Allen-Bradley

Bulletin 280E/281E, 284E ArmorStart® Distributed Motor Controllers with EtherNet/IP™

Selection Guide

LISTEN. THINK. SOLVE.®

ArmorStart Distributed Motor Controllers

ArmorConnect Power Media

General Information

Three-Phase Power Media

Control Power Media

Three-Phase and Control Power Media

Trademark List

		
Bulletin	**280E/281E**	**284E**
Type	EtherNet/IP™	
Horsepower Range:		
0.5…10 Hp (0.37…7.5 kW)	✓	—
0.5…5 Hp (0.4…3.0 kW)	—	✓
Starting Method:		
Full-Voltage and Reversing	✓	—
Sensorless Vector Control	—	✓
Environmental Rating:		
IP67/NEMA Type 4	✓	✓
Control Voltage:		
24V DC	✓	✓
Operational Voltage Ratings:		
200…480V AC	✓	—
380…480V AC	—	✓
Rated for Group Motor Installations	✓	✓
Local logic using DeviceLogix™	✓	✓
I/O Capability:		
Four Inputs	✓	✓
Two Outputs	✓	✓
Network Communications:		
EtherNet/IP™	✓	✓
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	✓	✓
Source Brake Contactor	—	✓
Dynamic Brake Connector	—	✓
Output Contactor	—	✓
EMI Filter	—	✓
Shielded Motor Cable	—	✓
Product Selection	**Page 7**	**Page 18**

Product Line Description

The ArmorStart Distributed Motor Controller is an integrated, pre-engineered, motor starter solution for On-Machine applications. The ArmorStart offers as standard, a robust IP67/NEMA Type 4 enclosure design, which is suitable for water wash-down environments. Its modular design offers simplicity in wiring using quick disconnects for the I/O, communications, and motor connection. Optional quick disconnects for control and three-phase power, fully integrates the plug-n-play solution. As standard, the ArmorStart offers four inputs and two outputs to be used with sensors and actuators. The ArmorStart Distributed Motor Controller offers as standard, a local at-motor disconnect means by incorporating the Bulletin 140M Manual Motor Protector. This eliminates the need for additional components that would otherwise be required in each motor branch circuit. The ArmorStart Distributed Motor Controllers are listed as suitable for Group Motor installations.

Features

EtherNet/IP Capabilities
The ArmorStart EtherNet/IP version includes an embedded dual port switch that supports Device Level Ring (DLR) and IEEE 1588 Transparent Clock for CIP Sync applications. The device has support for network DHCP or static IP address configuration. ControlLogix® add-on profile support is available for download. ArmorStart EtherNet/IP includes an embedded web server that allows access to status, diagnostics, and configuration from a standard web browser.

Network and I/O Capabilities
The ArmorStart EtherNet/IP Distributed Motor Controller delivers enhanced control and parameter configuration, device status, fault diagnostics, and remote start/stop control. ArmorStart EtherNet/IP includes four configurable 24V DC inputs and two solid state outputs, each with LED status indication. Outputs are sourcing type with a maximum current per output point of 0.5 A.

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
- RUN LED
- NETWORK LED
- FAULT LED

DeviceLogix - Local logic control
DeviceLogix provides local control over the device's discrete and network IO. It consists of function blocks, inputs, outputs, and actual hardware data, including fault and status bits. DeviceLogix configuration is accomplished through an easy to use programming tool within RSLogix 5000. Contact your local Rockwell Automation sales representative for software availability.

Reset Button
This is used as a local trip reset.

Motor Cable
A 3-meter unshielded, 4-conductor cordset is provided with every ArmorStart Distributed Motor Controller.

Modes of Operation

Bulletin 280 or 281 Full Voltage/Reversing Starter
This method is used in applications requiring across-the-line starting. The ArmorStart Bulletin 280 offers full-voltage starting, and the Bulletin 281 offers full-voltage starting for reversing applications.

Bulletin 284 Variable Frequency Drive

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.

Optimized Performance:

- Removable MOV provides trouble-free operation when used on ungrounded distribution systems.
- A relay pre-charge limits inrush current.
- Integral brake transistor provides dynamic braking capability using low cost IP20 brake resistors or IP67 plug and play resistors.
- 150% overload for 60 seconds or 200% overload for 3 seconds provides robust overload protection.
- Adjustable PWM frequency up to 16 kHz ensures quiet operation.

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)
- EtherNet/IP communications
- Robust IP67/NEMA Type 4 enclosure rating
- Quick disconnect connections for I/O, communications, motor, three-phase and control power
- Gland plate entry: conduit entrance or ArmorConnect power media
- LED status indication
- Local logic technology using DeviceLogix
- Factory installed option:
  – Hand/Off/Auto (HOA) keypad configuration

Table of Contents

Standards Compliance

UL 508
CSA C22.2, No. 14
EN/IEC 60947-4
EN/IEC 60947-4-1
CE Marked per Low Voltage Directive 2006/95/EC and EMC Directive 2004/108/EC
CCC
ODVA for EtherNet/IP and DeviceNet

Certifications

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

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.

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.

Fault Diagnostics

Fault diagnostics capabilities built in the ArmorStart Distributed Motor Controller:

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

Factory-Installed Options

HOA Selector Keypad

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

Catalog Number 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	E	–	F	12Z	–	10	C	–	CR	–	Option 1
a	*b*		*c*	*d*		*e*	*f*		*g*		*h*

a

Bulletin Number	
Code	Description
280	Full Voltage Starter
281	Reversing Starter

b

Communications	
Code	Description
E	EtherNet/IP

c

Enclosure Type	
Code	Description
F	Type 4 (IP67)

d

Contactor Size/Control Voltage
24V DC
12Z
23Z

e

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

f

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

h

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

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 26 for extended motor cable lengths.

EtherNet/IP Network Communication

Full-voltage starters — IP67/NEMA Type 4 with conduit entrance, Up to 480V AC

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

Full-voltage starters — IP67/NEMA Type 4 with ArmorConnect power media connections, Up to 480V AC

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

Reversing starters — IP67/NEMA Type 4 with conduit entrance, Up to 480V AC

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

Reversing starters — IP67/NEMA Type 4 with ArmorConnect power media connections, Up to 480V AC

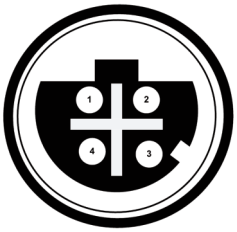
Current Rating [A]	kW		Hp			24V DC Control Voltage
	230V AC, 50 Hz	400V AC, 50 Hz	200V AC, 60 Hz	230V AC, 60 Hz	460V AC, 60 Hz	Cat. No.
0.24…1.2	0.18	0.37	—	—	0.5	281E-F12Z-10A-RR
0.5…2.5	0.37	0.75	0.5	0.5	1	281E-F12Z-10B-RR
1.1…5.5	1.1	2.2	1	1	3	281E-F12Z-10C-RR
3.2…16	4	7.5	3	5	10	281E-F23Z-25D-RR

Options – Factory Installed

	Description	Cat. No. Modification
	Hand/Off/Auto Selector Keypad (Bulletin 280)	-3
	Hand/Off/Auto Selector Keypad with Forward/Reverse Function (Bulletin 281)	-3FR
	Supplied ArmorStart without motor cable	-CRW
	ArmorConnect Power Media Connectivity, ArmorStart supplied without motor cable	-RRW

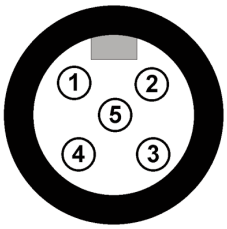
ArmorStart Receptacle Pin Outs

Receptacle Connections for EtherNet/IP (M12)



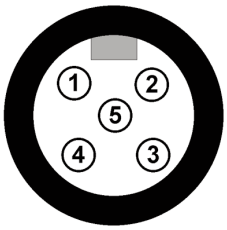
Pin 1: Tx+
Pin 2: Rx+
Pin 3: Tx-
Pin 4: Rx-

Receptacle Connections for Input (M12)



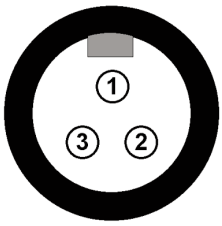
Pin 1: +24V (A3 or DNET)
Pin 2: Input 0
Pin 3: Common
Pin 4: Input 1
Pin 5: NC (no connection)

Receptacle Connections for Output, EtherNet/IP Version (M12)



Pin 1: NC (no connection)
Pin 2: NC (no connection)
Pin 3: Common
Pin 4: Output +24V DC (A1)
Pin 5: NC (no connection)

Receptacle Connections for Dynamic Brake (M22) — Bulletin 284E only

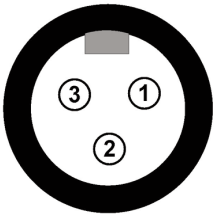


Pin 1: GND (green/yellow)
Pin 2: BR+ (black)
Pin 3: BR- (white)

Receptacle Connections for Incoming Control Power - 24V DC Only

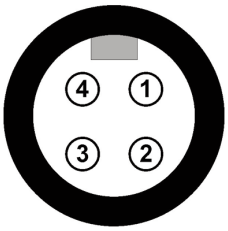
Pin 1: +24V DC unswitched (A3)(red)
Pin 2: Common (A2)(black)
Pin 3: PE (green)
Pin 4: Not used (blank)
Pin 5: +24V DC switched (A1)(blue)
Pin 6: Not used (white)

Receptacle Connections for Source or Control Brake — Bulletin 284E only



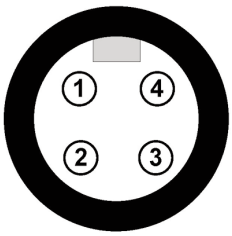
Pin 1: L1 (black)
Pin 2: GND (green/yellow)
Pin 3: L2 (white)

Receptacle Connections for Motor Connector -(M22)
Bulletin 280E/281E: 3 Hp or less
Bulletin 284E: 5 Hp or less



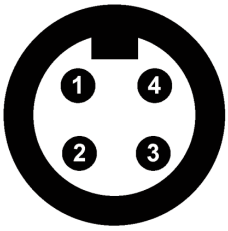
Pin 1: T1 (black)
Pin 2: T2 (white)
Pin 3: T3 (red)
Pin 4: Ground (green/yellow)

Receptacle Connections for Motor Connector - 10 Hp or greater (M35) — Bulletin 280E/281E only



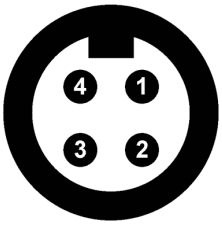
Pin 1: T1 (black)
Pin 2: Ground (green/yellow)
Pin 3: T3 (red)
Pin 4: T2 (white)

Receptacle Connections for Incoming 3-phase Power - 10 A Short Circuit Protection (M22)



Pin 1: L1 (black)
Pin 2: L2 (white)
Pin 3: L3 (red)
Pin 4: Ground (green/yellow)

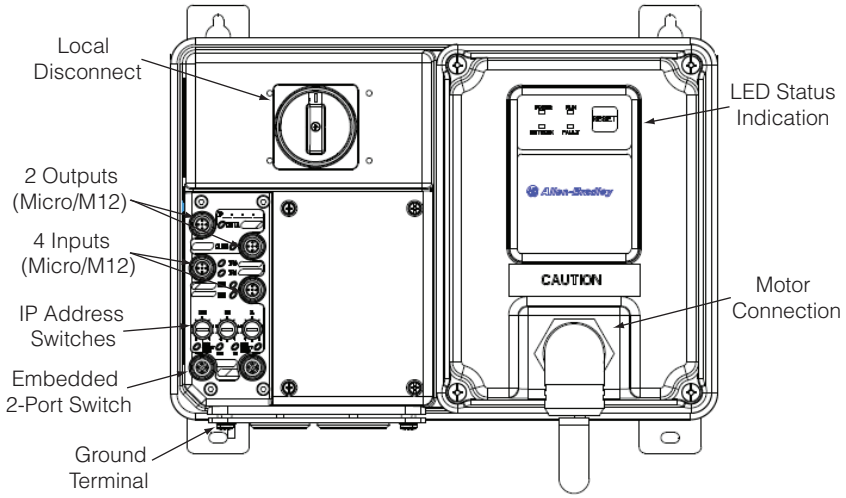
Receptacle Connections for Incoming 3-phase Power - 25 A Short Circuit Protection (M35)



Pin 1: L1 (black)
Pin 2: Ground (green/yellow)
Pin 3: L3 (red)
Pin 4: L2 (white)

Connections

Bulletin 280E/281E ArmorStart with EtherNet/IP Communications



Electrical Ratings		UL/NEMA			IEC		
Power Circuit	Rated Operation Voltage	200…480V			200…480V		
	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		
	Rated Operating Current Max.	280_-___-10A-*	1.2 A				
		280_-___-10B-*	2.5 A				
		280_-___-10C-*	5.5 A				
		280_-___-10D-*	16 A				
Control Circuit	Rated Operation Voltage	24V DC (+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
		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			—		

