ISO 13406-2
New International Standard for ergonomic requirements for image quality of flat panel displays.

ISO 13406-2 = Equivalent to ISO 9241-3/-7/-8 for CRT monitors

Final release = December 2000

ISO 13406-2 certificate covers:

- Display Luminance (Brightness)
- Contrast (In real life situation)
- Reflections
- Colour reproduction
- Brightness and colour uniformity
- Font analysis
- Pixel defects
- Flickering
- Type of application
What is ISO 13406-2?

- Provides data for image quality classification
- Measurement under workplace conditions
- Comparable criteria for benchmarking

The angle formed by the user and the center of the screen is called viewing direction $\Theta_D, \Phi_D$ and are specified by the supplier.

- $\Phi = 180^\circ$
- $\Phi = 90^\circ$
- $\Phi = 270^\circ$
- $\Phi = 0^\circ$
- $D$: viewing distance
o Viewing angle classification provides performance assessment type of application

- Class I: For parallel viewing by several users
- Class II: Adequate for 1 user (suitable for general office use)
- Class III: Limited viewing angle
- Class IV: Unacceptable for general use
Contrast ratio measurements:

- Dark room
  - IEC < 5 lx
  - ISO < 3 lx
- Office light horizontal 500 lx monitor angle 293 lx
- Sunlight
  > 5000 lx

Quotes from TUEV Rheinland:

- “Contrast ratios of 300:1, 350:1, 400:1 are lies”
- LCD Monitor manufacturers must specify contrast ratio:
  “xxx:1 in dark room(5 lx), yyy:1 in standard office environment (293 lx)”
Pixel defect classification as transparent information
- The manufacturer must publish pixel defect class
- User can claim warranty repair/exchange in case of exceeding defects

**What is ISO 13406-2?**

Per million pixel means: no difference between pixel and subpixel
ISO13406-2 says:

Pixelfailure **class 1:**
0 defects (no single one). No competitor is using that.

Pixelfailure **class 2:**
- max. 5 defect subpixels
- plus 2 always bright pixels (all 3 subpixels)
- plus 2 always dark pixels (all 3 subpixels)
- plus 2 clusters (in an array of 5 to 5 pixels (not subpixels) 2 defect subpixels allowed)

*per million pixel*

For 15” you have to multiply with 0.8 and for 17“/18“/20” with 1.3 .
For more details please see ISO13406-2 presentation.
ISO 13406-2 is the common market standard in Europe for Flat Panel Monitors

⇒ currently available performance data and data sheets are not easy for comparison different display types

⇒ Buyer, supplier and dealer get a lot of useful performance data of the display before their purchase decision

⇒ the end user is focusing more and more to flat panel quality criteria
ISO 13406-2

The viewing direction considers the use of the flat panel display monitor within illuminated workplaces and is therefore more practicable than e.g. the definition of the darkroom contrast.
ISO 13406-2 defines reflection classes

From reflection class the user is able to derive the suitability of the LCD flat panel display monitor for general office use.
ISO 13406-2

The knowledge of the viewing direction supports the user during installation and use of the LCD flat panel display monitor at the workplace.
ISO 13406-2 defines viewing direction range classes.

The user is able to conclude the uniformity of displayed information from viewing direction range class and is able to make a selection of the Flat panel display monitor for his needs.
ISO 13406-2 defines the pixel fault class.

The **pixel fault class** defines the maximum number of defective pixels and subpixels. This information is more useful compared to manufacturer specific declarations.
TUEV Rheinland started January 2000:

- Test and certificate according to ISO 13406-2 for the “TÜV ERGONOMICS APPROVED” test mark

- For this test mark, all new LCD Monitors since then include ISO 13406-2

- TUEV Rheinland started a lobby campaign to teach purchase managers of corporate customers to only accept bids from vendors in the future should their products comply to ISO13406-2

- First vendor already announced on July 1, 2000 that all his LCD monitors will be ISO 13406-2 certified (in conjunction with “TÜV Eco Circle”)

- TUEV Rheinland warned:
  "Vendors which will offer products to corporate customers without specs according to ISO13406-2, will not have any business chance by end of 2000 in Germany”
  “By mid 2001 same will happen in UK and later on in rest of Europe”
  “Within 2 years, the US market will have adopted ISO13406-2 as well"
o Beside LCD1510+, LCD1800 and LCD2110 all LCD monitors are ISO13406-2 certified

o NMD-E requested i.e. that NMV provides guaranteed CLASS II for pixel defects. We got the commitment.

o Critical forthcoming business issue for LCD monitors in project business

o PLEASE, let us know about any Project that

o requires “Specifications according to ISO-13406-2”
Attention:

The date mentioned in the column „available schedule“ is the date when the mass production will start.
„MP#001“ means with start of mass production.

The serial no. (MP#xxxxxxxxx) in the column „available schedule“ means from this serial no. onwards the models are ISO 13406-2 compliant.
ISO13406-2:

- Sony: not certified so far, due to rare requirement currently using their own pixel specs
- Samsung: all LCDs are certified
- Acer: all LCDs do have the certification
- LG: all LCDs do have the certification
- Philips: in preparation currently using their own pixel specs
- Eizo: started 1.5 years ago all LCDs do have the certification
- ADI: not yet, because they use in Korea more the TUEV product service, but they fight to get it for Europe
- Compaq: it is important and used since summer 2000 for all LCD products
- Iiyama: not yet, due to no project business
- Viewsonic: all LCDs do have the certification