

12 THINGS to Know Before Buying an INFRARED CAMERA



A GUIDE FOR INVESTING IN INFRARED



FLIR

We Know Infrared. Like Nobody Else.

The 12 Things You Need To Know Before Buying an Infrared Camera

Buying an infrared camera is different for all people. For some, cost will play a more dominant position whereas for others, certain key features or the desire to advance one's career through certified training might be more important. Most, however, want a high level of quality and value. Still more just don't want to make the wrong choice and end up with a new thermal imager that is heavy or hard to use.

At FLIR, we want you to succeed. Back in the mid-1960's, we brought the first commercial infrared camera to market. We invented this market. So rest assured this booklet will help you pick the best infrared camera!

Having been the world's largest infrared camera manufacturer and having operated the world's largest training organization – the Infrared Training Center or ITC – we've learned a thing or two about infrared. Here are "12 Things" to help you too.

Readers please note: we use the term "infrared camera," however we could have just as well used the term "thermal imager." They are one in the same, interchangeable terms.

If at any time you have a question on what is presented below, or you have questions on what infrared camera is best for you, please give us a call at **1 800 GO INFRARED** (1 800 464 6372).

Point #1: Buy an infrared camera that delivers accurate, repeatable results.

This may sound like a no-brainer, but if ever the phrase caveat emptor – i.e. “let the buyer beware” – it is here!

Imagine if you bought a calculator and you noticed that sometimes you added two-plus-two but when you hit the “equals” sign it didn’t add up to four! Even worse, imagine that when you bought this calculator you rather assumed that it would work, and like most people you didn’t question its accuracy. So, you went about your business and there were no problems. But, then one day you got a letter in the mail that your checking account was severely overdrawn, and you went back to crunch all the numbers and, while you were doing this, you noticed that the calculator made an error once in awhile.

You wouldn’t be happy, to say the least. What’s more, depending upon the errors made you could be just a little overdrawn – or you could be in serious trouble.

Said differently, a basic requirement of your infrared camera is to **produce accurate and repeatable results** – just like a calculator.

What are some standard metrics for you to think about when thinking of buying an infrared camera?

Well, after 40 years in the business, FLIR has maintained a solid, consistent accuracy standard that never waivers. It’s the industry standard: $\pm 2\%$ or 3.6°F , whichever is greater.

It’s read as “plus or minus two percent or 3.6 degrees Fahrenheit, whichever is greater.

So if you are shopping for an infrared camera, and you learn that the accuracy spec is “plus or minus 5%” or something higher than 3.6°F , then

you should stop right there and not even consider buying it.

Why? Because an infrared camera that could be 5% inaccurate could – just like the calculator in the example – get you into serious trouble. Your images and temperature measurements will be wrong. Another analogy is like saying “you almost got the phone number correct, you were only off by one digit.” Well guess what? It’s completely wrong.

Remember above how we said that a basic requirement of your infrared camera is to produce accurate and repeatable results? Well, there are two other requirements to making this work over and over again.

In order to produce accurate and repeatable results, there needs to be “inputs” in your camera for both “emissivity” and “reflected temperature,” as indicated with the red arrows in the picture below.



If you are concerned that you don't know what “emissivity” or “reflected temperature” mean, well that's ok. This is industry jargon and if you were to buy an infrared camera, you would familiarize yourself with these terms. There's more on training later on, so don't worry about this right now.

Just know that, again like in our example, you wouldn't buy a calculator that is missing the plus (+) sign button even if had an attractive selling price.

If a manufacturer is trying to sell you an infrared camera that doesn't have a place onscreen for you to input both emissivity and reflected temperature values – then you're buying a calculator that's missing a button!

Point #2: Buy an infrared camera with high detector resolution/image quality.

Just like buying a digital camera, the more pixels, the better the resolution, and the sharper the thermal image.

But to create another example from our everyday lives, let's say you just bought a High Definition TV. Now, let's say that in your local area, the local cable company doesn't broadcast an HD signal yet.

Now let's say you approach your local cable TV salesperson and say "well, I just bought an HD TV and I just want to hook it up to my regular (i.e. non-HD) cable jack in my living room. Will that still give me a High Definition picture on my new TV?"