		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
	Approximate Shipping Weight	18.1 kg (40 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: (#16 …#10 AWG)	Primary/Secondary terminal: 1.5…4.0 mm^2
	Tightening Torque	Primary terminal: 10.8 lb•in Secondary terminal: 4.5 lb•in	Primary Terminal: (1.2 N•m) Secondary terminal: (0.5 N•m)
	Wire Strip Length	0.35 in. (9 mm)	
	Control and Safety Monitor Inputs		
	Wire Size	#18…#10 AWG	1.0…4.0 mm^2
	Tightening Torque	6.2 lb•in	0.7 N•m
	Wire Strip Length	0.35 in. (9 mm)	
	Disconnect Lock Out	Maximum of 5/16 in. (8 mm) lock shackle or hasp. The hasp should not exceed 5/16 in. (8 mm) when closed, or damage will occur to disconnect guard.	
EMC Emission Levels	Conducted Radio Frequency Emissions	10V rms Communication cables 10V rms (PE) 150 KHz…80 MHz	
	Radiated Emissions	Class A	
EMC Immunity Levels	Electrostatic Discharge	4 kV contact and 8 kV Air	
	Radio Frequency Electromagnetic Field	10V/m, 80 KHz…1 GHz 3V/m, 1.4 GHz…2.0 GHz 1V/m, 2.0 GHz…2.7 GHz	
	Fast Transient	2 kV (Power) 2 kV (PE) 1 kV (Communications and control)	
	Surge Transient	1 kV (12) $_{L-L}$, 2 kV (2) $_{L-N}$ (earth)	
Overload Rating	Overload Current Range	280_-___-10A-*	0.24…1.2 A
		280_-___-10B-*	0.5…2.5 A
		280_-___-10C-*	1.1…5.5 A
		280_-___-10D-*	3.2…16 A
	Trip Classes	10, 15, 20	
	Trip Rating	120% of FLC setting	
	Number of poles	3	
Standards Compliance		UL 508; CSA C22.2, No. 14; EN/IEC 60947-4; EN/IEC 60947-4-1; CE Marked per Low Voltage 2006/95/EC; EMC Directive 2004/108/EC; CCC; ODVA for EtherNet/IP; ODVA for DeviceNet	
Certifications		cULus (File No. E3125, Guides NLDX, NLDX7)	

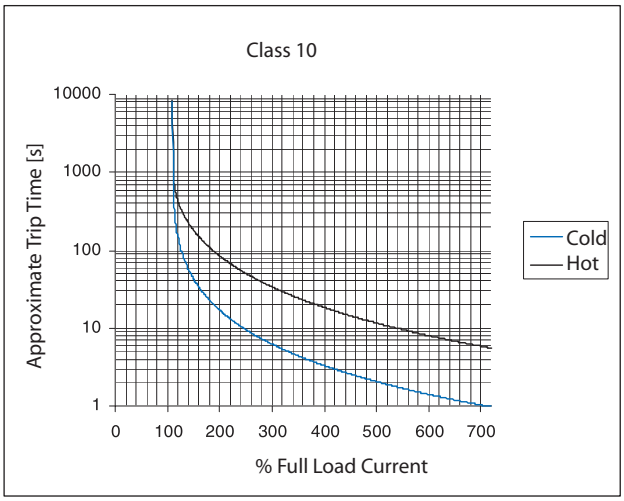
EtherNet/IP Version - Control and I/O Power Requirements						
		A1/A2✶	A3/A2❄	A1/A2✶	A3/A2❄	A3/A2‡
	Units	W/O HOA		W/ HOA		
Control Voltage	Volts	24V DC				
Module Inrush	Amps	0.92	0.30	1.09	0.125	0.295
Module Steady	Amps	0.06	0.30	0.23	0.125	0.295
Total Control Power (Pick Up)	Watts	22.08	7.20	26.16	3.00	7.08
Total Control Power (Running)	Watts	1.44	7.20	5.52	3.00	7.08

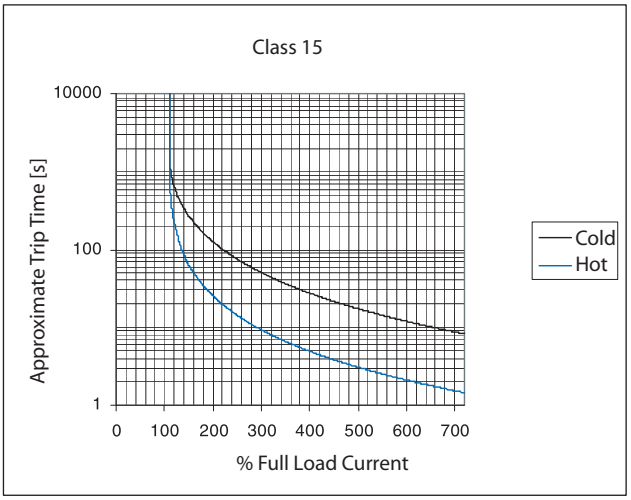
✶ Add power requirements for outputs (1 A max.) to A1/A2.
❄ Add power requirements for inputs (200 mA max.) to A3/A2.
‡ If A1 power is disconnected.

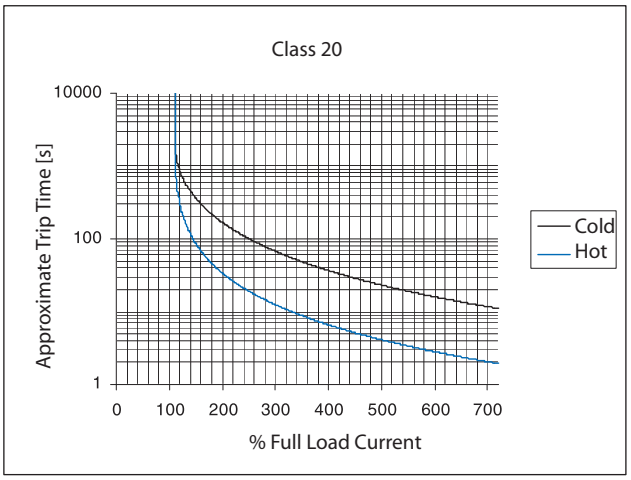
		UL/NEMA	IEC
Input Ratings Sourced from control circuit - A3/A2	Rated Operation Voltage	24V DC	
	Input On-State Voltage Range	10…26V DC	
	Input On-State Current	3.0 mA @ 10V DC	
		7.2 mA @ 24V DC	
	Input Off-State Voltage Range	0…5V DC	
	Input Off-State Current	<1.5 mA	
	Input Filter — Software Selectable		
	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…26.4V DC from DeviceNet	
	Current Available	50 mA max. per input, 200 mA total	
Output Ratings Sourced from Control Circuit - A1/A2	Rated Operation Voltage	26.4V DC	
	Rate Insulation Voltage	250V	
	Dielectric Withstand	1500V AC (UL)	2000V AC (IEC)
	Type of Control Circuit	Solid state sourcing output	
	Type of Current	24V DC	
	Conventional Thermal Current Ith	0.5 A each, 1 A max. combined	
	Type of Contacts	Normally open (N.O.)	
	Number of Contacts	2	
	Load Types	Resistive or light inductive	
	Surge Suppression	Integrated diode, clamps @ 35V DC	
	Thermo-Protection	Integrated short circuit and over current protection	
	Maximum Cycle Rate	30 operations/minute capacitive and inductive loads	
	Maximum Blocking Voltage	35V DC	
	Maximum On-State Voltage @ Maximum Output	1.5V DC	
	Maximum Off-State Leakage Current	10 µA	
Device Level Ring (DLR)		Beacon-based performance including IEEE 1588 end to end transparent clock	
	Maximum Nodes	50	
	Fault Recovery	Ring recovery time is less than 3 ms for a 50 node network	
EtherNet Port		2 D-coded, 4-pin female M12 connecters	
	Ports	Embedded switch with 2 ports	
	IP Address	DHCP enabled by default	
	DHCP Timeout	30 seconds	
	Communication Rate	10/100 Mbs with auto negotiate half duplex and full duplex	
	Data	Transported over both TCP and UDP	
Web Server		Embedded web server	
	Security	Login and password configurable	
	E-mail	Support Simple Mail Transfer Protocol (SMTP)	
	Configuration	Status, diagnostics, and configuration tabs	
Device Connections		Supports scheduled (Class 1) and unscheduled (Class 3 & UCMM) connections	
		6 - Class 3 connections	
		2 - Class 1 (1 exclusive owner, 1 input only and 1 listen only) connections are supported	

Motor Overload Trip Curves

Motor OL current parameter provides class 10,15, and 20 overload protection. Ambient insensitivity is inherent in the electronic design of the overload.

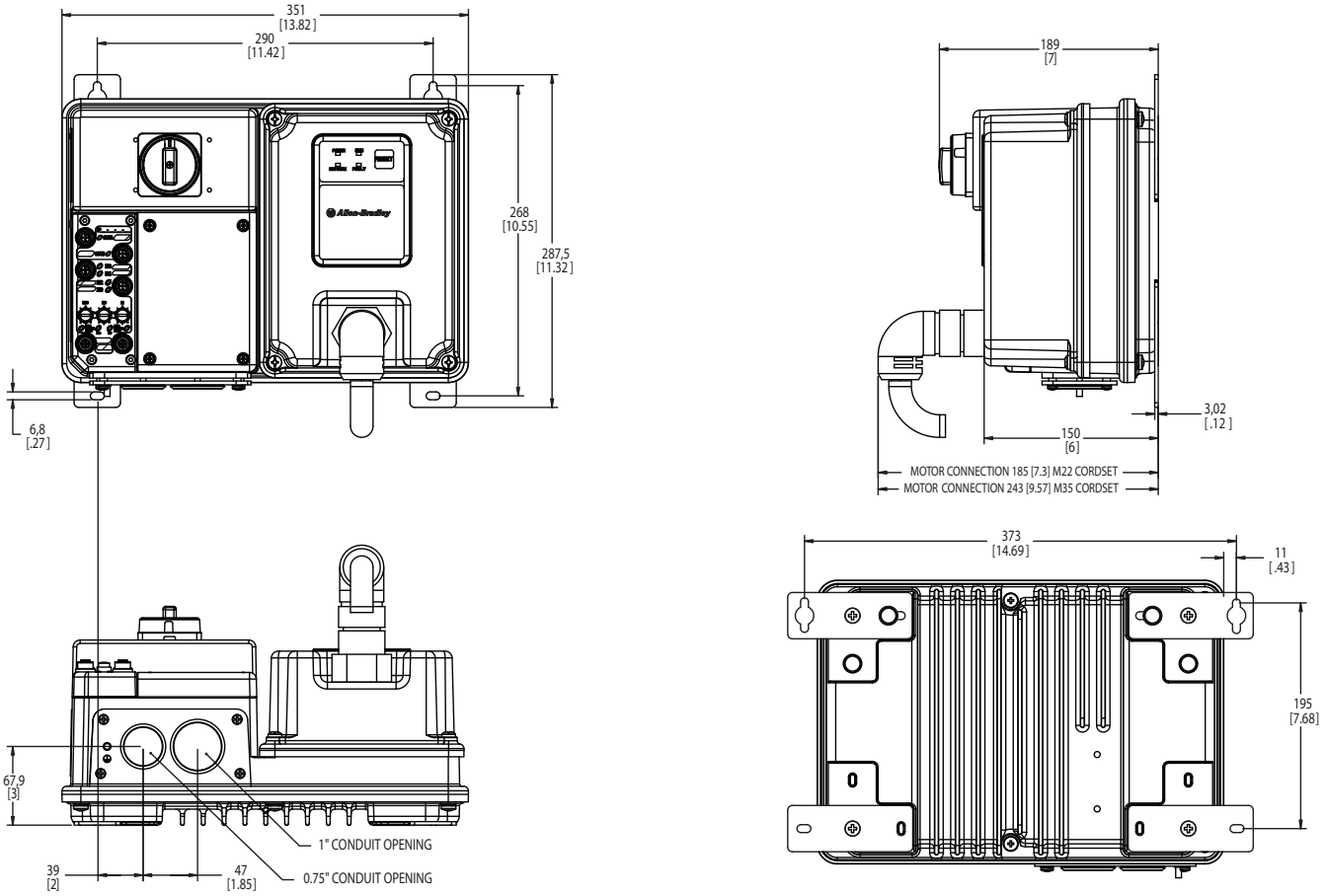






Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

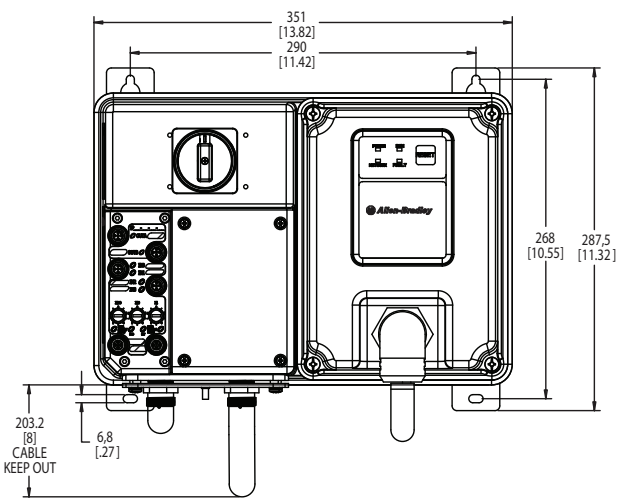
Dimensions for IP67/NEMA Type 4 with Conduit Entrance

