

Laboratory & Field Instruments: Titration Products

Titration Products

See Inside!

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- **NEW!** Sample Changers: effortless sample handling through total automation
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- **AutoCAT™** 9000 for automatic amperometric titrations
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- **Hach Digital Titrator:** an accurate alternative to buret titration
See pages 98-100.



Be Right™

Choosing Your TitraLab™ Titration Workstation

THE automated alternative to manual digital titration.

- Get ready for immediate analysis by combining a TitraLab workstation and application package of your choice
- Workstation comes complete with pre-programmed applications and all required accessories
- Application package includes documentation, electrodes, buffer and maintenance solutions; all you need to supply are the samples and titrant reagents



Basic Titrator—perfect for QC labs that always run the same samples



Volumetric Karl Fischer for quick moisture content determination between 0.1% & 100%

Features and Specifications

End point titration	1 to 2 EP		1 EP - Karl Fischer End Point	
Inflection point titration (Continuous & Incremental addition modes)	1 to 4 IP		—	
Direct pH/mV measurement	Yes		—	
pH/mV/°C Stat titration	—		—	
Conductivity measurement	—		—	
ISE measurement (Direct/Standard Additions)	—		—	
Volumetric Karl Fischer titration	—		Yes	
Number of titrating burettes	1	2	1	2
Burette stands	1, 5, 10, 25 & 50 mL (Meets ISO8655-3 Specifications)			
Electrode inputs	1 pH/mV + 1 Pt-Pt		1 Pt-Pt	
Result archiving	1 to 60 sample results		1 to 200 sample results	
Calibration archiving (electrode/reagent)	Last calibration		Last 100 electrode & last 100 reagent calibrations	
User programmable	10 methods + pre-programmed		50 methods + pre-programmed	
Method sequencing (in different beakers)	1 to 3 in series		—	
Method coupling (in the same beaker)	2		—	
Sample stack capacity	1 to 23 sample IDs per batch		1 to 126 sample IDs per batch	
Methods in library	1 to 10		1 to 50	
QC features	—		Yes	
Method/curve reprocessing	—		—	
Burette/electrode extension ABU52	—		—	
Peripherals - Extensions	Sample Changer (SAC850)/Printer/Balance/Peristaltic pump PC keyboard/Bar code reader/PC software (TitraMaster 85)		Sample Changer (SAC850/950)/Printer/Balance/Peristaltic pump PC keyboard/Bar code reader/PC software (TitraMaster 85)	
Dimensions (HxWxD) - Net weight	381 x 230 x 450 mm - 5 Kg			
USEPA (approved methods)				
pH	Yes			
Conductivity				
Alkalinity	Yes			
Acidity	Yes			
Hardness	Yes			
Chloride	Yes			
Ammonia (ISE)				
Fluoride (ISE)				
Nitrate (ISE)				

To configure your system please contact Hach at: 1-800-227-4224

Choosing Your TitraLab™ Titration Workstation

Titration Products



**Extended Titrator—
for more demanding
applications in QC lab**

TitraLab 865



**High performance
pH/mV Stat**

TitraLab 854

TitraLab 856



**Versatile QC/Research Titrator—
multi-parameter features, enhanced
for environmental water analysis**

TitraLab 870

1 to 4 EP		
1 to 8 IP	—	1 to 8 IP
Yes		
—	Yes	—
—	—	Yes
—	—	Yes
—	—	—
2	1	2
1, 5, 10, 25 & 50 mL (Meets ISO8655-3 Specifications)		
2 pH/mV + 1 Pt-Pt		
1 to 200 sample results		
Last 100 electrode & last 100 reagent calibrations		
50 methods + pre-programmed		
1 to 10 in series		
6	8	6
1 to 126 sample IDs per batch		
1 to 50		
Yes		
Yes		
Yes - Add up to 4 burettes & 4 Electrodes with 2x ABU52		
Sample Changer (SAC850/950)/Printer/Balance/Peristaltic pump		
PC keyboard/Bar code reader/PC software (TitraMaster 85)		
381 x 230 x 450 mm - 5 Kg		
Yes	Yes	Yes
Yes	Yes	Yes
Yes	Yes	Yes
Yes	Yes	Yes
Yes	Yes	Yes
		Yes
		Yes
		Yes

To configure your system please contact Hach at: 1-800-227-4224

Find it here... Buy it today on www.hach.com

U.S. customers only.



