

Table of Contents

11

Chemical Oxygen Demand

table of contents



Introduction.....11.2

Product Spotlights.....11.3

Benchtop11.4

COD with Bar Code Recognition 11.4

COD with up to 47 methods 11.6

COD for Wastewater Analysis 11.8

Certified Reagents.....11.9

Test Tube Heater11.10

11

Chemical Oxygen Demand

Introduction

Chemical Oxygen Demand

introduction



Wastewater needs to be monitored closely to prevent environmental pollution and human illness.

Oxygen Demand and COD

Chemical Oxygen Demand (COD) is a measure of the biologically available and inert organic matter that is susceptible to oxidation by a strong oxidizing agent.

The Hanna COD method is based on the well established closed dichromate-reflux colorimetric method. The colorimetric measurement of COD is faster and easier to perform than the titrimetric analysis; additional reagents are not required. The sample is added to the reagent vial and digested under closed reflux conditions and allowed to cool before measurement is taken. Reference standards can be made using potassium hydrogen phthalate (KHP). 1 mg of KHP is equal to 1.175 mg COD.

The US Environmental Protection Agency (EPA) specifies that the dichromate reflux method is the only method acceptable for reporting purposes. The advantage in using this method includes certifiable results as well as high accuracy.

COD Testing Applications

COD is used as a measurement of pollutants. It is normally measured in both municipal and industrial wastewater treatment plants and gives an indication of the efficiency of the treatment process. COD is measured on both influent and effluent water. The efficiency of the treatment process is normally expressed as COD removal, measured as a percentage of the organic matter purified during the cycle. COD has further applications in power plant operations, chemical manufacturing, commercial laundries, pulp and paper mills, agriculture and animal waste runoff, environmental studies and general education. Hanna equipment can be used in the laboratory or for on-site testing. The measurement procedure has been designed for ease of use by personnel at any skill level.

Wastewater monitoring examples:

COD Influent	COD Effluent	COD Removal
1214	451	62%
948	328	63%
1341	307	77%



www.hannainst.com

11.2

Beyond COD: Nitrogen and Phosphorus

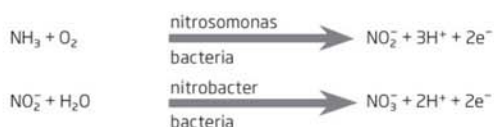
The goal in wastewater treatment is not only COD reduction, but also to control nitrogen and phosphorus, which are responsible for eutrophication phenomena in natural environments. COD, nitrogen, and phosphorus control are performed not only to obey environmental protection laws, but also to optimize plant costs.

Effective monitoring and control of parameters such as ammonia, nitrate, total nitrogen and total reactive phosphorus allow plant managers to profile and improve the health of aquatic ecosystems. By accurately monitoring levels of each specific pollutant, operational parameters can be adjusted to maintain high efficiency of biodegradation treatments while also minimizing costs.

Nitrogen

When a treatment plant uses processes like nitrification and denitrification, it is important to monitor and maintain the equilibrium between ammonia nitrogen, nitrate and total nitrogen during the bio-treatment. The nitrogen level is important because it relates to the quantity of oxygen provided in the nitrification area. Ammonia is also controlled because it can become very toxic for the bacteria responsible for denitrification.

Nitrification



Denitrification



Phosphorus

Phosphorus is measured during both biological and chemical dephosphorization. An excessive amount of phosphate discharged in superficial waters or in bio-treatment tanks causes an increase of algae and system eutrophication.



Product Spotlights

11

Chemical Oxygen Demand

product spotlights

11.3



HI83224

COD Meter and Multiparameter Photometer

The HI83224* is a multiparameter bench photometer that includes 15 methods for the measurement of ammonia, COD, chlorine, nitrate, nitrogen and phosphorus.

The HI83224 features a powerful interactive user support system that assists you before, during and after analysis. On-screen tutorials guide users through set-up, calibration and measurement procedures while context sensitive help screens are available at a push of a button.

