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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 oxygen equivalent of the organic matter in the sample 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 digested in a vial under closed reflux conditions. Potassium hydrogen phthalate is used as reference standard for COD analysis. The theoretical COD for 1 mg of potassium hydrogen phthalate is 1.175 mg.

Moreover, 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.

Monitoring examples:

Test #	COD INFLUENT	COD EFFLUENT	COD REMOVAL
1	1214	451	62%
2	948	328	63%
3	1341	307	77%

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

$NH_4^+ + 3/2\ O_2 \xrightarrow{\text{nitrosomonas}} NO_2^- + 2\ H^+ + H_2O$

$NO_2^- + 1/2\ O_2 \xrightarrow{\text{nitrobacteria}} NO_3^-$

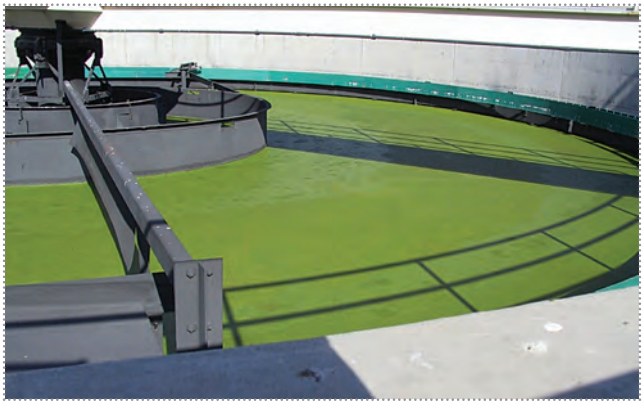
$NH_4^+ + 2\ O_2 \xrightarrow{\text{nitrobacteria}} NO_3^- + 2\ H^+ + H_2O$

Denitrification

$2NO_3^- + \text{carbon} \xrightarrow{\text{denitrobacteria}} N_2 + 3CO_2$

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



HI 83224

COD Meter and Multiparameter Photometer

11.4

The HI 83224* is a multiparameter bench photometer that includes 15 methods for the measurement of ammonia, COD, chlorine, nitrate, nitrogen and phosphorus.

The HI 83224 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.

**NOT FOR SALE IN THE UNITED STATES & GERMANY*

HI 83099

COD Laboratory Photometer

11.6

HI 83099 is one of the most versatile photometers on the market. In addition to COD, this meter measures up to 47 of the most important water quality parameters. The HI 83099 operates in three different ranges to cover virtually every COD application.

HI 839800

COD Test Tube Heater with 25 Vial Capacity

11.10

The HI 839800 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.

HI 83224

COD Meter and Multiparameter Photometer with Bar Code Recognition of Sample Vials

Application Designed Photometers

- Measures ammonia, chlorine, COD, nitrate, nitrogen and phosphorus
- Three operation modes: automatic, semi-automatic and manual
- Bar coded pre-dosed reagent vials
- On screen step-by-step tutorial
- Logs up to 200 samples
- Context sensitive help screen at a touch of a button
- USB connection

The HI 83224* is a multiparameter bench photometer that features 15 methods for measurement of ammonia, COD, chlorine, nitrate, nitrogen and phosphorus.

Automatic recognition of bar coded samples is an exciting feature of the HI 83224. This advanced meter scans each vial inserted into the vial holder and automatically identifies the sample method and range. This feature eliminates errors and simplifies the testing process.

The HI 83224 also features a powerful interactive user support system that assists users 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.

HI 83224 uses a new series of pre-dosed reagent vials for the 15 methods. Each reagent vial is bar coded with specific reagent information at our factory (with the exception of chlorine). This information is automatically scanned by the HI 83224 to assure that the vial and method are the same.

