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.

Table of Contents

4

This catalog product information is based on the **minimum** information needed to select an SMC soft starter for applications with low starting torque requirements. For product selection involving loads with high starting torque requirements (large fan, rock crusher, chipper, etc.), use of the free tools available from the Rockwell Automation Website is recommended:

http://www.ab.com/industrialcontrols/products/solid-state_motor_control/software/

Standards Compliance

UL 508
CSA C22.2 No.14
EN/IEC 60947-1
EN/IEC 60947-4-2

Certifications

cULus Listed (Open Type) (File No. E96956, Guides NMFT, NMFT7)
CSA Certified (File No. LR 1234)
CE Marked
CCC Certified

Modes of Operation

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

- Soft Start
- Selectable Kickstart
- Current Limit Start
- Dual Ramp Start
- Full Voltage Start
- Linear Speed Acceleration
- Preset Slow Speed
- Soft Stop

Optional Modes of Operation

Pump Control

- Start and Stop

Braking Control

- SMB — Smart Motor Braking
- Accu-Stop
- Slow Speed with Braking

Note: For detailed information about the different modes of operation, see page 4-109.

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.

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.

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.

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.

Network I/O
The SMC Flex can have up to two inputs and four outputs controlled via a communication network. The output contacts use the auxiliary contacts.

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

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 on page 4-127 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
150B	Enclosed Solid-State Controller with Isolation Contactor

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)
J	NEMA Type 12 (IP54)
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, 108 A and above)
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 4-125 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
152B	Solid-State Controller with Fusible Disconnect and Isolation Contactor
153H	Solid-State Controller with Circuit Breaker
153B	Solid-State Controller with Circuit Breaker and Isolation Contactor

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)
J	NEMA Type 12 (IP54)

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

g

Options (see page 4-125 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.	

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	—	—	—	—	—	—

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 Rockwell Automation sales office or 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-F625JHE
				230/240V AC, 50/60 Hz	150-F625NBA	⌘	150-F625JHA
	260…780	—	250	110/120V AC, 50/60 Hz	150-F780NBE	⌘	150-F780JHE
				230/240V AC, 50/60 Hz	150-F780NBA	⌘	150-F780JHA
	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 4-126 for terminal lug kits.

❄ Motor FLA rating should fall within specified current range for unit to operate properly. Special consideration should be given when using a motor with a potentially high starting current (greater than ten times motor FLA) with the SMC Flex in the "Full Voltage" starting mode. Contact Rockwell Automation technical support for further guidance.

§ 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 power supply is required for fan operation.

➢ Line and load termination are provided as standard.

⌘ Available in IP54 (Type 12) enclosure only.

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 Rockwell Automation sales office or 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-F625JAE
				230/240V AC, 50/60 Hz	150-F625NBA	⌘	150-F625JAA
	260…780	250	300	110/120V AC, 50/60 Hz	150-F780NBE	⌘	150-F780JAE
				230/240V AC, 50/60 Hz	150-F780NBA	⌘	150-F780JAA
	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 4-126 for terminal lug kits.

❄ Motor FLA rating should fall within specified current range for unit to operate properly. Special consideration should be given when using a motor with a potentially high starting current (greater than ten times motor FLA) with the SMC Flex in the "Full Voltage" starting mode. Contact Rockwell Automation technical support for further guidance.

§ 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 power supply is required for fan operation.

➢ Line and load termination are provided as standard.

⌘ Available in IP54 (Type 12) enclosure only.

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 Rockwell Automation sales office or 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-F625JBE
				230/240V AC, 50/60 Hz	150-F625NBA	⌘	150-F625JBA
	260…780	450	600	110/120V AC, 50/60 Hz	150-F780NBE	⌘	150-F780JBE
				230/240V AC, 50/60 Hz	150-F780NBA	⌘	150-F780JBA
	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 4-126 for terminal lug kits.

