

ArmorStart® Distributed Motor Controller	Page 4-2
• Bulletin 280/281	Page 4-3
• Bulletin 283	Page 4-18
• Bulletin 284	Page 4-34
• Bulletin 100 DSA I/O for Distributed Starters.....	Web†
 ArmorConnect® Three-Phase Power Media	 Page 4-58
• Three-Phase Power Trunk Cables.....	Page 4-61
• Three-Phase Power Drop Cables.....	Page 4-62
• Three-Phase Power Tees and Reducers	Page 4-63
• Three-Phase Power Receptacles	Page 4-65
 ArmorConnect® Control Power Media	 Page 4-58
• Control Power Trunk and Drop Cables	Page 4-67
• Control Power T-Ports	Page 4-68
• Control Power Receptacles	Page 4-69
• Control Power Shorting Plugs	Page 4-70
 Solid-State Reduced Voltage Starters	 Page 4-73
• SMC™ Flex Smart Motor Controller	Page 4-76
• SMC™-3 Smart Motor Controller	Page 4-98
• SMC™ Dialog Plus Smart Motor Controller	Page 4-120
• STC™ Starting Torque Controller	Page 4-136
 Solid-State Contactors	
• Bulletin 156.....	Page 4-139

† Information for this product line is available on the Industrial Controls Catalog website: www.ab.com/catalogs.

ArmorStart® Distributed Motor Controller

Product Overview

Distributed Motor Controllers



Bulletin	280D/281D	280A/281A	283D	283A	284D	284A
Horsepower Range:						
0.5...10 Hp (0.37...7.5 kW)	✓	✓	—	—	—	—
0.5...10 Hp (0.37...5.5 kW)	—	—	✓	✓	—	—
0.5...5 Hp (0.4...3.0 kW)	—	—	—	—	✓	✓
Starting Method:						
Full-Voltage and Reversing	✓	✓	—	—	—	—
Current Limit, Soft Start including Soft Stop	—	—	✓	✓	—	—
Sensorless Vector Performance	—	—	—	—	✓	✓
Sensorless Vector Control	—	—	—	—	✓	✓
Environmental Rating:						
IP67/NEMA Type 4	✓	✓	✓	✓	✓	✓
NEMA Type 4X	✓	—	✓	—	✓	—
Control Voltage Ratings: 24V DC, 120V AC, and 240V AC	✓	✓	✓	✓	✓	✓
Operational Voltage Ratings:						
200...480V AC	✓	✓	✓	✓	—	—
200...240V AC	—	—	—	—	✓	✓
380...480V AC	—	—	—	—	✓	✓
500...575V AC	✓	✓	✓	✓	✓	✓
Rated for Group Motor Installations	✓	✓	✓	✓	✓	✓
Network Communications with DeviceNet™ including DeviceLogix™	✓	✓	✓	✓	✓	✓
I/O Capability:						
Four Inputs and Two Outputs	✓	—	✓	—	✓	—
Two Outputs	—	✓	—	✓	—	✓
Network Communications via ArmorPoint® Distributed I/O Products (DeviceNet, EtherNet, ControlNet™)	—	✓	—	✓	—	✓
I/O Expansion with ArmorPoint Distributed I/O Products	✓	✓	✓	✓	✓	✓
LED Status Indication	✓	✓	✓	✓	✓	✓
Gland Plate Entry:						
Conduit Entrance	✓	✓	✓	✓	✓	✓
ArmorConnect Power Media	✓	✓	✓	✓	✓	✓
Quick Disconnects (I/O, Communications, Motor Connection, Three-Phase and Control Power)	✓	✓	✓	✓	✓	✓
Extended Length Motor and Brake Cables	✓	✓	✓	✓	✓	✓
Factory Installed Options:						
HOA Keypad	✓	✓	✓	✓	✓	✓
Safety Monitor	✓	✓	✓	✓	✓	✓
Control Brake Contactor	—	—	—	—	✓	✓
Source Brake Contactor	—	—	✓	✓	✓	✓
Dynamic Brake Connector	—	—	—	—	✓	✓
Output Contactor	—	—	—	—	✓	✓
EMI Filter	—	—	—	—	✓	✓
Shielded Motor Cable	—	—	—	—	✓	✓
0...10V Analog Input	—	—	—	—	✓	✓
Product Selection	Page 4-4		Page 4-20		Page 4-36	



280/281 ArmorStart Distributed Motor Controller

- On-Machine starting solution
- Full-voltage and reversing
- Horsepower range 0.5...10 Hp (0.37...7.5 kW)
- Robust IP67/NEMA Type 4 and NEMA Type 4X enclosure rating
- Modular plug and play design
- Quick disconnect connections for I/O, communications, motor, three-phase and control power
- Gland plate entry: conduit entrance or ArmorConnect power media
- Four inputs and two outputs (expandable with ArmorPoint)
- LED status indication
- DeviceNet communications
- DeviceLogix component technology
- Peer-to-peer communication (ZIP)
- Connectivity to ArmorPoint distributed I/O products
- ControlNet and EtherNet communications via ArmorPoint
- Factory installed options:
 - Hand/Off/Auto (HOA) keypad configuration
 - Safety monitor

Table of Contents

Product Overview this page
 Product Selection 4-4
 Options/Accessories 4-7
 Specifications..... 4-11
 Approx. Dimensions . 4-14

Standards Compliance

UL 508
 CSA C22.2, No. 14
 EN/IEC 60947-1
 CE Marked per Low Voltage Directive 73/23/EEC and EMC Directive 89/336/EEC

Certifications

cULus (File No. E3125,
 Guides NLDX, NLDX7)

Description

The Bulletin 280/281 ArmorStart Distributed Motor Controller is an integrated, pre-engineered, starter for full-voltage and reversing applications. The ArmorStart offers a robust IP67/NEMA Type 4 enclosure design, which is suitable for water wash-down environments. The ArmorStart products are also offered with NEMA Type 4X rating, suitable for environment wash down with caustic chemicals used in the food and beverage industry. The wash-down rating is 1000 psi for the NEMA Type 4X rated devices. The modular plug-and-play design offers simplicity in wiring the installation. The quick disconnects for the I/O, communications, and motor connection reduce the wiring time and eliminate wiring errors. The ArmorStart offers as standard, four DC inputs and two relay outputs to be used with sensors and actuators respectively, for monitoring and controlling the application process. The ArmorStart's LED status indication and built-in diagnostics capabilities allows ease of maintenance and troubleshooting. The optional Hand/Off/Auto (HOA) keypad allows for local start/stop control at the ArmorStart Distributed Motor Controller.

The Bulletin 280/281 ArmorStart Distributed Motor Controller offers short-circuit protection per UL 508 and IEC 60947. The ArmorStart is rated for local-disconnect service by incorporating the Bulletin 140 Motor Protector as the local-disconnect, eliminating the need for additional components. The ArmorStart Distributed Motor Controllers are suitable for group motor installations.

Mode of Operation

Full-Voltage Start

This method is used in applications requiring across-the-line starting. Full in-rush current and locked-rotor torque are realized. The ArmorStart Bulletin 280 offers full-voltage starting, and the Bulletin 281 offers full-voltage starting for reversing applications.

Description of Features

Overload Protection

The Bulletin 280/281 ArmorStart Distributed Motor Controller incorporates, as standard, electronic motor overload protection. This overload protection is accomplished electronically with an I^2t algorithm. The ArmorStart's overload protection is programmable via the communication network providing the user with flexibility. The overload trip class can be selected for class 10, 15, or 20 protection. Ambient insensitivity is inherent in the electronic design of the overload.

Inputs

The inputs are single keyed (two inputs per connector), which are sourced from DeviceNet power (24V DC), with LED status indication.

Outputs

Two dual-key relay output connectors are supplied as standard. The outputs are sourced from the control voltage power, which can be either, 24V DC, 120V AC, or 240V AC with LED status indication.

Motor Cable

With every Bulletin 280/281 ArmorStart Distributed Motor Controller, a 3-meter unshielded 4-conductor cordset is provided with each unit as standard.

Gland Plate Entrance

The ArmorStart product offers two different methods for connecting incoming three-phase and control power to the device. One method offered is the traditional conduit entrance which provides a 3/4 and 1 in. conduit hole opening for wiring three-phase and control power. The second method offers connectivity to the ArmorConnect power media. Factory installed receptacles are provided for connectivity to both three-phase and control power media.

LED Status Indication

The LED Status Indication provides four status LEDs and a Reset button. The LEDs provide status indication for the following:

- **POWER LED**
The LED is illuminated solid green when control power is present and with the proper polarity
- **RUN LED**
This LED is illuminated solid green when a start command and control power are present
- **NETWORK LED**
This bicolor (red/green) LEDs indicates the status of the communication link
- **FAULT LED**
Indicates Controller Fault (trip) condition
- The "Reset Button" as a local trip reset.

Fault Diagnostics

Fault diagnostics capabilities built in the ArmorStart Distributed Motor Controller help you pinpoint a problem for easy troubleshooting and quick re-starting.

- Short Circuit
- Overload
- Phase Loss
- Control Power Loss
- Control Power Fuse Detection
- I/O Fault
- Output Power Fuse Detection
- Overtemperature
- Phase Imbalance
- DeviceNet Power Loss
- EEPROM Fault
- Hardware Fault

Network and Expandable I/O Capabilities

The Bulletin 280D/281D ArmorStart Distributed Motor Controller delivers enhanced control to access parameter settings and provides fault diagnostics and remote start/stop control. DeviceNet is the communication protocol provided with the ArmorStart, including DeviceLogix.

The Bulletin 280A/281A ArmorStart Distributed Motor Controller allows connectivity to the ArmorPoint backplane. The ArmorPoint I/O system can communicate using DeviceNet, ControlNet, or EtherNet communication protocols. In addition to the different network protocols, the ArmorPoint Distributed I/O products allow the I/O capability to be expanded beyond the standard two outputs. The two dual-key relay output connectors are supplied as standard. The outputs are sourced from the control voltage power of 24V DC, 120V AC, or 240V AC. LED status indication is also provided. When using the ArmorPoint, a maximum of two ArmorPoint Distributed Motor Controllers can be connected to the ArmorPoint Distributed I/O product.

ArmorStart® Distributed Motor Controller

Catalog Number Explanation

Cat. No. Explanation

Examples given in this section are for reference purposes. This basic explanation should not be used for product selection; not all combinations will produce a valid catalog number.

280 - **D** - **F** - **12Z** - **10** - **C** - **CR** - **Option 1** - **Option 2**

a *b* *c* *d* *e* *f* *g* *h* *i*

a

Bulletin Number	
280	Full Voltage Starter
281	Reversing Starter

e

Short Circuit Protection (Motor Circuit Protector)	
10	10 A Rated Device
25	25 A Rated Device

h

Option 1	
3	Hand/Off/Auto Selector Keypad
3FR	Hand/Off/Auto Selector Keypad with Forward/Reverse

b

Communications	
D	DeviceNet™
A	ArmorPoint

f

Overload Selection Current Range	
A	0.24...1.2 A
B	0.5...2.5 A
C	1.1...5.5 A
D	3.2...16 A

i

Option 2	
SM	Safety Monitor

c

Enclosure Type	
F	Type 4 (IP67)
S	Type 4X

d

Contactor Size/Control Voltage		
24V DC	120V AC	240V AC
12Z	12D	12B
23Z	23D	23B

g

Control and 3-Phase Power Connections/Motor Cable Connection (CR: Conduit/Round Media) or (RR: Round/Round Media)				
Code		Description		
		Control Power	3-Phase Power	Motor Cable
CR	blank	Conduit Entrance	Conduit Entrance	3 m, unshielded cordset male 90°
CR	W *	Conduit Entrance	Conduit Entrance	No cable
RR	blank	Round Media (Male Receptacle)	Round Media (Male Receptacle)	3 m, unshielded cordset male 90°
RR	W *	Round Media (Male Receptacle)	Round Media (Male Receptacle)	No cable

* See Accessories on page 4-7 for extended motor cable lengths.

Product Selection

Full-voltage starters — IP67/NEMA Type 4 with conduit entrance and DeviceNet communications, Up to 575V AC

Current Rating [A]	kW		Hp				24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
	230V AC 50 Hz	400V AC 50 Hz	200V AC 60 Hz	230V AC 60 Hz	460V AC 60 Hz	575V AC 60 Hz	Cat. No.	Cat. No.	Cat. No.
0.24...1.2	0.18	0.37	—	—	0.5	0.5	280D-F12Z-10A-CR	280D-F12D-10A-CR	280D-F12B-10A-CR
0.5...2.5	0.37	0.75	0.5	0.5	1	1.5	280D-F12Z-10B-CR	280D-F12D-10B-CR	280D-F12B-10B-CR
1.1...5.5	1.1	2.2	1	1	3	3	280D-F12Z-10C-CR	280D-F12D-10C-CR	280D-F12B-10C-CR
3.2...16	4	7.5	3	5	10	10	280D-F23Z-25D-CR	280D-F23D-25D-CR	280D-F23B-25D-CR

Full-voltage Starters — IP67/NEMA Type 4 with conduit entrance and ArmorPoint communications, Up to 575V AC

Current Rating [A]	kW		Hp				24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
	230V AC 50 Hz	400V AC 50 Hz	200V AC 60 Hz	230V AC 60 Hz	460V AC 60 Hz	575V AC 60 Hz	Cat. No.	Cat. No.	Cat. No.
0.24...1.2	0.18	0.37	—	—	0.5	0.5	280A-F12Z-10A-CR	280A-F12D-10A-CR	280A-F12B-10A-CR
0.5...2.5	0.37	0.75	0.5	0.5	1	1.5	280A-F12Z-10B-CR	280A-F12D-10B-CR	280A-F12B-10B-CR
1.1...5.5	1.1	2.2	1	1	3	3	280A-F12Z-10C-CR	280A-F12D-10C-CR	280A-F12B-10C-CR
3.2...16	4	7.5	3	5	10	10	280A-F23Z-25D-CR	280A-F23D-25D-CR	280A-F23B-25D-CR

Full-voltage starters — IP67/NEMA Type 4 with quick disconnects for ArmorConnect power media and DeviceNet communications, Up to 575V AC

Current Rating [A]	kW		Hp				24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
	230V AC 50 Hz	400V AC 50 Hz	200V AC 60 Hz	230V AC 60 Hz	460V AC 60 Hz	575V AC 60 Hz	Cat. No.	Cat. No.	Cat. No.
0.24...1.2	0.18	0.37	—	—	0.5	0.5	280D-F12Z-10A-RR	280D-F12D-10A-RR	280D-F12B-10A-RR
0.5...2.5	0.37	0.75	0.5	0.5	1	1.5	280D-F12Z-10B-RR	280D-F12D-10B-RR	280D-F12B-10B-RR
1.1...5.5	1.1	2.2	1	1	3	3	280D-F12Z-10C-RR	280D-F12D-10C-RR	280D-F12B-10C-RR
3.2...16	4	7.5	3	5	10	10	280D-F23Z-25D-RR	280D-F23D-25D-RR	280D-F23B-25D-RR

Full-voltage starters — IP67/NEMA Type 4 with quick disconnects for ArmorConnect power media and ArmorPoint communications, Up to 575V AC

Current Rating [A]	kW		Hp				24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
	230V AC 50 Hz	400V AC 50 Hz	200V AC 60 Hz	230V AC 60 Hz	460V AC 60 Hz	575V AC 60 Hz	Cat. No.	Cat. No.	Cat. No.
0.24...1.2	0.18	0.37	—	—	0.5	0.5	280A-F12Z-10A-RR	280A-F12D-10A-RR	280A-F12B-10A-RR
0.5...2.5	0.37	0.75	0.5	0.5	1	1.5	280A-F12Z-10B-RR	280A-F12D-10B-RR	280A-F12B-10B-RR
1.1...5.5	1.1	2.2	1	1	3	3	280A-F12Z-10C-RR	280A-F12D-10C-RR	280A-F12B-10C-RR
3.2...16	4	7.5	3	5	10	10	280A-F23Z-25D-RR	280A-F23D-25D-RR	280A-F23B-25D-RR

Full-voltage starters — NEMA Type 4X with conduit entrance and DeviceNet communications, Up to 575V AC

Current Rating [A]	kW		Hp				24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
	230V AC 50 Hz	400V AC 50 Hz	200V AC 60 Hz	230V AC 60 Hz	460V AC 60 Hz	575V AC 60 Hz	Cat. No.	Cat. No.	Cat. No.
0.24...1.2	0.18	0.37	—	—	0.5	0.5	280D-S12Z-10A-CR	280D-S12D-10A-CR	280D-S12B-10A-CR
0.5...2.5	0.37	0.75	0.5	0.5	1	1.5	280D-S12Z-10B-CR	280D-S12D-10B-CR	280D-S12B-10B-CR
1.1...5.5	1.1	2.2	1	1	3	3	280D-S12Z-10C-CR	280D-S12D-10C-CR	280D-S12B-10C-CR
3.2...16	4	7.5	3	5	10	10	280D-S23Z-25D-CR	280D-S23D-25D-CR	280D-S23B-25D-CR

Full-voltage starters — NEMA Type 4X with quick disconnects for ArmorConnect power media and DeviceNet communications, Up to 575V AC

Current Rating [A]	kW		Hp				24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
	230V AC 50 Hz	400V AC 50 Hz	200V AC 60 Hz	230V AC 60 Hz	460V AC 60 Hz	575V AC 60 Hz	Cat. No.	Cat. No.	Cat. No.
0.24...1.2	0.18	0.37	—	—	0.5	0.5	280D-S12Z-10A-RR	280D-S12D-10A-RR	280D-S12B-10A-RR
0.5...2.5	0.37	0.75	0.5	0.5	1	1.5	280D-S12Z-10B-RR	280D-S12D-10B-RR	280D-S12B-10B-RR
1.1...5.5	1.1	2.2	1	1	3	3	280D-S12Z-10C-RR	280D-S12D-10C-RR	280D-S12B-10C-RR
3.2...16	4	7.5	3	5	10	10	280D-S23Z-25D-RR	280D-S23D-25D-RR	280D-S23B-25D-RR

Reversing starters — IP67/NEMA Type 4 with conduit entrance and DeviceNet communications, Up to 575V AC

Current Rating [A]	kW		Hp				24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
	230V AC 50 Hz	400V AC 50 Hz	200V AC 60 Hz	230V AC 60 Hz	460V AC 60 Hz	575V AC 60 Hz	Cat. No.	Cat. No.	Cat. No.
0.24...1.2	0.18	0.37	—	—	0.5	0.5	281D-F12Z-10A-CR	281D-F12D-10A-CR	281D-F12B-10A-CR
0.5...2.5	0.37	0.75	0.5	0.5	1	1.5	281D-F12Z-10B-CR	281D-F12D-10B-CR	281D-F12B-10B-CR
1.1...5.5	1.1	2.2	1	1	3	3	281D-F12Z-10C-CR	281D-F12D-10C-CR	281D-F12B-10C-CR
3.2...16	4	7.5	3	5	10	10	281D-F23Z-25D-CR	281D-F23D-25D-CR	281D-F23B-25D-CR

Reversing starters — IP67/NEMA Type 4 with conduit entrance and ArmorPoint communications, Up to 575V AC

Current Rating [A]	kW		Hp				24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
	230V AC 50 Hz	400V AC 50 Hz	200V AC 60 Hz	230V AC 60 Hz	460V AC 60 Hz	575V AC 60 Hz	Cat. No.	Cat. No.	Cat. No.
0.24...1.2	0.18	0.37	—	—	0.5	0.5	281A-F12Z-10A-CR	281A-F12D-10A-CR	281A-F12B-10A-CR
0.5...2.5	0.37	0.75	0.5	0.5	1	1.5	281A-F12Z-10B-CR	281A-F12D-10B-CR	281A-F12B-10B-CR
1.1...5.5	1.1	2.2	1	1	3	3	281A-F12Z-10C-CR	281A-F12D-10C-CR	281A-F12B-10C-CR
3.2...16	4	7.5	3	5	10	10	281A-F23Z-25D-CR	281A-F23D-25D-CR	281A-F23B-25D-CR

Reversing starters — IP67/NEMA Type 4 with quick disconnects for ArmorConnect power media and DeviceNet communications, Up to 575V AC

Current Rating [A]	kW		Hp				24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
	230V AC 50 Hz	400V AC 50 Hz	200V AC 60 Hz	230V AC 60 Hz	460V AC 60 Hz	575V AC 60 Hz	Cat. No.	Cat. No.	Cat. No.
0.24...1.2	0.18	0.37	—	—	0.5	0.5	281D-F12Z-10A-RR	281D-F12D-10A-RR	281D-F12B-10A-RR
0.5...2.5	0.37	0.75	0.5	0.5	1	1.5	281D-F12Z-10B-RR	281D-F12D-10B-RR	281D-F12B-10B-RR
1.1...5.5	1.1	2.2	1	1	3	3	281D-F12Z-10C-RR	281D-F12D-10C-RR	281D-F12B-10C-RR
3.2...16	4	7.5	3	5	10	10	281D-F23Z-25D-RR	281D-F23D-25D-RR	281D-F23B-25D-RR

Reversing starters — IP67/NEMA Type 4 with quick disconnects for ArmorConnect power media and ArmorPoint communications, Up to 575V AC

Current Rating [A]	kW		Hp				24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
	230V AC 50 Hz	400V AC 50 Hz	200V AC 60 Hz	230V AC 60 Hz	460V AC 60 Hz	575V AC 60 Hz	Cat. No.	Cat. No.	Cat. No.
0.24...1.2	0.18	0.37	—	—	0.5	0.5	281A-F12Z-10A-RR	281A-F12D-10A-RR	281A-F12B-10A-RR
0.5...2.5	0.37	0.75	0.5	0.5	1	1.5	281A-F12Z-10B-RR	281A-F12D-10B-RR	281A-F12B-10B-RR
1.1...5.5	1.1	2.2	1	1	3	3	281A-F12Z-10C-RR	281A-F12D-10C-RR	281A-F12B-10C-RR
3.2...16	4	7.5	3	5	10	10	281A-F23Z-25D-RR	281A-F23D-25D-RR	281A-F23B-25D-RR

4

Reversing starters — NEMA Type 4X with conduit entrance and DeviceNet communications, Up to 575V AC

Current Rating [A]	kW		Hp				24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
	230V AC 50 Hz	400V AC 50 Hz	200V AC 60 Hz	230V AC 60 Hz	460V AC 60 Hz	575V AC 60 Hz	Cat. No.	Cat. No.	Cat. No.
0.24...1.2	0.18	0.37	—	—	0.5	0.5	281D-S12Z-10A-CR	281D-S12D-10A-CR	281D-S12B-10A-CR
0.5...2.5	0.37	0.75	0.5	0.5	1	1.5	281D-S12Z-10B-CR	281D-S12D-10B-CR	281D-S12B-10B-CR
1.1...5.5	1.1	2.2	1	1	3	3	281D-S12Z-10C-CR	281D-S12D-10C-CR	281D-S12B-10C-CR
3.2...16	4	7.5	3	5	10	10	281D-S23Z-25D-CR	281D-S23D-25D-CR	281D-S23B-25D-CR

Reversing starters — NEMA Type 4X with quick disconnects for ArmorConnect power media and DeviceNet communications, Up to 575V AC

Current Rating [A]	kW		Hp				24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
	230V AC 50 Hz	400V AC 50 Hz	200V AC 60 Hz	230V AC 60 Hz	460V AC 60 Hz	575V AC 60 Hz	Cat. No.	Cat. No.	Cat. No.
0.24...1.2	0.18	0.37	—	—	0.5	0.5	281D-S12Z-10A-RR	281D-S12D-10A-RR	281D-S12B-10A-RR
0.5...2.5	0.37	0.75	0.5	0.5	1	1.5	281D-S12Z-10B-RR	281D-S12D-10B-RR	281D-S12B-10B-RR
1.1...5.5	1.1	2.2	1	1	3	3	281D-S12Z-10C-RR	281D-S12D-10C-RR	281D-S12B-10C-RR
3.2...16	4	7.5	3	5	10	10	281D-S23Z-25D-RR	281D-S23D-25D-RR	281D-S23B-25D-RR

Options – Factory Installed

Description		Cat. No. Modification										
	Hand/Off/Auto Selector Keypad	-3										
	Hand/Off/Auto Selector Keypad with Forward/Reverse Function	-3FR										
	Safety Monitor	-SM										
	Supplied without motor cable	<table border="1"> <thead> <tr> <th>Enclosure Rating</th> <th>Cat. No.</th> </tr> </thead> <tbody> <tr> <td>IP67</td> <td rowspan="2">-CRW</td> </tr> <tr> <td>NEMA Type 4X</td> </tr> </tbody> </table>	Enclosure Rating	Cat. No.	IP67	-CRW	NEMA Type 4X					
Enclosure Rating	Cat. No.											
IP67	-CRW											
NEMA Type 4X												
	Connectivity to ArmorConnect Power Media supplied without motor cable	<table border="1"> <thead> <tr> <th>Short Circuit Protection Rating</th> <th>Enclosure Rating</th> <th>Cat. No.</th> </tr> </thead> <tbody> <tr> <td rowspan="2">10 A</td> <td>IP67</td> <td rowspan="4">-RRW</td> </tr> <tr> <td>NEMA Type 4X</td> </tr> <tr> <td rowspan="2">25 A</td> <td>IP67</td> </tr> <tr> <td>NEMA Type 4X</td> </tr> </tbody> </table>	Short Circuit Protection Rating	Enclosure Rating	Cat. No.	10 A	IP67	-RRW	NEMA Type 4X	25 A	IP67	NEMA Type 4X
Short Circuit Protection Rating	Enclosure Rating	Cat. No.										
10 A	IP67	-RRW										
	NEMA Type 4X											
25 A	IP67											
	NEMA Type 4X											

4

Accessories
Sealing Caps

Description	For Use With	Cat. No.
Plastic Sealing Cap (M12)*	Input I/O Connection	1485A-M12
AC Micro Aluminum Sealing Cap - External*	Output I/O Connection	889A-RMCAP
Stainless Steel Sealing Cap (M12)*	Input I/O Connection	1485AS-C3
Stainless Steel Sealing Cap (M12)*	Output I/O Connection	889AS-RMCAP

* To achieve IP67 rating, sealing caps must be installed on all unused I/O connections.
 * To achieve IP69K/NEMA 4X rating, sealing caps must be installed on all unused I/O connections.

Cables

Description	Cable Rating	Length m (ft)	Cat. No.
Extended Motor Cable Cordsets			
90° M22 Motor Cordset	IP67/NEMA Type 4	6 (19.6)	280-MTR22-M6
		14 (45.9)	280-MTR22-M14
90° M35 Motor Cordset	IP67/NEMA Type 4	6 (19.6)	280-MTR35-M6
		14 (45.9)	280-MTR35-M14
90° M22 Motor Cordset	IP69K	6 (19.6)	280S-MTR22-M6
		14 (45.9)	280S-MTR22-M14
90° M35 Motor Cordset	IP69K	6 (19.6)	280S-MTR35-M6
		14 (45.9)	280S-MTR35-M14
Motor Cable Patchcords			
90° Male/Straight Female M22	IP67/NEMA Type 4	1 (3.3)	280-MTR22-M1D
		3 (9.8)	280-MTR22-M3D
90° Male/Straight Female M35	IP67/NEMA Type 4	1 (3.3)	280-MTR35-M1D
		3 (9.8)	280-MTR35-M3D
90° Male/Straight Female M22	IP69K	1 (3.3)	280S-MTR22-M1D
		3 (9.8)	280S-MTR22-M3D
90° Male/Straight Female M35	IP69K	1 (3.3)	280S-MTR35-M1D
		3 (9.8)	280S-MTR35-M3D

ArmorPoint® Media §

Description	Length m (ft)	Cat. No.
ArmorPoint Bus Extension Cable including Terminating Resistor	1 (3.3)	280A-EXT1
Extension Cable to connect two ArmorStart Distributed Motor Controllers to ArmorPoint communication protocol	1 (3.3)	280A-EXTCABLE

§ ArmorPoint media is only available with an IP67/NEMA Type 4 rating.



DeviceNet Media

Description		Length m (ft)	Cat. No.
	KwikLink pigtail drops are Insulation Displacement Connector (IDC) with integral Class 1 round cables for interfacing devices or power supplies to flat cable	1 m (3.3)	1485P-P1E4-B1-N5
		2 m (6.5)	1485P-P1E4-B2-N5
		3 m (9.8)	1485P-P1E4-B3-N5
		6 m (19.8)	1485P-P1E4-B6-N5
	DeviceNet Mini- T-Port Tap	Left Keyway	1485P-P1N5-MN5KM
		Right Keyway	1485P-P1N5-MN5NF
Description		Connector	Cat. No.
	Grey PVC Thin Cable	Mini Straight Female Mini Straight Male	1485G-P* N5-M5
		Mini Straight Female Mini Right Angle Male	1485G-P* W5-N5
		Mini Right Angle Female Mini Straight Male	1485G-P* M5-Z5
		Mini Right Angle Female Mini Straight Male	1485G-P* W5-Z5
	Thick Cable	Mini Straight Female Mini Straight Male	1485C-P† N5-M5
		Mini Straight Female Mini Right Angle Male	1485C-P† W5-N5
		Mini Right Angle Female Mini Straight Male	1485C-P† M5-Z5
		Mini Right Angle Female Mini Straight Male	1485C-P† W5-Z5
Description		Length m (ft)	Cat. No.
	DeviceNet Configuration Terminal Used to interface with objects on a DeviceNet network. Includes 1 m communications cable.	1 m (3.3)	193-DNCT
	Communication cable, color-coded bare leads	1 m (3.3)	193-CB1
	Communication cable, microconnector (male)	1 m (3.3)	193-CM1
	Panel Mount Adapter/Door Mount Bezel Kit	—	193-DNCT-BZ1

* See publication M116-CA001_-EN-P for complete cable selection information.

* Replace symbol with desired length in meters (Example: **1485G-P1N5-M5** for a 1 m cable). Standard cable lengths: 1, 2, 3, 4, 5, and 6 m.

† Replace symbol with desired length in meters (Example: **1485C-P1N5-M5** for a 1 m cable). Standard cable lengths: 1, 2, 3, 4, 5, 6, 8, 10, 12, 18, 24, and 30 m.

Sensor Media

Description		ArmorStart I/O Connection	Pin Count	Connector	Cat. No.
	DC Micro Patchcord	Input	5-pin	Straight Female Straight Male	889D-F4ACDM- 
				Straight Female Right Angle Male	889D-F4ACDE- 
	DC Micro V-Cable	Input	5-pin	Straight Female	879D-F4ACDM- 
				Right Angle Male	879D-R4ACM- 
	AC Micro Patchcord	Output	3-pin	Straight Female Straight Male	889R-F3AERM- 
				Straight Female Right Angle Male	889R-F3AERE- 

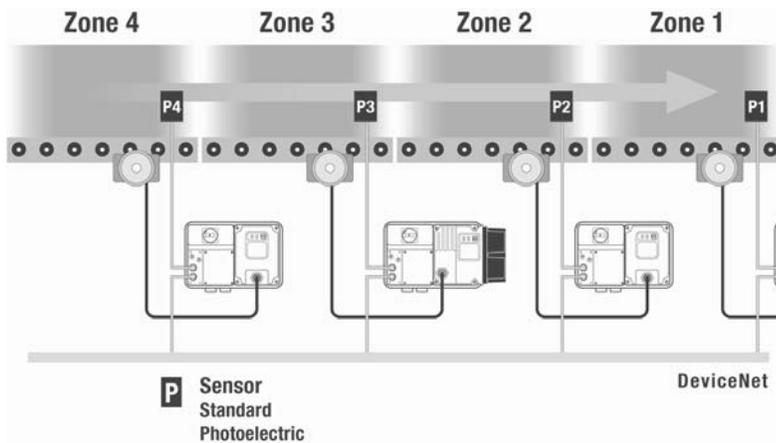
* See publication M116-CA001A-EN-P for complete cable selection information.

> Replace symbol with desired length in meters (Example: **889D-F4ACDM-1** for a 1 m cable). Standard cable lengths: 1, 2, 5, and 10 m.

NOTE: Stainless steel versions may be ordered by adding an **S** to the cat. no. (Example: **889DS-F4ACDM-1**)

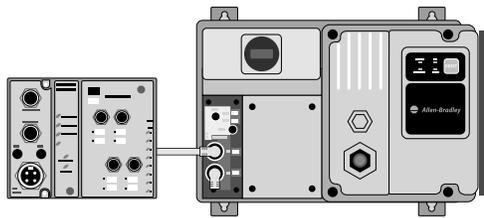
Visit our website: www.ab.com/catalogs

Peer-to-Peer Communications



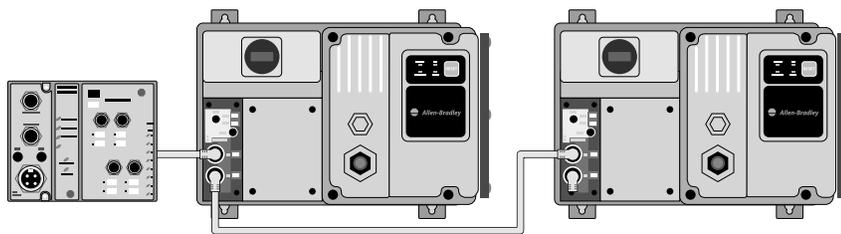
The Zone Control capabilities of ArmorStart Distributed Motor Controller is ideal for large horsepower (0.5...10 Hp) motored conveyors. The ArmorStart Distributed Motor Controllers have built-in DeviceNet Communications, DeviceLogix technology, and the added Zone Interlocking Parameters (ZIP) which allows one ArmorStart to consume data directly from up to four other DeviceNet nodes without going through the network scanner. These direct communications between conveyor zones are beneficial in a merge, diverter, and accumulation conveyor applications.

ArmorStart to ArmorPoint Connectivity - (Networks other than DeviceNet)



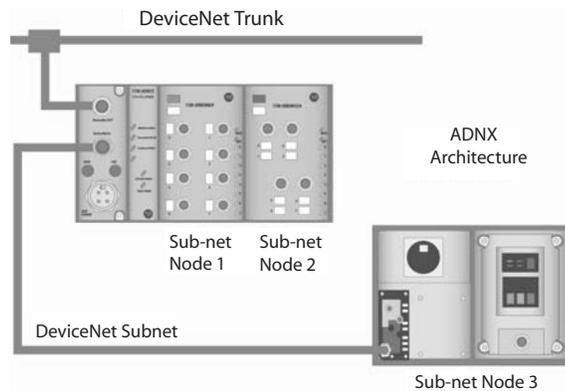
When connecting to the Bulletin 1738 ArmorPoint Distributed I/O product, a network adapter and at least one ArmorPoint Digital Output, Digital Input, Analog, AC and Relay product, or Specialty product must be selected. The ArmorPoint Distributed I/O can accommodate up to 63 modules per network node. The cable that connects the ArmorPoint Distributed I/O product to the ArmorStart Distributed Motor Controller is the Bulletin 280A-EXT1. The 280A-EXT1 includes an ArmorPoint bus extension cable and a network terminating resistor.

Note: Access to DeviceLogix programming is available with RSNetworkx for DeviceNet.



If an additional ArmorStart Distributed Motor Controller is to be connected, the Bulletin 280A-EXTCABLE will be required. A maximum of two ArmorStart Distributed Motor Controllers can be connected to the Bulletin 1738 Distributed I/O.

I/O Expansion with DeviceNet



If the I/O capability of the Bulletin 280/281D ArmorStart Distributed Motor Controller needs to be expanded beyond the standard four inputs and two outputs, the ArmorStart Distributed Motor Controller with the DeviceNet communication protocol can be configured to the ADNX Architecture, in which the ArmorStart is part of the DeviceNet subnet, using the Bulletin 1738-ADNX ArmorPoint Distributed I/O product.

Bulletin 1738 ArmorPoint Distributed I/O Products

Digital Output Products

Description	Cat. No.
24V DC, eight source output with eight M12 connectors	1738-OB8EM12
24V DC, eight source output with eight M8 connectors	1738-OB8EM8
24V DC, four source output with four M12 connectors	1738-OB4EM12
24V DC, four source output with four M8 connectors	1738-OB4EM8
24V DC, two source output with two M12 connectors	1738-OB2EM12
24V DC, two source output, 2 A prot. with two M12 connectors	1738-OB2EPM12
24V DC, four sink output with four M12 connectors	1738-OV4EM12



Digital Input Products

Description	Cat. No.
24V DC, eight sink input with four M12 connectors, two points per connector	1738-IB8M12
24V DC, eight sink input with eight M8 connectors	1738-IB8M8
24V DC, eight sink input with one M23 connector	1738-IB8M23
24V DC, four sink input with four M12 connectors	1738-IB4M12
24V DC, four sink input with four M8 connectors	1738-IB4M8
24V DC, two sink input with two M12 connectors	1738-IB2M12
24V DC, four source input with four M12 connectors	1738-IV4M12



Analog Products

Description	Cat. No.
24V DC analog current input with two M12 connectors	1738-IE2CM12
24V DC analog voltage input with two M12 connectors	1738-IE2VM12
24V DC analog current output with two M12 connectors	1738-OE2CM12
24V DC analog voltage output with two M12 connectors	1738-OE2VM12
24V DC, two thermocouple input	1738-IT2IM12
24V DC, two RTD input	1738-IR2M12



Power Supply Products

Description	Cat. No.
ArmorPoint I/O Field Potential Distributor Module	1738-FPD
24V DC Expansion Power Supply	1738-EP24DC



AC and Relay Products

Description	Cat. No.
24V DC Coil, N.O. DPST relay with two M12 connectors	1738-OW4M12
24V DC Coil, N.O. DPST relay with two AC M12 connectors	1738-OW4M12AC
120V AC, two input with two AC 4-pin M12 connectors	1738-IA2M12AC4
120V AC, two input with two AC 3-pin M12 connectors	1738-IA2M12AC3
120/230V AC, two output with two AC 3-pin M12 connectors	1738-OA2M12AC3



Specialty Products

Description	Cat. No.
ArmorPoint I/O RS-232 ASCII Serial Interface Module	1738-232ASCM12
ArmorPoint I/O RS-485 ASCII Serial Interface Module	1738-485ASCM12
24V DC Very High Speed Counter Module	1738-VHSC24M23
ArmorPoint 5V Encoder/Counter Module	1738-IJM23
ArmorPoint Synchronous Serial Interface Module with Absolute Encoder	1738-SSIM23



Adapter Products

Description	Cat. No.
ArmorPoint DeviceNet Adapter Module, Drop or Pass-through, with male and female M12 connectors	1738-ADN12
ArmorPoint DeviceNet Adapter Module, Drop only, with male M18 connector	1738-ADN18
ArmorPoint DeviceNet Adapter Module, Drop or Pass-through, with male and female M18 connectors	1738-ADN18P
ArmorPoint DeviceNet 24V DC Adapter Module with subnet expansion	1738-ADNX
ArmorPoint Redundant ControlNet Adapter Module	1738-ACNR
ArmorPoint Ethernet/IP 10/100 Mbps Adapter Module	1738-AENT



Electrical Ratings		UL/NEMA		IEC			
Power Circuit	Rated Operation Voltage	200...575V		200...575V			
	Rate Insulation Voltage	600V		600V			
	Rated Impulsed Voltage	6 kV		6 kV			
	Dielectric Withstand	2200V AC		2500V AC			
	Operating Frequency	50/60 Hz		50/60 Hz			
	Utilization Category	N/A		AC-3			
	Protection Against Shock	N/A		IP2X			
Control Circuit	Rated Operation Voltage	24V DC (+10%, -15%) A2 (should be grounded at voltage source)					
		120V AC (+10%, -15%) A2 (should be grounded at voltage source)					
		240V AC (+10%, -15%) A2 (should be grounded at voltage source)					
	Rate Insulation Voltage	250V			250V		
	Rated Impulsed Voltage	—			4 kV		
	Dielectric Withstand	1500V AC			2000V AC		
	Overvoltage Category	—			III		
Short Circuit Protection	SCPD Performance Type 1	Current Rating	Voltage	480Y/277V	480/480V	600Y/347V	600V
		0.24...1.2 A	Sym. Amps RMS	65 kA	65 kA	30 kA	30 kA
		0.5...2.5 A					
		1.1...5.5 A					
	3.2...16 A	30 kA	30 kA	30 kA	30 kA		
SCPD List	Size per NEC Group Motor				—		

Power Requirements							
	Units	W/O HOA			W/ HOA		
Control Voltage	Volts	24V DC	120V AC	240V AC	24V DC	120V AC	240V AC
Contactors (Pick Up)	Amps	3.000	0.583	0.292	3.000	0.583	0.292
Contactors (Hold In)	Amps	0.038	0.075	0.038	0.063	0.075	0.038
Total Control Power (Pick Up)	VA (W)	(72.00 W)	70	70	(76.00 W)	83	84
Total Control Power (Hold In)	VA (W)	(0.91 W)	9	9	(5.58 W)	22	23

External Devices powered by Control Voltage							
Outputs (2) (1 A max. each)	Amps	2	2	2	2	2	2
Total Control (Pick Up) with max outputs	VA (W)	(120.00 W)	310	550	(66.00 W)	336	579
Total Control (Hold In) with max outputs	VA (W)	(49.00 W)	249	489	(58.00 W)	275	518

Input Ratings	Rated Operation Voltage	24V DC						
	Input On-State Voltage Range	10...26V DC						
	Input On-State Current	3.0 mA @ 10V DC						
		7.2 mA @ 24V DC						
	Input Off-State Voltage Range	0...5V DC						
	Input Off-State Current	<1.5 mA						
	Input Filter — Software Selectable							
	Off to On	Settable from 0...64 ms in 1 ms increments						
	On to Off	Settable from 0...64 ms in 1 ms increments						
	Input Compatibility	N/A			IEC 1+			
	Number of Inputs	4						
	Sensor Source							
	Voltage Status Only	11...25V DC from DeviceNet						
	Current Available	50 mA max. per input, 200 mA total						
Output Ratings (Sourced from Control Circuit)	Rated Operation Voltage	240V AC/30V DC			240V AC/30V DC			
	Rate Insulation Voltage	250V			250V			
	Dielectric Withstand	1500V AC			2000V AC			
	Operating Frequency	50/60 Hz			50/60 Hz			
	Type of Control Circuit	Electromechanical relay						
	Type of Current	AC/DC						
	Conventional Thermal Current lth	Total of both outputs ≤ 2 A						
	Type of Contacts	Normally open (N.O.)						
	Number of Contacts	2						
	ArmorPoint Ratings	Backplane Current Load	400 mA					

ArmorStart® Distributed Motor Controller

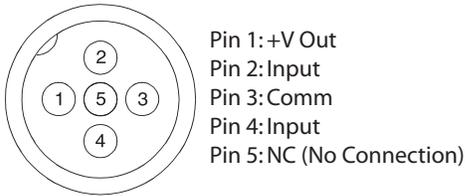
Specifications, Continued

		UL/NEMA	IEC	
Environmental	Operating Temperature Range	-20...+40 °C (-4...+104 °F)		
	Storage and Transportation Temperature Range	-25...+85 °C (-13...+185 °F)		
	Altitude	2000 m		
	Humidity	5...95% (non-condensing)		
	Pollution Degree	3		
	Enclosure Ratings	NEMA 4/12/13	IP67	
		NEMA 4X	IP69K	
Approximate Shipping Weight	6.8 kg (15 lb)			
Mechanical	Resistance to Shock			
	Operational	15 G		
	Non-Operational	30 G		
	Resistance to Vibration			
	Operational	1 G, 0.15 mm (0.006 in.) displacement		
	Non-Operational	2.5 G, 0.38 mm (0.015 in.) displacement		
	Power and Ground Terminals			
	Wire Size	Primary/Secondary terminal: (#18 ...#10 AWG)	Primary/Secondary terminal: 1.0...4.0 mm ²	
	Tightening Torque	Primary terminal: 10.6...21.6 lb•in Secondary terminal: 5.3...7.3 lb•in	Primary Terminal: (1.2...2.4 N•m) Secondary terminal: (0.6...0.8 N•m)	
	Wire Strip Length	0.35 in. (9 mm)		
	Control and Safety Monitor Inputs			
	Wire Size	(22...10 AWG)	0.34...4.0 mm ²	
	Tightening Torque	5.0...5.6 lb•in	0.6 N•m	
	Wire Strip Length	0.35 in. (9 mm)		
	Other Rating	EMC Emission Levels		
		Conducted Radio Frequency Emissions	Class A	
		Radiated Emissions	Class A	
EMC Immunity Levels				
Electrostatic Discharge		4 kV contact and 8 kV Air		
Radio Frequency Electromagnetic Field		10V/m		
Fast Transient		2 kV		
Surge Transient		1 kV _{L-L} , 2 kV _{L-N} (earth)		
Overload Characteristics				
Overload Current Range		0.24...1.2 A		
		0.5...2.5 A		
		1.1...5.5 A		
		3.2...16 A		
Trip Classes		10, 15, 20		
Trip Rating		120% of FLC setting		
Number of poles		3		
DeviceNet Specifications				
DeviceNet Supply Voltage Rating		Range 11...25V DC, 24V DC nominal		
DeviceNet Input Current		167 mA @ 24V DC - 4.0 W		
		364 mA @ 11V DC - 4.0 W		
External Devices powered by DeviceNet		Sensors inputs 4 x 50 mA - total 200 mA		
Total w/max Sensor Inputs (4)		367 mA @ 24V DC - 8.8 W		
DeviceNet Input Current Surge		15 A for 250 μs		
DeviceNet Communications				
Baud Rates	125, 250, 500 kbps			
Distance Maximum	500 m (1630 ft) @ 125 kbps			
	200 m (656 ft) @ 250 kbps			
	100 m (328 ft) @ 500 kbps			
Certifications	cULus (File No. E3125) UL 508 EN/IEC 60947-4-1 CE Marked per Low Voltage Directive 73/23/EEC and EMC Directive 89/336/EEC			

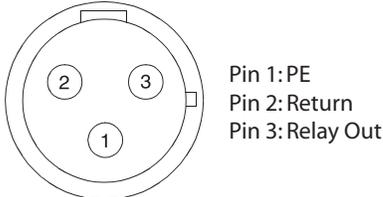
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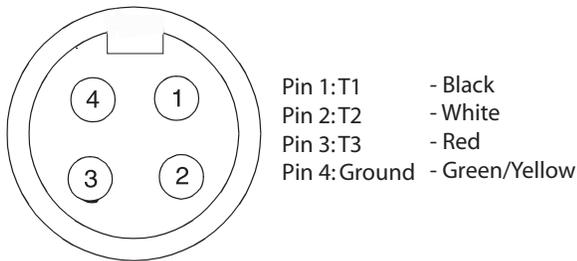
External Connections for Input Connector



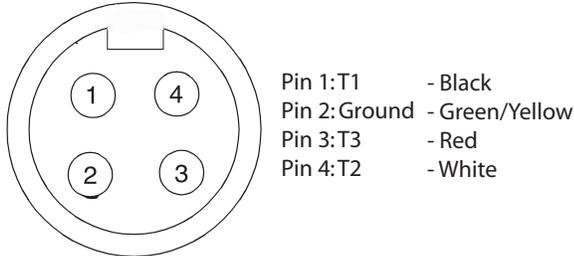
External Connections for Output Connector



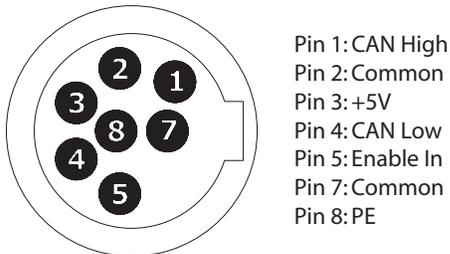
External Connections for Motor Connector (≤ 3 Hp @ 460V AC)



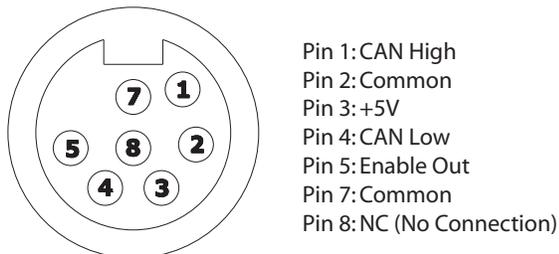
External Connections for Motor Connector (> 3 Hp @ 460V AC)



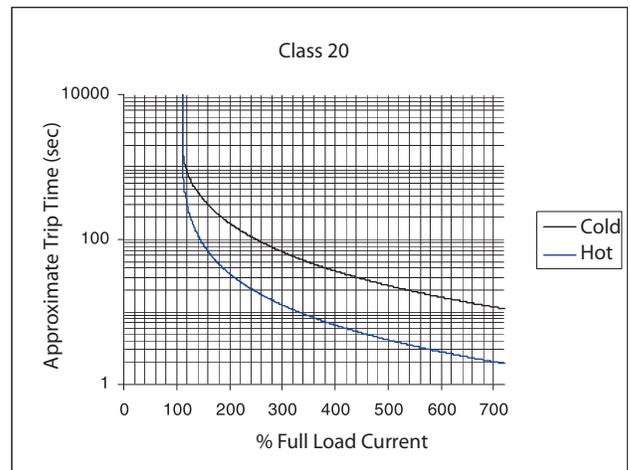
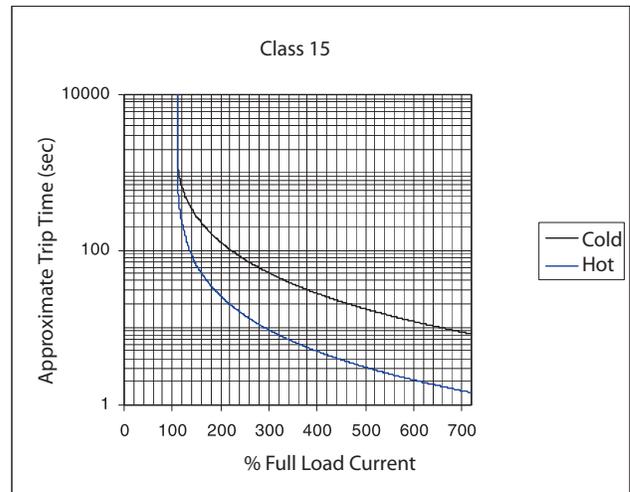
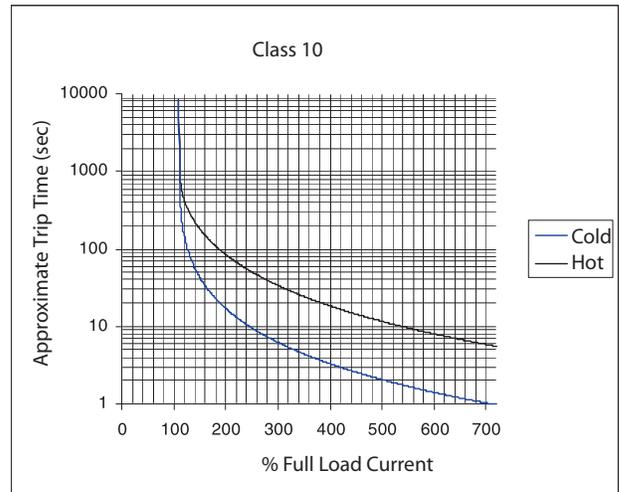
External Connections for ArmorPoint Interface (IN)



External Connections for ArmorPoint Interface (OUT)



Overload Curves



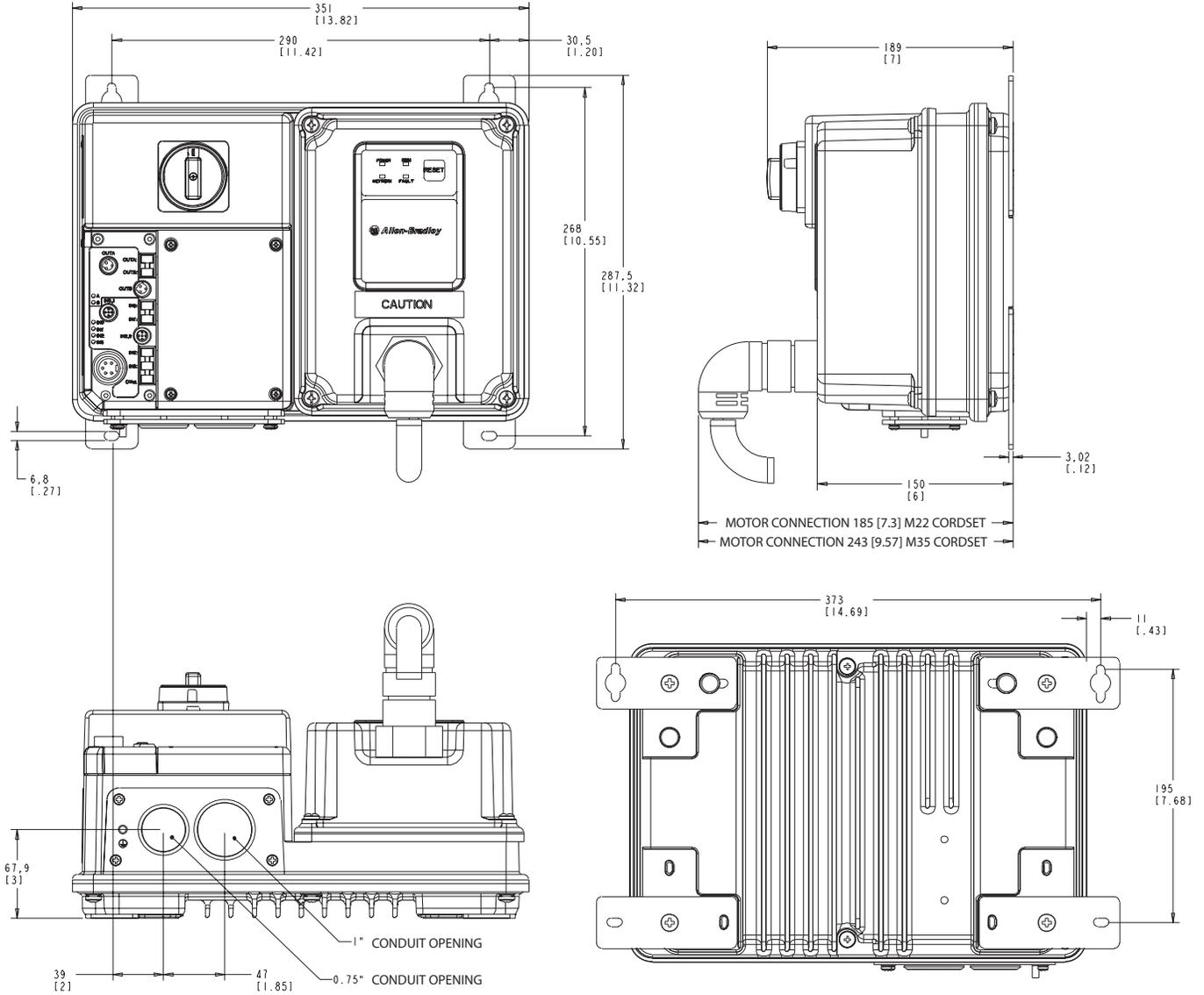
ArmorStart® Distributed Motor Controller

Approximate Dimensions

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

Dimensions for IP67/NEMA Type 4 with Conduit Entrance

4

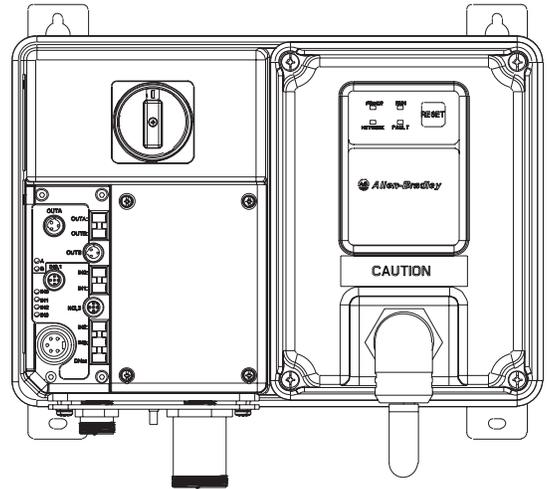
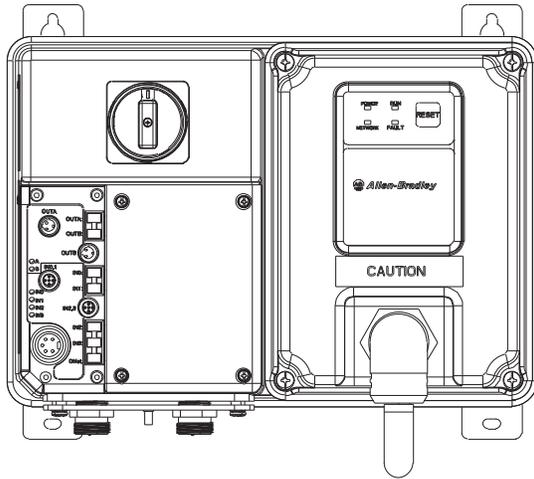


