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VIEWSONIC EUROPE LIMITED PIXEL POLICY

ISO 13406-2 is an [ISO](#) standard, with the full title "Ergonomic requirements for work with visual displays based on flat panels -- Part 2: Ergonomic requirements for flat panel displays". It is best known to end consumers for defining a series of flat-panel display "classes" with different numbers of permitted defects (or "dead pixels"). ISO 13406-2 also provides a classification of Viewing Direction Range Classes and Reflection Classes.

As part of an ISO standard, the classes are guidelines, and not mandatory. Where implemented, the interpretation of the standard by the panel or end product manufacturer and effects in terms of labelling of products, what class of panel is used, etc., can vary.

Pixel Fault Classes

The standard lists four classes of devices, where a device of a specified class may contain a certain maximum number of defective pixels. Three distinct types of defective pixels are described:

- type 1 = a hot pixel (always on, being colour white)
- type 2 = a dead pixel (always off, meaning black)
- type 3 = a stuck pixel (one or more sub-pixels (red, blue or green) are always on or always off)

The table below shows the maximum number of allowed defects (per type) per 1 million pixels.

Definition of Pixel Fault Classes – Maximum number of faults per *million* pixels

Class	Type 1	Type 2	Type 3	Cluster with more than one type 1 or type 2 faults	Cluster of type 3 faults
I	0	0	0	0	0
II	2	2	5	0	2
III	5	15	50	0	5
IV	50	150	500	5	50

Dark Dot Defects

A dark dot defect is usually caused by a transistor in the transparent electrode layer that is stuck "on." It continuously runs a charge across the liquid crystal material, so no light ever passes through to the RGB layer.

Bright Dot Defects

A bright dot defect is a group of three sub-pixels (one pixel) all of whose transistors are not working. This allows all light to pass through to the RGB layer, creating a bright white pixel that is always on.

Partial Sub-Pixel Defects

A partial sub-pixel defect is a manufacturing defect in which the RGB film layer was not cut properly.

TAB Faults

A TAB Fault is caused by a connection failure from the TAB that connects the transparent electrode layers to the video driver board of an LCD.

TAB stands for Tape Automated Bonding, which is one of several methods employed in the LCD display manufacturing process to electrically connect hundreds of signal paths going to the rows and columns of electrodes in layer 6 (the transparent electrode layer) in the LCD display to the video ICs on the driver board that drive these electrodes.

If an LCD display is subjected to extreme heat or cold or physical shock, this could cause one or more TAB connections to fail inside the display. This failure requires replacement of the LCD display module itself. If these connections were to fail, the effect would be that an entire row or column of pixels would fail to activate. In the examples below, a horizontal or vertical black line would appear on the display, while the rest of the display would appear normal. The horizontal failure runs from edge to edge; the vertical failure runs from top to bottom.

Stuck Sub-Pixels

A stuck sub-pixel is a pixel that is always "on." This is usually caused by a transistor that is not getting any power, and is therefore continuously allowing light at that point to pass through to the RGB layer. This means that any given pixel will stay red, blue, or green, and will not change when attempting to display an image. These pixels may only show up using certain applications, or they may be on all of the time.

Stuck versus dead pixels

Stuck pixels are often incorrectly referred to as dead pixels, which have a similar appearance. In a dead pixel, all three sub-pixels are permanently off, producing a permanently black pixel. Dead pixels can result from similar manufacturing anomalies as stuck pixels, but may also occur from a non-functioning transistor resulting in complete lack of power to the pixel. Dead pixels are much less likely to correct themselves over time or be repaired through any of several popular methods.

Stuck pixels, unlike dead pixels, have been reported by LCD screen owners to disappear, and there are several popular methods purported to fix them, such as gently rubbing the screen (in an attempt to reset the pixel; this method has been confirmed on a stuck green sub-pixel), cycling the colour value of the stuck pixel rapidly (in other words, flashing bright colours on the screen,) or simply tolerating the stuck pixel until it disappears (which can take anywhere from a day to years). While these methods can work on some stuck pixels others cannot be fixed by the above methods. Also some stuck pixels will reappear after being fixed if the screen is left off for several hours.

