Technical Data

Original Instructions

Armor PowerFlex AC Drives Specifications

Bulletins 35S, 35E

Rockwell Automation offers a wide array of starting solutions that range from electromechanical to solid-state. We have taken On-Machine™ motor control to the next level with our Armor™ PowerFlex® AC drives solution. Smart, safe, secure, and simple—Armor PowerFlex drives are a scalable solution that is designed to help meet your application needs.

Armor PowerFlex drives are used with an Allen-Bradley® Logix programmable controller. They feature:

- Volts/Hz, Sensorless Vector, and Velocity Vector motor control
- Safe Torque Off, either hardwired or deployed over the EtherNet/IP™ network (integrated safety)
- Built-in dual-port EtherNet/IP supports multiple network topologies and Device Level Ring functionality
- CIP Security™

Armor PowerFlex Variable Frequency AC Drives (VFDs) make it easier for you to manage your systems, identify problems before downtime happens, and the built-in intelligence proactively tells you about maintenance requirements or possible issues. The Armor PowerFlex drive is suited for variable frequency applications that require more precise motor control. Armor PowerFlex drives are available in safety and standard versions.

The Armor PowerFlex drive offers IP54/IP66, UL Type 1/12/4 enclosure designs, which are suitable for water wash down environments when appropriate cables are attached or sealing caps are in place.

Fault diagnostic capabilities, including status indicators, are built in to the Armor PowerFlex drive to help you pinpoint a problem for easy troubleshooting and quick restarting.

All Armor PowerFlex drives feature an embedded dual-port EtherNet/IP switch. EtherNet/IP connectivity supports seamless integration into the Logix environment. Armor PowerFlex drives help you apply this open network by making connections simple with built-in dual EtherNet/IP communication ports. EtherNet/IP connectivity provides the flexibility to support multiple network topologies – linear, star, or ring configurations. Support for Device Level Ring (DLR) functionality gives you an added advantage.

Features

Armor PowerFlex drives features include:

- Premier integration with Logix controllers
  - built-in startup wizard
  - automatic device configuration (ADC) support
  - firmware supervisor support
  - Add-on Profile (AOP) with automatically created contextualized tags
- Hardwired or integrated safety in one device
- CIP Security
- Embedded dual 1 Gb Ethernet ports support star, linear, and Device Level Ring (DLR) topologies
- IP54/66, UL Type 1/4/12, hygienic-friendly design
- Ambient operating temperature -25…+55 °C (-13…+131 °F)
- Common single-box construction reduces training needs
- Electromechanical Disconnect (patent pending)
  - Local disconnect with lockout capability
  - Integrated thermal detection and automatic line isolation
  - Integrated motor branch short-circuit and ground fault protection (self-protected)
  - Line loss or fuse loss detection
  - User test points for PPE requirements
  - Monitored disconnect status
- AC Induction motor control
- Open- and closed-loop velocity operation
- Power media with plug-and-play connections
- Rated up to 3 Hp for Frame A
- Safe Torque Off (STO) and Safe Speed Monitoring functions (SLS, SDI, SLP, and SS1)
- Four standard inputs and two standard configurable I/Os
- Integrated safety version includes safety I/Os:
  - Four single-channel safety inputs or two dual-channel safety inputs
  - One bipolar safety output, can be used as safe brake control (SBC)
- Electromechanical (EM) Brake
  - One cable for brake and motor
- Front panel keypad (HOJ)
- External 24V DC Power (no mains configuration)
- Internal power supply option helps lower installation cost
- One incremental encoder interface
  - Suitable for both standard and safety applications
- Dynamic Brake function with quick connect, two resistor types based on application needs
  - Light duty: mounts directly to the unit
  - Normal (standard) duty: mounted up to 1 m (3.3 ft) from unit

Figure 1 - Armor PowerFlex AC Drive Features (shown: Drive with integrated safety version, without internal power supply)

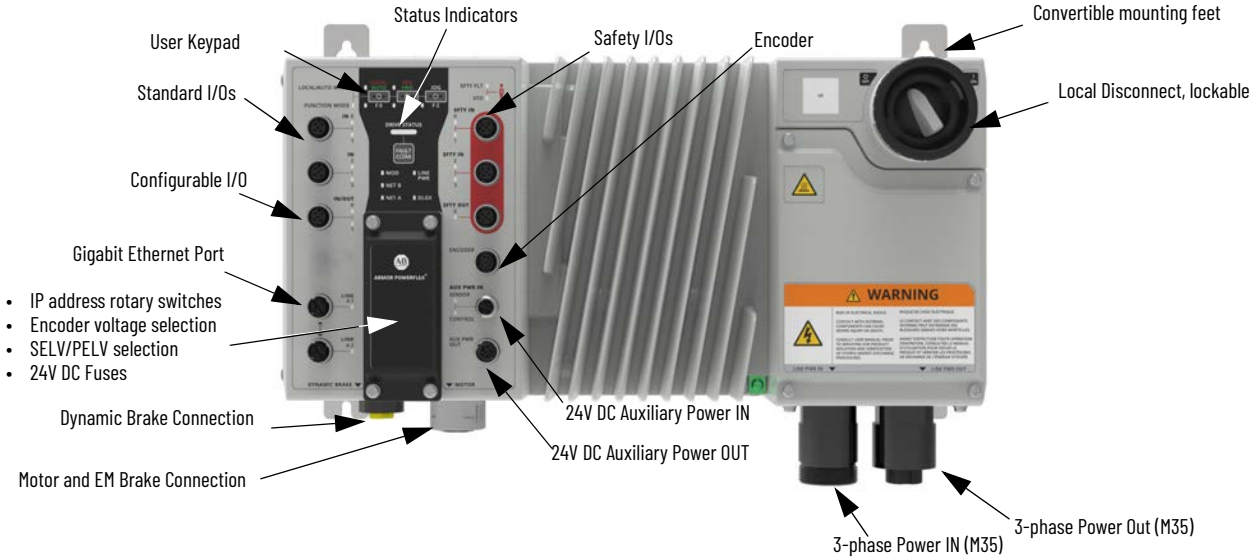


Table 1 - Features Description

Feature	Description
Premier Integration	• One software tool for controller and drive setup • Faster configuration with full access to device data • Streamlined configuration and programming
Local Disconnect	• Removes power from the motor terminals when in the OFF condition • Lockable
Automatic Device Configuration	• Detects a replaced Armor PowerFlex drive and downloads all configuration data automatically • Minimizes the need for manual reconfiguration • Reduces downtime
Auxiliary Power	• External 24V DC allows mains free configuration • Local and network monitoring
Setup Wizards	• QuickStart wizard simplifies startup workflows
User Test Points	• Measure bus voltage and internal 3-phase status for PPE requirements
Internal Power Supply (Optional)	• Internal source 24V DC auxiliary power • Eliminates the need to run separate auxiliary/control power to each unit
CIP Energy	• Family of embedded objects and services – Optimizes energy usage from basic energy awareness to more advanced functions for the control of energy demand-response
CIP Security	• Uses an EtherNet/IP network to provide a secure transport layer – Lets the drive help protect itself from malicious communication. • Provides the following security features – End point authentication – Data Integrity – Data Confidentiality
Dynamic Brake Quick Connect and Resistor	• Lets you use light- or standard-duty resistor • Allows excess electrical energy to be dissipated as thermal energy by directing it through a large resistor • Allows a faster stop without causing a DC bus overvoltage
Electromechanical Brake (Optional)	• Internally controls the state of the electromechanical motor brake • Source voltage (380...480V AC) actuates the motor brake solenoid • A network brake status bit is accessible for diagnostic purposes
Electromechanical Disconnect (EMD)	• Integrates the motor branch short circuit and ground fault protection devices and is considered self protected • Does not require additional motor control branch circuit protection • Multiple Armor PowerFlex drives can be applied in a group application
EMI Filter	• Required for CE compliance
Encoder Support	• Supports a single encoder – Single- or dual-channel – Differential (AqB) – Sine-cosine – Hiperface (analog only)

Table 1 - Features Description (Continued)

Feature	Description
EtherNet/IP Communications Network	• Embedded dual-port switch, 1 Gigabit per port • Device-level ring support
Functional Safety	• Up to SIL 3 Category 4 PLe performance • Hardwired STO • Network safety supports STO, SS1, SLS, SDI, SLP, SBC • Embedded Safe Inputs and Output
Gland Plate Entrance	• Supports feed-through power • Offers conduit or cord hardwired connectivity • Offers quick connect connectivity to ArmorConnect® and HARTING® power media

Studio 5000 Logix Designer

Armor PowerFlex drives are integrated within the Studio 5000 environment. Data associated with the drive is automatically generated to ease configuration and minimize the need to manually program the required configuration and tags.

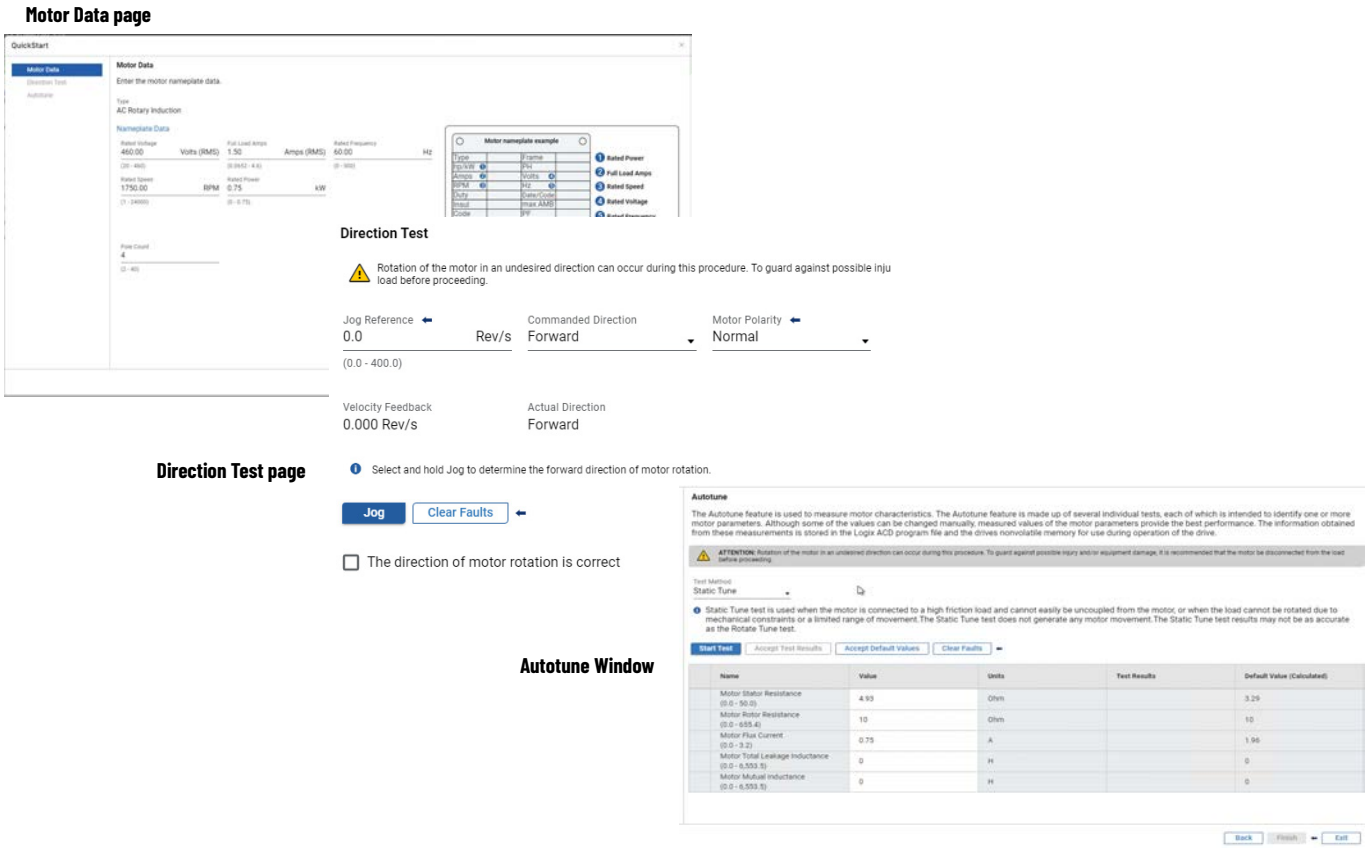
- Add-on Profiles (AOPs) for Armor PowerFlex drives provide seamless integration into the Logix environment.
- Configuration files from Studio 5000 Logix Designer® application can be transferred directly to the Armor PowerFlex drive over EtherNet/IP.
- Automatic Device Configuration downloads configuration data to a replaced device, minimizing the need for a manual reconfiguration.

Simplified AOP User Interface

The user interface for the Armor PowerFlex drives is simple and easy to set up and configure. This simplified profile helps to speed up system design, integration, and maintenance.

The QuickStart wizard can help you set up your device using three easy prompts, which are shown in Figure 2.

Figure 2 - QuickStart Wizard Prompts



Motor Control Modes

Velocity control is accomplished via three options for control mode:

- Volts/Hertz (V/Hz)
- Sensorless Vector
- Velocity Vector (requires encoder)

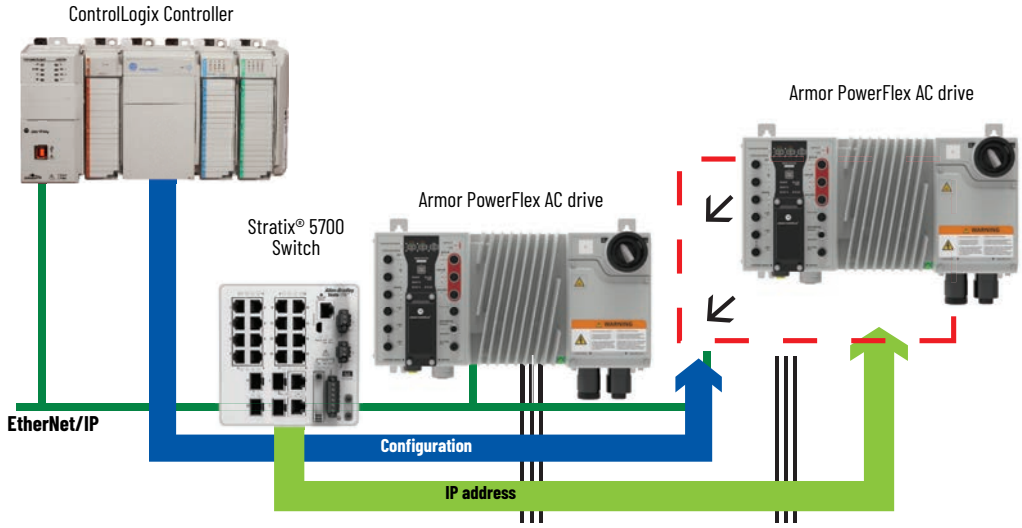
Table 2 - Armor PowerFlex Drives Control Mode Comparison

Volts/Hertz	Sensorless Vector (SVC)	Velocity Vector (VVC)
• Basic control method – provides a variable-frequency drive for applications like simple conveyor, fan, and pump • Fair speed and starting torque at a reasonable cost • Generally regarded as the most common VFD control scheme • Suitable for both constant torque and variable torque applications • Up to 150% of rated torque at zero speed for startup and peak loads	• Better speed regulation and the ability to produce a high starting torque • May not be appropriate when more than one motor is connected to the same drive • No external sensor to obtain motor feedback • Mathematically determines the motor speed with optimum accuracy • Simpler and less costly solution than installing and connecting an encoder • Provides sufficient feedback in most applications to enable pseudo closed-loop operation	• An adaptive controller uses information gained during autotuning, actual reference information, and motor feedback to provide independent torque and flux control, – allows continuous regulation of the motor speed and improved overall control • A high-bandwidth regulator replaces the volts/Hertz core used in V/Hz and SVC control modes – helps eliminate nuisance trips caused by shock loads – continuously adapts to changes in the motor load and load characteristics • Requires a feedback device for optional motor speed control

Automatic Device Configuration

Automatic Device Configuration (ADC) lets Logix controllers detect a replaced PowerFlex drive and download all configuration data automatically, minimizing the need for manual reconfiguration. This feature helps to enhance productivity by facilitating reduced downtime.

Figure 3 - Automatic Device Configuration



Motor Control Features

Table 3 lists the features and benefits of the control modes of Armor PowerFlex drives.

Table 3 - Motor Control Features

Feature	Description
Acceleration Control	• user-configurable acceleration and deceleration times – Indicates the time it should take for velocity to go from 0...rated motor speed or vice versa
Economizer Mode	• sensorless vector control with an additional energy savings function • when steady-state speed is achieved, the economizer becomes active – automatically adjusts the drive output voltage based on the applied load
Flying Start	• starts a rotating motor as quickly as possible, and resume normal operation with a minimal impact on load or speed.
Load Monitor	• monitors the drive for conditions where more (shear pin) or less (load loss) power than expected is being provided to or provided by the motor to drive a particular load • shear pin: – monitors for power greater than the configured level – may indicate a stuck load • load loss – monitors for power less than the configured level – may indicate that the load is no longer connected to the motor
Motor Thermal Overload	• helps to prevent overheating and possible damage to the connected motor • when the drive detects that the motor is too hot, a thermal overload condition is declared – power to the motor is removed to allow the motor to cool and the overload condition to clear – when the overload condition is cleared, the motor can be restarted

Safe Torque Off and Safe Monitor Functions

Hardwired and integrated safety features are available on the Armor PowerFlex safety drive. See the Armor PowerFlex AC Drives User Manual, publication 35-UM001 for details about how to set up and configure these functions.

Safety Solutions

In the past, implementing safety solutions often meant sacrificing productivity. Armor PowerFlex drives address productivity concerns by offering safety options that help protect your people and equipment while also reducing unplanned downtime.

Choose from a hardwired configuration that is wired directly into the drive, or use integrated safety that is delivered via EtherNet/IP networks. You can implement safety with Armor PowerFlex drives by using either built-in features or safety add-on instructions.

Hardwired Safe Torque Off is ideal for safety-related applications that benefit from removal of rotational power to the motor without removing power from the drive. This functionality offers the benefit of quick startup after a demand on the safety system. Torque is permitted when one pair of inputs is energized; it is disabled when either input is de-energized. Figure 4 shows an example hardwired Safe Torque Off (STO) application.

Integrated Safe Torque Off provides the same benefits and safety ratings as hardwired Safe Torque Off, plus the ability to simplify your machine design and minimize equipment redundancies.

- One GuardLogix® controller can provide both safety and standard control, so that safety and non-safety functions share the same EtherNet/IP network
- Operators and maintenance personnel have visibility to all machine events including safety events. This enables a quick response that lets the machine return to full production.

Figure 5 shows an example integrated STO application.

