Technical white paper

HP Ultra High Definition 4K Z Displays

The clarity you need to do your best work

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HP Z Displays with Ultra High Definition (UHD) 4K resolutions provide a clearer image with lifelike detail and out-of-the-box color calibration that make workflows more efficient and observations more accurate and informed. Plus, with the impressive viewing angles of IPS, collaboration is easier than ever. These advantages lead to better decision making and a higher quality of work for professionals in fields including digital media, image analysis, product development, and more. With extreme graphics presentation, extraordinary color, and flexible connectivity, HP UHD 4K Z Displays will help you see more so you can do more—and do it better.

See the UHD 4K difference

To best understand UHD 4K resolution, as well as its benefits, it pays to understand the other available formats and how they differ.

High Definition (HD) and Full HD (FHD)

You are most likely already familiar with the HD format since it has become the standard for the television viewing experience in households around the world. Any video image with a resolution of 1280 x 720 pixels in a 16:9 aspect ratio is defined as HD.

When it first emerged, HD set a new precedent for crystal-clear, immersive viewing, and quickly became the standard for film, television, the internet, and gaming. Most consumers have upgraded their TVs and Monitors beyond HD to FHD or 1080 x 1920 pixels to see crisper, more life-like images.

Quad HD (QHD)

QHD offers a more detailed view, having four times the vertical resolution of standard 720p HD. And while the name might make it sound like the equivalent of 4K, its resolution at 2560 x 1440 pixels (and a 16:9 aspect ratio) is actually much less. While there are Quad HD displays, this format has recently become more common on smartphones.

Ultra High Definition (UHD)

4K UHD formats provide what is widely considered to be the best viewing experience.

4K

For added clarity, 4K displays have a 3840 x 2160 resolution and 8 million pixels - roughly five million more pixels than QHD. With 4K, users see four times the resolution of Full HD display. Compared to QHD, 4K offers more details, less pixelation, and extra space to view more browser windows and documents at one time. Despite all these benefits, prices on a 4K can be comparable to QHD so don't just assume 4K won't fit into your budget.

Why is UHD 4K better?

More pixels and higher resolution add up to an extremely rich, immersive experience. The sharper images and fonts of UHD mean less eye strain and a more realistic depiction of images onscreen.

	FHD	QHD	4K
Resolution	1080 x 1920	2560 x 1440	3840 x 2160

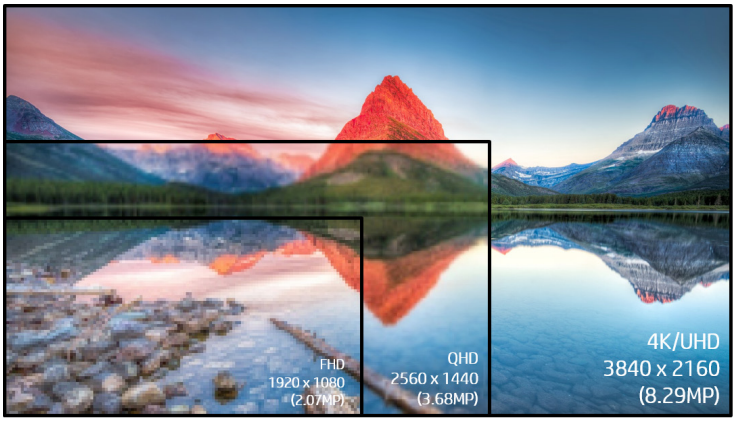

Figure 1. Comparison of Full HD, Quad HD and 4K resolutions

Although higher resolutions such as 8K and 10K exists today, 4K is where most of the developers are creating software and programs today. As part of our innovation backbone, HP will continue to investigate higher resolution and create products that will meet the market's needs.

Who benefits from UHD 4K displays

When your work depends on noticing the details and making keen observations, you can't beat the sharpness of UHD 4K displays. A few examples of industries that see major benefits from these displays include:

Digital media

It's clear that 4K is quickly becoming the new standard in digital media. The major advantage of recording content in 4K is its superior resolution of fine spatial detail. From films and streaming video, to photography and video game development—if it's not created in 4K, it will be soon. This means that animators, editors, and post-production staff who work in 4K, get better results. The improved detail and accurate color throughout the workflow results in a more impressive finished product.

