A look at DC servo motors.

There is no simple definition of a DC servo motor. In fact, some would argue there is no such thing as servo motor. This argument is based on the idea that the term servo is a description that applies to a function and not a device. It is a servomechanism that performs this function and not the motor alone.

The servomechanisms function covers the entire electromechanical process from mechanical, software or electrical user input, to processing and comparing the desired and actual conditions, and to mechanically move an output or load. The processing and comparing of desired and actual values is a critical point here, as without this the mechanism is not a true servomechanism and the motor within the mechanism is therefore not considered a servo motor.

It is also widely considered by many engineers, educators and servo system manufacturers that the servomechanism must control the speed and position of the load. However this can be disputed given that it implies you actually want to control the position of the load. This is true because the actual term servo is derived from the Latin “servus” or slave and you may not want your slave to control the position of a load, you may just require the slave to run at a steady speed or to push with a constant force. But whatever the task you command it is still a slave so long as it does your bidding or attempts to do your bidding. It is at this point that we begin to understand the importance of feedback. The feedback could be for the position of the motor and or load if that is what you wish to control and this would be fed back to your “servo position controller” or it also may be the motors current and speed that are fed back to the “servo amplifier” the important thing is that this feedback forms a closed loop between the command and the action. Without the closed loop you can’t be sure that you have control over your slave.

Thus, to be a servo motor it must be part of a servomechanism and to be a servomechanism it must have closed loop feedback.

From here things can get a little more complicated because one can then start to ponder if the motor follows the command accurately enough. This is where the servo motor feedback resolution is not high enough. The slave says to its master “Your talking to fast I can’t keep up” or the command is too large for the slave “I am trying master but it is just too heavy to lift”. There are many other scenarios where a servo mechanism is not performing well but the motor is still a servo motor, it is still a slave just not a very good one. The important thing is that it does tell the master that it is not performing and the master can then adjust its commands.

If any single component within the mechanism does not have the functional processes to perform in the closed loop then the whole mechanism ceases to become a servo mechanism and the motor is no longer a servo motor. For example, a system consists of a position controller, an amplifier and a DC motor fitted with an encoder for feedback. However the amplifier has only the ability to accelerate but not to decelerate the load. If the position controller commands a move that requires active deceleration the system is not functional as a servomechanism and thus the motor is no longer a servo.

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