FLUKE®

Food Safety
Temperature Measurement

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Why measure food temperature?

Monitoring food temperature is essential to **keep it safe** for consumption.

And—**it's required** by the Food and Drug Administration (FDA).

The good thing is, new thermometers make monitoring food temperature 20 times faster than it used to be.

The FDA recommends measuring food temperatures during food receiving, storing, cooking, serving, cooling and reheating.

Doing so:

- Increases **product quality** and consistency

- Reduces liability

- Greatly reduces waste

This booklet explains the FDA guidelines and provides tips for taking temperature measurements with Fluke FoodPro food safety thermometers.

Infrared vs. contact measurement

Food safety standards require you to measure the surface temperature of food as well as the internal temperatures, depending on the circumstances.

Infrared thermometers allow you to scan food products and quickly read their surface temperatures.

A thermometer with a **temperature probe** allows you to pierce food product and measure the internal temperature.

To save time, use a thermometer that can make both kinds of measurements.

Thermometer options	
Infrared	**Contact**
Surface temperature only	Core temperature
Good for quick, surveys of multiple points and moving objects	Must wait for probe to stabilize
Low hygiene risk	Must be cleaned between measurements
No impact on product	Pierces product/ packaging

Infrared measurement
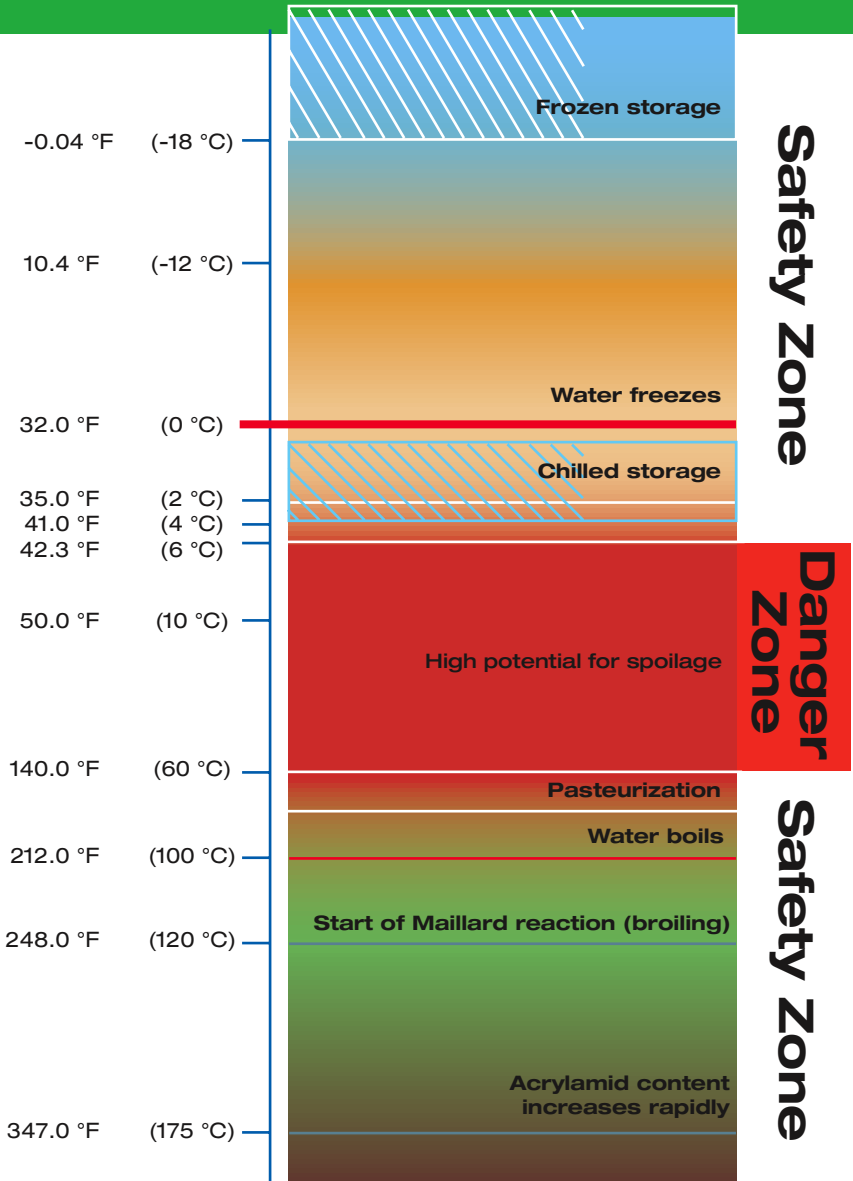

Contact measurement

HACCP
Federal guidelines

HACCP stands for Hazard Analysis of Critical Control Points.

