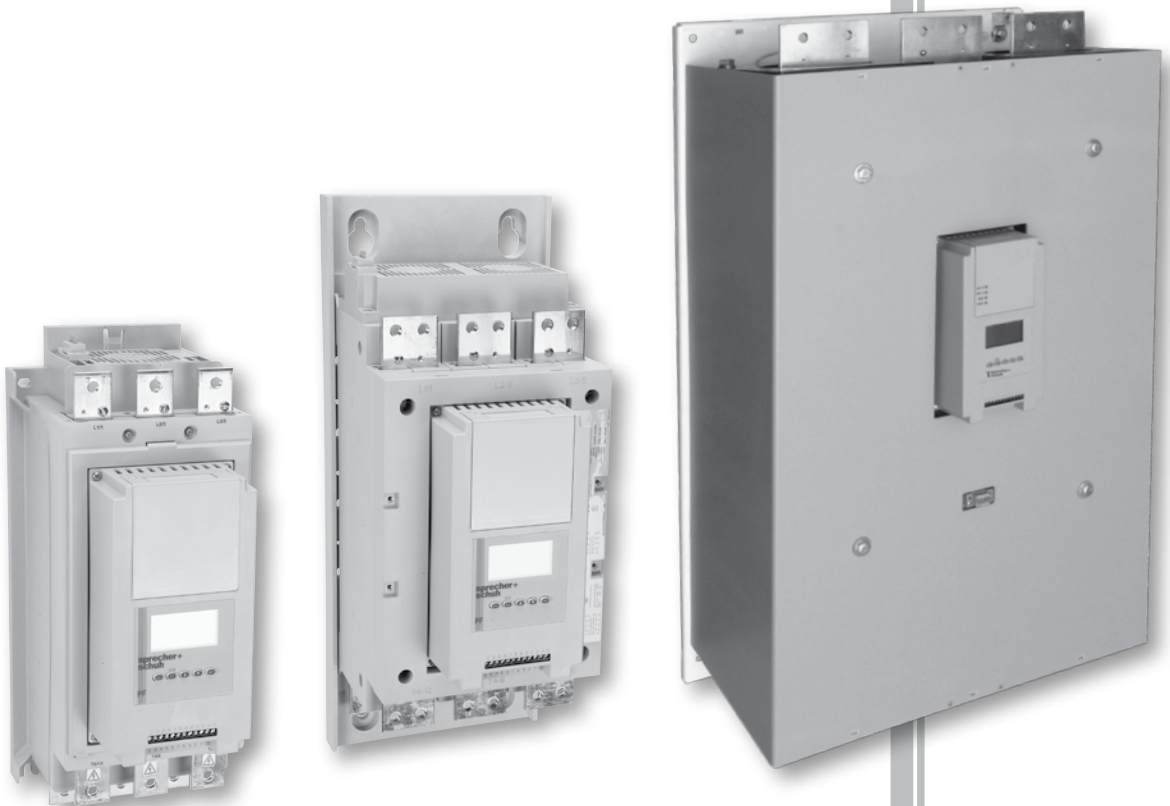


## **PF Softstarters 5A ... 1250A**

Quick Instruction Guide



visit [www.sprecherschuh.com/literature](http://www.sprecherschuh.com/literature)  
to download the entire PF Softstarter User Manual

## Introduction

This guide provides you with the basic information required to start up your PF Softstarter. When reading this document, look for this symbol “Step x” to guide you through the four basic steps required to install, start-up, and program the PF Softstarter.

The information provided in this Quick Start guide does not replace the User Manual which can be ordered on CD-ROM or downloaded by visiting [www.sprecherschuh.com](http://www.sprecherschuh.com). The Quick Start guide assumes the installer is a qualified person with previous experience and basic understanding of electrical terminology, configuration procedures, required equipment, and safety precautions.

For safety of maintenance personnel as well as others who might be exposed to electrical hazards associated with maintenance activities, follow all local safety related work practices (for example, the NFPA 70E, Part II in the United States). Maintenance personnel must be trained in the safety practices, procedures, and requirements that pertain to their respective job assignments.

For detailed PF Softstarter information including set-up, programming, precautions, and application considerations, refer to the following documentation.

| Title                      | Publication Number | Availability   |
|----------------------------|--------------------|--|
| PF Softstarter User Manual | LIT-MAN-PF-311     | <a href="http://www.sprecherschuh.com/literature">www.sprecherschuh.com/literature</a> |

## Step 1: Read the General Precautions



### WARNING

- Only personnel familiar with the controller and associated machinery should plan or implement the installation, start-up, and subsequent maintenance of the system. Failure to do this may result in personal injury and/or equipment damage.
- Hazardous voltage is present in the motor circuit even when the PF Softstarter is off. To avoid shock hazard, disconnect main power before working on the controller, motor, and control devices such as Start-Stop push buttons. Procedures that require parts of the equipment to be energized during troubleshooting, testing, etc., must be performed by properly qualified personnel, using appropriate local safety work practices and precautionary measures.
- Failure of solid state power switching components can cause overheating due to a single-phase condition in the motor. To prevent injury or equipment damage, the use of an isolation contactor or shunt trip type circuit breaker on the line side of the PF Softstarter is recommended. This device should be capable of interrupting the motor's lock rotor current.
- Hazardous voltages that can cause shock, burn, or death are present on L1, L2, L3, T1, T2, T3, T4, T5, and T6. Power terminal covers for units rated 108..480 A can be installed to prevent inadvertent contact with terminals. Disconnect the main power before servicing the motor controller, motor, or associated wiring.

