

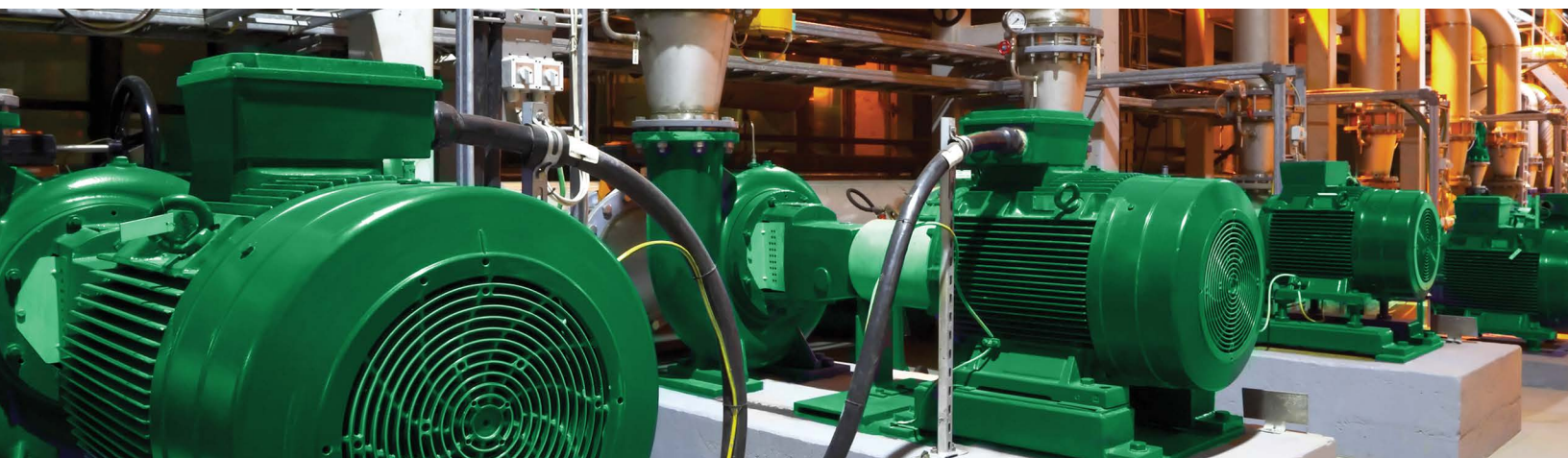
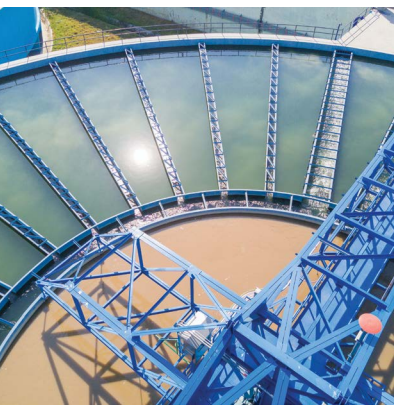


Expertise Applied | Answers Delivered

# MOTOR PROTECTION

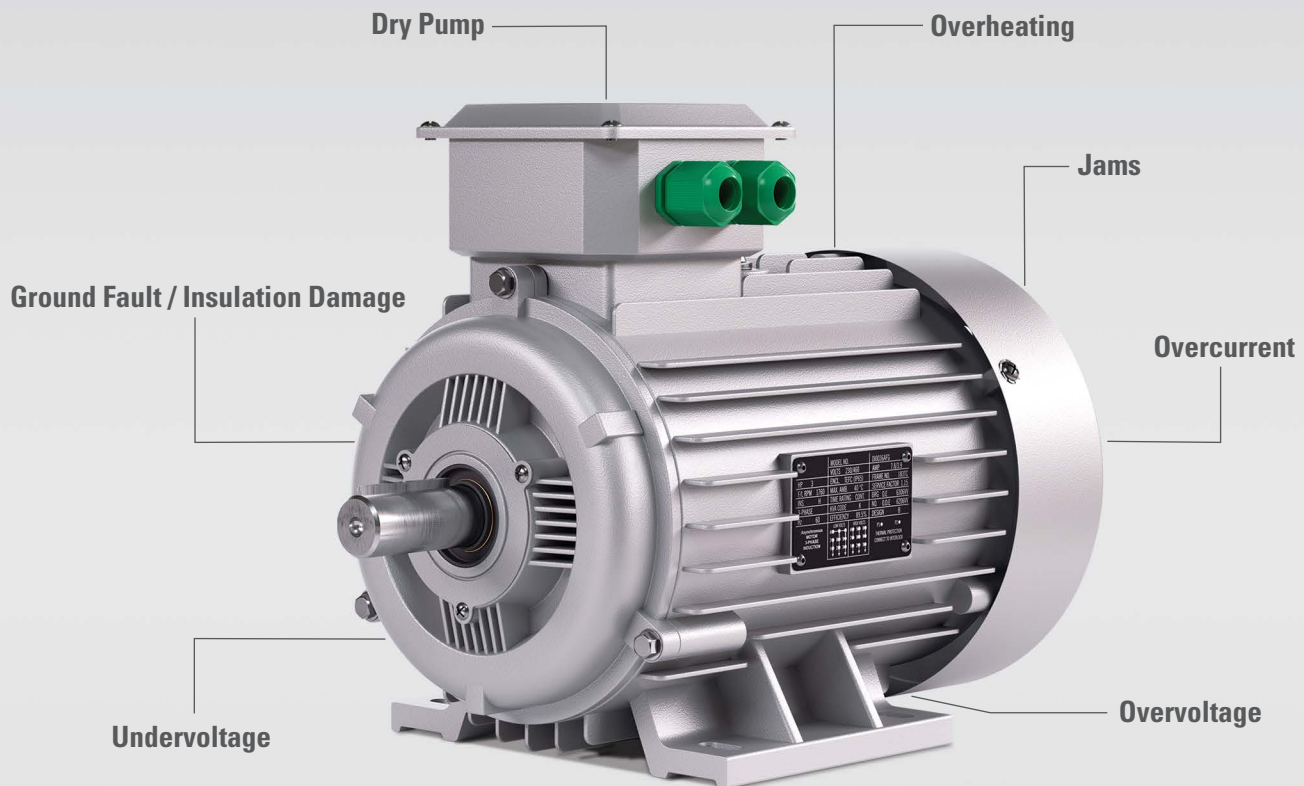
**ANY SIZE MOTOR | ANY APPLICATION | EXPERT PROTECTION**







# Improve **Safety** Reduce Downtime Protect Your Investment



*My customer had the Littelfuse MotorSaver 201A-AU on a motor in his plant. There was a phase loss situation that would have ended up with the loss of a 200 hp motor if it hadn't been protected by Littelfuse.*

— Michael D., Loyd's Electric Supply

# Unbeatable Motor Protection

## Basic and Standard Motor Protection

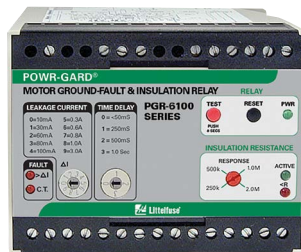
Protection for low-voltage motors, including ground-fault protection, overload, and overtemperature.



