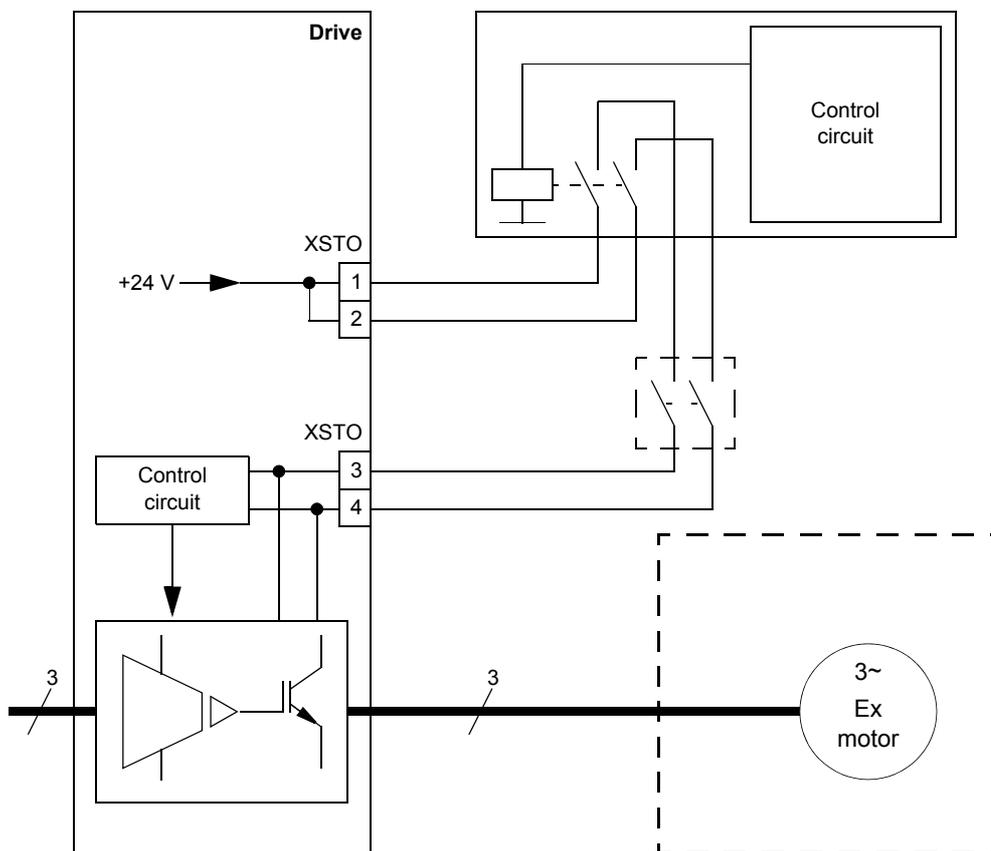


Application guide

ATEX-certified Safe disconnection function, Ex II (2) GD for ACS850 drives (+Q971)



List of related manuals

Hardware and firmware manuals

	Code (English)
ACS850-04 (1.1 to 45 kW) hardware manual	3AUA0000045496
ACS850-04 (55 to 160 kW) hardware manual	3AUA0000045487
ACS850-04 (160 to 560 kW, 200 to 700 hp) hardware manual	3AUA0000081249
ACS850-04 (200 to 500 kW) hardware manual	3AUA0000026234
ACS850 Standard Control Program firmware manual	3AUA0000045497

Option manuals and guides

Application guide - Safe torque off function for ACSM1, ACS850 and ACQ810 drives	3AFE68929814
Technical catalogue - Electronic products and relays	2CDC110004C0206

General safety guides

Safety and functional safety - A general guide	1SFC001008B0201
ABB Safety information and solutions	www.abb.com/safety
Potentially explosive atmospheres - The basics you need to know about motors and drives	3AUA0000037223

You can find manuals and other product documents in PDF format on the Internet. See section Document library on the Internet on the inside of the back cover. For manuals not available in the Document library, contact your local ABB representative.

Application guide

ATEX-certified Safe disconnection function, Ex II (2) GD for ACS850 drives (+Q971)

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Introduction to the guide

Contents of this chapter

This guide contains information on implementing an ATEX-compliant protective circuit using the Safe torque off feature, along with a motor thermal protection method example, and the ATEX certification documents.

Applicability

This guide is applicable to the ACS850 drives with the ATEX-certified Safe disconnection function (option +Q971).

The Safe disconnection function introduced in this guide is certified with a EU-type examination certificate as protective system in accordance with the ATEX product directive 2014/34/EU (previously 94/9/EC).

Target audience

This guide is intended for personnel who install, start-up, use and service the ATEX-certified Safe disconnection function (option +Q971) of the drive. Read the manual before working on the drive. You are expected to know the fundamentals of electricity, wiring, electrical components, electrical schematic symbols and ATEX/Ex regulations.

