

HOMESAFE INSPECTION

INFRARED CAMERA COMPARISONS FOR RESIDENTIAL INSPECTION

These specs, along with HomeSafe's standards of practice, are based on years of research, and use in over 40,000 home inspections. An inadequate camera puts an inspector at risk of liability, and can result in homeowners taking expensive actions that are not warranted.

Residential inspection applications require infrared cameras that allow for scanning whereas most building engineering and other "traditional" uses involve point and shoot. Residential inspection also requires the ability to capture detail that is not required for many other applications. And, the materials used in homes have very minor temperature differences as opposed to other applications.

Therefore, you will find cameras at all levels of cost that do not have the combinations of capabilities required in residential inspection. One high end camera reviewed, for instance, had high thermal sensitivity and high image clarity, but had slow scanning speed and a narrow angle lens. Additionally, many features that don't make a difference are touted in advertising while required features are completely left out.

And camera specs are presented in ways that create confusion such as providing specs on the LCD display that appear as if they are the specs for IR resolution. Specifications may be presented using different scientific notation. Don't assume – ask for clarification.

Currently, cameras being marketed for home inspection fall into three ranges – a "high performance" in the range of plus or minus \$18,000, a "mid performance" of plus or minus \$9,000, and a "low performance" of plus or minus \$4,000. The "low performance" cameras do not have the capabilities necessary for accurate use in home inspection. "Mid performance" cameras often don't have many of the necessary capabilities for speed and accuracy, and "high performance" cameras must also be evaluated closely as most were not built specifically for home inspection applications.

You can request customizations in some instances although what you will pay for these (such as \$2,500 for a different lens) can add so much to the cost that it makes more sense to move up to a more expensive camera. Beware that some "low performance" cameras charge thousands of dollars for add-ons that do not enhance the camera's basic functionality. You will find this by looking at the difference in features and price between models within the same "series".

HomeSafe sells cameras as a convenience to inspectors and has no patents on camera technology. Camera manufacturers are encouraged to develop cameras meeting the optimal specifications for the home inspection industry.

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Infrared Cameras	Optimal	S300-DHI	MikroScan HI	MikroScan 2
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Required Features For Optimal Residential Inspection

Thermal Sensitivity	.08 or Below C	< .08 C	.05 C	.05 C
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(May be referred to as Noise Equivalent Temperature Detection or NETD. It may also be notated as mk whereas 50 mk = .05 C sensitivity. This is the measure of the sensitivity of the detector in Centigrade. This should be measured at 30° C from 3 meters. Be sure you are looking at Thermal Sensitivity and not Temperature Accuracy. Scientific research shows that cameras used in residential inspection require thermal sensitivity of equal or less than .08 C at optimal conditions. This is one of the most expensive features of an infrared camera, although cost is coming down for lower sensitivity detectors.)

Detector Resolution in Pixels	≥ 320x240=76,800	320x240=76,800	320x240=76,800	160x120=19,200
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(You get the number of pixels by multiplying the two numbers, thus 320 x 240 has 4 times more clarity than 160 x 120. Resolutions are improving, and cameras are now available with 640 x 480 resolutions but they are not yet financially feasible for home inspection. Be sure that you are looking at the Detector Resolution and not at the Image Display resolution, which may be capable of a higher resolution than the detector can provide. Also be sure you are not looking at the Visible Camera Resolution. A 3 megapixel visible camera for instance has resolution of 1280 x 1040.)

Frames Per Second Performance	30	60	60	60
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(This is your scanning speed and affects how quickly you can work. Cameras with low Frames Per Second, or FPS, do not adjust as rapidly as you move the camera and result in a choppy image that misses portions of the area scanned if you move too fast. Because many lower performance cameras have FPS speed as slow as 6 or even lower, this is often left out of the spec sheets.)

IR Photo Capability w/Download	Yes	Yes	Yes	Yes
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(It seems self evident that being able to download IR photos for reporting is a requirement of an IR camera to be used in home inspection; however, there are low performance cameras on the market that do not have this capability.)

Recommended Important Features For Optimal Residential Inspection

mRAD	<5	2.7	1.2	1.2
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(The RAD – or Radiation Absorption Dose – is a measure of the signal processor. This is the capability of detection rather than the capability for display of what is detected. More and smaller detection “dots” sent from the camera result in more information, more accurate information, and information with a higher sensitivity coming back. mRAD refers to a measure in millirad or a millionth of a RAD. A lower number is better and refers to more sensor “dots” providing information to the detector, and thus more accurate information than fewer larger “dots” would provide. While high performance cameras have mRAD’s of 1 – 3, lower end cameras may be above 7.)

Natural Field of View Lens	Between 35° - 45° and 25° - 30°	36° x 28°	36° x 28°	18° x 14°
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(“Natural” Field of View refers to a view through the camera that is close to what you see with your eyes and is neither too close causing loss of perspective, nor too far away - wide angle -causing loss of detail. Lesser angles will give a narrower field of view – like looking through a tube. Not only does this slow you down significantly, you miss the perspective and lose the thermal sensitivity. **The optimal “natural” field of view lens angle is 36° x 28°**)

Manual Focus at Lens	Manual	Yes	Yes	No
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(This allows for rapid adjustment of light coming in for better image interpretation. Some cameras have a manual focus capability somewhere other than the lens, which slows you down and can be awkward. This applies to the visible image integrated camera or video recorder.)

