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NETD – INFO AND GUIDE

This guide is about a very common question you'll encounter about Pulsar's XQ/XP 17µm (Micron) sensors (Pixel Pitch) and the NETD rating (>18, >25, >40)

The questions usually go something like this "Why does Pulsar still use 17um sensors while all the other brands use 12µm?" or "Isn't a 17µm sensor old?"

There are some interesting articles on this topic from Pulsar that are well worth the read.

Pixel pitch, explained | 12 µm vs. 17 µm - Pulsar Journal (pulsar-nv.com)

If you'd prefer, here's Pulsars official video on the topic: Pixel pitch, explained | 12 µm vs. 17 µm | Choosing the right sensor (youtube.com)

A BRIEF GLOSSARY:

RESOLUTION = The number of pixels in a sensor package (384x288, 640x480, 1024x768)

PIXEL PITCH = The size of each pixel in the sensor, which results in the size of the complete sensor package. In conjunction with the lens, this also impacts the base magnification of the optic.

NETD = The thermal sensitivity of each pixel (The incremental difference in temp it can perceive) – The lower the µm rating, the finer the incremental difference it can see and present on a given resolution.

Here's some extracts with the more poignant points:

Figuring out which pixel pitch of the thermal imaging sensor (also known as microbolometer) suits you best – 12 or 17 microns – is a common dilemma. Does size matter? A simple answer is – yes, it does. But you should know beforehand that pixel pitch directly influences base magnification, image quality and thermal imager sensitivity. So, when it comes to choosing the right one, there are a lot of beliefs and misconceptions floating around. In this article, we will try to explain them all.

The most important characteristic that affects the thermal resolution of a thermal imaging device is the sensor's NETD (Noise Equivalent Temperature Difference). It is measured in millikelvins. The NETD of a sensor is a parameter that represents the smallest temperature difference that the sensor can perceive. This parameter corresponds to a signal-to-noise ratio equal to one. In other words, the change in the sensor output signal at a temperature difference equal to NETD corresponds to the noise level of the sensor. The lower the NETD value, the higher the sensor sensitivity.

In conditions of low thermal contrast, the image in the Helion 2 XP50 Pro is more informative compared to the Axion 2 XG35. This is not a set of spots with a limited number of shades between black and white; this is a "photographic" contrast image with a large range of mid-tones and high-quality rendering of the target and background. The best thermal resolution of the Helion 2 XP50 Pro comes primarily from the sensor's NETD sensitivity – a good NETD is especially important for scenes with low thermal contrast when objects have approximately the same temperature. For example, landscapes.

The larger the pixel and the larger its area, the more LWIR (Long Wavelength Infrared) radiation it is able to receive and the higher the sensitivity of the entire thermal imaging sensor. The effect of sensor size on NETD underlies the very principle of sensors with one or another pixel size.

When writing technical specifications in the device certificate, some manufacturers are guided by the parameters of market leaders and indicate the numbers that a potential consumer wants to see. As a result, today on the market, you can find devices with a NETD value less than 25 mK declared for sensors with a 12-micron pixel (for example, for a sensor 640×512 @12µm), which is not true.

Some manufacturers use and take into account signal post-processing, such as image filtering, to increase NETD value. The result obtained in this way cannot be considered as the NETD value of the sensor. More correctly, it is the NETD value of a thermal imaging device and looks nice on paper. In reality, improving the NETD (i.e., reducing the value of the parameter) due to image filtering leads to a decrease in the spatial resolution of the image visible on display, as well as to the loss of image detail and lowers its informational value.

In the development of sensors and thermal imaging devices, there are objective laws and limitations that cannot be bypassed. A top thermal imaging device cannot be cheap. If thermal imaging devices similar in terms of declared field and functional capabilities have a significant difference in price, then it is highly probable that a low price in a more affordable device is achieved by making compromises in terms of image quality. This should be kept in mind when choosing a thermal imaging device.

In summary, the NETD rating is very important to the performance of the thermal optic and there's a very good reason that Pulsar continue to use and develop their 17µm sensor. There are lots of misconceptions about the claimed performance of 12µm sensors and the fundamental laws of the technology. There's no debate that Pulsar 17µm sensor is the most highly developed and produces the best image on the market.

A CHANGE IN THE MARKET AND THE RATING SYSTEM - sNETD

Recently, there has been a change in the market in relation to NETD ratings and the industry standard for specifications. As end users and dealers to put a lot of weight on these ratings in regard to the perceived performance and advancement of the technology, it's important to understand the difference between NETD and sNETD (System NETD)

Pulsar is by far the oldest manufacturer of thermal optics now has been at the forefront of the development of this technology since inception. They have put a significant effort into the chain of electronics that enhances the performance and specification of the factory components, which includes a steady progression of the NETD ratings over the last decade. They have made a point of their rating system being ethical and quantifiable rather than advertising their products with the "lowest potential" sNETD rating.

sNETD = the potential for enhanced performance via post processing of the signal from the sensor, and the adjoining hardware. This rating has been known and the information accessible on the French Lynred website for some time.

