HANNA instruments

PL 100 / PL 101

Amperometric

Chlorine Titrators

Instruction Manual

Dear Customer,
Thank you for choosing a Hanna Product.
This instruction manual has been written for the following products:

PL 100 Free Chlorine Titrator

PL 101 Total Chlorine Titrator

Both the instruments have features such as recorder outputs, 12VDC power supply for safety and reduction of EMI and built-in stirrer.

Please read this instruction manual carefully before using the instrument. It will provide you with the necessary information for the correct use of the instrument, as well as a precise idea of its versatility.

These instruments are in compliance with CE directives EN 50081-1, EN 50082-1 and EN 61010-1.

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PRELIMINARY EXAMINATION

Remove the instrument from the packing material and examine it carefully to make sure that no damage has occurred during shipping. If there is any noticeable damage, notify your Dealer immediately.

Each titrator is supplied complete with HI 710005 or HI 710006 12VDC power adapter.

PL 100C and PL 101C are also supplied with:

- HI 3500A-1 10mL burette
- HI 3500B reagent container
- HI 3500C rubber bulb
- 50mm (2") long (dia. 7 mm/0.3") magnetic stir bar
- HI 3132B glass-body platinum-platinum electrode with 1 m (3.3") cable and BNC connector
- HI 76405 electrode holder
- small spoon
- graph paper
- recorder plug

Note Save all packing materials until you are sure that the instrument functions correctly. Any damaged or defective items must be returned in their original packing materials together with the supplied accessories.

Safety Precautions

Please take the time to read the safety precautions carefully wherever they appear in this manual. They are provided to prevent personal injury and damage to the instrument. This safety information applies to the operators and service personnel and the following two captions are used:

CAUTION: identifies conditions or practices that could result in damage to the instrument or persons;

WARNING: identifies conditions or practices that could result in personal injury or loss of life.

Note Because of the inherent dangers in handling chemical samples, standards and reagents, HANNA Instruments strongly recommends the user of this product to review the Material Safety Data Sheets and become familiar with safe handling procedures and proper usage prior to handling any chemicals.

GENERAL DESCRIPTION

The Hanna PL 100 and PL 101 Chlorine Analyzers are amperometric titrators which allow the determination of the chlorine content in a known quantity of sample . The PL 100 measures Free Chlorine and the PL 101 Total Chlorine.

The Hanna PL 100 and PL 101 Amperometric Titrators are laboratory instruments containing a precision adjustable voltage source, a microammeter with LCD display, and a speed regulated magnetic stirrer.

They operate providing a constant voltage to a dual electrode platinum probe and indicating the resulting probe current. As titration proceeds, the change of the electrode current is noted. At the point known as the End Point, abrupt change in the slope of the current curve occurs and the titration is complete. Sample concentration may be derived from the End Point value.

The magnetic stirrer rotates at 300 RPM during the titration to ensure proper mixing of the sample and titrant, yet slowly enough to avoid volatilization of the measured species. The stirrer motor is turned on and off with a rocker switch on the front panel.

The instrument case features a stainless steel top and easy visible LCD display for viewing the measured probe current. Adjustment of applied probe voltage is provided by a digital potentiometer. The potentiometer setting is controlled by two keys in the front panel: "↑" and "↓". A static digital memory retains the last value set when the instrument power is removed.

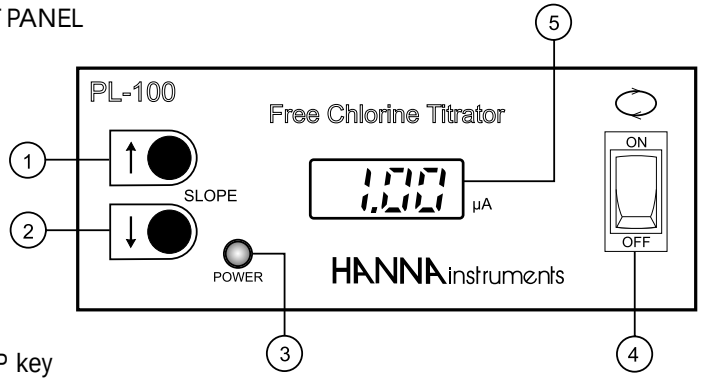
The PL 100 and PL 101 also feature a recorder output which provides a low impedance output voltage from 0.00 to 2.00V: This voltage corresponds to the probe current displayed on the front panel LCD display. Probe current range is 0.00 to 2.00 µA.

A 10 mL glass automatic burette system is available together with standard titration solutions 0.00564N Phenylarsine Oxide (PAO) and 0.000564N PAO, to cover the 0-1.5 ppm of Cl_2 or 1-15ppm of Cl_2.

