

# newsletter

## Display standards – who cares?

**“[stan-dard]: something set up and established by authority as a rule for the measure of quantity, weight, extent, value, or quality”, says the encyclopaedia. Means that this is something that has been approved by a standards organization or is accepted as a de facto standard by the industry. Means that “somebody cares”...**

This newsletter edition promotes the work of standards bodies in the displays area and emphasises that the displays community should actively care about the making and application of standards.



Non-standard or new standard?

### Standards are necessary

ISO describes it very clearly: “If there were no standards, we would soon notice. Standards make an enormous contribution to most aspects of our lives – although very often, that contribution is invisible. It is when there is an absence of standards that their importance is brought home. For example, as purchasers or users of products, we soon notice when they turn out to be of poor quality, do not fit, are incompatible with equipment we already have, are unreliable or dangerous. When products meet our expectations, we tend to take this for granted. We are usually

unaware of the role played by standards in raising levels of quality, safety, reliability, efficiency and interchangeability – as well as in providing such benefits at an economical cost.” This becomes evident when you try to compare the contrast of those TVs you desperately need for the football world cup!

Common use of the word standard implies that it is a universally agreed upon set of guidelines. However, the plurality of standards-issuing bodies means that in many cases, a document claiming to be a “standard” does not necessarily have the support of many parties. As Andrew S. Tanenbaum, a famous computer scientist, said, “The nice thing about standards is that there are so many to choose from”. We give an insight into the number of standards bodies and the resulting landscape.

Ken Vassie defined in the May 2006 issue of Veritas et Visus “Display Standard” ([www.veritasetvisus.com](http://www.veritasetvisus.com)) what the main steps necessary to create suitable (display) standards are:

- Definition of the “Context of an intended use”
- Definition of displays measurement
- Creation of mock up environment
- Assessment Method/Procedure
- Definition of Figure of Merit (FoM)
- Definition of Specification Method

### Who cares? We do!

So the process seems clear and straightforward. The most tricky thing is to find enough people who (take) care about giving input and sorting things out. **adria**'s job is to create awareness for displays standards, to promote them and to disseminate them.

## Contents

- **Editorial: Display standards – who cares?**
- **Standards meeting at SEMICON Europa**
- **Display Standards Organisations: Why so many?**
- **European involvement in FPD standards**
- **Events calendar**

**advanced displays  
research integration action.**

### adria's mission

is to strengthen the advanced display industries in Europe by creating a European platform for advanced displays research and technology



Information Society  
Technologies

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## adria and SEMI FPD standards meeting at SEMICON Europa

On May 5, 2006, adria and SEMI organized the second meeting on Flat Panel Display (FPD) Standardization. Presenters Mokoto Yamamoto from Japan, Il Ho Kim from Korea, Mark Ding from China, Mark Fihn from the USA, and Uwe Behringer from Germany explained the status and their vision about worldwide FPD standardization.

### SEMI FPD Standardization Activities in Asia

Mr. Yamamoto, SEMI co-chair for FPD Technology from the company Murata Machinery reported about the status of the FPD standardization in Korea, Taiwan, China and Japan.

The **Korean** FPD Working Group (WG) consists of a LCD WG split in a Mura Revision sub-WG and a Back-light Unit sub WG latter divided in a Reliability task force (TF) and in a Terminology Revision TF. The roadmap for Korea shows that they plan to establish a WG for FPD and a WG for OLED in 2007.

In **Taiwan** the FPD WG is divided into seven task forces:

- Motion Picture response time TF
- MURA TF
- Color Filter TF
- Backlight TF
- Polarizing Film TF

Main partners in Taiwan are ITRI, SEMI, TTLA, TDMDA and CIPO. SEMI also established an FPD Safety Group (SG) in Taiwan with the TF for Equipment Safety and the TF for Fire Protection.

**China's** FPD WG was kicked off on September 17, 2005, co-held by CVIA (China Video Industry Association) and SEMI. China has been focusing on three standardization issues:

- LCD TV Screen Size
- LCD TV Panel Module Assembly
- LCD Glass Substrate Economical Cut

The last issue means that China will only select screen sizes with the best economical cut. The last China FPD WG meeting was held during the FDP China 2006, March 28-30, 2006 in Shanghai. Here the charter was to develop technical specifications and guides related to glass substrates, material handling systems and manufacturing equipment for FDP.

