

# Altivar Process ATV600, ATV900 and Modular

Variable Speed Drives  
For Asynchronous and Synchronous motors

## ATEX manual

for applications in explosive gas atmosphere or in the presence of combustible dust

11/2023



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The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither Schneider Electric nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

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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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## Important Information

### NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, service, 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 a hazardous situation which, if not avoided, **will result in** death or serious injury.

### **WARNING**

**WARNING** indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

### **CAUTION**

**CAUTION** indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

### **NOTICE**

**NOTICE** is used to address practices not related to physical injury.

### PLEASE NOTE

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 material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

### Qualification Of Personnel

Only appropriately trained persons who are familiar with and understand the contents of this manual and all other pertinent product documentation are authorized to work on and with this product. In addition, these persons must have received safety training to recognize and avoid hazards involved. These persons must have sufficient technical training, knowledge and experience and be able to foresee and detect potential hazards that may be caused by using the product, by changing the settings and by the mechanical, electrical and electronic equipment of the entire system in which the product is used. All persons working on and with the product must be fully familiar with all applicable standards, directives, and accident prevention regulations when performing such work.

## Intended Use

This product is a drive for three-phase synchronous, asynchronous motors and intended for industrial use according to this manual. The product may only be used in compliance with all applicable safety standard and local regulations and directives, the specified requirements and the technical data. The product must be installed outside the hazardous ATEX zone. Prior to using the product, you must perform a risk assessment in view of the planned application. Based on the results, the appropriate safety measures must be implemented. Since the product is used as a component in an entire system, you must ensure the safety of persons by means of the design of this entire system (for example, machine design). Any use other than the use explicitly permitted is prohibited and can result in hazards. Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel.

## Product Related Information

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

### DANGER

#### HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Only appropriately trained persons who are familiar with and fully understand the contents of the present manual and all other pertinent product documentation and who have received all necessary training to recognize and avoid hazards involved are authorized to work on and with this drive system.
- Installation, adjustment, repair and maintenance must be performed by qualified personnel.
- Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of all equipment.
- Only use properly rated, electrically insulated tools and measuring equipment.
- Do not touch unshielded components or terminals with voltage present.
- Prior to performing any type of work on the drive system, block the motor shaft to prevent rotation.
- Insulate both ends of unused conductors of the motor cable.
- Do not short across the DC bus terminals or the DC bus capacitors or the braking resistor terminals.

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

### DANGER

#### HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Before performing work on the equipment:

- Disconnect all power, including external control power that may be present. Take into account that the circuit breaker or main switch does not de-energize all circuits.
- Place a "Do Not Turn On" label on all power switches related to the drive system.
- Lock all power switches in the open position.
- Wait 15 minutes to allow the DC bus capacitors to discharge.
- Verify the absence of voltage<sup>1</sup>

Before applying voltage to the drive system:

- Verify that the work has been completed and that the entire installation cannot cause hazards.
- If the mains input terminals and the motor output terminals have been grounded and short-circuited, remove the ground and the short circuits on the mains input terminals and the motor output terminals.
- Verify proper grounding of all equipment.
- Verify that all protective equipment such as covers, doors, grids is installed and/or closed.

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

1. Refer to the *Verify the Absence of Voltage* section of the Installation Manual.

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Damaged products or accessories may cause electric shock or unanticipated equipment operation.

  **DANGER**

**ELECTRIC SHOCK OR UNANTICIPATED EQUIPMENT OPERATION**

Do not use damaged products or accessories.

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

Damaged products or accessories may cause electric shock or unanticipated equipment operation.

  **DANGER**

**POTENTIAL FOR EXPLOSION**

Install and use this equipment in non-hazardous locations only.

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

Your application consists of a whole range of different interrelated mechanical, electrical, and electronic components, the drive being just one part of the application. The drive by itself is neither intended to nor capable of providing the entire functionality to meet all safety-related requirements that apply to your application. Depending on the application and the corresponding risk assessment to be conducted by you, a whole variety of additional equipment is required such as, but not limited to, external encoders, external brakes, external monitoring devices, guards, etc. As a designer/manufacturer of machines, you must be familiar with and observe all standards that apply to your machine. You must conduct a risk assessment and determine the appropriate Performance Level (PL) and/or Safety Integrity Level (SIL) and design and build your machine in compliance with all applicable standards. In doing so, you must consider the interrelation of all components of the machine. In addition, you must provide instructions for use that enable the user of your machine to perform any type of work on and with the machine such as operation and maintenance in a safe manner. The present document assumes that you are fully aware of all normative standards and requirements that apply to your application. Since the drive cannot provide all safety-related functionality for your entire application, you must ensure that the required Performance Level and/or Safety Integrity Level is reached by installing all necessary additional equipment.

## **WARNING**

### **INSUFFICIENT PERFORMANCE LEVEL/SAFETY INTEGRITY LEVEL AND/ OR UNINTENDED EQUIPMENT OPERATION**

- Conduct a risk assessment according to EN ISO 12100 and all other standards that apply to your application.
- Use redundant components and/or control paths for all critical control functions identified in your risk assessment.
- Implement all monitoring functions required to avoid any type of hazard identified in your risk assessment, for example, slipping or falling loads.
- Verify that the service life of all individual components used in your application is sufficient for the intended service life of your overall application.
- Perform extensive commissioning tests for all potential error situations to verify the effectiveness of the safety-related functions and monitoring functions implemented, for example, but not limited to, speed monitoring by means of encoders, short circuit monitoring for all connected equipment, correct operation of brakes and guards.
- Perform extensive commissioning tests for all potential error situations to verify that the load can be brought to a safe stop under all conditions.

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

The products may perform unexpected movements because of incorrect wiring, incorrect settings, incorrect data or other errors.

## **WARNING**

### **UNANTICIPATED EQUIPMENT OPERATION**

- Carefully install the wiring in accordance with the EMC requirements.
- Do not operate the product with unknown or unsuitable settings or data.
- Perform a comprehensive commissioning test.

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





## **⚠ WARNING**

### **LOSS OF CONTROL**

- The designer of any control scheme must consider the potential failure modes of control paths and, for critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop, overtravel stop, power outage and restart.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines (1).
- Each implementation of the product must be individually and thoroughly tested for proper operation before being placed into service.

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

(1) For USA: 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.

The temperature of the products described in this manual may exceed 80 °C (176 °F) during operation.

## **⚠ WARNING**

### **HOT SURFACES**

- Ensure that any contact with hot surfaces is avoided.
- Do not allow flammable or heat-sensitive parts in the immediate vicinity of hot surfaces.
- Verify that the product has sufficiently cooled down before handling it.
- Verify that the heat dissipation is sufficient by performing a test run under maximum load conditions.

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

## ***NOTICE***

### **DESTRUCTION DUE TO INCORRECT MAINS VOLTAGE**

Before switching on and configuring the product, verify that it is approved for the mains voltage.

