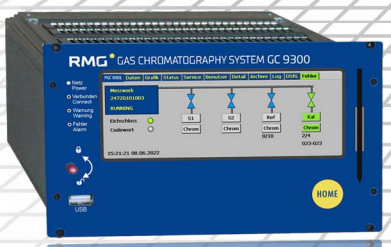
RMG
ONE STEP AHEAD

RMG PROCESS GAS CHROMATOGRAPH

PGC 9301

Operating manual



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Document information

This document is a translation of the original German operating instructions.

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.

The latest version of this manual and the manuals of other devices can be downloaded conveniently from our website.

Version	Version date	Changes
V00	November 2025	Initial creation

Protection notice pursuant to DIN ISO 16016

Preface

Dear Customer,

Thank you for deciding to purchase a product from RMG Messtechnik GmbH.

We would like to ask you to take the time to read this manual carefully, paying special attention to the safety information provided throughout the text and the section on ‘safety information’.

This is essential for handling and working with the product safely.

Our products are continuously developed, so there may be some minor differences between the product you have received and the depictions provided in this operating manual.

If you have any questions that are not answered by this manual, please contact us; we will be happy to help.

If you have any suggestions for improvements we could make, please let us know.

RMG Messtechnik GmbH

Table of contents

1 About this manual

This operating manual provides information that is required for proper, faultless and safe operation of the PGC 9301 gas chromatograph.

It forms an integral part of the PGC 9301 and must be kept near the device and accessible to personnel at all times.

The manual is intended for technically qualified personnel who have received training in installation, operation, maintenance and repair.

Personnel must have carefully read and understood this manual before commencing any work. The basic prerequisite for safe working is compliance with all of the specified safety and handling instructions.

Illustrations in this manual are provided to give a basic understanding and may differ from the product's actual design.

1.1 Validity of the manual

This manual applies to the PGC 9301 gas chromatograph (hereinafter also referred to as the 'PGC').

The PGC is used as an individual component in a complete system. The manuals for other components used therefore also apply in addition to this manual. If you find contradictory instructions in the various manuals, please contact RMG Messtechnik GmbH and/or the manufacturers of the other components.

1.2 Abbreviations

The following abbreviations are used in this manual:

PGC	**P**rocess **G**as **C**hromatograph
PED	**P**ressure **E**quipment **D**irective
DVGW	**D**eutscher **V**erein des **G**as- und **W**asserfaches [German Technical and Scientific Association for Gas and Water]
MessEG	**Mess**- und **E**ich**g**esetz [German Measures and Verification Act]
MessEV	**Mess**- und **E**ich**v**erordnung [German Measures and Verification Ordinance]
MID	**M**easuring **I**nstruments **D**irective

Table 1: Abbreviations

1.3 Symbols

The following symbols are used in this manual:

1., 2., etc.	Indicates action steps that must be carried out in the specified sequence.
▶	Indicates a measure or activity to be carried out
➡	Indicates the consequence of an implemented measure or action step
■	Indicates a general list of information
	Indicates a reference to a section in this manual

Table 2: Symbols used

1.4 Structure of safety instructions

Safety instructions in this manual are identified by symbols and introduced by signal words.

They contain information on the type and source of the hazard and describe the consequences of disregarding the safety instructions.

Finally, the measures and activities required to avoid the hazard are described.

The safety instructions are structured as follows in this manual:

⚠ DANGER

Imminent danger

Potential consequences of failing to observe the safety instruction: Death or serious injury

- ▶ Preventative measure or activity

⚠ WARNING

Dangerous situation

Potential consequences of failing to observe the safety instruction: Serious or irreversible injury

- ▶ Preventative measure or activity

⚠ CAUTION

Potentially dangerous situation

Potential consequences of failing to observe the safety instruction: Minor or slight injury

- ▶ Preventative measure or activity

NOTE

Warning of property damage and instructions for use

Instructions for use and useful or important information

2 General information

2.1 Intended use

The Process gas chromatograph PGC 9301 analyses natural gases 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).

The separate GC 9300 evaluation unit calculates the energy content, compressibility factor and other parameters from the individual components determined in the PGC 9301 measuring unit. The GC 9300 also determines the analysis sequence as a control computer and outputs the measurement results. The PGC 9301 measuring unit can only be operated together with the GC 9300.

The PGC 9301 measuring unit is designed for use in Zone 1 potentially explosive atmospheres and features an Ex d housing ('pressure-resistant enclosure' ignition protection class) with connection housing ('increased safety' ignition protection class) and the required ATEX safety classification (see section 2.4 "Conformity").

The permissible temperature and electrical performance data for operating the PGC 9301 in potentially explosive atmospheres can be found in section 13 "Technical data".

The PGC 9301 has been designed and manufactured in accordance with the latest state-of-the-art technologies and recognised safety standards and guidelines. Nevertheless, use of the same may result in hazards or damage to the device and other property. You may only use the PGC 9301 as intended and in a technically perfect condition.

Observe the operating manual and follow the handling instructions and the installation, commissioning, operation and servicing guidelines.

Clean and maintain the device regularly and observe the regulations on wearing personal protective equipment (safety helmet, safety goggles, safety boots).

2.2 Foreseeable misuse

Foreseeable misuse refers to any use for purposes other than those mentioned above, in particular:

- Use of the device by uninstructed personnel.
- Failure to follow the operating company's operating instructions.
- Failure to observe the operating manual.

NOTE

Unintended use

All warranty claims are rendered void in case of unintended use. Furthermore, the Process gas chromatograph PGC 9301 may lose its approval (ATEX).

2.3 Limitation of liability

All information and instructions in this manual have been compiled taking into account the applicable standards and regulations, the latest state-of-the-art developments and many years of knowledge and experience.

RMG Messtechnik GmbH accepts no liability for damage caused by:

- Failure to observe this manual;
- Unintended use;
- Use of untrained personnel;
- Operating errors;
- Unauthorised conversions;
- Technical alterations;
- Use of non-approved spare parts.

The obligations agreed in the supply contract, the General Terms and Conditions and the statutory regulations valid at the time the contract was concluded shall apply.

2.4 Conformity

The Process gas chromatograph PGC 9301 is approved and placed on the market for use in an Ex Zone 1 in accordance with the EMC Directive 2014/30/EU and the ATEX Directive 2014/34/EU.

Applied harmonised standards:

- EN 61326-1:2013
- EN IEC 61000-4-2:2009
- EN IEC 61000-4-3:2020
- EN IEC 61000-4-4:2012
- EN IEC 61000-4-5:2014 +A1:2017
- EN IEC 61000-4-6:2014
- IEC 61000-4-8:2010
- EN IEC 61000-4-11:2021-10
- EN IEC 60079-0:2018
- EN 60079-1:2014
- EN IEC 60079-7:2015 +A1:2018

The EU Declaration of Conformity can be found in the annex.

The device has the following labels:

CE

II 2G Ex db e IIB+H2 T5/ T4 Gb

Please contact RMG Messtechnik GmbH if you have any questions or require additional information.

2.5 Type plate

The PGC 9301 gas chromatograph's type plate is located on the front plate of the device.

The figure below shows a sample type plate:

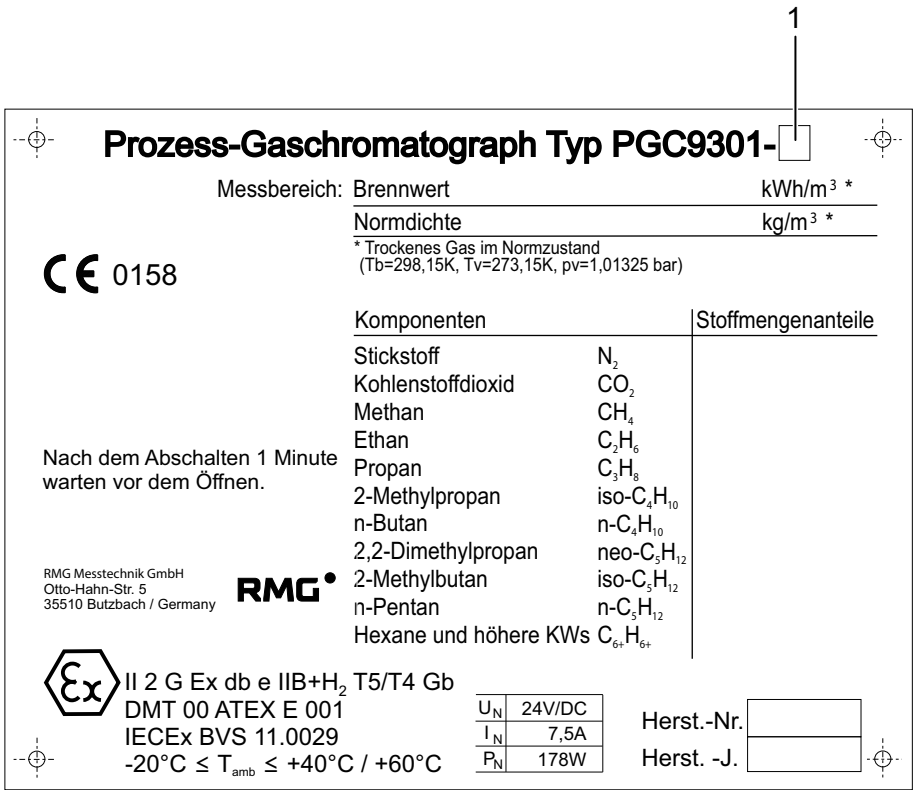

Fig. 1: Type plate for the PGC 9301 Core (example)

No.	Description
1	Denotes the number of measuring streams 1 – 2

2.6 Personnel qualifications

⚠ DANGER

Danger of death if personnel are insufficiently qualified

If unqualified personnel carry out work in potentially explosive atmospheres (such as mechanical and/or electrical installation and, in particular, commissioning for the first time), there is a risk of serious injury or even death.

- ▶ All activities may only be carried out by personnel who have received training and instruction relating to working in potentially explosive atmospheres.
- ▶ Keep unqualified personnel away from the danger zones.
- ▶ Have all work carried out checked by responsible specialists.
- ▶ Mechanical installations should also only be carried out by suitably qualified individuals who have the necessary knowledge for the work to be carried out and the tools to be used. Pressurised components represent a potential hazard.

NOTE

Recommended qualifications for personnel

In general, the following qualification is recommended for all individuals working with or on the PGC 9301 gas chromatograph:

- Training / education on working in potentially explosive atmospheres.
- Ability to correctly assess hazards and risks when handling the PGC 9301 and all connected devices.
- Training / education through RMG Messtechnik GmbH for working with gas measuring devices.
- Training / instruction in all country-specific standards and guidelines to be observed for the work to be carried out on the PGC 9301 and on the GC 9301.

The following personnel qualifications are defined for the various activities associated with the PGC 9301:

Operation:	The operating personnel use and operate the device in the context of its intended use. They receive information from the operating company about the tasks assigned to them and potential hazards.
Cleaning and care:	The device may only be cleaned and maintained by suitably qualified specialist personnel.
Maintenance and repair:	Maintenance and repair work may only be carried out by specialists who have received training in the advanced operation and parameterisation of the device and in carrying out preventive maintenance work. They are also able to carry out the tasks assigned to them due to their professional training and experience, as well as their knowledge of the relevant standards and regulations. These specialists are familiar with the applicable legal regulations on accident prevention and can recognise and avoid potential hazards independently.
Installation and electrical engineering work:	Installation and electrical engineering work may only be carried out by a qualified electrician. They must have specialist training, knowledge and experience in electrical engineering, and be familiar with the relevant standards and regulations (DIN VDE 0105, IEC 364, etc.). The qualified electrician is familiar with the applicable legal regulations on accident prevention and can recognise and avoid potential hazards independently.

2.7 The operating company's responsibility

The device is used in the commercial sector. The operating company that owns the device is therefore subject to the statutory occupational health and safety obligations.

In addition to the safety instructions provided in this manual, the safety, accident prevention and environmental protection regulations applicable to the device's area of use must be observed.

The following applies in particular:

- As the operating company, ensure that only sufficiently qualified personnel work on the device.
- Ensure that all employees who work with the device have read and understood this manual.
- You are also obligated to train personnel at regular intervals and to inform them of the risks and hazards involved in using the device.
- Have work carried out by qualified personnel checked by responsible specialists.
- Define the responsibilities for installation, operation, troubleshooting, maintenance and cleaning, and regulate them clearly.
- Provide the necessary personal protective equipment for the personnel.

2.8 Scope of delivery

The actual scope of delivery may differ from the explanations and illustrations provided here in the case of custom versions, the utilisation of additional ordering options or due to the latest technical changes.

However, the standard scope of delivery is outlined in the table below:

Component	Quantity
Process gas chromatograph PGC 9301	1
Operating manual	1

Table 3: Scope of delivery

Further information on the device can also be found in section 4 entitled 'Product description'.

3 Safety instructions

3.1 Risk assessment and risk minimisation

The PGC 9301 has been manufactured in accordance with the latest state-of-the-art technologies and the recognised safety regulations and standards, but use of the same still involves risks. These risks were identified during the development process and assessed by qualified employees. A corresponding risk analysis was carried out and design-related measures were derived and implemented to minimise the risks.

Any remaining residual risks are emphasised by safety and handling instructions in this manual.

Risk minimisation measures:

The maximum permissible temperature range and the maximum permissible operating pressure are specified on the type plate and in section 13 "Technical data". The device may only be operated within these specified ranges.

3.2 General safety instructions

⚠ DANGER

Risk of personal injury and property damage!

Failure to observe the safety instructions may result in danger of death, harm to human health and environmental and property damage.

▶ Observe all of the following safety instructions!

Please note that the safety instructions in this manual and on the device cannot cover all potential hazardous situations, as it is impossible to foresee all the ways that different circumstances may interact in.

Simply following the specified instructions may not be sufficient to ensure proper operation.

- Always be attentive and think for yourself.
- Before working with the device for the first time, read this operating manual carefully, especially the safety instructions.
- This operating manual warns of unavoidable residual risks for users, third parties, devices or other property in its safety instructions.
- Only operate the device if it is in perfect condition, in compliance with the operating manual and in accordance with its intended use.
- Please also observe the local statutory accident prevention, installation and assembly regulations.

3.3 Safety instructions for transport

⚠ WARNING

Risk of injury during transport

There is a risk of serious injury when transporting the PGC 9301 due to falling or slipping loads.

- Only use the mounting and frame elements provided to lift the device.
- Pay attention to the permissible load-bearing capacity of the lifting devices used.
- Before lifting, ensure that the load is secured.
- Never remain underneath suspended loads.
- Note that the device may slip, topple over or fall during lifting or setting down, particularly if the lifting equipment does not have sufficient load-bearing capacity.
- If the device is supplied on a Euro pallet, it can be transported with a pallet truck or forklift.

3.4 Safety instructions for installation

The PGC 9301 may only be installed and connected in accordance with the following safety instructions:

- Empty and aerate the sampling line that the PGC 9301 is to be connected to. This is the only way to ensure that the line is depressurised and that there is no explosive gas mixture in the line.
- Pressurised pipes may only be fitted by trained specialist personnel.
- Ensure that the power connection's performance data corresponds to the data on the type plate.

⚠ DANGER

Risk of explosion due to improper installation of the PGC 9301

The Process gas chromatograph PGC 9301 is approved for use in potentially explosive atmospheres and designed accordingly, provided that it has been installed professionally and in accordance with the specifications provided in the operating manual. Improper installation (e.g. leaks in the gas line or faulty electrical connections) can lead to a significant risk of explosion.

- ▶ Only install the PGC 9301 in its original, complete and error-free condition.
- ▶ Equalise the housing potential by connecting an earthing cable to the housing.
- ▶ When connecting additional devices and sensors in potentially explosive atmospheres, ensure that the appropriate explosion protection is provided for these components.
- ▶ Provide galvanic isolation for intrinsically safe components when connecting to the PGC 9301.
- ▶ Use cables that are suitable for the cable glands.
- ▶ Only have devices and sensors connected to the PGC 9301 by specialist personnel in accordance with EN 60079-14 and in compliance with national regulations.
- ▶ Use suitable tools and materials to prevent damage to components.
- ▶ Always use a slightly damp cloth to clean the housing to avoid static charge caused by friction.

⚠ CAUTION

Risk of cuts

Although all sharp edges on the device have been removed as far as possible, there is still a risk of minor cuts.

- ▶ Wear suitable personal protective equipment when carrying out all work on the device.
- ▶ Remove any burrs that may still be present on the housing and at the mounting points.

3.5 Safety instructions for commissioning

The PGC 9301 may only be commissioned in accordance with the following safety instructions:

- ▶ Do not use the PGC 9301 or its attachments as potential handholds or climbing aids!
- ▶ Before switching on the power supply, ensure that all of the gas lines to the measuring unit and the measuring unit itself have been purged. If there is still air in the line system or in the measuring unit, this will destroy the analysis unit.

3.6 Safety instructions for normal operation

In principle, the instructions issued by the operating company that owns the system that the PGC 9301 is installed in apply.

Please also observe the safety instructions listed below:

- Only use the PGC 9301 in its original, complete and error-free condition.
- Read this operating manual carefully to avoid incorrect operation and only use the PGC 9301 as intended (see section 2.1 "Intended use").
- The PGC 9301 gas chromatograph may be operated in Ex Zone 1. However, for safe operation, observe and do not exceed the performance limits specified on the type plate and in section 13 "Technical data".
- Do not use the gas chromatograph as a potential climbing aid or handhold!

3.7 Safety instructions for maintenance, servicing and cleaning

Servicing and maintenance work or repairs that are not described in the operating manual must not be carried out without first consulting with the manufacturer beforehand.

Interventions or modifications to the gas chromatograph that are not described in this operating manual are not permitted.

⚠ DANGER

Danger of death due to electrical voltage

The device must be switched off and disconnected from the mains before carrying out any maintenance, servicing or cleaning work. Failure to do so may result in serious injury or even death.

- Switch off the power supply to the device and disconnect it from the mains before commencing any work.
- Only carry out work on the device that is described in this manual. Ensure that the device is not energised while work is being carried out.

⚠ WARNING

Risk of injury due to improper maintenance, servicing and cleaning

Serious injury may result if maintenance, servicing and cleaning work is carried out incorrectly or a defective, damaged or unsafe device is used again.

- Only allow maintenance, servicing and cleaning work to be carried out by specialist personnel who have the necessary knowledge for the work to be carried out and the tools to be used.
- Take a damaged or unsafe device out of circulation immediately and label it accordingly to prevent it from being used again unintentionally.
- In general, it is recommended that repairs or the replacement of a defective device should only be carried out by RMG Service.

3.8 Special types of hazard – explosion protection

The Process gas chromatograph PGC 9301 is approved for use in potentially explosive atmospheres and designed accordingly, provided that it has been installed and commissioned professionally and in accordance with the specifications provided in the operating manual.

This symbol warns you of a potentially explosive atmosphere. Observe the instructions next to the symbol.

⚠ DANGER

Danger of death when working in potentially explosive atmospheres

If the PGC 9301 Core and connected devices and sensors are installed and operated in a potentially explosive atmosphere, there is a risk that even the slightest ignition energy can cause an explosion when working on the PGC.

This may result in serious injury or even death.