**Japan** has by far the biggest FPD standardization programme. 3 committees each divided into several TFs:

- FDP Factory Automation Committee
  - Future Generation AMHS TF
  - AMHS & Vibration TF
  - Single Substrate handling I/F TF
  - FDP Factory Automation 5 year review TF
- FPD Color Filter & Optical Elements
  - Resin BM Resistively TF
  - Chromaticity TF
  - FPD Color Filter Standards 5 Year Review TF
  - Polarization Film TF
  - Backlight TF
- FPD Mask Committee
  - Large Size Mask TF

Today, there are 43 specific **SEMI FPD Standards**. The Flat Panel Display Volume consists of standards for **materials and equipment** used in the manufacture and test of active matrix liquid crystal display (AMLCD) assemblies. Recent efforts have



The maybe most well known standardization body ISO is not the only one...

focused on terminology, flat panel display substrate characteristics (i.e., size, thickness, quality area, surface roughness), and carrier specifications.

## Display standards organisations

**Of course SEMI is not the only organisation involved in FPD standards making, and materials and equipment is not the only standards field.**

The following list shows some of the Organizations involved in flat panel display standardization today:

- ANSI: American National Standards Institute
- ASTM: American Society for Testing and Materials
- CIE: Commission Internationale de l'Eclairage
- CORM: Council for Optical Radiation Measurements
- EIA: Electronic Industries Association
- JEITA: Japan Electronics & IT Industries Association
- IEC: International Electrotechnical Committee
- IEEE: Institute of Electrical and Electronics Engineers
- ISO: International Organization for Standardization
- NEMA: National Electrical Manufacturers Association DICOM
- NIDL: National Information Display Laboratory
- NIST: National Institute of Standards and Technology
- SEMI: Semiconductor Equipment and Materials International
- SMPTE: Society of Motion Picture and Television Engineers
- SPWG: Standards Panel Working Group
- VESA: Video Electronics Standards Association

This list is by far not exhaustive.

### Why do we need so many standards organizations?

Mark Fihn from "Veritas et Visus" listed 92 standards organisations in his presentation at the **adria**-SEMI meeting and he said that this is just the tip of the iceberg; their number is even growing.



92 organizations are claiming to have displays-related standards: Still just "the tip of the iceberg"...

Of course, there are clear benefits of displays standards:

- Second-sourcing flexibility
- Lower pricing and improved negotiation leverage
- Inventory minimization
- The ability to upgrade
- Cross-platform interchangeability
- Ease of serviceability
- Remote Test/Diagnostics
- Ability to focus on price/performance

As a common human-machine interface displays have penetrated our everyday life largely: So it makes sense, that organisations active in different fields take care about the impact of displays in their specific area – as long as the standards they create are not contradictory. That's the theory. Reality draws a different picture.

### Too less standards in the displays area

Even though there are so many standards organisation worldwide involved in FPD standards, all atten-

dees at the Munich meeting agreed that there is even a lack of standards in the displays industry. Despite the large number of organizations claiming to have display-related standards, there are actually very few such standards in use. Most applications come without display-related standards, for example cars, digital still cameras, video cameras, and more. Even broadly accepted standards face conflicting guidelines – e.g. NTSC vs. PAL vs. SECAM. Emerging technologies start generally without any standards, in the LCD field already a few standards exist (see table); for PDP, LCoS, etc., almost no standards have been established.

Displays standards are classified according to their field of application:

#### Equipment standards

Describing the metrology for assessment of photometric and colorimetric properties of display devices integrated in e.g. multimedia equipment (CD and DVD players, TV sets, etc.) as covered by IEC TC100.

#### Component standards

Define the basic properties of components used for manufacturing of displays (e.g. SEMI FPD standards for backlight units, polarizers, etc.).

#### Manufacturing standards

Define interfaces between machinery and equipment in order to facilitate matching components in manufacturing lines.

#### Device standards

Describe outline dimensions, location and kind of contact pads and connectors to make displays easily replaceable in devices like mobile computers (e.g. standard panels working group, SPWG).

#### Ergonomics standards

Describing the minimum performance requirements that have to be fulfilled in order to assure safe working conditions (e.g. ISO TC159, SC4, 9241-301-307) and safe use of the displays also in

non-working environment conditions (entertainment, education, etc.).

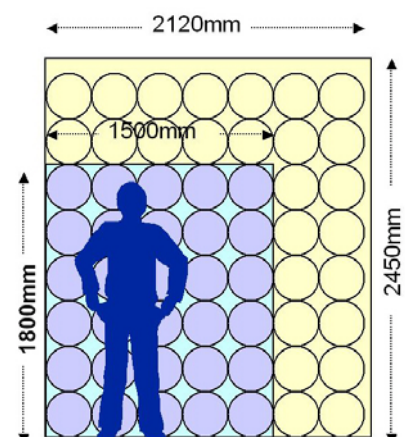
### Examples

The following table shows parameters for "industry standard" LCD panels (SPWG). Despite successes in some fields, there are areas where standards are still missing but definitely needed.