**Failure to follow these instructions can result in equipment damage.**



# 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 ATV630, 650, 660 & 680, ATV930, 950, 960 & 980 and Altivar Process Modular variable speed drives to control and command motors installed in explosive atmospheres (ATEX)

### Validity Note

Original instructions and information given in this manual have been written in English (before optional translation).

This documentation is valid for the Altivar Process drives described in the Installation manuals or the Integration manual for and Altivar Process Modular, this manual is intended to Qualified Partners.

The technical characteristics of the devices described in the present document also appear online. To access the information online:

Step	Action
1	Go to the Schneider Electric home page <a href="http://www.schneider-electric.com">www.schneider-electric.com</a> .
2	In the <b>Search</b> box type the reference of a product or the name of a product range. <ul style="list-style-type: none"><li>Do not include blank spaces in the reference or product range.</li><li>To get information on grouping similar modules, use asterisks (*).</li></ul>
3	If you entered a reference, go to the <b>Product Datasheets</b> search results and click on the reference that interests you. If you entered the name of a product range, go to the <b>Product Ranges</b> search results and click on the product range that interests you.
4	If more than one reference appears in the <b>Products</b> search results, click on the reference that interests you.
5	Depending on the size of your screen, you may need to scroll down to see the data sheet.
6	To save or print a data sheet as a .pdf file, click <b>Download XXX product datasheet</b> .

The characteristics that are presented in the present document should be the same as those characteristics that appear online. In line with our policy of constant improvement, we may revise content over time to improve clarity and accuracy. If you see a difference between the document and online information, use the online information as your reference.

### Related Documents

Use your tablet or your PC to quickly access detailed and comprehensive information on all our products on [www.schneider-electric.com](http://www.schneider-electric.com).

The internet site provides the information you need for products and solutions:

- The whole catalog for detailed characteristics and selection guides,
- The CAD files to help design your installation, available in over 20 different file formats,
- All software and firmware to maintain your installation up to date,
- A large quantity of White Papers, Environment documents, Application solutions, Specifications... to gain a better understanding of our electrical systems and equipment or automation,
- And finally all the User Guides related to your drive, listed below:

#### ATV600

Title of Documentation	Catalog Number
Catalog: Altivar Process ATV600 variable speed drives	<a href="#">DIA2ED2140502EN</a> (English), <a href="#">DIA2ED2140502FR</a> (French)
ATV600 Getting Started	<a href="#">EAV63253</a> (English), <a href="#">EAV63254</a> (French), <a href="#">EAV63255</a> (German), <a href="#">EAV63256</a> (Spanish), <a href="#">EAV63257</a> (Italian), <a href="#">EAV64298</a> (Chinese)
ATV600 Getting Started Annex (SCCR)	<a href="#">EAV64300</a> (English)

Title of Documentation	Catalog Number
ATV630, ATV650 Installation Manual	<a href="#">EAV64301</a> (English), <a href="#">EAV64302</a> (French), <a href="#">EAV64306</a> (German), <a href="#">EAV64307</a> (Spanish), <a href="#">EAV64310</a> (Italian), <a href="#">EAV64317</a> (Chinese), <a href="#">EAV64301PT</a> (Portuguese)
ATV600 Programming Manual	<a href="#">EAV64318</a> (English), <a href="#">EAV64320</a> (French), <a href="#">EAV64321</a> (German), <a href="#">EAV64322</a> (Spanish), <a href="#">EAV64323</a> (Italian), <a href="#">EAV64324</a> (Chinese), <a href="#">EAV64318PT</a> (Portuguese)
ATV600 Modbus Serial Link Manual (Embedded)	<a href="#">EAV64325</a> (English)
ATV600 Ethernet Manual (Embedded)	<a href="#">EAV64327</a> (English)
ATV600 Ethernet IP - Modbus TCP Manual (VW3A3720, 721)	<a href="#">EAV64328</a> (English)
ATV600 BACnet MS/TP Manual (VW3A3725)	<a href="#">QGH66984</a> (English)
ATV600 PROFIBUS DP manual (VW3A3607)	<a href="#">EAV64329</a> (English)
ATV600 DeviceNet manual (VW3A3609)	<a href="#">EAV64330</a> (English)
ATV600 PROFINET manual (VW3A3627)	<a href="#">EAV64331</a> (English)
ATV600 CANopen Manual (VW3A3608, 618, 628)	<a href="#">EAV64333</a> (English)
ATV600 Communication Parameters	<a href="#">EAV64332</a> (English)
ATV600 Embedded Safety Function manual	<a href="#">EAV64334</a> (English)
Altivar Process Drive Systems Installation manual	<a href="#">NHA37119</a> (English), <a href="#">NHA37121</a> (French), <a href="#">NHA37118</a> (German), <a href="#">NHA37122</a> (Spanish), <a href="#">NHA37123</a> (Italian), <a href="#">NHA37130</a> (Chinese), <a href="#">NHA37124</a> (Dutch), <a href="#">NHA37126</a> (Polish), <a href="#">NHA37127</a> (Portuguese), <a href="#">NHA37129</a> (Turkish)
ATV660 Handbook	<a href="#">NHA37111</a> (English), <a href="#">NHA37110</a> (German)
ATV680 Handbook	<a href="#">NHA37113</a> (English), <a href="#">NHA37112</a> (German)
ATV600F, ATV900F Installation Instruction sheet	<a href="#">NVE57369</a> (English)
ATV600, ATV900 ATEX manual	<a href="#">NVE42416</a> (English)
SoMove: FDT	<a href="#">SoMove FDT</a> (English, French, German, Spanish, Italian, Chinese)
ATV600: DTM	<a href="#">ATV6xx DTM Library EN</a> (English - to be installed first), <a href="#">ATV6xx DTM Lang FR</a> (French), <a href="#">ATV6xx DTM Lang DE</a> (German), <a href="#">ATV6xx DTM Lang SP</a> (Spanish), <a href="#">ATV6xx DTM Lang IT</a> (Italian), <a href="#">ATV6xx DTM Lang CN</a> (Chinese)
Application Note: ATV600 Multi Drives Booster Control Optimized	<a href="#">QGH36060</a> (English)
Application Note: ATV600 Multi Masters Booster Control Pressure Feedback with Service Continuity	<a href="#">QGH36061</a> (English)
Application Note: ATV600 Multi Drives Standard Level Control	<a href="#">QGH36059</a> (English)

## ATV900

Title of Documentation	Catalog Number
Catalog: Variable speed drives Altivar Process ATV900	<a href="#">DIA2ED2150601EN</a> (English), <a href="#">DIA2ED2150601FR</a> (French)
ATV930, ATV950 Getting Started	<a href="#">NHA61578</a> (English), <a href="#">NHA61579</a> (French), <a href="#">NHA61580</a> (German), <a href="#">NHA61581</a> (Spanish), <a href="#">NHA61724</a> (Italian), <a href="#">NHA61582</a> (Chinese)
ATV900 Getting Started Annex (SCCR)	<a href="#">NHA61583</a> (English)
ATV930, ATV950 Installation manual	<a href="#">NHA80932</a> (English), <a href="#">NHA80933</a> (French), <a href="#">NHA80934</a> (German), <a href="#">NHA80935</a> (Spanish), <a href="#">NHA80936</a> (Italian), <a href="#">NHA80937</a> (Chinese)