[See page 11.4](#)



HI83099

COD Laboratory Photometer

The HI83099 is one of the most versatile photometers on the market. In addition to COD, this meter measures 44 of the most important water quality parameters. The HI83099 operates in three different ranges to cover virtually every COD application.

[See page 11.6](#)



HI839800

COD Test Tube Heater with 25 Vial Capacity

The HI839800 COD reactor is an easy to use test tube heater with intuitive operation and durable construction. The reactor's aluminum block features a 25-vial capacity and a well for a reference temperature probe.

[See page 11.10](#)

HI83224

COD Meter and Multiparameter Photometer

with Barcode Recognition of Sample Vials

From ammonia to phosphorus, the HI83224 benchtop photometer offers 15 measurement methods for different key water quality parameters in addition to chemical oxygen demand (COD) in 3 different ranges. The HI83224 features a barcode reader that can be used for barcoded sample vials. The reader scans each vial and automatically identifies the method and range, eliminating potential errors and simplifying the testing process.

This photometer features an advanced optical system that uses special tungsten lamps, narrow band interference filters, and silicon photodetectors to ensure accurate photometric readings every time. The HI83224 uses a graphic backlit LCD that allows for an intuitive user interface, offering a tutorial mode that gives a step-by-step procedure for performing a measurement. The result obtained can be displayed in various chemical forms based on the user's preference. For tracking of data, results can be logged and then exported to a Windows® compatible PC using the HI92000 software and HI920013 USB cable.

Barcode Recognition

Automatic recognition of bar coded samples is an exciting feature of the HI83224. This advanced meter scans each vial inserted into the vial holder and automatically identifies the sample method and range. The barcode has four digits: the first two digits are for parameter identification and the second two digits are for reagent lot ID. Vials for different methods can be distinguished by a barcode printed on the vial and the cap color - the barcodes for different methods are shown in the table below. For parameters that don't use a barcoded reagent, the vials supplied with the instrument can be used.

Vial Rotation

During the measurement phase of the analysis, the state-of-the-art vial rotator spins the vial to identify the method via the barcode, then rotates while taking a number of absorbance readings. The instrument then converts the readings to concentration units and displays the result on the easy to read screen.



- **Improved Accuracy**
 - Using the "average" function further improves reading accuracy. When enabled in the setup menu, the instrument takes 180 absorbance readings through the vial as it rotates. Each individual reading represents a measurement through a new optical path. Averaging the absorbance readings minimizes errors due to vial inconsistencies.
- **Method Verification**
 - A dedicated METHOD CHECK button is available to verify the vial barcode, eliminating the potential for vial confusion or incorrect sample readings.
- **Backlit Graphic LCD Display**
 - The HI83224 features an adjustable backlit graphic display with virtual keys and on-screen help to provide for an intuitive user interface.
- **Data Logging**
 - Users can store up to 200 readings by simply pressing the LOG key. Logged readings are just as easily recalled by pressing the dedicated RCL button. Stored data includes parameter, test results, sample number, lot number, instrument ID, date and time.
- **PC Connectivity**
 - Logged readings can be transferred to a PC via USB using HI92000 Windows® compatible software.
- **Result Conversion**
 - Eliminates confusion by automatically converting readings to other chemical forms. Common conversions are available at the touch of a button.
- **On-screen Tutorial**
 - With the tutorial function enabled, short guides relating to the current operation are displayed.
- **Built-in Timer**
 - Display of time remaining before a measurement is taken. Ensures that all readings are taken at the appropriate reaction intervals for the test being performed.
- **Error Messages**
 - Messages on display alerting to problems including barcode error, wrong vial, and different reagent lot.
- **Cooling Lamp Indicator**
 - To maintain the desirable wavelength to be used for absorbance, it is necessary to ensure components are not overheated from the heat generated by the tungsten lamp. Each photometer is designed to allow a minimal amount of time for components to cool.

ADP
Application Designed Photometers

Specifications HI83224

Light Source	tungsten lamps with narrow band interference filters
Light Detector	silicon photocell
Data Logging	up to 200 samples
PC Connectivity	USB
Environment	0 to 50°C (32 to 122°F); RH max 90% non-condensing
Power Supply	230 VAC or 115 VAC power adapter
Dimensions	235 x 212 x 143 mm (9.2 x 8.34 x 5.62")
Weight	2.3 kg (5.1 lb)
Ordering Information	HI83224-01 (115V) and HI83224-02 (230V) are supplied with sample vials (10), vial cleaning cloths (4), scissors and instruction manual.



