

ABB INDUSTRIAL DRIVES

## User's manual

ATEX-certified motor thermal protection functions for cabinet-built ACS880 drives (options +L513+Q971 and +L514+Q971)



# List of related manuals

<b>General drive manuals</b>	Code (English)
Safety instructions for ACS880 multidrive cabinets and modules	<a href="#">3AUA0000102301</a>
Mechanical installation instructions for ACS880 multidrive cabinets	<a href="#">3AUA0000101764</a>
Electrical planning instructions for ACS880 multidrive cabinets and modules	<a href="#">3AUA0000102324</a>
<b>Drive hardware manuals</b>	
ACS880-07 (45 to 630 kW, 50 to 700 hp) hardware manual	<a href="#">3AUA0000105718</a>
ACS880-07 (560 to 2800 kW) hardware manual	<a href="#">3AUA0000143261</a>
ACS880-17 drives hardware manual	<a href="#">3AXD50000020436</a>
ACS880-37 drives hardware manual	<a href="#">3AXD50000020437</a>
ACS880-107 inverter units hardware manual	<a href="#">3AUA0000102519</a>
ACS880-07CLC drives hardware manual	<a href="#">3AXD50000131457</a>
<b>Drive firmware manuals</b>	
ACS880 primary control program firmware manual	<a href="#">3AUA0000085967</a>
<b>PC tool manuals</b>	
Start-up and maintenance PC tool Drive composer user's manual	<a href="#">3AUA0000094606</a>
<b>Drive option manuals</b>	
ACS-AP-x Assistant control panels user's manual	<a href="#">3AUA0000085685</a>
Prevention of unexpected start-up (+Q950) for ACS880 multidrives user's manual	<a href="#">3AUA0000145934</a>
Prevention of unexpected start-up (+Q950) for ACS880-07/17/37 drives user's manual	<a href="#">3AUA0000145922</a>
Safely-limited speed with the encoder interface (+Q965) for ACS880-07/17/37 drives user's manual	<a href="#">3AXD50000019727</a>
Safely-limited speed with the encoder interface (+Q965) for ACS880 multidrives user's manual	<a href="#">3AXD50000019728</a>
Safely-limited speed without the encoder interface (+Q966) for ACS880 multidrives user's manual	<a href="#">3AUA0000145935</a>
Emergency stop, configurable stop category 0 or 1 (+Q978) for ACS880-07/17/37 drives user's manual	<a href="#">3AUA0000145920</a>
Emergency stop, configurable stop category 0 or 1 (+Q979) for ACS880 multidrives user's manual	<a href="#">3AUA0000145933</a>
Emergency stop, configurable stop category 0 or 1 (+Q979) for ACS880-07/17/37 drives user's manual	<a href="#">3AUA0000145921</a>
FSO-12 safety functions module user's manual	<a href="#">3AXD50000015612</a>
FSO-21 safety functions module user's manual	<a href="#">3AXD50000015614</a>
FSE-31 pulse encoder interface module user's manual	<a href="#">3AXD50000016597</a>
Manuals and quick guides for I/O extension modules, fieldbus adapters, etc.	
<b>General safety guides</b>	
Functional safety; Technical guide No. 10	<a href="#">3AUA0000048753</a>
Safety and functional safety; A general guide	<a href="#">1SFC001008B0201</a>
ABB Safety information and solutions	<a href="http://www.abb.com/safety">www.abb.com/safety</a>
Potentially explosive atmospheres. The basics you need to know about motors and drives	<a href="#">3AUA0000037223</a>

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.

# User's manual

ATEX-certified motor thermal protection functions for  
cabinet-built ACS880 drives

(options +L513+Q971 and +L514+Q971)

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# 1

## Introduction to the manual

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### Contents of this chapter

This chapter contains information on the manual, gives safety instructions and other general information for the reader.

### Applicability

The manual applies to cabinet-built ACS880 single drives and multidrives with the options:

- +L513+Q971 and +2L513+Q971  
(+3L513+Q971 available as an application-engineered option)
- +3L514+Q971, +5L514+Q971 and +8L514+Q971.

The motor thermal protection functions described in this manual are certified, with an EU-type examination certificate, as protective systems in accordance with the ATEX Product Directive 2014/34/EU (previously 94/9/EC).

### Safety instructions

Only qualified specialists are allowed to install, control and maintain the ATEX-certified motor thermal protection functions (see EN/IEC 60079-14). Obey all safety regulations required with application of Ex motors in Zone 1/21 (equipment category 2) or Zone 2/22 (equipment category 2 or 3).



**WARNING!** Read and obey all safety instructions given for the drive. If you ignore them, injury or death, or damage to the equipment can occur.

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This manual does not repeat the complete safety instructions of the drive but it only includes the instructions related to the scope of this manual. The general instructions are given in this section and the option-specific instructions in the appropriate chapter.

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In addition to this manual,

- for ACS880 single drives, see the drive hardware manual
- for ACS880 air-cooled multidrives, see *Safety instructions for ACS880 multidrive cabinets and modules* (3AUA0000102301 [English]).

The function described in this manual activates the Safe torque off (STO) function of the drive/inverter unit. The STO function of the ACS880 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 unit.



**WARNING!** The functions described in this manual 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 STO function of ACS880 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.

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**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 protection 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.

### ■ Example circuit diagrams of this manual

The purpose of the example circuit diagrams is to help in understanding the operation of the ATEX-certified motor thermal protection functions. The diagrams do not cover all possible details and variants of the drives. The component designations do not necessarily match each drive.



**WARNING!** Never connect, test or measure a drive based on the diagrams of this manual. Each delivery is unique. Before you start the work on the electric circuits of a drive, always refer to the delivery-specific circuit diagrams.

---

## Commissioning the drive for a motor in a hazardous area

Commission the drive according to the requirements and limitations set by the application, the motor manufacturer's instructions, drive firmware manual, local laws and regulations and this manual.

### ■ Minimum switching frequency

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 chapter [Parameter settings](#) for instructions on how to make the setting.

## Target audience

The manual is intended for people who install, start-up, use and service the ATEX-certified motor thermal protection functions 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.

## Contents

This manual contains information on implementing the ATEX-certified motor thermal protection functions in the ACS880 cabinet-built drives, as well as the ATEX certification documents.

This manual consists of the following chapters:

- [Introduction to the manual](#) introduces this manual, gives safety instructions and other general information for the reader.
- [ATEX-certified motor thermal protection function with PTC thermistor relays \(+L513+Q971\)](#) describes how the function is used for protecting the motor with PTC thermistor relays, and provides the related safety data.
- [ATEX-certified motor thermal protection function with Pt100 relays \(+L514+Q971\)](#) describes how the function is used for protecting the motor with Pt100 relays, and provides the related safety data.
- [Parameter settings](#) lists the parameters that you have to set for the safety functions.
- [Technical data](#) contains the technical specifications of the relays, applicable standards, ATEX compliance markings and certificates.
- [Circuit diagrams](#) contains example circuit diagrams illustrating the operation and wiring of the functions.

## Related documents

- Product manuals (see the inside of the front cover)
  - Circuit diagrams delivered with the drive
  - Part lists delivered with the drive
-

## Terms and abbreviations

The abbreviations used in this manual are listed below.

Term / abbreviation	Description	Reference
ATEX	Directives 2014/34/EU (94/9/EC) and 1999/92/EC are commonly referred to as the ATEX directives (from "Atmosphères Explosibles")	-
BCU	Type of drive control unit used in ACS880 drives	-
CM-MSS.41	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
Ex eb, Ex ec	Types of protection, increased safety	IEC 60079-7:2015
Ex i	Intrinsically safe	EN 60079-11:2012 and IEC 60079-11:2011
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
Frame (size)	Relates to the construction type of the drive in question. For example, several drive types with different power ratings can have the same basic construction, and a frame size is used in reference to all those drive types. With the ACS880-07 (smaller), the frame size marking of the drive indicates the physical size of the drive, eg, R6. With the ACS880-07 (larger), the frame size marking of the drive indicates the quantity and frame size of the diode supply modules plus the quantity and frame size of the inverter modules, eg, "2×D8T +3×R8i". With the ACS880-17 and ACS880-37, the frame size marking of the drive indicates the quantity and frame size of the IGBT supply modules plus the quantity and frame size of the inverter modules, eg, "2×R8i +3×R8i".	-
FSE-31	Pulse encoder interface module which can be used in safety applications	-
FSO	Safety functions module (FSO-12 or FSO-21)	-
FSO-12	Safety functions module which does not support the use of safety encoders	-
FSO-21	Safety functions module which supports the FSE-31 module and the use of safety encoders	-
FIT	Failure in time: 1E-9 hours	IEC 61508
HFT	Hardware fault tolerance	IEC 61508
PFD	Probability of dangerous failures on demand	IEC 61508
PLC	Programmable logic controller	-

Term / abbreviation	Description	Reference
PTC	Positive temperature coefficient; PTC thermistor, PTC resistor temperature sensor.	-
Pt100	A platinum temperature sensor with a resistance of 100 ohm at 0 °C (32 °F)	-
RTD	Resistance temperature detector	-
SAR	Safe acceleration range. In the FSO module, there are two sets of SAR parameters (SAR0 and SAR1) that are used to define and/or monitor the deceleration ramp in safety functions. SAR0 parameters are used in the SSE function. SAR1 parameters are used in the SS1 function.	-
SBC	Safe brake control. A safety function in the FSO module.	-
SIL	Safety integrity level	IEC 61508
SS1	Safe stop 1. A safety function in the FSO module.	EN/IEC 61800-5-2
SSE	Safe stop emergency. A safety function in the FSO module.	-
STO	Safe torque off. In this manual, this term is used in two different contexts: <ul style="list-style-type: none"> <li>• the STO circuit in the drive (the drive STO function)</li> <li>• the STO safety function in the FSO module.</li> </ul> Safety functions in the FSO module (eg, STO, SSE and SS1) activate the drive STO function, that is, open the drive STO circuit. In addition, some safety functions can activate the STO safety function in the FSO module, which in turn opens the drive STO circuit.	EN/IEC 61800-5-2
Stop category 0	Uncontrolled stop	EN/IEC 60204-1
Stop category 1	Controlled stop	EN/IEC 60204-1
T1	Proof test interval	IEC 61508
ZCU	Type of drive control unit used in ACS880 drives.	-
Zone	An IEC term for hazardous areas. Hazardous areas are divided into zones, according to the degree of hazard. The degree of hazard is defined according to the probability of the occurrence of explosive atmospheres.	EN/IEC 60079 series

## 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.





# **ATEX-certified motor thermal protection function with PTC thermistor relays (+L513+Q971)**

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## **Contents of this chapter**

This chapter describes the ATEX-certified motor thermal protection function (option +L513+Q971) and gives instructions on how to wire, install and start up the function. It also describes the PTC thermistor relays available for the option and gives fault tracing and maintenance instructions. The safety data is also given.

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## Description

This protection function monitors the temperature of a motor with PTC resistor sensors (PTC thermistors) in a potentially explosive atmosphere. It is possible to

- monitor either the motor's bearings or windings (+L513+Q971) or
- monitor both the motor's bearings and windings (+2L513+Q971 or +3L513+Q971).

The function is activated when the PTC sensor resistance exceeds the overtemperature limit. The function activates the Safe torque off (STO) function of the drive. This disables the control voltage of the power semiconductors of the drive output stage. This prevents the inverter from generating the torque required to rotate the motor. The motor coasts to a stop.

ACS880-07/17/37 drives with the option +Q978: Also the main contactor/breaker is opened.

ACS880-07 drives, frames nxDXT + nxR8i with a main contactor/breaker (option +F250/+F255) and ACS880-17/37 drives, frames nxR8i + nxR8i: When the STO function is activated in the inverter unit, the main contactor/breaker is opened after user-defined delay (defined with parameter *94.11*, the default value is 600 s). See hardware and firmware manuals for more information.

Other safety functions in the drive can also use the STO function. In addition, the FSO module can be included in the activation sequence of the ATEX-certified motor thermal protection function. See the circuit diagrams delivered with the drive for the actual safety circuitry.

The FSO safety functions module (FSO-12 or FSO-21) is an optional device used with the ACS880 drives to implement safety functions. When installed, it reserves the standard STO connection of the drive. In this case, the FSO module activates the STO function of the drive (that is, opens the drive STO circuit) either immediately or after a deceleration ramp.

You can implement the motor thermal protection function with or without an FSO safety functions module:

- Without an FSO module, the opening contacts of the PTC relay(s) open the STO circuit of the drive (see section [Without an FSO module](#) on page 17).
- With an FSO module, the opening contacts of the PTC relay(s) activate the STO or Safe stop 1 (SS1) function of the FSO module and the FSO module opens the STO circuit of the drive (see section [With an FSO module](#) on page 18). For more information on the safety functions of the FSO module, see *FSO-12 safety functions module user's manual* (3AXD50000015612 [English]) or *FSO-21 safety functions module user's manual* (3AXD50000015614 [English]).

Always consider which stop category (0 = immediate STO or 1 = delayed STO after SS1) is more appropriate for the motor in overtemperature situations.

The protection function circuit is motor specific, also in multidrives where several motors are connected. The function stops only the motor where overtemperature is detected.

It is possible to get information on the status of the protection function by means of a normally-open contact. The information can be obtained separately from the bearing and stator thermistors. The contact can be wired to a digital input on the drive control unit or to an external control system. For instructions, see section [Wiring](#) on page 23.

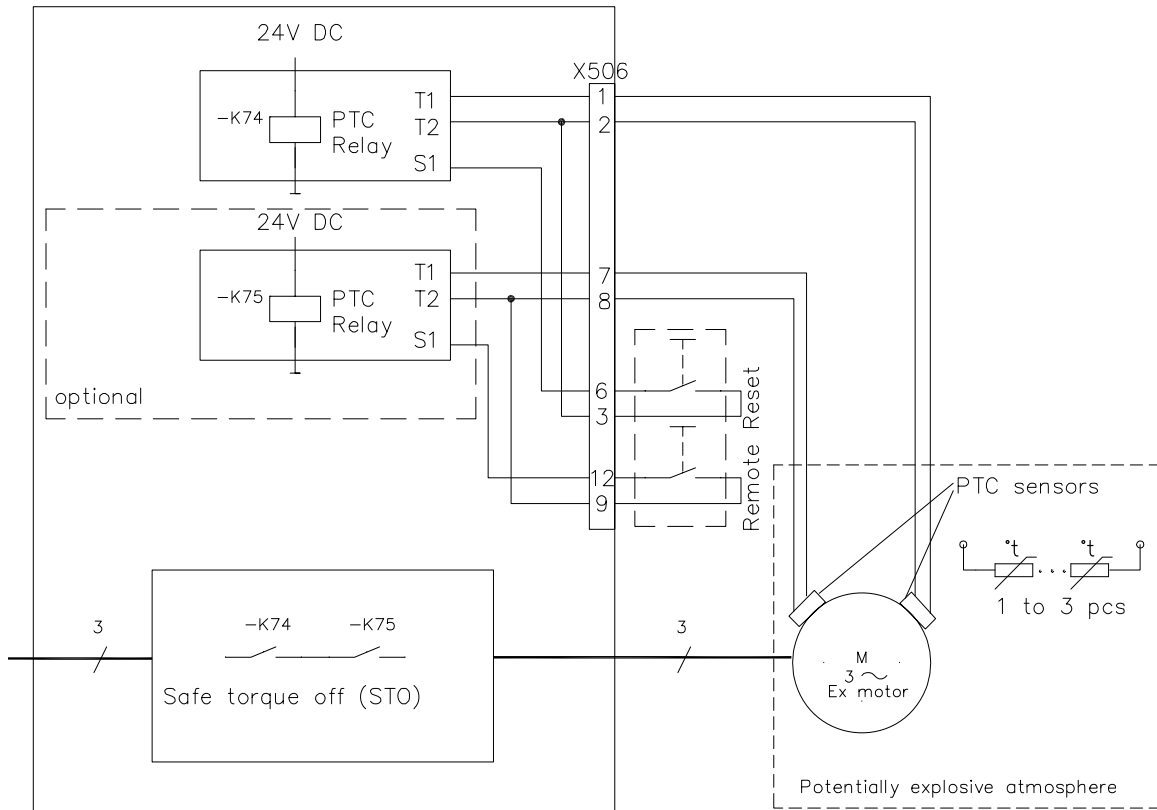
The temperature measurement circuit of ABB Ex motors has basic insulation. For information on the insulation of the thermistor relays, see its data starting on page 56.