In addition to these a 0.00188N Iodine standard titration solution is available in the range 0-4ppm of Total Chlorine.

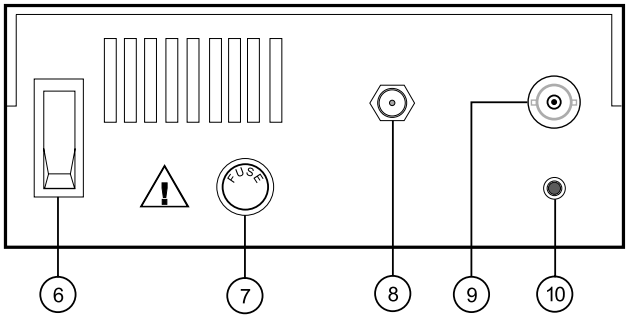
FUNCTIONAL DESCRIPTION

FRONT PANEL



1. UP key
2. DOWN key
3. Power LED
4. Stirrer ON/OFF switch
5. LCD Display

REAR PANEL



6. ON/OFF switch
7. Fuse holder
8. 12 VDC socket (for HI710005 or HI 710006)
9. BNC Electrode socket
10. Recorder output

FRONT PANEL

Display

The digital redout indicates the probe current in microamps. An overcurrent situation (greater than 1.99 µA) results in a "1." display (no tenths or hundredths digit). To reduce probe current, merely reduce probe voltage by pressing the front panel "↓" key.

Power on indicator

During normal operation the red front panel indicator LED should be on continuously, indicating that the instrument is turned on.

Stirrer motor switch

This switch, located on the right hand side of the front panel, operates the stirrer. Instrument power must be on (LED indicator on) for the stirrer to operate.

"↑" and "↓" bias control keys

Bias voltage applied to the probe is controlled by a digital potentiometer. The potentiometer has sixty-four steps which are selected with the front panel "↑" and "↓" keys. A single depression causes the potentiometer setting to increase or decrease by one step. Pressing and holding one of the keys for one second causes the potentiometer to increment or decrement at ten steps per second until the key is released or until the end of the taper is reached.

A static digital memory retains the last setting when the power is turned off or removed from the system.

REAR PANEL

Power on switch

To power on and off the instrument.

Probe input connector

The probe is connected to the rear of the instrument with a BNC connector.

Recorder output connector

The recorder output female connector is located on the rear panel of the instrument. The recorder connecting cable is terminated with a male banana type plug provided with the instrument.

Recorder output

The recommended recorder hookup uses a shielded, twisted-pair cable. The shield should be connected to (earth) ground at the recorder end and left open at the instrument end.

The output is 0.00 to 2.00 V corresponding to 0.00 to 2.00 µA probe current as indicated on the front panel display.

Power

Power is provided from the mains through a HI 710005 or HI 710006 power adapter. Be sure the mains voltage matches the input voltage specified on the power adapter. The power adapter output connector plugs into a socket on the back panel of the instrument.

Caution: The power adapter may be damaged if not operated at the correct voltage.

Fuse

The instrument power conditioning circuitry is protected with a 200 mA, 5 x 20mm tubular fuse located on the rear panel. To replace the fuse simply twist off the fuse holder cap and replace the fuse.

Unplug the meter before replacing the fuse.

SPECIFICATIONS

	PL 100	PL 101
Range	0 - 750mVDC probe voltage 0.00 - 2.00µA probe current	
Resolution	0.01 µA	
Accuracy	± 0.01 µA	
Probe	HI 3132B glass-body platinum electrode with 1 m (3.3”) cable	
Recorder output	0.00 to 2.00V corresponding to 0.00 to 2.00 µA	
Typical EMC Deviation	± 1% f.s.	
Stirrer Motor Speed	300 ± 10 RPM (constant)	
Power Source	12VDC through HI 710005 or HI 710006 (included)	
Environment	0 to 50°C (32 to 122°F); 0 to 95%RH (non condensing)	
Dimensions	180x180x70mm (7.1x7.1x2.8")	
Weight	1.6 Kg (3.6 lb.)	

Amperometric titration involves measuring the electrical current flow between two electrodes, usually platinum, immersed in a known quantity of a sample solution which contains an unknown concentration of the chemical to be measured. The titration of the chlorine with the reducing compound Phenylarsine Oxide (PAO) is an application of this technique.

When a small potential is applied across the two platinum electrodes of the titrator probe immersed in the solution containing Free Chlorine, a small electrical current will flow. The reversible reaction $Cl_2 + 2e^- \rightleftharpoons 2\ Cl^-$ occurs at both electrodes as the reducible form is oxidized at the anode and the oxidized form is reduced at the cathode.

