Control panel solutions

Reduce costs and quicken installation using combination motor controllers
Motor branch circuits

Motor branch circuits are circuits designed specifically for the electrical control of motor loads in electrical control panels. They provide functions essential for the protection of the conductors, as well as for the safe operation and maintenance of the motor. The first element is a motor disconnect, serving as a means to disconnect and lock out the motor circuit. Next is a device providing a means for short-circuit protection. A motor controller is included to start and stop the motor. The last element is overload protection, serving to protect the motor in the event of an overload. Note that some or all of these elements may be incorporated into one device.
Combination motor controllers

Combination motor controllers (CMCs), consisting of a manual motor protector, a contactor and a lineside adapter, provide a cost-effective means for branch circuit applications. Combination motor controllers are tested and listed by UL® as a self-protected device that provides the four essential motor branch circuit functions: disconnect, short-circuit protection, controller and motor overload protection. UL defines this type of combination as UL 508 Type F. CMCs can be used with commoning links that further reduce wiring as well. CMCs take up less space, are quick to install and are low in price. Combination motor controllers also provide 50–65 kA short-circuit current ratings, which is more than adequate protection in a majority of the locations where control panels are applied in industrial facilities.

Manual motor controllers

Manual motor controllers (MMCs) consist of a manual motor protector and a contactor (no lineside adapter). MMCs are not recognized by UL as a self-protected device, meaning they require an upstream protective device such as a breaker or fuses. MMCs are ideal for group motor applications where a breaker or fuse provides branch protection for a group of motors protected and controlled by multiple MMCs.
Motor branch circuit types

These functions can exist in various combinations of electrical components. The specific combination used is dependent on the application. The following table lists the various combinations and benefits.

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**Fuse and Starter**
- Disconnect Motor Disconnect
- Fuses Short-Circuit Protection

**Breaker and Starter**
- Breaker Motor Disconnect
- Short-Circuit Protection

**Motor Circuit Protector and Starter**
- Motor Circuit Protector
- Short-Circuit Protection

**Manual Motor Protector (Type E)**
- Manual Motor Protector
- Motor Controller

**Combination Motor Controller (Type F)**
- Motor Controller

**Installation**
- Installation effort: High, Moderate, Low
- Lineside commoning links: Not available, Yes

**Usability**
- Controller options: Remote, Remote, Manual only, Manual or remote
- Resetability after short-circuit: Replacement fuses necessary, Reset breaker switch, Reset MCP switch, Reset MMP switch, Reset CMC switch

**Protection**
- Sizing protective devices:
  - Fuses are sized up to 175% of the FLA to prevent nuisance tripping during startup. Because the fuses are oversized for the motor FLA, an overload relay is also needed.
  - Breakers are sized up to 250% of the FLA to prevent nuisance tripping during startup. Because the breaker is oversized for the motor FLA, an overload relay is also needed.
  - MCPs are sized up to 800 to 1100% of the FLA to prevent nuisance tripping during startup. Because the MCP provides no thermal protection, an overload relay is needed.
  - MMPs are sized according to the motor FLA to provide overload protection. The MMP includes short circuit that is designed to mimic the motor inrush (14 times FLA).
  - CMCs are sized according to the motor FLA to provide overload protection. The CMC includes short circuit that is designed to mimic the motor inrush (14 times FLA).

**Safety**
- Padlockable provision: Included in disconnect, Yes, with breaker accessory, Yes, with MCP accessory, Included in MMP, Included in MMP

**Cost**
- Component price: Low, Moderate, Low
- Panel space (and cost): Moderate, Moderate, Low, Low
Eaton’s **XT** line of IEC power control is ideally suited for motor-control applications. The **XT** line consists of contactors, overload relays, manual motor protectors, MMCs and CMCs that are designed to install quickly and minimize costs. Features such as toolless assembly and front access coil termination make **XT** easy to install compared with similar competitive devices. Low coil power consumption in **XT** contactors significantly reduces power supply and control power transformer sizing and costs.

**Compare these motor branch circuits**

These 15 branch circuits are sized for (4) 3 HP, (3) 5 HP, (3) 7.5 HP and (5) 10 HP motors based on the NEC. Dimensions are in inches (mm).

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5. **Combination Type:**
   **Breaker–Starter**
   - Panel space requirement: 3.75 ft²
   - No. of components: 45
   - No. of DIN rails: 2
   - No. of power circuit wires: 135
   - Approx. installation time: 110 minutes

6. **Combination Type:**
   **Fuse–Starter**
   - Panel space requirement: 3.83 ft²
   - No. of components: 60
   - No. of DIN rails: 3
   - No. of power circuit wires: 180
   - Approx. installation time: 130 minutes

7. **Combination Type:**
   **CMC**
   - Panel space requirement: 1.51 ft²
   - No. of components: 21
   - No. of DIN rails: 1
   - No. of power circuit wires: 54
   - Approx. installation time: 45 minutes
   - *Half the space! Half the installation time!*

8. **Motor Starter**
   (Contactor + overload relay)

9. **Combination Motor Controller**

10. **Manual Motor Protector**
Eaton is dedicated to ensuring that reliable, efficient and safe power is available when it's needed most. With unparalleled knowledge of electrical power management across industries, experts at Eaton deliver customized, integrated solutions to solve our customers' most critical challenges.

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