

Altivar 32

Variable speed drives
for synchronous and asynchronous motors

ATEX manual

For ATEX applications in explosive gas atmosphere or in the presence of combustible dust

03/2010



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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

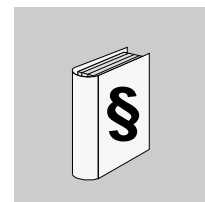
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Safety Information



Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure..



The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

DANGER indicates an imminently hazardous situation, which, if not avoided, **will result** in death or serious injury.

WARNING

WARNING indicates a potentially hazardous situation, which, if not avoided, **can result** in death, serious injury or equipment damage.

CAUTION

CAUTION indicates a potentially hazardous situation, which, if not avoided, **can result** in injury or equipment damage.

CAUTION

CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result** in equipment damage.

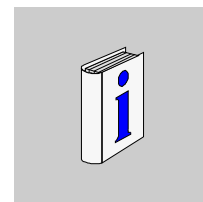
PLEASE NOTE

The word "drive" as used in this manual refers to the controller portion of the adjustable speed drive as defined by NEC.

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this product.

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About the book



At a Glance

Document Scope

The purpose of this document is to explain how the STO (Safe Torque Off) safety function allows the Altivar 32 variable speed drive to control and command motors installed in explosive atmospheres (ATEX).

Validity Note

This documentation is valid for the Altivar 32 drive.

Related Documents

Title of Documentation	Reference Number
ATV32 Quick Start	S1A41715
Altivar 32 Installation manual	S1A28686
Altivar 32 Programming manual	S1A28692
Altivar 32 Modbus manual	S1A28698
Altivar 32 CANopen manual	S1A28699
ATV32 Communication parameters	S1A44568
ATV32 Safety manual	S1A45606
ATV32 other option manuals: see www.schneider-electric.com .	

You can download the latest versions of these technical publications and other technical information from our website at www.schneider-electric.com.

Before you begin

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What's in this Chapter?

This chapter contains the following topics:

Topic	Page
Safety instructions	7

Safety instructions

Read and understand these instructions before performing any procedure with this drive.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand this manual before installing or operating the drive. Installation, adjustment, repair, and maintenance must be performed by qualified personnel.
- The user is responsible for compliance with all international and national electrical code requirements with respect to grounding of all equipment.
- Many parts of this drive, including the printed circuit boards, operate at the line voltage. **DO NOT TOUCH.** Use only electrically insulated tools.
- **DO NOT** touch unshielded components or terminal strip screw connections with voltage present.
- **DO NOT** short across terminals PA/+ and PC/- or across the DC bus capacitors.
- Before servicing the drive:
 - Disconnect all power, including external control power that may be present.
 - Place a "DO NOT TURN ON" label on all power disconnects.
 - Lock all power disconnects in the open position.
 - **WAIT 15 MINUTES** to allow the DC bus capacitors to discharge.
 - Measure the voltage of the DC bus between the PA/+ and PC/- terminals to ensure that the voltage is less than 42 Vdc.
 - If the DC bus capacitors do not discharge completely, contact your local Schneider Electric representative. Do not repair or operate the drive.
- Install and close all covers before applying power or starting and stopping the drive.

Failure to follow these instructions will result in death or serious injury.

DANGER

UNINTENDED EQUIPMENT OPERATION

- Read and understand the programming manual before operating the drive.
- Any changes made to the parameter settings must be performed by qualified personnel.

Failure to follow these instructions will result in death or serious injury.

WARNING

DAMAGED DRIVE EQUIPMENT

Do not operate or install any drive or drive accessory that appears damaged.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

WARNING

LOSS OF CONTROL

- The designer of any wiring scheme must consider the potential failure modes of control channels and, for certain critical control functions, provide a means to achieve a safe state during and after a channel failure. Examples of critical control functions are emergency stop and overtravel stop.
- Separate or redundant control channels must be provided for critical control functions.
- System control channels may include links carried out by the communication. Consideration must be given to the implications of unanticipated transmission delays or failures of the link¹.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

1. For additional information, refer to NEMA ICS 1.1 (latest edition), "Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control" and to NEMA ICS 7.1 (latest edition), "Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems."

▲ CAUTION**INCOMPATIBLE LINE VOLTAGE**

Before turning on and configuring the drive, ensure that the line voltage is compatible with the supply voltage range shown on the drive nameplate. The drive may be damaged if the line voltage is not compatible.

Failure to follow these instructions can result in injury or equipment damage.

CAUTION**RISK OF DERATED PERFORMANCE DUE TO CAPACITOR AGING**

The product capacitor performances after a long time storage above 2 years can be degraded. In that case, before using the product , apply the following procedure:

- Use a variable AC supply connected between L1 and L2 (even for ATV32●●●N4 references).
- Increase AC supply voltage to have:
 - 25% of rated voltage during 30 min
 - 50% of rated voltage during 30 min
 - 75% of rated voltage during 30 min
 - 100% of rated voltage during 30 min

Failure to follow these instructions can result in equipment damage.

Introduction

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What's in this Chapter?

This chapter contains the following topic:

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Functional Safety and ATEX applications

General

The variable speed drive Altivar 32 integrates the STO (Safe Torque Off) safety function which prohibits unintended equipment operation. The motor no longer produces torque. The use of the STO safety function allows the drive to be installed as a part of the safety-related electrical, electronic and programmable electronic control systems, dedicated to the safety of a machine or an industrial process. This safety function complies with the standard for safety of machinery EN 954-1 (1996): Category 2 to 3. It complies also with the standard for functional safety IEC/EN 61508 and with the power drive systems' product standard IEC/EN 61800-5-2, SIL2 capability. It complies also with the standards for functional safety EN ISO 13849-1 (2008): Category 3 PLd, IEC 61508 (2002) (parts 1&2): SIL 1 to SIL 2, IEC 62061 (2005): SIL CL 2, prEN 50495E (2008).