### 460 201A-AU Voltage/Phase Monitors

- 3-phase over/undervoltage protection
- Phase loss protection
- Reverse phase protection
- Unbalanced voltage protection
- Rapid cycling

[Littelfuse.com/460](http://Littelfuse.com/460)  
[Littelfuse.com/201A-AU](http://Littelfuse.com/201A-AU)



### PGR-6100 Motor Ground-Fault and Insulation Relay

- Continuous online and off-line monitoring
- Online monitoring to detect ground faults
- Off-line monitoring of insulation resistance
- CT loop monitoring
- Two analog outputs and Form C alarm contacts to indicate insulation resistance and ground-fault current

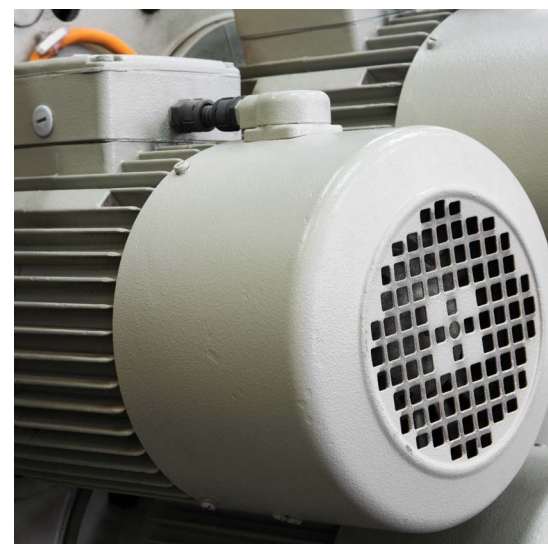
[Littelfuse.com/pgr-6100](http://Littelfuse.com/pgr-6100)



### 455 Voltage/Phase Monitor

- Contact failure detection
- History of past 20 fault causes
- With optional Informer-MS hand-held Diagnostic Tool, wirelessly view faults and conditions
- 3-phase over/undervoltage protection
- Phase loss protection
- Reverse phase protection
- Unbalanced voltage protection
- Rapid cycling

[Littelfuse.com/455](http://Littelfuse.com/455)



# FROM BASIC TO ADVANCED, FIND THE RIGHT LEVEL OF PROTECTION FOR YOU.

## Advanced Motor Protection

Multi-function protection for low and medium-voltage motors includes dynamic thermal modeling, metering, and overcurrent reduction setting for maintenance.



### Littelfuse MotorSaver®, 777-P2 Current and Voltage Monitor

- 3-phase voltage/phase protection
- Current overload protection
- Current underload protection
- Current unbalance
- Ground-fault protection
- Onboard display for easy programming
- Remote communications capability

[Littelfuse.com/777-P2](http://Littelfuse.com/777-P2)



### MPU-32 Motor Protection Unit

Advanced motor protection model for larger, complex motors. Provides current and temperature protection, data logging, and metering.

- Modular, compact design
- Overcurrent reduction setting for maintenance
- Dynamic thermal modeling
- 4-line, 80-character LCD display
- Communications options for almost any network
- Optional RTD protection
- Optional differential protection

[Littelfuse.com/mpu-32](http://Littelfuse.com/mpu-32)



### MPS Motor Protection System

One of the most advanced and customizable dynamic thermal models to protect any motor in any application.

- Monitors voltage, current, power and temperature (22 motor protection functions)
- Starter control, metering, and data logging
- Waveform capture for better fault analysis
- Overcurrent reduction setting for maintenance
- 80-character vacuum fluorescent display
- Conformal coating, rugged extruded aluminum housing, and internal vibration countermeasures for the harshest environments
- Dynamic thermal modeling
- Optional RTD module. RTDs can be assigned to be stator, bearing, or ambient temperature. RTD voting is optional and RTDs can bias the dynamic thermal model for more complete protection
- Optional differential protection
- Modular design makes installation easy

[Littelfuse.com/mps](http://Littelfuse.com/mps)







### Bluetooth\* Overload Relay

#### MP8000

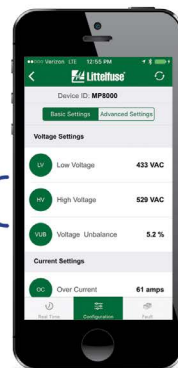
- Interact with relay using app on your smartphone or tablet
- Bluetooth\* communication up to 30 feet away\*\*
- Ethernet communications for network and remote access
- Single-phase and universal three-phase voltage/phase protection
- Current overload and underload protection
- Current unbalance
- Ground-fault protection

[www.littelfuse.com/BluetoothRelay](http://www.littelfuse.com/BluetoothRelay)

*There's a smarter way to protect your motors. A super smart relay communicates with your smart phone via Bluetooth\* up to 30 feet away. Monitor and control the MP8000 through the Littelfuse MP8000 App.*



No need to open the control panel. Keeps you safe from arc-flash hazards.



Stay dry, stay comfortable, stay seated.



Save time. Leave your PPE in the locker.



See fault codes, reset, and configure the relay remotely. It's as easy as your favorite app.



Control multiple MP8000 Relays from one device.

\* Bluetooth is a trademark of its respective owner

\*\* Enclosure and smartphone or tablet type may affect connectivity range.

