

RMG PROCESS GAS CHROMATOGRAPH PGC 9301/PGC 9301 Biogas

Technical data sheet



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Version	Version date	Changes
V00	November 2023	Initial creation
V01	June 2026	Additional data for PGC 9301 Biogas

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Technical data sheet

General information

The Process gas chromatograph PGC 9301 analyses natural gases and determines the quantities of the individual components of these gases.

The PGC 9301 Biogas analyses biogas and biomethane and determines the quantities of the individual components of these gases.

The complete 'Process gas chromatograph PGC 9301' system always consists of the measuring unit (PGC 9301) and the evaluation unit or analysis computer (GC 9300).

Functionality

The Process 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/PGC 9301 Biogas

- Measurement of up to 11 different components in natural gas, biogas and biomethane.
- Automatic, regular calibration.

Gas analysis controller GC 9300

- Controller for the PGC 9301/PGC 9301 Biogas 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

Type designation

PGC 9301

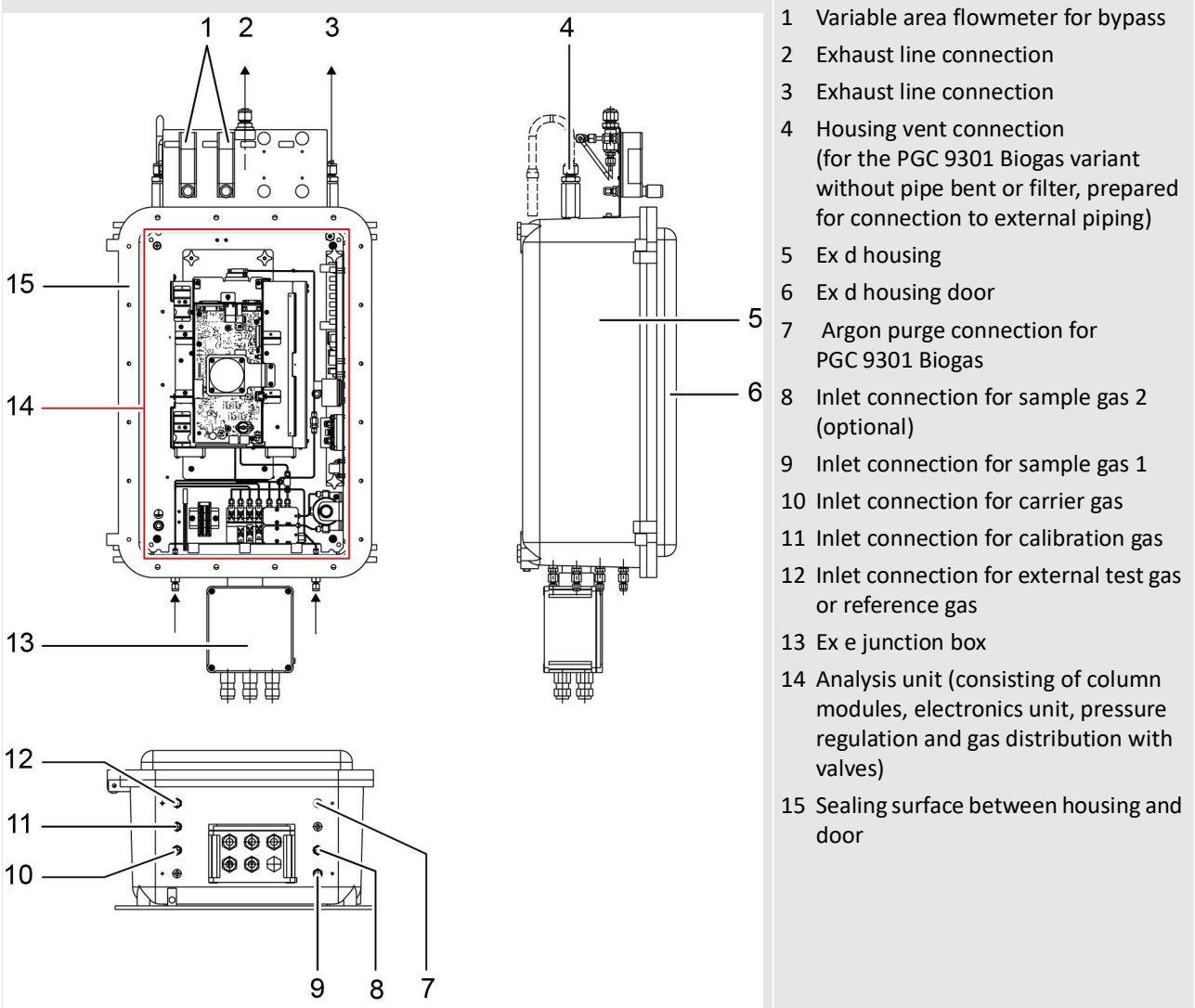
- Application: Natural gas

PGC 9301 Biogas

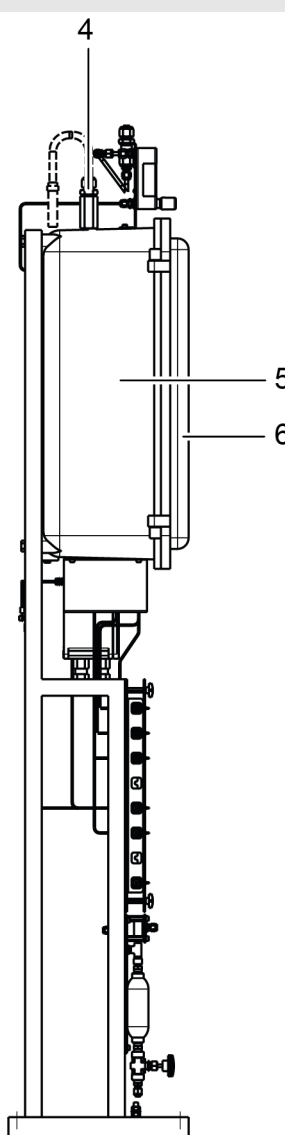
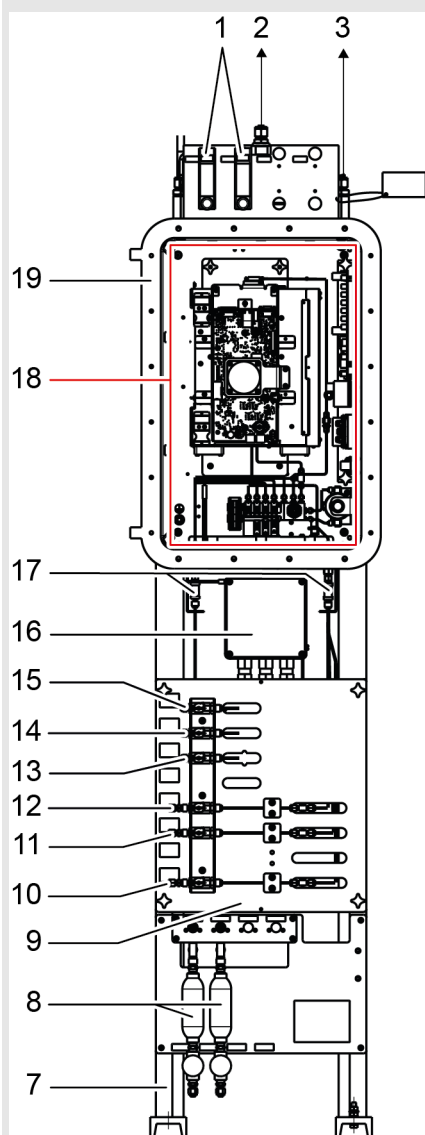
- Application: Biogas and biomethane

Variants

Wall-mounted variant:



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 Housing vent connection (for the PGC 9301 Biogas variant without pipe bent or filter, prepared for connection to external piping)
- 5 Ex d housing
- 6 Ex d housing door
- 7 Frame for floor-mounted assembly
- 8 Condensate collection container with drain valves
- 9 Gas connection plate incl. piping to the analysis unit
- 10 Argon purge connection for PGC 9301 Biogas
- 11 Inlet connection for sample gas 2 (optional)
- 12 Inlet connection for sample gas 1
- 13 Inlet connection for external test gas or reference gas
- 14 Inlet connection for calibration gas
- 15 Inlet connection for carrier gas
- 16 Ex e junction box
- 17 Particle filter upstream of the analysis unit
- 18 Analysis unit (consisting of column modules, electronics unit, pressure regulation and gas distribution with valves)
- 19 Sealing surface between housing and door

Dimensions:

- 450 mm x 1850 mm x 325 mm (W x H x D)

Weight:

- approx. 88 kg, including frame

Design of the measuring unit
PGC 9301
PGC 9301 Biogas

Analysis unit consisting of two gas chromatography columns:

- Column 1, HSA for determining: N_2 , CH_4 , CO_2 , C_2H_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)

- Column 1, Molsieve 5Å for determining: N_2 , CH_4 , H_2 , O_2
- Column 2, PoraPLOT U for determining: CO_2 , C_2H_6 , H_2S , COS, C_3H_8 , iso- C_4H_{10} , n- C_4H_{10}

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 PGC 9301 / PGC 9301 Biogas gas inlets are standard on the left-hand side. ■ 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 housing of the PGC 9301/PGC 9301 Biogas.
Electrical connections	■ Connection diagram: see operating manual. ■ 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 stream		
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 (H_s):	7.5 – 14.00 kWh/m ³	0.124 kWh/m ³ (0.8% of full scale value)	< 0.000263 kWh/m ³ (< 0.00235% of measured value)
Standard density (ρ_B):	0.72 – 1.17 kg/m ³	0.5% of measured value	< 0.000079 kg/m ³ (< 0.0097% of measured value)
Additional parameters:	■ Wobbe index ■ Density ratio (d) ■ Net calorific value (H_i) ■ Lower Wobbe index (W_i)		
1) Additional requirements are available on request.			
2) Double standard deviation (2σ) based on 20 consecutive laboratory measurements of synthetic gas 11D (calibration gas)			
PGC 9301 Biogas analysis values	Measuring range	Max. measurement uncertainty ³⁾	Repeatability ⁴⁾
Calorific value (H_s):	7.5 – 14.00 kWh/m ³	0.124 kWh/m ³ (0.8% of full scale value)	0.0004 kWh/m ³ (0.0037% of measured value)
Standard density (ρ_B):	0.72 – 1.17 kg/m ³	0.5% of measured value	0.00015 kg/m ³ (0.014% of measured value)
These values refer to the result obtained using a 1-point calibration with the corresponding calibration gas.			

Additional parameters:	■ Wobbe index ■ Density ratio (d) ■ Net calorific value (H_i) ■ Lower Wobbe index (W_i)
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3) Additional requirements are available on request.

4) Double standard deviation (2σ) based on 20 consecutive laboratory measurements of synthetic gas 9E (calibration gas)

Gas composition PGC 9301	Measuring range (11-component operation) [mol %] ¹⁾	Measuring range (10-component operation) [mol %] ¹⁾	Max. measurement uncertainty [mol %] ¹⁾	Repeatability [mol %] ²⁾
Methane (CH ₄)	60 – 100	60 – 100	0.3	< 0.00500
Ethane (C ₂ H ₆)	0 – 17	0 – 17	0.3	< 0.00250
Propane (C ₃ H ₈)	0 – 8	0 – 8	0.2	< 0.00262
2-Methyl propane (iso-C ₄ H ₁₀)	0 – 4	0 – 4	0.1	< 0.00089
n-Butane (n-C ₄ H ₁₀)	0 – 2	0 – 2	0.1	< 0.00062
2,2-Dimethyl propane (neo-C ₅ H ₁₂)	0 – 0.1	–	0.04	< 0.0001
2-Methyl butane (iso-C ₅ H ₁₂)	0 – 0.3	0 – 0.3	0.04	< 0.00001
Pentane (n-C ₅ H ₁₂)	0 – 0.3	0 – 0.3	0.04	< 0.00001
C6+	0 – 0.3	0 – 0.3	0.04	< 0.00082
Carbon dioxide (CO ₂)	0 – 15	0 – 15	0.3	< 0.00149
Nitrogen (N ₂)	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.

