

# Wine Analysis Products



2<sup>nd</sup> Edition





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# 360° Value

## We Design, Manufacture, Supply and Support All of Our Products

HANNA is the largest family-owned manufacturer of electroanalytical instrumentation in the world. From instrumentation to electrodes and reagents, all of our products are designed and manufactured in one of our state-of-the-art production facilities.

When you buy a HANNA product, you're not only buying the best value for your money, but you're also adding the benefit of HANNA's unsurpassed customer service and post-sale technical support.

### Local Support

After you have made your investment, you should never feel uncertain about the support or technical service you will receive. For over 30 years, HANNA has developed relationships with its customers built on quality products with personal service and support.

### Worldwide Offices

With over 50 offices spanning more than 30 countries, HANNA has positioned itself as a worldwide leader in laboratory instrumentation. Offering research grade quality at competitive prices, we strive to work with you to develop a HANNA solution tailored to your needs, on your budget.

### 24/7 Access

Our full catalog is available online at [www.hannainst.com](http://www.hannainst.com). There you can search for products, look up local office contacts, download instruction manuals and print brochures any time of day, wherever you are.

### Quality Assurance

Our products are developed under strict ISO 9001:2000 standards. Every HANNA instrument undergoes stringent quality control tests at different stages of manufacturing including 100% quality control checks just prior to shipment.

**Designed to Measure:** pH, Free and Total SO<sub>2</sub>, Reducing Sugars, Total Acidity, Nitrogen, Volatile Acidity, General Alcohol, Potassium, Fluoride, Ammonium



## HI 901 & HI 902 **Automatic Titration Systems**

### **A Complete Analysis**

A complete analysis comprises of sample preparation, dispensing of titrant solution, stirring, measuring and waiting times, recognition of the end point and storing the results. All the parameters that a titration requires are grouped into a method. Use the supplied methods or create your own.

- **Clip-Lock™ Exchangeable Burette System**  
With Clip-Lock™, it only takes a couple seconds to exchange the reagent burettes to perform a different titration.
- **Support up to 100 titration methods** (standard and user defined)
- **Dynamic/Linear dosing**
- **Color LCD with backlight**
- **Precise dosing system** (accuracy under 0.1% of burette volume)
- **Titration graph can be displayed on-screen & saved**
- **Self diagnostic features for peripheral devices**
- **Reminders for titrant age and standardization expiration**
- **Easily incorporated into any existing GLP data management program**
- **User customized reports** can be printed, saved to USB flash drive or transferred to PC via RS232

### **ORDERING INFORMATION**

**HI 901-01** (115V) and **HI 901-02** (230V) are supplied with (1) 25 mL glass burette, (1) burette driver assembly, power adapter and instructions.

**HI 902-01** (115V) and **HI 902-02** (230V) back titration and multiple end-point titrators are supplied with (1) 25 mL glass burette, (1) burette driver assembly, power adapter and instructions.



## Electrodes, Solutions and Accessories

| PARAMETER | AMMONIA                                       | BROMIDE                                    |                          | FLUORIDE                               |                          | POTASSIUM                               |                               |
|-----------|---|--|--------------------------|--|--------------------------|---|-------------------------------|
| Code      | HI 4101                                       | HI 4002                                    | HI 4102                  | HI 4010                                | HI 4110                  | HI 4014                                 | HI 4114                       |
| Type      | Gas-Sensing; Combination                      | Solid-state; Half-cell                     | Solid-state; Combination | Solid-state; Half-cell                 | Solid-state; Combination | Polymer Membrane; Half-cell             | Polymer Membrane; Combination |
| Use       | Determination of ammonium and ammonia in wine | Determination of free bromide ions in wine |                          | Determination of free fluoride in wine |                          | Determination of potassium ions in wine |                               |

### pH ELECTRODES

- HI 1048B** pH electrode for wine and must with CPS™ (clogging prevention system), open junction, refillable, glass body, BNC connector and 1 m (3.3') cable
- HI 1131B** Glass-body, single junction, refillable, combination pH electrode.
- HI 1083B** Glass-body, micro, Viscolene, non-refillable, combination pH electrode.
- FC 200B** Plastic-body (PVDF), open junction, conic, Viscolene, non-refillable, combination pH electrode.

### pH BUFFER SOLUTIONS

- HI 7004L** pH 4.01 buffer solution, 500 mL
- HI 7007L** pH 7.01 buffer solution, 500 mL
- HI 7010L** pH 10.01 buffer solution, 500 mL

### ELECTRODE CLEANING SOLUTIONS

- HI 7061L** General cleaning solution, 460 mL

### pH ELECTRODE STORAGE SOLUTIONS

- HI 70300L** Storage solution, 460 mL

### ACCESSORIES

- HI 7662-T** Temperature probe with 1 m (3.3') cable
- HI 900100** Dosing Pump
- HI 900280** Dosing tube
- HI 900270** Aspiration tube
- HI 900105** 5 mL Burette
- HI 900110** 10 mL Burette
- HI 900125** 25 mL Burette
- HI 900301** Propeller stirrer with sliding positioning collar
- HI 900930** RS232 cable for PC connection
- HI 900900** Windows® compatible software



- Calibration Check™
- Electrode diagnostics
- Designed specifically for wine analysis
- Electrode condition is shown on display
- Log up to 100 samples
- Last calibration date and data
- Calibration alarm timeout
- Instrument ID Number
- Real Time Clock
- Clog-resistant electrode
- USB

## HI 2222 pH and Temperature Meter

### Recognizing dirty pH electrodes

During the process of wine making, most pH measurements are made in the must. When measuring the pH of must, a pH electrode's measuring bulb and junction can quickly get dirty from sediment deposits. This becomes a big problem during the actual pH measurement and during subsequent measurements if the electrode was not properly cleaned. Simply, a dirty pH electrode can give results that are up to 0.5 pH inaccurate – even after a pH calibration has just been performed.

### Knowing when to clean pH electrodes

Conventional pH meters do not warn the user when the pH electrode is dirty. A common example of this occurs just after calibrating the instrument – the pH electrode is immersed into the pH 7 buffer and the reading is lower than expected (pH 6.8 or 6.9 instead of 7.0). HI 2222 uses HANNA's unique technology to detect when the electrode is dirty and gives a warning during calibration.

### Cleaning pH electrodes

It is of the utmost importance to properly clean your pH electrode prior to use. Cleaning solutions tailored to specific applications are required in order to remove all the deposits on the sensitive bulb and junction. HI 70635 (wine deposits removal) and HI 70636 (wine stain removal) are tailored made cleaning solutions that remove all deposits from your pH electrode to guarantee accurate measurements and electrode longevity. HANNA is the only manufacturer to offer tailor made cleaning solutions for winemaking.



