



Karl Fischer Titration





## HI933 Karl Fischer Volumetric Titrator

for Moisture Determination

The HI933 is an automatic volumetric Karl Fischer titrator with high accuracy, great flexibility and repeatability.

The titrator is designed to perform titrations for a variety of sample types/matrices, allowing the user to obtain both good results and high-speed analysis. The HI933 analyzes for water content ranging from 100 ppm to 100%. This powerful titrator automatically dispenses the titrant, detects the endpoint, and performs all necessary calculations and graphing.

- Small footprint, requires minimal bench space
- Casing made with strong, chemically resistant plastic
- Powerful built-in algorithms for termination criteria based on fixed mV endpoint or absolute/relative drift
- Titrant standardization and sample analysis averaging
- Minimized water vapor entry with the Sealed Solvent System
- Balance interface for automatic weighing
- Support for 100 titration methods
- User-customizable reports
- Clearly displayed warning and error messages



## Burette and Dosing System

### Precision Dosing Pump

Our unmatched 40,000 step piston driven pump is capable of delivering as little as 0.125  $\mu\text{L}$  of titrant accurately and precisely.



### Anti-Diffusion Dispensing Tip

A specially designed glass dispensing tip delivers titrant precisely into high turbulence mixing zones, ensuring a rapid reaction. Its angular construction helps prevent titrant from diffusing into the sample solvent.

### Chemically Resistant Tubing and Syringe

Aspiration and dispensing tubes are constructed of durable, chemically resistant PTFE and feature a light-blocking polyurethane outer sleeve to protect light sensitive reagents.

## Titration and Solvent System

### Efficient Sample Handling

The HI933 features a quick-remove sample port with a replaceable rubber septum allowing for fast and easy sample introduction to the titration vessel. An integrated magnetic stirrer ensures homogeneity for an accurate and speedy reaction.

## Chemically Resistant Titration Vessel

The glass and PTFE titration cell and fittings are designed to withstand the harsh solvents and reagents involved in Karl Fischer reactions.

## Sealed Solvent System

The titration vessel is completely sealed to minimize exposure to ambient humidity, keep the system dry, and reduce titrant consumption while saving time between titrations. Solvent may be exchanged in a matter of seconds without opening the titration vessel.

## Visually Recognizable Desiccant

A rechargeable, color-indicating, silica gel desiccant prevents the ingress of ambient humidity into the sealed system while maintaining full titrator functionality. The desiccant color change allows a user to recognize when its adsorption capacity has depleted and is ready for replacement or recharging.

## Titration Capabilities

### Dynamic Titrant Dosing

The dynamic dosing feature allows for timely and accurate titration results by relating the titrant volume dosed to the mV response from the titration reaction. This provides for larger doses near the beginning of a titration and smaller, more precise doses near the titration endpoint.

### Drift Rate Compensation

HI933 automatically adjusts the titration calculation to account for the effects of any ambient humidity entering the titration cell. This provides a more accurate result by correcting for water not present in the actual sample.

## Titration Results Averaging

Successive results from a titration method may be averaged with recording of the standard deviation.

## Titrant Recordkeeping

The HI933's titrant database can store information for up to 20 titrants. The database may be programmed to remind a user when to standardize their titrant, reducing error in analysis.

## Selectable Endpoint Criteria

HI933 employs a dual platinum pin electrode for bivalent endpoint determination. Users may choose termination criteria based on mV stability times or drift rates.

## Multistage Cell Preparation

A pre-titration stage eliminates residual water present in the solvent and the cell, providing a reliable baseline start to analysis. Standby mode then keeps the solvent dry between titrations and when the titrator is not in use.

## Interface and Display

### Detailed Titration Graphs

A real-time titration curve can be displayed during each titration; this feature is useful when new methods are tested or when a procedure requires optimization.

### Interactive Color Display

A large, color LCD screen clearly shows the chosen titration method along with results, units, dosing size, titration volume, drift rate, and mV value.

### Simple & Quick Navigation

Virtual key selections present on the display allow for simple and quick navigation between screens and menus without getting lost in a nest of information.

## Data and Storage

### Customizable Titration Reports

Each titration report is fully customizable so users can ensure they are storing and filing the appropriate data required for their application and procedures.

