



**Bulletin 150 — SMC Flex Smart Motor Controller**

The SMC Flex controller provides microprocessor controlled starting for standard 3-phase squirrel-cage induction or Wye-Delta (6-lead) motors. Seven standard modes of operation are available within a single controller.

- 1...1250 A Range
- Seven Standard Start Modes
- Options Include Pump Control and Braking Control

**Features**

- Built in SCR Bypass/Run Contactor
- Built in Electronic Motor Overload Protection
- CT on each Phase
- Metering
- DPI Communication
- LCD Display
- Keypad Programming
- Four Programmable Auxiliary Contacts

The SMC Flex controller is available for motors rated 1...1250 A; 200...480V AC, 200...600V AC, or 230...690V AC, 50/60 Hz. In addition to motors, the SMC Flex controller can be used to control resistive loads.

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**Standards Compliance/Approvals**

- UL 508
- EN/IEC 60947-4-2
- cULus Listed (open type) File No. E96956
- CE Marked (open type) per EMC Directive and Low Voltage Directive
- CCC (108...480 A)

**Modes of Operation**

The SMC Flex controller provides the following modes of operation as Standard:

**Soft Start**

This method covers the most general applications. The motor is given an initial torque setting, which is user adjustable. From the initial torque level, the output voltage to the motor is steplessly increased during the acceleration ramp time, which is user adjustable.

**Selectable Kickstart**

The kickstart feature provides a boost at startup to break away loads that may require a pulse of high torque to get started. It is intended to provide a current pulse, for a selected period of time.

**Current Limit Start**

This method provides current limit start and is used when it is necessary to limit the maximum starting current. The starting current is user adjustable. The current limit stating time is user adjustable.

**Dual Ramp Start**

This starting method is useful on applications with varying loads, starting torque, and start time requirements. Dual Ramp Start offers the user the ability to select between two separate start profiles with separately adjustable ramp times and initial torque settings.

**Full Voltage Start**

This method is used in applications requiring across-the-line starting. The SMC controller performs like a solid-state contactor. Full inrush current and locked-rotor torque are realized. The SMC may be programmed to provide full voltage start in which the output voltage to the motor reaches full voltage in 1/4 second.

**Linear Speed Acceleration**

With this type of acceleration mode, a closed-loop feedback system maintains the motor acceleration at a constant rate. The required feedback signal is provided by a DC tachometer coupled to the motor (tachometer supplied by user 0...5V DC, 4.5V DC = 100% speed). Kickstart is available with this mode.

**Preset Slow Speed**

This method can be used on applications that require a slow speed for positioning material. The Preset Slow Speed can be set for either Low, 7% of base speed, or High, 15% of base speed. Reversing is also possible through programming. Speeds provided during reverse operation are Low, 10% of base speed, or High, 20% of base speed.

**Soft Stop\***

The Soft Stop option can be used in applications requiring an extended stop time. The voltage ramp down time is use adjustable from 0 to 120 seconds. The load will stop when the voltage drops to a point where the load torque is greater than the motor torque.

## Optional Modes of Operation

### Pump Control - Start and Stop\*

This option is used to reduce surges during the starting and stopping of a centrifugal pump by smoothly accelerating and decelerating the motor. The microprocessor analyzes the motor variables and generates commands which control the motor and reduce the possibility of surges occurring in the system. The pump control module also provides a built-in anti-backspin timer.

## Braking Control

### SMB Smart Motor Braking\*

This option provides motor braking for applications that require the motor to stop faster than a coast to rest. Braking control, with automatic zero speed shut off, is fully integrated into the compact design of the SMC controller. This design facilitates a clean, straight forward installation and eliminates the requirement for additional hardware such as braking contactors, resistors, timers, and speed sensors. The microprocessor based braking system applies braking current to a standard squirrel-cage induction motor. The strength of the braking current is programmable from 150...400% of full-load current.

### Slow Speed with Braking\*

Slow Speed with Braking is used on applications that require slow speed (in the forward direction) for positioning or alignment and also require braking control to stop. Slow speed adjustments are 7% (low) or 15% (high) of rated speed. Slow speed acceleration current is adjustable from 0...450%. Slow speed running current is adjustable from 0...450% of full-load current. Braking current is adjustable from 0...400%.

### Accu-Stop\*

This option is used in applications requiring controlled position stopping. During stopping, braking torque is applied to the motor until it reaches preset slow speed (7% or 15% of rated speed) and holds the motor at this speed until a stop command is given. Braking torque is then applied until the motor reaches zero speed. Braking current is programmable from 0...400% of full-load current. Slow Speed Current is programmable from 0...450% of full-load current. Slow speed can be programmed for either 7% (low) or 15% (high).

\* Not intended to be used as an emergency stop. Refer to the applicable standards for emergency stop requirements.

## Description of Features

### Electronic Motor Overload Protection

The SMC Flex controller incorporates, as standard, electronic motor overload protection. This overload protection is accomplished electronically with an  $I^2t$  algorithm.

When coordinated with the proper short circuit protection, overload protection is intended to protect the motor, motor controller, and power wiring against overheating caused by excessive overcurrent. The SMC Flex controller meets applicable requirements as a motor overload protective device.

The controller's overload protection is programmable, providing the user with flexibility. The overload trip class consists of either OFF, 10, 15, 20 or 30 protection. The trip current is programmed by entering the motor full-load current rating, service factor, and selecting the trip class.

Thermal memory is included to accurately model motor operating temperature. Ambient temperature insensitivity is inherent in the electronic design of the overload.

### Stall Protection and Jam Detection

Motors can experience locked-rotor currents and develop high torque levels in the event of a stall or a jam. These conditions can result in winding insulation breakdown or mechanical damage to the connected load. The SMC Flex controller provides both stall protection and jam detection for enhanced motor and system protection. Stall protection allows the user to program a maximum stall protection delay time from 0...10 seconds. The stall protection delay time is in addition to the programmed start time and begins only after the start time has timed out. If the controller senses that the motor is stalled, it will shut down after the delay period has expired. Jam detection allows the user to determine the motor jam detection level as a percentage of the motor's full-load current rating. To prevent nuisance tripping, a jam detection delay time, from 0.0...99.0 seconds, can be programmed. This allows the user to select the time delay required before the SMC Flex controller will trip on a motor jam condition. The motor current must remain above the jam detection level during the delay time. Jam detection is active only after the motor has reached full speed.

### Underload Protection

Utilizing the underload protection of the SMC Flex controller, motor operation can be halted if a drop in current is sensed.

The SMC Flex controller provides an adjustable underload trip setting from 0...99% of the programmed motor full-load current rating with an adjustable trip delay time of 0...99 seconds.

### Undervoltage Protection

The SMC Flex controller's undervoltage protection will halt motor operation if a drop in the incoming line voltage is detected. The undervoltage trip level is adjustable as a percentage of the programmed line voltage, from 0...99%. To eliminate nuisance trips, a programmable undervoltage trip delay time of 0...99 seconds can also be programmed. The line voltage must remain below the undervoltage trip level during the programmed delay time.

### Overvoltage Protection

If a rise in the incoming line voltage is detected, the SMC Flex controller's overvoltage protection will halt motor operation. The overvoltage trip level is adjustable as a percentage of the programmed line voltage, from 0...199%. To eliminate nuisance trips, a programmable overvoltage trip delay time of 0...99 seconds can also be programmed. The line voltage must remain above the overvoltage trip level during the programmed delay time.

### Voltage Unbalance Protection

Voltage unbalance is detected by monitoring the 3-phase supply voltage magnitudes in conjunction with the rotational relationship of the three phases. The controller will halt motor operation when the calculated voltage unbalance reaches the user-programmed trip level.

The voltage unbalance trip level is programmable from 0...25% unbalance.

### Excessive Starts Per Hour

The SMC Flex controller allows the user to program the allowed number of starts per hour (up to 99). This helps eliminate motor stress caused by repeated starting during a short time period.

### Metering

Power monitoring parameters include:

- 3-phase current
- 3-phase voltage
- Power in kW or mW
- Power usage in KWH or mWH
- Power Factor
- Motor thermal capacity usage
- Elapsed time

**Note:** The motor thermal capacity usage allows the user to monitor the amount of overload thermal capacity usage before the SMC Flex controller's built-in electronic overload trips.

### Built-in DPI Communication Capabilities

A serial interface port is provided as standard, which allows connection to a Bulletin 20 Human Interface Module and a variety of Bulletin 20-COMM Communication Modules. This includes Allen-Bradley Remote I/O, DeviceNet, ControlNet, Ethernet, ProfiBUS, Interbus, and RS485-DF1.

### LCD Display

The SMC Flex controller's three-line 16-character backlit LCD display provides parameter identification using clear, informative text. Controller set up can be performed quickly and easily without the use of a reference manual. Parameters are arranged in an organized four-level menu structure for ease of programming and fast access to parameters.

### Keypad Programming

Programming of parameters is accomplished through a five-button keypad on the front of the SMC Flex controller. The five buttons include up and down arrows, an Enter button, a Select button, and an Escape button. The user needs only to enter the correct sequence of keystrokes for programming the SMC Flex controller.

### Auxiliary Contacts

Four fully programmable hard contacts are furnished as standard with the SMC Flex controller:

Aux #1, Aux #2, Aux #3, Aux #4

- N.O./N.C.
- Normal/Up-to-Speed/External Bypass/Fault/Alarm/Network

### Network I/O

The SMC Flex can have up to two (2) inputs and four (4) outputs controlled via a communication network. The output contacts use the auxiliary contacts.