# Calibration Check™ Indications



Optimal condition



Clogged junction



Clogged junction,  
dirty electrode



Aged/dirty  
electrode



Electrode failure

HI 1048P  
pH Wine Electrode with CPS™

See p. 9



## pH 3.00 Buffer: Tailor-made Calibration for Wine Analysis

Since most wine measurements are taken at a pH of less than 4, these meters have been pre-programmed at a custom calibration point of 3.00 pH.

Using the pH 3.00 buffer will minimize any measurement error due to calibration.

## ORDERING INFORMATION

HI 2222-01 (115V) and HI 2222-02 (230V) are supplied with HI 1048P pH electrode, HI 7669/2W stainless steel temperature probe, HI 76404N electrode holder, pH 3 and pH 7 buffer sachets, cleaning solutions for removing wine stains and deposits, electrode refilling solution, 5 mL graduated syringe, 12 Vdc power adapter and instruction manual.

## ELECTRODES

- HI 1048P** Refillable pH electrode with CPS™, glass body and 1 m (3.3') cable
- HI 7669/2W** Temperature probe

## pH SOLUTIONS

- HI 5003** pH 3.00 buffer solution, 500 mL
- HI 50003-02** pH 3.00 buffer solution, (25) 20mL sachets
- HI 7007L** pH 7.01 buffer solution, 500 mL
- HI 7010L** pH 10.01 buffer solution, 500 mL
- HI 7001L** pH 1.68 buffer solution in FDA approved bottle, 500 mL
- HI 8006L** pH 6.86 buffer solution in FDA approved bottle, 500 mL
- HI 8007L** pH 7.01 buffer solution in FDA approved bottle, 500 mL
- HI 8009L** pH 9.18 buffer solution in FDA approved bottle, 500 mL
- HI 8010L** pH 10.01 buffer solution in FDA approved bottle, 500 mL

## ELECTRODE SOLUTIONS

- HI 70635L** Cleaning solution for wine deposits, 500 mL
- HI 700635P** Cleaning Solution for wine deposits, (25) 20mL sachets
- HI 70636L** Cleaning solution for wine stains, 500 mL
- HI 700636P** Cleaning Solution for wine stains, (25) 20 mL sachets
- HI 7061L** General Cleaning solution, 500 mL
- HI 70300L** Electrode storage solution, 500 mL
- HI 7082** 3.5M KCl Electrolyte, (4) 30 mL, for double junction electrodes

## ACCESSORIES

- HI 92000** Windows® compatible software
- Checktemp®C** Pocket thermometer, range: -50.0 to 120.0°C



- Electrode monitoring
- Waterproof
- Automatic temperature compensated pH
- Automatic 1 or 2 point calibration
- Clog-resistant electrode
- B.E.P.S. (Battery Error Prevention System)
- HOLD button to freeze readings on display
- Last calibration warning

## Environmentally Friendly

**Powered by Rechargeable Batteries**

When batteries are low, simply plug the HI 9026W into an electrical outlet using the 12 Vdc power adaptor/charger to recharge.

# HI 9126W pH and Temperature Meter

## Calibration Check™ System

Each time pH calibration is performed, the meter internally compares the new calibration with the one previously stored. When the comparison indicates a significant difference, the clean message blinks on the LCD to advise the user that the pH electrode may need to be cleaned and another calibration will need to be performed.

### ORDERING INFORMATION

**HI 9126W-01** (115V) and **HI 9126W-02** (230V) are supplied with HI 1048B pH electrode, HI 7662 stainless steel temperature probe, pH 3 and pH 7 buffer sachets, cleaning solutions for removing wine stains and deposits, 100 mL plastic beaker, 12 Vdc power adaptor/charger and instruction manual.

### ELECTRODES

- HI 1048B** Refillable pH electrode with glass body and 1 m (3.3') cable
- HI 7669/2W** Temperature probe

### pH SOLUTIONS

- HI 50003-02** pH 3.00 buffer solution, (25) 20mL sachets
- HI 7007L** pH 7.01 buffer solution, 500 mL

### ELECTRODE SOLUTIONS

- HI 700635P** Cleaning Solution for wine deposits, (25) 20mL sachets
- HI 700636P** Cleaning solution for wine stains, (25) 20 mL sachets
- HI 70300L** Electrode storage solution, 500 mL
- HI 7082** 3.5M KCl Electrolyte, (4) 30 mL, for double junction electrodes

# HI 1048 CPS™ Electrode

An Electrode Specifically Designed for Wine Analysis

HI 1048 series is ideal for use with HANNA's Wine Line pH instruments such as HI 222 benchtop pH meter and HI 9026W portable pH meter

## CPS™ (Clogging Prevention System)

Conventional pH electrodes use ceramic junctions that clog quickly when used with wine. When the junction is clogged, the electrode does not function.

CPS™ technology utilizes the porousness of ground glass coupled with a PTFE sleeve to prevent clogging of the junction. The ground glass allows proper flow of the liquid, while the PTFE sleeve repels dirt.

With HANNA's new CPS™ technology, pH electrodes stay fresh for up to 20 times longer than conventional electrodes.

## ORDERING INFORMATION

**HI 1048P** (for HI 2222) pH electrode with open CPS™ (Clogging Prevention System) junction, BNC connector and 1 m (3.3') cable for wine and must applications.

**HI 1048PB** (for HI 9026W) pH electrode with open CPS™ (Clogging Prevention System) junction, BNC connector and 1 m (3.3') cable for wine and must applications.

# HI 2222 • HI 9126W Tailor-made Accessories



## HI 190M Magnetic Stirrer

The HI 190M is a magnetic mini-stirrer with electronic controls that allow the user to regulate speed with precision.

### Speedsafe™ Technology

Ensures that the maximum speed is never exceeded even if a load is suddenly removed.



## Solutions

### pH 3.00 Buffer: Tailor-made Calibration

Since most wine measurements are taken at a pH of less than 4, these meters have been pre-programmed at a custom calibration point of 3.00 pH.

Using the pH 3.00 buffer will minimize any measurement error due to calibration. HI 5003 is available in a 500 mL bottle and HI 50003-02 is available in a 25 pack of 20 ml sachets.

### Electrode Cleaning Solutions Dedicated to Wine

HI 70636 for wine stains and HI 70635 for wine deposits will help keep your electrode clean and your measurements accurate.





# HI 84100 Sulfur Dioxide mini Titrator

The HANNA HI 84100 offers the possibility to test free or total  $\text{SO}_2$  in all the wines including the red ones that are difficult to test with manual methods because the color changes are hardly seen.

