Rack Mount Table-Top NMHC Analyzer

Non Methane Hydrocarbon FID 109A

The 109A is a rack mount and table top, fully heated FID analyzer for the continuous, simultaneous determination of the gaseous mass concentration of Methane Carbon, Non Methane Organic Carbon and Total Organic Carbon (TVOC) using the Dual Flame Ionization Detector method. Full Compliance confirmed:

- ***EN ISO 25140 and VDI 3481 for the Automatic Methane/Non Methane Concentration Measurement***
- ***QAL1 EN 14181-EN ISO 4659 and EN 15267, EN 12619:2013 for Total Organic Carbon (VOC/TGOC)***
- ***USA EPA Method 25A for Total VOC/TGOC and Automatic Methane/Non Methane Concentration***

Low cost of ownership. Low fuel gas consumption. Combustion air supply for the FID detector is built in. No external cylinder for synthetic air is needed. To prevent well known HC hang up (memory effect) and related sample drifting, the heated sample line can easily be connected inside of the heated oven. This prevents any cold spot and any related HC condensation, (Back purge feature not available for 109A-OVE).

The 109A is the most used HFID analyzer throughout the stack testing industry for measuring the Continuous, Simultaneous Methane, Total Hydrocarbon and Non Methane Hydrocarbon Concentration

Printed on 100% Recycled Paper

29N2-1525-2024

General:

Analyzer fully complies with EN ISO 25140. THC (TVOC) circuit fully complies with QAL1 (EN 14181-EN ISO 14659), with EN 12619:2013, in USA with EPA Method 25A and Method 503

The 109A is the only available heated non methane gaseous organic carbon NMGOC (NMHC) FID analyzer with an internal permanently installed sample filter to be cleaned by pack purge with compressed air or nitrogen. This feature cleans the sample filter AND the sample line and sample probe at the same time and nearly eliminates sample related drifting once being automated. A stack filter probe is not required when the analyzer is used as a "stand alone", or the stack probe is equipped with a solenoid valve to allow the back purged contamination to be vented downstream of the stack filter. This makes the 109A highly ideal for CEM and CEM certification applications with extremely low sample line drift (hang up).

The rugged modular and highly reliable design and construction also make the analyzers ideal for mobile temporary field/stack testing applications, as it is used by many numerous stack testing laboratories all over the World.

The J.U.M. Engineering HFID Model 109A is time proven in over 24 years. It is a highly reliable and outstandingly rugged 19" rack mount or table top heated NMGOC (Non Methane Gaseous Organic Carbon) analyzer. Built for very low drift, high accuracy, sensitivity and stability. The 109A uses two parallel operating hydrogen flame ionization detectors (FID) in a heated oven to prevent the loss of high molecular weight hydrocarbons and to provide reliable performance in the analysis of high concentrations down to very low trace concentration levels of gaseous organic carbon contaminants in emissions, air and other gases and high purity gases. One of the two sample capillaries is connected in series to a temperature controlled catalyst module. This catalyst oxidizes all hydrocarbons except Methane carbon. Both detectors are connected to two individual electrometer amplifiers. From these two FID signals, total organic gaseous carbon from the detector without the catalyst and methane carbon from the detector with the catalyst, the non methane organic carbon signals is generated via differential calculation. Thus resulting in three continuous simultaneous 0-10 VDC signals shown on individual front panel displays. Three individual DC voltage and one 4-20 mA signal are available in the rear panel plus optional RS 232 data outputs per channel. All sample containing parts and components are discretely integrated into the heated chamber. The permanently installed heated sample filter is cleaned by back purging with compressed air or nitrogen. This allows uninterrupted measurements during cleaning the sample filter. While back purging the sample filter, the external sample line and sample probe is also cleaned. The use of a stack probe filter is not necessary when the FID is used in a stand alone mode. The combustion air supply for the detector is built in. No expensive zero gas generator or external cylinder for synthetic air is needed. The proprietary rear panel sample line adapter-plate system allows cold-spot free coupling of a heated sample line inside of the heated oven without the need of special tools. The fittings can easily be accessed through a wrench port in the right side panel.

