

## ArmorStart ST Distributed Motor Controller (includes safety versions)

Bulletin Numbers 281E, 281ES, 281GS, 284E, 284ES, 284GS

ArmorStart® ST is an integrated, pre-engineered, motor starting solution that implements a safety-related stop function that conforms to Category 0 of IEC 60204-1.



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

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice. If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

**注意:** 在安装、配置、操作和维护本产品前，请阅读本文档以及“其他资源”部分列出的有关设备安装、配置和操作的相应文档。除了所有适用规范、法律和标准的有关要求之外，用户还必须熟悉安装和接线说明。

安装、调整、投运、使用、组装、拆卸和维护等各项操作必须由经过适当训练的专业人员按照适用的操作规范实施。

如果未按照制造商指定的方式使用该设备，则可能会损害设备提供的保护。

**ATENCIÓN:** Antes de instalar, configurar, poner en funcionamiento o realizar el mantenimiento de este producto, lea este documento y los documentos listados en la sección Recursos adicionales acerca de la instalación, configuración y operación de este equipo. Los usuarios deben familiarizarse con las instrucciones de instalación y cableado y con los requisitos de todos los códigos, leyes y estándares vigentes.

El personal debidamente capacitado debe realizar las actividades relacionadas a la instalación, ajustes, puesta en servicio, uso, ensamblaje, desensamblaje y mantenimiento de conformidad con el código de práctica aplicable. Si este equipo se usa de una manera no especificada por el fabricante, la protección provista por el equipo puede resultar afectada.

**ATENÇÃO:** Leia este e os demais documentos sobre instalação, configuração e operação do equipamento que estão na seção Recursos adicionais antes de instalar, configurar, operar ou manter este produto. Os usuários devem se familiarizar com as instruções de instalação e fiação além das especificações para todos os códigos, leis e normas aplicáveis.

É necessário que as atividades, incluindo instalação, ajustes, colocação em serviço, utilização, montagem, desmontagem e manutenção sejam realizadas por pessoal qualificado e especializado, de acordo com o código de prática aplicável.

Caso este equipamento seja utilizado de maneira não estabelecida pelo fabricante, a proteção fornecida pelo equipamento pode ficar prejudicada.

**ВНИМАНИЕ:** Перед тем как устанавливать, настраивать, эксплуатировать или обслуживать данное оборудование, прочитайте этот документ и документы, перечисленные в разделе «Дополнительные ресурсы». В этих документах изложены сведения об установке, настройке и эксплуатации данного оборудования. Пользователи обязаны ознакомиться с инструкциями по установке и прокладке соединений, а также с требованиями всех применимых норм, законов и стандартов.

Все действия, включая установку, наладку, ввод в эксплуатацию, использование, сборку, разборку и техническое обслуживание, должны выполняться обученным персоналом в соответствии с применимыми нормами и правилами.

Если оборудование используется не предусмотренным производителем образом, защита оборудования может быть нарушена.

**注意:** 本製品を設置、構成、稼働または保守する前に、本書および本機器の設置、設定、操作についての参考資料の該当箇所に記載されている文書に目を通してください。ユーザは、すべての該当する条例、法律、規格の要件に加えて、設置および配線の手順に習熟している必要があります。

設置調整、運転の開始、使用、組立て、解体、保守を含む諸作業は、該当する実施規則に従って訓練を受けた適切な作業員が実行する必要があります。

本機器が製造メーカーにより指定されていない方法で使用されている場合、機器により提供されている保護が損なわれる恐れがあります。

**ACHTUNG:** Lesen Sie dieses Dokument und die im Abschnitt „Weitere Informationen“ aufgeführten Dokumente, die Informationen zu Installation, Konfiguration und Bedienung dieses Produkts enthalten, bevor Sie dieses Produkt installieren, konfigurieren, bedienen oder warten. Anwender müssen sich neben den Bestimmungen aller anwendbaren Vorschriften, Gesetze und Normen zusätzlich mit den Installations- und Verdrahtungsanweisungen vertraut machen.

Arbeiten im Rahmen der Installation, Anpassung, Inbetriebnahme, Verwendung, Montage, Demontage oder Instandhaltung dürfen nur durch ausreichend geschulte Mitarbeiter und in Übereinstimmung mit den anwendbaren Ausführungsvorschriften vorgenommen werden.

Wenn das Gerät in einer Weise verwendet wird, die vom Hersteller nicht vorgesehen ist, kann die Schutzfunktion beeinträchtigt sein.

**ATTENTION :** Lisez ce document et les documents listés dans la section Ressources complémentaires relatifs à l'installation, la configuration et le fonctionnement de cet équipement avant d'installer, configurer, utiliser ou entretenir ce produit. Les utilisateurs doivent se familiariser avec les instructions d'installation et de câblage en plus des exigences relatives aux codes, lois et normes en vigueur. Les activités relatives à l'installation, le réglage, la mise en service, l'utilisation, l'assemblage, le démontage et l'entretien doivent être réalisées par des personnes formées selon le code de pratique en vigueur.

Si cet équipement est utilisé d'une façon qui n'a pas été définie par le fabricant, la protection fournie par l'équipement peut être compromise.

**주요:** 본 제품 설치, 설정, 작동 또는 유지 보수하기 전에 본 문서를 포함하여 설치, 설정 및 작동에 관한 참고 자료 섹션의 문서들을 반드시 읽고 숙지하십시오. 사용자는 모든 관련 규정, 법규 및 표준에서 요구하는 사항에 대해 반드시 설치 및 배선 지침을 숙지해야 합니다.

설치, 조정, 가동, 사용, 조립, 분해, 유지보수 등 모든 작업은 관련 규정에 따라 적절한 교육을 받은 사용자들 통해서만 수행해야 합니다.

本装置を製造者が 명시しない方法で使用されている場合、機器により提供されている保護が損なわれる恐れがあります。

**ATTENZIONE:** Prima di installare, configurare ed utilizzare il prodotto, o effettuare interventi di manutenzione su di esso, leggere il presente documento ed i documenti elencati nella sezione "Altre risorse", riguardanti l'installazione, la configurazione ed il funzionamento dell'apparecchiatura. Gli utenti devono leggere e comprendere le istruzioni di installazione e cablaggio, oltre ai requisiti previsti dalle leggi, codici e standard applicabili.

