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Temperature

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Temperature



About Thermometers

Precise process control is one of the most important factors in maintaining high quality in production, just as precision and accuracy are the key to research. Temperature is a crucial variable in both production and research.

Glass and metal thermometers use thermal expansion to measure temperature. This method uses a physical law which gives a false sense of reliability, since one assumes the measurement is "true" because he or she can see how it works. This system is no longer suitable for many reasons and their accuracy and range are very limited. Glass construction is fragile and can be dangerous to a person's health, as well as to the environment. For these reasons, an alternative way of measuring temperature has become necessary. Hanna electronic thermometers are designed to withstand mechanical stress and extreme environments while maintaining high accuracy.

Electronic thermometers have provided the versatility, speed and accuracy requested by operators in all areas of temperature measurement. Speed is important when the reactions being monitored change rapidly. Small, compact sensors are preferable for tightly arranged areas, such as electronics and other miniature applications. Electronic thermometers allow users to monitor maximum, minimum and even average temperatures.

Dedicated research teams, precision process control, integrated production facilities and an overall team effort is required to meet the demanding applications of our users. Hanna's extensive professional thermometer line constitutes the true dedication Hanna commits to thermometer design and production.

Measurement Unit

Temperature is one of the most common physical properties in our everyday life. It is defined as the property of a body that determines the transfer of heat to or from other bodies. Physically, temperature affects variations in the macroscopic parameters of a body such as volume and pressure, among others.

The fundamental temperature scale is the absolute, thermodynamic or Kelvin scale. The Kelvin (K) unit of thermodynamic temperature, is the fraction 1/273.16 of thermodynamic temperature of the triple point of water. The triple point of water is a standard fixed point at which ice, liquid water, and water vapor are in equilibrium.

Two empirical temperature scales are in common use: the Celsius and Fahrenheit scales. These scales are based on two fixed points.

The Celsius (formally Centigrade) temperature scale uses the Celsius (°C) units, defined as 1/100th of the difference between the temperature of boiling (100°C) and freezing points (0°C) of water. The relationship between the Kelvin and Celsius scales is given by:

$$K = ^\circ C + 273.15$$

The Fahrenheit scale uses Fahrenheit (°F) units, where the temperature of boiling water is taken at 212°F, and the temperature of the freezing point at 32°F. The scale originally used the temperature of a mixture of ice and common salt as 0°F, and the inventor's approximate body temperature as 96°F. The relationship between the Fahrenheit and Celsius scales is calculated by:

$$^\circ F = ^\circ C \cdot 9/5 + 32$$

Achieving Thermometer Accuracy

Even though it is easy to show resolutions of 0.1°C with digital thermometers, there is no relationship between resolution and accuracy of measurements.

Here is a list of the main causes that can have an effect on accuracy in temperature measurements:

- **Instrument**
 - The instrument may have an extended scale and 19,000 points of measurement may be obtained. Within these 19,000 points, the instrument may perform differently because of internal linearity.
- **Electronic components**
 - The internal electronics have a drift that depends on the ambient temperature. For this reason, the accuracy of the instrument is stated at a specific temperature of 20 or 25°C, and the drift has to be specified for each degree of variation with respect to the reference temperature.
- **LCD**
 - Liquid crystals have an operating limitation which is a function of temperature. Their normal range is between 0 and 50°C, but there are components capable of performing between -20 and 70°C.
- **Batteries**
 - Instrument battery power supply also has limitations of use.
- **Temperature sensor**
 - This is a separate accuracy, which is to be added to the instrument's error.

Also, if the probe supplied is connected to the meter during factory calibration, the probe error is eliminated but will reappear if the probe is replaced.

With all the possible forces influencing accuracy, calibration verification is essential. Hanna's CAL Check™ can verify an accurate calibration quickly and easily.

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Importance of Accuracy

Up to a few years ago, accuracy was not a very critical aspect and tolerances of a few degrees did not jeopardize a process. From the time that hazard analysis and critical control points (HACCP) programs became a necessity, measurement accuracy has become a discriminating factor. Due to health risk factors, now an error of a few tenths of a degree can decide whether food can still be kept or must be discarded. In 1990, Hanna began to produce thermometers for our customers' HACCP programs to comply with new governmental regulations. Soon after, Hanna became the market leader in Europe as a result of the technological solutions offered to our users.

User Calibration of Typical Thermometers

To calibrate typical thermometers you need:

- For thermocouple thermometers
 - A simulator of the emf (electromotive force) generated by the thermocouple
- For thermometers with NTC/PTC sensor
 - At least two thermostatic baths
- For Pt100 thermometers
 - A resistance simulator
- For infrared thermometers
 - A heat source (panel) at controlled temperature

Few users can afford this investment in time and materials for checking their thermometers' accuracy. Hanna's exclusive CAL Check™ is a quick and cost effective way to verify accuracy.

Hanna CAL Check™ Calibration Feature

As previously described, the electronic components of an instrument shift with time. Hanna has made it possible for users, with the simple touch of a button, to verify whether the response of the instrument is within the tolerance limit of $\pm 0.02^\circ\text{C}$.

The CAL Check™ system acts by substituting the sensor with an internal resistor which corresponds to 0°C ; thus simulates the response that the temperature probe would have at 0°C .

Standardization

Hanna has designed a series of pre-calibrated temperature probes with a maximum error of 2°C for trouble-free replacement.

Thermocouple Thermometer Calibration

Although quite fast, thermocouple thermometers read with a response time much slower than other sensors and technologies. Unfortunately, the measurement of the thermocouple emf (electromotive force) loses accuracy because of the measuring system itself, based on the emf generated by the temperature difference between cold and hot junctions. The same emf may be generated under different conditions, for example:

- Hot junction at 100°C ; cold junction at 20°C ; difference: 80°C or
- Hot junction at 90°C ; cold junction at 10°C ; difference: 80°C

A temperature difference of 80°C is obtained with two different temperatures of the sample. It is, therefore, very important to



determine the cold junction temperature very precisely. The ability to do this has a large effect on the accuracy of the measuring system. A thermocouple thermometer is made of two thermometers, one that measures the cold junction, and one for measuring the emf generated by the thermocouple. The cold junction is usually measured with an NTC type sensor, which has response times different from those of the thermocouple. Another crucial point is measuring the actual value of the cold junction, without any environmental influence and dispersions.

To partially solve this problem, Hanna has devised the calibration of the instrument-thermocouple system by dipping the probe in melting ice, thus allowing the user to calibrate the measuring system at 0°C .

Thanks to this solution, it is now possible to use thermocouple thermometers for HACCP controls with an accuracy of $\pm 0.3^\circ\text{C}$, which is the same performance of our Pt100 or NTC thermometers, but with a higher response time.

Calibration Test Keys

To check the calibration status of the instrument, calibrated keys have been prepared in the range from -18 to 70°C . These keys reproduce the value of the sensor at different temperatures. Simply disconnect the measuring probe, replace it with the key and ensure that the instrument reads the simulated value.

Hanna calibrates all thermometers with a standard probe. All NTC temperature probes are inspected and calibrated with standard instruments. During quality inspection, our technicians make sure that the reading errors are within the stated accuracies.

In addition, Hanna provides users with the necessary tools to verify that your thermometers read accurate values. Our complete line of electronic thermometers provides fast and precise measurements down to a tenth of a degree Celsius.

Hanna thermometers may be divided into four main categories: thermistor thermometers, thermocouple thermometers, Pt100 thermometers and infrared thermometers.

Thermometers Introduction



Thermistor Thermometers

The thermistor is a semi-conductor device whose resistivity (r) varies as a function of temperature (T):

$$R = R_0 [1 + a (T - T_0)]$$

where

R = resistance of temp. at T T = temp at the end of measurement
 R_0 = resistance of temp. at T_0 T_0 = temp at the beginning of measurement

Temperature resistance coefficient is the parameter that determines if the resistivity variation is positive (as with the Positive Temperature Coefficient, or PTC sensors) or negative (as with the Negative Temperature Coefficient, or NTC thermistors). It is possible to determine the temperature by applying a potential difference and measuring the resistance.

Thermistor sensors are suitable for a temperature range of -50 to 150°C (-58 to 302°F). Higher temperatures may damage the semi-conductor sensor. Accurate temperature measurements are possible (tenths of degree) due to the high sensitivity of the sensor.

Thermocouple Thermometers

The thermocouple consists of the junction of two wires of different metals. At a given temperature, a potential difference results at the opposite extremes of the two wires (Seebeck effect), with the respective variations linearly related within small intervals. It is therefore possible to determine the temperature given the potential difference and characteristics of the two metals. The measurement end of the thermocouple probe is called the hot junction, while the connection of the thermocouple to the meter is the cold junction. An error is introduced as the cold junction is exposed to the ambient temperature. This error can be eliminated by physically putting the cold junction into an ice bath and forcing a reference temperature of 0°C, or by electronically compensating for the cold junction temperature effect. There are various types of thermocouples, identified by an ANSI code using a letter of the alphabet. The K type is the most commonly used thermocouple.

Pt100 Thermometers

The operating principle of resistance thermometers is based on the increase of electric resistance of metal conductors (RTD: Resistance Temperature Detectors) with temperature.

This physical phenomenon was discovered by Sir Humphry Davy in 1821. In 1871, Sir William Siemens described the application of this property using platinum, thereby introducing an innovation in the manufacturing of temperature sensors. Platinum resistance thermometers have been used as an international standard for measuring temperatures between hydrogen triple point at 13.81 K and the freezing point of antimony at 630.75°C (1167.26°F).

Among the various metals to be used in the construction of resistance thermometers, platinum (Pt), a noble metal, is the one that can measure temperatures throughout a wide range; from -251°C (-419.8°F) to 899°C (1650.2°F), with a linear behavior.

Platinum RTD thermometers were common in the seventies but have now been replaced with thermistor sensors because of their smaller dimensions and faster response to temperature changes. The most common RTD sensor using platinum is the Pt100, which means a resistance of 100Ω at 0°C with a temperature coefficient of 0.00385Ω per degree Celsius. For a higher price one can buy platinum sensors with 250, 500 or 1000Ω (Pt1000).

The main disadvantage of RTD probes is the resistance of the connection cable. This resistance prevents the use of standard two-wire cables for lengths over a few meters, since it affects the accuracy of the reading. For this reason, to obtain high levels of accuracy in industrial and laboratory applications, the use of a three or four-wire system is recommended.

For all its Pt100 thermometers and probes, Hanna has chosen the multiple-wire technology for higher accuracy.

Infrared Thermometers

All objects emit a radiant energy in the infrared (IR) spectrum that falls between visible light and radio waves.

The origins of IR measurements can be traced back to Sir Isaac Newton's prism and the separation of sunlight into colors and electromagnetic energy. In 1800, the relative energy of each color was measured, but it was not until early 20th century that IR energy was quantified. It was then discovered that this energy is proportional to the 4th power of the object's temperature.

IR instrumentation using this formula has been around for over 50 years. They almost exclusively use an optic device that detects the heat energy generated by the object that the sensor is aimed at. This is then amplified, linearized and converted into an electronic signal which in turn shows the surface temperature in Celsius or Fahrenheit degrees.

Infrared measurements are particularly suitable for areas where it is difficult or undesirable to take surface measurements using conventional contact sensors. Applications for IR meters include non-destructive testing of foodstuffs, moving machinery, and high temperature surfaces.

Thermometers Introduction



An ideal surface for IR measurements is a black body or radiator with an emissivity of 1.0. Emissivity is the ratio of the energy radiated by an object at a certain temperature to that emitted by a perfect radiator at the same temperature.

The shinier or more polished the surface, the less accurate the measurements. For example, the emissivity of most organic material and rough or painted surfaces is in the 0.95 region and hence, suitable for IR measurements.

On the other hand, surfaces of highly polished or shiny material, such as mirrors or aluminum, may not be appropriate for this application without using some form of filtration. This is due to other factors, namely, reflectivity and transmissivity. The former is a measure of an object's ability to reflect infrared energy while the latter is its ability to transmit it.

Another important and practical concern with IR measurements is the field of view. Infrared meters measure the average temperature of all objects in their field of view. To obtain an accurate result, it is important that the object completely fills the instrument's field of view and there are no obstacles between the meter and the object. The distance-to-target ratio, or the optic coefficient, is therefore an important consideration.



* Given for e-H₂, which is hydrogen at the equilibrium concentration of the ortho and para molecular forms.

