°C/°F pH

pH / Temperature Meters for Dairy Products

with Application Specific Probes

HANNA® instruments

www.hannacom.pt

HI99162

pH / Temperature Meter for Milk

with Application Specific Probe

- Waterproof
- Application specific electrode
- Automatic Temperature Compensation
- Automatic one or two-point calibration
- Multi-level LCD display
- On-screen tutorial for calibration and set up
- Stability indicator for accurate data recording
- Battery Error Prevention System
- Battery life displayed on startup
- Supplied as a complete kit

The Hanna Instruments HI99162 is a durable, waterproof, and portable pH and temperature meter designed specifically for milk analysis. Automatic calibration is done at one or two points with two sets of buffers. All calibration and measurement readings are automatically compensated for temperature variations. The split-level LCD displays both pH and temperature readings, along with indicators for reading stability, battery percentage, and calibration instructions.

shown actual size

Application Importance

The measurement of pH in milk is important in testing for impurities, spoilage, and signs of mastitis infection. While there are a number of factors that affect the composition of milk, pH measurements can help producers understand what might be causing certain compositional changes. pH measurements are commonly performed at various points in a milk processing plant.

Fresh milk has a pH value of 6.7. When the pH value of the milk falls below pH 6.7, it typically indicates spoilage by bacterial degradation. Bacteria from the family of Lactobacillaceae are lactic acid bacteria (LAB) responsible for the breakdown of the lactose in milk to form lactic acid. Eventually when the milk reaches an acidic enough pH, coagulation or curdling will occur along with the characteristic smell and taste of "sour" milk.

Milk with pH values higher than pH 6.7 potentially indicate that the milk may have come from cows infected with mastitis. Mastitis is an ever-present challenge with dairy milking cows. When infected, the cow's immune system releases histamine and other compounds in response to the infection. There is a resulting increase in permeability of endothelial and epithelial cell layers, allowing blood components to pass through a paracellular pathway. Since blood plasma is slightly alkaline, the resulting pH of milk will be higher than normal. Typically milk producers can perform a somatic cell count to detect a mastitis infection, but a pH measurement offers a quick way to screen for infection.

Understanding the pH of raw milk can also help producers optimize their processing techniques. For example, in operations that use Ultra High Temperature (UHT) processing, even small variations from pH 6.7 can affect the time required for pasteurization and the stability of the milk after treatment.

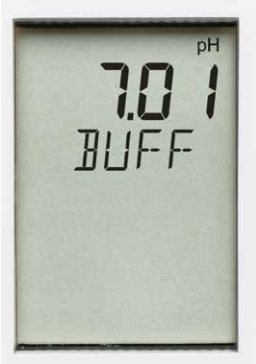
Specifications

pH	Range*	-2.00 to 16.00 pH
	Resolution	0.01 pH
	Accuracy	±0.02 pH
	Calibration	automatic, one or two-point calibration with two sets of standard buffers (standard pH 4.01, 7.01, 10.01 or NIST pH 4.01, 6.86, 9.18)
	Temperature Compensation	automatic from -5.0 to 105.0°C (23 to 221°F)
Temperature	Range*	-5.0 to 105.0°C / 23.0 to 221.0°F
	Resolution	0.1°C/0.1°F
	Accuracy	±0.5°C (up to 60°C); ±1.0°C (outside) / ±1°F (up to 140°F); ±2.0°F (outside)
Additional Specifications	Probe (included)	FC101D pre-amplified pH probe with internal temperature sensor, DIN connector and 1 m (3.3') cable (included)
	Battery Type/Life	1.5V AAA (3) / approximately 1200 hours of continuous use
	Auto-off	auto-off after 8 minutes of non-use
	Environment	0 to 50°C (32 to 122°F); RH max. 100%
	Dimensions / Weight	152 x 58 x 30 mm (6.0 x 2.3 x 1.2") / 205 g (7.2 oz)

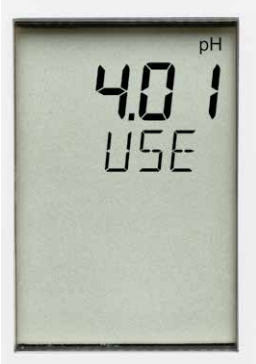
* Limits will be reduced to actual sensor limits

