RMG
ONE STEP AHEAD

RMG PROCESS GAS CHROMATOGRAPH

PGC 9301

Technical data sheet

Contact details

Manufacturer information

Address:	RMG Messtechnik GmbH Otto-Hahn-Straße 5 D-35510 Butzbach
Main Office:	+49 6033 897-0
Phone Service:	+49 6033 897-897
Phone spare parts:	+49 6033 897-897
Fax:	+49 6033 897-130
Mail:	service@rmg.com
Website:	www.rmg.com

Document information

This document is the translation of the original German Technical data sheet.

We reserve the right to make changes to the content. Minor and editorial errors not caused by gross negligence or wilful misconduct shall not give rise to any liability or indemnification claims. RMG Messtechnik GmbH assumes that the documentation and operating instructions are used by competent personnel.

You can easily download the latest version of this Technical data sheet and the data sheets for other devices from our website.

Version	Version date	Changes
V00	November 2023	Initial creation

Protection notice pursuant to DIN ISO 16016

Technical data sheet

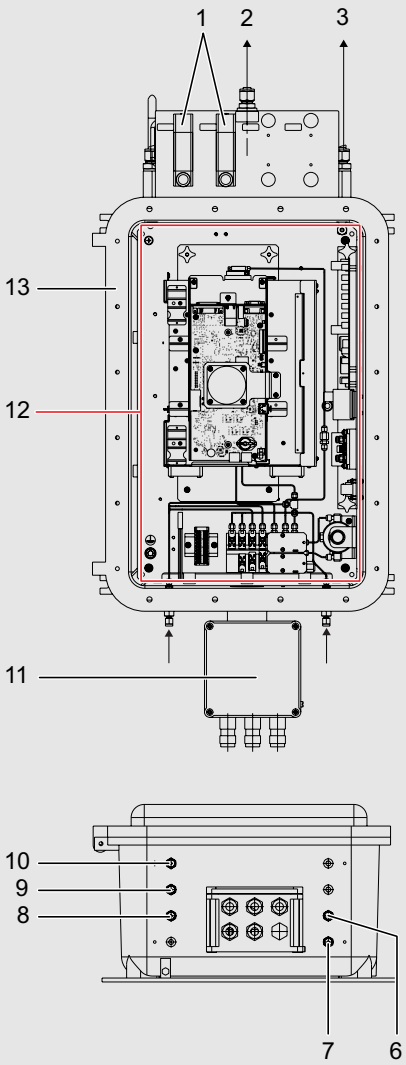
General information
The Prozess gas chromatograph PGC 9301 analyses natural gases and determines the quantities of the individual components of these gases. The complete 'Prozess gas chromatograph PGC 9301' system always consists of the measuring unit (PGC 9301) and the evaluation unit or analysis computer (GC 9300).

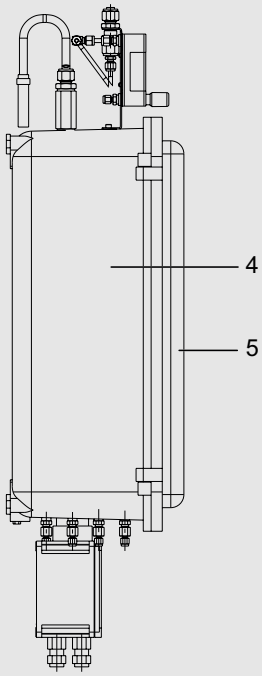
Functionality	
The Prozess gas chromatograph PGC 9301 analyses the composition of natural gas and determines its key components in molar percentage. To achieve this, the PGC 9301 separates individual gas constituents in specialised capillaries, i.e. columns. These components then pass sequentially through a thermal conductivity detector, which measures their respective molar percentages. During this process, a carrier gas continuously flows through the miniature column/detector unit and is supplied with a defined quantity of sample gas for analysis. To ensure consistent accuracy, the gas chromatograph is automatically calibrated at regular intervals. For this purpose, a gas mixture with a known composition is analysed. Based on the determined molar fractions, the GC 9300 controller calculates the values for calorific value, heating value, standard density, density ratio, and Wobbe index. In addition, the GC 9300 controller is used for operation, controls the analysis process as the system computer, and outputs measurement results. All operating parameters are stored on it. The controller can only be used with the PGC 93xx process gas chromatograph and is not compatible with any other system.	
Functions	**Measuring unit PGC 9301** ■ Measurement of up to 11 different components in natural gas. ■ Automatic, regular calibration. **Gas analysis controller GC 9300** ■ Controller for the PGC 9301 measuring unit. ■ Calculation of calorific value, standard density, heating value, density ratio, and Wobbe index based on the percentage composition of the individual gas components, in accordance with ISO 6976. Optional calculation of the methane number according to DIN EN 16726. ■ Storage of analysis results in archives (minute, hour, day, month). ■ Comprehensive communication capabilities (Modbus, RMGBus, DSfG, etc.). ■ Selection of operating modes for maintenance purposes and for the analysis of gas samples. ■ Maintenance function: heating out (bake-out) ■ Monitoring of analogue and binary input signals.