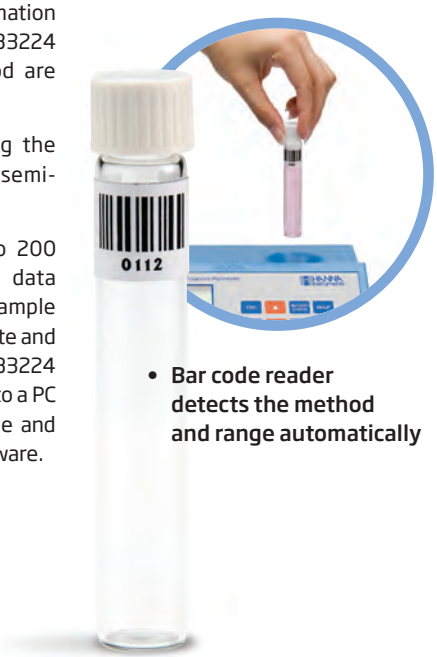
Users have the choice of operating the HI 83224 in automatic mode, semi-automatic mode and manual mode.

HI 83224 can log and recall up to 200 different measurements. Stored data includes parameter, test results, sample number, lot number, instrument id, date and time. For data management, the HI 83224 bench photometer can be connected to a PC via the optional HI 920013 USB cable and HI 92000 Windows® compatible software.

Avoid vial confusion and wrong samples with bar code identification

Sample vials inserted into the HI 83224 are identified using bar codes. The bar codes for different methods are shown in the table below. For parameters that don't use a bar coded reagents, the vials supplied with the instrument should be used. The bar code has 4 digits. The first 2 digits are for parameter identification and the second 2 digits are for reagent lot ID.

HI 83224 has a powerful interactive help system that assists the user during the analysis process. At a touch of a button, users can get detailed help tailored to the current information on the LCD. A tutorial mode is also available and can be accessed via the setup menu.



- Bar code reader detects the method and range automatically

PART CODE	METHOD	VIAL BAR CODE
HI 94764A-25	Ammonia, LR	01xx
HI 94764B-25	Ammonia HR	02xx
HI 93701-01	Chlorine, Free	N/A
HI 93711-01	Chlorine, Total	N/A
HI 94766-50	Nitrate	05xx
HI 94767A-50	Nitrogen, Total LR	16xx; 06xx
HI 94767B-50	Nitrogen, Total HR	17xx; 07xx
HI 94754A-25	Oxygen Demand, Chemical (COD) LR	12xx
HI 94754B-25	Oxygen Demand, Chemical (COD) MR	13xx
HI 94754C-25	Oxygen Demand, Chemical (COD) HR	24xx
HI 94758A-50	Phosphorus, Reactive	30xx
HI 94758B-50	Phosphorus, Acid Hydrolyzable	31xx
HI 94758C-50	Phosphorus, Total	32xx
HI 94763A-50	Phosphorus, Reactive HR	33xx
HI 94763B-50	Phosphorus, Total HR	34xx

Note: xx represents the reagent lot code.

*NOT FOR SALE IN THE UNITED STATES & GERMANY

SPECIFICATIONS	HI 83224
Light Source	tungsten lamps
Light Detector	silicon photocells with narrow-band interference filters
Data Logging	up to 200 samples
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)

Some analytical methods require digestion of the sample. For digestion of the vials, use the HANNA HI 839800 reactor only.

For safety, the optional HI 740217 safety shield and HI 740216 test tube cooling rack for the HI 839800 are strongly recommended.

