



Titration

Systems and Autosampler



Hanna Instruments Titration Systems

Titration is a quantitative measurement of an analyte in solution by its complete reaction with a reagent. Titration is used in analytical chemistry to determine the amount or concentration of a substance. In a titration, one reagent (the titrant) is slowly added to a solution containing the species being measured (the analyte). As it is added, a chemical reaction occurs between the titrant and analyte. The point where all analyte is consumed, and an equal quantity of titrant and analyte are present, is called the equivalence point. This is determined by one type of indicator that is also present in the solution, or by a measurable physical change in the solution, like pH, electrode potential, conductivity, or light absorption (color). In practice, an abrupt change of this physical property signals the end of titration, called the endpoint.

The purpose of titration is to determine the quantity or concentration of an analyte with a known concentration of a titrant. Titrations are based on chemical reactions and these reactions must fulfill four requirements:

- The reaction must be fast, so that after the titrant's addition, the reaction occurs instantly
- The reaction must go to completion
- The reaction must have well-known stoichiometry (reaction ratios)
- A convenient method of endpoint detection must be available

Manual titration is done with a burette which is a long graduated tube that holds the titrant. The amount of titrant used in the titration is determined by reading the difference between the volume of titrant in the burette before the titration and when the endpoint is determined. The most important factor for making accurate titrations is to read the burette volume with precision. Generally, chemists use the bottom of the meniscus (rounded liquid level) to read the reagent volume in the burette. Additional required equipment for manual titration would be: a beaker, a pipette to measure the sample volume, an indicator solution or electrode (for endpoint detection), and a standardized titrant.

Automatic Titration

Automatic titration is done with instrumentation that delivers the titrant, stops at the endpoint and calculates the concentration of the analyte automatically. They are the best for accurate and repeatable results. An electrochemical measurement is used to determine the endpoint.

Some complex analysis performed by automatic titrators are...

- Acid-base, specific ion, redox determination by potentiometric endpoint detection.
- Determination of water concentration using Karl Fischer reagents and detection by a bivolametric sensor .



The required equipment would be the automatic titrator, the (standardized) titrant, a burette for the titrant, a pipette (to measure the sample volume), a beaker, sensor, and a stirring mechanism.

The automatic titrator must have an accurate liquid-dispensing system. In high accuracy systems, this is typically a stepper motor-driven piston burette, a valve system to switch between titrant inlet and outlet, and a titration tip to dispense the titrant into the sample solution. These three main subsystems must be as accurate as possible, with very low gear backlash in the burette drive mechanism, low piston seal flexing, accurate burette glass cylinder diameter, and low dead volume in the valve. Also required are chemically-resistant tubing and for Karl Fischer Titration an anti-diffusion titrant dispensing tip.

Standards and Standardization

One of the substances involved in a titration must be used as a standard for which the amount of substance present is accurately known. The standard can be present either in the form of a pure substance or as a standard solution, a (solution whose composition is accurately known). The titrant solution can be standardized in two ways; using a primary standard, or more commonly, titrating it against a previously standardized solution.

General procedure used in manual titration

Before starting, make sure that all glassware, especially the burette, is clean and dry.

Accurately measure a volume of the analyte sample into a beaker or Erlenmeyer flask.

Add a suitable indicator to the flask.

Pour the titrant into the burette, read the start-point of the liquid on the burette.

Turn the tap of the burette to allow the titrant to slowly fall into the analyte. Swirl the flask with the other hand or with a magnetic stirrer.

The indicator should change color as the titrant is added, but then quickly return to its original color.

As the endpoint is approached, the indicator takes longer to turn back to its starting color. At this point add the titrant more slowly (one drop at a time).

When the indicator remains at its end color, the reaction has reached the endpoint.

Measure the amount of titrant liquid used, as shown on the scale of the burette.

Repeat as many trials as needed, and then average the volumes.

Once the reactant has been neutralized with a known volume and concentration of titrant, it's possible to calculate the reacted concentration in moles per liter or other unit.



HI902C

Automatic Titration System



- Intuitive user interface
- USB port allows for the transfer of methods and reports to a PC or another titrator via USB flash drive
- Two sensor inputs with the addition of a second analog board
- Field upgradable software
- RS232 port allows direct connection to an analytical laboratory balance
- Multi-language support
- Four working modes; potentiometric titrator, pH meter, mV meter, and ISE meter
- Potentiometric titrator
 - Linked titration methods allow two methods to run in sequence
 - Acid-base, non-aqueous, redox, complexometric, precipitation, back titrations, and titre determination can be performed
 - Supports up to 100 titration methods (standard and user-defined)
 - Supplied standard methods pack or create your own
 - Titration graph can be displayed on-screen and saved as a bitmap
 - Choice of endpoint detection: equivalence point (1st or 2nd derivative) or fixed pH/mV value
- Reminders for titrant age and standardization expiration
- Multiple endpoint titrations with multiple molecular weights and reaction ratios
- Supports two burette dosing pumps with the ability to perform back titrations
- Clip-Lock™ exchangeable burette system enables users to exchange burettes in a matter of seconds
- 5, 10, or 25 mL precision ground glass syringe with PTFE plunger
- 40,000 step screw drive, piston dosing pump
- 3-way motor driven valve
- PTFE burette tubing with polyurethane tube jacketing
- pH meter
 - Full featured research grade pH meter
 - Automatic Temperature Compensation (ATC)
 - Up to five calibration points with automatic recognition of standard buffers
 - Up to five custom buffers can be used for calibration
- mV (ORP) meter
 - Relative mV calibration
- ISE meter
 - Numerous concentration units including: mol/L, mmol/L, mg/L, mg/mL, ug/L, %, ppt, ppm, g/L, and user-defined
 - Up to 5 calibration points with 5 custom standards



- Support for 2 electrodes, 2 burette dosing pumps and 2 stirrers



- Clip-Lock™ Exchangeable Burette System
 - With Clip-Lock™, it only takes a few seconds to exchange the reagent burettes to perform a different titration



- Method sequencing
 - Linked titration methods allow two methods to run in sequence



- Easy upgrades
 - Field upgradable software via USB
 - Convenient for saving data

Powerful Customization, Accurate Analysis

The HI902C is an automatic titrator that complements our wide range of products dedicated to quick and accurate laboratory analysis. HI902C can perform acid-base, redox, complexometric, precipitation, back titrations and titre determinations.

The HI902C dispenses the titrant, detects the endpoint and performs all necessary calculations automatically.

This versatile titrator supports up to 100 standard or user-defined methods. When powered on, the instrument initiates an internal diagnostics check and then readies itself for the first titration of the day. A large color LCD screen clearly shows the chosen method and related information. A real-time titration curve can be shown on the display; this feature is useful when new methods are tested or when a procedure needs to be optimized. At the end of the titration, the data (including the graph) is automatically stored and can be transferred to a flash drive or PC by USB connection.

This titrator is supplied with a pack of standard methods or you can create your own. Methods (standard or user) can be created, stored or edited with the PC Hanna software and then transferred to the titrator by USB flash drive. Software updates can also be performed using a USB flash drive as well.

Users can connect pH, ORP or ISE electrodes to the HI902C, as well as create a complete workstation with a PC, monitor, keyboard and printer.

The HI902C complies with GLP specifications. All GLP information from each sample can be stored, including ID number, date and time of analysis, electrode ID code, and last calibration date.

Clip-Lock™ Exchangeable Burette System

With Clip-Lock™, it only takes a few seconds to exchange the reagent burettes to perform a different titration.

The Clip-Lock™ exchangeable burette system prevents cross contamination while reducing loss of time and reagents. Simply slide out the burettes and detach the dispensing tubes from the overhead assembly for quick exchange.

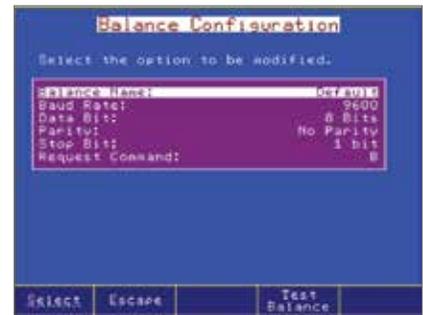
Having several prepared burettes on hand will make the Hanna HI902C one of the fastest and most versatile titration systems on the market.



- Fully customizable titration methods



- Linked methods allow two methods to run in sequence



- Fully configurable balance interface



- Up to 5 pH calibration points, with automatic buffer recognition



- Relative mV calibration allows for a mV offset



- Select your ISE type from the available list

Versatile Data Management

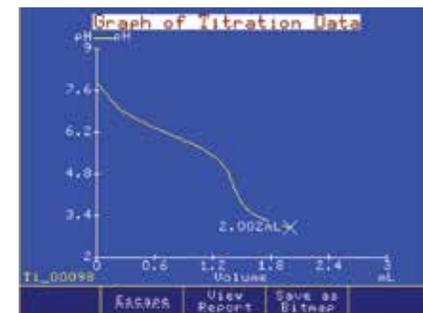
- HI902C titration system can be easily incorporated into any existing GLP data management program:
 - Easily record all necessary GLP information with every sample, such as sample identification, company and operator name, date, time, electrode ID codes and calibration information
- Data can be transferred to a USB flash drive or PC with the Hanna HI900PC application software
- The USB port allows for the easy transfer of methods, reports and software upgrades via USB flash drive
- Users can print reports of analyses directly from the titrator using a standard parallel printer
- An external monitor and keyboard can be attached for added versatility



- Customizable Reports
 - Titration reports are fully customizable



- Titration Reports
 - Titration or pH/mV/ISE results can be viewed on-screen or transferred to a USB flash drive or PC



- Titration Graphs
 - Titration graphs can be viewed on-screen or saved as images and transferred along with titration report

Specifications

HI902C

mV	Range	-2000.0 to 2000.0 mV
	Resolution	0.1 mV
	Accuracy (@25°C/77°F)	±0.1 mV
pH	Range	-2.000 to 20.000 pH
	Resolution	0.1, 0.01, 0.001 pH
	Accuracy (@25°C/77°F)	±0.001 pH
ISE	Range	1×10^{-6} to 9.99×10^{10}
	Resolution	1, 0.1, 0.01
	Accuracy (@25°C/77°F)	±0.5% monovalent; ±1% divalent
Temperature	Range	-5.0 to 105.0°C/23 to 221°F/ 268.2 to 378.2 K
	Resolution	0.1°C/0.1°F/0.1K
	Accuracy (@25°C/77°F)	±0.1°C/±0.4°F/±0.2K
Other Specifications	Burette Sizes	5, 10, and 25 mL
	Burette Resolution	1/40000
	Display Resolution	0.001 mL
	Dosing Accuracy	±0.1% of full burette volume
	Display	5.7" (320 x 240 pixel) backlit color LCD
	Languages	English, Portuguese, Spanish
	Methods	Load up to 100 methods (standard and user-defined)
	Burette Auto-Detection	Burette size is automatically recognized when inserted into the unit
	Programmable Stirrer	Propeller type, 100-2500 RPM, automatically held within 10% of the set value, resolution 100 rpm
	Flow Rate	User-selectable from 0.1 mL/min to 2 x burette volumes/min
	Temperature Compensation	Manual (MTC) or Automatic (ATC)
	Endpoint Determination	Equivalence point (1st or 2nd derivative) or fixed pH/mV value
	pH Calibration	Up to five-point calibration, eight standard buffers and five custom buffers
	mV Calibration	Single point offset
	ISE Calibration	Up to five-point calibration, seven standard solutions and five user-defined standards
	Potentiometric Titrations	Acid-base (pH or mV-mode), redox, precipitation, complexometric, non-aqueous, ion-selective, argentometric, back titrations, and titre determination
	Measurement Units	User-specified expression of concentration units to suit specific calculation requirements
	Real Time & Stored Graphs	mV-volume or pH-volume titration curve, 1st derivative curve or 2nd derivative curve pH-mode, mV-mode or ISE mode: pH/mV/concentration values versus time-datalogging results
	Data Storage	Up to 100 titration and pH/mV/ISE reports
	USB Host (Side)	Flash drive compatibility for transfers of methods and reports
	Peripherals (Rear)	Connections for VGA display, PC-keyboard, parallel printer, USB device input, RS232, interface for auto-sampler
	GLP Conformity	Instrumentation data storage and printing capabilities
	Operating Environment	10 to 40°C (50 to 104°F), up to 95% RH
	Storage Environment	-20 to 70°C (-4 to 158°F), up to 95% RH
	Power	"-01" models: 115VAC; "-02" models: 230VAC; 50/60 Hz
	Dimensions	390 x 350 x 380 mm (15.3 x 13.8 x 14.9 in)
	Weight	Approximately 10 kg (22 lbs.) with one pump and stirrer assembly
Ordering Information	<p>HI902C1-01 (115V) / HI902C1-02 (230V): titrator with one analog board, stirrer with stand, 25 mL glass burette, dosing pump drive, temperature sensor, USB cable, 256 Mb USB flash drive and PC software.</p> <p>HI902C2-01 (115V) / HI902C2-02 (230V): titrator with two analog boards, stirrer with stand, 25 mL glass burette, dosing pump drive, temperature sensor, USB cable, 256 Mb USB flash drive and PC software.</p>	

HI921

Autosampler



- Flexible, accurate detection of the titration endpoint with HI902C potentiometric titrator
- Automation of up to 18 samples per tray
 - 16 and 18 sample trays available based on beaker size required.
 - 16 sample tray holds 150 mL beaker
 - 18 sample tray holds 100 mL beaker
- Absolute encoder in sample tray
 - The Autosampler always knows the tray position. It never needs calibration and never needs to "home"
- Electrode rinse feature
 - Up to 3 beakers per tray can be designated for electrode dip rinses; a primary, secondary, and tertiary rinse.
- Automatic addition of reagents or deionized water to the sample beaker by peristaltic pump
- Included control panel for manual operation of motors and pumps
- Built-in magnetic stirrer or optional overhead propeller stirrer
- Barcode reader interface for easy sample tracking
 - USB barcode reader interface for easy sample identification
- Built-in RFID in each tray, communicating tray serial number and number of beakers it holds
- Optical IR beam detects presence or absence of beakers in the tray
 - Ensures the Autosampler doesn't proceed with titration if a beaker is missing
- USB interface
 - Use with barcode reader
 - Field upgradable software
- Sample trays made of chemically-resistant materials and are removable, easy to clean and dishwasher safe.
- Electrode holder can accommodate 3 x 12 mm electrodes, temperature sensor, 1 aspiration tube, and 5 multipurpose tubes (reagent addition, burette dosing)
 - Allows user to switch between methods without having to physically switch electrodes
- Real time progress of the sequence and results shown on the HI902 titrator screen.
- Integrated peristaltic (up to 3) or diaphragm pump (optional)
- Sample leveling feature
 - Automatic leveling for fast preparation of volumetric samples
- Waste removal feature
 - Aspirate completed samples into a waste container.