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## ■ Operation principle

### Without an FSO module

ACS880



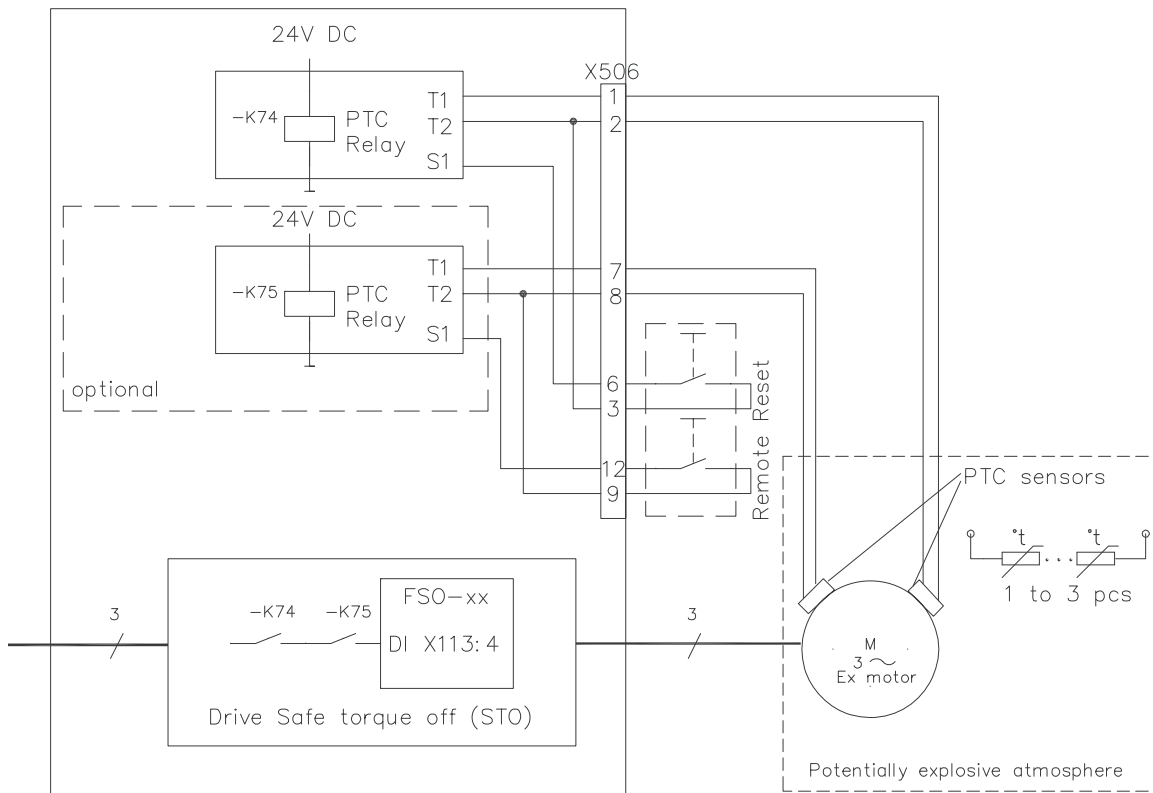
1. When the motor temperature rises to the thermistor wake-up level, the resistance of the thermistor increases sharply.
2. The PTC thermistor relay detects the change and indicates motor overtemperature through its output contacts.
3. The opening contacts of the PTC relay(s) open the STO circuit of the drive. This prevents the drive from generating the torque required to rotate the motor.
4. The drive generates an STO indication (parameter 31.22, see page 44).
5. If the auxiliary contacts of the PTC relays are wired to a digital input, the loss of the signal triggers a motor overtemperature indication in the drive (see page 44).
6. After the motor temperature has decreased to normal, the user resets the PTC relay(s) using remote reset buttons (or the buttons on the PTC relays themselves). See the circuit diagrams of the delivery.
7. Optional: The user resets the drive faults either from the reset source defined by the user (parameter 31.11, see page 45) or locally with the drive control panel:
  - the STO fault in the drive (if configured with drive parameter 31.22, see page 44)
  - the motor overtemperature fault in the drive (if configured, see page 44).



**WARNING!** We recommend that you do not use the autoreset setting (that is, short-circuit the reset switch terminals of the PTC relay) with a safety device protecting an Ex motor.

**With an FSO module**

ACS880



1. When the motor temperature rises to the thermistor wake-up level, the resistance of the thermistor increases sharply.
2. The PTC thermistor relay detects the change and indicates motor overtemperature through its output contacts.
3. The opening contacts of the PTC relay(s) switch off the voltage to terminal X113:4 of the FSO module (this is configured as the input of the STO [or SS1] function in the FSO module).
4. The FSO module opens the STO circuit of the drive either immediately (STO function) or after a deceleration ramp (SS1 function). This prevents the drive from generating the torque required to rotate the motor.
5. The drive generates an STO indication (parameter 31.22, see page 44).
6. The FSO module generates an STO indication (parameter FSOGEN.61, see page 47).
7. If the auxiliary contacts of the PTC relay(s) are wired to a digital input, the loss of the signal triggers a motor overtemperature indication (see page 44).
8. After the motor temperature has decreased to normal, the user resets the PTC relay(s) using remote reset buttons (or the buttons on the PTC relays themselves). See the circuit diagrams of the delivery.
9. Optional: The user resets the drive faults either from the reset source defined by the user (parameter 31.11, see page 45) or locally with the drive control panel:
  - the STO fault in the drive (if configured with drive parameter 31.22, see page 44)
  - the motor overtemperature fault in the drive (if configured, see page 44),
10. Optional: The user resets the safety function in the FSO module with the reset button (if a reset circuit is wired and configured, see page 46 and the next section).



**WARNING!** We recommend that you do not use the autoreset setting (that is, short-circuit the reset switch terminals of the PTC relay) with a safety device protecting an Ex motor.

---

## Resetting the ATEX-certified motor thermal protection function

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. The manual reset is set in the ATEX-certified PTC thermistor relay at the factory. This makes sure that the ATEX requirement on manual reset is fulfilled and you do not have to configure any faults in the drive (or FSO) parameters.

If you change the manual reset setting in the PTC thermistor relay, make sure that the user cannot restart the drive without a manual reset.

You can configure the manual reset either in:

- the drive with the motor overtemperature or STO indication parameters (see page [44](#))
- the FSO module by connecting a reset circuit to the FSO module (see page [46](#)).

ACS880-07/17/37 drives with the option +Q978 or +Q979 (Emergency stop): In these safety functions, a reset circuit is connected to the FSO module and the user must reset the safety function with the emergency stop reset button. In this case, the user must reset also the ATEX-certified motor thermal protection function with the emergency stop reset button. Do not change this setting.

## Indications of the ATEX-certified motor thermal protection function

An indication of the safety function can come from several sources:

- the motor overtemperature indication in the drive
- the STO indication in the drive
- the STO indication in the FSO module.

If you want to avoid parallel indications in overtemperature situations, you can set one or several of the indication parameters value to *No indication (or None)* or *Event*:

- the motor overtemperature indication with drive parameters *31.01...31.02* or *35.11...35.12* (see page [44](#)),
- the STO indication in the drive with drive parameter *31.22 STO indication run/stop* (see page [44](#)),
- the STO indication in the FSO module with FSO parameter *FSOGEN.61 STO indication ext request* (see page [47](#)).

**Note:** If the PTC thermistor relay is not in the manual reset mode, make sure that at least one of these indications generates a fault.

---


## **PTC thermistor relays**

The ATEX-certified motor thermal protection function contains one (+L513) or two (+2L513) ABB CM-MSS.41 thermistor relays by default. Three ABB CM-MSS.41 thermistor relays (+3L513) are available as an application-engineered option.

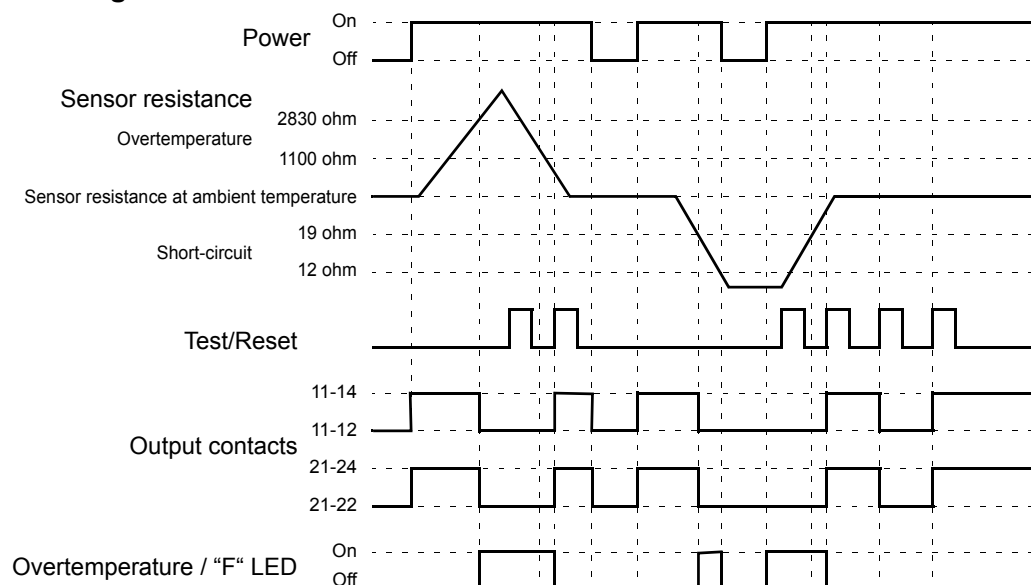
DOLD MK 9163N.12/110-ATEX thermistor relay(s) are available by request.

## ■ ABB CM-MSS.41 thermistor motor protection relay

### Layout

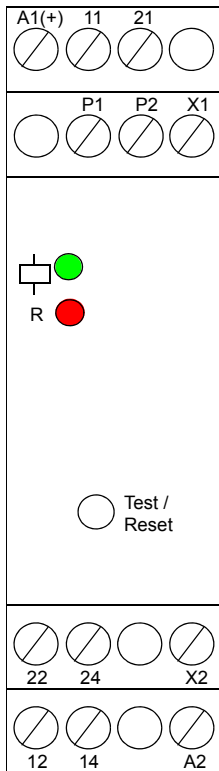
	A1-A2	Power supply			
	T1-T2	Measuring circuit with 1...3 sensors.			
	S1-T2	Remote reset push button switch			
		 <b>WARNING!</b> Even though autoreset of the relay can be implemented by connecting these terminals together, this is not recommended when used in the protection function of an Ex motor.			
	11-12/14	Output contacts (1) <ul style="list-style-type: none"> <li>• 11: Common</li> <li>• 12: Normally-closed</li> <li>• 14: Normally-open</li> </ul>			
①					
	21-22/24	Output contacts (2) <ul style="list-style-type: none"> <li>• 21: Common</li> <li>• 22: Normally-closed</li> <li>• 24: Normally-open</li> </ul>			
	Test / Reset	Fault reset button Reset = Confirms a rectified fault, a reset device after test routine, or a change in configuration. Only possible if measured value is less than the switch-on resistance.			
②					
①	<b>LEDs</b>	<b>Indication of operational states</b>			
	“U” LED (green)	Supply voltage present			
	“F” LED (red)	Fault message (excessive motor temperature, or wire breakage or short-circuit in the measurement circuit)			
	“R” LED (yellow)	Output relay status			
②	<b>DIP switches</b>				
	Position	1	2	3	4
	ON	Not in use	Not in use	Short-circuit detection de-activated	Non-volatile fault storage de-activated
	OFF (default)	Not in use	Not in use	Short-circuit detection activated	Non-volatile fault storage activated

### Operation diagram



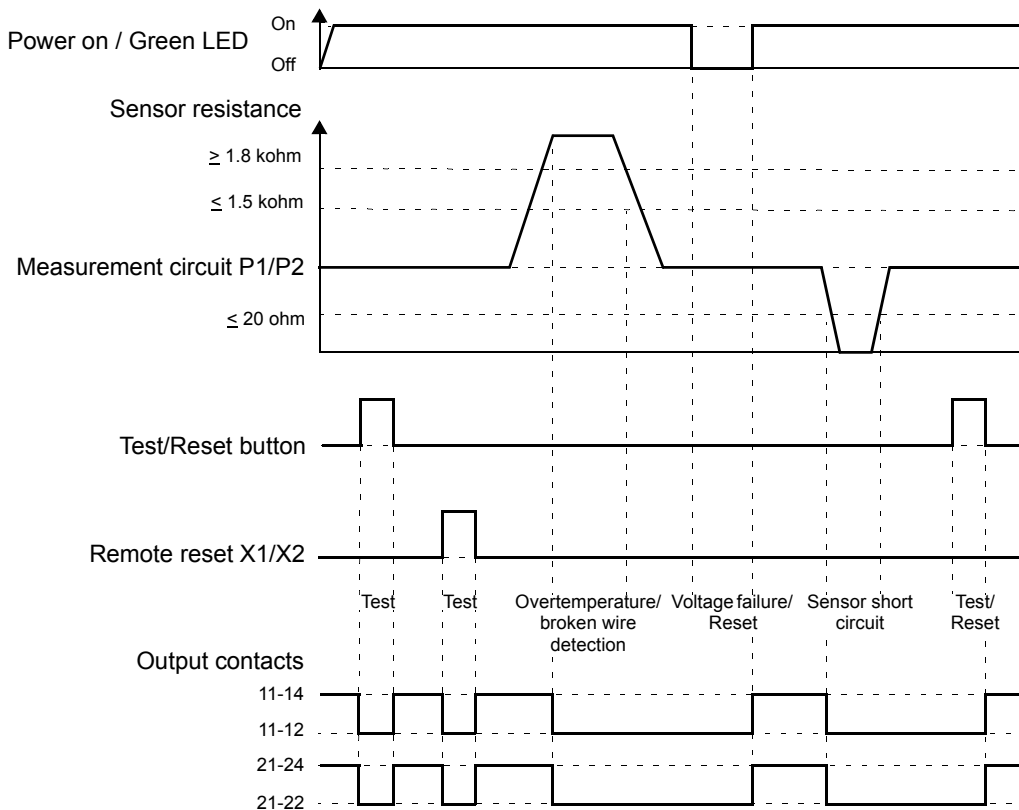
## DOLD MK 9163N.12/110-ATEX thermistor relay

### Layout



A1-A2	Power supply
P1-P2	Measuring circuit with 1...6 sensors
X1-X2	Remote reset push button switch
11-12/14	Output contacts (1) <ul style="list-style-type: none"> <li>• 11: Common</li> <li>• 12: Normally-closed</li> <li>• 14: Normally-open</li> </ul>
21-22/24	Output contacts (2) <ul style="list-style-type: none"> <li>• 21: Common</li> <li>• 22: Normally-closed</li> <li>• 24: Normally-open</li> </ul>
Test/Reset	Test and internal reset button
Upper LED (green)	Supply voltage present
"R" LED (red)	Fault (overtemperature, or broken wire/short circuit in the sensor circuit)

### Operation diagram



## **Wiring**

### **■ General wiring instructions**

1. Wire only the PTC sensor circuit into the potentially explosive atmosphere.
2. The installation of the PTC 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).
3. Install the drive, including the components of the ATEX-certified motor thermal protection function, outside the explosive atmosphere.
4. Route the sensor cables away from the motor cable. We recommend shielded sensor cables to minimize electromagnetic interference from power cables.
5. Ground all sensor cable shields to a single grounding point outside the explosive atmosphere.

**Note:** The drive STO function has a redundant architecture, that is, both STO channels must be used in the safety function implementation. For more information, see the hardware manual.

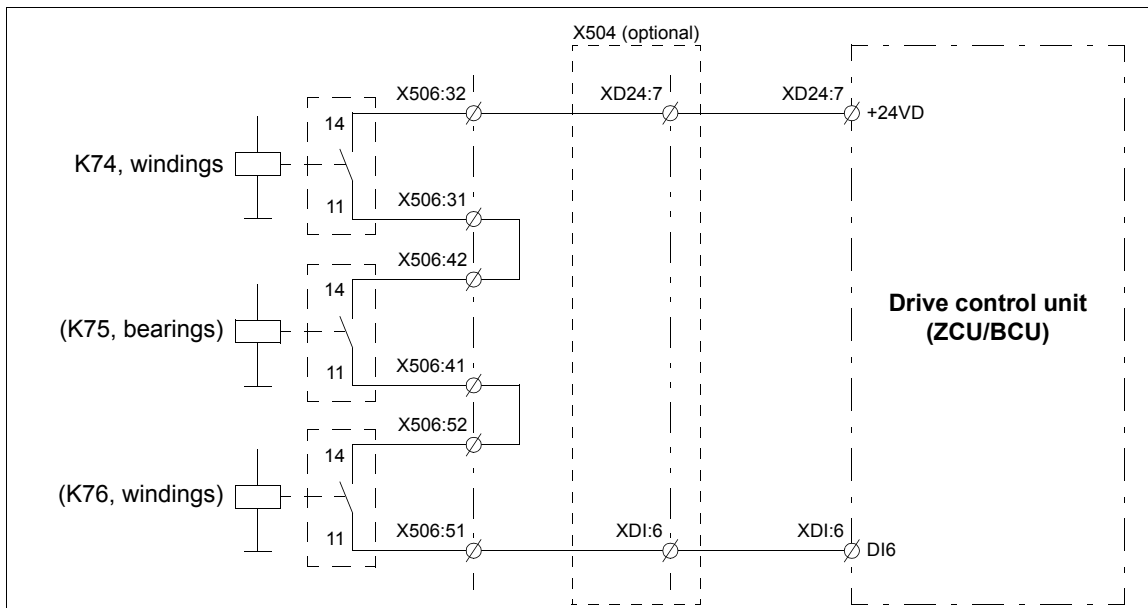
---

## ■ Wiring example

In this example, contacts of the PTC thermistor relay(s) are wired to digital input DI6 of the drive control unit for indication purposes.

1. Connect the PTC sensor(s) of the motor to the PTC thermistor relay(s) [K74] (and [K75] and [K76] if present) through terminal block [X506].
2. Connect a +24 V DC source via contacts 11 and 14 of the PTC thermistor relay(s) (pre-wired to terminal block [X506] at the factory) to digital input DI6 on the drive control unit. The contacts are wired in series.
3. Connect a reset button for the PTC relay(s) via terminal block [X506] (recommended).
4. With an FSO module (not shown in the figure):
  - If necessary, connect a reset circuit to an input of the FSO module (for example, DI X113:2).

See the circuit diagrams delivered with the drive for the actual wiring and terminals. For a wiring diagram example, see page 73.




## Start-up and acceptance test

You need the Drive composer PC tool or a control panel to perform the start-up and acceptance test.

If you have to set FSO module parameters, you need the Drive composer pro PC tool.

Initial status: Make sure that the drive is ready for use, that is, you have done the tasks of the drive start-up procedure. See the hardware manual.

