

MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

Reference package for procurement and maintenance review

ALLEN-BRADLEY

41391-454-01-S1FX

STANDARD SOFT-STARTER CONTROL MODULE

Used with the applicable SMC Flex configuration.

REFERENCE PACKAGE

OFFICIAL DOCUMENT

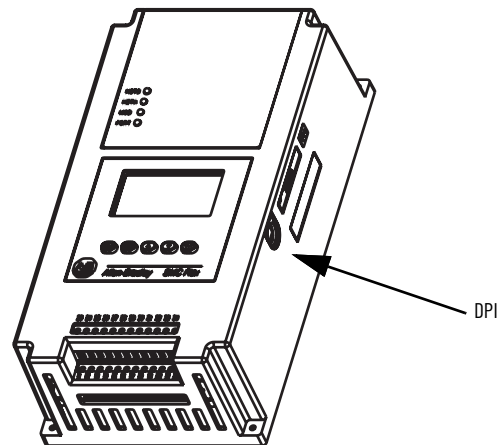
Selected official manufacturer pages follow this cover.

Source: Allen-Bradley SMC Flex applicable manufacturer documentation

Communication

A serial interface port (DPI) is provided as standard, which lets you connect the SMC Flex controller connection to the Bulletin 20-HIM LCD interface modules.

Figure 22 - DPI Location

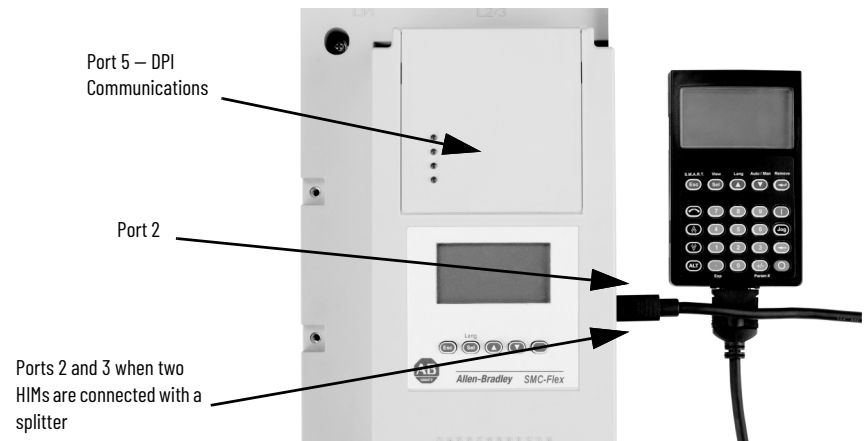


You can connect two peripheral devices to the DPI. The maximum output current through the DPI is 280 mA.

Programming

Setup is easy with the built-in keypad and three-line, 16 character backlit LCD. Parameters are organized in a three-level menu structure that uses a text format for straightforward programming.

