

## Dust and dirt do not stand a chance – free view due to camera filters

To achieve optimum image quality the sensor needs to be kept free of dust. As pixels today are the same size as dust particles or even much smaller, a single speck of dust on the image sensor can drastically reduce the quality of the image.

The short distance to the pixel means that under certain lighting conditions a speck of dust on the image sensor can cast the pixel beneath it entirely in shadow. The speck of dust appears as a dark spot in the camera image.

### Background

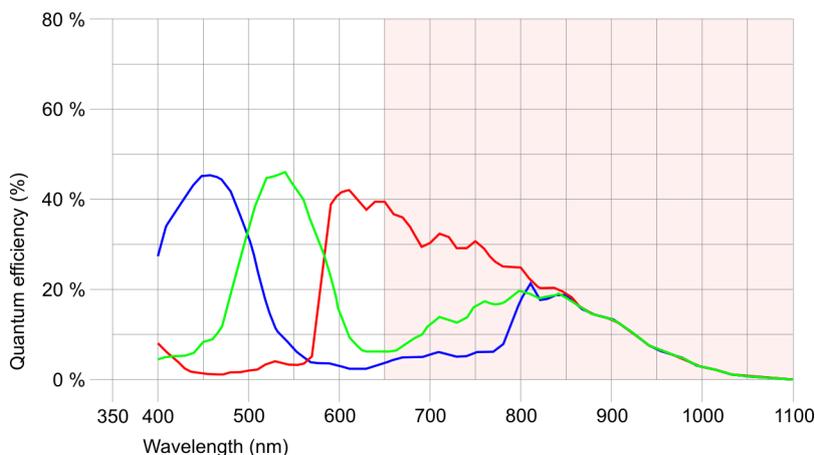
The image sensor of a camera is an important component and requires protection against contamination. Each sensor in an IDS camera has an adhesive-bonded Schott D263 type sensor cover glass. This glass is opaque to wavelengths below 330 nm.

By default, another filter glass is used in front of the image sensor in all housed cameras to prevent the intrusion of dust particles. The space in front of the image sensor is protected against ingress of dust. Once the camera has been closed in the IDS cleanroom production, no dust can get onto the image sensor.

Color cameras by default use an IR cut filter, which is required to ensure correct color rendering. The default non-reflective filter glass in monochrome cameras has no filter effect.

### Spectral filtering of the incident light

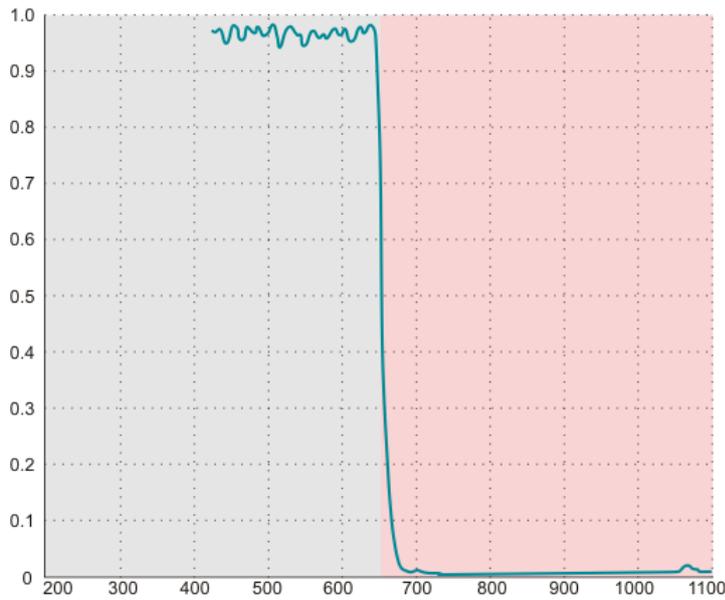
The second purpose of the filter is the spectral filtering of light in front of the image sensor. Color camera pixels are also sensitive to light in the IR spectrum. If IR light hits the image sensor as well as visible light, this leads to color distortions and the image produced is dull.



Red, green and blue wavelengths on the example of UI-324x

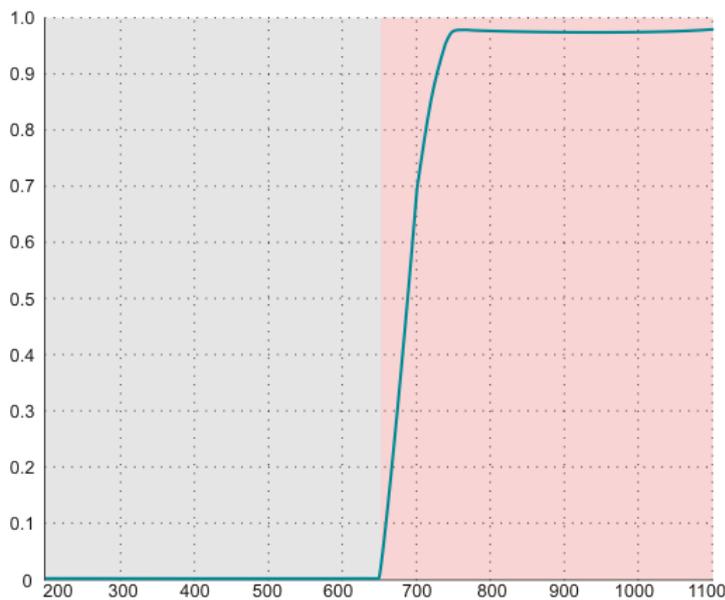
For this reason, the detection of IR light is not desirable in most applications. IDS Imaging Development Systems GmbH fits all color cameras with a filter that blocks incident IR light as standard (HQ filter).