Gas composition PGC 9301 Biogas	Single point calibration Meas.range (11-comp) [mol %] ⁵⁾	Multilevel calibration Meas.range (10-comp.) [mol %] ⁶⁾	Max. measurement uncertainty [mol %] ³⁾	Repeatability [mol %] ⁴⁾
Methane (CH ₄)	60 – 100	60 – 100	0.3	0.01400
Ethane (C ₂ H ₆)	0 – 12	0 – 12	0.3	0.00350
Propane (C ₃ H ₈)	0 – 8	0 – 8	0.2	0.00262
2-Methyl propane (iso-C ₄ H ₁₀)	0 – 4	0 – 4	0.1	0.00090
n-Butane (n-C ₄ H ₁₀)	0 – 4	0 – 4	0.1	0.00092
Hydrogen (H ₂)	0 – 3	0 – 5	0.04	<0.0041
Oxygen (O ₂)	0 – 4	0 – 4	0.04	<0.0021
Hydrogen sulfide (H ₂ S)	0 – 1	0 – 1	on request	0.00200
Carbonyl sulfide (COS)	0 – 1	0 – 1	on request	0.00180
Carbon dioxide (CO ₂)	0 – 10	0 – 10	0.3	<0.00149
Nitrogen (N ₂)	0 – 15	0 – 20	0.3	<0.00456

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.

5) These values refer to the result obtained using a 1-point calibration with the corresponding calibration gas.

6) These values refer to the result obtained using a multilevel calibration with the corresponding calibration gas.

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 NI/h This results in a calculated carrier gas consumption of 3,510 NI/year.			
Sample gas	■ 3.4 NI/h			
Bypass	■ 0 – 100 NI/h (adjustable)			
Calibration gas	■ 3.4 NI/h (when connected, e.g. during calibration) With 4 calibration measurements per day, this results in a calculated consumption of approximately 320 NI/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 PGC 9301	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 ₂ H ₆): 4.00	■ Propane (C ₃ H ₈): 1.0	■ Ethane (C ₂ H ₆): 4.00	■ Propane (C ₃ H ₈): 1.00
	■ 2-Methyl propane (iso-C ₄ H ₁₀): 0.20	■ n-butane (n-C ₄ H ₁₀): 0.20	■ 2-Methyl propane (iso-C ₄ H ₁₀): 0.20	■ n-butane (n-C ₄ H ₁₀): 0.20
	■ 2,2-Dimethyl propane (neo-C ₅ H ₁₂): 0.05	■ 2-Methyl butane (iso-C ₅ H ₁₂): 0.05	■ 2,2-Dimethyl propane (neo-C ₅ H ₁₂): 0.00	■ 2-Methyl butane (iso-C ₅ H ₁₂): 0.05
	■ Pentane (n-C ₅ H ₁₂): 0.05	■ Hexane (n-C ₆ H ₁₄): 0.05	■ Pentane (n-C ₅ H ₁₂): 0.05	■ Hexane (n-C ₆ H ₁₄): 0.05
	■ Nitrogen (N ₂): 4.00		■ Nitrogen (N ₂): 4.00	
Calibration gas setpoints PGC 9301 Biogas	gas components in [mol %]			
	■ Methane (CH ₄): 79.0118	■ Carbon dioxide (CO ₂): 2.002	■ Ethane (C ₂ H ₆): 3.9985	■ Propane (C ₃ H ₈): 3.0052
	■ 2-Methyl propane (iso-C ₄ H ₁₀): 0.5011	■ n-butane (n-C ₄ H ₁₀): 0.5001	■ Hydrogen (H ₂): 0.9983	■ Oxygen (O ₂): 1.9911
	■ Nitrogen (N ₂): 4.00	■ Hydrogen sulfide (H ₂ S): 50 ppm	■ Carbonyl sulfide (COS): 50 ppm	

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 measurement 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		

Space for personal notes



ONE STEP AHEAD

Subject to change without notice!

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