Only qualified specialists are allowed to install, control and maintain the ATEX-certified Safe disconnection function. See EN IEC 60079-14; follow all safety regulations required with applications of motors for explosive atmospheres (later referred as Ex motors in this guide) in Zone 1/21 (equipment category 2), or Zone 2/22 (equipment category 2 or 3).

Safety instructions



WARNING! Read and follow all safety instructions given for the drive. Ignoring the safety instructions can cause physical injury or death, or damage to the equipment.

This manual does not repeat the complete safety instructions of the drive but summarizes the instructions related to the ATEX-certified Safe disconnection function. The general instructions are given in this section and the option-specific instructions in the appropriate chapter.

In addition to this manual, see the drive hardware manual.

Never work on the drive, the braking chopper circuit, the motor cable or the motor when input power is applied to the drive. Always ensure by measuring that no voltage is actually present.

The safety function described in this guide activates the Safe torque off (STO) function of the drive/inverter module. The STO function of the ACS850 drives is certified (SIL 3 according to EN/ IEC 61800-5-2 and IEC 61508). For a detailed description of the STO function, see the hardware manual of your drive/inverter module.



WARNING! The functions described in this guide do not disconnect the voltage of the main and auxiliary circuits from the drive. Never work on the electrical parts of the drive or the motor before you have also disconnected the drive system from the electric supply, from rotating permanent magnet motors and from rotating motors equipped with sine filters, and made sure by measuring that there is no dangerous voltage present.



WARNING! The Safe torque off feature of ACS850 drives cannot prevent the intermediate DC current from flowing through, and heating up, the motor in case a short-circuit occurs in the output stage of the drive. The supplier must take this into account when planning the protection of the installation.

Note: When you connect the temperature sensor(s) of the Ex motor to the drive STO terminals through a relay, ensure the availability of required reinforced (double) insulation between the main circuit (motor) and the control unit. For example, the insulation of the temperature sensor in the Ex motor and the insulation of the protection relay affect the insulation of the whole circuit. All Ex motors manufactured by ABB have basic insulation between the main circuit and the temperature sensor. Similarly, ABB thermistor relays have basic insulation between the sensor circuit and relay output. This ensures double insulation for the ATEX-certified motor thermal protection function between the main circuit and the drive control unit.

The ATEX-certified Safe disconnection function

When the drive/inverter module is equipped with the option +Q971, its Safe torque off (STO) function is certified as a Safe disconnection function. It can be used as a protective system to protect equipment in potentially explosive atmospheres. The certificate is an EU Type examination certificate in accordance with the ATEX Product Directive 2014/34/EU (previously 94/9/EC).

Commissioning the drive for a motor in a hazardous area

Commission the drive according to the requirements and limitations set by the application, the instructions of the motor manufacturer, drive Firmware manual and local laws and regulations.

The certificate of the Ex motor typically requires that you set a minimum limit for the output switching frequency of the drive. Make sure that the Ex motor is operated above the minimum output switching frequency specified by the motor manufacturer. See section [Switching frequency limitation](#) on page 13.

Compliance with the European ATEX Product Directive 2014/34/EU (94/9/EC)

The system integrator is responsible for the compliance of the complete thermal motor protection circuit with the European ATEX Product Directive 2014/34/EU (previously 94/9/EC). Make sure that the:

- drive is equipped with the ATEX-certified Safe disconnection function (+option +Q971)
- motor thermal protection relay is ATEX-compliant
- motor thermal protection circuit is wired according to the instructions given in this guide and in the motor manual and according to the installation requirements of the relevant standard(s) of EN/IEC 60079 series.

Contents

This guide contains the following chapters:

- [Introduction to the guide](#) introduces this guide.
- [Implementing a Safe disconnection function](#) gives instructions for implementing an ATEX-compliant motor thermal protection circuit using the ATEX-certified Safe disconnection function (option +Q971) of the drive/inverter module.
- [Technical data](#) contains a list of related standards and directives, safety data and the drive ATEX certificates and Declaration of Conformity documents.

Related documents

See inside of the front cover for [List of related manuals](#).

Terms and abbreviations

The abbreviations used in this manual are listed below.

Abbreviation	Description	Reference
ATEX	Directives 2014/34/EU (previously 94/9/EC) and 1999/92/EC refers to the ATEX directives (from "ATmosphères EXplosibles").	
CM-MSS	ABB thermistor motor protection relay.	
Ex	An IEC term used in the context of explosive atmospheres.	IEC 60079 series
Ex d	Type of protection, flameproof enclosures.	EN/IEC 60079-1
Ex e	Type of protection, increased safety, to be replaced with Ex eb.	EN 60079-7:2007 and IEC 60079-7:2006

Abbreviation	Description	Reference
Ex eb, Ex ec	Types of protection, increased safety.	IEC 60079-7:2015
Ex motors	Motors used in explosive atmospheres.	
Ex nA	Type of protection, non-sparking enclosures, to be replaced with Ex ec.	EN/IEC 60079-15:2010
SIL	Safety integrity level.	IEC 61508
STO	Safe torque off (EN 61800-5-2: 2007).	
T1	Proof test interval (IEC 61508: 2010).	
PTC	Positive temperature coefficient; PTC thermistor, PTC resistor temperature sensor.	

