RMG

PROZESS GAS CHROMATOGRAPH

RGC 7

The RGC 7 process gas chromatograph analyzes the composition of natural gas with admixtures of hydrogen and determines their most important components.

TECHNOLOGY BY RMG H_2 READY

FUNCTION AND STRUCTURE

Gas quality matters. The entire RGC 7 family from RMG stands for advanced gas quality measurement approved according to MessEG.

The RGC 7 process gas chromatograph analyzes the composition of natural gas with admixtures of hydrogen or upgraded biogas and determines their most important components (up to 14, depending on the measuring unit version) in mol % proportions. From these proportions, the following quantities are calculated (according to ISO 6976 or GPA 2172-09): Superior and inferior calorific value, standard density, density ratio and Wobbe number. 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 and hydrogen
- 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 RGC 7 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 RGC 7, 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 RGC 7 is ±0.15 percent (calorific value and standard density). With argon as the second carrier gas, the RGC 704 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 and Power-to-gas - you can reduce your operating costs and get even more accurate and reliable energy consumption data.

Zuverlässige Technik

To calculate the gas compressibility, the RGC 7 measures the compressibility based on the AGA 8 compressibility index. The percentage of up to fourteen 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 2172.

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

Fully integrated

The process gas chromatograph is available in the Version RGC 704. 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 APPLIKATION

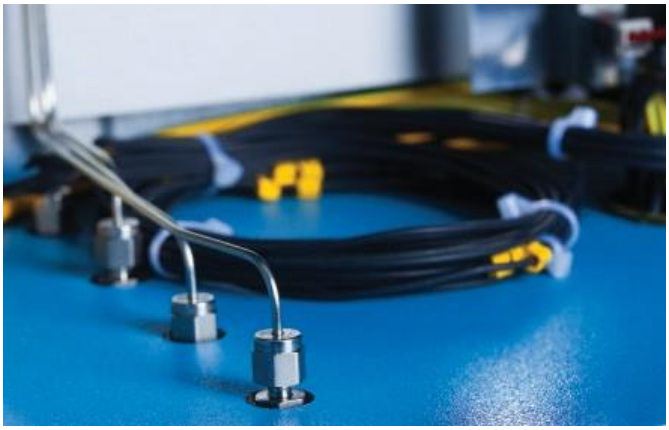
Meeting requirements

In addition to the calorific value and standard density, the RGC 7 also calculates the relative density, the calorific value and the Wobbe Index.

Reliable functionality

RMG has optimized the method of analyzing the composition of natural gas, natural gas with admixtures of hydrogen and biogas. In the RGC 7, 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 RGC 7 can also be used to determine relative density, inferior calorific value and Wobbe index.

The analytical computer of the RGC 7 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 RGC 7 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 RGC 7 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 RGC 7. 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 RGC 7 can be used anywhere in the world except North America. General approvals such as ATEX and IECEx are available; local metrological approvals may apply.

DESIGN AND FINISHES

State-of-the-art design

The RGC 7 measures the percentages of up to fourteen major natural gas constituents needed to calculate the AGA 8 compressibility number.

The RGC 7 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 RGC 7 additionally measures the conventional components of natural gas (e.g., nitrogen, carbon dioxide and methane up to hexanes), including hydrogen.

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-stream version gases from up to two 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 RGC 7 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 RGC 7:

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 RGC 7

Measurement range mol-%		Hydrogen/Helium version
		RGC 704
Columns		1 + 2 + 4
Methane	C_1	≥ 50
Ethane	C_2	≤ 15
Propane	C_3	≤ 15
i-Butane	iC_4	≤ 4
n-Butane	nC_4	≤ 1.8
Neo-Pentane	$neoC_5$	0.1
i-Pentane	iC_5	≤ 0.5
n-Pentane	nC_5	≤ 0.5
Hexane	C_6+	≤ 0.3
Catbon dioxide	CO_2	≤ 20
Nitrogen	N_2	≤ 30
Oxygen	O_2	≤ 3.8
Hydrogen	H_2	≤ 20
Helium	He	≤ 0.36
Carrier gas		Helium + Argon
Superior calorific value [1])	Hs	5.53 – 14.00 kWh/m³
Standard density [2])	ρn	0.59– 1.36 kg/m₃

[1]) Tb = 25 °C, Tv = 0 °C, pv = pb = 101,325 kPa
[2]) Tn = 0 °C, pn = 101,325 kPa

Technical specification for RGC

Measuring element	
Ambient temperature	-20 °C bis +55 °C
Degree of protection	IP 65
Ex device protection type	II2 G Ex de IIB T5 (<40 °C)/ T4 (<60 °C)
Carrier gas	Helium 5.0 + Argon 5.0
Analysis time	≈ 1 minute
Measuring uncertainty • superior caloric value • standard density	 < ±0,15 % < ±0,15 %
Dimensions (mm)	W x H x D = 350 x 1834 x 325
Weight	60 kg (incl. stand)
Power supply	24 V DC
Power requirement	max. 150 W [1])
Prozessanschlüsse • carrier, measuring and Calibration gas • exhaust gas	**compression connection inlet** 1/8" 4 mm **exhaust gas** Bypass → 6 mm Exhaust line for casing purging at RGC 704 → 12 mm
Gas consumption	**Carrier gas:** Helium 12 ml/min; Argon 6 ml/min **Calibration gas:** 0,5 – 0,9 Nl/d

Analytical computer	
Dimensions (mm)	W x H x D = 213 x 128,4 x 310
Power supply	24 V DC
Inputs	20 digital 8 analog
Outputs	12 digital 4 analog
Power requirement	25 W
Interfaces	2 x LAN [2]) COM 1-7 2 x USB [3]) 7 x seriell (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

[1]) Current when switching on: 6 A in the first 3 minutes
[2]) LAN1 reserved for measuring element
[3]) closed for custody transfer metering

Most important features

- Modular system for measuring the composition of natural gas including gases from a mixture of hydrocarbons, air and optionally hydrogen
- PTB approval (just RGC 704) for the determination of the molar fractions of the gas components as well as the calorific value and standard density
- In the RGC 704, helium and argon are the carrier gases
- Single and multi-flow version for gas from up to two measuring points
- Analytical computer with touch screen for easy operation
- Digital communication via network, DSfG and Modbus
- Detailed archives and logbooks for storage of measured values and messages, also of chromatograms for one week
- 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

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ONE STEP AHEAD

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