ArmorStart Distributed Motor Controllers

ArmorStart ST, ArmorStart LT, and ArmorStart (Bulletins 280, 281, 284, 290, 291, 294)

Technical Data	ArmorStart ST Distributed Motor Controller Specifications
Selection Guide	ArmorConnect Power Media and ArmorStart Motor and Brake Media

LISTEN.
THINK.
SOLVE.®

A-B *Allen-Bradley* • *Rockwell Software*

**Rockwell
Automation**

What's Inside

Topic	Contents	Page
Select an ArmorStart	Flowchart for selecting the right type of ArmorStart® distributed motor controller for your application. Product Comparison chart that compares the features between the ArmorStart controller systems. Overview that describes the common features of the various ArmorStart controller systems. Descriptions of the hard-wired and integrated safety versions. Information on cables and connectors.	3
ArmorStart ST Distributed Motor Controllers	Product description, product selection tables, and accessories	19
ArmorStart LT Distributed Motor Controller	Product description, product selection tables, and accessories	33
ArmorStart Distributed Motor Controllers with EtherNet/IP Communications	Product description, product selection tables, and accessories	47
ArmorStart Distributed Motor Controllers with DeviceNet Communications	Product description, product selection tables, and accessories	57
Accessories	Three-phase power, control and aux power, motor control, IO, and safety media	67
Additional Resources	Related publications	77

What's New

This publication presents an overview of the entire ArmorStart® family of products, including a list of ArmorStart product technical data publications.

This publication includes the new safety versions of ArmorStart ST motor controllers.

With the new Allen-Bradley ArmorStart ST distributed motor controllers with integrated safety, manufacturers can simplify production by installing their control hardware on machines instead of in cabinets. It can be mounted directly on a machine, allowing users to implement functional safety with quick connections for faster installation.

The Armorstart ST with integrated safety is the first networked safety enabled On-Machine solution designed to integrate into Allen-Bradley Logix controllers and programmed using Studio 5000 software. Using one network via EtherNet/IP and one software tool helps streamline conveyance automation.

The ArmorStart ST motor controllers offer safety ratings of up to Category 4, PLe and SIL CL 3. They also have built-in safe torque-off, which removes rotational power to the motor but the drive remains powered for faster restarts. This can help keep workers safe and improve uptime by allowing for faster start-ups after safety demands are made. It can also reduce wear caused by repetitive start-ups.

Select an ArmorStart

This section helps you to determine which ArmorStart controller is right for your application. Figure 1 helps you to determine which type of system you may need based on motor control type and guides you through the variable-frequency drive (VFD) systems. Figure 2 guides you through the systems that use full-voltage/reversing starters.

Figure 1 - Motor Control Modes and Variable-frequency Drive ArmorStart Systems
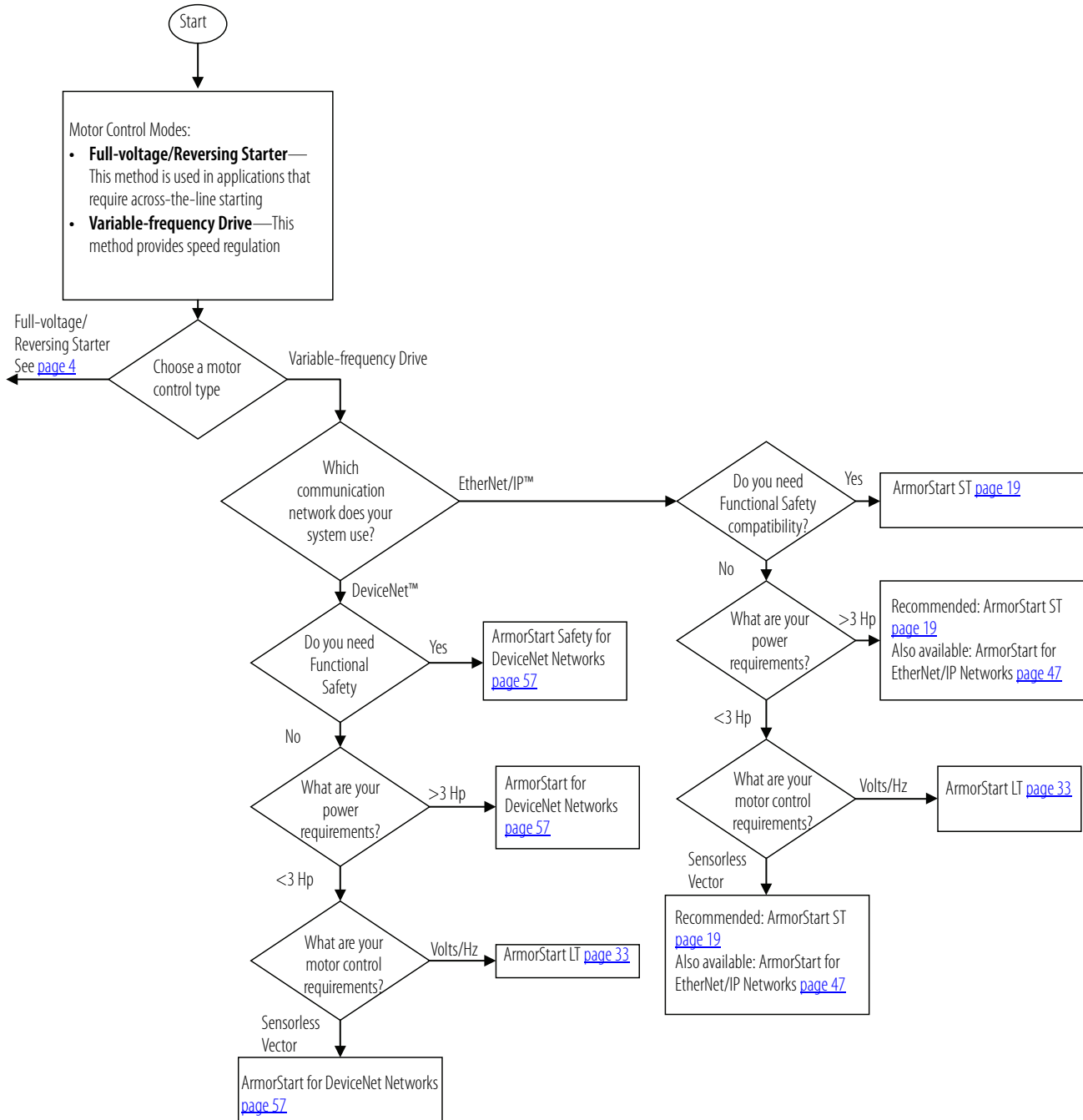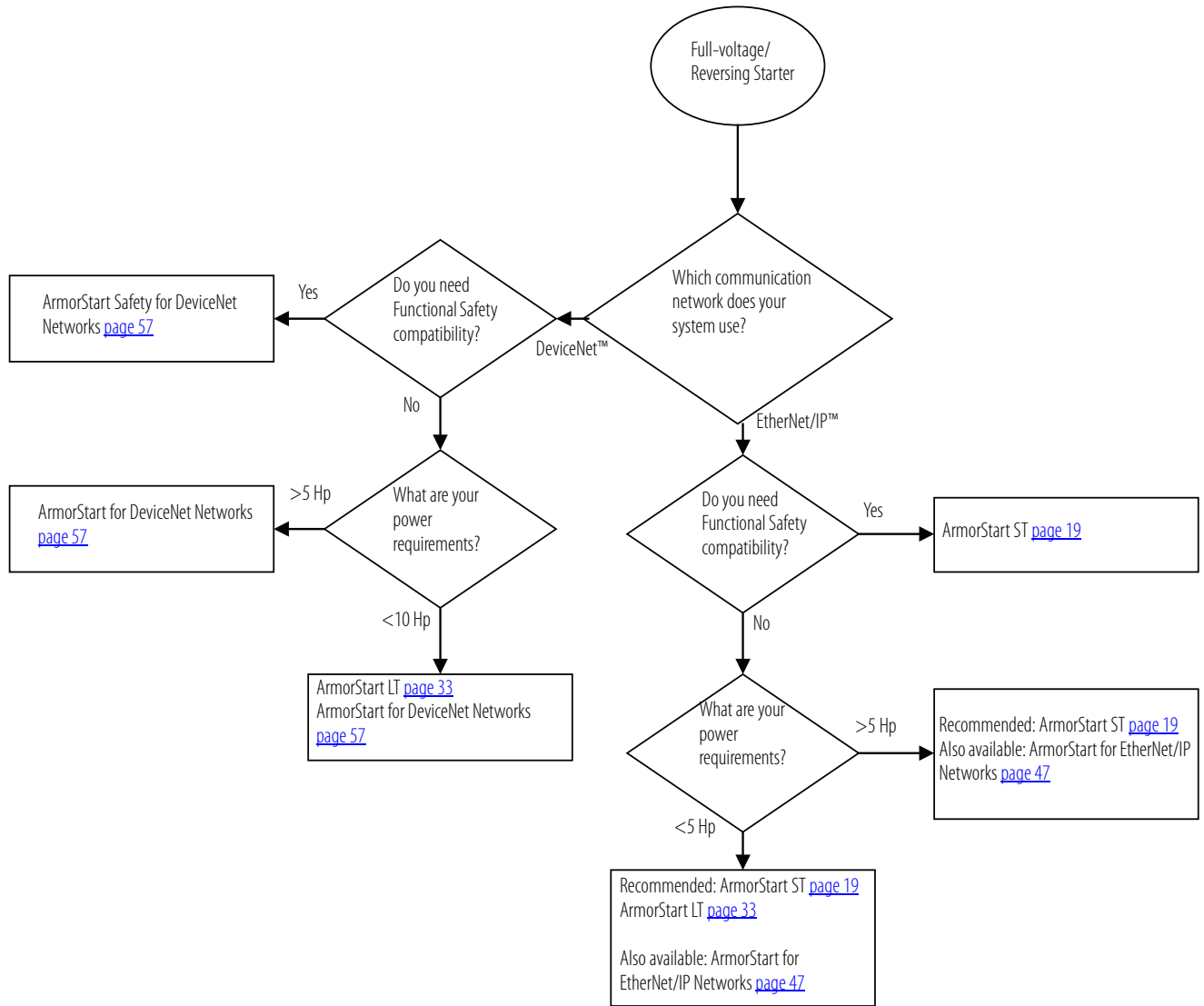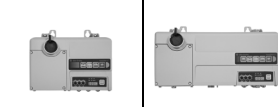
Start

Motor Control Modes:
- **Full-voltage/Reversing Starter**— This method is used in applications that require across-the-line starting
- **Variable-frequency Drive**—This method provides speed regulation

Full-voltage/ Reversing Starter See page 4

Choose a motor control type

Variable-frequency Drive

Which communication network does your system use?

EtherNet/IP™

Do you need Functional Safety compatibility?

Yes → ArmorStart ST page 19

No

What are your power requirements?

>3 Hp → Recommended: ArmorStart ST page 19
Also available: ArmorStart for EtherNet/IP Networks page 47

<3 Hp

What are your motor control requirements?

Volts/Hz → ArmorStart LT page 33

Sensorless Vector → Recommended: ArmorStart ST page 19
Also available: ArmorStart for EtherNet/IP Networks page 47

DeviceNet™

Do you need Functional Safety

Yes → ArmorStart Safety for DeviceNet Networks page 57

No

What are your power requirements?

>3 Hp → ArmorStart for DeviceNet Networks page 57

<3 Hp

What are your motor control requirements?

Volts/Hz → ArmorStart LT page 33

Sensorless Vector → ArmorStart for DeviceNet Networks page 57

Figure 2 - Full-voltage/Reversing Starter ArmorStart Systems

```
                                    ┌─────────────┐
                                    │Full-voltage/│
                                    │Reversing    │
                                    │Starter      │
                                    └─────────────┘
                                           │
                                           ▼
              ┌──────────────┐        ◇ Which communication
 ArmorStart   │ Do you need  │  Yes      network does your
 Safety for   │ Functional   │◄───       system use?
 DeviceNet    │ Safety       │
 Networks     │ compatibility?│      DeviceNet™
 page 57      └──────────────┘
                     │ No                   │ EtherNet/IP™
                     ▼                       ▼
 ArmorStart   ◇ What are  >5 Hp      ◇ Do you need    Yes    ArmorStart ST
 for DeviceNet  your      ◄───         Functional    ───►    page 19
 Networks       power                  Safety
 page 57        requirements?          compatibility?
                     │ <10 Hp               │ No
                     ▼                       ▼
 ArmorStart LT page 33          ◇ What are    >5 Hp   Recommended: ArmorStart ST page 19
 ArmorStart for DeviceNet         your        ───►    Also available: ArmorStart for EtherNet/IP
 Networks page 57                 power                Networks page 47
                                  requirements?
                                       │ <5 Hp
                                       ▼
                          Recommended: ArmorStart ST page 19
                          ArmorStart LT page 33

                          Also available: ArmorStart for
                          EtherNet/IP Networks page 47
```

Product Comparison

	ArmorStart ST		ArmorStart LT		Legacy ArmorStart for EtherNet/IP		Legacy ArmorStart for DeviceNet	
Bulletin Nos.	281E, 281ES, 281GS	284E, 284ES, 284GS	290, 291	294	280E, 281E	284E	280D, 281D	284D
Hp Range	0.5…10 Hp (0.37…7.5 kW)	1…5 Hp (0.75…3.3 kW)	0.5…5Hp (0.37…3.3 kW)	0.5…2 Hp (0.37…1.5 kW)	0.5…10 Hp (0.37…7.5 kW)	0.5…5 Hp (0.37…3.3 kW)	0.5…10 Hp (0.37…7.5 kW)	0.5…5 Hp (0.37…3.3 kW)
Start Method	Full-voltage and Reversing	VFD – Sensorless Vector Control	Full-voltage and Reversing	VFD – V/Hz	Full-voltage and Reversing	VFD – Sensorless Vector Control	Full-voltage and Reversing	VFD – Sensorless Vector Control
Control (Auxiliary) Voltage Rating	24V DC		24V DC[2]		24V DC		24V DC, 120V AC, or 240V AC	
Operational Voltage Rating	200…600V AC	380…480V AC	200…480V AC	380…480V AC	200…600V AC	380…480V AC	200…600V AC	380…480V AC
Environmental Rating	IP67/UL Type 4/12/13[1]		IP66/UL Type 4/12[1]		IP67/UL Type 4/12/13[1]		IP67/UL Type 4/12/13[1]	
Functional Safety Capability	Yes		No		No		Yes	
Network Communication	EtherNet/IP		EtherNet/IP or DeviceNet®		EtherNet/IP		DeviceNet	
Status Indicators	Yes		Yes		Yes		Yes	
Local Logic with DeviceLogix™	Yes		Yes		Yes		Yes	
Peer-to-peer ZIP	No		Yes, DeviceNet version only		No		Yes	
I/O capability	Standard: 4 digital input/2 digital output Optional: 6 digital input and safety I/O		6 self-configurable points		4 input/2 output		4 input/2 output	
ArmorConnect® Compatible	Yes		Yes		Yes		Yes	
Gland Plate Entry	Quick connection via ArmorConnect		Conduit power entrance or Quick connection via ArmorConnect		Conduit power entrance or Quick connection via ArmorConnect		Conduit power entrance or Quick connection via ArmorConnect	
UL Listed for Group Motor Installation	Yes		Yes		Yes		Yes	
Standards Compliance	CCC, CE, cULus, KCC, RCM, TÜV	CE, cULus, KCC, RCM, TÜV	CCC, CE, cULus, KCC, RCM	CE, cULus, KCC, RCM	CCC, CE, cULus, KCC, RCM	CE, cULus, KCC, RCM	CCC, CE, cULus, KCC, RCM, TÜV	CE, cULus, KCC, RCM, TÜV
Factory-installed Options	• Hand-Off-Auto (HOA) keypad	• Hand-Off-Auto (HOA) keypad	• Hand-Off-Auto (HOA) keypad • Internal 24V DC power supply • Quick connect power and motor connections	• Hand-Off-Auto (HOA) keypad • Source brake contactor • Internal 24V DC power supply • Quick connect power and motor connections	• Hand-Off-Auto (HOA) keypad	• Hand-Off-Auto (HOA) keypad • Source brake contactor • Dynamic brake connector • Output contactor • EMI filter	• Hand-Off-Auto (HOA) keypad • Safety monitor	• Hand-Off-Auto (HOA) keypad • Safety monitor • Control brake contactor • Source brake contactor • Dynamic brake connector • Output contactor • EMI filter

(1) A sealing cap must be installed on any unused connection to achieve IP67 and UL Type 4/12/13 environmental rating.

(2) An optional internal power supply is only available when the incoming power is 400Y/230V…480Y/277V.

ArmorStart System Overview

The ArmorStart Distributed Motor Controllers are integrated, pre-engineered starters with models for full-voltage and reversing applications and variable-frequency AC drive applications. The ArmorStart family was developed to improve productivity and reduce installation and commissioning cost, by allowing you to mount your motor control near the motor. The ArmorStart devices offer a design that is suitable for wet and dirty environments and they include embedded safety, embedded field I/O, embedded EtherNet/IP™, and DLR.

ArmorStart motor controllers with hardwired safety achieve a category 0 stop with safe torque off functionality, capable of category 4 functionality. A Guard I/O™, EtherNet/IP, or DeviceNet® safety module is used to achieve SIL 3, CL3, and PLe performance. The safety I/O module monitors and controls the internal safety function. See Hard-wired Safety Related Parts on page 16, for information on which modules can be used as part of the ArmorStart system.

ArmorStart ST with integrated safety motor controllers achieve a category 0 stop with integrated safe torque off functionality, capable of category 4 via a single EtherNet/IP network. The integrated safety controller issues the STO command over the EtherNet/IP network and the ArmorStart ST executes the command to achieve SIL 3, CL3, and PLe performance. Integrated safety eliminates the extra cost for additional components, installation, and commissioning. See Integrated Safety Features on page 17 for more information.
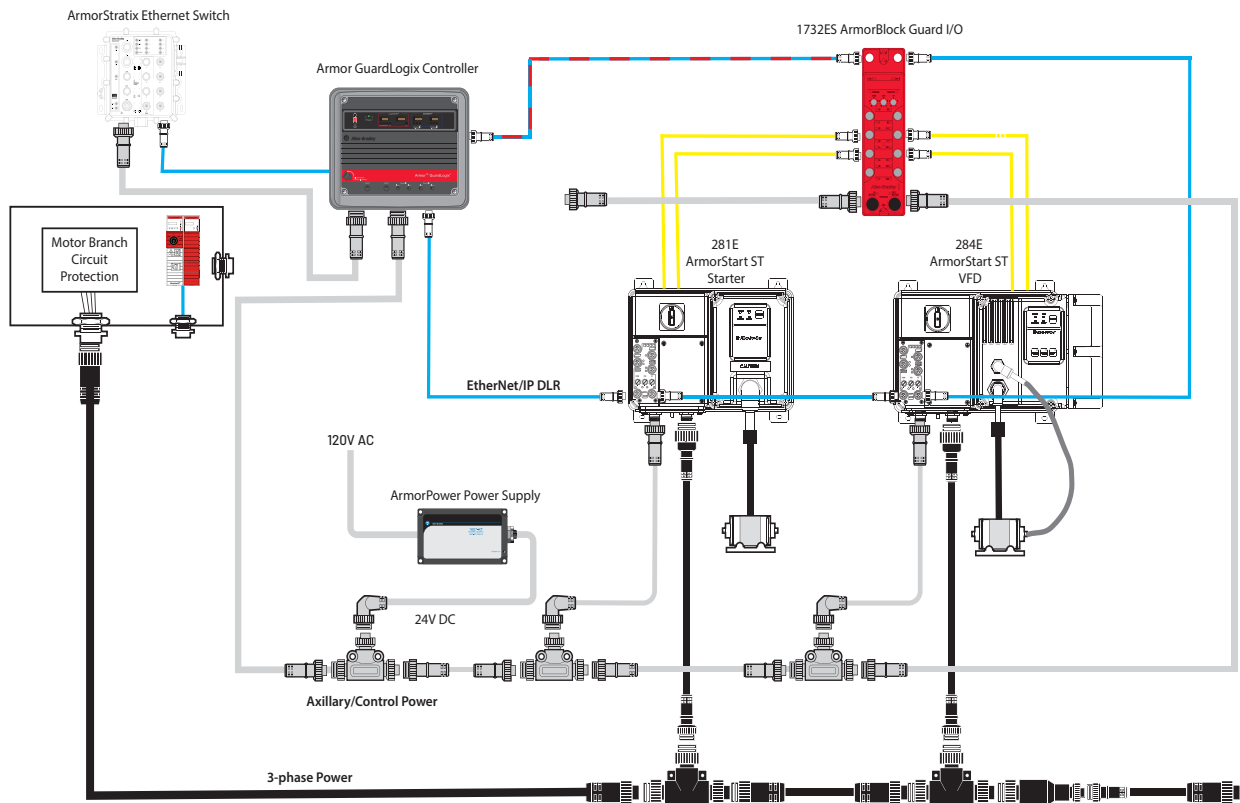
Typical Configurations

Typical motor control systems include selections from several categories of Allen-Bradley® motor control products and control components.
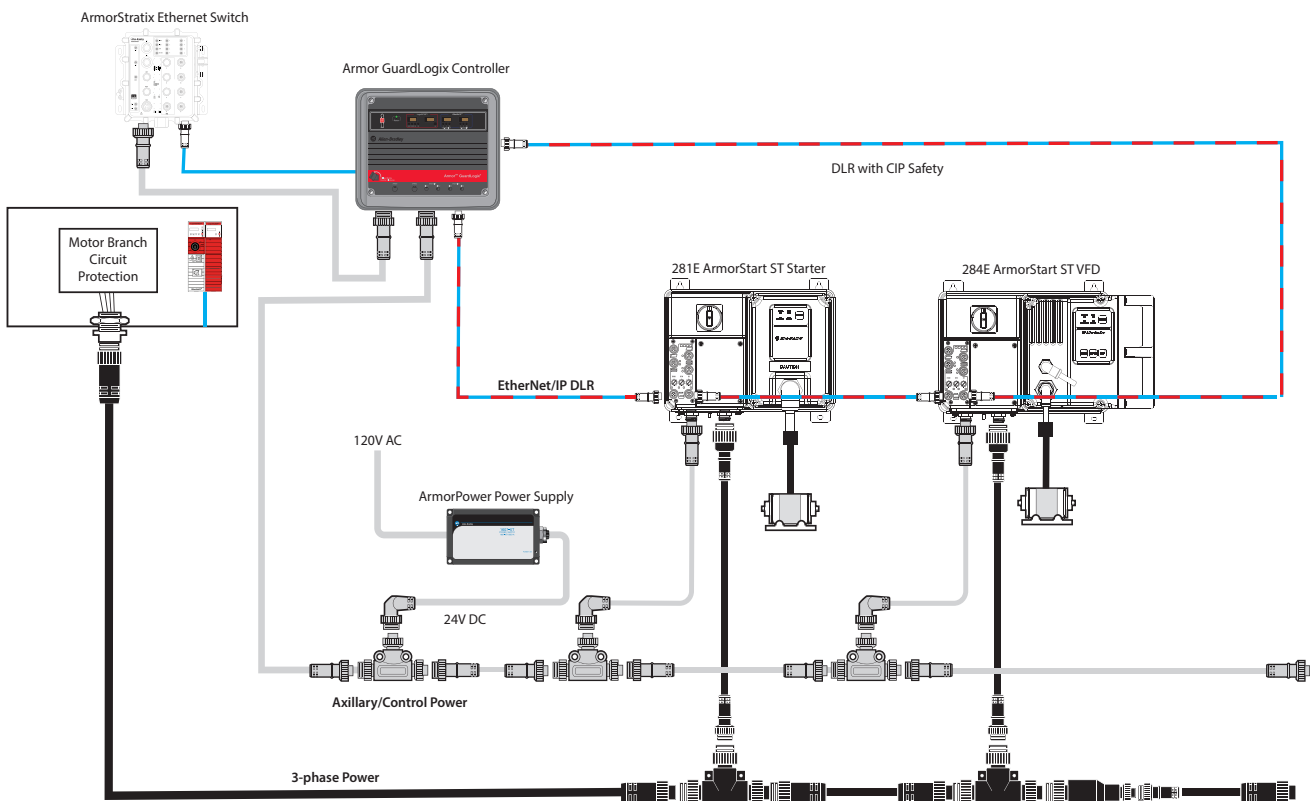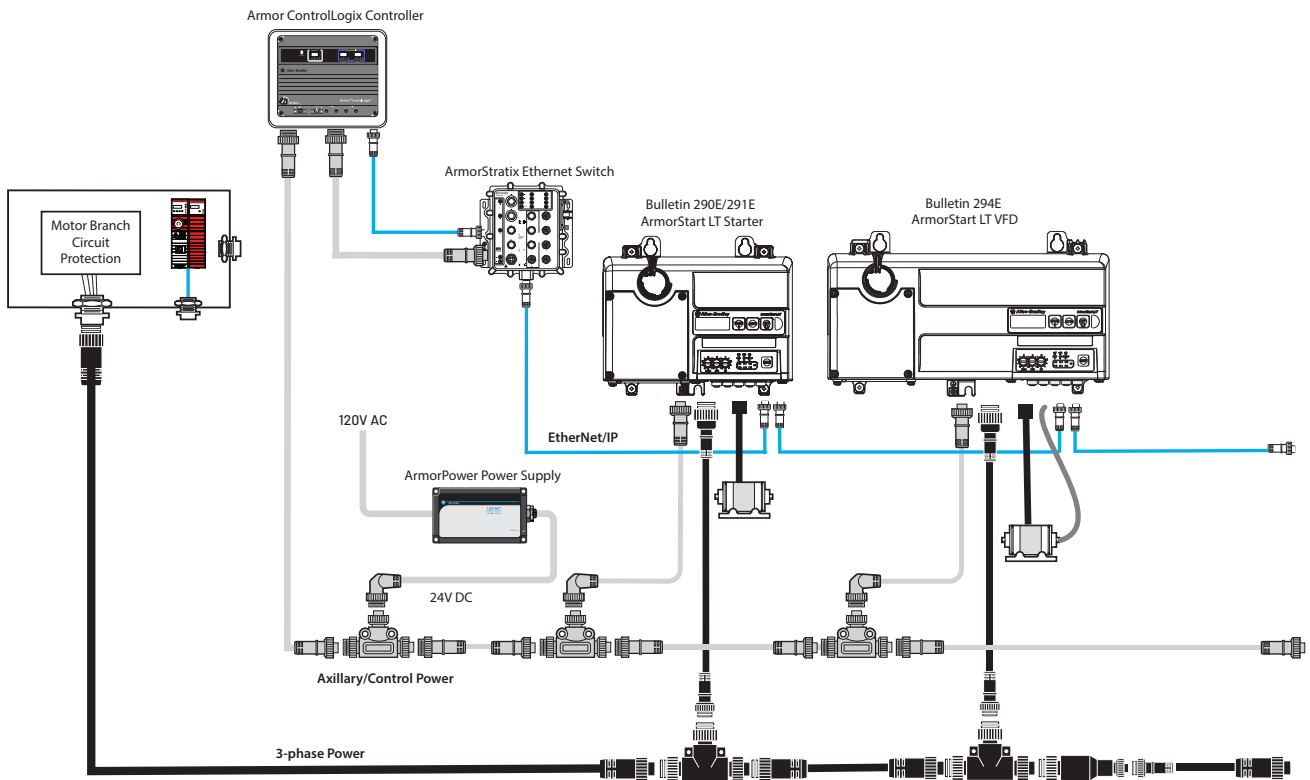
Standard system with ArmorStart ST controller
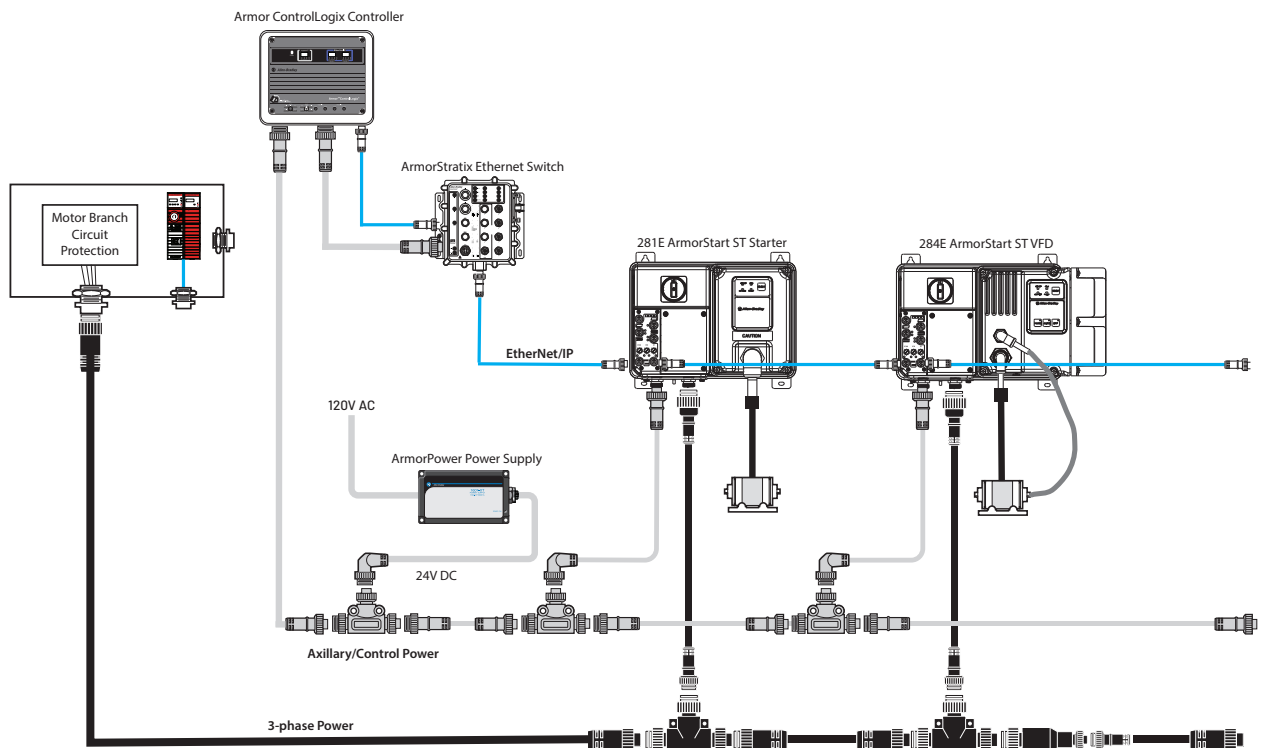
Hardwired safety system with ArmorStart ST safety controller