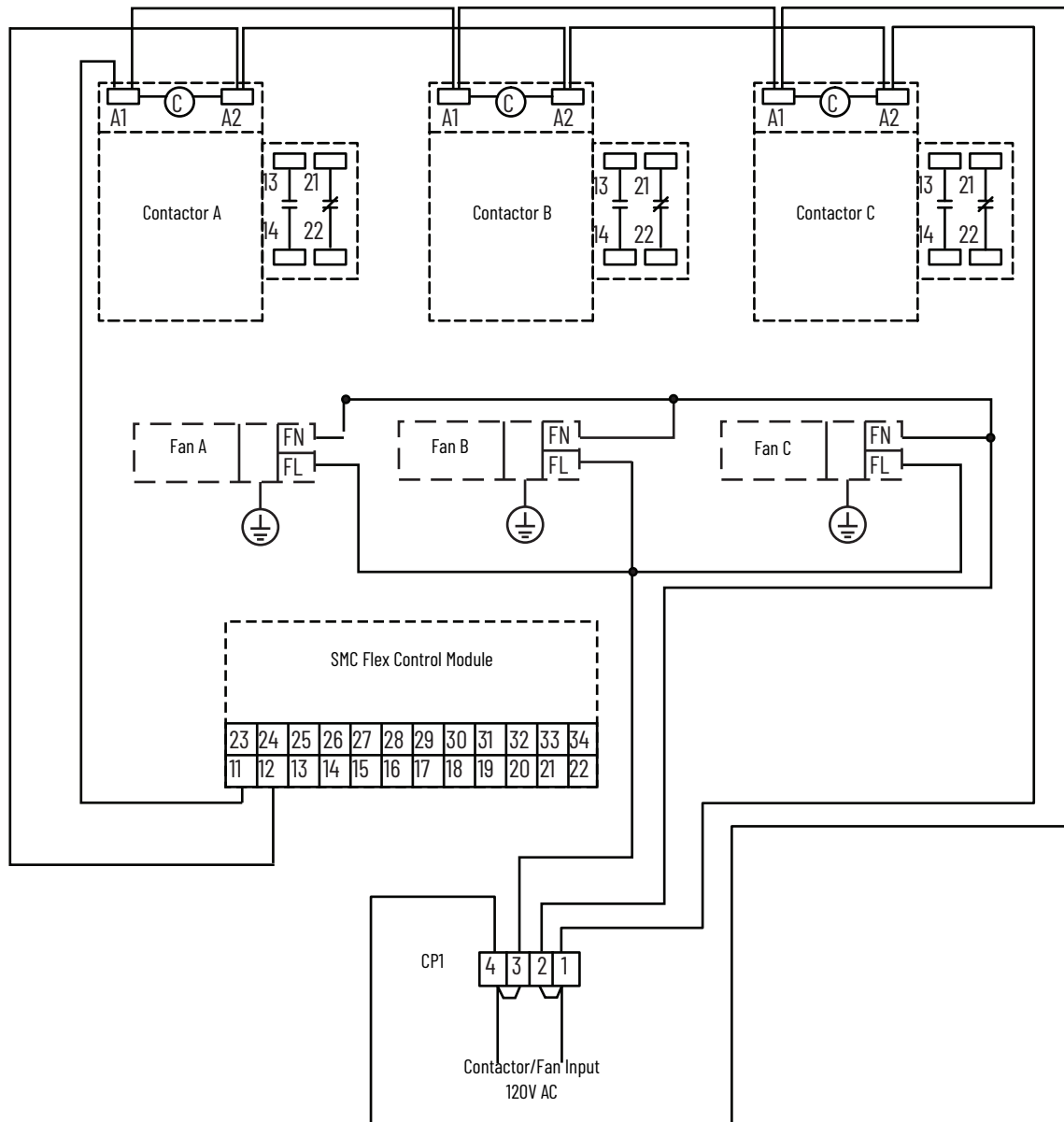
Figure 23 - Built-in Keypad and LCD



Status Indication

- Four programmable hard contact outputs are provided as standard. All auxiliary contacts are programmable for the following states:
- Normal (selectable N.O./N.C.)
- Up-to-Speed (selectable N.O./N.C.)
- Alarm (selectable N.O./N.C.)
- Fault (selectable N.O./N.C.)
- Network Control (selectable N.O./N.C.)
- External Bypass (N.O. only)

Figure 38 - Internal Wiring and 120V Control Connection Diagram—625...1250 A Devices



Control Wire Specifications

[Table 10](#) lists the control terminal wire capacity, the tightening torque requirements, and the wire strip length. Each control terminal can accept a maximum of two wires.

Table 10 - Control Wiring and Tightening Torque

Wire Size	Torque	Wire Strip Length
0.75...2.5 mm ² (#18...14 AWG)	0.6 N•m (5 lb.-in.)	5.6...8.6 mm (0.22...0.34 in.)

Fan Power

Controllers that are rated 5...1250 A have heatsink fan(s). See [Table 11](#) for the heatsink fan control power VA requirements.

Fan Terminations

See [Figure 31](#), [Figure 32](#), and [Figure 33](#) for fan power connection locations.



ATTENTION: The fan jumpers have been factory installed for 110/120V AC input. See [Figure 39](#) for 220/240V AC fan wiring (5...480 A devices only).

Figure 39 - Power Terminations

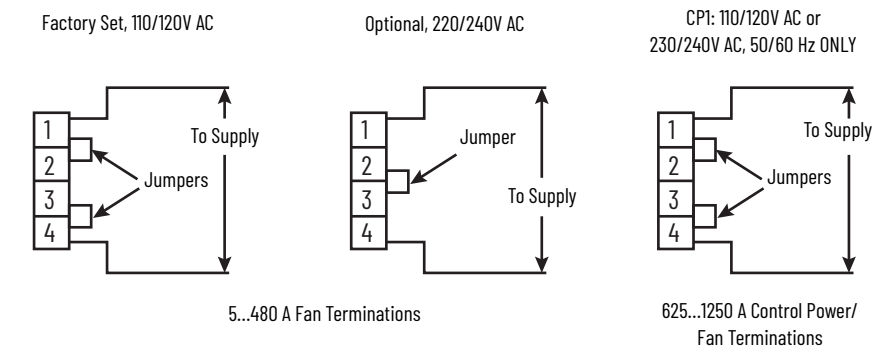
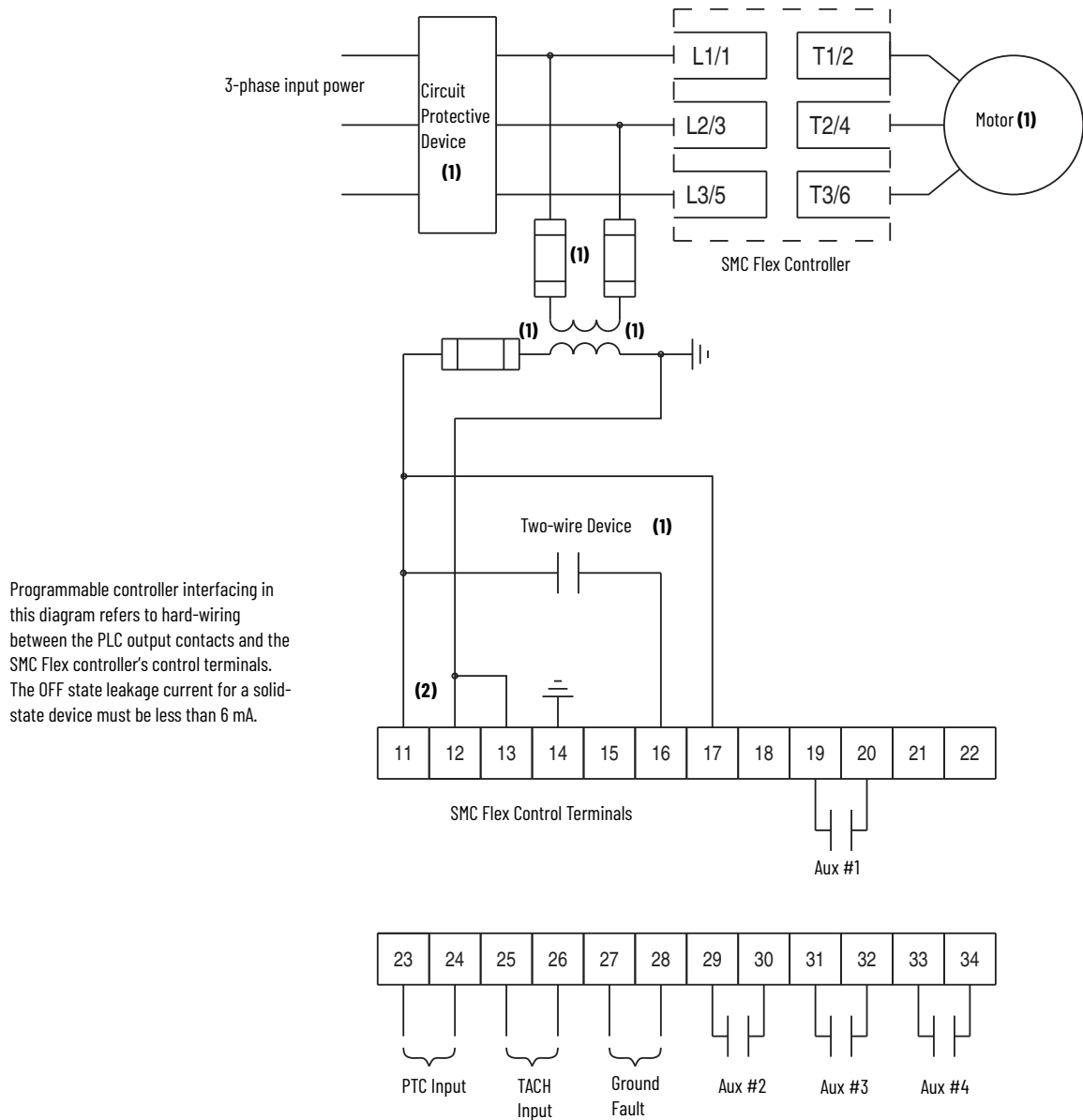