On-screen Features

- Temperature
  - °C and °F measurement modes

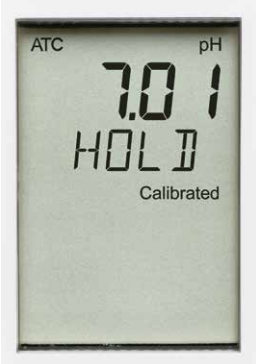


- Buffer sets
  - Calibrate to standard (pH 4.01, pH 7.01, pH 10.01) or NIST (pH 4.01, pH 6.86, pH 9.18) buffers



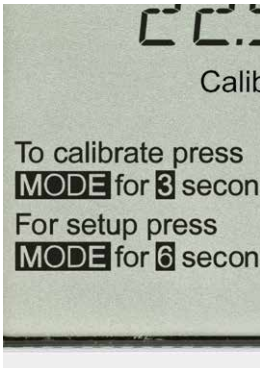
- Calibration prompts
  - On-screen prompts during the calibration process

- Stability indicator
  - "Not Stable" tag disappears when the reading is stable for accurate data recording



- Freeze readings
  - Press the SET/HOLD button to hold readings on the display

- Battery percentage
  - Battery percentage is displayed at startup

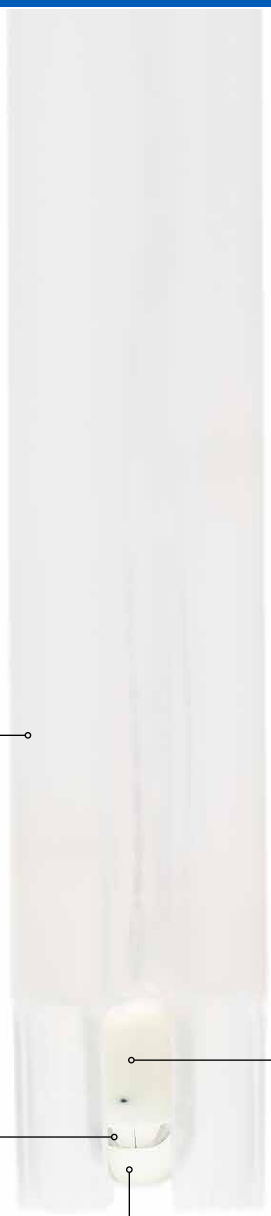


- On-screen guides
  - On-screen quick guides for entering calibration and set up

FC101D

pH / Temperature Probe for Milk

- PVDF body
- Spheric glass tip
- Single ceramic junction
- Double junction
- Built-in temperature sensor



- PVDF body
  - The FC101D is composed of food grade PVDF plastic. This material is highly durable and chemically resistant.

- General purpose glass
  - The FC101D uses general purpose (GP) glass. The formulation allows for fast response over a wide range of temperatures. The FC101D is suitable to use with samples that measure from 0 to 80°C.

- Refillable electrolyte
  - The silver-free electrolyte ensures no precipitate can clog the junction. An easy to use fill cap allows for quick refilling of electrolyte solution to maintain adequate head pressure.

- Single ceramic junction
  - A porous ceramic frit allows the silver-free electrolyte to flow slowly into solution, providing accurate readings for aqueous samples.

- Built-in temperature sensor
  - A thermistor temperature sensor is in the tip of the indicating pH bulb. A temperature sensor should be as close as possible to the indicating pH electrode in order to compensate for variations in temperature.

- Spheric tip shape
  - The shape of the sensing membrane provides a large surface area for contact with milk samples. The highly durable construction provides accurate measurements on the dairy farm as well as the production facility.

Specifications

Description	preamplified pH/temperature probe
Reference	double, Ag/AgCl
Junction	ceramic, single
Electrolyte	KCl 3.5M
Max Pressure	0.1 bar
Range	pH: 0 to 13
Recommended Operating Temperature	0 to 80°C (32 to 176°F) - GP
Tip /Shape	spheric (dia: 7.5 mm)
Temperature Sensor	yes
Amplifier	yes
Body Material	PVDF
Cable	coaxial; 1 m (3.3')
Connection	DIN

Calibrate and measure samples right in the case

Our custom carrying case features a beaker holder for calibration on the production floor.