FORWARD TITRATION

The gradual addition of the reductant PAO (titrant), in an environment buffered at pH 7, irreversibly reduces the oxidized form of the Chlorine present. The reaction it undergoes is:

$$PhAsO + Cl_2 + 2H_2O \longrightarrow PhAsO(OH)_2 + 2Cl^- + 2H^+$$

(Ph = phenyl) (a)

The final removal of all oxidized Chlorine terminates the reversible reaction and the probe current goes to zero.

In the case of Chloramine determination, the pH is lowered to 4 and potassium iodide is added to convert the chloramine species to an equivalent amount of triiodide.

$$NH_2Cl + 3I^- + H_2O + H^+ \longrightarrow NH_4OH + Cl^- + I_3^-$$

(monochloramine).

$$NHCl_2 + 6I^- + H_2O + 2H^+ \longrightarrow NH_4OH + 2Cl^- + 2I_3^-$$

(dichloroamine).

The triiodide is titrated with PAO with the current change measured amperometrically.

$$PhAsO + I_3^- + 2H_2O \longrightarrow 3I^- + PhAsO(OH)_2 + 2H^+$$

(b)

By knowing the exact amount of the reductant added which just extinguishes the probe current, the original concentration of Chlorine present in the sample may be calculated. Required data for the calculation are: sample volume, re-

ductant concentration and the activity ratio of the reductant to the measured substance.

BACK TITRATION

For waters which contain potential chemical interferences or low concentration of Total Chlorine, a back-titration is recommended. In the back-titration procedure, a known excess amount of PAO is added to the sample at pH 4 with an excess of iodide. The PAO reacts with the free chlorine and chloramines present. The amount of unreacted PAO is titrated with an iodine solution. A blank back-titration is also required. The total chlorine is then calculated, based on the PAO left in the sample.

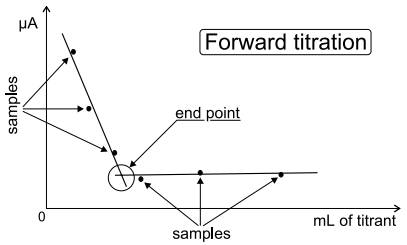
The back amperometric End Point is signaled when free iodine (triiodide ion) is present, which is indicated by a current flow between the electrodes (see chemical reaction (a) and (b)).

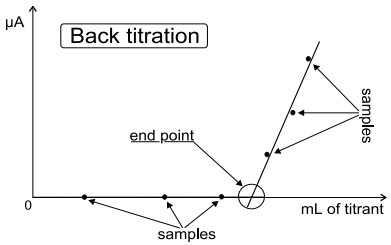
The back-titration method is popular in wastewater laboratories because:

- the sample chlorine can be “fixed” at the sampling site with the addition of excess reductant.
- Since the End Point is reversed, there is less interference from iodine-demand substances in the sample.

END POINT DETERMINATION

At the point known as the End Point, abrupt change in the slope of the current curve occurs and the titration is complete. Typical titration plots for the forward and back amperometric titration are shown in pictures below.





As the End Point is approached titrant has to be delivered in small amounts, while microampere readings have to be re-

corded after each addition (for best results at least 3 points before and 3 points after the End Point). The End Point is determined by the intersection of the two best lines through the points. The titrant volume is multiplied by a factor to obtain the sample chlorine concentration or can be read (only in case of forward titration) straight from the graph if the PL 100/PL 101 graph-paper is used.

HOW TO SELECT THE CORRECT AMPEROMETRIC TITRATION PROCEDURE

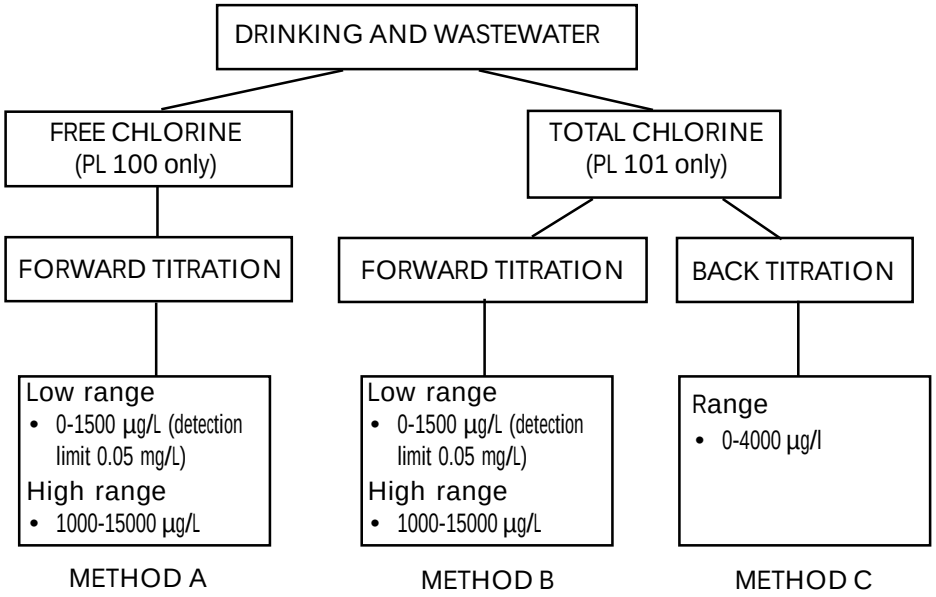
Select the procedure that best fits to your need as suggested in the block diagram below.

