TORONTECH

PORTABLE FTIR GAS ANALYZER

Portable FTIR Gas Analyzer - ToronFTIR™ G12000

ToronFTIR™ G12000 is a portable FTIR gas analyzer built for continuous emissions and VOC monitoring at fixed pollution sources such as coal-fired power, steel, cement, and waste-incineration plants. The instrument reads the infrared fingerprint of a flowing gas sample and quantifies dozens of components at once, from combustion gases like SO_2, NO, and CO to a wide list of volatile organic compounds. A heated, corrosion-protected sample cell lets the analyzer work directly on hot, humid, and corrosive flue gas without losing reactive or condensable species.

The ToronFTIR™ G12000 pairs the analyzer with a full-process heated sampling system and a flue-gas pretreatment stage, so the sample reaches the cell at temperature and free of dust. A room-temperature DTGS detector removes any need for liquid-nitrogen or thermoelectric cooling, which keeps field operation simple. Battery power, a portable workstation, and a transport case make the system practical for stack surveys, mobile audits, and emergency response away from mains power.

The analyzer measures more than fifty gas components as standard and accepts a customized gas menu on request. Software handles multi-point calibration, dry and wet concentration conversion, temperature and pressure compensation, and automatic correction of cross-interference between components. Continuous logging, trend charts, spectral replay, and Excel export give operators a full record for reporting and later review.

APPLICATIONS

Portable FTIR Gas Analyzer - ToronFTIR™ G12000 Applications

The ToronFTIR™ G12000 supports emissions compliance, process monitoring, and safety work across heavy industry and environmental services.

- Fixed-Source Emissions Monitoring: measures stack gas at coal-fired power, steel, cement, glass, and waste-incineration plants for regulatory reporting.
- VOC Compliance Monitoring: quantifies organized VOC emissions in industrial flue gas across many organic species in one scan.
- Hot, Humid, Corrosive Flue Gas: heated sampling and anti-corrosion optics handle demanding stack conditions that defeat cold-cell analyzers.
- Environmental Emergency Response: screens inorganic hazardous gases and toxic organics in ambient air during spills and incidents.
- Process and Combustion Optimization: tracks CO, CO_2, NOx, and hydrocarbons to tune burners and reduce fuel use.
- Industrial Hygiene and Safety: detects toxic gases such as HCl, HF, HCN, phosgene, and carbon disulfide around production areas.
- Research and Method Development: builds spectral libraries and studies multi-component gas mixtures in academic and industrial labs.

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FEATURES

Portable FTIR Gas Analyzer - ToronFTIR™ G12000 Key Features

The ToronFTIR™ G12000 combines simultaneous multi-gas analysis with rugged, field-ready sampling.

- Simultaneous Multi-Gas Analysis: measures more than fifty gas components in a single scan, with a customizable gas menu on request.
- Room-Temperature DTGS Detector: operates without liquid-nitrogen or thermoelectric cooling, which simplifies field deployment.
- Long 4.5-Meter Optical Path: a folded long-path cell lowers detection limits for trace pollutants.
- Heated, Corrosion-Resistant Cell: anti-corrosion coatings and 180 °C heating allow direct measurement of wet, acidic flue gas.
- Full-Process Heated Sampling: heated probe and lines above 180 °C prevent condensation and loss of reactive species.
- Three-Stage Filtration: high-temperature, corrosion-resistant filters remove 0.5 to 5 µm particles before the cell.
- Fast Scanning: at least five scans per second supports rapid trend tracking and averaging.
- Dry and Wet Conversion: reports concentrations on both a dry and wet basis to match reporting requirements.
- Temperature and Pressure Compensation: corrects for site conditions and automatically resolves cross-interference between gases.
- Continuous Logging and Trends: records spectra, displays concentration trend charts, and replays saved spectra for review.
- Excel Data Export: saves results in a spreadsheet format ready for report preparation.
- Portable Battery Operation: mobile lithium power packs and a transport case support stack surveys and remote audits.
- One-Click Remote Diagnostics: generates a status file operators can send to service engineers for support.

THEORY & METHOD

Theory and Method

Fourier transform infrared gas analysis identifies and quantifies gases by the way their molecules absorb infrared light. Each gas absorbs at characteristic wavenumbers set by the vibration of its chemical bonds, so a mixture produces a combined spectrum that the software separates into individual components. The ToronFTIR™ G12000 records the full spectrum in a single measurement rather than scanning one wavelength at a time, which lets it report many gases at once and repeat the measurement several times each second.

At the core sits a Michelson interferometer. A beamsplitter with moisture-proof windows divides the infrared beam into two paths that reflect off a fixed and a moving mirror. Recombining the beams produces an interferogram, and a Fourier transform converts it into an absorbance spectrum. The Beer-Lambert relationship then links absorbance to concentration: a longer optical path and higher absorbance mean more molecules in the beam. A folded path of at least 4.5 meters inside a sub-1-liter cell gives the sensitivity needed for low-level pollutants.

