Accommodating Motors with Low Field Voltages

Background

On special motors, where the armature voltages may be substantially greater than the field voltage, it is sometimes required to have a different supply voltage for the field of the drive.

Size 1 Mentor II & Quantum III drives have a built-in Field Current Regulator. The regulator regulates the desired motor field current by producing a variable voltage derived from the AC power lines. Supplying a drive field regulator with excessive voltage (i.e. 480Vac supply for a motor's field of 90Vdc) is not recommended. Doing so results in high motor field current peaks which can cause excessive motor heating premature insulation degradation.

In this document we will show how to determine the proper supply voltage for your unique motor along with the specialized wiring that will be required to complete the setup.

Implementation - Supply Power

The Switch Mode Power Supply (the SMPS) common to all Mentor II & Quantum III drives must be supplied with at least 220Vac. This is applied to the terminal strip pictured below and highlighted.
Field Voltage

A practical AC Line Voltage suitable for the field supply will depend on what voltage the motor field requirement is from the nameplate. A rule of thumb would be to take DC Voltage that the motor nameplate calls out and multiply that with a range of 1.2-1.8 of that value.

i.e.

A practical AC Supply for a Field Regulator to create voltage for a 90Vdc field would be:

\[ 90 \times 1.2 = 108\text{Vac (Low range)} \]
\[ 90 \times 1.8 = 162\text{Vac (Hi range)} \]

In this example, 120Vac would be a sufficient supply to allow for full field regulation and control.

Transformer

A sufficient current supply must be available for the field. This includes the Step-down transformer VA ratting as well as the line supply ratting. In order to size the transformer properly you will have to know the current draw as well as the voltage desired and then select the transformer accordingly.

i.e.

2A field with our 120Vac supply

\[ \text{VA} = \text{Current} \times \text{Voltage} \]
\[ \text{VA} = I \times V \]
\[ \text{VA} = 2 \times 120 \]

Transformer must be 240VA minimum. Since this is close to a standard sized machine tool transformer (250VA) it is recommended that you select the next larger standard size 350-500VA depending upon the manufacturer selected).

Phasing

The line power in, the supply voltage to the SMPS and to the Field regulator all must be in phase with the other supplies through out the circuit. Failure to do so will result in a shift of phase of 180° and the loss of control over the field regulator.

Check the phasing

The easiest way to check your phasing is with a DMM (Digital Multi Meter). When measuring from Line 1 (AC supply) to E1 (SMPS) the measurement will read Zero Volts as well as Line 3 (AC supply) to E3 (SMPS). From E3 to L11 (with the addition of a temporary jumper from H4 –X2) you will see your step down voltage from your transformer plus E1 to E3 (line) voltage. In this example it would be 120 Vac + 480Vac = 600Vac. From E3 to L11 should read the transformer secondary voltage of 120Vac which is the supply to the field regulator. After testing remove the jumper connecting H4 – X2.
**Wiring Connection**

- Remove any wires connecting to **L11 to L12** of the power board.
- Remove **E3 fast-on connection from the MDA 3 field regulator** (Location is circled below). Tape the now lose wire with electrical tape.
- Connect **L1 to E1** and **L3 to E3** of the power board.
- From **L12** of the power board connect to the primary side of the transformer (**H1**). We use L12 because it is a connection to E1 but after the fusing on the power board.
- Connect to **E3** to the Primary side of the transformer (**H4**)
- Connect **X1** to terminal **L11** of the power board.
- Finally connect **X2** of the transformer to the fast-on terminal **E3** of the **MDA 3 field regulator board**.

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**Drive Pictured from Underneath**

**Step Down Transformer**

<table>
<thead>
<tr>
<th>480Vac Supply</th>
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<tbody>
<tr>
<td>L1</td>
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<tr>
<td>L2</td>
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<td>L3</td>
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**480Vac Supply**

**Primary** : 120Vac

**Secondary**

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Step Up Applications

In the application note CTAN 203 describes how to step up the supply voltage to accommodate for fields that need a higher voltage supply. A specific transformer to do this application is sited and a part number is given for ordering.

Questions:  Ask the author ??

Josh Kibler  Email: mailto:Josh.Kibler@emerson.com  Tel: 716-774-0093