

AutoCAT™ 9000 Automatic Chlorine Amperometric Titrator

Disinfectant Monitoring

DW

WW

PW

IW

Features and Benefits

Pre-Programmed for Easier Use

Embedded software in the AutoCAT 9000 titrator lets the process be “hands-off.” After the initial instrument setup, the desired titration method is selected to begin the test. The titrator directs the user—step by step—through sample preparation, and then automatically conducts the titration.

USEPA-Approved Methods

The AutoCAT 9000 titrator 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.”

- 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, 0.05 to 5 mg/L, Standard Method 4500-ClO₂ E

Automatic Calculations

End Point Determination—Two modes:

1. Automatic: The endpoint is calculated without user-intervention. The instrument performs a “global least squares regression analysis” to determine the exact endpoint. This fully automated mode is successful more than 90% of the time.
2. Manual: The user visually inspects the titration curve and selects the linear portions of the curve prior to and after the endpoint. The instrument then calculates the exact endpoint as the intersection of least squares regression line-fits to these data points. Endpoint determination can be repeated until the best line fit is obtained (lowest uncertainty in the result is displayed) before accepting the final result.

Analyte Concentration—After the endpoint is determined, concentration is automatically calculated using the titrant concentration, volume of titrant delivered at the endpoint, and the appropriate formula for the selected method.

Replicate Averaging—Analyze single or replicate test samples. A running average and the standard deviation of the results will automatically be calculated and stored for replicate tests.



The world's first automated amperometric titrator dedicated to measurement of free and total chlorine, chlorine dioxide, chlorite, and sulfite. Built-in titration procedures are virtually free from error and uncertainty. The AutoCAT™ 9000 Titrator uses USEPA-approved methods for chlorine, chlorine dioxide, and chlorite.

Better Control of Titration Results

The autoburette of the AutoCAT 9000 titrator accurately and precisely controls the titrant delivery. The smallest user-selectable volume increment setting is 0.3 µL and is adjustable. A pre-dose option can be used to speed up titrations—without compromising accuracy—by delivering a large initial volume, and then changing to a small volume increment to assure that enough measurement points are obtained for accurate endpoint determination. Titrant delivery is far more accurate and precise than when performing manual titrations.

DW = drinking water WW = wastewater municipal PW = pure water / power
IW = industrial water E = environmental C = collections FB = food and beverage



Be Right™

Specifications*

Methods

7 embedded methods:

- Chlorine dioxide and chlorite (amperometric forward titration)
- Chlorine dioxide generator yield (amperometric forward titration)
- Free chlorine (amperometric forward titration)
- Total chlorine (amperometric back titration)
- Total chlorine (amperometric forward titration)
- Sulfite (amperometric back titration)
- Total oxidants ("quick" two step amperometric titration for chlorine dioxide and chlorite)

Titration Termination

Automatic or manual

Titrant Addition

Incremental

Titration Curve

Up to 2000 points can be stored

Calibration Method

2 embedded procedures: titrant standardization methods for 5.64 mN PAO (forward titration) and 28.2 mN Iodine Standard Solution (back titration)

Current Ranges

2 μ A, 20 μ A, 200 μ A, 1 mA

Sample Temperature

-10 to 100°C (14 to 212°F)

Temperature Resolution

0.1°C (0.18°F)

Environmental Operating Conditions

Temperature: 5 to 40°C (41 to 104°F)

Humidity: 20 to 80%

Electrode

Dual platinum, self-cleaning

Display

Graphic 128 x 128-dot LCD, real-time graphics

Interface

Alphanumeric keypad

Languages: English, Spanish, French

Output/Input

RS-232, serial output to printer/PC, PS/2 port for PC keyboard

Printout

Automatic, GLP compliant, selectable (off or 80 columns), detailed or condensed, graphic or no graphic

Storage Capacity

Non-volatile memory, storage of 200 titration results

Magnetic Stirrer

22 reproducible speeds (0 to 1100 rpm) in 50-rpm increments

Burette

Burette volume: 5 mL

Burette step motor: 18,000 steps

UV-protected encapsulated glass syringe

Enclosure

Splashproof, ABS plastic

Compliance/Certifications

Instrument: CE marking; EMC directive 89/336/EED Compliant;

LV directive 73/23/EEC Compliant

Burette: ISO/FDIS 8655-3

Power Requirement

90/264 Vac, 47/63 Hz, 115 VA

Fuses

Slow-blow 1.0 A, 250 V (secondary is factory-serviceable only)