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	HI 94764A-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	HI 94764B-25 (25 tests)
Chlorine, Free**	0.00 to 5.00 mg/L	0.01 mg/L from 0.00 to 0.99 mg/L; 0.1 mg/L above 0.99 mg/L	±0.03 mg/L or ±4% of reading	DPD	HI 93701-01 (100 tests) HI 93701-03 (300 tests)
Chlorine, Total**	0.00 to 5.00 mg/L	0.01 mg/L from 0.00 to 0.99 mg/L; 0.1 mg/L above 0.99 mg/L	±0.03 mg/L or ± 4% of reading	DPD	HI 93711-01 (100 tests) HI 93711-03 (300 tests)
Chemical Oxygen Demand LR	0 to 150 mg/L (as COD)	1 mg/L	±5 mg/L or ±5% of reading***	dichromate, mercuric sulfate, EPA*	HI 94754A-25 (25 tests)
Chemical Oxygen Demand MR	0 to 1500 mg/L (as COD)	1 mg/L	±15 mg/L or ±4% of reading***	dichromate, mercuric sulfate, EPA*	HI 94754B-25 (25 tests)
Chemical Oxygen Demand HR	0 to 15000 mg/L (as COD)	10 mg/L	±150 mg/L or ±3% of reading***	dichromate, mercuric sulfate, EPA*	HI 94754C-25 (25 tests)
Chemical Oxygen Demand LR	0 to 150 mg/L (ppm)	1 mg/L	±5 mg/L or ±5% of reading***	dichromate, mercury free◇	HI 94754D-25 (25 tests)
Chemical Oxygen Demand MR	0 to 1500 mg/L (ppm)	1 mg/L	±15 mg/L or ±4% of reading***	dichromate, mercury free◇	HI 94754E-25 (25 tests)
Chemical Oxygen Demand LR	0 to 150 mg/L (ppm)	1 mg/L	±5 mg/L or ±5% of reading***	dichromate, follows official method ISO 15705	HI 94754F-25 (25 tests)
Chemical Oxygen Demand MR	0 to 1000 mg/L (ppm)	1 mg/L	±15 mg/L or ±4% of reading***	dichromate, follows official method ISO 15705	HI 94754G-25 (25 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***	chromotropic acid	HI 94766-50 (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***	chromotropic acid	HI 94767A-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	HI 94767B-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	HI 94758B-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	HI 94758A-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	HI 94763A-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	HI 94758C-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	HI 94763B-50 (50 tests)

ORDERING INFORMATION

HI 83224-01 (115V) and **HI 83224-02** (230V) are supplied with sample vials (10), vial cleaning cloths (4), scissors and instruction manual.

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ACCESSORIES

HI 839800-01 HANNA reactor (115 VAC)
HI 839800-02 HANNA reactor (230 VAC)
HI 93703-50 Vial cleaning solution, 230 mL
HI 731318 Cloth for wiping vials (4)
HI 731340 200 µL automatic pipette
HI 731341 1000 µL automatic pipette
HI 731342 2000 µL automatic pipette
HI 731350 Tips for HI 731340 (25)
HI 731351 Tips for HI 731341 (25)
HI 731352 Tips for HI 731342 (4)
HI 740142P 1 mL graduated syringe (10 pcs)
HI 740143 1 mL graduated syringe (6 pcs)
HI 740144 Pipette tip (6 pcs)
HI 740157P Plastic refilling pipette (20 pcs)
HI 740216 Test tube cooling rack (25 holes)
HI 740217 Laboratory bench safety shield
HI 92000 Windows® compatible software
HI 920013 USB cable for PC connection

HI 731340 200 µL Automatic Pipette

Notes:
* Method with chromium-sulfuric acid is officially recognized by EPA for wastewater analysis.
◇ This method is recommended for general purpose analysis with no chloride interference.
** @ 25°C (77°F)
*** Whichever is greater

HI 83099

COD Meter and Multiparameter Photometer

Application Designed Photometers

- Easy COD measurement
- Outstanding measurement quality
- Save space in your laboratory
- PC compatible
- 47 methods

ORDERING INFORMATION

HI 83099-01 (115V) and **HI 83099-02** (230V) is supplied with glass cuvettes (3), cell protective cap, batteries, 12 VDC adapter and instructions.

SOLUTIONS

HI 93703-50	Cuvette cleaning solution, 230 mL

ACCESSORIES

HI 83099-100	Sample prep kit
HI 3898	Test kit for chloride concentration
HI 839800-01	HANNA reactor (115 VAC)
HI 839800-02	HANNA Reactor (230 VAC)
HI 151-00	Thermometer with stainless steel probe
HI 731318	Cuvette cleaning cloth (4)
HI 731321	Measurement cuvette (4)
HI 731325N	Cuvette cap (4)
HI 740216	Test tube cooling rack (25 tube capacity)
HI 740217	Laboratory bench safety shield
HI 92000	Windows® compatible application software
HI 920013	USB cable for PC connection

HI 83099 is one of the most versatile photometers on the market. In addition to COD, this meter measures up to 47 of the most important water quality parameters using liquid or powder reagents. The amount of reagent is precisely dosed to ensure maximum reproducibility.

