

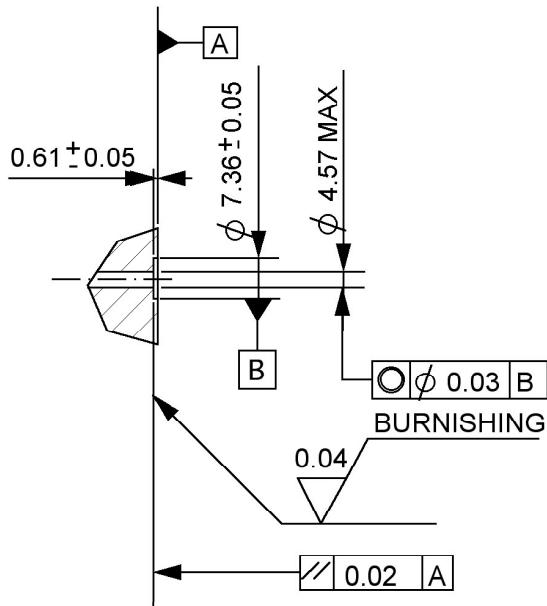
## R1-2 Design Example 2

R1-2.1 *Seal Design* — See Figure R1-2.

R1-2.2 *Surface Hardness* — The sealing surface (the bottom of the counterbore) has a minimum hardness of 300 Vickers. The hardness may be tested per ISO 6507.

R1-2.3 *Surface Roughness* — The sealing surface (the bottom of the counterbore) has a surface roughness of 0.04 micrometers Ra max. The surface roughness may be tested per SEMI F37-0299.

R1-2.4 *Surface Scratches* — The sealing surface (the bottom of the counterbore) is without any lateral scratches which are visible to non-magnified normal vision.



**Figure R1-2**  
**Design Example 2**

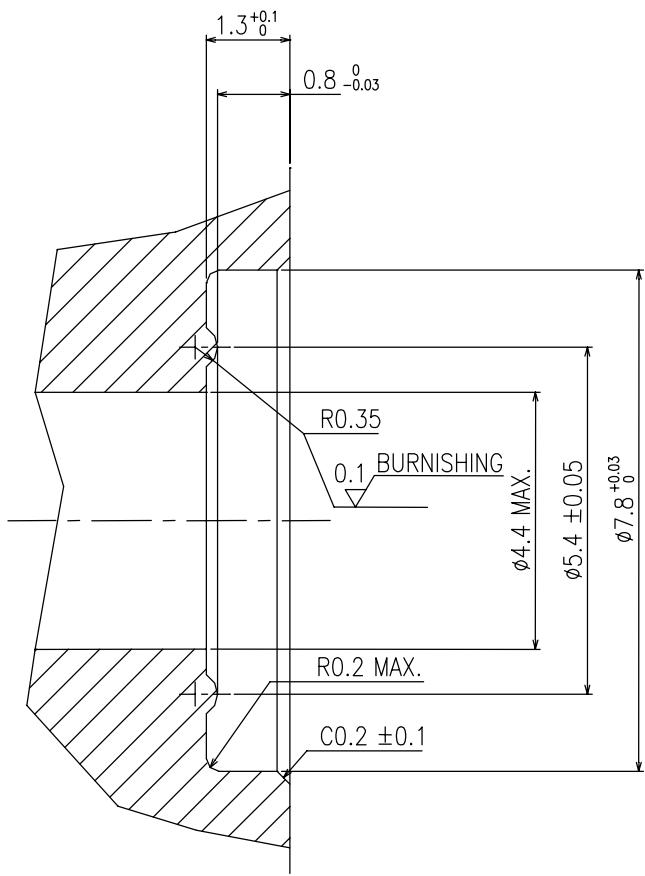
### R1-3 Design Example 3

R1-3.1 *Seal Design* — See Figure R1-3.

R1-3.2 *Surface Hardness* — The sealing surface (the bottom of the counterbore) has a minimum hardness of 300 Vickers. The hardness may be tested per ISO 6507.

R1-3.3 *Surface Roughness* — The sealing surface (the bottom of the counterbore) has a surface roughness of 0.1 micrometers Ra max. The surface roughness may be tested per SEMI F37-0299.

R1-3.4 *Surface Scratches* — The sealing surface (the bottom of the counterbore) is without any lateral scratches which are visible to non-magnified normal vision.



**Figure R1-3**  
**Design Example 3**

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## SEMI F83-0304

# SPECIFICATION FOR DIMENSION OF TWO PORT COMPONENTS (EXCEPT MFC/MFM) FOR 1.125 INCH TYPE TWO FASTENER CONFIGURATION SURFACE MOUNT GAS DISTRIBUTION SYSTEMS

This specification was technically approved by the Global Gases Committee and is the direct responsibility of the Japanese Gases & Facilities Committee. Current edition approved by the Japanese Regional Standards Committee on November 20, 2003. Initially available at [www.semi.org](http://www.semi.org) February 2004; to be published March 2004.

### 1 Purpose

1.1 This standard establishes the properties and physical dimensions of two port components for 1.125 inch type surface mount gas distribution systems.

### 2 Scope

2.1 This document includes common requirements, layout, size, detailed specifications, and dimensions of the components.

2.2 This standard applies to all two port two fastener components (except mass flow controllers and mass flow meters). The components (i.e. valves, pressure regulators, pressure transducers, filters and purifiers) are mounted on substrates with fasteners accessible from the top.

2.3 This standard only applies to components, which control flow of  $\leq 50$  slm nitrogen equivalent at 308 kPa (44.7 psia). This standard also only applies to components with operating pressures less than 3445 kPa (500 psia) at 20°C.

**NOTICE:** This standard does not purport to address safety issues, if any, associated with its use. It is the responsibility of the users of this standard 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 only addresses the component; it does not address the seals, the sealing system, or the assembly process and does not guarantee the performance of the sealing system. The user should be aware that gas delivery system performance and sealing system performance are addressed elsewhere in the SEMI standards.

3.2 The user should be aware that alternative technologies are commercially available.

3.3 International, national, and local codes, regulations, and laws should be consulted to ensure that the

equipment meets regulatory requirements in each location of use.

### 4 Referenced Standards

#### 4.1 SEMI Standards

SEMI E49.9 — Guide for Ultrahigh Purity Gas Distribution Systems in Semiconductor Manufacturing Equipment

SEMI F20 — Specification for 316L Stainless Steel Bar, Extruded Shapes, Plate, and Investment Castings for Components Used in High Purity Semiconductor Manufacturing Applications

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

ASME Y14.5 — Dimensioning and Tolerancing

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

### 5 Terminology

#### 5.1 Definitions

5.1.1 *components for surface mount* — a gas distribution system component having inlets and outlets located on the bottom of the component with the attachment mechanism accessible from the top.

5.1.2 *Ra* — roughness average. The arithmetic average of the absolute values of the measure profile height deviations taken within the sampling length and measured from the graphical centerline.

5.1.3 *two fastener configuration* — the component has two fasteners per sealing point. The sealing point is located in the middle of the two fasteners.

### 6 Common Requirements

6.1 *Dimensional Requirements* — All components shall meet the requirements outlined in Figure 1. All

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geometric dimensioning and tolerancing complies with ASME Y14.5 and/or the applicable ISO standard.

NOTE 1: All dimensions are in millimeters unless otherwise noted.

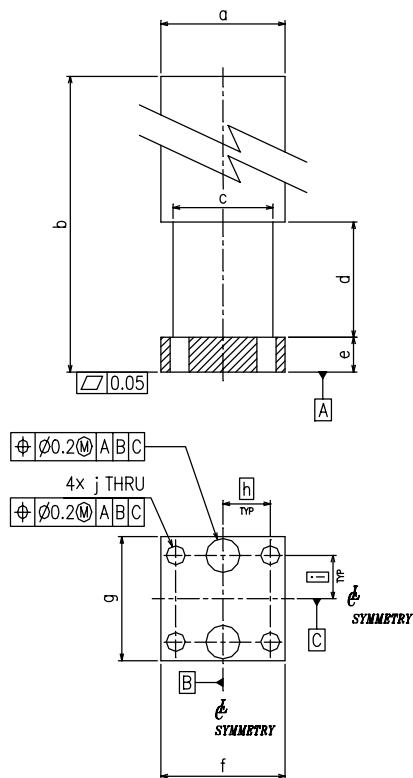
NOTE 2: The through hole of the sealing port will be elliptical if the through hole is drilled at an angle. In this case, the diameter shall apply to the major diameter of the ellipse.

**6.2 Material** — The material used to manufacture the base of the components shall comply to SEMI F20 with the exception that the sulfur content shall comply to SEMI E49.9.

NOTE 3: SEMI E49.9 was withdrawn. However, a ballot to combine E49.8 and E49.9 in one single standard was submitted for SEMICON West 2003.

**6.3 Burrs and Sharp Edges** — Unless specifically noted on the drawing, remove all burrs and sharp edges.

**6.4 Handles and Displays** — Rotating handles and removable displays shall stay within the maximum envelope of the base of the component with the exception of toggle and/or lockout/tagout valves at the discretion of the system designer. They shall be movable or removable such that they do not interfere with the access of the mounting fasteners from above.



a	b	c	d	e	f	g	h	i	j
$\phi 28.6$ MAX	127 MAX	$\phi 23$ MAX	20.6 MIN	$6.5$ $\pm 0.2$	$28.6$ $+ 0.3$ $- 0.5$	$28.6$ $+ 0.3$ $- 0.5$	10.9	10	$\phi 4.4$ $\pm 0.1$

UNIT: [mm]

**Figure 1**  
**Dimensional Requirements for All Components**



## 7 Related Documents

### 7.1 ISO Standards<sup>2</sup>

ISO 406 — Technical Drawings - Tolerancing of Linear and Angular Dimensions

ISO 1101 — Technical Drawings - Geometrical Tolerancing - Tolerancing of Form, Orientation, Location, and Run-Out - Generalities, Definitions, Symbols, and Indications on Drawings.

ISO 1660 — Technical Drawings - Dimensioning and Tolerancing of Profiles

ISO 2692 — Technical Drawings - Geometrical Tolerancing - Maximum Material Principle

ISO 6507 — Metallic Materials - Vickers Hardness Test

ISO 8015 — Technical Drawings - Fundamental Tolerancing Principles

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<sup>2</sup> ISO Central Secretariat, 1, rue de Varembé, Case postale 56, CH-1211 Genève 20, Switzerland. <http://www.iso.ch>

## RELATED INFORMATION 1

### EXAMPLES OF SEAL DESIGNS FOR 1.125 INCH TYPE SURFACE MOUNT COMPONENTS

**NOTICE:** This related information is not an official part of SEMI F83 and was derived from the work of the originating task force. This related information was approved for publication by full ballot procedures. Determination of the suitability of the material is solely the responsibility of the user.

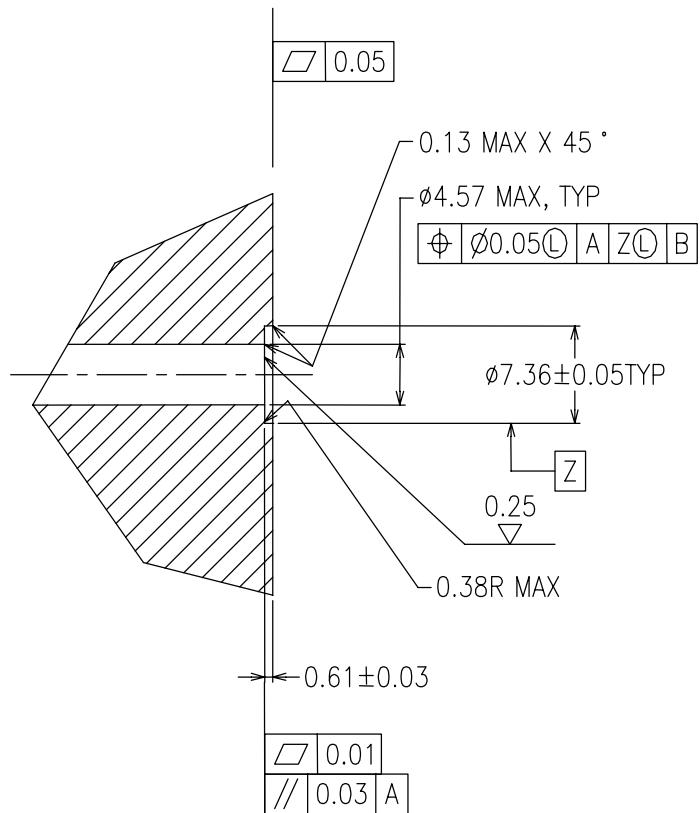
#### R1-1 Design Example 1

R1-1.1 *Seal Design* — See Figure R1-1.

R1-1.2 *Surface Hardness* — The sealing surface (the bottom of the counterbore) has a minimum hardness of 170 Vickers. The hardness may be tested per ISO 6507.

R1-1.3 *Surface Roughness* — The sealing surface (the bottom of the counterbore) has a surface roughness of 0.25 micrometers Ra max. The surface roughness may be tested per SEMI F37-0299.

R1-1.4 *Surface Scratches* — The sealing surface (the bottom of the counterbore) is without any lateral scratches which are visible to non-magnified normal vision.



**Figure R1-1**  
**Design Example 1**

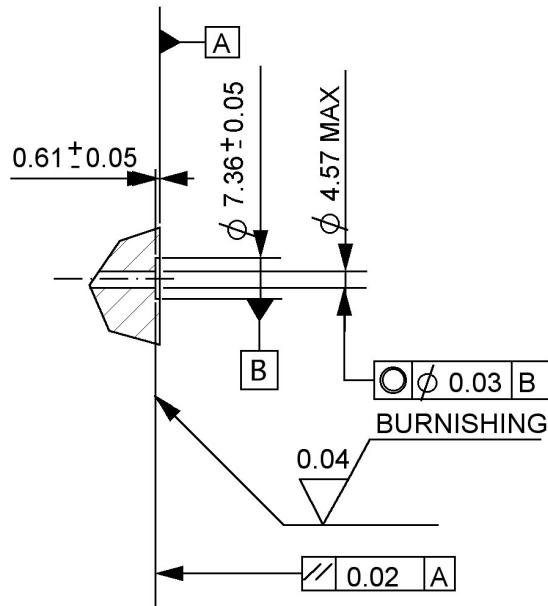
## R1-2 Design Example 2

R1-2.1 *Seal Design* — See Figure R1-2.

R1-2.2 *Surface Hardness* — The sealing surface (the bottom of the counterbore) has a minimum hardness of 300 Vickers. The hardness may be tested per ISO 6507.

R1-2.3 *Surface Roughness* — The sealing surface (the bottom of the counterbore) has a surface roughness of 0.04 micrometers Ra max. The surface roughness may be tested per SEMI F37-0299.

