



## UV / PERSULFATE TOC ANALYZER

- Continuous Sampling through Analysis
- Large Sample Tubing
- Automatic Self-Cleaning
- Computer Control (not processor)



- Most Reliable NDIR
- Wireless-Intranet Ready
- Real-Time Local/Remote Data Logging and Control
- Extensive Application Uses

### Model 101

## OVERVIEW

The analyzer is housed in corrosion and weather resistant FRP NEMA 4/IP 66 enclosure suitable for operation in Class I Div 2 hazardous locations with optional purge package.

It is simple to install, is completely automatic and delivered in a fully factory calibrated condition.

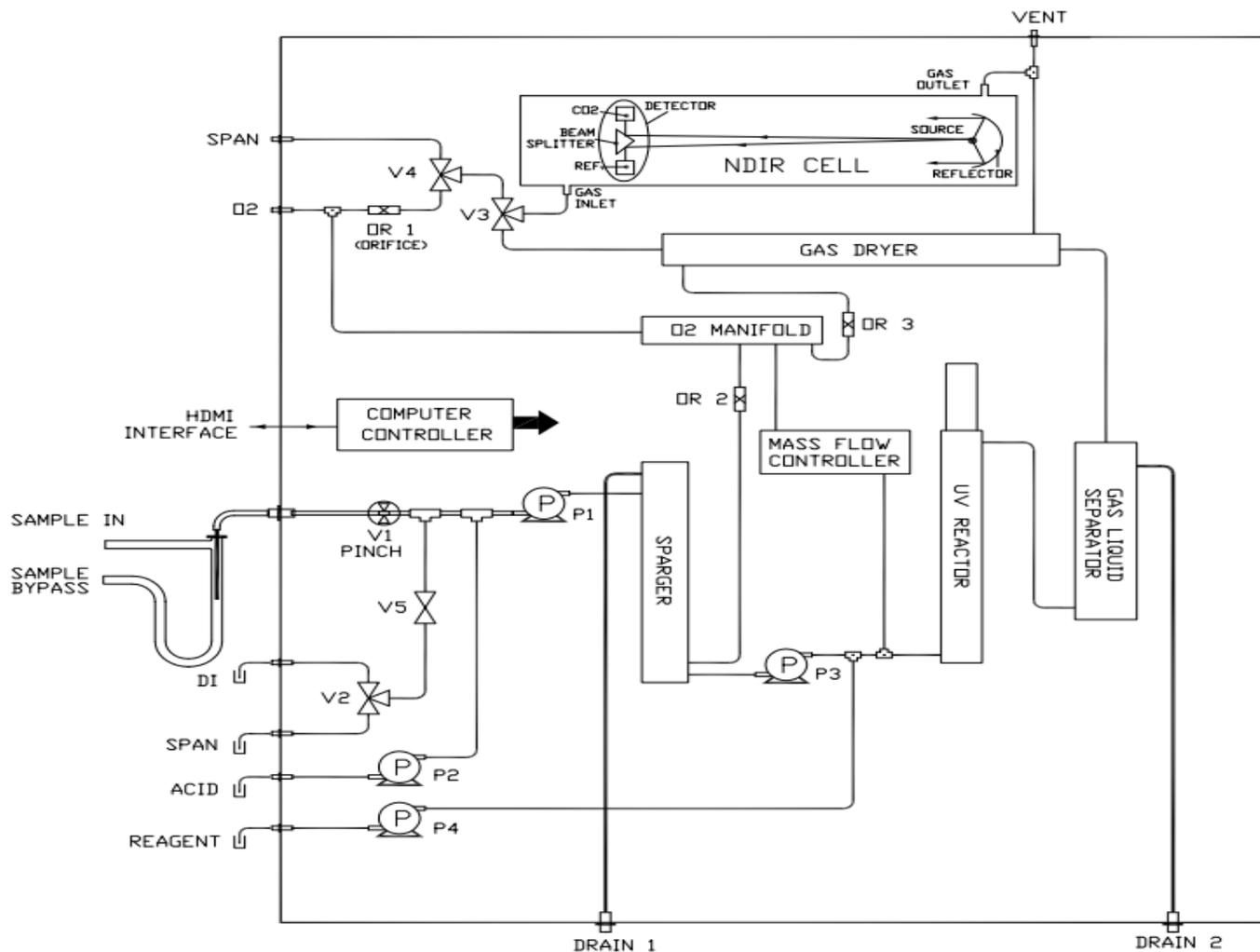
Complete "as built" installation drawings are submitted with each analyzer.

