Options for ABB drives

User’s manual
FPTC-01 thermistor protection module (option +L536) for ACS880 drives
List of related manuals

<table>
<thead>
<tr>
<th>Drive hardware manuals</th>
<th>Code (EN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACS880-01 hardware manual</td>
<td>3AJA0000078093</td>
</tr>
<tr>
<td>ACS880-04 hardware manual</td>
<td>3AJA0000128301</td>
</tr>
<tr>
<td>ACS880-04 single drive module packages hardware manual</td>
<td>3AJA0000138495</td>
</tr>
<tr>
<td>ACS880-14 and -34 single drive module packages hardware manual</td>
<td>3AXD5000022021</td>
</tr>
<tr>
<td>ACS880-04XT drive modules (500 to 1200 kW) hardware manual</td>
<td>3AXD5000025169</td>
</tr>
<tr>
<td>ACS880-07 (45 to 630 kW) hardware manual</td>
<td>3AJA0000105718</td>
</tr>
<tr>
<td>ACS880-07 (560 to 2800 kW) hardware manual</td>
<td>3AJA0000143261</td>
</tr>
<tr>
<td>ACS880-17 hardware manual</td>
<td>3AXD5000020436</td>
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<tr>
<td>ACS880-37 hardware manual</td>
<td>3AXD5000020437</td>
</tr>
<tr>
<td>ACS880-104 hardware manual</td>
<td>3AJA0000104271</td>
</tr>
<tr>
<td>ACS880-107 hardware manual</td>
<td>3AJA0000105219</td>
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<tr>
<td>Drive firmware manuals</td>
<td></td>
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<tr>
<td>ACS880 primary control program firmware manual</td>
<td>3AJA0000085967</td>
</tr>
<tr>
<td>Option manuals and guides</td>
<td></td>
</tr>
<tr>
<td>ACS-AP-x assistant control panels user’s manual</td>
<td>3AJA0000085685</td>
</tr>
<tr>
<td>FSO-12 safety functions module user’s manual</td>
<td>3AXD50000015612</td>
</tr>
<tr>
<td>FSO-21 safety functions module user’s manual</td>
<td>3AXD50000015614</td>
</tr>
<tr>
<td>FSE-31 pulse encoder interface module user’s manual</td>
<td>3AXD50000016597</td>
</tr>
<tr>
<td>FPTC-01 thermistor protection module (option +L536) user’s manual</td>
<td>3AXD50000027750</td>
</tr>
<tr>
<td>Manuals and quick guides for I/O extension modules, fieldbus adapters, etc.</td>
<td></td>
</tr>
<tr>
<td>Drive PC tool manuals</td>
<td></td>
</tr>
<tr>
<td>Drive composer start-up and maintenance PC tool user’s manual</td>
<td>3AJA0000094606</td>
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<tr>
<td>General safety guides</td>
<td></td>
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<tr>
<td>Functional safety: Technical guide No. 10</td>
<td>3AJA0000048753</td>
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<tr>
<td>Safety and functional safety: A general guide</td>
<td>1SFC00100880201</td>
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<tr>
<td>ABB Safety information and solutions</td>
<td><a href="http://www.abb.com/safety">www.abb.com/safety</a></td>
</tr>
<tr>
<td>Potentially explosive atmospheres. The basics you need to know about motors and drives</td>
<td>3AJA0000037223</td>
</tr>
</tbody>
</table>

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

FPTC-01 thermistor protection module
(option +L536) for ACS880 drives

Table of contents

1. Safety
5. Mechanical installation
6. Electrical installation
8. Start-up and acceptance test
# Table of contents

1. Safety
   - Contents this chapter ........................................ 9
   - Use of warnings ............................................... 9
   - Safety in installation and maintenance ..................... 10
   - Other warnings ............................................... 11

2. Introduction to the manual
   - Contents of this chapter ..................................... 13
   - Applicability .................................................. 13
   - Compatibility .................................................. 13
   - Target audience .............................................. 14
   - Contents of the manual ....................................... 15
   - Related documents ............................................ 15
   - Terms and abbreviations ..................................... 16
   - Exclusion of liability ........................................ 19

3. Hardware description
   - Contents of this chapter ..................................... 21
   - Product overview ............................................. 21
     - Operation basics ........................................... 22
     - XFLT input (Fault) ......................................... 22
     - XWRN input (Warning) ..................................... 22
     - Layout ....................................................... 23
   - Markings ....................................................... 25

4. Option description and instructions
   - Contents of this chapter ..................................... 27
     - ACS880-01/04/04X/14/34/104 drives and modules ........... 28
     - Cabinet-built drives ....................................... 28
   - Resetting the safety function ................................ 29
   - Indications of the safety function ......................... 30
   - Switching frequency limitation ................................ 31
## Table of contents

- Fault reaction function ................................................. 32
- FPTC-01 module .......................................................... 32
- STO function in the drive/inverter modules ....................... 32
- FSO module .............................................................. 32

### 5. Mechanical installation

- Contents of this chapter .................................................. 33
- Necessary tools and instructions .................................... 33
- Unpacking and examining the delivery ............................ 33
- Installing the module .................................................... 34

### 6. Electrical installation

- Contents of this chapter .................................................. 37
- Warnings ........................................................................ 37
- Necessary tools and instructions .................................... 37
- General cabling instructions .......................................... 38
- Terminal designations .................................................... 39
- Wiring ........................................................................... 40
  - Wiring example 1 ....................................................... 41
  - Wiring example 2 ....................................................... 42
  - Wiring example 3 ....................................................... 43
  - Wiring example 4 ....................................................... 44

### 7. Parameter settings

- Contents of this chapter .................................................. 45
- Drive/inverter .............................................................. 45
  - Other recommended settings ...................................... 48
- FSO module .............................................................. 49
  - General parameters .................................................. 50
  - Parameters related to the STO function ......................... 53
  - Parameters related to the SSE function ......................... 56
  - Parameters related to the SS1 function ......................... 57
  - SS1 ramp parameters in the drive/inverter module ....... 59
- FSE module and safety pulse encoder parameters ............. 60
- Additional notes .......................................................... 62
- Mechanical brake control ............................................. 62
# Table of contents

8. **Start-up and acceptance test**
   - Contents of this chapter ............................................. 63
   - Before you start ..................................................... 63
   - Acceptance test ..................................................... 64

9. **Fault tracing**
   - Contents of this chapter ............................................. 67
   - Reporting failures ................................................... 67
   - FPTC-01 module replacement ....................................... 67
   - Fault and warning messages ....................................... 68
   - LEDs ........................................................................ 70

10. **Maintenance**
    - Contents of this chapter ............................................. 71
    - Maintenance .............................................................. 71
    - Proof test interval ................................................... 72
    - Competence ............................................................. 73
    - Residual risk ............................................................ 73
    - Intentional misuse .................................................... 73
    - Decommissioning ...................................................... 73

11. **Technical data**
    - Contents of this chapter ............................................. 75
    - Dimension drawing ................................................... 76
    - Isolation areas ........................................................ 77
    - Connections ............................................................. 78
      - Motor thermistor connection .................................... 78
      - STO relay output connection .................................... 78
    - Ambient conditions .................................................. 78
    - Safety data .............................................................. 79
    - Safety block diagrams .............................................. 82
    - Response times ........................................................ 83
    - Relevant failure modes ............................................. 84
    - General rules, notes and definitions ............................. 86
      - Validation of the safety functions ............................. 86
      - Validation procedure ............................................... 85
8 Table of contents

Acceptance test reports ........................................ 86
Competence ..................................................... 86
Ambient conditions ............................................. 86
Reporting problems and failures related to safety functions 86
Related standards and directives ................................. 87
Compliance with the European Machinery Directive .......... 88
TÜV Nord certificate ........................................... 93

Further information
Product and service inquiries ................................ 95
Product training ................................................ 95
Providing feedback on ABB Drives manuals ................. 95
Document library on the Internet ............................. 95
Safety

Contents this chapter
The chapter contains the warning symbols used in this manual and the safety instructions which you must obey when you install or connect an option module to a drive. If you ignore the safety instructions, injury, death or damage can occur. Read this chapter before you start the installation.

Use of warnings
Warnings tell you about conditions which can cause injury or death, or damage to the equipment. They also tell you how to prevent the danger. The manual uses these warning symbols:

Electricity warning tells you about hazards from electricity which can cause injury or death, or damage to the equipment.
10 Safety

General warning tells you about conditions, other than those caused by electricity, which can cause injury or death, or damage to the equipment.

Safety in installation and maintenance

These instructions are for all who install or connect an option module to a drive and need to open its front cover or door to do the work.

WARNING! Obey these instructions. If you ignore them, injury or death, or damage to the equipment can occur.

- If you are not a qualified electrician, do not do installation or maintenance work.
- Disconnect the drive from all possible power sources. After you have disconnected the drive, always wait for 5 minutes to let the intermediate circuit capacitors discharge before you continue.
- Disconnect all dangerous voltages connected to other connectors or parts in reach. For example, it is possible that 230 V AC is connected from outside to a relay output of the drive.
- Always use a multimeter to make sure that there are no parts under voltage in reach. The impedance of the multimeter must be at least 1 Mohm.
Other warnings

**WARNING!** The Safe torque off (STO) feature 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.

**WARNING!** ACS880 cabinet-built drives: Never connect, test or measure a drive based on the diagrams of this manual. Each delivery is unique. Before starting the work on the electric circuits of a drive, always refer to the delivery-specific circuit diagrams.
12 Safety
Introduction to the manual

Contents of this chapter
This chapter gives basic information on the manual.

Applicability
This manual applies to the FPTC-01 module and to the Safe motor temperature safety function which uses the FPTC-01 module (option +L536).

Compatibility
The FPTC-01 module is compatible with:
• ACS880-01/04/04X/14/34/104 drives and modules
• ACS880-07/17/37 cabinet-built single drives
• ACS880 multidrives
• ACS880 primary control program version 2.2 or later
• FSO-12 safety functions module
• FSO-21 safety functions module
14 Introduction to the manual

Target audience

This manual is intended for people who plan the installation, install, start up, use and service the option module. Before you do work on the module, read this manual and the applicable drive manual that contains the hardware and safety instructions for the product in question.

You are expected to know the fundamentals of electricity, wiring, electrical components and electrical schematic symbols and Ex regulations.

The manual is written for readers worldwide. Both SI and imperial units are shown.
Contents of the manual

The manual consists of these chapters:

• **Safety** contains the safety instructions which you must obey when you install the module.
• **Introduction to the manual** (this chapter) introduces the manual.
• **Hardware description** gives a short description of the module.
• **Option description and instructions** describes the Safe motor temperature function implemented with the module and the drive Safe torque off function.
• **Mechanical installation** contains a delivery checklist and instructions on installing the module.
• **Electrical installation** contains instructions on wiring the module.
• **Parameter settings** lists the parameters related to the safety function.
• **Start-up and acceptance test** contains instructions on starting up the module and the acceptance test for the Safe motor temperature function.
• **Fault tracing** shows how to trace faults with the status LEDs on the module.
• **Technical data** contains the technical data of the module, the safety data and relevant certificates and Declarations of Conformity.

Related documents

• Product manuals, see the inside of the front cover.
• **ACS880 cabinet-built drives**: Circuit diagrams delivered with the drive.
### Terms and abbreviations

<table>
<thead>
<tr>
<th>Term/abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cat.</td>
<td>Category. Classification of the safety-related parts of a control system in respect of their resistance to faults and their subsequent behavior in the fault condition, and which is achieved by the structural arrangement of the parts, fault detection and/or by their reliability. The categories are: B, 1, 2, 3 and 4.</td>
</tr>
<tr>
<td>CCF</td>
<td>Common cause failure (EN ISO 13849-1)</td>
</tr>
<tr>
<td>DC</td>
<td>Diagnostic coverage (%) (EN ISO 13849-1)</td>
</tr>
<tr>
<td>DI</td>
<td>Digital input</td>
</tr>
<tr>
<td>DO</td>
<td>Digital output</td>
</tr>
<tr>
<td>DTC</td>
<td>Direct torque control</td>
</tr>
<tr>
<td>EMC</td>
<td>Electromagnetic compatibility</td>
</tr>
<tr>
<td>Ex</td>
<td>An IEC term used in the context of explosive atmospheres</td>
</tr>
<tr>
<td>Ex d</td>
<td>Type of protection, flameproof enclosures (EN/IEC 60079-1)</td>
</tr>
<tr>
<td>Ex e</td>
<td>Type of protection, increased safety (EN 60079-7:2007 and IEC 60079-7:2006), to be replaced with Ex eb</td>
</tr>
<tr>
<td>Ex eb, Ex ec</td>
<td>Types of protection, increased safety (IEC 60079-7:2015)</td>
</tr>
<tr>
<td>Ex motors</td>
<td>Motors used in explosive atmospheres</td>
</tr>
<tr>
<td>Ex nA</td>
<td>Type of protection, non-sparking enclosures (EN/IEC 60079-15:2010), to be replaced with Ex ec</td>
</tr>
<tr>
<td>FEA-03</td>
<td>F-series extension adapter module</td>
</tr>
<tr>
<td>FPTC-01</td>
<td>Thermistor protection module</td>
</tr>
<tr>
<td>FSE-31</td>
<td>Pulse encoder interface module which can be used in safety applications</td>
</tr>
<tr>
<td>FSO</td>
<td>Safety functions module (FSO-12 or FSO-21)</td>
</tr>
<tr>
<td>FSO-12</td>
<td>Safety functions module which does not support the use of safety encoders</td>
</tr>
<tr>
<td>Term/abbreviation</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>FSO-21</td>
<td>Safety functions module which supports the FSE-31 module and the use of safety encoders</td>
</tr>
<tr>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>HFT</td>
<td>Hardware fault tolerance. (EN/IEC 62061, IEC 61508)</td>
</tr>
<tr>
<td>MTTF&lt;sub&gt;d&lt;/sub&gt;</td>
<td>Mean time to dangerous failure: (The total number of life units) / (the number of dangerous, undetected failures) during a particular measurement interval under stated conditions (EN ISO 13849-1)</td>
</tr>
<tr>
<td>PELV</td>
<td>Protected extra-low voltage (IEC 60364-4-41)</td>
</tr>
<tr>
<td>PFD</td>
<td>Probability of dangerous failure on demand (IEC 61508)</td>
</tr>
<tr>
<td>PFD&lt;sub&gt;0&lt;/sub&gt;</td>
<td>PFD&lt;sub&gt;0&lt;/sub&gt; for low demand mode of operation (IEC 61511)</td>
</tr>
<tr>
<td>PFH</td>
<td>Average frequency of dangerous failure [1/h] (Probability of dangerous failures per hour) (IEC 61508, EN/IEC 61800-5-2, EN/IEC 62061)</td>
</tr>
<tr>
<td>PL</td>
<td>Performance level (levels are: a, b, c, d and e). Correlates to SIL. (EN ISO 13849-1)</td>
</tr>
<tr>
<td>PTC</td>
<td>Positive temperature coefficient</td>
</tr>
<tr>
<td>SAR</td>
<td>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.</td>
</tr>
<tr>
<td>Safety system</td>
<td>Whole safety system including, for example, human interface, FPTC-01 module, FSO module, drive and sensors.</td>
</tr>
<tr>
<td>SBC</td>
<td>Safe brake control. A safety function in the FSO module.</td>
</tr>
<tr>
<td>SC</td>
<td>Systematic capability (IEC 61508)</td>
</tr>
<tr>
<td>SFF</td>
<td>Safe failure fraction (%) (IEC 61508)</td>
</tr>
<tr>
<td>SIL</td>
<td>Safety integrity level (levels are: 1, 2, 3, and 4). Correlates to PL. (IEC 61508)</td>
</tr>
<tr>
<td>SILCL</td>
<td>SIL claim limit. Maximum SIL that can be claimed for a safety function or subsystem. (EN/IEC 62061)</td>
</tr>
</tbody>
</table>
**Introduction to the manual**

**SMT** Safe motor temperature. (EN/IEC 61800-5-2)

**SS1** Safe stop 1 (EN/IEC 61800-5-2). A safety function in the FSO module.

**SSE** Safe stop emergency. A safety function in the FSO module.

**STO** Safe torque off. (EN/IEC 61800-5-2)

In this manual, this term is used in two different contexts:
- the STO circuit in the drive (the drive STO function)
- the STO safety function in the FSO module.

**Stop category 0** Uncontrolled stop (EN/IEC 60204-1)

**Stop category 1** Controlled stop (EN/IEC 60204-1)

**T1** Proof test interval (IEC 61508). T1 is a parameter used to define the probabilistic failure rate (PFH or PFD) for the safety function or subsystem. Performing a proof test at a maximum interval of T1 is required to keep the SIL capability valid. The same interval must be followed to keep the PL capability (EN ISO 13849) valid. Note that any T1 values stated cannot be regarded as a guarantee or warranty. See also section Proof test interval on page 72.

**XFLT** PTC input for Safe temperature fault in the FPTC module

**XWRN** PTC input for motor temperature warning in the FPTC module

**Zone** Potentially explosive atmosphere. 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.
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 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.
Hardware description

Contents of this chapter
This chapter gives a short description of the module.

Product overview
The FPTC-01 module implements the Safe motor temperature (SMT) safety function as defined in EN/IEC 61800-5-2:2007.
Inside the module, there is reinforced insulation between the motor thermistor connection and the other terminals of the module. The insulation forms a reliable protective separation between the motor main circuit and the drive control circuits. Therefore, the drive control board is PELV compatible also when the FPTC-01 module and a thermistor protection circuit are installed.
Operation basics

The module includes two PTC sensor inputs:

- **XFLT** executes the SIL/PL capable SMT safety function by activating the drive Safe torque off (STO) function. This input is a safety-related input and can be used for protection function purposes.

- **XWRN** generates a warning to the drive. This is not a safety-related input and can only be used for indication purposes.

**XFLT input (Fault)**

When the motor temperature rises above the PTC sensor limit temperature, the sensor resistance increases sharply. This indicates overtemperature to the FPTC-01 module. The FPTC-01 module executes the SMT function by switching off the drive Safe torque off (STO) circuit. This activates the drive STO function.

The STO function disables the control voltage of the power semiconductors of the drive output stage. This prevents the drive from generating the torque required to rotate the motor. If the motor is running when the STO function is activated, it coasts to a stop.

**XWRN input (Warning)**

When the motor temperature rises above the PTC sensor limit temperature, the sensor resistance increases sharply. The module sends a warning indication to the drive.