The use of the STO safety function is required for the Altivar 32 variable speed drive to control and command motors installed in explosive atmospheres (ATEX).

The STO safety function is an ATEX certified function according ATEX 94/9/EC directive

Protection of the ATEX motor

The STO input is connected to the switching system which is embedded in the thermal detector of the ATEX motor (or connected to the switching system of the control system if ATEX sensors of PTC type are used).

⚠ DANGER

RISK OF EXPLOSION

The LI6 input on the Altivar 32 drive, available for the motor thermal protection by using PTC detector (switch SW2 moved to the PTC position), shall not be used for the motor thermal protection in an ATEX application.

Only the STO input of the drive must be used for ATEX applications.

Failure to follow these instructions will result in death or serious injury.

Applications for explosive atmosphere (ATEX)

3

What's in this Chapter?

This chapter contains the following topics:

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Identification of the ATEX marking	14

Classification of ATEX zones

- The European directive 1999/92/EC (also called ATEX 137, or directive for protection of workers) classifies the ATEX zones and the type of products that they are compatible with. The user should define the ATEX zone in which the ATEX motor will be installed.
- The variable speed drive Altivar 32 must always be installed in a safe area, outside the hazardous ATEX zone. Different schemes for installation are suggested in this document. They are compatible with the use of motors in ATEX zones 2, 22, 1 or 21. The table below summarises characteristics related to each ATEX zone.

Atmosphere	Zone	Definition	Presence of explosive atmosphere per year
Gas	0	Explosive atmosphere is present continuously, for long periods or frequently due to malfunctions	> 1000 h
Dust	20		
Gas	1	Explosive atmosphere is likely to occur due to expected malfunctions	10 ... 1000 h
Dust	21		
Gas	2	Explosive atmosphere is unlikely to occur or, if occurring, is likely to only be of short duration and not in normal duty	< 10 h
Dust	22		

Nota: Neither electrical equipments nor motors can be installed in ATEX zone 0 or 20.

General

The European directive 94/9/EC (also called ATEX 95, or product directive) defines applicable requirements for ATEX products and requirements for procedure of certification.

OEMs, installers, users are responsible for the choice and the commissioning of the products they use in order to realise the ATEX protection of systems that they design or systems that they implement.

- The motor needs to be ATEX certified and compatible for use in zone 2/22 or 1/21.
- The motor shall be equipped with thermal detector(s) with embedded switching system ATEX certified, or shall be equipped with thermal detector(s) ATEX certified, associated to a control unit, which is to be also ATEX certified.

Note: Usually, the control unit is designed to be used outside the hazardous ATEX zone. Then it is possible to install the control unit near the variable speed drive, in the safe area.

The switching system, embedded into the thermal detector, or included into the control unit of the thermal protection of the ATEX motor, shall be connected to the STO input of the variable speed drive Altivar 32. When the excessive temperature of the ATEX motor is reached, the control system trips automatically the STO safety function. The electrical power of the motor is removed to help to ensure a temperature of the motor frame below the maximum temperature depending on the gas or the dust atmosphere in which the ATEX motor is installed.

When the ATEX application needs to apply the STO safety function, a safety module (type Preventa), is to be used. The suggested schemes describe how the switching system, embedded into the thermal detector or included into the control unit, is connected to the safety module. The output of the safety module is to be connected to the STO input of the variable speed drive Altivar 32.

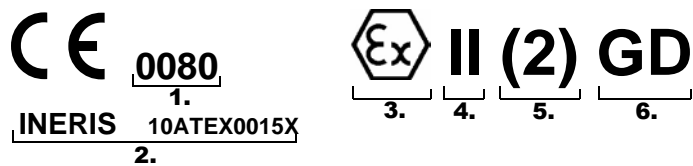
Stopping category related to the IEC/EN 60204-1

The schemes for installation, suggested in this document, show the use of a safety module (type Preventa XPS-AC) in combination with an ATEX application, with the use of the safety function when the stopping category 0, related to IEC/EN 60204-1, is required.


The user should take care for using a temporised safety module (type Preventa XPS-ATE), in combination with the ATEX application when the stopping category 1, related to IEC/EN 60204-1, is required, or using the embedded SS1 safety function.

Identification of the ATEX marking

The variable speed drive Altivar 32, ATEX certified, can be recognised by the specific marking reproduced hereafter:



Single marking complies with all of the applications covered by the ATEX certification of the drive.

- 1 0080 is the identification number of the notified body INERIS, which has delivered the notifications for systems of production quality assurance of production lines for drives, in compliance with the standard EN 13980.
- 2 **INERIS 10ATEX0015X** is the identification code of the EC Type examination certificate issued by the notified body INERIS to demonstrate the compliance of the variable speed drive with the requirements of the ATEX 94/9/EC directive.
- 3  is the logo related to the identification of an ATEX product.
- 4 **II** relates to the use of products for ATEX application in surface industries. (ATEX applications for mines industries are prohibited).
- 5 **(2)** Parenthesis identifies the variable speed drive Altivar 32 as a product associated with the control & command of an ATEX motor installed in a hazardous zone. The number 2 identifies the ATEX motor as a product of category 2 for use in ATEX zones 1 or 21. Motors of category 3 for use in ATEX zones 2 or 22 are also covered by this marking.
- 6 **G** for Gas, is related to ATEX applications in atmospheres with explosive gas.
D for Dust, is related to ATEX applications in atmospheres with a mixture of explosive dust.