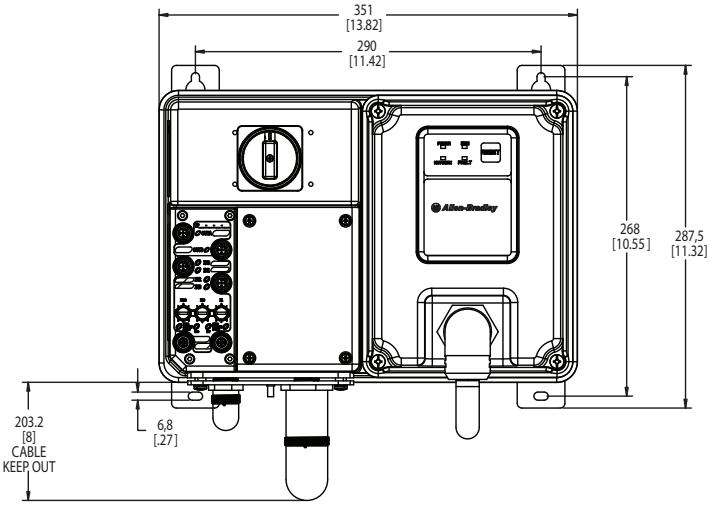


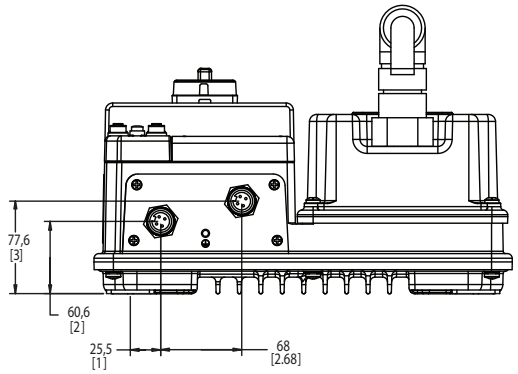
Approximate Dimensions

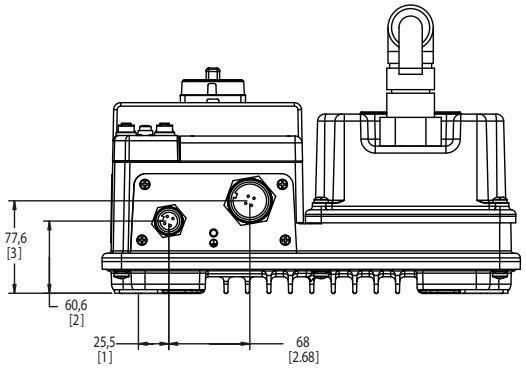
Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

Dimensions for IP67/NEMA Type 4 with ArmorConnect Connectivity









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)
- EtherNet/IP communications
- Robust IP67/NEMA Type 4 enclosure rating
- Quick disconnect for I/O, communications, motor, three-phase, and control power connections
- LED status indication
- Local logic technology using DeviceLogix
- Factory installed options:
  - EMI filter
  - Dynamic brake connector
  - Hand/Off/Auto (HOA) with jog
  - Source brake contactor
  - Shielded motor cable
  - Output contactor

Table of Contents

Standards Compliance

UL 508C
CSA C22.2, No. 14
EN/IEC 60947-4-2, EN 50178, EN 61800-3
CE Marked per Low Voltage Directive 2006/95/EC and EMC Directive 2004/108/EC
CCC
ODVA for EtherNet/IP and DeviceNet

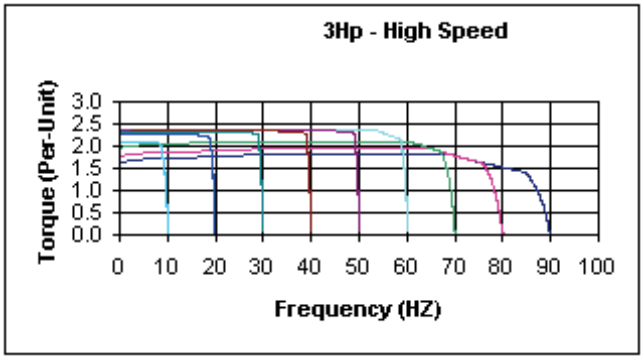
Certifications

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

Mode of Operation

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.



- The Autotune feature allows the Bulletin 284 (SVC) to adapt to individual motor characteristics.
- Timer, Counter, Basic Logic and StepLogic™ functions can reduce hardware design costs and simplify control schemes.
- Integral PID functionality enhances application flexibility.
- Develops high torque over a wide speed range and adapts to individual motor characteristics.

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.

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
- Overtemperature
- Output Fuse Protection
- Brake Fuse Protection
- Internal Communication Fault
- DC Bus Fault
- EEPROM Fault
- Hardware Fault
- Restart Retries
- Miscellaneous Fault

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 is required to be CE compliant. When selected, a 3–meter shielded 4–conductor motor cordset is provided as standard. This is only available with sensorless vector control.

Source Brake Contactor

An internal contactor is used to switch an electromechanical motor brake On/Off. The motor brake contactor is powered from the main power circuit. The configuration of the R1 relay controls the function of the brake. A customer accessible 2.5 A fuse is provided to protect the brake cable. Included is a 3-meter 3-pin cordset for connection to the motor brake as standard.

Shielded Motor Cable

A 3-meter shielded 4-conductor cordset is provided instead of the 3-meter unshielded 4-conductor cordset, when the EMI Filter is selected.

Dynamic Brake Connector

This includes a 3-meter, 3-pin cordset for connection to a IP20 dynamic brake module. See Accessories on page 29 for available modules.

IP67 Dynamic Brake Connector

The IP67 Dynamic Brake Resistor design offers simplicity in wiring and installation. The DB1 option must be selected in order to have the quick disconnect connectivity. The cable length of the IP67 Dynamic Brake Resistor is available in 0.5 and 1.0 m. See Accessories on page 30 for available IP67 Dynamic Brake Resistors.

Output Contactor

An internal contactor is sourced from control voltage to isolate the load side of the VFD. Control voltage or the at-motor disconnect controls the ON/OFF of the output contactor. A sequenced stop involving the output contact cannot be performed.

Sensorless Vector Control (SVC), typical of Powerflex 40 Class Drive

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

a

Bulletin Number	
Code	Description
284	VFD Starter

b

Communications	
Code	Description
E	EtherNet/IP

c

Enclosure Type	
Code	Description
F	Type 4 (IP67)

d

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

e

Output Current	
380…480V	
Code	Description
D1P4	1.4 A, 0.4 kW, 0.5 Hp
D2P3	2.3 A, 0.75 kW, 1.0 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

g

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

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 26 for extended motor and brake cable lengths.

i

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

j

Option 2		
Code		Description
DB	blank	DB Brake Connector
DB1	blank	Connectivity to IP67 DB Resistor
SB	blank	Source Brake Contactor
SB	W ∗	No cable

k

Option 3	
Code	Description
EMI	EMI Filter
OC	Output Contactor

EtherNet/IP Network Communication

IP67/NEMA Type 4 with conduit entrance, Sensorless Vector Control, 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 Cat. No.
380...480V, 50/60 Hz 3-Phase	0.4	0.5	1.4	284E-FVD1P4Z-10-CR
	0.75	1	2.3	284E-FVD2P3Z-10-CR
	1.5	2	4	284E-FVD4P0Z-10-CR
	2.2	3	6	284E-FVD6P0Z-25-CR
	3	5	7.6	284E-FVD7P6Z-25-CR

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

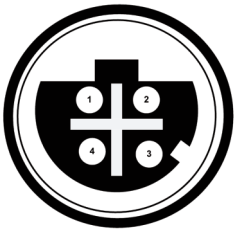
Input Voltage	3-Phase kW Rating	3-Phase Hp Rating	Output Current	24V DC Control Voltage Cat. No.
380…480V, 50/60 Hz 3-Phase	0.4	0.5	1.4	284E-FVD1P4Z-10-RR
	0.75	1	2.3	284E-FVD2P3Z-10-RR
	1.5	2	4	284E-FVD4P0Z-10-RR
	2.2	3	6	284E-FVD6P0Z-25-RR
	3	5	7.6	284E-FVD7P6Z-25-RR

Options – Factory Installed

Description		Cat. No. Modification
	Hand/Off/Auto Selector and Jog Keypad	-3
	EMI Filter	-EMI
	Output Contactor	-OC
	Shielded motor cable	-CRN
	Supplied without motor cable	-CRW
	Source brake supplied with cable	-SB
	Source brake supplied without cable	-SBW
	Dynamic Brake Connector (IP20 brake)	-DB
	Dynamic Brake Connector (IP67 brake)	-DB1
	ArmorConnect Power Media Connectivity, ArmorStart supplied with shielded motor cable	-RRN
	ArmorConnect Power Media Connectivity, ArmorStart supplied without motor cable	-RRW

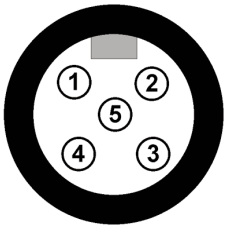
ArmorStart Receptacle Pin Outs

Receptacle Connections for EtherNet/IP (M12)



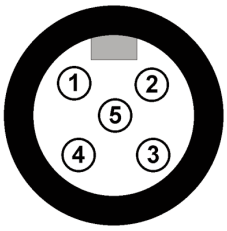
Pin 1: Tx+
Pin 2: Rx+
Pin 3: Tx-
Pin 4: Rx-

Receptacle Connections for Input (M12)



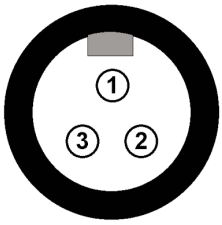
Pin 1: +24V (A3 or DNET)
Pin 2: Input 0
Pin 3: Common
Pin 4: Input 1
Pin 5: NC (no connection)

Receptacle Connections for Output, EtherNet/IP Version (M12)



Pin 1: NC (no connection)
Pin 2: NC (no connection)
Pin 3: Common
Pin 4: Output +24V DC (A1)
Pin 5: NC (no connection)

Receptacle Connections for Dynamic Brake (M22) — Bulletin 284E only

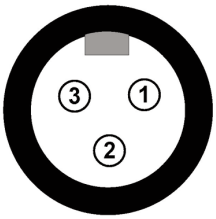


Pin 1: GND (green/yellow)
Pin 2: BR+ (black)
Pin 3: BR- (white)

Receptacle Connections for Incoming Control Power - 24V DC Only

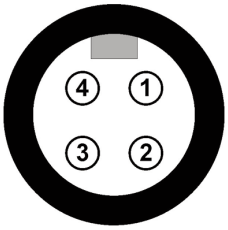
Pin 1: +24V DC unswitched (A3)(red)
Pin 2: Common (A2)(black)
Pin 3: PE (green)
Pin 4: Not used (blank)
Pin 5: +24V DC switched (A1)(blue)
Pin 6: Not used (white)

Receptacle Connections for Source or Control Brake — Bulletin 284E only



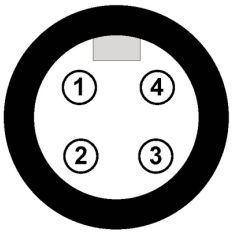
Pin 1: L1 (black)
Pin 2: GND (green/yellow)
Pin 3: L2 (white)

Receptacle Connections for Motor Connector -(M22)
Bulletin 280E/281E: 3 Hp or less
Bulletin 284E: 5 Hp or less



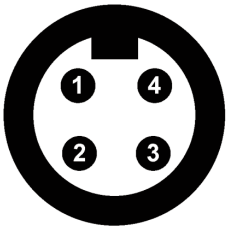
Pin 1: T1 (black)
Pin 2: T2 (white)
Pin 3: T3 (red)
Pin 4: Ground (green/yellow)

Receptacle Connections for Motor Connector - 10 Hp or greater (M35) — Bulletin 280E/281E only



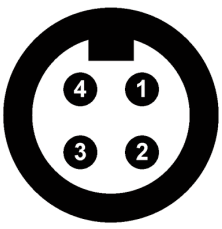
Pin 1: T1 (black)
Pin 2: Ground (green/yellow)
Pin 3: T3 (red)
Pin 4: T2 (white)

Receptacle Connections for Incoming 3-phase Power - 10 A Short Circuit Protection (M22)



Pin 1: L1 (black)
Pin 2: L2 (white)
Pin 3: L3 (red)
Pin 4: Ground (green/yellow)

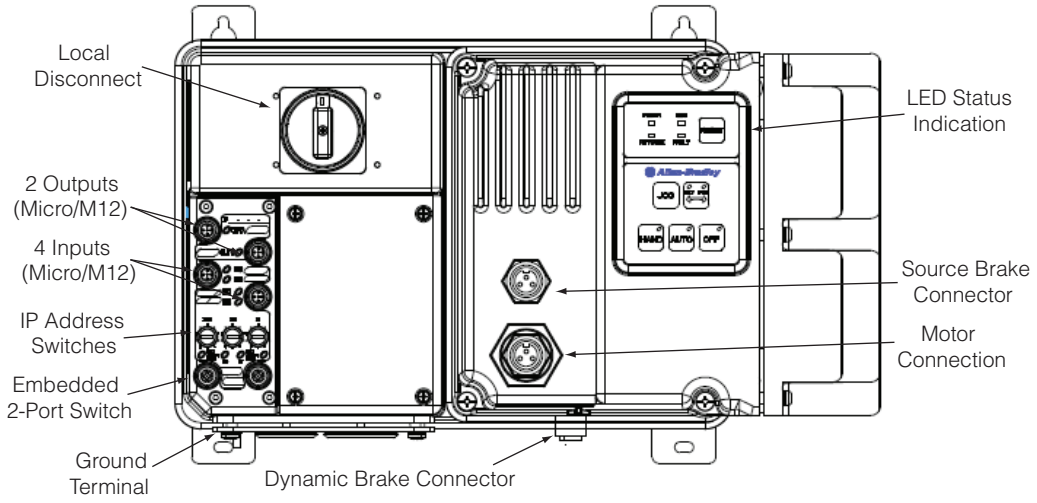
Receptacle Connections for Incoming 3-phase Power - 25 A Short Circuit Protection (M35)



Pin 1: L1 (black)
Pin 2: Ground (green/yellow)
Pin 3: L3 (red)
Pin 4: L2 (white)

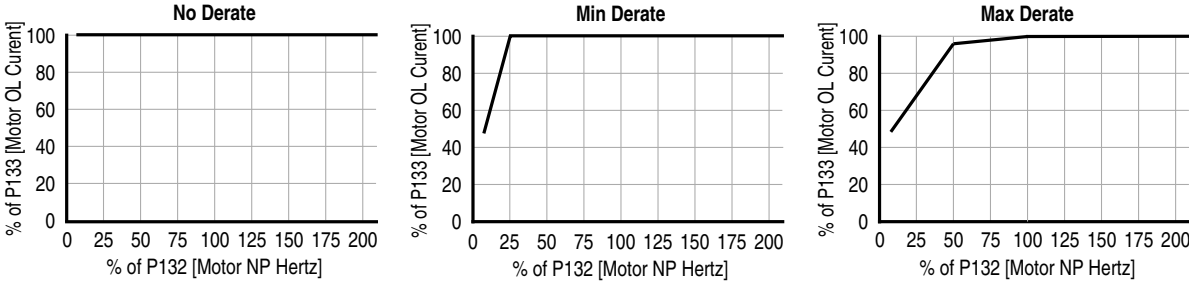
Connections

Bulletin 284E ArmorStart with EtherNet/IP Communications



Motor Overload Trip Curves

Motor OL current parameter provides class 10 overload protection. Ambient insensitivity is inherent in the electronic design of the overload.