❄ Motor FLA rating should fall within specified current range for unit to operate properly. Special consideration should be given when using a motor with a potentially high starting current (greater than ten times motor FLA) with the SMC Flex in the "Full Voltage" starting mode. Contact Rockwell Automation technical support for further guidance.

§ 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 power supply is required for fan operation.

➢ Line and load termination are provided as standard.

⌘ Available in IP54 (Type 12) enclosure only.

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 4-126 for terminal lug kits.

❄ Motor FLA rating should fall within specified current range for unit to operate properly. Special consideration should be given when using a motor with a potentially high starting current (greater than ten times motor FLA) with the SMC Flex in the "Full Voltage" starting mode. Contact Rockwell Automation technical support for further guidance.

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

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 4-126 for terminal lug kits.

❄ Motor FLA rating should fall within specified current range for unit to operate properly. Special consideration should be given when using a motor with a potentially high starting current (greater than ten times motor FLA) with the SMC Flex in the "Full Voltage" starting mode. Contact Rockwell Automation technical support for further guidance.

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

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 4-126 for terminal lug kits.

❄ Motor FLA rating should fall within specified current range for unit to operate properly. Special consideration should be given when using a motor with a potentially high starting current (greater than ten times motor FLA) with the SMC Flex in the "Full Voltage" starting mode. Contact Rockwell Automation technical support for further guidance.

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

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 s, and stopping time is adjustable from 0…120 s.	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
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 100VA Control Circuit Transformer (fused primary and secondary)	-6PX
	1000VA Control Circuit Transformer (fused primary and secondary)	-6PK
	1600VA Control Circuit Transformer (fused primary and secondary)	-6PL
	2000VA 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	RS-485	-20S
	DeviceNet	-20D
	Ethernet/IP	-20E
	Control Net	-20C
	ProfiBUS	-20P
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
Oil Pump Starter	Bulletin 509 NEMA Size 1starter and Bulletin 592 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 and Overload Relay	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 Bypass Contactor and Overload Relay	5…43 A	-BP
	60…85 A	
	108…135 A	
	201…251 A	
	317…361 A	
	480 A	

Accessories

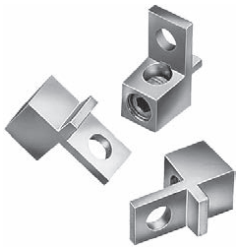
Protective Modules∗

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

Current Rating [A]	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.
IEC line or load terminal covers for 108 and 135 A devices. Dead front protection	1	**150-TC1**
IEC line or load terminal covers for 201…251 A devices. Dead front protection	1	**150-TC2**
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

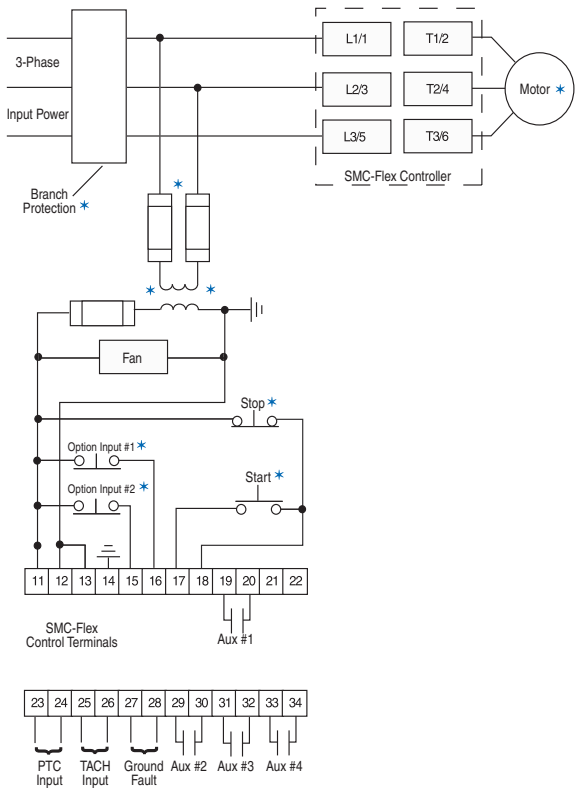
		Description		Cat. No.
	Hand-Held Human Interface Modules	LCD Display, Full Numeric Keypad∗		**20-HIM-A3**
		LCD Display, Programmer Only∗		20-HIM-A5
	Door-Mounted Human Interface Modules	Remote (Panel Mount) LCD Display, Full Numeric Keypad		**20-HIM-C3S**
		LCD Display, Programmer Only HIM (includes 3 m cable)		**20-HIM-C5S**
	Human Interface Module Interface Cables	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	RS485 DF1 Communication Adapter	Bulletin 150 SMC-Flex	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™ RS-232 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.