Measuring unit PGC 9301	
Type designation	
PGC 9301	■ Application: Natural gas

Variants

Wall-mounted variant:

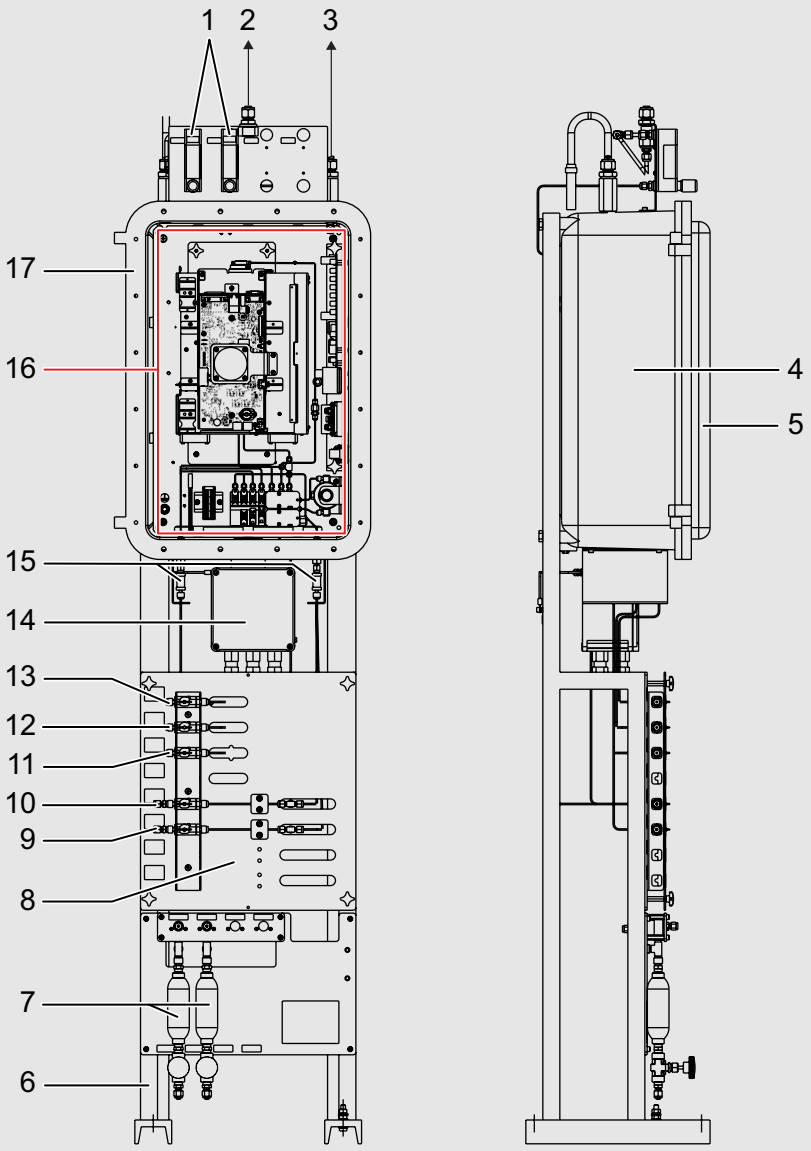




1 Variable area flowmeter for bypass
2 Exhaust line connection
3 Exhaust line connection
4 Ex d housing
5 Ex d housing door
6 Inlet connection for sample gas 2 (optional)
7 Inlet connection for sample gas 1
8 Inlet connection for carrier gas
9 Inlet connection for calibration gas
10 Inlet connection for external test gas or reference gas
11 Ex e junction box
12 Analysis unit (consisting of column modules, electronics unit, pressure regulation and gas distribution with valves)
13 Sealing surface between housing and door

Dimensions:	■ 450 mm x 1004 mm x 265 mm (W x H x D)
Weight:	■ approx. 67 kg

Floor-mounted variant:



1 Variable area flowmeter for bypass
2 Exhaust line connection
3 Exhaust line connection
4 Ex d housing
5 Ex d housing door
6 Frame for floor-mounted assembly
7 Condensate collection container with drain valves
8 Gas connection plate incl. piping to the analysis unit
9 Inlet connection for sample gas 2 (optional)
10 Inlet connection for sample gas 1
11 Inlet connection for external test gas or reference gas
12 Inlet connection for calibration gas
13 Inlet connection for carrier gas
14 Ex e junction box
15 Particle filter upstream of the analysis unit
16 Analysis unit (consisting of column modules, electronics unit, pressure regulation and gas distribution with valves)
17 Sealing surface between housing and door

Dimensions:	■ 450 mm x 1850 mm x 325 mm (W x H x D)
Weight:	■ approx. 140 kg, including frame
Design of the measuring unit	
Analysis unit consisting of two gas chromatography columns:	■ Column 1, HSA for determining: N_2, CH_4, CO_2, $C2H_6$ ■ Column 2, 5CB for determining: C_3H_8, iso-C_4H_{10}, (neo-C_5H_{12}), n-C_4H_{10}, iso-C_5H_{12}, n-C_5H_{12}, C6+ (higher hydrocarbons are measured as a sum)
Number of measuring streams	■ Max. 2
Carrier gas	■ Helium 5.0

Process gas connections	■ General information: All of the screw connections are fundamentally designed as a Swagelok system. All of the PGC 9301's gas inlets are established as standard from the left. ■ Sample gas: 4 mm compression fitting ■ Alternative screw connection (1/8", 3 mm, 6 mm) not standard, but available on request. ■ Carrier gas and calibration gas: 1/8" pipe connection / compression fitting. ■ Exhaust: 2 x 12 mm pipe connection / compression fitting. There is a bypass line, an exhaust line and an additional vent line for the PGC 9301's housing.