Forward titration can be performed in two ranges:

LOW RANGE when using 0.000564N PAO

HIGH RANGE when using 0.00564N PAO

Do not perform measurements using the forward titration method when chlorine concentration is under 0.05 mg/L. Use back titration for low concentrations of Total chlorine.



HOW TO COLLECT THE SAMPLE

Free chlorine is a strong oxidizing agent and in natural waters reacts with various inorganic and organic compounds, its decomposition being influenced by parameters like reactant concentrations, pH, temperature, salinity and sunlight.

Combined chlorine (chloroamines) is more stable and persistent in the environment.

For best results, the delay between sample collection and analysis should be minimized.

Plastic sample containers have a high chlorine demand, thus collect sample in glass bottles. If possible rinse the container with a portion of the sample otherwise rinse with deionized water.

Fill the bottle up to the rim and keep it tightly closed.

Avoid excess agitation and exposure to sunlight when sampling.

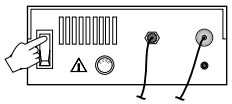
If the back titration method is used for total chlorine determination, preserve the sample on site. Add 2.00 mL of 0.00564N standard PAO solution and 1.0 mL pH 4 Acetate Buffer to a clean dry glass container with at least 150 mL capacity. At the sampling site, measure 100 mL of sample and carefully transfer it to the sample container. Swirl to mix.

It is important that the entire contents of the sample container be transferred to the beaker used in the titration. Rinse the bottle a few times with a small amount of chlorine free water.

OPERATIONAL GUIDE

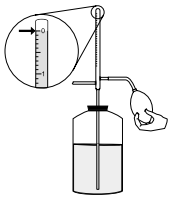
INITIAL PREPARATION

- Connect the power supply adapter to the DC input
- Connect the probe to the BNC connector.
- Be sure the front stirring switch is in the OFF position and turn the instrument on by the ON/OFF switch on the rear panel.



PROCEDURES

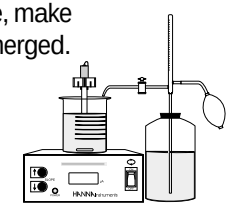
Method A: free chlorine forward titration (PL100 only)



1. Fill the bottle of the automatic burette with 0.000564N PAO solution (HI 70471) for titrations up to 1500 µg/L Cl_2 or use the 0.00564N PAO solution (HI 70470) for titrations up to 15000 µg/L Cl_2. Fill the 10 mL automatic burette to the zero mark.
2. Use a 100 mL volumetric pipet to transfer 100 mL of sample to a 250 mL beaker and add about 100 mL chlorine free water.
3. Place the stirbar into the beaker.
4. Add 1 mL of pH 7 phosphate buffer solution (HI 70472) to the beaker.

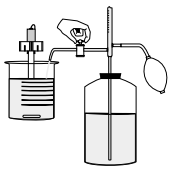
Note: If the pH of the sample is between 6.0 and 7.5 it is not necessary to add the buffer.

5. Turn on the speed controlled stirrer and place the beaker on the top of the PL 100.
6. Immerse the probe tip into the sample, make sure the platinum electrodes are submerged.



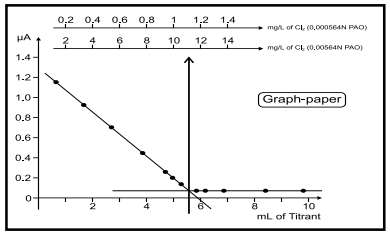
7. Adjust the potentiometric setting, using the "↑" and "↓" keys on the front panel until the display reads about 1.00.

8. Dispense the titrant into the beaker in small increments. Note the downward reading on the amperometric titrator. Record the display reading that corresponds exactly to the mL of the titrant added. Record at least 3 points before and 3 points after the End Point.