- ▶ Observe all relevant country-specific regulations for the installation of devices, sensors and additional cabling in potentially explosive atmospheres (e.g. IEC 60079-10, IEC 60079-14, IEC 80079-20-1).
- ▶ Only use tools that are authorised for use in Ex zone 1 for maintenance and repair work. The use of unsuitable tools can damage components and render the device's explosion protection ineffective.
- ▶ Avoid any risk of ignition due to mechanical effects such as impact or friction.

4 Product description

The PGC 9301 process gas chromatograph is used for analysing natural gases. It determines the concentrations of the individual gas components.

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). Based on the measurement results determined in the measuring unit, the separate analysis computer calculates important parameters such as the energy content, the compressibility factor and other gas-related parameters.

The GC 9300 analysis computer handles both the evaluation and the control of the analysis process in the measuring unit and outputs the measurement results. The PGC 9301 measuring unit is always operated in conjunction with the GC 9300.

Only the PGC 9301 measuring unit is described in detail below. For details on the analysis computer, please refer to the associated operating manual, which you can download from our website at www.rmg.com.

4.1 Structure of the PGC 9301

The PGC 9301 measuring unit is available in two variants:

- PGC 9301 with housing for wall-mounted assembly (see fig. 2)
- PGC 9301 with housing and frame for floor-mounted assembly (see fig. 3)

The measuring unit essentially consists of the following components:

- 1x pressure-resistant Ex d housing
- 1x analysis unit (consisting of column modules, electronics unit, pressure control and gas distribution with valves)
- 1x Ex e junction box
- 2x sample gas connection
- 1x carrier gas connection
- 1x calibration gas connection
- 1x reference or external test gas connection
- 2x bypass exhaust line connection

The variant with frame for floor-mounted assembly additionally includes the following components:

- Frame for floor-mounted assembly
- Gas connection plate mounted on the frame, incl. piping to the analysis unit
- Condensate collection container with drain screws

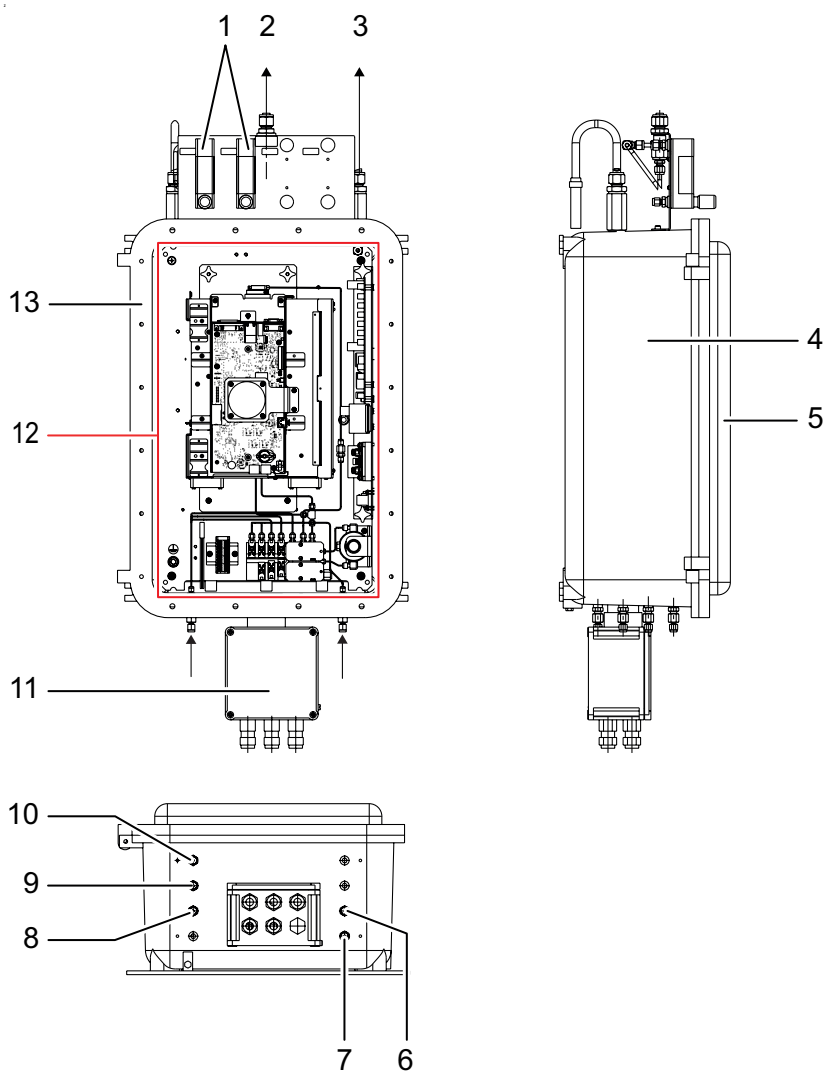

Fig. 2: PGC 9301 with housing for wall-mounted assembly

No.	Description	No.	Description
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		

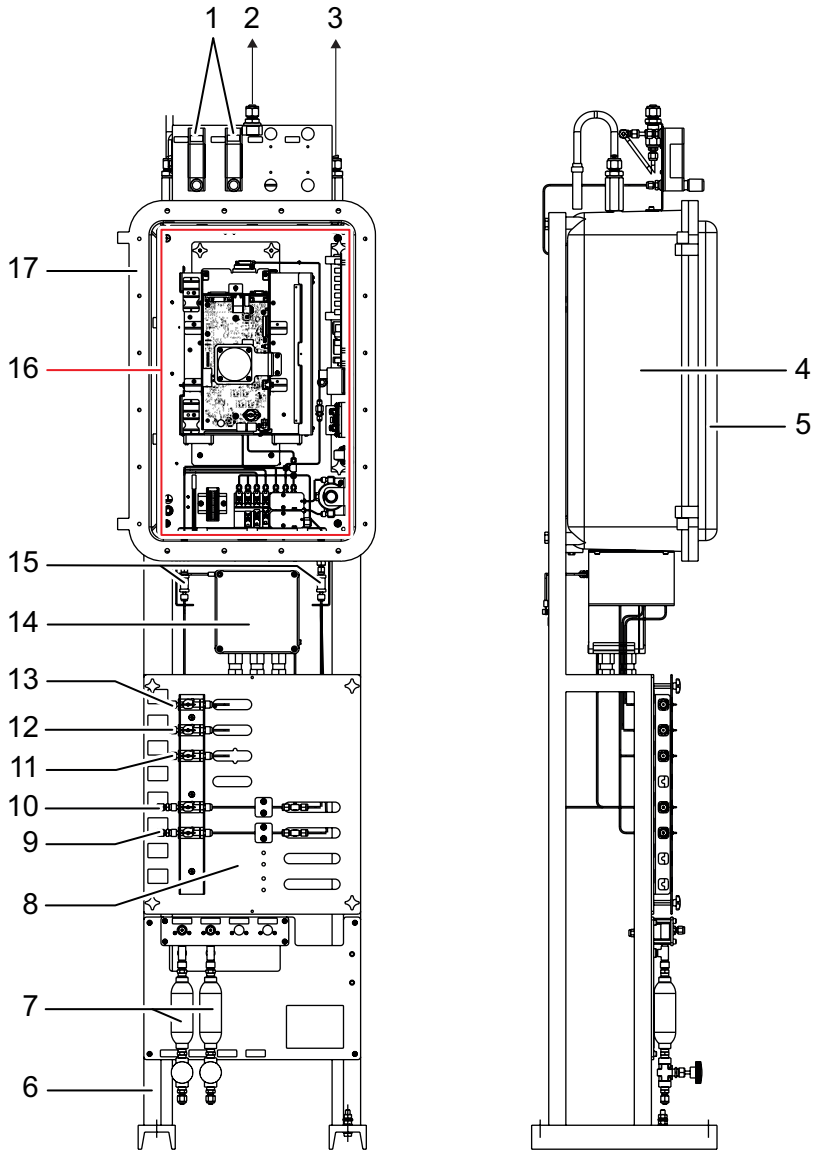

Fig. 3: Process gas chromatograph PGC 9301 with housing and frame for floor-mounted assembly

No.	Description	No.	Description
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)

No.	Description	No.	Description
17	Sealing surface between housing and door		

The exact dimensions of the PGC 9301 variants can be found in section 13 "Technical data".

4.1.1 Design of the analysis unit

The analysis unit is completely housed in the measuring unit's Ex d housing (see fig. 4).

It consists of the following components:

- **Gas distribution** with control valves to direct the sample gas, calibration gas and reference gas to the column modules as required and to add the carrier gas.
- **Pressure regulation** consisting of pressure sensors and pressure regulator to monitor and regulate the analysis gas pressure upstream of the column modules. The pressure setting is adjusted at the factory during basic calibration of the device.
- **Column modules A and B**. Each column module comprises an injector, a reference and measurement column, the thermal conductivity detectors, the column heating and the injector heating.
- **Electronics unit** with analogue section, digital section and communication unit. Data acquisition and processing, temperature control and pressure monitoring, as well as communication with the column modules' mainboard, take place here. The mainboard is responsible for evaluating the chromatogram and transmitting all of the measurement data to the analysis computer (GC 9300).

The Ex d housing is heated to ensure the required internal temperature.

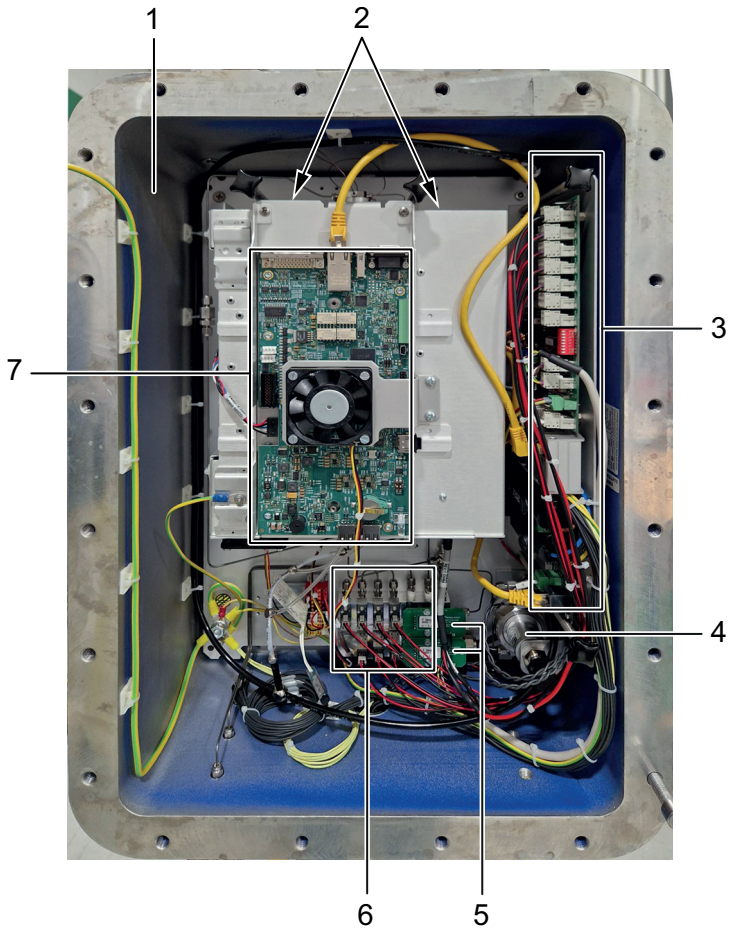

Fig. 4: Analysis unit

No.	Description	No.	Description
1	Ex d housing	2	Column modules A and B
3	Electronics unit	4	Pressure regulator
5	Pressure sensors	6	Control valves of the gas distribution
7	Mainboard		

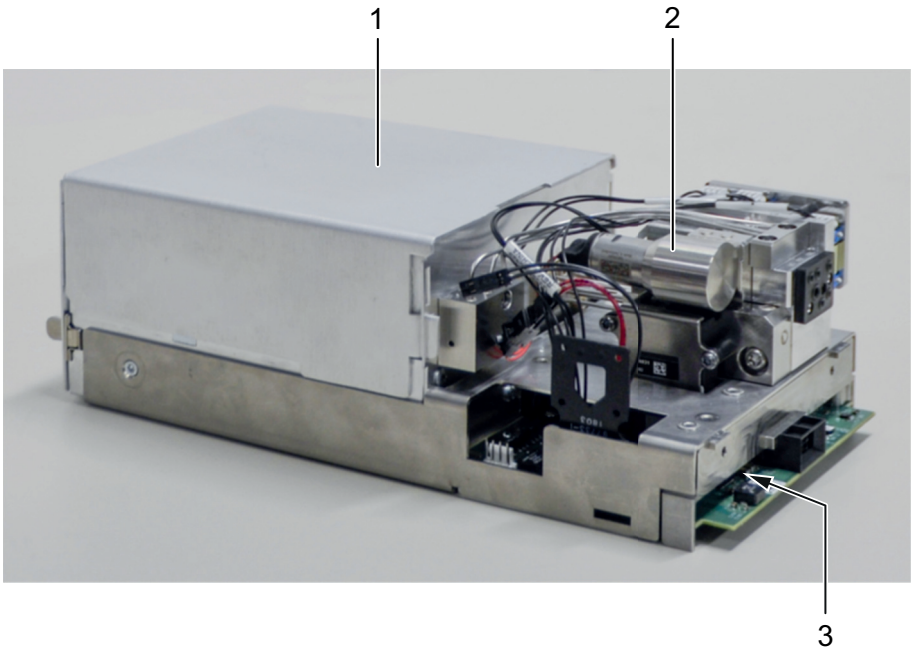

Fig. 5: Column module

No.	Description	No.	Description
1	Column module	2	Column pressure regulation
3	Column electronics		

4.1.2 Design of the gas distribution

The job of the gas distribution with the associated control valves is to direct one of two sample gas streams (the calibration gas or the reference gas) to the column modules for analysis and to supply the carrier gas.

What is known as the 'double block and bleed' valve arrangement was chosen to avoid contamination of the selected gas stream by potential valve leakages (see fig. 6).

In fig. 6, the calibration gas is connected (shown in green) and it can be seen that the volumes between the valves of the other gas streams are vented to the atmosphere (shown in red). Any leaks that occur cannot, therefore, contaminate the analysis gas stream.

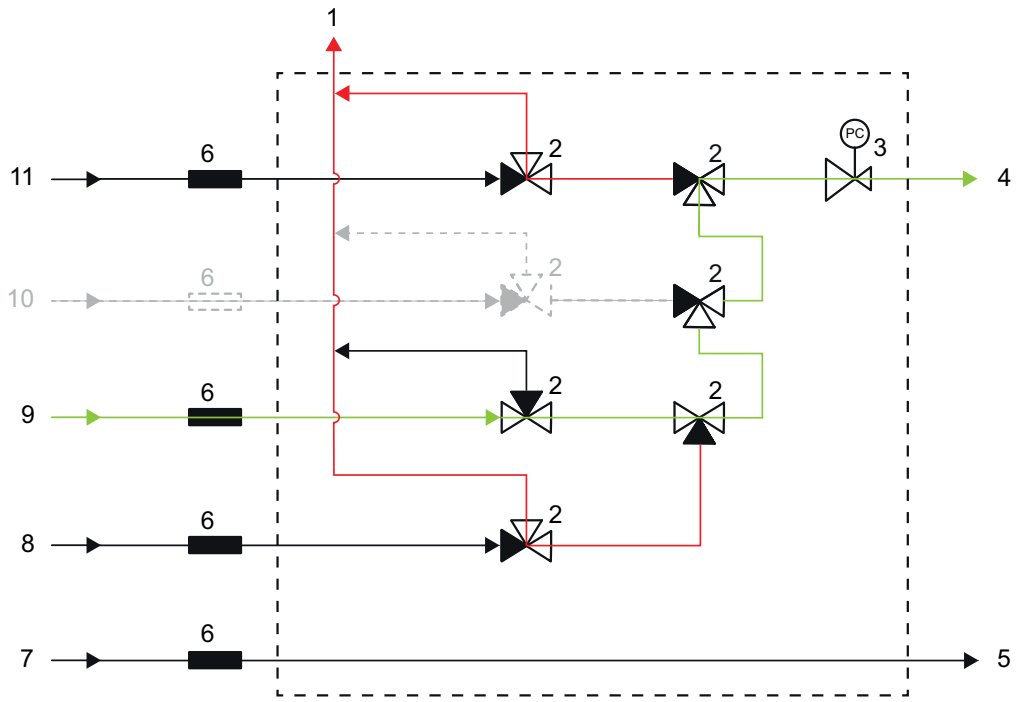

Fig. 6: Gas distribution (schematic diagram)

No.	Description	No.	Description
1	Ventilation	2	Control valve
3	Pressure regulator	4	Analysis gas to the column modules
5	Carrier gas to the column modules	6	Filter
7	Carrier gas	8	Reference gas or ext. Test gas
9	Calibration gas	10	Sample gas 2 (optional)
11	Sample gas 1		

4.2 Function of the PGC 9301

The PGC 9301 is approved and designed for use with 'normal' natural gas.

fig. 7 below shows the functional design of the gas chromatograph as a block diagram.