R1-2.4 *Surface Scratches* — The sealing surface (the bottom of the counterbore) is without any lateral scratches which are visible to non-magnified normal vision.



**Figure R1-2**  
**Design Example 2**

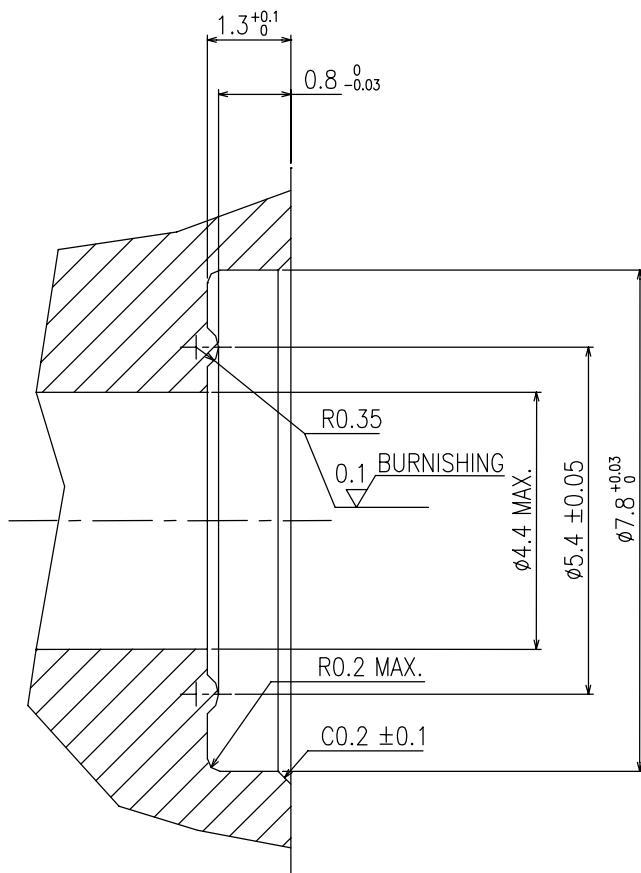
### R1-3 Design Example 3

R1-3.1 *Seal Design* — See Figure R1-3.

R1-3.2 *Surface Hardness* — The sealing surface (the bottom of the counterbore) has a minimum hardness of 300 Vickers. The hardness may be tested per ISO 6507.

R1-3.3 *Surface Roughness* — The sealing surface (the bottom of the counterbore) has a surface roughness of 0.1 micrometers Ra max. The surface roughness may be tested per SEMI F37-0299.

R1-3.4 *Surface Scratches* — The sealing surface (the bottom of the counterbore) is without any lateral scratches which are visible to non-magnified normal vision.



**Figure R1-3**  
**Design Example 3**

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## SEMI F84-0304

# SPECIFICATION FOR DIMENSION OF THREE PORT COMPONENTS (EXCEPT MFC/MFM) FOR 1.125 INCH TYPE TWO FASTENER CONFIGURATION SURFACE MOUNT GAS DISTRIBUTION SYSTEMS

This specification was technically approved by the Global Gases Committee and is the direct responsibility of the Japanese Gases & Facilities Committee. Current edition approved by the Japanese Regional Standards Committee on November 20, 2003. Initially available at [www.semi.org](http://www.semi.org) February 2004; to be published March 2004.

### 1 Purpose

1.1 This standard establishes the properties and physical dimensions of three port components for 1.125 inch type surface mount gas distribution systems.

### 2 Scope

2.1 This document includes common requirements, layout, size, detailed specifications, and dimensions of the components.

2.2 This standard applies to all three port two fastener components (except mass flow controllers and mass flow meters). The components (i.e. valves, pressure regulators, pressure transducers, filters and purifiers) are mounted on substrates with fasteners accessible from the top.

2.3 This standard only applies to components, which control flow of  $\leq 50$  slm nitrogen equivalent at 308 kPa (44.7 psia). This standard also only applies to components with operating pressures less than 3445 kPa (500 psia) at 20°C.

**NOTICE:** This standard does not purport to address safety issues, if any, associated with its use. It is the responsibility of the users of this standard to establish appropriate safety and health practices and determine the applicability of regulatory or other limitations prior to use.

### 3 Limitations

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equipment meets regulatory requirements in each location of use.

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SEMI F20 — Specification for 316L Stainless Steel Bar, Extruded Shapes, Plate, and Investment Castings for Components Used in High Purity Semiconductor Manufacturing Applications

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

ASME Y14.5 — Dimensioning and Tolerancing

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

### 5 Terminology

#### 5.1 Definitions

5.1.1 *components for surface mount* — a gas distribution system component having inlets and outlets located on the bottom of the component with the attachment mechanism accessible from the top.

5.1.2 *Ra* — roughness average. The arithmetic average of the absolute values of the measure profile height deviations taken within the sampling length and measured from the graphical centerline.

5.1.3 *two fastener configuration* — the component has two fasteners per sealing point. The sealing point is located in the middle of the two fasteners.

### 6 Common Requirements

6.1 *Dimensional Requirements* — All components shall meet the requirements outlined in Figure 1. All

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geometric dimensioning and tolerancing complies with ASME Y14.5 and/or the applicable ISO standard.

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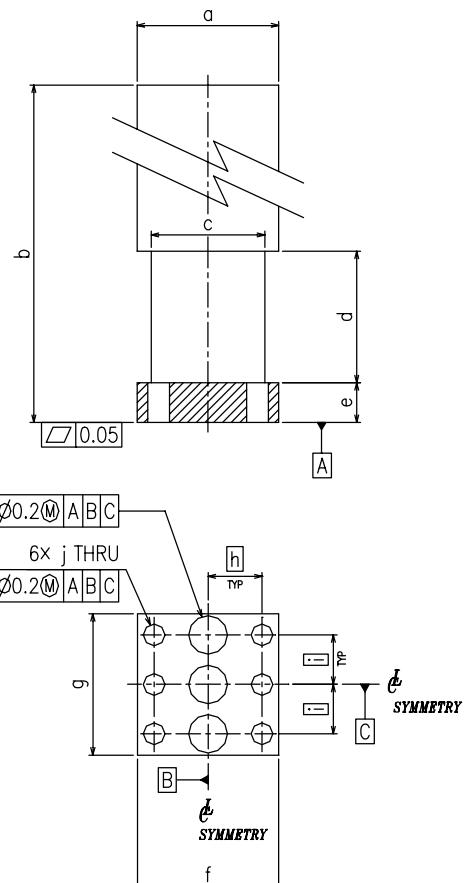
NOTE 2: The through hole of the sealing port will be elliptical if the through hole is drilled at an angle. In this case, the diameter shall apply to the major diameter of the ellipse.

**6.2 Material** — The material used to manufacture the base of the components shall comply to SEMI F20 with the exception that the sulfur content shall comply to SEMI E49.9.

NOTE 3: SEMI E49.9 was withdrawn. However, a ballot to combine E49.8 and E49.9 in one single standard was submitted for SEMICON West 2003.

**6.3 Burrs and Sharp Edges** — Unless specifically noted on the drawing, remove all burrs and sharp edges.

**6.4 Handles and Displays** — Rotating handles and removable displays shall stay within the maximum envelope of the base of the component with the exception of toggle and/or lockout/tagout valves at the discretion of the system designer. They shall be movable or removable such that they do not interfere with the access of the mounting fasteners from above.



<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>	<i>g</i>	<i>h</i>	<i>i</i>	<i>j</i>
φ28.6 MAX	127 MAX	φ23 MAX	20.6 MIN	6.5 ±0.2	28.6 +0.3 -0.5	28.6 +0.3 -0.5	10.9	10	φ4.4 ±0.1

UNIT: [mm]

**Figure 1**  
**Dimensional Requirements for All Components**



## 7 Related Documents

### 7.1 ISO Standards<sup>2</sup>

ISO 406 — Technical Drawings - Tolerancing of Linear and Angular Dimensions

ISO 1101 — Technical Drawings - Geometrical Tolerancing - Tolerancing of Form, Orientation, Location, and Run-Out - Generalities, Definitions, Symbols, and Indications on Drawings.

ISO 1660 — Technical Drawings - Dimensioning and Tolerancing of Profiles

ISO 2692 — Technical Drawings - Geometrical Tolerancing - Maximum Material Principle

ISO 6507 — Metallic Materials - Vickers Hardness Test

ISO 8015 — Technical Drawings - Fundamental Tolerancing Principles

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## RELATED INFORMATION 1

### EXAMPLES OF SEAL DESIGNS FOR 1.125 INCH TYPE SURFACE MOUNT COMPONENTS

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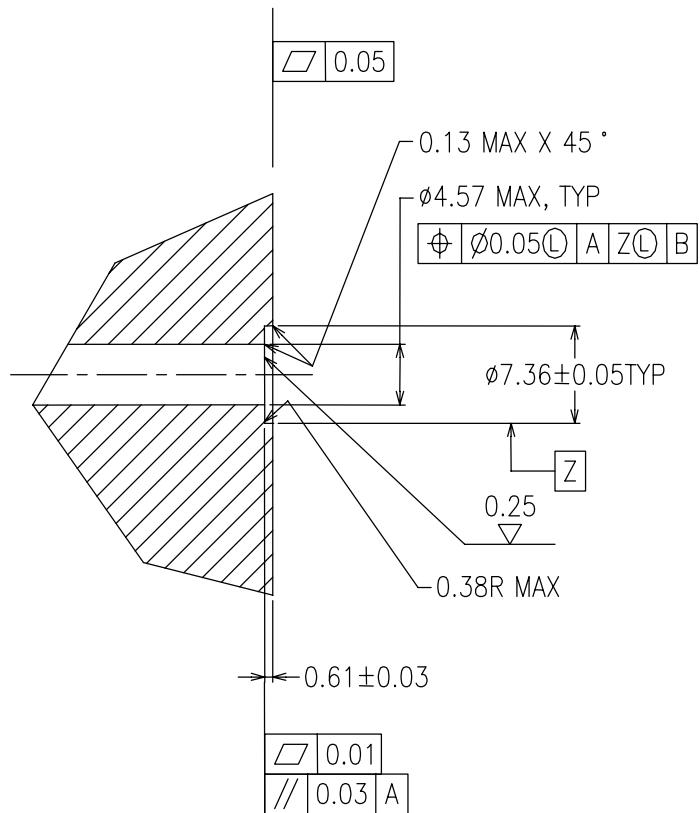
#### R1-1 Design Example 1

R1-1.1 *Seal Design* — See Figure R1-1.

R1-1.2 *Surface Hardness* — The sealing surface (the bottom of the counterbore) has a minimum hardness of 170 Vickers. The hardness may be tested per ISO 6507.

R1-1.3 *Surface Roughness* — The sealing surface (the bottom of the counterbore) has a surface roughness of 0.25 micrometers Ra max. The surface roughness may be tested per SEMI F37-0299.

R1-1.4 *Surface Scratches* — The sealing surface (the bottom of the counterbore) is without any lateral scratches which are visible to non-magnified normal vision.



**Figure R1-1**  
**Design Example 1**

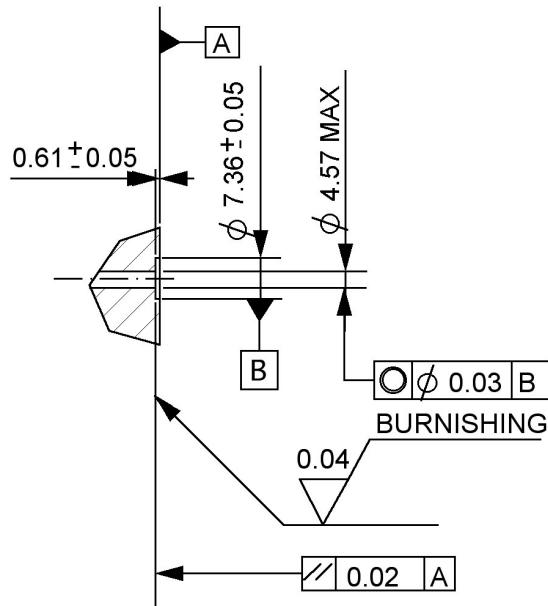
## R1-2 Design Example 2

R1-2.1 *Seal Design* — See Figure R1-2.

R1-2.2 *Surface Hardness* — The sealing surface (the bottom of the counterbore) has a minimum hardness of 300 Vickers. The hardness may be tested per ISO 6507.

R1-2.3 *Surface Roughness* — The sealing surface (the bottom of the counterbore) has a surface roughness of 0.04 micrometers Ra max. The surface roughness may be tested per SEMI F37-0299.

R1-2.4 *Surface Scratches* — The sealing surface (the bottom of the counterbore) is without any lateral scratches which are visible to non-magnified normal vision.



**Figure R1-2**  
**Design Example 2**

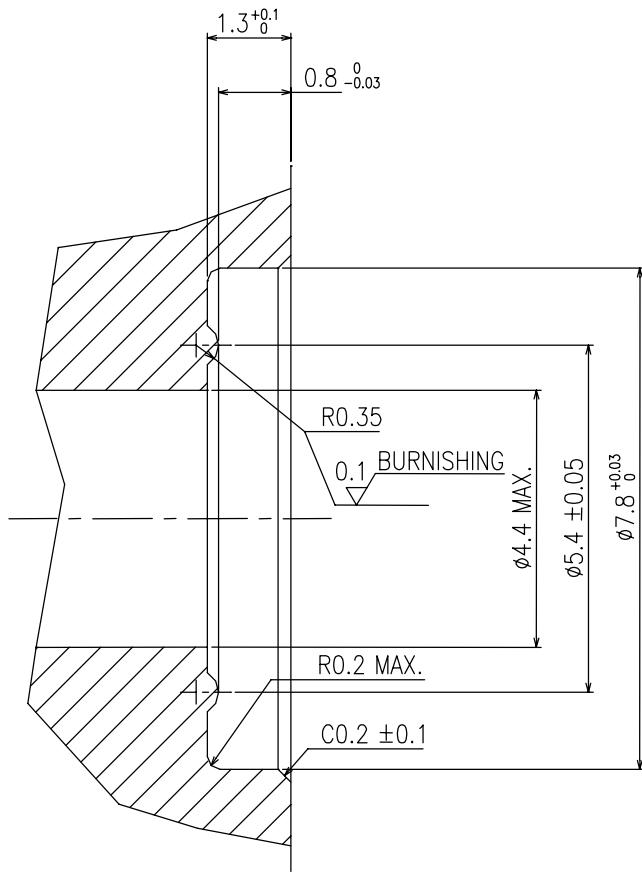
### R1-3 Design Example 3

R1-3.1 *Seal Design* — See Figure R1-3.

