

SEMI RoHS Working Group Whitepaper:

Recommending Size and Weight Metrics to be Considered when Identifying Equipment as “Large-scale” for EU RoHS2

(March 2013)

Purpose:

The purpose of this white paper is to recommend criteria to suppliers of semiconductor and photovoltaic manufacturing equipment for determining whether their equipment meets the “large-scale” qualification for Large-scale Stationary Industrial Tools per the European RoHS Directive and the related Frequently Asked Questions (FAQ) document provided by the European Commission.

Note: The SEMI RoHS Working Group (and other organizations) uses the acronyms LSIT and LFI for “Large-scale Stationary Industrial Tools” and “Large-scale Fixed Installations”, respectively. The FAQ treats the hyphen differently and uses LSSIT and LSFI as acronyms. The former set is used in this whitepaper.

Background

The European Union RoHS Directive [2011/65/EU](#), known as RoHS2 became effective January 3, 2013. It is a revision (a ‘recast’) of the original EU RoHS Directive 2002/95/EC.

A significant change in RoHS2 is the introduction of definitions for two types of equipment that are excluded from the scope of RoHS2; large-scale stationary industrial tools (LSIT), and large-scale fixed installations (LFI). Several parameters are given for identifying these equipment types including that they be ‘large-scale.’ However, RoHS2 does not provide any guidance as to how ‘large-scale’ should be understood.

In December of 2012, the European Commission released a [Frequently Asked Questions document](#) (a FAQ) related to RoHS2. In the FAQ several important points are made regarding the meaning of ‘large-scale’ as applied to LSIT and LFI, all of which are expressed in question 3.1 of the FAQ, namely, “What are ‘large-scale stationary industrial tools’ and ‘large-scale fixed installations’ ?” The points are summarized in the following sub-sections which present the key observation followed by supporting text from the FAQ,

1. **Difference In Meaning** – The term ‘large-scale’, though a criterion common to determining if equipment is LSIT or LFI, has a different meaning in each case. The characteristics indicating a stationary industrial tool is large-scale will not necessarily be the same as those indicating a fixed installation is large-scale.

“...it is important to consider that the meaning of ‘large-scale’ in absolute terms may be a different one for tools and installations, as there are differences between tools and installations.” [Q3.1 ¶2]

“...‘large-scale’ does not necessarily have the same meaning for tools and installations.” [Q3.1 ¶15]

2. **Relative Magnitude** – Even though the meaning of ‘large-scale’ is different when applied to stationary industrial tools versus fixed installations, it seems clear that a large-scale fixed installation will be larger than a large-scale stationary industrial tool.

“...Tools that are large-scale in comparison to smaller industrial tools can be significantly smaller than large-scale installations.” [Q3.1 ¶15]

3. **Priority of Dimension** – Even though the idea of ‘large-scale’ is not limited by the FAQ to physical dimensions, the FAQ sets up physical size and weight as the priority differentiator. The FAQ does not provide size and weight metrics, but nonetheless envisions equipment could be border-line with regard to the perspective of the decision maker (e.g., perhaps derived from their view of example LSIT given in Q3.1 ¶7). If the equipment is somehow border-line with regard to the size or weight metrics being used, then the other factors contributing to ‘large-scale’ can be considered to make the final decision.
 - a. “...The following criteria can be applied to tools as installed, but specific guidance metrics should be developed. Any of the following criteria can be an indicator:
 - Dimensions (for guidance see above listed examples of tools);
 - o Tool size;
 - o Size, movement or force of moving parts;
 - Weight (for guidance see above listed examples of tools).” [Q3.1 ¶15]
 - b. “Where the size or weight of a tool or an installation is close to the guidance metrics for large-scale, or where it is difficult to determine its exact size or weight with regard to its classification as large-scale, complexity or required utilities may be taken into consideration as a qualitative indicator.” [Q3.1 ¶16]
4. **Other ‘large-scale’ Characteristics** – The term ‘large-scale’ is not entirely determined by physical size alone. It can include other characteristics such as functional complexity, capacity, and the utilities required for the equipment. However, size and weight are the primary means the FAQ recommends should be used to determine if equipment is large scale.
 - a. “... ‘Large-scale’ refers to dimensional or similar criteria...” [Q3.1 ¶5]
 - b. “... ‘Large-scale’ can be used to identify and differentiate between tools because of their size, weight, capacity, throughput or other performance related criteria. It also relates to tool or installation complexity, and to the effort needed for installing, operating, maintaining and de-installing a tool or an installation.” [Q3.1 ¶13]
5. **LFI have guidance metrics, LSIT do not** – The European Commission was able to provide some guidance metrics for deciding whether a fixed installation is large-scale or not. However, they did not provide such metrics for stationary industrial tools.
 - a. “...The following guidance metrics and qualitative criteria can be applied for installations. If the installation exceeds the minimum requirements for one of the following criteria, it can be considered large-scale:
 - If, when installing or de-installing the installation, it is too large to be moved in an ISO 20 foot container because the total sum of its parts as transported is larger than 5,71m x 2,35m x 2,39m, it can be considered large-scale.
 - The maximum weight of many road trucks is 44 tonnes. Thus if, when installing or de-installing the installation, it is too heavy to be moved by a 44 tonne road truck, because the total sum of its parts as transported weighs more than the truck's load capacity, it can be considered large-scale.
 - If heavy-duty cranes are needed for installation or de-installation, the installation can be considered large-scale.
 - An installation that does not fit within a normal industrial environment, without the environment needing structural modification, can be considered large-scale. Examples for modifications are modified access areas, strengthened foundations etc.
 - If an installation has a rated power greater than 375 kW, it can be considered large-scale.