HI99164

pH / Temperature Meter for Yogurt

with Application Specific Probe

- Waterproof
- Application specific electrode
- Automatic Temperature Compensation
- Automatic one or two-point calibration
- Multi-level LCD display
- On-screen tutorial for calibration and set up
- Stability indicator for accurate data recording
- Battery Error Prevention System
- Battery life displayed on startup
- Supplied as a complete kit

The Hanna Instruments HI99164 is a durable, waterproof, and portable pH and temperature meter designed specifically for yogurt analysis. Automatic calibration is done at one or two points with two sets of buffers. All calibration and measurement readings are automatically compensated for temperature measurements. The split-level LCD displays both pH and temperature readings, along with indicators for reading stability, battery percentage, and calibration instructions.

shown actual size

Application Importance

Monitoring pH is crucial in producing consistent, quality yogurt. Yogurt is made by the fermentation of milk with live bacterial cultures. Following pasteurization and compositional adjustment, milk is homogenized for a consistent texture, heated to the desired thickness, and cooled before inoculation. Most yogurt is inoculated with a starter culture consisting of *Lactobacillus bulgaricus* and *Streptococcus thermophilus*. Once the live culture is added, the mixture of milk and bacteria is incubated, allowing for fermentation of lactose to lactic acid. As lactic acid is produced, there is a correlating drop in pH. Due to the more acidic mixture, the casein protein in milk coagulates and precipitates out, thickening the milk into a yogurt-like texture.

Yogurt producers cease incubation once a specific pH level is reached. Most producers have a set point between pH 4.0 and 4.6 in which fermentation is stopped by rapid cooling. The amount of lactic acid present at this pH level is ideal for yogurt, giving it the characteristic tartness, aiding in thickening, and acting as a preservative against undesirable strains of bacteria.

By verifying that fermentation continues to a predetermined pH endpoint, yogurt producers can ensure their products remain consistent in terms of flavor, aroma, and texture. A deviation from the predetermined pH can lead to a reduced shelf life of yogurt or create a product that is too bitter or tart. Syneresis is the separation of liquid, in this case whey, from the milk solids; this can occur if fermentation is stopped too early or too late, resulting in yogurt that is respectively too alkaline or too acidic. Consumers expect yogurt to remain texturally consistent, so ensuring fermentation is stopped at the appropriate pH is vital to consumer perception.

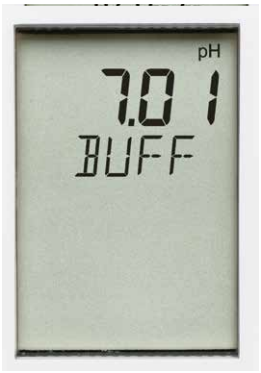
Specifications

pH	Range*	-2.00 to 16.00 pH
	Resolution	0.01 pH
	Accuracy	±0.02 pH
	Calibration	automatic, one or two-point calibration with two sets of standard buffers (standard pH 4.01, 7.01, 10.01 or NIST pH 4.01, 6.86, 9.18)
	Temperature Compensation	automatic from -5.0 to 105.0°C (23 to 221°F)
Temperature	Range*	-5.0 to 105.0°C / 23.0 to 221.0°F
	Resolution	0.1°C/0.1°F
	Accuracy	±0.5°C (up to 60°C); ±1.0°C (outside) / ±1°F (up to 140°F); ±2.0°F (outside)
Additional Specifications	Probe (included)	FC213D pre-amplified pH probe with internal temperature sensor, DIN connector and 1 m (3.3') cable (included)
	Battery Type/Life	1.5V AAA (3) / approximately 1200 hours of continuous use
	Auto-off	auto-off after 8 minutes of non-use
	Environment	0 to 50°C (32 to 122°F); RH max. 100%
	Dimensions / Weight	152 x 58 x 30 mm (6.0 x 2.3 x 1.2") / 205 g (7.2 oz)

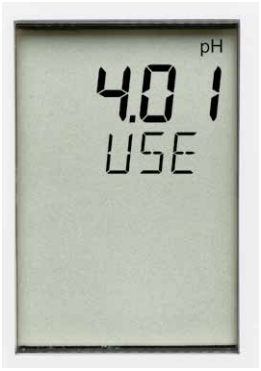
* Limits will be reduced to actual sensor limits

