WESTLOCK
CONTROLS

Accutrak
Safety Manual
With Magnum XT 90 Proximity Switches, SPDT/DPDT Mechanical Switches and Inductive Proximity Sensor (NJ2-V3-N)

Safety Manual: SMAN-002		**Revision: A**	
Prepared By: Anthony Paolini	**Date:** May 20, 2015	**Drafting Work Order:** 24174	**ECN:** 13543
Reviewed By: E. Barroso	**Date:** 3/19/20	**Approved By:** C. Irwin	**Date:** 4/8/20

WESTLOCK CONTROLS
280 N. MIDLAND AVE., STE. 258, SADDLE BROOK, NJ 07663 TEL: 201-794-7650 FAX: 201-794-0913

www.westlockcontrols.com

Revision History

Revision	Rev. A
May 20, 2015	03/19/2020
Initial release	

Westlock Controls Locations

USA
Phone: (201) 794-7650 •Fax: (201) 794-0913

Europe
Phone: 011-44-189-251-6277

Table of Content

1. Purpose and Scope

This document provides an overview of the user responsibilities for installation, operation and maintenance of an Accutrak position monitor containing the Magnum XT-90 proximity switch, V3 SPDT/DPDT Mechanical switch and Inductive Proximity Sensor in order to maintain the designed Safety Integrity
level. Items that will be addressed are proof testing, repair and replacement of the related components, lifetime, environmental and application limits, parameter settings and replacement of the related component , lifetime, environmental and application limits and parameter settings using an Accutrak assembled with either V3 SPDT Mechanical Switches or Magnum XT-90 Proximity switches.

2. Diagnostic Response Time.

An Accutrak that contains either V3 SPDT mechanical or Magnum XT-90 proximity switch, when used in a SPDT 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 this Accutrak position monitor shall be to the I.O.M supplied (TECH-549-EN). It is essential that the Accutrak 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.

When using the Accutrak product within a safety system it should be noted that switch contact ratings should be no more than 60% of the switch vendors ratings, and that any non-resistive load must have transient protection added by the end user.

2.2 Proof test

The objective of proof testing is to detect failures within the Accutrak 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 Accutrak (Proof Test Coverage). The person(s) performing the proof test on the Accutrak 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 Accutrak (TECH-549-EN).

2.3 Repair and replacement

When replacing either switch type it is essential that the instructions for that specific Accutrak variation 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 an Accutrak.

- An Accutak with either switch type 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.

- The development process of an Accutrak containing either switch type is suitable up to SIL3, allowing redundant use of the transmitter up to this Safety Integrity Level, depending the PFD_{AVG} calculation of the entire Safety Instrumented Function.

- When using an Accutrak containing either switch type in a redundant configuration, a common cause factor should be included in reliability calculations. For details see the FMEDA report.

· The reliability data listed in the FMEDA report is only valid for the useful life time of an Accutrak containing either switch type. The failure rates of an Accutrak containing 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 Accutrak's switch(s) will change its output when the attached valve moves to the configured position.

Table 1 below details the failure rates for the V3 SPDT mechanical switch (M02), DPDT Mechanical switch (M04), Proximity Sensor (M08) NJ2-V3-N and Magnum XT-90 proximity switch (M06) all of which can be used within the following series of enclosures; 2007,9479, 360, 366, 5004/5044, 9358,1040,9044,9468.

Table 1 Failure rates according to IEC 61508 in FIT

ACCUTRAK Series 360,366,1040,2007,9479, **5004/5044. Switch Circuit Qty. (all switch codes)**	**λ_{SD}**	**λ_{SU1}**	**λ_{DD}**	**λ_{DU}**	
1 Switch Circuit	0	11	0	94	
2 Switches Circuit	0	22	0	119	
3 Switches Circuit	0	34	0	149	
4 Switches Circuit	0	45	0	174	
1 Switch Circuit w/PVST	11	0	86	8	
2 Switches Circuit w/PVST	22	0	110	9	
3 Switches Circuit w/PVST	34	0	139	10	
4 Switches Circuit w/PVST	45	0	163	11	

The architectural constraint type for the ACCUTRAK Valve Position Monitor is A. The hardware fault tolerance of the device is 0. The SIS designer is responsible for meeting other requirements of applicable standards for any given SIL as well.

[1] It is important to realize that the No Effect failures are no longer included in the Safe Undetected failure category according to IEC 61508, edition 2, 2010.

[2] Safe Failure Fraction needs to be calculated on (sub) system level.

2.5 Environmental and Application limits

Accutrak position monitors are certified to various protection methods and environmental temperature limitations. These can be found on the product label (found on the outside of the cover) and on the supporting IOM delivered with each unit. If the Accutrak position monitor is used outside of the application limits then the reliability data listed in Section 2.5 becomes invalid.

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 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

Version: V0

Revision: R0

Version History: V0, R0:

Review: V0, R0:

Release status: