

# IPS-Pro LCD technology



## LCD technology evolves

Since its introduction in the 1970s, Liquid Crystal Display (LCD) technology has evolved substantially. Improvements in resolution, viewing angle and luminance have built acceptance for use in demanding professional markets, including grayscale diagnostic imaging.

## IPS and IPS-Pro

Developed by Hitachi Displays, Ltd. in 1996, In-Plane Switching (IPS) was the first LCD technology to provide a solution for the viewing angle limitations. However, IPS compromised both on-axis contrast and resolution. In 1998, high-resolution IPS panels were introduced. Unfortunately, the luminance achieved on IPS-based color displays was not sufficient for medical applications. Hence, monochrome displays were used, which by nature offer a three times higher luminance.

Hitachi's IPS-Pro LCD technology is a breakthrough for medical imaging. IPS-Pro substantially improves viewing angle, brightness, contrast, black levels and switching speed, producing the best solution on the market for multi-modality medical imaging.

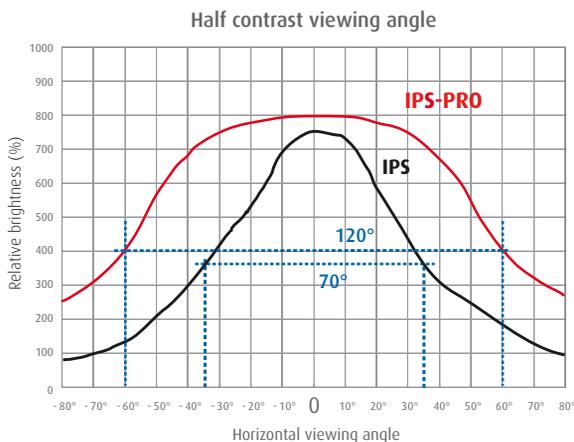
## Main benefits of IPS-Pro

### 1. Viewing angle

Probably the most noticeable advancement of IPS-Pro is the distinctly improved viewing angle. In fact, the viewing angle has been improved so markedly that we need to introduce a new, more representative specification. This specification will be called the Half Contrast Viewing Angle (HCA). As you might expect, this is nothing else than the viewing angle up to where the contrast ratio has dropped to half the maximum value.

As can easily be observed in the graph, the gain in half contrast viewing angle with IPS-Pro technology is substantial. The typical gain is 50 degrees, nearly twice the value achieved with IPS technology (from 70 to 120 degrees).

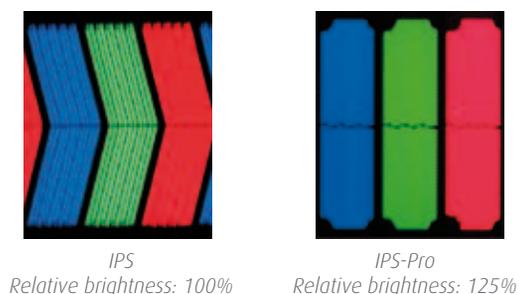
With this wide viewing angle, subtle details can be identified even off-angle, accommodating multiple-display configurations and providing a perfect solution for referral and teaching situations.



### 2. Brightness

The aperture architecture of IPS-Pro increases the luminance output by 25% over standard IPS technology. Together with Barco's unique Diagnostic Luminance backlight technology, the new IPS-Pro technology has a maximum luminance of 800 cd/m<sup>2</sup> (233 fL). Until recently, luminance levels this high were only available on grayscale displays. But with the combination of IPS-Pro and Diagnostic Luminance backlight technology, color and grayscale studies can now be viewed together on a single, multi-modality display system.

### Aperture architecture of IPS vs. IPS-Pro



### 3. Contrast

Another advantage of the optimized IPS-Pro cell architecture is improved contrast. IPS-Pro delivers a contrast ratio of 800:1, compared to 400:1 with the previous IPS technology. Contrast is critical in diagnostic imaging to see the full range of DICOM JND values (just noticeable differences). In normal dark reading room environments, this improved contrast means that radiologists can see more details and work through their exam list more productively.

### 4. Switching speed

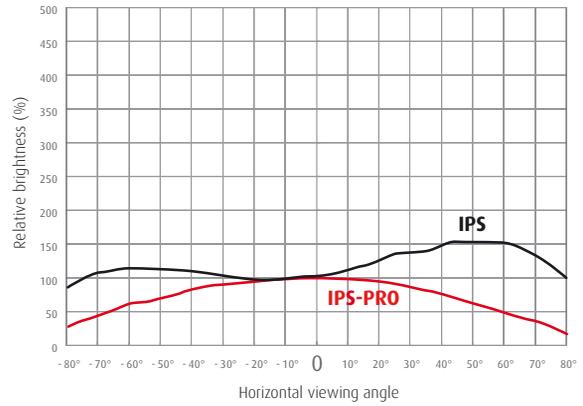
Thanks to improvements in cell structure and new LCD materials, the switching characteristics of IPS-Pro based LCD panels have been significantly improved compared to those of other technologies. On average, this improvement may amount up to 300% compared to the monochrome IPS panels that are now widely used for diagnostic viewing.

### 5. Black level

Improved contrast also results in better black levels. However, IPS-Pro not only makes black levels “blacker”; it also makes them more uniform and less dependent of the viewing angle.

When reading exams in a dark room, most radiologists will observe that the black levels are not uniform. This is a fundamental shortcoming of LCD technology. Since IPS-Pro doubles the contrast ratio and is much less viewing angle dependent, the black variations become significantly smaller. This means that, according to the DICOM GSDF curve, these variations in black uniformity become less noticeable because they fall below the visual threshold for the ambient light level in the reading room.

Black level



### IPS-Pro vs. IPS WideView

IPS-Pro is one of several LCD architectures that have been developed to improve the contrast and viewing angle characteristics of LCD displays. IPS WideView, for example, offers very similar benefits.

Depending on the display’s intended use, Barco carefully selects the most suitable LCD architecture for every medical display product. That explains why Barco diagnostic color monitors, such as the Coronis Fusion 6MP DL and Coronis Color 2MP, are fitted with IPS-Pro technology, while Barco diagnostic grayscale displays, such as the Coronis Fusion 10MP, are equipped with IPS WideView.

### Diagnostic benefits of IPS-Pro

In summary, the adoption of IPS-Pro technology offers the following clinical advantages for diagnostic imaging:

	IPS	IPS-Pro	Diagnostic benefits
Relative brightness	100%	125%	Enhanced multi-modality imaging
Contrast ratio	750:1	800:1	Increased productivity and accuracy
Half Contrast Angle	70°	120°	Supports multi-user viewing
Switching speed	50 ms	18 ms	High-grade dynamic images without artifacts

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