Graphic Explanation

Motor Starter Protection

Motor controllers are highly susceptible to damage due to short circuits. Even for moderate or low-level faults, extensive damage may occur if the short circuit protective device is not carefully selected. The most vulnerable parts are the starter contacts and heater elements. Fault currents can weld the contacts and cause the heater elements to vaporize or be critically damaged. The metalized vapors from such damage then can initiate further starter destruction in the enclosure.

Often, after a fault, no apparent damage is visible (i.e., the contacts are not welded and the heater elements are not burnt up). However, the heat energy from the fault may have caused too high of a heat excursion for the heater elements or overload relay sensing element to withstand, with the result being a permanently altered and degradated level of overload protection.

The question is, what can be done to obtain the highest degree of short circuit protection for motor controllers? The solution is to use short circuit protective devices that are current-limiting and size them as close as practical. A current-limiting fuse can cut off the short-circuit current before it reaches damaging levels. Even for potentially high short-circuit currents, the quick clearing of the fuse can limit the current passed through the starter to safe levels. Dual-element Class RK5 and RK1 fuses are recommended since they can be sized at 125% of the motor full-load current, rather than 300% sizing for non-time-delay fuses.

The branch circuit protective device size cannot exceed the maximum rating shown on equipment labels or controller manufacturer's tables. 430.53 requires observance of the requirements of 430.52 plus, for circuits under 430.53(C) the motor running overload device and controller must be approved for group installation with a specified maximum rating protective device. Under 430.54 for multi-motor and combination-load equipment, the rating of the branch circuit protective device cannot exceed the rating marked on the equipment. Therefore, be sure to check labels, controller overload relay tables, equipment nameplates, etc. In no case can the manufacturer's specified rating be exceeded. This would constitute a violation of NEC® 110.3(B). When the label, table, etc. is marked with a "Maximum Fuse Amp Rating" rather than marked with a "Maximum Overcurrent Device" this then means only fuses can be used for the branch circuit protective device.

Achieving Short Circuit Protection

In order to properly select an overcurrent device for a motor starter, four areas require particular attention:

1. Withstand rating of the contactor.
2. Wire Damage,
3. Cross-over point of the fuse and relay curve,
4. Motor Damage.

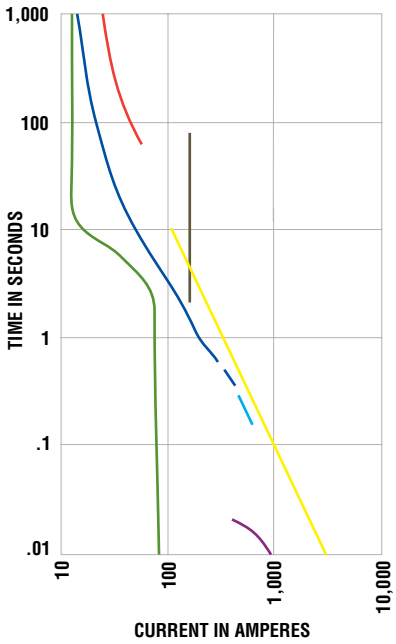
Please refer to the following graph.

Contactor Withstand Rating

The first area of concern is the withstand rating of the contactor. In order to prevent damage to the contactor, the maximum peak let-through current (I_p) and maximum clearing energy (I^2t) (amps^2 seconds) of the fuse must be less than the equivalent ratings for the contactor. The clearing time and let-through characteristics of the fuse must be considered when verifying adequate protection of the contactor.

Wire Damage

Secondly, motor circuit conductors have a withstand rating that must not be exceeded. If the overcurrent protective device is not capable of limiting the short-circuit current to a value below the wire with-stand, the wire may be damaged, or destroyed.



Motor and Motor Circuit Damage Protection
10 H.P @ 460V

Legend:

- Motor Start
- Overload Relay
- Motor Damage
- 12 AWG Wire Damage
- Thermal Withstand Limit
- Contactor Breaking Current
- Contactor Withstand $30I_e^2$

Cross Over Point

Thirdly, the cross-over point (I c) is the point where the fuse curve intersects the overload relay curve. For current levels less than the cross-over point the overload relay opens the circuit. For current values greater than the cross-over point the fuses open the circuit and prevent thermal damage to the overload relay, contacts, and the motor circuit. This point of intersection should be approximately 7-10 times Ie, where Ie is rated current. Ideally the fuse should allow the overload relay to function under overload conditions, and operate before the overcurrent reaches the contactor's breaking capacity.

Motor Damage

Finally, all motors have an associated motor damage curve. Single phasing, overworking, and locked rotor conditions are just a few of the situations that cause excessive currents in motor circuits. Excessive currents cause motors to overheat, which in turn causes the motor winding insulation to deteriorate and ultimately fail. Overload relays and dual-element, time-delay fuses, are designed to open the motor circuit before current levels reach the motor damage curve.

IEC and UL Standards for Allowable Damage

IEC 947-4-1 and UL508E differentiate between two different types of coordination, or damage levels.

— Type "1" Considerable damage, requiring replacement. No external damage to the enclosure. short circuit protective devices interrupt intermediate to high short-circuit currents which exceed the withstand rating of the motor starter. A non-current- limiting device will interrupt these high currents, but this type of damage will typically result.

— Type "2" "No Damage" is allowed to either the contactor or overload relay. Light contact welding is allowed, but must be easily separable. (Note: If access is not possible and the contacts cannot be separated, Type "2" protection cannot be achieved.) This level of protection typically can only be provided by a current-limiting device, that is, one which limits the available short-circuit current to a significantly lower value.

Graphic Explanation

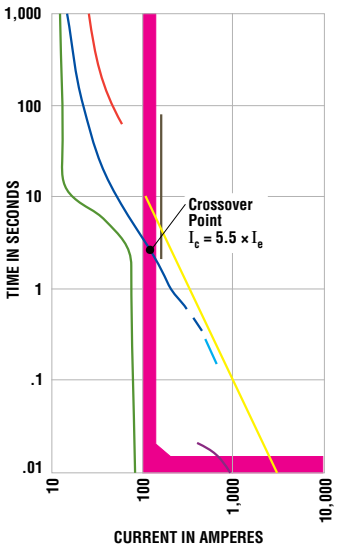
Five Choices — 1 Solution

IEC Motor Starter Protection

Five methods of providing motor starter overcurrent protection are delineated in the five examples that follow. In noting the levels of protection provided by each method, it becomes apparent that the use of dual-element, time-delay fuses (Example 5) is the only one that gives protection at all levels whether it be “Type 2,” “Back-up Overload,” “Back-up Single-Phase,” etc.

These examples are based on a typical motor circuit consisting of an IEC Starter, and a 10 HP, 460V motor (Service factor = 1.15). These “Level of Protection” examples reflect the branch circuit protective device operating in combination with the IEC starter overload relays sized at approximately 115% of motor FLA and contactor Ie = 18 amps.

Example 1



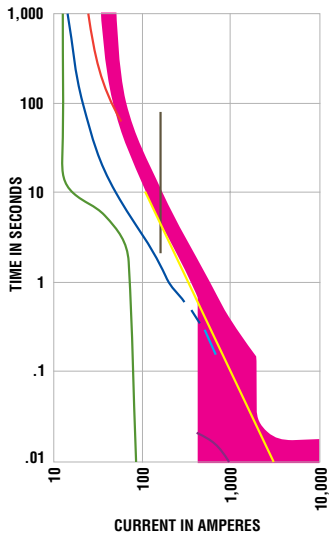
Motor Circuit Protector
(700% FLA)

Legend:
- Motor Start
- Overload Relay
- Motor Damage
- 12 AWG Wire Damage
- Thermal Withstand Limit
- Contactor Breaking Current
- Contactor Withstand $30I_e^2$
- MCP (700%)

Level of Protection:

Type "2"	No
Single-Phase	Yes
Back-up Single-Phase	No
Overload	Yes
Back-up Overload	No
Meets 110.10	No
Meets 430.52	Yes

Example 2



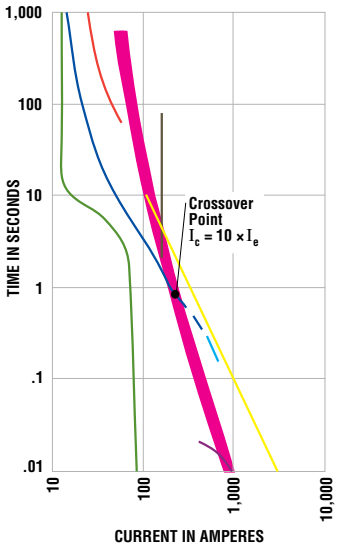
Molded Case Circuit Breaker
(250% FLA)

Legend:
- Motor Start
- Overload Relay
- Motor Damage
- 12 AWG Wire Damage
- Thermal Withstand Limit
- Contactor Breaking Current
- Contactor Withstand $30I_e^2$
- MCCB 40A

Level of Protection:

Type "2"	No
Single-Phase	Yes
Back-up Single-Phase	No
Overload	Yes
Back-up Overload	No
Meets 110.10	No
Meets 430.52	Yes

Example 3



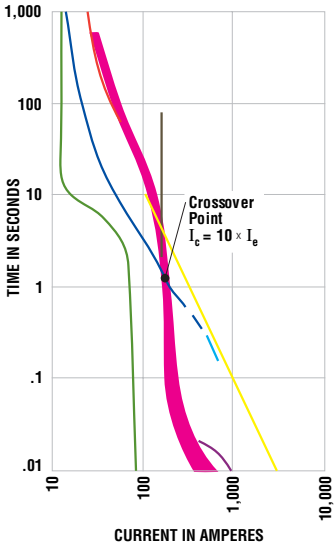
Fast-Acting Fuse
(300% FLA)

Legend:
- Motor Start
- Overload Relay
- Motor Damage
- 12 AWG Wire Damage
- Thermal Withstand Limit
- Contactor Breaking Current
- Contactor Withstand $30I_e^2$
- Fast-Acting Fuse 45A

Level of Protection:

Type "2"	Yes
Single-Phase	Yes
Back-up Single-Phase	No
Overload	Yes
Back-up Overload	No
Meets 110.10	Yes
Meets 430.52	Yes

Example 4



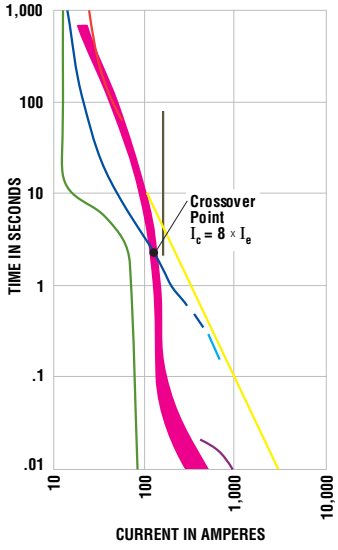
Dual-Element, Time-Delay Fuse
(175% FLA)

Legend:
- Motor Start
- Overload Relay
- Motor Damage
- 12 AWG Wire Damage
- Thermal Withstand Limit
- Contactor Breaking Current
- Contactor Withstand $30I_e^2$
- Low-Peak, Dual-Element, Time-Delay 25A

Level of Protection:

Type "2"	Yes
Single-Phase	Yes
Back-up Single-Phase	No
Overload	Yes
Back-up Overload	No
Meets 110.10	Yes
Meets 430.52	Yes

Example 5



Dual-Element, Time-Delay Fuse
(125%) - Class RK1 or J

Legend:
- Motor Start
- Overload Relay
- Motor Damage
- 12 AWG Wire Damage
- Thermal Withstand Limit
- Contactor Breaking Current
- Contactor Withstand $30I_e^2$
- Low-Peak, Dual-Element, Time-Delay 17 ½A

Level of Protection:

Type "2"	Yes
Single-Phase	Yes
Back-up Single-Phase	Yes
Overload	Yes
Back-up Overload	Yes
Meets 110.10	Yes
Meets 430.52	Yes

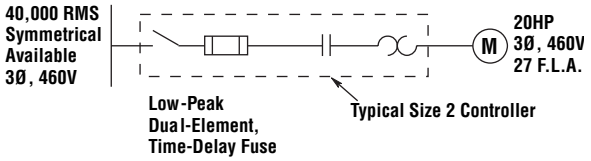
Motor Controller Marking

A new 2005 NEC® 430.8 requirement is that most motor controllers be marked with their short-circuit current rating (SCCR). Controller manufacturers have the discretion to test, list, and mark their controllers at the standard fault levels of UL 508 (shown in the table below) or the manufacturer can choose to test, list and mark for higher levels of short-circuit currents. A controller with a marked SCCR makes it easier to establish the short-circuit current rating for an industrial control panel as is now required in NEC® 409.110.

Motor Controller Protection

The diagram below shows a Size 2, combination motor controller supplying a 460 volt, 3Ø, 20Hp motor. The short-circuit withstand of this and other motor controllers are established so that they may be properly protected from short circuit damage.

Short Circuit Protection of Motor Controller



There are several independent organizations engaged in regular testing of motor controllers under short circuit conditions. One of these, Underwriter's Laboratories, tests controllers rated one horsepower or less and 300V or less with 1000 amps short-circuit current available to the controller test circuit. Controllers rated 50Hp or less are tested with 5000 amps available and controllers rated above 50Hp to 200Hp are tested with 10,000 amps available. See the table below for these values.*

Motor Controller HP Rating	Test Short Circuit Current Available*
1Hp or less and 300V or less	1000A
50Hp or less	5000A
Greater than 50Hp to 200Hp	10,000A
201Hp to 400Hp	18,000A
401Hp to 600Hp	30,000A
601Hp to 900Hp	42,000A
901Hp to 1600Hp	85,000A

* From Industrial Control Equipment, UL508.

It should be noted that these are basic short circuit requirements. Higher, combination ratings are attainable if tested to an applicable standard. However, damage is usually allowed.

430.52 of the National Electrical Code® allows dual-element, time-delay fuses and other overcurrent protective devices to be sized for branch circuit protection (short circuit protection only). Controller manufacturers often affix labels to the inside of the motor starter cover which recommend the maximum size fuse for each overload relay size.

A paragraph in NEC® 430.52 states:

> *Where maximum branch circuit short circuit and ground fault protective device ratings are shown in the manufacturer's overload relay table for use with a motor controller or are otherwise marked on the equipment, they shall not be exceeded even if higher values are allowed as shown above.***

** "Above" refers to other portions of 430-52 not shown here.

This paragraph means that the branch circuit overcurrent protection for overload relays in motor controllers must be no greater than the maximum size as shown in the manufacturer's overload relay table. These maximum branch circuit sizes must be observed even though other portions of 430.52 allow larger sizing of branch circuit overcurrent protection.

The reason for this maximum overcurrent device size is to provide short circuit protection for the overload relays and motor controller.

Type 1 Versus Type 2 Protection

UL has developed a short circuit test procedure designed to verify that motor controllers will not be a safety hazard and will not cause a fire.

Compliance to the standard allows deformation of the enclosure, but the door must not be blown open and it must be possible to open the door after the test. In the standard short circuit tests, the contacts must not disintegrate, but welding of the contacts is considered acceptable. Tests allow the overload relay to be dam-aged with burnout of the current element completely acceptable. For short circuit ratings in excess of the standard levels listed in UL508, the damage allowed is even more severe. Welding or complete disintegration of contacts is acceptable and complete burnout of the overload relay is allowed. Therefore, a user cannot be certain that the motor starter will not be damaged just because it has been UL Listed for use with a specific branch circuit protective device. UL tests are for safety, with the doors closed but do allow a significant amount of damage as long as it is contained within the enclosure.

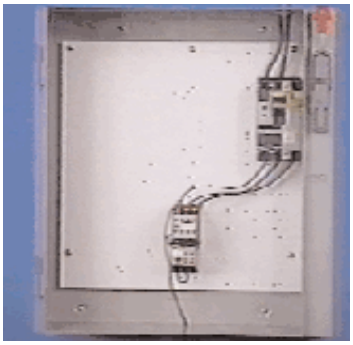


Photo 1 Before Test: MCP as motor branch circuit protection for 10HP, IEC Starter with 22,000 amps available at 480V.

Photo 2: Same as Photo 1, but during the test with MCP as the motor branch circuit protection. The heater elements vaporized and the contacts were severely welded. Extensive starter repair or total starter replacement would be required. This level of damage is permissible by UL508 or UL508E/IEC60947-4-1 Type 1 protection.

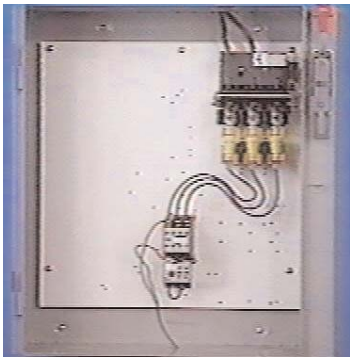


Photo 3 During Test: same test circuit and same type starter during short circuit interruption. The difference is current-limiting fuses provide the motor branch circuit protection. This illustrates the level of protection required by UL508E and IEC 60947-4-1 for Type 2 "no damage" protection. The heaters and overload relays maintained calibration, which is extremely important to retain circuit overload protection. This starter could be put back into service without any repair.

In order to properly select a branch circuit protective device that not only provides motor branch circuit protection, but also protects the circuit components from damage, the designer must look beyond mere safety standards. Coordination (protection) of the branch circuit protective device and the motor starter is necessary to insure that there will be no damage or danger to either the starter or the surrounding equipment. There is an "Outline of Investigation," (UL508E) and an IEC (International Electrotechnical Commission) Standard IEC Publication 60947, "Low Voltage Switchgear and Control, Part 4-1: Contactors and Motor Starters," that offer guidance in evaluating the level of damage likely to occur during a short circuit with various branch circuit protective devices. These standards address the coordination (protection) between the branch circuit protective device and the motor starter. They provide a method to measure the performance of these devices should a short circuit occur. They define two levels of protection (coordination) for the motor starter:

Type 1. Considerable damage to the contactor and overload relay is acceptable. Replacement of components or a completely new starter may be needed. There must be no discharge of parts beyond the enclosure.

Type 2. No damage is allowed to either the contactor or over-load relay. Light contact welding is allowed, but must be easily separable.

Where Type 2 protection is desired, the controller manufacturer must verify that Type 2 protection can be achieved by using a specified protective device. US manufacturers have both their NEMA and IEC motor controllers verified to meet the Type 2 requirements outlined in UL508E and IEC 60947-4. As of this writing only current-limiting devices have been able to provide the current limitation necessary to provide verified Type 2 protection. In many cases, Class J, Class RK1, or Class CC fuses are required, because Class RK5 fuses and circuit breakers aren't fast enough under short circuit conditions to provide Type 2 protection.

Tables: Type 2 Motor Starter/Cooper Bussmann Fuses

On the following pages are motor starters of several manufacturers that have been verified by testing for Type 2 protection using the fuses denoted. These are maximum fuse sizes; for specific applications, it may be desirable to size closer. In some cases, the fuse type/amp rating shown is greater than that permitted for branch circuit protection for a single motor per 430.52 (footnoted); however, the size may be applicable for group motor protection applications. In a few cases, the fuse type/amp rating may be too small for typical motor starting applications (footnoted). It is recommended to use these fuse types/amp ratings in conjunction with the fuse type/sizing philosophy (backup motor overload, optimal or maximum branch circuit protection - see Motor Protection Table explanation in Motor Circuit Protection Section of this book.) This data was obtained from the manufacturers or their web sites.

The following pages have Fuse/Starter (IEC & NEMA) Type 2 "no damage" Tables for:

General Electric	165 to 169
Rockwell Automation/Allen-Bradley	170 to 171
Square D Co.	172 to 175
Siemens	176 to 177
Cutler-Hammer	178 to 180

General Electric Company — IEC (UL & CSA Verified)

200 Volt, Three-Phase Motors

HP (FLC)	CONTACTOR	OLR	MAX FUSE LPJ_SP CLASS J
0.5 (2.5)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1J	4
0.5 (2.5)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1K	8†
0.75 (3.7)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1K	8
1 (4.8)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1L	10
1.5 (6.9)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1M	12
2 (7.8)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1N	20†
3 (11.0)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1P	20
5 (17.5)	CL02, CL03, CL04, CL25, CL45	RT*1S	35
5 (17.5)	CL06, CL07, CL08, CL09, CL10	RT*2B	35
5 (17.5)	CL03, CL04, CL45	RT*1T	45†
7.5 (25.3)	CL04, CL05	RT*1U	45
7.5 (25.3)	CL06, CL07, CL08, CL09, CL10	RT*2D	60†
7.5 (25.3)	CL04, CL45	RT*1V	60†
10 (32.2)	CL45	RT*1W	70
10 (32.2)	CL06, CL07, CL08, CL09, CL10	RT*2E	70
15 (48.3)	CL07, CL08, CL09, CL10	RT*2G	100
20 (62.1)	CL08, CL09, CL10	RT*2H	125
20 (62.1)	CK08, CK09, CK95	RT*3B	125
25 (78.2)	CK08, CK09	RT*3C	150

230 Volt, Three-Phase Motors

HP (FLC)	CONTACTOR	OLR	MAX FUSE LPJ_SP CLASS J
0.5 (2.2)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1J	4
0.75 (3.2)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1K	8†
1 (4.2)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1L	10
1.5 (6.0)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1L	10
2 (6.8)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1M	12
3 (9.6)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1N	20
5 (15.2)	CL02, CL03, CL04, CL25, CL45	RT*1S	35†
5 (15.2)	CL06, CL07, CL08, CL09, CL10	RT*2B	35†
7.5 (22.0)	CL03, CL04, CL45	RT*1T	45
7.5 (22.0)	CL06, CL07, CL08, CL09, CL10	RT*2C	45
7.5 (22.0)	CL03, CL04, CL45	RT*1U	45
10 (28.0)	CL04	RT*1V	60
10 (28.0)	CL45	RT*1V	60
10 (28.0)	CL06, CL07, CL08, CL09, CL10	RT*2D	60
15 (42.0)	CL06, CL07, CL08, CL09, CL10	RT*2F	90
20 (54.0)	CL07, CL08, CL09, CL10	RT*2G	100
20 (54.0)	CL07, CL08, CL09, CL10	RT*2H	125†
25 (68.0)	CK08, CK09, CK95	RT*3B	125
25 (68.0)	CL08, CL09, CL10	RT*2J	125
30 (80.0)	CK08, CK09, CK95	RT*3B	125
25 (68.0)	CK08, CK09	RT*3C	150

* Replace * with “A” or “M”

† Sized larger than code max for single motor.