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ViewSonic LCD Monitors

ViewSonic has one of the best pixel Warranties of any monitor manufacturer. Our monitors conform to an International standard covering all ergonomic aspects of displays.

Part of this specification, ISO 13406 Part 2 Class II covers allowable pixels and sub-pixel defects.

For ViewSonic 4:3 and widescreen computer monitors, we offer lower sub-pixel figures than this International standard. In some cases our limits are better by a large margin - see the table below.

Additionally we exceed the ISO specification by offering zero defective COMPLETE pixels and Zero defective "Sub-Pixels" on ViewSonic VP Series products. (i.e. zero contiguous Red, Green and Blue sub-pixel group)

Screen Size/Resolution	Viewsonic Product	Bright Dot (White Pixel)	or Dark Dot (Black Pixel)	or Combination of Bright + Dark	Max "Sub Pixels" (Red, Green or Blue Dots)
15" - 1024 x768	VA/VX/VG/VE Series	2	2	2	3
16" - 1366 x 768	VA/VX/VG/VE Series	2	2	2	3
17"/19" - 1280 1024	VA/VX/VG/VE Series	2	2	2	3
17"/19"/20" - 1400 x1050	VA/VX/VG/VE Series	3	3	3	3
17"/19" Wide - 1440 x 900	VA/VX/VG/VE Series	3	3	3	3
20"/21" - 1600 x 1200	VA/VX/VG/VE Series	4	4	4	3
20"/22" Wide - 1680 x 1050	VA/VX/VG/VE Series	4	4	4	3
24"/26"/28" - 1920 x 1200	VA/VX/VG/VE Series	5	5	5	3
HD Resolution (1920 x 1080)	VA/VX/VG/VE Series	4	4	4	3
VP Series - All Resolutions	VP Series	0	0	0	0

ViewSonic Projectors

Please contact your local ViewSonic Call Centre for further information regarding ViewSonic Projectors.

ViewSonic Viewbook's, Netbooks, "Q" Series LCD's, Digital Photo Frames, Portable Media Players and All-in-one PC's

Viewsonic Europe follows the ISO 13406-2 for our System products. They are covered under the "Class II" section.

Screen Size/Resolution	Viewsonic Product	Bright Dot (White Pixel)	Dark Dot (Black Pixel)	Max combination of Bright and Dark Dots	Max "Sub Pixels" (Red, Green or Blue Dots)
10.2" - 1024 x 600	Netbook	1	1	1	3
12.1" - 1280 x 800	ViewBook	2	2	2	5
13.3" - 1366 x 768	ViewBook	2	2	2	5
18.5" - 1366 x 768	AIO-PC	2	2	2	5
19" - 1440 x 900	Q Series LCD	3	3	3	6
20"/22" - 1680 x 1050	Q Series LCD	4	4	4	9
24" - 1920 x 1200	Q Series LCD	5	5	5	12
7" - 800 x 480	Digital Photo Frame	1	1	1	2
8" - 800 x 600	Digital Photo Frame	1	1	1	2
10" - 1024 x 600	Digital Photo Frame	1	1	1	3
4.3" - 1280 x 720	Portable Media Player	2	2	2	5
5" - 1280 x 720	Portable Media Player	2	2	2	5

ViewSonic LCD TV's and Commercial Displays

The ISO Specification does not apply to LCDTV and Commercial Displays, not being desktop displays. Below is Viewsonic Europe's Pixel Policy on these products below:

Viewsonic Model	Resolution	Bright Dot (White Pixel)	Dark Dot (Black Pixel)	or Combination of Bright + Dark	Max "Sub Pixels" (Red, Green or Blue Dots)
NX1940	1440 x 900	3	3	3	6
NX2240	1680 x 1050	4	4	4	9
N2010	640 x 480	1	1	1	2
N2600W	1366 x 768	0	2	2	5
N3246W	1366 x 768	0	2	2	5
N3260W	1366 x 768	0	2	2	5
N3760W	1366 x 768	0	2	2	5
N4060W	1366 x 768	0	2	2	5
CD3200	1366 x 768	0	2	2	5
CD4200/4220	1366 x 768	0	2	2	5
CD4620	1920 x 1080	0	4	4	10