# MOTOR PROTECTION SELECTION COMPARISON

FEATURE (IEEE#)	PGR-6100	201A-AU	455	460	777-P2	MP8000	MPU-32	MPS
Overload (49, 51)						✓	✓	✓
Underload						✓		✓
Overcurrent (50, 51)/Jam					✓	✓	✓	✓
Reduced Overcurrent Mode							✓	✓
Undercurrent (37)					✓	✓	✓	✓
Current Unbalance, Phase Loss/Reversal (37)		✓	✓	✓	✓	✓	✓	✓
Over (59)/Undervoltage (27)		✓	✓	✓	✓	✓		✓
Voltage Unbalance		✓	✓	✓	✓	✓		✓
Ground Fault (50G/N, 51G/N)	✓				✓	✓	✓	✓
Overtemperature (49)					*	✓	✓	✓
Rapid Cycling/Jog		✓	✓	✓	✓	✓	✓	✓
Starter Control								✓
Differential (87)							✓	✓
Internal CTs					✓ (Up to 90A)*	✓ (Up to 100A)		
On-Unit Metering					3 digit display	Via smartphone	4 line x 20 characters	4 line x 20 characters
Data Logging			20 faults		Last fault	Last 1,000 faults	100 events	64 events
Waveform Capture								✓
Offline Insulation Monitoring	✓							
Bluetooth*** Communication to Smartphone App**						✓		
Communications					✓	✓	✓	✓
Warranty	5-years	5-years	5-years	5-years	5-years	5-years	10-years	10-years

\* Other versions exist with different current monitoring ranges and temperature monitoring. Consult specific series datasheets for more details.

\*\* The Littelfuse App supports:

iPhone\*\*\* 4S and higher (iOS version 9.0 and higher)

iPad\*\*\* 3rd generation and higher (iOS version 9.0 and higher)

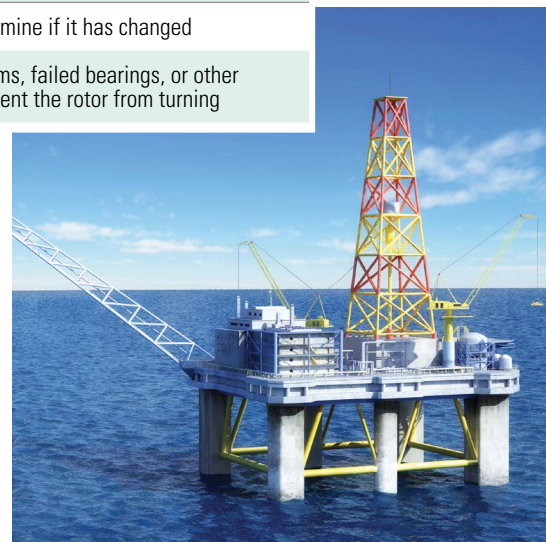
Android\*\*\* Smartphone with Bluetooth\*\*\* 4.0 – BLE (Google Android\*\*\* version 4.3 and higher)

Android\*\*\* Tablet with Bluetooth\*\*\* 4.0 – BLE (Google Android\*\*\* version 4.3 and higher)

\*\*\* iPhone, iPad, Android, Bluetooth, Google Android,

# COMMON CAUSES OF RELAY INDICATIONS AND POSSIBLE CORRECTIONS

RELAY INDICATION	LIKELY CAUSE	CORRECTION
<b>Overcurrent</b>	Overvoltage	Correct voltage problem at source
	Undervoltage	Check wiring; contact utility
	Excess flow	Review pump spec/application
	Bad bearings	Replace bearings
	Foreign material in pump	Clean out pump
	Jammed pump	Clean out pump
<b>Undercurrent</b>	Restricted flow	Correct flow restriction
	Lack of liquid to pump	Shut down until liquid is restored
	Broken shaft coupling or belt	Repair mechanical components
<b>Current Unbalance</b>	Bad wiring	Examine and correct
	Unbalanced power input	Reconnect single-phase loads to balance phases
<b>Overvoltage</b>	Bad regulation from utility	Correct voltage problem at source
<b>Undervoltage</b>	Bad regulation from utility	Correct voltage problem at source
	Wiring problem	Examine and correct
<b>Single Phase</b>	Broken wire	Repair wiring
	Bad contactor	Replace contactor
	Blown fuse/utility failure	Replace fuse/contact utility
<b>Phase Reversal</b>	Miswiring upstream in electrical system	Exchange two phases at input to pump power panel
<b>Ground Fault</b>	Small defect in insulation	Have motor tested and re-varnished if feasible
	Contamination in wiring or junction boxes	Clean out contamination
<b>Contactor Failure</b>	Faulty contactor	Replace contactor/contacts
	Bad connections on load side	Repair connections
<b>Overtemperature</b>	Poor ventilation	Unblock air ventilation to motor cooling fins and general area. Clean motor of dust and debris.
	Unbalance condition	See "current imbalance" above
	Bearing friction	Lube or replace bearings
<b>Jam</b>	Load exceeds motor's capability	Inspect the load to determine if it has changed
	Mechanical jam	Check for mechanical jams, failed bearings, or other problem that would prevent the rotor from turning





# Protect Motors with Current-Limiting Fuses



Current-limiting fuses open very quickly to interrupt high value faults. This limits the let-through current, enhancing worker safety and motor protection.

- Protect motors and pumps from damaging overcurrent
- Increase the short-circuit current rating of panels and equipment

## Legend

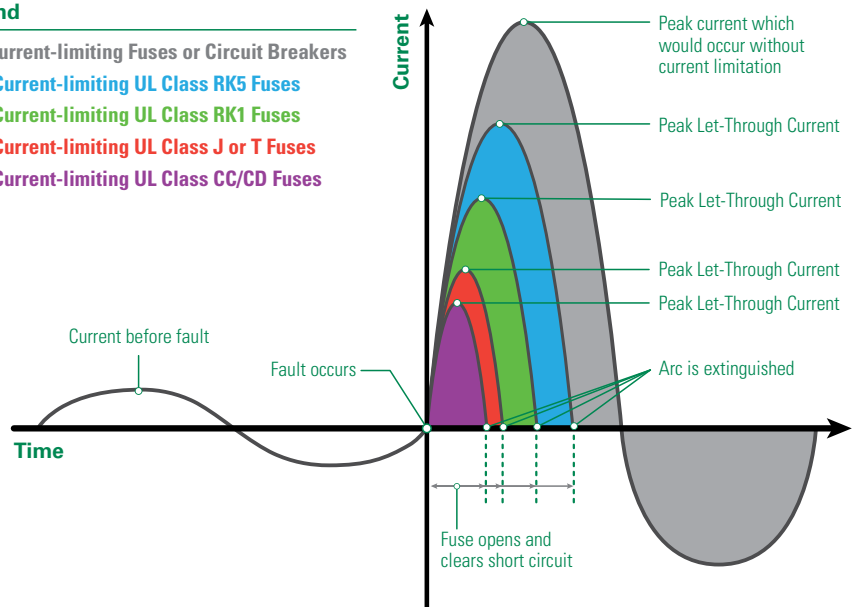
Non Current-limiting Fuses or Circuit Breakers