## TechTip: Free view due to camera filters



Filter type HQ

A different type of filter performs the exact opposite function. It lets IR light through and blocks the visible portion of the light. This is particularly useful in applications in which work is carried out using IR lighting. Light from other light sources is filtered out reliably by the daylight cut filter "DL Cut".

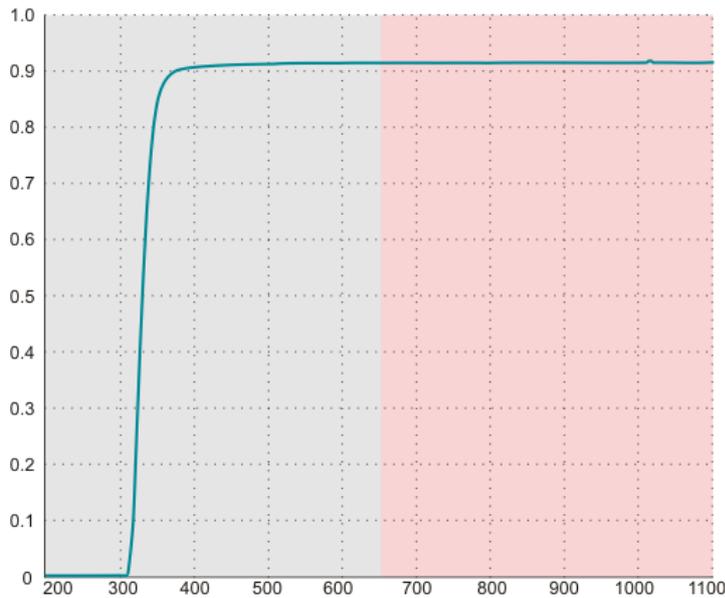


Filter type DL

Cameras with a so-called GL filter – a glass without any spectral filter characteristics – remain sensitive to the entire light spectrum.

The transmission curves for the various filters indicate which filter to use for a specific application. In some exceptional cases, therefore, it may be useful to also fit a GL filter to a color camera, for example.

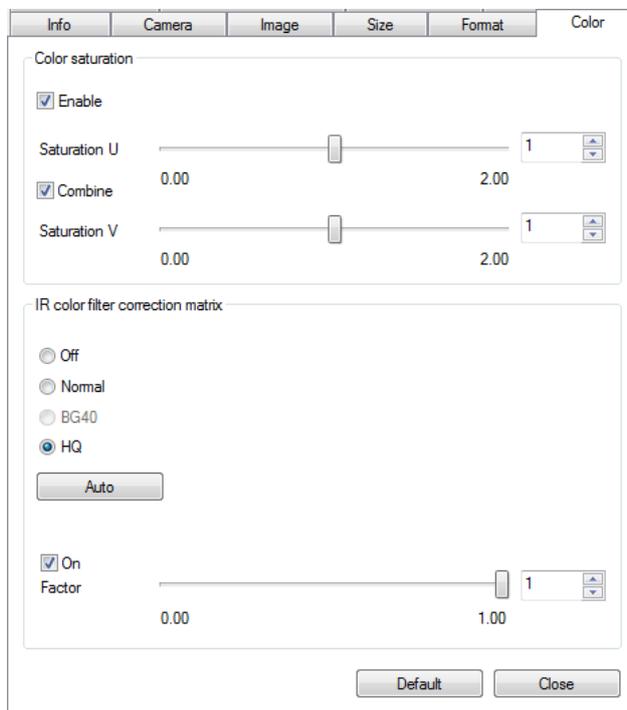
## TechTip: Free view due to camera filters



Filter type GL

### Camera filter in uEye Cockpit

When using color cameras with IR filter glasses, you need to set the appropriate color correction matrix to ensure correct color rendering. The driver detects the IR filter type and sets this value automatically. It is possible to set the sensor color correction manually via the slider or to disable it entirely. In the “Color” tab of the camera properties, you can change the settings via the “IR color filter correction matrix” area.



Properties “Color”

## TechTip: Free view due to camera filters

### Application areas

An argument for using an IR cut filter is that IR light has the effect of reducing the color reproduction.



Color images with and without HQ filter

Captures with daylight cut filter can be used to evaluate specific characteristics of the photographed objects, for example to discover plant damages. Here, for example the effect is used that captures of healthy leaves look different than sick leaves with IR light.



Color image with DL filter

### Summary

Filter glasses protect the sensor against dirt and allow a correct color reproduction. For special applications, cameras with different filter glasses can be used or the color correction can be easily disabled in uEye Cockpit. Alternatively, the image acquisition with RAW format prevents any change of the pixel values.

Note the specific information in the uEye manual when you need to clean dirty filter glasses. Operate the camera only with built-in filters as dirt is hard to remove from the sensor without using special materials. For this reason, the filter of the new USB 3 uEye CP Rev. 2 cannot be removed with a special tool as it was previously possible for older C-mount models.

The table below gives an overview of the optical filters which are installed in uEye cameras:

Filter type	Name	Refractive index ( $n_{\text{Filter}}$ )	Glass type	Thickness (f)	Cut-off frequency	Non-reflective
IR cut filter	HQ	1.53	D263	1 mm	650 nm	On one side
Glass	GL	1.53	D263T	1 mm	330 nm	On both sides
Daylight cut filter	DL	1.53	RG695	1 mm	695 nm	-

For further information on camera filters, refer to the uEye manual at <http://de.ids-imaging.com/manuals-ueye.html>.

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