<b>Action</b>	<input checked="" type="checkbox"/>
 <b>WARNING!</b> Obey the <a href="#">Safety instructions</a> , page 9. If you ignore them, injury or death, or damage to the equipment can occur.	<input type="checkbox"/>
<b>Checks and settings with no voltage connected</b>	
Check that the classification of the motor thermal protection function corresponds to the Ex classification of the environment and the Ex motor.	<input type="checkbox"/>
The motor manufacturer selects the PTC sensors for the motor temperature measurement. Check that the temperature on-off resistances match those of the protective relay.	<input type="checkbox"/>
Check that the installation of PTC sensors complies with the requirements for the applicable type of protection (see page 23).	<input type="checkbox"/>
Check that the wires are connected to the appropriate terminals and the terminals are tightened. (Pull on the wires to check.)	<input type="checkbox"/>
<b>Settings with voltage connected</b>	
If necessary, set the appropriate parameters. See section <a href="#">Parameter settings</a> on page 43.	<input type="checkbox"/>
If necessary, configure the motor overtemperature and STO indication. See section <a href="#">Reset method and status indications</a> on page 44.	<input type="checkbox"/>
<b>Acceptance test procedure</b>	
To test short-circuit detection, short-circuit the sensor input with a 20 ohm resistance (you do not have to disconnect the sensor circuit). Expected outcome: Fault trip (the appropriate LED lights). Drive STO is activated. Make sure the correct indications are activated.	<input type="checkbox"/>
To test wire break monitoring, disconnect the sensor circuit. Expected outcome: Fault trip (the appropriate LED lights). Drive STO is activated. Make sure the correct indications are activated.	<input type="checkbox"/>
To test excess temperature detection, increase the resistance of the sensor circuit from 50...1500 ohm to 4 kohm. Expected outcome: Fault trip (the appropriate LED lights). Drive STO is activated. Make sure the correct indications are activated.	<input type="checkbox"/>
With the relay(s) in tripped state, try to start the drive. The drive must not start before the PTC relay(s) and/or any drive (and FSO) faults are reset.	<input type="checkbox"/>
Fill in and sign the acceptance test report which verifies that the safety function is safe and accepted to operation.	<input type="checkbox"/>

## Maintenance

After the operation of the safety circuit has been verified at start-up, the circuit requires a periodic proof test at least every two years.

If you change any wirings or components related to the motor thermal protection function after the start-up, repeat the procedure given in section [Start-up and acceptance test](#) above.

## Fault tracing

For the warning and fault messages generated by the drive, see the drive firmware manual.

For the fault indication LEDs of the PTC relays, see section [PTC thermistor relays](#) on page [20](#).

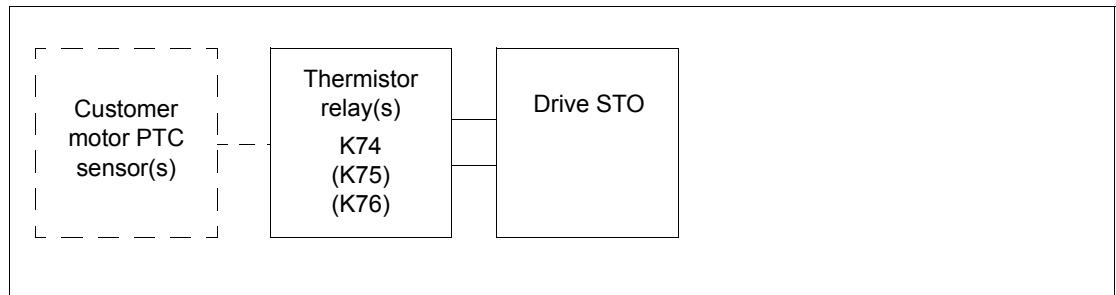
For the status LEDs of the FSO module, see the FSO module user's manual.

---

## Safety data and block diagrams

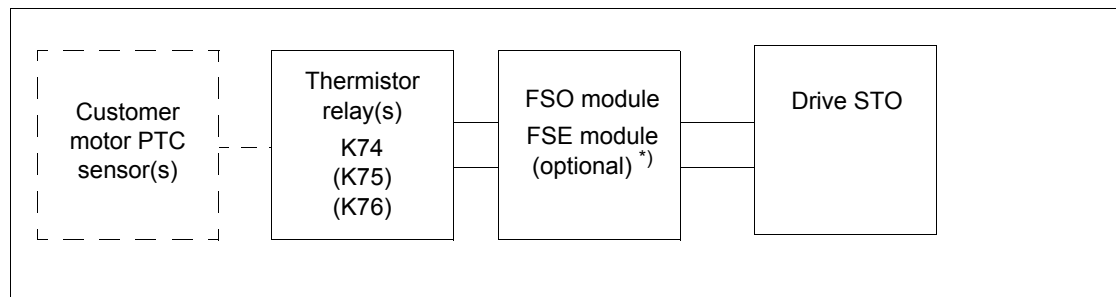
The safety block diagrams show the components that are included in the safety data calculations.

### ■ Without an FSO module



<b>SIL</b>	1
<b>HFT</b>	0
<b>T1</b>	2 years
<b>PFD (1, 2 or 3 relays)</b>	5.00E-2

### ■ With an FSO module



<sup>\*)</sup> The FSE module is included in the calculations only if a safety encoder is used in the application, the FSO-21 module is configured to activate the SS1 function (stop category 1) in overtemperature situations and the ramp monitoring method is used in the SS1 function.

<b>SIL</b>	1
<b>HFT</b>	0
<b>T1</b>	2 years
<b>PFD (1, 2 or 3 relays)</b>	5.02E-2





# 3

## **ATEX-certified motor thermal protection function with Pt100 relays (+L514+Q971)**

---

### **Contents of this chapter**

This chapter describes the ATEX-certified motor thermal protection function (option +L514+Q971) and gives instructions on how to wire, install and start up the function. It also describes the Pt100 relays available for the option and gives fault tracing and maintenance instructions. The safety data is also given.

---

## Description

### ■ General

This protection function monitors the temperature of a motor with Pt100 sensors in a potentially explosive atmosphere. It is possible to

- monitor the motor's stator (+3L514+Q971)
- monitor bearings and stator (+5L514+Q971) or
- monitor the bearings and double-monitor the stator (+8L514+Q971).

The function is activated when the motor temperature exceeds the set operating temperature limit of the Pt100 relay. The function activates the Safe torque off (STO) function of the drive. This disables the control voltage of the power semiconductors of the drive output stage. This prevents the inverter from generating the torque required to rotate the motor. The motor coasts to a stop.

ACS880-07/17/37 drives with the option +Q978: Also the main contactor/breaker is opened.

ACS880-07 drives, frames nxDXT + nxR8i with a main contactor/breaker (option +F250/+F255) and ACS880-17/37 drives, frames nxR8i + nxR8j: When the STO function is activated in the inverter unit, the main contactor/breaker is opened after user-defined delay (defined with parameter *94.11*, the default value is 600 s). See hardware and firmware manuals for more information.

Other safety functions in the drive can also use the STO function. In addition, an FSO module can be included in the activation sequence of the ATEX-certified motor thermal protection function. See the circuit diagrams delivered with the drive for the actual safety circuitry.

The FSO safety functions module (FSO-12 or FSO-21) is an optional device used with the ACS880 drives to implement safety functions. When installed, it reserves the standard STO connection of the drive. In this case, the FSO module activates the STO function of the drive (that is, opens the drive STO circuit) either immediately or after a deceleration ramp.

You can implement the motor thermal protection function with or without an FSO safety functions module:

- Without an FSO module, the opening contacts of the Pt100 relay(s) open the STO circuit of the drive (see section [Without an FSO module](#) on page 32).
- With an FSO module, the opening contacts of the Pt100 relay(s) activate the STO or Safe stop 1 (SS1) function of the FSO module and the FSO module opens the STO circuit of the drive (see section [With an FSO module](#) on page 33). For more information on the safety functions of the FSO module, see *FSO-12 safety functions module user's manual* (3AXD50000015612 [English]) or *FSO-21 safety functions module user's manual* (3AXD50000015614 [English]).

Always consider which stop category (0 = immediate STO or 1 = delayed STO after SS1) is more appropriate for the motor in overtemperature situations.

The protection function circuit is motor specific, also in multidrives where several motors are connected. The function stops only the motor where overtemperature is detected.

It is possible to get information on the status of the protection function by means of a normally-open contact. The information can be obtained separately from the bearing and stator sensors. The contact can be wired to a digital input on the drive control unit or to an external control system. For instructions, see section [Wiring](#) on page 37.

---

## ■ Pt100 relays

The Pt100 relays (3, 5 or 8 pieces) are configurable PLCs. In addition to the actuation of the motor thermal protection function, it is possible to get, for example, a 4...20 mA analog temperature signal from each Pt100 sensor.

The used Pt100 relays are [Ex i] (intrinsically safe) approved associated apparatus (Ex i barrier). The installation and cabling of the protection circuit in the ACS880 cabinet is done as intrinsically safe according to EN/IEC 60079-14 ed. 5 clause 16.

If Pt100 sensors in the Ex Zone are not protected by an Ex type of protection (eg, Ex eb, Ex ec or Ex d), the cabling from sensors to the terminal blocks in the drive must be done as intrinsically safe [Ex i] installation. To comply with the [Ex i] requirements, use shielded or shielded twisted pair cable.

If Pt100 sensors in the Ex Zone are protected by an Ex type of protection (eg, Ex eb, Ex ec or Ex d), the intrinsically safe [Ex i] installation and cabling are not required. In case the final installation does not need [Ex i] installation, the Ex i markings must be removed or covered from the cabinet.

The drive delivery contains a notification label, stating: *Note! This sensor circuit is not executed as intrinsically safe [Ex i] installation.*

If [Ex i] installation is not required, you must attach the label to the drive cabinet.

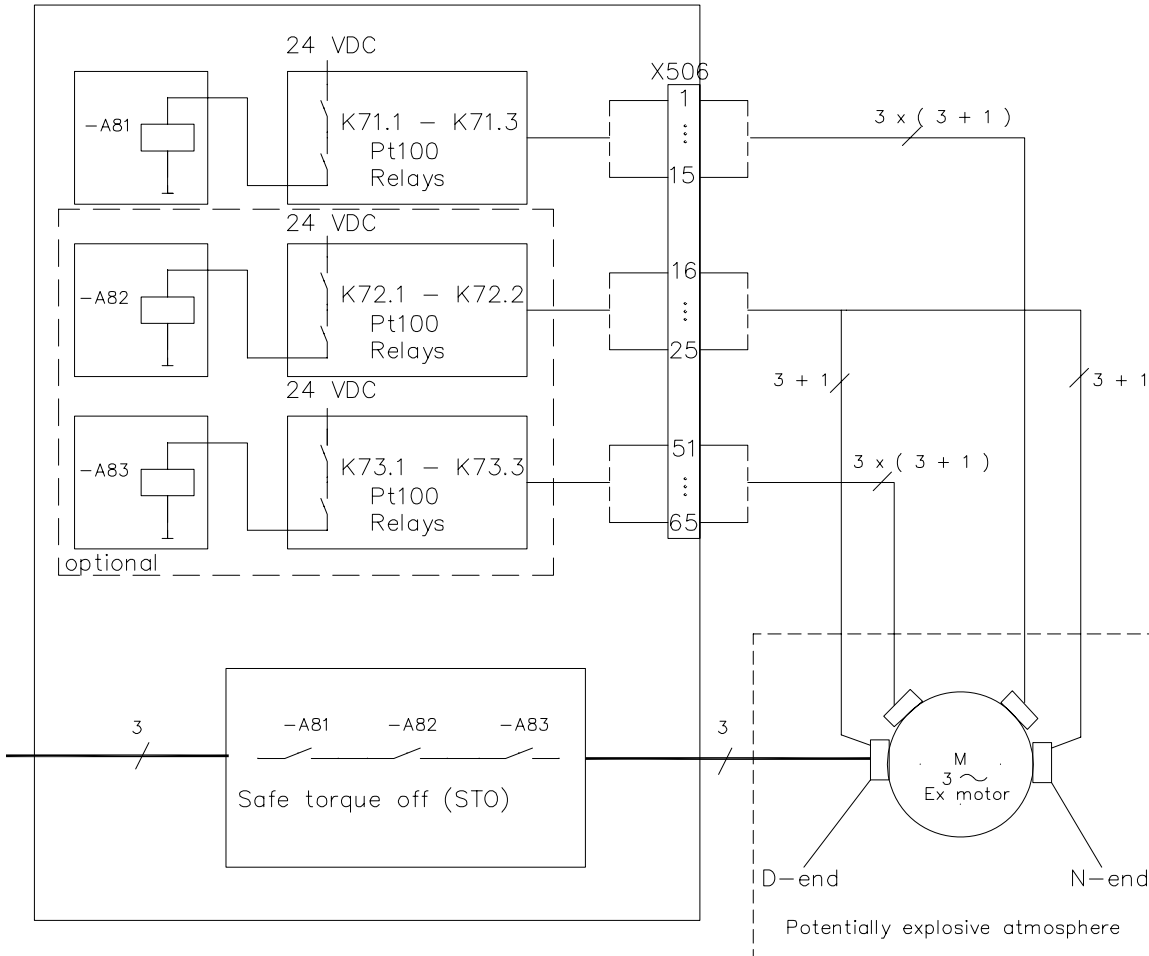
The temperature measurement circuit of ABB motors has basic insulation. For information on the insulation of the Pt100 relay, see its data starting on page [60](#).

---

## Operation principle

### Without an FSO module

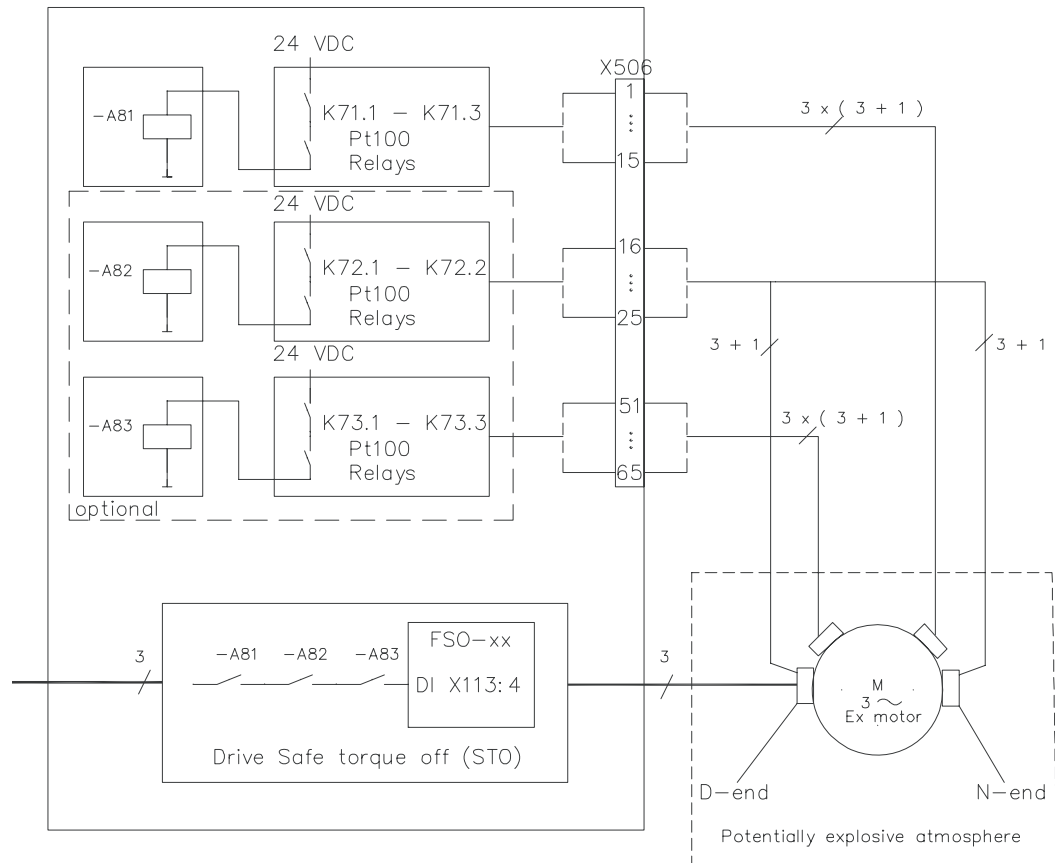
ACS880



1. When the motor temperature rises, the sensor resistance increases linearly.
2. When the motor temperature exceeds the set operating temperature limit of the Pt100 relay, the relay indicates motor overtemperature through its output contacts.
3. The opening contacts of the extension relay(s) [-A81] ([-A82] and [-A83]) open the STO circuit of the drive. This prevents the drive from generating the torque required to rotate the motor.
4. The drive generates an STO indication (parameter 31.22, see page 44).
5. If the extension relay(s) [-A81] ([-A82] and [-A83]) are wired to a digital input, the loss of the signal triggers a motor overtemperature fault in the drive (see page 44).
6. After the motor temperature has decreased to normal, the Pt100 relays reset automatically.
7. The user must reset the drive faults either from the reset source defined by the user (parameter 31.11, see page 45) or locally with the drive control panel:
  - the STO fault in the drive (if configured with drive parameter 31.22, see page 44)
  - the motor overtemperature fault in the drive (if configured, see page 44).

## ■ With an FSO module

ACS880



1. When the motor temperature rises, the sensor resistance increases linearly.
2. When the motor temperature exceeds the set operating temperature limit of the Pt100 relay(s), the relay indicates motor overtemperature through its output contacts.
3. The opening contacts of the extension relay(s) [-A81] ([-A82] and [-A83]) switch off the voltage to terminal X113:4 of the FSO module (this is configured as the input of the STO [or SS1] function in the FSO module).
4. The FSO module opens the STO circuit of the drive either immediately (STO function) or after a deceleration ramp (SS1 function). This prevents the drive from generating the torque required to rotate the motor.
5. The drive generates an STO indication (parameter 31.22, see page 44).
6. The FSO module generates an STO indication (parameter *FSOGEN.61*, see page 47).
7. If the extension relay(s) [-A81] ([-A82] and [-A83]) are wired to a digital input, the loss of the signal triggers a motor temperature fault in the drive (see page 44).
8. After the motor temperature has decreased to normal, the Pt100 relays reset automatically.
9. The user must reset the faults either from the reset source defined by the user (parameter 31.11, see page 45) or locally with the drive control panel:
  - the STO fault in the drive (if configured with drive parameter 31.22, see page 44)
  - the motor overtemperature fault in the drive (if configured, see page 44).
10. **Optional:** The user must reset the safety function in the FSO module with the reset button (if a reset circuit is wired and configured, see page 46 and the next section)

## Resetting the ATEX-certified motor thermal protection function

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. The Pt100 relay is reset automatically. To fulfill the ATEX requirement on manual reset, make sure that the user cannot restart the drive without a manual reset.

