



# SEMI S2-0310e

## ENVIRONMENTAL, HEALTH, AND SAFETY GUIDELINE FOR SEMICONDUCTOR MANUFACTURING EQUIPMENT

This Safety Guideline was technically approved by the global Environmental Health & Safety Technical Committee. This edition was approved for publication by the global Audits and Reviews Subcommittee on December 24, 2011. Available at [www.semiviews.org](http://www.semiviews.org) and [www.semi.org](http://www.semi.org) in February 2012; originally published in 1991; previously published December 2011.

**NOTICE:** Paragraphs entitled “NOTE” are not an official part of this Safety Guideline and are not intended to modify or supersede the official Safety Guideline. These have been supplied by the committee to enhance the usage of the Safety Guideline.

**NOTICE:** This Document contains material that has been balloted and approved by the SEMI Environmental Health & Safety Technical Committee, but is not immediately effective. This material and the date on which it becomes effective are included in Delayed Revisions Sections 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10. The provisions of this information are not an authoritative part of the Document until their effective dates. The main body of SEMI S2-0310 remains the authoritative version. Some or all of the provisions of revisions not yet in effect may optionally be applied prior to the effective date, providing they do not conflict with portions of the authoritative version other than those that are to be revised or replaced as part of the deferred change, and are labeled accordingly. Material that is to be replaced by revisions that are not yet in effect is preceded by a NOTICE indicating its status.

### 1 Purpose

1.1 This Safety Guideline is intended as a set of performance-based environmental, health, and safety (EHS) considerations for semiconductor manufacturing equipment.

### 2 Scope

**NOTICE:** Revisions to § 2 will be effective upon the July 2012 publication as shown in Delayed Revisions Sections 6 and 7. The global Environmental Health & Safety Technical Committee has voted that the revisions are **OPTIONAL** before the Effective Date.

2.1 *Applicability* — This guideline applies to equipment used to manufacture, measure, assemble, and test semiconductor products.

2.2 *Contents* — This Document contains the following sections:

1. Purpose
2. Scope
3. Limitations
4. Referenced Standards and Documents
5. Terminology
6. Safety Philosophy
7. General Provisions
8. Evaluation Process
9. Documents Provided to User
10. Hazard Warning Labels
11. Safety Interlock Systems
12. Emergency Shutdown
13. Electrical Design

- 14. Fire Protection
- 15. Heated Chemical Baths
- 16. Ergonomics and Human Factors
- 17. Hazardous Energy Isolation
- 18. Mechanical Design
- 19. Seismic Protection
- 20. Automated Material Handlers
- 21. Environmental Considerations
- 22. Exhaust Ventilation
- 23. Chemicals
- 24. Ionizing Radiation
- 25. Non-Ionizing Radiation and Fields
- 26. Lasers
- 27. Sound Pressure Level
- 28. Related Documents
- Appendix 1 — Enclosure Openings
- Appendix 2 — Design Guidelines for Equipment Using Liquid Chemicals
- Appendix 3 — Ionizing Radiation Test Validation
- Appendix 4 — Non-Ionizing Radiation (Other than Laser) and Fields Test Validation
- Appendix 5 — Fire Protection: Flowchart for Selecting Materials of Construction
- Appendix 6 — Laser Data Sheet – SEMI S2

2.3 *Precedence of Sectional Requirements* — In the case of conflict between provisions in different sections of this guideline, the section or subsection specifically addressing the technical issue takes precedence over the more general section or subsection.

**NOTICE:** SEMI Standards and Safety Guidelines do not purport to address all safety issues associated with their use. It is the responsibility of the users of the Documents to establish appropriate safety and health practices, and determine the applicability of regulatory or other limitations prior to use.

### 3 Limitations

3.1 This guideline is intended for use by supplier and user as a reference for EHS considerations. It is not intended to be used to verify compliance with local regulatory requirements.

