

SEMI MS11-0318

SPECIFICATION FOR MICROFLUIDIC PORT AND PITCH DIMENSIONS

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1 Purpose

1.1 The purpose of this Document is to provide standard pitch dimensions for developers of microfluidic devices.

2 Scope

2.1 The Scope of this Document is limited to providing a specific set of values for pitch in a microfluidic interface design, and port size, that ensure that two mating components fit properly.

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 Standard covers microfluidic designs with pitch ranging from 0.100 mm to 10.00 mm.

4 Referenced Standards and Documents

4.1 None.

5 Terminology

5.1 Definitions

5.1.1 *diameter of a port* — value of the width of the opening at the microfluidic interface.

5.1.2 *microfluidic interface design* — provisions for mechanical clamping, fluidic sealing, and port array locations that define how two mating fluidic components fit together.

5.1.3 *pitch* — designed distance from center-to-center of adjacent ports along one axis of a two-dimensional array of ports.

5.1.4 *port* — hole through which fluid can pass at the interface between two microfluidic components or layers.

5.1.5 *port array* — designed set of ports arranged a two-dimensional planar array, each with a designed [X, Y] location.

5.1.6 *port array origin* — position in the X-Y plane that defines the [0, 0] location for the port array.

5.1.7 *port location* — the [X, Y] coordinates of the center of a given port, with respect to the port array origin.

5.1.8 *wall* — physical barrier between two adjacent ports.

6 Specification Requirements for Microfluidic Pitch and Port Design

6.1 Requirements for Pitch

6.1.1 Specify pitch for X axis. Refer to Table 1 below for available options.

6.1.2 Specify pitch for Y axis. Refer to Table 1 below for available options.

6.1.3 Specify layout type: square, rectangular, interleaved, or mixed density.

6.1.4 Specify number of ports along each of the X and Y axes of the array (e.g., 12 ports by 3 ports).

6.2 Requirements for Port Size

6.2.1 When the Microfluidic Interface Design requires isolation (mechanical, fluidic, and electrical), the port size must be selected such that walls between adjacent ports are sufficiently thick to maintain mechanical integrity of the interface.

6.3 Requirements for Mechanical Precision

6.3.1 Loose Mechanical Precision

6.3.1.1 Tolerance on each actual port location with respect to port array origin shall be less than or equal to 0.2 times the pitch.

6.3.2 Tight Mechanical Precision

6.3.2.1 Tolerance on each actual port location with respect to port array origin shall be less than or equal to 0.1 times the pitch.

6.4 Requirements for Port Array Origin Marking

6.4.1 The product shall include a visual indicator for the identification of the port array origin.

6.4.2 The product shall include a visual indicator for the three-dimensional coordinate axes, identifying the X and Y axes in the port array plane, that is unambiguous through rotation of the product about any axis.

6.4.3 The product datasheet shall provide an explanatory drawing of the port array origin visual indicator, and the coordinate axes visual indicator.

6.5 Examples of Pitch designs based on this standard are shown in Appendix 1 of this Standard. The allowed pitch values are shown below in Table 1.

Table 1 Allowed Pitch Values

<i>Range: 0.100–1.000 (mm)</i>	<i>Range: 1.00–10.00 (mm)</i>
0.100	1.00
0.125	1.25
0.150	1.50
0.175	1.75
0.200	2.00
0.225	2.25
0.250	2.50
0.300	3.00
0.350	3.50
0.400	4.00
0.450	4.50
0.500	5.00
0.600	6.00
0.700	7.00
0.800	8.00
0.900	9.00
1.000	10.00

7 Certification

7.1 In order to certify compliance to this Specification, the following requirement applies:

7.1.1 The manufacturer shall provide a certificate of compliance to this Standard when requested by customer.

8 Product Labeling

8.1 The compliance to this Standard shall be stated on the product datasheet.

8.2 Product labeling is not required on the product itself.

9 Packing and Package Labeling

9.1 None required.

10 Related Documents

10.1 *SEMI Standards and Safety Guidelines*

SEMI MS3 — Terminology for MEMS Technology

SEMI MS6 — Guide for Design and Materials for Interfacing Microfluidic Systems

SEMI MS7 — Specification for Microfluidic Interfaces to Electronic Device Packages

SEMI MS9 — Specification for High Density Permanent Connections Between Microfluidic Devices

10.2 *ANSI/SLAS Standard*¹

ANSI/SLAS 4-2004 — Microplates — Well Positions

10.3 *ISO Standard*²

IWA 23:2016 — Interoperability of Microfluidic Devices – Guidelines for Pitch Spacing Dimensions and Initial Device Classification

10.3.1 Possible compatibility with other related Standards: ISO IWA 23 specifies a ‘metric multiple pitch concept.’

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APPENDIX 1

MICROFLUIDIC INTERFACE PITCH DESIGN USING THIS STANDARD

NOTICE: The material in this Appendix is an official part of SEMI MS11 and was approved by full letter ballot procedures on December 13, 2017.

A1-1 Examples

A1-1.1 Figures in these examples all exhibit ‘Loose Mechanical Precision’; some exhibit ‘Tight Mechanical Precision’ as specified by this Standard. Note that the calculated total tolerance will depend on the choice of Port Array Origin.

A1-1.2 All figures in these examples have a suitable ‘port array origin marking’, the requirements of which are given in § 6.4 ‘Requirements for Port Array Origin Marking. These indicate the port at which the *X-Y* plane has its physical origin. The *Z* axis is up out of the plane as indicated by a circled ‘*Z*’.