General Electric Company — IEC (UL & CSA Verified)

460 Volt, Three-Phase Motors

HP (FLC)	CONTACTOR	OLR	MAX FUSE LPJ_SP CLASS J
0.5 (1.1)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1F	1.5††
0.5 (1.1)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1G	2
0.75 (1.6)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1H	4†
1 (2.1)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1J	4
1.5 (3.0)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1K	8†
2 (3.4)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1K	8†
3 (4.8)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1L	10
5 (7.6)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1N	20†
7.5 (11.0)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1P	20
10 (14.0)	CL02, CL03, CL04, CL25, CL45	RT*1R	25
10 (14.0)	CL06, CL07, CL08, CL09, CL10	RT*2A	30
15 (21.0)	CL03, CL04, CL45	RT*1T	45
15 (21.0)	CL06, CL07, CL08, CL09, CL10	RT*2C	45
20 (27.0)	CL04, CL45	RT*1V	60
20 (27.0)	CL06, CL07, CL08, CL09, CL10	RT*2D	60
25 (34.0)	CL45	RT*1W	70
25 (34.0)	CL06, CL07, CL08, CL09, CL10	RT*2E	70
30 (40.0)	CL06, CL07, CL08, CL09, CL10	RT*2E	70
30 (40.0)	CL06, CL07, CL08, CL09, CL10	RT*2F	90
40 (52.0)	CL07, CL08, CL09, CL10	RT*2G	100
50 (65.0)	CL08, CL09, CL10	RT*2H	125
50 (65.0)	CL08, CL09, CL10	RT*3B	125
50 (65.0)	CL08, CL09, CL10	RT*2J	125
60 (77.0)	CL09, CL10	RT*3B	125
60 (77.0)	CL09, CL10	RT*2K	150

575 Volt, Three-Phase Motors

HP (FLC)	CONTACTOR	OLR	MAX FUSE LPJ_SP CLASS J
0.5 (0.9)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1F	1.5
0.75 (1.3)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1G	2
0.75 (1.3)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1H	4†
1 (1.7)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1H	4†
1.5 (2.4)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1J	4
2 (2.7)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1J	4
2 (2.7)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1K	8†
3 (3.9)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1K	8
5 (6.1)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1L	10
5 (6.1)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1M	12
7.5 (9.0)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1N	20
10 (11.0)	CL00, CL01, CL02, CL03, CL04, CL25, CL45	RT*1P	20
15 (17.0)	CL02, CL03, CL04, CL25, CL45	RT*1S	35
15 (17.0)	CL06, CL07, CL08, CL09, CL10	RT*2B	35
20 (22.0)	CL03, CL04, CL45	RT*1T	45
20 (22.0)	CL06, CL07, CL08, CL09, CL10	RT*2C	45
20 (22.0)	CL03, CL04, CL45	RT*1U	45
25 (27.0)	CL04, CL45	RT*1V	60
25 (27.0)	CL06, CL07, CL08, CL09, CL10	RT*2D	60
30 (32.0)	CL04, CL45	RT*1V	60
30 (32.0)	CL06, CL07, CL08, CL09, CL10	RT*2D	60
30 (32.0)	CL45	RT*1W	70
30 (32.0)	CL06, CL07, CL08, CL09, CL10	RT*2E	70
40 (41.0)	CL06, CL07, CL08, CL09, CL10	RT*2E	70
40 (41.0)	CL06, CL07, CL08, CL09, CL10	RT*2F	90
50 (52.0)	CL07, CL08, CL09, CL10	RT*2G	100
60 (62.0)	CL07, CL08, CL09, CL10	RT*2H	125
60 (62.0)	CK08, CK09, CK95	RT*3B	125
75 (77.0)	CK08, CK09, CK95	RT*3B	125
75 (77.0)	CK08, CK09	RT*3C	150

* Replace * with “A” or “M”

†† May be too small to allow some motors to start.

† Sized larger than code max for single motor.

General Electric Company — NEMA (UL & CSA Verified)

200 Volt, Three-Phase Motors

HP (FLC)	OLR	MAX FUSE LPJ_SP CLASS J
0.5 (2.5)	CR324CXE	6
0.5 (2.5)	CR123C326A	6
0.75 (3.7)	CR123C356A	8
0.75 (3.7)	CR324CXF	10
1 (4.8)	CR324CXF	10
1 (4.8)	CR123C526A	10
1.5 (6.9)	CR324CXG	15
1.5 (6.9)	CR123C778A	15
1.5 (6.9)	CR123C695A	15
2 (7.8)	CR324CXG	17.5
2 (7.8)	CR123C867A	17.5
3 (11.0)	CR324CXG	20
3 (11.0)	CR123C125B	20
5 (17.5)	CR234CXH	35
5 (17.5)	CR234FXK	35
5 (17.5)	CR123C180B	35
5 (17.5)	CR123C198B	35
5 (17.5)	CR123F233B	35

230 Volt, Three-Phase Motors

HP (FLC)	OLR	MAX FUSE LPJ_SP CLASS J
0.5 (2.2)	CR123C268A	5
0.5 (2.2)	CR324CXE	6
0.75 (3.2)	CR324CXF	7
0.75 (3.2)	CR123C356A	7
1 (4.2)	CR324CXF	10
1 (4.2)	CR123C466A	10
1.5 (6.0)	CR324CXF	15
1.5 (6.0)	CR123C695A	15
2 (6.8)	CR324CXG	15
2 (6.8)	CR324DXG	15
2 (6.8)	CR123C778A	15
3 (9.6)	CR324CXG	20
3 (9.6)	CR324DXG	20
3 (9.6)	CR123C104B	20
5 (15.2)	CR234CXH	30
5 (15.2)	CR234DXH	30
5 (15.2)	CR123C163B	30
7.5 (22.0)	CR324DXH	45
7.5 (22.0)	CR324FXK	45
7.5 (22.0)	CR123C228B	45
7.5 (22.0)	CR123C250B	45
7.5 (22.0)	CR123C270B	45

460 Volt, Three-Phase Motors

HP (FLC)	OLR	MAX FUSE LPJ_SP CLASS J
0.5 (1.1)	CR123C131A	2.5
0.5 (1.1)	CR324CXD	3
0.75 (1.6)	CR324CXD	3.5
0.75 (1.6)	CR123C196A	3.5
1 (2.1)	CR123C268A	5
1 (2.1)	CR324CXE	6
1.5 (3.0)	CR324CXE	6
1.5 (3.0)	CR123C356A	6
2 (3.4)	CR324CXF	7
2 (3.4)	CR123C379A	7
3 (4.8)	CR324CXF	10
3 (4.8)	CR123C526A	10
5 (7.6)	CR324CXG	15
5 (7.6)	CR324DXG	15
5 (7.6)	CR123C867A	15
7.5 (11.0)	CR324CXG	20
7.5 (11.0)	CR324DXG	20
7.5 (11.0)	CR123C125B	20
10 (14.0)	CR234CXH	30
10 (14.0)	CR234DXH	30
10 (14.0)	CR123C163B	30
15 (21.0)	CR324CXH	45
15 (21.0)	CR324DXH	45
15 (21.0)	CR324FXK	45
15 (21.0)	CR123C228B	45
15 (21.0)	CR123F243B	45

575 Volt, Three-Phase Motors

HP (FLC)	OLR	MAX FUSE LPJ_SP CLASS J
0.5 (0.9)	CR123C109A	2
0.5 (0.9)	CR324CXD	3
0.75 (1.3)	CR324CXD	3
0.75 (1.3)	CR123C163A	3
1 (1.7)	CR324CXD	3.5
1 (1.7)	CR123C196A	3.5
1 (1.7)	CR324CXE	3.5
1.5 (2.4)	CR324CXE	6
1.5 (2.4)	CR123C301A	6
2 (2.7)	CR324CXE	6
2 (2.7)	CR123C326A	6
3 (3.9)	CR324CXF	10
3 (3.9)	CR123C419A	10
5 (6.1)	CR324CXF	15
5 (6.1)	CR123C695A	15
7.5 (9.0)	CR324CXG	20
7.5 (9.0)	CR324DXG	20
7.5 (9.0)	CR123C104B	20
7.5 (9.0)	CR123C955A	20
10 (11.0)	CR123C125B	20
10 (11.0)	CR324CXG	20
10 (11.0)	CR324DXG	20
15 (17.0)	CR234DXH	35
15 (17.0)	CR234FXK	35
15 (17.0)	CR123C180B	35
20 (22.0)	CR324DXH	45
20 (22.0)	CR324FXK	45
20 (22.0)	CR123C228B	45
20 (22.0)	CR123C250B	45
20 (22.0)	CR123C270B	45

Motor Controller & Fuse Selection For Type 2 Protection

General Electric Company — NEMA (UL & CSA Verified)

200 Volt, Three-Phase Motors

HP (FLC)	OLR	MAX FUSE LPJ_SP CLASS J	MAX FUSE KRP-C_SP CLASS L
7.5 (25.3)	CR324DXH	50	
7.5 (25.3)	CR324FXK	50	
7.5 (25.3)	CR123C273B	50	
7.5 (25.3)	CR123C303B	50	
7.5 (25.3)	CR123F300B	50	
10 (32.2)	CR324DXJ	70	
10 (32.2)	CR324FXK	70	
10 (32.2)	CR123C330B	70	
10 (32.2)	CR123F395B	70	
15 (48.3)	CR324DXJ	100	
15 (48.3)	CR324FXL	100	
15 (48.3)	CR123F614B	100	
20 (62.1)	CR324FXL	125	
20 (62.1)	CR123F772B	125	
25 (78.2)	CR234FXM	175	
25 (78.2)	CR324GXP	175	
25 (78.2)	CR123F104C	175	
30 (92.0)	CR234FXM	200	
30 (92.0)	CR324GXP	200	
30 (92.0)	CR123F118C	200	
40 (120.0)	CR234FXM	250	
40 (120.0)	CR324GXP	250	
40 (120.0)	CR123F161C	250	
50 (150.0)	CR324GXQ	300	
50 (150.0)	CR324HXS	300	
60 (177.0)	CR324GXQ	350	
60 (177.0)	CR324HXS	350	
75 (221.0)	CR324GXQ	450	
75 (221.0)	CR324HXS	450	
100 (285.0)	CR324HXT	600	
125 (359.0)	CR324HXT		1000
150 (414.0)	CR324HXT		1000

230 Volt, Three-Phase Motors

HP (FLC)	OLR	MAX FUSE LPJ_SP CLASS J	MAX FUSE KRP-C_SP CLASS L
10 (28.0)	CR324DXJ	60	
10 (28.0)	CR324FXK	60	
10 (28.0)	CR123C303B	60	
10 (28.0)	CR123F327B	60	
15 (42.0)	CR324DXJ	90	
15 (42.0)	CR324FXL	90	
15 (42.0)	CR123F567B	90	
15 (42.0)	CR123F487B	90	
15 (42.0)	CR123F440B	90	
20 (54.0)	CR324FXL	110	
20 (54.0)	CR123F719B	110	
25 (68.2)	CR324FXL	150	
25 (68.2)	CR324FXM	150	
25 (68.2)	CR324GXP	150	
25 (68.2)	CR123F848B	150	
25 (68.2)	CR123F914B	150	
30 (80.0)	CR234FXM	175	
30 (80.0)	CR324GXP	175	
30 (80.0)	CR123F104C	175	
40 (104.0)	CR234FXM	225	
40 (104.0)	CR324GXP	225	
40 (104.0)	CR123F133C	225	
50 (130.0)	CR234FXM	250	
50 (130.0)	CR324GXP	250	
50 (130.0)	CR123F161C	250	
60 (145.0)	CR324GXQ	300	
60 (145.0)	CR324HXS	300	
75 (192.0)	CR324GXQ	400	
75 (192.0)	CR324HXS	400	
100 (248.0)	CR324GXQ	500	
100 (248.0)	CR324HXS	500	
125 (312.0)	CR324HXT		900
150 (360.0)	CR324HXT		1000
200 (480.0)	CR324HXT		1000

COOPER Bussmann

General Electric Company — NEMA (UL & CSA Verified)

460 Volt, Three-Phase Motors

HP (FLC)	OLR	MAX FUSE LPJ_SP CLASS J	MAX FUSE KRP-C_SP CLASS L
20 (27.0)	CR324DXH	60	
20 (27.0)	CR324DXJ	60	
20 (27.0)	CR324FXK	60	
20 (27.0)	CR123C303B	60	
20 (27.0)	CR123F327B	60	
20 (27.0)	CR123C330B	60	
25 (34.0)	CR324DXJ	70	
25 (34.0)	CR324FXK	70	
25 (34.0)	CR123C366B	70	
25 (34.0)	CR123F430B	70	
30 (40.0)	CR324DXJ	90	
30 (40.0)	CR324FXL	90	
30 (40.0)	CR123C400B	90	
30 (40.0)	CR123F487B (SIZE 3)	90	
30 (40.0)	CR123F487B (SIZE 4)	90	
40 (52.0)	CR324FXL	110	
40 (52.0)	CR123F658B (SIZE 3)	110	
40 (52.0)	CR123F658B (SIZE 4)	110	
50 (65.0)	CR324FXL	125	
50 (65.0)	CR123F772B	125	
50 (65.0)	CR324FXM	125	
50 (65.0)	CR324GXP	125	
50 (65.0)	CR123F848B	125	
60 (77.0)	CR324FXM	150	
60 (77.0)	CR324GXP	150	
60 (77.0)	R123F104C (SIZE 3)	150	
60 (77.0)	R123F104C (SIZE 4)	150	
75 (96.0)	CR234FXM	200	
75 (96.0)	CR324GXP	200	
75 (96.0)	CR123F118C	200	
100 (124.0)	CR234FXM	250	
100 (124.0)	CR324GXP	250	
100 (124.0)	CR123F161C	250	
125 (156.0)	CR324GXQ	350	
125 (156.0)	CR324HXS	350	
150 (180.0)	CR324GXQ	400	
150 (180.0)	CR324HXS	400	
200 (240.0)	CR324GXQ	500	
200 (240.0)	CR324HXS	500	
250 (302.0)	CR324HXT		900
300 (361.0)	CR324HXT		1000
350 (414.0)	CR324HXT		1000
400 (477.0)	CR324HXT		1000
450 (515.0)	CR324HXT		1000