Title of Documentation	Catalog Number
ATV600F, ATV900F Installation Instruction sheet	<a href="#">NVE57369</a> (English)
ATV900 Programming manual	<a href="#">NHA80757</a> (English), <a href="#">NHA80758</a> (French), <a href="#">NHA80759</a> (German), <a href="#">NHA80760</a> (Spanish), <a href="#">NHA80761</a> (Italian), <a href="#">NHA80762</a> (Chinese)
ATV900 Embedded Modbus Serial Link manual	<a href="#">NHA80939</a> (English)
ATV900 Embedded Ethernet manual	<a href="#">NHA80940</a> (English)
ATV900 PROFIBUS DP manual (VW3A3607)	<a href="#">NHA80941</a> (English)
ATV900 DeviceNet manual (VW3A3609)	<a href="#">NHA80942</a> (English)
ATV900 PROFINET manual (VW3A3627)	<a href="#">NHA80943</a> (English)
ATV900 CANopen manual (VW3A3608, 618, 628)	<a href="#">NHA80945</a> (English)
ATV900 EtherCAT manual (VW3A3601)	<a href="#">NHA80946</a> (English)
ATV900 Communication Parameters addresses	<a href="#">NHA80944</a> (English)
ATV900 Embedded Safety Function manual	<a href="#">NHA80947</a> (English)
ATV900 Safety functions manual (VW3A3802) Upcoming commercialization	<a href="#">NVE64209</a> (English), <a href="#">NVE64210</a> (French), <a href="#">NVE64211</a> (German), <a href="#">NVE64212</a> (Spanish), <a href="#">NVE64213</a> (Italian), <a href="#">NVE64214</a> (Chinese)
Drive Systems ATV960 handbook	<a href="#">NHA37115</a> (English), <a href="#">NHA37114</a> (German)
Drive Systems ATV980 handbook	<a href="#">NHA37117</a> (English), <a href="#">NHA37116</a> (German)
Drive Systems ATV990 handbook Multidrive Systems	<a href="#">NHA37142</a> (English), <a href="#">NHA37141</a> (German)
Drive Systems ATV960, ATV980 Installation manual	<a href="#">NHA37118</a> (German), <a href="#">NHA37119</a> (English), <a href="#">NHA37121</a> (French), <a href="#">NHA37122</a> (Spanish), <a href="#">NHA37123</a> (Italian), <a href="#">NHA37124</a> (Dutch), <a href="#">NHA37126</a> (Polish), <a href="#">NHA37127</a> (Portuguese), <a href="#">NHA37129</a> (Turkish), <a href="#">NHA37130</a> (Chinese)
SoMove: FDT	<a href="#">SoMove FDT</a> (English, French, German, Spanish, Italian, Chinese)
ATV900: DTM	<a href="#">ATV9xx DTM Library EN</a> (English - to be installed first), <a href="#">ATV9xx DTM Lang FR</a> (French), <a href="#">ATV9xx DTM Lang DE</a> (German), <a href="#">ATV9xx DTM Lang SP</a> (Spanish), <a href="#">ATV9xx DTM Lang IT</a> (Italian), <a href="#">ATV9xx DTM Lang CN</a> (Chinese)

## Electronic Product Data sheet

Scan the QR code in front of the drive to get the product data sheet.

## Terminology

The technical terms, terminology, and the corresponding descriptions in this manual normally use the terms or definitions in the relevant standards.

In the area of drive systems this includes, but is not limited to, terms such as **error**, **error message**, **failure**, **fault**, **fault reset**, **protection**, **safe state**, **safety function**, **warning**, **warning message**, and so on.

Among others, these standards include:

- IEC 61800 series: Adjustable speed electrical power drive systems
- IEC 61508 Ed.2 series: Functional safety of electrical/electronic/programmable electronic safety-related
- EN 954-1 Safety of machinery - Safety related parts of control systems
- ISO 13849-1 & 2 Safety of machinery - Safety related parts of control systems
- IEC 61158 series: Industrial communication networks - Fieldbus specifications
- IEC 61784 series: Industrial communication networks - Profiles
- IEC 60204-1: Safety of machinery - Electrical equipment of machines – Part 1: General requirements

In addition, the term **zone of operation** is used in conjunction with the description of specific hazards, and is defined as it is for a **hazard zone** or **danger zone** in the EC Machinery Directive (2006/42/EC) and in ISO 12100-1.

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## EC Declaration of Conformity

The EC Declaration of Conformity can be obtained on [www.se.com](http://www.se.com)

## Certification for functional safety

The integrated safety function is compatible and certified following IEC 61800-5-2 Ed.1 Adjustable speed electrical power drive systems – Part 5-2 : Safety requirements – Functional

IEC 61800-5-2 as a product standard, sets out safety-related considerations of Power Drive Systems Safety Related PDS (SR) s in terms of the framework of IEC 61508.

Compliance with IEC 61800-5-2 standard, for the following described safety function, will facilitate the incorporation of a PDS(SR) (Power Drive System with safety-related functions) into a safety-related control system using the principles of IEC 61508, IEC 60204-1, IEC 62061 and ISO 13849-1 & ISO 13849-2 for process-systems and machinery.

The defined safety function is

- SIL 3 capability in compliance with IEC 61800-5-2 and IEC 61508 series
- Performance Level PL e in compliance with ISO 13849-1
- Category 3 in compliance with European standard ISO 13849-1

Also refer to the Safety function capability section in the ATV600 Safety Function manual [EAV64334](#).

The safety demand mode of operation is considered in high demand or continuous mode of operation according to the IEC 61800-5-2 standard.

The certificate for functional safety is accessible on [www.se.com](http://www.se.com)

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# Chapter 1

## Introduction

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### Functional Safety and ATEX applications

#### General

The variable speed drive ATV630, 650, 660 & 680, ATV930, 950, 960 & 980 and Altivar Process Modular integrates the STO (Safe Torque Off) safety function which shuts off the motor torque safely. 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.

The integrated safety function is compatible and certified following the information given in the Certification for Functional Safety section (*see page 14*). It complies also with the EN 50495 (2010): Safety devices required for the safe functioning of equipment with respect to explosion risks.

The use of the STO safety function is required for the variable speed drive ATV630, 650, 660 & 680, ATV930, 950, 960 & 980 and Altivar Process Modular 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 and 2014/34/EU directive.

#### Monitoring Of the ATEX Motor

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

The variable speed drive ATV630, 650, 660 & 680, ATV930, 950, 960 & 980 and Altivar Process Modular intended to be used to command and control asynchronous motors shall be installed only outside potentially explosive atmospheres for the protection of explosion-protected motors.





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# Chapter 2

## Applications for explosive atmosphere (ATEX)

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### What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
ATEX zones	18
ATEX Marking	19

## ATEX zones

### Classification

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.