- Results in minutes
- Simple to operate
- Pre-programmed with analysis method

## All-In-One

Built in magnetic stirrer with electrode, beaker and reagent holder in one compact unit.

## Free and Total Sulfur Dioxide

An important reason for adding  $\text{SO}_2$  is to avoid oxidation. When there is oxygen around,  $\text{SO}_2$  itself becomes oxidized before phenol compounds in the wine, and so acts as an oxygen scavenger. Also,  $\text{SO}_2$  suppresses the activity of enzymes that cause browning and other problems.

Molecular  $\text{SO}_2$  is what really is protecting your wine. When you add  $\text{SO}_2$ , depending of circumstances, some of it immediately becomes bound. The relationship between the amount of  $\text{SO}_2$  and amount of  $\text{SO}_2$  remaining free is complex. It is clear, however, that is largely governed by the total  $\text{SO}_2$  content of the wine. The rate of binding decreases as the free  $\text{SO}_2$  concentration increases. The exact relationship between free and bound (total-free)  $\text{SO}_2$  will vary from wine to wine.

Below 30-60 ppm, 33% to 50% of  $\text{SO}_2$  addition becomes bounded. What remains is called "free" and it is divided in two parts. The larger, and relatively ineffective free part is "bisulphite" ( $\text{HSO}_3^-$ ). The smaller part of the free is the active molecular. The amount of molecular  $\text{SO}_2$  in your wine depends both on the level of free  $\text{SO}_2$  present as well as pH. For instance, at pH 3.2, the amount of the free  $\text{SO}_2$  for 0.8 ppm molecular  $\text{SO}_2$  is 22 ppm. At pH 3.5, you will need 43 ppm free - essentially double. In most situations, 0.8 ppm, molecular  $\text{SO}_2$  during bulk storage and at bottling will provide you with adequate protection from oxidation and bacterial action. This includes prevention of malolactic bacteria as well.

It is important to remember that the amount of free  $\text{SO}_2$  in the wine depends on three things: how much is added, how much was present before the addition and how much of your addition promptly becomes bound.

The level at which molecular  $\text{SO}_2$  can be detected by the human senses is about 2.0 ppm. This is also the level which is needed for maximum protection of your wine. This is particularly true in the case of sweet, and most notably, botrytised wines.

## ORDERING INFORMATION

**HI 84100-01** (115V) and **HI 84100-02** (230V) are supplied with reagent set for 20 titrations, 50 mL beakers (2), 20 mL beakers (2), scissors, tube set with cap, ORP electrode, stir bar, electrode refill solution (30 mL), 1 mL syringe, wine deposit cleaning solution sachets (2), wine stain cleaning solution sachets (2), power cable and instructions.

## PROBES

**HI 3148B/50** ORP Probe with shorter cable

## SOLUTIONS

- HI 70635** Cleaning solution for wine deposits, 500 mL
- HI 70636** Cleaning solution for wine stains, 500 mL
- HI 7082** Electrode filling solution, 30 mL (4)

**HI 70300L** Electrode storage solution, 500 mL

## REAGENTS

- HI 84100-50** Titrant solution, 110 mL
- HI 84100-51** Alkaline reagent, 500 mL
- HI 84100-52** Acid reagent for total  $\text{SO}_2$ , 500 mL
- HI 84100-53** Acid reagent for free  $\text{SO}_2$ , 500 mL
- HI 84100-54** Stabilizer reagent (25)
- HI 84100-55** Calibration standard, 500 mL

## ACCESSORIES

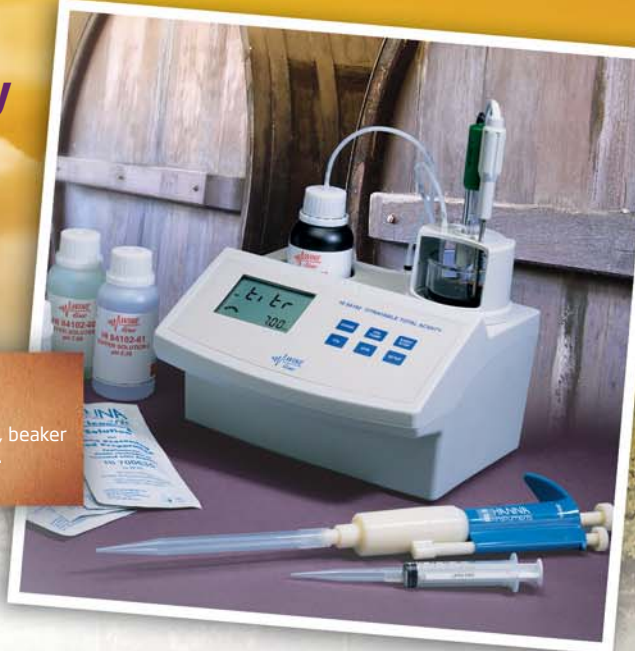
- HI 70483T** Tube set with cap for titrant bottle and tip
- HI 731316** Stir bar (5)
- HI 740036P** Beaker 50 mL (10)
- HI 740037P** Beaker 20 mL (10)

# HI 84102 Total Acidity mini Titrator

- Results in minutes
- Simple to operate
- Pre-programmed with analysis method

## All-In-One

Built in magnetic stirrer with electrode, beaker and reagent holder in one compact unit.



## Titrateable Total Acidity

Acids occur naturally during the growing of grapes as part of the fermentation process wines show lower levels of acid when there are hot growing seasons or when the grapes come from hotter regions. In the proper proportion, acids are a desirable trait and give the wine character.

The three predominant acids in wine are tartaric, malic, and citric, all of which are intrinsic to the grape. Tartaric acid is the principal acid in grapes and is a component that promotes a crisp flavor and graceful again in wine. A moderate amount of a wine's acid comes from malic acid, which contributes to fruitiness, and a small amount comes from citric acid. Wine also contains trace amounts of other acids. The least desirable acid in wine is acetic acid, which, when present in more than a nominal amount, give swine a sour vinegary aspect.

Total acidity, also called titrateable acidity, is the sum of the fixed and volatile acids. In the United States the total acidity is usually expressed in terms of tartaric acid, even though the other acids are measured.

Total acidity directly effects the color and flavor of wine and depending on the style of the wine, is sought in a perfect balance with the sweet and bitter sensations of other components. Too much acidity makes wine tart and sharp; too little makes wines flat, flabby and uninteresting. Proper acidity in wine is what makes it refreshing and an ideal accompaniment to food.

The proper acid level of a wine varies. Sweeter wines generally require somewhat higher levels to retain the proper balance. For dry table wine the acceptable range is usually 0.60 to 0.75%; for sweet wine it's 0.70 to 0.85%.