Analyzer Features

- Made in Germany
- ***1st Sampling Choice:*** Maintenance free, permanently installed sample filter back purge system allows filter to be cleaned without dismantling (automatic back purge optional)
- ***2nd Sampling Choice:*** **D**isposable sample filter which is easily accessible in the rear panel without special tools. This optional available feature ***reflects a 20% price advantage over a standard analyzer using our back purge filter.***
- All components in contact with sample are fully heated and digitally maintained at 190°C
- Built-In sample pump
- Built-in combustion air supply, no extra burner air bottle needed
- Permanent 2 micron stainless steel wire mesh back purge sample filter or optional 2 micron disposable sample filter. Disposable sample filter optional
- "Overflow" calibration system for safe zero and span calibration
- Automatic flame out alarm contact and optional available fuel shut off valve
- Fast response time
- Low fuel consumption
- Microprocessor PID type temperature controller
- Cold spot free coupling of a heated sample line inside the heated oven with optional Adapter Plate (not available with OVE Option)
- Remote control for sample, zero gas, span gas and back purge is standard
- Automatic or remote range change optional

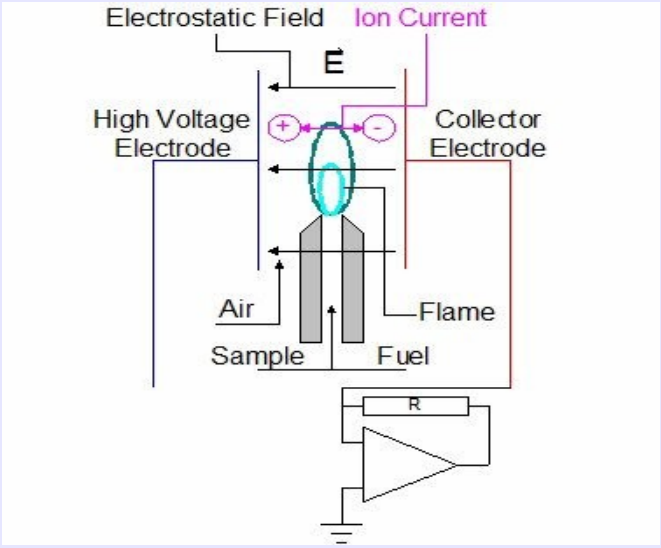
Applications

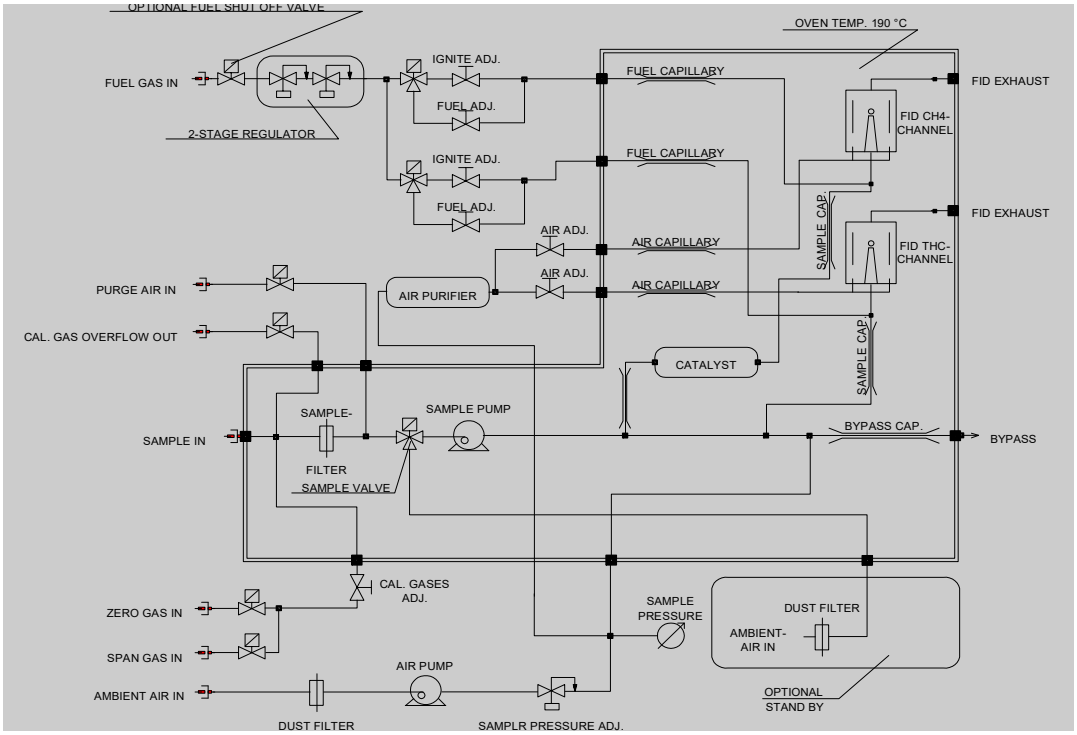
- Compliance monitoring of source total organic gaseous carbon, methane carbon and non methane organic gaseous carbon in full compliance with US EPA Methods 25A and US EPA IACA TCM-042
- VOC compliance stack emissions monitoring Industrial printing press, coating system and dryer systems
- Oil fume monitoring
- US EPA VOC compliance testing of bakery stack emissions
- RDE Testing: Measuring raw exhaust continuous and simultaneous methane, non methane and total hydrocarbon automobile exhaust emissions during driving conditions
- Optimizing industrial ovens
- Fence line (perimeter) monitoring
- Solvent recovery monitor for carbon bed break through
- Catalytic combustion and converter monitoring/testing
- Thermal combustion monitoring/testing
- Carbon adsorption regeneration monitoring and control
- Raw exhaust engine and vehicle emissions analysis
- Hydrocarbon contamination monitoring in air and other gases