For the resistance limits and other technical details of the FPTC-01 module, see chapter *Technical data*. 
Layout
## Hardware description

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Retaining clips</td>
</tr>
<tr>
<td>2</td>
<td>Lock</td>
</tr>
<tr>
<td>3</td>
<td>Diagnostics LEDs (see section LEDs on page 70)</td>
</tr>
<tr>
<td>4</td>
<td>Mounting screw</td>
</tr>
<tr>
<td>XWRN</td>
<td>2-pin detachable terminal block for PTC warning (non-safety related)</td>
</tr>
<tr>
<td>XFLT</td>
<td>2-pin detachable terminal block for PTC fault (safety related)</td>
</tr>
<tr>
<td>XSTO1</td>
<td>2-pin detachable terminal block for STO output 1</td>
</tr>
<tr>
<td>XSTO2</td>
<td>2-pin detachable terminal block for STO output 2</td>
</tr>
</tbody>
</table>
## Markings

The type designation label is attached on the back side of the FPTC-01 module. An example label and description of the label contents are shown below.

![Label Example](image)

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Type</td>
</tr>
<tr>
<td>2</td>
<td>Serial number of format RYWSSSS, where</td>
</tr>
<tr>
<td>R:</td>
<td>Component revision: A, B, C, …</td>
</tr>
<tr>
<td>Y:</td>
<td>Last digit of the manufacturing year: 4, 5, … for 2014, 2015</td>
</tr>
<tr>
<td>WW:</td>
<td>Manufacturing week: 01, 02, … for week 1, week 2, …</td>
</tr>
<tr>
<td>SSSS:</td>
<td>Integer starting every week from 0001</td>
</tr>
<tr>
<td>3</td>
<td>ABB MRP code of the module</td>
</tr>
<tr>
<td>4</td>
<td>Combined ABB MRP code, serial number and manufacturing location</td>
</tr>
<tr>
<td>5</td>
<td>RoHS mark</td>
</tr>
</tbody>
</table>
Option description and instructions

Contents of this chapter

This chapter describes the Safe motor temperature function implemented with the FPTC-01 module and the drive Safe torque off function and gives instructions for the user.

Overview

To implement the Safe motor temperature (SMT) function, you can connect the FPTC-01 module directly to the drive Safe torque off (STO) circuit, or you can use it together with an FSO module.

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 (stop category 0) or after a deceleration ramp (stop category 1).

Note: The Safe motor temperature function is motor-specific also in the ACS880 multidrives where several motors are connected to the drive.
ACS880-01/04/04X/14/34/104 drives and modules

The module is available as a factory-installed option (+L536) or as an add-on kit for drives and inverter modules.

For the kit, the user:
- installs the option module to an option slot of the drive control unit,
- connects the PTC temperature sensors of the motor to the PTC inputs of the option module, and
- connects the drive STO terminals to the STO output of the option module (or to the FSO module and configures the FSO module to perform the STO or SS1 function).

Cabinet-built drives

For cabinet-built ACS880-07/17/37 single drives and ACS880 multidrives, the module is available as factory-installed options:
- +L536
- +L536+Q973 (with the FSO-12 module)
- +L536+Q972 (with the FSO-21 module)
- +L536+Q972+L521 (with the FSO-21 and FSE-31 modules).

The user connects the PTC temperature sensors of the motor to the PTC inputs of the module.
Resetting the safety function

The Ex regulations require that the safety function must be reset manually. When the XFLT input detects a motor overtemperature situation, the FPTC-01 module generates a fault to the drive. The user must reset the drive before it is possible to restart the drive.

When the XWRN input detects a motor overtemperature situation, the FPTC-01 module generates a warning to the drive. This is not a safety-related function and does not need a reset.

When an FSO module is used together with the FPTC-01 module, it is possible that the user must reset the safety function also with a reset button connected to the FSO module. This depends on parameter settings and other safety functions in the FSO module. For more information, see section FSO module on page 49.

**Note**: The reset function of the safety function is not SIL classified.
Indications of the safety function

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

1. LED indications on the FPTC-01 module:
   - The Fault LED is red when motor temperature is outside the allowed (safe) temperature range (XFLT input).
   - The WARNING LED is red when motor temperature outside the temperature warning range (XWRN input).

2. Safe motor temperature fault (XFLT) or motor temperature warning (XWRN) in the drive.

3. STO indication in the drive:
   - The drive STO indication is active when the SMT safety function has activated the drive STO function. The type of the indication is set with parameter 31.22.

4. STO indication on the FSO module:
   - The STO LED is green when the safety function has activated the drive STO.

5. STO indication from the FSO module to the drive:
   - The FSO module sends an indication to the drive when the FSO module activates the drive STO. The type of the indication is set with parameter FSOGEN.61.

To avoid parallel indications, set the STO indication parameters (31.22 and/or FSOGEN.61) to value None/No indication or Event. See chapter Parameter settings for instructions.

Note: The indications of the safety function are not SIL classified.
Switching frequency limitation

The certificate of the Ex motor requires that you set a minimum limit for the switching frequency of the drive. Make sure that the Ex motor is operated above the minimum switching frequency specified by the motor manufacturer.

For ABB Ex motors, use parameter 95.15 to set the required minimum switching frequency (see page 47).

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.
Fault reaction function

- **FPTC-01 module**
  The FPTC-01 module has a fault reaction function. When the module detects an internal fault or fault in the temperature sensor circuit, it gives a request to the drive control unit to stop modulation and activates the drive STO function.

- **STO function in the drive/inverter modules**
  The STO function in the drive/inverter module has internal fault diagnostics and a fault reaction function which causes a fault trip in case it detects a redundancy fault of STO control signals or any internal failure. See the hardware and firmware manuals of the drive/inverter module.

- **FSO module**
  The fault reaction function of the FSO module trips the drive if it detects a failure. The FSO module activates the STO or Safe stop emergency (SSE) function. This activates the drive STO function and opens the main contactor/breaker. The drive STO function is active until the fault has been repaired.
  
  The FSO module goes into the Fail-safe mode. The FSO module LED STATUS/FAULT is red until the fault has been repaired.
  
  To exit the Fail-safe mode, remove the cause of the fault and reset the FSO module by switching the power off and on, by pressing the Boot FSO button on the Safety view of Drive composer pro or with drive parameter 96.09 FSO reboot.
  
  For more information, see the drive firmware manual and the FSO module user’s manual.
Mechanical installation

Contents of this chapter
This chapter contains a delivery checklist and instructions on installing the module.

Necessary tools and instructions
• Torx screwdriver (T10)
For a complete list of tools, see the applicable drive hardware manual.

Unpacking and examining the delivery
1. Open the option package.
2. Make sure that the package contains:
   • FPTC-01 module
   • STO cable
   • this manual.
3. Make sure that there are no signs of damage.
Installing the module

**WARNING!** Obey the safety instructions. See chapter Safety. If you ignore the safety instructions, injury or death can occur.

1. Pull out the lock.
2. Put the module carefully into its position on the drive until the retaining clips lock it into position.
3. Push in the lock.
4. Tighten the screw.
   
   **Note:** The screw tightens the connections and grounds the module. It is necessary for fulfilling the EMC requirements and for proper operation of the module.

**WARNING!** Do not tighten the screw tighter than 0.8 N·m. Too high a torque breaks the thread.

See the applicable drive manual for further instructions on how to install the module to the drive.

**Note:** Do not install the FPTC-01 module on an FEA-03 F-series extension adapter. The diagnostics of the module requires that you install it directly on the drive control unit.
36 Mechanical installation
Electrical installation

Contents of this chapter
This chapter contains instructions on wiring the module.

Warnings

WARNING! Obey the safety instructions. See chapter Safety. If you ignore the safety instructions injury or death can occur.

Make sure that the drive is disconnected from the input power during installation. If the drive is already connected to the input power, wait for 5 minutes after disconnecting the input power.

Necessary tools and instructions
Screwdriver with a set of suitable bits, cabling tools.
38 Electrical installation

General cabling instructions

1. For the STO circuit wiring, use the type of cable specified in the appropriate drive or inverter module hardware manual (except when an FSO module or other safety relays are installed in the STO command chain).

2. Wire only the sensor circuit into the potentially explosive atmosphere.

3. 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).

4. Install the drive (or inverter module), the Safe torque off (STO) circuit, and the protection relay outside the hazardous zone.

5. Route the sensor cables away from the motor cable.

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

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.
## Terminal designations

<table>
<thead>
<tr>
<th>Marking</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>XSTO1</td>
<td>STO channel 1</td>
</tr>
<tr>
<td>11</td>
<td>In, +24 V DC in for STO</td>
</tr>
<tr>
<td>12</td>
<td>Out, +24 V DC out for STO</td>
</tr>
<tr>
<td>XSTO2</td>
<td>STO channel 2</td>
</tr>
<tr>
<td>21</td>
<td>In, +24 V DC in for STO</td>
</tr>
<tr>
<td>22</td>
<td>Out, +24 V DC out for STO</td>
</tr>
<tr>
<td>XFLT</td>
<td>PTC FAULT (SMT function)</td>
</tr>
<tr>
<td>T1</td>
<td>In, 0...+5 V DC</td>
</tr>
<tr>
<td>T2</td>
<td>Out</td>
</tr>
<tr>
<td>XWRN</td>
<td>PTC WARNING (non-safety related)</td>
</tr>
<tr>
<td>T3</td>
<td>In, 0...+5 V DC</td>
</tr>
<tr>
<td>T4</td>
<td>Out</td>
</tr>
</tbody>
</table>
Wiring

This section presents four ways to connect the FPTC-01 module to the drive STO terminals.

