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A comparison of all Testo thermal imagers testo 883 testo 865s testo 868s testo 871s testo 872s testo 890 **Overview** 640 x 480 pixels 320 x 240 pixels 240 x 180 pixels 160 x 120 pixels 160 x 120 pixels 320 x 240 pixels Infrared resolution Number of pixels: The more the (307,200 pixels) (19,200 pixels) (43,200 pixels) (76,800 pixels) (76,800 pixels) (19,200 pixels) 480 x 360 pixels 640 x 480 pixels 1280 x 960 pixels testo SuperResolution Fourfold number of pixels 320 x 240 pixels 320 x 240 pixels 640 x 480 pixels (1,228,800 pixels) (76,800 pixels) (76,800 pixels) (172,800 pixels) (307,200 pixels) (307,200 pixels) <0.14 °F <0.07 °F <0.07 °F < 0.18 F <0.14 °F <0.09 °F Thermal sensitivity (NETD) Smallest possible temperature (<0.04 °C) difference that can be displayed: (< 0.10 °C) (<0.08 °C) (<0.08 °C) (<0.04 °C) (<0.05 °C) The smaller the better (100 mK) (80 mK) (80 mK) (50 mK) (40 mK) (40 mK) -4 to 536 °F -22 to 1,202 °F -22 to 212 °F -22 to 212 °F -22 to 212 °F -22 to 212 °F Measuring range (-20 to +280 °C) (-30 to +100 °C) / (-30 to +100 °C) / (-30 to +100 °C) / (-30 to +650 °C) (-30 to +100 °C) / 0 to 1,202 °F 0 to 1,202 °F 0 to 1,202 °F 0 to 662 °F 0 to +350 °C / (0 to +650 °C) (0 to +650 °C) (0 to +650 °C) 0 to 1,202 °F (0 to +650 °C) High-temperature option: 662 to 2,192 °F (350 to 1,200 °C) Fixed focus Manual and **Focus** Image focusing Fixed focus Fixed focus Fixed focus Manual autofocus Integration of external Connection to other Testo testo 605i testo 605i testo 605i Testo radio humidity measuring instruments measuring instruments Thermohygrometer Thermohygrometer Thermohygrometer probes **Communication with free** Fast and easy image analysis, ✓ \checkmark \checkmark \checkmark testo Thermography App creation and dispatch of short reports, remote control of the Free, licence-free software for **PC** software testo IRSoft \checkmark \checkmark \checkmark \checkmark ✓ comprehensive analysis and reporting **Functions Humidity mode** Evaluate mould risk with traffic-✓ \checkmark **✓** light scale testo ScaleAssist Automatic contrast adjustment for ✓ ✓ \checkmark optimum evaluation of building Panoramic image assistant Stitch up to 3 x 3 images together \checkmark to one overall image testo SiteRecognition Automatic measurement \checkmark **✓** location recognition and image management Process analysis package Record thermal processes as a ✓ time progression as a video or timelapse **Technical data** Lens/field of view (FOV) The larger the value, the larger the 31° x 23° 31° x 23° 35° x 26° 42° x 30° Standard: Standard: 42° x 32° visible image section 30° x 23° 25° lens: 25° x 19° Telephoto: Telephoto: 12° x 9° 15° x 11° Super-tele: 6.6° x 5° Smallest possible object size Standard: Standard: **Spatial resolution** 3.4 mrad 3.4 mrad 2.6 mrad 2.3 mrad which can be recognized from (IFOV) 1.7 mrad 1.13 mrad 3.3 ft (1 m) distance 25° lens: 0.68 mrad Telephoto: Telephoto: 0.7 mrad 0.42 mrad Super-tele: 0.18 mrad Minimum focusing distance < 1.6 ft < 1.6 ft < 1.6 ft < 1.6 ft Standard: Standard: (< 0.5 m)(< 0.5 m)(< 0.5 m)(< 0.5 m)< 0.3 ft < 0.3 ft (0.1 m) (< 0.1 m)25° lens: < 0.7 ft (0.2 m) Telephoto: Telephoto: < 1.6 ft < 1.6 ft (0.5 m) (< 0.5 m)Super-tele: < 6.6 ft (2 m) ±3.6 °F (±2 °C), ±3.6 °F (±2 °C). ±3.6 °F (±2 °C), ±3.6 °F (±2 °C), ±3.6 °F (±2 °C), ±3.6 °F (±2 °C), Accuracy ±2% of reading (higher value applies) 9 Hz 9 Hz 9 Hz 9 Hz 27 Hz 33 Hz Image refresh frequency Number of images per second within EU **Features** Integrated digital camera Real image is stored with thermal \checkmark image **Rotating handle ✓** and display Laser marker Shows exact position of the \checkmark \checkmark ✓ laser and the corresponding temperature measurement value in the imager display LED (additional light) For better lighting of the the real image

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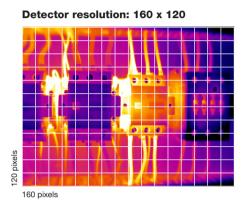
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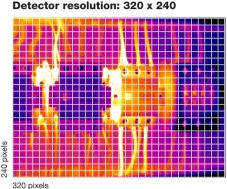


Infrared resolution/ detector resolution

As in a digital camera, the detector in a thermal imager records image points (pixels), which are ordered in the so-called sensor matrix in a thermogram. A sensor matrix of 160×120 pixels records a total of 19,200 pixels, reflecting 19,200 individual measurement values. An imager with a 320×240 pixel detector (= 76,800 pixels) therefore produces four times more measurement values than an imager with 160×120 pixels.

