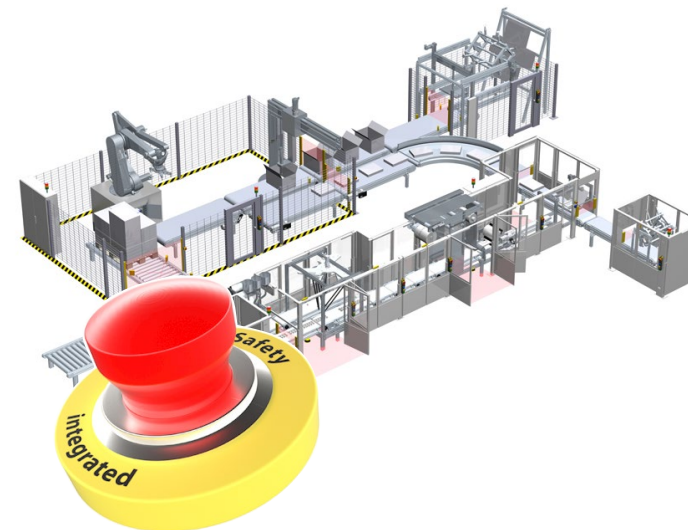


Functional safety



Integrated in the inverter



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Functional safety

Functional safety describes the required measures that need to be taken by means of electrical or electronic equipment to prevent or eliminate dangers due to functional errors. For this purpose, the functional safety in the inverter provides safety functions, safe inputs and safe outputs.

This means that the prerequisites on the control and drive side for optimum practical implementation of protective functions for the protection of persons on machines in accordance with the Machinery Directive are met. Planning and installation expenditure is reduced.

Functional safety monitors the safe compliance with limit values. If monitored limit values are exceeded, the functional safety initiates reactions for the error case according to EN 61800-5-2.

This documentation describes the safety functions available in the inverters that can be used for machine safety. The individual functions are described independently of the inverter to provide a basis for risk assessment.

Identification of the components

The functional safety components and the associated connections are usually marked in yellow. Since the functional safety standards do not prescribe color coding, the components and terminals can also be designed in other colors.

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Safety instructions

By safety instructions, we mean information for the use of products that serves to warn the user of hazards and to instruct behavior that will not result in harm to people. In this document, these are distinguished as follows according to ANSI Z535.6:

DANGER!

Indicates an extremely hazardous situation. Failure to comply with this instruction will result in severe irreparable injury and even death.

WARNING!

Indicates an extremely hazardous situation. Failure to comply with this instruction may result in severe irreparable injury and even death.

CAUTION!

Indicates a hazardous situation. Failure to comply with this instruction may result in slight to medium injury.

NOTICE

Indicates a material hazard. Failure to comply with this instruction may result in material damage.

Numeric notation

As a rule, a period is used as a decimal separator in this documentation.

Example: 1234.56

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Certification

The certification of the integrated safety is based on these test fundamentals:

- EN ISO 13849-1:
- Safety of machinery – safety-related parts of control systems – Part 1
- EN ISO 13849-2:
- Safety of machinery – safety-related parts of control systems – Part 2
- EN 60204-1: Safety of machinery – electrical equipment of machines – Part 1
- IEC 61508, Part 1-7: Functional safety of safety-related electrical/electronic/programmable electronic systems
- EN 61800-5-1: Adjustable speed electrical power drive systems – Part 5-1: Safety requirements
 - electrical, thermal and energy requirements
- EN 61800-5-2: Adjustable speed electrical power drive systems – Part 5-2: Safety requirements
 - functional safety
- IEC 62061: Safety of machinery – functional safety of safety-related electrical/electronic/programmable electronic control systems

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Risk assessment

Before a machine can be put into circulation, the manufacturer of the machine has to conduct a risk assessment according to the 2006/42/EC: Machinery Directive [UKCA: S.I. 2008/1597 - The Supply of Machinery (Safety) Regulations 2008] to determine the hazards associated with the use of the machine.

For the preparation of the risk assessment, the relevant guidelines, standards and laws must be taken into account.

The risk assessment procedure

Safety of machinery, risk assessment and risk reduction are described in DIN EN ISO 12100:2013-08. With the result of the risk assessment, the machine manufacturer determines the required risk reduction (SIL, PL) for the selected safety functions according to DIN EN ISO 13849-1 or EN 62061.


DANGER!

Improper installation of the safety technology can cause an uncontrolled starting action of the drives.

- Possible consequences: Death or severe injuries
- Possible remedy:
 - Safety technology may only be installed and commissioned by qualified personnel.
 - Observe the documentation of the respective inverters.