SAC850 and SAC950 Sample Changers

Effortless sample handling through total automation.



SAC950 Sample Changer

- **Compact and Adaptable**—the SAC850 and SAC950 are compatible with a wide selection of removable sample trays, making them remarkably space-efficient
- **Flexible and Programmable**—sample preparation sequences can be programmed from TitraMaster 85 Titration PC Software with specific macro commands to fit your requirements
- **Quick and Efficient**—simultaneous movements of the turntable and electrode arm for efficient operation. Dynamic Spray and/or immersion rinse for thorough rinsing using a high flow rate pumps ensure thorough and efficient cleaning with no risk of cross contamination (between samples) helping you achieve greater accuracy and reproducibility, irrespective of the number of samples per cycle
- **Safe and Clean**—our unique bayonet concept keeps electrodes and delivery tips securely in place
- **Reliable High Torque Stirrer**—for even the most viscous samples

The Obvious Choice for Your Laboratory

Radiometer Analytical sample changers are capable of handling multiple combinations of titrations, direct pH, pX and conductivity measurements fast and efficiently. Connect to a TitraLab® titration workstation or a direct measurement meter with or without PC software selected from our complete laboratory product range and your laboratory will virtually run itself!

SAC950: Extended Model for Increased Sample Capacity

- Multi-radius sample trays for up to 70 samples
- External parking position
- External dip rinsing and electrode conditioning on 1 or 2 positions
- Beaker cover module for sample protection prior to analysis

SAC850: Basic Model for Sample Automation of Batches of 23 Samples or Less

- Single-radius sample trays for up to 23 samples
- Parking position on sample tray
- Dip rinsing/electrode conditioning performed on 1 or 2 dedicated positions on sample tray

SAC850/950 Options:

- Dynamic rinsing combined with waste disposal performed inside the current sample beaker
- Reagent addition peristaltic pump module

Common Tray Configurations

Product No.	SAC850 Sample Trays†
X91T080	Kit 25-positions turntable, SAC850, 22-45 mL & 8-25 mL PP, 50 mL LF glass beakers
X91T084	Kit 20-positions turntable, SAC850, 40-100 mL PP beakers
	SAC950 Sample trays†
X91T081	Kit 70-positions turntable, SAC9xx, 22-45 mL & 8-25 mL PP beakers, 50 mL LF glass beakers
X91T085	Kit 36-positions turntable, SAC9xx, 40-100 mL PP beakers

†Other trays available for different beaker sizes up to 400 mL, please contact us.

The SAC850,Ba or SAC950,Ba Sample Changers are delivered with a full set of connecting cables and setup accessories but no sample tray. SACx50,Ba versions operate with a selection of xx-position sample tray kits complete with accessories and delivery tubing to be ordered separately.

Prod. No.	Description
R41T043	SAC850,Ba Sample Changer, Standard version with cables
R41T044	SAC950,Ba Sample Changer, Extended version with cables

To configure your system please contact Hach at: 1-800-227-4224

Revolutionary instrument for automatic amperometric titrations.

- Automatic calculation of analyte concentration
- Automatic "hands-free" operation
- Easy-to-use interface
- Real-time graphics and graphic print output
- Automatic archiving of results
- Titrant calibration
- Electrode cleaning
- Greater accuracy and precision than manual titrations

Built-In Titrant Standardization Procedures

Users are guided through the standardization of the titrant with methods built into the instrument. Titrant concentration is automatically updated after standardization and can also be entered from the Certificate of Analysis (downloadable from www.hach.com), for the specific lot of titrant used.

Automated EPA Approved Methods

The AutoCAT automates the USEPA approved amperometric titration procedures for chlorine, chlorine dioxide, and chlorite determinations as described in "Standard Methods for the Examination of Water and Wastewater." Sample preparation is presented to the user in easy to understand screen displays. When the titration begins, the titration is entirely "hands-off."