With Current-limiting UL Class RK5 Fuses

With Current-limiting UL Class RK1 Fuses

With Current-limiting UL Class J or T Fuses

With Current-limiting UL Class CC/CD Fuses



## Current Limiting Fuses for Motor Protection

FUSE	AMPERE RATING	VOLTAGE RATING	INTERRUPTING RATING
<b>Class CC/CD Fuse (CCMR)</b>	$\frac{2}{10}$ to 60 A	600 V ac 250 V dc: $\frac{2}{10}$ – 2 A, 4 $\frac{1}{2}$ – 10 A, 35 – 60 A 300 V dc: $2\frac{1}{4}$ – 4 A 500 V dc: 12 – 30 A	AC: 200 kA (UL) AC: 300 kA (Self-certified) DC: 20 kA
<b>Class J Fuse (JTD, JTD-ID)</b>	$\frac{8}{10}$ to 600 A	600 V ac 300 V dc ( $\frac{8}{10}$ – 100A) 500 V dc (110 – 600A)	AC: 200 kA (UL) AC: 300 kA (Self-certified) DC: 20 kA
<b>Class RK5 Fuse (FLSR, FLSR-ID)</b>	$\frac{1}{10}$ to 600 A	600 V ac 300 V dc	AC: 200 kA (UL) AC: 300 kA (Self-certified) DC: 20 kA
<b>Class RK1 Fuse (LLNRK, LLSRK, LLSRK-ID)</b>	$\frac{1}{10}$ to 600 A	250 V ac / 125 V dc (LLNRK) 600 V ac / 300 V dc (LLSRK, LLSRK-ID)	AC: 200 kA (UL) AC: 300 kA (Self-certified) DC: 20 kA

# Indication Increases Worker Safety



## Indicating Fuses & Fuse Blocks Increase Worker Safety

- Quickly see which fuse to replace, reducing maintenance time and costs
- Improve safety: no need to probe circuits to identify the opened fuse
- Small footprint saves space
- DIN-rail mounting eases installation



**LF Series Fuse Holders**  
Patent US8810420

## Indicating Fuses & Blocks for Motor Protection

Littelfuse offers double the amount of RK5 fuses with indication.<sup>1</sup>

FUSE	AMPERE RATING	VOLTAGE RATING	INTERRUPTING RATING
Indicating Class RK1 Fuse (LLSRK-ID)	1/10 to 600 A	600 V ac 300 V dc	AC: 200 kA (UL) AC: 300 kA (Self-certified) DC: 20 kA
Indicating Class RK5 Fuse (FLSR-ID)	1/10 to 600 A	600 V ac 300 V dc	AC: 200 kA (UL) AC: 300 kA (Self-certified) DC: 20 kA
Indicating Class RK5 Fuse (FLNR-ID)	35 to 600 A	250 V ac 125 V dc	AC: 200 kA (UL) AC: 300 kA (Self-certified) DC: 20 kA
Indicating Class J Fuse (JTD-ID)	9/10 to 600 A	600 V ac 300 V dc (9/10 - 100 A) 500 V dc (110 - 600 A)	AC: 200 kA (UL) AC: 300 kA (Self-certified) DC: 20 kA
Class RK1, RK5 Indicating Fuse Blocks (LFR25 Series, LFR60 Series)	0 to 600 A	250 V ac (LFR25) 600 V ac (LFR60)	200 kA RMS SYM
Class J Indicating Fuse Blocks (LFJ60 Series, LFPSJ Series)	0 to 600 A (LFJ60) 30 and 60 A (LFPSJ)	600 V ac (LFJ60) 600 V ac/DC (LFPSJ)	200 kA (LFPSJ)

<sup>1</sup>According to publicly available information on competitor websites as of September 2017.