Le attività come installazione, regolazioni, utilizzo, assemblaggio, disassemblaggio e manutenzione devono essere svolte da personale adeguatamente addestrato, nel rispetto delle procedure previste.

Qualora l'apparecchio venga utilizzato con modalità diverse da quanto previsto dal produttore, la sua funzione di protezione potrebbe venire compromessa.

**DIKKAT:** Bu ürünün kurulumu, yapılandırılması, işletilmesi veya bakımı öncesinde bu dokümanı ve bu ekipmanın kurulumu, yapılandırılması ve işletimi ile ilgili İlave Kaynaklar bölümünde yer listelenmiş dokümanları okuyun. Kullanıcılar yürürlükteki tüm yönetmelikler, yasalar ve standartların gereksinimlerine ek olarak kurulum ve kablolama talimatlarını da öğrenmek zorundadır.

Kurulum, ayarlama, hizmete alma, kullanma, parçaları birleştirme, parçaları sökme ve bakım gibi aktiviteler sadece uygun eğitimli kişiler tarafından yürürlükteki uygulama yönetmeliklerine uygun şekilde yapılabilir.

Bu ekipman üretici tarafından belirlenmiş amacın dışında kullanılırsa, ekipman tarafından sağlanan koruma bozulabilir.

**注意事項:** 在安装、設定、操作或維護本產品前，請先閱讀此文件以及列於「其他資源」章節中有關安裝、設定與操作此設備的文件。使用者必須熟悉安裝和配線指示，並符合所有法規、法律和標準要求。

包括安裝、調整、交付使用、使用、組裝、拆卸和維護等動作都必須交由已經過適當訓練的人員進行，以符合適用的實作法規。

如果將設備用於非製造商指定的用途時，可能會造成設備所提供的保護功能受損。

**POZOR:** Než začnete instalovat, konfigurovat či provozovat tento výrobek nebo provádět jeho údržbu, přečtěte si tento dokument a dokumenty uvedené v části Dodatečné zdroje ohledně instalace, konfigurace a provozu tohoto zařízení. Uživatelé se musejí vedle požadavků všech relevantních vyhlášek, zákonů a norem nutně seznámit také s pokyny pro instalaci a elektrické zapojení.

Činnosti zahrnující instalaci, nastavení, uvedení do provozu, užívání, montáž, demontáž a údržbu musí vykonávat vhodně proškolený personál v souladu s příslušnými prováděcími předpisy.

Pokud se toto zařízení používá způsobem neodpovídajícím specifikaci výrobce, může být narušena ochrana, kterou toto zařízení poskytuje.

**UWAGA:** Przed instalacją, konfiguracją, użytkowaniem lub konserwacją tego produktu należy przeczytać niniejszy dokument oraz wszystkie dokumenty wymienione w sekcji Dodatkowe źródła omawiające instalację, konfigurację i procedury użytkowania tego urządzenia. Użytkownicy mają obowiązek zapoznać się z instrukcjami dotyczącymi instalacji oraz oprowadowania, jak również z obowiązującymi kodeksami, prawem i normami.

Działania obejmujące instalację, regulację, przekazanie do użytkowania, użytkowanie, montaż, demontaż oraz konserwację muszą być wykonywane przez odpowiednio przeszkolony personel zgodnie z obowiązującym kodeksem postępowania.

Jeśli urządzenie jest użytkowane w sposób inny niż określony przez producenta, zabezpieczenie zapewniane przez urządzenie może zostać ograniczone.

**OBBS!** Läs detta dokument samt dokumentet, som står listat i avsnittet Övriga resurser, om installation, konfiguration och drift av denna utrustning innan du installerar, konfigurerar eller börjar använda eller utföra underhållsarbete på produkten. Användare måste bekanta sig med instruktioner för installation och kabeldragning, förutom krav enligt gällande koder, lagar och standarder.

Åtgärder som installation, justering, service, användning, montering, demontering och underhållsarbete måste utföras av personal med lämplig utbildning enligt lämpligt bruk.

Om denna utrustning används på ett sätt som inte anges av tillverkaren kan det hända att utrustningens skyddsanordningar försätts ur funktion.

**LET OP:** Lees dit document en de documenten die genoemd worden in de paragraaf Aanvullende informatie over de installatie, configuratie en bediening van deze apparatuur voordat u dit product installeert, configureert, bediend of onderhoudt. Gebruikers moeten zich vertrouwd maken met de installatie en de bedrijfsinstructies, naast de vereisten van alle toepasselijke regels, wetten en normen.

Activiteiten zoals het installeren, afstellen, in gebruik stellen, gebruiken, monteren, demonteren en het uitvoeren van onderhoud mogen uitsluitend worden uitgevoerd door hiervoor opgeleid personeel en in overeenstemming met de geldende praktijkregels.

Indien de apparatuur wordt gebruikt op een wijze die niet is gespecificeerd door de fabrikant, dan bestaat het gevaar dat de beveiliging van de apparatuur niet goed werkt.

### Summary of Changes

This publication contains the following new or updated information. This list includes substantive updates only and is not intended to reflect all changes.

Topic	Page
Added UK to CE requirements.	2, 4
Added EcoDesign publication to the Additional Resources list.	8

### Personal and Safety Precautions



**ATTENTION:**

- This unit has remote sources of power. Disconnect all power sources before the cover is removed. Failure to comply could result in death or serious injury.
- Do not attempt to service internal components when the unit is energized. Complete lock out / tag out procedures for all input power sources.



**SHOCK HAZARD:** Packaged drives contain high-voltage capacitors that take time to discharge after removal of the mains supply. Before working on the drive, isolate the main power supply from line inputs (L1, L2, L3). Wait 3 minutes for the capacitors to discharge to minimal voltage levels. Failure to do so could result in personal injury or death.