You must configure the manual reset either in:

- the drive with the motor overtemperature or STO indication parameters (see page 44)
- the FSO module by connecting a reset circuit to the FSO module (see page 46).

ACS880-07/17/37 drives with the option +Q978 or +Q979 (Emergency stop): In these safety functions, a reset circuit is connected to the FSO module and the user must reset the safety function with the emergency stop reset button. In this case, the user must reset also the ATEX-certified motor thermal protection function with the emergency stop reset button. Do not change this setting.

## Indications of the ATEX-certified motor thermal protection function

An indication of the safety function can come from several sources:

- the motor overtemperature indication in the drive
- the STO indication in the drive
- the STO indication in the FSO module.

If you want to avoid parallel indications in overtemperature situations, you can set one or several of the indication parameters value to *No indication* (or *None*) or *Event*:

- the motor overtemperature indication with drive parameters 31.01...31.02 or 35.11...35.12 (see page 44),
- the STO indication in the drive with drive parameter 31.22 *STO indication run/stop* (see page 44),
- the STO indication in the FSO module with FSO parameter *FSOGEN.61 STO indication ext request* (see page 47).

**Note:** Make sure that at least one of these indications generates a fault to ensure that the required manual reset is implemented.

---

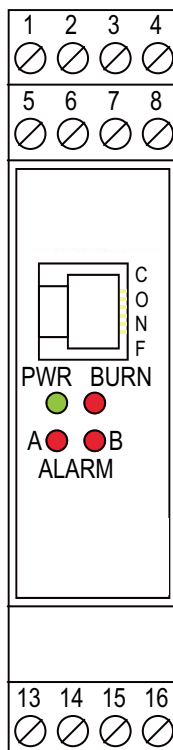
## Pt100 relays

The option contains three (+3L514), five (+5L514) or eight (+8L514) GM International D1073S relays by default. PRelectronics 9116B1 relays are available as application engineered.

The option also contains one, two or three DOLD LG5925.48 extension relays in the Safe torque off and diagnostic circuits.

### ■ GM International D1073S relay (programmable)

#### Layout



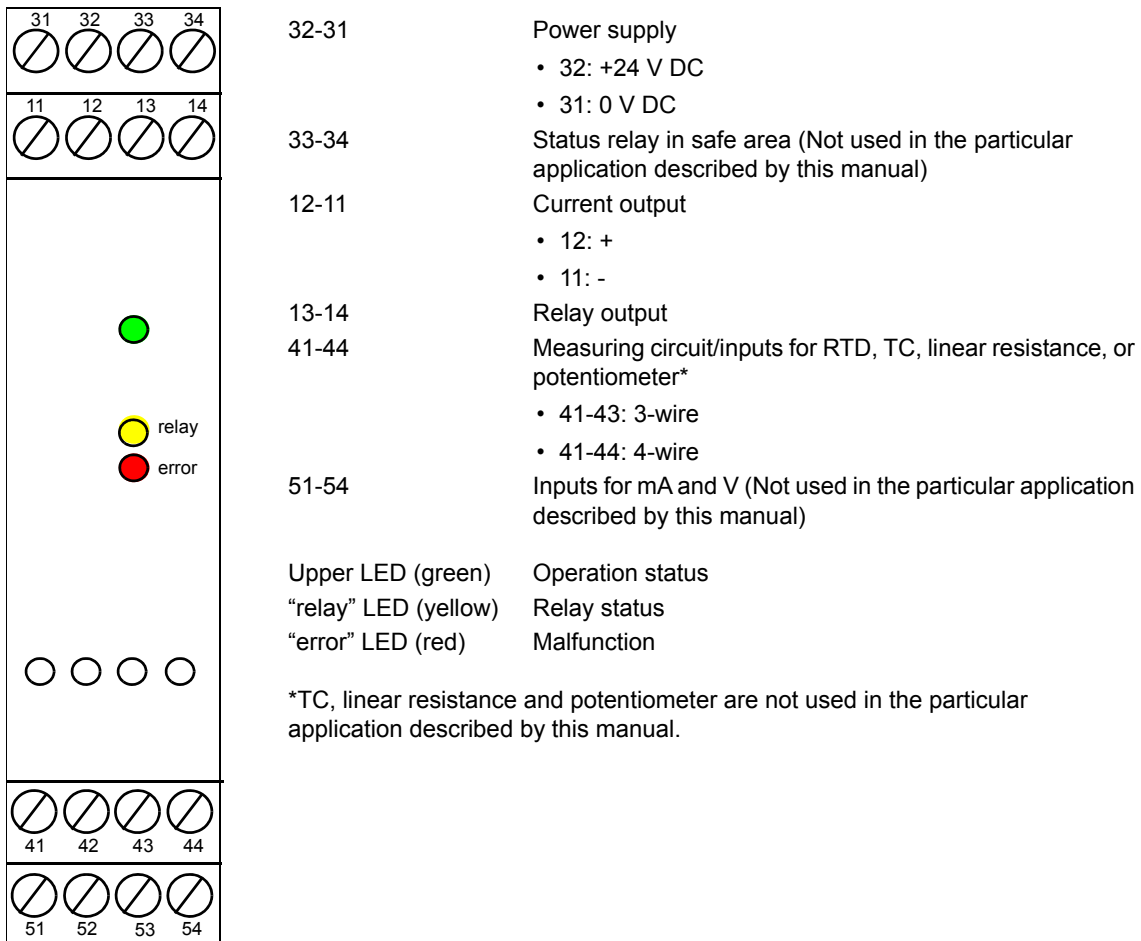
1-2	Current output
	<ul style="list-style-type: none"> <li>• 1: + Output channel 1 for Current Source Mode or Voltage Source Mode*</li> <li>• 2: - Output channel 1 for Current Source Mode or Voltage Source Mode*</li> </ul>
	This output has been pre-wired to terminal block X506. See the circuit diagrams starting on page 71.
3-4	Power supply
	<ul style="list-style-type: none"> <li>• 3: + 24 V DC</li> <li>• 4: - 24 V DC</li> </ul>
5-6	Output contacts (Alarm A)
7-8	Output contacts (Alarm B)
13-16	Measuring circuit
	<ul style="list-style-type: none"> <li>• 13: Input channel 1 for 3-4 wire RTD, Reference Junction Compensator Option 91 or potentiometer*</li> <li>• 14: Input channel 1 for 3-4 wire RTD</li> <li>• 15: + Input channel 1 for 4 wire RTD, thermocouple TC or potentiometer*</li> <li>• 16: Input channel 1 for 3-4 wire RTD, thermocouple TC or potentiometer*</li> </ul>
CONF	Programming channel
"PWR" LED (green)	Supply voltage present
"BURN" LED (red)	Burnout detected
"A" LED (red)	Alarm A**
"B" LED (red)	Alarm B**

\*Voltage Source Mode, Reference Junction Compensator Option 91, potentiometer and thermocouple TC are not used in the particular application described by this manual.

\*\***Note:** For SIL applications, alarm contacts must be used in series with equal configuration. Relay contact shown in de-energized position.

## ■ PRelectronics 9116B1 universal converter relay (programmable)

### Layout



## ■ Pt100 relay programming

The Pt100 relays are programmable and you need a dedicated programming tool for the relay. The programming tools are not included in the delivery. See pages [60](#) and [62](#) for ordering information.

## Wiring

### ■ General wiring instructions

1. Wire only the sensor circuit into the potentially explosive atmosphere.
2. The installation of the Pt100 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).
3. Install the drive, including the components of the ATEX-certified motor thermal protection function, outside the explosive atmosphere.
4. If the installation of the Pt100 sensor circuit does not comply with an appropriate type of protection, obey the installation and wiring requirements for intrinsically safe (Ex i) circuits, as given in EN/IEC 60079-14 ed. 5, clause 16. See also section [Pt100 relays](#) on page [31](#).
5. Route the sensor cables away from the motor cable. We recommend shielded sensor cables to minimize electromagnetic interference from power cables.
6. Ground all sensor cable shields to a single grounding point outside the explosive atmosphere.

**Note:** The drive STO function has a redundant architecture, that is, both STO channels must be used in the safety function implementation. For more information, see the hardware manual.

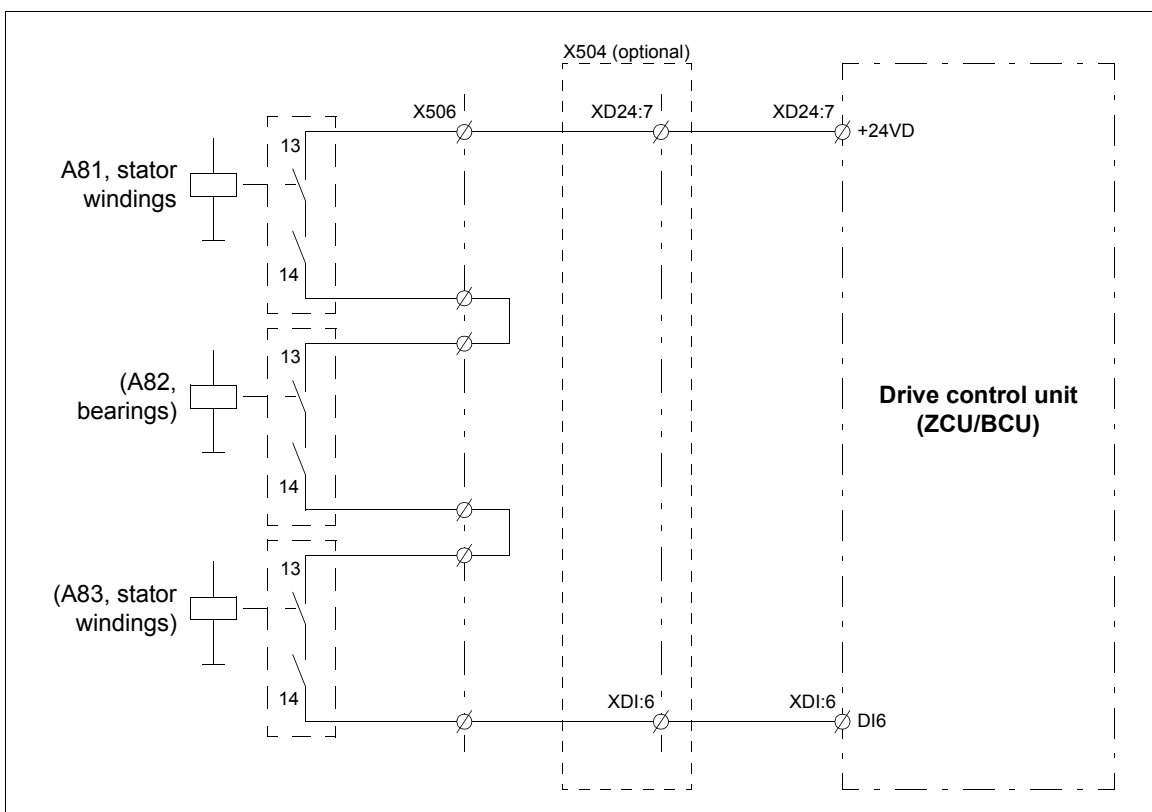
---

## ■ Wiring example

In this example, contacts of the Pt100 relay(s) are wired to digital input DI6 of the drive control unit.

1. Connect the Pt100 sensor(s) of the motor to the relay(s) K71.x, K72.x and K73.x (whichever are present) through terminal block [X506].
2. Connect a +24 V DC source via contacts 14 and 13 of the extension relays (A81, A82, A83, if present) to digital input DI6 on the drive control unit. The contacts are wired in series.
3. With an FSO module (not shown in the figure): If necessary, connect a reset circuit to an input of the FSO module (for example, DI X113:2).

See the circuit diagrams delivered with the drive for the actual wiring and terminals. For a wiring diagram example, see page [76](#).




## Start-up and acceptance test

You need the Drive composer PC tool or a control panel to perform the start-up and acceptance test.

If you have to set FSO module parameters, you need the Drive composer pro PC tool.

Initial status: Make sure that the drive is ready for use, that is, you have done the tasks of the drive start-up procedure. See the hardware manual.

<b>Action</b>	<input checked="" type="checkbox"/>
 <b>WARNING!</b> Obey the <a href="#">Safety instructions</a> , page 9. If you ignore them, injury or death, or damage to the equipment can occur.	<input type="checkbox"/>
<b>Checks and settings with no voltage connected</b>	
Check that the classification of the motor thermal protection function corresponds to the Ex classification of the environment and the Ex motor.	<input type="checkbox"/>
The motor manufacturer selects the Pt100 sensors for the motor temperature measurement. Check that the temperature trip levels match those of the protective relay and set the Pt100 relay respectively.	<input type="checkbox"/>
Check that the installation of Pt100 sensors complies with the requirements for the applicable type of protection (see page 37).	<input type="checkbox"/>
Check that the wires are connected to the appropriate terminals and the terminals are tightened. (Pull on the wires to check.)	<input type="checkbox"/>
Set the trip level of the Pt100 relay of the relay. For example, for temperature class T3 the values are: <ul style="list-style-type: none"> <li>• 120...140 °C when only tripping is used</li> <li>• alarm 120...140 °C and trip 130...150 °C when both alarm and trip are used.</li> </ul> <b>Note:</b> Set the temperatures according to the temperature class of the motor. To modify the settings of the relay, you need a programming tool. See pages 60 and 62 for ordering information.	<input type="checkbox"/>
Check that the other settings of the relay are adequate.	<input type="checkbox"/>
<b>Settings with voltage connected</b>	
If necessary, set the appropriate parameters. See section <a href="#">Parameter settings</a> on page 43.	<input type="checkbox"/>
If necessary, configure the motor overtemperature indication message. See section <a href="#">Motor overtemperature indication</a> on page 44.	<input type="checkbox"/>
<b>Acceptance test procedure</b>	
To test wire break monitoring, disconnect the sensor circuit. Expected outcome: Fault trip (the appropriate LED lights). Drive STO is activated. Make sure the correct indications are activated.	<input type="checkbox"/>
With the relay(s) both in tripped and in reset state, try to start the drive. The drive must not start before the drive (and FSO) faults are reset.	<input type="checkbox"/>
Fill in and sign the acceptance test report which verifies that the safety function is safe and accepted to operation.	<input type="checkbox"/>

## Maintenance

After the operation of the circuit has been verified at start-up, the circuit requires a proof test at least once in a year.

If you change any wirings or components related to the motor thermal protection function after the start-up, repeat the procedure given in section [Start-up and acceptance test](#) above.

## Fault tracing

For the warning and fault messages generated by the drive, see the drive firmware manual.

For the fault indication LEDs of the relay, see section [Pt100 relays](#) on page 35.

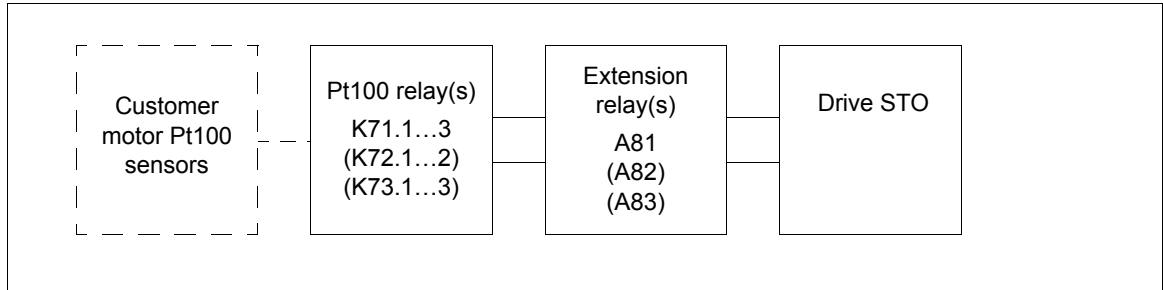
For the status LEDs of the FSO module, see the FSO module user's manual.

---

## Safety data

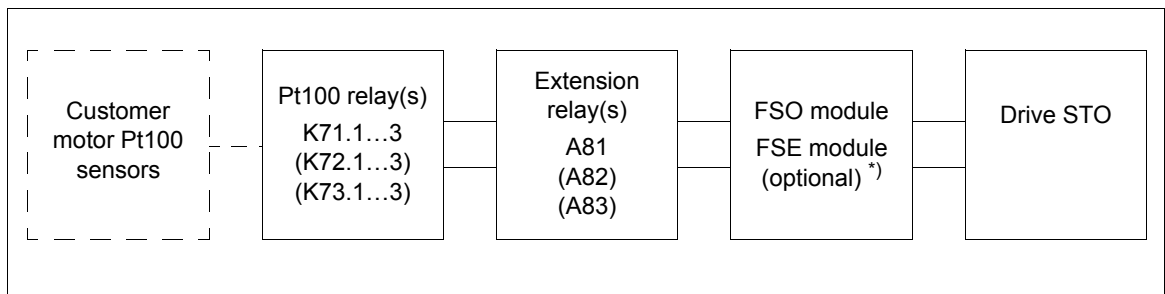
The safety block diagrams show the components that are included in the safety data calculations.

### ■ Without an FSO module



<b>SIL</b>	1
<b>HFT</b>	0
<b>T1</b>	1 year
<b>PFD (3, 5 or 8 relays)</b>	4.02E-4

### ■ With an FSO module



\*) The FSE module is included in the calculations only if a safety encoder is used in the application, the FSO-21 module is configured to activate the SS1 function (stop category 1) in overtemperature situations and the ramp monitoring method is used in the SS1 function.

<b>SIL</b>	1
<b>HFT</b>	0
<b>T1</b>	1 year
<b>PFD (3, 5 or 8 relays)</b>	5.85E-4



# 4

## Parameter settings

---

### Contents of this chapter

This chapter lists the parameters that you have to set for the ATEX-certified motor thermal protection functions (options +L513+Q971 and +L514+Q971).



**WARNING!** In case of missing or inaccurate information, do not operate the motor before you have made sure the parameter settings are correct.

---

### Drive / inverter unit

#### ■ 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, use parameter *95.15* to set the required minimum switching frequency. For more information, see the firmware manual.