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Project planning

Note during project planning:

- Use of additional components
 - Only components that are appropriate to the risk reduction of the application may be used.
- Service life
 - For functional safety components, the service life must be observed.
 - After the service life of a component has expired, the component must be replaced. Further operation is not permitted!
- Acceptance
 - The machine manufacturer must check and prove the operability of the safety functions used.
(The validation must also include tests under error conditions).
- Functional test
 - After installation and after every modification, the machine operator must check and validate the safety function.
 - During operation, the safety functions must be checked and validated at regular intervals.
The risk assessment or prevailing regulations determine the time intervals between the inspections.

For detailed project planning and error-free handling of the safety functions, it is essential that you observe the "Original operating instructions/project planning document" documentation of the inverter.

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Safety functions

With the safety functions in the inverter, limit values of motion functions can be monitored safely. In the event of an error, operation of the system is stopped via the stop functions.

There are special help and maintenance functions for setup operation and maintenance of the system.

The available safety functions depend on the inverter series. Observe the features of the inverters.

✓ Stop functions

These safety functions cause the system to stop:

- Safe torque off (STO)
- Safe stop 1 (SS1)
- Safe stop 2 (SS2)
- Safe stop emergency (SSE)
- Safe operating stop (SOS)
- Safe brake control (SBC)
- Cascading STO (CAS) (trigger STO in several inverters simultaneously)

⚙ Monitoring functions

These safety functions monitor limit values of speed-dependent motion functions:

- Safe maximum speed (SMS)
- Safely limited speed (SLS)
- Safe speed monitoring (SSM)

These safety functions monitor limit values of position-dependent motion functions:

- Safely limited increment (SLI)
- Safe direction (SDI)
- Safely limited position (SLP)
- Position dependent safe speed (PDSS)
- Safe cam (SCA)

⚙ Help and maintenance functions

These functions are used to set up and maintain the system:

- Safe homing (SHOM)
- Operation mode selector (OMS)
- Repair mode selector (RMS)
- Enable switch (ES)
- Safe Muting (MUT)

⚙ Safety bus

A safety bus can be established via the following networks:

- PROFINET or PROFIBUS with PROFIsafe protocol
- EtherCAT with FSoE protocol
- CIP Safety with EtherNet/IP

Safe parameter setting

To use the safety functions, the appropriate parameters must be set in the inverter. These parameters are not directly accessible, but are subject to "safe parameterization". These are set via a separate dialog in the Engineering Tools "EASY Starter", "PLC Designer" or "Engineer".

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Safe parameter setting

To use the safety functions, the appropriate parameters must be set in the inverter. These parameters are not directly accessible, but are subject to "safe parameterization". These are set via a separate dialog in the Engineering Tools "EASY Starter", "PLC Designer" or "Engineer".

The download link for the latest version of Engineering Tools will be e-mailed to you free of charge after you complete the download form:

<https://www.lenze.com/de-de/service/software-downloads/easy-engineering-tools>

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Versions

The functional scope of functional safety depends on the inverter series:

		i550 cabinet	i550 protec	i550 motec	i650 motec	i750 cabinet	i950 cabinet
Stop functions	Safe torque off (STO)	✓	✓	✓	✓	✓	✓
	Safe stop 1 (SS1)				✓	✓	✓
	Safe stop 2 (SS2)					✓	✓
	Safe stop emergency (SSE)					✓	✓
	Safe operating stop (SOS)					✓	✓
	Safe brake control (SBC)					✓	✓
	Cascading STO (CAS)						✓
Monitoring functions	Safe maximum speed (SMS)					✓	✓
	Safely limited speed (SLS)					✓	✓
	Safe speed monitoring (SSM)					✓	✓
	Safely limited increment (SLI)					✓	✓
	Safe direction (SDI)					✓	✓
	Safely limited position (SLP)					✓	✓
	Position dependent safe speed (PDSS)					✓	✓
Help and maintenance functions	Safe cam (SCA)					✓	✓
	Safe homing (SHOM)					✓	✓
	Operation mode selector (OMS)						✓
	Repair mode selector (RMS)					✓	✓
	Enable switch (ES)					✓	✓
Safety bus	Safe Muting (MUT)				✓	✓	✓
	PROFINET or PROFIBUS with PROFIsafe protocol						✓
	EtherCAT with FSoE protocol					✓	✓
	CIP Safety with EtherNet/IP				✓		

Stop functions

STO

SS1

SSE

SS2

SOS

SBC

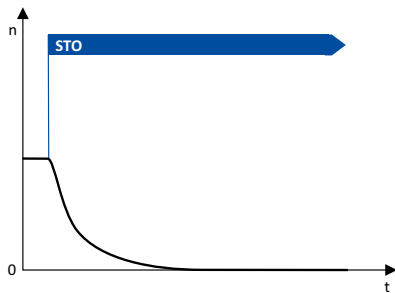
CAS

Safe torque off (STO)

The "Safe Torque Off (STO)" safety function safely switches off the drive. The drive coasts to a stop.