- Bar code reader detects the method and range automatically

COD Test	Range	Resolution	Accuracy	Method	Reagent Code
COD LR	0 to 150 mg/L (as O ₂)	1 mg/L	±5 mg/L or ±5 % of reading**	dichromate EPA†	HI94754A-25 (25 tests)
	0 to 150 mg/L	1 mg/L	±5 mg/L or ±5 % of reading**	dichromate mercury-free**	HI94754D-25 (25 tests)
	0 to 150 mg/L	1 mg/L	±5 mg/L or ±5 % of reading**	dichromate ISO [§]	HI94754F-25 (25 tests)
COD MR	0 to 1500 mg/L (as O ₂)	1 mg/L	±15 mg/L or ±4 % of reading**	dichromate EPA†	HI94754B-25 (25 tests)
	0 to 1500 mg/L	1 mg/L	±15 mg/L or ±4 % of reading**	dichromate mercury-free**	HI94754E-25 (25 tests)
	0 to 1500 mg/L	1 mg/L	±15 mg/L or ±4 % of reading**	dichromate ISO [§]	HI94754G-25 (25 tests)
COD HR	0 to 15000 mg/L (as O ₂)	10 mg/L	±150 mg/L or ±3 % of reading**	dichromate	HI94754C-25 (25 tests)

Test	Range	Resolution	Accuracy*	Method	Reagent Code
Ammonia LR	0.00 to 3.00 mg/L (as NH ₃ -N)	0.01 mg/L	±0.10 mg/L or ±5 % of reading**	Nessler	HI94764A-25 (25 tests)
Ammonia HR	0 to 100 mg/L (as NH ₃ -N)	1 mg/L	±1 mg/L or ±5 % of reading**	Nessler	HI94764B-25 (25 tests)
Chlorine, Free**	0.00 to 5.00 mg/L	0.01 mg/L below 0.99 mg/L; 0.1 mg/L above 0.99 mg/L	±0.03 mg/L or ±4 % of reading**	DPD	HI93701-01 (100 tests) HI93701-03 (300 tests)
Chlorine, Total**	0.00 to 5.00 mg/L	0.01 mg/L below 0.99 mg/L; 0.1 mg/L above 0.99 mg/L	±0.03 mg/L or ±4 % of reading**	DPD	HI93711-01 (100 tests) HI93711-03 (300 tests)
Nitrate	0.0 to 30.0 mg/L (as NO ₃ -N)	0.1 mg/L	±1.0 mg/L or ±5 % of reading** @20°C	chromotropic acid	HI94766-50 (50 tests)
Nitrogen, Total LR	0.0 to 25.0 mg/L (as N)	0.1 mg/L	±1.0 mg/L or ±5 % of reading** @20°C	chromotropic acid	HI94767A-50 (50 tests)
Nitrogen, Total HR	10 to 150 mg/L (as N)	1 mg/L	±3 mg/L or ±4 % of reading**	chromotropic acid	HI94767B-50 (50 tests)
Phosphorus, Acid Hydrolyzable	0.00 to 1.60 mg/L (as P)	0.01 mg/L	±0.05 mg/L or ±5 % of reading**	ascorbic acid	HI94758B-50 (50 tests)
Phosphorus, Reactive	0.00 to 1.60 mg/L (as P)	0.01 mg/L	±0.05 mg/L or ±5 % of reading**	ascorbic acid	HI94758A-50 (50 tests)
Phosphorus, Reactive HR	0.0 to 32.6 mg/L (as P)	0.1 mg/L	±0.5 mg/L or ±5 % of reading**	vanadomolybdophosphoric acid	HI94763A-50 (50 tests)
Phosphorus, Total	0.00 to 1.15 mg/L (as P)	0.01 mg/L	±0.05 mg/L or ±6 % of reading**	ascorbic acid	HI94758C-50 (50 tests)
Phosphorus, Total HR	0.0 to 32.6 mg/L (as P)	0.1 mg/L	±0.5 mg/L or ±5 % of reading**	vanadomolybdophosphoric acid	HI94763B-50 (50 tests)



HI740217
Lab Safety Shield



HI740216
Test Tube Cooling Rack

For safety, the optional HI740217 safety shield and HI740216 test tube cooling rack for the HI839800 are strongly recommended.