575 Volt, Three-Phase Motors

HP (FLC)	OLR	MAX FUSE LPJ_SP CLASS J	MAX FUSE KRP-C_SP CLASS L
25 (27.0)	CR324DXH	60	
25 (27.0)	CR324DXJ	60	
25 (27.0)	CR324FXK	60	
25 (27.0)	CR123C303B	60	
25 (27.0)	CR123F327B	60	
25 (27.0)	CR123C330B	60	
30 (32.0)	CR324DXJ	70	
30 (32.0)	CR324FXK	70	
30 (32.0)	CR123C330B	70	
30 (32.0)	CR123F395B	70	
40 (41.0)	CR324DXJ	90	
40 (41.0)	CR324FXL	90	
40 (41.0)	CR123C400B	90	
40 (41.0)	CR123F567B	90	
40 (41.0)	CR123F487B	90	
50 (52.0)	CR324FXL	110	
50 (52.0)	CR123F658B (SIZE 3)	110	
50 (52.0)	CR123F658B (SIZE 4)	110	
60 (62.0)	CR324FXL	125	
60 (62.0)	CR123F772B	125	
75 (77.0)	CR324FXM	150	
75 (77.0)	CR324GXP	150	
75 (77.0)	R123F104C (SIZE 3)	150	
75 (77.0)	R123F104C (SIZE 4)	150	
100 (99.0)	CR234FXM	200	
100 (99.0)	CR324GXP	200	
100 (99.0)	CR123F118C	200	
125 (125.0)	CR234FXM	250	
125 (125.0)	CR324GXP	250	
125 (125.0)	CR123F161C	250	
150 (144.0)	CR324GXQ	300	
150 (144.0)	CR324HXS	300	
200 (192.0)	CR324GXQ	400	
200 (192.0)	CR324HXS	400	
250 (242.0)	CR324GXQ	500	
250 (242.0)	CR324HXS	500	
300 (289.0)	CR324HXT		800
350 (336.0)	CR324HXT		1000
400 (382.0)	CR324HXT		1000
450 (412.0)	CR324HXT		1000
500 (472.0)	CR324HXT		1000

Motor Controller & Fuse Selection For Type 2 Protection

COOPER Bussmann

Rockwell Automation, Allen-Bradley — IEC (UL & CSA Verified)

200 Volt, Three-Phase Motors

HP (FLC)	CONTACTOR BASIC CAT. # (a)	OVERLOAD RELAY BASIC CAT. # (b)	MAX FUSE LPJ_SP CLASS J	MAX FUSE LP-CC CLASS CC
0.5 (2.5)	100-C09	193-E**EB	6	6
0.75 (3.7)	100-C09	193-E**EB	10	10
1 (4.8)	100-C09	193-E**FB	15†	15
1.5 (6.9)	100-C09	193-E**FB	15	15
2 (7.8)	100-C09	193-E**FB	15	15††
3 (11)	100-C12	193-E**FB	20	20††
5 (17.5)	100-C23	193-E**GB	30	30††
7.5 (25.3)	100-C30	193-E**HC	40	
10 (32.2)	100-C37	193-E**HC	50	
15 (48.3)	100-C60	193-E**KE	80	
20 (62.1)	100-C72	193-E**KE	100	
25 (78.2)	100-C85	193-E**KE	100††	

230 Volt, Three-Phase Motors

HP (FLC)	CONTACTOR BASIC CAT. # (a)	OVERLOAD RELAY BASIC CAT. # (b)	MAX FUSE LPJ_SP CLASS J	MAX FUSE LP-CC CLASS CC
0.5 (2.2)	100-C09	193-E**DB	6	6
0.75 (3.2)	100-C09	193-E**EB	10†	10
1 (4.2)	100-C09	193-E**FB	15†	15
1.5 (6)	100-C09	193-E**FB	15	15
2 (6.8)	100-C09	193-E**FB	15	15
3 (9.6)	100-C12	193-E**FB	20	20
5 (15.2)	100-C16	193-E**GB	20††	20††
7.5 (22)	100-C23	193-E**GB	30††	30††
10 (28)	100-C30	193-E**HC	40††	
15 (42)	100-C43	193-E**JD	50††	
20 (54)	100-C60	193-E**KE	80††	
25 (68)	100-C72	193-E**KE	100	
30 (80)	100-C85	193-E**KE	100††	

460 Volt, Three-Phase Motors

HP (FLC)	CONTACTOR BASIC CAT. # (a)	OVERLOAD RELAY BASIC CAT. # (b)	MAX FUSE LPJ_SP CLASS J	MAX FUSE LP-CC CLASS CC
0.5 (1.1)	100-C09	193-E**DB	3	3
0.75 (1.6)	100-C09	193-E**DB	6†	6
1 (2.1)	100-C09	193-E**DB	6	6
1.5 (3)	100-C09	193-E**EB	10†	10
2 (3.4)	100-C09	193-E**EB	10†	10
3 (4.8)	100-C09	193-E**FB	15†	15
5 (7.6)	100-C09	193-E**FB	15	15††
7.5 (11)	100-C12	193-E**FB	20	20††
10 (14)	100-C16	193-E**GB	20††	20††
15 (21)	100-C23	193-E**GB	30††	30††
20 (27)	100-C30	193-E**HC	40	
25 (34)	100-C37	193-E**HC	50	
30 (40)	100-C43	193-E**JD	50††	
40 (52)	100-C60	193-E**KE	80	
50 (65)	100-C72	193-E**KE	100	
60 (77)	100-C85	193-E**KE	100††	

575 Volt, Three-Phase Motors

HP (FLC)	CONTACTOR BASIC CAT. # (a)	OVERLOAD RELAY BASIC CAT. # (b)	MAX FUSE LPJ_SP CLASS J	MAX FUSE LP-CC CLASS CC
0.5 (0.9)	**100-C09**	**193-E**DB**	**3**	**3**
0.75 (1.3)	**100-C09**	**193-E**DB**	**3**	**3**
1 (1.7)	**100-C09**	**193-E**DB**	**6†**	**6**
1.5 (2.4)	**100-C09**	**193-E**DB**	**6**	**6**
2 (2.7)	**100-C09**	**193-E**EB**	**10†**	**10**
3 (3.9)	**100-C09**	**193-E**FB**	**10**	**10**
5 (6.1)	**100-C09**	**193-E**FB**	**15**	**15**
5 (7.6)	**100-C09**	**193-E**FB**	**15**	**15††**
7.5 (9)	**100-C09**	**193-E**FB**	**15**	**15††**
10 (11)	**100-C12**	**193-E**FB**	**20**	**20††**
15 (17)	**100-C23**	**193-E**GB**	**30**	**30††**
20 (22)	**100-C30**	**193-E**HC**	**40**	
25 (27)	**100-C37**	**193-E**HC**	**50**	
30 (32)	**100-C37**	**193-E**HC**	**50**	
40 (41)	**100-C60**	**193-E**KE**	**80**	
50 (52)	**100-C72**	**193-E**KE**	**100**	
60 (62)	**100-C85**	**193-E**KE**	**100**	

(a) Catalog number is not complete, add coil voltage code and auxiliary contact description.
(b) Catalog number is not complete, replace ** with trip class and reset mode.
†† May be too small to allow some motors to start.
† Sized larger than code max for single motor.

Motor Controller & Fuse Selection For Type 2 Protection

Rockwell Automation, Allen-Bradley — NEMA (UL & CSA Verified)

200 Volt, Three-Phase Motors

HP (FLC)	STARTER† SIZE	CAT. #	HEATER # ELEMENT	MAX FUSE LPN-RK_SP/LPJ_SP CLASS RK1/J
1.5 (6.9)	0	509-A	W48	15
2 (7.8)	0	509-A	W50	15
3 (11.0)	0	509-A	W53	20
5 (17.5)	1	509-B	W59	30
7.5 (25.3)	2	509-C	W63	50
10 (32.2)	3	509-D	W65	60
15 (48.3)	3	509-D	W68	100
20 (62.1)	3	509-D	W71	100
25 (78.2)	3	509-D	W75	150
30 (92.0)	4	509-E	W77	175
40 (120.0)	4	509-E	W81	200
50 (150.0)	5	509-F	W37	200††
60 (177.1)	5	509-F	W39	250††
75 (221.0)	5	509-F	W41	350

230 Volt, Three-Phase Motors

HP (FLC)	STARTER† SIZE	CAT. #	HEATER ELEMENT	MAX FUSE LPN-RK_SP/LPJ_SP CLASS RK1/J
2 (6.8)	0	509-A	W48	15
3 (9.6)	0	509-A	W52	20
5 (15.2)	1	509-B	W57	30
7.5 (22.0)	2	509-C	W61	45
10 (28.0)	3	509-C	W64	60
15 (42.0)	3	509-D	W66	90
20 (54.0)	3	509-D	W69	100
25 (68.2)	3	509-D	W73	100††
30 (80.0)	3	509-D	W75	150
40 (104.0)	4	509-E	W79	175
50 (130.0)	4	509-E	W83	200
60 (154.0)	5	509-F	W37	200††
75 (192.0)	5	509-F	W40	300
100 (248.0)	5	509-F	W43	400

460 Volt, Three-Phase Motors

HP (FLC)	STARTER† SIZE	CAT. #	HEATER ELEMENT	MAX FUSE LPS-RK_SP/LPJ_SP CLASS RK1/J
5 (7.6)	0	509-A	W49	15
7.5 (11.0)	1	509-B	W53	20
10 (14.0)	1	509-B	W56	30
15 (21.0)	2	509-C	W61	45
20 (27.0)	2	509-C	W63	60
25 (34.0)	3	509-D	W66	60
30 (40.0)	3	509-D	W66	90
40 (52.0)	3	509-D	W69	100
50 (65.0)	3	509-D	W72	100
60 (77.0)	4	509-E	W74	125
75 (96.0)	4	509-E	W77	175
100 (124.0)	4	509-E	W82	200
125 (156.0)	5	509-F	W37	200††
150 (180.0)	5	509-F	W39	250††
200 (240.0)	5	509-F	W42	400

575 Volt, Three-Phase Motors

HP (FLC)	STARTER† SIZE	CAT. #	HEATER ELEMENT	MAX FUSE LPS-RK_SP/LPJ_SP CLASS RK1/J
5 (6.1)	0	509-A	W47	12
7.5 (9.0)	1	509-B	W51	20
10 (11.0)	1	509-B	W53	20
15 (17.0)	2	509-C	W58	35
25 (27.0)	2	509-C	W63	60
30 (32.0)	3	509-D	W64	70
40 (41.0)	3	509-D	W66	90
50 (52.0)	3	509-D	W69	100
60 (62.0)	4	509-E	W71	100
75 (77.0)	4	509-E	W74	125
100 (99.0)	4	509-E	W78	175
125 (125.0)	5	509-F	W35	200
150 (144.0)	5	509-F	W36	200††
200 (192.0)	5	509-F	W40	300

† Catalog number is not complete. Refer to Bulletin 509 Section of A-B Industrial Control Catalog to specify complete catalog starter number.

†† May be too small to allow some motors to start.