The **FDA recommends HACCP guidelines** to foodservice professionals and institutions for controlling the temperatures that product should be stored, cooked, or cooled to, as well as the length of time food products can safely remain at specific temperatures.*

HACCP is now mandated for meat, poultry, and seafood production plants, as well as fruit and egg process plants.

*Source: US Department of Health and Human Services, Public Health Service, Food and Drug Administration, 1997 Food Code, Annex 5; HACCP Guidelines

Frozen storage

-0.04 °F   (-18 °C)

10.4 °F   (-12 °C)

Water freezes

32.0 °F   (0 °C)

Chilled storage

35.0 °F   (2 °C)
41.0 °F   (4 °C)
42.3 °F   (6 °C)

50.0 °F   (10 °C)

High potential for spoilage

140.0 °F   (60 °C)

Pasteurization

212.0 °F   (100 °C)

Water boils

Start of Maillard reaction (broiling)

248.0 °F   (120 °C)

**Acrylamid content
increases rapidly**

347.0 °F   (175 °C)

Safety Zone

Danger Zone

Safety Zone

HACCP steps to follow:

- Analyze hazards
- Identify critical control points
- Establish preventive measures with critical limits for each control point
- Establish procedures to monitor the critical control points
- Establish corrective actions to be taken when monitoring shows that a critical limit has not been met
- Establish procedures to verify that the system is working properly
- Establish effective record keeping to document the HACCP system

Critical control points

A critical control point (CCP) is any place along the food flow where time/temperature issues are critical to ensure food safety. **Monitor your food temperature at all points.**

Most of these points can be quickly measured using a non–contact, infrared thermometer.

CCP: Receiving

When a delivery of fresh or frozen food arrives, take infrared measurements to verify that the products, shipping crates, and internal temperature of the delivery truck are within the safety zone.
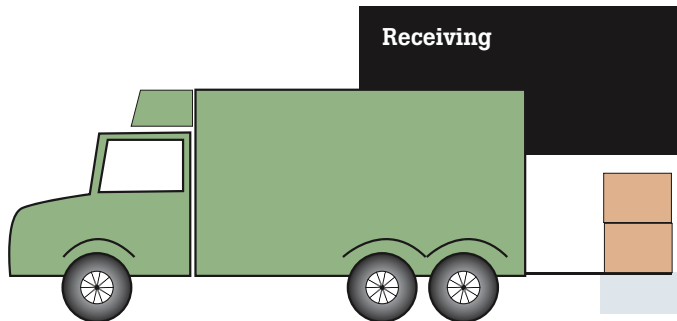
Receiving

| Selected receiving temperatures	
Fresh meat	< 40 °F (5 °C)
Poultry (frozen)	< 0 °F (–18 °C)
Raw ground meat	< 40 °F (4 °C)
Delicatessen	< 40 °F (5 °C)
Milk products	< 10 °F (10 °C)
Baked goods (cream-filled, unheated)	< 40 °F (5 °C)
Frozen foods	< 0 °F (–18 °C)
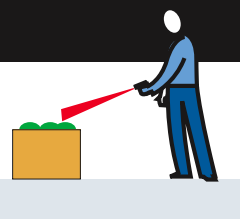
CCP: Storage

Once received, verify that frozen and chilled foods are stored at or below 40 °F (4.4 °C) to assure freshness and quality.

In supermarkets where product may be stacked unevenly or too high in display cases and freezers, **check to find warm spots or uneven cooling.**

Infrared thermometers make it quick and easy to regularly monitor temperatures of items stored in walk-ins.
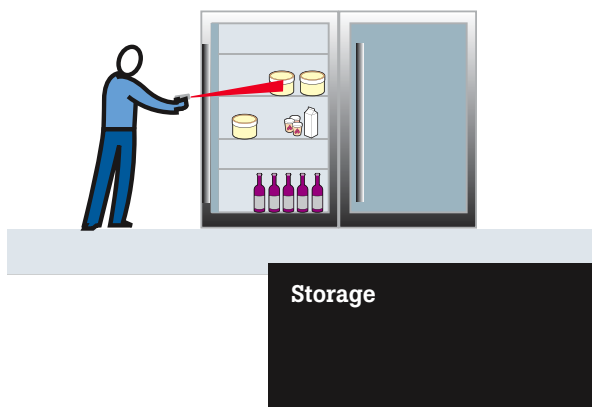
Storage