For Ex motors supplied by other motor manufacturers, contact the motor manufacturer for the correct value and your local ABB representative for instructions on how to make the parameter setting in the drive.

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## ■ Reset method and status indications

To configure a manual reset for the temperature protection function in the drive, you can set either the STO indication (parameter *31.22 STO indication run/stop*) or the motor temperature indication so that it generates a fault.

### 31.22 STO indication run/stop

Set this parameter to value *Fault/Fault* or *Fault/Warning*.

- *Fault/Fault*: This generates a fault in the drive/inverter unit every time the drive/inverter unit STO function is activated.
- *Fault/Warning*: This generates a fault in the drive/inverter unit when the drive is running and warning when the drive is stopped.

When this STO fault is generated, the drive trips due to overtemperature and you must reset the drive with a manual reset command before you can restart the drive.

**Note:** You can also configure the FSO module so that it sends a fault to the drive each time it activates the drive STO function. See parameter *FSOGEN.61* on page 47.

The default values set for the options at the factory:

- option +L513+Q971 (PTC relays, with or without an FSO module): *Warning/Warning*
- option +L514+Q971 (Pt100 relays, with or without an FSO module): *Fault/Fault*.

### Motor overtemperature indication

There are two ways to configure the motor overtemperature indication.

#### Example 1

The ACS880 primary control program has two separate temperature monitoring functions. In this example, one of these functions (External event function 1) is configured to monitor digital input DI6 (you can also use another digital input). When off (0), the function triggers the user-selected indication and shows the user-defined message.

To configure the motor overtemperature indication in the drive:

1. Select the digital input which indicates the status of the external event:
  - set parameter *31.01 External event 1 source* to *DI6*.
2. Select the type of the external event 1:
  - set parameter *31.02 External event 1 type* to *Fault*, *Warning* or *Warning/Fault*.  
If you set this parameter to *Fault*, the drive trips due to overtemperature and you must reset the drive with a manual reset command before you can restart the drive.
3. If necessary, edit the indication message with the control panel (see *ACS-AP-x Assistant control panels user's manual* (3AUA0000085685 [English])).

#### Example 2

In this example, the motor temperature is read from digital input DI6 (in this case you cannot use any other digital input).

1. Select *PTC DI6* as the source of the temperature with parameter *35.11 Temperature 1 source* (use the same setting also with Pt100 sensors)  
This creates a warning indication.
  2. If you want a fault indication, set also parameter *35.12 Temperature 1 fault limit* to *4000 ohm*.
  3. If necessary, edit the indication message with the control panel (see *ACS-AP-x Assistant control panels user's manual* (3AUA0000085685 [English])).
-

### 31.11 Fault reset selection

Select the correct source of an external fault reset signal with parameter *31.11 Fault reset selection*.

#### ■ Other recommended settings

We recommend that you also set these parameters to improve the safety of the application:

- minimum and maximum speeds (parameter group 30)
- maximum current, power and torque (group 30)
- acceleration and deceleration times
- stall protection (parameters *31.24 ... 31.28*)
- motor load curve (parameters *35.50 ... 35.55*)
- motor cable protection (parameters *35.60 .... 35.62*)

For more information, see the drive firmware manual.

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## FSO module

If you use an FSO module in the safety system configuration, set and check the FSO parameters listed in this section.

You need the Drive composer pro PC tool to set the FSO module parameters, and a password to be able to download the configuration to the FSO module from Drive composer pro. For the default password of the FSO module, see the FSO module user's manual. For more information on the Drive composer pro PC tool, see *Start-up and maintenance PC tool Drive composer user's manual* (3AUA0000094606 [English]).

Follow the configuration steps described in the FSO module user's manual, chapter *Configuration*.

There are parameters that you must set always and parameters that are related only to certain safety functions. These tables list the parameters that are relevant to the options +L513+Q971+Q973/Q972 and +L514+Q971+Q973/Q972. The example values apply only to these options.

You can use the FSO-21 module (+Q972) also with a safety pulse encoder and the FSE-31 pulse encoder interface module (+L521). In this case, check and set the parameters listed in section *FSE module and safety pulse encoder parameters* on page 52.

You can configure the FSO module so that it opens the drive/inverter unit STO either immediately (STO function in the FSO module, stop category 0) or after a deceleration ramp (SS1 function in the FSO module, stop category 1). For the options described in this manual, ABB has configured the FSO module so that it activates the STO function (stop category 0). Always consider which stop category is more appropriate for the motor in overtemperature situations.

**Note:** If other safety functions are configured in the same FSO module (for example, options +Q950, +Q965, +Q966, +Q978 or +Q979), the same parameter values apply to all safety functions. You must take all safety functions into consideration when you configure the FSO module. See the FSO module user's manual and the safety option user's manuals for a complete list of the parameter settings.

### ■ General parameters

These parameters are common to all safety functions in the STO module.

Index	Name	Example value	Description
FSOGEN.11	Stop completed output	None	Sets the digital output that indicates the completion of any stop function. Active when the FSO module has completed the STO, SSE or SS1 function. <u>ACS880-07/17/37 drives with the option +Q978 or +Q979:</u> ABB has configured the emergency stop indication lamp to this digital output at the factory. Make sure that this value corresponds to the actual wiring. See the circuit diagrams of the delivery. Do not change this setting.
FSOGEN.21	Motor nominal speed	1500 rpm	Sets the nominal motor speed. Adjust the default value to meet the ratings of the motor in use.
FSOGEN.22	Motor nominal frequency	50 Hz	Sets the nominal motor frequency. Adjust the default value to meet the ratings of the motor in use.

Index	Name	Example value	Description
FSOGEN.41	Power-up acknowledgement	Automatic	<p>Sets the power-up acknowledgement method of the FSO module.</p> <p><i>Automatic:</i> You do not need to push a reset button after switching on the FSO module. The FSO module generates the acknowledgement signal automatically after the power-up.</p> <p><i>Manual:</i> The FSO module reads the external acknowledgement signal through the digital input defined by parameter <a href="#">FSOGEN.42</a>.</p> <p>Make sure that the value is <i>Automatic</i>.</p>
FSOGEN.42	Acknowledgement button input	None	<p>Sets the digital input for the acknowledgement signal when parameter <a href="#">STO.02 STO acknowledgement</a> has value <i>Manual</i>.</p> <p><i>None:</i> In the safety functions described in this manual, parameter <a href="#">STO.02 STO acknowledgement</a> has value <i>Automatic</i> and this parameter has value <i>None</i> (no acknowledgement signal connected).</p> <p>In the safety functions described in this manual, you can use this parameter to implement manual reset in the FSO module (see section <a href="#">Resetting the ATEX-certified motor thermal protection function</a> on page 19 or 34). Set the digital input which the reset circuit is connected to with this parameter.</p> <p><a href="#">ACS880-07/17/37 drives with the option +Q978 or +Q979:</a> The value of this parameter is <i>DI X113:2</i>. A reset circuit is connect to the FSO module and the user must reset the safety function with the emergency stop reset button also when motor overtemperature is reached. Do not change this setting.</p>
FSOGEN.51	Zero speed without encoder	90 rpm	<p>Sets the general zero speed limit for safety functions when no safety encoder is in use.</p> <p><u>STO function:</u> The value has no effect.</p> <p><u>SS1 function:</u> The FSO module activates drive STO function when the drive has decelerated the motor speed below this value. Adjust the default value when necessary.</p> <p><a href="#">ACS880-07/17/37 drives with the option +Q978:</a> Also the main contactor/breaker is opened.</p>
FSOGEN.52	Zero speed with encoder	0 rpm	<p>Sets the general zero speed limit for safety functions when a safety encoder is in use.</p> <p><u>STO function:</u> The value has no effect.</p> <p><u>SS1 function:</u> The FSO module activates drive STO function when the drive has decelerated the motor speed below this value. Adjust the default value when necessary.</p> <p><a href="#">ACS880-07/17/37 drives with the option +Q978:</a> Also the main contactor/breaker is opened.</p> <p><b>Note:</b> This parameter is used only with FSO-21 and when a safety encoder is used in the application.</p>
FSOGEN.61	STO indication ext request	Warning	<p>Sets the type of the event that the FSO module generates and sends to the drive after external requests that end to a successful activation of the drive STO function (STO, SSE or SS1).</p> <p><i>None, Warning, Event:</i> You do not have to reset the drive/inverter unit.</p> <p><i>Fault:</i> You have to reset the drive/inverter unit.</p> <p>In the safety functions described in this manual, you can use this indication as the motor overtemperature indication message and to implement a manual reset. Adjust the default value when necessary.</p>

Index	Name	Example value	Description
FSOGEN.62	STO indication safety limit	Fault	<p>Sets the type of the event that the FSO module generates and sends to the drive for limit hits during ramp and time monitoring of safety ramps SAR0 and SAR1.</p> <p><u>STO function:</u> The value has no effect.</p> <p><u>SS1 function:</u> When the motor speed does not follow the stop ramp or the time limit is exceeded, the FSO module activates the STO function and generates this user-defined indication. Check the default setting and adjust if necessary. If you select <i>Fault</i>, you must reset the drive before you can restart it.</p>

## ■ Parameters for the STO function

These parameters are related to the STO function of the FSO module. With stop category 0 the FSO module activates the STO function in overtemperature situations. In addition, the FSO module can activate the STO function in fault situations.

Index	Name	Example value	Description
STO.02	STO acknowledgement	Automatic	<p>Sets the acknowledgement method used in the STO, SSE and SS1 functions.</p> <p><i>Automatic:</i> The FSO module resets the STO function automatically after the STO request have been removed.</p> <p><i>Manual:</i> The FSO module reads the external acknowledgement signal through the digital input defined by parameter <a href="#">FSOGEN.42</a>. In the safety functions described in this manual, you can use this setting to implement a manual reset for the motor temperature protection function in the FSO module (see section <i>Resetting the ATEX-certified motor thermal protection function</i> on page <a href="#">19</a> or <a href="#">34</a>).</p> <p><u>ACS880-07/17/37 drives with the option +Q978 or +Q979:</u> The FSO module is configured so that after the safety function activation, the user must reset the FSO manually with the emergency stop reset button (this parameter is set to <i>Manual</i>). In this case, the user must reset the FSO module with the emergency stop reset button also when motor overtemperature is reached. Do not change this setting.</p>
STO.11	STO input A	None	<p>Sets the digital input that is connected to the primary input of the STO function.</p> <p>In the safety functions described in this manual, this parameter has value <i>None</i>.</p> <p><u>ACS880-07/17/37 drives with the option +Q978 or +Q979:</u> ABB has connected the emergency stop button to this digital input at the factory. Make sure that the setting corresponds to the circuit diagrams of the delivery.</p> <p><u>ACS880 multidrives with the option +Q979:</u> ABB has connected the emergency stop safety relay to this digital input at the factory. Make sure that the setting corresponds to the circuit diagrams of the delivery.</p> <p><b>Note:</b> The default value after factory reset is <i>DI X113:1 &amp; X114:1</i>. Always check this parameter after factory reset.</p>
STO.12	STO input B	DI X113:4	<p>Sets the digital input that is connected to the secondary input of the STO function.</p> <p>For the safety functions described in this manual, ABB has configured the contacts of the PTC/Pt100 relay to this digital input at the factory. Make sure that the setting corresponds to the circuit diagrams of the delivery.</p> <p><b>Note:</b> The default value after factory reset is <i>None</i>. Always check this parameter after factory reset.</p>

Index	Name	Example value	Description
STO.13	Restart delay after STO	2000 ms	<p>Sets the time after which the restart of the drive is allowed after the FSO module has activated the STO function and opened the drive STO circuit. With this parameter, you can allow a restart of the drive before the motor has stopped (fly-start). This parameter is valid only if the STO function is requested from STO input A (<a href="#">STO.11</a>) or STO input B (<a href="#">STO.12</a>).</p> <p><b>STO function:</b> Adjust the value when necessary. If you do not want to use the fly-start feature, set this parameter to the same value as parameter <a href="#">STO.13</a>.</p> <p><b>SS1 function:</b> This value has no effect.</p>
STO.14	Time to zero speed with STO or modoff	2000 ms	<p>Sets the time after which the acknowledgement is allowed after coast stop in the STO and SSE functions. Set this parameter value to the estimated time in which the motor coasts to a stop from the maximum speed.</p> <p><b>STO function:</b> This parameter sets the time after which the STO function is completed. Parameter <a href="#">STO.13</a> defines the time after which the restart of the drive is allowed. Adjust the value when necessary.</p> <p><b>SS1 function:</b> This parameter is used only when the motor speed does not follow the ramp settings or the time monitoring limit is exceeded and the FSO module activates the STO function. Adjust the value when necessary.</p> <p><b>When a safety encoder is used:</b> This parameter is relevant only if an encoder or FSE module failure occurs. The FSO module goes into the Fail-safe mode and activates the STO function. For more information, see the FSO-21 module user's manual.</p> <p><b>Note:</b> The default value after factory reset is 3,600,000 ms. Always check this parameter after factory reset.</p>
<b>SBC usage</b>			
SBC.11	STO SBC usage	None	<p>Sets how the mechanical brake is used together with the STO function.</p> <p>In the safety functions described in this manual, this feature is not used and this parameter has value <i>None</i>.</p> <p><b>ACS880-07/17/37 drives with the option +Q978:</b> The SBC function is used in the emergency stop implementation to control the auxiliary safety relay(s) which is connected to the main contactor/breaker. Make sure that the value is <i>Delayed brake</i>.</p>

## ■ Parameters for the SSE function

These parameters are related to the Safe stop emergency (SSE) function of the FSO module. The safety functions described in this manual do not use this function, but the FSO module can activate the SSE function in internal fault situations.

Index	Name	Example value	Description
SSE.13	SSE function	Immediate STO	<p>Sets the type of the SSE function.</p> <p><i>Immediate STO</i>: The FSO module activates the drive STO function immediately after the SSE request.</p> <p><i>Emergency ramp</i>: The FSO module first ramps down the motor speed and when the speed is below the zero speed limit (parameter <a href="#">FSOGEN.51</a> or <a href="#">FSOGEN.52</a>) it activates the STO function. SAR0 parameters define the deceleration ramp (for more information, see the FSO module user's manual).</p> <p>For the safety functions described in this manual, ABB has set this parameter to value <i>Immediate STO</i> at the factory. Adjust the default value when necessary.</p> <p><b>Note</b>: The default value after factory reset is <i>Emergency ramp</i>. Always check this parameter after factory reset.</p>
<b>SBC usage</b>			
SBC.15	SSE/SS1 SBC speed	0 rpm	<p>Sets the absolute speed below which the FSO module activates the brake (SBC) while ramping.</p> <p><i>0 rpm</i>: The feature is not in use.</p> <p>In the safety functions described in this manual, this feature is not used. Make sure that the value is <i>0 rpm</i>.</p>

## ■ Parameters for the SS1 function

Set these parameters only if you want that the FSO module activates the SS1 function in overtemperature situations (stop category 1).

Index	Name	Example value	Description
SS1.01	SS1 activity and version	Version 1	<p>Activates or deactivates the SS1 function and shows the version of the SS1 function.</p> <p><i>Version 1</i>: Activates version 1 of the SS1 function. For more information, see the FSO module user's manual.</p>
SS1.11	SS1 input A	None	Sets the digital input that is connected to the primary input of the SS1 function.
SS1.12	SS1 input B	DI X113:4	<p>Sets the digital input that is connected to the secondary input of the SS1 function.</p> <p><b>Note</b>: The default value after factory reset is <i>None</i>. Always check this parameter after factory reset.</p>
SS1.13	SS1 monitoring method	Ramp	<p>Sets the method used for the SS1 monitoring. Adjust the default value when necessary.</p> <p><u>Time monitoring</u>: The FSO module monitors that a user-defined deceleration time limit is not exceeded. (See parameter <a href="#">SS1.14</a>.)</p> <p><u>Ramp monitoring</u>: The FSO module monitors that the motor decelerates along a user-defined stop ramp. (See SAR1 ramp parameters <a href="#">200.112</a>, <a href="#">SARx.21</a>, <a href="#">SARx.22</a> and <a href="#">SARx.02</a>.)</p>

Index	Name	Example value	Description
SS1.14	SS1 delay for STO	20000 ms	<p>Sets the security delay after which the FSO module activates the drive STO and SBC at the latest, if the motor speed has not gone below the zero speed limit (parameter <a href="#">FSOGEN.51</a> or <a href="#">FSOGEN.52</a>) yet.</p> <p><u>Time monitoring:</u> This value sets the security delay that the FSO module monitors. Adjust the default value when necessary.</p> <p><u>Ramp monitoring:</u> This value has no effect in the operation.</p>
<b>SAR1 ramp settings</b>			
200.112	SAR1 ramp time to zero	2000 ms	<p>Sets the target time for the stop ramp SAR1 that is used in the SS1 and function. Adjust the default value when necessary.</p> <p>Target time = The time in which the drive decelerates the motor from speed <a href="#">200.202 SAR speed scaling</a> to zero.</p> <p><b>Note:</b> With value <i>0 ms</i>, the drive uses the emergency stop ramp set by drive parameter 23.23 (see section <a href="#">SS1 ramp parameters in the drive/inverter unit</a> below). Also in this case, the FSO module only monitors the actual ramp (ramp monitoring or time monitoring).</p>
200.202	SAR speed scaling	1500 rpm	<p>Sets a speed value that the FSO module uses as a reference point in ramp parameter calculations (see SAR1 ramp parameters <a href="#">200.112</a>, <a href="#">SARx.21</a>, <a href="#">SARx.22</a> and <a href="#">SARx.02</a>). Adjust the default value when necessary.</p>
SARx.02	SAR initial allowed range	100 ms	<p>Sets the initial allowed range for the SAR0/SAR1 ramp. This parameter moves the location of the maximum monitoring ramp forward on the time axis, when monitoring is started. The slope of the ramp stays the same as defined with parameters <a href="#">200.202</a> and <a href="#">SARx.22</a>. For more information, see the FSO module user's manual.</p> <p><u>Time monitoring:</u> This value has no effect in the operation.</p> <p><u>Ramp monitoring:</u> Adjust the default value when necessary.</p>
SARx.21	SAR1 min ramp time to zero	1000 ms	<p>Sets the minimum ramp time for the SAR1 ramp monitoring.</p> <p><u>Time monitoring:</u> This value has no effect in the operation.</p> <p><u>Ramp monitoring:</u> Sets the minimum stop ramp time for the emergency stop. Adjust the default value when necessary.</p> <p><b>Note:</b> With value <i>0 ms</i>, the minimum ramp is not monitored.</p>
SARx.22	SAR1 max ramp time to zero	3000 ms	<p>Sets the maximum ramp time for the SAR1 ramp monitoring.</p> <p><u>Time monitoring:</u> This value has no effect in the operation.</p> <p><u>Ramp monitoring:</u> Sets the maximum stop ramp time for the emergency stop. Adjust the default value when necessary.</p>
<b>SBC usage</b>			
SBC.15	SSE/SS1 SBC speed	0 rpm	<p>Sets the absolute speed below which the FSO module activates the brake (SBC) while ramping.</p> <p><i>0 rpm:</i> The feature is not in use.</p> <p>In the safety functions described in this manual, this feature is not used. Make sure that the value is <i>0 rpm</i>.</p>

In addition to the parameters related to the SS1 function, change or set the value of these parameters.