Of course the answer is "No, it won't work."

It won't work because the regular cable jack isn't broadcasting the exceedingly high pixel count of High Definition. So, even if he has a TV capable of displaying High Definition, if there's no High Definition feed, so to speak, then it just won't work no matter how good the display is.

Maybe the person who sold our friend here the High Definition TV focused too heavily on the capabilities of the display itself – the TV. But maybe he also ignored the fact that our friend wouldn't be able to buy any high definition access.

It's the same with infrared cameras.

In our example, let's assume that the "feed" or the "HD cable access" is really the "IR detector pixel resolution" and the TV itself is the "LCD display."

Again, buyer beware: if a salesperson says, "we offer 640 x 480 or 307,200 pixel resolution," the next question from you should be: "Is that Detector resolution or LCD resolution?"

The LCD display resolution may in fact be 640 x 480 (read 640 by 480) or capable of displaying 307,200 pixels (640 multiplied by 480) of image content. But, if the IR detector pixel resolution – the "feed" as it were – is only 160 x 120 or 19,200 pixels, then it just doesn't matter what the display resolution is capable of.

Said differently, you can't get a lower detector resolution to "broadcast" in higher definition even if the LCD display has the capability to show more pixels. Or: you can't make your HD TV work with a regular cable jack!

You should always ask what is the detector resolution, and what is the detector pixel count? This is really the true resolution of the camera you are about to buy. If you look at this, then yes, the more [detector] pixels, the sharper the thermal image.

Point #3: Buy an infrared camera where you can change the battery yourself.

This is one of the most important aspects of usability after you buy your new infrared camera. It's also one of those items that is hard to process until after you've been working with your camera for awhile and you realize what a limitation it is if you can't change your own battery.

Let's think about using a cordless drill in your home. Like many homeowners, this author will from time to time remodel a room. In fact I've just

guted my kitchen. Now, as I think about the job, I say to myself things like “tomorrow I’m going to hang the blue board.” Then I think, “do I have enough drywall screws, I’ve got my drill, I’ve got the material.”

My point here is that when you think about your job, you assume certain things. In this case, I know I won’t have a problem doing the job because I have a good, high quality drill and you know what? Once I get started, my battery will die and I will pop it out, take another one from the charging station and pop it into my drill and, importantly: keep on working.

I think it’s safe to say for most anyone that nothing is more frustrating to start working on something and then have to completely stop because something simple just won’t work right! If my battery died and I couldn’t change it right then and there... If my battery died and I had to plug a cord into my drill and wait 2 hours for it to recharge, well, then I’d go buy a different drill.

The same is true – if not more true – for infrared cameras. How can it be more true? Well, if you’re using your camera to inspect electrical problems, or to inspect important assets like motors and pumps and production lines in a manufacturing facility, and your IR camera loses power, you could expose yourself and others to safety concerns – particularly in an electrical substation that hasn’t been inspected in awhile. At a minimum, you’re on the clock, so it is most likely costing you – or your company – money. Not to mention, you’ll definitely look like you bought the wrong IR camera, or worse: that you don’t know what you’re doing.

Here’s the scoop on power management systems for IR cameras:

- *Always buy an infrared camera that allows you to “pop-in/pop-out” a new battery as shown in the picture nearby. Whether they call this “field replaceable” or “portable” doesn’t really matter. Just make sure you can change the battery yourself, quickly and easily.*
- *Be sure that in addition to being able to replace the battery quickly and easily, you get an extra battery and a battery charging station.*

- *Battery technology has come a long way in recent years, so it's reasonable to expect that the infrared camera – or power drill – you're buying uses Lithium Ion battery technology. These will have a longer battery life, allowing you to work longer on a single battery.*
- *Finally, if at all possible, some manufacturers even offer car/truck chargers that allow you to charge the battery in the camera compartment when you're in your car or truck. The benefits of this are obvious – no less so than how convenient it is for you to charge your cell phone from your car; it's a real benefit!*



Point #4: Buy an infrared camera that outputs standard JPEG format.

This point is short on text to explain, but long on being a clear benefit to end-users. Would you buy a computer that wasn't Microsoft Word compatible? Of course not. You shouldn't buy an infrared camera that requires additional software in order to convert their proprietary thermal image formats into a standard jpeg.