# Motor Protection Tables

## Selection of Class RK5 Fuses or POWR-PRO® Class RK1 Fuses Based on Motor Full Load Amps

TIME DELAY UL CLASS RK1 OR RK5 FUSE AMPERE RATING	MOTOR RUNNING PROTECTION (USED WITHOUT PROPERLY SIZED OVERLOAD RELAYS) MOTOR FULL - LOAD AMPS		BACK - UP MOTOR RUNNING PROTECTION (USED WITH PROPERLY SIZED OVERLOAD RELAYS) MOTOR FULL - LOAD AMPS	
	MOTOR SERVICE FACTOR OF 1.15 OR GREATER OR WITH TEMP. RISE NOT OVER 40 °C.	MOTOR SERVICE FACTOR LESS THAN 1.15 OR WITH TEMP. RISE GREATER THAN 40 °C.	MOTOR SERVICE FACTOR OF 1.15 OR GREATER OR WITH TEMP. RISE NOT OVER 40 °C.	MOTOR SERVICE FACTOR LESS THAN 1.15 OR WITH TEMP. RISE GREATER THAN 40 °C
1/10	0.08 - 0.09	0.09 - 0.10	0 - 0.08	0 - 0.09
1/8	0.10 - 0.11	0.11 - 0.125	0.09 - 0.10	0.10 - 0.11
15/100	0.12 - 0.15	0.14 - 0.15	0.11 - 0.12	0.12 - 0.13
2/10	0.16 - 0.19	0.18 - 0.20	0.13 - 0.16	0.14 - 0.17
1/4	0.20 - 0.23	0.22 - 0.25	0.17 - 0.20	0.18 - 0.22
3/10	0.24 - 0.30	0.27 - 0.30	0.21 - 0.24	0.23 - 0.26
4/10	0.32 - 0.39	0.35 - 0.40	0.25 - 0.32	0.27 - 0.35
1/2	0.40 - 0.47	0.44 - 0.50	0.33 - 0.40	0.36 - 0.43
6/10	0.48 - 0.60	0.53 - 0.60	0.41 - 0.48	0.44 - 0.52
8/10	0.64 - 0.79	0.70 - 0.80	0.49 - 0.64	0.53 - 0.70
1	0.80 - 0.89	0.87 - 0.97	0.65 - 0.80	0.71 - 0.87
1 1/8	0.90 - 0.99	0.98 - 1.08	0.81 - 0.90	0.88 - 0.98
1 1/4	1.00 - 1.11	1.09 - 1.21	0.91 - 1.00	0.99 - 1.09
1 1/10	1.12 - 1.19	1.22 - 1.30	1.01 - 1.12	1.10 - 1.22
1 1/2	1.20 - 1.27	1.31 - 1.39	1.13 - 1.20	1.23 - 1.30
1 9/10	1.28 - 1.43	1.40 - 1.56	1.21 - 1.28	1.31 - 1.39
1 8/10	1.44 - 1.59	1.57 - 1.73	1.29 - 1.44	1.40 - 1.57
2	1.60 - 1.79	1.74 - 1.95	1.45 - 1.60	1.58 - 1.74
2 1/4	1.80 - 1.99	1.96 - 2.17	1.61 - 1.80	1.75 - 1.96
2 1/2	2.00 - 2.23	2.18 - 2.43	1.81 - 2.00	1.97 - 2.17
2 9/10	2.24 - 2.39	2.44 - 2.60	2.01 - 2.24	2.18 - 2.43
3	2.40 - 2.55	2.61 - 2.78	2.25 - 2.40	2.44 - 2.60
3 1/10	2.56 - 2.79	2.79 - 3.04	2.41 - 2.56	2.61 - 2.78
3 1/2	2.80 - 3.19	3.05 - 3.47	2.57 - 2.80	2.79 - 3.04
4	3.20 - 3.59	3.48 - 3.91	2.81 - 3.20	3.05 - 3.48
4 1/2	3.60 - 3.99	3.92 - 4.34	3.21 - 3.60	3.49 - 3.91
5	4.00 - 4.47	4.35 - 4.86	3.61 - 4.00	3.92 - 4.35
5 9/10	4.48 - 4.79	4.87 - 5.21	4.01 - 4.48	4.36 - 4.87
6	4.80 - 4.99	5.22 - 5.43	4.49 - 4.80	4.88 - 5.22
6 1/4	5.00 - 5.59	5.44 - 6.08	4.81 - 5.00	5.23 - 5.43
7	5.60 - 5.99	6.09 - 6.52	5.01 - 5.60	5.44 - 6.09
7 1/2	6.00 - 6.39	6.53 - 6.95	5.61 - 6.00	6.10 - 6.52
8	6.40 - 7.19	6.96 - 7.82	6.01 - 6.40	6.53 - 6.96
9	7.20 - 7.99	7.83 - 8.69	6.41 - 7.20	6.97 - 7.83
10	8.00 - 9.59	8.70 - 10.00	7.21 - 8.00	7.84 - 8.70
12	9.60 - 11.99	10.44 - 12.00	8.01 - 9.60	8.71 - 10.43
15	12.00 - 13.99	13.05 - 15.00	9.61 - 12.00	10.44 - 13.04
17 1/2	14.00 - 15.99	15.22 - 17.39	12.01 - 14.00	13.05 - 15.21
20	16.00 - 19.99	17.40 - 20.00	14.01 - 16.00	15.22 - 17.39
25	20.00 - 23.99	21.74 - 25.00	16.01 - 20.00	17.40 - 21.74
30	24.00 - 27.99	26.09 - 30.00	20.01 - 24.00	21.75 - 26.09
35	28.00 - 31.99	30.44 - 34.78	24.01 - 28.00	26.10 - 30.43
40	32.00 - 35.99	34.79 - 39.12	28.01 - 32.00	30.44 - 37.78
45	36.00 - 39.99	39.13 - 43.47	32.01 - 36.00	37.79 - 39.13
50	40.00 - 47.99	43.48 - 50.00	36.01 - 40.00	39.14 - 43.48
60	48.00 - 55.99	52.17 - 60.00	40.01 - 48.00	43.49 - 52.17
70	56.00 - 59.99	60.87 - 65.21	48.01 - 56.00	52.18 - 60.87
75	60.00 - 63.99	65.22 - 69.56	56.01 - 60.00	60.88 - 65.22
80	64.00 - 71.99	69.57 - 78.25	60.01 - 64.00	65.23 - 69.57
90	72.00 - 79.99	78.26 - 86.95	64.01 - 72.00	69.58 - 78.26
100	80.00 - 87.99	86.96 - 95.64	72.01 - 80.00	78.27 - 86.96
110	88.00 - 99.99	95.65 - 108.69	80.01 - 88.00	86.97 - 95.65
125	100.00 - 119.99	108.70 - 125.00	88.01 - 100.00	95.66 - 108.70
150	120.00 - 139.99	131.30 - 150.00	100.01 - 120.00	108.71 - 130.43
175	140.00 - 159.99	152.17 - 173.90	120.01 - 140.00	130.44 - 152.17
200	160.00 - 179.99	173.91 - 195.64	140.01 - 160.00	152.18 - 173.91
225	180.00 - 199.99	195.65 - 217.38	160.01 - 180.00	173.92 - 195.62
250	200.00 - 239.99	217.39 - 250.00	180.01 - 200.00	195.63 - 217.39
300	240.00 - 279.99	260.87 - 300.00	200.01 - 240.00	217.40 - 260.87
350	280.00 - 319.99	304.35 - 347.82	240.01 - 280.00	260.88 - 304.35
400	320.00 - 359.99	347.83 - 391.29	280.01 - 320.00	304.36 - 347.83
450	360.00 - 399.99	391.30 - 434.77	320.01 - 360.00	347.84 - 391.30
500	400.00 - 479.99	434.78 - 500.00	360.01 - 400.00	391.31 - 434.78
600	480.00 - 600.00	521.74 - 600.00	400.01 - 480.00	434.79 - 521.74

