Altivar 32

Variable speed drives
for synchronous and asynchronous motors

Safety integrated functions manual

10/2012

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www.schneider-electric.com

Schneider Electric

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

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

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

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

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

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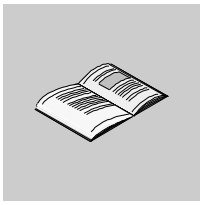
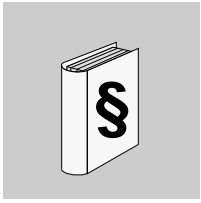


Safety Information



Important Information

NOTICE

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

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

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

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

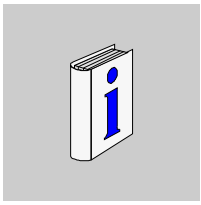
NOTICE is used to address practices not related to physical injury.

PLEASE NOTE

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

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

About the Book



At a Glance

Document Scope

The purpose of this document is to provide information about safety functions incorporated in Altivar 32. These functions allow you to develop applications oriented in the protection of man and machine.

Validity Note

This documentation is valid for the Altivar 32 drive.

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

Step	Action
1	Go to the Schneider Electric home page *www.schneider-electric.com*.
2	In the **Search** box type the reference of a product or the name of a product range. ● Do not include blank spaces in the model number/product range. ● To get information on a grouping similar modules, use asterisks (*).
3	If you entered a reference, go to the **Product datasheets** search results and click on the reference that interests you. If you entered the name of a product range, go to the **Product Ranges** search results and click on the product range that interests you.
4	If more than one reference appears in the **Products** search results, click on the reference that interests you.
5	Depending on the size of your screen, you maybe need to scroll down to see the data sheet.
6	To save or print a data sheet as a .pdf file, click **Download XXX product datasheet**.

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

Related Documents

Title of Documentation	Reference Number
ATV32 Quick Start guide	S1A41715
ATV32 Quick Start Annex	S1B39941
ATV32 Installation manual	S1A28686
ATV32 Programming manual	S1A28692
ATV32 Atex manual	S1A45605
ATV32 Safety manual	S1A45606
ATV32 Modbus manual	S1A28698
ATV32 CANopen manual	S1A28699
ATV32 PROFIBUS DP manual	S1A28700
ATV32 Modbus TCP - EtherNet/IP manual	S1A28701
ATV32 DeviceNet manual	S1A28702
ATV32 EtherCAT manual	S1A28703
ATV32 communication parameters manual	S1A44568
ATV32 certificates, see www.schneider-electric.com	NA

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

Product Related Information

The information provided in this manual supplements the product manuals.

Carefully read the product manuals before using the product.

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

⚠ ⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

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

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

⚠ DANGER

UNINTENDED EQUIPMENT OPERATION

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

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

⚠ WARNING

DAMAGED DRIVE EQUIPMENT

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

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

⚠ WARNING

LOSS OF CONTROL

- The designer of any wiring scheme must consider the potential failure modes of control channels and, for certain critical control functions, provide a means to achieve a safe state during and after a channel failure.
  Examples of critical control functions are emergency stop and overtravel stop.
- Separate or redundant control channels must be provided for critical control functions.
- Each implementation of a control system must be individually and thoroughly tested for proper operation before being placed into service.
- System control channels may include links carried out by the communication. Consideration must be given to the implications of unanticipated transmission delays or failures of the link**1**.

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

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

⚠ CAUTION

INCOMPATIBLE LINE VOLTAGE

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

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

NOTICE

RISK OF DERATED PERFORMANCE DUE TO CAPACITOR AGING

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

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

Failure to follow these instructions can result in equipment damage.

Qualification of personnel

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

All persons working on and with the product must be fully familiar with all applicable standards, directives, and accident prevention regulations when performing such work.

Intended use

The functions described in this manual are only intended for use with the basic product; you must read and understand the appropriate product manual.The product may only be used in compliance with all applicable safety regulations and directives, the specified requirements and the technical data.Prior to using the product, you must perform a risk assessment in view of the planned application. Based on the results, the appropriate safety measures must be implemented.Since the product is used as a component in an entire system, you must ensure the safety of persons by means of the design of this entire system (for example, machine design).

Operate the product only with the specified cables and accessories. Use only genuine accessories and spare parts.Any use other than the use explicitly permitted is prohibited and can result in hazards.Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel.The product must NEVER be operated in explosive atmospheres (hazardous locations, Ex areas).

User Comments

We welcome your comments about this document. You can reach us by e-mail at techpub.drives@schneider-electric.com.

Generalities

1

What Is in This Chapter?

This chapter contains the following topics:

Introduction

Overview

The safety functions incorporated in Altivar 32 allow you to develop applications oriented towards protection of people and machinery.

The safety functions are configured with SoMove software.

Integrated safety functions provide the following benefits:
- Additional standards-compliant safety functions
- No need for external safety devices
- Reduced wiring effort and space requirements
- Reduced costs

The Altivar 32 drives are compliant with the requirements of the standards in terms of implementation of safety functions.

Safety Functions as Defined by IEC 61800-5-2

Definitions

Acronym	Description
STO	**Safe Torque Off** The purpose of this function is to switch the motor to zero torque mode, so it is relevant in terms of safety since no torque is available to the motor. The power modules are inhibited and the motor decelerates in freewheel mode or the motor is prevented from starting.
SLS	**Safely Limited Speed** SLS monitors an adjustable speed limit. If the maximum speed is exceeded, the drive is shut down safely.
SS1	**Safe Stop 1** SS1 consists of: ● Monitored deceleration of the movement according to a specified ramp. ● STO (triggered after standstill has been reached).

Notation

The graphic display terminal (to be ordered separately - reference VW3A1101) menus are shown in square brackets.

The integrated 7-segment display terminal menus are shown in round brackets.

Parameter names are displayed on the graphic display terminal in square brackets.

Parameter codes are displayed on the integrated 7-segment display terminal in round brackets.

Standards and Terminology

Overview

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

In the field of drive systems this includes, but is not limited to, terms such as safety function, safe state, fault, fault reset, failure, error, error message, warning, warning message, etc.

These standards include:

- IEC 61800 series: Adjustable speed electrical power drive systems
- IEC 61508 Ed.2 series: Functional safety of electrical/electronic/programmable electronic safety-related systems
- EN 954-1 Safety of machinery - Safety related parts of control systems
- EN ISO 13849-1 & 2 Safety of machinery - Safety related parts of control systems

EC Declaration of Conformity

The EC Declaration of Conformity for the EMC Directive can be obtained on www.schneider-electric.com.

ATEX Certification

The ATEX certificate can be obtained on www.schneider-electric.com.

Functional Safety Certification

The integrated safety functions are compatible and certified according to IEC 61800-5-2 Ed.1 Adjustable speed electrical power drive systems - Part 5-2: Safety requirements - Functional.

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

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

The defined safety functions are:

- SIL2 and SIL3 capability in compliance with IEC 61800-5-2 and the IEC 61508 Ed.2 series.
- Performance Level d and e in compliance with ISO 13849-1.
- ICompliant with Category 3 and 4 of European standard ISO 13849-1 (EN 954-1).

Also refer to Safety Function Capability.

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

The functional safety certificate is accessible on www.schneider-electric.com.

Basics

Functional Safety

Automation and safety engineering are two areas that were completely separate in the past but have recently become more and more integrated.

The engineering and installation of complex automation solutions are greatly simplified by integrated safety functions.

Usually, the safety engineering requirements depend on the application.

The level of requirements results from the risk and the hazard potential arising from the specific application.

IEC 61508 standard

The standard IEC 61508 Functional safety of electrical/electronic/programmable electronic safety-related systems covers the safety-related function.

Instead of a single component, an entire function chain (for example, from a sensor through the logical processing units to the actuator) is considered as a unit.

This function chain must meet the requirements of the specific safety integrity level as a whole.

Systems and components that can be used in various applications for safety tasks with comparable risk levels can be developed on this basis.

SIL - Safety Integrity Level

The standard IEC 61508 defines 4 safety integrity levels (SIL) for safety functions.

SIL1 is the lowest level and SIL4 is the highest level.

A hazard and risk analysis serves as a basis for determining the required safety integrity level.

This is used to decide whether the relevant function chain is to be considered as a safety function and which hazard potential it must cover.

PFH - Probability of a dangerous Hardware Failure per Hour

To maintain the safety function, the IEC 61508 standard requires various levels of measures for avoiding and controlling detected faults, depending on the required SIL.

All components of a safety function must be subjected to a probability assessment to evaluate the effectiveness of the measures implemented for controlling detected faults.

This assessment determined the PFH (Probability of a dangerous Failure per Hour) for a safety system.

This is the probability per hour that a safety system fails in a hazardous manner and the safety function cannot be correctly executed.

Depending on the SIL, the PFH must not exceed certain values for the entire safety system.

The individual PFH values of a function chain are added. The result must not exceed the maximum value specified in the standard.

Performance level	Probability of a dangerous Failure per Hour (PFH) at high demand or continuous demand
4	$\geq 10^{-9} ... < 10^{-8}$
3	$\geq 10^{-8} ... < 10^{-7}$
2	$\geq 10^{-7} ... < 10^{-6}$
1	$\geq 10^{-6} ... < 10^{-5}$

PL - Performance level

The standard IEC 13849-1 defines 5 Performance levels (PL) for safety functions.

a is the lowest level and e is the highest level.

Five levels (a, b, c, d, and e) correspond to different values of average probability of dangerous failure per hour.

Performance level	Probability of a dangerous Hardware Failure per Hour
e	$\geq 10^{-8} ... < 10^{-7}$
d	$\geq 10^{-7} ... < 10^{-6}$
c	$\geq 10^{-6} ... < 3 * 10^{-6}$
b	$\geq 3 * 10^{-6} ... < 10^{-5}$
a	$\geq 10^{-5} ... < 10^{-4}$

HFT - hardware fault tolerance and SFF - Safe Failure Fraction

Depending on the SIL for the safety system, the IEC 61508 standard requires a specific hardware fault tolerance HFT in connection with a specific proportion of safe failures SFF (Safe Failure Fraction).

The hardware fault tolerance is the ability of a system to execute the required safety function in spite of the presence of one or more hardware faults.

The SFF of a system is defined as the ratio of the rate of safe failures to the total failure rate of the system.

According to IEC 61508, the maximum achievable SIL of a system is partly determined by the hardware fault tolerance HFT and the safe failure fraction SFF of the system.

IEC 61508 distinguishes two types of subsystem (type A subsystem, type B subsystem).

These types are specified on the basis of criteria which the standard defines for the safety-relevant components.

SFF	HFT type A subsystem			HFT type B subsystem		
	0	1	2	0	1	2
< 60%	SIL1	SIL2	SIL3	----	SIL1	SIL2
60% ...< 90%	SIL2	SIL3	SIL4	SIL1	SIL2	SIL3
60% ...< 99%	SIL3	SIL4	SIL4	SIL2	SIL3	SIL4
⩾ 60%	SIL3	SIL4	SIL4	SIL3	SIL4	SIL4

PFD - Probability of Failure on Demand

The standard IEC 61508 defines SIL using requirements grouped into two broad categories: hardware safety integrity and systematic safety integrity. A device or system must meet the requirements for both categories to achieve a given SIL.

The SIL requirements for hardware safety integrity are based on a probabilistic analysis of the device. To achieve a given SIL, the device must meet targets for the maximum probability of dangerous failure and a minimum Safe Failure Fraction. The concept of 'dangerous failure' must be rigorously defined for the system in question, normally in the form of requirement constraints whose integrity is verified throughout system development. The actual targets required vary depending on the likelihood of a demand, the complexity of the device(s), and types of redundancy used.

The PFD (Probability of Failure on Demand) and RRF (Risk Reduction Factor) of low demand operation for different SILs are defined in IEC 61508 are as follows:

SIL	PFD	PFD (power	RRF
1	0.1 - 0.01	10^{-1} - 10^{-2}	10 - 100
2	0.01 - 0.001	10^{-2} - 10^{-3}	100 - 1000
3	0.001 - 0.0001	10^{-3} - 10^{-4}	1000 - 10,000
4	0.0001 - 0.00001	10^{-4} - 10^{-5}	10,000 - 100,000

In continuous operation, these change to the following:

SIL	PFD	PFD (power	RRF
1	0.00001 - 0.000001	10^{-5} - 10^{-6}	100,000 - 1,000,000
2	0.000001 - 0.0000001	10^{-6} - 10^{-7}	1,000,000 - 10,000,000
3	0.0000001 - 0.00000001	10^{-7} - 10^{-8}	1000 - 10,000
4	0.00000001 - 0.000000001	10^{-8} - 10^{-9}	100,000,000 - 1,000,0000,000

The hazards of a control system must be identified then analyzed in a risk analysis. These risks are gradually mitigated until their overall contribution to the hazard is deemed to be acceptable. The tolerable level of these risks is specified as a safety requirement in the form of a target probability of a dangerous failure over a given period of time, stated as a discrete SIL level.

Dtected Fault Avoidance Measures

Systematic errors in the specifications, in the hardware and the software, usage faults and maintenance faults in the safety system must be avoided to the maximum degree possible. To meet these requirements, IEC 61508 specifies a number of measures for fault avoidance that must be implemented depending on the required SIL. These measures for fault avoidance must cover the entire life cycle of the safety system, i.e. from design to decommissioning of the system.

Description

2

What Is in This Chapter?

This chapter contains the following topics:

STO Safe Torque Off)

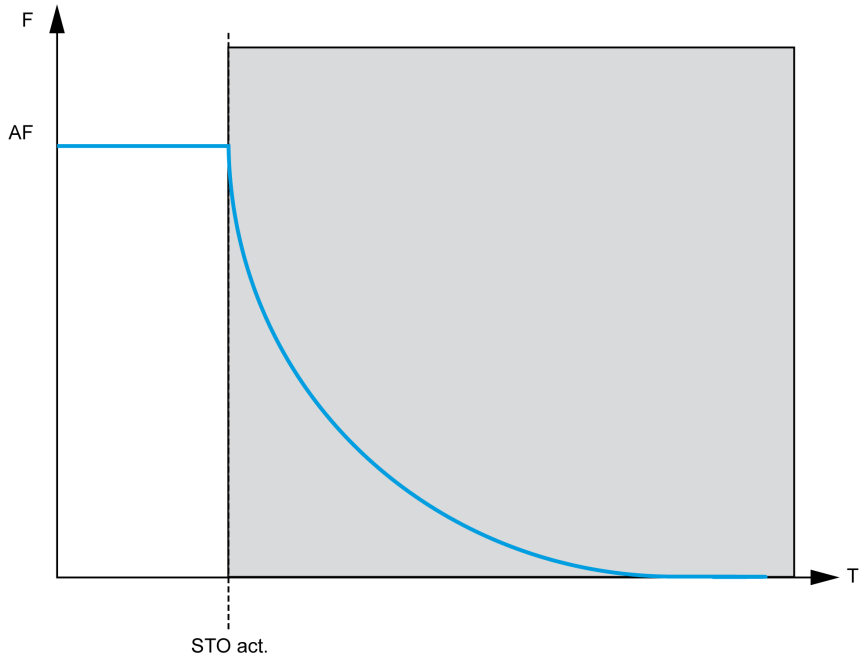
Overview

The purpose of this function is to bring the motor into a zero torque condition as the motor decelerates or to prohibit the motor from starting. So it is relevant in terms of safety since no torque is available in the motor.

The STO logic input is always assigned to this function.

If a paired terminal line in two channels is required to control STO, the function can also be enabled by the safe logic inputs.

The STO status can be accessed with the drive or with SoMove.



F: Frequency, AF: Actual Frequency, T: Time, STO Act.: STO activation

STO Normative Reference

The STO function is defined in section 4.2.2.2 of standard IEC 61800-5-2 (the 07/2007 version):

Power, that can cause rotation (or motion in the case of a linear motor), is not applied to the motor.The PDS(SR) (Power Drive System with safety-related functions) will not provide energy to the motor which can generate torque (or force in the case of a linear motor).NOTE 1 This safety function corresponds to an uncontrolled stop in accordance with stop category 0 of IEC 60204-1.NOTE 2 This safety function may be used where power removal is required to prevent an unexpected start-up.NOTE 3 In circumstances where external influences (for example, falling of suspended loads) are present, additional measures (for example, mechanical brakes) may be necessary to prevent any hazard.NOTE 4 Electronic equipment and contactors do not provide adequate protection against electric shock, and additional insulation measures may be necessary.