ArmorStratix Ethernet Switch

1732ES ArmorBlock Guard I/O

Armor GuardLogix Controller

281E
ArmorStart ST
Starter

284E
ArmorStart ST
VFD

Motor Branch
Circuit
Protection

EtherNet/IP DLR

120V AC

ArmorPower Power Supply

24V DC

Axillary/Control Power

3-phase Power

Integrated safety system with ArmorStart ST safety controller

ArmorStratix Ethernet Switch

Armor GuardLogix Controller

DLR with CIP Safety

281E ArmorStart ST Starter

284E ArmorStart ST VFD

Motor Branch
Circuit
Protection

EtherNet/IP DLR

120V AC

ArmorPower Power Supply

24V DC

Axillary/Control Power

3-phase Power

Standard system with ArmorStart LT controller

Armor ControlLogix Controller

ArmorStratix Ethernet Switch

Bulletin 290E/291E
ArmorStart LT Starter

Bulletin 294E
ArmorStart LT VFD

Motor Branch
Circuit
Protection

120V AC

EtherNet/IP

ArmorPower Power Supply

24V DC

Axillary/Control Power

3-phase Power

ArmorStart Distributed Motor Controller Common Features and Capabilities

Modes of Operation

The ArmorStart line of products offers different modes of operation.

- Full Voltage and Full Voltage Reversing

  Full-voltage and full-voltage reversing start modes are used in applications that require across-the-line starting. They have full inrush current and locked-rotor torque.

Full Voltage and Full Voltage Reversing Start
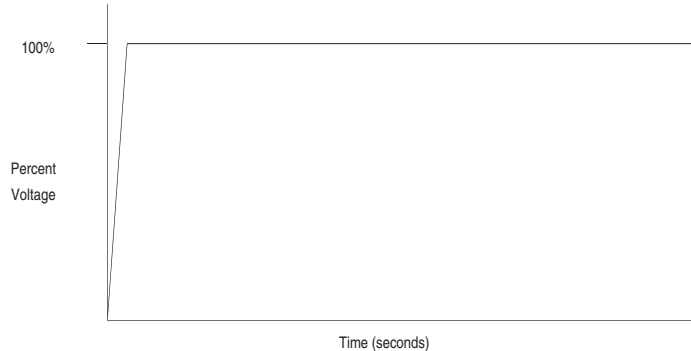
- Volts per Hertz (V/Hz) — VFD Performance

  This method provides good speed regulation across a wide speed range spectrum of the drive. Basic control yields the most cost-effective performance when sensorless vector control is not required.

VFD - V/Hz Example (3 Hp, high speed)
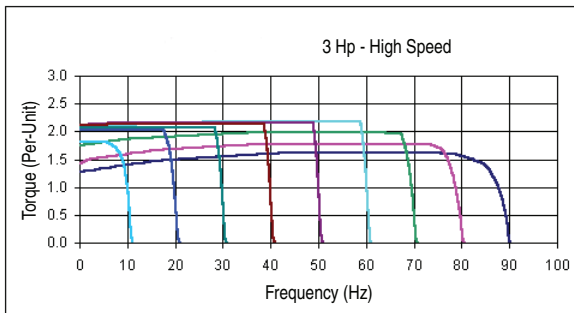
- VFD Sensorless Vector Control (SVC)

  This method provides excellent speed regulation across the entire speed range of the drive. The Autotune feature allows the ArmorStart controller to adapt to individual motor characteristics.

VFD - SVC Example (3 Hp, high speed).
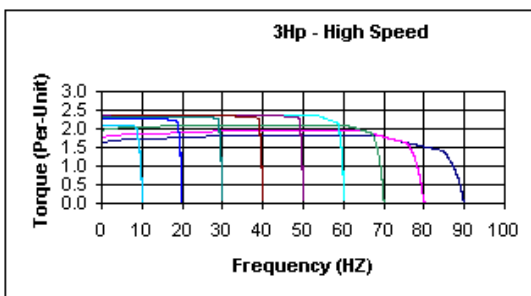
Group Motor Applications

The ArmorStart family of motor controllers is UL Listed as suitable for group motor applications. Where NFPA 70 (National Electrical Code) or NFPA 79 are required installation standards, this allows two or more motors to be connected to the same branch circuit without individual motor branch short-circuit or ground-fault protection. See Applying More Than One ArmorStart Motor Controller in a Single Branch Circuit on Industrial Machinery, publication 280-AT003, for additional information.
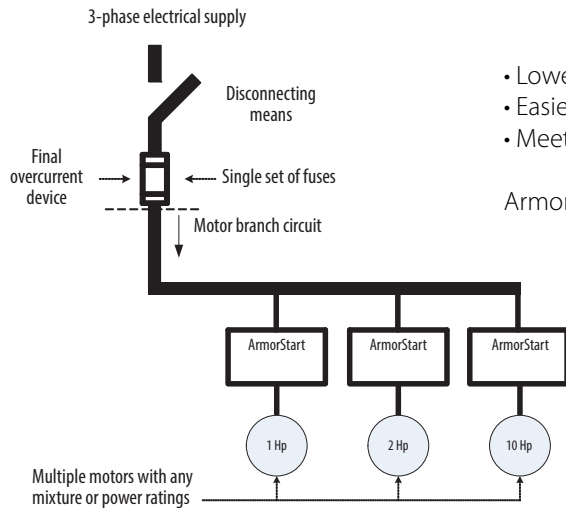
- Lower system cost
- Easier installation
- Meets NFPA Machinery Directive and NFPA70 Electrical Code

ArmorStart devices are **Marked "Suitable for Group Motor Installation"**

At-motor Maintenance Disconnect

The ArmorStart family of motor controllers comes equipped with a local ON/OFF motor disconnect means with locking provision. Industrial standards require a local at-motor disconnect to be within eye sight of the motor for maintenance or other shutdown reasons. This local disconnect can eliminate the need for additional components that would otherwise be required in each motor branch circuit, such as the installation of individual motor branch disconnect switches.

Quick Disconnects

The modular design of the ArmorStart family of motor controllers offers simplicity in wiring using quick disconnects for the I/O, communications, power, and motor connections. Quick disconnects fully integrate the plug-n-play solution resulting in significant installation cost savings. See ArmorConnect Power Media and ArmorStart Motor and Brake Media, publication 280PWR-SG001, for additional information.

Gland Plate

The ArmorStart and ArmorStart LT product lines offer different methods of connecting incoming three-phase and control power to the device. One method that is offered is the traditional conduit entrance with a conduit hole opening. The other method offers connectivity to the ArmorConnect power media. Factory-installed receptacles are provided for connectivity to both three-phase and control power media when ArmorConnect connectivity is selected.

User I/O (field devices)

The ArmorStart family of motor controllers offers a flexible solution for inputs and outputs for field devices. See the specific product line selection pages for information.

Node Address Switches

Manual node address switches are conveniently located on the front of the ArmorStart controller, with EtherNet/IP network connectivity.

Light-emitting diode (LED) status indication and Fault Diagnostics

ArmorStart motor controllers provide a comprehensive cluster of status and diagnostic indicators. The LED indicators provide status of the following topics: POWER, RUN, NETWORK STATUS, FAULT, AND I/O. See the specific product selection pages for fault indications listings that are available for each ArmorStart controller.

Overload Protection

ArmorStart motor controllers incorporate a standard electronic motor overload protection. This overload protection is accomplished electronically with an I^2t algorithm. The overload protection is programmable via the communication network providing you with flexibility. Ambient insensitivity is inherent in the electronic design of the overload. See the product selection pages for details on availability and trip class choices.

DeviceLogix

DeviceLogix technology is a platform-independent logic engine that is embedded into several Rockwell Automation® devices, such as push button stations, I/O blocks, motor starters, and drives. This logic engine controls outputs and manages status information locally within a device.

ArmorStart motor controllers offer local programmable logic via DeviceLogix. DeviceLogix is a standalone program that resides within the ArmorStart motor controller and implements operations such as, AND, OR, NOT, Timers, Counters, and Latches.
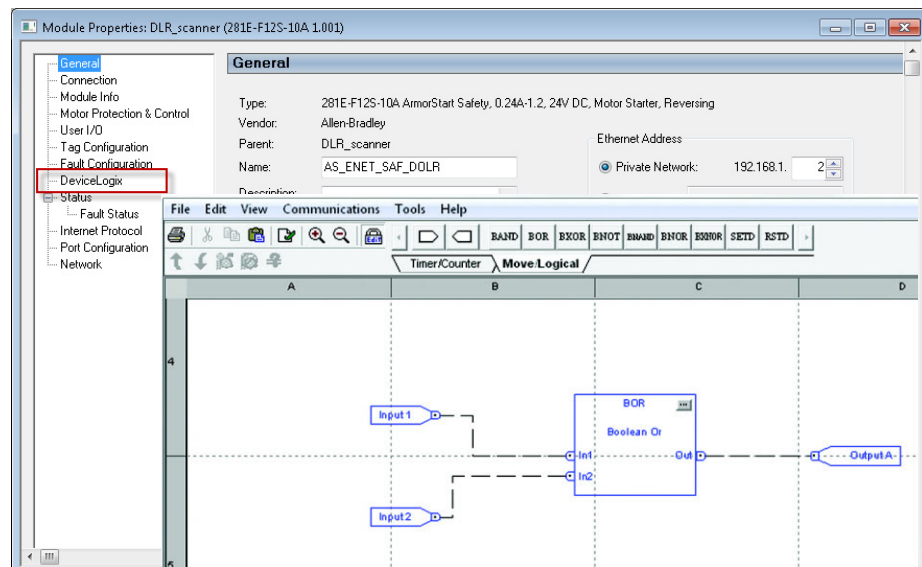
Network and Communication

ArmorStart motor controllers are available with EtherNet/IP or DeviceNet network capabilities. ArmorStart controllers with DeviceNet include Zone Interlocking Parameters (ZIP peer-to-peer communications) which allow one ArmorStart controller to receive data directly, from up to four other DeviceNet nodes, without going through a network PLC or PAC. ArmorStart controllers with EtherNet/IP include embedded ethernet switch technology, which is designed to enable end devices to, form linear and ring network topologies. The EtherNet/IP versions support DLR protocol and IEEE 1588 transparent clock for CIP Motion™.

DLR functionality helps you achieve higher network resiliency. If one device on the EtherNet/IP network fails, the other devices are able to continue operation. DLR technology, which is an ODVA™ standard, helps reduce configuration time and costs by minimizing the number of managed switches and reducing cabling needs while allowing you to create a single network ring that connects all components at the device level.

Device Status and Configuration

Configuration is accomplished using Studio 5000® software for EtherNet/IP enabled products and RSNetWorx™ for DeviceNet enabled products. ArmorStart controllers offer an Add-on Profile (AOP) for Allen-Bradley® ControlLogix® or CompactLogix™ Programmable Logic Controllers (PLCs). The AOP simplifies setup and commissioning via predefined tags and a setup wizard. The AOP allows copy and paste functionality for quick setup and configuration of multiple controllers.

Factory-installed Options

Option Availability

	ArmorStart ST	ArmorStart LT	Legacy ArmorStart
1 m dynamic brake cable included (DB option)	—	—	yes
3 m brake cable[1] included	—	—	yes[3]
3 m motor cable included	—	—	yes[3]
DeviceNet network	—	yes	yes
EtherNet/IP network	yes	yes	yes
Dynamic brake connector	yes	—	yes
EMI filter	yes	yes	yes
Hand/Off/Auto (HOA) selector keypad	yes	yes	yes
Internal power supply[2]	—	yes	—
IP20 dynamic brake (DB option)	—	—	yes
IP67 dynamic brake (DB1 option)	yes	—	yes
Output contactor	—	—	yes
Safety I/O	yes	—	yes
Safety monitor	yes	—	yes
EM brake	yes	yes	yes

(1) Control brake or source brake cable.
(2) The internal power supply is only available when the incoming power is 400Y/230V…480Y/277V.
(3) Longer cables are available, but are separately purchased.

Hand/Off/Auto (HOA) Selector Keypad

The HOA Selector Keypad allows for local start/stop control. Variations of the keypad include capabilities to JOG and to Forward/Reverse motor direction.

EMI Filter

The EMI filter is required to be CE compliant. ArmorStart ST and LT require a separately purchased shielded motor cable. Legacy ArmorStarts provide a 3 m, 4-conductor motor cable; longer cables are available when purchased separately.

Source EM Brake Contactor (electromechanical)

An internal contactor is used to switch an electromechanical motor brake On/Off. The source motor brake contactor is powered from the main power circuit. The configuration of the R1 relay controls the function of the brake. ArmorStart ST and LT require a separately purchased EM brake cable. Legacy ArmorStart controllers provide a 3 m, 3-conductor EM brake cable; longer cables are available when purchased separately.

Shielded Motor Cable

A 3 m, shielded 4-conductor cordset is required when the EMI filter is selected. ArmorStart ST and LT controllers require a separately purchased shielded motor cable. Legacy ArmorStart controllers provide a 3 m, 4-conductor shielded motor cable; longer cables are available when purchased separately.

Dynamic Brake Connector (DB or DB1 option)

A 3-pin dynamic brake connector is available for ArmorStart ST controllers and legacy ArmorStart VFDs. The resistor is purchased separately. When an ArmorStart controller is selected with the DB option a 3 m, 3-pin cordset is provided to connect an IP20 resistor.

IP67 Dynamic Brake Resistor (DB1 option)

The IP67 dynamic brake resistor design offers simplicity in wiring and installation. DB1 must be selected in the catalog number to apply this option. The IP67 dynamic brake resistor is ordered separately and comes with a 0.5 or a 1.0 m cable.

Output Contactor

Legacy ArmorStart controllers' optional, 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.

Safety Monitor

The safety monitor option is available for legacy ArmorStart controllers. It allows for independent monitoring of the output status of the device. The function is implemented using a normally closed contact with mechanically linked contacts. Two terminal blocks are provided as the inputs which may be used with an external safety circuit. The external safety circuit monitors the status of the isolation contactor.

Internal Power Supply (IPS)

The ArmorStart LT 24V DC IPS provides all control and I/O power and is sourced from the incoming 3-phase power. The at-motor disconnect removes motor and output power when in the OFF position, but control power remains to allow communications.

Safety Solutions

ArmorStart controllers address productivity concerns by offering safety options that help protect your people and equipment while also reducing planned and unplanned downtime.

ArmorStart controllers offer a choice of safety options:

- Hardwired Safe Torque Off is designed for safety-related applications that benefit from removal of rotational power from the drive. This functionality offers the benefit of quick startup after a demand on the safety system SIL 3Category 4, PLe.
- Integrated Safe Torque Off on EtherNet/IP provides the same benefits as hardwired Safe Torque Off – plus the ability to simplify your machine design and minimize required equipment. SIL 3, Category 4, PLe.

Hard-wired Safety Features

ArmorStart Safety and ST distributed motor controllers are intended to be combined with ArmorBlock® Guard I/O™ modules to form a subsystem that is part of the overall machine stop function. The motor controllers are connected to the safety I/O module through specified cable assemblies. The combination of one of these controllers, the safety module, and the specified interconnecting cables are referred to as the ArmorStart safety-related parts.

The catalog numbers and specific combinations for these safety-related components are shown in the following tables. The safety I/O module and control program must be configured appropriately to meet Category 4, PLe certification. See the appropriate Guard I/O User Manual, for Ethernet networks: publication 1791ES-UM001, for DeviceNet networks: publication 1791DS-UM001.

ArmorBlock Guard I/O provides all of the advantages of traditional distributed I/O for safety systems, but has an IP67 package that can be mounted directly on your machine. On-machine™ safety I/O reduces wiring time and startup costs for safety controller applications by eliminating electrical boxes and simplifying cable installation. The ArmorBlock® family provides industrially-hardened I/O blocks that you can mount directly on equipment near sensors or actuators. Wiring the I/O to the sensors and actuators is easy using pre-wired quick disconnect cables. With modules that support CIP Safety protocol over EtherNet/IP or DeviceNet networks, you can easily integrate safety and standard control systems by using safety and standard messages on the same wire.

Hard-wired Safety Related Parts

Network	Catalog Number	Description
EtherNet/IP	281E…S* * - denotes safety version of Bulletin 281E	Bulletin 281E distributed motor controller — controller is full-voltage, reversing
	284E…S* * - denotes safety version of Bulletin 284E	Bulletin 284E distributed motor controller — controller is variable-frequency AC drive
	1732ES-IB12XOBV2	**24V DC, 12 Input/**2 Bipolar Pair Output, **EtherNet/IP Safety**
	1732ES-IB8XOBV4	**24V DC, 8 Input/** 4 Bipolar Pair Output, **EtherNet/IP Safety**
DeviceNet	280…S* * - denotes safety version of Bulletin 280	Bulletin 280 Distributed Motor Controller — controller is full-voltage, nonreversing
	281…S* * - denotes safety version of Bulletin 281	Bulletin 281 Distributed Motor Controller — controller is full-voltage, reversing
	284…S* * - denotes safety version of Bulletin 284	Bulletin 284 Distributed Motor Controller — controller is variable-frequency AC drive
	1732DS-IB8XOBV4	24V DC, 8 Input/4 Bipolar Pair Output, DeviceNet Safety
—	889D-F4HJDM-*, 889D-F4AEDM-*or equivalent * - denotes length	**SM cable assembly - Interconnecting cable assembly between safety module input and ArmorStart controller**. Assembly provides contactor position feedback. P/M cable assembly - Interconnecting cable assembly between safety module output and ArmorStart controller. Assembly provides output contactor coil power. See Accessories on page 67,for more information.

System View Example
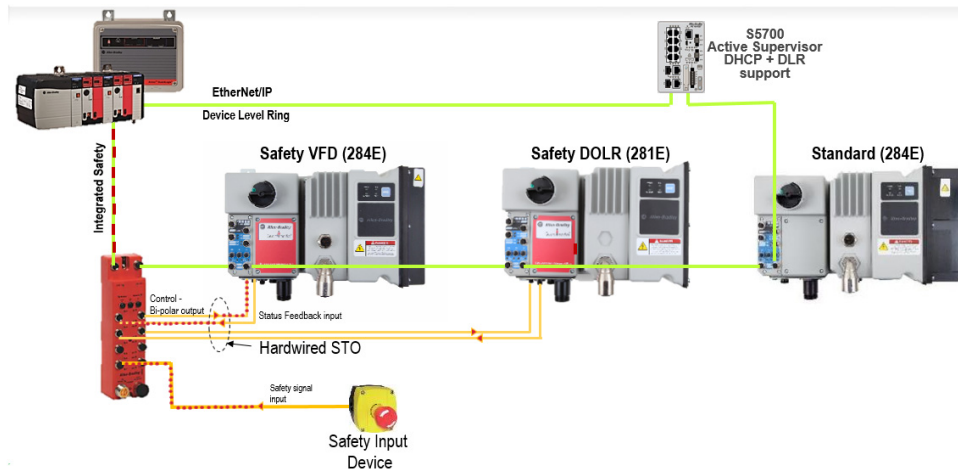
Integrated Safety Features

When used as part of an integrated safety system that includes a GuardLogix® 5570 and 5580ES controller or Compact GuardLogix® 5380ES controller, the integrated safety function's option module provides safety ratings up to and including SIL CL 3 and Categroy 4, PLe. Studio 5000 Logix Designer® application version 30 or later is also required.

Premiere integration with Functional Safety
- A single GuardLogix controller for both safety and standard control
- Single software environment –Studio 5000 Logix Designer®
- Visibility to all machine events enables a quick response to allow the machine to return to full production
- Safety and standard control operate via a single EtherNet/IP network
- Management of multiple safety zones, coexist on the same network and to share data between the safety and standard applications.
- Helps simplify your machine design and minimize equipment redundancies
- Fewer components mean smaller panel enclosures, which help reduce machine footprint

Integrated Safety using EtherNet/IP
- Standard Ethernet provides seamless integration into the IT Infrastructure
- Integrated Safety enhances machine performance and flexibility
- Combined with other On-Machine™ products reduces machine complexity, reduces time and labor costs for integration
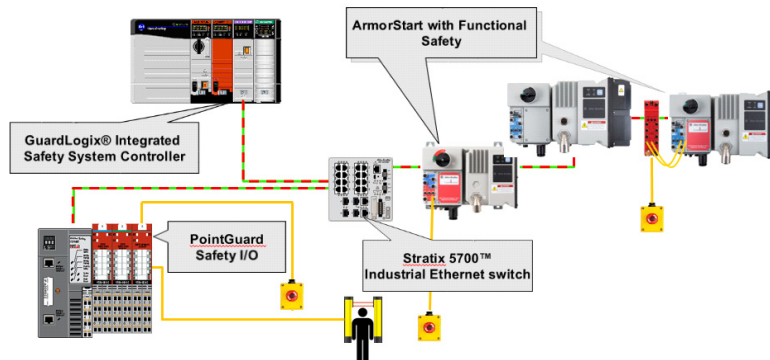
ArmorConnect Power and Control Media

ArmorConnect 3-Phase Power Input Media

ArmorConnect® 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 controller. These cable system components allow quick connection of ArmorStart controllers, which reduces installation time. They allow for repeatable, consistent connection of the three-phase and control power to the ArmorStart controller and motor. They provide a plug and play environment that also helps to avoid mis-wiring of the system. See Accessories on page 67 for details.

Through-panel receptacles   Trunk cable assemblies   Tee, reducer adapter, and field attachable connector

Control (Auxiliary) Power Media

Auxiliary power media offers a mini style quick disconnect cable that provides a secure connection to the ArmorStart controllers. For ArmorStart ST controllers, the auxiliary power media components are based on a 4-pin, mini connector to avoid mis-wires. Other ArmorStart controllers use 6-pin/5-used mini connectors. The connectors can be straight or right angled and are physically keyed to avoid wiring mishaps. See Control and Auxiliary Power Media on page 70 for details.

Through-panel receptacles   4-pin mini auxiliary power cables   Tees

ArmorStart Motor and Brake Cables

Motor and brake cables vary depending on the type of ArmorStart device. The cables are available in multiple configurations and lengths.

- See Motor Cables (M29) on page 31 for ArmorStart ST cables.
- See Motor Cables (M22) on page 44 for ArmorStart LT cables.
- See Motor Cables on page 56 for ArmorStart with EtherNet/IP communication cables.
- See Motor Cables on page 65 for ArmorStart with DeviceNet communication cables.

I/O and Network Media

Connection Devices include Network Media for Ethernet, Input and Output devices, and Safety Connection Systems. Rockwell Automation offers many product solutions in cordsets, patchcords, V- and Y-cables, splitters, field-attachable connectors, and receptacles.

- See Ethernet Media on page 73 for available options.
- See DeviceNet Media on page 74 for available options.
- See Control and Auxiliary Power Media on page 70 for available I/O connection options.

I/O cordset and patchcord   Ethernet cordset and patchcord

ArmorStart ST Distributed Motor Controllers

Description

The ArmorStart ST controller is a pre-engineered distributed motor-starting solution that is suitable for conveyance applications. The ArmorStart ST controller has different quick connectors compared to the legacy ArmorStart controller. The ArmorStart ST controller provides the equivalent of an embedded dual-port EtherNet/IP switch.