Figure 4 - Hardwired Safe Torque Off

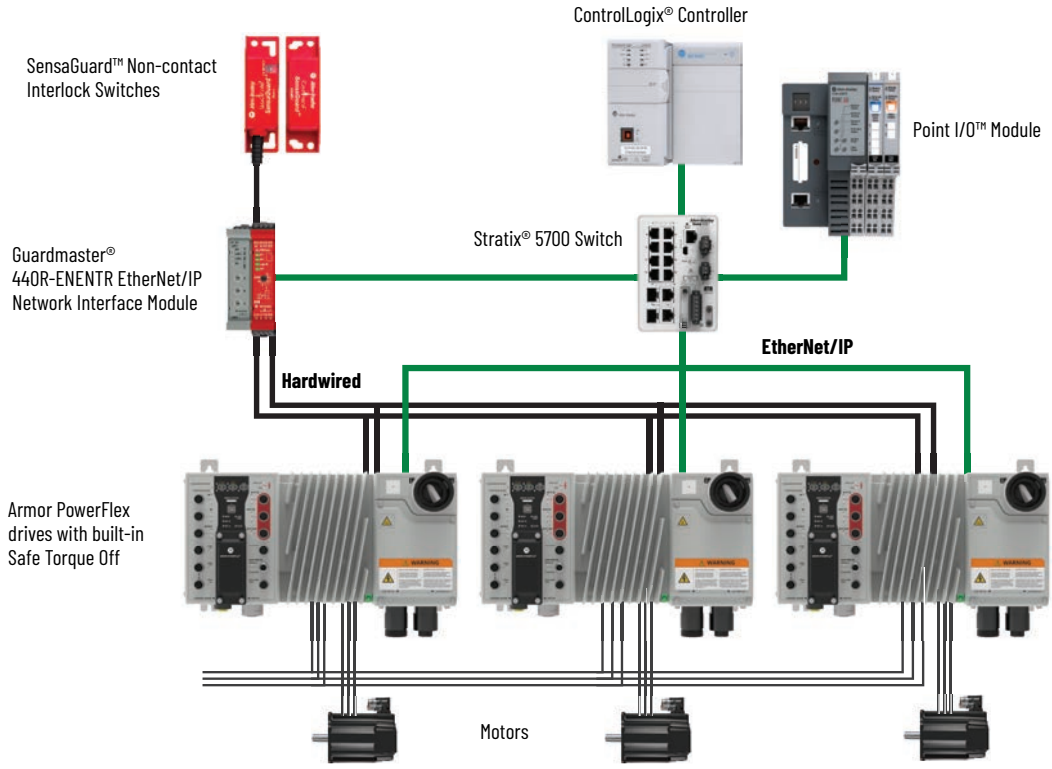


Figure 5 - Integrated Safe Torque Off

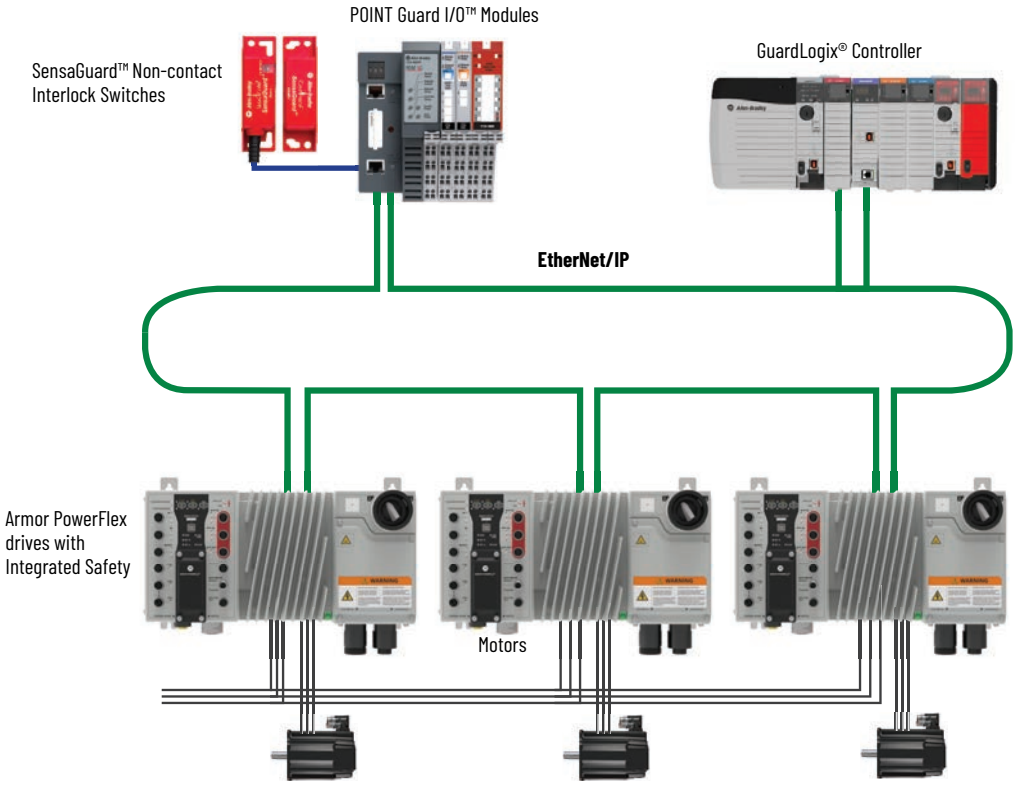


Table 4 - Functional Safety Support

Function Type	Software Version	Safety Function	Safety Capability up to:	Minimum Controller Required
Integrated Safety Over the EtherNet/IP Network				
Drive-based stopping functions	v31	• Timed Safe Stop 1 (SS1) • Safe Brake Control (SBC)	SIL 3, PLe, CAT4	• Standard Connection Only: – GuardLogix/ControlLogix: 5570, 5580 – Compact GuardLogix/ControlLogix: 5370, 5380 – Armor GuardLogix, ControlLogix: 5570 • Standard and Safety or Safety Only Connection: – GuardLogix: 5570, 5580 – Compact GuardLogix: 5370, 5380
		• Monitored Safe Stop1 (SS1)	SIL 2, PLd CAT3	
Controller-based stopping functions	v31	• Safe Brake Control (SBC)	SIL 3, PLe, CAT4	
		• Monitored Safe Stop1 (SS1)	SIL 2, PLd CAT3	
Controller-based monitoring functions	v31	• Safely Limited Speed (SLS) • Safely Limited Position (SLP) • Safe Direction (SDI)	SIL 2, PLd, CAT3	
Integrated STO mode	v31	Safe Torque-off (STO)	SIL 3, PLe, CAT4	• GuardLogix: 5570, 5580 • Compact GuardLogix: 5370, 5380 • Armor GuardLogix: 5570
Hardwired Safety				
Hardwired STO mode	–	Safe Torque-off (STO)	SIL 3, PLe, CAT4	• GuardLogix/ControlLogix: 5570, 5580 • Compact GuardLogix/ControlLogix: 5370, 5380 • Armor GuardLogix, ControlLogix: 5570

Encoder Operation

The Armor PowerFlex drive has a feedback interface that allows an external feedback device (encoder) to be connected to the product. An encoder can provide more accurate velocity control by providing an indication of the actual speed of the motor/load.

The encoder signals are connected to both safety and standard drive control. The standard control provides encoder power and the safety control can be configured to monitor the encoder power supply. Standard control can use single-ended encoder signals, but differential signals are required for safety functions.

One sine/cosine (generic or Hiperface) or AqB encoder can be used to provide position and velocity feedback to the safety controller. SIL 2, PLd is achievable with a single encoder and drive-based or controller-based safety functions.

The encoder detects wire error faults via diagnostics and reports them to the user. Table 5 lists the diagnostics that are supported for each encoder configuration. For more information about encoders, safety encoders, and diagnostic operation, see the Armor PowerFlex AC Drives User Manual, publication 35-UM001.

Table 5 - Supported Encoder Diagnostic Functions

Encoder Configuration	Encoder Type	Supported Standard Diagnostics
Standard	• Digital incremental, single-channel, single-ended • Digital incremental, single-channel, differential • Digital incremental, dual-channel, single-ended • Digital incremental dual-channel, differential • Generic sine/cosine	Wire Error Detection: digital incremental dual-channel, dual-ended only Velocity Comparison: all types
Safety	• AqB • Sine/Cosine • Hiperface (Analog Only)	Encoder Voltage Monitoring (Configurable)
		Maximum Speed Limit (Configurable)
		Maximum Acceleration (Configurable)
		Maximum Encoder Input Frequency
	• AqB	Inverse Signal Monitoring
		Quadrature Error Detection
	• Sine/Cosine and Hiperface (Analog Only)	$Sin^2 + Cos^2$ Vector Length Monitoring
		Zero-crossing Detection
		Signal Offset (Sine/Cosine Encoder Type Only)

Group Motor Application

The Armor PowerFlex drives and their mating cable assemblies can be applied using NFPA 70 (NEC), NFPA 79, and specific local electrical codes as required.

The Armor PowerFlex drive integrates the motor branch short-circuit and ground fault protection devices and is considered self-protected. Therefore, no additional motor control branch circuit protection is required. You can apply multiple Armor PowerFlex drives in a group application, because each Armor PowerFlex is self-protected. You must follow the local electrical codes for the protection of the feeder conductors using recommended Branch Circuit Protection devices.

Motor cable assemblies are not supplied and must be ordered separately. To comply with the UL Listing of the drive, use the Rockwell Automation® motor cable assembly that is specified by the instructions for the drive. See the On-Machine Media for Armor PowerFlex, ArmorStart®, and ArmorConnect Products Selection Guide, publication, 280PWR-SG001.

Product Comparison

		
Bulletin	**35S Safety Armor PowerFlex Drive**	**35E Armor PowerFlex Drive**
Rated output current	2.3...6.0 A	2.3...6.0 A
Rated Hp	1...3	1...3
Rated kW	0.75...2.2	0.75...2.2
Built-in safety functions	✓	–
Integrated VFD	✓	✓
EM braking (hybrid motor cable)	✓	✓
Dynamic braking	✓	✓
Local Maintenance Switch	✓	✓
Short-circuit current rating	Self protected up to 100 kA	Self protected up to 100 kA
CIP Security	✓	✓
User I/O	✓	✓
Safety I/O	✓	–
Functional Safety	✓	–
Auxiliary power	24V DC	24V DC
Feed-through power connections	✓	✓
Ingress Protection	IP54/IP66, UL Type 1/4/12	IP54/IP66, UL Type 1/4/12
IP address configuration	Static or dynamic	Static or dynamic
100% complete field installation	QuickConnect cables with optional power input glands	QuickConnect cables with optional power input glands
Automatic device configuration	✓	✓
Device-level Ring capable	✓	✓
Communication	Dual-port 1 Gb Ethernet switch	Dual-port 1 Gb Ethernet switch
Motor control options:		
Sensorless vector	✓	✓
Velocity vector	✓	✓
Economizer SVC motor	✓	✓
Closed Loop Velocity Vector Control	✓	✓
Product Selection	page 15	page 14

Typical Configurations

Typical motor control systems include selections from several categories of Allen-Bradley® motor control products and connection media. Figure 6 through Figure 9 depict typical system configurations.

Figure 6 - Standard Drives Configuration

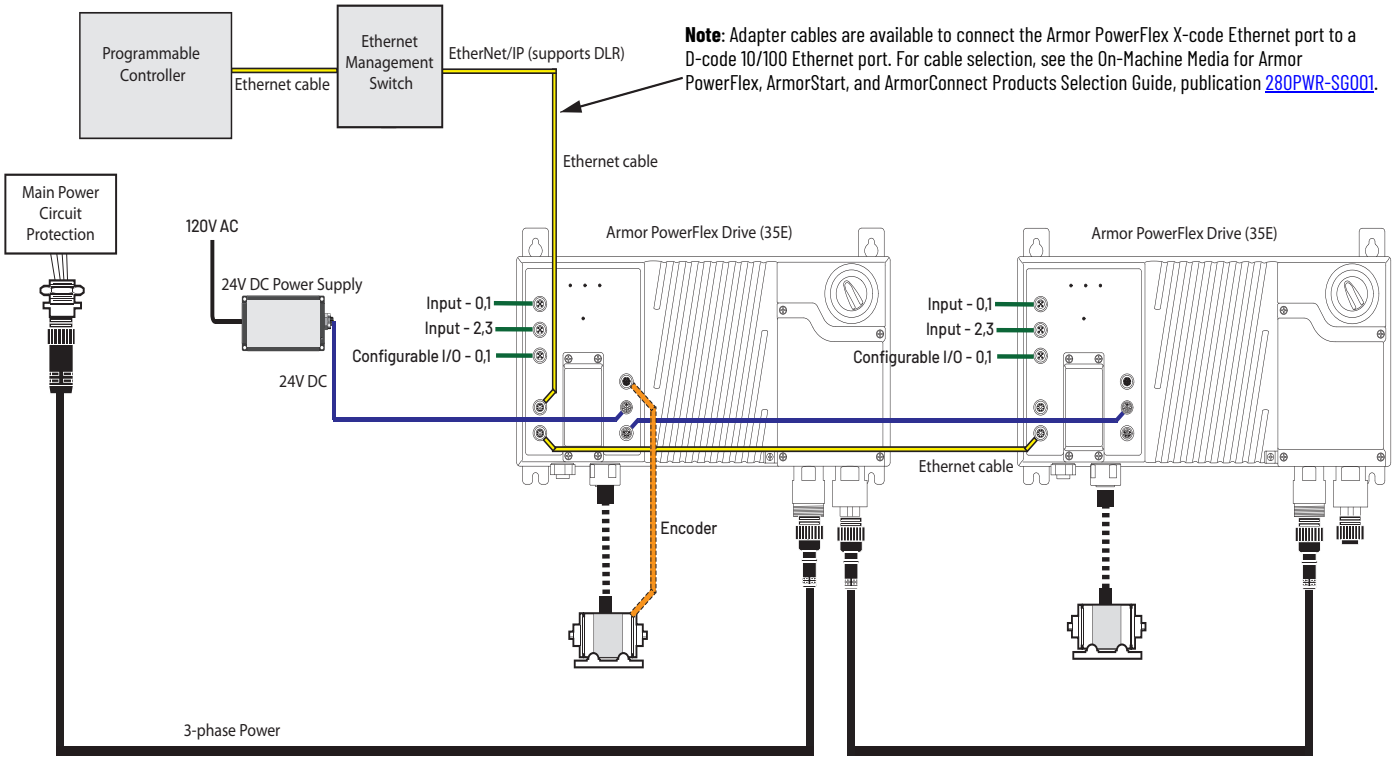


Figure 7 - Hardwired Safe Torque Off

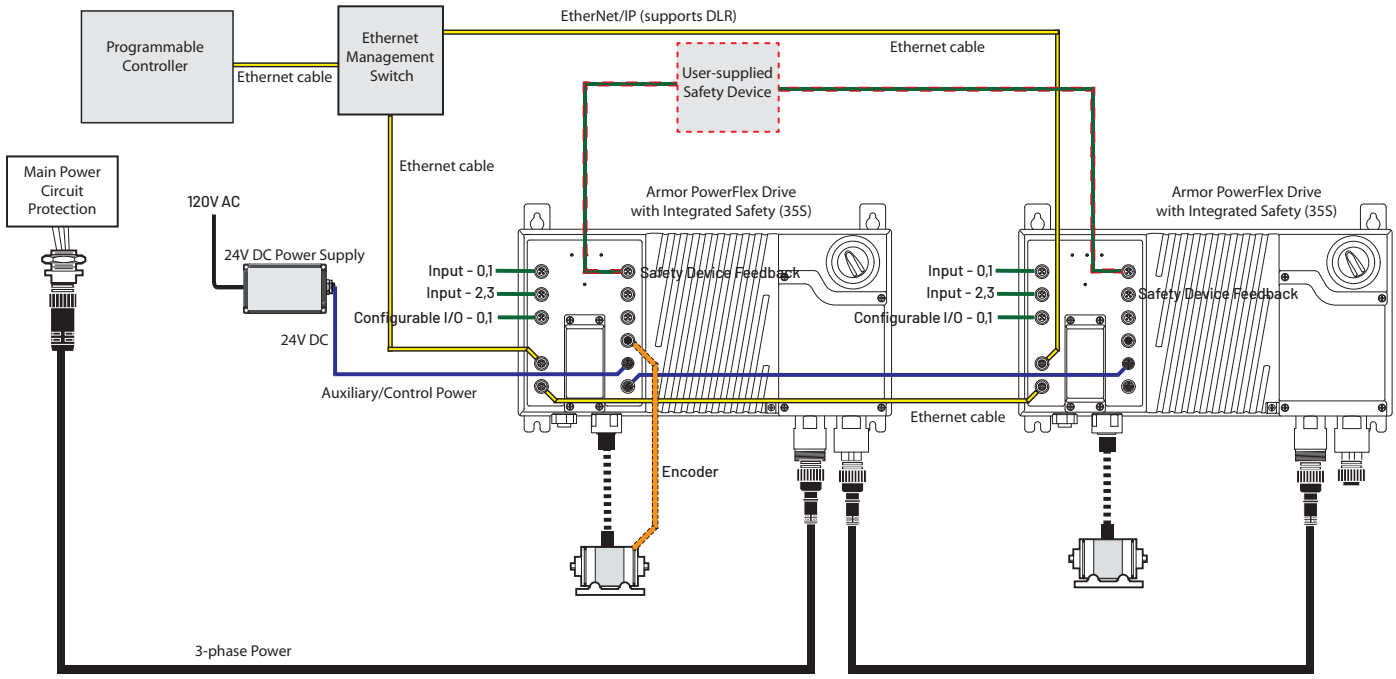


Figure 8 - Integrated Safe Torque Off (STO) or Timed Safe Stop (SS1)

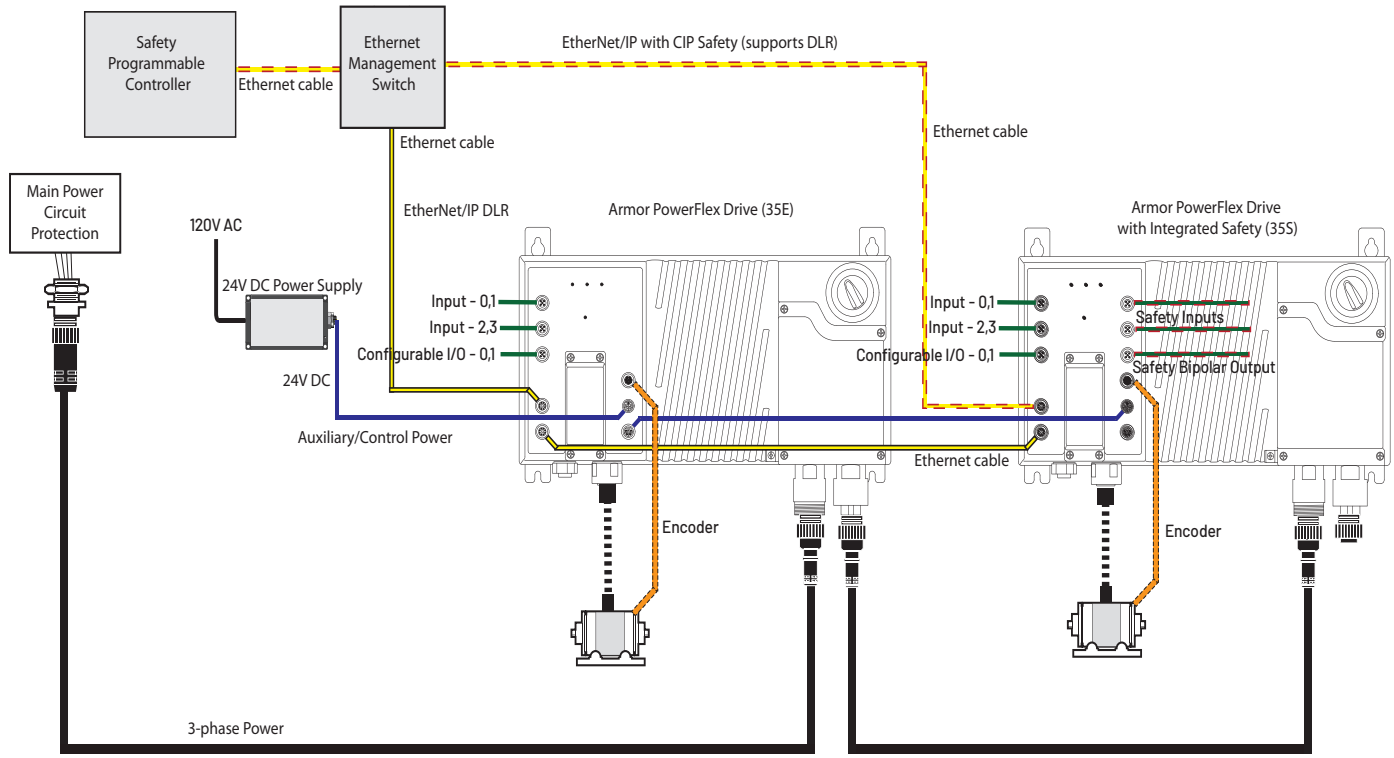
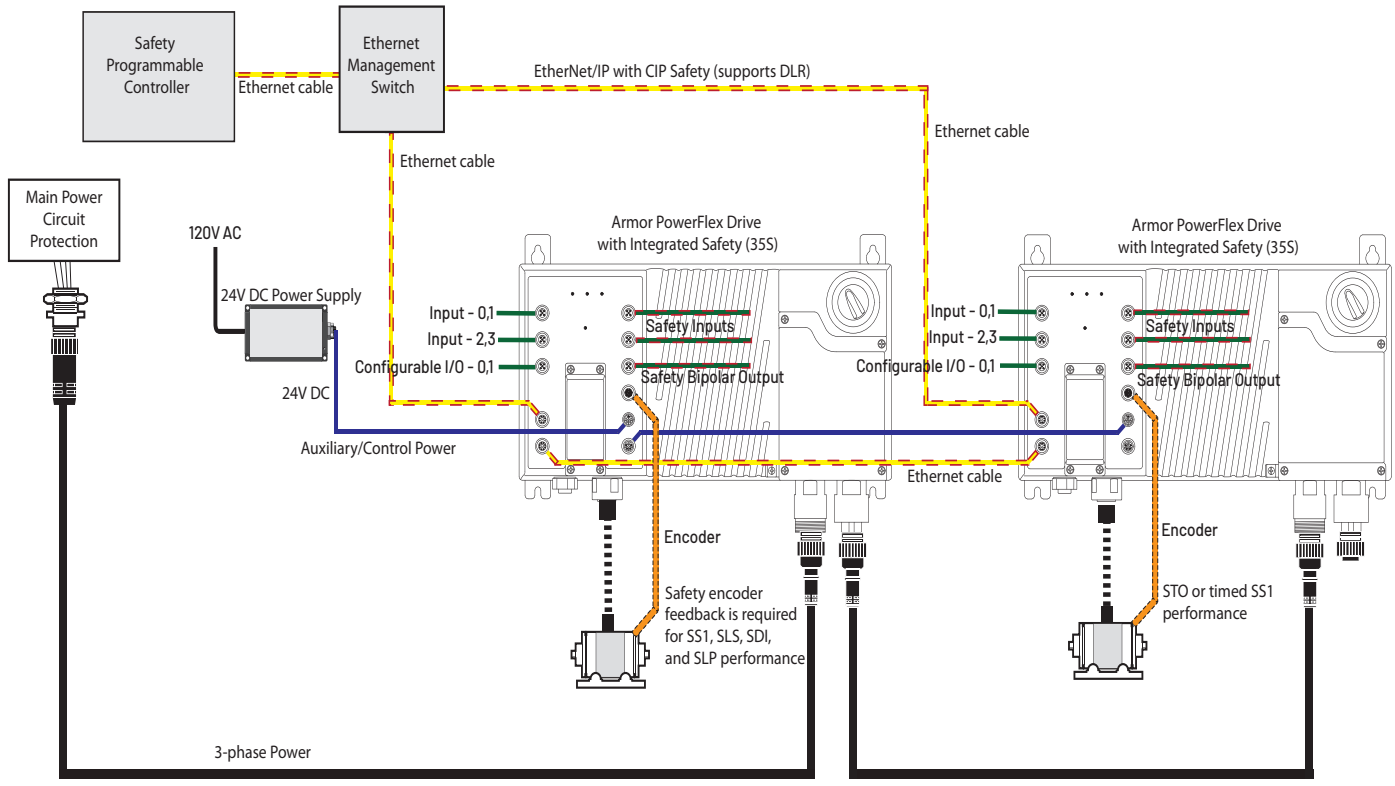


Figure 9 - Integrated Safe Speed Monitor Functions



Catalog Number Explanation

Examples that are given in this section are not intended to be used for product selection. Not all combinations generate a valid cat. no. Use ProposalWorks™ software to configure the Armor PowerFlex Drive. ProposalWorks software is available from rok.auto/systemtools.

35	S	-	6	D	1	-	L	0	0	1
a	b		c	d	e		f	g	h	i

a	
Bulletin Number	
Code	**Description**
35	Armor PowerFlex Drive

b	
Type	
Code	**Description**
S	Integrated Safety
E	Standard with EtherNet/IP

c	
Enclosure Type	
Code	**Description**
6	IP54/66, Type 1/4/12, NEMA Type 1/4/12

d	
Line Voltage	
Code	**Description**
D	480Y/277V AC, 50/60 Hz

e	
Motor Power Output Rating	
Code	**Description**
1	1 Hp, 0.75 kW, 2.3 A
2	2 Hp, 1.5 kW, 4.0 A
3	3 Hp, 2.2 kW, 6.0 A

f	
24V DC Auxiliary Power Source	
Code	**Description**
L	External
P	Internal

g	
Power-in Gland	
Code	**Description**
0	Cord/conduit
1	Round Quick Connect
2	Square Quick Connect

h	
EM Brake	
Code	**Description**
0	None
1	Included

i	
EMI Filter	
Code	**Description**
1	Included

Armor PowerFlex Standard Drives

The standard Armor PowerFlex drive includes the following features:

- Up to 3 Hp
- AC induction motor control
- User I/O
- Local manual control
- Local, lockable disconnect

Bulletin 35E Standard Drives with EMI filter, Line Voltage 480/277V AC, 50/60 Hz

Rated Current [A]	Motor Power		Auxiliary Power Source	Power-in Gland	EM Brake	Cat. No.
	[Hp]	[kW]				IP66, Type 1/4/12 Enclosure
Frame A						
2.3	1	0.75	External	Cord/Conduit	None	35E-6D1-L001
				Cord/Conduit	Included	35E-6D1-L011
				Round Quick Connect	None	35E-6D1-L101
				Round Quick Connect	Included	35E-6D1-L111
				Square Quick Connect	None	35E-6D1-L201
				Square Quick Connect	Included	35E-6D1-L211
			Internal	Cord/Conduit	None	35E-6D1-P001
				Cord/Conduit	Included	35E-6D1-P011
				Round Quick Connect	None	35E-6D1-P101
				Round Quick Connect	Included	35E-6D1-P111
				Square Quick Connect	None	35E-6D1-P201
				Square Quick Connect	Included	35E-6D1-P211
4.0	2	1.5	External	Cord/Conduit	None	35E-6D2-L001
				Cord/Conduit	Included	35E-6D2-L011
				Round Quick Connect	None	35E-6D2-L101
				Round Quick Connect	Included	35E-6D2-L111
				Square Quick Connect	None	35E-6D2-L201
				Square Quick Connect	Included	35E-6D2-L211
			Internal	Cord/Conduit	None	35E-6D2-P001
				Cord/Conduit	Included	35E-6D2-P011
				Round Quick Connect	None	35E-6D2-P101
				Round Quick Connect	Included	35E-6D2-P111
				Square Quick Connect	None	35E-6D2-P201
				Square Quick Connect	Included	35E-6D2-P211
6.0	3	2.2	External	Cord/Conduit	None	35E-6D3-L001
				Cord/Conduit	Included	35E-6D3-L011
				Round Quick Connect	None	35E-6D3-L101
				Round Quick Connect	Included	35E-6D3-L111
				Square Quick Connect	None	35E-6D3-L201
				Square Quick Connect	Included	35E-6D3-L211
			Internal	Cord/Conduit	None	35E-6D3-P001
				Cord/Conduit	Included	35E-6D3-P011
				Round Quick Connect	None	35E-6D3-P101
				Round Quick Connect	Included	35E-6D3-P111
				Square Quick Connect	None	35E-6D3-P201
				Square Quick Connect	Included	35E-6D3-P211

Armor PowerFlex Safety Drives

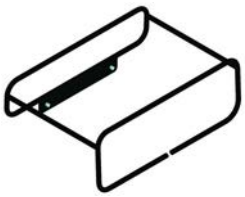
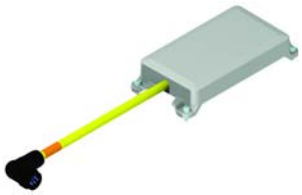
Our Armor PowerFlex Safety drives include the following features:

- Up to 3 Hp
- AC induction motor control
- User standard and safety I/O
- Local manual control
- Local, lockable disconnect
- Hard-wired Safe Torque Off (STO)
- Integrated drive-based Safe Stop functions
- Integrated controller-based Safe Monitor functions

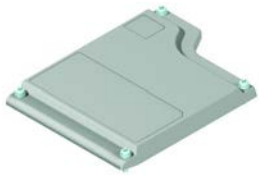
Bulletin 35S Safety Drives with EMI filter, Line Voltage 480/277V AC, 50/60 Hz

Rated Current [A]	Motor Power		Auxiliary Power Source	Power-in Gland	EM Brake	Cat. No.
	[Hp]	[kW]				IP66, Type 1/4/12 Enclosure
Frame A						
2.3	1	0.75	External	Cord/Conduit	None	35S-6D1-L001
				Cord/Conduit	Included	35S-6D1-L011
				Round Quick Connect	None	35S-6D1-L101
				Round Quick Connect	Included	35S-6D1-L111
				Square Quick Connect	None	35S-6D1-L201
				Square Quick Connect	Included	35S-6D1-L211
			Internal	Cord/Conduit	None	35S-6D1-P001
				Cord/Conduit	Included	35S-6D1-P011
				Round Quick Connect	None	35S-6D1-P101
				Round Quick Connect	Included	35S-6D1-P111
				Square Quick Connect	None	35S-6D1-P201
				Square Quick Connect	Included	35S-6D1-P211
4.0	2	1.5	External	Cord/Conduit	None	35S-6D2-L001
				Cord/Conduit	Included	35S-6D2-L011
				Round Quick Connect	None	35S-6D2-L101
				Round Quick Connect	Included	35S-6D2-L111
				Square Quick Connect	None	35S-6D2-L201
				Square Quick Connect	Included	35S-6D2-L211
			Internal	Cord/Conduit	None	35S-6D2-P001
				Cord/Conduit	Included	35S-6D2-P011
				Round Quick Connect	None	35S-6D2-P101
				Round Quick Connect	Included	35S-6D2-P111
				Square Quick Connect	None	35S-6D2-P201
				Square Quick Connect	Included	35S-6D2-P211
6.0	3	2.2	External	Cord/Conduit	None	35S-6D3-L001
				Cord/Conduit	Included	35S-6D3-L011
				Round Quick Connect	None	35S-6D3-L101
				Round Quick Connect	Included	35S-6D3-L111
				Square Quick Connect	None	35S-6D3-L201
				Square Quick Connect	Included	35S-6D3-L211
			Internal	Cord/Conduit	None	35S-6D3-P001
				Cord/Conduit	Included	35S-6D3-P011
				Round Quick Connect	None	35S-6D3-P101
				Round Quick Connect	Included	35S-6D3-P111
				Square Quick Connect	None	35S-6D3-P201
				Square Quick Connect	Included	35S-6D3-P211

Optional Accessories

	Description			Frame Size	Cat. No.
	Logic Guard • Black metal construction			A	35-LG1-AB
	Splash plastic shield • Clear plastic			A	35-SPS-AB
	Dynamic Brake Resistors	Light Duty • IP54/66, Type 1/4/12, NEMA Type 1/4/12 • Right-angle plug connector • Mounts directly on Armor PowerFlex drive	50 W, 360 Ω	A	35R-00AP1K
		Normal Duty • 1 m (3.3 ft) cable • IP54/66, Type 1/4/12, NEMA Type 1/4/12 • Right-angle plug connector • Separate mounting from Armor PowerFlex Drive	100 W, 360 Ω	A	35T-360P500

Renewal Parts

	Description	Frame Size	Cat. No.
	Logic section door	A	35-LSD-AB
	Power section door	A	35-PSD-A
	Power section inner cover	A	35-PSC-A
	Mounting feet • Set of 4 • Includes screws	A	35-MMF-AB

Renewal Parts (Continued)

	Description		Frame Size	Cat. No.
	Safety Bypass Plug • Used to bypass hardwired STO during setup		A	35-SPM12M
	Gland Plates	Conduit	A	35-CPG-AB
		Round Connectors	A	35-RPG-AB
		Square Connectors	A	35-SPG-AB

Table 6 - Fuses

Description	Rated Current [A]	Interrupting Capacity	Rated Voltage	Manufacturer	Dimensions [mm (in)]	Cat. No.
3-phase AC Power Fuses • UL Listed Class CC • Std. 248-14	20	100 kA rms	600V AC	Bussman	38.1 x 10.3 (1.5 x 0.41)	KTK-20
EM Brake Fuses • UL Listed Class CC • Std. 248-14	6	100 kA rms	600V AC	Bussman	38.1 x 10.3 (1.5 x 0.41)	KTK-6
Unswitched (Control) 24V DC Power Fuse • Fuse T C • H CLIP	2.5	1500 A @250V AC	250V DC	Littlefuse	20 x 5.2 (0.78 x 0.2)	21502.5MXP
Switched (Sensor) 24V DC Power Fuse • Fuse T C • 4 A, 250V • H CLIP	4	1500 A @250V AC	250V DC	Littlefuse	21.5 x 5.5 (0.84 x 0.21)	215004.MXP

Overview

This section contains descriptions of three-phase power, control (auxiliary) power, motor, brake, I/O, and network communication media, suitable for Armor PowerFlex drive connections. This section also contains typical wiring diagrams that list common cables and media for various Armor PowerFlex drives. In addition to the products listed in the tables in this section, Rockwell Automation offers other options to extend your system.

For complete ordering information, including available options, pinout, dimension, and other specifications, see the following publications.

- On-Machine Media for Armor PowerFlex, ArmorStart, and ArmorConnect Products Selection Guide, publication 280PWR-SG001
- Cordsets & Field Attachables Technical Data, publication 889-TD002
- Ethernet Media Specifications, publication 1585-TD001

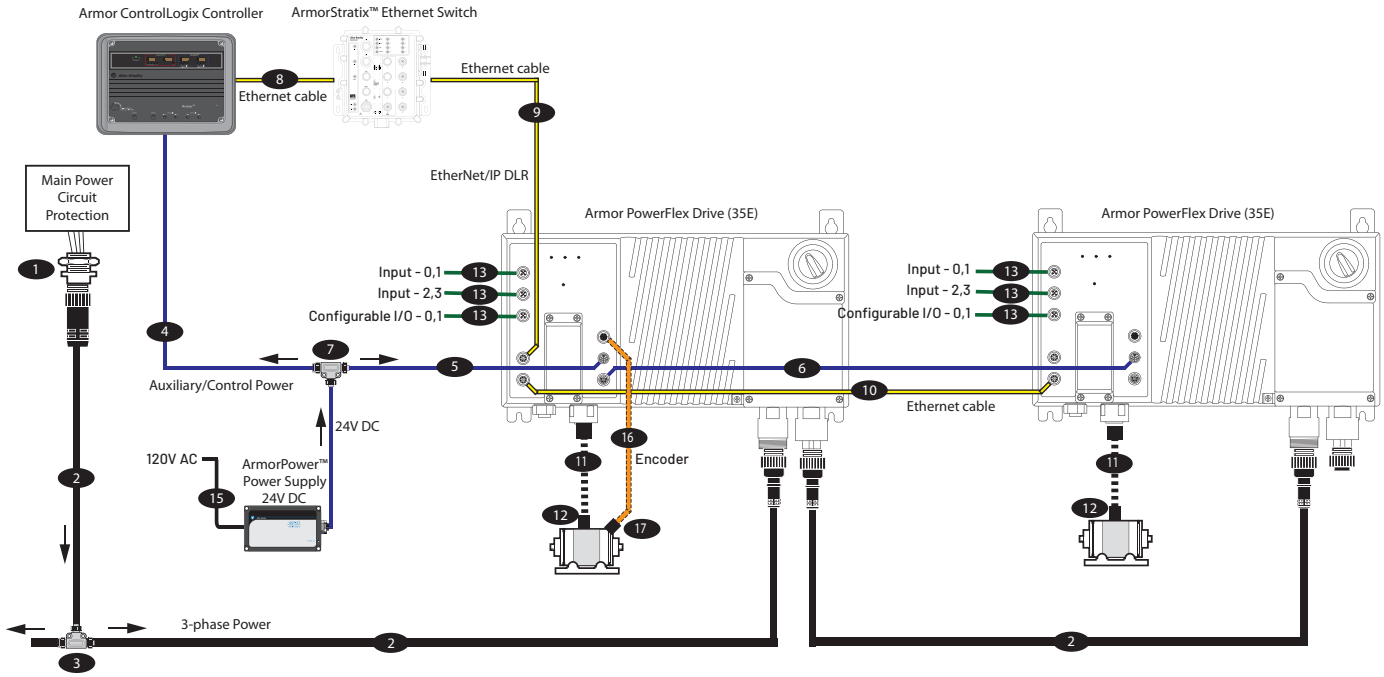
Media Overview

ArmorConnect Three-phase Power Media	Auxiliary (Control) Power Media	Motor and Brake Media	I/O and Network Media
 Trunk cable assemblies  Tee, reducer adapter, and fiel attachable connector  Through-panel receptacles	 5-pin M12 L-code cordset  Tees  Through-panel receptacles	 Motor cable	 I/O cordset and patchcord  Ethernet cordset and patchcord
• Three-phase and control power cable systems – cordsets – patchcords – receptacles – tees – reducers – accessories • Reduces installation time • Provides plug-and-play environment – helps avoid miswiring	• L-Code quick connect cable • Based on a 5-pin mini-connector • Connectors can be straight or right angled • Physically keyed to avoid incorrect wiring	• Available in multiple configurations and lengths	• Network media for Ethernet • Input and output devices • Safety connection systems • Solutions include: – cordsets – patchcords – V- and Y-cables – splitters – field-attachable connectors – receptacles

Typical Wiring Configurations

Typical motor control systems include selections from several categories of Allen-Bradley® motor control products and connection media.

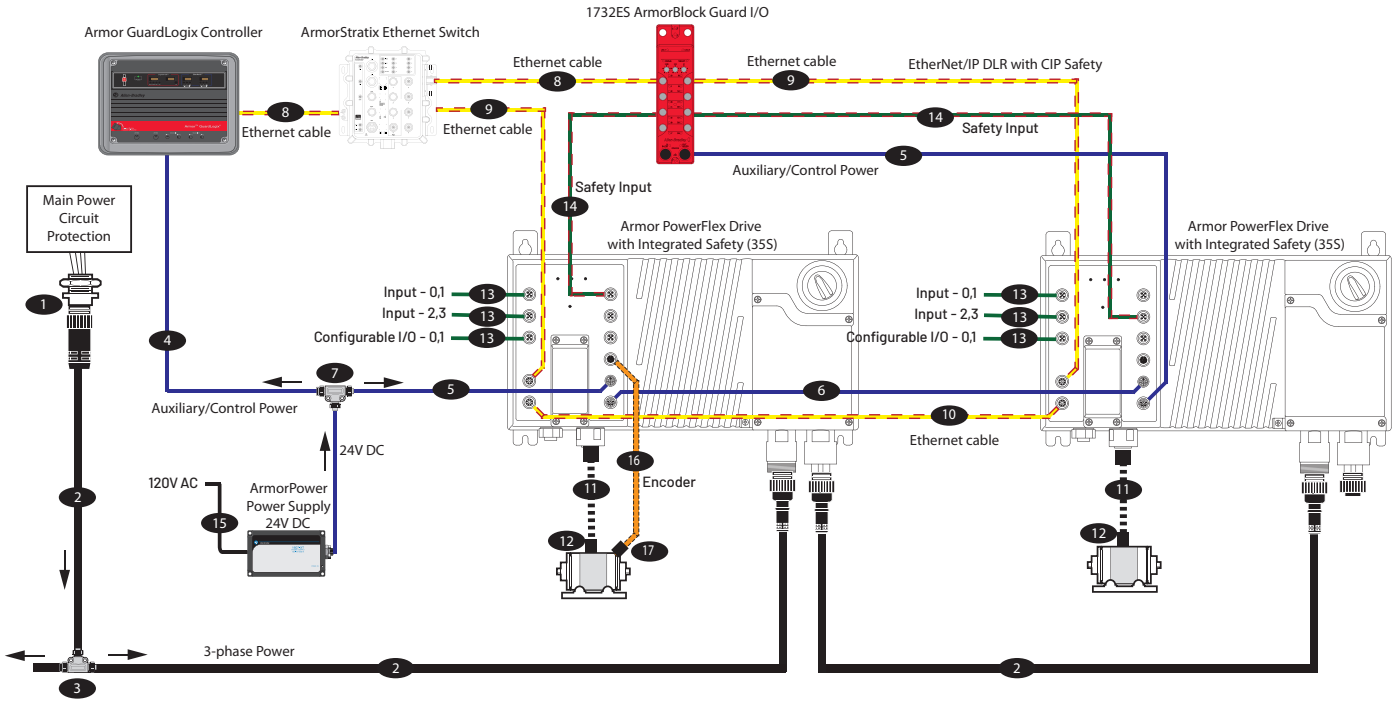
Armor PowerFlex Drive Standard System



Item	Description	Example Cat. No.
1	Three-phase power receptacle, round or Three-phase power receptacle, square	280-M35F-M*xx*(1) or HARTING® 61 04 201 2753
2	Three-phase power cable, round or Three-phase power cable, square	280-PWRM35A-M*xx*(1) or HARTING 61 04 202 2953 L*xxx*(1)
3	Three-phase power t-port, round or Three-phase power t-port, square	280-T35 or HARTING 09 12 008 4720
4 5 6	Auxiliary/Control power cable, 4-pin Auxiliary/Control power cable, 4 to 5-pin Auxiliary/Control power cable, 5-pin Auxiliary/Control power cable, 5-pin	889N-F4AFNM-*xx*(1) 889L-R5JFN4M-*xx*(1) 889L-R5JFLE-*xx*(1)
7	Auxiliary/Control power t-port, 4-pin	898N-43PB-N4KF
not shown	Auxiliary/Control power receptacle, 4-pin	888N-D4AF1-*xx*(1)
8 9 10	Ethernet patchcord 10/100 MB, D-code to D-code Ethernet patchcord 10/100 MB, X-code to D-code Ethernet patchcord 1 GB, X-code to X-code	1585D-M4TBDM-*xx*(1) 1585D-E8TGD4E-*xx*(1) 1585D-E8TGDE-*xx*(1)
11	Motor and EM brake cable, 7-pin or Motor cable (no EM brake), 4-pin	357-PWRM29A-M*xx*(1) or 280-PWRM29A-M*xx*(1) 284-PWRM29A-M*xx*(1)
12	Motor and EM brake receptacle, 7-pin or Motor receptacle, 4-pin	357-M29M-M05 or 284-M29M-M03
13	I/O cables, standard	889D-R5ACDE-*xx*(1)
15	120V AC line in cable	889N-F3AFC-F-*xx*(1)
16	Encoder cable	889D-R8FBDE-*xx*(1)
17	Encoder receptacle	888D-F8AB3-*xx*(1)

(1) *xx* specifies the available cable/wire lengths.

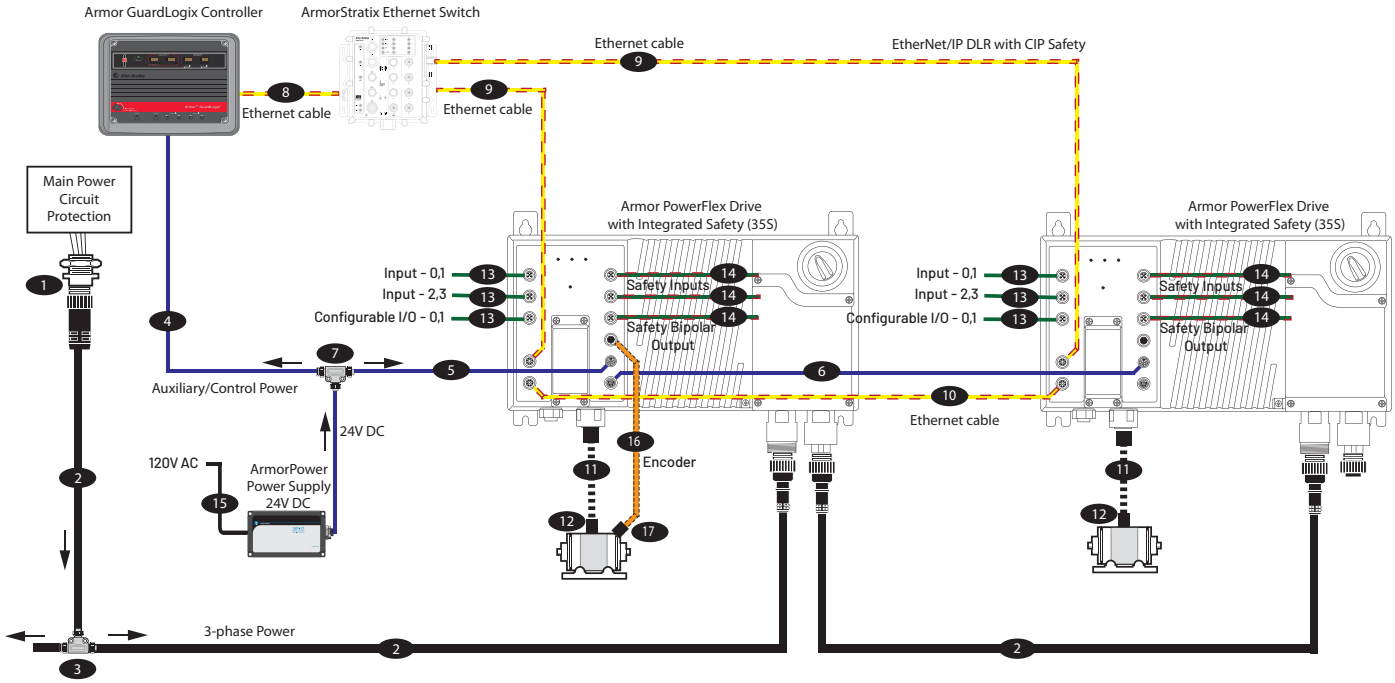
Armor PowerFlex Drive with Hardwired Safety



Item	Description	Example Cat. No.
1	Three-phase power receptacle, round or Three-phase power receptacle, square	280-M35F-M*xx*(1) or HARTING 61 04 201 2753
2	Three-phase power cable, round or Three-phase power cable, square	280-PWRM35A-M*xx*(1) or HARTING 61 04 202 2953 L*xxx*(1)
3	Three-phase power t-port, round or Three-phase power t-port, square	280-T35 or HARTING 09 12 008 4720
4 5 6	Auxiliary/Control power cable, 4-pin Auxiliary/Control power cable, 4 to 5-pin Auxiliary/Control power cable, 5-pin Auxiliary/Control power cable, 5-pin	889N-F4AFNM-*xx*(1) 889L-R5JFN4M-*xx*(1) 889L-R5JFLE-*xx*(1)
7	Auxiliary/Control power t-port, 4-pin	898N-43PB-N4KF
not shown	Auxiliary/Control power receptacle, 4-pin	888N-D4AF1-*xx*(1)
8 9 10	Ethernet patchcord 10/100 MB, D-code to D-code Ethernet patchcord 10/100 MB, X-code to D-code Ethernet patchcord 1 GB, X-code to X-code	1585D-M4TBDM-*xx*(1) 1585D-E8TGD4E-*xx*(1) 1585D-E8TGDE-*xx*(1)
11	Motor and EM brake cable, 7-pin or Motor cable (no EM brake), 4-pin	357-PWRM29A-M*xx*(1) or 280-PWRM29A-M*xx*(1) 284-PWRM29A-M*xx*(1)
12	Motor and EM brake receptacle, 7-pin or Motor receptacle, 4-pin	357-M29M-M05 or 284-M29M-M03
not shown	Safety bypass plug	35-SPM12M
13 14	I/O cables, standard I/O cables, safety	889D-R5ACDE-*xx*(1) 889D-R5NCDE-*xx*(1)
15	120V AC line in cable	889N-F3AFC-F-*xx*(1)
16	Encoder cable	889D-R8FBDE-*xx*(1)
17	Encoder receptacle	888D-F8AB3-*xx*(1)

(1) *xx* specifies the available cable/wire lengths.

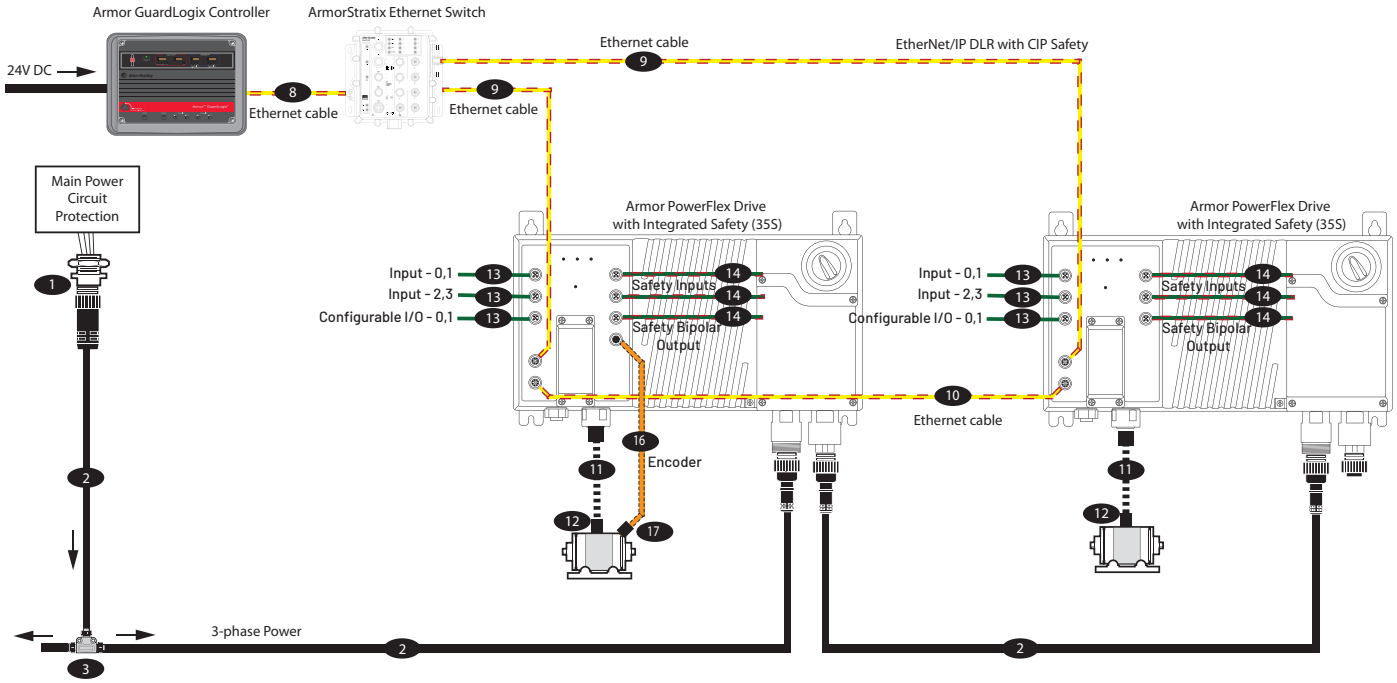
Armor PowerFlex Drive with Integrated Safety



Item	Description	Example Cat. No.
1	Three-phase power receptacle, round or Three-phase power receptacle, square	280-M35F-M*xx*(1) or HARTING 61 04 201 2753
2	Three-phase power cable, round or Three-phase power cable, square	280-PWRM35A-M*xx*(1) or HARTING 61 04 202 2953 L*xxx*(1)
3	Three-phase power t-port, round or Three-phase power t-port, square	280-T35 or HARTING 09 12 008 4720
4 5 6	Auxiliary/Control power cable, 4-pin Auxiliary/Control power cable, 4 to 5-pin Auxiliary/Control power cable, 5-pin Auxiliary/Control power cable, 5-pin	889N-F4AFNM-*xx*(1) 889L-R5JFN4M-*xx*(1) 889L-R5JFLE-*xx*(1)
7	Auxiliary/Control power t-port, 4-pin	898N-43PB-N4KF
not shown	Auxiliary/Control power receptacle, 4-pin	888N-D4AF1-*xx*(1)
8 9 10	Ethernet patchcord 10/100 MB, D-code to D-code Ethernet patchcord 10/100 MB, X-code to D-code Ethernet patchcord 1 GB, X-code to X-code	1585D-M4TBDM-*xx*(1) 1585D-E8TGD4E-*xx*(1) 1585D-E8TGDE-*xx*(1)
11	Motor and EM brake cable, 7-pin or Motor cable (no EM brake), 4-pin	357-PWRM29A-M*xx*(1) or 280-PWRM29A-M*xx*(1) 284-PWRM29A-M*xx*(1)
12	Motor and EM brake receptacle, 7-pin or Motor receptacle, 4-pin	357-M29M-M05 or 284-M29M-M03
not shown	Safety bypass plug	35-SPM12M
13 14	I/O cables, standard I/O cables, safety	889D-R5ACDE-*xx*(1) 889D-R5NCDE-*xx*(1)
15	120V AC line in cable	889N-F3AFC-F-*xx*(1)
16	Encoder cable	889D-R8FBDE-*xx*(1)
17	Encoder receptacle	888D-F8AB3-*xx*(1)

(1) *xx* specifies the available cable/wire lengths.

Armor PowerFlex Drive with Integrated Safety and with Internal Power Supply



Item	Description	Example Cat. No.
1	Three-phase power receptacle, round or Three-phase power receptacle, square	280-M35F-M*xx*(1) or HARTING 61 04 201 2753
2	Three-phase power cable, round or Three-phase power cable, square	280-PWRM35A-M*xx*(1) or HARTING 61 04 202 2953 L*xxx*(1)
3	Three-phase power t-port, round or Three-phase power t-port, square	280-T35 or HARTING 09 12 008 4720
8 9 10	Ethernet patchcord 10/100 MB, D-code to D-code Ethernet patchcord 10/100 MB, X-code to D-code Ethernet patchcord 1 GB, X-code to X-code	1585D-M4TBDM-*xx*(1) 1585D-E8TGD4E-*xx*(1) 1585D-E8TGDE-*xx*(1)
11	Motor and EM brake cable, 7-pin or Motor cable (no EM brake), 4-pin	357-PWRM29A-M*xx*(1) or 280-PWRM29A-M*xx*(1) 284-PWRM29A-M*xx*(1)
12	Motor and EM brake receptacle, 7-pin or Motor receptacle, 4-pin	357-M29M-M05 or 284-M29M-M03
not shown	Safety bypass plug	35-SPM12M
13 14	I/O cables, standard I/O cables, safety	889D-R5ACDE-*xx*(1) 889D-R5NCDE-*xx*(1)
15	120V AC line in cable	889N-F3AFC-F-*xx*(1)
16	Encoder cable	889D-R8FBDE-*xx*(1)
17	Encoder receptacle	888D-F8AB3-*xx*(1)

(1) *xx* specifies the available cable/wire lengths.