**EPA
COMPLIANT**



Titration Products

The AutoCAT 9000 has the following USEPA approved methods:

- Forward titration for Free Chlorine, 0.1 to 5 mg/L (Standard Method 4500-Cl D. 4b)
- Forward titration for Total Chlorine, 1.2 µg/L to 5 mg/L (Standard Method 4500-Cl D. 4d)
- Back titration for Total Chlorine, 5.1 µg/L to 5 mg/L (Standard Method 4500-Cl C.)
- Chlorine Dioxide with Chlorite, 0.1 to 5 mg/L Standard Method 4500-ClO₂ E.)
- Sulfite (as SO₂, Sodium Bisulfite)

The AutoCAT ships complete with all accessories necessary for free and total chlorine titrations, including burette, dual platinum electrode, temperature sensor, stir bar, plus all tubing and reagents. Please see below for required reagents for chlorine dioxide/chlorite, or for back total chlorine methods, and accessories.

Prod. No.	Description
5008100	AutoCAT 9000

ADDITIONAL REQUIRED CHLORINE DIOXIDE/CHLORITE METHOD REAGENTS

141832	Hydrochloric acid std. solution, 2.5 N, 100 mL
16726H	Potassium Iodide, ACS, 100 g

ADDITIONAL REQUIRED TOTAL CHLORINE BACK TITRATION METHOD REAGENT

2333353	Iodine standard, 0.0282 N, 1000 mL
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OPTIONAL ACCESSORIES

A70P021	Kyoline brand thermal printer with cable
A70P025	Thermal paper for Kyoline, pkg. of 10-rolls

Specifications*

Electrode Dual platinum	Output RS-232 Serial output to printer/PC
Display Real-time graphics, menu driven, LCD	Languages English, French, and Spanish
Power Requirement 90/264 Vac, 47/63 Hz, 115 VA	Enclosure Splashproof, with alphanumeric keypad
Dimensions 38 x 23 x 45 cm (H x W x D) (15 x 9 x 17.7")	<i>*Subject to change without notice.</i>

For information on Hach's non-automated Amperometric Titrator call 1-800-227-4224.



For more information, call to request Literature #2533, or visit www.hach.com

Hach Digital Titrator

Accurate, convenient titrations without the bulk, fragility, or waste of a conventional buret.



- *Faster than a buret*
- *Rugged design*
- *18 parameters*
- *Interchangeable cartridges*

**EPA
Equivalency
for the following
Digital Titrator
methods:
Acidity, Alkalinity,
Chloride,
Calcium Hardness,
Total Hardness,
Sulfite**

Digital Titrator: Fast, Precise, Economical

Precise, less technique-sensitive

Digital Titrator automatically calculates precise volume of titrant dispensed. Accuracy obtained in microliters.

End-point easier to determine

The number used for calculation of sample concentration is recorded directly from the Digital Titrator's digital counter.

Saves time

Titration cartridges can be changed in seconds and eliminate glassware clean up before and after titration.

No cross contamination

Cartridges are always fresh and sealed against outside contamination.

Economical

Cartridges contain strong, concentrated reagents, so comparatively low volumes are used – waste is minimal.

Portable

With the Digital Titrator, titrations can be performed in the manufacturing plant or the field.

Problems with Buret Technique

Buret technique is dependent on operator skill.

Operator must examine level of buret to determine volume dispensed, a technique subject to visual interpretation.

Titration solutions must be prepared and measured, and all glassware must be acid-washed, rinsed with DI water, and dried.

Improper handling of reagent solutions and even slightly soiled glassware can compromise results.

Buret reagents are formulated with chemicals of low normality and subsequently require higher volumes. Ratio of standard titrant to D.T. cartridge is approximately 80:1.

Buret glassware cannot be safely transported to the plant or field.

Buret titrations require glass buret, buret stand, buret clamp, and funnel for filling.

