

TOC 2100C Process Total Organic Carbon Analyzer

- Compact, lightweight industrial design for easy installation and operation
- Two rugged combined enclosures for industrial environments
- Continuous analysis for real-time results
- UV promoted persulfate oxidation plus infrared detection utilizing the BINOS 100E
- Automatic two-point calibration with solenoid valves
- Electronic flow and leakage control
- PLC – automatic calibration functions
- Meets NAMUR certification requirements



FEATURES

The TOC 2100C Process Total Organic Carbon Analyzer is an on-line analyzer for industrial water applications in ranges from 0-2 parts-per million (ppm) up to 0-5,000 ppm carbon. The TOC 2100C offers high reliability, low maintenance and accurate real-time analysis of process streams.

Continuous operation, ultraviolet-promoted persulfate oxidation is used to convert organic carbon-to-carbon dioxide. A very accurate BINOS non-dispersive infrared analyzer determines the total organic compound present by measuring the level of carbon dioxide produced in the reaction. Output is calibrated to read part-per-million carbon. This cost-effective, rugged industrial design provides fast, continuous response and simple operation.

The TOC 2100C is an industrial product with two combined cabinets to reduce corrosion and potentially costly down-time and repairs. The lower cabinet, which contains the analytical portion of the measuring system, is made of corrosion-resistant polyester. The upper housing that contains the electronics, is made of electromagnetic compatible steel. The use of two combined cabinets protects the electronics from potentially corrosive sample leaks.

APPLICATIONS

The TOC 2100C is used in a wide variety of applications and industries. Organic contamination can indicate a loss of raw material or product, a potential environmental hazard or possible damage to capital equipment. The chemical and petrochemical industries use the TOC 2100C to monitor organics in treatment facility wastewater, plant effluent, condensate return, cooling water, process water and more.

In the food and beverage industries the TOC 2100C is used to monitor wastewater and effluent for organic loading and product loss and for condensate return for potentially damaging organic compounds. The semiconductor industry monitors reclaimed water to protect valuable ion exchange columns from damage due to high levels of organics. Nuclear power and fossil fuel power plants monitor organics in steam loops, condensate return and boiler feedwater before organics form damaging acids and CO₂. Wastewater treatment plants monitor incoming wastewater for organic loading to determine treatment needs.

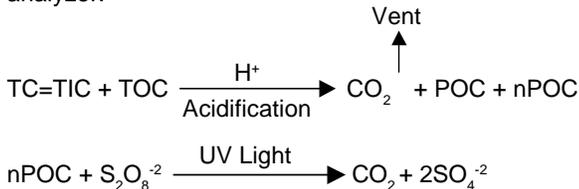
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PRINCIPAL OF OPERATION

The TOC 2100C uses an ultraviolet-promoted persulfate oxidation and infrared detection (BINOS) to continuously determine the concentration of soluble, non-volatile, reactive organics. The sample containing organic compounds is continuously mixed with a persulfate/phosphoric acid solution. After inorganic carbon compounds are removed by the acidification and sparging, the mixture is exposed to ultraviolet radiation. Organics are oxidized to CO_2 which is measured with an infrared analyzer.



(TIC = Total Inorganic Carbon)

(TOC = Total Organic Carbon)

(POC = Purgeable Organic Carbon)

(nPOC = non-Purgeable Organic Carbon)

Sample flows into the analyzer through the sample pump. The sample is acidified with a sodium or ammonium persulfate/phosphoric acid solution and sparged with nitrogen to remove the inorganic carbon compound. After passing through a liquid/gas separator, the sample flows to the reaction chamber where it is exposed to ultraviolet light. UV radiation assists the persulfate to completely oxidize the organic carbon compounds to CO_2 . Nitrogen is introduced to the reactor chamber to act as a carrier gas for the CO_2 .

Upon leaving the reactor, the gas then flows through a self-draining condensate trap to remove moisture. The gas then enters the non-dispersive infrared detector which measures the CO_2 content. The organic concentration in ppm is derived automatically from the CO_2 content. This proven concept provides for fast, reliable, real-time response while maintaining high accuracy. Since the TOC 2100C is a continuous organics analyzer, the information can also be routed to a recorder or computer for control purposes and data storage.

Options available for the TOC 2100C include isolated 4 to 20 mA output, Z purge and total carbon analysis.