**ATTENTION:**

- Installation, adjustments, initial startup, use, assembly, disassembly, and maintenance must be performed by suitably trained personnel in accordance with the applicable code of practice.
- If this equipment is used in a manner that is not specified by the manufacturer, the protection that is provided by the equipment, could be impaired.



**WARNING:** Circumstances that can cause an explosion could exist, which could lead to personal injury or death, property damage, or economic loss. Tripping of the instantaneous-trip circuit breaker is an indication that a fault current has been interrupted. Current-carrying components of a magnetic motor controller must be examined and replaced if they are damaged, to reduce the risk of fire or electrical shock.



**ATTENTION:** This publication is intended for qualified service personnel responsible for installing and servicing these devices. You must have previous experience with and a basic understanding of electrical terminology, configuration procedures, required equipment, and safety precautions.



**ATTENTION:** Solid-state equipment has operational characteristics that differ from the characteristics of electromechanical equipment. Safety Guidelines for the Application, Installation, and Maintenance of Solid-state Controls, publication [SGL-11](#), available from your local Rockwell Automation sales office or online at [rok.auto/literature](http://rok.auto/literature), describes some important differences between solid-state equipment and hard-wired electromechanical devices.



**ATTENTION:** The National Electrical Code (NEC), NFPA79, and any other governing regional or local code overrides the information in this manual. Rockwell Automation cannot assume responsibility for the compliance or proper installation of the ArmorStart controller or associated equipment. A hazard of personal injury and/or equipment damage exists if codes are ignored during installation.

### Avoid Electrostatic Discharge



**ATTENTION:** This ArmorStart controller contains ESD (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when you install, test, service, or repair this assembly. Component damage can result if ESD control procedures are not followed. If you are not familiar with static control procedures, see an applicable ESD protection handbook.

### Electrical Safety Considerations

**IMPORTANT**

To comply with the CE and UK Low Voltage Directive (LVD), all connections to this equipment must be powered from a source compliant with the following:

- Safety extra low voltage (SELV) Supply
- Protected extra low voltage (PELV) Supply

To comply with UL/C-UL requirements, this equipment must be powered from a source compliant with the following:

- IEC 60950-1 Ed. 2.1, Clause 2.2 - SELV Circuits



**SHOCK HAZARD:**

- To avoid electrical shock, open the appropriate upstream protection (disconnect switch or branch circuit protection) before connecting and disconnecting cables.
- Risk of shock exists. Unused receptacles must be capped, the environmental rating might not be maintained with uncapped receptacles.
- Do not operate controls or open covers without appropriate personal protective equipment. Failure to comply can result in serious injury or death.



**ATTENTION:** If a malfunction or damage occurs, make no attempt to repair. Return the module to the manufacturer for repair. Do not dismantle the module. Repair is only available for I/O modules that are found in Cat. Nos. 28xES and 28xGS.

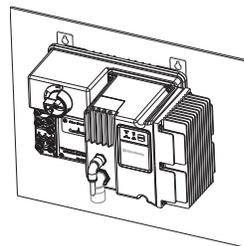
### Environment Considerations



At the end of its life, this equipment must be collected separately from any unsorted municipal waste.

### ArmorStart ST Characteristics

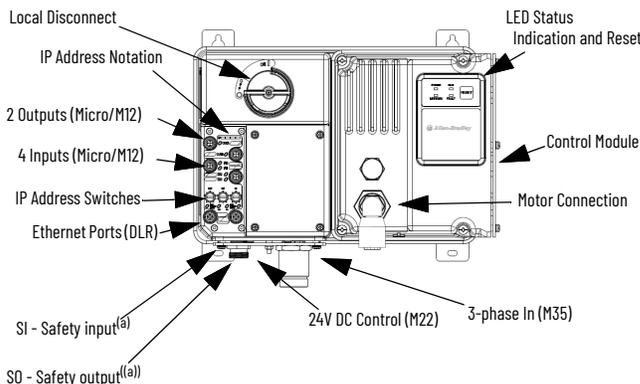
#### Acceptable Mount Orientations



**IMPORTANT**

For proper heat dissipation and product operation, mount the device vertically as shown.

#### Features (ArmorStart ST Starter is pictured)

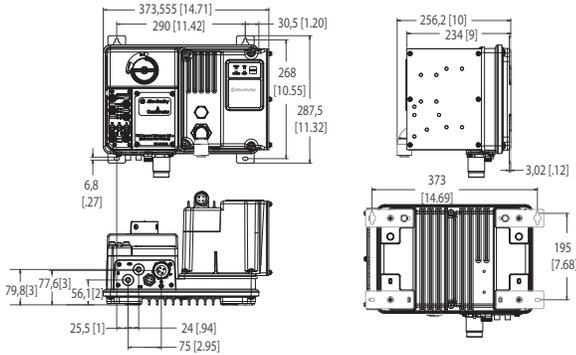


(a) An ArmorStart controller with a standard I/O module is pictured. The approximate locations of the safety input and output are shown for reference. The safety input and output would only be present if an ArmorStart controller is selected with the safety I/O module option.

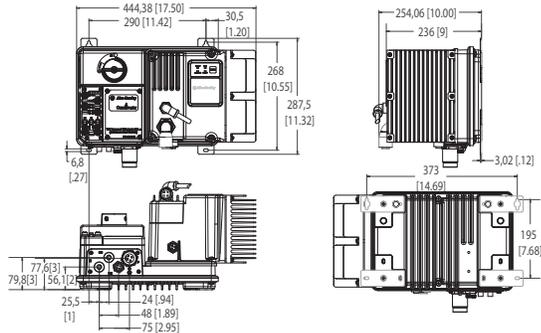
### Approximate Dimensions

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

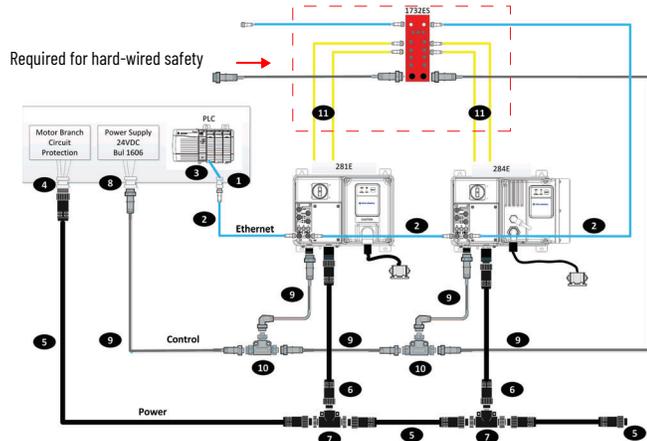
#### Dimensions for ArmorStart ST Starter