This equipment has been designed to operate outside of any hazardous location. Only install this equipment in zones known to be free of a hazardous atmosphere.

## DANGER

### POTENTIAL FOR EXPLOSION

Install and use this equipment in non-hazardous locations only.

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

Different wiring diagrams for installation are suggested in this document. They are compatible with the use of motors in ATEX zones 1/21 or 2/22

The following table summarizes 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		

**NOTE:** Neither electrical equipment nor motors can be installed in ATEX zone 0 or 20.

### General

The European directives 94/9/EC and 2014/34/UE (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 realize the ATEX protection of systems that they design or systems that they implement.

- The motor needs to be ATEX certified EX "d" and compatible for use in zone 1/21 or 2/22.
- The motor shall be equipped with thermal sensor(s) with embedded switching system ATEX certified, or shall be equipped with thermal sensor(s) ATEX certified, associated to a control unit (Level of protection intrinsic safety "i"), 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, outside the hazardous ATEX zone.

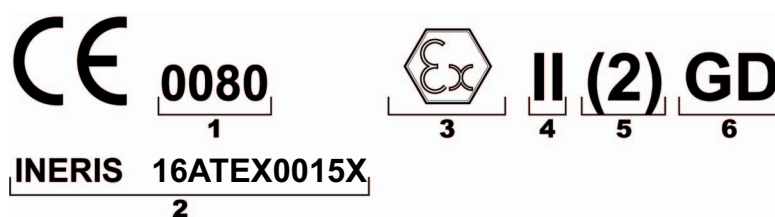
The switching system, embedded into the thermal sensor, or included into the control unit of the thermal protection of the ATEX motor, shall be connected to the STO input of the variable speed drive ATV630, 650, 660 & 680, ATV930, 950, 960 & 980 and Altivar Process Modular. When the excessive temperature of the ATEX motor is reached, the control system triggers 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, and prevent automatic restart, then a safety module (type Preventa) is to be used. The suggested wiring diagrams describe how the switching system, embedded into the thermal sensor or included into the control unit, is connected to the safety module. The output of the safety module must be connected to the STO input of the variable speed drive ATV630, 650, 660 & 680, ATV930, 950, 960 & 980 and Altivar Process Modular.

## ATEX Marking

### Identification

The variable speed drive Altivar ATV630, 650, 660 & 680, ATV930, 950, 960 & 980 and Altivar Process Modular, ATEX certified, can be recognized by the specific marking reproduced hereafter:



- 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 16ATEX0015X** 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 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 ATV630, 650, 660 & 680, ATV930, 950, 960 & 980 and Altivar Process Modular 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.



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# Chapter 3

## Wiring Diagrams For ATEX Applications

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### What Is in This Chapter?

This chapter contains the following topics:

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ATEX Installation Case 2: Single drive with motor thermal switch and with Safety Module Type Preventa XPS-AF	24
ATEX Installation Case 3: Single drive with PTC and control unit	26
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## General

### Requirements

Requirements provided by the ATEX standards for installation should be fulfilled. Also follow the requirements below:

- IEC 60079-14 Electrical installations design, selection and erection, for applications in atmospheres with explosive gas,
- local regulation, cabling rules for applications in atmospheres with presence of gas or dust.


### Wiring Diagrams Presentation

Schemes suggested in this document for installation and commissioning of variable speed drives ATV630, 650, 660 & 680, ATV930, 950, 960 & 980 and Altivar Process Modular for ATEX applications are based on thermal sensors (for example a PTC sensor) embedded in the ATEX motor and an intrinsic safety "i" control unit. The control unit is a device which converts in a switching function the variation of the characteristic of a thermal sensor.

### ATEX Periodic test

The complete functional 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.

### Shielded Cables on I/O

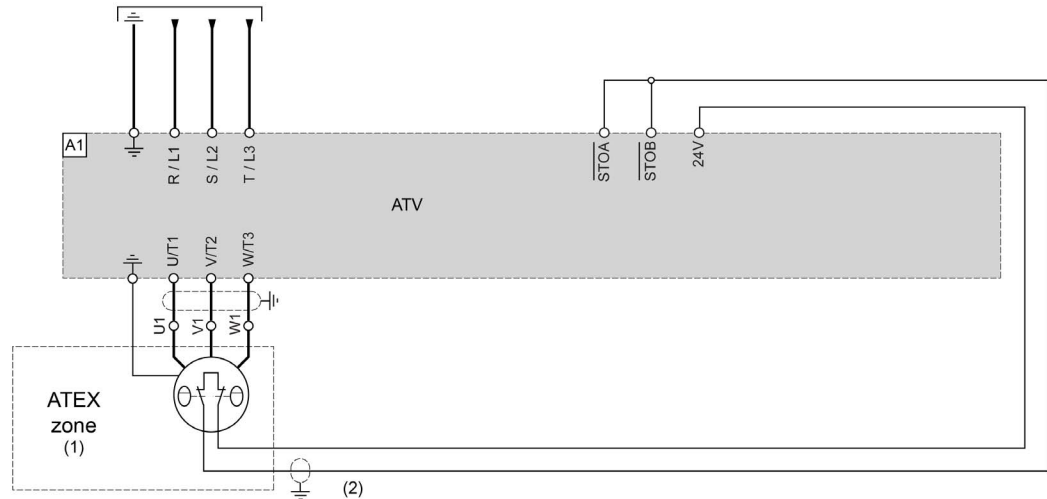
 <b>WARNING</b>
<b>UNANTICIPATED EQUIPMENT OPERATION</b>
<ul style="list-style-type: none"><li>● Use shielded cables for all digital and analog I/O signals and communication signals.</li><li>● Ground cable shields at a single point.</li><li>● Route communication cables and I/O cables separately from power cables.</li></ul>
<b>Failure to follow these instructions can result in death, serious injury, or equipment damage.</b>

