

DynamiQ-X NG2210 and DynamiQ-X NG2220

Gas chromatographs for on-line
natural gas analysis



DynamiQ-X NG2210 and NG2220

Gas chromatographs

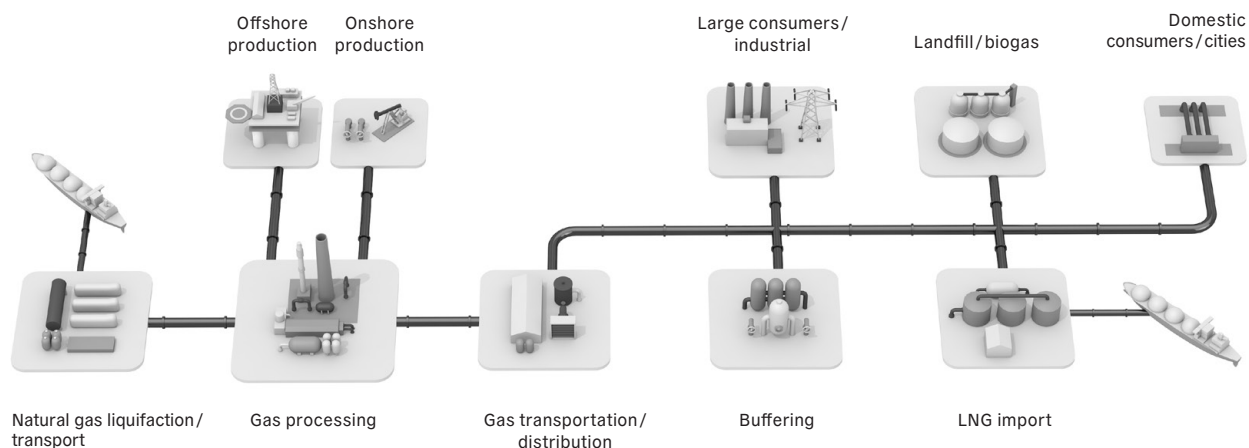
The **DynamiQ-X NG2210** provides fast and accurate on-line monitoring of natural gas, and delivers calorific values for composition control and custody transfer purposes.

The **DynamiQ-X NG2220** performs the same analysis for natural gas containing hydrogen concentrations up to 20 % using only one carrier gas.

The analyzer is extremely compact while its capabilities are massive. The applied microGC chips enable analysis times of less than a minute.



Areas of application



The fast and accurate natural gas analyzer can be applied for composition control and custody transfer in many parts of the natural gas infrastructure:

- Transportation and distribution networks for natural gas
- Natural gas storage
- Natural gas city gate stations
- Blending stations
- Natural gas conditioning stations
- Mobile analysis and measurement systems
- Offshore
- Power-to-gas systems



Calorific value

In delivery to end users such as gas-fired power plants or energy companies that supply natural gas for home heating, the gas composition needs to be known to determine the calorific value of the natural gas.

Monitoring

Moreover, the natural gas composition in distribution networks needs to be monitored to ensure that it complies with legal gas composition standards. Local and near-real-time analysis allows for fast adjustment of the natural gas composition to meet legislation. This also applies to mixing plants for adding nitrogen to high-calorific natural gas, to convert it into low-calorific gas.

Hydrogen

Injecting sustainably produced green hydrogen into natural gas streams provides another way to reduce greenhouse gas emissions. As the hydrogen concentration may vary over time, near-real-time monitoring of the gas composition of this natural gas/hydrogen blend is needed to determine its calorific value.

The compact DynamiQ-X NG2210 and NG2220 micro gas chromatographs provide a solution for all these natural gas applications – and more.

DynamiQ-X microGC gas analyzer

Very short analysis times

The DynamiQ-X NG2210 and NG2220 microGC gas analyzers accommodate two or three gas chromatograph (GC) units working in parallel, each performing a different GC analysis under individually optimized conditions. Each GC unit contains a state-of-the-art microchip-based injector and a thermal conductivity detector (TCD) combined with a proven microbore GC column, and is set with optimal chromatography conditions. This enables a compact instrument as well as very short analysis times of typically less than a minute.

Hydrogen, oxygen and nitrogen detection

The DynamiQ-X NG2220 is equipped with an additional third GC unit to detect hydrogen, oxygen and nitrogen. This third GC unit has a separate carrier gas inlet, so optionally a second carrier gas can be applied.