Safety Function (SF) level required for STO function

Configuration	SIL Safety Integrity Levelaccording to IEC 61-508	PL Performance Levelaccording to ISO-13849
STO with or without safety module	SIL 2	PL d
STO & LI3 with or without safety module	SIL 3	PL e
LI3 and LI4	SIL 2	PL d
LI5 and LI6	SIL 2	PL d

- For the machine environment (IEC 60204-1 and Machinery Directive), a reset must never lead to restarting.
  One of the most important scenarios is when STO has been activated, and the power supply is then switched off.
  In this case, if STO is deactivated during the loss of supply, the motor must not restart automatically.
  The safety module can help prevent accidental restarting if the above occurs.
  So a safety module is required if the machine restarts automatically after STO deactivation.
- E_stop of several BDMs (Background Debug Modules) in a PDS: the safety module has safety outputs for applications which require one or more safety outputs.

In other environments, the safety module is not required, unless the application requires it: system fallback position.

SS1 Safe Stop 1

Overview

This function is used to stop the motor following a dedicated deceleration ramp. The motor speed is monitored during the deceleration ramp. STO is initiated when the motor speed falls below a specified threshold.

The unit of the SS1 deceleration ramp is in Hz/s. To get the shape of the ramp you need to configure 2 parameters:

[SS1 ramp unit] (5 5 r U) (Hz/s) to give the unit of the ramp in 1 Hz/s, 10 Hz/s and 100 Hz/s

[SS1RampValue] (5 5 r t) (0.1) to set the value of the ramp

Ramp calculation:

Ramp = SSrU*SSrt

Example: If SSrU = 10 Hz/s and SSrt = 50 the deceleration ramp is 50 Hz/s.

When the function is activated, the SS1 function reference has priority over all other reference channels.

When a fault is detected within the safety function, the drive will trip and stop using the internal STO command.

This safety function is configured with SoMove software, see Commissioning *(see page 63)*.

The SS1 status can be accessed with the drive or with SoMove.

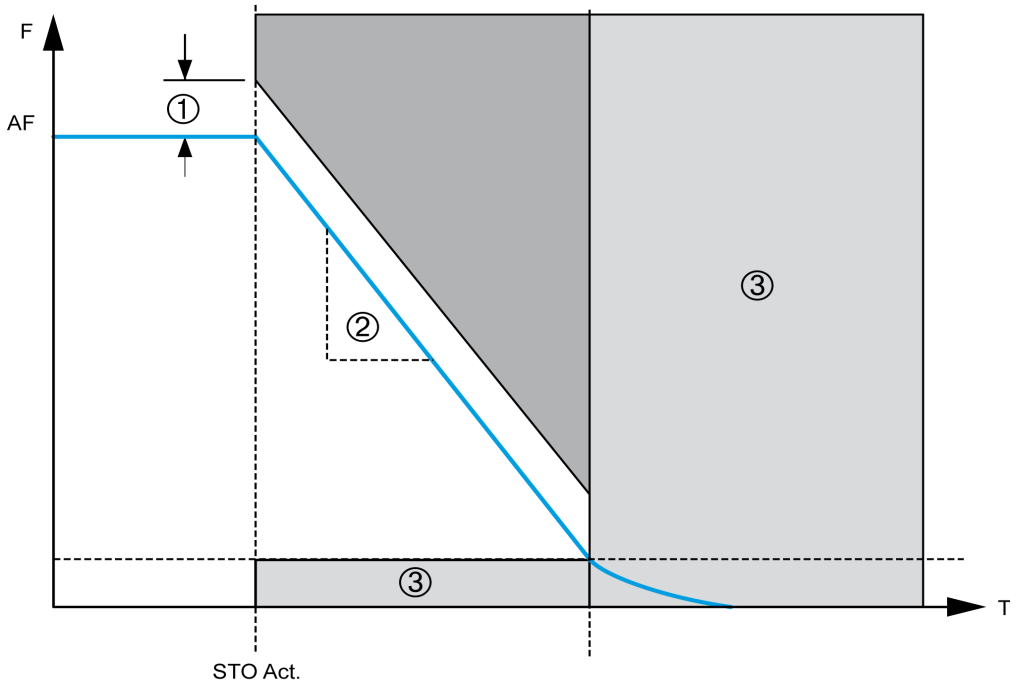
Behavior on Activation of the SS1 Function

The SS1 function monitors the Motor Speed and checks the **[SS1 trip threshold]** (5 5 t t).

During the SS1 ramp, if the trip zone is reached, the drive trips in **[Safe function fault]** 5 A F F detected fault mode and the drive stops in freewheel mode.

When the Motor Speed reaches the **[Standstill level]** (5 5 5 L) an STO is set.

The protection depends on the stator frequency.



①: SS1 trip threshold, ②: SS1 deceleration ramp (dV/dT), ③: Stop, F: Frequency, AF: Actual Frequency, T: Time, STO Act.: STO activation

Behavior on Deactivation of the SS1 Function

After an SS1 stop, send a new run command (even if the run command is set on level command).

If the SS1 request disappears before the end of the safety function, the safety function continues to run until STO is reached.

SS1 Normative reference

The SS1 function is defined in section 4.2.2.2 of standard IEC 61800-5-2:

The PDS(SR) (Power Drive System with safety-related functions) either Type B. initiates and monitors the motor deceleration rate within set limits to stop the motor and initiates the STO function when the motor speed is below a specified limit; or Type C. initiates the motor deceleration and initiates the STO function after an application-specific time delay.

NOTE: This safety function corresponds to a controlled stop in accordance with stop category 1 of IEC 60204-1.

In accordance with IEC 60204-1, the SS1 function generates a stop category 1 for the PDS but generates a stop category 0 after:

- The motor stops (when the motor speed is below a specified limit)
- Or an application-specific time delay

Safety Function (SF) level required for SS1 function

Table with four columns

Function	Configuration	SIL Safety Integrity Level according to IEC 61-508	PL Performance Level according to ISO-13849
SS1 Type C	STO with Preventa module	SIL 2	PL d
	STO and LI3 with Preventa module	SIL 3	PL e
SS1 Type B	LI3 and LI4	SIL 2	PL d
	LI5 and LI6	SIL 2	PL d

SLS Safety Limited Speed

Overview

This function is used to limit a machine's speed. Its main purpose is to monitor the motor speed and adjust the speed to a setpoint.

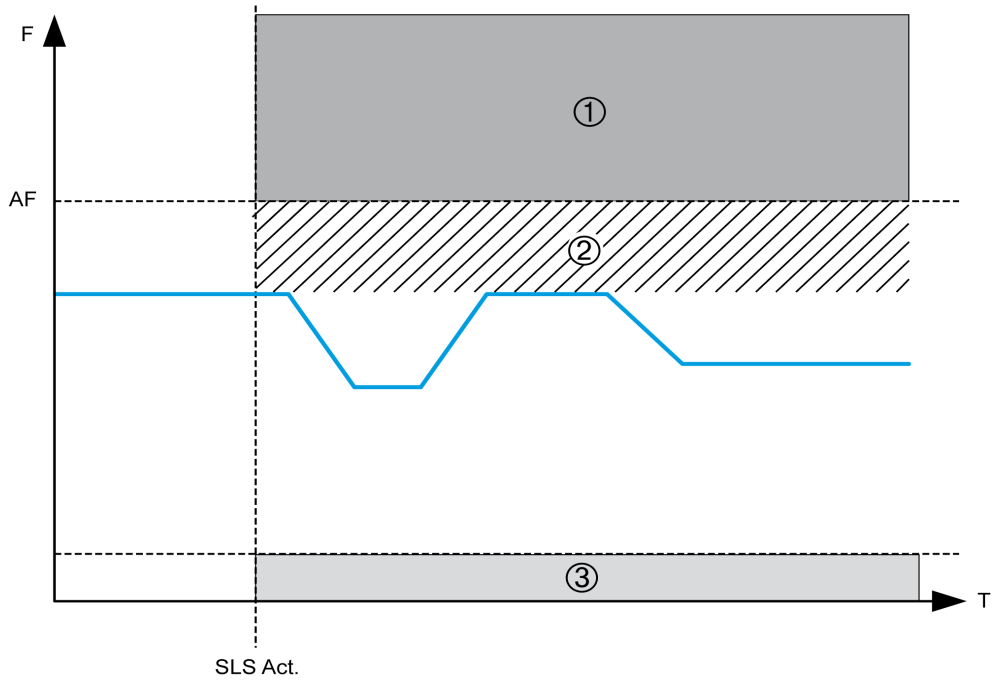
There are 3 types of SLS function:
- SLS type 1: Used to monitor the motor speed; trips in STO mode in the event of overspeed.
- SLS type 2: Used to limit the motor speed to a setpoint; trips in STO mode in the event of overspeed.
- SLS type 3: Same as type 2 with specific behavior when the motor speed is above the tolerance threshold. Trips in STO mode in the event of overspeed.

When the function is activated, the SLS function reference has priority over all other reference channels.This safety function is configured with SoMove software, see commissioning *(see page 63)*.The SLS status can be accessed with the drive or with SoMove.

Behavior on Activation of the SLS Type 1 Function

When the function is activated:
- If the current frequency or stator frequency is above the **[SLS tolerance threshold]** (5 L t t), the **[Safe function fault]** 5 A F F detected fault is triggered
- If the current frequency or stator frequency is under the **[SLS tolerance threshold]** (5 L t t), the speed is limited to the actual speed. The main reference channel can only decrease the speed reference.

While the function is activated:
- If the current frequency decreases and reaches the **[Standstill level]** (5 5 5 L) frequency, STO is activated.
- If the current frequency or stator frequency increases and reaches **[SLS tolerance threshold]** (5 L t t), the drive trips in 5 A F F detected fault mode.



①: Error and Stop, ②: Reference upper limit, ③: Stop, F: Frequency, AF: Actual Frequency, T: Time, SLS Act.: SLS activation

Behavior on Activation of the SLS Type 2 Function

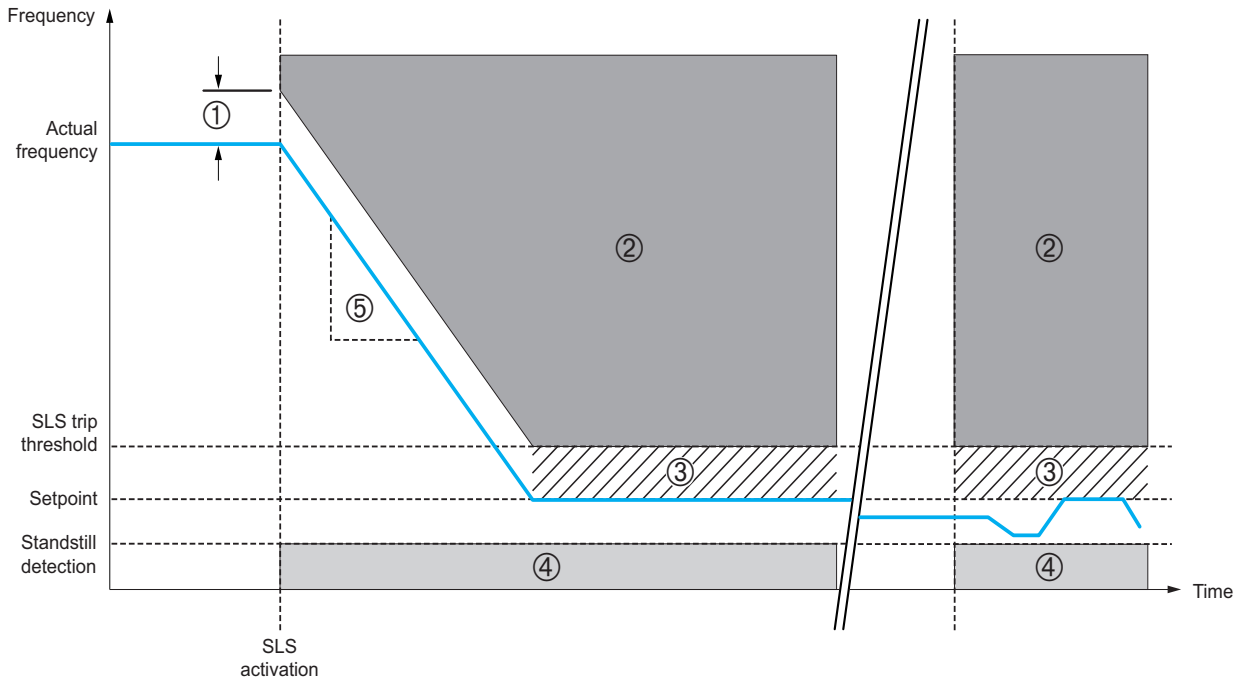
When the function is activated:

- If the current frequency is above the **[SLS tolerance threshold]** ($5LtE$), the drive decelerates until it reaches the **[Set point]** ($5LSP$) frequency with the same ramp as the SS1 function.
- If the current frequency is below the ($5LtE$) and above the ($5LSP$) the drive decelerates until it reaches the ($5LSP$) frequency with the same ramp as the SS1 function.
- If the current frequency is below the ($5LSP$) the speed is limited by the setpoint and cannot go any higher.

Once the ($5LSP$) is reached, is it still possible to vary the reference speed between **[Standstill level]** ($5SSL$) and the $5LSP$.

While the function is activated:

- If the current frequency decreases and reaches the ($5SSL$) frequency, STO is activated.
- If the current frequency or stator frequency increases and reaches the ($5LtE$), the drive trips in SAFF detected fault mode.



①: SLS trip threshold, ②: Error and Stop, ③: Reference upper limit, ④: Stop, ⑤: SS1 deceleration ramp (dV/dT)

Behavior on Activation of the SLS Type 3 Function

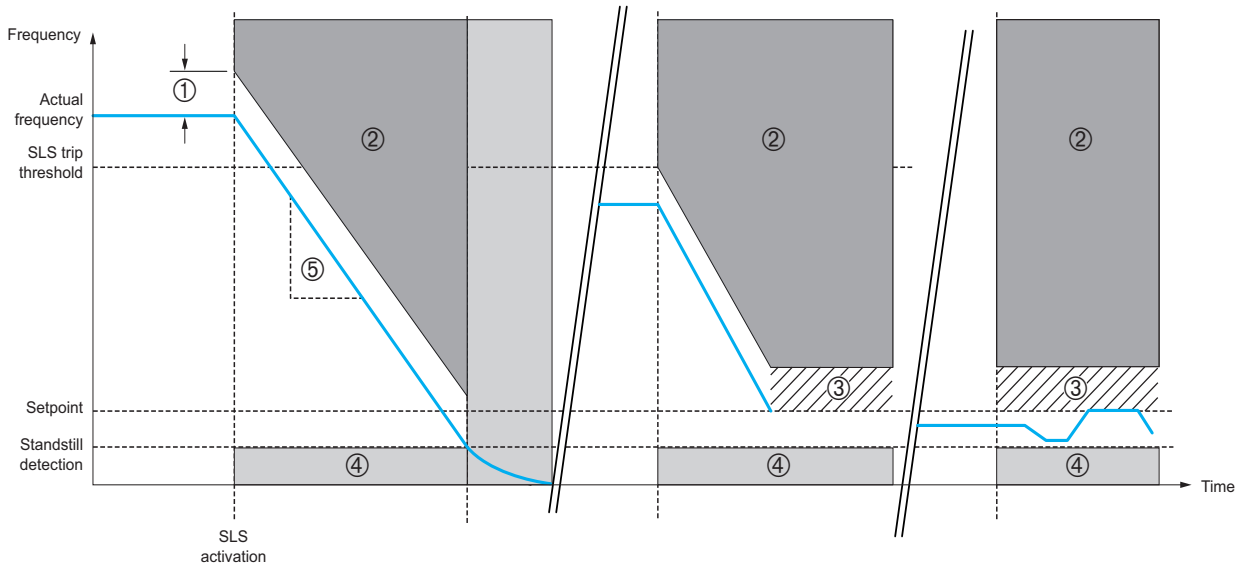
When the function is activated:

- If the current frequency is above the **[SLS tolerance threshold]** (S L t t), the drive decelerates until it reaches the **[Standstill level]** (S S S L) frequency with the same ramp as the SS1 function and an STO is set.
- If the current frequency is below the (S L t t) and above the (S L S P) the drive decelerates until it reaches the (S L S P) frequency with the same ramp as the SS1 function and remains equal to the Setpoint frequency until it is deactivated.
- If the current frequency is below the (S L S P) the current reference is not changed but limited to the ({(notrans) SLSP}).