Reference Temperatures

In 1990, NIST established 17 fixed points of the International Temperature Scale (ITS-90) related to reproducible physical phenomena in nature. The ITS-90 Fixed Points are shown in the chart below:

Equilibrium state	K	°C
Vapor pressure point of helium	3 to 5	-270.15 to -268.19
Triple point of hydrogen	13.8033*	-259.346*
Boiling point of hydrogen at a pressure of 33.330.6 Pa	17.042*	-256.108*
Boiling point of equilibrium hydrogen	20.28*	-252.87*
Triple point of neon	27.102	-246.048
Triple point of oxygen	54.361	-218.789
Triple point of argon	83.8058	-189.3442
Triple point of mercury	234.3156	-38.8344
Triple point of water	273.16	0.01
Triple point of gallium	302.9146	29.7646
Melting point of indium	429.7485	156.5985
Melting point of tin	505.078	231.928
Melting point of zinc	692.677	419.527
Melting point of aluminum	933.473	660.323
Melting point of silver	1234.93	961.78
Melting point of gold	1337.33	1064.18
Melting point of copper	1357.77	1084.62

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Product Spotlights

Temperature

Product Spotlights

HI935007N

K-Type Thermocouple
Thermometer with
Penetration Probe

The HI935007N is a portable thermometer that measures temperatures as high as 1350°C. The resolution remains 0.1 up to 199.9°C and automatically changes to 1.0 above.

The fixed HI766C penetration probe with 1 m (3.3') flexible cable is also supplied with the instrument.

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HI93501N • HI93501NS

Thermistor Thermometer
for the Food Industry

The HI93501N is a waterproof thermometer designed to be used daily in food applications such as industrial kitchens and catering. The "S" version also adds a stability indicator bargraph and HOLD button to freeze readings on the LCD.

The included HI762PWL penetration probe can be replaced with an assortment of HI762 probes for specific applications.

The display indicates the remaining battery power at startup then continuously checks the battery level and warns the user with ample time to change the battery. When low battery power may affect your results, the meter will shut down and ensure that accuracy is not compromised.

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HI93510 • HI93510N

Thermistor Thermometer

The HI93510 is a high performance, waterproof thermometer tailor made for lab and field use. The LCD displays the highest and lowest readings in the cycle along with the current temperature. To freeze the reading for easy recording, simply press the HOLD button. Celsius or Fahrenheit range can be selected at the touch of a button. Battery level is shown at startup and a low battery warning with BEPS assures long periods of trouble free use.

The HI93510N offers all the features of the HI93510 plus a CAL button to allow the operator to calibrate the meter and probe in an ice bath at 0°C. This will assure the removal of the combined meter and probe interchange error. In addition to calibration capabilities, HI93510N has a user-activated backlit display.

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	K-type	K _J T - type	Range	CALButton	CALCheck™	PC Compatibility	BEPS	HOLD Feature	Waterproof	Autorangeing	Logging	Alarm	Interchangeable Probe	Multiple Channels	Backlit LCD	Stability Bargraph	Page
Thermocouple Thermometers																	
HI935005	•		°C/°F				•	•	•				•				14.8
HI935005N	•		°C/°F	•				•	•				•		•		14.8
HI935002	•		°C/°F					•	•	•			•	•			14.9
HI93531	•		°C/°F					•	•	•			•				14.10
HI93531N	•		°C/°F	•				•	•	•			•		•		14.10
HI93531R	•		°C/°F	•		•	•	•	•				•		•		14.10
HI93532	•		°C/°F					•	•	•			•	•			14.11
HI93532R	•		°C/°F	•		•	•	•	•				•	•	•		14.11
HI93530	•		°C/°F					•	•	•			•				14.12
HI93530N	•		°C/°F	•			•	•	•				•		•		14.12
HI9063	•		°C/°F					•	•	•	•		•				14.13
HI93551		•	°C/°F					•	•	•			•				14.14
HI93551N		•	°C/°F	•				•	•	•			•				14.14
HI93542		•	°C/°F					•	•	•			•	•			14.15
HI93552R		•	°C/°F	•		•	•	•	•				•	•	•		14.15
HI935007N	•		°C		•		•		•	•							14.27
Thermistor Thermometers																	
HI9241			°C		•		•		•				•				14.28
HI93501N			°C		•		•		•				•				14.29
HI93501NS			°C		•		•	•	•				•		•		14.29
HI93503			°C		•		•	•	•				•			•	14.30
HI93510			°C/°F				•	•	•				•				14.31
HI93510N			°C/°F	•			•	•	•				•		•		14.31
Infrared Thermometers																	
HI99551			°C/°F					•									14.37
HI99556			°C/°F					•					•				14.37
Pt100 Thermometers																	
HI955501			°C							•			•				14.38
HI955502			°C							•							14.38
Temperature Dataloggers																	
HI141			°C/°F			•	•		•		•	•		•			14.40
HI140			°C/°F			•	•		•		•	•					14.41
HI143			°C/°F			•					•	•					14.42

HI935005 · HI935005N

K-Type Thermocouple Thermometers

- HOLD
 - HOLD Function
- BEPS
 - Alerts the user of low battery power that could adversely affect readings
- Battery indicator
 - Battery life indicator at startup
- Backlight
 - Backlit display (N version)
- Waterproof
 - Compact, heavy-duty and waterproof

The HI935005 series meters are waterproof, K-type thermometers offering accurate temperature measurements in a wide range, as well as 1600 hours of battery life.

These units display current temperature along with the minimum and maximum values achieved during the measuring session on the LCD.

The HOLD button freezes the display to allow the user time to record readings. The °C/°F button switches between the Celsius and Fahrenheit temperature scale. The CLR button restarts the evaluation of high and low values.

The HI935005N features a user-activated backlight for low or no light conditions. A CAL button allows the operator a simple one-point calibration in an ice bath at 0°C when probe interchange occurs.

The instruments are equipped with BEPS (Battery Error Prevention System), which alerts the user in the event that low battery power could adversely affect readings.

A wide variety of interchangeable probes are available to meet your specific needs. Optional rubber boots are available.

*K-type thermocouple probes should be ordered separately to meet your specific application.



Specifications	HI935005	HI935005N
Range	-50.0 to 199.9°C and 200 to 1350°C; -58.0 to 399.9°F and 400 to 2462°F	
Resolution	0.1°C (-50.0 to 199.9°C) and 1°C (outside); 0.1°F (-58.0 to 399.9°F) and 1°F (outside)	
Accuracy	±0.2% f.s. (for 1 year, excluding probe error)	
Probe	HI766 series K-type thermocouple (not included)*	
CAL Button	N/A	yes
Backlit LCD	N/A	yes
Battery Type / Life	1.5V AA (3) / approximately 1600 hours of continuous use (with backlight off); HI935005 only: auto-off selectable after 8 or 60 minutes of non-use (can be disabled)	
Environment	-10 to 50°C (14 to 122°F); RH max 100%	
Dimensions	150 x 80 x 36 mm (5.9 x 3.1 x 1.4")	
Weight	235 g (8.3 oz.)	
Ordering Information	HI935005 and HI935005N are supplied with batteries, protective case and instructions	
Probes	HI766C	Penetration, stainless steel K-type thermocouple temperature probe with 1 m cable
	HI766D	Air/gas, stainless steel K-type thermocouple temperature probe with 1 m (3.3') cable
	HI766E1	General purpose/penetration, stainless steel K-type thermocouple temperature probe with 1 m (3.3') cable

Thermocouple probes begin on page 14.16



HI935002

Dual-channel, K-Type Thermocouple Thermometer

- Multiple input channels
 - Dual input channels
- HOLD
 - HOLD function
- BEPS
 - Alerts the user of low battery power that could adversely affect readings
- Battery indicator
 - Battery life indicator at startup
- Waterproof
 - Compact, heavy-duty and waterproof

HI935002 is a 2-channel, waterproof, K-type thermometer that offers accurate temperature measurements in a wide range, as well as 1600 hours of battery life.

These units display current temperature along with the minimum and maximum temperature for each channel achieved during the measuring session. The difference between each channel can be shown, or a relative value can be set on each channel and variances around that value can be monitored.

The HOLD button freezes the display to allow the user time to record readings.

The instruments are equipped with BEPS (Battery Error Prevention System), which alerts the user in the event that low battery power could adversely affect readings.

Specifications	HI935002
Range	-50.0 to 199.9°C and 200 to 1350°C; -58.0 to 399.9°F and 400 to 2462°F
Resolution	0.1°C (-50.0 to 199.9°C) and 1°C (outside); 0.1°F (-58.0 to 399.9°F) and 1°F (outside)
Accuracy	±0.2% f.s. (for 1 year, excluding probe error)
Probe	HI766 series K-type thermocouple (not included)*
Battery Type / Life	1.5V AA (3) / approx. 1600 hours of continuous use
Environment	-10 to 50°C (14 to 122°F); RH max 100%
Dimensions	150 x 80 x 36 mm (5.9 x 3.1 x 1.4")
Weight	235 g (8.3 oz.)
Ordering Information	HI935002 is supplied with batteries and instructions.
Probes	HI766C Penetration, stainless steel K-type thermocouple temperature probe with 1 m cable
	HI766D Air/gas, stainless steel K-type thermocouple temperature probe with 1 m (3.3') cable
	HI766E1 General purpose/penetration, stainless steel K-type thermocouple temperature probe with 1 m (3.3') cable

*K-type thermocouple probes should be ordered separately to meet your specific application.

Thermocouple probes begin on page 14.16

HI93531 · HI93531N · HI93531R

0.1° Resolution K-Type Thermocouple Thermometers

- HOLD
 - HOLD function
- BEPS
 - Alerts the user of low battery power that could adversely affect readings
- Battery indicator
 - Battery life indicator at startup
- Backlight
 - Backlit display (N and R versions)
- Waterproof
 - Compact, heavy-duty and waterproof
- Connectivity
 - PC and printer compatible (R version)

These waterproof thermometers feature 0.1° resolution in the -149.9 to 999.9°C (-24.9 to 999.9°F) range, making them ideal for precise temperature measurements. The instruments display the current temperature along with the minimum and maximum extremes achieved.

The HOLD button freezes the display to allow the user time to record readings. The °C/°F button switches between the Celsius and Fahrenheit temperature scale. The CLR button restarts the evaluation of high and low values.

The HI93531N and HI93531R feature a user-activated backlight for low or no light conditions. The CAL button allows a simple one-point calibration in an ice bath at 0°C when probe interchange occurs. The HI93531R adds RS232 output that allows for data transfer to a PC or printer.

The instruments are equipped with BEPS (Battery Error Prevention System), which alerts the user in the event that low battery power could adversely affect readings.

*K-type thermocouple probes should be ordered separately to meet your specific application.