Not all non-purgeable organic carbons are oxidized. As examples, humic acid, fulvic acid and caffeine are not completely oxidized and are difficult to measure. (See Table 1.)

The TOC 2100C is generally applied to analytical tasks where the trend of the concentration of non-purgeable organic carbon is the parameter of interest. In this mode of operation, it is not used for process control but serves as a monitoring device with trend or alarm outputs. In such applications, accuracy and repeatability requirements are not generally as stringent as with traditional process analysis/control instrumentation. Since the analyzer responds to the composite values of the carbon dioxide produced by the oxidation of all oxidizable, non-purgeable organics, a process stream of variable composition may influence the repeatability achieved.

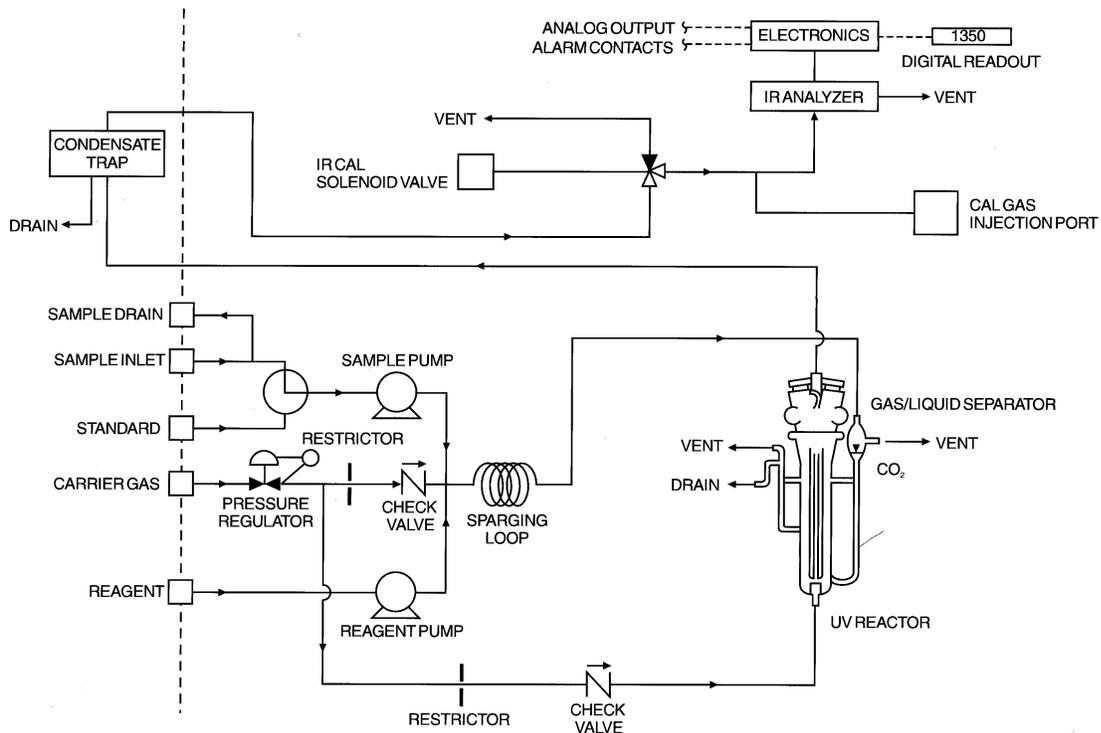
Table 1
**OXIDATION OF NON-PURGEABLE ORGANIC COMPOUNDS BY COMBINED
 UV-PERSULFATE OXIDATION TECHNIQUES**

