

CHAPTER ONE

# Introduction

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# Introduction

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This User Guide describes two products.

- **TQ10 Torque Servo Drive** – Accepts a  $\pm 10\text{V}$  analog command input signal from a controller, and produces a corresponding amount of motor current.
- **TQ10SD Step & Direction Servo Drive** – Accepts step and direction signals from industry standard indexers, and produces a corresponding amount of motor rotation.

## Names in this User Guide

**TQ10** – In this manual, when we use the name **TQ10**, it will apply to both products. Because most features are identical for both products, this will usually be the case.

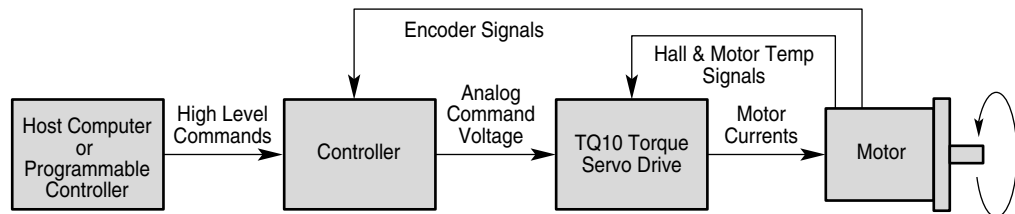
**TQ10SD** – If we need to point out differences between the two products, for features that are not identical, we will specifically call the product by its full name—**TQ10 Torque Drive**, or **TQ10SD Step & Direction Drive**.

## TQ10 Torque Drive – Description & Block Diagram

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The TQ10 Torque Drive is a servo drive designed to run three phase brushless DC servo motors equipped with Hall effect sensors, using trapezoidal commutation. It can also operate brushed DC servo motors.

The block diagram for a typical system is shown below.



*Block Diagram – TQ10 Torque Drive*

The host computer or programmable controller may or may not be necessary, depending upon the motion controller's capabilities.

The analog command voltage is a *torque command* that represents commanded current. It can range from  $-10\text{VDC}$  to  $+10\text{VDC}$ . For each volt of command input, the TQ10 will produce 1.0 A of output current to the motor.

Inside the TQ10 the torque command goes into one of the inputs of a summing node. A feedback signal representing actual motor current goes into the other input. When actual current is subtracted from commanded current at the summing node, the difference is *current error*.

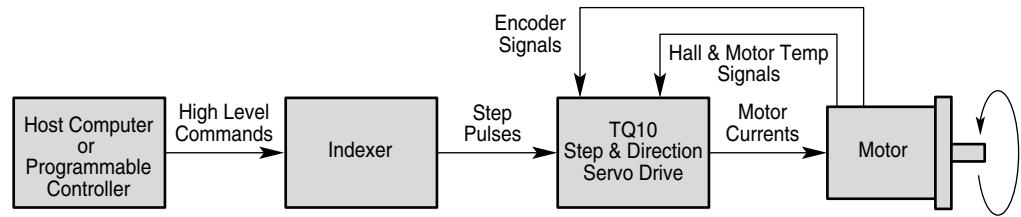
The resulting error signal goes through an error amplifier whose output controls a pulse width modulation (PWM) circuit. If actual current is too low, the PWM circuit will send longer pulses to the drive's power stage. These pulses keep the stage turned on longer, which results in more motor current. If actual current is too high, the PWM circuit sends shorter pulses, resulting in less motor current.

# TQ10 Step & Direction Drive – Description & Block Diagram

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The TQ10SD Step & Direction Drive is a servo drive designed to run three phase brushless DC servo motors equipped with Hall effect sensors. It can also operate brushed DC servo motors.

The block diagram for a typical system is shown below.



*TQ10SD Step & Direction Drive – Block Diagram*

The host computer or programmable controller may or may not be necessary, depending upon the motion controller's capabilities.

There are two circuit boards inside the TQ10SD—a *control board* and a *torque drive board*. The control board takes in control signals, and transforms them into a torque command. The drive board takes the torque command, and produces motor current in an amount proportional to the command.

The TQ10SD generates a move profile based upon step and direction signals from the indexer. For each step pulse received, the drive will make the motor turn one encoder count. Incoming step pulses represent *commanded position*, and go into one of the inputs of a summing node. Incoming encoder counts represent *actual position*, and go into the other input of the summing node. During a typical move, actual position will differ from commanded position by at least a few encoder counts. Actual position is subtracted from commanded position at the summing node—the result is *position error*. The TQ10SD produces an error signal, an analog voltage proportional to the error. The error signal is modified by the PID control loop, then continues to the torque drive circuit board as a *torque command*. The torque drive board is the same board that is used in the TQ10 Torque Drive; for a description of how the torque command is transformed into motor current, see the previous section describing the TQ10 Torque Drive.

## Other Features – TQ10 & TQ10SD

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### Dip Switches

The TQ10 Drive (the name TQ10 now refers to both drives) has 12 DIP switches on the top and three DIP switches on the bottom. You can set these switches to configure the drive for your particular application.

### Inputs and Outputs

All input and output signal connections are made on the front panel of the drive, through removable screw terminal connectors.

## Cooling Options

The drive has a heatplate design. If you mount the drive to a surface that provides sufficient heatsinking capabilities, you may not need a separate heatsink.

An external heatsink/fan unit is available from Compumotor as an option.

The drive is open on the top and bottom. You can purchase optional covers from Compumotor. If you install the covers, you may also need to install the heatsink/fan unit, to help keep the drive within its temperature limits.

You can purchase TQ10 or TQ10SD drives from Compumotor that have the heatsink/fan unit and the covers installed at the factory. Part numbers for these drives are TQ10-EHS and TQ10SD-EHS. (The suffix -EHS is an acronym for *Enclosure/Heat Sink*.)

## **Compumotor SM and NeoMetric Series Brushless Servo Motors**

Compumotor manufactures SM and NeoMetric Series servo motors; you can use these motors with the TQ10 Drive. Each motor is equipped with Hall effect sensors, an encoder, and a thermostat. The motor cables are color coded, which makes connecting the motor to the drive a straightforward procedure.

## **Compumotor Family of Products**

The TQ10 Drive is completely compatible with Compumotor's broad range of single-axis and multi-axis motion control products.