### Flexible GLP Management

All necessary GLP (Good Laboratory Practice) information can be recorded with each sample including: sample identification, company and operator name, date, time, electrode ID codes, and calibration information.

### Effortless Data Transfer

Data can easily be transferred to a USB flash drive or PC with the Hanna HI900PC application software. The USB port allows for the transfer of titration methods, titration reports, and software upgrades via USB flash drive.

## Methods of Analysis

### Customizable Methods

HI933 can store up to 100 user-defined or standard titration methods. Each method may be customized and optimized for performance based on application and user requirements.

### Titration Method Support

Onsite installation, training, and customization is available from one of our Applications or Service experts. Hanna offers continued support via phone or webinar for any questions you might have along the way.

### Adaptable Standard Methods

Our technical experts can program and customize standard methods developed by such affiliations as ISO, ASTM, AOAC, AOCS, EPA, and more directly onto your titrator. Ask our Sales Consultants which standard methods are possible with our HI933 Karl Fischer system.



## Connectivity and Functionality

### Configurable Balance Interface

Sample size may be automatically entered from any laboratory analytical balance with a RS232 serial output saving time and labor.

### Multiple Peripherals

Users can print reports directly from the titrator using a standard parallel printer. An external monitor and keyboard may be attached for added versatility, as well as an analytical balance for automatic sample mass entry for titrations.

## Versatile Data Management

Incorporate 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 Hanna HI900PC software
- 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
- A keyboard can be attached for added versatility

Specifications	HI933	
Measurement	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
	Result Statistic	mean, standard deviation
Titration 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
	Solvent Handling System	sealed system, integrated diaphragm air pump
Electrode	Type	HI76320 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
	Accuracy (@25°C/77°F)	±0.1 %
Stirrer	Type	magnetic, optically regulated, digital stirrer
	Speed	200-2000 rpm
	Resolution	100 rpm
Storage	Methods	Up to 100 (standard and user) methods
	Reports	Up to 100 complete titration reports and drift rate reports
Additional Specifications	Display	5.7" graphical color display with backlight
	Peripheral Devices	PC (USB standard B); flash drive (USB standard A); analytical balance (DB-9 Socket); printer (DB-25 Socket); keyboard (6-pin Mini DIN)
	Languages	English, Portuguese, Spanish, and French
	Power Supply / Power Draw	100-240 Vac, 50/60 Hz / 0.5 Amps
	Enclosure Material	ABS/PC and Steel
	Keypad	polyester
	Operating Environment	10 to 40°C (50 to 104°F); up to 80% RH
	Storage Environment	-20 to 70°C (-4 to 158°F); up to 95% RH
	Dimensions	315 x 205 x 375 mm (12.4 x 8.1 x 14.8")
	Weight	approx. 4.3 kg (9.5 lbs.) with 1 pump, stirrer and sensors
Ordering Information	<b>HI933-01</b> and <b>HI933-02</b> are supplied with HI76320 dual platinum pin electrode, dosing pump, 5 mL burette assembly with tubing, air pump/stirrer 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, USB flash drive, quality certificate, ISO 8655 burette compliance report and instruction manual binder.	



Specifications	HI76320
Sensor Type	dual platinum pin polarization electrode
Voltage Range	2 mV to 1000 mV
Voltage Resolution	0.1 mV
Accuracy (@25°C/77°F)	±0.1%
Polarization Current	1, 2, 5, 10, 15, 20, 30 or 40 µA
Sensor Connection	BNC

\*100-240 VAC  
 \*-01\* models, US plug (type A)  
 \*-02\* models, European plug (type C)



## HI934 Karl Fischer Coulometric Titrator

The HI934 is a Karl Fischer coulometric titrator with high accuracy, great flexibility and repeatability.

The titrator is designed to perform titrations for a variety of applications, allowing the user to obtain both good results and high-speed analysis. The HI934 analyzes for water content ranging from 1 ppm to 5%. This powerful titrator effectively monitors the KF reaction, detects the endpoint, and performs all necessary calculations and graphing.

