Hach astroTOC UV Process TOC Analyzer

Application—for industrial process water and wastewater

The chemical/petrochemical industries have numerous applications for on-line Total Organic Carbon (TOC) analysis, although the pharmaceutical, sugar, food and beverage industries have applications as well.

The primary application is chemical and petrochemical plants which use large amounts of water for processing product. These plants are organized into business units that are responsible for the production of a particular chemical product. Water is heated in the boiler to create steam that is used for power generation, and cracking hydrocarbons in preparation for further processing. Once the steam is used for heating in the production process, the TOC levels are measured to determine if they are low enough for the steam to be repolished and recirculated to avoid the high cost of the initial clean-up. If TOC levels in the steam exceed the limit for repolishing, then it is sent to waste. This application is commonly known as "Return Condensate TOC".

Water from a natural source is used to cool the product in the heat exchanger and a TOC measurement is taken to detect organic carbon compounds for early detection of process leaks and determine if the water can be returned to it's origin or must be sent to waste for clean up. This application is known as "Cooling Water TOC".

The unit outfall application is a TOC measurement taken at the outfall of the business unit. This water has been in contact with the process, contaminated and sent directly into the wastewater treatment plant. If the TOC levels indicate a spill condition, the business unit notifies the treatment plant of an incoming high TOC concentration waste stream. Operators can divert the stream into a holding tank or pond, to be released later into the treatment process at a controlled rate. The unit outfall TOC measurement assures the business unit is charged fairly for the clean up.

Industrial design

The Hach astroTOC UV Process TOC Analyzer is a rugged, low-maintenance analyzer designed to withstand the most severe conditions. Designed as a true process analyzer, it features a dual-compartment enclosure that separates and protects the electronics from the analytical section.

Modular construction, a streamlined design and large-bore flow paths simplify maintenance and service. For severe applications, an optional self-cleaning blowback filter removes large particles from sample lines, and an optional air purifier improves the quality of the compressed air supply by removing CO_2. The modular design also offers a broad spectrum of factory-set analysis ranges.

Advanced diagnostics

The Hach astroTOC UV Process TOC Analyzer features advanced diagnostics that help protect the analyzer during process spill conditions. Loss of sample and loss of UV reactor flow are standard integrated diagnostic features, as well as loss of sparger flow, loss of carrier gas, and pump tube deterioration. Optional alarms for reagent levels and enclosure spills are also available.

During a spill event, operators can attend to other instruments while the astroTOC UV remains protected. A programmable process spill threshold automatically takes the instrument off-line and into auto-clean mode when TOC readings exceed this threshold. The instrument auto recovers and returns to standard operation when TOC measurements return to acceptable levels.

The Hach astroTOC UV Process TOC Analyzer

- Industrial design withstands the most severe conditions
- Advanced diagnostics
- Flexible analysis system allows analysis of high salt and hard-to-oxidize samples
- Based on the proven Astro process TOC analyzer platform
- Drift- and interference-free NDIR detector with PVDF (KYNAR) flow-through cell is impervious to corrosion

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Flexible analysis system

The astroTOC UV Analyzer features dual-range non-dispersive infrared (NDIR) CO_2 detection with a multi-staged UV lamp reactor and on-board sample dilution. These features enable high salt, high suspended solids, and hard-to-oxidize sample analysis. While the analyzer is factory-set for a single range, it can be easily adapted to a broad and flexible selection of ranges, from 0-5 mg/L to 0-20,000 mg/L.

Based on an established platform

The Hach astroTOC UV Process TOC Analyzer was designed and manufactured based on more than 25 years of industry-leading TOC analysis experience. With hundreds of installations worldwide, this analyzer was developed with input from many end users and our extensive global service network.

Principle of operation

The astroTOC UV Analyzer combines chemical and ultraviolet oxidation techniques in a low-temperature reactor to deliver direct TOC measurements. It uses a multi-staged UV oxidation reactor and a chemically impervious non-dispersive infrared (NDIR) CO_2 detector system, assuring full compliance with *Standard Methods* 5310 C and EPA method 415.1.

In the first analysis step, the sample is mixed with acid, converting the total inorganic carbon (TIC) into CO_2. The TIC sparger removes all the CO_2 from the sample solution. Subsequently, the TIC-free sample is mixed with sodium persulfate and routed through the UV reactor, oxidizing the TOC into CO_2. The gas/liquid mixture is transported by the carrier gas into the gas-liquid separator (GLS), where the sample gas is separated and diverted into the NDIR detector for the direct, interference-free CO_2 measurement. The resulting CO_2 concentration measurement is directly proportional to the original TOC concentration found in the sample. The front panel displays the TOC concentration in mg/L.