4

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.
	Auxiliary Contacts		Four fully programmable contacts as normal/up-to-speed/fault/alarm/network (N.O./N.C.), or external bypass (N.O. only).
Optional Features	Pump Control		Helps reduce fluid surges in centrifugal pumping systems during starting and stopping period. Starting time is adjustable from 0…30 s. Stopping time is adjustable from 0…120 s.
	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



* Customer supplied.

Electrical Ratings				
		Device Rating	UL/CSA/NEMA	IEC
Power Circuit	Rated Operation Voltage	480V	200…480V AC (–15%, +10%)	200…415V
		600V	200…600V AC (–15%, +10%)	200…500V
		690V	230…600V AC (–15%, +10%)	230…690V/Y (–15%, +10%)
	Rated Insulation Voltage	480V	N/A	500V
		600V		500V
		690V		690V
	Rated Impulse Voltage	480V	N/A	6000V
		600V		
		690V		
	Dielectric Withstand	480V	2200V AC	2500V
		600V		
		690V		
	Repetitive Peak Inverse Voltage Rating	480V	1400V	1400V
		600V	1600V	1600V
		690V	1800V	1800V
	Operating Frequency	All	50/60 Hz	
	Utilization Category	5…480 A	MG 1	AC-53B:3.0-50:1750
		625…1250 A	MG 1	AC-53B:3.0-50:3550
	Protection Against Electrical Shock	5…85 A	N/A	IP20
		108…480 A		IP2X (with terminal covers)
		625…1250 A		IP00 (open device)
	DV/DT Protection	480V & 600V	RC Snubber Network	
		690V	None	
	Transient Protection	480V & 600V	Metal Oxide Varistors: 220 Joules	
		690V	None	
Control Circuit	Rated Operational Voltage§	5…480 A	100…240V AC or 24V AC/DC	
		625…1250 A	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	

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

Electrical Ratings								
Short-Circuit Protection	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		Two fuses in parallel A070URD33xxx1250		Two fuses in parallel 6,6URD33xxx1250	
		1250	85 kA		Two fuses in parallel A070URD33xxx1250		Two 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.

§ Type 1 performance/protection indicates that, under a short-circuit condition, the fused or circuit breaker-protected starter shall cause no danger to persons or installation but may not be suitable for further service without repair or replacement.

♣ For short-circuit current rating (SCCR) for enclosed panel with external bypass or isolation contactor, see the Industrial Controls catalog website: www.ab.com/catalogs.