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**NOTICE**

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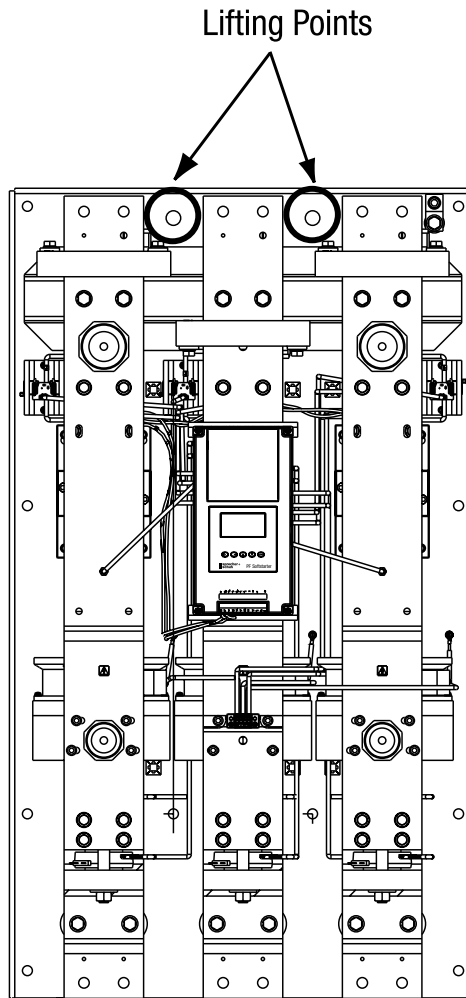
- The controller contains ESD- (electrostatic discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing, or repairing the assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with static control procedures, refer to applicable ESD protection handbooks.
- Stopping modes are not intended to be used as an emergency stop. The user is responsible for determining which stopping mode is best suited to the application. Refer to the applicable standards for emergency stop requirements.
- Pump Stopping may cause motor heating depending on the mechanical dynamics of the pumping system. Therefore, select the lowest stopping time setting that will satisfactorily stop the pump.
- Slow Speed running is not intended for continuous operation due to reduced motor cooling.
- The fan jumpers have been factory installed for 110/120V AC input. Refer to page 9 for 220/240V AC fan wiring (5... 480 A devices only).
- When installing or inspecting protective modules, make sure that the controller has been disconnected from the power source. The protective module should be inspected periodically for damage or discoloration. Replace if necessary.
- An incorrectly applied or installed controller can damage components or reduce product life. Wiring or application errors such as under sizing the motor, over sizing the controller, incorrect or inadequate AC supply, excessive ambient temperatures, or power quality may result in malfunction of the system.
- The Motor Overload parameter must be programmed by the installer to provide proper protection. Overload configuration must be properly coordinated with the motor.
- This product has been designed and tested as Class A equipment for EMC compatibility. Use of the product in domestic environments may cause radio interference, in which case, the installer may need to employ additional mitigation methods.
- Disconnect the controller from the motor before measuring insulation resistance (IR) of the motor windings. Voltages used for insulation resistance testing can cause SCR failure. Do not make any measurements on the controller with an Insulation Resistance (IR or Megger) tester.

**Step 2: Installation Mounting**

| <b>Enclosure Ratings</b>         |  |
|----------------------------------|--|
| Standard Device Rating           | IP00 (NEMA Open Type)                            |
| Minimum Required Enclosure       | IP23 (NEMA Type 1)                               |
| Recommended Enclosure            | IP54 (NEMA Type 12), sizing guide in User Manual |
| Enclosure Internal Temperature   | -5... 50 °C (23... 122 °F)                       |
| <b>Orientation and Clearance</b> |  |
| Mounting Orientation             | Vertical   |
| Minimum horizontal clearance     | 0 cm (0 in.)                                     |
| Minimum vertical clearance       | 15 cm (6 in.)                                    |

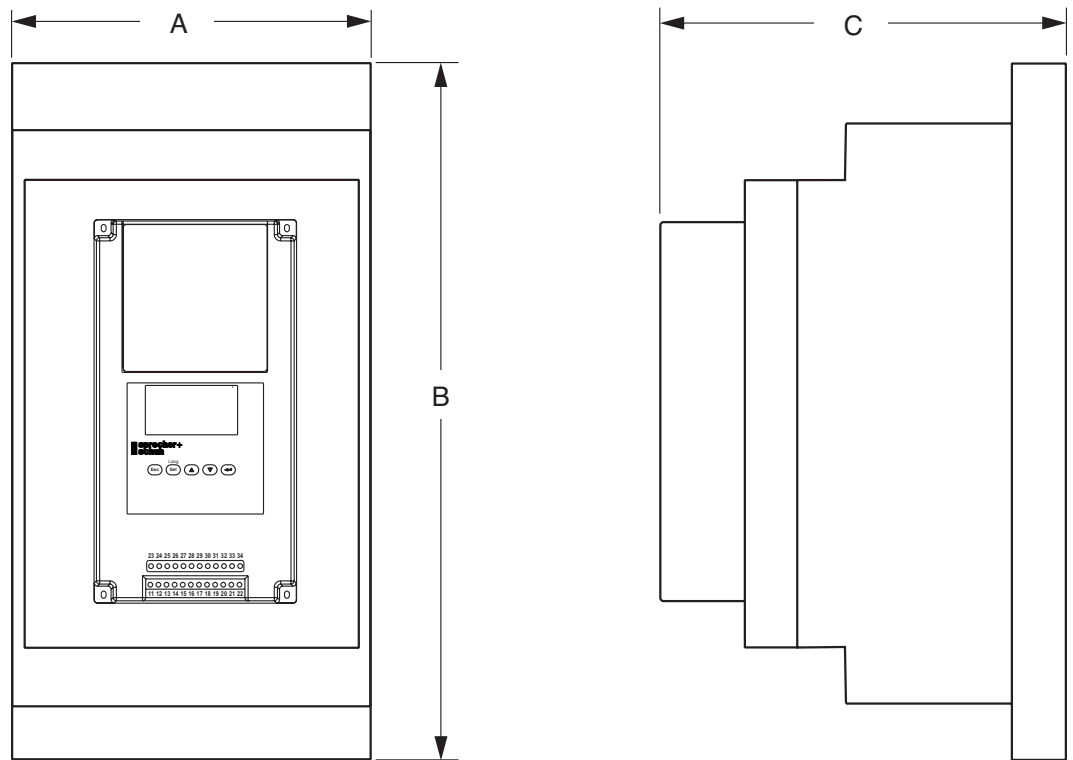
*Controllers rated 625...1250 A*

**Device must be lifted only at the designated lift points identified with labels.**



**Dimensions**

For detailed dimensions, please refer to the PF Softstarter User Manual.