Specifications*

DIGITAL TITRATOR	CARTRIDGES	TITRASTIR® CONTINUOUS MIXER/STAND
Delivery 800 digits/mL or 0.00125 mL/digit	Volume 13 mL	Dimensions 6.4 x 15.2 x 22.9 cm (2.5 x 6 x 9")
Accuracy ±1%. (Uncertainty of readings is 1 digit. Most samples require more than 100 digits.)	Number of Tests Most reagents are formulated to provide 100 typical titrations, but number may vary depending on sample concentration.	Weight 2.6 kg (5.75 lb)
Weight 132 g (4.7 oz)	Weight (full) 56.75 g (2 oz)	Power Requirements 115 or 230 Vac, 50/60 Hz, 20 VA

*Subject to change without
notice.

Prod. No.	Description
1690001	Digital Titrator with plastic case, a manual, and five straight delivery tubes
1720500	Delivery tubes, straight with J-hook, 5/pk
4157800	Delivery tubes, 90° with J-hook, 5/pk
1449501	Empty titration cartridge w/blank label
KIT	
2270900	Universal Digital Titrator Kit with Digital Titrator, manual, 100-mL graduated cylinder, 125- and 250-mL Erlenmeyer flasks, demineralizer bottle, clippers, and a carrying case

Digital Titrator Accessories

TitraStir® Continuous Mixer/Stand

The Digital Titrator can be hand-held, or you can attach it to this convenient laboratory stand. The TitraStir Titration Stand is a single-speed, magnetic stirring plate with a built-in support rod and custom holder for the Digital Titrator. Titration flasks rest on a white glass disc, so color changes are easy to see, and the support rod can be used to attach clamps, rings, and other hardware.

Prod. No. Description

ACCESSORIES

- 1940000** TitraStir Stand, 115 Vac
Includes power cord, support rod and mounting hardware, holder for Digital Titrator assembly (or other apparatus), glass disc, and stir bar. Digital Titrator not included.
- 1940010** TitraStir Stand, 230 Vac
Includes same as above.

REPLACEMENT PARTS FOR TitraStir STAND

- 1942700** Support Rod
- 1940100** Titrator/Electrode Holder
- 1513700** Glass Disc (white)
- 410316** Stir Bar (2" x 0.5")

1942700 Support Rod

1940100 Titrator/
Electrode Holder

1513700 Glass Disc
(white)

1940000 TitraStir Stand



Titration Products



Over 40
ready-to-use
titrant solutions
available.

EPA Equivalent Cartridges

Parameter	Method	Range	Titrant	Product No.
Acidity ¹	Methyl Orange	10-160 mg/L CaCO ₃	0.1600N NaOH	1437701
Acidity ¹	Phenolphthalein	10-160 mg/L CaCO ₃	0.1600N NaOH	1437701
Acidity ¹	Methyl Orange	100-4000 mg/L CaCO ₃	1.600N NaOH	1437901
Acidity ¹	Phenolphthalein	100-4000 mg/L CaCO ₃	1.600N NaOH	1437901
Alkalinity ²	Phenolphthalein	10-160 mg/L CaCO ₃	0.1600N H ₂ SO ₄	1438801
Alkalinity ²	Phenolphthalein	100-4000 mg/L CaCO ₃	1.600N H ₂ SO ₄	1438901
Alkalinity, Total ²	Bromcresol/Methyl Red	10-160 mg/L CaCO ₃	0.1600N H ₂ SO ₄	1438801
Alkalinity, Total ²	Bromcresol/Methyl Red	100-4000 mg/L CaCO ₃	1.600N H ₂ SO ₄	1438901
Aqua Ammonia	Colorimetric pH End Point	5-35 % as NH ₃	8.00 N Sulfuric Acid	1439101
Chloride ³ *	Mercuric Nitrate	10-160 mg/L Cl ⁻	0.2256N Hg(NO ₃) ₂	1439301
Chloride ³ *	Mercuric Nitrate	100-8000 mg/L Cl ⁻	2.256N Hg(NO ₃) ₂	92101
Hardness, Calcium ⁴	EDTA (CalVer® 2)	10-160 mg/L CaCO ₃	0.0800M EDTA	1436401
Hardness, Calcium ⁴	EDTA (CalVer® 2)	100-4000 mg/L CaCO ₃	0.800M EDTA	1439901
Hardness, Total ⁵	EDTA (ManVer® 2)	10-160 mg/L CaCO ₃	0.0800M EDTA	1436401
Hardness, Total ⁵	EDTA (ManVer® 2)	100-4000 mg/L CaCO ₃	0.800M EDTA	1439901
Sulfite ⁶	Iodate-Iodide	0-800 mg/L SO ₃ ²⁻	0.3998N KIO ₃ -KI	1496101

¹ Equivalent to Standard Method 2310 B (4a), 18th, 19th, 20th, and online edition.