#### Dimensions for ArmorStart ST VFD



### ArmorStart ST Power and Control Terminals



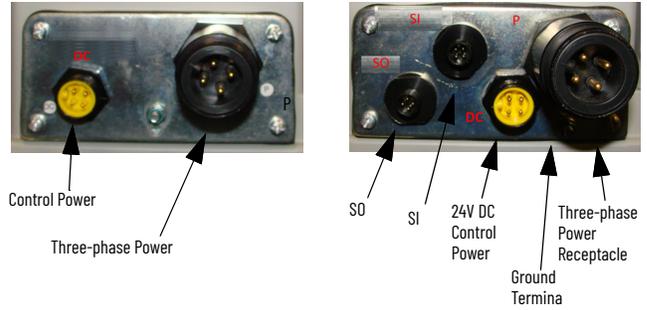
- ① CAT5e Bulkhead Connector and Receptacle - Example **Cat.No. 1585A-DD4JD**
- ② CAT5e Patchcord, IP67, M12 D-Code, Plug Straight, Plug Right Angle - Example **Cat.No. 1585D-M4TBDE-\***
- ③ CAT5e, Patch Cable, RJ45 to M12 Plug - Example **Cat.No. 1585D-M4TBJM-\***
- ④ Three-Phase Power Receptacles - Socket receptacles are a panel mount connector with flying leads - Example **Cat. No. 280-M35F-M1**
- ⑤ Three-Phase Power Trunk- Patchcord cable with integral socket or plug connector on each end - Example **Cat. No. 280-PWRM35A-M\***
- ⑥ Three-Phase Power Drop- Patchcord cable with integral socket or plug connector on each end - Example **Cat. No. 280-PWRM35A-M\***
- ⑦ Three-Phase Power Tee connects to one M35 drop line to trunk connectors - **Cat. No. 280-T35**
- ⑧ Control Power Receptacles - Socket receptacles are a panel mount connector with flying leads - **Cat. No. 888N-D4AF1-IF**
- ⑨ Control/Auxiliary Power Media Patchcords - Patchcord cable with integral socket or plug connector on each end - Example **Cat. No. 889N-F4AFNM-\***
- ⑩ Control/Auxiliary Power Tees - The Tee is used with cordset or patchcord to connect several ArmorStart ST controllers to the same control power source.- Example **Cat. No. 898N-43PB-N4KT**
- ⑪ Patch cable between Safety I/O module input and ArmorStart connector labeled "SM" and "P/M". This cable provides status and control feedback to the safety system. - Example **Cat. No. 889D-F4AEDM-\***

See the On-Machine™ Media for Armor™ PowerFlex®, ArmorStart, and ArmorConnect® Products Selection Guide, publication [280PWR-S6001](#), for specific cable information.

### Factory-installed ArmorConnect Gland Plate Connections

Standard Performance Gland

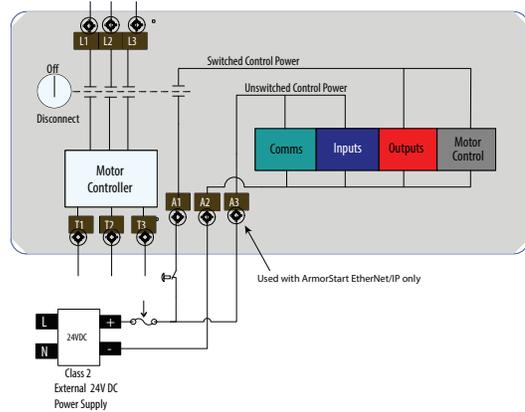
Safety Performance Gland



#### ArmorConnect Gland Plate Conductor Codes

Terminal Designations	Description
A1 (+)	Switched Auxiliary Power Input
A2 (-)	Auxiliary Power Common
A3 (+)	Unswitched Auxiliary Power
PE	Ground
1/L1	Line Power - Phase A
3/L2	Line Power - Phase B
5/L3	Line Power - Phase C
SI/O	Safety Input
SI/1	Safety Input
SO/P	Safety Output (P)
SO/M	Safety Output (M)

### ArmorStart ST Control Circuit Wiring Diagram



### Branch Circuit Protection



**ATTENTION:** Select the motor branch circuit protection that complies with the NFPA79/ or NFPA70 (NEC) and any other governing regional or local codes.



**WARNING:** If the branch circuit protective device trips, you must verify that the Source Brake function is still operational before putting the equipment back in service. If the source brake function is not working properly, loss of brake function or motor damage can occur.



**WARNING:** Do not install the ArmorStart ST controller where the maximum available fault current exceeds the product rating.

#### Branch Fuse and Circuit Rating

Short Circuit Protection	Short Circuit Protection Device (SCPD) Performance Type 1	Current Rating	
		10 MCP	Voltage
		Sym. Amps rms	65 kA
		Max. Circuit Breaker	60 A <sup>(1)</sup>
		Max. Fuse	60 A <sup>(2)</sup>
	25 MCP	Voltage	480Y/277V
		Sym. Amps rms	30 kA
		Max. Circuit Breaker	60 A <sup>(1)</sup>
		Max. Fuse	60 A <sup>(2)</sup>
	SCPD List	Size per NFPA 79 for Group Motor Applications	

(1) Cat. No. 140G-H6C3-C60.

(2) Type Class CC, J, or T.

ArmorStart ST controllers use 24V DC control power for communications and I/O. The control power terminal connections are labeled A1, A2, and A3. Switched power (A1) supplies outputs and motor control. Unswitched power (A3) supplies logic power and sensor inputs.