# Motor Protection Tables

## Selection of Class RK5 Fuses or POWR-PRO® Class RK1 Fuses Based on Motor Horsepower

MOTOR HP	FULL LOAD AMPS	WITHOUT OVERLOAD RELAYS		WITH OVERLOAD RELAYS		SWITCH OR FUSE CLIP RATING
		S.F. = 1.15 OR MORE, TEMP RISE NOT OVER 40 °C	S.F. = LESS THAN 1.15 OR TEMP RISE MORE THAN 40 °C	S.F. = 1.15 OR MORE, TEMP RISE NOT OVER 40 °C	S.F. = LESS THAN 1.15 OR TEMP RISE MORE THAN 40 °C	
<b>120 VOLT 1-PHASE MOTORS (120 V CIRCUIT)</b>						
1/6	4.4	5	5	5 9/10	5 9/10	30
1/4	5.8	7	6 1/4	7 1/2	7	30
1/3	7.2	9	8	9	9	30
1/2	9.8	12	10	15	12	30
3/4	13.8	15	15	17 1/2	17 1/2	30
1	16	20	17 1/2	20	20	30
1 1/2	20	25	20	25	25	30
2	24	30	25	30	30	30
<b>230 VOLT 1-PHASE MOTORS (240 V CIRCUIT)</b>						
1/6	2.2	2 1/2	2 1/2	2 9/10	2 9/10	30
1/4	2.9	3 1/2	3 2/10	4	3 1/2	30
1/3	3.6	4 1/2	4	4 1/2	4 1/2	30
1/2	4.9	5 6/10	5 6/10	6 1/4	6	30
3/4	6.9	8	7 1/2	9	8	30
1	8	10	9	10	10	30
1 1/2	10	12	10	15	12	30
2	12	15	12	15	15	30
3	17	20	17 1/2	25	20	30
5	28	35	30*	35	35	60
7 1/2	40	50	45	50	50	60
10	50	60	50	70	60	60
<b>200 VOLT 3-PHASE MOTORS (208 V CIRCUIT)</b>						
1/2	2.5	3	2 9/10	3 2/10	3	30
3/4	3.7	4 1/2	4	5	4 1/2	30
1	4.8	6	5 6/10	6 1/4	6	30
1 1/2	6.9	8	7 1/2	7 1/2	8	30
2	7.8	9	8	10	9	30
3	11	12	12	15	15	30
5	17.5	20	20	25	25	30
7 1/2	25.3	30*	25*	35	30*	60
10	32.2	40	35	45	40	60
15	48.3	60	50	70†	60	60
20	62.1	75	70	80	75	100
25	78.2	90	80	100	90	100
30	92	110	100*	125	110	200
40	120	150	125	150	150	200
50	150	175	150	200	175	200
60	177	200*	200*	225	225	400
75	221	250	250	300	300	400
100	285	350	300	400	350	400
125	359	400*	400*	450	450	600
150	414	500	450	600	500	600

\* Visit [Littelfuse.com/technicalcenter](http://Littelfuse.com/technicalcenter) to see additional Motor Protection Tables.



(Continued from table on opposite page)

MOTOR HP	FULL LOAD AMPS	WITHOUT OVERLOAD RELAYS		WITH OVERLOAD RELAYS		SWITCH OR FUSE CLIP RATING
		S.F. = 1.15 OR MORE, TEMP RISE NOT OVER 40 °C	S.F. = LESS THAN 1.15 OR TEMP RISE MORE THAN 40 °C	S.F. = 1.15 OR MORE, TEMP RISE NOT OVER 40 °C	S.F. = LESS THAN 1.15 OR TEMP RISE MORE THAN 40 °C	

**230 VOLT 3-PHASE MOTORS (240 V CIRCUIT)**

½	2.2	2 ⅙ <sub>10</sub>	2 ½	2 ⅙ <sub>10</sub>	2 ⅙ <sub>10</sub>	30
¾	3.2	4	3 ½	4	4	30
1	4.2	5	4 ½	5 ⅙ <sub>10</sub>	5	30
1 ½	6.0	7 ½	6 ¼	7 ½	7 ½	30
2	6.8	8	7 ½	9	8	30
3	9.6	12	10	12	12	30
5	15.2	17 ½	17 ½	20	17 ½	30
7 ½	22	25	25	30	30	30
10	28	35	30*	35	35	60
15	42	50	45	60	50	60
20	54	60*	60*	70	70	100
25	68	80	75	90	80	100
30	80	100	90	100	100	100
40	104	125	110	150	125	200
50	130	150	150	175	150	200
60	154	175	175	200	200	200
75	192	225	200*	250	225	400
100	248	300	250	350	300	400
125	312	350	350	400	400	400
150	360	450	400*	450	450	600
200	480	600	500	600	600	600

**460 VOLT 3-PHASE MOTORS (480 V CIRCUIT)**

½	1.1	1 ⅔ <sub>10</sub>	1 ¼	1 ⅔ <sub>10</sub>	1 ⅔ <sub>10</sub>	30
¾	1.6	2	1 ⅝ <sub>10</sub>	2	2	30
1	2.1	2 ½	2 ¼	2 ⅔ <sub>10</sub>	2 ½	30
1 ½	3.0	3 ½	3 ⅔ <sub>10</sub>	4	3 ½	30
2	3.4	4	3 ½	4 ½	4	30
3	4.8	5 ⅔ <sub>10</sub>	5	6	5 ⅔ <sub>10</sub>	30
5	7.6	9	8	10	9	30
7 ½	11	12	12	15	15	30
10	14	17 ½	15	17 ½	17 ½	30
15	21	25	20	30	25	30
20	27	30*	30*	35	35	60
25	34	40	35	45	40	60
30	40	50	45	50	50	60
40	54	60*	60*	70	60*	100
50	65	80	70	90	75	100
60	77	90	80	100	90	100
75	96	110	110	125	125	200
100	124	150	125	175	150	200
125	156	175	175	200	200	200
150	180	225	200*	225	225	400
200	240	300	250	300	300	400

\* Visit [Littelfuse.com/technicalcenter](http://Littelfuse.com/technicalcenter) to see additional Motor Protection Tables.