ArmorStart® Distributed Motor Controller

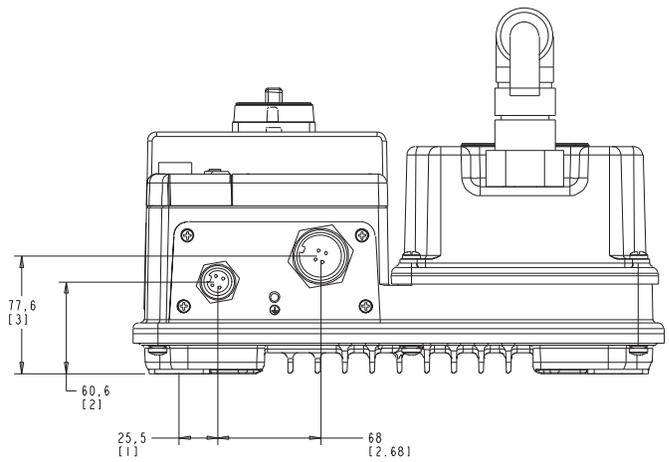
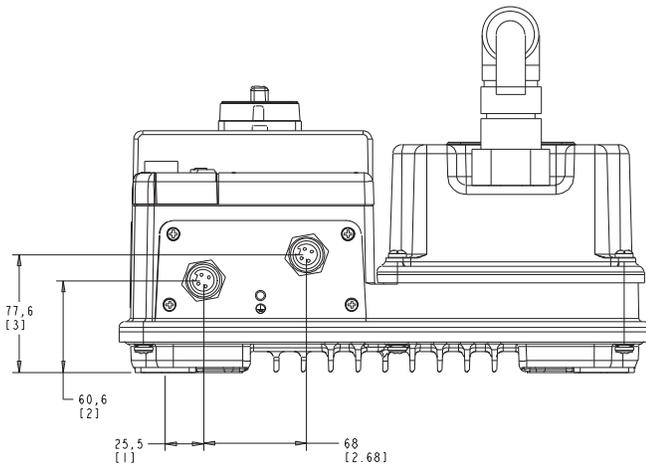
Approximate Dimensions, Continued

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

Dimensions for IP67/NEMA Type 4 with ArmorConnect Connectivity



4



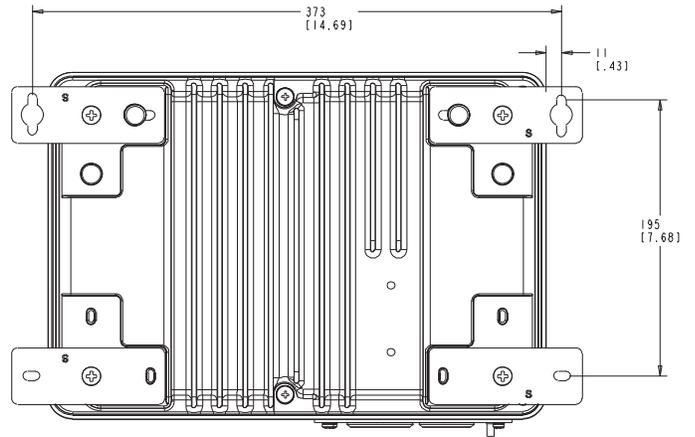
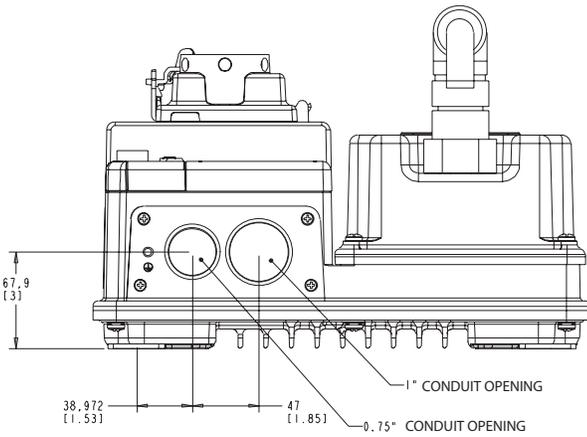
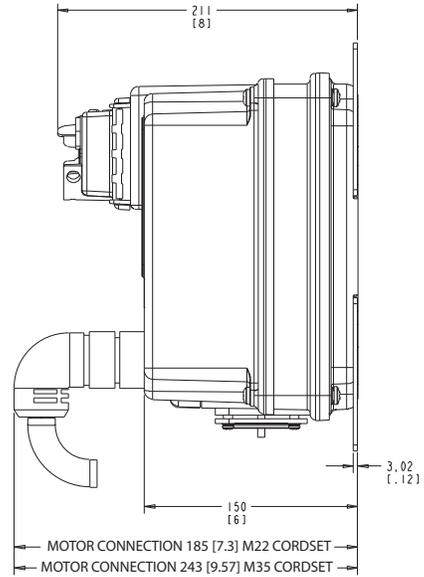
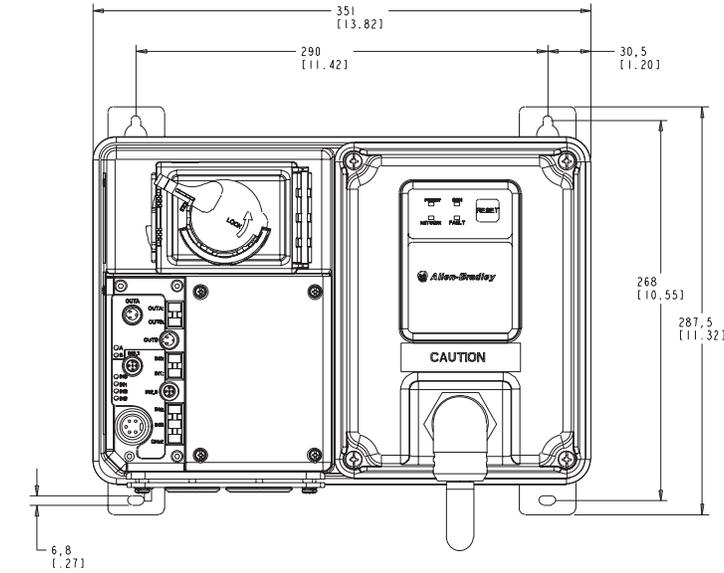
ArmorStart® Distributed Motor Controller

Approximate Dimensions, Continued

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

Dimensions for NEMA Type 4X with Conduit Entrance

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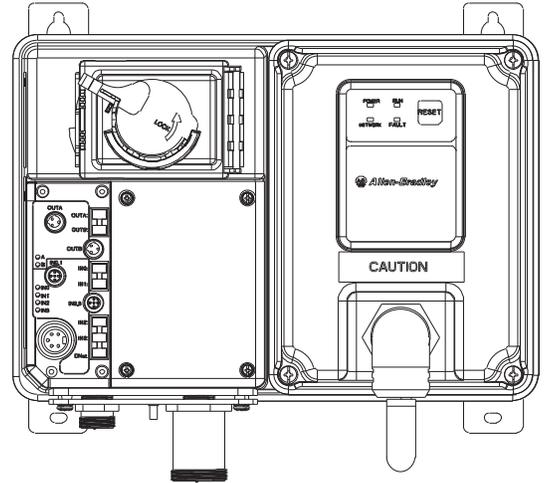
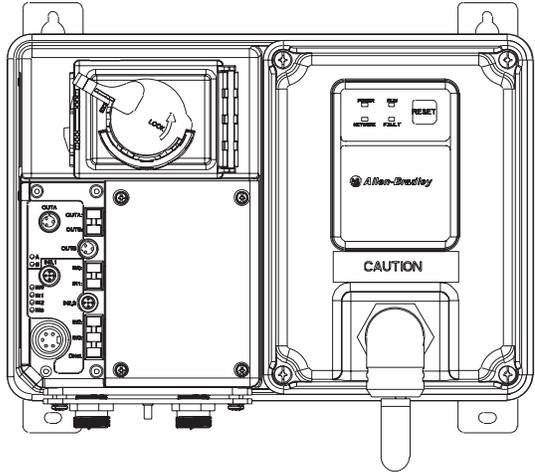


ArmorStart® Distributed Motor Controller

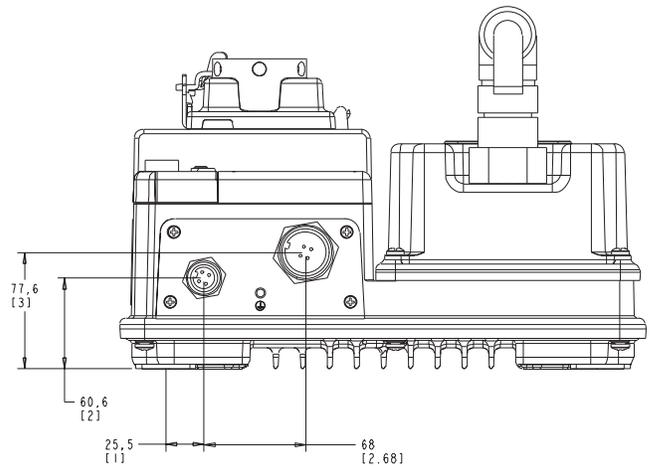
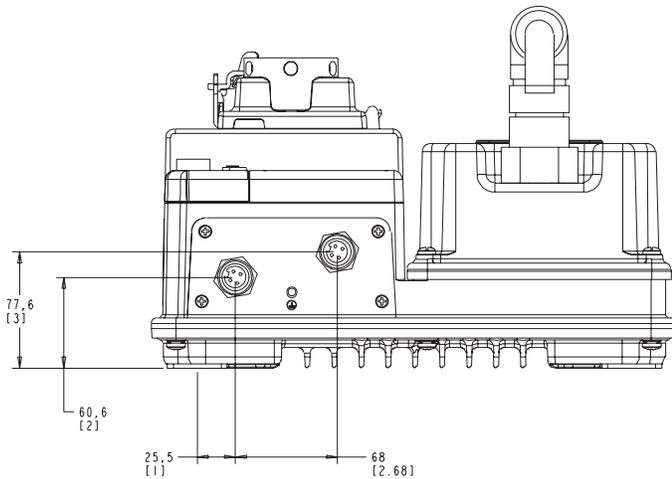
Approximate Dimensions, Continued

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

Dimensions for NEMA Type 4X with ArmorConnect Connectivity



4





Bulletin 283 ArmorStart Distributed Motor Controller

- On-Machine starting solution
- Solid-state motor control
- Horsepower range 0.5...10 Hp (0.37...5.5 kW)
- Robust IP67/NEMA Type 4 and NEMA Type 4X enclosure rating
- Modular plug and play design
- Quick disconnect connections for I/O, communications, motor, three-phase and control power
- Gland plate entry: conduit entrance or ArmorConnect power media
- Four inputs and two outputs (expandable with ArmorPoint)
- LED status indication
- DeviceNet communications
- DeviceLogix component technology
- Connectivity to ArmorPoint distributed I/O products
- Peer-to-peer communications
- ControlNet and EtherNet communication via ArmorPoint
- Factory installed options:
 - Hand/Off/Auto (HOA) keypad configuration
 - Source brake contactor
 - Safety monitor

Table of Contents

Product Overview this page

Product Selection 4-20

Accessories..... 4-23

Specifications..... 4-27

Approximate Dimensions..... 4-30

Standards Compliance

UL 508
 CSA C22.2, No. 14
 EN/IEC 60947-2
 CE Marked per Low Voltage Directive 73/23/EEC and EMC Directive 89/336/EEC

Certifications

cULus (File No. E96956, Guides NMFT, NMFT7)

4

Description

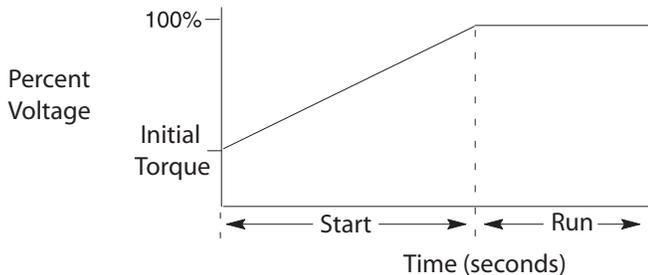
The Bulletin 283 ArmorStart Distributed Motor Controller is an integrated, pre-engineered starter for solid-state motor control applications. The ArmorStart offers a robust IP67/NEMA Type 4 enclosure design, which is suitable for water wash-down environments. The ArmorStart products are also offered with NEMA Type 4X rating, suitable for environment wash down with caustic chemicals used in the food and beverage industry. The wash-down rating is 1000 psi for the NEMA Type 4X rated devices. The modular plug-and-play design offers simplicity in wiring the installation. The quick disconnects for the I/O, communications, and motor connection reduces the wiring time and eliminates wiring errors. The ArmorStart offers as standard, four DC inputs and two relay outputs to be used with sensors and actuators respectively, for monitoring and controlling the application process. The ArmorStart's LED status indication and built-in diagnostics capabilities, allows for ease of maintenance and troubleshooting. The optional Hand/Off/Auto (HOA) keypad allows for local start/stop control and Emergency Stop system configuration at the ArmorStart Distributed Motor Controller.

The Bulletin 283 ArmorStart Distributed Motor Controller offers short circuit protection per UL 508 and IEC 60947. The ArmorStart is rated for local-disconnect service by incorporating the Bulletin 140 Motor Protector as the local-disconnect, eliminating the need for additional components. The ArmorStart Distributed Motor Controllers are suitable for group motor installations.

Mode of Operation

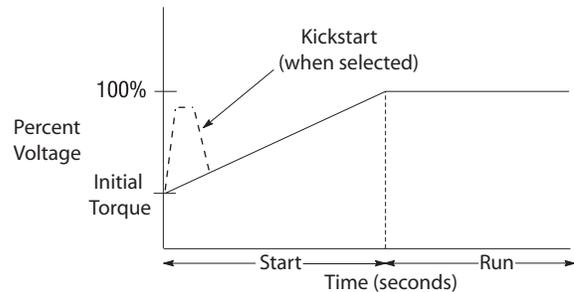
Soft Start

This method has the most general application. The motor is raised from an initial torque value to full voltage. This initial torque is adjustable to 15, 25, 35, or 65% of locked rotor torque. The motor voltage is gradually increased during the acceleration ramp time, which can be adjusted from 1...45 s.



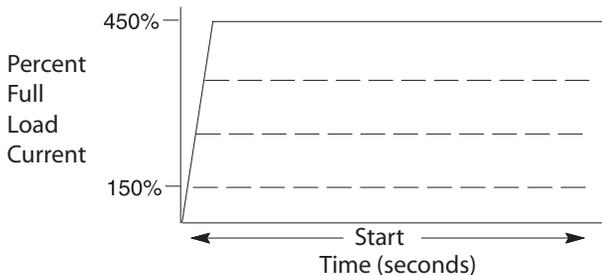
Selectable Kick Start

A kickstart, or boost, at the beginning of the start mode is intended to provide a current pulse of 450% of the full load current. The kickstart time is adjustable from 0.5...1.5 s. This allows the motor to develop additional torque at startup for loads which may need an initial boost.



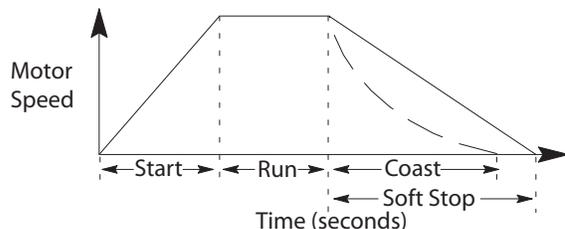
Current Limit Start

This starting mode is used when it is necessary to limit the maximum starting current. It can be adjusted for 150...600% of full load amps. Start times are selectable from 1...45 s.



Soft Stop

The Soft Stop function can be used with applications that require an extended coast to rest. When enabled, the voltage ramp-down time can be selected from 1...90 s. The motor will stop when the motor voltage drops to a point where the load torque is greater than the motor torque.



Description of Features

Overload Protection

The Bulletin 283 ArmorStart Distributed Motor Controller incorporates, as standard, electronic motor overload protection. This overload protection is accomplished electronically with an I^2t algorithm. The ArmorStart's overload protection is programmable via the communication network providing the user with flexibility. The overload trip class allows for class 10 overload protection. Ambient insensitivity is inherent in the electronic design of the overload.

LED Status Indication

The LED Status Indication provides four status LEDs and a Reset button. The LEDs provide status indication for the following:

- **POWER LED**

The LED is illuminated solid green when control power is present and with the proper polarity

- **RUN LED**

This LED is illuminated solid green when a start command and control power are present

- **NETWORK LED**

This bi-color (red/green) LED indicates the status of the communication link

- **FAULT LED**

Indicates Controller Fault (trip) condition

- The "Reset Button" as a local trip reset.

Inputs

The inputs are single-keyed (two inputs per connector), which are sourced from DeviceNet power (24V DC), with LED status indication.

Outputs

Two dual-key relay output connectors are supplied as standard. The outputs are sourced from the control voltage power, which can be either, 24V DC, 120V AC or 240V AC with LED status indication.

Gland Plate Entrance

The ArmorStart product offers two different methods for connecting incoming three-phase and control power to the device. One method offered, is the traditional conduit entrance which provides a 3/4 in. and 1 in. conduit hole opening for wiring three-phase and control power. The second method offers connectivity to the ArmorConnect power media. Factory installed receptacles are provided for connectivity to both three-phase and control power media.

Factory Installed Options

HOA Selector Keypad

The HOA Selector Keypad allows for local start/stop control.

Source Brake Contactor

An internal contactor is used to switch the electromechanical motor brake on/off. The motor brake is powered from the main power circuit. A customer accessible 3.0 A fuse is provided to protect the brake cable. A 3-meter, 3-pin cable for connection to the motor brake, is provided as standard when this option is selected.

Safety Monitor

The Safety Monitor Option allows for independent monitoring of the output status of the device. The function is implemented using a normally closed contact which complies with IEC 60947-5-1 for mechanically linked contacts. Two terminal blocks are provided as the inputs which may be used with an external safety circuit. The external safety circuit monitors the status of the isolation contactor.

Fault Diagnostics

Fault diagnostics capabilities built into the Bulletin 283 ArmorStart Distributed Motor Controller help you pinpoint a problem for easy troubleshooting and quick re-starting.

- Short Circuit
- Overload
- Phase Loss
- Shorted SCR
- Phase Rotation
- Control Power Loss
- Control Power Fuse Detection
- DeviceNet Power Loss
- Output Fuse Detection
- I/O Fault
- Brake Fuse Detection
- Overtemperature
- Phase Imbalance
- Internal Communication Fault
- Heatsink Temperature Fault
- EEPROM Fault
- Hardware Fault

Motor Cable

With every Bulletin 283 ArmorStart Distributed Motor Controller, a 3-meter unshielded 4-conductor cordset is provided with each unit as standard.

Network and Expandable I/O Capabilities

The Bulletin 283D ArmorStart Distributed Motor Controller delivers enhanced control to access parameter settings and provides fault diagnostics, and remote start/stop control. DeviceNet is the communication protocol, provided with the ArmorStart including DeviceLogix.

The Bulletin 283A ArmorStart Distributed Motor Controller allows connectivity to the ArmorPoint backplane. The ArmorPoint I/O system can communicate using DeviceNet, ControlNet, or EtherNet communication protocols. In addition to the different network protocols, the ArmorPoint Distributed I/O products allow the I/O capability to be expanded beyond the standard two outputs. The two dual-key relay output connectors are supplied as standard. The outputs are sourced from the control voltage power of 24V DC, 120V AC, or 240V AC. LED status indication is also provided, as standard with ArmorPoint. When using the ArmorPoint, a maximum of two ArmorPoint Distributed Motor Controllers can be connected to the ArmorPoint Distributed I/O product.

ArmorStart® Distributed Motor Controller

Catalog Number Explanation/Product Selection

Cat. No. Explanation

Examples given in this section are for reference purposes. This basic explanation should not be used for product selection; not all combinations will produce a valid catalog number.

283 **D** - **F** **B** **19Z** - **25** **D** - **CR** - **Option 1** - **Option 2** - **Option 3**

a *b* *c* *d* *e* *f* *g* *h* *i* *j* *k*

a

Bulletin Number	
283	Solid-State Starter

b

Communications	
D	DeviceNet™
A	ArmorPoint

c

Enclosure Type	
F	Type 4 (IP67)
S	Type 4X

d

Input Line Voltage	
Code	Description
B	200...460V AC, 3-Phase, 50/60 Hz
C	200...575V AC, 3-Phase, 50/60 Hz

e

Controller Size/Control Voltage		
24V DC	120V AC	240V AC
3Z	3D	3B
9Z	9D	9B
16Z	16D	16B
19Z	19D	19B

f

Short Circuit Protection (Motor Circuit Protector)	
10	10 A Rated Device
25	25 A Rated Device

g

Overload Selection Current Range	
A	1.1...3.0 A
B	3.0...5.5 A
C	5.3...7.6 A
D	6.3...16.0 A

i

Option 1	
3	Hand/Off/Auto Selector Keypad

j

Option 2		
SB	blank	Source Brake Contactor
SB	W *	No cable

k

Option 3	
Code	Description
SM	Safety Monitor

h

Control and 3-Phase Power Connections/Motor Cable Connection (CR: Conduit/Round Media) or (RR: Round/Round Media)				
Code		Description		
		Control Power	3-Phase Power	Motor Cable
CR	blank	Conduit Entrance	Conduit Entrance	3 m, unshielded cordset male 90°
CR	W *	Conduit Entrance	Conduit Entrance	No cable
RR	blank	Round Media (Male Receptacle)	Round Media (Male Receptacle)	3 m, unshielded cordset male 90°
RR	W *	Round Media (Male Receptacle)	Round Media (Male Receptacle)	No cable

* See Accessories on page 4-23 for extended motor and source brake cable lengths.

4

Product Selection

IP67/NEMA Type 4 with conduit entrance and DeviceNet communications, Up to 480V AC

Current Rating (A)	kW		Hp			24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
	230V AC 50 Hz	380/ 400/ 415V AC 50 Hz	200V AC 60 Hz	230V AC 60 Hz	460V AC 60 Hz	Cat. No.	Cat. No.	Cat. No.
1.1...3.0	0.37	1.1	0.5	0.5	1.5	283D-FB3Z-10A-CR	283D-FB3D-10A-CR	283D-FB3B-10A-CR
3.0...5.5	1.5	2.2	1	1	3	283D-FB9Z-10B-CR	283D-FB9D-10B-CR	283D-FB9B-10B-CR
5.3...7.6	3	3	1.5	2	5	283D-FB16Z-10C-CR	283D-FB16D-10C-CR	283D-FB16B-10C-CR
6.3...16	4	5.5	3	5	10	283D-FB19Z-25D-CR	283D-FB19D-25D-CR	283D-FB19B-25D-CR

IP67/NEMA Type 4 with conduit entrance and ArmorPoint communications, Up to 480V AC

Current Rating (A)	kW		Hp			24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
	230V AC 50 Hz	380/ 400/ 415V AC 50 Hz	200V AC 60 Hz	230V AC 60 Hz	460V AC 60 Hz	Cat. No.	Cat. No.	Cat. No.
1.1...3.0	0.37	1.1	0.5	0.5	1.5	283A-FB3Z-10A-CR	283A-FB3D-10A-CR	283A-FB3B-10A-CR
3.0...5.5	1.5	2.2	1	1	3	283A-FB9Z-10B-CR	283A-FB9D-10B-CR	283A-FB9B-10B-CR
5.3...7.6	3	3	1.5	2	5	283A-FB16Z-10C-CR	283A-FB16D-10C-CR	283A-FB16B-10C-CR
6.3...16	4	5.5	3	5	10	283A-FB19Z-25D-CR	283A-FB19D-25D-CR	283A-FB19B-25D-CR

IP67/NEMA Type 4 with quick disconnects for ArmorConnect power media and DeviceNet communications, Up to 480V AC

Current Rating (A)	kW		Hp			24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
	230V AC 50 Hz	380/ 400/ 415V AC 50 Hz	200V AC 60 Hz	230V AC 60 Hz	460V AC 60 Hz	Cat. No.	Cat. No.	Cat. No.
1.1...3.0	0.55	1.1	0.5	0.5	1.5	283D-FB3Z-10A-RR	283D-FB3D-10A-RR	283D-FB3B-10A-RR
3.0...5.5	1.1	2.2	1	1	3	283D-FB9Z-10B-RR	283D-FB9D-10B-RR	283D-FB9B-10B-RR
5.3...7.6	1.5	3	1.5	2	5	283D-FB16Z-10C-RR	283D-FB16D-10C-RR	283D-FB16B-10C-RR
6.3...16	4	5.5	3	5	10	283D-FB19Z-25D-RR	283D-FB19D-25D-RR	283D-FB19B-25D-RR

IP67/NEMA Type 4 with quick disconnects for ArmorConnect power media and ArmorPoint communications, Up to 480V AC

Current Rating (A)	kW		Hp			24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
	230V AC 50 Hz	380/ 400/ 415V AC 50 Hz	200V AC 60 Hz	230V AC 60 Hz	460V AC 60 Hz	Cat. No.	Cat. No.	Cat. No.
1.1...3.0	0.55	1.1	0.5	0.5	1.5	283A-FB3Z-10A-RR	283A-FB3D-10A-RR	283A-FB3B-10A-RR
3.0...5.5	1.1	2.2	1	1	3	283A-FB9Z-10B-RR	283A-FB9D-10B-RR	283A-FB9B-10B-RR
5.3...7.6	1.5	3	1.5	2	5	283A-FB16Z-10C-RR	283A-FB16D-10C-RR	283A-FB16B-10C-RR
6.3...16	4	5.5	3	5	10	283A-FB19Z-25D-RR	283A-FB19D-25D-RR	283A-FB19B-25D-RR

NEMA Type 4X with conduit entrance and DeviceNet communications, Up to 480V AC

Current Rating (A)	kW		Hp			24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
	230V AC 50 Hz	380/ 400/ 415V AC 50 Hz	200V AC 60 Hz	230V AC 60 Hz	460V AC 60 Hz	Cat. No.	Cat. No.	Cat. No.
1.1...3.0	0.55	1.1	0.5	0.5	1.5	283D-SB3Z-10A-CR	283D-SB3D-10A-CR	283D-SB3B-10A-CR
3.0...5.5	1.1	2.2	1	1	3	283D-SB9Z-10B-CR	283D-SB9D-10B-CR	283D-SB9B-10B-CR
5.3...7.6	1.5	3	1.5	2	5	283D-SB16Z-10C-CR	283D-SB16D-10C-CR	283D-SB16B-10C-CR
6.3...16	4	5.5	3	5	10	283D-SB19Z-25D-CR	283D-SB19D-25D-CR	283D-SB19B-25D-CR

NEMA Type 4X with quick disconnects for ArmorConnect power media and DeviceNet communications, Up to 480V AC

Current Rating (A)	kW		Hp			24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
	230V AC 50 Hz	380/ 400/ 415V AC 50 Hz	200V AC 60 Hz	230V AC 60 Hz	460V AC 60 Hz	Cat. No.	Cat. No.	Cat. No.
1.1...3.0	0.55	1.1	0.5	0.5	1.5	283D-SB3Z-10A-RR	283D-SB3D-10A-RR	283D-SB3B-10A-RR
3.0...5.5	1.1	2.2	1	1	3	283D-SB9Z-10B-RR	283D-SB9D-10B-RR	283D-SB9B-10B-RR
5.3...7.6	1.5	3	1.5	2	5	283D-SB16Z-10C-RR	283D-SB16D-10C-RR	283D-SB16B-10C-RR
6.3...16	4	5.5	3	5	10	283D-SB19Z-25D-RR	283D-SB19D-25D-RR	283D-SB19B-25D-RR

IP67/NEMA Type 4 with conduit entrance and DeviceNet communications, Up to 575V AC

Current Rating (A)	kW		Hp				24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
	230V AC 50 Hz	400V AC 50 Hz	200V AC 60 Hz	230V AC 60 Hz	460V AC 60 Hz	575V AC 60 Hz	Cat. No.	Cat. No.	Cat. No.
1.1...3.0	0.55	1.1	0.5	0.5	1.5	2	283D-FC3Z-10A-CR	283D-FC3D-10A-CR	283D-FC3B-10A-CR
3.0...5.5	1.1	2.2	1	1	3	3	283D-FC9Z-10B-CR	283D-FC9D-10B-CR	283D-FC9B-10B-CR
5.3...7.6	1.5	3	1.5	2	5	5	283D-FC16Z-10C-CR	283D-FC16D-10C-CR	283D-FC16B-10C-CR
6.3...16	4	5.5	3	5	10	10	283D-FC19Z-25D-CR	283D-FC19D-25D-CR	283D-FC19B-25D-CR

IP67/NEMA Type 4 with conduit entrance and ArmorPoint communications, Up to 575V AC

Current Rating (A)	kW		Hp				24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
	230V AC 50 Hz	400V AC 50 Hz	200V AC 60 Hz	230V AC 60 Hz	460V AC 60 Hz	575V AC 60 Hz	Cat. No.	Cat. No.	Cat. No.
1.1...3.0	0.55	1.1	0.5	0.5	1.5	2	283A-FC3Z-10A-CR	283A-FC3D-10A-CR	283A-FC3B-10A-CR
3.0...5.5	1.1	2.2	1	1	3	3	283A-FC9Z-10B-CR	283A-FC9D-10B-CR	283A-FC9B-10B-CR
5.3...7.6	1.5	3	1.5	2	5	5	283A-FC16Z-10C-CR	283A-FC16B-10C-CR	283A-FC16B-10C-CR
6.3...16	4	5.5	3	5	10	10	283A-FC19Z-25D-CR	283A-FC19D-25D-CR	283A-FC19B-25D-CR

IP67/NEMA Type 4 with quick disconnects for ArmorConnect power media and DeviceNet communications, Up to 575V AC

Current Rating (A)	kW		Hp				24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
	230V AC 50 Hz	400V AC 50 Hz	200V AC 60 Hz	230V AC 60 Hz	460V AC 60 Hz	575V AC 60 Hz	Cat. No.	Cat. No.	Cat. No.
1.1...3.0	0.55	1.1	0.5	0.5	1.5	2	283D-FC3Z-10A-RR	283D-FC3D-10A-RR	283D-FC3B-10A-RR
3.0...5.5	1.1	2.2	1	1	3	3	283D-FC9Z-10B-RR	283D-FC9D-10B-RR	283D-FC9B-10B-RR
5.3...7.6	1.5	3	1.5	2	5	5	283D-FC16Z-10C-RR	283D-FC16D-10C-RR	283D-FC16B-10C-RR
6.3...16	4	5.5	3	5	10	10	283D-FC19Z-25D-RR	283D-FC19D-25D-RR	283D-FC19B-25D-RR

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IP67/NEMA Type 4 with quick disconnects for ArmorConnect power media and ArmorPoint communications, Up to 575V AC

Current Rating (A)	kW		Hp				24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
	230V AC 50 Hz	400V AC 50 Hz	200V AC 60 Hz	230V AC 60 Hz	460V AC 60 Hz	575V AC 60 Hz	Cat. No.	Cat. No.	Cat. No.
1.1...3.0	0.55	1.1	0.5	0.5	1.5	2	283A-FC3Z-10A-RR	283A-FC3D-10A-RR	283A-FC3B-10A-RR
3.0...5.5	1.1	2.2	1	1	3	3	283A-FC9Z-10B-RR	283A-FC9D-10B-RR	283A-FC9B-10B-RR
5.3...7.6	1.5	3	1.5	2	5	5	283A-FC16Z-10C-RR	283A-FC16B-10C-RR	283A-FC16B-10C-RR
6.3...16	4	5.5	3	5	10	10	283A-FC19Z-25D-RR	283A-FC19D-25D-RR	283A-FC19B-25D-RR

NEMA Type 4X with conduit entrance and DeviceNet communications, Up to 575V AC

Current Rating (A)	kW		Hp				24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
	230V AC 50 Hz	400V AC 50 Hz	200V AC 60 Hz	230V AC 60 Hz	460V AC 60 Hz	575V AC 60 Hz	Cat. No.	Cat. No.	Cat. No.
1.1...3.0	0.55	1.1	0.5	0.5	1.5	2	283D-SC3Z-10A-CR	283D-SC3D-10A-CR	283D-SC3B-10A-CR
3.0...5.5	1.1	2.2	1	1	3	3	283D-SC9Z-10B-CR	283D-SC9D-10B-CR	283D-SC9B-10B-CR
5.3...7.6	1.5	3	1.5	2	5	5	283D-SC16Z-10C-CR	283D-SC16D-10C-CR	283D-SC16B-10C-CR
6.3...16	4	5.5	3	5	10	10	283D-SC19Z-25D-CR	283D-SC19D-25D-CR	283D-SC19B-25D-CR

NEMA Type 4X with quick disconnects for ArmorConnect power media and DeviceNet communications, Up to 575V AC

Current Rating (A)	kW		Hp				24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
	230V AC 50 Hz	400V AC 50 Hz	200V AC 60 Hz	230V AC 60 Hz	460V AC 60 Hz	575V AC 60 Hz	Cat. No.	Cat. No.	Cat. No.
1.1...3.0	0.55	1.1	0.5	0.5	1.5	2	283D-SC3Z-10A-RR	283D-SC3D-10A-RR	283D-SC3B-10A-RR
3.0...5.5	1.1	2.2	1	1	3	3	283D-SC9Z-10B-RR	283D-SC9D-10B-RR	283D-SC9B-10B-RR
5.3...7.6	1.5	3	1.5	2	5	5	283D-SC16Z-10C-RR	283D-SC16D-10C-RR	283D-SC16B-10C-RR
6.3...16	4	5.5	3	5	10	10	283D-SC19Z-25D-RR	283D-SC19D-25D-RR	283D-SC19B-25D-RR

Options – Factory Installed

Description		Cat. No.	Modification	
	Hand/Off/Auto Selector Keypad		-3	
	Safety Monitor		-SM	
Supplied without motor cable		Enclosure Rating	-CRW	
		IP67		
Supplied with source brake cable		IP67	-SB	
		NEMA Type 4X		
Supplied without source brake cable		IP67	-SBW	
		NEMA Type 4X		
Connectivity to ArmorConnect Power Media supplied without motor cable		Short Circuit Protection Rating	-RRW	
		10 A		
		25 A		IP67
				NEMA Type 4X

Accessories

Sealing Caps

Description	For Use With	Cat. No.
Plastic Sealing Cap (M12)*	Input I/O Connection	1485A-M12
AC Micro Aluminum Sealing Cap - External*	Output I/O Connection	889A-RMCAP
Stainless Steel Sealing Cap (M12)*	Input I/O Connection	1485AS-C3
Stainless Steel Sealing Cap (M12)*	Output I/O Connection	889AS-RMCAP

* To achieve IP67 rating, sealing caps must be installed on all unused I/O connections.

* To achieve IP69K/NEMA 4X rating, sealing caps must be installed on all unused I/O connections.

Cables

Description	Cable Rating	Length m (ft)	Cat. No.
Extended Motor Cable Cordsets			
90° M22 Motor Cordset	IP67/NEMA Type 4	6 (19.6)	280-MTR22-M6
		14 (45.9)	280-MTR22-M14
90° M35 Motor Cordset	IP67/NEMA Type 4	6 (19.6)	280-MTR35-M6
		14 (45.9)	280-MTR35-M14
90° M22 Motor Cordset	IP69K	6 (19.6)	280S-MTR22-M6
		14 (45.9)	280S-MTR22-M14
90° M35 Motor Cordset	IP69K	6 (19.6)	280S-MTR35-M6
		14 (45.9)	280S-MTR35-M14
Motor Cable Patchcords			
90° Male/Straight Female M22	IP67/NEMA Type 4	1 (3.3)	280-MTR22-M1D
		3 (9.8)	280-MTR22-M3D
90° Male/Straight Female M35	IP67/NEMA Type 4	1 (3.3)	280-MTR35-M1D
		3 (9.8)	280-MTR35-M3D
90° Male/Straight Female M22	IP69K	1 (3.3)	280S-MTR22-M1D
		3 (9.8)	280S-MTR22-M3D
90° Male/Straight Female M35	IP69K	1 (3.3)	280S-MTR35-M1D
		3 (9.8)	280S-MTR35-M3D
Brake Cable Cordsets			
90° M25 Source Brake Cable	IP67/NEMA Type 4	6 (19.6)	285-BRC25-M6
		14 (45.9)	285-BRC25-M14
	IP69K	6 (19.6)	285S-BRC25-M6
		14 (45.9)	285S-BRC25-M14

ArmorPoint® Media §

Description	Length m (ft)	Cat. No.
ArmorPoint Bus Extension Cable including Terminating Resistor	1 m (3.3)	280A-EXT1
Extension Cable to connect two ArmorStart Distributed Motor Controllers to ArmorPoint communication protocol	1 m (3.3)	280A-EXTCABLE

§ ArmorPoint media is only available with an IP67/NEMA Type 4 rating.



Allen-Bradley

Visit our website: www.ab.com/catalogs
Preferred availability cat. nos. are printed in **bold**

DeviceNet Media ❖

Description		Length m (ft)	Cat. No.	
	KwikLink pigtail drops are Insulation Displacement Connector (IDC) with integral Class 1 round cables for interfacing devices or power supplies to flat cable	1 (3.3)	1485P-P1E4-B1-N5	
		2 (6.5)	1485P-P1E4-B2-N5	
		3 (9.8)	1485P-P1E4-B3-N5	
		6 (19.8)	1485P-P1E4-B6-N5	
	DeviceNet Mini- T-Port Tap	Left Keyway	1485P-P1N5-MN5KM	
		Right Keyway	1485P-P1N5-MN5NF	
Description		Connector	Cat. No.	
	Grey PVC Thin Cable	Mini Straight Female Mini Straight Male	1485G-P❖N5-M5	
		Mini Straight Female Mini Right Angle Male	1485G-P❖W5-N5	
		Mini Right Angle Female Mini Straight Male	1485G-P❖M5-Z5	
		Mini Right Angle Female Mini Straight Male	1485G-P❖W5-Z5	
	Thick Cable	Mini Straight Female Mini Straight Male	1485C-P‡N5-M5	
		Mini Straight Female Mini Right Angle Male	1485C-P‡W5-N5	
		Mini Right Angle Female Mini Straight Male	1485C-P‡M5-Z5	
		Mini Right Angle Female Mini Straight Male	1485C-P‡W5-Z5	
Description		Length m (ft)	Cat. No.	
	DeviceNet Configuration Terminal Used to interface with objects on a DeviceNet network. Includes 1 m communications cable.	1 (3.3)	193-DNCT	
		Communication cable, color-coded bare leads	1 (3.3)	193-CB1
		Communication cable, micro-connector (male)	1 (3.3)	193-CM1
	Panel Mount Adapter/Door Mount Bezel Kit	—	193-DNCT-BZ1	

❖ See publication M116-CA001_-EN-P for complete cable selection information.

❖ Replace symbol with desired length in meters (Example: **1485G-P1N5-M5** for a 1 m cable). Standard cable lengths: 1, 2, 3, 4, 5, and 6 m.

‡ Replace symbol with desired length in meters (Example: **1485C-P1N5-M5** for a 1 m cable). Standard cable lengths: 1, 2, 3, 4, 5, 6, 8, 10, 12, 18, 24, and 30 m.

Sensor Media ❖

Description	ArmorStart I/O Connection	Pin Count	Connector	Cat. No.	
	DC Micro Patchcord	Input	5-pin	Straight Female Straight Male	889D-F4ACDM->
				Straight Female Right Angle Male	889D-F4ACDE->
	DC Micro V-Cable	Input	5-pin	Straight Female	879D-F4ACDM->
				Right Angle Male	879D-R4ACM->
	AC Micro Patchcord	Output	3-pin	Straight Female Straight Male	889R-F3AERM->
				Straight Female Right Angle Male	889R-F3AERE->

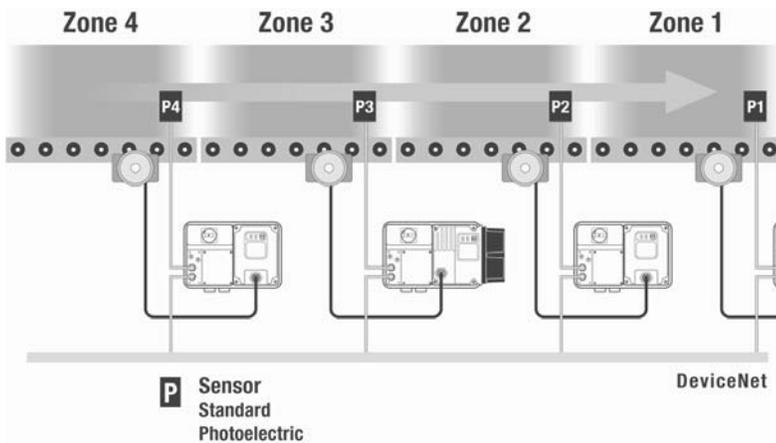
❖ See publication M116-CA001A-EN-P for complete cable selection information.

> Replace symbol with desired length in meters (Example: **889D-F4ACDM-1** for a 1 m cable). Standard cable lengths: 1, 2, 5, and 10 m.

NOTE: Stainless steel versions may be ordered by adding an "S" to the cat. no. (Example: **889DS-F4ACDM-1**)

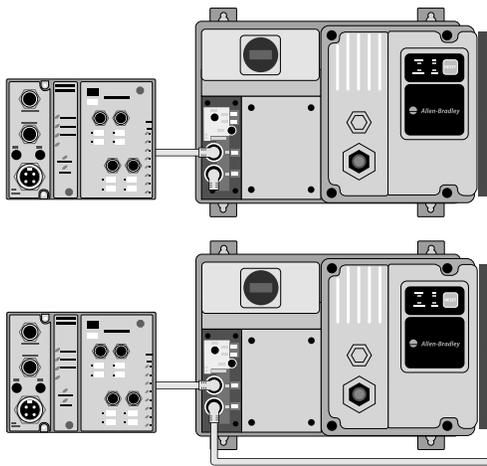


Peer-to-Peer Communications



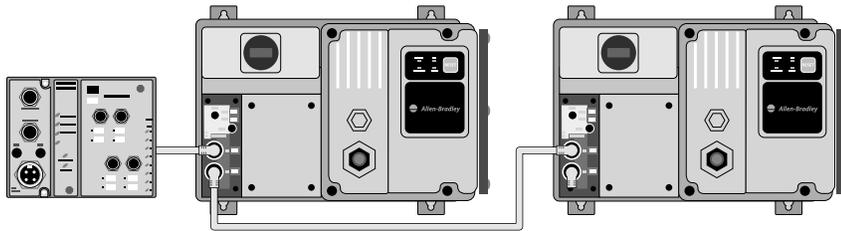
The Zone Control capabilities of ArmorStart Distributed Motor Controller is ideal for large horsepower (0.5...10 Hp) motored conveyors. The ArmorStart Distributed Motor Controllers have built-in DeviceNet Communications, DeviceLogix technology, and the added Zone Interlocking Parameters (ZIP) which allows one ArmorStart to consume data directly from up to four other DeviceNet nodes without going through the network scanner. These direct communications between conveyor zones are beneficial in a merge, diverter, and accumulation conveyor applications.

ArmorStart to ArmorPoint Connectivity - (Networks other than DeviceNet)



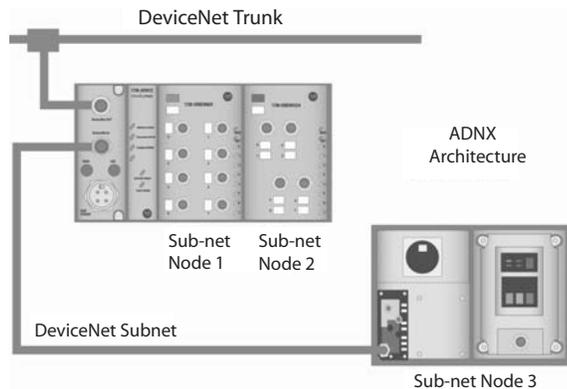
When connecting to the Bulletin 1738 ArmorPoint Distributed I/O product, a network adapter and at least one ArmorPoint Digital Output, Digital Input, Analog, AC and Relay product, or Specialty product must be selected. The ArmorPoint Distributed I/O can accommodate up to 63 modules per network node. The cable that connects the ArmorPoint Distributed I/O product to the ArmorStart Distributed Motor Controller is the Bulletin 280A-EXT1. The 280A-EXT1 includes an ArmorPoint bus extension cable and a network terminating resistor.

Note: Access to DeviceLogix programming is available with RSNetworkx for DeviceNet.



If an additional ArmorStart Distributed Motor Controller is to be connected, the Bulletin 280A-EXTCABLE will be required. A maximum of two ArmorStart Distributed Motor Controllers can be connected to the Bulletin 1738 Distributed I/O.

I/O Expansion with DeviceNet



If the I/O capability of the Bulletin 280/281D ArmorStart Distributed Motor Controller needs to be expanded beyond the standard four inputs and two outputs, the ArmorStart Distributed Motor Controller with the DeviceNet communication protocol can be configured to the ADNX Architecture, in which the ArmorStart is part of the DeviceNet subnet, using the Bulletin 1738-ADNX ArmorPoint Distributed I/O product.

Bulletin 1738 ArmorPoint Distributed I/O Products

Digital Output Products

Description	Cat. No.
24V DC, eight source output with eight M12 connectors	1738-OB8EM12
24V DC, eight source output with eight M8 connectors	1738-OB8EM8
24V DC, four source output with four M12 connectors	1738-OB4EM12
24V DC, four source output with four M8 connectors	1738-OB4EM8
24V DC, two source output with two M12 connectors	1738-OB2EM12
24V DC, two source output, 2 A prot. with two M12 connectors	1738-OB2EPM12
24V DC, four sink output with four M12 connectors	1738-OV4EM12



Digital Input Products

Description	Cat. No.
24V DC, eight sink input with four M12 connectors, two points per connector	1738-IB8M12
24V DC, eight sink input with eight M8 connectors	1738-IB8M8
24V DC, eight sink input with one M23 connector	1738-IB8M23
24V DC, four sink input with four M12 connectors	1738-IB4M12
24V DC, four sink input with four M8 connectors	1738-IB4M8
24V DC, two sink input with two M12 connectors	1738-IB2M12
24V DC, four source input with four M12 connectors	1738-IV4M12



Analog Products

Description	Cat. No.
24V DC analog current input with two M12 connectors	1738-IE2CM12
24V DC analog voltage input with two M12 connectors	1738-IE2VM12
24V DC analog current output with two M12 connectors	1738-OE2CM12
24V DC analog voltage output with two M12 connectors	1738-OE2VM12
24V DC, two thermocouple input	1738-IT2IM12
24V DC, two RTD input	1738-IR2M12



Power Supply Products

Description	Cat. No.
ArmorPoint I/O Field Potential Distributor Module	1738-FPD
24V DC Expansion Power Supply	1738-EP24DC



AC and Relay Products

Description	Cat. No.
24V DC Coil, N.O. DPST relay with two M12 connectors	1738-OW4M12
24V DC Coil, N.O. DPST relay with two AC M12 connectors	1738-OW4M12AC
120V AC, two input with two AC 4-pin M12 connectors	1738-IA2M12AC4
120V AC, two input with two AC 3-pin M12 connectors	1738-IA2M12AC3
120/230V AC, two output with two AC 3-pin M12 connectors	1738-OA2M12AC3



Specialty Products

Description	Cat. No.
ArmorPoint I/O RS-232 ASCII Serial Interface Module	1738-232ASCM12
ArmorPoint I/O RS-485 ASCII Serial Interface Module	1738-485ASCM12
24V DC Very High Speed Counter Module	1738-VHSC24M23
ArmorPoint 5V Encoder/Counter Module	1738-IJM23
ArmorPoint Synchronous Serial Interface Module with Absolute Encoder	1738-SSIM23



Adapter Products

Description	Cat. No.
ArmorPoint DeviceNet Adapter Module, Drop or Pass-through, with male and female M12 connectors	1738-ADN12
ArmorPoint DeviceNet Adapter Module, Drop only, with male M18 connector	1738-ADN18
ArmorPoint DeviceNet Adapter Module, Drop or Pass-through, with male and female M18 connectors	1738-ADN18P
ArmorPoint DeviceNet 24V DC Adapter Module with subnet expansion	1738-ADNX
ArmorPoint Redundant ControlNet Adapter Module	1738-ACNR
ArmorPoint Ethernet/IP 10/100 Mbps Adapter Module	1738-AENT



ArmorStart® Distributed Motor Controller Specifications

Electrical Ratings		UL/NEMA		IEC			
Power Circuit	Rated Operation Voltage	200...575Y		200...575V			
	Rate Insulation Voltage	600V		500V			
	Rated Impulsed Voltage	6 kV		6 kV			
	Dielectric Withstand	2200V AC		2500V AC			
	Operating Frequency	50/60 Hz		50/60 Hz			
	Utilization Category	N/A		AC-3			
	Protection Against Shock	N/A		IP2X			
Control Circuit	Rated Operation Voltage	24V DC (+10%, -15%) A2 (should be grounded at voltage source)					
		120V AC (+10%, -15%) A2 (should be grounded at voltage source)					
		240V AC (+10%, -15%) A2 (should be grounded at voltage source)					
	Rated Insulation Voltage	250V		250V			
	Rated Impulsed Voltage	—		4 kV			
	Dielectric Withstand	1500V AC		2000V AC			
	Overvoltage Category	—		III			
Operating Frequency	50/60 Hz						
Short Circuit Protection	SCPD Performance Type 1	Current Rating	Voltage	480Y/277V	480/480V	600Y/347V	600V
		1.1...3.0 A	Sym. Amps RMS	65 kA	65 kA	30 kA	30 kA
		3.0...5.5 A					
		5.3...7.6 A					
	6.3...16 A	30 kA	30 kA	30 kA	30 kA		
SCPD List	Size per NEC Group Motor			—			

4

Power Requirements				
Control Voltage (Nom)	Units	24V DC	120V AC	240V AC
Power supply (Nom)	Amps	0.170	0.110	0.060
Total Control Power (Starting/Stopping)	VA (W)	(90.1 W)	35	35
Total Control Power (Running)	VA (W)	(7.9 W)	28	28
External Devices powered by Control Voltage				
Outputs (2) (1 A max. each)	Amps	2	2	2
Total Control (Pick Up) with max outputs	VA (W)	(138.0 W)	275	515
Total Control (Hold In) with max outputs	VA (W)	(56.0 W)	268	508

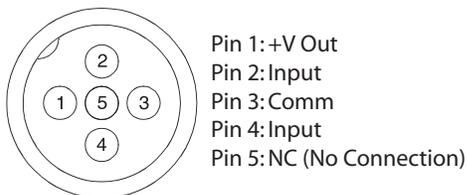
Input Ratings	Rated Operation Voltage	24V DC		
	Rated Insulation Voltage	1500V AC		
	Input On-State Voltage Range	10...26V DC		
	Input On-State Current	3.0 mA @ 10V DC		
		7.2 mA @ 24V DC		
	Input Off-State Voltage Range	0...5V DC		
	Input Off-State Current	<1.5 mA		
	Input Filter — Software Selectable			
	Off to On	Settable from 0...64 ms in 1 ms increments		
	On to Off	Settable from 0...64 ms in 1 ms increments		
	Input Compatibility	N/A	IEC 1+	
	Number of Inputs	4		
	Sensor Source			
	Voltage Status Only	11...25V DC from DeviceNet		
	Current Available	50 mA max. per input, 200 mA total		
Output Ratings (Sourced from Control Circuit)	Rated Operation Voltage	250V AC/30V DC	250V AC/30V DC	
	Rated Insulation Voltage	250V	250V	
	Dielectric Withstand	1500V AC	2000V AC	
	Operating Frequency	50/60 Hz	50/60 Hz	
	Type of Control Circuit	Electromechanical relay		
	Type of Current	AC/DC		
	Conventional Thermal Current Ith	Total of both outputs ≤ 2 A		
	Type of Contacts	Normally open (N.O.)		
Number of Contacts	2			
ArmorPoint Ratings	Backplane Current Load	400 mA		

ArmorStart® Distributed Motor Controller

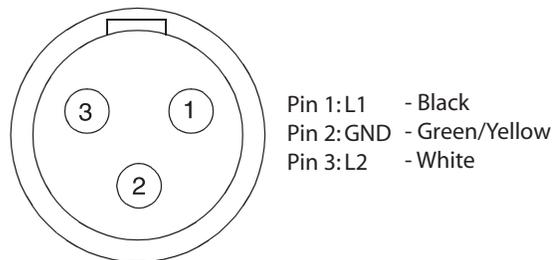
Specifications, Continued

		UL/NEMA	IEC	
Environmental	Operating Temperature Range	-20...+40 °C (-4...+104 °F)		
	Storage and Transportation temperature range	-25...+85 °C (-13...+185 °F)		
	Altitude	2000 m		
	Humidity	5...95% (non-condensing)		
	Pollution Degree	3		
	Enclosure Ratings	NEMA 4/12/13	IP67	
	Enclosure Ratings	NEMA 4X	IP69K	
	Approximate Shipping Weight	16.8 kg (37 lb)		
Mechanical	Resistance to Shock			
	Operational	15 G		
	Non-Operational	30 G		
	Resistance to Vibration			
	Operational	1 G, 0.15 mm (0.006 in.) displacement		
	Non-Operational	2.5 G, 0.38 mm (0.015 in.) displacement		
	Power and Ground Terminals			
	Wire Size	Primary/Secondary terminal: (#18 ...#10 AWG)	Primary/Secondary terminal: 1.0...4.0 mm ²	
	Tightening Torque	Primary terminal: 10.6...21.6 lb•in Secondary terminal: 5.3...7.3 lb•in	Primary terminal: (1.2...2.4 N•m) Secondary terminal: (0.6...0.8 N•m)	
	Wire Strip Length	0.35 in. (9 mm)		
	Control and Safety Monitor Inputs			
	Wire Size	(22...10 AWG)	0.34...4.0 mm ²	
	Tightening Torque	5.0...5.6 lb•in	0.6 N•m	
	Wire Strip Length	0.35 in. (9 mm)		
	Other Rating	EMC Emission Levels		
		Conducted Radio Frequency Emissions	Class A	
Radiated Emissions		Class A		
EMC Immunity Levels				
Electrostatic Discharge		4 kV contact and 8 kV Air		
Radio Frequency Electromagnetic Field		10V/m		
Fast Transient		2 kV		
Surge Transient		1 kV (12) _{L-L} , 2 kV (2) _{L-N} (earth)		
Overload Characteristics				
Overload Current Range		1.1...3.0 A		
		3.0...5.5 A		
		5.3...7.6 A		
		6.3...16 A		
Trip Class		10		
Trip Rating		120% of FLC setting		
Number of Poles		3		
DeviceNet Specifications				
DeviceNet Supply Voltage Rating		Range 11...25V DC, 24V DC nominal		
DeviceNet Input Current		167 mA @ 24V DC - 4.0 W		
		364 mA @ 11V DC - 4.0 W		
External Devices powered by DeviceNet		Sensors inputs 4 x 50 mA - total 200 mA		
Total w/max Sensor Inputs (4)		367 mA @ 24V DC - 8.8 W		
DeviceNet Input Current Surge	15 A for 250 μs			
DeviceNet Communications				
Baud Rates	125, 250, 500 kbps			
Distance Maximum	500 m (1630 ft) @ 125 kbps			
	200 m (656 ft) @ 250 kbps			
	100 m (328 ft) @ 500 kbps			
Certifications	cULus (File No. E96956) UL 508 EN/IEC 60947-4-2 CE Marked per Low Voltage Directive 73/23/EEC and EMC Directive 89/336/EEC			

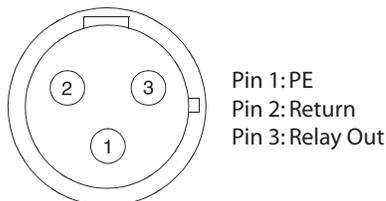
External Connections for Input Connector



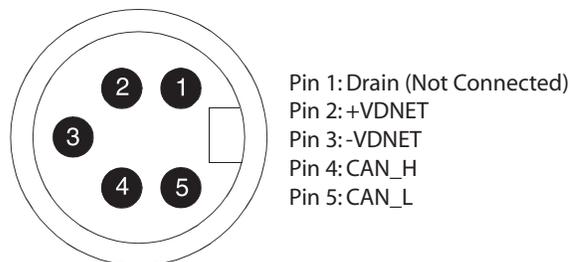
External Connections for Brake Contactor Connector