HI 83099 bench photometer can be connected to a PC via a USB cable. The optional HI 92000 Windows® Compatible Software helps users manage their data.

HI 83099 features a powerful interactive user support that assists the user during each step of the analysis process. A tutorial mode is also available in the Setup Menu.

SPECIFICATIONS	HI 83099
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 or built-in rechargeable battery
Auto-off	after 10 min. of non-use in measuring mode. after 1 hour of non-use in calibration mode with last reading reminder
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 (ppm)	dichromate EPA‡ dichromate mercury-free◇◇ dichromate ISO◇	HI 93754A-25 HI 93754D-25 HI 93754F-25
COD MR	0 to 1500 mg/L (ppm) 0 to 1000 mg/L (ppm)	dichromate EPA‡ dichromate mercury-free◇◇ dichromate ISO◇	HI 93754B-25 HI 93754E-25 HI 93754G-25
COD HR	0 to 15000 mg/L (ppm)	dichromate	HI 93754C-25

WATER QUALITY TEST	RANGE	METHOD	REAGENT CODE†
Alkalinity	0 to 500 mg/L (ppm) as $CaCO_3$	bromocresol green	HI 93755-01
Aluminum	0.00 to 1.00 mg/L (ppm)	aluminon	HI 93712-01
Ammonia MR	0.00 to 10.00 mg/L (ppm)	Nessler	HI 93715-01
Ammonia LR	0.00 to 3.00 mg/L (ppm)	Nessler	HI 93700-01
Bromine	0.00 to 8.00 mg/L (ppm)	DPD	HI 93716-01
Calcium	0 to 400 mg/L (ppm)	oxalate	HI 937521-01**
Chlorine Dioxide	0.00 to 2.00 mg/L (ppm)	chlorophenol Red	HI 93738-01
Chlorine*, Free	0.00 to 2.50 mg/L (ppm)	DPD	HI 93701-01
Chlorine*, Total	0.00 to 3.50 mg/L (ppm)	DPD	HI 93711-01
Chromium VI HR	0 to 1000 µg/L	diphenylcarbohydrazide	HI 93723-01
Chromium VI LR	0 to 300 µg/L	diphenylcarbohydrazide	HI 93749-01
Color of Water	0 to 500 PCU	colorimetric platinum cobalt	–
Copper HR	0.00 to 5.00 mg/L (ppm)	bicinchoninate	HI 93702-01
Copper LR	0 to 1000 µg/L	bicinchoninate	HI 95747-01
Cyanuric Acid	0 to 80 mg/L (ppm)	turbidimetric	HI 93722-01
Fluoride	0.00 to 2.00 mg/L (ppm)	SPADNS	HI 93729-01
Hardness, Calcium	0.00 to 2.70 mg/L (ppm)	calmagite	HI 93720-01
Hardness, Magnesium	0.00 to 2.00 mg/L (ppm)	EDTA	HI 93719-01
Hydrazine	0 to 400 µg/L	p-dimethylaminobenzaldehyde	HI 93704-01
Iodine	0.0 to 12.5 mg/L (ppm)	DPD	HI 93718-01
Iron HR	0.00 to 5.00 mg/L (ppm)	phenantroline	HI 93721-01
Iron LR	0 to 400 µg/L	TPTZ	HI 93746-01**
Magnesium	0 to 150 mg/L (ppm)	calmagite	HI 937520-01**
Manganese HR	0.0 to 20.0 mg/L (ppm)	periodate	HI 93709-01
Manganese LR	0 to 300 µg/L	PAN	HI 93748-01**
Molybdenum	0.0 to 40.0 mg/L (ppm)	mercaptoacetic acid	HI 93730-01
Nickel HR	0.00 to 7.00 g/L	photometric	HI 93726-01
Nickel LR	0.000 mg/L to 1.000 mg/L (ppm)	PAN	HI 93740-01**
Nitrate	0.0 to 30.0 mg/L (ppm)	cadmium reduction	HI 93728-01
Nitrite HR	0 to 150 mg/L (ppm)	ferrous sulfate	HI 93708-01
Nitrite LR	0.00 to 0.35 mg/L (ppm)	diazotization	HI 93707-01
Oxygen, Dissolved (DO)	0.0 to 10.0 mg/L (ppm)	Winkler	HI 93732-01
Ozone	0.00 to 2.00 mg/L (ppm)	DPD	HI 93757-01
pH	6.5 to 8.5 pH	phenol red	HI 93710-01
Phosphate HR	0.0 to 30.0 mg/L (ppm)	amino acid	HI 93717-01
Phosphate LR	0.00 to 2.50 mg/L (ppm)	ascorbic acid	HI 93713-01
Phosphorus	0.0 to 15.0 mg/L (ppm)	amino acid	HI 93706-01
Potassium HR	20 to 200 mg/L (ppm)	turbidimetric tetraphenylborate	HI 93750-01
Potassium MR	10 to 100 mg/L (ppm)	turbidimetric tetraphenylborate	HI 93750-01
Potassium LR	0.0 to 20.0 mg/L (ppm)	turbidimetric tetraphenylborate	HI 93750-01
Silica	0.00 to 2.00 mg/L (ppm)	heteropoly blue	HI 93705-01
Silver	0.000 to 1.000 mg/L (ppm)	PAN	HI 93737-01**
Sulfate	0 to 150 mg/L (ppm)	turbidimetric	HI 93751-01
Zinc	0.00 to 3.00 mg/L (ppm)	zincon	HI 93731-01