Technical Specifications

Table 7 - Standards Compliance and Certifications

Certification	Standards Compliance
cULus	• UL 61800-5-1, 1st Ed, Rev • CSA C22.2 No. 274-17, 2nd Ed
RCM	• Radiocommunications Act:1992 (including Amendments up to 2018) • Radiocommunications (Electromagnetic Compatibility) Standard 2017 • Radiocommunications Labeling (Electromagnetic Compatibility) Notice 2017
CE	• 2014/35/EU Low Voltage Directive • 2014/30/EU EMC Directive • 2006/42/EC Machinery Directive (Cat 35S Only) • 2011/65/EU RoHS Directive • Reg 2019/1781 (2009/125/EC) Ecodesign Directive • RoHS standard EN 63000 • Low Voltage Directive EN 61800-5-1 • EMC EN 61800-3
Functional Safety (TÜV Rheinland) (EU and UK) Cat: 35S Only	• EN ISO 13849-1 • EN 61800-5-2 • IEC 61508 PARTS 1-7 • EN 62061 • EN 60204-1 • Certified up to SIL3/PLe with Safe Torque Off • Certified up to SIL2/PLd with Safe Speed Monitoring • Certified up to SIL3/PLe with Safety I/O • 2006/42/EC Machinery Directive
KCC	Korean Registration of Broadcasting and Communications Equipment Compliant with the following standards: • Article 58-2 of Radio Waves Act, Clause 3 • R-R-RAA-35X • R-R-RAA-35 ACC
Efficiency Class	Ecodesign regulation (EU) 2019/1781, IE2 efficiency class, per Ecodesign Regulation (EU) 2019/1781
SEMI F47	Certified compliant with the following standards: • SEMI F47.0706 • IEC 61000-4-11 • IEC 61000-4-34
Morocco	• Arrêté ministériel n° 6404-15 du 1 er muharram 1437(15 octobre 2015) • Arrêté ministériel n° 6404-15 du 29 ramadan 1436(16 juillet 2015) • NM EN 61800-3 :2018 • NM EN 61800-5-1 :2014
UKCA	• 2016 No. 1101 Low Voltage • 2016 No. 1091 EMC • 2008 No. 1597 Machinery (Cat 35S Only) • 2012 No. 3032 RoHS • 2021 No. 745 ECO Design • RoHS standard EN 63000 • Low Voltage Directive EN 61800-5-1 • EMC EN 61800-3
The drive is also designed to meet the appropriate portions of the following specifications: • NFPA 70 - US National Electrical Code • NFPA 79 - Electrical Standard for Industrial Machinery • NEMA ICS 7.1 - Safety standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems	

Electrical Ratings

Table 8 - Power Circuit

Attribute			Value
Rated Voltage	Operating		380...480V AC, ±10% (solidly wye-grounded)
	Insulation		Reinforced
	Impulse		8.7 kV
	Dielectric withstand	Primary-ground	4800V DC
		Secondary-ground	2800V DC
	Frequency	Operating	48...63 Hz
Overvoltage Category			Overvoltage Category 3
Resistance to Shock			Protective Separation

Table 9 - External Auxiliary/Control Circuit Ratings

Attribute		Value
Rated Voltage	Operating	24V DC power supply is required, PELV or SELV(1)
	SELV Insulation to chassis	Basic
	Dielectric withstand	500V AC
	Operating Frequency	DC
	Overvoltage Category	SELV and Overvoltage Category 2

(1) SELV (separated extra-low voltage) and PELV (protective extra-low voltage) circuits. These circuits have a nominal voltage that does not exceed 50V AC or 120V ripple-free DC.

Table 10 - External Auxiliary Power Requirements(1)

Attribute		Unswitched Auxiliary (Sensor) Power ON	Switched Auxiliary (Output) Power ON	Concurrent Unswitched and Switched Auxiliary Power ON
Current (with no I/O demand)	Nominal	271 mA	30.27 mA	301.27 mA
	Max	2.5 A	4 A	6.5 A
Power (Nominal Current x 24V)	Operating	6.5 W	0.726 W	7.226 W
	Max	66 W	105 W	171 W
Peak Inrush Current		1.687 A @ 0.25 ms	3.77 A @ 0.25 ms	6.497 A @ 0.15 ms

(1) You must consider the power demands of the I/O when sizing the external 24V DC power supply.

Table 11 - Internal Power Supply (Optional)

Attribute		Value
Rated Operating Voltage	SELV(1)	24V DC +10%, -15%
Current	no I/O demand	345.54 mA nominal
	with I/O demand	6.5 A max
Power (Nominal Current x 24V)	no I/O demand	8.3 W
	with I/O demand	171 W max

(1) SELV (separated extra-low voltage) circuits. These circuits have a nominal voltage that does not exceed 50V AC or 120V ripple-free DC.

Table 12 - Protection Specifications

Attribute		Value
Short Circuit Current Rating, max		100,000 A symmetrical
DC Bus	Nominal Bus	680V DC
	Overvoltage Fault	820V DC
	Undervoltage Fault	390V DC
Power Ride-Thru	at 0% load	Loss of input power (0% volts) for 20...500 ms results in < 10% motor speed reduction
	at 100% load	• Loss of input power (0% volts) for 20 ms results in < 10% motor speed reduction • Loss of input power (0% volts) for 200 ms results in speed reduction to zero in just over 1 s – results in under-voltage fault) • Loss of phase (40% volts) for 200 ms results in < 10% motor speed reduction
Electronic Motor Overload Protection		Class 10
Overcurrent	Hardware limit	200%
	Instantaneous fault	300%
Ground Fault Trip		Phase-to-ground on drive output, EM brake, and Dynamic Brake
Short-circuit Trip		Phase-to-phase on drive output, EM brake, and Dynamic Brake
Short Circuit Protection Device (SCPD) Performance	Max Branch Circuit Protection	size per local codes(1)

(1) Compatible Circuit Breakers: Cat. No. 140MT-D9C60 or Cat. No. 140G-H6C3-C60.

Table 13 - Drive Characteristics

Attribute				Value
Efficiency				up to IE2
General Specifications	Maximum Hp Rating/Input Voltage			3 Hp/480V
	Preset Speeds			4, user configurable
Control Functions	Carrier Frequency			2...16 kHZ, based on 4 kHz
	Stop Modes — multiple programmable			Includes: Ramp, Coast, DC-Brake, and Ramp-to-Stop
	Acceleration/Deceleration Times			4, independently programmable from 0...600 s
Real-time Clock (RTC) backup				7 days
Max Input/Output Operating Current	Rated Operating Current	1 Hp (0.75 kW)	Input	3.2 A
			Output	2.3 A
		2 Hp (1.5 kW)	Input	5.7 A
			Output	4.0 A
		3 Hp (2.2 kW)	Input	7.5 A
			Output	6.0 A
	Frequency		Line Input	48...63 Hz
			Motor Output	0...500 Hz

Table 14 - Motor Control Circuit Specifications

Attribute		Value
Method		Volts/Hertz, Sensorless Vector Control (SVC), Economizer SVC motor control, Closed Loop Velocity Vector Control
Carrier Frequency		2...16 kHz, Drive rating based on 4 kHz
Performance	V/Hz	±1% of base speed across a 60:1 speed range
	SVC	±0.5% of base speed across a 100:1 speed range
	SVC Economizer	±0.5% of base speed across a 100:1 speed range
	Velocity Vector Control (VVC)	±0.5% of base speed across a 60:1 speed range ±0.5% of base speed, up to a 20:1 speed range
Performance with Encoder	SVC	±0.1% of base speed across a 100:1 speed range(1)
	SVC Economizer	±0.1% of base speed across a 1000:1 speed range
	VVC	±0.1% of base speed, up to a 60:1 speed range
Output Voltage Range		0V to rated motor voltage
Output Frequency Range		0...500 Hz (programmable)

Table 14 - Motor Control Circuit Specifications (Continued)

Attribute	Value
Efficiency	See Performance Specifications per Ecodesign Regulations (EU) 2019/1781 on page 30
Stop Modes	Multiple programmable stop modes, including: Ramp, Coast, DC-Brake, and Ramp-to-Stop
Acceleration/Deceleration	Four independently programmable times. Each time can be programmed from 0...600 s
Intermittent Overload	150% Overload capability for up to 60 s, 180% for up to 3 s (200% programmable)

(1) For more information, see the Armor PowerFlex Drives user manual, publication 35-UM001.

Table 15 - Mechanical Ratings

Attribute			Value
Approximate Shipping Weight		without package	9.1 kg (20 lb)
		with package	10.3 kg (23 lb)
Enclosure rating	with dust caps		IP54, UL Type 1/12
	with sealing caps		IP66, UL Type 4
Resistance to Shock per IEC 60068-2-27		Operational	25 G, 6 ms, half sine waveform
		Non-operational	25 G, 6 ms, half sine waveform
Resistance to Vibration per IEC 60068-2-6		Operational	20 mm p-p from 5...9 Hz; 3 G from 9...500 Hz
		Non-operational	0.075 mm amplitude from 10...57 Hz; 1 G from 57...150 Hz
Power and Ground Terminals	Wire Size, Max	Primary Terminal	8.4 mm^2 (8 AWG)
	Tightening Torque	Primary Terminal	1.5 N•m (13 lb•in)
	Wire Strip Length		0.35 in. (9 mm)
Disconnect Lock Out			Recommend 8 mm (5/16 in.) lock shackle or hasp. The hasp must not exceed 8 mm (5/16 in.) when closed.

Table 16 - Standard I/O Specifications, Discrete Inputs

Attributes		Value
Input Compatibility		IEC 61131-2
Source Power	Unswitched	24V DC
Operating Voltage		24V DC +10%/-15%
Input Current, Max		50 mA per input, 200 mA max total
Source	Unswitched	24V DC
Connection Type		single-key M12 quick disconnect
Input Voltage per IEC 61131-2 Type 1	ON State	15...26.4V DC
	OFF State	0...5V DC
Current per IEC 61131-2 Type 1	ON State	> 2 mA
	OFF State	< 2 mA
Sink mode (SNK)	OFF	< 5V DC
	ON	≥ 15V DC
Sensor	Supply voltage	24V DC, -15%/+10%
	Leakage current, max	< 2 mA
	Sourcing current	50 mA per input, 200 mA max total
	Operating voltage	19.2...26V DC
De-bounce filter	Input, software configurable	0...65000 ms
	Hardware, fixed	63.9 kHz, 15.6 µs

Table 17 - Configurable I/O Specifications, Self-configurable Points

Attributes	Value
Operating Voltage	24V DC
Self-configurable points per connector	2
Source	Switch power
Connection Type	single-key M12 quick disconnect
Operating voltage	19.2...26V DC

Table 17 - Configurable I/O Specifications, Self-configurable Points (Continued)

Attributes			Value
Input Configuration	Input Compatibility		IEC 61131-2
	No. of Inputs		0...2, total I/O not to exceed 2
	Source	switched	24V DC
	Type		DC current sinking
	Sensor	Supply voltage	24V DC, -15%/+10%
		Leakage current, max	< 2 mA
		Sourcing current	50 mA per input, 100 mA max total
	Input Voltage per IEC 61131-2 Type 1	ON State	15...26.4V DC
		OFF State	0...5V DC
	Current per IEC 61131-2 Type 1	ON State	> 2 mA
		OFF State	< 2 mA
	De-bounce filter	Input, software configurable	0...65000 ms
		Hardware, fixed	100 µs
Output configuration	Output Compatibility		IEC 61131-2
	No. of Outputs		0...2, total I/O not to exceed 2
	Source	switched	24V DC
	Type		DC Sourcing
	Load		Resistive or light inductive loads (DC-1)
	Output state		Normally open
	Overcurrent protection		2 A maximum, all outputs combined
	Output Voltage	Operating	19.2...26V DC
	Output Current	Output Thermal Current, I_{th}	0.5 A per output max
		OFF State leakage, max	1 µA
		Peak	2 A
	Surge Suppression		Integrated diode, clamps @ 33V DC
	Thermal Protection		Integrated short-circuit and overcurrent protection

Table 18 - Encoder Specifications

Attribute		Value
Types		Incremental Quadrature (AqB) Incremental Sin/Cos Hiperface (analog signals only) Pulse (Single Channel)
Supply		5V/12V, 250 mA
Quadrature		90°, ± 20° @ 25 °C (77 °F)
Duty Cycle		50%, +10%
Requirements	Digital	Line driver type, 3.5...12V DC output, single-ended or differential, and capable of supplying 10 mA min per channel. Allowable input is DC up to 250 kHz max. The encoder I/O automatically scales to allow 5V and 12V DC nom.
	Analog	sin/cos, 2.5V, 1Vp-p Allowable input up to 167 kHz max

Safety Specifications

Table 19 - Functional Safety (Bulletin 35S only)

Attribute			Value
Functional safety rating	Hardwired stop control	STO	SIL 3, PLe, Cat. 4
	Integrated safety and advanced safety stop control	STO and SS1(t)	SIL 3, PLe, Cat. 4, maximum.
		SS1(r), SLS, SDI, SLP	SIL 2, PLd, Cat. 3, maximum.(1)
	Safety inputs	1 channel	SIL 2, PLd
		2 channel	SIL 3, PLe
	Safety output	Bi-polar	SIL 3, PLe, Cat. 4

(1) With application appropriate encoder feedback.

Table 20 - Required Software

Network		Software	Version
EtherNet/IP		FactoryTalk® Linx	6.20 or later
		Studio 5000 Logix Designer	31.0 or later
		Add-on Profile	Download the most current version from the Product Compatibility and Download Center at rok.auto/pcdc
		BOOTP/DHCP Utility	Version 2.3 or later (BOOTP is not supported.)
Programmable Controller			**Firmware Version**
35S and 35E Armor PowerFlex versions	GuardLogix and Compact GuardLogix controllers (see Table 4 for the listing of compatible controllers)		31.0 or later
35E Armor PowerFlex version	ControlLogix and CompactLogix controllers (see Table 4 for the listing of compatible controllers)		31.0 or later

Table 21 - Safety I/O Ratings

Attribute	Safety Inputs	Safety Output
Number	4 single-channel or 2 dual-channel	1 bi-polar
Type	Sinking	Sink and Source
Source	Unswitched power	Switched power
On-State Current per input	3.2 mA	–
On-State Current total	12.5 mA	–
Output Current	–	1.0 A nominal

Environmental Specifications

Table 22 - Environmental Specifications

Attribute				Value
Ambient Temperature Range	Operating	without derating		-25...+40 °C (-13...+104 °F)
		with derating	90% motor output current	-25...+45 °C (-13...+113 °F)
			80% motor output current	-25...+50 °C (-13...+122 °F)
			70% motor output current	-25...+55 °C (-13...+131 °F)
	Storage and Transportation			–40...+70 °C (–40...+158 °F)
Altitude				4800 m (15,748 ft) max
Humidity				5...95%, noncondensing
Pollution Degree (Surrounding Environment)				I and II
Sound Pressure Level	A-weighted			< 30 dBA
Housing	EMC Emission Levels	Conducted Radio Frequency Emissions		C2
	EMC Immunity Levels	Electrostatic Discharge		Second Environment
		Radio Frequency Electromagnetic Field		
		Fast Transient		
		Surge Transient		

Resistance to Cleaning Chemicals

Table 23 - Chemical Resistance Test Results(1)

Chemical		Chemical Resistance Test Results(2)		
		Housing	Label	Cable
0.5% weight/volume sodium hydroxide (NaOH)		**Good**-Fair	Good	**Good**-Fair
Simple Green® All-Purpose Cleaner (5%)		**Good**-Fair	Good	**Good**-Fair
3% volume/volume Clorox® bleach	regular (5.25% sodium hypochlorite [NaOCl])	**Good**-Fair	Good	**Good**-Fair
	concentrated (8.25% NaOCl)	**Good**-Fair	Good	**Good**-Fair
Ecolab® Quorum® Yellow LP cleaner (5 fl oz/gal)		**Good**-Fair	Good	**Good**-Fair
Ecolab® Whisper® V sanitizer (3%)		**Good**-Fair	Good	**Good**-Fair
Spor-Klenz® Ready-to-Use Sterilant		**Good**-Fair	Good	**Good**-Fair

(1) Testing was performed at room temperature for a period of 24 hours and results were observed both visually and under a microscope.
(2) See Table 24 for definitions.

Table 24 - Chemical Resistance Test Definitions

Term	Definition
Good	No visible change in surface appearance
Fair	Slight discoloration or marring of the surface
Poor	Defects will interfere with the functioning of the part and/or operator use

Performance Specifications per Ecodesign Regulations (EU) 2019/1781

480V Drive Information and Loss Summary

Table 25 - 480V Drive Information

Attribute		Rated Output Power, Normal Duty		
		1 Hp	2 Hp	3 Hp
Rated Output Current	[A]	2.3	4	6
Rated Apparent Power	[kVA]	1.83	3.19	4.78

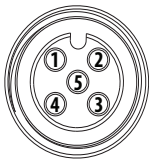
Table 26 - 480V Drive Loss Summary

Attribute	Rated Output Power, Normal Duty [Hp]	Power Supply	Load % (Speed/Torque)							
			(90/100)	(90/50)	(50/100)	(50/50)	(50/25)	(10/100)	(10/50)	(10/25)
IE classification	1	with or without	IE2	–	–	–	–	–	–	–
	2									
	3									
% IEC reference loss	1	with	44.10%	44.30%	47.60%	45.50%	43.60%	49.30%	46.00%	43.80%
		without	30.40%	28.50%	32.50%	29.10%	26.90%	33.40%	29.20%	27.00%
	2	with	42.70%	44.90%	48.00%	46.70%	45.70%	50.70%	47.40%	45.80%
		without	32.30%	31.50%	36.00%	32.50%	30.50%	37.70%	32.80%	30.50%
	3	with	44.10%	45.20%	50.00%	47.20%	45.40%	53.20%	48.00%	45.50%
		without	35.80%	34.20%	40.30%	35.40%	32.60%	42.50%	35.70%	32.50%
Overall CDM Losses [W]	1	with	62.6	54.6	61.4	54	51	60.3	53.4	50.7
		without	43.1	35.1	41.9	34.5	31.5	40.8	33.9	31.2
	2	with	80.3	65.6	78	64.4	58.9	75.7	63.3	58.3
		without	60.8	46.1	58.5	44.9	39.4	56.2	43.8	38.8
	3	with	104.5	80	100.5	78.1	69.1	96.7	76.3	68.2
		without	85	60.5	81	58.6	49.6	77.2	56.8	48.7
Efficiency	1	with	95.9%	93.5%	95.9%	93.5%	88.8%	96.0%	93.6%	88.9%
		without	97.1%	95.7%	97.2%	95.8%	92.8%	97.3%	95.8%	92.8%
	2	with	96.9%	95.4%	97.0%	95.5%	92.3%	97.1%	95.5%	92.3%
		without	97.6%	96.7%	97.7%	96.8%	94.7%	97.8%	96.9%	94.8%
	3	with	97.3%	96.2%	97.4%	96.3%	93.8%	97.5%	96.4%	93.9%
		without	97.8%	97.1%	97.9%	97.2%	95.5%	98.0%	97.3%	95.6%
Losses to Rated Apparent Power	1	with	3.42%	2.98%	3.36%	2.95%	2.79%	3.30%	2.92%	2.77%
		without	2.36%	1.92%	2.29%	1.89%	1.72%	2.23%	1.85%	1.70%
	2	with	2.52%	2.06%	2.45%	2.02%	1.85%	2.37%	1.98%	1.83%
		without	1.91%	1.45%	1.83%	1.41%	1.24%	1.76%	1.37%	1.22%
	3	with	2.19%	1.67%	2.10%	1.63%	1.45%	2.02%	1.60%	1.43%
		without	1.78%	1.27%	1.69%	1.23%	1.04%	1.62%	1.19%	1.02%

Connector Data

Connector Pinouts and Cable Torques

I/O Standard Input (M12)



Input
Pin 1:+24V unswitched power (sensor power)
Pin 2: Input n+1
Pin 3: Input Common
Pin 4: Input n
Pin 5: Chassis (PE)

Cable Connector Torque
0.5...0.6 N•m (0.37...0.44 lb•in)
(hand tight)

I/O Configurable Input or Output (M12)

Input
Pin 1: +24V switched power (control power)
Pin 2: Input 1
Pin 3: I/O Common
Pin 4: Input 0
Pin 5: Chassis (PE)

Output
Pin 1: Not used (+24V)
Pin 2: Output 1
Pin 3: I/O Common
Pin 4: Output 0
Pin 5: Chassis (PE)

Cable Connector Torque
0.5...0.6 N•m (0.37...0.44 lb•in)

I/O Safety: Configurable 2-channel safety input with test outputs (M12)