Table 11 - Heatsink Fan Control Power

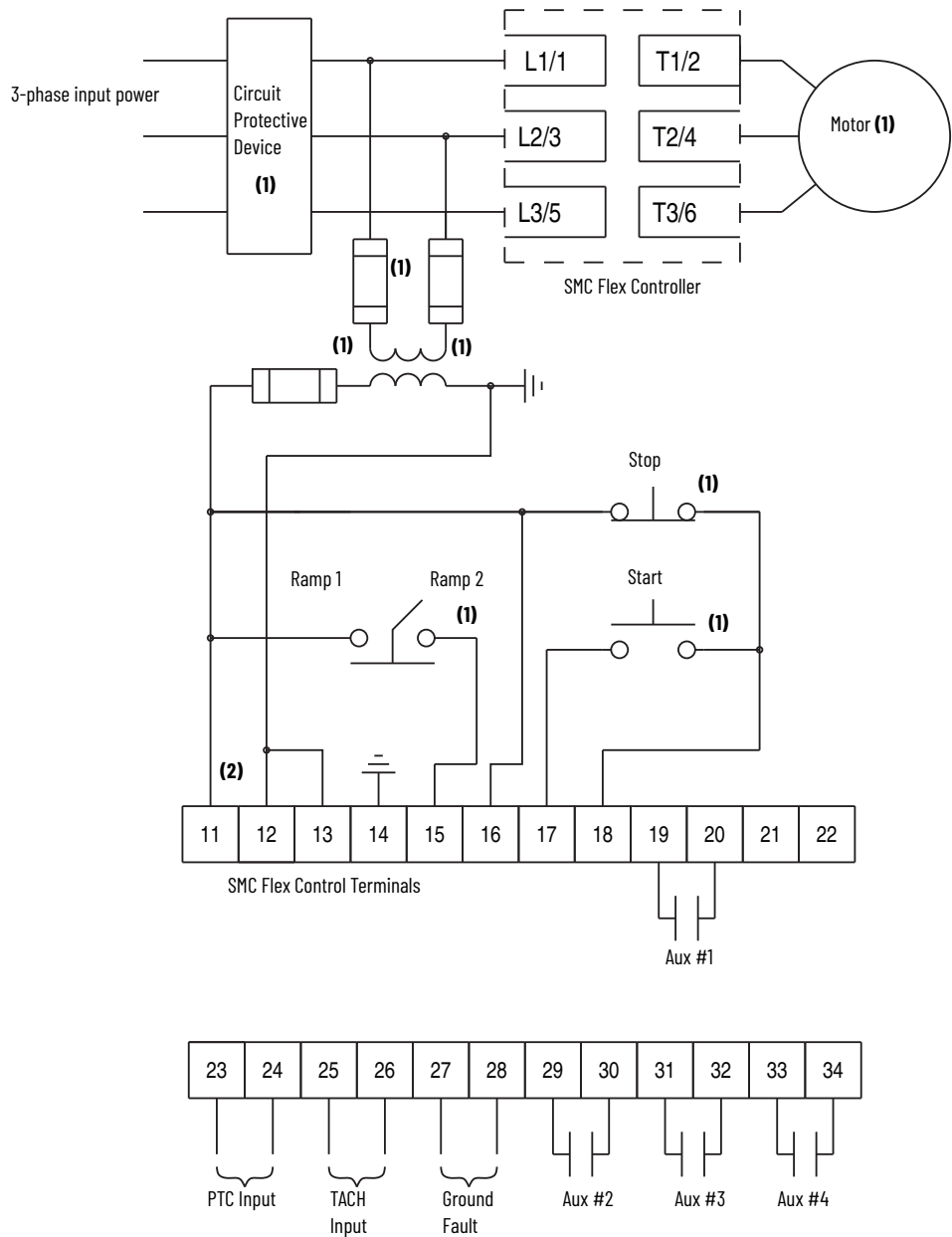
Controller Rating	Heatsink Fan VA
5...135 A	20
201...251 A	40
317...480 A	60
625...780 A	150 (internally wired)
970...1250 A	150 (internally wired)