You should demand a demo from any infrared camera manufacturer so they can show you both (1) how many keystrokes or "clicks" it takes to output an image and (2) outputting a standard JPEG right from the camera. Standard JPEG makes it easy to email your images or place within Microsoft Word documents without trouble or frustration!

In the United States, FLIR holds the patent on what is called a fully radiometric JPEG, which means that all your temperature data stored in the thermal image on your infrared camera is automatically transferred to the industry standard JPEG format. Said differently, you get to keep all your temperature data stored in the JPEG – even when you email it to a colleague, supervisor, customer, etc.

The analogy here is, what if you bought a new phone with an embedded camera in it, and that camera took great color pictures, but when you went to email them ... they only transmitted black and white versions of your pictures! In effect, it would strip away the color, strip away much of the value of your phone's camera. The same is true with infrared cameras. You buy an infrared camera for the sharp thermal imaging and for the temperature measurement data in those images. After all, that's why they call it a "thermal imager." If you took thermal images but then, when you send them over email, it strips out all the temperature data, it's like our camera phone that only transmits in black and white!

Again, ask for a demo to see what the level of difficulty is to download a JPEG. Be sure to inquire if those JPEGs are standard or first have to run

through the manufacturers proprietary or conversion software. Finally, you should really decide whether or not you want the ability to send fully radiometric JPEGs over email.

Point #5: Buy a lightweight, ergonomic infrared camera.

Material sciences, manufacturing robotics, and other key engineering factors will literally weigh on your decision of what infrared camera to purchase.



Weight, pure and simple, is a concern. A camera that weighs even just a pound or two more than another will start to cause back and arm strain within 20 minutes. One need look no further than all sorts of products we use everyday, from vacuum cleaners to that really neat new lawn trimmer we see on the TV infomercials. Lightweight is key, especially if you will use the camera frequently or for extended periods.

Also, the small, lighter and more ergonomic the infrared camera, the more likely you will be able to hang it off your work belt in a holster to give you hands-free control whenever you need it. Be careful here, however, because a manufacturer can make a holster any size. Most "toolbox" infrared cameras today should weigh in at under 2 lbs and feel very easy-to-grasp in your hand.

The infrared camera's physical interface – its buttons – are critical to its ease-of-use. While it may seem counter-intuitive, it is often the case that an extra button or keypad will actually make it easier to use your infrared camera, as opposed to trying to do the same functions with less buttons. Some infrared cameras even have integrated onscreen (even “touch-screen”) keypads or sketch-with-a-stylus functionality. These may cost a bit more, but the added functionality is significant and should be seriously considered.

The on-camera buttons should also be very comfortable to use, but more importantly, intuitive to understanding what function each button delivers. In some instances, manufacturers can also make infrared cameras for the military, where the buttons must be literally certified for battlefield conditions. FLIR has done a good job transferring the ease-of-use and durability it puts into its military-grade infrared cameras into its commercial infrared cameras. In addition to improving ease-of-use, it can also be more relevant in harsh manufacturing or extreme heat/cold weather environments.

It's critical that you get a demo and walk through the various day-to-day activities you will perform: saving an image, downloading to your PC, creating a simple report. Why? Because until you see firsthand how many clicks and steps it will take you with any given infrared camera/software package, you will never know if the system will work well for you. Some infrared cameras require multiple steps to do a simple task, and some simple operations can be buried deep within some difficult-to-use menus. Get a demo on the basic functions – or you could be significantly increasing the day to day difficulty – not to mention frustration – you will run into after you've bought your infrared camera.

Point #6: Buy an infrared camera that incorporates a mega pixel visual camera with a built-in illuminator lamp to help clearly document your work.



Infrared cameras see in total darkness but visual cameras, as we all know, require well lighted conditions and high resolution to generate clear, sharp pictures.

Would you buy a digital camera to take family pictures without a flash? Of course not! Why? Because you know you're going to run into situations where night is approaching, or the room just isn't well lit. If you're in a commercial environment, you're going to run into these situations more, not less.

These pictures say a thousand words. It's the same target.