Continuous monitoring

The instrument is designed for continuous monitoring and therefore works in a stand-alone configuration using the integrated processor on a future-proof operating system based on Linux RT, without the need for a separate controller to give commands. In addition, dedicated DynamiQ PC software can be used to analyze the collected data in further detail and to change operation settings.

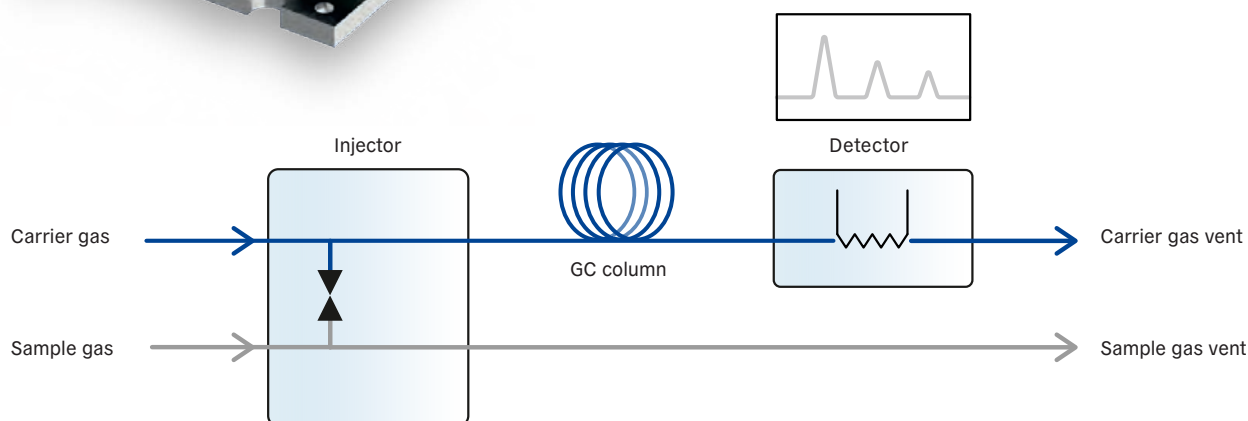
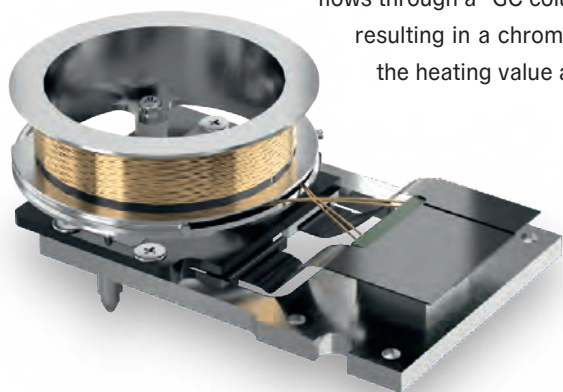
The PC can be connected to the analyzer at any location via a network connection.

Compact device

The compact instrument has a volume of only 10l and weighs less than 15 kg, so it is very easy to transport and can be deployed anywhere for gas analysis if local power and gas bottles are available.

DynamiQ's micro gas chromatography

The natural gas analysis is realized by means of gas chromatography, a proven analysis method for determining the chemical composition of a gas mixture. A small volume of the sample gas is injected into the carrier gas and this mixture flows through a "GC column", where the gas components are separated and individually detected, resulting in a chromatogram. From this chromatogram, the components' concentrations and the heating value are calculated.



Standard measurement range

Component	Measurement range (mole %)	
Methane (CH ₄)	40–100 %	
Carbon dioxide (CO ₂)	0–20 %	GC Unit 1
Ethane (C ₂)	0–15 %	
Air (N ₂ + O ₂)	0–30 %	
Propane (C ₃)	0–15 %	
i-Butane (i-C ₄)	0–5 %	
n-Butane (n-C ₄)	0–5 %	
Neopentane (neo-C ₅)	0–1 %	GC Unit 2
i-Pentane (i-C ₅)	0–2 %	
n-Pentane (n-C ₅)	0–2 %	
Hexane+ (C ₆ +) *	0–1 % *	
Hydrogen (H ₂)	0–20 %	
Oxygen (O ₂)	0–5 %	GC Unit 3**
Nitrogen (N ₂)	0–30 %	

* Total of higher-boiling hydrocarbons ** NG2220 only

Calculated values ***

- Normalized components
- Unnormalized sum
- Superior and inferior heating value
- Wobbe index
- Relative density and density
- Molar mass
- Compressibility

*** According to ISO 6976:2016

Robust enclosure

The ATEX/IECEX-certified DynamiQ-X analyzers are housed in an explosion-safe marine-grade aluminum IP65 enclosure.