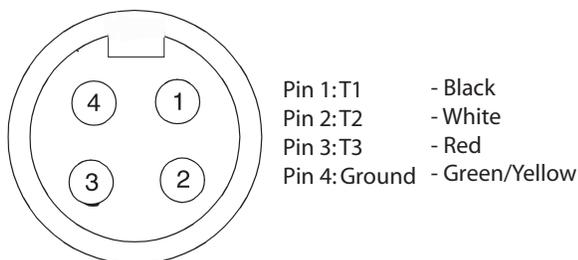
External Connections for Output Connector



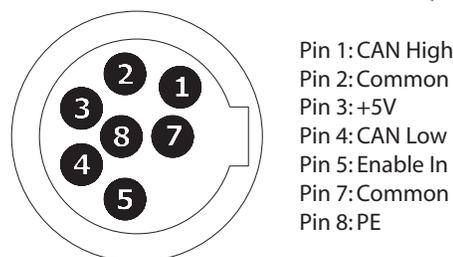
External Connections for DeviceNet Connector



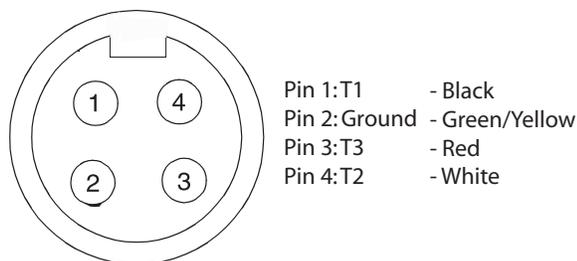
External Connections for Motor Connector (≤ 5 Hp @ 460V AC)



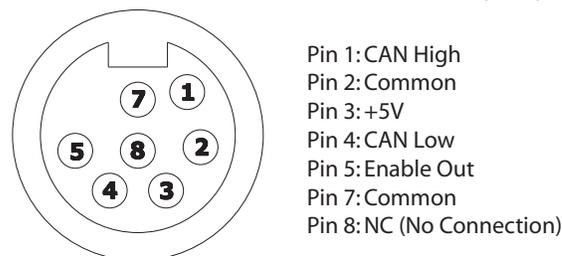
External Connections for ArmorPoint Interface (IN)



External Connections for Motor Connector (> 5 Hp @ 460V AC)

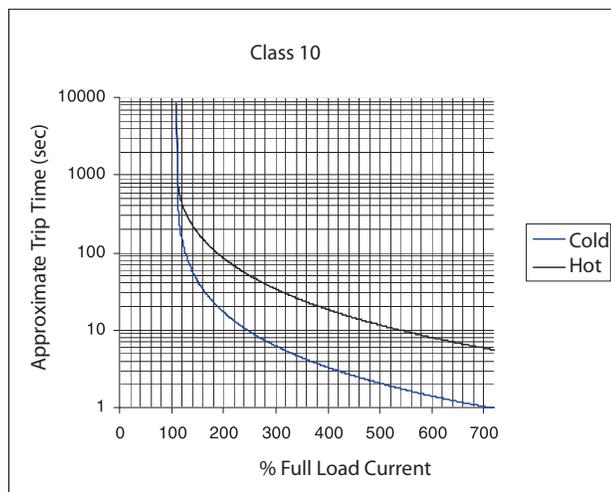


External Connections for ArmorPoint Interface (OUT)



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Overload Curves



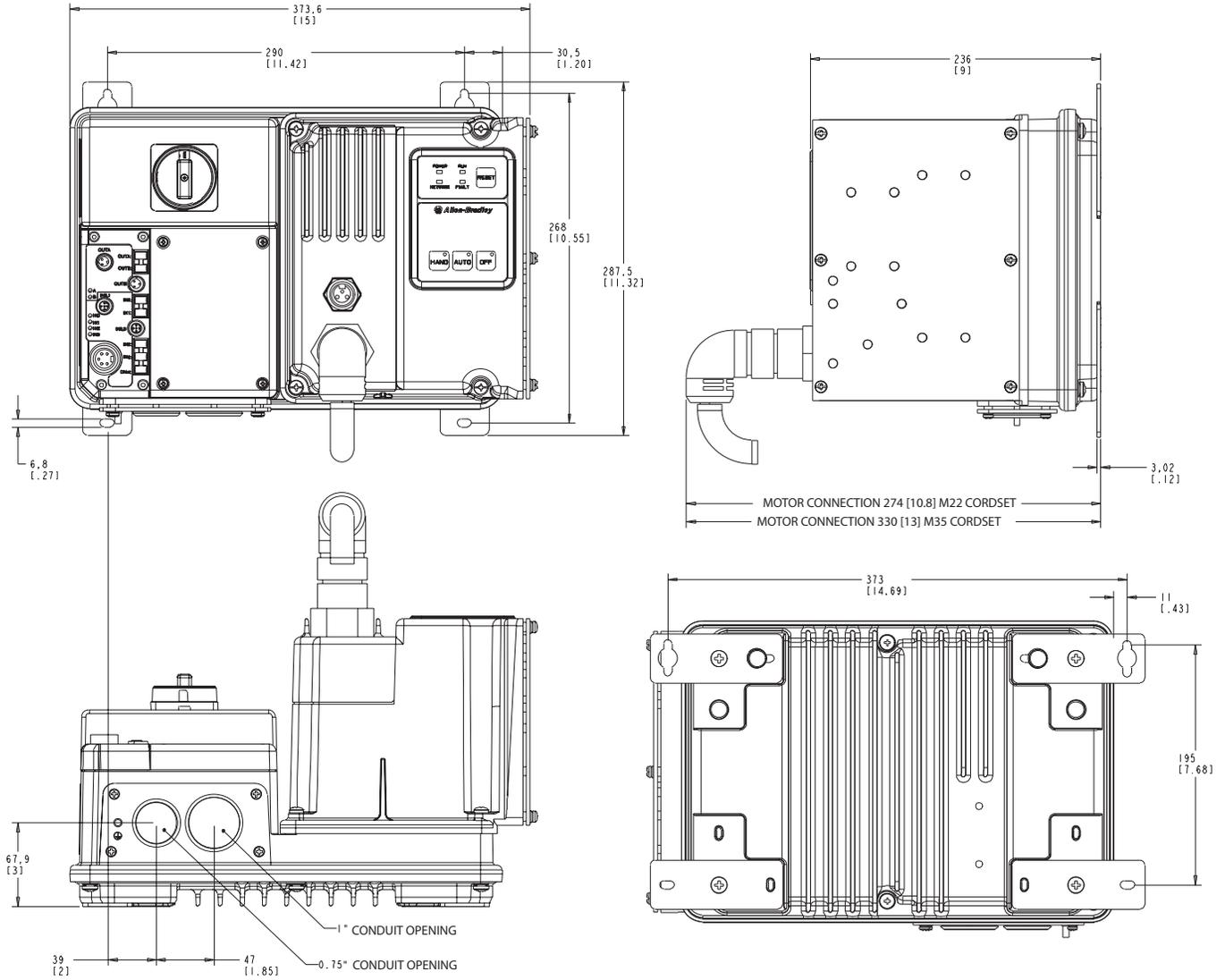
ArmorStart® Distributed Motor Controller

Approximate Dimensions

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

Dimensions for IP67/NEMA Type 4 with Conduit Entrance

4

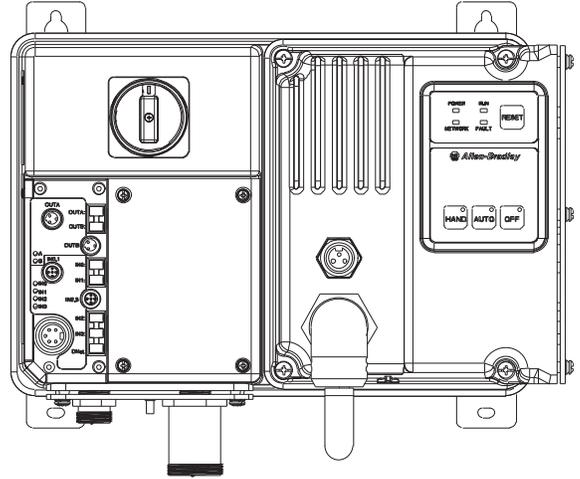
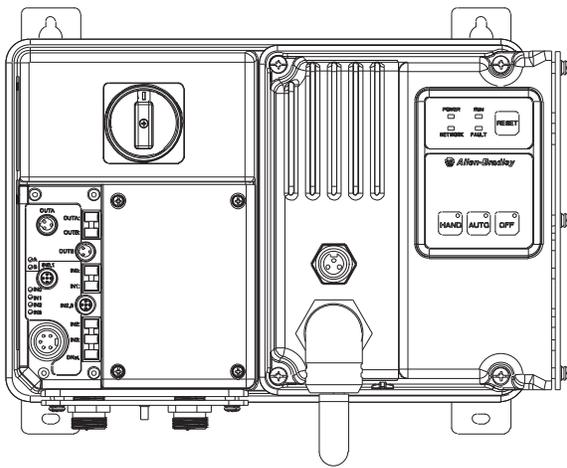


ArmorStart® Distributed Motor Controller

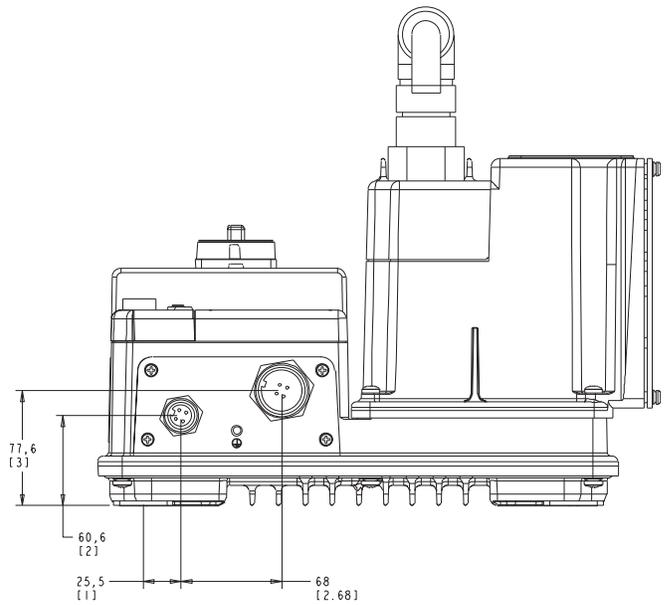
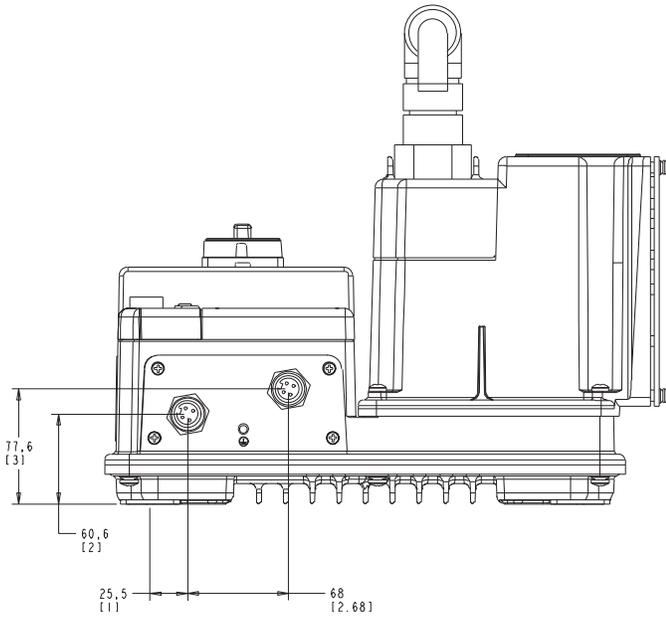
Approximate Dimensions, Continued

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

Dimensions for IP67/NEMA Type 4 with ArmorConnect Connectivity



4



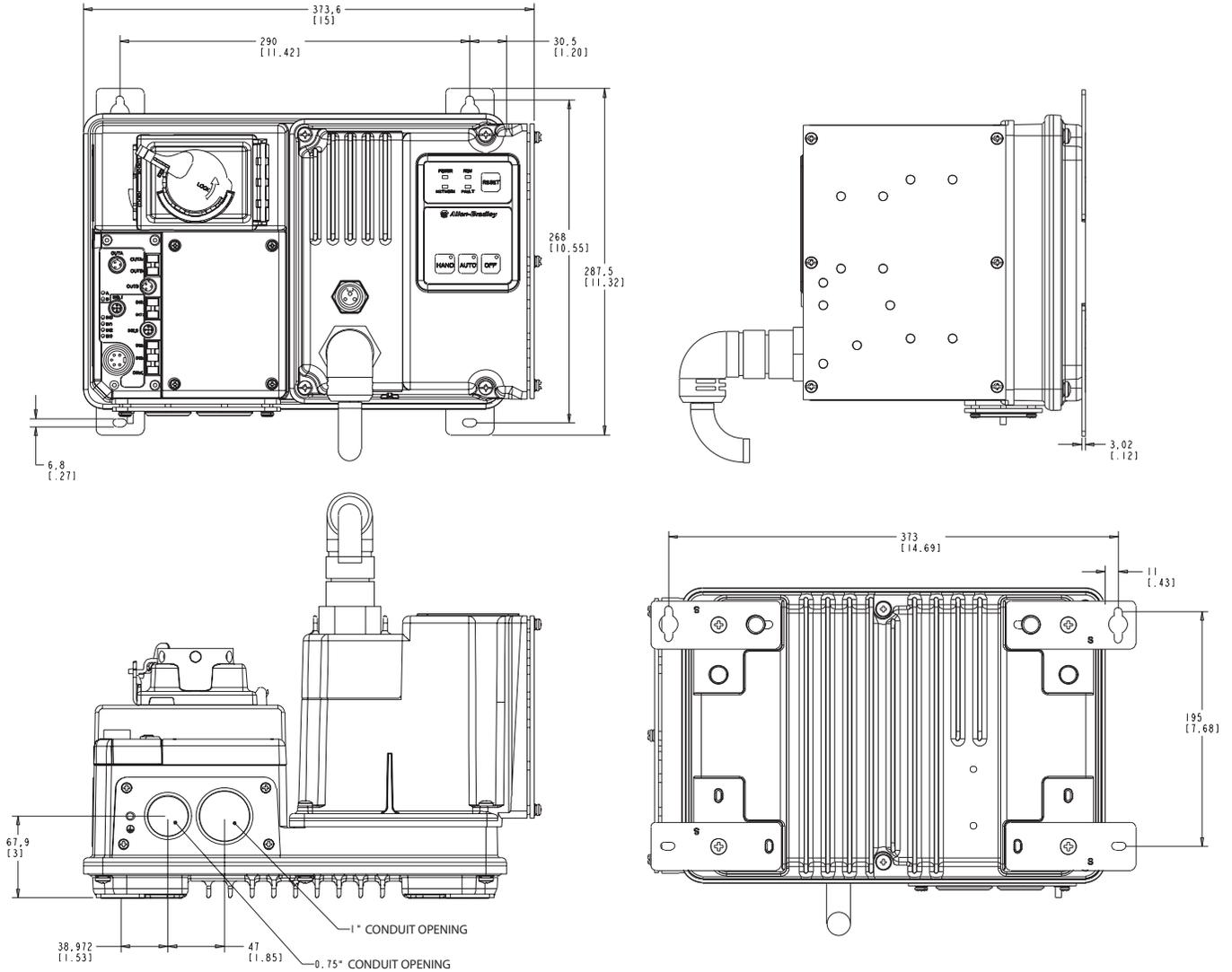
ArmorStart® Distributed Motor Controller

Approximate Dimensions, Continued

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

Dimensions for NEMA Type 4X with Conduit Entrance

4

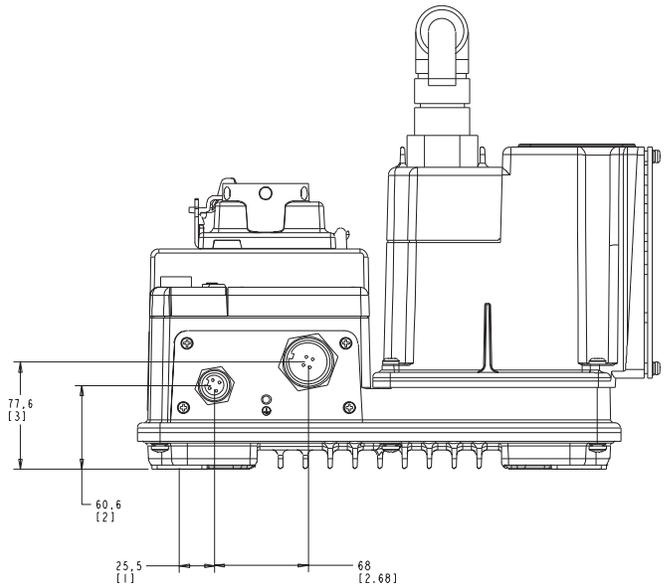
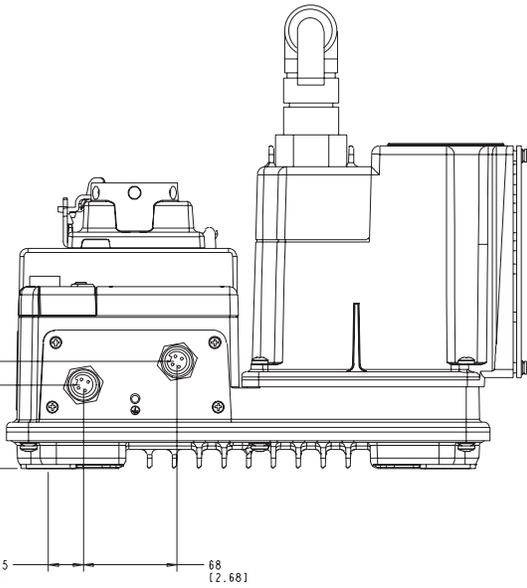
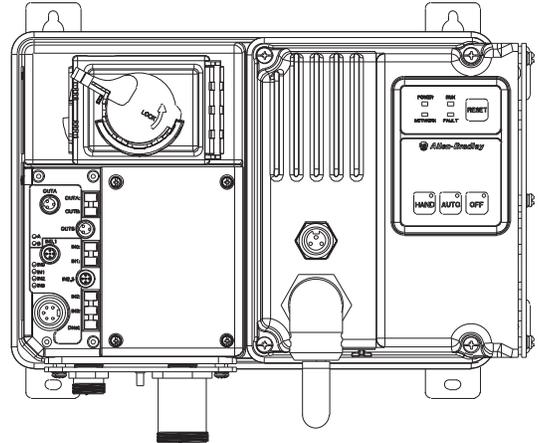
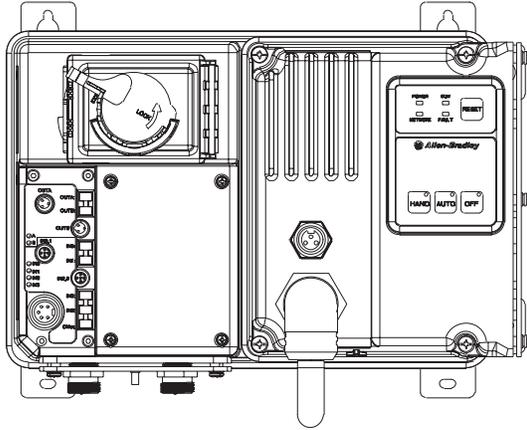


ArmorStart® Distributed Motor Controller

Approximate Dimensions, Continued

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

Dimensions for NEMA Type 4X with ArmorConnect Connectivity



4



Bulletin 284 ArmorStart Distributed Motor Controller

- On-Machine starting solution
- Variable frequency AC drive using PowerFlex® technology
- Horsepower range 0.5...5 Hp (0.4...3.3 kW)
- Robust IP67/NEMA Type 4 and NEMA Type 4X enclosure rating
- Modular plug and play design
- Quick disconnect connections for I/O, communications, motor, three-phase, and control power
- Four inputs and two outputs (expandable with ArmorPoint)
- LED status indication
- DeviceNet communications
- DeviceLogix component technology
- Peer-to-peer communications (ZIP)
- Connectivity to ArmorPoint distributed I/O products
- ControlNet and EtherNet communication via ArmorPoint
- Factory installed options:
 - EMI filter
 - Dynamic brake connector
 - Output contactor
 - 0...10V analog input
 - Hand/Off/Auto (HOA) keypad configuration
 - Control brake contactor
 - Source brake contactor
 - Shielded motor cable
 - Safety monitor

Table of Contents

Product Overview..... this page

Product Selection..... 4-36

Accessories 4-42

Specifications 4-47

Approx. Dimensions... 4-50

Standards Compliance

UL 508C
 CSA C22.2, No. 14
 EN/IEC 60947-1, EN 50178,
 EN 61800-3
 CE Marked per Low Voltage
 Directive 73/23/EEC and EMC
 Directive 89/336/EEC

Certifications

cULus (File No. E207834,
 Guide NMMS, NMMS7)

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Description

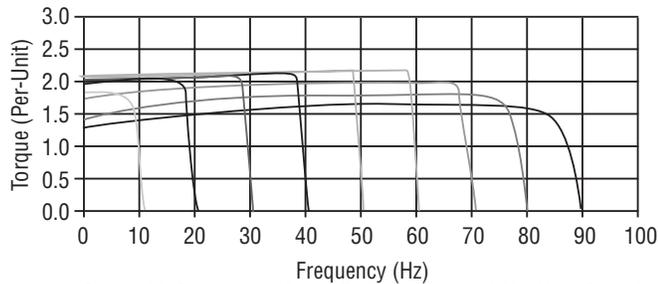
The Bulletin 284 ArmorStart Distributed Motor Controller is an integrated, pre-engineered starter for variable frequency AC drive applications. The ArmorStart offers a robust IP67/NEMA Type 4 enclosure design, which is suitable for water wash-down environments. The ArmorStart products are also offered with NEMA Type 4X rating, suitable for environment wash down with caustic chemicals used in the food and beverage industry. The wash-down rating is 1000 psi for the NEMA Type 4X rated devices. The modular plug-and-play design offers simplicity in wiring the installation. The quick disconnects for the I/O, communication, and motor connection reduce the wiring time and eliminate wiring errors. The ArmorStart offers, as standard, four DC inputs and two relay outputs to be used with sensors and actuators respectively, for monitoring and controlling the application process. The ArmorStart's LED status indication and built-in diagnostics capabilities allows ease of maintenance and troubleshooting. The optional Hand/Off/Auto (HOA) keypad allows for local start/stop control at the ArmorStart Distributed Motor Controller.

The Bulletin 284 ArmorStart Distributed Motor Controller offers short circuit protection per UL 508C and IEC 60947-1. The ArmorStart is rated for local-disconnect service by incorporating the Bulletin 140 Motor Protector as the local-disconnect, eliminating the need for additional components. The ArmorStart Distributed Motor Controllers are suitable for group motor installations.

Mode of Operation

Volts per Hertz (Sensorless Vector Performance)

This method provides excellent speed regulation and high levels of torque across the entire speed range of the drive, and improved speed regulation even as loading increases. Basic control yields the most cost effective performance when sensorless vector control is not required.

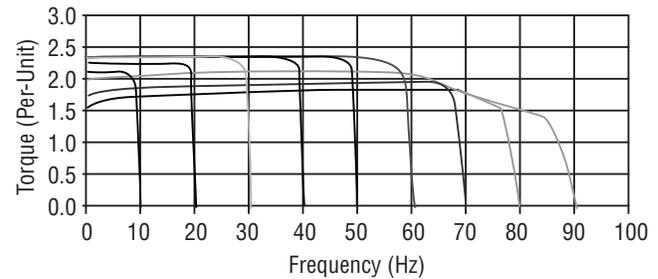


Additional Features

- Four Preset Speeds
- Flying Start
- Auto Restart

Sensorless Vector Control (SVC)

Sensorless vector control provides exceptional speed regulation and very high levels of torque across the entire speed range of the drive.



Additional Features

- Eight Preset Speeds
- Skip Frequency
- Flying Start
- Auto Restart
- Process Control Loop (PID)
- Step Logic Functionality
- Timer/Counter Functions

Description of Features

Overload Protection

The Bulletin 284 ArmorStart Distributed Motor Controller incorporates, as standard, electronic motor overload protection. This overload protection is accomplished electronically with an I^2t algorithm. The ArmorStart's overload protection is programmable via the communication network providing the user with flexibility. The overload trip class allows for class 10 overload protection. Ambient insensitivity is inherent in the electronic design of the overload.

Motor Cable

With every Bulletin 284 ArmorStart Distributed Motor Controller, a 3-meter unshielded 4-conductor cordset is provided with each unit as standard. If the optional EMI filter is selected, a 3-meter shielded 4-conductor cordset is provided with each unit as standard.

LED Status Indication

The LED Status Indication provides four status LEDs and a Reset button. The LEDs provide status indication for the following:

- **POWER LED**

The LED is illuminated solid green when control power is present and with the proper polarity

- **RUN LED**

This LED is illuminated solid green when a start command and control power are present

- **NETWORK LED**

This bicolor (red/green) LEDs indicates the status of the communication link

- **FAULT LED**

Indicates Controller Fault (trip) condition

- The "Reset Button" as a local trip reset.

Inputs

The inputs are single keyed (two inputs per connector), which are sourced from DeviceNet power (24V DC), with LED status indication.

Outputs

Two dual-key relay output connectors are supplied as standard. The outputs are sourced from the control voltage power, which can be either, 24V DC, 120V AC, or 240V AC with LED status indication.

Factory Installed Options

HOA Selector Keypad with Jog Function

The HOA Selector Keypad with Jog Function allows for local start/stop control with capabilities to JOG and to Forward/Reverse motor direction.

EMI Filter

The EMI Filter option is required if the Bulletin 284 ArmorStart Distributed Motor requires to be CE compliant. If the EMI Filter is selected, a 3-meter shielded 4-conductor cordset is provided as standard. This option is only available with sensorless vector control.

Dynamic Brake Connector

A 3-meter, 3-pin cable for connection to a dynamic brake module is provided as standard when this option is selected. See Accessories on page 4-44 for available dynamic brake modules.

Control Brake Contactor

An internal contactor is used to switch the electromechanical motor brake On/Off. The motor brake is powered from the control voltage circuit. A customer accessible 3.0 A fuse is provided to protect the brake cable. One 3-meter 3-pin cable for connection to the motor brake is provided as standard when this option is selected.

Source Brake Contactor

An internal contactor is used to switch the electromechanical motor brake on/off. The motor brake is powered from the main power circuit. A customer accessible 3.0 A fuse is provided to protect the brake cable. A 3 meter, 3-pin cable for connection to the motor, is provided as standard when this option is selected.

Gland Plate Entrance

The ArmorStart product offers two different methods for connecting incoming three-phase and control power to the device. One method offered is the traditional conduit entrance which provides a 3/4 and 1 in. conduit hole opening for wiring three-phase and control power. The second method offers connectivity to the ArmorConnect power media. Factory installed receptacles are provided for connectivity to both three-phase and control power media.

Fault Diagnostics

Fault diagnostics capabilities built into the Bulletin 284 ArmorStart Distributed Motor Controller help you pinpoint a problem for easy troubleshooting and quick re-starting.

- Short Circuit
- Overload
- Phase Short
- Ground Fault
- Stall
- Control Power Loss
- Control Power Fuse Protection
- I/O Fault
- Overcurrent
- Brake Fuse Protection
- Overtemperature
- Output Fuse Protection
- DeviceNet Power Loss
- Internal Communication Fault
- DC Bus Fault
- EEPROM Fault
- Hardware Fault
- Restart Retries
- Miscellaneous Fault

Network and Expandable I/O Capabilities

The Bulletin 284D ArmorStart Distributed Motor Controller delivers enhanced control to access parameter settings and provides fault diagnostics, and remote start/stop control. DeviceNet is the communication protocol, provided with the ArmorStart including DeviceLogix.

The Bulletin 284A ArmorStart Distributed Motor Controller allows connectivity to the ArmorPoint backplane. The ArmorPoint I/O system can communicate using DeviceNet, ControlNet, or EtherNet communication protocols. In addition to the different network protocols, the ArmorPoint Distributed I/O products allow the I/O capability to be expanded beyond the standard two outputs. The two dual-key relay output connectors are supplied as standard. The outputs are sourced from the control voltage power of 24V DC, 120V AC, or 240V AC. LED status indication is also provided, as standard with ArmorPoint. When using the ArmorPoint, a maximum of two ArmorPoint Distributed Motor Controllers can be connected to the ArmorPoint Distributed I/O product.

Output Contactor

An internal contactor will be sourced from control voltage to isolate the load side of the Bulletin 284 ArmorStart Distributed Motor Controller. When control power is applied the output contactor is closed and when control power is removed the output contactor opens. There is no switching element such as a relay in the system. If control power is lost then the output contactor will open since its coil power is lost. A sequenced stop involving the output contact cannot be performed.

Shielded Motor Cable

A 3-meter shielded 4-conductor cordset is provided instead of the 3-meter unshielded 4-conductor cordset. If the EMI Filter is selected, a 3-meter shielded 4-conductor cordset is provided as standard.

Safety Monitor

The Safety Monitor Option allows for independent monitoring of the output status of the device. The function is implemented using a normally closed contact which complies with IEC 60947-5-1 for mechanically linked contacts. Two terminal blocks are provided as the inputs which maybe used with an external safety circuit. The external safety circuit monitors the status of the output contactor.

0...10V Analog Input

The Bulletin 284 Distributed Motor Controller with Sensorless Vector Control provides a 0...10V analog input. The 0...10V Analog Input, 15 A, factory-installed option provides a 0...10V external frequency command from the 0...10V or +/-10V analog input or remote potentiometer. A 5-pin micro receptacle is provided for connectivity for customer connection. A shielded 5-conductor cordset or patch cord is recommended.

ArmorStart® Distributed Motor Controller

Catalog Number Explanation – PowerFlex4 /Product Selection

Cat. No. Explanation

Examples given in this section are for reference purposes. This basic explanation should not be used for product selection; not all combinations will produce a valid catalog number.

284 **D** – **F** **H** **D2P3** – **D** – **10** – **CR** – **Option 1** – **Option 2** – **Option 3**
a *b* *c* *d* *e* *f* *g* *h* *i* *j* *k*

a

Bulletin Number	
284	VFD Starter

b

Communications	
D	DeviceNet™
A	ArmorPoint

c

Enclosure Type	
F	Type 4 (IP67)
S	Type 4X

d

Torque Performance Mode	
Code	Description
H	Volts per Hertz (Sensorless Vector Performance)

e

Output Current			
200...240V		380...480V	
Code	Description	Code	Description
B2P3	2.3 A, 0.4 kW, 0.5 Hp	D1P4	1.4 A, 0.4 kW, 0.5 Hp
B4P5	4.5 A, 0.75 kW, 1.0 Hp	D2P3	2.3 A, 0.75 kW, 1.0 Hp
B7P6	7.6 A, 1.5 kW, 2.0 Hp	D4P0	4.0 A, 1.5 kW, 2.0 Hp
—	—	D6P0	6.0 A, 2.2 kW, 3.0 Hp
—	—	D7P6	7.6 A, 3.3 kW, 5.0 Hp

f

Control Voltage	
Code	Description
Z	24V DC
D	120V AC
B	240V AC

g

Short Circuit Protection (Motor Circuit Protector)	
10	10 A Rated Device
25	25 A Rated Device

i

Option 1	
Code	Description
3	Hand/Off/Auto Selector Keypad with Jog Function

j

Option 2		
CB	blank	Control Brake Contactor
CB	W *	No cable
DB	blank	DB Brake Connector
SB	blank	Source Brake Contactor
SB	W *	No cable

k

Option 3	
Code	Description
OC	Output Contactor
SM *	Safety Monitor

h

Control and 3-Phase Power Connections / Motor Cable Connection (CR: Conduit/Round Media) or (RR: Round/Round Media)				
Code		Description		
		Control Power	3-Phase Power	Motor Cable
CR	blank	Conduit Entrance	Conduit Entrance	3 m, unshielded cordset male 90°
CR	N	Conduit Entrance	Conduit Entrance	3 m, shielded cordset male 90°
CR	W *	Conduit Entrance	Conduit Entrance	No cable
RR	blank	Round Media (Male Receptacle)	Round Media (Male Receptacle)	3 m, unshielded cordset male 90°
RR	N	Round Media (Male Receptacle)	Round Media (Male Receptacle)	3 m, shielded cordset male 90°
RR	W *	Round Media (Male Receptacle)	Round Media (Male Receptacle)	No cable

* See Accessories on page 4-42 for extended motor and brake cable lengths.
 * The output contactor is included with the Safety Monitor option.

Product Selection

IP67/NEMA Type 4 with conduit entrance, DeviceNet communications and Volts per Hertz torque performance, Up to 480V AC

Input Voltage	3-Phase kW Rating	3-Phase Hp Rating	Output Current	24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
				Cat. No.	Cat. No.	Cat. No.
200...240V, 50/60 Hz 3-Phase	0.4	0.5	2.3	284D-FHB2P3Z-10-CR	284D-FHB2P3D-10-CR	284D-FHB2P3B-10-CR
	0.75	1	4.5	284D-FHB4P5Z-10-CR	284D-FHB4P5D-10-CR	284D-FHB4P5B-10-CR
	1.5	2	7.6	284D-FHB7P6Z-25-CR	284D-FHB7P6D-25-CR	284D-FHB7P6B-25-CR
380...480V, 50/60 Hz 3-Phase	0.4	0.5	1.4	284D-FHD1P4Z-10-CR	284D-FHD1P4D-10-CR	284D-FHD1P4B-10-CR
	0.75	1	2.3	284D-FHD2P3Z-10-CR	284D-FHD2P3D-10-CR	284D-FHD2P3B-10-CR
	1.5	2	4	284D-FHD4P0Z-10-CR	284D-FHD4P0D-10-CR	284D-FHD4P0B-10-CR
	2.2	3	6	284D-FHD6P0Z-25-CR	284D-FHD6P0D-25-CR	284D-FHD6P0B-25-CR
	3	5	7.6	284D-FHD7P6Z-25-CR	284D-FHD7P6D-25-CR	284D-FHD7P6B-25-CR

ArmorStart® Distributed Motor Controller

Product Selection, Continued

IP67/NEMA Type 4 with conduit entrance, ArmorPoint communications, and Volts per Hertz torque performance, Up to 480V AC

Input Voltage	3-Phase kW Rating	3-Phase Hp Rating	Output Current	24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
				Cat. No.	Cat. No.	Cat. No.
200...240V, 50/60 Hz 3-Phase	0.4	0.5	2.3	284A-FHB2P3Z-10-CR	284A-FHB2P3D-10-CR	284A-FHB2P3B-10-CR
	0.75	1	5	284A-FHB4P5Z-10-CR	284A-FHB4P5D-10-CR	284A-FHB4P5B-10-CR
	1.5	2	7.6	284A-FHB7P6Z-25-CR	284A-FHB7P6D-25-CR	284A-FHB7P6B-25-CR
380...480V, 50/60 Hz 3-Phase	0.4	0.5	1.4	284A-FHD1P4Z-10-CR	284A-FHD1P4D-10-CR	284A-FHD1P4B-10-CR
	0.75	1	2.3	284A-FHD2P3Z-10-CR	284A-FHD2P3D-10-CR	284A-FHD2P3B-10-CR
	1.5	2	4	284A-FHD4P0Z-10-CR	284A-FHD4P0D-10-CR	284A-FHD4P0B-10-CR
	2.2	3	6	284A-FHD6P0Z-25-CR	284A-FHD6P0D-25-CR	284A-FHD6P0B-25-CR
	3	5	7.6	284A-FHD7P6Z-25-CR	284A-FHD7P6D-25-CR	284A-FHD7P6B-25-CR

IP67/NEMA Type 4 with quick disconnects for ArmorConnect power media, DeviceNet communications and Volts per Hertz torque performance, Up to 480V AC

Input Voltage	3-Phase kW Rating	3-Phase Hp Rating	Output Current	24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
				Cat. No.	Cat. No.	Cat. No.
200...240V, 50/60 Hz 3-Phase	0.4	0.5	2.3	284D-FHB2P3Z-10-RR	284D-FHB2P3D-10-RR	284D-FHB2P3B-10-RR
	0.75	1	4.5	284D-FHB4P5Z-10-RR	284D-FHB4P5D-10-RR	284D-FHB4P5B-10-RR
	1.5	2	7.6	284D-FHB7P6Z-25-RR	284D-FHB7P6D-25-RR	284D-FHB7P6B-25-RR
380...480V, 50/60 Hz 3-Phase	0.4	0.5	1.4	284D-FHD1P4Z-10-RR	284D-FHD1P4D-10-RR	284D-FHD1P4B-10-RR
	0.75	1	2.3	284D-FHD2P3Z-10-RR	284D-FHD2P3D-10-RR	284D-FHD2P3B-10-RR
	1.5	2	4	284D-FHD4P0Z-10-RR	284D-FHD4P0D-10-RR	284D-FHD4P0B-10-RR
	2.2	3	6	284D-FHD6P0Z-25-RR	284D-FHD6P0D-25-RR	284D-FHD6P0B-25-RR
	3	5	7.6	284D-FHD7P6Z-25-RR	284D-FHD7P6D-25-RR	284D-FHD7P6B-25-RR

IP67/NEMA Type 4 with quick disconnects for ArmorConnect power media, ArmorPoint communications, and Volts per Hertz torque performance, Up to 480V AC

Input Voltage	3-Phase kW Rating	3-Phase Hp Rating	Output Current	24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
				Cat. No.	Cat. No.	Cat. No.
200...240V, 50/60 Hz 3-Phase	0.4	0.5	2.3	284A-FHB2P3Z-10-RR	284A-FHB2P3D-10-RR	284A-FHB2P3B-10-RR
	0.75	1	4.5	284A-FHB4P5Z-10-RR	284A-FHB4P5D-10-RR	284A-FHB4P5B-10-RR
	1.5	2	7.6	284A-FHB7P6Z-25-RR	284A-FHB7P6D-25-RR	284A-FHB7P6B-25-RR
380...480V, 50/60 Hz 3-Phase	0.4	0.5	1.4	284A-FHD1P4Z-10-RR	284A-FHD1P4D-10-RR	284A-FHD1P4B-10-RR
	0.75	1	2.3	284A-FHD2P3Z-10-RR	284A-FHD2P3D-10-RR	284A-FHD2P3B-10-RR
	1.5	2	4	284A-FHD4P0Z-10-RR	284A-FHD4P0D-10-RR	284A-FHD4P0B-10-RR
	2.2	3	6	284A-FHD6P0Z-25-RR	284A-FHD6P0D-25-RR	284A-FHD6P0B-25-RR
	3	5	7.6	284A-FHD7P6Z-25-RR	284A-FHD7P6D-25-RR	284A-FHD7P6B-25-RR

NEMA Type 4X with conduit entrance, DeviceNet communications and Volts per Hertz torque performance, Up to 480V AC

Input Voltage	3-Phase kW Rating	3-Phase Hp Rating	Output Current	24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
				Cat. No.	Cat. No.	Cat. No.
200...240V, 50/60 Hz 3-Phase	0.4	0.5	2.3	284D-SHB2P3Z-10-CR	284D-SHB2P3D-10-CR	284D-SHB2P3B-10-CR
	0.75	1	4.5	284D-SHB4P5Z-10-CR	284D-SHB4P5D-10-CR	284D-SHB4P5B-10-CR
	1.5	2	7.6	284D-SHB7P6Z-25-CR	284D-SHB7P6D-25-CR	284D-SHB7P6B-25-CR
380...480V, 50/60 Hz 3-Phase	0.4	0.5	1.4	284D-SHD1P4Z-10-CR	284D-SHD1P4D-10-CR	284D-SHD1P4B-10-CR
	0.75	1	2.3	284D-SHD2P3Z-10-CR	284D-SHD2P3D-10-CR	284D-SHD2P3B-10-CR
	1.5	2	4	284D-SHD4P0Z-10-CR	284D-SHD4P0D-10-CR	284D-SHD4P0B-10-CR
	2.2	3	6	284D-SHD6P0Z-25-CR	284D-SHD6P0D-25-CR	284D-SHD6P0B-25-CR
	3	5	7.6	284D-SHD7P6Z-25-CR	284D-SHD7P6D-25-CR	284D-SHD7P6B-25-CR

NEMA Type 4X with quick disconnects for ArmorConnect power media, DeviceNet communications and Volts per Hertz torque performance, Up to 480V AC

Input Voltage	3-Phase kW Rating	3-Phase Hp Rating	Output Current	24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
				Cat. No.	Cat. No.	Cat. No.
200...240V, 50/60 Hz 3-Phase	0.4	0.5	2.3	284D-SHB2P3Z-10-RR	284D-SHB2P3D-10-RR	284D-SHB2P3B-10-RR
	0.75	1	4.5	284D-SHB4P5Z-10-RR	284D-SHB4P5D-10-RR	284D-SHB4P5B-10-RR
	1.5	2	7.6	284D-SHB7P6Z-25-RR	284D-SHB7P6D-25-RR	284D-SHB7P6B-25-RR
380...480V, 50/60 Hz 3-Phase	0.4	0.5	1.4	284D-SHD1P4Z-10-RR	284D-SHD1P4D-10-RR	284D-SHD1P4B-10-RR
	0.75	1	2.3	284D-SHD2P3Z-10-RR	284D-SHD2P3D-10-RR	284D-SHD2P3B-10-RR
	1.5	2	4	284D-SHD4P0Z-10-RR	284D-SHD4P0D-10-RR	284D-SHD4P0B-10-RR
	2.2	3	6	284D-SHD6P0Z-25-RR	284D-SHD6P0D-25-RR	284D-SHD6P0B-25-RR
	3	5	7.6	284D-SHD7P6Z-25-RR	284D-SHD7P6D-25-RR	284D-SHD7P6B-25-RR



ArmorStart® Distributed Motor Controller

Catalog Number Explanation – PowerFlex40/Product Selection

Cat. No. Explanation

Examples given in this section are for reference purposes. This basic explanation should not be used for product selection; not all combinations will produce a valid catalog number.

284 D – F V D2P3 D – 10 – CR – Option 1 – Option 2 – Option 3

a
b
c
d
e
f
g
h
i
j
k

Bulletin Number	
Code	Description
284	UFD Starter

Communications	
Code	Description
D	DeviceNet™
A	ArmorPoint

Enclosure Type	
Code	Description
F	Type 4 (IP67)
S	Type 4X

Torque Performance Mode	
Code	Description
V	Sensorless Vector Control and Volts per Hertz

Output Current					
200...240V		380...480V		500...600V	
Code	Description	Code	Description	Code	Description
B2P3	2.3 A, 0.4 kW, 0.5 Hp	D1P4	1.4 A, 0.4 kW, 0.5 Hp	E1P7	1.7 A, 0.75 kW, 1.0 Hp
B5P0	5.0 A, 0.75 kW, 1.0 Hp	D2P3	2.3 A, 0.75 kW, 1.0 Hp	E3P0	3.0 A, 1.5 kW, 2.0 Hp
B7P6	7.6 A, 1.5 kW, 2.0 Hp	D4P0	4.0 A, 1.5 kW, 2.0 Hp	E4P2	4.2 A, 2.2 kW, 3.0 Hp
—	—	D6P0	6.0 A, 2.2 kW, 3.0 Hp	E6P6	6.6 A, 4.0 kW, 5.0 Hp
—	—	D7P6	7.6 A, 3.3 kW, 5.0 Hp	—	—

Control Voltage	
Code	Description
Z	24V DC
D	120V AC
B	240V AC

Short Circuit Protection (Motor Circuit Protector)	
Code	Description
10	10 A Rated Device
25	25 A Rated Device

Control and 3-Phase Power Connections / Motor Cable Connection (CR: Conduit/Round Media) or (RR: Round/Round Media)				
Code		Description		
		Control Power	3-Phase Power	Motor Cable
CR	blank	Conduit Entrance	Conduit Entrance	3 m, unshielded cordset male 90°
CR	N	Conduit Entrance	Conduit Entrance	3 m, shielded cordset male 90°
CR	W *	Conduit Entrance	Conduit Entrance	No cable
RR	blank	Round Media (Male Receptacle)	Round Media (Male Receptacle)	3 m, unshielded cordset male 90°
RR	N	Round Media (Male Receptacle)	Round Media (Male Receptacle)	3 m, shielded cordset male 90°
RR	W *	Round Media (Male Receptacle)	Round Media (Male Receptacle)	No cable

Option 1	
Code	Description
3	Hand/Off/Auto Selector Keypad with Jog Function

Option 2		
Code	Description	Control Brake Contactor
CB	blank	Control Brake Contactor
CB	W *	No cable
DB	blank	DB Brake Connector
SB	blank	Source Brake Contactor
SB	W *	No cable

Option 3	
Code	Description
A10	0...10V Analog Input
EMI	EMI Filter
OC	Output Contactor
SM *	Safety Monitor

* See Accessories on page 4-42 for extended motor and brake cable lengths.
 * The output contactor is included with the Safety Monitor option.

Product Selection

IP67/NEMA Type 4 with conduit entrance, DeviceNet communications, Sensorless Vector Control, and Volts per Hertz torque performance, Up to 575V AC

Input Voltage	3-Phase kW Rating	3-Phase Hp Rating	Output Current	24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
				Cat. No.	Cat. No.	Cat. No.
200...240V, 50/60 Hz 3-Phase	0.4	0.5	2.3	284D-FVB2P3Z-10-CR	284D-FVB2P3D-10-CR	284D-FVB2P3B-10-CR
	0.75	1	5	284D-FVB5P0Z-10-CR	284D-FVB5P0D-10-CR	284D-FVB5P0B-10-CR
	1.5	2	7.6	284D-FVB7P6Z-25-CR	284D-FVB7P6D-25-CR	284D-FVB7P6B-25-CR
380...480V, 50/60 Hz 3-Phase	0.4	0.5	1.4	284D-FVD1P4Z-10-CR	284D-FVD1P4D-10-CR	284D-FVD1P4B-10-CR
	0.75	1	2.3	284D-FVD2P3Z-10-CR	284D-FVD2P3D-10-CR	284D-FVD2P3B-10-CR
	1.5	2	4	284D-FVD4P0Z-10-CR	284D-FVD4P0D-10-CR	284D-FVD4P0B-10-CR
	2.2	3	6	284D-FVD6P0Z-25-CR	284D-FVD6P0D-25-CR	284D-FVD6P0B-25-CR
	3	5	7.6	284D-FVD7P6Z-25-CR	284D-FVD7P6D-25-CR	284D-FVD7P6B-25-CR
460...600V, 50/60 Hz 3-Phase	0.75	1	1.7	284D-FVE1P7Z-10-CR	284D-FVE1P7D-10-CR	284D-FVE1P7B-10-CR
	1.5	2	3	284D-FVE3P0Z-10-CR	284D-FVE3P0D-10-CR	284D-FVE3P0B-10-CR
	2.2	3	4.2	284D-FVE4P2Z-10-CR	284D-FVE4P2D-10-CR	284D-FVE4P2B-10-CR
	4	5	6.1	284D-FVE6P6Z-25-CR	284D-FVE6P6D-25-CR	284D-FVE6P6B-25-CR

ArmorStart® Distributed Motor Controller

Product Selection, Continued

IP67/NEMA Type 4 with conduit entrance, ArmorPoint communications, Sensorless Vector Control, and Volts per Hertz torque performance, Up to 575V AC

Input Voltage	3-Phase kW Rating	3-Phase Hp Rating	Output Current	24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
				Cat. No.	Cat. No.	Cat. No.
200...240V, 50/60 Hz 3-Phase	0.4	0.5	2.3	284A-FVB2P3Z-10-CR	284A-FVB2P3D-10-CR	284A-FVB2P3B-10-CR
	0.75	1	5	284A-FVB5P0Z-10-CR	284A-FVB5P0D-10-CR	284A-FVB5P0B-10-CR
	1.5	2	7.6	284A-FVB7P6Z-25-CR	284A-FVB7P6D-25-CR	284A-FVB7P6B-25-CR
380...480V, 50/60 Hz 3-Phase	0.4	0.5	1.4	284A-FVD1P4Z-10-CR	284A-FVD1P4D-10-CR	284A-FVD1P4B-10-CR
	0.75	1	2.3	284A-FVD2P3Z-10-CR	284A-FVD2P3D-10-CR	284A-FVD2P3B-10-CR
	1.5	2	4	284A-FVD4P0Z-10-CR	284A-FVD4P0D-10-CR	284A-FVD4P0B-10-CR
	2.2	3	6	284A-FVD6P0Z-25-CR	284A-FVD6P0D-25-CR	284A-FVD6P0B-25-CR
	3	5	7.6	284A-FVD7P6Z-25-CR	284A-FVD7P6D-25-CR	284A-FVD7P6B-25-CR
460...600V, 50/60 Hz 3-Phase	0.75	1	1.7	284A-FVE1P7Z-10-CR	284A-FVE1P7D-10-CR	284A-FVE1P7B-10-CR
	1.5	2	3	284A-FVE3P0Z-10-CR	284A-FVE3P0D-10-CR	284A-FVE3P0B-10-CR
	2.2	3	4.2	284A-FVE4P2Z-10-CR	284A-FVE4P2D-10-CR	284A-FVE4P2B-10-CR
	4	5	6.1	284A-FVE6P6Z-25-CR	284A-FVE6P6D-25-CR	284A-FVE6P6B-25-CR

IP67/NEMA Type 4 with quick disconnects for ArmorConnect power media, DeviceNet communications, Sensorless Vector Control, and Volts per Hertz torque performance, Up to 575V AC

Input Voltage	3-Phase kW Rating	3-Phase Hp Rating	Output Current	24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
				Cat. No.	Cat. No.	Cat. No.
200...240V, 50/60 Hz 3-Phase	0.4	0.5	2.3	284D-FVB2P3Z-10-RR	284D-FVB2P3D-10-RR	284D-FVB2P3B-10-RR
	0.75	1	5	284D-FVB5P0Z-10-RR	284D-FVB5P0D-10-RR	284D-FVB5P0B-10-RR
	1.5	2	7.6	284D-FVB7P6Z-25-RR	284D-FVB7P6D-25-RR	284D-FVB7P6B-25-RR
380...480V, 50/60 Hz 3-Phase	0.4	0.5	1.4	284D-FVD1P4Z-10-RR	284D-FVD1P4D-10-RR	284D-FVD1P4B-10-RR
	0.75	1	2.3	284D-FVD2P3Z-10-RR	284D-FVD2P3D-10-RR	284D-FVD2P3B-10-RR
	1.5	2	4	284D-FVD4P0Z-10-RR	284D-FVD4P0D-10-RR	284D-FVD4P0B-10-RR
	2.2	3	6	284D-FVD6P0Z-25-RR	284D-FVD6P0D-25-RR	284D-FVD6P0B-25-RR
	3	5	7.6	284D-FVD7P6Z-25-RR	284D-FVD7P6D-25-RR	284D-FVD7P6B-25-RR
460...600V, 50/60 Hz 3-Phase	0.75	1	1.7	284D-FVE1P7Z-10-RR	284D-FVE1P7D-10-RR	284D-FVE1P7B-10-RR
	1.5	2	3	284D-FVE3P0Z-10-RR	284D-FVE3P0D-10-RR	284D-FVE3P0B-10-RR
	2.2	3	4.2	284D-FVE4P2Z-10-RR	284D-FVE4P2D-10-RR	284D-FVE4P2B-10-RR
	4	5	6.1	284D-FVE6P6Z-25-RR	284D-FVE6P6D-25-RR	284D-FVE6P6B-25-RR

IP67/NEMA Type 4 with quick disconnects for ArmorConnect power media, ArmorPoint communications, Sensorless Vector Control, and Volts per Hertz torque performance, Up to 575V AC

Input Voltage	3-Phase kW Rating	3-Phase Hp Rating	Output Current	24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
				Cat. No.	Cat. No.	Cat. No.
200...240V, 50/60 Hz 3-Phase	0.4	0.5	2.3	284A-FVB2P3Z-10-RR	284A-FVB2P3D-10-RR	284A-FVB2P3B-10-RR
	0.75	1	5	284A-FVB5P0Z-10-RR	284A-FVB5P0D-10-RR	284A-FVB5P0B-10-RR
	1.5	2	7.6	284A-FVB7P6Z-25-RR	284A-FVB7P6D-25-RR	284A-FVB7P6B-25-RR
380...480V, 50/60 Hz 3-Phase	0.4	0.5	1.4	284A-FVD1P4Z-10-RR	284A-FVD1P4D-10-RR	284A-FVD1P4B-10-RR
	0.75	1	2.3	284A-FVD2P3Z-10-RR	284A-FVD2P3D-10-RR	284A-FVD2P3B-10-RR
	1.5	2	4	284A-FVD4P0Z-10-RR	284A-FVD4P0D-10-RR	284A-FVD4P0B-10-RR
	2.2	3	6	284A-FVD6P0Z-25-RR	284A-FVD6P0D-25-RR	284A-FVD6P0B-25-RR
	3	5	7.6	284A-FVD7P6Z-25-RR	284A-FVD7P6D-25-RR	284A-FVD7P6B-25-RR
460...600V, 50/60 Hz 3-Phase	0.75	1	1.7	284A-FVE1P7Z-10-RR	284A-FVE1P7D-10-RR	284A-FVE1P7B-10-RR
	1.5	2	3	284A-FVE3P0Z-10-RR	284A-FVE3P0D-10-RR	284A-FVE3P0B-10-RR
	2.2	3	4.2	284A-FVE4P2Z-10-RR	284A-FVE4P2D-10-RR	284A-FVE4P2B-10-RR
	4	5	6.1	284A-FVE6P6Z-25-RR	284A-FVE6P6D-25-RR	284A-FVE6P6B-25-RR

NEMA Type 4X with conduit entrance, DeviceNet communications, Sensorless Vector Control, and Volts per Hertz torque performance, Up to 575V AC

Input Voltage	3-Phase kW Rating	3-Phase Hp Rating	Output Current	24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
				Cat. No.	Cat. No.	Cat. No.
200...240V, 50/60 Hz 3-Phase	0.4	0.5	2.3	284D-SVB2P3Z-10-CR	284D-SVB2P3D-10-CR	284D-SVB2P3B-10-CR
	0.75	1	5	284D-SVB5P0Z-10-CR	284D-SVB5P0D-10-CR	284D-SVB5P0B-10-CR
	1.5	2	7.6	284D-SVB7P6Z-25-CR	284D-SVB7P6D-25-CR	284D-SVB7P6B-25-CR
380...480V, 50/60 Hz 3-Phase	0.4	0.5	1.4	284D-SVD1P4Z-10-CR	284D-SVD1P4D-10-CR	284D-SVD1P4B-10-CR
	0.75	1	2.3	284D-SVD2P3Z-10-CR	284D-SVD2P3D-10-CR	284D-SVD2P3B-10-CR
	1.5	2	4	284D-SVD4P0Z-10-CR	284D-SVD4P0D-10-CR	284D-SVD4P0B-10-CR
	2.2	3	6	284D-SVD6P0Z-25-CR	284D-SVD6P0D-25-CR	284D-SVD6P0B-25-CR
460...600V, 50/60 Hz 3-Phase	3	5	7.6	284D-SVD7P6Z-25-CR	284D-SVD7P6D-25-CR	284D-SVD7P6B-25-CR
	0.75	1	1.7	284D-SVE1P7Z-10-CR	284D-SVE1P7D-10-CR	284D-SVE1P7B-10-CR
	1.5	2	3	284D-SVE3P0Z-10-CR	284D-SVE3P0D-10-CR	284D-SVE3P0B-10-CR
	2.2	3	4.2	284D-SVE4P2Z-10-CR	284D-SVE4P2D-10-CR	284D-SVE4P2B-10-CR
	4	5	6.1	284D-SVE6P6Z-25-CR	284D-SVE6P6D-25-CR	284D-SVE6P6B-25-CR

4

NEMA Type 4X with quick disconnects for ArmorConnect power media, DeviceNet communications, Sensorless Vector Control, and Volts per Hertz torque performance, Up to 575V AC

Input Voltage	3-Phase kW Rating	3-Phase Hp Rating	Output Current	24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
				Cat. No.	Cat. No.	Cat. No.
200...240V, 50/60 Hz 3-Phase	0.4	0.5	2.3	284D-SVB2P3Z-10-RR	284D-SVB2P3D-10-RR	284D-SVB2P3B-10-RR
	0.75	1	5	284D-SVB5P0Z-10-RR	284D-SVB5P0D-10-RR	284D-SVB5P0B-10-RR
	1.5	2	7.6	284D-SVB7P6Z-25-RR	284D-SVB7P6D-25-RR	284D-SVB7P6B-25-RR
380...480V, 50/60 Hz 3-Phase	0.4	0.5	1.4	284D-SVD1P4Z-10-RR	284D-SVD1P4D-10-RR	284D-SVD1P4B-10-RR
	0.75	1	2.3	284D-SVD2P3Z-10-RR	284D-SVD2P3D-10-RR	284D-SVD2P3B-10-RR
	1.5	2	4	284D-SVD4P0Z-10-RR	284D-SVD4P0D-10-RR	284D-SVD4P0B-10-RR
	2.2	3	6	284D-SVD6P0Z-25-RR	284D-SVD6P0D-25-RR	284D-SVD6P0B-25-RR
460...600V, 50/60 Hz 3-Phase	3	5	7.6	284D-SVD7P6Z-25-RR	284D-SVD7P6D-25-RR	284D-SVD7P6B-25-RR
	0.75	1	1.7	284D-SVE1P7Z-10-RR	284D-SVE1P7D-10-RR	284D-SVE1P7B-10-RR
	1.5	2	3	284D-SVE3P0Z-10-RR	284D-SVE3P0D-10-RR	284D-SVE3P0B-10-RR
	2.2	3	4.2	284D-SVE4P2Z-10-RR	284D-SVE4P2D-10-RR	284D-SVE4P2B-10-RR
	4	5	6.1	284D-SVE6P6Z-25-RR	284D-SVE6P6D-25-RR	284D-SVE6P6B-25-RR

Options – Factory Installed

Description			Cat. No. Modification	
	Hand/Off/Auto Selector Keypad		-3	
	Safety Monitor		-SM	
EMI Filter		-EMI		
Output Contactor		-OC		
Shielded motor cable	Enclosure Rating		-CRN	
	IP67			
Supplied without motor cable	NEMA Type 4X		-CRW	
	IP67			
Supplied with control brake cable	NEMA Type 4X		-CB	
	IP67			
Supplied without control brake cable	NEMA Type 4X		-CBW	
	IP67			
Supplied with source brake cable	NEMA Type 4X		-SB	
	IP67			
Supplied without source brake cable	NEMA Type 4X		-SBW	
	IP67			
0...10 Analog Input	NEMA Type 4X		-A10	
	IP67			
Dynamic Brake Connector	NEMA Type 4X		-DB	
	IP67			
Connectivity to ArmorConnect Power Media supplied with shielded motor cable	Short Circuit Protection Rating	Enclosure Rating		-RRN
		10 A	IP67	
	25 A		NEMA Type 4X	
		IP67		
Connectivity to ArmorConnect Power Media supplied without motor cable	10 A	NEMA Type 4X		
		25 A	IP67	
NEMA Type 4X				

4

Sealing Caps

Description	For Use With	Cat. No.
Plastic Sealing Cap (M12)*	Input I/O Connection	1485A-M12
AC Micro Aluminum Sealing Cap - External*	Output I/O Connection	889A-RMCAP
Stainless Steel Sealing Cap (M12)*	Input I/O Connection	1485AS-C3
Stainless Steel Sealing Cap (M12)*	Output I/O Connection	889AS-RMCAP

* To achieve IP67 rating, sealing caps must be installed on all unused I/O connections.