On-screen Features

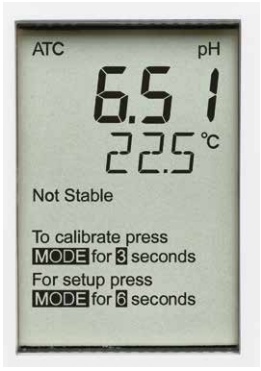
- Temperature
  - °C and °F measurement modes



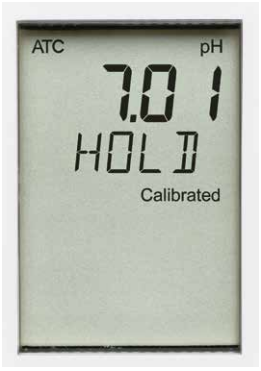
- Buffer sets
  - Calibrate to standard (pH 4.01, pH 7.01, pH 10.01) or NIST (pH 4.01, pH 6.86, pH 9.18) buffers



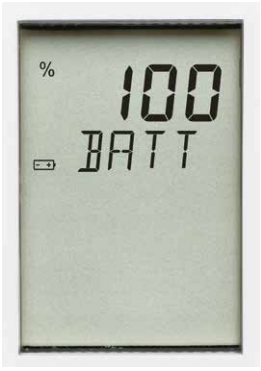
- Calibration prompts
  - On-screen prompts during the calibration process



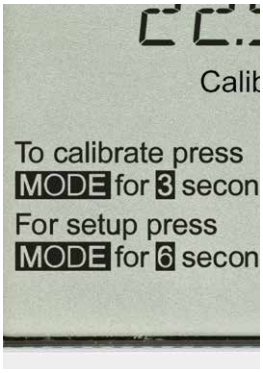
- Stability indicator
  - "Not Stable" tag disappears when the reading is stable for accurate data recording



- Freeze readings
  - Press the SET/HOLD button to hold readings on the display



- Battery percentage
  - Battery percentage is displayed at startup



- On-screen guides
  - On-screen quick guides for entering calibration and set up

FC213D

pH / Temperature Probe for Yogurt

- Glass body
- Conic glass tip
- Low temperature glass
- Open Junction reference
- Built-in temperature sensor

- Glass body
  - The glass body of the FC213D allows standards and samples to more quickly reach thermal equilibrium while also providing chemical resistance.

- Low temperature glass
  - The FC213D electrode uses Low Temperature (LT) glass for the sensing bulb. The LT glass tip is a lower resistance glass formulation. As the temperature of the sensing glass decreases, the resistance of the LT glass will increase approaching that of standard glass at ambient temperatures. The FC213D is suitable to use with samples that measure from 0 to 50°C.

- Viscolene electrolyte
  - The viscolene electrolyte offers a hard gel interface between the inner electrode components and the sample being measured. The electrolyte is silver-free for use in yogurt and is maintenance-free.

- Open junction reference
  - Clogging of the reference junction is a common challenge faced by yogurt producers as the milk solids and proteins can easily build up on the electrode. The open junction design of the FC213D resists clogging and continues to provide accurate, stable readings.

- Built-in temperature sensor
  - A thermistor temperature sensor is in the tip of the indicating pH electrode. A temperature sensor should be as close as possible to the indicating pH bulb in order to compensate for variations in temperature.

- Conic tip shape
  - This design allows for penetration into semisolids and emulsions for the direct measurement of pH in yogurt products.

Specifications

Description	pre-amplified pH / temperature probe
Reference	double
Junction	open
Electrolyte	viscolene
Max Pressure	0.1 bar
Range	pH: 0 to 12
Recommended Operating Temperature	0 to 50°C (32 to 122°F)
Tip /Shape	conic
Temperature Sensor	yes
Amplifier	yes
Body Material	glass
Cable	coaxial; 1 m (3.3')
Connection	DIN

Calibrate and measure samples right in the case

Our custom carrying case features a beaker holder for calibration on the production floor.