Tubeless analyzer

A one-piece manifold replaces tubing found in traditional GCs. This adds to the robustness and performance of the analyzer, as fewer connections reduce possible sources of leakage. In fact, the GC column is the only “tube” inside the instrument.

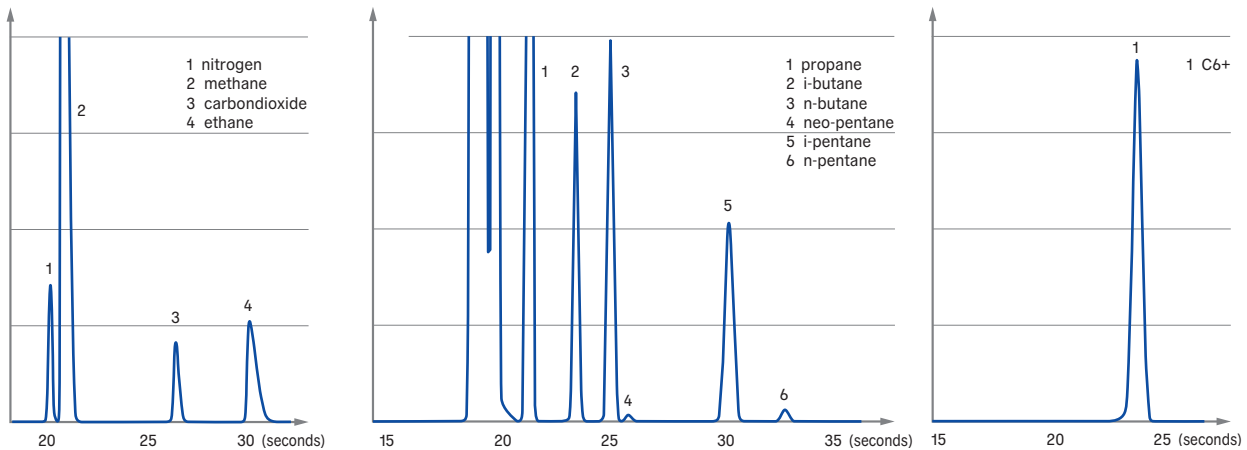
Fast exchange of cartridges

The cartridge, which contains the GC units, can be replaced by the end user. The replacement is simple and can be done within 10 minutes. Approximately two hours after cartridge replacement, the DynamiQ-X analyzers are fully operable again.

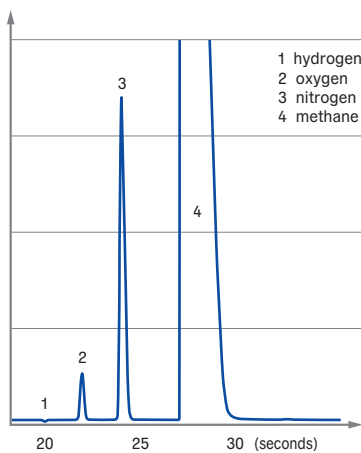
Stream selector

The analyzer has a built-in stream selector to connect up to four streams and/or calibration gas bottles. This integrated stream selector switches between the different gas inlets, so only one stream is introduced into the analyzer at a time. The stream selector has a double block and bleed design so there are virtually no history or cross-contamination effects between the different gas streams. After the stream selector, the selected sample gas, together with the carrier gas, is led in parallel through all GC units.





Natural gas chromatograms:
C1-C2 (left), C3-C5 (center) and C6+ (right)



Hydrogen in natural gas chromatogram

In addition, an external (VICI) 16-port multi-stream selector can be connected and controlled from the instrument software.

Injector

Time-controlled injection is used, with an integrated array of pneumatically controlled micro membrane valves. This makes injection extremely accurate and reproducible, and provides short analysis times.

Detector

The in-house-fabricated detector chip is a thermal conductivity detector (TCD), a robust device featuring simplicity, a large dynamic range, a general response to both organic and inorganic species, and a non-destructive character. The temperature-controlled micro TCD – with 2x24 bit digital detector electronics – automatically adapts for different gases and is protected against overheating. Qmicro's microchip TCD technology results in a detection limit better than 0.5 ppm (for pentane).