Model 281*-RRG is used in full-voltage and reverse applications. Model 284*- RRG-* is used in variable frequency applications where more precise motor control is needed. The ArmorStart ST controller offers an IP67/UL Type 4/12/13 enclosure rating that is suitable for water wash-down environments, when cables or a sealing cap is in place.

The ArmorStart ST controller has four configurable (sink/source) DC inputs and two sourcing solid-state outputs, as standard. These inputs and outputs are used with sensors and actuators respectively, for monitoring and controlling the application process.

ArmorStart ST controllers include DeviceLogix, a high-performing local logic engine that is used when a fast I/O response is critical to the application.

UL Lists the ArmorStart controller and its mating cable assemblies are suitable for installation in motor groups in accordance with 7.2.10.4 of NFPA® 79, Electrical Standard for Industrial Machinery®. From the perspective of the ArmorStart product family, being Listed for group installation means one set of fuses or one circuit breaker can protect a branch circuit that has two or more of these motor controllers that are connected to it.

There are three varieties of ArmorStart ST controllers available:
- The standard version implements a safety-related stop function that conforms to category 0 of IEC 60204-1.
- The ArmorStart ST hard-wired safety version controller is used with an Allen-Bradley Safety I/O ArmorBlock, catalog number 1732ES-IB12XOBV2 or 1732ESIB8XOBV4. Over-molded cables (Allen-Bradley 889N series) connect the ArmorBlock unit to the ArmorStart units. This configuration provides for implementation of a safety-related stop function in machines with the capability of Category 4, PLe, according to EN ISO 13849-1 and SIL 3, according to EN 62061/IEC 61508. For additional information regarding the Safety I/O module, see Guard I/O EtherNet/IP Safety Modules User Manual, publication 1791ES-UM001.
- The ArmorStart ST integrated safety version is used with an Allen-Bradley GuardLogix and Compact GuardLogix PLC using a single environment for standard and safety motor control. This configuration provides for implementation of a safety-related stop functions and safety I/O in machines with the capability of Category 4, PLe, according to EN ISO 13849-1 and SIL CL 3, according to EN 62061/IEC 61508.

Both the hard-wired and integrated safety solutions reduce machine complexity where multiple safety zones exist while also reducing integration and total installation cost. A single software environment is used for setup and commissioning standard and safety functions using Studio 5000 software.

ArmorStart ST common features include:
- Native dual-port Ethernet switch and supports DLR over EtherNet/IP
- Four digital inputs and two digital outputs
- IP67/UL Type 4/12/13 enclosure rating
- Quick disconnect connections for I/O, communications, motor, three-phase, and control power
- ArmorConnect power media is the only UL recommended cabling solution
- Comprehensive local light-emitting diode status indication
- Local logic technology using DeviceLogix
- TÜV certified up to Category 4, PLe, SIL 3, CL3 safety level
- Factory-installed option:
  - Local Hand-Off-Auto (HOA) keypad for manual control

ArmorStart ST VFD features include:
- Source (EM) brake connector
- Dynamic brake connector
- EMI filter

Bulletin 281E/281ES/281GS ArmorStart ST Full-voltage Reversing Distributed Motor Controller with RRG Gland

The ArmorStart ST catalog numbers 281E-…Z-…-RRG… are the standard version motor controllers and are used in applications that require across-the-line starting.
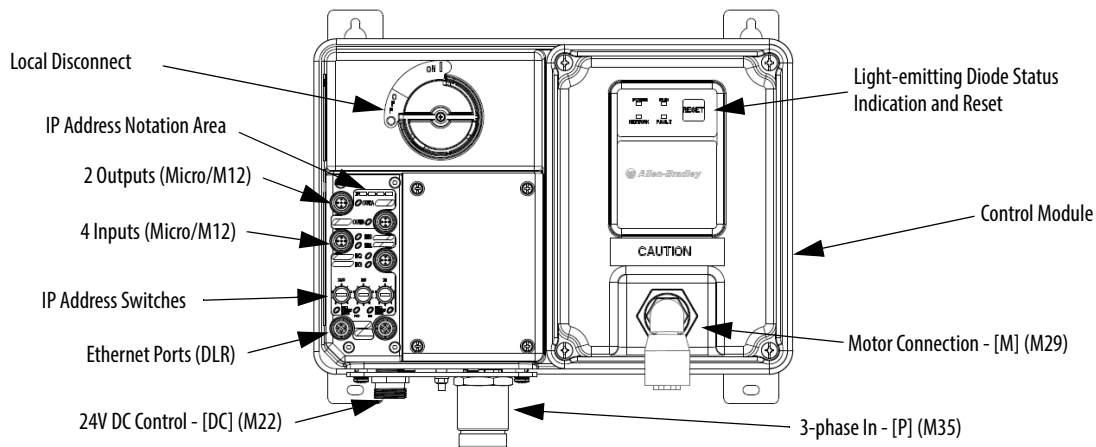
The ArmorStart ST catalog numbers 281E-…S-…-RRG… are the hardwired safety version motor controllers and are used in applications that require across-the-line starting and are also key to the overall machine safety compliance based on the risk assessment. This safety system solution can achieve a maximum of Category 4, PLe Safety.

The ArmorStart ST catalog numbers 281ES-…S-…-RRG… and 281GS-…S-…-RRG… are the integrated safety version motor controllers and are used in applications that require across-the-line starting and are also key to the overall machine safety compliance based on the risk assessment. This safety system solution can achieve a maximum of Category 4, PLe Safety.
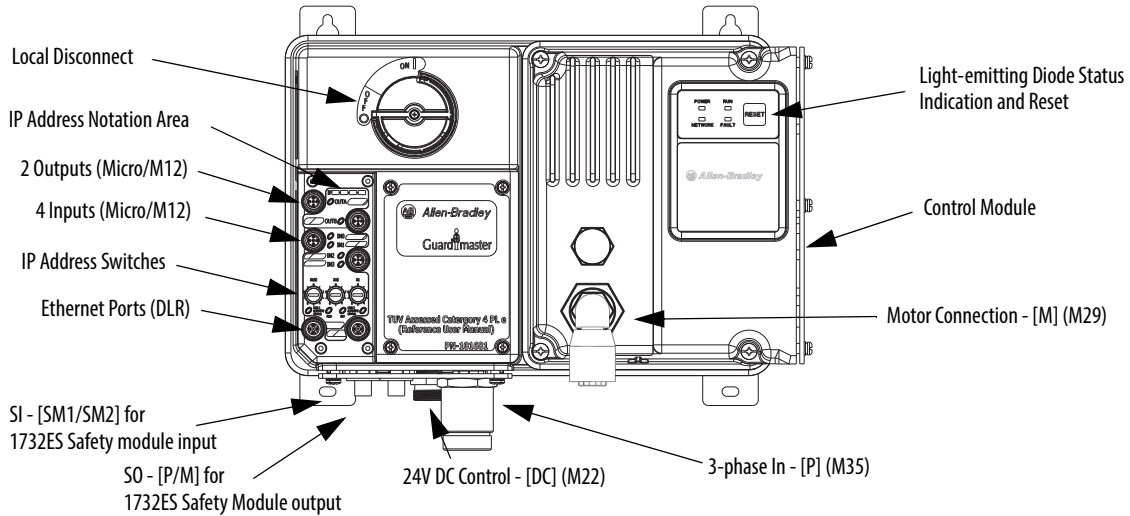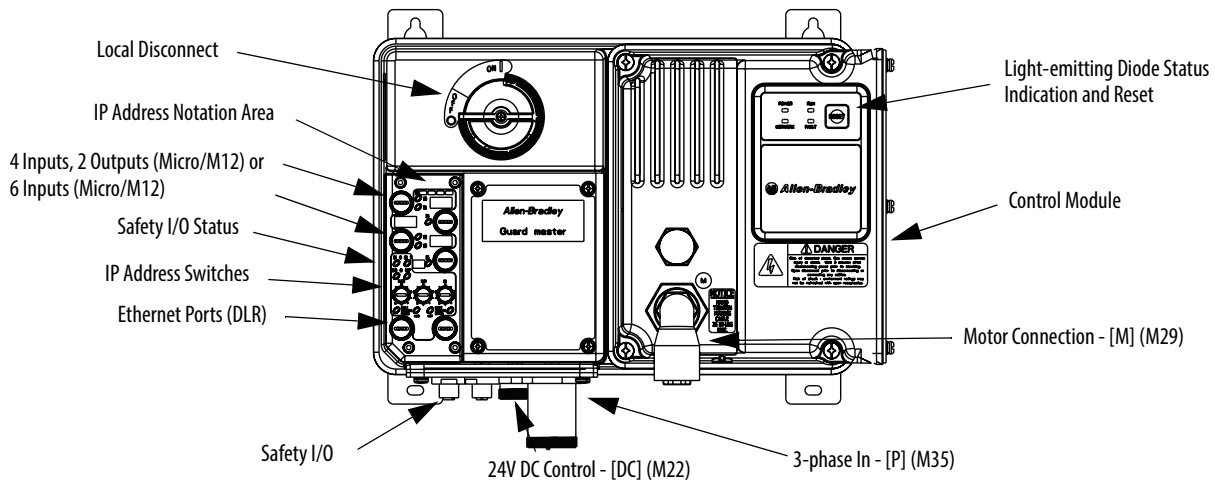

Fault diagnostics capabilities that are built into the ArmorStart ST controller, cover the following conditions:

• Short Circuit	• Control Power Loss	• Output Power Fuse Protection	• EEPROM Fault
• Overload[1]	• Control Power Fuse Detection	• Overtemperature	• Hardware Fault
• Phase Loss	• I/O Fault	• Phase Imbalance	• Miscellaneous Fault

(1) The overload trip class can be selected for class 10, 15, or 20 protection.

Fault diagnostics capabilities that are built into the ArmorStart ST with integrated safety controller, cover these additional conditions:

• Torque Disable	• Torque Permitted	• Circuit Fault	
• Safety I/O Wiring Fault	• Safety Dual Channel Configuration Fault		

Catalog Number Explanation

Examples that are 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.

281	ES	-	F	12	S	-	10	C	-	RRG	-	3FR	-	22
a	b		c	d	e		f	g		h		i		j

a	
Bulletin Number	
Code	**Description**
281	Reversing Starter

b	
ArmorStart ST Version	
Code	**Description**
E	Standard version when Control Voltage Code is **Z** or Hard-wired safety version when Control Voltage Code is **S**
ES[1]	Integrated Safety version with 4 inputs/2 outputs discrete
GS[1]	Integrated Safety version with 6inputs/0 outputs discrete

c	
Enclosure Type	
Code	**Description**
F	IP67/UL Type 4/12/13

d	
Contactor Size	
Code	**Description**
12	12 A
23	23 A

(1) Only available when Control Voltage Code **S** is selected.

e	
Control Voltage	
Code	**Description**
Z	24V DC, standard version
S	24V DC, safety version

f	
Short-circuit Protection (Motor Circuit Protection)	
Code	**Description**
10	10 A rated device
25	25 A rated device

g	
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	
Control and 3-Phase Power Connections/Motor Cable Connection[2]	
Code	**Description**
RRG	Round Media—male receptacle for control and power cables, female receptacle for motor cable

i	
HOA Option	
Code	**Description**
3FR	Hand/Off/Auto keypad with Forward/Reverse

j	
Safety I/O Option[1]	
Code	**Description**
00	No Safety I/O
22	Safety I/O

(1) Only available for ArmorStart ST Version codes **ES** or **GS**.
(2) Cables are sold separately.

Product Selection

Standard Reversing Starters with ArmorConnect power media connections

Current Rating [A]	kW		Hp				Cat. No.
	230V AC, 50 Hz	400V AC, 50 Hz	200V AC, 60 Hz	230V AC, 60 Hz	480V AC, 60 Hz	575V AC, 60 Hz	
0.24…1.2	0.18	0.37	—	—	0.5	0.5	281E-F12Z-10A-RRG
0.5…2.5	0.37	0.75	0.5	0.5	1	1.5	281E-F12Z-10B-RRG
1.1…5.5	1.1	2.2	1	1	3	3	281E-F12Z-10C-RRG
3.2…16	4	7.5	3	5	10	10	281E-F23Z-25D-RRG

Hard-wired Safety Reversing Starters with ArmorConnect power media connections

Current Rating [A]	kW		Hp				Cat. No.
	230V AC, 50 Hz	400V AC, 50 Hz	200V AC, 60 Hz	230V AC, 60 Hz	480V AC, 60 Hz	575V AC, 60 Hz	
0.24…1.2	0.18	0.37	—	—	0.5	0.5	281E-F12S-10A-RRG
0.5…2.5	0.37	0.75	0.5	0.5	1	1.5	281E-F12S-10B-RRG
1.1…5.5	1.1	2.2	1	1	3	3	281E-F12S-10C-RRG
3.2…16	4	7.5	3	5	10	10	281E-F23S-25D-RRG

Integrated Safety Reversing Starters with ArmorConnect power media connections and safety I/O

Current Rating [A]	kW		Hp				Cat. No.[1]	
	230V AC, 50 Hz	400V AC, 50 Hz	200V AC, 60 Hz	230V AC, 60 Hz	480V AC, 60 Hz	575V AC, 60 Hz	I/O: 4 Input/2 Output	I/O: 6 Input/0 Output
0.24…1.2	0.18	0.37	—	—	0.5	0.5	281ES-F12S-10A-RRG-22	281GS-F12S-10A-RRG-22
0.5…2.5	0.37	0.75	0.5	0.5	1	1.5	281ES-F12S-10B-RRG-22	281GS-F12S-10B-RRG-22
1.1…5.5	1.1	2.2	1	1	3	3	281ES-F12S-10C-RRG-22	281GS-F12S-10C-RRG-22
3.2…16	4	7.5	3	5	10	10	281ES-F23S-25D-RRG-22	281GS-F23S-25D-RRG-22

(1) To select units without safety I/O, change cat. no. suffix from **22** to **00**.

Factory-installed Options

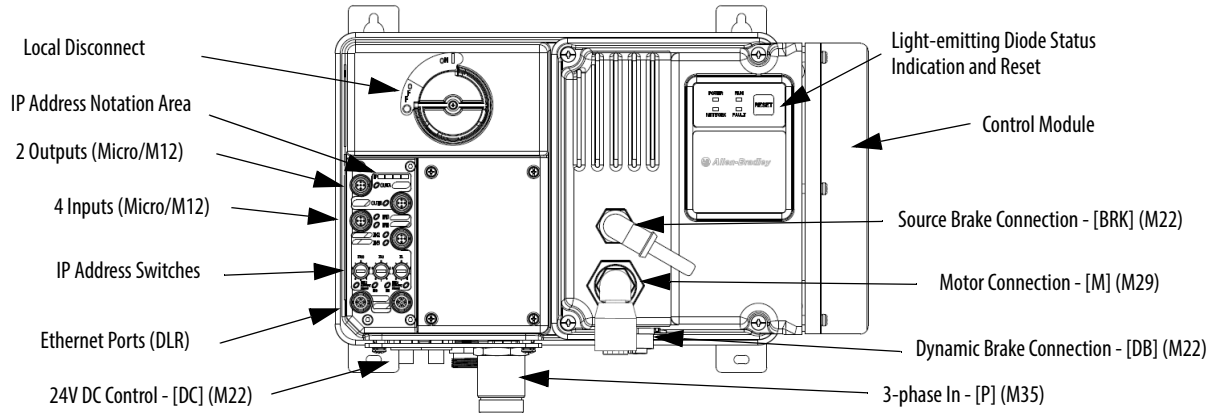|	Description	Cat. No. Modification
Allen-Bradley REV FWD HAND AUTO OFF	Hand/Off/Auto Selector Keypad with Forward/Reverse Function	-3FR
	With dual-channel safety input and bi-polar safety output or Without dual-channel safety input and bi-polar safety output	-22[1][2] -00[1][2]

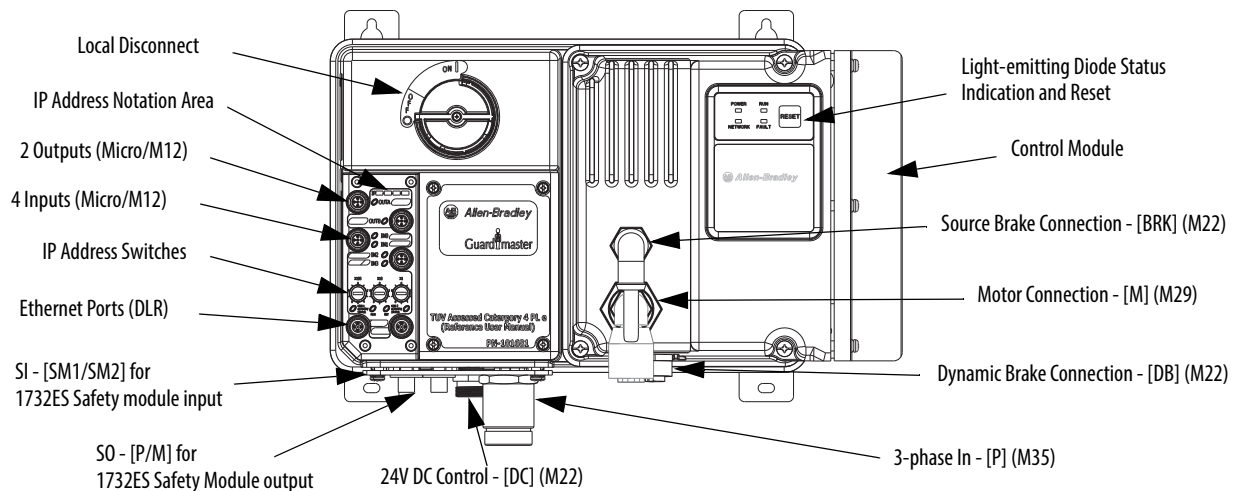(1) Only available for **ES** or **GS** communication type selections.
(2) Replace -22 with -00 when no safety I/O is needed.

Bulletin 284E/284ES/284GS ArmorStart ST VFD Distributed Motor Controller with RRG Gland

The ArmorStart catalog numbers 284E-…Z-RRG… are the standard version motor controllers and are used in applications that require regulated speed control of AC Motors. Variable speed and control are accomplished through selectable V/Hz or SVC control.

Local Disconnect

IP Address Notation Area

2 Outputs (Micro/M12)

4 Inputs (Micro/M12)

IP Address Switches

Ethernet Ports (DLR)

24V DC Control - [DC] (M22)

Light-emitting Diode Status Indication and Reset

Control Module

Source Brake Connection - [BRK] (M22)

Motor Connection - [M] (M29)

Dynamic Brake Connection - [DB] (M22)

3-phase In - [P] (M35)

The ArmorStart catalog numbers 284E-…S-RRG… are the safety version motor controllers and are used in applications that require regulated speed control of AC Motors. Variable speed and control are accomplished through selectable V/Hz or SVC control. This is key to the overall machine safety compliance based on the risk assessment. This safety system solution can achieve a maximum of SIL CL 3, and Category 4, PLe Safety.

Local Disconnect

IP Address Notation Area

2 Outputs (Micro/M12)

4 Inputs (Micro/M12)

IP Address Switches

Ethernet Ports (DLR)

SI - [SM1/SM2] for 1732ES Safety module input

SO - [P/M] for 1732ES Safety Module output

24V DC Control - [DC] (M22)

Light-emitting Diode Status Indication and Reset

Control Module

Source Brake Connection - [BRK] (M22)

Motor Connection - [M] (M29)

Dynamic Brake Connection - [DB] (M22)

3-phase In - [P] (M35)

The ArmorStart catalog number 284ES-…S-RRG… and 284GS…S-RRG… are the integrated safety version motor controllers and are used in applications that require regulated speed control of AC Motors. Variable speed and control are accomp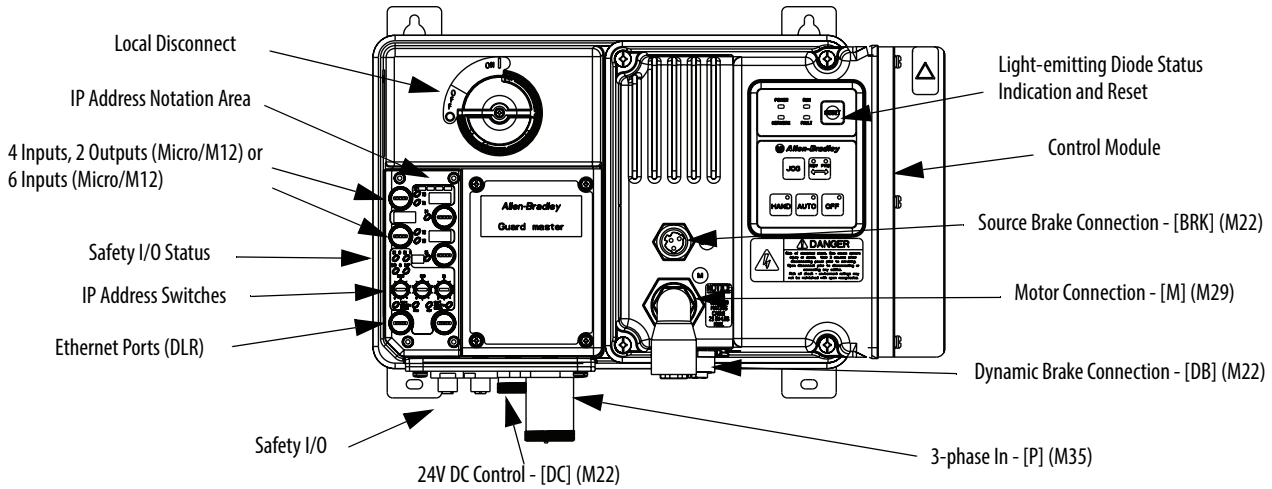lished through selectable V/Hz or SVC control. This is key to the overall machine safety compliance based on the risk assessment. This safety system solution can achieve a maximum of SIL CL 3 and Category 4, PLe Safety.

Local Disconnect

IP Address Notation Area

4 Inputs, 2 Outputs (Micro/M12) or
6 Inputs (Micro/M12)

Safety I/O Status

IP Address Switches

Ethernet Ports (DLR)

Safety I/O

24V DC Control - [DC] (M22)

Light-emitting Diode Status
Indication and Reset

Control Module

Source Brake Connection - [BRK] (M22)

Motor Connection - [M] (M29)

Dynamic Brake Connection - [DB] (M22)

3-phase In - [P] (M35)

Fault diagnostics capabilities that are built into the ArmorStart ST VFD cover the following conditions:

• Short Circuit	• Control Power Loss	• Output Fuse Protection	• Hardware Fault
• Overload[1]	• Control Power Fuse Detection	• Brake Fuse Protection	• Restart Retries
• Phase Short	• I/O Fault	• Internal Communication Fault	• Miscellaneous Fault
• Ground Fault	• Overcurrent	• DC Bus Fault	
• Stall	• Overtemperature	• EEPROM Fault	

(1)   Class 10 protection is the only overload trip class.

Fault diagnostics capabilities that are built into the ArmorStart ST with integrated safety VFD, cover these additional conditions:

• Torque Disable	• Torque Permitted	• Circuit Fault	
• Safety I/O Wiring Fault	• Safety Dual Channel Configuration Fault		

Catalog Number Explanation

Examples that are 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	ES	-	F	V	D2P3	S	-	10	-	RRG	-	3	-	SBG-DB1	-	EMI	-	22
a	b		c	d	e	f		g		h		i		j		k		l

a	
Bulletin Number	
Code	Description
284	VFD Starter

b	
ArmorStart ST Version	
Code	Description
E	Standard version when Control Voltage Code is **Z** or Hard-wired safety version when Control Voltage Code is **S**
ES[1]	Integrated Safety version with 4 inputs/2 outputs discrete
GS[1]	Integrated Safety version with 6 inputs/0 outputs discrete

c	
Enclosure Type	
Code	Description
F	IP67/UL Type 4/12/13

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

(1) Only available when Control Voltage Code **S** is selected.

e	
Output Current	
Code	Description
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, standard version
S	24V DC, safety version

g	
Short-circuit Protection (Motor Circuit Protection)	
Code	Description
10	10 A rated device
25	25 A rated device

h	
Control and 3-Phase Power Connections/Motor Cable Connection[2]	
Code	Description
RRG	Round Media—male receptacle for control and power cables, female receptacle for motor cable

i	
HOA Option	
Code	Description
3	Hand/Off/Auto keypad with Forward/Reverse and Jog

j	
Brake	
Code	Description
DB1	Connectivity to IP67 DB Resistor
SBG	Source (EM) Brake

k	
Filter	
Code	Description
EMI	EMI Filter

l	
Safety I/O Option[1]	
Code	Description
00	No Safety I/O
22	Safety I/O

(1) Only available for ArmorStart ST Version codes **ES** or **GS**.

(2) Cables are sold separately.

