Optidrive Applications Support Library

Application Note	**AN-ODE-2-045**
Title	**Using Multiple Motors In Parallel**
Related Products	**Optidrive E2**
Level **2**	1 – Fundamental - No previous experience necessary 2 – Basic – Some Basic drives knowledge recommended 3 – Advanced – Some Basic drives knowledge required 4 – Expert – Good experience in topic of subject matter recommended

Overview

In some applications it is possible to operate multiple motors connected to a single Optidrive E2. This application note described the considerations and guidelines that should be given to such applications in order to select the correct drive and to operate it successfully.

Multiple Motor Applications

Multiple motor with single drive operation is generally suited to applications where the motors are always required to run at approximately the same speed and where motor loads are not mechanically coupled together.

Drives can be used to run multiple motors in applications where slight motor speed variation (generally only a few percent) does not cause a problem in the overall process being performed (motors speeds are not required to be precisely synchronised). Ideal applications include fans and pumps, where accurate speed synchronisation within the application is generally not required.

General Rules for Multiple Motor Applications

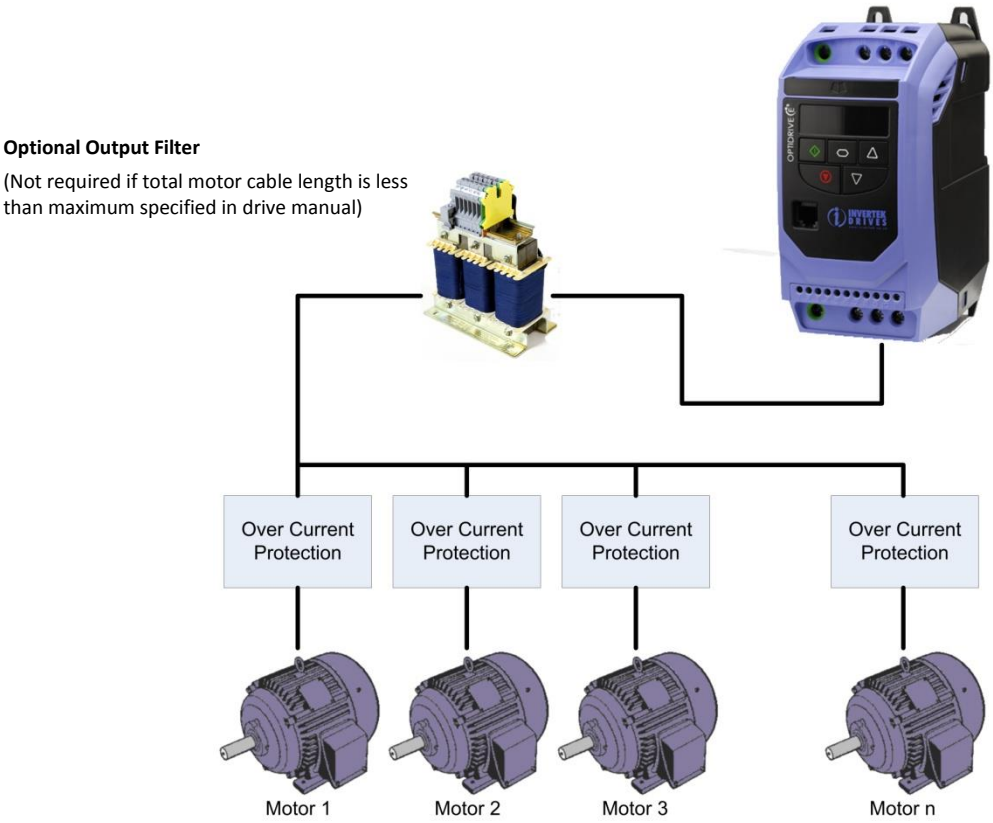
- Providing that all the motors are permanently connected to the Optidrive E2, the required drive can usually be selected based on the total of the motor current ratings connected.
- The total cable length required should not exceed the maximum allowed for the drive in use – refer to the User Guide for details of the maximum cable length. The allowed total cable length can be increased by 100% if an output filter is used.
- To avoid possible motor damage, each individual motor must be protected by a thermal overload device. The drive over-current protection settings cannot be used to protect multiple motors.
- Only standard AC industrial three phase motors should be used.
- The Effective Switching Frequency Parameter (P-17) should be set to the minimum value (normally 4kHz).
- The Spin Start function (P-33) cannot be used

Providing the above design rules are met and the motors are permanently connected to the drive, the drive should be sized based on the total nameplate *current* (not kW or HP) of the connected motors.

Wiring Configurations

The diagrams below shows a common installation setup where a single drive is used to control a larger (>1) number of smaller rated motors.