Dimensions are in millimeters (inches).

| Controller Rating [A] | Height (B)     | Width (A)     | Depth (C)     | Approximate Shipping Weight |
|-----------------------|----------------|---------------|---------------|-----------------------------|
| 5... 85               | 321.0 (12.60)  | 150.0 (5.90)  | 203.0 (8.00)  | 5.7 kg (12.5 lb)            |
| 108... 135            | 443.7 (17.47)  | 196.4 (7.74)  | 212.2 (8.35)  | 15.0 kg (33.0 lb)           |
| 201 ...251            | 560.0 (22.05)  | 225.0 (8.86)  | 253.8 (9.99)  | 30.4 kg (67.0 lb)           |
| 317...480             | 600.0 (23.62)  | 290.0 (11.42) | 276.5 (10.89) | 45.8 kg (101 lb)            |
| 625...780             | 1041.1 (41.00) | 596.9 (23.50) | 346.2 (13.63) | 179 kg (395 lb)             |
| 970...1250            | 1041.1 (41.00) | 596.9 (23.50) | 346.2 (13.63) | 224 kg (495 lb)             |

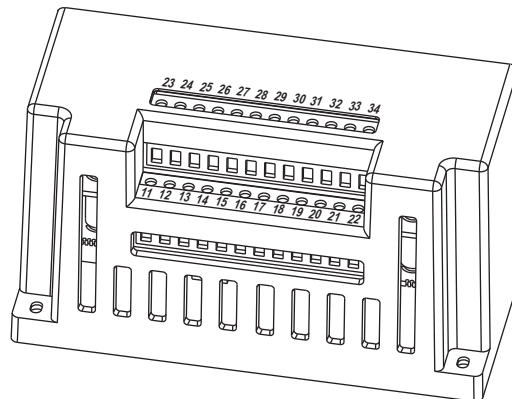
**Power Wiring**

Refer to the product nameplate or the PF Softstarter User Manual for device specific information.

| PF Rating [A] | Lug Kit Cat. No. ① | Wire Strip Length | Conductor Range                              | Max. No. Lugs/Pole |           | Tightening Torque       |                       |
|---------------|--------------------|-------------------|--|--------------------|-----------|-------------------------|-----------------------|
|               |                    |                   |  | Line Side          | Load Side | Wire - Lug              | Lug - Busbar          |
| 5...85        | Built-in           | 18...20 mm        | 2.5...85 mm <sup>2</sup><br>(#14...3/0 AWG)  | —                  | —         | 11.3 N•m<br>(100 lb•in) | —                     |
| 108...135     | PNX-1120           | 18...20 mm        | 16...120 mm <sup>2</sup><br>(#6...250 MCM)   | 1                  | 1         | 31 N•m<br>(275 lb•in)   | 23 N•m<br>(200 lb•in) |
| 201...251     | PNX-1120           | 18...20 mm        | 16...120 mm <sup>2</sup><br>(#6...250 MCM)   | 2                  | 2         | 31 N•m<br>(275 lb•in)   | 23 N•m<br>(200 lb•in) |
| 317...480     | PNX-1240           | 18...25 mm        | 25...240 mm <sup>2</sup><br>(#4...500 MCM)   | 2                  | 2         | 42 N•m<br>(375 lb•in)   | 28 N•m<br>(250 lb•in) |
| 625...780     | CA6-DL630          | 32 mm/64 mm       | 70...240 mm <sup>2</sup><br>(2/0...500 MCM)  | 2                  | 2         | 45 N•m<br>(400 lb•in)   | 68 N•m<br>(600 lb•in) |
| 970           | CA6-DL860          | 26 mm/48 mm       | 120...240 mm <sup>2</sup><br>(4/0...500 MCM) | 1                  | 1         | 45 N•m<br>(400 lb•in)   | 68 N•m<br>(600 lb•in) |
| 1250          | CA6-DL630          | 32 mm/64 mm       | 70...240 mm <sup>2</sup><br>(2/0...500 MCM)  | 1                  | 1         | 45 N•m<br>(400 lb•in)   | 68 N•m<br>(600 lb•in) |
|               | CA6-DL860          | 26 mm/48 mm       | 120...240 mm <sup>2</sup><br>(4/0...500 MCM) | 1                  | 1         |                         |                       |

① Lug kits include three lugs

**Control Terminals**



| Terminal | Description             | Terminal | Description                    | Footnotes  |
|----------|-------------------------|----------|--------------------------------|--|
| 11 ③④    | Control Power Input (+) | 23 ①     | PTC Input                      | ① Do not connect any additional loads to these terminals. These “parasitic” loads may cause incorrect operation.<br>② When set for External Bypass mode, the PF Softstarter can be used to control a properly sized external contactor and overload once the motor reaches full speed. The PF Softstarter overload functionality is disabled in this mode.<br>③ RC Snubbers are required on inductive type loads connected to auxiliary contacts.<br>④ Control power on units rated 625...1250 A is pre-wired internally, from terminal block CP1. |
| 12 ③④    | Control Power Common    | 24 ①     | PTC Input                      |  |
| 13       | Controller Enable Input | 25       | Tachometer Input               |  |
| 14       | Ground                  | 26       | Tachometer Input               |  |
| 15 ①③    | Option Input #2         | 27 ①     | Ground Fault Transformer Input |  |
| 16 ①③    | Option Input #1         | 28 ①     | Ground Fault Transformer Input |  |
| 17 ①③    | Start Input             | 29 ②③    | Aux Contact #2                 |  |
| 18 ①③    | Stop Input              | 30 ②③    | Aux Contact #2                 |  |
| 19 ②③    | Aux Contact #1          | 31 ②③    | Aux Contact #3                 |  |
| 20 ②③    | Aux Contact #1          | 32 ②③    | Aux Contact #3                 |  |
| 21       | Not Used                | 33 ②③    | Aux Contact #4                 |  |
| 22       | Not Used                | 34 ②③    | Aux Contact #4                 |  |

**Control Wiring**

Refer to the product nameplate for additional details. Depending on the specific application, additional control circuit transformer VA capacity may be required.