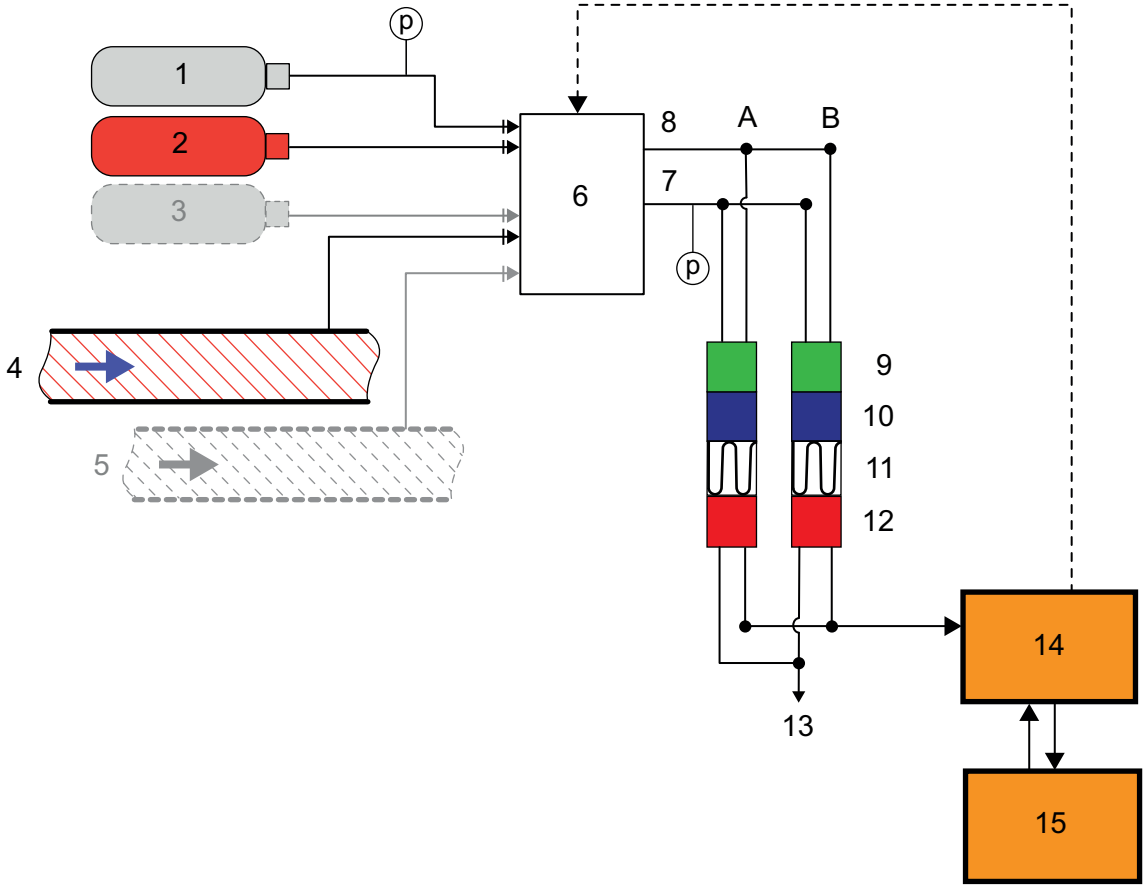

Fig. 7: Block diagram of the gas chromatograph

No.	Description	No.	Description
1	Carrier gas (helium)	2	Calibration gas
3	Reference gas (optional)	4	Sample gas 1
5	Sample gas 2 (optional)	6	Gas distribution
7	Analysis gas (e.g. sample gas 1, sample gas 2 (optional), calibration gas, reference gas (optional))	8	Carrier gas (helium)
A	Column module A	B	Column module B
9	Column pressure regulator	10	Injector
11	Separation columns	12	Thermal conductivity detector (TCD)
13	Exhaust	14	Electronics unit for evaluating measured values and processing data
15	Analysis computer (GC 9300)		

A gas sample is taken from the process line by means of a sampling probe (fig. 7, no. 4) and fed into the gas distribution (fig. 7, no. 6). Depending on the requirement (e.g. analysis or calibration), one of the following four gas inlets is connected towards column modules A and B by means of control valves (a 'double block and bleed' valve unit; see fig. 6):

- Sample gas 1 (fig. 7, no. 4)
- Sample gas 2 (optional) (fig. 7, no. 5)
- Calibration gas (fig. 7, no. 2)
- Reference gas or ext. Test gas (optional) (fig. 7, no. 3)

Before the sample to be analysed is fed to the column modules, a pressure reduction (fig. 6, no. 3) takes place to ensure a defined pressure in the column modules. (A gas dryer may also be provided as an option).

In addition, the carrier gas (fig. 7, no. 1) is supplied to the column modules via the gas distribution. The carrier gas pressure must be set directly at the carrier gas cylinder's pressure regulation, as no further pressure regulators are installed.

Although the individual column modules also have pressure regulation (fig. 7, no. 9) for setting the carrier gas pressure, its sole purpose is to keep the carrier gas pressure constant for the analysis so as to ensure consistent analysis results. The carrier gas pressure cannot be adjusted here.

The PGC 9301 works with 2 column modules (A and B) for analysis purposes.

The following gas components are determined in the column modules:

Column A (carrier gas: helium)	Column B (carrier gas: helium)
■ Nitrogen (N_2)	■ Propane (C_3H_8)
■ Methane (CH_4)	■ Butane (C_4H_{10})
■ Carbon dioxide (CO_2)	■ Pentane (C_5H_{12})
■ Ethane (C_2H_6)	■ Hexane (C_6H_{14})
	■ Higher hydrocarbons

Table 4: Determination of gas components in the column modules

The order in which the gas components are listed corresponds to the chronological sequence during the analysis.

A precisely defined amount of the gas to be analysed is fed to the separation columns (fig. 7, no. 11) by means of the injector (fig. 7, no. 10). This sample is passed through the separation columns by the carrier gas, which constitutes what is known as the 'mobile phase'.

The separation of the gas mixture is based on the interaction between the stationary phase, the coating or filling of the columns and the components of the gas flowing past. Through adsorption and other interactions of varying strength between the individual components and the stationary phase, the individual constituents are selectively delayed during their passage, moving through the column at different speeds. So all of the components appear separated in time at the column outlet.

A thermal conductivity detector (fig. 7, no. 12) detects the exit of the components. A signal of varying length and height is thus generated for each component (a 'peak'). The area under the signal curve is a measure for the corresponding mole fraction.

Helium is used as the carrier gas in the analysis unit. Two columns operated in parallel are used for separation.

Further evaluation of the determined area fractions takes place in the GC 9300 analysis computer.

The GC 9300 analysis computer is the controller for the PGC 9301 and controls the analysis sequence in the analysis unit. In normal operation, the next analysis is started straight after completion of an analysis, with an analysis taking approximately 3 – 4 minutes depending on the variant.

The analysis series is interrupted by automatic calibrations. A calibration typically comprises four calibration gas analyses (or more, adjustable) and lasts approximately 15 minutes. Averaging is performed from the third or fourth measurement onwards, and the first measurements are discarded.

The PGC 9301 can be configured as a **single-stream unit** for analysing gas from **one** sampling point or, as an option, as a **dual-stream unit** for **two** sampling points.

NOTE

Using the PGC 9301 as a dual-stream unit

If the PGC 9301 is used as a dual-stream unit, the default setting provides for the measured gas to change with each analysis. If this setting is retained, there may be a risk of mixing of any residual gases remaining in the system.

- ▶ It is advisable to change the measurement setting so that several consecutive measurements are performed with the same sample gas to reduce the likelihood of mixing.
- ▶ Please observe the relevant calibration regulations for measurements subject to calibration.

4.2.1 Principles of analysis

The factory default setting ensures good separation of the individual gas components as they pass through the columns. The corresponding parameter set is referred to as the **method**. Some of these settings are displayed and monitored by means of the analysis computer. The **method** defines physical principles of the analysis process that have a direct influence on the analysis result:

- Column temperatures

  The column temperatures have a direct influence on the separation performance and the analysis times. The temperature of the columns is therefore kept constant and displayed on the analysis computer.
- Runtime

  The runtime determines over what period the data acquisition and evaluation of the **T**hermal **C**onductivity **D**etector (TCD) signals takes place.
- Purging time

  The purging time specifies how long the sample loops are purged with fresh sample gas before injection. This is permanently set during factory calibration.
- Carrier gas pressure

  A defined inlet pressure (5.5 bar) is required since the pneumatically controlled valves of the injectors are actuated by means of the carrier gas. The setting is made at the carrier gas supply's pressure regulation unit. The set pressure is monitored by the analysis computer.

NOTE

Difference between carrier gas pressure and column carrier gas pressure

Please note:

- The carrier gas pressure is set at the carrier gas supply's pressure regulation unit and should be 5.5 bar.
- The column carrier gas pressure is kept constant by the integrated pressure regulation of the respective column module. The column pressure regulator may only be adjusted by trained specialist personnel, as this affects the analysis results.

- Sample gas pressure

  The sample gas pressure is set at the factory to 1 bar at the gas distribution. This specified value should be kept within a specified tolerance range, therefore the pressure value is monitored in the analysis computer and a message is issued if necessary.

Since many analysis-related values are monitored by the GC 9300 analysis computer and settings need to be made there, please also refer to the associated operating manual, which is available for download on our website at www.rmg.com.

4.2.2 Analysis sequence

The basic sequence of an analysis cycle is explained using the following pneumatic diagram of a column module. Only one column module is considered in detail for the sake of simplicity.

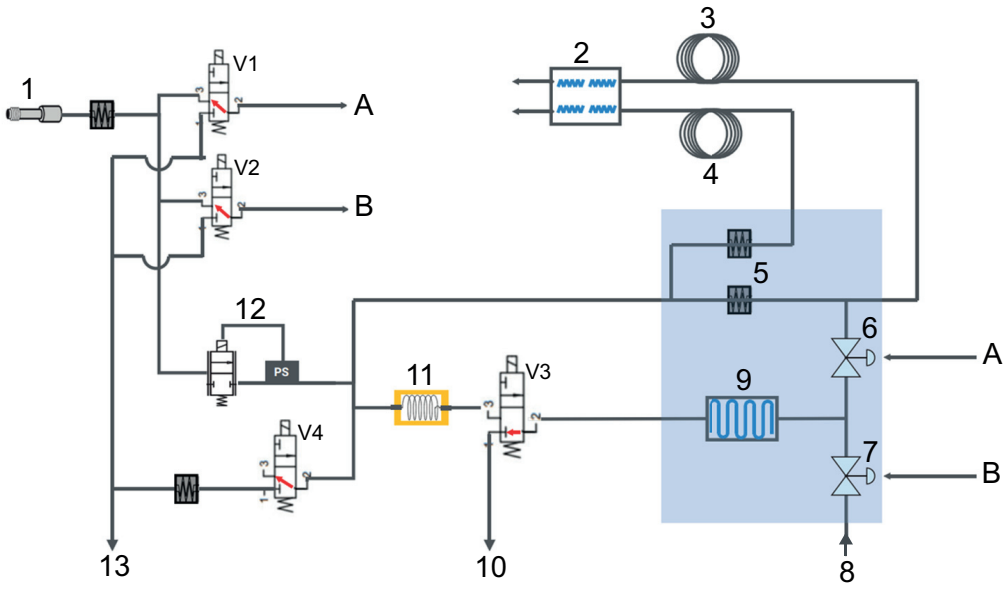

Fig. 8: Pneumatic diagram of a column module

No.	Description	Function
1	Carrier gas inlet	■ Supplies both the columns and the pneumatic actuator of the injector valve and the sample valve with carrier gas. Carrier gas is supplied to the actuators at an inlet pressure of 5.5 bar, while the carrier gas for analysis in the separation columns is reduced to the required value by means of the pressure regulation (no. 11).
2	Thermal conductivity detector	■ Detects the exit of the individual gas components from the respective column.
3	Analysis column	■ Separation column for analysing the gas sample
4	Reference column	■ Separation column for analysing the carrier gas
5	Flow restrictors	■ Control the amount of carrier gas so that a continuous flow through the columns is ensured.
6	Injector valve	■ Injects the gas from the sample loop into the separation columns.
7	Sample gas valve	■ The sample loop is purged with fresh sample gas by opening the sample gas valve. ■ A defined volume of sample gas is enclosed in the sample loop by closing the sample gas valve.
8	Sample gas inlet	■ Provides the analysis gas that has been switched through from the gas distribution (fig. 6) for analysis.
9	Sample loop	■ In the sample loop, the gas sample to be analysed is brought to the required pressure by adding carrier gas.
10	Sample gas return	■ Returns the gas used for purging the sample loop back to the gas system.
11	Loop for pressure-reduced carrier gas	■ What exactly is this needed for??
12	Carrier gas pressure regulation	■ Sets the carrier gas pressure to the required value for the analysis.
13	Carrier gas vent	■ Vents the pneumatic actuators and the carrier gas loop.
V1	Solenoid valve	■ Controls the pneumatic actuator of the injector valve (no. 6).
V2	Solenoid valve	■ Controls the pneumatic actuator of the sample gas valve (no. 7).
V3	Solenoid valve	■ Switches the gas path between purging and pressurising the sample gas loop.
V4	Solenoid valve	■ Opens or closes the path for venting the carrier gas loop.

Sequence of an analysis cycle

1. Starting position or purging of the sample loop

   In the starting position, the sample loop (no. 9) is continuously purged with sample gas. The sample gas valve (no. 7) is open for this purpose, and solenoid valve V3 opens the return path to the gas system (no. 10).

2. Pressurisation of the sample loop

   Before the sample gas can be pressurised, the sample gas valve (no. 7) is closed first of all and, at the same time, solenoid valve V3 is switched to enclose a defined volume of sample gas in the sample loop (no. 9). The carrier gas, which has been pressure-reduced by the pressure regulation (no. 11), then enters the sample loop and thus increases the pressure of the sample gas to the value required for the analysis.

3. Injection

   For injecting the sample gas into the analysis column (no. 3), the injector valve (no. 6) is opened so that the enclosed sample gas from the sample loop (no. 9) is injected together with the carrier gas into the analysis column. At the same time, only carrier gas flows through the reference column (no. 4).

4. Analysis

   The injector valve (no. 6) is closed again before the analysis begins. The sample gas is then separated into its individual components in the separation column. The individual components pass through the thermal conductivity detector one after another. The chromatogram, which provides information about the composition of the analysed sample gas, is created from the peaks detected by the sensors.

4.3 PGC 9301 gas supply

4.3.1 Carrier gas

The helium carrier gas used must correspond to at least class 5.0 (99.999%). For proper operation of the measuring unit, the inlet pressure must be within the following tolerance range:

- p_T = 5.5 bar (±10%)

A pressure sensor that monitors the carrier gas pressure and whose output signal is processed by the analysis computer (e.g. for warning and alarm messages) is installed in the gas distribution.

Depending on the column pressure and variant, the total carrier gas consumption is:

- $Q_T \approx 0.4$ Nl/h

4.3.2 Calibration gas

The following composition is used for the internal calibration gas:

Component	Natural gas (type 11D), concentration in [mol %]
Nitrogen	4.00
Methane	88.90
Carbon dioxide	1.50
Ethane	4.00
Propane	1.00
Isobutane	0.20
n-butane	0.20
Neopentane	0.05
Isopentane	0.05
n-pentane	0.05
n-hexane	0.05
Oxygen	0.00
Hydrogen	0.00

Table 5: Calibration gas – composition used

The inlet pressure of the calibration gas is set to:

- p_e = 1.0 bar (internal)

This setting must be made before the basic calibration. A subsequent change is not permitted. The permissible deviations during operation are:

- Δp_e = ±10%

There is continuous gas consumption throughout the entire calibration time. At an inlet pressure of p_e = 1.0 bar, the total flow rate is:

- Q = 3.4 Nl/h

NOTE

Calibration gas certificate

The calibration gas certificate specifies requirements regarding the gas's permissible minimum temperatures and usage period.

- ▶ Observe the permissible minimum temperature of the calibration gas. Ensure that the temperature never falls below this value.
- ▶ Do not continue to use the calibration gas once the permissible usage period has elapsed.

4.3.3 Sample gas

NOTE

Permissible properties of the sample gases

- The sample to be analysed must be in the gaseous state and dry.
- Liquid components and other contaminants are not permitted!
- In official calibration operation, the limit values on the type plate apply to the column modules' working range.

The values specified in sections 4.3.1 and 4.3.2 apply to the inlet pressure and gas consumption.

The column modules' working range lies within the following limit values:

Component	Concentration in [mol %]
Nitrogen	0 – 30
Methane	60 – 100
Carbon dioxide	0 – 15
Ethane	0 – 17
Propane	0 – 8
Isobutane	0 – 4
n-butane	0 – 4
Neopentane	0 – 0.1
Isopentane	0 – 0.3
n-pentane	0 – 0.3
C6+	0 – 0.3

Table 6: Permissible limit values for the column modules' working range

4.4 Additional components available as options

4.4.1 Sampling probe (type PES 50T)

The sampling probe (type PES 50T) is used to extract sample gas from the gas pipeline and supply it to the PGC 9301 for analysis.

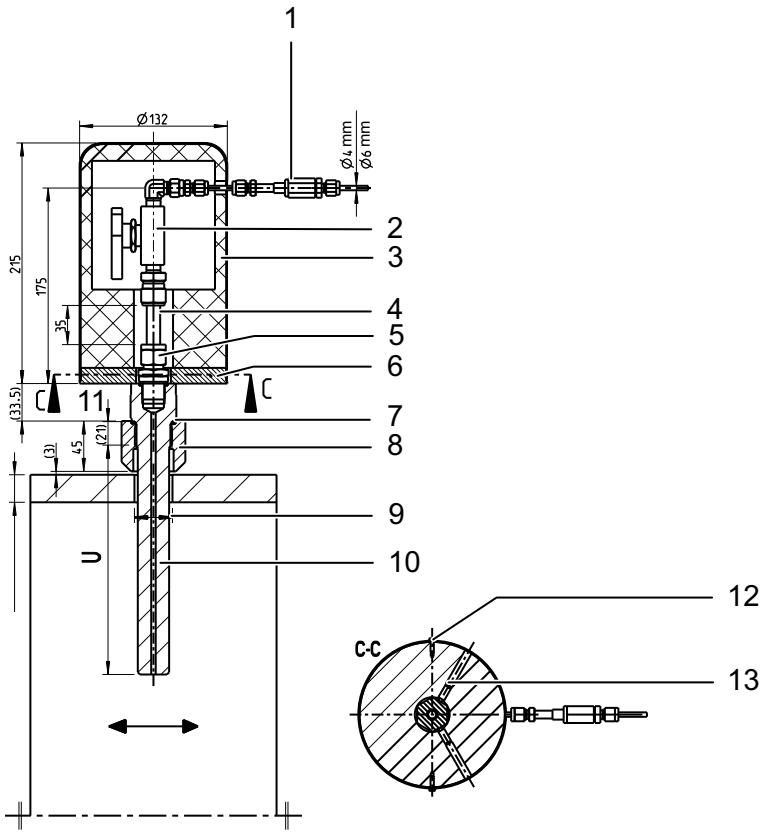

Fig. 9: Sampling probe PES 50T

No.	Description	No.	Description
1	Insulating screw connection for potential separation (optional)	2	Ball valve
3	Aluminium protective hood insulated with base disc	4	Pipe 12x1.5
5	G1/2” screw-in connection	6	Base disc
7	Aluminium sealing ring in accordance with DIN 7603 for G1/2” screw-in fitting	8	Socket G1/2”, G3/4” or G1” with threaded hole in accordance with DIN 3852-2, shape C or Y. Provided by the customer. Height = 45 mm ‘Attention: Take the immersion depth into account for deviating socket heights!’
9	Thread: ■ G1/2”= Drill hole in pipe min. Ø20 ■ G3/4”= Drill hole in pipe min. Ø26 ■ G1”= Drill hole in pipe min. Ø32	10	Probe tube stub G1/2”, G3/4” or G1”
11	Aluminium sealing ring in accordance with DIN 7603 for G1/2” screw-in fitting	12	Cross-hole screw with sealing option (option with protective hood)
13	Grub screw with point for securing the base disc to the hexagon of the screw connection (option with protective hood)		

Technical description

Nominal size	Unsupported installation length	For socket with thread
DN 600	205	G1”
DN 500	201	G1”
DN 400	168	G1” and G¾”
DN 300	141	G1” and G¾”
DN 250	122	G¾” and G½”
DN 200	104	G¾” and G½”
DN 150	84	G¾” and G½”
DN 100	66	G¾” and G½”
DN 80	57	G¾” and G½”
DN 50	48	G¾” and G½”

Fitting may only take place in a depressurised state!

Please note that the drill hole in the pipeline must be centred to the socket and have a diameter of min. 20 mm for a G1/2” thread, min. 26 mm for a G3/4” thread and min. 32 mm for a G1” thread.

Flow velocity: 20 m/s

Operating pressure: 155.1 bar

Operating temperature: -40°C to +93°C

The strength calculation was performed in accordance with DIN 43772 and ASME PTC 19.3 TW 2016

Immersion depths in accordance with DIN EN ISO 10715-Sept. 2000.

All of the probe parts are made of stainless steel. The screw connections and stopcocks are Swagelok.

4.4.2 Type PPS 02-R sampling probe

The sampling probe (type PPS 02-R) is also used to extract sample gas from the gas pipeline and supply it to the PGC 9301 for analysis.