* To achieve IP69K/NEMA 4X rating, sealing caps must be installed on all unused I/O connections.

Cables

Description	Cable Rating	Length [m (ft)]	Cat. No.
Extended Motor Cable Cordsets			
90° M22 Motor Cordset	IP67/NEMA Type 4	6 (19.6)	280-MTR22-M6
		14 (45.9)	280-MTR22-M14
90° M22 Motor Cordset	IP69K	6 (19.6)	280S-MTR22-M6
		14 (45.9)	280S-MTR22-M14
Motor Cable Patchcords			
90° Male/Straight Female M22	IP67/NEMA Type 4	1 (3.3)	280-MTR22-M1D
		3 (9.8)	280-MTR22-M3D
90° Male/Straight Female M22	IP69K	1 (3.3)	280S-MTR22-M1D
		3 (9.8)	280S-MTR22-M3D
Shielded Motor Cable Cordsets			
90° M22 Motor Cordset	IP67/NEMA Type 4	6 (19.6)	284-MTRS22-M6
90° M22 Motor Cordset	IP67/NEMA Type 4	14 (45.9)	284-MTRS22-M14
90° M22 Motor Cordset	IP69K	6 (19.6)	284S-MTRS22-M6
90° M22 Motor Cordset	IP69K	14 (45.9)	284S-MTRS22-M14
Shielded Motor Cable Patchcords			
90° Male/Straight Female M22	IP67/NEMA Type 4	1 (3.3)	284-MTRS22-M1D
90° Male/Straight Female M22	IP67/NEMA Type 4	3 (9.8)	284-MTRS22-M3D
90° Male/Straight Female M22	IP69K	1 (3.3)	284S-MTRS22-M1D
90° Male/Straight Female M22	IP69K	3 (9.8)	284S-MTRS22-M3D
Extended Brake Cable Cordsets			
90° M25 Source Brake Cable	IP67/NEMA Type 4	6 (19.6)	285-BRC25-M6
90° M25 Source Brake Cable	IP67/NEMA Type 4	14 (45.9)	285-BRC25-M14
90° M25 Source Brake Cable	IP69K	6 (19.6)	285S-BRC25-M6
90° M25 Source Brake Cable	IP69K	14 (45.9)	285S-BRC25-M14

ArmorPoint® Media §

Description	Length [m (ft)]	Cat. No.
ArmorPoint Bus Extension Cable including Terminating Resistor	1 (3.3)	280A-EXT1
Extension Cable to connect two ArmorStart Distributed Motor Controllers to ArmorPoint communication protocol	1 (3.3)	280A-EXTCABLE

§ ArmorPoint media is only available with an IP67/NEMA Type 4 rating.

DeviceNet Media ❖

Description		Length [m (ft)]	Cat. No.
	KwikLink pigtail drops are Insulation Displacement Connector (IDC) with integral Class 1 round cables for interfacing devices or power supplies to flat cable	1 (3.3)	1485P-P1E4-B1-N5
		2 (6.5)	1485P-P1E4-B2-N5
		3 (9.8)	1485P-P1E4-B3-N5
		6 (19.8)	1485P-P1E4-B6-N5
	DeviceNet Mini- T-Port Tap	Left Keyway	1485P-P1N5-MN5KM
		Right Keyway	1485P-P1N5-MN5NF
Description		Connector	Cat. No.
	Gray PVC Thin Cable	Mini Straight Female Mini Straight Male	1485G-P❖N5-M5
		Mini Straight Female Mini Right Angle Male	1485G-P❖W5-N5
		Mini Right Angle Female Mini Straight Male	1485G-P❖M5-Z5
		Mini Right Angle Female Mini Straight Male	1485G-P❖W5-Z5
	Thick Cable	Mini Straight Female Mini Straight Male	1485C-P‡N5-M5
		Mini Straight Female Mini Right Angle Male	1485C-P‡W5-N5
		Mini Right Angle Female Mini Straight Male	1485C-P‡M5-Z5
		Mini Right Angle Female Mini Straight Male	1485C-P‡W5-Z5
Description		Length m (ft)	Cat. No.
	DeviceNet Configuration Terminal Used to interface with objects on a DeviceNet network. Includes 1 m communications cable.	1 (3.3)	193-DNCT
	Communication cable, color-coded bare leads	1 (3.3)	193-CB1
	Communication cable, microconnector (male)	1 (3.3)	193-CM1
	Panel Mount Adapter/Door Mount Bezel Kit	—	193-DNCT-BZ1

❖ See publication M116-CA001_-EN-P for complete cable selection information

❖ Replace symbol with desired length in meters (Example: 1485G-P1N5-M5 for a 1 m cable). Standard cable lengths: 1, 2, 3, 4, 5, and 6 m.

‡ Replace symbol with desired length in meters (Example: 1485C-P1N5-M5 for a 1 m cable). Standard cable lengths: 1, 2, 3, 4, 5, 6, 8, 10, 12, 18, 24, and 30 m

Sensor Media ❖

Description	ArmorStart I/O Connection	Pin Count	Connector	Cat. No.	
	DC Micro Patchcord	Input	5-pin	Straight Female Straight Male	889D-F4ACDM->
				Straight Female Right Angle Male	889D-F4ACDE->
	DC Micro V-Cable	Input	5-pin	Straight Female	879D-F4ACDM->
				Right Angle Male	879D-R4ACM->
	AC Micro Patchcord	Output	3-pin	Straight Female Straight Male	889R-F3AERM->
				Straight Female Right Angle Male	889R-F3AERE->

❖ See publication M116-CA001_-EN-P for complete cable selection information.

> Replace symbol with desired length in meters (Example: 889D-F4ACDM-1 for a 1 m cable). Standard cable lengths: 1, 2, 5, and 10 m.

Note: Stainless steel versions may be ordered by adding an "S" to the cat. no. (Example: 889DS-F4ACDM-1).

Dynamic Brake Modules +

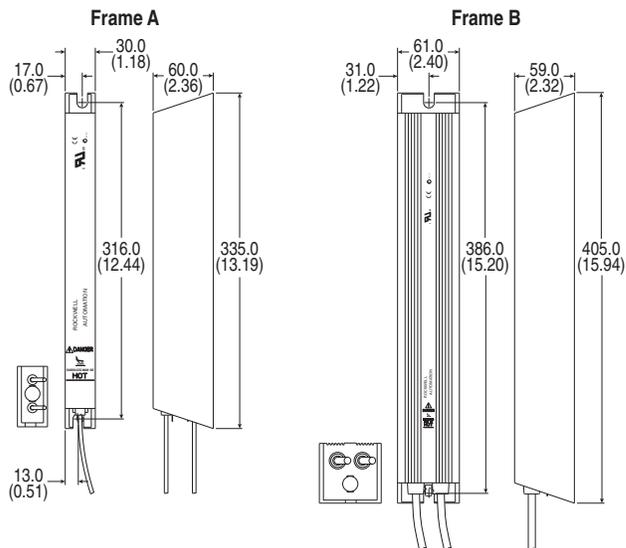
Input Voltage	Drive Ratings			Cat. No. ✦
	kW	Hp	Min. Resistance [Ω]	
240V, 50/60 Hz, 3-Phase	0.4	0.5	48	AK-R2-091P500
	0.75	1.0	48	AK-R2-091P500
	1.5	2.0	48	AK-R2-091P500
	2.2	3.0	32	AK-R2-047P500
	3.7	5.0	32	AK-R2-047P500
480V, 50/60 Hz, 3-Phase	0.4	0.5	97	AK-R2-360P500
	0.75	1.0	97	AK-R2-360P500
	1.5	2.0	97	AK-R2-360P500
	2.2	3.0	77	AK-R2-120P1K2
	4.0	5.0	77	AK-R2-120P1K2

✦ The resistors listed in this table are rated for 5% duty cycle.

+ Dynamic brake modules have an IP00 rating.

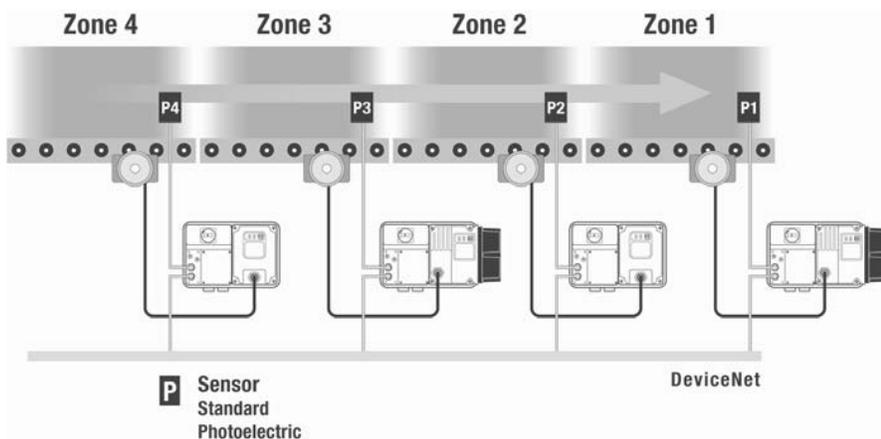
Dynamic Brake Modules — Approximate Dimensions

Dimensions are in millimeters (inches) and weights are in kilograms (pounds).



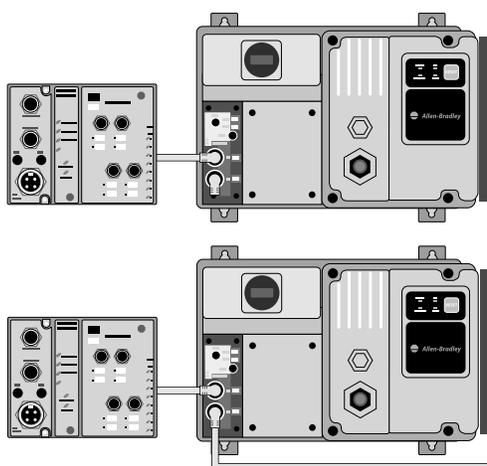
Frame	Cat. No.	Weight [kg (lb)]
A	AK-R2-091P500, AK-R2-047P500, AK-R2-360P500	1.1 (2.5)
B	AK-R2-030P1K2, AK-R2-120P1K2	2.7 (6)

Peer-to-Peer Communications



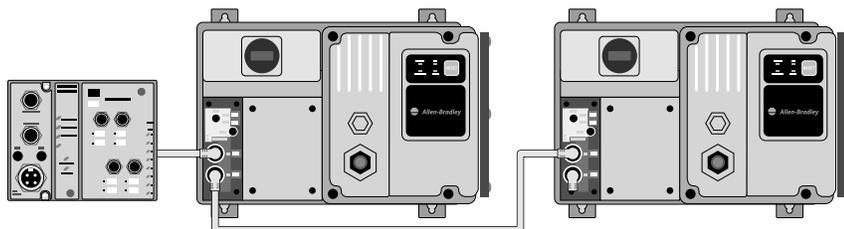
The Zone Control capabilities of ArmorStart Distributed Motor Controller is ideal for large horsepower (0.5...10 Hp) motored conveyors. The ArmorStart Distributed Motor Controllers have built-in DeviceNet Communications, DeviceLogix technology, and the added Zone Interlocking Parameters (ZIP) which allows one ArmorStart to consume data directly from up to four other DeviceNet nodes without going through the network scanner. These direct communications between conveyor zones are beneficial in a merge, diverter, and accumulation conveyor applications.

ArmorStart to ArmorPoint Connectivity - (Networks other than DeviceNet)



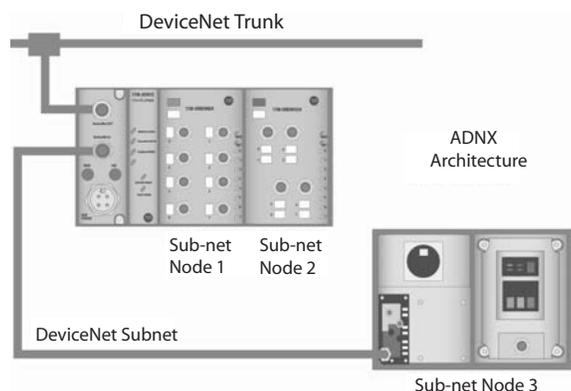
When connecting to the Bulletin 1738 ArmorPoint Distributed I/O product, a network adapter and at least one ArmorPoint Digital Output, Digital Input, Analog, AC and Relay product, or Specialty product must be selected. The ArmorPoint Distributed I/O can accommodate up to 63 modules per network node. The cable that connects the ArmorPoint Distributed I/O product to the ArmorStart Distributed Motor Controller is the Bulletin 280A-EXT1. The 280A-EXT1 includes an ArmorPoint bus extension cable and a network terminating resistor.

Note: Access to DeviceLogix programming is available with RSNetworkx for DeviceNet.



If an additional ArmorStart Distributed Motor Controller is to be connected, the Bulletin 280A-EXTCABLE will be required. A maximum of two ArmorStart Distributed Motor Controllers can be connected to the Bulletin 1738 Distributed I/O.

I/O Expansion with DeviceNet



If the I/O capability of the Bulletin 280/281D ArmorStart Distributed Motor Controller needs to be expanded beyond the standard four inputs and two outputs, the ArmorStart Distributed Motor Controller with the DeviceNet communication protocol can be configured to the ADNX Architecture, in which the ArmorStart is part of the DeviceNet subnet, using the Bulletin 1738-ADNX ArmorPoint Distributed I/O product.

Bulletin 1738 ArmorPoint Distributed I/O Products

Digital Output Products

Description	Cat. No.
24V DC, eight source output with eight M12 connectors	1738-OB8EM12
24V DC, eight source output with eight M8 connectors	1738-OB8EM8
24V DC, four source output with four M12 connectors	1738-OB4EM12
24V DC, four source output with four M8 connectors	1738-OB4EM8
24V DC, two source output with two M12 connectors	1738-OB2EM12
24V DC, two source output, 2 A prot. with two M12 connectors	1738-OB2EPM12
24V DC, four sink output with four M12 connectors	1738-OV4EM12



Digital Input Products

Description	Cat. No.
24V DC, eight sink input with four M12 connectors, two points per connector	1738-IB8M12
24V DC, eight sink input with eight M8 connectors	1738-IB8M8
24V DC, eight sink input with one M23 connector	1738-IB8M23
24V DC, four sink input with four M12 connectors	1738-IB4M12
24V DC, four sink input with four M8 connectors	1738-IB4M8
24V DC, two sink input with two M12 connectors	1738-IB2M12
24V DC, four source input with four M12 connectors	1738-IV4M12



Analog Products

Description	Cat. No.
24V DC analog current input with two M12 connectors	1738-IE2CM12
24V DC analog voltage input with two M12 connectors	1738-IE2VM12
24V DC analog current output with two M12 connectors	1738-OE2CM12
24V DC analog voltage output with two M12 connectors	1738-OE2VM12
24V DC, two thermocouple input	1738-IT2IM12
24V DC, two RTD input	1738-IR2M12



Power Supply Products

Description	Cat. No.
ArmorPoint I/O Field Potential Distributor Module	1738-FPD
24V DC Expansion Power Supply	1738-EP24DC



AC and Relay Products

Description	Cat. No.
24V DC Coil, N.O. DPST relay with two M12 connectors	1738-OW4M12
24V DC Coil, N.O. DPST relay with two AC M12 connectors	1738-OW4M12AC
120V AC, two input with two AC 4-pin M12 connectors	1738-IA2M12AC4
120V AC, two input with two AC 3-pin M12 connectors	1738-IA2M12AC3
120/230V AC, two output with two AC 3-pin M12 connectors	1738-OA2M12AC3



Specialty Products

Description	Cat. No.
ArmorPoint I/O RS-232 ASCII Serial Interface Module	1738-232ASCM12
ArmorPoint I/O RS-485 ASCII Serial Interface Module	1738-485ASCM12
24V DC Very High Speed Counter Module	1738-VHSC24M23
ArmorPoint 5V Encoder/Counter Module	1738-IJM23
ArmorPoint Synchronous Serial Interface Module with Absolute Encoder	1738-SSIM23



Adapter Products

Description	Cat. No.
ArmorPoint DeviceNet Adapter Module, Drop or Pass-through, with male and female M12 connectors	1738-ADN12
ArmorPoint DeviceNet Adapter Module, Drop only, with male M18 connector	1738-ADN18
ArmorPoint DeviceNet Adapter Module, Drop or Pass-through, with male and female M18 connectors	1738-ADN18P
ArmorPoint DeviceNet 24V DC Adapter Module with subnet expansion	1738-ADNX
ArmorPoint Redundant ControlNet Adapter Module	1738-ACNR
ArmorPoint Ethernet/IP 10/100 Mbps Adapter Module	1738-AENT



ArmorStart® Distributed Motor Controller Specifications

Electrical Ratings		UL/NEMA		IEC			
Power Circuit	Rated Operation Voltage	200...575V		200...500V			
	Rate Insulation Voltage	600V		600V			
	Rated Impulsed Voltage	6 kV		6 kV			
	Dielectric Withstand	2200V AC		2500V AC			
	Operating Frequency	50/60 Hz		50/60 Hz			
	Utilization Category	N/A		AC-3			
Protection Against Shock		N/A		IP2X			
Control Circuit	Rated Operation Voltage	24V DC (+10%, -15%) A2 (should be grounded at voltage source)					
		120V AC (+10%, -15%) A2 (should be grounded at voltage source)					
		240V AC (+10%, -15%) A2 (should be grounded at voltage source)					
	Rate Insulation Voltage	250V		250V			
	Rated Impulsed Voltage	—		4 kV			
	Dielectric Withstand	1500V AC		2000V AC			
Overvoltage Category	—		III				
Operating Frequency	50/60 Hz						
Short Circuit Protection	SCPD performance Type 1	Current Rating	Voltage	480Y/277V	480/480V	600Y/347V	600V
		10 A	Sym. Amps	65 kA	65 kA	30 kA	30 kA
		25 A	RMS	30 kA	30 kA	30 kA	30 kA
	SCPD List	Size per NEC Group Motor				—	

Power Requirements										
Control Voltage	Units	No Options			Brake or Output Contactor			w/ Brake and Output Contactor		
	Volts	24V DC	120V AC	240V AC	24V DC	120V AC	240V AC	24V DC	120V AC	240V AC
Total Control VA (Pick Up)	VA (W)	10 (W)	27	27	(13 W)	49	49	(15 W)	71	71
Total Control VA (Hold In)	VA (W)	10 (W)	27	27	(13 W)	28	31	(15 W)	35	35

External Devices powered by Control Voltage										
Outputs (2) (1 A max. each)	Amps	2	2	2	2	2	2	2	2	2
Total Control VA (Pick Up) with max outputs	VA (W)	(58 W)	267	507	(61 W)	289	551	(63 W)	311	551
Total Control VA (Hold In) with max outputs	VA (W)	(58 W)	267	507	(61 W)	271	515	(63 W)	275	515

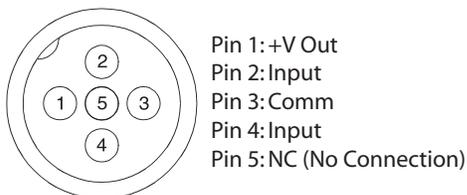
Input Ratings	Rated Operation Voltage	24V DC			
	Input On-State Voltage Range	10...26V DC			
	Input On-State Current	3.0 mA @ 10V DC			
		7.2 mA @ 24V DC			
	Input Off-State Voltage Range	0...5V DC			
	Input Off-State Current	<1.5 mA			
	Input Filter — Software Selectable				
	Off to On	Settable from 0...64 ms in 1 ms increments			
	On to Off	Settable from 0...64 ms in 1 ms increments			
	Input Compatibility	N/A		IEC 1+	
	Number of Inputs	4			
	Sensor Source				
	Voltage Status Only	11...25V DC from DeviceNet			
Current Available	50 mA max. per input, 200 mA total				
Output Ratings (Sourced from Control Circuit)	Rated Operation Voltage	240V AC/30V DC		240V AC/30V DC	
	Rate Insulation Voltage	250V		250V	
	Dielectric Withstand	1500V AC		2000V AC	
	Operating Frequency	50/60 Hz		50/60 Hz	
	Type of Control Circuit	Electromechanical relay			
	Type of Current	AC/DC			
	Conventional Thermal Current Ith	Total of both outputs ≤ 2 A			
	Type of Contacts	Normally open (N.O.)			
Number of Contacts	2				
ArmorPoint Ratings	Backplane Current Load	400 mA			

ArmorStart® Distributed Motor Controller

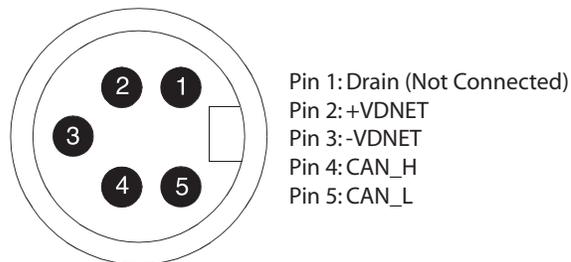
Specifications, Continued

		UL/NEMA	IEC	
Environmental	Operating Temperature Range	-20...+40 °C (-4...+104 °F)		
	Storage and Transportation Temperature Range	-25...+85 °C (-13...+185 °F)		
	Altitude	1000 m		
	Humidity	5...95% (non-condensing)		
	Pollution Degree	3		
	Enclosure Ratings	NEMA 4/12/13	IP67	
		NEMA 4X	IP69K	
Approximate Shipping Weight	13.6 kg (30 lb)			
Mechanical	Resistance to Shock			
	Operational	15 G		
	Non-Operational	30 G		
	Resistance to Vibration			
	Operational	1 G, 0.15 mm (0.006 in.) displacement		
	Non-Operational	2.5 G, 0.38 mm (0.015 in.) displacement		
	Wire Size	Primary/Secondary terminal: (18 ...10 AWG)	Primary/Secondary terminal: 1.0...4.0 mm ²	
	Tightening Torque	Primary terminal: 10.6...21.6 lb•in Secondary terminal: 5.3...7.3 lb•in	Primary terminal: (1.2...2.4 N•m) Secondary terminal: (0.6...0.8 N•m)	
	Wire Strip Length	0.35 in. (9 mm)		
	Control and Safety Monitor Inputs			
	Wire Size	(22...10 AWG)	0.34...4.0 mm ²	
	Tightening Torque	5.0...5.6 lb•in	0.6 N•m	
	Wire Strip Length	0.35 in. (9 mm)		
	Other Rating	EMC Emission Levels		
		Conducted Radio Frequency Emissions	Class A	
Radiated Emissions		Class A		
EMC Immunity Levels				
Electrostatic Discharge		4 kV contact and 8 kV Air		
Radio Frequency Electromagnetic Field		10V/m		
Fast Transient		2 kV		
Surge Transient		1 kV (12) L-L, 2 kV (2) L-N (earth)		
Overload Characteristics				
Trip Class		10		
Overload Protection		I ² t overload protection - 150% for 60 s, 200% for 30 s		
Number of Poles		3		
DeviceNet Specifications				
DeviceNet Supply Voltage Rating		Range 11...25V DC, 24V DC nominal		
DeviceNet Input Current		167 mA @ 24V DC - 4.0 W		
		364 mA @ 11V DC - 4.0 W		
External Devices powered by DeviceNet		Sensors inputs 4 x 50 mA - total 200 mA		
Total w/max Sensor Inputs (4)		367 mA @ 24V DC - 8.8 W		
DeviceNet Input Current Surge		15 A for 250 μs		
DeviceNet Communications				
Baud Rates	125, 250, 500 kbps			
Distance Maximum	500 m (1630 ft) @ 125 kbps			
	200 m (656 ft) @ 250 kbps			
	100 m (328 ft) @ 500 kbps			
Certifications	cULus (File No. E207834) UL 508C EN/IEC 60947-1, EN 50178, EN 61800-3 CE Marked per Low Voltage Directive 73/23/EEC and EMC Directive 89/336/EEC			

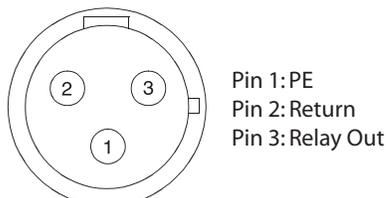
External Connections for Input Connector



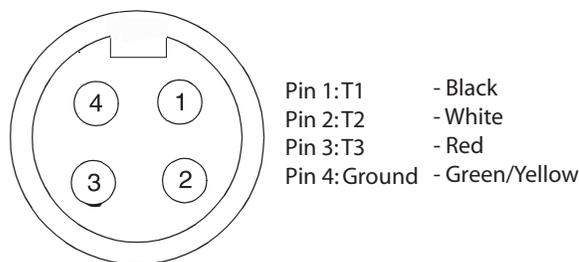
External Connections for DeviceNet Connector



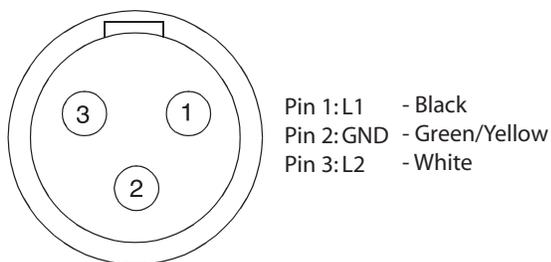
External Connections for Output Connector



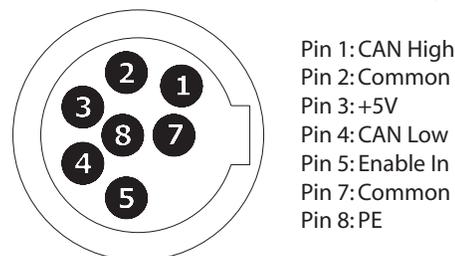
External Connections for Motor Connector



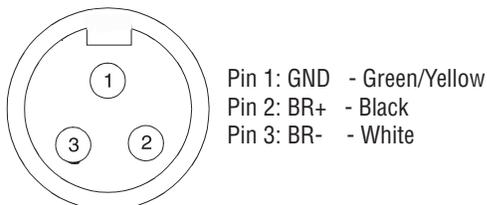
External Connections for Brake Contactor Connector



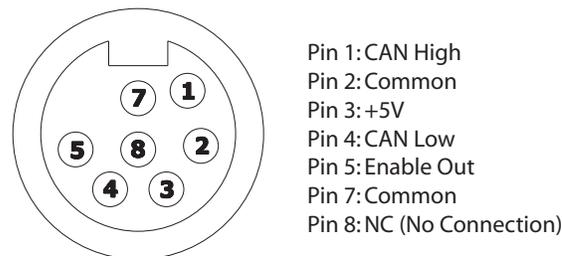
External Connections for ArmorPoint Interface (IN)



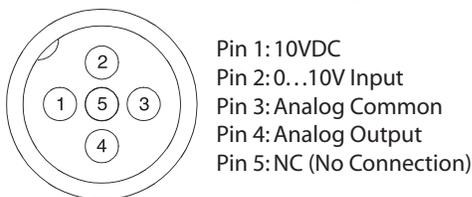
External Connections for Dynamic Brake Connection



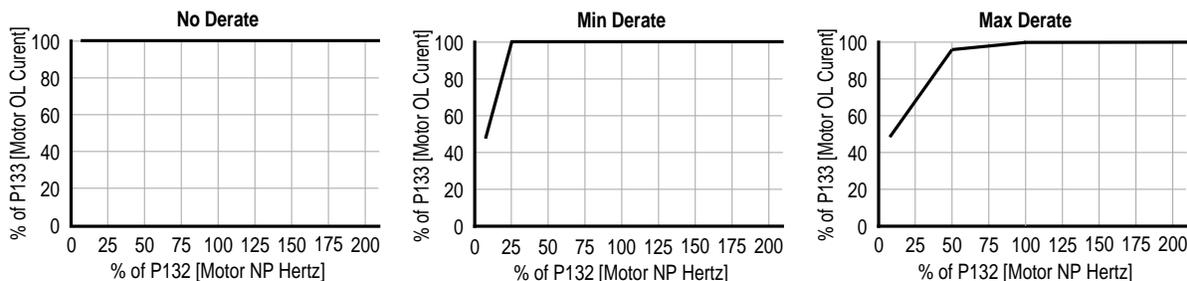
External Connections for ArmorPoint Interface (OUT)



External Connections for 0...10V Analog Input



Overload Curves



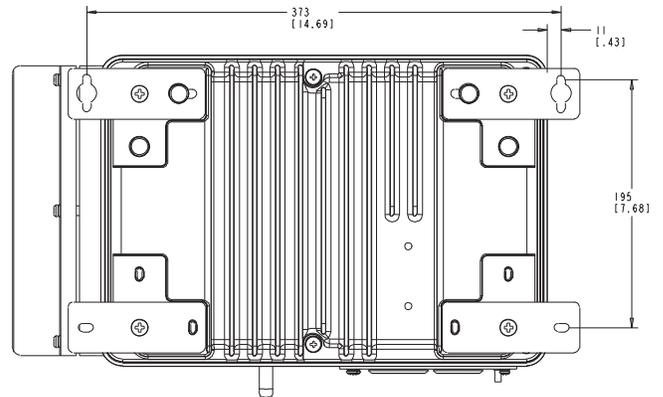
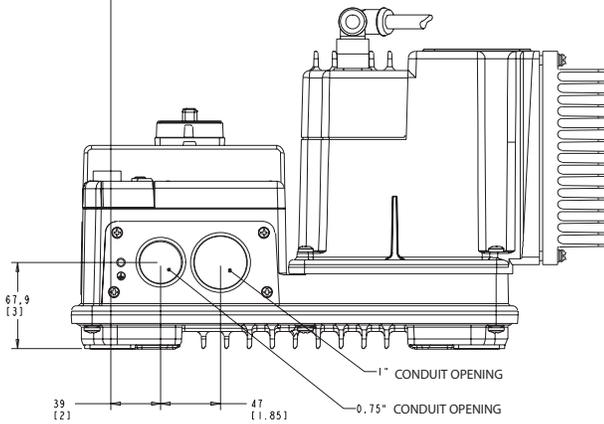
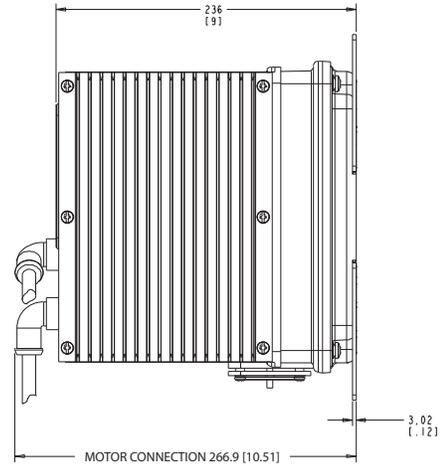
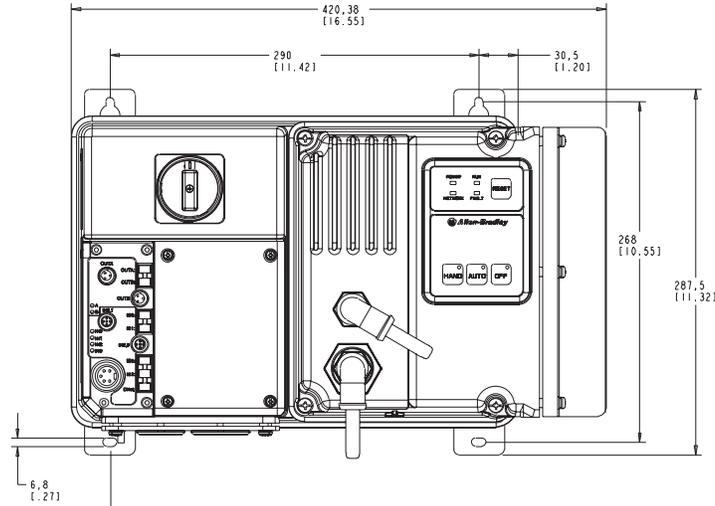
ArmorStart® Distributed Motor Controller

Approximate Dimensions

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

Dimensions for 1 Hp and below @ 230V AC, 2 Hp and below @ 460V AC, and 2 Hp and below @ 575V AC, IP67/NEMA Type 4 with Conduit Entrance

4

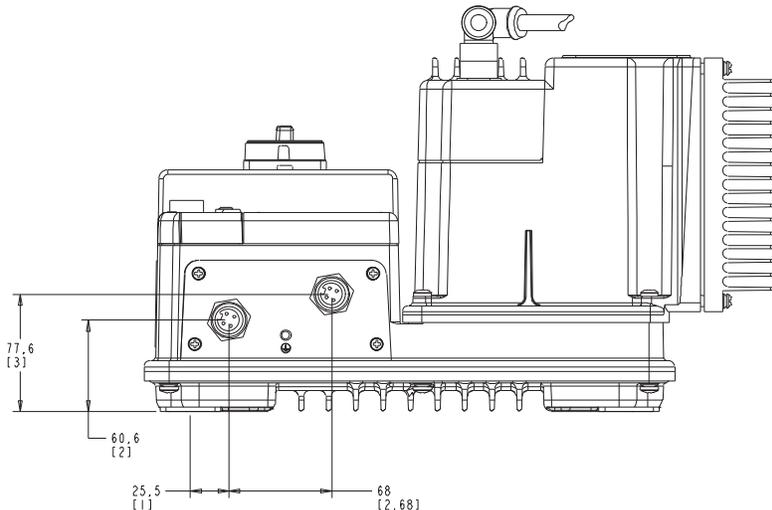
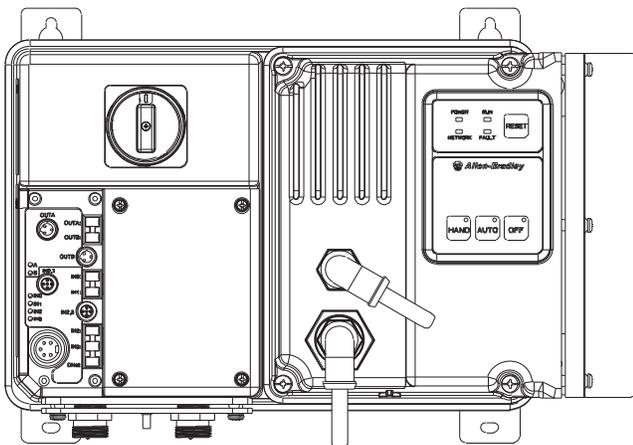


ArmorStart® Distributed Motor Controller

Approximate Dimensions, Continued

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

Dimensions for 1 Hp and below @ 230V AC, 2 Hp and below @ 460V AC, and 2 Hp and below @ 575V AC, IP67/NEMA Type 4 with ArmorConnect Connectivity



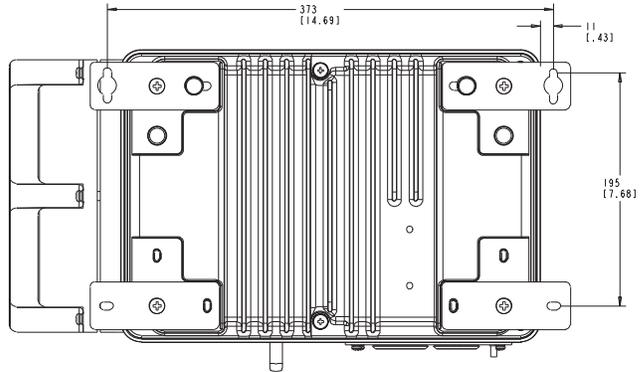
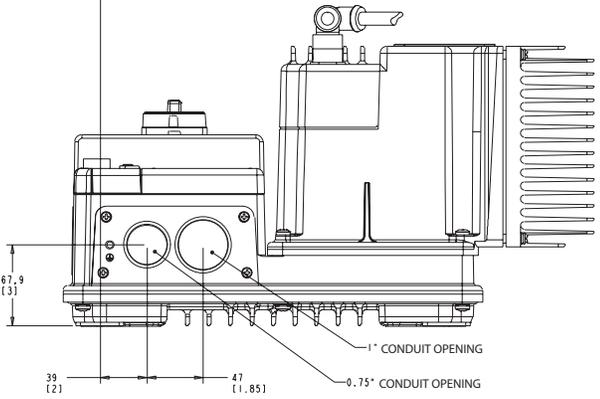
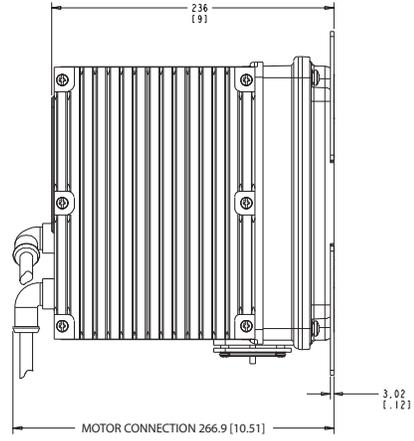
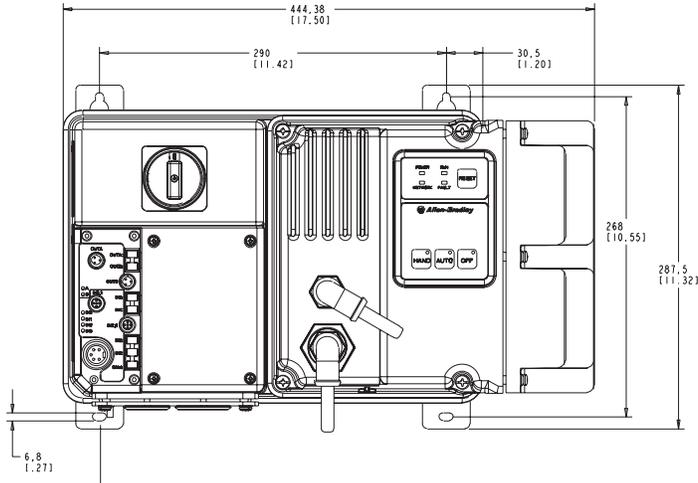
ArmorStart® Distributed Motor Controller

Approximate Dimensions, Continued

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

Dimensions for 2 Hp @ 230V AC, 3 Hp and above @ 460V AC, and 3 Hp and above @ 575V AC, IP67/NEMA Type 4 with Conduit Entrance

4

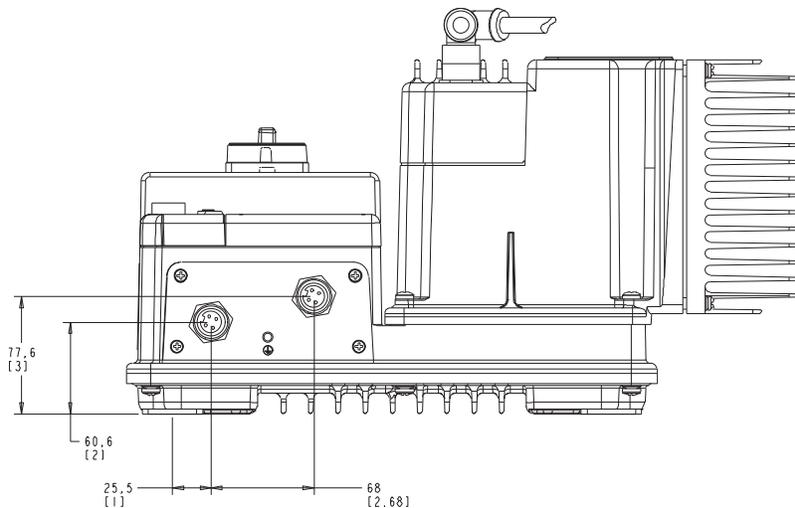
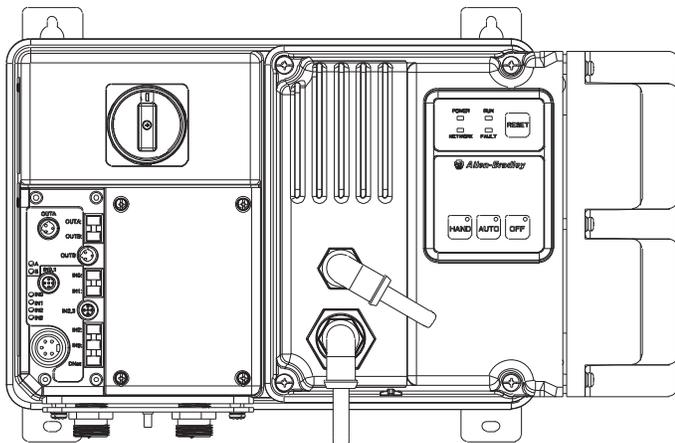


ArmorStart® Distributed Motor Controller

Approximate Dimensions, Continued

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

Dimensions for 2 Hp @ 230V AC, 3 Hp and above @ 460V AC, and 3 Hp and above @ 575V AC, IP67/NEMA Type 4 with ArmorConnect Connectivity



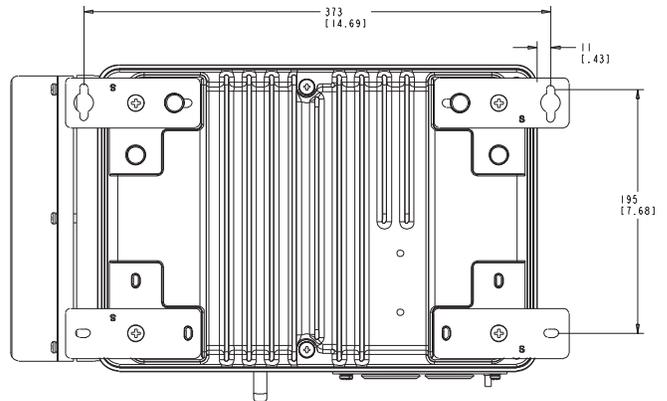
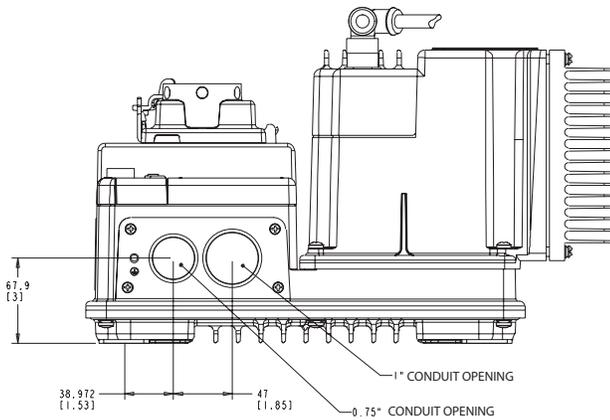
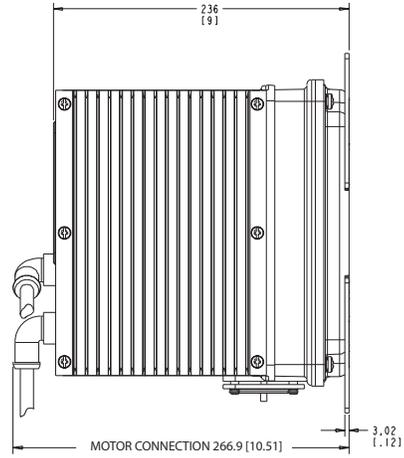
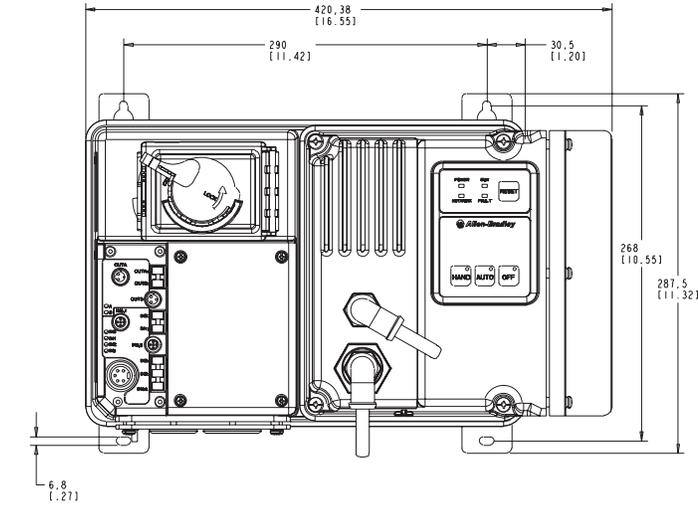
ArmorStart® Distributed Motor Controller

Approximate Dimensions, Continued

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

Dimensions for 1 Hp and below @ 230V AC, 2 Hp and below @ 460V AC, and 2 Hp and below @ 575V AC, NEMA Type 4X with Conduit Entrance

4

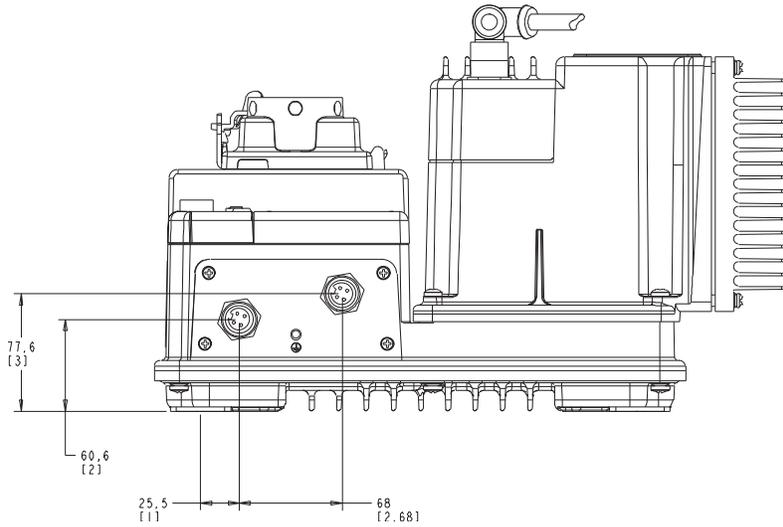
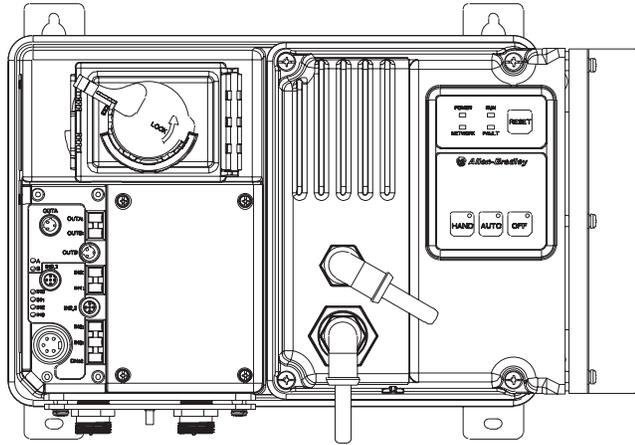


ArmorStart® Distributed Motor Controller

Approximate Dimensions, Continued

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

Dimensions for 1 Hp and below @ 230V AC, 2 Hp and below @ 460V AC, and 2 Hp and below @ 575V AC, NEMA Type 4X with ArmorConnect Connectivity



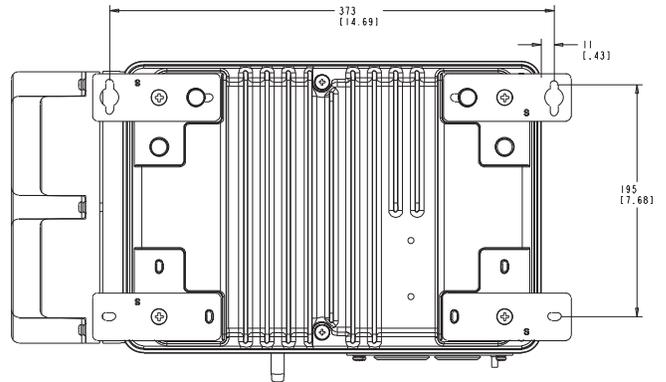
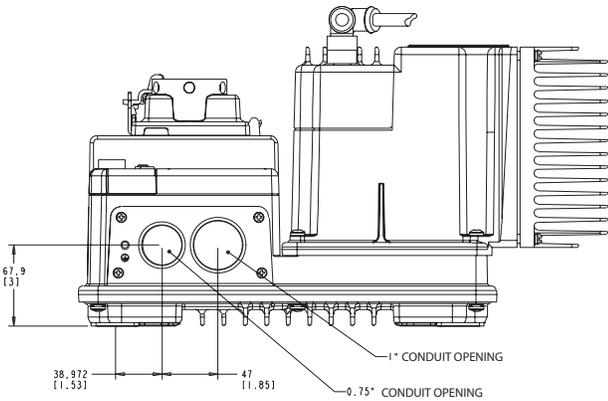
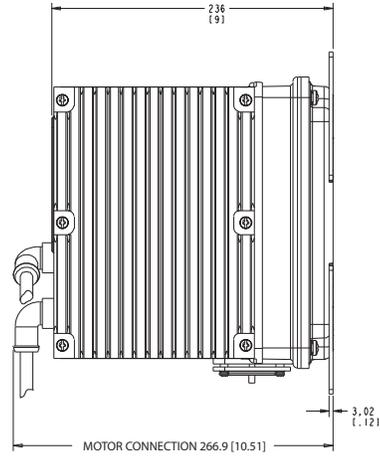
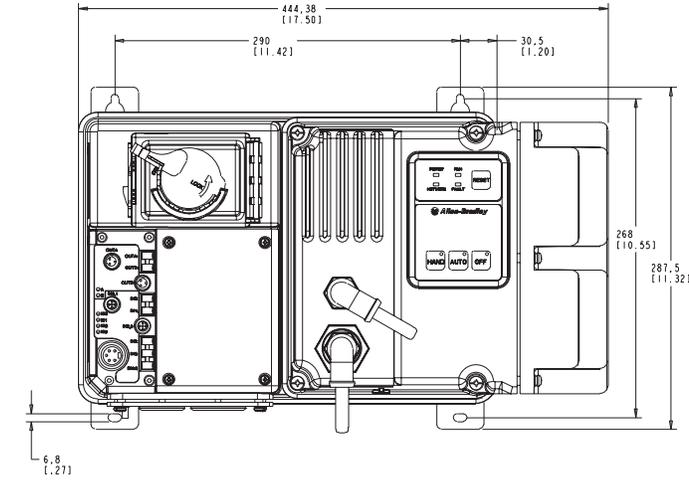
ArmorStart® Distributed Motor Controller

Approximate Dimensions, Continued

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

Dimensions for 2 Hp @ 230V AC, 3 Hp and above @ 460V AC, and 3 Hp and above @ 575V AC, NEMA Type 4X with Conduit Entrance

4

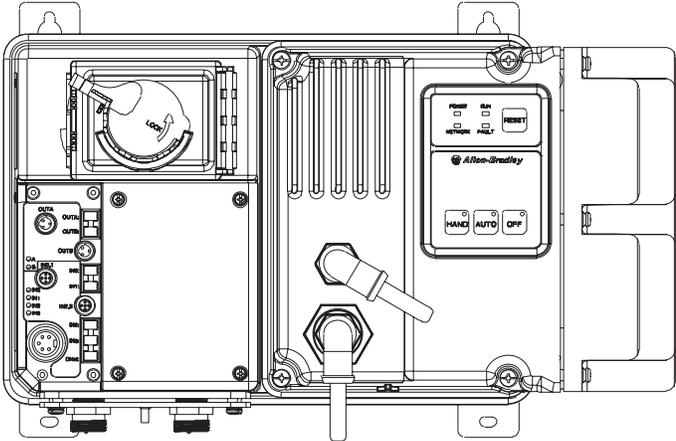


ArmorStart® Distributed Motor Controller

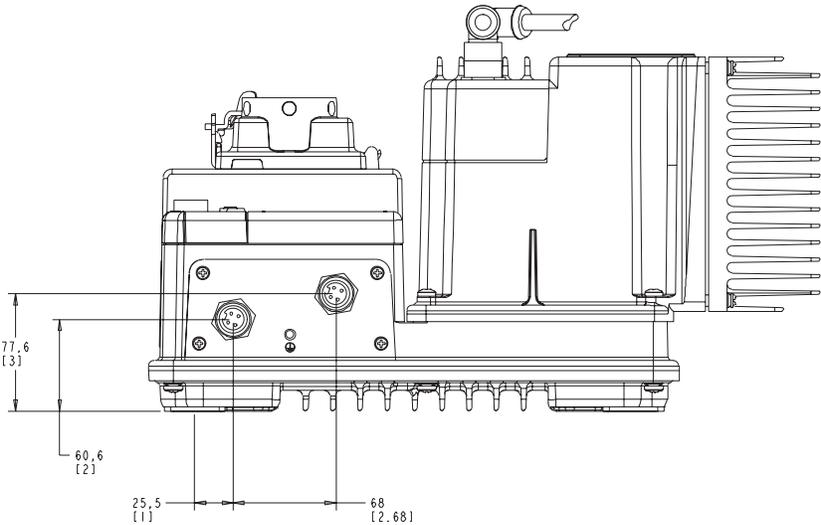
Approximate Dimensions, Continued

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

Dimensions for 2 Hp @ 230V AC, 3 Hp and above @ 460V AC, and 3 Hp and above @ 575V AC, NEMA Type 4X with ArmorConnect Connectivity



4



Three-Phase Power Media

	 Three-Phase Power Trunk Cable	 Three-Phase Power Drop Cable	 Three-Phase Power Tees and Reducers	 Three-Phase Power Receptacles	 Three-Phase Power Accessories
Description	<ul style="list-style-type: none"> • Cordset - Cable with integral female or male connector on one end • PatchCord - Cable with integral female or male connector on each end 	<ul style="list-style-type: none"> • Cordset - Cable with integral female or male connector on one end • PatchCord - Cable with integral female or male connector on each end 	<ul style="list-style-type: none"> • Tee - Connects to a single drop line to trunk with quick change connectors • Reducing Tee - Connects to a single drop line (Mini) to trunk (quick change) connector • Reducer - Connects from quick change male connector to mini female connector 	<ul style="list-style-type: none"> • Female receptacles are a panel mount connector with flying leads • Male receptacles are a motor junction box mounted connector with flying leads 	<ul style="list-style-type: none"> • Sealing Caps offered in versions to interface with female or male connectors • Locking Clips clamshell design clips over three power phase connector to limit customer access
Features	<ul style="list-style-type: none"> • Rated for motor branch circuits • Straight or right angle connectors • 4-pin connector type • Cable rating: TC-ER/STOOW • Multiple standard lengths 	<ul style="list-style-type: none"> • Rated for motor branch circuits • Straight or right angle connectors • 4-pin connector type • Cable rating: TC-ER/STOOW • Multiple standard lengths 	<ul style="list-style-type: none"> • Rated for motor branch circuits • Trunk Tee, Reducing Tee and Reducer • 4-pin connector type 	<ul style="list-style-type: none"> • Rated for motor branch circuits • Male and female configurations • 4-pin connector type • 1/2 in. NPT • Available in 1 m length 	<ul style="list-style-type: none"> • Sealing Caps - available in quick change and mini styles • Locking Clips are design for the quick change and mini style connectors
Rated Voltage	600V	600V	600V	600V	—
Connector Body Dimensions	<ul style="list-style-type: none"> • Straight: 88.9 x 38.6 mm • Right angle: 75.5 x 74 mm 	<ul style="list-style-type: none"> • Straight: 56 x 25.4 mm • Right angle: 44.9 x 40.4 mm 	<ul style="list-style-type: none"> • Trunk Tee: 108 x 73.6 mm • Reducing Tee: 108 x 65.5 mm • Reducer: 112.5 x 38.1 mm 	<ul style="list-style-type: none"> • M22 Female: 33.45 x 25.45 mm • M22 Male: 28.04 x 25.45 mm • M35 Female: 71.12 x 38.10 mm • M35 Male: 63.50 x 38.10 mm 	—
Product Selection	Page 4-61	Page 4-62	Page 4-63	Page 4-65	Page 4-71

Control Power Media

	 Control Power Trunk & Drop Cables	 Control Power T-ports	 Control Power Receptacles	 Control Power Shorting Plugs	 Control Power Accessories
Description	Cable with integral connector on either one or both ends	Cable with single male connector attached to two female connectors	Panel mount connector with flying leads	Integral connector with leads shorted for specific application requirements	Sealing caps, mounting nuts, and sealing washers
Features	<ul style="list-style-type: none"> • 6-pin/5-used configuration • Male and female • Straight or right angle versions • 16 AWG conductors, cable dual rated UL TC/Open Wiring and STOOW • Multiple standard lengths 	<ul style="list-style-type: none"> • 6-pin/5-used configuration • Compact design • Color-coded E-stop in and E-stop out configurations 	<ul style="list-style-type: none"> • 6-pin/5-used configuration • Male and female • 16 AWG conductors • 1/2 NPT mounting threads • Multiple standard lengths 	<ul style="list-style-type: none"> • 6-pin/5-used configuration • Male • Multiple versions color coded for simple identification 	<ul style="list-style-type: none"> • Rugged durable construction • Designed to mate with Control Power media
Rated Voltage	600V	600V	600V	600V	—
Connector Body Dimensions	<ul style="list-style-type: none"> • Straight: 56 x 25 mm (2.2 x 1 in.) • Right angle: 40 x 45 mm (1.6 x 1.8 in.) 	72 x 64 mm (2.8 x 2.5 in.)	30 x 25 mm (1.2 x 1 in.)	56 x 25 mm (2.2 x 1 in.)	—
Product Selection	Page 4-67	Page 4-68	Page 4-69	Page 4-70	Page 4-71

Description

The ArmorStart Power Media offers both three-phase and control power cable systems of cordsets, patchcords, receptacles, tees, reducers, and accessories to be used with the ArmorStart Distributed Motor Controller. These cable system components allow quick connection of ArmorStart Distributed Motor Controllers, thereby reducing installation time. They allow repeatable, reliable connection of the three-phase and control power to the ArmorStart Distributed Motor Controller and motor by providing a plug-and-play environment that also avoids system miswiring.