Detection method

ASTM, EN, EPA, ISO and Standard Methods recommend TOC analysis methods using NDIR detection. This technique provides stable, accurate measurement by detecting CO_2 gas. The detector performs CO_2 measurement and compares it against a reference measurement. The difference between the two measurements is equal to the concentration of CO_2 present in the cell.

The NDIR measurement rays in the astroTOC UV Analyzer follow a direct path to a concave mirror and a bundled path back to the receiver. This avoids the inherent drawbacks of the wall-bounce path, including loss of sensitivity and inaccurate measurement due to the interference of dust particles or water droplets on the NDIR cell wall.

Non-corrosive NDIR detector

The cell body of the astroTOC UV NDIR detection system is made of PVDF (KYNAR) that is impervious to corrosion. The mirror and window are made of sapphire, which is less susceptible to scratching and therefore helps to provide a continuously accurate measurement.

Hach astroTOC UV Process TOC Analyzer Specifications*

Range
0-5 up to 20,000 mg/L TOC

Accuracy
± 2% of full scale, non-diluted ranges at 25° C (77° F)
± 4% of full scale, diluted ranges at 25° C (77° F)

Repeatability
± 2% of reading, non-diluted ranges at 25° C (77° F)
± 4% of reading, diluted ranges at 25° C (77° F)

Minimum Detection Limit
≤0.015 mg/L for range 0-5 mg/L at 25° C (77° F)

Response Time
T90 ≤ 8 minutes (includes TIC sparging and may vary according to range)

Inlet Pressure
0.15-6 bar (2-87 psig)

Flow Rate
20-200 mL/min

Sample Temperature Range
2° C to 70° C (36° F to 158° F)

Operating Temperature Range
5° C to 40° C (41° F to 104° F)

Recorder Outputs
Two 4-20 mA analog outputs selectable for sample concentration, analyzer system warning or auto range indication

Alarms
Five relays selectable for sample concentration alarm, analyzer system warning or analyzer system shutdown alarm. Each is equipped with an SPDT relay with contacts rated for 3A resistive load at 250 VAC or 0.5A at 30V.

Optional Serial Communication
One multi-function RS232 or RS485 serial port (ModBUS, CSV)

Power
115/230 VAC 50/60 Hz (switch selectable)
300 VA maximum

Sample Inlet/Outlet Connection
1/4-inch OD tube, compression fitting

Drain Connection
1 1/2-inch OD standard drain pipe

Carrier Gas
1/8-inch OD tube, compression fitting
Clean, CO_2-free air or Nitrogen at 2.8-6.2 bar (40-90 psig)

Compliance/Certification
CE certified, listed to UL and CSA safety standards by ETL
Standard Methods 5310 C, EPA 415.1

Enclosure
Cold Rolled Steel epoxy powder coated
Optional Stainless Steel

Dimensions
Approximately 981 mm (38.6 inches) tall, 675 mm (26.6 inches) wide, 220 mm (8.7 inches) deep