STO corresponds to an uncontrolled shutdown according to EN 60204-1, category 0.

With STO, additional measures are required for an "emergency switching off" according to EN 60204-1.



Activation

Directly:

- Via a safety bus
- Via a safe input (depending on the version)

Triggering this safety function

Automatically after the safety functions have expired:

- Safe stop 1 (SS1)
- Safe stop emergency (SSE)

As a consequence in case of errors in the safety functions:

- Safe operating stop (SOS)
- Safe maximum speed (SMS)
- Safely limited speed (SLS)
- Safely limited increment (SLI)
- Safe direction (SDI)
- Safely limited position (SLP)
- Position dependent safe speed (PDSS)

! DANGER!

The power supply is not safely disconnected.

- Possible consequences: Death or severe injuries due to electrical voltage.
- Possible remedy: Turn off the power supply.

Uncontrolled rotation of the motor possible.

- Possible consequences: Death or severe injuries
- Possible remedy: Set the motor to standstill mechanically.

Automatic restart can occur if the request of the safety function is deactivated.

- Possible consequences: Death or severe injuries
- Possible remedy: External measures that ensure an acknowledged restart ensure that the drive does not start until acknowledged.

Stop functions

STO

SS1

SSE

SS2

SOS

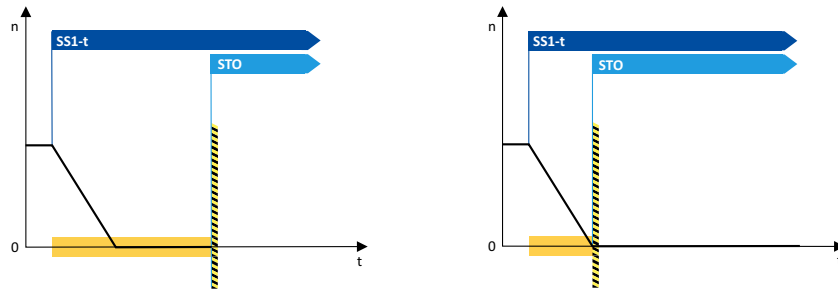
SBC

CAS

Safe stop 1 (SS1)

The "Safe Stop 1 (SS1)" safety function monitors whether a deceleration ramp in the application causes the drive to come to a standstill.

SS1 corresponds to a controlled stop according to EN 60204-1, stop category 1.



Via delay time

Via standstill

When setting the values, make sure that the drive actually comes to a standstill after the time has elapsed, as STO is activated after the time has elapsed. If the drive is not at a standstill at this point, it coasts to a stop.

Activation

Directly:

- Via a safety bus
- Via a safe input (depending on the version)

Automatically after the safety functions have expired:

- Safe stop emergency (SSE)

As a consequence in case of errors in the safety functions:

- Safe maximum speed (SMS)
- Safely limited speed (SLS)
- Safely limited increment (SLI)
- Safe direction (SDI)
- Safely limited position (SLP)
- Position dependent safe speed (PDSS)



DANGER!

The power supply is not safely disconnected.

- Possible consequences: Death or severe injuries due to electrical voltage.
- Possible remedy: Turn off the power supply.

Uncontrolled rotation of the motor possible.

- Possible consequences: Death or severe injuries
- Possible remedy: Set the motor to standstill mechanically.

Automatic restart can occur if the request of the safety function is deactivated.

- Possible consequences: Death or severe injuries
- Possible remedy: External measures that ensure an acknowledged restart ensure that the drive does not start until acknowledged.

Stop functions

STO

SS1

SSE

SS2

SOS

SBC

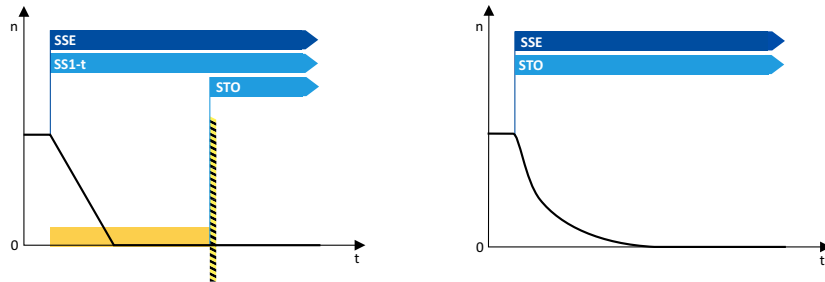
CAS

Safe stop emergency (SSE)

The "Safe stop emergency (SSE)" safety function has a higher priority for triggering the "Safe torque off (STO)" or "Safe stop 1 (SS1)" stop functions.