Product Selection

Standard VFD Starters with ArmorConnect power media connections

Input Voltage	Output Current [A]	kW	Hp	Cat. No.
380…480V, 50/60 Hz	2.3	0.75	1	284E-FVD2P3Z-10-RRG-SBG-DB1-EMI
	4	1.5	2	284E-FVD4P0Z-10-RRG-SBG-DB1-EMI
	6	2.2	3	284E-FVD6P0Z-25-RRG-SBG-DB1-EMI
	7.6	3	5	284E-FVD7P6Z-25-RRG-SBG-DB1-EMI

Hard-wired Safety VFD Starters with ArmorConnect power media connections

Input Voltage	Output Current [A]	kW	Hp	Cat. No.
380…480V, 50/60 Hz	2.3	0.75	1	284E-FVD2P3S-10-RRG-SBG-DB1-EMI
	4	1.5	2	284E-FVD4P0S-10-RRG-SBG-DB1-EMI
	6	2.2	3	284E-FVD6P0S-25-RRG-SBG-DB1-EMI
	7.6	3	5	284E-FVD7P6S-25-RRG-SBG-DB1-EMI

Integrated Safety VFD Starters with ArmorConnect power media connections and safety I/O

Input Voltage	Output Current [A]	kW	Hp	Cat. No.[1]	
				I/O: 4 Input/2 Output	I/O: 6 Input/0 Output
380…480V, 50/60 Hz	2.3	0.75	1	284ES-FVD2P3S-10-RRG-SBG-DB1-EMI-22	284GS-FVD2P3S-10-RRG-SBG-DB1-EMI-22
	4	1.5	2	284ES-FVD4P0S-10-RRG-SBG-DB1-EMI-22	284GS-FVD4P0S-10-RRG-SBG-DB1-EMI-22
	6	2.2	3	284ES-FVD6P0S-25-RRG-SBG-DB1-EMI-22	284GS-FVD6P0S-25-RRG-SBG-DB1-EMI-22
	7.6	3	5	284ES-FVD7P6S-25-RRG-SBG-DB1-EMI-22	284GS-FVD7P6S-25-RRG-SBG-DB1-EMI-22

(1) To select units without safety I/O, change cat. no. suffix from **22** to **00**.
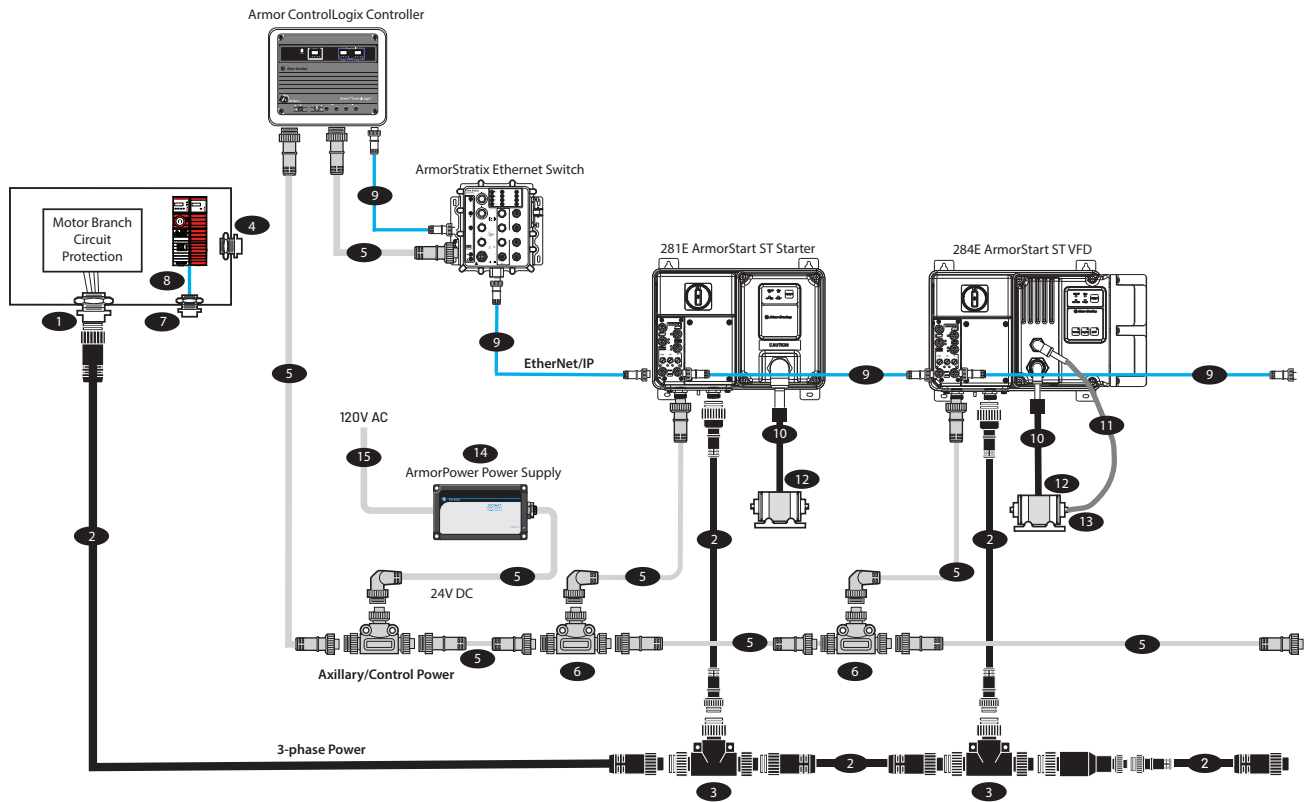
Factory-installed Options

	Description	Cat. No. Modification
	Hand/Off/Auto Selector and Jog Keypad	-3
	With dual-channel safety input and bi-polar safety output or Without dual-channel safety input and bi-polar safety output	-22[1][2] -00[1][2]

(1) Only available for **ES** or **GS** communication type selections.
(2) Replace -22 with -00 when no safety I/O is needed.
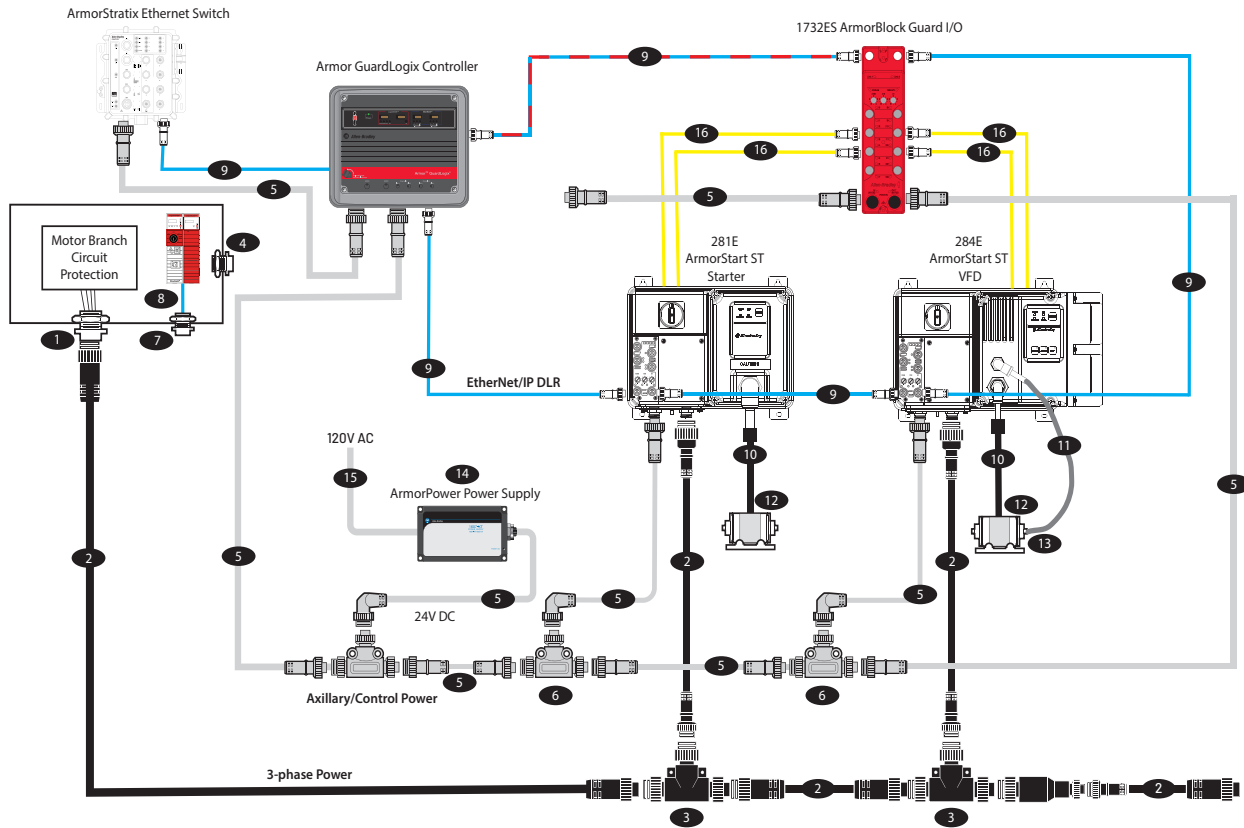
Accessories

Standard ArmorStart ST

	Description	Example Cat. Nos.	For cable configuration details and lengths:
1	Three-phase power receptacle	280-M35F-M*xx*[1]	See Three-phase Power Receptacles on page 68
2	Three-phase power trunk cable & drop cable	280-PWRM35A-M*xx*[1]	See Three-phase Power Trunk and Drop Cables on page 67
3	Three-phase power t-port	280-T35	See Three-phase Power T-ports and Reducing Adapters on page 69
4	Auxiliary/Control power receptacle	888N-D4AF1-*xx*[1]	See Auxiliary/Control Power Receptacles on page 71
5	Auxiliary/Control power trunk & drop cable	889N-F4AFNM-*xx*[1]	See Auxiliary/Control Power Cordsets on page 70 or Auxiliary/Control Power Patchcords on page 70
6	Auxiliary/Control power t-port	898N-43PB-N4KT	See Auxiliary/Control Power T-Ports on page 71
7	Ethernet bulkhead adapter (RJ45-M12)	1585A-DD4JD	See Ethernet Media on page 73
8	Ethernet transition cable (RJ45 patchcord-M12 receptacle)	1585D-D4TBJM*xx*[1]	See Ethernet Media on page 73
9	Ethernet patchcord	1585D-M4TBDM-*xx*[1]	See Ethernet Media on page 73
10	Motor cable	280-PWRM29A-M*xx*[1] 284-PWRM29A-M*xx*[1]	See Motor Cables (M29) on page 31
11	Brake cable	285-BRC22-M*xx*[1]D	See Brake Cables (M22) on page 31
12	Motor receptacle	284-M29M-M05	See Motor and Panel Receptacles (M29) on page 31
13	Brake receptacle	285-M24M-M05	See Brake Motor and Panel Receptacles (M22) on page 31
14	24V DC power supply	1607-XT50D1A	See ArmorPower On-Machine Power Supplies: https://ab.rockwellautomation.com/Power-Supplies/ArmorPower-On-Machine
15	120V AC line in cable, 3-pin	889N-F3AFC-F-*xx*[1]	See Auxiliary/Control Power Cordsets on page 70
not shown	I/O cables	889D-F4ACDM-*xx*[1]	See I/O Media on page 72

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

See ArmorConnect Power Media and ArmorStart Motor and Brake Media Selection Guide, publication 280PWR-SG001, for available options and technical specifications.
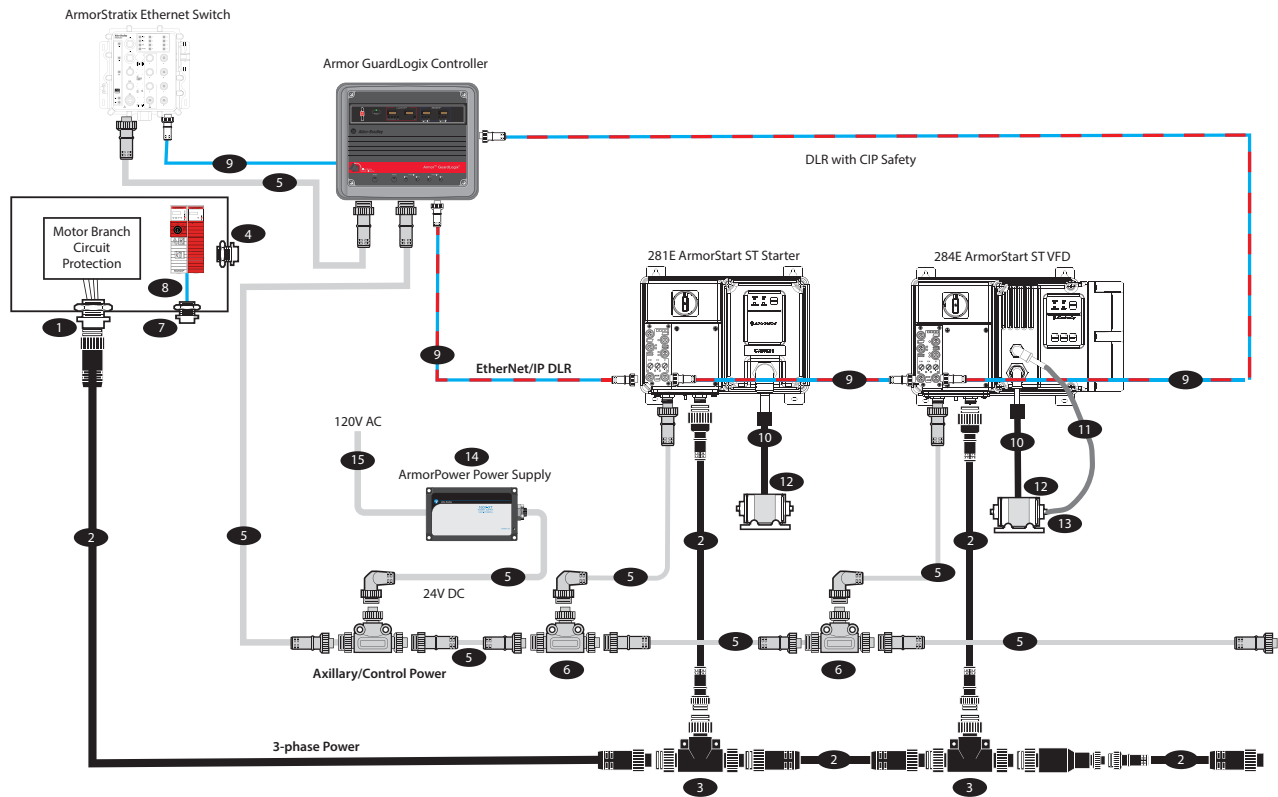
ArmorStart ST with Hard-wired Safety

	Description	Example Cat. Nos.	For cable configuration details and lengths:
1	Three-phase power receptacle	280-M35F-M*xx*[1]	See Three-phase Power Receptacles on page 68
2	Three-phase power trunk cable & drop cable	280-PWRM35A-M*xx*[1]	See Three-phase Power Trunk and Drop Cables on page 67
3	Three-phase power t-port	280-T35	SeeThree-phase Power T-ports and Reducing Adapters on page 69
4	Auxiliary/Control power receptacle	888N-D4AF1-*xx*[1]	See Auxiliary/Control Power Receptacles on page 71
5	Auxiliary/Control power trunk & drop cable	889N-F4AFNM-*xx*[1]	See Auxiliary/Control Power Cordsets on page 70 or Auxiliary/Control Power Patchcords on page 70
6	Auxiliary/Control power t-port	898N-43PB-N4KT	See Auxiliary/Control Power T-Ports on page 71
7	Ethernet bulkhead adapter (RJ45-M12)	1585A-DD4JD	See Ethernet Media on page 73
8	Ethernet transition cable (RJ45 patchcord-M12 receptacle)	1585D-D4TBJM*xx*[1]	See Ethernet Media on page 73
9	Ethernet patchcord	1585D-M4TBDM-*xx*[1]	See Ethernet Media on page 73
10	Motor cable	280-PWRM29A-M*xx*[1][1] 284-PWRM29A-M*xx*[1]	See Motor Cables (M29) on page 31
11	Brake cable	285-BRC22-M*xx*[1]D	See Brake Cables (M22) on page 31
12	Motor receptacle	284-M29M-M05	See Motor and Panel Receptacles (M29) on page 31
13	Brake receptacle	285-M24M-M05	See Brake Motor and Panel Receptacles (M22) on page 31
14	24V DC power supply	1607-XT50D1A	See ArmorPower On-Machine Power Supplies: https://ab.rockwellautomation.com/Power-Supplies/ArmorPower-On-Machine
15	120V AC line in cable, 3-pin	889N-F3AFC-F-*xx*[1]	See Auxiliary/Control Power Cordsets on page 70
16	AmorBlock Guard I/O DC mini cable	889D-F4AEDM-*xx*[1]	See I/O Media on page 72
not shown	I/O cables	889D-F4ACDM-*xx*[1]	See I/O Media on page 72

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

See ArmorConnect Power Media and ArmorStart Motor and Brake Media Selection Guide, publication 280PWR-SG001, for available options and technical specifications.

ArmorStart ST with Integrated Safety

	Description	Example Cat. Nos.	For cable configuration details and lengths:
1	Three-phase power receptacle	280-M35F-Mxx[1]	See Three-phase Power Receptacles on page 68
2	Three-phase power trunk cable & drop cable	280-PWRM35A-Mxx[1]	See Three-phase Power Trunk and Drop Cables on page 67
3	Three-phase power t-port	280-T35	See Three-phase Power T-ports and Reducing Adapters on page 69
4	Auxiliary/Control power receptacle	888N-D4AF1-xx[1]	See Auxiliary/Control Power Receptacles on page 71
5	Auxiliary/Control power trunk & drop cable	889N-F4AFNM-xx[1]	See Auxiliary/Control Power Cordsets on page 70 or Auxiliary/Control Power Patchcords on page 70
6	Auxiliary/Control power t-port	898N-43PB-N4KT	See Auxiliary/Control Power T-Ports on page 71
7	Ethernet bulkhead adapter (RJ45-M12)	1585A-DD4JD	See Ethernet Media on page 73
8	Ethernet transition cable (RJ45 patchcord-M12 receptacle)	1585D-D4TBJMxx[1]	See Ethernet Media on page 73
9	Ethernet patchcord	1585D-M4TBDM-xx[1]	See Ethernet Media on page 73
10	Motor cable	280-PWRM29A-Mxx[1] 284-PWRM29A-Mxx[1]	See Motor Cables (M29) on page 31
11	Brake cable	285-BRC22-Mxx[1]D	See Brake Cables (M22) on page 31
12	Motor receptacle	284-M29M-M05	See Motor and Panel Receptacles (M29) on page 31
13	Brake receptacle	285-M24M-M05	See Brake Motor and Panel Receptacles (M22) on page 31
14	24V DC power supply	1607-XT50D1A	See ArmorPower On-Machine Power Supplies: https://ab.rockwellautomation.com/Power-Supplies/ArmorPower-On-Machine
15	120V AC line in cable, 3-pin	889N-F3AFC-F-xx[1]	See Auxiliary/Control Power Cordsets on page 70
not shown	I/O cables	889D-F4ACDM-xx[1]	See I/O Media on page 72

(1) xx specifies the available cable lengths.

See ArmorConnect Power Media and ArmorStart Motor and Brake Media Selection Guide, publication 280PWR-SG001, for available options and technical specifications.

Motor Cables (M29)

Cordsets with flying leads or patchcord cables are available in various lengths and physical configurations.

Cordsets

Patchcords

	No. of Pins	Wire Size	Assembly Rating	Environmental Rating	Cordsets		Patchcords	
					Straight Male	Right-angle Male	Straight Male/ Straight Female	Right-angle Male/ Right-angle Female
Shielded	4	12 AWG	600V, 25 A	IP67/UL 4/12	284-PWRM29G-M*xx*[1]	—	284-PWRM29A-M*xx*[1]	—
Unshielded					280-PWRM29G-M*xx*[1]	280-PWRM29H-M*xx*[1]	280-PWRM29A-M*xx*[1]	280-PWRM29D-M*xx*[1]

(1)   *xx* specifies the cable length, see Cable Lengths table to complete the cat. no. (for example, the cable length for Cat. No. 284-PWRM29G-M1 is 1 m).

Motor and Panel Receptacles (M29)

	No. of Pins	Wire Size	Assembly Rating	Environmental Rating	Cat. No.
Straight male connector with 0.3 m cable and wire, shielded	4	12 AWG	600V, 25 A	IP67/UL 4/12	284-M29M-M03
Straight female panel connector with 0.3 m cable and wire, shielded					284-M29F-M03

Brake Cables (M22)

	No. of Pins	Wire Size	Assembly Rating	Environmental Rating	Cordsets		Patchcords	
					Straight Male	Right-angle Male	Straight Male/ Straight Female	Right-angle Male/ Right-angle Female
Unshielded	3	16 AWG	600V, 10 A	IP67/UL 4/12	285-BRC22-M*xx*[1]	285-BRC22H-M*xx*	285-BRC22-M*xx*[1]D	285-BRC22D-M*xx*[1]D

(1)   *xx* specifies the cable length, see Cable Lengths table to complete the cat. no. (for example, the cable length for Cat. No. 285-BRC22-M1 is 1 m).

Brake Motor and Panel Receptacles (M22)

	No. of Pins	Assembly Rating	Environmental Rating	Cat. No.
Straight male connector with 0.5 m cable and wire	3	600V, 10 A	IP67/UL 4/12	285-M24M-M05
Straight female panel connector with 0.25 m cable and wire				285-M24F-M025

Sealing Cap

	Cat. No.
M22 sealing cap, when no brake cable is used	1485A-C1

Cable Lengths

Code	05	1	015	2	3	4	6	8	10	12	14
Length [m (ft)]	0.5 (1.6)	1 (3.3)	1.5 (4.9)	2 (6.6)	3 (9.8)	4 (13.1)	6 (19.7)	8 (26.2)	10 (32.8)	12 (39.4)	14 (45.9)

Notes:

ArmorStart LT Distributed Motor Controller

Description

ArmorStart LT controller is a compact, integrated, pre-engineered, On-Machine motor-starting solution. Bulletin 290 devices are full-voltage, nonreversing motor control, Bulletin 291 devices are full-voltage reversing motor control, and Bulletin 294 devices are variable speed motor control.

The controllers are equipped with a UL® Listed at-motor disconnect that supports a lockout-tagout (LOTO) provision. ArmorStart LT controllers are Listed as suitable for group installations per UL and can be applied with either branch circuit breaker protection or fuse protection. It provides an IP66/UL Type 4/12[1] enclosure suitable for water washdown environments in a single box construction that will minimize inventory needs. All external connections are made from the bottom of the unit, which minimizes accidental contact with moving equipment. ArmorStart LT controllers come standard with quick disconnect receptacles for the I/O and network connections.

ArmorStart LT controllers include DeviceLogix, a high-performing local logic engine that is used when a fast I/O response is critical to the application. The controllers also include either DeviceNet communications capability or an embedded dual-port EtherNet/IP switch that supports Device Level Ring (DLR) topology.

ArmorStart LT controllers leverage the capabilities of the Rockwell Automation Integrated Architecture® so you can achieve an unmatched level of integration and ease of use. The architecture of ArmorStart LT controllers allows Premiere Integration with Allen-Bradley ControlLogix® or CompactLogix™ line of Automation Controllers and Programmable Logic Controllers (PLCs). Studio 5000 is the only programming software that you need. This software consolidates controller programming, device configuration, and maintenance into a single, integrated environment. ArmorStart LT controllers include tools like an add-on profile that automatically generates PLC tag names for quick and efficient configuration and programming.

Bulletin 290/291/294 devices include:
- DeviceNet and EtherNet/IP communication options
- Six configurable I/O points
- IP66/UL Type 4/12 enclosure rating
- Quick disconnect connections for I/O and communications
- Comprehensive local light-emitting diode status indication
- Local logic technology using DeviceLogix
- Conduit entrance or ArmorConnect power media gland plate
- Peer-to-peer (ZIP) for DeviceNet versions
- Internal EMI filter (Bulletin 294 devices only)
- Factory-installed options:
  - Quick disconnect receptacles for power, control, and motor connections
  - Local Hand-Off-Auto (HOA) keypad for manual control
  - Internal power supply (IPS) eliminating the need to run additional control power to each unit
  - Electromechanical brake connection (source brake) (Bulletin 294 devices only)

---

(1) The G2 gland option is rated IP66/ UL Type 4

Bulletin 290/291 ArmorStart LT Distributed Motor Controller

The Bulletin 290/291 ArmorStart controller is used in applications that require across-the-line starting. The controllers have full inrush current and locked-rotor torque. Bulletin 290 controllers provide full-voltage and Bulletin 291 controllers provide full-voltage, reversing, motor control performance.
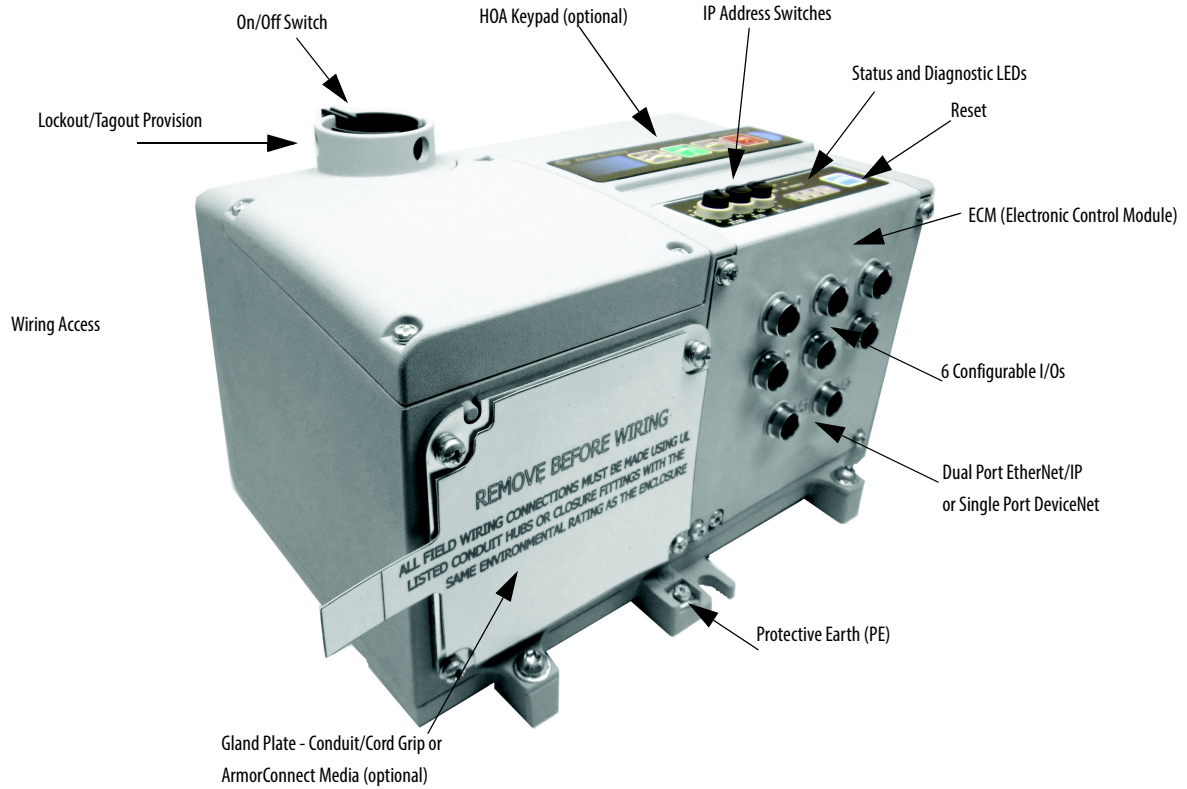
Fault diagnostics capabilities that are built into the Bulletin 290/291 ArmorStart controller cover the following conditions:

• Overload Trip	• Sensor Short Trip	• Jam Trip	• Output Short Trip
• Phase Loss Trip	• Phase Imbalance Trip	• Stall Trip	• User-defined Trip
• Under-power Trip	• NonVolatile Memory Trip	• Underload Trip	• Hardware Fault

Catalog Number Explanation

Examples that are 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.

290	E	–	F	A	Z	–	G1	–	option 1	–	option 2
a	b		c	d	e		f		g		h

a	
Bulletin Number	
Code	**Description**
290	Full-voltage Starter
291	Reversing Starter

b	
Communications	
Code	**Description**
E	EtherNet/IP
D	DeviceNet™

c	
Enclosure Type	
Code	**Description**
F	IP66/UL Type 4/12

d	
Overload Selection	
Code	**Description**
A	0.24…3.5 A
B	1.1…7.6 A

e	
Control Voltage	
Code	**Description**
Z	External 24V DC control power
P	Internal power supply[3]

f	
Gland Plate Options (Power and Motor)[1]	
Code	**Description**
G1	Conduit entry
G2	ArmorConnect
G3[4]	Gland kits

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

h	
Option 2	
Code	**Description**
blank[2]	Factory option

(1) IP66/UL Type 4 is available with all gland options. UL Type 4/12 is available with G1 and G3 gland option.