Figure 42 - Typical Wiring Diagram for Two-wire Control with Stopping Control (No DPI Control)



Note Number	Information
1	Customer supplied
2	See the controller nameplate to verify the rating of the control power input voltage. For units rated 625...1250 A, terminals 11 and 12 are factory pre-wired from terminal block CP1 - terminals 1 and 4.

Figure 43 - Typical Wiring Diagram for Dual Ramp Applications

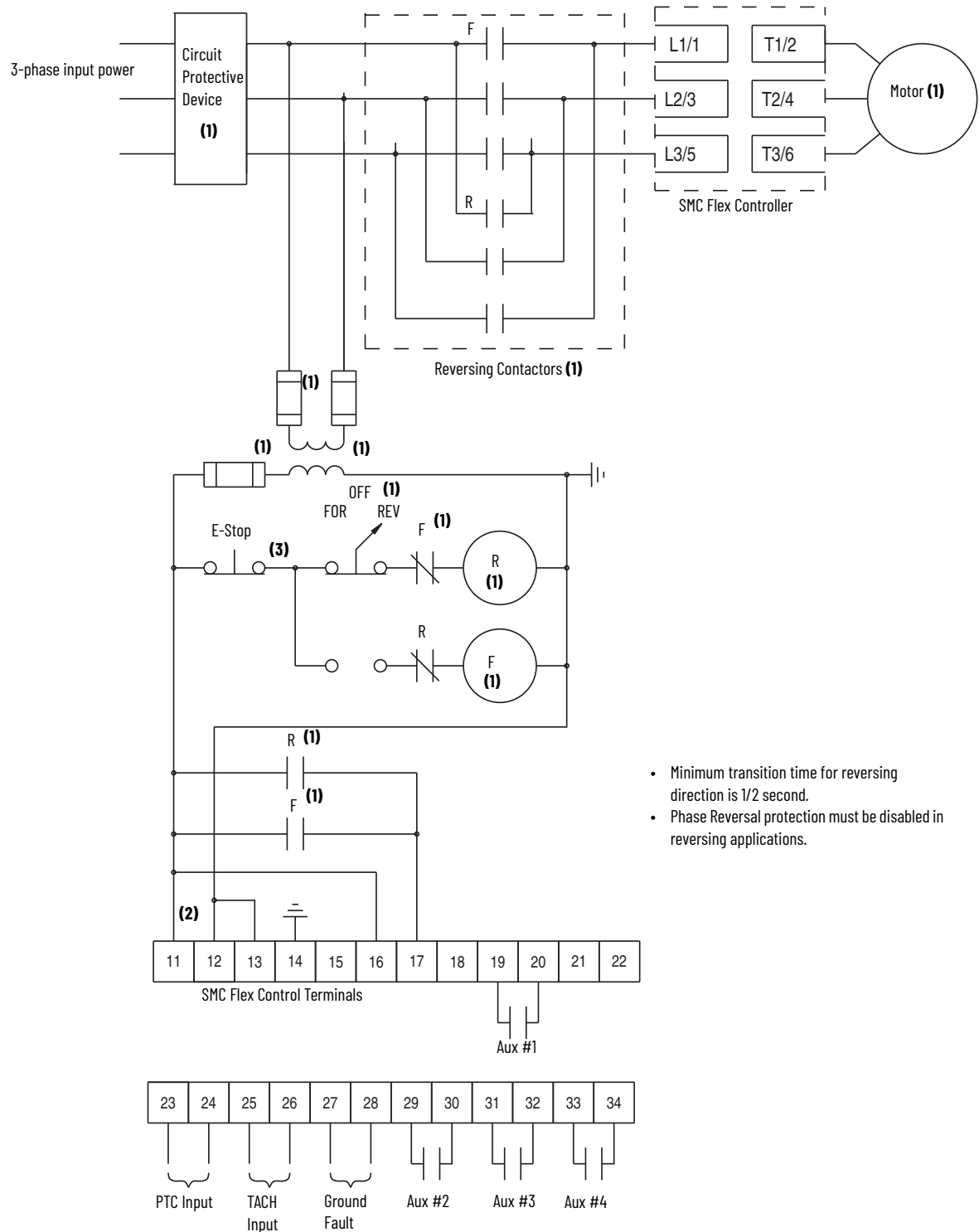


Note Number	Information
1	Customer supplied
2	See the controller nameplate to verify the rating of the control power input voltage. For units rated 625...1250 A, terminals 11 and 12 are factory pre-wired from terminal block CP1 - terminals 1 and 4.

Use [Figure 44](#) when start-stop originates from either a Bulletin 20-HIM LCD interface module or a Bulletin 20-COMM communication module that is connected to the SMC Flex controller.