Electrical connections	■ Connection diagram: see section 6.3.1 "Terminal assignment" ■ Recommended cable type for power supply and heating: NYY-J 3Gx2.5 mm² If the control cabinet and the PGC 9301 are more than 50 m apart, the following cable type should be used for the power supply: ■ NYY-J 3G 4 mm²
Cable glands	Clamping ranges of the cable glands (permissible cable diameters): ■ 5x 8.7 mm (inner sheath), 6.1 – 13.1 mm (outer sheath)
Data lines	The maximum length for data lines is 50 m when using the following specified cable types: ■ Recommended cable type for data lines for indoor installation: Helukat, 600 S/FTP 4 x 2 AWG23/1 FRNC ■ Recommended cable type for data lines for underground installation: Helukat, 600E S/FTP 4 x 2 AWG23/1 PVC ■ Recommended cable type for data lines for outdoor installation: Helukat, 600A S/FTP 4 x 2 AWG23/1 PVC/PVC The maximum length cannot be guaranteed if other cable types are used. **Note – measuring unit and GC 9300 > 50 to 100 m apart:** This cable length can only be achieved without interference with the help of an additional switch in the PGC housing. Switch to be used: SFN 5TX from Phoenix Contact **Note – measuring unit and GC 9300 > 100 m apart:** These lengths can be achieved without interference by converting to fibre optic or VDSL cables. If there is a non-Ex area within a radius of 50 m around the PGC, the fibre optic variant is always the preferred option (in this case, the Ethernet connection runs from the PGC to the non-Ex area and, from there, via the fibre optic coupler to the fibre optic cable, etc.).
Fibre optic cable	■ The length is limited to 3,000 m. ■ Couplers to be used: EL-100XS-1TX-1FX-MM-ST media converter from EKS Engel GmbH (preferred option) or EL-100U3-1TX-1FX-MM-ST media converter from EKS Engel GmbH ■ Cable types to be used: - For underground installation: EKS-A-DQ (ZN) B2Y 4G 50/125 – ST/ST - For indoor installation: EKS-I-VHH (ZN) 2G 50/125
VDSL	■ The length is limited to 500 m. ■ Couplers to be used: Industrial Ethernet-VDSL2 Extender from EKS Engel (preferred) or Fast Ethernet eX-S110-XT Extender from Perle Systems ■ Cable types to be used: - Helukat 600A S/FTP 4 x 2 x AWG23/1 PVC/PVC - Helukabel RE-2Y(St)Yv with n x 2 x 0.75 mm² - Helukabel PAAR-Tronic-CY-CY (LIYCY-CY) with n x 2 x 0.75 mm²