9. Construct a titration graph using the PL 100 graph paper.

10. Draw the best-fit line through each set of points. The end point is determined by the intersection of the two best lines through the points.

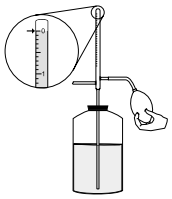


11. Read directly the free chlorine concentration on the top of the graph by drawing a straight vertical line through the End Point or read the volume of titrant used until the End Point and multiply by 2 when titrant (a) 0.00564N PAO is used or multiply by 0.2 when titrant (b) 0.000564N PAO is used.

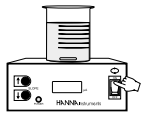
$$mL_{(\text{till End Point})} \times 2_{(\text{or } 0.2)} = \text{mg/L Free } Cl_2.$$

Method B: Total Chlorine Forward Titration (PL 101 only)

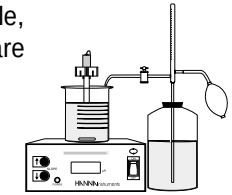
1. Fill the bottle of the automatic burette with 0.000564N PAO solution (HI 70471) for titrations up to 1500µg/L Cl_2 or use the 0.00564N PAO solution (HI 70466) for titrations up to 15000µg/L Cl_2. Fill the 10 mL automatic burette to the zero mark.



2. Use a 100 mL volumetric pipet to transfer 100mL of sample to a 250 mL beaker and add about 100 mL chlorine free water.
3. Add one spoon of potassium iodide from the bottle (HI 70468) and swirl to dissolve. Place the stirbar into the beaker.
4. Add 1 mL of pH 4 acetate buffer solution (HI 70467) into the beaker.
5. Turn on the speed controlled stirrer and place the beaker on the top of the PL 101.

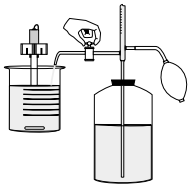


6. Immerse the probe tip into the sample, make sure the platinum electrodes are submerged.



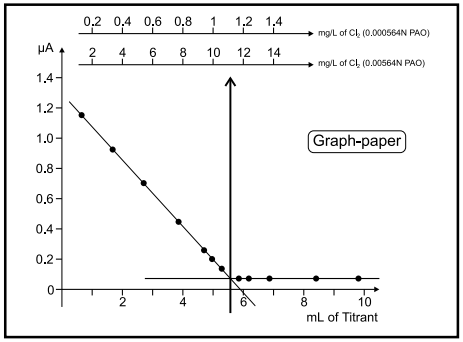
7. Adjust the potentiometric setting, using the "↑" and "↓" keys on the front panel until the display reads about 1.00.

8. Dispense the titrant into the beaker in small increments. Note the downward reading on the amperometric titrator. Record the display reading that corresponds exactly to the mL of titrant added. Record at least 3 points before and 3 points after the End Point.



10. Construct a titration graph using the PL 101 graph-paper.

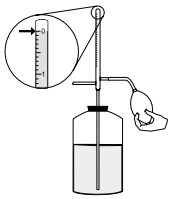
11. Draw the best-fit line through each set of points. The End Point is determined by the intersection of the two best lines through the points.



12. Read directly the total chlorine concentration on the top of the graph by drawing a straight vertical line through the End Point or read the volume of titrant used until the End Point and multiply by 2 when titrant (a) 0.00564N PAO is used or multiply by 0.2 when titrant (b) 0.000564N PAO is used.

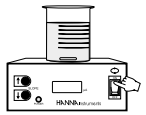
$$mL_{(till\ End\ Point)} \times 2_{(or\ 0.2)} = mg/L\ Total\ Cl_2.$$

Method C: Total Chlorine back titration (PL 101 only)

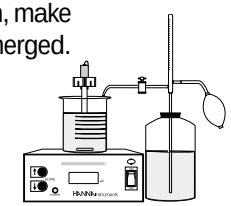


Instrument setting

1. Fill the bottle of the automatic burette with 0.00188N I_2 solution (HI 70469) and fill the 10 ml automatic burette to the zero mark.
2. Place the stirbar into a clean 250 mL beaker and add about 200 mL deionized water.
3. Add 1 mL of pH 4 acetate buffer (HI 70467) and one spoon of potassium iodide from the bottle (HI 70468).



4. Turn on the speed controlled stirrer and place the beaker on the top of the PL 101.
5. Immerse the probe tip into the solution, make sure the platinum electrodes are submerged.

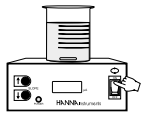


6. Add 1.5 mL of the iodine solution into the beaker and adjust the potentiometric setting using the "↑" and "↓" keys on the front panel until the display reads about 0.50 -0.70. Switch off the stirring action.

