

SEMI C56-0305 (Reapproved 0211)

SPECIFICATIONS AND GUIDELINES FOR DICHLOROSILANE (SiH₂Cl₂)

This Standard was technically approved by the global Gases Committee. This edition was approved for publication by the global Audits & Reviews Subcommittee on December 21, 2010. Available at www.semiviews.org and www.semi.org in February 2011; originally published March 2005.

NOTICE: This document was reapproved with minor editorial changes.

1 Purpose

1.1 The purpose of this document is to provide a series of specifications for different grades of dichlorosilane (SiH₂Cl₂) that are used in the semiconductor industry.

2 Scope

2.1 This document covers requirements for all grades of dichlorosilane (SiH₂Cl₂) used in the semiconductor industry.

2.2 If analytical methods are not complete, the requirements are presented as a guideline.

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 Description

3.1 Dichlorosilane is a flammable, corrosive, colorless liquid which hydrolyzes in the presence of moisture. It oxidizes readily and rapidly to release hydrogen chloride. It is easily ignited in the presence of air.

4 Referenced Standards and Documents

4.1 SEMI Standards

SEMI C1 — Guide for the Analysis of Liquid Chemicals

SEMI C3 — Specifications for Gases

NOTICE: Unless otherwise indicated, all documents cited shall be the latest published versions.

5 Terminology

5.1 Terminology appropriate to this standard is defined in SEMI C3.

6 Requirements

6.1 Purity and other requirements for the various grades of dichlorosilane are given in Table 1.

Table 1 Impurity and Other Requirements for Various Grades of Dichlorosilane

Previous SEMI Reference #	C3.18-1102 (Specification)	C3.31-1102 (Specification)
Purity	97%	99%
Impurities	Maximum Acceptable Level ^{#1}	
All Other Chlorosilanes (Monochlorosilane, Silicon Tetrachloride, Trichlorosilane)	3% (liquid phase)	1% (liquid phase) ^{#2}
Aluminum	1.0 ppbw (vapor phase derived)	1.0 ppbw (vapor phase derived)
Arsenic	0.5 ppbw (vapor phase derived)	0.2 ppbw (vapor phase derived)
Boron	0.3 ppbw (vapor phase derived)	0.1 ppbw (vapor phase derived)

<i>Previous SEMI Reference #</i>	<i>C3.18-1102 (Specification)</i>	<i>C3.31-1102 (Specification)</i>
Carbon	10 ppmw (vapor phase derived)	1 ppmw (vapor phase derived)
Iron	50 ppbw (liquid phase)	50 ppbw (liquid phase)
Phosphorus	0.3 ppbw (vapor phase derived)	0.3 ppbw (vapor phase derived)

#1 An analysis of significant figures has not been considered. The number of significant figures will be based on analytical accuracy and the precision of the provided procedure.

#2 Monochlorosilane not to exceed 0.5%.

#3 This specification applies to the appropriate phase of the cylinder as delivered.

#4 The liquid phase purity is to be based on the chlorosilane determination. In addition, argon + helium are to be controlled in the vapor phase to less than 0.5%. This argon + helium determination will not affect the percent purity determination.

#5 Initial purging of the vapor phase is recommended to reduce inert gas content used in the cylinder fill procedure.

#6 Analytical procedures for the doping elements, metals and selected impurities are to be determined between the user and supplier at the present time.

7 Electrical Requirements

7.1 Electrical requirements for the various grades of dichlorosilane are given in Table 2.

Table 2 Electrical Requirements for Various Grades of Dichlorosilane

<i>Previous SEMI Reference #</i>	<i>C3.18-1102 (Specification)</i>	<i>C3.31-1102 (Specification)</i>
Resistivity ^{#1}	Greater than 50 ohm-cm (<i>n</i> -type) ^{#2}	Greater than 150 ohm-cm (<i>n</i> -type) ^{#2}

#1 The resistivity measurement technique is to be determined between supplier and user.

#2 Monocrystalline silicon formed from this material, not the material itself.

8 Physical Constants

8.1 The physical constants of dichlorosilane are given in Table 3 (for information only).

Table 3 Physical Constants of Dichlorosilane (for information only)

	<i>Metric Units</i>	<i>US Units</i>
Molecular weight	100.99	100.99
CAS Number	4109-96-0	4109-96-0
Boiling point at 1 atm	8.2°C	46.8°F
Density of gas at 25°C (77°F) and 1 atm	4.168 kg/m ³	0.260 lb/ft ³
Specific gravity of gas at 21.1°C (70°F) and 1 atm (air = 1)	3.48	3.48
Density of liquid at 25°C (77°F)	122 kg/m ³	7.62 lb/ft ³

9 Analytical Procedures for Purity of 97% of Dichlorosilane

NOTE 1: The sample is extremely flammable and corrosive. Test for leaks before sampling. Ensure good electrical grounding.

9.1 *Other Chlorosilanes* — This procedure is for the determination of other chlorosilanes (monochlorosilane, trichlorosilane and silicon tetrachloride) in dichlorosilane using a gas chromatograph with a thermal conductivity detector.