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# Testo thermal imagers: Highest resolution with testo SuperResolution technology.

In professional thermography, the highest level of precision is crucial. For this reason, Testo has developed a special technology for high-resolution thermal images.

The testo SuperResolution technology produces very precise thermal images. This means:

- Four times as many readings in the thermal image
- Geometric resolution of the thermal image (IFOVgeo) improved by a factor of 1.6
- Increase of the smallest measurable object (IFOVmeas) by a factor of 1.6
- Optimized analysis possibilities on a PC thanks to highest detail density

**How does testo SuperResolution work?**

testo SuperResolution combines two known and recognized procedures: the so-called super-sampling and the so-called deconvolution.

**Higher resolution thanks to super-sampling**

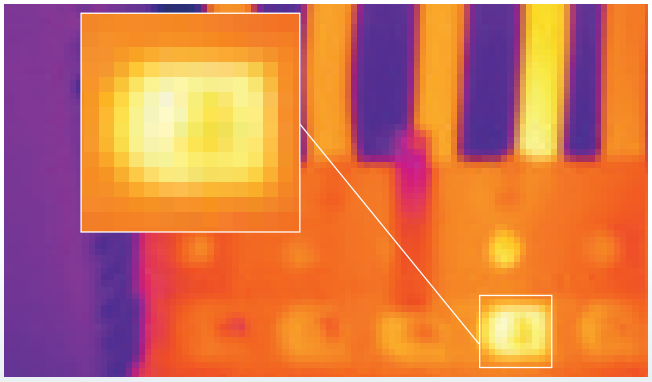
The classic super-sampling principle works by moving the entire detector matrix half a pixel width each way so that the image sequence created is stitched together into a single image.

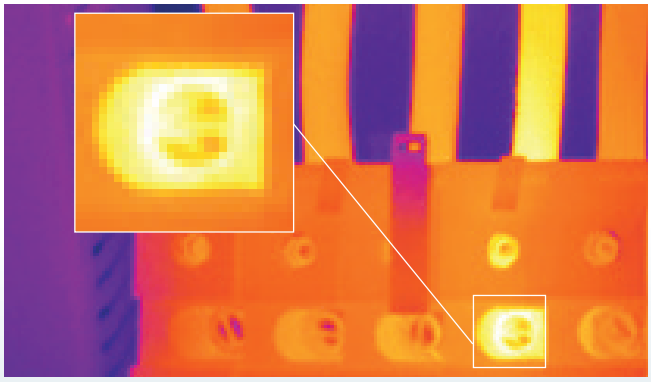
The gaps between the individual pixels are filled with additional information and the limit frequency of the detector is improved.

In super-sampling, the thermal imagers from Testo use the natural tremor (from Latin tremere = to tremble), i. e. the minimal movement present in every person, for the thermographic recording. This creates a sequence of images that are minimally offset from each other at random. Testo's special algorithm creates from this additional information and readings a higher-resolution image of the thermographically recorded object.

**Sharper focus images thanks to deconvolution**

The ‘deconvolution’ process improves the image quality through the detailed knowledge of the infrared lens properties. This takes place through a reconstruction of the thermal image from the actual radiation of the thermographically recorded object and the exact knowledge of the imager’s lens data. The result is a far sharper thermal image.





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**Reconstruction of the original signal for more detailed thermal images (fig.1)**

The black line in figure 1 represents the original signal. The grey bars are the original pixel values. The blue bars in the left-hand graphic stand for the artificially created interpolation values – these cannot reconstruct the original signal. The orange bars in the right-hand graphic are the testo SuperResolution values – they are able to reconstruct the original signal.
In our case, this means that with the output signal of the detector and the knowledge of the lens properties of the thermal imager, the input signal, i.e. the actual radiation of the thermographically recorded object, is reconstructed. The results in the creation of clearly higher-focus thermal image. The testo SuperResolution thus works through a combination of super-sampling, deconvolution and a specially developed algorithm. It improves the geometric resolution by a factor of 1.6 as well as the resolution of the thermal image by four times. In terms of image impression, this is comparable to a larger detector and a higher resolution.

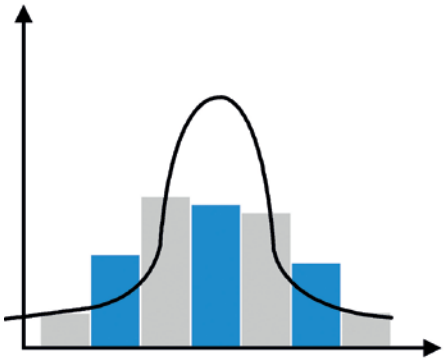
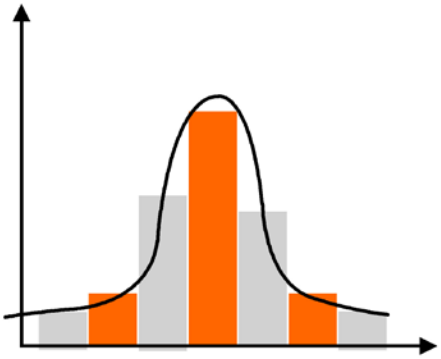


Fig. 1: Increasing the presentation resolution by interpolation does not produce greater detail.



Improvement of detail through testo SuperResolution.

**Proof of the quality of the testo SuperResolution technology (fig.2)**

In thermography, there are several factors that play an important role in relation to the quality of the thermal image. Two of these factors which are particularly important are geometric resolution and sharpness of the object. The improved resolution and sharpness can be seen by looking at several narrow slit diaphragms. A slit diaphragm mask with vertical apertures that gradually become smaller and closer together, is placed in front of a black panel radiator at a constant temperature. Without testo SuperResolution technology, the image becomes blurred with increasing proximity of the slits. The same process with testo SuperResolution technology results in an overall sharper image, in which far more details are clearly visible despite the slits becoming smaller and closer together.

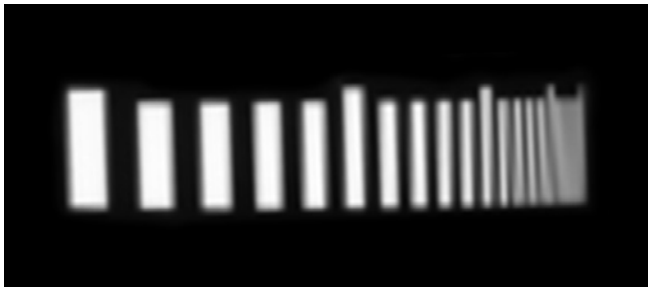
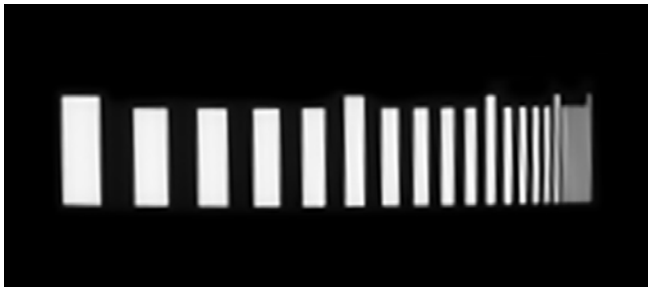


Fig. 2: Recording without testo SuperResolution technology



Recording with testo SuperResolution technology

msp/04.2019 – Subject to change, including technical changes.