



TOC-V Series

Shimadzu
Total Organic Carbon Analyzer



Shimadzu's World-leading TOC Analyzers

Total solutions for all aims and conditions
Comprehensive 8-model line-up for both laboratory
and on-line use

Comprehensive selection of options enables the analysis of a wide range of samples, including ultrapure water and polluted water, as well as solid and gas samples.

Laboratory Models

Combustion catalytic oxidation/NDIR method

TOC-Vcsh



Standalone
high-sensitivity model

TOC-Vcsn



Standalone
standard model

TOC-Vcph



PC-controlled
high-sensitivity model

TOC-Vcpn



PC-controlled
standard model

TOC-VE



Standalone

Option

Auto sampler ASI-V



(Reference page : P12)

8-Port Sampler OCT-1



(Reference page : P13)

TOC has been adopted in various fields as an accurate quick indicator of total organic content.

- Study and monitoring of organic contamination of rivers, lakes, dams, and other water in the natural water cycle.
- Water quality control of industrial effluent and sewage plant effluent and operation management for effluent processing.
- Process control of the organic content in water at all types of factory.
- Environmental and biotechnology research and R&D at test organizations.
- Control of purified or recycled water for the semiconductor, pharmaceutical, water-washing system, or nuclear power industries.
*Compliance with FDA 21 CFR part 11 (CPH, CPN, and WP models).
- Study and monitoring of the degree of contamination of soil, sludge, and sediments.

On-line Models

Wet chemical oxidation/NDIR method

Combustion catalytic oxidation/NDIR method

TOC-Vws

TOC-VWP

ON-LINE TOC-Vcsh



TN (Total Nitrogen Unit) TNM-1

Solid sample combustion unit SSM-5000A



(Reference page : P14)



(Reference page : P15)

Total Organic Carbon Measurement is

Combustion catalytic oxidation/NDIR method

TOC-Vcs

TOC-VCP

The key point about a TOC analyzer is whether it can efficiently oxidize hard-to-decompose insoluble and macromolecular organic compounds, not just the easily decomposed, low molecular weight, organic compounds.

The 680°C combustion catalytic oxidation method, that was developed by Shimadzu and subsequently spread round the world, can efficiently analyze all organic compounds.

Example: TOC Oxidation Performance Evaluation Test

Evaluation using the method prescribed in the European Standard, Determination of samples containing particles (EN1484 Annex C).

- Test solution: TOC 100 mgC/L suspension of 20 to 100µm cellulose (Ultrasonic treatment should not be used.)
- Measurement method: 3 repeated measurements during stir with a magnetic stirrer.
- Evaluation criteria: Mean measured value between 90 and 110 mgC/L. CV (coefficient of variation) should be < 10%.

Test results

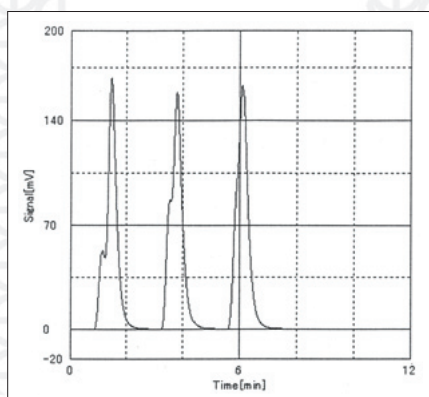
Using TOC-VCPH

Mean measured value: 98.64 mgC/L CV: 2.43%

Using TOC-VCPH + ASI-V (incorporating magnetic stirrer)

Mean measured value: 99.41 mgC/L CV: 1.70%

Proof of accurate measurement of cellulose suspension with high recovery



Extremely wide range from 4µg/L to 25,000 mg/L for applications from ultrapure water to highly contaminated water.

- Combination of highly sensitive NDIR with a high-volume sample combustion system achieves sub-10 µg/L level TOC analysis.
- Specify the blank check program to automatically conduct the blank check by creating and analyzing ultrapure water inside the system.
- High concentration samples are analyzed by diluting to 25,000 mg/L by the built-in automatic dilution function.

Simultaneous TOC and TN (Total Nitrogen) analysis (with TN unit).

Note: In the case of simultaneous TOC and TN analysis, TOC high sensitivity analysis using high sensitivity catalyst is impossible.

Use compressed air

(with carrier gas purification kit).

Analyze gas and solid samples as well as liquids

(with gas sample injection kit or solid sample combustion unit).

Shimadzu's Forte

Combustion catalytic oxidation/NDIR method

TOC-VE

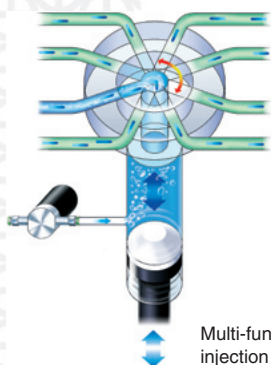
Basic model, incorporating all essential functions. TOC analyzer with priority on easy measurement through manual sample injection and simple operations.



Further evolution of the automatic sample injection system

Syringe with sparging function

- Efficient, automatic acidification and sparging for NPOC measurements reduces measurement time by approximately 40% (compared with other Shimadzu products).
- Automatic dilution reduces salinity, acidity, and alkalinity to considerably extend the maintenance period for the catalyst and combustion tube. (Maintenance period depends on the sample and measurement conditions.)
- Dual flow line washing methods: rinsing with sample or rinsing with dilution water.
- Sample intake tubes provided for individual TOC analyzer measurements during Autosampler use.



Multi-function sample pretreatment / injection system

The essential part of the system - the combination of 680°C combustion catalytic oxidation with newly designed high-sensitivity NDIR - is identical to TOC-VCS/CP.

Simple analysis using an LCD and keyboard designed for ease of operation.

System can be upgraded with a TN unit (for simultaneous TOC and TN measurements).

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Special Accessories

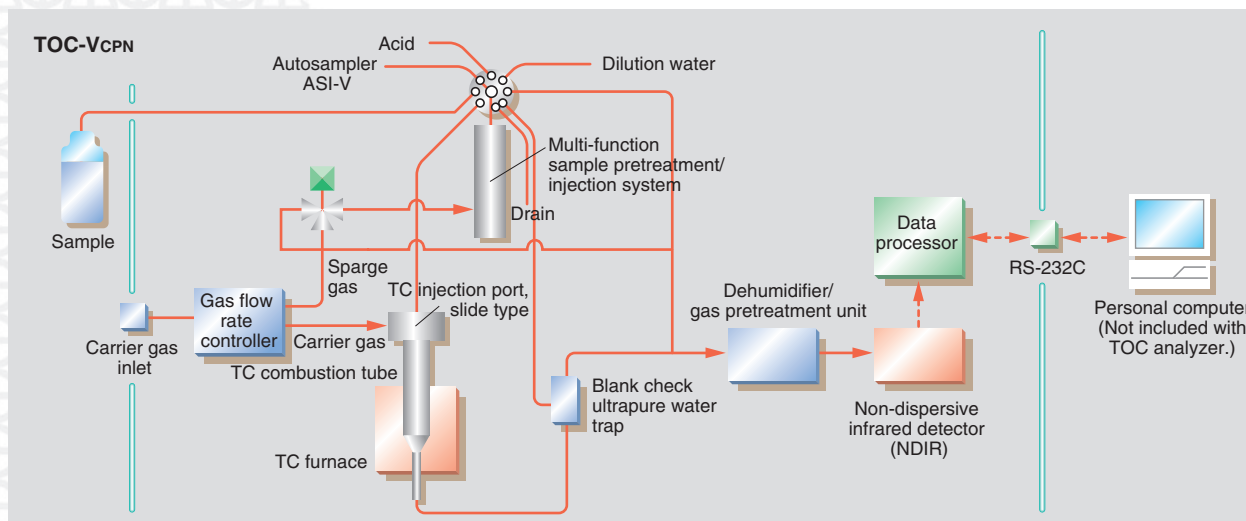
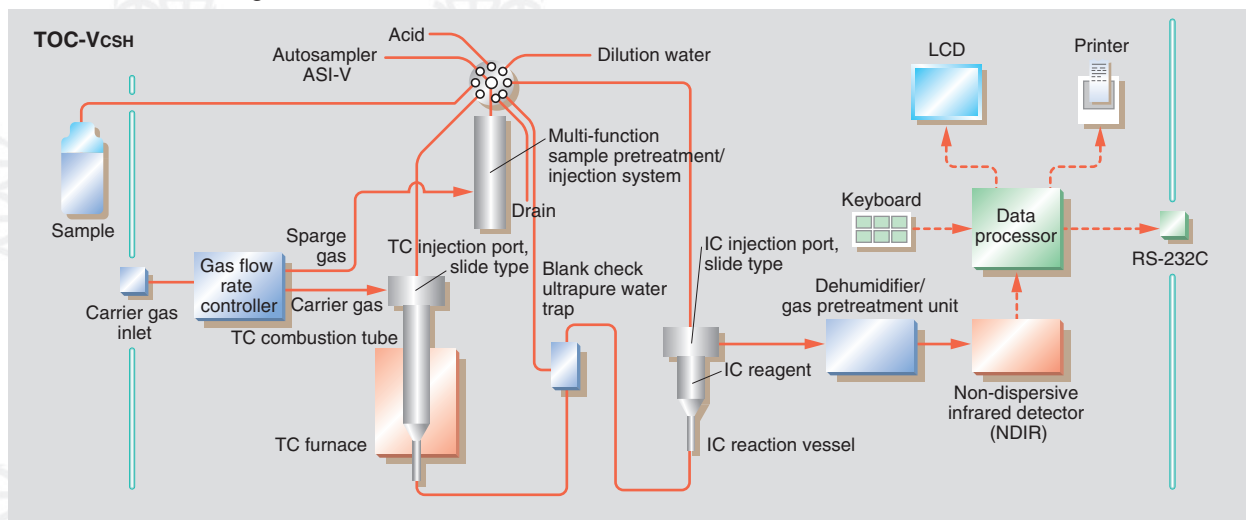
Select a microliter syringe to suit the application.

P/N	Description	Comment
638-60733-01	Microsyringe MANU10	for 10 μ L
638-60733-02	Microsyringe MANU25	for 25 μ L
638-60733-03	Microsyringe MANU50	for 50 μ L
638-60733-04	Microsyringe MANU100	for 100 μ L
638-60733-05	Microsyringe MANU250	for 250 μ L

Principle of the Combustion Catalytic

Combustion catalytic oxidation/NDIR method

Measurement flow line diagram



TC (Total Carbon) Measurement

Carrier gas (purified air) is passed at a controlled flow rate of 150 mL/min through an oxidation catalyst-filled TC combustion tube, heated to 680°C. When the sample pretreatment/injection system injects the sample into the combustion tube, the TC in the sample is oxidized or decomposes to create carbon dioxide. The carrier gas carrying the combustion products from the combustion tube is cooled and dehumidified in the dehumidifier before passing via the halogen scrubber into the sample cell of the non-dispersive infrared detector (NDIR), where the carbon dioxide is detected. The NDIR analog signal forms a peak, and the data processor calculates the peak area. To measure the TC concentration of the sample, the relationship between the TC concentration and peak area (calibration curve) is predetermined using a TC standard solution, to express the peak area as a ratio of the TC concentration. TC comprises TOC (Total Organic Carbon) and IC (Inorganic Carbon).

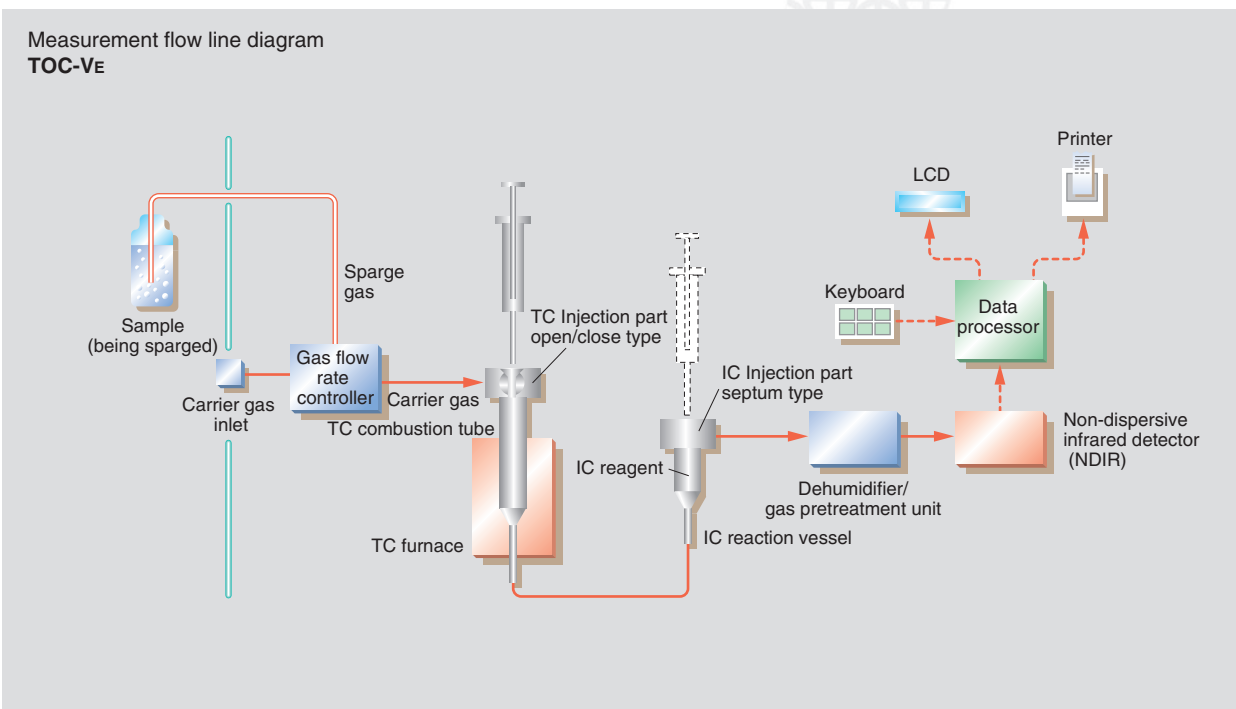
IC (Inorganic Carbon) Measurement

The acidified sample is sparged with the carrier gas (purified air) to convert only the IC in the sample to carbon dioxide. This carbon dioxide is detected by the NDIR and the sample IC concentration is measured in the same way as TC. The IC is a combination of carbonate and bicarbonate.