3.2 It is not the philosophy of this guideline to provide all of the detailed EHS design criteria that may be applied to semiconductor manufacturing equipment. This guideline provides industry-specific criteria, and refers to some of the many international codes, regulations, standards, and specifications that should be considered when designing semiconductor manufacturing equipment.

3.3 Existing models and subsystems should continue to meet the provisions of SEMI S2-93A. Models with redesigns that significantly affect the EHS aspects of the equipment should conform to the latest version of SEMI S2. This guideline is not intended to be applied retroactively.

3.4 In many cases, references to standards have been incorporated into this guideline. These references do not imply applicability of the entire standards, but only of the sections referenced.



## 4 Referenced Standards and Documents

### 4.1 SEMI Standards and Safety Guidelines

SEMI E6 — Guide for Semiconductor Equipment Installation Documentation

SEMI F5 — Guide for Gaseous Effluent Handling

SEMI F14 — Guide for the Design of Gas Source Equipment Enclosures

SEMI F15 — Test Method (SF<sub>6</sub> Tracer Gas) for Enclosures Has Been Moved to SEMI S6

SEMI S1 — Safety Guideline for Equipment Safety Labels

SEMI S3 — Safety Guideline for Process Liquid Heating System

SEMI S6 — EHS Guideline for Exhaust Ventilation of Semiconductor Manufacturing Equipment

SEMI S7 — Safety Guidelines for Environmental, Safety, and Health (ESH) Evaluation of Semiconductor Manufacturing Equipment

SEMI S8 — Safety Guidelines for Ergonomics Engineering of Semiconductor Manufacturing Equipment

SEMI S10 — Safety Guideline for Risk Assessment and Risk Evaluation Process

SEMI S12 — Guidelines for Equipment Decontamination

SEMI S13 — Environmental, Health and Safety Guideline for Documents Provided to the Equipment User for Use with Semiconductor Manufacturing Equipment

SEMI S14 — Safety Guidelines for Fire Risk Assessment and Mitigation for Semiconductor Manufacturing Equipment

SEMI S22 — Safety Guideline for the Electrical Design of Semiconductor Manufacturing Equipment

### 4.2 ANSI Standards<sup>1</sup>

ANSI/IEEE C95.1 — Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz

ANSI/RIA R15.06 — Industrial Robots and Robot Systems – Safety Requirements

ANSI/ISA S84.01 — Application of Safety Instrumented Systems for the Process Industry

### 4.3 CEN/CENELEC Standards<sup>2</sup>

CEN EN 775 — Manipulating Industrial Robots – Safety

CEN EN 1050 — Safety of Machinery – Principles of Risk Assessment

CEN EN 1127-1 — Explosive Atmospheres – Explosion Prevention and Protection – Part 1: Basic Concepts and Methodology

### 4.4 DIN Standards<sup>3</sup>

DIN V VDE 0801 — Principles for Computers in Safety-Related Systems

### 4.5 IEC Standards<sup>4</sup>

IEC 60825-1 — Safety of Laser Products – Part 1: Equipment Classification, Requirements

<sup>1</sup> American National Standards Institute, 25 West 43<sup>rd</sup> Street, New York, NY 10036, USA; Telephone: 212.642.4900, Fax: 212.398.0023, <http://www.ansi.org>

<sup>2</sup> European Committee for Standardization, Avenue Marnix 17, B-1000 Brussels; Telephone: 32.2.550.08.11, Fax: 32.2.550.08.19, <http://www.cen.eu>

<sup>3</sup> Deutsches Institut für Normung e.V., Available from Beuth Verlag GmbH, Burggrafenstrasse 4-10, D-10787 Berlin, Germany; <http://www.din.de>

<sup>4</sup> International Electrotechnical Commission, 3 rue de Varembe, Case Postale 131, CH-1211 Geneva 20, Switzerland; Telephone: 41.22.919.02.11, Fax: 41.22.919.03.00, <http://www.iec.ch>