

# PROCESS GAS CHROMATOGRAPH

## PGC 9300



The PGC 9300 process gas chromatograph analyzes the composition of natural gas or upgraded biogas and determines their most important components.



# FUNCTION AND STRUCTURE

Gas quality matters. The entire PGC 9300 family from RMG stands for advanced gas quality measurement approved according to MessEG.

The PGC 9300 process gas chromatograph analyzes the composition of natural gas or upgraded biogas and determines their most important components (up to 13, depending on the measuring unit version) in mol % proportions. From these proportions, the following quantities are calculated (according to ISO 6976 or GPA 217209): Superior and inferior calorific value, standard density, density ratio and Wobbe number (optional the methane number as well). Be ready for the change of gas qualities in the network.



## Proven performance. Reliable in use.

Renewable energy is on the rise and brings fluctuations in natural gas quality. This increases the need for additional measurements of hydrogen and oxygen components to accurately determine the gas composition.

## RMG - your competent partner

- More than 150 years of experience in the natural gas industry
- Leading global solution provider in the field of control, measurement and analysis technology
- Products and solutions for transportation, storage, distribution and consumption of natural gas
- On-site support with global expertise
- Single-source provider with broad product portfolio and services

## Guaranteed accuracy

RMG's PGC 9300 process gas chromatograph meets all the requirements of the fast-growing natural gas industry. It is approved for fiscal and custody transfer metering by the Physikalisch-Technische Bundesanstalt (National Metrology Institute) in Germany. The instrument accurately determines the calorific value of natural gas, helping to reduce costs while lowering carrier consumption.

The Microelectronic Mechanical System (MEMS) technology ensures stable and reliable operation of the PGC 9300, making this process gas chromatograph the first instrument of its kind in the world to provide integrated measurement of natural gas. Hydrogen and oxygen content can be measured, always in compliance with the appropriate approvals for custody transfer measurements.

## Precise by design

The measuring accuracy of the PGC 9300 is  $\pm 0.10$  percent (calorific value and standard density) and enables as PGC 9303 hydrogen measurements with up to 5 % with using helium as the carrier gas only. With argon as the second carrier gas, the PGC 9304 is capable of capable of measuring hydrogen at up to 20%. The instruments are therefore suitable for demanding applications in the field of renewable energies, biogas and PowertoGas - you can reduce your operating costs and get even more accurate and reliable energy consumption data.

## Reliable technology

To calculate the gas compressibility, the PGC 9300 measures the compressibility based on the AGA 8 compressibility index. The percentage of up to thirteen different main natural gas constituents is measured. This data will be used for calculating the upper and lower calorific value, standard density, relative density and Wobbe index, taking into account the constituent characteristics in accordance with the ISO 6976 or GPA 217209.

The reliable measurement method enables determination of the energy content of measured gas for invoicing purposes.

## Fully integrated

The process gas chromatographs of the PGC series are available in four different configurations - PGC 9301, PGC 9302, PGC 9303 and PGC 9304. The instruments consist of five main components: Measuring unit, analyzer, sample probe, pressure reducer and gas supply unit. They are designed according to the modular principle and can be equipped with two or three column modules depending on the components to be measured.





# REQUIREMENTS AND AREAS OF APPLICATION

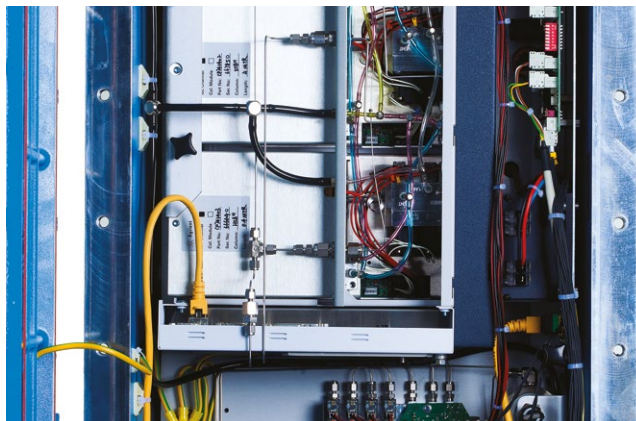
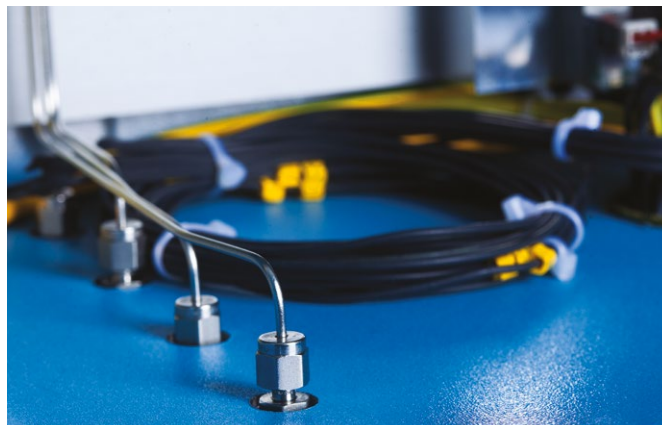
## Meeting requirements