Index	Name	Pre-set value (STO function)	Value with the SS1 function
STO.12	STO input B	DI X113:4	None
FSOGEN.51	Zero speed without encoder	90 rpm	If you do not use a safety encoder, adjust the default value to meet the motor in use.
FSOGEN.52	Zero speed with encoder	0 rpm	If you use a safety encoder, adjust the default value to meet the motor in use.
FSOGEN.62	STO indication safety limit	Fault	Adjust the default value when necessary.

### SS1 ramp parameters in the drive/inverter unit

You must set these parameters only for the SS1 function.

If FSO parameter [200.112 SAR1 ramp time to zero](#) is set to 0, drive parameters define the stop ramp that is used in the SS1 function:

- [21.04 Emergency stop mode](#) is set to value *Eme ramp stop* (Off3)
- [23.23 Emergency stop time](#) is set to a suitable value.

Also in this case, the FSO module monitors the actual stop ramp (ramp monitoring or time monitoring). For more information, see the firmware manual.

### FSE module and safety pulse encoder parameters

Set and check these parameters only when you use a safety pulse encoder and the FSE-31 pulse encoder interface module with the FSO-21 module.

Index	Name	Example value	Description
200.231	FSE 3X act and par version	Version 1	Activates the FSE-31 encoder interface and shows the version of the encoder parameter groups (91 and 92).
200.232	Number of encoders	Single encoder CH1	Shows the number of safety pulse encoders connected to the FSE module.
S_ENCGEN.01	Safe pulse encoder version	Version 1	Activates the safety pulse encoder and shows the version parameter group S_ENCGEN.
S_ENCGEN.11	FSE diagnostic failure reaction	STO	Sets the action taken when there is a problem with the FSE module. <i>STO</i> : The FSO module goes into the Fail-safe mode and activates the drive STO function. <b>Note</b> : This parameter is relevant only when there are no active safety functions.
S_ENCGEN.14	Enc speed cross comp tolerance	1 rpm	Sets the encoder speed cross comparison tolerance. This defines how much the axle speed of the motor can change within 1 ms. Adjust the default value to meet the ratings of the motor in use.
S_ENCGEN.41	Gear numerator encoder 1	1	Sets the rotation direction for the safety pulse encoder. With this parameter, you can change the rotation direction of the motor. Adjust the default value if necessary.
91.11	Module 1 type	FSE-31	Sets the type of the safety pulse encoder interface module 1.
91.12	Module 1 location	2	Sets the slot in which the safety pulse encoder interface module 1 is located.
92.01	Encoder 1 type	HTL1	Activates or deactivates the communication with the safety pulse encoder interface module 1 and sets the type for the safety pulse encoder.
92.02	Encoder 1 source	Module 1	Sets the safety pulse encoder interface module that the safety pulse encoder 1 is connected to.

Index	Name	Example value	Description
92.10	Pulses/revolution	2048	Sets the number of HTL pulses per revolution for safety pulse encoder 1. Adjust the default value to meet the safety pulse encoder in use. Make sure that the value is according to the encoder nameplate.
92.17	Accepted pulse freq of encoder 1	300 kHz	Sets the maximum pulse frequency range of encoder 1. Adjust the default value to meet the motor and safety pulse encoder in use. You can use this formula to define the value: $r\_max \times ppr\_enc + 10\%$ , where <ul style="list-style-type: none"> <li><math>r\_max</math> = the maximum motor speed (rpm) used in the application (or the motor nominal speed)</li> <li><math>ppr\_enc</math> = Pulses/revolution of the safety pulse encoder (parameter <a href="#">92.10</a>).</li> </ul>

## ■ Notes

### ACS880-07/17/37 drives with the option +Q978

In motor overtemperature situations, the FSO module also opens the main contactor/circuit breaker.

### ACS880-07/17/37 drives with the option +Q978 or +Q979

The FSO module is configured so that after the safety function activation, the user must reset the FSO module manually with the emergency stop reset button. In this case, the user must reset the FSO module with the emergency stop reset button also after motor overtemperature situations. Also the indication lamp on the reset button is illuminated. Do not change the setting.

## Mechanical brake control

If you use a mechanical brake with the motor thermal protection circuit, pay special attention to the control of the mechanical brake.

If the motor deceleration by the mechanical brake causes extra heat generation in the ATEX area, make sure that the use of the brake does not rise the temperature excessively. In this case, make sure that the mechanical brake is activated only at the zero speed (see parameters [SBC.11 STO SBC usage](#), [SBC.15 SSE/SS1 SBC speed](#) and [FSOGEN.51](#) or [FSOGEN.52](#)).

In some cases you cannot use the brake for the motor deceleration when the motor thermal protection circuit has tripped, and the motor temperature is excessive already.

For more information, see the drive firmware manual (or the FSO user's manual if you use the Safe brake control (SBC) function of the FSO module).





# 5

## Technical data

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### Contents of this chapter

This chapter contains the technical specifications of the protection functions and the PTC and Pt100 relays. It also gives general rules, notes and definitions related to safety functions and lists related standards. The ATEX compliance markings and certificates are also included.

### The ATEX-certified motor thermal protection functions

Response time: < 200 ms

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## PTC thermistor relays

### ■ ABB CM-MSS.41

#### Ordering information

Part number	CM-MSS.41P (Push-in terminals): 1SVR740712R1200
	CM-MSS.41S (Screw terminals): 1SVR730712R1200

#### Power supply A1-A2 (non-isolated)

Rated voltage	24...240 V AC/DC
Rated control supply voltage tolerance	-15%...+10%
Rated frequency	15...400 Hz
Typical current/ power consumption	24 V AD/DC: 33 mA/ 0.55 VA 220-240 V AC: 11 mA/ 1.6 VA

#### Measuring circuit /Sensor circuit T1-T2

Sensor type	PTC type A (DIN/EN 44081, DIN/EN 44082)
Number of sensor circuits	1
Max. total resistance with sensors in cold state in the circuit	< 750 ohm
Overtemperature switch-off resistance (relay de-energizes)	2.8 kohm ± 1%
Overtemperature switch-on resistance (relay energizes)	1.1 kohm ± 1%
Short-circuit detection	configurable
Short-circuit detection: switch-off resistance (relay de-energizes)	< 12 ohm
Short-circuit detection: switch-on resistance (relay energizes)	> 19 ohm
Interrupted wire detection: switch-off resistance (relays de-energize)	dynamic
Interrupted wire detection: switch-on resistance (relays energize)	not available
Non-volatile fault storage	configurable
Test function	Yes
Maximum voltage in sensor circuit	1.33 kOhm: 2.5 V 4 kOhm: 3.7 V ∞ kOhm: 5.5 V
Maximum current in sensor circuit	3.7 mA
Maximum sensor cable length	2 × 100 m with 0.75 mm <sup>2</sup> , 2 × 400 m with 2.5 mm <sup>2</sup>
Accuracy within the rated control supply voltage tolerance	0.50%
Accuracy within the temperature range	0.01% / K
Repeat accuracy (constant parameters)	on request
Reaction time of the safety function	<100 ms
Hardware fault tolerance (HFT)	0

#### Control circuit S1-T2

Control function	Manual reset: yes Auto reset: adjustable Remote reset: adjustable
Maximum no-load voltage (S1-T2 open)	5.5 V
Maximum current (S1-T2 jumpered)	0.6 mA
Maximum cable length	2 × 100 m with 0.75 mm <sup>2</sup> , 2 × 400 m with 2.5 mm <sup>2</sup>

### Indication of operating states

Control supply voltage	"U" LED (green)
Relay status	"R" LED (yellow)
Fault message	"F" LED (red)

### Operating controls

Test / Reset	front-face button
Configuration of DIP switch 1	non-volatile fault storage
Configuration of DIP switch 2	short-circuit detection

### Output circuit

Kind of output	11-12/14	relay, 1st c/o (SPDT) contact
	21-22/24	relay, 2nd c/o (SPDT) contact
Operating principle		closed-circuit principle
Contact material		AgNi alloy, Cd free
Rated operational voltage $U_e$ (IEC/EN 60947-1)		250 V AC
Minimum switching voltage / Minimum switching current		24 V / 10 mA
Maximum switching voltage / Maximum switching current		See ' <i>Load limit curves</i> ' in the data sheet of the relay (2CDC112216D0201 [English]).
Rated operating current $I_e$ (IEC/EN 60947-5-1):		
	AC-12 (resistive) at 230 V	4 A
	AC-15 (inductive) at 230 V	3 A
	DC-12 (resistive) at 24 V	4 A
	DC-13 (inductive) at 24 V	2 A
AC Rating (UL 508):		
utilization category (Control Circuit Rating Code)	B 300	
maximum rated operational voltage	300 V AC	
maximum continuous thermal current at B 300	5 A	
maximum making/breaking apparent power at B 300	3600/360 VA	
general purpose rating	250 V AC - 4 A	
Mechanical lifetime		$30 \times 10^6$ switching cycles
Electrical lifetime	at AC12, 230 V AC, 4 A	$0.1 \times 10^6$ switching cycles
Maximum fuse rating to achieve short-circuit protection:		
	n/c contact	10 A fast-acting
	n/o contact	10 A fast-acting

### Ambient temperature

Operation	-20...+60 °C (-4...+140 °F)
Storage	-40...+85 °C (-4...+185 °F)

### Terminals

Wire size	
	Screw connection technology
	fine-strand with(out) wire end ferrule:
	1 x 0.5-2.5 mm <sup>2</sup> (1 x 20-14 AWG)
	2 x 0.5-1.5 mm <sup>2</sup> (2 x 20-16 AWG)
	rigid:
	1 x 0.5-4 mm <sup>2</sup> (1 x 20-12 AWG)
	2 x 0.5-2.5 mm <sup>2</sup> (2 x 20-14 AWG)
	Easy Connect Technology (push-in)
	fine-strand with(out) wire end ferrule:
	2 x 0.5-1.5 mm <sup>2</sup> (2 x 20-16 AWG)
	rigid:
	2 x 0.5-1.5 mm <sup>2</sup> (2 x 20-16 AWG)
Stripping length	8 mm (0.32 in)
Tightening torque	0.6-0.8 Nm (5.31-7.08 lb.in)

**Dimensions**

Height × width × depth	product	22.5 x 85.6 x 103.7 mm (0.89 x 3.37 x 4.08 in)
	packaging	97 x 109 x 30 mm (3.82 x 4.29 x 1.18 in)

**Approvals**

ATEX Ex II (2) G D

**Isolation data**Rated insulation voltage  $U_i$  (IEC/EN 60947-1, IEC/EN 60664-1)Supply circuit / Measuring circuit<sup>1)</sup> 300 V AC

Supply circuit / Output circuits 300 V AC

Measuring circuit<sup>1)</sup> / Output circuits 300 V AC

Output circuit 1 / Output circuit 2 300 V AC

Rated impulse withstand voltage  $U_{imp}$  (IEC/EN 60947-1, IEC/EN 60664-1)Supply circuit / Measuring circuit<sup>1)</sup> 4 kV / 6 kV

Supply circuit / Output circuits 4 kV / 6 kV

Measuring circuit<sup>1)</sup> / Output circuits 4 kV / 6 kV

Output circuit 1 / Output circuit 2 4 kV

Basic insulation (IEC/EN 60664-1)

Supply circuit / Measuring circuit<sup>1)</sup> 600 V AC

Supply circuit / Output circuits 600 V AC

Measuring circuit<sup>1)</sup> / Output circuits 600 V AC

Output circuit 1 / Output circuit 2 300 V AC

Test voltage, routine test (IEC/EN 60255-27)

Supply circuit / Measuring circuit<sup>1)</sup> 2.5 kV, 50 Hz, 1 min.

Supply circuit / Output circuits 2.5 kV, 50 Hz, 1 min.

Measuring circuit<sup>1)</sup> / Output circuits 2.5 kV, 50 Hz, 1 min.

Test voltage, type test (IEC/EN 60255-27)

Supply circuit / Measuring circuit<sup>1)</sup> 6 kV / 1.2 - 50  $\mu$ sSupply circuit / Output circuits 6 kV / 1.2 - 50  $\mu$ sMeasuring circuit<sup>1)</sup> / Output circuits 6 kV / 1.2 - 50  $\mu$ sOutput circuit 1 / Output circuit 2 6 kV / 1.2 - 50  $\mu$ s

Protective separation (IEC/EN 61140, EN 50178)

Supply circuit / Measuring circuit<sup>1)</sup> yes, up to 300 V

Supply circuit / Output circuits yes

Measuring circuit<sup>1)</sup> / Output circuits yes

Output circuit 1 / Output circuit 2 no

Pollution degree (IEC/EN 60664-1) 3

Overvoltage category (IEC/EN 60664-1) III

<sup>1)</sup> Potential of measuring circuit = Potential of control circuit

More information, see *Thermistor motor protection relay CM-MSS.41 Data sheet* (2CDC112216D0201 [English]) in the ABB Library.

## ■ DOLD MK 9163N.12/110-ATEX

### Ordering information

Part number 0056901

### Power supply A1-A2 (non-isolated)

Rated voltage 24 V AC/DC  
 Voltage range AC 0.8...1.1  $U_H$   
 at 10% residual ripple: DC 0.9...1.25  $U_H$   
 at 48% residual ripple: DC 0.8...1.1  $U_H$   
 Frequency 45...65 Hz  
 Power consumption AC: 1.5 VA  
 DC: 0.85 V

### Measuring circuit P1-P2

Response value 3.2...3.8 kohm  
 Switch-on resistance (relay energizes) 1.5...1.8 kohm  
 Switch-off resistance (relay de-energizes) > 3.8 kohm  
 Short circuit on measuring circuit < 20 ohm  
 Loading of measuring circuit < 5 mW (R = 1.5 kohm)  
 Measuring voltage  $\leq 2$  V (R = 1.5 kohm)  
 Max. sensor cable length for short-circuit detection 2 x 50 m with 0.5 mm<sup>2</sup>, 2 x 150 m with 1.5 mm<sup>2</sup>,  
 2 x 250 m with 2.5 mm<sup>2</sup>

### Reset circuit X1/X2

Remote reset switch type Reset X1/X2 with NO contact (voltage free)  
 Remark This input is not galvanic separated from measuring input P1/P2.

### Output contacts (terminals 11-12/14, 21-22/24)

Number of contacts Two changeover contacts  
 Contact material AgNi 10 + 0.2 microAu  
 Rated switching current AC-15 (inductive) 230 V: 3 A  
 EN 60947-5-1 DC-13 (inductive) 24 V: 2 A  
 Mechanical life  $\geq 30 \times 10^6$  switching cycles  
 Electrical life  $1.5 \times 10^6$  switching cycles with a resistive load of 4 A  
 at 230 V,  $\cos \phi = 0.6$   
 Short circuit strength, max. line circuit breaker C 16 A  
 EN 60947-5-1

### Indication of operating states

Supply voltage present LED (green)  
 Fault "R" LED (red)

### Ambient temperature

Operation -20...+60 °C

### Terminals

Wire size Minimum: 0.5 mm. Maximum: 1 x 2.5 mm<sup>2</sup> stranded  
 ferruled or 2 x 1.5 mm<sup>2</sup> stranded ferruled.

### Dimensions

Height x width x depth 90 x 22.5 x 102 mm

### Approvals

ATEX Ex II (2) G D

**Isolation data**

**Note:** The supply and measurement circuits are not electrically isolated. Use a dedicated power supply for the PTC relay(s).

Rated impulse withstand voltage between all isolated circuits	4 kV (EN 60664-1)
Pollution degree	2
Overtoltage category	III

More information on the relay is available at [www.dold.com](http://www.dold.com).

