

# SMC™ Flex Specifications

Bulletin Number 150

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## Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
Industrial Automation Wiring and Grounding Guidelines, publication <a href="#">1770-4.1</a>	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, <a href="http://www.ab.com">http://www.ab.com</a>	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at <http://www.rockwellautomation.com/literature/>. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.





Features	SMC™ Flex
	200...690V 1...1250 A
Soft Start	S
Kickstart	S
Current Limit	S
Dual Ramp Start	S
Full Voltage	S
Soft Stop	S
Pump Control	O
Preset Slow Speed	S
Linear Acceleration/Deceleration	S
SMB™ Smart Motor Braking	O
Accu-Stop™	O
Slow Speed with Braking	O
Integrated Bypass Contactor	S
Integrated Motor Overload Protection	S
DPI Communication	S
Metering	S
Motor Winding Heater Function	‡
Diagnostic Faults and Alarms	S
Parameter Configuration/Programming	S
Human Interface Module (HIM)	O
Configuration Software: Drives Explorer and Drives Executive	O
Network Communications	O
Inside Delta Connection	S
Standards Compliance: CE Marked per Low Voltage Directive 73/23/EEC, 93/68/EEC CSA Certified (File No. LR 1234) UL Listed (File No. E96956)	S

S = Standard Feature  
 O = Optional Feature  
 ‡ Option using a Bulletin 1410 motor winding heater.

**Standards Compliance**

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

**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

**Certifications**

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

**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.

## 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 inputs and four 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 on page 22 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 19 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

*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	—	—	—	—	—	—

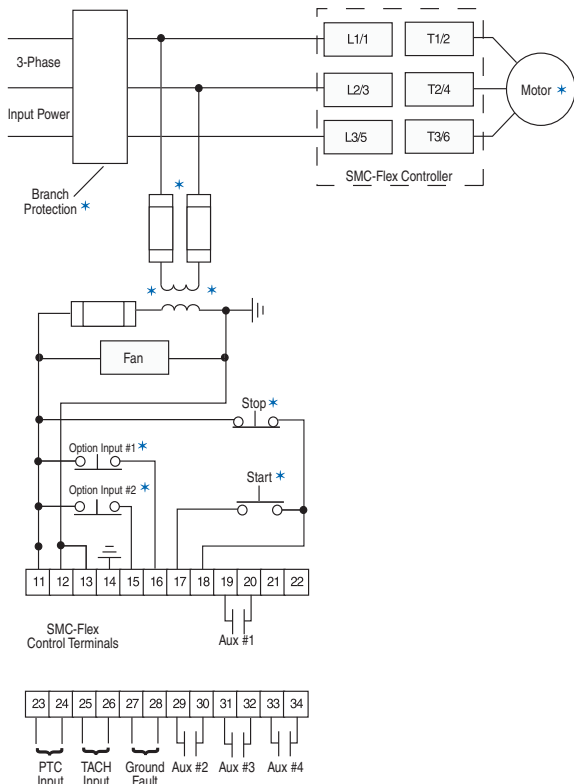
*g*

Options (see page 19 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.	

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.
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		
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.

★ IP20 when largest wire size is used. Rating is possible with smaller size wire by using an insulated ferrule or lug, which reduces the largest size wire to the size used in the application.

‡ IP2X when largest wire size is used with Cat. No. 150-TC terminal covers. When other wire sizes are used, Cat. No. 150-TC terminal covers provide dead front protection only.

Electrical Ratings							
SCPD Performance 200...600V		Type 1 $\clubsuit$ $\Delta$					
SCCR List $\star$		Max. Standard Available Fault	Max. Standard Fuse [A] $\ddagger$	Max. Standard Available Fault	Max. Circuit Breaker [A]	Max. High Fault	Max. Fuse [A] $\S$
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 $\clubsuit$					
SCCR List $\star$		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			

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

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

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

$\clubsuit$  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.

$\Delta$  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](http://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) <sup>Δ</sup>	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 $\Omega$ $\pm$ 150 $\Omega$				
	Reset Resistance		1600 $\Omega$ $\pm$ 100 $\Omega$				
	Short-Circuit Trip Resistance		25 $\Omega$ $\pm$ 10 $\Omega$				
	Max. Voltage at PTC Terminals ( $R_{PTC} = 4 \text{ k}\Omega$ )		< 7.5V				
	Max. Voltage at PTC Terminals ( $R_{PTC} = \text{open}$ )		30V				
	Max. No. of Sensors.		6				
	Max. Cold Resistance of PTC Sensor Chain		1500 $\Omega$				
Response Time		800 ms					
Tach Input		0...5V DC, 4.5V DC = 100% Speed					

<sup>Δ</sup> 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 mm <sup>2</sup> (14...3/0 AWG) Line Lower — 0.8...2.5 mm <sup>2</sup> (18...14 AWG) Load Upper — 2.5...50 mm <sup>2</sup> (14...1 AWG) Load Lower — 0.8...2.5 mm <sup>2</sup> (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]	5	Line	Delta
			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)	