Conclusion: The higher the resolution, the better a thermal imager can measure smaller objects from a greater distance, still providing sharp-focus images.



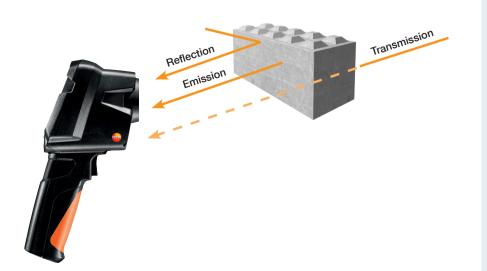


Emissivity, reflectance, transmittance

Emissivity is a measure of the ability of a material to emit infrared radiation. 100 % emission, and therefore an emissivity of 1, would be ideal, however this never occurs in daily life. Concrete is close, with an emissivity of 0.93, i.e. 93 % of the IR radiation is emitted by the concrete itself. Objects with an emissivity of 0.8 and higher are considered to be well suited to thermography. This value can be set in the imager.

Reflectance is a measure of the ability of a material to reflect infrared radiation. In general, smooth, polished surfaces reflect more strongly than rough, matt surfaces made of the same material. Applied to the already mentioned example of concrete, that means that concrete reflects 7 % of the ambient IR radiation. The reflected temperature must be taken into account in the measurement of objects with low emissivity. An offset factor in the camera enables the reflection to be calculated out and the accuracy of the temperature measurement is thus improved. This value can be set in the imager.

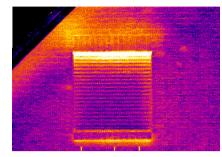
Transmission is the ability of a material to allow IR radiation to pass through it. However, most materials do not allow long-wave IR radiation to pass through, so that the transmissivity can as a rule be neglected.

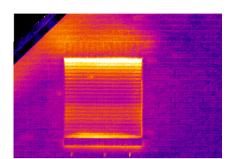


Thermal sensitivity (NETD)

The thermal sensitivity (Noise Equivalent Temperature Difference, NETD) states which smallest possible temperature difference a thermal imager can display. The value is usually given in millikelvin (mK). For example, the value 120 mK means the the thermal imager is able to record temperature differences from 120 mK (= 0.22 °F (0.12 °C)).

Conclusion: The smaller the NETD value, the higher the quality of the measurement.



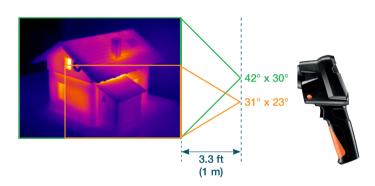


NETD 80 mK

NETD 50 mK

Field of view (FOV) Spatial resolution (IFOV)

The field of view (FOV) determines the visible image section of a thermal imager. It is given in degrees of angle, and is dependent on the detector resolution and lens of the imager. It can be compared to a person's field of view.



IFOVgeo is given in milliradiants (mrad) and describes the smallest object which can still be demonstrated by one pixel in the thermal image and shown in the display, dependent on the measurement distance. What does that mean? At a distance of 3.3 ft (1 m), a detector resolution of 160 x 120 pixels and an FOV of 31°, the IFOVgeo is 3.4 mrad. One pixel thus demonstrates a measurement spot with a 0.13 in (3.4 mm) edge length, which is shown in the imager's display.

More example calculations:

Distance: 6.6 ft (2 m), detector resolution = 160×120 , field of view = 31° : measurement spot = 0.27 in (6.8 mm) (3.4 mrad x 2)

Distance: 16.4 ft, detector resolution = 160 x 120, field of view = 31°: measurement spot = 0.67 in (17 mm) (3.4 mrad x 5)

The IFOVgeo is however only a thoeretical value. An object to be measured will in reality not fit into the grid prescribed by the imager's resolution. This is why there is the IFOVmeas.

IFOVmeas is the smallest real measurable object.

The rule of thumb is: IFOVmeas = IFOVgeo x 3

Example: 3.4 mrad x 3 = 0.40 in (10.2 mm).

This means: From $3.3~{\rm ft}$ (1 m) distance, objects up to a size of $0.40~{\rm in}$ (10.2 mm) can be correctly measured.

Tip: If the object to be thermographically recorded is smaller than the IFOVgeo, the measurement of the object will not be correct. Recommendations: educe the measurement distance, select a different lens, or use a thermal imager with a better IFOVgeo.