# Motor Protection Tables

(Continued from table on previous page)

MOTOR HP	FULL LOAD AMPS	WITHOUT OVERLOAD RELAYS		WITH OVERLOAD RELAYS		SWITCH OR FUSE CLIP RATING
		S.F. = 1.15 OR MORE, TEMP RISE NOT OVER 40 °C	S.F. = LESS THAN 1.15 OR TEMP RISE MORE THAN 40 °C	S.F. = 1.15 OR MORE, TEMP RISE NOT OVER 40 °C	S.F. = LESS THAN 1.15 OR TEMP RISE MORE THAN 40 °C	
<b>575 VOLT 3-PHASE MOTORS (600V CIRCUIT)</b>						
½	0.9	1 ⅛	1	1 ⅛	1 ⅛	30
¾	1.3	1 ⅙ <sub>10</sub>	1 ¼ <sub>10</sub>	1 ⅙ <sub>10</sub>	1 ⅙ <sub>10</sub>	30
1	1.7	2	1 ⅘ <sub>10</sub>	2 ¼	2	30
1 ½	2.4	3	2 ½	3	3	30
2	2.7	3 ⅔ <sub>10</sub>	2 ⅘ <sub>10</sub>	3 ½	3 ⅔ <sub>10</sub>	30
3	3.9	4 ½	4	5	4 ½	30
5	6.1	7 ½	7	8	7 ½	30
7 ½	9	10	10	12	12	30
10	11	12	12	15	15	30
15	17	20	17 ½	25	20	30
20	22	25	25	30	30	30
25	27	30*	30*	35	35	60
30	32	40	35	40	40	60
40	41	50	45	60	50	60
50	52	60	60	70†	60	60
60	62	75	70	80	75	100
75	77	90	80	100	90	100
100	99	110	110	125	125	200
125	125	150	125	175	150	200
150	144	175	150	200	175	200
200	192	225	200*	250	225	400

\* Visit [Littelfuse.com/technicalcenter](http://Littelfuse.com/technicalcenter) to see additional Motor Protection Tables.

**NOTES:** S.F. = Motor Service Factor

\* Fuse Reducers Required

† 100 Amp Switch Required

## Selection of POWR-PRO® Class J Fuses Based on Motor Full Load Amps

MOTOR F.L.A.	JTD_ID / JTD AMPERE RATING	MOTOR F.L.A.	JTD_ID / JTD AMPERE RATING	MOTOR F.L.A.	JTD_ID / JTD AMPERE RATING
0.00 – 0.60	⅘ <sub>10</sub>	12.1 – 14.5	17 ½	76.1 – 84.0	110
0.61 – 0.80	1	14.6 – 17.0	20	84.1 – 90.0	125
0.81 – 1.00	1 ¼	17.1 – 21.0	25	90.1 – 102	150
1.01 – 1.20	1 ½	21.1 – 25.0	30	103 – 125	175
1.21 – 1.65	2	25.1 – 28.5	35	126 – 144	200
1.66 – 2.00	2 ½	28.6 – 34.0	40	145 – 162	225
2.01 – 2.40	3	34.1 – 37.0	45	163 – 180	250
2.41 – 3.30	4	37.1 – 41.0	50	181 – 204	300
3.31 – 4.10	5	41.1 – 48.0	60	205 – 240	350
4.11 – 4.90	6	48.1 – 52.0	70	241 – 288	400
4.91 – 6.40	8	52.1 – 59.0	80	289 – 312	450
6.41 – 8.00	10	59.1 – 66.0	90	313 – 360	500
8.01 – 9.80	12	66.1 – 76.0	100	361 – 432	600
9.81 – 12.0	15				

NOTE: For severe motor starting conditions, fuses may be sized up to 225 % motor F.L.A. (See NEC Article 430.52 for Exceptions)



## Selection of CCMR Time-Delay Fuses Based on Motor Full Load Amps

MOTOR FULL LOAD CURRENT (F.L.A.)						CCMR AMPERE RATING
FOR MOTORS WITH AN ACCELERATION TIME OF 2 SECONDS OR LESS		FOR MOTORS WITH AN ACCELERATION TIME OF 5 SECONDS OR LESS		FOR MOTORS WITH AN ACCELERATION TIME OF 8 SECONDS OR LESS		
MIN. F.L.A. (1)	MAX F.L.A. (3)	MIN. F.L.A. (1)	MAX F.L.A. (3)	MIN F.L.A. (2)	MAX F.L.A. (3)	
0.2	0.2	0.2	0.2	0.2	0.2	3/10
0.3	0.4	0.3	0.4	0.3	0.3	1/2
0.4	0.6	0.4	0.5	0.4	0.5	8/10
0.5	0.7	0.5	0.6	0.5	0.6	1
0.6	1.0	0.6	0.9	0.6	0.8	1 1/4
0.8	1.1	0.8	1.0	0.7	0.9	1 1/2
0.9	1.3	0.9	1.1	0.8	1.0	1 3/4
1.1	1.4	1.1	1.2	0.9	1.1	2
1.2	2.1	1.2	2.1	1.2	1.8	2 1/2
1.5	2.6	1.5	2.6	1.4	2.3	3
1.8	3.0	1.8	3.0	1.6	2.6	3 1/2
2.1	3.4	2.1	3.2	1.8	2.8	4
2.3	3.9	2.3	3.3	2.0	2.8	4 1/2
2.6	4.3	2.6	3.4	2.3	2.8	5
2.9	4.8	2.9	3.7	2.5	3.1	5 3/4
3.3	5.2	3.3	4.0	2.7	3.4	6
3.5	5.4	3.5	4.1	2.8	3.5	6 1/4
3.6	5.7	3.6	4.2	3.2	3.7	7
4.1	5.8	4.1	4.3	3.4	3.8	7 1/2
4.3	6.2	4.3	4.6	3.6	4.2	8
4.6	6.9	4.6	5.2	4.0	4.5	9
5.2	7.7	5.2	5.8	4.5	4.9	10
5.8	8.9	5.8	6.6	5.4	5.5	12
6.9	10.0	6.9	7.7	6.7	6.7	15
8.9	13.5	8.9	10.0	6.8	9.0	20
11.5	15.8	11.2 (2)	11.8	9.0	11.0	25
14.3	17.8	13.4 (2)	13.4	10.0	15.0	30
20.7	23.3	16.1	17.9	15.6	15.9	35
23.7	26.7	18.4	20.5	17.8	18.2	40
26.6	30.0	20.7	23.1	20.0	20.4	45
30.0	33.3	23.0	25.6	22.3	22.7	50
35.5	40.0	27.6	30.1	26.7	27.3	60

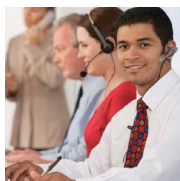
- 1 Based on NEC requirement limiting the rating of time-delay fuses to 175 % of motor F.L.A., or next higher rating.
- 2 Based on NEC exception permitting fuse rating to be increased, but not to exceed, 225 % motor F.L.A., however per NEC Article 430.52 Class CC (0-30) fuses can now be sized up to 400 % of motor F.L.A.
- 3 Based on Littelfuse CCMR time-delay characteristics.