HI 3898

Chloride Test Kit

Quick Chloride Tests

The HI 3898 is a chloride concentration test kit developed according to the ISO 15705:2002 method.

This very important test is recommended by ISO, since an excessive presence of chloride can interfere with the COD analysis.

This test gives a fast YES/NO reply to the question if chloride will interfere with the COD analysis. If chloride concentration is greater than the official maximum level, the solution turns yellow and the sample needs to be diluted before performing the COD test, otherwise if the solution is orange-brown, the sample doesn't need to be diluted.

The maximum level allowed is 1000 ppm of Cl^- following ISO methods, or 2000 ppm of Cl^- for US EPA, APHA, AWWA and WEF methods.

SPECIFICATIONS	HI 3898
Range	1000 ppm Cl^- (ISO) 2000 ppm Cl^- (EPA)
Analysis Method	visual evaluation
Sample Volume	2 mL
Number of Tests	100
Dimensions	120 x 110 x 90 mm (4.7 x 4.3 x 3.5")
Weight	200 g (7.0 oz.)

ORDERING INFORMATION

HI 3898 is supplied with 25 mL chloride titrant (4), chloride Indicator 7 mL (1), glass cuvette with plastic stopper (1) and calibrated syringes of 1.0 mL with tip (2).

SOLUTIONS

HI 93703-50 Cuvette cleaning solution, 230 mL

Notes:
‡ Method with chromium-sulfuric acid is officially recognized by EPA for wastewater analysis.
◇ The HI 93754F-25 and HI 93754G-25 method follows the official method ISO 15705.
◇◇ This method is recommended for general purpose analysis with no chloride interference.
† Unless noted otherwise, all reagent codes ending with -01 are for 100 tests. Replace the -01 with -03 for 300 tests.
* For Chlorine, liquid reagents are available.
** Reagents for 50 tests, replace -01 for -03 for 150 tests

HI 83214

COD Meter and Multiparameter Photometer for Wastewater Analysis

Application Designed Photometers

- **Easy COD measurement**

  HI 83214 multiparameter photometer is pre-calibrated to measure COD levels at three ranges at the touch of a key pad.

- **Outstanding measurement quality**

  An advanced optical system assures high accuracy measurements throughout the entire range.

- **Save space in your laboratory.**

  The compact size of the HI 83214 allows users to eliminate the clutter of bulky and costly spectrophotometers.

The HI 83214 multiparameter photometer is a compact instrument featuring different ranges and methods, suitable for a wide range of applications.