Some analytical methods require digestion of the sample. For digestion of the vials, use the Hanna HI839800 reactor only.

Notes:
† Method with chromium-sulfuric acid is officially recognized by EPA for wastewater analysis.
§ The HI94754F-25 and HI94754G-25 method follows the official method ISO 15705.
** This method is recommended for general purpose analysis with no chloride interference.

* @ 25°C (77°F) unless otherwise stated
** Whichever is greater

www.hannainst.com | **HANNA**
instruments

11.5

Chemical Oxygen Demand

benchtop

11

HI83099

COD Meter and Multiparameter Photometer

- Up to 47 measurement methods including COD
- Backlit Graphic LCD Display
 - The HI83099 features a backlit graphic display with virtual keys and on-screen help to provide for an intuitive user interface.
- Data Logging
 - Users can store up to 200 readings by simply pressing the dedicated LOG button. Logged readings are easily recalled by pressing the RCL button.
- PC Connectivity
 - Logged readings can be transferred to a PC via USB using the HI92000 Windows® compatible software.
- Result Conversion
 - Eliminates confusion by automatically converting readings to other chemical forms. Common conversions are available at the touch of a button.
- On-screen Tutorial
 - With the tutorial function enabled, short guides relating to the current operation are displayed.
- Auto-shut off
 - Automatic shut off after 10 minutes of non-use when the meter is in measurement mode and operating on the internal rechargeable battery.
- Battery Status Indicator
- Built-in Timer
 - Display of time remaining before a measurement is taken. Ensures that all readings are taken at the appropriate reaction intervals for the test being performed.
- Error Messages
 - Messages on display alerting to problems including no cap, high zero, and standard too low.
- Cuvette Cover
 - Aids in stopping stray light from affecting measurements.
- Cooling Lamp Indicator
 - To maintain the desirable wavelength to be used for absorbance, it is necessary to ensure components are not overheated from the heat generated by the tungsten lamp. Each photometer is designed to allow a minimal amount of time for components to cool.



One of the most versatile photometers in the market

From aluminum to zinc, the HI83099 benchtop photometer offers 47 measurement methods for different key water quality parameters, including chemical oxygen demand (COD) in 3 different ranges. This photometer features an advanced optical system that uses special tungsten lamps, narrow band interference filters, and silicon photodetectors to ensure accurate photometric readings every time. The HI83099 uses a graphic backlit LCD that allows for an intuitive user interface, offering a tutorial mode that gives a step-by-step procedure for performing a measurement. The result obtained can be displayed in various chemical forms based on the user's preference. For tracking of data, results can be logged and then exported to a Windows® compatible PC using the HI92000 software and HI920013 USB cable.

Specifications

Specifications	HI83099
Light Source	tungsten lamps with narrow band interference filters
Light Life	the life of the instrument
Light Detector	silicon photocell
Environment	0 to 50°C (32 to 122°F); RH max 90% non-condensing
Power Supply	external 12 VDC power adapter or built-in rechargeable battery
Dimensions	235 x 200 x 110 mm (9.2 x 7.87 x 4.33")
Weight	0.9 kg (2 lbs.)