The image on the right is taken with an infrared camera with, essentially, some "headlights" mounted on it – the "target illuminator," as many thermographers would call it.



The visual image on the left is the same target taken with a camera with no illuminator lamp. You can clearly see the difference.

Point #7: Buy an infrared camera with a built-in laser pointer.

Safety, convenience and ease-of-use are all good reasons to buy an infrared camera with a built-in laser pointer. These tend to be available on all cameras, except for the most basic, entry level models.

Safety is always the best reason to spend a little more on the right tool. If you shouldn't be touching the target you're looking at with an infrared camera – say for example, an electrical box, motor, pump or something when viewed from a ladder – then the laser pointer helps you in two important ways.

The laser pointer keeps your hand free and clear from danger while allowing you to point to the area of concern to a co-worker (or supervisor or customer) standing nearby. It allows more than one person the ability to fixate on the problem in front of them.

Secondly, the laser pointer helps you orient yourself in relation to the target. This is particularly true if you are standing more than 10' away from the target. It answers your internal question: "now, what is the camera looking at specifically?" The laser pointer allows you to see precisely where the infrared camera's lens is focused. It's also ideal in gaining more orientation in dark environments, even if you're standing closer to the target.

There are many analogies here, but to go back to the consumer world it's like having a dishwasher or microwave. Can you imagine not having these "tools" in your kitchen. If you speak with thermographers who have built-in laser pointers on their infrared cameras, they will tell you "they couldn't imagine working without it." Enough said.

Point #8: Buy an infrared camera with software upgrade potential.

Today, most infrared cameras come with free software to help you analyze your images and create reports. By all accounts, they are a helpful tool made all the more necessary by both the corporate need to document findings, but also increasingly to use thermal images and reports to substantiate or trigger insurance claims, while the reports themselves are often sold to commercial and consumer customers for a wide range of inspections: energy audits, electrical inspections, gas detection surveys, building envelope analyses and predictive maintenance surveys.

While these entry-level freeware programs are helpful and useful, many individuals quickly find that they need more software functions. What's important to note here is you don't want to buy a camera and then, after a few months of using it, decide that you're now ready to do more but only then be limited because there is no upgrade path.

Buy your second boat first!

Why do I say that? Well, to anyone who has ever bought a boat this is a common theme. The reason is simple. To someone new to boating, it is easy to think "I'll buy a small boat without all those built-in electronics. I just want to get started. It's going to take some time for me to get accustomed to all this anyways."

Our friend here, let's call him Joe, has a good point. The problem is Joe is going to get his boat and after a few weeks, he's going to be pretty comfortable with using it. A few more weeks after that, Joe's going to have it down pat. A few weeks after that Joe's going to be bored with his purchase and frustrated because he can't really upgrade his boat without spending a lot of money; enough money that makes him think he made the wrong purchase decision and now he has to try to sell his now-used boat if he wants to go out and buy a new boat with the features and functionality he now wants.

Joe's not alone. We've all been there.

There are a couple of points here that you really should think about. First, you should at least get a demo for the infrared camera that's one level above what you're currently thinking about buying. Of course it will cost more money, but don't just skip over the thought process based solely on price. Know what features and functions you're giving up if you buy the less costly model. Even if you end up buying that less costly, lower-end model you will know what you're missing and this, in and of itself, is an education in infrared. So yes, you should consider buying your second infrared camera first.

But, more to our original point, if you buy the less expensive model and you know that, like a boat, you can't upgrade the hull or the "chassis." But, unlike a boat, an infrared camera's "hull" or "chassis" is really related to the fundamental quality of engineering design and manufacture, which means you can upgrade its functionality quite a bit with the purchase of some new add-on software.

We don't have time and space here to go through all the things you can do with this new software, and this table below doesn't do justice to all the great things you'd be able to do, but here it is for reference. When you get a demo, you can always ask to see the software upgrade and its features and functionality. Ok, here's the chart:

| ITEM DESCRIPTION | FREE SOFTWARE | UPGRADED SOFTWARE |
|----------------------------|---------------|-------------------|
| Word Document | Yes | Yes |
| Image manipulation in word | No | Yes |
| Instant report generation | No | Yes |
| Movable PIP/Fusion | No | Yes |
| Report Customization | No | Yes |
| Trending | No | Yes |
| Archiving | No | Yes |
| Formulas | No | Yes |
| Arrow Tool | No | Yes |
| Digital Zoom | No | Yes |

Point #9: Buy an infrared camera with enhanced image fusion capabilities.