(2) Leave blank unless there is a customer-specific option defined by the factory.

(3) The internal power supply is only available when the incoming power is 400Y/230V…480Y/277V.

(4) See Options on page 37 for special gland configurations for daisy chaining.

Product Selection

EtherNet/IP Network Communication

Full-voltage Starters—IP66/UL Type 4/12 with Conduit Entrance, up to 480Y/277V AC

Current Rating [A]	kW		Hp		External 24V DC Control Voltage	Internal 24V DC Control Voltage[2]
	230V AC, 50 Hz	**400/415V AC, 50 Hz**	**200/230V AC, 60 Hz**	**460V AC, 60 Hz**	**Cat. No.**	**Cat. No.**
0.24…3.5	0.75	1.5	1	2	290E-FAZ-G1[1]	290E-FAP-G1[1]
1.1…7.6	1.5	3	2	5	290E-FBZ-G1[1]	290E-FBP-G1[1]

(1) If necessary, replace the G1 suffix code with G3 and refer to the User-Installed Options for kit selection.

Full-voltage Starters—IP66/UL Type 4 with ArmorConnect Power Media Connections, up to 480Y/277V AC

Current Rating [A]	kW		Hp		External 24V DC Control Voltage	Internal 24V DC Control Voltage[2]
	230V AC, 50 Hz	**400/415V AC, 50 Hz**	**200/230V AC, 60 Hz**	**460V AC, 60 Hz**	**Cat. No.**	**Cat. No.**
0.24…3.5	0.75	1.5	1	2	290E-FAZ-G2	290E-FAP-G2
1.1…7.6	1.5	3	2	5	290E-FBZ-G2	290E-FBP-G2

(2) The internal power supply is only available when the incoming power is 400Y/230V…480Y/277V.

Reversing Starters—IP66/UL Type 4/12 with Conduit Entrance, up to 480Y/277V AC

Current Rating [A]	kW		Hp		External 24V DC Control Voltage	Internal 24V DC Control Voltage[2]
	230V AC, 50 Hz	400/415V AC, 50 Hz	200/230V AC, 60 Hz	460V AC, 60 Hz	Cat. No.	Cat. No.
0.24…3.5	0.75	1.5	1	2	291E-FAZ-G1[1]	291E-FAP-G1[1]
1.1…7.6	1.5	3	2	5	291E-FBZ-G1[1]	291E-FBP-G1[1]

(1)   If necessary, replace the G1 suffix code with G3 and refer to the User-Installed Options for kit selection.

Reversing Starters—IP66/UL Type 4 with ArmorConnect Power Media Connections, up to 480Y/277V ACC

Current Rating [A]	kW		Hp		External 24V DC Control Voltage	Internal 24V DC Control Voltage[2]
	230V AC, 50 Hz	400/415V AC, 50 Hz	200/230V AC, 60 Hz	460V AC, 60 Hz	Cat. No.	Cat. No.
0.24…3.5	0.75	1.5	1	2	291E-FAZ-G2	291E-FAP-G2
1.1…7.6	1.5	3	2	5	291E-FBZ-G2	291E-FBP-G2

DeviceNet Network Communications

Full-voltage starters—IP66/UL Type 4/12 with Conduit Entrance, up to 480Y/277V AC

Current Rating [A]	kW		Hp		External 24V DC Control Voltage	Internal 24V DC Control Voltage[2]
	230V AC, 50 Hz	400/415V AC, 50 Hz	200/230V AC, 60 Hz	460V AC, 60 Hz	Cat. No.	Cat. No.
0.24…3.5	0.75	1.5	1	2	290D-FAZ-G1[1]	290D-FAP-G1[1]
1.1…7.6	1.5	3	2	5	290D-FBZ-G1[1]	290D-FBP-G1[1]

(1)   If necessary, replace the G1 suffix code with G3 and refer to the User-Installed Options for kit selection.

Full-voltage Starters—IP66/UL Type 4 with ArmorConnect Power Media Connections, up to 480Y/277V AC

Current Rating [A]	kW		Hp		External 24V DC Control Voltage	Internal 24V DC Control Voltage[2]
	230V AC, 50 Hz	400/415V AC, 50 Hz	200/230V AC, 60 Hz	460V AC, 60 Hz	Cat. No.	Cat. No.
0.24…3.5	0.75	1.5	1	2	290D-FAZ-G2	290D-FAP-G2
1.1…7.6	1.5	3	2	5	290D-FBZ-G2	290D-FBP-G2

Reversing Starters—IP66/UL Type 4/12 with Conduit Entrance, up to 480Y/277V AC

Current Rating [A]	kW		Hp		External 24V DC Control Voltage	Internal 24V DC Control Voltage[2]
	230V AC, 50 Hz	400/415V AC, 50 Hz	200/230V AC, 60 Hz	460V AC, 60 Hz	Cat. No.	Cat. No.
0.24…3.5	0.75	1.5	1	2	291D-FAZ-G1[1]	291D-FAP-G1[1]
1.1…7.6	1.5	3	2	5	291D-FBZ-G1[1]	291D-FBP-G1[1]
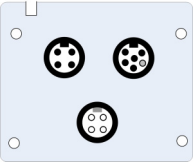
(1)   If necessary, replace the G1 suffix code with G3 and refer to the User-Installed Options for kit selection.

Reversing Starters—IP66/UL Type 4 with ArmorConnect Power Media Connections, up to 480Y/277V AC

Current Rating [A]	kW		Hp		External 24V DC Control Voltage	Internal 24V DC Control Voltage[2]
	230V AC, 50 Hz	400/415V AC, 50 Hz	200/230V AC, 60 Hz	460V AC, 60 Hz	Cat. No.	Cat. No.
0.24…3.5	0.75	1.5	1	2	291D-FAZ-G2	291D-FAP-G2
1.1…7.6	1.5	3	2	5	291D-FBZ-G2	291D-FBP-G2

(2)   The internal power supply is only available when the incoming power is 400Y/230V…480Y/277V.

Options

	Description	For Use With Bulletin	Cat. No. Modification
Factory-installed Options			
	Hand/Off/Auto Selector Keypad	290	–3
	Hand/Off/Auto Selector Keypad with Forward/Reverse Function	291	–3FR
	Conduit/Cord-Ready Gland Plate	290/291	-G1
	ArmorConnect Power Media Connectivity Gland Plate	290/291	-G2
User-installed Option			
	See User-installed Gland Plates table	290/291	-G3

User-installed Gland Plates

	Description	Pkg. Quantity	For Use With Bulletin	Cat. No.
Alternative Gland Plates for Daisy Chain Power	Use when punching custom gland	5 each (screws included)	290/291	290-G3-A1
	Use when no IPS and no SB options are selected			290-G3-A2
	Use when IPS option is selected and no SB option is selected.			290-G3-A4

Bulletin 294 ArmorStart LT Distributed Motor Controller

Bulletin 294 ArmorStart LT controller provides variable speed motor control performance.
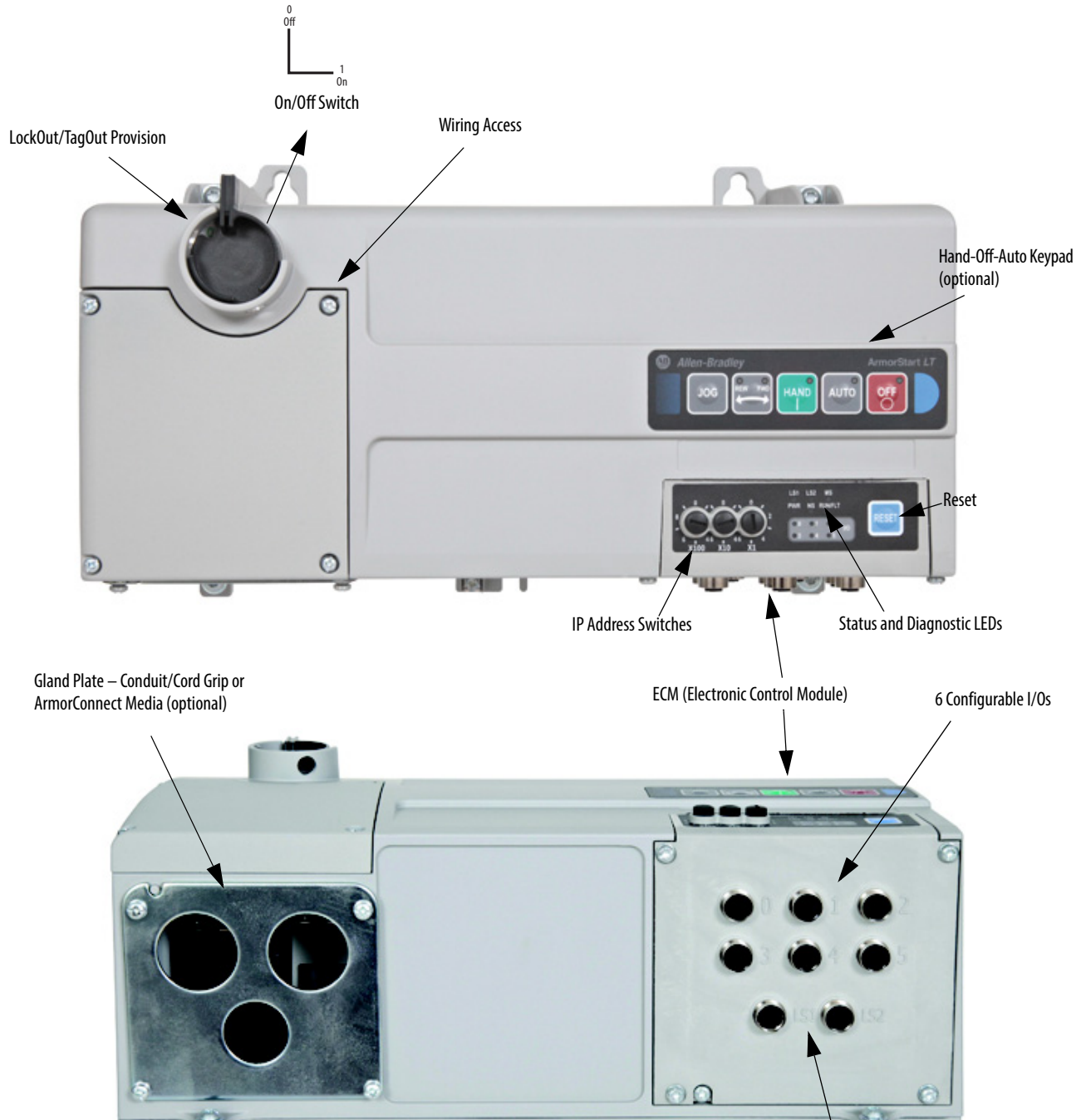
Fault diagnostics capabilities that are built into the Bulletin 294 ArmorStart controller cover the following conditions:

• Overload Trip	• Overcurrent Trip	• Stall Trip	• Drive Hardware Fault
• Phase Loss Trip	• NonVolatile Memory Trip	• Overtemperature Trip	• Output Short Trip
• Under-power Trip	• Parameter Sync Trip	• Ground Fault	• User-defined Trip
• Sensor Short Trip	• DC Bus/Open Disconnect Trip	• Restart Retries Trip	• Hardware Fault

Catalog Number Explanation

Examples that are 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.

294		E	-	F	D1P5	Z	-	G1	Option 1	-	Option 2
a		b		c	d	e		f	g		h

a	
Bulletin Number	
Code	**Description**
294	VFD Starter

b	
Communications	
Code	**Description**
E	EtherNet/IP
D	DeviceNet

c	
Enclosure Type	
Code	**Description**
F	IP66/UL Type 4/12

d	
Output Current	
Code	**Description**
D1P5	1.5 A (0.4 kW), 0.5 Hp
D2P5	2.5 A (0.75 kW), 1.0 Hp
D4P2	3.6 A (1.5 kW), 2.0 Hp

e	
Control Voltage	
Code	**Description**
Z	External 24V DC control power
P	Internal power supply[2]

f	
Gland Plate Options (Power and Motor)[1]	
Code	**Description**
G1	Conduit entry
G2	ArmorConnect
G3	Gland Kits[4]

g	
Option 1	
Code	**Description**
3	Hand/Off/Auto selector keypad with Jog function

h	
Option 2	
Code	**Description**
SB	Source Brake
blank[3]	No option

(1) IP66/UL Type 4 is available with all gland options. UL Type 4/12 is available with G1 and G3 gland option.
(2) The internal power supply is only available when the incoming power is 400Y/230V…480Y/277V.
(3) Leave blank unless there is a customer-specific option defined by the factory.
(4) See for special gland configurations for daisy chaining.

Product Selection

VFD (V/Hz) - EtherNet/IP Network Communication

IP66/UL Type 4/12 with conduit entrance and EMI filter, VFD (V/Hz)

Input Voltage	Output Voltage [V]	Input Current [A]	Output Current [A]	3-Phase kW Rating	3-Phase Hp Rating	External 24V DC Control Voltage	Internal 24V DC Control Voltage[2]
						Cat. No.	Cat. No.
380Y/220V…480Y/277V AC (+/- 10%), 3-phase, 50/60 Hz	0…460	1.8	1.5	0.37	0.5	294E-FD1P5Z-G1[1]	294E-FD1P5P-G1[1]
		3	2.5	0.75	1	294E-FD2P5Z-G1[1]	294E-FD2P5P-G1[1]
		5.5	3.6	1.5	2	294E-FD4P2Z-G1[1]	294E-FD4P2P-G1[1]

(1)   If necessary, replace the G1 suffix code with G3 and refer to the User-Installed Options for kit selection.

IP66/UL Type 4 with ArmorConnect and EMI filter, VFD (V/Hz)

Input Voltage	Output Voltage [V]	Input Current [A]	Output Current [A]	3-Phase kW Rating	3-Phase Hp Rating	External 24V DC Control Voltage	Internal 24V DC Control Voltage[2]
						Cat. No.	Cat. No.
380Y/220V…480Y/277V AC (+/- 10%), 3-phase, 50/60 Hz	0…460	1.8	1.5	0.37	0.5	294E-FD1P5Z-G2	294E-FD1P5P-G2
		3	2.5	0.75	1	294E-FD2P5Z-G2	294E-FD2P5P-G2
		5.5	3.6	1.5	2	294E-FD4P2Z-G2	294E-FD4P2P-G2

VFD (V/Hz) - DeviceNet Network Communication

IP66/UL Type 4/12 with conduit entrance and EMI filter, VFD (V/Hz)

Input Voltage	Output Voltage [V]	Input Current [A]	Output Current [A]	3-Phase kW Rating	3-Phase Hp Rating	External 24V DC Control Voltage	Internal 24V DC Control Voltage[2]
						Cat. No.	Cat. No.
380Y/220V…480Y/277V AC (+/- 10%), 3-phase, 50/60 Hz	0…460	1.8	1.5	0.37	0.5	294D-FD1P5Z-G1[1]	294D-FD1P5P-G1[1]
		3	2.5	0.75	1	294D-FD2P5Z-G1[1]	294D-FD2P5P-G1[1]
		5.5	3.6	1.5	2	294D-FD4P2Z-G1[1]	294D-FD4P2P-G1[1]

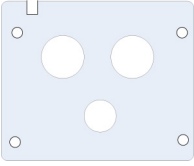(1)   If necessary, replace the G1 suffix code with G3 and refer to the User-Installed Options for kit selection.
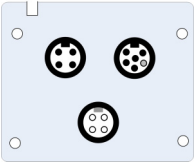
IP66/UL Type 4 with ArmorConnect and EMI filter, VFD (V/Hz)

Input Voltage	Output Voltage [V]	Input Current [A]	Output Current [A]	3-Phase kW Rating	3-Phase Hp Rating	External 24V DC Control Voltage	Internal 24V DC Control Voltage[2]
						Cat. No.	Cat. No.
380Y/220V…480Y/277V AC (+/- 10%), 3-phase, 50/60 Hz	0…460	1.8	1.5	0.37	0.5	294D-FD1P5Z-G2	294D-FD1P5P-G2
		3	2.5	0.75	1	294D-FD2P5Z-G2	294D-FD2P5P-G2
		5.5	3.6	1.5	2	294D-FD4P2Z-G2	294D-FD4P2P-G2

(2)   The internal power supply is only available when the incoming power is 400Y/230V…480Y/277V.

Options

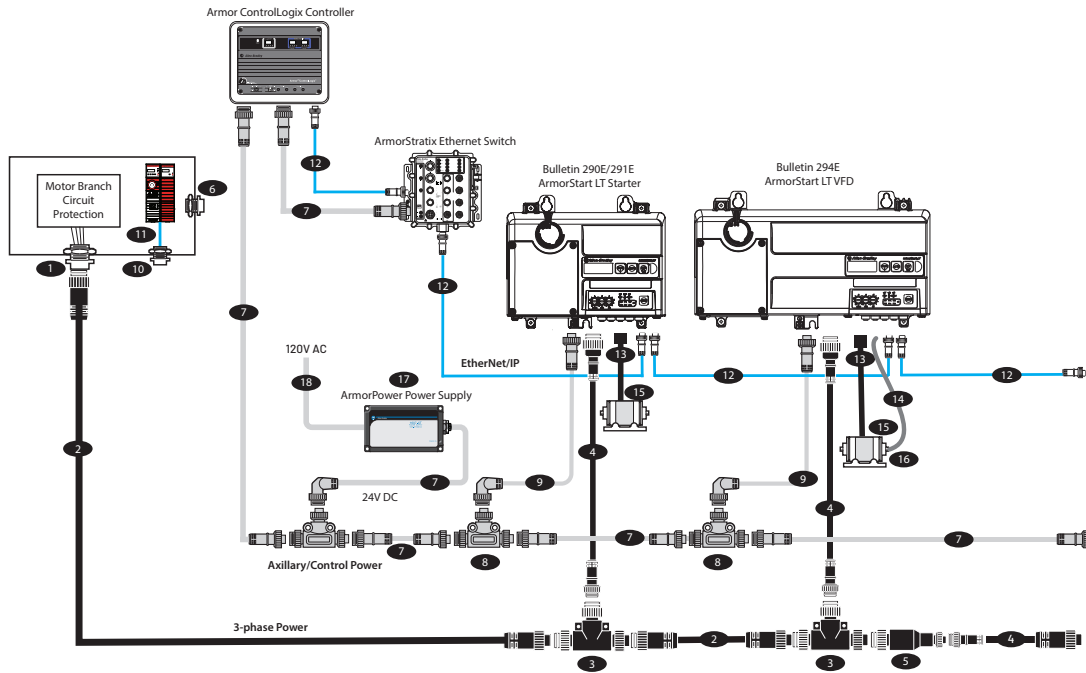|	Description	Cat. No. Modification
Factory-installed Options		
	Hand/Off/Auto Selector and Jog Keypad	-3
	Source brake (electromechanical)	-SB
	Conduit/Cord-Ready Gland Plate	-G1
	ArmorConnect Power Media Connectivity Gland Plate	-G2
User-installed Option		
	See User-installed Gland Plates table	-G3

User-installed Gland Plates

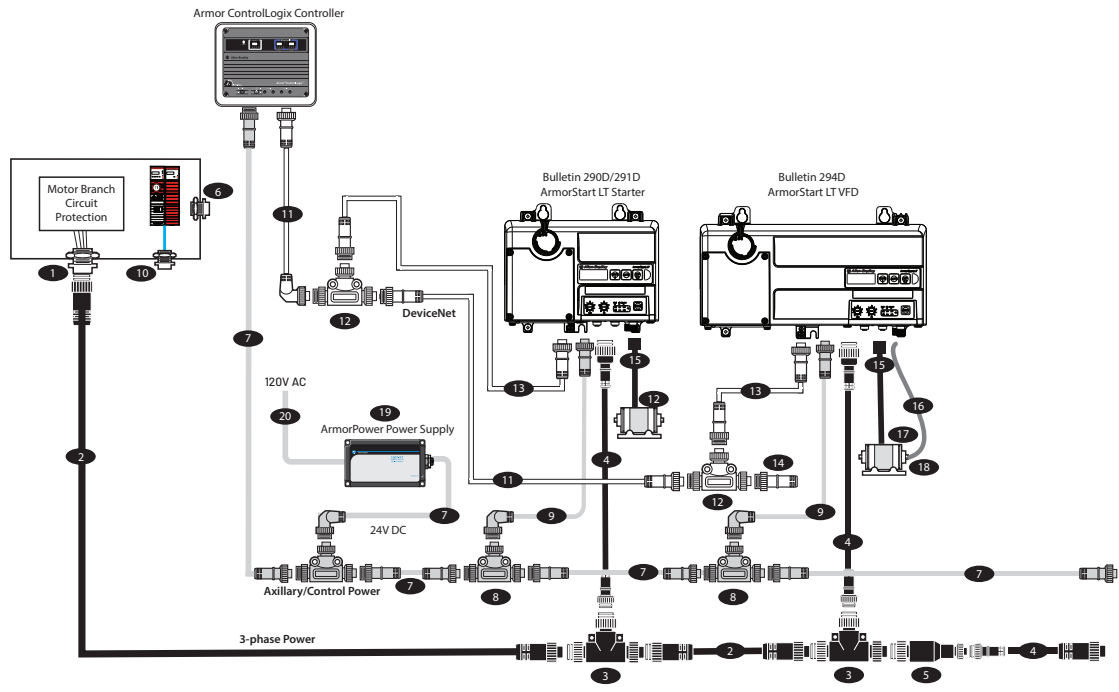|	Description	Pkg. Quantity	For Use With Bulletin	Cat. No.
Alternative Gland Plates for Daisy Chain Power	Use when punching custom gland.	5 each (screws included)	294	290-G3-A1
	Use when no IPS and no SB options are selected.			290-G3-A2
	Use when SB option is selected and no IPS option is selected.			290-G3-A3
	Use when IPS option is selected and no SB option is selected.			290-G3-A4
	Use when IPS and SB options are selected.			290-G3-A5

Accessories

ArmorStart LT with Ethernet Communication

	Description	Example Cat. Nos.	For cable configuration details and lengths:
1	Three-phase power receptacle	280-M35F-M*xx*[1]	See Three-phase Power Receptacles on page 68
2	Three-phase power trunk cable	280-PWRM35A-M*xx*[1]	See Three-phase Power Trunk and Drop Cables on page 67
3	Three-phase power t-port reducing drop	280-RT35	See Three-phase Power T-ports and Reducing Adapters on page 69
4	Three-phase power drop cable	284-PWRM22A-M*xx*[1]	See Three-phase Power Drop Cables on page 68
5	Three-phase power reducing adapter	280-RA35	See Three-phase Power T-ports and Reducing Adapters on page 69
6	Auxiliary/Control power receptacle	888N-D4AF1-*xx*[1]	See Auxiliary/Control Power Receptacles on page 71
7	Auxiliary/Control power trunk cable	889N-F4AFNM-*xx*[1]	See Auxiliary/Control Power Cordsets on page 70 or Auxiliary/Control Power Patchcords on page 70
8	Auxiliary/Control power t-port	898N-543ES-NKF	See Auxiliary/Control Power T-Ports on page 71
9	Auxiliary/Control power drop cable	889N-F65GFNM-*xx*[1]	See Auxiliary/Control Power Cordsets on page 70 or Auxiliary/Control Power Patchcords on page 70
10	Ethernet bulkhead adapter (RJ45-M12)	1585A-DD4JD	See Ethernet Media on page 73
11	Ethernet transition cable (RJ45 patchcord–M12 receptacle)	1585D-D4TBJM*xx*[1]	See Ethernet Media on page 73
12	Ethernet patchcord	1585D-M4TBDM-*xx*[1]	See Ethernet Media on page 73
13	Motor cable	280-PWRM22A-M*xx*[1] 280-PWRM24A-M*xx*[1]	See Motor Cables (M22) on page 44
14	Brake cable	285-BRC22-M*xx*[1]D	See Brake Cables (M22) on page 45
15	Motor receptacle	280-M22M-M1	See Motor and Panel Receptacles (M22) on page 44
16	Brake receptacle	285-M24M-M05	See Brake and Panel Receptacles (M22) on page 45
17	24V DC power supply	1607-XT50D1A	See ArmorPower On-Machine Power Supplies: https://ab.rockwellautomation.com/Power-Supplies/ArmorPower-On-Machine
18	120V AC line in cable, 3-pin	889N-F3AFC-F-*xx*[1]	See Auxiliary/Control Power Cordsets on page 70
not shown	I/O cables	889D-F4ACDM-*xx*[1]	See I/O Media on page 72

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

See ArmorConnect Power Media and ArmorStart Motor and Brake Media Selection Guide, publication 280PWR-SG001, for available options and technical specifications.

ArmorStart LT with DeviceNet Communication

	Description	Example Cat. Nos.	
1	Three-phase power receptacle	280-M35F-M*xx*[1]	See Three-phase Power Receptacles on page 68 or Control and Auxiliary Power Media on page 70
2	Three-phase power trunk cable	280-PWRM35A-M*xx*[1]	See Three-phase Power Trunk and Drop Cables on page 67
3	Three-phase power t-port reducing drop	280-RT35	See Three-phase Power T-ports and Reducing Adapters on page 69
4	Three-phase power drop cable	284-PWRM22A-M*xx*[1]	See Three-phase Power Drop Cables on page 68
5	Three-phase power reducing adapter	280-RA35	See Three-phase Power T-ports and Reducing Adapters on page 69
6	Auxiliary/Control power receptacle	888N-D4AF1-*xx*[1]	See Auxiliary/Control Power Receptacles on page 71
7	Auxiliary/Control power trunk cable	889N-F4AFNM-*xx*[1]	See Auxiliary/Control Power Cordsets on page 70 or Auxiliary/Control Power Patchcords on page 70
8	Auxiliary/Control power t-port	898N-543ES-NKF	See Auxiliary/Control Power T-Ports on page 71
9	Auxiliary/Control power drop cable	889N-F65GFNM-*xx*[1]	See Auxiliary/Control Power Cordsets on page 70 or Auxiliary/Control Power Patchcords on page 70
10	DeviceNet receptacle	1485F-P1N5-A	See DeviceNet Media on page 74
11	DeviceNet trunk cable	1485C-P*xx*[1]N5-M5	See DeviceNet Media on page 74
12	DeviceNet t-port	1485P-P1N5-MN5KF	See DeviceNet Media on page 74
13	DeviceNet drop cable	1485G-P*xx*[1]N5-M5	See DeviceNet Media on page 74
14	DeviceNet terminator	1485A-T1M5	See DeviceNet Media on page 74
15	Motor cable	280-PWRM22A-M*xx*[1] 280-PWRM24A-M*xx*[1]	See Motor Cables (M22) on page 44
16	Brake cable	285-BRC22-M*xx*[1]D	See Brake Cables (M22) on page 45
17	Motor receptacle	280-M22M-M1 280-M24M-M1	See Motor and Panel Receptacles (M22) on page 44
18	Brake receptacle	285-M24M-M05	See Brake and Panel Receptacles (M22) on page 45
19	24V DC power supply	1607-XT50D1A	See ArmorPower On-Machine Power Supplies: https://ab.rockwellautomation.com/Power-Supplies/ArmorPower-On-Machine
20	120V AC line in cable, 3-pin	889N-F3AFC-F-*xx*[1]	See Auxiliary/Control Power Cordsets on page 70
not shown	I/O cables	889D-F4ACDM-*xx*[1]	See I/O Media on page 72

(1) *xx* specifies the available cable lengths. xxx
      specifies the cable/connector configuration. Types can include: patchcord or cordset, male or female, straight or right-angle, shielded or unshielded.