*Controllers rated 5... 480 A*

Control power is connected to the product through terminals 11 and 12.

|                                      |  |
|--------------------------------------|--|
| Conductor Range                      | 0.75...2.5 mm <sup>2</sup> (18...14 AWG) |
| Torque                               | 0.6 N•m (5 lb•in)                        |
| Maximum Number of Wires per Terminal | 2  |
| AC Control Voltage Input             | 100...240V AC or 24V AC (+10/-15%)       |
| Supply Type                          | 1-phase, 50/60 Hz                        |
| 24V AC Power Requirement             | 130VA                                    |
| 100...240V AC Power Requirement      | 75VA                                     |
| DC Control Voltage Input             | 24V DC (+10/-15%)                        |
| Inrush Current                       | 5 A                                      |
| Inrush Time                          | 250 ms                                   |
| Transient Watts                      | 60 W                                     |
| Transient Time                       | 500 ms                                   |
| Steady State Watts                   | 24 W                                     |
| Recommended Supply                   | 1606-XLP50E                              |
| Fan Power Input (AC only)            | separately wired                         |
| 5...135 A                            | 20VA                                     |
| 201...251 A                          | 40VA                                     |
| 317...480 A                          | 60VA                                     |

*Controllers rated 625... 1250 A*

Control power is connected to the product through terminal block CP 1, at terminals 1 and 4.

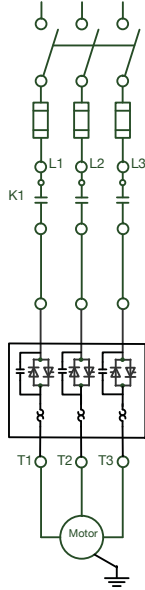
|                                      |   |
|--------------------------------------|---|
| Conductor Range                      | 0.75...2.5 mm <sup>2</sup> (18...14 AWG)      |
| Torque                               | 0.6 N•m (5 lb•in)                             |
| Maximum Number of Wires per Terminal | 2   |
| Control Voltage Input                | 110/120V AC or 230/240V AC, (+10/-15%)        |
| Supply Type                          | 1-phase, 50/60 Hz                             |
| Control Power Input                  | 800VA (includes controller, bypass, and fans) |

Typical Wiring Diagrams

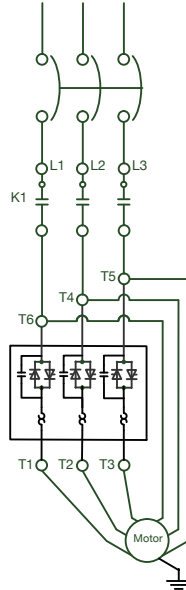
Typical Power Wiring Examples

Diagrams per NEMA Symbology

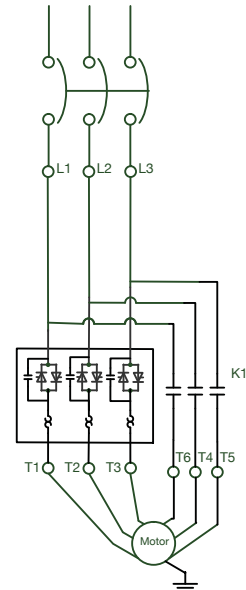
Line Connection with Isolation Contactor (Default Mode)



Delta Connection with Isolation Contactor (Optional Mode)

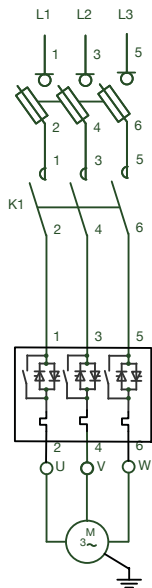


Delta Connection with Shorted SCR Protection (Optional Mode)

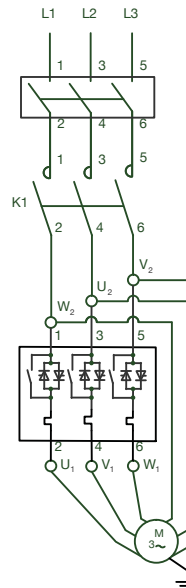


Diagrams per IEC Symbology

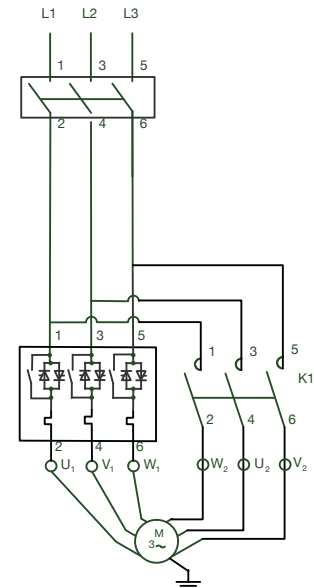
Line Connection with Isolation Contactor (Default Mode)



Delta Connection with Isolation Contactor (Optional Mode)



Delta Connection with Shorted SCR Protection (Optional Mode)



