

SCHMERSAL Tech Briefs:

Safe Speed & Standstill Monitoring



DN3PS2



AZS2305



SRB-E...FWS



PSC1



Overview

Safe Operational Speeds

Sometimes machines may need to be operated outside of normal conditions, at various speeds and with safety guards open. These occasions would include set-up and parameter setting tasks. European harmonized C-standards, such as DIN EN 12417, have defined several machine operating modes:

Mode 1: "Automatic" - a machine engaged at its normal production process speed with all safety guards closed and secured.

Mode 2: "Set-up" - the machine is running at significantly reduced speeds with the safety guards opened to allow for adjustment activities.

Mode 3: "Extended manual intervention" - requires the use of an enabling switch to allow operators to activate a limited number of machine functions at higher speeds, with safety guards open. Maximum speed is prescribed to set limits.



Standstill

Another consideration in the monitoring of safe speeds is to insure that the machine has reached standstill before safety guards can be opened. After the removal of power to a motor, a machine may still pose hazardous conditions because of flywheel overrun, spindle momentum, or unstable rest positions. Guards protecting these areas need to remain locked until dangerous conditions have abated.

Methods of monitoring speed or standstill

There are several methods of monitoring safe speeds and standstill:

Back EMF monitoring Back electromotive force, or Back EMF, is a phenomenon that occurs in electric motors where the rotating armature in the presence of a magnetic field produces a voltage which opposes the original applied voltage. Since Back EMF is proportional to the armature rotational speed and remains after the supply voltage has been removed, monitors can use it to indirectly measure the motor's speed or determine standstill if absent. The DN3PS2 standstill monitoring relay uses this method of monitoring.

Fail to safe timer Another method to insure standstill is to incorporate a fail-to-safe timer in the circuit. Once power is removed from a motor running at a specific speed, it will usually reach standstill in a consistent amount of time. The timer can be set to delay the enabling signal to unlock the guard doors for the duration needed for the motion to stop. Both the AZS2305 and the SRB-E...FWS Series can be used to safely unlock guards at a consistent defined time.

Monitoring sensor signals There are a variety of devices that can generate a signal based on the movement of the machine, such as proximity sensors, resolvers, and encoders. The signals generated are picked up by the monitor to determine speed or standstill. The SRB-E...FWS Series uses proximity sensors to monitor standstill while the PSC1 can use various types of encoders to monitor multiple axis.

Standstill Monitor

DN3PS2

- 3-phase Back EMF monitoring
- Simple wiring
- Requires no external sensors
- Rated up to 600V AC
- Time delayed outputs possible
- 22.5mm housing
- PLe / Category 4

Fail To Safe Timer

AZS2305

- 0.1 second to 99 minute delay
- Cross short recognition
- 3 enabling circuits
- 2 transistor outputs
- Integral System Diagnostic (ISD)
- 2 channel microprocessor control
- PLe / Category 3

Multifunction

SRB-E...FWS

- Monitors 1 or 2 impulse sensors (for standstill monitoring)
- Safe timer from 0.5s to 50 min
- Reset input
- 2 safe relay outputs
- 1 semiconductor output
- 2 signaling semiconductor outputs
- Guard door monitoring option
- Integral System Diagnostic (ISD)
- 2 channel microprocessor control
- PLe / Category 4

PSC1-C-10-SDM...

- 14 safe inputs
- 4 safe semiconductors (2A)
- 2 safe relay outputs
- 2 auxiliary outputs (250mA)
- Safe drive monitoring 1 to 8 axis
- PLe / Category 4
- Various safe speed functions:
 - SSM - Safe Speed Monitoring
 - STO - Safe Torque Off
 - SS1 - Stop Category 1
 - SS2 - Stop Category 2
 - SLS - Safe Limited Speed
 - SDI - Safe Direction
 - SLI - Safety-Limited Increment

Applications

- Material handling systems
- Packaging machinery
- Chemical processing equipment
- Robot cells
- Folding or brake presses
- Filter presses
- Punching machines
- Printing machines
- Injection molding
- Palletizers
- Packaging equipment

Available Literature



Contact

Schmersal USA
15 Skyline Drive
Hawthorne, NY 10532
Tel: 914-347-4775
Fax: 914-347-1567
E-mail: salesusa@schmersal.com

Schmersal Canada
29 Centennial Road, Unit 1
Orangeville ON L9W 1R1
Tel: 519-307-7540
Fax: 519-307-7543
E-Mail: salescanada@schmersal.com