

Understanding the RVSS soft starter initial torque parameter

The initial torque parameter of the reduced voltage soft starter

Application

The reduced voltage soft starter (RVSS) is used to reduce starting torque and current to minimize mechanical stresses and peak currents in an industrial application. Each application is unique in some way, so adjusting initial torque parameter values to achieve optimum system performance is often done during commissioning.

Initial torque parameter value correlation to current

In many cases, default values of RVSS operating parameters can be used to achieve successful starts. The parameter values can then be tuned to achieve smooth operation and/or eliminate trip conditions attributed to current and voltage issues in a system.

In some cases, it is useful to know the correlation of initial torque parameter values to mains current levels during the start to ensure that the application will run within system design parameters involving cable sizing, voltage drop, and mains current capacity, to name a few.

Table 1 denotes the initial torque parameter values and the corresponding current level as a percentage of locked rotor current.

Table 1. Initial Torque Parameter Values

Torque Setting	Current as % Locked Rotor	Initial Motor Torque
85%	92%	Maximum (S811+/S801+/S611)
71%	84%	
56%	75%	
45%	67%	RVSS default value
36%	60%	
33%	57%	
27%	52%	Wye-delta equivalent
19%	44%	
14%	37%	Minimum for current limit
9%	30%	
1%	10%	

Note: These are typical values for a NEMA® design B type motor. The starting torque versus locked rotor current relationship will vary for other NEMA design types as determined by the manufacturer.

Voltage ramp start

The voltage ramp start method is the most commonly used. In this method, the start ramp begins with an initial torque (voltage) and ramps to 100% of the mains voltage at the end of the ramp time. Motor acceleration is dependent on the applied torque and the load, if any, imposed on the motor during the start sequence. It is not uncommon for the motor to achieve synchronous speed prior to the expiration of the ramp time. The Eaton S811+, S801+, and S611 reduced voltage soft starters will detect this condition and command the internal bypass contactors to close at this time.

Motor rotation should begin within 2 seconds of energization. An initial torque value that is too low will introduce unnecessary heat energy into the motor prior to motor rotation. This value may be adjusted in conjunction with the ramp time parameter to ensure that the RVSS does not trip on stall or jam protections during the motor start sequence. If initial motor rotation is noted to be excessively aggressive, the initial torque parameter may be adjusted to a lower value.



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Current limit start

The Eaton S811+, S801+, and S611 soft starters may be configured to use the current limit method of motor starting. With this method, the initial torque parameter determines the current level for the duration of the start ramp time. Please note that the 19% value is listed as the minimum acceptable setting for a current limit start. Motors require a minimum current to be able to develop sufficient torque during the start sequence to continue acceleration to synchronous speed. Unlike the voltage ramp start method that begins with the initial torque value but then increases to 100%, the current limit is held constant. Failure to provide adequate motor current may result in hung starts whereas the motor accelerates to some point but then stagnates as it fails to accelerate further to synchronous speed. Current limit is often used to try to overcome deficiencies in the mains circuit. Experience has shown that failure to deliver approximately 2.5 x motor FLA or greater current usually results in a failed start attempt. This event is not a soft starter failure, but rather insufficient current in the motor to develop the required torque to achieve synchronous speed.

Kick start

These values are identical to normal initial torque parameter settings. Kick-start times are routinely 2 seconds or less, and the initial torque settings for the kick-start feature are independent of the normal initial torque parameter settings.

Supporting documentation

Manuals	Reference Number
S811+ User Manual	MN03900001E
S801+ User Manual	MN03900002E
S611 User Manual	MN03902011E

Additional help

In the event that additional help is needed, please contact the Technical Resource Center at 1-877-ETN-CARE, Option 2, Sub Option 2.

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