TOC (TC-IC) Measurement

Subtracting the IC concentration from the TC concentration determines the TOC concentration.

Oxidation/NDIR TOC Analyzer



NPOC Measurement (TOC by acidification/sparging method)

A small amount of hydrochloric acid is added to acidify the sample and the sample is sparged with sparge gas. This converts all IC in the sample to carbon dioxide and drives the CO₂ out of the sample solution. The TOC concentration is determined by measuring the TC of the sample after the IC is eliminated.

NPOC measurement is equivalent to TOC measurement using acidification and sparging (IC elimination) defined for official test methods (EPA, ASTM, EN, etc.). As any purgeable organic compounds may be lost from the sample during sparging, the TOC measured by this method can be called NPOC (Non-Purgeable Organic Carbon).

POC (Purgeable Organic Carbon) Measurement

POC measurement is the measurement of the TOC of the organic carbon driven from the sample by the sparge gas in the sparging process during NPOC measurement. The CO₂ component in the sparge gas is eliminated when the sparge gas passes through the CO₂ absorber. The POC is then oxidized in the POC combustion tube to create carbon dioxide, which is detected by the NDIR.

This data is processed in the same way as in TC measurement.

TOC (NPOC + POC) Measurement

The TOC concentration is obtained by adding the POC concentration to the NPOC concentration.

TN (Total Nitrogen) Measurement

Carrier gas (purified air) is passed at a controlled flow rate of 150 mL/min through a combustion tube that is filled with thermal decomposition catalyst and heated to 720°C. When the sample pretreatment/injection system injects the sample into the combustion tube, the TN in the sample thermally decomposes to create nitrogen monoxide. The carrier gas carrying the nitrogen monoxide from the combustion tube is cooled and dehumidified in the dehumidifier before passing into a chemiluminescence detector, where the nitrogen monoxide is detected. The chemiluminescence detector utilizes the gas-phase chemiluminescence of ozone and nitrogen monoxide, such that the detected nitrogen monoxide analog signal forms a peak. To measure the TN concentration of the sample, the relationship between the TN concentration and peak area (calibration curve) is predetermined using a TN standard solution, to express the peak area as a ratio of the TN concentration.

TOC/TN Measurement

After acidification and sparging to eliminate IC, the sample is injected into the combustion tube, where the TN decomposes and the TOC (NPOC) of the sample simultaneously is oxidized to form CO₂. This carbon dioxide is detected by an NDIR connected in series with the chemiluminescence detector. The series connection between the NDIR and the chemiluminescence detector allows the nitrogen monoxide and carbon dioxide generated from a single sample injection to be simultaneously detected.

Shimadzu Wet Oxidation TOC Analyzers Aim for High

Wet oxidation/NDIR method

TOC-VWS

TOC-VWP



TOC-VWS



TOC-VWP

Newly designed high-sensitivity NDIR achieves ultrahigh sensitivity measurements.

Sensitivity and accuracy enhanced by minimizing the reagent blanks that hinder accurate analysis.

Measurement Principle

TC Measurement

Phosphoric acid and the oxidant (persulfate) are added to the sample, which is heated under UV illumination to convert the TC in the sample to carbon dioxide. This carbon dioxide flows with the carrier gas via the dehumidifier into the NDIR sample cell. The area of the carbon dioxide peak signal is measured and this peak area is converted to TC concentration using a pre-prepared calibration curve.

IC Measurement

The sample is acidified with phosphoric acid and sparged to convert the IC in the sample to carbon dioxide. This carbon dioxide is detected by the NDIR and the sample IC concentration is measured in the same way as TC.

Powerful oxidation through a combination of peroxosulfuric acid, UV illumination, and heating.

No need of purging of reagent bottle reduces consumption of carrier gas.

TOC Measurement

Subtracting the IC concentration from the TC concentration determines the TOC concentration.

NPOC Measurement

The sample is acidified with phosphoric acid and sparged to eliminate the IC. The NPOC concentration is determined by measuring the TC (=NPOC) of the sample after the IC is eliminated, using the same method as for TC measurement.

Sensitivity with Great Oxidation Performance

Trace level TOC measurement in Ultra-pure water.

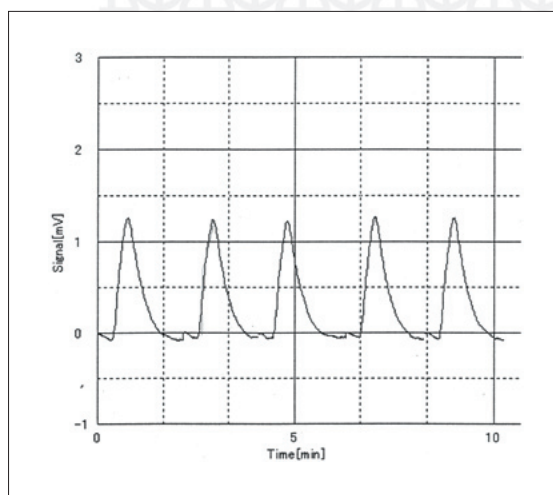
Conditions

Analyzer	TOC-Vws
Principle	TOC measurement by IC removal (acidifying and sparging)
Injection volume	20.4mL
Number of measurements	5