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Selected food storage temperatures	
Fresh meat	35 °F to 39 °F (2 °C to 4 °C)
Fresh poultry	35 °F to 39 °F (2 °C to 4 °C)
Raw ground meat (shelf life critical factor)	35 °F to 39 °F (2 °C to 4 °C)
Milk products	33 °F to 39 °F (1 °C to 4 °C)
Fresh fish	35 °F to 38 °F (2 °C to 3 °C)
Frozen foods	0 °F (–18 °C) and under
Ice cream	0 °F (–18 °C) and under

CCP: Cooking

During cooking, exact temperatures can be vital to preventing food–borne illness. To avoid bacteria growth, **many foods must be cooked to a specific temperature before serving.**

An infrared thermometer confirms that your surface temperatures are within the safety zone. To confirm internal temperatures, use a thermometer that includes an internal probe.
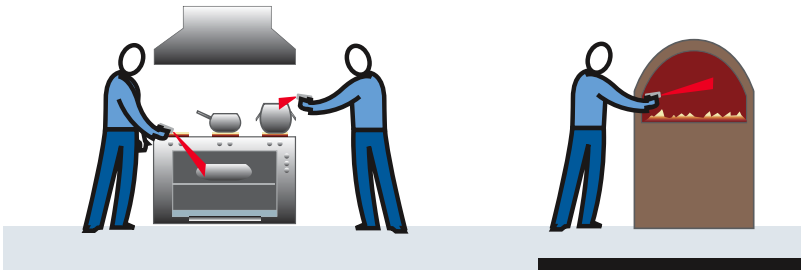
Cooking

| Selected internal food temperatures	
Ground products	
Hamburger	160 °F (71 °C)
Chicken, turkey	165 °F (74° C)
Beef, veal, lamb roasts & steaks	
Medium-rare	145 °F (63 °C)
Medium	160 °F (71 °C)
Well-done	170 °F (77 °C)
Poultry	
Chicken, whole and pieces	180 °F (82 °C)
Turkey, unstuffed	180 °F (82 °C)
Whole	180 °F (82 °C)
Breast	170 °F (77 °C)
Dark meat	180 °F (82 °C)
Eggs	
Casseroles	160 °F (71 °C)
Sauces, custards	160 °F (71 °C)

Tip: Frequently check the temperature of deep fryers to prevent the formation of acrylamids.

CCP: Holding and serving

Food products that are ready to be served or sold and are located in holding or serving areas must be kept out of the Temperature Danger Zone: 40 °F to 140 °F or 4.4 °C to 60 °C.

Cold Holding. Use an infrared thermometer to verify that the temperature of products held in open–top refrigeration units, such as fresh meat or fish displays, buffets, or preparation units, does not exceed 40 °F (4.4 °C).

Warm Holding. Warm prepared foods that are kept in steam tables, warming ovens, and other heated serving and holding areas should be carefully monitored to remain at 140 °F (60 °C) or above.
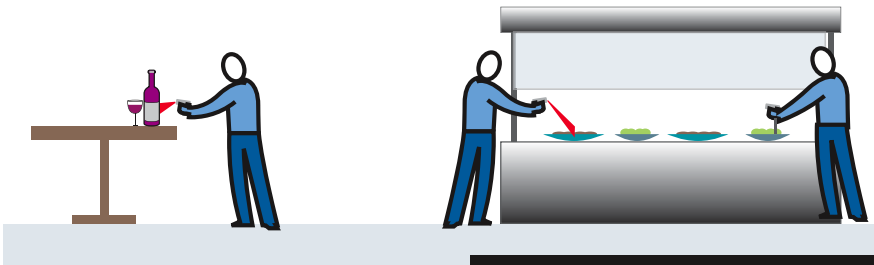
Holding and serving

Tips:

- To use an infrared thermometer to check the internal temperatures of soups and other liquids, agitate them before reading.