### Ground Fault Input

The SMC Flex can monitor for ground fault conditions. An external core balance current transformer is required for this function. See SMC Flex User Manual for additional information.

### Tach Input

A motor tachometer is required for the Linear Speed Start mode. Please see the Specifications section page 36 for tachometer characteristics.

### PTC Input

A motor PTC input can be monitored by the SMC Flex. In the event of a fault, the SMC Flex will shut down and indicate a motor PTC fault.

Open and Non-Combination

**150 – F135 F B D B – 8L**  
*a b c d e f g*

*a*

Bulletin Number	
Code	Description
150	Solid-State Controller

*b*

Controller Ratings	
Code	Description
F5	5 A, 3 Hp @ 460V AC
F25	25 A, 15 Hp @ 460V AC
F43	43 A, 30 Hp @ 460V AC
F60	60 A, 40 Hp @ 460V AC
F85	85 A, 60 Hp @ 460V AC
F108	108 A, 75 Hp @ 460V AC
F135	135 A, 100 Hp @ 460V AC
F201	201 A, 150 Hp @ 460V AC
F251	251 A, 200 Hp @ 460V AC
F317	317 A, 250 Hp @ 460V AC
F361	361 A, 300 Hp @ 460V AC
F480	480 A, 400 Hp @ 460V AC
F625	625 A, 500 Hp @ 460V AC
F780	780 A, 600 Hp @ 460V AC
F970	970 A, 800 Hp @ 460V AC
F1250	1250 A, 1000 Hp @ 460V AC

*c*

Enclosure Type	
Code	Description
F	NEMA Type 4/12 (IP65) (Non-Combination Only)
N	Open

*d*

Input Line Voltage	
Open Type	
Code	Description
B	200...460V AC, 3-phase, 50 and 60 Hz
C	200...575V AC, 3-phase, 50 and 60 Hz
Z	230...690V AC, 3-phase, 50 and 60 Hz (Open Only)
Non-Combination Enclosed Only	
H	200...208V AC, 3-phase, 50 and 60 Hz
A	230V AC, 3-phase, 50 and 60 Hz
B	400...460V AC, 3-phase, 50 and 60 Hz
C	500...575V AC, 3-phase, 50 and 60 Hz

*e*

Control Voltage	
Code	Description
D	100...240V AC (5...480 A units)
R	24V AC/DC (5...480 A units) (Open Only)
E	110/120V AC (625...1250 A units)
A	230/240V AC (625...1250 A units)

*f*

Options (Select Only One)	
Code	Description
Blank	Standard
B	Pump Control
D	Braking Control

*g*

Options (Non-Combination only)(see page 16 for a full listing)	
Code	Description
8L	Line-Mounted Protective Module (enclosed only)
8M	Load-Mounted Protective Module (enclosed only)
8B	Line- and Load-Mounted Protective Modules (enclosed only)
Load-side MOVs are not available with Pump and Braking options, or on delta-connected motors. MOVs can be field installed for open type units.	

Combination

**152H – F480 F BD B – 59 – 8B**  
*a b c d e f g*

*a*

Bulletin Number	
Code	Description
152H	Solid-State Controller with Fusible Disconnect
153H	Solid-State Controller with Circuit Breaker

*b*

Controller Ratings	
Code	Description
F5	5 A, 3 Hp @ 460V AC
F25	25 A, 15 Hp @ 460V AC
F43	43 A, 30 Hp @ 460V AC
F60	60 A, 40 Hp @ 460V AC
F85	85 A, 60 Hp @ 460V AC
F108	108 A, 75 Hp @ 460V AC
F135	135 A, 100 Hp @ 460V AC
F201	201 A, 150 Hp @ 460V AC
F251	251 A, 200 Hp @ 460V AC
F317	317 A, 250 Hp @ 460V AC
F361	361 A, 300 Hp @ 460V AC
F480	480 A, 400 Hp @ 460V AC
F625	625 A, 500 Hp @ 460V AC
F780	780 A, 600 Hp @ 460V AC

*c*

Enclosure Type	
Code	Description
F	NEMA Type 4/12 (IP65)

*d*

Line Voltage, 120V AC Control Voltage	
Code	Description
HD	200...208V AC, 3-phase, 50 and 60 Hz
AD	230V AC, 3-phase, 50 and 60 Hz
BD	400...460V AC, 3-phase, 50 and 60 Hz
CD	500...575V AC, 3-phase, 50 and 60 Hz

*e*

Control Options	
Code	Description
Blank	Standard
B	Pump Control
D	Braking Control

*f*

Horsepower									
Cat. No.	Hp Rating	Cat. No.	Hp Rating	Cat. No.	Hp Rating	Cat. No.	Hp Rating	Cat. No.	Hp Rating
33	0.5	39	5	46	40	52	150	60	450
34	0.75	40	7.5	47	50	54	200	61	500
35	1	41	10	48	60	56	250	62	600
36	1.5	42	15	49	75	57	300	63	700
37	2	43	20	50	100	58	350	65	800
38	3	44	25	51	125	59	400	67	1000
—	—	45	30	—	—	—	—	—	—

*g*

Options (see page 20 for a full listing)	
Code	Description
8L	Line-Mounted Protective Module
8M	Load-Mounted Protective Module
8B	Line- and Load-Mounted Protective Modules
Load-side MOVs are not available with Pump and Braking options, or when used with inside-the-delta connections.	

Bulletin 150  
**SMC™ Flex Smart Motor Controller**  
Product Selection

Product Selection

Open Type and Non-Combination Enclosed (IP65, Type 4/12) Controllers — For use with Line-Connected Motors

Enclosures other than those listed are available; consult your local Allen-Bradley distributor.

Rated Voltage [V AC]	Motor Current (A)*	Max. kW, 50 Hz	Max. Hp, 60 Hz	Control Power	Open Type — Line-Connected Motors*	IP65 (Type 4/12) Enclosed Non-Combination Controllers§
					Cat. No.	Cat. No.
200/208	1...5	—	1	100...240V AC, 50/60 Hz	150-F5NBD	150-F5FHD
				24V AC/DC*	150-F5NBR	—
	5...25	—	5	100...240V AC, 50/60 Hz	150-F25NBD	150-F25FHD
				24V AC/DC*	150-F25NBR	—
	8.6...43	—	10	100...240V AC, 50/60 Hz	150-F43NBD	150-F43FHD
				24V AC/DC*	150-F43NBR	—
	12...60	—	15	100...240V AC, 50/60 Hz	150-F60NBD	150-F60FHD
				24V AC/DC*	150-F60NBR	—
	17...85	—	25	100...240V AC, 50/60 Hz	150-F85NBD	150-F85FHD
				24V AC/DC*	150-F85NBR	—
	27...108	—	30	100...240V AC, 50/60 Hz	150-F108NBD	150-F108FHD
				24V AC/DC*	150-F108NBR	—
	34...135	—	40	100...240V AC, 50/60 Hz	150-F135NBD	150-F135FHD
				24V AC/DC*	150-F135NBR	—
	67...201	—	60	100...240V AC, 50/60 Hz	150-F201NBD	150-F201FHD
				24V AC/DC*	150-F201NBR	—
	84...251	—	75	100...240V AC, 50/60 Hz	150-F251NBD	150-F251FHD
				24V AC/DC*	150-F251NBR	—
	106...317	—	100	100...240V AC, 50/60 Hz	150-F317NBD	150-F317FHD
				24V AC/DC*	150-F317NBR	—
	120...361	—	125	100...240V AC, 50/60 Hz	150-F361NBD	150-F361FHD
				24V AC/DC*	150-F361NBR	—
	160...480	—	150	100...240V AC, 50/60 Hz	150-F480NBD	150-F480FHD
				24V AC/DC*	150-F480NBR	—
	208...625	—	200	110/120V AC, 50/60 Hz	150-F625NBE	150-F625FHE
				230/240V AC, 50/60 Hz	150-F625NBA	150-F625FHA
	260...780	—	250	110/120V AC, 50/60 Hz	150-F780NBE	150-F780FHE
				230/240V AC, 50/60 Hz	150-F780NBA	150-F780FHA
	323...970	—	350	110/120V AC, 50/60 Hz	150-F970NBE	—
				230/240V AC, 50/60 Hz	150-F970NBA	—
	416...1250	—	400	110/120V AC, 50/60 Hz	150-F1250NBE	—
				230/240V AC, 50/60 Hz	150-F1250NBA	—

\* Controllers rated 108 A and greater are not equipped with line and load terminal lugs. See page 31 for terminal lug kits.

\* Motor FLA rating should fall within specified current range for unit to operate properly.

§ These controllers require a separate 100...240V, 50/60 Hz single-phase control source. To add a control circuit transformer to the enclosure, add the appropriate option code to the catalog string.

\* Separate 120V or 240V single phase is required for fan operation.

➤ Line and load termination are provided as standard.

**Open Type and Non-Combination Enclosed (IP65, Type 4/12) Controllers — For use with Line-Connected Motors, Continued**

Enclosures other than those listed are available; consult your local Allen-Bradley distributor.