Autosampler - Automate up to 18 samples

Hanna Instruments is pleased to introduce the HI921 Autosampler.

The HI921 Autosampler is an automated titration sample handling system designed for use with the HI902C Potentiometric Titration System. This high quality system makes the titration of multiple samples quick and easy.

The HI921 can utilize up to three peristaltic pumps and one diaphragm pump for reagent addition, sample leveling, and waste aspiration. An included control panel allows for manual operation of the motors and pumps. The HI921 also features sample leveling, built-in magnetic stirrer, reagent addition, electrode rinse feature, USB interface with compatible barcode reader and built-in RFID for each tray.

With the Autosampler, up to 18 samples can be run consecutively. The HI921 Autosampler interfaces directly with the HI902C to access titration methods. Once a method is established, the user can then customize the automation sequence of their samples for this method. Sample names and size can be customized or auto filled in with preset values. Once the Autosampler sequence is complete, two reports are available for review: a sequence report, with a table outlining each sample name, beaker position, sample size, and result for the tray, and a detailed titration report for each individual sample, including the graph of the titration data.



Peristaltic and Diaphragm Pumps



- Up to three peristaltic pumps can be added at anytime
- User replaceable pump systems
- Peristaltic
 - Uses high performance plastic that's engineered to be chemically resistant, & have long service life.
 - Resistant to temperature fluctuations
 - Reagent addition, sample leveling, waste removal
 - Greater than 200 mL/min flow
- Diaphragm
 - Simple plug connection for tubing
 - Greater than 400 mL/min flow

The Autosampler comes with multiple configurations for pumps, including up to three peristaltic pumps and a single diaphragm pump. The pump system has a simple install process and can be connected with out the need of a technical repair person. The diaphragm pump system has a simple plug-in setup with clearly defined inputs for the tubing.

Status indicator lights

Easy to see status lights on both sides on top of autosampler. These can be seen from far away and also correspond to the status indicator on the HI902C LCD. These lights double as a safety feature and pressing them at any time will automatically stop any titration process.



Steady Green
Idle, ready to start

Flashing Green
Running



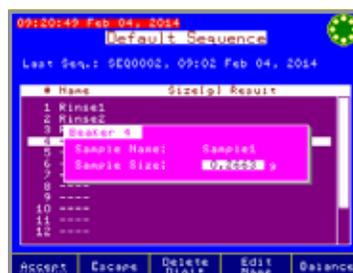
Flashing Yellow
Paused



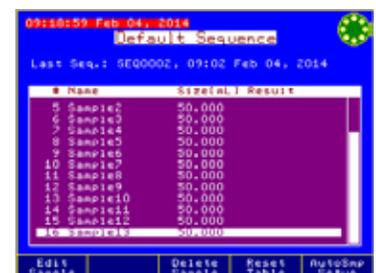
Red
Error or emergency stopped,
or initializing during power on



- **RFID Recognition**
 - Sample trays are automatically detected and identified when placed on the Autosampler.



- **Digital Balance Compatibility**
 - Sample weights are communicated when connected to a digital balance.



- **Speedy Sample Entry**
 - Sample names can be automatically incremented for speedy sample identification.



Specifications

HI921

Electrode Holder Slots	3 x 12-mm electrodes
	1 temperature sensor
	1 aspiration tube
	5 multi - purpose slots (titrant/reagent tubes)
	1 overhead stirrer
Temperature Sensor	HI7662-A (included)
Stirrers	Built-in magnetic stirrer
	Optional overhead propeller stirrer
Peristaltic Pumps	Resolution
	Accuracy
Diaphragm Pump	Up to 3 can be installed
	Installs in slots #1, 2, 3
Trays	Installs in slot #4
Beakers	16 beakers x 150 mL (HI920-11660)
	18 beakers x 100 mL (HI920-11853)
	Built-in RFID, transmits the tray type and serial number to Autosampler
Control Panel	ASTM short-form glass beakers
	HI920-060 (150 mL), fits HI920-11660 tray - Plastic beakers
	HI920-053 (100 mL), fits HI920-11853 tray - Plastic beakers
Barcode Reader	Buttons for manual operation of tray
	Manual operation of peristaltic or diaphragm pumps
	2-line backlit display with status information
Report Storage	Compatible with USB barcode readers. Use to add sample names
Ordering Information	Up to 40 trays of samples .(e.g.: 720 reports for 18-beaker tray)
	HI921-XY Autosampler - X is the number of peristaltic pumps (0-3) Y is the number of diaphragm pumps (0-1): HI921-10 Autosampler with 1 peristaltic pump, HI921-20 Autosampler with 2 peristaltic pumps, HI921-30 Autosampler with 3 peristaltic pumps, HI921-01 Autosampler with 1 membrane pump, HI921-11 Autosampler with 1 peristaltic pump and 1 membrane pump, HI921-21 Autosampler with 2 peristaltic pumps and 1 membrane pump, HI921-31 Autosampler with 3 peristaltic pumps and 1 membrane pump

HI903

Karl Fischer Volumetric Titrator

for Moisture Determination



Measures 100 ppm to 100% water content

- **Precision titrant delivery system**
 - 40,000 step piston dosing pump
 - Accurate to 0.1%
 - Delivers as little as 0.125 μL of titrant
 - Precision ground, 5 mL glass burette with PTFE plunger, PTFE burette tubing, and polyurethane tube jacketing (thermally insulating, light blocking)
 - Glass anti-diffusion dispensing tip
 - Clip-Lock™ exchangeable burette system enables users to exchange reagent burettes in a matter of seconds
- **Sealed solvent system**
 - Change to fresh solvent in a matter of seconds without opening the titration vessel
 - Minimizes exposure to ambient humidity which reduces titrant consumption and saving time
 - PTFE solvent tubing is resistant to harsh KF solvents and titrants
- **Beaker top**
 - Chemically-resistant reaction vessel cap and fittings
 - Quick-remove sample port plug with replaceable silicone rubber septum for sample introduction
- **Anti-diffusion burette tip**
 - Delivers titrant in high turbulence zone, ensuring rapid reaction
 - Prevents unwanted diffusion of titrant into solvent
- **Built-in stirrer**
 - Automatic, integrated magnetic stirrer adjustable from 200-2000 RPM
 - Optical feedback for automatic speed control
 - Optional external magnetic stirrer available
- **Rechargeable indicating desiccant**
 - Prevents the ingress of ambient humidity into the sealed solvent system while maintaining full titrator functionality
 - Minimizes changes to titrant titre
 - Indicates when adsorption capacity is depleted
 - Regenerates at 150°C
- **PTFE bottle cap**
 - Caps fit any GL45-threaded bottle
 - Chemically-resistant caps and fittings
 - Removable desiccant cartridges



Adaptable, High Accuracy Moisture Determination

The HI903 Karl Fischer Volumetric Titrator for moisture analysis is an extension of Hanna's highly successful potentiometric titrator platform. The HI903 combines an ultra-high precision titrant delivery system with optically-regulated magnetic stirring, sophisticated endpoint determination, dynamic dosing and background drift correction algorithms.

The result is an extremely adaptable titrator capable of titrating with superior accuracy and precision, even for samples with low moisture content. The HI 903 dispenses the titrant, detects the endpoint and performs all necessary calculations automatically.

The HI903 comes equipped with a solvent-handling system to reduce cell conditioning time and can be connected directly to a laboratory analytical balance via RS232 serial interface.

The HI903's powerful software and intuitive menus are easily navigated on the large, color LCD display, making it simple to view results. Choose from included methods or develop a custom method for almost any application or sample type. Methods (standard or user) can be created, stored or edited with the PC Hanna software and then transferred to the titrator by USB flash drive. Software updates can also be performed using a USB flash drive as well.



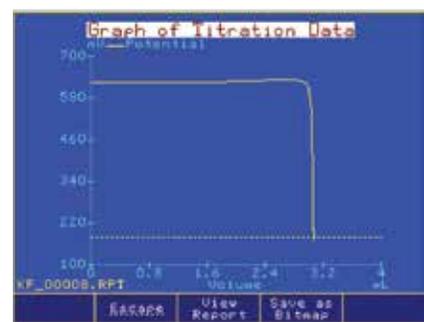
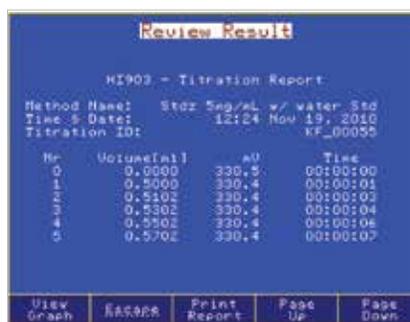
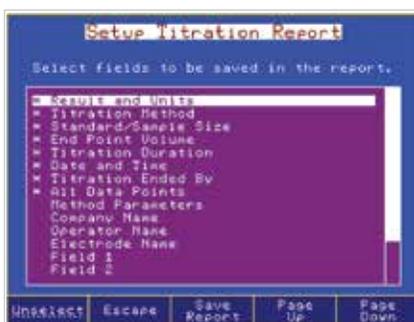
Clip-Lock™ Exchangeable Burette System

With Clip-Lock™, it only takes a couple of seconds to exchange the reagent burettes to perform a titration with a different titrant. (i.e. 5 mg/mL to 1 mg/mL)

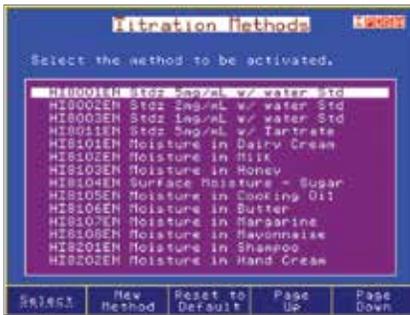
The Clip-Lock™ exchangeable burette system prevents cross contamination while reducing loss of time and reagents. Simply slide out the burettes, detach the aspiration tube from the titrant bottle, and detach the dispensing tube from the sample cell for quick exchanges.