- Remember to monitor exposure times in serving areas, as well as temperatures

- Thermometers with quick response time (half a second) can take multiple readings in rapid succession. For example, you can scan a buffet line to ensure all hot holding pans are at a safe serving temperature.
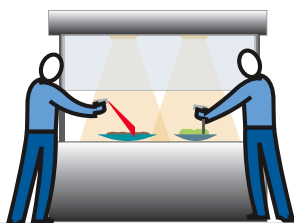
CCP: Cooling

Improper cooling is the number one cause of food-borne illness. After food has been cooked and served use an IR thermometer to confirm that leftovers are:

- Taken from above 140 °F to below 70 °F (60 °C to 21.1 °C) within two hours
- Taken down to below 40 °F (4.4 °C) within another four hours

CCP: Reheating

The last important temperature–related checkpoint is reheating.

Your infrared thermometer can confirm that foods are being reheated to at least 165 °F (73.9 °C) to **destroy any bacteria caused by improper cooling or storage techniques.**

Equipment maintenance and control

Is your equipment operating within the specified temperature range?

Examine your cleaning, cooling and cooking equipment with an infrared thermom–eter. Compare the recommended operating temperature with the actual reading on your thermometer, and adjust the equipment settings accordingly.

Infrared thermometers can also detect hot spots or leaks in equipment and pipes. Take sample readings of:

- Freezers, walk–ins, refrigeration lines, compressor motors, electrical and HVAC equipment
- Ovens, ranges, rotisseries, deep fryers and dishwashers
- Freshly washed dishes

**Verify whether temperatures are appropriate and look for variations** from the norm.

Cleaning and disinfection temperatures and concentrations

Cleaning and disinfection solutions only achieve their full effectiveness when they are **used in the right concentration and at the recommended temperature.**

Check the temperature of the water and cleaning and/or disinfection solution during the cleaning process to make sure that it meets requirements.

Temperature is especially important when cleaning residue from burnt-on protein or starch-rich foods, as well as fats, which are difficult to remove at lower temperatures.
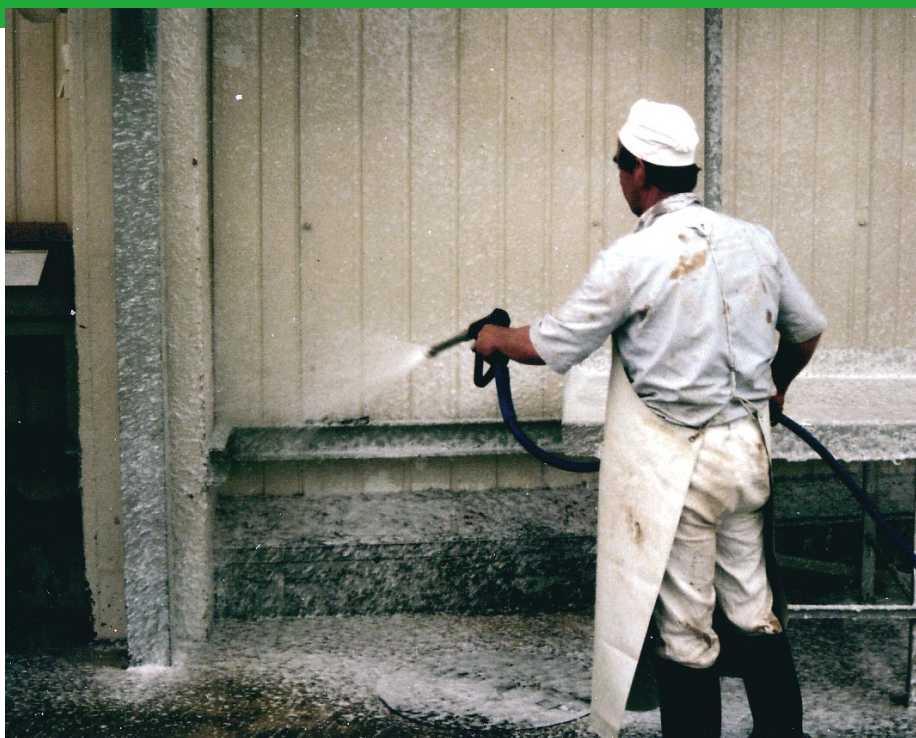
FoodPro Thermometer
The first line of defense

The Fluke FoodPro non–contact thermometer is the first line of defense against improper receiving, storage and holding temperatures.

This **easy to use, fast and accurate surface temperature scanner** allows workers to make frequent non–contact temperature measurements much faster than contact units and without fear of cross contamination.

