



Product Solutions Announcement

Delta Industrial Automation Global Solution Center



Product	AMD	Type	VFD-C2000	Security Level	<input checked="" type="checkbox"/> General <input type="checkbox"/> High <input type="checkbox"/> Top
				No.	N/A
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ECMA-C3 Testing based on C2000

Devices and tools:

Inverter: VFD007C23A, Firmware 1.002(11081), PG:EMC-PG01U

PM motor: ECMA-C30602ES

Operation Steps:

1. Wiring the power line of ECMA-C3 with C2000 UVW Ports based on Red(U) White(V) Black(W).
2. Set correct parameters 01-00, 01-01 and 01-02 based on PM you are using.
3. Key in the following parameters:

Pr. no	Definition	Setting value
05-33	IM or PM motor choice	1
05-34	PM motor rated current (A)	1.55
05-35	PM motor rated power (kw)	0.20
05-36	PM motor rated speed (rpm)	3000
05-37	PM magnetic roles	10
05-38	PM Inertia (E^{-4} kg-m ²)	0.2

4. Set 05-00=5 for PM motor auto-tuning:

05-33 to 05-37 must be set before PM motor auto-tuning. However, 05-38 has nothing to do with auto-tuning but for automatical bandwidth in ASR.

5. Check the following parameters after PM motor auto-tuning:

05-39 stator resistance, 05-40 PM Ld, 05-41 PM Lq and 05-43 PM Ke

6. Set parameters about encoder:

10-00	Encoder types	2
10-01	Pulse Encoder PPR	2500
10-02	Encoder operation modes	1

7. Set 05-00=4 for PM magnetic angle detecting:

The angle would be set into 05-42 automatically after the magnetic angle detecting. And for ECMA series motor, 05-42 will be 0° or 360° because of the setting in factory. Hence, if the motor is ECMA, we can cancel the magnetic angle detecting but set 05-42=0 directly.

8. Set 00-11=4 for PM FOC PG control mode.

9. Repower the inverter:

Since ECMA use the ABZ encoder, the rotor magnetic information can be obtained only at the power-on time. So after the necessary parameters setting, we should repower inverter and makes PG can obtain the rotor magnetic information in case of fly run based on wrong magnetic information.

10. Set 11-00=2 for inertia auto-tuning:

- Set speed command= $\frac{2}{3}$ *rated speed of PM(05-36).
- Set acceleration and deceleration time is 1.5s or 2s.
- Forward and reverse in turn until 11-01 is stable. (11-01 must be based on 05-38)

11. Set ASR parameters based on the practical situations:

- Please set 11-03 11-04 11-05 if we set 11-00=1 and finish the inertia auto-tuning.
- Please set 11-06 to 11-11 if we set 11-00=0 which doesn't need the inertia auto-tuning.

Attentions:

A. Why must we wiring ECMA-C3 with C2000 based on Red(U) White(V) Black(W)?

ECMA-C3 is one special PM motor in Delta since it's encoder doesn't have UVW signals but only ABZ signal. So the C2000 PG01U must get the magnetic position from ECMA-C3 based on the communication coding. So the Red White Black cables must be wired in one stable sequence, and if not, the communication coding would be wrong and C2000 can't get the

right magnetic position which can determine whether FOC+PM run successfully.

B. Why must we repower the inverter after setting all parameters?

The ECMA-C3 only send the coding communication signals to C2000 PG01U one time when power on. So after setting all parameters, if we want to run successfully, we must get the magnetic position from ECMA-C3, and only repower it can obtain the coding communication for magnetic position from ECMA-C3.

C. Is Inertia Auto-Tuning optional or mandatory

Inertia Auto-Tuning is for enhancing the output torque and ASR regulation ability against the variable loading inertia. Hence, this is optional not mandatory.

Sometimes, your loading situation is not so complicated, so you don't need take the inertia Auto-Tuning. Otherwise, we suggest you take it and it is helpful for your loading driving.

D. Why can we driving PM which has a big power gap with C2000 inverter since we use the vector control?

The power gap is not the issue for driving motor by Vector Control. For IM or PM, even if the power gap between motor with inverter is big, we still can use inverter to drive this motor by vector control because we have **motor rated current parameter** for protecting the auto-tuning, and **electronic thermal characteristic for motor parameter** for protecting the normal running. Hence, please kindly understand the power gap between motor with inverter is not problem as long as inverter power is bigger than motor power in theory.

However, if the IM motor rated current is less then 10% of inverter rated current, it is not suggested to drive since the current resolution is not OK.

E. Is Pr01-02 necessary for C2000 PM driving?

The Pr01-02 namely rated voltage of PM motor is not necessary when we use C2000 to drive PM motor. This parameter is related to weakness flux control for IM FOC control. But for PM FOC control, the weakness flux will be related to drive input voltage rank but not to Pr01-02.

E.g. if we use one 220V series C2000 to drive PM motor, when the output voltage of C2000 gets 220V, it will start weakness. So it is nothing to do with the parameter Pr01-02.

For any PM motor, C2000 PM FOC weakness method is the same. Pr01-02 is not related to it.

F. Can we use 380V series C2000 to drive 110V ECMA motor?

For ECMA motor in Delta, the voltage rules:

- Rated Voltage 110V, Maximum Voltage 220V
- Rated Voltage 220V, Maximum Voltage 380V

So if we use 380 series C2000 to drive 110V ECMA motor, the C2000 will go to weak when the output voltage gets 380V, but the ECMA motor maximum voltage is 220V for 110V series. So the motor will be demagnetization by the over-voltage. Hence, please use 220V series C2000 to drive 110V ECMA-MOTOR just like this case.

G. Why doesn't C2000 have Z signal trigger position parameter?

For ECMA motor in Delta, it doesn't need this parameter since U V W is hidden by coding. But for common ABZ UVW encoder, Z trigger position has U rising-edge and U falling-edge, please see the picture below.

In generally, ABZ UVW encoder should be Z position in U falling-edge, so C2000 just regard it as the default, and there is no any parameter can let you change Z signal trigger. However, if you are facing one ABZ UVW encoder with Z position in U rising-edge, please make your PG card wiring exchange A to A bar, B to B bar for solving it. Otherwise, the control will be failure.