Typical Control Wiring Examples

Fig 1.A  
2 Wire Control with Fault Indication

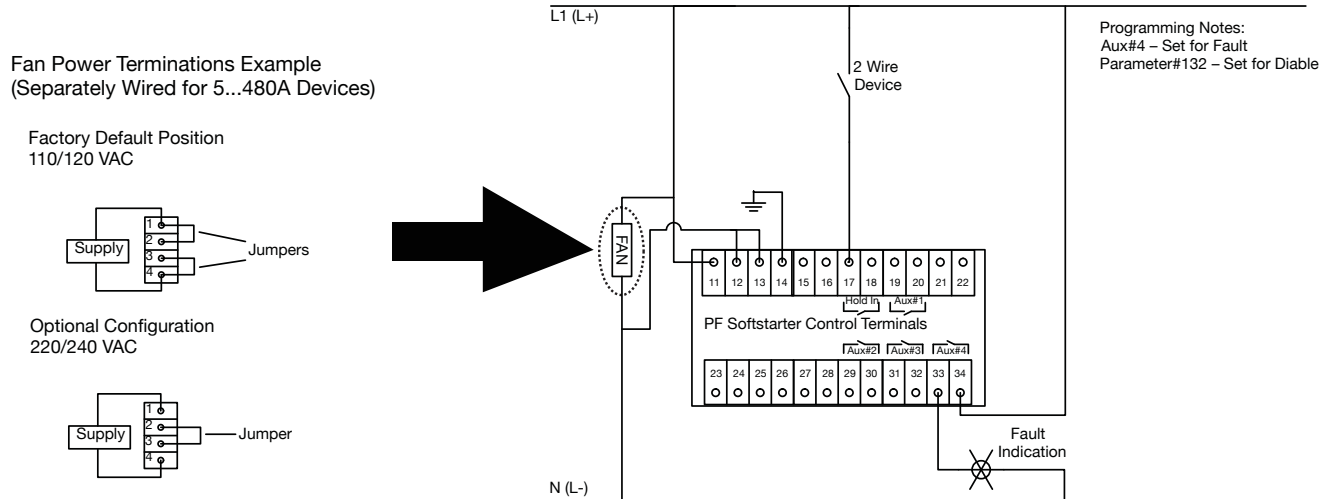
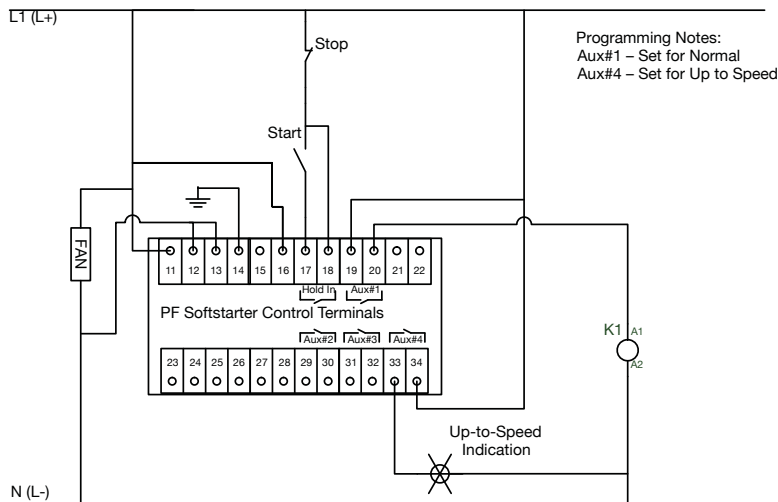
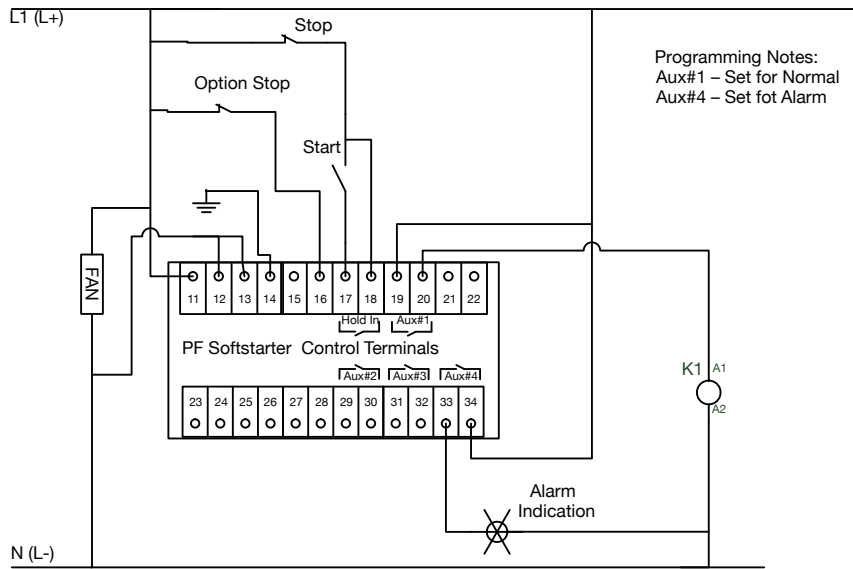


Fig 1.B  
3 Wire Control Isolation Contactor (K1),  
and Up-to-Speed Indication



Typical Control Wiring Examples, Continued

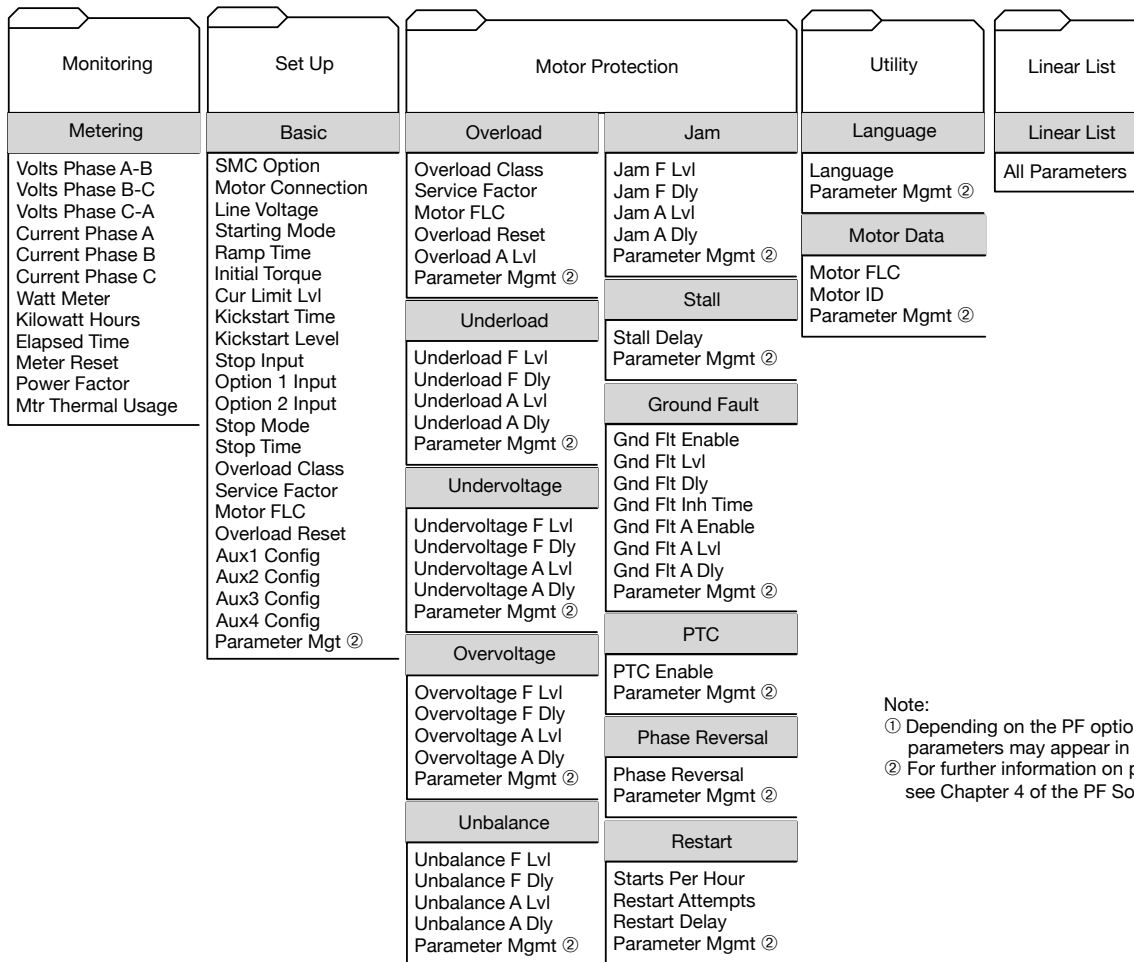
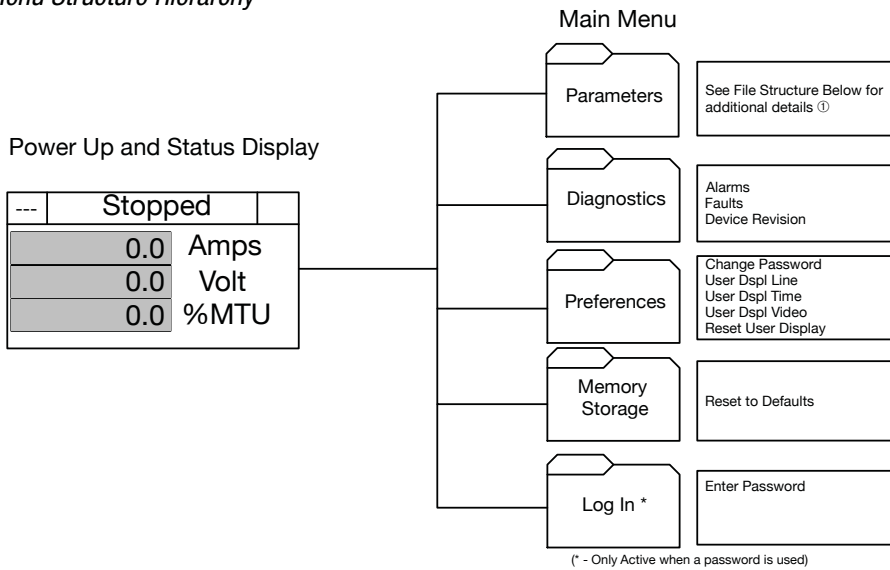
Fig 1.C  
3 Wire Control with Option Stopping, Isolation Contactor (K1),  
and Alarm Indication