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	250 ms
				Transient Watts	60 W
				Transient Time	500 ms
				Steady State Watts	24 W
				Minimum Allen-Bradley Power Supply	1606-XLP50E
		625…1250 A	751 VA (recommended 800 VA)		
	Heatsink Fan(s)♣		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	70		
		43	81		
		60	97		
		85	129		
		108	91		
		135	104		
		201	180		
		251	198		
		317	225		
		361	245		
		480	290		
		625	446		
		780	590		
		970	812		
		1250	1222		
Auxiliary Contacts 19/20 (Aux #1) 29/30 (Aux #2) 31/32 (Aux #3) 33/34 (Aux #4)	Type of Control Circuit		Electromagnetic relay		
	Number of Contacts		1		
	Type of Contacts		programmable N.O./N.C.		
	Type of Current		AC		
	Rated Operational Current		3 A @ 120V AC, 1.5 A @ 240V AC		
	Conventional Thermal Current I_{th} AC/DC		5 A		
	Make/Break VA		3600/360		
	Utilization Category		AC-15/DC		
PTC Input Ratings	Response Resistance		3400 Ω ±150 Ω		
	Reset Resistance		1600 Ω ±100 Ω		
	Short-Circuit Trip Resistance		25 Ω ±10 Ω		
	Max. Voltage at PTC Terminals (R_{PTC} = 4 kΩ)		< 7.5V		
	Max. Voltage at PTC Terminals (R_{PTC} = open)		30V		
	Max. No. of Sensors.		6		
	Max. Cold Resistance of PTC Sensor Chain		1500 Ω		
	Response Time		800 ms		
Tach Input			0…5V DC, 4.5V DC = 100% Speed		

♣ 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 (-4…167 °F)
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 [A]		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)	

Dimensions are in millimeters (inches). Dimensions are not intended for manufacturing purposes.

Approximate Dimensions and Shipping Weights

Open Type Controllers

Rating [A]	Height	Width	Depth	Weight
5…85	321 (12.6)	150 (5.9)	203 (8.0)	5.7 kg (12.6 lbs)
108…135	443.7 (17.47)	196.4 (7.74)	205.2 (8.08)	15.0 kg (33 lbs).
201…251	560 (22.05)	225 (8.86)	253.8 (9.99)	30.4 kg (67 lbs).
317…480	600 (23.62)	290 (11.42)	276.5 (10.89)	45.8 kg (101 lbs)
625…780	1041.1 (41.0)	596.9 (23.5)	346.2 (13.63)	179 kg (395 lbs)
970…1250	1041.1 (41.0)	596.9 (23.5)	346.2 (13.63)	224 kg (495 lbs)

Enclosed-Type Line-Connected Controllers

Factory-installed options may affect enclosure size requirements.
Exact dimensions can be obtained after order entry. Please consult your local Rockwell Automation sales office or Allen-Bradley distributor.