Schemes of cabling for ATEX applications

4

What's in this Chapter?

This chapter contains the following topics:

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General

The user is responsible for compliance with all international and national electrical code requirements with respect to grounding of all equipment.

Requirements provided by the ATEX standards for installation should be fulfilled, when applicable:

- IEC 60079-14 for applications in atmospheres with explosive gas.
- local regulation, cabling rules for applications in atmospheres with presence of combustible dust.

in ATEX zone 1 or zone 2, for applications in atmospheres with explosive gas, the requirements of the IEC 60079-14 standard for installation are applicable.

IEC 60079-14: Electrical apparatus for explosive gas atmospheres - Part 14: Electrical installations in hazardous areas (other than mines).

in ATEX zone 21 or zone 22, for applications in atmospheres with presence of combustible dust, the requirements of the IEC 61241-14 standard for installation are applicable.

IEC 61241-14 : Electrical apparatus for use in the presence of combustible dust - Part 14: Selection and installation.

Schemes

Schemes suggested in this document for installation and commissioning of variable speed drive Altivar 32 for ATEX applications include different types of thermal detectors used with the ATEX motor.

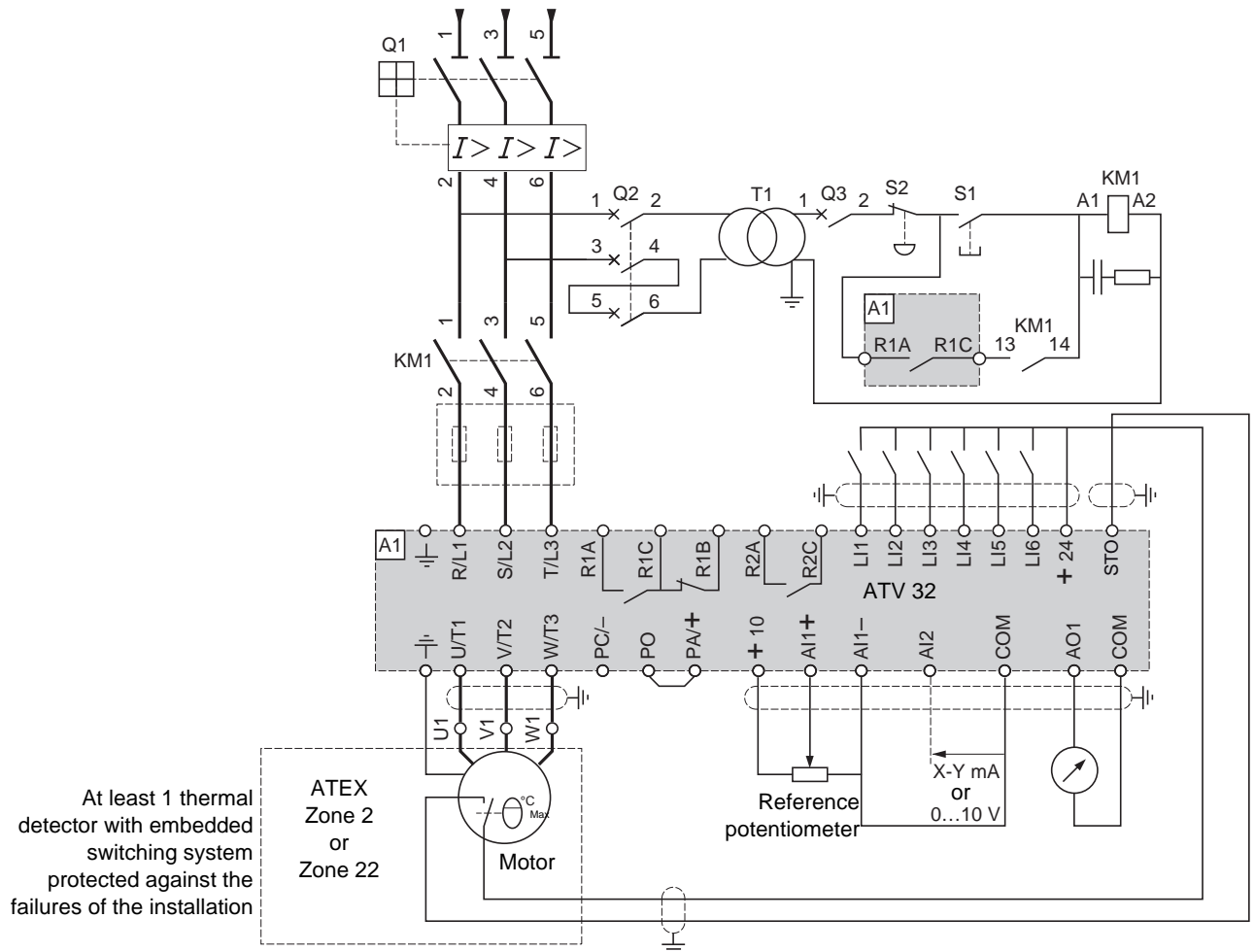
- If the ATEX motor, installed in an hazardous zone 2 or zone 22, includes at least one thermal detector with an embedded switching system protected against the failures of the installation (as defined in 3.1.4 of the IEC/EN 60947-8 standard) then, the switching system of this thermal detector can be directly connected to the STO input of the variable speed drive. See Scheme for ATEX installation N° 1 page [19](#) and Scheme for ATEX installation N° 2 page [20](#).
- If the ATEX motor, installed in an hazardous zone 1 or 21, includes at least two thermal detectors with an embedded switching system (as defined in 3.1.4 of the IEC/EN 60947-8 standard) then, the switching system of these thermal detectors can be directly connected in series to the STO input of the variable speed drive. See Scheme for ATEX installation N° 5 page [23](#) and Scheme for ATEX installation N° 6 page [24](#).
- If the ATEX motor, installed in an hazardous zone 2 or 22, includes at least one thermal detector without any embedded switching system (for example a PTC sensor), then this one thermal detector shall be connected to a control unit (as defined in 3.1.15 of the IEC/EN 60947-8 standard). The control unit is a device which converts in a switching function the variation of the characteristic of a thermal detector. See Scheme for ATEX installation N° 3 page [21](#) and Scheme for ATEX installation N° 4 page [22](#).
Note: The same requirement applies to thermal detectors without any embedded switching system for motors installed in an hazardous zone 1 or 21. See Scheme for ATEX installation N° 7 page [25](#) and Scheme for ATEX installation N° 8 page [26](#).