Electrical Ratings		UL/NEMA			IEC		
Power Circuit	Rated Operation Voltage	380…480V			380…480V		
	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		
	Rated Maximum Operating Current	2.5 A					
		5.5 A					
		16 A					
Control Circuit	Rated Operation Voltage	24V DC (+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			50/60 Hz		
Short Circuit Protection	SCPD performance Type 1	**Current Rating**	**Voltage**	480Y/277V	480/480V	600Y/347V	600V
		10 A	Sym. Amps RMS	65 kA	65 kA	30 kA	30 kA
		25 A		30 kA	30 kA	30 kA	30 kA
	SCPD List	Size per NEC Group Motor			—		

		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
	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: (16 …10 AWG)	Primary/Secondary terminal: 1.5…4.0 mm^2
	Tightening Torque	Primary terminal: 10.8 lb•in Secondary terminal: 4.5 lb•in	Primary terminal: (1.2 N•m) Secondary terminal: (0.5 N•m)
	Wire Strip Length	0.35 in. (9 mm)	
	Control and Safety Monitor Inputs		
	Wire Size	(18…10 AWG)	1.0…4.0 mm^2
	Tightening Torque	6.2 lb•in	0.7 N•m
	Wire Strip Length	0.35 in. (9 mm)	
	Disconnect Lock Out	Maximum of 5/16 in. (8 mm) lock shackle or hasp. The hasp should not exceed 5/16 in. (8 mm) when closed, or damage will occur to disconnect guard.	
EMC Emission Levels	Conducted Radio Frequency Emissions	10V rms Communication cables 10V rms (PE) 150 KHz…80 MHz	
	Radiated Emissions	Class A	
EMC Immunity Levels	Electrostatic Discharge	4 kV contact and 8 kV Air	
	Radio Frequency Electromagnetic Field	10V/m, 80 KHz…1 GHz 3V/m, 1.4 GHz…2.0 GHz 1V/m, 2.0 GHz…2.7 GHz	
	Fast Transient	2 kV (Power) 2 kV (PE) 1 kV (Communications and control)	
	Surge Transient	1 kV (12) $_{L-L}$, 2 kV (2) $_{L-N}$ (earth)	
Standards Compliance		UL 508C; CSA C22.2, No. 14; EN50178; EN61800-3; EN/IEC 60947-4-2; CE Marked per Low Voltage 2006/95/EC; EMC Directive 2004/108/EC; CCC; ODVA for EtherNet/IP; ODVA for DeviceNet	
Certifications		cULus (File No. E207834, Guide NMMS, NMMS7)	

Specifications

Drive Characteristics	Sensorless Vector Control
Maximum Hp (kW)/Input Voltage	2 Hp (1.5 kW)/230V AC 5 Hp (3.3 kW)/480V AC, 5 Hp (4.0 kW)/600V AC
Overload Capacity	150% for 60 seconds, 200% for 3 seconds
Preset Speeds	8
Carrier Frequency	2…16 kHz
Skip Frequency	✓
Process Control Loop	✓ (PID)
StepLogic Functionality	✓
Timer/Counter Functions	✓

Drive Ratings — VFD Output Current vs. Input Current					
Line Voltage	Frequency [Hz]	3-Phase kW Rating	3-Phase Hp Rating	Output Current [A]	Input Current [A]
				Sensorless Vector Control	Sensorless Vector Control
380	50	0.4	—	1.4	2.15
		0.75	—	2.3	3.80
		1.5	—	4.0	6.40
		2.2	—	6.0	9.00
		3.0	—	7.6	12.40
460	60	—	0.5	1.4	1.85
		—	1	2.3	3.45
		—	2	4.0	5.57
		—	3	6.0	8.20
		—	5	7.6	12.5

Protective Specifications — Sensorless Vector Control	
Motor Protection	I^2t overload protection — 150% for 60 seconds, 200% for 3 seconds (provides Class 10 protection)
Overcurrent	200% hardware limit, 300% instantaneous fault
Over Voltage	380…460V AC Input — Trip occurs @ 810V DC bus voltage (equivalent to 575V AC incoming line)
Under Voltage	380…480V AC Input — Trip occurs @ 390V DC bus voltage (equivalent to 275V AC incoming line)
Faultless Power Ride Through	100 milliseconds

Control Specifications — Sensorless Vector Control	
Carrier Frequency	2…16 kHz drive rating based on 4 kHz
Frequency Accuracy **Digital Input** **Analog Input**	 within ±0.05% of set output frequency within ±0.5% of maximum output frequency, 10-bit resolution
Speed Regulation (open loop with slip compensation)	±1% of base speed across a 60:1 speed range
Stop Modes	Multiple programmable stop modes including: Ramp, Coast, DC-Brake, Ramp-to-Hold, and S Curve
Acceleration/Deceleration	Two independently programmable acceleration and deceleration times: each time may be programmed from 0…600 seconds in 0.1 second increments
Intermittent Overload	150% overload capability for up to 1 minute, 200% overload capability for up to 3 seconds
Electronic Motor Overload Protection	Class 10 protection with speed sensitive response

Sensorless Vector Control (SVC) Minimum DB Resistance			
	Drive Rating		Minimum DB Resistance
Input Voltage	[kW]	[Hp]	[Ω]
480V, 50/60 Hz, Three-Phase	0.4	0.5	97
	0.75	1	97
	1.5	2	97
	2.2	3	97
	4.0	5	77

✦ Resistors listed are rated 5% duty cycle.

EtherNet/IP Version - Control and I/O Power Requirements				
	Units	A1/A2✶	A3/A2❄	A3/A2‡
Control Voltage	Volts	24V DC		
Current	Amps	0.375	0.125	0.35
Total Control Power (no options)	Watts	9	3	8.4
Total Control Power (with Dynamic Brake **or** Output Contactor option)	Watts	12	3	8.4
Total Control Power (with Dynamic Brake **and** Output Contactor option)	Watts	15	3	8.4

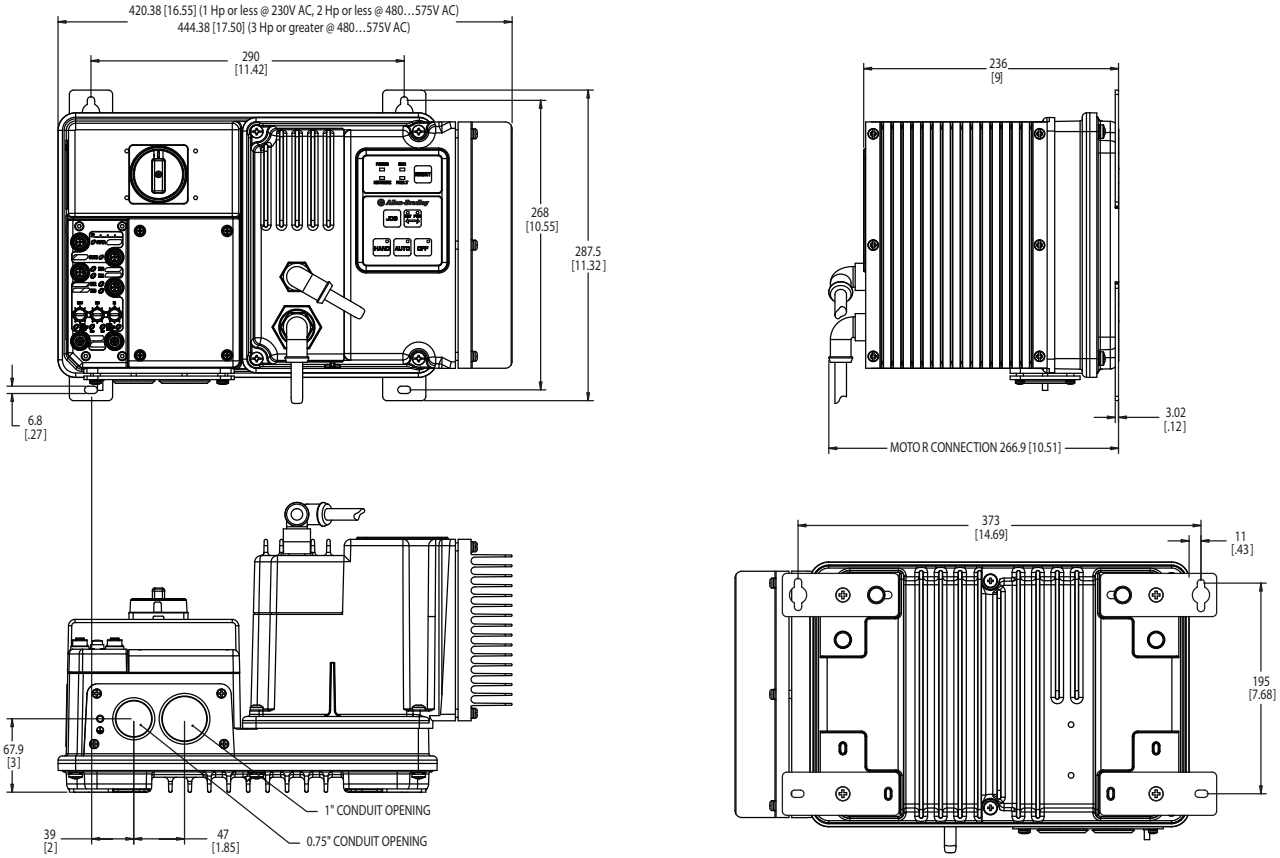
✶ Add power requirements for outputs (1 A max.) to A1/A2.
❄ Add power requirements for intputs (200 mA max.) to A3/A2.
‡ If A1 power is disconnected.

		UL/NEMA	IEC
Input Ratings Sourced from control circuit - A3/A2	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…26.4V DC from DeviceNet	
	Current Available	50 mA max. per input, 200 mA total	
Output Ratings Sourced from control circuit - A1/A2	Rated Operation Voltage	26.4V DC	
	Rate Insulation Voltage	250V	
	Dielectric Withstand	1500V AC (UL)	2000V AC (IEC)
	Type of Control Circuit	Solid state sourcing output	
	Type of Current	24V DC	
	Conventional Thermal Current Ith	0.5 A each, 1 A max. combined	
	Type of Contacts	Normally open (N.O.)	
	Number of Contacts	2	
	Load Types	Resistive or light inductive	
	Surge Suppression	Integrated diode, clamps @ 35V DC	
	Thermo-Protection	Integrated short circuit and over current protection	
	Maximum Cycle Rate	30 operations/minute capacitive and inductive loads	
	Maximum Blocking Voltage	35V DC	
	Maximum On-State Voltage @ Maximum Output	1.5V DC	
	Maximum Off-State Leakage Current	10 µA	
Device Level Ring (DLR)		Beacon-based performance including IEEE 1588 end to end transparent clock	
	Maximum Nodes	50	
	Fault Recovery	Ring recovery time is less than 3 ms for a 50 node network	
EtherNet Port		2 D-coded, 4-pin female M12 connecters	
	Ports	Embedded switch with 2 ports	
	IP Address	DHCP enabled by default	
	DHCP Timeout	30 seconds	
	Communication Rate	10/100 Mbs with auto negotiate half duplex and full duplex	
	Data	Transported over both TCP and UDP	
Web Server		Embedded web server	
	Security	Login and password configurable	
	E-mail	Support Simple Mail Transfer Protocol (SMTP)	
	Configuration	Status, diagnostics, and configuration tabs	
Device Connections		Supports scheduled (Class 1) and unscheduled (Class 3 & UCMM) connections	
		6 - Class 3 connections	
		2 - Class 1 (1 exclusive owner, 1 input only and 1 listen only) connections are supported	