**IMPORTANT** If device status is important, the A3 terminal must have an unswitched power source.

### Group Motor Installations for USA and Canada Markets

The ArmorStart ST distributed motor controllers are listed for group installations per NFPA 79, Electrical Standard for Industrial Machinery and NFPA 70, National Electrical Code (NEC).

**IMPORTANT** For additional information regarding group motor installations with the ArmorStart ST distributed motor controller, see Applying More Than One ArmorStart Motor Controller in a Single Branch Circuit on Industrial Machinery Application Technique, publication [280-AT003](#).

#### Cable Workmanship Guidelines

See the National Electrical Code (NEC) NFPA 70 and/or the Electrical Standard for Industrial Machinery, NFPA 79 for proper installation details.

**IMPORTANT** The safety ground - PE must be connected to earth ground. Some codes could require redundant ground paths and periodic examination of connection integrity.

**IMPORTANT** To avoid electrolytic corrosion on the external earth terminal, avoid spraying moisture directly on the terminal. When used in washdown environments, apply a sealant or other corrosion inhibitor on the external ground terminal to minimize any negative effects of galvanic or electrochemical corrosion. Ground connections must be inspected regularly.

**IMPORTANT** For Bulletin 284E EMC compatibility, the motor 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 ArmorStart ST controller, for electrical bonding. The motor cable must be kept as short as possible to avoid electromagnetic emissions and capacitive currents. CE and UK conformity of ArmorStart ST controller with EMC Directive does not confirm that the entire machine installation complies with CE and UK EMC requirements.

## EtherNet/IP Receptacle Connections

### EtherNet/IP™ Connector (M12) - Socket



Pin 1: TxData+ (white/orange)  
 Pin 2: RxData+ (white/green)  
 Pin 3: TxData- (orange)  
 Pin 4: RxData- (green)

### I/O Connector (M12) - Socket



**Input**  
 Pin 1 - +24V (A3 pwr)  
 Pin 2 - Input  
 Pin 3 - Common  
 Pin 4 - Input  
 Pin 5 - NC (no connection)

**Output (a)**  
 Pin 1 - Not used (+24V DC)  
 Pin 2 - NC (no connection)  
 Pin 3 - Common  
 Pin 4 - Output +24V DC (A1 pwr)  
 Pin 5 - NC (no connection)

(a) This connector has optional configurations for units with integrated safety. For details, see ArmorStart ST Integrated Safety User Manual, publication [280ES-UM002](#).

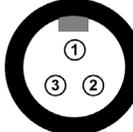
## Power Connections

### Motor Connector (M29) - Socket



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

### Dynamic Brake Connection (M22) - Socket



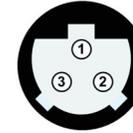
Pin 1 - Ground (green/yellow)  
 Pin 2 - BR+ (black)  
 Pin 3 - BR- (white)

### Incoming Control Power 24V DC (M22) - Plug



Pin 1 - 24V DC switched (brown)  
 Pin 2 - 24V DC unswitched (white)  
 Pin 3 - Common unswitched (blue)  
 Pin 4 - Common switched (blue)

### Em Brake Contactor (M22) - Socket



Pin 1 - Ground (green/yellow)  
 Pin 2 - B1 (black)  
 Pin 3 - B2 (white)

### Incoming Three-Phase Power (M35) - Plug

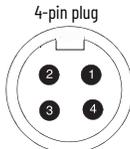


Pin 1 - L1 (black)  
 Pin 2 - Ground (green/yellow)  
 Pin 3 - L3 (red)  
 Pin 4 - L2 (white)

## Hard-wired Safety I/O Connections<sup>(a)</sup>

### Safety Input Monitor (SM1/SM2)

Pin 1 - SM1 (brown)  
 Pin 2 - SM2 (white)  
 Pin 3 - NC (no connection) (blue)  
 Pin 4 - NC (no connection) (black)



### Safety Output Power (P/M)

Pin 1 - NC (no connection) (brown)  
 Pin 2 - M (white)  
 Pin 3 - NC (no connection) (blue)  
 Pin 4 - P (black)

## Integrated Safety User I/O Connections<sup>(a)</sup>

### Safety Input Connections

Pin 1 - Test Output 1  
 Pin 2 - Safety Input 1  
 Pin 3 - Common  
 Pin 4 - Safety Input 0  
 Pin 5 - Test Output 0



### Safety Output Connections

Pin 1 - NC (no connection)  
 Pin 2 - Safety Sink Output  
 Pin 3 - Common (Safety 24V)  
 Pin 4 - Safety Source Output  
 Pin 5 - Common (Safety 24V)

## Configuring IP Address

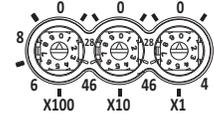
The network address switches are found on the front. The ArmorStart ST controller reads these switches first to determine if they are set to a valid address. The ArmorStart ST controller is shipped with the switches set to 999 and ready for DHCP. If you intend to bump the motor to check rotation either from the HOA or the controller and there is no safety connection, the controller accepts a RUN command, by default. But to accomplish this, you must change the local IP address from DHCP to a fixed address. Do this via the local switches or over RSLink<sup>®</sup>, by setting a valid fixed address. If a safety connection is already present, this out-of-box behavior is not allowed. When bumping the motor is done, you must reset an appropriate IP address for the application needs. For example, if DHCP is required, reset the switches to 999 and cycle power. See ArmorStart ST user manuals, publications [280ES-UM001](#) and [280ES-UM002](#), for details.



**WARNING:** To avoid unintended operation, the ArmorStart ST controller must be assigned a fixed IP address. If a DHCP server is used, it must be configured to assign a fixed IP address for the ArmorStart ST controller. Failure to observe this precaution could result in unintended machine motion or loss of process control.

The setting of 888 causes a reset to defaults. To resume communications, a valid address must be set.

### EtherNet/IP Address Example



## Basic Setup Parameters

### ArmorStart ST Starter



### ArmorStart ST VFD



## Control Module Status and Reset

The Control Module status and diagnostics consist of four light-emitting diode (LEDs) and a Reset button. The following is a brief explanation of the operation of each status indicator that is found on the control module.