ATEX periodic test

The complete safety loop (which starts from the ATEX motor thermal sensor up to the STO safety function embedded in the drive), shall be activated at least once a year for preventive maintenance purposes, in order to check that the electrical power is always automatically removed from the motor in case of excessive temperature.

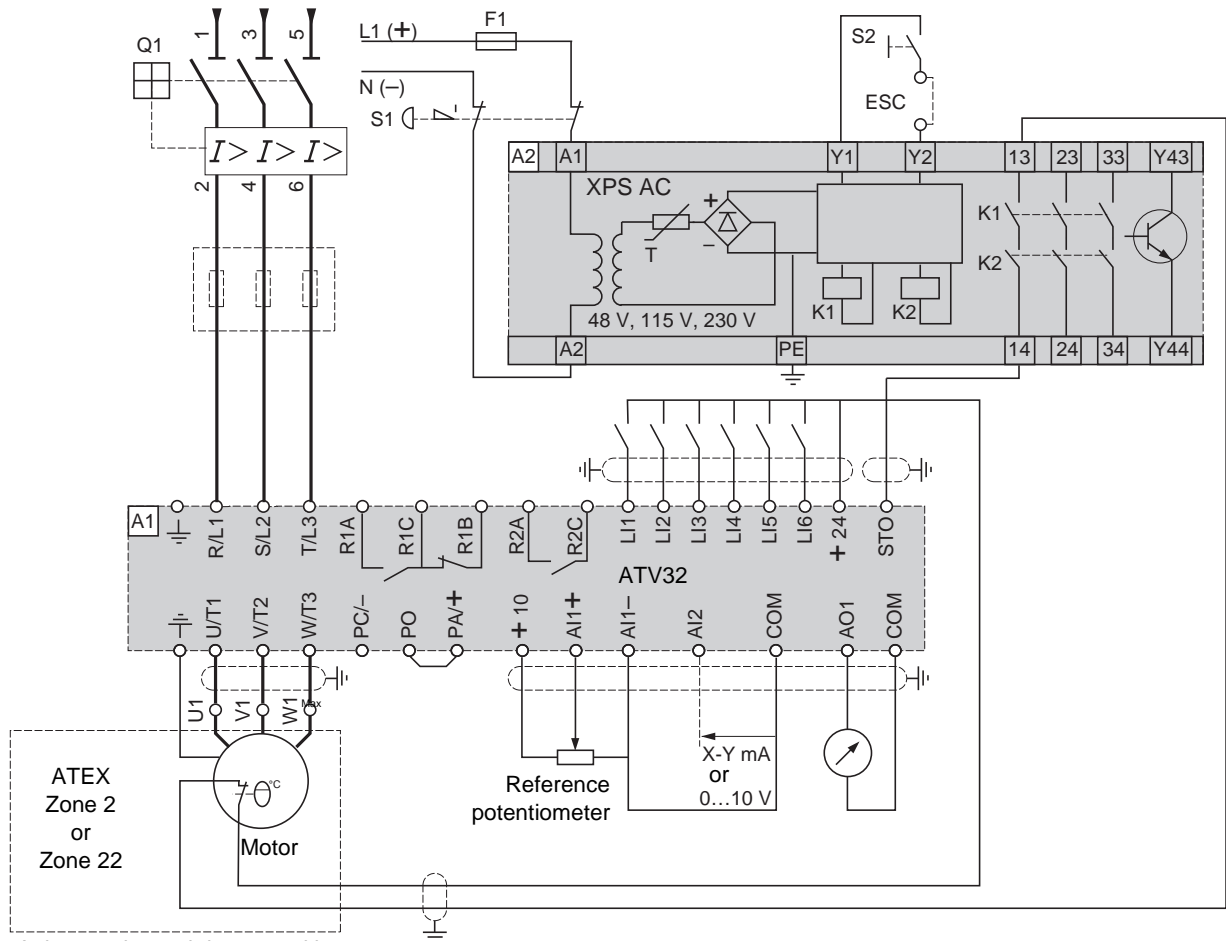
Scheme for ATEX installation N° 1

- ATEX motor in Zone 2 or 22,
- STO input used for protection of the ATEX motor only,
- Thermal protection of the ATEX motor by using of an ATEX thermal detector with embedded switching system,
- Embedded switching system protected against the failures of the installation.