## ATEX Installation Case 1: Single drive with motor thermal switch

### Description

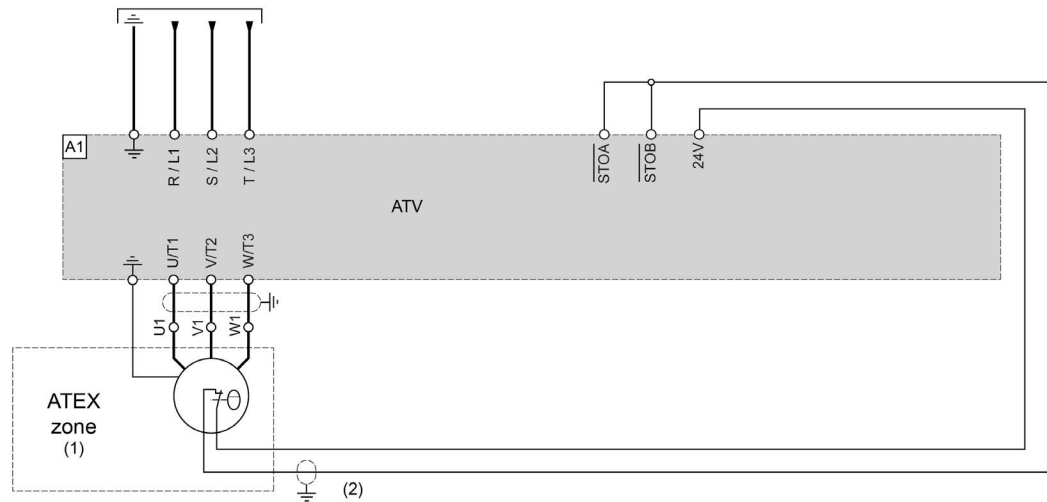
- ATEX motor in Zone 1 or 21 or 2 or 22 (following wiring diagram).
- STO inputs used for thermal protection of the ATEX motor, SIL1 capability according to IEC 61508, stop category 0 according to IEC 60204-1 without protection against supply interruption or voltage reduction and subsequent rotation.
- Thermal protection of the ATEX motor by using an ATEX thermal switch.

### Wiring Diagram For ATEX Zone 1 or 21



- (1) ATEX Zone 1 or 21. ATEX Motor type "d" with embedded type "d" thermal switches. These thermal switches must fulfill the reinforced insulation according to IEC 61800-5-1.
- (2) Cable and wiring following IEC 60079-14 standard. STO cables must be shielded and run apart from the supply cable.

### Wiring Diagram For ATEX Zone 2 or 22



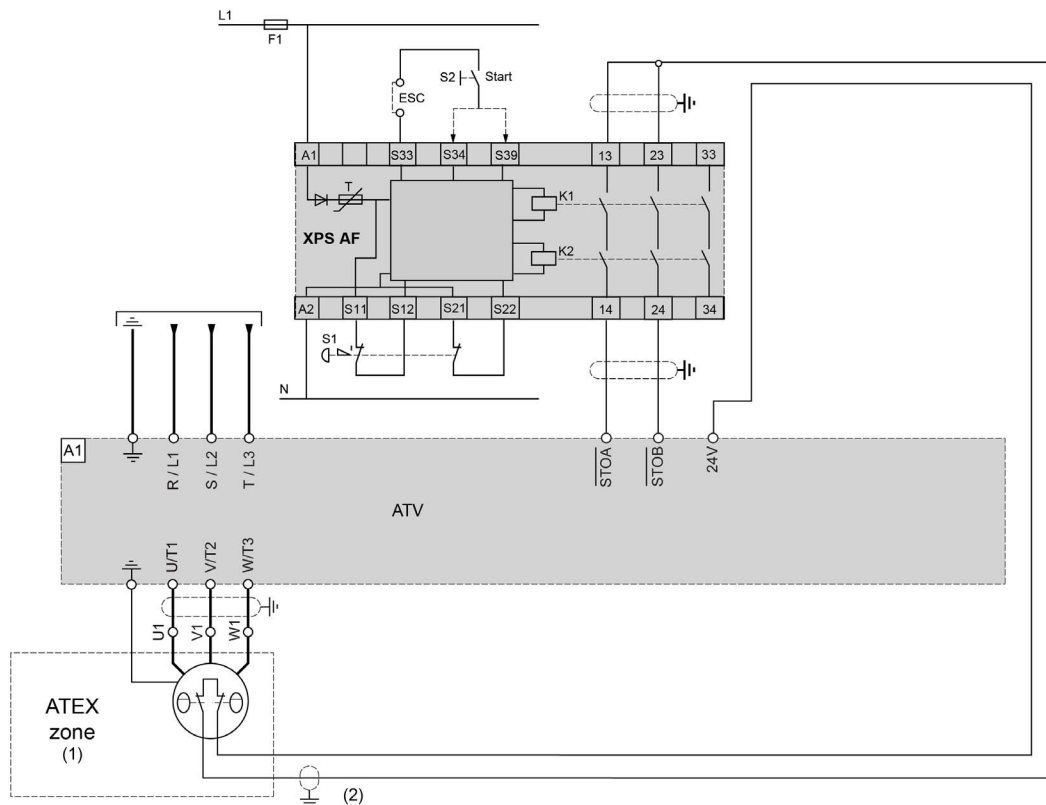
- (1) ATEX Zone 1 or 21. ATEX Motor type "d" with embedded type "d" thermal switch. This thermal switch must fulfill the reinforced insulation according to IEC 61800-5-1.
- (2) Cable and wiring following IEC 60079-14. STO cables must be shielded and run apart from the supply cable.

## ATEX Installation Case 2: Single drive with motor thermal switch and with Safety Module Type Preventa XPS-AF

### Description

- ATEX motor in Zone 1 or 21 or 2 or 22 (following wiring diagram).
- STO input used for thermal protection of the ATEX motor, SIL 1 capability according to IEC 61508 and for functional safety SIL3 capability according to IEC61508, stop category 0 according to IEC 60204-1, and category 3 PL e according to ISO 13849-1.
- Thermal protection of the ATEX motor by using an ATEX thermal switch.