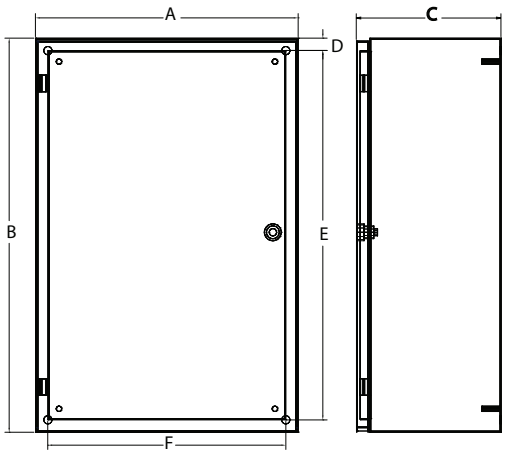


Figure 1 — Wall-Mount

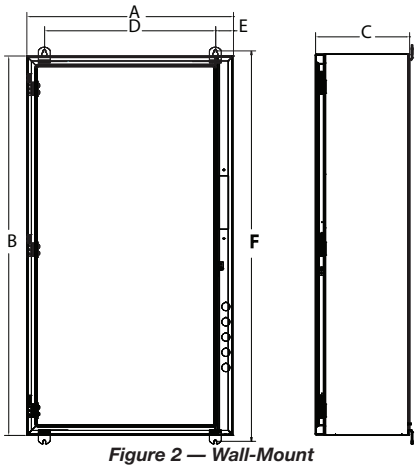


Figure 2 — Wall-Mount

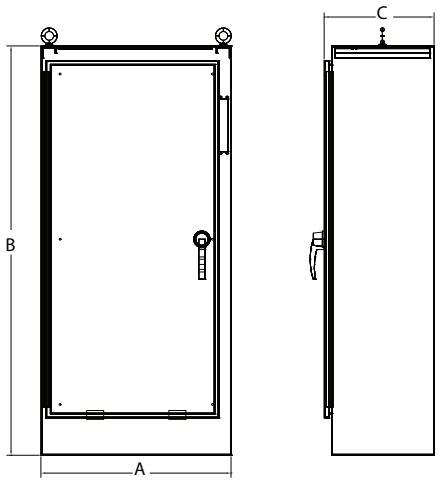


Figure 3 — Floor-Mount

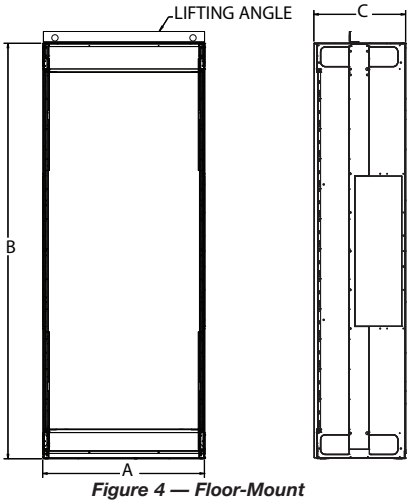


Figure 4 — Floor-Mount

Controller Rating [A]	Bulletin	With Option	Dimension Figure No.	Dimensions in inches (mm)					
				A (Width)	B (Height)	C (Depth)	D (Mtg. Dim.)	E (Mtg. Dim.)	F (Mtg. Dim.)
SMC-Flex Combination Controller									
5…25	152H,153H,152B,153B	—	1	16 (406)	24 (610)	10 (254)	0.75 (19)	22.5 (572)	14.5 (368)
		BP,NB,NI,6_		24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
43	152H,153H,152B,153B	—	1	16 (406)	24 (610)	10 (254)	0.75 (19)	22.5 (572)	14.5 (368)
		BP, 6_		24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
		NI, NB		30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
60	153H, 153B	—	1	16 (406)	24 (610)	10 (254)	0.75 (19)	22.5 (572)	14.5 (368)
	152H, 153H,153B	6_		24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
	152H,152B	—		24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
	152H,152B, 153B,153H	NI, NB		30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
85	153B, 153H	—	1	16 (406)	24 (610)	10 (254)	0.75 (19)	22.5 (572)	14.5 (368)
	152B,152H	—		24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
	152H, 153H,153B	6_		24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
	153H	BP		24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
		BP , 6_		30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
	152B, 152H,153B	BP,NB,NI		30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
108	152H,153H	—	1	30 (762)	38 (965)	14 (356)	0.75 (19)	36.5 (927)	28.5 (724)
		6_		30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
	153H,153B,152H,152B	BP, NB,NI		36 (914)	51 (1295)	14 (356)		49.5 (1257)	34.5 (876)
135	152H,153H	—	1	30 (762)	38 (965)	14 (356)	0.75 (19)	36.5 (927)	28.5 (724)
		6_		30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
	152H,152B,153H,153B	BP, NB,NI		36 (914)	51 (1295)	14 (356)		49.5 (1257)	34.5 (876)
201	152H,153H	—	1	30 (762)	38 (965)	14 (356)	0.75 (19)	36.5 (927)	28.5 (724)
		6_		30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
	152B,153B,153H,152H	BP, NB,NI		36 (914)	51 (1295)	14 (356)		49.5 (1257)	34.5 (876)
251	152H,153H	—	1	30 (762)	38 (965)	14 (356)	0.75 (19)	36.5 (927)	28.5 (724)