Scheme for ATEX installation N° 2

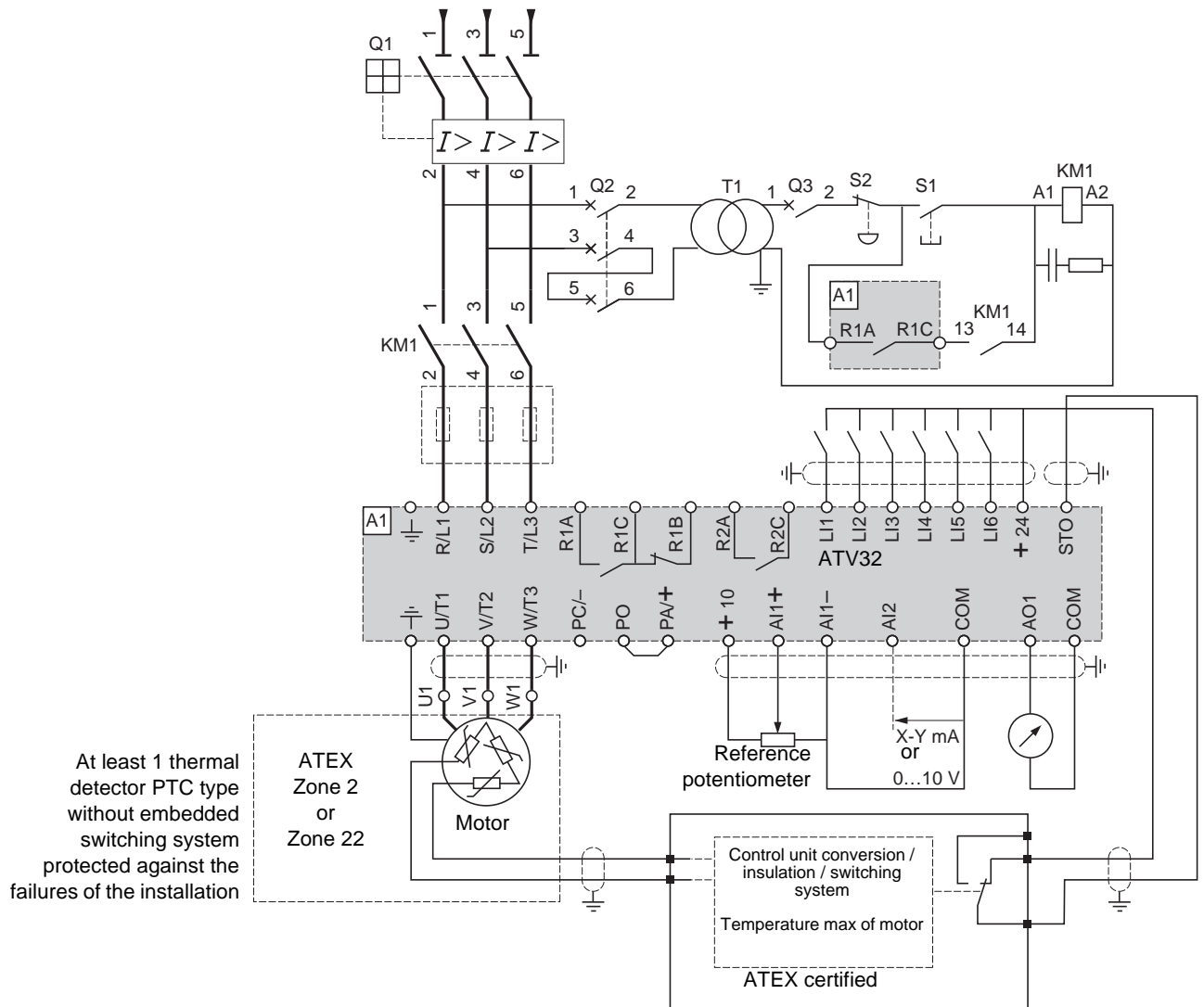
- ATEX motor in Zone 2 or 22,
- STO input used for protection of the ATEX motor and for the functional safety of Category 3 (EN 954-1) and for SIL 2 (IEC/EN 61508 or IEC/EN 61800-5-2) in stopping category 0 according to IEC/EN 60204-1,
- Thermal protection of the ATEX motor by using of an ATEX thermal detector with embedded switching system,
- Embedded switching system protected against the failures of the installation.



At least 1 thermal detector with embedded switching system protected against the failures of the installation