HI99165

pH / Temperature Meter for Cheese

with Application Specific Probe

- Waterproof
- Application specific electrode
- Automatic Temperature Compensation
- Automatic one or two-point calibration
- Multi-level LCD display
- On-screen tutorial for calibration and set up
- Stability indicator for accurate data recording
- Battery Error Prevention System
- Battery life displayed on startup
- Supplied as a complete kit

The Hanna Instruments HI99165 is a durable, waterproof, and portable pH and temperature meter designed specifically for cheese analysis. Automatic calibration is done at one or two points with two sets of buffers. All calibration and measurement readings are automatically compensated for temperature measurements. The split-level LCD displays both pH and temperature readings, along with indicators for reading stability, battery percentage, and calibration instructions.

shown actual size

Application Importance

pH is an essential measurement throughout the entire cheesemaking process. From the initial measurements of incoming milk to the final measurements of ripened cheese, pH is the most important parameter for cheese quality and safety control.

Acidification of milk begins with the addition of bacterial culture and rennet. The bacteria consume lactose and create lactic acid as a byproduct of fermentation, lowering the pH of the milk. Once the milk reaches a particular pH, the rennet is added. The enzymes in rennet help to speed up curdling and create a firmer substance. For cheesemakers that dilute their rennet, the pH of the dilution water is also critical; water that is near pH 7 or higher can deactivate the rennet, causing problems with coagulation.

Once the curds are cut, stirred, and cooked, the liquid whey must be drained. The pH of whey at draining directly affects the composition and texture of the final cheese product. Whey that has a relatively high pH contributes to higher levels of calcium and phosphate and results in a stronger curd. Typical pH levels at draining can vary depending on the type of cheese; for example, Swiss cheese is drained between pH 6.3 and 6.5 while Cheddar cheese is drained between pH 6.0 and 6.2.The next stages of milling and salting are affected by pH as well. During milling, curds are cut into smaller pieces to prepare the cheese for salting. Curds with a lower pH at milling result in a harder cheese. A low pH will also result in higher salt absorption during the salting stage. When curds are pressed into a final, solid form, the pH directly affects how well the curds fuse together. If the pH is too high during pressing, the curds will not bind together as well and the final cheese will have a more open texture. During brining, the cheese soaks up salt from the brine solution and loses excess moisture. The pH of the brine solution should be close to the pH of the cheese, ensuring equilibrium of ions like calcium and hydrogen. If there is an imbalance during brining, the final product can have rind defects, discoloration, a weakened texture, and a shorter shelf life.

Cheeses must fall within a narrow pH range to provide an optimal environment for microbial and enzymatic processes that occur during ripening. Bacterial cultures used in ripening are responsible for characteristics like the holes in Swiss cheese, the white mold on Brie rinds, and the aroma of Limburger cheese. A deviation from the ideal pH is not only detrimental to the ecology of the bacteria, but also to the cheese structure. Higher pH levels can result in cheeses that are more elastic while lower pH levels can cause brittleness.

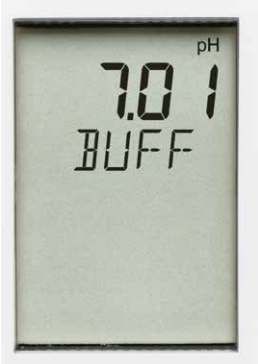
Specifications

pH	Range*	-2.00 to 16.00 pH
	Resolution	0.01 pH
	Accuracy	±0.02 pH
	Calibration	automatic, one or two-point calibration with two sets of standard buffers (standard pH 4.01, 7.01, 10.01 or NIST pH 4.01, 6.86, 9.18)
	Temperature Compensation	automatic from -5.0 to 105.0°C (23 to 221°F)
Temperature	Range*	-5.0 to 105.0°C / 23.0 to 221.0°F
	Resolution	0.1°C/0.1°F
	Accuracy	±0.5°C (up to 60°C); ±1.0°C (outside) / ±1°F (up to 140°F); ±2.0°F (outside)
Additional Specifications	Probe (included)	FC242D pre-amplified pH probe with internal temperature sensor, DIN connector and 1 m (3.3') cable (included)
	Battery Type/Life	1.5V AAA (3) / approximately 1200 hours of continuous use
	Auto-off	auto-off after 8 minutes of non-use
	Environment	0 to 50°C (32 to 122°F); RH max. 100%
	Dimensions / Weight	152 x 58 x 30 mm (6.0 x 2.3 x 1.2") / 205 g (7.2 oz)