**Wiring example 1** (see page 41): The STO outputs of the FPTC-01 module are connected directly to the STO terminals of the drive.

- **ACS880-01/04/14/34/04X/104 drives and modules**: In the factory-installed option (+L536), the wiring is done at the factory according to this example.
- **ACS880 cabinet-built drives**: In the option +L536, terminal block [X969] is located between the module and the drive control board (not shown in the figure). See the circuit diagrams delivered with the drive for the actual wiring.

**Wiring example 2** (see page 42): The STO outputs of the FPTC-01 module are connected to an FSO module, and the STO outputs of the FSO module to the STO terminals of the drive with a two-channel connection. In this case, the FSO module controls the drive STO function.

- **Cabinet-built drives**: In the option +L536+Q973/Q972 (+L521), terminal block [X68] is located between the module and the FSO module (not shown in the figure). See the circuit diagrams delivered with the drive for the actual wiring.

**Wiring example 3** (see page 43): The STO outputs of the FPTC-01 module are connected to an FSO module, and the STO outputs of the FSO module to the STO terminals of the drive with a one-channel connection. If you use a one-channel connection, make sure that you can reach the required safety integrity level (SIL).

**Wiring example 4** (see page 44): An external safety relay is connected between the FPTC-01 module and the drive STO inputs with a two-channel connection.

**Note**: Only the XFLT input of the FPTC module is shown in the examples. The XWRN input is not safety-related and does not activate the drive STO function.
Wiring example 1

This connection is SIL2 capable (redundancy between STO channels).
Wiring example 2

With an FSO module, two-channel connection. This connection is SIL2 capable (redundancy between STO channels).
Wiring example 3

With an FSO module, one-channel connection. This connection is SIL1 capable (no redundancy between STO channels).
Wiring example 4

With an external safety relay, two-channel connection. This connection is SIL2 capable (redundancy between STO channels).
Parameter settings

Contents of this chapter
This chapter contains the drive and FSO module parameter settings.

Drive/inverter
Use the Drive composer PC tool or the control panel to set the parameter values.

This table lists the parameters related to the safety function in ACS880 primary control program. For more information, see the drive firmware manual.

<table>
<thead>
<tr>
<th>Index</th>
<th>Name / Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>31.22</td>
<td>STO indication run/stop</td>
<td>Selects which indications are given when one or both Safe torque off (STO) signals are switched off or lost. The indications also depend on whether the drive is running or stopped when this occurs. For more information, see the firmware manual.</td>
</tr>
</tbody>
</table>
Warning/Warning

The drive generates a warning both when the drive is running and when it is stopped. This parameter value does not affect the SMT function, but this is the recommended setting (see section *Indications of the safety function* on page 30). For the cabinet-built drives, ABB has set this value at the factory.

35.30 FPTC configuration word

Activates FPTC modules installed on the control unit of the drive.

With this word, it is also possible to suppress the non-safety related motor temperature warnings (XWRN input). It is not possible to suppress the SMT faults (XFLT input).

<table>
<thead>
<tr>
<th>Index</th>
<th>Name / Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Module in slot 1</td>
<td>1 = Yes: Module installed in slot 1.</td>
</tr>
<tr>
<td>1</td>
<td>Disable slot 1 warning</td>
<td>1 = Yes: Warnings from the module in slot 1 suppressed.</td>
</tr>
<tr>
<td>2</td>
<td>Module in slot 2</td>
<td>1 = Yes: Module installed in slot 2.</td>
</tr>
<tr>
<td>3</td>
<td>Disable slot 2 warning</td>
<td>1 = Yes: Warnings from the module in slot 2 suppressed.</td>
</tr>
<tr>
<td>4</td>
<td>Module in slot 3</td>
<td>1 = Yes: Module installed in slot 3.</td>
</tr>
<tr>
<td>5</td>
<td>Disable slot 3 warning</td>
<td>1 = Yes: Warnings from the module in slot 3 suppressed.</td>
</tr>
<tr>
<td>6...15</td>
<td>Reserved</td>
<td></td>
</tr>
</tbody>
</table>
### Parameter settings

<table>
<thead>
<tr>
<th>Index</th>
<th>Name / Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>35.04</td>
<td>FPTC status word</td>
<td>Displays the status of FPTC modules. The word can be used as the source of eg. external events. This parameter is read-only.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bit</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Module found in slot 1</td>
<td>1 = Yes: An FPTC module has been detected in slot 1.</td>
</tr>
<tr>
<td>1</td>
<td>Fault active in slot 1</td>
<td>1 = Yes: The module in slot 1 has an active SMT fault.</td>
</tr>
<tr>
<td>2</td>
<td>Warning active in slot 1</td>
<td>1 = Yes: The module in slot 1 has an active motor temperature warning.</td>
</tr>
<tr>
<td>3</td>
<td>Module found in slot 2</td>
<td>1 = Yes: An FPTC module has been detected in slot 2.</td>
</tr>
<tr>
<td>4</td>
<td>Fault active in slot 2</td>
<td>1 = Yes: The module in slot 2 has an active SMT fault.</td>
</tr>
<tr>
<td>5</td>
<td>Warning active in slot 2</td>
<td>1 = Yes: The module in slot 2 has an active motor temperature warning.</td>
</tr>
<tr>
<td>6</td>
<td>Module found in slot 3</td>
<td>1 = Yes: An FPTC module has been detected in slot 3.</td>
</tr>
<tr>
<td>7</td>
<td>Fault active in slot 3</td>
<td>1 = Yes: The module in slot 3 has an active SMT fault.</td>
</tr>
<tr>
<td>8</td>
<td>Warning active in slot 3</td>
<td>1 = Yes: The module in slot 3 has an active motor temperature warning.</td>
</tr>
<tr>
<td>9...15</td>
<td>Reserved</td>
<td></td>
</tr>
</tbody>
</table>

| 95.15 | Special HW settings | Contains hardware-related settings that can be enabled and disabled by toggling the specific bits. |

<table>
<thead>
<tr>
<th>Bit</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>EX motor</td>
<td>1 = The driven motor is an Ex motor provided by ABB for potentially explosive atmospheres. This sets the required minimum switching frequency for ABB Ex motors. <strong>Note:</strong> For non-ABB Ex motors, contact your local ABB representative.</td>
</tr>
</tbody>
</table>
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.
FSO module

If you use an FSO module with the FPTC-01 module, 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 to keep the certificate valid and parameters that are related only to certain safety functions. This chapter lists the parameters that are relevant to the option +L536+Q973 (with FSO-12) and +L536+Q972 (with FSO-21).

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, set the parameters listed in section FSE module and safety pulse encoder parameters on page 60.

The example values apply to ACS880 cabinet-built drives. One FPTC module is connected to the FSO module with a two-channel connection (digital inputs X113:4 and X114:4, see the example on page 42).

You can configure the FSO module so that it opens the drive STO circuit either immediately after the safety function request (stop category 0) or after a deceleration ramp (stop category 1). In the first case, the FSO module activates the STO function in the FSO module. In the second case, it activates the SS1 function. Example values are given for both cases.
Always consider which stop category is more appropriate for the motor in overtemperature situations. In the ACS880 cabinet-built drives, the FSO module is configured at the factory so that it activates the STO function (stop category 0).

### General parameters

Set these FSO parameters always when you use the FSO module with the FPTC-01 module.

<table>
<thead>
<tr>
<th>Index</th>
<th>Name</th>
<th>Example value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FSOGEN.</td>
<td>Stop completed output</td>
<td>None</td>
<td>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.</td>
</tr>
<tr>
<td>FSOGEN.</td>
<td>Motor nominal speed</td>
<td>1500 rpm</td>
<td>Sets the nominal motor speed. Adjust the default value to meet the motor in use.</td>
</tr>
<tr>
<td>FSOGEN.</td>
<td>Motor nominal frequency</td>
<td>50 Hz</td>
<td>Sets the nominal motor frequency. Adjust the default value to meet the motor in use.</td>
</tr>
<tr>
<td>FSOGEN.</td>
<td>Power-up acknowledgement</td>
<td>Automatic</td>
<td>Sets the power-up acknowledgement method of the FSO module.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Automatic</strong>: 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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Manual</strong>: The FSO module reads the external acknowledgement signal through the digital input defined by parameter FSOGEN.42. Make sure that the value is Automatic.</td>
</tr>
</tbody>
</table>
### Parameter settings

<table>
<thead>
<tr>
<th>Index</th>
<th>Name</th>
<th>Example value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FSOGEN. Acknowledgment button input</td>
<td>None</td>
<td>Selects the digital input for the acknowledgement signal when parameter STO.02 has value Manual. In the safety function described in this manual, parameter STO.02 has value Automatic and this parameter has value None (no acknowledgement signal connected to the input).</td>
<td></td>
</tr>
<tr>
<td>FSOGEN. Zero speed without encoder</td>
<td>90 rpm</td>
<td>Sets the general zero speed limit for safety functions when no safety encoder is in use. STO function: No effect. SS1 function: The FSO module activates drive STO function when the drive has decelerated the motor speed below this value. Adjust the default value when necessary.</td>
<td></td>
</tr>
<tr>
<td>FSOGEN. Zero speed with encoder</td>
<td>0 rpm</td>
<td>Sets the general zero speed limit for safety functions when a safety encoder is in use. STO function: No effect. SS1 function: The FSO module activates drive STO function when the drive has decelerated the motor speed below this value. Adjust the default value when necessary.</td>
<td></td>
</tr>
<tr>
<td>FSOGEN. STO indication ext request</td>
<td>Warning</td>
<td>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). None, Warning, Event: You do not have to reset the drive/inverter before you can restart it. Fault: You have to reset the drive/inverter before you can restart it.</td>
<td></td>
</tr>
</tbody>
</table>
Parameter settings

<table>
<thead>
<tr>
<th>Index</th>
<th>Name</th>
<th>Example value</th>
<th>Description</th>
</tr>
</thead>
</table>
| FSOGEN, STO 62 indication safety limit | Fault          | 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.
|       |                               |               | STO function: No effect.
|       |                               |               | SS1 function: 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 event.
|       |                               |               | None, Warning, Event: You do not have to reset the drive/inverter before you can restart it.
|       |                               |               | Fault: You have to reset the drive/inverter before you can restart it. |

1) The value does not affect the SMT function, but other safety functions in the FSO module can require a certain value (see sections Resetting the safety function on page 29, Indications of the safety function on page 30 and Additional notes on page 62).