Approximate Dimensions

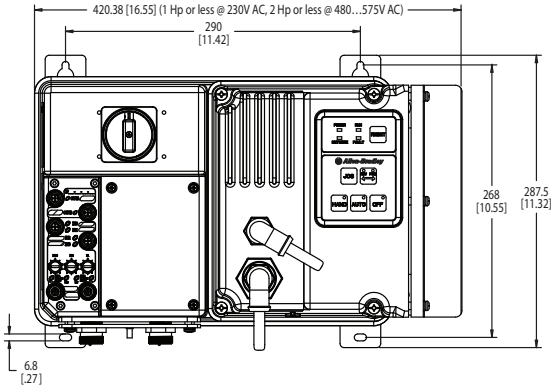
Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

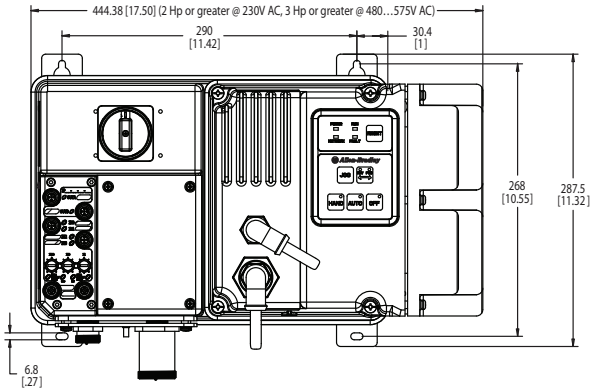
Dimensions for IP67/NEMA Type 4 with Conduit Entrance

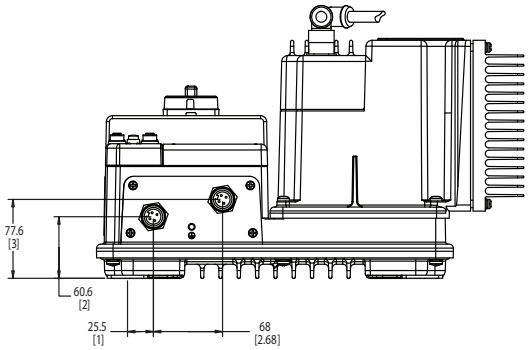


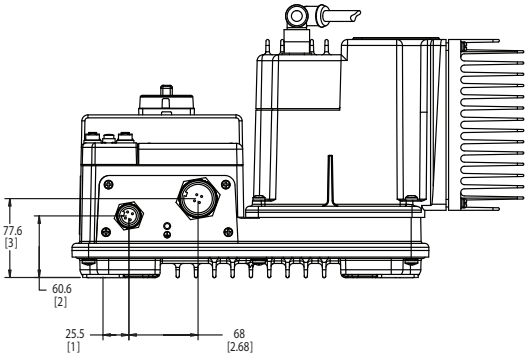
Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes. All dimensions are subject to change.

Dimensions for IP67/NEMA Type 4 with ArmorConnect Connectivity



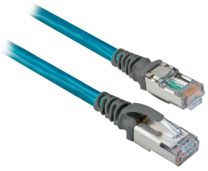






Industrial EtherNet Media♣

Description	Connector Type	Unshielded Cat. No.
M12, D-Code Patchcords and Cordsets		
	Straight male to straight male	1585D-M4TBDM-✶
	Straight male to right angle male	1585D-M4TBDE-✶
	Right angle male to right angle male	1585D-E4TBDE-✶
	Straight male to straight female	1585D-M4TBDF-✶
Front Mount Receptacle		
	Front mount female to RJ45	1585D-D4TBJM-✶
Transition Cable		
	Straight male to RJ45	1585D-M4TBJM-✶

Description	Conductors	Jacket Material	Cable Type	Jacket Color	Cat. No.
RJ45 Patchcords					
	4-pair	Riser PVC	Unshielded twisted pair	Teal	1585J-M8PBJM-✶
		High-flex TPE		Teal	1585J-M8TBJM-✶
M12 to RJ45 Bulkhead Adapter					
	• Transition from IP20 environment to IP67 environment • In-cabinet connectivity with RJ45 connector providing On-Machine solution with M12 D Code connector • Differential 100 ohm terminators used for unused pairs • Cat 5e				1585A-DD4JD

✶ Replace symbol with 1 (1 m), 2 (2 m), 5 (5 m) or 10 (10 m) for standard cable lengths and additional increments of 5 m, up to 75 m.
♣ See On-Machine Connectivity Catalog for complete cable selection information.

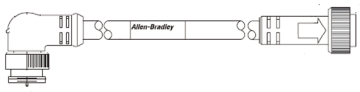
Sensor Media ⌘

Description		ArmorStart I/O Connection	Pin Count	Connector	Cat. No.
EtherNet/IP Communications					
	DC Micro Patchcord	Input/Output	4-pin	Straight Female Straight Male	889D-F4ACDM-➤
				Straight Female Right Angle Male	889D-F4ACDE-➤
	DC Micro V-Cable	Input	4-pin	Straight Female	879D-F4ACDM-➤
				Right Angle Male	879D-R4ACM-➤

⌘ See On-Machine™ Connectivity Catalog 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.

Motor and Brake Cables

Description		Cable Rating	Length [m (ft)]	Cat. No.
Motor Cable Cordsets	90° M22 Motor Cordset	IP67/NEMA Type 4	3 (9.8)	280-MTR22-M3
			6 (19.6)	280-MTR22-M6
			10 (32.8)	280-MTR22-M10
			14 (45.9)	280-MTR22-M14
			20 (65.6)	280-MTR22-M20
	90° M35 Motor Cordset	IP67/NEMA Type 4	3 (9.8)	280-MTR35-M3
			6 (19.6)	280-MTR35-M6
			10 (32.8)	280-MTR35-M10
			14 (45.9)	280-MTR35-M14
			20 (65.6)	280-MTR35-M20
Motor Cable Cordsets, High Flex	90° M22 Motor Cordset	IP67/NEMA Type 4	3 (9.8)	280-MTRF22-M3
			6 (19.6)	280-MTRF22-M6
			8 (26.2)	280-MTRF22-M8
			10 (32.8)	280-MTRF22-M10
			14 (45.9)	280-MTRF22-M14
			20 (65.6)	280-MTRF22-M20
Motor Cable Cordsets, Shielded (VFD)	90° M22 Motor Cordset	IP67/NEMA Type 4	3 (9.8)	284-MTRS22-M3
			6 (19.6)	284-MTRS22-M6
			14 (45.9)	284-MTRS22-M14
Extended Source/Control Brake Cable Cordsets	90° M25 Source Brake Cable	IP67/NEMA Type 4	6 (19.6)	285-BRC25-M6
			14 (45.9)	285-BRC25-M14
Extended Source/Control Brake Cable Cordsets, High Flex	90° M25 Source Brake Cable	IP67/NEMA Type 4	3 (9.8)	285-BRCF25-M3
			6 (19.6)	285-BRCF25-M6
			10 (32.8)	285-BRCF25-M10
			14 (45.9)	285-BRCF25-M14
			20 (65.6)	285-BRCF25-M20



Description	Description	Cable Rating	Length [m (ft)]	Cat. No.
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
Motor Cable Patchcords, Shielded (VFD)	90° Male/Straight Female M22	IP67/NEMA Type 4	1 (3.3)	284-MTRS22-M1D
			3 (9.8)	284-MTRS22-M3D

Dynamic Brake Cable

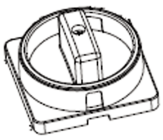
Description	Cable Rating	Length [m (ft)]	Cat. No.
M22 Dynamic Brake Cable (DB Option)	IP67/NEMA Type 4	3 (9.8)	285-DBK22-M3

Sealing Caps

	EtherNet/IP	
	Input	Output
	Cat. No.	Cat. No.
Plastic Sealing Cap (M12)✶	1485A-M12	1485A-M12
Motor Connector Aluminum Sealing Cap (M22) for 10 A protection✶	—	1485A-C1
Motor Connector Aluminum Sealing Cap (M35) for 25 A protection✶	—	889A-QMCAP
Dynamic Brake Connector (M22)	—	1485A-C1
Source/Control Brake Cap (M25)	—	♣

✶ To achieve IP67 rating, sealing caps must be installed on all unused I/O connections.
♣ Contact your local Allen-Bradley sales office or Rockwell Automation distributor.

Other Accessories

	Description	Cat. No.
	**Locking Tag** • Padlock attachment to the lockable handles • Up to three padlocks 4…8 mm (5/16 in.) Ø shackle	140M-C-M3
	Replacement At-Motor Handle Kit includes: (1) handle, (1) guard, and (3) screws	280-DISHDL
Cord grips for ArmorStart devices with 10 A short circuit protection rating		
	3/4 in. Strain relief cord connector and 3/4 in. lock nut Cable range: 0.31…0.56 in. Used with control power media cordset - Example cat. no.: 889N-M65GF-M2	Thomas & Betts Cord Grip Cat. No. 2931NM
	1 in. Strain relief cord connector and 1 in. lock nut Cable range: 0.31…0.56 in. Used with control power media cordset - Example cat. no.: 280-PWR22G-M	Thomas & Betts Cord Grip Cat. No. 2940NM
Cord grips for ArmorStart devices with 25 A short circuit protection rating		
	3/4 in. Strain relief cord connector and 3/4 in. lock nut Cable range: 0.31…0.56 in. Used with control power media cordset - Example cat. no.: 889N-M65GF-M2	Thomas & Betts Cord Grip Cat. No. 2931NM
	1 in. Strain relief cord connector and 1 in. lock nut Cable range: 0.70…0.95 in. Used with three-phase power media cordset - Example cat. no.: 280-PWR35G-M1	Thomas & Betts Cord Grip Cat. No. 2942NM

Dynamic Brake Selection for DB Option

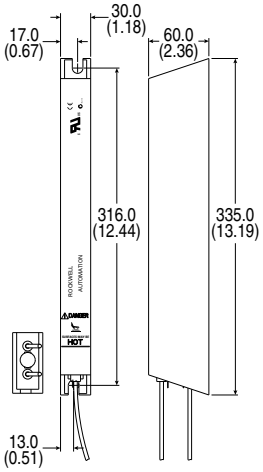
Drive and Motor Size [kW (Hp)]	Resistance [Ω]	Continuous Power [kW]	Max. Energy [kJ]	Max. Braking Torque [% of motor]	Application Type 1❄		Application Type 2❄		Cat. No.∗
					Braking Torque [% of motor]	Duty Cycle‡	Braking Torque [% of motor]	Duty Cycle‡	
380…480V AC Input Drives									
0.37 (0.5)	360	0.086	17	305%	100%	47%	150%	31%	AK-R2-360P500
0.75 (1)	360	0.086	17	220%		23%	150%	15%	AK-R2-360P500
1.5 (2)	360	0.086	17	110%		12%	110%	11%	AK-R2-360P500
2.2 (4)	120	0.26	52	197%		24%	150%	16%	AK-R2-120P1K2
4 (5)	120	0.26	52	124%		13%	124%	10%	AK-R2-120P1K2

∗ Check resistor ohms against the minimum resistance for the drive that is being used.
‡ The duty cycle listed is based on the full speed to zero deceleration. For constant regen at full speed, the duty cycle capability is half the values listed.
❄ Application Type 1 represents maximum capability up to 100% of braking torque, where possible. Application Type 2 represents greater than 100% of braking torque up to a maximum of 150%, where possible.

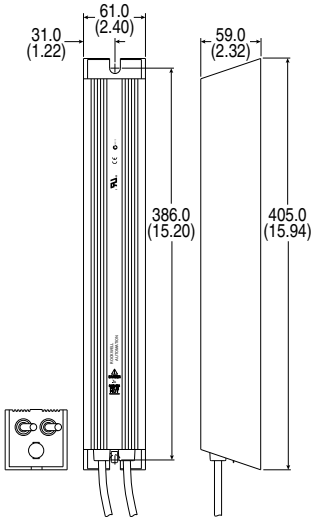
ArmorStart Bulletin 284 Option DB (IP20) Resistor Installation Dimensions

Dimensions are in millimeters (inches) and weights are in kilograms (pounds). Dimensions are not intended to be used for manufacturing purposes.

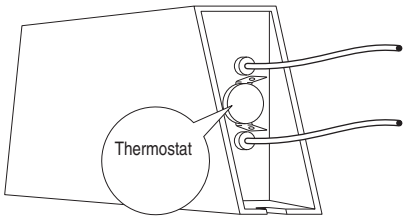
Frame A



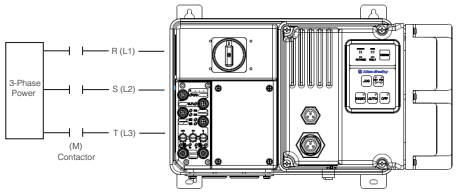
Frame B

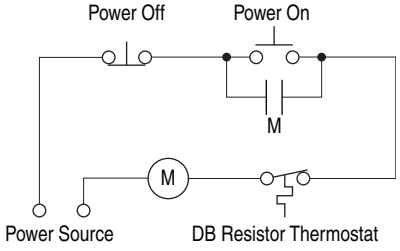


Frame	Cat. No.	Weight [kg (lb)]
A	AK-R2-091P500, AK-R2-047P500, AK-R2-360P500	1.1 (2.5)
B	AK-R2-030P1K2, AK-R2-120P1K2	2.7 (6)



Recommended thermostat control wiring to prevent dynamic brake overheating





Dynamic Brake Selection for DB1 (IP67) Option

Drive and Motor Size [kW (Hp)]	Resistance [Ω]	Continuous Power [kW]	Max. Energy [kJ]	Max. Braking Torque [% of motor]	Application Type 1❄		Application Type 2❄		Cat. No.§
					Braking Torque [% of motor]	Duty Cycle‡	Braking Torque [% of motor]	Duty Cycle‡	
380…480V AC Input Drives									
0.37 (0.5)	360	0.086	17	305%	100%	47%	150%	31%	284R-360P500-M∗
0.75 (1)	360	0.086	17	220%		23%	150%	15%	284R-360P500-M∗
1.5 (2)	360	0.086	17	110%		12%	110%	11%	284R-360P500-M∗
2.2 (4)	120	0.26	52	197%		24%	150%	16%	284R-120P1K2-M∗
4 (5)	120	0.26	52	124%		13%	124%	10%	284R-120P1K2-M∗

∗ Length is user-selectable based on a suffix added to the catalog number. For a length of 500±10 mm, add **-M05** to the end of the catalog number. For a length of 1000±10 mm, add **-M1** to the end of the catalog number.