NOTE: These values were calculated for motors with Locked Rotor Current (LRA), not exceeding the following values:

MOTOR F.L.A.	LRA*
0.00 – 1.00	850 %
1.01 – 2.00	750 %
2.01 – 10.0	650 %
10.1 – 17.8	600 %

\*If motor LRA varies from these values, contact Littelfuse.

### An Extension of Your Team



#### Technical Hotline (800-TEC-FUSE or 800-832-3873)

Littelfuse engineers are a phone call away to help identify potential issues and provide product recommendations to resolve problems.

#### Application and Field Support

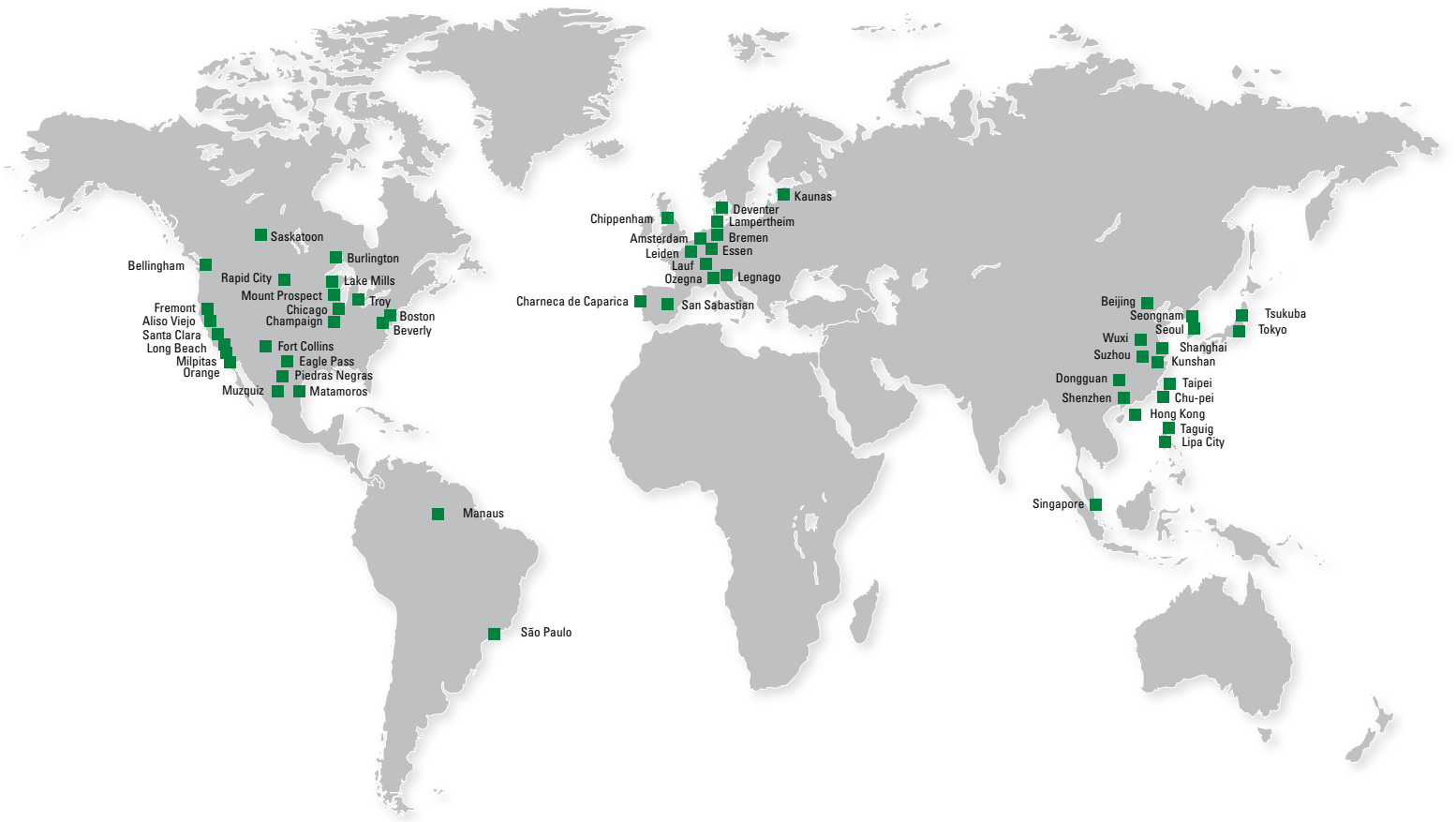
Our experienced product and application engineers work step-by-step with customers from design to installation to determine the best solution.

#### Motor Protection White Paper

Download our white paper on motor protection at [Littelfuse.com/MotorProtectionWhitePaper](http://Littelfuse.com/MotorProtectionWhitePaper)



# LOCAL RESOURCES FOR A **GLOBAL** MARKET



## [Littelfuse.com/MotorProtection](http://Littelfuse.com/MotorProtection)

For a comprehensive library of resources including datasheets, product manuals, white papers, application guides, demos, online design tools, catalogs, and more, visit [www.Littelfuse.com/TechnicalResources](http://www.Littelfuse.com/TechnicalResources).

**Littelfuse World Headquarters**  
8755 West Higgins Road, Suite 500  
Chicago, IL 60631, USA

**Technical Support:**  
Tel: +1-800-TEC-FUSE  
E-mail: [techline@littelfuse.com](mailto:techline@littelfuse.com)

**Customer Service:**  
Tel: +1-800-227-0029  
E-mail: [PG\\_CSG@littelfuse.com](mailto:PG_CSG@littelfuse.com)  
Fax: +1-847-787-5190

**Littelfuse SymCom**  
222 Disk Drive  
Rapid City, SD 57701, USA

**Technical Support:**  
Tel: +1-800-832-3873  
E-mail: [techline@littelfuse.com](mailto:techline@littelfuse.com)

**Customer Service:**  
Tel: +1-800-227-0029  
E-mail: [PG\\_CSG@littelfuse.com](mailto:PG_CSG@littelfuse.com)  
Fax: +1-605-348-5685

**Littelfuse Startco**  
140 – 15 Innovation Boulevard  
(The Galleria Building)  
Saskatoon, SK S7N 2X8  
Tel: +1-306-373-5505



Littelfuse products are certified to many standards around the world. To check certifications on specific components, please refer to the specific product datasheet on [Littelfuse.com](http://Littelfuse.com).

**Disclaimer Notice** – Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at [www.littelfuse.com/product-disclaimer](http://www.littelfuse.com/product-disclaimer).