PowerXL DM1, DH1, and DG1 VFDs Flying Start and configuration

Overview

Flying Start is the standard function available within DM1, DM1 Pro, DG1, and DH1 variable frequency drives (VFDs), and works in any open-loop control mode. When this function is properly used, Flying Start can help reduce mechanical stress on components and help reduce unplanned system downtime when momentary interruptions to operations occur.

The Flying Start mode is used to start into a rotating motor as quickly as possible in order to resume normal operation with minimal impact on load or speed. In Flying Start mode, the VFD responds to a start command by identifying the motor speed and then synchronizing its output to the frequency, amplitude, and phase to the spinning motor. The motor will then be reconnected at its existing speed, and be smoothly accelerated to the commanded frequency. This process eliminates overcurrent tripping and significantly reduces the time it takes for the motor to reach its desired frequency. Because the motor is "picked up" smoothly at its rotating speed and ramped to the proper speed, there is very little or no mechanical stress on the system.

It is possible that application conditions, such as a loss of input voltage to the VFD or a loss of a control system command during operation, may cause the motor to rotate while the VFD output modulation is off. In these situations, the modulation to the motor is removed and the motor will be free to coast. If the modulation from the VFD is again initiated to the motor (e.g., main power comes back online or control system command is given), the VFD will attempt to control the motor while the motor is still rotating due to the inertia of the load.

The PowerXL™ DM1, DM1 Pro, DG1, and DH1 drives allow the Flying Start function to be active after main power on, at error reset, at auto-restart, or after modulation to the motor is initiated by the VFD. Flying Start helps to reduce overcurrent and overvoltage trips and significantly reduces the time for the motor to reach its commanded frequency. Depending on which Flying Start mode the drive is set to, the drive scans the output frequencies from the positive maximum frequency to the negative maximum frequency in order to find the magnetizing current of the motor. Once the drive finds the magnetizing current, it will then pick the motor up from this point and ramp it to the frequency setpoint.

Per **Table 1**, using DM1 and DM1 Pro as an example, Flying Start mode can be configured by setting P4.1.8 Start mode to the following:

* 0 = Ramp
* 1 = Flying Start From Stop Frequency
* 2 = Flying Start From Max Frequency

Table 1. Parameter adaptation in DM1, DG1, and DH1 VFDs

VFD type	Parameter	Parameter setting
DM1 and DM1 Pro	P4.1.8	0: Ramp 1: Flying Start From Stop Frequency 2: Flying Start From Max Frequency
DG1	P7.9	0: Ramp 1: Flying Start From Stop Frequency 2: Flying Start From Max Frequency
DH1	P4.1.10	0: Ramp 1: Flying Start From Stop Frequency 2: Flying Start From Max Frequency

F·T·N

Powering Business Worldwide

Figure 1. Parameter modes and settings

Parameter setting descriptions

Ramp

The drive starts from 0 Hz and ramps up to the frequency reference value. However, the load inertia or starting friction may cause prolonged acceleration time.

Flying Start From Stop Frequency

If the VFD is started with the "Flying Start From Stop Frequency" mode, the drive's response to a start command is to search for and synchronize with the motor's actual speed (frequency and phase) and voltage, using the last operating frequency as a starting point. After the drive and motor speed have been synchronized, the motor accelerates to the commanded frequency.

Flying Start From Max Frequency

If the VFD is started with the "Flying Start From Max Frequency" mode, the drive's response to a start command is to search for and synchronize with the motor's actual speed (frequency and phase) and voltage, using the maximum operating frequency as a starting point. After the drive and motor speed have been synchronized, the motor decelerates to the commanded frequency.

Important note: It is important to remember that the AR (Auto Restart) function is set with Flying Start as default in all DM1, DG1, and DH1 drives. The user can select "ramp start," in which the Flying Start speed scans the drive from set minimum frequency to maximum frequency, including both forward and reverse directions. If it is not intended to set the motor to run in "reverse" direction, the user will need to "disable" the "reverse enable" in P1.16 of DG1 (firmware V36.05), in P4.1.5 of DH1 (firmware V6.07), and in P4.1.4 of DM1 (firmware V1.07), because "Reverse enabled" is set as default.

FATON
Powering Business Worldwide