Compared to the traditional conduit installations, with the ArmorStart Power Media you profit and benefit from:

- Reduce commissioning time
- Plug-and-play design eliminates wiring errors
- Increased system design flexibility
- No special tools required
- Reduced labor costs

Three-Phase Power Media

The three-phase power media offers both mini- and quick-change disconnect cables that provide a secure connection to the ArmorStart Distributed Motor Controller. Connectors can be straight or right angled and are physically keyed to prevent wiring mishaps. The cabling options include:

- Cordsets: Cable with integral male or female connector at one end and flying leads at the other
- Patchcords: Cable with integral connector at each end (one male, one female)

Available in 0.5, 1, 1.5, 2, 2.5, 3, 4, 6, 8, 10, 12, or 14 m lengths.

The three-phase tees and reducer offer flexibility in system design. The 4-pin T-port connects a single drop line to the trunk.

The receptacles provide a termination point at the panel and motor junction box. The female receptacles can be used for a panel mount connection. The male receptacles can be used for a quick disconnect at the motor junction box.

The three-phase power media components are rated for motor branch circuits per UL 2237.

Control Power Media

The control power media offers a mini disconnect cables that provide a secure connection to the ArmorStart Distributed Motor Controller. The control power media components are a 6-pin/5-used configuration to prevent mis-wiring with network connectors. Connectors can be straight or right angled and are physically keyed to prevent wiring mishaps. The cabling options include:

- Cordsets: Cable with integral male or female connector at one end and flying leads at the other

Available in 2, 5, or 10 m lengths.

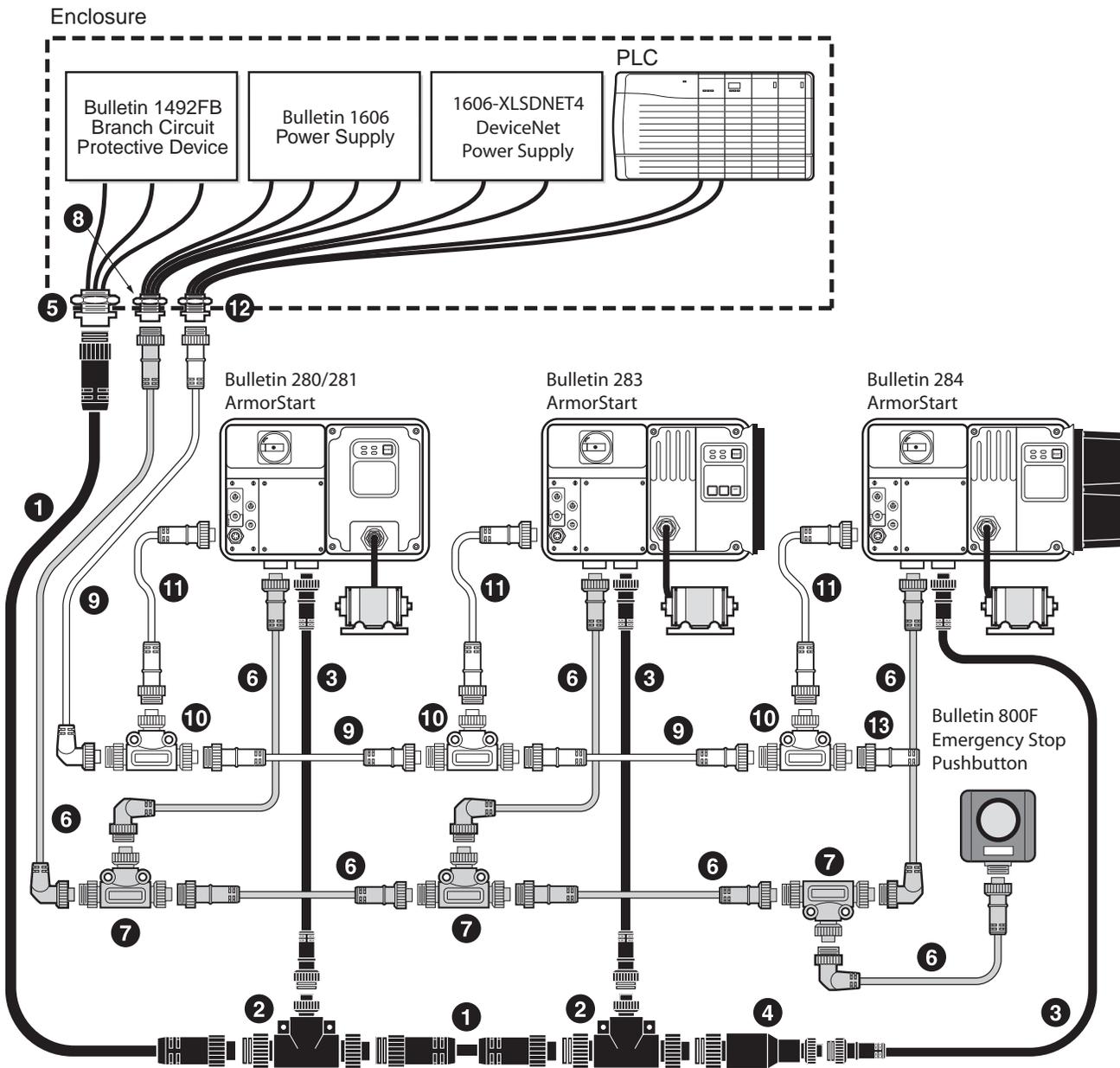
- Patchcords: Cable with integral connector at each end (one male, one female)

Available in 1, 2, 3, 5, or 10 m lengths.

The control power tees offer flexibility in system design. The 6-pin/5-used T-port connects a single drop line to the trunk. Two types of tees are offered. The E-stop In tee is used to connect to the Bulletin 800F On-Machine E-Stop station using a control power media patchcord. The E-stop Out tee is used with a cordset or patchcord to connect to the ArmorStart Distributed Motor Controller.

The receptacles provide a termination point at the panel and ArmorStart Distributed Motor Controller. The female receptacles can be used for a panel mount connection. The male receptacles can be used for a quick disconnect at the ArmorStart Distributed Motor Controller with gland plate design.

ArmorStart Media Diagram



4

- | | |
|------------------------------------|--------------------------------|
| 1. 3-Phase Power Patchcord (Trunk) | 8. Control Power Receptacle |
| 2. 3-Phase Power T-port | 9. DeviceNet Patchcord (Trunk) |
| 3. 3-Phase Power Patchcord (Drop) | 10. DeviceNet T-port |
| 4. 3-Phase Power Reducer | 11. DeviceNet Patchcord (Drop) |
| 5. 3-Phase Power Receptacle | 12. DeviceNet Receptacle |
| 6. Control Power Patchcord | 13. DeviceNet Terminator |
| 7. Control Power T-port | |

	<p>Bulletin 280 — ArmorStart Three-Phase Power Trunk Cables (Cordsets and Patchcords)</p> <ul style="list-style-type: none"> Rated for motor branch circuits per UL 2237 One-piece molded design Can be used as a drop cable for ArmorStart Distributed Motor Controllers with a short circuit protection rating of 25 A, or when desired to minimize voltage drops on extended cable runs 	<p>Standards Compliance UL 2237</p> <p>Certifications UL Listed (File No. E318496, Guide PVVA)</p>
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Product Selection

Cordsets ✱

Pin Count	Assembly Rating	Cat. No.			
		Straight Female	Right-Angle Female	Straight Male	Right-Angle Male
4-Pin	600V, 25 A	280-PWRM35E-M*	280-PWRM35F-M*	280-PWRM35G-M*	280-PWRM35H-M*

Patchcords ✱

Pin Count	Assembly Rating	Cat. No.			
		Straight Female Straight Male	Right-Angle Female Straight Male	Straight Female Right-Angle Male	Right-Angle Female Right-Angle Male
4-Pin	600V, 25 A	280-PWRM35A-M*	280-PWRM35B-M*	280-PWRM35C-M*	280-PWRM35D-M*

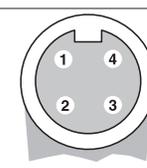
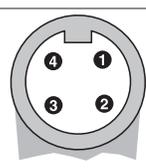
* The cat. no. is incomplete as shown. For desired length, replace the symbol with: **05** — 0.5 m (1.62 ft), **1** — 1 m (3.3 ft), **015** — 1.5 m (4.9 ft), **2** — 2 m (6.5 ft), **025** — 2.5 m (8.1 ft), **3** — 3 m (9.8 ft), **4** — 4 m (13.1 ft), **6** — 6 m (19.7 ft), **8** — 8 m (26.2 ft), **10** — 10 m (32.8 ft), **12** — 12 m (39.4 ft), or **14** — 14 m (45.9 ft).

✱ Stainless steel version may be ordered by adding "S" to the catalog number. For example: **280S-PWRM35A-E-M3**.

Specifications

Mechanical	
Coupling Nut	Black Anodized Aluminum or 316 Stainless Steel
Housing	Black PVC
Insert	Black PVC
Cable Diameter	0.775 in. +/- 0.12 in. (19.68 mm +/- 0.5 mm)
Electrical	
Contacts	Copper Alloy with Gold over Nickel Plating
Cable	Black PVC, dual rated UL TC/Open Wiring and STOOW
Cable Rating	600V AC/DC
Assembly Rating	600V @ 25 A, Symmetrical Amps RMS Fault: 65 kA when used with Class CC, T, or J type fuses
Environmental	
Enclosure Type Rating	IP67, NEMA 4; IP69K 1200 psi washdown
Operating Temperature	UL Type TC 600V 90 °C Dry 75 °C Wet, Exposed Run (ER) or MTW 600V 90 °C or STOOW 105 °C 600V - CSA STOOW 600V FT2

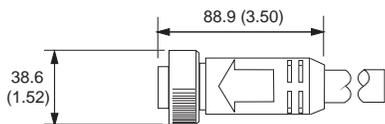
Pinout and Color Code

	Face View Pinout	
	4-Pin	
	 <p>Female</p>	 <p>Male</p>
Color Code	1 Black 2 Green/Yellow Extended PIN	3 Red 4 White

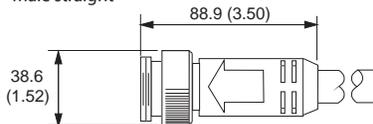
Approximate Dimensions

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes and are subject to change.

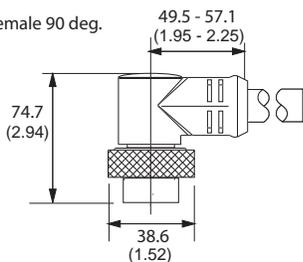
Female straight



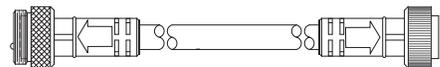
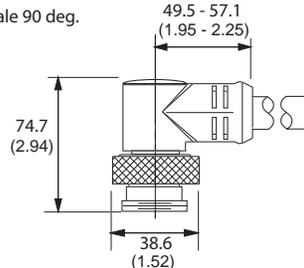
Male straight



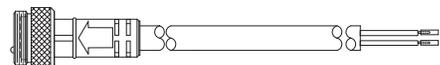
Female 90 deg.



Male 90 deg.



Example of Patchcord



Example of Cordset

ArmorConnect® Power Media

Product Selection/Specifications/Approximate Dimensions



Bulletin 280 — ArmorStart Three-Phase Power Drop Cables (Cordsets and Patchcords)

- Rated for motor branch circuits per UL 2237
- One-piece molded design
- Can be used as a trunk cable for ArmorStart Distributed Motor Controllers with a short circuit protection rating of 10 A

Standards Compliance

UL 2237

Certifications

UL Listed (File No. E318496, Guide PVVA)

Product Selection

Cordsets ❄

Pin Count	Assembly Rating	Cat. No.			
		Straight Female	Right-Angle Female	Straight Male	Right-Angle Male
4-Pin	600V, 10 A	280-PWRM22E-M*	280-PWRM22F-M*	280-PWRM22G-M*	280-PWRM22H-M*
4-Pin	600V, 15 A	280-PWRM24E-M*	280-PWRM24F-M*	280-PWRM24G-M*	280-PWRM24H-M*

Patchcords ❄

Pin Count	Assembly Rating	Cat. No.			
		Straight Female Straight Male	Right-Angle Female Straight Male	Straight Female Right-Angle Male	Right-Angle Female Right-Angle Male
4-Pin	600V, 10 A	280-PWRM22A-M*	280-PWRM22B-M*	280-PWRM22C-M*	280-PWRM22D-M*
4-Pin	600V, 15 A	280-PWRM24A-M*	280-PWRM24B-M*	280-PWRM24C-M*	280-PWRM24D-M*

* The cat. no. is incomplete as shown. For desired length, replace the symbol with: **05** — 0.5 m (1.62 ft), **1** — 1 m (3.3 ft), **015** — 1.5 m (4.9 ft), **2** — 2 m (6.5 ft), **025** — 2.5 m (8.1 ft), **3** — 3 m (9.8 ft), **4** — 4 m (13.1 ft), **6** — 6 m (19.7 ft), **8** — 8 m (26.2 ft), **10** — 10 m (32.8 ft), **12** — 12 m (39.4 ft), or **14** — 14 m (45.9 ft).

❄ Stainless steel version may be ordered by adding "S" to the catalog number. For example: **280S-PWRM22A-E-M3**.

Specifications

Mechanical	
Coupling Nut	Black Anodized Aluminum or 316 Stainless Steel
Housing	Black PVC
Insert	Black PVC
Cable Diameter	0.43 in. +/- 0.12 in. (10.9 mm +/- 0.5 mm)
Electrical	
Contacts	Brass with Gold over Nickel Plating
Cable	Black PVC, dual rated UL TC/Open Wiring and STOOW
Cable Rating	600V AC/DC
Assembly Rating	600V @ 10 A or 600V @ 15 A, Symmetrical Amps RMS Fault: 65 kA when used with Class CC, T, or J type fuses
Environmental	
Enclosure Type Rating	IP67, NEMA 4; IP69K 1200 psi washdown
Operating Temperature	UL Type TC 600V 90 °C Dry 75 °C Wet, Exposed Run (ER) or MTW 600V 90 °C or STOOW 105 °C 600V - CSA STOOW 600V FT2

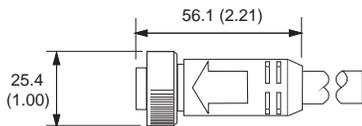
Pinout and Color Code

	Face View Pinout	
	4-Pin	
	Female	Male
Color Code	1 Black 2 White	3 Red 4 Green/Yellow Extended PIN

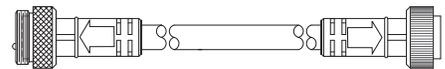
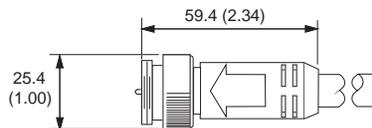
Approximate Dimensions

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes and are subject to change.

Female straight

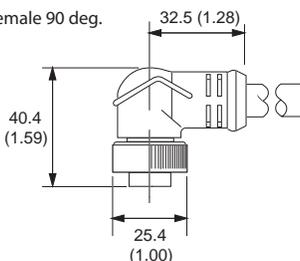


Male straight

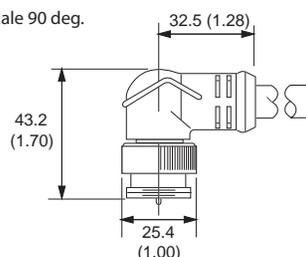


Example of Patchcord

Female 90 deg.



Male 90 deg.



Example of Cordset





Bulletin 280 ArmorStart Three-Phase Power Tees and Reducers (4-Pole)

- Rated for motor branch circuits per UL 2237
- 4-pin T-port connects a single drop line to the trunk
- 4-pin configuration

Standards Compliance

UL 2237

Certifications

UL Listed (File No. E318496, Guide PVVA)

Product Selection

Tees and Reducing Adapters ❄

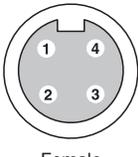
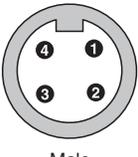
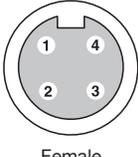
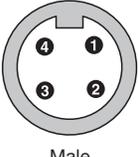
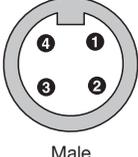
Description	Assembly Rating	Color Code	Cat. No.
M35, 3-Phase Power Tee, 4 pole	25 A	A	280-T35
M35, 3-Phase Power Tee Reducing drop M22, 4 pole	Trunk 25 A/Drop 15 A	B	280-RT35
M35, 3-Phase Reducing Adapter, 4 pole	15 A	C	280-RA35

❄ Stainless steel version may be ordered by adding "S" to the catalog number. For example: **280S-T35**.

Specifications

Mechanical	
Coupling Nut	Black Anodized Aluminum (Trunk), Black Zinc Diecast (Drop) or 316 Stainless Steel
Housing	Black PVC
Insert	Black PVC
Electrical	
Contacts	Copper Alloy with Gold over Nickel Plating
Voltage	600V AC/DC
Assembly Rating	Trunk Tee: 25 A Reducing Tee: Trunk 25 A/Drop 15 A Reducer: 15 A
Symmetrical Amps RMS Fault: 65 kA when used with Class CC, T, or J type fuses	
Environmental	
Enclosure Type Rating	IP67, NEMA 4; IP69K 1200 psi washdown

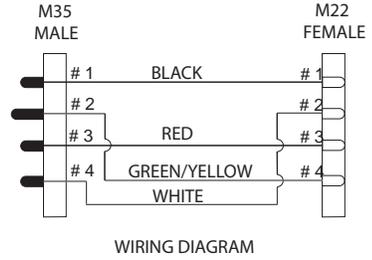
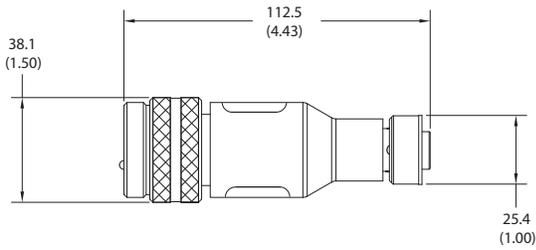
Pinout and Color Code

Assembly Rating	Color Code	Face View Pinout	
		4-Pin	
		Quick Change Connector	Mini Connector
Trunk Tee: 25 A	A	 Female	 Male
		1 Black 2 Green/Yellow Extended PIN	3 Red 4 White
Reducing Tee: Trunk 25 A/Drop 15 A	B	 Female	 Male
		1 Black 2 Green/Yellow Extended PIN	3 Red 4 White
Reducer: Trunk 25 A/Drop 15 A	C	 Male	 Female
		1 Black 2 Green/Yellow Extended PIN	3 Red 4 Green/Yellow Extended PIN
Reducer: Trunk 25 A/Drop 15 A	C	 Male	 Female
		1 Black 2 Green/Yellow Extended PIN	3 Red 4 Green/Yellow Extended PIN

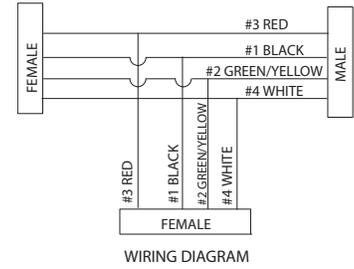
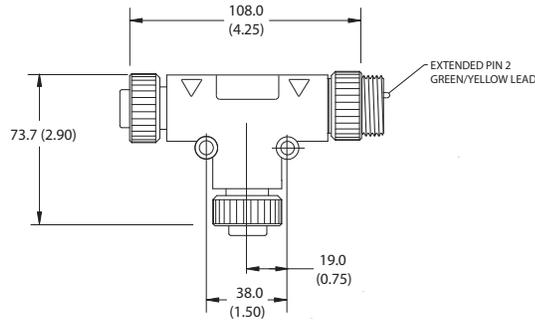
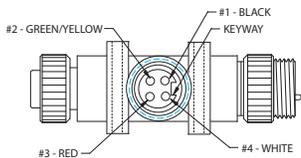
Bulletin 280
ArmorConnect® Power Media
 Approximate Dimensions

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes and are subject to change.

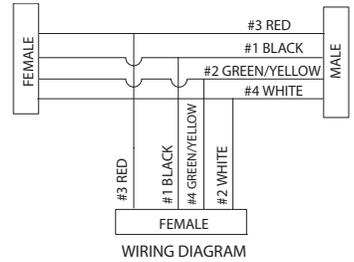
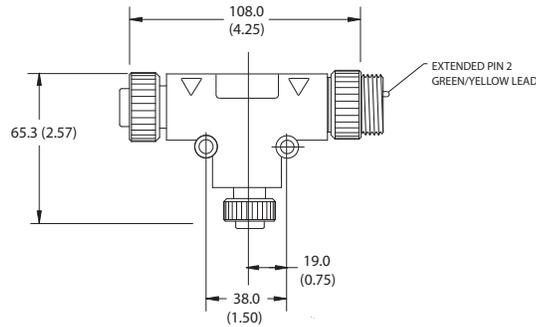
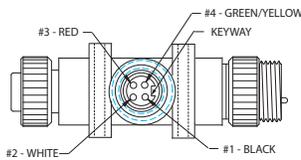
Reducer



Power Tee



Power Tee - reducing drop



4

	<p>Bulletin 280 — ArmorStart Three-Phase Power Receptacles (Male and Female)</p> <ul style="list-style-type: none"> Rated for motor branch circuits per UL 2237 16 and 10 AWG conductors 4-pin configuration Female receptacles can be used for panel mount connection Male receptacles can be used for quick disconnect motor junction box 1/2 in.-14 NPT threads 	<p>Standards Compliance UL 2237</p> <p>Certifications UL Listed (File No. E318496, Guide PVVA)</p>
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Product Selection
Receptacles ❄

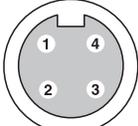
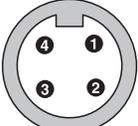
Pin Count	Assembly Rating	Color Code	Cat. No.	
			Female	Male
4-Pin	16 AWG 600V 10 A	A	280-M22F-M1	280-M22M-M1
4-Pin	14 AWG 600V 15 A	A	280-M24F-M1	280-M24M-M1
4-Pin	10 AWG 600V 25 A	B	280-M35F-M1	280-M35M-M1

❄ Stainless steel version may be ordered by adding "S" to the catalog number. For example: **280S-M35F-M1**.

Specifications

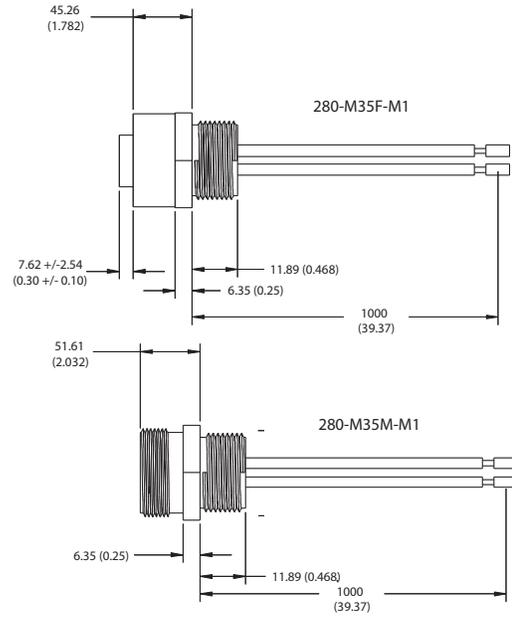
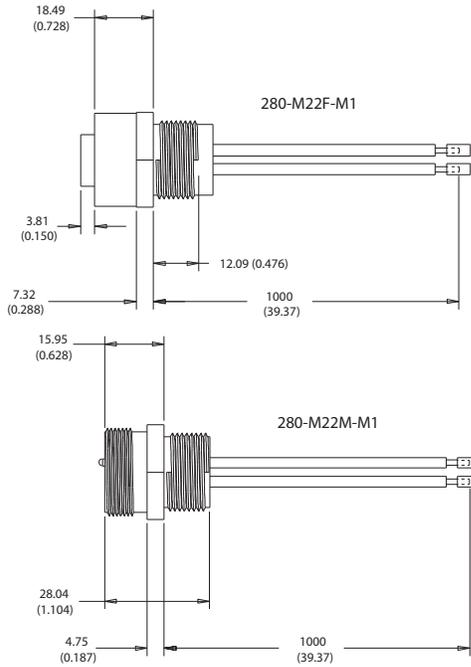
Mechanical	
Insert	Black PVC
Receptacle Shell Material	Black Anodized Aluminum (female) and Zinc DieCast, Black E-Coat (male) or 316 Stainless Steel
Electrical	
Contacts	Copper Alloy with Gold over Nickel Plating (Trunk), Brass with Gold over Nickel Plating (Drop)
Cable Rating	600V AC/DC
Assembly Rating	4-pin — 16 AWG, 600V @ 10 A 4-pin — 14 AWG, 600V @ 15 A 4-pin — 10 AWG, 600V @ 25 A Symmetrical Amps RMS Fault: 65 kA when used with Class CC, T, or J type fuses
Environmental	
Enclosure Type Rating	IP67, NEMA 4; IP69K 1200 psi washdown

Pinout and Color Code

		Face View Pinout			
		4-Pin			
		Female		Male	
Assembly Rating	Color Code				
16 AWG 600V 10 A	A			1 Black 2 White	3 Red 4 Green/Yellow Extended PIN
10 AWG 600V 25 A	B	1 Black 2 Green/Yellow Extended PIN	3 Red 4 White		

Approximate Dimensions

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes and are subject to change.



	<p>Bulletin 889N — ArmorStart Control Power Trunk and Drop Cables</p> <ul style="list-style-type: none"> • 6-pin/5-used configuration to prevent mis-wiring with network connectors • One-piece molded design • 16 AWG exposed run (ER) rated cable • Red overmolds to indicate presence of E-stop wiring
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Product Selection

Cordsets ✱

Pin Count	Assembly Rating	Cat. No.			
		Straight Female	Right-Angle Female	Straight Male	Right-Angle Male
6-Pin/5-used	16 AWG 600V 10 A	889N-F65GF-✱	889N-R65GF-✱	889N-M65GF-✱	889N-E65GF-✱

✱ Replace symbol with desired length in meters (2, 5, or 10 standard).

✱ Stainless steel version may be ordered by adding "S" to the catalog number. For example: **889NS-F65GF-2**.

Patchcords ✱

Pin Count	Assembly Rating	Cat. No.			
		Straight Female Straight Male	Right-Angle Female Straight Male	Straight Female Right-Angle Male	Right-Angle Female Right-Angle Male
6-Pin/5-used	16 AWG 600V 10 A	889N-F65GFNM-‡	889N-R65GFNM-‡	889N-F65GFNE-‡	889N-R65GFNE-‡

‡ Replace symbol with desired length in meters (1, 2, 3, 5, or 10 standard).

✱ Stainless steel version may be ordered by adding "S" to the catalog number. For example: **889NS-F65GFNM-1**.

Specifications

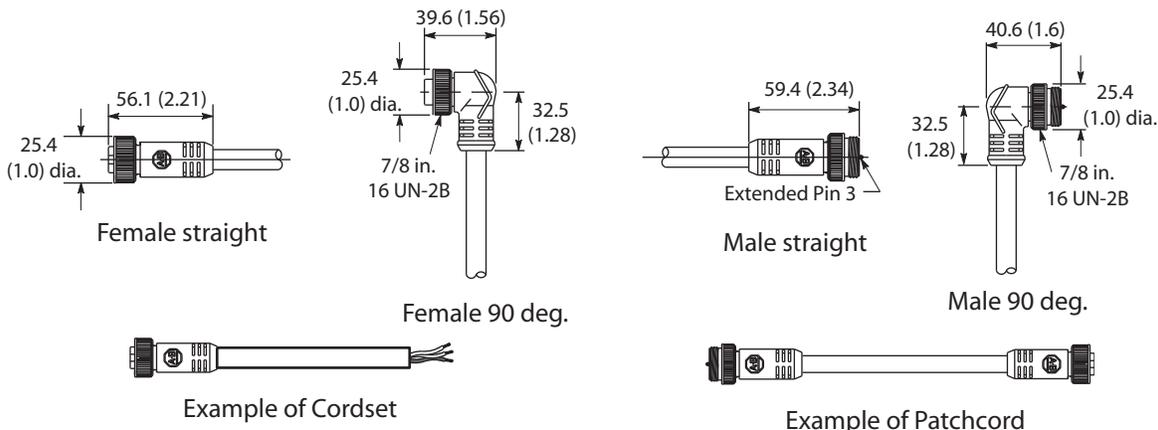
Mechanical	
Coupling Nut	Black epoxy coated zinc or 316 Stainless Steel
Overmold	Red Riteflex TPE
Insert	Yellow Riteflex TPE
Contacts	Brass/gold over palladium Nickel
Cable	Grey PVC, 16 AWG, dual rated UL TC/Open Wiring and STOOW
Cable Diameter	0.44 in. +/- 0.12 in. (11.18 mm +/- 0.5 mm)
Electrical	
Cable Rating	UL Type TC 600V 90 °C Dry 75 °C Wet, Open Wiring or MTW 600V 90 °C or STOOW 105 °C 600V - CSA STOOW 600V FT2
Assembly Rating	600V, 10 A
Environmental	
Enclosure Type Rating	IP67, NEMA 4; IP69K 1200 psi washdown
Operating Temperature	-20...+90 °C (-4...+194 °F)

Pinout and Color Code

	Face View Pinout	
	6-pin/5-used	
		
	Female	Male
Color Code	1 Red 2 Black 3 Green	4 Blank/Not Used 5 Blue 6 White

Approximate Dimensions

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes and are subject to change.



ArmorConnect® Power Media

Product Selection/Specifications/Approximate Dimensions



Bulletin 898 — ArmorStart Control Power T-Ports

- 6-pin/5-used configuration to prevent mis-wiring with network connectors
- One piece molded design
- Durable compact design

Product Selection

T-Ports ✱

Pin Count	Assembly Rating	Overmold Color	Wiring Diagram	Cat. No.
E-stop Out	600V 10 A	Red		898N-653ES-NKF
E-stop In		Black		898N-653ST-NKF

✱ Stainless steel version may be ordered by adding "S" to the catalog number. For example: **898NS-653ST-NKF**.

Specifications

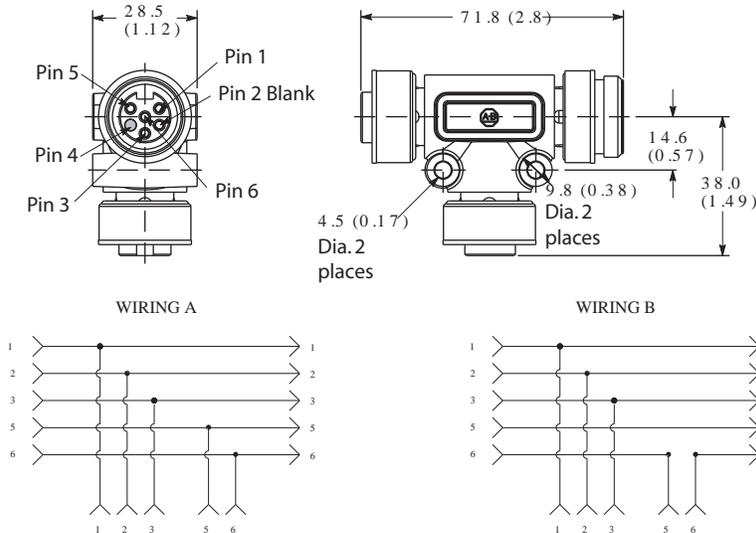
Mechanical	
Coupling Nut	Black epoxy coated zinc or 316 Stainless Steel
Housing	Riteflex TPE
Insert	Yellow Riteflex TPE
Contacts	Brass/gold over palladium Nickel
Electrical	
Assembly Rating	600V, 10 A
Environmental	
Enclosure Type Rating	IP67, NEMA 4; IP69K 1200 psi washdown
Operating Temperature	-20...+90 °C (-4...+194 °F)

Pinout and Color Code

Face View Pinout							
6-pin/5-used							
Female	Male						
Color Code	<table border="0"> <tr> <td>1 Red</td> <td>4 Blank/Not Used</td> </tr> <tr> <td>2 Black</td> <td>5 Blue</td> </tr> <tr> <td>3 Green</td> <td>6 White</td> </tr> </table>	1 Red	4 Blank/Not Used	2 Black	5 Blue	3 Green	6 White
1 Red	4 Blank/Not Used						
2 Black	5 Blue						
3 Green	6 White						

Approximate Dimensions

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes and are subject to change.





Bulletin 888N — ArmorStart Control Power Receptacles

- 6-pin/5-used configuration to prevent mis-wiring with network connectors
- 1/2 in. - 14 NPT threads

Product Selection

Receptacles

Pin Count	Assembly Rating	Cat. No.	
		Female	Male
6-Pin/5-used	16 AWG 600V 10 A	888N-D65AF1-*	888N-M65AF1-*

* Replace symbol with desired length in meters (0.3 or 1 standard).

* Stainless steel version may be ordered by adding "S" to the catalog number. For example: **888NS-D65AF1-1**.

Specifications

Mechanical	
Receptacle Shell	Male: Black epoxy coated zinc diecast Female: Black anodized Aluminum or 316 Stainless Steel
Insert	Yellow PVC
Contacts	Brass/gold over palladium Nickel
Electrical	
Assembly Rating	600V, 10 A
Environmental	
Enclosure Type Rating	IP67, NEMA 4; IP69K 1200 psi washdown
Operating Temperature	-20...+90 °C (-4...+194 °F)

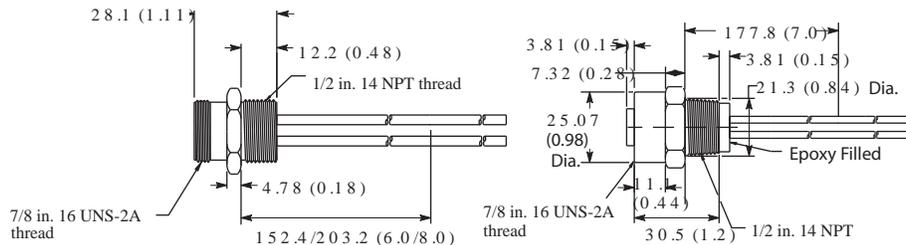
Pinout and Color Code

	Face View Pinout	
	6-pin/5-used	
	Female	Male
Color Code	1 Red 2 Black 3 Green	4 Blank/Not Used 5 Blue 6 White



Approximate Dimensions

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes and are subject to change.



ArmorConnect® Power Media

Product Selection/Specifications/Approximate Dimensions



Bulletin 889A — ArmorStart Control Power Shorting Plugs

- 6-pin/5-used configuration to prevent mis-wiring with network connectors
- 1/2 in. - 14 NPT threads

Product Selection

Shorting Plugs ✱

Configuration	Assembly Rating	Overmold Color	Wiring Diagram	Cat. No.
E-stop In	600V 10 A	Red	1. ← 2. ← N/C 3. ← N/C 4. ← Blank 5. ← N/C 6. ←	889A-M65SP61
E-stop Out		Black	1. ← N/C 2. ← N/C 3. ← N/C 4. ← Blank 5. ← 6. ←	889A-M65SP65

✱ Stainless steel version may be ordered by adding "S" to the catalog number. For example: **889AS-M65SP61**.

Specifications

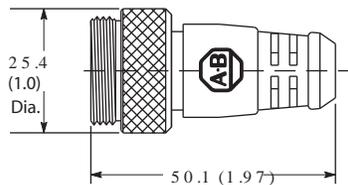
Mechanical	
Coupling Nut	Black epoxy coated zinc
Overmold	Riteflex TPE
Insert	Yellow Riteflex TPE
Contacts	Brass/gold over palladium Nickel
Electrical	
Assembly Rating	600V, 10 A
Environmental	
Enclosure Type Rating	IP67, NEMA 4; IP69K 1200 psi washdown
Operating Temperature	-20...+90 °C (-4...+194 °F)

Pinout and Color Code

	Face View Pinout	
	6-pin/5-used	
	Female	Male
Color Code	1 Red 2 Black 3 Green	4 Blank/Not Used 5 Blue 6 White

Approximate Dimensions

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes and are subject to change.



Accessories
Locking Clips



Description	Material	Package Quantity	Cat. No.
The clam shell design clips over the three-phase power media trunk connection, to limit customer access.	Black, ABS/PC Plastic	10	280-MTR35-LC
The clam shell design clips over the three-phase power media drop connection, to limit customer access.		10	280-MTR22-LC

Sealing Caps



Connector Style	Material	Thread Configuration	Dimensions	Cat. No.
Mini	Grey, Anodized Aluminum	External	7/8 in. -16 UN 2 A Threads 	1485A-C1
		Internal	7/8 in. -16 UN 2 B Threads 	889A-NCAP
Quick Change		External	1-3/8 in. -16 UN 2A Threads 	889A-QMCAP
		Internal	1-3/8 in. -16 UN 2B Threads 	889A-QCAP

Mounting Nuts and Flat Seals

Description	Package Quantity	Cat. No.
Mounting nuts for 1/2 in. - 14 NPT threaded receptacles	10	889A-U1NUT-10
Flat sealing washers for 1/2 in. - 14 NPT threaded receptacles	10	889A-U1FSL-10

On-Machine E-Stop Stations

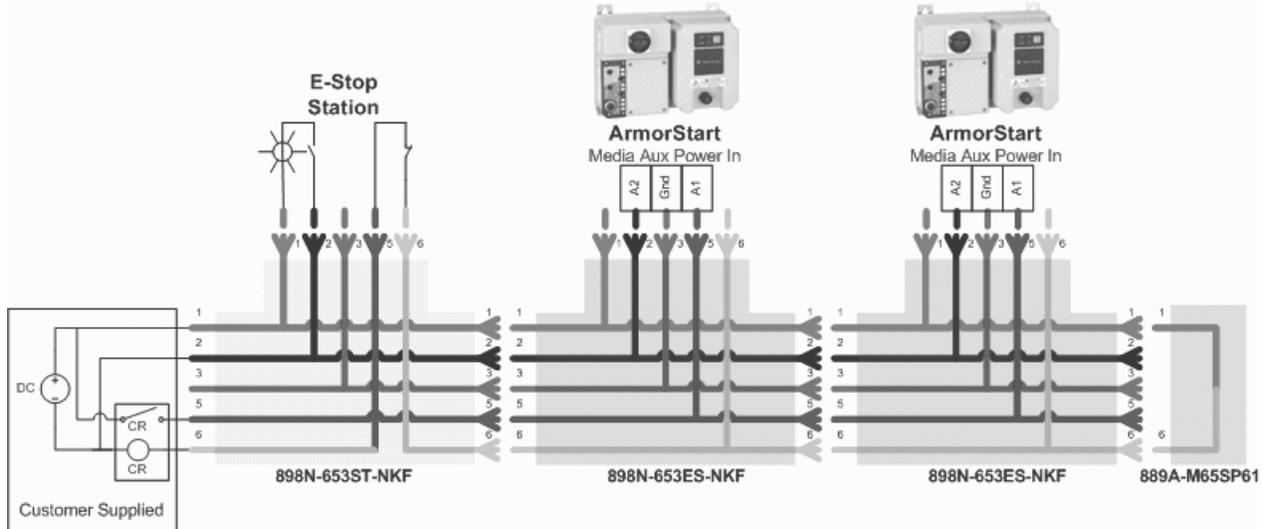


Enclosure Type	Quick Connect	Knockout Type	Operator	Illumination Voltage	Contact Configuration	Cat. No.
Plastic	Mini receptacle	Metric	Twist to release	24V AC/DC	1 N.C./1 N.O.	800F-1YMQ4
				120V AC		800F-1YMQ5
				240V AC		800F-1YMQ6
24V AC/DC				800F-1MYMQ4		
120V AC				800F-1MYMQ5		
240V AC				800F-1MYMQ6		
Metal						

4

E-Stop Circuit

ArmorConnect Cordset/Receptacle	ArmorStart Terminations
Pin Out:	RED – No connection
Pin 1 - RED	Black – A2(-)
Pin 2 - Black	Green - PE
Pin 3 - Green	Blank/Not Used
Pin 4 - Blank/ Not used	Blue – A1(+)
Pin 5 - Blue	White –No connection
Pin 6 - White	



Bulletin 150 — Solid-State Reduced Voltage Starters

The Allen-Bradley SMC™ Smart Motor Controller product line offers a broad range of products for starting and stopping standard 3-phase squirrel-cage induction motors and wye-delta motors.

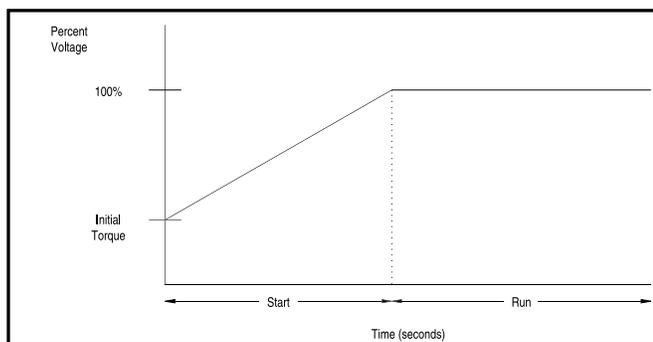
					
	SMC™ Flex	SMC™-3	SMC™ Dialog Plus	STC™	
Features	200...690V 1...1250 A	200...600V 1...480 A	200...600V 1...1000 A	100...240V 1Ø, 1...22 A	200...600V 3Ø, 1...22 A
Soft Start	S	S	S	S	S
Kickstart	S	S	S	—	—
Current Limit	S	S	S	—	—
Dual Ramp Start	S	—	S	—	—
Full Voltage	S	—	S	—	—
Energy Saver	—	—	S	—	—
Soft Stop	S	S	O	—	—
Pump Control	O	—	O	—	—
Preset Slow Speed	S	—	O	—	—
Linear Speed	S	—	—	—	—
SMB™ Smart Motor Braking	O	—	O	—	—
Accu-Stop™	O	—	O	—	—
Slow Speed with Braking	O	—	O	—	—
Integrated Bypass Contacts	S	S	—	—	—
Integrated Motor Protection	S	S	S	—	—
Single-phase Operation	—	—	—	S	—
Communication	S	—	S	—	—
Metering	S	—	S	—	—
Keypad Programming/LCD Display	S	—	S	—	—
Inside Delta Connection	S	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	S	S	S
Product Selection	Page 4-79	Page 4-100	Page 4-123	Page 4-136	

S = Standard Feature
 O = Optional Feature

The SMC controllers provide the following modes of operation:

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.



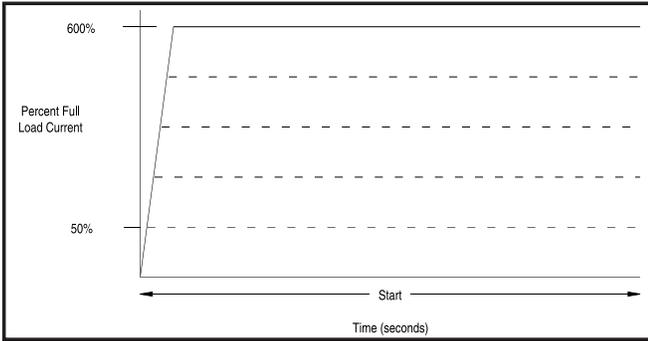
Full Voltage Start

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.



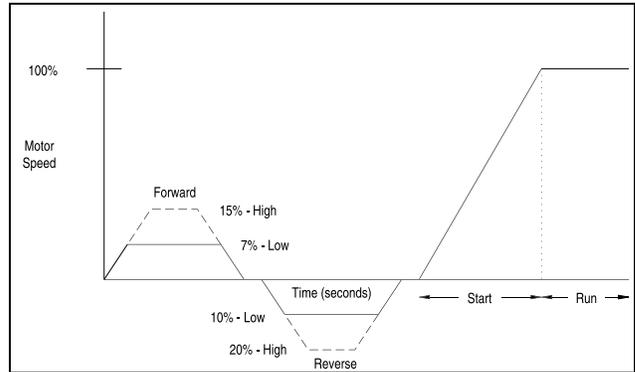
Current Limit Start

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 staving time is user adjustable.



Preset Slow Speed

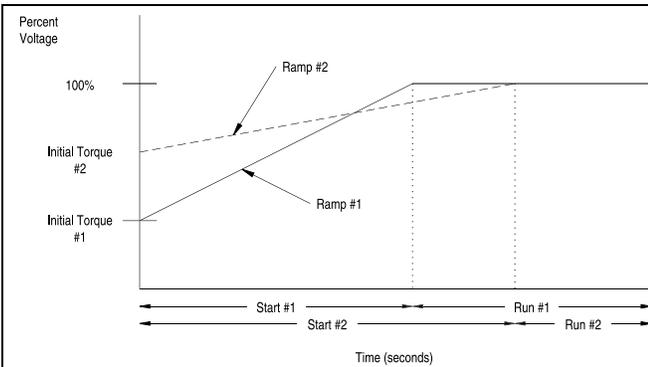
This method can be used on applications that require a slow speed for positioning material. The Preset Slow Speed can be set for either Low, 7% of base speed, or High, 15% of base speed. Reversing is also possible through programming. Speeds provided during reverse operation are Low, 10% of base speed,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



4

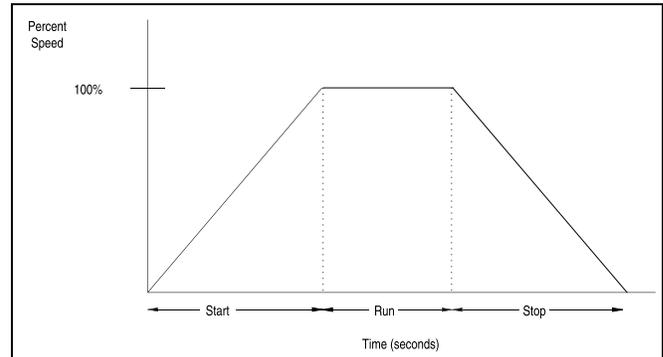
Dual Ramp Start

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.



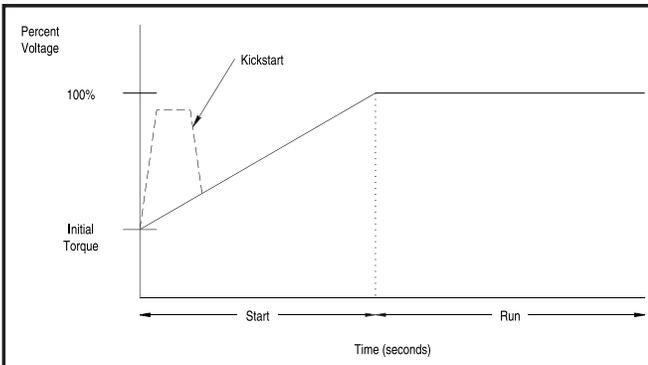
Linear Speed Acceleration

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.



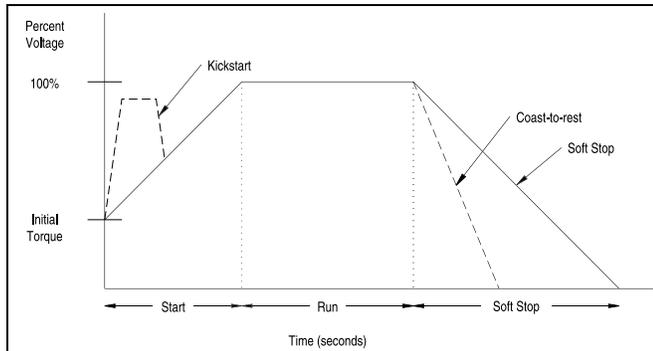
Selectable Kickstart

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.



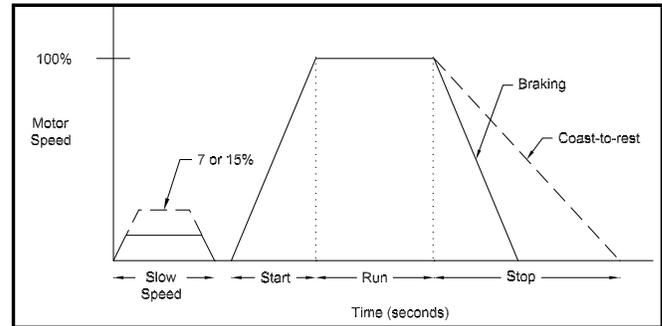
Soft Stop ⚡

The Soft Stop option can be used in applications requiring an extended coast-to-rest. The voltage ramp down time is user adjustable. The load will stop when the voltage drops to a point where the load torque is greater than the motor torque.



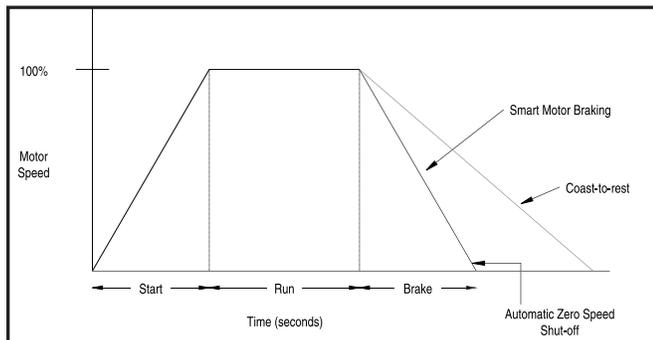
Slow Speed with Braking ⚡

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, slow speed running current, and braking current are all adjustable.



SMB Smart Motor Braking ⚡

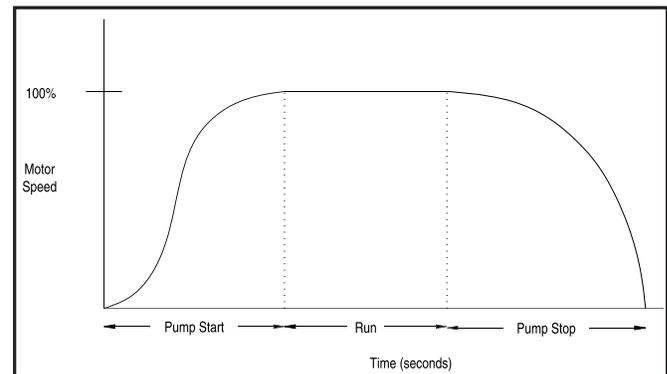
This option provides motor braking for applications that require the motor to stop faster than a coast to rest. Braking control, with automatic zero speed shut off, is fully integrated into the compact design of the SMC controller. This design facilitates a clean, straight forward installation and eliminates 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 user programmable.



Pump Control

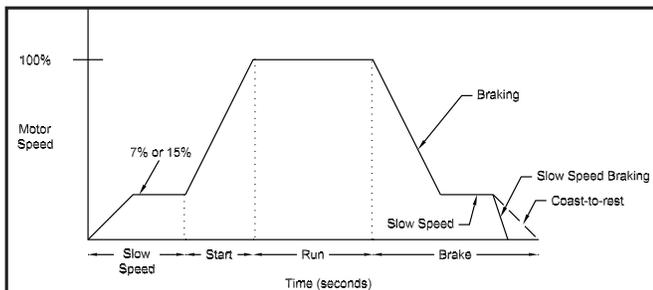
Start and Stop ⚡

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 motor torque and reduce the possibility of surges occurring in the system.



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 and slow speed current are user programmable. 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.



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

Features..... this page

Cat. No. Explanation 4-78

Product Selection 4-79

Options 4-89

Accessories..... 4-90

Specifications..... 4-92

Approx. Dims. 4-97

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

Note: For detailed information about the different modes of operation, see page 4-73.

Optional Modes of Operation

Pump Control

- Start and Stop

Braking Control

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

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 4-92 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.

SMC™ Flex Smart Motor Controllers

Cat. No. Explanation

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

f

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

g

Options (Non-Combination only) (see page 4-89 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.

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)

4

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

g

Options (see page 4-89 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 connection.

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-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 4-90 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 power supply 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 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-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 4-90 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 power supply is required for fan operation.

➤ Line and load termination are provided as standard.

SMC™ Flex Smart Motor Controllers

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 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-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 4-90 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 power supply 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 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.
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	—	

4

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 4-90 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 power supply is required for fan operation.

> Line and load termination are provided as standard.



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 4-90 for terminal lug kits.

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

♣ 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 4-90 for terminal lug kits.

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

♣ 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 4-90 for terminal lug kits.

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

♣ 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.
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 4-90 for terminal lug kits.