Earthing concept	Earthed on both sides (+/-) or (L/N) using capacitors (DC or AC)
Shielding	Provided by the customer
Area of application	
Ambient temperature at the Installation site	■ -20°C to +60°C (installation in temperature-controlled rooms)
Minimum sample gas temperature	Above water and hydrocarbon dew point
Maximum sample gas temperature	100°C
Analysis duration	Approx. 3.5 minutes / measuring current
Maximum storage time before commissioning	The PGC 9301 may stand (carefully sealed against moisture) **for a maximum of 4 weeks without a continuous helium supply**. Damage to the device cannot be ruled out if it is left for longer without a helium supply or in an unsuitable environment. **Warranty claims are expressly excluded in such cases.**
Approvals in accordance with	
EU Directives	■ EMC Directive 2014/30/EU
EX approvals	■ ATEX Directive 2014/34/EU ATEX label: II2G Ex db e IIB T4/T5 Gb

PGC 9301 analysis values	**Measuring range**	**Max. measurement uncertainty**[1)]	**Repeatability**[2)]
Calorific value (Ho):	7.5 – 14.00 kWh/m³	0.124 kWh/m³ (0.8% of full scale value)	< 0.000263 kWh/m³ (< 0.00235% of measured value)
Standard density (ρn):	0.72 – 1.17 kg/m³	0.5% of measured value	< 0.000079 kg/m³ (< 0.0097% of measured value)
Additional parameters:	■ Wobbe index ■ Density ratio (D_v) ■ Net calorific value (H_u) ■ Lower Wobbe index (W_u)		

1) Additional requirements are available on request.
2) Double standard deviation (2σ) based on 20 consecutive laboratory measurements of synthetic gas 11D (calibration gas)

Gas composition	**Measuring range (11-component operation) [mol %]**	**Measuring range (10-component operation) [mol %]**	**Max. measurement uncertainty [mol %]**[1)]	**Repeatability [mol %]**[2)]
Methane	60 – 100	60 – 100	0.3	< 0.00500
Ethane	0 – 17	0 – 17	0.3	< 0.00250
Propane	0 – 8	0 – 8	0.2	< 0.00262
Isobutane	0 – 4	0 – 4	0.1	< 0.00089
n-butane	0 – 0.2	0 – 0.2	0.1	< 0.00062
Neopentane	0 – 0.1	–	0.04	< 0.0001
Isopentane	0 – 0.3	0 – 0.3	0.04	< 0.00001
n-pentane	0 – 0.3	0 – 0.3	0.04	< 0.00001
C6+	0 – 0.3	0 – 0.3	0.04	< 0.00082
Carbon dioxide	0 – 15	0 – 15	0.3	< 0.00149

