The GATEKEEPER
Man - Machine Safeguarding News from SCHMERSAL

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# Safe Monitoring of Speed and Standstill

Guard locking safety devices are used to either protect operators from opening a guard door and being exposed to hazards or to protect a process from being abruptly interrupted from an unauthorized opening of a guard door. ISO 14119 refers to these two types of locking as guard locking or process locking respectively. An access guard should remain locked until a safe signal indicating a safe or ready state is received within the monitoring safety circuit. This signal can be based on complete standstill of hazardous motions or reduced speeds below hazardous considerations. Certain standards and regulations will provide guidance on what is considered safe speeds such as ANSI B65.1-2005 dealing with printing press systems.

The monitoring for a safe state of a standstill condition which will trigger the unlock signal can be achieved by a variety of different practices. Some of the more common methods include the monitoring of a rotating part. A safe state or "zero speed" is established once the revolutions have been reduced to a predetermined non-hazardous frequency. Another method is monitoring the back electromagnetic force (EMF) directly off of a motor. An EMF reading in the low millivolt range from the line voltage will represent a safe state for opening a guard. If the time it takes for the residual hazards of the machine to abate is constant, a fail-to-safe timer can also be utilized. Once a stop command is initialized the timer will begin a programmed count-down which upon completion will send the unlock signal to the safety device.

Monitoring for a predetermined safe speed is typically reserved for operations which require access to moving parts while a guard door is opened, such as tool setup/adjustments, troubleshooting or maintenance activities. However, it can also be applied similarly to standstill practices where only at a safe speed will a locking device be allowed to unlock. The monitoring of safe speeds is performed by more advanced monitoring controllers and commonly utilizes encoders or resolvers for speed detection.

## Safe speed and standstill monitors from Schmersal

### SRB-E...FWS Standstill monitor / Timer

The multifunction SRB-E...FWS can be used to monitor for standstill or activate a fail-to-safe timer delay. For standstill operation, the SRB-E...FWS will evaluate the impulses produced by rotating movement in inductive proximity switches. When the recorded sequence of impulses falls below the limiting frequency, the enabling paths close. SRB-E...FWS range standstill monitors are equipped with Integral System Diagnostics (ISD) for fast and simple recognition of faults. The user receives information regarding the switching condition of the standstill monitor and sensor by means of multi-function LED. Options also include a guard door monitoring function for safe signal processing of safety interlocking devices.

Online Product Catalog

### PSC1 Programmable Safety Controller

The Programmable Safety Controller PSC1 consists of freely programmable compact safety controllers with I/O extension modules for signal processing of emergency stop switches, guard door switches, light grids and additional mechanical and electronic safety switchgear. Additionally there is the possibility via numerous functions to monitor axes for safe speed applications. Functions include Safe speed monitoring, safe torque off, safe limited increments and safe direction.

Online Product Catalog
Brochure (PDF)
Tech Brief (PDF)


### AZS2305 Timer

The AZS fail-safe delay timer provides for the secure measurement of a preset time up to 99 minutes. The enabling signal for the control system is only given when the present time has elapsed which then makes it possible to open a guard locking device. AZS range fail-safe delay timers are of-ten used where dangerous situation can occur after a machine has been switched off, e.g. because of running-down movements.

Online Product Catalog

### DN3PS2 Standstill monitor

The DN3PS2 is a safety rated standstill monitoring relay which uses back electromotive force to detect standstill. 1 or 3 phase motors of up to 600VAC can be monitored without the need of any additional external sensors. The monitoring ability of the DN3PS2 allows it to be used in applications with VFD and up to PLe per ISO 13849 and SIL 3 per IEC 61508.

Tech Brief (PDF)

## Solenoid locks and accessories

Locking safety switches not only detect the closed safety guard, but provide a lock to prevent the guard from opening until the hazardous motion has abated. They are available as electromechanical solenoid interlocks with separate actuator keys. Similar electronic devices use a secondary non-contact sensor to detect door closure and feature solenoid locks, a motorized bolt lock, or an electromagnetic lock.

There are also a variety of accessories associated with standstill and safe speed monitoring. Pushbuttons and other control devices are used to signal the system to shut down and unlock the safety guards. An enabling device can manually control the machine at a safe speed with the guards open. Schmersal also offers proximity sensors to detect machine standstill.

### Electromechanical locks

[AZM161 Solenoid lock]

[AZM170 Solenoid lock]

[AZM190 Solenoid lock]

[AZM415 Solenoid lock]

[TKF/TKM Solenoid lock]

[TZF/TZM Solenoid lock]

### Electronic locks

[AZM201 RFID solenoid lock]

[AZM300 RFID solenoid lock]

[AZM400 Motorized bolt lock]

[MZM100 Electromagnetic lock]

### Controls & Accessories

[BDF200 Control station]

[BDF100 Control station]

[Pushbuttons]

[ZSD Enabling Device]

[IFL Proximity sensor]

[Door handles]

## For Reference


**Tech Brief**
**Safe Speed & Standstill Monitoring**

Our one page overview of Safe Speed and Standstill Monitoring and the related products we offer. It includes background information and further resources to find out more. Available as PDF only.

[Download the Tech Brief]

## Pop Quiz

High inertia machines, which take prolonged time to come to a safe state after receiving a stop command, may present special safeguarding requirements. Take the quiz to gauge your understanding on safeguarding techniques for high inertia machines. Hosted by EHS Today

Take The Quiz


## Ask The Expert

**Devin Murray**
TUV Functional Safety Engineer
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**Q: How do I know what speeds are considered safe for machine interactions?**

**A:** As with any aspect of safeguarding, a machine specific (Type C) standard should be used as a reference for selecting safe speeds. For example ANSI/RIA15.06 deals with robots and robotic cells and references the speed limitation of 250mm/s during human interaction. For equipment or applications where Type C standards do not apply, a risk assessment should be used to determine the speed limitations. The speed 250mm/s is referenced in many safety standards as this is the average human reaction time. It is suggested that an operator will not be able to avoid a hazard on processes moving faster than this speed.

**Have a question?** Ask Devin: [dmurray@schmersal.com]

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