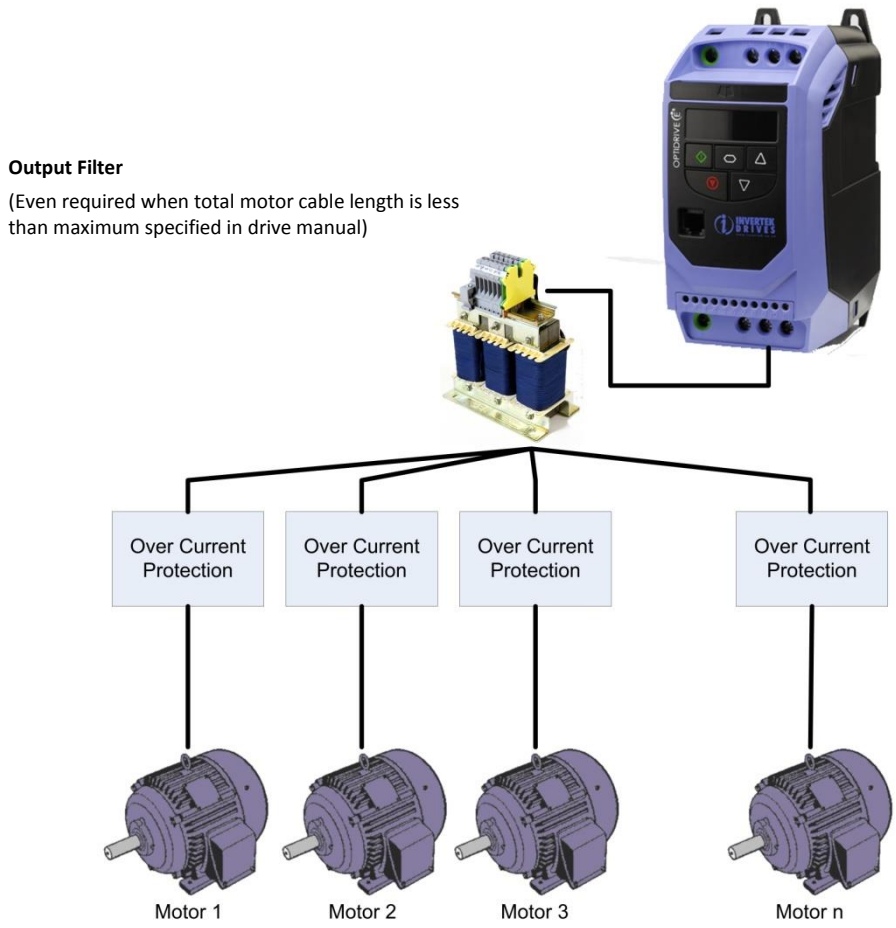
Configuration 1: Series Connection



With this connection method a single motor cable is run between the drive and the first motor and connection is then daisy chained from one motor to the next. The cable from the drive to the first motor is therefore typically long and is required to be rated to the combined current [A] ratings of all of the over-current protection devices. This configuration typically results in the Over-current protection being located close to the motor it protects, making the cable run between the over-current protection and the associated motor very short.

The output filter is required only when the accumulative motor cable length is greater than the maximum motor cable length specified for the drive (given in the drive operating manual).

Configuration 2: Parallel Connection



With this connection method individual motor cables are run between the drive and each of the motors with a common connection (star) point located close to the drive. Over-current protection for this configuration is typically located near to the drive so that each motor cable down-stream from the over current protection device is rated only for the motor it protects.

The output filter is normally required for this connection method, even when the accumulative motor cable length is less than the maximum motor cable length specified for the drive (given within the drive operating manual).

Example of Drive Sizing with permanently connected motors

An Optidrive e2 is required to control six fan motors as follows:

3 x 0.75kW, 1.9 Amps FLC

1 x 2.2kW, 5.2 Amps FLC

The Supply Voltage is 3 Phase 400 Volts. The cable length required is 10metres per fan, wired in series (configuration 1 - above).

Total Amps Required = 1.9 + 1.9 + 1.9 + 5.2 = 10.9 Amps. Referring to the Optidrive E2 User Guide, an 5.5kW 400V drive will provide 14 Amps output current and would be suitable. The 'Motor Rated Current' parameter (P-08) should be set to 10.9 Amps. Each motor requires an individual overload device to protect it, and an output filter is not generally required as the motors are series connected and motor cable length is less than the maximum allowed for this drive model.

Applications where Individual Motors are Not Permanently connected to the Drive

In some applications it might be desirable to use a single drive to operate multiple motors where all of the motors are not operating at the same time (are not always permanently connected to the drive output). Motors might be selected or deselected by means of contactors or switches located between the individual motors and the drive output.

