ESP301 and High Friction Stepper Motor Stages

The main characteristic of a stepper motor is that each motion cycle has a number of stable positions. When current is applied to one of its windings (also known as phases), the rotor will try to find one of these stable points and stay there until another phase is energized. The energy required to hold the stable point is referred to as holding torque. Controllers and amplifiers driving the stepper motors should be set accordingly to the required holding torque.

In the case of unbalanced loads or high-friction, lead screw stages such as BGM-PP or RV-PP stages, it is possible that the stepper motor experiences an external force which can cause stalling or missing steps. This disadvantage can be corrected by increasing the motor holding current duration in order to offset the load torque using the ESP301 motion controller.

Default stage parameters for the ESP301 motion controller are optimized for no load condition. Therefore when driving a stage susceptible to the above description with the ESP301 users will need to keep full current until motion is done.

In order to keep full current until motion done use the following command:

QR
Reduce motor current

This command is normally used to help reduce the motor heating typically generated by stepper motors by reducing the specified step motor's current (i.e., torque) output. In this application of the command, current will be kept at 100% through motion done state plus a user specified time delay.

Syntax:

xxQRnn1,nn2
xxQR?

Command Description:

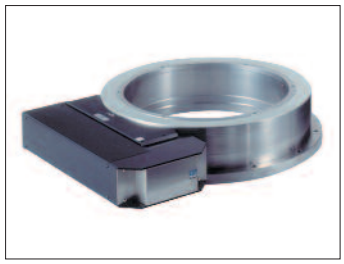
The parameter **nn2** specifies the percentage reduction of the maximum current and takes effect after motion has stopped and the duration of the specified **nn1** time delay has expired. If **xx** is equal to 0, the torque reduction parameters get applied to all axes.

In this application of QR set nn2=0 (zero percent reduction or full current until motion done) and nn1= xx (user defined millisecond delay).

Example:

For axis one, full current until motion done and 200 millisecond delay, the syntax is as follows:

1QR0,200



Parameter	Description	Range	Unit	Type
xx	Axis number	1 to Max Axes	None	[int]
nn1	Delay period	0 to 60000	Milliseconds	[int]
nn2	Motor current reduction percentage	0 to 100	Percent of max. motor current	[float]

Note - It is important to note that holding the motor current for longer will decrease the expected MTBF of the stage. It is recommended to contact Newport to verify user specifications or it may be advisable to use a high performance motion controller such as the XPS Universal Motion Controller.

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