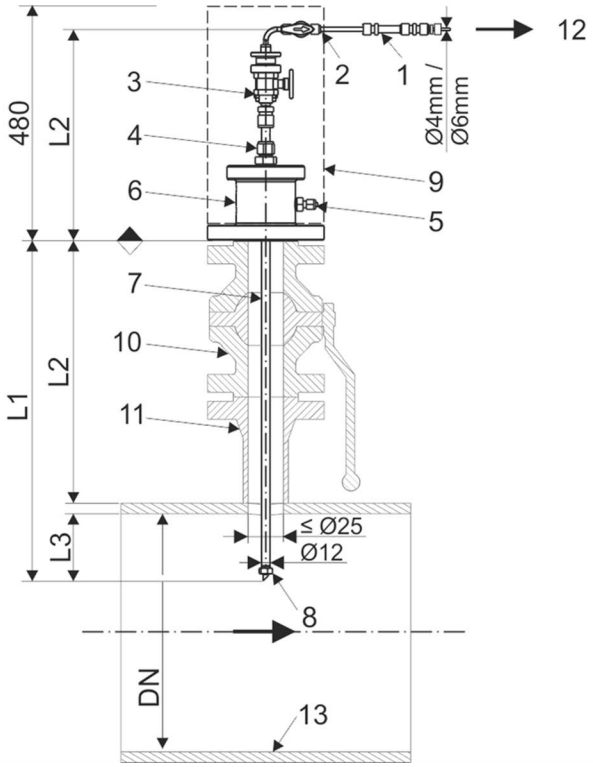

Fig. 10: Type PPS 02-R sampling probe

No.	Description	No.	Description
1	Insulating screw connection for potential separation (optional)	2	Stopcock
3	Stopcock with support ring for insertion / extraction tool	4	Through fitting
5	Vent valve	6	Connection head with flange connection
7	Probe tube Ø12 mm	8	Extraction stop (M10 nut)
9	Stainless steel insulating hood (optional)	10	Ball valve (provided by the customer)
11	Weld-on stub (provided by the customer)	12	Sample outlet to HP reduction
13	Gas line		

Technical description

- Operating pressure (PN) max. 100 bar g
- Operating temperature: -28°C / +65°C
- All probe parts are made of stainless steel
- O-rings made of 72 NBR 872
- Screw connections and stopcocks are from Swagelok

- Connection head with flange connection in accordance with ASME B16.5 Flange ANSI 2":
  - ANSI 150 RF, ANSI 150 RTJ, ANSI 300 RF, ANSI 300 RTJ, ANSI 600 RF and ANSI 600 RTJ.

The exact immersion depth L1 is required (L1 = L2 + pipe wall thickness + L3) to determine the probe size.

The probe is permanently set by RMG to the specified immersion depth and cannot be changed thereafter. The dimension L1 can be selected between 330 – 430 mm, 430 – 530 mm or 585 – 685 mm.

- Recommended immersion depth L3 = 1/3 DN, (min. 50 mm).

The probe height L4 is between 300 and 400 mm depending on the set immersion depth L1.

The pipe section to be welded on and the ball valve between the probe and the ball valve are not included in the scope of delivery.

Flange connection elements can be supplied as options:

- Bolts with dimensions in accordance with ANSI B16.5 with thread dimensions in accordance with ANSI B1.1; material ASTM A320, grade L7, zinc-plated and silver chrome-plated
- Nuts with thread dimensions in accordance with ANSI B1.1; material ASTM A320, grade L7, zinc-plated and silver-chrome-plated
- Seals:
  - RF flange
    Grooved with dimensions in accordance with ANSI B16.5, made of 1.4541 with graphite coating and centring ring
  - RTJ flange
    Ring gasket with dimensions in accordance with ANSI B16.5, made of soft iron
- Acceptance certificates in accordance with DIN EN 10204
  Bolts: 3.2
  Nuts: 3.1
  Seals: 3.1

Other flange connection elements are available on request.

Please note that the opening in the pipeline must be centred to the pipe section and ball valve and have a diameter of min. 25 mm.

Tests:

- Strength test at 1.5 x PN.
- Leak test at 1.1 x PN.
- Function test; each probe is inserted and extracted under design pressure.

4.4.3 Pressure reduction stage DRS 200

The pressure reduction stage DRS 200 reduces the pressure of sample gases from high-pressure to low-pressure conditions to enable safe and precise measurement.

It is available in 'Wall-mounted assembly' and 'Stand version' variants.

Wall-mounted assembly

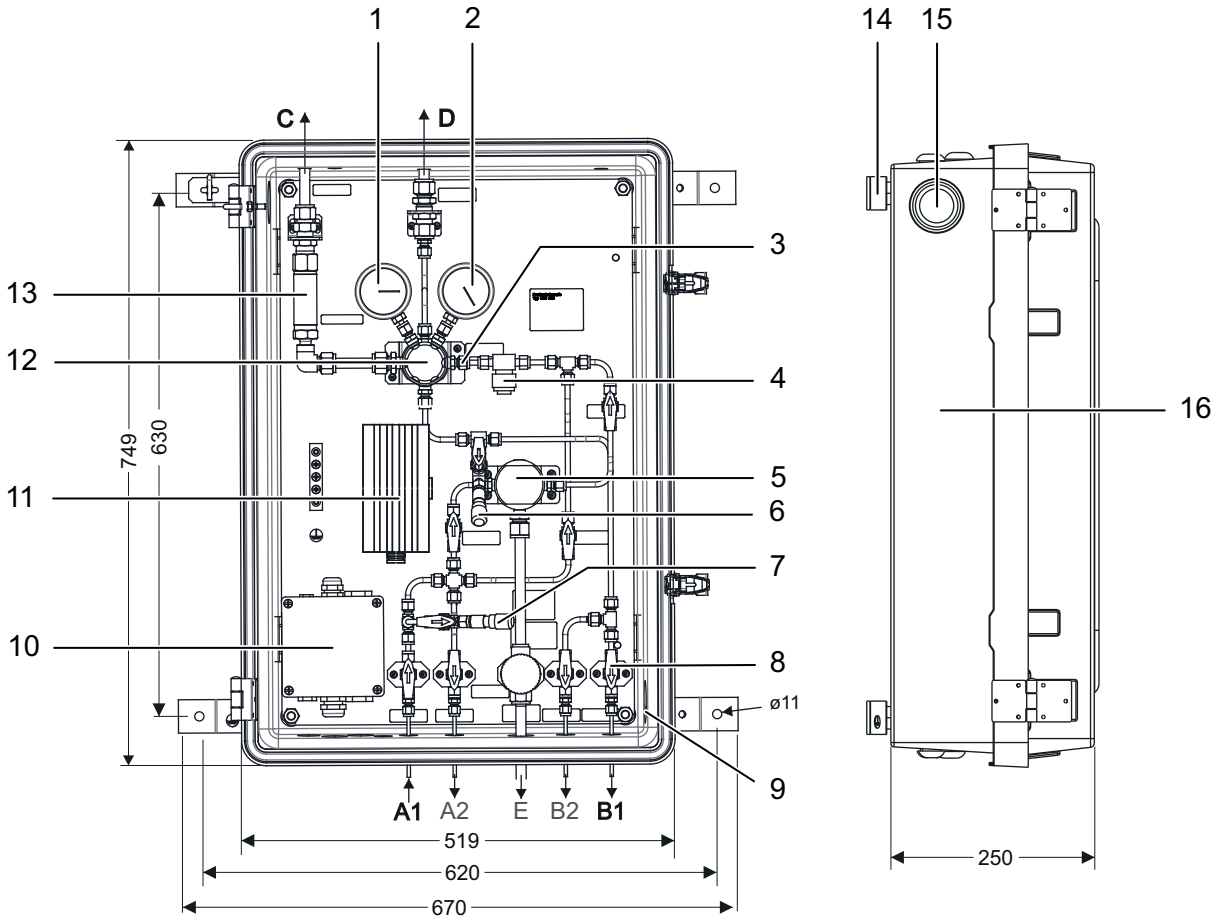

Fig. 11: Pressure reduction stage DRS 200 (wall-mounted assembly)

No.	Description	No.	Description
Standard:			
1	Downstream pressure gauge, *0 – 6, 0 – 10 bar g selectable	2	Upstream pressure gauge, 0 – 160, 0 – 100, 0 – 40 bar g selectable
3	Restrictor oriface Ø 0.4 mm	4	Sintered metal filter
8	Stopcock	10	Ex (e) (i) terminal box for item no. 11, 1 and heating analysis line
12	Pressure reducer inlet pressure max. 100 bar Outlet pressure 0.14 – 7 bar	13	SSV with 3 bar opening pressure
14	Bracket for wall-mounted assembly	15	Ventilation
16	Insulated protective enclosure with window, door hinge on left		
Options:			
1	*with limit value signal transmitter (adjustable)	5	Coalescence filter with bypass line
6	Test connection – low pressure area with shut-off valve (mini measuring coupling series 1215)	7	Test connection – upstream pressure area with shut-off valve (mini measuring coupling series 1215)

No.	Description	No.	Description
11	Ex heating 100 W with 30°C fixed value thermostat in connection cable and protective grid	A2	Sample gas outlet HP
B2	Sample gas outlet LP 2	E	Condensate outlet (12 mm pipe)
Standard pipe connections:			
A1	Sample gas inlet HP	B1	Sample gas outlet LP 1
C	Blow-off line from SSV (12 mm pipe)	D	Breathing line from pressure regulator (12 mm pipe)

- Supply line for connections A1, A2, B1, B2:
  - Standard: 4 mm pipe, optional: 6 mm pipe
- Customer connections in Swagelok system (stainless steel)
- Total weight: 30 kg
- Temperature range: -20°C / +60°C

Stand version

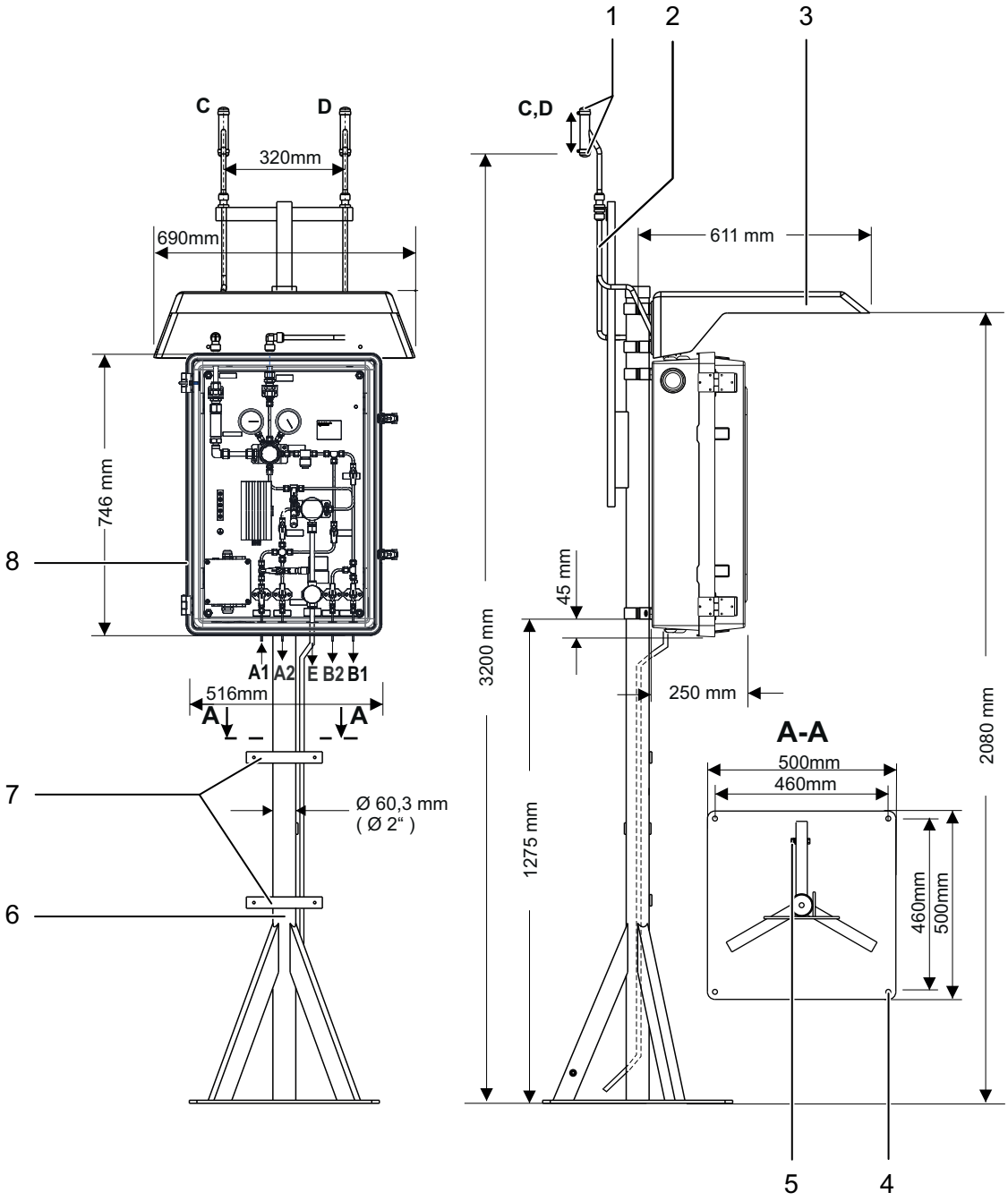

Fig. 12: Pressure reduction stage DRS 200 (stand version)

No.	Description	No.	Description
1	Insect protection screen	2	Blow-out device
3	Protective roof	4	Drill hole Ø 11 mm
5	PE screw	6	Stand (stainless steel)
7	Cable strain relief rail	8	DRS 200 in insulated protective enclosure: For details on the DRS 200, see fig. 11
Options:			
A2	Measurement outlet HP	B2	Measurement outlet LP 2
E	Condensate outlet (12 mm pipe)		

No.	Description	No.	Description
Standard pipe connections:			
A1	Sample gas inlet HP	B1	Sample gas outlet LP 1
C	Blow-off line from SSV (12 mm pipe)	D	Breathing line from pressure regulator (12 mm pipe)

- Supply line for connections A1, A2, B1, B2:
  - Standard: 4 mm pipe, optional: 6 mm pipe
- Customer connections in Swagelok system (stainless steel)
- Total weight: 70 kg
- Temperature range: -20°C / +60°C

Functional diagram

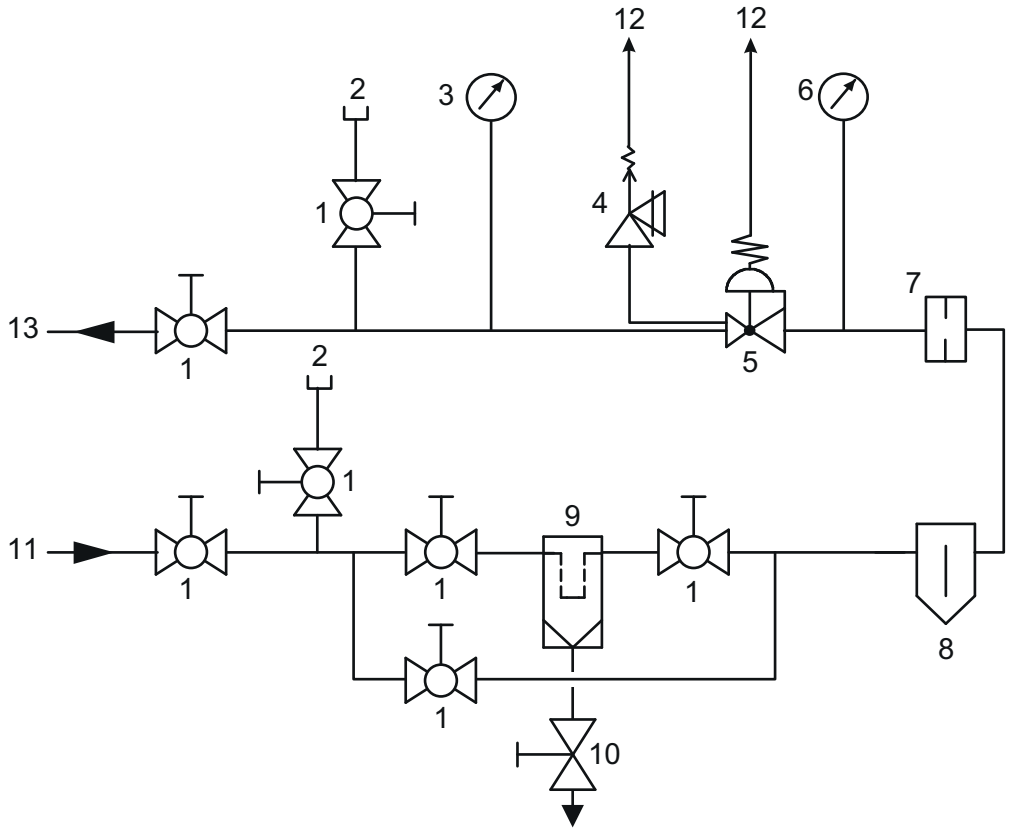

Fig. 13: Pressure reduction stage DRS 200 – functional diagram

No.	Description	No.	Description
1	Ball valve	2	Mini measuring coupling
3	Downstream pressure gauge	4	SSV
5	HP pressure reducer	6	Upstream pressure gauge
7	Restrictor oriface	8	Filter
9	Coalescence filter	10	Shut-off valve
11	Inlet pressure = 100 bar g (max.)	12	to the surroundings
13	Outlet pressure = 0.14 – 7 bar g		

4.4.4 Pressure reduction stage DRS 100

The pressure reduction stage DRS 100 also reduces the pressure, but only of one sample gas, from high-pressure to low-pressure conditions to enable safe and precise measurement.