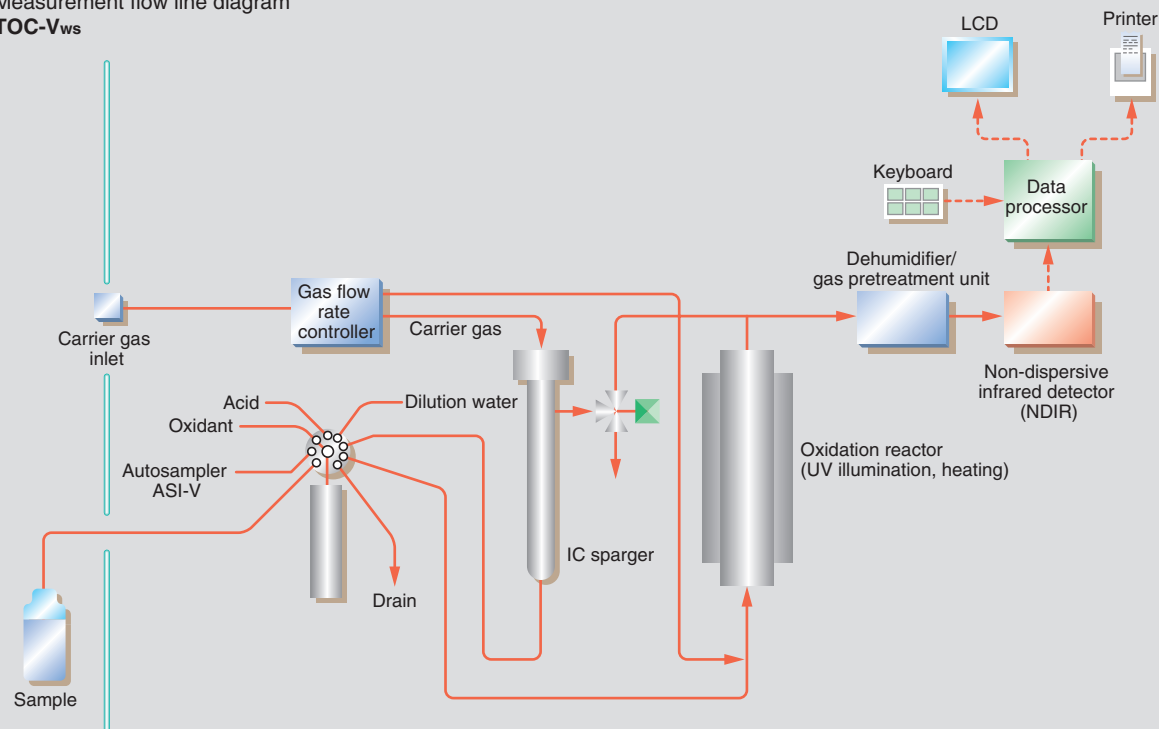
Results

Number	Results($\mu\text{g/L}$)
#1	2.31
#2	2.27
#3	2.52
#4	2.47
#5	2.49
mean	2.41
SD	0.114 $\mu\text{g/L}$
CV	4.73%

High accuracy measurement of TOC as low as $2\mu\text{g/L}$ (ppb)



Measurement flow line diagram
TOC-Vws



S Model with Screen and Keyboard or P Model Under PC

S Models

TOC-Vcs

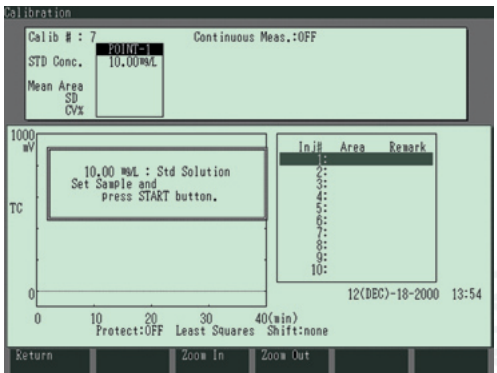
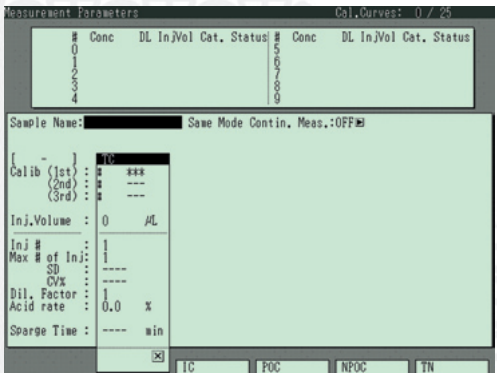
The combination of simple, easily operated keyboard and large LCD makes these models easy to use.

TOC-Vws



A separate window for each measurement condition setting item enhances clarity and ease of input.

Helpful operation guides are displayed.



Frequently used functions such as calibration, measurement, and ASI measurement are assigned dedicated keys to reduce operations.

The method function registers measurement conditions.

Features (Common to S and P Models)

Automatic setting of optimal measurement conditions

When creating the calibration curve, the optimal measurement conditions are displayed when the standard solution concentration is set. Detailed calibration curve information can easily be referenced when setting the measurement conditions.

Automatic condition changing and re-analysis of out-of-range samples

If the sample peak goes over the calibration curve range, measurement conditions such as dilution rate and injection volume are automatically changed and the analysis is repeated.

Automatic selection of the best calibration curve

Up to three calibration curves can be set for sample measurement. The optimal calibration curve is selected for the sample and the sample measurements are conducted using these measurement conditions.

Control Select the Model that Suits your Application

P Models

TOC-VCP

All TOC analyzer operations, control, and data collection can be conducted by a personal computer.

TOC-VWP

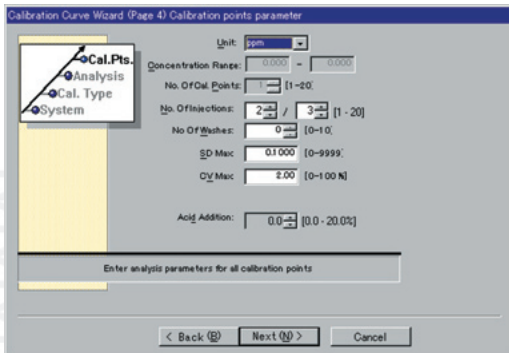
Enhanced software security functions support FDA 21 CFR Part 11.

PC Specifications for PC Control (P Model)

CPU	Pentium 400 MHz, or above. (800 MHz recommended for Part 11 compatibility.)
Video functions	SVGA (800 x 600 dots min.) (1024 x 768 dots min. recommended)
OS	Windows 2000/XP Professional
Main memory	Capacity required by OS + 64 MB min.
Hard disk	20 MB min. for installation
External storage medium	CD drive (CD-R drive for Part 11 compatibility.)

* Adobe Acrobat for Windows is also required for Part 11 compatibility.

Wizards allow simple input of measurement and calibration settings.



All information is stored as files in the personal computer for reference and re-use.

The measurement conditions and results can be output to EXCEL or other application software or input from other application software.

Automatic exclusion of anomalous values and re-calculation of repeated analyses

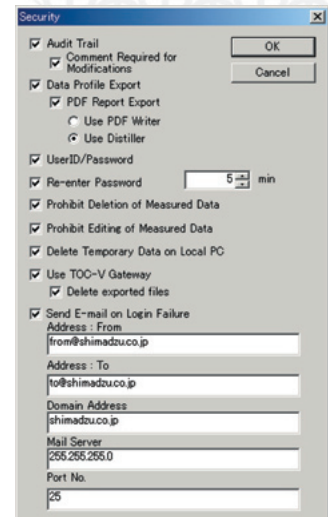
The mean value, standard deviation, and coefficient of variation are displayed and printed during repeated analyses. Anomalous values can be automatically eliminated and re-calculated.

Convenient automatic power off function

Automatic power off after electric furnace cools down ensures power is not left on and saves energy.



User authentication, user authority level restriction, and operation history functions ensure data reliability. Combination with the Shimadzu CLASS Agent data-management software provides customer support for Part 11 compatibility.