Exclusion of liability

ABB is not responsible for the implementation, verification and validation of the overall safety system. It is the responsibility of the end user (or other party) who is responsible for the overall system, system safety and compliance with ATEX/Ex regulations.

The end user (or other responsible party) must make sure that the entire implementation complies with all relevant standards, directives and local electrical code, and that the system is tested, verified and validated correctly.



Implementing a Safe disconnection function

Contents of this chapter

This chapter contains instructions on implementing an ATEX-compliant thermal motor protection circuit using the ATEX-certified Safe disconnection function (option +Q971), of the ACS850 drive.

Two-channel connection to drive STO terminals

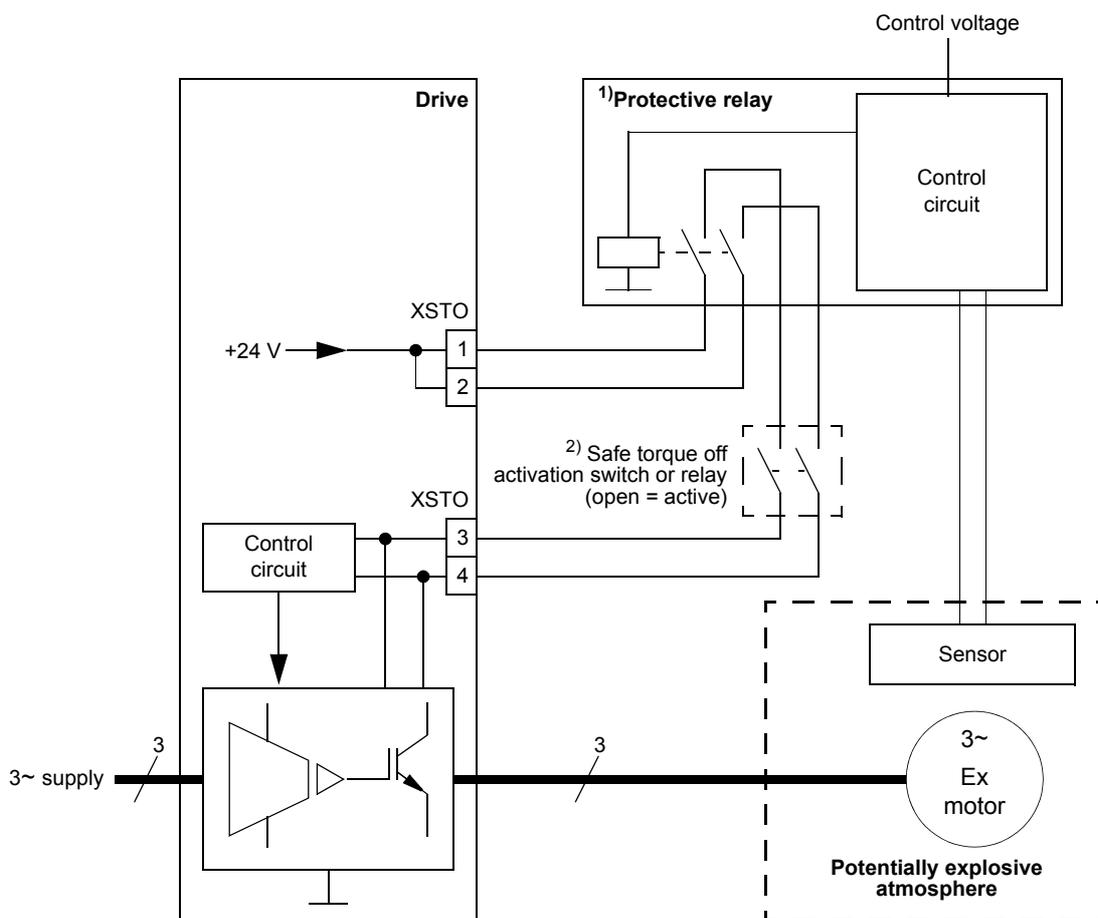
■ General

This section describes an implementation of the ATEX-compliant motor thermal protection circuit. The circuit uses the ATEX-certified Safe disconnection function (option +Q971) of the drive and a two-channel (redundant) connection to the drive STO terminals.

■ Connection diagram

The diagram below shows the connections. The system integrator must acquire the components and do the installation drawn outside the drive border line.

The output contacts of the protective relay can be connected in series with another Safe torque off activation switch/relay (if present).



1) An ATEX-compliant protective relay. The relay monitors a sensor circuit, and activates the Safe torque off function of the drive by opening the control circuits when necessary.