R1-3.2 *Surface Hardness* — The sealing surface (the bottom of the counterbore) has a minimum hardness of 300 Vickers. The hardness may be tested per ISO 6507.

R1-3.3 *Surface Roughness* — The sealing surface (the bottom of the counterbore) has a surface roughness of 0.1 micrometers Ra max. The surface roughness may be tested per SEMI F37-0299.

R1-3.4 *Surface Scratches* — The sealing surface (the bottom of the counterbore) is without any lateral scratches which are visible to non-magnified normal vision.



**Figure R1-3**  
**Design Example 3**

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## SEMI F85-0304

# SPECIFICATION FOR DIMENSION OF ONE PORT COMPONENTS FOR 1.125 INCH TYPE FOUR FASTENER CONFIGURATION SURFACE MOUNT GAS DISTRIBUTION SYSTEMS

This specification was technically approved by the Global Gases Committee and is the direct responsibility of the Japanese Gases & Facilities Committee. Current edition approved by the Japanese Regional Standards Committee on November 20, 2003. Initially available at [www.semi.org](http://www.semi.org) February 2004; to be published March 2004.

## 1 Purpose

1.1 This standard establishes the properties and physical dimensions of one port components for 1.125 inch type surface mount gas distribution system.

## 2 Scope

2.1 This document includes common requirements, layout, size, detailed specifications, and dimensions of the components.

2.2 This standard applies to all one port four fastener components. The components are mounted on substrates with fasteners accessible from the top.

2.3 This standard only applies to components, which control flow of  $\leq 50$  slm nitrogen equivalent at 308 kPa (44.7 psia). This standard also only applies to components with operating pressures less than 3445 kPa (500 psia) at 20°C.

**NOTICE:** This standard does not purport to address safety issues, if any, associated with its use. It is the responsibility of the users of this standard 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 only addresses the component; it does not address the seals, the sealing system, or the assembly process and does not guarantee the performance of the sealing system. The user should be aware that gas delivery system performance and sealing system performance are addressed elsewhere in the SEMI standards.

3.2 The user should be aware that alternative technologies are commercially available.

3.3 International, national, and local codes, regulations, and laws should be consulted to ensure that the equipment meets regulatory requirements in each location of use.

## 4 Referenced Standards

### 4.1 SEMI Standards

SEMI E49.9 — Guide for Ultrahigh Purity Gas Distribution Systems in Semiconductor Manufacturing Equipment

SEMI F20 — Specification for 316L Stainless Steel Bar, Extruded Shapes, Plate, and Investment Castings for Components Used in High Purity Semiconductor Manufacturing Applications

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

ASME Y14.5 — Dimensioning and Tolerancing

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

## 5 Terminology

### 5.1 Definitions

5.1.1 *components for surface mount* — a gas distribution system component having inlets and outlets located on the bottom of the component with the attachment mechanism accessible from the top.

5.1.2 *four fastener configuration* — the component has four fasteners located on an interface, independent of number of sealing point.

5.1.3 *Ra* — roughness average. The arithmetic average of the absolute values of the measure profile height deviations taken within the sampling length and measured from the graphical centerline.

## 6 Common Requirements

6.1 *Dimensional Requirements* — All components shall meet the requirements outlined in Figure 1. All geometric dimensioning and tolerancing complies with ASME Y14.5 and/or the applicable ISO standard.

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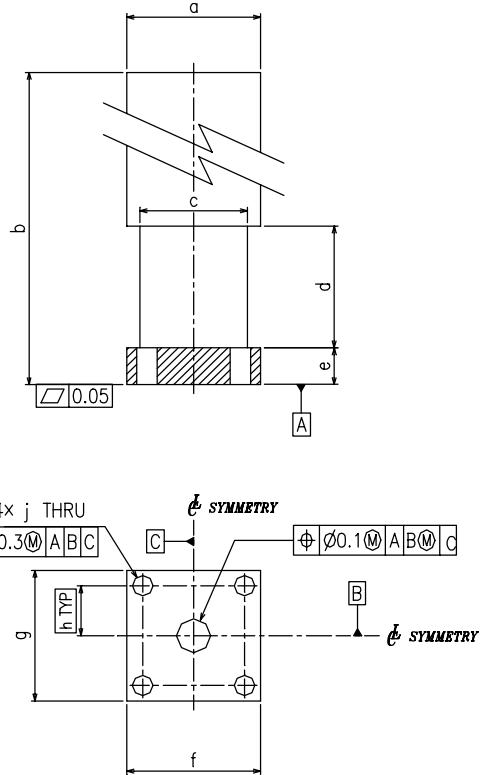
NOTE 2: The through hole of the sealing port will be elliptical if the through hole is drilled at an angle. In this case, the diameter shall apply to the major diameter of the ellipse.

**6.2 Material** — The material used to manufacture the base of the components shall comply to SEMI F20 with the exception that the sulfur content shall comply to SEMI E49.9.

NOTE 3: SEMI E49.9 was withdrawn. However, a ballot to combine E49.8 and E49.9 in one single standard was submitted for SEMICON West 2003.

**6.3 Burrs and Sharp Edges** — Unless specifically noted on the drawing, remove all burrs and sharp edges.

**6.4 Displays** — Removable displays shall stay within the maximum envelope of the base of the component. They shall be movable or removable such that they do not interfere with the access of the mounting fasteners from above.



<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>	<i>g</i>	<i>h</i>	<i>j</i>
φ28.6 MAX	127 MAX	φ23 MAX	20.6 MIN	6.5 ± 0.2	28.6 + 0.3 - 0.5	28.6 + 0.3 - 0.5	10.9	φ4.4 ± 0.1

UNIT: [mm]

**Figure 1**  
**Dimensional Requirements for All Components**



## 7 Related Documents

### 7.1 ISO Standards<sup>2</sup>

ISO 406 — Technical Drawings - Tolerancing of Linear and Angular Dimensions

ISO 1101 — Technical Drawings - Geometrical Tolerancing - Tolerancing of Form, Orientation, Location, and Run-Out - Generalities, Definitions, Symbols, and Indications on Drawings.

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<sup>2</sup> ISO Central Secretariat, 1, rue de Varembé, Case postale 56, CH-1211 Genève 20, Switzerland. <http://www.iso.ch>

## RELATED INFORMATION 1

### EXAMPLES OF SEAL DESIGNS FOR 1.125 INCH TYPE SURFACE MOUNT COMPONENTS

**NOTICE:** This related information is not an official part of SEMI F85 and was derived from the work of the originating task force. This related information was approved for publication by full ballot procedures. Determination of the suitability of the material is solely the responsibility of the user.

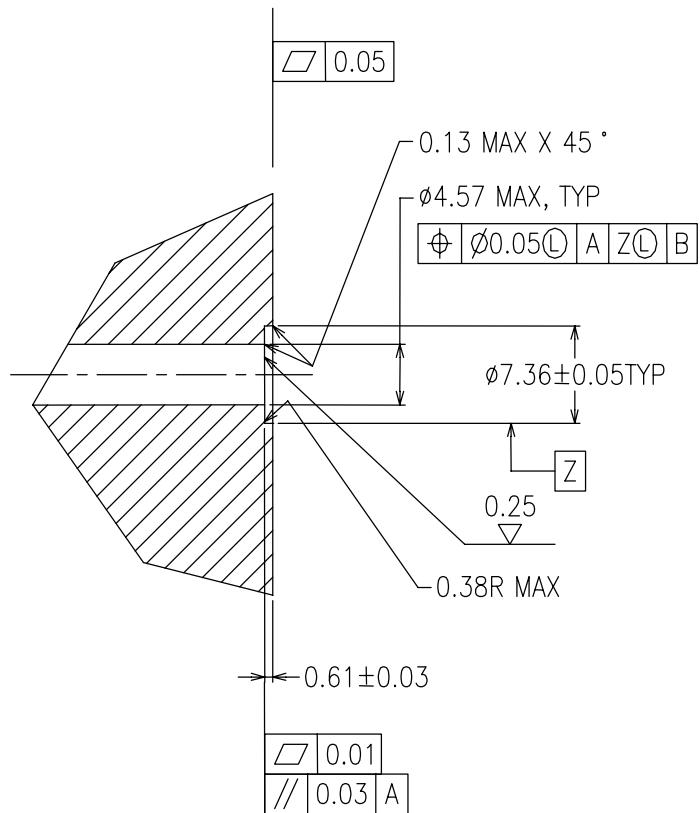
#### R1-1 Design Example 1

R1-1.1 *Seal Design* — See Figure R1-1.

R1-1.2 *Surface Hardness* — The sealing surface (the bottom of the counterbore) has a minimum hardness of 170 Vickers. The hardness may be tested per ISO 6507.

R1-1.3 *Surface Roughness* — The sealing surface (the bottom of the counterbore) has a surface roughness of 0.25 micrometers Ra max. The surface roughness may be tested per SEMI F37-0299.

R1-1.4 *Surface Scratches* — The sealing surface (the bottom of the counterbore) is without any lateral scratches which are visible to non-magnified normal vision.



**Figure R1-1**  
**Design Example 1**

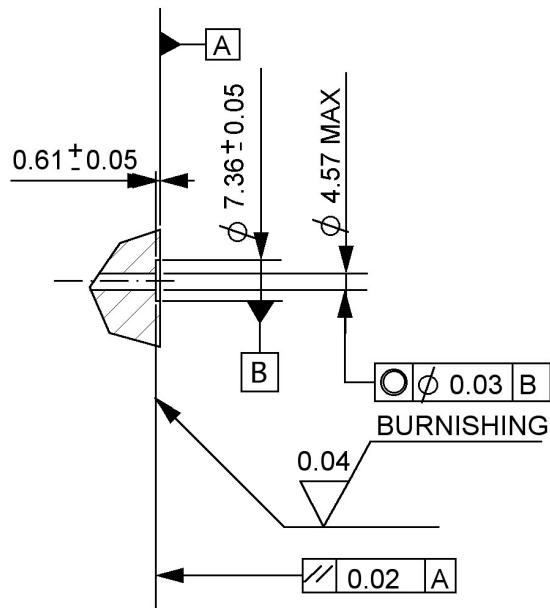
## R1-2 Design Example 2

R1-2.1 *Seal Design* — See Figure R1-2.

R1-2.2 *Surface Hardness* — The sealing surface (the bottom of the counterbore) has a minimum hardness of 300 Vickers. The hardness may be tested per ISO 6507.

R1-2.3 *Surface Roughness* — The sealing surface (the bottom of the counterbore) has a surface roughness of 0.04 micrometers Ra max. The surface roughness may be tested per SEMI F37-0299.

R1-2.4 *Surface Scratches* — The sealing surface (the bottom of the counterbore) is without any lateral scratches which are visible to non-magnified normal vision.



**Figure R1-2**  
**Design Example 2**

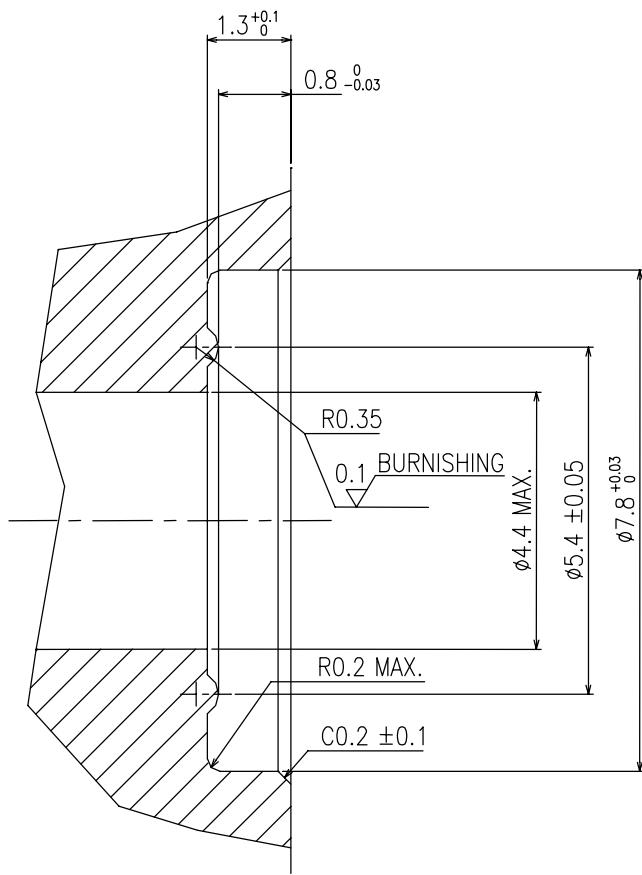
### R1-3 Design Example 3

R1-3.1 *Seal Design* — See Figure R1-3.

R1-3.2 *Surface Hardness* — The sealing surface (the bottom of the counterbore) has a minimum hardness of 300 Vickers. The hardness may be tested per ISO 6507.

R1-3.3 *Surface Roughness* — The sealing surface (the bottom of the counterbore) has a surface roughness of 0.1 micrometers Ra max. The surface roughness may be tested per SEMI F37-0299.

R1-3.4 *Surface Scratches* — The sealing surface (the bottom of the counterbore) is without any lateral scratches which are visible to non-magnified normal vision.



**Figure R1-3**  
**Design Example 3**

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## SEMI F86-0304

# SPECIFICATION FOR DIMENSION OF TWO PORT COMPONENTS (EXCEPT MFC/MFM) FOR 1.125 INCH TYPE FOUR FASTENER CONFIGURATION SURFACE MOUNT GAS DISTRIBUTION SYSTEMS

This specification was technically approved by the Global Gases Committee and is the direct responsibility of the Japanese Gases & Facilities Committee. Current edition approved by the Japanese Regional Standards Committee on November 20, 2003. Initially available at [www.semi.org](http://www.semi.org) February 2004; to be published March 2004.

### 1 Purpose

1.1 This standard establishes the properties and physical dimensions of two port components for 1.125 inch type surface mount gas distribution system.

### 2 Scope

2.1 This document includes common requirements, layout, size, detailed specifications, and dimensions of the components.

2.2 This standard applies to all two port four fastener components (except mass flow controllers and mass flow meters). The components (i.e. valves, pressure regulators, pressure transducers, filters and purifiers) are mounted on substrates with fasteners accessible from the top.

2.3 This standard only applies to components, which control flow of  $\leq 50$  slm nitrogen equivalent at 308 kPa (44.7 psia). This standard also only applies to components with operating pressures less than 3445 kPa (500 psia) at 20°C.

**NOTICE:** This standard does not purport to address safety issues, if any, associated with its use. It is the responsibility of the users of this standard 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 only addresses the component; it does not address the seals, the sealing system, or the assembly process and does not guarantee the performance of the sealing system. The user should be aware that gas delivery system performance and sealing system performance are addressed elsewhere in the SEMI standards.