While the function is activated:

- If the current frequency decreases and reaches the (S S S L) frequency, STO is activated.
- If the current frequency or stator frequency increases and reaches the (S L t t), the drive trips in SAFF detected fault mode.

The **[Set Point]** S L S Pis linked to the rotor frequency.



①: SS1 trip threshold, ②: Error and Stop, ③: Reference upper limit, ④: Stop, ⑤: SS1 deceleration ramp (dV/dT)

Behavior on Deactivation of the SLS Function For all SLS types

If...	**Then ...**
the drive is still running when the function is deactivated	the main reference and the current run command are applied.
the drive has already stopped (STO or end of SS1)	a new run command must be sent to restart.
the SLS request disappears before the end of SS1 deceleration	the safe function continues to run until **[Set point]** (S L S P) or **[Standstill level]** (S S S L) are reached.
a stop command appears	the drive stops even if a safe function has been activated (but the safe function stays active and continues to monitor the trip zone). **NOTE:** A stop command has priority over the safe function.
a detected fault appears when a safe function has been configured	the drive stops according to the configured reaction to a detected fault and a new run command must be sent to restart.

SLS standards references

The SLS function is defined in section 4.2.3.4 of standard IEC 61800-5-2 The SLS function prevents the motor from exceeding the specified speed limit.

The safety function (SF) level required for the SLS function is:

Configuration	**SIL Safety Integrity Levelaccording to IEC 61-508**	**PL Performance Levelaccording to ISO-13849**
LI3 and LI4	SIL 2	PL d
LI5 and LI6	SIL 2	PL d

Safety Parameters Calculation

3

What Is in This Chapter?

This chapter contains the following topics:

SLS Type 1

Collect Application Data

Before starting to configure the SLS function, you must collect the following data:

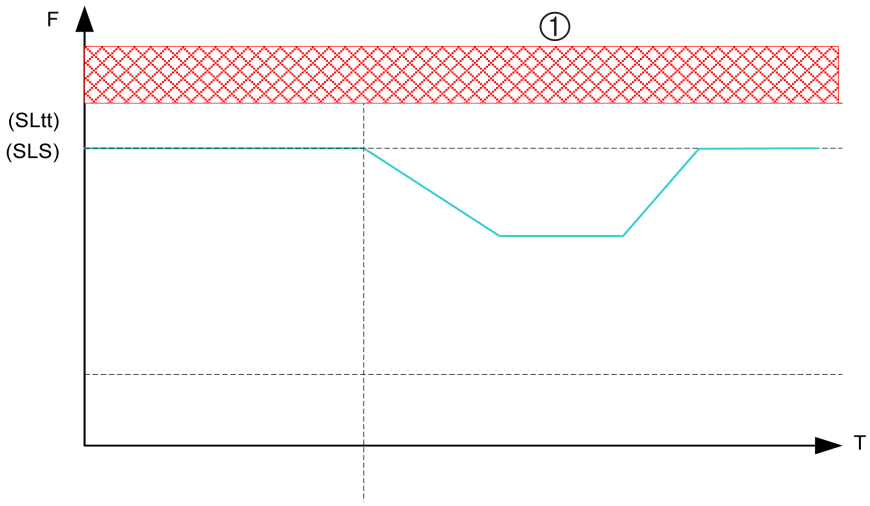
Code	Description	Unit	Comment
FrS	**[Rated motor freq.]**	Hz	See motor nameplate
nSP	**[Rated motorspeed]**	rpm	See motor nameplate
ppn	Motor pole pair number	–	See motor nameplate
Fmax(SLS)	Maximum motor frequency during SLS type 1	Hz	Maximum motor frequency when the SLS type 1 function: ● is about to be activated ● is used

First, calculate the rated motor slip frequency Fslip (Hz). It will then be used:

$$Fslip = FrS - \frac{Nsp \times ppn}{60}$$

To Configure the Function

Overview of diagram



①: Trip area, **SLtt**: SLS Tolerance Threshold, **SLS**: Maximum motor frequency during SLS type 1, F: Frequency, T: Time

Standstill Level

The recommended standstill level is: *SSSL = Fslip*

If the application requires a different standstill level, it can be set accordingly with the SSSL parameter.

Protection Threshold

The SLS tolerance threshold is computed by: *SLtt = 1.2 x Fmax(SLS) + Fslip*

Testing and Adjusting the Configuration

When configuration is complete, test the SLS function to check it behaves as expected.

Context	Drive Status	Adjustment
SLS activated and motor running at the fixed setpoint frequency	● SAFF detected fault ● SFFE.7 = 1	Motor frequency has reached the tolerance threshold. Increase SLtt in steps of 1 Hz and test again until the SAFF no longer occurs: *SLtt>1.2 x Fmax(SLS) + Fslip* If there is a big difference between the corrected SLtt and the recommended one, investigate the reason for frequency instability.

Example

Code	Description	Unit
FrS	**[Rated motor freq.]**	50 Hz
nSP	**[Rated motorspeed]**	1350 rpm
ppn	Motor pole pair number	2
Fmax (SLS)	Maximum motor frequencyduring SLS type 1	50 Hz

With these numerical values, the configuration of SLS type 1 is:

$$Fslip = 50 - \frac{1350 \times 2}{60} = 5 \text{ Hz}$$

SSSL = Fslip = 5 *Hz*

SLtt = 1.2 x *Fmax(SLS)* + *Fslip* = 1.2 x 50 + 5 = 65 *Hz*

SLS Type 2 and Type 3

Collect Application Data

Before starting to configure the SLS function, you must collect the following data:

Code	Description	Unit	Comment
FrS	**[Rated motor freq.]**	Hz	See motor nameplate
nSP	**[Rated motorspeed]**	rpm	See motor nameplate
ppn	Motor pole pair number	–	See motor nameplate
Fmax (SLS) (1)	Maximum motor frequency when SLS type 2/3 is activated	Hz	Maximum motor frequency when the SLS type 2/3 function is about to be activated
dEC	**[Deceleration]**	Hz	User defined. Ramp deceleration used on SLS activation

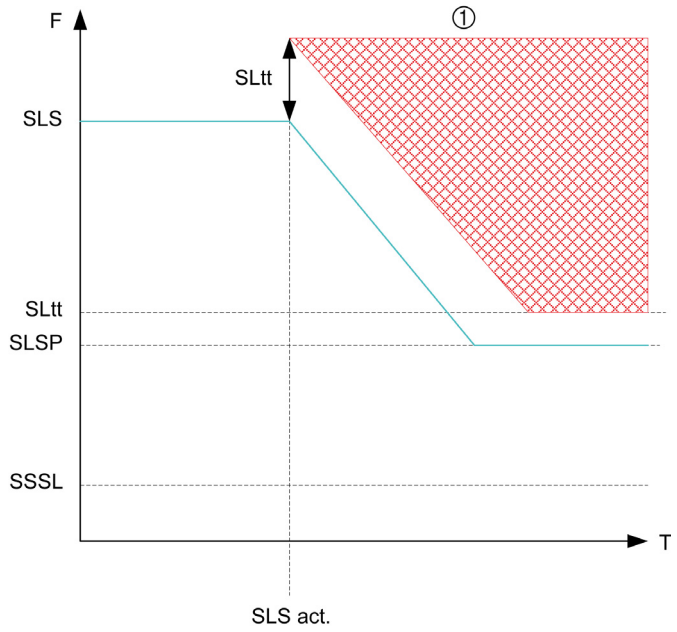
(1) Before configuring the SLS function, you must define Fsetpoint (SLS) and dEC.

First, calculate the rated motor slip frequency Fslip (Hz). It will then be used:

$$Fslip = FrS - \frac{Nsp \times ppn}{60}$$

To Configure the Function

Overview of diagram



①: Trip area, **SLS**: Maximum motor frequency, **SLtt**: SLS Tolerance Threshold, F: Frequency, T: Time, **SLSP**: SLS Setpoint, **SSSL**: Standstill level, **SLS Act.**: SLS Activation

Standstill Level

The recommended standstill level is: *SSSL = Fslip*

If the application requires a different standstill level, it can be set accordingly with the SSSL parameter.

Ramp Value and Ramp Unit

Depending on the user–selected deceleration, set the **[SS1 ramp value]** SSrt and **[SS1 ramp unit]** SSrU parameters according to the deceleration range, which includes dEC, and the available accuracy:

Min	Max	Accuracy	SSrt	SSrU
0.1 Hz/s	599 Hz/s	0.1 Hz/s	1 Hz/s	dEC
599 Hz/s	5990 Hz/s	1 Hz/s	10 Hz/s	dEC/10
5990 Hz/s	59900 Hz/s	10 Hz/s	100 Hz/s	dEC/100

SLS Setpoint

Set the SLS setpoint parameter (SLSP) to: *SLSP= Fsetpoint (SLS)*

Protection Threshold

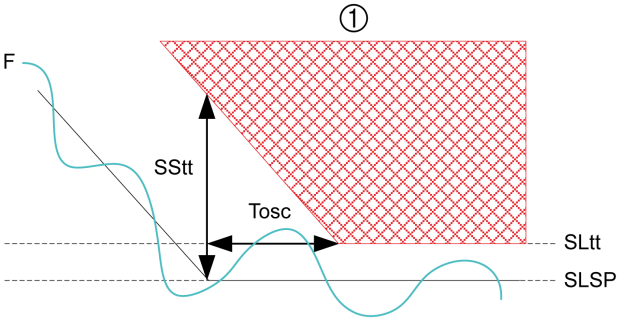
The SLS tolerance threshold is calculated by: *SLtt = 1.2 x SLSP + Fslip*

And the SS1 ramp trip threshold is calculated by: *SLtt = 0.2 x Fmax(SLS) + (SLtt – SLSP – Fslip)*

Testing and Adjusting the Configuration

When configuration is complete, test the SLS function to check it behaves as expected.

If a SAFF detected fault occurs during the test, check the following troubleshooting rules:

Context	Drive Status	Adjustment
SLS activated and deceleration ramp in progress	• SAFF detected fault • SFFE.3 = 1	Motor frequency has reached the trip zone. Increase SStt in steps of 1 Hz and test again until the SAFF no longer occurs: *SLtt>0.2 x Fmax(SLS) + (SLtt – SLSP – Fslip)* If there is a big difference between the corrected SStt and the recommended one, investigate the reason for frequency instability.
SLS activated and end of ramp at SLSP frequency	• SAFF detected fault • SFFE.3 = 1 or • SFFE.7 = 1	Motor frequency stabilization at SLSP takes too long and has reached the trip zone.  ①: Trip area, Tosc: T oscillation, F: Frequency The oscillations must be lower than SLtt before the time T(oscillation) elapses. If not, the frequency will reach the trip zone and an SAFF detected fault will be triggered. The relationship between SStt and T(oscillation) is: $T\ (osc) = \frac{SSST - (SLTT - SLSP - Fslip)}{SSRT \times SSRU}$ If more time is required for stabilization, increase SStt in steps of 1 Hz and test again until the SAFF no longer occurs. If the elapsed time required for oscillations to be less than SLtt is known, calculate SStt directly: *SStt = T(oscillation)new x SSrt x SSRU + (SLtt – SLSP – Fslip*) If there is a big difference between the corrected SStt and the recommended one, investigate the reason for frequency instability.
SLS activated and motor running at SLSP frequency	• SAFF detected fault • SFFE.7 = 1	Motor frequency has reached the tolerance threshold. Increase SLtt in steps of 1 Hz and test again until the SAFF no longer occurs: *SLtt* > 1.2 *x SLSP + Fslip* If there is a big difference between the corrected SStt and the recommended one, investigate the reason for frequency instability.

Example

Code	Description	Unit
FrS	Rated motor frequency	50 Hz
nSP	Rated motor speed	1350 rpm
ppn	Motor pole pair number	2
Fmax(SLS)	Maximum motor frequencyduring SLS type 2/3 is activated	50 Hz
Fsetpoint(SLS)	Motor frequancy setpoint	15 Hz
dEC	Ramp deceleration	20 Hz/s

With these numerical values, the configuration of SLS type 2 and 3 is:

$$Fslip = 50 - \frac{1350 \times 2}{60} = 5 \text{ Hz}$$

SSSL = Fslip = 5 *Hz*

dEC = 20 Hz/s which is between 0.1 Hz/s and 599 Hz/s so *SSRU* = 1 Hz/s and *SSrt* = 20.0

SLSP = Fsetpoint(SLS) = 15 *Hz*

SLtt = 1.2 x *SLSP)* + *Fslip* = 1.2 x 15 + 5 = 23 *Hz*

SStt = 0.2 x *Fmax(SLS)* + *(SLtt – SLSP – Fslip* = 0.2 x 50 + (23 – 15 – 5) = 13 *Hz*

$$T\ (oscillation) = \frac{SSSt - (SLtt - SLSP - Fslip)}{SSrt \times SSrU} = \frac{13 - (23 - 15 - 5)}{20 \times 1} = 500\ ms$$

In this example, the frequency oscillations are allowed to be higher than SLtt for 500 ms.

SS1

Collect Application Data

Before starting to configure the SS1 function, you must collect the following data:

Code	Description	Unit	Comment
FrS	Rated motor frequency	Hz	From motor
nSP	Rated motor speed	rpm	From motor
ppn	Motor pole pair number	–	From motor
Fmax(SS1)	Maximum motor frequencyduring SLS type 1	Hz	Maximum motor frequencywhen the SLS type 1 function: ● is about to be activated ● is used
dEC	Ramp deceleration	Hz/s	User defined. Ramp deceleration used on SLS activation

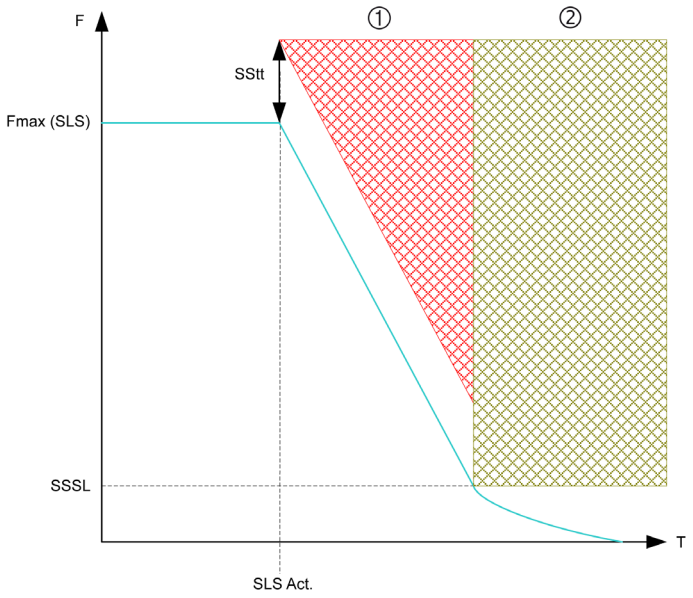
Before configuring the SS1 function, you must define dEC.

First, calculate the rated motor slip frequency Fslip (Hz).

$$Fslip = FrS - \frac{Nsp \times ppn}{60}$$

To Configure the Function

Overview of diagram



①: Trip areal, ②: STO ramp, SStt: SS1 trip threshold, F: Frequency, T: Time, Fmax: Maximum motor frequency, SSSL: Stand still level, **[SLS Act.]**: SLS activation

Standstill Level

The recommended standstill level is: *SSSL = Fslip*

If the application requires a different standstill level, it can be set accordingly with the SSSL parameter.

