



PowerFlex 750-Series ATEX Option Module

Catalog Number 20-750-ATEX



Allen-Bradley

by ROCKWELL AUTOMATION

User Manual

Original Instructions

Important User Information

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.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.



WARNING: Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.



ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.

IMPORTANT Identifies information that is critical for successful application and understanding of the product.

These labels may also be on or inside the equipment to provide specific precautions.



SHOCK HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.



BURN HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.



ARC FLASH HAZARD: Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

The following icon may appear in the text of this document.



Identifies information that is useful and can help to make a process easier to do or easier to understand.

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Summary of Changes

This manual contains new and updated information as indicated in the following table.

Topic	Page
Changed ATEX to Ex throughout the publication	Throughout
Added UKEx Regulations (2016 No. 1107) to heading	7
Added UKEx Regulations (2016 No. 1107) to Motor Requirements	8
Changed EN 50281-1-1, or according to IEC 61241-1 to EN 60079-31	8
Added UKEx System to heading	10
Changed DIN 440 to DIN 44082	12
Changed IEC 60947-8 or EN to EN/IEC	12, 41
Changed EC-Type-Examination to EU-Type-Examination under ATEX directive	43
Added UKCA (United Kingdom) to Certifications table	43

Introduction

Use this manual if you are responsible for designing, installing, configuring, or troubleshooting applications that use the PowerFlex® 750-Series ATEX option module. The 20-750-ATEX option module applies to the following PowerFlex 750-Series drives:

- PowerFlex 755TL low harmonic, non-regenerative drives
- PowerFlex 755TR regenerative drives
- PowerFlex 755TM drive systems with regenerative bus-supplies and common-bus inverters
- PowerFlex 755TS AC drives
- PowerFlex 755 AC drives
- PowerFlex 753 AC drives

Throughout this manual, PowerFlex 755T drive products are used to refer to PowerFlex 755TL drives, PowerFlex 755TR drives, and PowerFlex 755TM drive systems.

IMPORTANT Read and understand this user manual before you begin to design and install your ATEX system.

Notes:

Safety Concepts

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The PowerFlex® ATEX option module that is installed in a PowerFlex 750-Series drive or PowerFlex 755T drive products and equipped with an 11-Series I/O option module provides an ATEX-compliant safety function. This ATEX-compliant function provides a safe turn-off for equipment that is installed in a potentially explosive atmosphere according to 2014/34/EU.

ATEX Directive 2014/34/EU and UKEx Regulations (2016 No. 1107)

The PowerFlex 750-Series drives and PowerFlex 755T drive products, together with the ATEX and 11-Series I/O option modules, are compliant safety devices under the ATEX Directive and UKEx Regulations, and satisfy requirements for use in Group II, Category 2, (GD) applications with ATEX approved motors as described here:

- Group II – The motor is installed in a potentially explosive atmosphere that is not in a mine.
- Category 2 – The motor is likely to be exposed to an explosive atmosphere. A high level of protection is required.
- GD – The explosive atmosphere consists of a mixture of (G) gas vapors and (D) dust that can cause an explosion.

Certification of the drive for the ATEX group and category on its nameplate is based on installation, operation, and maintenance according to these items:

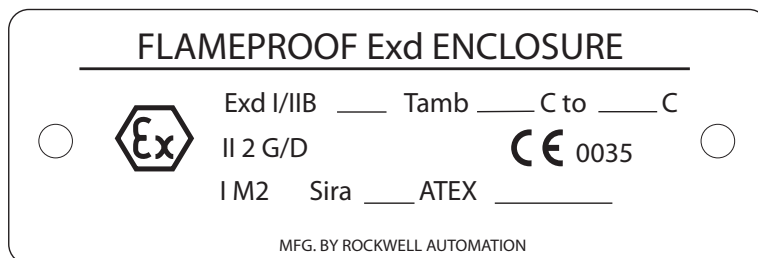
- This user manual
- The requirements in the drive user manual and installation instructions
- The instruction manual for the motor



ATTENTION: Follow all procedures in the standard installation and user manuals for the ATEX-certified drive with an ATEX-certified motor. You must also follow all additional instructions in this PowerFlex 750-Series ATEX Option Module User Manual. Equipment damage and/or personal injury can result if all additional instructions in this user manual are not followed.

Motor Requirements

- The motor must be manufactured under the guidelines of the ATEX Directive 2014/34/EU and UKEx Regulations (2016 No. 1107). The motor must be installed, operated, and maintained according to the instructions of the motor manufacturer.
- Only motors with nameplates that are marked for use on an inverter power source, and labeled for specific hazardous areas, can be used in hazardous areas on inverter (variable frequency) power.
- When the motor is rated ATEX Group II, Category 2 for use in gas environments (category 2G), the motor must be of flameproof construction, or Ex d (according to EN 60079-1). Group II motors are marked with a temperature or a temperature code.
- When the motor is rated ATEX Group II, Category 2 for use in dust environments (category 2D), you **must** protect the motor with an enclosure (according to EN 60079-31: Ex tD). Group II motors are marked with a temperature.
- The motor over-temperature signal is supplied to the drive by one of two methods:
 - A normally closed contact (open during over temperature condition) compatible with the digital (logic) input circuitry of the drive. If multiple sensors are required in the motor, the connection at the drive must be the result of all required contacts that are wired in series.
 - A positive temperature coefficient (PTC) type of thermal sensor. See [Appendix A](#) for specifications.
- See all product markings for additional cautions.
- Typical motor markings are contained on a motor certification nameplate similar to the sample here.



About the PowerFlex 750-Series ATEX Option Module

The PowerFlex ATEX option module and the 11-Series I/O option module for PowerFlex 750-Series AC drives and PowerFlex 755T drive products are safety system components of the equipment and protective systems. The option modules are intended for equipment that is used in potentially explosive atmospheres (Ex). Perform a risk assessment and safety analysis of the operating atmosphere and the ATEX system components before you begin this Ex installation:

- PowerFlex 750-Series drive
- PowerFlex 755TL low harmonic drives ⁽¹⁾
- PowerFlex 755TR regenerative drives ⁽¹⁾
- PowerFlex 755TM drive systems ⁽¹⁾
- PowerFlex 755TS AC drives
- Motor
- ATEX option module
- 11-Series I/O option module

Using the PowerFlex 750-Series ATEX Option Module with an 11-series I/O Option Module

The ATEX option module with the 11-Series I/O option module enables a PowerFlex 750-Series drive and PowerFlex 755T drive products to be used in Ex installations. The ATEX option module helps to reduce the risk of explosion due to an over-temperature condition in an Ex approved motor. In an Ex installation, the motor is installed in a potentially explosive atmosphere, while the drive is installed outside of the potentially explosive atmosphere. See [Figure 1](#).



WARNING: Risk of Explosion.

Do not install the PowerFlex 750-Series drive or PowerFlex 755T drive products in a potentially explosive atmosphere.

A drive that is installed in a potentially explosive atmosphere can cause an explosion.

(1) Throughout this manual, the PowerFlex 755TL low harmonic drives, PowerFlex 755TR regenerative drives, and PowerFlex 755TM drive systems are also referred to as PowerFlex 755T drive products.

Catalog Numbers for ATEX and 11-Series I/O Option Modules

This table lists the catalog numbers for the ATEX option module and the compatible 11-Series I/O option modules.

ATEX Option Module Cat. No.	11-Series I/O Option Module Cat. No.	Description
20-750-ATEX	20-750-1132D-2R	115V AC digital input Two relay outputs, digital
	20-750-1133C-1R2T	24V DC digital input Two transistor outputs, one relay output, digital
	20-750-1132C-2R	24V DC digital input Two relay outputs, digital

Catalog Numbers for Spare Terminal Plugs

This table contains the catalog numbers for the 11-Series I/O option module spare terminal plug kits.

Cat. No.	Spare Terminal Plug Kit
SK-R1-SCRWTB-EIO	Screw-down terminal plugs spare kit (set of three)
SK-R1-SPRGTB-EIO	Spring-clamp terminal plugs spare kit (set of three)

ATEX System and UKEx System

The overall system includes an Ex certified motor that is installed in a potentially explosive atmosphere. The motor is equipped with a thermal sensor that is connected to the ATEX option input. Do not install the drive in a potentially explosive atmosphere. See [Figure 1](#).



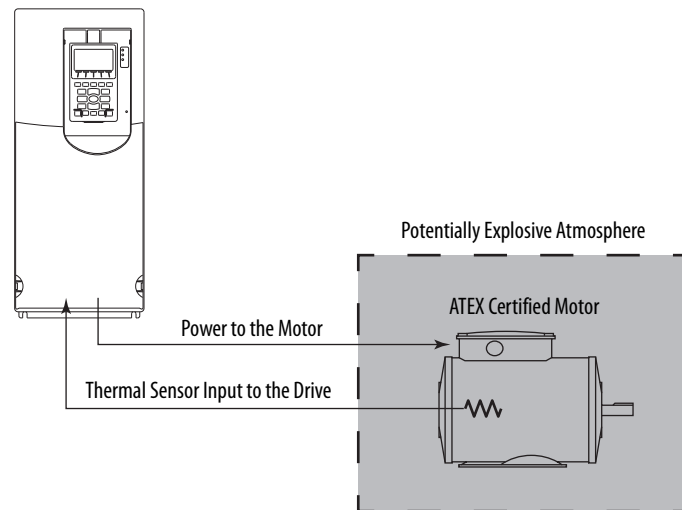
WARNING: Risk of Explosion.

Do not install the PowerFlex 750-Series drive or PowerFlex 755T drive products in a potentially explosive atmosphere.