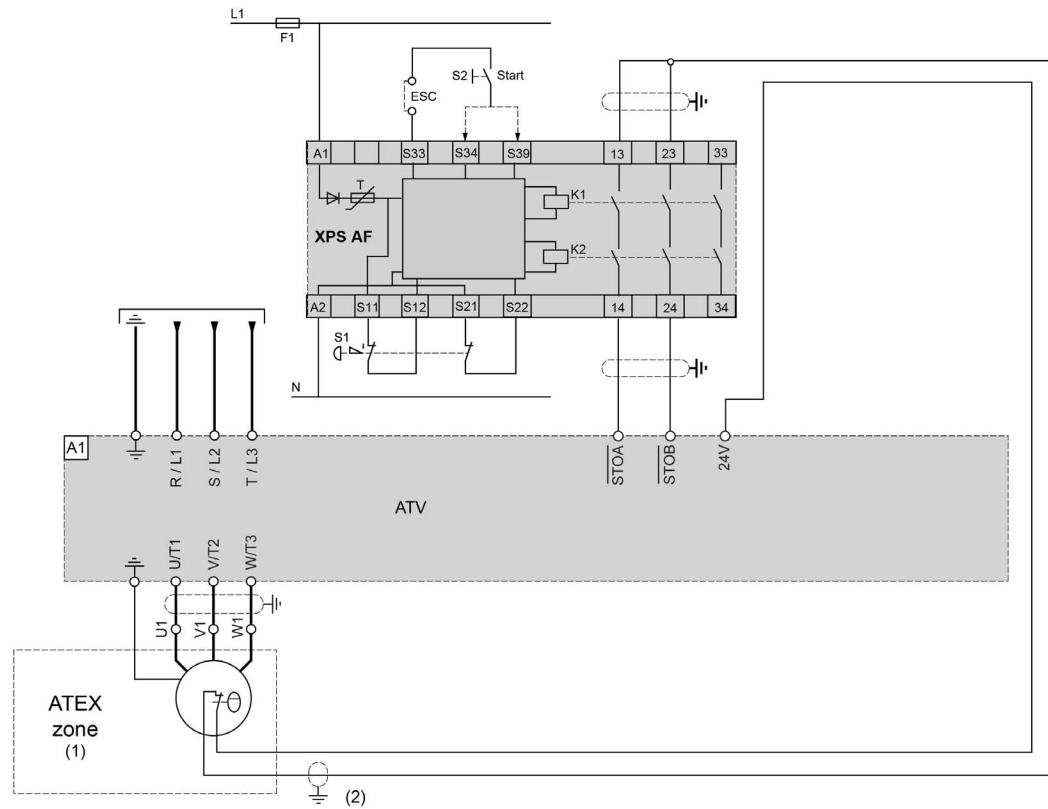
### Wiring Diagram For Zone 1 or 21



- (1) ATEX Zone 1 or 21. ATEX Motor type "d" with embedded type "d" thermal switches. These thermal switches must fulfill the reinforced insulation according to IEC 61800-5-1
- (2) Cable and wiring following IEC60079-14. STO cables must be shielded and run apart from the supply cable.



## Wiring Diagram For Zone 2 or 22



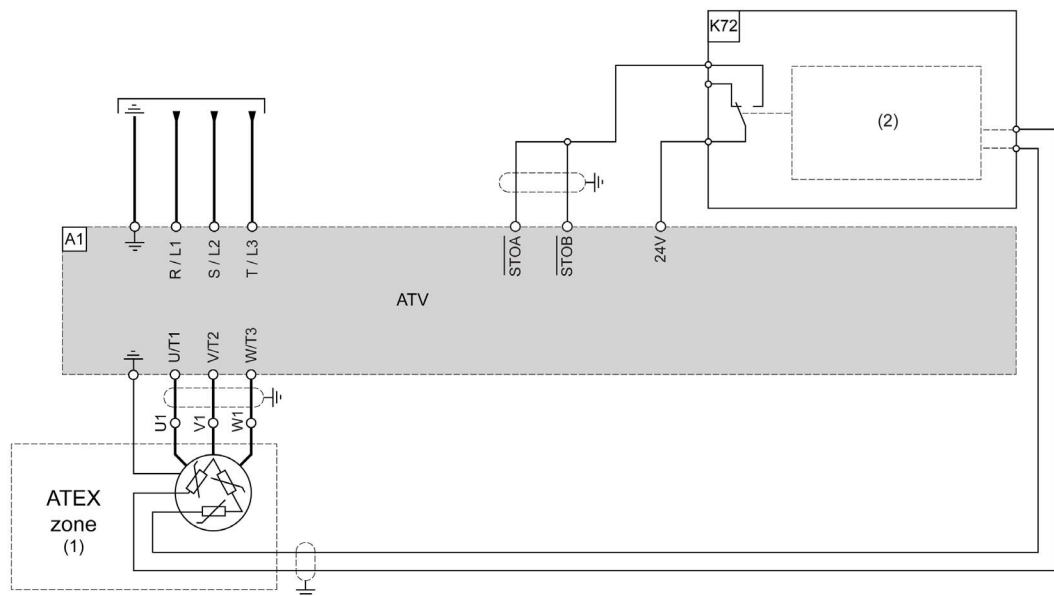
- (1) ATEX Zone 2 or 22. ATEX Motor type "d" with embedded type "d" thermal switch. This thermal switch must fulfill the reinforced insulation according to IEC 61800-5-1
- (2) Cable and wiring following IEC60079-14. STO cables must be shielded and run apart from the supply cable.

## ATEX Installation Case 3: Single drive with PTC and control unit

### Description

- ATEX motor in Zone 1 or 21 or 2 or 22
- STO inputs used for protection of the ATEX motor sensor only, SIL1 capability according to IEC 61508, stop category 0 according to IEC 60204-1 without protection against supply interruption or voltage reduction and subsequent rotation.
- Thermal protection of the ATEX motor by using an ATEX thermal sensor (PTC type, without embedded switching system), and a control unit for the PTC conversion, including the switching system.

### Wiring Diagram



**(1)** ATEX Zone 1 or 21 or 2 or 22 with at least 1 thermal sensor PTC type

**(2)** ATEX certified Control unit conversion / insulation / switching system with Level of protection intrinsic safety "i".

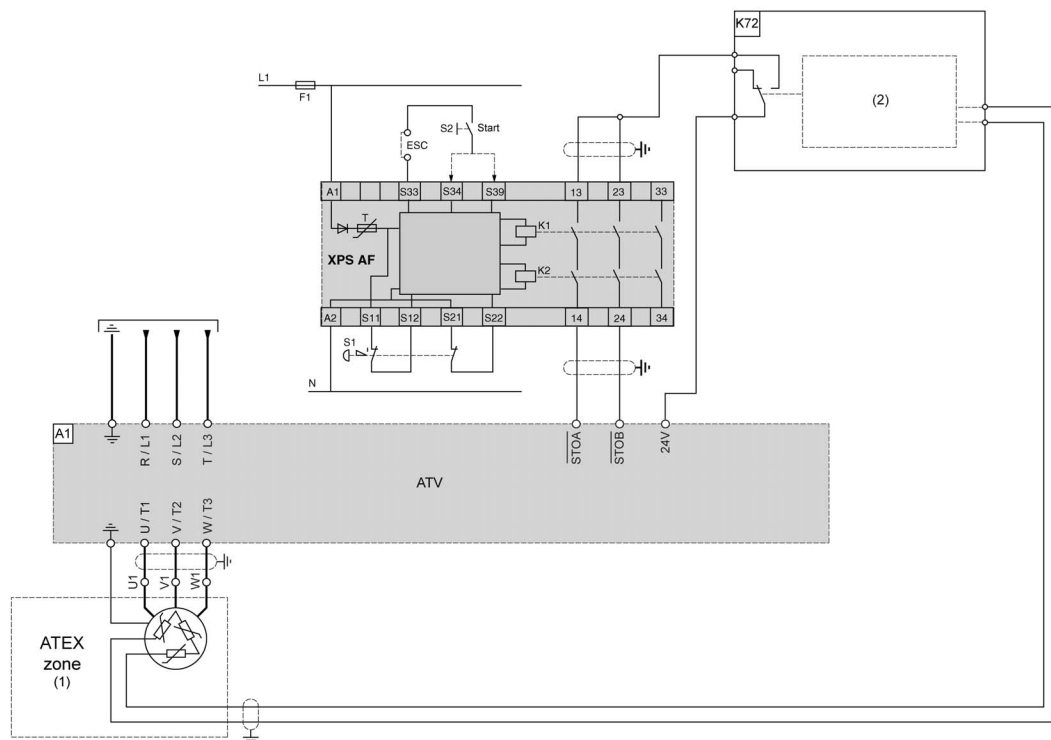
**(K72)** ATEX certified PTC relay

## ATEX Installation Case 4: Single drive with PTC and control unit and with Safety Module Type Preventa XPS-AF

### Description

- ATEX motor in Zone 1 or 21 or 2 or 22
- STO input used for protection of the ATEX motor, SIL 1 capability according to IEC 61508 and for functional safety SIL3 capability according to IEC61508, stop category 0 according to IEC 60204-1, and category 3 PL e according to ISO 13849-1.
- Thermal protection of the ATEX motor by using an ATEX thermal sensor (PTC type, without embedded switching system), and a control unit for the PTC conversion, including the switching system