Industry Standard LCD Panels "Are / Are Not":	
Are	Are Not
Std. Mechanical outline X & Y	Std. Thickness
Std. Mounting hole location	Std. Luminance
Std. I/O Connector and pin out	Std. Weight
Std. Active area centers	Std. Contrast ratio
EEDID LCD panel ID (PC2000)	Std. Viewing angle
Std. CCFL connector	Std. Color
Integrated Inverter Definitions	Std. Response time
Std. Inverter connector/position	Std. Resolution
FOS Measurement Parameters	
Cosmetic/Environmental Guide	

One major field still not standardized is the substrate size for panel production. The figure below shows different glass sizes called "generations": The glass area for "Generation 5 (Gen5)" is approx. 1500 x 1800 mm<sup>2</sup>, Gen6 is 1870 x 2230 mm<sup>2</sup> (not shown), Gen7 measures approx. 2120 x 2450 mm<sup>2</sup>. To understand these huge areas, the circles in the figure are the size of 300mm silicon wafers. And the story goes on: Gen8 (2300 x 2700 mm<sup>2</sup>) will be in production by end of this year, Gen9 and Gen10 (with lengths up to 3m!) are seen as possible scenarios.

However, panel manufacturers order substrates "custom made", optimized for their specific product portfolio: sizes Gen6.5 and Gen7.5 are in production.



Comparison of the different FPD display areas of Gen5 and 7 with the size of 300 mm silicon wafers.

Large-generation glass substrates can enable dramatic economics of scale for LCD manufacturers through substantial cost efficiencies and greater output per substrate. Large generation sizes do not only allow customers to get more panels per glass sheet, but also enable larger panels. While a typical Gen4 sheet yields four 17" panels, a Gen6 size substrate can produce eight larger panels of 32" diagonal, and a Gen7 glass allows for twelve 32" panels.

Not surprisingly, glass that's six feet tall seven feet wide, and less than a millimetre thick presents unique handling, storage and transportation challenges, not to mention the giant deposition equipment needed. With that, the economic risks dramatically increase, also for equipment manufacturers.

LCD television is driving the demand for large-generation glass and will emerge as a major application in the next few years. "For the expanding LCD TV market, the most critical driver is the cost reduction of LCD panels," said Koya Iwai, director of market development, Corning Display

Technologies. The most effective way in the short term is to manufacture a higher number of displays per substrate. For example, the 32" diagonal is considered the "sweet spot" size in LCD TV. Using Gen4, only a few can be made. Using Gen6, yields eight, using Gen7 even twelve. However, this strategy is not undisputed: One counter strategy is to design a highly productive "Super G5.5" fab or even use concepts like the ones for DVD production.

## More European involvement in the making of displays standards

**Observations from within different working groups of IEC and ISO show that active participation of European companies in standards making has been and still is insufficient. This is surely partly due to the fact that Europe is currently not a major manufacturing area.**

However, Europe wants to protect its citizens from safety risks, promote environmental and health standards, ergonomics and, most of all, has a materials and equipment community that is directly affected by manufacturing standards. After all, Europe is the biggest user of displays worldwide.

Europe should therefore be an active contributor to international display standards and can definitely assist the advancement of the visual performance and the manufacturability of displays. In the end, materials and equipment makers are the "enablers" for manufacturability and thus also drive innovation.

### Next adria / SEMI FPD Standards Meeting in Dresden

On November 8 and 9, 2006 SEMI will hold its Autumn Standardization Event in Dresden, Germany. **adria** and SEMI will organize the second FPD standardization meeting there. If you are interested to join, please send an eMail to the **adria** secretariat at [secretariat@adria-network.org](mailto:secretariat@adria-network.org) or directly contact Dr. Uwe Behringer at [uwe.behringer.ubc@t-online.de](mailto:uwe.behringer.ubc@t-online.de)

## Events Calendar

June 28-29, 2006

### OLEDs

Copthorne Tara, Kensington, London, UK

July 19, 2006

### Lighting Debate

Milton Keynes, Bletchley Park, UK'

August 2, 2006

### 23<sup>rd</sup> DFF Working Group Meeting

'Displays for the Automotive Industry'  
BMW Group, Munich, Germany

September 14, 2006

### 6<sup>th</sup> adria Roadmapping Workshop

Nokia Research Center, Tampere, Finland

September 25-27, 2006

### Organic Electronics Conference and Exhibition

Sheraton Hotel & Towers, Frankfurt, Germany

For updated information see [www.adria-network.org](http://www.adria-network.org).

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