In addition to the calorific value and standard density, the PGC 9300 also calculates the relative density, the calorific value, the WobbelIndex and optionally the methane number.

## Reliable functionality

RMG has optimized the method of analyzing the composition of natural gas and biogas. In the PGC 9300, individual gas components are separated from each other in special capillaries, i.e. columns. These flow one after the other through a thermal conductivity detector, which measures the respective percentages. In the process, carrier gas flows continuously through the miniature column/detector unit and is injected with a fixed amount of sample gas for analysis.

To ensure constant accuracy, the gas chromatograph is automatically calibrated at regular intervals. This involves analyzing a gas mixture with a known composition.



## Various areas of application

In addition to calculating the superior calorific value and the standard density for custody transfer measurements, the PGC 9300 can also be used to determine relative density, inferior calorific value, Wobbe index and methane number.

The analytical computer of the PGC 9300 can be connected to other measuring instruments via inputs, for example to measure room temperature and dew point. In addition contact pressure gauge can be connected, and it is possible to create collective fault messages for the pressure reducer as well as for the gas supply unit.

The PGC 9300 can also be used to manage multiple DSfG addresses. As long as the analytical computer is not connected to more than two DSfG bus systems, no special bus couplers are required.

## Fields of application:

- Custody transfer operation
- Legal metrology
- K-number determination
- Gas mixer control
- Power-to-gas
- Long-distance plants
- Municipal/regional utilities

# INTERACTION DIRECTLY ON THE DEVICE OR REMOTE

## Simple operation

The user interface of the PGC 9300 analyzer computer is a touch screen with a graphical interface that allows intuitive operation of the instrument. Individual parameters are described with help texts; the programmable display provides quick access to the 20 most important parameters or values.

## Flexible communication

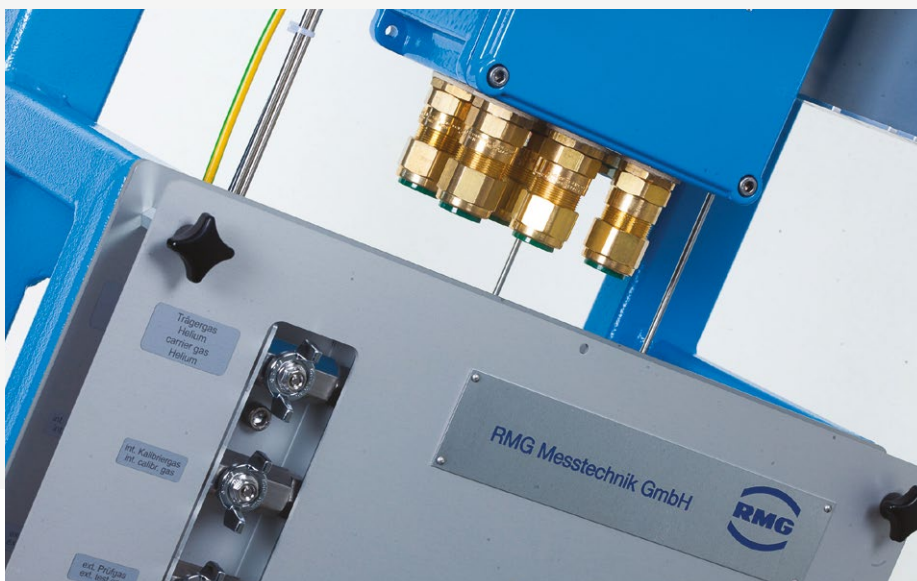
The analytical computer of the chromatograph has two TCP/IP interfaces: one for communication with the measuring unit and the other one for the operator and the RMGViewGC operating software. The analytical computer also supports a screen for remote operation via an Ethernet connection. On-site maintenance and field service can be minimized.