This is only an indicative list.” [Q3.1 ¶13]

- b. "In order to ensure legal certainty, specific guidance metrics for large-scale tools based on available technical data should be developed in the course of the implementation and enforcement of RoHS 2, and incorporated in a revised version of this guidance document. The benchmarks for large tools should be between and significantly different from those for large household appliances as discussed under WEEE 2, and those for large installations as listed in this document." [Footnote 12]

In this present absence of guidance metrics for stationary industrial tools, high tech equipment suppliers (including semiconductor equipment manufacturers and photovoltaic equipment manufacturers) are left to figure out for themselves what should be considered large-scale. This, however, is envisioned by the FAQ which states in paragraph 6 of question 3.1 that it is the responsibility of the manufacturer, importer or any other economic operator involved to assess whether his tool benefits from the LSIT or LFI exclusions, and also in paragraph 10 which says that the burden of proof is with the relevant importer, manufacturer or other economic operator (see RoHS 2 Article 3.10).

Recommendations

The SEMI RoHS Working Group recommends the following minimum size metrics (in blue italics) for assessing whether a stationary industrial tool is to be considered large-scale or not. The metrics are provided in light of the LSIT examples provided in the FAQ, which are

- "...
- Machines for the industrial production and processing of materials and goods, such as
 - o CNC lathes;
 - o Bridge-type milling and drilling machines;
 - o Metal forming presses;
 - o Newspaper printing presses;
 - Machines for the testing of work pieces, such as
 - o Electron beam, laser, bright light, and deep ultra violet defect detection systems;
 - o Automated integrated circuit board and printed wiring board testers;
 - Cranes;
 - Other machinery of similar size, complexity and weight." [Q3.1 ¶7]

and the observations of footnote 12 (quoted in 5(b), above) that the dimensions should be larger than those give for large household appliances in [WEEE 2](#) (i.e., 50 cm – see Annex III point 4), but smaller than those given for large-scale fixed installations (quoted in 5(a), above).

The SEMI RoHS Working Group recommends that in order to be considered 'large-scale' a stationary industrial tool should either

- **be at least 1 cubic meter in volume with at least two sides having a length of at least 1 meter each,**
- OR**
- **weigh at least 1000 kg,**

Where the tool is border-line with regard to a clear assessment of volume or weight to these metrics, other characteristics may be considered such as

- **The tool is complex – meaning "the tool consists of several hundred components interrelated to form subsystems for process parameters which comprise the tool's intended function." [Q3.1 ¶16]**
- **The tool requires other than simple utilities – the tool requires "special power connections and utility connections other than clean dry air or water supply and drain, such as high pressure compressed gas supply, vacuum lines, toxic or heat exhaust connections, or chemical supply lines and drains". [Q3.1 ¶16]**

Related Considerations for LSIT

It should be highlighted that *being determined to be “large-scale” alone is not sufficient reason to determine a piece of equipment may benefit from the large-scale stationary industrial tool (LSIT) scope exclusion of RoHS2 (ref Article 2.4.d)*. The equipment must match all the elements of the large-scale stationary industrial tools definition given in RoHS2, namely

- I. It is “an assembly of machines, equipment and/or components, functioning together for a specific application”;
- II. It is “permanently installed and de-installed by professionals at a given place”;
- III. It is “used and maintained by professionals in an industrial manufacturing facility or R&D facility”;
- IV. It is “large-scale”;

The answer to question 3.1 of the FAQ also offers guidance on some of these elements.

1. What are machines/tools? – “Tools are essentially machines, stand-alone or assemblies, often with moving parts, and used for example for the treatment or manufacturing of materials and work pieces. The Machinery Directive (2006/42/EC) can be used as guidance...” [Q3.1 ¶3]
Note: ‘specific application’ is included in the Machinery Directive’s definition of ‘machinery’. See the EU Commissions Guide to the Machinery Directive ([link](#)) for further guidance.
2. How should ‘permanently’ be understood? – “Machinery that has partial mobility, for example semi-mobile machinery running on rails, can be of ‘permanent use’. On the other hand, EEE that is intended to be used on different sites during its life is not considered as permanent. It is an indicator of permanent use if the equipment is not readily re-locatable (or ‘mobile intended’) and if it is intended for use at one single location.” [Q3.1 ¶11]
Note: Most high-tech equipment is designed so that it can be relocated (by professionals) if needed. It may, nonetheless, be considered ‘permanently installed’ as it is not *readily* re-locatable nor ‘mobile intended’.
3. Regarding installation and de-installation by professionals – “...scenarios such as the need for special assembling equipment, required permits, if the commissioning is a professional engineering exercise, specialised training, considerable installation time etc. can be indicators.” [Q3.1 ¶12]