Rated Voltage [V AC]	Motor Current (A)⚡	Max. kW, 50 Hz	Max. Hp, 60 Hz	Control Power	Open Type — Line-Connected Motors*	IP65 (Type 4/12) Enclosed Non-Combination Controllers§➤
					Cat. No.	Cat. No.
230	1...5	1.1	1	100...240V AC, 50/60 Hz	150-F5NBD	150-F5FAD
				24V AC/DC⚡	150-F5NBR	—
	5...25	5.5	7.5	100...240V AC, 50/60 Hz	150-F25NBD	150-F25FAD
				24V AC/DC⚡	150-F25NBR	—
	8.6...43	11	15	100...240V AC, 50/60 Hz	150-F43NBD	150-F43FAD
				24V AC/DC⚡	150-F43NBR	—
	12...60	15	20	100...240V AC, 50/60 Hz	150-F60NBD	150-F60FAD
				24V AC/DC⚡	150-F60NBR	—
	17...85	22	30	100...240V AC, 50/60 Hz	150-F85NBD	150-F85FAD
				24V AC/DC⚡	150-F85NBR	—
	27...108	30	40	100...240V AC, 50/60 Hz	150-F108NBD	150-F108FAD
				24V AC/DC⚡	150-F108NBR	—
	34...135	37	50	100...240V AC, 50/60 Hz	150-F135NBD	150-F135FAD
				24V AC/DC⚡	150-F135NBR	—
	67...201	55	75	100...240V AC, 50/60 Hz	150-F201NBD	150-F201FAD
				24V AC/DC⚡	150-F201NBR	—
	84...251	75	100	100...240V AC, 50/60 Hz	150-F251NBD	150-F251FAD
				24V AC/DC⚡	150-F251NBR	—
	106...317	90	125	100...240V AC, 50/60 Hz	150-F317NBD	150-F317FAD
				24V AC/DC⚡	150-F317NBR	—
	120...361	110	150	100...240V AC, 50/60 Hz	150-F361NBD	150-F361FAD
				24V AC/DC⚡	150-F361NBR	—
	160...480	132	200	100...240V AC, 50/60 Hz	150-F480NBD	150-F480FAD
				24V AC/DC⚡	150-F480NBR	—
	208...625	200	250	110/120V AC, 50/60 Hz	150-F625NBE	150-F625FAE
				230/240V AC, 50/60 Hz	150-F625NBA	150-F625FAA
	260...780	250	300	110/120V AC, 50/60 Hz	150-F780NBE	150-F780FAE
				230/240V AC, 50/60 Hz	150-F780NBA	150-F780FAA
	323...970	315	400	110/120V AC, 50/60 Hz	150-F970NBE	—
				230/240V AC, 50/60 Hz	150-F970NBA	—
	416...1250	400	500	110/120V AC, 50/60 Hz	150-F1250NBE	—
				230/240V AC, 50/60 Hz	150-F1250NBA	—

\* Controllers rated 108 A and greater are not equipped with line and load terminal lugs. See page 31 for terminal lug kits.

⚡ Motor FLA rating should fall within specified current range for unit to operate properly.

§ These controllers require a separate 100...240V, 50/60 Hz single-phase control source. To add a control circuit transformer to the enclosure, add the appropriate option code to the catalog string.

⚡ Separate 120V or 240V single phase is required for fan operation.

➤ Line and load termination are provided as standard.

## Open Type and Non-Combination Enclosed (IP65, Type 4/12) Controllers — For use with Line-Connected Motors, Continued

Enclosures other than those listed are available; consult your local Allen-Bradley distributor.

Rated Voltage [V AC]	Motor Current (A)⚡	Max. kW, 50 Hz	Max. Hp, 60 Hz	Control Power	Open Type — Line-Connected Motors*	IP65 (Type 4/12) Enclosed Non-Combination Controllers§➤
					Cat. No.	Cat. No.
400/415/460	1...5	2.2	3	100...240V AC, 50/60 Hz	150-F5NBD	150-F5FBD
				24V AC/DC⚡	150-F5NBR	—
	5...25	11	15	100...240V AC, 50/60 Hz	150-F25NBD	150-F25FBD
				24V AC/DC⚡	150-F25NBR	—
	8.6...43	22	30	100...240V AC, 50/60 Hz	150-F43NBD	150-F43FBD
				24V AC/DC⚡	150-F43NBR	—
	12...60	30	40	100...240V AC, 50/60 Hz	150-F60NBD	150-F60FBD
				24V AC/DC⚡	150-F60NBR	—
	17...85	45	60	100...240V AC, 50/60 Hz	150-F85NBD	150-F85FBD
				24V AC/DC⚡	150-F85NBR	—
	27...108	55	75	100...240V AC, 50/60 Hz	150-F108NBD	150-F108FBD
				24V AC/DC⚡	150-F108NBR	—
	34...135	75	100	100...240V AC, 50/60 Hz	150-F135NBD	150-F135FBD
				24V AC/DC⚡	150-F135NBR	—
	67...201	110	150	100...240V AC, 50/60 Hz	150-F201NBD	150-F201FBD
				24V AC/DC⚡	150-F201NBR	—
	84...251	132	200	100...240V AC, 50/60 Hz	150-F251NBD	150-F251FBD
				24V AC/DC⚡	150-F251NBR	—
	106...317	160	250	100...240V AC, 50/60 Hz	150-F317NBD	150-F317FBD
				24V AC/DC⚡	150-F317NBR	—
	120...361	200	300	100...240V AC, 50/60 Hz	150-F361NBD	150-F361FBD
				24V AC/DC⚡	150-F361NBR	—
	160...480	250	400	100...240V AC, 50/60 Hz	150-F480NBD	150-F480FBD
				24V AC/DC⚡	150-F480NBR	—
	208...625	355	500	110/120V AC, 50/60 Hz	150-F625NBE	150-F625FBE
				230/240V AC, 50/60 Hz	150-F625NBA	150-F625FBA
	260...780	450	600	110/120V AC, 50/60 Hz	150-F780NBE	150-F780FBE
				230/240V AC, 50/60 Hz	150-F780NBA	150-F780FBA
	323...970	560	800	110/120V AC, 50/60 Hz	150-F970NBE	—
				230/240V AC, 50/60 Hz	150-F970NBA	—
	416...1250	710	1000	110/120V AC, 50/60 Hz	150-F1250NBE	—
				230/240V AC, 50/60 Hz	150-F1250NBA	—

\* Controllers rated 108 A and greater are not equipped with line and load terminal lugs. See page 31 for terminal lug kits.

⚡ Motor FLA rating should fall within specified current range for unit to operate properly.

§ These controllers require a separate 100...240V, 50/60 Hz single-phase control source. To add a control circuit transformer to the enclosure, add the appropriate option code to the catalog string.

⚡ Separate 120V or 240V single phase is required for fan operation.

➤ Line and load termination are provided as standard.



# SMC™ Flex Smart Motor Controller

## Product Selection, Continued

### Open Type and Non-Combination Enclosed (IP65, Type 4/12) Controllers — For use with Line-Connected Motors, Continued

Enclosures other than those listed are available; consult your local Allen-Bradley distributor.

Rated Voltage [V AC]	Motor Current (A)*	Max. kW, 50 Hz	Max. Hp, 60 Hz	Control Power	Open Type — Line-Connected Motors*	IP65 (Type 4/12) Enclosed Non-Combination Controllers§
					Cat. No.	Cat. No.
500/575	1...5	2.2	3	100...240V AC, 50/60 Hz	150-F5NCD	150-F5FCD
				24V AC/DC*	150-F5NCR	—
	5...25	15	20	100...240V AC, 50/60 Hz	150-F25NCD	150-F25FCD
				24V AC/DC*	150-F25NCR	—
	8.6...43	22	40	100...240V AC, 50/60 Hz	150-F43NCD	150-F43FCD
				24V AC/DC*	150-F43NCR	—
	12...60	37	50	100...240V AC, 50/60 Hz	150-F60NCD	150-F60FCD
				24V AC/DC*	150-F60NCR	—
	17...85	55	75	100...240V AC, 50/60 Hz	150-F85NCD	150-F85FCD
				24V AC/DC*	150-F85NCR	—
	27...108	75	100	100...240V AC, 50/60 Hz	150-F108NCD	150-F108FCD
				24V AC/DC*	150-F108NCR	—
	34...135	90	125	100...240V AC, 50/60 Hz	150-F135NCD	150-F135FCD
				24V AC/DC*	150-F135NCR	—
	67...201	132	200	100...240V AC, 50/60 Hz	150-F201NCD	150-F201FCD
				24V AC/DC*	150-F201NCR	—
	84...251	160	250	100...240V AC, 50/60 Hz	150-F251NCD	150-F251FCD
				24V AC/DC*	150-F251NCR	—
	106...317	200	300	100...240V AC, 50/60 Hz	150-F317NCD	150-F317FCD
				24V AC/DC*	150-F317NCR	—
	120...361	250	350	100...240V AC, 50/60 Hz	150-F361NCD	150-F361FCD
				24V AC/DC*	150-F361NCR	—
	160...480	315	500	100...240V AC, 50/60 Hz	150-F480NCD	150-F480FCD
				24V AC/DC*	150-F480NCR	—
	208...625	450	600	110/120V AC, 50/60 Hz	150-F625NCE	150-F625FCE
				230/240V AC, 50/60 Hz	150-F625NCA	150-F625FCA
	260...780	560	800	110/120V AC, 50/60 Hz	150-F780NCE	150-F780FCE
				230/240V AC, 50/60 Hz	150-F780NCA	150-F780FCA
	323...970	710	1000	110/120V AC, 50/60 Hz	150-F970NCE	—
				230/240V AC, 50/60 Hz	150-F970NCA	—
	416...1250	900	1300	110/120V AC, 50/60 Hz	150-F1250NCE	—
				230/240V AC, 50/60 Hz	150-F1250NCA	—

