Reduce costs and quicken installation using combination motor controllers

Powering Business Worldwide

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.

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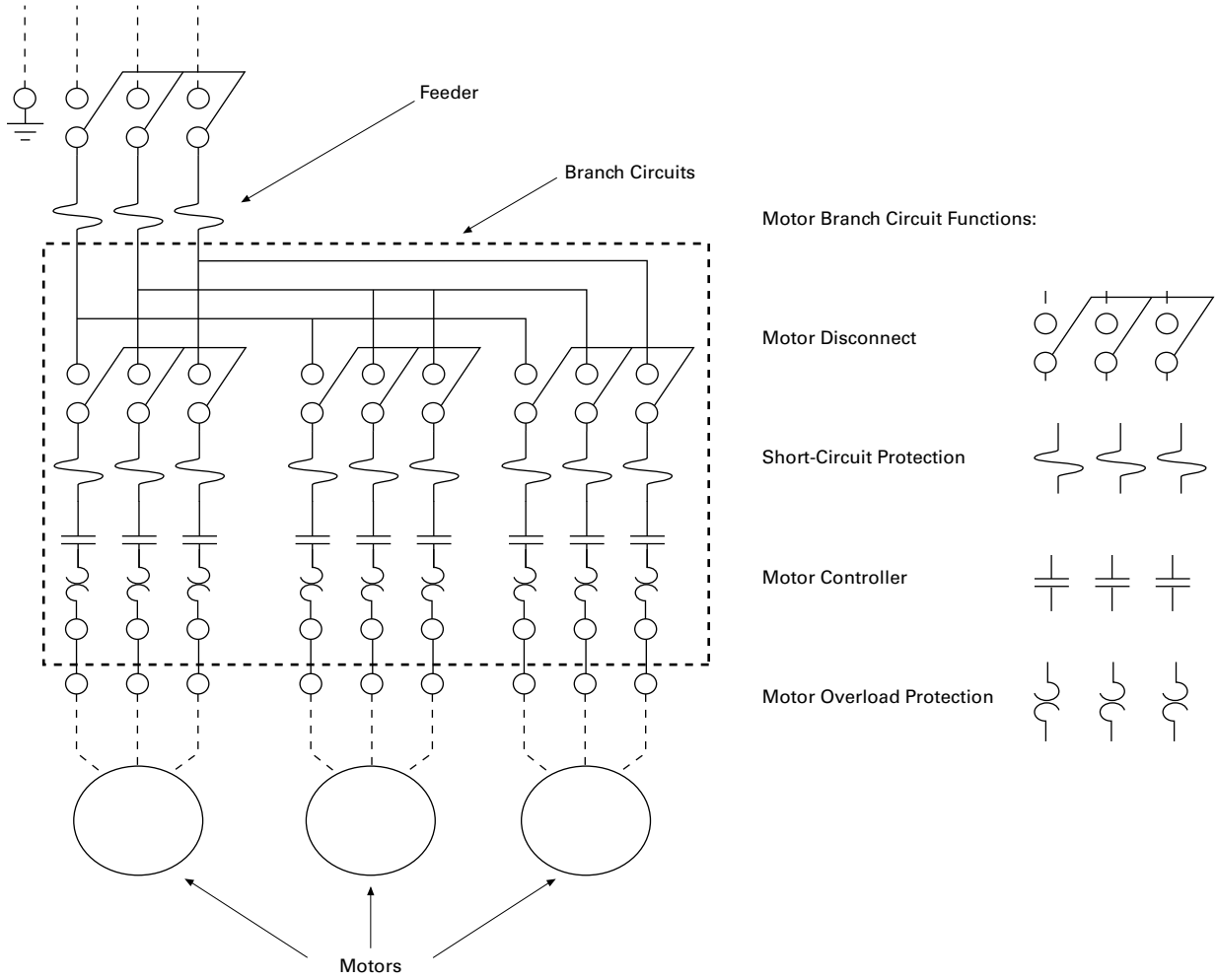

1. Motor Branch Circuit Functions

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.

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2. Combination Motor Controller

3. Manual Motor Controller

4. Unassembled Manual Motor Controller

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.

Motor Branch Devices	Fuse and Starter	Breaker and Starter	Motor Circuit Protector and Starter	Manual Motor Protector (Type E)	Combination Motor Controller (Type F)
	 **Disconnect** Motor Disconnect **Fuses** Short-Circuit Protection **Contactor** Motor Controller **Overload Relay** Motor Overload Protection	 **Breaker** Motor Disconnect Short-Circuit Protection **Contactor** Motor Controller **Overload Relay** Motor Overload Protection	 **MCP** Motor Disconnect Short-Circuit Protection **Contactor** Motor Controller **Overload Relay** Motor Overload Protection	 **MMP** Motor Disconnect Short-Circuit and Motor Overload Protection Motor Controller	 **CMC** Motor Disconnect Short-Circuit and Motor Overload Protection Motor Controller
Branch Circuit Functions					
Motor disconnect function	Disconnect	Breaker	Motor circuit protector	Manual motor protector	Manual motor protector
Short-circuit protection	Fuse block / fuses	Breaker	Motor circuit protector	Manual motor protector	Manual motor protector
Motor controller	Contactor	Contactor	Contactor	Manual motor protector	Contactor
Motor overload protection	Overload relay	Overload relay	Overload relay	Manual motor protector	Manual motor protector
Installation					
Installation effort	High	Moderate	Moderate	Low	Low
Lineside commoning links	Not available	Not available	Not available	Yes	Yes
Usability					
Controller options	Remote	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	Moderate	Low	Low
Panel space (and cost)	Moderate	Moderate	Moderate	Low	Low