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

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

SMC™ Flex Smart Motor Controllers

Product Selection, Continued

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 Rockwell Automation sales office or 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	152H-F5FHD-33	153H-F5FHD-33	
	—	0.75	5	152H-F5FHD-34	153H-F5FHD-34	
	—	1	5	152H-F5FHD-35	153H-F5FHD-35	
	—	1.5	25	152H-F25FHD-36	153H-F25FHD-36	
	—	2	25	152H-F25FHD-37	153H-F25FHD-37	
	—	3	25	152H-F25FHD-38	153H-F25FHD-38	
	—	5	25	152H-F25FHD-39	153H-F25FHD-39	
	—	5	25	152H-F25FHD-40	153H-F25FHD-40	
	—	10	43	152H-F43FHD-41	153H-F43FHD-41	
	—	15	60	152H-F60FHD-42	153H-F60FHD-42	
	—	20	85	152H-F85FHD-43	153H-F85FHD-43	
	—	25	85	152H-F85FHD-44	153H-F85FHD-44	
	—	30	108	152H-F108FHD-45	153H-F108FHD-45	
	—	40	135	152H-F135FHD-46	153H-F135FHD-46	
	—	50	201	152H-F201FHD-47	153H-F201FHD-47	
	—	60	201	152H-F201FHD-48	153H-F201FHD-48	
	230	—	75	251	152H-F251FHD-49	153H-F251FHD-49
		—	100	317	152H-F317FHD-50	153H-F317FHD-50
—		125	361	152H-F361FHD-51	153H-F361FHD-51	
—		150	480	152H-F480FHD-52	153H-F480FHD-52	
—		200	625	152H-F625FHD-54	153H-F625FHD-54	
—		250	780	152H-F780FHD-56	153H-F780FHD-56	
0.37		0.5	5	152H-F5FAD-33	153H-F5FAD-33	
0.55		0.75	5	152H-F5FAD-34	153H-F5FAD-34	
0.75		1	5	152H-F5FAD-35	153H-F5FAD-35	
1.1		1.5	25	152H-F25FAD-36	153H-F25FAD-36	
1.5		2	25	152H-F25FAD-37	153H-F25FAD-37	
2.2		3	25	152H-F25FAD-38	153H-F25FAD-38	
3.7		5	25	152H-F25FAD-39	153H-F25FAD-39	
5.5		7.5	25	152H-F25FAD-40	153H-F25FAD-40	
7.5		10	43	152H-F43FAD-41	153H-F43FAD-41	
11		15	43	152H-F43FAD-42	153H-F43FAD-42	
15		20	60	152H-F60FAD-43	153H-F60FAD-43	
18.5		25	85	152H-F85FAD-44	153H-F85FAD-44	
22		30	85	152H-F85FAD-45	153H-F85FAD-45	
30		40	108	152H-F108FAD-46	153H-F108FAD-46	
37		50	135	152H-F135FAD-47	153H-F135FAD-47	
45		60	201	152H-F201FAD-48	153H-F201FAD-48	
55	75	201	152H-F201FAD-49	153H-F201FAD-49		
75	100	251	152H-F251FAD-50	153H-F251FAD-50		
90	125	317	152H-F317FAD-51	153H-F317FAD-51		
110	150	361	152H-F361FAD-52	153H-F361FAD-52		
132	200	480	152H-F480FAD-54	153H-F480FAD-54		
185	250	625	152H-F625FAD-56	153H-F625FAD-56		
220	300	780	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 Rockwell Automation sales office or 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 Rockwell Automation sales office or 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	152H-F5FBD-33	153H-F5FBD-33
	0.55	0.75	5	152H-F5FBD-34	153H-F5FBD-34
	0.75	1	5	152H-F5FBD-35	153H-F5FBD-35
	1.1	1.5	5	152H-F5FBD-36	153H-F5FBD-36
	1.5	2	5	152H-F5FBD-37	153H-F5FBD-37
	2.2	3	5	152H-F5FBD-38	153H-F5FBD-38
	3.7	5	25	152H-F25FBD-39	153H-F25FBD-39
	5.5	7.5	25	152H-F25FBD-40	153H-F25FBD-40
	7.5	10	25	152H-F25FBD-41	153H-F25FBD-41
	11	15	25	152H-F25FBD-42	153H-F25FBD-42
	15	20	43	152H-F43FBD-43	153H-F25FBD-43
	18.5	25	43	152H-F43FBD-44	153H-F43FBD-44
	22	30	43	152H-F43FBD-45	153H-F43FBD-45
	30	40	60	152H-F60FBD-46	153H-F60FBD-46
	37	50	85	152H-F85FBD-47	153H-F85FBD-47
	45	60	85	152H-F85FBD-48	153H-F85FBD-48
	55	75	108	152H-F108FBD-49	153H-F108FBD-49
	75	100	135	152H-F135FBD-50	153H-F135FBD-50
	90	125	201	152H-F201FBD-51	153H-F201FBD-51
	110	150	201	152H-F201FBD-52	153H-F201FBD-52
132	200	251	152H-F251FBD-54	153H-F251FBD-54	
160	250	317	152H-F317FBD-56	153H-F317FBD-56	
200	300	361	152H-F361FBD-57	153H-F361FBD-57	
250	350	480	152H-F480FBD-58	153H-F480FBD-58	
250	400	480	152H-F480FBD-59	153H-F480FBD-59	
355	500	625	152H-F625FBD-61	153H-F625FBD-61	
450	600	780	152H-F780FBD-62	153H-F780FBD-62	
500/575	0.55	0.75	5	152H-F5FCD-34	153H-F5FCD-34
	0.75	1	5	152H-F5FCD-35	153H-F5FCD-35
	1.1	1.5	5	152H-F5FCD-36	153H-F5FCD-36
	1.5	2	5	152H-F5FCD-37	153H-F5FCD-37
	2.2	3	5	152H-F5FCD-38	153H-F5FCD-38
	3.7	5	25	152H-F25FCD-39	153H-F25FCD-39
	5.5	7.5	25	152H-F25FCD-40	153H-F25FCD-40
	7.5	10	25	152H-F25FCD-41	153H-F25FCD-41
	11	15	25	152H-F25FCD-42	153H-F25FCD-42
	15	20	43	152H-F43FCD-43	153H-F43FCD-43
	18.5	25	43	152H-F43FCD-44	153H-F43FCD-44
	22	30	43	152H-F43FCD-45	153H-F43FCD-45
	22	40	43	152H-F43FCD-46	153H-F43FCD-46
	37	50	60	152H-F60FCD-47	153H-F60FCD-47
	45	60	85	152H-F85FCD-48	153H-F85FCD-48
	55	75	85	152H-F85FCD-49	153H-F85FCD-49
	75	100	108	152H-F108FCD-50	153H-F108FCD-50
	90	125	135	152H-F135FCD-51	153H-F135FCD-51
	110	150	201	152H-F201FCD-52	153H-F201FCD-52
	132	200	201	152H-F201FCD-54	153H-F201FCD-54
160	250	251	152H-F251FCD-56	153H-F251FCD-56	
200	300	317	152H-F317FCD-57	153H-F317FCD-57	
250	350	361	152H-F361FCD-58	153H-F361FCD-58	
295	400	480	152H-F480FCD-59	153H-F480FCD-59	
315	450	480	152H-F480FCD-60	153H-F480FCD-60	
315	500	480	152H-F480FCD-61	153H-F480FCD-61	
450	600	625	152H-F625FCD-62	153H-F625FCD-62	
560	800	780	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 Rockwell Automation sales office or 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 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 100 VA 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	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	

4

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	
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

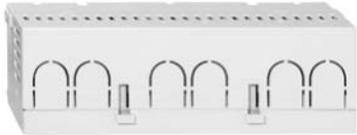
Line and Load terminals are provided as standard on enclosed SMCs.

♣ 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.
	Terminal Cover IEC line or load terminal covers for 108 and 135 A devices. Dead front protection	1	150-TC1
	Terminal Cover IEC line or load terminal covers for 201...251 A devices. Dead front protection	1	150-TC2
	Terminal Cover 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	
		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	Remote I/O Communication Adapter 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™ RS-232 to DPi	PC Interface	Serial 1203-SSS	
DPI to USB	PC Interface	USB 1203-USB	

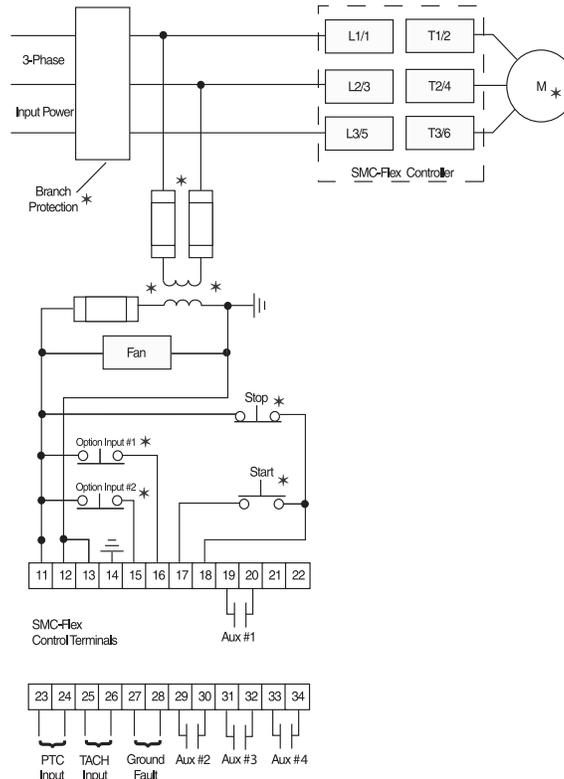
* Requires a 20-HIM-H10 cable to connect to the SMC-Flex.

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.

4

Wiring Diagram — Line Controller



* Customer supplied.

SMC™ Flex Smart Motor Controllers

Specifications, Continued

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.

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	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.

SMC™ Flex Smart Motor Controllers

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	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) (A)✦	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 \pm 150 Ω			
	Reset Resistance	1600 Ω \pm 100 Ω			
	Short-Circuit Trip Resistance	25 Ω \pm 10 Ω			
	Max. Voltage at PTC Terminals ($R_{PTC} = 4$ k Ω)	< 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			
Tach Input	Response Time	800 ms			
		0...5V DC, 4.5V DC = 100% Speed			

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

Bulletin 150
SMC™ Flex Smart Motor Controllers
 Specifications, Continued

4

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	
Resistance to Shock	Operational	625...1250 A	1.0 G Peak, 0.15 mm (0.006 in.) displacement	
		5...85 A	15 G	
	Non-Operational	108...480 A	5.5 G	
		625...1250 A	4 G	
		5...85 A	30 G	
		108...480 A	25 G	
Construction	Power Poles	5...85 A	Heatsink thyristor modular design	
		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 ² (14...3/0 AWG) Line Lower — 0.8...2.5 mm ² (18...14 AWG) Load Upper — 2.5...50 mm ² (14...1 AWG) Load Lower — 0.8...2.5 mm ² (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)	

Approximate Dimensions and Shipping Weights

Open Type Controllers

Dimensions are in millimeters (inches).

Dimensions are not intended for manufacturing purposes.

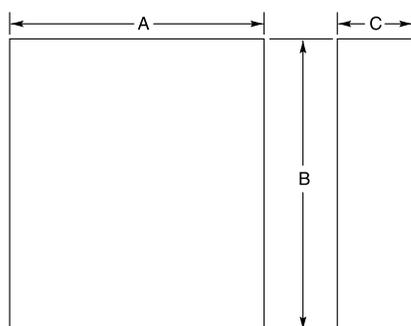
Rating (A)	Height	Width	Depth	Weight
5...85	321 (12.6)	150 (5.9)	203 (8.0)	5.7 kg (12.6 lbs)
108...135	443.7 (17.47)	196.4 (7.74)	205.2 (8.08)	15.0 kg (33 lbs)
201...251	560 (22.05)	225 (8.86)	253.8 (9.99)	30.4 kg (67 lbs)
317...480	600 (23.62)	290 (11.42)	276.5 (10.89)	45.8 kg (101 lbs)
625...780	1041.1 (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.



Controller Rating (A)	Disconnect Rating (A)	IP65 (Type 4/12)		
		B Height	A Width	C Depth
Non-Combination Controller				
5	—	610 (24)	406 (16)	254 (10)
25	—	610 (24)	406 (16)	254 (10)
43	—	610 (24)	406 (16)	254 (10)
60	—	610 (24)	406 (16)	254 (10)
85	—	610 (24)	406 (16)	254 (10)
108	—	762 (30)	610 (24)	305 (12)
135	—	762 (30)	610 (24)	305 (12)
201	—	965 (38)	762 (30)	356 (14)
251	—	965 (38)	762 (30)	356 (14)
317	—	1295 (51)	914 (36)	356 (14)
361	—	1295 (51)	914 (36)	356 (14)
480	—	1295 (51)	914 (36)	356 (14)
625	—	2286 (90)	762 (30)	508 (20)
780	—	2286 (90)	762 (30)	508 (20)

Controller Rating (A)	Disconnect Rating (A)	IP65 (Type 4/12)		
		B Height	A Width	C Depth
Combination Controllers with Fusible Disconnect				
5	30 A/J	610 (24)	406 (16)	254 (10)
25	30 A/J	610 (24)	406 (16)	254 (10)
43	60 A/J	610 (24)	406 (16)	254 (10)
60	100 A/J	610 (24)	406 (16)	254 (10)
85	100 A/J	610 (24)	406 (16)	254 (10)
108	200 A/J	965 (38)	762 (30)	356 (14)
135	200 A/J	965 (38)	762 (30)	356 (14)
201	400 A/J	965 (38)	762 (30)	356 (14)
251	400 A/J	965 (38)	762 (30)	356 (14)
317	600 A/J	1524 (60)	965 (38)	356 (14)
361	600 A/J	1524 (60)	965 (38)	356 (14)
480	* 600 A/J	1524 (60)	965 (38)	356 (14)
	‡ 800 A/L	2286 (90)	508 (20)	508 (20)
625	—	2286 (90)	1397 (55)	508 (20)
780	—	2286 (90)	1397 (55)	508 (20)
Combination Controllers with Circuit Breaker				
5	15 A	610 (24)	406 (16)	254 (10)
25	30 A	610 (24)	406 (16)	254 (10)
43	80 A	610 (24)	406 (16)	254 (10)
60	100 A	610 (24)	406 (16)	254 (10)
85	125 A	610 (24)	406 (16)	254 (10)
108	175 A/175 A Plug	965 (38)	762 (30)	356 (14)
135	225 A/225 A Plug	965 (38)	762 (30)	356 (14)
201	300 A/300 A Plug	965 (38)	762 (30)	356 (14)
251	400 A/400 A Plug	965 (38)	762 (30)	356 (14)
317	600 A/500 A Plug	1295 (51)	914 (36)	356 (14)
361	600 A/600 A Plug	1295 (51)	914 (36)	356 (14)
480	800 A/800 A Plug	1295 (51)	914 (36)	356 (14)
625	—	2286 (90)	1397 (55)	508 (20)
780	—	2286 (90)	1397 (55)	508 (20)

* Use this row for 460V -58 and 575V -59.

‡ Use this row for 460V -59 and 575V -60 and -61.



Bulletin 150 — Smart Motor Controllers — SMC™-3 Smart Motor Controller

The SMC-3 is a compact, simple to use, solid-state motor controller designed to operate 3-phase motors. It features a built-in overload relay and a built-in SCR bypass contactor on all three phases, allowing a smaller footprint than other soft starters on the market. This product is designed for many applications, including compressors, chillers, pumps, conveyors, and crushers. Modes of operation for the controller are as follows:

- Soft Start
- Current Limit Start
- Soft Stop
- Kick Start

The controllers offer two voltage ranges: 200...480V AC and 200...600V AC. All voltage ranges will operate at either 50 or 60 Hz.

- 1...480 A Range
- Built-In Electronic Motor Overload Protection
- Built-In SCR/Run Bypass
- Delta Compatibility

Table of Contents

Cat. No. Explanation	4-99
Product Selection	4-100
Typical Wiring Diags.	4-110
Specifications.....	4-112
Approx. Dimensions .	4-116
Enclosed Options	4-118
Accessories.....	4-118

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 (Open Type) per EMC and Low Voltage Directive
 CCC Certified

Modes of Operation

- Soft Start
- Current Limit Start
- Selectable Kickstart
- Soft Stop

Note: For detailed information about the different modes of operation, see page 4-73

Description of Features

Electronic Motor Overload Protection

The SMC-3 controller incorporates, as standard, electronic motor overload protection. This motor overload protection is accomplished electronically with the use of current transformers on each of the three phases. The controller's overload protection is programmable, providing the user with flexibility. The overload trip class selection consists of either OFF, 10, 15, or 20. The trip current is easily selected by adjusting the rotary potentiometer to the motor full-load current rating. Trip reset is selectable to either automatic or manual mode.

Note: Trip rating is 120% of dial setting.

Over-temperature

The SMC-3 monitors the SCR temperature by means of internal thermistors. When the power poles maximum rated temperature is reached, the microcomputer switches off the SMC, a TEMP fault is indicated via LED, and the 97/98 fault contact closes.

Phase Reversal Protection

When enabled via a DIP switch, 3-phase input power will be verified before starting. If input power phasing is detected to be incorrect, the start will be aborted and a fault indicated.

Phase Loss/Open Load

The unit will not attempt a start if there is a single-phase condition on the line. This protects from motor burnout during single-phase starting.

Phase Imbalance

The unit monitors for imbalance between phase currents. To prevent motor damage, the unit will trip if the difference between the minimum phase current and the maximum phase current exceeds 65% for 3 s, and a fault will be indicated.

Shorted SCR

Prior to every start and during starting, the unit will check all SCRs for shorts and unit load connections to the motor. If there is a shorted SCR in the SMC-3 and/or open load, the start will be aborted and a shorted SCR or open load fault will be indicated. This prevents damage from phase imbalance.

Push to Test

The unit with control wiring can be tested for fault conditions by using the Push to Test function. Hold down the Reset button for 7 s to activate the fault Aux (97, 98) and shut down the SMC-3. To clear, either push the Reset button or cycle control power to the device.

LED Description (Number of Flashes)

1. Overload
2. Overtemperature
3. Phase Reversal
4. Phase Loss/Open Load
5. Phase Imbalance
6. Shorted SCR
7. Test

Cat. No. Explanation
Open and Non-Combination

150 – C 30 F B D – 8L
a b c d e f g

a

Bulletin Number	
Code	Description
150	Solid-State Controller

b

Controller Type	
Code	Description
C	SMC-3

c

Ampere Ratings	
Code	Description
3	3 A
9	9 A
16	16 A
19	19 A
25	25 A
30	30 A
37	37 A
43	43 A
60	60 A
85	85 A
108	108 A
135	135 A
201	201 A
251	251 A
317	317 A
361	361 A
480	480 A

d

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

e

Input Line Voltage Open Type	
Code	Description
B	200...460V AC, 3-Phase, 50/60 Hz
C	200...600V AC, 3-Phase, 50/60 Hz

Non-Combination Enclosed Only	
Code	Description
H	200...208V AC, 3-Phase, 50/60 Hz
A	230V AC, 3-Phase, 50/60 Hz
B	400...460V AC, 3-Phase, 50/60 Hz
C	500...575V AC, 3-Phase, 50/60 Hz

f

Control Voltage	
Code	Description
D	100...240V AC
R	24V AC/DC (Open Type only)

g

Options (see page 4-118 for a full listing)	
Code	Description
8L	Line Mounted Protective Module (Enclosed Type only)

Load-side MOVs are not available when used with inside-the-delta connections. MOVs can be field installed for open type units.

Combination

152H – C 30 F BD 43 – 8L
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 Type	
Code	Description
C	SMC-3

c

Ampere Ratings	
Code	Description
3	3 A
9	9 A
16	16 A
19	19 A
25	25 A
30	30 A
37	37 A
43	43 A
60	60 A
85	85 A
108	108 A
135	135 A
201	201 A
251	251 A
317	317 A
361	361 A
480	480 A

d

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

e

Input Line Voltage Open Type	
Code	Description
HD	200...208V AC, 3-Phase, 50/60 Hz
AD	230V AC, 3-Phase, 50/60 Hz
BD	400...460V AC, 3-Phase, 50/60 Hz
CD	500...575V AC, 3-Phase, 50/60 Hz

g

Options (see page 4-118 for a full listing)	
Code	Description
8L	Line Mounted Protective Module (Enclosed Type only)

Load-side MOVs are not available 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, NEMA 4/12) Controllers — For use with Line-Connected Motors

Rated Voltage [V AC]	Motor Current (A)*	Max. kW, 50Hz	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...3	—	0.5	100...240V AC, 50/60 Hz	150-C3NBD	150-C3FHD
		—		24V AC/DC	150-C3NBR	—
	3...9	—	0.75...2	100...240V AC, 50/60 Hz	150-C9NBD	150-C9FHD
		—		24V AC/DC	150-C9NBR	—
	5.3...16	—	1.5...3	100...240V AC, 50/60 Hz	150-C16NBD	150-C16FHD
		—		24V AC/DC	150-C16NBR	—
	6.3...19	—	1.5...3	100...240V AC, 50/60 Hz	150-C19NBD	150-C25FHD
		—		24V AC/DC	150-C19NBR	—
	9.2...27.7	—	3...7.5	100...240V AC, 50/60 Hz	150-C25NBD	150-C25FHD
		—		24V AC/DC	150-C25NBR	—
	10...30	—	3...7.5	100...240V AC, 50/60 Hz	150-C30NBD	150-C30FHD
		—		24V AC/DC	150-C30NBR	—
	12.3...37	—	5...10	100...240V AC, 50/60 Hz	150-C37NBD	150-C37FHD
		—		24V AC/DC	150-C37NBR	—
	14.3...43	—	5...10	100...240V AC, 50/60 Hz	150-C43NBD	150-C43FHD
		—		24V AC/DC	150-C43NBR	—
	20...60	—	7.5...15	100...240V AC, 50/60 Hz	150-C60NBD	150-C60FHD
		—		24V AC/DC	150-C60NBR	—
	28.3...85	—	10...25	100...240V AC, 50/60 Hz	150-C85NBD	150-C85FHD
		—		24V AC/DC	150-C85NBR	—
27...108	—	20...30	100...240V AC, 50/60 Hz	150-C108NBD	150-C108FHD	
	—		24V AC/DC*	150-C108NBR	—	
34...135	—	25...40	100...240V AC, 50/60 Hz	150-C135NBD	150-C135FHD	
	—		24V AC/DC*	150-C135NBR	—	
67...201	—	40...60	100...240V AC, 50/60 Hz	150-C201NBD	150-C201FHD	
	—		24V AC/DC*	150-C201NBR	—	
84...251	—	50...75	100...240V AC, 50/60 Hz	150-C251NBD	150-C251FHD	
	—		24V AC/DC*	150-C251NBR	—	
106...317	—	60...100	100...240V AC, 50/60 Hz	150-C317NBD	150-C317FHD	
	—		24V AC/DC*	150-C317NBR	—	
120...361	—	75...125	100...240V AC, 50/60 Hz	150-C361NBD	150-C361FHD	
	—		24V AC/DC*	150-C361NBR	—	
160...480	—	100...150	100...240V AC, 50/60 Hz	150-C480NBD	150-C480FHD	
	—		24V AC/DC*	150-C480NBR	—	

* 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.



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

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...3	0.55	0.5	100...240V AC, 50/60 Hz	150-C3NBD	150-C3FAD
				24V AC/DC	150-C3NBR	—
	3...9	2.2	0.75...2	100...240V AC, 50/60 Hz	150-C9NBD	150-C9FAD
				24V AC/DC	150-C9NBR	—
	5.3...16	4	1.5...5	100...240V AC, 50/60 Hz	150-C16NBD	150-C16FAD
				24V AC/DC	150-C16NBR	—
	6.3...19	4	2...5	100...240V AC, 50/60 Hz	150-C19NBD	150-C25FAD
				24V AC/DC	150-C19NBR	—
	9.2...27.7	5.5	3...7.5	100...240V AC, 50/60 Hz	150-C25NBD	150-C25FAD
				24V AC/DC	150-C25NBR	—
	10...30	7.5	5...10	100...240V AC, 50/60 Hz	150-C30NBD	150-C30FAD
				24V AC/DC	150-C30NBR	—
	12.3...37	7.5	5...10	100...240V AC, 50/60 Hz	150-C37NBD	150-C37FAD
				24V AC/DC	150-C37NBR	—
	14.3...43	11	5...15	100...240V AC, 50/60 Hz	150-C43NBD	150-C43FAD
				24V AC/DC	150-C43NBR	—
	20...60	15	7.5...20	100...240V AC, 50/60 Hz	150-C60NBD	150-C60FAD
				24V AC/DC	150-C60NBR	—
	28.3...85	22	15...30	100...240V AC, 50/60 Hz	150-C85NBD	150-C85FAD
				24V AC/DC	150-C85NBR	—
27...108	30	20...40	100...240V AC, 50/60 Hz	150-C108NBD	150-C108FAD	
			24V AC/DC*	150-C108NBR	—	
34...135	37	25...50	100...240V AC, 50/60 Hz	150-C135NBD	150-C135FAD	
			24V AC/DC*	150-C135NBR	—	
67...201	55	40...75	100...240V AC, 50/60 Hz	150-C201NBD	150-C201FAD	
			24V AC/DC*	150-C201NBR	—	
84...251	75	50...100	100...240V AC, 50/60 Hz	150-C251NBD	150-C251FAD	
			24V AC/DC*	150-C251NBR	—	
106...317	90	60...125	100...240V AC, 50/60 Hz	150-C317NBD	150-C317FAD	
			24V AC/DC*	150-C317NBR	—	
120...361	110	75...150	100...240V AC, 50/60 Hz	150-C361NBD	150-C361FAD	
			24V AC/DC*	150-C361NBR	—	
160...480	132	100...200	100...240V AC, 50/60 Hz	150-C480NBD	150-C480FAD	
			24V AC/DC*	150-C480NBR	—	

* 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.

SMC™-3 Smart Motor Controllers

Product Selection, Continued

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

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.
380/400/ 415/460	1...3	1.1	0.5...1.5	100...240V AC, 50/60 Hz	150-C3NBD	150-C3FBD
				24V AC/DC	150-C3NBR	—
	3...9	4	1.5...5	100...240V AC, 50/60 Hz	150-C9NBD	150-C9FBD
				24V AC/DC	150-C9NBR	—
	5.3...16	7.5	5...10	100...240V AC, 50/60 Hz	150-C16NBD	150-C16FBD
				24V AC/DC	150-C16NBR	—
	6.3...19	7.5	5...10	100...240V AC, 50/60 Hz	150-C19NBD	150-C19NBR
				24V AC/DC	150-C19NBR	—
	9.2...27.7	11	7.5...15	100...240V AC, 50/60 Hz	150-C25NBD	150-C25NBR
				24V AC/DC	150-C25NBR	—
	10...30	15	7.5...20	100...240V AC, 50/60 Hz	150-C30NBD	150-C30FBD
				24V AC/DC	150-C30NBR	—
	12.3...37	18.5	10...25	100...240V AC, 50/60 Hz	150-C37NBD	150-C37FBD
				24V AC/DC	150-C37NBR	—
	14.3...43	22	10...30	100...240V AC, 50/60 Hz	150-C43NBD	150-C43FBD
				24V AC/DC	150-C43NBR	—
	20...60	30	15...40	100...240V AC, 50/60 Hz	150-C60NBD	150-C60FBD
				24V AC/DC	150-C60NBR	—
	28.3...85	45	25...60	100...240V AC, 50/60 Hz	150-C85NBD	150-C85FBD
				24V AC/DC	150-C85NBR	—
27...108	55	50...75	100...240V AC, 50/60 Hz	150-C108NBD	150-C108FBD	
			24V AC/DC*	150-C108NBR	—	
34...135	75	60...100	100...240V AC, 50/60 Hz	150-C135NBD	150-C135FBD	
			24V AC/DC*	150-C135NBR	—	
67...201	95...110	75...150	100...240V AC, 50/60 Hz	150-C201NBD	150-C201FBD	
			24V AC/DC*	150-C201NBR	—	
84...251	95...132	100...200	100...240V AC, 50/60 Hz	150-C251NBD	150-C251FBD	
			24V AC/DC*	150-C251NBR	—	
106...317	95...160	125...250	100...240V AC, 50/60 Hz	150-C317NBD	150-C317FBD	
			24V AC/DC*	150-C317NBR	—	
120...361	110...200	250...300	100...240V AC, 50/60 Hz	150-C361NBD	150-C361FBD	
			24V AC/DC*	150-C361NBR	—	
160...480	160...250	300...400	100...240V AC, 50/60 Hz	150-C480NBD	150-C480FBD	
			24V AC/DC*	150-C480NBR	—	

* 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.

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

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...3	1.5	0.75...2	100...240V AC, 50/60 Hz	150-C3NCD	150-C3FCD
				24V AC/DC	150-C3NCR	—
	3...9	5.5	3...7.5	100...240V AC, 50/60 Hz	150-C9NCD	150-C9FCD
				24V AC/DC	150-C9NCR	—
	5.3...16	7.5	5...10	100...240V AC, 50/60 Hz	150-C16NCD	150-C16FCD
				24V AC/DC	150-C16NCR	—
	6.3...19	11	7.5...15	100...240V AC, 50/60 Hz	150-C19NCD	150-C25FCD
				24V AC/DC	150-C19NCR	—
	9.2...27.7	15	7.5...20	100...240V AC, 50/60 Hz	150-C25NCD	150-C25FCD
				24V AC/DC	150-C25NCR	—
	10...30	18.5	10...25	100...240V AC, 50/60 Hz	150-C30NCD	150-C30FCD
				24V AC/DC	150-C30NCR	—
	12.3...37	22	15...30	100...240V AC, 50/60 Hz	150-C37NCD	150-C37FCD
				24V AC/DC	150-C37NCR	—
	14.3...43	22	15...40	100...240V AC, 50/60 Hz	150-C43NCD	150-C43FCD
				24V AC/DC	150-C43NCR	—
	20...60	37	20...50	100...240V AC, 50/60 Hz	150-C60NCD	150-C60FCD
				24V AC/DC	150-C60NCR	—
	28.3...85	55	30...75	100...240V AC, 50/60 Hz	150-C85NCD	150-C85FCD
				24V AC/DC	150-C85NCR	—
27...108	75	60...100	100...240V AC, 50/60 Hz	150-C108NCD	150-C108FCD	
			24V AC/DC*	150-C108NCR	—	
34...135	90	75...125	100...240V AC, 50/60 Hz	150-C135NCD	150-C135FCD	
			24V AC/DC*	150-C135NCR	—	
67...201	75...132	100...200	100...240V AC, 50/60 Hz	150-C201NCD	150-C201FCD	
			24V AC/DC*	150-C201NCR	—	
84...251	90...160	125...250	100...240V AC, 50/60 Hz	150-C251NCD	150-C251FCD	
			24V AC/DC*	150-C251NCR	—	
106...317	100...200	200...300	100...240V AC, 50/60 Hz	150-C317NCD	150-C317FCD	
			24V AC/DC*	150-C317NCR	—	
120...361	132...250	200...350	100...240V AC, 50/60 Hz	150-C361NCD	150-C361FCD	
			24V AC/DC*	150-C361NCR	—	
160...480	200...315	250...500	100...240V AC, 50/60 Hz	150-C480NCD	150-C480FCD	
			24V AC/DC*	150-C480NCR	—	

* 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.

Open Type Controllers — For use with Delta-Connected Motors

Rated Voltage [V AC]	Motor Current (A)*	Max. kW, 50Hz	Max. Hp, 60 Hz	Control Power	Open Type
					Cat. No.
200/208	1.7...5.1	—	1	100...240V AC, 50/60 Hz	150-C3NBD
		—		24V AC/DC	150-C3NBR
	5.1...16	—	1.5...3	100...240V AC, 50/60 Hz	150-C9NBD
		—		24V AC/DC	150-C9NBR
	9.1...27.6	—	3...7.5	100...240V AC, 50/60 Hz	150-C16NBD
		—		24V AC/DC	150-C16NBR
	10.9...32.8	—	3...10	100...240V AC, 50/60 Hz	150-C19NBD
		—		24V AC/DC	150-C19NBR
	14.3...43	—	3...10	100...240V AC, 50/60 Hz	150-C25NBD
		—		24V AC/DC	150-C25NBR
	17.3...52	—	5...10	100...240V AC, 50/60 Hz	150-C30NBD
		—		24V AC/DC	150-C30NBR
	21...64	—	7.5...20	100...240V AC, 50/60 Hz	150-C37NBD
		—		24V AC/DC	150-C37NBR
	25...74	—	7.5...20	100...240V AC, 50/60 Hz	150-C43NBD
		—		24V AC/DC	150-C43NBR
	34.6...104	—	15...30	100...240V AC, 50/60 Hz	150-C60NBD
		—		24V AC/DC	150-C60NBR
	50...147	—	15...40	100...240V AC, 50/60 Hz	150-C85NBD
		—		24V AC/DC	150-C85NBR
47...187	—	20...60	100...240V AC, 50/60 Hz	150-C108NBD	
	—		24V AC/DC*	150-C108NBR	
59...234	—	20...75	100...240V AC, 50/60 Hz	150-C135NBD	
	—		24V AC/DC*	150-C135NBR	
116...348	—	75...100	100...240V AC, 50/60 Hz	150-C201NBD	
	—		24V AC/DC*	150-C201NBR	
145...435	—	100...150	100...240V AC, 50/60 Hz	150-C251NBD	
	—		24V AC/DC*	150-C251NBR	
183...549	—	100...200	100...240V AC, 50/60 Hz	150-C317NBD	
	—		24V AC/DC*	150-C317NBR	
208...625	—	125...200	100...240V AC, 50/60 Hz	150-C361NBD	
	—		24V AC/DC*	150-C361NBR	
277...831	—	200...300	100...240V AC, 50/60 Hz	150-C480NBD	
	—		24V AC/DC*	150-C480NBR	

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

* Separate 120V or 240V single phase 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...5.1	0.25...1.1	1	100...240V AC, 50/60 Hz	150-C3NBD
				24V AC/DC	150-C3NBR
	5.1...16	1.1...4	1...5	100...240V AC, 50/60 Hz	150-C9NBD
				24V AC/DC	150-C9NBR
	9.1...27.6	2.2...7.5	3...7.5	100...240V AC, 50/60 Hz	150-C16NBD
				24V AC/DC	150-C16NBR
	10.9...32.8	2.2...7.5	3...10	100...240V AC, 50/60 Hz	150-C19NBD
				24V AC/DC	150-C19NBR
	14.3...43	4...11	3...15	100...240V AC, 50/60 Hz	150-C25NBD
				24V AC/DC	150-C25NBR
	17.3...52	4...15	5...15	100...240V AC, 50/60 Hz	150-C30NBD
				24V AC/DC	150-C30NBR
	21...64	5.5...18.5	7.5...20	100...240V AC, 50/60 Hz	150-C37NBD
				24V AC/DC	150-C37NBR
	25...74	5.5...22	7.5...25	100...240V AC, 50/60 Hz	150-C43NBD
				24V AC/DC	150-C43NBR
	34.6...104	7.5...30	15...40	100...240V AC, 50/60 Hz	150-C60NBD
				24V AC/DC	150-C60NBR
	50...147	15...45	20...50	100...240V AC, 50/60 Hz	150-C85NBD
				24V AC/DC	150-C85NBR
47...187	55	20...60	100...240V AC, 50/60 Hz	150-C108NBD	
			24V AC/DC*	150-C108NBR	
59...234	75	25...75	100...240V AC, 50/60 Hz	150-C135NBD	
			24V AC/DC*	150-C135NBR	
116...348	110	75...125	100...240V AC, 50/60 Hz	150-C201NBD	
			24V AC/DC*	150-C201NBR	
145...435	132	100...150	100...240V AC, 50/60 Hz	150-C251NBD	
			24V AC/DC*	150-C251NBR	
183...549	160	125...200	100...240V AC, 50/60 Hz	150-C317NBD	
			24V AC/DC*	150-C317NBR	
208...625	200	150...250	100...240V AC, 50/60 Hz	150-C361NBD	
			24V AC/DC*	150-C361NBR	
277...831	250	200...300	100...240V AC, 50/60 Hz	150-C480NBD	
			24V AC/DC*	150-C480NBR	

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

* Separate 120V or 240V single phase 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.
380/400/415/460	1.7...5.1	0.55...2.2	0.5...2	100...240V AC, 50/60 Hz	150-C3NBD
				24V AC/DC	150-C3NBR
	5.1...16	2.2...7.5	2...7.5	100...240V AC, 50/60 Hz	150-C9NBD
				24V AC/DC	150-C9NBR
	9.1...27.6	4...11	5...15	100...240V AC, 50/60 Hz	150-C16NBD
				24V AC/DC	150-C16NBR
	10.9...32.8	4...15	5...15	100...240V AC, 50/60 Hz	150-C19NBD
				24V AC/DC	150-C19NBR
	14.3...43	5.5...22	7.5...20	100...240V AC, 50/60 Hz	150-C25NBD
				24V AC/DC	150-C25NBR
	17.3...52	7.5...22	7.5...30	100...240V AC, 50/60 Hz	150-C30NBD
				24V AC/DC	150-C30NBR
	21...64	7.5...30	10...40	100...240V AC, 50/60 Hz	150-C37NBD
				24V AC/DC	150-C37NBR
	25...74	11...37	10...50	100...240V AC, 50/60 Hz	150-C43NBD
				24V AC/DC	150-C43NBR
	34.6...104	15...55	20...75	100...240V AC, 50/60 Hz	150-C60NBD
				24V AC/DC	150-C60NBR
	50...147	22...75	25...100	100...240V AC, 50/60 Hz	150-C85NBD
				24V AC/DC	150-C85NBR
47...187	90	40...150	100...240V AC, 50/60 Hz	150-C108NBD	
			24V AC/DC*	150-C108NBR	
59...234	132	50...150	100...240V AC, 50/60 Hz	150-C135NBD	
			24V AC/DC*	150-C135NBR	
116...348	160	150...250	100...240V AC, 50/60 Hz	150-C201NBD	
			24V AC/DC*	150-C201NBR	
145...435	250	200...350	100...240V AC, 50/60 Hz	150-C251NBD	
			24V AC/DC*	150-C251NBR	
183...549	315	250...450	100...240V AC, 50/60 Hz	150-C317NBD	
			24V AC/DC*	150-C317NBR	
208...625	355	300...500	100...240V AC, 50/60 Hz	150-C361NBD	
			24V AC/DC*	150-C361NBR	
277...831	450	350...700	100...240V AC, 50/60 Hz	150-C480NBD	
			24V AC/DC*	150-C480NBR	

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

* Separate 120V or 240V single phase 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.
500/575	1.7...5.1	0.75...3	1...3	100...240V AC, 50/60 Hz	150-C3NCD
				24V AC/DC	150-C3NCR
	5.1...16	3...7.5	3...10	100...240V AC, 50/60 Hz	150-C9NCD
				24V AC/DC	150-C9NCR
	9.1...27.6	5.5...15	7.5...20	100...240V AC, 50/60 Hz	150-C16NCD
				24V AC/DC	150-C16NCR
	10.9...32.8	5.5...22	7.5...30	100...240V AC, 50/60 Hz	150-C19NCD
				24V AC/DC	150-C19NCR
	14.3...43	7.5...22	10...40	100...240V AC, 50/60 Hz	150-C25NCD
				24V AC/DC	150-C25NCR
	17.3...52	11...30	15...50	100...240V AC, 50/60 Hz	150-C30NCD
				24V AC/DC	150-C30NCR
	21...64	11...37	15...60	100...240V AC, 50/60 Hz	150-C37NCD
				24V AC/DC	150-C37NCR
	25...74	15...45	20...60	100...240V AC, 50/60 Hz	150-C43NCD
				24V AC/DC	150-C43NCR
	34.6...104	22...55	30...100	100...240V AC, 50/60 Hz	150-C60NCD
				24V AC/DC	150-C60NCR
	50...147	30...90	40...150	100...240V AC, 50/60 Hz	150-C85NCD
				24V AC/DC	150-C85NCR
47...187	132	50...150	100...240V AC, 50/60 Hz	150-C108NCD	
			24V AC/DC*	150-C108NCR	
59...234	160	60...200	100...240V AC, 50/60 Hz	150-C135NCD	
			24V AC/DC*	150-C135NCR	
116...348	250	250...300	100...240V AC, 50/60 Hz	150-C201NCD	
			24V AC/DC*	150-C201NCR	
145...435	315	250...400	100...240V AC, 50/60 Hz	150-C251NCD	
			24V AC/DC*	150-C251NCR	
183...549	400	300...500	100...240V AC, 50/60 Hz	150-C317NCD	
			24V AC/DC*	150-C317NCR	
208...625	450	350...600	100...240V AC, 50/60 Hz	150-C361NCD	
			24V AC/DC*	150-C361NCR	
277...831	560	400...900	100...240V AC, 50/60 Hz	150-C480NCD	
			24V AC/DC*	150-C480NCR	

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

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

Combination Enclosed (IP65, NEMA 4/12) Controllers with Fusible Disconnect or Circuit Breaker

Rated Voltage [V AC]	Current Rating (A)	kW	Hp	IP65 (Type 4/12) Enclosed Combination Controllers with Fusible Disconnect *	IP65 (Type 4/12) Enclosed Combination Controllers with Circuit Breaker *
				Cat. No.	Cat. No.
200/208	3	—	0.5	152H-C3FHD-33	153H-C3FHD-33
	9	—	0.75	152H-C9FHD-34	153H-C9FHD-34
	9	—	1	152H-C9FHD-35	153H-C9FHD-35
	9	—	1.5	152H-C9FHD-36	153H-C9FHD-36
	16	—	2	152H-C16FHD-37	153H-C16FHD-37
	16	—	3	152H-C16FHD-38	153H-C16FHD-38
	25	—	5	152H-C25FHD-39	153H-C25FHD-39
	37	—	7.5	152H-C37FHD-40	153H-C37FHD-40
	43	—	10	152H-C43FHD-41	153H-C43FHD-41
	60	—	15	152H-C60FHD-42	153H-C60FHD-42
	85	—	20	152H-C85FHD-43	153H-C85FHD-43
	85	—	25	152H-C85FHD-44	153H-C85FHD-44
	108	—	30	152H-C108FHD-45	153H-C108FHD-45
	135	—	40	152H-C135FHD-46	153H-C135FHD-46
	201	—	60	152H-C201FHD-48	153H-C201FHD-48
	251	—	75	152H-C251FHD-49	153H-C251FHD-49
	317	—	100	152H-C317FHD-50	153H-C317FHD-50
361	—	125	152H-C361FHD-51	153H-C361FHD-51	
480	—	150	152H-C480FHD-52	153H-C480FHD-52	
230	3	0.37	0.5	152H-C3FAD-33	153H-C3FAD-33
	9	0.55	0.75	152H-C9FAD-34	153H-C9FAD-34
	9	0.75	1	152H-C9FAD-35	153H-C9FAD-35
	9	1.1	1.5	152H-C9FAD-36	153H-C9FAD-36
	9	1.5	2	152H-C9FAD-37	153H-C9FAD-37
	16	2.2	3	152H-C16FAD-38	153H-C16FAD-38
	25	3.7	5	152H-C25FAD-39	153H-C25FAD-39
	30	5.5	7.5	152H-C30FAD-40	153H-C30FAD-40
	37	7.5	10	152H-C37FAD-41	153H-C37FAD-41
	43	11	15	152H-C43FAD-42	153H-C43FAD-42
	60	15	20	152H-C60FAD-43	153H-C60FAD-43
	85	18.5	25	152H-C85FAD-44	153H-C85FAD-44
	85	22	30	152H-C85FAD-45	153H-C85FAD-45
	108	30	40	152H-C108FAD-46	153H-C108FAD-46
	135	37	50	152H-C135FAD-47	153H-C135FAD-47
	201	55	75	152H-C201FAD-49	153H-C201FAD-49
	251	75	100	152H-C251FAD-50	153H-C251FAD-50
317	90	125	152H-C317FAD-51	153H-C317FAD-51	
361	110	150	152H-C361FAD-52	153H-C361FAD-52	
480	147	200	152H-C480FAD-54	153H-C480FAD-54	

* 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.



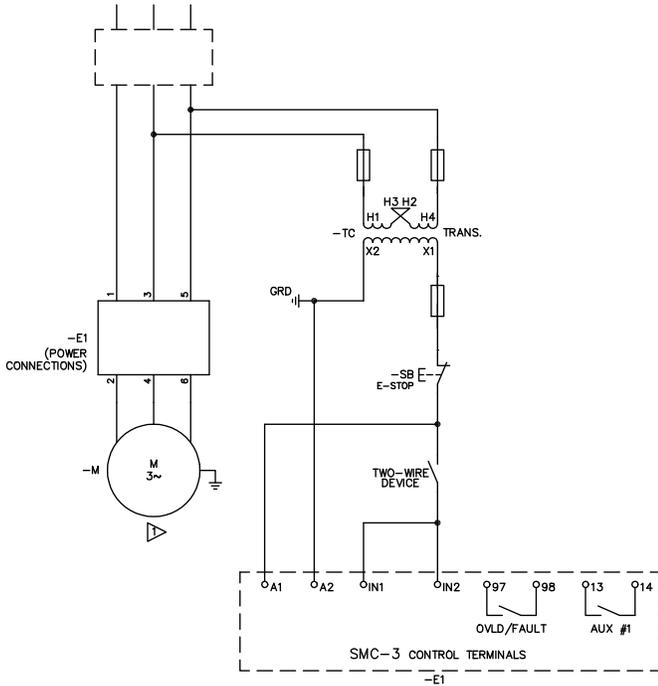
Combination Enclosed (IP65, NEMA 4/12) Controllers with Fusible Disconnect or Circuit Breaker, Continued

Rated Voltage [V AC]	Current Rating (A)	kW	Hp	IP65 (Type 4/12) Enclosed Combination Controllers with Fusible Disconnect *	IP65 (Type 4/12) Enclosed Combination Controllers with Circuit Breaker *	
				Cat. No.	Cat. No.	
460	3	0.37	0.5	152H-C3FBD-33	153H-C3FBD-33	
	3	0.55	0.75	152H-C3FBD-34	153H-C3FBD-34	
	3	0.75	1	152H-C3FBD-35	153H-C3FBD-35	
	9	1.1	1.5	152H-C9FBD-36	153H-C9FBD-36	
	9	1.5	2	152H-C9FBD-37	153H-C9FBD-37	
	9	2.2	3	152H-C9FBD-38	153H-C9FBD-38	
	16	3.7	5	152H-C16FBD-39	153H-C16FBD-39	
	16	5.5	7.5	152H-C16FBD-40	153H-C16FBD-40	
	25	7.5	10	152H-C25FBD-41	153H-C25FBD-41	
	30	11	15	152H-C30FBD-42	153H-C30FBD-42	
	37	15	20	152H-C37FBD-43	153H-C37FBD-43	
	43	18.5	25	152H-C43FBD-44	153H-C43FBD-44	
	43	22	30	152H-C43FBD-45	153H-C43FBD-45	
	60	30	40	152H-C60FBD-46	153H-C60FBD-46	
	85	37	50	152H-C85FBD-47	153H-C85FBD-47	
	85	45	60	152H-C85FBD-48	153H-C85FBD-48	
	108	55	75	152H-C108FBD-49	153H-C108FBD-49	
	135	75	100	152H-C135FBD-50	153H-C135FBD-50	
	500/575	201	110	150	152H-C201FBD-52	153H-C201FBD-52
		251	132	200	152H-C251FBD-54	153H-C251FBD-54
317		160	250	152H-C317FBD-56	153H-C317FBD-56	
361		200	300	152H-C361FBD-57	153H-C361FBD-57	
480		250	400	152H-C480FBD-59	153H-C480FBD-59	
3		0.55	0.75	152H-C3FCD-34	153H-C3FCD-34	
3		0.75	1	152H-C3FCD-35	153H-C3FCD-35	
9		1.1	1.5	152H-C9FCD-36	153H-C9FCD-36	
9		1.5	2	152H-C9FCD-37	153H-C9FCD-37	
9		2.2	3	152H-C9FCD-38	153H-C9FCD-38	
9		3.7	5	152H-C9FCD-39	153H-C9FCD-39	
16		5.5	7.5	152H-C16FCD-40	153H-C16FCD-40	
16		7.5	10	152H-C16FCD-41	153H-C16FCD-41	
25		11	15	152H-C25FCD-42	153H-C25FCD-42	
30		15	20	152H-C30FCD-43	153H-C30FCD-43	
37		18.5	25	152H-C37FCD-44	153H-C37FCD-44	
43		22	30	152H-C43FCD-45	153H-C43FCD-45	
43		30	40	152H-C43FCD-46	153H-C43FCD-46	
60		37	50	152H-C60FCD-47	153H-C60FCD-47	
85		45	60	152H-C85FCD-48	153H-C85FCD-48	
85	55	75	152H-C85FCD-49	153H-C85FCD-49		
108	75	100	152H-C108FCD-50	153H-C108FCD-50		
135	90	125	152H-C135FCD-51	153H-C135FCD-51		
201	132	200	152H-C201FCD-54	153H-C201FCD-54		
251	160	250	152H-C251FCD-56	153H-C251FCD-56		
317	200	300	152H-C317FCD-57	153H-C317FCD-57		
361	250	350	152H-C361FCD-58	153H-C361FCD-58		
480	315	500	152H-C480FCD-61	153H-C480FCD-61		

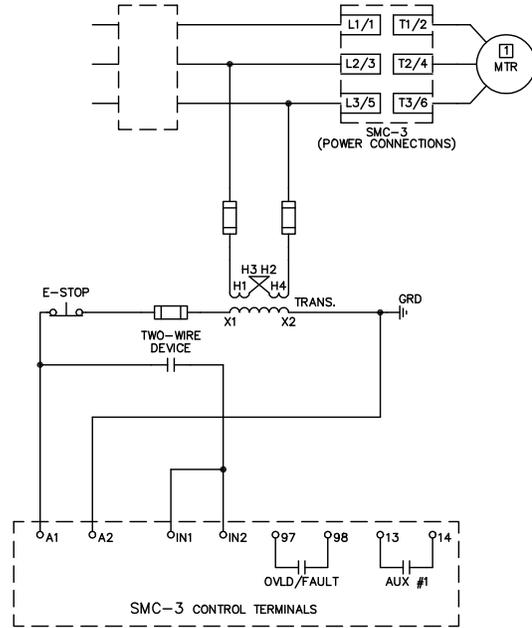
* These controllers require a separate 100...240V, 50/60 Hz single-phase control source. To add a control circuit transformer to the enclosure, add the appropriate option code to the catalog string.

Two-Wire Configuration

IEC



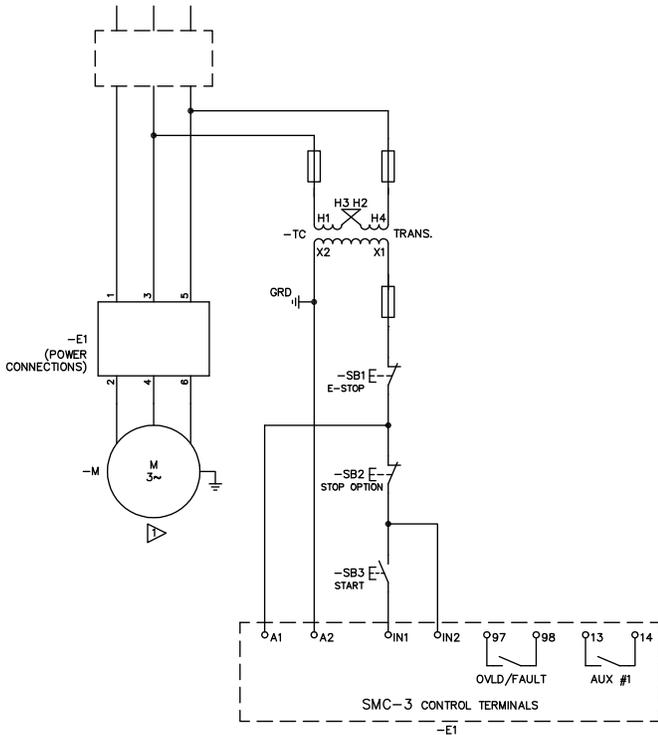
NEMA



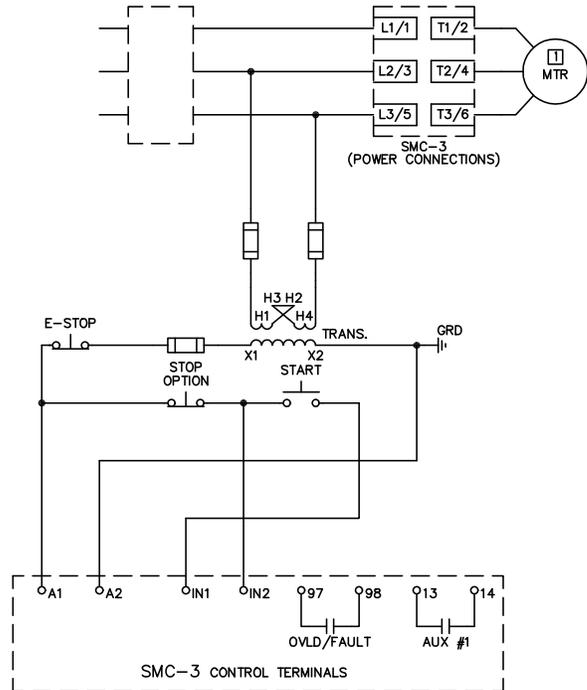
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Three-Wire Configuration

IEC

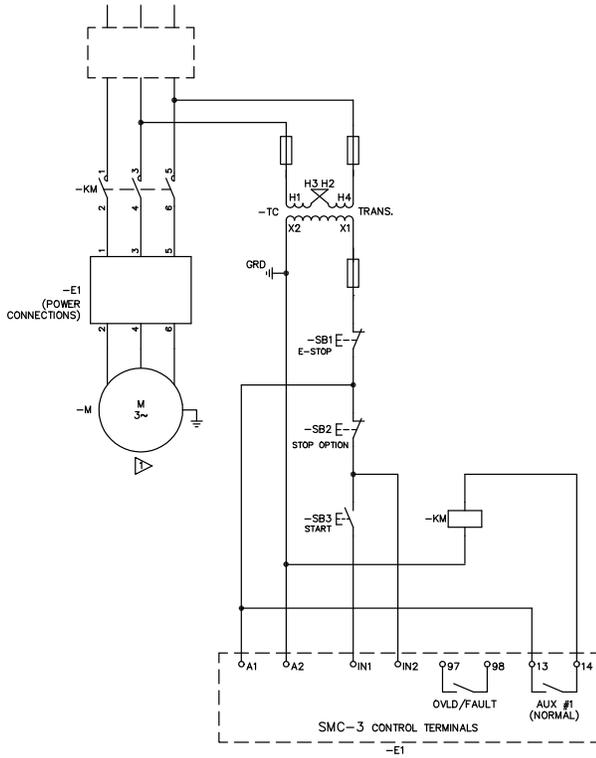


NEMA

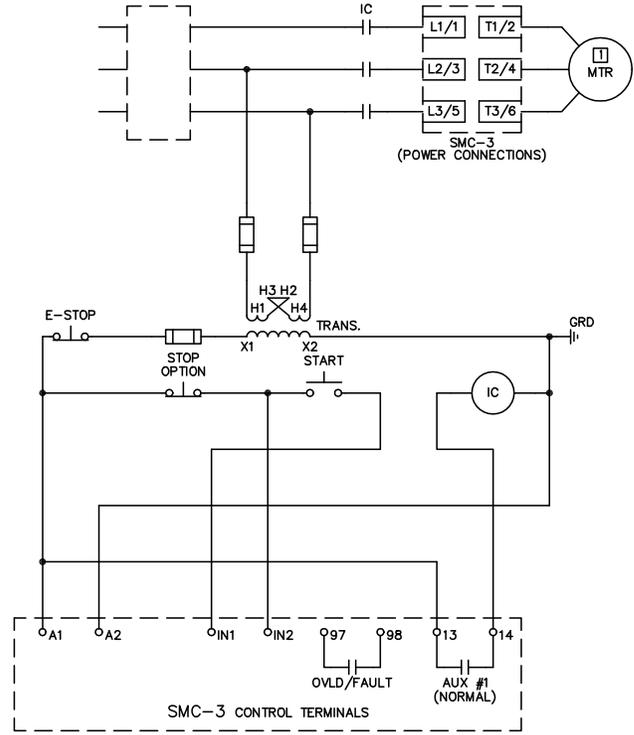


Isolation Contactor Configuration

IEC



NEMA

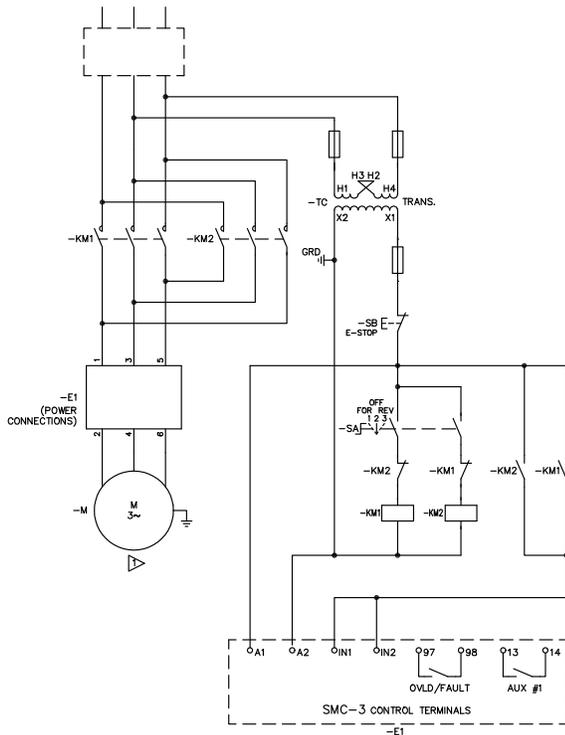


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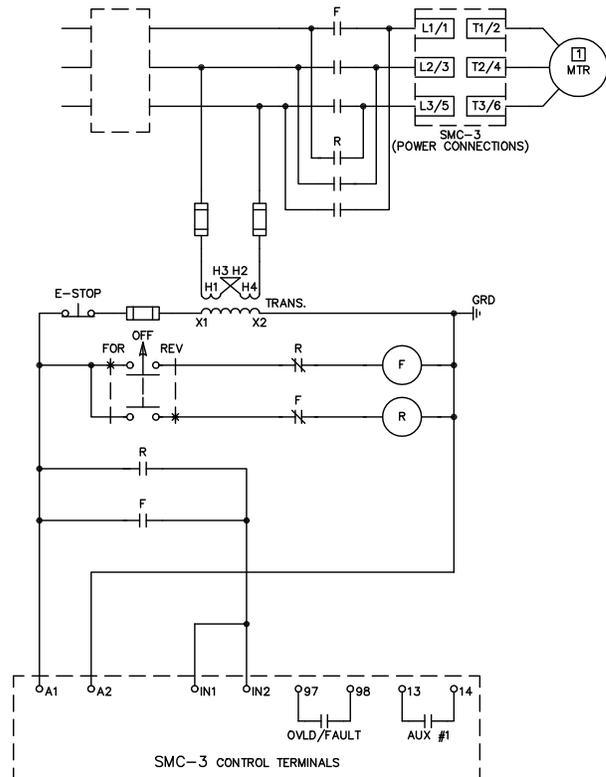
Reversing Configuration

Note: Minimum Off time equals 1.0 s.