Motor Controller & Fuse Selection For Type 2 Protection

COOPER Bussmann

Square D Company — IEC (UL & CSA Verified)

200 Volt, Three-Phase Motors

HP (FLC)	CONTACTOR	OLR	LPJ_SP CLASS J	MAX FUSE LPN-RK_SP CLASS RK1	KRP-C_SP CLASS L
0.5 (2.5)	LC1D09	LR2D1307	4		
0.75 (3.7)	LC1D09	LR2D1308	6		
1 (4.8)	LC1D09	LR2D1310	10		
1.5 (6.9)	LC1D09	LR2D1312	15		
2 (7.8)	LC1D09	LR2D1312	15		
2 (7.8)	LC1D09	LR2D1314	15		
3 (11.0)	LC1D012	LR2D1316	20		
5 (17.5)	LC1D018	LR2D1321	25††		
5 (17.5)	LC1D025	LR2D1322	35		
7.5 (25.3)	LC1D032	LR2D2353	40		
10 (32.2)	LC1D040	LR2D3355	60		
15 (48.3)	LC1D050	LR2D3357	70††		
15 (48.3)	LC1D050	LR2D3359	80		
15 (48.3)	LC1D065	LR2D3359	100		
20 (62.1)	LC1D050	LR2D3359	80††		
20 (62.1)	LC1D065	LR2D3359	100		
30 (92.0)	LC1F115	LR2F5367	200	200	
40 (120.0)	LC1F150	LR2F5569	250	250	
50 (150.0)	LC1F185	LR2F5569	300	250	
50 (150.0)	LC1F185	LR2F5571	300	300	
60 (177.0)	LC1F265	LR2F6573		350	
60 (177.0)	LC1F265	LR2F5571	350	350	
75 (221.0)	LC1F400	LR2F6575		450	
100 (285.0)	LC1F400	LR2F6575	500	500	
100 (285.0)	LC1F400	LR2F6577	600		601
125 (359.0)	LC1F500	LR2F6577	600		800

230 Volt, Three-Phase Motors

HP (FLC)	CONTACTOR	OLR	LPJ_SP CLASS J	MAX FUSE LPN-RK_SP CLASS RK1	KRP-C_SP CLASS L
0.5 (2.2)	LC1D09	LR2D1307	4		
0.75 (3.2)	LC1D09	LR2D1308	6		
1 (4.2)	LC1D09	LR2D1310	10		
1.5 (6.0)	LC1D09	LR2D1310	10		
1.5 (6.0)	LC1D09	LR2D1312	15		
2 (6.8)	LC1D09	LR2D1312	15		
3 (9.6)	LC1D09	LR2D1314	15		
3 (9.6)	LC1D012	LR2D1316	20		
5 (15.2)	LC1D018	LR2D1321	25		
7.5 (22.0)	LC1D032	LR2D1322	35		
10 (28.0)	LC1D032	LR2D2353	40††		
15 (42.0)	LC1D050	LR2D3357	70		
20 (54.0)	LC1D050	LR2D3359	80††		
20 (54.0)	LC1D065	LR2D3359	100		
40 (104.0)	LC1F115	LR2F5367	225	200	
40 (104.0)	LC1F115	LR2F5369	225	225	
50 (130.0)	LC1F150	LR2F5569	250	250	
60 (154.0)	LC1F185	LR2F5569	300	250	
60 (154.0)	LC1F185	LR2F5571	300	300	
75 (192.0)	LC1F265	LR2F6571	400	350	
75 (192.0)	LC1F265	LR2F6573	400	400	
100 (248.0)	LC1F400	LR2F6575	500	500	
125 (312.0)	LC1F400	LR2F6575	500	500	
125 (312.0)	LC1F400	LR2F6577	600		700
150 (360.0)	LC1F500	LR2F6577	600		800
200 (480.0)	LC1F500	LR2F7579			1000
250 (600.0)	LC1F630	LR2F7581			1350
300 (720.0)	LC1F630	LR2F8583			1600

460 Volt, Three-Phase Motors

HP (FLC)	CONTACTOR	OLR	LPJ_SP CLASS J	MAX FUSE LPS-RK_SP CLASS RK1	KRP-C_SP CLASS L
0.5 (1.1)	LC1D09	LR2D1306	3		
0.75 (1.6)	LC1D09	LR2D1306	3		
1 (2.1)	LC1D09	LR2D1307	4		
1.5 (3.0)	LC1D09	LR2D1308	6		
2 (3.4)	LC1D09	LR2D1308	6		
3 (4.8)	LC1D09	LR2D1310	10		
5 (7.6)	LC1D09	LR2D1312	15		
5 (7.6)	LC1D09	LR2D1314	15		
7.5 (11.0)	LC1D012	LR2D1316	20		
10 (14.0)	LC1D018	LR2D1321	25		
15 (21.0)	LC1D032	LR2D1322	35		
20 (27.0)	LC1D032	LR2D2353	40		
25 (34.0)	LC1D040	LR2D3355	60		
30 (40.0)	LC1D040	LR2D3355	60		
30 (40.0)	LC1D050	LR2D3357	70		
40 (52.0)	LC1D050	LR2D3359	80		
40 (52.0)	LC1D065	LR2D3359	100		
50 (65.0)	LC1D050	LR2D3359	80††		
50 (65.0)	LC1D065	LR2D3359	100		
75 (96.0)	LC1F115	LR2F5367	200	200	
100 (124.0)	LC1F150	LR2F5569	250	250	
125 (156.0)	LC1F185	LR2F5569	300	250	
125 (156.0)	LC1F185	LR2F5571	350	350	
150 (180.0)	LC1F265	LR2F6571	400	350	
150 (180.0)	LC1F265	LR2F6573	400	400	
200 (240.0)	LC1F400	LR2F6573	450	500	
200 (240.0)	LC1F400	LR2F6575	500	500	
250 (302.0)	LC1F400	LR2F6575	500	500	
250 (302.0)	LC1F400	LR2F6577	600		650
300 (361.0)	LC1F500	LR2F6577	600		800
350 (414.0)	LC1F500	LR2F7579			800
400 (477.0)	LC1F500	LR2F7579			1000
500 (590.0)	LC1F630	LR2F7581			1350
600 (720.0)	LC1F630	LR2F8583			1600

575 Volt, Three-Phase Motors

HP (FLC)	CONTACTOR	OLR	LPJ_SP CLASS J	MAX FUSE LPS-RK_SP CLASS RK1	KRP-C_SP CLASS L
0.75 (1.3)	LC1D09	LR2D1306	3		
1 (1.7)	LC1D09	LR2D1306	3		
1.5 (2.4)	LC1D09	LR2D1307	4		
2 (2.7)	LC1D09	LR2D1308	6		
3 (3.9)	LC1D09	LR2D1308	6		
5 (6.1)	LC1D09	LR2D1312	10		
7.5 (9.0)	LC1D012	LR2D1314	15		
7.5 (9.0)	LC1D018	LR2D1316	20		
10 (11.0)	LC1D018	LR2D1316	20		
15 (17.0)	LC1D025	LR2D1321	25		
15 (17.0)	LC1D032	LR2D1322	35		
20 (22.0)	LC1D032	LR2D1322	35		
30 (32.0)	LC1D040	LR2D3355	45††		
40 (41.0)	LC1D050	LR2D3357	70		
50 (52.0)	LC1D065	LR2D3359	80		
50 (52.0)	LC1D080	LR2D3359	90		
60 (62.0)	LC1D065	LR2D3359	80††		
60 (62.0)	LC1D080	LR2D3359	90††		
75 (77.0)	LC1F115	LR2D3363	150	125	
100 (99.0)	LC1F115	LR2F5367	200	200	
125 (125.0)	LC1F150	LR2F5569	250	250	
150 (144.0)	LC1F185	LR2F5569	300	250	
150 (144.0)	LC1F185	LR2F5571	300	300	
200 (192.0)	LC1F265	LR2F5571	400	350	
200 (192.0)	LC1F265	LR2F6573	400	400	
250 (242.0)	LC1F400	LR2F6575	500	500	
300 (289.0)	LC1F400	LR2F6575	500	500	
300 (289.0)	LC1F400	LR2F6577	600		601
350 (336.0)	LC1F500	LR2F6577	600		700
400 (382.0)	LC1F500	LR2F6577	600		800
500 (472.0)	LC1F500	LR2F7579			1000
600 (576.0)	LC1F630	LR2F7581			1200
800 (770.0)	LC1F630	LR2F8583			1600

†† May be too small to allow some motors to start.

Motor Controller & Fuse Selection For Type 2 Protection

Square D Company — IEC (UL & CSA Verified)

200 Volt, Three-Phase Motors

HP (FLC)	CONTACTOR	OLR	MAX FUSE		
			LP-CC CLASS CC	LPJ_SP CLASS J	TCF CUBEFuse
0.5 (2.5)	LC1D09	LRD1508	8	6	6
0.75 (3.7)	LC1D09	LRD1508	8	6	6
1 (4.8)	LC1D09	LRD1510	25	20	20
1.5 (6.4)	LC1D09	LRD1512	25	20	20
2 (7.8)	LC1D09	LRD1512	25	20	20
3 (11.0)	LC1D12	LRD1516	25	20	20
5 (17.5)	LC1D18	LRD1522		25*	25*
7.5 (25.3)	LC1D40	LRD1530		50	50
10 (32.2)	LC1D40	LRD3555		60	60
15 (48.3)	LC1D50	LRD3557		70*	70*
20 (62.1)	LC1D65	LRD3559		100	100
25 (78.2)	LC1D80	LRD3563		125	
30 (92.0)	LC1D115	LRD5569		175	
40 (120)	LC1D150	LRD5569		200	

230 Volt, Three-Phase Motors

HP (FLC)	CONTACTOR	OLR	MAX FUSE		
			LP-CC CLASS CC	LPJ_SP CLASS J	TCF CUBEFuse
0.75 (3.4)	LC1D09	LRD1508	8	6	6
1 (4.2)	LC1D09	LRD1510	25	20	20
1.5 (6.0)	LC1D09	LRD1512	25	20	20
2 (6.8)	LC1D09	LRD1512	25	20	20
3 (9.5)	LC1D12	LRD1516	25	20	20
5 (15.2)	LC1D18	LRD1521		25	25
7.5 (22.0)	LC1D25	LRD1522		35	35
10 (28.0)	LC1D40	LRD1530		50	50
15 (42.0)	LC1D50	LRD3557		70	70
20 (54.0)	LC1D65	LRD3559		100	100
25 (68.0)	LC1D80	LRD3563		125	
30 (80.0)	LC1D80	LRD3560		125	
40 (104)	LC1D115	LRD5569		175	

460 Volt, Three-Phase Motors

HP (FLC)	CONTACTOR	OLR	MAX FUSE		
			LP-CC CLASS CC	LPJ_SP CLASS J	TCF CUBEFuse
1.5 (3.0)	LC1D09	LRD1508	8	6	6
2 (3.4)	LC1D09	LRD1508	8	6	6
3 (4.8)	LC1D09	LRD1510	25	20	20
5 (7.6)	LC1D09	LRD1512	25	20	20
7.5 (11.0)	LC1D12	LRD1516	25	20	20
10 (14.0)	LC1D18	LRD1521		25	25
15 (21.0)	LC1D25	LRD1522		35	35
20 (27.0)	LC1D40	LRD1530		50	50
25 (34.0)	LC1D40	LRD3555		60	60
30 (40.0)	LC1D40	LRD3555		60	60
30 (40.0)	LC1D50	LRD3557		70	70
40 (52.0)	LC1D50	LRD3559		80	80
50 (65.0)	LC1D65	LRD3559		80*	80*
50 (65.0)	LC1D65	LRD3559		100	100
60 (77.0)	LC1D80	LRD3563		125	
75 (96.0)	LC1D115	LRD5569		175	
100 (124)	LC1D125	LRD5569		200	

575 Volt, Three-Phase Motors

HP (FLC)	CONTACTOR	OLR	MAX FUSE		
			LP-CC CLASS CC	LPJ_SP CLASS J	TCF CUBEFuse
2 (2.7)	LC1D09	LRD1508	8	6	6
3 (3.9)	LC1D09	LRD1508	8	6	6
5 (6.1)	LC1D09	LRD1512	25	20	20
7.5 (9.0)	LC1D09	LRD1514	25	20	20
10 (11.0)	LC1D12	LRD1516	25	20	20
10 (11.0)	LC1D18	LRD1516	30	20	20
15 (17.0)	LC1D18	LRD1522		25	25
20 (22.0)	LC1D25	LRD1522		35	35
25 (27.0)	LC1D40	LRD1530		50	50
30 (32.0)	LC1D40	LRD3555		60	60
40 (41.0)	LC1D50	LRD3557		70	70
50 (52.0)	LC1D65	LRD3559		100	100
60 (62.0)	LC1D80	LRD3561		125	
75 (77.0)	LC1D115	LR9D5567		150	
100 (99.0)	LC1D115	LR9D5569		175	
125 (125)	LC1D150	LR9D5569		200	

* May be too small to allow some motors to start.