## ORDERING INFORMATION

**HI 84102-01** (115V) and **HI 84102-02** (230V) is supplied with reagent set for 20 titrations, 2000  $\mu$ L automatic pipette, plastic tips for 2000  $\mu$ L automatic pipette (2), 50 mL beakers (2), tube set with cap, pH electrode, temperature probe, stir bar, power cable, electrode refill solution (30 mL), mL syringe (1), wine deposits cleaning solution sachets (2), wine stain cleaning solution sachets (2) and instruction manual.

## ELECTRODES

- HI 1048B** pH Electrode  
**HI 7662-T** Temperature Probe

## SOLUTIONS

- HI 70635** Cleaning solution for wine deposits, 500 mL

- HI 70636** Cleaning solution for wine stains, 500 mL  
**HI 7082** Electrode filling solution, 30 mL (4)  
**HI 70300L** Electrode storage solution, 500 mL

## REAGENTS

- HI 84102-50** Titrant solution, 110 mL  
**HI 84102-55** Calibration standard, 100 mL  
**HI 84102-60** Buffer solution 1, pH 7.00, 500 mL  
**HI 84102-61** Buffer solution 2, pH 8.20, 500 mL

## ACCESSORIES

- HI 70483T** Tube set with cap for titrant bottle and tip  
**HI 731316** Stir bar (5)  
**HI 731342** Automatic pipette 2000  $\mu$ L  
**HI 731352** Tips for 2000  $\mu$ L automatic pipette (4)  
**HI 740036P** Beaker 50 mL (10)



- Twist-on electrode holder and built-in stirrer
- Quick, automatic analysis
- Compact and lightweight
- Log up to 50 samples
- Simple, intuitive interface

Each ISE meter is supplied with ISE electrode, reference half cell, temperature probe, magnetic stir bar, filling solution, plastic beakers, automatic pipette, manual pipette, syringe, power cable and instruction manual.

## ISE Meters w/Twist-on Electrode Holder and Built-in Stirrer

### HI 84185 ISE Ammonia Nitrogen Meter

The HI 84185 ISE Ammonia Nitrogen meter measures the ammonia nitrogen ( $N-NH_3$ ) content in wine using an ion selective electrode. A double standard addition method (which is a simple and rapid method of analysis) is used and the result is readily displayed in ammonia nitrogen ( $N-NH_3$ ) mg/L (ppm).

#### ORDERING INFORMATION

**HI 84185-01** (115V) and **HI 84185-02** (230V) are supplied with reagents set (20 tests), 1000  $\mu$ L automatic pipette with tips (6), 50 mL beakers (2), HI 61101 ammonia electrode, HI 7662-T temperature probe, stir bar (2), HI 4001-40 refilling solution, 30 mL (4), HI 4001-51 replacement membrane (10), HI 4000-47-4 and HI 4000-47-7 pH 4 and 7 powder packets, 1 mL syringe, 1 mL pipette, tweezers, power cable and instructions.

### HI 84184 ISE Fluoride Meter

The HI 84184 ISE Fluoride meter measures the fluoride content in wine using an ion selective electrode.

A double standard addition method (which is a simple and rapid method of analysis) is used and the result is readily displayed in  $F^-$  mg/L (ppm).

#### ORDERING INFORMATION

**HI 84184-01** (115V) and **HI 84184-02** (230V) are supplied with reagents set (20 tests), 1000  $\mu$ L automatic pipette with tips (4), 50 mL beakers (2), 20 mL beakers (2), HI 61010 fluoride half cell, HI 5315 reference half cell, HI 7662-T temperature probe, stir bar (2), HI 7075 refilling solution, 30 mL (4), 1 mL syringe, 1 mL pipette, power cable and instructions.

### HI 84181 ISE Potassium Meter

The HI 84181 ISE Potassium meter measures the potassium content in wine using an ion selective electrode. A double standard addition method (which is a simple and rapid method of analysis) is used and the result is readily displayed in g/L  $K^+$  (ppt).

#### ORDERING INFORMATION

**HI 84181-01** (115V) and **HI 84181-02** (230V) are supplied with reagents set (20 tests), 2000  $\mu$ L automatic pipette with tips (6), 50 mL beakers (2), HI 61014 potassium half cell, HI 5315 reference half cell, HI 7662-T temperature probe, stir bar (2), HI 7075 refilling solution, 30 mL (4), 1 mL syringe, 1 mL pipette, power cable and instructions.

## HI 9143W

HI 9143W Dissolved Oxygen meter can measure DO in bottled wine as well as in the storage tanks. This meter has automatic compensation capabilities for conditions that can impact the accuracy of your reading such as temperature, altitude, humidity and salinity. This meter also comes with our Spot Check probe.

## HI 9142W

HI9142W is our easy to use dissolved oxygen meter with our Spot Check probe.

- **Waterproof**
- **Spot Check Probe fits into most wine bottle necks**
- **Fast, professional results**



## Dissolved Oxygen Meters with Spot Check Probe

### The Importance of Measuring Dissolved Oxygen in Wine:

There are several stages where it is important to measure for Dissolved Oxygen:

- 1. Test for the level of oxygen during racking and tank movements.** Whether its reduced or alternatively oxidized, the taste of wine can be dramatically effected by oxygen.
- 2. Test for oxygen pickup during pad, DE, and crossflow filtrations.** DO monitoring ensures consistent process control and operation of equipment.
- 3. Monitor micro O<sub>2</sub> treatment during maturation process.** Plotting the dissolved oxygen present during treatment aids in timely and effective micro O<sub>2</sub> implementations.
- 4. Test the tank for the amount of oxygen after processing and before bottling.** The concentration of molecular oxygen should be measured in the wine before bottling and should be less than 0.5 mg/L. If the concentration of oxygen is greater than 0.5 mg/L, it can generally be lowered by sparging with nitrogen gas (see Zoecklein et al., 1995).
- 5. Test oxygen in bottled wine.** During bottling, oxygen must be monitored regularly to insure minimal impact on wine quality during final filtration and filler/corker operations.

### ORDERING INFORMATION

**HI 9142W** is supplied with HI 76408 wine spot check DO probe with 1 m (3.3') cable, 2 spare membranes, HI 7041S electrolyte solution (30 mL), batteries, calibration screwdriver, rugged carrying case and instructions.

**HI 9143W** is supplied with HI 76408 wine spot check DO probe with 1 m (3.3') cable, 2 spare membranes, HI 7041S electrolyte solution (30 mL), batteries, rugged carrying case and instructions.