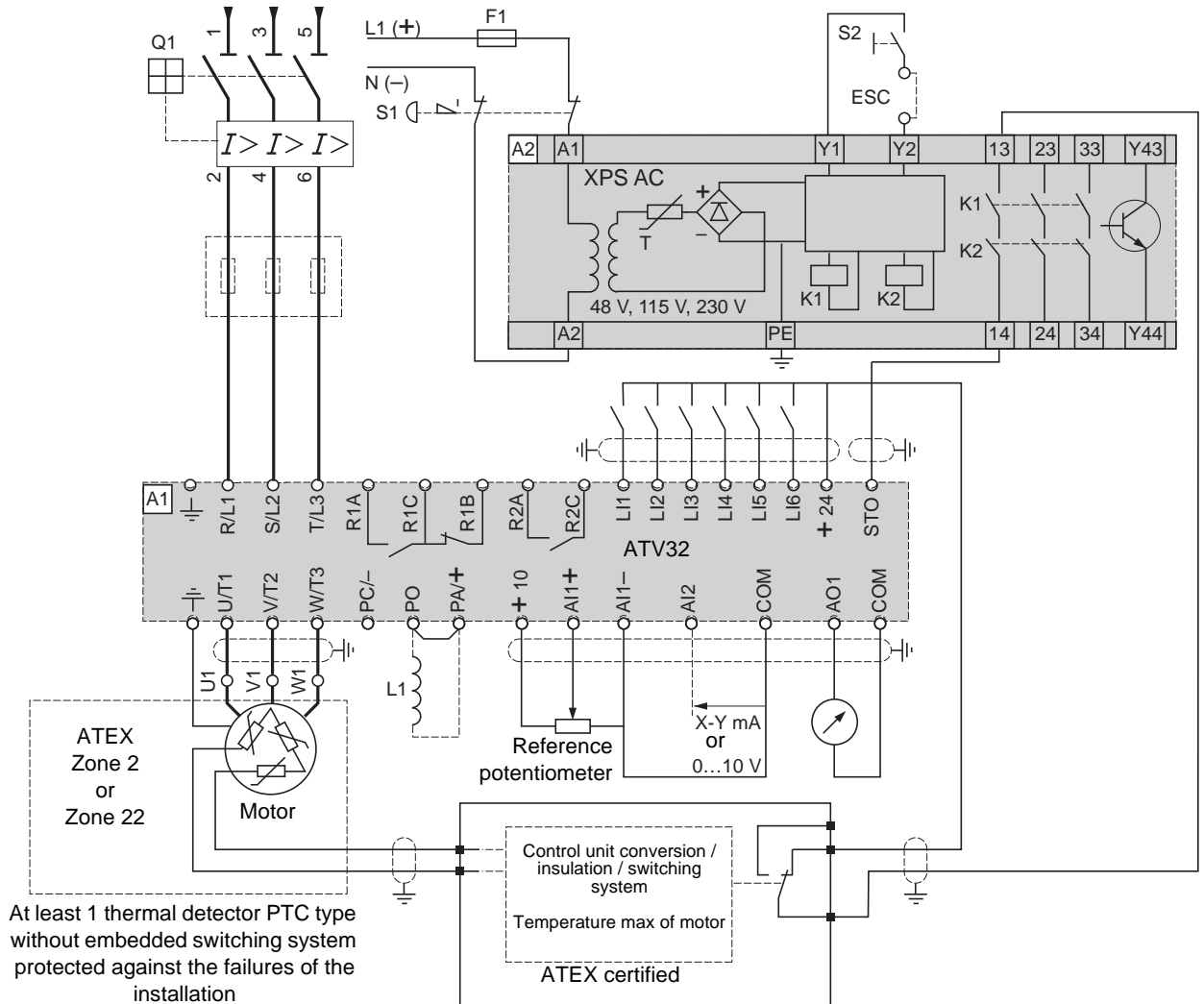
Scheme for ATEX installation N° 3

- ATEX motor in Zone 2 or 22,
- STO input used for protection of the ATEX motor only,
- Thermal protection of the ATEX motor by using of an ATEX thermal detector (PTC type, without embedded switching system), and a control unit for the PTC conversion, including the switching system,
- Embedded switching system protected against the failures of the installation.