SSE is primarily controlled from all states, operating modes or safety functions.

SSE immediately triggers the assigned stop function.



Activation

Directly:

- Via a safety bus
- Via a safe input (depending on the version)



DANGER!

The power supply is not safely disconnected.

- Possible consequences: Death or severe injuries due to electrical voltage.
- Possible remedy: Turn off the power supply.

Automatic restart can occur if the request of the safety function is deactivated.

- Possible consequences: Death or severe injuries
- Possible remedy: External measures ensure that the drive does not start until acknowledged.

Stop functions

STO

SS1

SSE

SS2

SOS

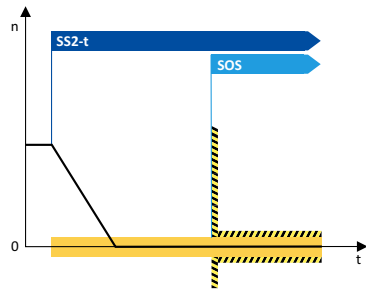
SBC

CAS

Safe stop 2 (SS2)

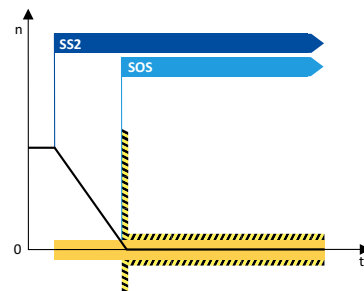
The "Safe Stop 2 (SS2)" safety function monitors whether a deceleration ramp in the application causes the drive to come to a standstill.

SS2 corresponds to a controlled stop according to EN 60204-1, stop category 2.



Via delay time

When setting the values, make sure that the drive is actually in the SOS tolerance window after the time has elapsed. If this is not the case, STO is activated and the drive coasts to a stop.



Via standstill

Activation

Directly:

- Via a safety bus
- Via a safe input (depending on the version)

Triggering this safety function

As a consequence in case of errors in the safety functions:

- Safe maximum speed (SMS)
- Safely limited speed (SLS)
- Safe speed monitoring (SSM)
- Safely limited increment (SLI)
- Safe direction (SDI)
- Safely limited position (SLP)
- Position dependent safe speed (PDSS)



DANGER!

Uncontrolled rotation of the motor possible if no safety rated encoder system is used.

- Possible consequences: Death or severe injuries
- Possible remedy: Use a safety-rated encoder system.

Automatic restart can occur if the request of the safety function is deactivated.

- Possible consequences: Death or severe injuries
- Possible remedy: External measures ensure that the drive does not start until acknowledged.

Stop functions

STO

SS1

SSE

SS2

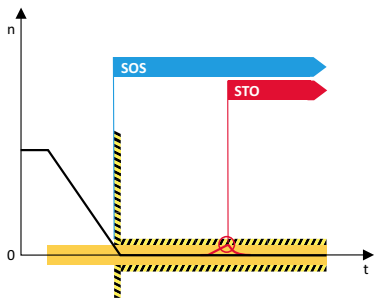
SOS

SBC

CAS

Safe operating stop (SOS)

The "Safe Operating Stop (SOS)" safety function monitors the standstill of the drive. The reached position is actively held and monitored.



Activation

Directly:

- Via a safety bus
- Via a safe input (depending on the version)

Triggering this safety function

Automatically after the safety functions have expired:

- Safe stop 2 (SS2)



DANGER!

Uncontrolled rotation of the motor possible if no safety rated encoder system is used.

- Possible consequences: Death or severe injuries
- Possible remedy: Use a safety rated encoder system to use this function.

Automatic restart can occur if the request of the safety function is deactivated.

- Possible consequences: Death or severe injuries
- Possible remedy: External measures ensure that the drive does not start until acknowledged.