HI 83214 is designed and built to perform COD analysis in accordance with EPA 410.4 and ISO 15705:2002 standards. Ensuring accurate and repeatable results, it is the ideal tool for documenting waste treatment processes.

Besides the fundamental parameter of COD, H 83214 also measures total ammonia, free and total chlorine, nitrate, nitrogen and total reactive phosphorus.

HI 83214 allows for a complete wastewater analysis in a single, powerful instrument.

SPECIFICATIONS	HI 83214
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 or built-in rechargeable battery
Auto-off	after 10 min. of non-use in measuring mode. after 1 hour of non-use in calibration mode with last reading reminder
Dimensions	235 x 200 x 110 mm (9.2 x 7.87 x 4.33")
Weight	0.9 Kg (2 lbs.)

PARAMETER	RANGE	METHOD	REAGENT CODE
Ammonia, LR	0.00 to 3.00 mg/L	Nessler	HI 93764A-25
Ammonia, HR	0 to 100 mg/L	Nessler	HI 93764B-25
Chlorine, Free	0.00 to 5.00 mg/L	DPD	HI 93701-01, HI 93701-03
Chlorine, Total	0.00 to 5.00 mg/L	DPD	HI 93711-01, HI 93711-03
Nitrate	0.0 to 30.0 mg/L	Chromotropic acid	HI 93766-50
Nitrogen, Total	0.0 to 25.0 mg/L	Chromotropic acid	HI 93767A-50
Nitrogen, Total HR	10 to 150 mg/L	Chromotropic acid	HI 93767B-50
COD LR, EPA*	0 to 150 mg/L	Dichromate	HI 93754A-25
COD MR, EPA*	0 to 1500 mg/L	Dichromate	HI 93754B-25
COD HR	0 to 15000 mg/L	Dichromate	HI 93754C-25
COD LR, Mercury-free†	0 to 150 mg/L	Dichromate, mercury-free	HI 93754D-25
COD MR, Mercury-free†	0 to 1500 mg/L	Dichromate, mercury-free	HI 93754E-25
COD LR, ISO**	0 to 150 mg/L	Dichromate	HI 93754F-25
COD MR, ISO**	0 to 1000 mg/L	Dichromate	HI 93754G-25
Phosphorus, Reactive	0.00 to 5.00 mg/L	Ascorbic acid	HI 93758A-50
Phosphorus, Acid Hydrolyzable	0.00 to 5.00 mg/L	Ascorbic acid	HI 93758B-50
Phosphorus, Total	0.00 to 3.50 mg/L	Ascorbic acid	HI 93758C-50
Phosphorus, Reactive HR	0.0 to 100.0 mg/L	Vanadomolybdophosphoric acid	HI 93763A-50
Phosphorus, Total HR	0.0 to 100.0 mg/L	Vanadomolybdophosphoric acid	HI 93763B-50

ORDERING INFORMATION

HI 83214-01 (115V) and **HI 83214-02** (230V) is supplied with glass cuvettes (5), batteries, 12 VDC adapter and instructions

SOLUTIONS

HI 93703-50 Cuvette cleaning solution, 230 mL

ACCESSORIES

HI 3898 Chloride concentration test kit
HI 839800-01 HANNA reactor (115 VAC)
HI 839800-02 HANNA reactor (230 VAC)
HI 151-00 Thermometer with stainless steel probe
HI 731311 Cuvettes with caps for HI 83214 (15)
HI 731318 Cuvette cleaning cloth (4)
HI 731340 200 µL automatic pipette
HI 731341 1000 µL automatic pipette
HI 731342 2000 µL automatic pipette
HI 731350 Tips for 200 µL automatic pipette (25)
HI 731351 Tip for 1000 µL automatic pipette (25)
HI 731352 Tip for 2000 µL automatic pipette (4)
HI 740216 Test tube cooling rack (25 capacity)
HI 740217 Laboratory bench safety shield
HI 740219 COD test tube adapter for HI 83099
HI 92000 Windows® compatible application software
HI 920013 USB cable for PC connection