2) You can use the drive STO function for several external safety functions at the same time (for example, ATEX-compliant thermal motor protection, and emergency stop). If you do, you must connect the STO activation switches or relays used in other safety functions in series with the ATEX-compliant protective relay.

When you install the equipment, make sure that you maintain redundancy (separation) of switching signals.

■ Parameter settings

ACS850 standard control program

Note: A manual reset is mandatory in the temperature protection function, if it is required for ensuring the compliance of the system with Ex/ATEX regulations. When the protection relay detects motor overtemperature, the drive must not restart before a manual reset command. You can implement a manual reset in the ATEX-compliant protection relay (recommended) or by setting the drive parameter *30.07* into *Fault*.

Select the STO indication mode for the drive with parameter *30.07 Sto diagnostic*. In this example, *Fault* is required if the manual reset is implemented with the parameter *30.07 Sto diagnostic*. The control panel display shows fault message *0031 SAFE TORQUE OFF* when one or both STO inputs are activated (switched off) (0) or lost. If the drive control unit is externally powered, but no main power is connected to the drive, the fault message shows *0021 STO1 LOST* (for XSTO connection 1 - 3 and *0022 STO2 LOST* (for XSTO connection 2 -4). With the setting *Fault* the indication is the same independent on whether the drive is running or stopped when the STO input is activated. The drive can be restarted after resetting the fault.

If you implement the manual reset in the relay, the parameter *30.07* can be set to any value.

■ Switching frequency limitation

The certificate of the Ex motor typically requires that you set a minimum limit for the switching frequency of the drive.

For ABB Ex motors with ACS850 drives, set the minimum switching frequency to 3 kHz for both DTC motor control mode and scalar motor control mode. For more instructions, contact your ABB representative.

■ Wiring instructions

See sections [Connection diagram](#) on page 12 and [General wiring instructions](#) on page 18.

One-channel connection to drive STO terminals

■ General

This section represents the implementation of an ATEX-compliant thermal motor protection circuit:

- The circuit uses the ATEX-certified Safe disconnection function (option +Q971) of the drive.
- There is a one-channel (non-redundant) connection from the temperature protection relay to the drive STO terminals. Both STO inputs of the drive are connected to same output contact of the protection relay.
- One output contact of the protection relay is connected to a digital input of the drive.
- The drive control panel shows an overtemperature indication when the digital input switches off (the protection relay trips)

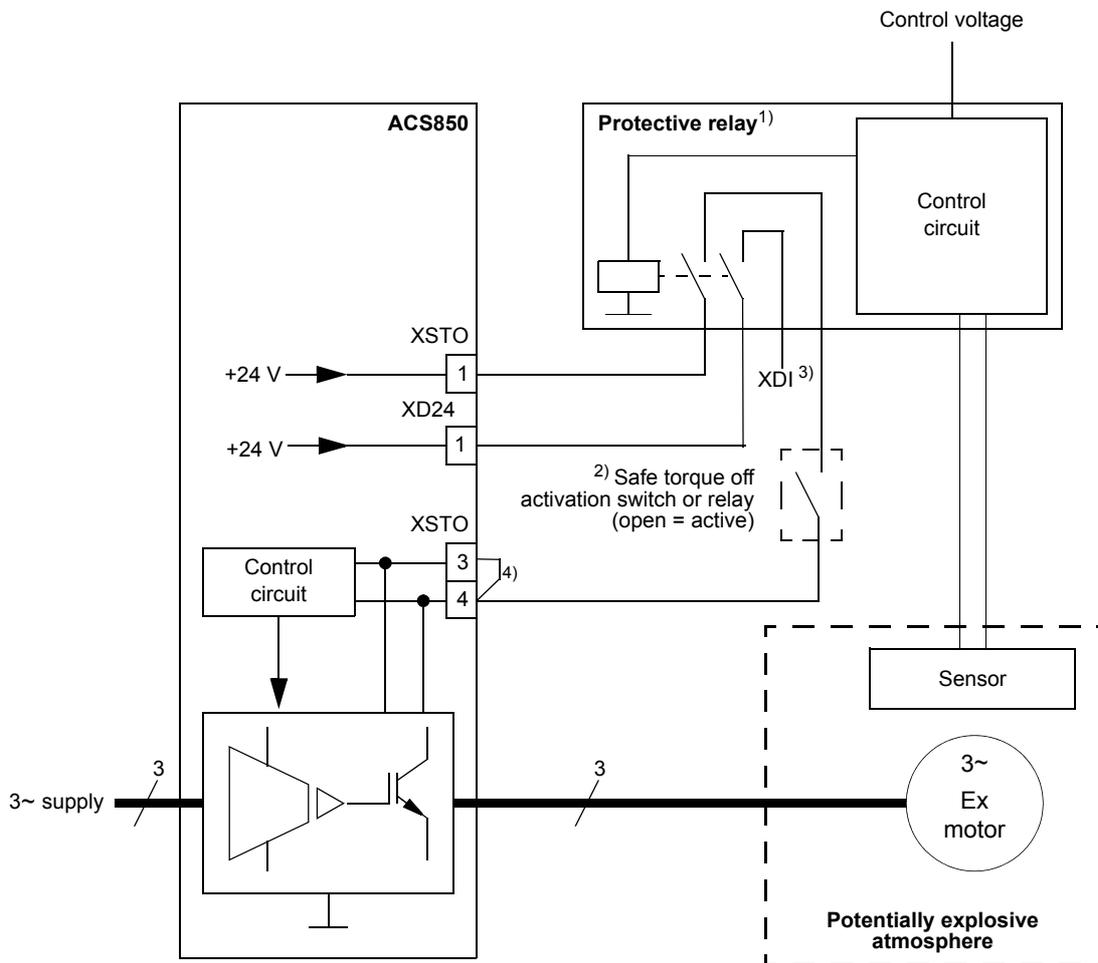
If you plan to use the one-channel (non-redundant) connection, make sure that you can reach the necessary safety integrity level. According to the standard EN 50495, SIL1 is sufficient for the protection of category 2 and 3 equipment.