Ramp Value and Ramp Unit

Depending on the user–selected deceleration, set the SSrt (ramp value) and SSrU (ramp unit) parameters according to the deceleration range, which includes dEC, and the available accuracy:

Min	Max	Accuracy	SSrU	SSrt
0.1 Hz/s	599 Hz/s	0.1 Hz/s	1 Hz/s	dEC
599 Hz/s	5990 Hz/s	1 Hz/s	10 Hz/s	dEC/10
5990 Hz/s	59900 Hz/s	10 Hz/s	100 Hz/s	dEC/100

Protection Threshold

The SS1 ramp trip threshold is calculated by: *SStt = 0.2 x Fmax (SS1)*

Testing and Adjusting the Configuration

When configuration is complete, test the SLS function to check it behaves as expected.

If a SAFF detected fault occurs during the test, check the following troubleshooting rules:

Context	Drive Status	Adjustment
SLS activated and deceleration ramp in progress	• SAFF detected fault • SFFE.3 = 1	Motor frequency has reached the trip zone.Increase SStt in steps of 1 Hz and test again until the SAFF no longer occurs: *SStt>0.2 x Fmax(SS1)* If there is a big difference between the corrected SStt and the recommended one, investigate the reason for frequency instability.

Example

Code	Description	Unit
FrS	Rated motor frequency	50 Hz
nSP	Rated motor speed	1350 rpm
ppn	Motor pole pair number	2
Fmax(SS1)	Maximum motor frequencywhen SS1 is activated	50 Hz
dEC	Ramp deceleration	20 Hz/s

With these numerical values, the configuration of SS1 is:

$$Fslip = 50 - \frac{1350 \times 2}{60} = 5 \text{ Hz}$$

SSSL = Fslip = 5 *Hz*

dEC = 20 Hz/s which is between 0.1 Hz/s and 599 Hz/s so *SSrU* = 1 Hz/s and *SSrt* = 20.0

SStt = 0.2 x *Fmax(SS1)* = 0.2 x 50 = 10 *Hz*

Incompatibility Between Safety Functions

4

What Is in This Chapter?

This chapter contains the following topics:

Limitations

Type Of Motor

The SLS and SS1 functions on ATV32 are **only applicable for asynchronous motors** with open-loop control profile.

STO can be used with synchronous and asynchronous motors.

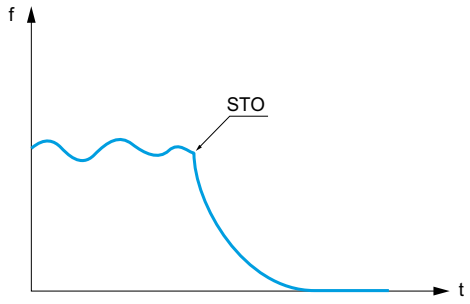
Prerequisites for Using Safety Functions

Some parameters have to be fulfilled for correct operation:

- The motor size is adequate for the application and is not at the limit of its capacity.
- The drive size has been correctly chosen for the line supply, sequence, motor and application and is not at the limit of their capacities as stated in the catalog.
- If required, the appropriate options are used.
  Example: dynamic braking resistor or motor choke.
- The drive is correctly set up with the right speed loop and torque characteristics for the application; the reference speed profile is perfectly controlled by the drive control loop.

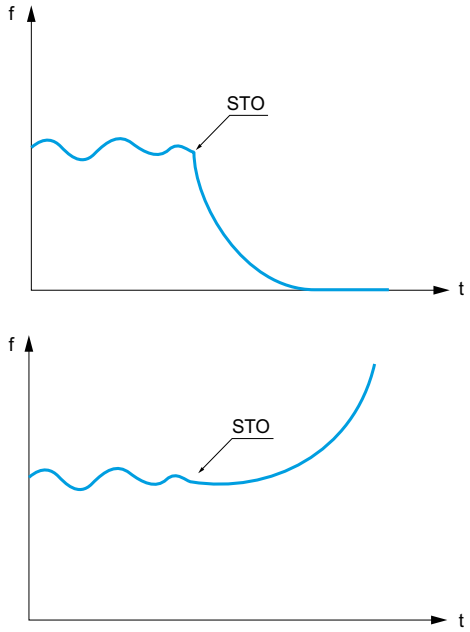
Authorized Safety Function Application

Sudden stopping is allowed after an STO request or freewheel stop.



Unauthorized Safety Function Application

Applications with acceleration of the load after drive shutdown or where there are long/permanent regenerative braking cycles are not allowed. Sudden stopping is not allowed after an STO request or freewheel stop.



Examples: vertical conveyors, vertical hoists, lifts or winders.

Limitation on Logical Input

- Sink mode is incompatible with the safety function. If you use the safety function, you need to wire your logic input in source mode.
- PTC on LI6 is incompatible with the safety function set on this input. If you are using the safety function on LI6, don't set the PTC switch to PTC
- If you are using the pulse input, you can't set the safety function on LI5 at the same time.

Fault Inhibition

Description

For some kinds of detected fault, **[Fault inhibit assign.]** (InH) can be requested to avoid the drive stopping when the fault occurs.

The purpose of fault inhibition is not compatible with the safety function.

When a safety function is active, a detected fault generated by the safety function SAFF cannot be inhibited.

Configuration Download

Description

In order to protect people and machine the configuration download of safe parameters is impossible with any kind of tools. Configuration download as SoMove, keypad, Simple-loader, Multi-loader, Ethernet or mobile phone are not possible.

With a configuration download, the parameters are downloaded in the drive, except the safe parameters.

The user can transfer a configuration in all situations. If a safety function has been activated, the functions using these same LI are no longer configured.

NOTE: If the downloaded configuration have functions (Preset speed,...) on LI3-4-5-6 and if the drive has a safety function configured on LI, safety function will not be erased. It is the functions that have the same LI as safety functions that are not transferred. Multiconfiguration/multimotor and macro configuration obey the same rules.

Factory settings

Description

If the drive is in safe mode and you activate the factory settings, only non-safety parameters will be downloaded to the drive. Safety parameters are not affected by the factory settings.

Priority Between Safety Functions

Description

1. STO has the highest priority. If the STO function is triggered, a Safe Torque Off is performed regardless of which other functions are active.
2. SS1 has medium priority in relation to the other safety functions.
3. SLS has the lowest priority.

Priority Between Safety and Drive Functions

Priority Table

o: Compatible functions

x: Incompatible functions

⇧ ⇦: The function indicated by the arrow has priority over the other.

Drive function	SLS	SS1	STO
[HIGH SPEED HOISTING] HSH -	⇧	⇧	⇧
[+/- SPEED] UPd -	⇧	⇧	⇧
[Skip Frequency] JPF	⇧	o	o
[Low speed time out] tLS	⇧	⇧	⇧
[MULTIMOTORS] nMC -	Configuration must be consistent with the 3 motors		o
[PRESET SPEEDS] PSS -	⇧	⇧	⇧
[PID REGULATOR] PId -	⇧	o	o
[RAMP] rPt -	⇧	⇧	⇧
[Freewheel stop ass.] nSt	⇦	⇦	⇧
[Fast stop assign.] FSt	⇦	⇧	⇧
[TRAVERSE CONTROL] trO -	o : both function's configurations mustn't overlap. o : motor frequency can exceed SLS set-point (but not the trip area)	⇧	⇧
[EXTERNAL FAULT] EtF -	⇦: NST x : DCI ⇧: fast, ramp, fallback, maintain	⇦: NST x : DCI ⇧: fast, ramp, fallback, maintain	⇦: NST ⇧: DCI ⇧: fast, ramp, fallback, maintain
[AUTOMATIC RESTART] Atr -	⇧	⇧	⇧
[FAULT RESET] rSt -	⇧	⇧	⇧
[JOG] JOG -	⇧	⇧	⇧
[STOP CONFIGURATION] Stt -			
[Ramp stop] rMP	⇧: SLS ramp ⇦: SLS steady	⇧	⇧
[Fast stop] FSt	⇧: SLS ramp ⇦: SLS steady	⇧	⇧
[DC injection] dCI	x	x	⇧
[Freewheel] nSt	⇦	⇦	⇧
[+/-SPEED AROUND REF.] SrE -	⇧	⇧	⇧
[POSITIONING BY SENSORS] LPO -	⇧: SLS ramp & position is not respected	⇧: Position is not respected	⇧
[RP input] PFrC	o : if LI5 is not use by the safety function	o : if LI5 is not use by the safety function	o : if LI5 is not use by the safety function
[Underload Detection] ULF	⇧	⇧	⇧
[Overload Detection] OLC	⇧	⇧	⇧
[Rope slack config.] rSd	x	x	x
[UnderV. prevention] StP	x	x	⇧

Drive function	SLS	SS1	STO
[AUTO DC INJECTION] AdC -	x	x	⇧
[DC injection assign.] dC I	x	x	⇧
[Load sharing] LbA	o : if the adapted load sharing frequency reaches the trip area, SAFF fault is trigged	⇧	⇧
[Motor control type] Ctt			
[Standard] Std	x	x	o
[SVC V] UUC	o	o	o
[V/F Quad.] UF9	x	x	o
[Energy Sav.] nLd	x	x	o
[Sync. mot.] SYn	x	x	o
[V/F 5pts] UF5	x	x	o
[OUTPUT PHASE LOSS] OPL	x : Motor output phase loss is detected by the safe function	x : Motor output phase loss is detected by the safe function	o
[Output cut] OAC	x	x	x
[Dec ramp adapt.] brA	o : if ramp adaptation reaches a trip area, SAFF fault is triggered	o : if ramp adaptation reaches a trip area, SAFF fault is triggered	⇧
[REF. OPERATIONS] OAI -	⇧	⇧	o
[2 wire] 2C	o : Run order on transition ⇧ Run order on level is not compatible	o : Run order on transition ⇧ Run order on level is not compatible	o : Run order on transition ⇧ Run order on level is not compatible
[PTC MANAGEMENT] PtC -	o : if LI6 is not use by the safety function	o : if LI6 is not use by the safety function	o : if LI6 is not use by the safety function
[FORCED LOCAL] LCF -	⇧	⇧	o
[LI CONFIGURATION]	o : inactive if LI is used by safety function	o : inactive if LI is used by safety function	o : inactive if LI is used by safety function
[MULTIMOTORS/CONFIG]. nnC -	o : except safety parameters	o : except safety parameters	o : except safety parameters
[FAULT INHIBITION] InH	x	x	x
[Profile] CHCF	LI used by safety function can not be switched	LI used by safety function can not be switched	LI used by safety function can not be switched
[Macro configuration] CFG	⇧: Macro configuration could be overlapped if safety function use a logical input requested by the macro configuration	⇧: Macro configuration could be overlapped if safety function use a logical input requested by the macro configuration	⇧: Macro configuration could be overlapped if safety function use a logical input requested by the macro configuration
[RAMP] rPt -	⇧: SLS ramp ⇦ : SLS steady	⇧	o
[Motor short circuit] SCF1	⇧	⇧	o
[Ground short circuit] SCF3	⇧	⇧	o
[Overspeed] SOF	⇧	⇧	o
[Sync. mot.] SYn	x	x	o
[Configuration Transfer]	o: except safety parameters	o: except safety parameters	o: except safety parameters
[Energy Sav.] nLd	x	x	o

For more information about these functions, see ATV32 Programming manual.

Safety Monitoring by HMI

5

What Is in This Chapter?

This chapter contains the following topics:

Status of Safety Functions

Description

With the HMI on the drive you can't configure safety functions, only monitoring is possible. There is one monitoring parameter for each safety function. See Introduction *(see page 12)* for more information about the safety function.

To access this parameter via the keypad or HMI: **[2 MONITORING]** (MON-)=> **[MONIT. SAFETY]** (SAF-)

- **[STO status]** (STO S): Status of the Safe Torque Off safety function
- **[SLS status]** (SLS S): Status of the Safely Limited Speed safety function
- **[SS1 status]** (SS 1S): Status of the Safe Stop 1 safety function

These statuses are not certified safety, they are informative.

For more information about these functions, see ATV32 Programming manual on www.schneider-electric.com.

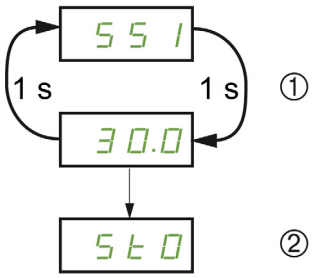
Dedicated HMI

Description

When a safety function is activated, certain dedicated messages can be displayed and certain status words can be set.

Embedded keypad and LED keypad:

Active safety function (STO, SS1, SLS) displayed alternately with the monitoring parameter. LED display on SS1 function:



①: Deceleration ramp, ② Drive is stopped. Wait safety function acknowledge.

Detected Fault Generated by the Drive

Description

When a fault occurs on the safety function, the drive displays **[Safety fault]** ($SAFF$). It can only be reset after powering the drive OFF/ON.

To see more information you can access the register to find out the possible reasons for tripping.

Safety Function Fault Error register ($SFFE$) accessible with a graphic keypad:

[DRIVE MENU] --> **[MONITORING]** --> **[DIAGNOSTICS]** --> **[MONITORING]** --> **[DIAGNOSTICS]** --> **[MORE FAULT INFO]** Safety Function Fault Error register

Or

[DRIVE MENU] --> **[MONITORING]** --> **[MONIT. SAFETY]** Safety Function Fault Error

It can also be accessed with the integrated display terminal **DRI** → **MON** → **SAF** → **SFFE**

SFFE register

Bit	Description
Bit0=1	Logic input debounce time-out (check value of Debounce time LIDT according to the application)
Bit1	Reserved
Bit2=1	Motor speed sign change during SS1 ramp
Bit3=1	Motor speed reached SS1 trip zone
Bit4	Reserved
Bit5	Reserved
Bit6=1	Motor speed sign change during SLS limitation
Bit7=1	Motor speed reached SS1 trip zone
Bit8	Reserved
Bit9	Reserved
Bit10	Reserved
Bit11	Reserved
Bit12	Reserved
Bit13=1	Not possible to measure the motor speed (check the motor wiring connection)
Bit14=1	Motor ground short-circuit detected (check the motor wiring connection)
Bit15=1	Motor phase to phase short-circuit detected (check the motor wiring connection)

This parameter is reset after powering OFF/ON.

Technical Data

6

What Is in This Chapter?

This chapter contains the following topics:

Electrical Data

Logic Type

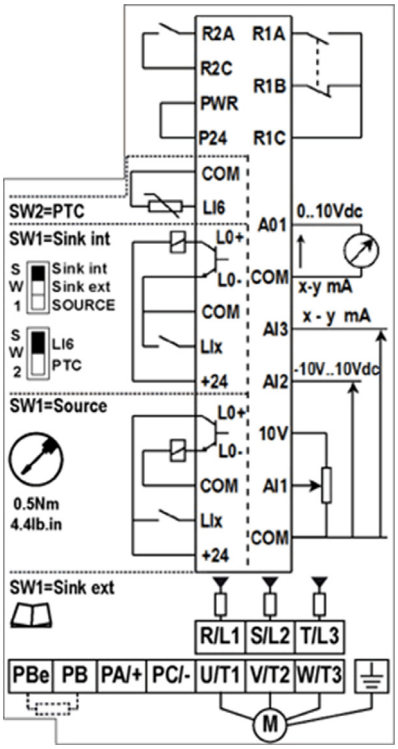
The drive logic inputs and logic outputs can be wired for logic type 1 or logic type 2.

Logic Type	Active State
1	The output draws current (Sink) Current flows to the input
2	The output supply flows from the input current Current (Source)

This safety function is only used in source mode, sink mode is not compatible with safety functions.

Signal inputs are protected against reverse polarity, outputs are protected against short-circuits. The inputs and outputs are galvanically isolated.

