Night Vision Optics

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NIGHT VISION OPTICS

- The first devices were developed in 1935, called Gen. 0 NV devices

- The first passive analog NV devices which could operate with the ambient light were called Gen. 1 NV, which are still available today

- Later the Gen. 2 NV devices were developed, which made the biggest step in the night vision history between two generations

- The most advanced NV devices currently on the market are Gen. 3 devices

- The latest development in NV are digital NV devices

GENERAL FEATURES

- Night vision devices are devided into analog and digital devices

- Analog NV devices amplify the light in the darkness with the help of an IIT

- Analog devices are classified by generations, which tells us how much the image intensifier tube amplifies the light

- The image seen through analog NV devices is direct, with no screen in between like in digital devices

- Digital NV devices have a sensor behind the objective lens, which captures the image

- The image gets converted into electrical signals, which are then displayed on the screen in the ocular

- Digital and analog night vision devices are available in many different shapes and sizes, each designed for a different purpose:
  - Night vision binoculars
  - Night vision monoculars (scopes)
  - Night vision goggles
  - Night vision clip-on devices

⊙ OPTICS
TRADE

ANALOG AND DIGITAL NIGHT VISION OPTICS

- Analog night vision devices are classified by generations, and these are available on the market:
  - Generation 1 Night vision devices
  - Generation 1+ Night vision devices
  - Generation 2 Night vision devices
  - Generation 2+ Night vision devices
  - Generation 3 Night vision devices

- The image color is normally black and green, but from the 2nd generation upwards, also better IITs are available, which display a black and white picture.

- Digital night vision devices are the latest development for nighttime observations

- Digital NV devices have a sensor behind the objective lens, which captures the image

- The image gets converted into electrical signals, which are then displayed on the screen in the ocular

- All digital night vision devices have a refresh rate

Pros and cons of analog night vision devices

- (+) Generation 2 and 3 analog night vision devices have very good contrast and light amplification

- (+) The image looks real and not like as you would look into a screen

- (+) Generation 3 rarely need an additional IR illuminator

- (+) Generation 2 devices need an IR illuminator only in complete darkness

- (+) Are not sensitive to reflections

- (+) For longer time observations analog devices are a lot more comfortable to use

- (+) Very low battery consumption

- (-) High price

- (-) Gen. 1 devices are affordable, but the image quality is not so good

- (-) They don´t feature some special features like taking photos or videos

- (-) are very sensitive to bright light sources (can be damaged during the day)

Pros and cons of digital night vision devices

- (+) Are a lot cheaper than Gen. 2 and Gen 3 NV devices

- (+) With the combination of a high-quality IR illuminator, the digital NV device can be very useful also on greater distances

- (+) In most cases, they perform even better than generation 1 night vision devices.

- (+) Compared to Gen. 1 night vision devices, the digital ones have the advantage that IR illuminators with long wavelengths can be used, which are completely invisible to all animals

- (+) They feature digital magnification

- (+) Possible to make photos and videos

- (+) Connectivity to a smartphone, tablet and computer

- (+) Can be used during the day

- (-) Very bright picture even on the lowest settings

- (-) Reflecting objects disturb the image

- (-) Big battery consumption

INFRARED ILLUMINATORS

- The human eye can see light in wavelengths from 380 to 740 nanometers. This wavelength spectrum is also called the visible light

- Wavelengths that are beyond the visible spectrum are longer and are called infrared wavelengths or infrared light

General features

- An IR illuminator is a flashlight that emits light in an infrared spectrum

- IR illuminators are available in different wavelengths

- The wavelength tells us, in combination with what kind of night vision they are designed to be used

For example:

- Most analog night vision devices on the market with a Gen. 1 IIT can see wavelengths up to 760-780nm.

- The most Gen. 2 NV devices can detect the light of wavelengths up to 850nm. Some special IIT´s from Photonis, like Photonis ECHO or XR-5, can detect light even up to 900nm.

- Gen. 3 NV devices can detect wavelengths up to 900nm, and the best Gen. 3 IIT´s, like Photonis 4G, 4G+, and XR5, can detect wavelengths even up to 1000nm.

Digital NV devices can detect wavelengths up to 950nm – 980nm

IR illuminators for analog night vision devices

- For analog night vision devices, only specific infrared illuminators work perfectly

- The buyer has to be cautious what is the maximal wavelength the NV can detect

    We recommend the following:

- For Gen. 1 NV devices an IR illuminator with a wavelength between 750nm and 780nm,

- For Gen. 2 devices an illuminator with a wavelength of 850nm, or up to 900nm illuminator if a high-quality IIT is built into the device

- For Gen. 3 devices an IR illuminator is mostly not needed, but an illuminator with a wavelength of 850nm - 900nm would work perfectly with all image intensifier tubes

IR illuminators for digital night vision devices

- Digital night vision devices are not very picky – they detect all wavelengths up to 950nm-980nm

- Because animals can detect wavelengths up to 850nm, we recommend an IR illuminator with a wavelength over 850nm.