² Equivalent to Standard Methods 2320 B, 18th, 19th, 20th, and online edition.

³ Equivalent to Standard Methods 4500-Cl C, 18th, 19th, 20th, and online edition.

⁴ Equivalent to Standard Methods 3500-Ca D, 18th, 19th, 20th, and online edition.

⁵ Equivalent to Standard Methods 2340 B or C, 18th, 19th, 20th, and online edition.

⁶ Equivalent to Standard methods 4500-SO₃ B, 18th, 19th, 20th, and online edition.

* Not for delivery to Connecticut.

Continued on next page.

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Digital Titrator Cartridges and Reagent Sets

Parameter	Method	Range	Titrant	DT Cartridge Prod. No.	Reagent Set Prod. No.
Acid-Base	Phenolphthalein End Point	1-10 meq/L Acid	1.600N NaOH	1437901	—
Acid-Base	Phenolphthalein End Point	10-4000 meq/L Acid	8N NaOH	1438101	—
Acid-Base	Phenolphthalein End Point	1-10 meq/L Base	1.600N H ₂ SO ₄	1438901	—
Acid-Base	Phenolphthalein End Point	10-4000 meq/L Base	8.00N H ₂ SO ₄	1439101	—
Acid-Base	Phenolphthalein End Point	10-4000 meq/L Base	8.00N HCl	1439001	—
Acidity	Methyl Orange	10-160 mg/L CaCO ₃	0.1600N NaOH	1437701	2272800
Acidity	Phenolphthalein	10-160 mg/L CaCO ₃	0.1600N NaOH	1437701	2272800
Acidity	Methyl Orange	100-4000 mg/L CaCO ₃	1.600N NaOH	1437901	2272800
Acidity	Phenolphthalein	100-4000 mg/L CaCO ₃	1.600N NaOH	1437901	2272800
Alkalinity	Phenolphthalein	10-160 mg/L CaCO ₃	0.1600N H ₂ SO ₄	1438801	2271900
Alkalinity	Phenolphthalein	100-4000 mg/L CaCO ₃	1.600N H ₂ SO ₄	1438901	2271900
Alkalinity, Total	Bromocresol/Methyl Red	10-160 mg/L CaCO ₃	0.1600N H ₂ SO ₄	1438801	2271900
Alkalinity, Total	Bromocresol/Methyl Red	100-4000 mg/L CaCO ₃	1.600N H ₂ SO ₄	1438901	2271900
Aqua Ammonia	Colorimetric pH Endpoint	5-35% NH ₃	8.00N H ₂ SO ₄	1439101	2930500
Carbon Dioxide	Phenolphthalein	10-100 mg/L CO ₂	0.3636N NaOH	1437801	2272700
Carbon Dioxide	Phenolphthalein	100-1000 mg/L CO ₂	3.636N NaOH	1438001	2272700
Chelant, Free	Magnesium Chloride	0-20 mg/L CaCO ₃	0.0800M MgCl ₂	2062501	—
Chelant, Total	Bismuth Nitrate	0-40 mg/L as Na ₄ EDTA	0.0200M Bi(NO ₃) ₃	2434501	—
Chloride	Mercuric Nitrate	10-160 mg/L Cl ⁻	0.2256N Hg(NO ₃) ₂	1439301*	2272600
Chloride	Silver Nitrate	10-100 mg/L Cl ⁻	0.2256N AgNO ₃	1439601	2288000
Chloride	Silver Nitrate	100-10000 mg/L Cl ⁻	1.128N AgNO ₃	1439701	2288000
Chloride	Mercuric Nitrate	100-8000 mg/L Cl ⁻	2.256N Hg(NO ₃) ₂	92101*	2272600
Chlorine, Free	Amperometric, Forward	0-1000 µg/L Cl ₂	0.00564N PAO	199901	—