FoodPro non–contact thermometer

Range	–20 °F to 200 °F (–30 °C to 200 °C)
Accuracy	± 2 °F (± 1 °C)
Response time	< 500 ms
Measurement distance (rec'd)	1 in to 10 in (25 mm to 250 mm)
Power supply	one AA battery
Sealing IP54	washable but not submergible
Warranty	2 years, limited

For complete specifications, please visit www.fluke.com

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FoodPro Plus Thermometer
The total temperature solution

Includes three functions:

1. **Infrared measurement**
2. Internal measurement using **contact probe**
3. **Timer** for controlling time–dependent processes

Also includes a dual–reading display showing the highest scanned temperature alongside the current reading. The field replaceable probe does not need recalibration.

FoodPro Plus thermometer

Non–contact Infrared	
Range	–30 °F to 525 °F (–35 °C to 275 °C)
Accuracy	± 2 °F (± 1 °C)
Response time	< 500 ms
Measurement distance (rec'd)	1 in to 10 in (25 mm to 250 mm)
Contact Probe	
Range	–40 °F to 400 °F
Accuracy	± 1 °F (± 0.5 °C)
Response time	7 to 8 seconds
Other	
Timer range	10 seconds to 8 hours
Power supply	one 9 V battery
Sealing IP54	washable but not submergible
Warranty	2 years, limited

Using thermometers

The FDA recognizes that quick scans of surface temperatures with an infrared thermometer facilitates general food safety:

"The infrared thermometer quickly registers surface temperatures, which facilitates general food safety system surveillance by allowing the scanning of numerous food temperatures over a short period of time." *

Having an **HACCP Check feature on your thermometer makes inspections 20 times faster.**

- A green light indicates safe hot and cold holding temperatures.

- A red light indicates potentially dangerous food temperatures.

1999 Federal Food Code, Annex 4, Section 8.

Infrared measurement tips

- Measuring shiny surfaces is difficult with non-contact (infrared) thermometers, because of the reflection. Paint a dark circle on shiny surfaces you wish to measure, to get an accurate reading.

- For locations that need to be maintained at a particular temperature, write that temperature on stickers and place them at each site for comparison.

- When measuring, get as close as possible to the target, without touching it.

- Steam, dust, smoke, and a dirty lens can all obstruct accurate infrared measurement.

- Measure internal temperatures of liquids by agitating the product; measure internal temperatures of hot or cold line checks by moving product 1 inch (25 mm) down and aim into gap.

Food safety training points

Educate
Make sure employees know the Danger Zone:
40 °F to 140 °F (4 °C to 60 °C)

Monitor
Strictly and frequently review hot and cold food product temperature requirements

- Minimize the time products are in the "Danger Zone"
- Foods left in the danger zone for more than 2 hours must be discarded, even if they look or smell fine
- If the temperature is above 90 °F (32.2 °C), the limit drops to 1 hour

Enforce
Correct improper storage and/or serving temperatures immediately

Scan
Quickly scan surface temperatures
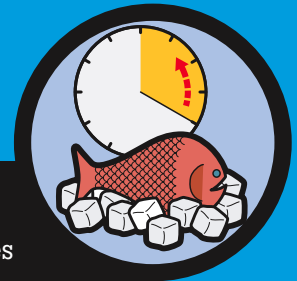without cross–contamination
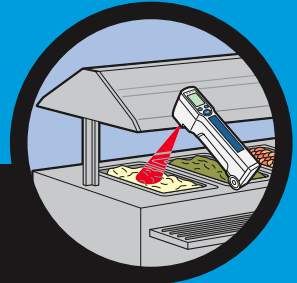
Probe
Verify internal temperature measurements
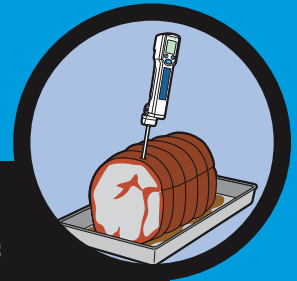
Time
Monitor cooking, cooling and holding times

Automatic HACCP lights

LEDs on the Fluke FoodPro thermometers automatically tell you whether food is in the danger zone.

18°C

Safer	**Danger Zone**	**Safer**
Chilled and Frozen Storage	Ripening Fermenting Warming–Cooling	Pasteurization Sterilization Conservation Warm Holding
Microorganism growth inhibited	Heavy growth of microorganisms	Microorganism growth inhibited or destroyed
4 °C	4 °C to 60 °C	60 °C
40 °F	40 °F to 140 °F	140 °F

Fluke. *Keeping your world up and running.*