Cabling Label



Getting and Operating the Safety Function

Logic Input

General-purpose logic inputs can be used to trigger a safety function. Logic inputs have to be combined in pairs to obtain a redundant request. There are only 4 general-purpose logic inputs that can be linked to safety functions (LI3, LI4, LI5, LI6).The pairs of logic inputs are fixed and are:

- LI3 and LI4
- LI5 and LI6
- Another combination is only possible for the STO function: LI3 and STO

Pairs of logic inputs can only be assigned once when they are linked to a safety function. When you set a safety function on an LI you can't set another function (safety or other) on this LI. If you set a non-safety function on an LI you can't set a safety function on this LI.

The SISTEMA Software

The SISTEMA software allows machine developers and testers of safety-related machine controls to evaluate the safety standard or level of their machine in the context of ISO 13849-1. The tool allows you to model the structure of safety-related control components based on the designated architectures, allowing automated calculation of the reliability standards with various levels of detail, including that of the Performance Level (PL).

The Altivar 32 Libraries are available from www.schneider-electric.com.

Preventa Safety Relays

Used for the creation of complex safety functions in machines, allowing management of the I/O, and also for protecting both the operator and the machine.

The Preventa range of products feature microprocessor-based technology using the redundancy principle, and are essential to ensure safe operation of dangerous machinery.

Safety Function Capability

PDS (SR) safety functions are part of an overall system

If the qualitative and quantitative safety objectives determined by the final application require some adjustments to ensure safe use of the safety functions, the integrator of the BDM (Background Debug Module) is responsible for these additional changes (for example, managing the mechanical brake on the motor).

Also, the output data generated by the use of safety functions (fault relay activation, error codes or information on the display, etc.) is not considered to be safety data.

Machine Application Function Configuration

		STO		**SS1 type C**		**SLS/STOSS1 type B**	
		STO	STO and LI3	STO with Preventa XPS ATE or XPS AV or equivalent	STO and LI3 with Preventa XPS AV or equivalent	LI3 LI4	LI5 LI6
Standard	IEC 61800-5-2 / IEC 61508 /	SIL2	SIL3	SIL2	SIL3	SIL2	
	IEC 62061 (1)	SIL2	SIL3 CL	SIL2 CL	SIL3 CL	SIL2 CL	
	EN 954-1 (2)	Category 3	Category 4	Category 3	Category 4	Category 3	
	ISO 13849-1 (3)	Category 3 PL d	Category 4 PL e	Category 3 PL d	Category 4 PL e	Category 3 PL d	
	IEC 60204-1 (4)	Category stop 0	Category stop 0	Category stop 1	Category stop 1		

(1) Because the IEC 62061 standard concerns integration, this standard distinguishes the overall safety function (which is classified SIL2 or SIL3 for ATV32 according to the diagrams Process system SF - Case 1 and Process system SF - Case 2 from components which constitute the safety function (which is classified SIL2 CL or SIL3 CL for ATV32).

(2) According to table 6 of IEC 62061 (2005).

(3) According to table 4 of EN 13849-1 (2008).

(4) If protection against supply interruption or voltage reduction and subsequent restoration is needed according to IEC 60204-1, a safety module type Preventa XPS AF or equivalent must be used.

Process Application Function Configuration

		STO		**SS1 type C**		**SLS SS1 type B STO**	
		STO	STO and LI3	STO with Preventa XPS ATE or XPS AV or equivalent	STO and LI3 with Preventa XPS AV or equivalent	LI3 LI4	LI5 LI6
Standard	IEC 61800-5-2 IEC 61508	SIL2	SIL3	SIL2	SIL3	SIL2	
	IEC 62061 (1)	SIL2 CL	SIL3 CL	SIL2 CL	SIL3 CL	SIL2 CL	

(1) Because the IEC 62061 standard concerns integration, this standard distinguishes the overall safety function (which is classified SIL2 or SIL3 for ATV32 according to diagrams CASE 1 and CASE 2 from components which constitute the safety function (which is classified SIL2 CL or SIL3 CL for ATV32).

Input Signal Safety Functions

Input signals safety functions	**Units**	**Value for LI3 to LI6**	**Value for STO**
Logic 0 (Ulow)	V	< 5	< 2
Logic 1 (Uhigh)	V	> 11	> 17
Impedance (24V)	kΩ	3.5	1.5
Debounce time	ms	< 1	< 1
Response time of safety function	ms	< 10	< 10

Summary of the Reliability Study

Function	Standard	Input	STO input	STO input & LI3	LI3 & LI4 or LI5 & LI6
STO	IEC 61508 Ed.2	SFF	96.7%	96%	94.8%
		PFD10y	7.26.10-4	4.00.10-4	2.44.10-3
		PFD1y	7.18.10-5	3.92.10-5	2.33.10-4
		PFHequ_1y	8.20 FIT (1)	4.47 FIT (1)	26.6 FIT (1)
		Type	B	B	B
		HFT	1	1	0
		DC	93.1%	91.5%	90%
		SIL capability	**2**	**3**	**2**
	IEC 62061 (1)	SIL CL capability	2	3	2
	EN 954-1 (2)	Category	3	4	3
	ISO 13849-1 (3)	PL	d	e	d
		Category	3	4	3
		MTTFd in years	13900	L1 3850L2 29300	4290
SS1 type BSLS	IEC 61508 Ed.2	SFF			93.3%
		PFD10y			2.72.10-3
		PFHequ_10y			31.1 FIT (1)
		Type			B
		HFT			0
		DC			78.7%
		SIL capability			2
	IEC 62061 (2)	SIL CL capability			2
	EN 954-1 (3)	Category			3
	ISO 13849-1 (4)	PL			d
		Category			3
		MTTFd in years			3670

(1) FIT: Failure In Time = Failure/10-9 hours.

(2) Because the IEC 62061 standard concerns integration, this standard distinguishes the overall safety function (which is classified SIL2 or SIL3 for ATV32 according to diagrams Process system SF - Case 1 and Process system SF - Case 2, from components which constitute the safety function (which is classified SIL2 CL or SIL3 CL for ATV32).

(3) According to table 6 of IEC 62061 (2005).

(4) According to table 4 of EN 13849-1 (2008).

Preventive annual activation of the safety function is recommended.

However, the safety levels can be obtained (with lower margins) without annual activation.

For the machine environment, a safety module is required for the STO function.

To avoid the use of a safety module, the Restart function parameters must be part of the safety function.

Please refer to the description of advantages of the safety module.

NOTE: The table above is not sufficient to evaluate the PL of a PDS. The PL evaluation has to be done at the system level. The fitter or the integrator of the BDM (Background Debug Module) has to do the system PL evaluation by including sensors data with numbers from the table above.

Debounce Time and Response Time

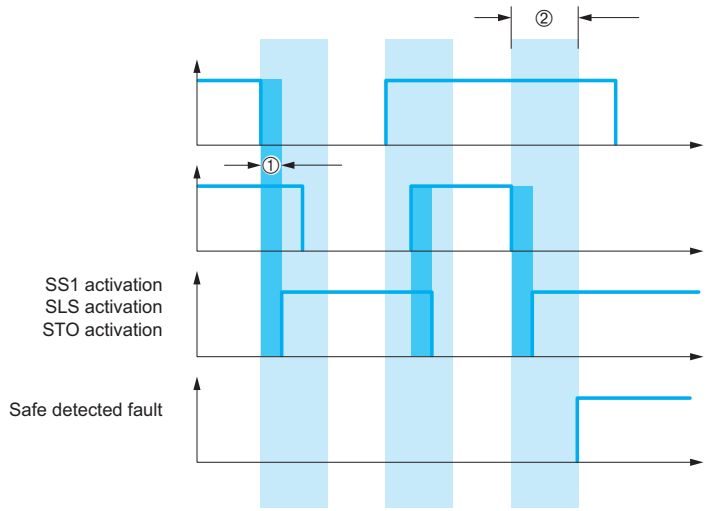
Description

On the ATV32 there are 2 parameters to configure LI for safety function (LI3, LI4, LI5, LI6).

The consistency of each pair of logical input is checked continuously.

[LI debounce time] L Idt: A logical state difference between LI3/LI4 or LI5/LI6 is allowed during debounce time, otherwise a detected fault is activated.

[LI response time] L Irt: The LI response time manages the safe function activation shift.



① : LI Response Time

② : LI Debounce Time

Certified Architectures

7

What Is in This Chapter?

This chapter contains the following topics:

Certified Architectures

NOTE: For certification relating to functional aspects, only the PDS(SR) (Power Drive System with safety-related functions) will be considered, not the complete system into which it is integrated to help to ensure the functional safety of a machine or a system/process.

These are the certified architectures:

- Multi-drive with the Safety module type Preventa XPS AF - Case 1
- Multi-drive with the Safety module type Preventa XPS AF - Case 2
- Multi-drive without the Safety module
- Safety with controller type Preventa XPS AV - Case 1
- Safety with controller type Preventa XPS AV - Case 2
- Safety with controller type Preventa XPS AF - Case 1
- Safety with controller type Preventa XPS AF - Case 2
- Safety according to IEC 61508 and IEC 60204-1 - Case 1
- Safety according to IEC 61508 and IEC 60204-1 - Case 2

The safety functions of a PDS(SR) (Power Drive System with safety-related functions) are part of an overall system.

If the qualitative and quantitative safety objectives determined by the final application require some adjustments to ensure safe use of the safety functions, the integrator of the BDM (Background Debug Module) is responsible for these additional changes (for example, managing the mechanical brake on the motor).

Also, the output data generated by the use of safety functions (fault relay activation, error codes or information on the display, etc.) is not considered to be safety data.

Multi-drive with the Safety module type Preventa XPS AF - Case 1

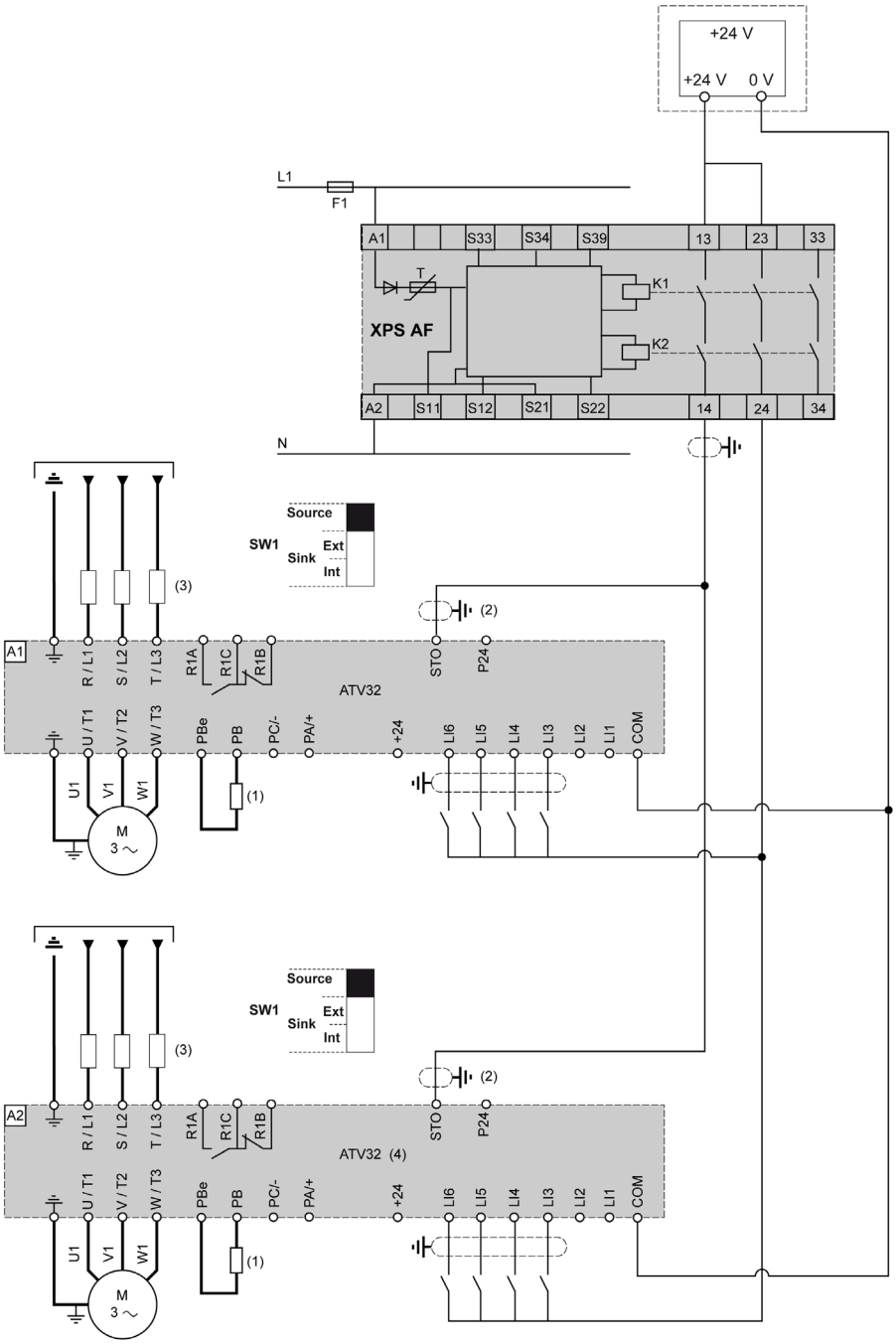
Multi-drive with the Safety module type Preventa XPS AF according to EN 954-1, ISO 13849-1 and IEC 60204-1 (Machine)

The following configurations apply to the diagram:

- STO category 4, PL e/SIL3 Machine with Safety module type Preventa XPS AF or equivalent and LI3 set to STO
- SLS category 3, PL d/SIL2 or SS1 type B category 3 on LI5/LI6

Or

- STO category 4, PL e/SIL3 Machine with Safety module type Preventa XPS AF or equivalent and LI3 set to STO
- LI4 and LI5/LI6 not set to a safety function



(1) Braking resistor, if used, (2) Standardized coaxial cable, type RG174/U according to MIL-C17 or KX3B according to NF C 93-550, external diameter 2.54 mm /0.09 in., maximum length 15 m / 49.21 ft. The cable shielding must be earthed, (3) Line choke, if used, (4) Multi-drives is possible with another drive (Example: ATV71 with PWR connection or Lexium servo drives)

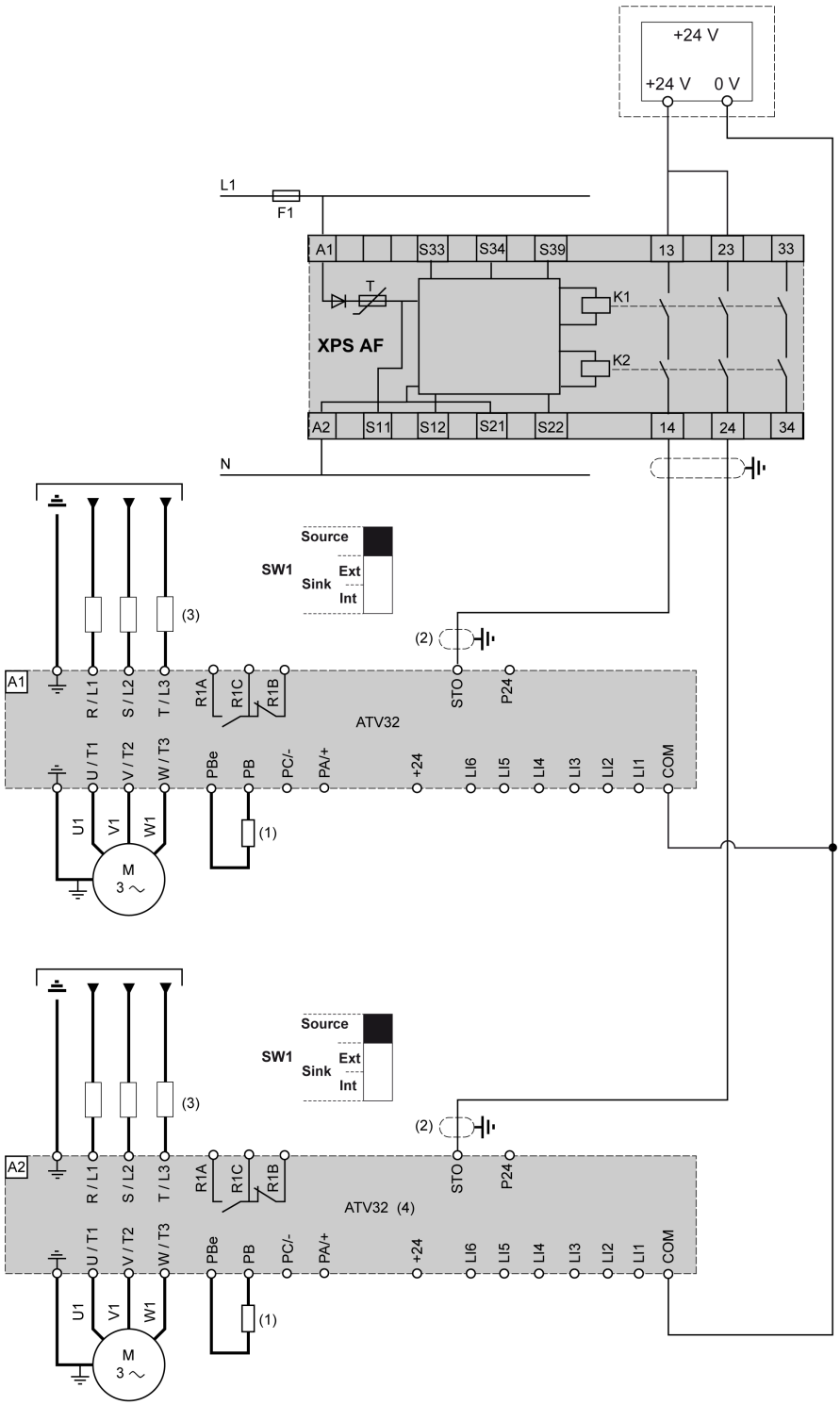
NOTE: For more information about the control terminal characteristics, please refer to the installation manual.