Image analysis

Professionals who analyze images, from photographers to geospatial analysts, are constantly having to make important decisions and reach conclusions based on the content they see. The additional screen real estate and enhanced detail, coupled with a higher bit depth/range of color, mean that UHD 4K displays provide a greater amount of information and accuracy on which to base an analysis. For example, petroleum engineers scouring hi-res maps for underground oil deposits can make major decisions on investments and purchasing rights more confidently, thanks to the sharp image clarity.

Software development

The growth in high-resolution mobile devices creates opportunities for application and software developers to utilize UHD displays to enhance their applications. The added screen real estate allows software developers to work with more lines of code than on a Full HD display while also having the ability to emulate the device display's native resolution—all on the HP UHD 4K Z Display. In addition, higher resolution creates sharper and easier to read characters that improves coding productivity - all on the HP UHD 4K display.

Finance/Accounting
Higher resolution means more data on the screen. With 4K solution, the user can see more columns and rows of their spreadsheet and ledger in one view without scrolling.

Designers
From product designers to civil engineers, 4K/UHD displays allow users to see more of their project on one screen and in enough detail to make a difference when working with their design. The benefits to designers are maximized with sharp geometry, beautiful renderings, and less time spent zooming in and out of blue prints and models.

These are just a few examples of industries that benefit from UHD displays. If your workflow requires superior resolution of fine spatial detail, accurate color, additional screen real estate or sharp image clarity, you too can benefit.

Lastly, 4K resolution allows the user to squeeze out every last dollar of their investment in professional discrete graphics and makes sure their future proof their display.

Compatibility

When you have the potential to enjoy the true vividness of UHD right in front of you, you'll want to make sure you're experiencing it fully. UHD 4K resolution works best when certain software versions and components are in place.

Software requirements to support high pixel density

To better experience UHD 4K resolution, it is beneficial to work with DPI-aware operating systems (OS) and/or applications. DPI (dots per inch) measures the sharpness of images on a display. DPI-aware operating systems and applications will recognize that a high-DPI display is attached and ensure that proper resources are loaded to take advantage of the extra pixels, giving the user clearer images, as well as the ability to scale and size fonts and icons. If the OS or application is not DPI-aware and therefore does not recognize a high-DPI display, the images and icons might appear very small or fuzzy.

Hardware requirements to support the high number of pixels

4K
- The graphics card must be capable of supporting 3840 x 2160 at 60 Hz to drive the display at the preferred mode.
- DisplayPort™ 1.2 or HDMI 2.0 outputs from the source device are required to support the 4K bandwidth.

The HP advantage

Display resolution is the most obvious measure of a display's performance. But other factors contribute to your overall viewing experience, including color calibration, viewing angles, and bit depth.

Color calibration

The matching of colors to a base color or from one device to another is called color calibration. It is widely employed in products like displays and printers to ensure an accurate representation of color. Displays use red, green, and blue to show the range of colors. For extra accuracy, HP UHD 4K Z Displays are factory calibrated to produce consistency across all displays, no matter where or how they are used. This out-of-the box color calibration ensures the visual integrity of the content creator's work from day one.

Bit depth

Bit depth refers to the amount of colors a display can produce. The most common display bit depths are eight- and ten-bits per RGB channel. For example, an eight-bit RGB display can show 256 shades of red, 256 shades of green, and 256 shades of blue per pixel. 10-bit RGB displays produce 1,024 shades of red, 1,024 shades of green, and 1,024 shades of blue per pixel. The difference in bit depths is most noticeable during color-intensive applications such as photo editing, animation, and designing. HP's UHD 4K Z Displays are 10-bit and produce more than one billion colors, essentially eliminating banding, artifacts, and contouring.

Pixels per inch

The pixels per inch (PPI) measures the pixel density of a screen, which can give you a good indication of the clarity and sharpness of the display. For example, the pixels on a 27" UHD/4K display would be four times smaller than the pixels on a 27" FHD display leading to an image that is four times clearer. Having these crisp images in HP's UHD/4K displays reduces eye strain and increases the precision and productivity of the user.

