# Safety Manual

## Silver Bullet 316SB, 316LT SPDT/DPDT Proximity Sensor

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## *1. Purpose and Scope*

This document provides an overview of the user responsibilities for installation, operation and maintenance of a 316SB or 316LT tungsten or Rhodium SPDT/DPDT proximity sensor in order to maintain the designed Safety Integrity level. Items that will be addressed are proof testing, and replacement the components over its lifetime, environmental and application limits, parameter settings.

## *2. Diagnostic Response Time*

The 316 SB or 316LT SPDT or DPDT proximity switch,when used in a SPDT or DPDT wiring configuration, has automatic diagnostic abilities by monitoring of the both the open and closed contacts.

The actual response time for the action of either type of switch is immediate and the diagnostic response time is related to the refresh rate of the host interface.

## *2.1 Installation and Maintenance*

The installation of the 316SB or 316 LT shall be to the I.O.M supplied (TECH 167)
It is essential that the 316 is used within the environmental and certification parameters. It is recommended that a periodic visual and operation evaluation is carried at least once a year or every 1 million cycles.

## *2.2 Proof test*

The objective of proof testing is to detect failures with the 316 that are not detected by any automatic diagnostics of the system. The concerns are undetected failures that prevent the Safety Instrumented Function from performing its intended function.

The frequency of proof testing, or the proof test interval, is to be determined in reliability calculations for the safety instrumented functions for which either switch type maybe applied. The proof tests must be performed more frequently or as frequently as specified in the calculation in order to maintain the required safety integrity of the Safety Instrumented Function.

The following proof test is recommended.

| Step | Action |
|---|---|
| 1. | Following Management of Change procedures for the site, take note of the switch Contact status (COM- N/O or COM - N/C). |
| 2. | Stroke the actuator and / or the valve to a desired position and check the opposite contacts from STEP 1 for continuity or electrical parameters. |
| 3. | Adjust cam position if necessary and take corrective action to ensure that the installation is carried out using the service air pressure. |
| 4. | Records any failures in the SIF inspection database. Restore the loop to full operation. |

This test will detect approximately 99% of possible DU failures in the 316 (Proof Test Coverage). The person(s) performing the proof test on the 316 proximity switch should be trained in SIS operations, including bypass procedures, position monitor maintenance and company Management of Change procedures. Tools required are: Refer to the I.O.M supplied with the 316SD or 316LT (TECH-167).

### *2.3 Repair and replacement*

When replacing the switch it is essential that the instructions are followed. Failure to follow these instructions may impair the reliability.

### *2.4 Reliability data and lifetime limit*

A detailed Failure Mode, Effects, and Diagnostics Analysis (FMEDA) report is available from Westlock Controls Corporation. This report details all failure rates and failure modes, common cause factors for applications with redundant devices and the expected lifetime of a 316. The 316SB, 316LT in either Tungsten or Rhodium, SPDT/DPDT is intended for low demand mode applications up to SIL3 for use in a simplex (1oo1) configuration, depending on the $PFD_{AVG}$ calculation of the entire Safety Instrumented Function.

- When using a 316 of either switch type in a redundant configuration, a common cause factor should be included in reliability calculations. For details see the FMEDA report.
- The failure rates of a 316 of either switch type may increase sometime after this period. Reliability calculations based on the data listed in the FMEDA report for mission times beyond the lifetime may yield results that are too optimistic, i.e. the calculated Safety Integrity Level will not be achieved.
- The Safety Function of the 316 will change its output when the attached the valve moves to the configured position.

### *2.5 Environmental and Application limits*

The 316SB and 316LT are certified to various protection methods and environmental temperature limitations. These can be found on the product manual.

### *2.6 Reporting a failure*

Any failures that are detected and that compromise functional safety should be reported to the Safety Office / QA Supervisor within Westlock Controls. It is recommended that customers and end users register the SIL product with Westlock Controls using the unique serial number located on the Identification Label.

## 3. Terms and Abbreviations

**Safety** Freedom from unacceptable risk of harm.

**Functional Safety** The ability of a system to carry out the actions necessary to achieve or to maintain a defined safe state for the equipment/machinery/plant/ apparatus under control of the system.

**Basic Safety** The equipment must be designed and manufactured such that it protects against risk of damage to persons by electrical shock and other hazards and against resulting fire and explosion. The protection must be effective under all conditions of the nominal operation and under single fault condition.

**Safety Assessment** The investigation to arrive at a judgment - based on evidence - of the safety achieved by safety-related systems.

Further definitions of terms used for safety techniques and measures and the description of safety related systems are given in IEC 61508-4.

**FMEDA** Failure Modes, Effects and Diagnostic Analysis.

**HFT** Hardware Fault Tolerance.

**Low demand mode** Mode, where the frequency of demands for operation made on a safety-related system is no greater than one per year and no greater than twice the proof test frequency.

**$PFD_{AVG}$** Average Probability of Failure on Demand.

**SFF** Safe Failure Fraction, the fraction of the overall failure rate of a device that results in either a safe fault or a diagnosed unsafe fault.

**SIF** Safety Instrumented Function, a set of equipment intended to reduce the risk due to a specific hazard (a safety loop).

**SIL** Safety Integrity Level, discrete level (one out of a possible four) for

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| | specifying the safety integrity requirements of the safety functions to be allocated to the E/E/PE safety-related systems where Safety Integrity Level 4 has the highest level of safety integrity and Safety Integrity Level 1 has the lowest. |
| **SIS** | Safety Instrumented System – Implementation of one or more Safety Instrumented Functions. A SIS is composed of any combination of sensor(s), logic solver(s), and final element(s). |

## 4. Status of the document

### *4.1 Releases*

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