- Small footprint, requires minimal bench space
- Casing made with strong, chemically resistant plastic
- Powerful built-in algorithms for termination criteria based on fixed mV endpoint or absolute/relative drift
- Sample analysis averaging and statistical data
- Minimized water vapor entry with the sealed solvent system
- Balance interface for automatic weighing
- Support for 100 titration methods
- User-customizable reports
- Clearly displayed warning and error messages

## Coulometric Reagent System

### Precision Iodine Generation

Hanna's dosing algorithm allows for an extremely small amount of iodine necessary for the Karl Fischer reaction to be generated electrolytically using a pulsed current up to 400 mA delivering titrant accurately and precisely.

## Titration and Solvent System

### Chemically Resistant Titration Vessel and Tubing

The glass titration cell and PTFE tubing is designed to withstand the harsh solvents and reagents involved in Karl Fischer reactions.

### Sealed Solvent System

Ground glass joints completely seal the glass titration cell minimizing exposure to ambient humidity, keeping the system dry, and reducing reagent consumption while saving time between titrations. Solvent may be exchanged in a matter of seconds with a quick fitting adjustment.

### Molecular Sieve Desiccant

High efficiency molecular sieve desiccant helps maintain low and stable drift rates within the titration cell while preventing the ingress of ambient humidity into the sealed solvent system.

### Digital built-in stirrer

Automatic, integrated magnetic stirrer adjustable from 200-2000 RPM with optical feedback for automatic speed control.

## Titration Capabilities

### Dynamic Titrant Dosing

The titration speed feature allows for timely and accurate titration results by relating the amount of iodine generated to the mV response from the Karl Fischer reaction.

### Drift Rate Compensation

The HI934 automatically adjusts the titration calculation to account for the effects of any ambient humidity entering the titration cell. This provides a more accurate result by correcting for water not present in the actual sample.

### Titration Results Averaging

Successive results from a titration method may be averaged with recording of the standard deviation.

### Selectable Endpoint Criteria

The HI934 employs a dual platinum pin electrode for bivoltammetric endpoint determination. Users may choose termination criteria based on mV stability times or drift rates.

### Multistage Cell Preparation

A pre-titration stage eliminates residual water present in the solvent and the cell, providing a reliable baseline start to analysis. Standby mode then keeps the solvent dry between titrations and when the titrator is not in use.

## Interface & Display

### Detailed Titration Graphs

A real-time titration curve can be displayed during each titration; this feature is useful when new methods are tested or when a procedure requires optimization.

### Interactive Color Display

A large, color LCD screen clearly shows the chosen titration method along with results, units, drift rate, and mV value.

### Simple and Quick Navigation

Virtual key selections present on the display allow for simple and quick navigation between screens and menus without getting lost in a nest of information.



## Data & Storage

### Customizable Titration Reports

Each titration report is fully customizable so users can ensure they are storing and filing the appropriate data required for their application and procedures.

### Flexible GLP Management

All necessary GLP (Good Laboratory Practice) information can be recorded with each sample including: sample identification, company and operator name, date, time, electrode ID codes, and calibration information.

### Effortless Data Transfer

Data can easily be transferred to a USB flash drive or PC with the Hanna HI900PC application software. The USB port allows for the transfer of titration methods, titration reports, and software upgrades via USB flash drive.

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The HI934 can store up to 100 user-defined or standard titration methods. Each method may be customized and optimized for performance based on application and user requirements.

### Titration Method Support

Onsite installation, training, and customization is available from one of our Applications or Service experts. Hanna offers continued support via phone or webinar for any questions you might have along the way.

### Adaptable Standard Methods

Our technical experts can program and customize standard methods developed by such affiliations as ISO, ASTM, AOAC, AOCS, EPA, and more directly onto your titrator. Ask our Sales Consultants which standard methods are possible with our HI934 Karl Fischer system.

## Connectivity and Functionality

### Configurable Balance Interface

Sample size may be automatically entered from any laboratory analytical balance with an RS232 serial output saving time and labor.

### Multiple Peripherals

Users can print reports directly from the titrator using a standard parallel printer. An external monitor and keyboard may be attached for added versatility, as well as an analytical balance for automatic sample mass entry for titrations.