IR Aperture Control	Manual	Manual	Automatic*	Automatic*
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(This applies to the IR camera function. It is also known as Temperature Sensitivity Control. It is not the same as Image or Focus Control. Manual aperture control allows for better image interpretation by allowing you to vary the image, as “overexposed” images can make a small or non-existent problem seem large. When this can be done manually you can make comparisons, and also work faster. Unfortunately most IR cameras on the market have automatic aperture control with manual focus options only available within the software, where it is cumbersome to use and does not enhance speed. The automatic re-focusing freezes the camera image at times and it is also necessary to force the camera to re-focus after scanning items with high temperature contrast or you will lose camera sensitivity.) * These cameras have a manual focus capability in the software.

LCD Brightness	Enhanced	Enhanced	Enhanced	Not Enhanced
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(Ask how the LCD is enhanced as compared to other camera LCDs, and be sure that LCD enhancement refers to the IR image, not just the visible light image.)

LCD Size	≥ 2.5 Inches	3.5 Inches	3.5 Inches	3.5 Inches
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Features That Assist In Residential Inspection

Video Capability w/Download	Yes	Yes, Integrated	Yes, With add on recorder	Yes, With add on recorder
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(There are times that it is helpful to capture your scanning on video as stand alone still pictures do not tell the whole story – such as demonstrating the extent of water damage that is too wide for a single photo. Most IR cameras have an input for a separate video camera – but this is awkward to use.)

Visual Photo Capability w/Download	Yes	Yes	Yes	No
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(Side by side photos showing the visible light picture as compared to the IR picture are needed in reports. Having an integrated camera is very convenient; however, the visible light cameras integrated into many IR cameras are poor. Compare the specs for the integrated visual photo camera to your regular digital camera, and note that most do not have flash capability.)

Radiometric Temperature Measurement	Convenient	No	Yes	Yes
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(You need to record the outside and inside temperatures and this can be done more efficiently without the need for separate equipment when it is integrated into the camera. Keep in mind that you need to measure ambient air temperature, not surface temperature so you must locate a surface that will be reflective of the air temperature, which is not necessarily the surface you are scanning.)

Humidity Indicator	Convenient	No	No	No
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(This is a convenient feature that eliminates a separate piece of equipment. Look for an indicator providing a measurement, not just an alarm.)

Features That Do Not Make A Difference in Residential Inspection But Enhance Reporting

Picture-in-Picture (Fusion)	Convenient	No	No	No
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(Sometimes combining these photos can assist in highlighting the situation, but other times it can lead to confusion. And you may not always be using the visible light camera that is integrated into the IR equipment. Side by side IR and visual photographs are the best way to highlight most situations in reports.)

Image Colorization	Useful	Grey Scale	Grey+Color	Grey+Color
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(Grey scale is more accurate for detection and should be used while working. Colorization provides attractive pictures for reporting and is becoming a standard due to colorized photos used in the media and advertising.)

Other Information

Type	Your Preference	Harness	Handheld	Handheld
(The harness unit marketed by HomeSafe is the only one of its kind, and was developed before affordable handheld IR cameras were commercially available.)				
Image Capability	More Is Better	Unlimited	≥1,000 Images	≥1,000 Images
Download Method	Your Preference	Data Stick	From Camera	From Camera

Specifications Not Discussed Above

Spectral Range is the same in all IR cameras to be used in residential inspection (7.5 – 13 or 14). Temperature Accuracy is not the number that expresses Thermal Sensitivity, and is generally the same in all cameras suitable for residential inspection – with less accuracy at the extreme ends of the temperature range. Weight is a consideration in that for handheld cameras you will be holding it up for considerable periods of time. Automatic functions (such as insulation alarms or dew point alarms) can lead to mistakes if over relied upon, and may not be accurate depending on the capabilities of the camera and the situation. The temperature range is only important if you expect to be working in extreme heat as some lower end cameras cut off around 100 F. Almost all IR cameras being marketed for home inspection have a more than adequate temperature range. The humidity range is important only if you work in extremely humid conditions. Acceptable vibration should be within an adequate range for residential inspection on any applicable camera (approximately 25G).

Cost

Camera Price – New*	Your Decision	Upon Request	\$16,475	\$9,875
Camera Price – Refurbished*	Your Decision	\$6,500 - \$6,800	NA	NA
Availability of Financing*	Your Preference	Yes	Yes	Yes
Financing Over 5 Years*		\$180 – \$200/mo.	\$350 - \$390/mo.	\$240 - \$260/mo.
Acoustic Package Price*	\$2,400	\$2,400	\$2,400	\$2,400
Camera Insurance Breakage and Theft	Important	Included	Included	Included
Camera Loaner Program	Important	Included	Included	Included
SIRI Training Program	42 Hours Class+Field	\$1,499**	\$1,499**	\$1,499**

*Pricing and package information as of 7/09 and subject to change. **Training programs may be discounted. Ask about special offers.

Additional equipment required includes a high quality moisture meter with short and long pins, and radiometric touch capability. HomeSafe recommends the Protometer SurveyMaster II which retails for approximately \$425.

Comments: HomeSafe's cameras are built and/or customized to unique specifications for residential inspection. Commercially available cameras from the same manufacturers will not have the same specifications and may cost more even with less "extras".

S300 DHI Harness is the best camera available for home inspection. Its picture is clearer, and its detection capability is higher than other comparable high performance cameras. The disadvantage is that harness units are larger than handheld units; however, many inspectors prefer working with the harness as you can let go of the camera. It also does not have some of the features that are convenient or enhance reporting. MikroScan HI is an excellent value in a hand-held camera meeting all of the required specifications for optimal residential inspection, and with many convenient features. It does not have one of the recommended features, that of manual aperture (sensitivity) control but this feature is difficult to find. MikroScan 2 is the best mid range camera available for residential inspection as it meets the most important requirement, that of temperature sensitivity, as well as rapid frames per second scanning speed, but does not have some of the other required or recommended features. It is not recommended however, and does not meet the specifications required for the HomeSafe Master Infrared Inspector Network.