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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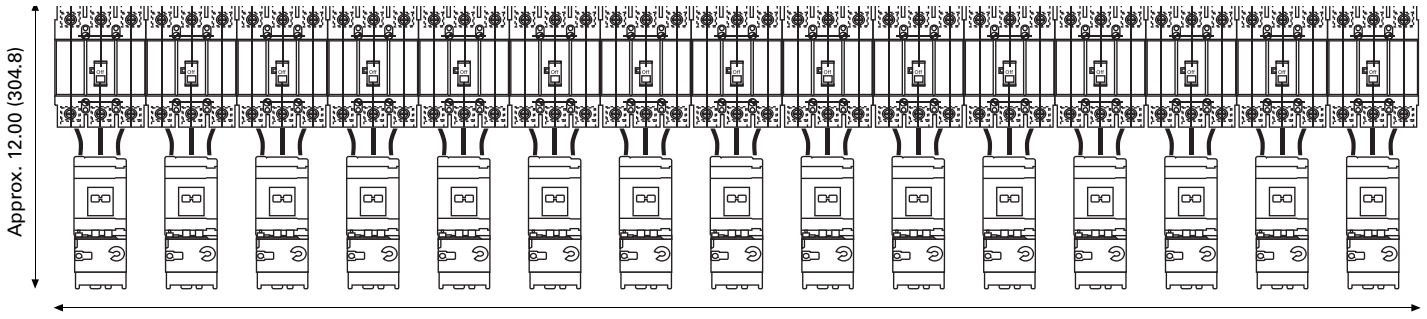

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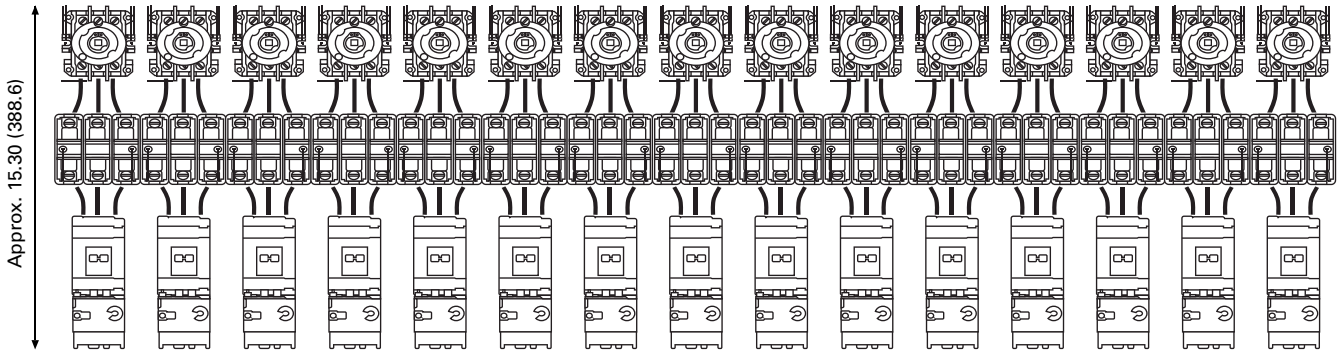

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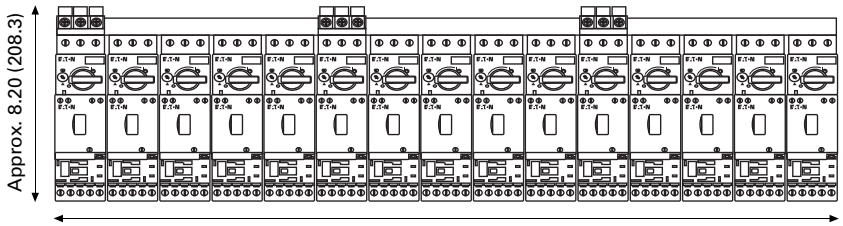

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Eaton's ***XT*** line of IEC power control is ideally suited for motor-control applications. The ***XT*** line consists of contactors, overload relays, manual motor protectors, MMCs and CMCs that are designed to install quickly and minimize costs. 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.

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.

Our focus is on delivering the right solution for the application. But, decision makers demand more than just innovative products. They turn to Eaton for an unwavering commitment to personal support that makes customer success a top priority. For more information, **visit www.eaton.com/electrical**.

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