Specifications	HI93531	HI93531N	HI93531R
Range	-200.0 to 999.9°C; 1000 to 1371°C -328.0 to 999.9°F; 1000 to 2500°F		
Resolution	0.1°C (-149.9 to 999.9°C); 0.2°C (-200.0 to -150.0°C); 1°C (outside) 0.1°F (-24.9 to 999.9°F); 0.2°F (-249.9 to -25.0°F); 0.3°F (-328.0 to -250.0°F); 1°F (outside)		
Accuracy	±0.5°C (-100.0 to 999.9°C); ±1°C (outside); ±1°F (-148.0 to 999.9°F); ±1.5°F (outside) (for 1 year, excluding probe error)		
Probe	HI766 series K-type thermocouple (not included)*		
CAL Button	N/A	yes	yes
Backlit LCD	N/A	yes	yes
RS232	N/A	N/A	yes
Battery Type / Life	1.5V AA (3) / approximately 500 hours of continuous use (with backlight off); auto-off after 60 minutes of non-use (can be disabled) Auto-off after 8-60 minutes (HI93532R)		
Environment	-10 to 60°C (14 to 122°F); RH max 100%		
Dimensions	150 x 80 x 36 mm (5.9 x 3.1 x 1.4")		
Weight	235 g (8.3 oz.)		
Ordering Information	HI93531, HI93531N and, HI93531R are supplied with batteries and instructions.		
Probes*	HI766C	Penetration, stainless steel K-type thermocouple temperature probe with 1 m cable	
	HI766D	Air/gas, stainless steel K-type thermocouple temperature probe with 1 m (3.3') cable	
	HI766E1	General purpose/penetration, stainless steel K-type thermocouple temperature probe with 1 m (3.3') cable	

Thermocouple probes begin on page 14.16



Specifications	HI93532	HI93532R
Range	-200.0 to 999.9°C; 1000 to 1371°C; -328.0 to 999.9°F; 1000 to 2500°F	
Resolution	0.1°C (-149.9 to 999.9°C); 0.2°C (-200.0 to -150.0°C); 1°C (outside) 0.1°F (-24.9 to 999.9°F); 0.2°F (-249.9 to -25.0°F); 0.3°F (-328.0 to -250.0°F); 1°F (outside)	
Accuracy	±0.5°C (-100.0 to 999.9°C); ±1°C (outside); ±1°F (-148.0 to 999.9°F); ±1.5°F (outside) (for 1 year, excluding probe error)	
Probe	HI766 series K-type thermocouple (not included)*	
CAL Button	N/A	yes
Backlit LCD	N/A	yes
RS232	N/A	yes
Battery Type / Life	1.5V AA (3) / approximately 500 hours of continuous use (with backlight off); auto-off after 60 minutes of non-use (can be disabled); auto-off after 8 minutes (HI93532R)	
Environment	-10 to 60°C (14 to 122°F); RH max 100%	
Dimensions	150 x 80 x 36 mm (5.9 x 3.1 x 1.4")	
Weight	235 g (8.3 oz.)	
Ordering Information	HI93532 and HI93532R are supplied with batteries and instructions.	
Probes*	HI766C	Penetration, stainless steel K-type thermocouple temperature probe with 1 m cable
	HI766D	Air/gas, stainless steel K-type thermocouple temperature probe with 1 m (3.3') cable
	HI766E1	General purpose/penetration, stainless steel K-type thermocouple temperature probe with 1 m (3.3') cable

Thermocouple probes begin on page 14.16

HI93532 · HI93532R

Dual-input, K-Type Thermocouple Thermometers

- HOLD
 - HOLD function
- Multiple input channels
 - Dual input
- BEPS
 - Alerts the user of low battery power that could adversely affect readings
- Battery indicator
 - Battery life indicator at start-up
- Waterproof
 - Compact, heavy-duty and waterproof
- Backlight
 - Backlit display (N and R versions)
- Connectivity
 - PC and printer compatible (R version)

Conditions often require the measurement of two samples at the same time. The HI93532 series feature two built-in channels for two K-type probe connectors.

These thermometers display current temperature along with the high and low values in either channel. You can also see the difference between the two channels simultaneously with the high and low of the difference.

The HOLD button freezes the display to allow the user time to record readings.

The HI93532R feature a user-activated backlight for low or no light conditions. The CAL button allows the operator to perform a simple one-point calibration in an ice bath at 0°C when probe interchange occurs.

The HI93532R adds RS232 output that allows for data transfer to a PC or printer.

The instruments are equipped with BEPS (Battery Error Prevention System), which alerts the user in the event that low battery power could adversely affect readings.

*K-type thermocouple probes should be ordered separately to meet your specific application.

HI93530 · HI93530N

0.1° Resolution K-Type Thermocouple Thermometers

- **HOLD**
 - HOLD function
- **BEPS**
 - Alerts the user of low battery power that could adversely affect readings
- **Battery indicator**
 - Battery life indicator at startup
- **Waterproof**
 - Waterproof casing
- **Backlight**
 - Backlit display (N version)

The HI93530 and HI93530N are waterproof thermometers that can read with a resolution of 0.1 in the -149.9 to 999.9°C (-24.9 to 999.9°F) range.

The HOLD button freezes the display to allow the user time to record readings. The °C/°F button switches between the Celsius and Fahrenheit temperature scale.

For high accuracy, the HI93530N features a CAL button to allow the operator a simple one-point calibration in an ice bath at 0°C when probe interchange occurs.

The HI93530N also incorporates a user-activated backlight for low or no light conditions.

Remaining battery power is displayed at startup, and these instruments are equipped with BEPS (Battery Error Prevention System), which alerts the user in the event that low battery power could adversely affect readings.

Several interchangeable probes are available to meet your specific needs. Optional rubber boots are also available.

*K-type thermocouple probes should be ordered separately to meet your specific application.



Specifications	HI93530	HI93530N
Range	-200.0 to 999.9°C; 1000 to 1371°C · -328.0 to 999.9°F; 1000 to 2500°F	
Resolution	0.1°C (-149.9 to 999.9°C); 0.2°C (-200.0 to -150.0°C); 1°C (outside) 0.1°F (-24.9 to 999.9°F); 0.2°F (-249.9 to -25.0°F); 0.3°F (-328.0 to -250.0°F); 1°F (outside)	
Accuracy	±0.5°C (-100.0 to 999.9°C); ±1°C (outside); ±1°F (-148.0 to 999.9°F); ±1.5°F (outside) (for 1 year, excluding probe error)	
Probe	HI766 K-type thermocouple (not included)*	
CAL Button	N/A	yes
Backlit LCD	N/A	yes
Battery Type / Life	1.5V AA (3) / approximately 500 hours of continuous use (with backlight off); auto-off after 60 minutes of non-use (can be disabled)	
Environment	-10 to 60°C (14 to 122°F); RH max 100%	
Dimensions	150 x 80 x 36 mm (5.9 x 3.1 x 1.4")	
Weight	235 g (8.3 oz.)	
Ordering Information	HI93530 and HI93530N are supplied with batteries and instructions.	
Probes	HI766C	Penetration, stainless steel K-type thermocouple temperature probe with 1 m cable
	HI766D	Air/gas, stainless steel K-type thermocouple temperature probe with 1 m (3.3') cable
	HI766E1	General purpose/penetration, stainless steel K-type thermocouple temperature probe with 1 m (3.3') cable

Thermocouple probes begin on page 14.16



HI9063

Heavy-duty K-Type Thermocouple Thermometer

- **HOLD**
 - HOLD function
- **BEPS**
 - Alerts the user of low battery power that could adversely affect readings
- **Battery indicator**
 - Battery life indicator at startup
- **Waterproof**
 - Waterproof casing

The HI9063 K-type thermocouple thermometer features auto-ranging, enhanced accuracy, and displays current temperature along with the high and low extremes achieved during the measuring session on the LCD.

The HOLD button freezes the display to allow the user time to record readings. The °C/°F button switches between the Celsius and Fahrenheit temperature scale. The CLEAR button assigns the reading to high and low temperature values.

The HI9063 is equipped with BEPS (Battery Error Prevention System), which alerts the user in the event that low battery power could adversely affect readings.

Specification	HI9063	
Range	-50.0 to 1350°C; -58.0 to 2462°F	
Resolution	0.1°C (up to 199.9°C); 1°C (outside); 0.1°F (up to 399.9°F); 1°F (outside)	
Accuracy	±0.2% F.S. (for 1 year, excluding probe error)	
Probe	HI766 series K-type thermocouple (not included)	
Battery Type / Life	1.5V AA (4) / approximately 2000 hours of continuous use	
Environment	-10 to 50°C (14 to 122°F); RH max 100%	
Dimensions	196 x 80 x 60 mm (7.7 x 3.1 x 2.4")	
Weight	500 g (1.1 lbs.)	
Ordering Information	HI9063 is supplied with batteries and instructions.	
Probes	HI766C	Penetration, stainless steel K-type thermocouple temperature probe with 1 m cable
	HI766D	Air/gas, stainless steel K-type thermocouple temperature probe with 1 m (3.3') cable
	HI766E1	General purpose/penetration, stainless steel K-type thermocouple temperature probe with 1 m (3.3') cable

Thermocouple probes begin on page 14.16

HI93551 · HI93551N

K, J, T-Type Thermocouple Thermometers

- HOLD
 - HOLD function
- BEPS
 - Alerts the user of low battery power that could adversely affect readings
- Battery indicator
 - Battery life indicator at startup
- Waterproof
 - Waterproof casing

These instruments offer the ability to take temperature measurements with different types of thermocouples and are equipped with a single button that switches between K-type, J-type or T-type thermocouples.

The HOLD button freezes the display to allow the user time to record readings. The CLR button restarts the evaluation of high and low values.

These thermometers display the current temperature along with the high and low extremes achieved during measurement.

For high accuracy, the HI93551N features a CAL button to allow the operator a simple one-point calibration in an ice bath at 0°C when probe interchange occurs.

The instruments are equipped with BEPS (Battery Error Prevention System), which alerts the user in the event that low battery power could adversely affect readings.



Specifications	HI93551	HI93551N
Range	K	-200.0 to 999.9°C and 1000 to 1371°C; -328.0 to 999.9°F and 1000 to 2500°F
	J	-200.0 to 999.9°C; -328.0 to 999.9°F and 1000 to 1832°F
	T	-200.0 to 400.0°C; -328.0 to 752.0°F
Resolution	K	0.1°C (-149.9 to 999.9°C); 0.2°C (-200.0 to -150.0°C); 1°C (1000 to 1371°C); 0.1°F (-24.9 to 999.9°F); 0.2°F (-249.9 to -25.0°F); 0.3°F (-328.0 to -250.0°F); 1°F (1000 to 2500°F)
	J	0.1°C (-200.0 to 999.9°C); 0.1°F (-149.9 to 999.9°F); 0.2°F (-328.0 to -150.0°F); 1°F (1000 to 1832°F)
	T	0.1°C (-149.9 to 400.0°C); 0.2°C (-200.0 to -150.0°C); 0.1°F (0.0 to 752.0°F); 0.2°F (-270.0 to -0.1°F); 0.3°F (-328.0 to -270.1°F)
Accuracy	±0.5°C (-100.0 to 999.9°C); ±1°C (outside); ±1°F (-148.0 to 999.9°F); ±1.5°F (outside) (for 1 year, excluding probe error)	
Probe	HI766 series K-type thermocouple (not included)*	
CAL Button	N/A	yes
Backlit LCD	N/A	N/A
RS232	N/A	N/A
Battery Type / Life	1.5V AA (3) / approximately 500 hours of continuous use (with backlight off); auto-off after 60 minutes of non-use (can be disabled); auto-off after 8 minutes (HI93551N)	
Environment	-10 to 60°C (14 to 122°F); RH max 100%	
Dimensions / Weight	150 x 80 x 36 mm (5.9 x 3.1 x 1.4") / 235 g (8.3 oz.)	
Ordering Information	HI93551 and HI93551N are supplied with batteries, instructions and protective case.	
Probes	HI766C	Penetration, stainless steel K-type thermocouple temperature probe with 1 m cable
	HI766D	Air/gas, stainless steel K-type thermocouple temperature probe with 1 m (3.3') cable
	HI766E1	General purpose/penetration, stainless steel K-type thermocouple temperature probe with 1 m (3.3') cable

*K-type thermocouple probes should be ordered separately to meet your specific application.



HI93542 · HI93552R

Dual-channel, K, J, T-Type Thermocouple Thermometers

- HOLD
 - HOLD function
- BEPS
 - Alerts the user of low battery power that could adversely affect readings
- Battery indicator
 - Battery life indicator at startup
- Waterproof
 - Waterproof casing
- Backlight
 - Backlit display (HI93552R)
- Connectivity
 - PC and printer compatible (HI93552R)

The HI93542 and HI93552R are dual-channel waterproof K, J, and T-type thermocouple thermometers that can switch between thermocouple types at the touch of a button.

At any time, users can switch views to see all information on either channel, display current temperature or average along with the high and low values. Users can also see the difference between the two channels simultaneously, along with the high and low of the difference.

The HOLD button freezes the display to allow the user time to record readings. The °C/°F button switches between the Celsius and Fahrenheit temperature scale. The CLEAR button restarts the evaluation of high and low values.

For high accuracy, the HI93552R features a CAL button to allow the operator a simple one-point calibration in an ice bath at 0°C when probe interchange occurs.

The HI93552R also adds an RS232 output that allows for data transfer to a PC or printer.

The instruments are equipped with BEPS (Battery Error Prevention System), which alerts the user in the event that low battery power could adversely affect readings.