Stop functions

STO

SS1

SSE

SS2

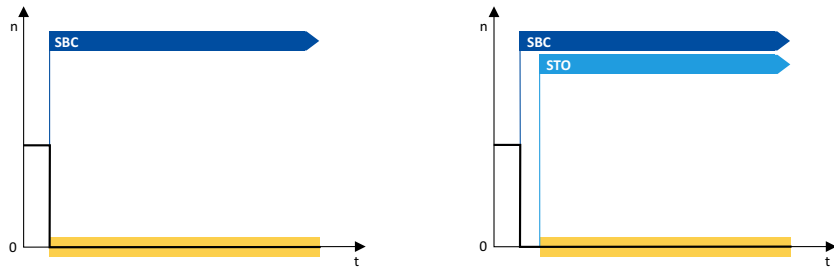
SOS

SBC

CAS

Safe brake control (SBC)

The "Safe Brake Control (SBC)" safety function enables the safe control of a brake of the drive that is active at standstill, i.e. the brake closes when the brake voltage is switched off. To prevent the motor from working against the closed brake, STO can be activated simultaneously or with a time delay.



Activation

Directly:

- Via a safety bus
- Via a safe input (depending on the version)


DANGER!

The power supply is not safely disconnected.

- Possible consequences: Death or severe injuries due to electrical voltage.
- Possible remedy: Turn off the power supply.

Automatic restart can occur if the request of the safety function is deactivated.

- Possible consequences: Death or severe injuries
- Possible remedy: External measures ensure that the drive does not start until acknowledged.

Stop functions

STO

SS1

SSE

SS2

SOS

SBC

CAS

Cascading STO (CAS)

The “Cascading STO (CAS)” safety function enables the synchronized shutdown of an entire drive system. CAS switches off all connected drives synchronously by triggering an STO request. The drives then coast to a stop.



Activation

For cascading, the STO signal must be transferred from a safe output to a safe input of the slave drive. For the restart of the system, the safety function must then be acknowledged for each drive.

Monitoring functions

SMS

SLS

SSM

SLI

SDI

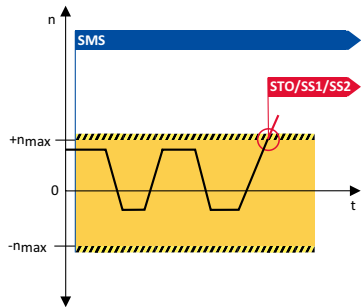
SLP

PDSS

SCA

Safe maximum speed (SMS)

The "Safe maximum speed (SMS)" safety function monitors the maximum speed of the drive.



Activation

Directly:

- Via a safety bus
- Via a safe input (depending on the version)

Response when monitoring limits are exceeded

Triggering the stop functions STO, SS1 or SS2.



DANGER!

Uncontrolled rotation of the motor possible if no safety rated encoder system is used.

- Possible consequences: Death or severe injuries
- Possible remedy: Use a safety rated encoder system to use this function.

Monitoring functions

SMS

SLS

SSM

SLI

SDI

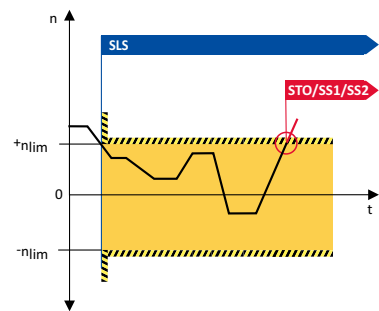
SLP

PDSS

SCA

Safely limited speed (SLS)

The "Safely limited speed (SLS)" safety function monitors up to 4 arbitrary operating speeds of the drive.



Activation

Directly:

- Via a safety bus
- Via a safe input (depending on the version)

Response when monitoring limits are exceeded

Triggering the stop functions STO, SS1 or SS2.



DANGER!

Uncontrolled rotation of the motor possible if no safety rated encoder system is used.

- Possible consequences: Death or severe injuries
- Possible remedy: Use a safety rated encoder system to use this function.

Monitoring functions

SMS

SLS

SSM

SLI

SDI

SLP

PDSS

SCA

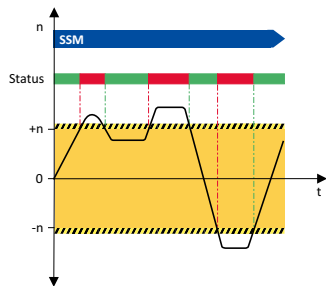
Safe speed monitoring (SSM)

The "Safe speed monitoring (SSM)" safety function monitors the amount of any operating speed of the drive.

A status message indicates compliance with the monitoring limits.

Application examples:

- Safe speed monitoring.
- Despite excessive speed, no immediate machine standstill may occur. The operating personnel is only informed safely.



Activation

Directly:

- Via a safety bus
- Via a safe input (depending on the version)

Response when monitoring limits are exceeded

The status message is reset.

- Safety bus: Status bit
- Safe output: Status change active/inactive



DANGER!

Uncontrolled rotation of the motor possible if no safety rated encoder system is used.