Versatile Data Management

- HI900 Series titration systems can be easily incorporated into any existing GLP data management program:
 - Easily record all necessary GLP information with every sample, such as sample identification, company and operator name, date, time, electrode ID codes and calibration information
- Data can be transferred to a PC using the Hanna HI900PC software application
- The USB port allows for the easy transfer of methods, reports and software upgrades via a USB flash drive
- Users can print reports of analyses directly from the titrator using a standard parallel printer
- An external monitor and keyboard can be attached for added versatility



- Customizable reports
 - Titration reports are fully customizable
- Titration Reports
 - Titration results can be viewed on-screen or transferred to a USB storage device
- Titration Graphs
 - Titration graphs can be viewed on-screen or saved as images and transferred along with titration report



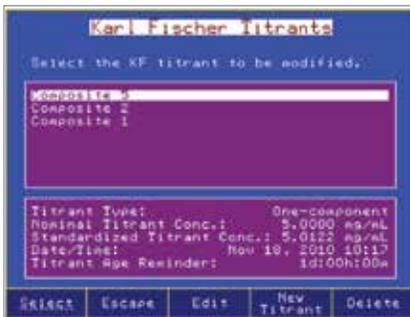
- **Methods**
 - The HI903 comes with a standard method pack



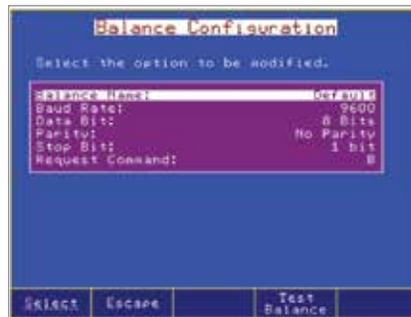
- **Standby**
 - The HI903 keeps the solvent dry between samples and corrects for water entering the cell (drift rate)



- **Results**
 - Titration results are displayed with links to average results or a user-customized report



- **Titrant database**
 - The HI903 stores standardization information for up to 20 titrants and displays a reminder when standardization is due



- **Fully configurable balance interface**
 - Enter sample size automatically from any laboratory analytical balance with RS232 serial output



- **Fully customizable titration methods**
 - Customize methods for any application

- **Titrant database**
 - Stores standardization information for up to 20 titrants
 - Standardization reminders
- **Supports up to 100 titration methods (standard and user defined)**
- **Dynamic dosing with optional pre-dispensing**
 - For faster titration without sacrificing accuracy
- **Results displayed directly in the selected units**
- **Titration graph can be displayed on-screen and saved as a bitmap**
- **Multi-language support**
- **USB flash drive input**
 - Transfer methods, reports and graphs to either a PC or other HI903 titration system
 - Field upgradable software
- **Incorporates into any GLP data management program:**
 - Easily record all necessary GLP information with every sample, including company and operator name, date, time, electrode ID codes and standardization information

- **Compatible with most major brands of Karl Fischer reagents**
- **Proper mixing of titrant and analyte**
 - Digital, magnetic stirring system with optical feedback
 - Conical titration cell to facilitate mixing over a wide volume range
 - Upward dispensing of titrant to ensure rapid reaction
- **Flexible, accurate detection of the titration endpoint**
 - Dual platinum pin polarization electrode for bivalent indication
 - Signal averaging reduces noise
 - Selectable endpoint criteria: fixed mV persistence, relative drift stop or absolute drift stop
- **Balance interface**
 - Automatically acquire sample mass via serial RS232 interface
- **Easy to operate**
 - User friendly interface
 - Context-sensitive help screens
 - Self-diagnostic features for external components including dosing pump, burette and stirrer
- **Ideal for food and beverage, pharmaceuticals, cosmetics, chemical and petrochemical manufacturing**

Specifications

HI903

Titration	Range	100 ppm to 100%
	Resolution	1 ppm (0.0001%)
	Result Units	%, ppm, mg/g, µg/g, mg, µg, mg/mL, µg/mL, mg/pc, µg/pc
	Sample Type	liquid or solid
Determination	Pre-Titration Conditioning	automatic
	Background Drift Correction	automatic or user-selectable value
	Endpoint Criteria	fixed mV persistence, relative drift stop or absolute drift stop
	Dosing	dynamic with optional pre-dispensing rate
	Result Statistic	mean, standard deviation
Clip Lock™ Exchangeable Burette System	Dosing Pump Resolution	1/40000 of the burette volume (0.125 µL per dose) with 5 mL burette
	Dosing Pump Accuracy	±0.1% of full burette volume
	Syringe	5 mL precision ground glass with PTFE plunger
	Valve	motor-driven 3-way, PTFE liquid contact material
	Tubing	PTFE with light block and thermal jacketing
	Dispensing Tip	glass, fixed position, anti-diffusing
	Titration Vessel	conical with operation volume between 50-150 mL
Electrode	Solvent Handling System	sealed system, integrated diaphragm air pump
	Type	HI76320D dual platinum pin, polarization electrode
	Connection	BNC
	Polarization Current	1, 2, 5, 10, 15, 20, 30 or 40 µA
	Voltage Range	2 mV to 1000 mV
	Voltage Resolution	0.1 mV
Stirrer	Accuracy (@25°C/77°F)	±0.1 %
	Type	magnetic, optically regulated, digital stirrer
	Speed	200-2000 rpm
Peripheral Devices	Resolution	100 rpm
	PC	easily view, transfer, print or delete methods and reports via HI900PC application
	USB Flash Drive	easily upgrade software or transfer methods and reports between devices using a USB drive
	Laboratory Analytical Balance	RS232 to connect any laboratory balance
	Printer	print directly from the HI903 to a printer via parallel port
	Monitor	instrument status and titrations can be viewed on a larger screen using any VGA-compatible external monitor
Additional Specifications	Keyboard	alphanumeric text can be entered using an optional PS/2 keyboard
	Graphic Display	5.7" (320 x 240 pixel) color LCD
	Titration Methods	up to 100 (standard and user) methods
	Data Storage	up to 100 complete titration reports and drift rate reports can be stored
	GLP Conformity	Good Laboratory Practice and instrument data storage and printing
	Languages	English, Portuguese, Spanish, and French
	Enclosure Material	ABS plastic and steel
	Keypad	polycarbonate
	Power Supply	"-01" model: 115VAC, 50/60 Hz; "-02" model: 230VAC, 50/60 Hz;
	Operating Environment	10 to 40°C, up to 95% RH
	Storage Environment	-20 to 70°C, up to 95% RH
Dimensions	390 x 350 x 380 mm (15.3 x 13.8 x 14.9")	
Weight	approximately 10 kg (22 lbs.)	
Ordering Information	HI903-01 (115V) and HI903-02 (230V) are supplied with HI76320 dual platinum pin electrode, dosing pump, 5 mL burette assembly with tubing, air pump assembly with tubing, beaker and bottle top assemblies and all fittings, desiccant cartridges (4) with indicating desiccant, stir bar, waste bottle, calibration key, USB cable, power cable, HI900PC application, USB flash drive, quality certificate, ISO 8655 burette compliance report and instruction manual binder.	

See a list of accessories on page 35

HI904

Karl Fischer Coulometric Titrator



Measures 1 ppm to 5% water content

- Precision dosing system by generator electrode
 - 400 mA pulsed current
 - Available with or without a diaphragm
- Molecular sieve desiccant
 - Prevents the ingress of ambient humidity into the sealed solvent system while maintaining full titrator functionality
 - Regenerates at 300°C
- Sealed generator cell
 - Generator electrode
 - Dual pin bivalent platinum sensing electrode
 - Molecular sieve desiccant cartridge
 - Replaceable septum for liquid sampling port
 - Accessory port
- Built-in stirrer
 - Automatic, integrated magnetic stirrer adjustable from 200-2000 RPM
 - Optical feedback for automatic speed control
 - Extra optional port for external stirrer
- Sealed solvent system
 - Change to fresh reagent in a matter of seconds without opening titration vessel
 - Minimizes exposure to ambient humidity
 - PTFE tubing is resistant to harsh KF chemicals
 - Sealed tube holder to collect PTFE tube after exchanging reagent
- PTFE bottle cap
 - Caps fit any GL45-threaded bottle
 - Chemically-resistant caps and fittings
 - Removable desiccant cartridges



Adaptable, High Accuracy Moisture Determination

The HI904 Karl Fischer Coulometric Titrator for moisture analysis is an extension of Hanna's highly successful titrator platform. The HI904 combines an ultra-high electrolytically generated iodine dynamic dosing system with optically-regulated magnetic stirring, sophisticated endpoint determination, and background drift correction algorithms.

The result is an extremely adaptable titrator capable of titrating with superior accuracy and precision for samples with low moisture content. The HI 904 applies a pulsed DC current for titrant generation, detects the endpoint and performs all necessary calculations automatically.

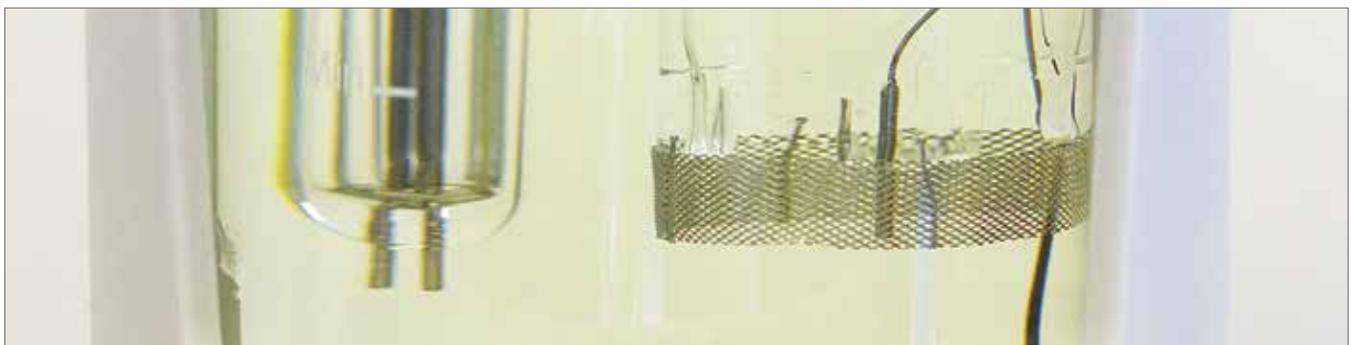
The HI904 comes equipped with a solvent handling system to reduce cell conditioning time and can be connected directly to a laboratory analytical balance via RS232 serial interface.

The HI904's powerful software and intuitive menus are easily navigated on the large, color LCD display, making it simple to view results. Choose from included methods or develop a custom method for almost any application or sample type. Methods (standard or user) can be created, stored or edited with the PC Hanna software and then transferred to the titrator by USB flash drive.



- **Fritted (Diaphragm) Generator**

- Anode/analyte and cathode/catholyte separated by glass diaphragm
- Prevents anode-generated iodine from being reduced to iodide at the cathode
- Ideal for extremely low H₂O content, high accuracy demand, nitrogenous compounds, easily reduced samples



- **Frit-Less (No Diaphragm) Generator**

- Uses one easy to replace Karl Fischer reagent
- Lower and more stable drift rates
- Easier cleaning of generator cell

Versatile Data Management

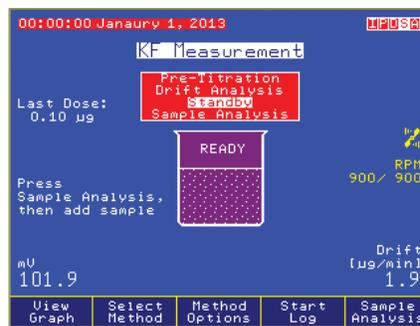
- HI900 Series titration systems can be easily incorporated into any existing GLP data management program:
 - Easily record all necessary GLP information with every sample, such as sample identification, company and operator name, date, time, electrode ID codes and calibration information
- Data can be transferred to a PC using the Hanna HI900PC software application
- The USB port allows for the easy transfer of methods, reports and software upgrades via a USB flash drive
- Users can print reports of analyses directly from the titrator using a standard parallel printer
- An external monitor and keyboard can be attached for added versatility



- Customizable general options
 - Titration general options can be configured to user requirements

- Titration Reports
 - Titration results can be viewed on-screen or transferred to a USB storage device

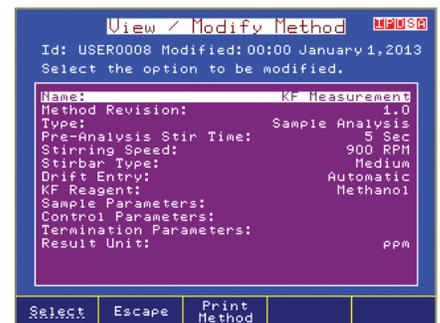
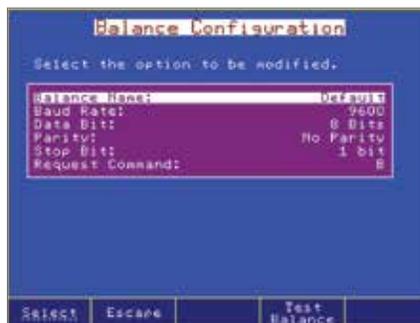
- Titration graphs
 - Titration graphs can be viewed on-screen or saved as images and transferred along with titration report



- Sample Analysis
 - Interface displays real-time monitoring of water content and results

- Standby
 - The HI904 keeps the solvent dry between samples and monitors the drift rate

- Results
 - Titration results are displayed with options to average results or a user-customized report



- Sample Addition
 - The HI904 recommends a sample size based on expected results

- Fully configurable balance interface
 - Enter sample weight automatically from any laboratory analytical balance with RS232 serial output

- Fully customizable titration methods
 - Customize methods for any application

- Supports up to 100 methods (standard user defined)
- Results displayed directly in the selected units
- Titration graph can be displayed on-screen and saved as an image to be transformed to a PC or printed
- USB flash drive input
 - Transfer methods, reports, and graphs to either a PC or other titration system
 - Field upgradable software
- Incorporates into any GLP data management program:
 - Easily record all necessary GLP information with every sample, including company and operator name, date, time, electrode ID codes and standardization information
- Proper mixing of reagent and sample
 - Digital, magnetic stirring system with optical feedback
 - Adjustable stirring speed to facilitate mixing.
- Flexible, accurate detection of the titration endpoint
 - Dual platinum pin polarization electrode for bivalent detection of endpoint
- Multi-language support
- Balance interface
 - Automatically acquire sample mass via RS232 serial interface
- Easy to operate
 - User-friendly interface
 - Context-sensitive help screens