2) Only with FSO-21 and when a safety encoder is used in the application.
Parameters related to 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.

<table>
<thead>
<tr>
<th>Index</th>
<th>Name</th>
<th>Example value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>STO.02</td>
<td>STO acknowledge</td>
<td>Automatic1)</td>
<td>Sets the acknowledgement method used in the STO, SSE and SS1 functions. Automatic: The FSO module resets the STO function automatically after the STO request have been removed. Manual: The FSO module reads the external acknowledgement signal through the digital input defined by parameter FSOGEN.42.</td>
</tr>
<tr>
<td>STO.11</td>
<td>STO input A</td>
<td>None</td>
<td>Sets the digital input that is connected to the primary input of the STO function. In this example, this parameter has value None. Note: The default value after factory reset is DI X113:1 &amp; X114:1. Always check this parameter after factory reset.</td>
</tr>
<tr>
<td>STO.12</td>
<td>STO input B</td>
<td>STO: Di X113:4 &amp; X114:4, SS1: None</td>
<td>Sets the digital input that is connected to the secondary input of the STO function. Note: The default value after factory reset is None. Always check this parameter after factory reset. Note: In a non-redundant system, (Wiring example 3 on page 43), you can uses a one-channel input (for example, DI X113:4).</td>
</tr>
<tr>
<td>Index</td>
<td>Name</td>
<td>Example value</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>------</td>
<td>---------------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| STO.13 | Restart delay after STO | 2000 ms | 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 (STO.11) or STO input B (STO.12).

STO function: 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 STO.13.

SS1 function: No effect. |
| STO.14 | Time to zero speed with STO or modoff \(^{20}\) | 2000 ms | Sets the time after which the acknowledgement is allowed after coast stop in the STO and SSE functions. Configured to the estimated time in which the motor coasts to a stop from the maximum speed.

STO function: This parameter sets the time after which the STO function is completed. Parameter STO.13 defines the time after which the restart of the drive is allowed. Adjust the value when necessary.

SS1 function: 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.

Note: The default value after factory reset is 3,600,000 ms. Always check this parameter after factory reset. |
### SBC usage

<table>
<thead>
<tr>
<th>Name</th>
<th>Example value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBC.11 SBC usage</td>
<td>None</td>
<td>Sets how the mechanical brake is used together with the STO function. In the safety function described in this manual, this feature is not used. Make sure that the value is None. See also section Mechanical brake control on page 62.</td>
</tr>
</tbody>
</table>

### I/O settings

<table>
<thead>
<tr>
<th>Name</th>
<th>Example value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAFEIO. DI X113:4 36 diag pulse on/off</td>
<td>On ³¹</td>
<td>Sets the diagnostic pulse of digital input X113:4 on or off. Or: The input monitors that it receives test pulses. In this example (see page 22), the STO/SS1 request is connected to this digital input.</td>
</tr>
<tr>
<td>SAFEIO. DI X114:4 40 diag pulse on/off</td>
<td>On ³¹</td>
<td>Sets the diagnostic pulse of digital input X114:4 on or off. Or: The input monitors that it receives test pulses. In this example (see page 22), the STO/SS1 request is connected to this digital input. <strong>Note:</strong> In a non-redundant system, (Wiring example 3 on page 43), you can use a one-channel input (for example, DI X113:4). In this case, this parameter has no effect.</td>
</tr>
</tbody>
</table>

³¹ The value does not affect the SMT function, but other safety functions in the FSO module can require a certain value (see sections Indications of the safety function on page 30 and Additional notes on page 62). ⁵¹ When a safety encoder is used; 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 FSO-21 module user’s manual. ⁵ The safety data (see page 79) is based on the assumption that this diagnostic measure for the wiring is active (On). If pulsing is disabled, you must consider other measures to ensure sufficient diagnostic coverage of the wiring failures.
Parameters related to the SSE function

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

<table>
<thead>
<tr>
<th>Index</th>
<th>Name</th>
<th>Example value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSE.13</td>
<td>SSE function</td>
<td>Immediate STO</td>
<td>Sets the type of the SSE function. Immediate STO: The FSO module activates the drive STO function immediately after the SSE request (stop category 0). Emergency ramp: The FSO module first ramps down the motor speed and when the speed is below the zero speed limit (parameter FSOGEN.51 or FSOGEN.52) it activates the STO function (stop category 1). SAR0 parameters define the deceleration ramp (for more information, see the FSO module user’s manual). Note: The default value after factory reset is Immediate STO. Always check this parameter after factory reset.</td>
</tr>
<tr>
<td>SBC.15</td>
<td>SSE/SS1 SBC speed</td>
<td>0 rpm</td>
<td>Sets the absolute speed below which the FSO module activates the brake (SBC) while ramping. 0 rpm: The feature is not in use. In the safety function described in this manual, this feature is not used. Make sure that the value is 0 rpm. See also section Mechanical brake control on page 62.</td>
</tr>
</tbody>
</table>
Parameters related to the SS1 function

Set these parameters when you want that the motor speed is first decelerated to the user-defined zero speed value.

<table>
<thead>
<tr>
<th>Index</th>
<th>Name</th>
<th>Example value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS1.01</td>
<td>SS1 activity and version</td>
<td>Version 1</td>
<td>Activates or deactivates the SS1 function and shows the version of the SS1 function. Version 1: Activates version 1 of the SS1 function.</td>
</tr>
<tr>
<td>SS1.11</td>
<td>SS1 input A</td>
<td>None</td>
<td>Sets the digital input that is connected to the primary input of the SS1 function.</td>
</tr>
<tr>
<td>SS1.12</td>
<td>SS1 input B</td>
<td>STO: None</td>
<td>Sets the digital input that is connected to the secondary input of the SS1 function.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SS1: DI X113:4 &amp; X114:4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Note: The default value after factory reset is None. Always check this parameter after factory reset.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Note: In a non-redundant system, (Wiring example 3 on page 43), you can use a one-channel input (for example, DI X113:4).</td>
</tr>
<tr>
<td>SS1.13</td>
<td>SS1 monitoring method</td>
<td>Ramp</td>
<td>Sets the method used for the SS1 monitoring. Adjust the default value when necessary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Time monitoring: The FSO module monitors that a user-defined deceleration time limit is not exceeded. (See parameter SS1.14.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ramp monitoring: The FSO module monitors that the motor decelerates along a user-defined stop ramp. (See SAR1 ramp parameters 200.112, SARx.21, SARx.22 and SARx.02.)</td>
</tr>
</tbody>
</table>
Parameter settings

<table>
<thead>
<tr>
<th>Index</th>
<th>Name</th>
<th>Example value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS1.14</td>
<td>SS1 delay for STO</td>
<td>20000 ms</td>
<td>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 \textit{FSOGEN.51} or \textit{FSOGEN.52}) yet. Time monitoring: This value sets the security delay that the FSO module monitors. Adjust the default value when necessary. Ramp monitoring: No effect.</td>
</tr>
<tr>
<td>SAR1 ramp settings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>200.112</td>
<td>SAR1 ramp time to zero</td>
<td>2000 ms</td>
<td>Sets the target time for the stop ramp SAR1 that is used in the SS1 and function. Adjust the default value when necessary. Target time = The time in which the drive decelerates the motor from speed 200.202 SAR speed scaling to zero. Note: With value 0 ms, the drive uses the emergency stop ramp set by drive parameter 23.23 (see section SS1 ramp parameters in the drive/inverter module on page 59).</td>
</tr>
<tr>
<td>200.202</td>
<td>SAR speed scaling</td>
<td>1500 rpm</td>
<td>Sets a speed value that the FSO module uses as a reference point in ramp parameter calculations (see SAR1 ramp parameters 200.112, SARx.21, SARx.22 and SARx.02). Adjust the default value when necessary.</td>
</tr>
</tbody>
</table>
SS1 ramp parameters in the drive/inverter module

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.

