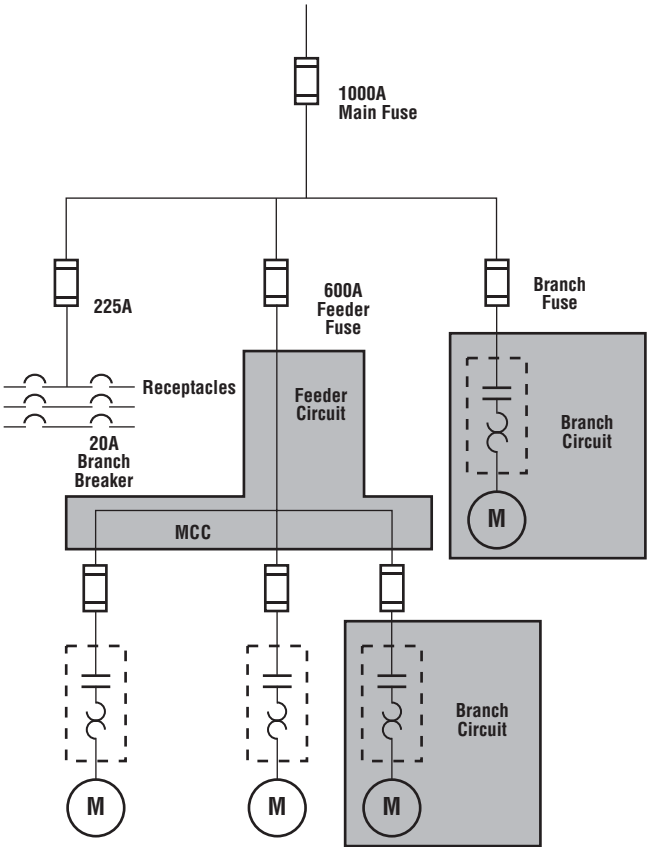
NEC® 430.52 Explanation

Motor Circuit Protection

Motor circuit protection describes the short-circuit protection of conductors supplying power to the motor, the motor controller, and motor control circuits/conductors.

430.52 provides the maximum sizes or settings for overcurrent devices protecting the motor branch circuit. A branch circuit is defined in Article 100 as "The circuit conductors between the final overcurrent device protecting the circuit and the outlet(s)."

NEC® Motor Circuit Protection Requirements



Note that the branch circuit extends from the last branch circuit overcurrent device to the load.

Table 430.52 lists the maximum sizes for Non-Time-Delay Fuses, Dual Element (Time-Delay) Fuses, Instantaneous Trip Circuit Breakers, and Inverse Time Circuit Breakers. Sizing is based on full load amp values shown in Table 430.247 through 430.250, not motor nameplate values.

For example, the maximum time-delay fuse for a 10HP, 460 volt, 3 phase motor with a nameplate FLA of 13 amps would be based on 175% of 14 amps, not 175% of 13 amps.

Table 430.52. Maximum Rating or Setting of Motor Branch Circuit, Short-Circuit and Ground Fault Protective Devices

	Percent of Full-Load Current			
Type of Motor	Non-Time-Delay Fuse**	Dual-Element (Time-Delay) Fuse**	Instantaneous Trip Breaker	Inverse Time Breaker*
Single-phase motors	300	175	800	250
AC polyphase motors other than wound-rotor				
Squirrel Cage:				
Other than Design E	300	175	800	250
Design E	300	175	1100	250
Synchronous†□	300	175	800	250
Wound Rotor	150	150	800	150
Direct-current (constant voltage)	150	150	250	150

For certain exceptions to the values specified, see 430.52 through 430.54.

* The values given in the last column also cover the ratings of non-adjustable inverse time types of circuit breakers that may be modified as in 430.52.

** The values in the Non-Time-Delay Fuse Column apply to Time-Delay Class CC fuses.

†□ Synchronous motors of the low-torque, low-speed type (usually 450 rpm or lower), such as are used to drive reciprocating compressors, pumps, etc., that start unloaded, do not require a fuse rating or circuit-breaker setting in excess of 200 percent of full-load current.

Standard sizes for fuses and fixed trip circuit breakers, per 240.6, are 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100, 110, 125, 150, 175, 200, 225, 250, 300, 350, 400, 450, 500, 600, 700, 800, 1000, 1200, 1600, 2000, 2500, 3000, 4000 5000, and 6000 amps. Additional standard fuse sizes are 1, 3, 6, 10, and 601 amps.

The exceptions in 430.52 allow the user to increase the size of the overcurrent device if the motor is not able to start. All Class CC fuses can be increased to 400%, along with non-time-delay fuses not exceeding 600 amps. Time-delay (dual-element) fuses can be increased to 225%. All Class L fuses can be increased to 300%. Inverse time (thermal-magnetic) circuit breakers can be increased to 400% (100 amp and less) or 300% (larger than 100 amps). Instant trip circuit breakers may be adjusted to 1300% for other than Design B motors and 1700% for energy efficient Design B motors.

430.52(C)(2) reminds the user that the maximum device ratings which are shown in a manufacturer's overload relay table must not be exceeded even if higher values are allowed by other parts of 430.52.

430.52(C)(3) details the requirements that instant-trip CBs can only be used if part of a listed combination motor controller.