Specifications	HI904	
Titration	Range	1 ppm to 5%
	Resolution	0.1ppm (0.0001%)
	Result Units	%, ppm, ppt, mg/g, µg/g, mg, µg, mg/mL, µg/mL, mg Br/100g, g Br/100g, mg Br, g Br
	Sample Type	Liquid or Solid (external dissolution / extraction)
	Titration Vessel	Operating volume between 100 - 200 mL
	Reagent Handling System	Sealed system with integrated diaphragm air pump and beaker adapter
Generator Electrode	Configuration	Fritted or Fritless (with or without diaphragm)
	Current Control	Automatic or fixed (400 mA)
	Electrode Type Detection	Automatic
Determination	Pre Titration Conditioning	Automatic
	Background Drift Correction	Automatic; User-Selectable Value
	Endpoint Criteria	Fixed mV persistence, relative drift stop, or absolute drift stop
	Dosing	Dynamic with three speed settings
	Result statistic	Mean, Standard Deviation
Detector Electrode	Type / Connection	Dual platinum pin, polarization electrode / BNC connector
	Polarization Current	1, 2, 5, or 10 µA
	Voltage Range	2 mV to 1100 mV
	Voltage Resolution	0.1 mV
	Accuracy (@25°C/77°F)	±0.1%
Peripheral Devices	PC	Easily view, transfer, print or delete methods and reports via HI900 PC application
	USB Flash Drive	Easily upgrade software or transfer methods and reports between devices using a USB drive
	Laboratory Analytical Balance	RS232 to connect a laboratory analytical balance
	Printer	Print directly from the HI904 to a parallel port printer
	Monitor	Instrument status and titrations can be viewed on a larger screen using any VGA compatible external monitor
	Keyboard	Alphanumeric text can be entered using an optional PS/2 keyboard
Additional Specifications	Graphic Display	5.7" (320 x 240 pixel) color LCD
	Titration Methods	Up to 100 (standard and user methods)
	Data Storage	Up to 100 titration and drift rate reports can be stored
	GLP Conformity	Good Laboratory Practice and instrument data storage and printing
	Languages	English, Portuguese, Spanish, and French
	Enclosure Material	ABS Plastic and Steel
	Keypad	Polycarbonate
	Power Supply	115 VAC, 50 - 60 Hz, 230 VAC, 50 - 60 Hz
	Operating Environment	10 - 40°C, up to 95% RH
	Storage Environment	-20 to 70°C, up to 95% RH
Dimensions / Weight	390 x 350 x 380 mm (15.3 x 13.8 x 14.9"); approximately 10 kg (22 lbs.)	
Ordering Information	<p>HI904D-01 (with Diaphragm), HI904-01 (115V) and HI904D-02 (with Diaphragm), HI904-02 (230V) are supplied with dual platinum pin electrode, air pump assembly, titration vessel assembly (glass vessel, accessory port stopper, sample port cap and septum, stir bar, desiccant, desiccant cartridge, fittings), vessel support with adapter, pump locking screw with plastic head, reagent bottle assembly (bottle cap, desiccant, desiccant cartridge, fittings, tubing (silicone and PTFE)), water bottle assembly (waste bottle, bottle cap, desiccant, desiccant cartridge, fittings, tubing (silicone and PTFE)), calibration key, reagent exchange adapter, accessory holder assembly, joint grease, Karl Fischer generator electrode (removable generator electrode cable), USB cable, USB storage device, HI900 PC application software, power adapter, quality certificate and instruction manual binder.</p>	

HI84530

Total Titratable Acidity Titrator and pH Meter

for Water Analysis

- **Piston Driven Pump with Dynamic Dosing**
 - For highly accurate, repeatable results.
- **Two Endpoints and Two Ranges**
- **CAL-CHECK®**
 - Alerts users to potential problems during calibration such as contaminated buffers or a dirty/broken pH electrode.
- **Log-on-Demand**
 - Log data up to 400 samples (200 for titration; 200 for pH/mV).
- **Graphic Mode/Exportable Data**
 - Displays in-depth data on titration, which can then be stored and exported to either a USB drive or PC using the USB connection.
- **Automatic Stirrer Speed Control**
 - Maintains stirrer speed at approximately 600 rpm regardless of viscosity of solution.
- **GLP Features**
 - Meets Good Laboratory Practices
- **Easy to Use Interface**
 - User intuitive design with large keys and easy to navigate screens.
- **HELP Features**
 - Dedicated HELP key with content sensitive help
- **pH/mV Meter**



Easy to Use, Fast and Affordable All-in-one Solution

The HI84530 is an easy to use, fast and affordable mini automatic titrator with a pH meter designed for the rapid and accurate analysis of Total Titratable and Strong Acidity in water. This new generation of mini automatic titrator improves upon the titrant delivery system and measuring ranges for increased accuracy compared to previous models. This meter reflects Hanna's years of experience as a manufacturer of analytical instruments.

The HI84530 incorporates a precise piston dosing system, which allows for a highly accurate determination of the amount of titrant used. It is also capable of dynamic dosing, making testing both faster and more accurate. Pump calibrations are performed with the provided Hanna standard, help assure the accuracy of the measurement.

An intuitive interface makes the instrument simple to use and the dedicated HELP key guides the user through set-up, calibration status, and troubleshooting.

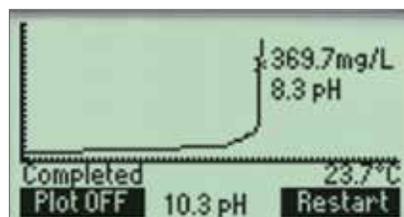
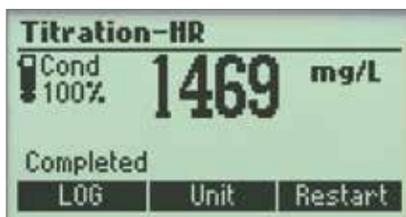
This mini titrator includes a pre-programmed analysis method based on the Standard Methods of Water and Wastewater Determination. It uses a powerful algorithm which analyzes the shape of the electrode response in order to determine when the titration reaction has reached completion.

This mini titrator is also designed to be used as a benchtop pH/mV meter. The CAL-CHECK function not only ensures an accurate pH reading when the HI84530 is used as a pH meter but also an accurate titration since the end point is determined by a set pH value.

Total Titratable Acidity

Water acidity is an important parameter to monitor, it can affect the corrosive capacity of water, chemical reaction rates and biological processes. Acidity can also be used to monitor pollution in wastewater and drinking water.

Total titratable acidity is a measure of all of the hydrogen ions present in a sample. Many factors can contribute to the acidity of a water sample including strong acids (hydrochloric, sulfuric, nitric, etc.), weak acids (organic acids) and other acidic components (aluminum, iron, etc.).



- **Easy and clear measurement**
 - The HI84530 is a single parameter titrator designed to measure total acidity in a few easy steps. The HI84530 displays the results directly on the screen in user-selectable units.
- **pH meter with electrode condition on display**
 - The HI84530 also functions a pH meter. The HI84530 also displays the electrode condition on the LCD using Hanna's exclusive electrode diagnostics.
- **Titration Curve Displayed On Screen**
 - The HI84530 offers real time graphing of the titration curve on the LCD.

Specifications

HI84530

Titratable Acidity (LR)	Range (as CaCO ₃)	15.0 - 400.0 mg/L; 0.3 - 8.0 meq/L
	Resolution	0.1 mg/L / 0.1 meq/L
	Accuracy (@ 25 °C/78 °F)	±1 ppm or 3% of reading, whichever is greater
Titratable Acidity (HR)	Range (as CaCO ₃)	300 - 4000 mg/L; 6.0 - 80.0 meq/L
	Resolution	1 mg/L / 0.1 meq/L
	Accuracy (@ 25 °C/78 °F)	± 15 ppm or 3% of reading, whichever is greater
pH	Range	-2.0 to 16.0 pH / -2.00 to 16.00 pH
	Resolution	0.1 pH / 0.01 pH
	Accuracy (@ 25 °C/78 °F)	± 0.01 pH
mV	Range	-2000.0 to 2000.0 mV
	Resolution	0.1 mV
	Accuracy (@ 25 °C/78 °F)	± 1.0 mV
Temperature	Range	-20.0 to 120.0 °C (-4.0 to 248.0 °F)
	Resolution	0.1 °C
	Accuracy (@ 25 °C/78 °F)	±0.4 °C without probe error
Additional Specifications	Titration Method	Acid-base titration - total acidity / strong acidity
	Titration Principle	Endpoint titration : 8.30 pH (phenolphthalein) / 3.7 pH (Methyl Orange)
	Pump Speed	10 mL/min
	Stirring Speed	600 rpm
	pH Temperature Compensation	Manual or automatic from -20 to 120 °C (-4 to 248 °F)
	Logging	Up to 200 samples
	pH Calibration	One, two or three-point calibration; four available buffers (4.01, 7.01, 8.30, 10.01)
	pH Electrode	HI1131B glass body pH electrode with BNC connector and 1 m (3.3') cable (included)
	Temperature Probe	HI7662T stainless steel temperature probe with 1 m (3.3') cable (included)
	Environment	0 to 50 °C (32 to 122 °F); max 95% RH non-condensing
	Power Supply	12 VDC power adapter
	Dimensions	235 x 200 x 150 mm (9.2 x 7.9 x 5.9")
	Weight	1.9 kg (67.0 oz.)
Ordering Information	HI84530-01 (115V) and HI84530-02 (230V) are supplied with HI1131B pH electrode, HI7662-T temperature probe, HI84530-70 Reagent kit for water analysis, two 100 mL beakers, Dosing Pump Valve, 5 mL Syringe, 1 mL plastic pipette, tube set (aspiration tube with titrant bottle cap and dispensing tube with tip), Stir bar, Power Adapter, and Instruction manual.	

See a list of reagents and accessories on page 36

HI84531

Titratable Alkalinity Titrator and pH Meter

for Water Analysis

- **Piston Driven Pump with Dynamic Dosing**
 - For highly accurate, repeatable results.
- **CAL-CHECK®**
 - Alerts users to potential problems during calibration such as contaminated buffers or dirty/broken pH electrodes.
- **Log-on-Demand**
 - Log data up to 400 samples (200 for titration; 200 for pH/mV).
- **Graphic Mode/Exportable Data**
 - Displays in-depth data on titration, which can then be stored and exported to either a USB drive or PC using the USB connection.
- **Automatic Stirrer Speed Control**
 - Maintains stirrer speed at approximately 600 rpm regardless of viscosity of solution.
- **GLP Features**
 - Meets Good Laboratory Practices
- **Easy to Use Interface**
 - User intuitive design with large keys and easy to navigate screens.
- **HELP Features**
 - Dedicated HELP key for content sensitive help
- **pH/mV Meter**



Easy to Use, Fast and Affordable All-in-one Solution

The HI84531 is a dedicated mini titrator and pH meter designed for low to high levels of alkalinity. It performs a potentiometric titration with a pH electrode to determine total titratable alkalinity or strong alkalinity in water. A titrant is slowly added to the sample while the pH and temperature are carefully monitored. The software analyzes the resulting titration curve and calculates the volume of titrant required to reach the endpoint. The user can choose either to measure strong alkalinity with a 8.30 pH end point (known as phenolphthalein alkalinity) or total alkalinity with a 4.50 pH endpoint (known as bromocresol green alkalinity).

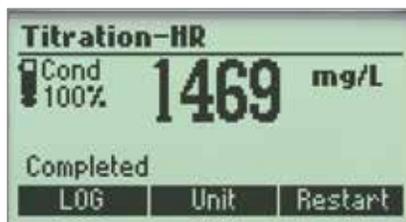
The dispensed titrant volume is used to automatically calculate the alkalinity, which can be displayed in mg/L or meq/L as CaCO₃. Titrations are conducted using the low range titrant HI84531-50 (30 to 400 mg/L as CaCO₃) or the high range titrant HI84531-51 (300 to 4000 mg/L as CaCO₃).

This mini titrator is also designed to be used as a benchtop pH/mV meter. The CAL-CHECK® function not only ensures an accurate pH reading when the HI84531 is used as a pH meter but also an accurate titration since the end point is determined by a set pH value.

Total Alkalinity

Total titratable alkalinity is a measure of primarily three types of alkalinities present in a water sample: hydroxide, carbonate and bicarbonate. Alkalinity in water can be the result of contributions from common chemicals, including carbonate, bicarbonate, hydroxide, phosphates, borate and organic acid salts.

The alkalinity of a water sample indicates its ability to resist pH change. The amount of alkalinity in water is mostly due to the bicarbonate/carbonate present. A low alkalinity level indicates that the water is susceptible to pH changes. While a high alkalinity level indicates that the water will be able to resist pH changes. Alkalinity can also be used to determine the corrosive capacity of water and an estimation of water hardness.



- **Electrode condition on display**
 - These titrators feature a pH meter which also displays the electrode condition on the LCD.
- **Easy and clear measurement**
 - These titrators are designed to measure in a few easy steps. The results are displayed directly on the screen.
- **Titration Curve Displayed On Screen**
 - The HI84531 offers real time graphing of the titration curve on the LCD.