Chlorine, Free	DPD-FEAS	0-3.00 mg/L Cl ₂	0.00564N FEAS	2292301	2445300
Chlorine, Total	Amperometric, Back	6-1000 µg/L Cl ₂	0.028N Iodine	2333301	—
Chlorine, Total	Amperometric, Forward	0-1000 µg/L Cl ₂	0.00564N PAO	199901	—
Chlorine, Total	DPD-FEAS	0-3.00 mg/L Cl ₂	0.00564N FEAS	2292301	2445300
Chlorine, Total	Iodometric	1-400 mg/L Cl ₂	0.02256N Na ₂ S ₂ O ₃	2409101	—
Chlorine, Total	Iodometric	20-2000 mg/L Cl ₂	0.113N Na ₂ S ₂ O ₃	2267301	2272500
Chlorine, Total	Iodometric	2000-70000 mg/L Cl ₂	2.00N Na ₂ S ₂ O ₃	1440101	2444800
Chromate	Iodometric	20-400 mg/L CrO ₄ ²⁻	0.2068N Na ₂ S ₂ O ₃	2267601	2272400
Hardness, Calcium	EDTA (CalVer® 2)	1-16 G.d.h.	0.1428M EDTA	1496001	2447300
Hardness, Calcium	EDTA (CalVer® 2)	10-200 G.d.h.	0.714M EDTA	1495901	2447400
Hardness, Calcium	EDTA (CalVer® 2)	10-160 mg/L CaCO ₃	0.0800M EDTA	1436401	2447200
Hardness, Calcium	EDTA (CalVer® 2)	100-4000 mg/L CaCO ₃	0.800M EDTA	1439901	2447500
Hardness, Total	EDTA (ManVer® 2)	1-16 G.d.h.	0.1428M EDTA	1496001	2447800
Hardness, Total	EDTA (ManVer® 2)	10-200 G.d.h.	0.714M EDTA	1495901	2447900
Hardness, Total	EDTA (ManVer® 2)	10-160 mg/L CaCO ₃	0.0800M EDTA	1436401	2448000
Hardness, Total	EDTA (ManVer® 2)	100-4000 mg/L CaCO ₃	0.800M EDTA	1439901	2448100
Hardness, Total, Sequential	EDTA (CalVer® 2 & ManVer® 2)	1-16 G.d.h.	0.1428M EDTA	1496001	—
Hardness, Total, Sequential	EDTA (CalVer® 2 & ManVer® 2)	10-200 G.d.h.	0.714M EDTA	1495901	2448500
Hardness, Total, Sequential	EDTA (CalVer® 2 & ManVer® 2)	10-160 mg/L CaCO ₃	0.0800M EDTA	1436401	2448600
Hardness, Total, Sequential	EDTA (CalVer® 2 & ManVer® 2)	100-4000 mg/L CaCO ₃	0.800M EDTA	1439901	2448700
Hypochlorite	Iodometric Method	50-150 g/L Cl ₂	2.26N Na ₂ S ₂ O ₃	2686901	2687000
Iron	EDTA	10-100 mg/L Fe	0.0716M EDTA	2081701	2449200
Iron	EDTA	100-1000 mg/L Fe	0.716M EDTA	2081801	2449300
Nitrite	Ceric Ion Titration	100-2500 mg/L NaNO ₂	0.5 N Ceric Ion	2270701	—
Oxygen, Dissolved	Azide mod. of Winkler Method	1-10 mg/L DO	0.200N Na ₂ S ₂ O ₃	2267501	2272200
Oxygen, Dissolved	Azide mod. of Winkler Method	10-100 mg/L DO	2.00N Na ₂ S ₂ O ₃	1440101	—
Salinity	Mercuric Nitrate	0-100 ppt Salinity	2.570N Hg(NO ₃) ₂	2393701*	—
Sulfite	Iodate-Iodide	0-800 mg/L SO ₃ ²⁻	0.3998N KIO ₃ ·KI	1496101	2272300
Volatile Acids	Phenolphthalein End Point	100-2400 mg/L CH ₃ COOH	0.9274N NaOH	1484201	2460200

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