Nitrogen	0 – 30	0 – 30	0.3	< 0.00256
The limit of detection (LOD) is ≤ 5 ppm for all components. The measured value is 3 standard deviations above the mean value of the zero / blank measurement.				
Technical data for the measuring unit				
Inlet pressure:				
Sample / calibration / test gas	■ 1 – 4 bar			
Carrier gas	■ 5.5 bar			
Gas consumption:				
Carrier gas	■ Helium: ~ 0.4 Nl/h This results in a calculated carrier gas consumption of 3,510 Nl/year.			
Sample gas	■ 3.4 Nl/h			
Bypass	■ 0 – 100 Nl/h (adjustable)			
Calibration gas	■ 3.4 Nl/h (when connected, e.g. during calibration) With 4 calibration measurements per day, this results in a calculated consumption of approximately 320 Nl/year. Note: The calibration gas consumption is subject to fluctuations.			
Calibration:				
Calibration interval	The calibration interval can be set individually (max. 35 days). The default setting is daily calibration. Calibration comprises at least 4 individual measurements, with the mean values of the last 2 measurements being used for calibration.			
Faulty calibration	If the first calibration is faulty, a second calibration is always performed automatically. If this is faulty, the PGC 9301 switches to the 'STOP' operating mode.			
Calibration gas setpoints	**for 11 gas components in [mol %]:**		**for 10 gas components in [mol %]**	
	■ Methane (CH_4): 88.90	■ Carbon dioxide (CO_2): 1.50	■ Methane (CH_4): 88.95	■ Carbon dioxide (CO_2): 1.5
	■ Ethane (C_2H_6): 4.00	■ Propane (C_3H_8): 1.0	■ Ethane (C_2H_6): 4.00	■ Propane (C_3H_8): 1.00
	■ Isobutane (iso-C_4H_{10}): 0.20	■ n-butane (n-C_4H_{10}): 0.20	■ Isobutane (iso-C_4H_{10}): 0.20	■ n-butane (n-C_4H_{10}): 0.20
	■ Neopentane (neo-C_5H_{12}): 0.05	■ Isopentane (iso-C_5H_{12}): 0.05	■ Neopentane (neo-C_5H_{12}): 0.00	■ Isopentane (iso-C_5H_{12}): 0.05
	■ n-pentane (n-C_5H_{12}): 0.05	■ n-hexane (n-C_6H_{14}): 0.05	■ n-pentane (n-C_5H_{12}): 0.05	■ n-hexane (n-C_6H_{14}): 0.05
	■ Nitrogen (N_2): 4.00		■ Nitrogen (N_2): 4.00	
Power supply:				
Measuring unit	■ 24 V DC (21 V – 27 V)			
Housing heating	■ 24 V DC (21 V – 27 V)			
Protection class	■ IP 65 (observe the assembly instructions in the operating manual!)			
Power consumption:				
Measuring unit connection	■ Max. 150 W (according to manufacturer specifications)			
Housing heating connection	■ 100 W (when switched on)			
Inrush currents	■ Max. 4.8 A (continuous) at housing heating connection (when switched on)			