Pin 1: Test Output 1
Pin 2: Safety Input n+1
Pin 3: Common
Pin 4: Safety Input n
Pin 5: Test Output 0

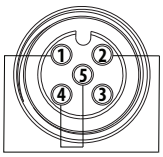
Cable Connector Torque
0.5...0.6 N•m (0.37...0.44 lb•in)

I/O Safety: Configurable bipolar output (M12)

Pin 1: NC (no connection)
Pin 2: Output n (N) sinking
Pin 3: Output Power Common
Pin 4: Output n (P) sourcing
Pin 5: Output Power Common

Cable Connector Torque
0.5...0.6 N•m (0.37...0.44 lb•in)

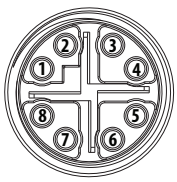
I/O Safety: Jumper Bypass Plug



Pin 1: connect to Pin 2
Pin 2: connect to Pin 1
Pin 3: NC (no connection)
Pin 4: connect to Pin 5
Pin 5: connect to Pin 4

Cable Connector Torque
0.5...0.6 N•m (0.37...0.44 lb•in)

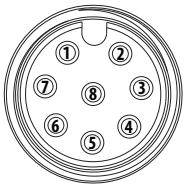
EtherNet 1 GB (M12)



Pin 1: D1+ (white/orange)
Pin 2: D1- (orange)
Pin 3: D2+ (white/green)
Pin 4: D2- (green)
Pin 5: D4+ (white/brown)
Pin 6: D4- (brown)
Pin 7: D3- (blue)
Pin 8: D3+ (white/blue)

Cable Connector Torque
0.5...0.6 N•m (0.37...0.44 lb•in)

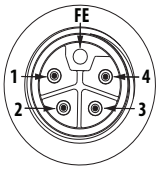
Encoder (M12)



Pin 1: Output A, SIN-
Pin 2: Output A, SIN+
Pin 3: Output B, COS-
Pin 4: Output B, COS+
Pin 5: not used
Pin 6: not used
Pin 7: Encoder supply ground
Pin 8: Encoder supply power (5V or 12V)

Cable Connector Torque
0.5...0.6 N•m (0.37...0.44 lb•in)

Auxiliary Power IN (M12)



Pin 1: +24V unswitched power (sensor power) (brown)
Pin 2: Switched power ground (white)
Pin 3: Unswitched power ground (blue)
Pin 4: +24V switched power (black)
FE: FE pass-through jumper (gray)

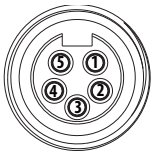
Cable Connector Torque
0.5...0.6 N•m (0.37...0.44 lb•in)

Auxiliary Power OUT (M12)

Pin 1: +24V unswitched power (control power) (brown)
Pin 2: Switched power ground (white)
Pin 3: Unswitched power ground (blue)
Pin 4: +24V switched power (black)
FE: FE pass through jumper (gray)

Cable Connector Torque
0.5...0.6 N•m (0.37...0.44 lb•in)
(hand tight)

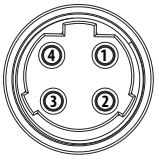
Dynamic Brake Connection (M22)



Pin 1: DB temp SW-
Pin 2: DB resistor T1
Pin 3: Chassis (PE)
Pin 4: DB resistor T2
Pin 5: DB temp SW+

Cable Connector Torque
0.5...0.6 N•m (0.37...0.44 lb•in)

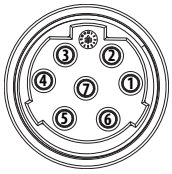
Motor without EM brake (M29)



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

Cable Connector Torque
0.5...0.6 N•m (0.37...0.44 lb•in)

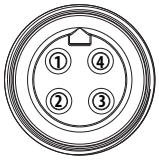
Motor with EM brake (M29)



Pin 1: Motor T1 (black)
Pin 2: Motor T2 (white)
Pin 3: Motor T3 (red)
Pin 4: Ground (green/yellow)
Pin 5: EM brake T1
Pin 6: EM brake T2
Pin 7: Drain wire

Cable Connector Torque
0.5...0.6 N•m (0.37...0.44 lb•in)

Three-Phase Power IN with Round Connector (M35)

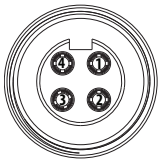


Pin 1: L1 (black)
Pin 2: Ground (green/yellow)
Pin 3: L3 (red)
Pin 4: L2 (white)

Use when application requires UL or CE compliance, as standard

Cable Connector Torque
0.5...0.6 N•m (0.37...0.44 lb•in)

Three-Phase Power OUT with Round Connector (M35)



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

Use when application requires UL or CE compliance, as standard

Cable Connector Torque
0.5...0.6 N•m (0.37...0.44 lb•in)

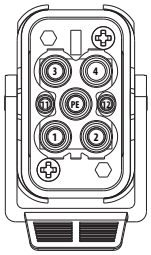
Three-Phase Power IN with Square Connector

Pin 1: Line input 1
Pin 2: Line input 2
Pin 3: Line input 3
Pin 4: not used
Pin 11: not used
Pin 12: not used
Center Pin: Chassis (PE)

Use when application requires CE compliance, as standard

Cable Connector Torque
Snap in place (no torque)

Three-Phase Power OUT with Square Connector

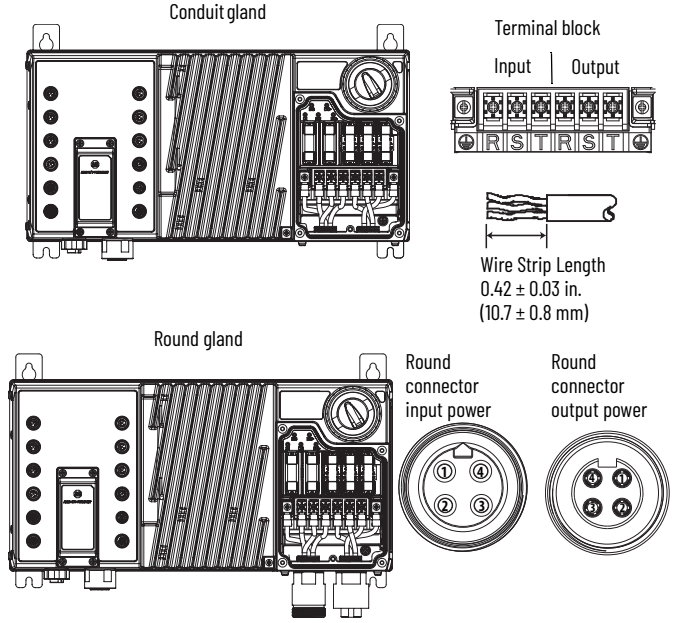


Pin 1: Line input 1
Pin 2: Line input 2
Pin 3: Line input 3
Pin 4: not used
Pin 11: not used
Pin 12: not used
Center Pin: Chassis (PE)

Use when application requires CE compliance, as standard

Cable Connector Torque
Snap in place (no torque)

Factory-installed ArmorConnect Gland Plate Connections



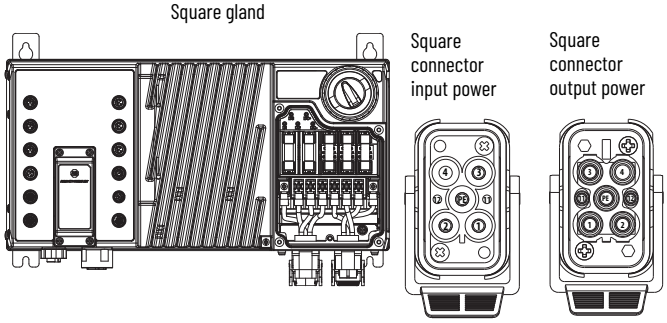


Table 27 - Conduit Types and 3-phase Power Designations

Gland 0 - Conduit		Gland 1 - Round Connector		Gland 2 - Square Connector	
Terminal - ⏚	ground	Pin 1	Line 1	Pin 1	Line 1
Terminal - R	Line 1 (input)	Pin 2	ground	Pin 2	Line 2
Terminal - S	Line 2 (input)	Pin 3	Line 3	Pin 3	Line 3
Terminal - T	Line 3 (input)	Pin 4	Line 2	Pin 4	not used
Terminal - R	Line 1 (output)	–	–	Pin 11	not used
Terminal - S	Line 2 (output)	–	–	Pin 12	not used
Terminal - T	Line 3 (output)	–	–	Center Pin	ground
Terminal - ⏚	ground	–	–	–	–

Wiring Diagrams

Figure 10 - Bulletin 35S Integrated Safety Version Armor PowerFlex Drive Internal Wiring

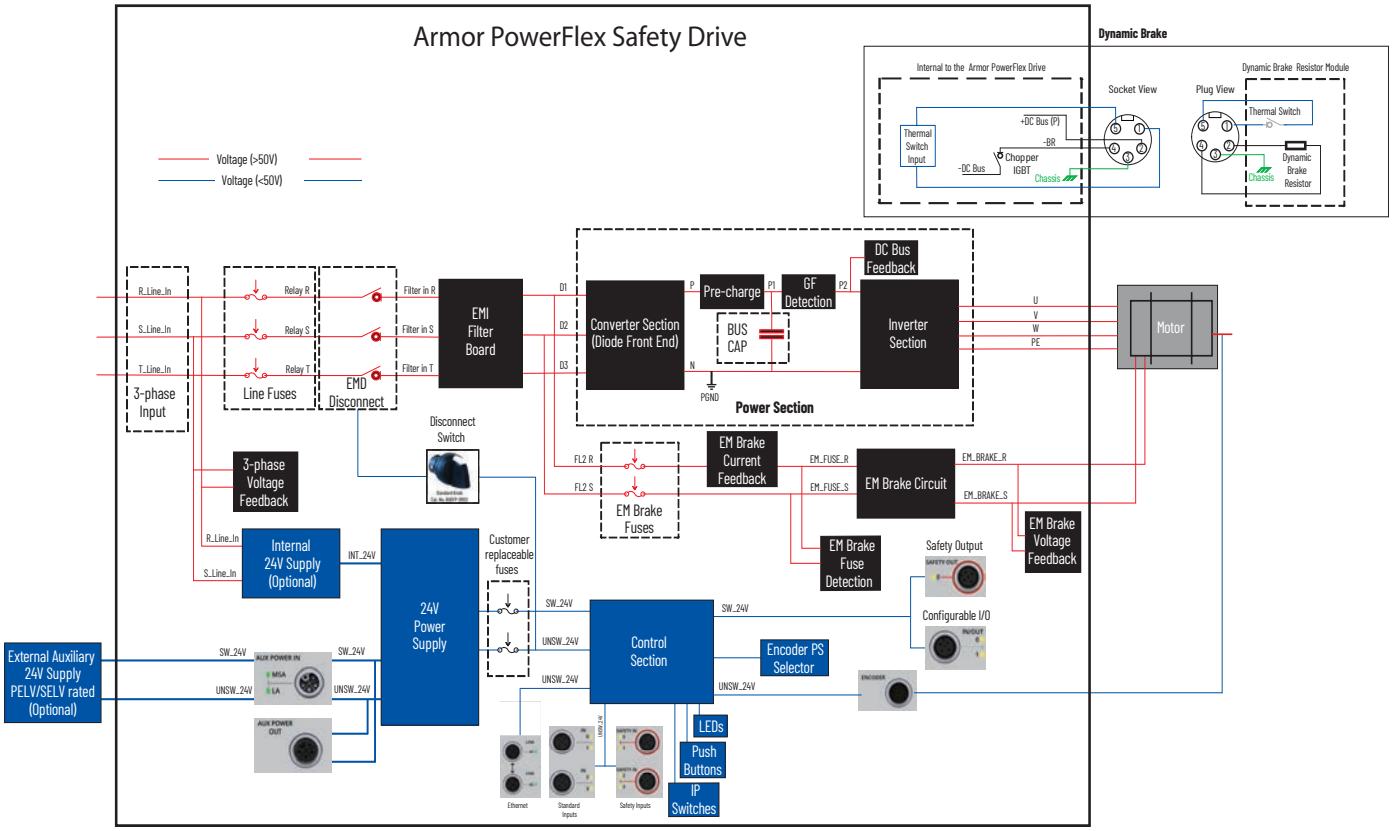
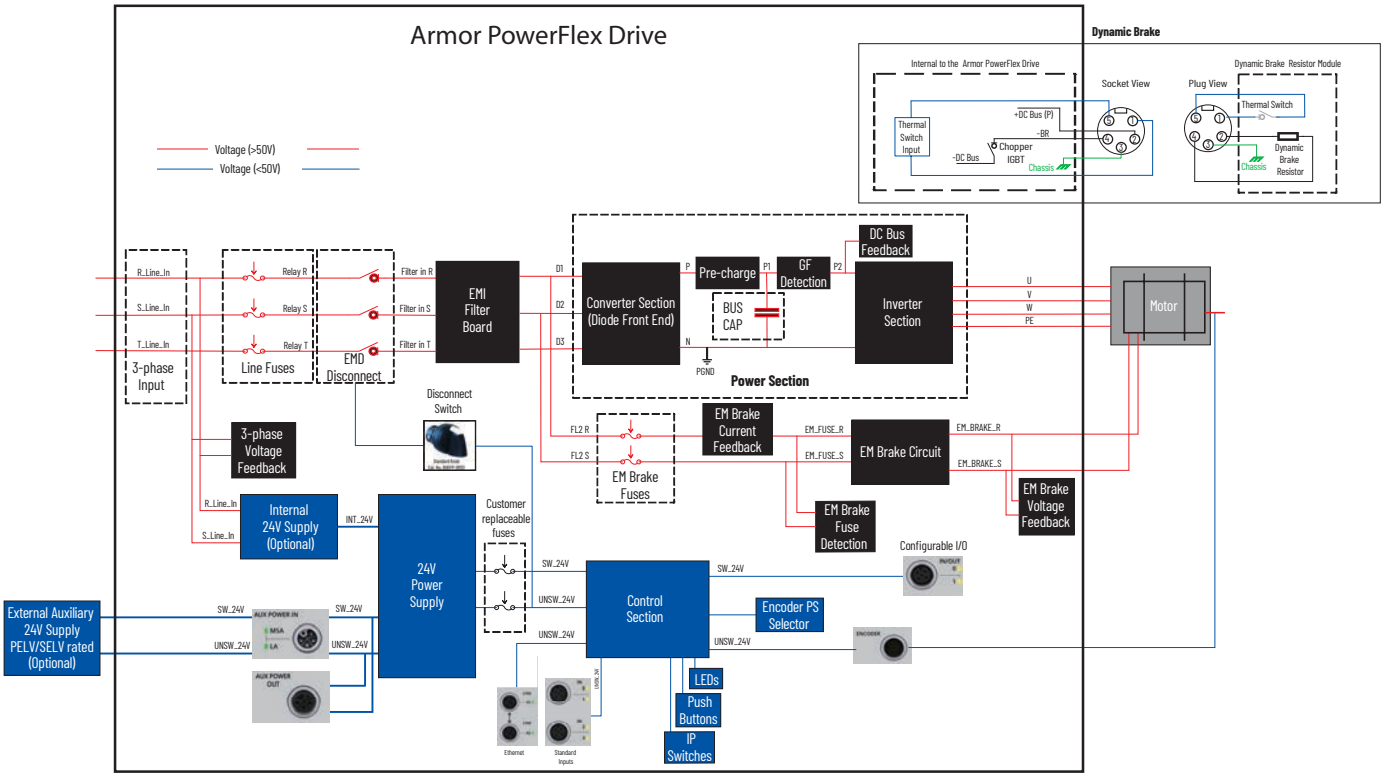


Figure 11 - Bulletin 35E — Standard Version Armor PowerFlex VFD Internal Wiring



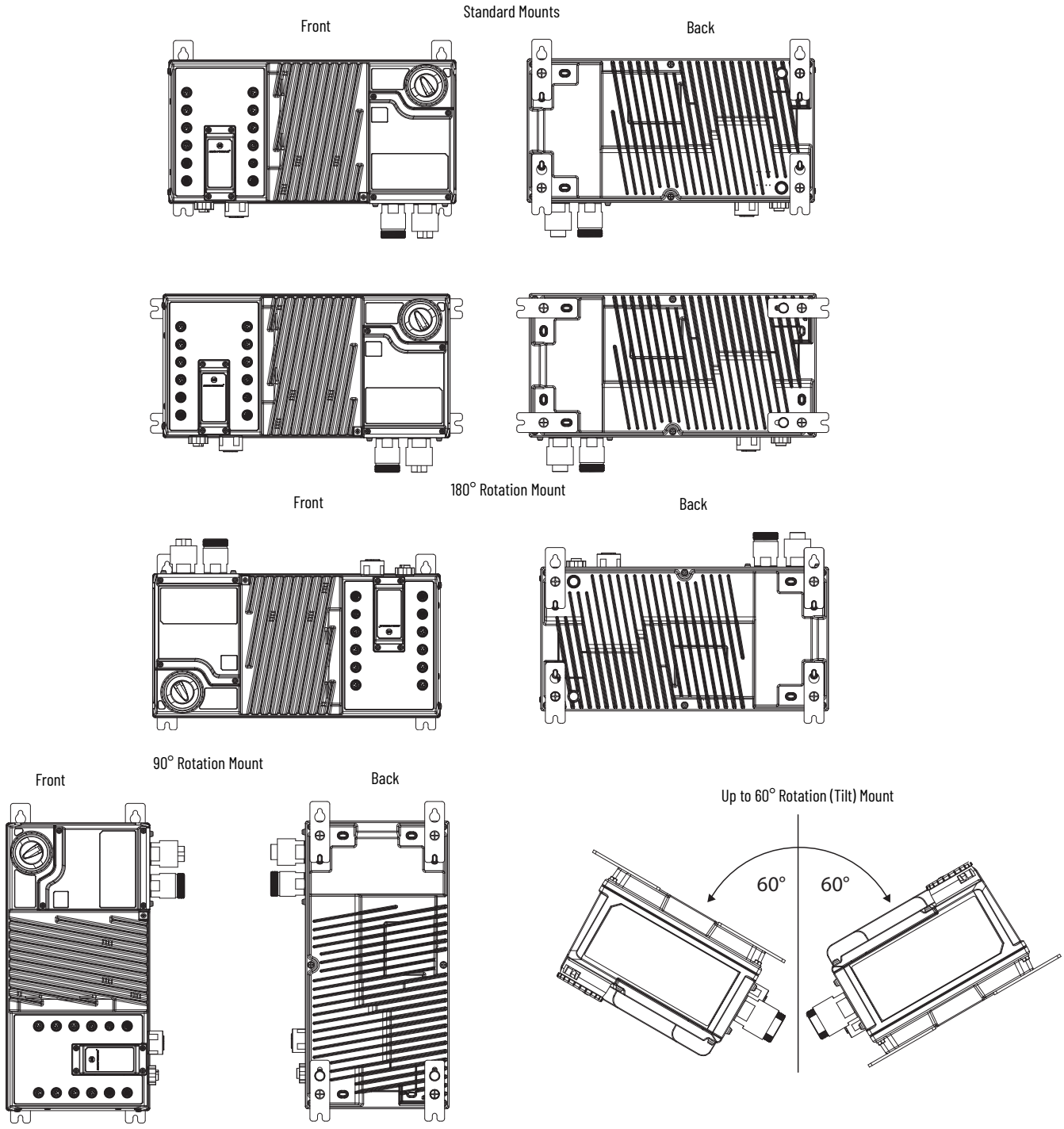
Mounting Orientation

Table 28 and Figure 12 explain the mounting orientation options that are available with Armor PowerFlex devices.