Ordering Information

HI83099-01 (115V) and **HI83099-02** (230V) is supplied with glass cuvettes with caps (4), cell protective cap, batteries, 12 VDC adapter, sample preparation kit (for turbidity or concentrated samples), cloth for wiping cuvettes, 60mL glass bottle for DO analysis, scissors, and instructions.


www.hannainst.com

COD Test	Range	Method	Reagent Code
COD LR	0 to 150 mg/L	dichromate EPA† dichromate mercury-free** dichromate ISO*	HI93754A-25 HI93754D-25 HI93754F-25
COD MR	0 to 1500 mg/L	dichromate EPA† dichromate mercury-free** dichromate ISO*	HI93754B-25 HI93754E-25 HI93754G-25
COD HR	0 to 15000 mg/L	dichromate	HI93754C-25

Water Quality Test	Range	Method	Reagent Code†
Alkalinity	0 to 500 mg/L (ppm) as CaCO ₃	bromocresol green	HI93755-01
Aluminum	0.00 to 1.00 mg/L	aluminon	HI93712-01
Ammonia MR	0.00 to 10.00 mg/L	Nessler	HI93715-01
Ammonia LR	0.00 to 3.00 mg/L	Nessler	HI93700-01
Bromine	0.00 to 8.00 mg/L	DPD	HI93716-01
Calcium	0 to 400 mg/L	oxalate	HI937521-01
Chlorine Dioxide	0.00 to 2.00 mg/L	chlorophenol red	HI93738-01
Chlorine, Free	0.00 to 2.50 mg/L	DPD	HI93701-01*
Chlorine, Total	0.00 to 3.50 mg/L	DPD	HI93711-01*
Chromium VI HR	0 to 1000 µg/L	diphenylcarbohydrazide	HI93723-01
Chromium VI LR	0 to 300 µg/L	diphenylcarbohydrazide	HI93749-01
Color of Water	0 to 500 PCU	colorimetric platinum cobalt	-
Copper HR	0.00 to 5.00 mg/L	bicinchoninate	HI93702-01
Copper LR	0 to 1000 µg/L	bicinchoninate	HI93747-01
Cyanuric Acid	0 to 80 mg/L	turbidimetric	HI93722-01
Fluoride	0.00 to 2.00 mg/L	SPADNS	HI93729-01
Hardness, Calcium	0.00 to 2.70 mg/L	calmagite	HI93720-01
Hardness, Magnesium	0.00 to 2.00 mg/L	EDTA	HI93719-01
Hydrazine	0 to 400 µg/L	p-dimethylaminobenzaldehyde	HI93704-01
Iodine	0.0 to 12.5 mg/L	DPD	HI93718-01
Iron HR	0.00 to 5.00 mg/L	phenantroline	HI93721-01
Iron LR	0 to 400 µg/L	TPTZ	HI93746-01
Magnesium	0 to 150 mg/L	calmagite	HI937520-01
Manganese HR	0.0 to 20.0 mg/L	periodate	HI93709-01
Manganese LR	0 to 300 µg/L	PAN	HI93748-01
Molybdenum	0.0 to 40.0 mg/L	mercaptoacetic acid	HI93730-01
Nickel HR	0.00 to 7.00 g/L	photometric	HI93726-01
Nickel LR	0.000 mg/L to 1.000 mg/L	PAN	HI93740-01
Nitrate	0.0 to 30.0 mg/L	cadmium reduction	HI93728-01
Nitrite HR	0 to 150 mg/L	ferrous sulfate	HI93708-01
Nitrite LR	0.00 to 1.15 mg/L	diazotization	HI93707-01
Oxygen, Dissolved (DO)	0.0 to 10.0 mg/L	Winkler	HI93732-01
Ozone	0.00 to 2.00 mg/L	DPD	HI93757-01
pH	6.5 to 8.5 pH	phenol red	HI93710-01
Phosphate HR	0.0 to 30.0 mg/L	amino acid	HI93717-01
Phosphate LR	0.00 to 2.50 mg/L	ascorbic acid	HI93713-01
Phosphorus	0.0 to 15.0 mg/L	amino acid	HI93706-01
Potassium HR	20 to 200 mg/L	turbidimetric tetraphenylborate	HI93750-01
Potassium MR	10 to 100 mg/L	turbidimetric tetraphenylborate	HI93750-01
Potassium LR	0.0 to 20.0 mg/L	turbidimetric tetraphenylborate	HI93750-01
Silica	0.00 to 2.00 mg/L	heteropoly blue	HI93705-01
Silver	0.000 to 1.000 mg/L	PAN	HI93737-01
Sulfate	0 to 100 mg/L	turbidimetric	HI93751-01
Zinc	0.00 to 3.00 mg/L	zincon	HI93731-01

Notes:

- † Method with chromium-sulfuric acid is officially recognized by EPA for wastewater analysis.
 * The HI93754F-25 and HI93754G-25 method follows the official method ISO 15705.
 ** This method is recommended for general purpose analysis with no chloride interference.
 * For Chlorine, liquid reagents also available.