A drive that is installed in a potentially explosive atmosphere can cause an explosion.

Figure 1 - Basic ATEX Application

PowerFlex 750-Series Drive or PowerFlex 755T drive products (750-Series drive shown)



The ATEX option module monitors the thermal sensor in the motor. When the thermal sensor reaches its trip point, the drive initiates a Safe Torque Off function and removes torque-producing power from the motor. The ATEX safety function has a safety integration level (SIL) capability limit of 1 according to IEC 61508.

ATEX Function

The PowerFlex 750-Series ATEX option module can be configured to support Ex certified motors that are equipped with either a thermostat or a PTC-type thermal sensor.



ATTENTION: Risk of electric shock. If a motor insulation fault occurs, high voltage can be present at the ATEX terminal block and wiring. Be sure that all drive covers are installed when power is applied to the drive.

Thermostat Trip

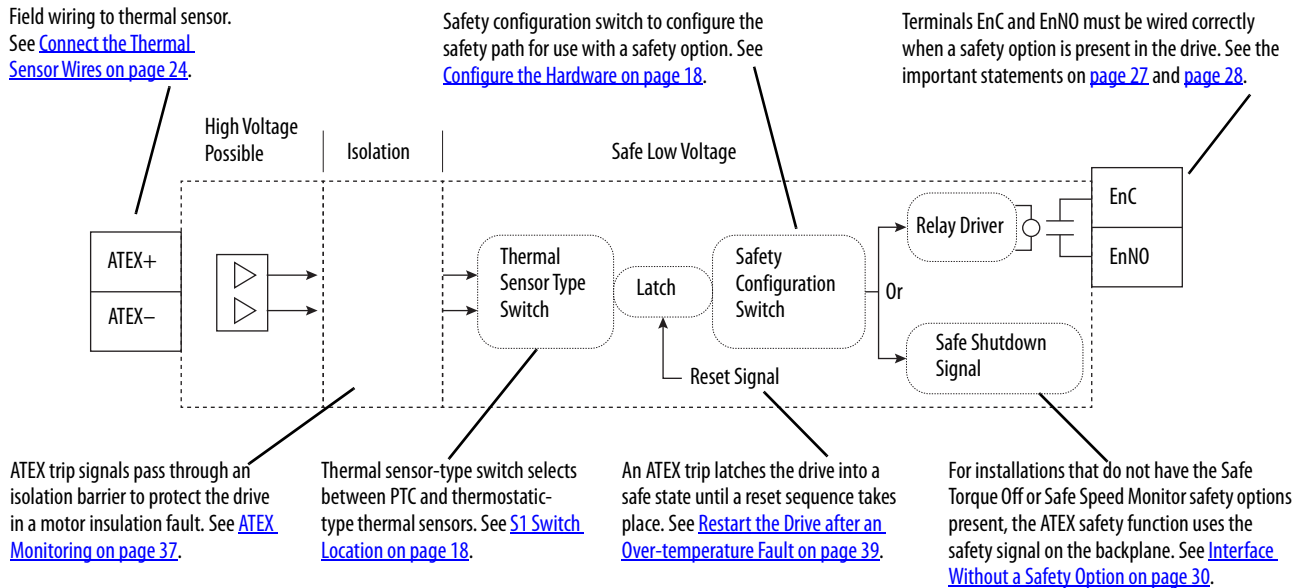
When the circuit is configured to trip with a thermostat, the ATEX option module supports a normally closed, dry-contact thermostat. The safe-off function initiates when the ATEX option module detects that the contact is open. This trip can be the result of a broken wire, or an over-temperature condition in the motor.

Positive Temperature Coefficient (PTC) Trip

When the circuit is configured to trip with a PTC-type thermal sensor, the ATEX option module supports sensors with characteristics according to DIN 44081/DIN 44082. The ‘Mark A’ measuring circuit on the ATEX option module is designed in accordance to EN/IEC 60947-8. This circuit trips when the motor temperature has reached its trip point, or an open-wire/short-circuit condition is detected in the sensor circuit.

Loss of voltage to the measuring circuit also initiates the safe-off function. The ATEX option module internally sources this voltage.

Figure 2 - ATEX Circuitry



Safe State

The safe state includes all operation that occurs outside of the other monitoring and stopping behavior that is defined as part of the ATEX option module. The ATEX safety function, as provided by the ATEX option module, places the drive in a safe state by removing the power from the gate firing circuits of the output power devices (IGBTs).

Hardware Fault Tolerance

Hardware fault tolerance is the minimum number of faults that can cause a loss of the safety function as defined by EN 61800-5-2 and IEC 61508 Part 2. The overall ATEX function has a hardware fault tolerance of zero.

IMPORTANT If one fault occurs in the safety path, the safety function can become compromised.

Safety Reaction Time

The safety reaction time is the amount of time from a safety-related event as input to the system until the system is in the safe state.

The safety reaction time from an input signal trigger to the initiation of the ATEX safety function.

Table 1 - Safety Reaction Time

Drive	Safety Reaction Time
PowerFlex 753 drives	30 ms (max)
PowerFlex 755 drives	
PowerFlex 755TL low harmonic drives	
PowerFlex 755TR regenerative drives PowerFlex 755TM drive systems	

Contact Information If Safety Option Failure Occurs

If you experience a failure with any safety-certified device, contact your local Allen-Bradley distributor to do the following:

- Return the device to Rockwell Automation so the failure is appropriately logged for the catalog number that is affected and a record is made of the failure.
- Request a failure analysis (if necessary) to determine the probable cause of the failure.

Notes:

Installation and Wiring

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You must follow the installation steps that are described in this installation and wiring section. The PowerFlex® 750-Series ATEX option module with an 11-Series I/O module is part of an Ex safety control system.



ATTENTION: Only qualified personnel familiar with adjustable frequency AC drives and associated machinery can plan or implement the installation, startup, and subsequent maintenance of the system. Failure to comply can result in personal injury and/or equipment damage.



ATTENTION: The following information is a guide for proper installation. Rockwell Automation does not assume responsibility for the compliance or the noncompliance to any code, national, local, or otherwise, for the proper installation of this equipment. Personal injury and/or equipment damage can occur if codes are ignored during installation.

Perform a Risk Assessment of the Operational Environment

Before you begin the installation, perform a risk assessment to compare the ATEX option specifications with the potentially explosive atmosphere where you want to install the system. See [Safety Concepts on page 7](#).

■ Perform a Safety Analysis of the Motor

The Ex safety system includes the thermal sensor in the motor and the wiring to the ATEX daughter card. [Verify Operation on page 31](#) gives methods for functional tests of the system from the input to the ATEX daughter card, but these tests do not verify the thermal sensor response or the wiring from the motor. Follow the recommendations of the motor manufacturer for safe use of the motor in Ex installations and possible functional test procedures.

■ Remove Power to the System

Before performing any work on the drive, remove all power to the system.



ATTENTION:

- Electric Shock Hazard. Verify that all sources of AC and DC power are de-energized and locked out or tagged out in accordance with the requirements of ANSI/NFPA 70E, Part II.
- To avoid an electric shock hazard, verify that the voltage on the bus capacitors has discharged before performing any work on the drive. Measure the DC bus voltage at the +DC and -DC terminals or test points. The voltage must be zero.

For the location of the terminal block and test point sockets, see the manual for your drive:

- PowerFlex 750-Series AC Drives Installation Instructions, publication [750-IN001](#).
 - PowerFlex 750-Series Products with TotalFORCE® Control Installation Instructions, publication [750-IN100](#).
 - PowerFlex 755TM IP00 Open Type Kits Installation Instructions, publication [750-IN101](#).
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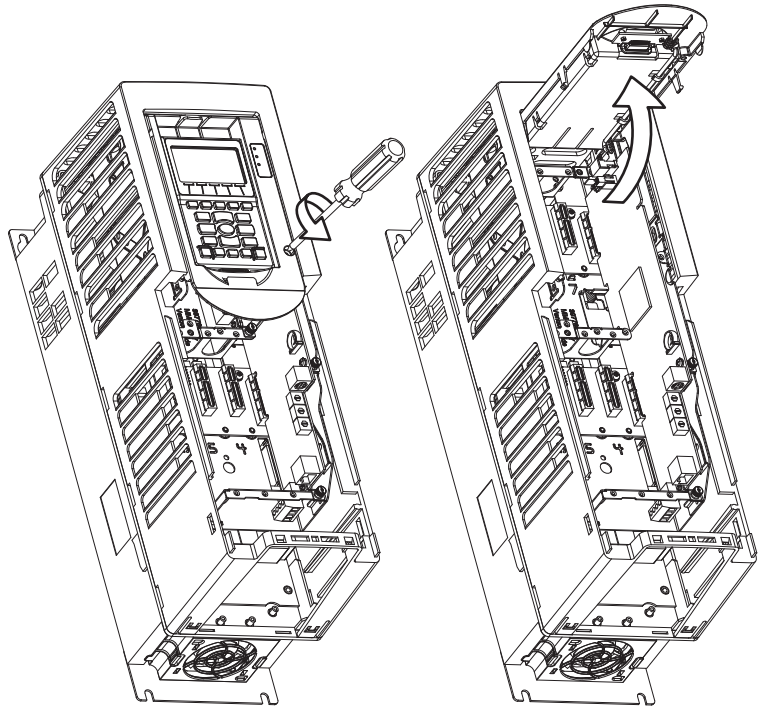
Access the Control Pod

The option module is installed in the drive control pod. Different drives have different ways to access the control pod.