- Possible consequences: Death or severe injuries
- Possible remedy: Use a safety rated encoder system to use this function.

Monitoring functions

SMS

SLS

SSM

SLI

SDI

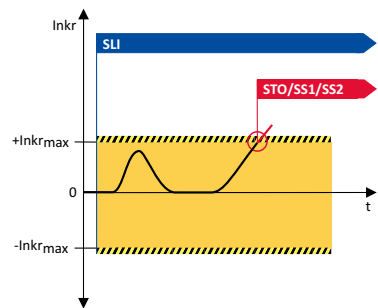
SLP

PDSS

SCA

Safely limited increment (SLI)

The "Safely limited increment (SLI)" safety function monitors the amount of a maximum permissible position change.



Activation

Directly:

- Via a safety bus
- Via a safe input (depending on the version)

Response when monitoring limits are exceeded

Triggering the stop functions STO, SS1 or SS2.



Uncontrolled rotation of the motor possible if no safety rated encoder system is used.

- Possible consequences: Death or severe injuries
- Possible remedy: Use a safety rated encoder system to use this function.

Monitoring functions

SMS

SLS

SSM

SLI

SDI

SLP

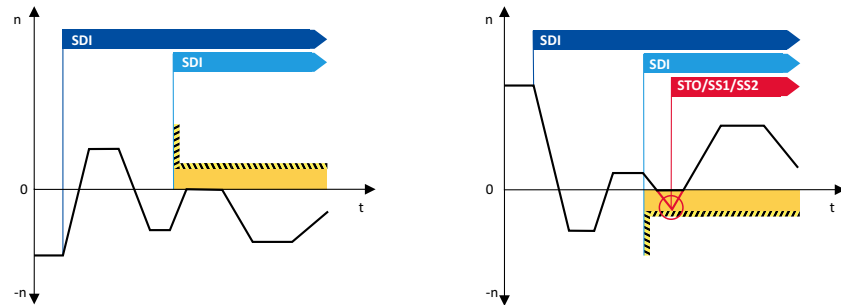
PDSS

SCA

Safe direction (SDI)

The "Safe direction (SDI)" safety function monitors the direction of rotation of the drive.

A tolerance window can be used to define the number of increments that the drive may move in the blocked direction.



Activation

Directly:

- Via a safety bus
- Via a safe input (depending on the version)
- A delay time for monitoring can be set.

Response when monitoring limits are exceeded

Triggering the stop functions STO, SS1 or SS2.



DANGER!

Uncontrolled rotation of the motor possible if no safety rated encoder system is used.

- Possible consequences: Death or severe injuries
- Possible remedy: Use a safety rated encoder system to use this function.

Monitoring functions

SMS

SLS

SSM

SLI

SDI

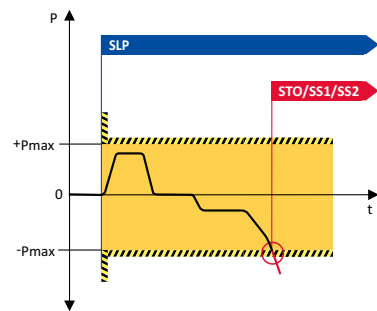
SLP

PDSS

SCA

Safely limited position (SLP)

The "Safely limited position (SLP)" safety function monitors up to 4 absolute position limits of a permissible movement range.



Activation

Directly:

- Via a safety bus
- Via a safe input (depending on the version)

Response when monitoring limits are exceeded

Triggering the stop functions STO, SS1 or SS2.



DANGER!

Uncontrolled rotation of the motor possible if no safety rated encoder system is used.

- Possible consequences: Death or severe injuries
- Possible remedy: Use a safety rated encoder system to use this function.

Monitoring functions

SMS

SLS

SSM

SLI

SDI

SLP

PDSS

SCA

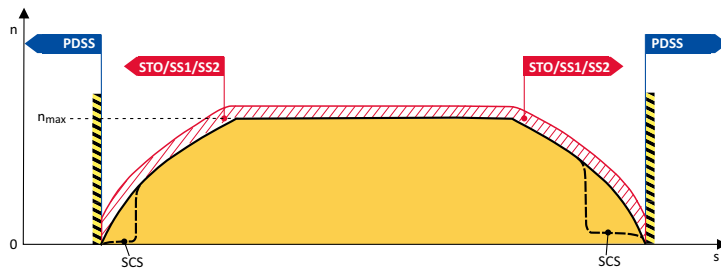
Position dependent safe speed (PDSS)

The safety function "Position dependent safe speed (PDSS)" monitors the speed of a drive depending on the absolute position along a limited movement range in order to ensure timely standstill at the position limits.