IEC



NEMA



Bulletin 150
SMC™-3 Smart Motor Controllers
 Specifications

4

Standard Features								
Selectable Start Times	2, 5, 10, 15, 20, 25, or 30 s							
Selectable Initial Torque	0%, 25%, 35%, and 65% of locked rotor torque							
Selectable Current Limit	150%, 250%, 350%, and 450% of full load current							
Selectable Kick Start — 450% FLA	0, 0.5, 1.0, or 1.5 s							
Selectable Soft Stop	Off, 100%, 200%, or 300% of the start time setting when wired							
Electrical Ratings								
	UL/CSA/NEMA			IEC				
Rated Operation Voltage	200...480V AC 200...600V AC			200...480V~ — 400V~ 500V~ — 500V~				
Rated Insulation Voltage	600V AC			500V~				
Dielectric Withstand	2200V AC			2500V~				
Repetitive Peak	200...480V AC: 1400V 200...600V AC: 1600V			200...480V~: 1400V 500V~: 1600V				
Operating Frequency	50/60 Hz			50/60 Hz				
Power Circuit	1...37 A	—			AC-53b: 3.5-15:3585			
	43...60 A	—			AC-53b: 4.5-30:1770			
	85 A	—			AC-53b: 4.5-30:3570			
	108 A	—			AC-53b: 4.5-30:1770			
	135 A	—			AC-53b: 3.5-30: 1770			
	201...251 A	—			AC-53b: 3.5-30: 1770			
	317...480 A	—			AC-53b: 3.5-30: 1770			
Number of Poles	Equipment designed for 3-phase only							
Rated Impulse Voltage	6 kV							
DV/DT Protection	1000V/μs							
Overvoltage Category	III							
SCPD Performance	Type 1							
		Non-Time Delay		Thermal Magnetic Circuit Breaker		High Capacity Time Delay Class CC/J/L		
SCPD List‡	Max. Standard Available Fault	Max. Standard Fuse (A)*	Max. Standard Available Fault	Max. Circuit Breaker (A)	Max. Standard Available Fault	Max. Fuse (A)		
Short Circuit Protection	3	5 kA	12	5 kA	15	70 kA	6	
	9	5 kA	30	5 kA	30	70 kA	15	
	16	5 kA	60	5 kA	60	70 kA	30	
	19	5 kA	70	5 kA	70	70 kA	40	
	25	5 kA	100	5 kA	100	70 kA	50	
	30	10 kA	110	10 kA	110	70 kA	60	
	37	10 kA	125	10 kA	125	70 kA	60	
	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	250	
	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	
	Delta Device Operational Current Rating (A)	5.1	5 kA	15	5 kA	15	70 kA	10
		16	5 kA	60	5 kA	60	70 kA	30
		27.6	5 kA	70	5 kA	70	70 kA	60
32.8		5 kA	125	5 kA	125	70 kA	70	
43		5 kA	150	5 kA	150	70 kA	90	
52		10 kA	200	10 kA	200	70 kA	100	
64		10 kA	250	10 kA	250	70 kA	100	
74		10 kA	250	10 kA	250	70 kA	150	
104		10 kA	400	10 kA	300	70 kA	225	
147		10 kA	400	10 kA	400	70 kA	300	
187		10 kA	600	10 kA	500	70 kA	400	
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	69 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	
831		42 kA	1600	42 kA	1200	69 kA	1600	

* Non-time delay fuses (K5).

‡ Consult local codes for proper sizing of short-circuit protection.

Electrical Ratings					
		UL/CSA/NEMA	IEC		
Rated Operational Voltage (+10%, -15%)		100...240V AC, 24V AC/DC	100...240V~, 24V AC/DC		
Rated Insulation Voltage		250V	250V~		
Rated Impulse Voltage		2.5 kV	4 kV		
Dielectric Withstand		1500V AC	2000V~		
Overvoltage Category		II	III*		
Operating Frequency		50/60 Hz	50/60 Hz		
Input onstate voltage minimum, during start (IN1, IN2)		85V AC, 19.2V DC / 19.2V AC			
Input onstate current (IN1, IN2)		9.8 mA @ 120V AC / 19.6 mA @ 240V AC, 7.3 mA @ 24V AC/DC			
Input offstate voltage maximum (IN1, IN2)		40V AC, 17V DC / 12V AC			
Input offstate current @ input offstate voltage (IN1, IN2)		<10 mA, <12 mA			
Control Circuit	3...37 A	215 mA @ 120V AC / 180 mA @ 240V AC, 800 mA @ 24V DC / 660 mA @ 24V AC			
	43...85 A	200 mA @ 120V AC / 100 mA @ 240V AC, 700 mA @ 24V AC/DC			
	Control Power with Fan, during start		Fan Power	Control Power	
		108...135 A	20VA	200 mA @ 120V AC / 120 mA @ 240V AC, 600 mA @ 24V AC/DC	
		201...251 A	40VA		
	317...480 A	60VA			
Control Power without Fan, during start	3...37 A	205 mA @ 120V AC / 145 mA @ 240V AC, 705 mA @ 24V DC / 580 mA @ 24V AC			
		Controller Rating (A)	Steady State Heat Dissipation (W)	Overload Current Range (A)	
		3	11	1...3	
		9	12	3...9	
		16	14	5.3...16	
		19	15	6.3...19	
		25	17	9.2...27.7	
		30	19	10...30	
		37	24	12.3...37	
Steady State Heat Dissipation and Overload Current Range			43	34	14.3...43
			60	50	20...60
			85	82	28.3...85
			108	62	27...108
			135	75	34...135
			201	129	67...201
			251	147	84...251
			317	174	106...317
			361	194	120...361
			480	239	160...480

Auxiliary Contacts			
		UL/CSA/NEMA	IEC
Rated Operational Voltage		250V AC/30V DC	250V~/30V DC
Rated Insulation Voltage		250V	250V~
Rated Impulse Voltage		2.5 kV	4 kV
Dielectric Withstand		1500V AC	2000V~
Overvoltage Category		II	III*
Operating Frequency		50/60 Hz	50/60 Hz
Utilization Category		D300/D300	AC-15/DC
TB-97, -98 (OVLD/Fault)	Type of Control Circuit	Electromagnetic relay	
	Number of Contacts	1	
	Type of Contacts	Normally Open (N.O.)	
	Type of Current	AC/DC	
	Rated Operational Current (max.)	0.6 A @ 120V~ and 0.3 A @ 240V~	
	Conventional Thermal Current I_{th}	1 A	
TB-13, -14 (Normal/Up-to-Speed)	Make/Break VA	432/72	
	Type of Control Circuit	Electromagnetic relay	
	Number of Contacts	1	
	Type of Contacts	Normally Open (N.O.)	
	Type of Current	AC/DC	
	Rated Operational Current (max.)	0.6 A @ 120V~ and 0.3 A @ 240V~	
Conventional Thermal Current I_{th}	1 A		
Make/Break VA	432/72		

* Overvoltage category II, when either control or auxiliary circuit is wired to a SELV or PELV circuit.

Bulletin 150
SMC™-3 Smart Motor Controllers
 Specifications, Continued

4

Electrical Ratings			
Side-Mount Auxiliary Contacts			
		UL/CSA/NEMA	IEC
Rated Operational Voltage		250V AC/30V DC	250V AC/30V DC
Rated Insulation Voltage		250V	250V AC
Rated Impulse Voltage		2.5 kV	4 kV
Dielectric Withstand		1500V AC	2000V AC
Overvoltage Category		II	III*
Operating Frequency		50/60 Hz	50/60 Hz
TB-23, -24 (Normal/Up-to-Speed) TB-33, -34 (Normal/Up-to-Speed)	Utilization Category	C300/R150	AC-15/DC-13
	Type of Control Circuit	Electromagnetic relay	
	Number of Contacts	1	
	Type of Contacts	Normally Open (N.O.)	
	Type of Current	AC/DC	
	Rated Operational Current (max.)	1.5 A @ 120V AC, 0.75A @ 240V AC, 1.17 A @ 24V DC	
	Conventional Thermal Current I_{th}	2.5 A	
	Make/Break VA	1800/180V AC, 28V DC (resistive)	
	Type of Control Circuit	B300/R300	AC-15/DC-13
	Type of Control Circuit	Electromagnetic relay	
TB-11, -12 (Normal/Up-to-Speed)	Number of Contacts	1	
	Type of Contacts	Normally Open (N.O.)	
	Type of Current	AC/DC	
	Rated Operational Current (max.)	3 A @ 120V AC, 1.5A @ 240V AC, 1.17 A @ 24V DC	
	Conventional Thermal Current I_{th}	5 A	
	Make/Break VA	3600/360V AC, 28V DC (resistive)	

* Overvoltage category II, when either control or auxiliary circuit is wired to a SELV or PELV circuit.

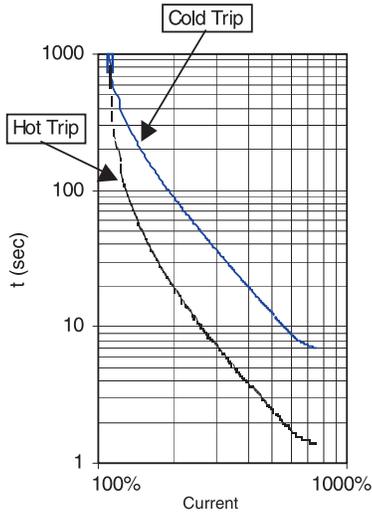
Environmental	
Operating Temperature Range	-5...+50 °C (23...122 °F) (open) -5...+40 °C (23...104 °F) (enclosed)
Storage and Transportation Temperature Range	-25...+85 °C (-13...+185 °F)
Altitude	2000 m (6560 ft)
Humidity	5...95% (non-condensing)
Pollution Degree	2
Type of Protection	IP2X

Mechanical Ratings			
Resistance to Vibration	Operational	1.0 G Peak, 0.15 mm (0.006 in.) displacement	
	Non-Operational	2.5 G Peak, 0.38 mm (0.015 in.) displacement	
Resistance to Shock	Operational	15 G	
	Non-Operational	30 G	
Line Power Terminals	Cable Size	3...37 A	2.5...25 mm ² (14...4 AWG) 2.3...2.8 N•m (20...25 in-lbs)
		43...85 A	2.5...95 mm ² (14...3/0 AWG) 11.3...12.4 N•m (100...110 in-lbs)
	Tightening Torque	108...135 A	23 N•m (200 in-lbs)
		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	
		Cable Size	3...37 A
Tightening Torque	43...85 A		2.5...50 mm ² (14...1 AWG) 11.3...12.4 N•m (100...110 in-lbs)
	108...135 A	23 N•m (200 in-lbs)	
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	
Control Terminals		Cable Size Tightening Torque	All

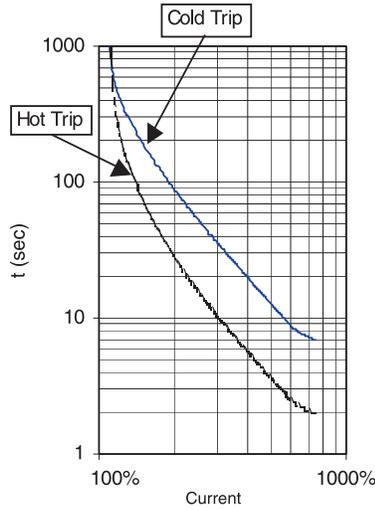
Other			
		UL/CSA/NEMA	IEC
EMC Emission Levels	Conducted Radio Frequency Emissions	—	Class A
	Radiated Emissions	—	Class A
EMC Immunity Levels	Electrostatic Discharge	4 kV Contact and 8 kV Air Discharge	8 kV Air Discharge
	Radio Frequency Electromagnetic Field	—	Per EN/IEC 60947-4-2
	Fast Transient	—	Per EN/IEC 60947-4-2
	Surge Transient	—	Per EN/IEC 60947-4-2

SMC-3 Overload Trip Curves

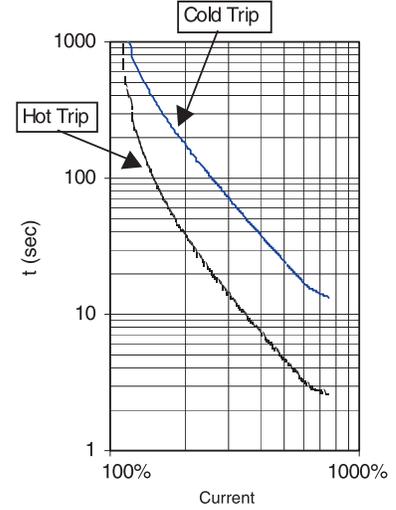
Trip Class 10



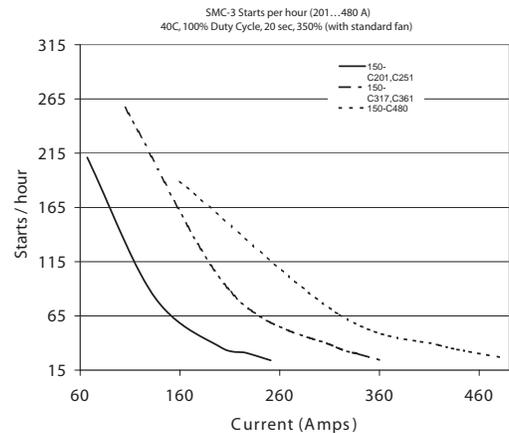
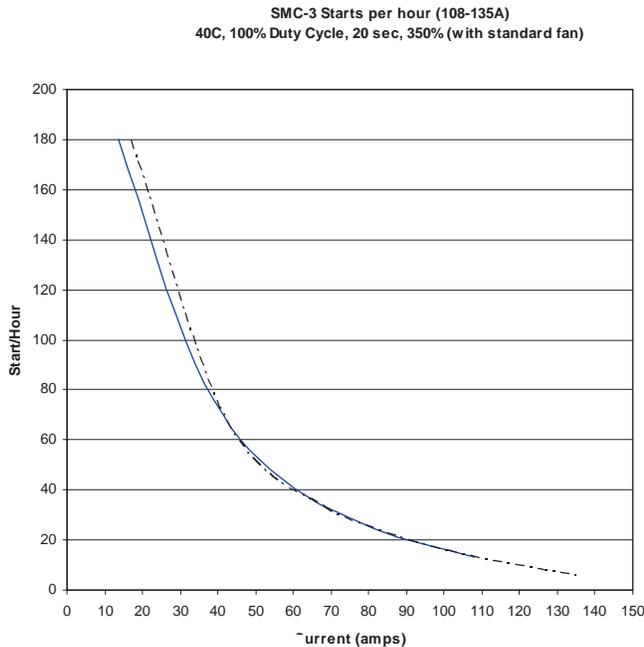
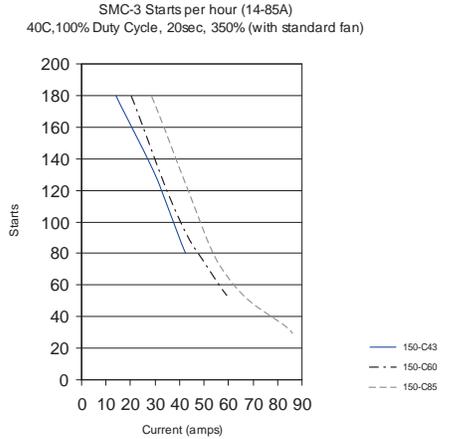
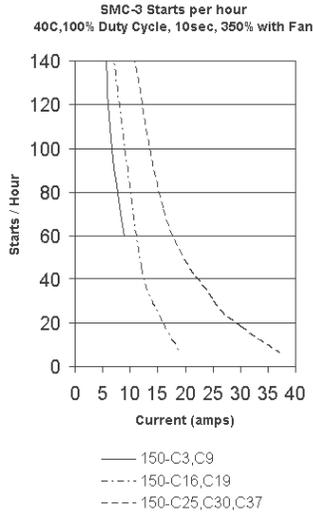
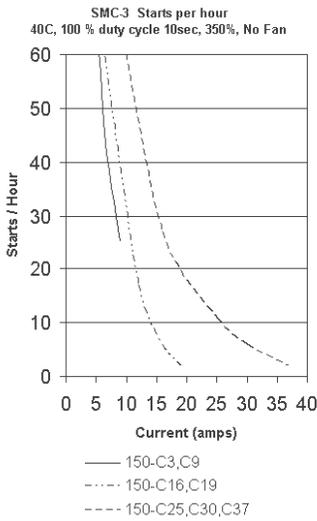
Trip Class 15



Trip Class 20



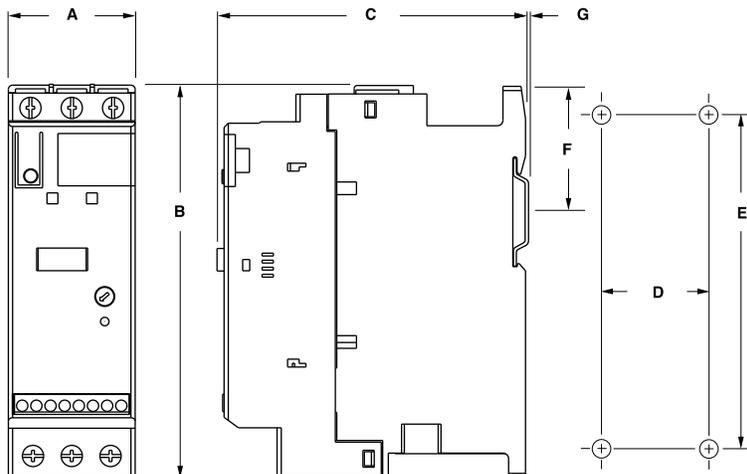
Starts per Hour Curves



Bulletin 150
SMC™-3 Smart Motor Controllers
 Approximate Dimensions

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

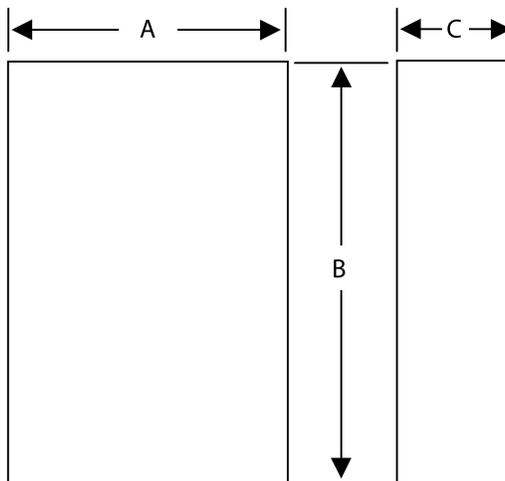
Open Type



4

Rating (A)	A	B	C	D	E	F	G	Mounting Hole Size	Weight kg (lbs)
1...37	44.8 (1-49/64)	139.7 (5-1/2)	100 (4-21/64)	35 (1-3/8)	132 (5-13/64)	46.4 (1.81)	2 (1/16)	4.6 (0.18)	0.86 (1.9)
43...85	72 (2.83)	206 (8.11)	130 (5.12)	55 (2.17)	198 (7.8)	102 (4.02)	2 (1/16)	5.3 (0.21)	2.25 (5.0)
108...135	196.4 (7.74)	443.7 (17.47)	205.2 (8.08)	166.6 (6.56)	367 (14.45)	—	—	7.5 (0.295)	15 (33)
201...251	225 (8.86)	560 (22.05)	265.3 (10.45)	150 (5.91)	504.1 (19.85)	—	—	11.5 (0.45)	30.4 (67)
317...480	290 (11.42)	600 (23.62)	298 (11.73)	200 (7.87)	539.2 (21.23)	—	—	11.5 (0.45)	45.8 (101)

Minimum Enclosure Size



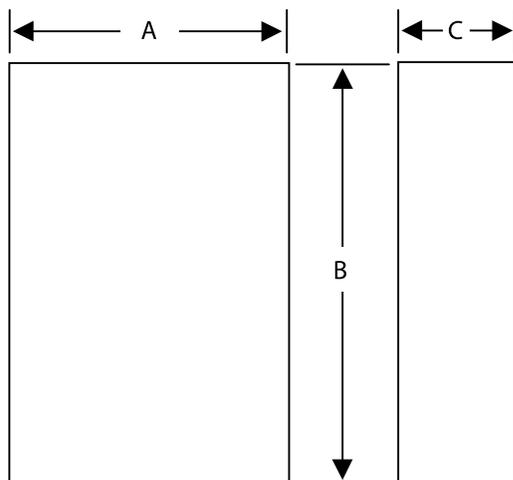
Controller	A Width	B Height	C Depth	Fan Requirements
1...37 A	224 (9)	305 (12)	152 (6)	none
43...85 A	406 (16)	305 (12)	203 (8)	none
108...135 A	762 (30)	610 (24)	305 (12)	none
201...251 A	965 (38)	762 (30)	356 (14)	none
317...480 A	1295 (51)	914 (36)	356 (14)	none

SMC™-3 Smart Motor Controllers

Approximate Dimensions, Continued

Enclosed Type Line-Connected Controllers

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.



Controller Rating (A)	Disconnect Rating (A)	IP65 (Type 4/12)		
		B Height	A Width	C Depth
Non-Combination Controller				
3	—	305 (12)	305 (12)	152 (6)
9	—	305 (12)	305 (12)	152 (6)
16	—	305 (12)	305 (12)	152 (6)
25	—	305 (12)	305 (12)	152 (6)
30	—	305 (12)	305 (12)	152 (6)
37	—	305 (12)	305 (12)	152 (6)
43	—	356 (14)	406 (16)	203 (8)
60	—	356 (14)	406 (16)	203 (8)
85	—	356 (14)	406 (16)	203 (8)
108	—	762 (30)	610 (24)	305 (12)
135	—	762 (30)	610 (24)	305 (12)
201	—	965 (38)	762 (30)	356 (14)
251	—	965 (38)	762 (30)	356 (14)
317	—	1295 (51)	914 (36)	356 (14)
361	—	1295 (51)	914 (36)	356 (14)
480	—	1295 (51)	914 (36)	356 (14)
Combination Controllers with Fusible Disconnect				
3	30 A/J	356 (14)	406 (16)	203 (8)
9	30 A/J	356 (14)	406 (16)	203 (8)
16	30 A/J	356 (14)	406 (16)	203 (8)
25	30 A/J	356 (14)	406 (16)	203 (8)
30	60 A/J	356 (14)	406 (16)	203 (8)
37	60 A/J	356 (14)	406 (16)	203 (8)
43	60 A/J	356 (14)	406 (16)	203 (8)
60	100 A/J	610 (24)	406 (16)	254 (10)
85*	100 A/J	610 (24)	406 (16)	254 (10)
85*	100 A/J	762 (30)	610 (24)	305 (12)
108	200 A/J	965 (38)	762 (30)	356 (14)
135	200 A/J	965 (38)	762 (30)	356 (14)
201	400 A/J	965 (38)	762 (30)	356 (14)
251	400 A/J	965 (38)	762 (30)	356 (14)
317	600 A/J	1524 (60)	965 (38)	356 (14)
361	600 A/J	1524 (60)	965 (38)	356 (14)
480	600 A/J	1524 (60)	965 (38)	356 (14)
Combination Controllers with Circuit Breaker				
3	15 A	356 (14)	406 (16)	203 (8)
9	15 A	356 (14)	406 (16)	203 (8)
16	20 A	356 (14)	406 (16)	203 (8)
25	30 A	356 (14)	406 (16)	203 (8)
30	40 A	356 (14)	406 (16)	203 (8)
37	50 A	356 (14)	406 (16)	203 (8)
43	80 A	610 (24)	406 (16)	254 (10)
60	100 A	610 (24)	406 (16)	254 (10)
85	125 A	610 (24)	406 (16)	254 (10)
108	175 A/175 A Plug	965 (38)	762 (30)	356 (14)
135	225 A/225 A Plug	965 (38)	762 (30)	356 (14)
201	300 A/300 A Plug	965 (38)	762 (30)	356 (14)
251	400 A/400 A Plug	965 (38)	762 (30)	356 (14)
317	600 A/600 A Plug	1295 (51)	914 (36)	356 (14)
361	600 A/600 A Plug	1295 (51)	914 (36)	356 (14)
480	800 A/800 A Plug	1295 (51)	914 (36)	356 (14)

* Dimensions for FHD-43, FAD-44, FBD-47, and FCD-48.

* Dimensions for FHD-44, FAD-45, FBD-48, and FCD-49

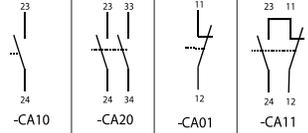
Enclosed Options

Option	Description	Cat. No. Modification
Push Buttons	Start-Stop Push Button	-1
Selector Switch	Hand-Off-Auto Selector Switch	-3
Pilot Light	Transformer Pilot Light - Red Run Indicator	-4R
Control Circuit Transformer	Control Circuit Transformer (fused primary and secondary)	-6P
Protective Module	480V Line Side Protective Module	3...480 A
	600V Line Side Protective Module	3...480 A
	480V Load Side Protective Module	43...480 A
	600V Load Side Protective Module	43...480 A
	480V Both Line and Load Side Protective Module	43...480 A
	600V Both Line and Load Side Protective Module	43...480 A
Auxiliary Contacts	1 N.O. auxiliary contact	for 3...480 A units
	2 N.O. auxiliary contacts	for 3...480 A units
	1 N.O. and 1 N.C. auxiliary contacts	for 3...480 A units
Disconnect Auxiliary	N.O. disconnect auxiliary mounted on the operating mechanism	-98
	N.C. disconnect auxiliary mounted on the operating mechanism	-99

4

Accessories

Auxiliary Contact Blocks

Description	N.O.	N.C.	Connection Diagram	Cat. No.
 <p>Auxiliary Contact Blocks for side mounting with sequence terminal designations 1- and 2-pole Quick and easy mounting without tools One block per device only</p>	1	0		150-CA10
	2	0		150-CA20
	0	1		150-CA01
	1	1		150-CA11 (Form C)

Fans

Description	Optional	For Use With	Pkg. Qty.	Cat. No.
 <p>Fan Field installed</p>	Optional	150-C3...37 150-D3...64	1	150-CF64
		Replacement		150-C43...85/150-D74...147
	150-C108, 150-C135			41391-801-03
	150-C201, 150-C251			41391-801-01
	150-C317...C480	41391-801-02		

Connecting Modules

Description	For Use With	Pkg. Qty.	Cat. No.
 <p>Connecting modules to 140-M Electrical interconnection between SMC-Delta/SMC-3 and 140-M. Motor protector and SMC must be mounted separately.</p>	Connects 140-M-C to 150-C3...25/150-D3...25	1	150-CC25
	Connects 140-M-D to 150-C3...25/150-D3...25	1	150-CD25
	Connects 140-M-F to 150-C3...37/150-D3...32	1	150-CF45
 <p>Connecting modules to 100-C Electrical interconnection between SMC-Delta/SMC-3 and 100-C. Contactor and SMC must be mounted separately.</p>	Connects 100-C09...23 to 150-C3...19/150-D3...20	1	150-CI23
	Connects 100-C30...37 to 150-C3...37/150-D3...32	1	150-CI37

Protective Modules

Protective modules must not be placed on the load side of a device when using an inside-the-delta connection.

Description	For Use With	Pkg. Qty.	Cat. No.
 <p>480V Protective Module</p>	150-C3...37NB or 150-D3...64NB (line only)	1	150-C84
	150-C43...85NB (line and/or load) or 150-D74...147NB (line only)	1	150-C84P
	150-C108...480NB (line and/or load)	1	150-F84L
<p>600V Protective Module</p>	150-C3...37NC or 150-D3...64NC (line only)	1	150-C86
	150-C43...85NC (line and/or load) or 150-D74...147NC (line only)	1	150-C86P
	150-C108...480NC (line and/or load)	1	150-F86L

IEC Terminal Covers

Description	For Use With	Pkg. Qty.	Cat. No.
 Terminal Cover IEC line or load terminal covers for 108...480 A devices. Dead front protection	150-C108...-C135	1	150-TC1
	150-C201...-C251	1	150-TC2
	150-C317...-C480	1	150-TC3

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 mm ² ...120 mm ²	3	3	3	199-LF1
	201...251 *		6	6		
	317...480 *	#4...500 MCM AWG 25 mm ² ...240 mm ²	6	6		199-LG1

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

* 1...85 A units have box lugs standard. No additional lugs are required.

* When a multi-conductor lug is required, refer to the Instruction Sheet for appropriate lug catalog number.

Marking Tags and Covers

Description	For Use With	Pkg. Qty.	Cat. No.
 Marking Tag Sheet 160 perforated paper labels each, 6 x 17 mm To be used with a transparent cover	150-C, 150-D	10	100-FMP
Transparent Cover To be used with marking tag sheets	150-C, 150-D	100	100-FMC

Remote Reset Solenoid

Description	For Use With	Pkg. Qty.	Cat. No.
 Remote Reset Solenoid for remote reset of electronic overload	193-T all, 150-C, 150-D	1	193-ER1⊗

⊗ Voltage Suffix Code

Available Coil Voltages 12...600V 50 Hz/12...600V 60 Hz

Standard Coil Voltages

Voltage	24	48	110	115	120	220	240
50 Hz	J	—	D	—	—	A	—
60 Hz	J	—	—	—	D	—	A
DC	Z24	Z48	—	Z01	—	—	—

Surcharge for special voltages up to 20 pcs. (no surcharge for quantities greater than 20 pcs.)

SMC™ Dialog Plus Smart Motor Controllers

Overview/Description of Features



Bulletin 150 — SMC™ Dialog Plus Smart Motor Controller

The SMC Dialog Plus™ controller provides microprocessor controlled starting for standard three-phase squirrel-cage induction motors. Four standard modes of operation are available within a single controller:

- Soft Start with Selectable Kickstart
- Current Limit Start with Selectable Kickstart
- Dual Ramp Start
- Full Voltage Start

Options include:

- Soft Stop
- Pump Control
- Preset Slow Speed
- SMB Smart Motor Braking
- Accu-Stop
- Slow Speed with Braking

Features include:

- Built-in electronic motor overload protection
- SCANport communication
- Three programmable auxiliary contacts
- Metering
- Keypad programming
- LCD display

The SMC Dialog Plus™ controller is available for motors rated 1...1000 A; 200...480V AC, or 200...600V AC, 50 and 60 Hz. In addition to motors, the SMC Dialog Plus™ controller can be used to control resistive loads.

Table of Contents

Features..... this page
 Cat. No. Explanation 4-122
 Product Selection 4-123
 Options 4-127
 Accessories..... 4-129
 Specifications..... 4-131
 Approx. Dimensions . 4-134

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 (Open Type) per EMC and Low Voltage Directive
- CCC Certified

Description of Features

Electronic Motor Overload Protection

The SMC Dialog Plus 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 Dialog Plus 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 can be selected for class 10, 15, 20, or 30 protection. The trip current is programmed by entering the motor full-load current rating.

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

Note: The current sensing capability of the SMC Dialog Plus controller is disabled during bypass operation. The Bulletin 825 Converter Module and 150-NFS fanning strip are required for providing current feedback in these applications. **Note:** To achieve calibration, 70% motor load or greater is required at the motor shaft for 2 s. Calibration is required when a Bulletin 825 Converter Module is not used.

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 Dialog Plus 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 s. 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...10.0 s, can be programmed. This allows the user to select the time delay required before the SMC Dialog Plus 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.

Energy Saver

This is a standard feature with the SMC Dialog Plus controller. It is used to save energy on applications where the motor is lightly loaded or unloaded for long periods of time. The Energy Saver is a built-in feature of the controller. It does not require additional panel space or external wiring. It also does not require a complicated setup procedure.

Phase Rebalance

The SMC Dialog Plus controller incorporates, as standard, a dynamic Phase Rebalance feature. The controller compensates for voltage unbalance by automatically adjusting the voltage output to balance the 3-phase currents drawn by the motor. When phase rebalance is achieved, motor life may be extended and production can continue without interruption. Phase Rebalance is a built-in feature of the controller and does not require a complicated setup procedure.

Note: Phase Rebalance requires the use of the Bulletin 825 Converter Module and the Cat. No. 150-NFS fanning strip.

Note: The performance of the Phase Rebalance feature is dependent on the motor's loading and characteristics. Severe imbalances cannot be corrected.

Underload Protection

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

Undervoltage Protection

The SMC Dialog Plus 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 s 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 Dialog Plus controller's overvoltage protection will halt motor operation. The overvoltage trip level is adjustable as a percentage of the programmed line voltage, from 0...99%. To eliminate nuisance trips, a programmable overvoltage trip delay time of 0...99 s 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 Dialog Plus 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
- Power usage in kWh
- 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 Dialog Plus controller's built-in electronic overload trips.

Note: In bypass configurations, the current sensing and power factor measurement capability of the SMC Dialog Plus controller is disabled. Three-phase current measurement, kW, kWh, and motor thermal capacity usage can still be maintained with the use of the Bulletin 825 Converter Module.

Note: The usage of an SMC Controller on a generator and line power requires the use of a Bulletin 825 Converter Module.

Built-in SCANport™ Communication

A serial interface port is provided as standard, which allows connection to a Bulletin 1201 Human Interface Module or a variety of Bulletin 1203 Communication Modules. This includes Allen-Bradley Remote I/O, DeviceNet network and RS-232/422/485-DF1.

LCD Display

The SMC Dialog Plus controller's two-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 Dialog Plus 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 Dialog Plus controller.

Auxiliary Contacts

Three hard contacts are furnished as standard with the SMC Dialog Plus controller. The first two contacts are programmable for Normal/Up-to-speed. The third is programmable for Normal/Fault.

SMC™ Dialog Plus Smart Motor Controllers

Cat. No. Explanation

Open and Non-Combination

150 – B180 N B D A – 8L

a b c d e f g

a

Bulletin Number	
Code	Description
150	Solid-State Controller
150B	Solid-State Controller and Isolation Contactor (enclosed only)

b

Controller Ratings	
Code	Description
B24	24 A, 1...15 Hp @ 460V AC
B35	35 A, 1...25 Hp @ 460V AC
B54	54 A, 1...40 Hp @ 460V AC
B97	97 A, 5...75 Hp @ 460V AC
B135	135 A, 5...100 Hp @ 460V AC
B180	180 A, 5...150 Hp @ 460V AC
B240	240 A, 5...200 Hp @ 460V AC
B360	360 A, 5...300 Hp @ 460V AC
B500	500 A, 4...400 Hp @ 460V AC
B650	650 A, 5...500 Hp @ 460V AC
B720	720 A, 5...600 Hp @ 460V AC
B850	850 A, 10...700 Hp @ 460V AC
B1000	1000 A, 10...800 Hp @ 460V AC

c

Enclosure Type	
Code	Description
N	Open
A	NEMA Type 1 (IP30)
F	NEMA Type 4 (IP65)
J	NEMA Type 12 (IP54)
H	NEMA Type 3R

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
Non-Combination Enclosed Only	
H	200...208V AC, 3-phase, 50 and 60 Hz
A	230V AC, 3-phase, 50 and 60 Hz
B	200...460V AC, 3-phase, 50 and 60 Hz
C	200...575V AC, 3-phase, 50 and 60 Hz

e

Control Voltage	
Code	Description
D	100...240V AC
R	24V AC/DC

f

Control Options (see page 4-127 for a full listing.)	
Note: Select Only One	
Code	Description
Blank	Standard
A	Soft Stop
B	Pump Control
C	Preset Slow Speed
D	SMB Smart Motor Braking
E	Accu-Stop
F	Slow Speed with Braking

g

Options	
Code	Description
8L	Line-Mounted Protective Module
8M	Load-Mounted Protective Module
8B	Line- and Load-Mounted Protective Modules

4

Combination

152H – B240 A BD B – 52 – 8B

a b c d e f g

a

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

b

Controller Ratings	
Code	Description
B24	24 A, 1...15 Hp @ 460V AC
B35	35 A, 1...25 Hp @ 460V AC
B54	54 A, 1...40 Hp @ 460V AC
B97	97 A, 5...75 Hp @ 460V AC
B135	135 A, 5...100 Hp @ 460V AC
B180	180 A, 5...150 Hp @ 460V AC
B240	240 A, 5...200 Hp @ 460V AC
B360	360 A, 5...300 Hp @ 460V AC
B500	500 A, 4...400 Hp @ 460V AC
B650	650 A, 5...500 Hp @ 460V AC
B720	720 A, 5...600 Hp @ 460V AC
B850	850 A, 10...700 Hp @ 460V AC
B1000	1000 A, 10...800 Hp @ 460V AC

c

Enclosure Type	
Code	Description
A	NEMA Type 1 (IP30)
J	NEMA Type 12 (IP54)
F	NEMA Type 4 (IP65)
H	NEMA 3R

d

Line 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
A	Soft Stop
B	Pump Control
C	Preset Slow Speed
D	SMB Smart Motor Braking
E	Accu-Stop
F	Slow Speed with Braking

f

Horsepower			
Code	Hp Rating	Code	Hp Rating
39	5	52	150
40	7-1/2	54	200
41	10	56	250
42	15	57	300
43	20	58	350
44	25	59	400
45	30	60	450
46	40	61	500
47	50	62	600
48	60	63	700
49	75	65	800
50	100	67	1000
51	125	—	—

g

Options (see page 4-127 for a full listing.)	
Code	Description
8L	Line-Mounted Protective Module
8M	Load-Mounted Protective Module
8B	Line- and Load-Mounted Protective Modules

Open Type Controllers

Up to 460V AC

Current* Rating (A)	kW*		Hp‡			100...240V AC 50/60 Hz Control Cat. No.	24V AC/DC Control Cat. No.
	230V AC 50 Hz	400V AC 50 Hz	200V AC 60 Hz	230V AC 60 Hz	460V AC 60 Hz		
24	5.5	11	1...5	1...7.5	1...15	150-B24NBD	150-B24NBR
35	10	18.5	1...10	1...10	1...25	150-B35NBD	150-B35NBR
54	15	22	1...15	1...20	1...40	150-B54NBD	150-B54NBR
97	25	45	5...30	5...30	5...75	150-B97NBD	§ 150-B97NBR
135	37	75	5...40	5...50	5...100	150-B135NBD	§ 150-B135NBR
180	51	90	5...60	5...60	5...150	150-B180NBD	§ 150-B180NBR
240	75	132	5...75	5...75	5...200	150-B240NBD	§ 150-B240NBR
360	110	200	5...125	5...150	5...300	150-B360NBD	§ 150-B360NBR
500	150	257	5...150	5...200	5...400	150-B500NBD	§ 150-B500NBR
650	200	355	5...200	5...250	5...500	150-B650NBD	§ 150-B650NBR
720	220	400	5...250	5...300	5...600	150-B720NBD	§ 150-B720NBR
850	257	475	10...300	10...350	10...700	150-B850NBD	§ 150-B850NBR
1000	315	530	10...350	10...400	10...800	150-B1000NBD	§ 150-B1000NBR

Up to 575V AC

Current* Rating (A)	kW*			Hp‡				100...240V AC 50/60 Hz Control Cat. No.	24V AC/DC Control Cat. No.
	230V AC 50 Hz	400V AC 50 Hz	500V AC 50 Hz	200V AC 60 Hz	230V AC 60 Hz	460V AC 60 Hz	575V AC 60 Hz		
24	5.5	11	15	1...5	1...7.5	1...15	1...20	150-B24NCD	150-B24NCR
35	10	18.5	22	1...10	1...10	1...25	1...30	150-B35NCD	150-B35NCR
54	15	22	37	1...15	1...20	1...40	1...50	150-B54NCD	150-B54NCR
97	25	45	63	5...30	5...30	5...75	5...75	150-B97NCD	§ 150-B97NCR
135	37	75	90	5...40	5...50	5...100	5...125	150-B135NCD	§ 150-B135NCR
180	51	90	132	5...60	5...60	5...150	5...150	150-B180NCD	§ 150-B180NCR
240	75	132	160	5...75	5...75	5...200	5...250	150-B240NCD	§ 150-B240NCR
360	110	200	250	5...125	5...150	5...300	5...350	150-B360NCD	§ 150-B360NCR
500	150	257	355	5...150	5...200	5...400	5...500	150-B500NCD	§ 150-B500NCR
650	200	355	475	5...200	5...250	5...500	5...600	150-B650NCD	§ 150-B650NCR
720	220	400	500	5...250	5...300	5...600	5...700	150-B720NCD	§ 150-B720NCR
850	257	475	600	10...300	10...350	10...700	10...800	150-B850NCD	§ 150-B850NCR
1000	315	530	710	10...350	10...400	10...800	10...1000	150-B1000NCD	§ 150-B1000NCR

Non-Combination Controllers — IP30 (Type 1) Vented Enclosed, IP65 (Type 4) Enclosed, and IP54 (Type 12) Enclosed

Require a separate 100...240V, 50/60 Hz single-phase control source. Line and load terminations are provided as standard. The IP65 (Type 4) Enclosed Non-Combination, and IP54 (Type 12) Enclosed Non-Combination 97...1000 A controllers include a bypass contactor and a Bulletin 825 converter module. Enclosures other than those listed are available; consult your local Rockwell Automation sales office or Allen-Bradley distributor.

208V AC

Current Rating	Hp	IP30 (Type 1) Vented Enclosed Non-Combination Controllers		IP65 (Type 4) Enclosed Non-Combination Controllers		IP54 (Type 12) Enclosed Non-Combination Controllers	
		200V AC 60 Hz	Cat. No.	Cat. No.	Cat. No.		
24	1...5	✱	150-B24AHD	➤	150-B24FHD	➤	150-B24JHD
35	1...10	✱	150-B35AHD	➤	150-B35FHD	➤	150-B35JHD
54	1...15	✱	150-B54AHD	➤	150-B54FHD	➤	150-B54JHD
97	5...30		150-B97AHD		150-B97FHD		150-B97JHD
135	5...40		150-B135AHD		150-B135FHD		150-B135JHD
180	5...60		150-B180AHD		150-B180FHD		150-B180JHD
240	5...75		150-B240AHD		150-B240FHD		150-B240JHD
360	5...125		150-B360AHD		150-B360FHD		150-B360JHD
500	5...150		150-B500AHD		150-B500FHD		150-B500JHD
650	5...200		150-B650AHD		150-B650FHD		150-B650JHD
720	5...250		150-B720AHD		150-B720FHD		150-B720JHD
850	10...300		150-B850AHD		150-B850FHD		150-B850JHD
1000	10...350		150-B1000AHD		150-B1000FHD		150-B1000JHD

* Controllers rated 97...360 A are not equipped with line and load terminal lugs. See page 4-129 for terminal lug kits.

✱ The minimum rating is: 0.7 kW for devices with current ratings of 54 A or less; 4 kW for devices rated 97...720 A; 7.5 kW for devices rated 850 A and greater.

‡ Hp ratings at motor terminal voltages for 208, 480, and 600 line volts, respectively.

§ 120V AC control is required for heatsink fan operation.

✱ Includes internal circulating fan rather than enclosure ventilation.

➤ Includes an internal circulating fan instead of a bypass contactor.

230V AC

Current Rating	kW*	Hp	IP30 (Type 1) Vented Enclosed Non-Combination Controllers		IP65 (Type 4) Enclosed Non-Combination Controllers		IP54 (Type 12) Enclosed Non-Combination Controllers	
	230V AC 50 Hz	230V AC 60 Hz	Cat. No.		Cat. No.		Cat. No.	
24	5.5	1...5	✱	150-B24AAD	➤	150-B24FAD	➤	150-B24JAD
35	10	1...10	✱	150-B35AAD	➤	150-B35FAD	➤	150-B35JAD
54	15	1...15	✱	150-B54AAD	➤	150-B54FAD	➤	150-B54JAD
97	25	5...30		150-B97AAD		150-B97FAD		150-B97JAD
135	37	5...40		150-B135AAD		150-B135FAD		150-B135JAD
180	51	5...60		150-B180AAD		150-B180FAD		150-B180JAD
240	75	5...75		150-B240AAD		150-B240FAD		150-B240JAD
360	110	5...125		150-B360AAD		150-B360FAD		150-B360JAD
500	150	5...150		150-B500AAD		150-B500FAD		150-B500JAD
650	200	5...200		150-B650AAD		150-B650FAD		150-B650JAD
720	220	5...250		150-B720AAD		150-B720FAD		150-B720JAD
850	257	10...300		150-B850AAD		150-B850FAD		150-B850JAD
1000	315	10...350		150-B1000AAD		150-B1000FAD		150-B1000JAD

4

460V AC

Current Rating	kW*	Hp	IP30 (Type 1) Vented Enclosed Non-Combination Controllers		IP65 (Type 4) Enclosed Non-Combination Controllers		IP54 (Type 12) Enclosed Non-Combination Controllers	
	400V AC 50 Hz	460V AC 60 Hz	Cat. No.		Cat. No.		Cat. No.	
24	11	1...15	✱	150-B24ABD	➤	150-B24FBD	➤	150-B24JBD
35	18.5	1...25	✱	150-B35ABD	➤	150-B35FBD	➤	150-B35JBD
54	22	1...40	✱	150-B54ABD	➤	150-B54FBD	➤	150-B54JBD
97	45	5...75		150-B97ABD		150-B97FBD		150-B97JBD
135	75	5...100		150-B135ABD		150-B135FBD		150-B135JBD
180	90	5...150		150-B180ABD		150-B180FBD		150-B180JBD
240	132	5...200		150-B240ABD		150-B240FBD		150-B240JBD
360	200	5...300		150-B360ABD		150-B360FBD		150-B360JBD
500	257	5...400		150-B500ABD		150-B500FBD		150-B500JBD
650	355	5...500		150-B650ABD		150-B650FBD		150-B650JBD
720	400	5...600		150-B720ABD		150-B720FBD		150-B720JBD
850	475	10...700		150-B850ABD		150-B850FBD		150-B850JBD
1000	530	10...800		150-B1000ABD		150-B1000FBD		150-B1000JBD

575V AC

Current Rating (A)	kW*	Hp	IP30 (Type 1) Vented Enclosed Non-Combination Controllers		IP65 (Type 4) Enclosed Non-Combination Controllers		IP54 (Type 12) Enclosed Non-Combination Controllers	
	500V AC 50 Hz	575V AC 60 Hz	Cat. No.		Cat. No.		Cat. No.	
24	15	1...20	✱	150-B24ACD	➤	150-B24FCD	➤	150-B24JCD
35	22	1...30	✱	150-B35ACD	➤	150-B35FCD	➤	150-B35JCD
54	37	1...50	✱	150-B54ACD	➤	150-B54FCD	➤	150-B54JCD
97	63	5...75		150-B97ACD		150-B97FCD		150-B97JCD
135	90	5...125		150-B135ACD		150-B135FCD		150-B135JCD
180	132	5...150		150-B180ACD		150-B180FCD		150-B180JCD
240	160	5...250		150-B240ACD		150-B240FCD		150-B240JCD
360	250	5...350		150-B360ACD		150-B360FCD		150-B360JCD
500	355	5...500		150-B500ACD		150-B500FCD		150-B500JCD
650	475	5...600		150-B650ACD		150-B650FCD		150-B650JCD
720	500	5...700		150-B720ACD		150-B720FCD		150-B720JCD
850	600	10...800		150-B850ACD		150-B850FCD		150-B850JCD
1000	710	10...1000		150-B1000ACD		150-B1000FCD		150-B1000JCD

* The minimum rating is 0.7 kW for devices with current ratings of 54 A or less; 4 kW for devices rated 97...720 A; 7.5 kW for devices 850 A and greater.

✱ Includes internal circulating fan rather than enclosure ventilation.

➤ Includes an internal circulating fan instead of a bypass contactor.

SMC™ Dialog Plus Smart Motor Controllers

Product Selection, Continued

Combination Controllers — IP30 (Type 1) Vented Enclosed with Fusible Disconnect, IP54 (Type 12) Enclosed with Fusible Disconnect, IP30 (Type 1) Vented Enclosed with Circuit Breaker, IP54 (Type 12) Enclosed with Circuit Breaker

Includes a 120V control transformer and line and load terminations. The IP54 (Type 12) Enclosed Combination with Fusible Disconnect and IP54 (Type 12) Enclosed Combination with Circuit Breaker 97...1000 A controllers include a bypass contactor and a Bulletin 825 converter module. Enclosures other than those listed are available; consult your local Rockwell Automation sales office or Allen-Bradley distributor. All Bulletin 153 numbers are supplied with thermal magnetic circuit breakers.

208V AC, 60 Hz

Hp Range	Controller Current Rating (A)‡	IP30 (Type 1) Vented Enclosed Combination Controllers with Fusible Disconnect		IP54 (Type 12) Enclosed Combination Controllers with Fusible Disconnect		IP30 (Type 1) Vented Enclosed Combination Controllers with Circuit Breaker		IP54 (Type 12) Enclosed Combination Controllers with Circuit Breaker	
		Cat. No.		Cat. No.		Cat. No.		Cat. No.	
1...5	24	✱	152H-B24AHD-39	+	152H-B24JHD-39	✱	153H-B24AHD-39	+	153H-B24JHD-39
7-1/2	35	✱	152H-B35AHD-40	+	152H-B35JHD-40	✱	153H-B35AHD-40	+	153H-B35JHD-40
10	35	✱	152H-B35AHD-41	+	152H-B35JHD-41	✱	153H-B35AHD-41	+	153H-B35JHD-41
15	54	✱	152H-B54AHD-42	+	152H-B54JHD-42	✱	153H-B54AHD-42	+	153H-B54JHD-42
20	97		152H-B97AHD-43		152H-B97JHD-43		153H-B97AHD-43		153H-B97JHD-43
25	97		152H-B97AHD-44		152H-B97JHD-44		153H-B97AHD-44		153H-B97JHD-44
30	97		152H-B97AHD-45		152H-B97JHD-45		153H-B97AHD-45		153H-B97JHD-45
40	135		152H-B135AHD-46		152H-B135JHD-46		153H-B135AHD-46		153H-B135JHD-46
50	180		152H-B180AHD-47		152H-B180JHD-47		153H-B180AHD-47		153H-B180JHD-47
60	180		152H-B180AHD-48		152H-B180JHD-48		153H-B180AHD-48		153H-B180JHD-48
75	240		152H-B240AHD-49		152H-B240JHD-49		153H-B240AHD-49		153H-B240JHD-49
100	360		152H-B360AHD-50		152H-B360JHD-50		153H-B360AHD-50		153H-B360JHD-50
125	360		152H-B360AHD-51		152H-B360JHD-51		153H-B360AHD-51		153H-B360JHD-51
150	500		152H-B500AHD-52		152H-B500JHD-52		153H-B500AHD-52		153H-B500JHD-52
200	650		152H-B650AHD-54		152H-B650JHD-54		153H-B650AHD-54		153H-B650JHD-54
250	720		152H-B720AHD-56		152H-B720JHD-56		153H-B720AHD-56		153H-B720JHD-56
300	850		152H-B850AHD-57		152H-B850JHD-57		153H-B850AHD-57		153H-B850JHD-57
350	1000		152H-B1000AHD-58		152H-B1000JHD-58		153H-B1000AHD-58		153H-B1000JHD-58

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230V AC, 60 Hz

Hp Range	Controller Current Rating (A)‡	IP30 (Type 1) Vented Enclosed Combination Controllers with Fusible Disconnect		IP54 (Type 12) Enclosed Combination Controllers with Fusible Disconnect		IP30 (Type 1) Vented Enclosed Combination Controllers with Circuit Breaker		IP54 (Type 12) Enclosed Combination Controllers with Circuit Breaker	
		Cat. No.		Cat. No.		Cat. No.		Cat. No.	
1...7-1/2	24	✱	152H-B24AAD-40	+	152H-B24JAD-40	✱	153H-B24AAD-40	+	153H-B24JAD-40
10	35	✱	152H-B35AAD-41	+	152H-B35JAD-41	✱	153H-B35AAD-41	+	153H-B35JAD-41
15	54	✱	152H-B54AAD-42	+	152H-B54JAD-42	✱	153H-B54AAD-42	+	153H-B54JAD-42
20	54	✱	152H-B54AAD-43	+	152H-B54JAD-43	✱	153H-B54AAD-43	+	153H-B54JAD-43
25	97		152H-B97AAD-44		152H-B97JAD-44		153H-B97AAD-44		153H-B97JAD-44
30	97		152H-B97AAD-45		152H-B97JAD-45		153H-B97AAD-45		153H-B97JAD-45
40	135		152H-B135AAD-46		152H-B135JAD-46		153H-B135AAD-46		153H-B135JAD-46
50	135		152H-B135AAD-47		152H-B135JAD-47		153H-B135AAD-47		153H-B135JAD-47
60	180		152H-B180AAD-48		152H-B180JAD-48		153H-B180AAD-48		153H-B180JAD-48
75	240		152H-B240AAD-49		152H-B240JAD-49		153H-B240AAD-49		153H-B240JAD-49
100	360		152H-B360AAD-50		152H-B360JAD-50		153H-B360AAD-50		153H-B360JAD-50
125	360		152H-B360AAD-51		152H-B360JAD-51		153H-B360AAD-51		153H-B360JAD-51
150	360		152H-B360AAD-52		152H-B360JAD-52		153H-B360AAD-52		153H-B360JAD-52
200	500		152H-B500AAD-54		152H-B500JAD-54		153H-B500AAD-54		153H-B500JAD-54
250	650		152H-B650AAD-56		152H-B650JAD-56		153H-B650AAD-56		153H-B650JAD-56
300	720		152H-B720AAD-57		152H-B720JAD-57		153H-B720AAD-57		153H-B720JAD-57
350	850		152H-B850AAD-58		152H-B850JAD-58		153H-B850AAD-58		153H-B850JAD-58
400	1000		152H-B1000AAD-59		152H-B1000JAD-59		153H-B1000AAD-59		153H-B1000JAD-59

‡ The nominal current rating for the combination package may differ from the controller, based on the horsepower. Consult your local Rockwell Automation sales office or Allen-Bradley distributor.

✱ Includes internal circulating fan rather than enclosure ventilation.