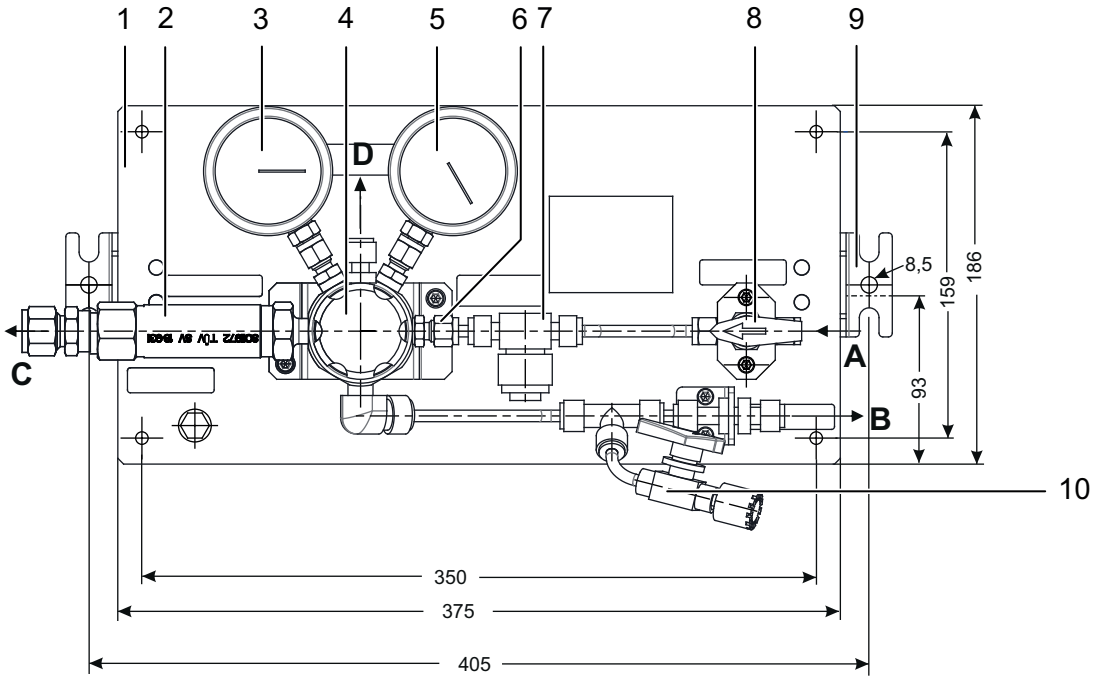

Fig. 14: Pressure reduction stage DRS 100

No.	Description	No.	Description
1	Mounting plate (Al)	2	Safety shut-off valve (SSV) with 3 bar g opening pressure
3	Outlet pressure gauge 0 – 6 bar g with reed contact transmitter as an option 0 – 10 bar g (optional)	4	High-pressure reducer Inlet: max. 100 bar g Outlet: 0.14 – 7 bar g
5	Inlet pressure gauge 0 – 160 bar g 0 – 100 bar g, 0 – 40 bar g optional	6	Restrictor oriface
7	Filter	8	Shut-off valve
9	Wall mount (optional)	10	Test connection (mini measuring coupling series 1215)
Connections:			
A	Sample gas inlet 6 mm pipe to Swagelok Screw connection (Optional 1/8”, 3 mm, 4 mm)	B	Sample gas outlet 6 mm pipe to Swagelok. Screw connection (Optional 1/8”, 3 mm, 4 mm)
C	SSV blow-off line 12 mm pipe to Swagelok Screw connection	D	Regulator breathing line 12 mm pipe to Swagelok. Screw connection

- Temperature range: -20°C / +60°C

Functional diagram

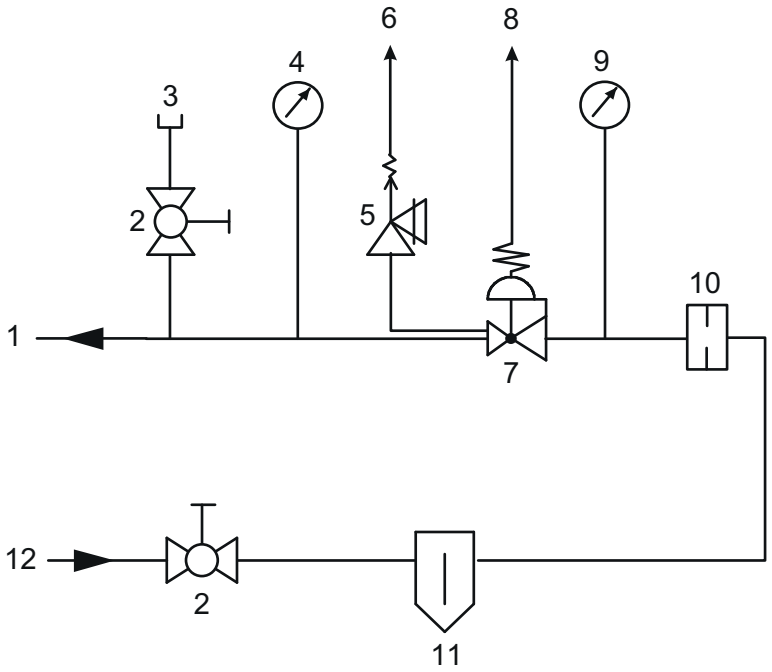

Fig. 15: Pressure reduction stage DRS 100 – functional diagram

No.	Description	No.	Description
1	Sample gas outlet: Outlet pressure = 0 – 7 bar	2	Shut-off valve
3	Test connection (mini measuring coupling series 1215)	4	Outlet pressure gauge 0 – 6 bar, with reed contact transmitter as an option, 0 – 10 bar (optional)
5	Safety shut-off valve (SSV) with 3 bar opening pressure	6	SSV blow-off line
7	High-pressure reducer Inlet: max. 100 bar Outlet: 0.14 – 7 bar	8	Regulator breathing line
9	Inlet pressure gauge 0 – 160 bar, 0 – 100 bar, 0 – 40 bar (optional)	10	Restrictor oriface
11	Filter	12	Sample gas inlet: Inlet pressure max. 100 bar

4.4.5 Gas supply unit with changeover unit for two carrier gas cylinders

The gas supply unit is equipped with an automatic changeover unit for two carrier gas cylinders.

The changeover unit guarantees an uninterrupted supply of carrier gas when two full carrier gas cylinders are connected. During operation, one cylinder is selected for gas extraction. As soon as this cylinder falls below the preselected minimum cylinder pressure (changeover pressure), the unit automatically switches to the other (still full) cylinder so that the empty cylinder can be replaced. The selector switch in the centre determines which cylinder gas is extracted from (if neither cylinder is below the set minimum pressure).

Please refer to section 11.2.3 "Automatic changeover unit (optional) – changing the carrier gas cylinder" for the initial commissioning and cylinder changeover descriptions.

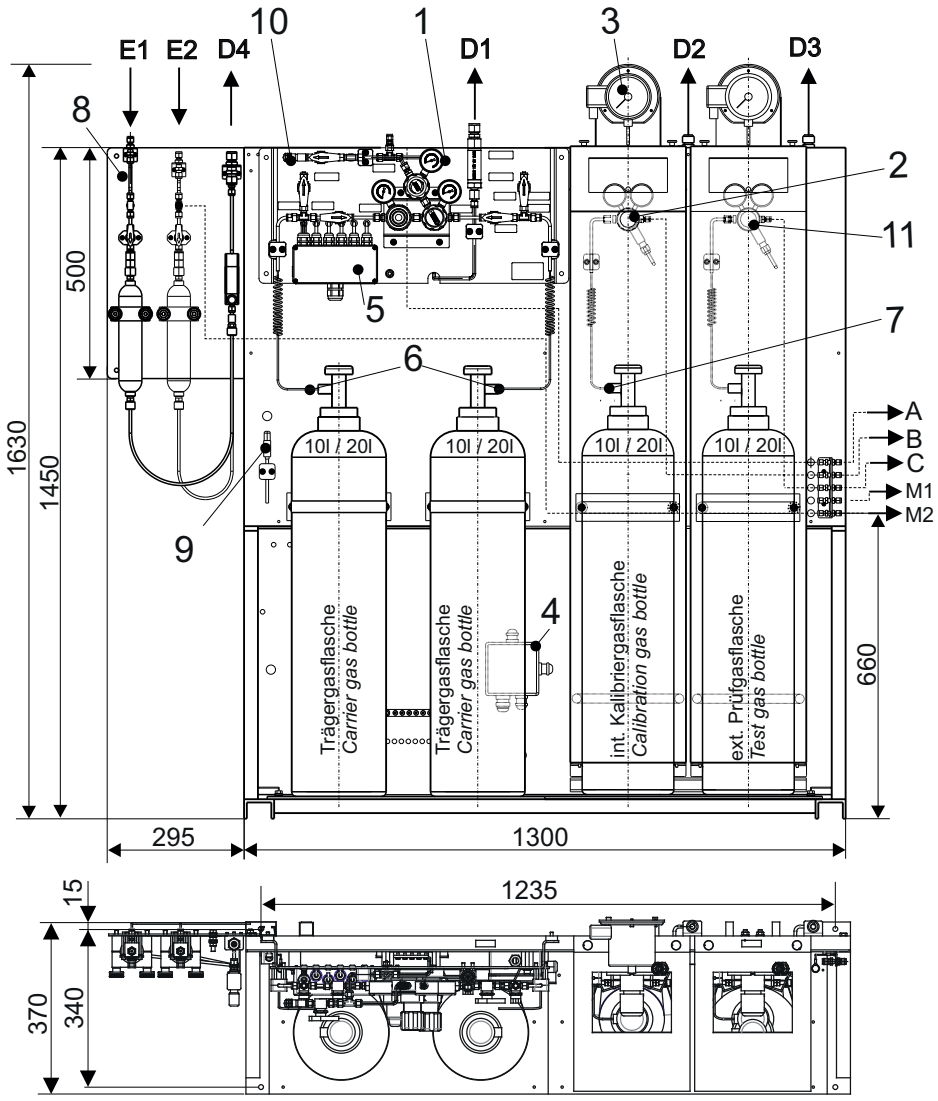

Fig. 16: Gas supply unit with changeover unit for two 10 l / 20 l carrier gas cylinders

No.	Description	No.	Description
1	Automatic changeover unit HP255 for two 10 l / 20 l carrier gas cylinders	2	10 l / 20 l int. calibration gas cylinder (heated) with upstream pressure reducer and SSV
3	Thermometer for cylinder temperature	4	Ex (e) terminal box for Ex cylinder heating
5	Ex (i) terminal box for contact pressure gauges (carrier gas cylinders) and room and cylinder thermometers	6	High-pressure spiral (stainless steel) with cylinder connection in accordance with DIN 477 No. 6 or in accordance with BS 341, No. 3
7	High-pressure spiral (stainless steel) with cylinder connection in accordance with DIN 477 No. 14 or BS 341 No. 4		

No.	Description	No.	Description
Optional:			
8	Manual sampling (inlet pressure max. 3 bar g) with 300 ml test cylinder Ø 50 mm (provided by the customer)	9	Room thermometer
10	Test connection with mini measuring coupling	11	External 10 l / 20 l test gas cylinder (heated) with upstream pressure reducer and SSV
12	SSV function test		
Connections:			
A	Carrier gas outlet	B	Int. calibration gas outlet
C	External Test gas outlet	M1/2	Sample gas outlet
D1	Blow-off line (carrier gas)	D2	Blow-off line (int. calibration gas)
D3	Blow-off line (ext. test gas)	D4	Exhaust line flowmeter
E1	Sample gas inlet 1	E2	Sample gas inlet 2, optional

- 1/8” pipe to connections A, B, C, M
- Ø 4 mm pipe to connections E1, E2
- Ø 12 mm pipe for connections D1 – D4
- Weight not incl. cylinders approx. 94 kg

All pipe fittings and pipelines with stainless steel compression ring system.

4.4.6 Carrier gas moisture filter – pre-filter purging unit

The pre-filter flushing unit available as an option allows the carrier gas moisture filter to be changed while operation of the downstream PGC 9301 is ongoing. Interruptions to the operating times due to filter changeover work are thus significantly reduced.

To ensure continuous operation of the PGC 9301, two carrier gas moisture filters with associated inlet, outlet and vent valves are arranged redundantly in the pre-filter purging unit. With the appropriate valve position, the stream of carrier gas can be supplied to the PGC 9301 using one filter at all times, while the second filter is being changed and subsequently purged.

The prerequisite is that the pre-filter purging unit is installed in the carrier gas line upstream of the PGC 9301 (see fig. 17).

Easy assembly

The components were mounted on a base plate of the same size to enable simple changeover from the original pre-filter unit to the optional pre-filter purging unit.

The external dimensions, the drill hole pattern for mounting on the wall and the position of the carrier gas connections are identical to the original variant. This means that, when changing the pre-filter unit types, an exchange can be carried out without any problems.

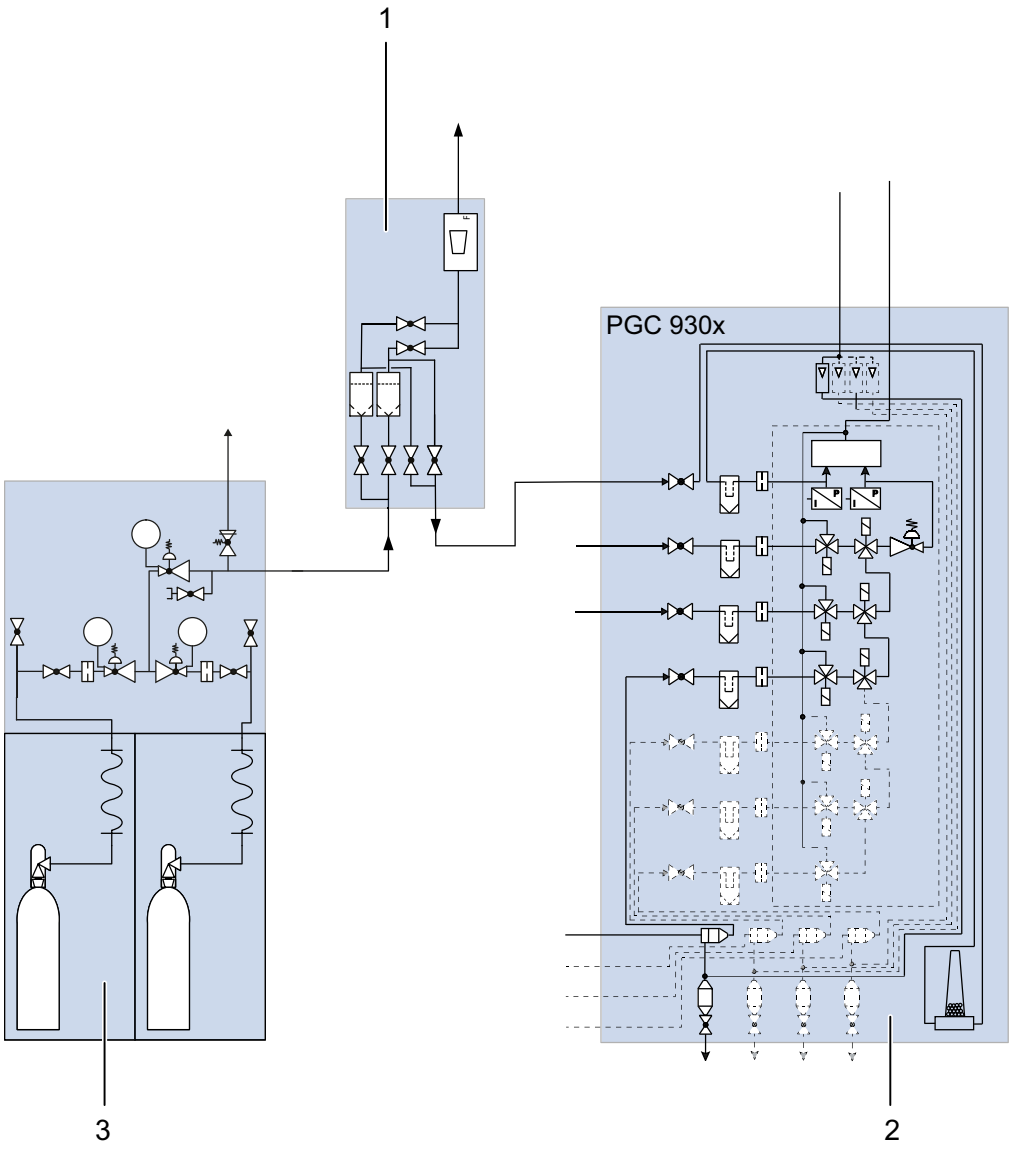

Fig. 17: Installation diagram for the pre-filter purging unit

No.	Description	No.	Description
1	Pre-filter purging unit	2	PGC 93xx
3	Carrier gas supply		

The figure below shows the pre-filter purging unit without filter installation.

Fig. 18: Pre-filter purging unit without filter installation

Please refer to section 11.2.4 "Pre-filter purging unit (optional) – changing the filter" for a detailed overview of the components and the initial commissioning and filter changeover descriptions.

5 Transport and storage

⚠ CAUTION

Danger due to improper transport

The PGC 9301 is a high-quality technical device with sensitive glass tubes and delicate connections and joints, some of which are exposed to flammable and explosive gases. Improper transport can lead to damage and thus to hazardous situations.

- ▶ Carry out all transport operations with the utmost care and caution to avoid damage to the device and risks to individuals.

5.1 Inspection after delivery

The Process gas chromatograph PGC 9301 is supplied in packaging that meets the customer's specific transport requirements. First of all, the delivery should be checked to ensure that it is complete. The device must be removed from its packaging for this purpose. The device is then installed or placed in storage.

Details on installing the device can be found in section 6 "Installation". Information on storing the device can be found in section 5.3 "Storing the PGC 9301".

5.2 Disposing of packaging material

Dispose of device components and packaging materials in an environmentally friendly manner and in accordance with the respective waste treatment and national disposal regulations and standards of the region or country that the device is delivered to.

NOTE

Reusing the packaging

If possible, keep the packaging, as it offers optimum protection during repeat transport (e.g. when changing the installation location, shipping for repair, etc.).

5.3 Storing the PGC 9301

Please note the following if it is necessary to put the Process gas chromatograph PGC 9301 into storage:

- ▶ Avoid long storage periods. The PGC 9301 is a high-precision measuring instrument that should not be stored for extended periods of time. Renewed factory calibration may be required if it is stored for longer than four weeks.
- ▶ Check the PGC 9301 for damage and correct functioning after storage.
- ▶ Have the device checked by RMG Service after a storage period of more than one year. To do this, send the device to RMG or arrange an appointment with the RMG Service organisation.
- ▶ Have installation and commissioning after storage carried out exclusively by qualified personnel.

- ▶ Observe the storage conditions listed below:
  - Position upright after unloading and secure against movement and toppling over.
  - Store in clean, dry and air-conditioned rooms
  - Keep all gas supply and exhaust lines closed during storage (as delivered). If necessary, seal the lines with sealing plugs or dummy plugs.
  - Ensure continuous carrier gas purging for storage periods longer than four weeks.

Alternatively, the PGC 9301 can be prepared for longer storage as follows:

- ▶ After switching off, purge the device at all inlets with nitrogen (5.0) at 3 bar for at least 15 minutes.
- ▶ Then close all of the inlet valves and seal both exhaust lines so that they are gas-tight with dummy plugs.

NOTE

Improper storage

Any improper storage can lead to damage and may require renewed factory calibration.

5.4 Transporting the PGC 9301

Observe the safety instructions listed in section 3.3 during transport!

To transport the device, it must be securely packaged to absorb light shocks and vibrations.

- ▶ Nevertheless, inform the transport company that all types of shocks and vibrations should be avoided during transport.
- ▶ Ensure that the device is not exposed to extreme temperature fluctuations.
- ▶ Protect the device from moisture.
- ▶ Transport the device lying on its back only, on a pallet and secured with wedges and tension straps against movement and toppling over.
- ▶ Please contact RMG Service without delay if you suspect that the device has been transported improperly or damaged during transport.

6 Installation

Observe the safety instructions listed in section 3.4 during installation!

In general, it is recommended that setup, connection or replacement of a PGC 9301 gas chromatograph should only be carried out by RMG Service.

⚠ WARNING

Danger due to incorrect installation

If the PGC 9301 is not installed or fitted correctly, this can pose a risk to both people and property.

- Only specialist personnel may carry out the installation work.
- Only install the PGC 9301 in accordance with the instructions given in this manual.
- Obtain the consent of the operating company that owns the system for the installation.

6.1 Mechanical installation

6.1.1 Installation location and ambient conditions

The variants of the PGC 9301 gas chromatograph are approved for installation in Zones 1 and 2. The respective variant is connected to the analysis computer, which is installed in a non-Ex area, by means of an Ethernet cable and additional signal cables.