### ACCESSORIES

- HI 76408** Spot check DO probe for wine with 1 m (3.3') cable
- HI 7040L** Zero oxygen solution (500 mL)
- HI 7041S** Refilling electrolyte solution (30 mL)
- HI 76407A/P** Replacement membrane (5)



**All-In-One**  
Built in magnetic stirrer with electrode and beaker holder in one compact unit.

## HI 83540 Alcohol Meter

Alcohol determination made simple

Until now, the determination of alcohol in wine required wine makers to invest in expensive gas chromatography or HPLC equipment, or to use alternate methods such as ebulliometry or hydrometry which are time consuming. The HI 83540 alcohol determination analyzer uses a patent pending conductimetric known addition procedure that allows wine makers to accurately determine alcohol concentration in minutes.

The sophisticated software in the instrument performs all necessary calculations and adjustments to provide the user with a direct readout of alcohol in % volume right on the graphic LCD.

### Significance of Use

Alcohol content is a critical parameter in the analysis of wine, representing the first and most important criteria for classifying the wine into quality classes.

From a qualitative standpoint, alcohol concentration plays an important role in the conservation of a wine over time. From a sensory standpoint, alcohol content influences the power, warmth and sweetness of a wine. Lower alcoholic concentrations tend to taste sweeter.

The alcohol content is also used to classify wines for taxation: Regional government regulations use alcohol % as a criteria to classify the wine as a table wine or an alcoholic beverage.



### About the Instrument

- Backlit LCD with user-friendly interface
- Log and recall data
- USB connection - PC compatible
- Good Laboratory Practice (GLP)
- Calibration data reminders
- Built-in Magnetic Stirrer
- Twist-on electrode holder
- Choice of automatic (ATC), manual (MTC) or no temperature compensation (NoTC)

### About the Measurement

- Exclusive patent pending conductimetric known addition procedure
- Quick results: tests takes less than 5 minutes
- No sample preparation required
- Better than 1.0% accuracy
- Automatic sugar compensation: Fixed, by Wine Type, and by sugar concentration
- Not dependent on barometric pressure

### ORDERING INFORMATION

**HI 83540-01** (115V) and **HI 83540-02** (230V) is supplied with a reagents set for 50 tests, 60 mL plastic syringe, 30 mL plastic syringe, 100 mL beaker, HI 76315 alcohol probe, stir bar, power adapter and Instruction manual.

### PROBE

**HI 76315** Alcohol probe

### ACCESSORIES

- HI 83540-50** Standard solution, (3) 500 mL
- HI 83540-51** Electrode cleaning solution, 230 mL
- HI 83540-55** Calibration solution, 230 mL
- HI 731316** Stir bar (5)
- HI 740035** Beaker, 100 mL (10)
- HI 740225** 60 mL syringe
- HI 740235** 30 mL syringe bar
- HI 92000** Windows compatible software

- **Datalogging**  
Log on demand up to 100 samples (50) pH measurement; (50) titration
- **Good Laboratory Practice**  
View last calibration data for pH electrode and pump.
- **Eliminates subjective factors**
- **Measures in units of meq/L, meq% or mg/L**
- **3 point pH calibration**
- **Automatic pH temperature compensation**
- **Automatic “anytime” help**
- **Backlit LCD with an intuitive user interface**



The HI 84433 has two operating options:

- 1) pH measurement using the meter in pH mode.
- 2) Formol Number determination by titration of wines and fruit juice samples with sodium hydroxide solution to an 8.2 pH end point. (Note: sample step prep required)

**All-In-One**  
Built in magnetic stirrer with electrode and beaker holder in one compact unit.

## HI 84433 Formol Number Titrator and pH Meter

HI 84433 Provides Professional Results Quickly and Accurately.

The HI 84433 is an easy to use microprocessor-based automatic mini titrator and pH meter designed for the rapid and accurate determination of Formol Number in wines. By eliminating subjective factors including color indicators, errors in mathematical calculations or erratic titrant additions from the measurement, the HI 84433 makes Formol Number determination precisely.

The HI 84433 has a simple and accurate peristaltic pump to ensure the best accuracy and repeatability. To ensure instrument accuracy, perform a pump calibration with the provided HANNA standard.

### ORDERING INFORMATION

**HI 84433-01** (115V) and **HI 84433-02** (230V) are supplied with HI 1131B pH electrode, HI 7662-M temperature probe, HI 84433-50 low concentration titrant solution (100 mL), HI 84433-51 pH adjustment solution (100 mL), HI 84433-55 pump calibration solution (100 mL). HI 84433-60 Formol base reagent (230 mL), HI 70004 pH 4.01 buffer solution sachets (2), HI 70007 pH 7.01 buffer solution sachets (2), HI 70082 pH 8.20 buffer solution sachets (2), 100 mL beakers (2), tube set with dispensing tip (2), magnetic stir bars, medium (2), 12 Vdc power adapter and instruction manual.

### REAGENTS

- HI 84433-50** Titrant solution low concentration, 100 mL  
**HI 84433-51** pH adjustment solution, 100 mL  
**HI 84433-55** Pump calibration solution, 100mL

- HI 84433-58** Additional reagent, 30 mL  
**HI 84433-60** Formol base reagent, 230 mL  
**HI 84433-70** Reagents kit

### pH CALLIBRATION SOLUTIONS

- HI 7004M** Buffer Solution pH 4.01, 230 mL  
**HI 7007M** Buffer Solution pH 7.01, 230 mL  
**HI 7008M** Buffer Solution pH 8.20, 230 mL

### ELECTRODE SOLUTIONS

- HI 70300M** Storage Solution, 230 mL  
**HI 7061M** Cleaning Solution, 230 mL  
**HI 7071** Filling solution for HI 1131B, 30 mL (4)  
**HI 731351** Tip for 1000 µL fixed volume pipette (25)



- Dual Level LCD
- IP 65 Waterproof Protection
- Automatic Temperature Compensation
- Easy Measurement
- B.E.P.S. (Battery Error Prevention System)
- Quick, Precise Results

Readings displayed in approx. 1.5 seconds.

- Single Point Calibration
- Small Sample Size (2 metric drops)
- Automatic Shut-off
- Stainless Steel Sample Well



### Professional Results

The stainless steel sample well accepts samples as small as 2 metric drops.

## Wine Refractometers

### Accurate Analysis for Wine Professionals

**HANNA** offers four wine refractometers to meet the requirements of cultural differences found throughout the wine industry. The HI 96811, HI 96812, HI 96813 and HI 96814 Digital Wine Refractometers are rugged, lightweight and waterproof for measurements in the lab or field.

Each instrument offers a different but valid way to measure the density of grape must and other sugar based liquids.

These instruments utilize internationally recognized references for unit conversion and temperature compensation.