Specifications	HI93542	HI93552R
Range	K	-200.0 to 999.9°C and 1000 to 1371°C; -328.0 to 999.9°F and 1000 to 2500°F
	J	-200.0 to 999.9°C; -328.0 to 999.9°F and 1000 to 1832°F
	T	-200.0 to 400.0°C; -328.0 to 752.0°F
Resolution	K	0.1°C (-149.9 to 999.9°C); 0.2°C (-200.0 to -150.0°C); 1°C (1000 to 1371°C); 0.1°F (-24.9 to 999.9°F); 0.2°F (-249.9 to -25.0°F); 0.3°F (-328.0 to -250.0°F); 1°F (1000 to 2500°F)
	J	0.1°C (-200.0 to 999.9°C); 0.1°F (-149.9 to 999.9°F); 0.2°F (-328.0 to -150.0°F); 1°F (1000 to 1832°F)
	T	0.1°C (-149.9 to 400.0°C); 0.2°C (-200.0 to -150.0°C); 0.1°F (0.0 to 752.0°F); 0.2°F (-270.0 to -0.1°F); 0.3°F (-328.0 to -270.1°F)
Accuracy	±0.5°C (-100.0 to 999.9°C); ±1°C (outside); ±1°F (-148.0 to 999.9°F); ±1.5°F (outside) (for 1 year, excluding probe error)	
Probe	HI766 series K-type thermocouple (not included)	
CAL Button	N/A	yes
Backlit LCD	N/A	yes
RS232	N/A	yes
Battery Type / Life	1.5V AA (3) / approximately 500 hours of continuous use (with backlight off); auto-off: after 60 minutes of non-use (HI93542); selectable after 8 or 60 minutes of non-use (HI93552) (can be disabled for all models)	
Environment	-10 to 60°C (14 to 122°F); RH max 100%	
Dimensions	150 x 80 x 36 mm (5.9 x 3.1 x 1.4")	
Weight	235 g (8.3 oz.)	
Ordering Information	HI93542 and HI93552R are supplied with batteries, instructions and protective case.	
Probes	HI766C	Penetration, stainless steel K-type thermocouple temperature probe with 1 m cable
	HI766E1	General purpose/penetration, stainless steel K-type thermocouple temperature probe with 1 m (3.3') cable

Thermocouple probes begin on page 14.16

HI766
HI766 K-Type Thermocouple Probes

HI766PX Series, Probes with Detachable Handle

The HI766PX series are K-type thermocouple temperature probes to be used with thermocouple thermometers. These probes are ideal for measuring samples at very high temperatures, such as in industrial applications.

All probes are made of stainless steel for long life and easy cleaning. The HI766PX series includes a wide range of probes for measurement of liquids, air, gas and penetration in semisolids, as well as curved, planed or hard-to-reach surfaces. In addition, models are available with interchangeable or fixed handles for maximum versatility.



HI766HD, Probe Handle

A rugged, PVC handle with a 1 meter (3.3') cable. It is provided with a female connector, which allows the connection of any HI766Px probe.

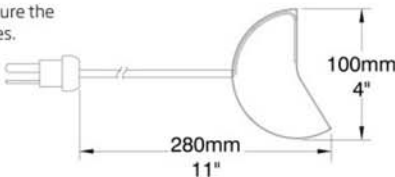
HI766EX, Extension Cable

A coiled cable which extends the probe cable by 1 m (3.3') , with two connectors at the two ends (1 male and 1 female).



HI766PA, Roller Surface Probe

This probe is designed to measure the temperature of convex surfaces.

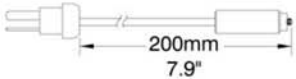


Specifications

Code	Application	Max. Temperature	Response Time (90% of final value)	Probe Length	Probe
HI766PA	convex surfaces, moving rollers	320°C (600°F)	7 seconds	280 mm (11')	stainless steel

HI766PB, Surface Probe

Temperature probe for measurements on surfaces.



Specifications

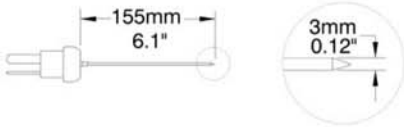
Code	Application	Max. Temperature	Response Time (90% of final value)	Probe Dimensions	Probe
HI766PB	hot solids, furnaces, molds	650°C (1200°F)	8 seconds	L 200 mm x dia 16 mm (7.9 x 0.6")	stainless steel

HI766 K-Type Thermocouple Probes



HI766PC, Penetration Probe

K-type thermocouple probe with sharp tip for penetration of semi-solid samples.



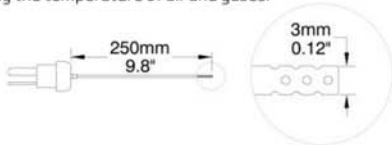
Specifications

Code	Application	Max. Temperature	Response Time (90% of final value)	Probe Dimensions	Probe
HI766PC	semi-solids, meat, rubber	900°C (1650°F)	15 seconds	L 155 mm x dia 3 mm (6.1 x 0.12")	stainless steel



HI766PD, Probe for Air and Gas

K-type thermocouple probe for measuring the temperature of air and gases.



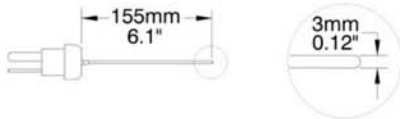
Specifications

Code	Application	Max. Temperature	Response Time (90% of final value)	Probe Dimensions	Probe
HI766PD	air, gases	300°C (570°F)	20 seconds	L 250 mm x dia 3 mm (9.8 x 0.12")	stainless steel



HI766PE1, General Purpose Probe

General purpose, penetration probe.



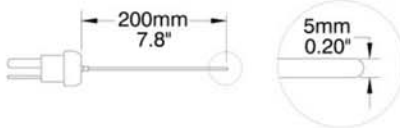
Specifications

Code	Application	Max. Temperature	Response Time (90% of final value)	Probe Dimensions	Probe
HI766PE1	liquids, air, gases	900°C (1650°F)	6 seconds	L 155 mm x dia 3 mm (6.1 x 0.12")	stainless steel



HI766PE2, General Purpose Probe

General purpose, penetration probe.



Specifications

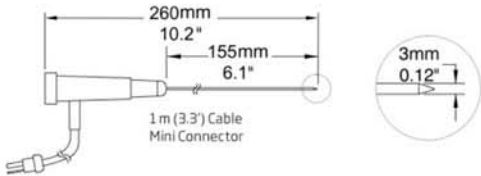
Code	Application	Max. Temperature	Response Time (90% of final value)	Probe Dimensions	Probe
HI766PE2	liquids, air, gases	900°C (1650°F)	6 seconds	L 200 mm x dia 5 mm (7.8 x 0.2")	stainless steel

HI766

HI766 K-Type Thermocouple Probes with Handle

HI766C, Penetration Probe

K-type thermocouple probe with sharp tip for penetration of semi-solid samples.

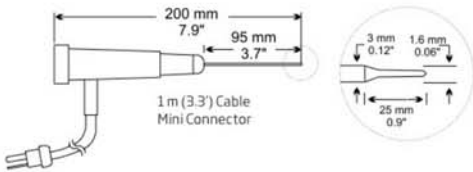


Specifications

Code	Application	Max. Temperature	Response Time (90% of final value)	Probe Dimensions	Probe	Cable Color
HI766C	semi-solids, meat, rubber	900°C (1650°F)	15 seconds	L 155 mm x dia 3 mm (6.1 x 0.12")	stainless steel	green
HI766CL	semi-solids, meat, rubber	900°C (1650°F)	15 seconds	L 310 mm x dia 5 mm (12.2 x 0.19")	stainless steel	green

HI766C1, Ultra-Fast Penetration Probe

Penetration probe with fast response time.

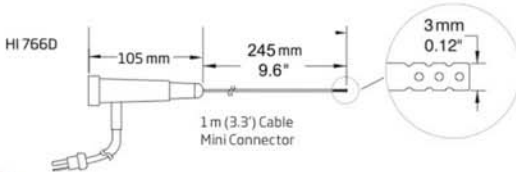


Specifications

Code	Application	Max. Temperature	Response Time (90% of final value)	Probe Dimensions	Probe	Cable Color
HI766C1	semi-solids, food	300°C (570°F)	4 seconds	L 95 mm x dia 1.6 mm (3.7 x 0.06")	stainless steel	green

HI766D Probe for Air and Gas

K-type thermocouple probe for measuring the temperature of air and gases.



Specifications

Code	Application	Max. Temperature	Response Time (90% of final value)	Probe Dimensions	Probe	Cable Color
HI766D	air, gases	300°C (570°F)	20 seconds	L 245 mm x dia 3 mm (9.6 x 0.12")	stainless steel	green

HI766

HI766 K-Type Thermocouple Probes with Handle

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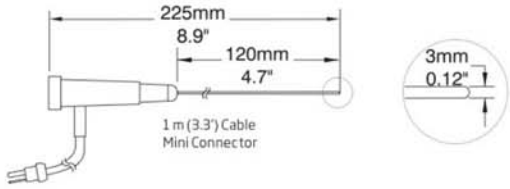
Temperature

thermocouple probes



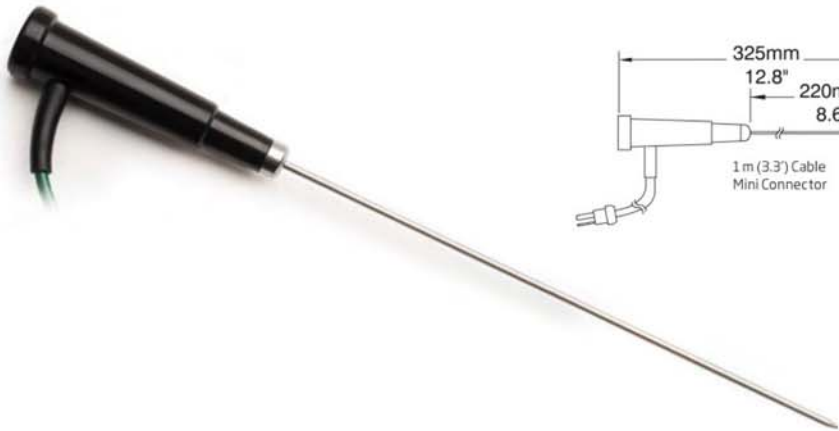
HI766E1, General Purpose Probe

General purpose, penetration probe.



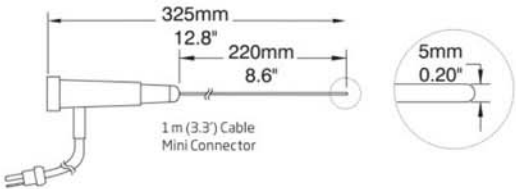
Specifications

Code	Application	Max. Temperature	Response Time (90% of final value)	Probe Dimensions	Probe	Cable Length
HI766E1	liquids, air, gases	900°C (1650°F)	6 seconds	L 120 mm x dia 3 mm (4.7 x 0.12")	stainless steel	1 m (3.3')



HI766E2, General Purpose Probe

General purpose, penetration probe.



Specifications

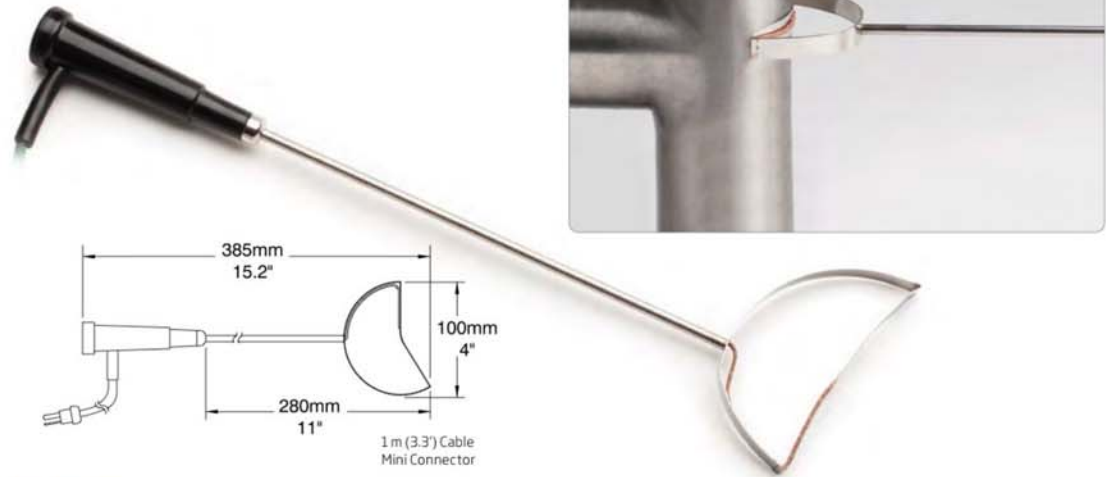
Code	Application	Max. Temperature	Response Time (90% of final value)	Probe Dimensions	Probe	Cable Length
HI766E2	liquids, air, gases	900°C (1650°F)	6 seconds	L 220 mm x dia 5 mm (8.5 x 0.2")	stainless steel	1 m (3.3')

HI766

HI766 K-Type Thermocouple Surface Probes

HI766A, Roller Surface Probe

This probe is designed to measure the temperature of convex surfaces.