### Parameters

<table>
<thead>
<tr>
<th>Index</th>
<th>Name</th>
<th>Example value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SARx.02</td>
<td>SAR initial allowed range</td>
<td>100 ms</td>
<td>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 200.202 and SARx.22. For more information, see the FSO module user’s manual. Time monitoring: No effect. Ramp monitoring: Adjust the default value when necessary.</td>
</tr>
<tr>
<td>SARx.21</td>
<td>SAR1 min ramp time to zero</td>
<td>1000 ms</td>
<td>Sets the minimum ramp time for the SAR1 ramp monitoring. Time monitoring: No effect. Ramp monitoring: Sets the minimum stop ramp time for the emergency stop. Adjust the default value when necessary. Note: With value 0 ms, the minimum ramp is not monitored.</td>
</tr>
<tr>
<td>SARx.22</td>
<td>SAR1 max ramp time to zero</td>
<td>3000 ms</td>
<td>Sets the maximum ramp time for the SAR1 ramp monitoring. Time monitoring: No effect. Ramp monitoring: Sets the maximum stop ramp time for the emergency stop. Adjust the default value when necessary.</td>
</tr>
</tbody>
</table>
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 these parameters only when you use a safety pulse encoder and the FSE-31 pulse encoder interface module with the FSO-21 module.

<table>
<thead>
<tr>
<th>Index</th>
<th>Name</th>
<th>Example value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>200.231</td>
<td>FSE 3X act and par version</td>
<td>Version 1</td>
<td>Activates the FSE-31 encoder interface and shows the version of the encoder parameter groups (91 and 92).</td>
</tr>
<tr>
<td>200.232</td>
<td>Number of encoders</td>
<td>Single encoder CH1</td>
<td>Shows the number of safety pulse encoders connected to the FSE module.</td>
</tr>
<tr>
<td>S_ENCGEN.01</td>
<td>Safe pulse encoder version</td>
<td>Version 1</td>
<td>Activates the safety pulse encoder and shows the version parameter group S_ENCGEN.</td>
</tr>
</tbody>
</table>
| S_ENCGEN.11 | FSE diagnostic failure reaction | STO | Sets the action taken when there is a problem in the FSE module.  
**STO**: The FSO module goes into the Fail-safe mode and activates the drive STO function.  
**Note**: 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 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. |
### Parameter settings

<table>
<thead>
<tr>
<th>Index</th>
<th>Name</th>
<th>Example value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>91.11</td>
<td>Module 1 type</td>
<td>FSE-31</td>
<td>Sets the type of the safety pulse encoder interface module 1.</td>
</tr>
<tr>
<td>91.12</td>
<td>Module 1 location</td>
<td>2</td>
<td>Sets the slot in which the safety pulse encoder interface module 1 is located.</td>
</tr>
<tr>
<td>92.01</td>
<td>Encoder 1 type</td>
<td>HTL1</td>
<td>Activates or deactivates the communication with the safety pulse encoder interface module 1 and sets the type for the safety pulse encoder.</td>
</tr>
<tr>
<td>92.02</td>
<td>Encoder 1 source</td>
<td>Module 1</td>
<td>Sets the safety pulse encoder interface module that the safety pulse encoder 1 is connected to.</td>
</tr>
<tr>
<td>92.10</td>
<td>Pulses/revolution</td>
<td>2048</td>
<td>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.</td>
</tr>
</tbody>
</table>
| 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: $f_{\text{max}} = \frac{r_{\text{max}} \times \text{ppr}_\text{enc} + 10\%}{10}$, where
  - $r_{\text{max}}$ = the maximum motor speed used in the application (or the motor nominal speed)
  - \text{ppr}_\text{enc} = \text{Pulses/revolution of the safety pulse encoder (parameter 92.10).}$
Additional notes

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

In motor overtemperature situations, the FSO module also opens the main contractor/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 manually with the emergency stop reset button. In this case, the user must reset the FSO module with the emergency stop reset button also in motor overtemperature situations. Also the indication lamp on the reset button is illuminated.

The compliance of the emergency stop function with the relevant standards requires this setting. Do not change this setting.

Mechanical brake control

If you use a mechanical brake with the thermal motor 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 Ex zone, make sure that the use of the brake does not rise the temperature excessively.

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).
Start-up and acceptance test

Contents of this chapter
This chapter contains the start-up instructions and the acceptance test for the safety function.

Note: Only a competent person with expertise and knowledge of the safety function as well as functional safety and Ex regulations can do the start-up and adjust the related settings (IEC 61508-1 clause 6).

Before you start
Make sure that you have completed these start-up tasks for the drive:
• Checks and settings with no voltage connected
• Powering up the drive
• Setting up the drive control program.

See the applicable drive hardware manual.

Make sure you have set the correct parameter values for the safety function. See chapter Parameter settings.
64  Start-up and acceptance test

Acceptance test

You need the Drive composer PC tool or the control panel to perform the acceptance test.

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.

<table>
<thead>
<tr>
<th>Action</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WARNING!</strong> Obey the safety instructions. See chapter Safety. If you ignore the safety instructions injury or death can occur.</td>
<td></td>
</tr>
<tr>
<td><strong>Checks and settings with no voltage connected</strong></td>
<td></td>
</tr>
<tr>
<td>The motor manufacturer selects the PTC sensors for the motor temperature measurement according to the specified temperature class. Make sure that the temperature on-off resistances match those of the FPTC module.</td>
<td></td>
</tr>
<tr>
<td>After you have done the wiring, check the connections against the appropriate circuit diagrams and examples in chapter Electrical installation.</td>
<td></td>
</tr>
<tr>
<td>Drives with R8i inverter modules: Check that the STO OUT output on the inverter control unit (A41) is chained to the STO inputs of all inverter modules. The STO circuit is disabled in spare part modules.</td>
<td></td>
</tr>
<tr>
<td>Make sure that the SIL/PL of the safety function meets the target SIL/PL. If SIL2 is required, make sure that the STO connection between FPTC module and drive STO is kept separated.</td>
<td></td>
</tr>
<tr>
<td><strong>Settings with voltage connected</strong></td>
<td></td>
</tr>
<tr>
<td>Make sure that you have activated the FPTC module in the correct slot (parameter 35.30).</td>
<td></td>
</tr>
<tr>
<td>Make sure that all parameters relevant to the safety function are set as defined in chapter Parameter settings on page 45.</td>
<td></td>
</tr>
<tr>
<td><strong>Acceptance test procedure</strong></td>
<td></td>
</tr>
<tr>
<td>Make sure that you can run and stop the motor freely during the test.</td>
<td></td>
</tr>
<tr>
<td>Start drive and make sure that motor is running.</td>
<td></td>
</tr>
</tbody>
</table>
| Cause an overtemperature situation:  
  - increase the resistance in the XFLT input above 3.6 kohm (for example, open-circuit). | |
<table>
<thead>
<tr>
<th>Action</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Make sure that the correct indications are activated:</td>
<td>✔</td>
</tr>
<tr>
<td>• the SMT fault and other indications depending on the parameter settings and if an FSO module is installed (see section <em>Indications of the safety function</em> on page 30).</td>
<td></td>
</tr>
<tr>
<td>Make sure that the STO is activated and the motor stops (by coasting or by ramping down to zero speed).</td>
<td></td>
</tr>
<tr>
<td>Make sure that you cannot start the drive before you have reset the drive.</td>
<td></td>
</tr>
<tr>
<td>Reset the drive. Make sure you cannot reset and restart the drive before the input resistance in the XFLT input has been decreased below 1.6 kohm.</td>
<td>✔</td>
</tr>
<tr>
<td>Restart the drive and motor and make sure they operate normally.</td>
<td></td>
</tr>
<tr>
<td>Cause a short-circuit situation:</td>
<td>✔</td>
</tr>
<tr>
<td>• decrease the resistance in the XFLT input below 50 ohm.</td>
<td></td>
</tr>
<tr>
<td>Make sure that the correct indications are activated:</td>
<td>✔</td>
</tr>
<tr>
<td>• the SMT fault and other indications depending on the parameter settings and if an FSO module is installed (see section <em>Indications of the safety function</em> on page 30).</td>
<td></td>
</tr>
<tr>
<td>Make sure that the STO is activated and the motor stops (by coasting or by ramping down to zero speed).</td>
<td>✔</td>
</tr>
<tr>
<td>Make sure that you cannot start the drive before you have reset the drive.</td>
<td></td>
</tr>
<tr>
<td>Reset the drive. Make sure you cannot reset and restart the drive before the input resistance in the XFLT input has been increased above 50 ohm.</td>
<td>✔</td>
</tr>
<tr>
<td>Restart the drive and motor and make sure they operate normally.</td>
<td></td>
</tr>
<tr>
<td>If necessary, test the XWRN input: Make sure the motor temperature indication is activated in motor overtemperature and short-circuit situations. Connect a resistor (resistance 50 ohm...3.6 kohm) between the XFLT inputs.</td>
<td></td>
</tr>
<tr>
<td>Fill in and sign the acceptance test report which verifies that the safety function is safe and accepted to operation.</td>
<td></td>
</tr>
</tbody>
</table>
Start-up and acceptance test
Fault tracing

Contents of this chapter
This chapter shows how to trace faults with fault and warning messages and LEDs on the module.

Reporting failures
You must report any failures of the FPTC-01 and FSO modules and the drive Safe torque off function to ABB.

