

Subject : Permanent Magnet Synchronous Motor control using serial (23 bit) encoder with MD810G53X (EtherCAT variant) drive

Document Category : General

Product Category : MD810 drive

Issued By : David Bedford

Confidentiality : Low / High

Authorized By : Raúl Sampé

Circulation : Distributors / Internal

Revision History

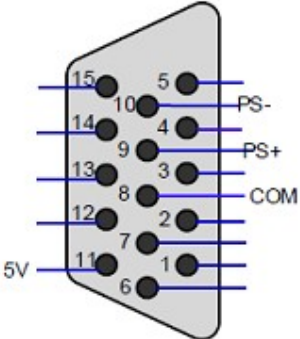
Revision	Date	Revising Author	Description
1.0	Jan 17, 2022	David Bedford	First issue

Summary of contents

This document describes the set up and commissioning of MD810G53X (EtherCAT variant) drive when controlling permanent magnet synchronous motor with serial (23 bit) encoder.

1. Encoder connection.

In MD810G53X (EtherCAT variant) drive, the serial encoder should be connected to connector CN6. CN6 is a SUB D15 (DB15) connector. The following table describes the pinout of CN6 connector.

DB15 23-bit Encoder port (CN6)	Pin No.	Signal	
	9	PS+	
	10	PS-	
	11	5V	
	8	COM	

2. Drive parameters set up.

In order to control permanent magnet synchronous motor, the basic parameters described in table 1 below related to the motor should be set.

Table 1. Basic parameters for PMS motor control.

Parameter	Setting	Description
F0-01	Set to 1 for closed loop control (FVC)	1 st motor control mode
F0-10	Set the desired maximum frequency (Hz)	This parameter sets the maximum output frequency. Some parameters are scaled to the value of this parameter, like the acceleration/deceleration times. Also the frequency setpoint by analog input is scaled to the value of this parameter.
F0-12	Set the desired upper limit of the frequency setpoint	This parameter limits the frequency setpoint
F1-00	Set to 2 for PMS motor control	Selection of PMS motor control
F1-01	Set the motor rated power (kW)	Rated power of the motor in kW
F1-02	Set the motor rated voltage (V)	Rated voltage of the motor.
F1-03	Set the motor rated current (A)	Rated current of the motor in A.
F1-04	Set the motor rated frequency (Hz)	Rated frequency of the motor in Hz.
F1-05	Set the motor rated speed (RPM)	Rated speed of the motor in RPM.

Additional to the motor settings, the parameters described in table 2 below related to the encoder should be set.

Table 2. Encoder related parameters.

Parameter	Setting	Description
F1-15	Set to 1 to use PG2 input (connector CN6) to connect the feedback encoder	This parameter is used to select if PG2 input (connector CN6) is used as pulse input frequency (0) or feedback encoder (1)
F1-23	Set to 1 for serial (23 bit) encoder	This parameter is used to select the encoder type connected to PG2 input (connector CN6)
F1-30	Set depending on the installation location and wiring of the encoder	Encoder wiring flag. Used to reverse the A, B phases of the encoder. This parameter is set automatically by dynamic auto-tuning (F1-37=12).

Please ensure that F1-28 is set to 0. If this parameter is not set to 0, change the setting (to 0) and remove completely the power supply to the drive (power and control) in order to take effect.

3. Auto-tuning procedure.

In order to control a permanent magnet synchronous motor in closed loop, it is compulsory to perform a dynamic (rotating) auto-tuning procedure, which measures the motor parameters. As described in the table 3 below, the selection of the auto-tuning method by parameter F1-37 (Auto-tuning selection), determines which parameters are measured.

In both methods described in table 3, the *encoder installation angle* (parameter F1-31) is measured. In any case, it is highly recommended to execute “synchronous motor dynamic no-load auto-tuning” (F1-37=12), which also measures the back EMF of the motor.

Table 3. Dynamic (rotating) auto-tuning methods, depending on F1-37 setting.

F1-37 (Auto-tuning selection)	Parameters identified by tuning
11: Synchronous motor no-load partial auto-tuning	<ul style="list-style-type: none">- stator resistance value (F1-06)- d/q shaft inductance (d: F1-17, q: F1-18)- encoder installation angle (F1-31)
12: Synchronous motor dynamic no-load auto-tuning	<ul style="list-style-type: none">- stator resistance value (F1-06)- d/q shaft inductance (d: F1-17, q: F1-18)- encoder wiring flag (F1-30)- encoder installation angle (F1-31)- back EMF (F1-19)

After executing auto-tuning successfully, perform a trial RUN, to check that the drive is able to control the motor properly.