Specifications					
Code	Application	Max. Temperature	Response Time (90% of final value)	Probe Dimensions	Probe
HI766A	convex surfaces, moving rollers	320°C (600°F)	7 seconds	280 mm (11") (probe length)	stainless steel

HI766B, Surface Probe

Temperature probe for measurements on surfaces.



Specifications					
Code	Application	Max. Temperature	Response Time (90% of final value)	Probe Dimensions	Probe
HI766B	hot solids, furnaces, molds	650°C (1200°F)	8 seconds	L 200 mm x dia 16 mm (7.9 x 0.6")	stainless steel

HI766

HI766 K-Type Thermocouple Surface Probes

14

Temperature

thermocouple probes

14.21

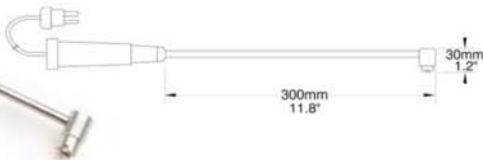


The following probes are designed to ensure optimal contact with surfaces of different shapes and dimensions.

When using these probes, the handle temperature must never exceed 150°C (302°F) to avoid possible damage to the probe.

HI766B1, 90° Angle Surface Probe

Probe for measuring the temperature of 90° angle surfaces.



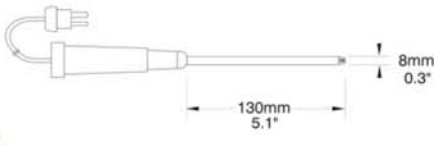
Specifications

Code	Application	Max. Temperature	Response Time (90% of final value)	Probe Dimensions	Probe	Sensor
HI766B1	hard to reach surfaces	450°C (840°F)	8 seconds	L 300 mm x dia 30 mm (11.8 x 1.2")	stainless steel	spring-loaded



HI766B2, Surface Probe

Probe for measuring the temperature of round surfaces.



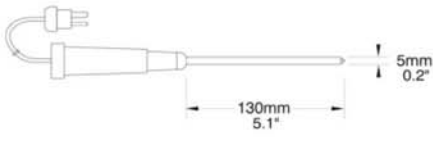
Specifications

Code	Application	Max. Temperature	Response Time (90% of final value)	Probe Dimensions	Probe	Sensor
HI766B2	solids, furnaces, molds	900°C (1650°F)	3 seconds	L 130 mm x dia 8 mm (5.1 x 0.3")	stainless steel	spring-loaded



HI766B3, Small Surface Probe

Probe for measuring the temperature of small surfaces.



Specifications

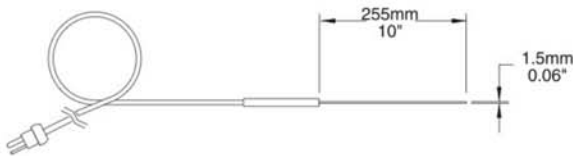
Code	Application	Max. Temperature	Response Time (90% of final value)	Probe Dimensions	Probe	Sensor
HI766B3	small surfaces	200°C (390°F)	6 seconds	L 130 mm x dia 5 mm (5.1 x 0.2")	stainless steel, insulated tube	spring-loaded

HI766

HI766 K-Type Thermocouple Probes for Specific Applications

HI766F, High Temperature Probe

Probe with flexible sheath without handle, designed to measure high temperatures.



Specifications						
Code	Application	Max. Temperature	Response Time (90% of final value)	Probe Dimensions	Probe	Cable Length
HI766F	high temperature	1100°C (2000°F)	4 seconds	L 255 mm x dia 1.5 mm (10 x 0.06")	AISI 316 stainless steel	1 m (3.3')

HI766F1, Wire Temperature Probe

Wire probe, designed to access hard to reach places. Probe does not incorporate a handle.



Specifications						
Code	Application	Max. Temperature	Response Time (63.2% F.S.)	Probe Dimensions	Sensor	Wire length
HI766F1	hard to reach areas	480°C (900°F)	1 second	dia 2 mm (0.08")	exposed wires	1 m (3.3')
HI766F1/5	hard to reach areas	480°C (900°F)	1 second	dia 2 mm (0.08")	exposed wires	5 m (16.4')

HI766 K-Type Thermocouple Probes for Specific Applications

HI766Z, Wire Temperature Probe

Wire probe, designed to measure temperature inside ovens.



Specifications

Code	Application	Max Temperature	Response Time (90% of final value)	Probe Dimensions	Sensor	Cable Length
HI766Z	ovens	1100°C (2000°F)	4 seconds	L 255 mm x dia 1.5 mm (10 x 0.06")	stainless steel	1.7 m (5.6')
HI766Z/3	ovens	1100°C (2000°F)	4 seconds	L 255 mm x dia 1.5 mm (10 x 0.06")	stainless steel	3 m (9.9')
HI766Z/7	ovens	1100°C (2000°F)	4 seconds	L 255 mm x dia 1.5 mm (10 x 0.06")	stainless steel	7 m (22.9')

HI766TV1, Pipe Clamp Probe

Probe for measuring the temperature of pipes and tubes.



Specifications

Code	Application	Max. Temperature	Response Time (90% of final Value)	Clamp Opening Diameter	Sensor
HI766TV1	pipes, tubes	200°C (390°F)	8 seconds	max 35 mm (1.4")	housed inside the clamp

HI766

HI766 K-Type Thermocouple Probes for Specific Applications

HI766TR1, Penetration Probe

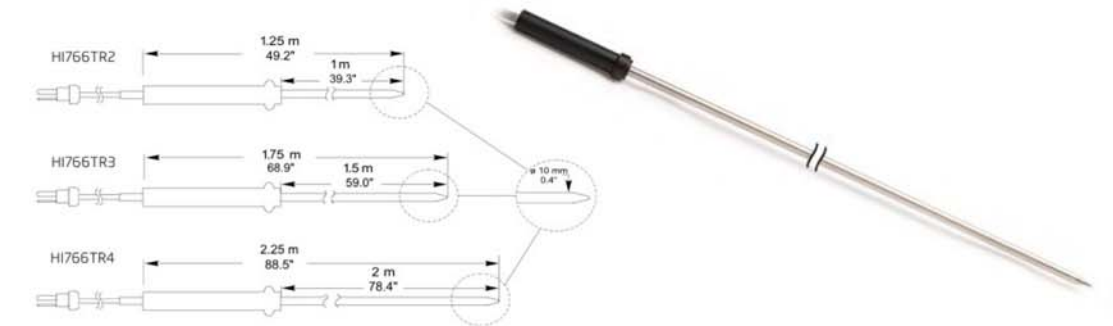
K-type thermocouple probe with sharp tip for penetration of semi-solid samples.



Specifications					
Code	Application	Max Temperature	Response Time (90% of final value)	Probe Dimensions	Sensor
HI766TR1	semi-solids, liquids	250°C (482°F)	10 seconds	L 500 mm x dia 10 mm (19.7 x 0.4")	stainless steel

HI766TR2, HI766TR3, HI766TR4
Penetration Probes

K-type thermocouple probes with sharp tip for penetration of semi-solid samples.



Specifications					
Code	Application	Max Temperature	Response Time (90% of final value)	Probe Length	Sensor
HI766TR2	semi-solids, liquids	250°C (482°F)	10 seconds	1 m (3.3')	stainless steel
HI766TR3	semi-solids, liquids	250°C (482°F)	10 seconds	1.5 m (5')	stainless steel
HI766TR4	semi-solids, liquids	250°C (482°F)	10 seconds	2 m (6.6')	stainless steel

HACCP and Food Quality Testing

Hanna Thermometers for the Food Sector

Operators in the food sector need an extensive range of products in order to guarantee the quality and safety of food supplied to the public while maintaining compliance with local and federal laws. In order to satisfy the need for quality, safety, and compliance, Hanna manufactures a vast range of products with the necessary accuracy and reliability to check the quality of food in all phases of preparation and distribution.

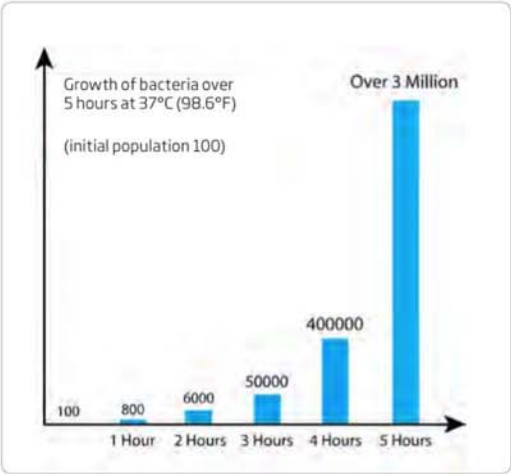
Many of Hanna's portable and pocket thermometer lines have become synonymous with temperature control in restaurants and catering facilities.

For the adverse measurement conditions found in food production areas, typically with high humidity and condensation problems, Hanna has manufactured a substantial array of waterproof meters.

To satisfy the requirements of HACCP, Hanna supplies a complete range of thermometers and pH meters to check goods from production to transport and from catering to storage. Documentation is a must in certain production cycles and important for HACCP programs. For this Hanna offers a range of logging meters. These are stand-alone meters that can measure and log the parameters without any supervision. Shock-resistant protective boots are available for many of our instruments.

Temperature

Temperature of food is constantly monitored to keep growth of pathogens and microorganisms under control. Temperature is important in production to ensure that the food is not spoiled and the quality is not compromised, therefore enhancing its value. Food needs to be kept at the correct temperature while stored, displayed, and on the move. If temperature is not properly controlled, bacteria can grow to dangerous levels in just a few hours.



The table below lists recommended temperatures for different products. It is vital to monitor and document the temperature to which food has been exposed.

Product	Temp.	Product	Temp.
Chunks of Meat	≤ 7°C	Smoked Fish	≤ 7°C
Minced Meat	≤ 4°C	Frozen Food	≤ -18°C
Innards	≤ 3°C	Milk	≤ 7°C
Frozen Chicken	≤ -12°C	Fruit and Vegetables	≤ 10°C
Deep-freeze Chicken	≤ -18°C	Eggs	≤ 8°C
Fresh Fish	≤ 2°C	Dried Fruit	≤ 25°C

Products and their recommended storage temperatures



Temperature plays an important role in the processing and preparation of edible products containing meat

Meat

The temperature of meat at slaughterhouses is a vital quality control test and needs to be checked at various points of production. Fresh meat should be stored at about 2°C (35.6°F).

For deep-freeze meat in storage, it should have an internal temperature around -22°C (-7.6°F) with the surface temperature reaching -35°C (-31°F). In order to thaw the meat properly, the surrounding temperature should be 7°C (44.6°F).

Ham and Sausages

The temperature of salted meat stored for several months is around 2°C (35.6°F). Afterwards, the product is rinsed and dried at around 25°C (77°F) prior to maturing at a preset temperature for a particular product. For sausages, the mixed ingredients are cooked at a certain temperature and then cooled at around 5 to 15°C (41 to 59°F).

Beverages

The temperature of spring or deep well waters that are extracted for beverage production must be continuously monitored to ensure purity. During the production of soft drinks, syrup is pasteurized before being added, to prevent bacteriological problems. In order to prepare fruit juices, fruit pulp is heated to just below boiling point for a few seconds to reduce the presence of microorganisms. During both of these processes, accurate temperature monitoring is crucial.

Temperature control also plays a crucial role in beer production. For example, malt has to be heated to 75°C (167°F) during the mash process. Once the mash is cooled, the vessel is heated above

14

HACCP & Food Quality Testing

Temperature

food applications introduction

boiling point to prepare the mash for a strainer; later the mash is heated to up to 120°C (248°F) for a few seconds to pasteurize it. The type of yeast then used for the fermentation process is also temperature dependent. By controlling the fermentation temperature, operators can determine the time needed for the product to fully develop. Temperature is also controlled during filtration, which is needed in order to remove particles and improve the taste and longevity of beer. In order to remove protein, beer is cooled down to almost 0°C (32°F). As with many other products on the market, beer is pasteurized at around 60°C (140°F) after it has been bottled to eliminate the presence of microorganisms.



