



TECHNICAL SPECIFICATION

Supply of TOC Sampling and Analysis System **for VCU Exhaust Stack**

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1. **Scope of supply:**

This specification defines the minimum technical and functional requirements for the supply of a continuous **Total Organic Carbon (TOC)** only sampling and analysis system intended for installation on a Vapor Combustion Unit (VCU) exhaust stack with a diameter of 1.8 meters. The system shall be suitable for operation in hazardous classified areas and fully compliant with ATEX requirements.

2. **Site condition:**

- System shall be suitable for outdoor industrial environments.
- Ambient operating temperature: 0°C up to 55°C.
- Yearly rainfall: 220 mm/year
- Relative humidity up to 95%.
- System shall be resistant to dust and direct sunlight.

3. **Applicable Standards:**

- ATEX Directive 2014/34/EU
- IECEx Certification Scheme
- EN 60079 Series
- EN 12619 – Determination of total gaseous organic carbon concentration
- EN 14181 – Quality assurance of automated measuring systems
- EN 15267 – Certification of automated measuring systems
- ISO 14956
- CE marking requirements
- Applicable local hazardous area and electrical regulations

4. **Composition of Fumes:**

Component	Mass%	Mole%
O ²	13.4	12.1
CO ²	7.9	5.2
H ₂ O	3.9	6.2
SO ²	0	0
N ²	74.7	76.5



5. System Description:

- The supplier shall provide a complete TOC monitoring system including all components required for continuous sampling, conditioning, analysis, calibration, control, and data acquisition
- The complete system shall include stack sampling probe, heated sample line, sample conditioning system, analyzer unit, calibration gas system, local controller, and data acquisition system.
- The system shall be designed for continuous industrial operation under outdoor environmental conditions.

6. Stack Sampling Probe:

- Stock diameter: 1,800 mm. (Acc' to Appendix A)
- Flue gas temperature: Approx. 800 – 1000 c°
- Sampling probe shall be suitable for installation on 3" nozzle located at the VCU exhaust stack installed by the VCU manufacture.
The sampling nozzle shall be located 350 mm above 2*4" nozzle for temporary sampling probe that shall be measured once a year according to the regulator demand.
The total height of the 2*4" nozzle for temporary measurement shall be 1,200 mm above service platform.
The service platform width shall be 1,000 mm supplied and installed by the VCU manufacture
- The TOC sampler supplier shall approve the service platform dimension as well as all nozzle diameters and location. (Acc' to appendix A)
- Probe material shall be stainless steel 316L or higher corrosion-resistant material
- Probe insertion length shall be suitable for representative accurate sampling across the stack section. (1,800 mm diameter)
- Probe shall include heated construction to prevent condensation and hydrocarbon losses.
- Sampling probe shall include replaceable particulate filter.
- Probe design shall allow safe maintenance and removal during shutdown conditions.
- All probe-mounted components installed in hazardous areas shall be ATEX certified.

7. Heated sample Line:

- Sample transport line shall be electrically heated and insulated.
- Heating system shall maintain sample temperature above dew point under all operating conditions.
- Temperature control accuracy shall be $\pm 2^{\circ}\text{C}$ or better.



- Sample line materials shall be chemically resistant to hydrocarbons and combustion gases.
- Sample line shall be suitable for outdoor installation and UV exposure.
- Maximum allowable sample transport delay shall be specified by supplier.
- All hazardous area installations shall comply with ATEX requirements.
- Line lengths shall be approx. 30 meter from the VCU to the cabinet unit.

8. Sample Conditioning System

- The sample conditioning system shall ensure delivery of clean and stable sample gas to the analyzer.
- System shall include filtration, moisture handling, condensate management, and flow regulation.
- Materials in contact with process gas shall be corrosion resistant.
- Conditioning system shall minimize hydrocarbon adsorption and sample losses.
- The unit shall include protection canopy.
- System shall include flow indicators and fault alarms.
- Automatic drainage arrangement shall be included where applicable.
- Sample conditioning cabinet shall be suitable for industrial outdoor environments.

9. TOC analyzer unit:

- Analyzer shall provide continuous measurement of Total Organic Carbon concentration.
- Preferred measurement principle shall be Flame Ionization Detection (FID) according to EN 12619.
- Analyzer shall be suitable for continuous 24/7 industrial operation.
- Analyzer shall provide configurable measurement ranges suitable for expected VCU emissions.
- Typical measuring ranges may include 0–10 ppm, 0–100 ppm, 0–1,000 ppm, or higher.
- Analyzer response time shall be suitable for continuous emissions monitoring applications.
- Analyzer shall include automatic diagnostics and self-monitoring functions.
- Analyzer drift shall be minimized and suitable for long-term stable operation.
- Analyzer cabinet shall be suitable for industrial outdoor installation.
- Analyzer system shall include local display and operator interface.

10. Calibration Gas System:

- Supplier shall provide complete calibration gas handling system.
- System shall include zero gas and span gas connections.
- Calibration manifold shall include pressure regulators, valves, and flow control devices.
- Automatic or semi-automatic calibration capability shall be included.



- Calibration system shall allow routine verification of analyzer accuracy.
- Calibration gas tubing and fittings shall be compatible with hydrocarbon calibration gases.
- Supplier shall specify recommended calibration gases and concentrations.
- 60-meter gas transport line.

11. Control System and Data Acquisition:

- System shall include local controller and data acquisition unit installed at the control room of the loading terminal.
- Controller shall continuously display measured TOC concentration and system status.
- Historical data logging capability shall be included.
- System shall include alarm management for analyzer fault, low flow, calibration fault, and system malfunction.
- Communication interfaces shall include Modbus RTU and/or Modbus TCP.
- Analog outputs shall include minimum 4–20 mA signals.
- System shall support integration with plant DCS or SCADA systems.
- Event and alarm history shall be retained within the system.

12. System Cabinet:

- The system must be housed within a climate-controlled enclosure cabinet suitable for the reference environmental conditions.
- The cabinet will be installed in pressurized enclosure with protection type for Zone 2.
- The cabinet dimension shall be approx. 2/2/2 meter fitted with two doors. One of the doors shall be fitted with a safety glass window to allow a direct view of the system installed in the cabinet.
- The analytical instrument shall be installed on a Stainless-Steel rack mounted in the cabin.
- The cabinet will be equipped with an automatic control system for the circulation of the protective gas with leakage compensation; this system automatically pressurizes the cabinet, maintaining a protective gas (uncontaminated air or inert gas supplied by the client) inside it at a pressure higher than that of the external atmosphere. thereby preventing the ingress of hazardous gases.
- the system will contain the following units: supply of protective gas, purge gas discharge, pressure control and command and control the the purging and pressurization logic.
- The cabinet shall be design and built by the supplier so it will be easy to transport to site location.
- The unit shall be supplied with the following certifications and documentations:
 - 3.1 material certificate for the structural steelwork.



- EU Declaration of Conformity.
 - IP certificate.
 - ATEX certificate.
 - Pressure test.
- the cabinet will be supplied with automatic control system for the circulation of the protective gas with leakage compensation.
The system automatically pressurizes the cabinet, maintaining an internal pressure higher than the external pressure.
An alarm shall be provided to indicate the loss or pressurization in the event of drop or loss of pressure.
- To cabinet will be fitted with one Ex-rated air condition system to maintain the temperature at the cabinet. The air condition type will be design so it won't disturb the positive pressure mechanism in the cabinet. The unit will include all the necessary part to obtain temperature for the smooth operation of the unit.

13. **Hazardous area requirements:**

- All field-installed electrical equipment shall be ATEX certified.
- Equipment shall be suitable for installation **Zone 2 cat 3G hazardous areas**.
- Supplier shall specify equipment category, gas group, and temperature class.
- Minimum enclosure protection rating shall be IP65.

14. **Electrical Requirements:**

- Power supply shall be 230 VAC, 50 Hz unless otherwise specified.
- All terminals and wiring shall be clearly identified.
- Grounding and bonding provisions shall be included.
- Electrical equipment shall include surge protection where required.

15. **Factory Acceptance Test (FAT):**

- Supplier shall perform FAT prior to shipment.
- Testing shall include functional verification, calibration verification, communication testing, and alarm verification.
- FAT reports shall be submitted for client approval.

16. **Documentation requirements:**

- Technical datasheets
- General arrangement drawings
- Electrical wiring diagrams
- P&ID drawings
- ATEX certificates



- Operation and maintenance manuals
- Calibration procedures
- Spare parts list for two years of operation
- Factory acceptance test documentation

17. **Tag and Marking:**

The unit accessories shall bear name plate made of stainless steel or a permanent equipment labeling tag

The plate thickness shall be 1.5 mm'.

The plate shall contain the following data:

- Manufacturer name.
- Manufacturer country.
- Equipment model.
- Manufacturer item number.

18. **Warranty:**

- Minimum warranty period shall be 12 months from commissioning or 18 months from delivery, whichever occurs first.

Should any defect due to faulty design, materials or bad workmanship become apparent during the guarantee period, the vendor shall repair or otherwise rectify the defects, and free of charge to purchaser.

Changes shall be made at a time and a manner agreeable to the client.

19. **Vendor Information Required:**

- Analyzer manufacturer and model
- Measurement technology details
- ATEX certification documentation
- Reference installations
- Power consumption
- Utility requirements
- Recommended spare parts
- Delivery schedule
- Detailed compliance statement against this specification

T.O.C:



NO.	Description	Unit	Price
1	Full TOC analyzer for VCU unit including all the described elements and accessories	1	