LED	Definition	Recommended Action
POWER	This LED is illuminated steady green when switched control power is present and with the proper polarity.	Verify that 24V DC is present on A1 and A2. Check if the local disconnect is in the OFF position.
RUN	This LED is illuminated steady green when a start command and control power are present.	Verify that 24V DC is present on A1 and A3. Check if you are properly commanding to RUN via Instance 162 or 166. Verify that the safety function is satisfied for the safety version controller. Check that the safety I/O module output for SO (P/M) is on.
NETWORK	This bicolor LED is used to indicate the status of the internal network connection.	See LED Status Explanation table on <a href="#">page 7</a> , for information.
FAULT	This LED is used to indicate the fault status of the ArmorStart controller. When the unit is faulted, the unit responds with a specific blink pattern to identify the fault.	See Control Fault Indication on <a href="#">page 6</a> for information.

The Reset button is a local trip reset.

(a) Connector availability is dependent on the type of ArmorStart ST controller that is selected.

### Control Fault Indication

When faulted, the unit responds with a specific FAULT LED blink pattern to identify the fault. The FAULT LED blinks red in a prescribed fault pattern when a protection fault (trip) condition is present. The LED blinks in 0.5 second intervals when indicating a fault code. Once the pattern is finished, there is a 2 s pause after which the pattern is repeated. These faults are also indicated in Trip Status (Parameter 4). Last PR Fault (Parameter 61) identifies the last protection fault that occurred on the ArmorStart controller and can provide more information about the type of fault. You can enable or disable some faults as indicated in the Fault Blink Pattern Explanation table, by using Parameter 24 (Pr Fault Enable). See the ArmorStart ST user manuals, publications [280ES-UM001](#) and [280ES-UM002](#), for more information.

#### Fault Blink Pattern Explanation

Blink Pattern	Parameter 4 (Trip Status) Bit Number	Bulletin 281E Controller		Bulletin 284E Controller		Definition	Action
		Fault Trip Status	Auto-resettable <sup>(1)</sup>	Fault Trip Status	Auto-resettable		
1	0	Short Circuit	No	Short Circuit	No	Short Circuit indicates that the Bulletin 140M motor protector has tripped, or that the internal wiring protection algorithm has detected an unsafe current surge. This fault cannot be disabled.	Determine cause of trip. Try to reset the circuit breaker by using the disconnect handle. If the conditions continue, check power wiring or replace base module.
2	1	Overload	Yes	—	—	The load has drawn excessive current and based on the overload trip class that is selected, the device has tripped. This fault cannot be disabled.	Check that the load is operating correctly and the ArmorStart is properly configured.
		—	—	Overload	Drive Controlled <sup>(2)</sup>	The load has drawn excessive current and based on the overload trip class that is selected, the device has tripped. This fault cannot be disabled.	<ol style="list-style-type: none"> <li>1. Reduce load so drive output current does not exceed the current set Motor DL Current (Parameter 133).</li> <li>2. Check Boost Select (Parameter 184) setting.</li> <li>3. Drive rating of 150% for 1 minute.</li> <li>4. Reduce load or extend Accel Time 200% or when 3 seconds has been exceeded.</li> </ol>
3	2	Phase Loss	Yes	—	—	Indicates a missing supply phase. This fault can be disabled and is disabled by default.	Check that the 3-phase voltage is present at the line side connections.
		—	—	Phase Short	Drive Controlled	Indicates that the drive has detected a phase short. This fault cannot be disabled.	Check the wiring between the drive and motor. Check the motor for grounded phase. Check the motor and drive output terminal wiring for a shorted condition. Replace the drive if the fault cannot be cleared.
4	3	Reserved	—	Ground Fault	Drive Controlled	Indicates that the drive has detected a ground fault. This fault cannot be disabled.	Check the motor and external wiring to the drive output terminals for a grounded condition.
5	4	Reserved	—	Stall	Drive Controlled	Indicates that the drive has detected a stall condition, which indicates the motor, has not reached full speed. This fault cannot be disabled.	Increase Accel Time (Parameters 139/140 or 167/168) or reduce load so drive output current does not exceed the current set by Current Limit 1 (Parameter 189).
6	5	Control Power	Yes	Control Power	Yes	Indicates a loss of control power voltage or a blown control power circuit. This fault can be disabled and is disabled by default.	Check control voltage, wiring, and proper polarity (A1/A2 terminal). Also, check and replace the control voltage fuse, if necessary.
7	6	I/O Fault	Yes	I/O Fault	Yes	This error can indicate a shorted sensor, shorted input device, or input wiring mistakes. It can also indicate a blown output fuse. This fault can be disabled and is disabled by default.	Correct, isolate, or remove the wiring error before restarting the system.
8	7	Over Temperature	Yes	Over Temperature	Yes	Indicates that the operating temperature has been exceeded. This fault cannot be disabled.	Check for blocked or dirty heatsink fins. Verify that ambient temperature has not exceeded 40 °C (104 °F). 1. Clear the fault or cycle power to the drive.
9	8	Phase Imbalance	Yes	—	—	Indicates an imbalance supply voltage. This fault can be disabled and is disabled by default.	Check the power system and correct if necessary.
		—	—	Over Current	Drive Controlled	Indicates that the drive has detected an overcurrent fault. This fault cannot be disabled.	Check programming. Check for excess load, improper Boost Select (Parameter 184) setting. DC brake voltage is set too high or other causes of excess current. SW Current Trip 1 (Parameter 198) has been exceeded, check load requirements and SW Current Trip 1 setting.
10	9	A3 Power Loss	Yes	A3 Power Loss	Yes	Power has been lost or has dropped below the 12V threshold. This fault can be disabled and is disabled by default.	Check the state of the network power supply (A3/A1 terminal) and look for media problems.
11	10	Reserved	—	Internal Comms	No	Indicates that an internal communication fault has been detected. There is a 10 second delay before an F11 Internal Comm fault is present. This fault cannot be disabled.	—
12	11	Reserved	—	DC Bus Fault	Drive Controlled	Power Loss - DC bus voltage remained below 85% of nominal. Undervoltage - DC bus voltage fell below the minimum value. Overvoltage - DC bus voltage exceeded maximum value. This fault cannot be disabled.	Monitor the incoming AC line for low voltage or line power interruption. Check the input fuses. Monitor the AC line for high line voltage or transient conditions. Bus overvoltage can also be caused by motor regeneration. Extend the decel time or install the dynamic brake option.
13	12	EEPROM Fault	No	EEPROM Fault	No	A major fault that renders the ArmorStart controller inoperable. This fault cannot be disabled.	If the fault was initiated by a transient, power cycling can clear the problem, otherwise replacement of the ArmorStart could be required.
14	13	Hardware Fault	No	Hardware Fault	No	Indicates an Internal FAN RPM is low, Internal temperature monitor failure, Internal Brake fuse opened, or incorrect base or control module. This fault cannot be disabled.	Check for a base/starter module mismatch. If no mismatch exists, it might be necessary to replace the ArmorStart unit. (Hdw Flt is the factory-enabled default setting.)
15	14	Reserved	—	Restart Retries	Drive controlled	This fault is generated when the drive detects that the auto retries count has been exceeded. The Restart feature is programmable and it is disabled by default. Therefore, the fault can also be disabled.	Correct the cause of the fault and manually clear.
16	15	Reserved	—	Misc. Fault	Drive controlled	For ArmorStart ST VFD units, this fault is actually the logical AND of several drive faults that are not specifically enumerated. These faults include DB1 Brake fault, Heatsink Over Temperature, Params Defaulted fault, and SVC Autotune fault, which are indicated by the value of the Last Protection Trip parameter (61). This fault cannot be disabled.	<ol style="list-style-type: none"> <li>1. Check for blocked or dirty heatsink fins. Check that ambient temperature has not exceeded 40 °C (104 °F) and mounted properly.</li> <li>2. Clear the fault or cycle power to the drive.</li> <li>3. Program the drive parameters as needed. Restart procedure.</li> <li>4. Check for DB1 fault</li> </ol>