### HI 96811

Measures the refractive index and then displays the sugar content in grape samples from field samples or composite must samples at the winery.

### HI 96812

Measures the refractive index and displays in °Baumé. The °Baumé scale is based upon the density of liquids and is used to measure the sugar levels in winemaking.

### HI 96813

Measures the refractive index and displays both % brix and potential alcohol in units of % V/V.

### HI 96814

Measures the refractive index and displays % brix, Oechsle (°Oe) or KMW (°Babo) measurements.

### ORDERING INFORMATION

**HI 96811, HI 96812, HI 96813** and **HI 96814** are supplied with battery and instruction manual.

# HI 83742 Color and Total Phenols Photometer

## Color determination of wine

Analytical techniques have become a valuable tool of modern wine makers. The definition and the processing techniques to obtain the desired wine color are of key importance. The right decisions taken during maturation of the grapes, processing, aging and blending, all strongly influence the final resulting wine color.

The color of wine is always read after removal of suspended matter. There are mainly two color components present, yellow and red but also a blue or green hue may appear. The color hue is the ratio between the yellow color concentrations over the red one, and is an indication about the degree of evolution.

The yellow color in wine comes from the presence of tannins (polymers of flavonoid-procyanidins type, and non-flavonoid phenols) and can be read without dilution. The increase of the yellow-brown color in older wines is due to aging or oxidation.

The red colors of wines are caused by free anthocyanins, copigments of anthocyanins, and polymerized phenolic compounds. The color of these pigments is pH dependent and can be intensely dark. It is therefore necessary to dilute the wine sample taking care not to change the original wine pH. HANNA recommends using its special wine solvent to minimize possible errors due to dilution.

## Phenol determination of wine

Phenolic compounds are important for several reasons since they (i) affect the color of the wine, (ii) have an astringent taste, (iii) may cause pungent odor, (iv) are a source of oxygen reduction, and (v) are sources of browning substances.

Wine can contain a large variety of phenolic compounds and with traditional analytical techniques it is difficult to distinguish between total phenols and specific phenols (although some progress has been made with HPLC).



### 3 Measurements

In addition to color and total phenols measurement, the HI 83742 also measures tint.

## ORDERING INFORMATION

**HI 83742-01** (115V) and **HI 83742-02** (230V) is supplied with sample cuvetts (2) and caps, reagents for 5 tests (HI 83742-0, HI 83742A-0, HI 83742B-0, HI 83742C-0), 200 µL automatic pipette with (2) tips and instruction sheet, 2000 µL automatic pipette with tips (2), 5 mL syringe with tip, 1 mL plastic pipette, 3 mL plastic pipette, 12 VDC adapter, 1.5V AA batteries (4), tissue for wiping cuvetts and instructions in a rugged carrying case.

## REAGENT SETS

- HI 83742-20** Phenols reagent set (20 tests)
- HI 83742-25** Color reagent set for wine (20 tests) containing HI 83742-0 Wine Solvent 1
- HI 83742-27** Color reagent set for wine (20 tests) containing HI 83742-3 Wine Solvent 3

## ACCESSORIES

- DEMI-10** Bottle to prepare 10 L of demineralized water



## Factors favoring and inhibiting copper casse formulation in wine

### *Necessary conditions for proper casse formation*

#### **Strong reducing conditions**

Preventive Measure: Copper levels less than 0.3 mg/L

#### **Low ion concentrations**

Preventive Measure: Limit SO<sub>2</sub> addition

#### **High protein levels**

Preventive Measure: Cold-stabilize and bentonite fine to reduce proteins in white wine

#### **Light and Heat**

### Professional Copper in Wine Results

HI 83740 is an invaluable instrument to monitor this crucial parameter in the winemaking process.

## HI 83740 Copper Photometer

### The Importance of Monitoring Copper

Instability, which is initially manifested as a white haze (white wines) and later as a reddish-brown precipitate, could result from storage of bottled wine containing levels of copper above 0.5 mg/L. The precipitated casse develops only in the strong reducing conditions found in bottled wine. Instability can damage the quality of wine irreparably. Excessive levels of copper are toxic. Excessive levels of copper in wine may be removed or reduced by treatment of potassium ferrocyanide.

### Significance of Use

Grapes accumulate normally only a small amount of copper by natural translocation from roots. Unless exposed to significant airborne borne pollution or vineyard sprays, increased concentrations in wine result from contamination during post fermentation processing, like contact with non stainless steel equipment and as impurities in fining agents and filter media.

The copper concentration in wine is normally low, less than 0.10 to 0.30mg/L, because excess copper is precipitated during fermentation due to adsorption onto the yeast cells. This adsorption and precipitation can reduce the initial copper concentration with 40 to 89%. At higher concentration copper plays an important role in catalyzing oxidation reactions of wine phenols.

### ORDERING INFORMATION

**HI 83740-01** (115V) and **HI 83740-02** (230V) is supplied with sample cuvetts and caps (2), reagents for 5 tests (HI 83740A-O, HI 83740B-O, HI 83740C-O, HI 83740D-O), 20 mL glass vials with caps (2), 1 mL plastic pipette (2), 3 mL plastic pipette (2), spoons (2), 12 VDC adapter, 1.5V AA batteries (4), cuvet cleaning cloth and instruction manual in a rugged carrying case.

### REAGENT SETS

**HI 83740-20** Copper reagent set for wine (20 tests)

**HI 83742-25** Color Reagent Set for wine (Wine Solvent-1)

It is important to check the copper content both in must and in wine, because at levels about 9 mg/L copper becomes a metabolic toxin that inhibits or delays alcoholic fermentation, and concentrations exceeding 1mg/L may be sensorial detected and should be avoided.

Other copper related problems can be manifested as formation of white haze (in white wines) and later as a reddish brown amorphous precipitate. This precipitated "casse" develops only under the strongly reducing conditions found in bottles wines. It has been found that this casse is a mixture of copper compounds and proteins.

## Iron Concentration & Casse

**Wine containing less than 8 mg/L of iron:**  
there is no risk of casse

**Wine containing more than 8 mg/L of iron:**  
it is necessary to check the stability since there may be the possibility for casse to occur.

**Wine containing 8 to 15 mg/L of iron:** wine is subject to casse and needs treatment with SO<sub>2</sub>, citric acid or ascorbic acid.

**Wine containing over 15 mg/L of iron:** wine is highly subject to casse and needs treatment with potassium ferricyanide.

### Easy Iron Content Measurement

With just a few simple steps you can quickly and accurately measure the iron content of wine in mg/L.



## HI 83741 Iron Photometer

### Iron Concentration and Casse

The HANNA HI 83741 measures iron concentrations of both white and red wines. HI 83741 makes it possible to quickly and easily determine the state of your wine, and to act on it in case it may be necessary.