Note: The STO function of the drive must always have redundant connection. See [Connection diagram](#) on page 14.

■ Connection diagram

The diagram below shows the connections. The system integrator must acquire the components and do the installations drawn outside the drive border line.

The output contact of the protective relay can be connected in series with another Safe torque off activation switch/relay (if present).



1) An ATEX-compliant protective relay. The relay monitors a sensor circuit, and activates the Safe torque off function of the drive by opening the control circuits when necessary.

2) You can use the drive STO function for several external safety functions at the same time (for example, ATEX-compliant thermal motor protection, and emergency stop). If you do, you must connect the STO activation switches or relays used in other safety functions in series with the ATEX-complaint protective relay.

3) Connected to a digital input on the control board for the protection relay status indication.

4) The STO function of the drive must always have redundant connection. Connect the XSTO terminals 3 and 4 in accordance with the above figure.

When you install the equipment, make sure that you maintain separation of the switching (safety) signal with any other signals.

■ Parameter settings

ACS850 standard control program

Note: A manual reset is mandatory in an ATEX compliant safety functions. After the relay has detected a motor overtemperature, the drive must not restart before a manual reset command. This can be implemented either by a manual reset of the ATEX compliant relay with the motor overtemperature indication of ACS850 standard control program (indication to be set as *Fault*), or by setting the drive parameter 30.07 into *Fault* in ACS850 standard control program.

Select the STO indication for the drive with parameter 30.07 *Sto diagnostic*. In this example, *Fault* is required if the reset is implemented with the parameter 30.07 *Sto diagnostic*. The control panel display shows fault message 0031 *SAFE TORQUE OFF* when one or both STO inputs are switched off (0) or lost. If the drive control unit is externally powered, but no main power is connected to the drive, the fault message shows 0021 *STO1 LOST* (for XSTO connection 1 - 3) and 0022 *STO2 LOST* (for XSTO connection 2 - 4). With the setting *Fault* the indication is the same, independent on whether the drive is running or stopped when the STO input is switched off. The drive can be restarted after resetting the fault.

If you implement the manual reset in the relay, the parameter 30.07 can be set to any value.

Configuring a motor overtemperature indication message

Note: The control program of the drive has two separate temperature monitoring functions. In this example, one of these functions is configured to monitor digital input DI6.

To configure a motor overtemperature indication message on the drive control panel display, do the following steps:

1. Connect XD24:1 (+24 V DC) through one normally-open contact of the thermistor relay to digital input DI6 on the drive control unit.
2. Set parameter 31.02 *Mot temp1 src* to (4) *PTC JCU*.
3. Set parameter 31.01 *Mot temp1 prot* either to (1) *Alarm* or (2) *Fault* depending on the preferred indication.

Ensure that the thermistor relay, parameter 31.01 or parameter 30.07 lead to a fault which requires a manual reset action.

■ Switching frequency limitation

The certificate of the Ex motor typically requires that you set a minimum limit for the switching frequency of the drive.

For ABB Ex motors with ACS850 drives, set the minimum switching frequency to 3 kHz for both DTC motor control mode and scalar motor control mode. For more instructions, contact your ABB representative.

■ Wiring instructions

See sections [Connection diagram](#) on page 14 and [General wiring instructions](#) on page 18.

Thermal motor protection with two-channel connection

■ General

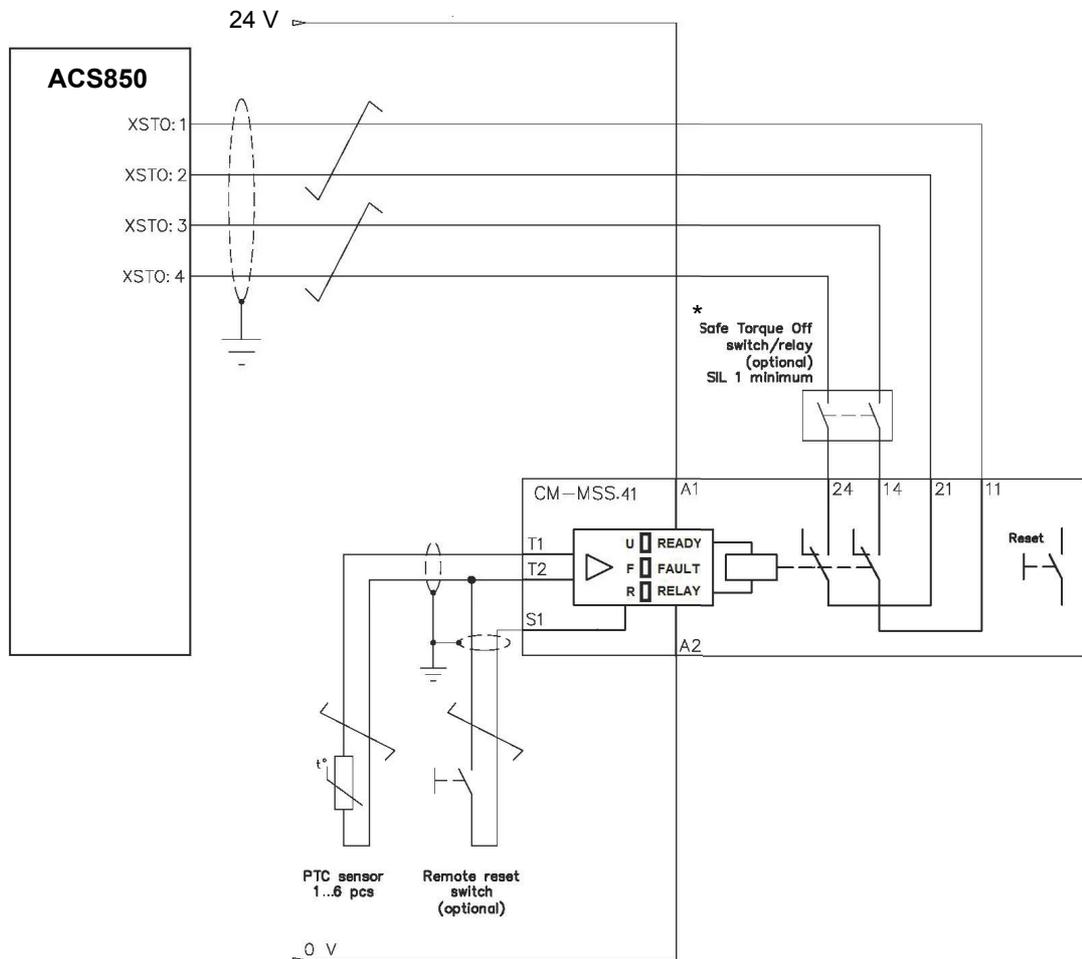
This section represents the implementation of an ATEX-compliant thermal motor protection circuit:

- The circuit uses the ATEX-certified Safe disconnection function of the drive.
- There is an ATEX certified thermistor motor protection relay to monitor the motor temperature.
- There is a two-channel connection from the temperature protection relay to the drive STO terminals. The STO inputs of the drive are connected to their respective output contacts of the protection relay.

Note: The STO function of the drive must always have redundant connection. See [Connection diagram \(two-channel connection\)](#) on page 17.

■ Connection diagram (two-channel connection)

The diagram below shows the wiring of a two-channel connection. The system integrator must acquire the components and do the installations drawn outside the drive border line.



* You can use the drive STO function for several external safety functions at the same time (for example, ATEX-compliant thermal motor protection, and emergency stop). If you do, you must connect the STO activation switches or relays used in other safety functions in series with the ATEX-complaint protective relay.

In two-channel installations, when you install the equipment, make sure that you maintain redundancy (separation) of switching signals.

Sensors

Make sure that the sensor type and the on-off resistances of the used sensors match with the protection relay specifications. Check the requirements for sensor and installation from the documentation of the thermistor relay to be used.

Protection relay

The protection relay monitors the motor equipped with temperature sensors. The sensor indicates the motor temperature for the protection relay. For example, with a PTC thermistor, when the motor temperature reaches the wake-up level of the sensor, the

resistance of the temperature sensor increases sharply. The relay detects the change and indicates motor overtemperature through its output contacts. The opening contacts break the Safe torque off circuits of the drive, thus disconnecting the power supply from the motor.

Use an ATEX-compliant protection relay only. The example employs an ABB CM-MSS.41 thermistor motor protection relay. You can find more information on that relay on the Internet, for example, in *the data sheet of the relay* (2CDC112216D0201). This relay enables implementing the manual reset function. When you use it, no drive parameter needs to be set to *Fault*.

Include the protection relay test to the start up and acceptance test of the thermal motor protection circuit. See the relay manual for the relay tests.