Sample handling decides accuracy as much as the optics. Reactive and condensable gases such as HCl, HF, NH_3, and water stick to cold surfaces or drop out as the sample cools, which biases the reading. The ToronFTIR™ G12000 keeps the probe, sample lines, and cell above 180 °C along the entire path, so the sample stays in the vapor phase from stack to detector. Anti-corrosion coatings protect the cell and reflector from acidic flue gas during extended field runs.

TECHNICAL SPECIFICATIONS

Portable FTIR Gas Analyzer - ToronFTIR™ G12000 Technical Specifications

Parameter	Specification
Measurement Principle	Fourier transform infrared (FTIR)
Detector	DTGS, room-temperature operation (no cooling required)

Parameter	Specification
Beamsplitter	Moisture-proof window material
Wavenumber Range	600 to 4500 cm^{-1} (minimum)
Spectral Resolution	4 cm^{-1} standard, 1 cm^{-1} optional
Scanning Frequency	≥ 5 scans per second
Optical Path Length	≥ 4.5 m
Sample Cell Volume	< 1.0 L
Sample Cell Heating	≥ 180 °C
Corrosion Protection	Anti-corrosion coating on sample cell and reflector
Indication Error (CO_2)	Within ±5%
Indication Error (other gases)	±5% relative for range > 60 μmol/mol; ±3 μmol/mol absolute for range ≤ 60 μmol/mol
Zero Drift	Within ±3%
Span Drift	Within ±3%
Sample Flow Influence	≤ ±2.0% FS
Ambient Temperature Influence	≤ ±5.0% FS
Supply Voltage Influence	≤ ±2.0% FS
Data Export	Excel format
Voltage	AC 220 V, 50 Hz, 300 W (110V is also available)

Sampling and Pretreatment System

Parameter	Specification
Heated Sampling System	Full-process heating, ≥ 180 °C constant temperature
Sampling Flow Rate	≥ 1.8 L/min
Pump Force	≥ 80 kPa
Filtration	Three-stage dust removal; high-temperature, corrosion-resistant, non-absorbent; 0.5 to 5 μm
Heated Sample Lines	≥ 5 m and ≥ 1 m, ≥ 180 °C, with duct temperature display
Heated Sampling Probe	≥ 1 m, ≥ 180 °C, front-end dust filter
Flue Gas Cooling	Two-stage semiconductor cooling, ≥ 80 NL/h, cool-down ≤ 30 min
Sample Gas Inlet Temperature	≤ 180 °C
Outlet Dew Point	≤ 5 °C
Precision Filtration	0.1 μm, L = 50 mm
Exhaust Capacity	3.3 NL/min
Anti-Negative-Pressure Capacity	-5000 Pa, 1 L/min
Sampling Chamber Heating	≥ 120 °C
Stainless Steel Probe	≥ 1 m, heated line ≥ 3 m, ≤ 2 μm pre-filter
Phosphoric Acid Titration Device	20% to 80% concentration, peristaltic pump 1 to 5 rpm/min

Standard Configuration

Item	Quantity	Description
Portable FTIR Gas Analyzer Main Unit	1 set	Main analyzer unit

Item	Quantity	Description
Full-Process Heated Sampling System	1 set	Heated probe (≥ 1 m), heated lines (≥ 5 m and ≥ 1 m), heated sampler
Portable Transport Case	1	Field carry case
Primary Metal Filter Elements	2	First-stage filtration
Secondary Metal Filters	2	Second-stage filtration
Tertiary Metal Filter Elements	2	Third-stage filtration
Analysis Software System	1 set	Multi-substance quantitative analysis
Factory Gas Calibration Spectral Library	1 set	Pre-loaded calibration spectra
Qualitative / Semi-Quantitative Libraries	≥ 200	Reference spectral libraries
Mobile Workstation	1	i7 CPU, 32 GB RAM, 1 TB storage, 14-inch 2.5K touchscreen
Mobile Lithium Power Sources	2	24 V, 55 Ah, 1500 W rated / 5000 W peak, 8 kg each
Flue Gas Pretreatment System	1 set	Cooling, filtration, and conditioning
Portable Printer	1	On-site report printing

Measurable Gas Components

The analyzer quantifies the following components as standard. Ranges are in mg/m³ unless marked %Vol, and cover a lower and an upper calibration span.

