Be sure. testo

The right way to measure.

Important tips on the operation and maintenance of the testo 104-IR

Preparation

Laser warning

Do not look directly into the laser. This can cause blindness.

Measuring methods

Measure without contact or with the contact probe.

Distance

Do not measure from distances > 1 m with the infrared system

Measuring range

The two laser spots show the exact limits of the measurement area. Ensure both laser spots are positioned on the measurement object.

Penetration measurement

For penetration measurement, insert minimum 3 cm.

IR measurement

Positioning

Point the infrared side of the measuring instrument at the object to be measured and switch on with the [▲] button.

Measurement

Press and hold the [▲] button, and continue pointing the laser at the measurement object (2 secs. sufficient).

Evaluation

Release button:

- Measurement result is frozen [Hold]. Switch through measurement values of last measurement with [Hold/Min/Max] button.

Tip: If the IR temperature measured exceeds the limit value, a penetration measurement must be carried out in order to determine the core temperature.

Penetration measurement

Switching on

Penetration mode: Fold out probe or press the [▼] button (if probe already folded out).

Preparation

Insert penetration probe into measurement object.

Tip:
Hold two identical measurement objects together and place the penetration probe between the two objects. Does not damage the goods!

Measurement

Auto Hold activated:

- Audible signal indicates end of measurement, Auto Hold and final value are shown in display.

Auto Hold deactivated:

- End measurement by pressing [Hold] button. Final value is displayed.

Evaluation

Switch through measurement result measurement values of last measurement with [Hold/Min/Max] button.

Care and maintenance

Cleaning

Clean instrument under running water with mild detergent.

Cleaning lens

Wet lens carefully with water or surgical spirit, and clean with a cotton swab.

Hazard Analysis and Critical Control Points

Hazard analysis and critical control points

Why HACCP?
The objective of this concept is to minimize food-related illnesses.
Food should be made safer for the consumer.

Which factors promote food-related illnesses?
- Globalization (raw products/import/export)
- Convenience products (semi-cooked products)
- Factory farming (salmonella)
- Mass tourism (unhygienic work, time pressure)
- Fast food, too many “producers” (street food)

In order to identify whether a food may become dangerous, we should ask ourselves the following questions:
- Does the product contain sensitive ingredients?
- Is it intended for sensitive target groups (the aged, the sick, infants etc.)?
- Are preventive programmes or preventive measures provided for in the manufacturing process in order to exclude risks or minimize them?
- Are there potentially toxic basic substances present (fungi, spores, proteins)?

7 principles of the HACCP concept

The Codex Alimentarius is the basis of the HACCP concept.
Self-monitoring is a key point in this.

The 7-point program supports effective implementation.

1. Determination of the relevant hazards (hazard analysis)
2. Identification of critical control points (= CCP)
3. Definition of limit values (only for CCPs)
4. Definition and implementation of efficient monitoring
5. Specification of corrective measures
6. Production of documents and records (documentation)
7. Definition of regular verification processes (self-monitoring obligation)

The HACCP concept makes a distinction between critical points and critical control points.

Critical points (CP)
= points in the process which do not pose a health risk, but can be regarded as critical in the procedure; e.g. quality parameters, compliance with specifications, identification.

Critical control points (CCP)
= points at which there is, in all probability, a relevant health risk to the consumer as long as this point is not fulfilled (i. e. controlled) e.g. heating steps, sufficient cooling, monitoring of foreign bodies.

Obligations of the food trader

Who is a food trader?
A food trader is anyone involved in activities relating to the production, processing or sale of foods.

The central element of the obligations

Documentation:
Food traders have an obligation to prove to the relevant authorities that they are conforming to the requirements of the regulation. They must ensure that the documents are up-to-date at all times, and that they are stored for an appropriate length of time.

Training: Food traders must ensure the following:

1. Company employees handling foods are monitored in accordance with the nature of their work and are instructed and/or trained in food hygiene.

2. People responsible for the development and application of this regulation or for the implementation of pertinent guidelines are given appropriate training in all areas of applying the HACCP principle, and

3. All requirements of national laws regarding training programmes for employees in certain food sectors are complied with.

Obligations of the food trader

Traceability
The food and animal feed traders must be able to prove when, where and by whom the goods were harvested, produced, processed, stored, transported, consumed or disposed of.

Upstream:
Tracing to the original producer, e.g. the farm.

Downstream:
Traceability from the producer via several processing and trade steps to the shop, and so to the consumer.