Measuring unit safety shutdown:	
In case of power failure:	After a power failure, the measuring unit starts in the safety program and performs a self-test. Once all of the operating parameters have returned to normal, the measuring unit is ready for measurement again. Once the GC 9300 analysis computer has restarted after a power failure, the power failure is reported as an error and a calibration is performed first of all. Normal measurement operation is resumed following successful calibration.
In case of carrier gas pressure failure:	If the pressure falls below a minimum value of 0.35 bar, a safety program that switches off the detectors and column heaters (30°C setpoint temperature) is activated in the measuring unit. Ongoing analyses are discarded. Normal measurement operation is resumed as soon as the nominal pressure is restored.
Gas analysis controller GC 9300	
Housing	
Dimensions	213 mm x 128,4 mm x 310 mm (W x H x D), 19" slot
Weight	2,5 kg
Ambient temperature	+5…+40°C (Installation in temperature-controlled rooms)
Protection class	IP 20 (protection against foreign bodies > 12.5 mm, no splash water protection)
Power supply	
Power supply	24 V DC -10%/+15%
Power consumption	25 W
Operation	
Control buttons	1 button (HOME)
Display	LCD Touchscreen 640 x 240 dots 256 Colours
Output (Text)	■ current measurement values, archived measurment data ■ programmable customer Display for quick access to the 20 most important parameters ■ Immediate help function
Output (Graphics)	■ Trends for all measurement values ■ current chromatograms
Electronic signature	■ planned
Web interface	Display and export of archives and parameters (e.g. in MS Excel format)
RMGView GC operating software	■ Display, Modification, and Export of Archives, Parameters, and Measurement Values (e.g. in MS Excel format) ■ Data book generation ■ Display and storage of chromatograms ■ Diagnose ■ The software is provided free of charge.
Storage/archiving	
Storage capacity (standard)	4 GB, SD card (industry requirements)

Measured values	■ Single analysis ■ Hourly averages ■ Daily averages ■ Monthly averages ■ Calibration results ■ DSfG-A ■ Event logbook ■ Parameter logbook ■ Storage for over 2 years
Chromatograms	■ Storage for up to 10 days
Hardware	
Embedded PC	CPU ARM1176 533 MHz 128 MB RAM 64 MB Flash
Operating system	
Windows CE 6.0	

Digital inputs		**Digital outputs**	
Quantity	20	Quantity	12
U_{max}	5 V	U_{max}	24 V
I_{max}	13 mA	I_{max}	100 mA
f_{max}	10 Hz	P_{max}	100 mW
Overvoltage protection	6,8 V	Overvoltage protection	33 V
Analog inputs		**Analog outputs**	
Quantity	8	Quantity	4
Resolution	20 Bit	Resolution	12 Bit
U_{max}	2,5 V	Load	600 Ohm
R_i	50 Ohm	Overvoltage protection	33 V
Overvoltage protection	6,8 V		

Temperature inputs	
Temperature input 1	PT100
Temperature input 2	PT100, PT1000
More	
Alarm contact	1 x available, R_{on} = 30 Ω
Warning contact	1 x available, R_{on} = 30 Ω
Passive inputs	2 x available, U_{max} = 30V
Data interfaces (Ethernet 2x)	
LAN 1	RJ-45, assigned to RMG network, used to connect the measuring unit, DHCP server, DHCP client or static IP address
LAN 2	RJ-45, Operator network, DHCP client or static IP address, Modbus TCP/IP or HTTP
For data exchange, RMG recommends using a static IP address, which must then be configured in the connected volume correctors (e.g. ERZ2000-NG, …).	

USB (2x)				
Front	for mouse, external hard drive or keyboard			
Rear panel	for connecting a PC			
Serielle Schnittstellen (7x)				
COM 1	RS 232 / RS 485 / RS 422			
COM 2	RS 232			
COM 3	RS 232 / RS 485, configurable via jumpers			
COM 4	RS 232 / RS 485, configurable via jumpers			
COM 5	RS 232			
COM 6	RS 232 / RS 485, configurable via jumpers			
COM 7	RS 232 / RS 485, configurable via jumpers			
Configuration bus/protocols:	**DSfG**	**Modbus RTU/ Modbus ASCII**	**RMGBus**	**WAGO - IO**
COM 1		X		
COM 2				X
COM 3	X	X	X	
COM 4	X		X	
COM 5		X		
COM 6		X	X	
COM 7		X		

ONE STEP AHEAD

Subject to change without notice!

RMG Messtechnik GmbH

Otto-Hahn-Straße 5
35510 Butzbach
Germany

Phone:+49 (0) 6033 897 – 0
Fax: +49 (0) 6033 897 – 130
Email: info@rmg.com

www.rmg.com

Additional information

If you would like to find out more about RMG's products and solutions, visit our website: **www.rmg.com**
or contact your customer adviser.

PGC 9301 – TD | V00-11.2025 | 2005.002.01-EN