Comprehensive calibration system handles many uses

- Output is linearized for all range.
- Calibration curve can be created to compensate for TC in water used for standard solution adjustment.
- A maximum of 25 (model S.) (model P has no limit) calibration curves can be stored and recalled. All calibration curve data can be displayed and recorded.

Accessories Evolved in Parallel with

Autosampler

ASI-V

Enhanced features and convenience with easier operation



Combining the ASI-V automatic sample injector with a TOC-V Series analyzer (except TOC-VE) creates a fully automatic analysis system.

Features

- Three sample vial capacities are available. Select the sample vial and sample rack to suit the analyzed sample.

- 9 mL vials x 93
- 24 mL vials x 93
- 40 mL vials x 68
- 125 mL vials x 24

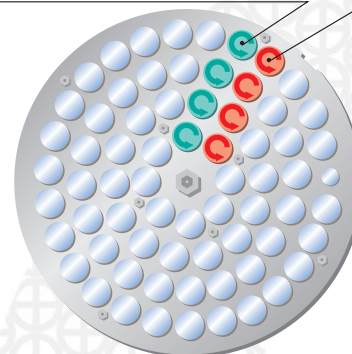
Combination

TOC-Vcs/cp	24 or 40mL vials
TOC-Vws/wp	40 or 125mL vials

- All three vial types have a well sealed septum that can be easily replaced with the screw cap.
- The sampling needle is optimized for sample extraction from highly-sealed vials and for sparging.
- Changing analysis conditions or adding sample vials during analysis is simple. System operation and carrier gas flow can be automatically stopped on completion of measurements.
- Creating multiple calibration curves and selecting the optimal curve for samples with significantly differing concentrations allows these samples to be analyzed in a single run.
- Rinsing both external and internal surfaces of the sampling needle prevents carryover between samples.

- Optional magnetic stirrers agitate the sample in the vials to prevent settling of suspended solids. (Applicable to 24 mL and 40 mL vials.)

Sample at measurement position
Sample at pre-measurement position



Example shows 40 mL vials.

- Magnetic stirrers are installed for the samples at the measurement position and previous position to provide powerful agitation prior to measurement.

Note: Magnetic stirrers works for only from #1 to #85 vials among all 93 of them, in the case of using 24mL vials.

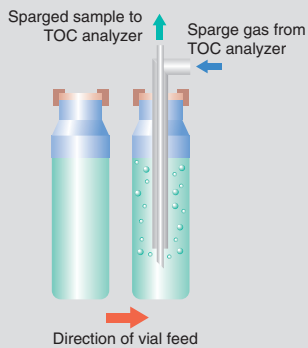
the TOC Analyzers

8-Port Sampler OCT-1

Sparging for NPOC measurement, the most frequently conducted analysis, can be selected from the following three types (if the external sparging kit is used).

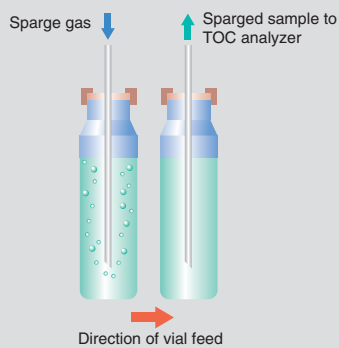
(for trace TOC measurements in purified water)

Consecutive sparging and measurement



(Can be used for all measurements except trace TOC measurement.)

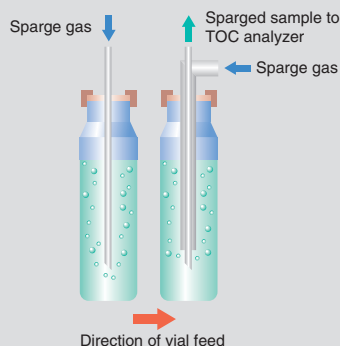
Parallel sparging and measurement



(Can be used for NPOC measurement of low-concentration TOC samples such as river water, lake and marsh water, sea water, or tap water.)

Parallel sparging and measurement

(Sparging at measurement position prevents re-absorption of atmospheric CO₂ into the sample.)



OCT-1

The bridge to ultra-simplified auto analysis



Bringing you an innovative but inexpensive autosampler that automates your analyzer system.

Setup is extremely easy, because special vials are not needed.

Other Features of the OCT-1

- Compact, straightforward configuration using an 8-port valve.
- Commercially available stirrers can be used with the OCT-1.
- Up to 2 OCT-1 units can be connected to a single TOC-V. As 8 sample containers can be loaded on a single OCT-1 unit, as many as 16 samples can be handled if 2 OCT-1 units are connected.



- TOC-V series products currently in use (except for TOC-VE) can be automated by being combined with the OCT-1.



Accessories Evolved in Parallel with

TN unit

TNM-1



Combining the TNM-1 with a TOC-VCS/CP analyzer creates a TOC/TN simultaneous analysis system.

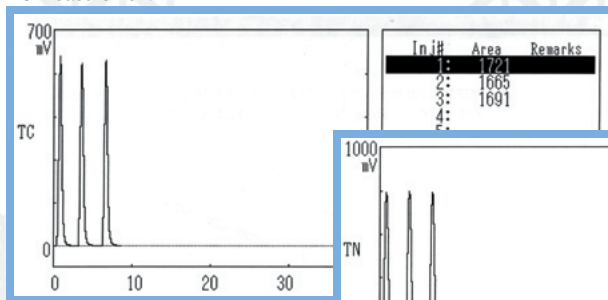
Features

- Combustion tube and oxidation catalyst are shared with TOC analysis, such that maintenance is virtually identical to dedicated TOC use. Maintenance is simple as no oxidant or other reagent is required.
- NO (nitrogen monoxide) is measured by Shimadzu's tried and tested chemiluminescence method.
- Measurements over a wide range up to 4000 mg/L.

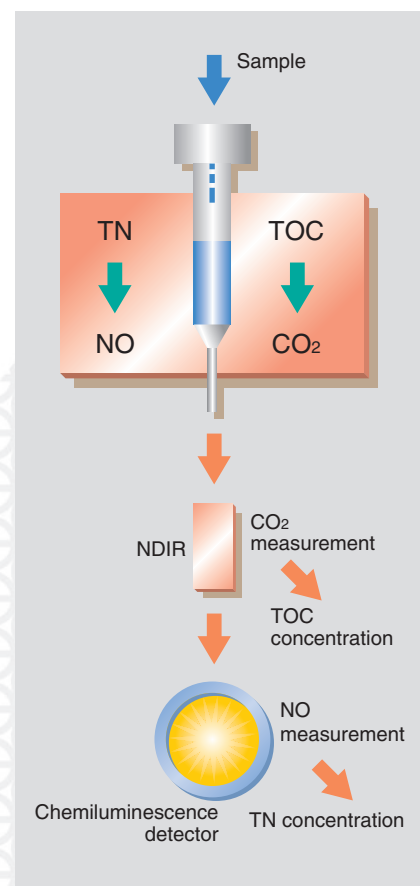
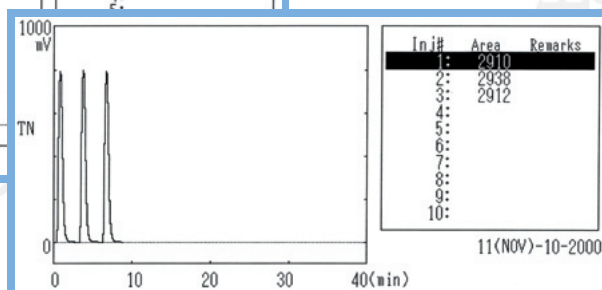
Note: In the case of simultaneous TOC and TN analysis, TOC high sensitivity analysis using high sensitivity catalyst is impossible.