### Significance of Use

Trace iron concentrations in wine are beneficial for enzyme activity, as a stabilizer, and as a functional component for proteins. At higher concentrations it alters the redox potential, in favoring oxidation, affecting sensory characteristics and participating in the formation of complexes with tannin and phosphates resulting in instabilities (casse). The most common iron case is "white casse" (iron phosphate), it is initially seen as milky white cloud and later as a precipitate. The "blue casse" (ferric tannate) that occurs less often can be observed in white wines, for example, after tannic acid additions.

Most of the iron present in wine is present in the ferrous Fe(II) state. The ratio of the Fe(II)/Fe(III) depends on the oxidation state of wine. If Fe (III) is formed, it can bind with phosphates that are normally present in wine.



### ORDERING INFORMATION

**HI 83741-01** (115V) and **HI 83741-02** (230V) is supplied with sample cuvetts and caps (2), reagents for 5 tests (HI 83741A-0, HI 83741B-0, HI 83742-0), scissors, 1000 µL automatic pipette with Instruction Sheet, plastic tips for 1000 µL automatic pipette (2), 1 mL plastic pipette (1), 12 VDC adapter, 1.5V AA batteries (4), cuvet cleaning cloth and instruction manual in a rugged carrying case.

### REAGENT SETS

**HI 83741-20** Iron reagents set for wine (20 tests)



## Typical Content of RS in Must and Wine

### MUST

|                   |         |             |
|-------------------|---------|-------------|
| Sweet Must :      | 20-25%  | 200-250 g/L |
| Normal :          | 10-20%  | 100-200 g/L |
| In Fermentation : | 4-12.5% | 40-125 g/L  |

### WINE

|              |           |            |
|--------------|-----------|------------|
| Sweet :      | 2.5-12.5% | 25-125 g/L |
| Semi Sweet : | 0.8-2.5%  | 8-25 g/L   |
| Almost Dry : | 0.2-0.8%  | 2-8 g/L    |
| Dry :        | 0-0.2%    | 0-2 g/L    |

### Easy 3 Step Measurement

- 1) Prepare the Sample.
- 2) Zero the Instrument.
- 3) Press READ and View the Results on the LCD.

## HI 83746 Reducing Sugars Photometer

### The Determination of Concentration of Reducing Sugars (RS)

The determination of concentration of reducing sugars (RS) is one of the most important parameters that need to be measured during the wine making process. Following the increase of RS during maturation of grapes can help decide when to start harvest. Having the highest possible sugar content is important because this is the main parameter that defines the commercial value of grapes. During the alcoholic fermentation instead, the decrease of sugars can be followed to decide when fermentation is completed, or allows making corrective actions if the content of RS is too low to obtain the desired alcohol degree or sweetness.

The predominant RS in grape products are glucose and fructose (hexoses). After reaction with excess alkaline cupric tartrate (Fehling reagents), the RS content can be determined colorimetrically.

The Fehling method is not an exact determination but an index of the reducing sugar concentration, because the reaction depends upon the amount and kind of RS present. When the reducing sugar content is known at the beginning of fermentation, the potential alcohol degree can be estimated multiplying the sugar concentration (in g/L) by 0.06. Phenols interfere in the Fehling reaction and therefore red wine must be colorized prior to analysis. Wine also contains non-fermentable reducing sugars like pentose which will also be analyzed by this method.

### ORDERING INFORMATION

**HI 83746-01** (115V) and **HI 83746-02** (230V) is supplied with glass cuvetts and caps (4), reagents for about 20 tests (HI 83746A-0 and HI 83746B-0), HI 93703-59 Charcoal, 200  $\mu$ L Automatic Pipette with two plastic tips, 1000  $\mu$ L Automatic Pipette with plastic tips (2), instruction Sheet for Automatic Pipette, Spoon, Funnel, Filter paper (25), 12 VDC Adapter, 1.5V AA batteries, (4), cuvet cleaning cloth and instruction manual in a rugged carrying case.

### OPTIONAL REAGENTS

**HI 83746-20** RS reagent set (20 tests)  
**HI 93703-59** Charcoal for decoloration of Red Wine (about 100 tests)



## HI 839800

### Test Tube Heater

With the HI 839800 test tube heater, users can speed up the analysis process of a large quantity of samples without sacrificing accuracy. The HI 839800 accepts a capacity of 25, 16 mm DIA vials.

105°C (221°F) or 150°C (302°F) reaction temperature

### ORDERING INFORMATION

**HI 839800-01** (115V)  
**HI 839800-02** (230V)

## Easy 4 Step Measurement

- 1) Prepare the Sample.
- 2) Zero the Instrument.
- 3) Add reagent and allow to react
- 4) Press READ and View the Results on the LCD.



## HI 83748 Tartaric Acid Photometer

### Tartaric Acid: Wine Acidity.

Tartaric acid and tartrate are playing an important role in the stability of wines. They can be present in wine and juice in various forms, like tartaric acid (H<sub>2</sub>T), potassium bi-tartrate (KHT) or calcium tartrate (CaT). The ratio of these depends mainly on the pH of the wine. The percent of tartrate present as bitartrate (HT<sup>-</sup>) is maximum at pH 3.7.

The formation of crystalline deposits (tartrate casse) is a phenomenon of wine aging but does not meet customer acceptance. It is therefore important to test for and to reduce potential of bottle precipitation. For example by adjusting the pH of the wine that significantly influences the potential of casse formation.

Potassium concentrations in wine can range from 600 to 2500 ppm in certain red wines. Although the potassium bi-tartrate is soluble in water, alcohol and low temperatures decrease its solubility. Especially during the alcoholic fermentation potassium bi-tartrate becomes increasingly insoluble resulting in super-saturation and precipitation. The KHT stability can be restored by chilling (with or without seeding). Wines with initial pH values below 3.65 can show a reduction in pH during cold stabilization because of generation of one free proton for each KHT precipitated. The pH may drop as much as 0.2 pH units. For wines at higher pH than 3.7, the pH shifts to a higher pH.

Calcium concentrations can range from 6 to 165 ppm and may complex with tartrate or oxalate to form crystalline precipitates. Calcium tartrate instabilities occur normally from 4 to 7 months after fermentation and are temperature independent.

Sulphates, proteins, gum and poly-phenols can form stable complexes with tartrate thus inhibiting case formation. The complexes are mainly between poly-phenols and tartaric acid in red, and proteins in white wine. This explains why, as pigment polymerization occurs, the holding capacity of tartaric acid diminishes, resulting in delayed casse. The sulfate instead does not complex with potassium from 50% in white wines up to 100% in red ones.