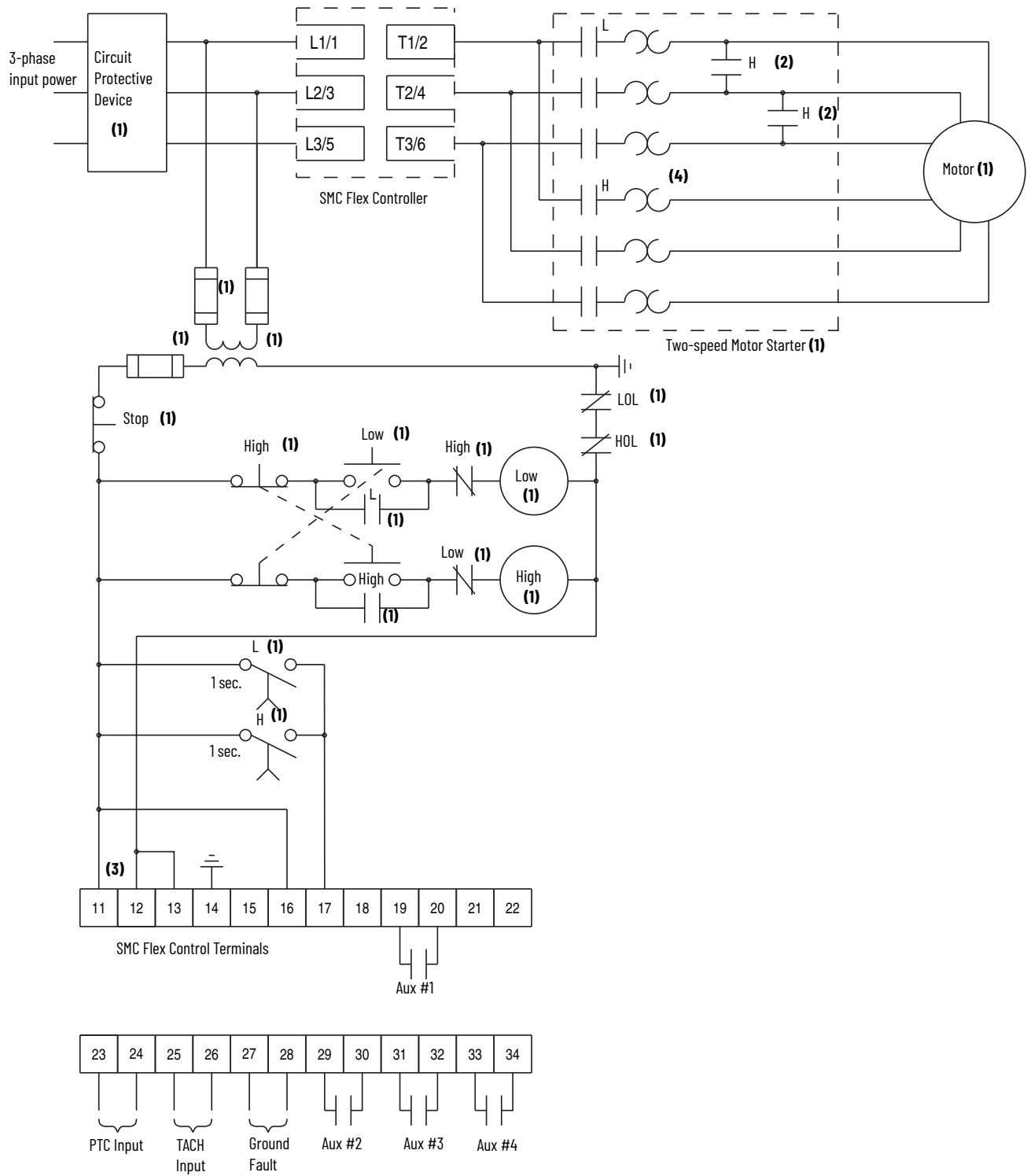
Logic mask must be properly configured. See [page 93](#).

