

SEMI Standards: S2 - S14 Breakdown

Defining the SEMI Standards

SEMI History: SEMI is an abbreviation for **S**emiconductor **E**quipment and **M**aterials **I**nternational. SEMI is an independent organization created 40 years ago to establish standardization within the semiconductor manufacturing industry. Shortly after the organization started, SEMI launched the SEMI Standards program. Today SEMI has grown into a global industry association serving the manufacturing supply chain for the micro- and nano-electronics industries, including: Semiconductors, Photo-voltaics (PV), High-Brightness LED, Flat Panel Display (FPD), Micro-electromechanical systems (MEMS), Printed and flexible electronics, and related micro- and nano-electronics.

SEMI Standards - Overall: SEMI Standards are considered voluntary technical agreements between suppliers and customers, aimed at improving product quality and reliability at a reasonable price and steady supply. SEMI standards provide specifications, guides, test methods, terminology, practices, etc. These documents are published in a 16 volume set.

SEMI standards cover every aspect of photovoltaic and semiconductor manufacturing: 3D-IC (3D) , Equipment Automation - Hardware and Software (E), Facilities (F), Flat Panel Display (D), Gases (C), High Brightness – LED, HB, MEMS/NEMS (MS), Materials (M), Microlithography (P), Packaging (G), Photovoltaic (PV), Process Chemicals (C), Safety Guidelines (S), Silicon Material & Process Control (MF), and Traceability (T). Perhaps the most critical of these standards are the Safety Guidelines (S).

SEMI Safety Certification: The Safety Guidelines (S) are perhaps the most critical of all the SEMI standards. The reason the safety guidelines cause so much concern is because semi-conductor production equipment is typically required to be "Certified" to the Safety Guidelines (S) by an accredited, third party, SEMI certification agency (i.e. US-NRTL).

SEMI Safety Guidelines: The SEMI Safety Guidelines Volume (S) consists of approximately 26 standards. The following provides a brief summary of the contents for some of the most frequently applied SEMI Safety Guideline (S) Product standards.

- **S1:** This standard provides guidance for the content and format of equipment safety labels and gives examples of symbols to use. It is intended for use by equipment manufacturers to create safety labels that alert persons to hazards associated with the equipment. The goal is to provide a unified international semiconductor-industry-specific safety labeling format.
- **S2:** This standard is intended as a set of performance-based environmental, health, and safety (EHS) considerations for semiconductor manufacturing equipment.
- **S3:** This standard provides minimum general safety considerations for the design and documentation of heating systems used for changing or maintaining the temperatures of process liquids used in semiconductor and flat panel display manufacturing. If you are not using this process, this standard does not apply to you.
- **S4:** This standard provides a method for determining which types of chemicals should have their cylinders stored in separate gas cabinets. It also indicates which cylinders may be stored together in a gas cabinet. The safety guideline is intended to be used by those working or doing research in semiconductor-related technology.



- **S5:** The purpose of this standard is to provide information and methods related to flow limiting devices that limit the rate of release of hazardous gases from gas cylinder valves during transportation, storage, and use.
- **S6:** This standard provides safety performance criteria for exhaust ventilation of semiconductor manufacturing equipment (SME) and test methods for assessing conformance to those criteria. The optimization of exhaust ventilation is becoming more important as energy efficiency and the physical constraints of exhaust ventilation utilities in manufacturing facilities become more pronounced. Efficiently designed exhaust ventilation should be provided to protect personnel, property, and the environment from health and safety risks. The purpose of this standard is to provide performance and design principles, test methods, and test criteria for exhaust ventilation.
- **S7:** This standard provides guidance on how information should be communicated when requested by the applicable SEMI 'S' Document or the evaluating purchaser. This Document provides qualification considerations for the evaluating purchaser and their personnel.
- **S8:** These guidelines provide ergonomics design principles and considerations for semiconductor manufacturing equipment. The purpose of these guidelines is to promote compatibility between the user and the equipment in the manufacturing environment.
- **S10:** The purpose of this guideline is to establish general principles for risk assessment to enable identification of hazards, risk estimation, and risk evaluation in a consistent and practical manner. This standard provides a framework for carrying out risk assessments on equipment in the semiconductor and similar industries and is intended for use by supplier and purchaser as a reference for EHS considerations.
- **S14:** This document provides considerations to the manufacturers of semiconductor manufacturing equipment that will assist them in assessing and mitigating the risk to equipment and product associated with fire and combustion by-products. Although these guidelines are written in the form of an assessment tool, they are intended for use throughout the design and development of semiconductor manufacturing equipment. These guidelines may also be used by the users of such equipment and by other interested parties to assess and compare the described risks of various equipment designs or in the design and evaluation of ancillary equipment or modifications. These guidelines are not intended to specify which techniques (e.g., selection of materials or detection systems) are to be used to mitigate fire risk. These guidelines do however recommend that the traditional risk management hierarchy of elimination, engineering controls, administrative controls, warning and work practices be followed. The appropriate application of these guidelines will result in a report which identifies, analyzes and assesses residual fire risks.

SEMI Compliance: Based on this understanding of the standards, under the Safety Guidelines, most product manufacturers must only meet portions of SEMI S2 & S8. Occasionally, SEMI S14 is required - when the product incorporates flammable or combustible materials.

**CertifiGroup can perform SEMI evaluations
including US-UL/CAN-CSA Product Certifications**