**Pt100 relays****GM International D1073S****Ordering information**

Model	D1073S
Programming tool (not included in the ABB delivery)	GM Pocket Portable Configurator PPC1090 or RS-232 serial line with PPC1092 Adapter and SWC1090 Configurator software (recommended)

**Power supply (terminals 3-4)**

Rated voltage	24 V DC (reverse polarity protected)
Voltage range	20...30 V DC
Power consumption	< 2.1 W at 30 V supply voltage, overload condition, relays energized and PPC1090 connected

**Measuring circuit (terminals 13-16)**

Sensor type	3-4 wire RTD Pt100 (For other alternatives, refer to <a href="http://www.gminternationalsrl.com">www.gminternationalsrl.com</a> .)
Integration time	500 ms
Resolution	20 microV
Visualization	0.1 °C on temperature 10 microV on mV 0.1% on potentiometer
Input range	Within rated limits of sensor (-10...+ 80 mV)
Measuring RTD current	≤ 0.5 mA
RTD line resistance compensation	≤ 10 ohm
RTD line resistance error compensation	-5...+20 ohm, programmable

**Current output (terminals 1-2)**

Signal range (span)	0/4 to 20 mA, on max. 600 ohm load source mode, current limited at 22 mA
Resolution	2 microA current output
Transfer characteristic	Linear or reverse
Response time	≤ 50 ms (10...90% step change)
Output ripple	≤ 20 mVrms on 250 ohm load

**Output contacts (terminals 5-8)**

Number of contacts	Two SPST relay contacts
Hysteresis	Programmable
ON-OFF delay time	0...1000 s, 100 ms step, separate setting
Rated switching current	2 A / 250 V AC / 500 VA 2 A / 250 V DC / 80 W (resistive load)

## Performance

Reference conditions 24 V supply, 250 ohm load, 23 ± 1 °C ambient temperature

Input:

- Calibration and linearity accuracy ≤ ± 40 microV on mV, 200 mohm on RTD or ± 0.05% of input value
- Temperature influence ≤ ± 2 microV, 20 mohm, 0.02% or ± 0.01% of input value for a 1 °C change

Analog output:

- Calibration accuracy ≤ ± 0.1% of full scale
- Linearity error ≤ ± 0.05% of full scale
- Supply voltage influence ≤ ± 0.05% of full scale for a min to max supply change
- Load influence ≤ ± 0.05% of full scale for a 0...100% load resistance change
- Temperature influence ≤ ± 0.01% on zero and span for a 1 °C change

## Indication of operating states

Supply voltage present	"PWR" LED (green)
Burnout detected	"BURN" LED (red)
Alarm A	"A" LED (red)
Alarm B	"B" LED (red)

## Ambient temperature

Operation	-20...+60 °C, relative humidity max. 90% non condensing, up to 35 °C
Storage	-45...+80 °C

## Dimensions

Height × width × depth	114.5 × 22.5 × 99 mm
------------------------	----------------------

## Approvals

ATEX Ex II (1) G D

IECEX

SIL 2 according to IEC 61508, IEC 61511 (EXIDA Report No. GM04)

DNV A-10169, KR ITA20769-EI001 for marine applications

## Isolation data

Isolation voltage (Test voltage):

- In/Outs 1.5 kV
- In/Supply 1.5 kV
- Analog Out/Supply 500 V
- Analog Out/ Alarm Outs 1.5 kV
- Alarm Outs/ Supply 1.5 kV
- Alarm Outs/ Alarm Outs 1.5 kV

More information on the relay is available at [www.gminternationalsrl.com](http://www.gminternationalsrl.com).

## ■ PRelectronics 9116B1 universal converter

### Ordering information

Universal converter - U <sub>o</sub> 28 V DC (max. loop voltage)	9116B1
Display / Programming front (Not included in the ABB delivery)	4501

### Power supply (terminals 32-31)

Rated voltage	24 V DC
Voltage range	19.2...31.2 V DC
Power consumption	< 3.5 W
Fuse	1.25 A SB / 250 V AC

### Status relay in safe area (terminals 33-34)

Not used in the particular application described by this manual.

### Measuring circuit/RTD input (terminals 41-44)

Sensor type	3-4 wire RTD Pt100 (For other alternatives, refer to <a href="http://www.prelectronics.com">www.prelectronics.com</a> .)
Effect of sensor cable resistance (3- / 4-wire)	< 0.002 ohm / ohm
Sensor error detection	Programmable ON/OFF
Short circuit detection	Yes
Cable resist. per wire (max.)	50 ohm
Sensor current	Nom. 0.2 mA

### TC, linear resistance or potentiometer inputs (terminals 41-44)

Not used in the particular application described by this manual.

### Current output (terminals 12-11)

Signal range (span)	0...23 mA
Programmable signal ranges	0/4...20 mA (default)
Load (max.)	20 mA / 600 ohm (default)
Load stability	≤ 0.01% of span / 100 ohm
Sensor error reaction	0 / 3.5 / 23 mA / none
NAMUR NE 43 Upscale / Downscale	23 mA / 3.5 mA
Output limitation	On 4...20 mA signals: 3.8...20.5 mA On 0...20 mA signals: 0...20.5 mA
Current limit	≤ 28 mA

### 2-wire 4...20 mA output (terminals 12-11)

Not used in the particular application described by this manual.

### Relay output (terminals 13-14)

Relay functions	Setpoint, Window, Sensor error, Power and Off
Hysteresis, in % of span/display range	0.1...25 / 1...25
ON-OFF delay time	0...3600 s, 100 ms step
Sensor error reaction	Break / Make / Hold
Max. voltage	250 V AC / 30 V DC
Max. current	2 AAC / 2 A DC
Max. AC power	500 VA / 60 W

### Current and voltage inputs (terminals 51-54)

Not used in the particular application described by this manual.

### Indication of operating states

Operation status	LED (green)
Relay status	"relay" LED (yellow)
Malfunction	"error" LED (red)

### Ambient temperature

Operation	-20...+60 °C
Storage	-20...+85 °C

### Terminals

Wire size (max...min) AWG 26...14 / 0.13...2.08 mm<sup>2</sup> stranded wire

### Dimensions

Without 4501, Height × width × depth 109 × 23.5 × 104 mm

With 4501, Height × width × depth 109 × 23.5 × 116 mm

### Approvals

ATEX Ex II (1) G D

IECEX

SIL 2 according to IEC 61508

### Isolation voltage

Test/working: Input to any ..... 2.6 kV AC/300 V AC  
reinforced isolation

Analog output to supply ..... 2.6 kV AC/300 V AC  
reinforced isolation

Status relay to supply ..... 1.5 kV AC/150 V AC  
reinforced isolation

More information on the relay is available at [www.prelectronics.com](http://www.prelectronics.com).

## General rules, notes and definitions

### ■ Validation of the safety functions

You must do an acceptance test (validation) to validate the correct operation of safety functions.

#### Validation procedure

You must do the acceptance test using the checklist given in sections *Start-up and acceptance test*:

- at initial start-up of the safety function
- after any changes related to the safety function (wiring, components, safety function related parameter settings etc.)
- after any maintenance action related to the safety function.

The acceptance test must include at least the following steps:

- having an acceptance test plan
- testing all commissioned functions for proper operation
- documenting all acceptance tests
- signing and storing the acceptance test report for further reference.

#### Acceptance test reports

You must store the signed acceptance test reports in the logbook of the machine and in the explosion protection document under the scope of the ATEX User Directive 1999/92/EC. The report must include, as required by the referred standards:

- a description of the safety application (including a figure)
- a description and revisions of safety components that are used in the safety application
- a list of all safety functions that are used in the safety application
- a list of all safety related parameters and their values
- documentation of start-up activities, references to failure reports and resolution of failures
- the test results for each safety function, checksums, date of the tests and confirmation by the test personnel.

You must store any new acceptance test reports performed due to changes or maintenance in the logbook of the machine and in the explosion protection document under the scope of the ATEX User Directive 1999/92/EC.

#### Competence

The acceptance test of the safety function must be carried out by a competent person with expertise and knowledge of the safety function as well as functional safety, as required by IEC 61508-1 clause 6, and ATEX/Ex regulations. The test procedures and report must be documented and signed by this person.

### ■ Ambient conditions

For the environmental limits for the safety functions and the drive, refer to the hardware manual.

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## ■ Reporting problems and failures related to safety functions

Contact your local ABB representative.

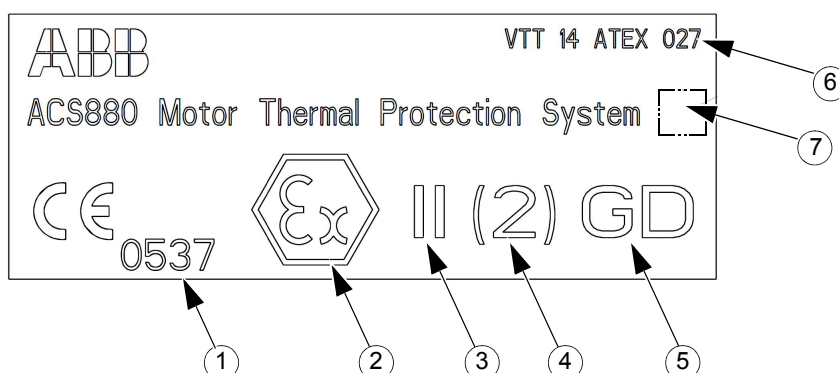
## Related standards and directives

The ATEX-certified motor thermal protection functions comply with the standards listed below.

Standard / Directive	Name
EN 50495: 2010	<i>Safety devices required for the safe functioning of equipment with respect to explosion risks</i>
IEC 61508: 2010	<i>Part 1 – General Requirements</i>
	<i>Part 2 – Requirements for electrical/electronic/programmable electronic safety-related systems</i>
EN 61800-5-2: 2007 IEC 61800-5-2: 2016	<i>Adjustable speed electrical power drive systems Part 5-2: Safety requirements - Functional</i>
IEC 61511-1: 2016	<i>Functional safety- Safety instrumented systems for the process industry sector-Part 1:Framework, definitions, system, hardware and application programming requirements</i>
2014/34/EU (previously 94/9/EC)	<i>European ATEX Product Directive</i>

## Markings of the drive

A sticker is attached to the drive to signify ATEX classification.



1	CE marking with Notified Body identification: The manufacturer declares that the product conforms with ATEX Product Directive 2014/34/EU (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, vapors or mists "D" = dust.
6	Type examination certificate reference.
7	QR code (with the factory code and tracing information).

# ATEX Certificate



EU-TYPE EXAMINATION  
CERTIFICATE  
VTT 14 ATEX 027 Issue 2

1 (2)



1. **EU-TYPE EXAMINATION CERTIFICATE**
2. **Equipment or Protective System Intended for use in Potentially explosive atmospheres Directive 2014/34/EU**
3. Reference: **VTT 14 ATEX 027 Issue 2**
4. Equipment: **Thermal motor protection system for converter drive ACS880/ACS880LC series**  
  
Certified types: **ACS880/ACS880LC +L513 +Q971  
ACS880/ACS880LC +L514 +Q971  
ACS880/ACS880LC +L513/+L514 +Q971 +Q973 (FSO-12)  
ACS880/ACS880LC +L513/+L514 +Q971 +Q972 (FSO-21)  
ACS880/ACS880LC +L513/+L514 +Q971 +Q972 +L521 (FSO-21 & FSE-31)**
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 Oy Drives  
Drives Service  
Kiitoradantie 14  
FI-01530 Vantaa  
Finland**

VTT Expert Services Ltd  
Kivimiehentie 4, Espoo  
P.O.Box 1001, FIN-02044 VTT, Finland

Tel + 358 20 722 111  
Fax + 358 20 722 7042



7. This equipment or protective system and any acceptable variations thereto are 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 21 of the Directive 2014/34/EU of February 2014, 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 EU-Type examination certificate relates only to the design, examination and tests of the specified equipment or protective system in accordance to the Directive 2014/34/EU. 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, 30.6.2017  
**VTT Expert Services Ltd**



Kari Koskela  
 Expert



Risto Sulonen  
 Product Manager

13.

**Schedule**

14.

**EU-TYPE EXAMINATION CERTIFICATE VTT 14 ATEX 027 Issue 2**

15.

## Description

Thermal protection is based on ATEX-certified PTC- relay (type L513) or Pt100-relay (type L514). 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

ACS880 ATEX-certified motor thermal protection functions system description, 3AXD10000331764, rev B  
 ACS880 ATEX-certified motor thermal protection functions safety data calculations, 3AXD10000331763, rev D  
 ACS880+L513 & +L514 ATEX-circuits diagrams, 3AXD10000363564, rev B (8 pages)  
 Certificate No. SEBS-A.093457/16 V1.0 by TÜV Nord  
 Certificate No. SEBS-A.161334/16 V 1.0 by TÜV Nord  
 Certificate No. SEBS-A.102621/15 V1.0 by TÜV Nord

17.

Special conditions for safe use          None

18.

## Essential Health and Safety Requirements

Assessment using standard referred in point 9 have confirmed compliance with the Directive 2014/34/EU, Annex II and particular point 1.5.

Certificate history

Issue	Date	Comment
-	3.5.2013	Prime certificate
1	1.3.2016	The introduction of new manufacturing places and a new PTC-relay
2	30.6.2017	The introduction of a new converter type and deleting one manufacturing place. Updating the certificate according to the new directive.

Espoo, 30.6.2017

**VTT Expert Services Ltd**


 Kari Koskela  
 Expert

 Risto Sulonen  
 Product Manager

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 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 converters**

**ACS880-07, -17, -37, -107**

**ACS880-07CLC**


identified with serial numbers beginning with 1 or 8

with regard to the safety function

**ATEX certified thermal motor protection** (option codes +L513 +Q971, +L514 +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

 II (2) GD

The following harmonized standard has been applied:

EN 50495:2010	Safety devices required for the safe functioning of equipment with respect to explosion risks
---------------	---

The following other standards have been applied:

EN 61800-5-2:2007	Adjustable speed electrical power drive systems – Part 5-2: Safety requirements - Functional
IEC 61800-5-2:2016	
IEC 61508:2010, parts 1-2	Functional safety of electrical / electronic / programmable electronic safety-related systems

Notified Body: VTT Expert Services Ltd, Notified Body number: 0537, Address: Kivimiehentie 4, 02150 Espoo, Finland

has assessed the conformity of the “ATEX certified thermal motor protection” function and has issued the certificate VTT 14 ATEX 027.



—  
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 3AXD10000497305.

Helsinki, 09 May 2018

Manufacturer representative:



Peter Lindgren  
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.



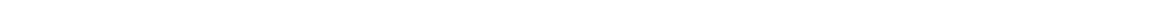
# Circuit diagrams

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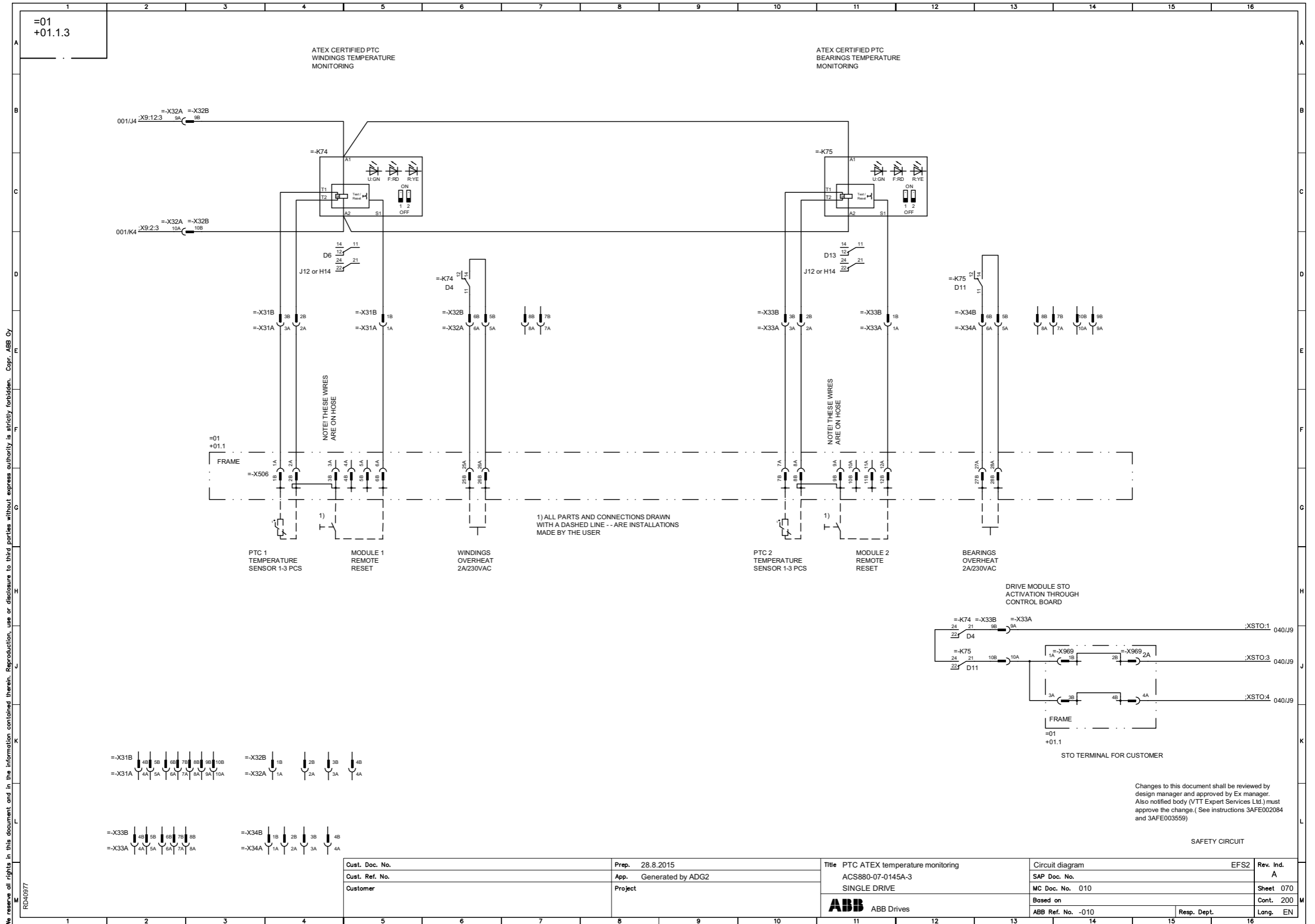
## Contents of this chapter

This chapter contains circuit diagram examples illustrating the operation of the ATEX-certified motor thermal protection functions. For the actual configuration, see the circuit diagrams delivered with the drive.