Figure 48 - Typical Wiring Diagram for Single-Speed Reversing Applications



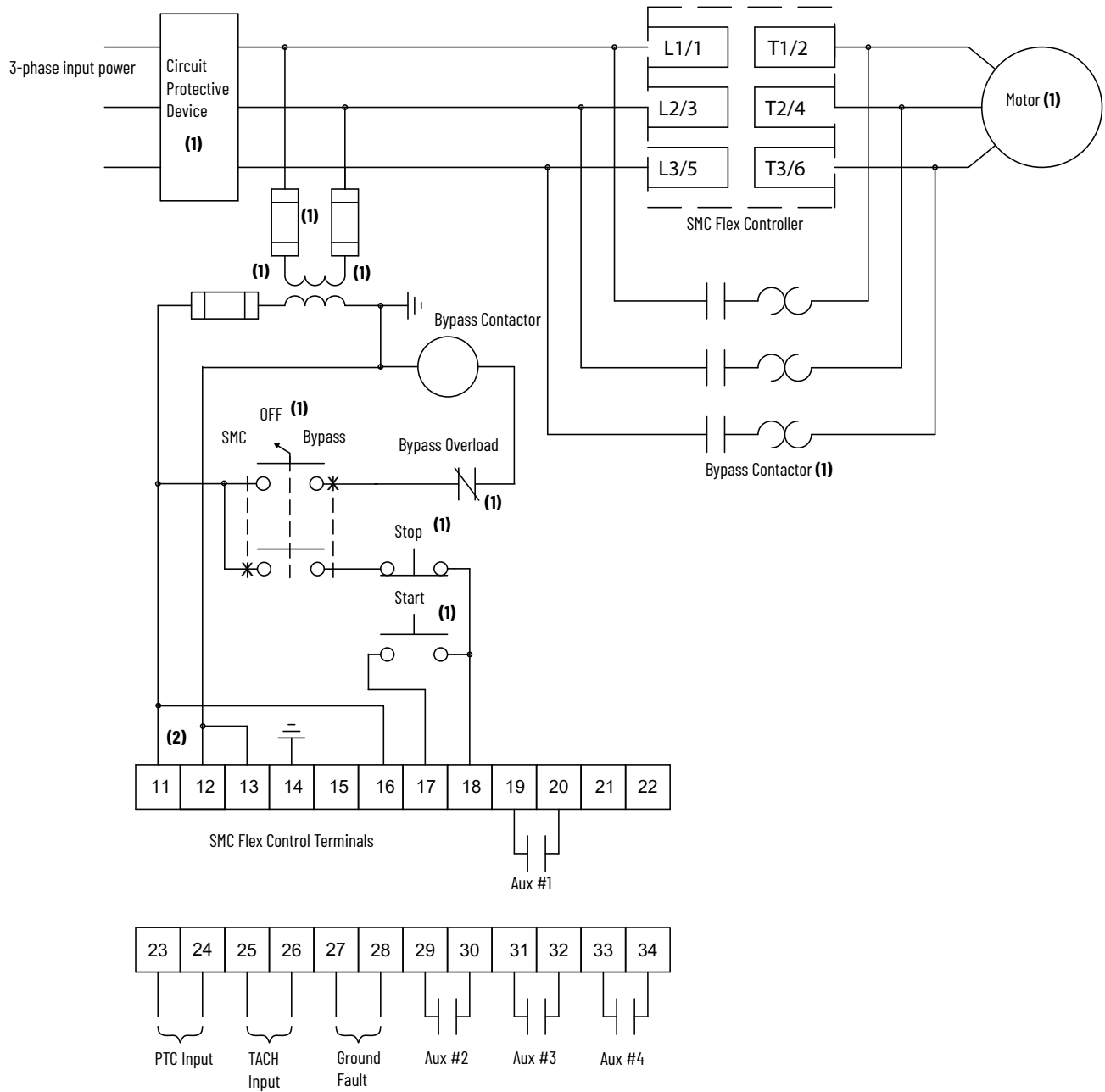
Note Number	Information
1	Customer supplied
2	See the controller nameplate to verify the rating of the control power input voltage. For units rated 625...1250 A, terminals T1 and T2 are factory pre-wired from terminal block CP1 - terminals 1 and 4.
3	Maintained push button.

Figure 49 - Typical Wiring Diagram for Two-speed Applications



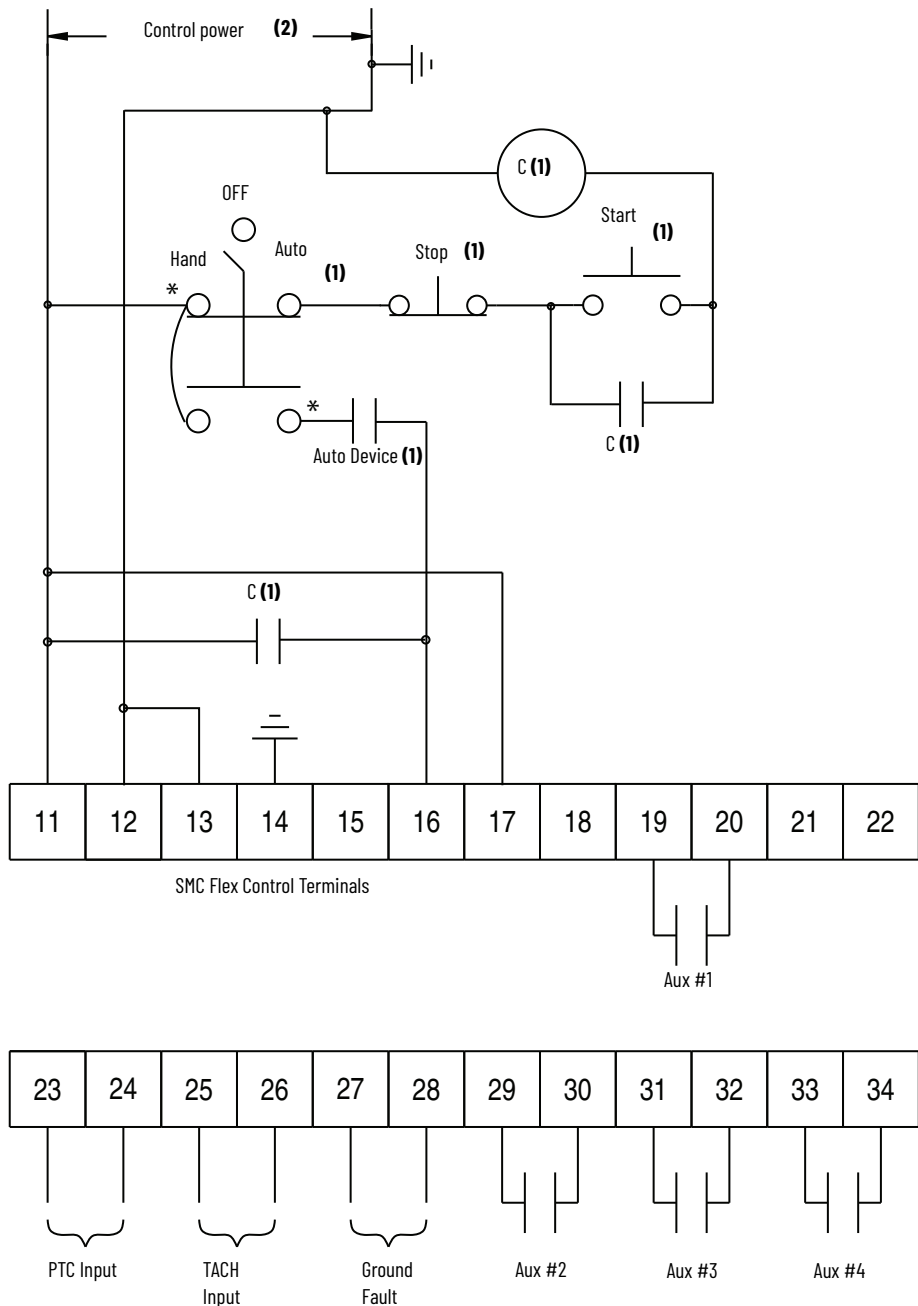
Note Number	Information
1	Customer supplied
2	Two-speed, consequent pole installations.
3	See the controller nameplate to verify the rating of the control power input voltage. For units rated 625...1250 A, terminals 11 and 12 are factory pre-wired from terminal block CP1 - terminals 1 and 4.
4	Overload must be disabled in SMC Flex controller.

