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FLUKE®

# VT02, VT04A, VT04

## Visual IR Thermometer

## Users Manual

October 2012, Rev.2, 4/14

## LIMITED WARRANTY AND LIMITATION OF LIABILITY

This Fluke product will be free from defects in material and workmanship for two years from the date of purchase. This warranty does not cover fuses, disposable batteries, or damage from accident, neglect, misuse, alteration, contamination, or abnormal conditions of operation or handling. Resellers are not authorized to extend any other warranty on Fluke's behalf. To obtain service during the warranty period, contact your nearest Fluke authorized service center to obtain return authorization information, then send the product to that Service Center with a description of the problem.

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To register your product online, visit http://register.fluke.com.

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# Introduction

The VT Series (the Product) are Visual IR Thermometers that combine a center-point temperature measurement with a blended digital image and heat map overlay. The thermal image removes the time necessary for component-by-component measurement associated with a traditional spot thermometer (radiometer). The Product is ideal for electrical, HVAC, and facility maintenance applications.

The recommended use model is:

1. Scan a broad area with the blended digital image and heat map overlay to quickly identify temperature anomalies that need more inspection.
2. Use the wide field-of-view to move closer to the target for a temperature measurement with more detail.
3. Capture both heat map and visual images with a single trigger pull.
4. Create a report with Fluke SmartView® software.

The Product is easy to use. Turn on and within seconds it provides an image with no training needed. Several features increase the accuracy and usability of the Product:

- Adjustable emissivity and reflected background compensation improves measurement accuracy on semi-reflective surfaces
- Hot and cold spot temperature markers that guide the user to the hottest and coldest regions in the infrared heat map
- Selectable color palettes
- Visual/heat map image alignment

The VT04A and VT04 include these additional features:

- High/Low Temperature Alarms
- Time-Lapse Image Capture
- Auto-Monitor Alarm

# How to Contact Fluke

To contact Fluke, use one of these telephone numbers:

- USA: 1-800-760-4523
- Canada: 1-800-36-FLUKE (1-800-363-5853)
- Europe: +31 402-675-200
- Japan: +81-3-6714-3114
- Singapore: +65-6799-5566
- Anywhere in the world: +1-425-446-5500

Or, visit Fluke's website at www.fluke.com.

To register your Product, visit http://register.fluke.com.

To view, print, or download the latest manual supplement, visit http://us.fluke.com/usen/support/manuals.

# Safety Information

A **Warning** identifies hazardous conditions and procedures that are dangerous to the user. A **Caution** identifies conditions and procedures that can cause damage to the Product or the equipment under test.

**⚠⚠ Warning**

**To prevent possible electrical shock, fire, or personal injury:**

- **Read all safety information before you use the Product.**
- **Carefully read all instructions.**
- **Use the Product only as specified, or the protection supplied by the Product can be compromised.**
- **Replace or recharge the batteries when the low battery indicator shows to prevent incorrect measurements.**
- **Do not use the Product around explosive gas, vapor, or in damp or wet environments.**
- **Do not use the Product if it operates incorrectly.**
- **Do not use the Product if it is damaged.**
- **See emissivity information for actual temperatures. Reflective objects result in lower than actual temperature measurements. These objects pose a burn hazard.**

- **Remove the batteries if the Product is not used for an extended period of time, or if stored in temperatures above 50 °C. If the batteries are not removed, battery leakage can damage the Product.**
- **Follow all battery care and charging instructions in this manual.**
- **Use only specified replacement parts.**
- **Use only the Fluke supplied power adapter to charge the VT04 battery.**

Table 1 is a list of symbols used on the Product or in this manual.

**Table 1. Symbols**

| Symbol | Description |
|---|---|
|  | Important information. See manual. |
|  | Hazardous voltage. Risk of electrical shock. |
|  N10140 | Conforms to relevant Australian standards. |
| CE | Conforms to requirements of European Union and European Free Trade Association. |
|  | Conforms to relevant South Korean EMC standards. |
|  **Li-ion** | This camera contains a Lithium-ion battery. Do not mix with the solid waste stream. Spent batteries should be disposed of by a qualified recycler or hazardous materials handler per local regulations. Go to Fluke's website for recycling information. |
|  | This product complies with the WEEE Directive (2002/96/EC) marking requirements. The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste. Product Category: With reference to the equipment types in the WEEE Directive Annex I, this product is classed as category 9 “Monitoring and Control Instrumentation” product. Do not dispose of this product as unsorted municipal waste. Go to Fluke's website for recycling information. |

# Before You Start

Table 2 is a list of all items included with the Product.

**Table 2. Packing List**

| Description | Part Number | Model | | |
|---|---|---|---|---|
| | | VT02 | VT04A | VT04 |
| VT02 Visual IR Thermometer | 4253599 | ● | | |
| VT04A Visual IR Thermometer | 4485211 | | ● | |
| VT04 Visual IR Thermometer | 4366444 | | | ● |
| AA Alkaline Batteries (QTY. 4) | 1560231 | ● | ● | |
| Rechargeable Battery | 4365971 | | | ● |
| Micro SD Memory Card and conversion adapter to standard SD Memory Card[1] | 4269849 | ● | ● | ● |
| Soft Transport/Storage Case | 466029 | ● | ● | |
| Transport/Storage Case | 4426115 | | | ● |
| Micro USB Charger/Power Supply | 4366918 | | | ● |
| VT Series Quick Reference Card[2] | 4477229 | ● | ● | ● |

[1] Fluke recommends the micro SD memory card that is supplied with the Product. Fluke does not warrant the use or reliability of aftermarket SD memory cards of different brands or capacities.

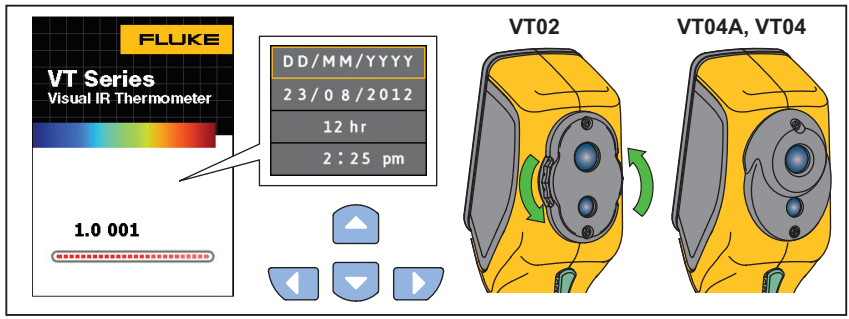
[2] Printed in English, Spanish, French, German, and Simplified Chinese. See http://www.fluke.com/vtquickstart for additional languages. To request a printed Quick Reference Card in a language not supplied with your product, email Fluke at TPubs@fluke.com. Specify the product name and language preference in the subject line.

# Power On and Off

To turn on the Product, push and hold MENU for 2 seconds. A start-up screen shows on the display and an indicator bar shows the status, see Figure 1. The indicator bar increases on power up and decreases on power down. After the start-up screen, the Product is ready to use. To turn off the Product, push and hold MENU for 2 seconds.

The LCD backlight (VT04A and VT04) turns off to save battery power if a button is not pushed for more than 2 minutes. You can push any button to turn on the backlight before the auto off time is exceeded. This feature is disabled in Alarm mode.

The Auto Off (VT04A and VT04) feature turns off the Product after a selected time interval. The default setting is 10 minutes and is user-selectable as 5, 10, 15, or 20 minutes of inactivity. This feature is disabled in Alarm mode.




hak03.eps

**Figure 1. Start-Up Screen and Status Indicator**

For the first time use, or when the batteries are removed for more than a few hours, the Date and Time menu opens. See page 19 for more information about how to set the date and time.

*Note*

*All visual IR thermometers need sufficient warm-up time for the most accurate temperature measurements. This time can often vary by model and by environmental conditions. Although most visual IR thermometers are fully warmed up in 3 to 5 minutes, it is always best to wait a minimum of 10 minutes if the most accurate temperature measurement is very important to your application. When you move a visual IR thermometer between environments with large differences in ambient temperature, more adjustment time can be required.*

# Rechargeable Battery

The VT04 has a rechargeable Li-ion battery.

*Note*

*New batteries are not fully charged. Two to ten normal charging/discharging cycles may be required before the battery charges to its maximum capacity.*

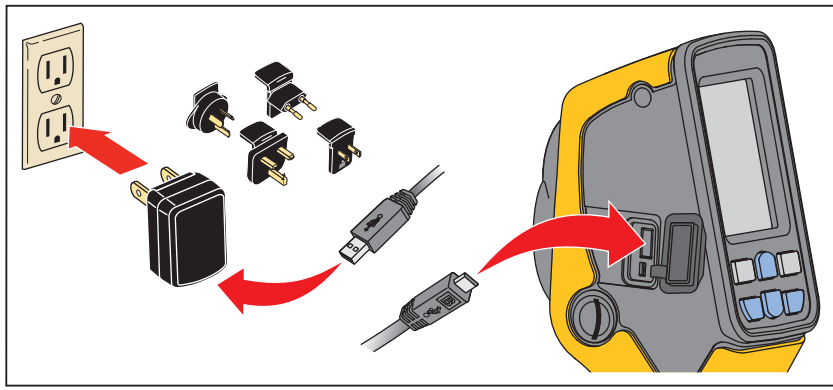
Before using the VT04 for the first time, charge the battery:

1. Plug the ac power supply into an ac wall outlet.
2. Connect the micro-USB connector to the VT04. See Figure 2.

   While the battery is charging, shows on the display and the status LED is red. When charged, shows on the display and the status LED is green. The typical charge time from 100 % discharged to 100 % charged is 5 to 6 hours.

*Note*

*Make sure the Product is near room temperature before you connect it to the charger. See the charging temperature specification. Do not charge in hot or cold places. Charging in extreme temperatures reduces the battery pack's ability to hold a charge.*



hak18.eps

**Figure 2. Rechargeable Battery**

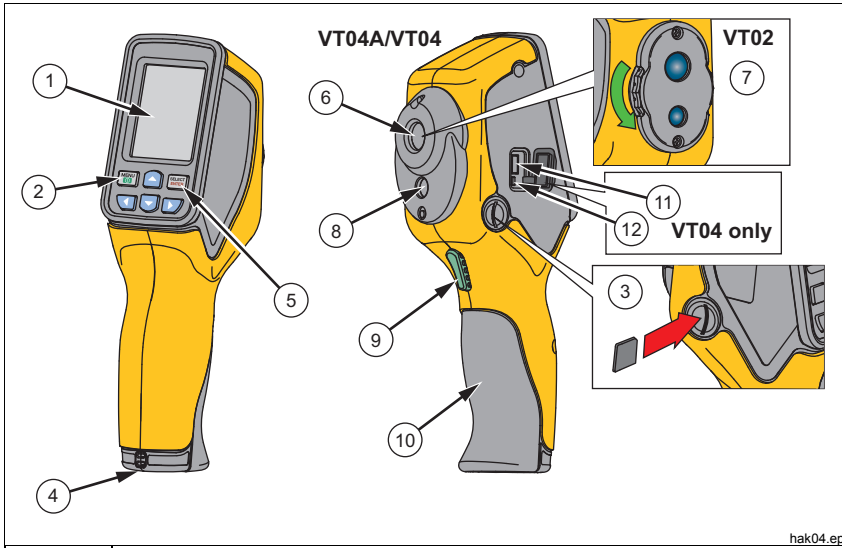
*Note*

*Use the micro SD memory card to download images from the Product to a PC. The micro-USB cable is for battery charging only.*

# Features and Controls

Table 3 is a list of the Product features with the location of each control.

**Table 3. Features**




| Item | Description |
|---|---|
| ① | LCD Display |
| ② | Power On/Off and Menu |
| ③ | Micro SD Memory Card Slot |
| ④ | Tripod Mount |
| ⑤ | Select/Enter |
| ⑥ | Infrared Lens |
| ⑦ | Rotating Lens Cover (VT02) |
| ⑧ | Visual Camera |
| ⑨ | Trigger for Image Capture |
| ⑩ | Battery Cover |
| ⑪ | Micro USB Connector (Input 2.5 W, 0.5 A at 5 V) |
| ⑫ | Battery Charge Status LED |

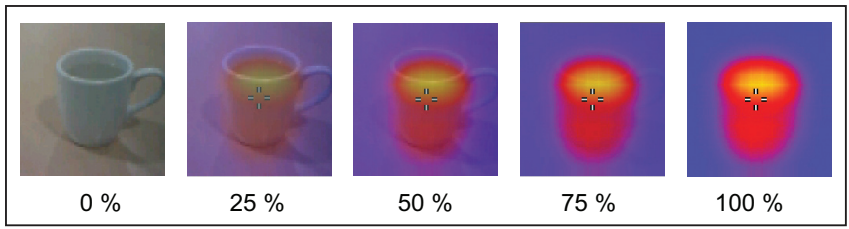
# Button Operation

Two functions are accessed directly from the buttons: Blending/Capture and Save. The arrow buttons are used for menu navigation.

## Image Blending

Image blending makes it easier to understand infrared heat maps through the use of an aligned visible image and infrared heat map. The Product captures a visible image with each infrared heat map to exactly show the target area and more effectively share it with others.

To use the blending function, push ▲/▼ to adjust the blending from 0 % to 100 %. The blend options are shown in Figure 3.




hak01.eps

**Figure 3. Blend Options**

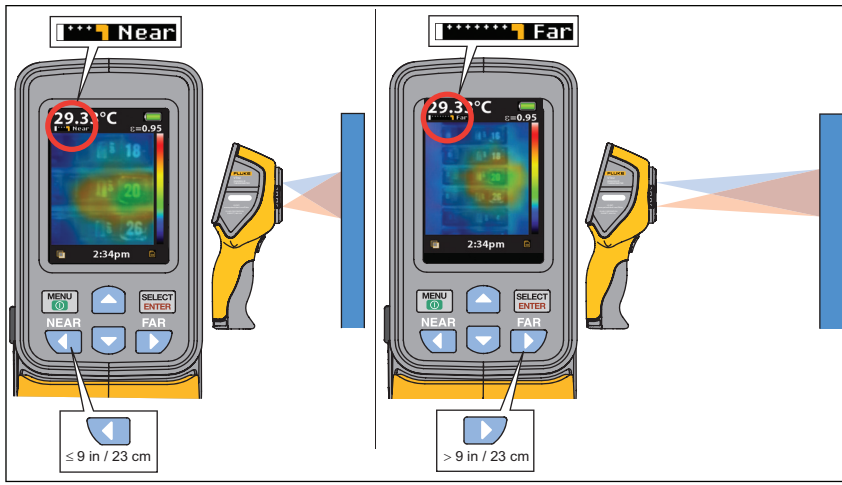
## Visual Image Alignment Control

The heat map overlay and the visual camera are positioned vertically in the VT Series. This vertical parallax will change with distance to your object. To correct the parallax for a near or far distance, you have a visual image alignment control. See Figure 4.

To toggle the control between a near object or far object:

1. Push NEAR (◀) for a measurement distance from 15 cm to 23 cm (6 in to 9 in).
2. Push FAR (▶) or a measurement distance further than 23 cm/9 in.

The Near or Far icon shows in the upper left corner of the display.




hak19.eps

**Figure 4. Visual Image Alignment**

## *Capture and Save*

The Product saves up to 10,000 images/GB on the micro SD memory card.

*Note*

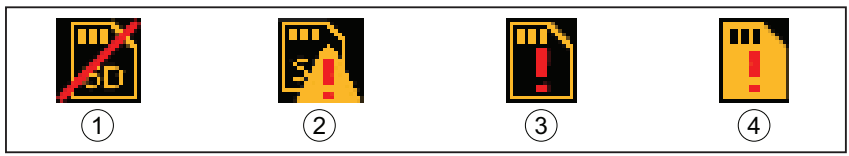
*Use the micro SD memory card to download images from the Product to a PC. The micro-USB cable is for battery charging only.*

To capture the image and save it to memory:

1. Point the Product at the object or area of interest.
2. Pull the trigger to capture the image.

   The image remains frozen for about 4 seconds. Next, a dialog box prompts you to save or discard the image.
3. Push SELECT ENTER to save or MENU to discard the image.

The display has an icon that shows the current status of the micro SD memory card, see Figure 5.




hak02.eps

**Figure 5. Micro SD Memory Card Warning Icons**

① No Micro SD Memory Card in slot

② Micro SD Memory Card error

③ Micro SD Memory Card empty

④ Micro SD Memory Card full

*Note*

*A routine file back-up procedure is recommended for the micro SD memory card to store these files in a safe location.*

# Menu Functions

To open the display menu, push MENU. The menu has options for memory, emissivity, background temperature, hot and cold markers, date, and time. For the VT04A and VT04, menu options that are set by you are saved in memory and remain as set each time you turn off and turn on the Product. At power on the start-up screen briefly shows the current settings for your review.

## Basic Navigation

The basic functions of the Product are accessible with the six buttons and color display. Only five options show on the display at one time. The ▲/▼ buttons scroll through the display menu. The middle option is always highlighted in yellow. See Figure 6.

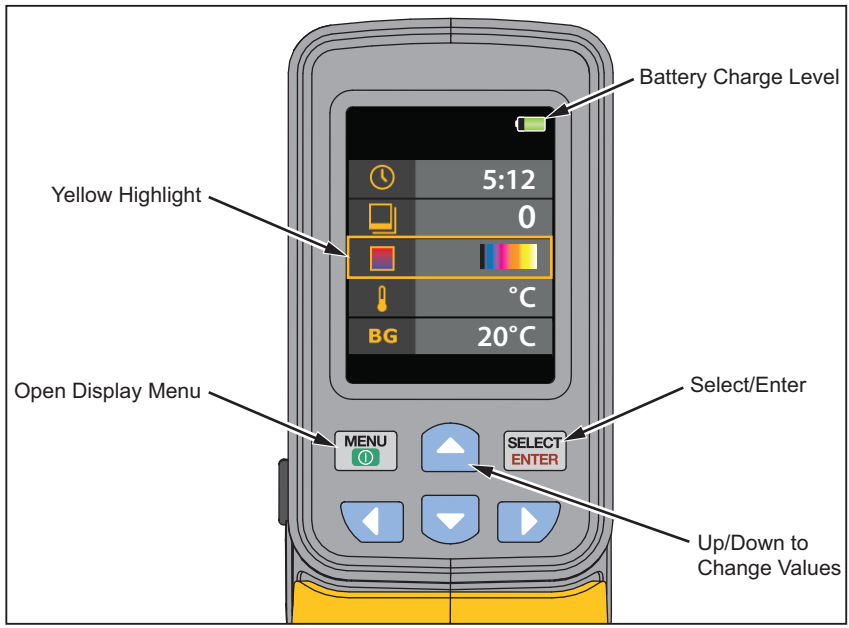



**Figure 6. Menu Navigation and Battery Icon**

Push SELECT ENTER to select the menu option and edit the value. The ▲/▼ buttons change the value of the menu selection. After adjustments are made, push SELECT ENTER to accept a new value and exit the edit mode. See Figure 7.

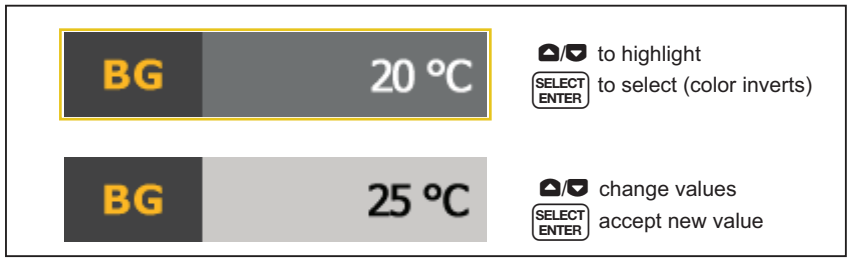
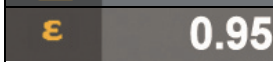
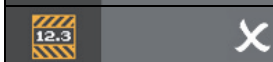
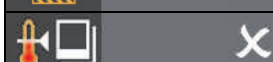
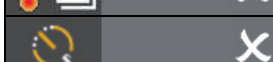
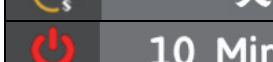
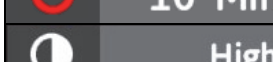



**Figure 7. Parameter Adjustment**

Table 4 is a list of the menu icons and their descriptions.

**Table 4. Menu Icons**

| Icon | Description | VT02 | VT04A VT04 |
|---|---|---|---|
|  | View Stored Images | ● | ● |
|  | Emissivity | ● | ● |
|  | Color Palette | ● | ● |
|  | Background Temperature | ● | ● |
|  | Hold and Cold Markers | ● | ● |
|  | Temperature Units | ● | ● |
|  | Clock (time and date) | ● | ● |
|  | High/Low Temperature Alarm | | ● |
|  | Auto-Monitor Alarm | | ● |
|  | Time-Lapse Image Capture | | ● |
|  | Auto Off | | ● |
|  | LCD Brightness (low, medium, high) | | ● |
|  | Save in BMP Format | | ● |
|  | Factory Reset | | ● |

## Review Memory

The Memory mode lets you view the stored images. You can also delete images in this menu.

1. Highlight the Memory icon.
2. Push SELECT ENTER to open the Memory mode.
3. Push ▲/▼ to scroll through and review the stored images.
4. Push SELECT ENTER to delete image.

## Emissivity

The emissivity is adjustable in 0.01 steps from 0.10 to 01.00. The default value is set at 0.95.

The correct emissivity values are important for you to make the most accurate temperature measurements. Emissivity of a surface can have a large effect on the apparent temperatures that the Product observes. Understanding the emissivity of the inspection surface can, but not always, allow you to obtain more accurate temperature measurements.

Go to http://www.fluke.com/emissivityexplanation for more information on emissivity and how to get the most accurate temperature measurements.

Go to http://www.fluke.com/emissivity for a chart that shows emissivity values of common materials.

## *Temperature Measurement*

All objects radiate infrared energy. The quantity of energy radiated is based on the actual surface temperature and the surface emissivity of the object. The Product senses the infrared energy from the surface of the object and uses this data to calculate an estimated temperature value. Many common objects and materials such as painted metal, wood, water, skin, and cloth are very good at radiating energy and it is easy to get relatively accurate measurements. For surfaces that are good at radiating energy (high emissivity), the emissivity factor is ≥90 % (0.90). This simplification does not work on shiny surfaces or unpainted metals as they have an emissivity of <60 % (0.60). These materials are not good at radiating energy and are classified as low emissivity. To more accurately measure materials with a low emissivity, an emissivity correction is necessary. Adjustment to the emissivity value will usually allow the Product to calculate a more accurate estimate of the actual temperature.

*Note*

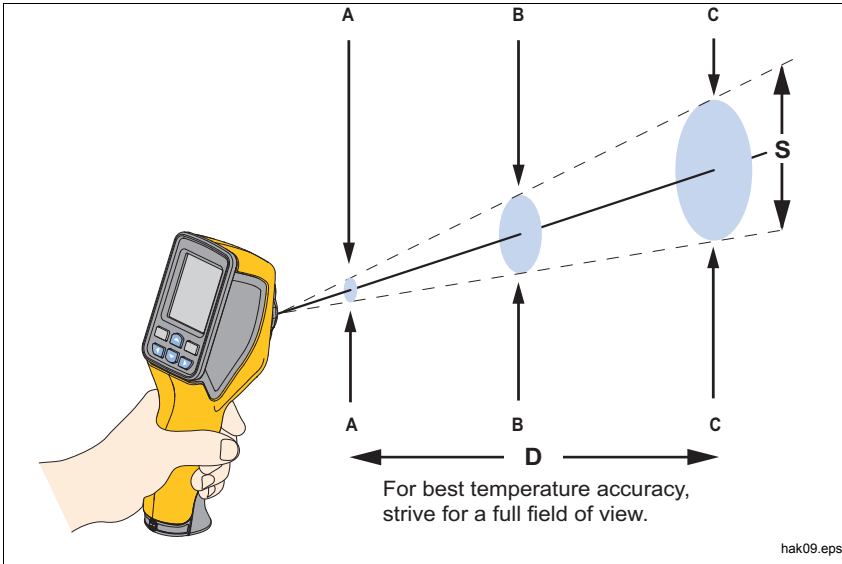
*Surfaces with an emissivity <0.60 make reliable and consistent determination of actual temperatures problematic. The lower the emissivity, the more potential error is associated with the temperature measurement calculations of the Product, even when emissivity and reflected background adjustments are attempted and performed properly.*

**⚠ Warning**

**To prevent personal injury, see emissivity information for actual temperatures. Reflective objects result in lower than actual temperature measurements. These objects pose a burn hazard.**

Table 5 shows the distance to area ratio (D:S) for measurement accuracy.

**Table 5. Temperature Measurement Accuracy**




| Model | D:S | A | B | C |
|---|---|---|---|---|
| VT02 | 6:1 | 38 mm @ 230 mm | 60mm @ 360 mm | 100 mm @ 600 mm |
| | | 1.5 in @ 9 in | 2.4 in @ 14.5 in | 4 in @ 24 in |
| VT04A<br>VT04 | 9:1 | 26 mm @ 230 mm | 40 mm @ 360 mm | 67 mm @ 600 mm |
| | | 1 in @ 9 in | 1.6 in @ 14.5 in | 2.7 in @ 24 in |

Figure 8 shows how the D:S ratio compares on-screen for both models. The higher the ratio, the smaller the target area needs to be for an accurate measurement. Figure 9 illustrates the detection ability.

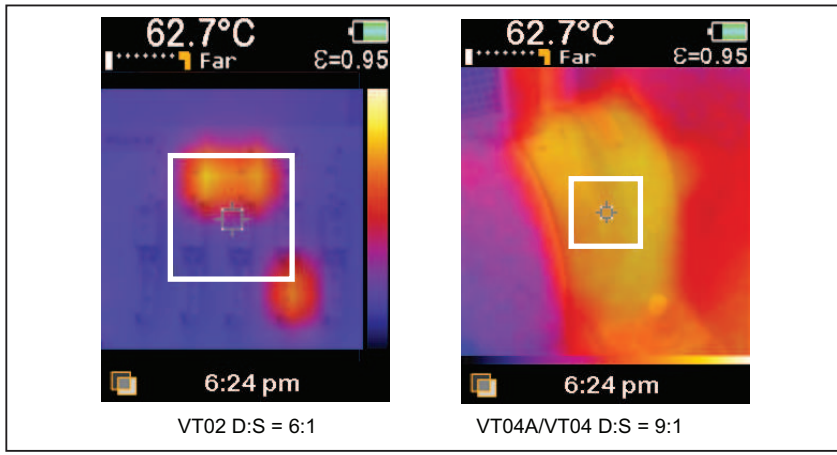
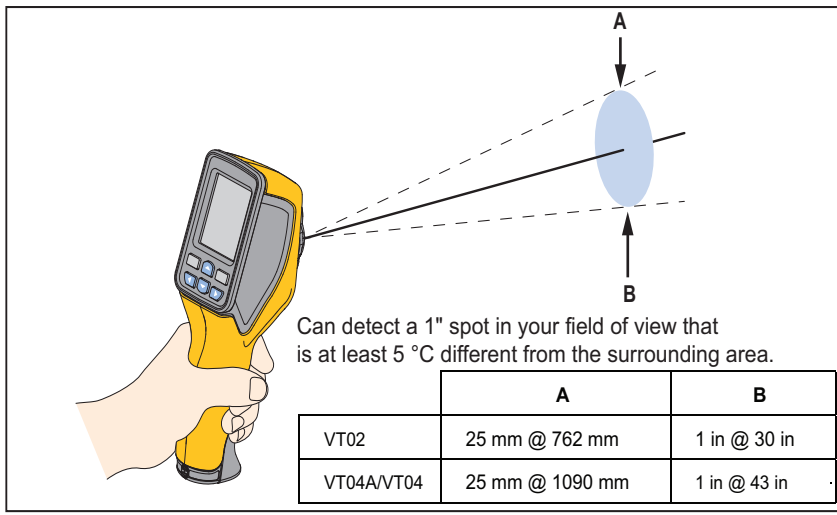



**Figure 8. On-Screen Comparison of D:S Ratio**




| | A | B |
|---|---|---|
| VT02 | 25 mm @ 762 mm | 1 in @ 30 in |
| VT04A/VT04 | 25 mm @ 1090 mm | 1 in @ 43 in |

**Figure 9. Detection Ability**