FPTC-01 module replacement
If the FPTC-01 module fails to operate, you have to replace it with a new one. You cannot repair the module.
## Fault and warning messages

The fault and warning messages in the ACS880 primary control program are these:

<table>
<thead>
<tr>
<th>Code (hex)</th>
<th>Name</th>
<th>Cause</th>
<th>What to do</th>
</tr>
</thead>
<tbody>
<tr>
<td>4991</td>
<td>Safe motor temperature 1</td>
<td>The FPTC module in option slot 1 indicates overtemperature in the XFLT input (safety related). 1. Motor temperature is too high, or 2. the thermistor is in short-circuit or disconnected.</td>
<td>1. Check the cooling of the motor. 2. Check the motor load and drive ratings. 3. Check the wiring of the temperature sensor. Repair wiring if faulty. 4. Measure the resistance of the sensor. Replace the sensor if faulty.</td>
</tr>
<tr>
<td>4992</td>
<td>Safe motor temperature 2</td>
<td>The FPTC module in option slot 2 indicates overtemperature in the XFLT input (safety related).</td>
<td></td>
</tr>
<tr>
<td>4993</td>
<td>Safe motor temperature 3</td>
<td>The FPTC module in option slot 3 indicates overtemperature in the XFLT input (safety related).</td>
<td></td>
</tr>
<tr>
<td>4990</td>
<td>FPTC not found</td>
<td>A thermistor protection module has been activated by parameter 35.30 but cannot be detected. The last digit of the auxiliary code identifies the slot.</td>
<td>Power down the control unit and check that the module is properly inserted in the correct slot.</td>
</tr>
</tbody>
</table>
Fault tracing

For the fault and warning messages of the FSO module, see the FSO module user's manual.

<table>
<thead>
<tr>
<th>Code (hex)</th>
<th>Name</th>
<th>Cause</th>
<th>What to do</th>
</tr>
</thead>
<tbody>
<tr>
<td>A497</td>
<td>Motor temperature 1 (Editable message text)</td>
<td>The FPTC module in option slot 1 has activated a motor temperature warning in the XWRN input (non-safety related). 1. Motor temperature is too high, or 2. the thermistor is in short-circuit or disconnected.</td>
<td>1. Check the cooling of the motor. 2. Check the motor load and drive ratings. 3. Check the wiring of the temperature sensor. Repair wiring if faulty. 4. Measure the resistance of the sensor. Replace sensor if faulty.</td>
</tr>
<tr>
<td>A498</td>
<td>Motor temperature 2 (Editable message text)</td>
<td>The FPTC module in option slot 2 has activated a motor temperature warning in the XWRN input (non-safety related). 1. Motor temperature is too high, or 2. the thermistor is in short-circuit or disconnected.</td>
<td></td>
</tr>
<tr>
<td>A499</td>
<td>Motor temperature 3 (Editable message text)</td>
<td>The FPTC module in option slot 3 has activated a motor temperature warning in the XWRN input (non-safety related). 1. Motor temperature is too high, or 2. the thermistor is in short-circuit or disconnected.</td>
<td></td>
</tr>
</tbody>
</table>
LEDs

The FPTC-01 module has three diagnostic LEDs.

<table>
<thead>
<tr>
<th>Name</th>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAULT</td>
<td>Red</td>
<td>The motor temperature is outside the allowed temperature range and the drive STO is active, or there is no PTC sensor connected to the XFLT input (safety related).</td>
</tr>
<tr>
<td>WARNING</td>
<td>Red</td>
<td>The motor temperature is outside the temperature warning range, or there is no PTC sensor connected to the XWRN input (non-safety related).</td>
</tr>
<tr>
<td>STATUS</td>
<td>Green</td>
<td>The module is powered up.</td>
</tr>
</tbody>
</table>

Note: When there is no sensor connected to the XWRN input, the WARNING LED is red even if you have suppressed the warnings from the module. You can connect a resistor (resistance 50 ohm...3.6 kohm) between the XWRN inputs to turn off the WARNING LED.
Contents of this chapter

This chapter gives maintenance instructions.

Maintenance

After the operation of the safety circuit has been tested at start-up, it does not need any maintenance during its specified lifetime, but the safety circuit must be tested periodically to keep the SIL/PL capability valid.

In addition to proof testing, it is a good practice to check the operation of the safety function when other maintenance procedures are carried out on the machinery. Do the acceptance test described in chapter Start-up and acceptance test.
If you change any wirings or components after the start-up, replace the FPTC-01 module, modify drive or FSO parameters or restore parameters to their factory default values, you must:

- Use only ABB approved spare parts.
- Register the change to the change log for the safety circuit or logbook of the machine.
- Test the safety function again after the change. Obey the rules given in chapter \textit{Start-up and acceptance test}.
- Document the tests and store the report into the logbook of the machine.

\textbf{Proof test interval}

After the operation of the safety function is validated at start-up, the safety function must be maintained by periodic proof testing. In high demand mode of operation, the maximum proof test interval is 20 years. In low demand mode of operation, the maximum proof test interval is 2 years (high or low demand as defined in IEC 61508, EN/IEC 62061 and EN ISO 13849-1). Regardless of the mode of operation, it is a good practice to check the operation of the safety function at least once a year. Do the test as described in chapter \textit{Start-up and acceptance test}.

The person responsible for the design of the complete safety function should also note the Recommendation of Use CNB/M/11.050 published by the European co-ordination of Notified Bodies concerning dual-channel safety-related systems with electromechanical outputs:

- When the safety integrity requirement for the safety function is SIL 3 or PL e (cat. 3 or 4), the proof test for the function must be performed at least every month.
- When the safety integrity requirement for the safety function is SIL 2 (HFT = 1) or PL d (cat. 3), the proof test for the function must be performed at least every 12 months.
This is a recommendation and depends on the required (not achieved) SIL/PL. For example, contactors, breakers, safety relays, contactor relays, emergency stop buttons, switches etc. are typically safety devices which contain electromechanical outputs. The FPTC-01 and FSO modules and the STO circuit of the drive do not contain electromechanical outputs.

**Competence**

The maintenance and proof test activities 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 Ex regulations.

**Residual risk**

The safety functions are used to reduce the recognized hazardous conditions. In spite of this, it is not always possible to eliminate all potential hazards. Therefore the warnings for the residual risks must be given to the operator.

**Intentional misuse**

The safety circuit is not designed to protect a machine against intentional misuse.

**Decommissioning**

When you decommission the module, make sure that the safety of the machine is maintained until the decommissioning is complete. Mark clearly on the module that it is decommissioned.
Technical data

Contents of this chapter

This chapter contains the technical data of the module, gives general rules, notes and definitions related to safety functions and lists the related standards and directives. The safety data, relevant certificates and Declarations of Conformity are also included.
Dimension drawing

The dimensions are in millimeters and [inches].
Isolation areas

This figure describes the different isolation areas of the module. Isolation areas A and B and the mounting screw are connected to ground. Isolation area C is in the same potential as the PTC sensor element in the motor.
Connections

Motor thermistor connection
- Wire size max. 2.5 mm²
- Length max. 700 m (2300 ft)
  (1400 m [4600 ft] for the whole loop)
- With the specified cable type: Detection of a short-circuited
  PTC sensor or cable is not guaranteed after 100 m (330 ft).
- Type: Draka JAMAK 1 x (2 + 1) x 0.5 mm² or similar
- Torque: 0.5 N·m
- Supported standards: DIN 44081 and DIN 44082
- Number of PTC thermistors: 1, 3 or 6 in series (in both inputs)
- Triggering threshold: 3.6 kohm
- Recovery threshold: 1.6 kohm
- PTC terminal voltage: < 5.0 V
- PTC terminal current: < 1 mA
- Short-circuit detection: < 50 ohm
  (for the effect of the cable length, see above)

STO relay output connection
- Wire size max. 2.5 mm² (with an FSO module: 1.5 mm²)
- Length max. 30 m (100 ft) (for the whole loop)
- Torque: 0.5 N·m
- Maximum contact rating: 24 V DC (17...30 V), 1 A / channel
- Maximum breaking capacity: 1000 VA

Ambient conditions
See the drive technical data.
The FPTC-01 module is a type A safety component as defined in IEC 61508-2.

The table gives the safety data for the SMT function with different configurations. The calculations are based on the worst case data of the drive Safe torque off (STO) function. The PFH_{D/PFD}\text{G} values can be different based on the internal configuration of the FSO module.

Note: The failure rate of the PTC sensor is not included in the calculations.

Two-channel configurations
1. FPTC module + drive STO (see Wiring example 1 on page 41)
2. a) FPTC module + drive STO + FSO module with STO function request (see Wiring example 2 on page 42), or
   b) FPTC module + drive STO + FSO module with SS1 function request (time monitoring)
3. FPTC module + drive STO + FSO module with SS1 function request (ramp monitoring), without an encoder interface (see Note 1 below)
4. FPTC module + drive STO + FSO-21 module with SS1 function request (ramp monitoring) + FSE-31 module, with an encoder interface (see Note 2 below)
5. FPTC module + drive STO + external safety relay (see Wiring example 4 on page 44).
80 Technical data

One-channel configurations

6. a) FPTC module + drive STO + FSO module with STO function request (see Wiring example 3 on page 43), or
   b) FPTC module + drive STO + FSO module with SS1 function request (time monitoring),

7. FPTC module + drive STO + FSO module with SS1 function request (ramp monitoring), without an encoder interface (see Note 1 below)

8. FPTC module + drive STO + FSO-21 module with SS1 function request (ramp monitoring) + FSE-31 module, with an encoder interface (see Note 2 below)

Note 1: When ramp monitoring is used in SS1 function, the FSO module monitors the motor speed during the deceleration ramp. Without an encoder, the speed monitoring function of the drive is included in the calculations.