Compliance with the cold chain: In the case of foods which cannot be stored at room temperature without potential problems, the cold chain must not be interrupted.

- Any deviations (e.g. during loading and unloading) are only permitted within certain limits (maximum +3 °C) and for a short period of time.
- In means of transport (e.g. containers cargo holds of trucks) larger than 2 m^3, or refrigerated storage areas larger than 10 m^3, the temperature must be recorded.
- The measuring instruments used must be calibrated at regular intervals.

Temperature limit values – Incoming Goods

In Incoming Goods, the result of the checks must be documented in the lists provided for this purpose. If the limit values have been exceeded, the goods must be rejected. This must be confirmed by the signature of the supplier (driver).

Important temperature limit values	Incoming goods
Meat, fish – deep-frozen	≤ -18 °C
Deep-frozen products	≤ -18 °C
Ice cream	≤ -18 °C
Meat, fish – frozen	≤ -12 °C
Fresh fish	≤ 2 °C
Minced meat (from EU businesses)	≤ 2 °C
Meat preparations (prepared and sold on site)	≤ 2 °C
Offal	≤ 3 °C
Fresh poultry, rabbit, hare, small game	≤ 4 °C
Meat preparations (from EU businesses)	≤ 4 °C
Meat preparations (prepared and sold on site)	≤ 4 °C
Fresh meat (hoofed animals, large game)	≤ 7 °C
Cooked meat products, delicatessen	≤ 7 °C
Smoked fish	≤ 7 °C
Baked goods with incompletely baked filling	≤ 7 °C
Baked goods with incompletely baked filling	≤ 7 °C

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Incoming Goods measurement in 3 steps

How do I measure correctly?
The most accurate measurement is always a core temperature measurement, i.e. a penetration probe measures the temperature in the interior of the refrigerated goods.
Disadvantage: The packaging can be damaged.

In order to avoid this, a three-stage process has been established in practice:

1. First of all, an infrared measuring instrument is used to scan the surfaces. If the temperature is clearly within the “green range”, the test is finished. Example: The yoghurt pots have a temperature of 5°C (Target: maximum 8 °C).

2. Is the temperature of some yoghurt pots over 8 °C? Then a contact probe is inserted between two yoghurt pots and a measurement taken. This measurement is also non-destructive.

3. Is the temperature still too high? Then a penetration measurement is finally carried out on one or more pots. The probe is inserted through the lid into the foodstuff and thus measures the correct core temperature.


Infrared measurement


Contact measurement


Penetration measurement

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Temperature limit values – food production, food service

The most important measurement parameter in food production and service is the temperature. It is measured not only in the foods (core temperature), but also in the oven (ambient temperature):

Commercial temperature limit values in the EU:

Important temperature limit values		
Hot food for serving soon (meat/fish)	≥ 80 °C minimum 3 mins. ≥ 72 °C minimum 10 mins.	≥ 65 °C
Cold dishes, delicatessen, crudités, cold cuts, non-preserved salads, dressings (milk, egg), desserts	≤ 7 °C	≤ 7 °C
Ice cream	Warm production (= pasteurization) 85 °C short-term heating 65 °C long-term heating Cold production ≤ -10 °C	≤ -18 °C (in packaging) ≤ -5 °C (service of bulk ice cream)
Retention samples	Retention samples Keep for at least 1 week at ≤ -18 °C	
Disinfection equipment	Water ≥ +82 °C	

Penetration measurement

Penetration measurement

Infrared measurement

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Temperature and hygiene in food preparation

Temperature and hygiene play an essential role in the processing and storage of foods. A study carried out by a Belgian restaurant chain showed that incorrect refrigeration was the cause in 56 percent of all cases of spoiled foods.

Hazards when processing food

1. Food is insufficiently refrigerated or heated.

2. Cooked food is stored for too long without refrigeration.

3. Refrigeration systems are overloaded.
Consequence: temperatures are too high.

4. Insufficient attention is paid to personal hygiene of employees.

5. “Clean” and “unclean” processes are not separated strictly enough.

6. Raw and already heated foods are stored together.

7. Liquid from defrosting comes into contact with other food.

Temperature penetration measurement

Temperature measurement in dough

Continuous temperature checks in production

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Tips on selecting measurement locations in storerooms

Suitable measuring points must be selected depending on the measurement task in the storeroom.