The schematic diagram below uses the 'with frame for floor-mounted assembly' variant to illustrate the separation of the installation locations in a gas station into the Ex area and the non-Ex area.

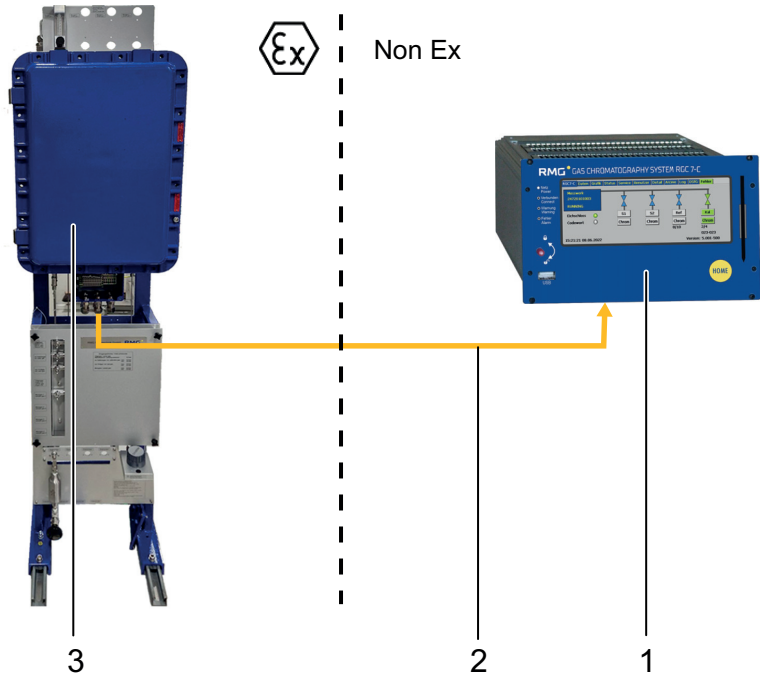

Fig. 19: Separation of the installation locations in a gas station

No.	Description	No.	Description
1	GC 9300 analysis computer	2	Ethernet connection
3	PGC 9301 measuring unit		

The following ambient conditions must be observed at the installation location:

Condition	Value
Air humidity	0 – 95% relative humidity, non-condensing
Exposure to direct sunlight	Should be avoided as far as possible.
Ambient temperature	-20 – +60°C (installation in temperature-controlled rooms)
Temperature fluctuations	Large and rapid temperature fluctuations should be avoided as far as possible.

Table 7: Ambient conditions for the PGC 9301

6.1.2 Device dimensions and weight

The PGC 9301 is designed for either wall- or floor-mounted assembly. The two device variants have the following device dimensions:

Wall-mounted variant:

- 450 mm x 1,004 mm x 265 mm (W x H x D)
- Weight: approx. 67 kg

Floor-mounted variant:

- 450 mm x 1,850 mm x 325 mm (W x H x D).
- Weight: approx. 140 kg including stand

6.1.3 Assembling the PGC 9301

NOTE

Compliance with the IP65 protection class

For products of the PGC93xx family of devices to comply with protection class IP65, the vent valve must be protected against the ingress of dirt and rain by connecting a goose-neck pipe or by attaching suitable piping to the outlet.

▶ Ensure that appropriate protection is fitted when assembling the device.

Wall-mounted assembly

For wall-mounted assembly, the PGC 9301 has two mounting rails (fig. 20, no. 2) on the rear of the device, with openings (fig. 20, no. 1) at the ends for mounting the device with screws.

▶ Ensure that you use screws with a load-bearing capacity sufficient for the weight of the device.

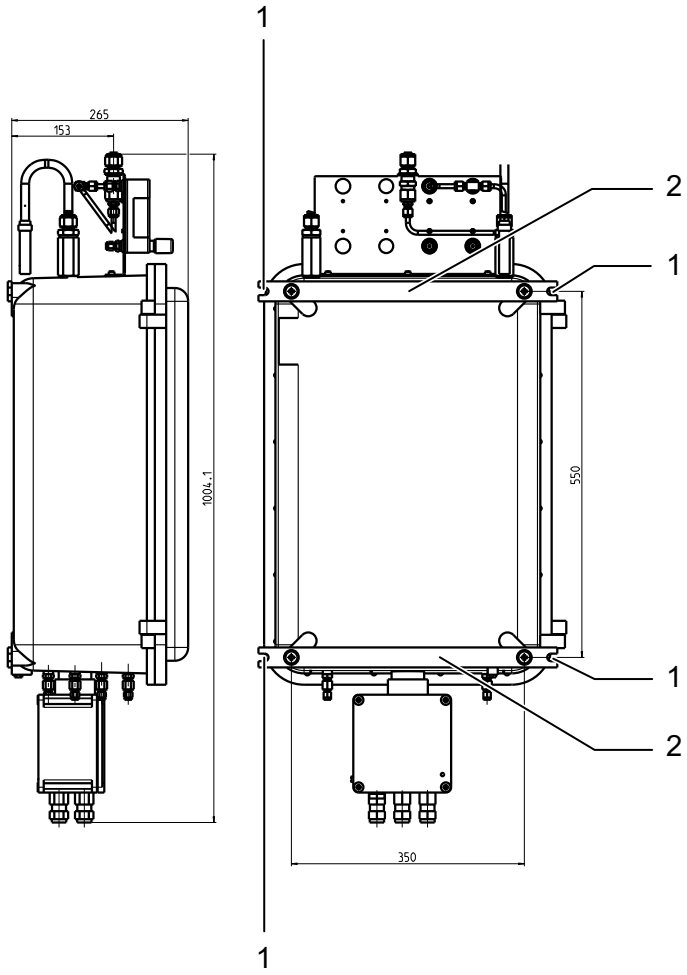

Fig. 20: PGC 9301 for wall-mounted assembly

No.	Description	No.	Description
1	Openings for screw mounting	2	Mounting rails

Floor-mounted assembly

The PGC 9301 for floor-mounted assembly is installed on a frame that has two U-profile rails (fig. 21, no. 2) for positioning on the floor. The profile rails contain a total of four drill holes (fig. 21, no. 1) for bolting the device to the floor.

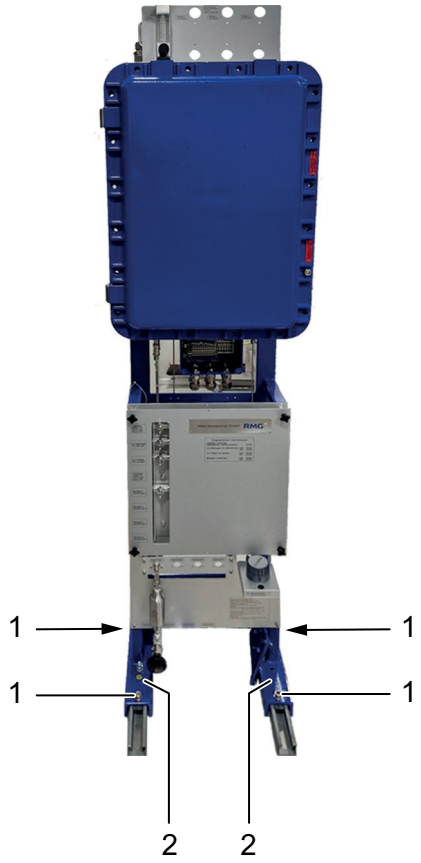

Fig. 21: PGC 9301 for floor-mounted assembly

No.	Description	No.	Description
1	Drill holes	2	U-profile rails

Assembly procedure:

1. Prepare the appropriate holes with dowels either in the wall or in the floor to be able to assemble the PGC 9301.
2. Position the PGC 9301 at the required location and bolt it to the substrate.

6.2 Installing the gas connection

6.2.1 Gas connections

Depending on the variant, the gas connections to the PGC 9301 are located either directly on the underside of the analysis unit housing (see fig. 22) or on the gas connection plate of the frame (see fig. 23).

Regardless of the variant, particle filters are located in the pipeline upstream of the analysis unit. All connections are designed with compression fittings for 1/8” pipelines. The supply lines to the connections must be made of stainless steel and be free of contamination, grease and solvents.

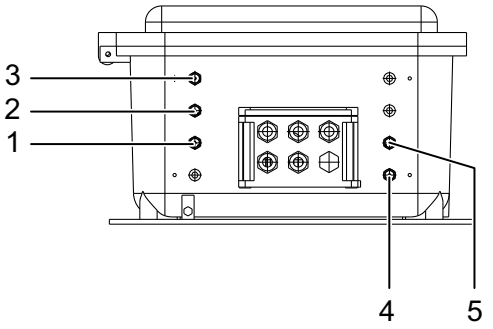

Fig. 22: Gas connections of the analysis unit on the underside of the housing

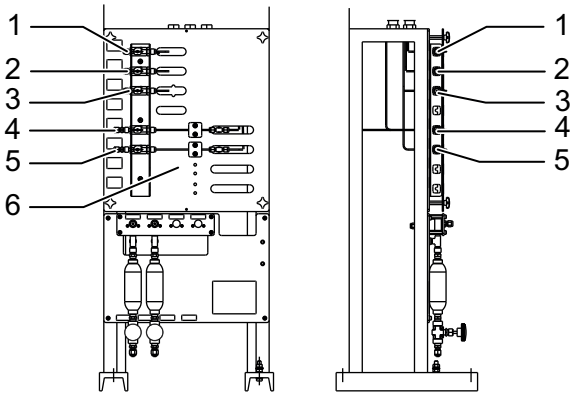

Fig. 23: Gas connections on the connection plate on the frame

No.	Description	No.	Description
1	Inlet connection for carrier gas (helium)	2	Inlet connection for calibration gas
3	Inlet connection for external test gas or reference gas	4	Inlet connection for sample gas 1
5	Inlet connection for sample gas 2 (optional)	6	Gas connection plate incl. piping to the analysis unit

Please observe the following instructions for installing the gas supply lines:

- ▶ The gas supply lines must be connected to the PGC 9301 in compliance with the provisions set out in the standard DIN EN ISO 16664:2017 (‘Gas analysis – Handling of calibration gases and gas mixtures – Guidelines’).
- ▶ Connect gases from gas cylinders when the ball valve is closed.
- ▶ The gas supply lines must be gas-tight in the required pressure range to avoid contamination with dirt or ambient air.
- ▶ Purge the gas supply lines after installation by first of all opening the respective compression fitting upstream of the particle filter on the underside of the analysis unit housing and then slowly opening the ball valve on the gas cylinder. Allow gas to flow through the line for a period of time to remove any contamination. Then close the ball valve and compression fitting again one after the other.
- ▶ Carry out a leak test once the installation work is complete. However, **never** use liquid leak detection agents!

NOTE

Helium leakage

Helium is used as the carrier gas. This can escape through even the smallest leaks in the system.

- ▶ Ensure that the system is sealed carefully and regularly check the system for leaks.

6.2.2 Vent and exhaust lines

The connections for the vent and exhaust lines are located at the top of the analysis unit housing (see fig. 24).

The vent and exhaust lines must be designed with a minimum internal diameter of 12 mm.

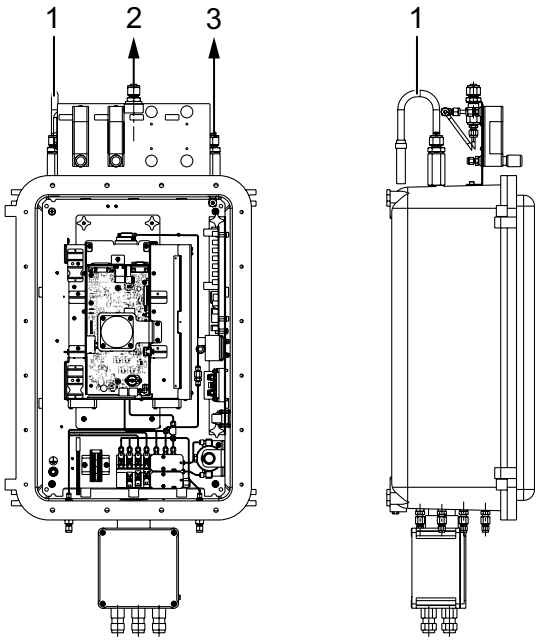

Fig. 24: Connections for vent and exhaust lines

No.	Description	No.	Description
1	Vent line	2	Exhaust line
3	Exhaust line		

Please observe the following instructions for installing the lines:

- ▶ Remove all of the sealing plugs or dummy plugs from the vent and exhaust lines. These must not be sealed during operation!
- ▶ No other devices may be connected to the lines.
- ▶ Exhaust lines of the measuring unit must be installed separately and must not be combined!
- ▶ No overpressure may build up in the lines!

6.3 Electrical installation

Before commencing work, ensure that you observe and follow all instructions and warnings from section 3 entitled ‘Safety instructions’. Ensure that the device is de-energised (power supply and signals) before making any changes to the wiring. Always follow the instructions in the following sections when carrying out the work.

NOTE

Switching on the power supply

The measuring unit may only be supplied with power once the carrier gas flow is ensured and the measuring unit has already been purged with carrier gas for 15 minutes.

⚠ DANGER

Danger of death due to electrical voltage

Work that is carried out incorrectly or when the device is not de-energised can lead to serious injury or even death.

- ▶ Only have the electrical installation carried out by a qualified electrician who can ensure that installation is carried out safely and correctly.
- ▶ De-energise the device before carrying out any work on the electrical installation.
- ▶ Work on the device may only be carried out after appropriate instruction on the device has been provided.
- ▶ Ensure that the power connection's performance data corresponds to the data on the device's type plate.
- ▶ Only use cables that fit the existing cable glands on the Ex e junction box. The cable diameter must be within the cable gland's clamping range.
- ▶ Seal unused cable entries in the Ex e junction box with impact-resistant sealing plugs secured against self-loosening and rotation.
- ▶ When closing the junction box, ensure that the seals are not damaged so that protection class IP65 is maintained.
- ▶ Equalise the housing potential by connecting an earthing cable to the housing or to the frame's designated earthing point (see section 6.3.2).
- ▶ During installation, observe the national, local and regulatory standards applicable to electrical installations and explosion protection (e.g. EN, DIN, VDE, etc.) at the device's location.

The electrical connections of the measuring unit are housed in the Ex e junction box. The required cables must be routed into the junction box through the cable glands.

- ▶ Ensure that the cable diameters match the cable glands' clamping ranges in accordance with the table below!

Number of Ex cable glands	Max. clamping range of inner sheath	Clamping range of outer sheath
5	8.7 mm	6.1 – 13.1 mm

Table 8: Permissible cable diameters for the cable glands' clamping ranges

6.3.1 Terminal assignment

Please refer to the figure and table below for the terminal assignment in the Ex e junction box. The table also contains information on which terminals on the rear of the GC 9300 analysis computer individual signal cables of the measuring unit are to be connected to.

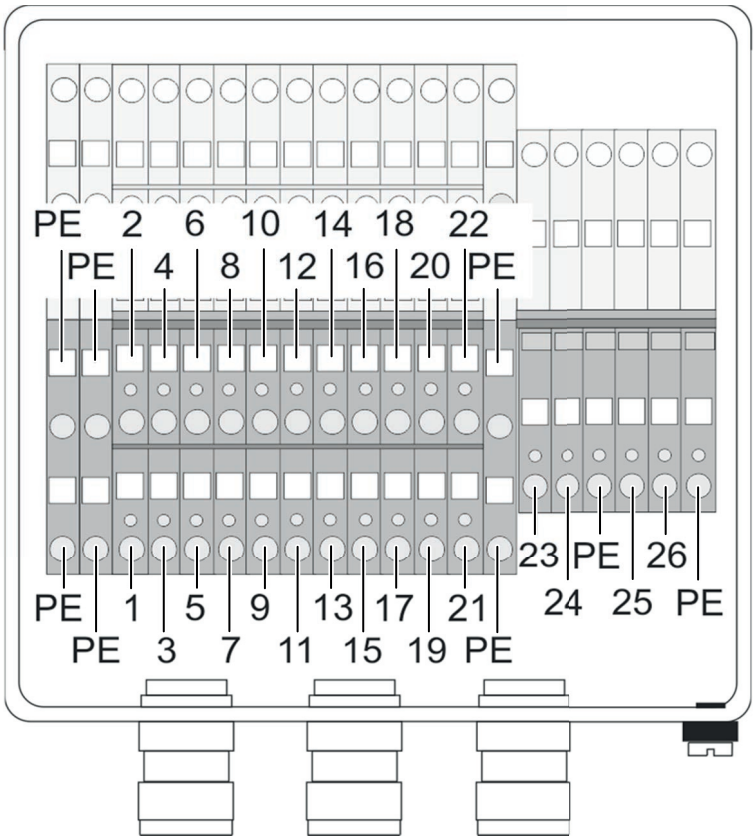

Fig. 25: Connection diagram for the Ex e junction box

Terminal of the Ex e junction box	Signal	Terminal of the GC 9300 analysis computer	Recommended cable type
1	p sample gas +	X5, pin 3	RE-2Y(St) Yv BK 2 x 2 x 0.75 mm^2
2	p sample gas -	X5, pin 4	
3	p carrier gas +	X5, pin 1	
4	p carrier gas -	X5, pin 2	
5	TxD+	X18 (Eth)	Herkulat, 600 A S/FTP 4 x 2 AWG23
6	TxD-		
7	RxD+		
8	RxD-		

Table 9: Terminal assignment of the Ex e junction box and GC 9300 analysis computer

Terminal of the Ex e junction box	Signal	Terminal of the GC 9300 analysis computer	Recommended cable type
11	Valve control of int. calibration gas	X2, pin 1	RE-2Y(St) Yv BK 4 x 2 0.75 mm^2
12	Valve control of ext. calibration gas	X2, pin 3	
13	Valve control for stream 1	X1, pin 1	
14	Valve control for stream 2	X1, pin 3	
17	GND	X1, pin 2, 4, 6, 8 X2, pin 2, 4	
23	+ 24 V DC heating		NYY-J 3G 2.5 mm^2 for cable lengths > 50 m: NYY-J 3G 4 mm^2
24	0 V DC heating		
24	+ 24 V DC Analysis unit		NYY-J 3G 2.5 mm^2 for cable lengths > 50 m: NYY-J 3G 4 mm^2
26	0 V DC Analysis unit		

Table 9: Terminal assignment of the Ex e junction box and GC 9300 analysis computer

NOTE

Measuring unit and analysis computer more than 80 metres apart

If the distance between the installation location of the measuring unit and the analysis computer is too great, or if cable lengths measuring longer than 80 metres are used, data transmission may be slowed down and there may be an increased susceptibility to errors.

- ▶ Connect a VDSL modem to ensure good data transmission.