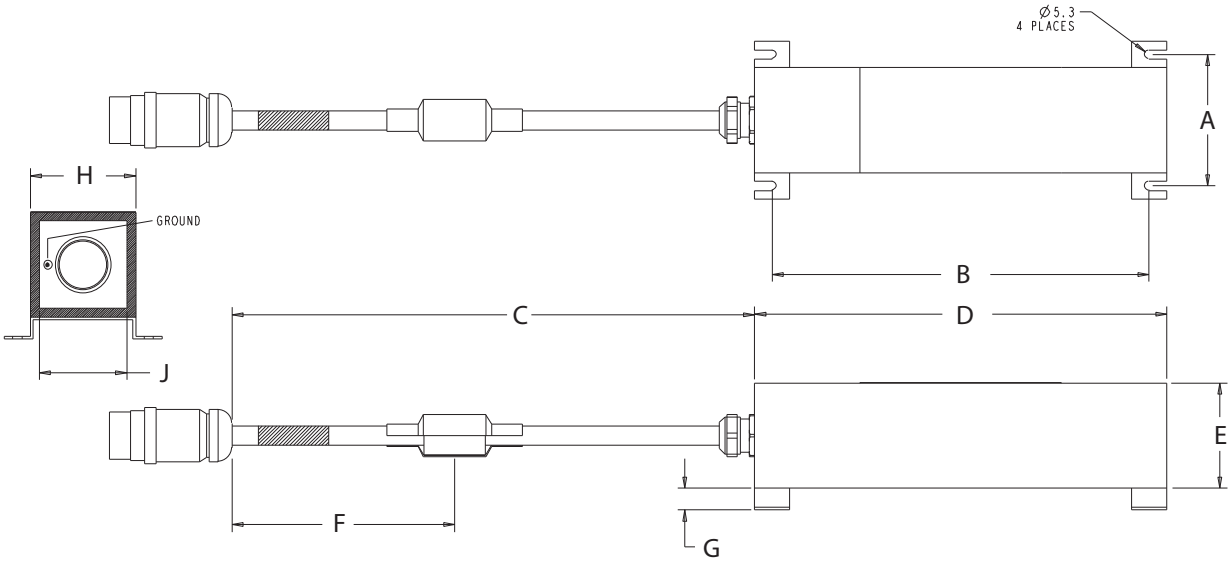
‡ The duty cycle listed is based on the full speed to zero deceleration. For constant regen at full speed, the duty cycle capability is half the values listed.

❄ Application Type 1 represents maximum capability up to 100% of braking torque, where possible. Application Type 2 represents greater than 100% of braking torque up to a maximum of 150%, where possible.

§ Drive rating and DB part numbers are not interchangeable. Only use specified resistor. Customer is responsible to evaluate if performance meets application requirement

ArmorStart Bulletin 284 Option DB1 (IP67) Resistor Installation Dimensions

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



Cat. No.	A	B	C	D	E	F	G	H	J
284R-091P500	89±3 (3.5±0.12)	215±5 (8.46±0.2)	M05 = 0.5 meter M1 = 1 meter	235±5 (9.25±0.2)	60±2 (2.36±0.08)	127 (5)	12.54 (0.49)	60±2 (2.36±0.08)	50±1.5 (1.97±0.06)
284R-360P500		215±5 (8.46±0.2)		235±5 (9.25±0.2)					
284R-120P1K2		420±5 (16.54±0.2)		440±5 (17.32±0.2)					

Note: The customer must protect the resistor in the event of a shorted switch in the VFD. This is done via PLC control. An example ControlLogix program can be downloaded from - http://samplecode.rockwellautomation.com

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	• Cordset - Cable with Integrel Female or Male connector on one end • PatchCord - Cable with integrel female or male connector on each end	• Cordset - Cable with Integrel Female or Male connector on one end • PatchCord - Cable with integrel female or male connector on each end	• Tee - Connects to a single drop line to trunk with M35 connectors • Reducing Tee - Connects to a single M22 drop line to trunk M35 connector • Reducer - Connects from M35 male connector to M22 female connector	• Female receptacles are a panel mount connector with flying leads • Male receptacles are a motor juction box mounted connector with flying leads	• 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	• Rated for Motor Branch Circuits - Meets UL 2237 for Industrial Machinery - 65ka High fault rating (SCCR) - Rated for wash down environments • Straight or Right Angle Connectors • 4-pin connector type • Cable Rating: TC-ER/• STOOW • Multiple Standard lengths	• Rated for Motor Branch Circuits - Meets UL 2237 for Industrial Machinery - 65ka High fault rating (SCCR) - Rated for wash down environments • Straight or Right Angle Connectors • 4-pin connector type • Cable Rating: TC-ER/STOOW • Multiple Standard lengths	• Rated for Motor Branch Circuits - Meets UL 2237 for Industrial Machinery - 65ka High fault rating (SCCR) - Rated for wash down environments • Trunk Tee, Reducing Tee and Reducer • 4-pin connector type	• Rated for Motor Branch Circuits - Meets UL 2237 for Industrial Machinery - 65ka High fault rating (SCCR) - Rated for wash down environments • Male and female configurations • 4-pin connector type • 1/2 in. NPT • Available in 1 meter length	• Sealing Caps - Available in M35 and M22 styles • Locking Clips - Designed for M35 and M22 connectors
Rated Voltage	600V	600V	600V	600V	—
Connector Body Dimensions	• Straight: 88.9 mm x 38.6 mm • Right Angle: 75.5 mm x 74 mm	• Straight: 56. mm x 25.4 mm • Right Angle: 44.9 mm x 40.4 mm	• Trunk Tee: 108 mm x 73.6 mm • Reducing Tee: 108 mm x 65.5 mm • Reducer: 112.5 mm x 38.1 mm	• M22 Female: 33.45 mm x 25.45 mm • M22 Male: 28.04 mm x 25.45 mm • M35 Female: 71.12 mm x 38.10 mm • M35 Male: 63.50 mm x 38.10 mm	—
Product Selection	**Page 34**	**Page 35**	**Page 36**	**Page 38**	**Page 44**

Control Power Media

	 **Control Power Cordsets & Patchcords**	 **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	• 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	• 6-pin/5-used configuration • Compact design • Color-coded E-stop in and E-stop out configurations	• 6-pin/5-used configuration • Male and female • 16 AWG conductors • 1/2 NPT mounting threads • Multiple standard lengths	• 6-pin/5-used configuration • Male • Multiple versions color coded for simple identification	• Rugged durable construction • Designed to mate with Control Power media
Rated Voltage	600V	600V	600V	600V	—
Connector Body Dimensions	• 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 40**	**Page 41**	**Page 42**	**Page 43**	**Page 44**

Power Media

Product Overview

Description

The 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 provide for 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 mis-wiring.

Compared to the traditional conduit installations, with 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 quick disconnect cables that provide a secure connection to the ArmorStart Distributed Motor Controller. The 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 power tee, reducing tee, and reducer offers flexibility in system design.

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.

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

Control Power Media

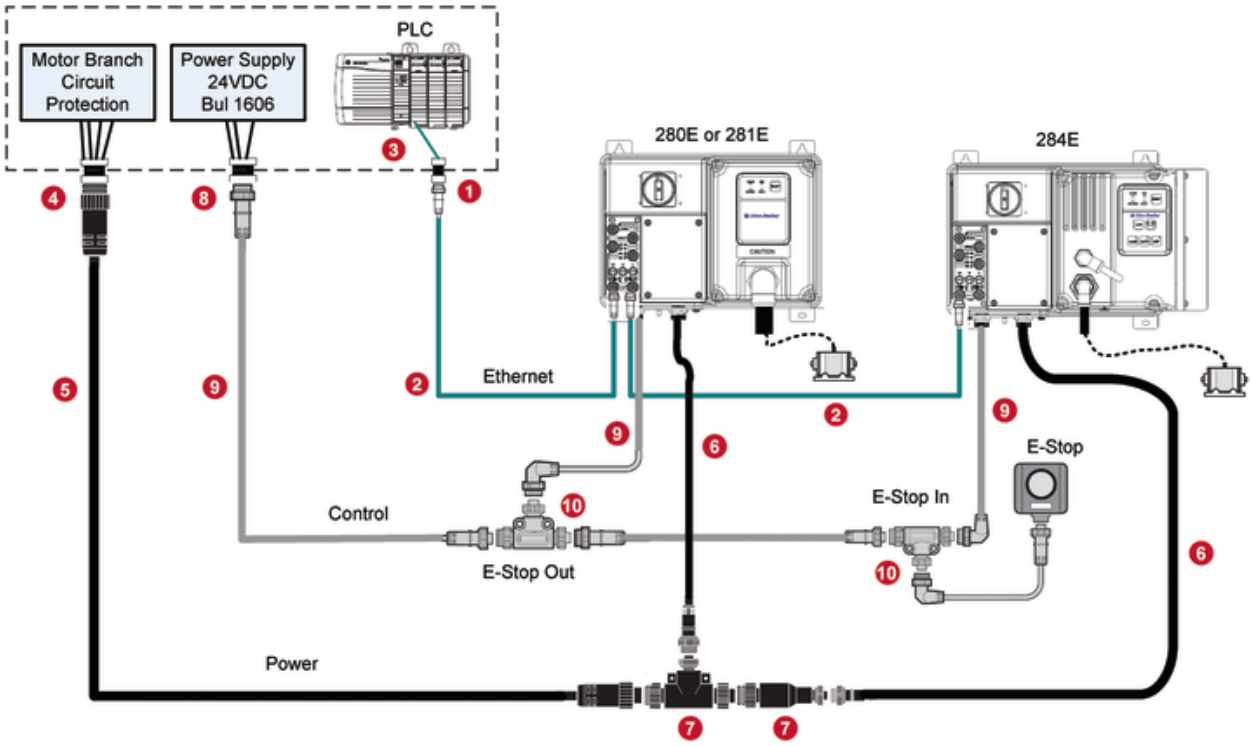
The control power media offers a mini disconnect cable that provides a secure connection to the ArmorStart Distributed Motor Controller. The control power media components are a 6-pin/5-used configuration to prevent mis-wiring with network connectors. The connectors can be straight or right angled and 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 offers 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 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.

Three-Phase Power, Control Power, and EtherNet/IP Media System Overview



EtherNet Cat5e Connections		Three-Phase Power Connections		Control Power Connections	
1.	CAT5e Bulkhead Connector and Receptacle (Example Cat. No.:1585A-DD4JD)	4.	Three-Phase Power Receptacles - Female receptacles are a panel mount connector with flying leads (Cat. No.: 280-M35F-M1)	8.	Control Power Receptacles - Female receptacles are a panel mount connector with flying leads (Cat. No.: 888N-D65AF1-*)
2.	CAT5e Patch Cord, IP67, M12 D-Code, Male Straight, Male Right Angle (Example Cat. No.: 1585D-M4TBDE-*)	5.	Three-Phase Power Trunk - Patchcord cable with integral female or male connector on each end (Example Cat. No.: 280-PWR35A-M*)	9.	Control Power Media Patchcords - PatchCord cable with integral female or male connector on each end (Example Cat. No.: 889N-F65GFNM-*)
3.	CAT5e, Patch Cable, IP20, RJ45 Male to RJ45 Male (Example Cat. No. 1585J-M4TB-*)	6.	Three-Phase Drop Cable - PatchCord cable with integral female or male connector on each end (Example Cat. No.: 280-PWR22A-M*)	10.	Control Power Tees - The E-stop In Tee (Cat. No.: 898N-653ST-NKF) is used to connect to the Bulletin 800F On-Machine E-Stop station using a control power media patchcord. The E-stop Out tee (Cat. No.: 898N-653ES-NKF) is used with cordset or patchcord to connect to the ArmorStart Distributed Motor Controller.
		7.	Three-Phase Power Tees and Reducer - Tee connects to a single drop line to trunk with quick change connectors (Cat. No.: 280-T35) Reducing Tee connects to a single drop line (Mini) to trunk (Quick change) connector (Cat. No.: 280-RT35) Reducer connects from quick change male connector to mini female connector(Cat. No.: 280-RA35)		

Three-Phase Power Media

Product Selection/Specifications/Approximate Dimensions

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

- Listed per UL 2237 for use in motor branch circuits per NFPA 79
- One piece molded design, M35 connection
- Can be used as a drop cable for 25 A rated ArmorStart Distributed Motor Controller or when desired to minimize voltage drops on extended cable runs

Table of Contents

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, 25 A	280-PWRM35E-M∗	280-PWRM35F-M∗	280-PWRM35G-M∗	280-PWRM35H-M∗

Patchcords ❄

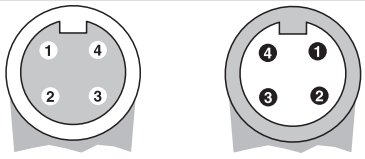
Pin Count	Assembly Rating	Cat. No.			
		Straight Female Straight Male	Right-Angle Female Straight Male	Straight Female Right-Angle Male	Right-Angle Female Right-Angle Male
4-pin	600V, 25 A	280-PWRM35A-M∗	280-PWRM35B-M∗	280-PWRM35C-M∗	280-PWRM35D-M∗

❄ Stainless steel version may be ordered by adding **S** to the cat. no. (Example: Cat. No. 280**S**-PWRM35A-M*)

∗ Replace symbol with code from table below that represents length desired.