Motor Controller & Fuse Selection For Type 2 Protection

Square D Company — IEC (UL & CSA Verified)

200 Volt, Three-Phase Motors

HP (FLC)	CONTACTOR	OLR	MAX FUSE		
			LP-CC CLASS CC	LPJ_SP CLASS J	TCF CUBEFuse
0.5 (2.5)	LC1D09	LRD07	8	6	6
0.75 (3.7)	LC1D09	LRD08	8	6	6
1 (4.8)	LC1D09	LRD10	25	17.5	17.5
1.5 (6.9)	LC1D09	LRD12	25	17.5	17.5
2 (7.8)	LC1D09	LRD12	25	17.5	17.5
3 (11.0)	LC1D12	LRD16	25	17.5	17.5
5 (17.5)	LC1D18	LRD21		25*	25*
7.5 (25.3)	LC1D40	LRD40		50	50
10 (32.2)	LC1D40	LRD3555		60	60
15 (48.3)	LC1D50	LRD3557		70	70
20 (62.1)	LC1D65	LRD3559		100	100
25 (78.2)	LC1D80	LRD3563		125	
30 (92.0)	LC1D115	LRD5569		175	
40 (120)	LC1D150	LRD5569		225	

230 Volt, Three-Phase Motors

HP (FLC)	CONTACTOR	OLR	MAX FUSE		
			LP-CC CLASS CC	LPJ_SP CLASS J	TCF CUBEFuse
0.5 (2.2)	LC1D09	LRD07	8	6	6
0.75 (3.2)	LC1D09	LRD08	8	6	6
1 (4.2)	LC1D09	LRD10	25	17.5	17.5
1.5 (6.0)	LC1D09	LRD12	25	17.5	17.5
2 (6.8)	LC1D09	LRD12	25	17.5	17.5
3 (9.6)	LC1D12	LRD16	25	17.5	17.5
5 (15.5)	LC1D18	LRD21		25	25
7.5 (22.0)	LC1D25	LRD22		35	35
10 (28.0)	LC1D40	LRD32		50	50
15 (42.0)	LC1D50	LRD3357		70	70
20 (54.0)	LC1D65	LRD3359		100	100
25 (68.0)	LC1D80	LRD3363		125	
30 (80.0)	LC1D80	LRD3363		125	
40 (104)	LC1D115	LRD5369		175	

460 Volt, Three-Phase Motors

HP (FLC)	CONTACTOR	OLR	MAX FUSE		
			LP-CC CLASS CC	LPJ_SP CLASS J	TCF CUBEFuse
0.75 (1.6)	LC1D09	LRD06	8	3	3
1 (2.1)	LC1D09	LRD07	8	6	6
1.5 (3.0)	LC1D09	LRD08	8	6	6
2 (3.4)	LC1D09	LRD08	8	6	6
3 (4.8)	LC1D09	LRD10	25	17.5	17.5
5 (7.6)	LC1D09	LRD12	25	17.5	17.5
7.5 (11.0)	LC1D12	LRD16	25	17.5	17.5
10 (14.0)	LC1D18	LRD21		25	25
15 (21.0)	LC1D25	LRD22		35	35
20 (27.0)	LC1D40	LRD32		50	50
25 (34.0)	LC1D40	LRD3355		60	60
30 (40.0)	LC1D40	LRD3355		60	60
30 (40.0)	LC1D50	LRD3357		70	70
40 (52.0)	LC1D50	LRD3359		80	80
50 (65.0)	LC1D65	LRD3359		100	100
60 (77.0)	LC1D80	LRD3363		125	
75 (96.0)	LC1D115	LRD5369		175	
100 (124)	LC1D125	LRD5369		225	

575 Volt, Three-Phase Motors

HP (FLC)	CONTACTOR	OLR	MAX FUSE		
			LP-CC CLASS CC	LPJ_SP CLASS J	TCF CUBEFuse
0.75 (1.3)	LC1D09	LRD06	8	3	3
1 (1.7)	LC1D09	LRD07	8	6	6
1.5 (2.4)	LC1D09	LRD07	8	6	6
2 (2.7)	LC1D09	LRD08	8	6	6
3 (3.9)	LC1D09	LRD08	25	6	6
5 (6.1)	LC1D09	LRD12	25	17.5	17.5
7.5 (9.0)	LC1D09	LRD14	25	17.5	17.5
10 (11.0)	LC1D12	LRD16	25	17.5	17.5
10 (11.0)	LC1D18	LRD16	30	17.5	17.5
15 (17.0)	LC1D18	LRD21		25*	25*
20 (22.0)	LC1D25	LRD22		35	35
25 (27.0)	LC1D40	LRD32		50	50
30 (32.0)	LC1D40	LRD3355		60	60
40 (41.0)	LC1D50	LRD3357		70	70
50 (52.0)	LC1D65	LRD3359		100	100
60 (62.0)	LC1D80	LRD3361		125	
75 (77.0)	LC1D115	LR9D5367		150	
100 (99.0)	LC1D115	LR9D5369		175	
125 (125)	LC1D150	LR9D5369		225	

* May be too small to allow some motors to start.

Motor Controller & Fuse Selection For Type 2 Protection

Square D Company — NEMA (UL & CSA Verified)

200 Volt, Three-Phase Motors

HP (FLC)	STARTER	CAT. #	HEATER SIZE	MAX FUSE	
				LPN-RK_SP CLASS RK1	LPJ_SP CLASS J
1.5 (6.9)	0	SB02V02S	B11.5*	12	15
2 (7.8)	0	SB02V02S	B12.8	15	15
3 (11.0)	0	SB02V02S	B19.5	17.5	20
5 (17.5)	1	SC03V02S	B32	25	30
7.5 (25.3)	1	SC03V02S	B50	40	45
10 (32.2)	2	SD01V02S	B62	50	60
15 (48.3)	3	SE01V02S	CC81.5	70	80
20 (62.1)	3	SE01V02S	CC112	100	100
25 (78.2)	3	SE01V02S	CC180	125	125
30 (92.0)	4	SF01V02S	CC156	150	150
40 (120.0)	4	SF01V02S	CC208	175	200
50 (150.0)	5	SG01V02S**	B3.70	225	250
60 (177.0)	5	SG01V02S**	B4.15	300	300
75 (221.0)	5	SG01V02S**	B5.50	350	400

230 Volt, Three-Phase Motors

HP (FLC)	STARTER	CAT. #	HEATER SIZE	MAX FUSE	
				LPN-RK_SP CLASS RK1	LPJ _SP CLASS J
1.5 (6.0)	0	SB02V02S	B10.2	10	12
2 (6.8)	0	SB02V02S	B11.5*	12	15
3 (9.6)	0	SB02V02S	B15.5	17.5	17.5
5 (15.2)	1	SC03V02S	B28.0	25	30
7.5 (22.0)	1	SC03V02S	B45	35	50†
10 (28.0)	2	SD01V02S	B50	45	50
15 (42.0)	3	SE01V02S	CC68.5	70	70
20 (54.0)	3	SE01V02S	CC94.0	80	90
25 (68.0)	3	SE01V02S	CC132	110	125
30 (80.0)	3	SE01V02S	CC196	125	150
40 (104.0)	4	SF01V02S	CC180	175	175
50 (130.0)	5	SG01V02S**	B3.30	200	200
60 (154.0)	5	SG01V02S**	B3.70	225	250
75 (192.0)	5	SG01V02S**	B4.15	300	300
100 (248.0)	5	SG01V02S**	B6.25	400	400

460 Volt, Three-Phase Motors

HP (FLC)	STARTER	CAT. #	HEATER SIZE	MAX FUSE	
				LPS-RK_SP CLASS RK1	LPJ _SP CLASS J
3 (4.8)	0	SB02V02S	B7.70*	8	9
5 (7.6)	0	SB02V02S	B12.8	15	15
7.5 (11.0)	1	SC03V02S	B19.5	17.5	20
10 (14.0)	1	SC03V02S	B25	20	25
15 (21.0)	2	SD01V02S	B36	30	35
20 (27.0)	2	SD01V02S	B45	40	45
25 (34.0)	2	SD01V02S	B70	50	60
30 (40.0)	3	SE01V02S	CC64.3	60	70
40 (52.0)	3	SE01V02S	CC87.7	80	90
50 (65.0)	3	SE01V02S	CC121	100	110
60 (77.0)	4	SF01V02S	CC121	125	125
75 (96.0)	4	SF01V02S	CC167	150	175
100 (124.0)	5	SG01V02S**	B3.00	200	200
125 (156.0)	5	SG01V02S**	B3.70	225	250
150 (180.0)	5	SG01V02S**	B4.15	300	300
200 (240.0)	5	SG01V02S**	B6.25	400	400

575 Volt, Three-Phase Motors

HP (FLC)	STARTER	CAT. #	HEATER SIZE	MAX FUSE	
				LPS-RK_SP CLASS RK1	LPJ _SP CLASS J
3 (3.9)	0	SB02V02S	B6.25	6	8
5 (6.1)	0	SB02V02S	B10.2	10	12
7.5 (9.0)	1	SC03V02S	B15.5	15	17.5
10 (11.0)	1	SC03V02S	B19.5	17.5	20
15 (17.0)	2	SD01V02S	B28.0	25	30
20 (22.0)	2	SD01V02S	B40	35	40
25 (27.0)	2	SD01V02S	B45	40	45
30 (32.0)	3	SE01V02S	CC50.1	50	50
40 (41.0)	3	SE01V02S	CC68.5	60	70
50 (52.0)	3	SE01V02S	CC87.7	80	90
60 (62.0)	4	SF01V02S	CC103	100	100
75 (77.0)	4	SF01V02S	CC121	125	125
100 (99.0)	4	SF01V02S	CC167	150	175
125 (125.0)	5	SG01V02S**	B3.00	200	200
150 (144.0)	5	SG01V02S**	B3.70	225	250
200 (192.0)	5	SG01V02S**	B4.15	300	300

* These overloads were not tested. Maximum fuse sizes are for the lower value of over-load which was tested.

** Y500

† Sized larger than code max for single motor.

Motor Controller & Fuse Selection For Type 2 Protection

COOPER Bussmann

Siemens — IEC (UL & CSA Verified)

200 Volt, Three-Phase Motors

HP (FLC)	STARTER	OLR	MAX FUSE		
			LPN-RK_SP CLASS RK1	LPJ_SP CLASS J	LP-CC CLASS CC
0.5 (2.5)	3TF30/40	3UA5000-1D	6	6	6
0.75 (3.7)	3TF30/40	3UA5000-1E	6	6	6††
1 (4.8)	3TF30/40	3UA5000-1F	8	8	10
1 (4.8)	3TF30/40	3UA5000-1G	10	10	10
1.5 (6.9)	3TF30/40	3UA5000-1H	15	15	20
2 (7.8)	3TF30/40	3UA5000-1J	15	15	20
3 (11.0)	3TF31/41	3UA5000-1K	20	20	30
3 (11.0)	3TF31/41	3UA5000-2S	25†	25†	30
5 (17.5)	3TF32/42	3UA5200-2B	30	30	30††
7.5 (25.3)	3TF34/44	3UA5500-2D	50	50	
10 (32.2)	3TF46	3UA5800-2E	60	60	
15 (48.3)	3TF46	3UA5800-2T	90	90	
20 (62.1)	3TF47	3UA5800-2V	125	125	
25 (78.2)	3TF48	3UA5800-8W	175	175	
30 (92.0)	3TF50	3UA6000-2X	200	200	
40 (120.0)	3TF50	3UA6000-3J	250	250	
50 (150.0)	31T52	3UA6200-3L	300	300	
75 (221.0)	3TF54	3UA6600-3C	400	400	
75 (221.0)	3TF54	3UA6600-3D	450	450	
100 (285.2)	3TF56	3UA6600-3D	500	500	
125 (359.0)	3TF56	3UA6600-3E	500	500††	