**Approximate Dimensions and Shipping Weights**  
**Open Type Controllers**

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

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

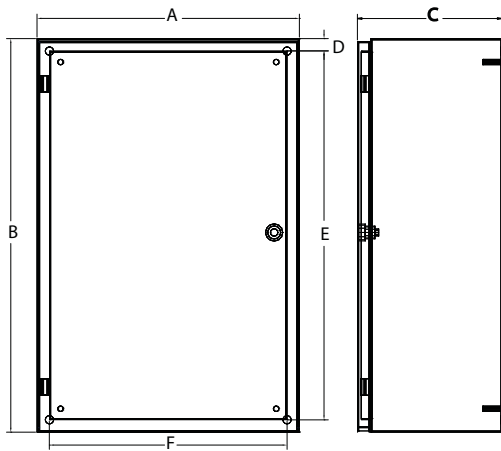


Figure 1 — Wall-Mount

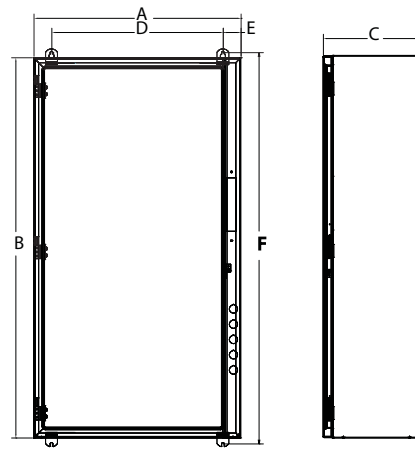


Figure 2 — Wall-Mount

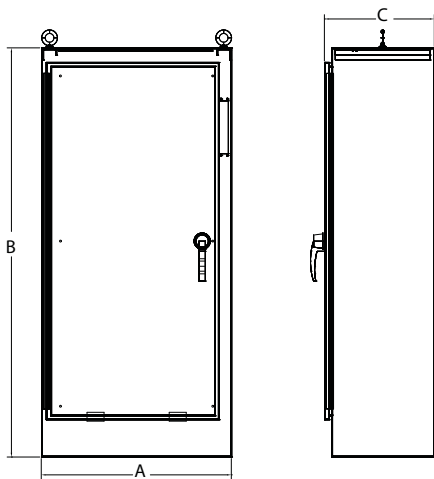


Figure 3 — Floor-Mount

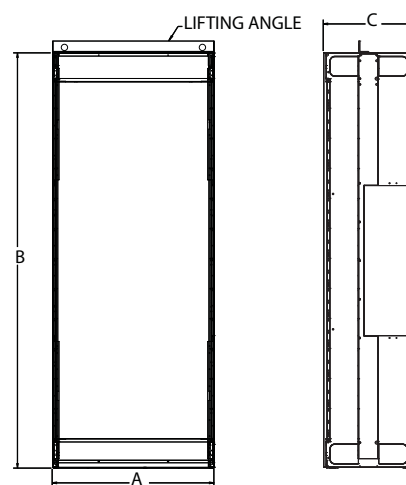


Figure 4 — Floor-Mount

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.)
<b>SMC-Flex Combination Controller</b>									
5...25	152H,152B,153H,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,152B,153H,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,153H,153B	NI, NB		30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
85	153H,153B	—	1	16 (406)	24 (610)	10 (254)	0.75 (19)	22.5 (572)	14.5 (368)
	152H,152B	—		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)
	152H,152B,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)
	152H,152B,153H,153B	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)
	152H,152B,153H,153B	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)
	152H,152B,153H,153B	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	—	2	36 (914)	60 (1524)	14 (356)	33.88 (861)	58.5 (1486)	34.5 (876)
		—		38 (965)	60 (1524)	17 (431)		1.75 (45)	61.69 (1567)
		152H,152B	6_	38 (965)	60 (1524)	17 (431)	1.75 (45)	61.69 (1567)	
	152H,152B,153B	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	—	2	36 (914)	60 (1524)	14 (356)	33.88 (861)	58.5 (1486)	34.5 (876)
		—		38 (965)	60 (1524)	17 (431)		1.75 (45)	61.69 (1567)
		152H, 152B	6_	38 (965)	60 (1524)	17 (431)	1.75 (45)	61.69 (1567)	
	152H,152B,153H,153B	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)	33.88 (861)	58.5 (1486)	34.5 (876)
		—		38 (965)	60 (1524)	17 (431)		1.75 (45)	61.69 (1567)
	152H	BP	2★§	38 (965)	60 (1524)	17 (431)	33.88 (861)	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)	—	—	—
	152H,152B,153H,153B	NB		105 (2664)	91.5 (2324)	20 (508)			
	152H	—		55 (1397)	91.5 (2324)	20 (508)			
		BP		70 (1778)	91.5 (2324)	20 (508)			
	153H,153B	—	65 (1651)	91.5 (2324)	20 (508)	—	—	—	
780	152H,152B	—	4	55 (1397)	91.5 (2324)	20 (508)	—	—	—
	152H,152B	BP,NI		70 (1778)	91.5 (2324)	20 (508)			
	152H,152B,153H,153B	NB		105 (2664)	91.5 (2324)	20 (508)			
	153H,153B	—		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...450 Hp @ 600V

♣ 200 Hp @ 240V AC, 400 Hp @480V, 500 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.)	
<b>Non-Combination Controller</b>										
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)	12 (305)		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)	
		150, 150B	NB	1	24 (610)	30 (762)		12 (305)	28.5 (724)	22.5 (572)
			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	1‡	24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)	
		150, 150B		6_	24 (610)	30 (762)		12 (305)	28.5 (724)	22.5 (572)
				NB,NI,6P_	1‡	30 (762)		38 (965)	14 (356)	36.5 (927)
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	—	1	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)	
				—	24 (610)	30 (762)		12 (305)	28.5 (724)	22.5 (572)
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)	
				NB	30 (762)	38 (965)		14 (356)	36.5 (927)	28.5 (724)
	150B	—	1	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)	
				—	30 (762)	38 (965)		14 (356)	36.5 (927)	28.5 (724)
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.

## Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

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