### Step 3: Basic Programming

The PF Softstarter can be programmed with the built-in keypad and LCD display.

#### Menu Structure Hierarchy



Access the Basic set up group by selecting the Parameters menu from the Main Menu and then Set Up. This programming group provides a limited parameter set, allowing quick start-up with minimal adjustment.

| Parameter Name and Description  | Values   | Default     |
|---|--|-------------|
| <b>Parameter # 14 - SMC Option</b><br>Displays the type of controller. This is factory set and not adjustable.  | Standard, Pump Control, Brake  | Read Only   |
| <b>Parameter # 15 - Motor Connection</b><br>Displays the motor type to which the device is being connected.   | Line or Delta  | Line        |
| <b>Parameter # 16 - Line Voltage</b><br>Displays the system line voltage to which the unit is connected.  | 0...10000  | 480         |
| <b>Parameter # 17 - Starting Mode</b><br>Allows the user to program the PF Softstarter for the type of starting that best fits the application.                         | Soft Start, Current Limit, Full Voltage, Linear Speed, Pump Control              | Soft Start  |
| <b>Parameter # 18 - Ramp Time</b><br>This sets the time period during which the controller will ramp the output voltage.  | 0...30 s   | 10          |
| <b>Parameter # 19 - Initial Torque</b><br>When the Soft Start mode is selected, this parameter sets the initial reduced voltage output level for the voltage ramp.      | 0... 90% of locked rotor torque  | 70          |
| <b>Parameter # 20 - Current Limit Level</b><br>When Current Limit mode is selected, this parameters sets level of current that is applied for the programmed Ramp Time. | 50... 600% FLC   | 350         |
| <b>Parameter # 22 - Kickstart Time</b><br>A boost current is provided to the motor for the programmed time period.  | 0.0... 2.0 s   | 0           |
| <b>Parameter # 23 - Kickstart Level</b><br>Adjusts the amount of current applied to the motor during kickstart.   | 0... 90% of locked rotor torque  | 0           |
| <b>Parameter # 133 - Stop Input</b><br>Allows the user to select the operation of terminal 18, Stop Input.  | Coast, Stop Option   | Coast       |
| <b>Parameter # 132 - Option Input 1</b><br>Allows the user to select the operation of terminal 16, Option Input #1.   | Disable, Coast, Stop Option, Fault, Fault NC, Network                            | Stop Option |
| <b>Parameter # 24 - Option Input 2</b><br>Allows the user to select the operation of terminal 15, Option Input #2.  | Disable, Slow Speed, Dual Ramp, Fault, Fault NC, Network, Clear Fault            | Disable     |
| <b>Parameter # 32 - Stop Mode</b><br>Allows the user to program the PF Softstarter for the type of stopping that best fits the application.                             | Soft Stop, Linear Speed, SMB, Accu-Stop, Pump Stop                               | Soft Stop   |
| <b>Parameter # 33 - Stop Time</b><br>This sets the time period which the controller will ramp the voltage during a stopping maneuver.                                   | 0.0... 120 s   | 0.0         |
| <b>Parameter # 44 - Overload Class</b><br>Allows the user to enter the desired Overload trip class for the motor.   | Disable, 10, 15, 20, 30  | 10          |
| <b>Parameter # 45 - Service Factor</b><br>Allows the user to enter the Service Factor of the motor. For IEC motors the typical value is 1.0. For NEMA                   | 0.01... 1.99   | 1.15        |
| <b>Parameter # 46 - Motor FLC</b><br>This is a user entered value that is needed so the device can provide proper motor Overload protection.                            | 1.0...2200   | 1.0         |
| <b>Parameter # 47 - OL Reset Mode</b><br>This value allows the user to define how the overload can reset.   | Auto, Manual   | Manual      |
| <b>Parameter # 107 - Aux1 Config</b><br>Auxiliary 1 contact is located at terminals 19 and 20 and allows the user to configure the operation of the contact.            | Normal, Up-to-speed, Fault, Alarm, Network Control, External Bypass: (N.O./N.C.) | Normal      |
| <b>Parameter # 110 - Aux2 Config</b><br>Auxiliary 2 contact is located at terminals 29 and 30 and allows the user to configure the operation of the contact.            | Normal, Up-to-speed, Fault, Alarm, Network Control, External Bypass: (N.O./N.C.) | Fault       |
| <b>Parameter # 108 - Aux3 Config</b><br>Auxiliary 3 contact is located at terminals 31 and 32 and allows the user to configure the operation of the contact.            | Normal, Up-to-speed, Fault, Alarm, Network Control, External Bypass: (N.O./N.C.) | Alarm       |
| <b>Parameter # 109 - Aux4 Config</b><br>Auxiliary 4 contact is located at terminals 33 and 34 and allows the user to configure the operation of the contact.            | Normal, Up-to-speed, Fault, Alarm, Network Control, External Bypass: (N.O./N.C.) | Normal      |
| <b>Parameter # 115 - Parameter Mgmt</b><br>Allows the user the ability to recall all Factory default parameter values.  | Ready, Load Default  | Ready       |