Gas Component	Formula	Lower Range	Upper Range
Oxygen	O_2	0 to 20.9 %Vol	-
Carbon monoxide	CO	0 to 75	0 to 1000
Nitric oxide	NO	0 to 80	0 to 600

Gas Component	Formula	Lower Range	Upper Range
Nitrogen dioxide	NO_2	0 to 50	0 to 600
Nitrous oxide	N_2O	0 to 50	0 to 400
Sulfur dioxide	SO_2	0 to 75	0 to 1000
Ammonia	NH_3	0 to 15	0 to 50
Hydrogen chloride	HCl	0 to 15	0 to 100
Hydrogen fluoride	HF	0 to 15	0 to 50
Hydrogen cyanide	HCN	0 to 50	0 to 100
Methane	CH_4	0 to 200	0 to 2000
Propane	C_3H_8	0 to 50	0 to 1000
Ethylene	C_2H_4	0 to 50	0 to 1000
Formaldehyde	HCHO	0 to 50	0 to 100
Benzene	C_6H_6	0 to 50	0 to 100
Toluene	C_7H_8	0 to 100	0 to 1000
Styrene	C_8H_8	0 to 100	0 to 1000
Water vapor	H_2O	0 to 25 %Vol	0 to 40 %Vol
Carbon dioxide	CO_2	0 to 25 %Vol	-
Propylene	C_3H_6	0 to 100	0 to 1000
Ethylbenzene	C_8H_{10}	0 to 100	0 to 1000
Acetylene	C_2H_2	0 to 15	0 to 50

Gas Component	Formula	Lower Range	Upper Range
Acrolein	C_3H_4O	0 to 50	0 to 100
Phenol	C_6H_6O	0 to 100	0 to 1000
Nitrobenzene	$C_6H_5NO_2$	0 to 150	0 to 1000
m-Xylene	C_8H_{10}	0 to 120	0 to 1000
p-Xylene	C_8H_{10}	0 to 120	0 to 1000
o-Xylene	C_8H_{10}	0 to 120	0 to 1000
Ethane	C_2H_6	0 to 50	0 to 1000
TVOC	-	0 to 50	0 to 1000
Hexane	C_6H_{14}	0 to 200	0 to 1000
Cyclohexane	C_6H_{12}	0 to 120	0 to 1000
Acetic acid	$C_2H_4O_2$	0 to 25	0 to 50
Acetone	C_3H_6O	0 to 100	0 to 1000
Methanol	CH_3OH	0 to 100	0 to 1000
Ethanol	C_2H_5OH	0 to 100	0 to 1000
Dichloromethane	CH_2Cl_2	0 to 100	0 to 1000
Chloroform	$CHCl_3$	0 to 100	0 to 1000
1,1-Dichloroethane	$C_2H_4Cl_2$	0 to 30	0 to 1000
Dichloroethylene	$C_2H_2Cl_2$	0 to 200	0 to 1000
Trichloroethylene	C_2HCl_3	0 to 100	0 to 1000

Gas Component	Formula	Lower Range	Upper Range
Tetrachloroethylene	C_2Cl_4	0 to 200	0 to 1000
Methyl acetate	$C_3H_6O_2$	0 to 100	0 to 1000
Amine (verify)	C_3H_8N	0 to 130	0 to 1000
Chlorobenzene	C_6H_5Cl	0 to 100	0 to 1000
Acrylonitrile	C_3H_3N	0 to 180	0 to 1000
Carbon disulfide	CS_2	0 to 15	0 to 50
Aniline	$C_6H_5NH_2$	0 to 100	0 to 1000
Vinyl chloride	C_2H_3Cl	0 to 100	-
Acetaldehyde	C_2H_4O	0 to 100	0 to 1000
Acetic anhydride	$C_4H_6O_3$	0 to 200	0 to 1000

The instrument also carries qualitative and semi-quantitative reference spectra for additional compounds, including ethanethiol, ethylamine, acetophenone, bromoethane, butane, sulfur hexafluoride, nitrogen trifluoride, ethyl acetate, acetic anhydride, diethyl ether, dimethyl disulfide, dimethylamine, phosgene, perfluoropropane, chloroethane, methyl mercaptan, dimethyl sulfide, methylamine, methyl formate, furfuryl alcohol, n-butanol, isopropanol, heptane, carbon tetrachloride, trichloromethane, trimethylamine, and propanol. The gas menu and ranges can be customized to the customer's application.

Factory Gas Calibration Components

Gas Component	Formula	Calibration Range
Sulfur dioxide	SO_2	0 to 1000 ppm
Nitric oxide	NO	0 to 2000 ppm
Nitrogen dioxide	NO_2	0 to 500 ppm

Gas Component	Formula	Calibration Range
Carbon monoxide	CO	0 to 5000 ppm
Carbon dioxide	CO_2	0 to 90%
Ammonia	NH_3	0 to 500 ppm
Hydrogen chloride	HCl	0 to 200 ppm
Water vapor	H_2O	0 to 30%
Nitrous oxide	N_2O	0 to 500 ppm
Methane	CH_4	0 to 2000 ppm
Ethane	C_2H_6	0 to 100 ppm
Propane	C_3H_8	0 to 100 ppm
Hydrogen fluoride	HF	0 to 100 ppm
Benzene	C_6H_6	0 to 100 ppm
Toluene	C_7H_8	0 to 100 ppm
Ethylbenzene	C_8H_{10}	0 to 100 ppm
Styrene	C_8H_8	0 to 100 ppm

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