Standardisation of electrostatic test methods and electrostatic discharge prevention measures for the world market

Dr Jeremy Smallwood
The World Trade Organisation (WTO)

• Deals with global rules of trade
• Aims to reduce barriers to trade
  – Promotes new markets and economic growth
• Technical Barriers to Trade Agreement
  – Governments ensure standardising bodies comply with WTO Code of Good Practice for Preparation Adoption and Application of Standards
3 complementary standardisation organisations

• Provide standardisation in support of the WTO Code of Good Practice for Preparation Adoption and Application of Standards
  – International Electrotechnical Commission (IEC)
  – International Standardisation Organisation (ISO)
  – International Telecommunication Union (ITU)
The International Electrotechnical Commission (IEC)

- IEC covers Electrotechnology
  - Associated symbols and terminology
  - Electromagnetic compatibility
  - Measurement and performance
  - Safety
  - Environment

- IEC standards serve as the basis for national standardisation and international trade
IEC data

• 179 Technical Committees (TCs) and Sub Committees (SCs)
• About 1000 experts
  – Industry
  – Commerce
  – Government institutions
  – Test and research labs
  – Academia
  – Consumer groups
TC101 Electrostatics
IEC TC101 Scope

• Standardisation in the field of electrostatics to provide general guidance on
  – test methods to evaluate the generation, retention and dissipation of electrical charges,
  – ascertaining the effect of electrostatic discharges
  – methods of simulation of electrostatic phenomena for testing purposes
  – requirements for design and implementation of handling areas or procedures, equipment, and materials used to reduce or eliminate electrostatic hazards or undesirable effects.
TC101 Activities

- TC101 is electrostatic expertise based rather than product oriented
- TC101 “products” are electrostatic standards such as test methods
- TC101 “clients” are “product” oriented TCs and industrial users
Development of new projects

- Driven by market needs
- TC101 does not have resources to develop new test methods
  - Existing proven methods will often be adopted and published as an international standard
  - In the electronics sector ESD Association Standards often form the basis of TC101 projects
- TC101 depends heavily on the donated time of experts and support of their organisations
TC101 standards and work program
Part 1 Guide to the principles of electrostatic phenomena

- 61340-1 Guide to the principles of electrostatic phenomena (pre-work stage)
- 61340-1-2 Definitions (In progress)
Part 2 Measurement methods in electrostatics

- 61340-2-1 Ability of materials and products to dissipate electrostatic charge (2002)
  - charge decay test methods
  - Faraday pail, electrostatic field measurements
- 61340-2-3 …for determining the resistance and resistivity of solid planar materials (2000)
  - Point-to-point resistance, resistance-to-ground, concentric ring surface resistance
Part 3 …simulation of electrostatic effects

- 61340-3-1 Human Body Model waveforms (imminent)
- 61340-3-2 Machine Model waveforms (imminent)
- 61340-3-3 Charged Device Model waveforms (pre-work stage)
- 61340-3-4 Socketed Device Model waveforms (pre-work stage)
- TC47 is responsible for application of waveforms to electronic devices
Part 4 Standard test methods for specific applications

- 61340-4-1 Electrical resistance of floor coverings (2003)
- 61340-4-2 Test methods for garments (pre-work stage)
- 61340-4-3 Footwear (2001)
- 61340-4-4 Properties of Flexible Intermediate Bulk Containers (2005)
- 61340-4-5 Footwear and flooring in combination (2004)
- 61340-4-6 Safety of Intermediate Bulk Containers (In progress)
Part 5 Protection of electronic devices

• 61340-5-3 Packaging for ESD sensitive devices (pre-work stage)
Hot topics
ESD shielding packaging

• Shielding packaging must protect against direct ESD and electrostatic fields
• There are many ways shielding performance can be achieved
  – We only have a test method for shielding bags
  – We don’t have a shielding test method for boxes
  – We don’t have a shielding test method for combinations of packaging (e.g. tape reel placed in conductive bag)
• The 61340-5-3 packaging project will provide guidance on ESD protective packaging issues
Electrostatic discharge measurements

• Measurement of ESD parameters such as current and charge transfer may be useful in assessing ESD risks
  – electronics and explosion hazards
• 61340-4-6 proposes a specific test method for assessing Intermediate Bulk Containers
• Other application areas are likely – providing the reproducibility and safety of the method can be satisfactorily demonstrated
Industrial electrostatic hazards avoidance

- Europe is developing standards in support of ATEX and Personal Protective Equipment Directives
  - CLC/TR50404 “Code of practice for avoidance of hazards due to static electricity”
- Many of these may have world-wide application
- 61340-4-4 Electrostatic classification of flexible intermediate bulk containers (FIBC)
  - Gives gas probe ignition test for FIBCs
Test methods for ESD garments and fabrics

• Electrostatic properties of garments are important in electronics damage prevention and ignition hazards avoidance in petrochemical and process industries
• Surface resistance and charge decay tests do not work for assessing all modern materials
• ESTAT Garments project
  – Concluded that peak ESD current and charge transfer, and external electrostatic fields are key parameters
  – Recommended and evaluated test methods that may well achieve standardisation
• BUT we still have not established realistic pass/fail criteria for electrostatic fields from garments
The future
Future markets

- TC101 will continue to be driven by the electronics market for the near future
- Demands for test methods and guidance related to electrostatic hazards will increase for many other markets and environments
  - Industrial
  - Domestic
  - Hospitals
  - Petroleum forecourt
  - Chemical
  - Pharmaceutical
Possible test methods and applications

• Electronics industry
  – Ionisers
  – Automated electronic production equipment
  – Tape & reel packaging

• Other industries
  – Hoses
  – Tyres and wheels
  – Conveyor belts
  – Furnishing materials

• ..you tell us what you need!
Implementing 61340-5-1: Future challenges for industry

- The new 61340-5-1 and -2 are expected within 2 years
  - more in line with ISO9000
- 61340-5-1 Requirements will be
  - ESD program plan
  - ESD training plan
  - Compliance verification plan
  - Some technical requirements
- You will be able to put what ESD measures you want to into the ESD Program
  - this flexibility is needed for world wide application in the electronics market
- -5-2 User Guide will be more comprehensive than before
- It will be possible to write an ESD Program which does not work, but does comply with 61340-5-1!!
- The challenge for industry users will be to use the standard effectively and write good ESD Programs for themselves.
To get involved in IEC standardisation work...

• The member National Committees are responsible for
  – Appointing experts to TC101
  – Proposing new projects
  – Approving standards under development

• To participate, contact your National Committee
  – See www.iec.ch for contact points