There's been a lot of buzz about fusion capabilities with infrared cameras. Our thinking on fusion is if it doesn't offer you more than just putting a fixed Picture-in-Picture (PiP) thermal overlay "box" over your visible image, then it may be more useful not to have it at all.

Instead, be sure that that you can do basic image manipulation, such as being able to move the "thermal box" around, or even make it bigger or smaller. More advanced fusion capabilities allow you to stretch and resize the thermal Pip using a stylus pen right onscreen, allowing you to customize your fusion to the exact target your looking at. This can be ideal for analyzing the problem, and it also just makes your infrared pop! For those who need to present documentation to supervisors or customers, this enhanced fusion capability will really make a favorable impact.

At its most advanced level, some infrared cameras allow you to "dial-in" a combination of visible and thermal imaging into one composite image. This can produce exceptional results and exceeding smart reports.

Rule of thumb: if you're looking at an infrared camera with built-in fusion capabilities, be sure you can move and resize the thermal box in the middle of the LCD display.

It's like a pair of bifocal eyeglasses. The top half lets you see clearly far away, while the bottom half is useful for close-up reading. You "resize" by looking up or looking down and they work great. But imagine if they put the close-up lens right in the middle of a normal pair of eyeglasses! And everywhere you look, there's this box in the middle and it gets in the way of everything you view. It wouldn't be useful. It would likely become annoying and you would want to turn it off.

That's why we say if the infrared camera you're looking at has a fixed box showing you a thermal overlay to your visual image and you can't move or resize that box, then don't buy it. You can easily do better.

FLIR has created a great video, and it really shows clearly what this is all about. You can view it at www.goinfrared.com/fusion.

Point #10: Buy an infrared camera with a wide temperature range.

Here's an easy one. When you buy an infrared camera, be sure that the temperature range it operates in is sufficient with the temperatures of the targets you will be viewing.

You don't want an infrared camera that can't measure the temperatures you want!

Point #11: Buy an infrared camera with upgrade potential.

This is a no-brainer for any product you buy. This author is always trying to be sure that what I buy has an upgrade path or some type of formal trade-in/trade-up program.

However, in the world of infrared cameras, it is not always possible. The engineering and sophistication of the infrared detector, robotic manufacturing techniques or specialty optics mean that some cameras can be easily upgrade whereas other can not.

Except for the least expensive cameras, however, many infrared cameras will allow you to upgrade the firmware to increase pixel counts and thermal

resolution, not to mention letting you upgrade all sorts of in-camera features and functionality. Wherever you can buy an infrared camera that allows you to upgrade in this fashion, that's a key value to you.

Why? Well, it's like you're "buying your second boat first without buying your second boat first!" It's like having your cake and eating it too – and let's face it, you don't get to do this too often!

If there isn't an upgrade path in this fashion, you should ask if the manufacturer routinely buys back used cameras in exchange for credit toward a new infrared camera purchase. You're not going to get top dollar for your used camera, but you will get a fair price.

This becomes more important when you see a feature that would substantially increase your productivity or safety – or, even help you lock-in a competitive advantage. These might be features such as buying a high definition infrared camera, or one with an embedded global positioning system (GPS), or one with a wireless remote.

There are also new infrared cameras capable of detecting gas leaks, such as volatile organic compounds (VOCs), methane, carbon monoxide and dozens of other types of gases that need to be monitored. And there are fixed-mount, auto-alarm activated cameras that are ideal for seeing through smoke, fog or complete darkness – typical conditions in many manufacturing environments. Today, fixed-mount infrared cameras are ideal for fire-safety applications in warehouses, coal piles or even waste sites, anywhere spontaneous combustion is a potential problem.

The bottom line is if you're buying from a manufacturer that has offered formal trade-in/trade-up programs, and makes all types of infrared cameras, then you're buying from a company that is in the position to continue to service all your infrared camera needs. You need a company you can grow with – or at least an infrared expert watching your back!