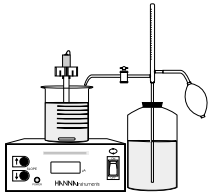
7. Remove the probe from the beaker and rinse the platinum electrodes with deionized water. The probe response slope is adjusted. Don't change the setting from this point.

Blank Titration

8. Refill the automatic burette to the zero mark.
9. Place the stirbar into a clean 250 mL beaker and add about 200 mL of deionized water.
10. Add exactly 2.00 mL of the standard 0.00564N PAO solution (HI 70466) to the beaker and swirl to mix.
11. Add 1 mL of pH 4 acetate buffer solution (HI 70467) and one spoon of potassium iodide from the bottle (HI 70468)
12. Turn on the speed controlled stirrer and place the beaker on the top of the PL 101.

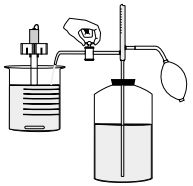


13. Immerse the probe tip into the sample and make sure the platinum electrodes are submerged.



14. Dispense 5 mL of titrant into the beaker.

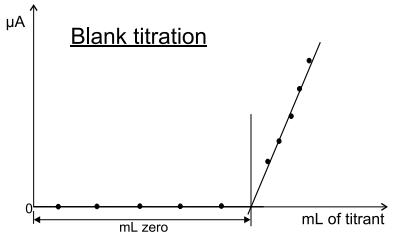
15. Continue dispensing titrant into the beaker in small increments. Record the display reading that corresponds exactly to the mL of titrant added. Record at least 3 points before and 3 points after the End Point.



16. Construct a titration graph.

17. Draw a best-fit line through each set of points. The End Point is determined by the intersection of the two best lines through the points.

18. Read the volume of titrant used until the End Point, this is mL zero.



Note: Standard Iodine is subjected to a normal degradation and this could lead to an increasing of the End Point under the same measurement conditions. Blank titration compensates for standard iodine degradation. Discard a standard iodine solution if the End Point is grater than 8 mL and repeat the procedure with new standard iodine.

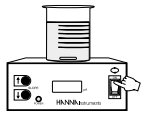
Sample titration

19. Refill the automatic burette to the zero mark.

20. Use a 100 mL volumetric pipet to transfer 100 mL of sample to a 250 mL beaker and add about 100 mL chlorine free water.

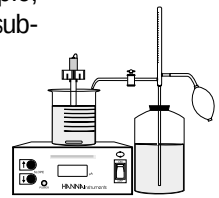
21. Add exactly 2 mL of the standard 0.00564N PAO solution (HI 70466) to the beaker and swirl to mix. Add 1 mL of pH 4 acetate buffer (HI 70467) and one spoon of potassium iodide from the bottle (HI 70468).

Note: If the sample is pretreated at the sampling site with the PAO and the acetate buffer as described before, transfer the sample quantitatively to the beaker and add one spoon of potassium iodide from the bottle (HI 70468)

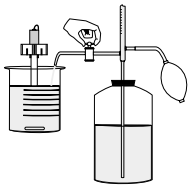


22. Turn on the speed controlled stirrer and place the beaker on the top of the PL 101.

23. Immerse the probe tip into the sample, make sure the platinum electrodes are submerged.

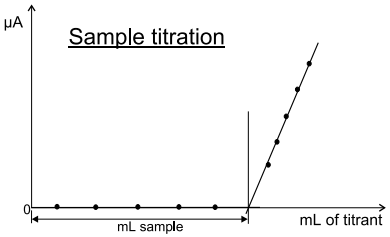


24. Dispense the titrant into the beaker in small increments. Note the reading that corresponds exactly to the mL of titrant added. Record at least 3 points before and 3 points after the End Point.



25. Construct a titration graph.

26. Draw a best-fit line through each set of points. The End Point is determined by the intersection of the two best lines through the points.



27. Read the volume of titrant used until the End Point. This is mL sample.

28. Calculate the total chlorine concentration using the formula:

4.00 - 4.00 x (mL sample)/(mL zero) = mg/L Total Cl_2.

Note: If a negative value is found, the sample contains an excess of de-chlorinating agent, such as sulfur dioxide, sulfite or bisulfite.

INTERFERENCES AND SOURCES OF ERRORS

Despite Standard Methods section 4500 Cl-A.3.b. states that "the amperometric method is the method of choice because it is not subject to interferences from color, turbidity, iron, manganese, or nitrite nitrogen", the amperometric method will detect (as all of the common chlorine methods) disinfectants such as bromine (Br_2), Ozone (O_3), Chlorine dioxide (ClO_2), and hydrogen peroxide (H_2O_2).