3.2 The user should be aware that alternative technologies are commercially available.

3.3 International, national, and local codes, regulations, and laws should be consulted to ensure that the

equipment meets regulatory requirements in each location of use.

### 4 Referenced Standards

#### 4.1 SEMI Standards

SEMI E49.9 — Guide for Ultrahigh Purity Gas Distribution Systems in Semiconductor Manufacturing Equipment

SEMI F20 — Specification for 316L Stainless Steel Bar, Extruded Shapes, Plate, and Investment Castings for Components Used in High Purity Semiconductor Manufacturing Applications

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

ASME Y14.5 — Dimensioning and Tolerancing

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

### 5 Terminology

#### 5.1 Definitions

5.1.1 *components for surface mount* — a gas distribution system component having inlets and outlets located on the bottom of the component with the attachment mechanism accessible from the top.

5.1.2 *four fastener configuration* — the component has four fasteners located on an interface, independent of number of sealing point.

5.1.3 *Ra* — roughness average. The arithmetic average of the absolute values of the measure profile height deviations taken within the sampling length and measured from the graphical centerline.

### 6 Common Requirements

6.1 *Dimensional Requirements* — All components shall meet the requirements outlined in Figure 1. All

<sup>1</sup> American Society of Mechanical Engineers. Three Park Avenue, New York, NY 10016-5990, USA. Telephone: 800.843.2763 (U.S./Canada), 95.800.843.2763 (Mexico), 973.882.1167 (outside North America). Website: [www.asme.org](http://www.asme.org)

geometric dimensioning and tolerancing complies with ASME Y14.5 and/or the applicable ISO standard.

NOTE 1: All dimensions are in millimeters unless otherwise noted.

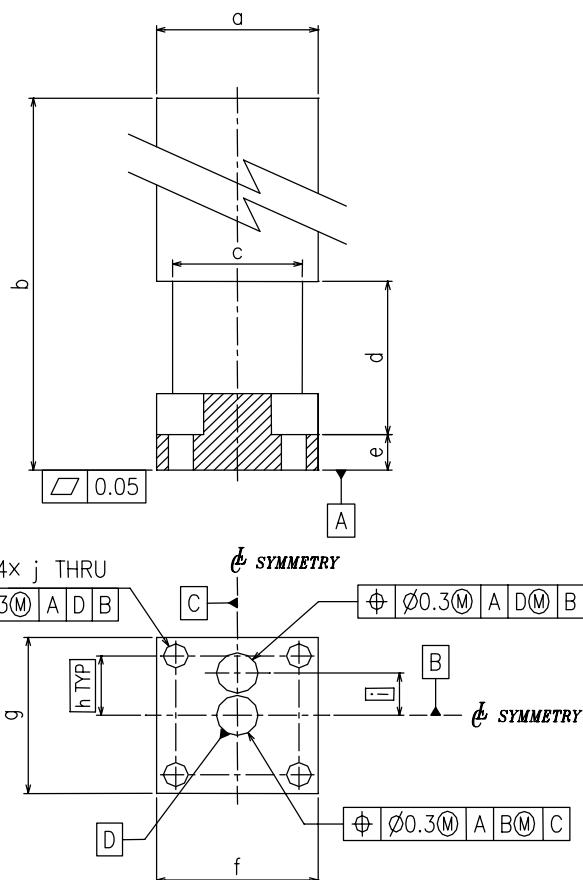
NOTE 2: The through hole of the sealing port will be elliptical if the through hole is drilled at an angle. In this case, the diameter shall apply to the major diameter of the ellipse.

**6.2 Material** — The material used to manufacture the base of the components shall comply to SEMI F20 with the exception that the sulfur content shall comply to SEMI E49.9.

NOTE 3: SEMI E49.9 was withdrawn. However, a ballot to combine E49.8 and E49.9 in one single standard was submitted for SEMICON West 2003.

**6.3 Burrs and Sharp Edges** — Unless specifically noted on the drawing, remove all burrs and sharp edges.

**6.4 Handles and Displays** — Rotating handles and removable displays shall stay within the maximum envelope of the base of the component with the exception of toggle and/or lockout/tagout valves at the discretion of the system designer. They shall be movable or removable such that they do not interfere with the access of the mounting fasteners from above.



<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>	<i>g</i>	<i>h</i>	<i>i</i>	<i>j</i>
$\phi 28.6$ MAX	127 MAX	$\phi 23$ MAX	20.6 MIN	$6.5$ $\pm 0.2$	$28.6$ $+ 0.3$ $- 0.5$	$28.6$ $+ 0.3$ $- 0.5$	10.9	7.75	$\phi 4.4$ $\pm 0.1$

UNIT: [mm]

**Figure 1**  
**Dimensional Requirements for All Components**



## 7 Related Documents

### 7.1 ISO Standards<sup>2</sup>

ISO 406 — Technical Drawings - Tolerancing of Linear and Angular Dimensions

ISO 1101 — Technical Drawings - Geometrical Tolerancing - Tolerancing of Form, Orientation, Location, and Run-Out - Generalities, Definitions, Symbols, and Indications on Drawings.

ISO 1660 — Technical Drawings - Dimensioning and Tolerancing of Profiles

ISO 2692 — Technical Drawings - Geometrical Tolerancing - Maximum Material Principle

ISO 6507 — Metallic Materials - Vickers Hardness Test

ISO 8015 — Technical Drawings - Fundamental Tolerancing Principles

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<sup>2</sup> ISO Central Secretariat, 1, rue de Varembé, Case postale 56, CH-1211 Genève 20, Switzerland. <http://www.iso.ch>

## RELATED INFORMATION 1

### EXAMPLES OF SEAL DESIGNS FOR 1.125 INCH TYPE SURFACE MOUNT COMPONENTS

**NOTICE:** This related information is not an official part of SEMI F86 and was derived from the work of the originating task force. This related information was approved for publication by full ballot procedures. Determination of the suitability of the material is solely the responsibility of the user.

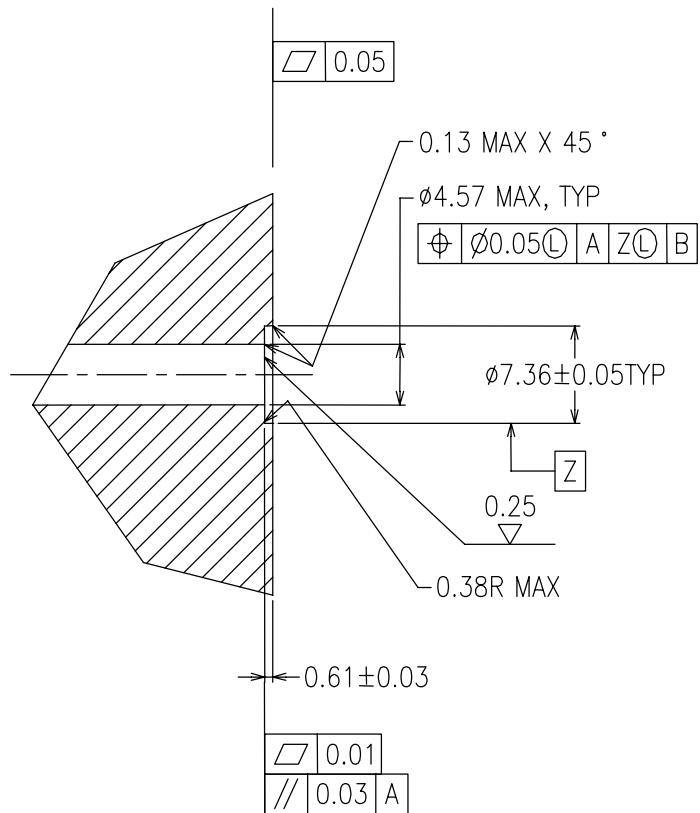
#### R1-1 Design Example 1

R1-1.1 *Seal Design* — See Figure R1-1.

R1-1.2 *Surface Hardness* — The sealing surface (the bottom of the counterbore) has a minimum hardness of 170 Vickers. The hardness may be tested per ISO 6507.

R1-1.3 *Surface Roughness* — The sealing surface (the bottom of the counterbore) has a surface roughness of 0.25 micrometers Ra max. The surface roughness may be tested per SEMI F37-0299.

R1-1.4 *Surface Scratches* — The sealing surface (the bottom of the counterbore) is without any lateral scratches which are visible to non-magnified normal vision.



**Figure R1-1**  
**Design Example 1**

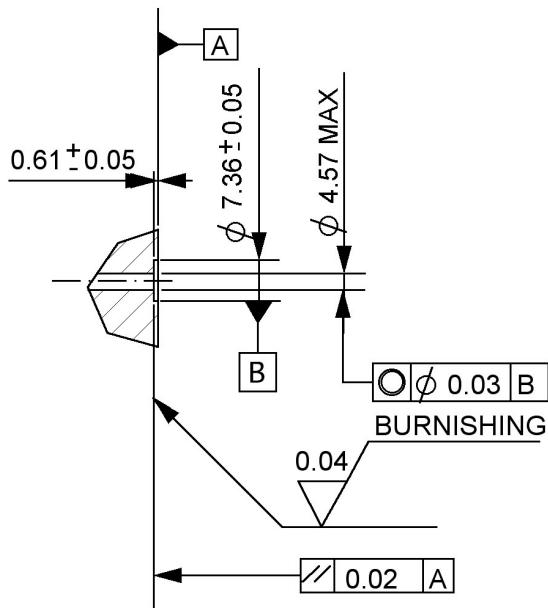
## R1-2 Design Example 2

R1-2.1 *Seal Design* — See Figure R1-2.

R1-2.2 *Surface Hardness* — The sealing surface (the bottom of the counterbore) has a minimum hardness of 300 Vickers. The hardness may be tested per ISO 6507.

R1-2.3 *Surface Roughness* — The sealing surface (the bottom of the counterbore) has a surface roughness of 0.04 micrometers Ra max. The surface roughness may be tested per SEMI F37-0299.

R1-2.4 *Surface Scratches* — The sealing surface (the bottom of the counterbore) is without any lateral scratches which are visible to non-magnified normal vision.



**Figure R1-2**  
**Design Example 2**

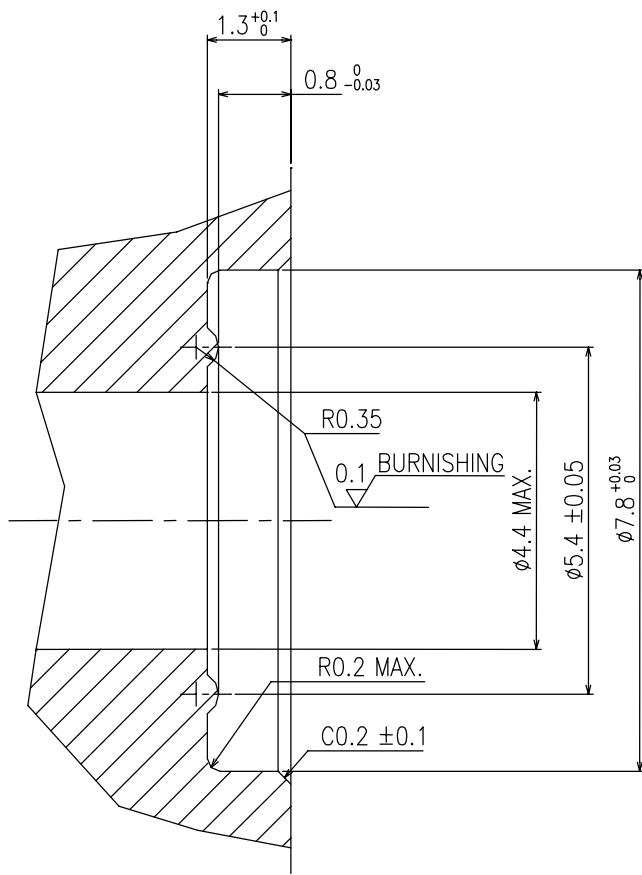
### R1-3 Design Example 3

R1-3.1 *Seal Design* — See Figure R1-3.

R1-3.2 *Surface Hardness* — The sealing surface (the bottom of the counterbore) has a minimum hardness of 300 Vickers. The hardness may be tested per ISO 6507.

R1-3.3 *Surface Roughness* — The sealing surface (the bottom of the counterbore) has a surface roughness of 0.1 micrometers Ra max. The surface roughness may be tested per SEMI F37-0299.

R1-3.4 *Surface Scratches* — The sealing surface (the bottom of the counterbore) is without any lateral scratches which are visible to non-magnified normal vision.



**Figure R1-3**  
**Design Example 3**

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## SEMI F87-0304

# SPECIFICATION FOR DIMENSION OF THREE PORT COMPONENTS (EXCEPT MFC/MFM) FOR 1.125 INCH TYPE FOUR FASTENER CONFIGURATION SURFACE MOUNT GAS DISTRIBUTION SYSTEMS

This specification was technically approved by the Global Gases Committee and is the direct responsibility of the Japanese Gases & Facilities Committee. Current edition approved by the Japanese Regional Standards Committee on November 20, 2003. Initially available at [www.semi.org](http://www.semi.org) February 2004; to be published March 2004.

### 1 Purpose

1.1 This standard establishes the properties and physical dimensions of two port components for 1.125 inch type surface mount gas distribution system.

### 2 Scope

2.1 This document includes common requirements, layout, size, detailed specifications, and dimensions of the components.

2.2 This standard applies to all three port four fastener components (except mass flow controllers and mass flow meters). The components (i.e. valves, pressure regulators, pressure transducers, filters and purifiers) are mounted on substrates with fasteners accessible from the top.

2.3 This standard only applies to components, which control flow of  $\leq 50$  slm nitrogen equivalent at 308 kPa (44.7 psia). This standard also only applies to components with operating pressures less than 3445 kPa (500 psia) at 20°C.

**NOTICE:** This standard does not purport to address safety issues, if any, associated with its use. It is the responsibility of the users of this standard 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 only addresses the component; it does not address the seals, the sealing system, or the assembly process and does not guarantee the performance of the sealing system. The user should be aware that gas delivery system performance and sealing system performance are addressed elsewhere in the SEMI standards.

3.2 The user should be aware that alternative technologies are commercially available.

3.3 International, national, and local codes, regulations, and laws should be consulted to ensure that the

equipment meets regulatory requirements in each location of use.

### 4 Referenced Standards

#### 4.1 SEMI Standards

SEMI E49.9 — Guide for Ultrahigh Purity Gas Distribution Systems in Semiconductor Manufacturing Equipment

SEMI F20 — Specification for 316L Stainless Steel Bar, Extruded Shapes, Plate, and Investment Castings for Components Used in High Purity Semiconductor Manufacturing Applications

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

ASME Y14.5 — Dimensioning and Tolerancing

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

### 5 Terminology

#### 5.1 Definitions

5.1.1 *components for surface mount* — a gas distribution system component having inlets and outlets located on the bottom of the component with the attachment mechanism accessible from the top.