Simultaneous measurement of TOC and TN

TC measurement



TN measurement



the TOC Analyzers

Solid sample combustion unit

SSM-5000A



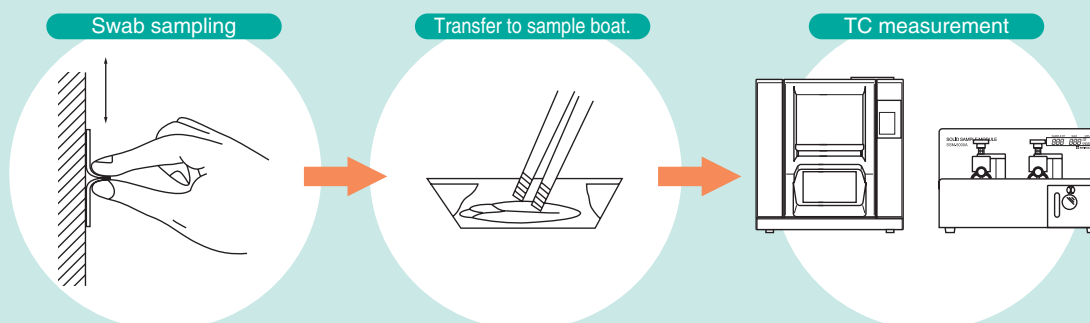
Combining the SSM-5000A with a TOC-Vcs/CP or a TOC-Vws/WP analyzer permits analysis of many solid samples in addition aqueous samples, including soil, sludge, and sediments. Carbon measurement in attached residues using the swab method can be conducted for cleaning validation.

The above photo shows a combination of the SSM-5000A with the TOC-VcsH.

Features

- Analysis of 1 g samples with up to 30 mg carbon content reduces weighing errors or errors due to the uneven distribution of the sample carbon content.
- The use of unique tandem measurement cells, combining a long cell to measure aqueous samples and a short cell for solid samples, permits a single TOC analyzer unit to handle a range from several 10 ppb TOC in ultrapure water to several 10% TOC in solid samples.
- Measurement of inorganic carbon (carbonate) in solid samples is also easy.
- Aqueous samples containing large amounts of suspended matter can be analyzed by inputting the sample in a sample boat.
- Switching between TOC-Vcs/CP or TOC-Vws/WP analysis of aqueous samples and SSM-5000A measurements of solid samples is achieved by simple screen settings.
- The SSM-5000A can be attached to a TOC-Vcs/CP or TOC-Vws/WP unit with Autosampler installed. (Automatic measurement of solid samples is not possible.)

Swab method for cleaning validation



Residue evaluation procedure using swab sampling with quartz microfiber filter paper and direct combustion carbon analysis

Please contact Shimadzu or its agents in your area for further information.

Options

Special Accessories

Carrier Gas Purification Kit Part number 638-41447-01

Compressed air supplied as instrument air or compressor air, for example, can be used as the carrier gas after elimination of the carbon-containing impurities, such as carbon dioxide and hydrocarbons. This kit is suitable for samples with TOC of 0.5 mg/L (0.5 ppm), or higher. This kit is available for TOC-VCSN/CPN.

Compressed air supply pressure: 300 to 700 kPa
Air consumption: approx. 300 mL/min
Dust, mist, drain liquid to be removed in advance.

Nitrogen Carrier Gas Kit Part number 638-42054

Using this kit, which consists of an oxygen-permeating tube and a CO₂ absorber, nitrogen gas can be used as a carrier gas instead of high-purity air. This kit is available for TOC-VCSH/CPH/CSN/CPN, TOC-V_E, and ON-LINE TOC-V_{CSH}. Purity of nitrogen gas should be 99.99% or higher.

When the kit is used, the measurement range of both TOC and IC is limited to 0 to 100mg/L. This kit cannot be combined with the TNM-1
This kit cannot be used with the Carrier Gas Purification Kit (638-41447-01).

Gas Purifier, adsorption type Part number 638-52824-02

This purifier eliminates impurities from cylinder gas not guaranteed to meet the following specifications, so that it can be used as the carrier gas.
CO, CO₂, HC content: each 1 ppm max.

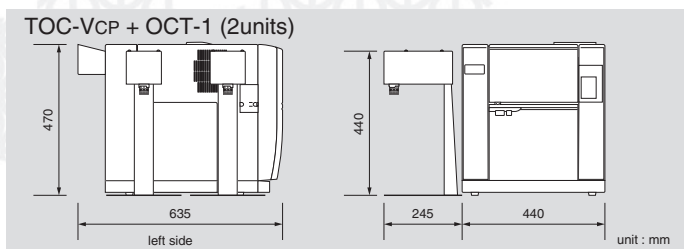
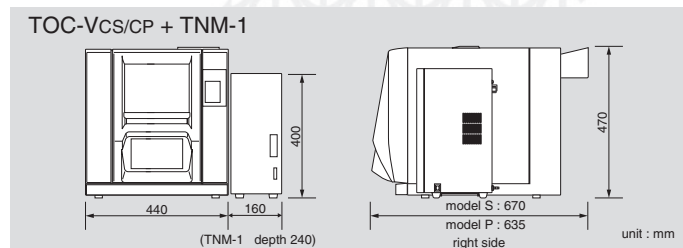
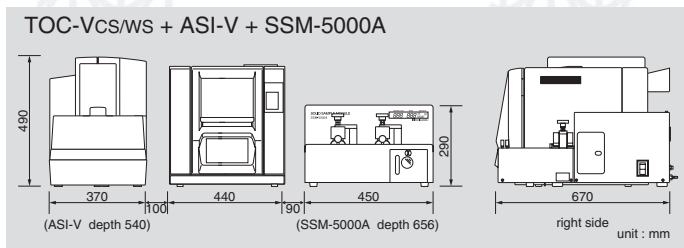
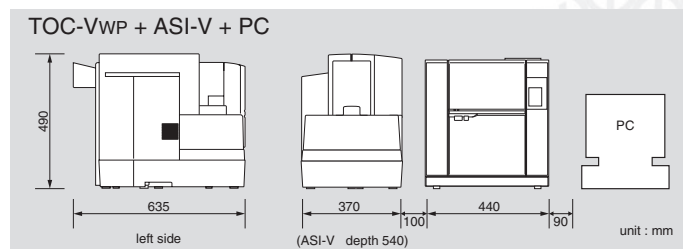
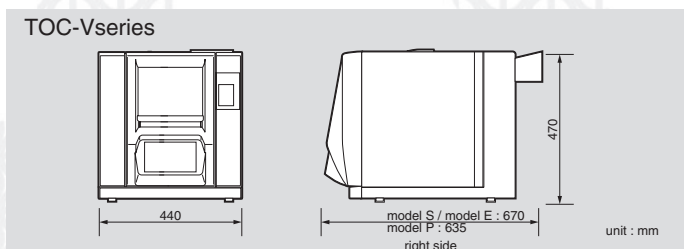
Gas Sample Injection Kit Part number 638-93149-03

Incorporating this kit with TOC-Vc** allows manual sample injection from a microliter syringe. Gas or aqueous samples can be injected. The TC, carbon dioxide, and TOC of a gas sample can be measured. (TOC is determined as (TC - CO₂). CO is included in TOC.)

