PSES Presentation
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IEC 60204-33 and Semiconductor Manufacturing Equipment
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Semiconductor Fabrication Equipment

- **Scope**

  “…applies to electrical and electronic equipment associated with semiconductor fabrication equipment for the manufacture, measurement, assembly, and test of semiconductors…

  With supplies \( \leq 1000\text{VAC}/1500\text{VDC} \ldots \leq 200\text{Hz} \)
A Little History

- 1947 First Transistor
- 1955 First Transistor on a chip
- 1986 First Industry Safety Guideline (SEMI S1 - Safety Guideline for Equipment Safety Labels)
- 1991 First Industry General Equipment Safety Guideline (SEMI S2 rapidly reshaped as S2-93)
- 1996 CE Marking to Machinery Directive
- 2005 First Industry Electrical Safety Guideline (SEMI S22)
- 2009 First Semiconductor Fabrication Equipment Specific IEC Standard (IEC 60204-33)
Some Chip Makers

- 1947 Bell Telephone Labs
- 1955 Shockley Transistor
- 1957 Fairchild Semiconductor
- 1959 National Semiconductor and Rheem Semiconductor
- 1961 Signetics, Amelco, Raytheon, H.P.
- 1968 Intel
- 1969 AMD
Some Fabrication Equipment Manufacturers

- 1956 Kulicke and Soffa Industries
- 1967 AMAT Founded
- 1975 KLA Instruments Founded
- 1980 Lam Research Founded
- ... Plus thousands of other SEMI suppliers
Safety and Compliance

- Earliest requirements were largely driven by customer specs (MESH, Red Book, etc.)
  ... augmented by “relevant” standards on an ad hoc basis
- Industry Guidelines were developed to reduce requirements for customization and establish consistent minimum criteria - SEMI and SEMATECH documents have become Industry Standard Practice
  ... augmented by “relevant” standards on an ad hoc basis and customer specific requirements as negotiated
CE Marking requirements call for an industry-wide approach to consider and manage compliance for the EU.

- SEMI White Paper and MOU; use of EHSR’s; and guidance documents for members
- SEMI ICRC to keep track of and act on emerging requirements
CE Marking

- Typically to Machinery, Low Voltage and Electromagnetic Compatibility Directives with others as required
- Numerous approaches and technical file content used to support the Declaration of Conformity
Some Electrical Standards used to support CE Mark

- EN 60204-1 Safety of Machinery – Electrical Parts of Machines
- IEC 60950-1 Information technology equipment - Safety
- IEC 61010-1 Standard for Safety Electrical Equipment For Measurement, Control, and Laboratory Use
- Largely determined by the equipment manufacturer
And Now – IEC 60204-33

- IEC 60204-33 Safety of machinery – Electrical equipment of machines – Part 33: Requirements for semiconductor fabrication equipment
Why IEC 60204-33?

To

- “…reflect the unique needs of electrical safety within the semiconductor manufacturing environment.
- include the use environment and the equipment itself
- …permit the flexibility of design and use required
- …and satisfy the electrical safety needs of the semiconductor industry”
SEMI S22 & IEC 60204-33

- SEMI S22 - Safety Guideline for The Electrical Design of Semiconductor Manufacturing Equipment
  - Grounded in the practical safety and compliance needs of the industry and containing those elements defined as critical in assuring electrical safety of equipment.
  - Is an Industry Guideline without independent authority
SEMI S22 & IEC 60204-33

- IEC 60204-33
  - Embeds the essential safety requirements captured in SEMI S22
  - Carries the authority of an international standard governing body
  - Is authorized under the EU Machinery Directive (to become harmonized ~ Sept. 2010)
Should we switch?

- YES!
- Why?
  - SFE has been represented as a special class of equipment and enjoys some latitude not available to other types of equipment. Using other standards will call for identifying the equipment as other than SFE.
  - The standard is aligned with identified best practices of the SFE industry.
  - Not using the applicable Type C standard may unnecessarily raise scrutiny at EU ports of entry.
Part 2

The next part of this presentation is in answer to the question:

“Does my IEC 60204-1 compliant equipment meet the requirements of IEC 60204-33?”

Answer - “No, not independently”

Gaps between these standards follow -
IEC 60204-33 Sections

- 4 General requirements
- 5 Incoming supply conductor terminations and devices for disconnecting and switching off
- 6 Protection against electric shock
- 7 Protection of equipment
- 8 Equipotential bonding
- 9 Control circuits, emergency off (EMO), and protective interlock circuits
- 10 Operator interfaces
- 11 Controlgear: location, mounting, and enclosures
- 12 Conductors and cables
- 13 Wiring practices
- 14 Electric motors and associated equipment
- 15 Accessories and lighting
- 16 Marking, warning signs and reference designations
- 17 Technical documentation
- 18 Testing
4 General requirements

- IEC 60204-33 goes beyond the earlier requirements for the handling of bulky and heavy parts of the machine.
For Details on Sections 5 thru 18

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