Examples of Compounds Fully Oxidized to CO₂

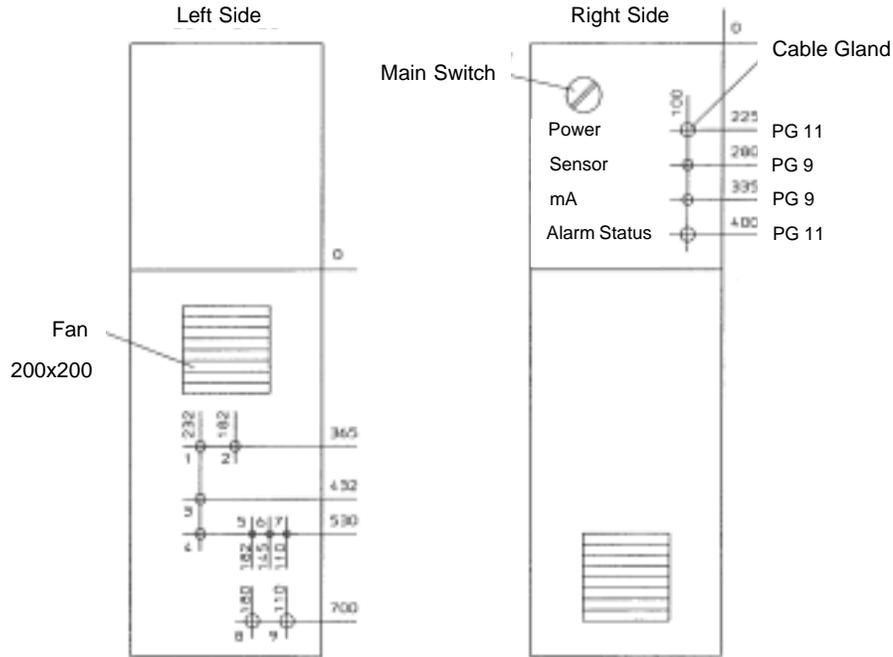
acetic acid	ethylene glycol	picoline
acetone*	glycerine	proline
acetonitrile	glycine	propanol
alanine	guanidine nitrate	propylene glycol
aniline	histidine	serine
arginine	KHP	sodium lauryl sulfate
aspartic acid	leucine	sucrose
benzene*	methanol*	sulfanilamide
butanol	2-methyl pyrazine	thiocyanate
butyric acid	morpholine	toluene*
chloroacetic acid	nicotinic acid	trichloroethylene*
chloroform*	pentachlorophenol	tyrosine
3,5-dimethyl pyrazol	pentanol	urea
EDTA	phenol	valine

* These organic compounds are purgeable to a small degree.
 Contact factory for more detail.

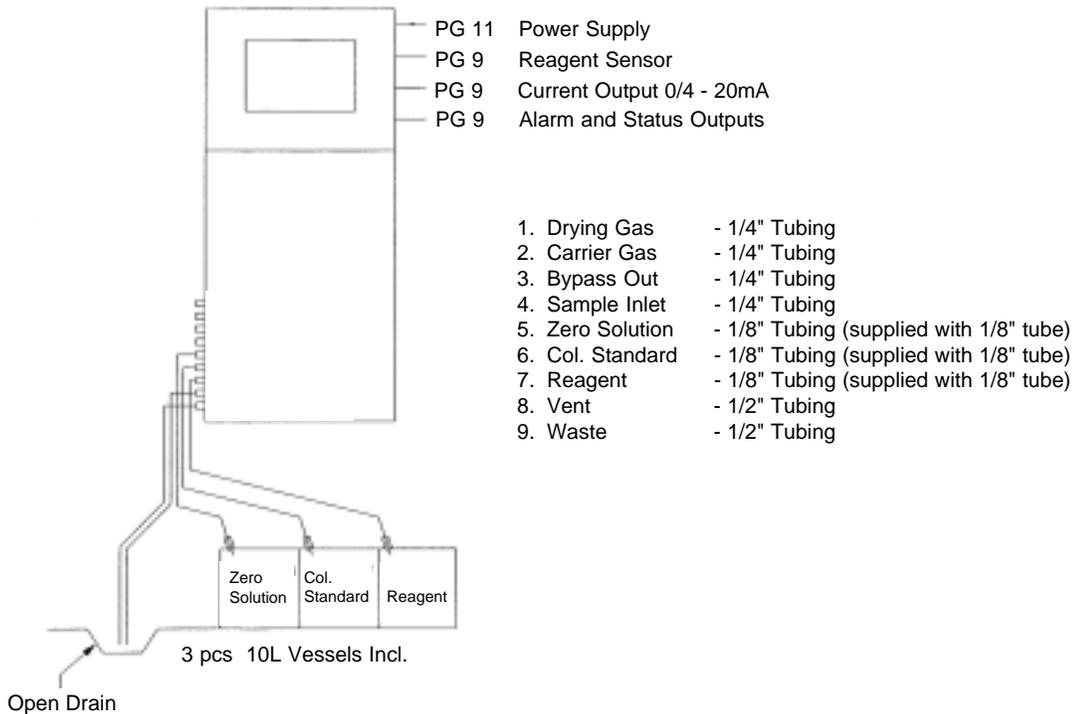
TOC 2100C FLOW DIAGRAM



MOUNTING AND DIMENSIONAL DRAWING



INSTALLATION DRAWING



SPECIFICATIONS

Functional

Principle: Ultraviolet-promoted persulfate oxidation/
single beam, non-dispersive infrared detection (Binos100)