See ArmorConnect Power Media and ArmorStart Motor and Brake Media Selection Guide, publication 280PWR-SG001, for available options and technical specifications.

Motor Cables (M22)

Cordsets with flying leads or patchcord cables are available in a variety of lengths and physical configurations.
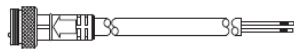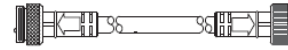
Cordsets

Patchcords

	No. of Pins	Wire Size	Assembly Rating	Environmental Rating	Cordsets	Patchcords
					Straight Male	Straight Male/Straight Female
Unshielded	4	16 AWG	600V, 10 A	IP67/UL 4/12	280-PWRM22G-M*xx*[2]	280-PWRM22A-M*xx*[2]
		14 AWG	600V, 15 A		280-PWRM24G-M*xx*[2]	280-PWRM24A-M*xx*[2]
Shielded[1]		16 AWG	600V, 10 A		284-PWRM22G-M*xx*[2]	284-PWRM22A-M*xx*[2]
		14 AWG	600V, 15 A		284-PWRM24G-M*xx*[2]	284-PWRM24A-M*xx*[2]

(1)	Required to meet CE compliance for radiated electromagnetic emissions. Cable length not to exceed 10 m.
(2)	xx specifies the cable length, see Sealing Cap table to complete the cat. no. (for example the cable length for Cat. No. 280-PWRM22G-M1 is 1 m).

Motor and Panel Receptacles (M22)

	No. of Pins	Wire Size	Assembly Rating	Environmental Rating	Cat. No.[1]
Straight male connector with 1 m cable and wire	4	16 AWG	600V, 10 A	IP66/UL 4	280-M22M-M1
		14 AWG	600V, 15 A		280-M24M-M1
Straight male connector with 1 m cable and wire, shielded		14 AWG	600V, 15 A		284-M24M-M1
Straight female panel connector with 1 m cable and wire		16 AWG	600V, 10 A		280-M22F-M1
		14 AWG	600V, 15 A		280-M24F-M1
Straight female panel connector with 1 m cable and wire, shielded		14 AWG	600V, 15 A		284-M24F-M1

(1)	User-installed receptacles are also available. See Three-phase Power Receptacles on page 68.

Brake Cables (M22)

	No. of Pins	Wire Size	Assembly Rating	Environmental Rating	Cordsets	Patchcords
					Straight Male	Straight Male/Straight Female
Unshielded	3	16 AWG	600V, 10 A	IP66/UL 4	285-BRC22-M*xx*[1]	285-BRC22-M*xx*[1]D

(1) xx specifies the cable length, see Sealing Cap table to complete the cat. no. (for example the cable length for Cat. No. 285-BRC22-M1 is 1 m).

Brake and Panel Receptacles (M22)

	No. of Pins	Wire Size	Assembly Rating	Environmental Rating	Cat. No.
Straight male connector with 0.5 m cable and wire	3	16 AWG	600V, 10 A	IP66/UL 4	285-M24M-M05
Straight female connector with 0.25 m cable and wire					285-M24F-M025

Cable Lengths

| Code	1	3	4	6	8	10	12	14	20
Length [m (ft)][1]	1 (3.3)	3 (9.8)	4 (13.1)	6 (19.7)	8 (26.2)	10 (32.8)	12 (39.4)	14 (45.9)	20 (65.6)

(1) Not all lengths are available for each cable type. See ArmorConnect Power Media and ArmorStart Motor and Brake Media Selection Guide, publication 280PWR-SG001, for details.

Sealing Cap

	Cat. No.
M22 sealing cap, when no brake cable is used	1485A-C1

Cord Grips

Recommended EMI/RFI Cord Grips[1]		
	The cable connector that is selected must provide good 360° contact and low transfer impedance from the shield or armor of the cable to the conduit entry plate at both the motor and the drive or drive cabinet for electrical bonding.	Recommendation: SKINTOP® MS-SC/MS-SCL cable grounding connectors or NPT/PG adapters from LAPPUSA

Cord grip for Motor, Power, and Control Recommended Thomas and Betts Cord Grips for G1 and G3 Glands.[2]

Description	Gland	Knockout Size	Cable Diameter Range [in²]	Thomas and Betts Part Nos.		
				Cord Grip	Sealing Ring	Lock Nut
Motor/Source Brake	G1	0.75 in.	0.500…0.750	2932NM	5263	142TB
Motor/Source Brake	G1	0.75 in.	0.660…0.780	2675	5263	142TB
Power	G1	1.0 in.	0.660…0.780	2676	5264	143
Power	G1	1.0 in.	0.770…0.895	2677	5264	143
Control Power, Motor/Source Brake	G3	M20	0.236…0.473	CC-IS020-G	[2]	GMN-M20
3-Phase Power	G3	M25	0.512…0.709	CC-IS025-G	[2]	GMN-M25

(1) This is **required** in order to contain radiated electromagnetic emissions and to be CE compliant.
(2) Contact Thomas and Betts for additional details or alternative solutions.

Notes:

ArmorStart Distributed Motor Controllers with EtherNet/IP Communications

Description

The ArmorStart distributed motor controller with EtherNet/IP communications pre-dates the ArmorStart ST controller.

Notable differences between the ArmorStart ST and ArmorStart with EtherNet/IP controller, include the following:

- ArmorStart ST motor connector is standard across starters and VFDs. Therefore, only the length of the cable matters.
- ArmorStart ST auxiliary/control power connector is standard across all On-Machine products. Therefore the same 4-pin Mini is applied.
- ArmorStart ST brake connector aligns with the ArmorStart LT solution for the same function.
- ArmorStart ST controller devices include standard product and functional safety versions.
- ArmorStart ST controller makes several options standard.
- ArmorStart ST controller is only available as a 100% quick connect solution.

The ArmorStart controller with EtherNet/IP is an integrated, pre-engineered, motor starter solution for On-Machine applications. The ArmorStart controller offers as standard, an IP67/UL Type 4/12/13 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 controller offers four inputs and two outputs to be used with sensors and actuators.

The ArmorStart controller with EtherNet/IP communication includes DeviceLogix, a high-performing local logic engine that is used when a fast I/O response is critical to the application.

The ArmorStart controller with EtherNet/IP is configurable by using Studio 5000 software. The ArmorStart EtherNet/IP version includes an embedded web server that allows access to status, diagnostics, and configuration from a standard web browser.

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.

UL Lists the ArmorStart controller and its mating cable assemblies for use ONLY with each other. Both are suitable for installation in motor groups in accordance with 7.2.10.4 of NFPA 79, Electrical Standard for Industrial Machinery. From the perspective of the ArmorStart product family, being Listed for group installation means one set of fuses or one circuit breaker can protect a branch circuit that has two or more of these motor controllers that are connected to it.

ArmorStart controllers with EtherNet/IP include:

- Native dual-port Ethernet switch and supports DLR over EtherNet/IP
- Four inputs and two outputs
- IP67/UL Type 4/12/13 enclosure rating
- Quick disconnect connections for I/O, communications, motor, three-phase, and control power[1]
- ArmorConnect power media is the only UL recommended solution
- Comprehensive local light-emitting diode status indication
- Local logic technology using DeviceLogix
- Factory-installed option:
  – Local Hand-Off-Auto (HOA) keypad for manual control
- Factory-installed option (VFD only):
  – EMI filter
  – Source brake contactor
  – Dynamic brake connector
  – IP67 Dynamic brake connector
  – Output contactor

Bulletin 280E/281E ArmorStart Distributed Motor Controller with EtherNet/IP Communications

The Bulletin 280E/281E ArmorStart controller with EtherNet/IP communications is used in applications that require across-the-line starting. The controllers have full inrush current and locked-rotor torque. Bulletin 280E controllers provide full-voltage and Bulletin 281E controllers provide full-voltage, reversing, motor control performance.

Fault diagnostics capabilities that are built into the Bulletin 280E/281E ArmorStart controller cover the following conditions:

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

(1) ArmorStart controllers with EtherNet/IP and ArmorStart ST controllers have different power connectivity when plug and play connections are chosen.

Catalog Number Explanation

Examples that are 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 | 12 | Z | – | 10 | C | – | CR | – | option 1 |
| a | b | | c | d | e | | f | g | | h | | i |

a	
Bulletin Number	
Code	**Description**
280	Full-voltage Starter
281	Reversing Starter

b	
Communication Type	
Code	**Description**
E	EtherNet/IP

c	
Enclosure Type	
Code	**Description**
F	IP67/UL Type 4/12/13

d	
Contactor Size	
Code	**Description**
12	12 A
23	23 A

e	
Control Voltage	
Code	**Description**
Z	24V DC

f	
Short-circuit Protection (Motor Circuit Protection)	
Code	**Description**
10	10 A rated device
25	25 A rated device

g	
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	
Control and 3-Phase Power Connections/Motor Cable Connection	
Code	**Description**
CR_	Conduit/Round Media; 3 m unshielded cordset, male 90°
CRW[1]	Conduit/Round Media; No cable
RR_	Round/Round Media (Male Receptacle); 3 m unshielded cordset, male 90°
RRW[1]	Round/Round Media (Male Receptacle); No cable

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

(1)   See Motor Cables on page 56 for extended motor cable lengths.

Product Selection

Full-voltage starters with conduit entrance, Up to 480V AC

Current Rating [A]	kW		Hp				Cat. No.
	230V AC, 50 Hz	400V AC, 50 Hz	200V AC, 60 Hz	230V AC, 60 Hz	460V AC, 60 Hz	575V AC, 60 Hz	
0.24…1.2	0.18	0.37	—	—	0.5	0.5	280E-F12Z-10A-CR
0.5…2.5	0.37	0.75	0.5	0.5	1	1.5	280E-F12Z-10B-CR
1.1…5.5	1.1	2.2	1	1	3	3	280E-F12Z-10C-CR
3.2…16	4	7.5	3	5	10	10	280E-F23Z-25D-CR

Full-voltage starters with ArmorConnect™ power media connections, Up to 480V AC

Current Rating [A]	kW		Hp				Cat. No.
	230V AC, 50 Hz	400V AC, 50 Hz	200V AC, 60 Hz	230V AC, 60 Hz	460V AC, 60 Hz	575V AC, 60 Hz	
0.24…1.2	0.18	0.37	—	—	0.5	0.5	280E-F12Z-10A-RR
0.5…2.5	0.37	0.75	0.5	0.5	1	1.5	280E-F12Z-10B-RR
1.1…5.5	1.1	2.2	1	1	3	3	280E-F12Z-10C-RR
3.2…16	4	7.5	3	5	10	10	280E-F23Z-25D-RR

Reversing starters with conduit entrance, Up to 480V AC

Current Rating [A]	kW		Hp				Cat. No.
	230V AC, 50 Hz	400V AC, 50 Hz	200V AC, 60 Hz	230V AC, 60 Hz	460V AC, 60 Hz	575V AC, 60 Hz	
0.24…1.2	0.18	0.37	—	—	0.5	0.5	281E-F12Z-10A-CR
0.5…2.5	0.37	0.75	0.5	0.5	1	1.5	281E-F12Z-10B-CR
1.1…5.5	1.1	2.2	1	1	3	3	281E-F12Z-10C-CR
3.2…16	4	7.5	3	5	10	10	281E-F23Z-25D-CR

Reversing starters with ArmorConnect power media connections, Up to 480V AC

Current Rating [A]	kW		Hp				Cat. No.
	230V AC, 50 Hz	400V AC, 50 Hz	200V AC, 60 Hz	230V AC, 60 Hz	460V AC, 60 Hz	575V AC, 60 Hz	
0.24…1.2	0.18	0.37	—	—	0.5	0.5	281E-F12Z-10A-RR
0.5…2.5	0.37	0.75	0.5	0.5	1	1.5	281E-F12Z-10B-RR
1.1…5.5	1.1	2.2	1	1	3	3	281E-F12Z-10C-RR
3.2…16	4	7.5	3	5	10	10	281E-F23Z-25D-RR

Factory-installed Options

	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

Bulletin 284E ArmorStart VFD Distributed Motor Controller with EtherNet/IP Communications

The Bulletin 284E ArmorStart controller with EtherNet/IP communications is used in applications that require VFD sensorless vector motor control.

Local Disconnect

IP Address Notation Area

2 Outputs (Micro/M12)

4 Inputs (Micro/M12)

IP Address Switches

Ethernet Ports (DLR)

LED Status
Indication and Reset

Control Module

Hand-Off-Auto Keypad

Source Brake Connection

Motor Connection

Fault diagnostics capabilities that are built into the Bulletin 284E ArmorStart controller cover the following conditions:

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

Catalog Number Explanation

Examples that are 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	IP67/UL Type 4/12/13

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 Rating)	
Code	**Description**
10	10 A
25	25 A

h	
Control/3-Phase Power Connections; Motor Cable Connection	
Code	**Description**
CR	Conduit/Round Media; 3 m unshielded cordset, male 90°
CRN	Conduit/Round Media; 3 m shielded cordset, male 90°
CRW[1]	Conduit/Round Media; No cable
RR	Round/Round Media (Male Receptacle); 3 m unshielded cordset, male 90°
RRN	Round/Round Media (Male Receptacle); 3 m shielded cordset, male 90°
RRW[1]	Round/Round Media (Male Receptacle); No cable

(1)   See Motor Cables on page 56 for extended motor cable lengths.

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

j	
Option 2	
Code	**Description**
DB	DB Brake Connector
DB1	Connectivity to IP67 DB Resistor
SB	Source Brake Contactor
SBW[1]	No cable

k	
Option 3	
Code	**Description**
EMI	EMI Filter
OC	Output Contactor

(1)   See Motor Cables on page 56 for extended motor cable lengths.
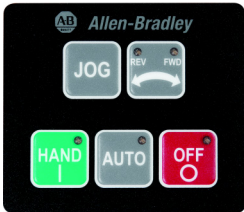
Product Selection

Conduit entrance, Sensorless Vector Control, and Volts per Hertz torque performance, Up to 480V AC

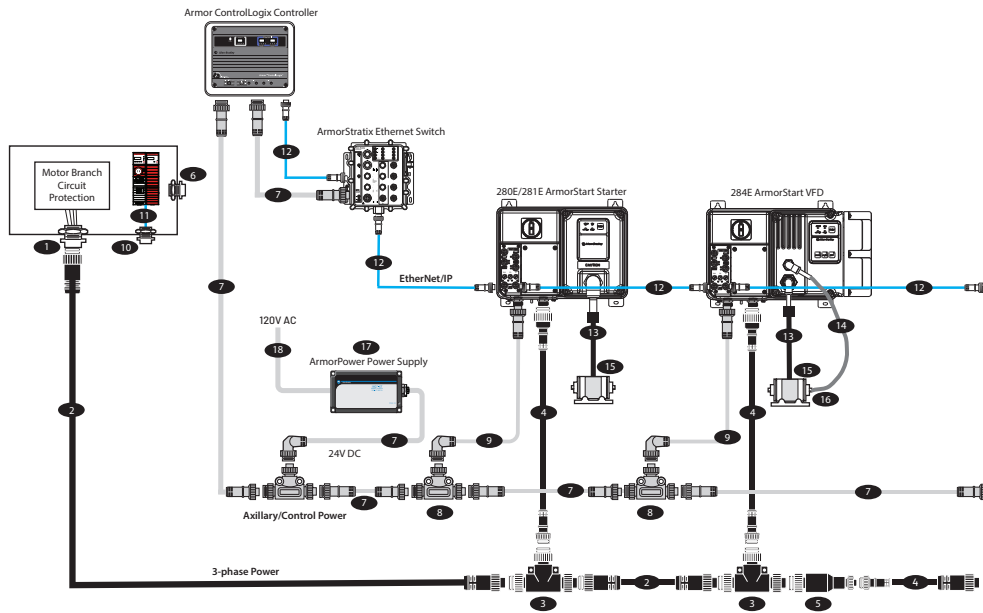| Input Voltage	3-Phase kW Rating	3-Phase Hp Rating	Output Current	24V DC Control Voltage
				Cat. No.
380...480V, 50/60 Hz 3-Phase	0.4	0.5	1.4	284E-FVD1P4Z-10-CR
	0.75	1	2.3	284E-FVD2P3Z-10-CR
	1.5	2	4	284E-FVD4P0Z-10-CR
	2.2	3	6	284E-FVD6P0Z-25-CR
	3.3	5	7.6	284E-FVD7P6Z-25-CR

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
	3.3	5	7.6	284E-FVD7P6Z-25-RR

Factory-installed Options

	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

Accessories

	Description	Example Cat. Nos.	For cable configuration details and lengths:
1	Three-phase power receptacle	280-M35F-M1	See Three-phase Power Receptacles on page 68
2	Three-phase power trunk cable	280-PWRM35A-Mxx[1]	See Three-phase Power Trunk and Drop Cables on page 67
3	Three-phase power t-port or Three-phase power t-port reducing drop	280-T35 (units with 25 A bases) 280-RT35 (units with 10 A bases)	See Three-phase Power T-ports and Reducing Adapters on page 69
4	Three-phase power drop cable	280-PWRM35A-Mxx[1] (starters with 25 A base) 280-PWRM22A-Mxx[1] (VFDs with 10/25 A base)	See Three-phase Power Drop Cables on page 68
5	Three-phase power reducing adapter	280-RA35 (units with 10 A bases)	See Three-phase Power T-ports and Reducing Adapters on page 69
6	Auxiliary/Control power receptacle	888N-D4AF1-xx[1]	See Auxiliary/Control Power Receptacles on page 71
7	Auxiliary/Control power trunk cable	889N-F4AFNM-xx[1]	See Auxiliary/Control Power Cordsets on page 70 or Auxiliary/Control Power Patchcords on page 70
8	Auxiliary/Control power t-port	898N-543ES-NKF	See Auxiliary/Control Power T-Ports on page 71
9	Auxiliary/Control power drop cable	889N-F65GFNM-xx[1]	See Auxiliary/Control Power Cordsets on page 70 or Auxiliary/Control Power Patchcords on page 70
not shown	Auxiliary/Control power shorting plug	898N-41AU-NM4	See Auxiliary/Control Power Shorting Plugs on page 71
10	Ethernet bulkhead adapter (RJ45-M12)	1585A-DD4JD	See Ethernet Media on page 73
11	Ethernet transition cable (RJ45 patchcord-M12 receptacle)	1585D-D4TBJMxx[1]	See Ethernet Media on page 73
12	Ethernet patchcord	1585D-M4TBDM-xx[1]	See Ethernet Media on page 73
13	Motor cable	280-MTR35-Mxx[1]D (starters with 25 A base) 280-MTR22-Mxx[1]D (VFDs with 10/25 A base)	See Motor Cables on page 56
14	Brake cable	285-BRC25-Mxx[1]D	See Brake Cables on page 56
15	Motor receptacle	280-M35M-M1 (starters with 25 A base) 280-M22M-M1 (VFDs with 10/25 A base)	See Motor and Panel Receptacles on page 56
16	Brake receptacle	285-M25M-M05	See EM Brake Receptacle on page 56
17	24V DC power supply	1607-XT50D1A	See ArmorPower On-Machine Power Supplies: https://ab.rockwellautomation.com/Power-Supplies/ArmorPower-On-Machine
18	120V AC line in cable, 3-pin	889N-F3AFC-F-xx[1]	See Auxiliary/Control Power Cordsets on page 70
not shown	I/O cables	889D-F4ACDM-xx[1]	See I/O Media on page 72

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

See ArmorConnect Power Media and ArmorStart Motor and Brake Media Selection Guide, publication 280PWR-SG001, for available options and technical specifications.

Motor Cables

Cordsets with flying leads or patchcord cables are available in various lengths and physical configurations.

					Cordsets		Patchcords
	No. of Pins	Wire Size	Assembly Rating	Environmental Rating	Right Angle	High-flex, Right Angle	Right-angle Male/ Straight Female
Shielded (M22)	4	16 AWG	600V, 10 A	IP67/UL 4/12	284-MTRS22-Mxx[2]	—	284-MTRS22-Mxx[2]D
Unshielded (M22)		16 AWG	600V, 10 A		280-MTR22-Mxx[2]	280-MTRF22-Mxx[2]	280-MTR22-Mxx[2]D
Unshielded (M35)		10 AWG[1]	600V, 32 A		280-MTR35-Mxx[2]	—	280-MTR35-Mxx[2]D

(1) M35 cables are suitable for units with 25 A bases (10 Hp, non-VFD controllers).

(2) xx specifies the cable length, see Cable Lengths table to complete the cat. no. (for example, the cable length for Cat. No. 284-MTRS22-M1 is 1 m).

Motor and Panel Receptacles

	No. of Pins	Assembly Rating	Environmental Rating	1 ft Cable Length [1]
Straight male connector with 1 m cable and wire (M22)	4	600V, 10 A	IP67/UL 4/12	280-M22M-M1
Straight male connector with 1 m cable and wire (M35)		600V, 32 A		280-M35M-M1
Straight female panel connector with 1 m cable and wire (M22)		600V, 10 A		280-M22F-M1
Straight female panel connector with 1 m cable and wire (M35)		600V, 32 A		280-M35F-M1

(1) User-installed receptacles are also available. See Three-phase Power Receptacles on page 68.

Brake Cables

	No. of Pins	Wire Size	Assembly Rating	Environmental Rating	Cordsets Right-angle Male	Cordsets High-flex, Right-angle Male	Patchcords Right-angle Male/Straight Female
Unshielded	3	16 AWG	600V, 10 A	IP67/UL 4/12	285-BRC25-Mxx[1]	285-BRCF25-Mxx[1]	285-BRC25-Mxx[1]D

(1) xx specifies the cable length, see Cable Lengths table to complete the cat. no. (for example, the cable length for Cat. No. 285-BRC25-M6 is 6 m).

EM Brake Receptacle

	No. of Pins	Assembly Rating	Environmental Rating	Cat. No.
Straight male connector with 0.5 ft wire	3	600V, 10 A	IP67/UL 4/12	285-M25M-M05

Cable Lengths

Code	1	3	4	6	8	10	12	14	20
Length [m (ft)][1]	1 (3.3)	3 (9.8)	4 (13.1)	6 (19.7)	8 (26.2)	10 (32.8)	12 (39.4)	14 (45.9)	20 (65.6)

(1) Not all lengths are available for each cable type. See ArmorConnect Power Media and ArmorStart Motor and Brake Media Selection Guide, publication 280PWR-SG001, for details.

Sealing Cap

	Cat. No.
M25 sealing cap, when no brake cable is used	280-BRCAP-M25

ArmorStart Distributed Motor Controllers with DeviceNet Communications

Description

The ArmorStart distributed motor controller with DeviceNet communications is an integrated, pre-engineered, motor starter solution for On-Machine applications. The ArmorStart controller offers as standard, an 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 controller offers four inputs and two outputs to be used with sensors and actuators.

The ArmorStart controller with DeviceNet communication includes DeviceLogix, a high-performing local logic engine that is used when a fast I/O response is critical to the application.

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.

UL Lists the ArmorStart controller and its mating cable assemblies for use ONLY with each other. Both are suitable for installation in motor groups in accordance with 7.2.10.4 of NFPA 79, Electrical Standard for Industrial Machinery. From the perspective of the ArmorStart product family, being Listed for group installation means one set of fuses or one circuit breaker can protect a branch circuit that has two or more of these motor controllers that are connected to it.