Screen Features



- Data Logging
 - Up to 200 measurement readings can be logged and recalled for future use.



- Log Recall
 - Logged data can easily be recalled and the chemical form can be converted at the touch of a button.



- Method Selection
 - Users can easily select any one of the 47 measurement methods via the dedicated METHOD button.



- Help screen

11

Chemical Oxygen Demand

benchtop

11.7

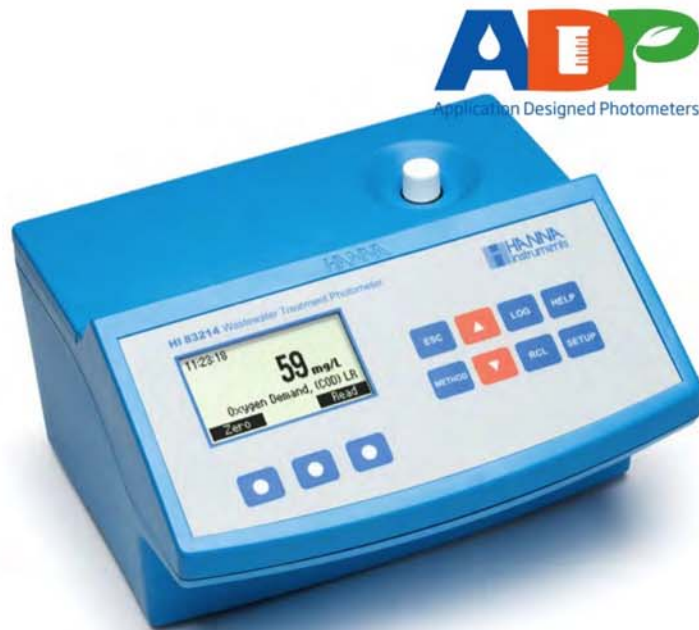
HI83214

COD Meter and Multiparameter Photometer

for Wastewater Analysis

- Backlit Graphic LCD Display
- Data Logging
 - Users can store up to 200 readings by simply pressing the LOG key. Logged readings are recalled by pressing the dedicated RCL button. Stored data includes parameter, test results, sample number, lot number, instrument ID, date and time.
- PC Connectivity
- Result Conversion
 - Eliminates confusion by automatically converting readings to other chemical forms. Common conversions are available at the touch of a button.
- On-screen Tutorial
- Built-in Timer
 - Display of time remaining before a measurement is taken. Ensures that all readings are taken at the appropriate reaction intervals for the test being performed.
- Error Messages
 - Messages on display alerting to problems including no cap, high zero, and standard too low.
- Cooling Lamp Indicator
 - To maintain the desirable wavelength to be used for absorbance, it is necessary to ensure components are not overheated from the heat generated by the tungsten lamp. Each photometer is designed to allow a minimal amount of time for components to cool.

From ammonia to phosphorus, the HI83214 benchtop photometer offers 15 measurement methods for different key water quality parameters including chemical oxygen demand (COD) in 3 different ranges. This photometer features an advanced optical system that uses special tungsten lamps, narrow band interference filters, and silicon photodetectors to ensure accurate photometric readings every time. The HI83214 uses a graphic backlit LCD that allows for an intuitive user interface, offering a tutorial mode that gives a step-by-step procedure for performing a measurement. The result obtained can be displayed in various chemical forms based on the user's preference.



Specifications	HI83214
Light Source	tungsten lamps with narrow-band interference filters
Light Detector	silicon photocell
Environment	0 to 50°C (32 to 122°F); RH max 90% non-condensing
Power Supply	external 12 VDC power adapter
Dimensions	235 x 200 x 110 mm (9.2 x 7.87 x 4.33")
Weight	0.9 kg (2 lbs.)