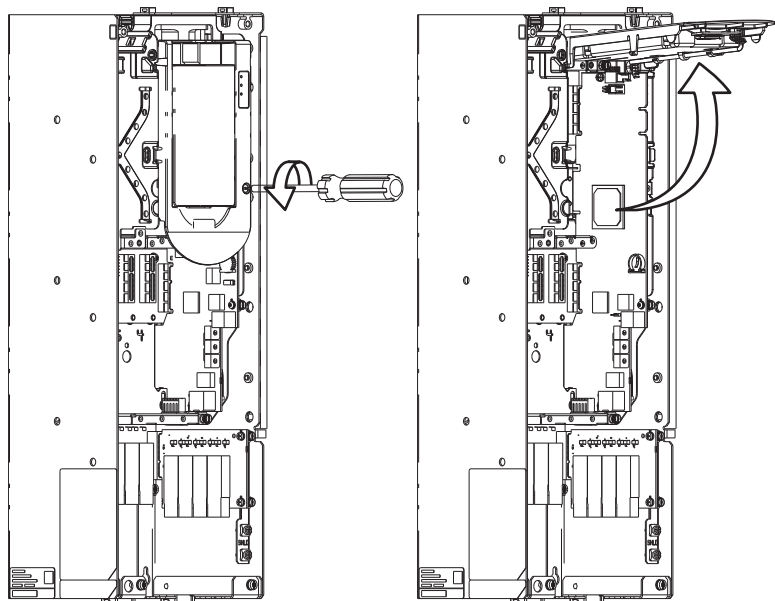
To access the control pod, follow these steps.

1. Open the door or remove the cover.
2. Loosen the retention screw on the HIM cradle.

3. Lift the cradle until the latch engages.



Panel-mounted Drives



Drives in Cabinet Enclosures

See the installation instructions for your drive for more information.

Configure the Hardware

The ATEX option module can be used in two different configurations:

- ATEX option module and 11-Series I/O option module that is used **without** an additional safety option module. See [page 20](#).
- ATEX option module and 11-Series I/O option module that is used **with** an additional safety option module, including:
 - PowerFlex 750-Series Safe Torque Off (catalog number 20-750-S)
 - PowerFlex 750-Series Safe Speed Monitor (catalog number 20-750-S1) option module
 - PowerFlex 755/755T Integrated Safety - Safe Torque Off (catalog number 20-750-S3)
 - PowerFlex 755/755T Integrated Safety Functions (catalog number 20-750-S4)
- See [page 21](#) for additional information.

S1 Switch Location

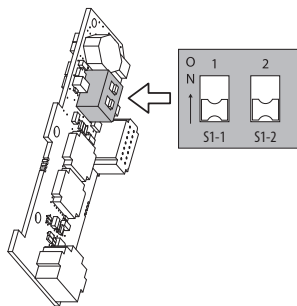


ATTENTION: Hazard of electric shock exists. Do not remove the insulation wrapper from the ATEX option module. Removal of the insulation wrapper can cause an electric shock hazard, and can cause damage to the drive.

See [Figure 3](#) for the location of the S1 switches on the ATEX option module:

- S1-1 is the safety configuration switch.
- S1-2 is the thermal sensor switch.

Figure 3 - ATEX Option Module S1 Switch Location



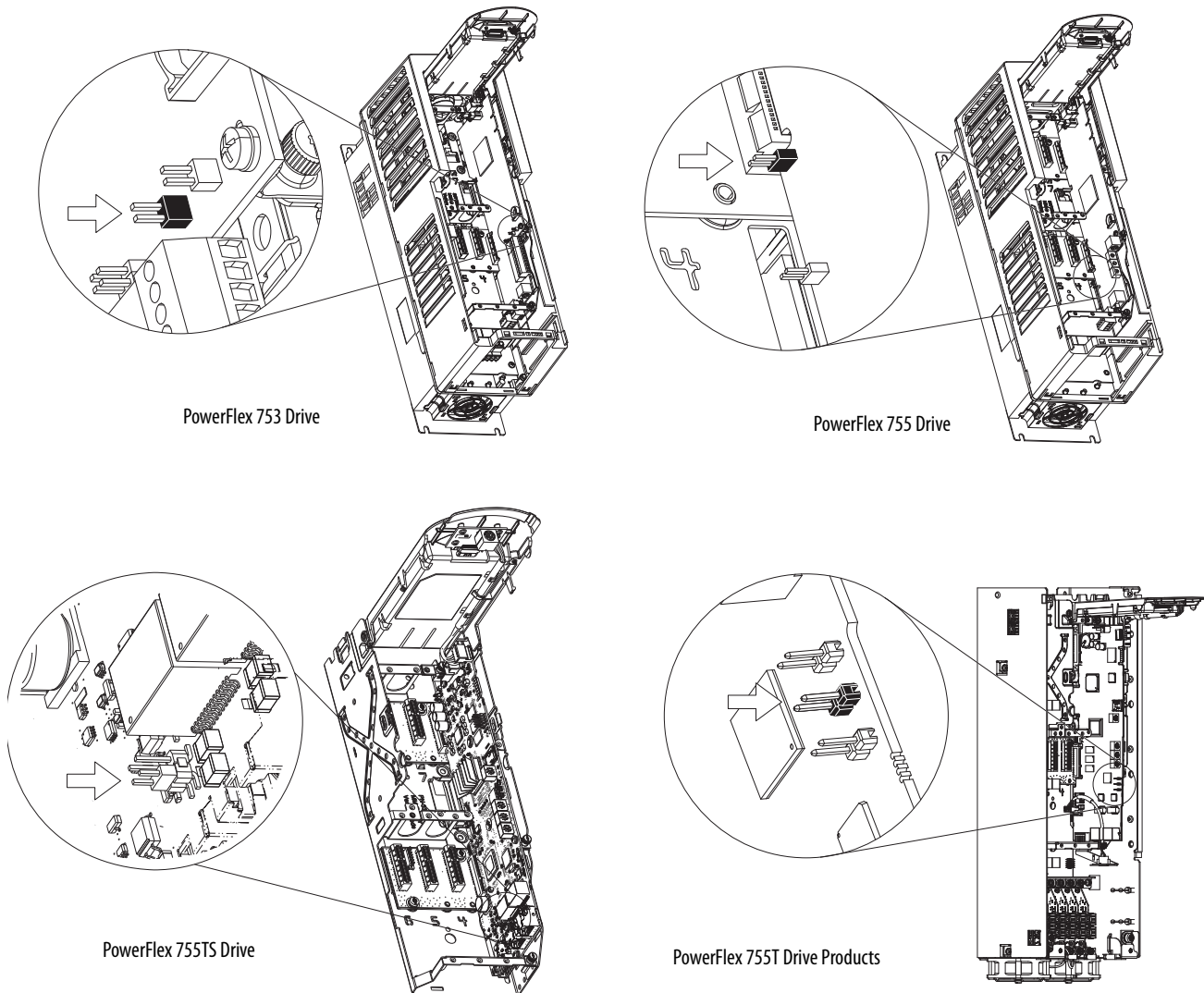
In this diagram, the ATEX option module is shown without the insulation wrapper. **Do not** remove the insulation wrapper from the ATEX option module.

Safety Enable Jumper Locations

See [Figure 4](#) for the location of the safety enable jumper on the main control board of the PowerFlex 750-Series drives and 755T drive products.

IMPORTANT PowerFlex 755 floor mount Frame 8 drives and larger do not have a safety enable jumper.

Figure 4 - Safety Enable Jumper Locations on the Main Control Board

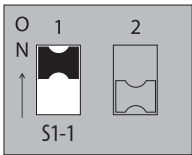
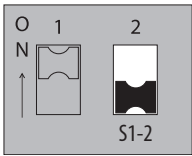
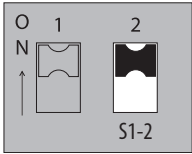


ATEX Option Module and 11-Series I/O Option Module without a Safety Option Module

To configure the ATEX option module with 11-Series I/O option module for use **without** an additional safety module, follow these steps.

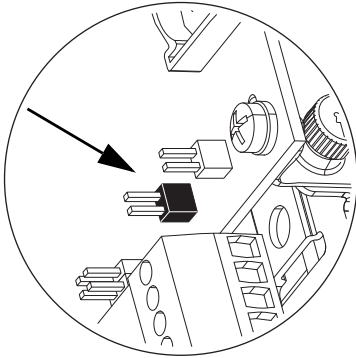
Normally you can only use one safety option module at a time on a drive. If you use two safety cards in a drive, a device conflict occurs. However, the ATEX option module with 11-Series I/O option module can have one additional safety module configured for use simultaneously, see [ATEX Option Module and 11-Series I/O Option Module with a Safety Option Module](#).

1. Set switch S1-1 to ON.
2. Set switch S1-2 for Thermostat mode or PTC mode.

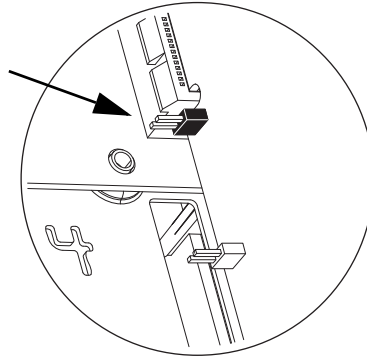
Switch	Setting	Description
S1-1	ON 	Configures the ATEX option module for use without an additional safety option module.
S1-2	OFF 	Configures the ATEX option module for Thermostat mode, over-temperature monitoring. Can be used with PTC-type thermal sensors if short circuit monitoring is not needed.
	ON 	Configures the ATEX option module for PTC mode. Provides both over-temperature and short circuit monitoring.