Back-flush-to-detector

DynamiQ-X analyzers are equipped with back-flush-to-detector technology. This increases the analytical column lifetime because polluting or reactive components are prevented from entering the column. Moreover, when using a second detector, both fore-flush and back-flush chromatograms run in parallel, which shortens the analysis even more. A standard natural gas C6+ analysis can be conducted every 45 seconds.

Fastloop

To be able to follow changes in the natural gas composition in near real-time, the DynamiQ-X analyzers feature a fast-loop. For sample flow refreshment, the fastloop increases the incoming sample flow by connecting a parallel gas channel that reduces the overall sample flow resistance.

Low carrier gas consumption

The gas port connections are 1/16" VICI Valco fittings. Typical carrier gas consumption is less than 15 ml/minute during an analysis. By applying optimal measurement settings, the use of carrier gas can be limited to one gas bottle set for each three years.

Helium 5.0 is the standard carrier gas for natural gas applications. A notable advantage is that hydrogen in all concentrations >50 ppm can be analyzed using helium as a carrier gas, so a full analysis of natural gas with hydrogen requires only one carrier gas. For low hydrogen concentrations <50 ppm, argon carrier gas can be used in the third NG2220 GC unit.

Operation and data processing

Stand-alone operation

DynamiQ-X analyzers are designed for on-line continuous monitoring, and therefore operate stand-alone and unattended.

Data processing and communication

The detector data is processed by an integrated processor. The autonomous running instrument generates data that is further communicated to the outside world by MODBUS or TCP protocols using RS485, RS232, Ethernet or Digital I/O ports. The DynamiQ-X analyzers can be connected to supervisory systems (such as SCADA) using these ports. Data is also stored on the GC and can be retrieved at any time.

DynamiQ PC software for data analysis and changing settings

Upon delivery, the DynamiQ-X analyzers are supplied with DynamiQ PC software, which allows setting, tuning and programming the DynamiQ-X analyzers, after which it runs stand-alone. Furthermore, this software can be used to analyze the collected data in detail. The communication between the the DynamiQ-X analyzers and the Windows PC is over a (wired) LAN connection.

The DynamiQ PC software is able to:

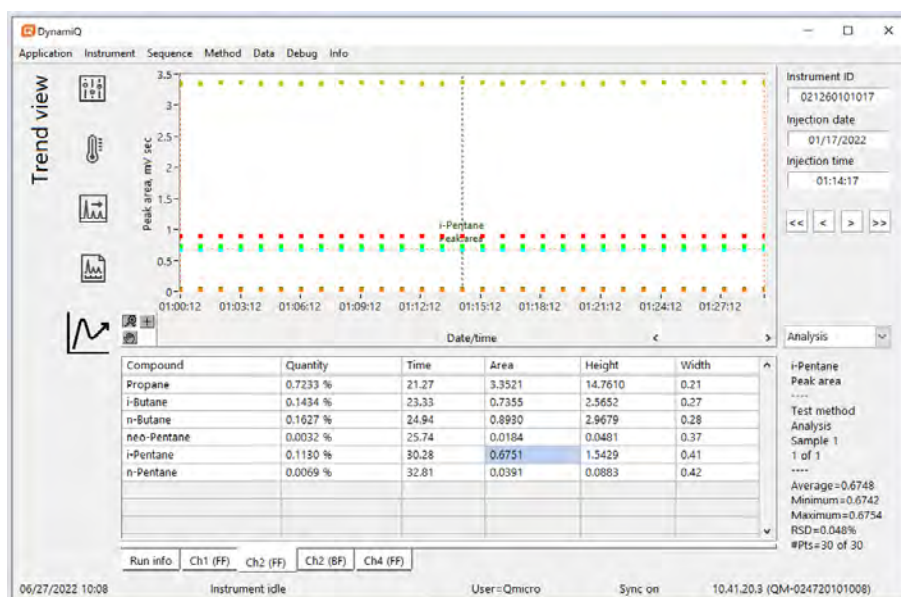
- View and change instrument and method settings;
- Perform calibration or validation runs;
- Perform multi-level calibration with polynomial fitting;
- Perform single or multiple analysis runs;
- Analyze collected data in detail;
- Show trend plots of measurement data and calculated results;
- Recalculate results;
- Export results data (to a delimited ASCII spreadsheet) for further processing.