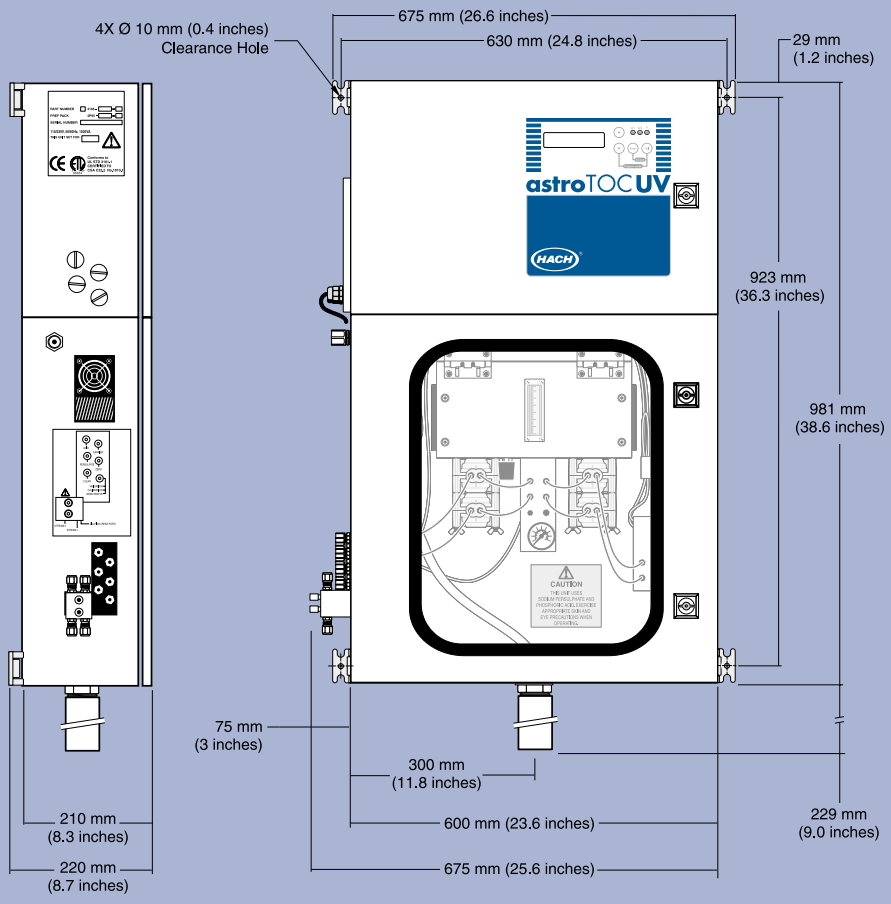
Mounting
Wall mount

Shipping Weight
120 lbs. (54 kg)

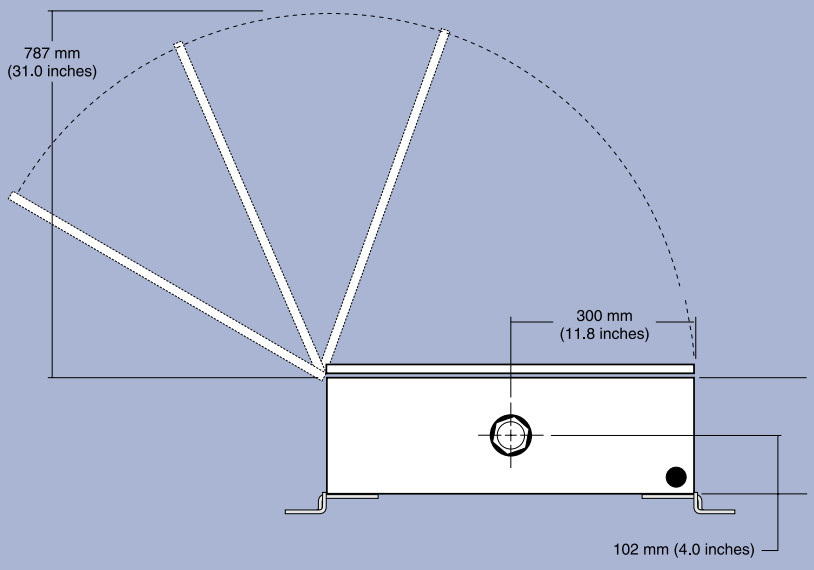
*Subject to change without notice.

Installation

The Hach astroTOC UV Analyzer is designed to be wall-mounted easily with four 10 mm (3/8-inch) screws. Adequate clearance must be left at the sides and bottom of the enclosure for plumbing and electrical connections. The sample inlet connection is 6 mm (1/4-inch) OD tube compression fitting and the drain connection is 1 1/2-inch OD standard drain pipe. Electrical connections are inside the instrument. Four thru-holes for 1/2" conduit fittings or four PG13.5 strain relief are provided.



SIDE VIEW **FRONT VIEW**



BOTTOM VIEW

How to Order

Hach astroTOC UV Analyzers are shipped with a start-up kit and a manual. An analyzer and a preference package part number must be selected.