Rated Voltage [V AC]	Motor Current (A)*	Max. kW, 50 Hz	Max. Hp, 60 Hz	Control Power	Open Type — Line-Connected Motors*
					Cat. No.
690/Y	27...108	90	100	100...240V AC, 50/60 Hz	150-F108NZD
	34...135	132	175	100...240V AC, 50/60 Hz	150-F135NZD
	67...201	160	200	100...240V AC, 50/60 Hz	150-F201NZD
	84...251	200	250	100...240V AC, 50/60 Hz	150-F251NZD
	106...317	315	400	100...240V AC, 50/60 Hz	150-F317NZD
	120...361	355	450	100...240V AC, 50/60 Hz	150-F361NZD
	160...480	450	600	100...240V AC, 50/60 Hz	150-F480NZD
	208...625	630	800	110/120V AC, 50/60 Hz	150-F625NZE
				230/240V AC, 50/60 Hz	150-F625NZA
	260...780	800	1000	110/120V AC, 50/60 Hz	150-F780NZE
				230/240V AC, 50/60 Hz	150-F780NZA
	323...970	1000	1300	110/120V AC, 50/60 Hz	150-F970NZE
				230/240V AC, 50/60 Hz	150-F970NZA
	416...1250	1200	1600	110/120V AC, 50/60 Hz	150-F1250NZE
				230/240V AC, 50/60 Hz	150-F1250NZA

\* Controllers rated 108 A and greater are not equipped with line and load terminal lugs. See page 31 for terminal lug kits.

\* Motor FLA rating should fall within specified current range for unit to operate properly.

§ These controllers require a separate 100...240V, 50/60 Hz single-phase control source. To add a control circuit transformer to the enclosure, add the appropriate option code to the catalog string.

\* Separate 120V or 240V single phase is required for fan operation.

> Line and load termination are provided as standard.



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## Open Type Controllers — For use with Delta-Connected Motors

Rated Voltage [V AC]	Motor Current (A)*	Max. kW, 50 Hz	Max. Hp, 60 Hz	Control Power	Open Type*
					Cat. No.
200/208	1.7...8.7	—	2	100...240V AC, 50/60 Hz	150-F5NBD
				24V AC/DC†	150-F5NBR
	8.7...43	—	10	100...240V AC, 50/60 Hz	150-F25NBD
				24V AC/DC†	150-F25NBR
	14.9...74	—	20	100...240V AC, 50/60 Hz	150-F43NBD
				24V AC/DC†	150-F43NBR
	20.8...104	—	30	100...240V AC, 50/60 Hz	150-F60NBD
				24V AC/DC†	150-F60NBR
	29.4...147	—	40	100...240V AC, 50/60 Hz	150-F85NBD
				24V AC/DC†	150-F85NBR
	47...187	—	60	100...240V AC, 50/60 Hz	150-F108NBD
				24V AC/DC†	150-F108NBR
	59...234	—	75	100...240V AC, 50/60 Hz	150-F135NBD
				24V AC/DC†	150-F135NBR
	116...348	—	100	100...240V AC, 50/60 Hz	150-F201NBD
				24V AC/DC†	150-F201NBR
	145...435	—	150	100...240V AC, 50/60 Hz	150-F251NBD
				24V AC/DC†	150-F251NBR
	183...549	—	200	100...240V AC, 50/60 Hz	150-F317NBD
				24V AC/DC†	150-F317NBR
	208...625	—	200	100...240V AC, 50/60 Hz	150-F361NBD
				24V AC/DC†	150-F361NBR
	277...831	—	300	100...240V AC, 50/60 Hz	150-F480NBD
				24V AC/DC†	150-F480NBR
	283...850	—	300	110/120V AC, 50/60 Hz	150-F625NBE
				230/240V AC, 50/60 Hz	150-F625NBA
	300...900	—	300	110/120V AC, 50/60 Hz	150-F780NBE
				230/240V AC, 50/60 Hz	150-F780NBA
	400...1200	—	400	110/120V AC, 50/60 Hz	150-F970NBE
				230/240V AC, 50/60 Hz	150-F970NBA
	533...1600	—	500	110/120V AC, 50/60 Hz	150-F1250NBE
				230/240V AC, 50/60 Hz	150-F1250NBA

\* Controllers rated 108 A and greater are not equipped with line and load terminal lugs. See page 31 for terminal lug kits.

† Motor FLA rating should fall within specified current range for unit to operate properly.

§ These controllers require a separate 100...240V, 50/60 Hz single-phase control source. To add a control circuit transformer to the enclosure, add the appropriate option code to the catalog string.

‡ Separate 120V or 240V single phase is required for fan operation.

➤ Line and load termination are provided as standard.

**Open Type Controllers — For use with Delta-Connected Motors, Continued**

Rated Voltage [V AC]	Motor Current (A)*	Max. kW, 50 Hz	Max. Hp, 60 Hz	Control Power	Open Type*
					Cat. No.
230	1.7...8.7	2.2	2	100...240V AC, 50/60 Hz	150-F5NBD
				24V AC/DC	150-F5NBR
	8.7...43	11	15	100...240V AC, 50/60 Hz	150-F25NBD
				24V AC/DC	150-F25NBR
	14.9...74	22	25	100...240V AC, 50/60 Hz	150-F43NBD
				24V AC/DC	150-F43NBR
	20.8...104	30	40	100...240V AC, 50/60 Hz	150-F60NBD
				24V AC/DC	150-F60NBR
	29.4...147	45	50	100...240V AC, 50/60 Hz	150-F85NBD
				24V AC/DC	150-F85NBR
	47...187	55	60	100...240V AC, 50/60 Hz	150-F108NBD
				24V AC/DC	150-F108NBR
	59...234	75	75	100...240V AC, 50/60 Hz	150-F135NBD
				24V AC/DC	150-F135NBR
	116...348	110	125	100...240V AC, 50/60 Hz	150-F201NBD
				24V AC/DC	150-F201NBR
	145...435	132	150	100...240V AC, 50/60 Hz	150-F251NBD
				24V AC/DC	150-F251NBR
	183...549	160	200	100...240V AC, 50/60 Hz	150-F317NBD
				24V AC/DC	150-F317NBR
	208...625	200	250	100...240V AC, 50/60 Hz	150-F361NBD
				24V AC/DC	150-F361NBR
	277...831	250	350	100...240V AC, 50/60 Hz	150-F480NBD
				24V AC/DC	150-F480NBR
	283...850	250	350	110/120V AC, 50/60 Hz	150-F625NBE
				230/240V AC, 50/60 Hz	150-F625NBA
	300...900	250	350	110/120V AC, 50/60 Hz	150-F780NBE
				230/240V AC, 50/60 Hz	150-F780NBA
	400...1200	400	400	110/120V AC, 50/60 Hz	150-F970NBE
				230/240V AC, 50/60 Hz	150-F970NBA
	533...1600	500	600	110/120V AC, 50/60 Hz	150-F1250NBE
				230/240V AC, 50/60 Hz	150-F1250NBA

\* Controllers rated 108 A and greater are not equipped with line and load terminal lugs. See page 31 for terminal lug kits.

\* Motor FLA rating should fall within specified current range for unit to operate properly.

§ These controllers require a separate 100...240V, 50/60 Hz single-phase control source. To add a control circuit transformer to the enclosure, add the appropriate option code to the catalog string.

♣ Separate 120V or 240V single phase is required for fan operation.

➤ Line and load termination are provided as standard.

## Open Type Controllers — For use with Delta-Connected Motors, Continued

Rated Voltage [V AC]	Motor Current (A)*	Max. kW, 50 Hz	Max. Hp, 60 Hz	Control Power	Open Type*
					Cat. No.
400/415/460	1.7...8.7	4	5	100...240V AC, 50/60 Hz	150-F5NBD
				24V AC/DC†	150-F5NBR
	8.7...43	22	30	100...240V AC, 50/60 Hz	150-F25NBD
				24V AC/DC†	150-F25NBR
	14.9...74	37	50	100...240V AC, 50/60 Hz	150-F43NBD
				24V AC/DC†	150-F43NBR
	20.8...104	55	75	100...240V AC, 50/60 Hz	150-F60NBD
				24V AC/DC†	150-F60NBR
	29.4...147	75	100	100...240V AC, 50/60 Hz	150-F85NBD
				24V AC/DC†	150-F85NBR
	47...187	90	150	100...240V AC, 50/60 Hz	150-F108NBD
				24V AC/DC†	150-F108NBR
	59...234	132	150	100...240V AC, 50/60 Hz	150-F135NBD
				24V AC/DC†	150-F135NBR
	116...348	160	250	100...240V AC, 50/60 Hz	150-F201NBD
				24V AC/DC†	150-F201NBR
	145...435	250	350	100...240V AC, 50/60 Hz	150-F251NBD
				24V AC/DC†	150-F251NBR
	183...549	315	450	100...240V AC, 50/60 Hz	150-F317NBD
				24V AC/DC†	150-F317NBR
	208...625	355	500	100...240V AC, 50/60 Hz	150-F361NBD
				24V AC/DC†	150-F361NBR
	277...831	450	700	100...240V AC, 50/60 Hz	150-F480NBD
				24V AC/DC†	150-F480NBR
	283...850	500	700	110/120V AC, 50/60 Hz	150-F625NBE
				230/240V AC, 50/60 Hz	150-F625NBA
	300...900	500	700	110/120V AC, 50/60 Hz	150-F780NBE
				230/240V AC, 50/60 Hz	150-F780NBA
	400...1200	710	1000	110/120V AC, 50/60 Hz	150-F970NBE
				230/240V AC, 50/60 Hz	150-F970NBA
	533...1600	900	1400	110/120V AC, 50/60 Hz	150-F1250NBE
				230/240V AC, 50/60 Hz	150-F1250NBA

\* Controllers rated 108 A and greater are not equipped with line and load terminal lugs. See page 31 for terminal lug kits.