### Versatile Data Management

- Easily incorporate 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 Hanna HI900PC software
- 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
- A keyboard can be attached for added versatility



- 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 water content, high accuracy demand, nitrogenous compounds and easily reduced samples



- Fritless (No Diaphragm) Generator
  - Uses one easy-to-replace Karl Fischer reagent
  - Lower and more stable drift rates
  - Easier cleaning of generator cell



Specifications		HI934
Measurement	Range	1 ppm to 5%
	Resolution	0.1ppm
	Result Units	%, ppm, mg/g, µg/g, mg, µg, mg/mL, µg/mL, ppt, mgBr/100g, gBr/100g, mgBr, gBr
	Sample Type	liquid or solid (external dissolution or extraction)
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 3 speed settings
	Result Statistic	mean, standard deviation
Titration Vessel	Type	borosilicate glass with standard taper glass joint connections
	Operating Volume	100 to 200 mL
	Septum	silicone rubber
	Septum Cap Thread	GL-18
	Reagent Port	standard Taper 19
Detector Electrode	Type / Connection	dual platinum pin, polarization electrode / BNC connector
	Glass Connection	standard Taper 14/20
	Polarization Current	1, 2, 5, or 10 µA
	Voltage Range	2 to 1100 mV
	Voltage Resolution	0.1 mV
	Accuracy (@25°C/77°F)	±0.1%
Generator Electrode	Type	diaphragm or diaphragm-less
	Electrode Type Detection	automatic
	Electrical Connection	5-pin connector with detachable cable
	Glass Connection	standard Taper 29/12
	Maximum Current	400 mA
	Current Control	automatic or Fixed (400 mA)
Stirrer	Type	magnetic, electronic regulated, digital stirrer
	Speed	200 to 2000 RPM
	Resolution	100 RPM
	External Stirrer	4-pin mini DIN connection allows for the control of an external stirring apparatus
Reagent Handling System	Type	sealed system with integrated diaphragm air pump
	Desiccant Type	molecular Sieves
	Bottle Thread Type	GL-45
	Glass Connection	standard Taper 19 (using supplied adapter)
	Reagent/Waste Tubing	PTFE
Additional Specifications	Display	5.7" graphical color display with backlight
	Peripheral Devices	PC (USB standard B); flash drive (USB standard A); analytical balance (DB-9 Socket); printer (DB-25 Socket); keyboard (6-pin Mini DIN)
	Languages	English, Portuguese, Spanish, and French
	Power Supply / Power Draw	100-240 Vac, 50/60 Hz / 0.5 Amps
	Enclosure Material	ABS/PC and stainless Steel
	Keypad	polyester
	Operating Environment	10 to 40°C (50 to 104°F); up to 80% RH
	Storage Environment	-20 to 70°C (-4 to 158°F); up to 95% RH
	Dimensions	315 x 205 x 375 mm (12.4 x 8.1 x 14.8")
	Weight	approx. 4.3 kg (9.5 lbs.) with 1 pump, stirrer and sensors

Ordering Information **HI934D-01** and **HI934D-02** are supplied with diaphragm, **HI934-01** and **HI934-02** are supplied without diaphragm

**All Models Include:** dual platinum pin electrode, air pump/stirrer 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.