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460V AC, 60 Hz

Hp Range	Controller Current Rating (A)‡	IP30 (Type 1) Vented Enclosed Combination Controllers with Fusible Disconnect		IP54 (Type 12) Enclosed Combination Controllers with Fusible Disconnect		IP30 (Type 1) Vented Enclosed Combination Controllers with Circuit Breaker		IP54 (Type 12) Enclosed Combination Controllers with Circuit Breaker	
		Cat. No.		Cat. No.		Cat. No.		Cat. No.	
1...15	24	✱	152H-B24ABD-42	+	152H-B24JBD-42	✱	153H-B24ABD-42	+	153H-B24JBD-42
20	35	✱	152H-B35ABD-43	+	152H-B35JBD-43	✱	153H-B35ABD-43	+	153H-B35JBD-43
25	35	✱	152H-B35ABD-44	+	152H-B35JBD-44	✱	153H-B35ABD-44	+	153H-B35JBD-44
30	54	✱	152H-B54ABD-45	+	152H-B54JBD-45	✱	153H-B54ABD-45	+	153H-B54JBD-45
40	54	✱	152H-B54ABD-46	+	152H-B54JBD-46	✱	153H-B54ABD-46	+	153H-B54JBD-46
50	97		152H-B97ABD-47		152H-B97JBD-47		153H-B97ABD-47		153H-B97JBD-47
60	97		152H-B97ABD-48		152H-B97JBD-48		153H-B97ABD-48		153H-B97JBD-48
75	97		152H-B97ABD-49		152H-B97JBD-49		153H-B97ABD-49		153H-B97JBD-49
100	135		152H-B135ABD-50		152H-B135JBD-50		153H-B135ABD-50		153H-B135JBD-50
125	180		152H-B180ABD-51		152H-B180JBD-51		153H-B180ABD-51		153H-B180JBD-51
150	180		152H-B180ABD-52		152H-B180JBD-52		153H-B180ABD-52		153H-B180JBD-52
200	240		152H-B240ABD-54		152H-B240JBD-54		153H-B240ABD-54		153H-B240JBD-54
250	360		152H-B360ABD-56		152H-B360JBD-56		153H-B360ABD-56		153H-B360JBD-56
300	360		152H-B360ABD-57		152H-B360JBD-57		153H-B360ABD-57		153H-B360JBD-57
350	500		152H-B500ABD-58		152H-B500JBD-58		153H-B500ABD-58		153H-B500JBD-58
400	500		152H-B500ABD-59		152H-B500JBD-59		153H-B500ABD-59		153H-B500JBD-59
450	650		152H-B650ABD-60		152H-B650JBD-60		153H-B650ABD-60		153H-B650JBD-60
500	650		152H-B650ABD-61		152H-B650JBD-61		153H-B650ABD-61		153H-B650JBD-61
600	720		152H-B720ABD-62		152H-B720JBD-62		153H-B720ABD-62		153H-B720JBD-62
700	850		152H-B850ABD-63		152H-B850JBD-63		153H-B850ABD-63		153H-B850JBD-63
800	1000		152H-B1000ABD-65		152H-B1000JBD-65		153H-B1000ABD-65		153H-B1000JBD-65

575V AC, 60 Hz

Hp Range	Controller Current Rating (A)‡	IP30 (Type 1) Vented Enclosed Combination Controllers with Fusible Disconnect		IP54 (Type 12) Enclosed Combination Controllers with Fusible Disconnect		IP30 (Type 1) Vented Enclosed Combination Controllers with Circuit Breaker		IP54 (Type 12) Enclosed Combination Controllers with Circuit Breaker	
		Cat. No.		Cat. No.		Cat. No.		Cat. No.	
1...20	24	✱	152H-B24ACD-43	+	152H-B24JCD-43	✱	153H-B24ACD-43	+	153H-B24JCD-43
25	35	✱	152H-B35ACD-44	+	152H-B35JCD-44	✱	153H-B35ACD-44	+	153H-B35JCD-44
30	35	✱	152H-B35ACD-45	+	152H-B35JCD-45	✱	153H-B35ACD-45	+	153H-B35JCD-45
40	54	✱	152H-B54ACD-46	+	152H-B54JCD-46	✱	153H-B54ACD-46	+	153H-B54JCD-46
50	54	✱	152H-B54ACD-47	+	152H-B54JCD-47		153H-B54ACD-47	+	153H-B54JCD-47
60	97		152H-B97ACD-48		152H-B97JCD-48		153H-B97ACD-48		153H-B97JCD-48
75	97		152H-B97ACD-49		152H-B97JCD-49		153H-B97ACD-49		153H-B97JCD-49
100	135		152H-B135ACD-50		152H-B135JCD-50		153H-B135ACD-50		153H-B135JCD-50
125	135		152H-B135ACD-51		152H-B135JCD-51		153H-B135ACD-51		153H-B135JCD-51
150	180		152H-B180ACD-52		152H-B180JCD-52		153H-B180ACD-52		153H-B180JCD-52
200	240		152H-B240ACD-54		152H-B240JCD-54		153H-B240ACD-54		153H-B240JCD-54
250	240		152H-B240ACD-56		152H-B240JCD-56		153H-B240ACD-56		153H-B240JCD-56
300	360		152H-B360ACD-57		152H-B360JCD-57		153H-B360ACD-57		153H-B360JCD-57
350	360		152H-B360ACD-58		152H-B360JCD-58		153H-B360ACD-58		153H-B360JCD-58
400	500		152H-B500ACD-59		152H-B500JCD-59		153H-B500ACD-59		153H-B500JCD-59
450	500		152H-B500ACD-60		152H-B500JCD-60		153H-B500ACD-60		153H-B500JCD-60
500	500		152H-B500ACD-61		152H-B500JCD-61		153H-B500ACD-61		153H-B500JCD-61
600	650		152H-B650ACD-62		152H-B650JCD-62		153H-B650ACD-62		153H-B650JCD-62
700	720		152H-B720ACD-63		152H-B720JCD-63		153H-B720ACD-63		153H-B720JCD-63
800	850		152H-B850ACD-65		152H-B850JCD-65		153H-B850ACD-65		153H-B850JCD-65
1000	1000		152H-B1000ACD-67		152H-B1000JCD-67		153H-B1000ACD-67		153H-B1000JCD-67

‡ The nominal current rating for the combination package may differ from the controller, based on the horsepower. Consult your local Rockwell Automation sales office or Allen-Bradley distributor.

✱ Includes internal circulating fan rather than enclosure ventilation.

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Open Type Options (only one selection allowed)

Option	Description	Cat. No. Modification
Soft Stop	Provides a ramp down time of 0...60 s for applications which require an extended coast-to-rest.	A§
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§
Preset Slow Speed	Provides preset slow speeds for positioning or alignment applications. Preset speeds can be selected at either 7% or 15% of rated motor speed, with adjustable slow speed current from 0...450% of full-load motor current.	C§
SMB Smart Motor Braking	Provides a microprocessor-based braking system that applies 3-phase braking current to a standard squirrel-cage induction motor. The strength of the braking current is adjustable from 0...400% of the motor's full-load current rating.	D§
Accu-Stop	Provides stopping control for general positioning or to minimize jogging to stop. A 3-phase braking current is applied to the motor (adjustable from 0...400% of full-load current) until it reaches a preset slow speed (either 7% or 15% of rated motor speed). The motor is held at this speed until a stop command is given. Braking torque is then applied until the motor reaches zero speed. Slow speed current is adjustable from 0...450% of full-load current.	E§
Slow Speed with Braking	Provides a preset slow speed for positioning or alignment applications. Preset speeds can be selected at either 7% or 15% of rated motor speed, with adjustable slow speed current from 0...450% of full-load current. Provides a microprocessor-based braking system that applies 3-phase braking current to a standard squirrel-cage induction motor. The strength of the braking current is adjustable from 0...400% of full-load motor current.	F§

§ Add the designated letter to the end of the cat. no. Example: To add the Pump Control option: **Cat. No. 150-B24NBDB**.

Enclosed Options

Option	Description	Cat. No. Modification
Soft Stop	Provides a ramp down time of 0...60 s for applications that require an extended coast-to-rest.	-A*
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*
SMB Smart Motor Braking	Provides a microprocessor-based braking system that applies 3-phase braking current to a standard squirrel-cage induction motor. The strength of the braking current is adjustable from 0...400% of the motor's full-load current rating.	24...1000 A -D*
Push Buttons	Start-Stop Push Button	-1
	Start-Stop Push Button with HOA Selector Switch	-1F
	Soft Stop Push Button*	-1XA
	Pump Stop Push Button*	-1XB
	Brake Push Button*	-1XD
Selector Switch	Hand-Off-Auto Selector Switch	-3
	SMC-Off-Bypass Selector Switch	-3B
Pilot Light	Transformer Pilot Light† (Red or Green Lens)	-4_
	Push-To-Test Pilot Light† (Red Lens)	-5_
Control Circuit Transformer	Control Circuit Transformer (fused primary and secondary)	-6P
SCR Fusing	Fast Acting Current Limiting SCR Fusing	for 24 A unit
	Fast Acting Current Limiting SCR Fusing	for 35 A unit
	Fast Acting Current Limiting SCR Fusing	for 54 A unit
	Fast Acting Current Limiting SCR Fusing	for 97...135 A unit
	Fast Acting Current Limiting SCR Fusing	for 180 A unit
	Fast Acting Current Limiting SCR Fusing	for 240 A unit
	Fast Acting Current Limiting SCR Fusing	for 360 A unit
	Fast Acting Current Limiting SCR Fusing	for 500 A unit
	Fast Acting Current Limiting SCR Fusing	for 650...720 A unit
	Fast Acting Current Limiting SCR Fusing	for 850 A unit
	Fast Acting Current Limiting SCR Fusing	for 1000 A unit
Door-Mounted Human Interface Module	Programmer Only (Type 1)	-HAP
	Programmer Only (Type 4/12)	-HJP
	Digital Control Panel (Type 1)	-HA2
	Digital Control Panel (Type 4/12)	-HJ2
Communication Module	Remote I/O	-GD1
	RS-232/422/485, DH485	-GD2
	DeviceNet™ Network	-GK5
	Enhanced DeviceNet	-GU6
	ControlNet	-CN1

* Add the designated letter to the end of the Cat. No. For example, to add the pump control option **Cat. No. 152H-B180JBDB-51**.

* Option push buttons are available only when the corresponding option module is selected. For example, **Cat. No. 150-A24JBDA-1XA**.

† Specify pilot light lens color. Options: **Red, Green**.

Bulletin 150
SMC™ Dialog Plus Smart Motor Controllers
Options, Continued

Enclosed Options, Continued

Option	Description		Cat. No. Modification	
Protective Module*	480V Line Side Protective Module	24...54 A	-8L	
	480V Line Side Protective Module	97...360 A		
	600V Line Side Protective Module	24...54 A		
	600V Line Side Protective Module	97...360 A		
	Protective Module*	480V Load Side Protective Module	24...54 A	-8M
		480V Load Side Protective Module	97...360 A	
		600V Load Side Protective Module	24...54 A	
		600V Load Side Protective Module	97...360 A	
	Protective Module*	480V Both Line and Load Side Protective Module	24...54 A	-8B
		480V Both Line and Load Side Protective Module	97...360 A	
		600V Both Line and Load Side Protective Module	24...54 A	
		600V Both Line and Load Side Protective Module	97...360 A	
Auxiliary Contacts*	N.O. auxiliary contacts	for 24...240 A	-90	
	N.O. auxiliary contacts	for 360...1000 A	-91	
	N.C. auxiliary contacts	for 24...240 A		
	N.C. auxiliary contacts	for 360...1000 A		
	1 N.O. and 1 N.C. auxiliary contacts	for 24...240 A	-901	
Unwired Control Relays➤	1 N.O. and 1 N.C. auxiliary contacts	for 360...1000 A		
	Bulletin 700CF 4-pole relay – 2 N.O. and 2 N.C.		-89F22	
	Bulletin 700CF 4-pole relay – 3 N.O. and 1 N.C.		-89F31	
Disconnect Auxiliary§	Bulletin 700CF 4-pole relay – 4 N.O.		-89F40	
	N.O. disconnect auxiliary mounted on operating mechanism		-98	
Circuit Breaker Disconnect Auxiliary+	N.C. disconnect auxiliary mounted on operating mechanism		-99	
	Internal N.O. circuit breaker auxiliary		-98X	
Service Entrance Label	Internal N.C. circuit breaker auxiliary		-99X	
	Service Entrance Label	24...650 A	-SEL	
UL Label	Service Entrance Label	720...1000 A		
	UL Label		-UL	
NEMA Bypass Contactor*	NEMA Bypass	for 24...97 A unit	-NB	
	NEMA Bypass	for 135...180 A unit		
	NEMA Bypass	for 240 A unit		
	NEMA Bypass	for 360 A unit		
	NEMA Bypass	for 500 A unit		
NEMA Isolation Contactor*	NEMA Isolation	for 24...97 A unit	-NI	
	NEMA Isolation	for 135...180 A unit		
	NEMA Isolation	for 240 A unit		
	NEMA Isolation	for 360 A unit		
	NEMA Isolation	for 500 A unit		

* Line and Load Side Protective Modules are standard on 500...1000 A units.

‡ Available only with enclosed Bulletin 150, 152 and 153 devices with bypass contactor. Maximum of four (4) auxiliary contacts.

§ Thermal overload for Bulletin 150 enclosed controllers only. Overload is standard on Bulletins 152 and 153.

➤ Instantaneous auxiliary contacts on Bulletin 700CF relays are non-convertible.

§ Available only with Bulletin 152 and 153 devices. Maximum of two (2) disconnect auxiliaries.

† Available only with Bulletin 153 devices. Maximum of two (2) disconnect auxiliaries.

‡ Order to be released to manufacturing upon release of signed print approval drawings.

* 650, 720, 850, and 1000 A units currently use a NEMA contactor.

4

Accessories

Protective Modules*

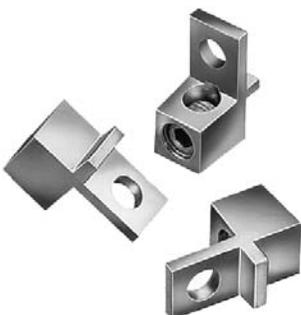
	Current Rating (A)	Description	Field Modification Cat. No.
	24...54	480 V Protective Module (Field Installed)	150-N84
		600 V Protective Module (Field Installed)	150-N86
	97...360	480 V Protective Module (Field Installed)	150-N84L
		600 V Protective Module (Field Installed)	150-N86L

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

* Surge protection is provided as standard on 500...1000 A units

4

Terminal Lug Kits (97...1000 A)

	Current Rating (A)	Wire Size	Total No. of Terminal Lugs Possible Each Side		Pkg. Quantity	Cat. No.
			Line Side	Load Side		
	97...135	#6...250 MCM AWG 16 mm ² ...120 mm ²	3	3	3	199-LF1
	180...360		6	6		
	500*	#4...500 MCM AWG 25 mm ² ...240 mm ²	6	6		199-LG1
	650...720*		9	9		
	850...1000*	(2) 1/0...500 MCM AWG 50 mm ² ...240 mm ²	6	6		

* Lugs are supplied with SMC.

IEC Terminal Covers

	Description	Field Modification Cat. No.
	IEC line- or load-side terminal covers for 97...135 A devices (includes line and load termination covers)	150-NT1
	IEC line- or load-side terminal covers for 180...360 A devices (includes line and load termination covers)	150-NT2

Description			Degree of Protection	Cat. No.	
 Cat. No. 1201-HAP  Cat. No. 1201-HA1  Cat. No. 1201-HA2	Human Interface Module ♦	Door Mount Bezel Kit	IP30 (Type 1)	1201-DMA	
		Programmer Only	IP30 (Type 1) +	1201-HAP	
		Programmer Only	IP65 (Type 4/12) with Bezel	1201-HJP	
		Analog Control Panel ‡	IP30 (Type 1) +	1201-HA1	
		Digital Control Panel ‡	IP30 (Type 1) +	1201-HA2	
		Digital Control Panel ‡	IP65 (Type 4/12) with Bezel	1201-HJ2	
Description			For Use With	Cat. No.	
 Communication Cable Cat. No. 1202-C10	Communication Cable	Male-Male	0.3 m	Human Interface Module and Communication Modules	1202-C03
			1 m		1202-C10
			3 m		1202-C30
			9 m		1202-C90
 Communication Module Cat. No. 1203-GD1	Communication Module ♦	Single Point Remote I/O	Bulletin 150 SMC Dialog Plus	1203-GD1	
		RS-232/RS-422/RS-485/DF1, or DH485 (Series B)		1203-GD2	
		ControlNet		1203-CN1	
		DeviceNet Network		1203-GK5	
		Enhanced DeviceNet		1203-GU6	
 Cat. No. 1203-FM1  Cat. No. 1203-SM1 Communication Option Kits	Flex I/O SCANport Module ♦ Flex I/O Terminal Base	Flex I/O Module >	Bulletin 150 SMC Dialog Plus	1203-FB1	
				SLC Communication Module	1203-FM1
					1203-SM1

‡ Start, Stop, and Jog buttons are the only active controls when used with the SMC Dialog Plus Controller.

+ Requires Type 1 Door Mount Bezel Kit.

♦ Separately powered 120/240V AC.

♦ Each Flex I/O SCANport Module requires (1) Cat. No. 1203-FB1 and (1) Cat. No. 1203-FM1.

> Requires a Communication Option Cable (Cat. No. 1202-C03/C10/C30/C90) to be functional. These units are not acceptable for NEMA Type 4 door mounting or UL Type 4X outdoor only.

SMC™ Dialog Plus Smart Motor Controllers

Accessories, Continued/Specifications

Converter Modules*

	Motor Full Load Current Range (A)	Cat. No.
 Cat. No. 825-MCM180	2.5...20 A	825-MCM20
	9...100 A	825-MCM180
 Cat. No. 825-MCM630	64...360 A	825-MCM630
Connection Cable (Replacement) Bul. 825-P to Bul. 825-MCM connection		825-MCA
	Description	Cat. No.
 Cat. No. 150-NFS	Fanning Strip for Bulletin 825 Converter Modules	150-NFS
 Cat. No. 825-MVM	M8 connections Set of 3 4 x 16 x 102 mm (1/8 x 5/8 x 4-1/64 in.) (125 A max.) Universally applicable Weight: 230 g	825-MVM

* Must be used with fanning strip Cat. No. 150-NFS.

Specifications

Functional Design Specifications			
Standard Features	Installation	Power Wiring	The SMC Dialog Plus Controller can be wired with or without an isolation contactor. Bypass contactors can be employed after the controller has brought the motor to full speed.
		Control Wiring	2- and 3-wire control for a wide variety of applications.
	Setup	Keypad	The SMC Dialog Plus Controller is configured with the front keypad and backlit LCD display.
		Software	Parameter values can be downloaded to the SMC Dialog Plus Controller with DriveTools programming software and the Cat. No. 1203-GD2 communication module.
	Communications	One serial port provided for connection to optional human interface and communication modules.	
	Starting Modes	Soft start with selectable kickstart, current limit, dual ramp, and full voltage in one unit.	
	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, elapsed time, power factor, motor thermal capacity usage.	
	Status Indication	Stopped, ramping, stopping, at speed, and fault.	
	Auxiliary Contacts	(1) Single-pole double-throw contact programmable as normal or up-to-speed; one programmable as normal or fault.	
Optional Features	Soft Stop	Extended coast-to-rest to minimize load shifting. Ramp down time is adjustable from 0...60 s.	
	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.	
	Preset Slow Speed	Enables the operator to position material. The preset slow speed can be set for low (7% of base speed), high (15% of base speed), reverse low (10% of base speed) or reverse high (20% of base speed).	
	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/Slow Speed with Braking	Combines Smart Motor Braking and Preset Slow Speed. Braking current is adjustable from 0...400% of full-load current. Slow speed can be set for either Low (7% of base speed) or High (15% of base speed).	

SMC™ Dialog Plus Smart Motor Controllers

Specifications, Continued

Electrical Ratings				
	UL/CSA/NEMA	IEC		
Power Circuit	Rated Operation Voltage	200...480V AC 200...600V AC (-15%, +10%)	200...415V 200...500V	
	Rated Insulation Voltage	N/A	500V	
	Rated Impulse Voltage	N/A	6000V	
	Dielectric Withstand	2200V AC	2500V	
	Repetitive Peak Inverse Voltage Rating	200...480V AC: 1400V 200...600V AC: 1600V	200...415V: 1400V 200...500V: 1600V	
	Operating Frequency	50/60 Hz	50/60 Hz	
	Utilization Category	MG 1	AC-53a	
	Protection Against Electrical Shock	N/A	IP00 (open device)	
	DV/DT Protection	RC Snubber Network		
	Transient Protection	Metal Oxide Varistors: 220 Joules @ 24...360 A 220 Joules @ 480V, 500...1000 A 300 Joules @ 600V, 500...1000 A		
SCPD Performance	Type 1			
SCPD List	Maximum Fuse or Circuit Breaker (A):			
Short-Circuit Protection	24	80		
	35	125		
	54	200		
	97	350		
	135	500		
	180	600		
	Device Operational Current Rating (A)	240	700	
	360	1000		
	500	1200		
	650	1600		
	720	2000		
	850	2500		
1000	3000			
Control Circuit	Rated Operational Voltage	100...240V AC 24V AC 24V DC	100...240V 24V 24V DC	
	Rated Insulation Voltage	N/A	240V	
	Rated Impulse Voltage	N/A	3000V	
	Dielectric Withstand	1600V AC	2000V	
	Operating Frequency	50/60 Hz	50/60 Hz	
	Protection Against Electric Shock	N/A	IP20	
Power Requirements	Control Module	40 VA		
	24	—		
	35	—		
	54	—		
	97	45 VA		
	135	45 VA		
	180	45 VA		
	Heatsink Fan(s) (A)*	240	45 VA	
	360	45 VA		
	500	145 VA		
	650	320 VA		
	720	320 VA		
	850	320 VA		
1000	320 VA			

* For devices rated 24...500 A, heatsink fans can be powered by either 110/120V AC or 220/240V AC. For devices rated 650...1000 A, heatsink fans can only be powered by 110/120V AC.

SMC™ Dialog Plus Smart Motor Controllers

Specifications, Continued

Electrical Ratings, Continued			
		UL/CSA/NEMA	IEC
Maximum Heat Dissipation (Watts)	Controller Rating (A)	24	110
		35	150
		54	200
		97	285
		135	490
		180	660
		240	935
		360	1170
		500	1400
		650	2025
720	2250		
850	2400		
1000	2760		
Auxiliary Contacts	Rated Operation Voltage	240V AC	240V
	Rated Insulation Voltage	N/A	240V
	Dielectric Withstand	1600V AC	2000V
	Operating Frequency	50/60 Hz	50/60 Hz
	Utilization Category	B300 (terminals 18...19) C300 (terminals 18...20) C300 (terminals 29...30)	AC-15
	SCPD Performance	Type 2	
	SCPD List	Class CC 8 A @ 1000 A Available Fault Current	
Environmental			
Operating Temperature Range		0...+50 °C (32...122 °F) (open) 0...+40 °C (32...104 °F) (enclosed)	
Storage and Transportation Temperature Range		-20...+75 °C	
Humidity		2000 m (6560 ft)	
Pollution Degree		5...95% (non-condensing)	
		2	
Mechanical			
Resistance to Vibration	Operational	1.0 G Peak, 0.006 in. displacement	
	Non-Operational	2.5 G, 0.015 in. displacement	
Resistance to Shock	Operational	15 G	
	Non-Operational	30 G	
Construction	Power Poles	Thermoset Moldings Heatsink hockey puck thyristor	24...135 A 180...1000 A
	Control Modules	Thermoset and Thermoplastic Moldings	
	Metal Parts	Anodized Aluminum, Plated Brass, Copper, or Painted Steel	
Terminals	Power Terminals	24...54 A	6.0 mm hole with clamp screw
		97 and 135 A	One 11.5 mm (0.453 in.) diameter hole each
		180...360 A	One 10.5 mm (0.413 in.) diameter hole each
		500 A	Two 13.5 mm (0.531 in.) diameter holes each
		650 and 720 A	Three 13.1 mm (0.515 in.) diameter holes each
	850 and 1000 A	Six 13.1 mm (0.515 in.) diameter holes each	
	Power Terminal Markings	NEMA, CENELEC EN50 012	
Control Terminals	M 3.5 x 0.6 Pozidriv screw with self-lifting clamp plate		
Other			
EMC Emission Levels	Conducted Radio Frequency Emissions	Class A	
	Radiated Emissions	Class A	
EMC Immunity Levels	Electrostatic Discharge	8 kV Air Discharge	
	Radio Frequency Electromagnetic Field	Per IEC 947-4-2	
	Fast Transient	Per IEC 947-4-2	
	Surge Transient	Per IEC 947-4-2	
Overload Characteristics	Current Range	1.0...999.9 A	
	Trip Classes	10, 15, 20, and 30	
	Trip Current Rating	120% of Motor FLC	
	Number of Poles	3	

Fuse Clip Sizing and Type for Fusible Combination Controllers*‡

Horsepower @ 480V	Fuse Clip Size/Type	Fuse Size Range [A]
15	30 A/Class J	0...30
20	60 A/Class J	31...60
25	60 A/Class J	31...60
30	60 A/Class J	31...60
40	100 A/Class J	61...100
50	100 A/Class J	61...100
60	200 A/Class J	101...200
75	200 A/Class J	101...200
100	200 A/Class J	101...200
125	400 A/Class J	201...400
150	400 A/Class J	201...400
200	400 A/Class J	201...400
250	400 A/Class J	401...600
300	600 A/Class J	401...600
350	600 A/Class J	401...600
400	1200 A/Class L	601...1600
450	1200 A/Class L	601...1600
500	1200 A/Class L	601...1600
600	1200 A/Class L	601...1600
700	1200 A/Class L	601...1600
800	1200 A/Class L	601...1600

* Consult NEC Handbook for proper fuse sizing guidelines.

‡ Optional fuse clip sizes and types are available upon request. Consult your local Rockwell Automation sales office or Allen-Bradley distributor.

Circuit Breaker Sizes and Rating Plug Sizes

Horsepower @ 480V	Circuit Breaker Size [A]/ Rating Plug Size [A]	Interrupting Rating in Symmetrical Amps @ 480V‡
15	150/50	14 000
20	150/50	14 000
25	150/60	14 000
30	150/70	14 000
40	150/100	14 000
50	150/125	14 000
60	250/150	25 000
75	250/175	25 000
100	250/225	25 000
125	250/250	25 000
150	400/300	35 000
200	400/400	35 000
250	600/500	35 000
300	600/600	35 000
350	800/800	35 000
400	800/800	50 000
450	1200/1000	50 000
500	1200/1200	50 000
600	1200/1200	50 000
700	2000/1600	65 000
800	2000/2000	65 000

‡ For higher interrupting ratings, consult your local Rockwell Automation sales office or Allen-Bradley distributor.

4

Approximate Dimensions and Shipping Weights

Open Type Controllers

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

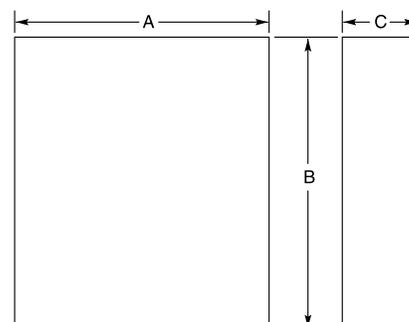
Controller Rating [A]	Height	Width	Depth	Weight
24	180 (7.09)	154 (6.06)	185 (7.29)	4.5 kg (10 lbs)
35	240 (9.45)	214 (8.43)	195 (7.68)	6.8 kg (15 lbs)
54	290 (11.42)	244 (9.61)	225 (8.86)	11.3 kg (25 lbs)
97	336 (13.23)	248 (9.77)	256 (10.09)	10.4 kg (23 lbs)
135	336 (13.23)	248 (9.77)	256 (10.09)	11.8 kg (26 lbs)
180	560 (22.06)	273 (10.75)	294 (11.58)	25 kg (55 lbs)
240	560 (22.06)	273 (10.75)	294 (11.58)	30 kg (65 lbs)
360	560 (22.06)	273 (10.75)	294 (11.58)	30 kg (65 lbs)
500	588 (23.17)	508 (20.00)	311 (12.23)	40.8 kg (90 lbs)
650...1000	1524 (60.0)	813 (32.00)	402 (15.83)	167.8 kg (370 lbs)

SMC™ Dialog Plus Smart Motor Controllers

Approximate Dimensions, Continued

Enclosed Type Controllers

Dimensions are in millimeters (inches). Dimensions are not intended for manufacturing purposes. All dimensions are subject to change. Factory-installed options may affect enclosure size requirements. Exact dimensions can be obtained after order entry. Consult your local Rockwell Automation sales office or Allen-Bradley distributor.



Controller Rating [A]	A			J			IP65 (Type 4)		
	IP30 (Type 1)			IP54 (Type 12)			B Height	A Width	C Depth
	B Height	A Width	C Depth	B Height	A Width	C Depth			
Non-Combination Controller									
24	610 (24)	406 (16)	229 (9)	610 (24)	406 (16)	229 (9)	610 (24)	406 (16)	229 (9)
35	762 (30)	610 (24)	305 (12)	762 (30)	610 (24)	305 (12)	762 (30)	610 (24)	305 (12)
54	762 (30)	610 (24)	305 (12)	762 (30)	610 (24)	305 (12)	762 (30)	610 (24)	305 (12)
97	762 (30)	610 (24)	305 (12)	762 (30)	610 (24)	305 (12)	762 (30)	610 (24)	305 (12)
135	965 (38)	762 (30)	356 (14)	965 (38)	762 (30)	356 (14)	965 (38)	762 (30)	356 (14)
180	965 (38)	762 (30)	356 (14)	965 (38)	762 (30)	356 (14)	965 (38)	762 (30)	356 (14)
240	965 (38)	762 (30)	356 (14)	1295 (51)	914 (36)	356 (14)	1295 (51)	914 (36)	356 (14)
360	1295 (51)	914 (36)	356 (14)	1524 (60)	914 (36)	356 (14)	1524 (60)	914 (36)	356 (14)
500	1524 (60)	914 (36)	356 (14)	2286 (90)	889 (35)	508 (20)	2134 (90)	1016 (35)	457 (20)
650	2286 (90)	889 (35)	508 (20)	2286 (90)	1778 (60)	508 (20)	2286 (90)	1778 (60)	508 (20)
720	2286 (90)	889 (35)	508 (20)	2286 (90)	1778 (60)	508 (20)	2286 (90)	1778 (60)	508 (20)
850	2286 (90)	889 (35)	508 (20)	2286 (90)	1778 (60)	508 (20)	2286 (90)	1778 (60)	508 (20)
1000	2286 (90)	889 (35)	508 (20)	2286 (90)	1778 (60)	508 (20)	2286 (90)	1778 (60)	508 (20)
Combination Controllers with Fusible Disconnect									
24	762 (30)	610 (24)	305 (12)	762 (30)	610 (24)	305 (12)	762 (30)	610 (24)	305 (12)
35	762 (30)	610 (24)	305 (12)	762 (30)	610 (24)	305 (12)	762 (30)	610 (24)	305 (12)
54 (60 A Disconnect)	762 (30)	610 (24)	305 (12)	762 (30)	610 (24)	305 (12)	762 (30)	610 (24)	305 (12)
54 (100 A Disconnect)	965 (38)	762 (30)	356 (14)	965 (38)	762 (30)	356 (14)	965 (38)	762 (30)	356 (14)
97	965 (38)	762 (30)	356 (14)	965 (38)	762 (30)	356 (14)	965 (38)	762 (30)	356 (14)
135	965 (38)	762 (30)	356 (14)	965 (38)	762 (30)	356 (14)	965 (38)	762 (30)	356 (14)
180	1295 (51)	914 (36)	356 (14)	1295 (51)	914 (36)	356 (14)	1295 (51)	914 (36)	356 (14)
240	1295 (51)	914 (36)	356 (14)	1295 (51)	914 (36)	356 (14)	1295 (51)	914 (36)	356 (14)
360	1524 (60)	965 (38)	356 (15)	1524 (60)	965 (38)	356 (15)	1524 (60)	965 (38)	356 (15)
500 (600 A Disconnect)	2134 (84)	1016 (40)	457 (18)	2134 (84)	1016 (40)	457 (18)	2134 (84)	1016 (40)	457 (18)
500 (1200 A Disconnect)	2286 (90)	1143 (55)	508 (20)	2286 (90)	1270 (55)	508 (20)	2286 (90)	1778 (55)	508 (20)
650	2286 (90)	1397 (55)	508 (20)	2286 (90)	1778 (55)	508 (20)	2286 (90)	1778 (55)	508 (20)
720	2286 (90)	1397 (55)	508 (20)	2286 (90)	1778 (55)	508 (20)	2286 (90)	1778 (55)	508 (20)
850	2286 (90)	1397 (55)	508 (20)	2286 (90)	2667 (95)	508 (20)	2286 (90)	2667 (95)	508 (20)
1000	2286 (90)	1397 (55)	508 (20)	2286 (90)	2667 (95)	508 (20)	2286 (90)	2667 (95)	508 (20)
Combination Controllers with Circuit Breaker									
24	762 (30)	610 (24)	305 (12)	762 (30)	610 (24)	305 (12)	762 (30)	610 (24)	305 (12)
35	762 (30)	610 (24)	305 (12)	762 (30)	610 (24)	305 (12)	762 (30)	610 (24)	305 (12)
54	762 (30)	610 (24)	305 (12)	762 (30)	610 (24)	305 (12)	762 (30)	610 (24)	305 (12)
97	965 (38)	762 (30)	356 (14)	965 (38)	762 (30)	356 (14)	965 (38)	762 (30)	356 (14)
135	965 (38)	762 (30)	356 (14)	965 (38)	762 (30)	356 (14)	965 (38)	762 (30)	356 (14)
180	1295 (51)	914 (36)	356 (14)	1295 (51)	914 (36)	356 (14)	1295 (51)	914 (36)	356 (14)
240	1295 (51)	914 (36)	356 (14)	1295 (51)	914 (36)	356 (14)	1295 (51)	914 (36)	356 (14)
360	1524 (60)	965 (38)	356 (14)	1524 (60)	965 (38)	356 (14)	1524 (60)	965 (38)	356 (14)
500	2134 (90)	1016 (35)	457 (20)	2134 (90)	1016 (35)	457 (20)	2134 (90)	1016 (35)	457 (20)
650	2286 (90)	1397 (55)	508 (20)	2286 (90)	1778 (50)	508 (20)	2286 (90)	1778 (50)	508 (20)
720	2286 (90)	1397 (55)	508 (20)	2286 (90)	1778 (50)	508 (20)	2286 (90)	1778 (50)	508 (20)
850	2286 (90)	1778 (55)	508 (20)	2286 (90)	2667 (65)	508 (20)	2286 (90)	2667 (65)	508 (20)
1000	2286 (90)	1778 (55)	508 (20)	2286 (90)	2667 (65)	508 (20)	2286 (90)	2667 (65)	508 (20)

STC™ Starting Torque Controller

Overview/Catalog Number Explanation/Product Selection



Bulletin 154 — Smart Motor Controllers — STC Starting Torque Controller

The STC Starting Torque Controller is a compact, simple-to-use, solid-state controller designed for low horsepower squirrel-cage induction motors. It is intended to relieve the starting torque surge encountered in typical across-the-line starting. This will allow for smoother starts and decreased equipment downtime due to shock and vibration problems.

The STC Controller is available in three current rated sizes: 11, 16, and 22 A. It is offered in four voltage ranges: 100...120, 200...230, 380...460, and 500...575V, 50/60 Hz.

The STC Controller is intended to operate in conjunction with an electromechanical motor starter.

- 11...22 A ratings
- Reduces starting torque surges

Table of Contents

Specifications..... 4-137
 Approximate Dimensions..... 4-138

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)
 CE Marked (Open Type) per
 EMC and Low Voltage
 Directive

Cat. No. Explanation

4

154 – A11 N B
a b c d

a

Bulletin Number	
Code	Description
154	Solid-State Controller

b

Controller Rating	
Code	Description
A11	11 A, 1...7.5 Hp @ 460V AC
A16	16 A, 1...10 Hp @ 460V AC
A22	22 A, 1...15 Hp @ 460V AC

c

Enclosure Type	
Code	Description
N	Open

d

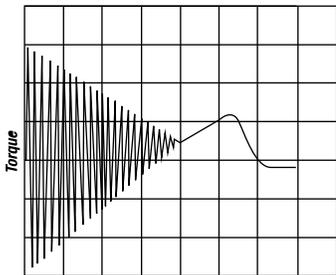
Input Line Voltage	
Code	Description
A	200...230V, 50/60 Hz
B	380...460V, 50/60 Hz
C	500...575V, 50/60 Hz
L	100...120V, 50/60 Hz

Single-Phase Selection — Open Type

Current Rating [A]	kW	Hp	Cat. No.
110...120V AC, 50/60 Hz			
11	0.75	1/2	154-A11NL
16	1.1	1	154-A16NL
22	1.5	1-1/2	154-A22NL
200...230V AC, 50/60 Hz			
11	1.5	1-1/2	154-A11NA
16	2.2	2	154-A16NA
22	3	3	154-A22NA

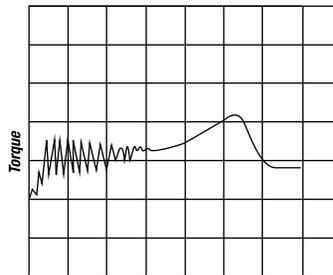
Three-Phase Selection — Open Type

Current Rating [A]	kW	Hp	Cat. No.
200V AC, 60 Hz			
11	3	3	154-A11NA
16	4.5	3	154-A16NA
22	6	5	154-A22NA
230V AC, 50/60 Hz			
11	2.2	3	154-A11NA
16	4	5	154-A16NA
22	5.5	7-1/2	154-A22NA
380...460V AC, 50/60 Hz			
11	4	7-1/2	154-A11NB
16	7.5	10	154-A16NB
22	11	15	154-A22NB
500...575V AC, 50/60 Hz			
11	5.5	10	154-A11NC
16	7.5	10	154-A16NC
22	11	20	154-A22NC



Typical Across-the-Line Response

The figure above shows how starting torque surge during motor starting can cause damage to the motor and to driver equipment.



STC™ Response

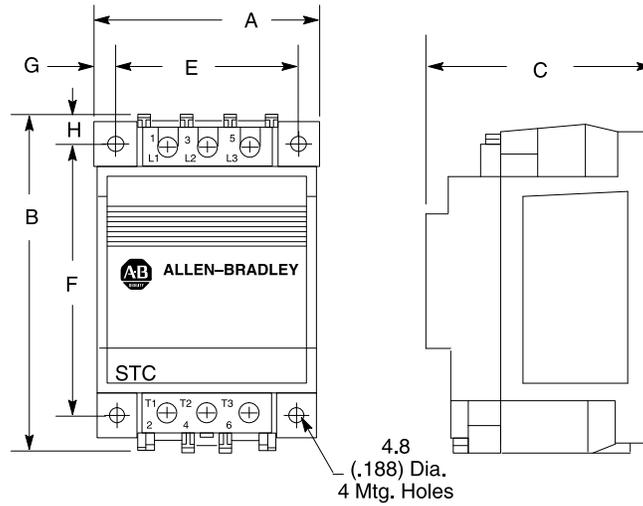
The figure above shows how the STC controller is effective in decreasing the magnitude of starting torque surges.

Cat. No.		154-A11...	154-A16...	154-A22...
Rated Operating Current	[A]	11	16	22
Maximum Heat Dissipation	[W]	15	18	24
Power Section		Back-to-back SCR(s)		
Rated Operational Voltage (+10%, -15%)		100...120, 200...230V AC, 50/60 Hz, 1-phase, or 200...230, 380...460, 500...575V AC, 50/60 Hz, 3-phase		
Cable Size	Power Terminals	1.5...6 mm ² (14...12 AWG)		
Thermal Capacity		IEC 34 (S1), NEMA MG 1		
Electrical Design Specifications/Test Requirements				
Repetitive Peak Inverse Voltage Rating		1400V up to 480V Line 1600V up to 600V Line		
Selectable Start Times		0.1...4.5 s		
Selectable Initial Torque Settings		10...80% Locked Rotor Torque		
Noise and RF Immunity		Surge Transient Peak 3400V. Showering Arc 1500V		
DV/DT Protection		RC Snubber Network		
Mechanical Design Specifications/Test Requirements				
Vibration		2.5 G for 60 min		
Shock		30 G for 11 ms		
Construction	Power Poles Control Metal Parts	High-temperature thermoplastic moldings Thermoplastic moldings Anodized aluminum, plated brass or copper		
Terminals	Power Terminals Power Terminals Markings	6.0 mm hole with clamping plate CENELEC EN50 012, NEMA		
Functional Design Specification				
Standard Features	Setup	Wiring Configuring	The STC controller is wired in series with a motor starter. The STC controller is configured with rotary digital switches.	
	Starting		From an initial torque setting, the STC controller increases the voltage gradually during the acceleration period until full voltage is achieved.	
	Running	Protection	Motor overload protection is provided by the overload relay as part of the motor starter.	
Environmental				
Temperature	Operating Storage	0...+50 °C (32...122 °F) -40...+85 °C (-40...+185 °F)		
Altitude		2000 m (6560 ft)		
Humidity		5...95% RH (non-condensing)		

Bulletin 154
STC™ Starting Torque Controller
 Approximate Dimensions

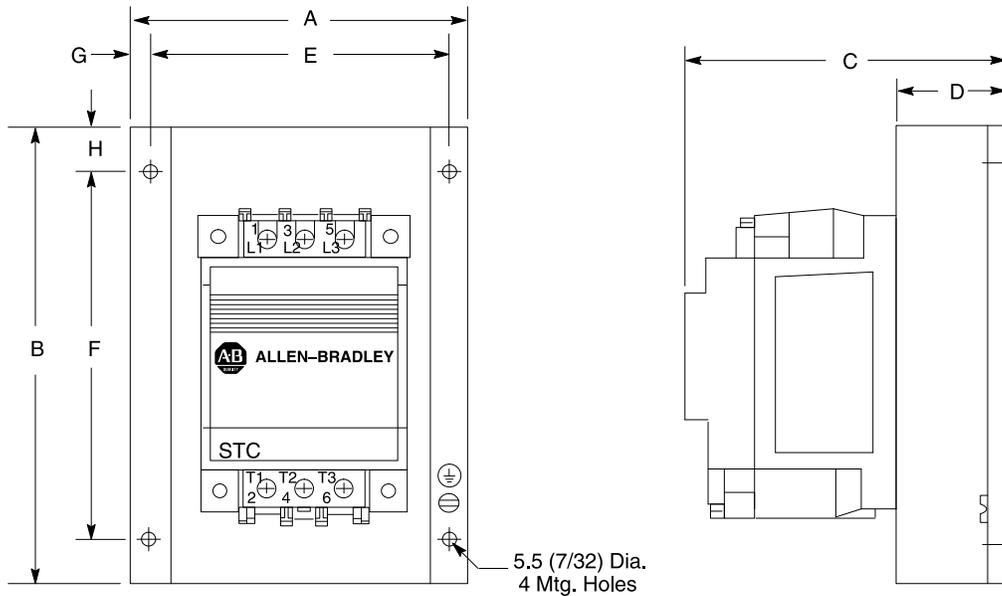
Dimensions are shown in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.

11 A Controller



4

16...22 A Controller



Open Type

Controller	A Width	B Height	C Depth	D	E	F	G	H	Approx. Ship. Wt.
11 A	75 (2-61/64)	111 (4-23/64)	77 (3-1/32)	—	60 (2-23/64)	90 (3-35/64)	7.5 (19/64)	10 (3-35/64)	2 kg (4.5 lbs)
16 A	122 (4-13/16)	127 (5)	101 (3-31/32)	24 (15/16)	110 (4-21/64)	90 (3-35/64)	6 (1/4)	18.5 (3/4)	2.25 kg (5 lbs)
22 A	154 (6-1/16)	180 (7-3/32)	127 (5)	50 (1-31/32)	140 (5-33/64)	140 (5-33/64)	7 (9/32)	20 (25/32)	3.15 kg (7 lbs)



Bulletin 156 — Solid-State Contactors

The Bulletin 156 Solid-State Contactors are designed for fast and demanding switching of loads such as heaters, solenoids, transformers and motors.

- Compact modular design complete with heatsink
- DIN Rail mountable
- Easy and quick installation
- Specification according to industry standard
- Available in single-phase, dual-phase, or three-phase version
- Operational current up to 50 A (AC-1), 15 A (AC-3)
- LED status indication
- Line voltage up to 600V AC
- Universal control voltage
- Burst firing (zero cross)
- IP 20 protection
- Built-in varistor protection phase or three-phase

Table of Contents

Product Selection this page
 Specifications..... 4-140
 Approximate
 Dimensions..... 4-143
Standards Compliance
 UL 508
 CSA 22.2 No. 14
 EN/IEC 60947-1
 EN/IEC 60947-4-2
 EN/IEC 60947-4-3
Certifications
 cULus Listed (File No. E96956,
 Guides NMFT, NMFT7)
 CE Marked (Open Type) per
 EMC and Low Voltage
 Directive

Single-Phase

Current Rating (A)	Control Voltage	Operational Voltage		
		Cat. No.		
		24...230V AC	24...480V AC	24...600V AC
15	5...24V DC	156-A15AB1	156-A15BB1	156-A15CB1
15	24...230V AC/DC	156-A15AA1	156-A15BA1	156-A15CA1
30	5...24V DC	156-A30AB1	156-A30BB1	156-A30CB1
30	24...230V AC/DC	156-A30AA1	156-A30BA1	156-A30CA1
50	5...24V DC	156-A50AB1	156-A50BB1	156-A50CB1
50	24...230V AC/DC	156-A50AA1	156-A50BA1	156-A50CA1

Dual-Phase

Current Rating (A)	Control Voltage	Operational Voltage		
		Cat. No.		
		24...230V AC	24...480V AC	24...600V AC
30	5...24V DC	156-A30AB2	156-A30BB2	156-A30CB2
30	24...230V AC/DC	156-A30AA2	156-A30BA2	156-A30CA2
50	5...24V DC	156-A50AB2	156-A50BB2	156-A50CB2
50	24...230V AC/DC	156-A50AA2	156-A50BA2	156-A50CA2

Three-Phase

Current Rating (A)	Control Voltage	Operational Voltage		
		Cat. No.		
		24...230V AC	24...480V AC	24...600V AC
10	5...24V DC	156-A10AB3	156-A10BB3	156-A10CB3
10	24...230V AC/DC	156-A10AA3	156-A10BA3	156-A10CA3
20	5...24V DC	156-A20AB3	156-A20BB3	156-A20CB3
20	24...230V AC/DC	156-A20AA3	156-A20BA3	156-A20CA3



Bulletin 156
Solid-State Contactors
 Specifications

Output specifications

	Single- and dual-phase*			Three-phase	
	15 A*	30 A	50 A	10 A	20 A
Operational current [A]					
AC-1, AC-51 (heater load) max.	15	30	50	10	20
AC-3, AC-53A (motor load) max.	15‡	15	15	10	10
Operational voltage (50/60 Hz)	24...230V AC				
	24...480V AC				
	24...600V AC				
Leakage current max.	1 mA				
Operational current max.	10 mA				
Semiconductor protection fusing					
Type 1 coordination	50 A gL / gG			35 A gL/gG	
Type 2 coordination I ² t (t=10 ms)1800 A ² s	1800 A ² s*			450 A ² s	

* Dual-phase: Current rating is accumulated, i.e., the sum of current in L1 and L2

* 15 A @ 600V equals 450 A²s

‡ AC-3, AC-53A (motor load) @ 600V AC is rated at 10A max.

Control circuit specifications

Control voltage range (±10%)	5...24V DC, 24...230V AC/DC				
Pick-up voltage max.	4.25V DC, 20.4V AC/DC				
Drop-out voltage min.	1.5V DC, 7.2V AC/DC				
Control current/power max.	15 mA at 24V DC, 1.5VA/6 mA at 24V DC				
Response time	½ cycle/1 cycle				
EMC immunity	Meets requirements of EN 50082-1 and EN 50082-2				

Operating Temperature

		Single- and dual-phase			Three-phase	
		15 A	30 A	50 A	10 A	20 A
Ambient temperature	+40 °C [A]	15	30	50	10	20
	+50 °C [A]	12.5	25	40	8	16
	+60 °C [A]	10	20	30	6.5	13

Insulation

Rated insulation voltage U _i	660V AC
Rated impulse withstand voltage U _{imp}	4 kV
Installation category	III

Materials

Housing	Self-extinguishing PPO UL94V1
Heatsink	Aluminium black anodized
Base	Electroplated steel

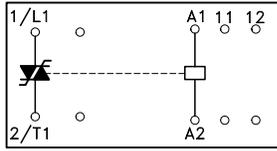
Thermal specifications

	Single- and dual-phase			Three-phase	
	15 A	30 A	50 A	10 A	20 A
Power dissipation continuous duty	1.2 W/A (per phase)			3 W/A	
intermittant duty	1.2 W/A _ duty cycle (per phase)			3 W/A _ duty cycle	
Ambient temperature range	-5 °C...+40 °C				
Cooling method	Natural convection				
Mounting	Vertical (see general mounting instructions)				
Storage temperature range	-20 °C...+80 °C				
Enclosure degree / pollution degree	IP 20/3				

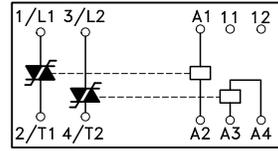
Wiring Diagram

Terminals 11 and 12 have no connection to the internal circuit.

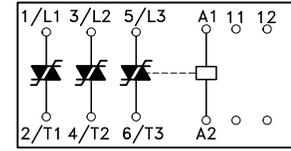
Single-phase



Dual-phase

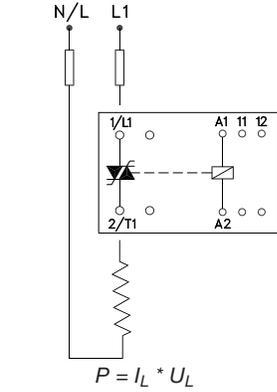


Three-phase



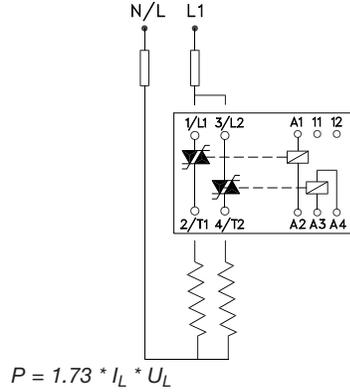
Applications

Single-phase



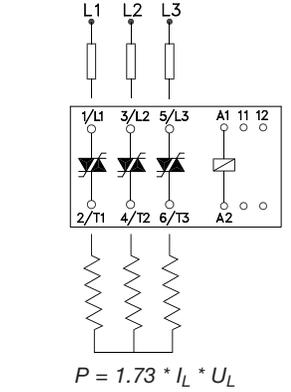
	Max. heater power [kW]		
	230V	400V	575V
15 A	3.5	6	8.7
30 A	6.9	12	17.3
50 A	11.5	20	28.8

Dual-phase



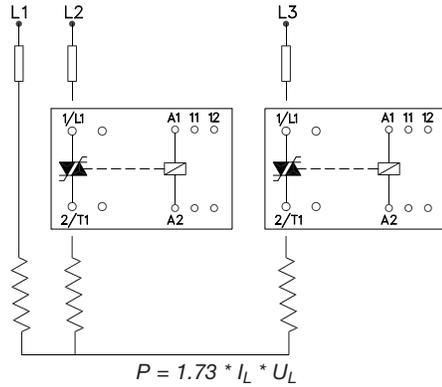
	Max. heater power [kW]		
	230V	400V	575V
30 A	6.9	12	17.3
50 A	11.5	20	28.8

Three-phase



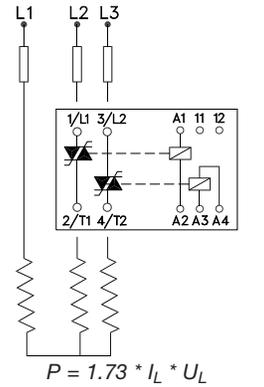
	Max. heater power [kW]		
	230V	400V	575V
10 A	4	6.9	10
20 A	8	13.8	20

Single-phase



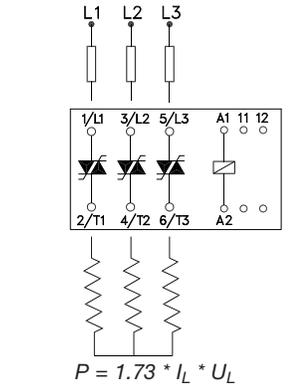
	Max. heater power [kW]		
	230V	400V	575V
15 A	6	10.3	15
30 A	11.9	20.8	29.9
50 A	19.9	34.6	49.7

Dual-phase



	Max. heater power [kW]		
	230V	400V	575V
30 A	6.9	12	17.3
50 A	11.5	20	28.8

Three-phase

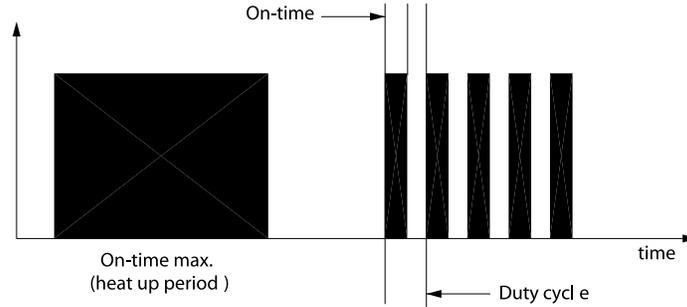


	Max. heater power [kW]		
	230V	400V	575V
10 A	4	6.9	10
20 A	8	13.8	20

Duty Cycle Rating

Load factor = On-time/Duty cycle time

If the Bulletin 156 Solid-State Contactor load factor is not 100%, it can be selected for a higher current than the rated value according to the tables below.



15 A Single-phase

Load current [A]	On-time max.	Load factor max.
17.5	15 min.	85%
20	13 min.	75%
22.5	11 min.	67%
25	9 min.	60%
27.5	7 min.	55%
30	5 min.	50%

15 A @ 600V Single-phase

Load current [A]	On-time max.	Load factor max.
17.5	15 min.	85%
20	13 min.	75%

30 A Single and Dual-phase

Load current [A]	On-time max.	Load factor max.
35	15 min	85%
40	13 min	75%
45	11.5 min	67%
50	10 min	60%

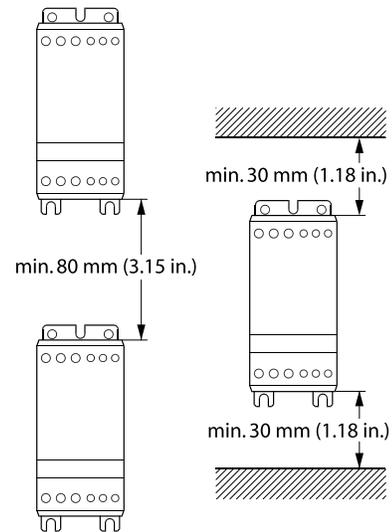
10 A Three-phase

Load current [A]	On-time max.	Load factor max.
12.5	15 min	85%
15	13 min	75%
17.5	11.5 min	67%
20	10 min	60%

Mounting instructions

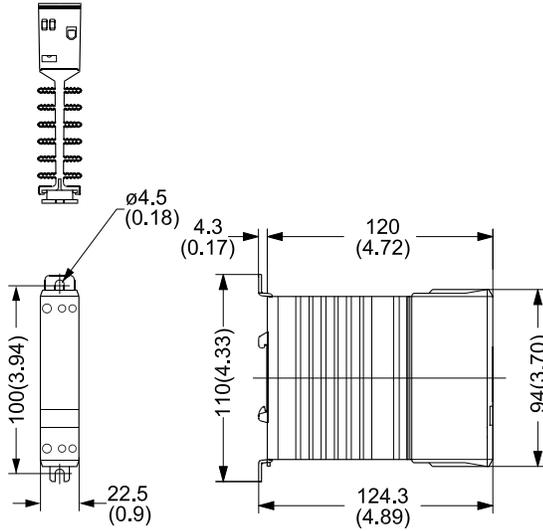
The controller is designed for vertical mounting. If the controller is mounted horizontally, the load current must be reduced by 50%. The controller needs no side clearance. Clearance between two vertically mounted controllers must be a minimum of 80 mm (3.15 in.). Clearance between a controller and the top and bottom walls must be a minimum of 30 mm (1.2 in.).

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

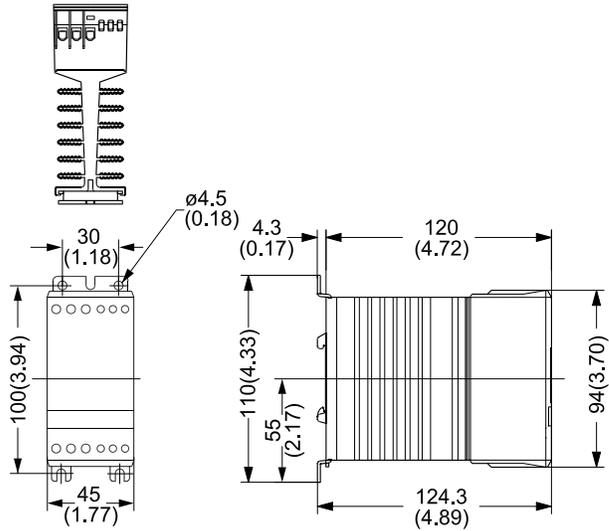


Dimensions in millimeters (inches). Dimensions are not intended for manufacturing purposes.

15 A Single-phase



30 A Single- and Dual-phase, 10 A Three-phase



50 A Single- and Dual-phase, 20 A Three-phase