## INSTALLATION

### Analyzer Mounting



# FLOW DIAGRAM



## OPERATION

Sample is continuously drawn by pump P1 either through a non-fouling sample By-Pass or directly from the bulkhead fitting, if the sample By-Pass is not used. P1 then delivers the sample through pinch valve V1 to the Sparger, where acid is added by pump P2 to lower the sample pH to 2 for conversion of the TIC (Total Inorganic Carbon) interference to dissolved CO<sub>2</sub>. All sample lines, including V1 have inside diameters of 3.2 millimeters throughout the analyzer in order to prevent blockage by suspended particles in the sample. Comet has avoided traditional TOC methods of placing small orifice valves in the sample lines.

The TIC related dissolved CO<sub>2</sub> is continuously sparged out by oxygen or CO<sub>2</sub>-free air in Comet's counter-flow Sparger which has been shown to be 99% effective in eliminating TIC from the sample, leaving only the Total Organic Carbon of the carbonaceous species. Pump P3 delivers the sample from the Sparger to the UV Reactor. Pump P4 delivers sodium persulfate reagent to assure complete oxidation of the TOC to dissolved CO<sub>2</sub> in the

Reactor. Oxygen flow is combined with the continuous sample stream as computer controlled by the Mass Flow Controller and acts as an oxidizer as well as a carrier gas for the dissolved CO<sub>2</sub>.

The CO<sub>2</sub> and vapor exhaust from the Reactor is directed to the Gas/Liquid Separator where the liquid is separated from the CO<sub>2</sub> and other gases and drained while the CO<sub>2</sub> gas is dried and proceeds through valve V3 to be analyzed by the Non-Dispersive Infrared Analyzer. The CO<sub>2</sub> generated in the Reactor is a direct correlation to the TOC of the sample and is converted as such, displayed and output through various methods as a TOC.

## **CLEANUP**

Pumps P1, P3, and P4 are stopped, blocking downstream flow. Pump P2 is sped up and delivers an acid wash through the entire sample input system including the interior By-Pass sample tube. The system automatically returns to its normal operating mode after a programmed or “on demand” actuation by the Operator or in response to an alarm of a sample clog. Because of its continuous method, any coating on the UV lamp is avoided and is continuously cleaned by persulfate and acid reagents, as experienced over years of operation.

## **CALIBRATION**

### **LIQUID:**

Model 101 avoids frequent calibrations due to Comet’s advanced technology and component selections but the analyzer should be checked every six (6) months to verify its calibrated state. Others require a costly periodic maintenance to calibrate and do preventive servicing on the analyzer and have adopted a “trust me” approach that the analyzer will remain in a proper calibrated state, whereas Comet has provided a complete auto-calibration utility to assure maximum “up time” of operation when different processes require recalibration.

To calibrate, V1 is actuated, blocking flow from the sample. V2 is sequenced for automatic DI/Zero and Span calibration solutions in response to computer command **NDIR GAS CALIBRATION**

