and the time, type, voltage, current, frequency and work status can be queried when the failure is occurred.
	LED display		Display parameters
	OLED display		Optional, prompts operation content in Chinese/English text.
	Copy parameter		Quickly copy parameters by using the special keyboard(only for OLED)
	Key lock and function selection		Lock part or all of keys, define the function scope of some keys to prevent misuse.
Commnic-tion	RS485/RS232		The optional completely isolated RS485/RS232 communication module can communicate with the host computer.
Environment	Environment temperature		-10 ℃ to 40 ℃ (temperature at 40 ℃ to 50 ℃, please derating for use)

Application of PI9000 inverter.

Permanent Magnet Synchronous Motor

Screw oil pumps, water pumps, compressor, hoisting, chemical fabric devices, Plastic machinery, wood processing machinery and machine tools and so on

Mine

Belt conveyor, hoisting machines air compressors, crushers, ball mills, centrifugal dewaters and so on

Machines Tools

Lathes, wood processing machinery, drilling machines ,grinding machines, milling machines and air compressors and so on

Textiles

Carding machines, roving machines, winders, warping machines knitting machines, warp knitting machines and so on

Oil pumps, water injection pumps, compressor and so on

Other machineries Hoisting, chemical, industrial, metal processing, paper machine, wood machine, punch machine .etc. heavy duty machine.