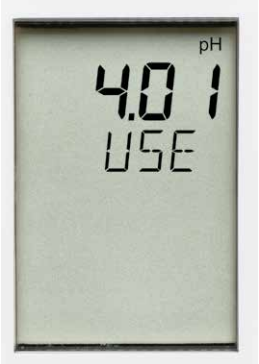
* Limits will be reduced to actual sensor limits

On-screen Features

- Temperature
  - °C and °F measurement modes



- Buffer sets
  - Calibrate to standard (pH 4.01, pH 7.01, pH 10.01) or NIST (pH 4.01, pH 6.86, pH 9.18) buffers



- Calibration prompts
  - On-screen prompts during the calibration process

- Stability indicator
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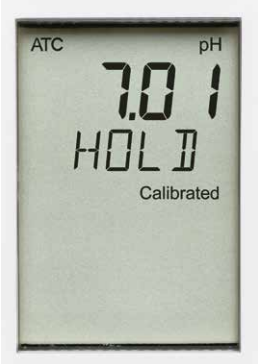
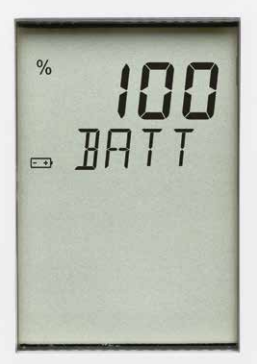
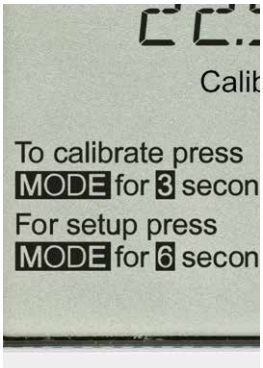


- Freeze readings
  - Press the SET/HOLD button to hold readings on the display



- Battery percentage
  - Battery percentage is displayed at startup



- On-screen guides
  - On-screen quick guides for entering calibration and set up

FC242D

pH / Temperature Probe for Cheese

- Stainless steel body
- Conic glass tip
- Low temperature glass
- Built-in temperature sensor

- AISI 316 stainless steel body
  - The metal body offers durability in the production facility and can withstand chloride concentrations that cause corrosion in other types of alloys.

- Low temperature glass
  - The FC242D electrode uses Low Temperature (LT) glass for the sensing bulb. The LT glass tip is a lower resistance glass formulation. As the temperature of the sensing glass decreases, the resistance of the LT glass will increase approaching that of standard glass at ambient temperatures. The FC242D is suitable to use with samples that measure from 0 to 50°C.

- Viscolene electrolyte
  - The viscolene electrolyte offers a hard gel interface between the inner electrode components and the sample being measured. The electrolyte is silver-free for use in cheese products and is maintenance-free.

- Built-in temperature sensor
  - A thermistor temperature sensor is in the tip of the indicating pH electrode. A temperature sensor should be as close as possible to the indicating pH bulb in order to compensate for variations in temperature.

- Conic tip shape
  - This design allows for penetration into solids, semi solids, and emulsions for the direct measurement of pH in cheese products.

Specifications

Description	pre-amplified pH / temperature probe
Reference	single
Junction	ceramic
Electrolyte	viscolene
Max Pressure	0.1 bar
Range	pH: 0 to 12
Recommended Operating Temperature	0 to 50°C (32 to 122°F)
Tip /Shape	conic
Temperature Sensor	yes
Amplifier	yes
Body Material	AISI 316 stainless steel
Cable	coaxial; 1 m (3.3')
Connection	DIN

Calibrate and measure samples right in the case

Our custom carrying case features a beaker holder for calibration on the production floor.

HI99162

HI99164

HI99165

HI99162 includes:

FC101D
pre-amplified pH probe with internal temperature sensor

100 mL plastic beaker

HI70004
pH 4.01 buffer solution sachet

HI70007
pH 7.01 buffer solution sachet

HI700640
electrode cleaning solution for milk deposits sachet (2)

1.5V AAA batteries (3)

instruction manual and visual quick start guide

rugged carrying case with custom insert

HI99164 includes:

FC213D
pre-amplified pH probe with internal temperature sensor

100 mL plastic beaker

HI70004
pH 4.01 buffer solution sachet

HI70007
pH 7.01 buffer solution sachet

HI700643
electrode cleaning and disinfection solution for yogurt products sachet (2)