Trends

The software is able to show a trend plot for the results of a series of analyses for a selected parameter e.g., quantity, time, area, height, width or a status parameter of the instrument at run start.

Historical data

All method parameters, analysis results, calibration results, calculated values and alarms can be stored with date and time stamp for at least two years, with a memory storage of up to 256 GB inside the DynamiQ-X NG2210 and NG2220. This facilitates problem-solving, may help to comply with legislation and enables observation of long-term trends.



DynamiQ software trend view screen example

Accessories

Cable (2 m)

All DynamiQ-X analyzers contain a receptacle for powering and communication. Optionally, a two-meter cable with connector and wiring scheme is provided to enable practical outward connections.

Junction box with cable

An optional junction box enables users to use their own cables (e.g. separate power cable and communication cable) for connection to the DynamiQ-X analyzers. It is an Ex e electrical junction box to be placed near the DynamiQ-X analyzer in the same zone. The box has a cable pre-attached with a connector for the instrument. Inside the box are terminals for wiring and the box has several (customizable) cable glands.



Mounting wall plate

Normally, the DynamiQ-X is wall-mounted with all gas and electrical connections directed downwards. The DynamiQ-X is standard supplied with a backplate, which enables it to be mounted to a wall or setup. In addition, an optional mounting wall plate is available which enables quick mounting and removal of the DynamiQ-X NG2210 and NG2220.

Protective case

To ensure safe transportation, a robust customized protective case is offered.



Carrier gas combiner

In cases where a single carrier gas is used, a T-connector enables one connection from the carrier gas bottle to the two carrier gas instrument inlets.

Vent plug set

An optional vent plug set with the correct screw thread eases connections between a vent line and the instrument.

Fastener set

A complete spare set of screws for the instrument housing is provided, along with fastener-set instructions.



Technical specifications

DynamiQ-X NG2210 and DynamiQ-X NG2220

Specifications	Values
Calorific value repeatability (range)	± 0.025% (6.15–16.15 kWh/m ³)
Calorific value calculation	ISO 6976:2016, GPA 2172, ASTM D3588
Cycle time	45 s
Operating temperature	–20 to 55 °C/–4 to 131 °F
Storage temperature	–20 to 60 °C/–4 to 140 °F
Moisture	5 to 95%
Dust/water protection	IP65 (only valid with receptacle cap/mating connections)
Power supply	20 to 28 VDC
Power consumption	20 W nominal, 75 W max
Dimensions	289 × 258 × 122 mm/11.4 × 10.2 × 4.8"
Weight	< 15 kg/33 lb. (without mounting brackets)
Gas ports	1/16" VICI Valco
Carrier gas	He (Ar can be optionally added for the NG2220)
Carrier gas input pressure	450 ± 5% kPa
Carrier gas consumption	15 ml/minute
Sampling	Pressurized
Sample pressure	10 to 100 kPa
Sample streams	4 (optional more)
Detectors	Fore-flush and back-flush micro TCD
Detection limit	500 ppb ... 100% (application dependent)
Communication ports	2× MODBUS over RS485 1× MODBUS over RS232 1× MODBUS over TCP/LAN Ethernet 2× digital I/O
Memory storage	Up to 256 GB
Certifications	ATEX/IECEX II 2G Ex db IIB+H2 T4 Gb; NEC&CEC Class I, Div. 1, Groups B,C and D, T4 (pending)
Meteorological approval	OIML R 140 class A compliant, PTB certified by German partner
Explosive atmospheres – Part 0	EN 60079-0 (2012) + A11:2013
Explosive atmospheres – Part 1: protection “d”	EN 60079-1 (2014)
Conducted & radiated emission (to 1 GHz SAC)	EN 55011 (2009) + A1 (2010)
ESD	EN-IEC 61000-4-2 (2009)
Radiated immunity	EN-IEC 61000-4-3 (2006) + A1 (2008) + A2 (2010)
EFT & surge	EN-IEC 61000-4-4 (2012) & EN-IEC 61000-4-5 (2014)
Conducted immunity	EN-IEC 61000-4-6 (2014)
Power frequency magnetic field	EN-IEC 61000-4-8 (2010)

Contact

Qmicro by Sensirion · Neptunusstraat 21 · 7521 WC · Enschede · The Netherlands · Phone: +31 88 6760 700
info@qmicro.com · www.qmicro.com