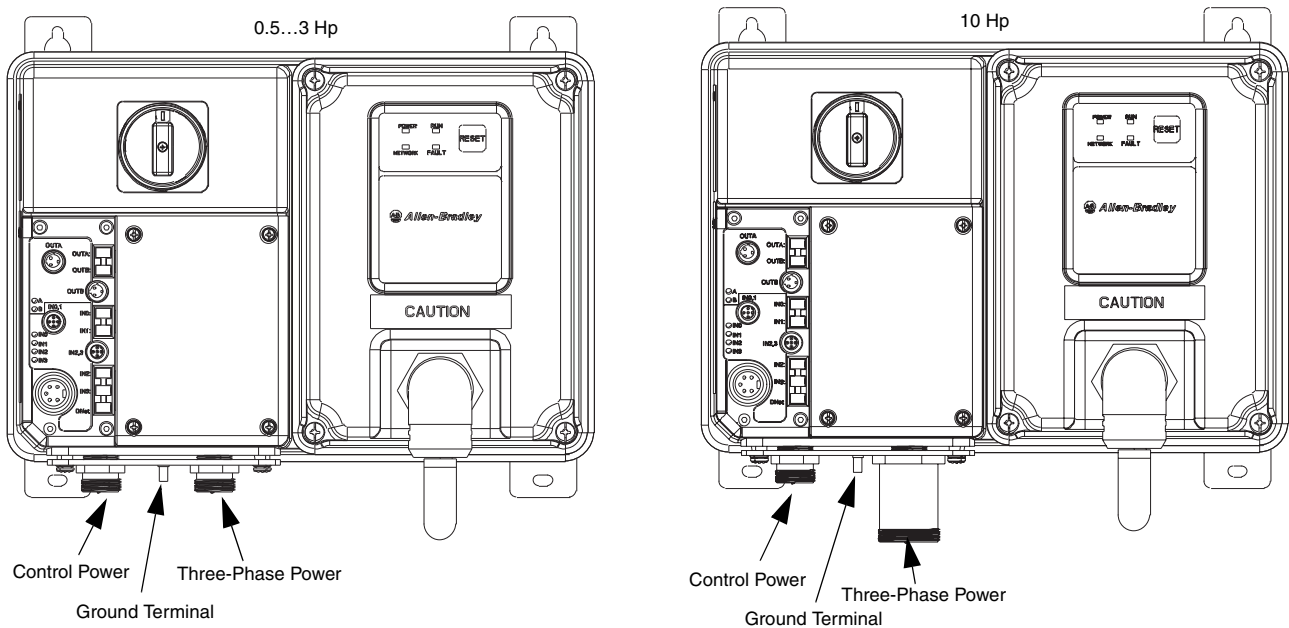ArmorStart controllers with DeviceNet include:
- DeviceNet communications
- Four inputs and two outputs
- IP67/Type 4 enclosure rating
- Quick disconnect connections for I/O, communications, motor, three-phase, and control power
- ArmorConnect power media is the only UL recommended solution
- Gland plate entry: conduit entrance or ArmorConnect power media
- Comprehensive local light-emitting diode status indication
- Local logic technology using DeviceLogix
- Peer-to-peer communication (ZIP)
- Factory-installed options:
  - Local Hand-Off-Auto (HOA) keypad for manual control
  - Safety monitor
- Factory-installed options (VFD only):
  - EMI filter
  - Source or control brake contactor
  - Dynamic brake connector
  - IP67 Dynamic brake connector
  - Output contactor

Bulletin 280D/281D ArmorStart Distributed Motor Controller with DeviceNet Communications

The Bulletin 280D/281D ArmorStart controller is used in applications that require across-the-line starting. The controllers have full inrush current and locked-rotor torque. Bulletin 280D controllers provide full-voltage and Bulletin 281D controllers provide full-voltage, reversing, motor control performance.
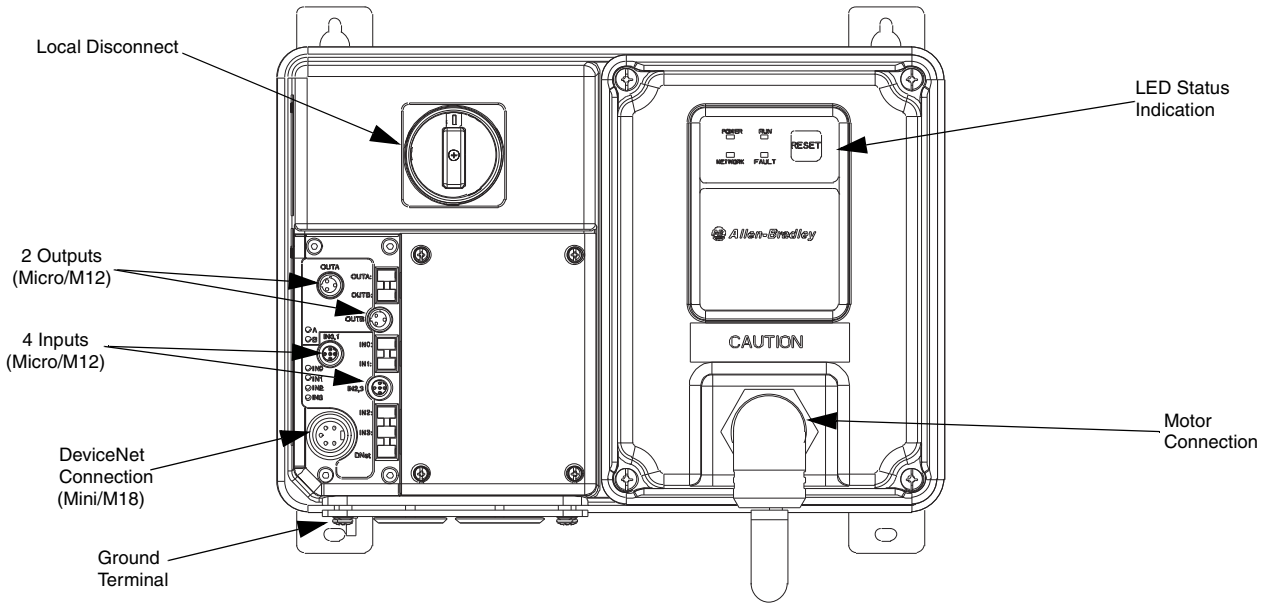
Bulletin 280D/281D ArmorStart Controller shown with ArmorConnect Connectivity

Fault diagnostics capabilities that are built into the Bulletin 280D/281D ArmorStart controller cover the following conditions:

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

Catalog Number Explanation

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

280	D	–	F	12	Z	–	10	C	–	CR	–	option 1	–	option 2
a	b		c	d	e		f	g		h		i		j

a	
Bulletin Number	
Code	**Description**
280	Full-voltage Starter
281	Reversing Starter

b	
Communication Type	
Code	**Description**
D	DeviceNet

c	
Enclosure Type	
Code	**Description**
F	IP67/NEMA Type 4

d	
Contactor Size	
Code	**Description**
12	12 A
23	23 A

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

f	
Short-circuit Protection (Motor Circuit Protection)	
Code	**Description**
10	10 A rated device
25	25 A rated device

g	
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	
Control and 3-Phase Power Connections/Motor Cable Connection	
Code	**Description**
CR	Conduit/Round Media; 3 m unshielded cordset, male 90°
CRW[2]	Conduit/Round Media; No motor cable
RR	Round/Round Media (Male Receptacle); 3 m unshielded cordset, male 90°
RRW[2]	Round/Round Media (Male Receptacle); No motor cable

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

j	
Option 2	
Code	**Description**
SM[1]	Safety Monitor

(1)   Not available with round media (RR) selection.
(2)   See Motor Cables on page 65 for extended motor cable lengths.

Product Selection

Full-voltage Starters with Conduit Entrance and DeviceNet Communications, up to 575V AC

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

Full-voltage Starters with Quick Disconnects for ArmorConnect Power Media and DeviceNet Communications, Up to 575V AC

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

### Reversing Starters with Conduit Entrance and DeviceNet Communications, Up to 575V AC

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

Reversing Starters with Quick Disconnects for ArmorConnect Power Media and DeviceNet Communications, Up to 575V AC

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

Bulletin 284D ArmorStart Distributed Motor Controller with DeviceNet Communications

The Bulletin 284D ArmorStart controller is used in applications that require VFD sensorless vector motor control.
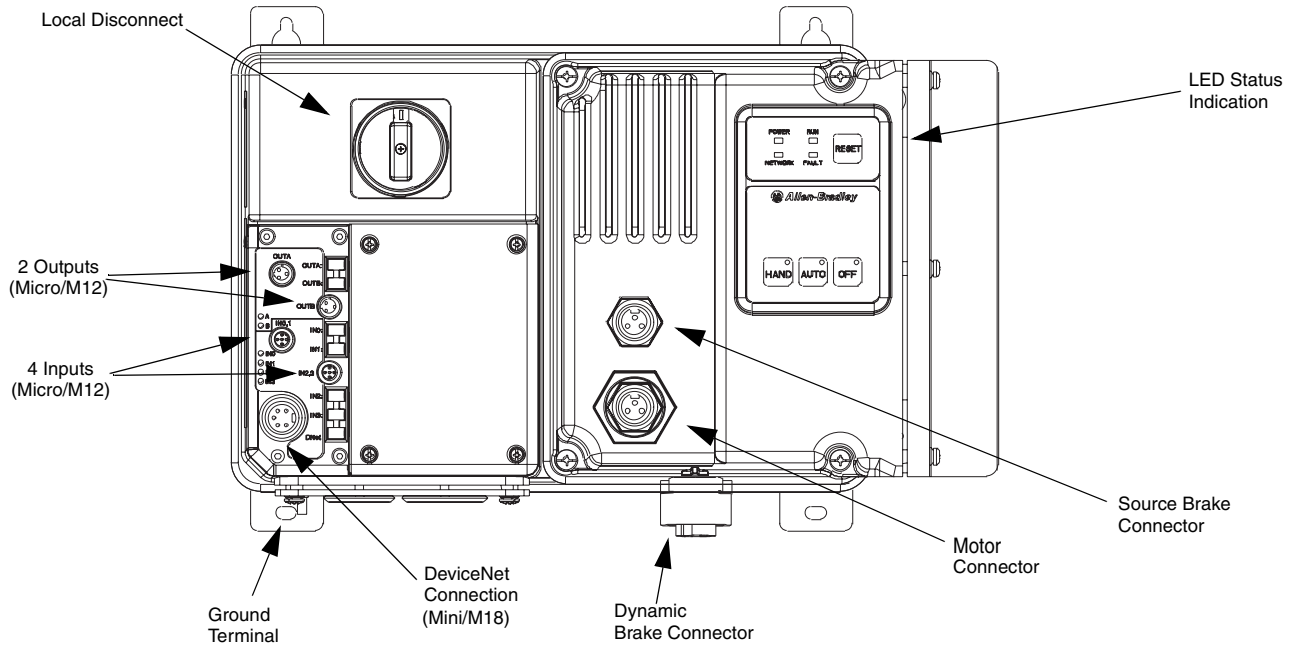
Bulletin 284D ArmorStart Controller shown with ArmorConnect Connectivity
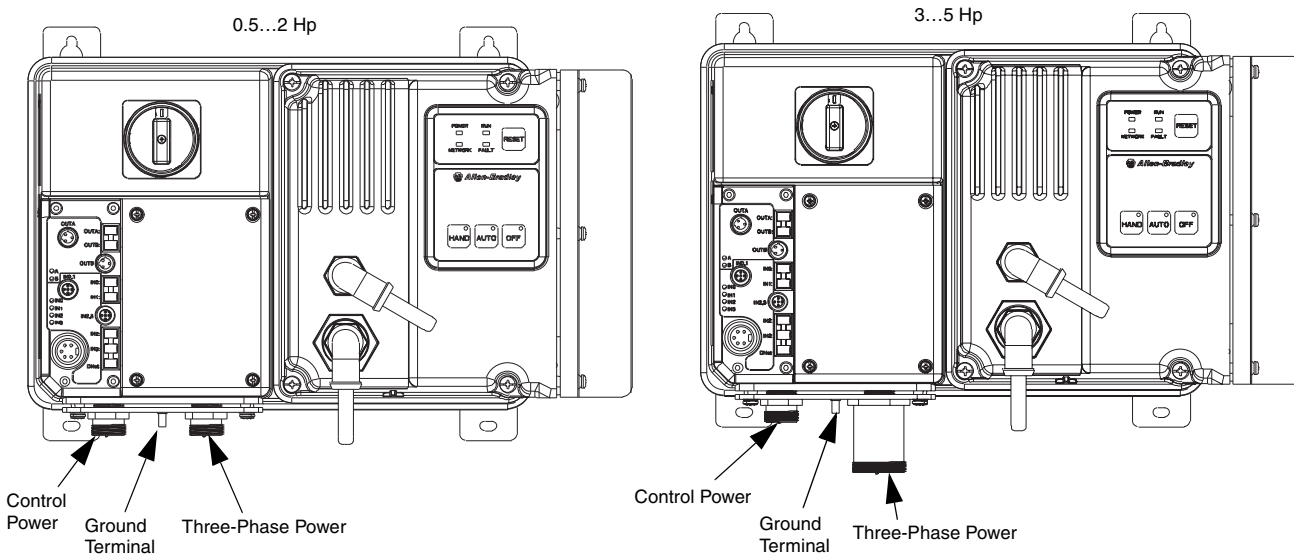
Fault diagnostics capabilities that are built into the Bulletin 284D ArmorStart controller cover the following conditions:

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

Catalog Number Explanation

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

284	D	–	F	V	D2P3	–	D	–	10	–	CR	–	option 1	–	option 2
a	b		c	d	e		f		g		h		i		j

a	
Bulletin Number	
Code	**Description**
284	VFD Starter

b	
Communications	
Code	**Description**
D	DeviceNet™

c	
Enclosure Type	
Code	**Description**
F	IP67/ NEMA Type 4

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
D	120V AC
B	240V AC

g	
Short-circuit Protection (Motor Circuit Protection)	
Code	**Description**
10	10 A rated
25	25 A rated

h	
Control/3-Phase Power Connections; Motor Cable Connection	
Code	**Description**
CR	Conduit/Round Media; 3 m unshielded cordset, male 90°
CRN	Conduit/Round Media; 3 m shielded cordset, male 90°
CRW[3]	Conduit/Round Media; No motor cable
RR	Round/Round Media (Male Receptacle); 3 m unshielded cordset, male 90°
RRN	Round/Round Media (Male Receptacle); 3 m shielded cordset, male 90°
RRW[3]	Round/Round Media (Male Receptacle); No motor cable

i	
Option 1	
Code	**Description**
3	Hand/Off/Auto Selector Keypad with jog function

j	
Option 2	
Code	**Description**
CB	Control Brake Contactor
CBW[3]	No cable
DB	DB Brake Connector
DB1	Connectivity to IP67 DB Resistor
DBW	No cable
SB	Source Brake Contactor
SBW[3]	No cable

k	
Option 3	
Code	**Description**
OC[1]	Output Contactor
SM[2]	Safety Monitor

(1) Output contactor is included with the safety monitor option.
(2) Not available with round media selection (RR).
(3) See for extended motor cable lengths.
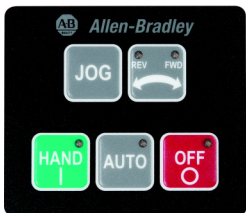
Product Selection

Conduit Entrance, Sensorless Vector Control, and Volts per Hertz torque performance, Up to 575V AC

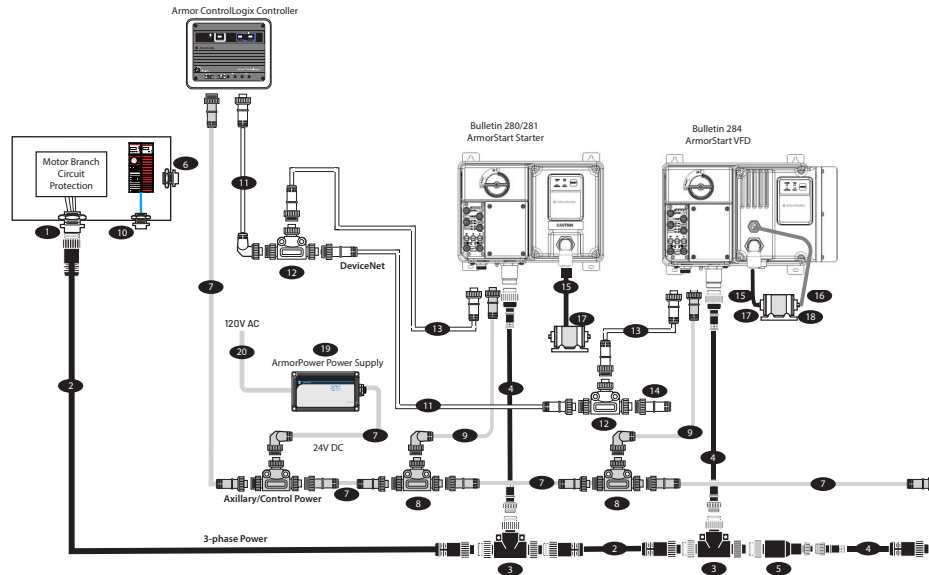| Input Voltage	3-Phase kW Rating	3-Phase Hp Rating	Output Current [A]	24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
				Cat. No.	Cat. No.	Cat. No.
380...480V, 50/60 Hz 3-Phase	0.4	0.5	1.4	284D-FVD1P4Z-10-CR	284D-FVD1P4D-10-CR	284D-FVD1P4B-10-CR
	0.75	1	2.3	284D-FVD2P3Z-10-CR	284D-FVD2P3D-10-CR	284D-FVD2P3B-10-CR
	1.5	2	4	284D-FVD4P0Z-10-CR	284D-FVD4P0D-10-CR	284D-FVD4P0B-10-CR
	2.2	3	6	284D-FVD6P0Z-25-CR	284D-FVD6P0D-25-CR	284D-FVD6P0B-25-CR
	3	5	7.6	284D-FVD7P6Z-25-CR	284D-FVD7P6D-25-CR	284D-FVD7P6B-25-CR

Quick Disconnects for ArmorConnect Power Media, Sensorless Vector Control, and Volts per Hertz Torque Performance, Up to 575V AC

Input Voltage	3-Phase kW Rating	3-Phase Hp Rating	Output Current [A]	24V DC Control Voltage	120V AC Control Voltage	240V AC Control Voltage
				Cat. No.	Cat. No.	Cat. No.
380...480V, 50/60 Hz 3-Phase	0.4	0.5	1.4	284D-FVD1P4Z-10-RR	284D-FVD1P4D-10-RR	284D-FVD1P4B-10-RR
	0.75	1	2.3	284D-FVD2P3Z-10-RR	284D-FVD2P3D-10-RR	284D-FVD2P3B-10-RR
	1.5	2	4	284D-FVD4P0Z-10-RR	284D-FVD4P0D-10-RR	284D-FVD4P0B-10-RR
	2.2	3	6	284D-FVD6P0Z-25-RR	284D-FVD6P0D-25-RR	284D-FVD6P0B-25-RR
	3	5	7.6	284D-FVD7P6Z-25-RR	284D-FVD7P6D-25-RR	284D-FVD7P6B-25-RR

Factory-installed Options

	Description	Cat. No. Modification
	Hand/Off/Auto Selector and Jog Keypad	-3
	Safety Monitor	-SM
	EMI Filter	-EMI
	Output Contactor	-OC
	Shielded motor cable	-CRN
	Supplied ArmorStart without motor cable	-CRW
	Supplied with control brake cable	-CB
	Supplied without control brake cable	-CBW
	Supplied with source brake cable	-SB
	Supplied without source brake cable	-SBW
	Dynamic Brake Connector (IP20 brake)	-DB
	Dynamic Brake Resistor (IP67 brake)	-DB1
	ArmorConnect Power Media Connectivity, ArmorStart supplied with shielded motor cable Short-circuit protection rating: 10 A, 25 A	-RRN
	ArmorConnect Power Media Connectivity, ArmorStart supplied without motor cable Short-circuit protection rating: 10 A, 25 A	-RRW

Accessories

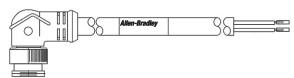|	Description	Example Cat. Nos.	For cable configuration details and lengths:
1	Three-phase power receptacle	280-M35F-M1	See Three-phase Power Receptacles on page 68
2	Three-phase power trunk cable	280-PWRM35A-M*xx*[1]	See Three-phase Power Trunk and Drop Cables on page 67
3	Three-phase power t-port or Three-phase power t-port reducing drop	280-T35 (units with 25 A bases) 280-RT35 (units with 10 A bases)	See Three-phase Power T-ports and Reducing Adapters on page 69
4	Three-phase power drop cable	280-PWRM35A-M*xx*[1] (starters with 25 A base) 280-PWRM22A-M*xx*[1] (VFDs with 10/25 A base)	See Three-phase Power Drop Cables on page 68
5	Three-phase power reducing adapter	280-RA35 (units with 10 A bases)	See Three-phase Power T-ports and Reducing Adapters on page 69
6	Auxiliary/Control power receptacle	888N-D4AF1-*xx*[1]	See Auxiliary/Control Power Receptacles on page 71
7	Auxiliary/Control power trunk cable	889N-F4AFNM-*xx*[1]	See Auxiliary/Control Power Cordsets on page 70 or Auxiliary/Control Power Patchcords on page 70
8	Auxiliary/Control power t-port	898N-543ES-NKF	See Auxiliary/Control Power T-Ports on page 71
9	Auxiliary/Control power drop cable	889N-F65GFNM-*xx*[1]	See Auxiliary/Control Power Cordsets on page 70 or Auxiliary/Control Power Patchcords on page 70
not shown	Auxiliary/Control power shorting plug	898N-41AU-NM4	See Auxiliary/Control Power Shorting Plugs on page 71
10	DeviceNet receptacle	1485F-P*xx*[1]N5-A	See DeviceNet Media on page 74
11	DeviceNet trunk cable	1485C-P*xx*[1]N5-M5	See DeviceNet Media on page 74
12	DeviceNet t-port	1485P-P1N5-MN5KF	See DeviceNet Media on page 74
13	DeviceNet drop cable	1485G-P*xx*[1]N5-M5	See DeviceNet Media on page 74
14	DeviceNet terminator	1485A-T1M5	See DeviceNet Media on page 74
15	Motor cable	280-MTR35-M*xx*[1]D (starters with 25 A base) 280-MTR22-M*xx*[1]D (VFDs with 10/25 A base)	See Motor Cables on page 65
16	Brake cable	285-BRC25-M*xx*[1]D	See Brake Cables on page 65
17	Motor receptacle	280-M35M-M1 (starters with 25 A base) 280-M22M-M1 (VFDs with 10/25 A base)	See Cable Lengths on page 65
18	Brake receptacle	285-M25M-M05	See EM Brake Receptacle on page 65
19	24V DC power supply	1607-XT50D1A	See ArmorPower On-Machine Power Supplies: https://ab.rockwellautomation.com/Power-Supplies/ArmorPower-On-Machine
20	120V AC line in cable, 3-pin	889N-F3AFC-F-*xx*[1]	See Auxiliary/Control Power Cordsets on page 70

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

See ArmorConnect Power Media and ArmorStart Motor and Brake Media Selection Guide, publication 280PWR-SG001, for available options and technical specifications.

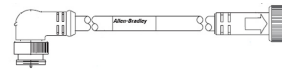## Motor Cables

Cordsets with flying leads or patchcord cables are available in various lengths and physical configurations.

Cordsets

Patchcords

	No. of Pins	Wire Size	Assembly Rating	Environmental Rating	Cordsets		Patchcords
					Right Angle	High-flex, Right Angle	Right-angle Male/ Straight Female
Shielded (M22)	4	16 AWG	600V, 10 A	IP67/UL 4/12	284-MTRS22-M*xx*[2]	—	284-MTRS22-M*xx*[2]D
Unshielded (M22)		16 AWG	600V, 10 A		280-MTR22-M*xx*[2]	280-MTRF22-M*xx*[2]	280-MTR22-M*xx*[2]D
Unshielded (M35)		10 AWG[1]	600V, 32 A		280-MTR35-M*xx*[2]	—	280-MTR35-M*xx*[2]D

(1)   M35 cables are suitable for units with 25 A bases (10 Hp, non-VFD controllers only).

(2)   xx specifies the cable length, see Cable Lengths table to complete the cat. no. (for example the cable length for Cat. No. 284-MTRS22-M1 is 1 m).

Motor and Panel Receptacles

	No. of Pins	Assembly Rating	Environmental Rating	Cat. No.[1]
Straight male connector with 0.5 m cable and wire (M22)	4	600V, 10 A	IP67/UL 4/12	280-M22M-M05
Straight male connector with 0.5 m cable and wire (M35)		600V, 32 A		280-M35M-M05
Straight female panel connector with 0.5 m cable and wire (M22)	4	600V, 10 A	IP67/UL 4/12	280-M22F-M05
Straight female panel connector with 0.5 m cable and wire (M35)		600V, 32 A		280-M35F-M05

(1)   User-installed receptacles are also available. See Three-phase Power Receptacles on page 68.

Brake Cables

	No. of Pins	Wire Size	Assembly Rating	Environmental Rating	Cordsets	Cordsets	Patchcords
					Right-angle Male	High-flex, Right-angle Male	Right-angle Male/Straight Female
Unshielded	3	16 AWG	600V, 10 A	IP67/UL 4/12	285-BRC25-M*xx*[1]	285-BRCF25-M*xx*[1]	285-BRC25-M*xx*[1]D

(1)   xx specifies the cable length, see Cable Lengths table to complete the cat. no. (for example the cable length for Cat. No. 285-BRC25-M6 is 6 m).

EM Brake Receptacle

	No. of Pins	Assembly Rating	Environmental Rating	Cat. No.
Straight male connector with 0.5 ft wire	3	600V, 10 A	IP67/UL 4/12	285-M25M-M05

Cable Lengths

Code	1	3	4	6	8	10	12	14	20
Length [m (ft)][1]	1 (3.3)	3 (9.8)	4 (13.1)	6 (19.7)	8 (26.2)	10 (32.8)	12 (39.4)	14 (45.9)	20 (65.6)

(1)   Not all lengths are available for each cable type. See ArmorConnect Power Media and ArmorStart Motor and Brake Media Selection Guide, publication 280PWR-SG001, for details.

Sealing Cap

	Cat. No.
M25 sealing cap, when no brake cable is used	280-BRCAP-M25

Cord Grips

Cord Grips for use with CR/CRW Gland

	Thomas & Betts Cord Grip 0.75 in. Strain Relief Cord Connector, 0.75 in. Lock Nut Cable Range: 0.31…0.56 in.	Thomas & Betts Part No. 2931NM
	Thomas & Betts Cord Grip 1 in. Strain Relief Cord Connector, 1 in. Lock Nut Cable Range: 0.31…0.56 in.	Thomas & Betts Part No. 2940NM

Power and Motor Control Media

In addition to the products listed in the following tables, other options exist for extending your system. See ArmorConnect Power Media and ArmorStart Motor and Brake Media Selection Guide, publication 280PWR-SG001, for available options and technical specifications.

Three-phase Power Input Media

Cordsets with flying leads or patchcord cables are available in various lengths and physical configurations.

Cordsets

Patchcords

Three-phase Power Trunk and Drop Cables
Also used as drop cables for ArmorStart ST and ArmorStart controllers with 25 A bases (10 Hp, non-VFD controllers).

Cordsets

No. of Pins	Wire Size	Assembly Rating	Environmental Rating	Cat. No.[1]			
				Straight Female	Right-Angle Female	Straight Male	Right-Angle Male
4	10 AWG	600V, 32 A	IP67/UL 4/12	280-PWRM35E-M*xx*[2]	280-PWRM35F-M*xx*[2]	280-PWRM35G-M*xx*[2]	280-PWRM35H-M*xx*[2]

Patchcords

No. of Pins	Wire Size	Assembly Rating	Environmental Rating	Cat. No.[1]			
				Straight Female/ Straight Male	Right-angle Female/ Straight Male	Straight Female/ Right-angle Male	Right-angle Female/ Right-Angle Male
4	10 AWG	600V, 32 A	IP67/UL 4/12	280-PWRM35A-M*xx*[2]	280-PWRM35B-M*xx*[2]	280-PWRM35C-M*xx*[2]	280-PWRM35D-M*xx*[2]

(1) Stainless steel version with IP69K/UL4X rating may be ordered by adding **S** to the cat. no. (Example: Cat. No. 280**S**–PWRM35A-M*).

(2) *xx* specifies the cable length, see Trunk and Drop Cable Lengths table to complete the cat. no. (for example the cable length for Cat. No. 280-**PWRM35A**-M1 is 1 m).

Trunk and Drop Cable Lengths

Code	05	1	015	2	025	3	4	6	8	10	12	14	15	20	25	30	35
Length [m (ft)]	0.5 (1.6)	1 (3.3)	1.5 (4.9)	2 (6.6)	2.5 (8.1)	3 (9.8)	4 (13.1)	6 (19.7)	8 (26.2)	10 (32.8)	12 (39.4)	14 (45.9)	15 (49.2)	20 (65.6)	25 (82.0)	30 (98.4)	35 (114.8)

Three-phase Power Drop Cables

Also used as non-shielded motor cables for ArmorStart LT controllers. Not compatible with ArmorStart ST controllers.