Milk and Dairy Products

Milk is checked for impurities and bacteria upon collection. During



storage, the temperature of milk is normally kept below 5°C (41°F). In order to slow down cream formation, milk is homogenized at about 60°C (140°F).

The pasteurization of milk results in the reduction of microorganisms by 95% and is attained by raising the temperature to over 72°C (161.6°F). For UHT (ultra heat treated), milk is heated to 135/150°C (275/302°F) in a pressurized vessel for a few seconds. If the process is repeated for several minutes, all microorganisms, including spores, are destroyed and the sterilized milk will have a 12 month shelf life. For cheese, temperature needs to be adjusted before and during various processes, for example, when rennet is added.

Temperature in the maturation chamber also determines the period of maturation needed. Likewise, temperature is important in the production of butter. For example, skimmed milk is separated from cream at around 55°C (131°F) and the cream is then cooled to about 8°C (46.4°F). The temperature of incoming milk is raised to 45°C (113°F) before the addition of a culture for yogurt manufacturing. In order to denature the whey proteins, milk is raised to very high temperatures. The incubation temperature is maintained for a few hours prior to its cooling to about 10°C (50°F).

Bread and Pasta

The temperature of stored grain in silos is controlled to ensure that premature fermentation does not occur. During pasta production, water at about 25°C (77°F) is added to wheat flour during fermentation of dough for bread-making, the temperature is kept at around 30°C (86°F). The oven temperature for baking should be around 260°C (500°F) and once baked, bread is cooled to room temperature. For semi-finished products that can be flash-baked, the dough has to be stored at very low temperatures.



Chocolate

Fermentation of cocoa beans is started by increasing the temperature to about 50°C (122°F). At different stages of chocolate manufacturing such as crystallization, accurate temperature measurement is a must. Once the chocolate is ready, the storage temperature should be monitored to ensure that it stays in the 15°C (59°F) range.



Coffee

In order to invoke an aroma, coffee beans are heated up to 200°C (392°F). During roasting, the temperature is closely monitored. In order to provide a long shelf life, the finished product is frozen at -40°C (-40°F) prior to drying. To produce a good coffee, it is important to ensure that the temperature of coffee machines does not exceed 80°C (176°F).



Sanitization of Machinery

The temperature of cleansing agents, together with their concentration, have a significant bearing on how effectively the machinery is sanitized. The temperature for fermentation vessels can range from room temperature to 40°C (104°F). For milk and yogurt, tanks may reach 70°C (158°F) and as high as 150°C (302°F) for steam sterilizers. In addition, regulatory bodies recommend a certain minimum temperature for cleaning agents to be effective; this can vary from 24°C (75.2°F) for iodine and ammonia and 49°C (120.2°F) for chlorine.



www.hannainst.com



HI935007N

K-Type Thermocouple Thermometer with Penetration Probe

- **CAL Check™**
 - Alerts users of calibration status
- **BEPS**
 - Alerts the user of low battery power that could adversely affect readings
- **Battery indicator**
 - Battery level indicator at startup
- **Waterproof**
 - Compact, heavy-duty and waterproof

The HI935007N is a portable thermometer that measures temperatures as high as 1350°C. The resolution remains 0.1 up to 199.9°C and automatically changes to 1.0 above.

The fixed HI766C penetration probe with 1 m (3.3') flexible cable is also supplied with the instrument.

With the optional protective rubber boot, the HI935007N can be used anywhere with maximum impact protection. These features along with a wide measurement range, make HI935007N extremely popular in catering, food preparation and restaurants.

the HI935007N's attractive price makes it possible for every operator to carry his or her own professional instrument.

Advanced battery management features include a display of remaining battery power at startup, low battery warning and BEPS (Battery Error Prevention System), which alerts the user in the event that low battery power could adversely affect readings, as well as auto-shut off capability to preserve battery life.

Specifications	HI935007N
Range	-50.0 to 199.9°C; 200 to 1350°C
Resolution	0.1°C (up to 199.9°C); 1°C (outside)
Accuracy	±0.2% full scale (excluding probe error)
Probe	HI766C penetration, stainless steel K-type thermocouple temperature probe with 1 m (3.3) cable (fixed)
Battery Type	1.5V AAA (3) / approximately 1000 hours of continuous use; auto-off after 8 minutes of non-use
Environment	-10 to 50°C (14 to 122°F); RH max 100%
Dimensions	152 x 58 x 30 mm (6.0 x 2.3 x 1.2")
Weight	205 g (7.2 oz.)
Ordering Information	HI935007N is supplied with HI766C fixed temperature probe, batteries, instructions and hard carrying case.

HI9241

Thermistor Thermometer with Pre-Calibrated Probe

- CAL Check™
 - Alerts users of calibration status
- BEPS
 - Alerts the user of low battery power that could adversely affect reading
- Battery indicator
 - Battery level indicator at startup
- Waterproof
 - Compact, heavy-duty and waterproof

HI9241 features a new streamlined design with bottom probe connection. This instrument measures a wide range from -50.0 to 150.0°C with exceptional accuracy. This meter is simple to operate and is supplied complete with the user-replaceable HI765PW general purpose penetration probe.

Users may exchange the probe with any in the HI765 series without requiring recalibration. A diverse assortment of HI765 probes and cable lengths are available. Probes can be ordered with different handle colors to prevent cross-contamination.

Advanced battery management features include a display of remaining battery power at startup, low battery warning and BEPS (Battery Error Prevention System), which alerts the user in the event that low battery power could adversely affect readings.

Users can check the meter's accuracy at any time with Hanna calibration keys. Simply plug the key into the meter's probe input and if the display value does not match those of the key, the meter is due for recalibration.



Specifications	HI9241
Range	-50.0 to 150.0°C
Resolution	0.1°C
Accuracy	±0.4°C (excluding probe error)
Probe	HI765PW general purpose/penetration, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable (included)
Battery Type/Life	1.5V AAA (3) /approximately 2000 hours of continuous use; auto-off after 8 minutes of inactivity
Environment	-10 to 50°C (14 to 122°F); RH max 100% non-condensing
Dimensions	152 x 58 x 30 mm (6.0 x 2.3 x 1.2")
Weight	205 g (7.2 oz.)
Ordering Information	HI9241 is supplied with HI765PW temperature probe, batteries, instructions and rugged carrying case.
Probes	HI765PW General purpose/penetration, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable
	HI765A Air/gas, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable
	HI765L Air/liquid, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable
	HI765W Thermistor wire, stainless steel temperature probe with 1 m cable

	
Specifications	HI93501N • HI93501NS
Range	-50.0 to 150.0°C
Resolution	0.1°C
Accuracy	±0.4°C for 1 year (excluding probe error)
Probe	HI762PWL penetration, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable (included)
Battery Type / Life	1.5V AAA (3) / approximately 2000 hours of continuous use; auto-off after 8 minutes of non-use
Environment	-10 to 50°C (14 to 122°F); RH max 100%
Dimensions	152 x 58 x 30 mm (6.0 x 2.3 x 1.2")
Weight	205 g (7.2 oz.)
Ordering Information	HI93501N and HI93501NS are supplied with HI762PWL temperature probe, batteries, instructions and rugged carrying case.
Probes	HI762A Air/gas, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable
	HI762L Air/liquid, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable
	HI762W Thermistor, stainless steel wire temperature probe with 1 m cable

Thermistor probes begin on page 14.32; calibration test keys begin on page 14.36

HI93501N • HI93501NS

Thermistor Thermometers

- CAL Check™
 - Alerts users of calibration status
- HOLD
 - HOLD feature (HI93501NS)
- BEPS
 - Alerts the user of low battery power that could adversely affect readings
- Battery indicator
 - Battery level indicator at startup
- Waterproof
 - Compact, heavy-duty and waterproof

The HI93501N is a waterproof thermometer designed for daily use in food applications such as industrial kitchens and catering. The “S” version also adds a stability indicator bargraph and HOLD button to freeze readings on the LCD.

The HI762PWL penetration probe is included. A diverse assortment of HI762 probes and cable lengths are available. Probes can be ordered with different handle colors to prevent cross-contamination.

The display indicates the remaining battery power at startup then continuously checks the battery level and warns the user with ample time to change the battery.

The instruments are equipped with BEPS (Battery Error Prevention System), which alerts the user in the event that low battery power could adversely affect readings.

Users can check the meter’s accuracy at any time with Hanna calibration keys. Simply plug the key into the meter’s probe input and if the display value does not match those of the key, the meter is due for recalibration.

HI93503

Waterproof Thermometer

with Pre-Calibrated Interchangeable Probe

- **CAL Check™**
 - Alerts users of calibration status
- **HOLD**
 - HOLD Feature
- **BEPS**
 - Alerts the user of low battery power that could adversely affect readings
- **Battery indicator**
 - Battery level indicator at startup
- **Waterproof**
 - Compact, heavy-duty and waterproof

The HI93503 features a new streamlined design with bottom probe connection. This instrument measures a wide range from -50.0 to 150.0°C with exceptional accuracy. This meter is simple to operate and supplied with the user-replaceable HI765PWL penetration probe.

The HI93503 also features a HOLD button to freeze the display to allow the user time to record readings, and a stability indicator.

Exchange the probe with any other model in the HI765 series without requiring recalibration. A diverse assortment of HI765 probes and cable lengths are available. Probes can be ordered with different handle colors to prevent cross-contamination.

The instrument is also equipped with BEPS (Battery Error Prevention System), which alerts the user in the event that low battery power could adversely affect readings.

Users can check the meter's accuracy at any time with Hanna calibration keys. Simply plug the key into the meter's probe input and if the display value does not match those of the key, the meter is due for recalibration.



Specifications	HI93503
Range	-50.0 to 150.0°C
Resolution	0.1°C
Accuracy	±0.4°C (excluding probe error)
Probe	HI765PWL penetration, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable (included)
Battery Type / Life	1.5V AAA (3) / approximately 2000 hours of continuous use, auto-off after 8 minutes of inactivity
Environment	-10 to 50°C (14 to 122°F); RH max 100%
Dimensions	152 x 58 x 30 mm (6.0 x 2.3 x 1.2")
Weight	205 g (7.2 oz.)
Ordering Information	HI93503 is supplied with HI765PWL temperature probe, batteries, instructions and hard carrying case.
Probes	HI765PWGeneral purpose/penetration, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable
	HI765AAir/gas, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable
	HI765SLAir/liquid, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable
	HI765WThermistor wire, stainless steel temperature probe with 1 m cable



HI93510 · HI93510N

Thermistor Thermometers

- **HOLD**
 - HOLD Feature
- **BEPS**
 - Alerts the user of low battery power that could adversely affect readings
- **Battery indicator**
 - Battery level indicator at startup
- **Backlight**
 - Backlit display (N version)
- **Waterproof**
 - Compact, heavy-duty and waterproof

The HI93510 is a waterproof thermometer tailored for the lab and field. The LCD displays the highest and lowest readings in the cycle along with the current temperature. To freeze the reading for easy recording, simply press the HOLD button. Celsius or Fahrenheit range can be selected at the touch of a button.

The HI93510N offers all the features of the HI93510 plus a CAL button to allow the operator to calibrate the meter and probe in an ice bath at 0°C. This will assure the removal of the combined meter and probe interchange error. In addition to calibration capabilities, HI93510N has a user-activated backlit display.

A diverse assortment of HI762 probes and cable lengths are available. Probes can be ordered with different handle colors to prevent cross-contamination.

Advanced battery management features include a display of remaining battery power at startup, low battery warning and BEPS (Battery Error Prevention System), which alerts the user in the event that low battery power could adversely affect readings.