## Step 4 - Operation and Troubleshooting

### Start Up Check List

1. Verify Input Supply voltage and wiring
2. Check output wiring
3. Check control wiring
4. Apply control power
5. Test local start/stop control

### Monitoring

The PF Softstarter has built in diagnostics and metering functions which can be accessed through a local or remote LCD display.

| Step | Action   |
|------|--|
| 1    | From any menu, Press Esc to get to the MAIN Device display.  |
| 2    | If using the built in display, Press Enter and continue to step #3.  |
| 3    | To View or Review the Metering Information<br>- Access the metering parameters by selecting PARAMETER / MONITORING / and then METERING.<br>Press enter to view any selected value. |

### Viewing and Clearing Faults

| Step | Action  |
|------|---|
| 1    | Press Esc to acknowledge the fault.   |
| 2    | To View or Review the fault information<br>- Go to MAIN MENU / DIAGNOSTICS / FAULTS / VIEW FAULT QUEUE.<br>- Or look at parameters 124... 128.  |
| 3    | Address the condition that caused the fault. The cause must be corrected before the fault can be cleared.   |
| 4    | After corrective action has been taken, clear the fault by one of these methods:<br>- Press and Hold the ESC key for 3 seconds.<br>- Cycle control power to the device.<br>- Program the PF Softstarter for a CLEAR FAULT, which can be found in MAIN MENU / DIAGNOSTICS / FAULTS.<br>- Option Input #2 (terminal 15) can be configured to clear faults with the use of N.O. push button. |

**Troubleshooting - Abbreviated Listing**

For a complete list of fault codes and troubleshooting tips, refer to the PF Softstarter User Manual.

| Display Fault                     | Fault Code               | Enabled       | Possible Causes  | Possible Solutions  |
|-----------------------------------|--------------------------|---------------|--|---|
| Line Fault with Phase Indication  | 1, 2, 3                  | prestart only | Missing supply phase<br>Motor not connected properly<br>Incoming 3-phase voltage instability   | Check for open line (i.e., blown fuse)<br>Check for open load lead<br>Verify power quality  |
| Shorted SCR with Phase indication | 4, 5, 6                  | all           | Shorted power module   | Check for shorted SCR, replace power module if necessary  |
| Open Gate with Phase Indication   | 7, 8, 9                  | start or stop | Open gate circuitry<br>Loose gate lead   | Perform resistance check; replace power module if necessary<br>Check gate lead connections to the control module  |
| PTC Power Pole and SCR Overtemp   | 10, 11                   |               | Controller ventilation blocked<br>Controller duty cycle exceeded<br>Fan failure<br>Ambient temperature limit exceeded<br>Failed thermistor | Check for proper ventilation<br>Check application duty cycle<br>Wait for motor to cool or provide external cooling<br>Replace power module or control module as needed<br>Replace fan           |
| Motor PTC                         | 12                       | running       | Motor ventilation blocked<br>Motor duty cycle exceeded<br>PTC open or shorted  | Check for proper ventilation<br>Check application duty cycle<br>Wait for motor to cool or provide external cooling<br>Check resistance of PTC   |
| Open Bypass with phase indication | 13, 14, 15               | running       | Control voltage is low<br>Inoperable power module bypass   | Check control voltage power supply<br>Replace power module<br>Check control module TB2...TB4 and TB5...TB7 for secureness<br>Check Aux 1, 2, 3, 4 configurations are not set to External Bypass |
| No Load Fault                     | 16, 17, 18, 40           | prestart only | Loss of load side power wiring<br>Start command cycled unexpectedly with motor rotating  | Check all load side power connections<br>Check motor windings   |
| Line Unbalance                    | 19                       | running       | Supply unbalance is greater than the user-programmed value<br>The delay time is too short for the application                              | Check power system and correct if necessary<br>Extend the delay time to match the application requirements  |
| Overvoltage                       | 20                       | running       | Supply voltage is greater than user programmed value<br>The delay time is too short for the application                                    | Check power system and correct if necessary<br>Correct the user-programmed value<br>Extend the delay time to match the application requirements   |
| Undervoltage                      | 21                       | running       | Supply voltage is less than user programmed value<br>The delay time is too short for the application                                       | Check power system and correct if necessary<br>Correct the user-programmed value<br>Extend the delay time to match the application requirements   |
| Overload                          | 22                       | running       | Motor overloaded<br>Overload parameters are not matched to the motor   | Check motor overload condition<br>Check values for overload class and motor FLC<br>Verify current draw of the motor   |
| Underload                         | 23                       | running       | Broken motor shaft, belts, toolbits, etc..<br>Pump cavitation<br>Incorrect user setting  | Check pump system, machine drive components, and loading<br>Check settings<br>Repair or replace motor   |
| Jam                               | 24                       | running       | Motor current has exceeded the user programmed jam level   | Correct source of jam or excessive loading<br>Check programmed time value   |
| Stall                             | 25                       | running       | Motor did not reach full speed by the end of the programmed ramp time<br>Incorrect user setting  | Correct source of stall or excessive loading<br>Adjust PF starting parameters to compensate for load  |
| Phase Reversal                    | 26                       | prestart only | Incoming supply voltage is not in the expected ABC sequence  | Check power wiring, correct if necessary  |
| Network and Comm's Loss           | 30, 31, 32<br>27, 28, 29 | all           | DPI network loss<br>Communication disconnection at the serial port   | Check communication adapters and verify connection to PF<br>Reconnect each DPI connected device   |
| Ground Fault                      | 33                       | running       | Ground fault current level has exceeded programmed value<br>The delay time is too short for the application                                | Check power system and motor; correct if necessary<br>Check programmed ground fault levels to match application requirements<br>Extend the delay time to match the application requirements     |
| Power Loss with phase indication  | 35, 36, 37               | start or stop | Missing supply phase (as indicated)<br>Internal CT problem   | Check for open line (i.e., blown line fuse)<br>Replace power pole as indicated  |
| Line Loss with phase indication   | 41, 42, 43               | start or stop | Incoming 3-phase voltage instability or distortion<br>High impedance connection  | Check supply voltage for capability to start/stop motor<br>Check for loose connections online side or motor side of power wires<br>Verify and correct input power quality                       |
| Internal 24V and System Faults    | 44, 45, 46,<br>128...209 | all           | Low line condition<br>Excessive load on  | Check the control power, verify it is within the specification<br>Check connections and grounding to the PF Softstarter control terminals<br>Replace control module                             |