† Motor FLA rating should fall within specified current range for unit to operate properly.

§ These controllers require a separate 100...240V, 50/60 Hz single-phase control source. To add a control circuit transformer to the enclosure, add the appropriate option code to the catalog string.

‡ Separate 120V or 240V single phase is required for fan operation.

➤ Line and load termination are provided as standard.

**Open Type Controllers — For use with Delta-Connected Motors, Continued**

Rated Voltage [V AC]	Motor Current (A)*	Max. kW, 50 Hz	Max. Hp, 60 Hz	Control Power	Open Type*
					Cat. No.
500/575	1.7...8.7	5.5	7.5	100...240V AC, 50/60 Hz	150-F5NCD
				24V AC/DC†	150-F5NCR
	8.7...43	15	40	100...240V AC, 50/60 Hz	150-F25NCD
				24V AC/DC†	150-F25NCR
	14.9...74	45	60	100...240V AC, 50/60 Hz	150-F43NCD
				24V AC/DC†	150-F43NCR
	20.8...104	55	100	100...240V AC, 50/60 Hz	150-F60NCD
				24V AC/DC†	150-F60NCR
	29.4...147	90	150	100...240V AC, 50/60 Hz	150-F85NCD
				24V AC/DC†	150-F85NCR
	47...187	132	150	100...240V AC, 50/60 Hz	150-F108NCD
				24V AC/DC†	150-F108NCR
	59...234	160	200	100...240V AC, 50/60 Hz	150-F135NCD
				24V AC/DC†	150-F135NCR
	116...348	250	300	100...240V AC, 50/60 Hz	150-F201NCD
				24V AC/DC†	150-F201NCR
	145...435	315	400	100...240V AC, 50/60 Hz	150-F251NCD
				24V AC/DC†	150-F251NCR
	183...549	400	500	100...240V AC, 50/60 Hz	150-F317NCD
				24V AC/DC†	150-F317NCR
	208...625	450	600	100...240V AC, 50/60 Hz	150-F361NCD
				24V AC/DC†	150-F361NCR
	277...831	560	900	100...240V AC, 50/60 Hz	150-F480NCD
				24V AC/DC†	150-F480NCR
	283...850	560	900	110/120V AC, 50/60 Hz	150-F625NCE
				230/240V AC, 50/60 Hz	150-F625NCA
	300...900	630	900	110/120V AC, 50/60 Hz	150-F780NCE
				230/240V AC, 50/60 Hz	150-F780NCA
	400...1200	800	1300	110/120V AC, 50/60 Hz	150-F970NCE
				230/240V AC, 50/60 Hz	150-F970NCA
	533...1600	1100	1600	110/120V AC, 50/60 Hz	150-F1250NCE
				230/240V AC, 50/60 Hz	150-F1250NCA

\* Controllers rated 108 A and greater are not equipped with line and load terminal lugs. See page 31 for terminal lug kits.

† Motor FLA rating should fall within specified current range for unit to operate properly.

§ These controllers require a separate 100...240V, 50/60 Hz single-phase control source. To add a control circuit transformer to the enclosure, add the appropriate option code to the catalog string.

‡ Separate 120V or 240V single phase is required for fan operation.

➤ Line and load termination are provided as standard.

## Combination Line-Connected Controllers — IP65 (Type 4/12) Enclosed with Fusible Disconnect or Circuit Breaker

These controllers include line and load terminations. Enclosures other than those listed are available; consult your local Allen-Bradley distributor. All 153 bulletin numbers are supplied with thermal magnetic circuit breakers.

The Fusible Disconnects do not come with fuses.

Rated Voltage [V AC]	kW, 50 Hz	Hp, 60 Hz	Controller Current Rating *	IP65 (Type 4/12) Enclosed Combination Controllers with Fusible Disconnect*	IP65 (Type 4/12) Enclosed Combination Controllers with Circuit Breaker*
				Cat. No.	Cat. No.
200	—	0.5	5 A	152H-F5FHD-33	153H-F5FHD-33
	—	0.75	5 A	152H-F5FHD-34	153H-F5FHD-34
	—	1	5 A	152H-F5FHD-35	153H-F5FHD-35
	—	1.5	25 A	152H-F25FHD-36	153H-F25FHD-36
	—	2	25 A	152H-F25FHD-37	153H-F25FHD-37
	—	3	25 A	152H-F25FHD-38	153H-F25FHD-38
	—	5	25 A	152H-F25FHD-39	153H-F25FHD-39
	—	5	25 A	152H-F25FHD-40	153H-F25FHD-40
	—	10	43 A	152H-F43FHD-41	153H-F43FHD-41
	—	15	60 A	152H-F60FHD-42	153H-F60FHD-42
	—	20	85 A	152H-F85FHD-43	153H-F85FHD-43
	—	25	85 A	152H-F85FHD-44	153H-F85FHD-44
	—	30	108 A	152H-F108FHD-45	153H-F108FHD-45
	—	40	135 A	152H-F135FHD-46	153H-F135FHD-46
	—	50	201 A	152H-F201FHD-47	153H-F201FHD-47
	—	60	201 A	152H-F201FHD-48	153H-F201FHD-48
	—	75	251 A	152H-F251FHD-49	153H-F251FHD-49
	—	100	317 A	152H-F317FHD-50	153H-F317FHD-50
	—	125	361 A	152H-F361FHD-51	153H-F361FHD-51
	—	150	480 A	152H-F480FHD-52	153H-F480FHD-52
	—	200	625 A	152H-F625FHD-54	153H-F625FHD-54
	—	250	780 A	152H-F780FHD-56	153H-F780FHD-56
230	0.37	0.5	5 A	152H-F5FAD-33	153H-F5FAD-33
	0.55	0.75	5 A	152H-F5FAD-34	153H-F5FAD-34
	0.75	1	5 A	152H-F5FAD-35	153H-F5FAD-35
	1.1	1.5	25 A	152H-F25FAD-36	153H-F25FAD-36
	1.5	2	25 A	152H-F25FAD-37	153H-F25FAD-37
	2.2	3	25 A	152H-F25FAD-38	153H-F25FAD-38
	3.7	5	25 A	152H-F25FAD-39	153H-F25FAD-39
	5.5	7.5	25 A	152H-F25FAD-40	153H-F25FAD-40
	7.5	10	43 A	152H-F43FAD-41	153H-F43FAD-41
	11	15	43 A	152H-F43FAD-42	153H-F43FAD-42
	15	20	60 A	152H-F60FAD-43	153H-F60FAD-43
	18.5	25	85 A	152H-F85FAD-44	153H-F85FAD-44
	22	30	85 A	152H-F85FAD-45	153H-F85FAD-45
	30	40	108 A	152H-F108FAD-46	153H-F108FAD-46
	37	50	135 A	152H-F135FAD-47	153H-F135FAD-47
	45	60	201 A	152H-F201FAD-48	153H-F201FAD-48
	55	75	201 A	152H-F201FAD-49	153H-F201FAD-49
	75	100	251 A	152H-F251FAD-50	153H-F251FAD-50
	90	125	317 A	152H-F317FAD-51	153H-F317FAD-51
	110	150	361 A	152H-F361FAD-52	153H-F361FAD-52
	132	200	480 A	152H-F480FAD-54	153H-F480FAD-54
	185	250	625 A	152H-F625FAD-56	153H-F625FAD-56
	220	300	780 A	152H-F780FAD-57	153H-F780FAD-57

\* These controllers require a separate 100...240V, 50/60 Hz single-phase control source. To add a control circuit transformer to the enclosure, add the appropriate option code to the catalog string.

\* The nominal current rating for the combination package may differ from the controller, based on the horsepower. Consult your local Allen-Bradley distributor.

**Combination Line-Connected Controllers — IP65 (Type 4/12) Enclosed with Fusible Disconnect or Circuit Breaker, Cont.**

These controllers include line and load terminations. Enclosures other than those listed are available; consult your local Allen-Bradley distributor. All 153 bulletin numbers are supplied with thermal magnetic circuit breakers.

The Fusible Disconnects do not come with fuses.

