ABB Low Voltage Drives
Variable Frequency Drives with Manual Motor Protectors (MMPs)

Certain applications benefit from the operation of multiple motors connected to a single variable frequency drive (VFD). Since a VFD monitors the combined current of all connected motors and not the individual current of each motor, ABB recommend that each motor have its own overload protection, short circuit protection and disconnecting means. To achieve this ABB recommend the use of manual motor protectors (MMPs) as they provide all three of the necessary features in a single package.

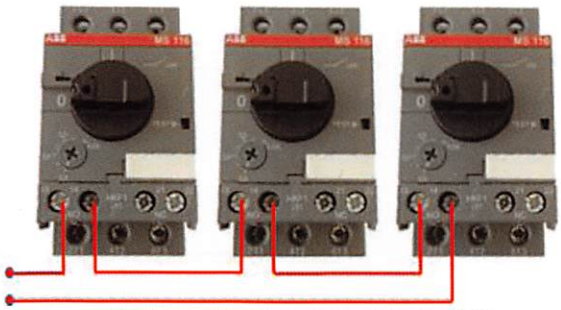
A variety of available VFD with MMPs configurations provide effective solutions to challenging applications. The table below reviews some of the main benefits and challenges of each solution.

Configurations	Benefits	Engineering Concerns
Single Drive with MMPs 	– Single building automation control point for hardwire run/stop, speed, and fault information. – VFDs with multiple motors are higher HP and usually include built-in harmonic mitigation hardware (i.e. DC link choke) standard. – Smaller overall footprint compared to a multiple drive package.	– Limited ability to start into multiple spinning motors. – Single motor short could trip out VFD on a fault. – All motors run at the same speed. – No redundancy if the drive fails.
Single Drive with Bypass and MMPs 	– Single building automation control point for run/stop, speed, and fault information. – VFDs with multiple motors are higher HP and usually include built in harmonic mitigation hardware (i.e. DC link choke) standard. – Smaller overall footprint compared to a multiple drive package. – Bypass provides some redundancy.	– Limited ability to start into multiple spinning motors. – Single motor short could trip out VFD on a fault. – All motors run at the same speed. – Redundancy is fixed to 60hz which may be a concern depending on the system.
Redundant Drive and MMPs 	– Single building automation control point for run/stop, speed, and fault information. – VFDs with multiple motors are higher HP and usually include built in harmonic mitigation hardware (i.e. DC link choke) standard. – Smaller overall footprint compared to a multiple drive package. – Redundancy gives full speed control above and below 60hz.	– Limited ability to start into multiple spinning motors. – Single motor short could trip out VFD on a fault. – All motors run at the same speed.
One Drive per Motor (No MMP) 	– Ability to control individual motors to optimize the system. – Total system redundancy if drive or motor fails – Ability to catch a free spinning motor.	– Drive may not have built-in harmonic mitigation hardware. External AC line reactor can be used, but this may not be enough to meet IEEE 519 building harmonic requirements. – Need to run individual isolated motor cabling between drives and motors. – Increased installation and integration costs.

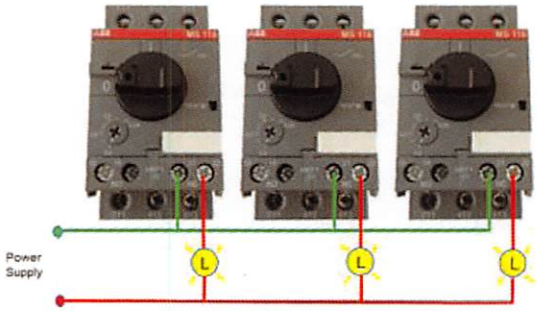
Status Feedback

There is an advantage to using an MMP with an available auxiliary contact. Appropriate wiring can provide an indication of whether an MMP is open/tripped or closed/motor-operating. Auxiliary contacts wired in series provide a single combined indication that one or more of the connected MMPs are open. Auxiliary contacts wired in parallel provide individual indications that a corresponding MMP is open. Wiring from an MMP auxiliary can be connected to pilot lights mounted on an enclosure door, or connected directly to a building automation system (BAS) controller. It is also possible for a BAS to monitor MMP status through serial communication (pass through I/O) by connecting an MMP's auxiliary contacts directly to a VFD's digital input(s).

Status Feedback Wiring Alternatives



Series – Single Combined Indication



Parallel – Individual Indications

MMP Motor Wiring

To minimize the risk of motor bearing currents and potential shock hazards, apply the following best practices:

1. Use a separate conduit run for each motor or use shielded VFD cable
2. Keep ground wires paired with corresponding motor wires
3. Properly size the ground wires

MMP Selection

When selecting MMPs it is important to properly match the MMP with the motor it will protect. Acquire the motor FLA from the motor supplier or if available the motor name plate itself and verify the current range of the selected MMP meets the protection requirements of the motor. If necessary contact the MMP supplier and/or motor supplier for further guidance.

Summary

- It is often beneficial to break up large multi-motor systems to provide system redundancy.
- Use a redundant drive configuration instead of a simple bypass to provide variable speed backup with system control above and below 60Hz.
- Use the advantage of an MMP's available auxiliary contact to provide feedback to the building automation system.
- Make sure to follow proper motor wiring practices.
- Properly size an MMP based on the corresponding motor FLA.

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