

FUSES

Fuses and circuit breakers are often used to protect motors from burning out due to current overloads. Fuses and circuit breakers are usually located outside the motor for easy access.

Fuses conduct electrical current normally when operating below their maximum rating. When an over current condition exists that exceeds the fuse's maximum rating, heat builds up inside the fuse. This causes the conduction element inside the fuse to melt. The element melts and opens the circuit. Electrical current can no longer flow to the motor, thus ceasing normal operation of the motor. A fuse with a melted element is called a blown fuse.

There are four basic types of fuses

- Fast acting
- Time-delay
- Multipurpose
- Current-limiting

The starting current of a motor can be from two to six times the running current of the motor. FAST-ACTING fuses blow immediately after the maximum rating of the fuse is exceeded. A FAST ACTING fuse used on a motor with a high starting current will blow before the motor can start running.

TIME -DELAY fuses will not blow unless an overload condition exists for an extended period of time, typically 10 seconds. The time delay is usually required when a motor has high starting currents.

The TIME-DELAY fuse has a disadvantage to the FAST-ACTING fuse if an extremely high current overload occurs. The motor could be damaged from the high current before the time delay is over. The FAST-ACTING fuse does not have the time delay, therefore, it can shut the motor off before damage may occur.

The MULTIPURPOSE fuse has the advantages of both FAST-ACTING and TIME-DELAY fuses. The MULTIPURPOSE fuse will not blow during small overloads lasting only short periods of time, such as when the motor is starting. If an extremely high overload occurs (over 500% maximum current rating) the fuse will blow immediately. The MULTIPURPOSE

fuse provides good motor protection from both long-term small overloads and short-term large overloads.

The CURRENT LIMITING fuse will never blow regardless of conditions. It prevents the electrical current to the motor from exceeding the rated current.

If a fuse continues to blow, check to see that it is the proper size rating for the application. If the fuse is the correct size, there could be another cause other than current flow.

Here are the maximum fuse ratings in amperes for motor running protection:

HP	AC Motors Single-Phase Split Phase or Cap Start	
	120V	240V
1/6	4.4	2.2
—	5.8	2.9
1/3	7.2	3.6
—	9.8	4.9
—	13.8	6.9
1	16.0	8.0

CIRCUIT BREAKERS

Many homes and businesses use circuit breakers rather than fuses. A CIRCUIT BREAKER is an automatic switch which will open a circuit if the current draw is too great.

CIRCUIT BREAKERS are usually rated the same as fuses. An "opened" Circuit Breaker must be manually reset. As with fuses, a circuit which is continually opening the breaker should be carefully examined. If the breaker has sufficient capacity, there may be a short or other problem within the circuit.

Fuses and Circuit breakers are not necessarily interchangeable. The UL (Underwriters Laboratories) nameplate on an HVAC device may indicate the type of over current protection required by the National Electrical Code.