230 Volt, Three-Phase Motors

HP (FLC)	STARTER	OLR	MAX FUSE		
			LPN-RK_SP CLASS RK1	LPJ_SP CLASS J	LP-CC CLASS CC
0.5 (2.2)	3TF30/40	3UA5000-1C	2.8	3††	3††
0.75 (3.2)	3TF30/40	3UA5000-1E	6	6	6††
1 (4.2)	3TF30/40	3UA5000-1F	8	8	10
1.5 (6.0)	3TF30/40	3UA5000-1G	10	10	10††
2 (6.8)	3TF30/40	3UA5000-1H	15	15	20
3 (9.6)	3TF30/40	3UA5000-1J	15	15	20
3 (9.6)	3TF31/41	3UA5000-1J	15	15	20
5 (15.2)	3TF32/42	3UA5200-2A	25	25	30
7.5 (22.0)	3TF33/43	3UA5200-2C	40	40	30††
10 (28.0)	3TF34/44	3UA5500-2D	50	50	
15 (42.0)	3TF46	3UA5800-2F	70	70	
20 (54.0)	3TF46	3UA5800-2T	90	90	
25 (68.0)	3TF47	3UA5800-2V	125	125	
30 (80.0)	3TF48	3UA5800-8W	175	175	
40 (104.0)	3TF50	3UA6000-2X	200	200	
50 (130.0)	3TF50	3UA6000-3J	250	250	
60 (154.0)	31T52	3UA6200-3L	300	300	
75 (192.0)	3TF54	3UA6600-3C	400	400	
100 (248.0)	3TF54	3UA6600-3D	450	450	
125 (312.0)	3TF56	3UA6600-3D	500	500	
150 (360.0)	3TF56	3UA6600-3E	500	500††	

460 Volt, Three-Phase Motors

HP (FLC)	STARTER	OLR	MAX FUSE		
			LPS-RK_SP CLASS RK1	LPJ_SP CLASS J	LP-CC CLASS CC
0.5 (1.1)	3TF30/40	3UA5000-1A	1.6	2	2.25
0.75 (1.6)	3TF30/40	3UA5000-1A	1.6††	2††	2.25††
1 (2.1)	3TF30/40	3UA5000-1C	2.8	3††	3††
1.5 (3.0)	3TF30/40	3UA5000-1D	6	6	6
2 (3.4)	3TF30/40	3UA5000-1E	6	6	6††
3 (4.8)	3TF30/40	3UA5000-1F	8	8	10
3 (4.8)	3TF30/40	3UA5000-1G	10	10	10
5 (7.6)	3TF30/40	3UA5000-1H	15	15	20
5 (7.6)	3TF30/40	3UA5000-1J	15	15	20
7.5 (11.0)	3TF31/41	3UA5000-1K	20	20	30
7.5 (11.0)	3TF31/41	3UA5000-2S	25†	25†	30
10 (14.0)	3TF32/42	3UA5200-2A	25	25	30
15 (21.0)	3TF33/43	3UA5200-2C	40	40	30††
20 (27.0)	3TF34/44	3UA5500-2D	50	50	
25 (34.0)	3TF46	3UA5800-2E	60	60	
30 (40.0)	3TF46	3UA5800-2F	70	70	
40 (52.0)	3TF46	3UA5800-2T	90	90	
50 (65.0)	3TF47	3UA5800-2V	125	125	
60 (77.0)	3TF48	3UA5800-8W	175†	175†	
75 (96.0)	3TF50	3UA6000-2X	200	200	
100 (124.0)	3TF50	3UA6000-3J	250	250	
125 (156.0)	31T52	3UA6200-3L	300	300	
150 (180.0)	3TF54	3UA6600-3B	300	300	
200 (240.0)	3TF54	3UA6600-3C	400	400	
250 (302.0)	3TF56	3UA6600-3D	500	500	
300 (361.0)	3TF56	3UA6600-3E	500	500††	

†† May be too small to allow some motors to start.

† Sized larger than code max for single motor.

Motor Controller & Fuse Selection For Type 2 Protection

COOPER Bussmann

Siemens — NEMA (UL & CSA Verified)

200 Volt, Three-Phase Motors

HP (FLC)	STARTER	OLR	MAX FUSE		
			LPN-RK_SP CLASS RK1	LPJ_SP CLASS J	LP-CC CLASS CC
0.5 (2.5)	SXLA	3UA5000-1D	6	6	6
0.75 (3.7)	SXLA	3UA5000-1E	6	6	6††
1 (4.8)	SXLA	3UA5000-1F	8	8	10
1.5 (6.9)	SXLA	3UA5000-1H	15	15	20
2 (7.8)	SXLB	3UA5400-1J	15	15	20
3 (11.0)	SXLB	3UA5400-1K	20	20	30
5 (17.5)	SXLC	3UA5400-2B	30	30	30††
7.5 (25.3)	SXLC	3UA5400-2D	50	50	
10 (32.2)	SXLD	3UA5800-2E	60	60	
15 (48.3)	SXLE	3UA5800-2T	90	90	
20 (62.1)	SXLE	3UA5800-2V	125	125	
25 (78.2)	SXLE	3UA5800-8W	175	175	
30 (92.0)	SXLF	3UA6200-2X	200	200	
40 (120.0)	SXLF	3UA6200-3J	250	250	
50 (150.0)	SXLG	3UA6600-3B	300	300	
60 (177.0)	SXLG	3UA6600-3C	400†	400†	
75 (221.0)	SXLG	3UA6600-3D	500†	450	

230 Volt, Three-Phase Motors

HP (FLC)	STARTER	OLR	MAX FUSE		
			LPN-RK_SP CLASS RK1	LPJ_SP CLASS J	LP-CC CLASS CC
0.5 (2.2)	SXLA	3UA5000-1C	2.8	3††	3††
0.75 (3.2)	SXLA	3UA5000-1E	6	6	6††
1 (4.2)	SXLA	3UA5000-1F	8	8	10
1.5 (6.0)	SXLA	3UA5000-1G	10	10	10††
2 (6.8)	SXLB	3UA5400-1H	15	15	20
3 (9.6)	SXLB	3UA5400-1K	20	20	30
5 (15.2)	SXLC	3UA5400-2B	30	30	30
7.5 (22.0)	SXLC	3UA5400-2C	40	40	30††
10 (28.0)	SXLD	3UA5800-2D	50	50	
15 (42.0)	SXLD	3UA5800-2F	70	70	
20 (54.0)	SXLE	3UA5800-2T	90	90	
25 (68.0)	SXLE	3UA5800-2U	150	150	
30 (80.0)	SXLE	3UA5800-8W	175	175	
40 (104.0)	SXLF	3UA6200-3H	225	225	
50 (130.0)	SXLF	3UA6200-3J	250	250	
60 (154.0)	SXLG	3UA6600-3B	300	300	
75 (192.0)	SXLG	3UA6600-3C	400	400	
100 (248.0)	SXLG	3UA6600-3D	500	450	

460 Volt, Three-Phase Motors

HP (FLC)	STARTER	OLR	MAX FUSE		
			LPS-RK_SP CLASS RK1	LPJ_SP CLASS J	LP-CC CLASS CC
0.5 (1.1)	SXLA	3UA5000-1A	1.6	2	2.25
0.75 (1.6)	SXLA	3UA5000-1A	1.6	2††	2.25††
1 (2.1)	SXLA	3UA5000-1C	2.8	3††	3††
1.5 (3.0)	SXLA	3UA5000-1D	6	6	6
2 (3.4)	SXLA	3UA5000-1E	6	6	6††
3 (4.8)	SXLB	3UA5400-1G	10	10	10
5 (7.6)	SXLB	3UA5400-1H	15	15	20
7.5 (11.0)	SXLC	3UA5400-1K	20	20	30
10 (14.0)	SXLC	3UA5400-2A	25	25	30
15 (21.0)	SXLD	3UA5800-2C	40	40	30††
20 (27.0)	SXLD	3UA5800-2D	50	50	
25 (34.0)	SXLD	3UA5800-2E	60	60	
30 (40.0)	SXLE	3UA5800-2F	70	70	
40 (52.0)	SXLE	3UA5800-2T	90	90	
50 (65.0)	SXLE	3UA5800-2V	125	125	
60 (77.0)	SXLF	3UA6200-2W	175†	175†	
75 (96.0)	SXLF	3UA6200-2X	200	200	
100 (124.0)	SXLF	3UA6200-3J	250	250	
125 (156.0)	SXLG	3UA6600-3B	300	300	
150 (180.0)	SXLG	3UA6600-3C	400	400	
200 (240.0)	SXLG	3UA6600-3D	500	450	

†† May be too small to allow some motors to start.

† Sized larger than code max for single motor.

Motor Controller & Fuse Selection For Type 2 Protection

Cutler Hammer Freedom Series — IEC (UL & CSA Verified)

200 Volt, Three-Phase Motors

HP (FLC)	STARTER NUMBER	HEATER ELEMENT	MAX FUSE LPJ_SP CLASS J	MAX FUSE LP-CC CLASS CC
0.5 (2.5)	AE16ANSO_C	H2106B-3	6	6
0.75 (3.7)	AE16ANSO_C	H2107B-3	6	6†
1 (4.8)	AE16ANSO_C	H2108B-3	10	15
1.5 (6.9)	AE16ANSO_C	H2109B-3	15	20
2 (7.8)	AE16BNSO_C	H2110B-3	17.5	25
3 (11.0)	AE16CNSO_C	H2111B-3	20	
5 (17.5)	AE16DNSO_C	H2112B-3	35	
7.5 (25.3)	AE16ENSO_B	H2114B-3	50	
10 (32.2)	AE16HNSO_B	H2115B-3	70	
15 (48.3)	AE16JNSO_B	H2116B-3	100	
20 (62.1)	AE16KNSO_B	H2117B-3	110	
25 (78.2)	AE16LNSO_	H2022-3	150	
30 (92.0)	AE16MNSO_	H2023-3	200	
40 (119.6)	AE16NNSO_	H2024-3	200	

230 Volt, Three-Phase Motors

HP (FLC)	STARTER NUMBER	HEATER ELEMENT	MAX FUSE LPJ_SP CLASS J	MAX FUSE LP-CC CLASS CC
0.5 (2.2)	AE16ANSO_C	H2106B-3	6	6
0.75 (3.2)	AE16ANSO-C	H2107B-3	6	6†
1 (4.2)	AE16ANSO-C	H2108B-3	10	15
1.5 (6.0)	AE16ANSO-C	H2109B-3	15	20
2 (6.8)	AE16BNSO_C	H2109B-3	15	20
3 (9.6)	AE16BNSO_C	H2110B-3	20	
5 (15.2)	AE16DNSO_C	H2112B-3	30	
7.5 (22.0)	AE16ENSO_C	H2113B-3	45	
10 (28.0)	AE16FNSO_B	H2114B-3	50	
15 (42.0)	AE16HNSO_B	H2116B-3	90	
20 (54.0)	AE16JNSO_B	H2117B-3	110	
25 (68.2)	AE16KNSO_B	H2117B-3	110	
30 (80.0)	AE16LNSO_	H2022-3	150	
40 (104.0)	AE16MNSO_	H2023-3	200	
50 (130.0)	AE16NNSO_	H2024-3	200	

460 Volt, Three-Phase Motors

HP (FLC)	STARTER NUMBER	HEATER ELEMENT	MAX FUSE LPJ_SP CLASS J	MAX FUSE LP-CC CLASS CC
0.5 (1.1)	AE16ANSO_C	H2104B-3	3	3
0.75 (1.6)	AE16ANSO_C	H2105B-3	3	3†
1 (2.1)	AE16ANSO_C	H2106B-3	6	6
1.5 (3.0)	AE16ANSO_C	H2106B-3	6	6
2 (3.4)	AE16ANSO_C	H2107B-3	6	6†
3 (4.8)	AE16ANSO_C	H2108B-3	10	15
5 (7.6)	AE16BNSO_C	H2110B-3	15	25
7.5 (11.0)	AE16CNSO_C	H2111B-3	20	
10 (14.0)	AE16DNSO_C	H2111B-3	30	
15 (21.0)	AE16ENSO_C	H2113B-3	45	
20 (27.0)	AE16FNSO_B	H2114B-3	50	
25 (34.0)	AE16GNSO_B	H2115B-3	70	
30 (40.0)	AE16HNSO_B	H2116B-3	90	
40 (52.0)	AE16JNSO_B	H2116B-3	100	
50 (65.0)	AE16KNSO_B	H2117B_3	110	
60 (77.0)	AE16LNSO_	H2022-3	150	
75 (96.0)	AE16MNSO_	H2023-3	200	
100 (124.0)	AE16NNSO_	H2024-3	200	