As a result, mechanical buffers can be dimensioned smaller or mechanical buffers and limit switches can be dispensed with altogether. A suitable safety-rated mechanical braking system may be required.

Application example:

- Monitoring a storage and retrieval unit between the end positions



Activation

Directly:

- Via a safety bus
- Via a safe input (depending on the version)

Response when monitoring limits are exceeded

Triggering the stop functions STO, SS1 or SS2.



DANGER!

Uncontrolled rotation of the motor possible if no safety rated encoder system is used.

- Possible consequences: Death or severe injuries
- Possible remedy: Use a safety rated encoder system to use this function.

Monitoring functions

SMS

SLS

SSM

SLI

SDI

SLP

PDSS

SCA

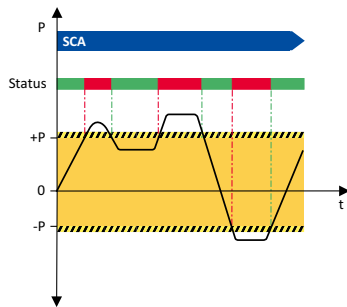
Safe cam (SCA)

The "Safe cam (SCA)" safety function monitors up to 4 arbitrary absolute lower and upper position limits.

A status message indicates compliance with the monitoring limits.

Application examples:

- Monitoring the parking position of a storage and retrieval machine.
- Collision avoidance for an X-Y-Z gantry when there is a fixed obstacle in the travel range.



Activation

Directly:

- Via a safety bus
- Via a safe input (depending on the version)

Response when monitoring limits are exceeded

- Safety bus: Status bit is reset
- Safe output: active/inactive



DANGER!

Uncontrolled rotation of the motor possible if no safety rated encoder system is used.

- Possible consequences: Death or severe injuries
- Possible remedy: Use a safety rated encoder system to use this function.

Help and maintenance functions

SHom

OMS

RMS

ES

MUT



Safe homing (SHOM)

Safety functions based on absolute positions require an absolute reference point to calculate and monitor the position.

- This reference point is defined with the complete reference run.
- The mini reference run can replace the complete reference run in certain operating states.

For the operation of a drive system with slip, consisting of motor encoder and load encoder, the encoder slip between motor encoder and load encoder can be compensated with parameterizable diagnostic positions.

Activation

SHom is activated by a control signal. The home position is taken over by a second control signal, which must follow the first control signal in a defined time interval.

Response in the event of errors

A faulty reference run triggers the STO stop function.


DANGER!

Uncontrolled rotation of the motor possible if no safety rated encoder system is used.

- Possible consequences: Death or severe injuries
- Possible remedy: Use a safety rated encoder system to use this function.

Help and maintenance functions

SHom

OMS

RMS

ES

MUT

Operation mode selector (OMS)

This function can be used to switch between normal operation and special operation of the drive.

The special operation enables a normal stop (STO, SS1, SS2) to be overridden by enabling via the enable switch (ES). The "emergency stop" function also has the highest priority in special operation.

The SLS motion function and the SLI monitoring function can be parameterized separately for special operation.

If the SMS monitoring function is active, special operation is also monitored.

Activation

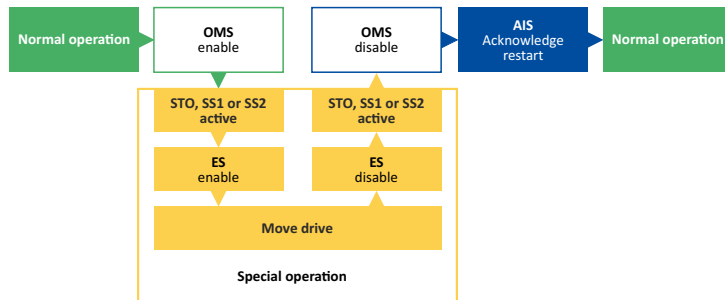
Directly:

- Via a safety bus
- Via a safe input (depending on the version)



When returning to normal operation, the automatic restart is not permissible.

- Possible consequences: Death or severe injuries



Help and maintenance functions

SHom

OMS

RMS

ES

MUT

Repair mode selector (RMS)

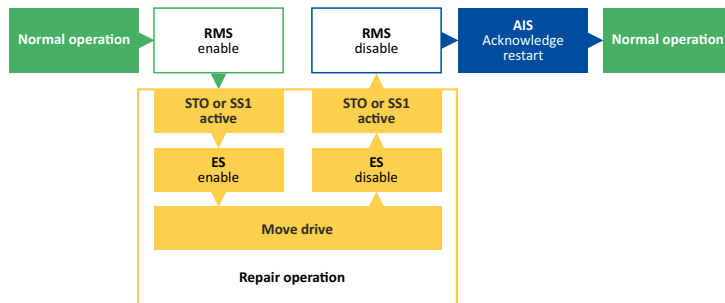
This function moves the drive from a situation that is blocking it ("Deadlock").