POC Kit Part number 638-91066

This kit allows measurement of the purgeable organic carbon (POC) that is driven from the sample during the sparging process at room temperature.

External Dimensions Diagram



ASI-V Magnetic Stirrer Part number 638-67075 for 24 mL vials Part number 638-67076 for 40 mL vials

When attached to the ASI-V Autosampler, the magnetic stirrer agitates the vial contents to prevent precipitation of insoluble organic carbon out of the sample.

* If 24 mL vials are used, of the total 93 vials, vials No. 1 to No. 85 are stirred.

ASI-V Stir bars Part number 046-00617-02 for 24 mL vials Part number 046-00617-03 for 40 mL vials

Suspended Sample Kit Part number for main frame 638-41460 for auto-sampler 638-93151

The TOC-Vc** sample flowpath is 0.5 mm. This kit expands the flowpath to 0.8 mm to allow intake of larger suspended matter. Homogenization of the sample to pulverize the suspended matter into as fine and uniform a state as possible is important for the accurate measurement of samples containing suspended matter.

External Sparge Kit Part number 638-77152

This kit sparges the sample in the Autosampler vials for efficient NPOC measurement.

Air Supply Pipe Set Part number 638-41204

Includes a 20 m air supply pipe.

Small Vial Rack Set for ASI-V Part number 638-53068

This set consists of a vial rack and 9mL vials, and enables measurements of small sample volume. Applicable models are: TOC-VCSH/CPH/CSN/CPN.
ASI-V Magnetic Stirrer or External Sparge Kit cannot be used when this set is used.

Specifications

Total Organic Carbon Analyzer TOC-V Series

	Total Organic Carbon Analyzer		PC-controlled Total Organic Carbon Analyzer		Basic model Total Organic Carbon Analyzer	Wet oxidation Total Organic Carbon Analyzer	PC-controlled Total Organic Carbon Analyzer
	high-sensitivity model	standard model	high-sensitivity model	standard model			
Model	TOC-VCSH	TOC-VCSN	TOC-VCPH	TOC-VCPN	TOC-VE	TOC-VWS	TOC-VWP
Measurement method	680 degC combustion catalytic oxidation/NDIR method				wet oxidation/NDIR		
Operation method	standalone		PC-controlled		standalone	standalone	PC-controlled
Measured items	TC,IC,TOC,NPOC (optional POC,TN)				TC,IC,TOC,NPOC (optional TN)	TC,IC,TOC,NPOC	
Applicable samples	aqueous sample (optional solid/gas samples)				aqueous sample	aqueous sample	
Measurement range (mg/L)	TC:0 to 25000 IC:0 to 30000	TC:0 to 25000 IC:0 to 3000	TC:0 to 25000 IC:0 to 30000	TC:0 to 25000 IC:0 to 3000	TC:0 to 20000 IC:0 to 20000	TC:0 to 3500 IC:0 to 3500	
Detection limit	4µg/L	50µg/L	4µg/L	50µg/L	—	0.5µg/L	
Measurement accuracy (reproducibility)	CV 1.5% max.				CV 2% max. (CV3% max.at 8000mg/L or higher)	CV 1.5% max. (CV2% max.at 100mg/L or higher)	
Measuring time	TC: aprox. 3 mins	TC: aprox. 3 mins	TC: aprox. 3 mins	TC: aprox. 3 mins	TC:aprox. 3 mins	TC:aprox. 4 mins	
	IC: aprox. 3 mins	IC: aprox. 4 mins	IC: aprox. 4 mins	IC: aprox. 3 mins	IC:aprox. 3 mins	IC:aprox. 4 mins	
Sample injection	automatic injection				manual injection	automatic injection	
Sample injection volume	10 to 2000µL variable	10 to 150µL variable	10 to 2000µL variable	10 to 150µL variable	1 to 150µL (requires change of syringe)	350 to 20400µL variable	
IC pre-treatment	Automatic internal acidification and sparging				Sparge gas supply	Automatic internal acidification and sparging	
Automatic dilution	dilution factor 2 to 50				none	dilution factor 2 to 50	
Carrier gas	High purity air					High purity nitrogen	
Gas pressure	300kPa						
Gas consumption	aprox. 1440 L/month	aprox. 2210 L/month	aprox. 1440 L/month	aprox. 2210 L/month	aprox. 2210 L/month	aprox. 3000 L/month(NPOC)	
	(operating conditions: 8 hours/day x 5days/week)						
Operating keys	built-in		use PC		built-in	built-in	use PC
Display	built-in LCD		use PC		built-in LCD	built-in LCD	use PC
Printer	built-in		PC printer		Optional	(CENTRONICS,ESC/P)	PC printer
Ambient temperature range	5 to 35degC						
Power supply	AC100~127V±10%,MAX800VA AC220~240V±10%,MAX1200VA					AC100~127V±10%,MAX350VA AC220~240V±10%,MAX350VA	
Dimensions	approx. (W)440 x (D)560 x (H)450mm(excluding protrusions)						
Weight	approx. 40kg				approx. 38kg		approx. 40kg

Autosampler ASI-V

Vial types	Select from three types: 24mL,40mL,125mL Optional 9mL vial rack is also available.
Number of vials	9mL : 93 24mL : 93 40mL : 68 125mL : 24
Vial septum	with dedicated septum
Sample sparging	OK (if the external sparging kit is used)
Dimensions W xDxH(mm)	370 x 540 x 490 (excluding protrusions)
Weight	approx. 14 kg

8-Port Sampler OCT-1

Number of OCT-1 Connection	Up to 2 OCT-1 units
Vial types	Any sample container can be used
Number of Vials	8 for a single OCT-1 16 for 2 OCT-1
Sample sparging	No sparging with OCT-1 (Sparging is done in the syringe of TOC-V)
Dimensions	Appros. 245 x 245 x 440 (excluding protrusions)
Weight	approx. 3.5 kg

