

# User System Requirements Document (USRD) for FOUP-to-Loadport Interoperability

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This document was presented by Toshiyuki Uchino (J300E/Hitachi, Ltd.)  
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J300E, and International SEMATECH



International  
SEMATECH



Japan  
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(J300E)

# User System Requirements Document (USRD) for FOUP-to-Loadport Interoperability

The purpose of this User Systems requirements Document (USRD) for FOUP-to-Loadport Interoperability is to provide early guidance to suppliers for a common operational model of FOUPs and Loadports to meet user requirements. Although FOUP and Loadport designs must comply with the relevant SEMI standards, full compliance to the SEMI standards may not ensure the required interoperability. This document identifies some issues that could lead to lack of interoperability and suggests design considerations in addition to the SEMI standards.

This USRD was created by agreement of International SEMATECH and J300E. It is intended as a starting point for discussions regarding interoperability issues and does not purport to identify or address all issues related to interoperability of FOUPs and loadports. International SEMATECH, J300E, Selete, and SEMI are engaged in a consensus effort to develop Best Practices for FOUP-to-Loadport interoperability for publication by SEMI. The Best Practices document will provide suppliers with design guidance for better interoperability based on the SEMI standards.

ISMT and Selete are cooperating to fully support development of specifications, test tools, test methods, and industry best practices to ensure FOUP-to-Loadport Interoperability. We strongly urge equipment suppliers and FOUP suppliers to engage in this development through SEMI to ensure timely and accurate solutions.

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# User System Requirements Document (USRD) for FOUP-to-Loadport Interoperability

**Scope: Common mechanical operation model of  
FOUP and Loadport.**

**USRD should be followed by *FOUP-to-Loadport  
Interoperability Best Practices Document* compiled  
with the help of the SEMI PI&C 300mm  
Interoperability Study Group.**

# 1. E62-y33 Variation for FOUP & Loadport

☹️ **To ensure proper open/close operation, loadport must be designed to adjust for variation in the distances to FOUP door and to FIMS door.**

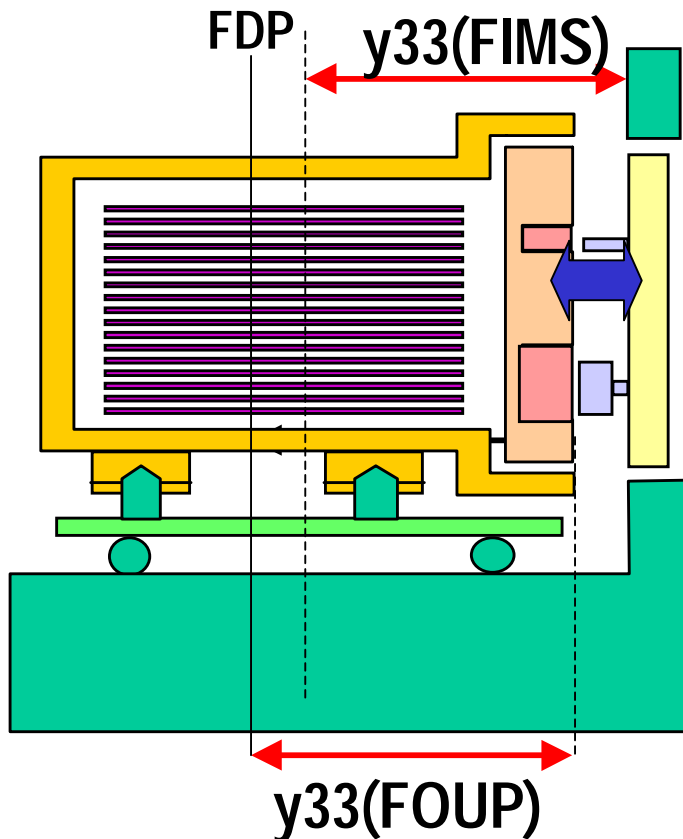
## Background

☹️ **The current standards specify only a single y33 dimension common to the both doors and do not ensure contact between the two doors which is mandatory for proper door catch.**

## Note

☹️ **Other features should not interfere with this door catch.**

# Background



If y33 values are as shown:

y33 at FIMS	y33 at FOUP	What will happen:
166mm	165mm	Doors do not touch; cannot open !
165mm	166mm	FOUP/FIMS have to deform.

## Possible remedies:

1. Tighten y33 tolerance on both sides!  
☹️!
2. Let FOUP take the mismatch between y33 values.  
☹️!
3. Let loadport take the mismatch between y33 values.  
😊!