LYNRED SENSOR LINEUP: Outdoor activities | Lynred

XQ SENSOR:

SENSOR NATIVE NETD	<30mK (f/1, 300K, 30Hz)
SYSTEM NETD	15-20mK using adapted noise reduction algorithms

XP SENSOR:

SENSOR NATIVE NETD	<30mK (f/1, 300K, 30Hz)
SYSTEM NETD	15-20mK using adapted noise reduction algorithms

XG SENSOR:

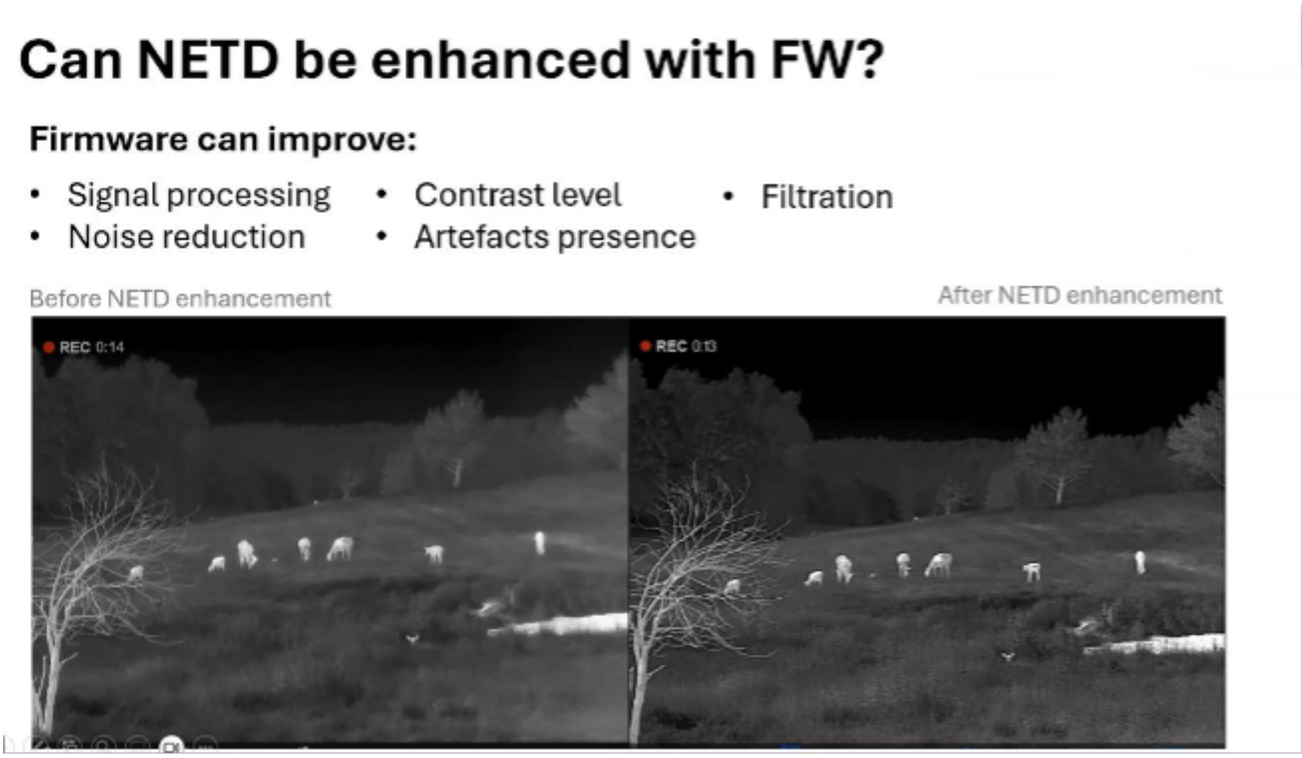
SENSOR NATIVE NETD	ATTO640D-02 < 50mK (f/1, 300K, 30Hz) ATTO640D-02+ < 40mK (f/1, 300K, 30Hz)
SYSTEM NETD	15-20mK using adapted noise reduction algorithms

XL SENSOR:

SENSOR NATIVE NETD	<50mK (f/1, 300K, 30Hz)
SYSTEM NETD	15-20mK using adapted noise reduction algorithms

XT SENSOR:

SENSOR NATIVE NETD	<50mK (f/1, 300K, 30Hz)
SYSTEM NETD	15-20mK using adapted noise reduction algorithms



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