Freezers, deep freezers
As well as the product temperature, the air temperature in the freezer is important. It is advisable to measure this in the vicinity of the air recirculation using a suitable probe (air probe). This is where the air is warmest. Data loggers with several input channels are recommended for monitoring deep freezers over a longer period of time. One probe measures the air temperature at ground level, for example, another at the maximum fill level, while a third measures the air temperature at the air recirculation.

Refrigerated storage areas, storerooms
As well as monitoring the air temperature and product temperature, the use of a measurement data storage device (data logger) is recommended.
If overly high values are detected, the data logger can be read out on the PC.

For refrigerated and deep-freeze storage areas which are larger than 10 m^3, data recording is even compulsory. According to **EN 12830**, 15 minutes are considered a suitable measurement interval.


Monitoring a food store


Monitoring in Incoming Goods


Monitoring in deep-freezers

Non-contact measurement:
What do I need to keep in mind?

There are instruments which measure the temperature without direct contact with the food: **infrared measuring instruments.** They are suitable for obtaining a rapid overview of the temperature of the products. This so-called non-destructive measurement enables the temperature to be determined without the instrument coming into contact with the product.

How does infrared measuring technology work?
Every object warmer than the absolute zero point temperature (-273°C) radiates thermal energy. This thermal energy is in the infrared range which is not visible to the human eye. This thermal energy can be measured and the temperature can be displayed using special optical sensors.

Measuring instrument optics
Infrared measuring instruments are classified by their optics. This number, e.g. 8:1, describes the ideal distance between the measuring instrument and the object of the measurement. This means that at a distance of 8 cm, a measurement spot with a diameter of 1 cm is measured. The larger this ratio, the greater the distance from the measurement object at which the measurement can be carried out. It is important to keep in mind that the measurement spot should not be larger than the product/packaging.

Do not look directly into the laser.

Infrared measurement refrigerated shelving

Infrared measurement in a deep-freezer

Infrared measurement in Incoming Goods

Non-contact measurement:
Tips for precise measurement

- The closer the better. This ensures that only the measurement object is measured, and not its surroundings too. With increasing distance between the measuring instrument and the measurement object, the diameter of the measured area (measurement spot) increases.

- Make sure that the measurement object is larger than the distance between the two laser points. The smaller the measurement object, the closer you have to get to the object.

- Acclimatize the measuring instrument to the ambient temperature: Either store the measuring instrument where it is used, or wait until the temperature of the measuring instrument has acclimatized to that of the measurement location.

- Measure packaged foods at places where the product and the packaging are in direct contact. Air pockets can falsify the result.

- Measure clean surfaces. Dirt, dust and frost can falsify the measurement result.

Penetration measurement:
What do I need to keep in mind?

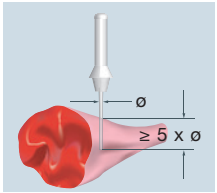
The most accurate measurement is always a core temperature measurement, i.e. a penetration probe measures the temperature in the interior of the refrigerated goods.

Measurements with penetration probes on non-frozen food:
For an optimum heat transfer from the food to the probe, the probe should be immersed at least 5 times (optimally 10 times) deeper into the material than its thickness.

Example: Diameter of the probe tip = 4 mm
Penetration depth = 4 mm x 5 = 20 mm

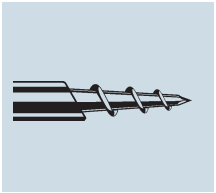
Immersion/penetration probes are designed specifically for measuring temperature in liquids and semi-solid substances (meat, fish, dough, etc.). With sufficient time, they are also suitable for air measurement.

Measurements in frozen food with special screw probe
For measurements in hard, frozen food, a special frozen food probe is required. It has a self-screwing tip (corkscrew tip). This is screwed in until the thread is no longer visible.



Penetration depth for measurements


Immersion/penetration probes


Screw-in probes

Penetration measurement:
What do I need to keep in mind?

Response time
Each probe requires a certain amount of time to reach the final temperature value for the food which it is measuring. The technical name for this value is the t99 time and it is given in catalogues and brochures. However, it only refers to measurement in water. In foods, this value is higher (approx. 15 seconds to 3 minutes, depending on the design of the probe, the materials and the thickness of the probe shaft).

Ambient temperature
Measuring instruments with thermocouple sensor technology and infrared measuring instruments are dependent on the ambient temperature. If the instrument is exposed to a cold environment for a longer time (> 2 mins), it will need an acclimatization time of 15 to 20 minutes.

Never store the measuring instrument in the deep-freeze area!

Penetration measurement in fish

Screw probe for frozen goods

Penetration measurement in cheese