Cordsets

	No. of Pins	Wire Size	Assembly Rating	Environmental Rating	Cat. No.[1]			
					Straight Female	Right-Angle Female	Straight Male	Right-Angle Male
Cordsets (M22)	4	16 AWG	600V, 10 A	IP67/UL 4/12	280-PWRM22E-Mxx[2]	280-PWRM22F-Mxx[2]	280-PWRM22G-Mxx[2]	280-PWRM22H-Mxx[2]
Cordsets (M24)		14 AWG	600V, 15 A		280-PWRM24E-Mxx[2]	280-PWRM24F-Mxx[2]	280-PWRM24G-Mxx[2]	280-PWRM24H-Mxx[2]

Patchcords

	No. of Pins	Wire Size	Assembly Rating	Environmental Rating	Cat. No.[1]			
					Straight Female/ Straight Male	Right-angle Female/ Straight Male	Straight Female/ Right-angle Male	Right-angle Female/ Right-Angle Male
Patchcords (M22)	4	16 AWG	600V, 10 A	IP67/UL 4/12	280-PWRM22A-Mxx[2]	280-PWRM22B-Mxx[2]	280-PWRM22C-Mxx[2]	280-PWRM22D-Mxx[2]
Patchcords (M24)		14 AWG	600V, 15 A		280-PWRM24A-Mxx[2]	280-PWRM24B-Mxx[2]	280-PWRM24C-Mxx[2]	280-PWRM24D-Mxx[2]

(1) Stainless steel version with IP69K/UL4X rating may be ordered by adding **S** to the cat. no. (Example: Cat. No. 280**S**-PWRM22A-M*).

(2) xx specifies the cable length, see Drop Cable Lengths table to complete the cat. no. (for example the cable length for Cat. No. 280-**PWRM22A**-M1 is 1 m).

Drop Cable Lengths

Code	05	1	015	2	025	3	4	6	8	10	12	14
Length [m (ft)]	0.5 (1.6)	1 (3.3)	1.5 (4.9)	2 (6.6)	2.5 (8.1)	3 (9.8)	4 (13.1)	6 (19.7)	8 (26.2)	10 (32.8)	12 (39.4)	14 (45.9)

Three-phase Power Receptacles

	No. of Pins	Wire Size	Assembly Rating	Environmental Rating	Cat. No.	
					Female	Male
Receptacle (M22)[1]	4	16 AWG	600V, 10 A	IP67/UL 4/12	280-M22F-Mxx[3]	280-M22M-Mxx[3]
Receptacle (M24)[1]		14 AWG	600V, 15 A		280-M24F-Mxx[3]	280-M24M-Mxx[3]
Receptacle (M35)[1]		10 AWG	600V, 32 A		280-M35F-Mxx[3]	280-M35M-Mxx[3]
Field-installed receptacle (M22)[2]		16 AWG	600V, 10 A 600V, 15 A		280-FAM22F	280-FAM22M
Field-installed receptacle (M35)[2]		10 AWG,	600V, 32 A		280-FAM35F	280-FAM35M

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

(2) The field-installed receptacle for use with an M24 cordset, is an M35 receptacle and if needed, its corresponding M35 mating receptacle.

(3) Replace xx with length in meters: 05 for 0.5 m, 1 for 1 m or 3 for 3 m.

Receptacle Mounting Nuts and Flat Seals

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

Three-phase Power T-ports and Reducing Adapters

	No. of Pins	Assembly Rating	Environmental Rating	Cat. No.[1]
Power Tee (M35)		32 A		280-T35
Power Tee (M35 with reducing M22 drop)	4	Trunk 32 A / Drop 15 A	IP67/UL 4/12	280-RT35
Reducing Adapter (M35)		15 A		280-RA35

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

Control and Auxiliary Power Media

See http://ab.rockwellautomation.com/connection-devices/cables-and-cordsets or Cordsets & Field Attachables Technical Data, 889-TD002 for additional control and auxiliary power media options and technical specifications.

Cordsets with flying leads or patchcord cables are available in various lengths and physical configurations

Cordsets

Patchcords

Auxiliary/Control Power Cordsets

For Use With	No. of Pins	Wire Size	Assembly Rating	Environmental Rating	Cat. No.			
					Straight Female	Right-Angle Female	Straight Male	Right-Angle Male
ArmorStart with EtherNet/IP, ArmorStart with DeviceNet, or ArmorStart LT	6-pin/5 used	16 AWG	600V, 10 A	IP67	889N-F65GF-*xx*[1]	889N-R65GF-*xx*[1]	889N-M65GF-*xx*[1]	889N-E65GF-*xx*[1]
ArmorStart ST	4	16 AWG	600V, 10 A	IP67/UL 4/12	889N-F4AFC-*xx*	889N-R4AFC-*xx*	—	—
Auxiliary Power Supply	3	16 AWG	600V, 13 A	IP67/UL 4/12	889N-F3AFC-*xx*	889N-R3AFC-*xx*	889N-U3AFC-*xx*	889N-V3AFC-*xx*

(1)   xx specifies the cable length, see Cordset Cable Lengths table to complete the cat. no. (for example, the cable length for Cat. No. 889N-F65GF-2 is 2 m). Custom cable lengths are also available, contact your local Rockwell Automation sales office or Allen-Bradley distributor.

Cordset Cable Lengths

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

Auxiliary/Control Power Patchcords

For Use With	No. of Pins	Wire Size	Assembly Rating	Environmental Rating	Cat. No.			
					Straight Female Straight Male	Right-Angle Female Straight Male	Straight Female Right-Angle Male	Right-Angle Female Right-Angle Male
ArmorStart with EtherNet/IP, ArmorStart with DeviceNet, or ArmorStart LT	6-pin/5 used	16 AWG	600V, 10 A	IP67	889N-F65GFNM-*xx*(2)	889N-R65GFNM-*xx*[2]	889N-F65GFNE-*xx*[2]	889N-R65GFNE-*xx*[2]
ArmorStart ST	4	16 AWG	600V, 10 A	IP67/UL 4/12	889N-F4AFNM-*xx*	889N-R4AFNM-*xx*	889N-F4AFNE-*xx*	889N-R4AFNE-*xx*

(2)   xx specifies the cable length, see Patchcord Cable Lengths table to complete the cat. no. (for example the cable length for Cat. No. 889N-F65GFNM-2 is 2 m). Custom cable lengths are also available, contact your local Rockwell Automation sales office or Allen-Bradley distributor.

Patchcord Cable Lengths

Feet	1.6	3.3	6.5	9.8	16.4	19.7	26.2	32.8
Meters	0.5	1	2	3	5	6	8	10
Code	0M5	1	2	3	5	6	8	10

Auxiliary/Control Power T-Ports

Type	For Use With	Pin Configuration	Assembly Rating	Environmental Rating	Cat. No.
Control/Auxiliary power	ArmorStart ST	Drop: 22 mm, 4-pin Trunk: 22 mm, 4-pin	250V, 4 A	IP67/UL 12	898N-43PB-N4KF
Auxiliary device (ArmorStart adapter tee when using ArmorStart EtherNet/IP version with quick disconnects)	ArmorStart with EtherNet/IP, ArmorStart with DeviceNet, or ArmorStart LT	Drop: 22 mm, 6-pin/5-used Trunk: 22 mm, 4-pin	600V, 8 A	IP67	898N-543ES-NKF
E-stop out, control power	ArmorStart with EtherNet/IP, ArmorStart with DeviceNet, or ArmorStart LT	22 mm, 6-pin/5-used	600V, 10 A	IP67	898N-653ES-NKF
E-stop in, control power	ArmorStart with EtherNet/IP, ArmorStart with DeviceNet, or ArmorStart LT	22 mm, 6-pin/5-used	600V, 10 A	IP67	898N-653ST-NKF

Auxiliary/Control Power Receptacles

	For Use With	No. of Pins	Wire Size	Assembly Rating	Environmental Rating	Cat. No.	
						Female	Male
Auxiliary power	ArmorStart ST	4	16 AWG	600V, 10 A	IP67	888N-D4AF1-xx[1]	—
Control power	ArmorStart with EtherNet/IP, ArmorStart with DeviceNet, or ArmorStart LT	6 (5 used)	16 AWG	600V, 10 A	IP67	888N-D65AF1-yy[2]	888N-M65AF1-yy[2]

(1) xx specifies the cable length, see Auxiliary Receptacle Wire Lengths to complete the cat. no. (for example the cable length for Cat. No. 888N-D4AF1-1F is 1 ft). Longer cable lengths are available, contact your local Rockwell Automation sales office or Allen-Bradley distributor.

(2) yy specifies the cable length, see Control Receptacle Wire Lengths to complete the cat. no. (for example the cable length for Cat. No. 888N-D65AF1-1 is 1 m).Longer cable lengths are available, contact your local Rockwell Automation sales office or Allen-Bradley distributor.

Auxiliary Receptacle Wire Lengths

Feet	1	3
Meters	0.3	0.9
Code	1F	3F

Control Receptacle Wire Lengths

Feet	1	3.3
Meters	0.3	1
Code	0M3	1

Auxiliary/Control Power Shorting Plugs

	For Use With	No. of Pins	Assembly Rating	Environmental Rating	Cat. No.
E-stop in	ArmorStart with EtherNet/IP, ArmorStart with DeviceNet, or ArmorStart LT	6 (5 used)	600V, 10 A	IP67	889A-M65SP61
E-stop out					889A-M65SP65
Male shorting plug	ArmorStart ST	4	600V, 10 A	IP67/UL 4/12	898N-41AU-NM4

I/O Media

DC Micro V-cable (Input)

For Use With	No. of Pins	Wire Size	Assembly Rating	Environmental Rating	Cat. No.	
					Straight Female	Right-Angle Female
All 24V DC I/O, except for DeviceNet	4	22 AWG	300V, 4 A	IP67/IP69K/NEMA 6P	879D-F4ACDM-xx[1]	879D-R4ACDM-xx[1]

(1)   xx specifies the cable length, see DC Micro V-Cable Lengths to complete the cat. no. (for example the cable length for Cat. No. 879D-F4ACDM-1 is 1 m).

DC Micro V-Cable Lengths

Feet	1.0	3.3	6.5	16.4
Meters	0.3	1	2	5
Code	0M3	1	2	5

DC Micro Patchcord (Input/Output)

For Use With	No. of Pins	Wire Size	Assembly Rating	Environmental Rating	Cat. No.			
					Straight Female Straight Male	Right-Angle Female Straight Male	Straight Female Right-Angle Male	Right-Angle Female Right-Angle Male
All 24V DC I/O, except for DeviceNet	4	22 AWG	250V, 4 A	IP67/NEMA 6P	889D-F4ACDM-xx[1]	889D-R4ACDM-xx[1]	889D-F4ACDE-xx[1]	889D-R4ACDE-xx[1]

(1)   xx specifies the cable length, see DC Micro and Mini Patchcord Lengths to complete the cat. no. (for example, the cable length for Cat. No. 889D-F4ACDM–10 is 10 m).

DC Mini Patchcord

For Use With	No. of Pins	Wire Size	Assembly Rating	Environmental Rating	Cat. No.			
					Straight Female Straight Male	Right-Angle Female Straight Male	Straight Female Right-Angle Male	Right-Angle Female Right-Angle Male
ArmorBlock Guard I/O	4	18 AWG	250V, 4 A	IP67/NEMA 6P	889D-F4AEDM-xx[1]	889D-R4AEDM-xx[1]	889D-F4AEDE-xx[1]	889D-R4AEDE-xx[1]

(1)   xx specifies the cable length, see DC Micro and Mini Patchcord Lengths to complete the cat. no. (for example, the cable length for Cat. No. 889D-F4AEDM–10 is 10 m).

DC Micro and Mini Patchcord Lengths

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

Ethernet Media

These tables list a sample of Ethernet media that is suitable for connection to ArmorStart devices. See Ethernet Network Media M12 Cable product selection for additional cable and media selections.

Patchcords

No. of Pins	Wire Size	Assembly Rating	Environmental Rating	Cat. No.			
				Straight Female Straight Male	Straight Male Straight Male	Straight Male Right-Angle Male	Right-Angle Male Right-Angle Male
4	24 AWG	—	IP67	1585D-M4TBDF-xx	1585D-M4TBDM-xx[1]	1585D-M4TBDE-xx	1585D-E4TBDE-xx

(1)   xx specifies the cable length in meters, (for example, the cable length for Cat. No. 1585D-M4TBDM-1 is 1 m). Standard lengths are 1, 2, 5, or 10 m. Additional lengths are available, see Ethernet Network Media M12 Cable product selection.

Receptacles

	No. of Conductors	Wire Size	Assembly Rating	Environmental Rating	Cat. No.	
					Unshielded	Shielded
Female M12 D-code, front mount to RJ45	4	Unshielded: 24 AWG Shielded: 26 AWG	300V	IP67	1585D-D4TBJM-xx	1585D-D4UBJM-xx

Transition Cable

	No. of Pins	Wire Size	Assembly Rating	Environmental Rating	Cat. No.	
					Unshielded	Shielded
Straight male M12 D-code to RJ45	4	Unshielded: 24 AWG Shielded: 26 AWG	—	IP67	1585D-M4TBJM-xx	1585D-M4UBJM-xx

Bulkhead Adapter

	No. of Pins	Assembly Rating	Environmental Rating	Cat. No.
				Unshielded
Female M12 receptacle to RJ45 female right-angle 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 Ω terminators that are used for unused pairs • Cat 5e	4	32V, 4 A	IP67	1585A-DD4JD

For more information and technical specifications for Ethernet Media, see 1585-TD001.

DeviceNet Media

These tables list a sample of DeviceNet media that is suitable for connection to ArmorStart devices. See DeviceNet Network Media for additional media selections.

Trunk and Drop Patchcords

No. of Pins	Wire Size	Assembly Rating	Environmental Rating	Cat. No.			
				Straight Female Straight Male	Straight Female Right-Angle Male	Right-Angle Female Straight Male	Right-Angle Female Right-Angle Male
5	22 and 24 AWG	250V, 4 A	IP67/UL 4/12	1485G-Pxx[1]N5-M5	1485G-Pxx[1]W5-N5	1485G-Pxx[1]M5-Z5	1485G-Pxx[1]W5-Z5
5	15 and 18 AWG	300V, 8 A	IP67/UL 4/12	1485C-Pxx[2]N5-M5	1485C-Pxx[2]W5-N5	1485C-Pxx[2]M5-Z5	1485C-Pxx[2]W5-Z5

(1) xx specifies the cable length in meters, (for example the cable length for Cat. No. 1485G-P1N5-M5 is 1 m). Standard cable lengths are: 1, 2, 3, 4, 5, and 6 m.
(2) xx specifies the cable length in meters, (for example the cable length for Cat. No. 1485C-P1N5-M5 is 1 m). Standard cable lengths: 1, 2, 3, 4, 5, 6, 8, 10, 12, 18, 24, and 30 m.

Receptacles

No. of Conductors	Wire Size	Assembly Rating	Environmental Rating	Cat. No.	
				Female	Male
5	22 and 24 AWG	250V, 4 A	IP67/UL 4/12	1485F-Pxx[1]N5-CG	1485F-Pxx[1]M5-CG
5	15 and 18 AWG	300V, 8 A	IP67/UL 4/12	1485F-Pxx[1]N5-A	1485F-Pxx[1]M5-A

(1) xx specifies the cable length in meters, (for example the cable length for Cat. No. 1485F-P1N5-CG is 1 m). Standard cable lengths are: 1, 2, 3, 4, 5, and 6 m.

T-ports

No. of Pins	Assembly Rating	Environmental Rating	Cat. No.	
			Left Keyway	Right Keyway
5	50V, 8 A	IP67/UL 12	1485P-P1N5-MN5KM	1485P-P1N5-MN5KF

Terminators

No. of Pins	Assembly Rating	Environmental Rating	Cat. No.	
			Female	Male
5	250V, 8 A	IP67/UL 4/12	1485A-T1N5	1485A-T1M5

KwikLink™ Pig Tail Drop Cables

	Assembly Rating	Environmental Rating	Cat. No.			
			1 m(3.3 ft)	2 m(6.5 ft)	3 m(9.8 ft)	6 m(19.8 ft)
KwikLink pigtail drops are Insulation Displacement Connector (IDC) with integral Class 1 round cables for interfacing devices or power supplies to flat cable.	24V DC, 8 A	IP67/UL 13	1485P-P1E4-B1-N5	1485P-P1E4-B2-N5	1485P-P1E4-B3-N5	1485P-P1E4-B6-N5

Configuration Terminal

	Description	Length m (ft)	Cat. No.
	DeviceNet Configuration Terminal Used to interface with objects on a DeviceNet network. Includes 1 m communications cable.	1 (3.3)	193-DNCT
	Communication cable, color-coded bare leads	1 (3.3)	193-CB1
	Communication cable, microconnector (male)	1 (3.3)	193-CM1
	Panel Mount Adapter/Door Mount Bezel Kit	—	193-DNCT-BZ1

Disconnect Accessory

Description	Cat. No.
Locking Tag Padlock attachment to the lockable handles Up to three padlocks 4…8 mm (5/16 in. diameter) shackle	140M-C-M3

Dynamic Brake Option Cables and Resistors

Choose DB or DB1 option depending on the ArmorStart motor controller type. Dynamic brake resistor options are available for VFD motor controllers only.

Option	Resistor Rating	ST	LT	with EtherNet/IP	with DeviceNet	See
DB	IP20	—	—	yes	yes	DB Option Accessories on page 76
DB1	IP67	yes	—	yes	yes	DB1 Option Accessories on page 77

DB Option Accessories

The ArmorStart controller when equipped with the DB or DB1 connector, requires you to separately purchase a braking resistor. The DB resistor has an embedded overload protection switch. This switch is connected to the control circuit to help prevent overheating under certain fault conditions.

Dynamic Brake Cable for ArmorStart with DeviceNet and ArmorStart with EtherNet/IP

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

Dynamic Brake Modules for ArmorStart with DeviceNet and ArmorStart with Ethernet/IP, with the DB Option

| Drive and Motor Size kW [Hp]	Resistance Ohms ±5%	Continuous Power [kW]	Max Energy [kJ]	Max Braking Torque % of Motor	Application Type 1[1] Braking Torque % of Motor	Duty Cycle %[2]	Application Type 2[3] Braking Torque % of Motor	Duty Cycle %[2]	Cat. No.[4]
380…480 Volt 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%	100%	23%	150%	15%	AK-R2-360P500
1.5 (2)	360	0.086	17	110%	100%	12%	110%	11%	AK-R2-360P500
2.2 (3)	120	0.26	52	197%	100%	24%	150%	16%	AK-R2-120P1K2
4 (5)	120	0.26	52	124%	100%	13%	124%	10%	AK-R2-120P1K2

(1) Application Type 1 represents maximum capability up to 100% braking torque where possible.

(2) The duty cycle that is listed, is based on full speed to zero speed deceleration. For constant regen. at full speed, the duty cycle capability is half of what is listed.

(3) Application Type 2 represents more than 100% braking torque where possible, up to a maximum of 150%.

(4) The dynamic brake resistors in this table are rated for a 5% duty cycle.

Note 1: Always check the resistor rating against the minimum resistance for the drive being used.

Note 2: Dynamic brake modules have an IP20 rating.

Dynamic Brake Modules Approximate Dimensions

Dimensions are not intended to be used for manufacturing purposes.
Dimensions are in millimeters (inches) and weights are in kilograms (pounds).
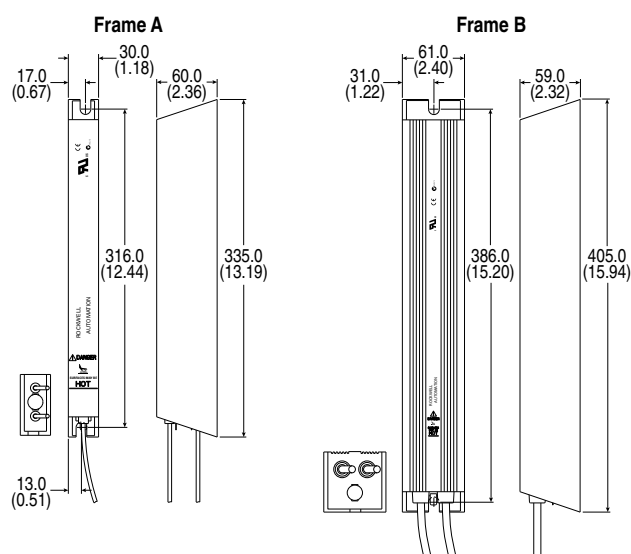
Frame	Cat. Nos.	Weight [kg (lb)]
A	AK-R2-091P500, AK-R2-047P500, AK-R2-360P500	1.1 (2.5)
B	AK-R2-030P1K2, AK-R2-120P1K2	2.7 (6)

See ArmorStart user manuals listed in [Additional Resources], for recommended thermostat wiring to avoid dynamic brake overheating. ArmorStart controllers equipped with the DB1 connector, require you to monitor the ArmorStart DB1 PCBA. When combined with upstream isolation, this helps to prevent resistor overheating.

DB1 Option Accessories

Dynamic Brake Modules for ArmorStart ST, ArmorStart with DeviceNet, and ArmorStart with Ethernet/IP, with DB1 Option

Drive and Motor Size kW	Resistance Ω ± 5%	Continuous Power kW	Max Energy kJ	Max Braking Torque % of Motor	Application Type 1[1]		Application Type 2[3]		Cat. No.[4]
					Braking Torque % of Motor	Duty Cycle %[2]	Braking Torque % of Motor	Duty Cycle %[2]	
380…480 Volt AC Input Drives									
0.37 (0.5)	360	0.086	17	305%	100%	47%	150%	31%	284R-360P500-M[5]
0.75 (1)	360	0.086	17	220%	100%	23%	150%	15%	284R-360P500-M[5]
1.5 (2)	360	0.086	17	110%	100%	12%	110%	11%	284R-360P500-M[5]
2.2 (3)	120	0.26	52	197%	100%	24%	150%	16%	284R-120P1K2-M[5]
4 (5)	120	0.26	52	124%	100%	13%	124%	10%	284R-120P1K2-M[5]

(1) Application Type 1 represents maximum capability up to 100% braking torque where possible.

(2) The duty cycle that is listed, is based on full speed to zero speed deceleration. For constant regen. at full speed, the duty cycle capability is half of what is listed.

(3) Application Type 2 represents more than 100% braking torque where possible, up to a maximum of 150%.

(4) Drive rating and DB part numbers are not interchangeable. Only use specified resistor. You are responsible to evaluate if performance meets application requirement.

(5) 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.

Bulletin 284 Dynamic Brake Resistor Approximate Dimensions

Dimensions are not intended to be used for manufacturing purposes.
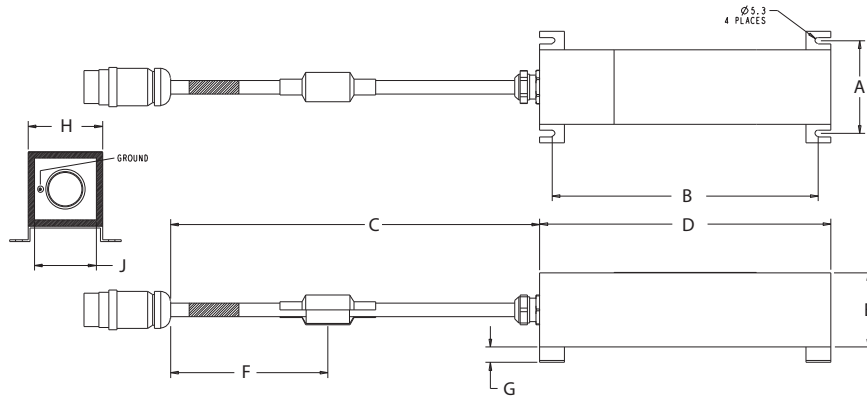
Cat. No.	A mm (in.)	B mm (in.)	C mm (in.)[1]	D mm (in.)	E mm (in.)	F mm (in.)	G mm (in.)	H mm (in.)	J mm (in.)
284R-360P500	89 ± 3 (3.5 ± 0.12)	215 ± 5 (8.46 ± 0.2)	M05 = 0.5 m M1 = 1 m	235 ± 5 (9.25 ± 0.2)	60 ± 2 (2.36 ± 0.08)	127 (5)	12.54 (0.49)	60 ± 2 (2.36 ± 0.08)	50 ± 1.5 (1.97 ± 0.06)
284R-120P1K2		420 ± 5 (16.54 ± 0.2)		440 ± 5 (17.32 ± 0.2)					

(1) Length is user-selectable based on the 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.

Additional Resources

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

Resource	Description
ArmorConnect Power Media and ArmorStart Motor and Brake Media Selection Guide, publication 280PWR-SG001	Provides selection information on cables and media for ArmorStart devices.
ArmorStart ST Motor Controller with Integrated Safety User Manual, publication 280ES-UM002	Provides information on how to install, configure, program, and use ArmorStart ST with integrated safety controllers.
ArmorStart ST Motor Controller User Manual, publication 280ES-UM001	Provides information on how to install, configure, program, and use ArmorStart ST controllers.
ArmorStart LT Distributed Motor Controller — EtherNet/IP User Manual, publication 290E-UM001	Provides information on how to install, configure, program, and use ArmorStart LT with EtherNet/IP controllers.
ArmorStart LT Distributed Motor Controller — DeviceNet User Manual, publication 290D-UM001	Provides information on how to install, configure, program, and use ArmorStart LT with DeviceNet controllers.
ArmorStart Distributed Motor Controller with EtherNet/IP User Manual, publication 280E-UM001	Provides information on how to install, configure, program, and use ArmorStart with EtherNet/IP controllers.
ArmorStart Distributed Motor Controller with DeviceNet User Manual, publication 280-UM002	Provides information on how to install, configure, program, and use ArmorStart with DeviceNet controllers.
ArmorStart Distributed Motor Controller Safety Version User Manual, publication 280-UM004	Provides information on how to install, configure, program, and use ArmorStart with DeviceNet safety version controllers.
ArmorStart ST Distributed Motor Controller Specifications, publication 280ES-TD001	Provides specification information for ArmorStart ST controllers.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, rok.auto/certifications	Provides declarations of conformity, certificates, and other certification details.

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

Rockwell Automation Support

Use the following resources to access support information.

Technical Support Center	Knowledgebase Articles, How-to Videos, FAQs, Chat, User Forums, and Product Notification Updates.	www.rockwellautomation.com/knowledgebase
Local Technical Support Phone Numbers	Locate the phone number for your country.	www.rockwellautomation.com/global/support/get-support-now.page
Direct Dial Codes	Find the Direct Dial Code for your product. Use the code to route your call directly to a technical support engineer.	www.rockwellautomation.com/global/support/direct-dial.page
Literature Library	Installation Instructions, Manuals, Brochures, and Technical Data.	www.rockwellautomation.com/literature
Product Compatibility and Download Center (PCDC)	Get help determining how products interact, check features and capabilities, and find associated firmware.	www.rockwellautomation.com/global/support/pcdc.page

Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete the How Are We Doing? form at http://literature.rockwellautomation.com/idc/groups/literature/documents/du/ra-du002_-en-e.pdf.

www.rockwellautomation.com

Power, Control and Information Solutions Headquarters

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