Application example:

- If an encoder fails, the drive must be moved to a position in which it can be repaired.

Notice: The connected encoders are not evaluated safety-related.

Only the stop functions configurable for RMS and the enable switch (ES) are active. All other safety functions are deactivated.



Activation

Directly:

- Via a safety bus
- Via a safe input (depending on the version)

Response in the event of errors

If the current positions are outside parameterized tolerance windows after returning from repair mode, the STO stop function is triggered.

A new reference run is required.



Unexpected motions with unexpected speed.

Violation of the permissible movement limits.

- Possible consequences: Death or severe injuries
- Possible remedy:
 - Use RMS exclusively to free a drive from a "deadlock".
 - If necessary, take additional safety measures to ensure that no persons can be endangered, since all monitoring functions are deactivated except for the enable switch (ES).
 - Use other functions to move the drive when it is not in a "deadlock"!

Help and maintenance functions

SHom

OMS

RMS

ES

MUT



Enable switch (ES)

This function makes it possible to override the normal stop functions in special operation.

- The enable switch overrides the stop function active in special operation. The stop function is deactivated without delay.
- The drive can then be moved freely as long as the enable switch is active.
- If the enable switch is deactivated, the stop function for special operation is activated again without delay.

Activation

Directly:

- Via a safety bus
- Via a safe input (depending on the version)

Help and maintenance functions

SHom

OMS

RMS

ES

MUT



Safe Muting (MUT)

This function deactivates selected safe inputs and all functions of the safety bus. "Safe Muting" is used to move the drive even if the inverter is in a safety state.

- The function may only be used during commissioning or for maintenance work.
- The function is active for a maximum of 30 minutes.
- It can be ended at any time.

Activation

As this function may only be used for commissioning and maintenance of the system, the Engineering Tool EASY Starter or PLC Designer is required for activation.

Activation is only possible with your own safe muting password.

Safe muting is active for a maximum of 30 minutes and is automatically deactivated after this time has elapsed. The drive immediately switches back to monitored operation.

Response in the event of errors

If the Safe Muting function is cancelled by an error, the monitored operation is immediately reactivated.

All previously deactivated safety functions are active again.



Activating the Safe Muting function deactivates safety functions!

- Possible consequences: Death or severe injuries
- Possible remedy:
 - Only authorized personnel may activate the Safe Muting function.
 - An emergency stop measure must be available that cannot be deactivated by Safe Muting.

Safety bus

PROFIsafe

FSOE

CIP Safety

PROFIsafe

PROFIsafe is the certified safety protocol for the transmission of safety-related data via PROFINET® or PROFIBUS®.

This safety bus supports the transmission of safe information via the PROFIsafe protocol according to the specification "PROFIsafe Profile for Safety Technology", version 2.0, of the PROFIBUS User Organization (PNO). The general data definitions of PROFIsafe apply.

The inverter must be equipped with a PROFINET or a PROFIBUS module. The inverter forwards the PROFIsafe information for safe evaluation.



Addressing

A unique PROFIsafe destination address is required so that a data telegram reaches the correct device. The safety address is adopted as the PROFIsafe target address. This address must match the corresponding configuration of the safety PLC.

Safety bus

PROFIsafe

FSoE

CIP Safety

FSoE

Fail-safe-over-EtherCAT (FSoE) PROFIsafe is the certified safety protocol for the transmission of safety-related data via EtherCAT®.

This safety bus enables the transmission of safe information via the FSoE protocol according to specification ETG.5100 S, version 1.2.0 of the EtherCAT User Organization (ETG). The general data definitions of the EtherCAT apply.

The inverter must be equipped with an EtherCAT module. The inverter forwards the FSoE information for safe evaluation.

Safety over EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

Safety over
EtherCAT®




Addressing

A unique FSoE target address destination address is required so that a data telegram reaches the correct device. The safety address is taken as the FSoE target address. This address must match the corresponding configuration of the safety PLC.

Safety bus

PROFIsafe

FSoE

CIP Safety



CIP Safety

CIP Safety™ is the certified safety protocol for the transmission of safety-related data via EtherNet/IP® in accordance with the specification "The CIP Networks Library Volume 5 CIP Safety" of the Open DeviceNet Vendor Association (ODVA).