3. Install the safety enable jumper on the main control board.

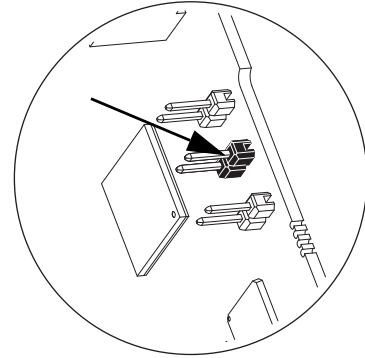
IMPORTANT The default setting of the safety enable jumper = installed.
For this step, verify that the safety enable jumper is **installed**.



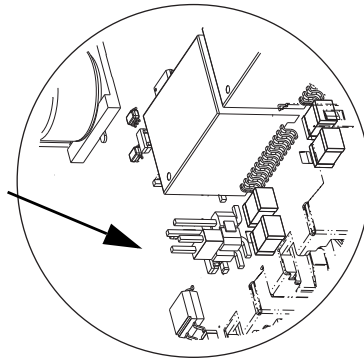
PowerFlex 753 Drive



PowerFlex 755 Drive



PowerFlex 755T Drive Products



PowerFlex 755TS Drive

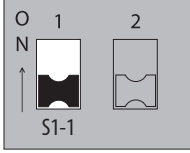
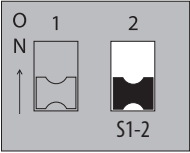
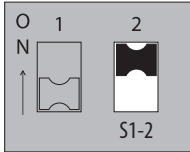
ATEX Option Module and 11-Series I/O Option Module with a Safety Option Module

An ATEX option module with 11-Series I/O option module can have one of the following additional safety modules configured for use simultaneously:

- PowerFlex 750-Series Safe Torque Off (catalog number 20-750-S)
- PowerFlex 750-Series Safe Speed Monitor (catalog number 20-750-S1)
- PowerFlex 755/755T Integrated Safety - Safe Torque Off (catalog number 20-750-S3)
- PowerFlex 755/755T Integrated Safety Functions (catalog number 20-750-S4)

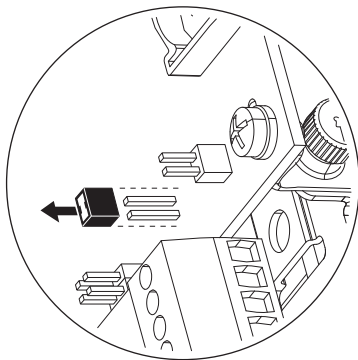
To configure the ATEX option module with 11-Series I/O option module for use with one of these option modules, follow these steps.

1. Set switch S1-1 to OFF.
2. Set switch S1-2 for Thermostat mode or PTC mode.

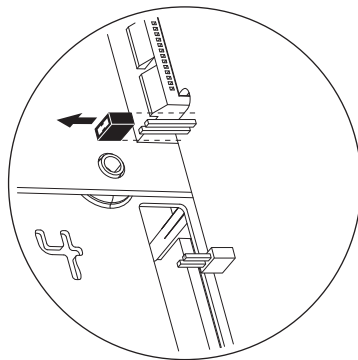
Switch	Setting	Description
S1-1	OFF 	Configures the ATEX option module for use with an additional safety option module.
S1-2	OFF 	Configures the ATEX option module for Thermostat mode, over-temperature monitoring. Can be used with PTC-type thermal sensors if short circuit monitoring is not needed.
	ON 	Configures the ATEX option module for PTC mode. Provides both over-temperature and short circuit monitoring.

3. Slide the safety enable jumper off the pins on the main control board.

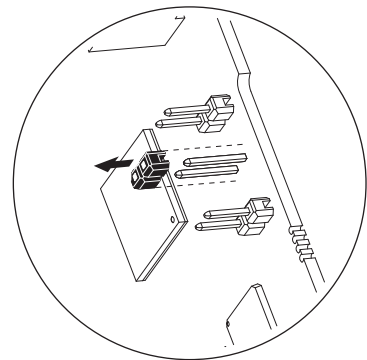
IMPORTANT The default setting of the safety enable jumper = installed.
For this step, verify that the safety enable jumper is **removed**.



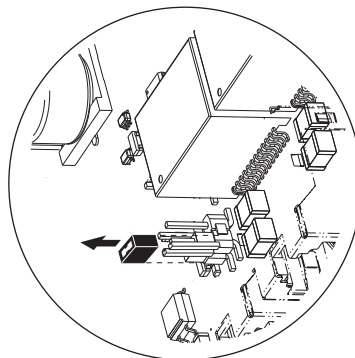
PowerFlex 753 Drive



PowerFlex 755 Drive



PowerFlex 755T Drive Products



PowerFlex 755TS Drive

Configuration of the safety enable jumper on the main control board is a requirement of each safety option module. For more information on these requirements, see the specific option module user manual:

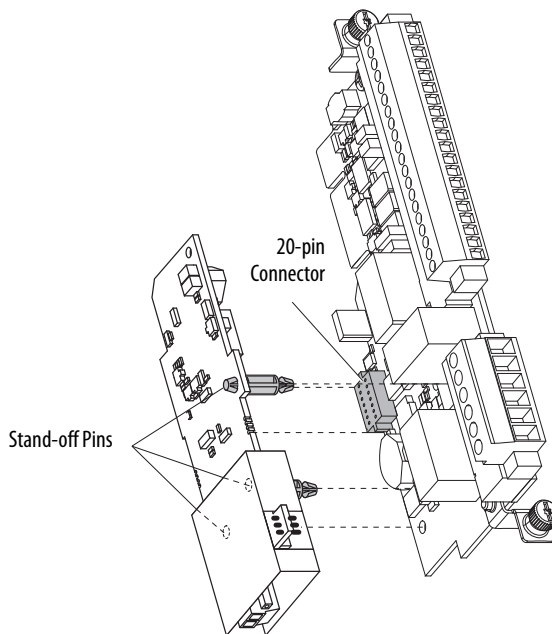
- PowerFlex 750-Series Safe Torque Off User Manual, publication [750-UM002](#)
- PowerFlex 750-Series Safe Speed Monitor Option Module Safety Reference Manual, publication [750-RM001](#)
- PowerFlex 755/755T Integrated Safety - Safe Torque Off Option Module, publication [750-UM004](#).
- PowerFlex 755/755T Integrated Safety Functions Option Module, publication [750-UM005](#).

Assemble the ATEX and 11-Series I/O Option Modules

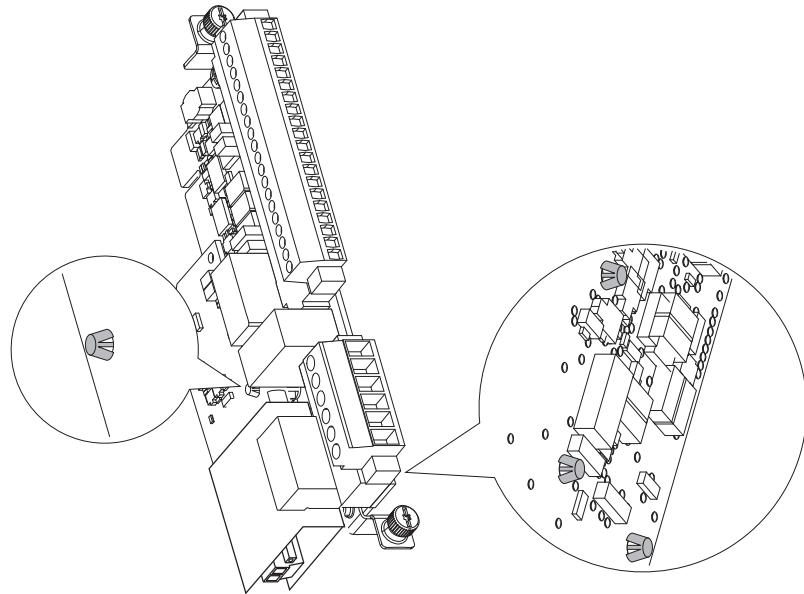
After the S1 switches and safety enable jumper are set for your application, join the ATEX option module with the 11-Series I/O option module.

IMPORTANT Verify that the ATEX function switches are configured correctly for your application before mounting on the 11-Series I/O option module. Once the module is snapped into place, the switches are no longer accessible.

1. Align the stand-off pins and the 20-pin connector.

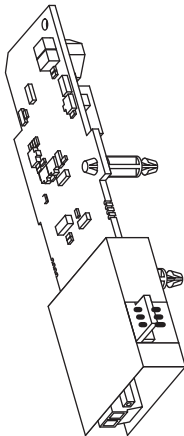


2. Pass the tips of the standoff pins through both boards so that the tip completely expands.



Connect the Thermal Sensor Wires

20-750-ATEX



Connect the thermal sensor wires to the removable terminal block of the ATEX option module.

Table 2 - ATEX Terminal Designations

	Terminal	Name	Description	Related Parameter
	ATEX+	ATEX input (+)	Motor protection device input.	Parameter 41 [ATEX Sts] See Parameter 41 [ATEX Sts] on page 37 .
	ATEX-	ATEX input (-)	Thermostat or PTC-type device. Polarity can be ignored.	

Cabling Requirements

Follow these requirements for thermal sensor wiring to the removable terminal block of the ATEX option module:

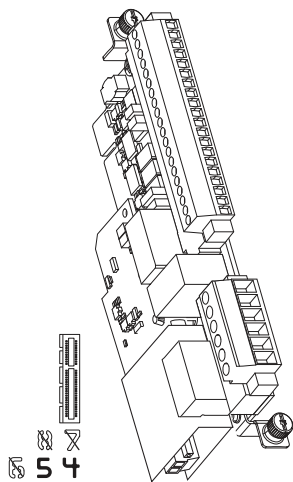
- Use cable duct, conduit, armored cable, or other means to help protect the thermal sensor wires from damage.
- Use shielded, twisted-pair cable.