6.3.2 Earthing

The internal earthing connections are made at the factory and are not, therefore, described in detail. Depending on the device variant, earthing cables must be attached by the customer at the following attachment points:

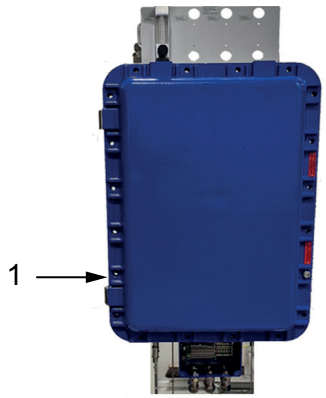

Fig. 26: Wall mounted variant

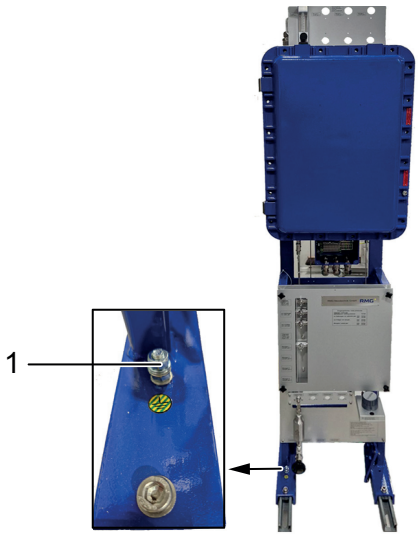

Fig. 27: Floor-mounted variant

No.	Description
1	Attachment point for earthing cable

▶ Please carry out earthing at the designated location (see fig. 26 and fig. 27). Use an earthing cable with a **minimum cross-section of 4 mm²**.

7 Operation

The following operating options are available when the GC 9300 gas analysis computer is connected to the PGC 9301 Core measuring unit:

- Reading the analysis results
- Starting a manual calibration
- Switching the analysis from sample gas to test gas (reference gas)
- Displaying and changing operating parameters
- Viewing the archives and logbooks
- Displaying chromatograms
- Displaying error messages
- Displaying the PGC 9301 Core device status

The touchscreen of the GC 9300 enables simple operation by means of a graphical user interface and easy-to-understand menus.

For a detailed description of the operating options and the user interface's menu pages, please refer to the GC 9300 operating manual. This is available for download on our website at www.rmg.com.

8 Commissioning

8.1 General commissioning instructions

Before commissioning, ensure that all the safety instructions listed have been observed and that installation has been carried out in accordance with the information provided in this manual.

Commissioning is generally carried out at the factory or by qualified technicians or field service staff. Commissioning is not discussed in detail here for this reason. RMG also offers training and commissioning services for this purpose.

NOTE

Commissioning together with the GC 9300

- ▶ Before switching on the supply voltage to the PGC 9301, ensure that all gas lines connected to the measuring unit and the analysis unit itself have been purged.
- ▶ If there is still air in the supply lines or in the analysis unit, this can lead to destruction of the column modules.
- ▶ Proceed as described in section 8.2 for purging.

Before commissioning the PGC 9301 gas chromatograph, an inspection of the measuring system must be carried out in accordance with the following ordinances and regulations:

- Section 15 of the German Ordinance on Industrial Safety and Health (BetrSichV)
- Section 5 of DGUV REGULATION 3 entitled ‘Electrical installations and equipment’
- Generally recognised rules of technology, in particular VDE 0100-100 ‘Low-voltage electrical installations’ and VDE 0165 ‘Explosion protection for electrical installations’

An acceptance certificate and corresponding test reports must be prepared for this inspection. They must always be kept close at hand together with the operating manual and the CE Declaration of Conformity. In addition, all documentation including the Declarations of Conformity and certificates must be checked to ensure that they are complete.

The following additional measures must also be carried out before commissioning:

- Checking the measuring system to ensure that it is complete.
- Performing a leak test on all gas-conducting lines. The test pressure must be at least 1.1 times the operating pressure. The leak tests must be documented with corresponding test reports.
- Presentation of qualification certificates for trained specialist personnel and the RMG test report for solder-free pipe fittings by the installation company.
- Checking and ensuring that the gases used meet the specified requirements.

8.2 Carrying out commissioning

Once it has been ensured that all of the gas supply lines and exhaust or vent lines are connected to the PGC 9301 and the electrical wiring to the GC 9300 analysis computer has been correctly installed, the steps described below must be performed for commissioning.

Please refer to section 6 "Installation" for information on the installation and electrical connection of the analysis computer.

Commissioning procedure

1. Before switching on, check that the carrier gas pressure set on the cylinder rack's external pressure regulator corresponds to the required value of **5.5 bar**.
2. If not already done after installation, the carrier gas supply line must now be purged.
   - ▶ To do this, first of all open the compression fitting upstream of the particle filter on the underside of the analysis unit housing.
   - ▶ Then slowly open the ball valve on the gas cylinder and allow gas to flow through the line for a period of time to remove any contamination.
   - ▶ Then close the ball valve and compression fitting again one after the other.
3. The gas lines for sample gas, calibration gas and reference gas must also be purged in the same way as described above.
4. Check all of the gas lines for leaks.
5. Before the power supply to the measuring unit may be switched on, carrier gas must flow through the analysis unit for **at least 15 minutes**.
   - ▶ To do this, open the ball valve on the carrier gas cylinder again and wait for the purging time to elapse.
6. Switch on the power supply.
   - ▶ The carrier gas pressure is now monitored using the internal pressure transducer and the GC 9300 analysis computer. The carrier gas pressure is now displayed in the **Status** menu of the analysis computer. The display can be used for fine adjustment. The value should be within the following tolerance range:
     - Carrier gas inlet pressure: **5.5 bar ±10%**
7. The inlet pressure for the sample gas, calibration gas and reference gas at the gas distribution's pressure regulator is set during factory calibration. Since the gas distribution connects the respective gas inlet to the column modules and routes it through the pressure regulator, all three gas inlets automatically have an identical pressure value:
   - Inlet pressure: **1.1 – 2.5 bar ±10%**
   - ▶ This setting must be made before basic calibration of the device, as a change to the inlet pressures is no longer permitted afterwards.
8. Once the inlet pressures have been set, select the **Basic calibration** operating mode in the **Detail** menu on the analysis computer.
   - ➡ The device performs a basic calibration. Once basic calibration is complete, the PGC 9301 automatically switches to the **AUTORUN** operating mode.

NOTE

Switching on the analysis computer for the first time

Some parameters are set to default values when the analysis computer is switched on for the first time.

- ▶ Check the values and modify them if necessary. Please refer to the analysis computer operating manual for a description of the operating menus and potential settings for various parameters.
- ▶ Changed values are saved and remain available even after switching on again.

NOTE

Column inlet pressure and column temperature

The column temperatures and the carrier gas pressure at the injector valves are set during factory calibration of the device.

During operation, the values are continuously monitored by the analysis computer.

- ▶ If the permissible limit values are exceeded, an error message is issued and no further analysis is performed.
- ▶ The limit values can be read and set in the analysis computer's user interface in the **Detail** menu under Measuring unit / analysis pressure / max. deviation or Measuring unit / carrier gas -I / max. deviation.

9 Operation

Once the PGC 9301 Core has been put into operation, it runs without interruption.

Observe the following instructions to ensure faultless operation:

- Read this operating manual carefully to avoid incorrect operation and only use the PGC 9301 Core as intended (see section 2.1 "Intended use").
- Only operate the PGC 9301 Core within the performance limits specified in the technical data (see section 13 "Technical data"), and do not exceed them.
- Protect the device from sources of heat (e.g. direct sunlight).
- Take a damaged or unsafe device out of circulation immediately and label it accordingly to prevent it from being used again unintentionally.
- Only have the defective device repaired by RMG Messtechnik GmbH.
- The flange fasteners, screw plugs, screw connections and check valves, oil supply and pressure tapping fittings, valves, protective tube and rotary adapter must **not** be loosened during operation

9.1 Operating modes

The GC 9300 is the controller of the PGC 9301 Core and controls the analysis sequence. It can therefore be used to select the operating modes for the chromatograph that are described in the following sections.

For a detailed description of how to select the operating modes in the user interface, please refer to the operating manual for the GC 9300 analysis computer. This is available for download on our website at www.rmg.com.

After selecting a new operating mode, the ongoing analysis or calibration is exited before switchover to the new operating mode takes place.

9.1.1 AUTORUN operating mode

The **AUTORUN** operating mode represents normal operation of the measuring unit, in which automatic analysis mode is performed. Cyclical sampling and analysis of the sample gas takes place. The analysis sequence is only interrupted by automatic calibration.

If calibration is unsuccessful, a second calibration is performed straight afterwards. If this is unsuccessful too, the AUTORUN mode is stopped automatically.

9.1.2 STOP operating mode

The **STOP** operating mode can be activated to end the analysis mode. Once the current analysis is complete, ongoing operation is interrupted.

9.1.3 Basic calibration operating mode

The **Basic calibration** operating mode is used for basic calibration during commissioning or by RMG Service. Basic calibration must not be performed during normal analysis mode.

If basic calibration has been triggered, the determined calibration values together with the retention times are stored as factors of the basic calibration in the analysis computer.

Once basic calibration is complete, the system automatically switches to the AUTORUN operating mode.

9.1.4 Normal calibration operating mode

The **Normal calibration** operating mode is used for manual calibration, which can be started at any time. Manual calibration is equivalent to automatic calibration.

During manual calibration, the valves are switched to the calibration gas inlet. The calibration cycle is then performed. It lasts up to 10 minutes, depending on how many calibration runs are set.

Following completion, the valves are switched back to the sample gas inlet to automatically resume continuous analysis of the sample gas in the AUTORUN operating mode.

The timing of the next automatic calibration is not affected by the execution of manual calibration.

9.1.5 Reference gas operating mode

The **Reference gas** operating mode is used to perform a test gas or reference gas analysis. The valves are switched to the test gas / reference gas inlet and a continuous analysis measurement of the reference gas is performed.

The PGC 9301 Core remains in this operating mode until it is switched again or the input maximum number of reference gas analyses is reached. It then automatically switches back to the AUTORUN operating mode.

9.2 Data storage

Various types of archives are available in the analysis computer for storing the analysis results.

Please refer to the associated operating manual for a detailed description of data storage. This is available for download on our website at www.rmg.com.

10 Potential errors and faults

Once the PGC 9301 Core has been put into operation, it generally runs without interruption. Nevertheless, faults or errors can occur, as described in the following sections.

10.1 Error messages

Errors that occur are output by the GC 9300 analysis computer as a text message with a defined error number. The error numbers are output in the print logs.

A complete list of all of the errors can be found in the GC 9300 analysis computer operating manual, which you can download from our website at www.rmg.com.

Only analysis-related error messages are dealt with at this point.

10.1.1 Errors in continuous analysis mode

Error no.	Error text	Description	Possible cause / measure
14 – 17	Current output – # limit	Current < 0/2 mA or > 21 mA	■ Check the limit values in the **Detail** menu under **Inlets and outlets**
50	Measuring unit timeout	The analysis unit does not deliver valid data	■ Communication error ■ Error in the analysis unit
		Communication error: The analysis unit is working without any errors, but no measured values are reaching the analysis computer.	■ Cable breakage ■ TCP/IP address entered incorrectly in the analysis computer
120	Ana.: Retention time	The retention time of one or more gas components deviates impermissibly from the basic values. (Retention times in the **Detail** menu for the individual components; permissible deviation under **Ana., Cal. calculation parameters / limit values**.)	■ Faulty pressure / temperature values (with error 50) ■ Impermissible gas composition (with error 121, 122) ■ Defective column module
121	Ana: Abn. tot.	The limit value is exceeded during standardisation to 100% (**Calibration results / area totals** and **Cal. calibration parameters / limit values**)	■ Impermissible gas composition ■ Pressure / temperature error (50) ■ Defective column module
122	Ana.: Concentration	Modules' working range exceeded or not reached	■ Impermissible gas composition
123 82 124 127	Ana.: Min. / max. Ho Ana.: Min. / max. CO2 Ana.: Min. / max. Wo Ana.: Min. / max. Rho,n	Measuring range exceeded or not reached	■ Check the limit values in the **Detail** menu under **Component parameters**
130	Min. / max. sample gas p	Depending on the activated inlet, the inlet pressure of the sample / calibration or reference gas is outside the tolerance.	■ Incorrect setting ■ Cylinder pressure ■ Check the **Status** menu
131	Carrier gas pressure -I	The carrier gas pressure is outside the tolerance	■ Incorrect setting ■ Cylinder pressure ■ Check the **Status** menu

Table 10: List of errors in continuous analysis mode

10.1.2 Errors during subsequent calibration

The errors listed below are only output during subsequent calibration or basic calibration. The occurrence of these errors leads to invalid calibration. The previous response factors are retained. All subsequent measured values are marked as faulty.

The errors cannot be acknowledged and are only reset by a valid subsequent calibration.

Error No.	Error text	Description	Possible cause
100	Cal.: Retention time	The newly determined retention times (current or stream values under **Times**) deviate impermissibly from the default values (**Ana., Cal. calculation parameters / limit values**)	■ Pressure / temperature error during subsequent calibration ■ Calibration gas supply ■ Faulty specification of calibration gas concentration (**Detail** menu under **Calibration parameters**) ■ Defective column module
101	Cal.: Response factor	The newly calculated response factors show an impermissible deviation (**Detail** menu under **Calibration results** and **Calibration parameters**)	■ See error number 100
103	Cal.: Total area	The total area determined during calibration deviates by more than 30% from the basic calibration value.	■ See error number 100

Table 11: List of errors during recalibration

10.2 GC 9300 power failure

After an analysis computer power failure (error 02 – power failure), a device self-test is initially carried out on restart. Once this is complete and the measuring unit is ready, a calibration is automatically initiated (after a specified waiting time). Analysis mode is continued after calibration.

11 Regular inspections, maintenance and repair

11.1 General information

Explosion-proof electrical controls must be maintained regularly. The time intervals for this maintenance and testing depend on the operating and ambient conditions.

- We recommend performing an annual inspection (e.g. in conjunction with the annual calibration inspection of the PGC 9301).
- All maintenance intervals and work can be found in the **enclosed** maintenance manual. Implementation of the measures described there must be documented. Such documentation is a prerequisite both for official calibration operation of the device and for claiming warranty services.
- The operating manual and the maintenance manual, plus acceptance certificates and test reports, must be kept accessible and always close at hand near the PGC 9301.
- If a part of the device that is relevant to explosion protection is repaired, the device may only be put back into operation following inspection by a recognised expert (see section 2.6 "Personnel qualifications").
- Acceptance by an expert is not required if repairs are carried out by the manufacturer.

⚠ DANGER

Risk of explosion when working in potentially explosive atmospheres

Work on live electrical equipment is generally prohibited in potentially explosive atmospheres (exception: intrinsically safe circuits).

If access to the analysis computer's or the measuring unit's electrical assemblies is required, the following measures must be strictly observed:

- Completely disconnect the device from the power supply.
- The pressure-resistant housing does not have an interlock switch, so observe a waiting time of at least one minute after switching off the power supply and before opening the pressure-resistant housing.
- Additionally, before opening the pressure-resistant housing, ensure that an explosive atmosphere is not present! Only use explosion-proof measuring devices approved for checking the atmosphere.
- For work on electronic assemblies: Earth the body through connection with an earthed object.
- If, in exceptional cases, work on live electrical equipment is required, this may only be carried out if an explosive atmosphere is not present! Before commencing work, check the atmosphere exclusively with explosion-proof measuring devices approved for this purpose.

⚠ DANGER

Danger of death due to damage to the device during maintenance and cleaning work

There is a risk of explosion during recommissioning if the device is damaged due to the use of unsuitable tools or improper maintenance or cleaning.

- ▶ Only use suitable tools to avoid damaging components.
- ▶ After working on the electrical connection's Ex e housing, check the seal for damage. Also check that the cable glands and sealing plugs are secure.
- ▶ Only clean the device with a slightly damp cloth to avoid static build-up on the housing.
- ▶ Take a damaged or unsafe device out of circulation immediately and label it accordingly to prevent it from being used again unintentionally.
- ▶ Only have the defective device repaired by RMG Messtechnik GmbH.

NOTE

Inspection of the pressure-resistant housing

Since pressure-resistant housings are only water-resistant under certain circumstances due to the flameproof gap (IP 65), attention must be paid to water accumulation in the housing.

Rusted or corroded gaps must not be cleaned with abrasives or wire brushes:

- ▶ Only clean corroded gaps with chemical agents (e.g. with reducing oils).
- ▶ Then treat the gaps carefully with acid-free anti-corrosion agents (e.g. ESSO RUST BAN 397, Mobil Oil Tecrex 39 or equivalent products).

11.2 Regular checks and measures

11.2.1 Draining condensate at the measuring unit

The variant of the PGC 9301 with frame has one (optionally two) condensate collection container(s) located below the gas connection plate (see Abb. 3, no. 7 in section 4.1).

The condensate must be drained from time to time using the drain valves under the container.

The drain intervals are determined by the moisture content of the sample gas. To establish appropriate drain intervals, the condensate should initially be drained at short intervals (e.g. weekly). Depending on the amount of condensate produced, the interval can then be gradually extended until the amount of condensate produced is approximately half the volume of the collection container.

Procedure

- ▶ Close the inlet valve to the analysis unit.
- ▶ **Attention: There is now explosive gas in the line at a line pressure of approx. 3 bar.**
- ▶ Carefully open the drain valve below the associated condensate collection container for approx. 10 seconds.

NOTE

Opening the drain valves

- Do **not** open the drain valves while analysis is ongoing, as this will cause a pressure drop in the analysis unit and thus disrupt the analysis!
- Instead, select the **STOP** operating mode and wait for the ongoing analysis to finish. Alternatively, draining can also be carried out during calibration (duration: approx. 10 minutes).

11.2.2 Changing the carrier gas cylinder

A carrier gas inlet pressure of 5.5 bar g is required for operation of the PGC 9301. This pressure may not drop by more than 10%. If the pressure drops further, an alarm message is triggered.

- You should therefore change the cylinder when indicated by the contact pressure gauge on the empty cylinder.
- Follow the instructions on the cylinder rack when changing cylinders.
- Prevent air from entering the system when changing cylinders!

If an automatic changeover unit between two carrier gas cylinders is **not** used, the carrier gas supply must be interrupted when changing cylinders. The analysis mode must also be interrupted for this purpose. Proceed as follows to do this:

1. Select the **STOP** operating mode in the Detail menu on the analysis computer.
   ➥ The ongoing analysis is exited properly and the STOP status is displayed on the analysis computer.
2. Manually close all inlet valves in the gas supply lines.
   ➥ Once the carrier gas pressure has dropped sufficiently, the software automatically reduces the column temperatures to 30°C and switches off the thermal conductivity detectors. The change in column temperature can be observed in the analysis computer's **Status** menu.
3. Once the column temperatures have dropped sufficiently, switch off the analysis unit or disconnect it from the power supply.
4. Change the carrier gas cylinder and then purge the pressure regulation unit and the gas supply line (see section 8.2 "Carrying out commissioning").
5. Check the carrier gas inlet pressure at the carrier gas cylinder's pressure regulation unit. It must correspond to the setpoint of 5.5 bar.
6. Now open the inlet valve of the carrier gas supply line to the measuring unit so that the analysis unit is purged for **at least 15 minutes**.
7. After the purging time has elapsed, switch the analysis unit back on or restore the power supply.
8. Open the remaining gas inlet valves again after a further waiting time of **15 minutes**.
9. Select the **Normal calibration** operating mode in the **Detail** menu on the analysis computer.
   ➥ Following successful calibration, the analysis computer automatically switches to the **AUTORUN** operating mode.