Rated Voltage [V AC]	kW, 50 Hz	Hp, 60 Hz	Controller Current Rating *	IP65 (Type 4/12) Enclosed Combination Controllers with Fusible Disconnect*	IP65 (Type 4/12) Enclosed Combination Controllers with Circuit Breaker*
				Cat. No.	Cat. No.
400/460	0.37	0.5	5 A	152H-F5FBD-33	153H-F5FBD-33
	0.55	0.75	5 A	152H-F5FBD-34	153H-F5FBD-34
	0.75	1	5 A	152H-F5FBD-35	153H-F5FBD-35
	1.1	1.5	5 A	152H-F5FBD-36	153H-F5FBD-36
	1.5	2	5 A	152H-F5FBD-37	153H-F5FBD-37
	2.2	3	5 A	152H-F5FBD-38	153H-F5FBD-38
	3.7	5	25 A	152H-F25FBD-39	153H-F25FBD-39
	5.5	7.5	25 A	152H-F25FBD-40	153H-F25FBD-40
	7.5	10	25 A	152H-F25FBD-41	153H-F25FBD-41
	11	15	25 A	152H-F25FBD-42	153H-F25FBD-42
	15	20	43 A	152H-F43FBD-43	153H-F25FBD-43
	18.5	25	43 A	152H-F43FBD-44	153H-F43FBD-44
	22	30	43 A	152H-F43FBD-45	153H-F43FBD-45
	30	40	60 A	152H-F60FBD-46	153H-F60FBD-46
	37	50	85 A	152H-F85FBD-47	153H-F85FBD-47
	45	60	85 A	152H-F85FBD-48	153H-F85FBD-48
	55	75	108 A	152H-F108FBD-49	153H-F108FBD-49
	75	100	135 A	152H-F135FBD-50	153H-F135FBD-50
	90	125	201 A	152H-F201FBD-51	153H-F201FBD-51
	110	150	201 A	152H-F201FBD-52	153H-F201FBD-52
	132	200	251 A	152H-F251FBD-54	153H-F251FBD-54
	160	250	317 A	152H-F317FBD-56	153H-F317FBD-56
	200	300	361 A	152H-F361FBD-57	153H-F361FBD-57
	250	350	480 A	152H-F480FBD-58	153H-F480FBD-58
	250	400	480 A	152H-F480FBD-59	153H-F480FBD-59
500/575	355	500	625 A	152H-F625FBD-61	153H-F625FBD-61
	450	600	780 A	152H-F780FBD-62	153H-F780FBD-62
	0.37	0.75	5 A	152H-F5FCD-34	153H-F5FCD-34
	0.55	1	5 A	152H-F5FCD-35	153H-F5FCD-35
	0.75	1.5	5 A	152H-F5FCD-36	153H-F5FCD-36
	1.1	2	5 A	152H-F5FCD-37	153H-F5FCD-37
	2.2	3	5 A	152H-F5FCD-38	153H-F5FCD-38
	3.7	5	25 A	152H-F25FCD-39	153H-F25FCD-39
	5.5	7.5	25 A	152H-F25FCD-40	153H-F25FCD-40
	7.5	10	25 A	152H-F25FCD-41	153H-F25FCD-41
	11	15	25 A	152H-F25FCD-42	153H-F25FCD-42
	15	20	43 A	152H-F43FCD-43	153H-F43FCD-43
	18.5	25	43 A	152H-F43FCD-44	153H-F43FCD-44
	22	30	43 A	152H-F43FCD-45	153H-F43FCD-45
	22	40	43 A	152H-F43FCD-46	153H-F43FCD-46
	37	50	60 A	152H-F60FCD-47	153H-F60FCD-47
	45	60	85 A	152H-F85FCD-48	153H-F85FCD-48
	55	75	85 A	152H-F85FCD-49	153H-F85FCD-49
	75	100	108 A	152H-F108FCD-50	153H-F108FCD-50
	90	125	135 A	152H-F135FCD-51	153H-F135FCD-51
	110	150	201 A	152H-F201FCD-52	153H-F201FCD-52
	132	200	201 A	152H-F201FCD-54	153H-F201FCD-54
	160	250	251 A	152H-F251FCD-56	153H-F251FCD-56
	200	300	317 A	152H-F317FCD-57	153H-F317FCD-57
	250	350	361 A	152H-F361FCD-58	153H-F361FCD-58
	295	400	480 A	152H-F480FCD-59	153H-F480FCD-59
	315	450	480 A	152H-F480FCD-60	153H-F480FCD-60
	315	500	480 A	152H-F480FCD-61	153H-F480FCD-61
	450	600	625 A	152H-F625FCD-62	153H-F625FCD-62
	560	800	780 A	152H-F780FCD-65	153H-F780FCD-65

\* These controllers require a separate 100...240V, 50/60 Hz single-phase control source. To add a control circuit transformer to the enclosure, add the appropriate option code to the catalog string.

\* The nominal current rating for the combination package may differ from the controller, based on the horsepower. Consult your local Allen-Bradley distributor.



### Control Options (open and enclosed)

Option	Description	Cat. No. Modification
Pump Control	Provides smooth motor acceleration and deceleration, reducing surges caused by the starting and stopping of centrifugal pumps. Starting time is adjustable from 0...30 seconds, and stopping time is adjustable from 0...120 seconds.	B*
Braking Control	Provides Smart Motor Braking (SMB), Accu-Stop, and Slow Speed with Braking.	D*

### Enclosed Options

Option	Description	Cat. No. Modification
Push Buttons	Start-Stop Push Button	-1
	Start-Stop Push Button with H-O-A Selector Switch	-1F
	Soft Stop Push Button*	1XA
	Pump Stop Push Button*	1XB
	Slow Speed Push Button*	1XC
	Brake Push Button*	1XD
	Accu-Stop/Slow Speed Push Button*	1XE
	Emergency Stop	-1E
	Fault Reset	-FR
Selector Switch	Hand-Off-Auto Selector Switch	-3
	SMC-Off-Bypass Selector Switch	-3B +
Pilot Lights	Transformer Pilot Light - Green Power On Indicator	-4G
	Transformer Pilot Light - Red Run Indicator	-4R
	Push-to-Test Pilot Light - Red Run Indicator	-5R
Control Circuit Transformer	Control Circuit Transformer (fused primary and secondary)	-6P
	Additional 100 VA Control Circuit Transformer (fused primary and secondary)	-6PX
	1000 VA Control Circuit Transformer (fused primary and secondary)	-6PK
	1600 VA Control Circuit Transformer (fused primary and secondary)	-6PL
	2000 VA Control Circuit Transformer (fused primary and secondary)	-6PM
Protective Modules	480V Line Side Protective Module	-8L
	600V Line Side Protective Module	
	480V Load Side Protective Module	-8M
	600V Load Side Protective Module	
	480V Both Line and Load Side Protective Modules	-8B
	600V Both Line and Load Side Protective Modules	
Human Interface Module	Door-mounted, Full Numeric (Type 4/12)	-HC3
Communication Module	Remote I/O	-20R
	RS-485	-20S
	DeviceNet	-20D
	Ethernet/IP	-20E
	Control Net	-20C
Disconnect Auxiliary	N.O. disconnect auxiliary mounted on operating mechanism	-98
	N.C. disconnect auxiliary mounted on operating mechanism	-99
Circuit Breaker Auxiliary	Internal N.O. circuit breaker auxiliary	-98X
	Internal N.C. circuit breaker auxiliary	-99X
Service Entrance Label	Service Entrance Label	-SEL
U.L. Label	U.L. Label	-UL
Oil Pump Starter	NEMA Size 1 509 and Solid-State Overload	-OPS

\* Add the designated letter to the end of the cat. no. Example: To add the Pump Control option: **Cat. No. 150-F361NBDB** or **Cat. No. 152H-F361FBDB-57**.

\* Option push buttons are available only when the corresponding option module is selected. Example: **Cat. No. 150-F108FBDB-1XB**.

+ Bypass contactor and overload are not included with this option. A **-NB** or **-BP** needs to be added to the catalog string to add these devices.


### Enclosed Options, Continued

Option	Description	Cat. No. Modification
NEMA Bypass Contactor	5...43 A	-NB
	60...85 A	
	108...135 A	
	201...251 A	
	317...361 A	
	480 A	
NEMA Isolation Contactor	5...43 A	-NI
	60...85 A	
	108...135 A	
	201...251 A	
	317...361 A	
	480 A	
MCS Isolation Contactor	5...43 A	15xB-F-
	60...85 A	
	108...135 A	
	201...251 A	
	317...361 A	
	480 A	
MCS Bypass Contactor	5...43 A	-BP
	60...85 A	
	108...135 A	
	201...251 A	
	317...361 A	
	480 A	

### Accessories


#### Protective Modules\*

Protective modules must not be placed on the load side of a device when using an inside-the-delta connection or with Pump and Braking control.

	Current Rating	Description	Field Modification Cat. No.
	5...85	480V Protective Module	150-F84
	108...1250		150-F84L
	5...85	600V Protective Module	150-F86
	108...1250		150-F86L

\* The same protective module mounts on the line or load side of the SMC-Flex. For applications requiring both line and load side protection, two protective modules must be ordered.