Wiring

■ General wiring instructions

Wire only the sensor circuit into the potentially explosive atmosphere.

Install the drive/inverter module, the Safe torque off circuit, and the protective relay outside the hazardous zone.

For the STO circuit wiring, use the type of cable specified in the appropriate hardware manual.

Route the sensor cables away from the motor cable.

We recommend to use shielded sensor cable to minimize electromagnetic interference from power cables.

Connect the control cable shields to the chassis only.

The installation must comply with the requirements of the relevant standard(s) of EN/IEC 60079 series.

The installation of the sensor circuit in the Ex Zone must comply with the requirements for the applicable type of protection, such as:

- Ex d (EN/IEC 60079-1),
- Ex eb (IEC 60079-7:2015; Ex e in EN 60079-7:2007 and IEC 60079-7:2006),
- Ex ec (IEC 60079-7:2015; Ex nA in EN/IEC 60079-15:2010).

■ Wiring diagrams

See the appropriate section.



Technical data

Contents of this chapter

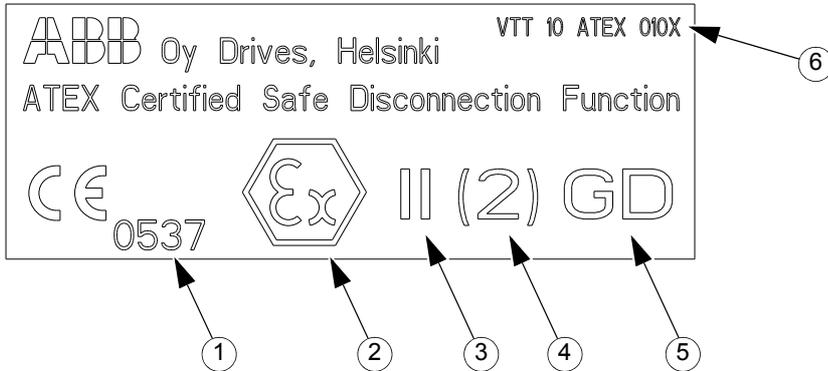
This chapter contains a list of related standards and directives, safety data and the drive ATEX certificates and Declaration of Conformity documents.

Related standards and directives

Code	Name
EN 50495: 2010	Safety devices required for the safe functioning of equipment with respect to explosion risks
IEC 61508:2010	Part 1: General Requirements
	Part 2: Requirements for electrical/electronic/programmable electronic safety-related systems
IEC 61511-1:2016	Functional safety - Safety instrumented systems for the process industry sector
EN 61800-5-2: 2007	Adjustable speed electrical power drive systems
	Part 5-2: Safety requirements - Functional

Markings of the drive/inverter module

An ATEX label is attached to the drive to signify compliance with the European ATEX Products Directive 2014/34/EU (previously 94/9/EC).



No.	Description
1	CE marking with Notified Body identification: The manufacturer declares that the product conforms with ATEX Directive 2014/34/EU (previously 94/9/EC). Notified Body: Eurofins Expert Services (Formerly VTT Expert Services, now part of the Eurofins Group).
2	Specific marking of explosion protection.
3	"II" = Product for other than mining applications.
4	"2" = Category 2 equipment. Parentheses indicate that the drive is to be installed outside the potentially explosive atmosphere.
5	Certified for use in explosive atmospheres caused by: "G" = gases, vapours or mists "D" = dust.
6	Certificate reference.

ATEX certificates



EC-TYPE EXAMINATION
CERTIFICATE
VTT 10 ATEX 010X Issue 2

1 (2)



1. **EC-TYPE EXAMINATION CERTIFICATE**
2. **Equipment or Protective System Intended for use in
Potentially explosive atmospheres
Directive 94/9/EC**
3. Reference: **VTT 10 ATEX 010X Issue 2**
4. Equipment: **Safe Disconnection Function of converter drives**
Certified type: **ACS850 and ACQ810 with option code + Q971**
5. Applicant: **ABB Oy Drives
Hiomotie 13
FIN-00381 Helsinki
Finland**
6. Manufacturers: **ABB Oy Drives
Hiomotie 13
FIN-00381 Helsinki
Finland**

**ABB AS/LV Drives
Aruküla tee 59
Rae vald
75301 Harjumaa
Estonia**

**ABB Malaysia Sdn Bhd
Sungai Way Free Industrial Zone (FIZ)
Factory 1, No.12, Jalan SS 8/2, 47300
Petaling Jaya, Selangor Darul Ehsan,
Malaysia**

**ABB Oy Drives
Drives Service
Kiitoradantie 14
FI-01530 Vantaa
Finland**



7. This equipment or protective system and any acceptable variations thereto is specified in the schedule and possible supplement(s) to this Certificate and the documents therein referred to.
8. VTT Expert Services Ltd, notified body number 0537, in accordance with Article 9 of the Council Directive 94/9/EC of March 1994, certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective system intended for use in potentially explosive atmospheres given in Annex II to the Directive
9. Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 50495 (2010)
10. If the sign "X" is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.
11. This EC-Type examination certificate relates only to the design, examination and tests of the specified equipment or protective system in accordance to the directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment or protective system. These are not covered by this certificate.
12. The marking of the equipment or protective system shall include the following:



II (2) GD

Espoo, 18.2.2016

VTT Expert Services Ltd



Martti Siirola
Senior Expert



Risto Sulonen
Product Manager



SCHEDULE TO EC-TYPE
EXAMINATION CERTIFICATE
VTT 10 ATEX 010X Issue 2

1 (1)

13. **Schedule**

14. **EC-TYPE EXAMINATION CERTIFICATE VTT 10 ATEX 010X Issue 2**

15. Description

Safe disconnection is achieved by using "Safe Torque Off"(STO)-function which is integrated in the standard drive as an internal hardware-solution. Power that can cause rotation is not applied to the motor. The safety related part of the adjustable speed electrical power drive system PDS (SR) will not provide energy to the motor which can generate torque.

16. Documents

ATEX Safe Disconnection Function, 3AXD10000016980, rev B (dated 14.1.2016) Certificate No. A031-0068/11, V1.0 by TÜV Nord

17. Special conditions for safe use

Circuit activating Safe Torque Off- function shall be constructed using fail-safe principle and ATEX-certified safety components (eg. thermal relays). All manufacturer's instructions shall be followed.

The drive themselves are to be installed outside potentially explosive atmospheres (article 1, section 2 of the Directive).

18. Essential Health and Safety Requirements

Assessment using standard referred in point 9 have confirmed compliance with the Directive 94/9/EC, Annex II and particular point 1.5.

Certificate history

Issue	Date	Comment
0	23.3.2010	Prime certificate
1	14.2.2011	The introduction of new type ACQ810 and the one channel option .The introduction of the new manufacturing site.
2	18.2.2016	The introduction of new manufacturing places and a new PTC-relay

Espoo, 18.2.2016

VTT Expert Services Ltd


Martti Siirola
Senior Expert


Risto Sulonen
Product Manager

Certificate without signatures shall not be valid.

This certificate, including the schedule, may only be reproduced in its entirety and without any change.

Declaration of Conformity



EU Declaration of Conformity

ATEX Directive 2014/34/EU

We

Manufacturer: ABB Oy
Address: Hiomotie 13, 00380 Helsinki, Finland
Phone: +358 10 22 11

Declare under our sole responsibility that the following products:

Frequency converter

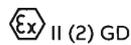
ACS850-04

identified with serial numbers beginning with 1 or 8
with regard to the safety function

ATEX certified safe disconnection function (option code +Q971)

are in conformity with all the relevant requirements for protective system of EU Directive for Equipment for Explosive Atmospheres 2014/34/EU.

Specific marking of explosion protection



The following harmonized standards have been applied:

EN 50495: 2010	<i>Safety devices required for the safe functioning of equipment with respect to explosion risks</i>
EN 61800-5-2: 2007	<i>Adjustable speed electrical power drive systems – Part 5-2: Safety requirements – Functional</i>

The following other standard has been applied:

IEC 61508: 2010	<i>Functional safety of electrical / electronic / programmable electronic safety-related systems</i>
-----------------	--



Notified Body: VTT Expert Services Ltd, Notified Body number 0537
Address: Kivimiehentie 4, P.O.Box 1001, 02044 Espoo, Finland

has assessed the conformity of the "ATEX certified safe disconnection function" of ACS850 drives and has issued the certificate VTT 10 ATEX 010X.

The products referred in this Declaration of Conformity fulfil the relevant provisions of other European Union Directives which are notified in Single EU Declaration of Conformity 3AXD10000497837.

Helsinki, 29 Jan 2018

Manufacturer representative:

A handwritten signature in black ink, appearing to read 'Vesa Kandell', is written over a horizontal line.

Vesa Kandell
Vice president, ABB Oy

Note: If the Declaration of Conformity is needed in any other official language of European Union than in English, contact ABB.

STO circuit cable specification

Type	2 × 2 × 0.75 mm ² low voltage, single shielded, twisted pair cable
Maximum length	25 m between STO inputs and the operating contact
Example	Li YCY TP 2×2×0.75 mm ² shielded twisted pair cable by HELUKABEL or CEAM

Further information

Product and service inquiries

Address any inquiries about the product to your local ABB representative, quoting the type designation and serial number of the unit in question. A listing of ABB sales, support and service contacts can be found by navigating to abb.com/searchchannels.

Product training

For information on ABB product training, navigate to new.abb.com/service/training.

Providing feedback on ABB Drives manuals

Your comments on our manuals are welcome. Navigate to new.abb.com/drives/manuals-feedback-form.

Document library on the Internet

You can find manuals and other product documents in PDF format on the Internet at abb.com/drives/documents.



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