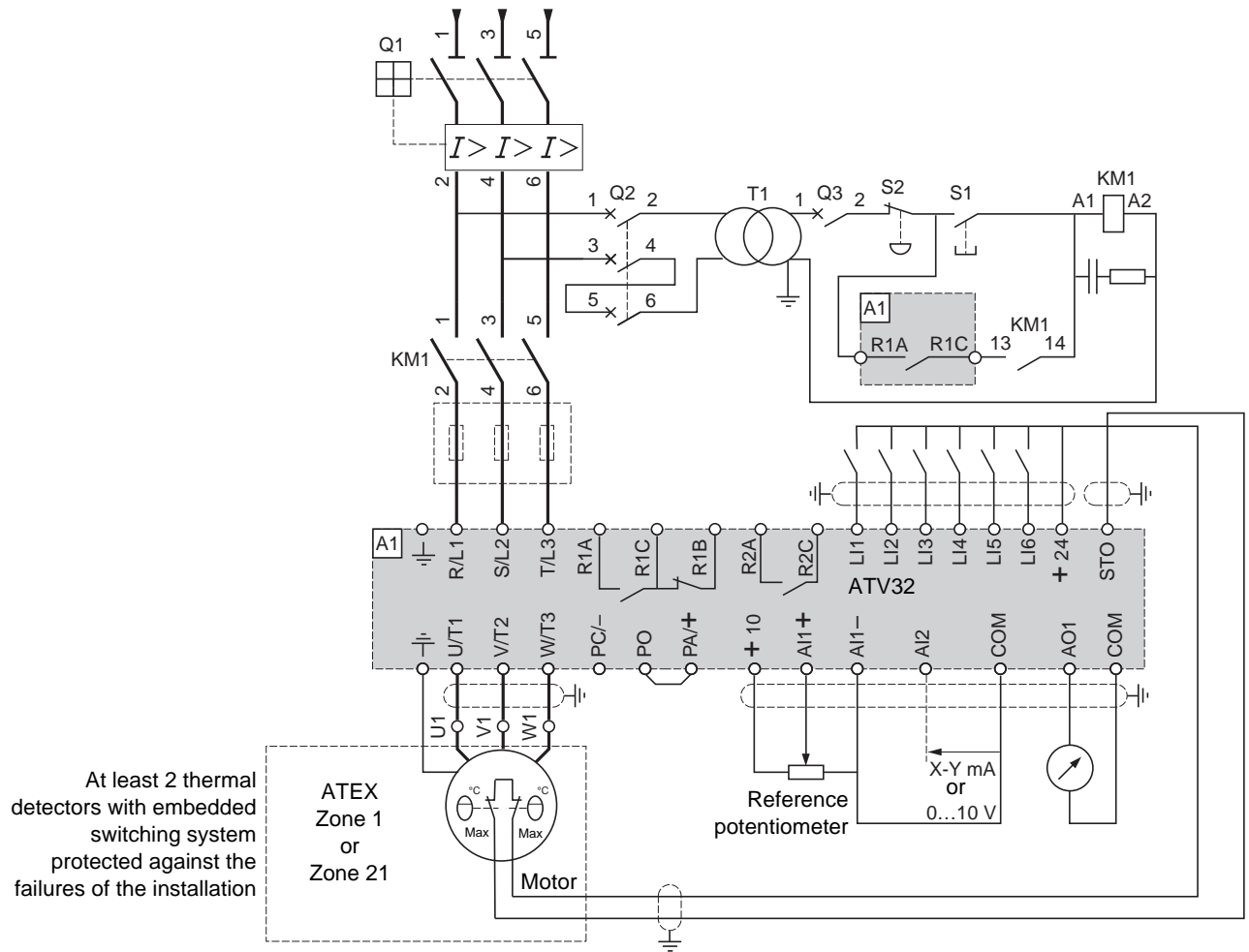
Scheme for ATEX installation N° 4

- ATEX motor in Zone 2 or 22,
- STO input used for protection of the ATEX motor and for the functional safety of Category 3 (EN 954-1) and for SIL 2 (IEC/EN 61508 or IEC/EN 61800-5-2) in stopping category 0 according to IEC/EN 60204-1,
- Thermal protection of the ATEX motor by using of an ATEX thermal detector (PTC type, without embedded switching system), and a control unit for the PTC conversion, including the switching system,
- Embedded switching system protected against the failures of the installation.



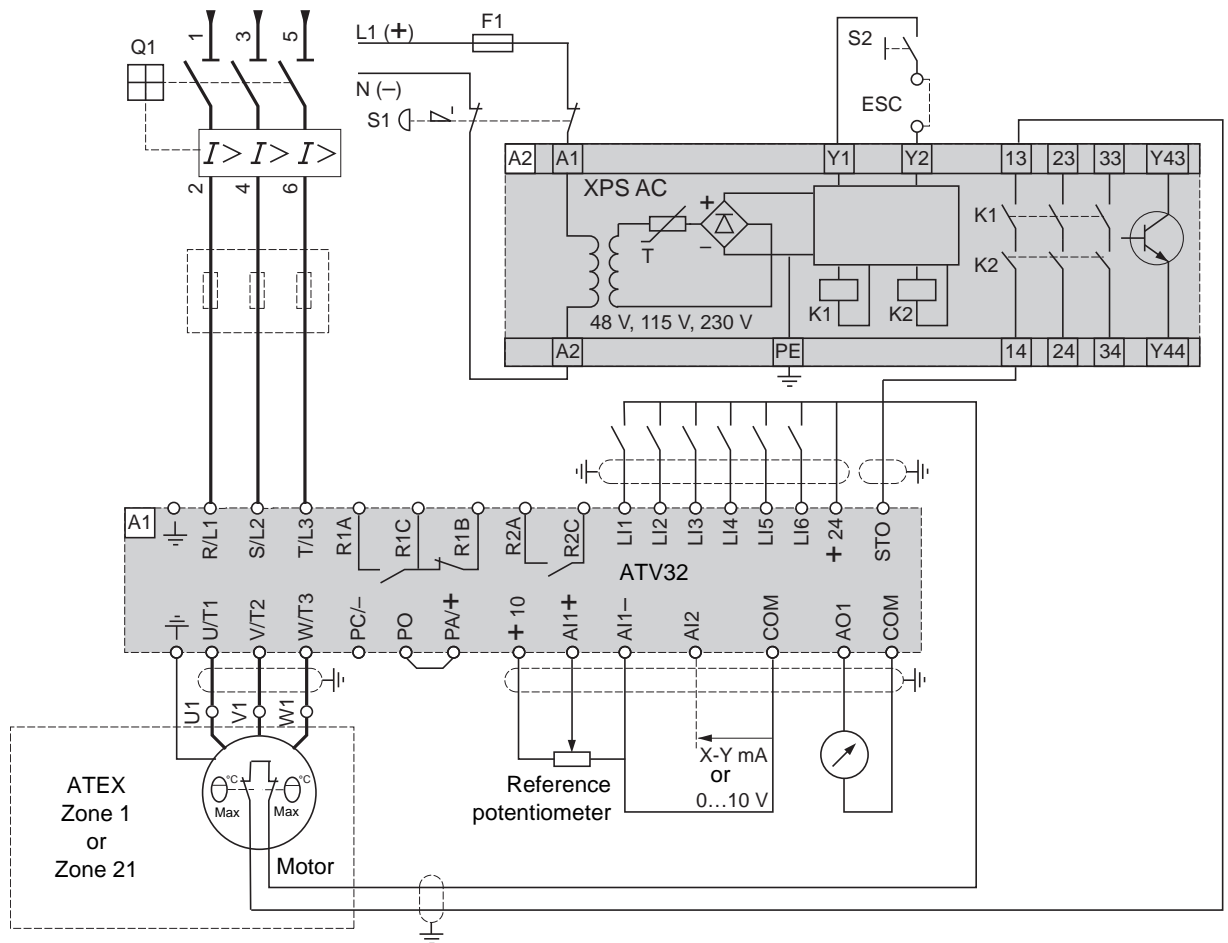
Scheme for ATEX installation N° 5

- ATEX motor in Zone 1 or 21,
- STO input used for protection of the ATEX motor only,
- Thermal protection of the ATEX motor by using of ATEX thermal detectors with embedded switching system protected against the failures of the installation.