In general all oxidants which can be reduced by the strong reducing agent PAO will interfere with the free chlorine determination. For the total chlorine determination, interference can be caused by compounds that oxidize iodide to iodine and those that can be reduced by PAO. For example, manganese in the lower oxidation states +2, +3, or +4 can be oxidized by the free chlorine. The oxidized formes of manganese (+4 to +7) can be reduced by PAO in free chlorine titration or manganese (+4 or +7) can oxidize iodide to iodine during the total chlorine titration.

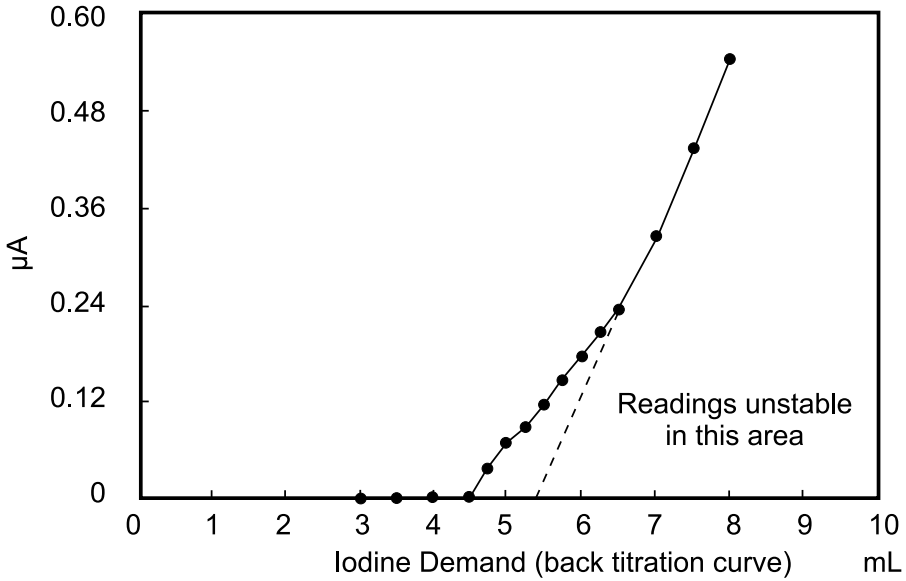
Hanna Instruments researchers found that nitrite interference can cause either a positive or negative interference depending on the order of reagent addition.

Therefore the preferred procedure in the back titration for Total Chlorine determination is buffering the solution to pH 4 before adding KI in order to minimize nitrite, manganese and iron interference.

For both free and total chlorine determination, Hanna instruments has selected PAO as reducing agent because it gives a sharper end point.

The potassium iodide used for the total chlorine determination can be oxidized with enough exposure to oxygen and ultraviolet light. Therefore keep the bottle of HI 70468 tightly closed and out of direct sunlight. Another possible error during total chlorine determination is volatilization of free iodine. Volatilization from the reaction mixture during the forward titration is minimized because excess iodide is present, but after adding the potassium iodide, start the titration as soon as possible. Keep the standard iodine solution in a closed, dark bottle to avoid volatilization of iodine.

Iodine demand of certain samples can cause a shift of the end point as shown in the following graph:



The iodine, formed in case of forward total chlorine determination or added as titrant during the backward titration, can be absorbed by suspended particles or can react with organic matter. This type of interference is common in the case of muddy or highly organic-rich samples.

Another source of error is due to the tendency of some metal to poison the electrodes of the titrator. Iron, copper, silver and some other species can plate or coat the platinum probe electrodes and diminish the probe response. Therefore the dual platinum electrode (DPE) has to be cleaned regularly (see electrode cleaning procedure on page 23).

MAINTENANCE

CALIBRATION REQUIREMENT

Calibration of the PL 100 and PL 101 Chlorine Titrators is not required.

If, for any reason, the measurements are inaccurate, contact your dealer or the nearest Hanna Customer Service Center for recalibration.

PROBE CONDITIONING

When the probe has not been used for some time (one week) or it is new, it is recommended that it be conditioned as follows:

1. Add a few drops of bleach to tap water in a 250 mL beaker and place the stir bar in the beaker.
2. Place the beaker on the PL 100/PL 101, turn on the instrument and the stir motor.
3. Immerse the probe in the solution, adjust the digital potentiometer for a current of 0.5 to 1.5 µA, and leave for ten minutes.

PROBE CLEANING PROCEDURE

Cleaning involves soaking the probe in a 1:1 nitric acid solution for two hours and than rinsing with deionized water. To stabilize the cleaned probe soak it in chlorinated tap water.