		6_		30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
	152B,153B,153H,152H	BP, NB,NI		36 (914)	51 (1295)	14 (356)		49.5 (1257)	34.5 (876)
317	153H	—	1	36 (914)	51 (1295)	14 (356)	0.75 (19)	49.5 (1257)	34.5 (876)
		6_		36 (914)	51 (1295)	14 (356)		49.5 (1257)	34.5 (876)
		BP,NB		36 (914)	60 (1524)	14 (356)		58.5 (1486)	34.5 (876)
	153B	—		36 (914)	60 (1524)	14 (356)		58.5 (1486)	34.5 (876)
	152H,152B	—	2	38 (965)	60 (1524)	17 (431)	33.88 (861)	1.75 (45)	61.69 (1567)
		6_		38 (965)	60 (1524)	17 (431)		1.75 (45)	61.69 (1567)
	152B,153B,152H	NB,NI	3	40 (1016)	84 (2134)	18 (457)	—	—	—
361	153H	—	1	36 (914)	51 (1295)	14 (356)	0.75 (19)	49.5 (1257)	34.5 (876)
		6_		36 (914)	51 (1295)	14 (356)		49.5 (1257)	34.5 (876)
		BP		36 (914)	60 (1524)	14 (356)		58.5 (1486)	34.5 (876)
	153B	—		36 (914)	60 (1524)	14 (356)		58.5 (1486)	34.5 (876)
	152H, 152B	—	2	38 (965)	60 (1524)	17 (431)	33.88 (861)	1.75 (45)	61.69 (1567)
	152H	6_		38 (965)	60 (1524)	17 (431)		1.75 (45)	61.69 (1567)
	153H,152B,153B,152H	NB,NI	3	40 (1016)	84 (2134)	18 (457)	—	—	—
480	153H	—	1	36 (914)	51 (1295)	14 (356)	0.75 (19)	49.5 (1257)	34.5 (876)
		6_		36 (914)	51 (1295)	14 (356)		49.5 (1257)	34.5 (876)
	153H,153B	BP,NI	1❄	36 (914)	60 (1524)	14 (356)		58.5 (1486)	34.5 (876)
	152H	—	2∗‡	38 (965)	60 (1524)	17 (431)	33.88 (861)	1.75 (45)	61.69 (1567)
		BP		38 (965)	60 (1524)	17 (431)		1.75 (45)	61.69 (1567)
		NB	3∗‡	40 (1016)	84 (2134)	18 (457)	—	—	—
		—	4∗§	20 (508)	91.5 (2324)	20 (508)	—	—	—
	153H.153B	BP,NB,NI	3∗§	40 (1016)	84 (2134)	18 (457)	—	—	—
	152B	BP,NB,NI,6_	3∗	40 (1016)	84 (2134)	18 (457)			
	152H,152B	BP,NB,NI	4	35 (889)	91.5 (2324)	20 (508)			
625	152B	—	4	55 (1397)	91.5 (2324)	20 (508)	—	—	—
	152B,152H,153B,153H	NB		105 (2664)	91.5 (2324)	20 (508)			
	152H	—		55 (1397)	91.5 (2324)	20 (508)			
		BP		70 (1778)	91.5 (2324)	20 (508)			
	153B,153H	—		65 (1651)	91.5 (2324)	20 (508)			
780	152B	—	4	55 (1397)	91.5 (2324)	20 (508)	—	—	—
	152B,152H	BP,NI		70 (1778)	91.5 (2324)	20 (508)			
	152B,152H,153B,153H	NB		105 (2664)	91.5 (2324)	20 (508)			
	153B,153H	—		65 (1651)	91.5 (2324)	20 (508)			

∗ Assumed line voltage to be 480V AC. Different voltage may necessitate a bigger enclosure size. Consult your local Rockwell Automation sales office or Allen-Bradley distributor.
❄ 350 Hp max.
‡ 150 Hp @ 208V AC, 350 Hp @480V, 400…4500 Hp @ 600V
§ 200 Hp @ 240V AC, 400 Hp @480V, 5000 Hp @ 600V