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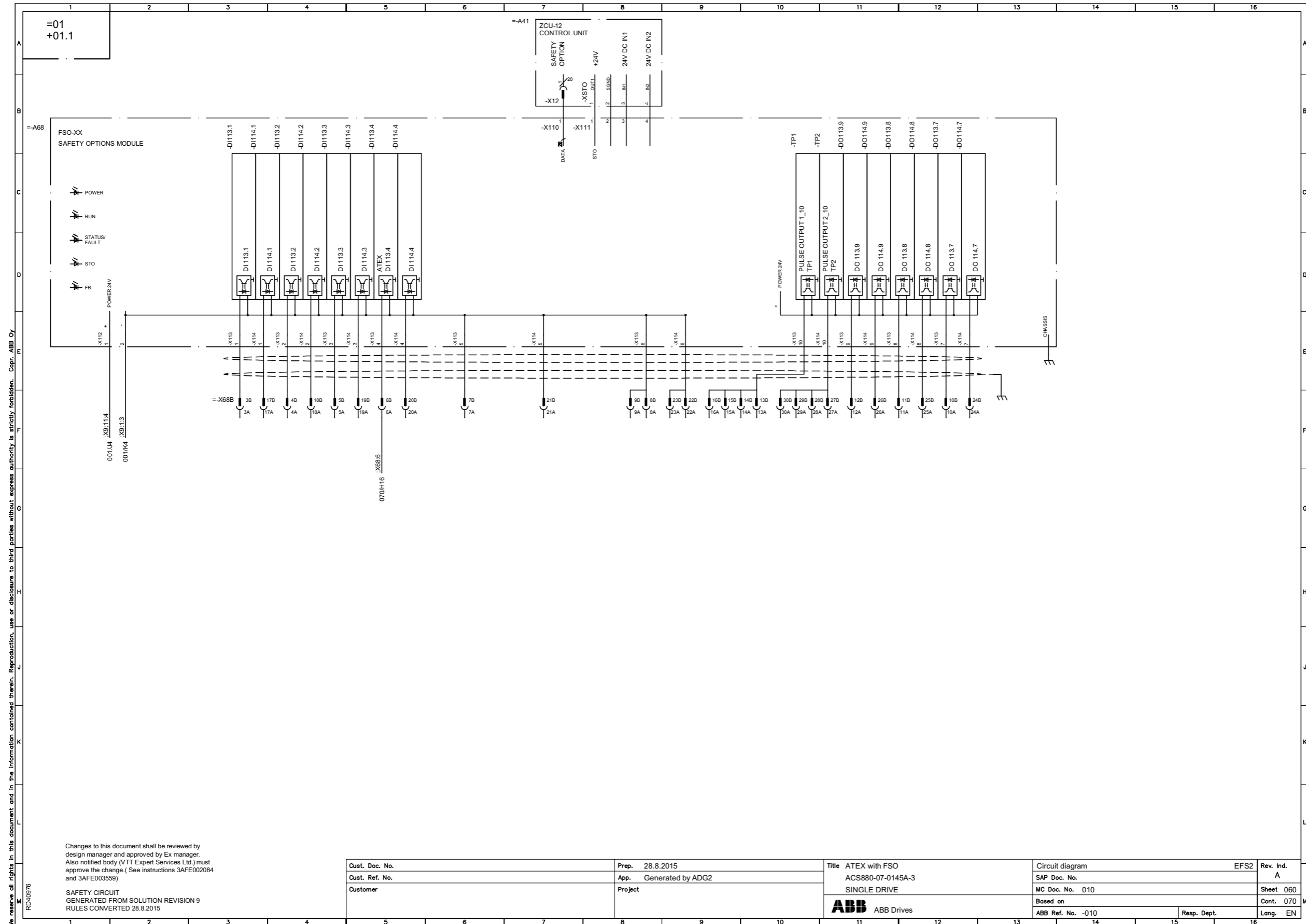
# +2L513+Q971 (PTC monitoring with two relays)



Cust. Doc. No.	Prep. 28.8.2015	Title	PTC ATEX temperature monitoring	EFS2	Rev. Ind.
Cust. Ref. No.	App. Generated by ADG2		ACS880-07-0145A-3		A
Customer	Project		SINGLE DRIVE		Sheet 070
			ABB ABB Drives		Cont. 200
				Resp. Dept.	Lang. EN

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+2L513+Q971+Q973 (PTC monitoring with two relays and FSO module) – Sheet 60

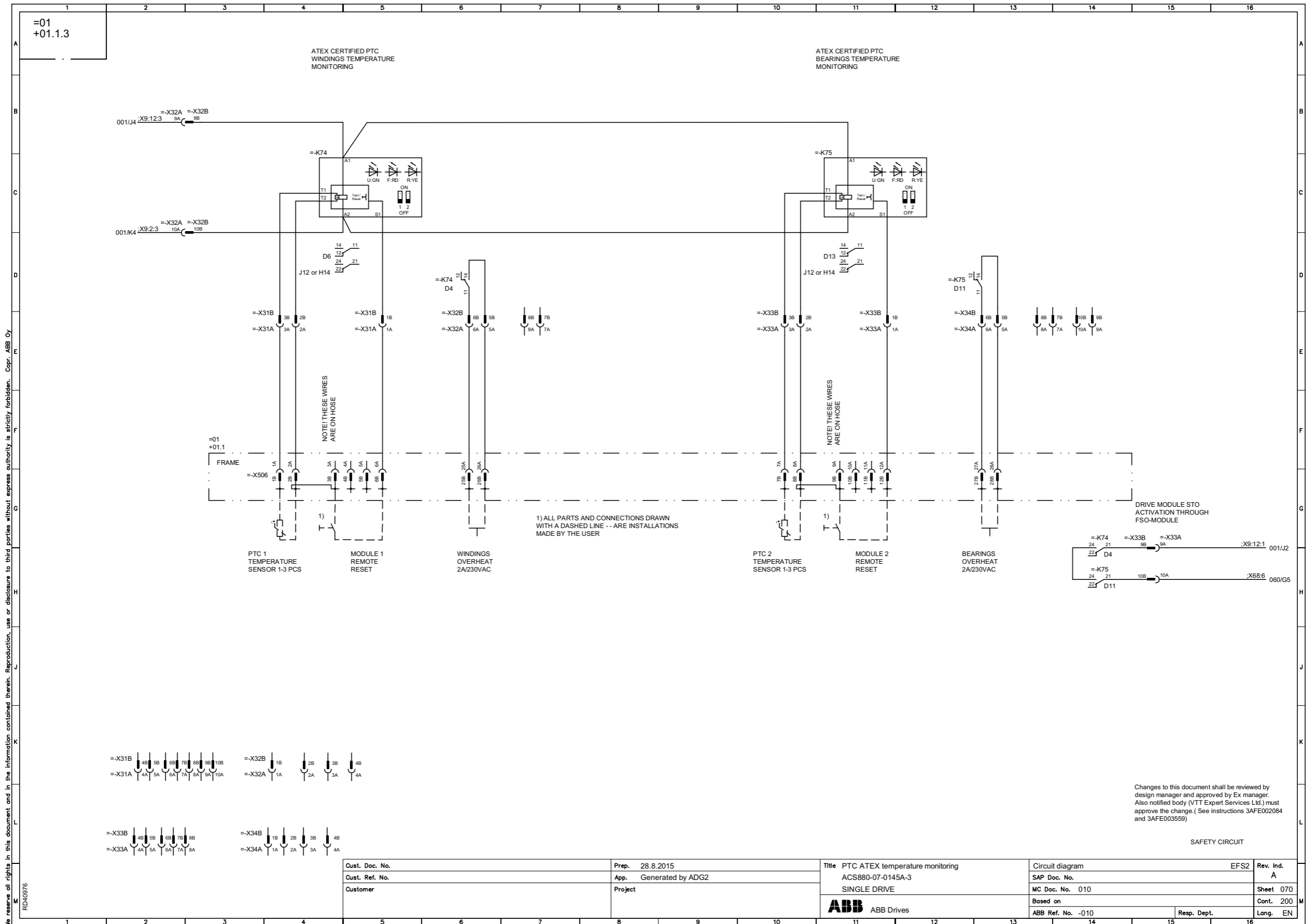


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Changes to this document shall be reviewed by design manager and approved by Ex manager. Also notified body (VTT Expert Services Ltd.) must approve the change. ( See instructions 3AFE002084 and 3AFE003559)  
SAFETY CIRCUIT  
GENERATED FROM SOLUTION REVISION 9  
RULES CONVERTED 28.8.2015

Cust. Doc. No.	Prep. 28.8.2015	Title ATEX with FSO	Circuit diagram	EFS2	Rev. Ind.
Cust. Ref. No.	App. Generated by ADG2	ACS880-07-0145A-3	SAP Doc. No.		A
Customer	Project	SINGLE DRIVE	MC Doc. No. 010		Sheet 060
		<b>ABB</b> ABB Drives	Based on		Cont. 070
			ABB Ref. No. -010	Resp. Dept.	Lang. EN

# +2L513+Q971+Q973 (PTC monitoring with two relays and FSO module) – Sheet 70



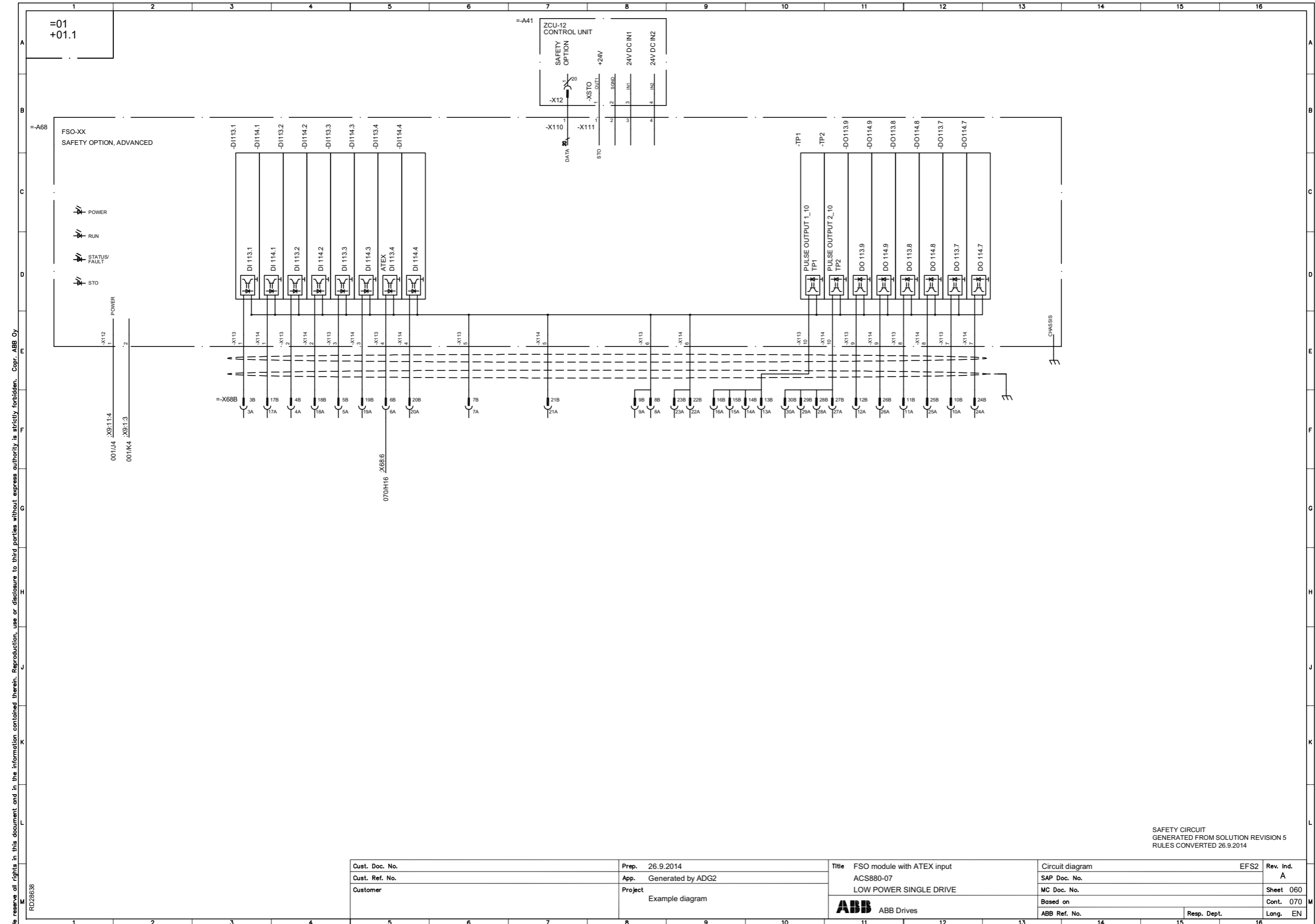
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Changes to this document shall be reviewed by design manager and approved by Ex manager. Also notified body (VTT Expert Services Ltd.) must approve the change. (See instructions 3AFE002084 and 3AFE003559)

SAFETY CIRCUIT

Cust. Doc. No.	Prep. 28.8.2015	Title PTC ATEX temperature monitoring	Circuit diagram	EFS2	Rev. Ind.
Cust. Ref. No.	App. Generated by ADG2	ACS880-07-0145A-3	SAP Doc. No.		A
Customer	Project	SINGLE DRIVE	MC Doc. No.	010	Sheet 070
		<b>ABB</b> ABB Drives	Based on		Cont. 200
			ABB Ref. No.	-010	Lang. EN
			Resp. Dept.		

+5L514+Q971+Q973 (Pt100 monitoring with five relays and FSO module) – Sheet 60

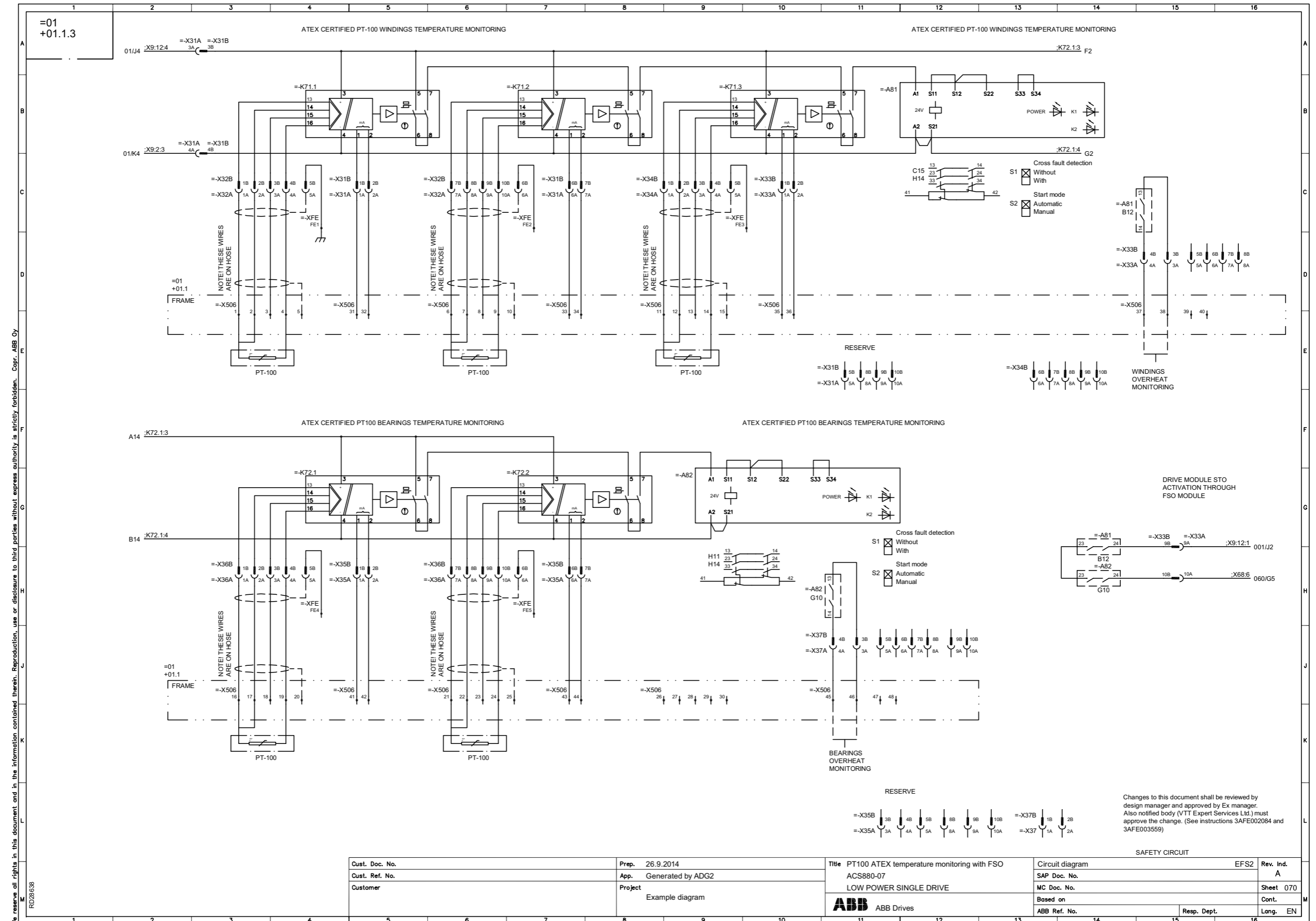


SAFETY CIRCUIT  
GENERATED FROM SOLUTION REVISION 5  
RULES CONVERTED 26.9.2014

Cust. Doc. No.	Prep. 26.9.2014	Title FSO module with ATEX input	Circuit diagram	EF52	Rev. Ind.
Cust. Ref. No.	App. Generated by ADG2	ACS880-07	SAP Doc. No.		A
Customer	Project Example diagram	LOW POWER SINGLE DRIVE	MC Doc. No.		Sheet 060
		<b>ABB</b> ABB Drives	Based on		Cont. 070
			ABB Ref. No.	Resp. Dept.	Lang. EN

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# +5L514+Q971+Q973 (Pt100 monitoring with five relays and FSO module) – Sheet 70



Cust. Doc. No.	Prep. 26.9.2014	Title PT100 ATEX temperature monitoring with FSO	Circuit diagram	EF52	Rev. Ind.
Cust. Ref. No.	App. Generated by ADG2	ACS880-07	SAP Doc. No.		A
Customer	Project Example diagram	LOW POWER SINGLE DRIVE	MC Doc. No.		Sheet 070
		<b>ABB</b> ABB Drives	Based on		Cont.
			ABB Ref. No.	Resp. Dept.	Lang. EN

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# 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](http://abb.com/searchchannels).

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