Specifications	HI93510	HI93510N
Range	-50.0 to 150.0°C; -58.0 to 302.0°F	
Resolution	0.1°C; 0.1°F (-58.0 to 230.0°F) and 0.2°F (outside)	
Accuracy	±0.4°C; ±0.8°F (for 1 year, excluding probe error)	
Probe	HI762BL air/liquid, stainless steel thermistor temperature probe with black handle and 1 m (3.3') cable (included)	
CAL Button	N/A	yes
Backlit LCD	N/A	yes
Battery Type / Life	1.5V AA (3) / approximately 2000 hours of continuous use (with backlight off); HI93510 only: auto-off selectable after 8 or 60 minutes of non-use (can be disabled)	
Environment	-10 to 50°C (14 to 122°F); RH max 100%	
Dimensions	150 x 80 x 36 mm (5.9 x 3.1 x 1.4")	
Weight	235 g (8.3 oz.)	
Ordering Information	HI93510 and HI93510N are supplied with HI762BL temperature probe, batteries and instructions.	
Probes	HI762L	Air/liquid, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable
	HI762A	Air/gas, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable

Thermistor probes begin on page 14.32; calibration test keys begin on page 14.36

HI762
HI762 Thermistor Probes

The HI762 temperature probes can be identified by the grey cap on the top of the handle and have the following specifications:

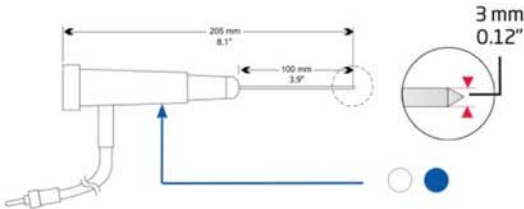
HI762 Probes	
Range	-50 to 150°C (-58 to 302°F)
Sensor	NTC thermistor
Accuracy	±0.2°C (±0.4°F)
Probe Handle	ABS
Interchange Error	±0.2°C (±0.4°F)
Probe	AISI 316 stainless steel
Response Time (90% of final value)	6 seconds

The HI762 series with NTC thermistor sensor offers a wide range of probes for measuring liquids, air and gases, and for penetration in semi-solids.

Models are available with a 1, 2 or 10 meter cable, and have colored handles for easy identification when measuring different samples.

HI762P

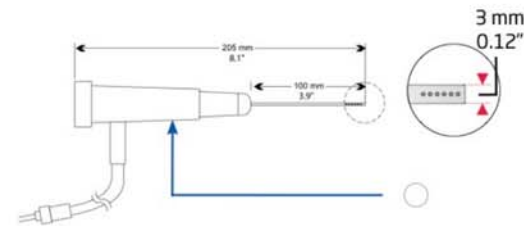
General purpose, penetration probe with colored handle.



Specifications		
1 m (3.3') Cable	2 m (6.6') Cable	Handle Color
HI762PW	–	white
HI762PBL	–	blue

HI762A

Thermistor probe for measuring the temperature of air and gases.



Specifications		
1 m (3.3') Cable	2 m (6.6') Cable	Handle Color
HI762A	–	white



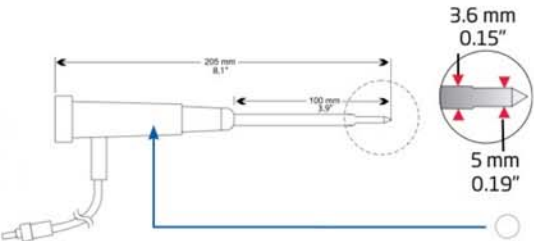
HI762

HI762 Thermistor Probes



HI762PWL

Thermistor probe with sharp tip for penetration of semi-solid samples.



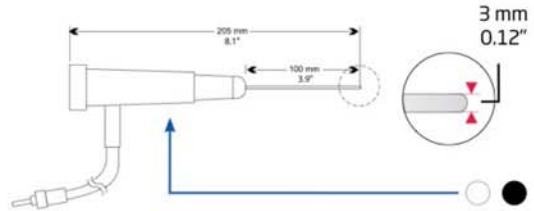
Specifications

1 m (3.3') Cable	2 m (6.6') Cable	10 m (32.8') Cable	Handle Color
HI762PWL	-	-	white



HI762L

Air, liquid probe.



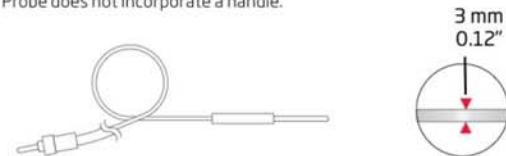
Specifications

1 m (3.3') Cable	2 m (6.6') Cable	10 m (32.8') Cable	Handle Color
HI762L	HI762L/2	HI762L/10	white
HI762BL	-	-	black



HI762W

Wire probe, designed to access hard to reach places. Probe does not incorporate a handle.



Specifications

1 m (3.3') Cable	2 m (6.6') Cable	10 m (32.8') Cable	Handle Color
HI762W	-	HI762W/10	-

HI765
HI765 Thermistor Probes

The HI765 temperature probes are provided with a PTC thermistor sensor, and have the following specifications:

HI765 Specifications	
Range	-50 to 150°C (-58 to 302°F)
Accuracy	±0.2°C (±0.4°F)
Sensor	PTC thermistor
Probe Handle	ABS
Interchange Error	±0.2°C (±0.4°F)
Probe	AISI 316 stainless steel
Response Time (90% of final value)	8 seconds

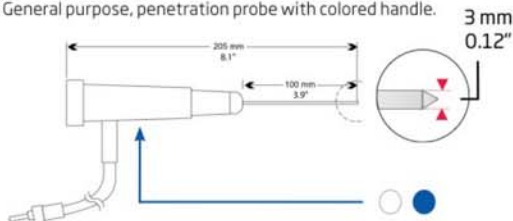
All probes are pre-calibrated with a maximum error of ±0.2°C (±0.4°F).

The HI765 series can be identified by the white cap on the top of the handle. This series offers a wide range of probes for measuring liquids, air and gases, and for penetration in semi-solids.

Models are available with a cable length of 1 or 10 meters and have colored handles for easy identification during measurements of different samples.

HI765P

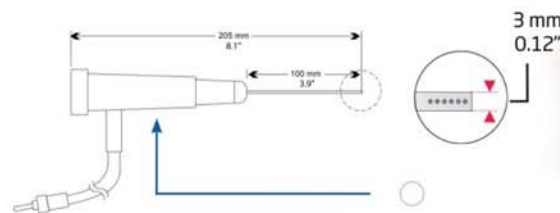
General purpose, penetration probe with colored handle.



Specifications		
1 m (3.3') Cable	10 m (32.8') Cable	Handle Color
HI765PW	HI765PW/10	white
HI765PBL	--	blue

HI765A

Thermistor probe for measuring the temperature of air and gases.



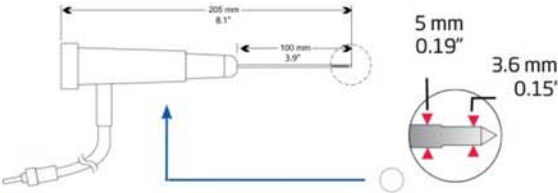
Specifications		
1 m (3.3') Cable	10 m (32.8') Cable	Handle Color
HI765A	HI765A/10	white



HI765
HI765 Thermistor Probes

HI765PWL

Thermistor probe with sharp tip for penetration of semi-solid samples.



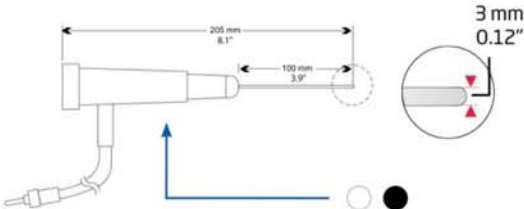
Specifications

1 m (3.3') Cable	2 m (6.6') Cable	Handle Color
HI765PWL	—	white



HI765L

Air, liquid probe.



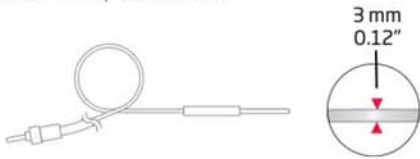
Specifications

1 m (3.3') Cable	10 m (32.8') Cable	Handle Color
HI765L	—	white
HI765BL	—	black



HI765W

Wire probe, designed to access hard-to-reach places.
Probe does not incorporate a handle.



Specifications

1 m (3.3') Cable	10 m (32.8') Cable
HI765W1	HI765W/10

HI765
HI765 Thermistor Probes

HI765BP

Thermistor probe without handle, designed to measure the temperature of stacked goods.



Specifications	
1 m (3.3') Cable	2 m (6.6') Cable
HI765BP1	-



Calibration Test Keys for Thermistor Thermometers

For measurements that are always reliable, thermometers must be calibrated periodically.

Hanna test keys offer a fast and simple way of checking the accuracy of your instruments.

Connect the key to the probe input. If the reading on the display differs more than 0.4°C (0.8°F) from the key rated value, your thermometer should be recalibrated at our technical service center.

Test Keys for Thermometers Using HI762 Probes

HI762-18C	Test key at -18°C	HI762-004F	Test key at -0.4°F
HI762000C	Test key at 0°C	HI762032F	Test key at 32°F
HI762070C	Test key at 70°C	HI762158F	Test key at 158°F

For periodic verification of your thermometer's calibration, it is recommended to check at least two points. Choose the test keys with the nominal values closest to the temperature usually measured.



Test Keys for Thermometers Using HI765 Probes

HI765-18C	Test key at -18°C	HI765-004F	Test key at -0.4°F
HI765000C	Test key at 0°C	HI765032F	Test key at 32°F
HI765070C	Test key at 70°C	HI765158F	Test key at 158°F

For periodic verification of your thermometer's calibration, it is recommended to check at least two points. Choose the test keys with the nominal values closest to the temperature usually measured.





HI99551 · HI99556

Infrared Thermometers for the Food Industry

- HOLD
 - HOLD Feature
- Battery indicator
 - Battery life indicator on startup
- Optional external probe can also be used (HI99556)

The HI99551 and HI99556 thermometers employ infrared technology to measure surface temperatures. Infrared readings are extremely fast, with a response time typically around one second.

One big advantage of these meters is the non-intrusive nature of measurements. This feature is particularly attractive for food distribution, retailing and markets, since it translates practicality into savings by leaving products intact, especially those sealed or pre-wrapped.

In order to measure the temperature, simply turn on the meter and point to the product or target. Readings are displayed on the LCD. This type of non-intrusive measurement is also useful when the surface temperature is too high to approach, for difficult to reach places or for hygiene requirements.

If you must check the core temperature in addition to surface measurement, the HI99556 is the ideal solution for you. Simply attach an optional external probe to the meter and you have a 2-in-1 infrared-thermistor thermometer.

A HOLD function freezes the display to allow the user time to record readings.

Specifications		HI99551-00 / HI99556-00	HI99551-10 / HI99556-10
Range	IR	-10 to 300°C	-20.0 to 199.9°C
	Probe (HI99556 only)	-40 to 150°C	-40 to 150.0°C
Resolution	IR	1°C	0.1°C
	Probe (HI99556 only)	1°C	0.1°C
Accuracy	IR	±2% of reading or ±2°C	±2% of reading or ±2°C
	Probe (HI99556 only)	±0.5°C (-20 to 120°C); ±0.5°C +1% reading (outside)	±0.5°C (-20 to 120°C); ±0.5°C +1% reading (outside)
IR Sensor Response Time		1 second	
IR Sensor Optic Coefficient		3:1 (ratio of distance to target diameter)	
Minimum Distance		30 mm (1.2")	
Probe (HI99556 only)		HI765PW general purpose/penetration, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable (included)	
Battery Type / Life		9V / approximately 150 hours of continuous use	
Environment		0 to 50°C (32 to 122°F); RH max 95%	
Dimensions		143 x 80 x 38 mm (5.6 x 3.2 x 1.5")	
Weight		320 g (11.3 oz.)	
Ordering Information		HI9955 ☐ x - ☐ y ☐	
		x = 1 meter with IR sensor x = 6 meter with IR sensor and HI765PW probe (40 to 150°C range)	y = 00 IR range from -10 to 300°C y = 10 IR range from -20 to 199.9°C
Probes		HI765PW General purpose/penetration, stainless steel thermistor temperature probe with white handle and 1 m (3.3') cable	

Thermistor probes begin on page 14.32; calibration test keys begin on page 14.36

HI955501 · HI955502

4-Wire Pt100 Thermometers

- Auto-ranging
- Available with interchangeable or fixed probe
- Economical
- Missing probe indicator (HI955501)
- Optional protective boot

Pt100 models are widely recognized as the most accurate, with the best stability, repeatability and linearity among thermometers. Add to this the 4-wire system that is practically impervious to lead-wire length error, and you have a powerful tool to measure temperature accurately.

The HI955501 works with the HI768 series of Pt100 temperature probes, while the HI955502 model is supplied with a fixed general-purpose probe.

The HI955501 also features a missing probe indicator to alert the user if no temperature probe is detected.

Both the HI955501 and HI955502 measure temperatures with 0.1°C resolution in the -199.9 to 199.9°C range and then automatically switch to 1°C from 200 to 850°C. Press RANGE and the resolution switches to 1°C at any time.