5.1.2 *four fastener configuration* — the component has four fasteners located on an interface, independent of number of sealing point.

5.1.3 *Ra* — roughness average. The arithmetic average of the absolute values of the measure profile height deviations taken within the sampling length and measured from the graphical centerline.

### 6 Common Requirements

6.1 *Dimensional Requirements* — All components shall meet the requirements outlined in Figure 1. All

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geometric dimensioning and tolerancing complies with ASME Y14.5 and/or the applicable ISO standard.

NOTE 1: All dimensions are in millimeters unless otherwise noted.

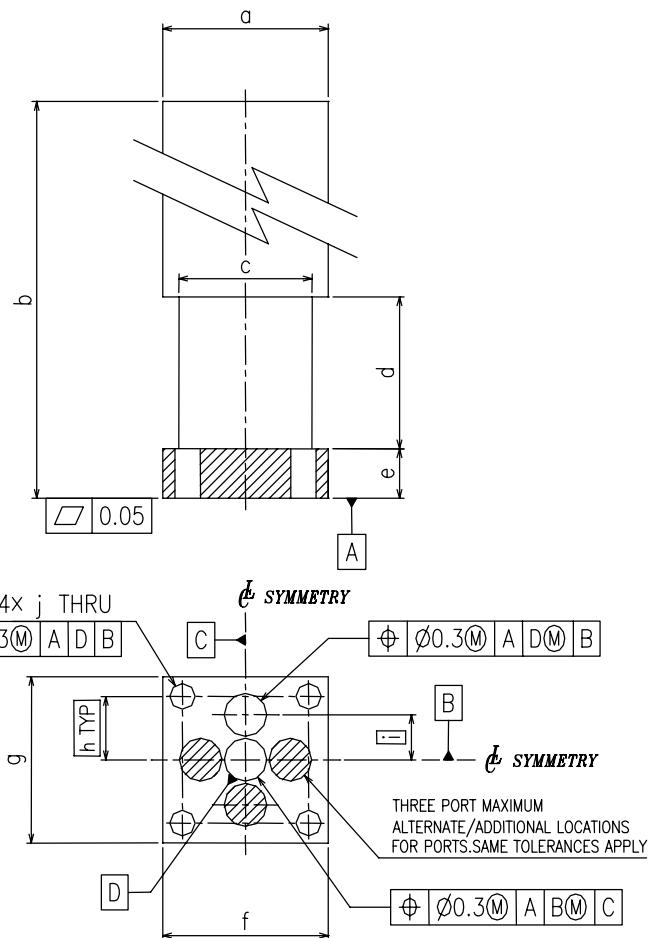
NOTE 2: The through hole of the sealing port will be elliptical if the through hole is drilled at an angle. In this case, the diameter shall apply to the major diameter of the ellipse.

**6.2 Material** — The material used to manufacture the base of the components shall comply to SEMI F20 with the exception that the sulfur content shall comply to SEMI E49.9.

NOTE 3: SEMI E49.9 was withdrawn. However, a ballot to combine E49.8 and E49.9 in one single standard was submitted for SEMICON West 2003.

**6.3 Burrs and Sharp Edges** — Unless specifically noted on the drawing, remove all burrs and sharp edges.

**6.4 Handles and Displays** — Rotating handles and removable displays shall stay within the maximum envelope of the base of the component with the exception of toggle and/or lockout/tagout valves at the discretion of the system designer. They shall be movable or removable such that they do not interfere with the access of the mounting fasteners from above.



a	b	c	d	e	f	g	h	i	j
Ø28.6 MAX	127 MAX	Ø23 MAX	20.6 MIN	6.5 ± 0.2	28.6 + 0.3 - 0.5	28.6 + 0.3 - 0.5	10.9	7.75	Ø4.4 ± 0.1

UNIT: [mm]

**Figure 1**  
**Dimensional Requirements for All Components**



## 7 Related Documents

### 7.1 ISO Standards<sup>2</sup>

ISO 406 — Technical Drawings - Tolerancing of Linear and Angular Dimensions

ISO 1101 — Technical Drawings - Geometrical Tolerancing - Tolerancing of Form, Orientation, Location, and Run-Out - Generalities, Definitions, Symbols, and Indications on Drawings.

ISO 1660 — Technical Drawings - Dimensioning and Tolerancing of Profiles

ISO 2692 — Technical Drawings - Geometrical Tolerancing - Maximum Material Principle

ISO 6507 — Metallic Materials - Vickers Hardness Test

ISO 8015 — Technical Drawings - Fundamental Tolerancing Principles

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<sup>2</sup> ISO Central Secretariat, 1, rue de Varembé, Case postale 56, CH-1211 Genève 20, Switzerland. <http://www.iso.ch>

## RELATED INFORMATION 1

### EXAMPLES OF SEAL DESIGNS FOR 1.125 INCH TYPE SURFACE MOUNT COMPONENTS

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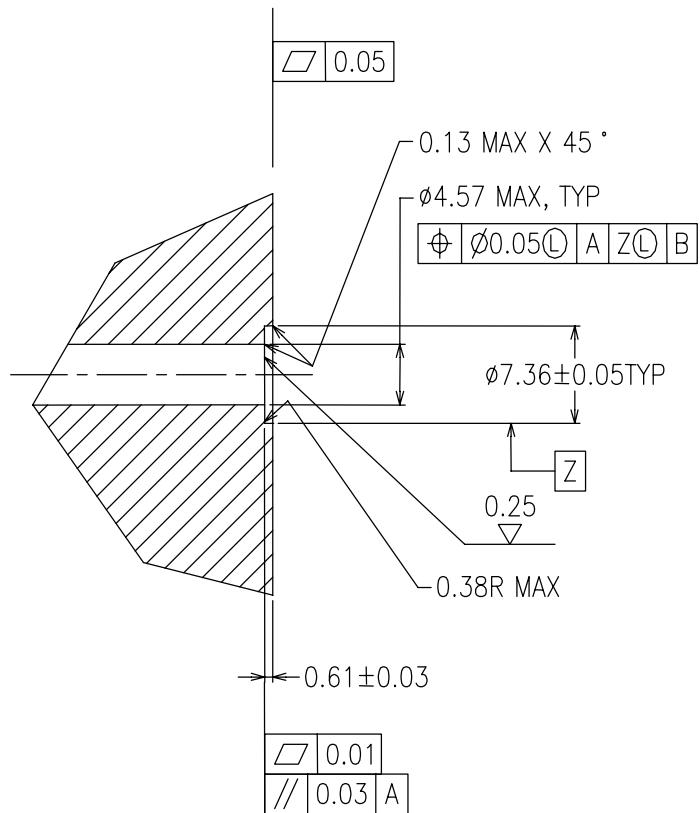
#### R1-1 Design Example 1

R1-1.1 *Seal Design* — See Figure R1-1.

R1-1.2 *Surface Hardness* — The sealing surface (the bottom of the counterbore) has a minimum hardness of 170 Vickers. The hardness may be tested per ISO 6507.

R1-1.3 *Surface Roughness* — The sealing surface (the bottom of the counterbore) has a surface roughness of 0.25 micrometers Ra max. The surface roughness may be tested per SEMI F37-0299.

R1-1.4 *Surface Scratches* — The sealing surface (the bottom of the counterbore) is without any lateral scratches which are visible to non-magnified normal vision.



**Figure R1-1**  
**Design Example 1**

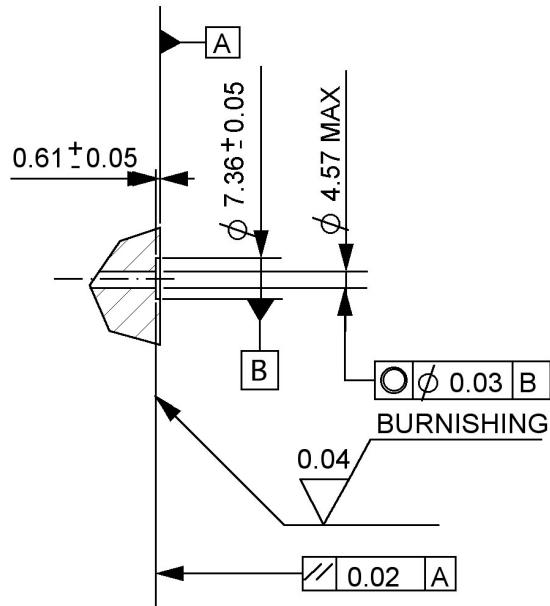
## R1-2 Design Example 2

R1-2.1 *Seal Design* — See Figure R1-2.

R1-2.2 *Surface Hardness* — The sealing surface (the bottom of the counterbore) has a minimum hardness of 300 Vickers. The hardness may be tested per ISO 6507.

R1-2.3 *Surface Roughness* — The sealing surface (the bottom of the counterbore) has a surface roughness of 0.04 micrometers Ra max. The surface roughness may be tested per SEMI F37-0299.

R1-2.4 *Surface Scratches* — The sealing surface (the bottom of the counterbore) is without any lateral scratches which are visible to non-magnified normal vision.



**Figure R1-2**  
**Design Example 2**

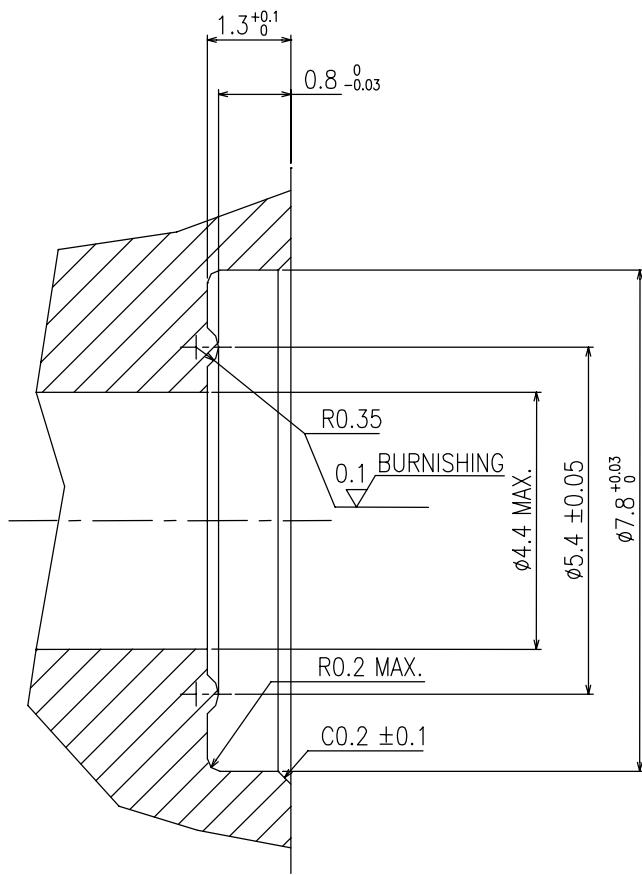
### R1-3 Design Example 3

R1-3.1 *Seal Design* — See Figure R1-3.

R1-3.2 *Surface Hardness* — The sealing surface (the bottom of the counterbore) has a minimum hardness of 300 Vickers. The hardness may be tested per ISO 6507.

R1-3.3 *Surface Roughness* — The sealing surface (the bottom of the counterbore) has a surface roughness of 0.1 micrometers Ra max. The surface roughness may be tested per SEMI F37-0299.

R1-3.4 *Surface Scratches* — The sealing surface (the bottom of the counterbore) is without any lateral scratches which are visible to non-magnified normal vision.



**Figure R1-3**  
**Design Example 3**

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## SEMI F88-0304<sup>E</sup>

# SPECIFICATION FOR DIMENSION OF STANDARD SIZE MASS FLOW CONTROLLERS AND MASS FLOW METERS FOR 1.5 INCH TYPE SURFACE MOUNT GAS DISTRIBUTION SYSTEMS

This specification was technically approved by the Global Gases Committee and is the direct responsibility of the Japanese Gases & Facilities Committee. Current edition approved by the Japanese Regional Standards Committee on November 20, 2003. Initially available at [www.semi.org](http://www.semi.org) February 2004; to be published March 2004.

<sup>E</sup> This document was modified in May 2004 with committee approval to correct an error made at the pre-ballot stage. Changes were made to Figure R1-2.

## 1 Purpose

1.1 This standard establishes the properties and physical dimensions of mass flow controllers and mass flow meters for 1.5 inch type surface mount gas distribution systems.

## 2 Scope

2.1 This document includes common requirements, layout, size, detailed specifications, and dimensions of the components.

2.2 This standard applies to all standard size mass flow controllers and mass flow meters. The components are mounted on substrates with fasteners accessible from the top.

2.3 This standard only applies to components, which control flow of  $\leq 50$  slm nitrogen equivalent at 308 kPa (44.7 psia). This standard also only applies to components with operating pressures less than 3445 kPa (500 psia) at 20°C.

**NOTICE:** This standard does not purport to address safety issues, if any, associated with its use. It is the responsibility of the users of this standard 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 only addresses the component; it does not address the seals, the sealing system, or the assembly process and does not guarantee the performance of the sealing system. The user should be aware that gas delivery system performance and sealing system performance are addressed elsewhere in the SEMI standards.

3.2 The user should be aware that alternative technologies are commercially available.

3.3 International, national, and local codes, regulations, and laws should be consulted to ensure that the

equipment meets regulatory requirements in each location of use.

## 4 Referenced Standards

### 4.1 SEMI Standards

SEMI E49.9 — Guide for Ultrahigh Purity Gas Distribution Systems in Semiconductor Manufacturing Equipment

SEMI F20 — Specification for 316L Stainless Steel Bar, Extruded Shapes, Plate, and Investment Castings for Components Used in High Purity Semiconductor Manufacturing Applications

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

ASME Y14.5 — Dimensioning and Tolerancing

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

## 5 Terminology

### 5.1 Definitions

5.1.1 *components for surface mount* — a gas distribution system component having inlets and outlets located on the bottom of the component with the attachment mechanism accessible from the top.

5.1.2 *Ra* — roughness average. The arithmetic average of the absolute values of the measure profile height deviations taken within the sampling length and measured from the graphical centerline.

## 6 Common Requirements

6.1 *Dimensional Requirements* — All components shall meet the requirements outlined in Figure 1. All geometric dimensioning and tolerancing complies with ASME Y14.5 and/or the applicable ISO standard.