Table 28 - Armor PowerFlex Drive Mounting Positions

Mounting Method (See Figure 12)	X-axis Orientation	Y-axis Orientation	Z-axis Orientation	High-voltage Connector Orientation
Standard	Horizontal	Vertical	Out	Pointing down
60° tilt—forward or back	Horizontal	± 60°		Angled downward
90°	90°	Vertical		Pointing left
180°	180°	Vertical		Pointing up

Figure 12 - Mounting Positions



Dimensions that are given in this section are in millimeters (inches) unless otherwise noted. Dimensions are not intended to be used for manufacturing purposes.

Figure 14 - Drilling Locations

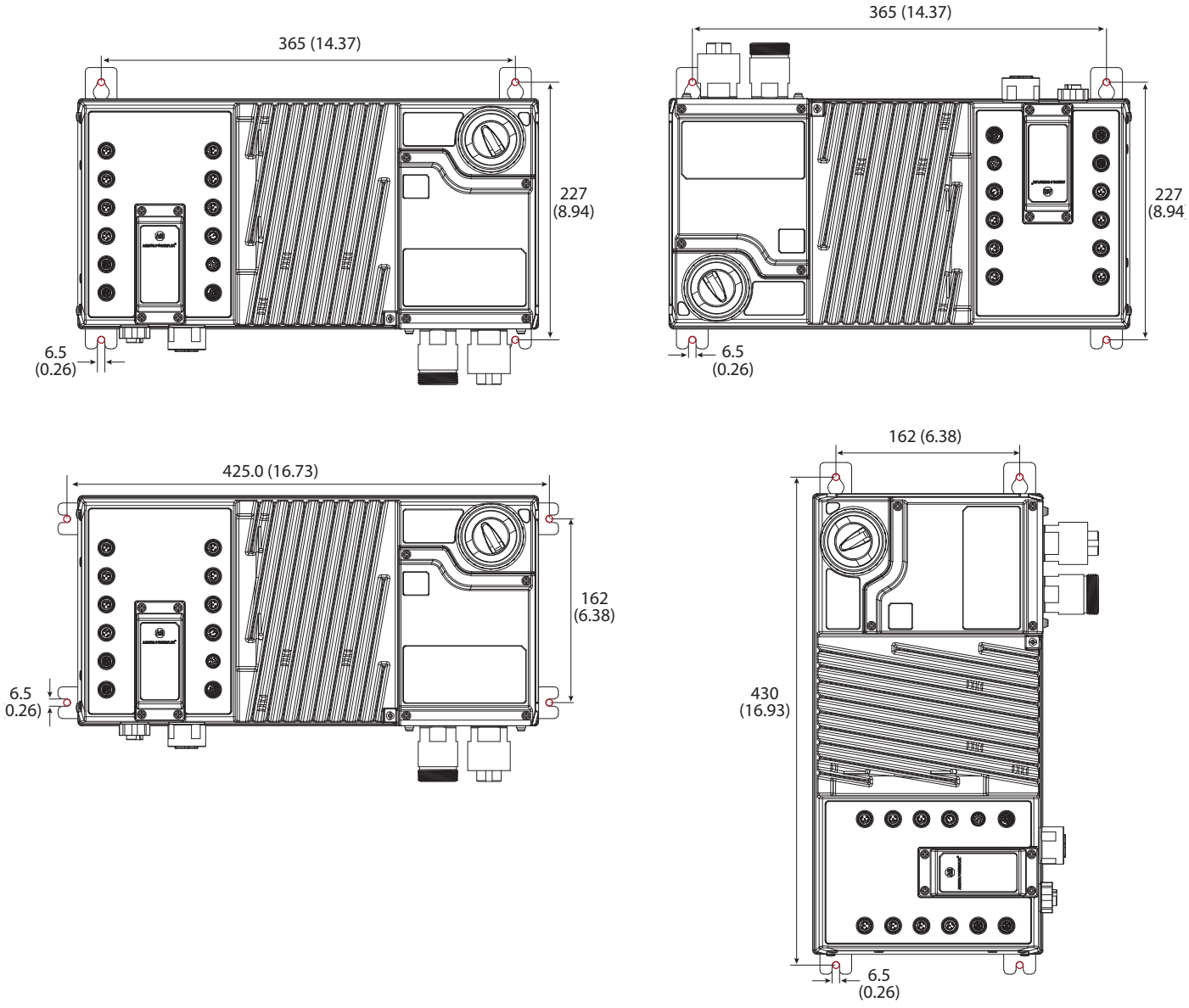
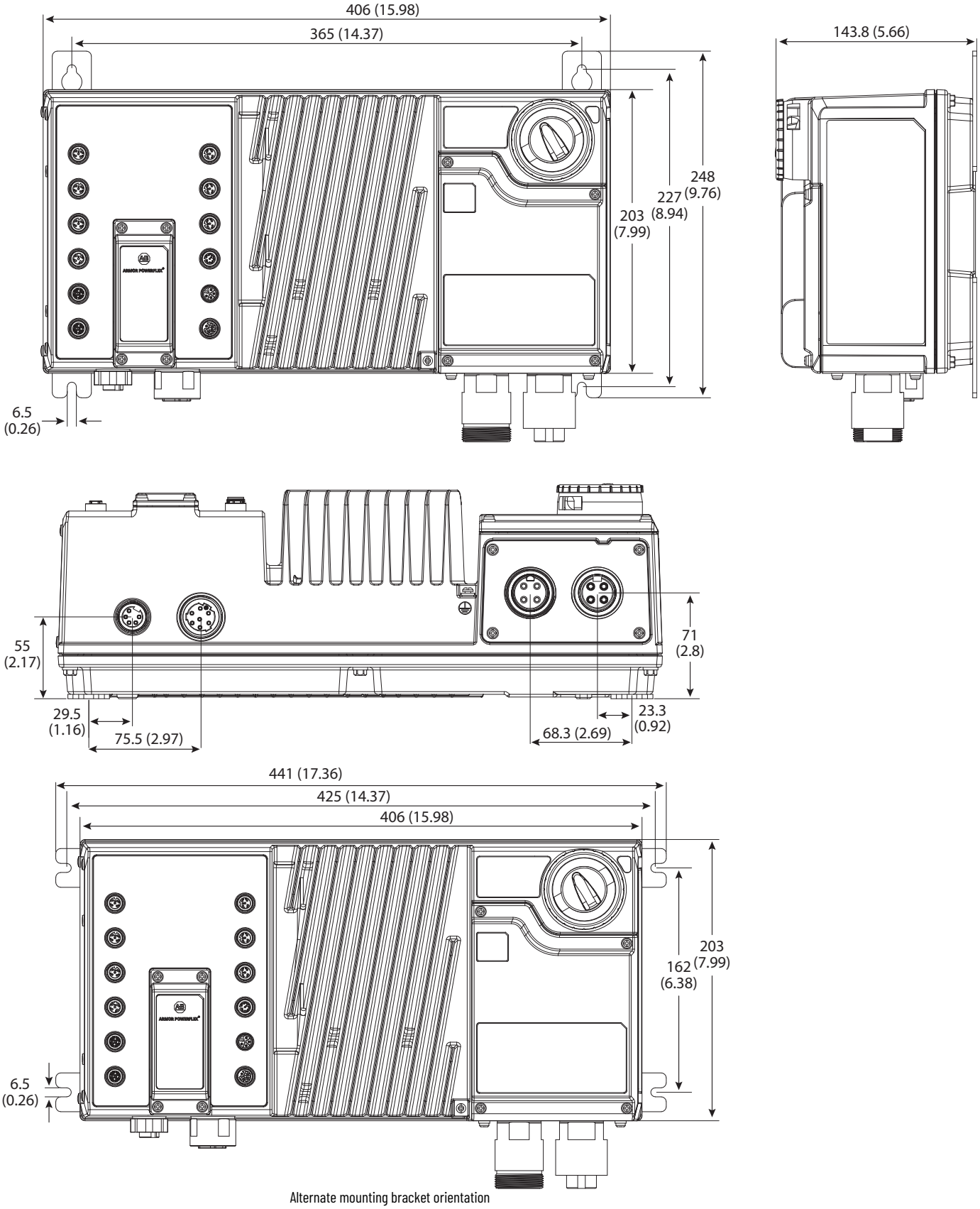


Figure 15 - Standard Mounting Position



Alternate mounting bracket orientation

Figure 16 - 180° Mount Position

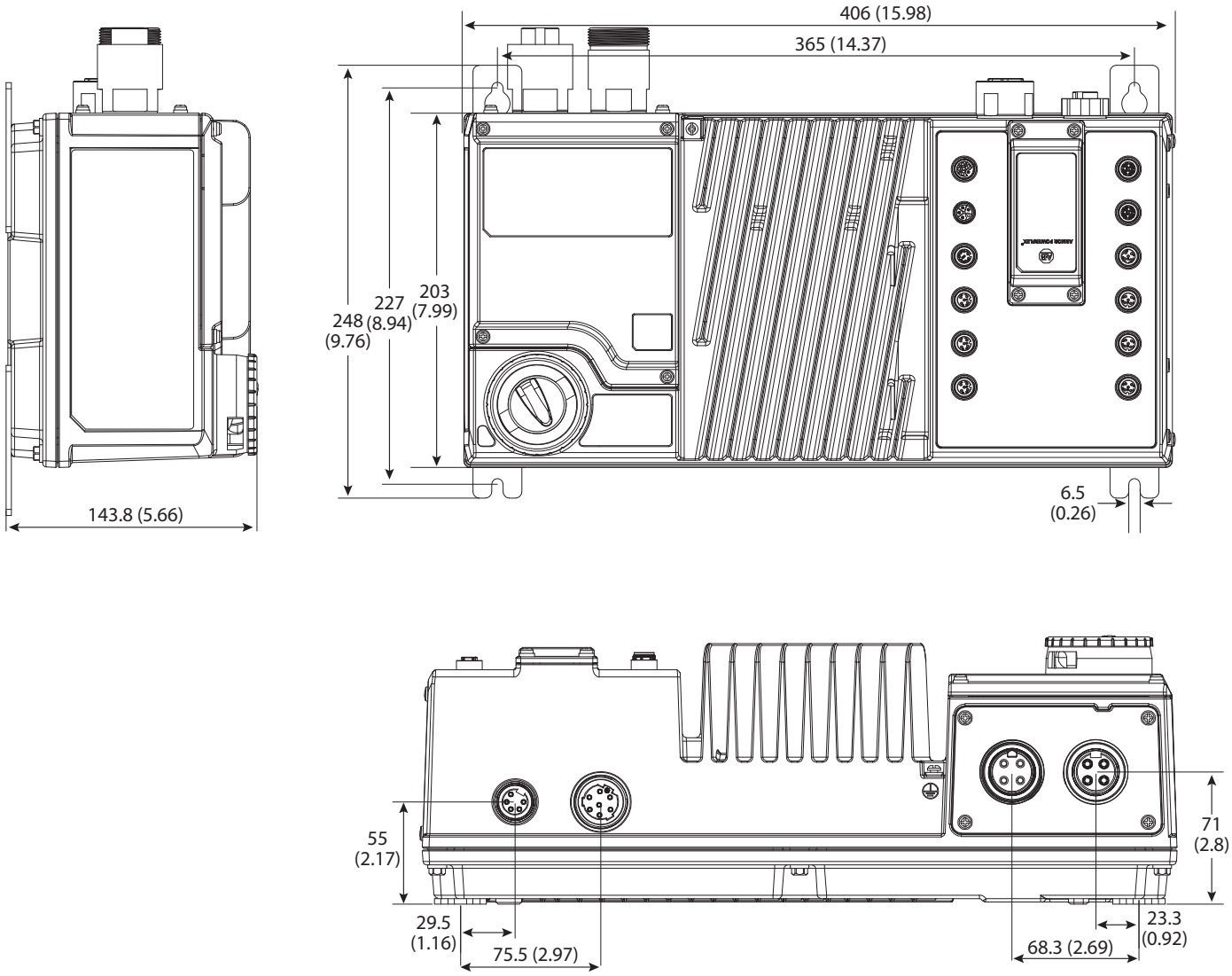


Figure 17 - 90° Mount Position

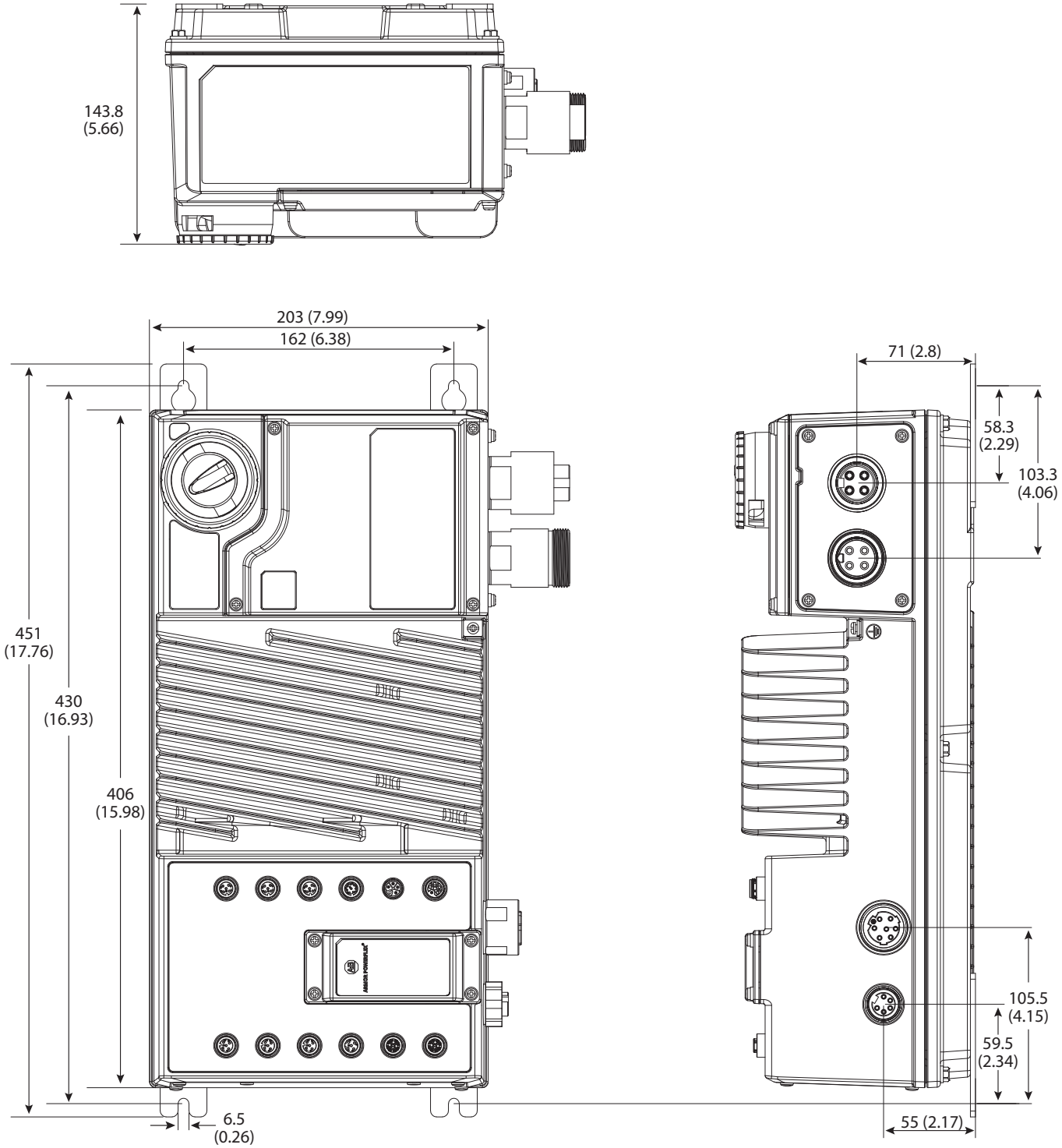
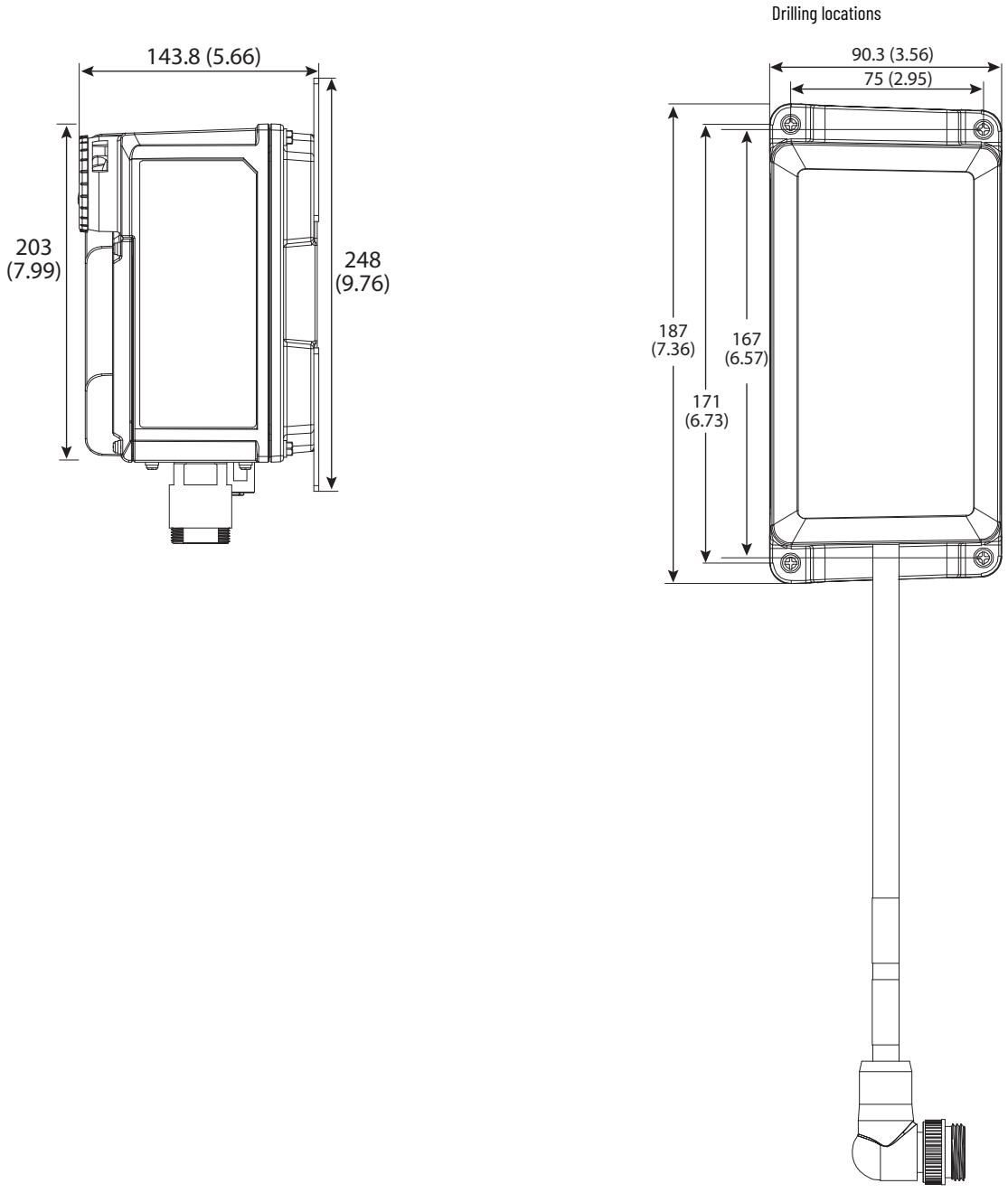