Figure 50 - Typical Wiring Diagram for SMC-Off-Bypass Control



Note Number	Information
1	Customer supplied
2	See the controller nameplate to verify the rating of the control power input voltage. For units rated 625...1250 A, terminals 11 and 12 are factory pre-wired from terminal block CP1 - terminals 1 and 4.

Figure 51 - Typical Wiring Diagram for Hand-Off-Auto Control with Stop Option and Start/Stop Push Buttons



Note Number	Information
1	Customer supplied
2	See the controller nameplate to verify the rating of the control power input voltage. For units rated 625...1250 A, terminals 11 and 12 are factory pre-wired from terminal block CP1 - terminals 1 and 4.

Programming

This chapter provides a basic understanding of the built-in programming keypad. This chapter also describes how to program the SMC Flex™ controller by modifying the parameters.

Keypad Description

[Table 14](#) describes the keys that are on the front of the SMC Flex controller.

Table 14 - SMC Flex Controller Keypad

Menu Button	Name	Function
	Escape	Exit a menu, cancel a change to a parameter value, or acknowledge a fault/alarm. Will clear a fault if held for 3 seconds. (Firmware version 6.001 or higher required)
	Select	Select a digit, select a bit, or enter edit mode in a parameter screen. Will get to menu to change the language being displayed.
	Up/Down Arrows	Scroll through options increase/decrease a value, or toggle a bit.
	Enter	Enter a menu, enter edit mode in a parameter screen, or save a change to a parameter value.

For ease of programming values, after using the Enter key to edit, use the Sel key to jump to the digit that needs to be modified, then use the arrow keys to scroll through the digits.

Programming Menu

Parameters are organized in a three-level menu structure for straightforward programming. [Figure 73](#) details the programming menu structure and the three-level hierarchy.

In order to change parameters, the controller must be in the STOP mode, and the control voltage must be present.

Parameter definitions are listed in Excel® spreadsheets in KnowledgeBase. [Table 15](#) summarizes the information that is in the spreadsheet.



This manual links to SMC Flex Soft Starter Parameters, publication [150-RD001](#); download the spreadsheet now for offline access.

Table 15 - SMC Flex Parameter Categories

Parameter Group	Description
Full Parameter List	Full list of all SMC Flex Controller Parameters
Logic Mask Requirements	Lists the Logic Mask Codes and Binary equivalents
Parameter Special Behavior	Describes codes that can appear under specific conditions and parameter configurations

Parameter Modification

All parameters are modified using the same method. [Table 19](#) lists the basic steps for modifying parameters.

Parameter values modified while the motor is operating are not valid until the next time that operation occurs. If the password is set, you cannot adjust parameters without logging in. Use the Sel key to highlight a single digit.

Table 19 - Modify Parameters

Description	Action	Display ⁽¹⁾						
—	—	<table><tr><td>0.0</td><td>Amps</td></tr><tr><td>0</td><td>Volt</td></tr><tr><td>0</td><td>%MTU</td></tr></table>	0.0	Amps	0	Volt	0	%MTU
0.0	Amps							
0	Volt							
0	%MTU							
1. Press the ESC key to go from the status display to the Main menu.		—						
2. Scroll with the Up/Down keys until the Parameter option is highlighted.		<table><tr><td>Main Menu</td></tr><tr><td>Parameter</td></tr><tr><td>Memory Storage</td></tr></table>	Main Menu	Parameter	Memory Storage			
Main Menu								
Parameter								
Memory Storage								
3. Press the Enter key to access the Parameter menu.		<table><tr><td>F G P :</td><td>File</td></tr><tr><td>Monitoring</td></tr><tr><td>Set Up</td></tr></table>	F G P :	File	Monitoring	Set Up		
F G P :	File							
Monitoring								
Set Up								
4. Scroll with the Up/Down keys until the option you want to use (Monitoring, Motor Protection, etc.) is highlighted. For this example, Set Up will be used.		<table><tr><td>F G P :</td><td>File</td></tr><tr><td>Set Up</td></tr><tr><td>Motor Protection</td></tr></table>	F G P :	File	Set Up	Motor Protection		
F G P :	File							
Set Up								
Motor Protection								
5. Press Enter to select the Set Up group.		—						
6. Scroll to Basic Set Up and press Enter. ⁽²⁾		<table><tr><td>F G P :</td><td>Group</td></tr><tr><td>Basic Set Up</td></tr></table>	F G P :	Group	Basic Set Up			
F G P :	Group							
Basic Set Up								
7. Scroll to the Starting Mode parameter by using the Up/Down keys, and press Enter.		<table><tr><td>F G P :</td><td>Parameter</td></tr><tr><td>Starting Mode</td></tr><tr><td>Ramp Time</td></tr></table>	F G P :	Parameter	Starting Mode	Ramp Time		
F G P :	Parameter							
Starting Mode								
Ramp Time								
8. Press Enter to select the option. Scroll to the option of your choice by using the Up/Down keys. For this example, we will choose Current Limit.		<table><tr><td>F G P :</td><td>P# 17</td></tr><tr><td>Starting Mode</td></tr><tr><td>Current Lim</td></tr></table>	F G P :	P# 17	Starting Mode	Current Lim		
F G P :	P# 17							
Starting Mode								
Current Lim								
9. Press the Enter key to accept the new setting.		—						
10. Scroll to the next parameter by using the Down key. Continue the process until all desired settings are entered.		<table><tr><td>F G P :</td><td>P# 18</td></tr><tr><td>Ramp Time</td></tr><tr><td>10</td><td>Secs</td></tr></table>	F G P :	P# 18	Ramp Time	10	Secs	
F G P :	P# 18							
Ramp Time								
10	Secs							