Specifications

HI84531

Total Titratable Alkalinity (Low Range), 50 mL sample	Range (as CaCO ₃)	30.0 - 400.0 mg/L; 0.6 - 8.0 meq/L
	Resolution	0.1 mg/L (ppm); 0.1 meq/L
	Accuracy (@25°C/77°F)	3% of reading or ± 1 mg/L, whichever is greater
Total Titratable Alkalinity (High Range), 50 mL sample	Range (as CaCO ₃)	300 - 4000 mg/L; 6.0 - 80.0 meq/L
	Resolution	1 mg/L (ppm); 1 meq/L
	Accuracy (@25°C/77°F)	3% of reading or ± 10 mg/L, whichever is greater
pH	Range	-2.0 to 16.0 pH / -2.00 to 16.00 pH
	Resolution	0.1 pH / 0.01 pH
	Accuracy (@25°C/77°F)	± 0.01 pH
	Calibration	1, 2 or 3 calibration points; 4 available buffers (4.01, 7.01, 8.30, 10.01)
mV	Range	-2000.0 to 2000.0 mV
	Resolution	0.1 mV
	Accuracy (@25°C/77°F)	± 1.0 mV
Temperature	Range	-20.0 to 120.0 °C (-4.0 to 248.0 °F)
	Resolution	0.1 °C
	Accuracy	±0.4 °C without probe error
Additional Specifications	Titration Method	acid-base titration (strong alkalinity /total alkalinity)
	Titration Principle	endpoint titration : 8.30 pH (phenolphthalein) / 4.50 pH (bromcresol green)
	Pump Volume	10 mL/min
	Stirring Speed	600 rpm
	pH Temperature Compensation	manual or automatic from -20 to 120 °C (-4 to 248 °F)
	Logging	Up to 400 samples (200 pH/mV, 200 titration)
	pH Electrode	HI1131B glass body pH electrode with BNC connector and 1 m (3.3') cable (included)
	Temperature Probe	HI7662-M stainless steel temperature probe with 1 m (3.3') cable (included)
	Environment	0 to 50 °C (32 to 122 °F); max 95% RH non-condensing
	Power Supply	12 VDC adapter
	Dimensions	235 x 200 x 150 mm (9.2 x 7.9 x 5.9")
	Weight	1.9 kg (67.0 oz.)
	Ordering Information	HI84531-01 (115V) and HI84531-02 (230V) are supplied with HI1131B pH electrode, HI7662-T temperature probe, HI84531-70 Reagent kit for water analysis, HI7061 cleaning solution, HI7004M pH 4.01 buffer solution (230 mL), HI70083M pH 8.30 buffer solution (230 mL), HI7010M pH 10.01 buffer solution (230 mL), 100 mL beakers (2), tube set with dispensing tip, medium stir bar, 12 VDC adapter, Instructions and quick reference guide.

See a list of reagents and accessories on page 37

HI84529

Titrateable Acids Mini Titrator and pH Meter

for the Dairy Industry

- **Piston Driven Pump with Dynamic Dosing**
 - For highly accurate, repeatable results.
- **CAL-CHECK®**
 - Alerts users to potential problems during calibration such as contaminated buffers or dirty/broken electrodes.
- **Log-on-Demand**
 - Log data up to 400 samples (200 for titration; 200 for pH/mV).
- **Graphic Mode/Exportable Data**
 - Displays in-depth data on titration, which can then be stored and exported to either a USB drive or PC using the USB connection.
- **Automatic Stirrer Speed Control**
 - Maintains stirrer speed at approximately 600 rpm regardless of viscosity of solution.
- **GLP Features**
 - Meets Good Laboratory Practices
- **Application Specific Electrode FC260B half-cell pH electrode.** This electrode is designed to measure all types of dairy related products
- **HI5315 double junction half-cell reference electrode.**
 - Features a plunger design to clear any clogging of the outer junction.



Easy to Use, Fast and Affordable All-in-one Solution

The HI84529 is an easy to use, fast and affordable mini automatic titrator and pH meter designed for testing acidity levels in dairy products. This new generation of mini automatic titrator improves upon the titrant delivery system and measuring ranges for increased accuracy compared to previous models. This meter reflects Hanna's years of experience as a manufacturer of analytical instruments.

This mini titrator includes a pre-programmed analysis method designed for acidity measurements for dairy analysis. It uses a powerful algorithm which analyzes the shape of the electrode response in order to determine when the titration reaction has reached completion. By simply pressing the START key, the HI84529 automatically performs an end point titration and displays results immediately in a choice of units.

Acidity Measurement and its Significance in the Dairy Industry

There are two fundamentally different measurements of dairy products: titrateable acidity and pH. The pH is a measurement of hydrogen ion concentration while titrateable acidity is the neutralizing capacity of a dairy product by a base.

An increase in acidity can be the result of bacteria formation. Monitoring acidity is a way of determining in the quality and freshness of dairy products. Acidity is determined by an end point titration using sodium hydroxide (a base), and is defined as the consumption of base necessary to shift the pH value from 6.6 (corresponding to fresh milk) to a pre-determined pH value. While pH 7.0 is the actual point of neutralization, phenolphthalein is commonly employed as a color indicator to determine the end point of reaction and with it, color change occurs at pH 8.3. Titrateable acidity is expressed in a variety of units based on the one which reflects the titration method and strength of base used during titration.

°SH – Soxlet Henkel degrees: obtained by titrating 100 mL of milk with 0.25N NaOH, using phenolphthalein as the indicator. This method is common in Central Europe.

°Th – Thorner degrees: obtained by titrating 100 mL of milk thinned with 2 parts distilled water, with 0.1N NaOH, using phenolphthalein as an indicator. Method is used mostly in Sweden and the CIS.

°D – Dornic degrees: obtained by titrating 100 mL of milk thinned with two parts distilled water, with 1.0N NaOH/9, using phenolphthalein as an indicator. Used mostly in the Netherlands and France.

% l.a. – percent lactic acid: obtained as °D divided by 100. Frequently used in the UK, USA, Canada, Australia and New Zealand.

Note: Taking into account the concentration of sodium hydroxide, the results expressed in one value can be easily converted into any other unit value by consulting the chart below.

From:	To:	Divide By:
%l.a.	°SH	0.0225
%l.a.	°D	0.0100
%l.a.	°TH	0.0090

Eliminate Subjectivity and Increase Efficiency.

The HI84529 Mini Titrator eliminates the subjective end point color change detection determined by the human eye, and instead employs the sensitivity and accuracy of a pH sensor. The titration method is a potentiometric end point determination using a pre-determined pH value.

Acidity of dairy products can be expressed in any of the units described earlier by simply selecting the desired unit. After performing a pump calibration with the supplied standard, you can then perform titrations, expressed in the desired unit, using the same titrant. This eliminates the inconvenience of purging the titrant and being sure that you have the right titrant concentration – saving time and titrant. The quantity of sample needed is much smaller in comparison to a traditional method. Either 20 or 50 mL is used in the low range and 20 mL is used in the high range as compared to 100 mL used in the traditional method.

Specifications	HI84529	
Titrator	Titratable Acidity Low Range	%l.a.: 0.01 to 0.20; °SH: 0.4 to 8.9; °D: 1.0 to 20.0; °TH: 1.1 to 22.2
	Titratable Acidity LR Resolution	%l.a.: 0.01 ; °SH: 0.1; °D: 0.1; °TH: 0.1
	Titratable Acidity High Range	%l.a.: 0.1 to 2.0; °SH: 4.4 to 88.9; °D: 10 to 200; °TH: 11.1 to 222.2
	Titratable Acidity HR Resolution	%l.a.: 0.1; °SH: 0.1; °D: 1; °TH: 0.1
	Accuracy LR (@25°C/77°F)	± 0.01 %l.a.
	Accuracy HR (@25°C/77°F)	± 0.1 %l.a.
	Titration Method	Acid-base titration
	Sample Size LR 20	20 mL or 20 g
	Sample Size LR 50	50 mL or 50 g
	Sample Size HR 20	20 mL or 20 g
	Principle	Endpoint titration, adjustable (pH 8.1 - 8.4 in 0.1 increments)
	Pump Speed	10 mL/min
Stirring Speed	800 (Low Range) / 1000 (High Range)	
pH Meter	Range	-2.0 to 16.0 pH / -2.00 to 16.00 pH
	Resolution	0.1 pH / 0.01 pH
	Accuracy (@25°C/77°F)	±0.01 pH
	Calibration	One, two or three-point calibration (pH 4.01, 6.00, 8.30, 10.01)
	Temperature Compensation	Manual or automatic
mV Meter	Range	-2000.0 to 2000.0 mV
	Resolution	0.1 mV
	Accuracy	± 1.0 mV
Temperature	Range	-20.0 to 120.0 °C (-4.0 to 248.0 °F)
	Resolution	0.1 °C
	Accuracy	±0.4 °C without probe error
Additional Specifications	Logging Data	Up to 400 samples (200 pH/mV, 200 titration)
	Electrodes	FC260B pH electrode with 1 m (3.3') cable (included), HI5315 reference probe with 1 m (3.3') cable (included)
	Temperature Probe	HI7662-M stainless steel temperature probe with 1 m (3.3') cable (included)
	Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
	Power Supply	12 VDC power adapter (included)
	Dimensions	235 x 200 x 150 mm (9.2 x 7.9 x 5.9")
	Weight	1.9 kg (67.0 oz.)
Ordering Information	HI84529-01 (115V) and HI84529-02 (230V) are supplied with HI84529-70 Reagent Kit for titratable acidity in dairy products, FC260B pH electrode, HI5315 Reference electrode, HI7662-M temperature probe, HI7072 fill solution (30 mL), HI700640 cleaning solution for milk deposits (2 x 20 mL), One capillary dropper pipette, Two 100 mL beakers, Tube set (aspiration tube with titrant bottle cape and dispensing tube with tip), Dosing Pump Valve, 5 mL Syringe, 1 mL plastic pipette, stir bar, power adapter, and instruction manual	

HI84532

Titratable Acidity Mini Titrator and pH Meter

for Fruit Juice

- **Piston Driven Pump with Dynamic Dosing**
 - For highly accurate, repeatable results.
- **CAL-CHECK®**
 - Alerts users to potential problems during calibration such as contaminated buffers or dirty/broken electrodes.
- **Log-on-Demand**
 - Log data up to 400 samples (200 for titration; 200 for pH/mV).
- **Graphic Mode/Exportable Data**
 - Displays in-depth data on titration, which can then be stored and exported to either a USB drive or PC using the USB connection.
- **Automatic Stirrer Speed Control**
 - Maintains stirrer speed at approximately 600 rpm regardless of viscosity of solution.
- **GLP Features**
 - Meets Good Laboratory Practices
- **Easy to Use Interface**
 - User intuitive design with large keys and easy to navigate screens.
- **HELP Features**
 - Dedicated HELP key for content sensitive help
- **pH/mV Meter**



Easy to Use, Fast and Affordable All-in-one Solution

The HI84532 digital automatic mini titrator and pH meter is designed for measuring the concentration of titratable hydrogen ions contained in fruit juice samples by neutralization with a strong base solution to a fixed pH as according to the Official Methods of Analysis of AOAC International. This new generation of mini automatic titrator improves upon the titrant delivery system and measuring ranges for increased accuracy compared to previous models. This meter reflects Hanna's years of experience as a manufacturer of analytical instruments.

A clear and intuitive user interface allows users to navigate the HI84532's menus and functions quickly. The HELP key located on the keypad aids in on-screen set-up, calibration status and troubleshooting.

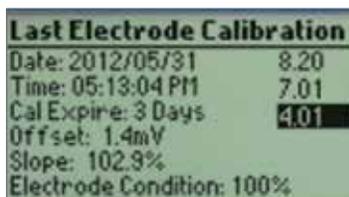
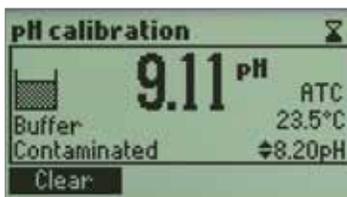
The HI84532 incorporates a precise piston dosing system, which allows for a highly accurate determination of the amount of titrant used. It is capable of dynamic dosing, making testing both faster and more accurate. Pump calibrations, performed with the provided Hanna standards, help assure the measurement accuracy.

This mini titrator is also designed to be used as a benchtop pH/mV meter. The CAL-CHECK function not only ensures an accurate pH reading when the HI84532 is used as a pH meter but also an accurate titration since the end point is determined by a set pH value.

Why Titratable Acidity is So Important

Titratable acidity is an important parameter in determining fruit maturity and sour taste in citrus fruits. The maturity of fruit is one of the most important factors to determine how well fruit will store and how it will taste. For some fruits, governmental quality standards (based on titratable acidity or the ratio of total soluble solids (°Brix) to titratable acidity) are in place to protect consumers. Immature fruit will normally have a low sugar to acid ratio as compared to mature fruit that will have a high sugar to acid ratio.

The HI84532 measures the concentration of titratable hydrogen ions contained in fruit juice samples by neutralization with a strong base solution to a fixed pH. This value includes all the substances of an acidic nature in the fruit juice including: free hydrogen ions, organic acids and acid salts. Titratable acidity is expressed as g/100 mL of the predominant acid. The predominant acids in fruit depend on the type of fruit being tested and include citric acid, tartaric acid, and malic acid.