Figure 18 - Armor PowerFlex Drive with Dynamic Brake



Connectors

Figure 19 - Conduit Connection

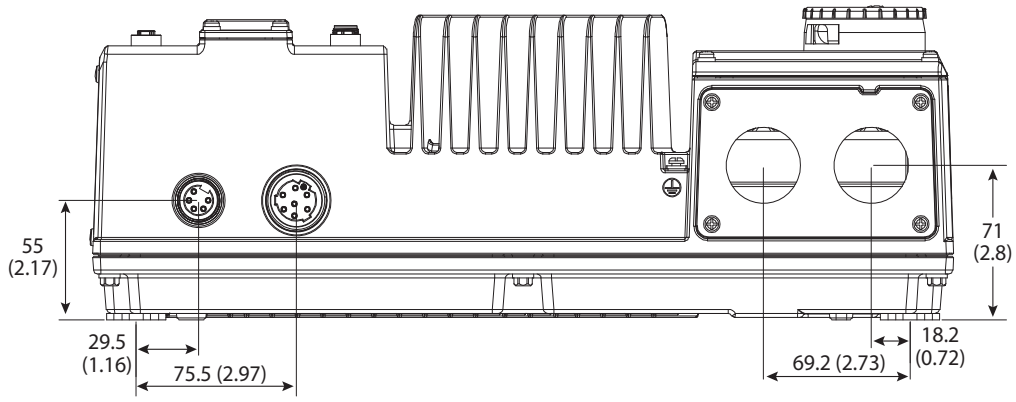


Figure 20 - Round QuickConnect Connectors

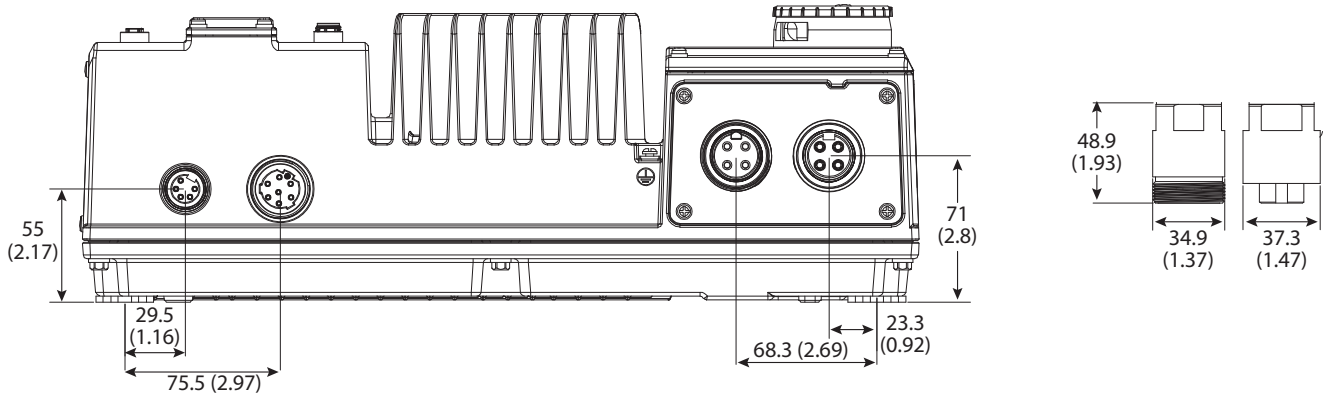
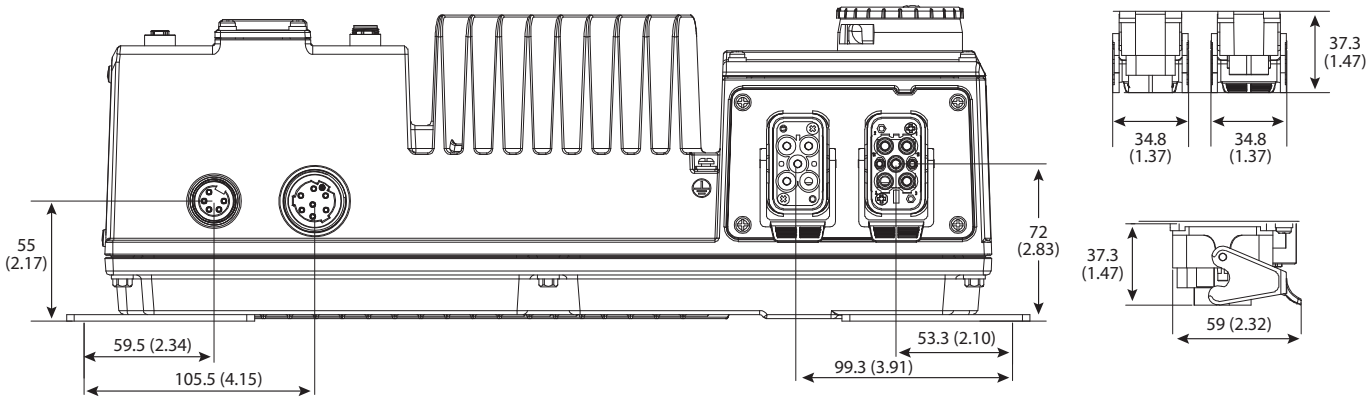


Figure 21 - Square QuickConnect Connectors



Accessories

Figure 22 - Cat. No. 35R-00AP1K Light-Duty Dynamic Brake Resistor

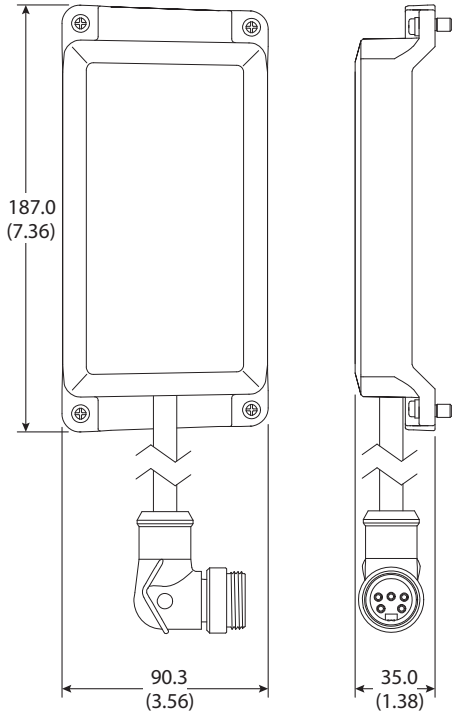


Figure 23 - Cat. Nos. 35T-360P500 and 35T-120P1K2 Normal-Duty Dynamic Brake Resistors

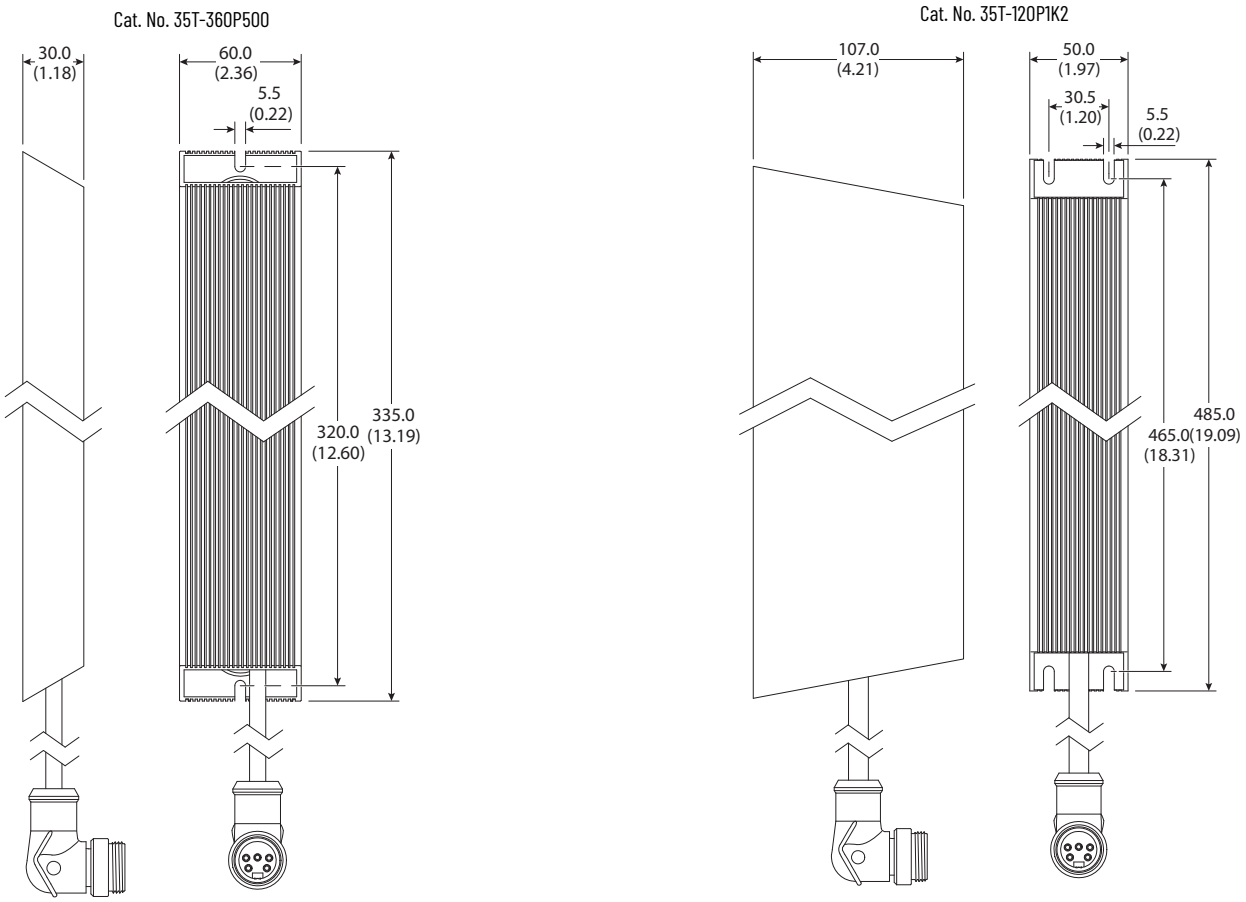


Figure 24 - Cat. No. 35-LG1-AB Logic Guard

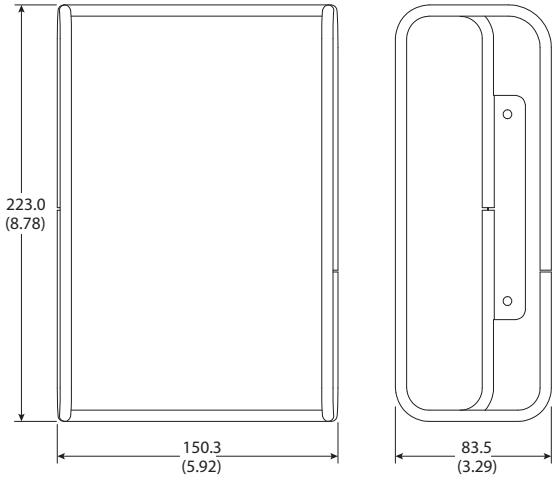
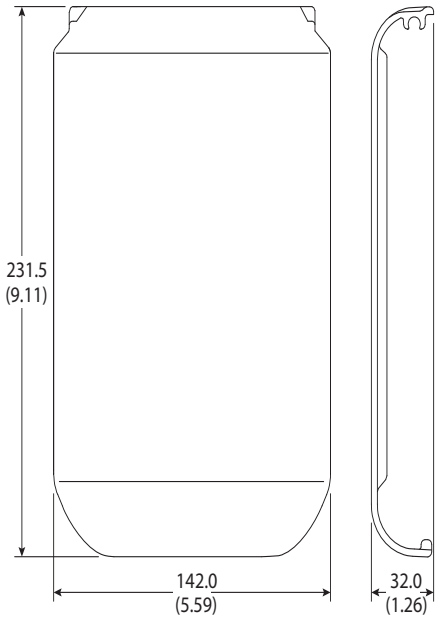


Figure 25 - Cat. No. 35-SPS-AB Splash Guard



Renewal Parts

Figure 26 - Cat. No. 35-MMF-AB Mounting Feet

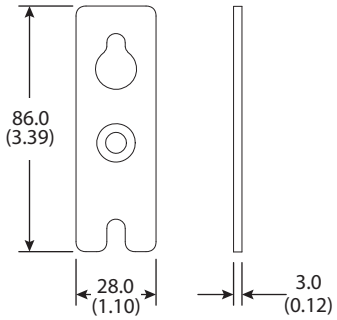


Figure 27 - Cat. No. 35-PSC-A Power Section Covers

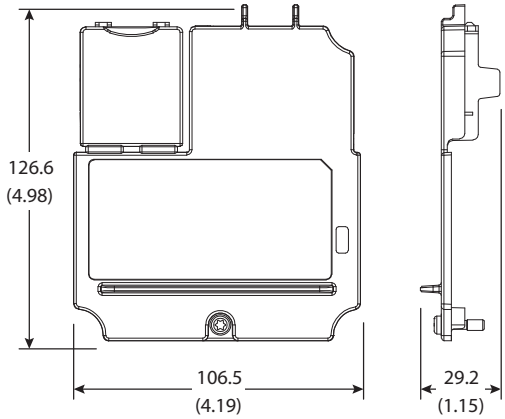


Figure 28 - Cat. No. 35-LSD-AB Logic Section Door

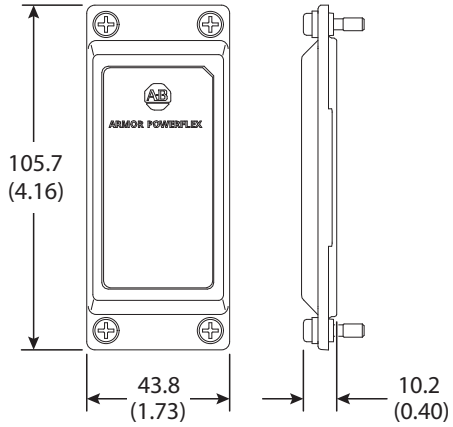
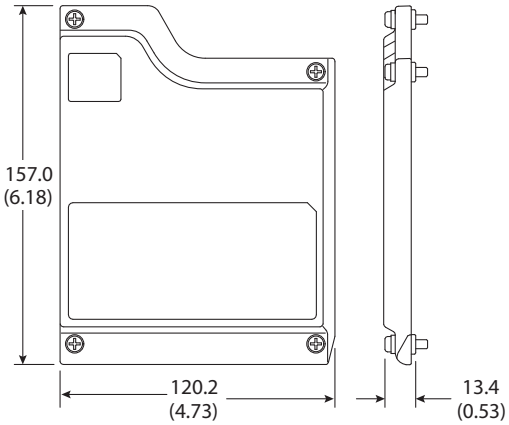


Figure 29 - Cat. No. 35-PSD-A Power Section Door



Notes:

Additional Resources

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

Resource	Description
Armor PowerFlex AC Drives User Manual, publication 35-UM001	Provides information on how to install, set up, program, operate, and troubleshoot Armor PowerFlex drives.
Armor PowerFlex AC Drives Installation Instructions, publication 35-PC001	Provides information on how to install and set up Armor PowerFlex drives.
On-Machine Media for Armor PowerFlex, ArmorStart, and ArmorConnect Products Selection Guide, publication 280PWR-SG001	Provides product selection and specification information for ArmorStart and ArmorConnect media.
Cordsets & Field Attachables Technical Data, publication 889-TD002	Provides additional control and auxiliary power media options and technical specifications.
Ethernet Media Specifications, publication 1585-TD001	Provides additional Ethernet media options and technical specifications.
ControlLogix 5580 and GuardLogix 5580 Controllers User Manual, publication 1756-UM543	Provides information about designing a system, using the controllers, and developing applications.
EtherNet/IP Network Devices User Manual, publication ENET-UM006	Describes how to configure and use EtherNet/IP devices to communicate on the EtherNet/IP network.
Ethernet Reference Manual, publication ENET-RM002	Describes basic Ethernet concepts, infrastructure components, and infrastructure features.
CIP Security with Rockwell Automation Products Application Technique, publication SECURE-AT001	Provides information on CIP Security, including which Rockwell Automation products support CIP Security.
System Security Design Guidelines Reference Manual, publication SECURE-RM001	Provides guidance on how to conduct security assessments, implement Rockwell Automation products in a secure system, harden the control system, manage user access, and dispose of equipment.
American Standards, Configurations, and Ratings: Introduction to Motor Circuit Design, publication IC-AT001	Provides an overview of American motor circuit design based on methods that are outlined in the NEC.
Industrial Components Preventive Maintenance, Enclosures, and Contact Ratings Specifications, publication IC-TD002	Provides a quick reference tool for Allen-Bradley industrial automation controls and assemblies.
Safety Guidelines for the Application, Installation, and Maintenance of Solid-state Control, publication SGI-1.1	Designed to harmonize with NEMA Standards Publication No. ICS 1.1-1987 and provides general guidelines for the application, installation, and maintenance of solid-state control in the form of individual devices or packaged assemblies incorporating solid-state components.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Compatibility and Download Center at rok.auto/pcdc	Download the most current version of the Add-on Profile.
Product Certifications website, rok.auto/certifications.	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at rok.auto/literature.

Rockwell Automation Support

Use these resources to access support information.

Technical Support Center	Find help with how-to videos, FAQs, chat, user forums, and product notification updates.	rok.auto/support
Knowledgebase	Access Knowledgebase articles.	rok.auto/knowledgebase
Local Technical Support Phone Numbers	Locate the telephone number for your country.	rok.auto/phonesupport
Literature Library	Find installation instructions, manuals, brochures, and technical data publications.	rok.auto/literature
Product Compatibility and Download Center (PCDC)	Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes.	rok.auto/pcdc

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Rockwell Automation maintains current product environmental compliance information on its website at rok.auto/pec.

Rockwell Otomasyon Ticaret A.Ş. Kar Plaza İş Merkezi E Blok Kat:6 34752, İçerenköy, İstanbul, Tel: +90 (216) 5698400 EEE Yönetmeliğine Uygundur

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AMERICAS: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444
EUROPE/MIDDLE EAST/AFRICA: Rockwell Automation NV, Pegasus Park, De Kleetlaan 12a, 1831 Diegem, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640
ASIA PACIFIC: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

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