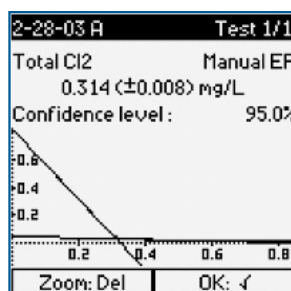
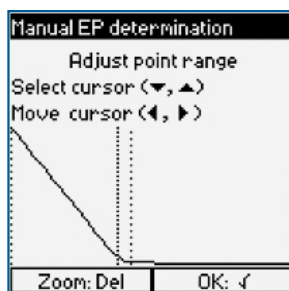
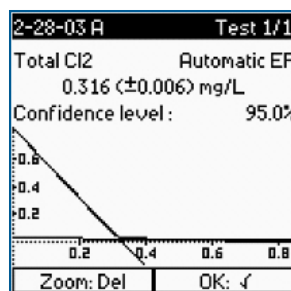
Dimensions

380 x 230 x 450 mm (15 x 9 x 17.8 in.) excluding tubing

Weight

5 kg (11 lb.) excluding reagent bottles

*Specifications subject to change without notice.



Automatic Archiving of Results

All test results are stored, are retrievable on command, and can be printed. The AutoCAT 9000 titrator also calculates and stores the mean and standard deviation for replicate measurements.

Real-Time Graphic Display and Hard Copy

See the data as it is collected, to immediately assess the quality of the analysis. Printed copies of analysis reports can be made with graphic titrant curve and text.

Print Hard Copies of Graphic Analysis Results

Purchase the optional printer to print hard copies of analysis reports with graphic titrant curve and text. Prints can also be used to manually reevaluate analysis results after-the-fact.

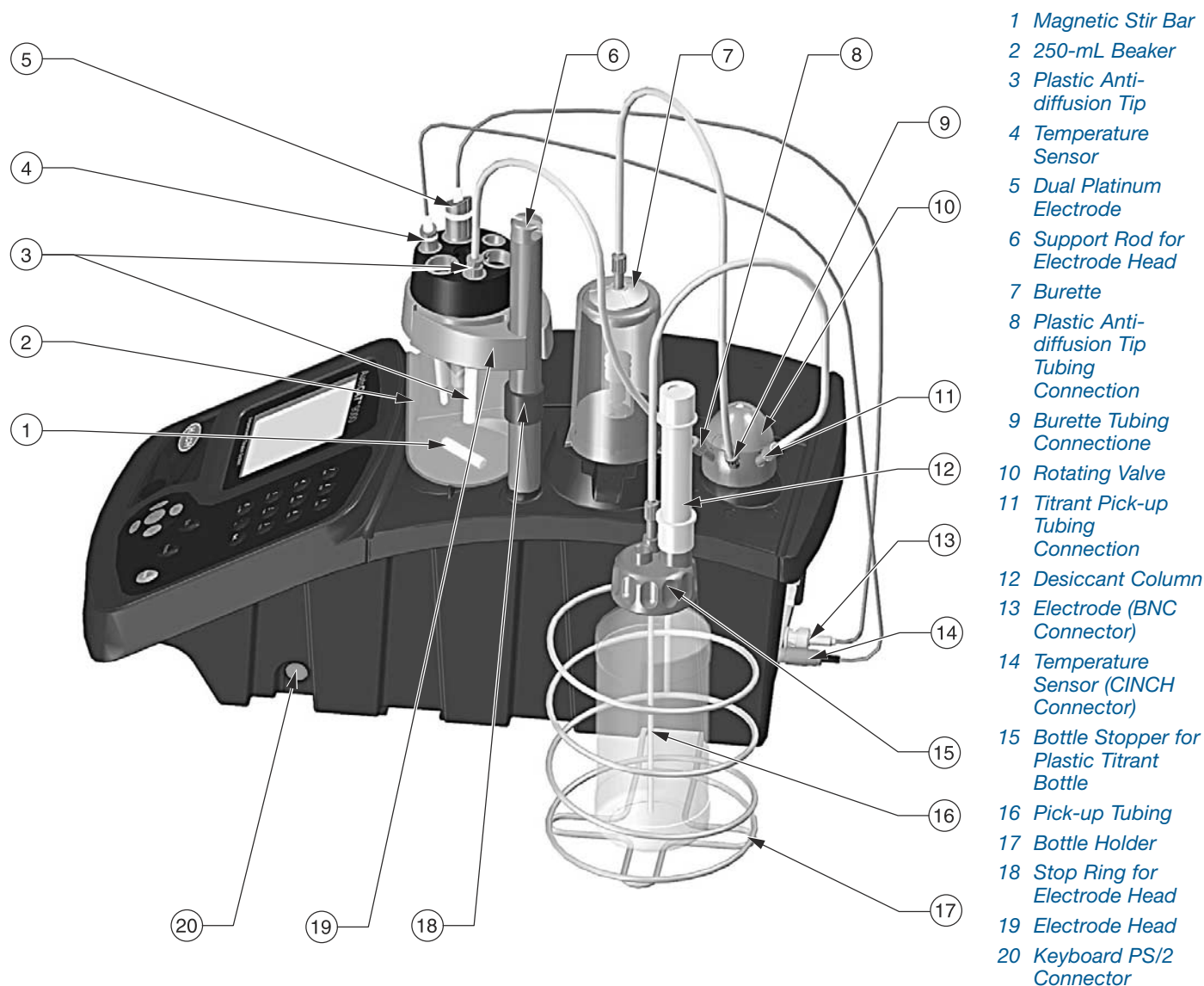
Superior Results Compared to Manual Methods