(1) **Auto-resettable Faults:** Some faults on the main control board are auto-resettable. The PrFlt Reset Mode (Parameter 23) determines how a fault is reset. When this parameter is set to the value 0 = manual mode, a local or remote fault reset is required to reset the fault. When this parameter is set to the value 1 = auto reset, faults are cleared automatically when the fault condition goes away. In addition to the Pr FltReset Mode (Parameter 23), the Auto Rstrt Tries (Parameter 192) must be set greater than 0.

(2) Whether or not the drive can be reset is determined by the type of internal drive fault that occurred. For additional information, see ArmorStart ST Motor Controller User Manual, publication [280ES-UM001](#), or ArmorStart ST Motor Controller with Integrated Safety User Manual, publication [280ES-UM002](#).

### EtherNet/IP and Safety LED Status Indication



Network LED status and diagnostics consist of the following LEDs:

- Link Activity/Status LEDs:
  - Link1 Activity/Status (Port 1) – LED Color: Bicolor (Green/Yellow)
  - Link2 Activity/Status (Port 2) – LED Color: Bicolor (Green/Yellow)
- Discrete Input/Output LEDs – LED Color: (Yellow)
- Network – Bicolor LED Red/Green represents the Ethernet Network status. (Located on the Control Module panel.)
- MOD – Bicolor LED Red/Green represents the Ethernet Module status.
- Safety Input/Output – LED Color: Bicolor (Yellow/Red)

#### LED Status Explanation

LED Status	Safety Connection	Standard Connection	Description	Recommended Action
<b>Link1 or Link2 port activity</b>				
Off	–	–	No link is established.	Check network connections.
Green	–	–	Link is established at 100 Mbps.	No action
Flashing Green	–	–	Transmit or receive activity present at 100 Mbps.	No action
Yellow	–	–	Link is established at 10 Mbps.	No action
Flashing Yellow	–	–	Transmit or receive activity present at 10 Mbps.	No action
<b>Discrete Input/Output – IN0...IN6, OUTA, and OUTB</b>				
Off	–	–	You have plugged into the I/O, but the indicator did not illuminate, once initiated.	Check that the wiring of Input or Output is correct. Verify that the corresponding bit is set to Output.
<b>NETWORK</b>				
Off	–	–	The NS LED is not illuminated.	Check to make sure that the product is properly wired and configured on the network.
Steady Green	–	–	CIP™ connection is established.	No action
Flashing Green	–	–	An IP address is configured, but no CIP connections are established, and an Exclusive Owner connection has not timed out.	Check to make sure that the product is properly wired and configured on the network.
Flashing Red	–	–	Connection has timed out.	Check to make sure that the PLC is operating correctly and that there are no media/cabling issues. Check to see if other network devices are in a similar state.
Steady red	–	–	Duplicate IP address detected	Check for node address conflict and resolve.
Flashes Green-Red	–	–	The device has not completed the initialization, is not on an active network, or has not finished self-test at power-up.	Remove or change the IP address of the conflicting device.
<b>Module – MOD</b>				
Off	No power	No power	No power	If no power is supplied to the device, the module status indicator is steady off.
Steady green	Execute/TQ permit	Ready	Ready, configured, and operational	Operating correctly and the PLC is in Run mode.
Flashing Green	Idle/TQ permit	Initializing	Standby	Check configuration or the PLC is not in Run mode.
Flashing Red	Abort	Major recoverable	Major recoverable	Press reset to clear. An incorrect or inconsistent configuration can cause this fault.
Steady red	Major self test fail	Major unrecoverable	Major unrecoverable	If the device has detected a nonrecoverable major fault, see ArmorStart ST Motor Controller User Manual, publication <a href="#">280ES-UM001</a> or ArmorStart ST Motor Controller with Integrated Safety User Manual, publication <a href="#">280ES-UM002</a> , for additional information.
Flashes Green-Red	Wait/configuring	Self test	Device self testing	Wait for self test to complete.
<b>Motion Power – MP</b>				
Off	No power	–	Torque disabled	Check device power. If Hardware or Network STO is not set high, torque will not be permitted. Check wiring and programming if Torque is disabled when it is supposed to be enabled.
Steady green	STO ready	–	Torque permitted	No action.
Flashing Red	STO demand	–	Torque not permitted	The STO Circuit is faulted.
<b>Safety Input – SIO/SI1</b>				
Off	Safety input OFF	–	Input off	Check device power.
Yellow	Safety input ON	–	Input on	No action.
Steady red	Wiring fail	–	Input fault	Check input wiring.
Flashing Red	Configuration fail	–	Partner fault	Dual input configuration issue detected.
<b>Safety Output – SOO/SO1</b>				
Off	Safety output OFF	–	Output off	Check device power. If the Safety Output is supposed to be on, check programming to make sure that it is commanded to be on.
Yellow	Safety output ON	–	Output on	No action.
Steady red	Wiring/configuration fail	–	Output fault	Check input wiring.