TN (Total Nitrogen) unit TNM-1

Measurement method	Chemiluminescence
Measured items	TN (Total Nitrogen)
Measurement range	0 to 4000mg/L (0 to 200mg/L for TOC-VE)
Detection limit	5µg/L (CPH,CSH) 20µg/L (CPN,CSN,E)
Measurement accuracy (reproducibility)	CV3% max.
Ozon Source Gas	Air (Compressor Air, or Housing Air) 500mL/min
Measuring time	approx. 4 mins.
Supplied gas	Air, pressure; 300kPa.
Power Requirement	100~240V 100VA, 50/60Hz
Dimensions W xDxH(mm)	approx. 160 x 235 x 400 (excluding protrusions)
Weight	approx. 8 kg

Solid sample combustion unit SSM-5000A

Method	TC:Catalytically aided combustion oxidation at 900°C. IC:Pre-acidification, oven temperature: 200°C.
Measured Item	TC,IC,TOC
Measuring Range*	TC:0.1 to 30mg carbon (1-20µg carbon in high sensitivity measurement) IC:0.1 to 20mg carbon
Sample Amount*	1gram-aqueous content < 0.5g
AnalysisTime*	5 to 6 minutes at a gas rate
Carrier Gas	99.9% O2 at the 500mL/min. High-purity O2 Gas is required for high sensitivity measurement.
Power Requirement	100-127V or 220-240V as ordered. 700VA, 50/60Hz
Dimensions W xDxH(mm)	approx. 450 x 656 x 290
Weight	approx. 30 kg

*Will vary with sample type and measurement condition.

Ideal for high-sensitivity continuous

On-line Models

ON-LINE TOC-VcSH



Combines Combustion Catalytic Oxidation at 680°C and NDIR Method

Combustion catalytic oxidation at 680°C oxidizes even persistent or insoluble organic compounds. This method accurately measures any type of organic substance not affected by interfering substances or the sample properties such as pH or conductivity.

Easy Maintenance

Combustion catalytic oxidation at 680°C eliminates the need for oxidizing reagents, saving the tasks of procuring and preparing reagents. No special draining operations are needed.

Off-line Measurement Functions

A dedicated on-line measuring port is provided for easily conducting interrupting analyses. The optional OCT-1a allow the automatic measurement of up to 15 samples.

The functionality for continuous automatic measurement has been added to the ability of the combustion catalytic oxidation/NDIR TOC-V Series to perform high-performance, high-sensitivity measurement of organic substances. The On-line TOC-VcSH can be used for continuous automatic high-sensitivity monitoring of water samples such as pure water and tap water.

Support Software for Pharmaceutical Water Management Applications

The On-line TOC-VcSH incorporates software for automatically performing tests specified by Japanese Pharmacopeia (resolution test) and USP (system suitability test). Combining the On-line TOC-VcSH with an OCT-1 (optional) enables fully automatic testing; setting the reagent is all that is required.

Meas. condition [1-12]	System conformity test condition	TOC test condition
Reagent	Standard	Test
Water	Solution	Solution
STD Conc. : 0.000mg/L	2.000mg/L	2.000mg/L
Port # : 1		4
Inj # : 3		
Max # of Inj : 3		
SD : ---		
CVX : ---		
Inj. Volume : 150 µL	150 µL	150 µL
Acid Ratio : 0.0 %	0.0 %	0.0 %
Sparge Time : 0.0 min	0.0 min	0.0 min
System conformity test (complete)		
Auto. testing : ON		
Period(hour) : 24(1~999)	Test start: 04(APR)-01-2003 10:00	
Auto. test(start) : OFF		
First failure : REPEAT		
Second failure : CONTINUE		
04(APR)-01-2003 09:30		

Wide Variety of TOC Measurement Methods

NPOC, IC, TC and TOC (TC-IC) measurements are possible with the On-line TOC-VcSH. TN measurement is also possible by adding an optional product. TOC and TN can be measured simultaneously.

monitoring of TOC

Main Applications

Management of pharmaceutical water

Management of ultrapure and recycled water for the semiconductor industry

Management of mains water

Impurity contamination management for all types of water used at plants (cooling water, recycled water, and boiler water)

Specifications

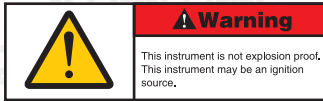
Measured items	NPOC (TOC by IC subtraction using acid sparging), TC, IC, TOC (TC-IC), TN (optional TNM-1 required)
Measurement method	680°C combustion catalytic oxidation/NDIR method 720°C combustion catalytic oxidation/ chemiluminescence method (when TNM-1 is connected)
Measurement range	TC: 0-500 µg/L to 0-25,000 mg/L variable IC: 0-500 µg/L to 0-30,000 mg/L variable
Measurement cycle	Approx. 5 to 999 minutes (for NPOC measurement)
Number of measurement channels	1 channel
Reproducibility	CV 1.5% max.
Linearity	±2% F.S. max.
Zero stability	±2% F.S. max. per day
Span stability	±2% F.S. max. per day (ambient temperature fluctuations within 5°C)
Calibration cycle	Variable in the range 1 to 999 hours
Sample injection method	Automatic injection using syringe pump/slider
Sample injection volume	Variable in the range 10 to 2,000 µL
Sample dilution function	Diluted in syringe; dilution factor: 2 to 50
IC pretreatment	Automatic acidification and sparging
Carrier gas	High-purity air or oxygen (1 ppm max. of CO, CO ₂ , or HC) High-purity nitrogen (1 ppm max. of CO, CO ₂ , or HC) (when using optional nitrogen gas carrier kit) Supply pressure: Approx. 600 kPa Flowrate: 150 mL/min (230 mL/min with sparging)
Measurement value output	Analog output: Select from 4 to 20mA, 0 to 16mA (insulation, load resistance: 750Ω max.), and 0 to 1VDC RS-232C: Baud rate; 9,600 bps, Data length; 8 bits, Parity; none, Stop bits; 1
Alarm output	Measurement value upper limit and upper upper limit alarms, system error alarm: No-voltage contact output (maximum: 5VA, 0.1A, 50V)
Control input	Remote stopping and starting of sample measurement and calibration
Sample conditions	Flowrate: Approx. 0.1 to 1 L/min Sample volume: 5 to 7 mL per measurement Temperature: 0 to 90°C
Ambient temperature	5 to 35°C
Power supply	AC 100 - 127V ±10% MAX 800VA 50/60 Hz AC 200 - 240V ±10% MAX 1200VA 50/60 Hz
Dimensions	Approx. 440 (W) x 560 (D) x 460 (H) mm (excluding protrusions)
Weight	Approx. 40 kg

Special Accessories

Nitrogen carrier gas kit	P/N 638-42054	High-purity N ₂ gas (1 ppm max. of CO, CO ₂ , or HC) can be used as the carrier gas. *Simultaneous use of TNM-1 and this option is not possible. *The measuring range with this option becomes 0-500µg/L to 0-100mg /L for TC and IC both.
Sample adjustment tank	P/N 638-42053	Used when bubbles are contained within the sample.



JQA-0376



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