#### Terminal Lug Kits (108...1250 A)

	Current Rating (A) *	Wire Size	Total No. of Line Controller Terminal Lugs Possible Each Side		Pkg. Qty.	Cat. No.
			Line Side	Load Side		
	108...135 ♣	#6...250 MCM AWG 16 mm²...120 mm²	3	3	3	199-LF1
	201...251 ♣		6	6		
	317...480 ♣	#4...500 MCM AWG 25 mm²...240 mm²	6	6		199-LG1
	625...780	2/0...500 MCM AWG	6	6		100-DL630
	970	4/0...500 MCM AWG	3	3		100-DL860
	1250 §	2/0...500 MCM AWG	3	3		100-DL630
		4/0...500 MCM AWG	3	3		100-DL860

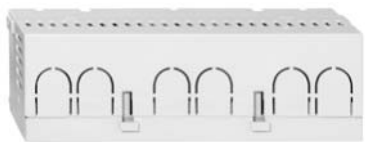
Line and Load terminals are provided as standard on enclosed SMCs.

\* 5...85 A units have box lugs standard. No additional lugs are required.

§ The 1250 A device requires (1) 100-DL630 and (1) 100-DL860 per connection.



♣ When a multi-conductor lug is required, refer to the User Manual for appropriate lug catalog number.

## IEC Terminal Covers

	Description†	Package Quantity	Field Modification Cat. No.
	<b>Terminal Cover</b> IEC line or load terminal covers for 108 and 135 A devices. Dead front protection	1	150-TC1
	<b>Terminal Cover</b> IEC line or load terminal covers for 201...251 A devices. Dead front protection	1	150-TC2
	<b>Terminal Cover</b> IEC line or load terminal covers for 317...480 A devices. Dead front protection	1	150-TC3

† 5...85 A units have terminal guards standard. No additional terminal guards are required.

## Human Interface and Communication Modules

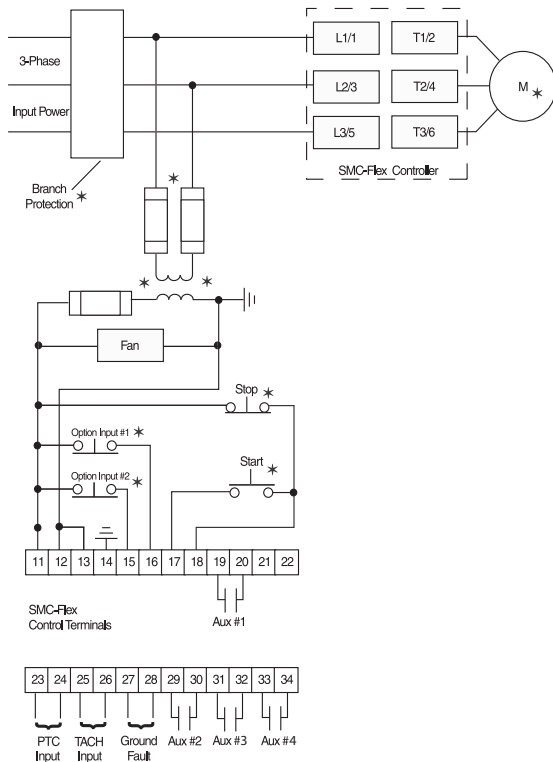
Description			Cat. No.	
	Hand Held Human Interface Modules	LCD Display, Full Numeric Keypad*	20-HIM-A3	
		LCD Display, Programmer Only*	20-HIM-A5	
	Door Mounted Human Interface Modules	Remote (Panel Mount)	20-HIM-C3S	
		LCD Display, Full Numeric Keypad	20-HIM-C5S	
	Human Interface Module Interface Cables	LCD Display, Programmer Only HIM (includes 3 m cable)	20-HIM-C5S	
		PowerFlex HIM Interface Cable, 1 m (39 in)	20-HIM-H10	
		Cable Kit (Male-Female) 0.33 m (1.1 ft)	1202-H03	
		Cable Kit (Male-Female) 1 m (3.3 ft)	1202-H10	
		Cable Kit (Male-Female) 3 m (9.8 ft)	1202-H30	
		Cable Kit (Male-Female) 9 m (29.5 ft)	1202-H90	
DPI/SCANport™ One to Two Port Splitter Cable		1203-S03		
Description (IP30/Type 1)		For Use With		
	Communication Modules	Remote I/O Communication Adapter	Bulletin 150 SMC Flex	20-COMM-R
		RS485 DF1 Communication Adapter		20-COMM-S
		PROFIBUS™ DP Communication Adapter		20-COMM-P
		ControlNet™ Communication Adapter (Coax)		20-COMM-C
		Interbus™ Communication Adapter		20-COMM-I
		Modbus/TCP Communication Adapter		20-COMM-M
		DeviceNet™ Communication Adapter		20-COMM-D
		EtherNet/IP™ Communication Adapter		20-COMM-E
		HVAC Communication Adapter		20-COMM-H
		ControlNet™ Communication Adapter (Fiber)		20-COMM-Q
	DriveTools™	Programming Software	WIN NT/2000/XP	9303-4DTE01ENE
	DriveTools™ Sp	Programming Software	WIN NT/2000/XP	9303-4DTS01ENE
	Anacanda RS232 to DPi	PC Interface	Serial	1203-SSS
	DPi to USB	PC Interface	USB	1203-USB

\* Requires a 20-HIM-H10 cable to connect to the SMC-Flex.

## Specifications

Functional Design Specifications			
Standard Features	Installation	Power Wiring	Standard squirrel-cage induction motor or a Wye-Delta, six-lead motor.
		Control Wiring	2- and 3-wire control for a wide variety of applications.
	Setup	Keypad	Front keypad and backlit LCD display.
		Software	Parameter values can be downloaded to the SMC-Flex Controller with DriveTools programming software and the Cat. No. 20-COMM... DPI communication module.
	Communications		One DPI provided for connection to optional human interface and communication modules.
	Starting and Stopping Modes		Soft Start Current Limit Start Dual Ramp Full Voltage Linear Speed Acceleration Preset Slow Speed Soft Stop
	Protection and Diagnostics		Power loss, line fault, voltage unbalance, excessive starts/hour, phase reversal, undervoltage, overvoltage, controller temp, stall, jam, open gate, overload, underload, communication fault.
	Metering		Amps, volts, kW, kWh, mW, mWh, elapsed time, power factor, motor thermal capacity usage.
	Alarm Contact		Overload, underload, undervoltage, overvoltage, unbalance, jam, stall, and ground fault
	Status Indication		Stopped, starting, stopping, at speed, alarm, and fault.
Optional Features	Auxiliary Contacts		Four fully programmable contacts as normal/up-to-speed/fault/alarm/network (N.O./N.C.), or external bypass (N.O. only).
	Pump Control		Helps reduce fluid surges in centrifugal pumping systems during starting and stopping period. Starting time is adjustable from 0...30 seconds. Stopping time is adjustable from 0...120 seconds.
	Braking Control	SMB Smart Motor Braking	Provides motor braking without additional equipment for applications that require the motor to stop quickly. Braking current is adjustable from 0...400% of the motor's full-load current rating.
		Accu-Stop	Provides controlled position stopping. During stopping, braking torque is applied to the motor until it reaches preset slow speed (7% or 15% of rated speed) and holds the motor at this speed until a stop command is given. Braking torque is then applied until the motor reaches zero speed. Braking current is programmable from 0...450% of full-load current.
		Slow Speed with Braking	Used on applications that require slow speed (in the forward direction) for positioning or alignment and also require braking control to stop.

## Wiring Diagram — Line Controller



Electrical Ratings			
	Device Rating	UL/CSA/NEMA	IEC
Power Circuit	Rated Operation Voltage	480V 600V 690V	200...415V 200...500V 230...690V/Y (-15%, +10%)
	Rated Insulation Voltage	480V 600V 690V	500V 500V 690V
	Rated Impulse Voltage	480V 600V 690V	6000V
	Dielectric Withstand	480V 600V 690V	2500V
	Repetitive Peak Inverse Voltage Rating	480V 600V 690V	1400V 1600V 1800V
	Operating Frequency	All	50/60 Hz
	Utilization Category	5...480 A 625...1250 A	MG 1 MG 1
	Protection Against Electrical Shock	5...85 A 108...480 A 625...1250 A	N/A IP20 IP2X (with terminal covers) IP00 (open device)
	DV/DT Protection	480V & 600V 690V	RC Snubber Network None
	Transient Protection	480V & 600V 690V	Metal Oxide Varistors: 220 Joules None
	Rated Operational Voltage§	5...480 A 625...1250 A	100...240V AC or 24V AC/DC 110/120V AC and 230/240V AC
	Rated Insulation Voltage	All	N/A 240V
	Rated Impulse Voltage	All	N/A 3000V
	Dielectric Withstand	All	1600V AC 2000V
	Operating Frequency	All	50/60 Hz
	Input onstate voltage minimum		85V AC, 19.2V DC / 20.4V AC
	Input onstate current		20 mA @120V AC / 40 mA @ 240V AC, 7.6 mA @ 24V AC/DC
	Input offstate voltage maximum		50V AC, 10V DC / 12V AC
	Input offstate current @ input offstate voltage		<10 mA AC, <3 mA DC
Control Circuit			

§ 690V power is only available with 100...240V control.