### **NDIR GAS CALIBRATION**

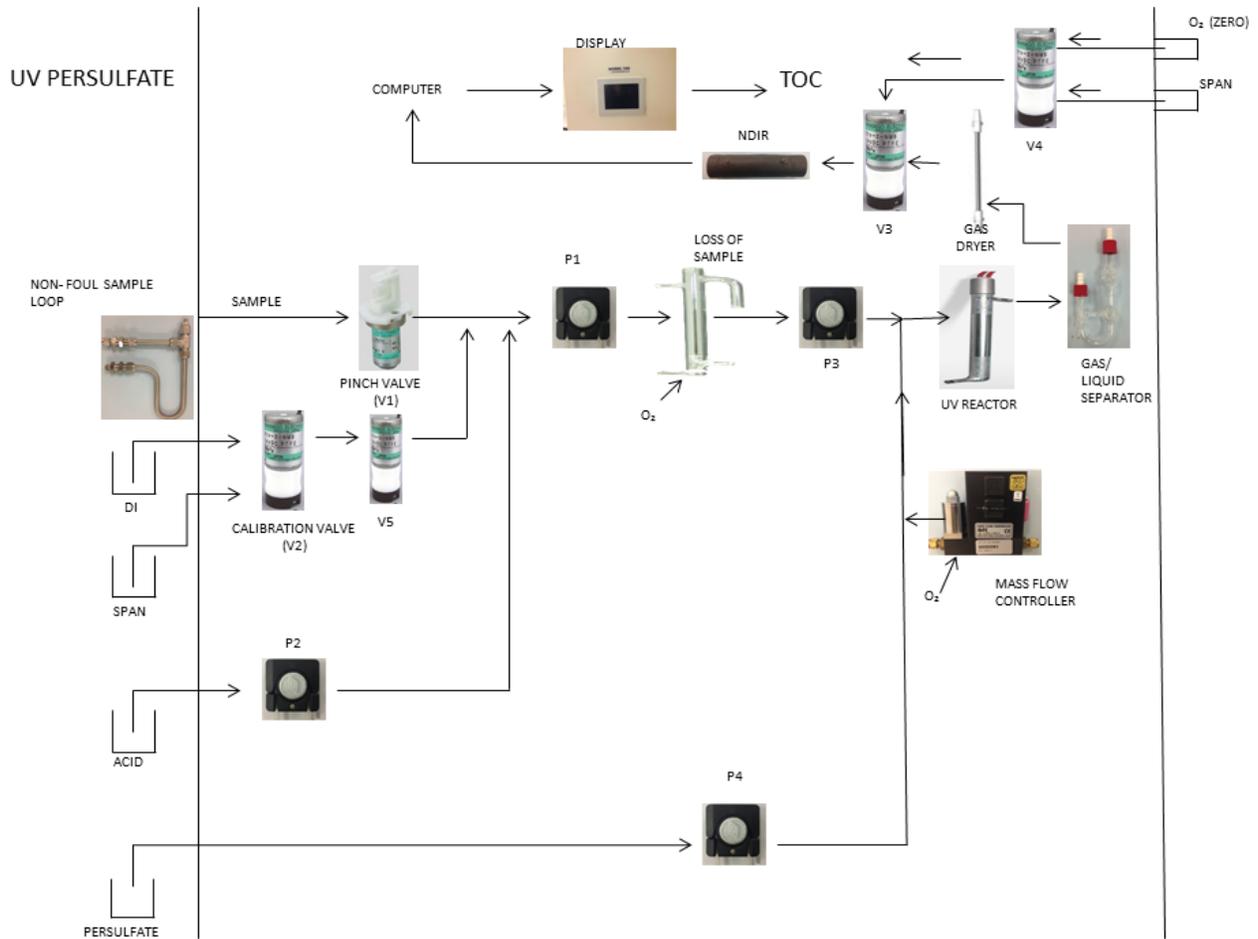
Comet’s advanced NDIR has superior reliability and stability and does not require recalibration for over a year in normal operation. However, again Comet has provided a full auto-calibration utility in recognition that any delay in operation is serious and any problem in the field should be quickly resolved by having all available remedies available, such as this onboard, easy-to-use automatic NDIR calibration utility.

Periodically a “zero” check is automatically made by flowing oxygen to the NDIR through V4 and V3, performing a completely automatic acceptance or resets the NDIR to a true gas “zero.” The “end-to-end” NDIR calibration is automatically performed by introducing oxygen or CO<sub>2</sub> - free air and then a CO<sub>2</sub> span gas through V4 and V3 as actuated and controlled by the onboard computer.