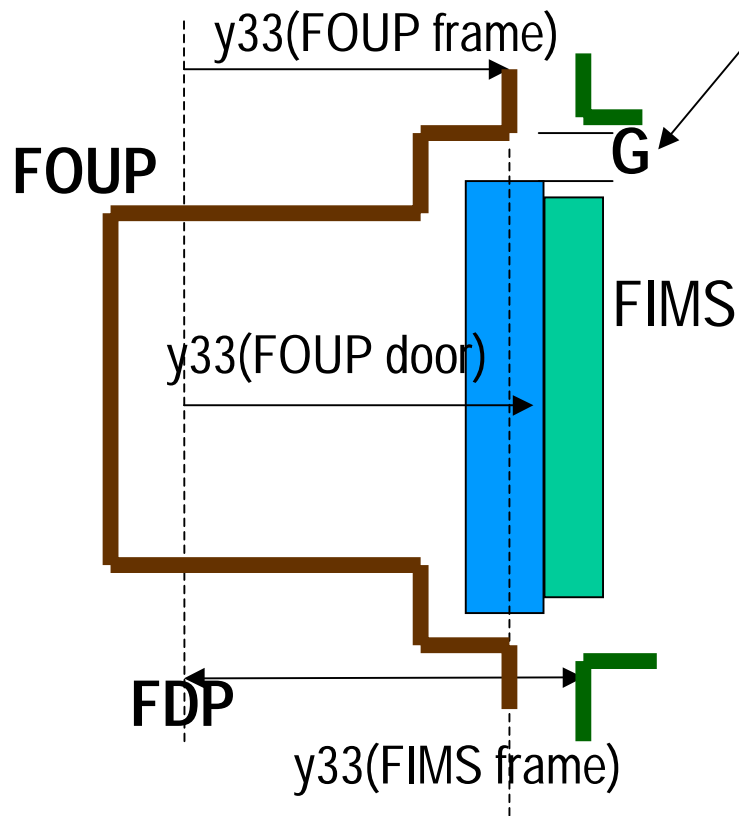
## 2. FOUP and FIMS Door/Frame Size Relation

☹️ The sizes of FOUP door, FOUP frame, FIMS door, and FIMS frame have to be designed relative to the FIMS seal zone dimensions (specified in E62) to provide proper clearances between any two of these four entities.

### Background

- ☹️ Current standard specifies seal zones, but does not specify door sizes and clearances.
- ☹️ Clearances have to be maintained to avoid rubbing between the entities.

# Background



## • Technical Issues

1. Recommend clearance “G”
2. “G” is not specified in the current SEMI standard. Only FIMS door seal zone is specified in E62.

## • Possible Remedies

1. FIMS door size has to be specified as well as the seal zone



2. Overlap of seal zones between FOUP and FIMS has to be specified.



### 3. Repeatability of FOUP Door Position

- ☹️ **When closing FOUP, Loadport must return FOUP Door to the same location from which it was taken.**
- ☹️ **FOUP is responsible for successfully accepting its door back into its frame if the door is returned to the same location from which it was taken.**

#### **Background**

- ☹️ **FOUP door hangs from FIMS door when FOUP door is being opened, and this hanging may cause rubbing of FOUP door in the FOUP door frame.**

## 4. Gap between FOUP and FIMS Frames

☹ **FOUP frame should not hit FIMS frame in any circumstance. Guideline recommendation may be as follows:**

$$y33 \text{ (FOUP frame)} = < y33 \text{ (FIMS frame)}$$

### Background

- ☹ Avoid particle generation due to hard hit.
- ☹ FOUP should not be pushed off the kinematic couplings.
- ☹ FOUP FDP should not be affected by frame contact.

### Note

- ☹ Elastic seal material is allowed to protrude from FIMS frame surface.

## 5. Accuracy of Wafer Location

☺ It is strongly preferred the FOUPs minimize SEMI E1.9 r1 dimension to keep wafer center concentric to FOUP center.

### Background

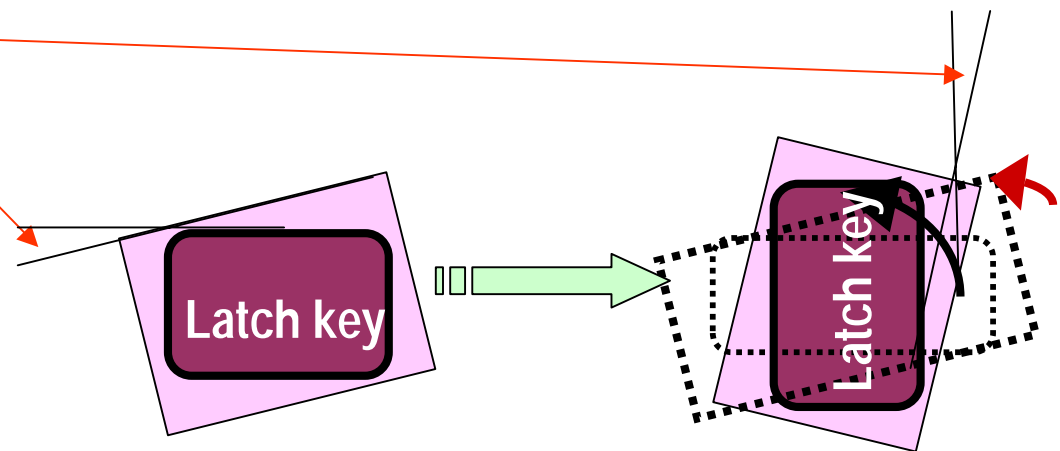
- ☹ In a FOUP, the wafers are pushed against the rear support when the wafer retainer on the FOUP door pushes the wafer as the door is being closed.
- ☹ Allowance of this location has a direct relation to the end effector ability design to pick up a wafer at a location with uncertainty.

## <Study requirement> Latch Key Operation

☹️ The following latch key issue has been observed and it requires resolution.

### Background

☹️ Redundant angle is left over when the latch key rotates 90°. Latch key hole does **NOT** quite rotate 90°.



### Note

☹️ This issue requires further study and appropriate action if necessary. It should be addressed during *Industry's Best Practice* development.