• CAL CHECK®

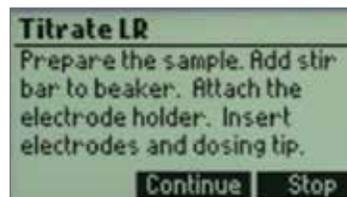
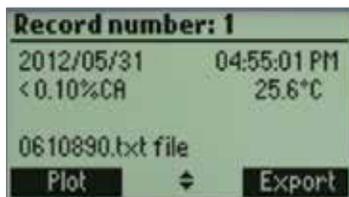
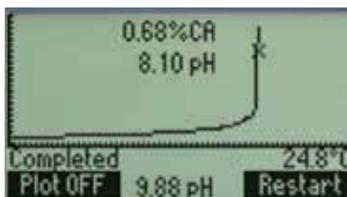
- CAL CHECK is a Hanna exclusive process for checking the condition of a pH electrodes to help keep measurements accurate.

• GLP

- The GLP feature records electrode and pump calibration data to help keep measurements accurate and reliable.

• Setup Screens

- The LCD features an easy to use setup screen.



• Titration Curve Displayed On Screen

- The HI84532 offers real time graphing of the titration curve on the LCD.

• Log and Recall Data

- The HI84532 can log up to 400 samples (200 for titration results; 200 for pH/mV) and recall or export data to a USB drive or PC.

• Tutorial and HELP Screens

- Accessing the tutorial menu provides helpful information during calibration and titration.

Specifications

HI84532

Titrator	Titrateable Acidity Range LR 5mL sample	g/100 mL as citric acid: 0.10 - 2.00% CA; g/100 mL as tartaric acid: 0.11 - 2.35% TA; g/100 mL as malic acid: 0.10 - 2.09 %MA
	Titrateable Acidity Range HR 5mL sample	g/100 mL as citric acid: 1.00 - 10.00% CA; g/100 mL as tartaric acid: 1.17 - 11.72% TA; g/100 mL as malic acid: 1.05 - 10.47 %MA
	Titrateable Acidity Resolution	0.01%
	Accuracy (@25°C/77°F)	3% of reading or ± 0.02 %CA whichever is greater
	Titration Method	Acid-base titration
	Principle	Endpoint titration: 8.1 pH
	Pump Speed	10 mL/min
	Stirring Speed	600 rpm
pH Meter	Range	-2.0 to 16.0 pH / -2.00 to 16.00 pH
	Resolution	0.1 pH / 0.01 pH
	Accuracy (@25°C/77°F)	±0.01 pH
	Calibration	One, two or three calibration points; four available buffers (4.01; 7.01; 8.20, 10.01)
	Temperature Compensation	Manual or automatic from -20 to 120°C (-4 to 248°F)
mV Meter	Range	-2000.0 to 2000.0 mV
	Resolution	0.1 mV
	Accuracy	± 1.0 mV
Temperature	Range	-20.0 to 120.0°C (-4.0 to 248.0°F)
	Resolution	0.1°C
	Accuracy (@25°C/77°F)	±0.4°C without probe error
Additional Specifications	Logging Data	Up to 400 samples (200 pH/mV, 200 titration)
	Electrode	HI1131B glass body pH electrode with BNC connector and 1 m (3.3') cable
	Temperature Probe	HI7662-T stainless steel temperature probe with 1 m (3.3') cable(included)
	Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
	Power Supply	12 VDC power adapter (included)
	Dimensions	235 x 200 x 150 mm (9.2 x 7.9 x 5.9")
	Weight	1.9 kg (67.0 oz.)
Ordering Information	HI84532-01 (115V) and HI84532-02 (230V) are supplied with HI84532-70 Reagent Kit for titrateable acidity in fruit juice, HI1131B pH electrode, HI7662-T temperature probe, HI7082 electrode fill solution (30 mL), two 100 mL beakers, One 20 mL beakers, tube set (aspiration tube with titrant bottle cap and dispensing tube with tip), dosing pump valve, 5 mL Syringe, 1 mL plastic pipette, stir bar, power adapter, and instruction manual	

HI84533

Formol Number Mini Titrator and pH Meter

for Wines and Fruit Juices

- **Piston Driven Pump with Dynamic Dosing**
 - For highly accurate, repeatable results.
- **CAL-CHECK®**
 - Alerts users to potential problems during calibration such as contaminated buffers or dirty/broken pH electrode.
- **Log-on-Demand**
 - Log data up to 400 samples (200 for titration; 200 for pH/mV).
- **Graphic Mode/Exportable Data**
 - Displays in-depth data on titration, which can then be stored and exported to either a USB drive or PC using the USB connection.
- **Automatic Stirrer Speed Control**
 - Maintains stirrer speed at approximately 600 rpm regardless of viscosity of solution.
- **GLP Features**
 - Meets Good Laboratory Practices
- **Easy to Use Interface**
 - User intuitive design with large keys and easy to navigate screens.
- **HELP Features**
 - Dedicated HELP key for content sensitive help
- **pH/mV Meter**



Easy to Use, Fast and Affordable All-in-one Solution

The HI84533 is an easy to use, fast and affordable mini automatic titrator designed for the rapid and accurate determination of formol number in wines or fruit juices. This new generation of mini automatic titrator improves upon the titrant delivery system and measuring ranges for increased accuracy compared to previous models. This meter reflects Hanna's years of experience as a manufacturer of analytical instruments.

The HI84533 incorporates a precise piston dosing system which allows for a highly accurate determination of the amount of titrant used. It is also capable of dynamic dosing, making testing both faster and more accurate. A pump calibration performed with the supplied Hanna standard help assure the accuracy of the measurement.

This mini titrator includes a user adjustable programmed analysis method designed for formol number analysis. It employs a powerful and effective algorithm to analyze the pH response to determine the exact pH end point, then uses this algorithm to perform the necessary calculations.

This mini titrator is also designed to be used as a benchtop pH/mV meter. The CAL-CHECK function not only ensures an accurate pH reading when the HI84533 is used as a pH meter but also an accurate titration since the end point is determined by a set pH value.

Why Formol Number is So Important

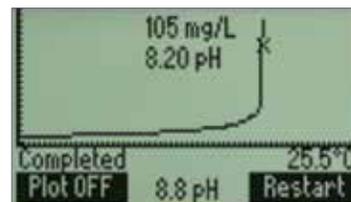
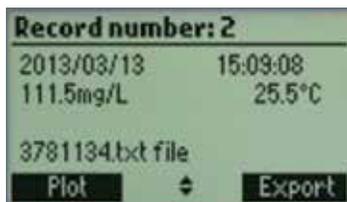
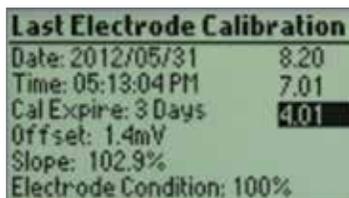
The amino-acid content and other nitrogen compounds in fruit juices and wines are expressed as total assimilable nitrogen and is determined by the formol method using an acid-base titration. The formol number (also known as formol index) is a parameter used for evaluation of the quality of fruit juices and wines.

The HI84533 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 endpoint. (Note: sample step prep required)

In wines, the concentration of alpha amino acid in grapes change as a function of maturity and crop load (yield to vine size ratio). The concentration increases with fruit maturation and decreases with crop load. In the fermentation of wine, there is a minimum amount of amino acid and other nitrogen compounds (eg: 150-200 mg/L of yeast assimilable nitrogen) that has to be present in the must/juice. Too low of an amount will result in a stuck fermentation in which there is not enough nitrogen for the yeast to thrive. Because of the importance of nitrogen in fermentation, it is desirable to determine the nitrogen concentration before fermentation.

In fruit juices, the formol nitrogen number is one of the basic parameters measured to determine quality. Depending on the type of fruit the number can increase or decrease with maturity. In orange and grapefruit juice, lower values are observed when the fruit is not suitably mature or there has been frost damage. In pineapple juice, a low number could be indicative of over-dilution with water or a disproportionate amount of the core was used. To determine the adulteration of fruit juices, the formol number along with the chromatography characterization of amino acids can be used.



- **GLP**
 - The GLP feature records electrode and pump calibration data to help keep measurements accurate and reliable.
- **Log and Recall Data**
 - The HI84533 can log up to 400 samples (200 for titration results; 200 for mV/pH) and recall or export data to a USB stick or PC.
- **Titration Curve Displayed On Screen**
 - The HI84533 offers real time graphing of the titration curve on the LCD.

Specifications

HI84533

Titrator	Range (as N)	Low range: 2.14 to 28.57 meq/L; 0.21 to 2.85 meq%; 30.0 to 400.0 mg/L High range: 21.7 to 71.4 meq/L; 2.14 to 7.14 meq%; 300 to 1000 mg/L
	Resolution	Low range: 0.01 meq/L; 0.01 meq%; 0.1 mg/L High range: 0.1 meq/L; 0.01 meq%; 1 mg/L
	Accuracy (@25°C/77°F)	3% of reading or ± 0.1 mg/L, which ever is greater
	Sample Volume	Low range: 10 mL High range: 5 mL
	Method	Acid-base titration
	Principle	Endpoint titration, adjustable (pH 8.1 - 8.3 in 0.1 increments)
	Pump speed	10 mL/min
	Stirring Speed	600 rpm
pH Meter	Range	-2.0 to 16.0 pH / -2.00 to 16.00 pH
	Resolution	0.1 pH / 0.01 pH
	Accuracy (@25°C/77°F)	±0.01 pH
	Calibration	1, 2, or 3 calibration points; 4 available buffers (4.01; 7.01; 8.20; 10.01)
	Temperature Compensation	Manual or automatic from -20 to 120°C (-4 to 248°F)
mV Meter	Range	-2000.0 to 2000.0 mV
	Resolution	0.1 mV
	Accuracy	±1.0 mV
	Logged Data	Up to 200 samples (pH or mV)
Temperature	Range	-20.0 to 120.0°C (-4.0 to 248.0°F)
	Resolution	0.1°C
	Accuracy	±0.4°C without probe error
Additional Specifications	Logging Data	Up to 400 samples (200 pH/mV, 200 titration)
	pH Electrode	HI1131B glass body, refillable, with BNC connector and 1 m (3.3') cable (included)
	Temperature Probe	HI7662-T stainless steel temperature probe with 1 m (3.3') cable (included)
	Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
	Power Supply	12 VDC adapter (included)
	Dimensions	235 x 200 x 150 mm (9.2 x 7.9 x 5.9")
	Weight	1.9 kg (67.0 oz.)
Ordering Information	HI84533-01 (115V) and HI84533-02 (230V) are supplied with HI84533-70 Reagent kit for formol number in wine and fruit juices, HI1131B pH electrode, HI7662-T temperature probe, HI7082 electrode fill solution (30 mL), two 100 mL beakers, HI70500 tube set (aspiration tube with titrant bottle cap and dispensing tube with tip), dosing pump valve, HI740236 syringe (5 mL), plastic pipette (1 mL), HI731319 stir bar, two sachets each of cleaning solution for wine deposits and wine stains, HI920013 power adapter, instruction manual and quality certificate.	

HI84500 Sulfur Dioxide Mini Titrator

for Wine Analysis

- **Piston Driven Pump with Dynamic Dosing**
 - For highly accurate, repeatable results.
- **Log-on-Demand**
 - Log data up to 400 samples (200 for titration; 200 for ORP).
- **Graphic Mode/Exportable Data**
 - Displays in-depth data on titration, which can then be stored and exported to either a USB drive or PC using the USB connection.
- **Automatic Stirrer Speed Control**
 - Maintains stirrer speed at approximately 700 rpm regardless of viscosity of solution.
- **GLP Features**
 - Meets Good Laboratory Practices
- **Easy to Use Interface**
 - User intuitive design with large keys and easy to navigate screens.
- **HELP Features**
 - Dedicated HELP key for content sensitive help
- **mV Meter**



Easy to Use, Fast and Affordable All-in-one Solution

The HI84500 is an easy to use, fast and affordable automatic mini titrator designed for testing free or total sulfur dioxide (SO₂) levels in wine. It includes a pre-programmed analysis method and uses a powerful algorithm in order to determine when the titration reaction has reached completion. The HI84500 incorporates a precision dosing pump which allows for a highly accurate determination of the amount of titrant used. Pump calibrations, performed with the provided Hanna standards, help assure the measurement accuracy. The HI84500 also features a new low range measurement and can also be used as a mV meter for direct ORP measurements.

This new generation of mini automatic titrator improves upon the titrant delivery system and measuring ranges for increased accuracy compared to previous models. This meter reflects Hanna's years of experience as a manufacturer of analytical instruments.

Why Free & Total Sulfur Dioxide is So Important

Wine makers add sulfur dioxide to wine in order to inhibit bacteria and wild yeast growth and to serve as an antioxidant to prevent browning. When SO₂ is added to wine, a portion of it becomes immediately bound while a remaining portion is unbound SO₂. The portion that is unbound is also called free; it is responsible for protecting the wine. The bound and unbound SO₂ together are referred to as total SO₂. The relationship between the amount of SO₂ added and the amount

of free SO₂ is complex. This relationship is governed by the total amount of SO₂ in the wine.