\*100-240 VAC

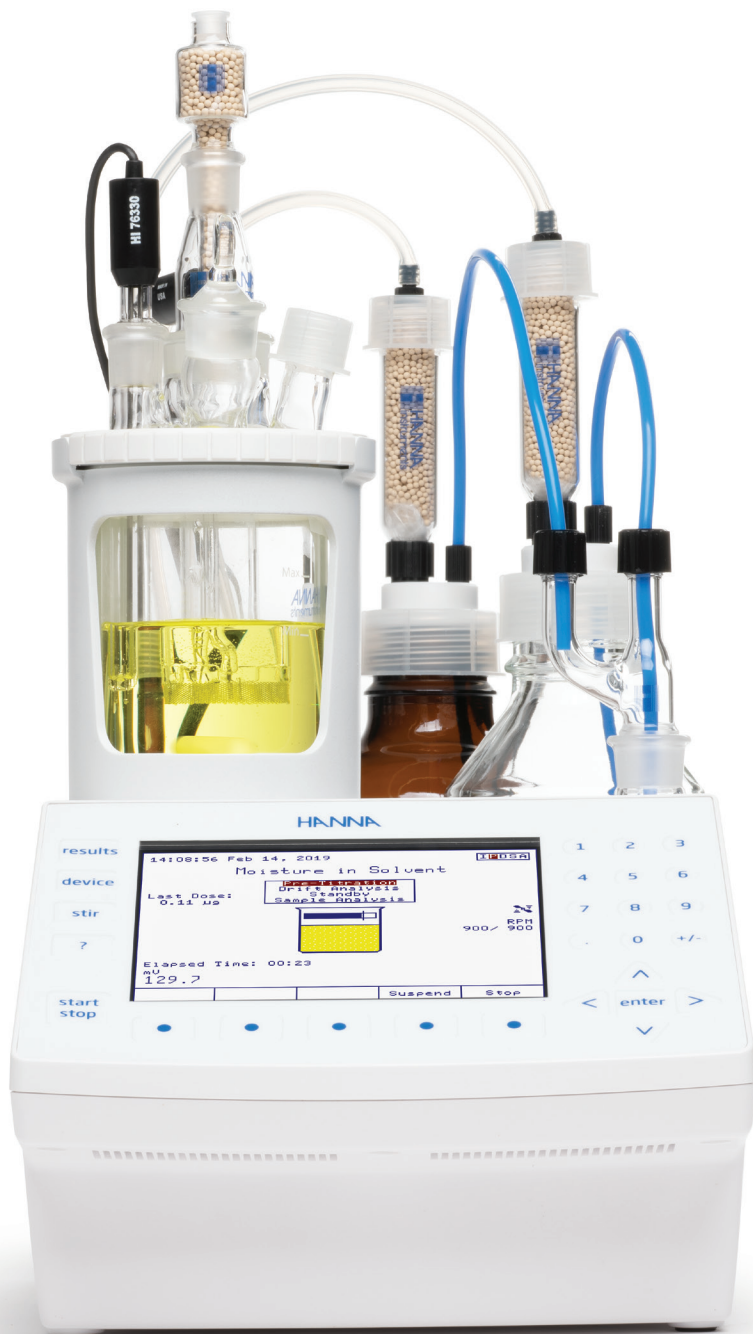
~01" models, US plug (type A)

~02" models, European plug (type C)



## HI933 KF Volumetric Titrator Accessories

Code	Description
HI76320	dual platinum pin KF electrode with BNC connector
HI900205	5 mL syringe
HI900522	beaker for HI903/HI933
HI900523	dispensing tip (2)
HI900527	septum (5)
HI900528	solvent port plugs (2)
HI900530	titrant bottle top assembly
HI900531	solvent/waste bottle top assembly
HI900532	desiccant cartridge for titration beaker or titrant bottle
HI900533	desiccant cartridge for solvent or waste bottle
HI900534	waste bottle
HI900535	tubing for solvent/waste handling (2)
HI900536	tubing for air pump (2)
HI900540	O-ring set
HI900550	desiccant, 250 g
HI900570S	aspiration tubing
HI900580S	dispensing tubing and fitting
HI900941	calibration key
HI900942	tool for burette cap removal
HI920013	USB cable
HI930100	pump assembly
HI930180	air pump and magnetic stirrer for HI933/HI934
HI930505	5 mL burette assembly
HI930520	beaker assembly
HI930900U	USB flash drive



## HI934 KF Coulometric Titrator Accessories

Code	Description
HI76330	detector electrode
HI900511	generator electrode with diaphragm
HI900512	generator electrode without diaphragm
HI900534	waste bottle
HI900535	tubing for solvent/waste handling (2)
HI900536	tubing for air pump (2)
HI900537	bottle top assembly (with molecular sieves)
HI900538	desiccant cartridge for reagent/waste bottles
HI900542	o-ring set
HI900543	glass joint grease
HI900551	molecular sieves, 150 g
HI900561	titration vessel (glass only)
HI900563	glass stopper, standard taper 19
HI900564	desiccant cartridge for generator electrodes
HI900566	open-top GL18 cap
HI900567	septum (5)
HI900568	reagent exchange adapter
HI900931	generator cable
HI900940	calibration key
HI920013	USB cable
HI930180	air pump and magnetic stirrer for HI933/HI934
HI930182	reagent adapter holder
HI930560	titrator vessel assembly
HI930900U	USB flash drive