### Wiring Diagram



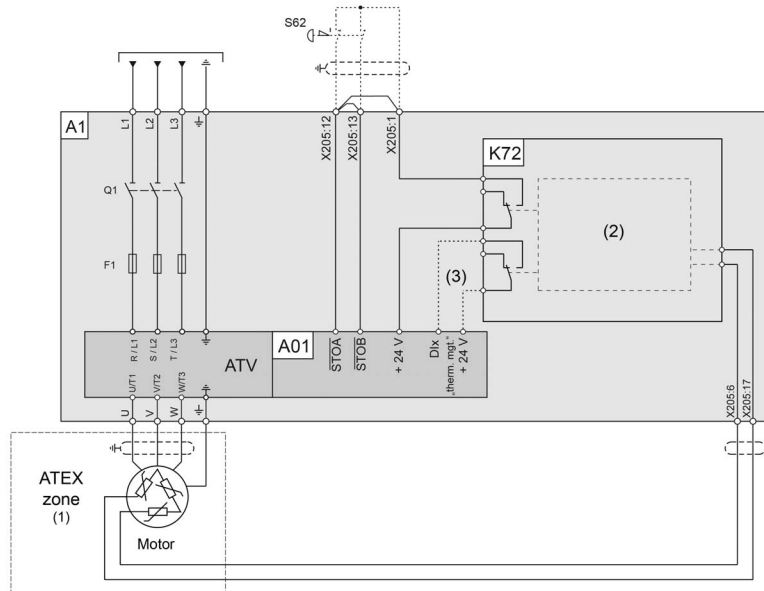
- (1) ATEX Zone 1 or 21 or 2 or 22 with at least 1 thermal sensor PTC type  
 (2) ATEX certified Control unit conversion / insulation / switching system  
 (K72) ATEX certified PTC relay

## ATEX Installation Case 5: Drive Systems with PTC schematic 1

### Description

- ATEX motor in Zone 1 or 21 or 2 or 22
- STO input used for protection of the ATEX motor, SIL 1 capability according to IEC61508 and for functional safety SIL3 capability according to IEC61508 and stop category 0 according to IEC 60204-1.
- Thermal protection of the ATEX motor by using an ATEX thermal sensor (PTC type, without embedded switching system), and a control unit for the PTC conversion, including the switching system

### Wiring Diagram



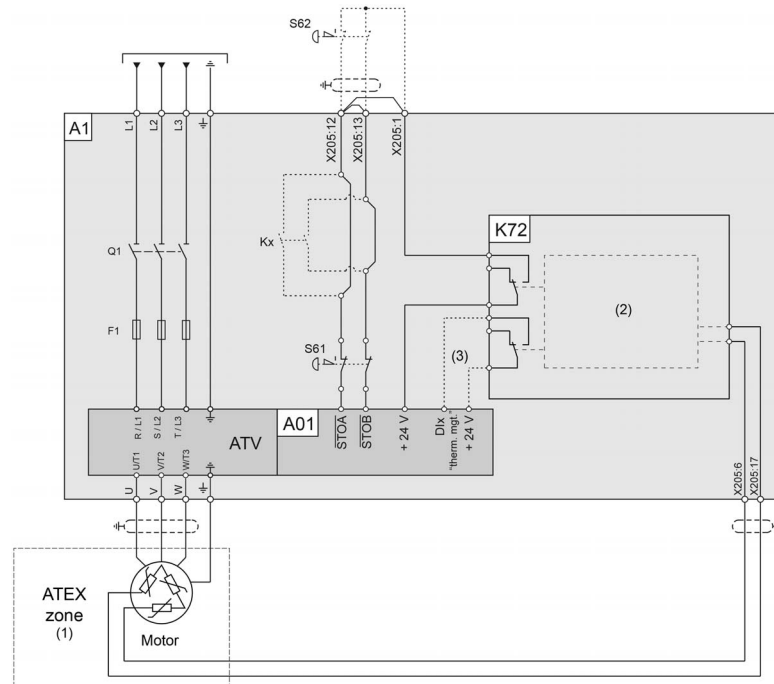
- (1) ATEX Zone 1 or 21 or 2 or 22 with at least 1 thermal sensor PTC type  
(2) ATEX certified Control unit conversion / insulation / switching system  
(3) (Dix) Internal I/O can be used for PTC monitoring.  
(K72) ATEX certified PTC relay  
(Dix) Internal I/O set to thermal management  
(S62) External emergency stop button.

## ATEX Installation Case 6: Drive Systems with PTC schematic 2

### Description

- ATEX motor in Zone 1 or 21 or 2 or 22
- STO input used for protection of the ATEX motor, SIL 1 capability according to IEC61508 and for functional safety SIL3 capability according to IEC61508 and stop category 0 according to IEC 60204-1.
- Thermal protection of the ATEX motor by using an ATEX thermal sensor (PTC type, without embedded switching system), and a control unit for the PTC conversion, including the switching system