Scheme for ATEX installation N° 6

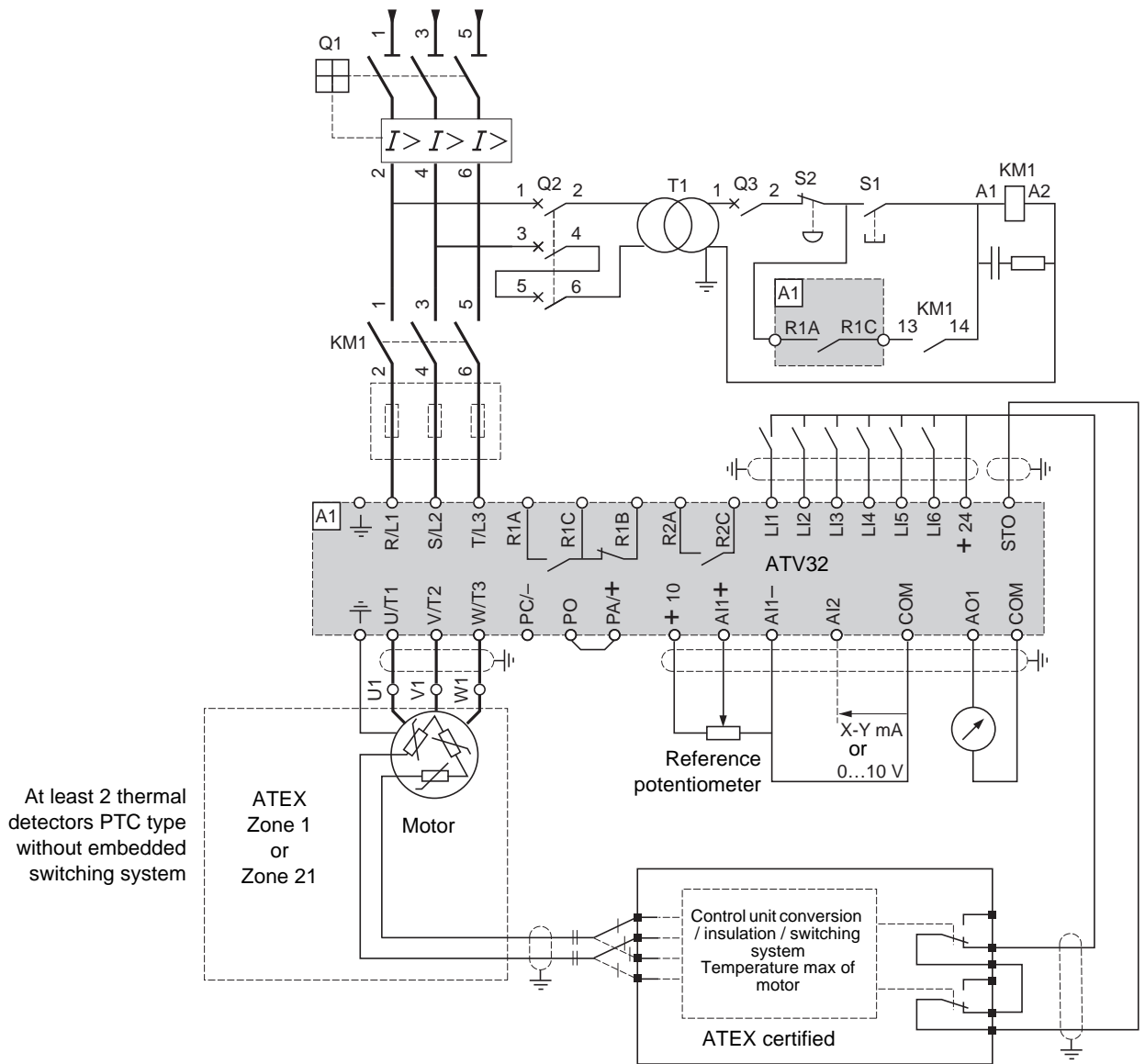
- ATEX motor in Zone 1 or 21,
- STO input used for protection of the ATEX motor and for the functional safety of Category 3 (EN 954-1) and for SIL 2 (IEC/EN 61508 or IEC/EN 61800-5-2) in stopping category 0 according to IEC/EN 60204-1,
- Thermal protection of the ATEX motor by using of ATEX thermal detectors with embedded switching system protected against the failures of the installation.



At least 2 thermal detectors with embedded switching system protected against the failures of the installation

Scheme for ATEX installation N° 7

- ATEX motor in Zone 1 or 21.
- STO input used for protection of the ATEX motor only.
- Thermal protection of the ATEX motor by using of ATEX thermal detectors (PTC type, without embedded switching system), and a control unit for the PTC conversion, including the switching system.



Scheme for ATEX installation N° 8

- ATEX motor in Zone 1 or 21.
- STO input used for protection of the ATEX motor and for the functional safety of Category 3 (EN 954-1) and for SIL 2 (IEC/EN 61508 or IEC/EN 61800-5-2) in stopping category 0 according to IEC/EN 60204-1.
- Thermal protection of the ATEX motor by using of ATEX thermal detectors (PTC type, without embedded switching system), and a control unit for the PTC conversion, including the switching system.