Note 2: When ramp monitoring is used the SS1 function and a safety encoder is used in the application (only the FSO-21 supports the use of safety encoders), speed monitoring during the deceleration ramp is based on the motor speed from the safety encoder. This is why the FSE-31 encoder interface module is included in the calculations. When time monitoring in used in the SS1 function (configurations 2b and 6b), the safety data is the same with and without an encoder interface. The failure rate of the safety encoder is not included in the calculations.
The MTTFd value (EN ISO 13849-1) of the module:

- 1708 years (two-channel connection)
- 1703 years (one-channel connection)

<table>
<thead>
<tr>
<th></th>
<th>Two-channel configurations</th>
<th>One-channel configurations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>SIL / SILCL</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>PL</td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>SFF (%)</td>
<td>&gt;90</td>
<td>&gt;90</td>
</tr>
<tr>
<td>PFH0 (1/h)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(T1 = 20a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5.50</td>
<td>E-09</td>
</tr>
<tr>
<td>PFDO (1/h)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(T1 = 2 a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.82</td>
<td>E-05</td>
</tr>
<tr>
<td>DC (%)</td>
<td>60</td>
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</tr>
<tr>
<td>SC</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Cat.</td>
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</tr>
<tr>
<td>HFT</td>
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<td>0</td>
</tr>
<tr>
<td>CCF</td>
<td>65</td>
<td>65</td>
</tr>
<tr>
<td>Lifetime (a)</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>
Safety block diagrams

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

**Note:** The failure rate of the PTC sensor is not included in the calculations.

Two-channel configurations

This diagram applies to configuration 1.

This diagram applies to configurations 2 and 3.

This diagram applies to configuration 4.
This diagram applies to configuration 5.

Note: The failure rate of the external safety relay is not included in the calculation.

One-channel configurations

This diagram applies to configurations 6 and 7.

Note: The failure rate of the safety encoder is not included in the calculation.

Response times

• FPTC-01 module: less than 10 ms
• SMT function: the response time of the PTC sensor + FPTC-01 module (<10 ms) + FSO module (<50 ms) + drive STO (<50 ms) + possible ramp delays
Relevant failure modes

- The SMT function trips spuriously (safe failure)
- The SMT function does not activate when requested

A fault exclusion on the failure mode “short-circuit on printed circuit board” has been made (EN 13849-2, table D.5). The analysis is based on the assumption that one failure occurs at one time. No accumulated failures have been analyzed.

The failures of the PTC sensor (thermistor) are not included in the failure analysis. The customer is responsible for the applicability of the PTC element.
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 chapter *Start-up and acceptance test*:
  - at initial start-up of the safety function
  - after any changes related to the safety function (circuit boards, wiring, components, settings, restoring parameter values to factory settings, etc.)
  - after any maintenance work 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, from each operation location
  - 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. 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.

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 Ex regulations. The test procedures and report must be documented and signed by this person.

Ambient conditions

For the environmental limits for the safety function and the drive, refer to the hardware manual of your drive.

Reporting problems and failures related to safety functions

Contact your local ABB representative.
### Related standards and directives

<table>
<thead>
<tr>
<th>Standard</th>
<th>Name</th>
</tr>
</thead>
</table>
Part 1 – General Requirements  
Part 2 – Requirements for electrical/electronic/programmable electronic safety-related systems |
| EN/IEC 61800-5-2:2007 | Adjustable speed electrical power drive systems – Part 5-2: Safety requirements – Functional |
| EN ISO 13849-1:2008 | Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design |
| IEC 61326-3-1:2008 | Electrical equipment for measurement, control and laboratory use – EMC requirements –  
Part 3-1: Immunity requirements for safety-related systems and for equipment intended to perform safety-related functions (functional safety) – General industrial applications |
| IEC 61511:2003   | Functional safety - Safety instrumented systems for the process industry sector |
| 2006/42/EC       | European Machinery Directive |
Technical data

Compliance with the European Machinery Directive

The drive is an electronic product which is covered by the European Low Voltage Directive. However, the drive internal safety function of this manual (option +L536) is in the scope of the Machinery Directive as a safety component. This function complies with European harmonized standards such as EN/IEC 61800-5-2. The declarations of conformity are shown below.
AABB

EU Declaration of Conformity
(according to Machinery Directive 2006/42/EC)

We, Manufacturer: ABB Oy, Drives
Address: Hietaniemi 13, P.O. Box 184, 00881 Helsinki, Finland,

hereby declare that products

ACSB00-01 390 – 690 Vac (Frames R1-R9)
ACSB00-04 390 – 590 Vac (Frames R10-R11)

are in conformity with the basic safety requirements of the Machinery Directive 2006/42/EC.

Safe torque off;

and with regard to the following optional safety functions with FISO-12 module (option code +Q873, encoderless):

Safe stop 1; Safe stop emergency; Safety-limited speed; Safe maximum speed;
Safe brake control; Prevention of Unexpected Start-up;

and with regard to the following optional safety functions (option codes +Q872 and +Q521, encoder supported):

Safe stop 1; Safe stop emergency; Safety-limited speed; Safe maximum speed;
Safe brake control; Safe speed monitor; Safe direction; Prevention of Unexpected Start-up;

and with regard to the following optional safety function with PPTO-01 terminator protection module (option code +Q534):

Safe Motor Temperature;

fulfill all the relevant safety component requirements of EC Machinery Directive 2006/42/EC, when the listed safety functions are used for safety component functionality.

The following harmonized standards below were used:

EN 61800-5-2: 2007
Adjustable speed electrical power driven systems - Part 5-2: Safety requirements - Functional safety
EN 60204-1: 2009 + A1: 2013
Safety of machinery - Functional safety of safety-related electrical, electronic or programmable systems in control systems
EN ISO 13849-1: 2008 + AC: 2010
Safety of machinery - Safety-related parts of control systems. Part 1: General requirements
EN ISO 13849-2: 2012
Safety of machinery - Safety-related parts of the control systems. Part 2: Definitions
Safety of machinery - Electrical equipment of machines - Part 1: General requirements
EU Declaration of Conformity
(According to Machinery Directive 2006/42/EC)

Other used standards:
IEC 61508 ed. 2: 2010

The products referred to in this Declaration of Conformity fulfill the relevant provisions of the Low Voltage Directive 2006/95/EC and EMC Directive 2004/108/EC. Declaration of conformity according to these directives is available from the manufacturer.

Person authorized to compile the technical file:

Name: Juhani Merimaa
Address: P.O. Box 194, 00381 Helsinki, Finland

Helsinki, 2015-11-09

[Signature]

Tuomas Jalkanen
Vice President
ABB Oy

27/01/2002WH16

Page 19
EU Declaration of Conformity
(According to Machinery Directive 2006/42/EC)

We,

Manufacturer: ABB Oy, Drives
Address: Huonekylä 13, P.O. Box 184, 00881 Helsinki, Finland.
Phone: +358 10 22 11

declare under our sole responsibility that the following products

ACS880-04, -07
ACS880-07
ACS880-17, -37
ACS880-104
ACS800 multiDrives

are in conformity with all the relevant safety component requirements of EEC Machinery Directive 2006/42/EC, when the listed safety functions are used for safety component functionality.

Safe torque off
Safe motor temperature, with FPTC-01 module (option code +G366)
Safe stop 1, Safe stop emergency, Safety limited speed, Safe maximum speed, Safe brake control, Prevention of unexpected start-up, with FSD-12 module (option code +Q671)

ACS880-07, -17, -37 and ACS880 multiDrives: Prevention of unexpected start-up (option codes +Q650, +Q657), Emergency stop (option code +Q651), +Q652, +Q653, +Q654, +Q657, +Q279, Safety-limited speed (option code +Q966)

30821000019907
EU Declaration of Conformity

(Conforming to Machinery Directive 2006/42/EC)

The following harmonized standards below were used:
- EN ISO 13849-1: 2006 + AC: 209
- EN ISO 13849-2: 2012
- IEC 61800-5-2: 2000 + AC: 2010

Other used standards:
- IEC 61508 ed. 2: 2010

The products referred in this Declaration of Conformity are in full compliance with the relevant provisions of the Low Voltage Directive 2006/95/EC and EMC Directive 2004/108/EC. Declaration of conformity according to these directives is available from the manufacturer.

Person authorised to compile the technical file:
Name: Vesa Titomaa
Address: P.O. Box 184, 00381 Helsinki, Finland

Helsinki, 20 Oct 2015

[Signature]

Pekka 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.
TÜV Nord certificate

TÜV Nord certificate for the FPTC-01 module and ACS880 drive series is attached below.

Certificate
No. SEBS-A.095524/19 V1.0
TÜV NORD Systems GmbH & Co. KG hereby certifies
ABB Oy
Hiomapuro 13
00381 Helsinki
Finland
that the
FPTC-01
as a plug-in module for the ABB industrial drive ACS880 series
with the safety function Safe Motor Temperature (SMT) meets the requirements listed in the following standards:
- IEC 61508 part 1:2010; part 2:2010; capable up to SIL 2
- ISO 13849-1:2006, ISO 13849-2:2012; capable up to PL c (category 1)
- IEC 61800-5-2:2007; capable up to SIL 2
- IEC 62061:2015; capable up to SILC 2

The module can also be used in safety applications up to SIL 2 according to IEC 61517-1:2004

Base of certification is the report DQ59-A.20552/15/TB in the v3.0 version.

This certificate entitles the holder to use the pictured safety approved mark.

Expiration date: 2020-11-27
Reference No: 811335954

Hamburg, 2019-11-27

T. Isola
Certification Area MRM
TÜV NORD SYSTEMS GmbH & Co. KG
Stoßelstraße 41, 22529 Hamburg, Germany
Technical data
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 www.abb.com/searchchannels.

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

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

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