Principle of Operation

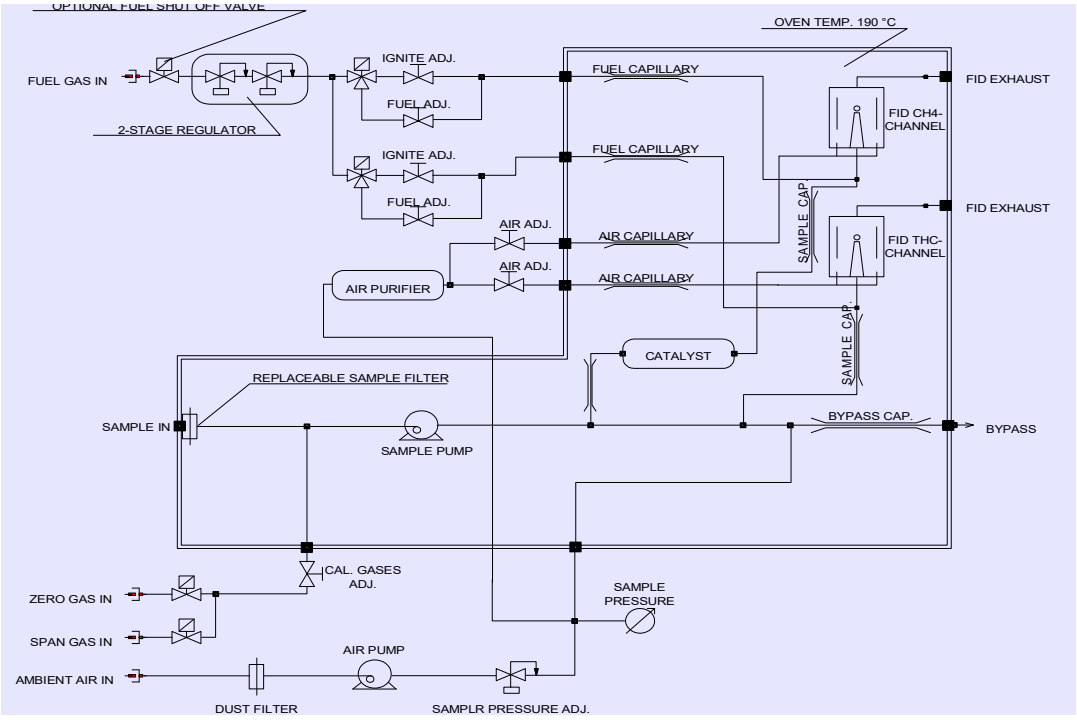
The Heated Flame Ionization Detection (HFID) method is used to determine the presence of hydrocarbon concentrations in gaseous samples. Two detectors are used in parallel, one for Total Hydrocarbons (THC) and the other for Methane Carbon (MC). The THC signal and the MC signal are both shown on two displays, while the MC signal is subtracted from the THC signal and displayed as Non Methane Hydrocarbon (NMHC) on the 3rd display. Burning hydrocarbon-free hydrogen in hydrocarbon-free air produces a negligible number of ions in the detector. Once a sample which contains any organic carbon matter is introduced into this flame, a very complex ionization process is started. This process creates a large number of ions. A high polarizing voltage is applied between the two electrodes around the burner nozzle and produces an electrostatic field. Now negative carbon ions migrate to the collector electrode and positive hydrogen ions migrate to the high voltage electrode. The so generated ionization current between the two electrodes is directly proportional to the hydrocarbon concentration in the sample that is burned by the flame. This signal is measured and amplified by a highly sensitive and stable electrometer amplifier unit. The FID response is linear over six orders of magnitude. The typical detection limit of the Detector is 100 ppb.

Our proprietary sample pressure regulator provides a controlled sample pressure and flow which gives admittance of a constant sample flow rate to the FID burners. This technique of using our non sample contact regulator is time proven for over 40 years by J.U.M. Engineering to provide the highest possible sample low flow rate stability at the lowest maintenance. Our compactly designed flow control module for fuel, ignition and air flow rates via low thermal mass needle valves use high precision pressure regulators. The needle valves are factory adjusted and sealed to ensure the optimization of the burner.





Complete flow diagram shown with standard back purge sample filter



Complete flow diagram shown with alternative disposable sample filter Option OVE 9

Technical Specifications

Method	Dual heated Flame Ionization Detector (HFID) one detector for THC (C_xH_y), second detector with catalytic converter for MC (CH_4), Subtraction of MC from THC
Sensitivity	Max. 1 ppm CH_4 full scale
Response time TGOC (THC)	<0.2 seconds @ sample inlet
Response time CH_4	< 15 seconds @ sample inlet
T_{90} time TGOC (THC)	< 1.2 seconds @ sample inlet
T_{90} time CH_4	< 50 seconds @ sample inlet
Linearity	Up to 10.000 ppm full scale within 1.5%
Oxygen synergism	< 2.5% Full Scale Deflection
Measuring ranges (ppm)	0-10,100, 1.000, 10.000, 100.000, others on request. Front panel turn switch, automatic or remote control optional
Signal outputs	One each per channel 0-10 VDC, one each per channel RS-232 data out, one channel only with 4-20 mA, RS 232 data out for all three channels (with ENGA option only)
Display	21/2 digit DVM or optional 6 digit direct reading ppm units with capability to display up to 3 overlapping ranges without range change.
Total sample flow through	2.5 to 2.8 l/min capacity @ operating temp.
Sample filter	Permanent 2 micron mesh filter, cleaned by back purge with compressed dry air or N2. Alternatively disposable change filter in rear panel. **Option OVE 9**
Zero and Span gas	Front panel turn switch select & remote control. Gas inlets on rear panel
Zero and span adjust	Manual duo dials on front panel
Fuel gas choice **(should be specified with purchase order)**	✗ Standard 40%H2/60%He, consumption approximately 180 ml/min ✗ Optional 100% H2, consumption approx. 40 ml/min ✗ Optional 40%N2/60%He, consumption approximately 180 ml/min
Burner air consumption	Built in burner air supply. No external cylinder air needed. Internally generated consumption approximately 260 ml/min. At 40/60 mixed fuels. Air consumption is approx. 450 ml/min
Oven temperature	190°C (374°F)
Temperature control heated oven and catalytic converter	2 micro-processor PID controllers
Power requirements	230VAC/50Hz, 900 W. 120 VAC/60Hz optional
Ambient temperature	5-43°C (41-110°F)
Dimensions (W x D x H)	19" (483 mm) x 460 mm x 221 mm
Weight	approx. 24 kg

Available Options

OVE 9	Quick change, disposable 2 micron sample filter housed in the heated oven in stead of back purge sample filter **(An approx. 20% Price Advantage)**
AMU 9	Automatic controlled range change with range identification
FSS 9	For portable applications; Small and safe FID-Fuel purifying storage; Always guarantees high purity 5.0 hydrogen quality. Low pressure, 50 liter metal hydride fuel purifying storage cartridge. Optional pressure regulator with pressure gauge mounted on 1/4“ Swagelok quick connector. Refilling from large cylinder is safe and can be performed with standard 0 to 10 bar (0 to 1 MPa) rated gas cylinder regulator.
FDR 9	Pressure regulator with trending pressure gauge for FSS 9 purifying storage system mounted on Swagelok quick connector
APO 9	Automatic sample filter pack purge; Internal, easily programmable back purge timing system for back purge time and purge sequence sequence. Cannot be used together with OVE 9 option!
AZM 9	Automatic flame ignition and re-ignition
ENGA 9	6-digit engineering units display 0-100.000 ppm (or others) with RS232 data output. 24 bit resolution allows to measure and log RS232 data throughout 2 to 3 measuring ranges without range change
FOAS 9	Flame out control with automatic fuel shut off valve
MBP 9	Integrated bypass pump for very long sample lines, also compensates sample pressure fluctuations of up to 2 bar at sample inlet. Not available with PDA option
RCC 9	Remote controlled range change with range identification (dry contact)
RCI4 9	4-20 mA analog output, galvanic isolated
RCI0 9	0-20 mA analog output, galvanic isolated

Optional low pressure hydrogen fuel gas filter FSS 9 and pressure regulator FDR 9 for mobile measurement applications. Allows typicality 20 plus hours of continuous usage of the 109A dual detector analyzer.

Questions and Answers about the low pressure rechargeable Hydrogen gas filter and storage system

Q: Is the new fuel gas filter storage a high pressure cylinder?
A: Actually no, it is not! The new hydrogen FID Fuel Gas filter which stores Hydrogen as Metal Hydride. It is charged at a low pressure of 1 MPa (10 bar), operating at pressures below 0.08 MPa (8 bar). It purifies contaminated Hydrogen to a very high 5.0 gas purity (99.000) The gas filter is very safe and withstands pressures of over 200 bar.

Q: Is the used filter storage a pressurized gas tank?
A: No, it is not a pressurized gas tank. In this system hydrogen is purified and stored in form of solid metal powder which chemically reacts to metal hydride when it is contacted with hydrogen gas.

Q: How could I know when I used up the purified hydrogen, and need to recharge?
A: If the FSS 9 uses a pressure regulator pressure to indicate the outlet pressure on its miniature pressure gauge. If the system is used correctly without a leak. the pressure in the storage drops below 0.15 MPa (1.5 bar) after approx. 20 hours and the FID flame(s) slowly will go out. If no optional FDR 9 pressure regulator with pressure gauge is used, an elapse of approximately 20 hours after correct charging is a good indicator to recharge the system. Any pressure gauge in the fuel line can be used as an indicator.

Q: Can your new gas filter system store gases other than Hydrogen?
A: No, it is strictly designed to store and purify Hydrogen gas.

Q: What will happen if system is charged with other gases than Hydrogen?
A: In practice it will then work just like a pressurized tank. However, if the stored gas is another one than Hydrogen it will destroy the dense filling of metal alloy powder and the storage will no longer purify and hold hydrogen gas properly.

Q: Is a pressure regulator required while using your new hydrogen storage system?
A: Even though that the internal regulator of the analyzer can handle the raw cartridge pressure, we strongly suggest that the offered FDR 9 pressure regulator for the cartridge is always being used.

Q: How long does it take to charge/recharge an empty cartridge?
A: Recharging is simple and fast. Shortest case charge time is around 60 plus minutes to charge at a pressure of 10 to 12 bar (1 to 1.2 MPa) at ambient air temperatures. Best charging results are reached after a couple of hours when the cartridge has reached room temperature. Any standard hydrogen pressure regulator with an adjustable output range of 0 to 15 bar (0-15 MPa) or some higher can be used for charging.

Q: What is the typical life span of the hydrogen storage system?
A: As purer the charged hydrogen gas is as higher is the life span of the system. When it is always being charged with r higher quality purity hydrogen, the charge/discharge quantities can come to 9'000 cycles which count to less than 10% decay in storage capacity. In fact, it can be considered as a limitless refillable tool.

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Approved Print Date: Jan. 2025