Installation Requirements

Installation must meet the radio frequency (RF) emission compliance and installation requirements that are outlined in the installation instructions:

- PowerFlex 750-Series AC Drives Installation Instructions, publication [750-IN001](#).
- PowerFlex 750-Series Products with TotalFORCE Control Installation Instructions, publication [750-IN100](#).
- PowerFlex 755TM IP00 Open Type Kits Installation Instructions, publication [750-IN101](#).

Install the ATEX Option Module Assembly



To install the ATEX option module with 11-Series I/O option module assembly in the drive, follow these steps.

1. Remove power from the drive and verify that the voltage on the bus capacitors has discharged.



ATTENTION:

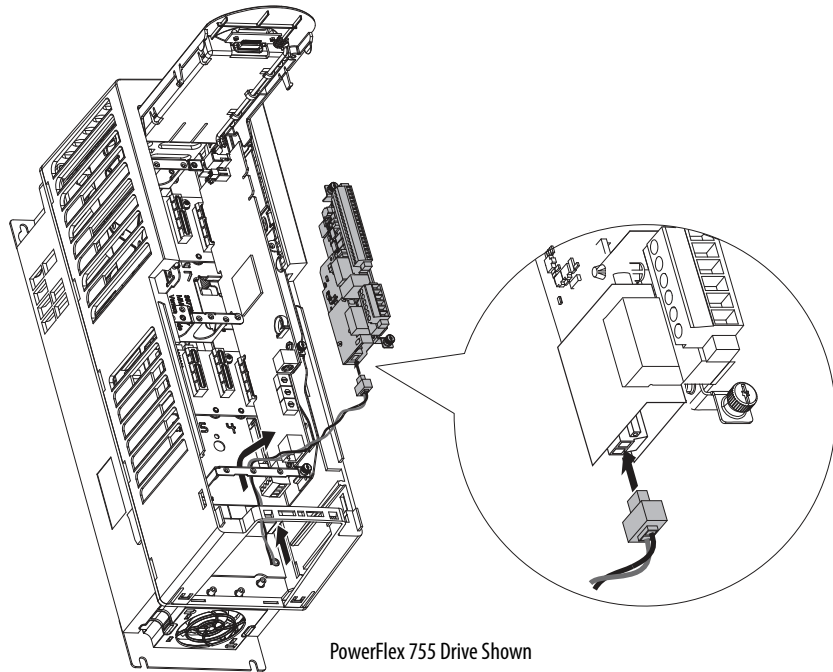
- Electric Shock Hazard. Verify that all sources of AC and DC power are de-energized and locked out or tagged out in accordance with the requirements of ANSI/NFPA 70E, Part II.
- To avoid an electric shock hazard, verify that the voltage on the bus capacitors has discharged before performing any work on the drive. Measure the DC bus voltage at the +DC and -DC terminals or test points. The voltage must be zero.

For the location of the terminal block and test point sockets, see the manual for your drive:

- PowerFlex 750-Series AC Drives Installation Instructions, publication [750-IN001](#).
- PowerFlex 750-Series Products with TotalFORCE Control Installation Instructions, [750-IN100](#).
- PowerFlex 755TM IP00 Open Type Kits Installation Instructions, [750-IN101](#).

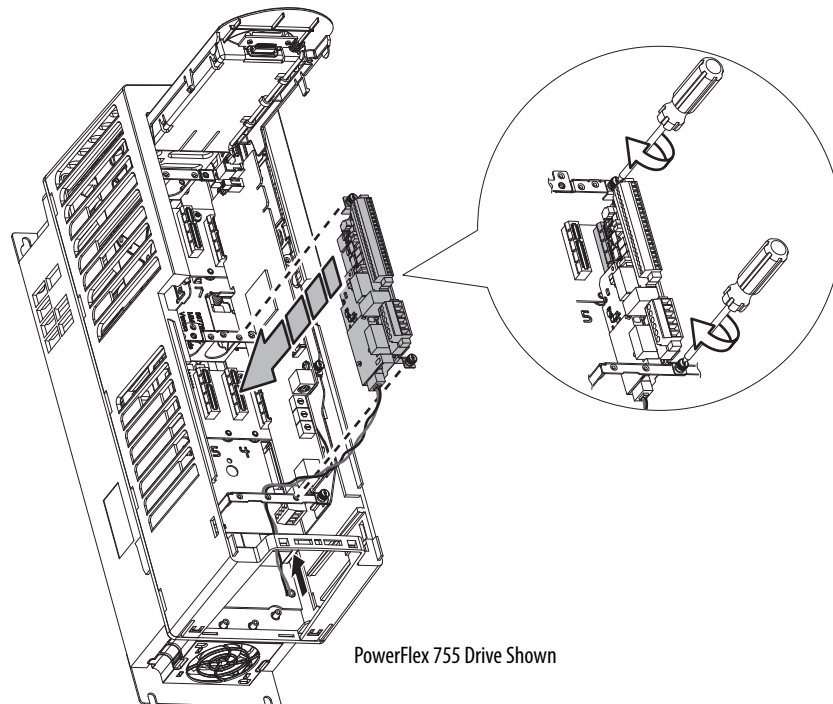
2. Route the thermal sensor wires that are attached to the ATEX removable terminal block under the lower mounting bracket.

TIP Leave enough length in the cable so that you can remove the option module in the future, if needed.



3. Plug in the removable terminal block and secure the screws before installing the assembly on the backplane.
4. Firmly press the 11-Series I/O option module edge connector into port 4 or port 5.

IMPORTANT The ATEX option module that is mounted on an 11-Series I/O option module can be installed only in drive ports 4 or 5.



5. Tighten the top and bottom retaining screws:
 - Recommended torque = 0.45 N•m (4.0 lb•in)
 - Recommended screwdriver = T15 Hexalobular



IMPORTANT Do not overtighten the retaining screws.

PowerFlex 750-Series Safe Torque Off Option Wiring

The ATEX option module with 11-Series I/O option module can be used with the Safe Torque Off (catalog number 20-750-S) option module. For information about the Safe Torque Off option module, see the PowerFlex Safe Torque Off User Manual, publication [750-UM002](#).



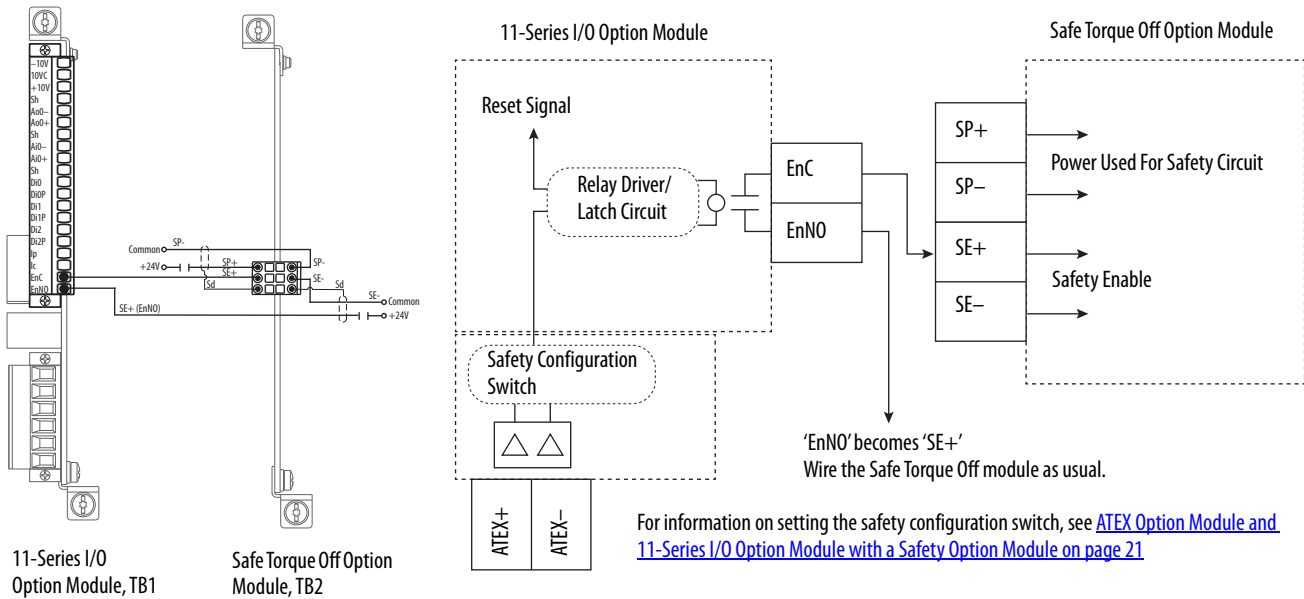
WARNING: Risk of Explosion.

If any changes are made to an installed system, the operation of that system must be verified. These changes include installation, removal, or modification of ATEX or functional safety options. Failure to verify that the operation of a completed installation can result in a safety system that does not function correctly. See [Verify Operation on page 31](#).

IMPORTANT When a safety option is installed with the ATEX option, you must wire the EnC and EnNO dry contacts.

[Figure 5](#) describes the wiring of the 11-Series I/O option module with the Safe Torque Off option module.

