1 Scope

1.1 ISA-TR84.00.02-2002 - Part 5 is informative and does not contain any mandatory requirements. ISA-TR84.00.02-2002 - Part 5 is intended to be used only with a thorough understanding of ISA-TR84.00.02-2002 - Part 1 which defines the overall scope.

1.2 ISA-TR84.00.02-2002 - Part 5 provides:

a) guidance in PFD analysis of logic solvers;

NOTE The term "logic solver" will be used throughout Part 5 to indicate the SIS logic solver. The logic solver technology may be any E/E/PES.

b) a method to determine the PFD of logic solvers;

c) failure rates and failure modes of logic solvers;

d) the impact of diagnostics, diagnostic coverage, covert faults, test intervals, common cause, systematic failures, redundancy of logic solvers on the PFD of the logic solver; and

e) a method for the verification of PFD of logic solvers.

1.3 The procedures and examples outlined in ISA-TR84.00.02-2002 - Part 5 provide the engineer with Markov modeling steps to be followed in determining a mathematical value for the PFD for typical configurations of SIS logic solvers designed according to ANSI/ISA-84.01-1996.

1.4 Persons using ISA-TR84.00.02-2002 - Part 5 require a basic knowledge of Markov Analysis.

1.5 See ISA-TR84.00.02-2002 - Part 1 (Introduction), Part 2 (Simplified Equations), Part 3 (Fault Tree Analysis), and Part 4 (Markov Analysis) if it is necessary to mathematically evaluate the SIL of the safety instrumented function (SIF).

NOTE The method illustrated herein (i. e. Markov analysis) may also be used to determine the PFD of other SIF components such as sensors and final elements. The logic solver was selected to illustrate how Markov Analysis is applied to a complex SIF component.

2 References

1. ANSI/ISA-84.01-1996 “Application of Safety Instrumented Systems for the Process Industries," Instrumentation, Systems, and Automation Society, Research Triangle Park, NC, 27709, February 1996.

2. ISA-TR84.00.02-2002, "Safety Instrumented Functions (SIF) – Safety Integrity Level Evaluation Techniques, Part 1: Introduction; Part 2: Determining the SIL of a SIF via Simplified Equations; Part 3: Determining the SIL of a SIF via Fault Tree Analysis; Part 4: Determining the SIL of a SIF via Markov Analysis; Part 5: Determining the PFD of SIS Logic Solvers via Markov Analysis," Instrumentation, Systems and Automation Society, Technical Report, Research Triangle Park, NC, 27709, 2002.

3. “Reliability, Maintainability and Risk” by David J. Smith, 4th Edition, 1993, Butterworth-Heinemann, ISBN 82-515-0188-1.

4. “Guidelines for Safe Automation of Chemical Processes," Center for Chemical Process Safety, American Institute of Chemical Engineers, New York, NY 10017, 1993.