## Compliance with industry standards

RMG guarantees the reliability of the PGC 9300. The device is PTB approved for custody transfer measurements of the calorific value and standard density of gas and the percentages of its components.

The PGC 9300 can be used anywhere in the world except North America. General approvals such as ATEX and IECs are available; local metrological approvals may apply.



# DESIGN AND FINISHES

## State-of-the-art design

The PGC 9300 measures the percentages of up to thirteen major natural gas constituents needed to calculate the AGA 8 compressibility number.

The PGC 9300 process gas chromatograph was designed from the ground up to use advanced MEMS technology to significantly reduce carrier gas consumption. Two to three years of continuous operation is possible with this state-of-the-art gas chromatograph. It takes less field personnel to change carrier gas cylinders.

The PGC 9300 additionally measures the conventional components of natural gas (e.g., nitrogen, carbon dioxide and methane up to hexanes), including hydrogen and oxygen, requiring only the carrier gas helium for operation. Just at higher hydrogen concentrations the second carrier gas argon will be used.

## Measuring unit

The column modules of the measuring unit transmit the measured values to the analytical computer via the network connection. In the standard version. The measuring unit is equipped for the analysis of sample gas from one measuring point. In the multi-flow version gases from up to four measuring points can be analyzed. For each gas flow, a bypass runs in parallel to the measuring mechanism. The low flow through the miniature measuring unit requires an increase in flow through the supply lines in order to be able to perform a measurement of current gas.



## Analysis computer

The analytical computer of the PGC 9300 can be used to control the gas analysis and evaluation of the measured values. In addition, the analytical computer is also the operating unit of the chromatograph. The easy-to-use touchscreen provides a quick overview of the current measurement results. The supplied operating software offers useful additional functions such as displaying the user interface on an external PC, from which the analyzer computer can be operated just as well as directly at the instrument. If desired, all necessary peripheral devices are included in the scope of delivery of the PGC 9300:

### Sample probe:

This is used for taking samples of sample gas from the gas line for analysis purposes. Versions are available for fixed installation or for pigged pipelines.

### Pressure reducer:

Lowers and stabilizes the pressure of the sample gas. The gas sampling line from the sample probe to the pressure reducer can be heat traced. This is required for gases that are humid and may cause condensation.

### Gas supply unit:

Includes a rack frame for positioning the carrier gas and calibration gas cylinders. Equipped with reserve cylinder and switchover device for the carrier gas and a temperature monitor for the calibration gas.

# MEASURING RANGE AND TECHNICAL DATA

## Measured components and ranges for PGC 9300

Measurement range mol %	Natural Gas	Biogas	Natural gas / Biogas C6 Version	Hydrogen / Helium Version
	PGC 9301	PGC 9302	PGC 9303	PGC 9304
Columns	A + B	B + C	A + B + C	A + B + C
Methane	65 - 100	70 - 100	65 - 100	55 - 100
Ethane	0 - 15 0 - 5,5	0 - 15	0 - 15	0 - 15
Propane	0 - 5.5	0 - 9	0 - 9	0 - 9
i-Butane	0 - 4	0 - 4	0 - 4	0 - 4
n-Butane	0 - 4	0 - 4	0 - 4	0 - 4
neo-Pentane	0 - 0.08	-	to n-Butan	to n-Butan
i-Pentane	0 - 0.15	-	0 - 0.15	0 - 0.3
n-Pentane	0 - 0.15	-	0 - 0.15	0 - 0.3
Hexane	0 - 0.3	-	0 - 0.3	0 - 0.3
Heptane	-	-	-	-
Octane	-	-	-	-
Nonan	-	-	-	-
Carbon dioxide	0 - 10	0 - 8	0 - 10	0 - 12
Nitrogen	0 - 20	0 - 20	0 - 20	0 - 25
Hydrogen	-	0 - 5	0 - 5	0 - 20
Helium	-	-	-	0 - 1
Carrier gas	Helium	Helium	Helium	Helium + Argon

## Technical specification for PGC 9300

Measuring element	
Ambient temperature	-10°C bis +55°C
Degree of protection	IP 54
Ex device protection type	II 2 G Ex de IIB T5/T4
Carrier gas	Helium 5.0 + Argon (PGC 9304)
Analysis time	3 - 4 minutes
Measuring uncertainty • superior calorific value • standard density	< ±0,10% < ±0,10%
Dimensions (mm)	W x H x D = 455 x 1830 x 335
Weight	75 kg
Power supply	24 V DC
Power requirement	190 W <sup>1)</sup>
Process connections • carrier, measuring and calibration gas • exhaust gas	compression connection 1/8" 12 mm
Gas consumption • carrier gas • calibration gas	1.0 - 1.2 NI/h <sup>2</sup> 1.2 - 1.6 NI/d