A compact, ergonomic design and a wrist-strap make it easy to carry them anywhere in the lab or plant. To protect the meter during field measurements, a Hanna shockproof boot is recommended.



Temperature

Pt100 thermometers

Specifications	HI955501	HI955502
Range	-199.9 to 199.9°C; -200 to 850°C	
Resolution	0.1°C (-199.9 to +199.9°C); 1°C (-200 to 850°C)	
Accuracy	±0.2°C and ±1 digit (-120.0 to 199.9°C); ±1°C and ±1 digit (-170 to 450°C); ±1% f.s. and ±1 digit (outside) (excluding probe error)	
Probe	HI768 series stainless steel Pt100 temperature probe with 1 m (3.3') cable (not included)	HI768P fixed general purpose/penetration, stainless steel Pt100 temperature probe with 1 m (3.3') cable (included)
Battery Type / Life	9V / approximately 150 hours of continuous use	
Environment	0 to 50°C (32 to 122°F); RH max 95%	
Dimensions	143 x 80 x 38 mm (5.6 x 3.2 x 1.5")	
Weight	320 g (11.3 oz.)	
Ordering Information	HI955501 is supplied with battery and instructions. HI955502 is supplied with HI768P fixed temperature probe, battery and instructions.	
Probes for HI955501	HI768A	Air/gas, stainless steel Pt100 temperature probe with 1 m (3.3') cable
	HI768L	Air/liquid, stainless steel Pt100 temperature probe with 1 m (3.3') cable
	HI768P	General purpose/penetration, Pt100 stainless steel temperature probe with 1 m (3.3') cable

HI768

HI768 Series: Pt100 Probes

The HI768 series of temperature probes is provided with a Pt100 sensor and features the following specifications:

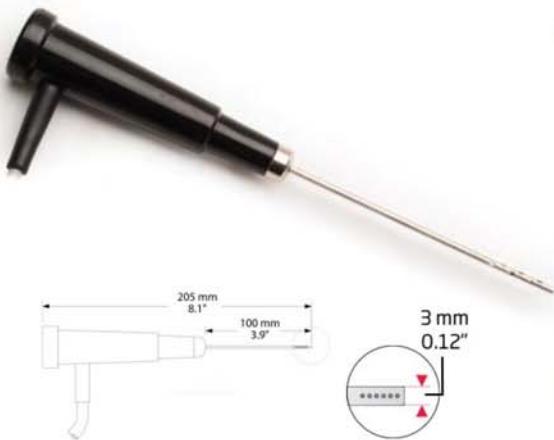
HI768 Specifications	
Range	-30 to 350°C (-22 to 622°F)
Sensor	Pt100
Accuracy	±0.25°C (±0.5°F) ±3% of reading
Probe Handle	Carilon®
Interchange Error	±0.2°C (±0.4°F)
Probe	AISI 316 stainless steel
Response Time	30 seconds



HI768P, General Purpose/
Penetration Probe

Pt100 probe for applications, such as air measurement and penetration of semi-solids.

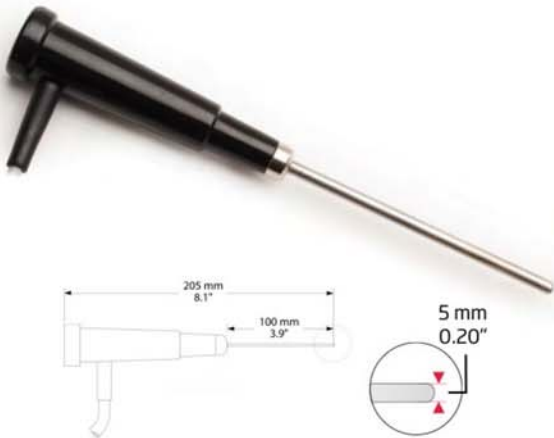
Specifications				
Code	Application	Probe Dimensions	Handle Color	Cable Length
HI768P	general purpose/ penetration	L 205 mm x dia 3 mm (0.12")	green	1 m (3.3')



HI768A

Pt100 probe for measuring the temperature of air and gases.

Specifications			
Code	Application	Probe Dimensions	Cable Length
HI768A	air, gases	L 205 mm x dia 3 mm (0.12")	1 m (3.3')



HI768L

Pt100 probe for applications, such as liquid and air.

Specifications			
Code	Application	Probe Dimensions	Cable Length
HI768L	liquid, air	L 205 mm x dia 5 mm (0.20")	1 m (3.3')

14

Temperature

dataloggers

HI141

Temperature Dataloggers

- BEPS (Battery Error Prevention System)
 - Alerts the user of low battery power that could adversely affect readings
- Multiple input channels
 - One or two channels with internal or external sensor
- Logging
 - Non-volatile storage of logging
- Waterproof
 - Waterproof casing

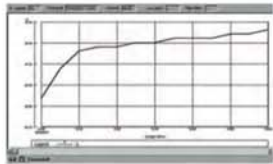
The HI141 series is a family of temperature dataloggers with either one or two channels, internal or external temperature sensors and an optional LCD. External temperature sensor models feature one or two stainless steel sensors on a 1 m (3.3') cable for direct insertion. the HI141 can store up to 16,000 temperature samples in a protected, non-volatile EEPROM memory. The logging interval can be set from once per second to once per 24 hour period, and logging delay can be set anywhere up to 199 hours. The MIN or MAX temperature between logging intervals can also be stored. All of your collected data is tamper-proof and stored into serial numbered lots.

The HI141000 Windows® compatible software supports communication between the logger and the PC through the HI141001 infrared transmitter.

The waterproof housing can include a convenient hanging hook (simply add an "H" to the end of the code). For a typical 1 minute logging interval, the battery will last about 4 years.



Specifications		Display	Molded Eye for Hanging	Sensor(s)	Cable Length (if applicable)	Range
Model Specific	HI141AH	•	•	1 internal	–	-40.0 to 80.0°C / -40.0 to 176.0°F
	HI141BH	•	•	1 external	1 m (3.3')	-40.0 to 125.0°C / -40.0 to 257.0°F
	HI141CH	•	•	1 internal	–	-20.0 to 70.0°C / -40.0 to 158.0°F
	HI141DH	•	•	1 external	1 m (3.3')	-40.0 to 125.0°C / -40.0 to 257.0°F
	HI141EH	•	•	1 internal	1 m (3.3')	-40.0 to 80.0°C / -40.0 to 175.0°F
				1 external		-40.0 to 125.0°C / -40.0 to 257.0°F
	HI141FH	•	•	2 external	1 m (3.3')	-40.0 to 125.0°C / -40.0 to 257.0°F
	HI141GH	•	•	1 internal	1 m (3.3')	-20.0 to 70.0°C / -40.0 to 158.0°F
				1 external		-40.0 to 125.0°C / -40.0 to 257.0°F
	HI141JH	•	•	2 external	1 m (3.3')	-40.0 to 125.0°C / -40.0 to 257.0°F
All Models	Resolution	0.1°C (-40.0 to 100.0°C); 0.2°C (> 100.0°C) 0.1°F (-40.0 to 190.0°F); 0.3°F (> 190.0°F)				
	Accuracy	±0.5°C (-40.0 to 0.0 and 70.0 to 100.0°C); ±0.4°C (0.0 to 70.0°C); ±1.0°C (> 100.0°C); ±1.0°F (-40.0 to 32.0 and 158.0 to 212.0°F); ±0.8°F (32.0 to 158.0°F); ±2.0°F (> 212.0°F)				
	Environment	RH 100%				
	Diameter	86.5 mm (3.4")				
	Height	35 mm (1.4")				
Ordering Information	Weight	150 g (5.5 oz.)				
	All HI141 models are supplied with 3.6V Lithium AA battery, magnetic key and instructions.					
Accessories	HI141000	Windows® compatible software (required)				
	HI141001	infrared transmitter (required)				
	HI740033	3.6 V AA lithium battery				
	HI740221	key for HI141 magnetic start				



- The HI140 logger is an excellent way to conform with HACCP requirements and guarantee safety throughout the food chain
- Through HI92140 application software (optional), all models can be programmed to read °C or °F
- Completely user friendly - set the parameters to best fit your application

Specifications

Model	Range	Resolution	Accuracy
HI140AH	-30.0 to 70.0°C / -22 to 158°F	0.5°C / 0.5°F	±1.5°C / ±3°F
HI140BH	-10.0 to 30.0°C / 14 to 86°F	0.2°C / 0.4°F	±0.5°C / ±1°F
HI140CH	-30.0 to 10.0°C / -22 to 50°F	0.2°C / 0.4°F	±0.5°C / ±1°F
HI140DH	20.0 to 60.0°C / 68 to 140°F	0.2°C / 0.4°F	±0.5°C / ±1°F
HI140GH	-5.0 to 15.0°C / 23 to 59°F	0.1°C / 0.2°F	±0.3°C / ±0.6°F
HI140HH	10 to 120°C / 50 to 248°F	1°C / 2°F	±2°C / ±4°F

Ordering Information

All HI140 models are supplied with batteries and instructions.

All loggers have the following features: programmable high and low alarm thresholds; programmable logging interval from 1 min. to 23 hours and 59 min; logging delay start selectable from 0 min. to 23 hours and 59 min; programmable ID number; infrared communication with PC interface; programmable real time clock; 3 x 1.5V AA batteries (included) with approx. life of 4 years at 25°C; dimensions: dia 86.5mm x h 35 mm; / weight: 150 g

HI140
Temperature
Dataloggers

- BEPS (Battery Error Prevention System)
 - Alerts the user of low battery power that could adversely affect readings
- Connectivity
 - Remotely controlled from the PC

HI140 loggers are not much larger than a PC mouse. They are housed in a smooth, yet tough ABS casing that is sealed against ingress of dust and water.

These dataloggers represent the most economical and secure way of monitoring temperature continuously over long periods of time. They can be placed with goods on the move, on supermarket shelves and in warehouses. They record the temperature at a given interval to make sure that perishable goods are not left unattended, such as on a loading dock on the other side of the world! For instance, users can check if fresh fish remained at unacceptable temperatures and for how long. They can provide that extra guarantee that goods never ventured out of limits of public safety.

HI140 models feature different temperature ranges to make them more accurate for your specific needs. A green LED on the front of the meter notifies users of the logging status, while a red LED serves as an alarm indication when undesired temperatures have been encountered.

The HI140 can store up to 7600 measurements at selectable intervals from 1 minute to 24 hours. All parameters can be set through our Windows® compatible software. An infrared cradle eliminates the need to put a connector on the meter - an undesirable dirt-trap in the food market and source of problems due to wear and tear over time.

Logged data can be transferred to a PC by simply placing the instrument on the HI90140 interface and running the HI92140 software. Users need just one interface connected to the PC to handle all Hanna dataloggers, each identified by a unique ID code.

The instruments are equipped with BEPS (Battery Error Prevention System), which alerts the user in the event that low battery power could adversely affect readings.

HI143
T-Logger with
Locking Wall Cradle

- Battery indicator
 - Battery life indicator on startup
- Connectivity
 - Logging start through PC
- Logging
 - Up to 4000 logged samples
- Security
 - Password protected

The HI143 is a temperature data logger with an internal NTC sensor. The HI143 is controlled via USB or RS232 on a PC with Hanna's Windows® compatible application software. Communication is made between the logger and the PC through the HI143001 transmitter with RS232, or HI143002 with USB connector. The supplied wall cradle makes it easy to lock the meter in place to prevent tampering, and the application software supports security passwords.



Specifications	HI143
Range	-30. to 70.0°C/-22.0 to 158.0°F
Resolution	0.1°C/0.1°F
Accuracy	±0.4°C (-20 to 60°C); ±0.6°C (outside); ±0.7°F (-4 to 140°C); ±1.1°F (outside)
Calibration	factory-calibrated
Data Logging	up to 4000 samples
Logging Interval	user selectable, from 1 minute to 24 hours
Battery Type / Life	CR2032 3V lithium ion / approximately 2 years
Protection	IP65 (water-resistant)
Dimensions	60 x 37 x 17 mm (2.4 x 1.5 x 0.7")
Ordering Information	HI143 is supplied with CR2032 lithium battery, wall cradle, lock and instructions. HI143-00 is supplied with HI143 logger, HI143001 RS232 communication cradle, Windows® compatible application software, CR2032 lithium battery, wall cradle, lock and instructions. HI143-10 is supplied with HI143 logger, HI143002 USB communication cradle, Windows® compatible application software, CR2032 lithium battery, wall cradle, lock and instructions.