Feet	1.62	3.3	4.9	6.5	8.1	9.8	13.1	19.7	26.2	32.8	39.4	45.9
Meters	0.5	1	1.5	2	2.5	3	4	6	8	10	12	14
Code	05	1	015	2	025	3	4	6	8	10	12	14

Pinout and Color Code

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

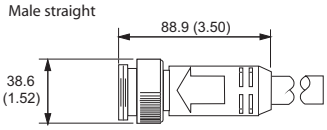
Specifications

Mechanical	
Coupling Nut	Black anodized aluminum
Housing	Black PVC
Insert	Black PVC
Cable Diameter	0.775 in. +/- 0.12 in. (19.68 mm +/- 0.5 mm) with four 10 AWG conductors
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
Short Circuit Current Rating (SCCR)	**Circuit Breaker:** Suitable for use on a circuit capable of delivering not more than 65000 RMS symmetrical amperes at 480V AC maximum when protected by Bul. 140U-H frame circuit breaker, not rated more than 480V, 100 A and a maximum interrupting of 65000 RMS symmetrical amperes. **Fusing:** Suitable for use on a circuit capable of delivering not more than 65000 RMS symmetrical amperes at 600V AC maximum when protected by CC, J, and T class fuses.
Environmental	
Enclosure Type Rating	IP67, NEMA 4 & 6P; 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

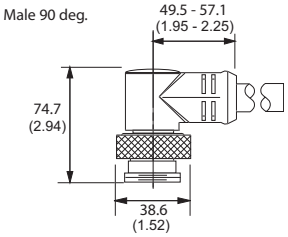
Approximate Dimensions

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

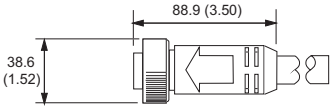
Male straight



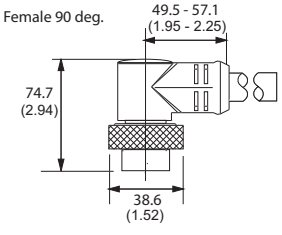
Male 90 deg.

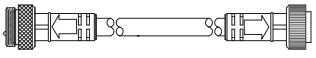


Female straight

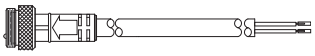


Female 90 deg.





Example of Patchcord



Example of Cordset

Publication 280E-SG001B-EN-P

Allen-Bradley

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

- Listed per UL 2237 for use in motor branch circuits per NFPA 79
- One-piece molded design, M22 connection
- Can be used as a trunk cable for 10 A rated ArmorStart Distributed Motor Controller
- Can be used as a 10 A non-shielded motor cable

Table of Contents

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∗

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∗

❄ Stainless steel version may be ordered by adding **S** to the cat. no. (Example: Cat. No. 280**S**-PWRM22A-M*)

∗ Replace symbol with code from table below that represents length desired.

Feet	1.62	3.3	4.9	6.5	8.1	9.8	13.1	19.7	26.2	32.8	39.4	45.9
Meters	0.5	1	1.5	2	2.5	3	4	6	8	10	12	14
Code	05	1	015	2	025	3	4	6	8	10	12	14

Pinout and Color Code

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

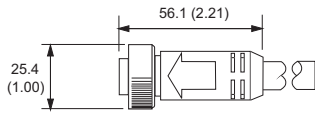
Specifications

Mechanical	
Coupling Nut	Black anodized aluminum
Housing	Black PVC
Insert	Black PVC
Cable Diameter	0.43 in. +/- 0.12 in. (10.9 mm +/- 0.5 mm) with four 16 AWG conductors
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
Short Circuit Current Rating (SCCR)	**Fusing:** Suitable for use on a circuit capable of delivering not more than 65000 RMS symmetrical amperes at 600V AC maximum when protected by CC, J, and T class fuses, rated 40 A non-time delay or 20 A time delay.
Environmental	
Enclosure Type Rating	IP67, NEMA 4 & 6P; 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

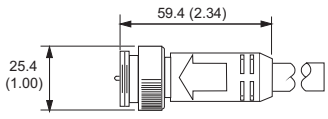
Approximate Dimensions

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

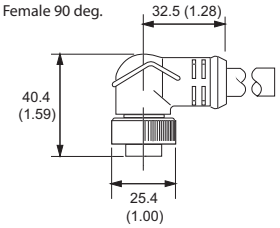
Female straight



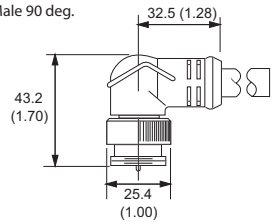
Male straight

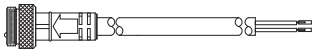


Female 90 deg.

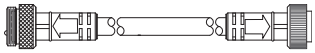


Male 90 deg.





Example of Cordset



Example of Patchcord

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

- Listed per UL 2237 for use in motor branch circuits per NFPA 79
  - One-piece molded design
  - M35 power tee
  - M35 power tee with M22 reducing drop
  - M35 to M22 straight reducer
- 4-pin T-port connects a single drop line to the trunk
- 4-pin configuration

Table of Contents

Standards Compliance

UL 2237

Certifications

UL Listed (File No. E318496, Guide PVVA)

Product Selection

Tees and Reducing Adapters ❄

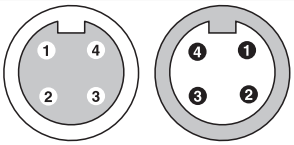
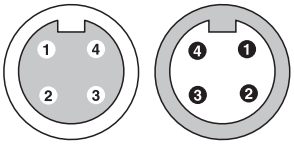
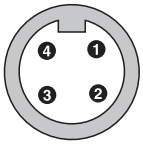
Description	Assembly Rating	Color Code	Cat. No.
M35, 3-Phase Power Tee, 4-pole	25 A	A	280-T35
M35, 3-Phase Power Tee Reducing drop M22, 4-pole	Trunk 25 A/Drop 15 A	B	280-RT35
M35, 3-Phase Reducing Adapter, 4-pole	15 A	C	280-RA35

❄ Stainless steel version may be ordered by adding **S** to the cat. no. (Example: Cat. No. 280**S**-T35)

Specifications

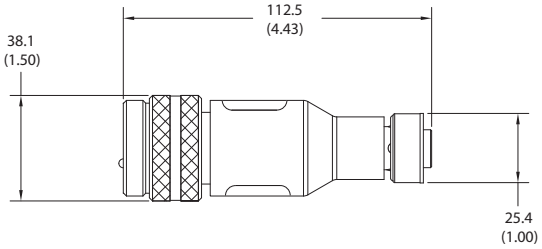
Mechanical	
Coupling Nut	Black anodized aluminum (Trunk), black zinc diecast (Drop)
Housing	Black PVC
Insert	Black PVC
Electrical	
Contacts	Copper alloy with gold over nickel plating
Voltage	600V AC/DC
Assembly Rating	Trunk Tee: 25 A Reducing Tee: Trunk 25 A/Drop 15 A Reducer: 15 A
Short Circuit Current Rating (SCCR)	*Trunk Tee* **Fusing:** Suitable for use on a circuit capable of delivering not more than 65000 RMS Symmetrical Amperes at 600V AC maximum when protected by CC, J, and T class fuses **Circuit Breaker:** Suitable for use on a circuit capable of delivering not more than 65000 RMS Symmetrical Amperes at 480V AC maximum when protected by Bul. 140U-H frame circuit breaker, not rated more than 480V, 100 A and a maximum interrupting of 65000 RMS Symmetrical Amperes. *Reducing Tee & Reducer* **Fusing:** Suitable for use on a circuit capable of delivering not more than 65000 RMS Symmetrical Amperes at 600V AC maximum when protected by CC, J, and T class fuses, rated 40 A non-time delay or 20 A time delay.
Environmental	
Enclosure Type Rating	IP67, NEMA 4 & 6P; 1200 psi washdown

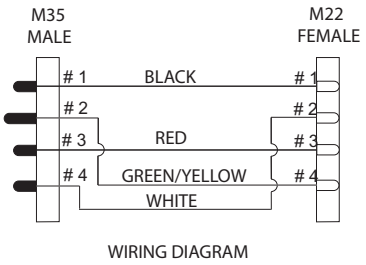
Pinout and Color Code

Assembly Rating	Color Code	Face View Pinout 4-Pin M35 Connector	M22 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	 Female 1 Black 2 White 3 Red 4 Green/Yellow Extended PIN
Reducer: Trunk 25 A/ Drop 15 A	C	 Male 1 Black 2 Green/Yellow Extended PIN 3 Red 4 White	 Female 1 Black 2 White 3 Red 4 Green/Yellow Extended PIN

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

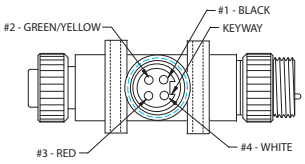
Reducer

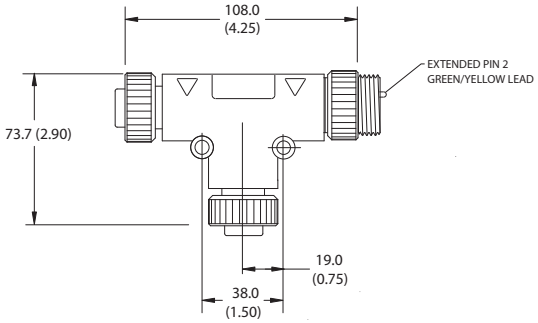


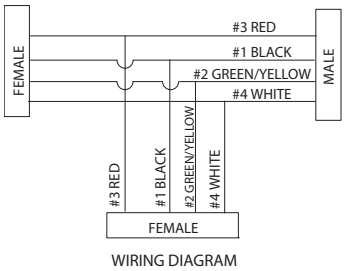


WIRING DIAGRAM

Power Tee

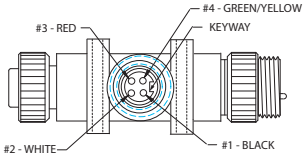


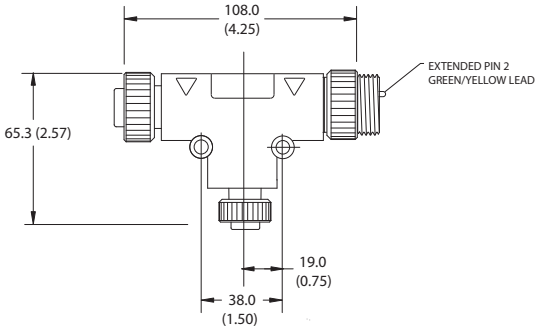


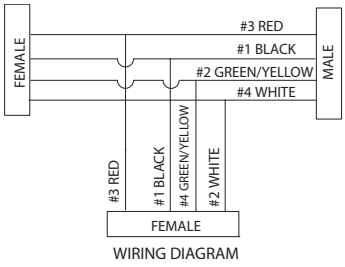


WIRING DIAGRAM

Power Tee - reducing drop







WIRING DIAGRAM

Bulletin 280 — Three-Phase Power Receptacles (Male and Female)

- Listed per UL 2237 for use in motor branch circuits per NFPA 79
- 16 & 10 AWG conductors
- 4-pin configuration, M35 or M22 connection
- 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

Table of Contents

Standards Compliance

UL 2237

Certifications

UL Listed (File No. E318496, Guide PVVA)

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
	10 AWG, 600V, 25 A	B	280-M35F-M1	280-M35M-M1

❄ Stainless steel version may be ordered by adding **S** to the cat. no. (Example: Cat. No. 280**S**-M22F-M1)

Accessories

Mounting Nuts and Flat Seals

Description	Pkg. 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		**889A-U1FSL-10**