ACCESSORIES

HI 3132B	Glass-body platinum-platinum electrode with 1 m (3.3”) cable and BNC connector
HI 3500A-1	10mL glass burette
HI 3500B	Reagent container
HI 3500C	Rubber bulb
HI 70466	PAO Standard solution 0.00564N (for PL 101 only)
HI 70467	Acetate buffer
HI 70468	Potassium iodide
HI 70469	Iodine standard solution
HI 70470	PAO Standard solution 0.00564N (for PL 100 only)
HI 70471	PAO Standard solution 0.000564N
HI 70472	Phosphate buffer
HI 710005	115 VAC to 12 VDC power adapter
HI 710006	230VAC to 12 VDC power adapter
HI 731320	50mm (2”) long, dia. 7 mm(0.3”) magnetic stirbar (10 pcs)
HI 76405	Electrode holder.

WARRANTY

All Hanna Instruments meters are guaranteed for two years against defects in workmanship and materials when used for their intended purpose and maintained according to instructions. The electrodes and the probes are guaranteed for a period of six months. This warranty is limited to repair or replacement free of charge.

Damage due to accident, misuse, tampering or lack of prescribed maintenance are not covered.

If service is required, contact the dealer from whom you purchased the instrument. If under warranty, report the model number, date of purchase, serial number and the nature of the failure. If the repair is not covered by the warranty, you will be notified of the charges incurred. If the instrument is to be returned to Hanna Instruments, first obtain a Returned Goods Authorization number from the Customer Service department and then send it with shipping costs prepaid. When shipping any instrument, make sure it is properly packaged for complete protection.

To validate your warranty, fill out and return the enclosed warranty card within 14 days from the date of purchase.

Hanna Instruments reserves the right to modify the design, construction and appearance of its products without advance notice.

OTHER PRODUCTS FROM HANNA

- CALIBRATION AND MAINTENANCE SOLUTIONS
- CHEMICAL TEST KITS
- CHLORINE METERS
- CONDUCTIVITY/TDS METERS
- DISSOLVED OXYGEN METERS
- HYGROMETERS
- ION SPECIFIC METERS (Colorimeters)
- MAGNETIC STIRRERS
- Na/NaCl METERS
- pH/ORP/Na ELECTRODES
- pH METERS
- PROBES (DO, µS/cm, RH, T, TDS)
- PUMPS
- REAGENTS
- SOFTWARE
- THERMOMETERS
- TRANSMITTERS
- TURBIDITY METERS
- Wide Range of Accessories

Most Hanna meters are available in the following formats:

- BENCH-TOP METERS
- POCKET-SIZED METERS
- PORTABLE METERS
- PRINTING/LOGGING METERS
- PROCESS METERS (Panel and Wall-mounted)
- WATERPROOF METERS
- METERS FOR FOOD INDUSTRY

For additional information, contact your dealer or the nearest Hanna Customer Service Center.
You can also e-mail us at tech@hannainst.com.

CE DECLARATION OF CONFORMITY

HANNA instruments

CE

DECLARATION OF CONFORMITY

We

Hanna Instruments Italia Srl
via E.Fermi, 10
35030 Sarmeola di Rubano - PD
ITALY

herewith certify that the amperometric titrators:

PL 100 PL101

have been tested and found to be in compliance with the following regulations:

IEC 801-2	Electrostatic Discharge
IEC 801-3	RF Radiated
IEC 801-4	Fast Transient
EN 55022	Radiated, Class B
EN 61010-1	User Safety Requirement

Date of Issue: 6-9-1996

D.Volpato - Engineering Manager
On behalf of
Hanna Instruments S.r.l.

Recommendations for Users

Before using these products, make sure that they are entirely suitable for the environment in which they are used.

Operation of these instruments in residential areas could cause unacceptable interference to radio and TV equipment.

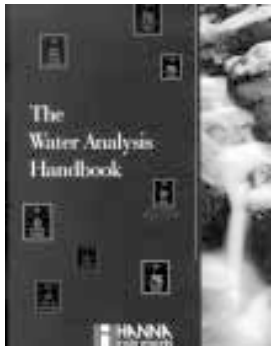
The metal band at the end of the sensor is sensitive to electrostatic discharges. Avoid touching this metal band at all times.

Any variation introduced by the user to the supplied equipment may degrade the instruments' EMC performance.

Unplug the instruments from power supply before opening the front cover.

HANNA LITERATURE

Lab Recording



Water Analysis Handbook

Envirocare

General Catalog

These and many others catalogs, handbooks and leaflets are available from Hanna. To receive your free copy, contact your dealer or the nearest Hanna Customer Service Center.

PRINTED IN PORTUGAL
MANPL100R1
07/98

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