Analytical computer	
Dimensions (mm)	W x H x D = 213 x 128,4 x 310
Power supply	24 V DC
Power requirement	25 W
Inputs	20 digital 8 analog
Outputs	12 digital 4 analog
Interfaces	2 x LAN <sup>2)</sup> 2 x USB <sup>3)</sup> 7 x serial (RS 232/485)

Gas supply unit	
Dimensions (mm)	W x H x D = 1300 x 1450 x 370
Power supply	230 V AC
Power requirement	100 W per heated cylinder

<sup>1)</sup> Switch-on current: 25 A for approx. 10 ms,  
10 A in the first 3 minutes

<sup>2)</sup> LAN1 reserved for measuring element

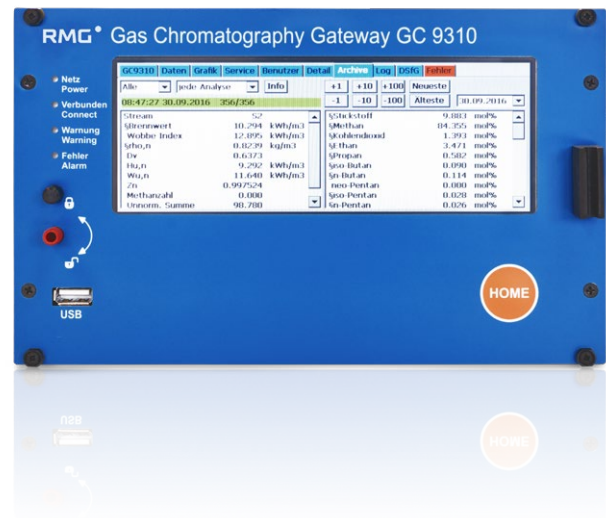
<sup>3)</sup> closed for custody transfer metering

# INTERFACE EXTENSION - GATEWAY GC 9310

## An important addition

An important addition to the PGC 9300 family is the GC 9310 gateway, which offers unique communication and data security capabilities. One GC 9310 allows four instead of two DSFG bus systems to be connected to each PGC 9300.

There is no limit to the number of gateways that can be used per PGC. The GC 9310 provides additional, freely usable inputs and outputs, interfaces and archives. The availability of your data is increased because it is stored redundantly in the GC 9310.



## YOUR ADVANTAGES

### More flexibility

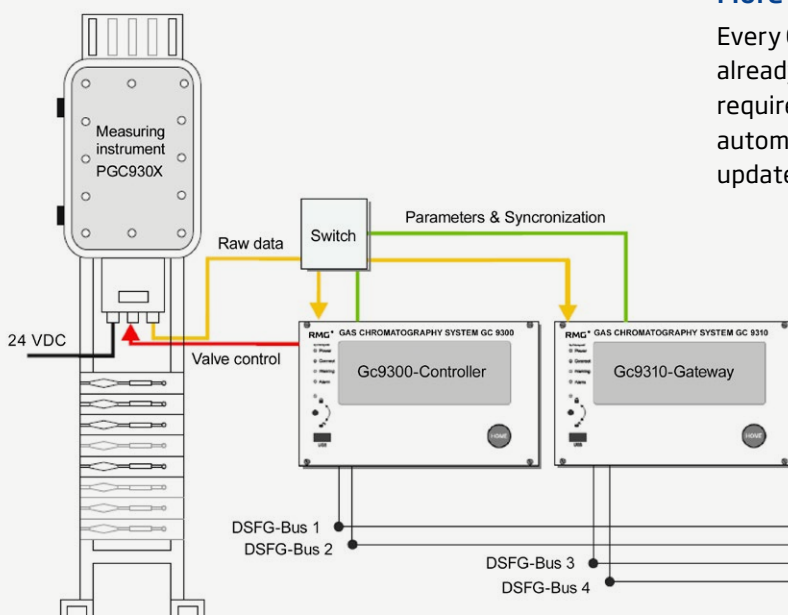
Each GC 9310 offers a number of additional and freely configurable inputs, outputs, interfaces and additional storage capacity. For example, a business partner can archive its own measured values and configure signals and data independently for his control room.