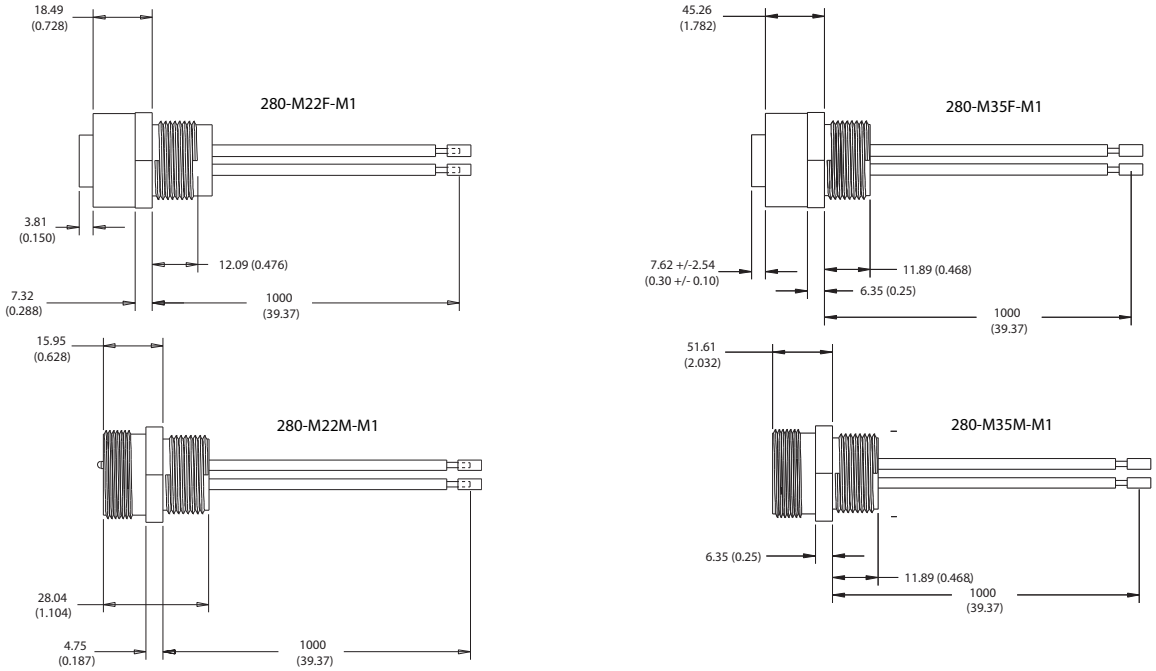
Specifications

Mechanical	
Insert	Black PVC
Receptacle Shell Material	Black anodized aluminum (female) and zinc diecast, black E-coat (male)
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 — 10 AWG, 600V @ 25 A 4-pin — 16 AWG, 600V @ 10 A
Short Circuit Current Rating (SCCR)	*4-pin — 10 AWG* **Fusing:** Suitable for use on a circuit capable of delivering not more than 65000 RMS Symmetrical Amperes at 600V AC maximum when protected by CC, J, and T class fuses **Circuit Breaker:** Suitable for use on a circuit capable of delivering not more than 65000 RMS Symmetrical Amperes at 480V AC maximum when protected by Bul. 140U-H frame circuit breaker, not rated more than 480V, 100 A and a maximum interrupting of 65000 RMS Symmetrical Amperes. *4-pin — 16 AWG* **Fusing:** Suitable for use on a circuit capable of delivering not more than 65000 RMS Symmetrical Amperes at 600V AC maximum when protected by CC, J, and T class fuses, rated 40 A non-time delay or 20 A time delay.
Environmental	
Enclosure Type Rating	IP67, NEMA 4 & 6P; 1200 psi washdown

Pinout and Color Code

Assembly Rating		Color Code	Face View Pinout — 4-Pin — M35 Connector — Female	Face View Pinout — 4-Pin — M35 Connector — Male	Face View Pinout — 4-Pin — M22 Connector — Female	Face View Pinout — 4-Pin — M22 Connector — Male
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		

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



Bulletin 889N — Control Power Trunk and Drop Cables

- 6-pin/5-used configuration to prevent mis-wiring with network connectors
- One-piece molded design
- 16 AWG exposed run (TC-ER) rated cable

Table of Contents

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 code from the table below that represents the desired length:

Feet	6.5	16.4	32.8
Meters	2	5	10
Code	2	5	10

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 code from the table below that represents the desired length:

Feet	3.3	6.5	9.8	16.4	32.8
Meters	1	2	3	5	10
Code	1	2	3	5	10

Specifications

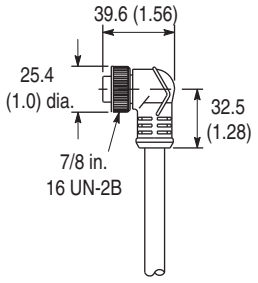
Mechanical	
Coupling Nut	Black epoxy coated zinc
Overmold	Black Riteflex TPE
Insert	Yellow Riteflex TPE
Contacts	Brass/gold over palladium nickel
Cable	Grey PVC, 16 AWG, dual rated UL TC/Open Wiring and STOOW
Cable Diameter	0.44 in. +/- 0.12 in. (11.18 mm +/- 0.5 mm)
Electrical	
Cable Rating	UL Type 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 6P, 1200 psi washdown
Operating Temperature	-20…+90 °C (-4…+194 °F)

Pinout and Color Code

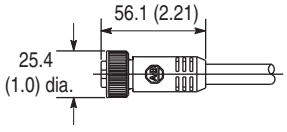
	Face View Pinout	
	6-pin/5-used	
		
	Female	Male
Color Code	1 Red (+) 2 Black (-) 3 Green (GND)	4 Blank/Not Used 5 Blue (S1) 6 White (S2)

Approximate Dimensions

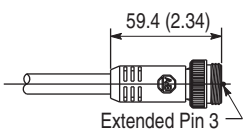
Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes and are subject to change.



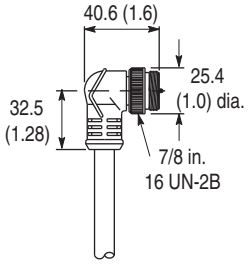
Female 90 Deg.



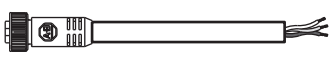
Female Straight



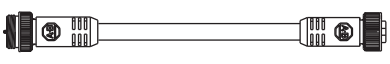
Male Straight



Male 90 Deg.



Example of Cordset



Example of Patchcord

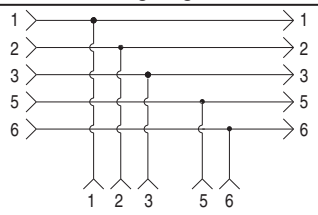
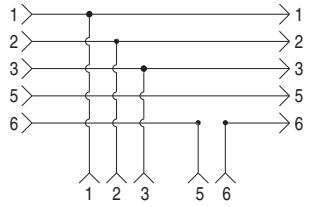
Bulletin 898N — Control Power T-Ports

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

Table of Contents

Product Selection

T-Ports

Configuration	Assembly Rating	Overmold Color	Wiring Diagram	Cat. No.
E-stop out	600V, 10 A	Red		898N-653ES-NKF
E-stop in	600V, 10 A	Black		898N-653ST-NKF

Specifications

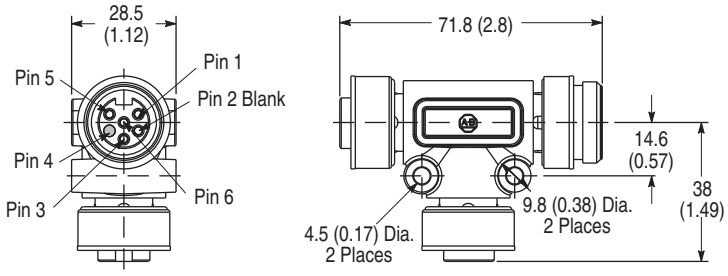
Mechanical	
Coupling Nut	Black epoxy coated zinc
Housing	Riteflex TPE
Insert	Yellow Riteflex TPE
Contacts	Brass/gold over palladium nickel
Electrical	
Assembly Rating	600V, 10 A
Environmental	
Enclosure Type Rating	IP67, NEMA 6P, 1200 psi washdown
Operating Temperature	-20…+90 °C (-4…+194 °F)

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.



Bulletin 888N — Control Power Receptacles

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

Table of Contents

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 length in meters (0.3 or 1 standard)

Specifications

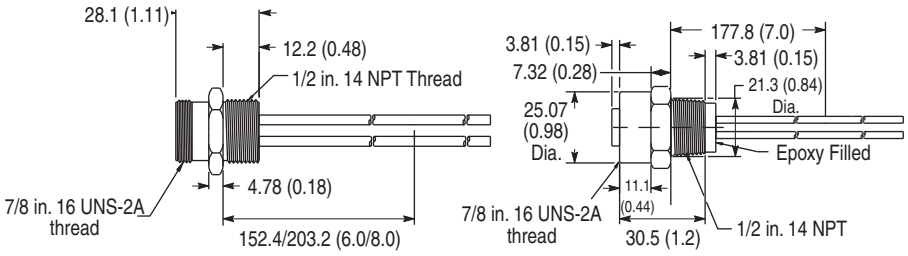
Mechanical	
Receptacle Shell	Male: Black epoxy coated zinc diecast Female: Black anodized aluminum
Insert	Yellow PVC
Contacts	Brass/gold over palladium nickel
Electrical	
Assembly Rating	600V, 10 A
Environmental	
Enclosure Type Rating	IP67, NEMA 6P, 1200 psi washdown
Operating Temperature	-20…+90 °C (-4…+194 °F)

Pinout and Color Code

	Face View Pinout	
	6-pin/5-used	
		
	Female	Male
Color Code	1 Red (+) 2 Black (-) 3 Green (GND)	4 Blank/Not Used 5 Blue (S1) 6 White (S2)

Approximate Dimensions

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



Bulletin 889A — Control Power Shorting Plugs

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

Table of Contents

Product Selection

Shorting Plugs

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

Specifications

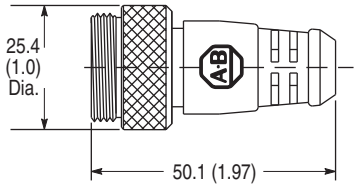
Mechanical	
Coupling Nut	Black epoxy coated zinc
Overmold	Riteflex TPE
Insert	Yellow Riteflex TPE
Contacts	Brass/gold over palladium nickel
Electrical	
Assembly Rating	600V, 10 A
Environmental	
Enclosure Type Rating	IP67, NEMA 6P, 1200 psi washdown
Operating Temperature	-20…+90 °C (-4…+194 °F)

Pinout and Color Code

	Face View Pinout	
	6-pin/5-used	
	 Female	 Male
Color Code	1 Red (+) 2 Black (-) 3 Green (GND)	4 Blank/Not Used 5 Blue (S1) 6 White (S2)

Approximate Dimensions

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



Specifications

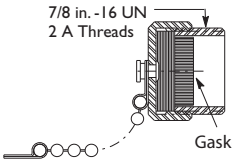
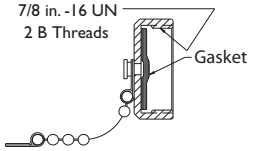
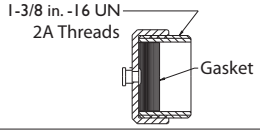
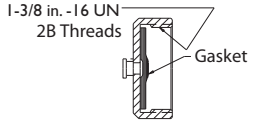
	Locking Clips	Sealing Caps
Mechanical		
Material	ABS/PC plastics	Anodized aluminum
Color	Black	Grey
Electrical		
	Non-current carrying, no ratings required	
Environmental		
Enclosure Type Rating	No rating required	IP67, NEMA 4 & 6P; 1200 psi washdown

Product Selection

Locking Clips

Description	Pkg. Quantity	Connector Style	Cat. No.
Clam shell design clips over the three-phase power media drop connection, to limit customer access.	10	M22 Connector	280-MTRLC-M22
Clam shell design clips over the three-phase power media trunk connection, to limit customer access.		M35 Connector	280-MTRLC-M35

Sealing Caps

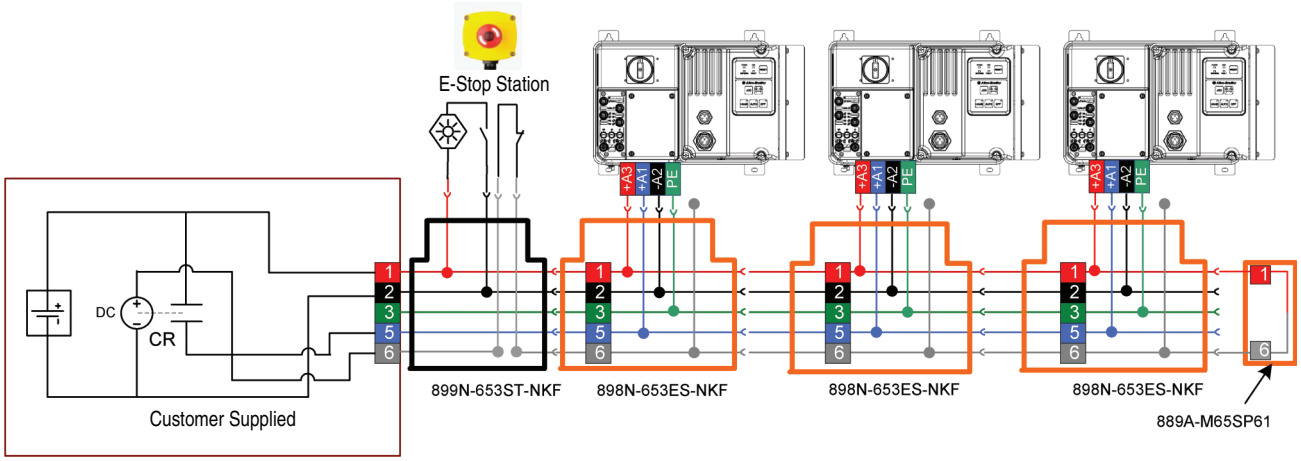
Connector Style	Material	Thread Configuration	Dimensions	Cat. No.
Control Power (M22)	Aluminum grey, anodized	External, male		**1485A-C1**
		Internal, female		889A-NCAP
3-Phase Power (M35)		External, male		889A-QMCAP
		Internal, female		889A-QCAP

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 40 mm	24V AC/DC	1 N.O./1 N.C.	800F-1YMQ4
Metal						800F-1MYMQ4

Example E-Stop Circuit for EtherNet/IP Bus Version

Pin 1	Red	A3
Pin 2	Black	A2 (-)
Pin 3	Green	PE
Pin 4	Blank	Not used
Pin 5	Blue	A1 (+)
Pin 6	White	Not Used



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