Tartaric acid concentrations in wine range normally from 1.5 to 4.0 g/L. This acid concentration may not be confused with total or titratable acidity of wines that are often expressed in tartaric acid content too. Although it is the tartaric acid that is the predominantly present acid (up to 60% of the total acidity), others like malic, citric and several volatile acids do give a significant contribution total acidity.

### ORDERING INFORMATION

**HI 83748-01** (115V) and **HI 83748-02** (230V) is supplied with sample cuvettes and caps (2), reagents for 5 tests (HI 83748A-0, HI 83748B-0), 200 µL automatic pipette with Instruction Sheet, plastic tips for 200 µL automatic pipette (2), 5 mL syringe with tip, 12 VDC adapter, 1.5V AA batteries (4), cuvet cleaning cloth and instruction manual in a rugged carrying case.

### REAGENT SETS

**HI 83748-20** Tartaric Acid reagents set for wine (20 tests)



## Turbidity, Bentonite and HI 83749

The prevention of protein haze or deposit in bottled white wines is a universal concern and often a wine needs to be stabilized before bottling. One commonly used stabilization agent is bentonite. Bentonite is a volcanic clay earth type filling agent (like kaolin). It improves the clarity and stability of wine but also has negative aspects because of the volume of lees formed, reduction of tannin and color. Since there are different types and qualities of bentonite with different capacity of protein removal, it is important to make laboratory trials with the same lot and wetting degree of the bentonite as that will be used in the cellar.

Protein stabilization is normally not a problem in bottled red wines because of the relatively high concentration of phenols that bind with and precipitate the instable proteins before bottling. Often bentonite is added to red wines at a level of about 12 g/hL (1lb/1000 gal), reducing colloidal suspended particles thus improving membrane filterability.

Wines with low phenol contents, such as rosé, light reds and whites should be checked for protein stability before bottling. HANNA is offering a rapid test to verify the risk of future protein haze formation. If protein instability is detected, a subsequent test can help define the right amount of bentonite to be added for improving protein stability. It is important not to overdose bentonite to avoid stripping wine flavor, body, and significant loss of color, especially in young red wines. Moreover, adding only the necessary amount of bentonite to obtain the desired protein stability also saves costs.

The meter measures turbidity of samples from 0.00 to 1200 NTU (Nephelometric Turbidity Units) and is USEPA compliant. In the USEPA measurement mode the instrument rounds the readings to meet USEPA reporting requirements. It has a continuous measurement mode to verify the settling rate of suspended matter, and a signal average (AVG) mode to accumulate multiple readings giving a final average value. The AVG routine is particularly useful to measure samples with suspended particles with different dimensions.

## HI 83749 Turbidity and Bentonite Photometer

- Good Laboratory Practice Capabilities
- Real Time Clock
- Log-on-demand (up to 200 measurements)
- Fast Tracker® Tag Identification System to log data with a location, time and date stamp.



### ORDERING INFORMATION

**HI 83748-01** (115V) and **HI 83748-02** (230V) is supplied with sample cuvetts and caps (2), reagents for 5 tests (HI 83748A-0, HI 83748B-0), 200 µL automatic pipette with Instruction Sheet, plastic tips for 200 µL automatic pipette (2), 5 mL syringe with tip, 12 VDC adapter, 1.5V AA batteries (4), cuvet cleaning cloth and instruction manual in a rugged carrying case.

### REAGENT SETS

**HI 83748-20** Tartaric Acid reagents set for wine (20 tests)

### Includes Fast Tracker™ Tag I.D. System

Easily install iButton® tags near your sample sites. Touch the HI 83749's matching connector to add the iButtons serial number, time and date stamp to the logged measurement data.



# HI 99551 & HI 99556

## Infrared Thermometers

Both the HI 99551 and HI 99556 incorporate infrared technology to measure surface temperature. This non-intrusive nature of measurement is ideal for leaving samples in tact.

In order to measure the temperature, simply point to the sample and hold down the measurement key. Readings are immediately displayed on the LCD.

HI 99556 includes a probe for core temperature measurement as well. Simply attach an optional external probe to the meter and you have a 2-in-1 infrared-thermistor thermometer.



### ORDERING INFORMATION

- HI 99551-00** Infrared thermometer, -10 to 300°C
  - HI 99551-10** Infrared thermometer, -20 to 199°C
  - HI 99551-01** Infrared thermometer, 14 to 572°F
  - HI 99556-00** Infrared thermometer + probe, -10 to 300°C\*
  - HI 99556-10** Infrared thermometer + probe, -20 to 199°C\*
  - HI 99556-01** Infrared thermometer + probe, 14 to 572°F\*
- \*Infrared range only



## Checktemp® Thermometer

The HANNA Checktemp® is a thermometer that utilizes a stainless steel probe with a blunt tip for liquid measurements. The measurement range is from -50 to 150°C or -58 to 302°F with 0.1° resolution. With an accuracy of ±0.3°C (±0.5°F), Checktemp® thermometers are in a league of their own.

### ORDERING INFORMATION

- HI 98505** (Checktemp®LC) °C
- HI 98506** (Checktemp®LF) °F



## Checktemp® 4 Folding Thermometer

As you unfold the stainless steel probe, the Checktemp® 4's CAL CHECK™ feature automatically turns ON and immediately performs a calibration test. CAL CHECK™ also alerts you if battery level is low or recalibration is needed. Range is -50.0 to 220°C or -58.0 to 428°F depending on model.

### ORDERING INFORMATION

- HI 151-00** (Checktemp® 4 C), °C
- HI 151-01** (Checktemp® 4 F), °F



## Checktemp® Dip Weighted Probe Thermometer

The Checktemp® Dip measures temperature from -20 to 100°C or -4 to 212°F depending on model. The hygienic stainless steel probe with 3 meter (9.9') cable is weighted so that it can be dipped into any vat or tank and measure the temperature at different depths.

### ORDERING INFORMATION

- HI 98509-01** (Checktemp® Dip C), °C
- HI 98510-01** (Checktemp® Dip F), °F

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Points accumulated from purchases can be redeemed for future purchases based on the HANNA Rewards Points Program system\*.

|                     |                     |
|---------------------|---------------------|
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| 1000 PTS = \$25 CR  | 4000 PTS = \$200 CR |
| 1500 PTS = \$50 CR  | 4500 PTS = \$225 CR |
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| 3000 PTS = \$125 CR | 6000 PTS = \$300 CR |

\* You must have HANNA Rewards Points Program card to redeem points.

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HANNA Rewards Points Program members agree to provide proof of purchase including price paid for any point credit to be applied to their account.

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