**Renewal Parts**

| Description       |                           | PF Rating    | Catalog Number <sup>①</sup>   |                             |            |
|-------------------|---------------------------|--------------|-------------------------------|-----------------------------|------------|
|                   |                           |              | For units rated 200...600V AC |                             |            |
|                   |                           |              | 100...240V AC                 | 24V AC/DC                   |            |
| Control Modules   | Standard                  | All          | PFS                           | PFS-024                     |            |
|                   | Pump                      | All          | PFB                           | PFB-024                     |            |
|                   | Braking                   | 5...85 A     | PFD-0085                      | PFD-0085-024                |            |
|                   |                           | 108...251 A  | PFD-0251                      | PFD-0251-024                |            |
|                   |                           | 317...480 A  | PFD-0480                      | PFD-0480-024                |            |
|                   |                           | 625...780 A  | PFD-0780                      | N/A                         |            |
|                   | 970...1250 A              | PFD-1250     | N/A                           |                             |            |
| Description       |                           | PF Rating    | Series                        | Catalog Number <sup>①</sup> |            |
|                   |                           |              |                               | Line Voltage                |            |
|                   |                           |              |                               | 200...480V                  | 200...600V |
| Power Poles       | 5 A                       | B            | PFL-0005-480V <sup>②</sup>    | PFL-0005-600V <sup>②</sup>  |            |
|                   | 25 A                      | B            | PFL-0025-480V <sup>②</sup>    | PFL-0025-600V <sup>②</sup>  |            |
|                   | 43 A                      | B            | PFL-0043-480V <sup>②</sup>    | PFL-0043-600V <sup>②</sup>  |            |
|                   | 60 A                      | B            | PFL-0060-480V <sup>②</sup>    | PFL-0060-600V <sup>②</sup>  |            |
|                   | 85 A                      | B            | PFL-0085-480V <sup>②</sup>    | PFL-0085-600V <sup>②</sup>  |            |
|                   | 108 A                     | B            | PFL-0108-480V <sup>②</sup>    | PFL-0108-600V <sup>②</sup>  |            |
|                   | 135 A                     | B            | PFL-0135-480V <sup>②</sup>    | PFL-0135-600V <sup>②</sup>  |            |
|                   | 201 A                     | B            | PFL-0201-480V <sup>②</sup>    | PFL-0201-600V <sup>②</sup>  |            |
|                   | 251 A                     | B            | PFL-0251-480V <sup>②</sup>    | PFL-0251-600V <sup>②</sup>  |            |
|                   | 317 A                     | B            | PFL-0317-480V <sup>②</sup>    | PFL-0317-600V <sup>②</sup>  |            |
|                   | 361 A                     | B            | PFL-0361-480V <sup>②</sup>    | PFL-0361-600V <sup>②</sup>  |            |
|                   | 480 A                     | B            | PFL-0480-480V <sup>②</sup>    | PFL-0480-600V <sup>②</sup>  |            |
|                   | 625 A                     | B            | PFL-0625-480V <sup>②</sup>    | PFL-0625-600V <sup>②</sup>  |            |
|                   | 780 A                     | B            | PFL-0780-480V <sup>②</sup>    | PFL-0780-600V <sup>②</sup>  |            |
|                   | 970 A                     | B            | PFL-0970-480V <sup>②</sup>    | PFL-0970-600V <sup>②</sup>  |            |
|                   | 1250 A                    | B            | PFL-1250-480V <sup>②</sup>    | PFL-1250-600V <sup>②</sup>  |            |
| Heatsink Fans     | 5...85 A                  | B            | PFV-0085                      |                             |            |
|                   | 108...135 A               | B            | PFV-0085                      |                             |            |
|                   | 201...251 A               | B            | PFV-0251                      |                             |            |
|                   | 317...480 A               | B            | PFV-0480                      |                             |            |
|                   | 625...1250 A              | B            | PFV-1250-120                  |                             |            |
|                   | 625...1250 A              | B            | PFV-1250-230                  |                             |            |
| Base Plate        | 201...251 A               | B            | PFM-0251                      |                             |            |
|                   | 317...480 A               | B            | PFM-0480                      |                             |            |
| By-Pass Contactor | 110/120V AC Control Power | 625...780 A  | B                             | 100-D180ED11 <sup>③</sup>   |            |
|                   |                           | 970...1250 A | B                             | 100-D420ED110 <sup>③</sup>  |            |
|                   | 230/240V AC Control Power | 625...780 A  | B                             | 100-D180EA11 <sup>③</sup>   |            |
|                   |                           | 970...1250 A | B                             | 100-D420EA110 <sup>③</sup>  |            |

① One piece provided per part number.  
 ② Three-phase power pole structure provided per part no.  
 ③ See Appendix D for special installation instructions.

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