The exact relationship between free and bound will vary from wine to wine. The amount of free SO₂ depends on how much is added, how much was present before the addition and how much was immediately bound. Free SO₂ exists in two forms. Bisulfite (HSO₃⁻) is the predominant form but is relatively ineffective. Molecular SO₂ is the minor form and is responsible for protecting the wine. The amount of molecular SO₂ available in wine is depended on the amount of free SO₂ present and the pH. Typically 0.8 ppm of molecular SO₂ provides adequate protection against bacteria growth and oxidation. In order to obtain this value for a wine sample that has a pH of 3.2 you would need 22 ppm of free SO₂, if the pH was at 3.5 you would need double, 44 ppm.

Molecular SO₂ can be detected by human senses at about 2.0 ppm. This level is needed for maximum protection of wine. Higher levels are needed for sweet and most notable, botrytised wine. The HI84500 can be used to test for free and total SO₂ in all wines, including red, which are difficult to test using traditional methods associated with a distinctive color change to determine the end point.

Application Specific ORP Electrode

The HI84500 is supplied with the HI3148B ORP electrode featuring CPS™ technology to prevent the clogging of the reference junction.

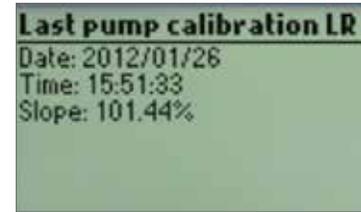
Conventional electrodes may clog quickly in biological samples such as wine. By design, the HI3148B ORP electrode utilizes a ground glass/PTFE sleeve junction which controls a steady, predictable flow of electrolyte solution, keeping the junction open. The hydrophobic properties of PTFE repels wetness and coatings.



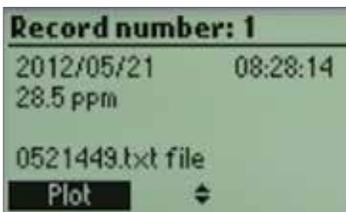
- **Titration Curve Displayed On Screen**
 - The HI84500 offers real time graphing of the titration curve on the LCD.



- **ORP**
 - During ORP measurements with stirrer on, the stirrer icon will be displayed.



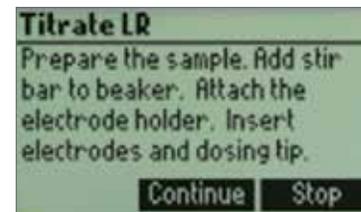
- **GLP**
 - Records pump calibration data to ensure measurements are accurate and reliable.



- **Log and Recall Data**
 - Log up to 400 samples (200 for titration results; 200 for ORP/mV) and recall or export data to a USB stick or PC.



- **Procedure Warnings**
 - Users are warned if there is an error in procedures such as the titration exceeded the maximum volume of titrant.



- **Tutorial and HELP Screens**
 - Accessing the tutorial menu provides helpful information during calibration and titration.

Specifications

HI84500

Titrator	Range	Low Range: 1.0 to 40.0 ppm of SO ₂ High Range: 30 to 400 ppm of SO ₂
	Resolution	Low Range: 0.1 ppm High Range: 1 ppm
	Accuracy (@25°C/77°F)	Low Range: 3% of reading or ±0.5 ppm, whichever is greater High Range: 3% of reading or ±1 ppm, whichever is greater
	Sample Volume	50 mL
	Method	Ripper Method
	Principle	Equivalence point redox titration
	Pump speed	10 mL/m in
	Stirring Speed	700 rpm
ORP Meter	Range	-2000.0 to 2000 mV
	Resolution	0.1 mV
	Accuracy (@25°C/77°F)	±1 mV
Additional Specifications	Logging Data	Up to 400 samples (200 ORP, 200 titration)
	Electrode	HI3148B glass body ORP electrode with BNC connector and 1 m (3.3') cable (included)
	Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
	Power Supply	12 VDC adapter (included)
	Dimensions	235 x 200 x 150 mm (9.2 x 7.9 x 5.9")
	Weight	1.9 kg (6.70 oz.)
Ordering Information	HI84500-01 (115V) and HI84500-02 (230V) are supplied with HI3148B ORP electrode, HI7082 Electrode Fill Solution (30 mL), HI84500-70 Reagent Kit for SO ₂ determination (consisting of: 1 bottle HI84500-50 (230 mL) low range titrant, 1 bottle HI84500-51 (230mL) high range titrant, 1 bottle HI84500-55 (120 mL) pump calibration standard, 1 bottle HI84500-60 acid reagent (230 mL), 1 bottle HI84500-61 alkaline reagent (120 mL), 50 packets HI84500-62 stabilizer packet), two 100 mL beakers, two 20 mL beakers, scissors, dosing pump valve, 5 mL syringe, 1 mL plastic pipette, tube set (aspiration tube with titrant bottle cap and dispensing tube with tip), stir bar, two sachets of cleaning solution for wine deposits, two sachets of cleaning solution for wine stains, 12 VDC adapter and instruction manual.	

See a list of reagents and accessories on page 39

HI84502

Total Acidity Mini Titrator and pH Meter

for Wine Analysis

- **Piston Driven Pump with Dynamic Dosing**
 - For highly accurate, repeatable results.
- **CAL-CHECK®**
 - Alerts users to potential problems during calibration such as contaminated buffers or dirty/broken pH electrode.
- **Log-on-Demand**
 - Log data up to 400 samples (200 for titration; 200 for pH/mV).
- **Graphic Mode/Exportable Data**
 - Displays in-depth data on titration, which can then be stored and exported to either a USB drive or PC using the USB connection.
- **Automatic Stirrer Speed Control**
 - Maintains stirrer speed at approximately 600 rpm regardless of viscosity of solution.
- **GLP Features**
 - Meets Good Laboratory Practices
- **Easy to Use Interface**
 - User intuitive design with large keys and easy to navigate screens.
- **HELP Features**
 - Dedicated HELP key for content sensitive help



Easy to Use, Fast and Affordable

The HI84502 is an easy to use, fast and affordable automatic mini titrator designed for testing total acidity levels in wine. It includes a pre-programmed analysis method and uses a powerful algorithm in order to determine when the titration reaction has reached completion. The results are displayed in g/L as tartaric acid. The HI84502 incorporates a precision piston driven dosing pump which allows for a highly accurate determination of the amount of titrant used. Pump calibrations performed with the provided Hanna standards, assure the accuracy of measurements.

This mini titrator is also designed to be used as a benchtop pH/mV meter. As a pH meter, it has many features of a professional grade benchtop including automatic calibration up to three points with four available buffers, a 0.01 pH resolution, accuracy of ± 0.01 pH, automatic temperature compensation and comprehensive GLP data.

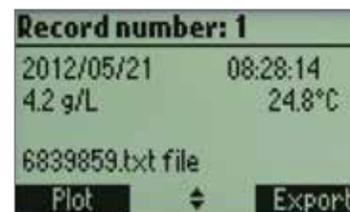
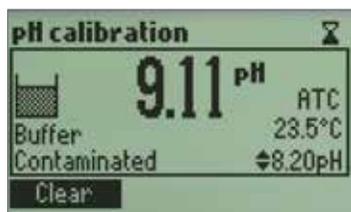
The GLP data includes date, time, offset, slope, and buffers used for calibration. Accuracy is always ensured with Hanna's unique CAL-CHECK feature, which analyzes the response of the electrode during the calibration process. Based on electrode response in the buffer, indicators are displayed on screen to alert the user of potential problems during calibration. These indicators include Buffer Contaminated, Electrode Dirty/Broken, and overall probe condition. The CAL-CHECK function not only ensures an accurate pH reading when the HI84502 is used as a pH meter but also an accurate titration since the end point is determined by a set pH value.

Why Titratable Total Acidity is So Important

Acids occur naturally during the growing of grapes and as part of the fermentation process. Wines show lower levels of acid when there is a hot growing season 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. Tartaric acid is the principal acid in grapes and is a component that promotes a crisp flavor and graceful aging in wine. A moderate amount of a wine's acid comes from malic acid, which contributes to fruitiness. 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, gives wine a sour or vinegary aspect.

Total acidity, also called titratable 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, with sweeter wines generally requiring somewhat higher levels to retain the proper balance.



- **CAL-CHECK®**
 - A Hanna exclusive process for checking the condition of electrodes which helps keep measurements accurate.
- **Titration Curve Displayed On Screen**
 - The HI84502 offers real time graphing of the titration curve on the LCD.
- **Log and Recall Data**
 - Log up to 400 samples (200 for titration results; 200 for mV/pH) and recall or export data to a USB stick or PC.

Specifications	HI84502	
Titrator	Range	Low Range: 0.1 to 5.0 g/L of tartaric acid High Range: 4.0 to 25.0 g/L of tartaric acid
	Resolution	0.1 g/L (ppt)
	Accuracy (@25°C/77°F)	3% of reading or ± 0.1 g/L, whichever is greater
	Sample Volume	10 mL LR / 2 mL HR
	Method	Acid Base Titration
	Principle	End point titration: 8.20 pH
	Pump speed	10 mL/min
	Stirring Speed	600 rpm
pH	Range	-2.00 to 16.00 pH
	Resolution	0.1 pH / 0.01 pH
	Accuracy (@25°C/77°F)	±0.01 pH
	Calibration	One, two or three calibration points, four available buffers (4.01, 7.01, 8.20, 10.01)
	Temperature Compensation	Manual or Automatic
ORP Meter	Range	-2000.0 to 2000.0 mV
	Resolution	0.1 mV
	Accuracy (@25°C/77°F)	±1 mV
	Logging Data	Up to 200 samples (combined samples for pH and mV)
Temperatre	Range	-20.0 to 120.0 °C (-4.0 to 248.0 °F)
	Resolution	0.1 °C
	Accuracy (@25°C/77°F)	±0.4 °C without probe error
Additional Specifications	Logging Data	up to 400 samples (200 pH/mV, 200 titration)
	pH Electrode	HI1048B glass body pH electrode with BNC connector and 1 m (3.3') cable (included)
	Temperature Probe	HI7662-T stainless steel temperature probe with 1 m (3.3') cable (included)
	Environment	0 to 50°C (32 to 122°F); RH max 95% non-condensing
	Power Supply	12 VDC adapter (included)
	Dimensions	235 x 200 x 150 mm (9.2 x 7.9 x 5.9")
	Weight	1.9 kg (67.0 oz.)
Ordering Information	HI84502-01 (115V) and HI84502-02 (230V) are supplied with HI1048B pH electrode, HI7082 Electrode Fill Solution (30 mL), HI84502-70 Reagent Kit (consisting of: 1 bottle HI84502-50 (230 mL) titration solution, 1 bottle HI84502-55 (120 mL) pump calibration standard,) two 100 mL beakers, two 20 mL beakers, dosing pump valve, 2000 µL, automatic pipette with two plastic tips, 5 mL syringe, 1 mL plastic pipette, tube set (aspiration tube with titrant bottle cap and dispensing tube with tip), stir bar, two sachets of cleaning solution for wine deposits, two sachets of cleaning solution for wine stains, 12 VDC adapter and instruction manual.	

See a list of reagents and accessories on page 39

Titration Solutions & Reagents

HI70401	Potassium hydrogen phthalate, 20 g
HI70402	Tartaric acid, 20 g
HI70403	Sodium thiosulfate penta hydrate, 20 g
HI70404	KI powder packets, 100 packets
HI70405	Glucose fructose standard, 20 g
HI70406	Sodium chloride, 20 g
HI70407	Potassium iodate, 20 g
HI70408	Oxalic acid, 20 g
HI70409	Potassium permanganate, 20 g
HI70423	NaOH solution, 0.11N (N/9), 1 L
HI70424	Amino-propanol buffer, 25 mL
HI70425	Sulfuric acid (16%), 500 mL
HI70426	Glyoxal, solution 40%, 1 L
HI70427	HNO ₃ solution (1.5 M), 500 mL
HI70428	NaOH solution (0.25 N), 1 L
HI70429	AgNO ₃ solution (0.05 M), 1L
HI70432	Hydrogen Peroxide solution 3%, 25 mL
HI70433	Stabilized iodine, 0.01N, 1L
HI70434	Phosphoric acid (85%), 500 mL
HI70435	NaOH solution (5 M), 500 mL
HI70436	Deionized water, 3.75 L
HI70437	Potassium iodide concentrated (30%) solution, 500 mL
HI70438	Tris buffer, 1L + 3.5g powder
HI70439	Sodium thiosulfate, 0.1 M, 1 L
HI70440	Iodine stabilized, 0.02 N, 1 L
HI70441	Iodine stabilized, 0.04 N, 1 L
HI70443	Sulfuric acid 10%, 500 mL
HI70444	Sulfuric acid 25%, 500 mL
HI70445	Nitric acid solution, 1 M, 500 mL
HI70446	Fehling solution A, 500 mL
HI70447	Fehling solution B, 500 mL
HI70448	AgNO ₃ solution, 0.02 M, 1 L
HI70449	EDTA solution, 0.02 M, 1 L
HI70453	HCl solution, 0.02 N, 1 L
HI70454	NaOH solution, 0.02 N, 1 L
HI70455	NaOH solution (0.01 N), 1 L
HI70456	NaOH solution (0.1 N), 1 L
HI70457	NaOH solution (1 N), 1 L
HI70458	H ₂ SO ₄ solution (0.01 M), 1 L
HI70459	H ₂ SO ₄ solution (0.05 M), 1 L
HI70462	HCl solution (0.01 N), 1 L
HI70463	HCl solution (0.1 N), 1 L
HI70464	HCl solution (1 N), 1 L
HI70465	Reagent for hydrogen peroxide titration, 25 mL
HI70466	Phenylarsine oxide standard solution, 500 mL
HI70467	Acetate buffer pH 4, 230 mL
HI70468	Potassium iodide powder for 100 tests
HI70469	0.00188N iodine standard solution, 250 mL (4)
HI70470	0.00564N phenylarsine oxide (PAO) standard solution, 500 mL
HI70471	Calibration solution 0,00564N PAO, 500 mL
HI70472	Phosphate buffer pH 7, 230 mL