## Additional Resources

These documents contain additional information concerning related products from Rockwell Automation. You can view or download publications at [rok.auto/literature](http://rok.auto/literature).

Resource	Description
ArmorStart ST Motor Controller User Manual, publication <a href="#">280ES-UM001</a>	Provides information on how to install, configure, program, and use ArmorStart ST controllers.
ArmorStart ST Motor Controller with Integrated Safety User Manual, publication <a href="#">280ES-UM002</a>	Provides information on how to install, configure, program, and use ArmorStart ST controllers with integrated safety.
On-Machine Media for Armor PowerFlex, ArmorStart, and ArmorConnect Products Selection Guide, publication <a href="#">280PWR-SG001</a>	Provides information on product specifications, ratings, certifications, system interface, wiring diagrams, and dimensions to aid in On-Machine™ media product selection.
ArmorStart ST Distributed Motor Controller Specifications Technical Data, publication <a href="#">280ES-TD001</a>	Provides information on product specifications, ratings, certifications, system interface, wiring diagrams, and dimensions, to aid in product selection.
Applying More Than One ArmorStart Motor Controller in a Single Branch Circuit on Industrial Machinery Application Technique, publication <a href="#">280-AT003</a>	Provides information on multiple ArmorStart controllers in a single branch circuit.
EtherNet/IP Network Devices User Manual, <a href="#">ENET-UM006</a>	Describes how to configure and use EtherNet/IP devices to communicate on the EtherNet/IP network.
Ethernet Reference Manual, <a href="#">ENET-RM002</a>	Describes basic Ethernet concepts, infrastructure components, and infrastructure features.
PowerFlex AC Drive Performance Specifications per Ecodesign Regulation (EU) 2019/1781 and UK SI 2021 No. 745, publication <a href="#">PFLEX-TD003</a>	Provides specifications per EU and UK Ecodesign, including efficiency class.
American Standards, Configurations, and Ratings: Introduction to Motor Circuit Design, publication <a href="#">IC-AT001</a>	Provides an overview of American motor circuit design based on methods that are outlined in the NEC.
Safety Guidelines for the Application, Installation, and Maintenance of Solid-state Control, publication <a href="#">SGI-1.1</a>	Designed to harmonize with NEMA Standards Publication No. ICS 1.1-1987 and provides general guidelines for the application, installation, and maintenance of solid-state control in the form of individual devices or packaged assemblies incorporating solid-state components.
Wiring and Grounding Guidelines for Pulse-width Modulated (PWM) AC Drives, publication <a href="#">DRIVES-IN001</a>	Provides information to install, protect, wire, and ground pulse-width modulated (PWM) AC drives.
Industrial Automation Wiring and Grounding Guidelines, publication <a href="#">I770-4.1</a>	Provides general guidelines for installing a Rockwell Automation industrial system.
Rockwell Automation Global SCCR tool, <a href="http://rok.auto/sccr">rok.auto/sccr</a>	Provides coordinated high-fault branch circuit solutions for motor starters, soft starters, and component drives.
Product Certifications website, <a href="http://rok.auto/certifications">rok.auto/certifications</a>	Provides declarations of conformity, certificates, and other certification details.

## Rockwell Automation Support

Use these resources to access support information.

<b>Technical Support Center</b>	Find help with how-to videos, FAQs, chat, user forums, Knowledgebase, and product notification updates.	<a href="http://rok.auto/support">rok.auto/support</a>
<b>Local Technical Support Phone Numbers</b>	Locate the telephone number for your country.	<a href="http://rok.auto/phonesupport">rok.auto/phonesupport</a>
<b>Technical Documentation Center</b>	Quickly access and download technical specifications, installation instructions, and user manuals.	<a href="http://rok.auto/techdocs">rok.auto/techdocs</a>
<b>Literature Library</b>	Find installation instructions, manuals, brochures, and technical data publications.	<a href="http://rok.auto/literature">rok.auto/literature</a>
<b>Product Compatibility and Download Center (PCDC)</b>	Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes.	<a href="http://rok.auto/pcdc">rok.auto/pcdc</a>

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## Waste Electrical and Electronic Equipment (WEEE)



At the end of life, this equipment should be collected separately from any unsorted municipal waste.

Rockwell Automation maintains current product environmental compliance information on its website at [rok.auto/pec](http://rok.auto/pec).

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

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AMERICAS: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444

EUROPE/MIDDLE EAST/AFRICA: Rockwell Automation NV, Pegasus Park, De Kleetlaan 12a, 1831 Diegem, Belgium, Tel: (32) 2663 0600, Fax: (32) 2 663 0640

ASIA PACIFIC: Rockwell Automation SEA Pte Ltd, 2 Corporation Road, #04-05, Main Lobby, Corporation Place, Singapore 618494, Tel: (65) 6510 6608, FAX: (65) 6510 6699

UNITED KINGDOM: Rockwell Automation Ltd., Pitfield, Kiln Farm, Milton Keynes, MK11 3DR, United Kingdom, Tel: (44)(1908) 838-800, Fax: (44)(1908) 261-917

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