Electrical Ratings							
SCPD Performance 200...600V		Type 1					
SCCR List*		Max. Standard Available Fault	Max. Standard Fuse (A)*	Max. Standard Available Fault	Max. Circuit Breaker (A)	Max. High Fault	Max. Fuse (A) ‡
Line Device Operational Current Rating (A)	5	5 kA	20	5 kA	20	70 kA	10
	25	5 kA	100	5 kA	100	70 kA	50
	43	10 kA	150	10 kA	150	70 kA	90
	60	10 kA	225	10 kA	225	70 kA	125
	85	10 kA	300	10 kA	300	70 kA	175
	108	10 kA	400	10 kA	300	70 kA	200
	135	10 kA	500	10 kA	400	70 kA	225
	201	18 kA	600	18 kA	600	70 kA	350
	251	18 kA	700	18 kA	700	70 kA	400
	317	30 kA	800	30 kA	800	69 kA	500
	361	30 kA	1000	30 kA	1000	69 kA	600
	480	42 kA	1200	42 kA	1200	69 kA	800
	625	42 kA	1600	42 kA	1600	74 kA	1600
	780	42 kA	1600	42 kA	2000	74 kA	1600
	970	85 kA	2500	85 kA	2500	85 kA	2500
	1250	85 kA	3000	85 kA	3200	85 kA	3000
Delta Device Operational Current Rating (A)	8.7	5 kA	35	5 kA	35	70 kA	17.5
	43	5 kA	150	5 kA	150	70 kA	90
	74	10 kA	300	10 kA	300	70 kA	150
	104	10 kA	400	10 kA	400	70 kA	200
	147	10 kA	400	10 kA	400	70 kA	200
	187	10 kA	600	10 kA	500	70 kA	300
	234	10 kA	700	10 kA	700	70 kA	400
	348	18 kA	1000	18 kA	1000	70 kA	600
	435	18 kA	1200	18 kA	1200	70 kA	800
	549	30 kA	1600	30 kA	1600	69 kA	1000
	625	30 kA	1600	30 kA	1600	69 kA	1200
	831	42 kA	1600	30 kA	1600	69 kA	1600
	850	42 kA	1600	42 kA	2000	74 kA	1600
	900	42 kA	1600	42 kA	2000	74 kA	1600
	1200	85 kA	3000	85 kA	3200	85 kA	3000
	1600	85 kA	3000	85 kA	3200	85 kA	3000
SCPD Performance 690V		Type 1					
SCCR List*		Device Rating	Max. Standard Available Fault	Max. Ampere Tested — North American Style		Max. Ampere Tested — European Style	
Maximum FLC	108		70 kA	A070URD33xxx500		6,9 gRB 73xxx400 6,6URD33xxx500	
	135		70 kA	A070URD33xxx500		6,9 gRB 73xxx400 6,6URD33xxx500	
	201		70 kA	A070URD33xxx700		6,9 gRB 73xxx630 6,6URD33xxx700	
	251		70 kA	A070URD33xxx700		6,9 gRB 73xxx630 6,6URD33xxx700	
	317		70 kA	A070URD33xxx900		6,9 gRB 73xxx800 6,6URD33xxx900	
	361		70 kA	A070URD33xxx900		6,9 gRB 73xxx800 6,6URD33xxx900	
	480		70 kA	A070D33xxx1250 A100URD73xxx1250		9 URD 73xxx1250 6,6URD33xxx1250	
	625		70 kA	A070URD33xxx1400		6,6URD33xxx1400	
	780		70 kA	A070URD33xxx1400		6,6URD33xxx1400	
	970		85 kA	2 fuses in parallel A070URD33xxx1250		2 fuses in parallel 6,6URD33xxx1250	
	1250		85 kA	2 fuses in parallel A070URD33xxx1250		2 fuses in parallel 6,6URD33xxx1250	

\* Consult local codes for proper sizing of short circuit protection.

\* Non-time delay fuses (K5 — 5...480V (8.7...831 A) devices; Class L — 625...1250V (850...1600 A) devices).

‡ High capacity fault rating when used with time delay class CC, J, or L fuses.



Bulletin 150  
**SMC™ Flex Smart Motor Controller**  
Specifications, Continued

Electrical Ratings			
Power Requirements	Control Module	1...480 A	120...240V AC
			Transformer
			75 VA
			24V AC
			Transformer
			130 VA
			24V DC
			Inrush Current
			5 A
			Inrush Time
Steady State Heat Dissipation with Control and Fan Power (Watts)	Controller Rating (A)	5	70
			25
			43
			60
			85
			108
			135
			201
			251
			317
Auxiliary Contacts 19/20 (Aux #1) 29/30 (Aux #2) 31/32 (Aux #3) 33/34 (Aux #4)	Type of Control Circuit	Number of Contacts	Electromagnetic relay
			1
			programmable N.O./N.C.
			AC
			3 A @ 120V AC, 1.5 A @ 240V AC
			5 A
			3600/360
			AC-15/DC
			3400 Ω ±150 Ω
			1600 Ω ±100 Ω
PTC Input Ratings	Response Resistance	Reset Resistance	25 Ω ±10 Ω
			< 7.5V
			30V
			6
			1500 Ω
			800 ms
			0...5V DC, 4.5V DC = 100% Speed
Heatsink Fan(s) (A) ♣	625...1250 A	751 VA (recommended 800 VA)	5...135 A, 20 VA
			201...251 A, 40 VA
			317...480 A, 60 VA
			625...1250 A, 150 VA
Steady State Heat Dissipation with Control and Fan Power (Watts)	Controller Rating (A)	5	70
			25
			43
			60
			85
			108
			135
			201
			251
			317
Auxiliary Contacts 19/20 (Aux #1) 29/30 (Aux #2) 31/32 (Aux #3) 33/34 (Aux #4)	Type of Control Circuit	Number of Contacts	Electromagnetic relay
			1
			programmable N.O./N.C.
			AC
			3 A @ 120V AC, 1.5 A @ 240V AC
			5 A
			3600/360
			AC-15/DC
			3400 Ω ±150 Ω
			1600 Ω ±100 Ω
PTC Input Ratings	Response Resistance	Reset Resistance	25 Ω ±10 Ω
			< 7.5V
			30V
			6
			1500 Ω
			800 ms
			0...5V DC, 4.5V DC = 100% Speed
Heatsink Fan(s) (A) ♣	625...1250 A	751 VA (recommended 800 VA)	5...135 A, 20 VA
			201...251 A, 40 VA
			317...480 A, 60 VA
			625...1250 A, 150 VA

♣ Heatsink fans can be powered by either 110/120V AC or 220/240V AC.

Environmental				
Operating Temperature Range		-5...50 °C (23...122 °F) (open) -5...40 °C (23...104 °F) (enclosed)		
Storage and Transportation Temperature Range		-20...+75 °C		
Altitude		2000 m (6560 ft)		
Humidity		5...95% (non-condensing)		
Pollution Degree		2		
Mechanical				
Resistance to Vibration	Operational	All	1.0 G Peak, 0.15 mm (0.006 in.) displacement	
	Non-Operational	5...480 A	2.5 G Peak, 0.38 mm (0.015 in.) displacement	
		625...1250 A	1.0 G Peak, 0.15 mm (0.006 in.) displacement	
Resistance to Shock	Operational	5...85 A	15 G	
		108...480 A	5.5 G	
		625...1250 A	4 G	
	Non-Operational	5...85 A	30 G	
		108...480 A	25 G	
		625...1250 A	12 G	
Construction	Power Poles	5...85 A	Heatsink thyristor modular design	
	Power Poles	108...1250 A	Heatsink hockey puck thyristor modular design	
	Control Modules		Thermoset and Thermoplastic Moldings	
	Metal Parts		Plated Brass, Copper, or Painted Steel	
Terminals	Power Terminals	5...85 A	Cable size — Line Upper — 2.5...95 mm² (14...3/0 AWG) Line Lower — 0.8...2.5 mm² (18...14 AWG) Load Upper — 2.5...50 mm² (14...1 AWG) Load Lower — 0.8...2.5 mm² (18...14 AWG) Tightening torque — 14.7 N•m (130 lb.-in.) Wire strip length — 18...20 mm (0.22...0.34 in.)	
		108...135 A	One M10 x 1.5 diameter hole per power pole	
		201...251 A	Two M10 x 1.5 diameter holes per power pole	
		317...480 A	Two M12 x 1.75 diameter holes per power pole	
		625...1250 A	Two 13.5 mm (0.53 in.) diameter holes per power pole	
	Power Terminal Markings		NEMA, CENELEC EN50 012	
	Control Terminals	M3 screw clamp	Clamping yoke connection	
Other				
EMC Emission Levels	Conducted Radio Frequency Emissions Radiated Emissions		Class A Class A	
EMC Immunity Levels	Electrostatic Discharge Radio Frequency Electromagnetic Field Fast Transient Surge Transient		8 kV Air Discharge Per EN/IEC 60947-4-2 Per EN/IEC 60947-4-2 Per EN/IEC 60947-4-2	
Overload Characteristics	Current Range		Line	Delta
		5	1...5	1.7...9
		25	5...25	8.6...43
		43	8.6...43	14.8...75
		60	12...60	20.8...104
		85	17...85	29.4...147
		108	27...108	47...187
		135	34...135	59...234
		201	67...201	116...348
		251	84...251	145...435
		317	106...317	183...549
		361	120...361	208...625
		480	160...480	277...831
		625	208...625	283...850
		780	260...780	300...900
		970	323...970	400...1200
		1250	416...1250	533...1600
			Trip Classes Trip Current Rating Number of Poles	10, 15, 20, and 30 117% of Motor FLC 3
	Certifications	Open Type Controllers		CE Marked Per Low Voltage Directive 73/23/EEC, 93/68/EEC UL Listed (File No. E96956)