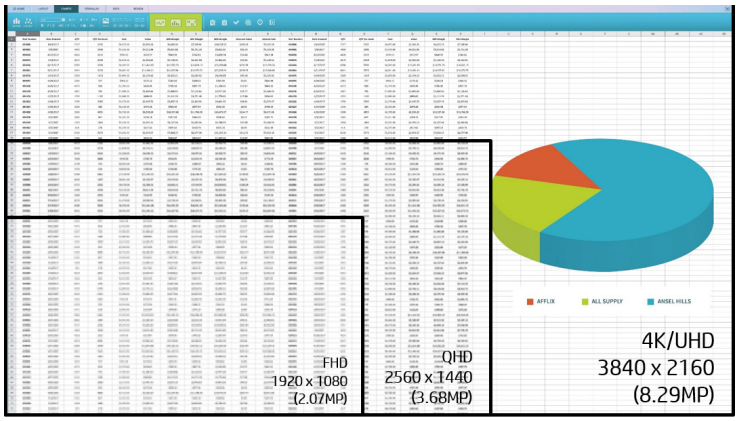

Figure 2. This is how the clarity of a pixel looks.

Viewing angles

The viewing angle of a display represents how far to the left or right, and how far down or up the content on the display can be observed without loss of image integrity. In-Plane Switching (IPS) displays have an optimal viewing angle of up to 178 degrees horizontally and vertically. By altering the direction of pixels within the display (parallel instead of perpendicular), an IPS display allows the screen to be viewed comfortably from several positions. HP UHD 4K Z Displays have viewing angles of 178 degrees horizontally and vertically, which is especially useful when several users are collaborating on one screen, or when the screen is viewed at an angle.

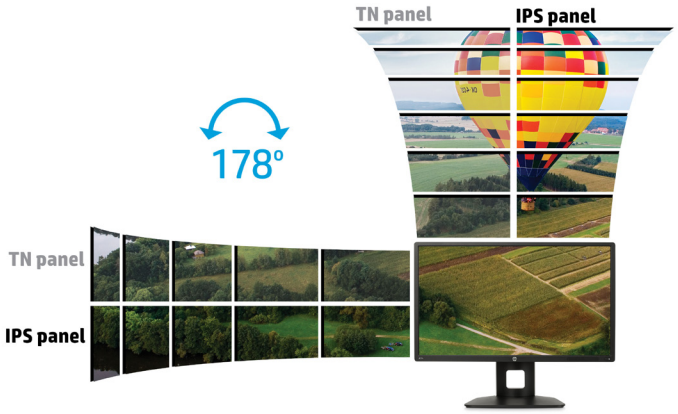

Figure 3. The effect different viewing angles have on an IPS display versus a traditional display.

HP UHD 4K Z Displays

When you can see more, you can do more—and do it better. HP Z Displays with 4K resolution provide an incredible presentation of highly detailed digital workflows so you can enjoy crystal-clear views of your projects, documents, and media.

HP Z24s 24-inch IPS UHD Display

Experience UHD/4K image presentation and factory-calibrated color accuracy out of the box with the most affordable HP UHD/4K display, which also delivers flexible connectivity and comfort features.

HP Z27s 27-inch IPS UHD Display

Join the ultra-high-definition movement and expand your visual workspace with UHD/4K presentation plus flexible connectivity and comfort features.

HP DreamColor Z32x Professional Display

Boost your productivity with a staggering 8 million pixels, 4K/UHD resolution, and up to four simultaneous feeds with PiP and PbP on an extra-large 31.5” screen.

Display	Viewable image area (diagonal)	Resolution	Aspect ratio	Viewing angle horizontal/ vertical	Pixels per inch	Brightness	Bit depth
HP Z24s	23.8-inch widescreen	3840 x 2160	16:9	178 degrees/ 178 degrees	185.4	300 cd/m2	8-bit
HP Z27s	26.9-inch widescreen	3840 x 2160	16:9	178 degrees/ 178 degrees	163	300 cd/m2	10-bit
HP Z32x	31.5-inch wide screen	3840 x 2160	16:9	178 degrees/ 178 degrees	140	300 cd/m2	10-bit

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