Digital control of the applied potential (to ± 0.1 μ V), digital measurement of current (with sub-nanoAmp resolution), real-time display of the titration progress, and accurate endpoint determination result in accurate measurements not obtainable by manual amperometric titrators.

Engineering Specifications

1. The chlorine instrument shall be a bench top instrument for measuring chlorine using amperometric titration method.
2. The titration procedure shall be fully automated, with user determined method and endpoint optimization.
3. The instrument shall be capable of measuring the following species of chlorine.
 - a) Chlorine dioxide by amperometric forward titration
 - b) Chlorine dioxide generator yield by amperometric forward titration
 - c) Free chlorine by amperometric forward titration
 - d) Total chlorine by amperometric back titration
 - e) Total chlorine by amperometric forward titration
4. The tests shall conform to the following USEPA-approved methods.
 - a) Forward titration for free chlorine, Standard Method 4500-Cl D. 4b
 - b) Forward titration for total chlorine, Standard Method 4500-Cl D. 4d
 - c) Back titration for total chlorine, Standard Method 4500-Cl C
 - d) Chlorine dioxide with chlorite, Standard Method 4500-ClO₂ E
5. The instrument shall also be capable of measuring:
 - a) Sulfite by amperometric back titration
 - b) Total oxidants ("quick" two step amperometric titration)
6. The measurement ranges of the instrument shall be:
 - a) Forward titration for free chlorine, 0.1 to 5 mg/L
 - b) Forward titration for total chlorine, 1.2 µg/L to 5 mg/L
 - c) Back titration for total chlorine, 5.1 µg/L to 5 mg/L
 - d) Chlorine dioxide with chlorite, 0.05 to 5 mg/L
 - e) Sulfite as SO₂ (bisulfite), 0 to 20 mg/L
7. The instrument shall provide graphical display and be capable of printing test results.
8. Power requirement shall be 115/230 Vac, 50/60 Hz.
9. The analyzer shall be warranted for one full year against defects in materials and workmanship.
10. The analyzer shall be Model AutoCAT™ 9000 Automatic Chlorine Amperometric Titrator manufactured by Hach Company.

Components



Ordering Information

The AutoCAT 9000 titrator ships complete with all accessories necessary for free and total chlorine titrations, including burette, dual platinum electrode, temperature sensor, stir bar, tubing, and reagents. Please see below for required reagents for chlorine dioxide/chlorite, back total chlorine methods, and accessories.

50081-00 AutoCAT™ 9000 Automatic Chlorine Amperometric Titrator

Additional Required Chlorine Dioxide/Chlorite Method Reagents

1418-32 Hydrochloric Acid Standard Solution, 2.5 N, 100 mL

16726H Potassium Iodide, ACS, 100 g

Additional Required Total Chlorine Back Titration Method Reagents

23333-53 Iodine Standard, 0.0282 N, 1000 mL

Accessories and Replacement Parts

50087-00 Temperature Sensor

50086-00 Double Platinum Electrode

50082-10 Burette Stand, 5 mL, red cover with connection tubing and key

50082-40 Delivery Tubing, with anti-diffusion tip

50085-00 Stir Bar

28341-00 SwifTest™ Reagent Dispenser, for potassium iodide (KI)

A70P021 Kyoline brand Thermal Printer, with cable, 115 V

A70P025 Thermal Paper, for printer, 10-roll pkg.

Chemicals and Reagents

1999-53 Phenylarsine oxide (PAO) solution, 5.64 mN, 1000 mL

14909-32 Acetate Buffer, pH 4.0, 100 mL, MDB, 1 mL per test

21553-32 Phosphate Buffer, pH 7, 100 mL, MDB, 1 mL per test

1077-60 Potassium Iodide (KI) Vial, replacement for SwifTest™ reagent dispenser, 300 tests

At Hach, it's about learning from our customers and providing the right answers. It's more than ensuring the quality of water—it's about ensuring the quality of life. When it comes to the things that touch our lives...

Keep it pure.

Make it simple.

Be right.

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