<sup>1</sup> American Society of Mechanical Engineers. Three Park Avenue, New York, NY 10016-5990, USA. Telephone: 800.843.2763 (U.S./Canada), 95.800.843.2763 (Mexico), 973.882.1167 (outside North America). Website: [www.asme.org](http://www.asme.org)

NOTE 1: All dimensions are in millimeters unless otherwise noted.

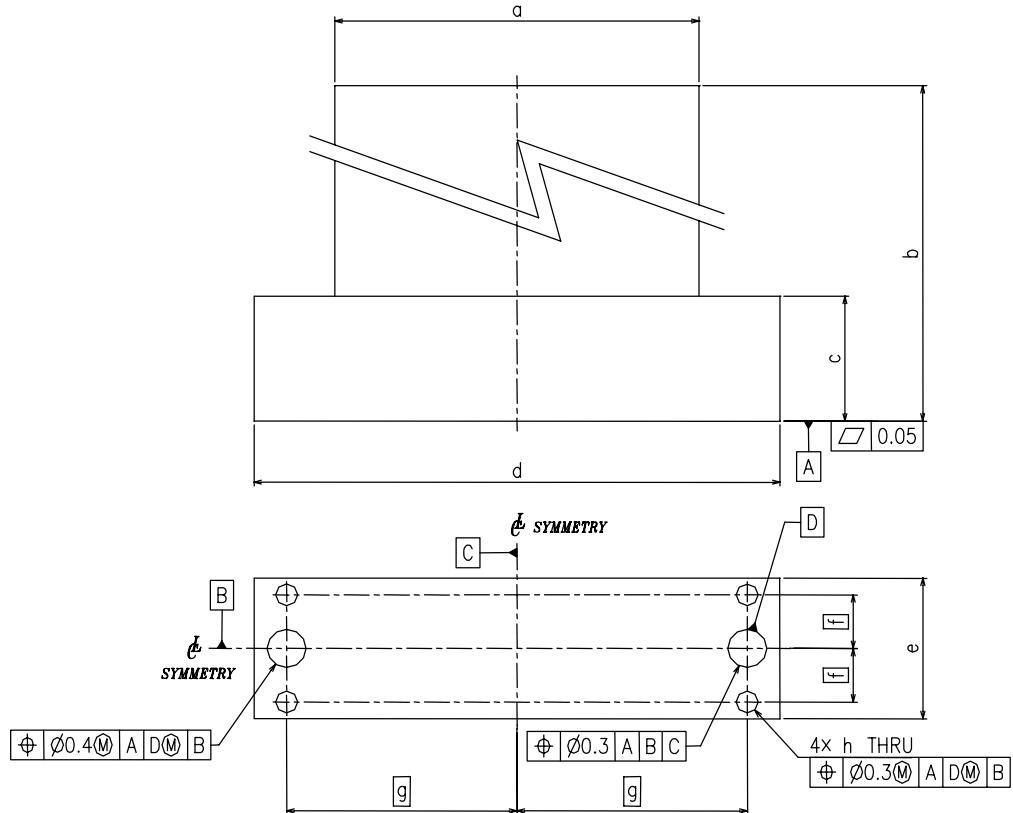
NOTE 2: The through hole of the sealing port will be elliptical if the through hole is drilled at an angle. In this case, the diameter shall apply to the major diameter of the ellipse.

**6.2 Material** — The material used to manufacture the base of the components shall comply to SEMI F20 with the exception that the sulfur content shall comply to SEMI E49.9.

NOTE 3: SEMI E49.9 was withdrawn. However, a ballot to combine E49.8 and E49.9 in one single standard was submitted for SEMICON West 2003.

**6.3 Burrs and Sharp Edges** — Unless specifically noted on the drawing, remove all burrs and sharp edges.

**6.4 Displays** — Removable displays shall stay within the maximum envelope of the base of the component. They shall be movable or removable such that they do not interfere with the access of the mounting fasteners from above.



a	b	c	d	e	f	g	h
82.7 MAX	180 MAX	40 MAX	110 $\pm 5.0$	38.15 $\pm 1.15$	15	46	$\phi 5.6$ $\pm 0.1$

UNIT: [mm]

**Figure 1**  
**Dimensional Requirements for All Components**



## 7 Related Documents

### 7.1 ISO Standards<sup>2</sup>

ISO 406 — Technical Drawings - Tolerancing of Linear and Angular Dimensions

ISO 1101 — Technical Drawings - Geometrical Tolerancing - Tolerancing of Form, Orientation, Location, and Run-Out - Generalities, Definitions, Symbols, and Indications on Drawings.

ISO 1660 — Technical Drawings - Dimensioning and Tolerancing of Profiles

ISO 2692 — Technical Drawings - Geometrical Tolerancing - Maximum Material Principle

ISO 6507 — Metallic Materials - Vickers Hardness Test

ISO 8015 — Technical Drawings - Fundamental Tolerancing Principles

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<sup>2</sup> ISO Central Secretariat, 1, rue de Varembé, Case postale 56, CH-1211 Genève 20, Switzerland. <http://www.iso.ch>

## RELATED INFORMATION 1

### EXAMPLES OF SEAL DESIGNS FOR 1.5 INCH TYPE SURFACE MOUNT COMPONENTS

**NOTICE:** This related information is not an official part of SEMI F88 and was derived from the work of the originating task force. This related information was approved for publication by full ballot procedures. Determination of the suitability of the material is solely the responsibility of the user.

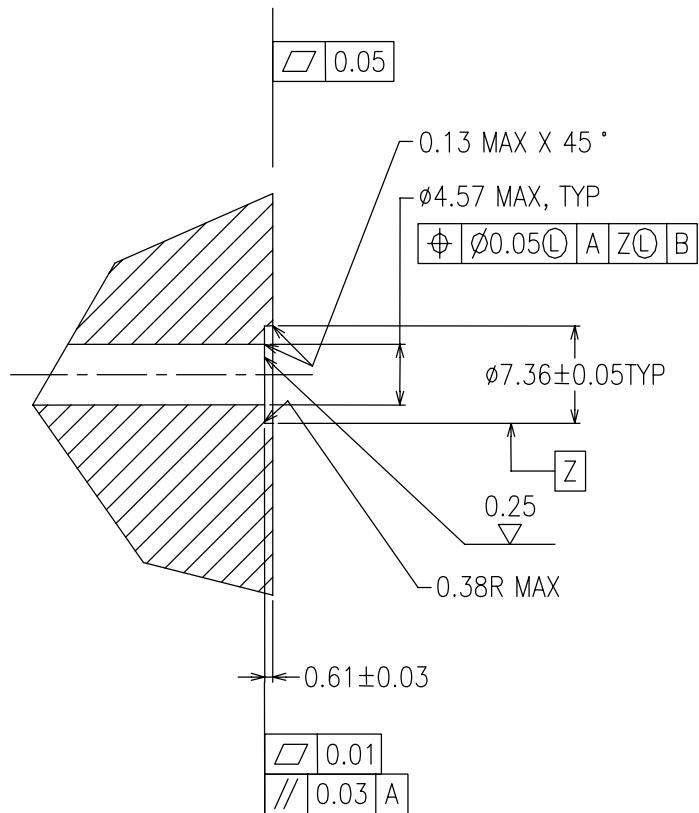
#### R1-1 Design Example 1

R1-1.1 *Seal Design* — See Figure R1-1.

R1-1.2 *Surface Hardness* — The sealing surface (the bottom of the counterbore) has a minimum hardness of 170 Vickers. The hardness may be tested per ISO 6507.

R1-1.3 *Surface Roughness* — The sealing surface (the bottom of the counterbore) has a surface roughness of 0.25 micrometers Ra max. The surface roughness may be tested per SEMI F37-0299.

R1-1.4 *Surface Scratches* — The sealing surface (the bottom of the counterbore) is without any lateral scratches which are visible to non-magnified normal vision.



**Figure R1-1**  
**Design Example 1**

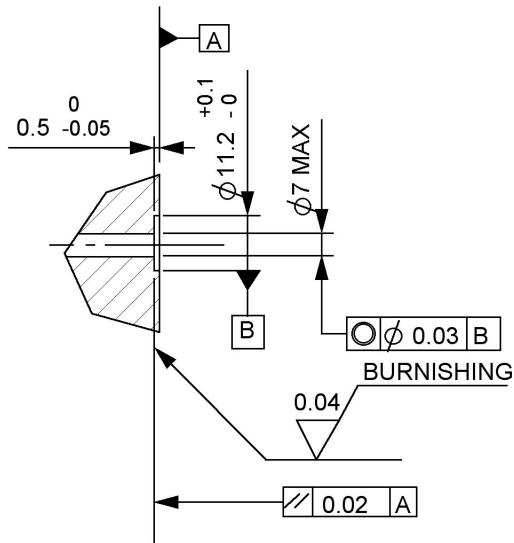
## R1-2 Design Example 2

R1-2.1 *Seal Design* — See Figure R1-2.

R1-2.2 *Surface Hardness* — The sealing surface (the bottom of the counterbore) has a minimum hardness of 300 Vickers. The hardness may be tested per ISO 6507.

R1-2.3 *Surface Roughness* — The sealing surface (the bottom of the counterbore) has a surface roughness of 0.04 micrometers Ra max. The surface roughness may be tested per SEMI F37-0299.

R1-2.4 *Surface Scratches* — The sealing surface (the bottom of the counterbore) is without any lateral scratches which are visible to non-magnified normal vision.



**Figure R1-2**  
**Design Example 2**

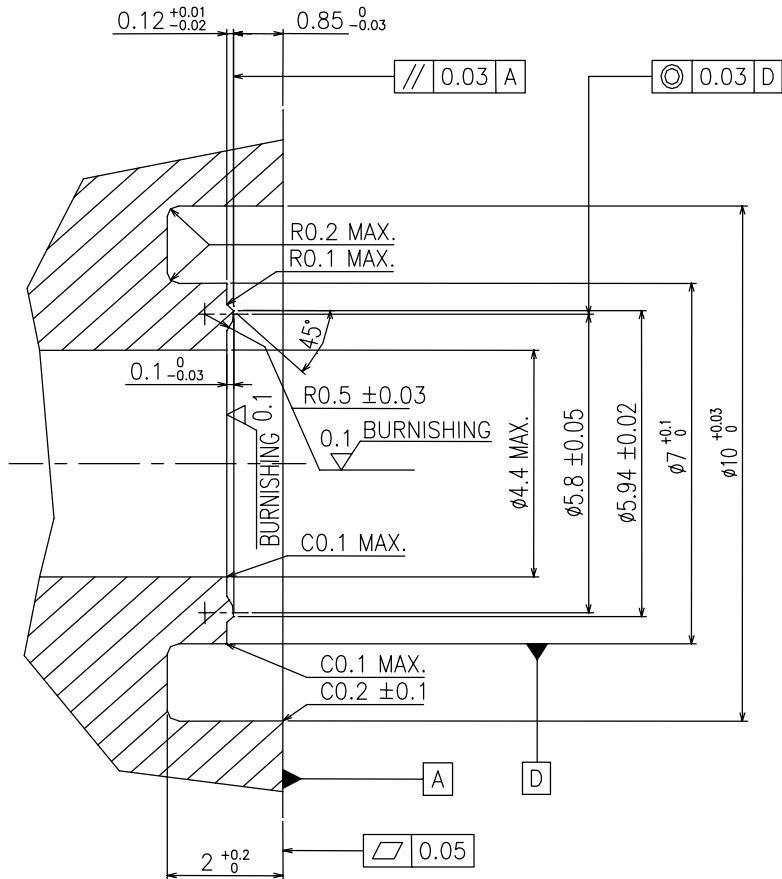
### R1-3 Design Example 3

R1-3.1 *Seal Design* — See Figure R1-3.

R1-3.2 *Surface Hardness* — The sealing surface (the bottom of the counterbore) has a minimum hardness of 300 Vickers. The hardness may be tested per ISO 6507.

R1-3.3 *Surface Roughness* — The sealing surface (the bottom of the counterbore) has a surface roughness of 0.1 micrometers Ra max. The surface roughness may be tested per SEMI F37-0299.

R1-3.4 *Surface Scratches* — The sealing surface (the bottom of the counterbore) is without any lateral scratches which are visible to non-magnified normal vision.



**Figure R1-3**  
**Design Example 3**

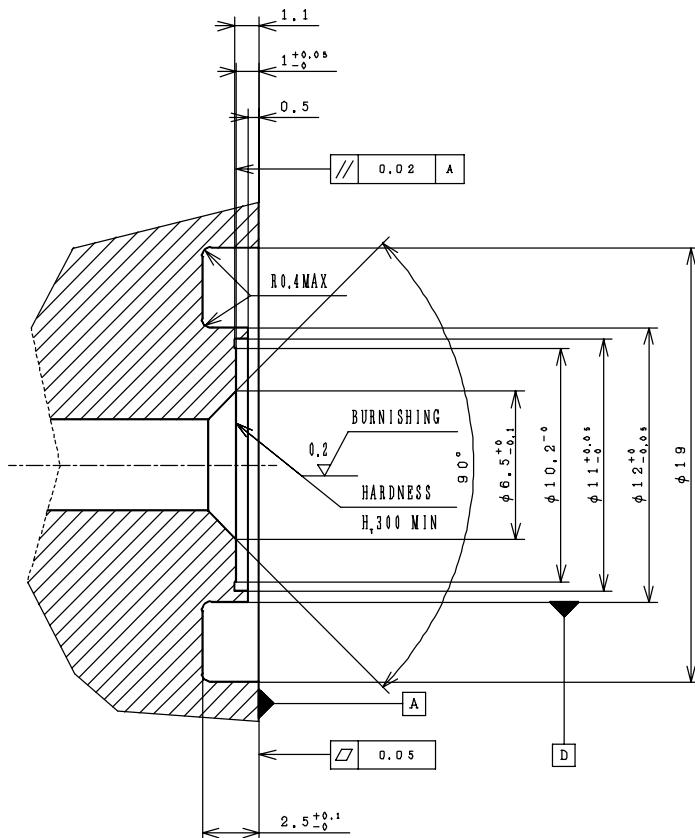
## R1-4 Design Example 4

R1-4.1 *Seal Design* — See Figure R1-4.

R1-4.2 *Surface Hardness* — The sealing surface (the bottom of the counterbore) has a minimum hardness of 300 Vickers. The hardness may be tested per ISO 6507.

R1-4.3 *Surface Roughness* — The sealing surface (the bottom of the counterbore) has a surface roughness of 0.2 micrometers Ra max. The surface roughness may be tested per SEMI F37-0299.

R1-4.4 *Surface Scratches* — The sealing surface (the bottom of the counterbore) is without any lateral scratches which are visible to non-magnified normal vision.