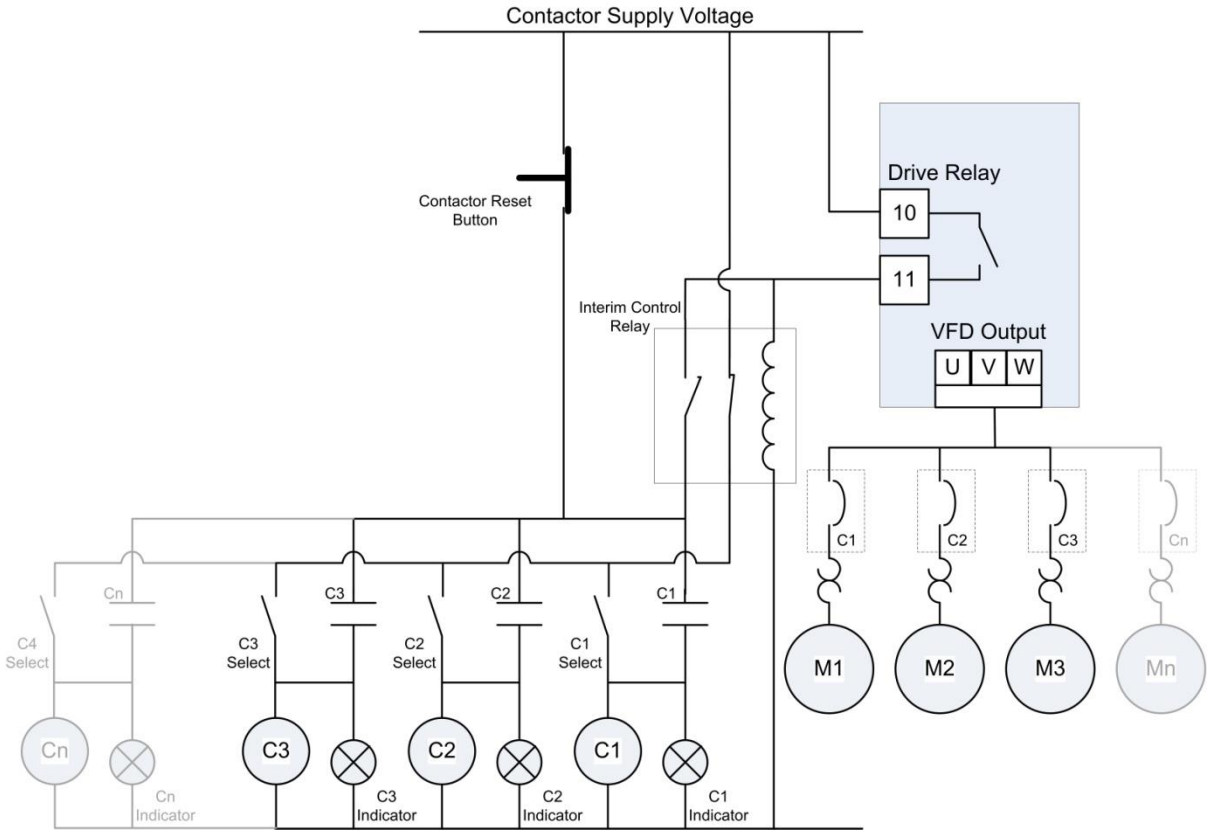
In such cases the best solution is to design the control system in such a way that motors cannot be connected or disconnected whilst the drive is enabled and running. Attempting to start a motor by closing a contactor or switch on the output side of the drive whilst the drive is enabled is likely to cause over current trips on the drive and prohibit operation.

If an application requires that different motors are run at different times (for example; in a bank of 6 fans, any number or configuration of fans might be selected to run at any particular time) then the sequence for changing the motor fan bank configuration would be as follows:

- Disable the drive via the run / Enable signal, and allow the drive to ramp the motors down to standstill
- Operate the Contactors to connect / disconnect the required motors to / from the drive
- Re-Enable the drive run signal to restart the system

Whilst this means that all motors must stop before the motor configuration can be changed, it ensures that nuisance over-current trips are not encountered.

Example Interlock Circuit to prevent motor switching whilst drive enabled



This circuit requires an additional interim relay in addition to the drive user relay in order to provide normally open and normally closed contacts for the successful operation of the circuit.

To select a motor the appropriate contactor select switch is closed (C# Select) whilst the drive is disabled. To deselect a motor the appropriate contactor select switch is opened and the contactor reset button pressed whilst the drive is disabled. Selected motors are shown by the corresponding indicators (C# Indicator).

The drive relay will need to be set to switch on a drive enabled condition. This is done by setting P-18 to '0'

Selecting or deselecting of motors is not possible once the drive is enabled / running and the drive relay closes.

The supply requirements to operate the contactors must not exceed the contact rating of the drive relay or the interim relay. The Drive relay maximum rating is 250Vac @ 6A / 30Vdc @ 5A. An appropriately rated Interim relay should be selected,

Applications where Motors are Connected Whilst the Drive is Running

It is not possible to connect and disconnect motors whilst the drive output is operating. All such applications with Optidrive E2 should be avoided.

Revision History			
Issue	Comments	Author	Date
01	Application Note Created	JP	03/03/12
02	Revised to new format	KB	24/04/14