Multi-drive with the Safety module type Preventa XPS AF - Case 2

Multi-drive with the Safety module type Preventa XPS AF according to EN 954-1, ISO 13849-1 and IEC 60204-1 (Machine)

The following configurations apply to the diagram below:

- STO category 3, PL d/SIL2 Machine with Safety module type Preventa XPS AF or equivalent
- SLS category 3, PL d/SIL2 or SS1 type B category 3 on LI3/LI4 or LI5/LI6



(1) Braking resistor, if used, (2) Standardized coaxial cable, type RG174/U according to MIL-C17 or KX3B according to NF C 93-550, external diameter 2.54 mm /0.09 in., maximum length 15 m / 49.21 ft. The cable shielding must be earthed, (3) Line choke, if used, (4) Multi-drives is possible with another drive (Example: ATV71 with PWR connection or Lexium servo drives).

NOTE: For more information about the control terminal characteristics, please refer to the installation manual.

Multi-drive without the Safety module

Multi-drive without the Safety module type Preventa XPS AF according to IEC 61508

The following configurations apply to the diagram below:

- STO SIL2 on STO
- SLS SIL2 or SS1 type B SIL2 on LI3/LI4 or LI5/LI6

Or

- STO SIL2 on STO
- SLS or SS1 type B on LI3/LI4
- LI5/LI6 not set to a safety function

Or

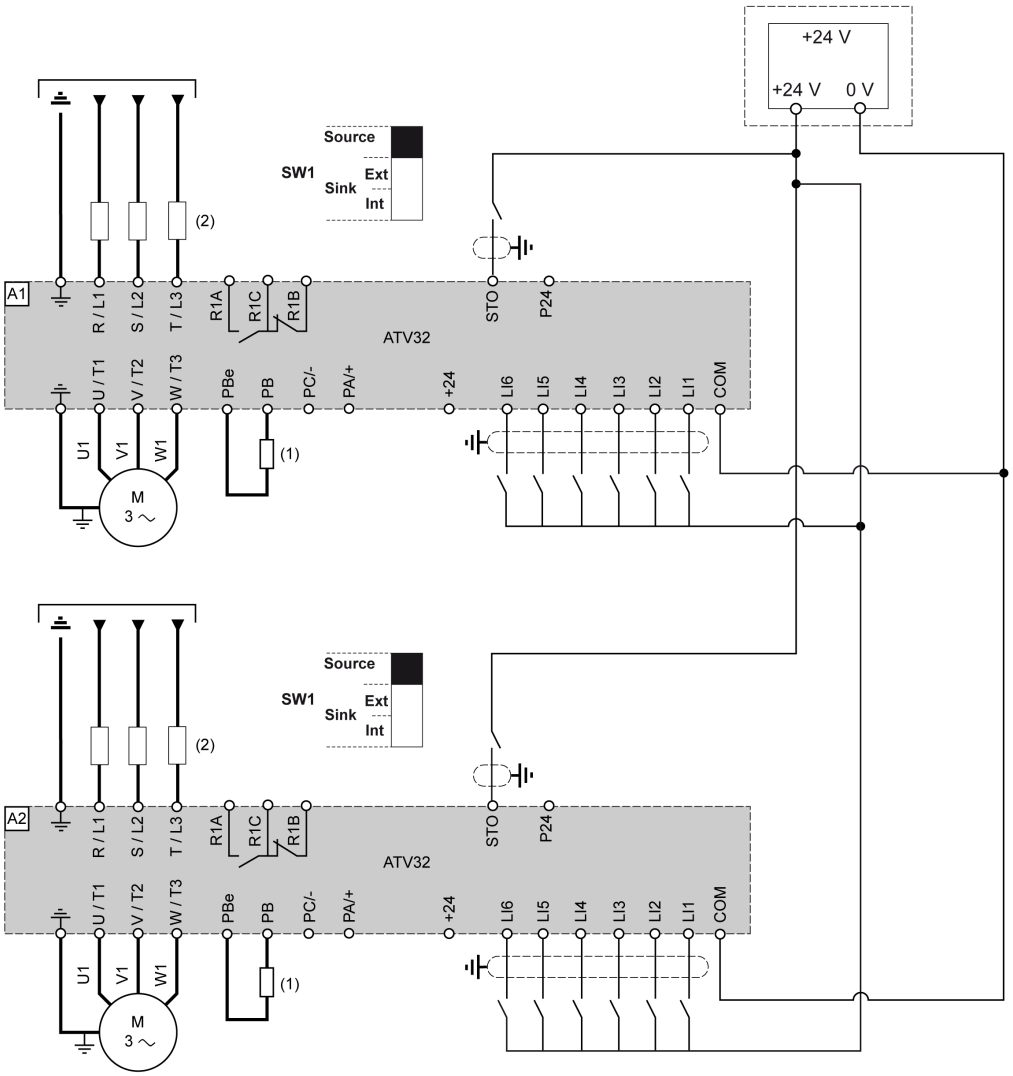
- STO SIL2 on STO
- LI3/LI4 and LI5/LI6 not set to a safety function

Or

- STO SIL3 on STO and LI3
- SLS SIL2 or SS1 type B SIL2 on LI5/LI6
- LI4 not set to a safety function

Or

- STO SIL3 on STO and LI3
- LI4 and LI5/LI6 not set to a safety function



(1) Braking resistor, if used, (2) Line chokes, if used.

NOTE: For more information about the control terminal characteristics, please refer to the installation manual.

Safety with controller type Preventa XPS AV - Case 1

Safety with controller type Preventa XPS AV according to EN 954-1, ISO 13849-1 and IEC 60204-1 (Machine)

The following configurations apply to the diagram below:

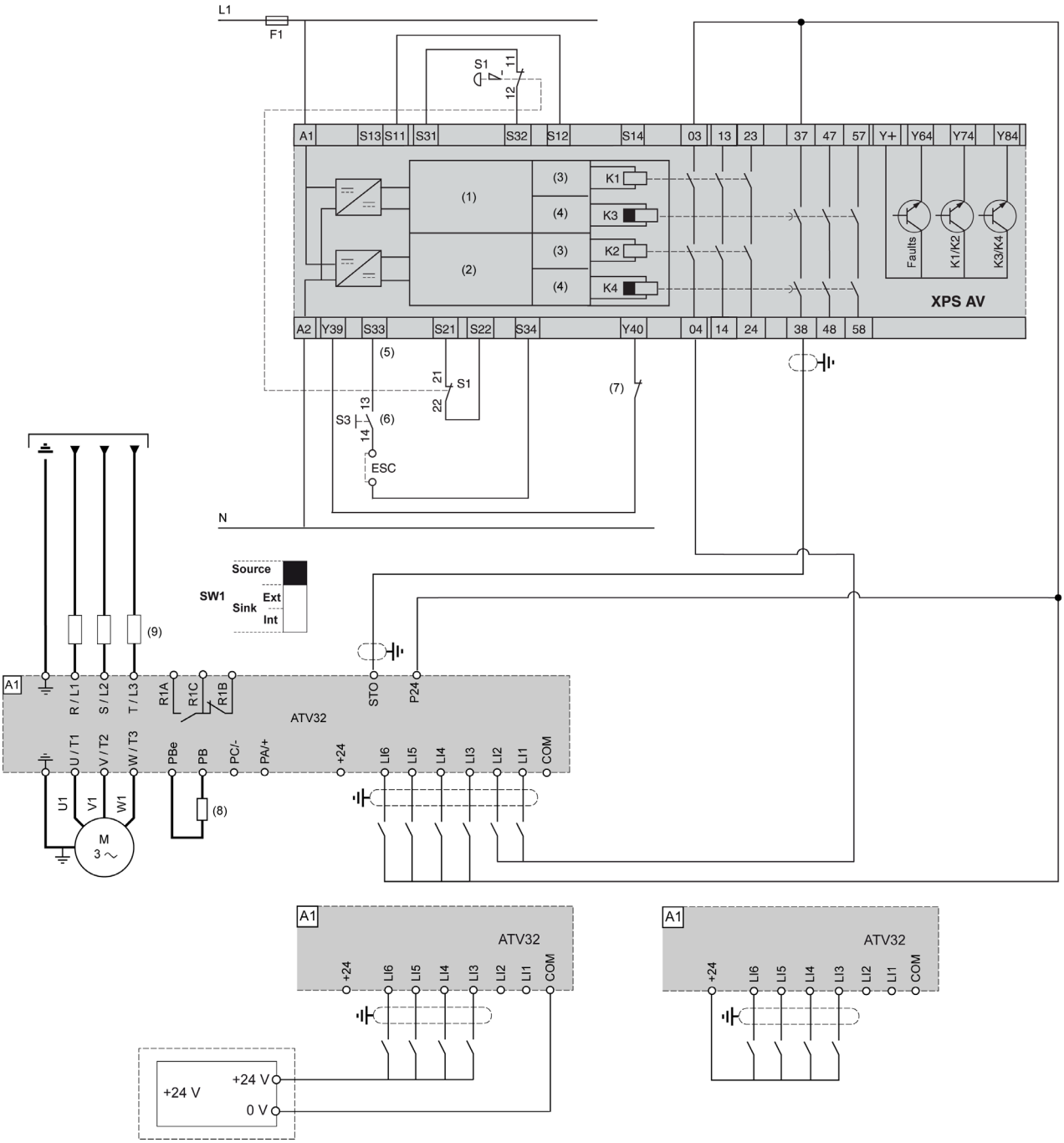
- SS1 type C category 3, PL d/SIL2 on STO with Safety module type Preventa XPS AV or equivalent

Or

- SS1 type C category 3, PL d/SIL2 on STO with Safety module type Preventa XPS AV or equivalent
- SLS category 3, PL d/SIL2 or SS1 type B category 3 on LI3/LI4
- LI5/LI6 not set to a safety function

Or

- SS1 type C category 3, PL d/SIL2 on STO and LI3 with Safety module type Preventa XPS AV or equivalent
- LI3/LI4 and LI5/LI6 not set to a safety function



(1) Channel 1 logic, (2) Channel 2 logic, (3) Output 1, (4) Output 2, (5) Emergency stop, (6) Start, (7) Time delay stop, (8) Braking resistor, if used, (9) Line chokes, if used

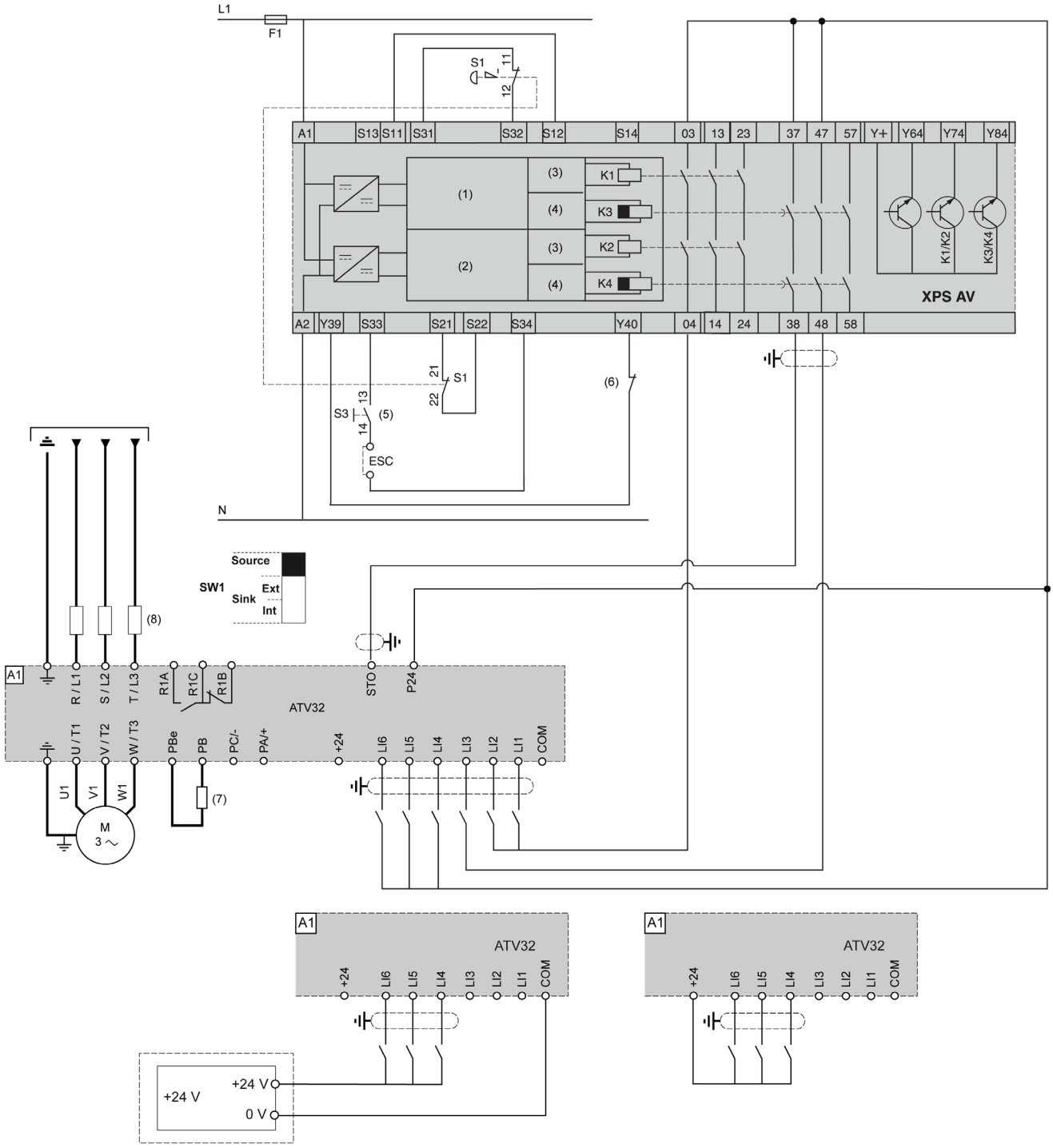
NOTE: For more information about the control terminal characteristics, please refer to the installation manual.

