

# Functional safety with ABB high performance machinery drives



ABB high performance machinery drives feature Safe Torque-Off function as standard.

Safety functions are essential features of today's variable speed drives when used in machinery applications. The safety functions control human and machine safety and stop, automatically or manually, the machine process when safety is threatened.

ABB high performance machinery drives provide speed, torque and motion control for demanding applications. They control induction, synchronous and asynchronous servo and high torque motors. The drives feature a built-in Safe Torque-Off function as standard and more safety functions can be implemented with an external safety system.

## Safe Torque-Off function as standard

The Safe Torque-Off function is included as standard in ABB high performance machinery drives. The function is used for the prevention of an unexpected start-up and other stopping related functions. It provides a cost-effective and certified solution that complies with the latest machinery safety standards.

## Safety functions with external safety system

The solutions for other safety functions can be implemented with an external and modular safety system. The safety functions available with the system are:

- Safe Stop 1 (SS1)
- Safe Brake Control (SBC)
- Safely Limited Speed (SLS)
- Safe Speed Monitor (SSM)
- Safe Direction (SDI)

With ABB high performance machinery drives, a package is provided to implement these functions. The package achieves at least SIL2 or PL d (Cat. 3) safety level. The application guide provided with the package gives clear instructions for the necessary connections and configurations, including a list of devices for each safety function.



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Product notes

### Safety functions

Safety functions for variable speed drives are described in the new IEC 61800-5-2 standard.

#### Safe Torque-Off (STO)

With the Safe Torque-Off function the drive will not provide a rotational field within thereby preventing the motor from generating a torque on the shaft. This function is used for prevention of an unexpected start-up and other stopping related functions.

#### Safe Stop 1 (SS1)

The Safe Stop 1 function initiates motor deceleration (e.g. emergency stop, stop category 1) and after stop activates the Safe Torque-Off.

#### Safe Brake Control (SBC)

The Safe Brake Control function provides a safe output signal to control the motor's mechanical brake.

#### Safely Limited Speed (SLS)

The Safely Limited Speed function prevents the motor from exceeding the specified safe speed limit.

#### Safe Speed Monitor (SSM)

The Safe Speed Monitor function provides a safe output signal to indicate whether the motor speed is below a specified limit. This function can be used also for safe standstill monitoring.

#### Safe Direction (SDI)

The Safe Direction function prevents the motor shaft from moving in an unintended direction.

#### Benefits of the safety system

- Certified devices to implement safety functions that comply with the latest machinery safety standards
- One system to cover different levels of machinery safety requirements
- Modular hardware and flexible software provide an optimum safety system today and in the future
- Configuration tool for easy engineering and implementation
- Risk assessment documentation and calculation tool for achievable safety level analysis

Safety function	Safety logic (base unit) and drive	Expansion modules (Safety logic)	
		Safety relay output module	Safe speed / standstill monitoring module
Safe Torque-Off (STO)	●	-	-
Safe Stop 1 (SS1)	●	-	-
Safe Brake Control (SBC)	●	●	-
Safely Limited Speed (SLS)	●	-	●
Safe Speed Monitor (SSM)	●	-	●
Safe Direction (SDI)	●	-	●

The table describes the required devices to implement safety functions with ABB high performance machinery drives.



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