(1) The display indicates that the second line is now active by highlighting the first character. If the LCD display does not provide a highlighted cursor, then the controller is in the Display mode.

(2) The SMC Option advises you if any control option (such as Pump Control) is resident. This parameter is factory set and you cannot modify it.

Soft Start

Use the parameters that are listed in [Table 20](#) to adjust the voltage ramp supplied to the motor.

Table 20 - Soft Start (Voltage Ramp) Parameters

Parameter No.	Parameter Name	Description	Value
17	Starting Mode	This must be programmed for Soft Start.	Soft Start
18	Ramp Time ⁽¹⁾	This programs the time period that the controller will ramp the output voltage up to full voltage from the Initial Torque level programmed.	0...30 s
19	Initial Torque	The initial reduced output voltage level for the voltage ramp to the motor is established and adjusted with this parameter.	0...90% locked rotor torque
22	Kickstart Time	A boost of current is provided to the motor for the programmed time period.	0.0...2.0 s
23	Kickstart Level	Adjusts the amount of current applied to the motor during the kickstart time.	0...90% locked rotor torque

(1) If the controller senses that the motor has reached full speed before it completes the Soft Start, it automatically switches to providing full voltage to the motor.

Configuring DataLink

DataLink™ is supported in the SMC Flex controller. DataLink is a mechanism that most drives use to transfer data to and from the controller without using an explicit message. The SMC Flex controller supports a 16-bit DataLink, allowing you to configure the device to return up to four additional pieces of information without the need for an explicit message.

Criteria for Using DataLink

- Each set of DataLink parameters in an SMC Flex controller can be used by only one adapter. If more than one adapter is connected, multiple adapters must not try to use the same DataLink.
- Parameter settings in the SMC Flex controller determine the data passed through the DataLink mechanism.
- When DataLink is used to change a value in the SMC Flex controller, the value is not written to the Non-Volatile Storage (NVS). However, if the SMC Flex controller is powered down, the current value is written to NVS.

To configure DataLink, you must use Parameters 88...103 of the SMC Flex controller. For additional information about DataLink, see the communication interface's user manual.

IMPORTANT	Node addressing of the DPI communication card can be programmed via software or a hand-held DPI HIM. You cannot use the on-board HIM to address the communication card.
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Updating Firmware

Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes from the Product Compatibility and Download Center at rok.auto/pcdc.

Renewal Parts Cross Reference

This appendix provides a cross reference from the originally ordered Cat. No., the label on the internal control module, and the orderable Cat. No. of the replacement part.

Table 53 - Control Modules

Controller Type	Controller Rating	Line Voltage	Control Input Voltage	Orderable Renewal Part No.	Control Module Cat. No. on the Label ⁽¹⁾
Standard	All	200...600V	100...240V	41391-454-01-S1FX	150-FS1FX
			24V AC/DC	41391-454-02-S2FX	150-FS2FX
		690V	110/120V	41391-454-05-S1FZ	150-FS1FZ
			230/240V		
Pump	All	200...600V	100...240V	41391-454-01-B1FX	150-FB1FX
			24V AC/DC	41391-454-02-B2FX	150-FB2FX
		690V	110/120V	41391-454-05-B1FZ	150-FB1FZ
			230/240V		
Braking	5...85 A	200...600V	100...240V	41391-454-01-D1AX	150-FD1AX
			24V AC/DC	41391-454-02-D2AX	150-FD2AX
	108...251 A	200...600V	100...240V	41391-454-01-D1BX	150-FD1BX
			24V AC/DC	41391-454-02-D2BX	150-FD2BX
		690V	110/120V	41391-454-05-D1BZ	150-FD1BZ
			230/240V		
	317...480 A	200...600V	100...240V	41391-454-01-D1CX	150-FD1CX
			24V AC/DC	41391-454-02-D2CX	150-FD2CX
		690V	110/120V	41391-454-05-D1CZ	150-FD1CZ
			230/240V		
	625...780 A	200...600V	110/120V	41391-454-01-D1DX	150-FD1DX
			230/240V		
		690V	110/120V	41391-454-05-D1DZ	150-FD1DZ
			230/240V		
	970...1250 A	200...600V	110/120V	41391-454-01-D1EX	150-FD1EX
			230/240V		
		690V	110/120V	41391-454-05-D1EZ	150-FD1EZ
			230/240V		

(1) These are not orderable catalog numbers. They appear on the product label of the orderable part. If you need to order a control module see [Appendix A](#).