

Vector control and motor parameter auto-tuning

● P0.08=1 rotation auto-tuning ; =2 Static auto-tuning

Inverter will run under the V/F control model automatically, when auto-tuning works.. It is not necessary to run V/F manually. The command resource should be from keypad. P0.01=0

At sensorless vector control model, the motor parameter on the nameplate should be recorded correctly. CHE series inverter will match the standard motor parameter according to motor nameplate . The good performance of Vector control model depends on the precision of motor parameter.

The steps of motor parameter auto-tuning is as followed

- Command resource should be from Keypad
- Set suitable Acceleration / Deceleration time. The large inertia Axis of motor should be consider to prolong the Acceleration / Deceleration time
- Record the motor actual parameter

Motor rated power

Motor rated frequency

Motor rated rotation speed

Motor rated voltage

- Rotation auto-tuning

Notice: In Rotation auto-tuning, motor should disconnect with load. Otherwise, it may not get correct parameter of motor..

Inverter will calculate below parameter of motor

Motor stator resistance

Motor rotor resistance

Motor leakage inductance

Motor mutual inductance

Current without load

If motor can't disconnect with load, only static auto-tuning is available

Static auto-tuning can detect the Motor Stator resistance, Motor rotor resistance and Motor leakage inductance, but can't get the value of Motor mutual inductance and Current without load. User can set the parameter by experience. The current without load is normally as 1/3 rated Current. The current without load on Small power motor can reach 50-60% as rated current.

● P0.00=0 sensorless vector control

After auto-tuning, the parameter of vector control can be set.. P3 group is the function of vector control. Vector control is two closed ring system. The inner ring is the current and the outer ring is speed. The adjusting PI parameter is found in P3 group (P3.00- P3.05). If output torque is insufficient at low speed, increase the value of PI parameter properly. If motor vibrate at low frequency, decrease the value of PI parameter. If over current occur when heavier load add to motor at high frequency, increase the value of PI parameter. If speed fluctuate, increase the value of PI parameter.

Be caution to change PI parameter, otherwise it may cause motor vibration

The speed bias can be adjusted by the parameter Slip compensation rate of VC. If actual

speed is lower than setting value, increase P3.09 (Slip compensation rate of VC). Otherwise reduce the value. The speed bias adjustment also can be done by changing motor rotor resistance value. Increase rotor resistance value, if actual speed is lower than setting speed. Otherwise, reduce rotor resistance value.

Torque limit is important parameter for vector control which determines the current limit point. The factory setting is 150% (inverter rated current). When motor over load too big, Inverter will reduce the current and frequency. Adjusting this parameter can increase motor torque output. The value should be set properly. Otherwise, Current limit function will not work. Meanwhile, improper setting may cause over current and overload fault.

Vector control relies on motor parameter (P2.06-P2.10). Incorrect motor parameter always cause speed increase slowly or output torque insufficient. Some phenomenon and steps should be followed:

1. Motor runs normally at high speed, but vibrate at low speed.

The value of stator resistance or rotor resistance may be too big to cause such problem happened. The value of stator resistance and rotor resistance should be in the same value class. And the gap between the two value should be close.

2. Motor runs normally at high speed, but torque output is insufficient at low speed.

The value of stator resistance may be too small.

3. The reasons that speed of motor can't reach target value:.

- The value bias of stator resistance is too large. The low value may cause the speed bias of motor too small to start. The high value may cause the speed bias of motor too large to exceed the range of calculation.
- The gap between leakage inductance and mutual inductance is too large. The high value of inductance may cause high current and high voltage. Finally the current can't increase. The low value may cause low current output and low torque output. Finally the speed can't increase.
- In commissioning, motor should run at 50HZ (motor rated frequency) and voltage output of inverter should reach 380V (rated voltage of motor). If voltage output lower, increase Motor leakage inductance and mutual inductance. If voltage output higher, reduce the value of Motor leakage inductance and mutual inductance.

Increase no load current also can enhance the torque of motor.

● **P0.00=2 Torque control (no PG vector control)**

Torque control is different from Speed control.

It is suitable on the application without high precision, such as wind, wire drawing. Under torque control mode, the speed of motor is determined by the Load. The Acceleration/ Deceleration speed of motor is not determined by Acceleration/ Deceleration time on inverter. The running speed is not determined by the Setting Frequency.

Code	Name	Description	Range	default
Pd.06	Torque setting source	0 : keypad (Pd.07) 1 : AI1 2 : AI2 3 : AI1+AI2 4: Multi-step setting 5 : Communication	0 ~ 5	0
Pd.07	Keypad torque setting	-100.0% ~ 100.0%	-100.0% ~ 100.0%	50.0%

When P0.00=2, torque control model is valid. Under Torque control Model, the torque output complies with the torque command setting. The output frequency is limited by Upper Limit Frequency. When the speed of motor is higher than the Upper Limit Frequency, the frequency output is limited and the output torque is different with setting torque.. Under torque control, the selection of Pd.06 is the torque command source. When Torque command source is from keypad (Pd.06 =0), set the value on Pd.07. When the value is negative, the motor runs at reverse direction.

Multi-function terminal can exchange between Torque Control Model and Speed Control Model.

When setting torque is higher than output torque, the output frequency will increase. The output frequency reach the Upper Limit Frequency, inverter will run at Upper frequency.

When setting torque is lower than output torque, the output frequency will reduce. When output frequency reach the Below limit frequency, inverter will run at Below frequency.

The value 100% on Pd.07 matches the Upper Limit Torque (P3.07). The adjustment on PD.06 and P3.07 can change the setting value of torque

Note: When inverter can get Stop Command at Torque Control model, the Speed control model will work automatically.

Code	Name	Decription	Range	default
Pd.08	Upper frequency limit selection	0 : Keypad (P0.05) 1 : AI1 2 : AI2 3 : Multi-step setting 4 : Communication (0 ~ 4	0

Set command source from several types of the Upper frequency command source on the code Pd.08,. Especially, it can change the upper frequency to control the output frequency.