Hypertherm®

Kollmorgen EtherCAT® Drives Supported by EDGE® Connect/T/TC CNCs

Application Note

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One of Hypertherm's long-standing core values is a focus on minimizing our impact on the environment. Doing so is critical to our, and our customers', success. We are always striving to become better environmental stewards; it is a process we care deeply about.

Introduction

The following information is provided to Hypertherm channel partners for reference purposes only, to help you select and configure an EtherCAT drive that is supported by EDGE Connect/T/TC CNCs.

> **NOTE:** Work in partnership with your drive manufacturer to select and configure the drives for your cutting system. Refer to your drive manufacturer's drive documentation for technical information about the drives.

When possible, the following information is provided to support integration of the drives with the cutting system and the CNC.

- Drive model supported
- Firmware revision supported
- Example drive amplifier file
- Setup and parameter notes

Setup files and parameters provided by Hypertherm can be used for the initial machine setup. We expect these files and parameters to be modified by the installer for the specific cutting system configuration and desired performance.

> **NOTE:** Make sure to follow the guidelines and instructions provided by the drive manufacturer.

Supported Kollmorgen drives

Series	Model	Firmware	Notes

AKD®	AKD-P*XXXXX*-NBEC-*XXXX*	V_01-14-00-002 and newer	• Use firmware for NBEC drives only.
			• Inputs and outputs supported for each drive amplifier.
			  ○ Digital - 7 inputs, 2 outputs
			  ○ Analog - 1 input, 1 output

	AKD-P*XXXXX*-NBCC-*XXXX*	V_01-14-00-002 and newer	• Use firmware for NBCC drives only.
			• Inputs and outputs supported for each drive amplifier.
			  ○ Digital - 7 inputs, 2 outputs
			  ○ Analog - 1 input, 1 output

NOTE:

- Mixing different brands of drives in one system has not been tested and is not recommended.
- All drives must support and be configured for a 1 ms update rate.
- Many drive amplifiers have I/O available for use. The need for additional I/O modules depends on the total number of I/O and the I/O style required. For a list of supported I/O modules, see the *EtherCAT® Drives and I/O Modules Supported by EDGE® Connect/T/TC CNCs* Application Note (809660).

Setup and parameters

From a high level, the process of setting up your drives is as follows.

1. Install the firmware using the drive software.
2. Set up the drive parameters per the drive manufacturer's instructions.
3. Make sure the drives are communicating on the network.

This section provides assistance with setting up the drive parameters. Work in partnership with your drive manufacturer to set up the drives for your cutting system. Refer to your drive manufacturer's drive documentation for more technical information about the drives.

Also refer to the following sections of the *EDGE® Connect Installation and Setup Manual* (809340).

- Section 3: Machine stop strategies and table hardware, for information about:
    - How the CNC enables and disables the drives, and stops motion
    - Drive enable signals
    - Drive Enable output and Drive Disabled input
    - Overtravel limits
    - Safety circuit
- Section 5: *Machine Axes*, for information about:
    - Axis orientation and positive motion
    - Axis assignment and setup
- Section 7: *I/O – Inputs and Outputs*, for information about:
    - How Phoenix® assigns I/O
    - Digital I/O and assignment
    - Analog I/O and assignment

NOTE:

- All drives must be set up as linear axes.
- All drives must support and be configured for a 1 ms update rate.
- For proper scaling of following error and proper operation with Phoenix, all drives should be set to 16-bit encoder feedback resolution.

Parameters in Workbench

Set/verify the following settings using the Kollmorgen Workbench software.

Parameter	Value
FB1.PSCALE	16 (this gives 2^16 counts/rev)
DS402.1ADDPOSFCFEED	1
DS402.1ADDPOSFCSHAFTREV	1
DS402.1ADDPOSGEARMOTORREV	1
DS402.1ADDPOSGEARSHAFTREV	1
DS402.POSFCFEED	65536
DS402.POSFCSHAFTREV	1
DS402.POSGEARMOTORREV	1
DS402.POSGEARSHAFTREV	1
DS402.VELSCALEDENOM	1
DS402.VELSCALENUM	1
FBUS.PARAM01	125
FBUS.PARAM02	1
FBUS.PARAM03	0
FBUS.PARAM04	1
FBUS.PARAM05	16
FBUS.PARAM06	0
FBUS.PARAM07	0
FBUS.PARAM08	0
FBUS.PARAM09	0
FBUS.PARAM10	0

Calculating encoder counts per mm (inch)

NOTE: Phoenix does not support the EU numbering format of using decimal points (periods) as numerical separators. Using decimal points as numerical separators will result in incorrect settings. Example:
Correct - 200,000.00 = Two hundred thousand
Incorrect - 200.000,00 = Two hundred

Encoder counts are a position scaling factor used by Phoenix. Refer to the drive manufacturer documentation for specific scaling information required by the drive.

In general, to determine the encoder counts per mm (inch), you will need to know the following:

- Counts per revolution of the motor
- Gear ratio
- Distance of travel in one revolution of the pinion gear
- Diameter of the pinion gear when it engages the rack

The formula you use is shown below:

$$\frac{x \text{ encoder counts}}{1 \text{ motor revolution}} \times \frac{x \text{ motor revolutions}}{1 \text{ pinion revolution}} \times \frac{1 \text{ pinion revolution}}{x \text{ pinion circumference X } \pi \text{ (pitch)}} = x \text{ encoder counts per mm (inch)}$$

Metric example:

Below is an example using more specific Kollmorgen sample data:

- Kollmorgen AKD drive with 65.536 encoder counts per revolution of the motor
- 10:1 gear ratio
- 150 mm pitch

$$\frac{65.536 \text{ encoder counts}}{1 \text{ motor revolution}} \times \frac{10 \text{ motor revolutions}}{1 \text{ pinion revolution}} \times \frac{1 \text{ pinion revolution}}{150 \text{ mm (pitch)}} = 4.369{,}067 \text{ encoder counts per mm}$$

English example:

Below is an example using more specific Kollmorgen sample data:

- Kollmorgen AKD drive with 65,536 encoder counts per revolution of the motor
- 10:1 gear ratio
- 5.91 in. pitch

$$\frac{65{,}536 \text{ encoder counts}}{1 \text{ motor revolution}} \times \frac{10 \text{ motor revolutions}}{1 \text{ pinion revolution}} \times \frac{1 \text{ pinion revolution}}{5.91 \text{ in. (pitch)}} = 110{,}890.017 \text{ encoder counts per inch}$$