**Figure R1-4**  
**Design Example 4**

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## SEMI F89-0304<sup>E</sup>

# SPECIFICATION FOR DIMENSION OF COMPACT SIZE MASS FLOW CONTROLLERS AND MASS FLOW METERS FOR 1.5 INCH TYPE SURFACE MOUNT GAS DISTRIBUTION SYSTEMS

This specification was technically approved by the Global Gases Committee and is the direct responsibility of the Japanese Gases & Facilities Committee. Current edition approved by the Japanese Regional Standards Committee on November 20, 2003. Initially available at [www.semi.org](http://www.semi.org) February 2004; to be published March 2004.

<sup>E</sup> This document was modified in May 2004 with committee approval to correct an error made at the pre-ballot stage. Changes were made to Figure R1-2.

## 1 Purpose

1.1 This standard establishes the properties and physical dimensions of mass flow controllers and mass flow meters for 1.5 inch type surface mount gas distribution systems.

## 2 Scope

2.1 This document includes common requirements, layout, size, detailed specifications, and dimensions of the components.

2.2 This standard applies to all compact size mass flow controllers and mass flow meters. The components are mounted on substrates with fasteners accessible from the top.

2.3 This standard only applies to components, which control flow of  $\leq 50$  slm nitrogen equivalent at 308 kPa (44.7 psia). This standard also only applies to components with operating pressures less than 3445 kPa (500 psia) at 20°C.

**NOTICE:** This standard does not purport to address safety issues, if any, associated with its use. It is the responsibility of the users of this standard 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 only addresses the component; it does not address the seals, the sealing system, or the assembly process and does not guarantee the performance of the sealing system. The user should be aware that gas delivery system performance and sealing system performance are addressed elsewhere in the SEMI standards.

3.2 The user should be aware that alternative technologies are commercially available.

3.3 International, national, and local codes, regulations, and laws should be consulted to ensure that the

equipment meets regulatory requirements in each location of use.

## 4 Referenced Standards

### 4.1 SEMI Standards

SEMI E49.9 — Guide for Ultrahigh Purity Gas Distribution Systems in Semiconductor Manufacturing Equipment

SEMI F20 — Specification for 316L Stainless Steel Bar, Extruded Shapes, Plate, and Investment Castings for Components Used in High Purity Semiconductor Manufacturing Applications

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

ASME Y14.5 — Dimensioning and Tolerancing

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

## 5 Terminology

### 5.1 Definitions

5.1.1 *components for surface mount* — a gas distribution system component having inlets and outlets located on the bottom of the component with the attachment mechanism accessible from the top.

5.1.2 *Ra* — roughness average. The arithmetic average of the absolute values of the measure profile height deviations taken within the sampling length and measured from the graphical centerline.

## 6 Common Requirements

6.1 *Dimensional Requirements* — All components shall meet the requirements outlined in Figure 1. All geometric dimensioning and tolerancing complies with ASME Y14.5 and/or the applicable ISO standard.

<sup>1</sup> American Society of Mechanical Engineers. Three Park Avenue, New York, NY 10016-5990, USA. Telephone: 800.843.2763 (U.S./Canada), 95.800.843.2763 (Mexico), 973.882.1167 (outside North America). Website: [www.asme.org](http://www.asme.org)

NOTE 1: All dimensions are in millimeters unless otherwise noted.

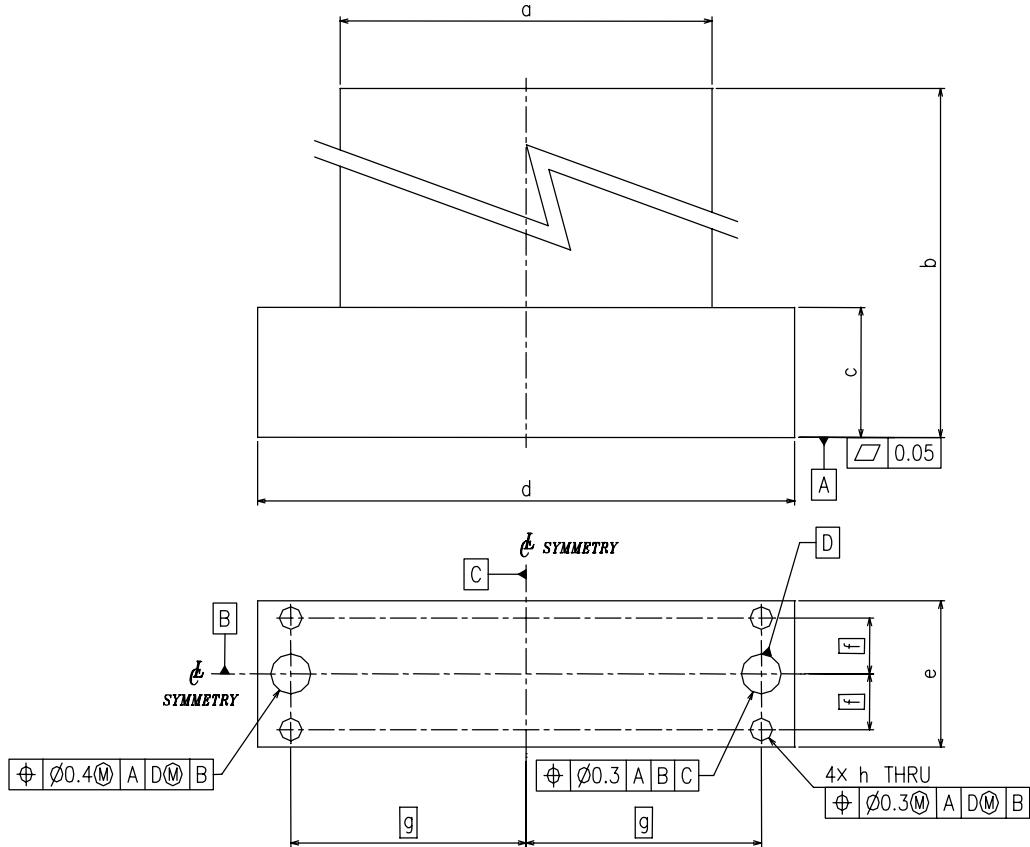
NOTE 2: The through hole of the sealing port will be elliptical if the through hole is drilled at an angle. In this case, the diameter shall apply to the major diameter of the ellipse.

**6.2 Material** — The material used to manufacture the base of the components shall comply to SEMI F20 with the exception that the sulfur content shall comply to SEMI E49.9.

NOTE 3: SEMI E49.9 was withdrawn. However, a ballot to combine E49.8 and E49.9 in one single standard was submitted for SEMICON West 2003.

**6.3 Burrs and Sharp Edges** — Unless specifically noted on the drawing, remove all burrs and sharp edges.

**6.4 Displays** — Removable displays shall stay within the maximum envelope of the base of the component. They shall be movable or removable such that they do not interfere with the access of the mounting fasteners from above.



a	b	c	d	e	f	g	h
70.5 MAX	180 MAX	40 MAX	99.5 $\pm 6.5$	38.15 $\pm 1.15$	15	39.9	$\phi 5.6$ $\pm 0.1$

UNIT: [mm]

**Figure 1**  
**Dimensional Requirements for All Components**



## 7 Related Documents

### 7.1 ISO Standards<sup>2</sup>

ISO 406 — Technical Drawings - Tolerancing of Linear and Angular Dimensions

ISO 1101 — Technical Drawings - Geometrical Tolerancing - Tolerancing of Form, Orientation, Location, and Run-Out - Generalities, Definitions, Symbols, and Indications on Drawings.

ISO 1660 — Technical Drawings - Dimensioning and Tolerancing of Profiles

ISO 2692 — Technical Drawings - Geometrical Tolerancing - Maximum Material Principle

ISO 6507 — Metallic Materials - Vickers Hardness Test

ISO 8015 — Technical Drawings - Fundamental Tolerancing Principles

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<sup>2</sup> ISO Central Secretariat, 1, rue de Varembé, Case postale 56, CH-1211 Genève 20, Switzerland. <http://www.iso.ch>

## RELATED INFORMATION 1

### EXAMPLES OF SEAL DESIGNS FOR 1.5 INCH TYPE SURFACE MOUNT COMPONENTS

**NOTICE:** This related information is not an official part of SEMI F89 and was derived from the work of the originating task force. This related information was approved for publication by full ballot procedures. Determination of the suitability of the material is solely the responsibility of the user.

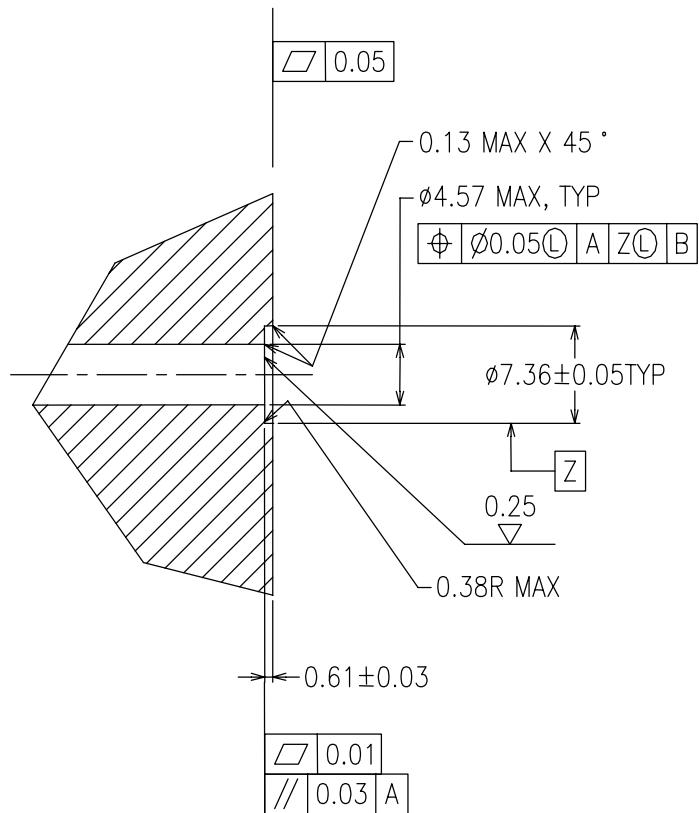
#### R1-1 Design Example 1

R1-1.1 *Seal Design* — See Figure R1-1.

R1-1.2 *Surface Hardness* — The sealing surface (the bottom of the counterbore) has a minimum hardness of 170 Vickers. The hardness may be tested per ISO 6507.

R1-1.3 *Surface Roughness* — The sealing surface (the bottom of the counterbore) has a surface roughness of 0.25 micrometers Ra max. The surface roughness may be tested per SEMI F37-0299.

R1-1.4 *Surface Scratches* — The sealing surface (the bottom of the counterbore) is without any lateral scratches which are visible to non-magnified normal vision.



**Figure R1-1**  
**Design Example 1**

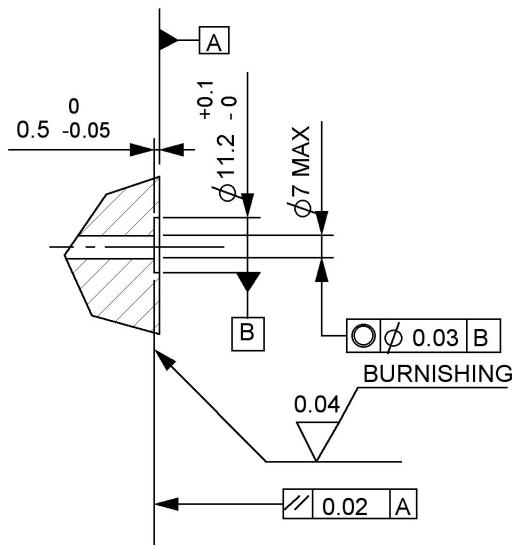
## R1-2 Design Example 2

R1-2.1 *Seal Design* — See Figure R1-2.

R1-2.2 *Surface Hardness* — The sealing surface (the bottom of the counterbore) has a minimum hardness of 300 Vickers. The hardness may be tested per ISO 6507.

R1-2.3 *Surface Roughness* — The sealing surface (the bottom of the counterbore) has a surface roughness of 0.04 micrometers Ra max. The surface roughness may be tested per SEMI F37-0299.

R1-2.4 *Surface Scratches* — The sealing surface (the bottom of the counterbore) is without any lateral scratches which are visible to non-magnified normal vision.



**Figure R1-2**  
Design Example 2

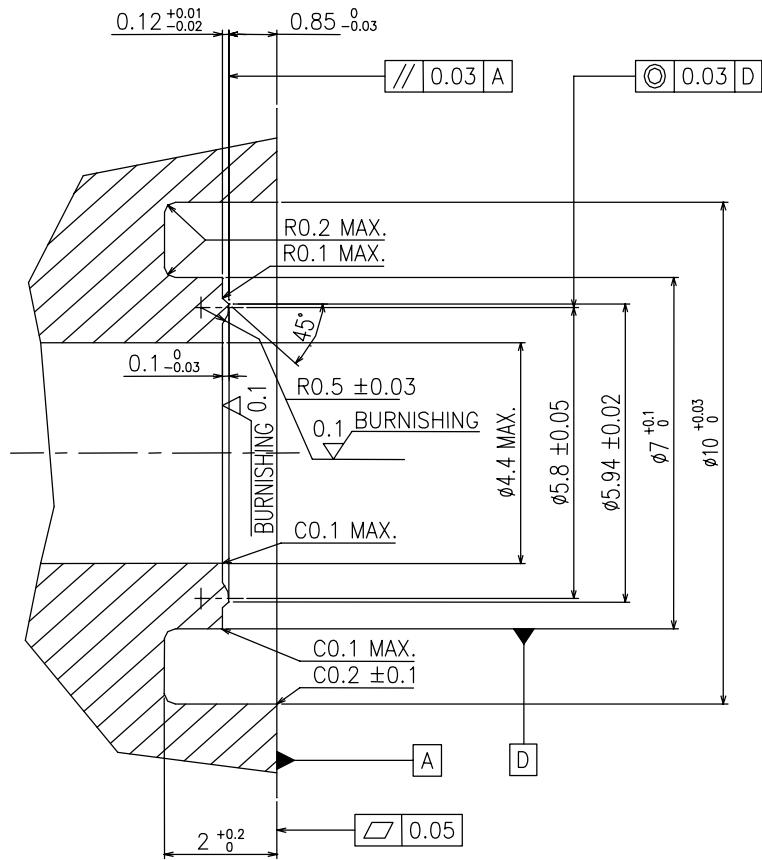
### R1-3 Design Example 3

R1-3.1 *Seal Design* — See Figure R1-3.

R1-3.2 *Surface Hardness* — The sealing surface (the bottom of the counterbore) has a minimum hardness of 300 Vickers. The hardness may be tested per ISO 6507.