Organics Ranges: (ppm , mgC/l)

0 to 2, 0 to 5, 0 to 10, 0 to 20, 0 to 50, 0 to 100, 0 to 200,
0 to 500, 0 to 1,000, 0 to 2,000 or 0 to 5,000 ppm carbon
(1 specified range)

Calibration:

Automatic two-point calibration or manual

Cooling System:

Temperature controlled Peltier cooler/permeation dryer

Display:

Two lines back lighted LCD reading in ppm (C) carbon
equivalent

Electrical Output:

4 to 20 mA, isolated, 0.2 to 1 V

Alarms:

Two freely programmable measuring alarms, 8 relays for
alarm and status signal

Signals:

Status signals for: operation, failure, maintenance,
calibration and need of maintenance

Power Requirements:

115 VAC \pm 10% 50/60 Hz, 1 phase,
3A, 350 W
230 VAC \pm 10% 50/60 Hz, 1 phase,
1.15 A, 350 W

Operating Ambient Temperature:

35° to 86°F (2° to 30°C)

Sample Requirements:

Inlet pressure: 3 psig min. (0.2 barg) , 15 psig maximum
(1 barg)

Drain pressure: open drain, atmospheric

Suspended solids: Sample should be free of particles
larger than 100 microns (0.1 mm)

Flow Rate: 50 to 2,000 ml/min. at by-pass (depending on
response requirements)

Carrier gas: Nitrogen (CO₂ free) 200 to 300 cc/min. at 75
to 100 psig (5 to 7 barg) depending on range

Drying Gas: Dry, (CO₂ free) instrument air < 1 L/min,
depending on range

Reagents: 5 gal./mo (19 L/mo) except 0 to 5,000 (ppm,
mgC/l), 12gal./mo (47 L/mo)

Performance*

Response Time: less than 5 min. to 90% fs.
Most ranges

Repeatability: \pm 3% of fs

Drift: \pm 3% of fs

Inorganic Carbon Removal:

99.5% for low salt*** streams

98.0% for high salt*** streams

Physical:

Enclosure classification: NEMA 3S, IP 54

External Dimensions: 49"x23"x14" (1250x570x345mm)

Weight: 200 lbs. (91 kg)

Enclosure Materials of construction:

Chemical components: polyester

Electrical components: Electromagnetic compatible
steel

*** Low salt 0.1% of FS, high salt 3% of FS.

Specifications subject to change without notice.

ORDERING INFORMATION

Model	Description	
2100C	Process Total Organic Carbon (TOC) Analyzer (2100C)	
Level 1	Model Designator	
1	A	English
	B	German
Level 2	Software Designator	
2	1	Standard Software TOC1.1
	X	Other Software (consult factory)
Level 3	Instrument	
3	0	Standard TOC
	1	TC
	XX	Special (consult factory)
Level 4	Power Supply and Enclosures	
4	1	115 VAC, 50/60 Hz, 19" cabinet, IP 54
	2	230 VAC, 50/60 Hz, 19" cabinet, IP 54
Level 5	Bench 1	
5	23	0-2 ppm (mgC/l)
	24	0-5 ppm (mgC/l)
	25	0-10 ppm (mgC/l)
	26	0-20 ppm (mgC/l)
	27	0-50 ppm (mgC/l)
	30	0-100 ppm (mgC/l)
	32	0-200 ppm (mgC/l)
	34	0-500 ppm (mgC/l)
	36	0-1,000 ppm (mgC/l)
	37	0-2,000 ppm (mgC/l)
	38	0-2,500 ppm (mgC/l)
	XX	Special (consult factory)
Level 6	Analog Outputs	
6	1	0-20 mA, optically isolated
	2	4-20 mA, optically isolated

NOTES: Included with each Model 2100C is a ship kit, which consists of:

- 10 / Container for Reagent
- 10 / Container Zero Solution
- 10 / Container Span Solution
- 1 Model 2100C Manual

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