# INTERIOR VIEW (Cover on)



# COMPONENTS



# DATA MANAGEMENT

The screenshot displays the 'Historical Data' window of the Comet Analytics software. The main window shows a TOC (Total Organic Carbon) graph for 'Range 3'. The y-axis represents TOC concentration from 0.0 to 1000.0, and the x-axis represents time with a scale of 6 minutes per major division. The graph shows a baseline TOC of approximately 372.484. A 'Sample Pressure (PSI)' of 3.43 is displayed. Below the graph, the 'Proc. Res. (Mohm)' is shown as 0.47. The interface includes a 'Run - Test' button and a 'Menu' button showing the date and time as 11/19/13 02:08. The analyzer ID is 1251. The Comet Analytics logo is visible in the bottom right corner of the main window.

On the right side, the 'Snap Data .Acquire (AB) - Comet Edition' window is open, displaying a table of system parameters:

Name	Address	Data Type	Value
Proc. Res. (Mohm)	F10.25	REAL	0.4754537
Proc. Cond. (VDC)	F8:1	REAL	1.692874
Proc. Cond. (uS/cm)	F10.16	REAL	2.103254
Proc. Temp. (VDC)	F8:2	REAL	2.502644
Proc. Temp. (degC)	F10.15	REAL	29.69972
Proc. Range	N7:5	INT	2
TOC ppb	F15.15	REAL	372.8084
TOC Cond. (VDC)	F8:5	REAL	6.729082
TOC Cond. (uS/cm)	F11:16	REAL	4.407001
TOC Temp. (VDC)	F8:6	REAL	2.966642
TOC Temp. (degC)	F11:15	REAL	34.91692
TOC Range	N7:4	INT	3
Pressure (PSI)	F8:13	REAL	3.541016
P1 (mL/min)	F15.22	REAL	3
P2 (mL/min)	F15:23	REAL	0.3
P3 (mL/min)	F15:25	REAL	0.03
P4 (mL/min)	F15:26	REAL	3.5
Last Blank Value(ppbC)	F15:5	REAL	3.479377
Last Cal Ver. Value (ppbC)	F15:6	REAL	607.3015
Last Sys. Suitability (%)	F15:10	REAL	100.5133
Last Cal Value (ppbC)	F15:32	REAL	329.9621
Alarm - Loss of Sample	N18:0/12	BIN	0
System Mode	N7:19	INT	5

A 'Stop' button is located below the table. The file path at the bottom of the window is C:\Users\Comet\Documents\Snap Data .Acquire\Data\11180002\_201133.csv Util.

## DESCRIPTION

The above is representative of **SNAP DATA** which is available as a standard feature for all Comet analyzers. Rather than rely on the physical exchange of an onboard memory card download to a PC for historical data, **SNAP DATA** provides real-time monitoring of operating data and status of critical onboard subassemblies for local and/or remote display and control. The data can be archived and directly transferred to EXCEL or used for complex studies, such as trend analysis or plant processes affected by interacting conditions. This data management approach is unique to Comet, as there is no other comparable TOC data management system available on the market today.

## SPECIFICATIONS

- **Analysis:** Total Organic Carbon TOC
- **Method:** Total Organic Carbon (TOC) with TIC removal by acidification and sparging, sodium persulfate UV promoted oxidation, CO<sub>2</sub> detection by Non- Dispersive Infrared Analysis (NDIR)
- **Ranges:** from 0-5 mg/l to 0-1000 mg/l (others on request)
- **Measurement type:** continuous
- **Accuracy:** ±2% of full scale
- **Response time:** from 6-9 minutes, depending on range
- **User interface:** touchscreen/ wireless /485 Modbus
- **SNAP DATA, real time Local + remote data logger and control**
- **Dimensions:** 20" (508mm) x 20" (508mm) x 12" (305mm)
- **Weight:** 25 Lbs (11.3kg)
- **Power Supply:** 110/220VAC.
- **Outputs:** 232c, 485 Modbus, wireless
- **Reagents:** phosphoric acid - Sodium Persulfate
- **Auto clean/ auto calibration**