NOTE

Recommissioning after interruption of the carrier gas supply

- If the power supply was switched off for longer than 30 minutes, further calibration should be carried out after approx. 1 to 2 hours.
- If error messages occur during the first calibration or at the start of analysis mode, this may be due to residual foreign gases.
- These messages should be acknowledged after approximately 2 hours of operation at the latest.

NOTE

Automatic shutdown of the analysis unit when the carrier gas pressure is too low

The carrier gas protects the analysis unit from the ingress of oxygen. If the carrier gas pressure drops below 2 to 3 bar, this protective function is no longer effective and the analysis unit is automatically shut down.

- ▶ It must be assumed that air has entered the analysis unit in the meantime if an automatic shutdown has occurred. Therefore, switch off the power supply before changing cylinders, since the analysis unit would automatically switch back on when sufficient pressure is restored, which could cause damage to the column modules.
- ▶ Proceed to change cylinders as described above. Be sure to observe the analysis unit's purging time before restoring the power supply.
- ▶ An RMG service call-out is required if an alarm message occurs after recommissioning!

11.2.3 Automatic changeover unit (optional) – changing the carrier gas cylinder

To change a gas cylinder, the steps in the description provided below must be performed in the order given. The same procedure is also to be used during commissioning to connect and purge two cylinders one after the other. Replacement of the left cylinder (designated A) is explained as an example using the functional diagram below (see Abb. 28). The same procedure applies to changing the right cylinder (designated B).

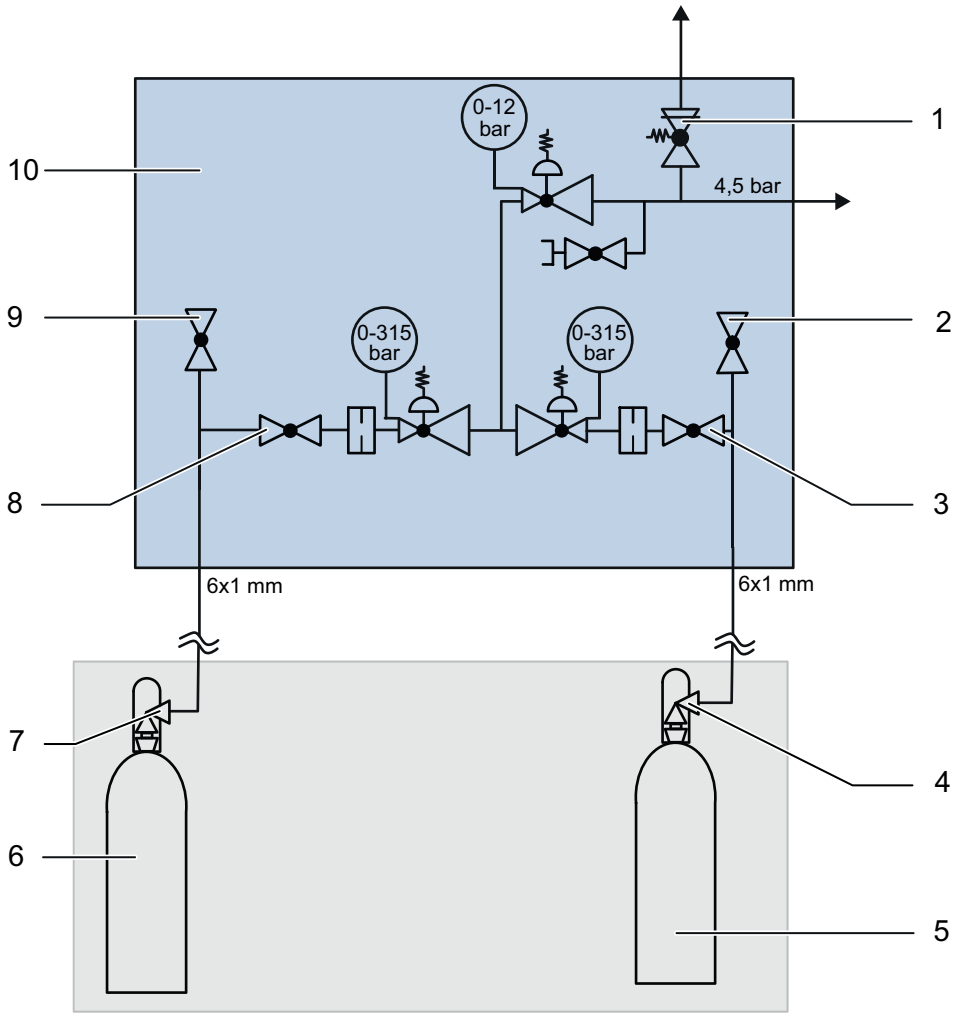

Fig. 28: Functional diagram explaining the automatic changeover unit (type USE-HP255)

No.	Description	No.	Description
1	SSV opening pressure 6 bar g	2	Vent valve for cylinder B
3	Extraction valve for cylinder B	4	Cylinder valve B
5	Carrier gas cylinder B	6	Carrier gas cylinder A
7	Cylinder valve A	8	Extraction valve A
9	Vent valve A	10	Automatic carrier gas changeover unit (type USE-HP255)

Procedure

1. Set the changeover unit's selector switch to cylinder B (no. 5) (arrow pointing to cylinder B) to replace cylinder A.
2. Close cylinder valve A (no. 7) and extraction valve A (no. 8).
3. Open vent valve A (no. 9) and close it again following pressure equalisation.
   ➡ **Attention: (Carrier) gas escapes at cylinder pressure!**
4. Remove empty cylinder A (no. 6) and connect full replacement cylinder A.

5. Open vent valve A (no. 9) and then open cylinder valve A (no. 7) to purge the line. Then close cylinder valve A (no. 7) again and wait for the pressure in the line to dissipate.
   ➡ **Attention: (Carrier) gas escapes at cylinder pressure!**
6. Close vent valve A (no. 9) again following successful pressure dissipation.
7. Repeat steps 5 and 6 two more times to purge the high-pressure line area so that it is free of air.
8. Open cylinder valve A (no. 7) and then extraction valve A (no. 8).

During commissioning or if both cylinders need to be changed, perform steps 1 to 8 for cylinder A and cylinder B consecutively. If the line between the changeover unit and extraction valve A or extraction valve B was not aerated (during a cylinder change in normal operation, for example), the procedure is now complete. Otherwise (during commissioning, for example), the following steps must be performed to purge the complete system so that it is free of air.

1. At the PGC's carrier gas inlet, to vent the carrier gas line loosen the inlet screw connection (with the carrier gas inlet valve closed) just enough for carrier gas to flow out freely. Do not unscrew the union nut completely.
2. Set the extraction pressure as precisely as possible to 5.5 bar at the changeover unit's downstream pressure regulator.
3. Allow the carrier gas to flow out at extraction pressure for approximately 2 minutes.
4. Set the selector switch to the opposite position (cylinder) and allow the carrier gas to flow out for a further 2 minutes to purge both sides of the changeover unit so that they are free of air.
5. Retighten the screw connection at the PGC's carrier gas inlet.
6. Check all of the lines for leaks.
7. Use the selector switch to select the cylinder to be used for extraction during operation.

11.2.4 Pre-filter purging unit (optional) – changing the filter

The figure below shows the components of the pre-filter purging unit and their functional and actual arrangement.

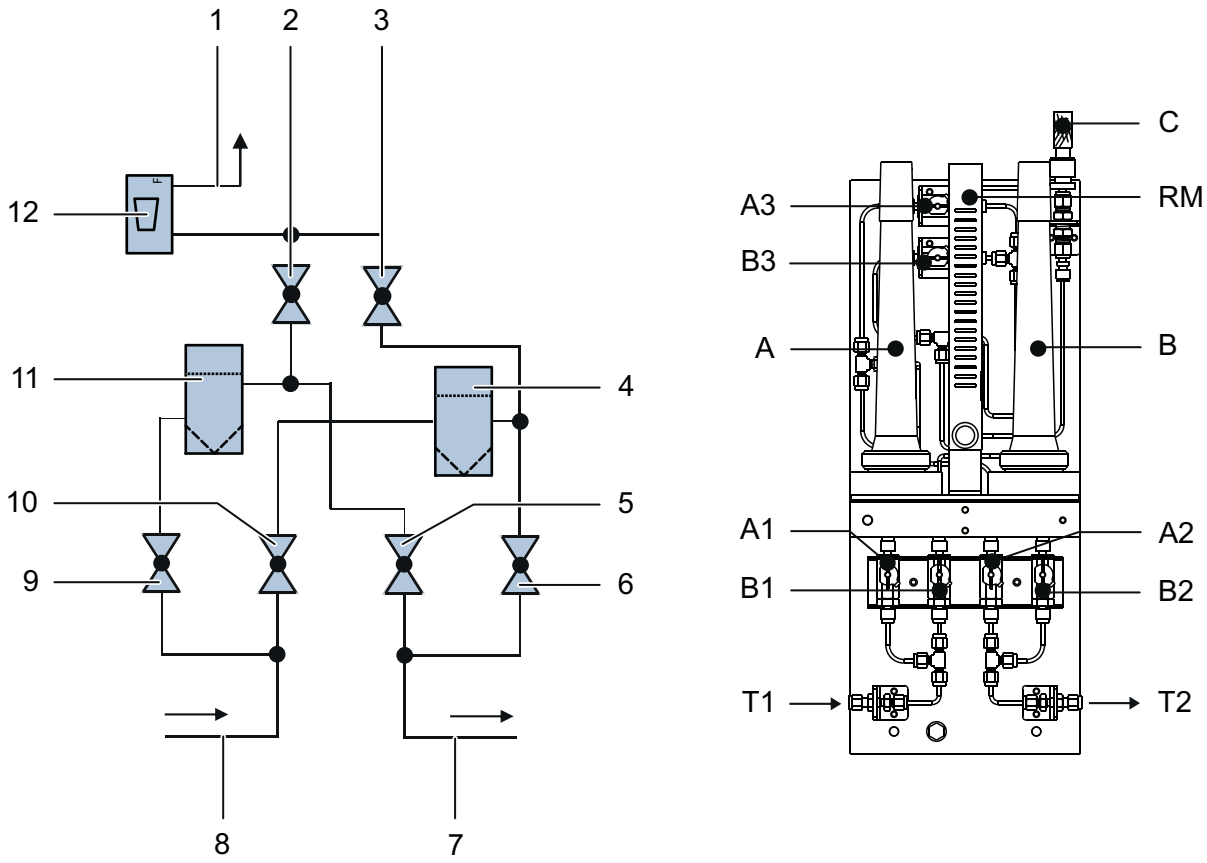

Fig. 29: Functional diagram and drawing of the pre-filter purging unit

No. in P&ID	No. in drwg.	Description	No. in P&ID	No. in drwg.	Description
1	C	Connection to the blow-off line	2	A3	Stopcock for purging outlet at filter A
3	B3	Stopcock for purging outlet at filter B	4	B	Filter B (right filter)
5	A2	Stopcock for outlet at filter A	6	B2	Stopcock for outlet at filter B
7	T2	Carrier gas outlet connection to the PGC 9301	8	D1	Carrier gas inlet connection from the supply
9	A1	Stopcock for inlet at filter A	10	B1	Stopcock for inlet at filter B
11	A	Filter A (left filter)	12	RM	Rotameter, adjustable

If a pre-filter purging unit is installed in the carrier gas line upstream of the PGC 9301, proceed as follows for initial commissioning and to change the filters:

Procedure for initial commissioning

1. All of the valves are closed. No filters are installed.
2. Install the HE filter at A.
3. Open stopcock A1.
4. Open stopcock A3.
5. Set the rotameter RM to 10 – 15 ml for purging mode. Purge for 24 hours.
6. Close stopcock A3.
7. Open stopcock A2 to put filter A into operation.

Filter change: Use new filter B, filter A is in operation

1. Install the HE filter at B.
2. Open stopcock B1.
3. Open stopcock B3.
4. Set the rotameter RM to 10 – 15 ml for purging mode. Purge for 24 h.
5. Close stopcock B3.
6. Close stopcock A2.
7. Open stopcock B2.
8. Close stopcock A1.
9. Open stopcock A3 to aerate it and close it again
10. Filter A can be removed.

Use new filter B, filter A is in operation:

1. Install the HE filter at B.
2. Open stopcock B1.
3. Open stopcock B3.
4. Set the rotameter RM to 10 – 15 ml for purging mode. Purge for 24 h.
5. Close stopcock B3.
6. Close stopcock A2.
7. Open stopcock B2.
8. Close stopcock A1.
9. Open stopcock A3 to aerate it and close it again
10. Filter A can be removed.

11.3 Repairs

If repair work is necessary, only have it carried out by RMG Messtechnik GmbH or service technicians who are authorised by RMG Messtechnik to avoid the loss of warranty claims due to faulty repairs!

NOTE

Spare parts and accessories

If you install, attach or use spare parts and accessories that are not supplied by RMG, you do so at your own risk. These products have not been tested or approved by RMG and may impair the system's design properties. The manufacturer accepts no liability for damage caused by the use of non-genuine parts or accessories.

For spare parts and repairs, please contact our 'Repairs & Spares' department using the following contact details:

Phone: +49 (0)6033 897-897

Email: repairs-spares@rmg.com

12 Decommissioning, dismantling and disposal

12.1 Decommissioning

If the measuring unit is to be decommissioned for an extended period of time, the device should be shut down.

To do this, it must first of all be disconnected from the power supply. Proceed as follows to do this:

1. Select the **STOP** operating mode in the **Detail** menu on the analysis computer.
   ➡ The ongoing analysis is exited properly first of all, and then the **STOP** status is displayed.
2. Manually close all inlet valves in the gas supply lines.
   ➡ Once the carrier gas pressure has dropped sufficiently, the software automatically reduces the column temperatures to 30°C and switches off the thermal conductivity detectors. The change in column temperature can be observed in the analysis computer's **Status** menu.
3. Once the column temperatures have dropped sufficiently, switch off the analysis unit or disconnect it from the power supply.
4. If possible, the measuring unit should continue to be supplied with carrier gas during the shutdown period. To do this, open the associated inlet valve again after switching off the measuring unit.
5. If this is not possible, seal the exhaust lines with a dummy plug so that they are gas-tight and keep them sealed until recommissioning.

The PGC 9301 must be prepared accordingly for a longer storage period. Please observe the information in section 5.3 "Storing the PGC 9301".

NOTE

Measures for recommissioning

- ▶ Be sure to remove the dummy plugs from the exhaust lines! Otherwise, excessive pressure will build up in the analysis unit, leading to irreparable damage!
- ▶ Observe the information from section 8.2 "Carrying out commissioning" for recommissioning. In particular, observe the required purging intervals.

12.2 Dismantling

⚠ DANGER

Danger of death due to electrical voltage

The device must be switched off or disconnected from the mains before carrying out any dismantling work. Failure to do so may result in serious injury or even death.

- ▶ Switch off the power supply to the device and disconnect it from the mains before commencing any work.
- ▶ Only carry out work on the device that is described in this manual. Ensure that the device is not energised while work is being carried out.

A prerequisite for dismantling is that the Process gas chromatograph PGC 9301 has been decommissioned as described in work steps 1 – 3 in section 12.1 . Please proceed as follows to further dismantle the device:

1. Disconnect the gas supply lines at the measuring unit's compression fittings.
2. Disconnect the connection cables in the Ex e junction box.
3. Loosen the wall or floor fixing screws.
4. Remove the device from its position.

12.3 Disposal

Dispose of device components and packaging materials in an environmentally friendly manner and in accordance with the respective waste treatment and national disposal regulations and standards of the region or country that the device is delivered to.

The following applies within the EU:

Devices that are no longer required must, in accordance with EU Directive
2012/19/EU or the German Electrical and Electronic Equipment Act (ElektroG), be sent for recycling at a recycling centre.

The device must not be disposed of together with household waste!

13 Technical data

The complete ‘Process gas chromatograph PGC 9301’ system always consists of the measuring unit (PGC 9301 Core) and the evaluation unit or analysis computer (GC 9300). However, only the measuring unit’s data is listed below.

For the data of the GC 9300 analysis computer, please refer to the associated operating manual, which you can download from our website at www.rmg.com.

PGC 9301 measuring unit	
Wall-mounted variant	
Dimensions	■ 450 mm x 1,004 mm x 265 mm (W x H x D)
Weight	■ Approx. 67 kg
Floor-mounted variant	
Dimensions	■ 450 mm x 1,850 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)
Measuring unit and cylinder rack	The calibration gas certificate specifies a minimum temperature for storage and operation. The temperature should not fall below this specified value.
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.			

Annex A – Declaration of Conformity

NOTE

EU Declaration of Conformity

The listed Declaration of Conformity reflects the status as at the operating manual issue date. The latest version of the EU Declaration of Conformity is available on our website at www.rmg.com.

EU-Declaration of Conformity
EU-Konformitätserklärung

CE

We / *Wir*: **RMG Messtechnik GmbH**
Otto – Hahn – Straße 5
35510 Butzbach
Germany

Declare under our sole responsibility that the product is in conformity with the directives. Product is labeled according to the listed directives and standards and in accordance with the Type-Examination.
Erklären in alleiniger Verantwortung, dass das Produkt konform ist mit den Anforderungen der Richtlinien. Das entsprechend gekennzeichnete Produkt ist nach den aufgeführten Richtlinien und Normen hergestellt und stimmt mit dem Baumuster überein.

Product: **Process Gas Chromatograph Type PGC 9301**
Produkt: ***Prozess-Gaschromatograph Typ PGC 9301***

Harmonisation Legislations *Harmonisierungsrechtsvorschriften*	EMV	ATEX
EU- Directives *EU-Richtlinie*	2014/30/EU	2014/34/EU
Marking *Kennzeichen*	---	Ex II 2G Ex db eb IIB+H_2 T5/T4 Gb
Normative Documents *Normative Dokumente*	EN 61326-1:2006 IEC 61000-4-2: 1995 IEC 61000-4-3: 2002 IEC 61000-4-4: 2004 IEC 61000-4-5: 1995 IEC 61000-4-6: 2003 IEC 61000-4-8: 1993	EN IEC 60079-0: 2018 EN 60079-1: 2014 EN IEC 60079-7: 2015 + A1: 2018
EC Type-Examination issued by *EG-Baumusterprüfung ausgestellt durch*	Prüfbericht / Test Report: FS-1104-173643-001 (Nemko GmbH)	Modul B DMT 00 ATEX E 001
Approval of a Quality System by *Anerkennung eines Qualitätssicherungssystems durch*	---	Modul D BVS 23 ATEX ZQS/E139 Notified Body: 0158 DEKRA Testing and Certification GmbH

RoHS 2011/65/EU

The object of the declaration described above is in conformity with Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.
Der oben beschriebene Gegenstand der Erklärung erfüllt die Vorschriften der Richtlinie 2011/65/EU des Europäischen Parlaments und des Rates vom 8. Juni 2011 zur Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten.

RMG Messtechnik GmbH
Butzbach, den 05.01.2026

Thorsten Dietz
(CEO)

i.V. Sascha Körner
(Technical Manager)

Sitz der Gesellschaft Butzbach • **Registergericht Friedberg** HRB 2535
Geschäftsführung Thorsten Dietz
Qualitätsmanagement DIN EN ISO 9001:2015

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Space for notes

ONE STEP AHEAD

Subject to change without notice!

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Additional information

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