COD Test	Range	Method	Reagent Code
COD LR	0 to 150 mg/L	dichromate EPA† dichromate mercury-free** dichromate ISO*	HI93754A-25 HI93754D-25 HI93754F-25
COD MR	0 to 1500 mg/L	dichromate EPA† dichromate mercury-free** dichromate ISO*	HI93754B-25 HI93754E-25 HI93754G-25
COD HR	0 to 15000 mg/L	dichromate	HI93754C-25

Parameter	Range	Method	Reagent Code
Ammonia, LR	0.00 to 3.00 mg/L	Nessler	HI93764A-25
Ammonia, HR	0 to 100 mg/L	Nessler	HI93764B-25
Chlorine, Free	0.00 to 5.00 mg/L	DPD	HI93701-01, HI93701-03
Chlorine, Total	0.00 to 5.00 mg/L	DPD	HI93711-01, HI93711-03
Nitrate	0.0 to 30.0 mg/L	chromotropic acid	HI93766-50
Nitrogen, Total	0.0 to 25.0 mg/L	chromotropic acid	HI93767A-50
Nitrogen, Total HR	10 to 150 mg/L	chromotropic acid	HI93767B-50
Phosphorus, Reactive	0.00 to 5.00 mg/L	ascorbic acid	HI93758A-50
Phosphorus, Acid Hydrolyzable	0.00 to 5.00 mg/L	ascorbic acid	HI93758B-50
Phosphorus, Total	0.00 to 3.50 mg/L	ascorbic acid	HI93758C-50
Phosphorus, Reactive HR	0.0 to 100.0 mg/L	vanadomolybdophosphoric acid	HI93763A-50
Phosphorus, Total HR	0.0 to 100.0 mg/L	vanadomolybdophosphoric acid	HI93763B-50

Ordering Information HI83214-01 (115V) and HI83214-02 (230V) is supplied with glass cuvettes (5), 9V batteries (2), 12 VDC adapter and Instructions

Notes:
† Method with chromium-sulfuric acid is officially recognized by EPA for wastewater analysis.
* The HI93754F-25 and HI93754G-25 method follows the official method ISO 15705.
** This method is recommended for general purpose analysis with no chloride interference.


www.hannainst.com

HI93754

COD Certified Reagents

11

Chemical Oxygen Demand

certified reagents



HI93754A

Certified COD Reagents

Hanna COD reagents are available in the following formats:
Each box of 25 vials is supplied with a Hanna certificate of quality.
The reagents are traceable to NIST SRM® 930.

COD Test	Range	Method	Reagent Code
COD LR	0 to 150 mg/L	dichromate EPA†	HI93754A-25
		dichromate mercury-free**	HI93754D-25
		dichromate ISO°	HI93754F-25
COD MR	0 to 1500 mg/L	dichromate EPA†	HI93754B-25
		dichromate mercury-free**	HI93754E-25
		dichromate ISO°	HI93754G-25
COD HR	0 to 15000 mg/L	dichromate	HI93754C-25

- Three measurement ranges to satisfy every need
 - As COD levels vary depending on the application and process measuring points, Hanna offers reagents to cover three separate ranges. Simply choose the best range for the application:
 - low range: 0 to 150 mg/L O₂
 - medium range: 0 to 1500 mg/L O₂
 - high range: 0 to 15000 mg/L O₂
- Accurate and repeatable measurements
 - Hanna COD reagents have been developed in accordance with Standard Methods 5220D, USEPA 410.4 and ISO 15705:2002 methods.
- Pre-dosed vials
 - Hanna vials contain approximately 3 mL of pre-dosed reagent. The operator just needs to add a small quantity of the sample.
- Quick and accurate measurements
 - With pre-dosed vials, test preparation time is dramatically reduced. There is no time-consuming reagent preparation procedure or glassware cleaning.
- Safe reagents
 - Hanna COD reagents are safe for operators and the environment. Vials and caps have been designed to avoid accidental reagent spills. Due to the pre-dosed reagents, the amount of chemicals and handling time is minimized.