Figure 5 - Connecting the ATEX Option with a Safe Torque Off Option



Operating Principle

The dry contact on the 11-Series I/O option module interrupts the safe enable input (SE+) on the Safe Torque Off option module. The maximum SIL capability of the ATEX function is SIL 1. The maximum SIL capability of the equipment that uses the Safe Torque Off option module remains the same.

Safe Speed Monitor Option Wiring

The ATEX option module with 11-Series I/O option module can be used with the Safe Speed Monitor (catalog number 20-750-S1) option module. For information about the Safe Speed Monitor option module, see the PowerFlex 750-Series Safe Speed Monitor Option Module Safety Reference Manual, publication [750-RM001](#).



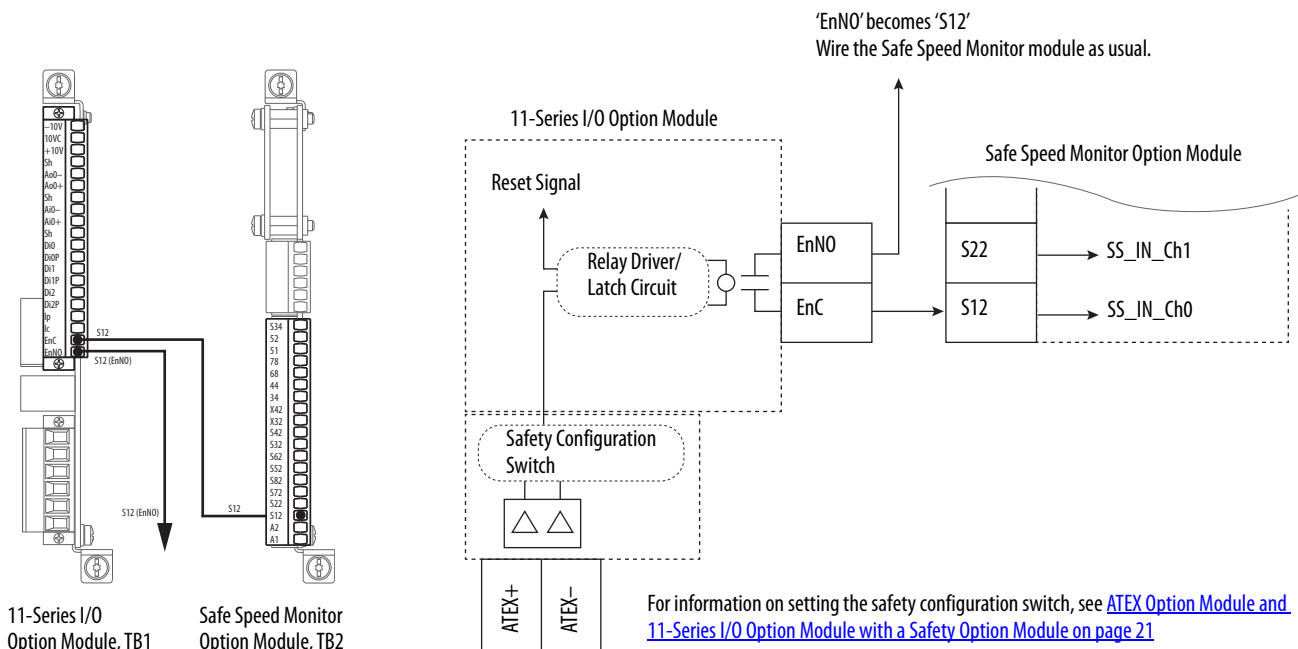
WARNING: Risk of Explosion.

If any changes are made to an installed system, the operation of that system must be verified. These changes include installation, removal, or modification of ATEX or functional safety options. Failure to verify that the operation of a completed installation can result in a safety system that does not function correctly. See [Verify Operation on page 31](#).

IMPORTANT When a safety option is installed with the ATEX option, you must wire the EnC and EnNO dry contacts.

[Figure 6](#) illustrates the wiring of the 11-Series I/O option module with the Safe Speed Monitor option module.

Figure 6 - Connecting the ATEX Option with a Safe Speed Monitor Option



Operating Principle

The dry contact on the 11-Series I/O option module interrupts the safe stop input channel 0 (SS_IN_CH0 pin S12) on the Safe Speed Monitor option module. The maximum SIL capability of the ATEX function is SIL 1. The maximum SIL capability of the equipment that uses the Safe Speed Monitor option module remains the same.

Safe Speed Monitor (SSM) Configuration Requirements



WARNING: Risk of Explosion.

You must set parameter 44 [Safe Stop Input] and parameter 45 [Safe Stop Type] to one of the options that are defined in this section.

Setting the parameters to a different option can result in an explosion.

The following Safe Speed Monitor parameters enable the ATEX function to immediately remove power to the motor in case of an ATEX fault condition.

You **must** set parameter 44 [Safe Stop Input] to one of these options:

- 1 - 2NC
- 3 - 1NC+1NO

You **must** set parameter 45 [Safe Stop Type] to one of these options:

- 0 - Torque Off
- 3 - Trq OffNoCk

Integrated Safety - Safe Torque Off Option Module

The ATEX option module with 11-Series I/O option module can be used with the PowerFlex 755/755T Integrated Safety - Safe Torque Off (catalog number 20-750-S3) option module. For information about the Integrated Safety - Safe Torque Off option module, see the PowerFlex 755/755T Integrated Safety - Safe Torque Off Option Module User Manual, publication [750-UM004](#).



WARNING: Risk of Explosion

If any changes are made to an installed system, the operation of that system must be verified. These changes include installation, removal, or modification of ATEX or functional safety options. Failure to verify that the operation of a completed installation can result in a safety system that does not function correctly. See Verify Operation on page 31.

IMPORTANT When a safety option is installed with the ATEX option, you must wire the EnC and EnNO dry contacts.

PowerFlex 755/755T Integrated Safety Functions Option Module

The 20-750-ATEX option can be wired to the safety input on an Integrated Safety Functions Option Module (20-750-S4). This is a general-purpose safety input, so you are responsible for the GuardLogix programming logic to tie the input to the SO.STOOutput tag. See the PowerFlex 755/755T Integrated Safety Functions Option Module User Manual, publication [750-UM005](#) for more information about the Integrated Safety Functions Option Manual.



WARNING: Risk of Explosion

If any changes are made to an installed system, the operation of that system must be verified. These changes include installation, removal, or modification of ATEX or functional safety options. Failure to verify that the operation of a completed installation can result in a safety system that does not function correctly. See Verify Operation on page 31.

IMPORTANT When a safety option is installed with the ATEX option, you must wire the EnC and EnNO dry contacts.

Reset the Drive after an SSM Fault Detection

The reset sequence depends on the configuration of the reset type for the SSM. To reset the drive, follow these steps.

1. Clear the ATEX fault condition.
2. Issue a clear fault command.
3. Cycle the safety device that is wired to both channels of the safe stop input so that both SS_IN_CHx inputs are cycled low to high.

If the SSM reset type is 'automatic', the drive is fully reset. Manual and Manual-monitored modes require the reset input to the SSM card to be either high, or cycled before the drive is fully reset.

Interface Without a Safety Option

The ATEX option module with the 11-Series I/O option module can be used without a safety option with the safety signal on the backplane. The EnC and EnNO contacts can be left unwired.

Verify Operation

Topic	Page
Description of Functionality	31
Motors with Thermostatic Switches	32
Motors with Positive Temperature Coefficient (PTC) Devices	33
Functional Proof Testing without a Test Fixture	34

Test the safety function for proper operation after initial installation and after the drive system is modified. We recommend annual functional testing during regular maintenance intervals.



WARNING: Risk of Explosion.

If any changes are made to an installed system, the operation of that system must be verified. These changes include installation, removal, or modification of ATEX or functional safety options. Failure to verify that the operation of a completed installation can result in a safety system that does not function correctly. See [Verify Operation on page 31](#).

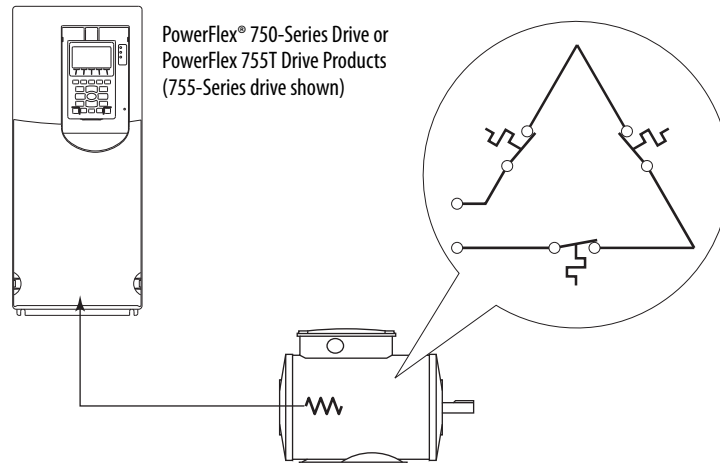
IMPORTANT For installation of PowerFlex 755T drive products (frame 8 and larger), check your drive firmware release notes for known anomalies and verify that there are no safety-related anomalies.

Description of Functionality

The ATEX option module with 11-Series I/O option module provides ATEX functionality for ATEX motors with thermostat contacts or PTC-type devices. The module removes power from the gate firing circuits of the drive output power devices (IGBTs) when the temperature circuit in the motor indicates that the motor temperature is too high.

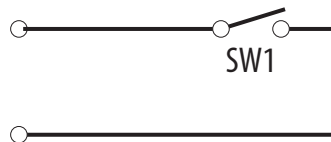
Motors with Thermostatic Switches

Thermostatic switches are arranged in series throughout the motor. Typically there is a switch, or a pair of switches, in each motor turn. Each switch opens when the local temperature is too high. The ATEX option module with I1-Series I/O option module can detect an over-temperature event anytime the circuit between the terminals is open.