### Wiring Diagram



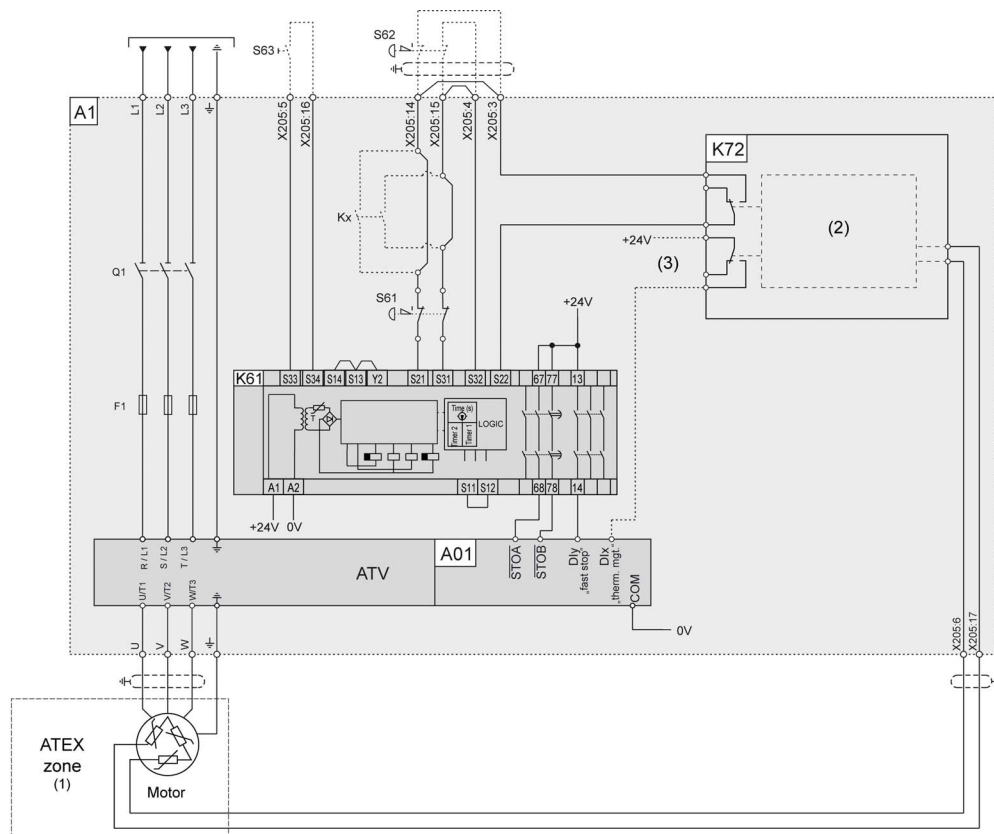
- (1) ATEX Zone 1 or 21 or 2 or 22 with at least 1 thermal sensor PTC type  
(2) ATEX certified Control unit conversion / insulation / switching system  
(K72) ATEX certified PTC relay  
(Dlx) Internal I/O set to thermal management  
(Kx) Optional additional contacts within the safety path  
(S61) Emergency Stop button mounted in the enclosure door.  
(S62) External emergency stop button.

## ATEX Installation Case 7: Drive Systems with PTC schematic 3

### Description

- ATEX motor in Zone 1 or 21 or 2 or 22
- STO input used for protection of the ATEX motor, SIL 1 capability according to IEC61508 and for functional safety SIL3 capability according to IEC61508, stop category 1 according to IEC 60204-1 and category 3 PL e according to ISO 13849-1.
- Thermal protection of the ATEX motor by using an ATEX thermal sensor (PTC type, without embedded switching system), and a control unit for the PTC conversion, including the switching system

### Wiring Diagram



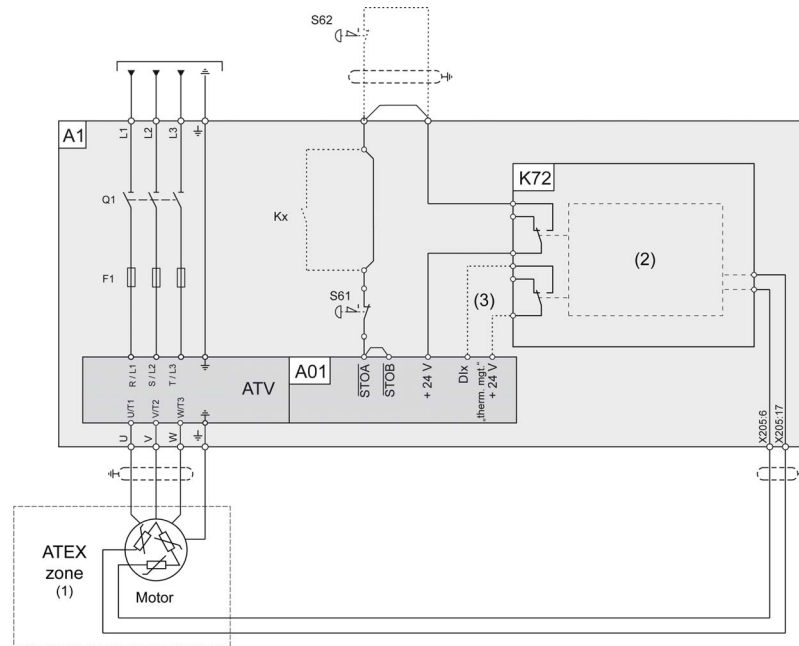
- (1) ATEX Zone 1 or 21 or 2 or 22 with at least 1 thermal sensor PTC type
- (2) ATEX certified Control unit conversion / insulation / switching system
- (K72) ATEX certified PTC relay
- (DIx) Internal I/O set to thermal management
- (DIy) Internal I/O set to fast stop
- (Kx) Optional additional contacts within the safety path
- (K61) Safety relay for monitoring the Emergency Stop circuit Preventa XPS-ATR
- (S61) Emergency Stop button mounted in the enclosure door
- (S62) External emergency stop button
- (S63) Manual reset button

## ATEX Installation Case 8: Drive Systems with PTC schematic 4

### Description

- ATEX motor in Zone 1 or 21 or 2 or 22
- STO input used for protection of the ATEX motor and for the functional safety of Category 3 (ISO 13849-1) and for SIL 1 (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 an ATEX thermal sensor (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.

### Wiring Diagram



- (1) ATEX Zone 1 or 21 or 2 or 22 with at least 1 thermal sensor PTC type  
 (2) ATEX certified Control unit conversion / insulation / switching system  
 (K72) ATEX certified PTC relay  
 (Dlx) Internal I/O set to thermal management  
 (Kx) Optional additional contacts within the safety path  
 (S61) Emergency Stop button mounted in the enclosure door.  
 (S62) External emergency stop button.







## E

**ELV**

Extra-Low Voltage. For more information: IEC 60449

**Error**

Discrepancy between a detected (computed, measured, or signaled) value or condition and the specified or theoretically correct value or condition.

## F

**Factory setting**

Factory settings when the product is shipped

**Fault**

Fault is an operating state. If the monitoring functions detect an error, a transition to this operating state is triggered, depending on the error class. A "Fault reset" is required to exit this operating state after the cause of the detected error has been removed. Further information can be found in the pertinent standards such as IEC 61800-7, ODVA Common Industrial Protocol (CIP).

**Fault reset**

A function used to restore the drive to an operational state after a detected error is cleared by removing the cause of the error so that the error is no longer active.

## L

**L/R**

Time constant equal to the quotient of inductance value (L) over the resistance value (R).

## N

**NC contact**

Normally Closed contact

**NO contact**

Normally Open contact

## O

**OEM**

Original Equipment Manufacturer

## P

**PA/+**

DC bus terminal

**PC/-**

DC bus terminal

**PELV**

Protective Extra Low Voltage, low voltage with isolation. For more information: IEC 60364-4-41

**PLC**

Programmable logic controller

**Power stage**

The power stage controls the motor. The power stage generates current for controlling the motor.

**PTC**

Positive Temperature Coefficient. PTC thermistor probes integrated in the motor to measure its temperature

**R**

**REACH**

Registration, Evaluation, Authorisation and restriction of Chemicals regulation

**RoHS**

Restriction of Hazardous Substances

**S**

**STO**

Safe Torque Off: No power that could cause torque or force is supplied to the motor

**W**

**Warning**

If the term is used outside the context of safety instructions, a warning alerts to a potential problem that was detected by a monitoring function. A warning does not cause a transition of the operating state.



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