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IT. Adjustable Frequency Drive (AFD) Applications

Application Note

Electromechanical Contactors and Starters

General

Can an ***IT.*** Contactor or Starter be used with an Adjustable Frequency Drive (AFD)? The answer in part is yes, and in part no. Because an AFD generates harmonics on both its input and output, which distorts the current waveforms, a successful application must take this factor into account.

Recommendations

Since an ***IT.*** Contactor has no current sensing circuitry, it can be applied satisfactorily on the input or output of an AFD. When used on the input line, the requirements of the application must be within the rms, peak and fault current ratings of the ***IT.*** Contactor. When used in a simple across-the-line motor application, identifying these parameters is an easy task. When used with an AFD, the task is somewhat more difficult.

AFDs have an input rectifier section which converts the AC line voltage to a DC voltage. To make this voltage suitable for use by its inverter section, most AFDs use a capacitor filter to smooth out the rectified DC voltage. This results in a high peak current being drawn from the AC line every half cycle of each phase voltage. The magnitude of the peak is determined by the impedance of the power line and the internal inductance and capacitance of the AFD. The peak current may also increase the AFD rms current levels. The AFD manufacturer can advise the magnitude of the peak current and the AFD rms input current under full load operation for particular installation conditions. This information may be used to select the appropriate ***IT.*** Contactor for the AC line input.

The selection of the output contactor is very straightforward. It is simply chosen for the motor rating. Overload protection is not normally needed on the AFD output, since most AFDs provide motor overload protection as a standard feature. If motor overload protection is not provided by the AFD, a separate overload device must be used.

The ***IT.*** Starter utilizes electronic current sensing to protect a motor in a typical across-the-line application. The harmonic currents present on the AFD input and output can affect the proper operation of the current sensing circuitry. The output of the AFD varies in frequency. Electronic current sensors are also tuned to a narrow band of operating frequencies to optimize their sensing ability. As a result, the ***IT.*** Starter, or other starters with electronic current sensing, *must not be applied on the input or output of an AFD*.

This microprocessor-based current protection feature, as well as the additional protective features of the ***IT.*** Starter, makes it the device of choice for the bypass application.

Figure 1 illustrates the *recommended applications*. In the first diagram, *the input line contactor* provides isolation for both the AFD and the *bypass line starter*. In the second diagram, the input line contactor only provides isolation for the AFD. The bypass line starter provides motor isolation in conjunction with the *AFD output contactor*, but the line isolation is provided by an upstream disconnect.

Note: Codes and regulations as well as user preferences, may require the use of a disconnect switch on the AFD input, the bypass input, and/or the motor input.

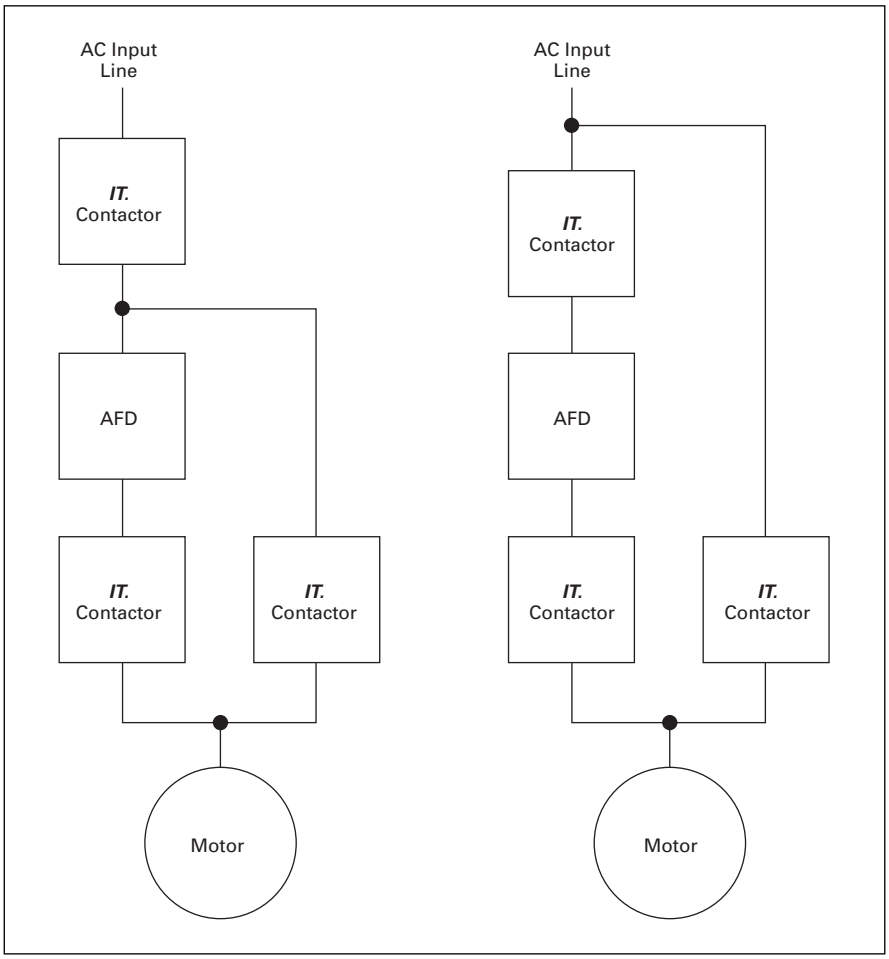

Figure 1. Recommended AFD Applications

Mounting Location

IT. Contactors and Starters may be mounted on the same panel or in proximity to an AFD without any detrimental effects.

Interlocking Requirements

As with any bypass arrangement, it is required that control circuit interlocks be used to prevent the AFD output contactor and bypass starter from being closed simultaneously. If a high inertia load is being driven, a timing function may also be required to keep the AFD output contactor from being closed and the AFD from starting until the motor has stopped. If the AFD includes an enabled catch a spinning motor feature, this time delay may not be needed. The AFD manufacturer can recommend the appropriate interlocking features to be utilized.

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