HI93754E



HI740215 Test Tube Cooling Rack

Notes:
* Method with chromium- sulfuric acid is officially recognized by EPA for wastewater analysis.
** Method follows the official method ISO 15705.
*** This method is recommended for general purpose analysis with no chloride interference.

11

Chemical Oxygen Demand

heating

HI839800

COD Test Tube Heater

with 25 Vial Capacity

- **Predefined Temperature Settings**
 - The test tube heater features two predefined temperature profiles at 150°C (221°F) and 105°C (301°F) that can be selected at the press of a button.
- **Temperature Alerts**
 - The HI839800 alerts users in the event that the temperature of the heating block is either above or below the set temperature. A timer icon reminds users to wait until the heating block has cooled or warmed up before inserting their samples.
- **Built-in Timer**
 - A built-in countdown timer of up to 180 minutes allows users to easily set the required digestion time by simply pressing the up and down arrows. Once a time has been set and the heating element is stable, a press of the START button begins the digestion procedure.
- **Status Indicator Lights**
 - Three LED lights are featured on the HI839800. A green LED indicates the heater has been turned on; a yellow LED indicates when the heater is actively heating up to a set temperature; a red LED indicates when the heater goes above 50°C, reminding the user that the aluminum element is hot.
- **Overheating Prevention**
 - The HI839800 contains a thermal fuse that prevents overheating. Should overheating occur, the heater automatically shuts down and all LED indicator lights turn off.
- **Reference Temperature Well**
 - In addition to the 25 vial capacity of the aluminum heating block, a small well is available for a temperature probe for users that wish to verify their heating block.
- **Two Operating Modes**
 - The HI839800 features two operating modes: idle and heating. Idle mode is the default mode in which the heater measures and displays the current temperature, target temperature, set reaction time, and an "idle" tag. Heating mode is activated when users press the START button; it starts when actively heating and continues during the countdown timer.
- **Continuous LCD Display**
 - The block temperature is continuously displayed on the easy to read LCD display, even when there is no active temperature program running. All relevant information in addition to temperature are easily visible during idle and heating mode.
- **Error Messages**
 - Messages on display alerting to problems including high or low temperature, hot surface, or heating system malfunction.

The HI839800 COD Test Tube Heater features two predefined temperature profiles: 150°C and 105°C. Digestions for chemical oxygen (COD) and total phosphorus are conducted at 150°C, while total nitrogen digestions are conducted at 105°C. The test tube heater automatically heats up to the set temperature, holding it until the countdown timer has finished. Once the timer has ended, a beep will sound and the heating element will turn off. The outer casing of the HI839800 remains cool to the touch, even during a timed digestion. An optional lab safety shield and test tube cooling rack provide a complete setup for sample digestions.



Outer casing stays cool to the touch!



HI740217
Lab Safety Shield



HI740216
Test Tube Cooling Rack

For safety, the optional HI740217 safety shield and HI740216 test tube cooling rack for the HI839800 are strongly recommended.

Specifications	HI839800
Temperature of Reaction	105°C or 150°C (221°F or 302°F)
Temperature Stability	±0.5°C (±0.9°F)
Temperature Range	-10°C to 160°C (14°F to 320°F)
Accuracy	±2°C (±3.6°F)
Capacity	25 vials (dia 16 x 100 mm), one receptacle for a stainless steel reference thermometer
Warm-up Time	10-15 minutes, depending on selected temperature
Operating Mode	timed (0 to 180 minutes) or infinity mode
Block	aluminum
Environment	5 to 50°C (41 to 122°F)
Power Supply (fuse protected)	HI839800-01: 115 VAC; 60 Hz; 250 W; HI839800-02: 230 VAC; 50 Hz; 250 W
Dimensions	190 x 300 x 95 mm (7.5 x 11.8 x 3.7")
Weight	approximately 4.8 kg (10.6 lb.)
Ordering Information	HI839800-01 (115V) and HI839800-02 (230V) is supplied with power cable and instructions.

11.10

HANNA
instruments | www.hannainst.com