Controller Rating [A]	Bulletin	With Option	Dimension Figure No.	Dimensions in inches (mm) A (Width)	B (Height)	C (Depth)	D (Mtg. Dim.)	E (Mtg. Dim.)	F (Mtg. Dim.)
Non-Combination Controller									
5…43	150	—	1	16 (406)	24 (610)	10 (254)	0.75 (19)	22.5 (572)	14.5 (368)
		6_	1✶	16 (406)	24 (610)	10 (254)		22.5 (572)	14.5 (368)
		BP	1	24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
	150, 150B	NB,NI	1	24 (610)	30 (762)	305(12)		28.5 (724)	22.5 (572)
	150	NB,6P_	1❄	30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
60	150	—	1	16 (406)	24 (610)	10 (254)	0.75 (19)	22.5 (572)	14.5 (368)
	150B	—		24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
		BP		24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
	150	6_	1❄	24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
		NB	1	24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
	150, 150B	NI		30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
85	150	—	1	16 (406)	24 (610)	10 (254)	0.75 (19)	22.5 (572)	14.5 (368)
	150B	—		24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
		BP		24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
	150	NB		24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
		6_	1❄	24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
	150, 150B	NB,NI,6P_	1❄	30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
108	150	—	1	24 (610)	30 (762)	12 (305)	0.75 (19)	28.5 (724)	22.5 (572)
		BP		30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
		NB		30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
	150B	—		30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
		NB,NI		36 (914)	51 (1295)	14 (356)		49.5 (1257)	34.5 (876)
135	150	—	1	24 (610)	30 (762)	12 (305)	0.75 (19)	28.5 (724)	22.5 (572)
		BP		30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
	150B	—		30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
	150	NB		30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
	150B	NB,NI		36 (914)	51 (1295)	14 (356)		49.5 (1257)	34.5 (876)
201	150	—	1	30 (762)	38 (965)	14 (356)	0.75 (19)	36.5 (927)	28.5 (724)
	150,150B	NB,NI,BP,6_		36 (914)	51 (1295)	14 (356)		49.5 (1257)	34.5 (876)
251	150	—	1	30 (762)	38 (965)	14 (356)	0.75 (19)	36.5 (927)	28.5 (724)
	150,150B	NB,NI,BP,6_		36 (914)	51 (1295)	14 (356)		49.5 (1257)	34.5 (876)
317	150	NB,NI,BP,6_	1	36 (914)	51 (1295)	14 (356)	0.75 (19)	49.5 (1257)	34.5 (876)
	150B	NB,NI,BP,6_		36 (914)	60 (1524)	14 (356)		58.5 (1486)	34.5 (876)
361	150	NB,NI,BP,6_	1	36 (914)	51 (1295)	14 (356)	0.75 (19)	49.5 (1257)	34.5 (876)
	150B	NB,NI,BP,6_		36 (914)	60 (1524)	14 (356)		58.5 (1486)	34.5 (876)
480	150	—	1	36 (914)	51 (1295)	14 (356)	0.75 (19)	49.5 (1257)	34.5 (876)
	150, 150B	BP,NB,NI		36 (914)	60 (1524)	14 (356)		58.5 (1486)	34.5 (876)
625	150	—	4	35 (889)	91.5 (2324)	20 (508)	—	—	—
		BP,NB		60 (1524)	91.5 (2324)	20 (508)			
	150B	—		60 (1524)	91.5 (2324)	20 (508)			
		NB		90 (2286)	91.5 (2324)	20 (508)			
780	150	—	4	35 (889)	91.5 (2324)	20 (508)	—	—	—
		BP,NB		60 (1524)	91.5 (2324)	20 (508)			
	150B	—		60 (1524)	91.5 (2324)	20 (508)			
		NB		90 (2286)	91.5 (2324)	20 (508)			

✶ Extra capacity transformer may require a larger enclosure; consult your local Rockwell Automation sales office or Allen-Bradley distributor.

❄ 1 kVA control transformers or larger extra capacity transformers may require a larger enclosure; consult your local Rockwell Automation sales office or Allen-Bradley distributor.