HI902C Titrator Accessories

Accessory Code	Description
HI900100	Titration dosing pump
HI900125	25 mL burette assembly (syringe, aspiration, and dispensing tubes)
HI900110	10 mL burette assembly (syringe, aspiration, and dispensing tubes)
HI900105	5 mL burette assembly (syringe, aspiration, and dispensing tubes)
HI900225	25 mL burette syringe
HI900210	10 mL burette syringe
HI900205	5 mL burette syringe
HI900260	3-way valve (3 gaskets and 3 screws)
HI900270	Aspiration tube with fitting (blue protection tube, gasket, and tube lock)
HI900280	Dispensing tube with fitting (standard dispensing tip, blue protection tube, gasket, and tube lock)
HI900301	Overhead stirrer assembly (overhead stirrer and 3 propellers)
HI900302	Propeller (3)
HI900303	High chemical resistant propeller (3)
HI900310	Overhead electrode holder (without stirrer)
HI900320	Stirrer stand



HI921 Autosampler Accessories

Accessory Code	Description
HI920-11660	Single row with RFID, 16 beaker position, 60mm dia.
HI920-060	Plastic beakers that fit HI920-11660 (20)
HI920-11853	Single row with RFID, 18 beaker position, 53mm dia.
HI920-053	Plastic beakers that fit HI920-11853 (20)
HI920-301	Overhead stirrer
HI920-101	Peristaltic pump with dispensing tubing
HI920-102	Peristaltic pump with aspiration tubing
HI920-201	Peristaltic pump replacement cap and rotor
HI920-202	Peristaltic pump complete tubing set with plastic dispensing tube
HI920-203	Peristaltic pump complete tubing set with stainless-steel aspiration tube
HI920-204	Peristaltic pump roller tube (3)
HI920-111	Membrane pump with tubing
HI920-212	Membrane pump complete tubing set
HI920-290	5m TYGON tube
HI920-280	1.5m Burette/Autosampler titrant dispensing tube
HI920-302	Replacement propellers (3)
HI920-303	High chemical resistance replacement propellers (3)
HI920-310	Three electrode holder
HI920-900	USB Memory Stick,
HI920-921	Control Panel for HI921
HI920-930	Titration/Autosampler communication cable
HI920-931	BNC Extension cable (1m)
HI920-932	Reference Extension cable (1m)
HI920-960	Tray Locking Screw
HI7662-A	Autosampler temperature sensor w/1.5m cable
HI731319	10x 25mmx7mm Stir bars



HI903 KF Volumetric Titrator Accessories

Electrode Code	Description
HI76320	Dual platinum pin KF electrode with DIN connector

Accessory Code	Description
HI900100	Titration dosing Pump
HI900520	Beaker Assembly (beaker, dispensing tip, septum, solvent port plug)
HI900505	5 mL burette assembly (syringe, aspiration, and dispensing tubes)
HI900205	5 mL burette syringe
HI900260	3-way valve (3 gaskets and 3 screws)
HI900522	KF beaker (glass only)
HI900523	Dispensing tip (2)
HI900527	Septum (5)
HI900528	Solvent port plugs (2)
HI900530	Titration bottle top assembly
HI900531	Solvent/Waste bottle top assembly
HI900532	Desiccant cartridge for KF beaker or titration bottle top
HI900533	Desiccant cartridge for solvent or waste bottle top
HI900534	Waste bottle
HI900180	Solvent-handling pump
HI900535	Tubing for solvent/waste handling
HI900536	Tubing for solvent-handling pump
HI900540	O-ring set
HI900570	Aspiration tubing and fitting (PTFE titration tubing, blue protection and tube lock)
HI900580	Dispensing tubing and fitting (PTFE titration tubing)
HI900942	Tool for burette cap removal
HI920013	USB cable for pc connection



HI904 KF Coulometric Titrator Accessories

Accessory Code	Description
HI900561	Titration vessel (glass only)
HI76330	Detector electrode
HI900511	Generator electrode with diaphragm
HI900512	Generator electrode without diaphragm
HI900180	Solvent handling pump
HI900181	Reagent adapter holder assembly
HI900182	Reagent adapter holder (glass only)
HI900560	Titration vessel assembly
HI900569	Reagent exchange adapter
HI900537	Bottle top assembly (with molecular sieves)
HI900538	Desiccant cartridge for reagent/waste bottles (with molecular sieve)
HI900535	Tubing set for reagent/waste handling (2)
HI900536	Tubing for solvent handling pump (2)
HI900566	Open-top GL18 cap
HI900563	Glass stopper, standard taper 19
HI900564	Desiccant cartridge for generator electrode
HI900542	O-ring set
HI900534	Waste bottle
HI900551	Molecular sieves, 200g
HI900940	Calibration key
HI900946	24V power supply
HI900567	Septum kit (5)
HI900543	Glass joint grease
HI900931	Generator cable
HI920013	USB Cable for PC Connection

HI84530 Reagents and Accessories

Reagent Code	Description
HI84530-50	Titrant solution for low range, 100 mL
HI84530-51	Titrant solution for high range, 100 mL
HI84530-55	Pump calibration standard, 100 mL
HI84530-60	Hydrogen peroxide, 30 mL
HI7004M	pH 4.01 buffer, 230 mL
HI7007M	pH 7.01 buffer, 230 mL
HI70083M	pH 8.30 buffer, 230 mL
HI7010M	pH 10.01 buffer, 230 mL
HI70300M	Storage solution, 230 mL
HI7082	pH electrode filling solution, 3.5M KCl, 30 mL (4)

Accessory Code	Description
HI70500	Tube set with cap for titrant bottle, tip and valve
HI731319	Stir bar, 25 x 7 mm (10)
HI740036P	100 mL beaker (10)
HI740236	5 mL syringe for mini titrator
HI920013	PC connection cable
HI1131B	Replacement pH electrode
HI7622T	Replacement temperature probe



HI84531 Reagents and Accessories

Reagent Code	Description
HI84531-50	Titration solution for low range, 120 mL
HI84531-51	Titration solution for high range, 120 mL
HI84531-55	Pump calibration standard for low and high range, 230 mL
HI7004M	pH 4.01 buffer, 230 mL
HI7007M	pH 7.01 buffer, 230 mL
HI70083M	pH 8.30 buffer, 230 mL
HI7010M	pH 10.01 buffer, 230 mL
HI70300M	Storage solution, 230 mL
HI7082	pH electrode filling solution, 3.5M KCl, 30 mL (4)

Accessory Code	Description
HI70500	Tube set with cap for titrant bottle, tip and valve
HI731319	Stir bar, 25 x 7 mm (10)
HI740036P	100 mL beaker (10)
HI920013	PC connection cable
HI1131B	Replacement pH electrode
HI7622T	Replacement temperature probe

HI84529 Reagents and Accessories

Reagent Code	Description
HI84529-50	Titration solution for low range 20, 120 mL
HI84529-51	Titration solution for high range 20, 120 mL
HI84529-52	Titration solution for low range 50, 120 mL
HI84529-55	Calibration standard solution, 230 mL
HI7004M	pH 4.01 buffer, 230 mL
HI7007M	pH 7.01 buffer, 230 mL
HI70083M	pH 8.30 buffer, 230 mL
HI7010M	pH 10.01 buffer, 230 mL
HI70300M	Storage solution, 230 mL
HI70640M	Cleaning solution for milk deposits, 230 mL
HI70641M	Cleaning and disinfection solution for dairy products, 230 mL
HI7072	Reference half-cell filling solution, 1M KNO ₃ , 30 mL (4)

Accessory Code	Description
HI70500	Tube set with cap for titrant bottle, tip and valve
HI731319	Stir bar, 25 x 7 mm (10)
HI740036P	100 mL beaker (10)
HI740037P	20 mL beaker (10)
HI740236	5 mL syringe for mini titrator
HI920013	PC connection cable
FC260B	Replacement pH half-cell electrode for dairy
HI5315	Replacement reference half-cell electrode
HI7622M	Replacement temperature probe



HI84532 Reagents and Accessories

Reagent Code	Description
HI84532-50	Titrant solution for low range, 100 mL
HI84532-51	Titrant solution for high range, 100 mL
HI84532-55	Calibration standard solution, 100 mL
HI7004M	pH 4.01 buffer, 230 mL
HI7007M	pH 7.01 buffer, 230 mL
HI70082M	pH 8.20 buffer, 230 mL
HI7010M	pH 10.01 buffer, 230 mL
HI70300M	Storage solution, 230 mL
HI7061M	General purpose cleaning solution, 230 mL
HI7082	pH electrode filling solution, 3.5M KCl, 30 mL (4)

Accessory Code	Description
HI70500	Tube set with cap for titrant bottle, tip and valve
HI731319	Stir bar, 25 x 7 mm (10)
HI740036P	100 mL beaker (10)
HI740037P	20 mL beaker (10)
HI740236	5 mL syringe for mini titrator
HI920013	PC connection cable
HI1131B	Replacement pH electrode
HI7622T	Replacement temperature probe

HI84533 Reagents and Accessories

Reagent Code	Description
HI84533-50	Titrant solution, 230 mL
HI84533-55	Pump calibration standard, 230 mL
HI84533-61	Formol base reagent, 230 mL
HI84533-62	pH adjustment reagent, 30 mL
HI84533-60	Additional reagent, 30 mL
HI7004M	pH 4.01 buffer, 230 mL
HI7007M	pH 7.01 buffer, 230 mL
HI70082M	pH 8.20 buffer, 230 mL
HI7010M	pH 10.01 buffer, 230 mL
HI70300M	Storage solution, 230 mL
HI70635L	Cleaning solution for wine deposits
HI70636L	Cleaning solution for wine stains
HI7082	pH electrode filling solution, 3.5M KCl, 30 mL (4)

Accessory Code	Description
HI70500	Tube set with cap for titrant bottle, tip and valve
HI731319	Stir bar, 25 x 7 mm (10)
HI740036P	100 mL beaker (10)
HI740236	5 mL syringe for mini titrator
HI920013	PC connection cable
HI1131B	Replacement pH electrode
HI7622T	Replacement temperature probe



HI84500 Reagents and Accessories

Reagent Code	Description
HI84500-50	Titrant solution for low range, 230 mL
HI84500-51	Titrant solution for high range, 230 mL
HI84500-55	Pump calibration standard, 120 mL
HI84500-60	Acid reagent, 230 mL
HI84500-61	Alkaline reagent (Total SO ₂), 120 mL
HI84500-62	Stabilizer packet (100)
HI7082	pH electrode filling solution, 3.5M KCl, 30 mL (4)
HI7020M	ORP test solution @ 240 mV (@25 °C), 230 mL
HI7092M	Oxidizing pretreatment solution, 230 mL
HI70635L	Cleaning solution for wine deposits
HI70636L	Cleaning solution for wine stains
HI70300M	Storage solution, 230 mL

Accessory Code	Description
HI70500	Tube set with cap for titrant bottle, tip and valve
HI731319	Stir bar, 25 x 7 mm (10)
HI740036P	100 mL beaker (10)
HI740037P	20 mL beaker (10)
HI740236	5 mL syringe for mini titrator
HI920013	PC connection cable
HI3148B	ORP electrode for wine

HI84502 Reagents and Accessories

Reagent Code	Description
HI84502-50	Titrant solution, 230 mL
HI84502-55	Pump calibration standard, 120 mL
HI7004M	pH 4.01 buffer, 230 mL
HI7007M	pH 7.01 buffer, 230 mL
HI70082M	pH 8.20 buffer, 230 mL
HI7010M	pH 10.01 buffer, 230 mL
HI70300M	Storage solution, 230 mL
HI70635L	Cleaning solution for wine deposits
HI70636L	Cleaning solution for wine stains
HI7082	pH electrode filling solution, 3.5M KCl, 30 mL (4)

Accessory Code	Description
HI70500	Tube set with cap for titrant bottle, tip and valve
HI731352	Tips for 2000 µL automatic pipette (4)
HI731342	Automatic pipette 2000 µL
HI731319	Stir bar, 25 x 7 mm (10)
HI740036P	100 mL beaker (10)
HI740236	5 mL syringe for mini titrator
HI920013	PC connection cable
HI1048B	Replacement pH electrode for wine
HI7622T	Replacement temperature probe



Hanna Instruments Inc.
584 Park East Drive,
Woonsocket, RI 02895
401-765-0045
www.hannainst.com