Analyzers

Cold Rolled Steel	Stainless Steel	
H-4195-1010	H-4195-3010	HACH astroTOC UV, 0 - 5 mg/l Range, 1 UV Lamp
H-4195-1020	H-4195-3020	HACH astroTOC UV, 0 - 10 mg/l Range, 1 UV Lamp
H-4195-1030	H-4195-3030	HACH astroTOC UV, 0 - 25 mg/l Range, 1 UV Lamp
H-4195-1040	H-4195-3040	HACH astroTOC UV, 0 - 50 mg/l Range, 1 UV Lamp
H-4195-1050	H-4195-3050	HACH astroTOC UV, 0 - 100 mg/l Range, 1 UV Lamp
H-4195-1060	H-4195-3060	HACH astroTOC UV, 0 - 200 mg/l Range, 1 UV Lamp, Dilution
H-4195-1070	H-4195-3070	HACH astroTOC UV, 0 - 500 mg/l Range, 1 UV Lamp, Dilution
H-4195-2000	H-4195-4000	HACH astroTOC UV, 0 - 100 mg/l Range, 2 UV Lamps
H-4195-2010	H-4195-4010	HACH astroTOC UV, 0 - 200 mg/l Range, 2 UV Lamps
H-4195-2020	H-4195-4020	HACH astroTOC UV, 0 - 500 mg/l Range, 2 UV Lamps
H-4195-2030	H-4195-4030	HACH astroTOC UV, 0 - 1000 mg/l Range, 2 UV Lamps
H-4195-2040	H-4195-4040	HACH astroTOC UV, 0 - 1000 mg/l Range, 2 UV Lamps, Dilution
H-4195-2050	H-4195-4050	HACH astroTOC UV, 0 - 2000 mg/l Range, 2 UV Lamps, Dilution
H-4195-2060	H-4195-4060	HACH astroTOC UV, 0 - 5000 mg/l Range, 2 UV Lamps, Dilution
H-4195-2070	H-4195-4070	HACH astroTOC UV, 0 - 10000 mg/l Range, 2 UV Lamps, Dilution
H-4195-2080	H-4195-4080	HACH astroTOC UV, 0 - 20000 mg/l Range, 2 UV Lamps, Dilution

Preference Packages

115V	230V	
4P95-1000-00	4P95-2000-00	Cold Rolled Steel (no charge)
4P95-1001-00	4P95-2001-00	Cold Rolled Steel, Level Detection Kit
4P95-1010-00	4P95-2010-00	Cold Rolled Steel, Additional UV Lamp
4P95-1011-00	4P95-2011-00	Cold Rolled Steel, Additional UV Lamp/Level Detection Kit
4P95-1100-00	4P95-2100-00	Cold Rolled Steel, View Window
4P95-1101-00	4P95-2101-00	Cold Rolled Steel, View Window/Level Detection Kit
4P95-1110-00	4P95-2110-00	Cold Rolled Steel, View Window/Additional UV Lamp
4P95-1111-00	4P95-2111-00	Cold Rolled Steel, View Window/Additional UV Lamp/Level Detection Kit
4P95-1300-00	4P95-2300-00	Stainless Steel, View Window (no charge)
4P95-1301-00	4P95-2301-00	Stainless Steel, View Window/Level Detection Kit
4P95-1310-00	4P95-2310-00	Stainless Steel, View Window/Additional UV Lamp
4P95-1311-00	4P95-2311-00	Stainless Steel, View Window/Additional UV Lamp/Level Detection Kit

Accessories

120161	Free-standing Rack Assembly
200123	astroTOC UV, 1 Yr. Spare Parts Kit
200124	astroTOC UV , 2 Yr. Spare Parts Kit
4000-0011	Z-Purge, LF/RT Mount, CL1 DIV2, A-D requires P/N 200130 Pneumatic Condenser Cooler Kit
4200-1001	PS200, Blowback Filter, FM 100 µm
4200-1002	PS200, Blowback Filter, FM 50 µm
4200-1003	PS200, Blowback Filter, FM 300 µm
4200-1004	PS200, Blowback Filter, FM 25 µm
4200-1005	PS200, Blowback Filter, FM 500 µm
4300-0001	AAS 300 CO2 Air Purifier with Electronic Timer for use with Compressed Air, 115V
4300-0002	AAS 300 CO2 Air Purifier with Electronic Timer for use with Compressed Air, 230V
4300-0003	AAS 300 CO2 Air Purifier with Pneumatic Timer for use with Compressed Air

Typical Proposal Specification

The TOC analyzer shall employ UV/Persulfate oxidation utilizing a multi-staged UV-Reactor coupled with a NDIR CO_2 detection system to measure TOC.

In addition, the analyzer shall consist of the following:

- Dual enclosures with analytical/electrical separation
- Epoxy powder-coated cold rolled steel, enclosure
- Compliance with Standard Methods 5310 C and EPA Method 415.1
- Grab sample and validation utilities for unknown sample or reference standard measurement
- User programmable auto calibration, auto validation, and auto cleaning
- Loss of sample flow and reactor feed detection
- Hinged pump assembly module
- Two 4-20 mA parameter mapped analog outputs
- User programmable auto ranging over four ranges
- Five-volt, free--function mapped relay outputs
- One optional RS232 or RS485 serial communication output (ModBUS, CSV)
- CE certified, listed to UL & CSA Safety Standards by ETL

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