575 Volt, Three-Phase Motors

HP (FLC)	STARTER NUMBER	HEATER ELEMENT	MAX FUSE LPJ_SP CLASS J	MAX FUSE LP-CC CLASS CC
0.75 (1.3)	AE16ANSO_C	H2104B-3	3	3
1 (1.7)	AE16ANSO_C	H2105B-3	3	3†
1.5 (2.4)	AE16ANSO_C	H2106B-3	6	6
2 (2.7)	AE16ANSO_C	H2107B-3	6	6
3 (3.9)	AE16ANSO_C	H2108B-3	10	15
5 (6.1)	AE16ANSO_C	H2109B-3	15	20
7.5 (9.0)	AE16BNSO_C	H2110B-3	20	
10 (11.0)	AE16CNSO_C	H2111B-3	20	
15 (17.0)	AE16DNSO_C	H2112B-3	35	
20 (22.0)	AE16ENSO_C	H2113B-3	45	
25 (27.0)	AE16FNSO_B	H2114B-3	50	
30 (32.0)	AE16GNSO_B	H2115B-3	70	
40 (41.0)	AE16HNSO_B	H2116B-3	90	
50 (52.0)	AE16KNSO_B	H2116B-3	100	
60 (62.0)	AE16LNSO_	H2021-3	110	
75 (77.0)	AE16LNSO_	H2022-3	150	
100 (99.0)	AE16MNSO_	H2023-3	200	
125 (125.0)	AE16NNSO_	H2024-3	200	

"-" Empty space designates where coil suffix must be added.

† May be too small to allow some motors to start.

Motor Controller & Fuse Selection For Type 2 Protection

Cutler Hammer Freedom Series — IEC (UL & CSA Verified)

200 Volt, Three-Phase Motors

HP (FLC)	STARTER NUMBER (Fixed Heaters)	MAX FUSE LPJ_SP CLASS J	MAX FUSE LP-CC CLASS CC
0.5 (2.5)	AE17ANSO_FJ	6	6
0.75 (3.7)	AE17ANSO_FK	6	6
1 (4.8)	AE17ANSO_FL	10	15
1.5 (6.9)	AE17ANSO_FM	15	15
2 (7.8)	AE17BNSO_FP	17.5	25
3 (11.0)	AE17CNSO_FQ	20	20†
5 (17.5)	AE17DNSO_FR	35	
7.5 (25.3)	AE17FNSO_FT	50	
10 (32.2)	AE17HNSO_KC	70	
15 (48.3)	AE17JNSO_KE	100	
20 (62.1)	AE17KNSO_KF	110	

230 Volt, Three-Phase Motors

HP (FLC)	STARTER NUMBER (Fixed Heaters)	MAX FUSE LPJ_SP CLASS J	MAX FUSE LP-CC CLASS CC
0.5 (2.2)	AE17ANSO_FH	3†	3†
0.75 (3.2)	AE17ANSO_FK	6	6†
1 (4.2)	AE17ANSO_FK	6†	6†
1.5 (6.0)	AE17ANSO_FM	15	15
2 (6.8)	AE17BNSO_FN	15	15
3 (9.6)	AE17CNSO_FP	20	20†
5 (15.2)	AE17DNSO_FR	30	30†
7.5 (22.0)	AE17ENSO_FS	45	
10 (28.0)	AE17FNSO_FT	60	
15 (42.0)	AE17HNSO_KD	90	
20 (54.0)	AE17JNSO_KE	110	
25 (68.2)	AE17KNSO_KF	110	

460 Volt, Three-Phase Motors

HP (FLC)	STARTER NUMBER (Fixed Heaters)	MAX FUSE LPJ_SP CLASS J	MAX FUSE LP-CC CLASS CC
0.5 (1.0)	AE17ANSO_FF	2	2
0.75 (1.6)	AE17ANSO_FG	3	3
1 (2.1)	AE17ANSO_FH	3	3†
1.5 (3.0)	AE17ANSO_FJ	6	6
2 (3.4)	AE17ANSO_FK	6	6†
3 (4.8)	AE17ANSO_FM	10	15
5 (7.6)	AE17BNSO_FN	15	15
7.5 (11.0)	AE17CNSO_FQ	20	20†
10 (14.0)	AE17DNSO_FR	30	30†
15 (21.0)	AE17ENSO_FS	45	
20 (27.0)	AE17FNSO_FT	60	
25 (34.0)	AE17GNSO_KC	70	
30 (40.0)	AE17HNSO_KD	90	
40 (52.0)	AE17JNSO_KE	110	
50 (65.0)	AE17KNSO_KF	110	

575 Volt, Three-Phase Motors

HP (FLC)	STARTER NUMBER (Fixed Heaters)	MAX FUSE LPJ_SP CLASS J	MAX FUSE LP-CC CLASS CC
0.75 (1.3)	AE17ANSO_FF	2	2†
1 (1.7)	AE17ANSO_FG	3	3†
1.5 (2.4)	AE17ANSO_FH	3†	3†
2 (2.7)	AE17ANSO_FJ	6	6
3 (3.9)	AE17ANSO-FL	10	15
5 (6.1)	AE17ANSO_FM	15	15
7.5 (9.0)	AE17BNSO-FP	20	20†
10 (11.0)	AE17CNSO_FQ	20	20†
15 (17.0)	AE17DNSO_FR	35	
20 (22.0)	AE17ENSO_FS	45	
25 (27.0)	AE17FNSO_FT	60	
30 (32.0)	AE17GNSO_KC	70	
40 (41.0)	AE17HNSO_KD	90	
50 (52.0)	AE17KNSO_KE	110	

"-" Empty space designates where coil suffix must be added.

† May be too small to allow some motors to start.

Motor Controller & Fuse Selection For Type 2 Protection

COOPER Bussmann

Cutler Hammer Freedom Series — NEMA (UL & CSA Verified)

200 Volt, Three-Phase Motors

HP (FLC)	SIZE	STARTER CAT. #	HEATER ELEMENT	MAX FUSE LPN-RK_SP CLASS RK1
0.5 (2.5)	00	AN16AN0_C	H2006B-3	4.5
0.75 (3.7)	00	AN16ANO_C	H2008B-3	8
1 (4.8)	00	AN16ANO_C	H2009B-3	10
1.5 (6.9)	0	AN16NDO_C	H2010B-3	15
2 (7.8)	0	AN16BNO_C	H2010B-3	17.5
3 (11.0)	0	AN16BNO_C	H2011B-3	20
7.5 (25.3)	1	AN16DNO_B	H2013B-3	45
10 (32.2)	2	AN16GNO_B	H2015B-3	70
15 (48.3)	3	AN16KNO_	H2021-3	100
20 (62.1)	3	AN16KNO_	H2021-3	110
25 (78.2)	3	AN16KNO	H2022-3	175
40 (119.6)	4	AN16NNO_	H2024-3	200
50 (149.5)	5	AN16SNO_B	H2007B-3	300
60 (166.8)	5	AN16SNO_B	H2007B-3	350
75 (220.8)	5	AN16SNO_B	H2008B-3	400

230 Volt, Three-Phase Motors

HP (FLC)	SIZE	STARTER CAT. #	HEATER ELEMENT	MAX FUSE LPN-RK_SP CLASS RK1
0.5 (2.2)	00	AN16ANO_C	H2006B-3	4.5
0.75 (3.2)	00	AN16ANO_C	H2007B-3	5.6
1 (4.2)	00	AN16ANO_C	H2008B-3	8
1.5 (6.0)	00	AN16ANO_C	H2009B-3	12
2 (6.8)	0	AN16BNO_C	H2009B-3	12
3 (9.6)	0	AN16BNO_C	H2011B-3	20
5 (15.2)	1	AN16DNO_B	H2012B-3	30
7.5 (22.0)	1	AN16DNO_B	H2013B-3	45
7.5 (22.0)	2	AN16GNO_B	H2013B-3	45
10 (28.0)	2	AN16GNO_B	H2014B-3	60
15 (42.0)	2	AN16GNO_B	H2015B-3	70
20 (54.0)	3	AN16KNO_	H2021-3	110
25 (68.2)	3	AN16KNO_	H2022-3	150
30 (80.0)	3	AN16KNO_	H2022-3	175
30 (92.0)	4	AN16NNO_	H2023-3	200
40 (104.0)	4	AN16NNO_	H2023-3	200
50 (130.0)	4	AN16NNO_	H2024-3	200
60 (145.0)	5	AN16SNO_B	H2007B-3	300
75 (192.0)	5	AN16SNO_B	H2007B-3	400
100 (248.0)	5	AN16SNO_B	H2008B-3	400

460 Volt, Three-Phase Motors

HP (FLC)	SIZE	STARTER CAT. #	HEATER ELEMENT	MAX FUSE LPS-RK_SP CLASS RK1
0.5 (1.1)	00	AN16ANO_C	H2004B-3	2
0.75 (1.6)	00	AN16ANO_C	H2005B-3	2.8
1 (2.1)	00	AN16ANO_C	H2006B-3	4.5
1.5 (3.0)	00	AN16ANO_C	H2007B-3	5.6
2 (3.4)	00	AN16ANO_C	H2008B-3	7
3 (4.8)	0	AN16BNO_C	H2009B-3	10
5 (7.6)	0	AN16BNO_C	H2010B-3	15
7.5 (11.0)	1	AN16DNO_B	H2011B-3	20
10 (14.0)	1	AN16DNO_B	H2012B-3	30
15 (21.0)	2	AN16GNO_B	H2013B-3	45
20 (27.0)	2	AN16GNO_B	H2014B-3	60
25 (34.0)	2	AN16GNO_B	H2015B-3	70
30 (40.0)	3	AN16KNO_	H2020-3	80
40 (52.0)	3	AN16KNO_	H2021-3	110
50 (65.0)	3	AN16KNO_	H2022-3	125
60 (77.0)	4	AN16NNO_	H2022-3	150
75 (96.0)	4	AN16NNO_	H2023-3	200
100 (124.0)	4	AN16NNO_	H2024-3	200
125 (156.0)	5	AN16SNO_B	H2007B-3	350
150 (180.0)	5	AN16SNO_B	H2007B-3	400
200 (240.0)	5	AN16SNO_B	H2008B-3	400

575 Volt, Three-Phase Motors

HP (FLC)	SIZE	STARTER CAT. #	HEATER ELEMENT	MAX FUSE LPS-RK_SP CLASS RK1
0.75 (1.3)	00	AN16ANO_C	H2005B-3	2.8
1 (1.7)	00	AN16ANO_C	H2005B-3	2.8
1.5 (2.4)	00	AN16ANO_C	H2006B-3	4.5
2 (2.7)	00	AN16ANO_C	H2007B-3	5.6
3 (3.9)	0	AN16BNO_C	H2008B-3	8
5 (6.1)	0	AN16BNO_C	H2009B-3	12
7.5 (9.0)	1	AN16DNO_B	H2010B-3	17.5
10 (11.0)	1	AN16DNO_B	H2011B-3	20
15 (17.0)	2	AN16GNO_B	H2012B-3	35
20 (22.0)	2	AN16GNO_B	H2013B-3	45
25 (27.0)	2	AN16GNO_B	H2014B-3	60
30 (32.0)	3	AN16KNO_	H2019-3	60
40 (41.0)	3	AN16KNO_	H2020-3	80
50 (52.0)	3	AN16KNO_	H2021-3	110
60 (62.0)	4	AN16NNO_	H2021-3	110
75 (77.0)	4	AN16NNO_	H2022-3	150
100 (99.0)	4	AN16NNO_	H2023-3	200
125 (125.0)	5	AN16SNO_B	H2006B-3	250
150 (144.0)	5	AN16SNO_B	H2007B-3	300
200 (192.0)	5	AN16SNO_B	H2007B-3	400

"_" Empty space designates where coil suffix must be added.