

ISA-TR84.00.05-2009

**Guidance on the Identification of Safety
Instrumented Functions (SIF)
in Burner Management Systems (BMS)**

Approved 10 December 2009

ISA-TR84.00.05-2009, Guidance on the Identification of Safety Instrumented Functions (SIF) in Burner Management Systems (BMS)

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1 Foreword

As a technical report, ISA-TR84.00.05 is provided for information purposes only and is not part of ANSI/ISA-84.00.01-2004 (ref. 4.1)

ISA-TR84.00.05 is intended for reference in applications where it has been determined that ANSI/ISA-84.00.01-2004 applies.

NOTE Throughout this technical report, the term "ANSI/ISA-84.00.01-2004" is used to refer to ANSI/ISA-84.00.01-2004 Parts 1-3 (IEC 61511 Modified).

ANSI/ISA-84.00.01-2004 provides minimum requirements for designing and managing safety instrumented systems (SISs) based on functional and integrity requirements established during a hazard and risk analysis. The specific methods used to conduct the hazard and risk analysis are outside the scope of this technical report. Additional guidance is provided in ANSI/ISA-84.00.01-2004 Part 3 (ref. 4.1) and in *Guidelines for Hazard Evaluation Procedures* (ref. 4.2).

The ISA84 committee determined that it was appropriate to provide supplemental information on the application of hazard and risk analysis to Burner Management Systems (BMS). The purpose of ISA-TR84.00.05 is to provide users of ANSI/ISA-84.00.01-2004 with guidance on how to identify safety functions within the BMS. Safety functions classified as Safety Instrumented Functions (SIFs) should be designed and managed according to ANSI/ISA-84.00.01-2004, as well as other applicable practices. The presented work processes and illustrations are not intended to replace, but instead to supplement, the requirements of good engineering practices applicable to BMS, such as NFPA 85, NFPA 86, API 556, ASME CSD-1, and API RP 14C (see Clause 4).

In jurisdictions where the governing authorities (e.g., national, federal, state, province, county, city) have established process safety design, process safety management, or other requirements, these take precedence over the guidance provided in this technical report.

NOTE The example BMS architectures represent possible system configurations and should not be interpreted as recommendations. The configurations used in actual applications are specific to the operating environment and process conditions where they are used. As such, no general recommendations can be provided that are applicable in all situations. The user of this technical report is cautioned to clearly understand the assumptions and data associated with the methodologies in this document before attempting to utilize the methods presented herein.

The users of ISA-TR84.00.05 will include:

- Manufacturers of BMSs who are applying the requirements of ANSI/ISA-84.00.01-2004, in addition to other applicable good engineering practices.
- Hazard and Risk Analysis teams identifying and classifying the SIFs within a BMS.
- SIS designers who want an understanding of the safety requirements of BMS.

2 Introduction

In the process industries, many types of instrumented systems are used to maintain a process within normal operating limits. When a process exceeds these limits, protective functions are used to reduce the risk of identified hazardous events associated with safety, environmental, and business consequences. Protective functions are often allocated to instrumented systems, which are designed and managed to achieve or maintain a safe state when a process reaches a prescribed condition.

ANSI/ISA-84.00.01-2004 applies to safety instrumented systems (SISs), which are instrumented systems implemented to prevent an event that results in major consequences and unacceptable lasting effects, usually involving significant harm to humans, substantial damage to the environment, and/or loss of community trust with possible loss of franchise to operate. As companies apply ANSI/ISA-84.00.01-2004 to the design of their process equipment, many want to consistently apply an identification and classification process across a facility.

Fired equipment is found throughout the process industries in many applications, including various types of heaters and boilers. The hazards associated with burner operation are managed by an instrumented system commonly referred to as the burner management system (BMS). The BMS provides interlocks and permissives to prevent misoperation of equipment and to safely handle faults caused by equipment failure. These events potentially result in uncontrolled fires, explosions, or implosions and in the unintended release of the materials being heated. This technical report refers to these functions as BMS functions.

This technical report shows examples of BMS functions required by good engineering practices applicable to BMS, such as NFPA 85 (ref. 4.4), NFPA 86 (ref. 4.5), API 556 (ref. 4.6), ASME CSD-1 (ref. 4.7), and API RP 14C (ref. 4.8). This technical report demonstrates how the work processes of Clauses 8 and 9 of ANSI/ISA-84.00.01-2004 can be applied to establish the functional and integrity requirements of the functions within the BMS. BMS functions should be implemented according to applicable good engineering practices, such as those previously referenced. ISA-TR84.00.05 illustrates how an identification and classification work process can be used to identify SIFs within the BMS.

3 Scope

- 3.1 ISA-TR84.00.05 is strictly informative and does not contain any mandatory requirements.
- 3.2 ISA-TR84.00.05 is intended to be used by those with an understanding of the basic requirements of ANSI/ISA-84.00.01-2004 and other good engineering practices applicable to BMS (references 4.4 to 4.8).
- 3.3 ISA-TR84.00.05 is intended to be used in conjunction with other good engineering practices. This technical report is not intended to stand alone or be a replacement for BMS-specific practices.
- 3.4 This technical report is intended to:
 - a) Identify and classify SIFs within typical BMSs for typical operating modes of fired equipment (e.g., pre-firing, light-off, shutdown, and normal operation);
 - b) Provide examples of typical safety assessments for the following equipment with BMSs: boilers (single burner), fired process heaters (multi-burner), thermal oxidizers, oil heater treaters and glycol reboilers.