Safety with controller type Preventa XPS AV - Case 2

Safety with controller type Preventa XPS AV according to EN 954-1, ISO 13849-1 and IEC 60204-1 (Machine)

The following configurations apply to the diagram below:

- SS1 type C category 4, PL e/SIL3 on STO and LI3 with Safety module type Preventa XPS AV or equivalent
- SLS category 3, PL d/SIL2 or SS1 type B category 3 PL d/SIL2 on LI5/LI6
- LI4 not set to a safety function



(1) Channel 1 logic, (2) Channel 2 logic, (3) Output 1, (4) Output 2, (5) Emergency stop, (6) Time delay stop, (7) Braking resistor, if used, (8) Line chokes, if used.

NOTE: For more information about the control terminal characteristics, please refer to the installation manual.

Safety with controller type Preventa XPS AF - Case 1

Safety with controller type Preventa XPS AF according to EN 954-1, ISO 13849-1, IEC 62061 and 60204-1 (Machine)

The following configurations apply to the diagram below:

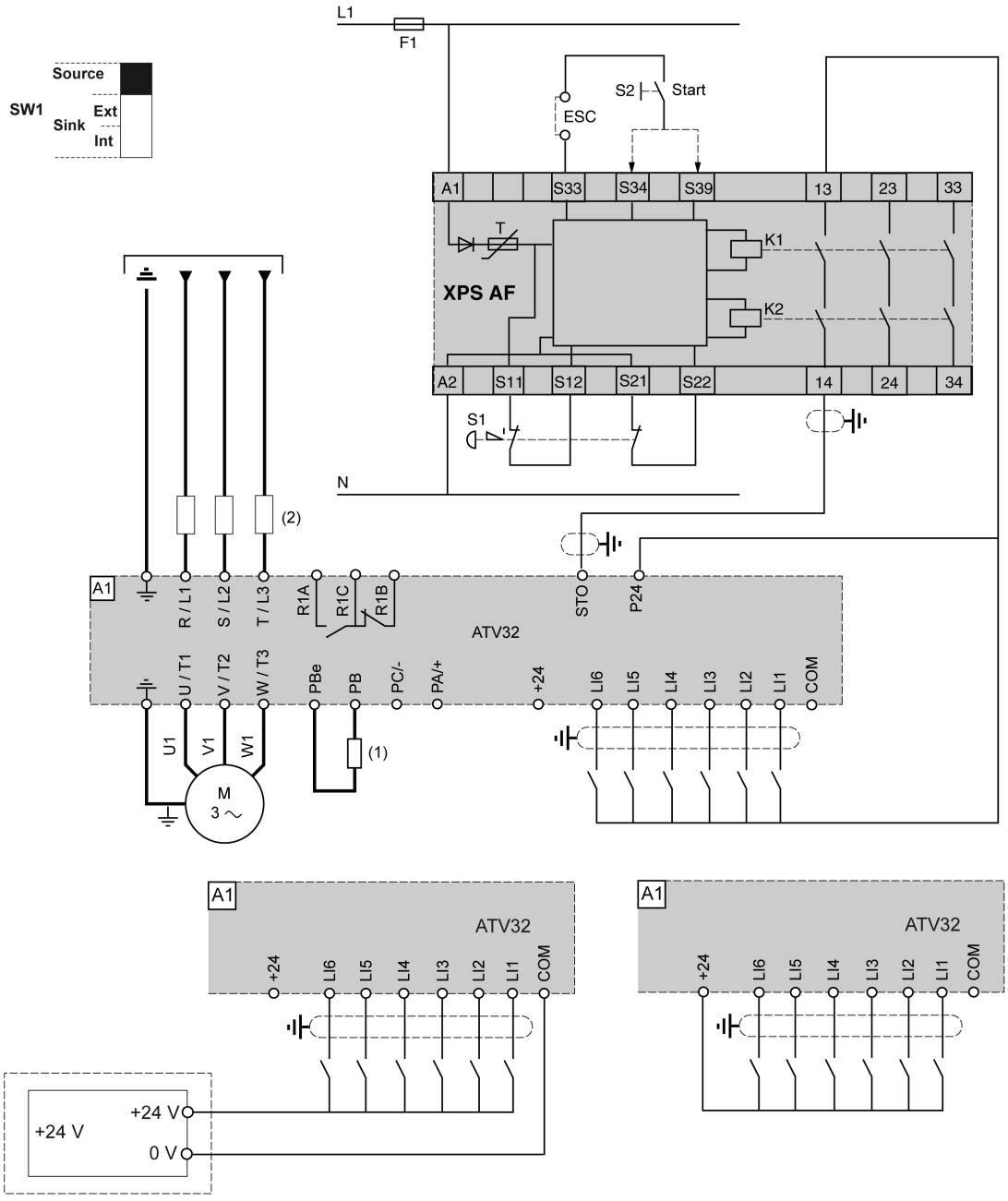
- STO category 3, PL d/SIL2 on STO with Safety module type Preventa XPS AF or equivalent
- SLS category 3, PL d/SIL2 or SS1 type B category 3 on LI3/LI4 or LI5/LI6

Or

- STO category 3, PL d/SIL2 on STO with Safety module type Preventa XPS AF or equivalent
- SLS category 3, PL d/SIL2 or SS1 type B category 3 on LI3/LI4
- LI5/LI6 not set to a safety function

Or

- STO category 3, PL d/SIL2 on STO with Safety module type Preventa XPS AF or equivalent
- LI3/LI4 and LI5/LI6 not set to a safety function



(1) Braking resistor, if used, (2) Line chokes, if used.

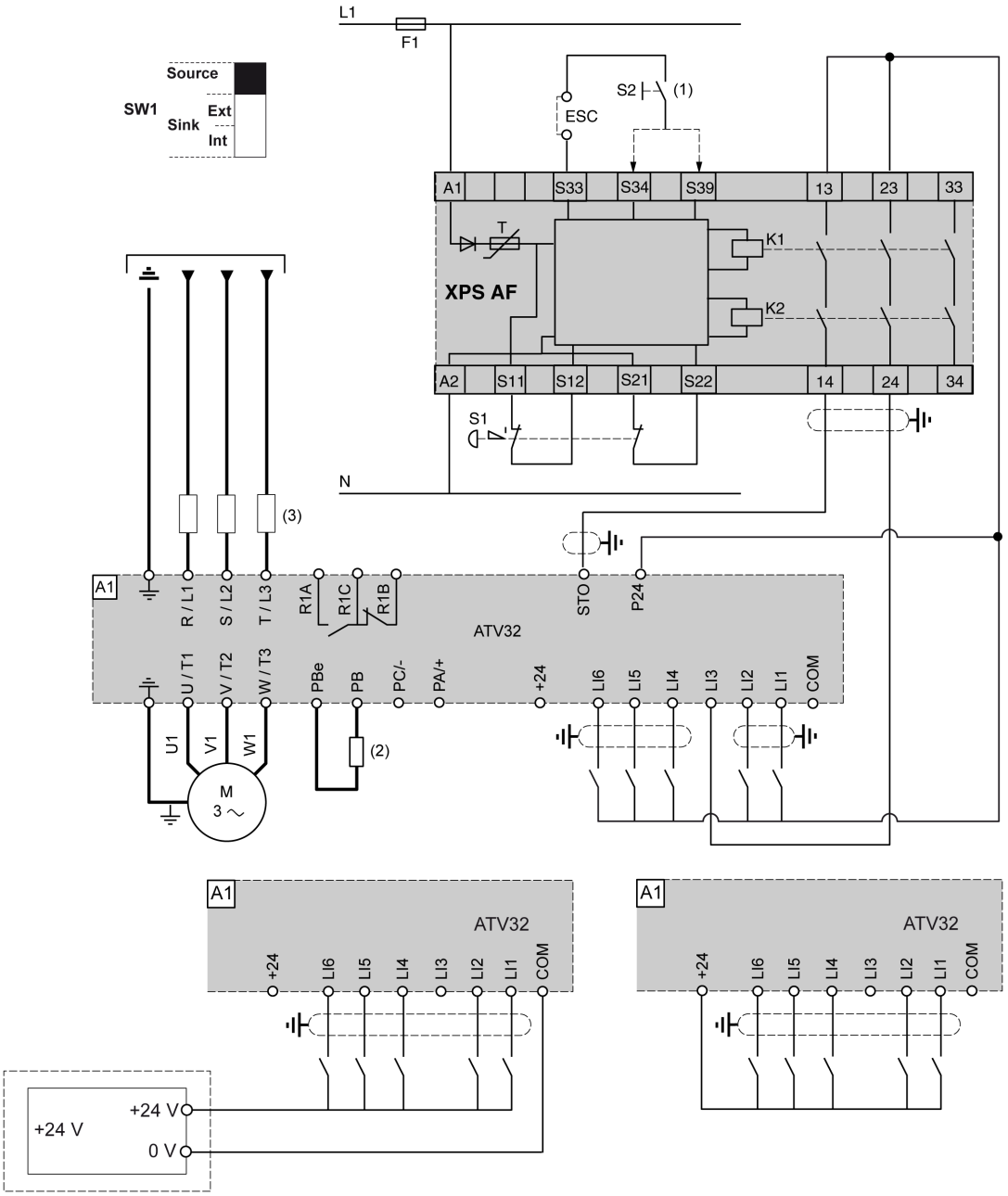
NOTE: For more information about the control terminal characteristics, please refer to the installation manual.

Safety with controller type Preventa XPS AF - Case 2

Safety with controller type Preventa XPS AF according to EN 954-1, ISO 13849-1, IEC 62061 and 60204-1 (Machine)

The following configurations apply to the diagram below:

- STO category 4, PL e/SIL3 on STO with Safety module type Preventa XPS AF or equivalent and LI3 set to STO
- SLS category 3, PL d/SIL2 or SS1 type B category 3 on LI5/LI6
- LI4 not set to a safety function



(1) Start, (2) Braking resistor, if used, (3) Line chokes if used.

NOTE: For more information about the control terminal characteristics, please refer to the installation manual.

Safety according to IEC 61508 and IEC 60204-1 - Case 1

Safety according to IEC 61508 and IEC 60204-1 without protection against supply interruption or voltage reduction and subsequent rotation

The following configurations apply to the diagram below:

- STO SIL2 on STO
- STO or SLS SIL2 or SS1 type B SIL2 on LI3/LI4 or LI5/LI6

Or

- STO SIL2 on STO
- STO or SLS or SS1 type B on LI3/LI4
- LI5/LI6 not set to a safety function

Or

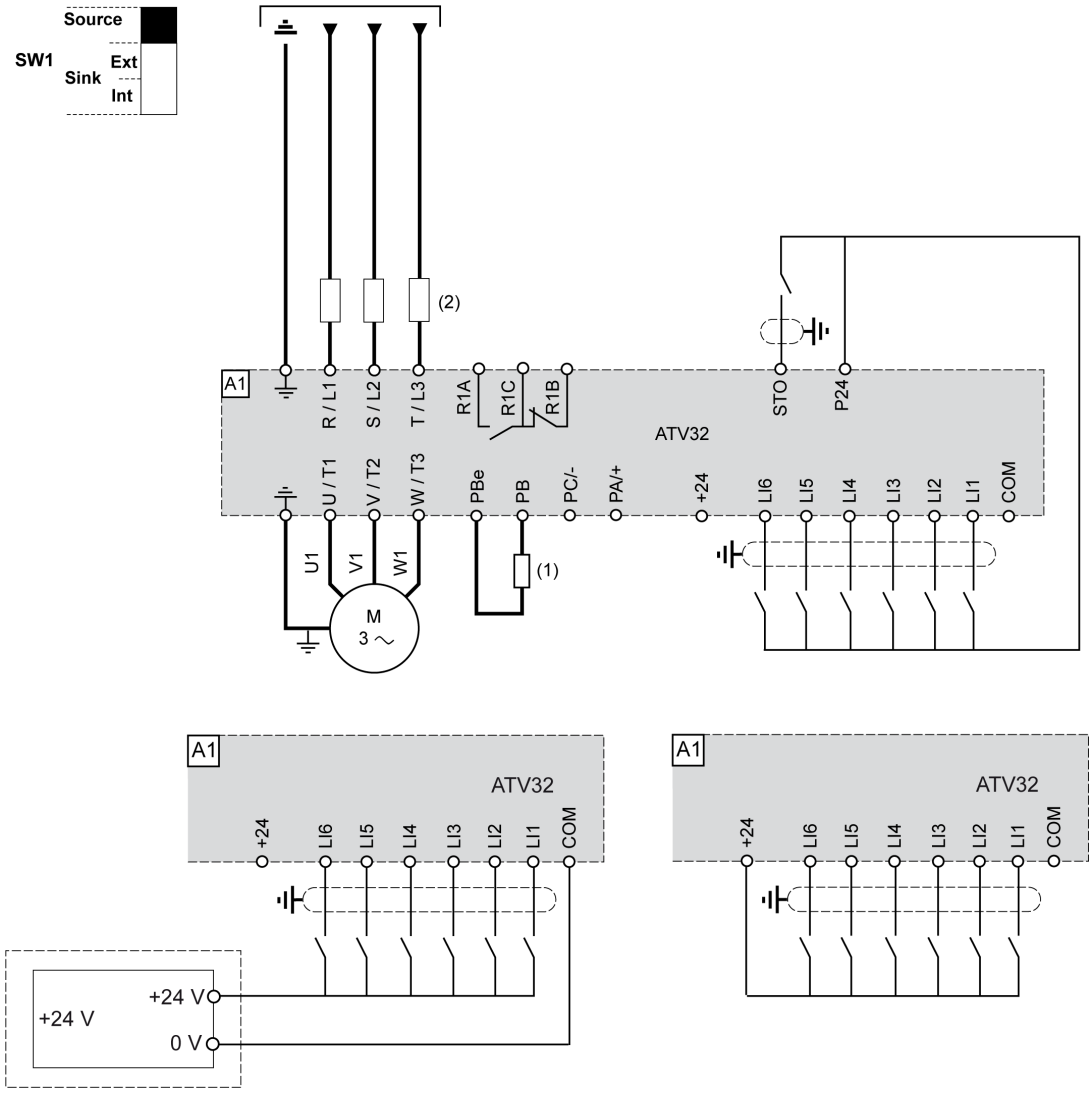
- STO SIL2 on STO
- LI3/LI4 and LI5/LI6 not set to a safety function

Or

- STO SIL3 on STO and LI3
- SLS SIL2 or SS1 type B SIL2 on LI5/LI6
- LI4 not set to a safety function

Or

- STO SIL3 on STO and LI3
- LI4 and LI5/LI6 not set to a safety function



(1) Braking resistor, if used, (2) Line chokes if used.

NOTE: For more information about the control terminal characteristics, please refer to the installation manual.

Safety according to IEC 61508 and IEC 60204-1 - Case 2

Safety according to IEC 61508 and IEC 60204-1 without protection against supply interruption or voltage reduction and subsequent rotation

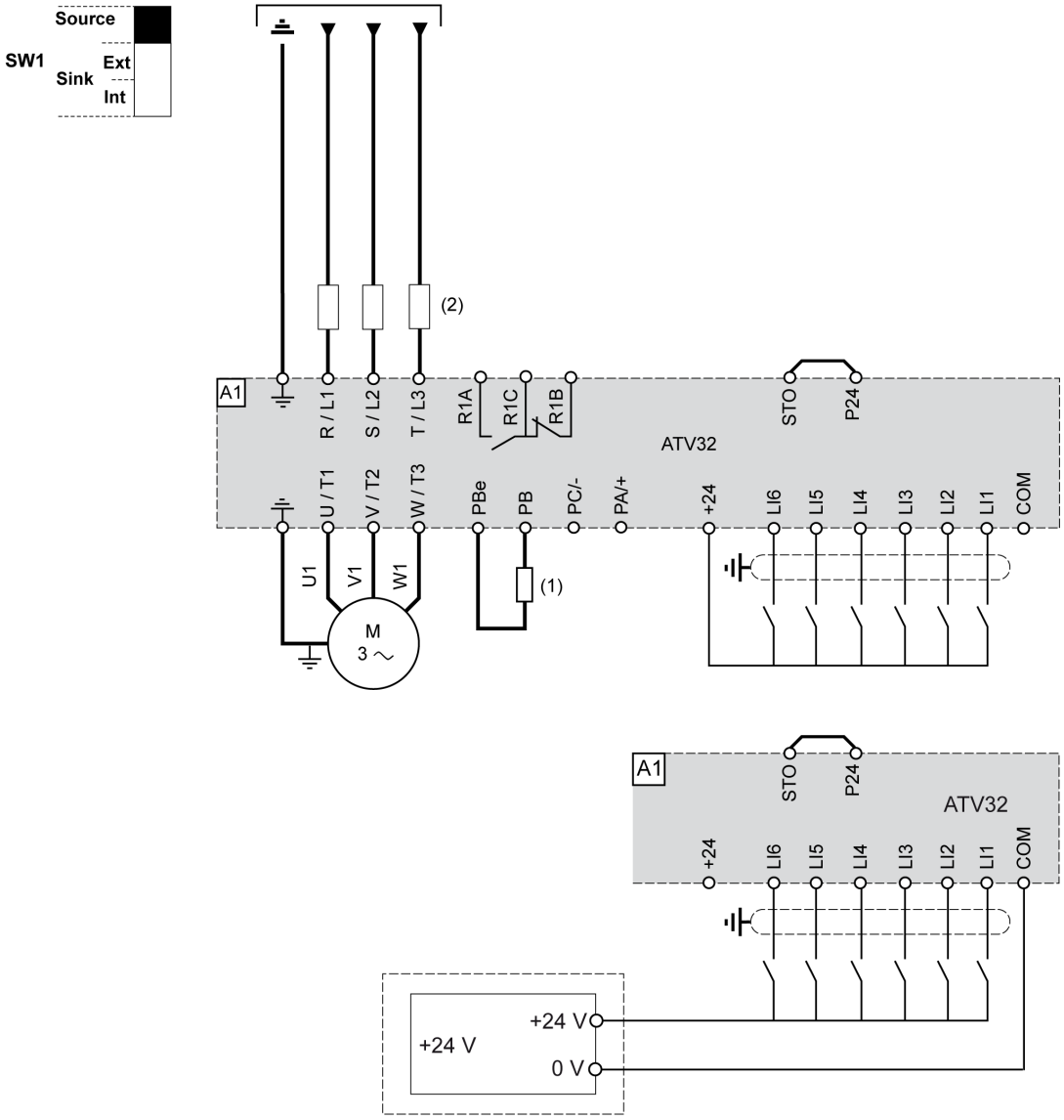
The following configurations apply to the diagram below:

- STO SIL2 on LI3 and LI4
- SLS SIL2 or SS1 type B SIL2 on LI5/LI6

Or

- STO SIL2 on LI3 and LI4
- LI5/LI6 not set to a safety function

Wiring Diagram



(1) Braking resistor, if used, (2) Line chokes, if used.

NOTE: For more information about the control terminal characteristics, please refer to the installation manual.

Commissioning

8

What Is in This Chapter?

This chapter contains the following topics:

Safety Tab

Introduction

To access the safety configuration, click the Safety tab. This screen is read-only, allowing you to see all current safety configurations.

The Safety tab provides access to:
- an outline of the safety features available on the ATV32 (accessible online/offline)
- the status of all I/O in connected mode
- general information about the machine (online/offline).

It also provides access to the following dialog boxes:
- Configure (only available in connected mode)
- Safety password
- Reset password.
- Reset the safety function

Steps to configure the safety functions

If...	Then ...
you are not in online mode	go to **Communication** → **Connect to Device** or click the **Connect to Device** icon
you are online mode	click the **Configure** button in the **Safety** tab.

Once connected:

Step	Action	Comment
1	click the **Configure** button in the **Safety** tab.	A dialog box now appears where you can enter or change your password

If...	Then ...
you have already entered a password	type in your password.
you never have entered a password	you need to choose a value between 1 and 65535. The password cannot have the value 0. Once this isyou have done this, you will enter the Configure safety window.

The Configure Safety panel

Overview

The **Configure Safety** panel includes the **Information**, **STO**, **SLS**, **SS1** and **I/O** tabs.

Information Tab

The **information** tab explains how to define safety information. The Safety Information data is displayed in the **Information** tab of the Safety HMI.

Information filled in automatically by SoMove:
- Date and time (format depends on the PC local and linguistic options)
- Device type
- Device reference

Information filled in manually:
- Device serial number)
- Machine name
- Company name

Safe Torque Off (STO) Tab

For more information about **STO** function see STO description *(see page 18)*.

For this function, only the associated set of inputs should be selected in the combo box. The parameter to be managed is: STOA.

Code	Name/Description	Factory setting
StO	**[Safe Torque Off]**	
StOA	**[STO function activation]**	**[No]**
nO	**[No: Not assigned]**	
L3P.	[LI3 and STO] : LI 3/STO Low state	
LI34	[LI3 and LI4] : LI 3/4 Low state	
LI56	[LI5 and LI6] : LI 5/6 Low state	
	This parameter is used to configure the channel used to trigger the STO function. If you set STOA=No, STO function is always active but just on STO input	

Safely Limited speed (SLS) Tab

For more information about **SLS** function see SLS description *(see page 22)*.

Code	Name/Description	Adj. range	Factory setting
SLS	**[Safely Limited Speed]**		
SLSA	**[SLS function activation]**		**[No]**
nO	**[No]**: Not assigned		
L3_4	[LI3 and LI4]: LI 3/4 Low state		
LI5_6	[LI5 and LI6]: LI 5/6 Low state		
	This parameter is used to configure the channel used to trigger the SLS function.		
SLt	**[Safe Limited speed Type Element]**		**[Type1]**
tYP1	[Type1] : LI 3/4 Low state		
tYP2	[Type2] : LI 3/4 Low state		
tYP3	[Type3] : LI 5/6 Low state		
	This parameter is used to select the SLS type. Refer to functions description to have information about behavior of different type.		
SLSP	**[SLS set point]** parameter	0 to 599 Hz	0
	This parameter is only visible if SLT = Type2 or SLT = Type3 SLSP is used to set the maximum speed		
SLtt	**[SLS tolerance threshold]** parameter	0 to 599 Hz	0
	The behavior of this parameter depends on the value of SLT, see above		
SSrt	**[SS1 ramp value]** parameter	1 to 5990	1
	The unit depends on the SSRU parameter. Use this parameter to set the value of the SS1 ramp. SS1 ramp = SSRT*SSRU Example: If SSRT = 250 and SSRU = 1 Hz/s then the speed of the ramp = 25 Hz/s. This parameter is specific. In fact, it is similar to the SS1 safety function configured in another tab.		

Code	Name/Description	Adj. range	Factory setting
SSrU	**[SS1 ramp unit]** parameter		**[1 Hz/s]**
1H	[1 Hz/s]		
10H	[10 Hz/s]		
100H	[100 Hz/s]		
	With this parameter you can set the SSRT unit. This parameter is specific. In fact, it is similar to the SS1 safety function configured in another tab.		
SSEt	**[SS1 trip threshold]**	0 to 599 Hz	0
	This parameter sets the tolerance zone around the deceleration ramp in which the frequency may vary. This parameter is specific. In fact, it is similar to the SS1 safety function configured in another tab.		
SSSL	**[SLS/SS1 standstill level]** parameter	0 to 599 Hz	0
	This parameter adjusts the frequency at which the drive should go into STO state at the end of the SS1 ramp. This parameter is specific. In fact, it is similar to the SS1 safety function configured in another tab.		

Safe Stop 1 (SS1) Tab

For more information about **SS1** function see SS1 description *(see page 20)*.

Code	Name/Description	Adj. range	Factory setting
SS1	**[Safe Stop 1]**		
SS1A	**[SL1 function activation]**		**[No]**
SSrt	**[SS1 ramp value]**	1 to 800	1
	The unit depends on the SSRU parameter. Use this parameter to set the value of the SS1 ramp. SS1 ramp = SSRT*SSRU Example: If SSRT = 250 and SSRU = 1 Hz/s then the speed of the ramp = 25 Hz/s. This parameter is specific. In fact, it is similar to the SLS safety function configured in another tab.		
SSrU	**[SS1 ramp unit]**		**[1 Hz/s]**
1H	[1 Hz/s]		
10H	[10 Hz/s]		
100H	[100 Hz/s]		
	With this parameter you can set the SSRT unit. This parameter is specific. In fact, it is similar to the SLS safety function configured in another tab.		
SSEt	**[SS1 trip threshold]** parameter	0 to 800 Hz	0
	This parameter sets the tolerance zone around the deceleration ramp in which the frequency may vary. This parameter is specific. In fact, it is similar to the SS1 safety function configured in another tab.		
SSSL	**[SLS/SS1 standstill level]** parameter	0 to 800 Hz	0
	This parameter adjusts the frequency at which the drive should go into STO state at the end of the SS1 ramp. This parameter is specific. In fact, it is similar to the SLS safety function configured in another tab.		

I/O Configuration

Code	Name/Description	Adj. range	Factory setting
StO	**[Safety Torque Off]**		
LIdt	**[LI debounce time]**	0 to 2000 ms	50
	In most cases, the two LIs in a pair of safety LIs (LI3-LI4 or LI5-LI6 or STO-LI3) will not be 100% synchronized. They will not change state at the same time. There is a small delta between the two LI transitions. LIdt is the parameter used to set this delta. If the two LIs change state with a delta lasting less than LIdt it is considered to be simultaneous transition of the LIs. If the delta lasts longer than LIdt, the drive considers the LIs to no longer be synchronized and a Safety fault is triggered.		

Code	Name/Description	Adj. range	Factory setting
L Irt	**[LI response time]**	0 to 50 ms	0
	This parameter is used to filter short impulses on the LI (only for LI3-LI4 or LI5-LI6, STO not concerned). Some applications send short impulses on the line to test it. This parameter is used to filter these short impulses. Commands are only taken into account if the duration is longer than L Irt. If the duration is shorter the drive considers that there is no command: the command is filtered.		

Reset Safety

This function is used to remove the safety function from the device. To access the function, click the **Reset Safety** function button in the **Safety** tab.

First enter the password, then confirm your choice.

After this action, all the safety parameters are set to factory settings.

Password Management - Modify Password

This function allows you to modify the safety password in the drive.

This tool is launched from the Safety tab using the Modify Safety Password button.

To modify the safety password, a session must be open in the drive. Opening a safety session means providing the drive with the correct safety password.

You need to choose a value between 1 and 65535. The password cannot have the value 0. Only use digits to create the password. No other characters will be taken into account.

Password Management - Reset Password

If you can't remember the safety password defined in the drive, you need to know the universal password to reset the drive. To obtain this password, contact your Schneider Electric contact.

After this operation, the device reverts to no defined safety password and the safety session is automatically closed.

However, the function configuration remains unchanged.

Monitoring and Status of Safety Functions

The Monitoring Tab

A parameter shows whether the drive is in a safe state or not (safety function configured):

- No safety function configured: STD
- Safety function configured: SFTY

Safety Status

Code	Name/Description
SAF-	**[MONIT. SAFETY]** menu - **Visible** on **SoMove and keypad**
STOS	**[STO status]** Status of the Safe Torque Off safety function
IdLE	**[IdLE]**: STO not in progress
STO	**[Safe stop]**: STO in progress
FLt	**[Fault]**: STO in detected fault
SLSS	**[SLS status]** Status of the Safe Limit speed safety function
nO	**[Not config]**: SLS not configured
IdLE	**[IdLE]**: SLS not in progress
SSI	**[Safe ramp]**: SLS ramp in progress
STO	**[Safe stop]**: SLS safe torque off request in progress
FLt	**[Fault]**: SLS in detected fault
SS1S	**[SS1 status]** Status of the Safe Stop 1 safety function
nO	**[Not config]**: SS1 not configured
IdLE	**[IdLE]**: SS1 not in progress
SSI	**[Safe ramp]**: SS1 ramp in progress
STO	**[Safe stop]**: SS1 safe torque off request in progress
FLt	**[Fault]**: SS1 in detected fault
SAF-	**[MONIT. SAFETY]** menu - **Visible** ONLY on **SoMove**
SFty	**[Safe drive status]** Safe status of the drive
Std	**[Standard drive]**: Standard product without safety function configured
SAFE	**[Safe drive]**: Safe product with at least 1 safety function configured

Machine Signature

Overview

The acceptance test for systems with Safety Integrated Functions focuses on validating the functionality of Safety Integrated monitoring and stop functions configured in the drive system.

The purpose of the test is to verify proper configuration of the defined safety functions and test mechanisms and to examine the response of dedicated monitoring functions to explicit input of values outside the tolerance limits.

The test must cover all drive-specific Safety configured monitoring functions and global Safety Integrated functionality in ATV32.

Condition Prior to Acceptance Test

- The machine is wired up correctly.
- All safety devices such as protective door monitoring devices, light barriers and emergency stop switches are connected and ready for operation.
- All motor parameters and command parameters must be correctly set on the drive.

Acceptance Test Process

The Acceptance Test is configured with SoMove software.

Step	Action	Comment
1	Select the **Device** → **Safety Function** → **Machine Signature** menu and follow the five steps below	
2	**General Information** To add this step to the final report select **Add to the machine signature** Click **Next**.	The information displayed here corresponds to the **Identification** section in the **Safety** tab.
3	**Function Summary** To add a function to the final report select **Add** to the machine signature Click **Next**	This step is composed of sub-steps. Each sub-step relates to one of the following safety functions: ● STO ● SLS ● SS1 In a function sub-step the function diagram and parameters values are displayed. A text box allows you to enter additional text in this step.
4	**I/O Summary** To add a function to the final report select **Add** to the machine signature Click **Next**	The information displayed here corresponds to the **LI summary** folder of the **Safety** tab.: ● The LI that are assigned to a safety function are displayed in red and show the related safety function ● The LI that are not assigned to a safety function do not show any assignment and are displayed in green
5	**Test** To add a function to the final report select **Add** to the machine signature Click **Next**	In this step you tick the box when you have tested the safety functions to confirm that you have checked the correct behavior of the functions for all devices.
6	**Key** Click **Finish** to create the report	The checksum of the safety parameters is displayed as it is calculated for transmission to the connected device when you click **Apply**. This allows you to compare the checksum value with the one displayed in the Identification menu on the graphic display terminal

Acceptance Report

SoMove creates the acceptance report.

It can generate the drive safety signature. This function provides a final private report when the drive has been configured as Safe and declared Safe during operation.This report is deemed to be a machine signature and certifies that all the Safety functions are operational.The Safety report has been added as an optional document to be printed to a printer or to a PDF file.

If the drive configuration is modified (not just the safety parameter), you must repeat the acceptance test.

Services and Maintenance

9

What Is in This Chapter?

This chapter contains the following topics:

Maintenance

Overview

By way of preventive maintenance, the STO function must be activated at least once a year. The drive power supply must be turned off and then on again before carrying out this preventive maintenance. The drive logic output signals cannot be considered to be safety-type signals. Install interference suppressors on all inductive circuits near the drive or coupled to the same circuit (relays, contactors, solenoid, valves, etc.).

Example: Open the protective door to see if the drive stops in accordance with the configured safety function.

NOTE: For more product information, see the installation manual and programming manual on www.schneider-electric.com.

Power and MCU Replacement

Overview

You can replace the MCU (Motor Control Unit) part (APP + HMI card) and the power part.

Depending on the drive configuration (safety function active or not), the drive response will differ.

If you replace the power and you keep your MCU, you won't lose your safety configuration but you need to repeat the Acceptance Test to avoid incorrect wiring or incorrect behavior of the safety function.

If you replace the MCU you will lose your safety configuration. You need to reinstall your Configuration on the new MCU and then repeat the Acceptance Test.

NOTE: For more product information, see the installation manual and programming manual www.schneider-electric.com.

Changing Machine Equipment

Overview

If you need to change any part of the ATV32 machine (Motor, Emergency stop, etc.) you must repeat the Acceptance Test.

NOTE: For more product information, see the installation manual and programming manual www.schneider-electric.com.