Notes:
* Method with chromium-sulfuric acid is officially recognized by EPA for wastewater analysis.
** The HI 93754F-25 and HI 93754G-25 method follows the official method ISO 15705.
† This method is recommended for general purpose analysis with no chloride interference

HANNA instruments

With Great Products, Come Great Results™

Certified COD Reagents

HANNA COD reagents are available in the following formats:

CODE	DESCRIPTION	METHOD	RANGE
HI 93754A-25	low range	EPA*	0 to 150 mg/L (ppm)
HI 93754B-25	medium range	EPA*	0 to 1500 mg/L (ppm)
HI 93754C-25	high range	EPA*	0 to 15000 mg/L (ppm)
HI 93754D-25	low range	Mercury-free***	0 to 150 mg/L (ppm)
HI 93754E-25	medium range	Mercury-free***	0 to 1500 mg/L (ppm)
HI 93754F-25	low range	ISO 15705**	0 to 150 mg/L (ppm)
HI 93754G-25	medium range	ISO 15705**	0 to 1000 mg/L (ppm)
HI 93754H-25	low range	–	0 to 150 mg/L (ppm)

Each box of 25 vials is supplied with a HANNA certificate of quality.

The reagents are traceable to NIST SRM® 930.

HANNA also produces mercury-free reagents to be used for analyzing samples without chloride.

- **Three measurement ranges to satisfy each 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 O_2
  medium range: 0 to 1500 mg/L or 0 to 1000 mg/L O_2
  high range: 0 to 15000 mg/L O_2

- **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 approx. 3 mL of pre-dosed reagent. The operator just needs to add a small quantity of the sample - 2 mL for LR and MR, and 0.2 mL for HR analysis.

- **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 is minimized.

HI 740216 Test Tube Cooling Rack

Notes:
* Method with chromium-sulfuric acid is officially recognized by EPA for wastewater analysis.
** The HI 93754F-25 and HI 93754G-25 method follows the official method ISO 15705.
*** This method is recommended for general purpose analysis with no chloride interference.

HI 839800

COD Test Tube Heater with 25 Vial Capacity

- **Low temperature alert**

  Appears when the block is warming up. It alerts the user that the temperature is below the set value.
- **High temperature alert**

  Appears when the block is warming up. It alerts the user that the temperature is above the set value.
- **Countdown timer**

  Shows time remaining until the heating element shuts off.

The HI 839800 COD reactor is constructed of durable materials. The aluminum block incorporates a 25-vial capacity and a well for a reference temperature probe.

The HI 839800 COD reactor is an easy to use test tube heater. Its well-marked user interface provides intuitive operation. The reactor is equipped with two predefined temperature settings: 150° and 105°C. COD and total phosphorus digestions are conducted at 150°C, and total nitrogen digestions are at the 105°C.

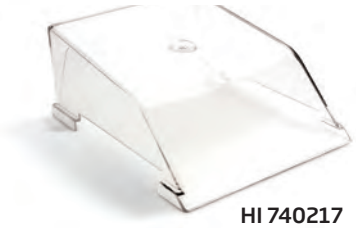
In addition, the HI 839800 has 3 LED's for visual indication. A green LED indicates power, a blinking red LED warns the user of a hot heater block (above 50°C), and a yellow LED indicates heating.

A three hour countdown timer is also incorporated to control timed digestions. When the countdown timer expires, a beep will sound and the heating element will turn off.

The reactor contains a thermal fuse that prevents overheating by turning off the heating element.

Block tempertaure is continuously displayed on the LCD even when there is no active temperature program running.

Outer casing stays cool to the touch!



HI 740217
Lab Safety Shield

HI 740216
Test Tube Cooling Rack

SPECIFICATIONS	HI 839800
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)	HI 839800-01: 115 VAC; 60 Hz; 250 W HI 839800-02: 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

HI 839800-01 (115V) and **HI 839800-02** (230V) is supplied with power cable and instructions.

ACCESSORIES

HI 740216	Test tube cooling rack (25 tube capacity)
HI 740217	Laboratory bench safety shield
HI 151-00	Electronic thermometer for reactor (°C)
HI 151-01	Electronic thermometer for reactor (°F)