Functional Proof Testing for Systems with Thermostat Contacts

Build a test fixture with a switch, a spare terminal plug (see [Catalog Numbers for Spare Terminal Plugs on page 10](#)), and this schematic.



To perform the thermostat contacts functional proof test, follow these steps.

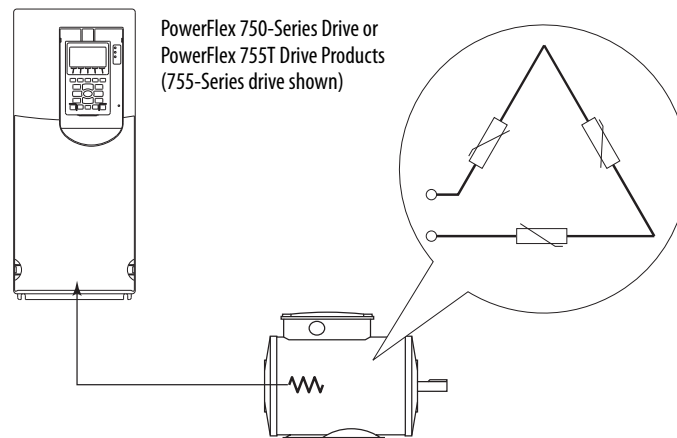
1. Close SW1.
2. Run the drive.
3. Open SW1.

If the system is working correctly, the drive faults due to a motor over-temperature event detection. See [ATEX Fault Descriptions on page 38](#).

4. If a safety option is present, check parameter 933 [Start Inhibits] and verify that bit 2 [Enabled] and bit 7 [Safety] are set to high.

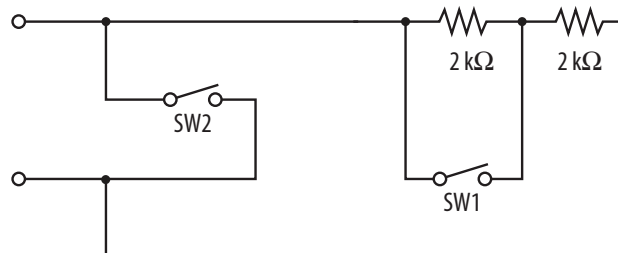
Motors with Positive Temperature Coefficient (PTC) Devices

PTC-type devices are arranged in series throughout the motor. The resistance of each PTC goes up as the motor temperature rises. The ATEX option module with 11-Series I/O option module can detect an over-temperature event. See [General Specifications on page 41](#) for PTC trip resistance thresholds.



Functional Proof Testing for Systems with PTC Devices

Build a test fixture with switches, resistors, a spare terminal plug (see [Catalog Numbers for Spare Terminal Plugs on page 10](#)), and this schematic. Resistors must be at least 1/8 W and 5% tolerance.



Over-temperature Functional Proof Test

To perform the PTC device over-temperature functional proof test, follow these steps.

1. Close SW1.
2. Open SW2.
3. Run the drive.
4. Open SW1.

If the system is working correctly, the drive faults due to a motor over-temperature event detection. See [ATEX Fault Descriptions on page 38](#).

5. If a safety option is present, check parameter 933 [Start Inhibits] and verify that bit 2 [Enabled] and bit 7 [Safety] are set to high.

Short Circuit Functional Proof Test

To perform the PTC device short circuit functional proof test, follow these steps.

1. Close SW1.
2. Open SW2.
3. Run the drive.
4. Close SW2.

If the system is working correctly, the drive faults due to a motor over-temperature event detection.

5. If a safety option is present, check parameter 933 [Start Inhibits] and verify that bit 2 [Enabled] and bit 7 [Safety] are set to high.

Functional Proof Testing without a Test Fixture

To test the ATEX safety function without a test fixture, follow these steps.

1. Wire the ATEX daughter card to the thermal sensor in the motor.
2. Power up the drive.
3. Verify that no faults exist.
4. Remove power from the drive and verify that the voltage on the bus capacitors has discharged.



ATTENTION:

- Electric shock hazard. Verify that all sources of AC and DC power are de-energized and locked out or tagged out in accordance with the requirements of ANSI/NFPA 70E, Part II.
- To avoid an electric shock hazard, verify that the voltage on the bus capacitors has discharged before performing any work on the drive. Measure the DC bus voltage at the +DC and -DC terminals or test points. The voltage must be zero.

For the location of the terminal block and test point sockets, see the manual for your drive:

- PowerFlex 750-Series AC Drives Installation Instructions, publication [750-IN001](#).
- PowerFlex 750-Series Products with TotalFORCE Control Installation Instructions, publication [750-IN100](#).
- PowerFlex 755TM IP00 Open Type Kits Installation Instructions, publication [750-IN101](#).

5. Unplug the ATEX terminal plug from the ATEX daughter board.
6. Power up the drive.

If the ATEX safety function is operating correctly, an over temperature fault is enunciated.

7. If a safety card is present, check parameter 933 [Start Inhibits] and verify that bit 2 [Enabled] and bit 7 [Safety] are set to high.
8. Remove power from the drive and verify that the voltage on the bus capacitors has discharged (see [step 4](#)).
9. Reinstall the ATEX terminal plug.
10. Power up the drive and verify that the over temperature fault can now be cleared.

If the SSM option is present, additional steps are required. See [Reset the Drive after an SSM Fault Detection on page 30](#).

Notes:

ATEX Monitoring

Topic	Page
Parameter 41 [ATEX Sts]	37
ATEX Fault Descriptions	38
ATEX Configuration Errors	38
Restart the Drive after an Over-temperature Fault	39

This section describes the parameter 41 [ATEX Sts] bit functionality, the ATEX faults and configuration errors, and how to restart the drive after an over-temperature fault.

Parameter 41 [ATEX Sts]

Parameter 41 [ATEX Sts] appears in the 11-Series I/O file, Motor PTC group, when the ATEX option module is installed.

This parameter provides the status of the ATEX thermal sensor. If an ATEX fault occurs, the corresponding bits change. When the temperature falls below the trip point, the bits change back to their original settings.

A descriptive fault message is displayed. The fault message can be retrieved from the fault queue after you clear the fault message from the display.

File	Group	No.	Display Name Full Name Description	Values	Read-write	Data Type																																															
11-Series I/O	Motor PTC	41	ATEX Sts ATEX Status This parameter is not latched and only displays the status of the ATEX thermal sensor. When an ATEX fault is present, the corresponding bit value is 1. When motor temperature is within the optimal range, the bit value is 0. This parameter is available only when an ATEX option module is installed.		RO	16-bit Integer																																															
			Options <table border="1"> <thead> <tr> <th></th> <th>Reserved</th> <th>PTC Selected</th> <th>Thermostat</th> <th>Reserved</th> <th>Reserved</th> <th>Reserved</th> <th>Reserved</th> <th>Reserved</th> <th>Reserved</th> <th>Reserved</th> <th>Reserved</th> <th>Reserved</th> <th>Voltage Loss</th> <th>Over Temp</th> <th>Short Cirtk</th> <th>Thrmsnsor OK</th> </tr> </thead> <tbody> <tr> <td>Default</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>Bit</td> <td>15</td> <td>14</td> <td>13</td> <td>12</td> <td>11</td> <td>10</td> <td>9</td> <td>8</td> <td>7</td> <td>6</td> <td>5</td> <td>4</td> <td>3</td> <td>2</td> <td>1</td> <td>0</td> </tr> </tbody> </table> Bit 0 "Thrmsnsor OK" – Thermal sensor is Ok. Bit 1 "Short Cirtk" – Short circuit fault that is detected by thermal sensor. Bit 2 "Over Temp" – Over temperature fault that is detected by thermal sensor. Bit 3 "Voltage Loss" – Voltage loss fault has taken place on ATEX board. Bit 13 "Thermostat" – Thermostat input has been selected. Bit 14 "PTC Selected" – PTC input has been selected.		Reserved	PTC Selected	Thermostat	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Voltage Loss	Over Temp	Short Cirtk	Thrmsnsor OK	Default	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
	Reserved	PTC Selected	Thermostat	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Voltage Loss	Over Temp	Short Cirtk	Thrmsnsor OK																																					
Default	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																					
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0																																					

ATEX Fault Descriptions

[Table 3](#) contains a list of ATEX-specific faults, a description, and the corrective action (where applicable).

Table 3 - ATEX Faults, Descriptions, and Actions

Event No. ⁽¹⁾	Fault/Alarm Text	Type	Fault Action ⁽²⁾	Description/Corrective Action
xx011	PTC Over Temp	Resettable fault	Coast	An over-temperature condition has been detected in the motor, or the sensor path has been broken.
xx012	PTC ShortCircuit			A short circuit condition has been detected in the sensor path. If the fault is unable to be cleared, make sure the thermal sensor that is connected is a PTC-type and not thermostatic.
xx013	ATX VoltageLoss			Possible hardware damage. A short in the motor to the thermal sensor. An excess of electromagnetic compatibility (EMC) noise due to improper grounding/shielding.
xx014	ThermostatOvrTmp			An over-temperature condition has been detected in the motor, or the sensor path has been broken.

(1) *xx* indicates the port number where the ATEX option module is installed.

(2) These faults initiate the ATEX function (uncontrolled stop).

ATEX Configuration Errors

[Table 4](#) shows an example of the device conflict text. A conflict can be enunciated under these conditions:

- During power-up, when the ATEX safety configuration switch is set improperly.
- If the ATEX option module with the 11-Series I/O option module is installed in a slot other than 4 or 5.