Point #12: Buy an infrared camera from a manufacturer with strong post-sale technical support and certified training.

If you are new to the field of infrared cameras, you will obviously want to think about customer service and technical support after you've purchased.

In addition to FLIR being the world's oldest and largest manufacturer of infrared cameras for commercial applications, they also own and run the world's largest student training organization – the Infrared Training Center or ITC.

The ITC provides training regardless of what type of infrared camera you own. They train students in all types of industries with a wide variation in applications, regardless of the make or model infrared camera you own.

If you are really unsure as to whether or not to buy an infrared camera, many have decided to enroll in training first, before they buy. It's always better to have a camera and bring it to class, but if you are really unsure, this is a great option.

The ITC prepared this "Top Ten List" of why the ITC should be your infrared training organization of choice.

- 1. ISO 9001 Registered**

No other infrared training organization in the world has this credential – the ITC is the only one!

- 2. The Best Infrared Training - No Matter Where You Are**

Whether you train at our in-house facilities in Boston or Sweden or at one of our many satellite locations throughout the world, you'll have access to our premier personnel, resources, and technology. We even offer instructor led web-based training, as well as self service web-based training.

- 3. Highest Qualified Instructors**

With more ASNT Level III and BINDT Category 3 certified thermographers on staff than any other training organization in the world, you'll have the opportunity to learn from instructors who have the highest credentials in infrared thermography.

4. **Over 100 Years Experience**

Together, our ITC instructors bring more than ten decades of practical thermography experience along with an in-depth knowledge of infrared theory.

5. **Guaranteed FLIR Factory-Authorized Training**

If you have invested in your career by purchasing a FLIR infrared camera, then receive training from the only factory-authorized training organization for FLIR thermography products.

6. **Full Color Course Materials**

Our full color training manuals help to reinforce your learning and provide an excellent resource after you leave the classroom.

7. **We Speak Your Language**

Our ITC staff provides training in more than 15 different languages, so nothing is left open to interpretation.

8. **Hands-on Software Training on Our Computers**

Along with comprehensive software training for your FLIR infrared camera, we provide computers for you to use at our state-of-the-art Boston and Sweden training locations.

9. **Simulation-Based Training**

We bring the field into our in-house applications labs at both of our Boston and Sweden training locations, so you'll gain practical experience that you can apply in the real world.

10. **InfraMation, the World's Largest IR Applications Conference**

Our annual event is jam-packed with learning opportunities designed to keep you up-to-date on the latest application innovations in the fast-moving world of thermography. Register here for InfraMation! www.inframation.org

Class sizes are purposely kept small to guarantee your access to FLIR's expert staff and research labs.

Register online at www.infraredtraining.com,
or call **1-866-TRAIN-IR** (1-866-872-4647)

SUMMARY

On behalf of this author and the entire FLIR organization, we hope this booklet has been informative, if even a bit entertaining.

We have tried our best to give you our best knowledge and helpful hints as you seek to purchase an infrared camera.

While we of course hope you will choose to buy a FLIR infrared camera, we also know that as more and more manufacturers enter the market, the choice of what to buy can become harder, if not more confusing, to make.

Like most things in life, the best decision is made when you've done your homework. This booklet gives you some straightforward ways to think about the field of infrared, how it relates to our everyday lives and what we do – but more to the point, please always ask for a demo. Get a demo in the type of application environment in which you work – not just in a conference room. Why? Because sometimes it's easy to fudge a demo in a "non-real" conference room-like environment. Lots of infrared cameras do accurate measurements in an air conditioned conference room, but will they maintain their accuracy when they are exposed to hotter or colder temperature differences in actual working conditions?

If you ask for a demo, and see firsthand how an infrared camera operates, you will have done your homework and you'll make the right buying decision.

We have a ready staff of internal experts, software and technical support technicians, direct sales engineers and application specialists, and a growing base of excellent distribution partners. We all stand by ready to answer any question you might have. So, please take advantage of what we have to offer. It's a free call and we are happy to talk to you.

What's your application?

What kind of infrared camera is best for your needs?

To speak to an infrared camera expert, please call

Ken on 021 940 801 or email at

ken@sciencedirections.com