### More security

Each GC 9310 includes an independent, custody transfer copy of the measured value archives and log data. Even in the unlikely event of a total loss of the GC 9300, you can reconstruct all data (measured values, mean values, logs and chromatograms) from the GC 9310.

### More user-friendliness

Every GC 9310 offers the ease of use and features you already appreciate on the GC 9300. The parameters required for operation of the GC 9310 are of course automatically retrieved from the associated GC 9300 and updated as needed.



Connection schema



# COMPATIBLE MODE-CONTROLLER GC 9390

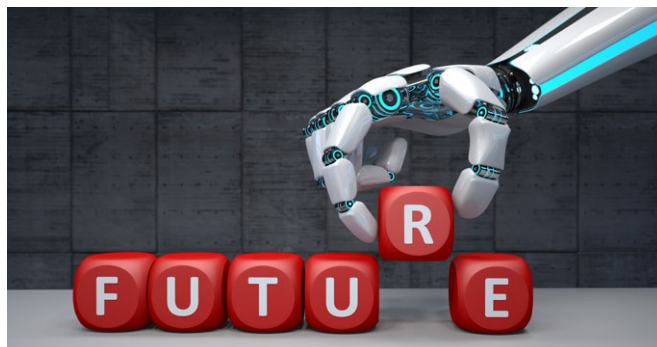
## Like a second life

The Compatible Mode Controller GC 9390 turns the old PGC 9000 VC into the modern PGC 9390 system with many advantages of the current PGC 9300 series. If an upgrade to a hydrogen-capable system is required at a later date, only the measuring unit needs to be replaced..

## Description

The PTB approved GC 9390 replaces the GC 9000 controller of the PGC 9000 VC. The GC 9390 brings the old PGC up to today's state of the art in every respect without having to replace the entire system. The GC 9390 offers more ease of use, more inputs and outputs and communication options, data and event archiving, a graphical touch display for local operation, and RMGViewGC as professional PC operating software.

Together with the new GC 9390 controller, the PGC 9000 VC becomes the custody transfer approved PGC 9090, which of course calculates according to the current ISO6976:2016. If hydrogen needs to be included in the measurement, the existing system can be upgraded to a complete PGC 9303 or PGC 9304 by exchanging the measuring mechanism.



## Advantages

- Full graphic display with touch operation, chromatogram and graphical trend display
- 20 digital inputs, 12 digital outputs, 8 analog inputs, 4 analog outputs
- 7 serial interfaces (incl. 2x DSfGA bus), 2 Ethernet interfaces (for RMGViewGC, remote control, DSfGIP, web interface, etc.)
- Complete custody transfer data and event archiving
- Reports, parameterization, data analysis and operation with RMGViewGC
- The additional components MRG 2203, bus coupler, DS 900 and DS 901 are no longer required.

## System-related limitations compared to a PGC 9300 system

- The GC 9310 gateway and the automatic Bake-out function are not supported due to the system limitations.
- Protocols for communication with bus couplers, special gateways, HP printers, the DS 900 data memory and recording devices are not supported, as the GC 9390 offers more modern alternatives in each case.
- Can only be used on PGC 9000 VC with CP 4002 measuring unit, not on the biogas variant (OXOS) or older variants.

## Installation

The existing GC 9000 can be replaced with the GC 9390 directly on site without changing the existing wiring. Finally, the new PGC 9090 main nameplate must be attached to the PGC 9000 VC. The existing infrastructure can still be used.

## Most important features

- Modular system for measuring the composition of natural gas and biogas, including gases from a mixture of hydrocarbons, air and optionally hydrogen
- PTB approval for the determination of the molar fractions of the gas components as well as the calorific value and standard density
- Measurement of natural gas and biogas using helium as carrier gas. In the PGC 9304, argon is used as an additional carrier gas.
- Single and multi-flow version for gas from up to four measuring points
- Analytical computer with touch screen for easy operation
- Detailed archives and logbooks for storage of measured values and messages, also of chromatograms for one week
- Digital communication via network, DSfG and Modbus
- Additional analog and digital inputs and outputs for connection to an external module equipped with a serial interface
- Low maintenance system, only recording of operating parameters
- Measuring unit in explosion-proof housing for installation in Ex zone 1
- Operating software RMGViewGC (MS Windows) for displaying, changing and exporting parameters to spreadsheet programs (MS Excel), data book creation, display/storage of chromatograms and remote control

Subject to technical changes.



ONE STEP AHEAD

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