Table 4 - ATEX Configuration Errors

Device Conflict Text	Description/Action
X Port 06	The ATEX option module and 11-Series I/O option module is installed in an unsupported port.
X Port 06 'Safe Speed Montr'	The safety configuration switch (S1-1) is set to 'ON', and a safety option is present.

Restart the Drive after an Over-temperature Fault

The drive enters a stop condition and stops current flow to the motor when an over-temperature condition is sensed in the motor.

To restart the drive, follow these steps.

1. To acknowledge the fault, press the Clear soft key.
The fault information is removed so that you can use the HIM.
2. Fix the condition that caused the fault.
The cause must be corrected before the fault can be cleared.
3. Clear the fault by one of these methods:
 - Press Stop (stops the drive)
 - Cycle drive power
 - Select the Clear soft key on the HIM Diagnostic folder Faults menu
4. Perform any reset sequence that is required by any other installed options, such as a Safe Speed Monitor option module.
5. Issue a valid start command to the drive.

TIP For more information on faults and how to restart the drive, see the troubleshooting section in the manual for your drive:

- PowerFlex 750-Series AC Drives Programming Manual, publication [750-PM001](#)
- PowerFlex Drives with TotalFORCE Control Programming Manual, publication [750-PM100](#)

Notes:

Specifications and Certifications

Topic	Page
General Specifications	41
11-Series I/O Option Module Terminal Block Specifications	41
Environmental Specifications	42
Certifications	43

This appendix provides specifications for the PowerFlex® ATEX option module with the 11-Series I/O option module.

General Specifications

This table provides general specifications.

Attribute	Value
Safety integrity level	SIL 1 per IEC 61508 (see Safety Data on page 42)
Conductor type	Shielded twisted-pair cable, max length 150 m (492 ft)
Conductor size ⁽¹⁾	0.3...2.5 mm ² (28...14 AWG)
Strip length	6.0 mm (0.24 in.)
Screwdriver blade	DIN 5264
PTC over-temperature trip resistance	>3.2 kΩ
PTC short circuit trip resistance	<100 Ω
PTC receiver ckt	EN/IEC 60947-8 compatible

(1) See the Industrial Automation Wiring and Grounding Guidelines, publication [1770-4.1](#).

11-Series I/O Option Module Terminal Block Specifications

This table provides wire size, torque, and wire strip length for the 11-Series I/O option module.

11-Series I/O Option Module Terminal Block	Terminal Type	Wire Size Range mm ² (AWG)		Torque N·m (lb·in)		Strip Length mm (in.)
		Max	Min	Max	Recommended	
TB1	Screw terminals	2.5 (14)	0.3 (28)	0.25 (2.2)	0.2 (1.8)	6 (0.24)
	Tension clamp terminals	2.5 (14)	0.13 (26)	N/A		10 (0.39)
TB2	Screw terminals	4.0 (12)	0.25 (24)	0.5 (4.4)	0.4 (3.5)	7 (0.28)
	Tension clamp terminals	4.0 (12)	0.25 (24)	N/A		10 (0.39)

Safety Data

The PFD and PFH values in [Table 5](#) were calculated based on equations in IEC 61508. This table shows the worst case calculated values for drive frames 1...10 with a proof test interval of 20 years.

IMPORTANT A proof test is not defined in this user manual. A proof test interval of 20 years is used for the calculations here.

These values show the SIL 1 consumption of the ATEX safety function to be approximately 30%. The safety calculations represent the local ATEX safety path from the input of the ATEX daughter card to the device that disables heat-producing power.

Table 5 - PFD and PFH for 20-year Proof Test Interval for All PowerFlex 753/755 and PowerFlex 755T Drives

Attribute	Value
Safety integrity level (SIL)	1
Hardware fault tolerance (HFT)	0
Mission Time (MT)	20
Probability of failure on demand (PFD)	<3.09E-02
Probability of failure per hour (PFH [1/hour])	<3.53E-07

Environmental Specifications

The installation must comply with all environmental, pollution degree, and drive enclosure rating specifications required for the operating environment.

Category	Specification
Ambient temperature	For detailed information on environmental, pollution degree, and drive enclosure rating specifications, see the technical data publication for your drive: <ul style="list-style-type: none"> PowerFlex 750-Series AC Drives Technical Data, publication 750-TD001 PowerFlex 750-Series Products with TotalFORCE® Control Technical Data, publication 750-TD100 PowerFlex 755TM IP00 Open Type Kits Technical Data, publication 750-TD101
Storage temperature	
Shock	
Operating	
Packaged for shipment	
Vibration	
Operating	
Packaged for shipment	
Sinusoidal load	
Random secured	
Surrounding environment	



ATTENTION: Failure to maintain the specified ambient temperature can result in a failure of the safety function.

- IMPORTANT** Products with a safety function installed must be protected against conductive contamination by one of the following methods:
- Select a product with an enclosure type of at least IP54, NEMA/UL Type 12
 - Provide an environmentally controlled location for the product that does not contain conductive contamination

Table 6 - Environmental Pollution Degree Description According to EN 61800-5-1

Surrounding Environment Pollution Degree	Conductive Contamination Allowed by Pollution Degree	Acceptable Enclosures
Pollution degree 1 and 2.	No possibility of conductive dust.	All enclosures are acceptable.
Pollution degree 3 and 4.	A possibility of conductive dust is allowed.	Enclosure that meets or exceeds IP54, NEMA/UL Type 12 is required.

Certifications

The ATEX option module (catalog number 20-750-ATEX) together with the 11-Series I/O option module (catalog numbers 20-750-1132D 2R, 20-750-1133C-1R2T, or 20-750-1132C-2R) are certified to be in conformity with the legislation and standards that are listed in this table.

Certification ⁽¹⁾	Legislation/Standard/Certificate
cULus (U.S. and Canada) ⁽²⁾	UL 508C (U.S.); C22.2 No.14 (Canada); and UL 61800-5-1
CE (Europe)	Low Voltage Directive (2014/35/EU) EN 61800-5-1 EMC Directive (2014/30/EU) EN 61800-3 ATEX Directive (2014/34/EU) EU-Type-Examination Certificate Number: TÜV 17 ATEX 7990 X EN 50495
UKCA (United Kingdom)	Electrical Equipment (Safety) Regulations (LV) (2016 No. 1101) EN 61800-5-1 Electromagnetic Compatibility Regulations (EMC) (2016 No. 1091) EN 61800-3 Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations (Ex) (2016 No. 1107) UKEX Type Examination Number: TÜV 21 UKEX 7032 X TÜV 21 UKEX 7036 X EN 50495
Regulatory Compliance Mark (Australia/New Zealand)	Radiocommunications Act: 1992 Radiocommunications (EMC) Standard: 2012 Radiocommunications Labeling (EMC) Notice: 2008 IEC 61800-3
KCC (Korea)	Radio Waves Act: Article 58-2

(1) Certification information can be viewed at, <http://rok.auto/certifications>.

(2) Underwriters Laboratories Inc. has not evaluated the ATEX option module for functional safety.

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Additional Resources

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

Resource	Description
PowerFlex 750-Series Products with TotalFORCE Control Installation Instructions, publication 750-IN100	Provides the basic steps to install PowerFlex 755TL low harmonic drives, PowerFlex 755TR regenerative drives, and PowerFlex 755TM drive systems.
PowerFlex 755TM IP00 Open Type Kits Installation Instructions, publication 750-IN101	Provides instructions to install IP00 Open Type kits in user-supplied enclosures.
PowerFlex 750-Series AC Drives Installation Instructions, publication 750-IN001	Provides the basic steps to install PowerFlex 750-Series AC drives.
PowerFlex Drives with TotalFORCE Control Programming Manual, publication 750-PM100 PowerFlex 750-Series AC Drives Programming Manual, publication 750-PM001	Provides detailed information on: I/O, control, and feedback options Parameters and programming Faults, alarms, and troubleshooting
PowerFlex 750-Series AC Drives Technical Data, publication 750-TD001	Provides detailed information on: Drive and bus supply specifications Option specifications Fuse and circuit breaker ratings
PowerFlex 750-Series Products with TotalFORCE Control Technical Data, publication 750-TD100	
PowerFlex 755TM IP00 Open Type Kits Technical Data, publication 750-TD101	Provides detailed information on: Kit selection Kit ratings and specifications Option specifications
PowerFlex 750-Series Safe Speed Monitor Option Module Safety Reference Manual, publication 750-RM001	Provides information for the Safe Speed Monitor option (Cat. No. 20-750-S1) that can be used as a component in a safety control system.
PowerFlex 750-Series Safe Torque Off User Manual, publication 750-UM002	Provides information for the Safe Torque Off option (Cat. No. 20-750-S) that can be used as a component in a safety control system.
PowerFlex 755/755T Integrated Safety - Safe Torque Off Option Module User Manual, publication 750-UM004	Provides information for the Integrated Safety - Safe Torque Off Option Module (Cat. No. 20-750-S3) that can be used as a component in a safety control system.
PowerFlex 755/755T Integrated Safety Functions Option Module, publication 750-UM005	Provides information for the Integrated Safety Functions Option Module (Cat. No. 20-750-S4) that can be used as a component in a safety control system.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, http://rok.auto/certifications	Provides declarations of conformity, certificates, and other certification details.

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

Rockwell Automation Support

Use these resources to access support information.

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

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Waste Electrical and Electronic Equipment (WEEE)



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





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Publication 750-UM003G-EN-P - November 2022

Supersedes Publication 750-UM003F-EN-P - April 2022

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