1.5V AAA batteries (3)

instruction manual and visual quick start guide

rugged carrying case with custom insert

HI99165 includes:

FC242D
pre-amplified pH probe with internal temperature sensor

100 mL plastic beaker

HI70004
pH 4.01 buffer solution sachet

HI70007
pH 7.01 buffer solution sachet

HI700642
electrode cleaning solution for cheese residues sachet (2)

1.5V AAA batteries (3)

instruction manual and visual quick start guide

rugged carrying case with custom insert

Accessories

Code	Description
FC101D	FC101D pre-amplified pH probe with internal temperature sensor, DIN connector and 1 m (3.3') cable (included) for HI99162
FC213D	FC213D pre-amplified pH probe with internal temperature sensor, DIN connector and 1 m (3.3') cable (included) for HI99164
FC242D	FC242D pre-amplified pH probe with internal temperature sensor, DIN connector and 1 m (3.3') cable (included) for HI99165
HI70004P	pH 4.01 buffer solution, 20 mL sachets (25)
HI7004L	pH 4.01 buffer solution, 500 mL bottle
HI70007P	pH 7.01 buffer solution, 20 mL sachets (25)
HI7007L	pH 7.01 buffer solution, 500 mL bottle
HI700640P	electrode cleaning solution for milk deposits, 20 mL sachets (25) for HI99162
HI70640L	electrode cleaning solution for milk deposits, 500 mL bottle for HI99162
HI700642P	electrode cleaning solution for cheese residues, 20 mL sachets (25) for HI99165
HI70642L	electrode cleaning solution for cheese residues, 500 mL bottle for HI99165
HI700643P	electrode cleaning and disinfection solution for yogurt products, 20 mL sachets (25) for HI99164
HI70643L	electrode cleaning and disinfection solution for yogurt products, 500 mL bottle for HI99164
HI70300M	electrode storage solution, 230 mL bottle
HI710023	shockproof boot (orange)
HI710024	shockproof boot (blue)
HI98501	Checktemp® digital thermometer

HI710023

shockproof rubber boot (orange)

HI710024

shockproof rubber boot (blue)

HI98501

Checktemp® digital thermometer

HI70640L

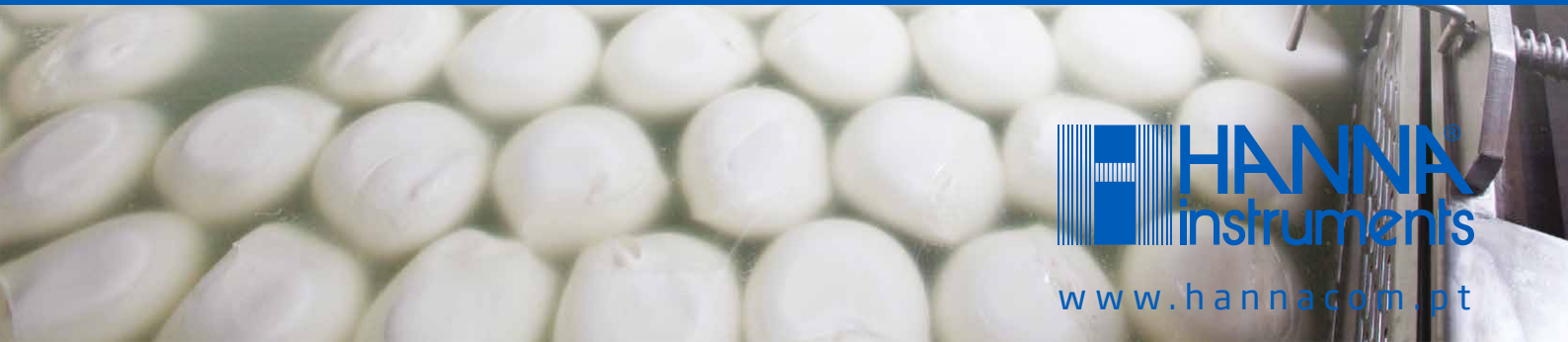
electrode cleaning solution for milk deposits, 500 mL bottle

HI70642L

electrode cleaning solution for cheese residues, 500 mL bottle

HI70643L

electrode cleaning and disinfection solution for yogurt products, 500 mL bottle



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