R1-3.3 *Surface Roughness* — The sealing surface (the bottom of the counterbore) has a surface roughness of 0.1 micrometers Ra max. The surface roughness may be tested per SEMI F37-0299.

R1-3.4 *Surface Scratches* — The sealing surface (the bottom of the counterbore) is without any lateral scratches which are visible to non-magnified normal vision.



**Figure R1-3**  
**Design Example 3**

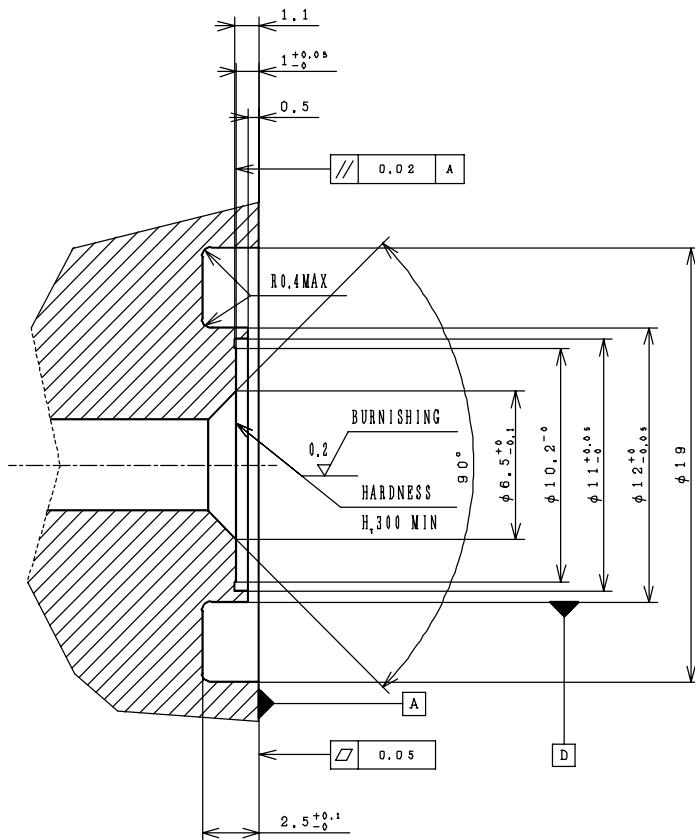
## R1-4 Design Example 4

R1-4.1 *Seal Design* — See Figure R1-4.

R1-4.2 *Surface Hardness* — The sealing surface (the bottom of the counterbore) has a minimum hardness of 300 Vickers. The hardness may be tested per ISO 6507.

R1-4.3 *Surface Roughness* — The sealing surface (the bottom of the counterbore) has a surface roughness of 0.2 micrometers Ra max. The surface roughness may be tested per SEMI F37-0299.

R1-4.4 *Surface Scratches* — The sealing surface (the bottom of the counterbore) is without any lateral scratches which are visible to non-magnified normal vision.



**Figure R1-4**  
**Design Example 4**

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## SEMI F90-0304<sup>E</sup>

# SPECIFICATION FOR DIMENSION OF STANDARD SIZE TWO PORT COMPONENTS (EXCEPT MFC/MFM) FOR 1.5 INCH TYPE TWO FASTENER CONFIGURATION SURFACE MOUNT GAS DISTRIBUTION SYSTEMS

This specification was technically approved by the Global Gases Committee and is the direct responsibility of the Japanese Gases & Facilities Committee. Current edition approved by the Japanese Regional Standards Committee on November 20, 2003. Initially available at [www.semi.org](http://www.semi.org) February 2004; to be published March 2004.

<sup>E</sup> This document was modified in May 2004 with committee approval to correct an error made at the pre-ballot stage. Changes were made to Figure R1-2.

## 1 Purpose

1.1 This standard establishes the properties and physical dimensions of two port components for 1.5 inch type surface mount gas distribution systems.

## 2 Scope

2.1 This document includes common requirements, layout, size, detailed specifications, and dimensions of the components.

2.2 This standard applies to all standard size two port two fastener components (except mass flow controllers and mass flow meters). The components (i.e. valves, pressure regulators, pressure transducers, filters and purifiers) are mounted on substrates with fasteners accessible from the top.

2.3 This standard only applies to components, which control flow of  $\leq 50$  slm nitrogen equivalent at 308 kPa (44.7 psia). This standard also only applies to components with operating pressures less than 3445 kPa (500 psia) at 20°C.

**NOTICE:** This standard does not purport to address safety issues, if any, associated with its use. It is the responsibility of the users of this standard 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 only addresses the component; it does not address the seals, the sealing system, or the assembly process and does not guarantee the performance of the sealing system. The user should be aware that gas delivery system performance and sealing system performance are addressed elsewhere in the SEMI standards.

3.2 The user should be aware that alternative technologies are commercially available.

3.3 International, national, and local codes, regulations, and laws should be consulted to ensure that the equipment meets regulatory requirements in each location of use.

## 4 Referenced Standards

### 4.1 SEMI Standards

SEMI E49.9 — Guide for Ultrahigh Purity Gas Distribution Systems in Semiconductor Manufacturing Equipment

SEMI F20 — Specification for 316L Stainless Steel Bar, Extruded Shapes, Plate, and Investment Castings for Components Used in High Purity Semiconductor Manufacturing Applications

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

ASME Y14.5 — Dimensioning and Tolerancing

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

## 5 Terminology

### 5.1 Definitions

5.1.1 *components for surface mount* — a gas distribution system component having inlets and outlets located on the bottom of the component with the attachment mechanism accessible from the top.

5.1.2 *Ra* — roughness average. The arithmetic average of the absolute values of the measure profile height deviations taken within the sampling length and measured from the graphical centerline.

5.1.3 *two fastener configuration* — the component has two fasteners per sealing point. The sealing point is located in the middle of the two fasteners.

<sup>1</sup> American Society of Mechanical Engineers. Three Park Avenue, New York, NY 10016-5990, USA. Telephone: 800.843.2763 (U.S./Canada), 95.800.843.2763 (Mexico), 973.882.1167 (outside North America). Website: [www.asme.org](http://www.asme.org)

## 6 Common Requirements

**6.1 Dimensional Requirements** — All components shall meet the requirements outlined in Figure 1. All geometric dimensioning and tolerancing complies with ASME Y14.5 and/or the applicable ISO standard.

NOTE 1: All dimensions are in millimeters unless otherwise noted.

NOTE 2: The through hole of the sealing port will be elliptical if the through hole is drilled at an angle. In this case, the diameter shall apply to the major diameter of the ellipse.

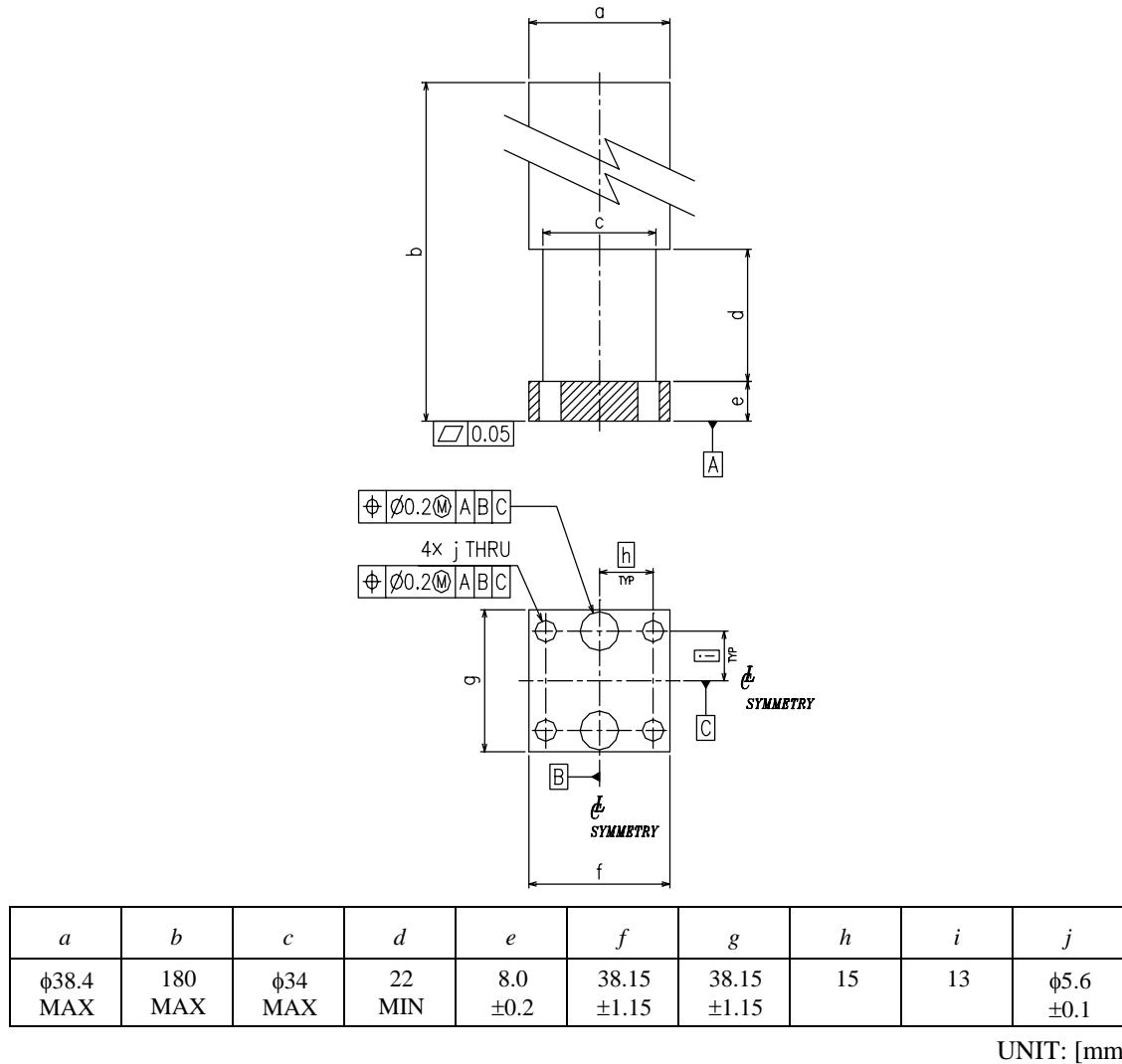
**6.2 Material** — The material used to manufacture the base of the components shall comply to SEMI F20 with

the exception that the sulfur content shall comply to SEMI E49.9.

NOTE 3: SEMI E49.9 was withdrawn. However, a ballot to combine E49.8 and E49.9 in one single standard was submitted for SEMICON West 2003.

**6.3 Burrs and Sharp Edges** — Unless specifically noted on the drawing, remove all burrs and sharp edges.

**6.4 Handles and Displays** — Rotating handles and removable displays shall stay within the maximum envelope of the base of the component with the exception of toggle and/or lockout/tagout valves at the discretion of the system designer. They shall be movable or removable such that they do not interfere with the access of the mounting fasteners from above.



**Figure 1**  
**Dimensional Requirements for All Components**



## 7 Related Documents

### 7.1 ISO Standards<sup>2</sup>

ISO 406 — Technical Drawings - Tolerancing of Linear and Angular Dimensions

ISO 1101 — Technical Drawings - Geometrical Tolerancing - Tolerancing of Form, Orientation, Location, and Run-Out - Generalities, Definitions, Symbols, and Indications on Drawings.

ISO 1660 — Technical Drawings - Dimensioning and Tolerancing of Profiles

ISO 2692 — Technical Drawings - Geometrical Tolerancing - Maximum Material Principle

ISO 6507 — Metallic Materials - Vickers Hardness Test

ISO 8015 — Technical Drawings - Fundamental Tolerancing Principles

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<sup>2</sup> ISO Central Secretariat, 1, rue de Varembé, Case postale 56, CH-1211 Genève 20, Switzerland. <http://www.iso.ch>

## RELATED INFORMATION 1

### EXAMPLES OF SEAL DESIGNS FOR 1.5 INCH TYPE SURFACE MOUNT COMPONENTS

**NOTICE:** This related information is not an official part of SEMI F90 and was derived from the work of the originating task force. This related information was approved for publication by full ballot procedures. Determination of the suitability of the material is solely the responsibility of the user.

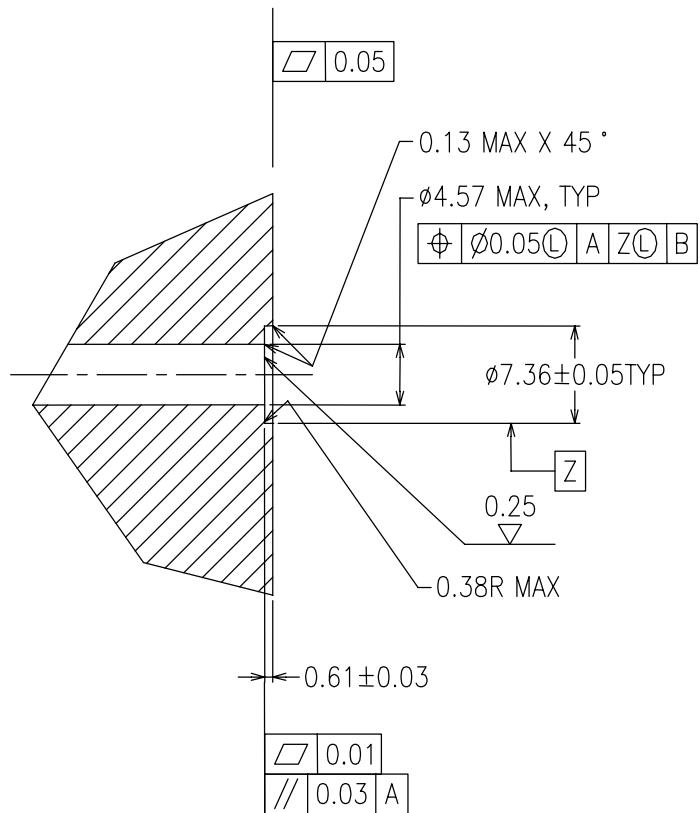
#### R1-1 Design Example 1

R1-1.1 *Seal Design* — See Figure R1-1.

R1-1.2 *Surface Hardness* — The sealing surface (the bottom of the counterbore) has a minimum hardness of 170 Vickers. The hardness may be tested per ISO 6507.

R1-1.3 *Surface Roughness* — The sealing surface (the bottom of the counterbore) has a surface roughness of 0.25 micrometers Ra max. The surface roughness may be tested per SEMI F37-0299.

R1-1.4 *Surface Scratches* — The sealing surface (the bottom of the counterbore) is without any lateral scratches which are visible to non-magnified normal vision.



**Figure R1-1**  
**Design Example 1**